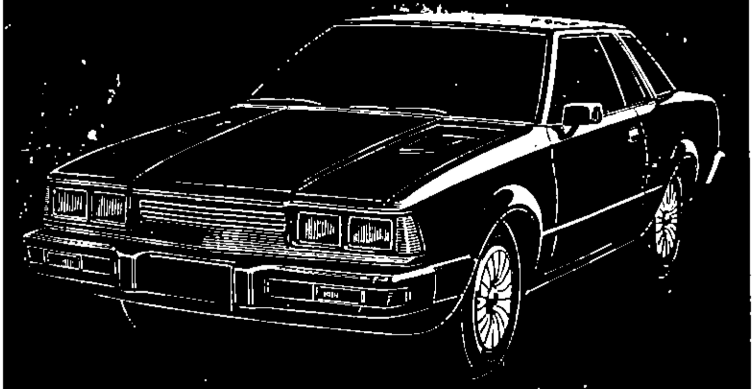


DATSUN

1980
DATSUN
200SX

SERVICE MANUAL

THE NAME OF QUALITY
NISSAN
NISSAN MOTOR CO., LTD.

DATSUN
200SX

Model
S110 Series

FOREWORD

This service manual has been prepared primarily for the purpose of assisting service personnel in providing effective service and maintenance of the 1980 DATSUN 200SX.

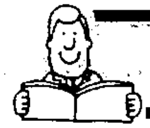
This manual includes procedures for maintenance, adjustments, removal and installation, disassembly and assembly of components, and trouble-shooting

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.

QUICK REFERENCE INDEX



HOW TO USE THIS MANUAL

- This Service Manual is designed as a guide for servicing cars.

- This manual is divided into **19** sections. The first half of the manual presents sections which concern the engine, and the second half presents sections which deal with the chassis and body.

- 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.
  2395 Cawthra
  Mississauga, Ontario
  Canada L5A 3P2

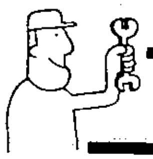
- The measurements given in this manual are primarily expressed with the SI unit (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

- 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.

DATSUN 200SX **Model S110 Series**

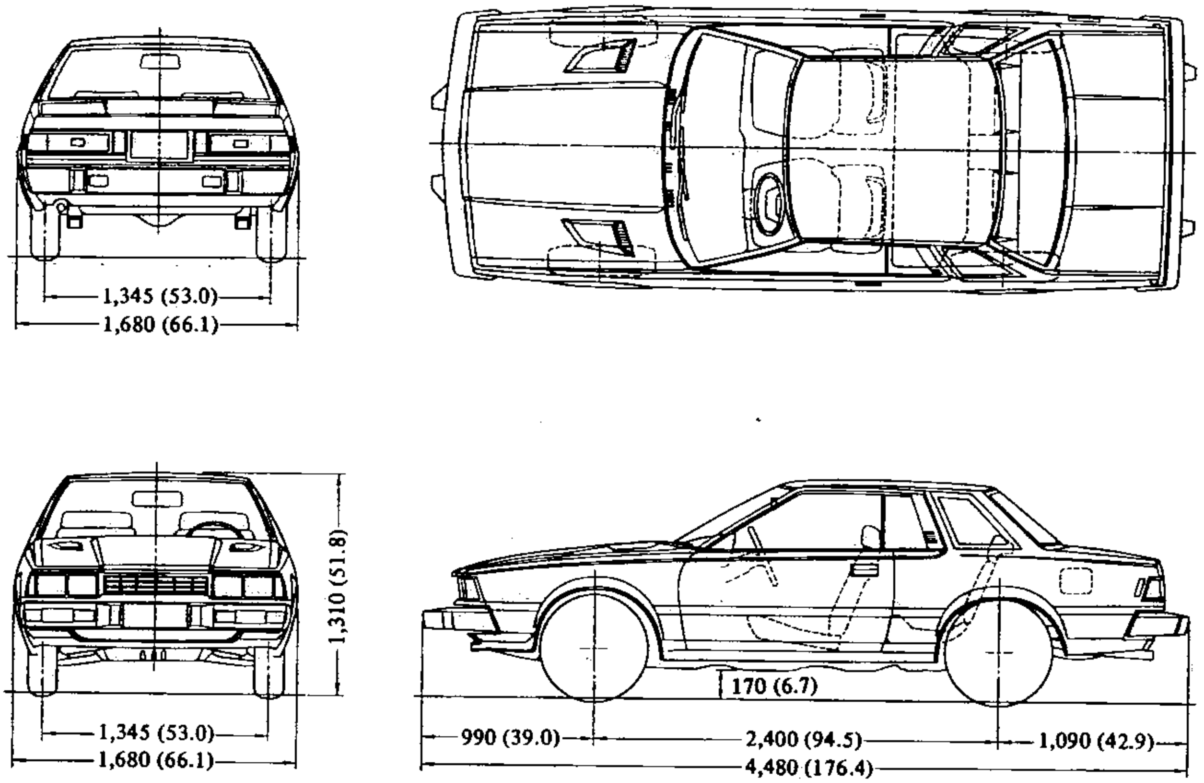
SECTION GI

GENERAL INFORMATION

CONTENTS

GENERAL VIEWS

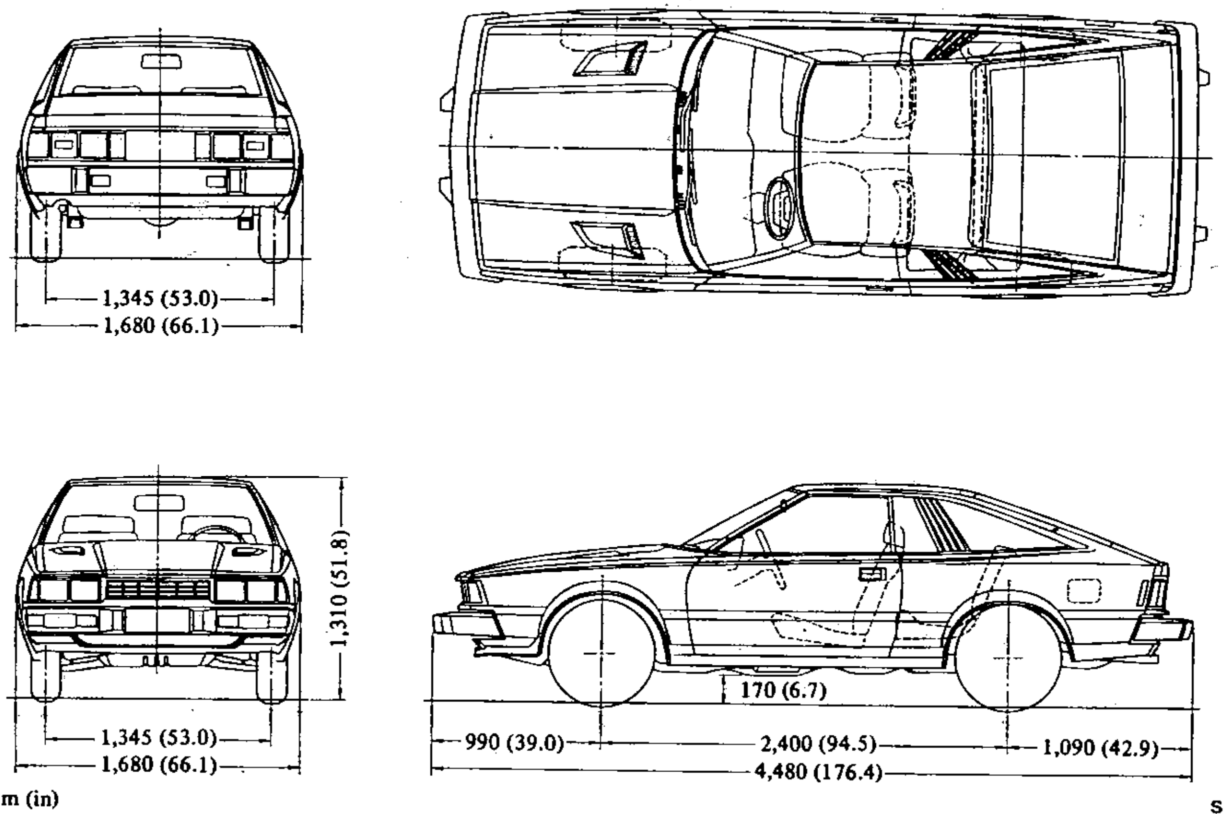
Hardtop



Unit: mm (in)

SGI002

Hatchback



Unit: mm (in)

SGI003

MODEL VARIATION

Destination	Class	Model		Engine	Transmission	Differential carrier	Road wheel Size .... Offset mm (in)	Tire size
U.S.A.	Hardtop	California	PLS110FEV	Z20E	FS5W71B	H165B	5J-14 .... 25 (0.98)	185/70-SR14
			PLS110AEV		3N71B			
	Hatchback		KPLS110FEV		FS5W71B			
			KPLS110AEV		3N71B			
	Hardtop	Non-California	PLS110FEU		FS5W71B		*1 5-1/2JJ-14 ..... 25 (0.98)	185/70-SR14
			PLS110AEU		3N71B			
	Hatchback		KPLS110FEU		FS5W71B			
			KPLS110AEU		3N71B			
Canada	Hardtop		PLS110FEN		FS5W71B		*2 4-T x 16 .... 35 (1.38)	T135/70D16*2
			PLS110AEN		3N71B			
	Hatchback		KPLS110FEN		FS5W71B			
			KPLS110AEN		3N71B			

*1: Aluminum wheel (Option)
*2: Spare tire

Prefix and suffix designations:

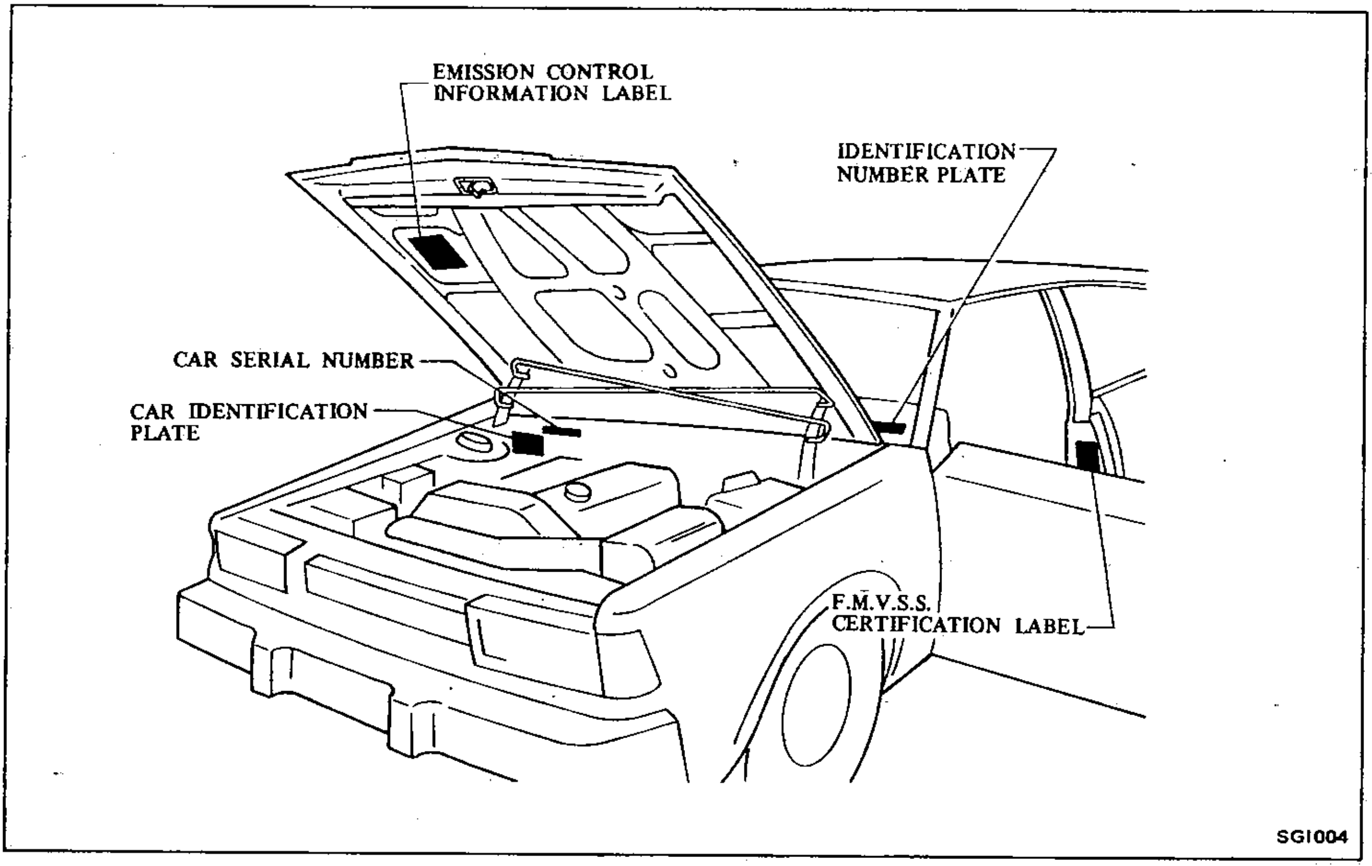
K P L S110 F E U C L R P S T

K : Hatchback
□ : Hardtop
P : Z20 engine
L : Left-hand drive

T : Sun roof (Glass)
S : Sport Luxury model
P : Power steering
R : Sun roof (Steel)
L : Rear window wiper
C : Air conditioner
U : Non-California model for U.S.A.
V : California model
N : Canada model
E : E.F.I.
F : Manual transmission
A : Automatic transmission

□: means no indication

IDENTIFICATION NUMBER



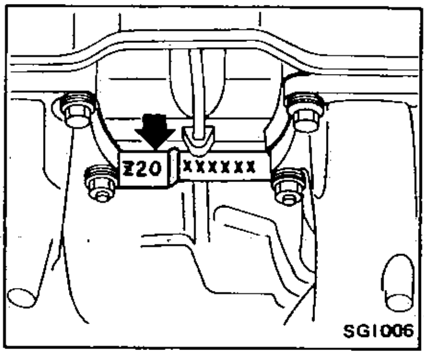
CAR SERIAL NUMBER

K P S110 - X X X X X X

- Hatchback — K
- Z20 engine — P
- Model — S110
- Car serial number — XXXXXX

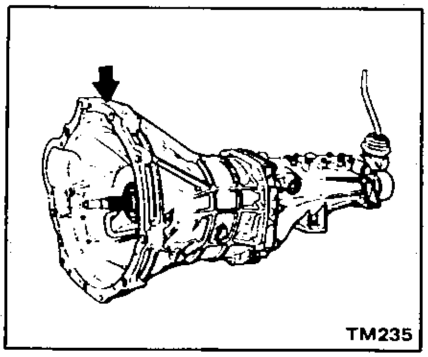
ENGINE SERIAL NUMBER

The engine serial number is stamped on the left side of the cylinder block.



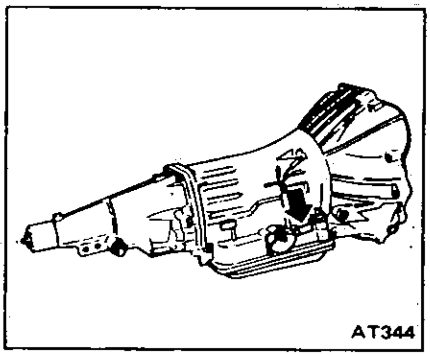
MANUAL TRANSMISSION NUMBER

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

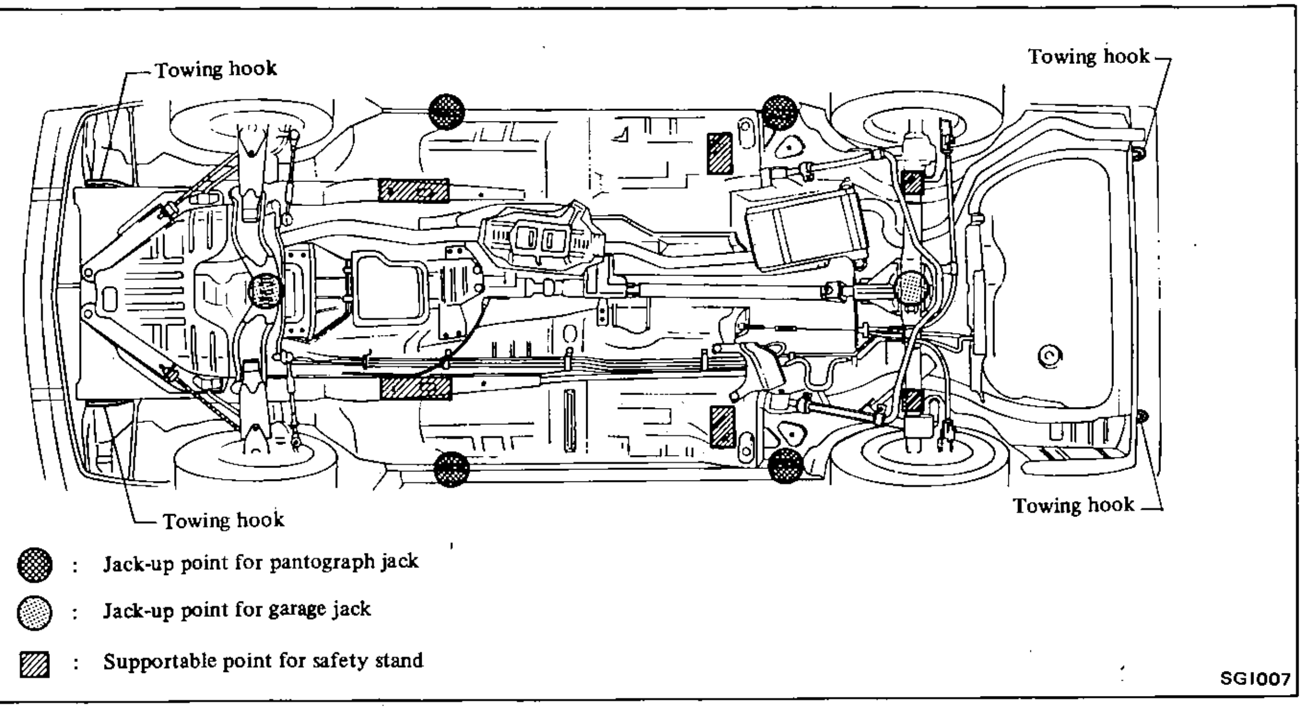


AUTOMATIC TRANSMISSION NUMBER

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



LIFTING POINTS AND TOWING



PANTOGRAPH JACK

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. Place wheel chocks at both 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.

GARAGE JACK AND SAFETY STAND

WARNING:

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

b. When jacking up the rear (front) of the car, place the chocks at the front (rear) of the front (rear) wheels to hold them.

CAUTION:

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

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

TIE-DOWN

FRONT SIDE

Use front towing hooks for tie-down.

REAR SIDE

Use rear towing hooks for tie-down.

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.

c. Before towing, make sure that the transmission, axles, steering system and power train are in good order. If any unit is damaged, a dolley must be used.

d. If the transmission is inoperative, tow the car with the rear wheels off the ground, or with the propeller shaft removed.

e. 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.

f. When towing an automatic transmission model on its rear wheels, do not exceed 30 km/h (20 MPH) and a distance of 30 km (20 miles).

g. Release the parking brake and set the gearshift lever in "Neutral" position before starting to tow the car.

SPECIAL SERVICE TOOLS

Special Tools play very important role in the maintenance of cars. These are essential to the safe, accurate and speedy servicing.

The working times listed in the column under FLAT RATE TIME in FLAT RATE SCHEDULE are computed based on the use of Special 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 Tool
KV00000000: Special Tool
EM00000000: Engine Overhauling Machine
GG00000000: General Gauge
LM00000000: Garage Tool
HT00000000: Hand Tool

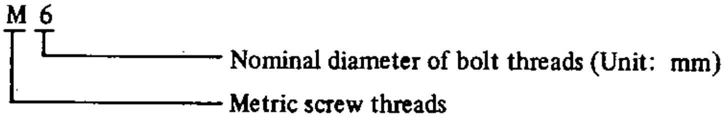
TIGHTENING TORQUE OF STANDARD BOLT

Grade	Bolt or nut size	Bolt or nut diameter* mm	Pitch mm	Tightening torque N·m (kg-m, ft-lb)
4T	M6	6.0	1.0	2.9 - 3.9 (0.3 - 0.4, 2.2 - 2.9)
	M8	8.0	1.25	7.8 - 10.8 (0.8 - 1.1, 5.8 - 8.0)
			1.0	7.8 - 10.8 (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	5.9 - 6.9 (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	7.8 - 10.8 (0.8 - 1.1, 5.8 - 8.0)
	M8	8.0	1.25	19 - 25 (1.9 - 2.5, 14 - 18)
			1.0	20 - 27 (2.0 - 2.8, 14 - 20)
	M10	10.0	1.5	36 - 50 (3.7 - 5.1, 27 - 37)
			1.25	39 - 51 (4.0 - 5.2, 29 - 38)
	M12	12.0	1.75	65 - 88 (6.6 - 9.0, 48 - 65)
			1.25	72 - 97 (7.3 - 9.9, 53 - 72)
	M14	14.0	1.5	109 - 147 (11.1 - 15.0, 80 - 108)

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

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter



DATSUN 200SX Model S110 Series

SECTION MA

MAINTENANCE

CONTENTS

MAINTENANCE SCHEDULE

The following tabels 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.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL							Reference page
Periodic maintenance should be performed at number of kilometers, miles or months, whichever comes first.	Kilometers x 1,000	1.6	12	24	36	48	60	72	
	(Miles x 1,000)	(1)	(7.5)	(15)	(22.5)	(30)	(37.5)	(45)	
	Months	—	6	12	18	24	30	36	

EMISSION CONTROL MAINTENANCE (CALIFORNIA)

Intake & exhaust valve clearance		Ⓐ		Ⓐ		Ⓐ		Ⓐ	MA- 6
Drive belts		A		I		Ⓘ		I	MA- 6
Engine oil & oil filter	See NOTE: (1)		R*	R*	R*	R*	R*	R*	MA- 7
Engine coolant						R*			MA- 8
Idle rpm		Ⓐ							MA-12
Fuel filter	See NOTE: (3)								MA-13
Fuel lines (hoses, piping, connections, etc.)						I*			MA-13
Air cleaner filter	See NOTE: (2)					Ⓡ			MA-14
Spark plugs						Ⓡ			MA- 9
Ignition wiring						I			MA- 9
Air induction valve filter	See NOTE: (2)					R*			MA-14
Vapor lines						I			MA-14

Abbreviations: A = Adjust R = Replace
I = Inspect, correct, replace if necessary

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 the vehicle 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.
(4) Ⓘ, Ⓡ and Ⓐ are the maintenance intervals required by California Regulations. Ⓡ limits the warranty coverage to these replacement intervals. I* and R* are the required maintenance intervals.
Other maintenance items and intervals are recommended by NISSAN MOTOR CO., LTD.

EMISSION CONTROL MAINTENANCE (NON-CALIFORNIA)

Intake & exhaust valve clearance		A		A		A		A	MA- 6
Drive belts		A		I		I		I	MA- 6
Engine oil & oil filter	See NOTE: (5)		R	R	R	R	R	R	MA- 7
Engine coolant						R			MA- 8
Idle rpm & mixture ratio	Idle rpm	A		A		A		A	MA-10
	Mixture ratio	I		I		I		I	MA-10
*Fuel filter	See NOTE: (7)								MA-13
Fuel lines (hoses, piping, connections, etc.)						I			MA-13
Air cleaner filter	See NOTE: (6)					R			MA-14
Ignition timing				A		A		A	MA-10
Spark plugs						R			MA- 9
*Ignition wiring						I			MA- 9
Air induction valve filter (except Canada)	See NOTE: (6)					R			MA-14
*Vapor lines						I			MA-14

Abbreviations: A = Adjust R = Replace
I = Inspect, correct, replace if necessary

(5) 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.
(6) More frequent maintenance is required under dusty driving conditions.
(7) If the vehicle 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.
(8) Maintenance items with "*" are recommended by NISSAN MOTOR CO., LTD.
Other maintenance items are required.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL							Reference page
Periodic maintenance should be performed at number of kilometers, miles or months, whichever comes first.	Kilometers x 1,000	1.6	12	24	36	48	60	72	
	(Miles x 1,000)	(1)	(7.5)	(15)	(22.5)	(30)	(37.5)	(45)	
	Months	–	6	12	18	24	30	36	
UNDERHOOD MAINTENANCE									
Brake, clutch, steering gear & automatic transmission fluid or oil level & leaks				I		I		I	MA-23, 24, 28, 33
Brake fluid				R		R		R	MA-28
Brake booster vacuum hoses, connections & check valve						I			MA-28
Air conditioning system hoses, connections & refrigerant leaks						I			MA-37
Power steering fluid & lines				I		I		I	MA-33
UNDER VEHICLE MAINTENANCE									
Brake, clutch, fuel & exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.				I		I		I	MA-23, 28
Manual transmission & differential gear oil	See NOTE: (9)			I		I		I	MA-23, 24
Steering gear box & linkage, suspension parts & propeller shaft for damaged, loose & missing parts	See NOTE: (10)	I		I		I		I	MA-24, 27, 34
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-26, 30 32
Disc brake pads & other brake components for wear, deterioration & leaks	See NOTE: (11)			I		I		I	MA-28
Front wheel bearing						I			MA-25
Locks, hinges & hood latch	See NOTE: (11)			L		L		L	MA-35
Seat belts, buckles, retractors, anchors & adjuster				I		I		I	MA-35
Foot brake, parking brake & clutch for stroke, free play & operation				I		I		I	MA-23, 28

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

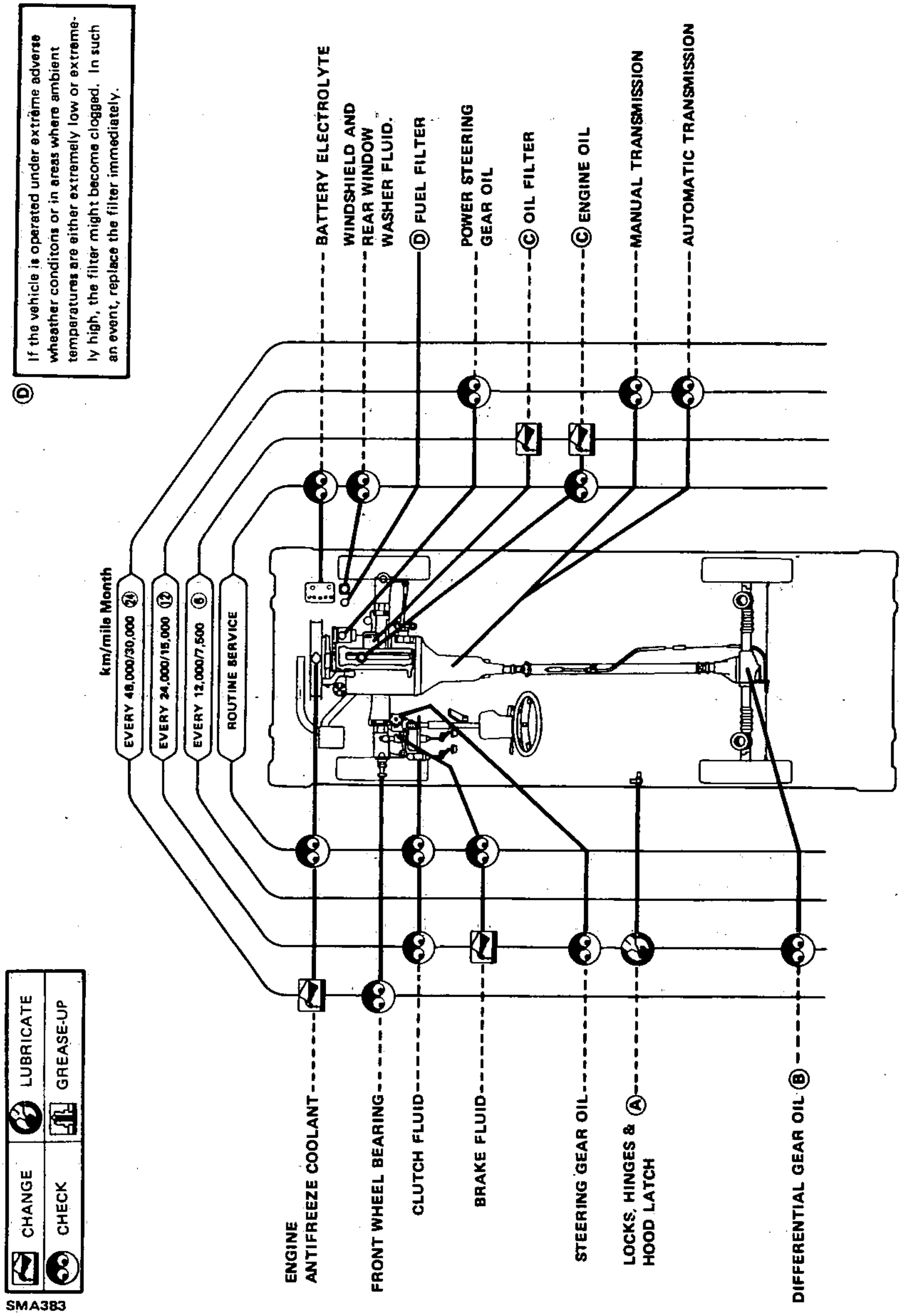
NOTE: (9) When towing a trailer, change oil in differential gear every 48,000 km (30,000 miles) or 24 months, whichever comes first.

(10) Steering linkage & front suspension ball joint inspection should be performed every 96,000 km (60,000 miles) or 4 years, whichever comes first.

(11) 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 vehicle usage, additional or more frequent maintenance may be required.

LUBRICATION CHART



Ⓓ If the vehicle is operated under extreme adverse wheather conditons 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.

Ⓒ 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.

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

Ⓐ 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.

RECOMMENDED FUEL AND LUBRICANTS

FUEL

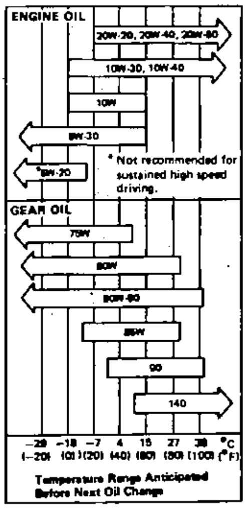
Use an unleaded gasoline only of at least 91 research octane number (Anti-knock index 87).

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 and steering	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	Hardtop	53	14 gal	11-5/8 gal
	Hatchback	60	15-7/8 gal	13-1/4 gal
Coolant	With heater	9.5	10 qt	8-3/8 qt
	Without heater	8.8	9-1/4 qt	7-3/4 qt
Engine	With oil filter	4.1	4-3/8 qt	3-5/8 qt
	Without oil filter	3.9	4-1/8 qt	3-3/8 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		1.1	2-3/8 pt	2 pt
Power steering system		1.2	1-1/4 qt	1-1/8 qt
Steering gear		0.28	5/8 pt	1/2 pt
Windshield washer tank		2.0	2-1/8 qt	1-3/4 qt
Rear window washer tank		1.0	1-1/8 qt	7/8 qt
Air conditioning system	Compressor oil	0.27	9.1 fl oz, 9.0 oz	9.5 fl oz, 9.0 oz
	Refrigerant	0.9 - 1.1 kg	2.0 - 2.4 lb	2.0 - 2.4 lb

ENGINE MAINTENANCE

BASIC MECHANICAL SYSTEM

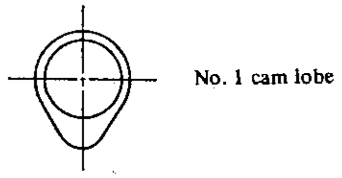
ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

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.

Valve clearance adjustment cannot be made while engine is in operation.

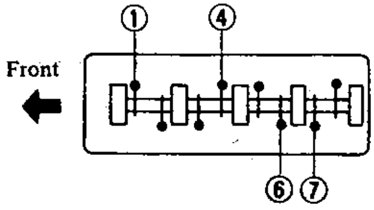
2. Remove valve rocker cover.
3. Set so that high point of No. 1 cam lobe points down.



SMA005

When turning crankshaft with starter, remove high tension cable from ignition coil, then turn it.

Adjust clearance of half of the valves. Adjust only ①, ④, ⑥, and ⑦ valves.

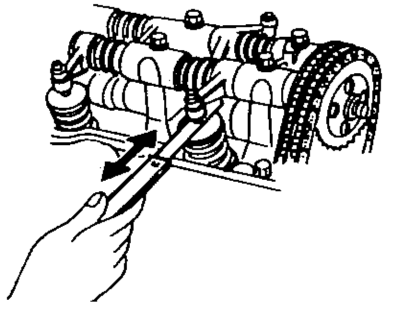


SMA049

Valve clearance (Hot)
Intake . . . ① ④ : 0.30 mm
(0.012 in)
Exhaust. . ⑥ ⑦ : 0.30 mm
(0.012 in)

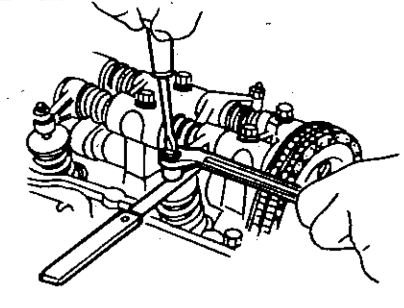
(1) Using feeler gauge, measure clearance between valve stem end and rocker arm screw.

Feeler gauge should move with a very slight drag.



SMA050

(2) If the clearance is not within specified value, loosen rocker arm nut and turn rocker arm screw to provide proper clearance.
(3) Hold rocker arm screw and tighten rocker arm nut.

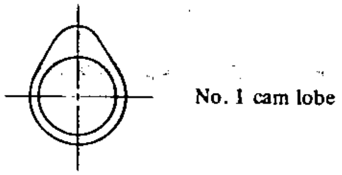


SMA051

Ⓣ: Rocker arm nut
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

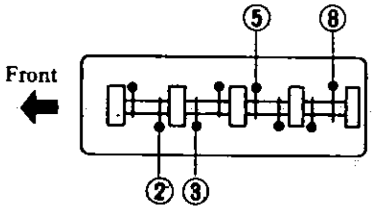
(4) Recheck clearance.

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



SMA001

Adjust ②, ③, ⑤ and ⑧ valves, using same procedure as for Step 3.



SMA052

Valve clearance (Hot)
Intake . . . ⑤ ⑧ : 0.30 mm
(0.012 in)
Exhaust. . ② ③ : 0.30 mm
(0.012 in)

5. Install valve rocker cover.

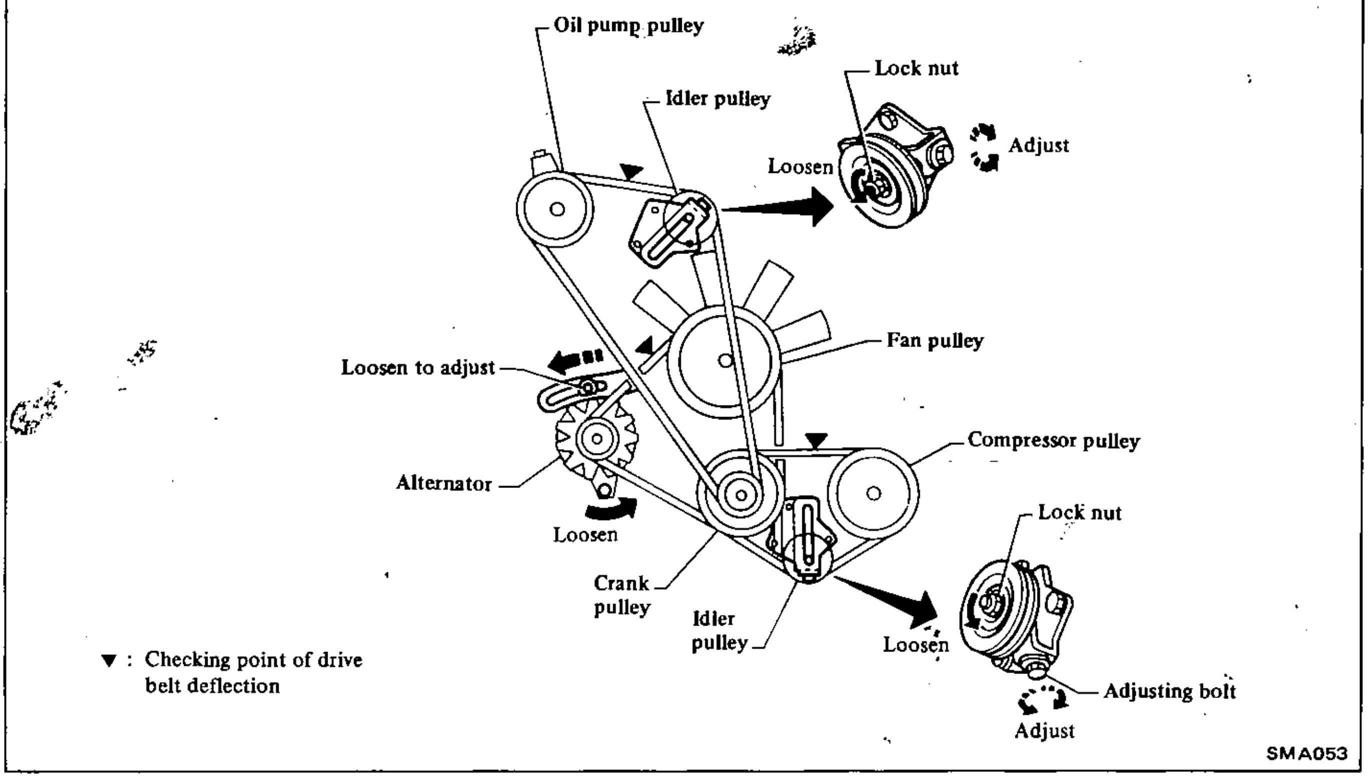
CHECKING AND ADJUSTING DRIVE BELTS

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.

Drive belt deflection:
8 - 12 mm
(0.31 - 0.47 in)
Applied pressing force:
98 N (10 kg, 22 lb)



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 within the specified range. Then tighten the bolts securely.

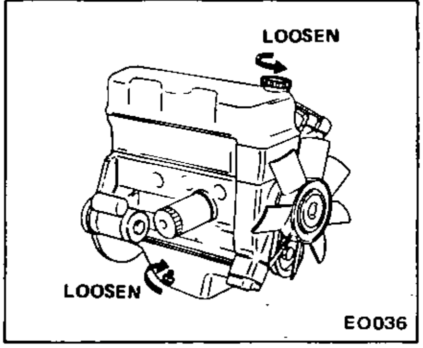
Air conditioner compressor and power steering oil pump belts

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

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 pan drain plug and oil filler cap, and allow oil to drain.

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

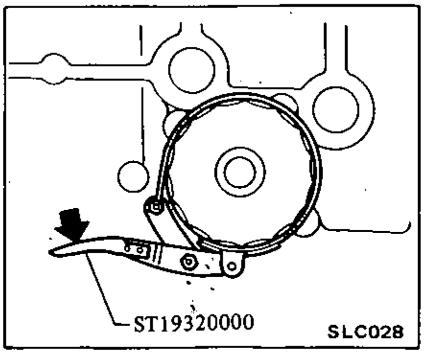


- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.**
- **An oil with extremely low viscosity indicates dilution with gasoline.**

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

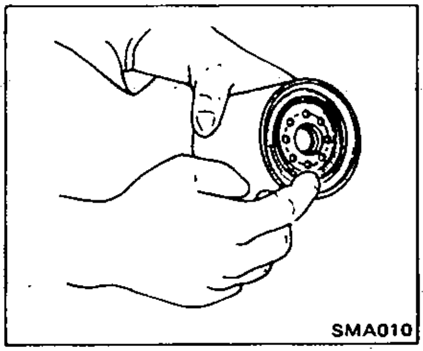
Ⓣ : Oil pan drain plug
20 - 29 N·m
(2.0 - 3.0 kg-m,
14 - 22 ft-lb)

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 filter.



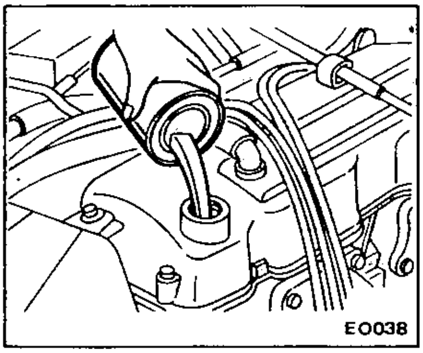
SMA010

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

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

Check oil level with dipstick.

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



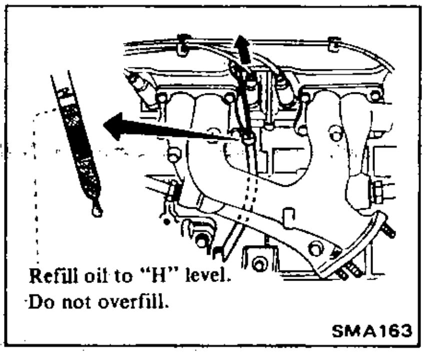
E0038

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 it reaches operating temperature. Then turn it off and wait several minutes. Check oil level. If necessary, add engine oil.

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



Refill oil to "H" level.
Do not overfill.

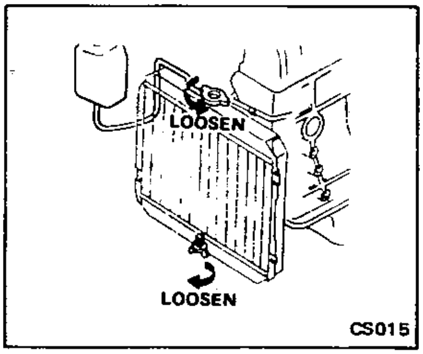
SMA163

CHANGING ENGINE COOLANT

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

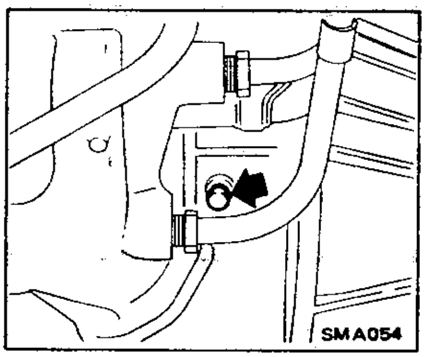
When changing engine coolant, on heater equipped models, set heater "TEMP" control lever at fully "HOT" position.

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



CS015

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



SMA054

3. Drain coolant completely. Then flush cooling system.

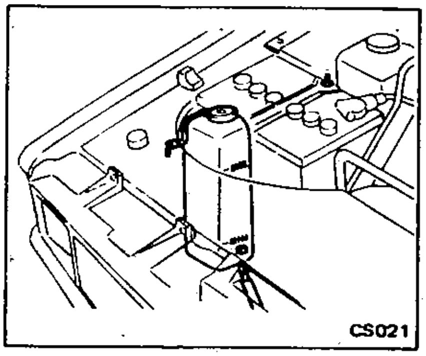
4. Close drain cock and plug.

5. Fill radiator with coolant up to filler opening, observing instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Cooling water capacity:
9.5 liters (10 US qt, 8-3/8 Imp qt)

6. Run engine for a few minutes. If necessary, add coolant.

7. Fill reservoir tank with coolant up to "MAX" level.



CS021

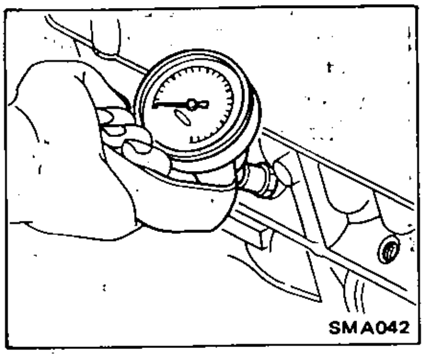
8. Install radiator cap.

Check drain valve and plug for any sign of leakage.

CHECKING ENGINE COMPRESSION PRESSURE

1. Warm up engine until water temperature indicator points to the middle of gauge.

2. Remove all spark plugs (on one side for California models).
3. Disconnect all harness connectors at injector.
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:
kPa (kg/cm^2, psi)/at rpm
Standard
1,177 (12.0, 171)/350
Minimum
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.

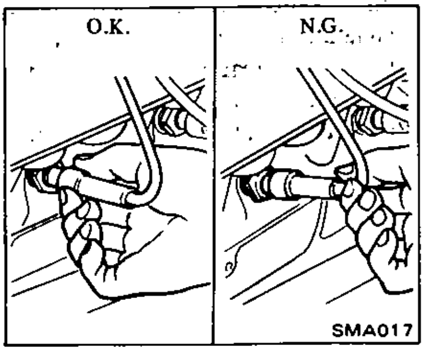
- **If adding oil helps the compression pressure**, chances are that piston rings are worn or damaged.
- **If pressure stays low**, valve may be sticking or seating improperly.
- **If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression**, there is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

  Oil and water in combustion chambers can result from this problem.

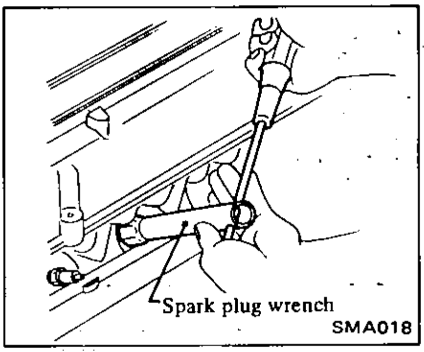
IGNITION AND FUEL SYSTEM

REPLACING SPARK PLUGS

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

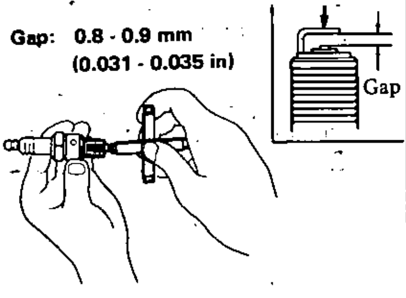


2. Remove spark plugs with spark plug wrench.



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

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



Gap: 0.8 - 0.9 mm
(0.031 - 0.035 in)

SPARK PLUG:

	Standard	Resistor built-in type
Standard type	BP6ES	BPR6ES
Hot type	BP5ES	BPR5ES
Cold type	BP7ES	BPR7ES

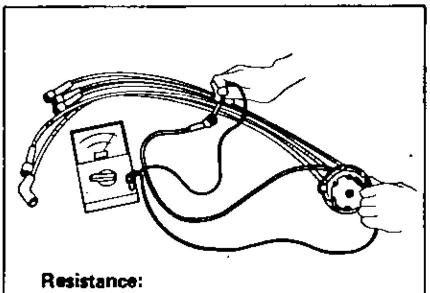
4. Install new spark plugs and reconnect high tension cables.

All cables are marked to identify their original locations.

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

CHECKING IGNITION WIRING

1. Visually check wiring 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.



Resistance:
Less than 30,000 ohms

Shake the wire while measuring resistance to check for intermittent brakes.

3. If the resistance is more than the limit, remove cable from cap and check the cable resistance only.

If resistance is still more than the limit, replace cable assembly.

ADJUSTING IDLE RPM, ADJUSTING IGNITION TIMING AND CHECKING MIXTURE RATIO (Non-California models)

Preparation

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

- Battery
- Ignition system
- EFI harness connectors
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge etc.)

2. Connect engine tachometer and timing light in their proper positions.

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

4. On automatic transmission equipped models, checks should be carried out while shift lever is in "D" position.

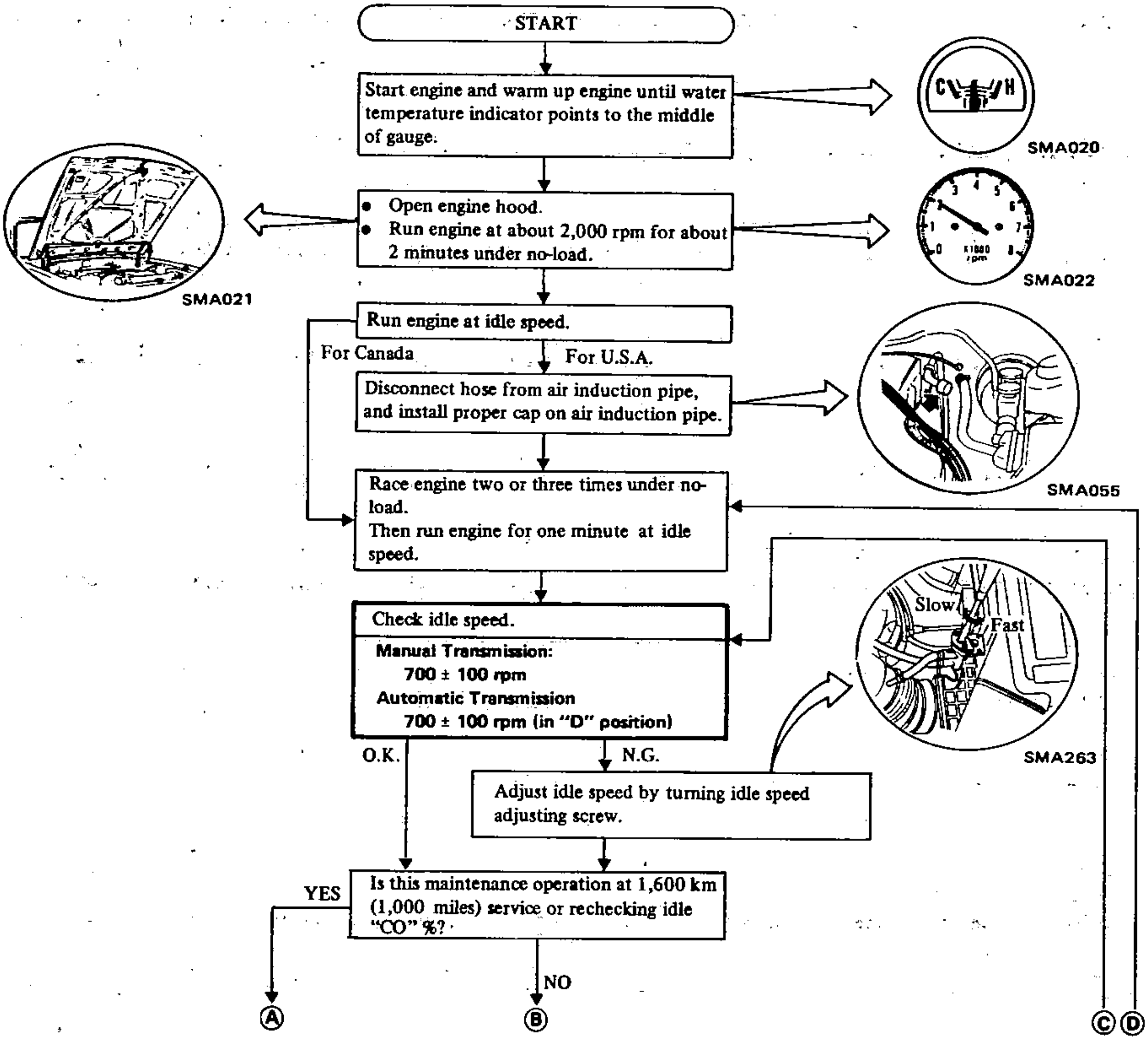
WARNING:

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

b. When racing engine on automatic transmission equipped models, make sure that shift lever is in "N" or "P" position and depress brake pedal 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



START

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

- Open engine hood.
- Run engine at about 2,000 rpm for about 2 minutes under no-load.

Run engine at idle speed.

For Canada

For U.S.A.

Disconnect hose from air induction pipe, and install proper cap on air induction pipe.

Race engine two or three times under no-load.
Then run engine for one minute at idle speed.

Check idle speed.

Manual Transmission:
700 ± 100 rpm
Automatic Transmission
700 ± 100 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning idle speed adjusting screw.

Is this maintenance operation at 1,600 km (1,000 miles) service or rechecking idle "CO" %?

YES

NO

Ⓐ

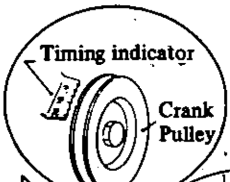
Ⓑ

Ⓒ Ⓓ

Ⓐ Ⓑ

Check ignition timing with timing light.

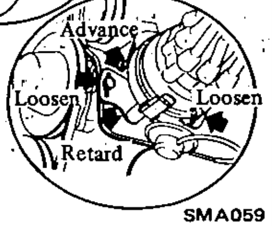
8 ± 2° B.T.D.C.



SMA028

N.G.

Adjust ignition timing by turning distributor after loosening bolts which secure distributor.



SMA059

Ⓒ Ⓓ

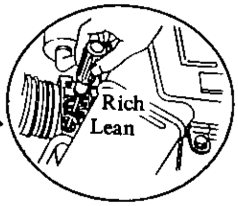
O.K.

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

Check "CO"% with "CO"-meter.

1.3 ± 1%

N.G.



SMA061

Adjust "CO"% by turning air by-pass screw on air flow meter.
When adjusting "CO"%, remove blind plug from air by-pass screw.
After adjustment, install the plug on air flow meter.

O.K.

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

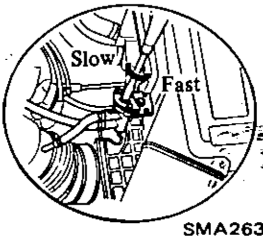
Start engine.

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

Check idle speed.

Manual Transmission:
700 ± 100 rpm
Automatic Transmission:
700 ± 100 rpm (in "D" position)

N.G.



SMA263

Adjust idle speed by turning idle speed adjusting screw.

O.K.

END

Note:

a. When measuring "CO" %, insert probe into tail pipe more than 0.4 m (16 in).
b. Use "CO"-meter after engine is fully warmed up.
c. When adjusting idle "CO" % at high altitude, adjust to obtain following values.

Unit: m (ft)

Altitude	Idle CO%
600 - 1,200 (2,000 - 4,000)	2.7%
1,200 - 1,800 (4,000 - 6,000)	3.8%
Above 1,800 (6,000)	5.0%

ADJUSTING IDLE RPM (California models)

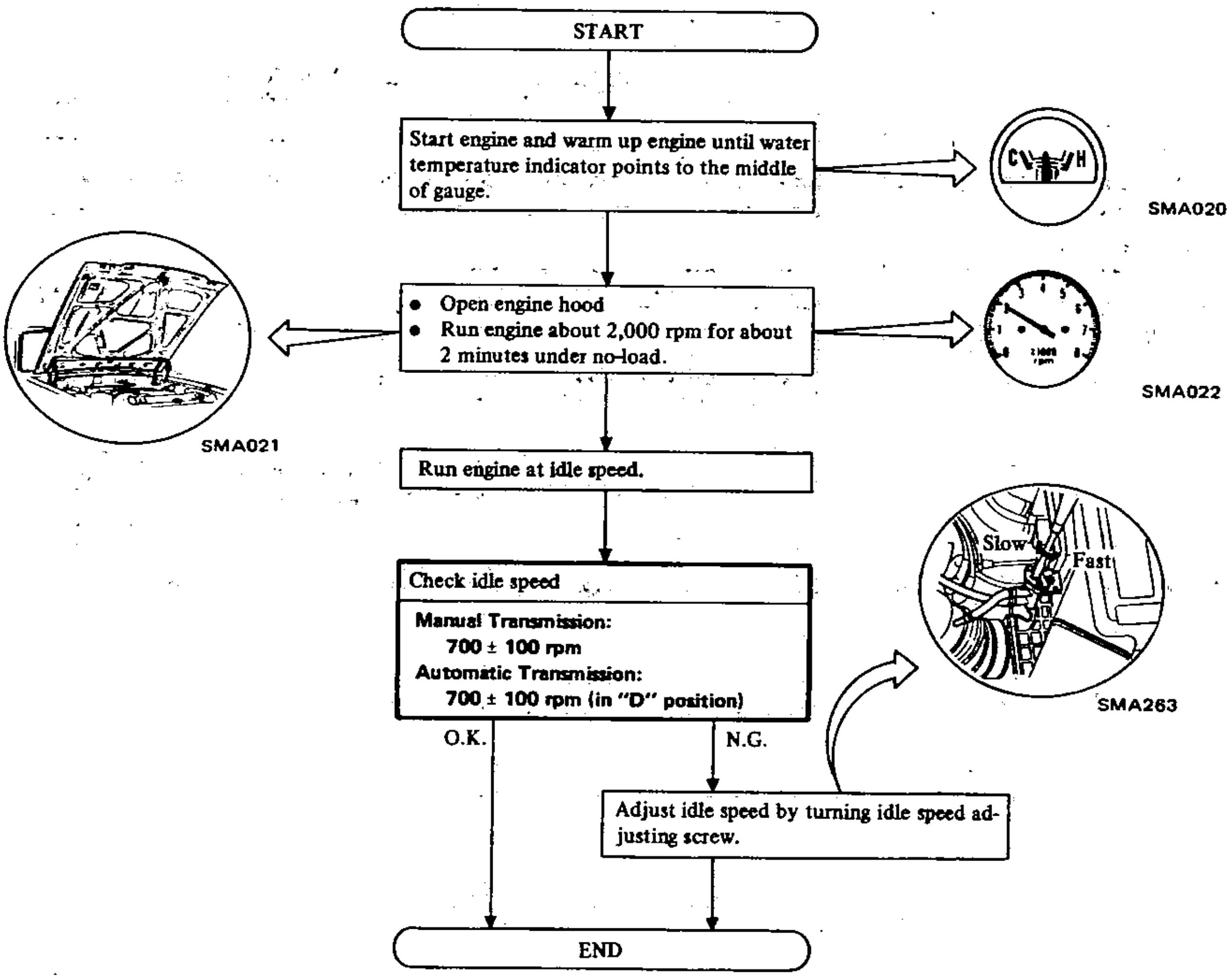
Preparation

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. When racing engine on automatic transmission equipped models, make sure that shift lever is in "N" or "P" position and depress brake pedal 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



START

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

- Open engine hood
- Run engine about 2,000 rpm for about 2 minutes under no-load.

Run engine at idle speed.

Check idle speed

Manual Transmission:
700 ± 100 rpm
Automatic Transmission:
700 ± 100 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning idle speed adjusting screw.

END

SMA020

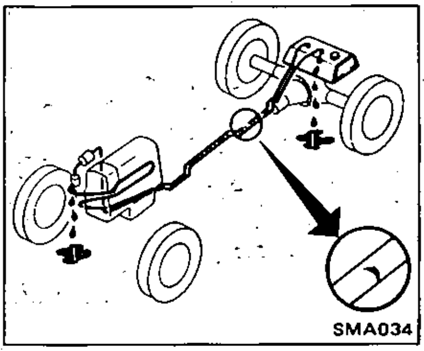
SMA021

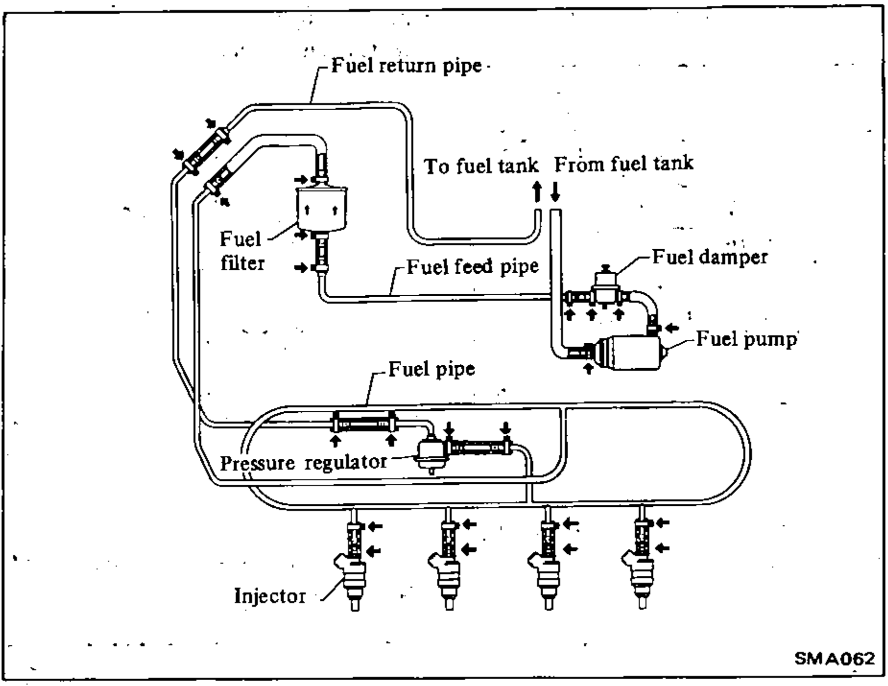
SMA022

SMA263

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.

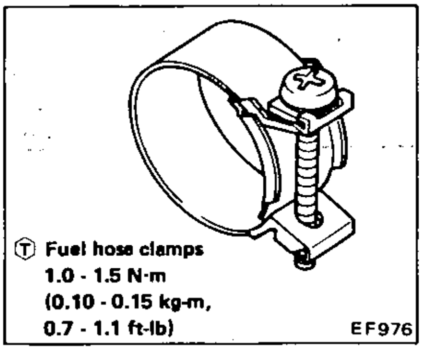




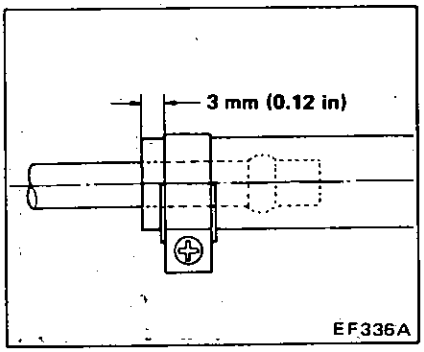
CAUTION:

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.



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



REPLACING FUEL FILTER

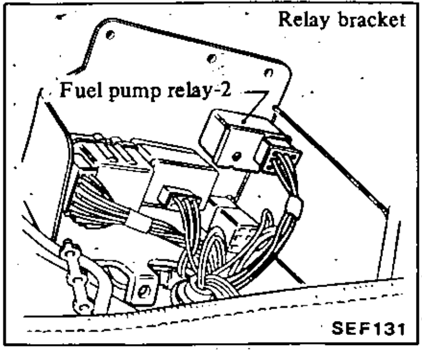
The fuel filter is designed especially for use with the EFI system. It should be replaced as an assembly.

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) Disconnect fuel pump relay-2 harness connector with engine running.



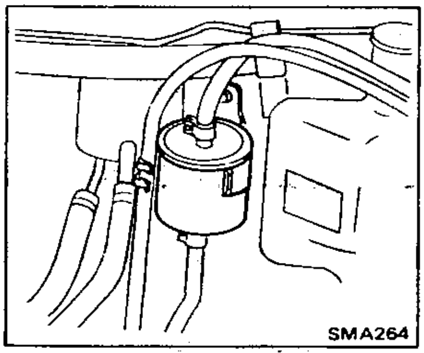
(3) After engine stall, crank the engine twice or three times.

(4) Turn ignition switch off and connect fuel pump relay-2 harness 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

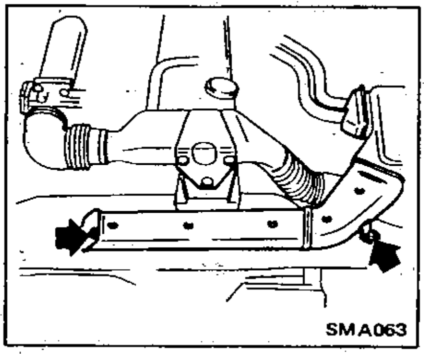


4. To install fuel filter, reverse the order of removal.

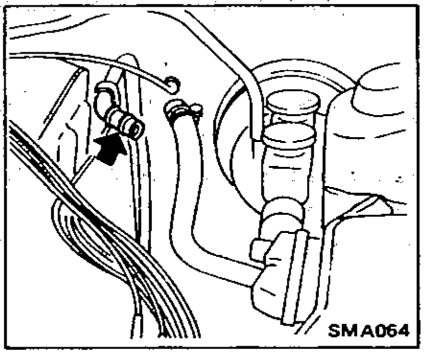
REPLACING AIR CLEANER FILTER

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

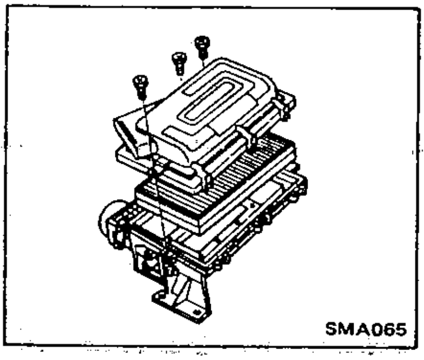
1. Disengage air duct.



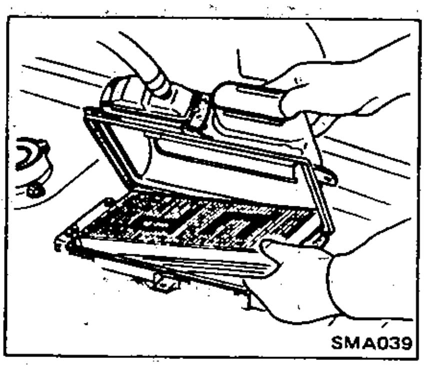
2. Disengage E.A.I. (Exhaust Air Induction System) hose from air induction pipe.



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

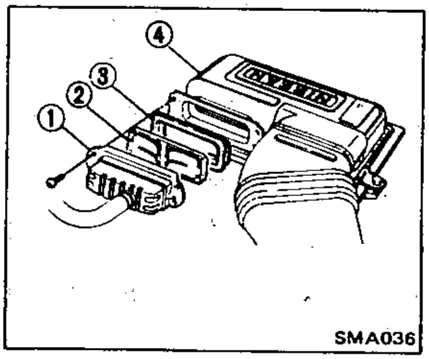


4. Install air cleaner filter **with "UP" mark facing upward.**



EMISSION CONTROL SYSTEM

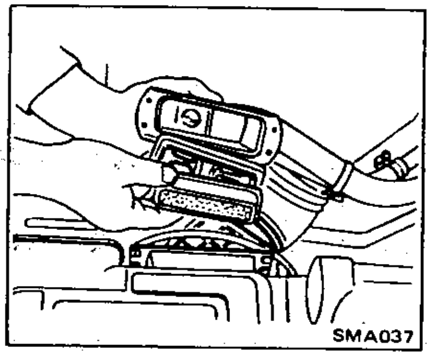
REPLACING AIR INDUCTION VALVE FILTER



1 Air induction valve case
2 Air induction valve
3 Air induction valve filter
4 Air cleaner

Remove air induction valve case from air cleaner, and take out air induction valve filter. Then install new air induction valve filter.

When replacing, pay strict attention to which direction the valve is facing so that exhaust gas will not flow backward.



CHECKING VAPOR LINES

Check all hoses and fuel tank filler cap for leaks.

1. Dsiconnect the vapor vent line connecting carbon canister to fuel tank.
2. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way carge cock) to the end of the vent line.
3. Supply pressure into the vapor vent line through the cock little by little until pressure becomes to the below.

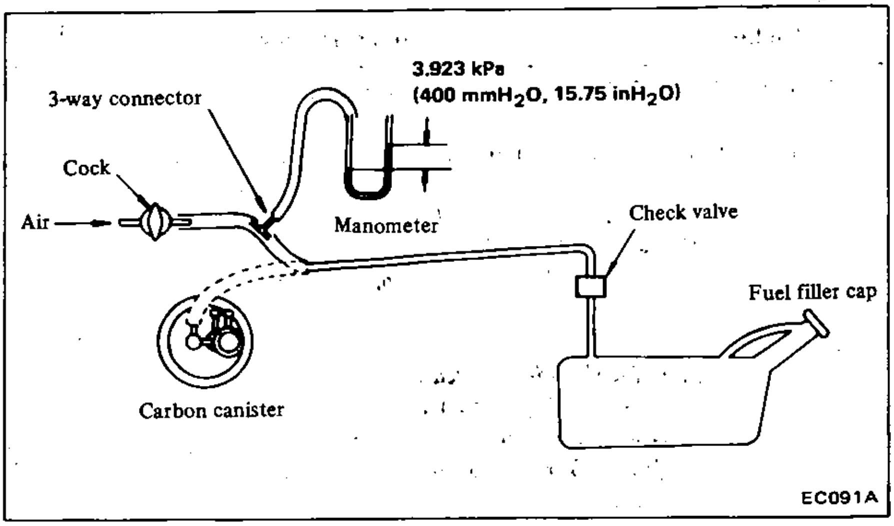
Leakage test pressure:
3.923 kPa (400 mmH$_2$O, 15.75 in H$_2$O)

4. Shut the cock completely and leave it unattended.
5. After 2.5 minutes, measure the height of the liquid in manometer.

Pressure variation:
Less than 0.245 kPa (25 mmH$_2$O, 0.98 inH$_2$O)

(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 staffy hose.

In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



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 procedure 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.

Condition	Probable cause	Corrective action

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 firstly 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 IC ignition system.
ENGINE CRANKS NORMALLY BUT WILL NOT START	Low or no current.	Check for loose terminal or disconnection in primary circuit. Check for burned points.
Ignition system in trouble	Malfunctioning distributor pick-up coil.	Replace.
	Improper air gap.	Adjust.
	Leak at rotor cap and rotor.	Clean or replace.
	Malfunctioning spark plug.	Clean, adjust plug gap or replace.
	Improper ignition timing.	Adjust.
	Malfunctioning ignition coil.	Replace.
	Disconnection of high tension cable.	Replace.
	Loose connection or disconnection in primary circuit.	Repair or replace.
	Irregular revolution trigger pulse.	Replace IC ignition unit.
	Malfunctioning IC ignition unit.	Replace.
Fuel system malfunction	Lack of fuel.	Supply.
	Damaged electronic fuel injection harness or relay.	Replace.
	Malfunctioning fuel pump (Listen to operating sound).	Replace.
	Damaged control unit.	Replace.
	Seized injector (Listen to operating sound).	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged water temp. sensor.	Replace.

For inspection procedures for electronic fuel injection system components, refer to Engine Fuel section.

Condition	Probable cause	Corrective action
Fuel system malfunction	Malfunctioning pressure regulator.	Replace.
	Dirty fuel filter.	Replace.
	Dirty or clogged fuel pipe.	Clean.
	Clogged fuel tank breather pipe.	Repair and clean.
Low compression	Incorrect spark plug tightening or damaged gasket.	Tighten to normal torque or replace gasket.
	Improper grade engine oil or low viscosity.	Replace with proper grade oil.
	Incorrect valve clearance.	Adjust.
	Compression leak from valve seat.	Lap valves.
	Sticky valve stem.	Correct or replace valve and valve guide.
	Weak or damaged valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.
	Sticking or defective piston ring.	Replace piston rings.
	Worn piston ring or cylinder.	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.
UNSTABLE ENGINE IDLING		
Ignition system in trouble	Malfunctioning ignition system (spark plug, high tension cable, distributor, IC ignition unit, ignition coil, etc.)	Replace.
	Incorrect basic ignition timing.	Adjust.
Engine mechanical system in trouble	Loose manifold and cylinder head bolts.	Retighten bolts.
	Incorrect valve clearance.	Adjust.
Fuel system malfunction	Clogged air cleaner filter.	Replace filter.
	Incorrect idle adjustment.	Adjust.
	Damaged manifold gaskets.	Replace gasket.
	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct–air flow meter to throttle chamber, etc.	Repair or replace.

Condition	Probable cause	Corrective action	
Fuel system malfunction	Damaged electronic fuel injection harness.	Replace.	For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Seized injector (Listen to operating sound).	Replace.	
	Malfunctioning air regulator (During warm-up driving only).	Replace.	
	Damaged control unit.	Replace.	
	Damaged water and air temp. sensor.	Replace.	
	Malfunctioning throttle valve switch.	Repair or replace.	
	Irregular fuel pressure.	Replace pressure regulator.	
Low compression		Previously mentioned.	
Others	Malfunctioning P.C.V. valve.	Check or replace.	
	Malfunctioning E.G.R. control system.	Correct or replace.	
HIGH ENGINE IDLE SPEED			
Fuel system malfunction	Incorrect adjustment of idle speed adjusting screw.	Correct.	
	Malfunctioning air regulator.	Replace. For inspection procedures for air regulator, refer to Engine Fuel section.	
Others	Throttle valve is opened excessively at idle.	Replace throttle chamber.	
	Malfunctioning F.I.C.D.	Replace.	
	Dragged accelerator linkage.	Check and correct accelerator linkage.	
	Malfunctioning Vacuum Control Valve (V.C.V.).	Check or replace if necessary.	
ENGINE POWER BELOW NORMAL			
Low compression		Previously mentioned.	
Ignition system in trouble	Incorrect ignition timing.	Adjust.	
	Malfunctioning spark plugs.	Clean, adjust or replace plugs.	
	Malfunctioning distributor pick-up coil.	Replace.	
Fuel system malfunction	Throttle valve does not open fully.	Adjust.	For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Damaged electronic fuel injection harness.	Replace.	
	Seized injector (Listen to operating sound).	Replace.	
	Malfunctioning air flow meter.	Replace.	
	Malfunctioning throttle valve switch.	Repair or replace.	
	Irregular fuel pressure.	Replace pressure regulator if necessary.	
	Clogged fuel pipe.	Replace if necessary.	
	Dirty or clogged fuel filter.	Replace.	
	Fuel pump will not work properly.	Replace.	

Condition	Probable cause	Corrective action
Air intake system malfunction	Clogged air cleaner filter.	Replace filter.
	Air leaking from manifold gasket.	Replace gasket.
	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct–air flow meter to throttle chamber etc.	Repair or replace.
Overheating	Insufficient coolant.	Replenish.
	Loose fan belt.	Adjust fan belt.
	Worn or damaged fan belt.	Replace.
	Malfunctioning thermostat.	Replace.
	Malfunctioning water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.
	Malfunctioning radiator filler cap.	Replace.
	Air in cooling system.	Retighten each part of cooling system.
	Improper engine oil grade.	Replace with proper grade oil.
	Incorrect ignition timing.	Adjust.
	Malfunctioning thermostat.	Replace.
Others	Improper octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Inflate to specified pressure.
	Dragging brake.	Adjust.
	Clutch slipping.	Adjust.
	Malfunctioning E.G.R. control system.	Correct or replace.
NOISY ENGINE		
Car knocking	Overloaded engine.	Use right gear in driving.
	Carbon knocking.	Disassemble cylinder head and clean carbon.
	Timing knocking.	Adjust ignition timing.
	Fuel knocking.	Use specified octane fuel.
	Preignition (misusing of spark plug).	Use specified spark plug.
Mechanical knocking		
Crankshaft bearing knocking.	This strong dull noise increases when engine is accelerated. To locate the place, cause a misfire on 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.

Condition	Probable cause	Corrective action
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 on 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 revolution of engine and which decreases as engine is warmed up, this noise is caused by piston and cylinder. To locate the place, cause a misfire on each cylinder.	This may cause an abnormal wearing of cylinder and lower compression which in turn will cause a lower out-put power and excessive consumption of oil. Overhaul engine.
Piston pin noise.	This noise is heard at each highest and lowest dead end of piston. To locate the place, cause a misfire on each cylinder.	This may cause a wear on piston pin, or piston pin hole. Renew piston and piston pin assembly.
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.	An improper adjustment of valve clearance.	Adjust.
	Noise of timing chain.	Adjust the tension of chain.
	An excessive end-play on crankshaft.	Disassemble engine and renew main bearing.
Others	Wear on clutch pilot bushing. **This noise will be heard when clutch is disengaged.**	Renew bushing and adjust drive shaft.
ABNORMAL COMBUSTION (backfire, after fire, run-on etc.)		
Ignition system in trouble	Improper ignition timing.	Adjust ignition timing.
	Improper heat range of spark plugs.	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.	Repair or replace.
	Damaged electronic fuel injection harness.	Replace. } For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section
	Damaged control unit.	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged water temp. sensor.	Replace.

Condition	Probable cause	Corrective action
Defective cylinder head, etc.	Improperly adjusted valve clearance.	Adjust.
	Excess carbon in combustion chamber.	Remove head and get rid of carbon.
	Damaged valve spring (backfire, after fire).	Replace it with a new one.
Others	Malfunctioning E.G.R. control system.	Correct or replace.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug.	Tighten it.
	Loose or damaged oil pan gasket.	Renew gasket or tighten it.
	Loose or damaged chain cover gasket.	Renew gasket or tighten it.
	Damaged oil seal in front and rear of crankshaft.	Renew oil seal.
	Loose or damaged rocker cover gasket.	Renew gasket or tighten it (but not too much).
	Improper tightening of oil filter.	Renew gasket and tighten it with the proper torque.
	Loose or damaged oil pressure switch.	Renew oil pressure switch or tighten it.
	Cylinder and piston wear.	Overhaul cylinder and renew piston.
	Improper location of piston ring or reversely assembled piston ring.	Remount piston rings.
	Damaged piston rings.	Renew rings. Repair or renew piston and cylinder.
	Worn piston ring groove and ring.	Renew piston and piston ring.
	Fatigue of valve oil seal lip.	Replace seal lip with a new one.
	Worn valve stem.	Renew valve or guide.
Others	Inadequate quality of engine oil.	Use the designated oil.
	Engine overheat.	Previously mentioned.
POOR FUEL ECONOMY		
Engine power below normal		Previously mentioned.
Fuel system malfunction	Exceeding idling revolution.	Adjust it to the designated rpm.
	Fuel leakage from fuel line.	Repair, replace or tighten the connection of fuel pipes.
	Damaged electronic fuel injection harness.	Replace. For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Damaged control unit.	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged air temperature sensor.	Replace.
	Malfunctioning throttle valve switch.	Replace.
	Irregular fuel pressure.	Replace pressure regulator if necessary.

Condition	Probable cause	Corrective action
TROUBLE IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality.	Use the designated oil.
	Overheat.	Previously mentioned.
	Malfunctioning oil pump regulator valve.	Disassemble oil pump and repair or renew it.
	Functional deterioration of oil pump.	Repair or replace it with a new one.
	Blocked oil filter.	Renew it.
	Increased clearance in various sliding parts.	Disassemble and replace the worn parts with new ones.
	Blocked oil strainer.	Clean it.
	Malfunctioning oil gauge pressure switch.	Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decreases.	Previously mentioned.
	Damaged quality or contamination of oil.	Exchange the oil with proper one and change element.
	Air leakage from air intake duct.	Repair or replace.
	Damaged air cleaner.	Change element.
	Overheat or overcool.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.
Scuffing of sliding parts	Decrease of oil pressure.	Previously mentioned.
	Insufficient clearances.	Readjust to the designated clearances.
	Overheat.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.

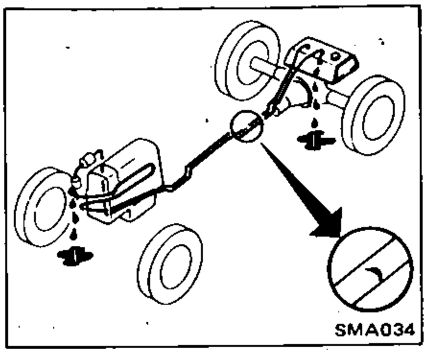
CHASSIS AND BODY MAINTENANCE

ENGINE CONTROL, FUEL AND EXHAUST SYSTEMS

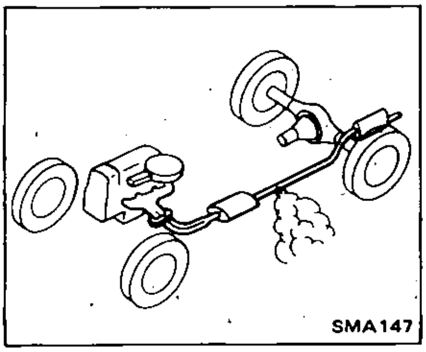
CHECKING FUEL AND EXHAUST SYSTEM

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

Fuel system

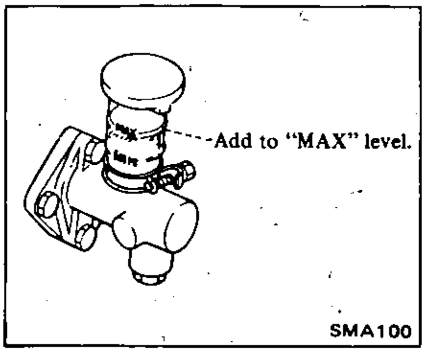


Exhaust system



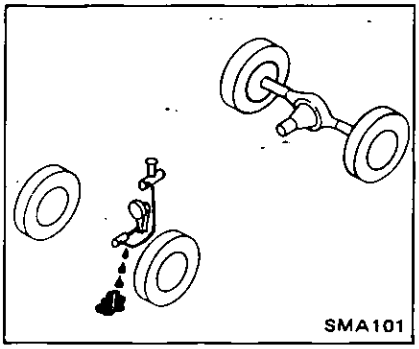
CLUTCH

CHECKING CLUTCH FLUID LEVEL AND LEAKS



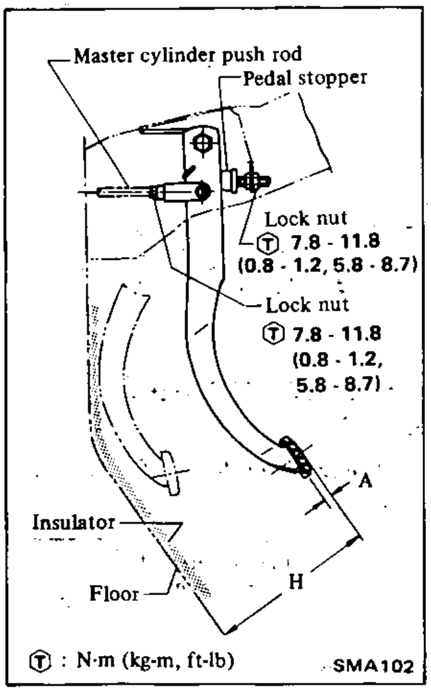
CHECKING CLUTCH SYSTEM

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.



Pedal height "H":
168 - 174 mm (6.61 - 6.85 in)
Pedal free play "A":
1 - 5 mm (0.04 - 0.20 in)

1. Adjust pedal height with pedal stopper. Then tighten lock nut.
2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

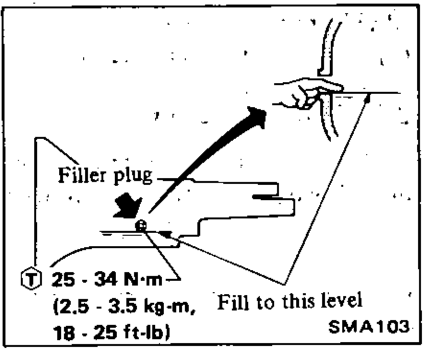
a. Pedal free play means the following total measured at position of pedal pad.
   - **Play due to clevis pin and clevis pin hole in pedal lever.**
   - **Play due to piston and piston rod.**

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

MANUAL TRANSMISSION

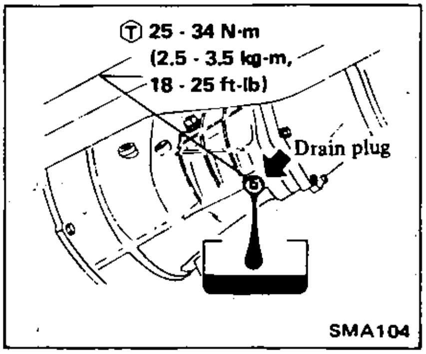
CHECKING MANUAL TRANSMISSION OIL LEVEL

Never start engine while checking oil level.

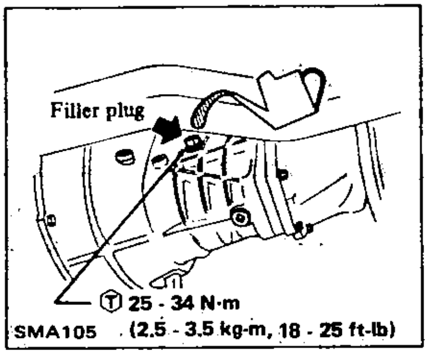


CHANGING MANUAL TRANSMISSION OIL

1. Drain oil completely.



2. Refill transmission and check oil level.



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

AUTOMATIC TRANSMISSION

CHECKING AUTOMATIC TRANSMISSION FLUID LEVEL

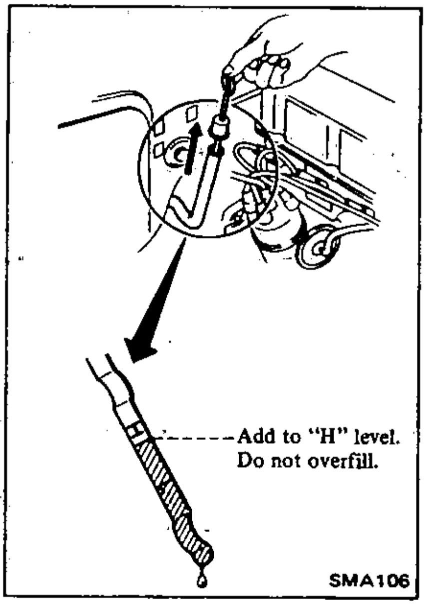
1. Check under following conditions.

(1) Place selector lever in "P" (PARK) position and idle engine.

(2) Maintain fluid temperature at 50 to 80°C (122 to 176°F).

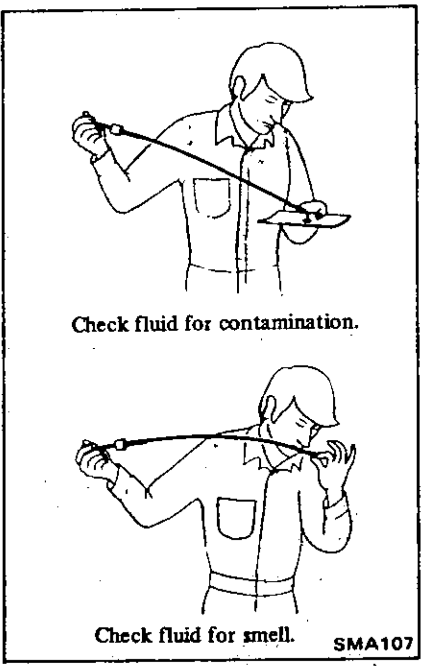
2. Add oil, if necessary.

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



CHECKING AUTOMATIC TRANSMISSION FLUID CONDITION

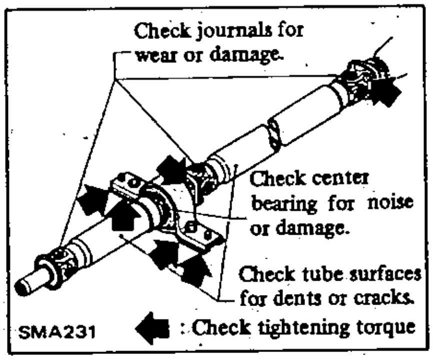
Check fluid for contamination to determine condition of automatic transmission. If fluid is very dark or smells burned, the frictional material (clutches, band, etc.) may need replacement.



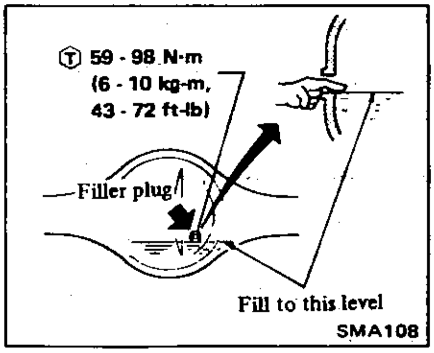
PROPELLER SHAFT AND DIFFERENTIAL CARRIER

CHECKING PROPELLER SHAFT

Check propeller shaft, replace if necessary.

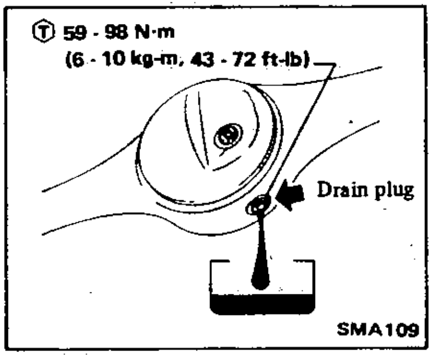


CHECKING DIFFERENTIAL CARRIER OIL LEVEL

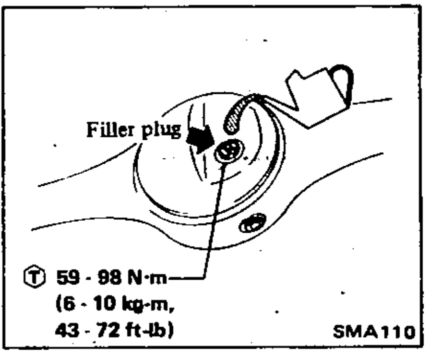


CHANGING DIFFERENTIAL CARRIER OIL

1. Drain oil completely.



2. Refill differential carrier and check oil level.



Oil capacity:
1.1 liters (2-3/8 US pt,
2 Imp pt)

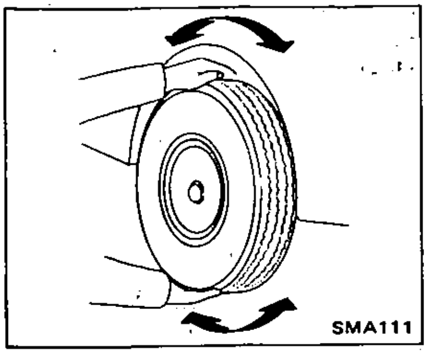
FRONT AXLE AND FRONT SUSPENSION

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.

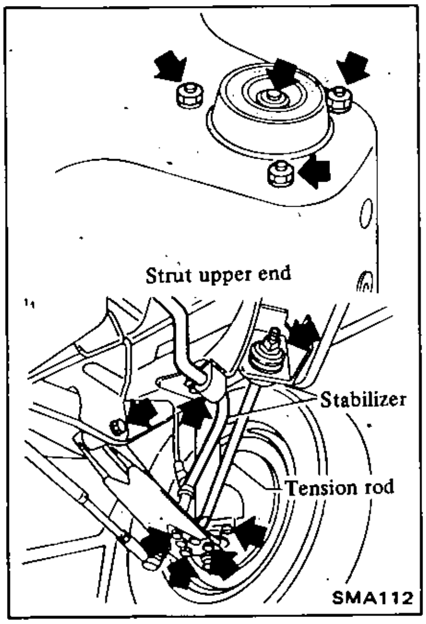


SMA111

Check suspension parts for looseness, wear, or damage.

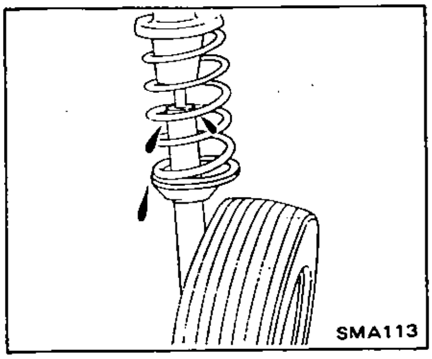
Retighten all loose nuts and bolts to the specified torque. Refer to Section FA for tightening torque.

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



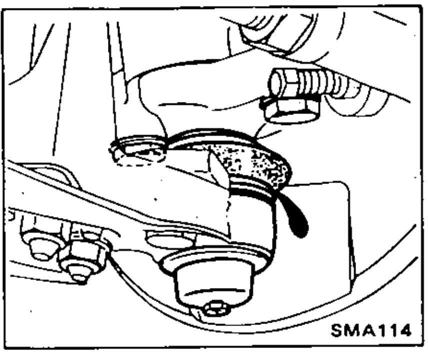
SMA112

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



SMA113

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



SMA114

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.

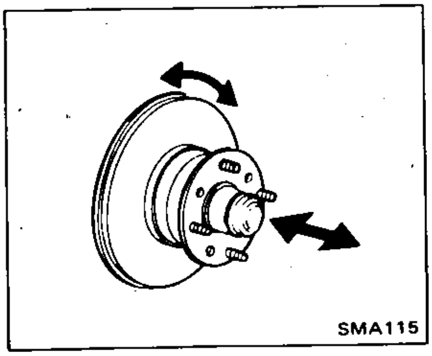
Refer to section BR.

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).



SMA115

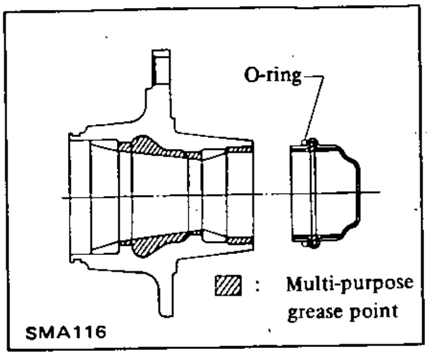
ADJUSTING WHEEL BEARING PRELOAD

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

1. Before adjustment, thoroughly clean all parts to prevent possible entry of dirt.

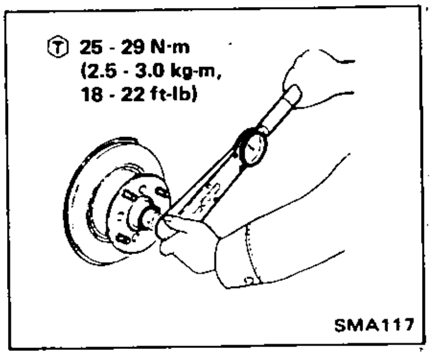
2. Apply recommended multi-purpose grease sparingly to the following parts.

- Threaded portion of spindle.
- Contact surface between wheel bearing washer and outer wheel bearing.
- Hub, hub cap and O-ring.
- Grease seal lip.



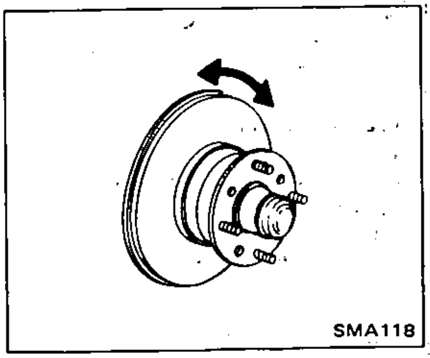
SMA116

3. Tighten wheel bearing nut.



SMA117

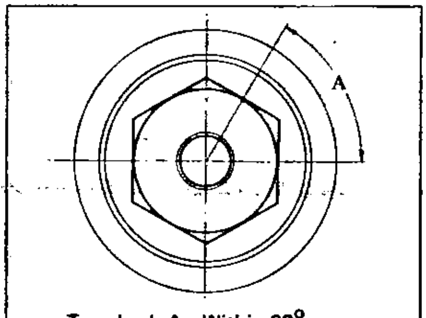
4. Turn wheel hub several times in both directions to seat wheel bearing correctly.



SMA118

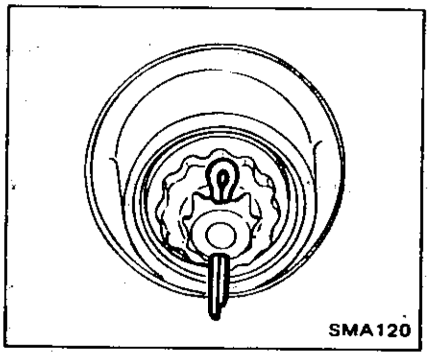
5. Again tighten wheel bearing nut.

6. Turn back wheel bearing nut within 60°.



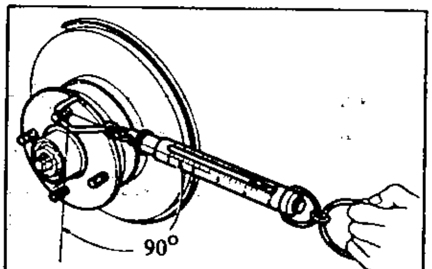
Turn back A: Within 60° SMA119

7. Fit adjusting cap and new cotter pin.



SMA120

8. Measure wheel bearing preload and axial play.

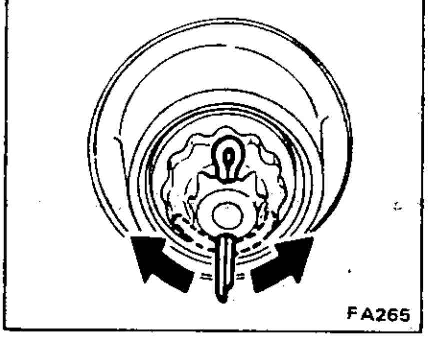


Axial play: 0 mm (0 in)
Wheel bearing preload
(As measured at wheel hub bolt):
With new parts
6.9 - 14.7 N
(0.7 - 1.5 kg, 1.5 - 3.3 lb)
With used parts
2.0 - 7.8 N
(0.2 - 0.8 kg, 0.4 - 1.8 lb)

SMA121

Repeat above procedures until correct starting torque is obtained.

9. Spread cotter pin.



FA265

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 (when not loaded)**
- **Repair or replace the damaged portion or parts.**

Camber, caster and king-pin inclination

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

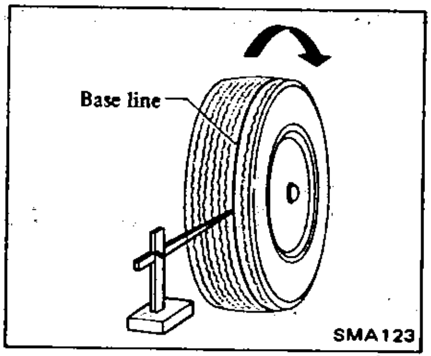
If camber, caster or king-pin inclination alignment is not within specifications, check pertinent parts.
Repair or replace as necessary.

Camber:
–40′ - 50′
Caster:
1°45′ - 3°15′
Kingpin inclination:
7°25′ - 8°55′

Toe-in

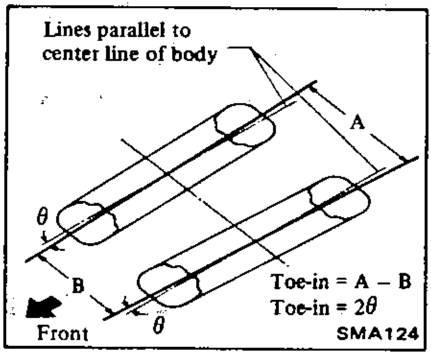
Measure toe-in, and make necessary adjustments. Use the following procedure when making adjustments.

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



SMA123

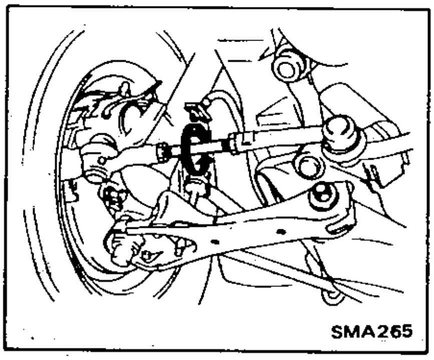
2. Set wheels in a straight-ahead position, and then lower front of car.
3. Measure toe-in and make necessary adjustments.



SMA124

Toe-in (Unladen):
0 - 2 mm (0 - 0.08 in)
0′ - 12′ (On both sides)
Side slip (Reference data)
Out 1 mm - In 1 mm/m
(Out 0.012 in - In 0.012 in/ft)

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

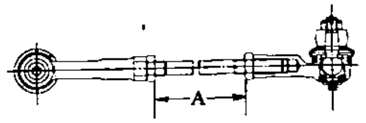


SMA265

"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.

If side rods have been disassembled, set the distance between lock nuts to the specified value "A" prior to reassembling.



Side rod length "A":
71.0 mm (2.795 in)

SST105

a. **Lock side rod bar lock nut so that ball joint on outer socket is 77° with respect to that on inner socket.**

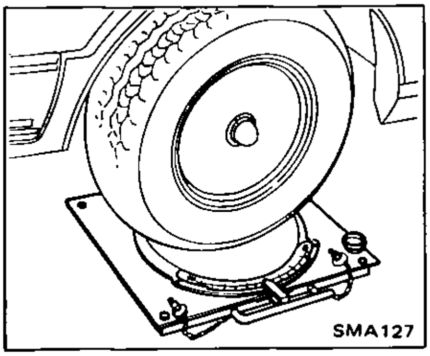
b. **Make sure that adjusting bar is screwed in each socket at least 25 mm (0.98 in).**

4. After correct toe-in has been obtained, tighten side rod bar lock nuts.

Ⓣ : **78 - 98 N·m**
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

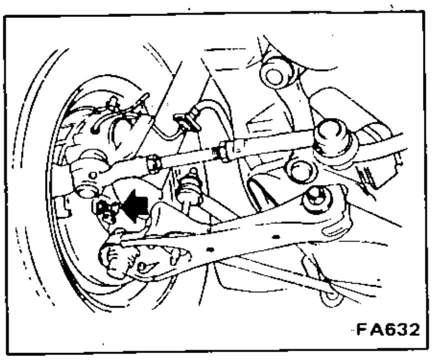
Front wheel turning angle

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



SMA127

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



FA632

Front wheel turning angle:
Toe-out turns (When inner wheel 20°)
Outer wheel 18.7°
Full turns [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].
Inner wheel 33° - 35°
Outer wheel 27° - 29°

Turning angle of outer wheel will automatically be set by adjusting turning angle of inner wheel to specified values.

3. After adjustment, lock adjusting lock nut.

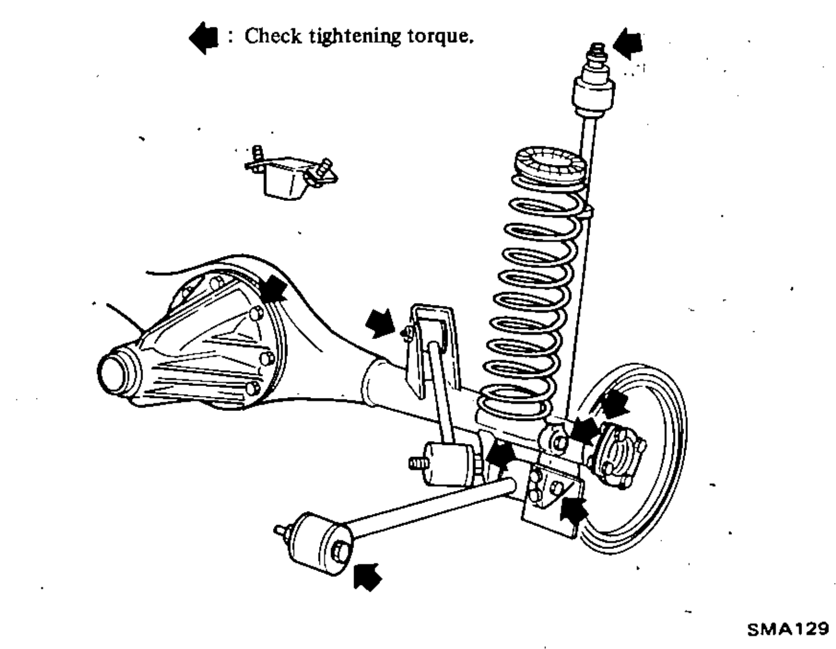
REAR AXLE AND REAR SUSPENSION

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.

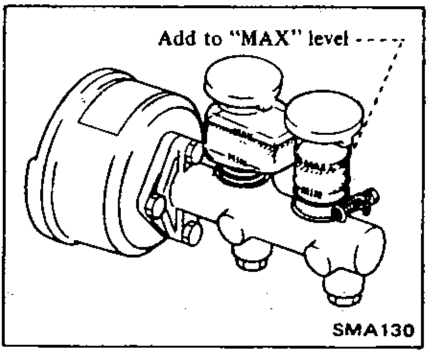
Replace all worn parts as instructed under Rear Suspension (Section RA).



SMA129

BRAKE SYSTEM

CHECKING BRAKE FLUID LEVEL AND LEAKS



SMA130

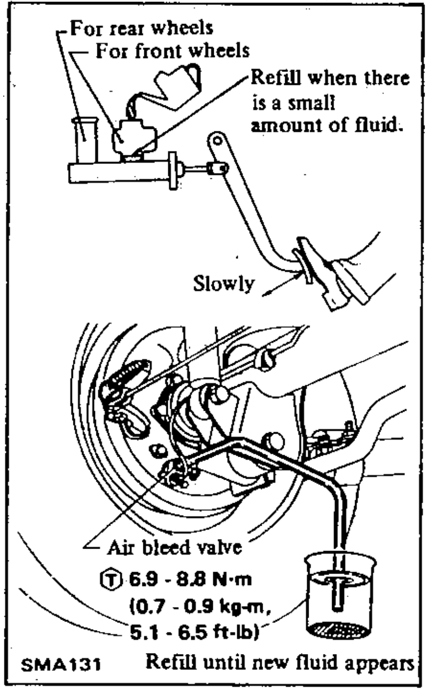
If fluid level is extremely low, check brake system for leaks.

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 oxidization as well as contains the foreign material and dirt.

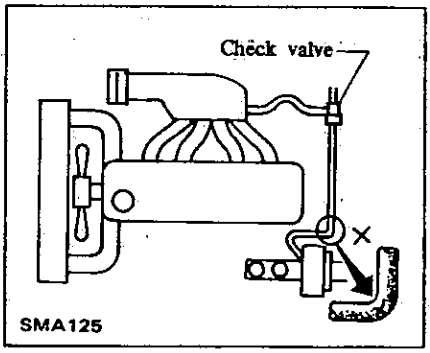


SMA131

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

CHECKING BRAKE BOOSTER VACUUM HOSES, CONNECTIONS AND CHECK VALVE

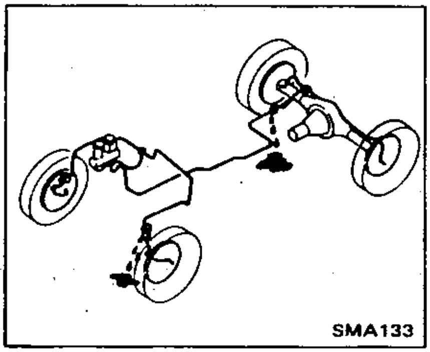
1. Check condition of vacuum hoses and connections.
2. Check vacuum hoses and check valve for air tightness.



SMA125

CHECKING BRAKE SYSTEM

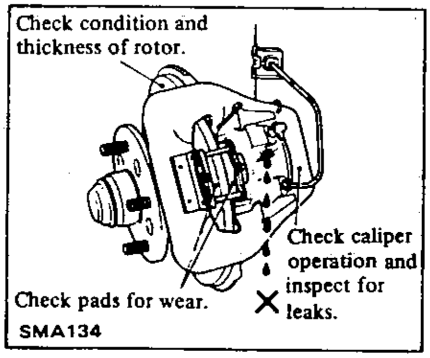
1. Check brake system for proper attachment, leaks, chafing, abrasion, deterioration, etc.



SMA133

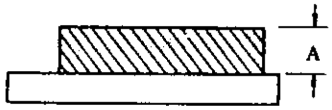
CHECKING DISC BRAKE

1. Check condition of disc brake components.



SMA134

Pad wear limit

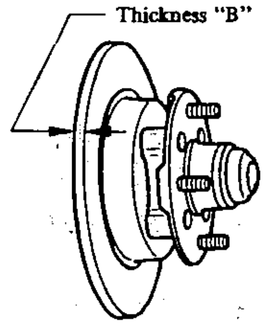


Pad wear limit (A)
N22 .... 2 mm (0.08 in)
AN12H .... 2 mm (0.08 in)

SMA266

Refer to Section BR for pad replacement.

Rotor repair limit

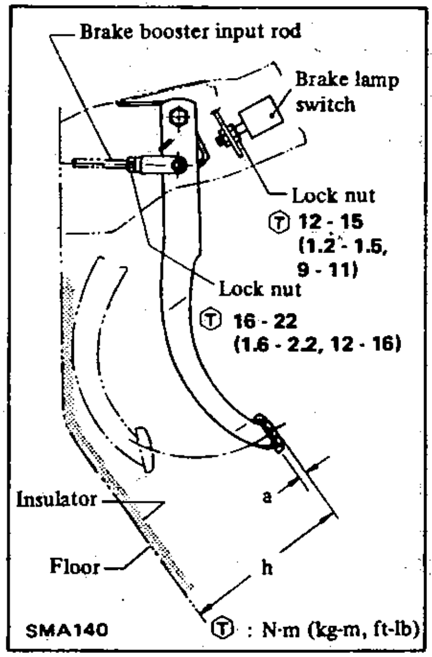


Rotor repair limit (B)
N22 .... 10.5 mm (0.413 in)
AN12H .... 8.6 mm (0.339 in)

SMA267

CHECKING FOOT BRAKE

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



SMA140

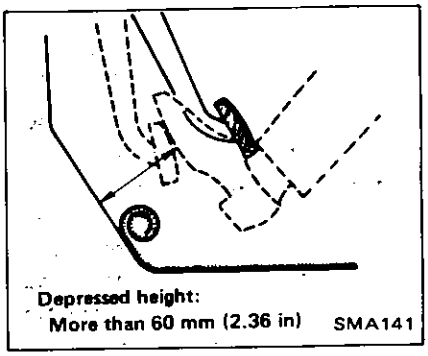
Pedal free height "h":
155 - 161 mm (6.10 - 6.34 in)
Pedal free play "a":
1 - 5 mm (0.04 - 0.20 in)

(1) Adjust pedal free height with brake 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.



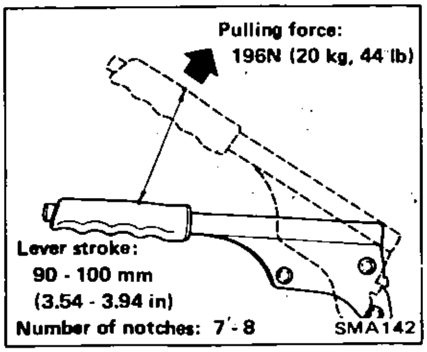
SMA141

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

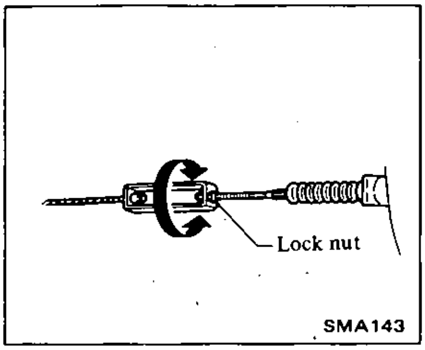
1. Pull lever with specified amount of force.

Measure lever stroke in a straight line at center of grip.



SMA142

2. Use adjuster to adjust lever stroke.



SMA143

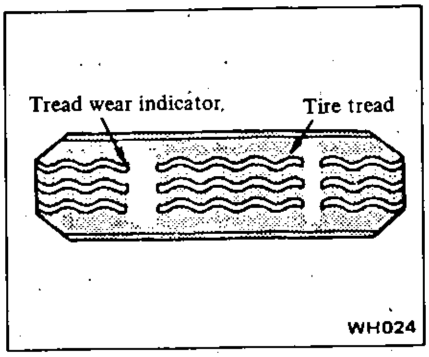
3. Bend parking brake warning lamp switch plate down so that brake warning light comes on when ratchet at parking brake lever is moved back one notch and goes out when returned to its original position.

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.



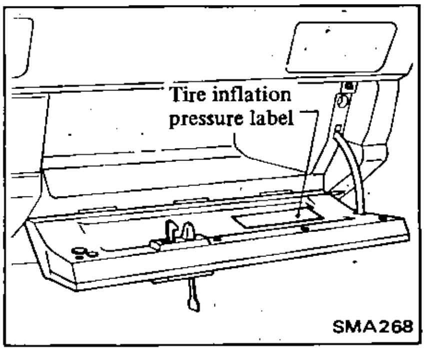
WH024

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

Tire inflation

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

Tire pressure should be measured when tire is cold.

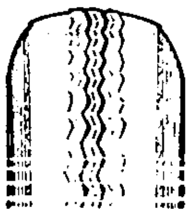
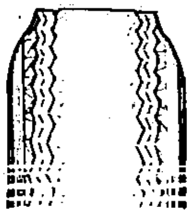
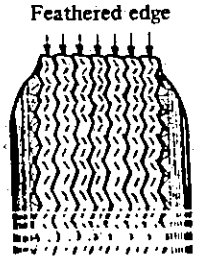
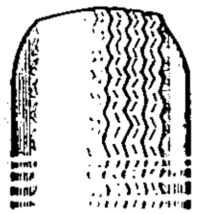


SMA268

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

Abnormal tire wear

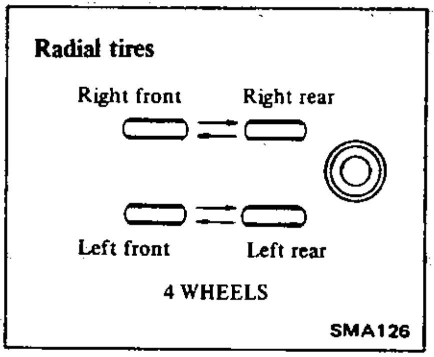
Correct abnormal tire wear according to the chart shown below.

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

SMA068

TIRE ROTATION

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



SMA126

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.

a. **When replacing a worn or damaged tire, use a replacement tire of the same size and load carrying capacity as that with which the car was equipped when manufactured. The use of different size and/or load capacity tires will not only shorten tire service life but may also result in a serious accident.**

b. **Do not use tires and wheels other than those recommended, and do not mix tires of different brands or tread patterns.**
The use of tires and wheels other than those recommended or the mixed use of tires of different brands or tread patterns can adversely affect the ride, braking, handling, ground clearance, body-to-tire clearance, and speedometer calibration.

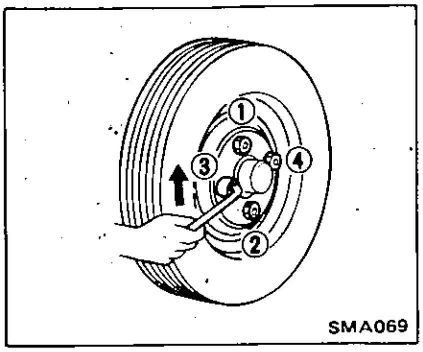
c. **It is recommended that new tires be installed in pairs on the same axle. When replacing only one tire, it should be paired with the most tread, to equalize braking traction.**

d. **When replacing original tires with those tires of an optional recommended size and of different diameter, the speedometer must be recalibrated.**

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.**

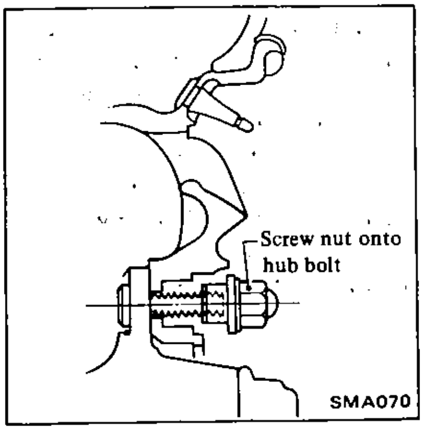


SMA069

Aluminum wheel

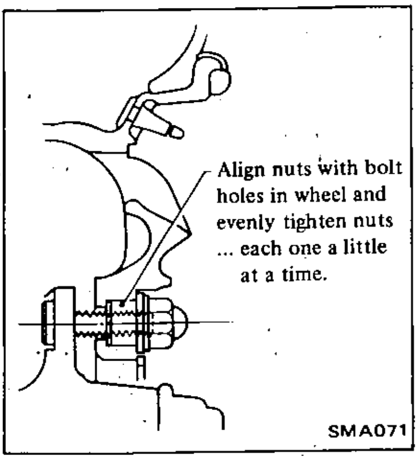
To install an aluminum wheel, proceed as follows:

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


Screw nut onto hub bolt

SMA070

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


Align nuts with bolt holes in wheel and evenly tighten nuts ... each one a little at a time.

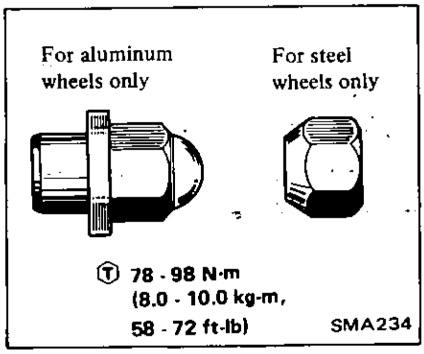
SMA071

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

Be sure to check the wheel nuts for tightness, after the aluminum wheel has been run for the first 1,000 km (600 miles) (also in 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.



Ⓣ 78 - 98 N·m (8.0 - 10.0 kg-m, 58 - 72 ft-lb)

SMA234

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

T-TYPE SPARE TIRE (Size T135/70D16)

The T-type spare tire is designed for **emergency use only.**

The spare tire can be used repeatedly for emergency situations.

Precautions when using T-type spare tire

- **Periodically check tire inflation pressure, and always keep it at 60 psi (412 kPa).**
- **Do not drive car at speed faster than 80 km/h (50 MPH).**
- **The T-type spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as the standard tire repair has been completed.**
- **Do not enter into an automatic carwash with the T-type spare tire fitted.**
- **Do not attach a tire chain.**
- **Do not use the T-type spare tire on other cars.**
- **Do not make a sharp turn, or apply the brake suddenly while driving.**
- **As soon as the tread wear indicator becomes visible, replace the tire with a new one.**
- **Mounting and dismounting to and from the road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

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

TIRE REPAIR

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

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

a. When repairing a puncture, use a tire repair kit furnished by any tire dealer, following instructions provided with kit.

b. If a puncture is too large or there is some damage to tire fabric, repair should be carried out by authorized tire dealer.

6. Discard when any of the following problems occurs:

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

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

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

7. Install tire, noting the following items:

a. Install valve core and inflate to proper pressure. Check the locating rings of the tire to be sure they show around the rim flanges on both sides.

b. Check valves for leakage after inflating tires.

c. Be sure to tighten valve caps firmly by hand.

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

WHEEL INSPECTION

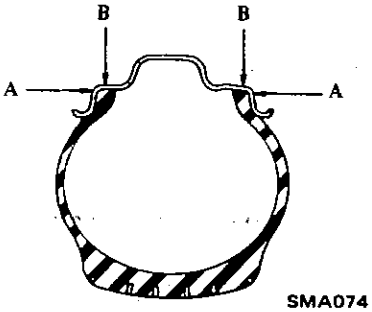
Inspect wheel, taking care of the following points, in order to ensure satisfactory steering condition as well as maximum tire life. If any defect is present, repair or replace as necessary.

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

2. Thoroughly remove rust, dust, oxidized rubber or sand from wheel rim.

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

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



SMA074

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

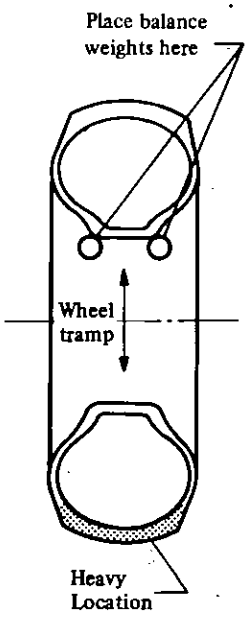
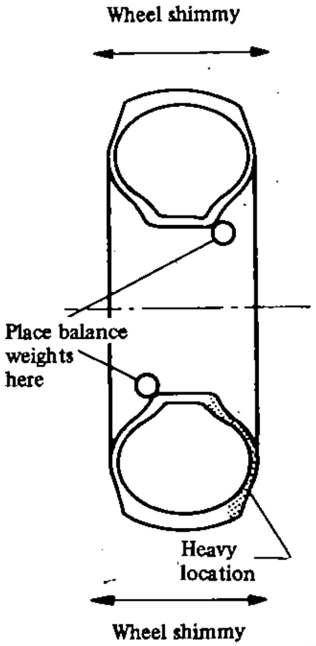
Inspect wheel and tire for wheel balance and correct it if unbalance is present, taking the following points into consideration.

1. Correct unbalance when the symptom of unbalance appears as wheel tramps and wheel shimmy.

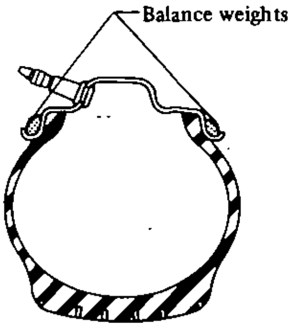
2. Balance wheel and tire both **statically and dynamically.**

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  	Balance dynamically 

SMA075



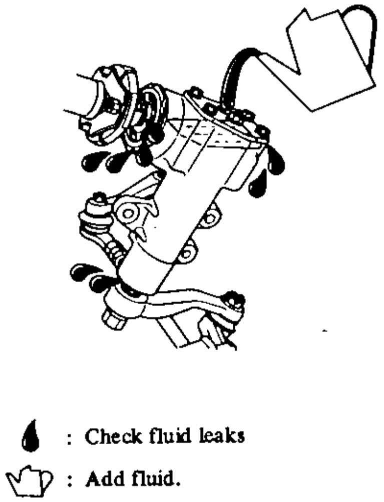
Maximum allowable unbalance at rim flange:
10 g (0.35 oz)
Balance weight:
10 - 60 g (0.35 - 2.12 oz)
at 10 g (0.35 oz) interval

SMA076

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

STEERING SYSTEM

CHECKING STEERING GEAR OIL LEVEL AND LEAKS



SMA604

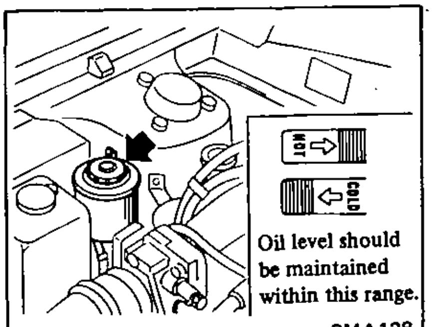
CHECKING POWER STEERING FLUID AND LINES

1. After stopping the engine, check oil level in reservoir.

Check dipstick on "HOT" side at normal operating temperature, or "COLD" side when oil is cold.

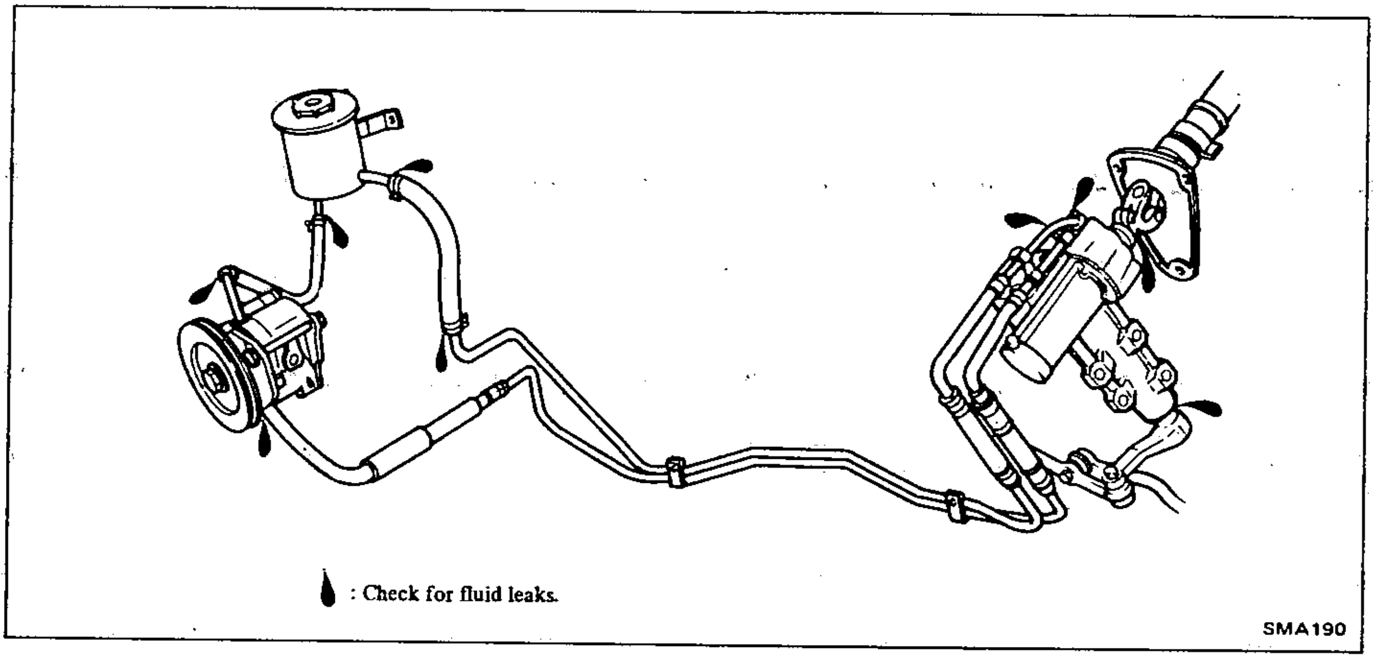
Add recommended oil if necessary.

CAUTION:
Do not overfill.



SMA128

2. Inspect line condition and check for leaks.



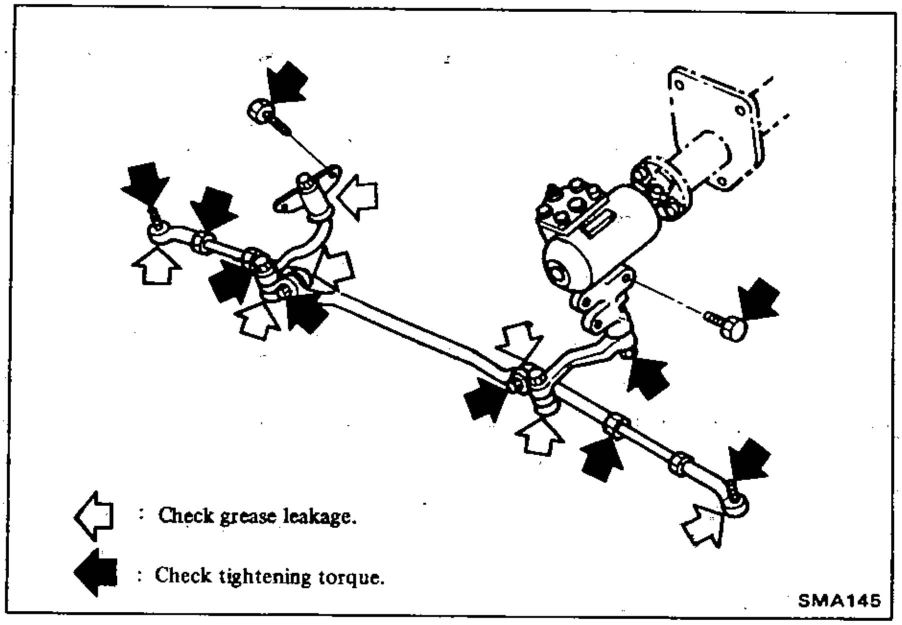
CHECKING STEERING GEAR BOX AND LINKAGE

Steering gear box

- Check parts for looseness, wear or damage. Retighten if neccessary. Refer to Section ST for tightening torque.

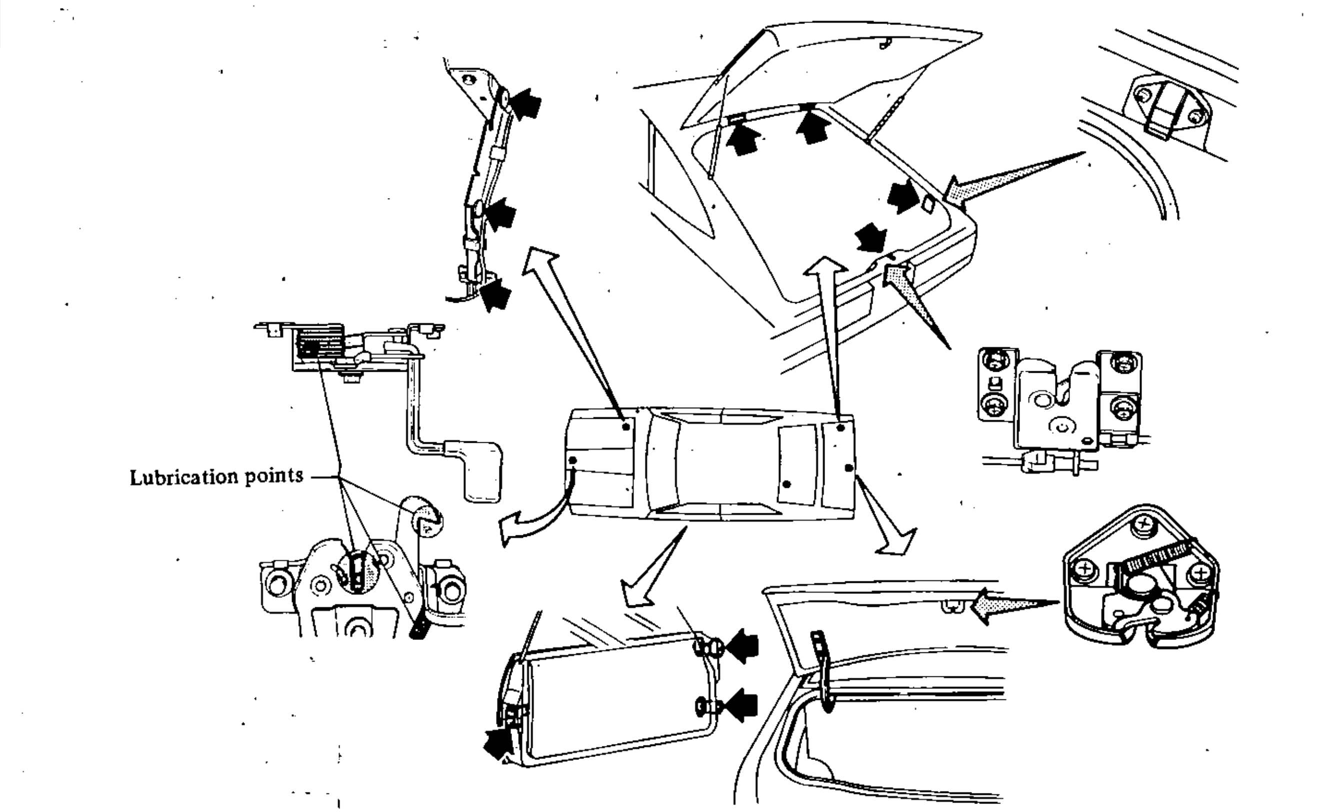
Steering linkage

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

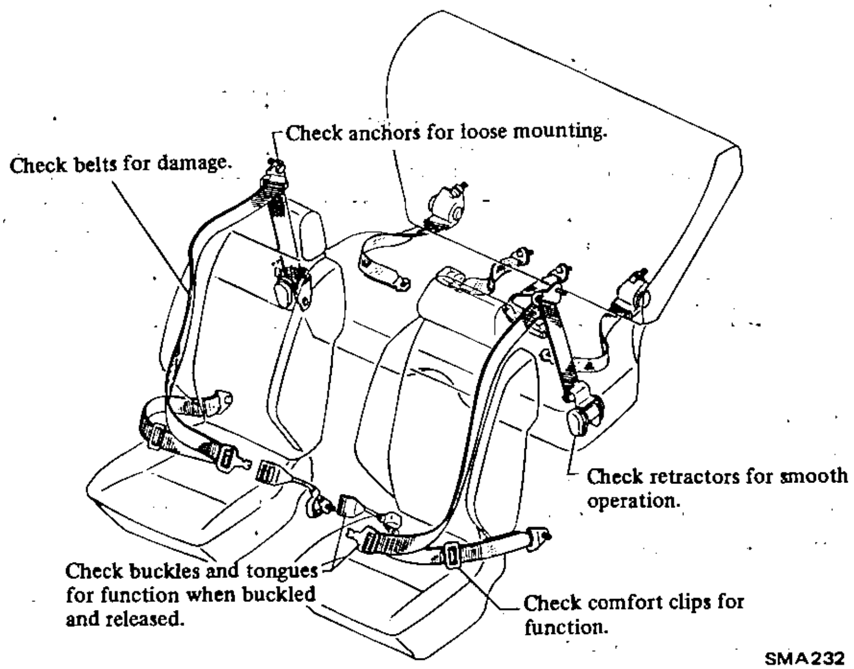


BODY

LUBRICATING LOCKS, HINGES AND HOOD LATCH



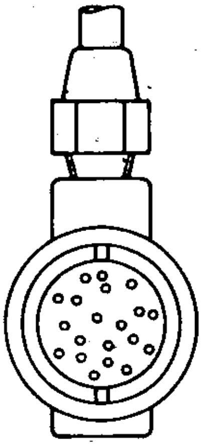
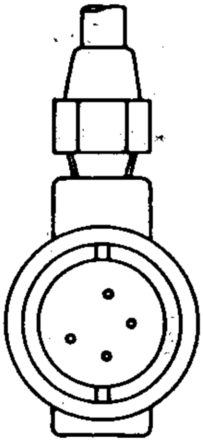
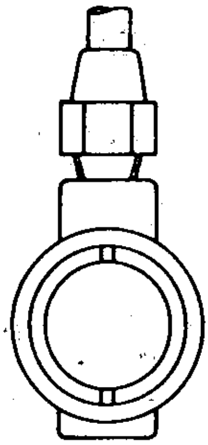
CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTER



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.

Check item \ Amount of refrigerant	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high pressure and low pressure lines.	Almost no difference between high pressure and low pressure side temperature.	High pressure side is warm and low pressure side is fairly cold.	High pressure side is hot and low pressure side is cold.	High pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. **Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.**  AC256	The bubbles are seen at intervals of 1 - 2 seconds.  AC257	Almost transparent. Bubbles may appear when engine speed is raised and lowered. **No clear difference exists betwen these two conditions.**  AC258	No bubbles can be seen.
Pressure of system.	High pressure side is abnormally low.	Both pressure on high and low pressure sides are slightly low.	Both pressures on high and low pressure sides are normal.	Both pressures on high and low pressure sides are abnormally high.
Repair.	**Stop compressor immediately** and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Be sure to recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

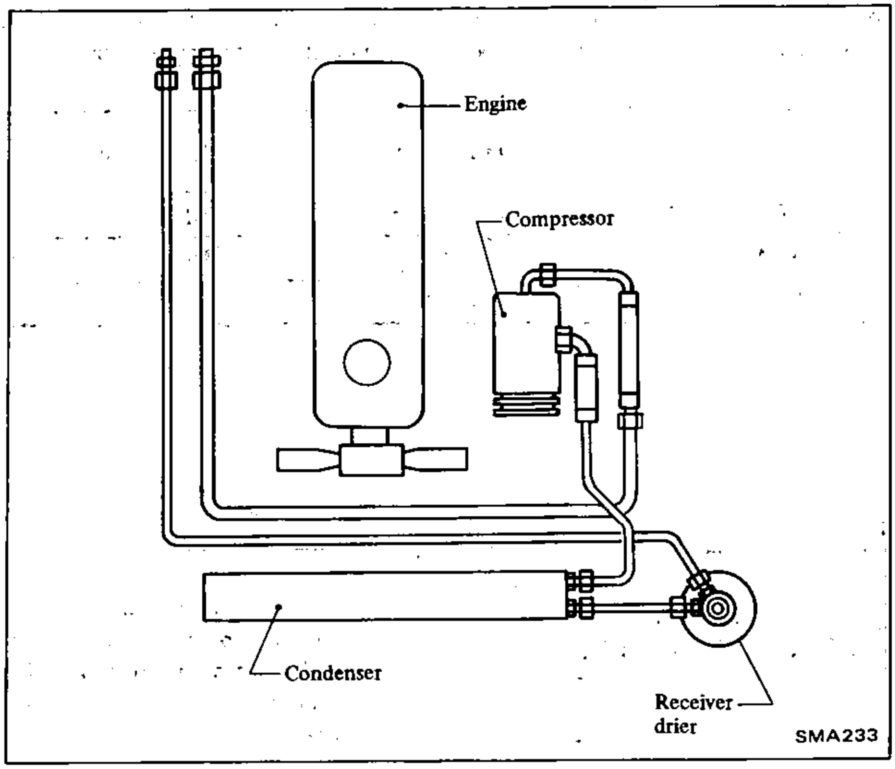
CHECKING COMPRESSOR DRIVE BELT

Refer to Engine Maintenance for inspection and adjustment.

CHECKING HOSES AND PIPES

Check heater and air conditioner for damaged hoses or pipes due to interference or friction with adjoining parts. If damage is minor, repair those affected hose or pipes. If damage is major and if there is the possibility of encountering holes, replace the affected parts.

Carefully check hoses and pipes, especially those located close to moving parts or sharp edge of panel.



CHECKING REFRIGERANT LEAKS

Conduct a leak test with 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.

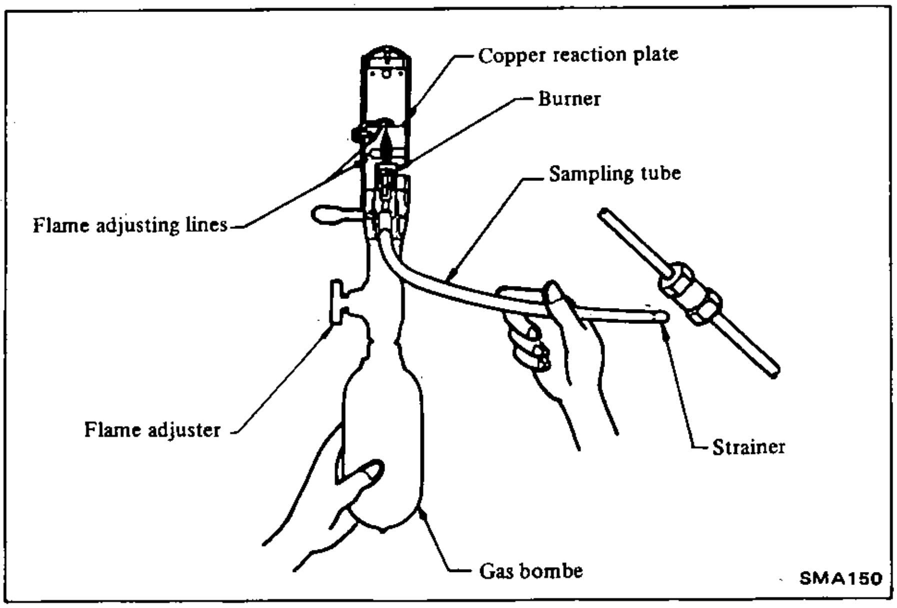
Major check points

(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



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:
a. **Never inhale the fumes produced by combustion of refrigerant gas since they are toxic.**
b. **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. 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

ENGINE MAINTENANCE

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance mm (in)	Hot	Cold*
Intake	0.30 (0.012)	0.21 (0.008)
Exhaust	0.30 (0.012)	0.23 (0.009)
Drive belt deflection Fan, Alternator, Air conditioner compressor, and Power steering oil pump mm (in)	8 - 12 (0.31 - 0.47)	
Applied pressed force N (kg, lb)	98 (10, 22)	
Compression pressure kPa (kg/cm², psi)/rpm Standard	1,177 (12.0, 171)/350	
Minimum	883 (9.0, 128)/350	

* **At ambient temperature 20°C (68°F). After checking valve clearance while engine is cold, also check it when engine is hot to see if it remains within the specified value. If it does not, readjust it.**

Ignition and fuel system

Spark plug

		Type			Plug gap mm (in)
		Standard	Hot type	Cold type	
U.S.A.	Standard	BP6ES	BP5ES	BP7ES	0.8 - 0.9 (0.031 - 0.035)
	Option	BPR6ES	BPR5ES	BPR7ES	
Canada		(Resistor built-in type)			
High tension cable resistance ohm				Less than 30,000	

Ignition timing, idle speed and idle "CO" %

	Non-California models	Califronia models
Manual transmission	8 ± 2° B.T.D.C./ 700 ± 100	6° B.T.D.C./ 700 ± 100
Automatic transmission (in "D" position)	8 ± 2° B.T.D.C./ 700 ± 100	6° B.T.D.C./ 700 ± 100
"CO" % at idling speed	1.3 ± 1% (No air)	Idle mixture screw is preset and sealed at factory.

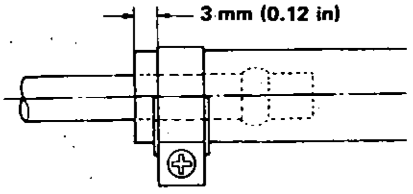
Emission control system

Unit: kPa (mmH$_2$O, inH$_2$O)

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

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Rocker arm nut	16 - 22	1.6 - 2.2	12 - 16
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"	168 - 174 (6.61 - 6.85)
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)	6.9 - 14.7 (0.7 - 1.5, 1.5 - 3.3)
With used parts N (kg, lb)	2.0 - 7.8 (0.2 - 0.8, 0.4 - 1.8)
Wheel alignment Camber degree	–40' - 50'
Caster degree	1°45' - 3°15'
Kingpin inclination degree	7°25' - 8°55'
Toe-in (Unladen)	0 - 2 mm (0 - 0.08 in) 0' - 12' (On both sides)
Side slip (Reference data)	Out 1 mm - In 1 mm/m (Out 0.012 in - In 0.012 in/ft)

Standard side rod length "A"	mm (in)	71.0 (2.80)
Front wheel turning angle Toe-out turns (When inner wheel is 20°) Outer wheel	degree	18.7°
Full turn* Inner wheel	degree	33° - 35°
Outer wheel		27° - 29°

*: 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.

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

Brake system

Unit: mm (in)

Pad wear limit	N22	2 (0.08)
	AN12H	2 (0.08)
Rotor repair limit	N22	10.5 (0.413)
	AN12H	8.6 (0.339)
Pedal height "h"		155 - 161 (6.10 - 6.34)
Pedal free play "a"		1 - 5 (0.04 - 0.20)
Pedal depressed height		More than 60 (2.36)
Parking brake Lever stroke [at pulling force: 196N (20 kg, 44 lb)]		90 - 100 (3.54 - 3.94)
Number of notches		7 - 8

Wheel and tire

Recommended cold tire inflation pressure		
Tire size	185/70SR14	26 psi (177 kPa)
	Spare tire T135/70D16	Do not use in excess of 80 km/h (50 MPH)
		60 psi (412 kPa)

Tire pressure should be checked when tires are COLD.

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch Pedal stopper lock nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Master cylinder push rod lock nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Manual transmission Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Propeller shaft and differential carrier Differential carrier drain and filler plugs	59 - 98	6 - 10	43 - 72
Front axle and front suspension Side rod lock nut	78 - 98	8.0 - 10.0	58 - 72
Brake system Air bleed valve	6.9 - 8.8	0.7 - 0.9	5.1 - 6.5
Brake 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 TOOL

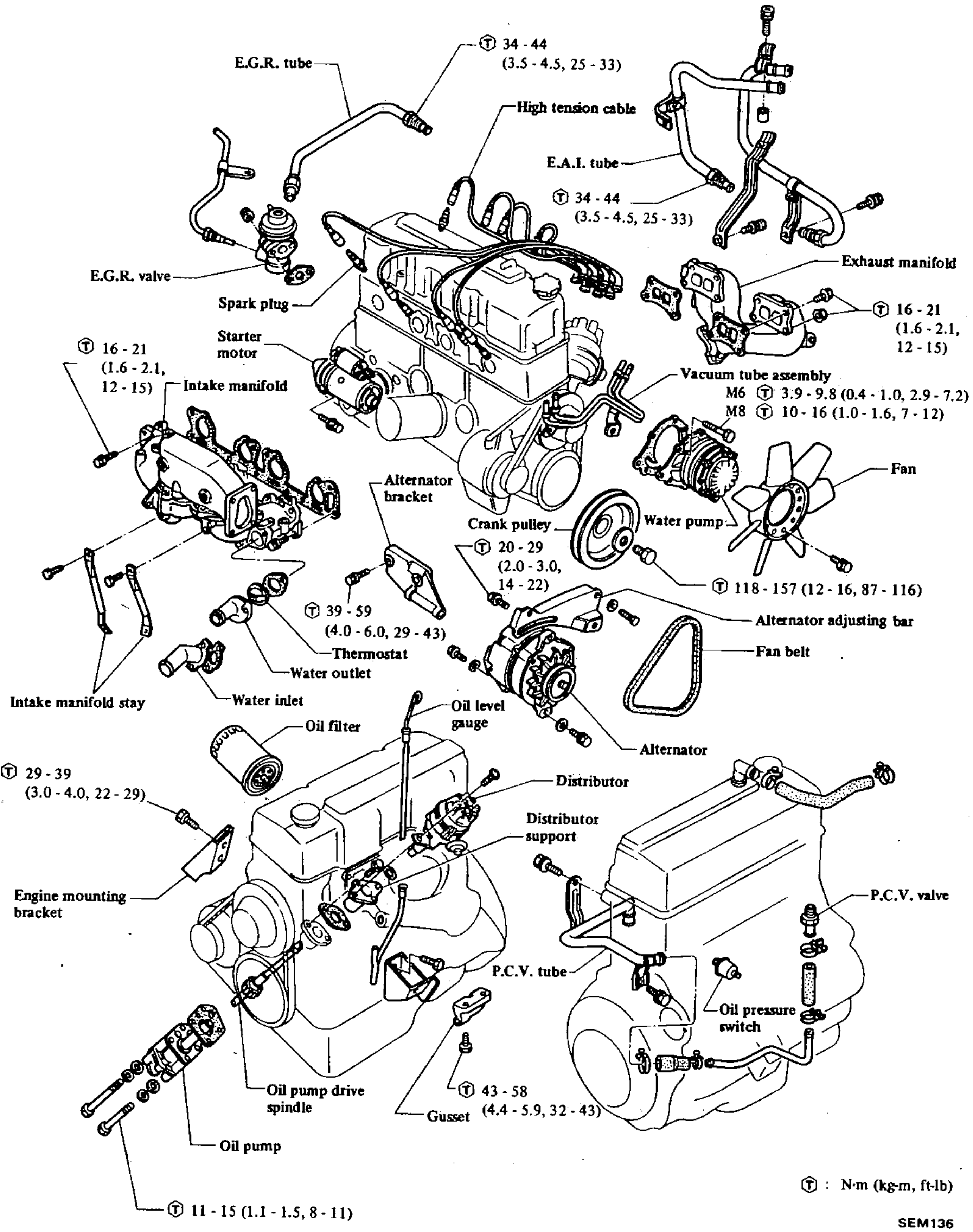
Tool number (Kent-Moore No.)	Tool name
ST19320000 (J25664)	Oil filter wrench 

SECTION EM

ENGINE MECHANICAL

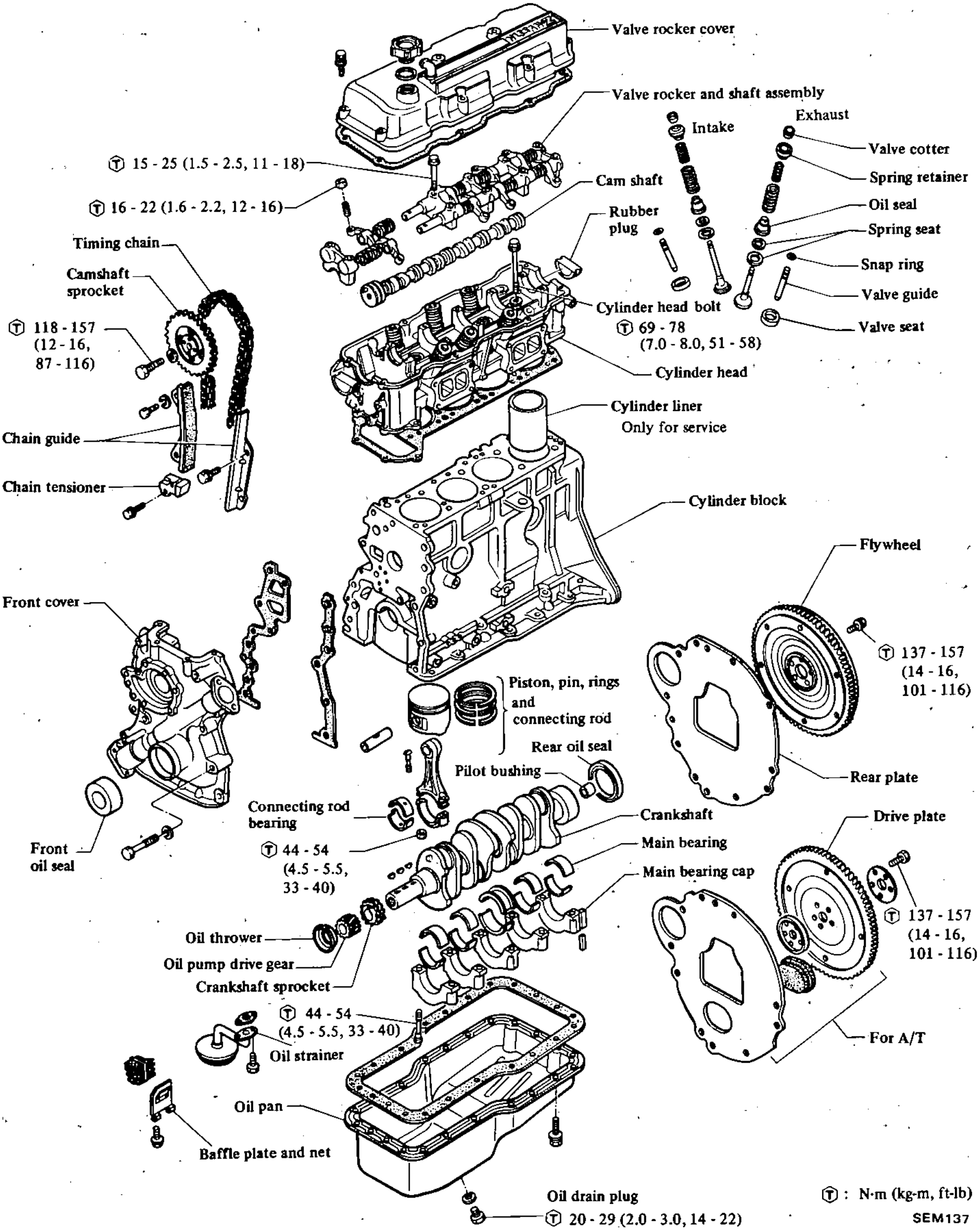
CONTENTS

ENGINE COMPONENTS (Outer parts)



SEM136

ENGINE COMPONENTS (Body parts)



ENGINE DISASSEMBLY

PRECAUTION

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

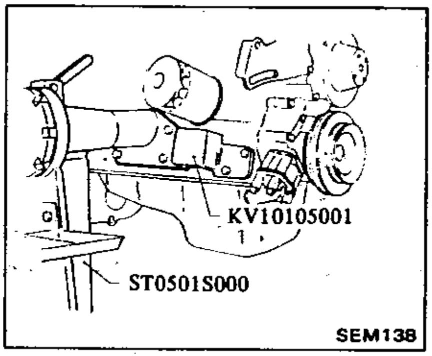
DISASSEMBLING ENGINE OVERALL

MOUNTING ENGINE ON WORK STAND

1. Remove following parts, located at rear and right side of engine.

- Starter motor
- Transmission
- Clutch cover assembly (using Tool KV30100100) or torque convertor
- Intake manifold stays
- Alternator and its bracket
- Engine mounting bracket

2. Install engine attachment to cylinder block. Then, mount the engine on the work stand.



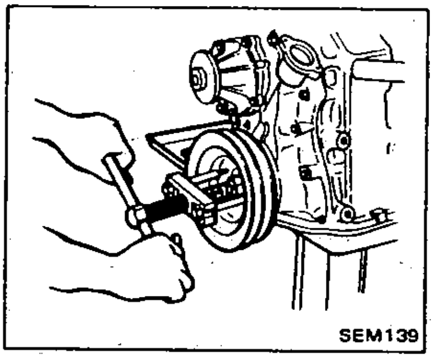
SEM138

3. Drain out engine oil and coolant.

REMOVING OUTER PARTS

4. Remove **engine front side parts.**

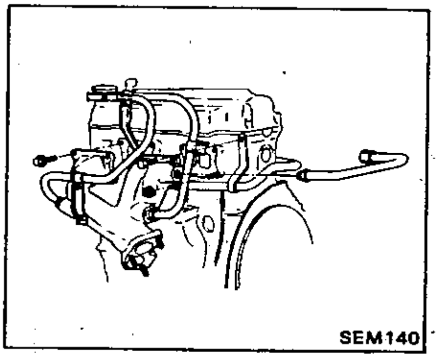
- Fan
- Drive belts
- Belt tensioner for power steering (if equipped)
- Alternator adjusting bar
- Water pump
- Vacuum tube assembly for distributor and canister
- Crankshaft pulley: Use suitable tool on air conditioner equipped model.



SEM139

5. Remove **engine left side parts.**

- Distributor cap and high tension cables
- Distributor
- Exhaust manifold with air induction tubes after removing E.G.R. tube.

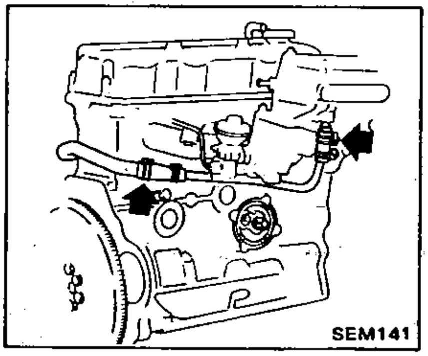


SEM140

- Compressor bracket (if equipped)
- Oil level gauge
- Engine mounting bracket
- Spark plugs

6. Remove **engine right side parts.**

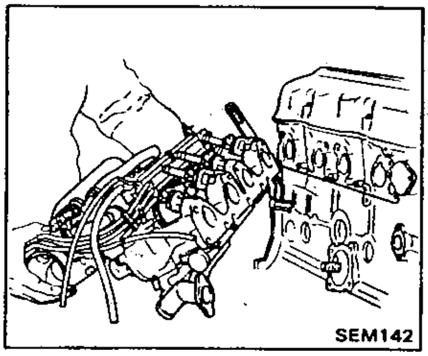
(1) Cylinder block-to-P.C.V. valve hose.



SEM141

(2) Power steering pump bracket and throttle chamber stay (if equipped)

(3) Intake manifold assembly including water inlet, water pipes, water outlet, vacuum tubes, E.G.R. valve, throttle chamber and EFI parts (Injectors, fuel pipes, air regulator, etc.)



SEM142

(4) And following parts.

- Oil filter (using Tool ST19320000)
- Oil pressure switch
- Spark plugs

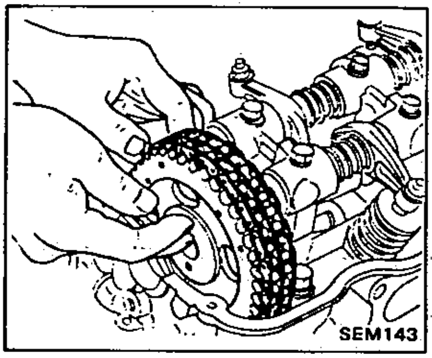
7. Remove **engine bottom side parts.**

- Oil pump and oil pump drive spindle.
- Gussets.

REMOVING BODY PARTS

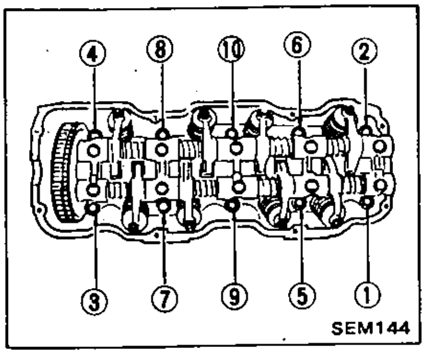
8. Remove oil pan and oil strainer.
9. Remove valve rocker cover.
10. Remove cylinder head assembly.

(1) Remove camshaft sprocket and slowly lower timing chain.



SEM143

(2) Loosen cylinder head bolts in the sequence shown.



(3) Remove bolts securing cylinder head to front cover.

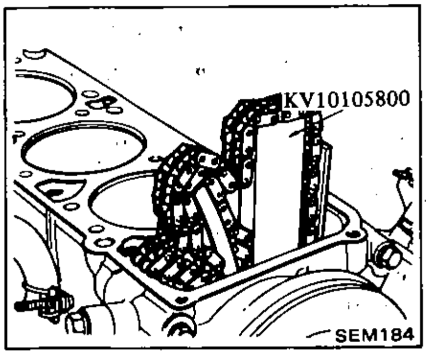
(4) Remove cylinder head.

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 with paint before removal.

c. Support timing chain by utilizing Tool between timing chains.



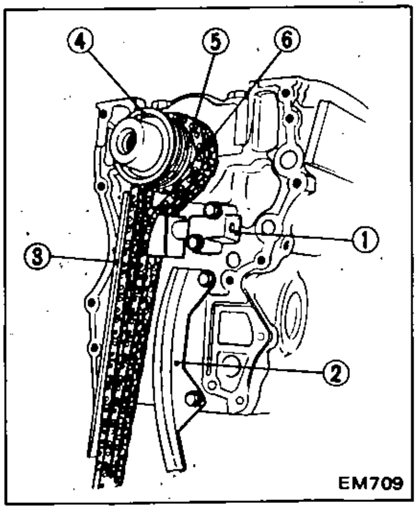
11. Remove front side parts.

(1) Front cover

(2) Chain tensioner and chain guide.

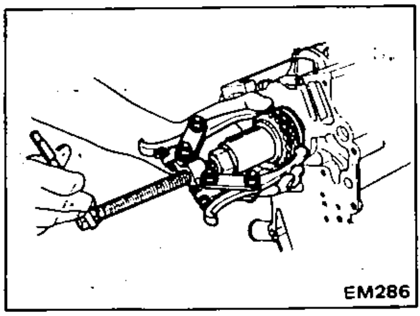
(3) Timing chain.

(4) Oil thrower, oil pump drive gear and crankshaft sprocket.



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

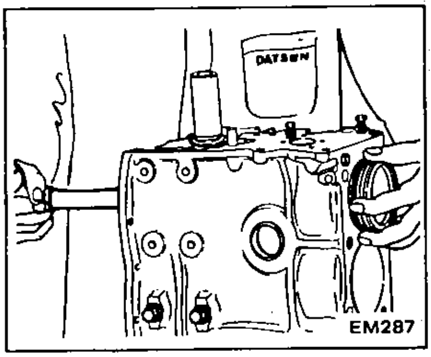
If it is hard to extract crankshaft sprocket, use a suitable puller.



12. Remove piston and connecting rod assembly.

(1) Remove connecting rod bearing cap with bearing.

(2) Push out piston with connecting rod toward cylinder head side.

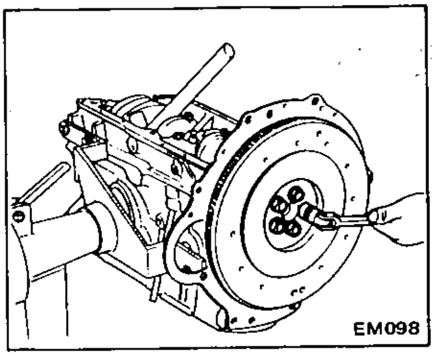


a. Piston can be easily removed by scraping carbon off top face of cylinder with a scraper.

b. Numbers are stamped on connecting rod and cap corresponding to each cylinder. Care should be taken to avoid wrong combination including bearing.

13. Remove flywheel and end plate.

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

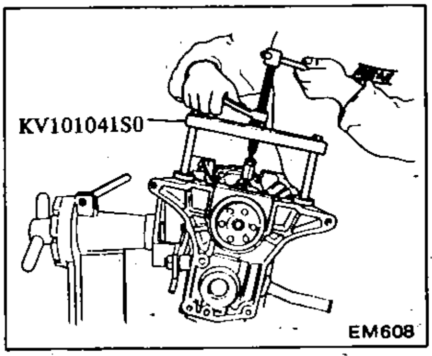


14. Remove crankshaft.

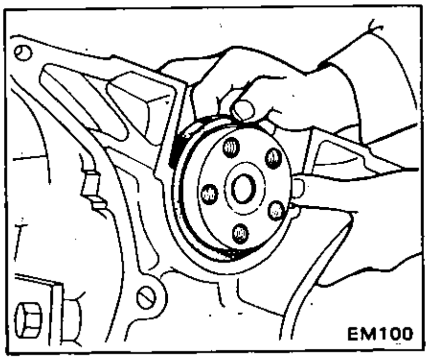
(1) Remove main bearing caps with bearings.

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

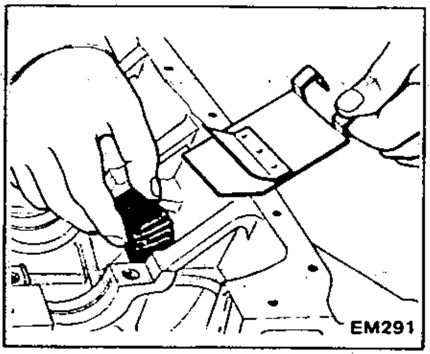
b. Use Tool to remove center and rear main bearing caps. Keep them in order.



(2) Remove rear oil seal.

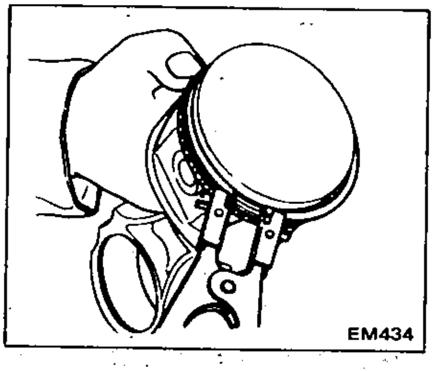


(3) Remove crankshaft.
(4) Remove main bearings at block side.
15. Remove baffle plate and steel net from cylinder block.

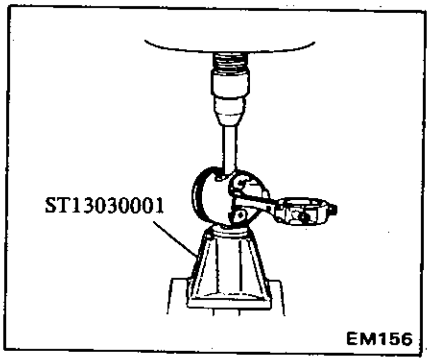


DISASSEMBLING PISTON AND CONNECTING ROD

1. Remove piston rings with a ring remover.



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

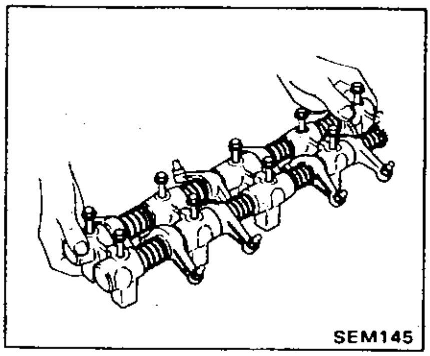


Keep the disassembled parts in order.

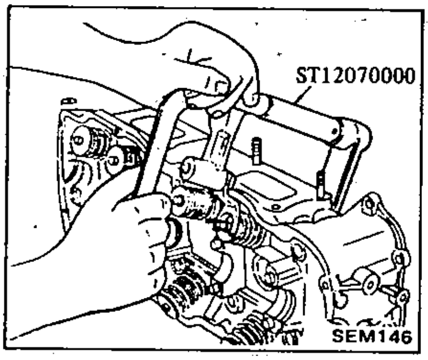
DISASSEMBLING CYLINDER HEAD

1. Remove rocker shaft assembly together with securing bolts.

a. Do not remove bolts at No.1 and No.5 brackets since rocker shaft bracket and rocker will spring out.
b. When loosening bolts, evenly loosen from outside in sequence.



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

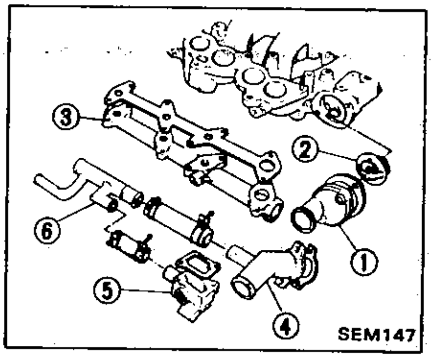


Keep the disassembled parts in order.

DISASSEMBLING INTAKE MANIFOLD

1. Remove following fuel system parts, referring to Section EF.
(1) Throttle chamber
(2) Air regulator
(3) Fuel and vacuum tube assembly
(4) Fuel pressure regulator
(5) Injectors
(6) Throttle control cable bracket

2. Remove cooling system parts.



1	Water outlet
2	Thermostat
3	Water gallery
4	Water outlet
5	Sensor housing
6	Water pipe

3. Remove following emission control system parts, referring to Section EC.
- E.G.R. control valve
- Thermal vacuum valves

Note installed direction of inlet and outlet for reassembly.

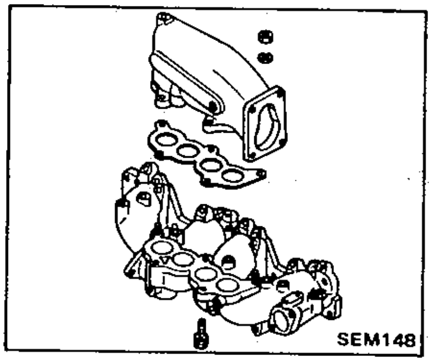
- Vacuum control valve
- Positive crankcase ventilation valve

4. Remove following miscellaneous parts.
- Fast idle control device (if equipped)
- Plugs
- Vacuum connectors

Note installed direction of outlet for reassembly.

- Water temperature sensors

5. Disassemble intake manifold body.



INSPECTION AND REPAIR

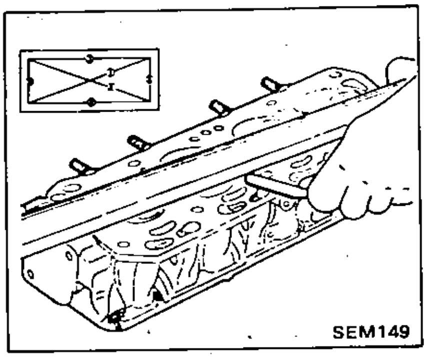
CYLINDER HEAD

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.

Warpage of surface:
Limit 0.1 mm (0.004 in)



SEM149

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"
Limit:
A + B = 0.2 mm (0.008 in)

VALVE GUIDE

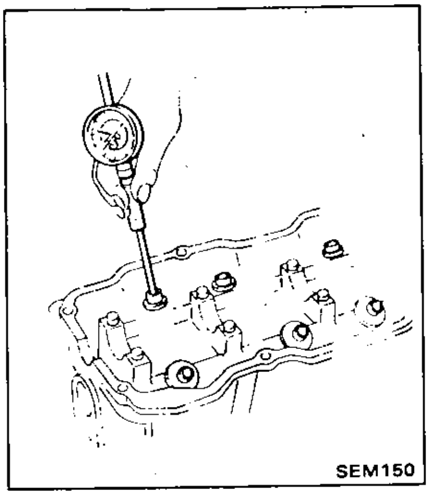
Measure the clearance between valve guide and valve stem. If the clearance exceeds the specified limit, replace the worn parts or both valve and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn or bent valve stem or by a worn valve guide.

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.



SEM150

(3) Subtract the highest reading of valve stem diameter from valve guide bore to obtain the stem to guide clearance.

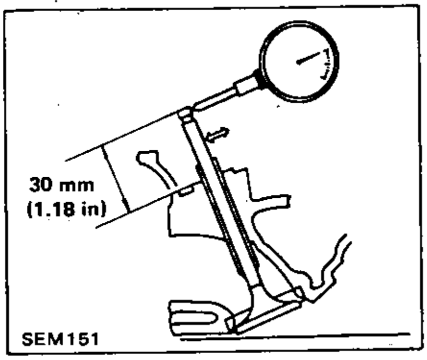
Stem to guide clearance:
Limit 0.1 mm (0.004 in)

2. Expedient method:

Pry valve in lateral direction, and measure deflection at stem end with dial gauge.

Stem end deflection:
Limit 0.2 mm (0.008 in)

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



SEM151

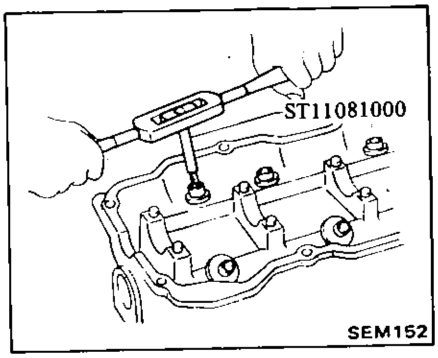
Replacement of valve guide

1. To remove old guides, use Tool ST11033000 and a press (under a 2-ton pressure) or a hammer.

Drive them out toward rocker cover. Heated cylinder head will facilitate the operation.

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

Reaming bore:
12.185 - 12.196 mm
(0.4797 - 0.4802 in)



SEM152

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

Valve guide of 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)

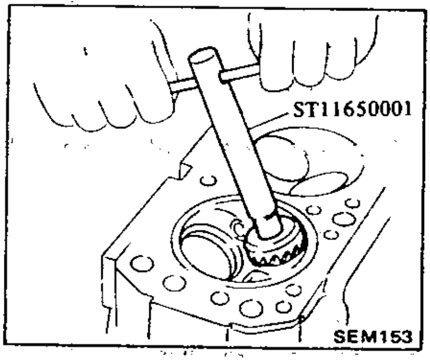
5. Correct valve seat surface with new valve guide as the axis.

VALVE SEAT INSERTS

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

Correct valve seat surface with Tool 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.



SEM153

a. When repairing valve seat, check valve guide for wear beforehand. If worn, replace it. Then correct valve seat.
b. The Tool should be used with both hands for uniform cutting.

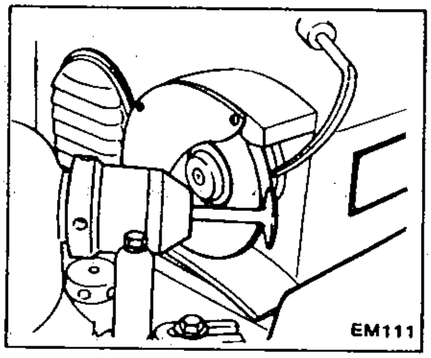
Replacement valve seat insert

1. Old insert can be removed by boring out until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in cylinder head.
2. Select a suitable valve seat insert and check its outside diameter.
3. Machine cylinder head recess to the concentric circles to valve guide center.
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 beds on the bottom face of its recess, and caulk more than 4 points.
7. Valve seats newly fitted 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 valve for worn, damaged or deformed valve head or stem. Correct or replace the valve that is faulty.
Refer to S.D.S.
2. Valve face or valve stem end surface should be refaced by using a valve grinder.

Valve head margin:
Limit 0.5 mm (0.020 in)
Grinding of valve stem end:
Limit 0.5 mm (0.020 in)

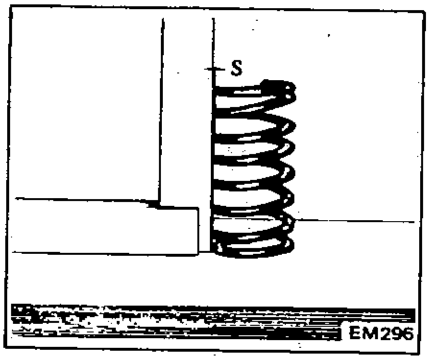


EM111

VALVE SPRING

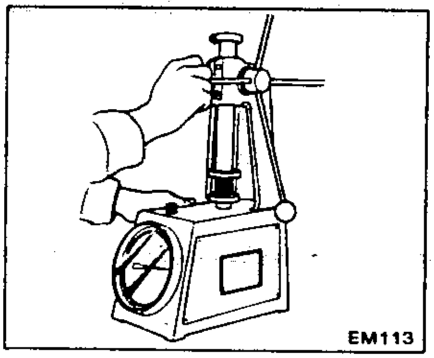
1. Check valve spring for squareness using a steel square and surface plate. If spring is out of square "S" more than specified limit, replace with new ones.

Out of square ("S"):
Outer
Limit 1.6 mm (0.063 in)
Inner
Limit 1.6 mm (0.063 in)



EM296

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.



EM113

ROCKER ARM AND ROCKER SHAFT

1. Check rocker arms and shafts for sign of wear or damage, and if worn excessively, replace rocker arm and/or shaft.
2. Check oil clearance between rocker arm and rocker shaft.

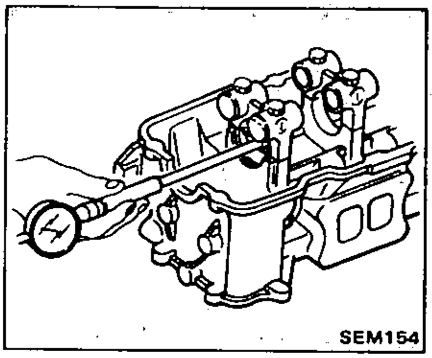
Rocker arm to shaft clearance:
0.007 - 0.049 mm
(0.0003 - 0.0019 in)

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.

Camshaft bearing clearance:
Limit 0.1 mm (0.004 in)



SEM154

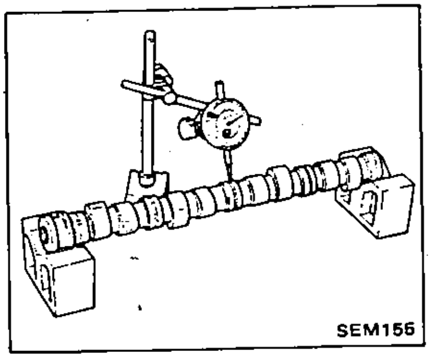
CAMSHAFT ALIGNMENT

1. Check camshaft, camshaft journal and cam surface for bend, wear or

damage. If beyond the specified limits. replace the parts.

2. A bend value is one-half of the total indicator reading obtained when camshaft is turned one full revolution with a dial gauge at center journal.

Camshaft bend
(Total indicator reading):
Limit 0.10 mm (0.0039 in)

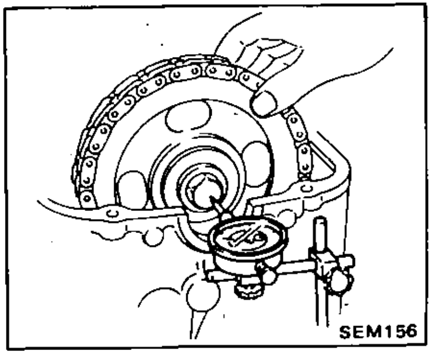

SEM155

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

Wear limit of cam height:
0.25 mm (0.0098 in)

4. Measure camshaft end play. If beyond the specified limit, replace camshaft or cylinder head assembly.

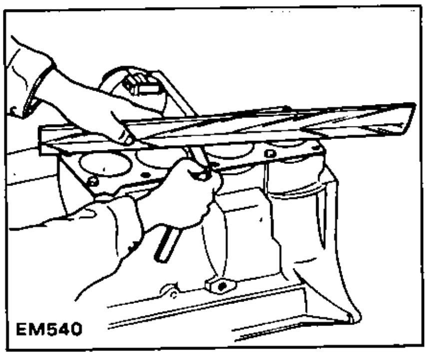
Camshaft end play:
Limit 0.2 mm (0.008 in)


SEM156

CYLINDER BLOCK

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

Warpage of surface:
Limit 0.1 mm (0.004 in)

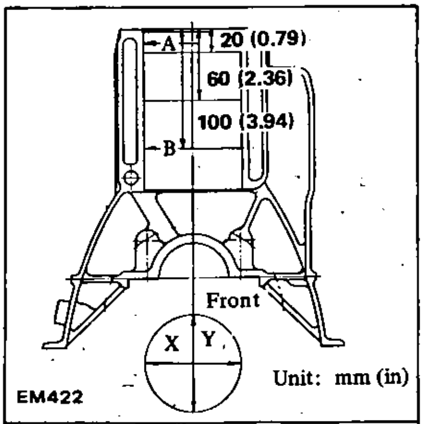

EM540

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"
Limit:
A + B = 0.2 mm (0.008 in)

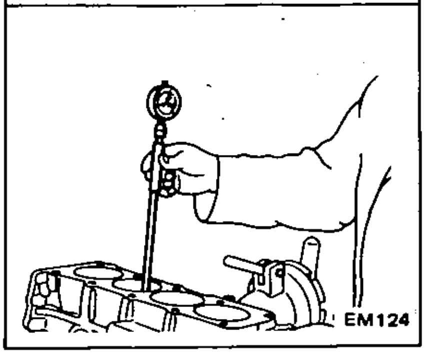
3. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper. If, those are excessive, rebore the cylinder walls by means of a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round.

Refer to S.D.S.

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



EM422


EM124

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:
0.08 to 0.09 mm
(0.0031 to 0.0035 in)

CYLINDER BORING

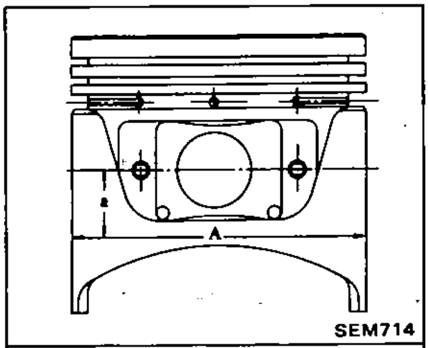
When any cylinder needs boring, all other cylinders must also be bored at the same time.

Determining bore size

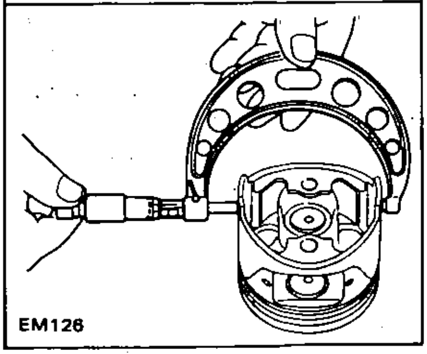
1. Determine piston oversize according to amount of wear of cylinder.

Oversize pistons are available for service. 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 "A".



SEM714


EM126

Dimension "a"
(distance from center of pin):
Approximately
20 mm (0.79 in)

Rebored size calculation

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

where,

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

Boring

CAUTION:

a. To prevent strain due to cutting heat, bore the cylinders in the order of 2-4-1-3.

b. Before boring any cylinder, install main bearing caps in place and tighten to the specification so that the crankshaft bearing bores will not become distorted from the boring operation.

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3. Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.
4. As a final step, cylinders should be honed to size.
5. Measure the finished cylinder bore for out-of-round or tapered part.

Refer to S.D.S.

Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat.

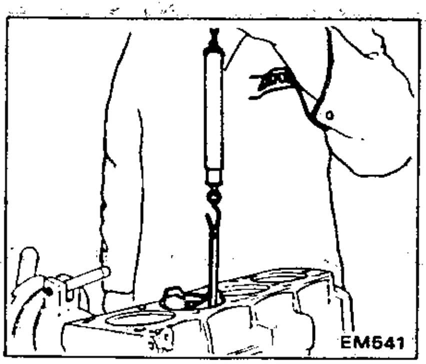
Measuring piston-to-cylinder clearance

6. This clearance can be checked easily by using a feeler gauge and a spring balance hooked on feeler gauge, measuring the amount of force required to pull gauge out from between piston and cylinder.

Feeler gauge used:
0.04 mm (0.0016 in)
Extracting force:
2.0 - 14.7 N
(0.2 - 1.5 kg, 0.4 - 3.3 lb)

a. When measuring clearance, slowly pull feeler gauge straight upward.

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


EM541

PISTON, PISTON PIN AND PISTON RING

PISTON

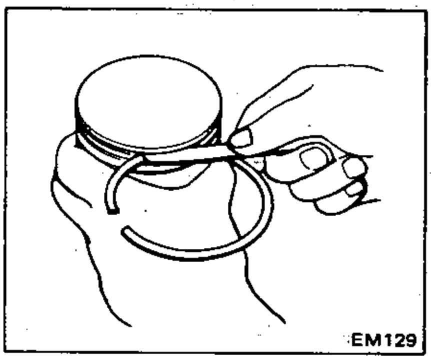
1. Scrape carbon off piston and ring grooves with a carbon scraper and a curved steel wire. The wire will be useful in cleaning bottom land of ring groove. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if such a fault is detected.

PISTON RING

1. Measure the side clearance of rings in ring grooves as each ring is installed.

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

Side clearance:
Limit 0.1 mm (0.004 in)

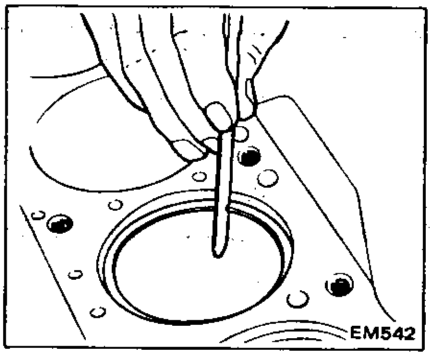

EM129

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

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

If ring gap exceeds the specified limit, replace ring.

Ring gap:
Limit 1.0 mm (0.039 in)

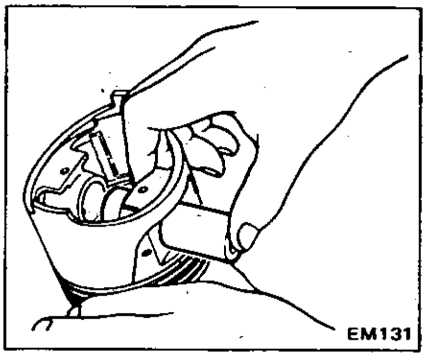

EM542

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 the fitting of piston pin into piston pin hole to be such an extent that it can be pressed smoothly by finger at room temperature. This piston pin must be a tight press fit into connecting rod.


EM131

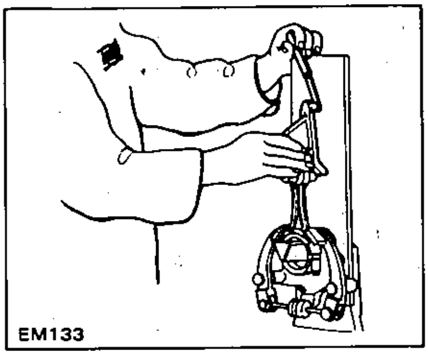
2. Measure oil clearance between piston pin and piston. If it is excessive, replace piston pin together with piston.

Piston pin to piston clearance:
0.006 - 0.013 mm
(0.0002 - 0.0005 in)

CONNECTING ROD

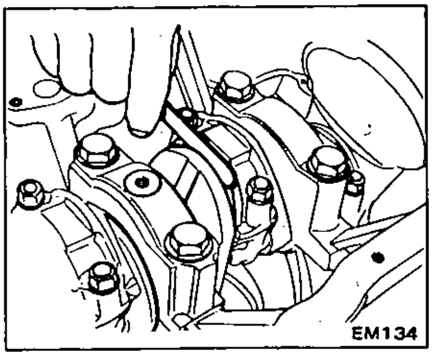
1. If a connecting rod has any flaw on both sides of the thrust face and the large end, correct or replace it.
2. Check connecting rod for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace.

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



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

Big end play:
Limit 0.6 mm (0.0024 in)



When replacing connecting rod, select so that weight difference between each cylinder is within 7 g (0.25 oz), in the condition of piston and connecting rod assembly.

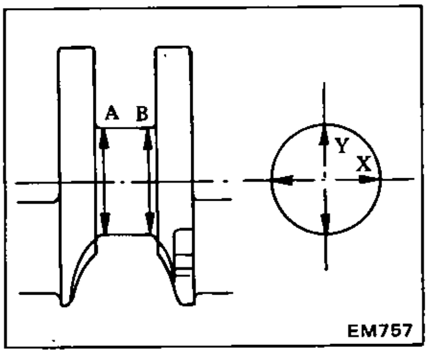
CRANKSHAFT

CRANK JOURNAL AND PIN

1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check with a micrometer journals and crank pins 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):
Limit 0.03 mm (0.0012 in)
Taper (A-B):
Limit 0.03 mm (0.0012 in)



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

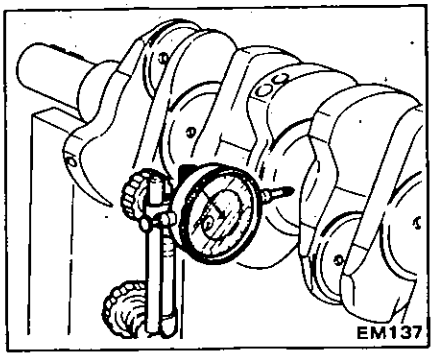
BEND AND END PLAY

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

Bend value is half of the total indicator reading obtained when crankshaft is turned one full revolution.

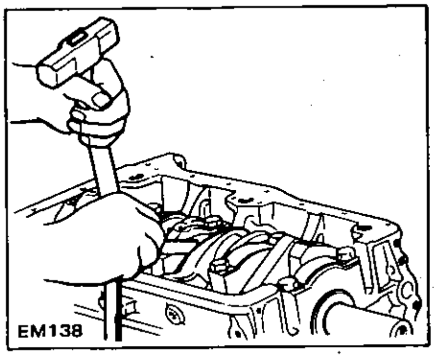
If bend exceeds the specified limit, replace or repair.

Bend
(Total indicator reading):
Limit 0.10 mm (0.0039 in)



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

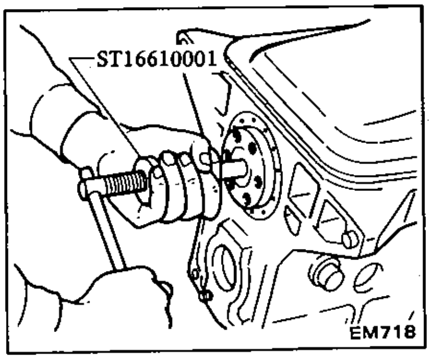
End play:
Limit 0.3 mm (0.012 in)



REPLACING PILOT BUSHING

To replace crankshaft rear pilot bushing, proceed as follows:

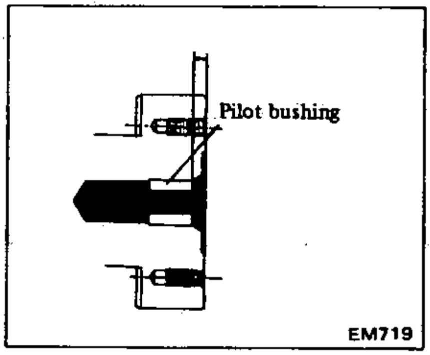
1. Pull out bushing using Tool.



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 "A".

Distance "A":
Approximately
4.0 mm (0.157 in)



EM719

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

MAIN BEARING AND CONNECTING ROD BEARING

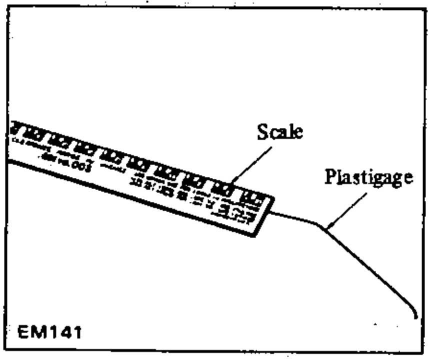
MAIN BEARING

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 axis, getting clear of the oil hole.



EM141

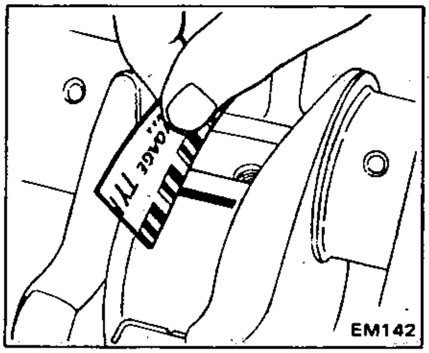
(2) Install bearing and bearing cap, with the bolts tightened to the specified torque.

Ⓣ : **Main bearing cap bolt**
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 bearing and cap. Compare width of plastigage at its widest part with the scale printed in plastigage envelope.

Main bearing clearance:
Limit 0.12 (0.0047 in)



EM142

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

Refer to S.D.S.

CONNECTING ROD BEARING

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

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

Connecting rod bearing clearance:
Limit 0.12 mm (0.0047 in)

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

Refer to S.D.S.

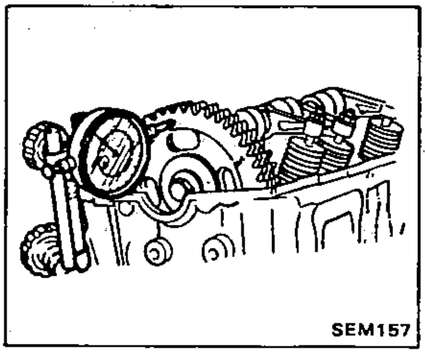
MISCELLANEOUS COMPONENTS

CAMSHAFT SPROCKET

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

If runout exceeds the specified limit, replace camshaft sprocket.

Runout:
(Total indicator reading)
Limit 0.1 mm (0.004 in)



SEM157

CHAIN

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

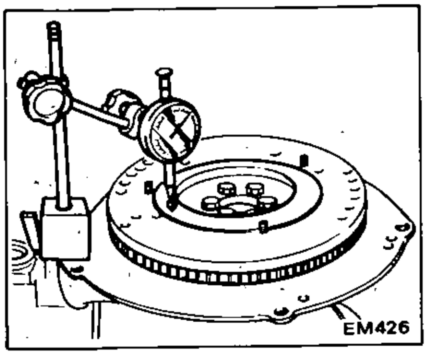
CHAIN TENSIONER AND CHAIN GUIDE

Check for wear and breakage. Replace if necessary.

FLYWHEEL

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

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



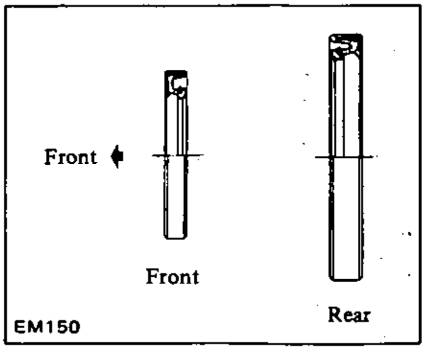
3. Check tooth surfaces of ring gear for flaws or wear.
   Replace if necessary.

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

FRONT AND REAR OIL SEAL

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

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



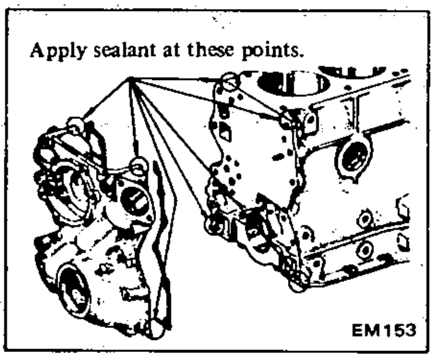
ENGINE ASSEMBLY

PRECAUTIONS

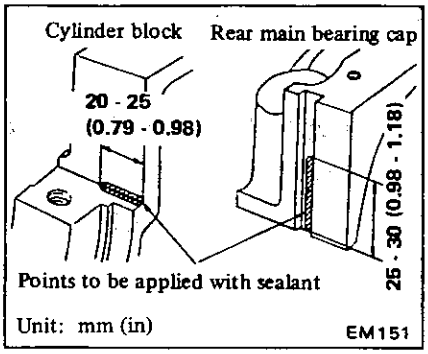
1. When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.
2. Use new packings and oil seals.
3. Be sure to follow specified tightening torque and order.
4. Apply sealant to the following points:

Do not apply sealant too much.

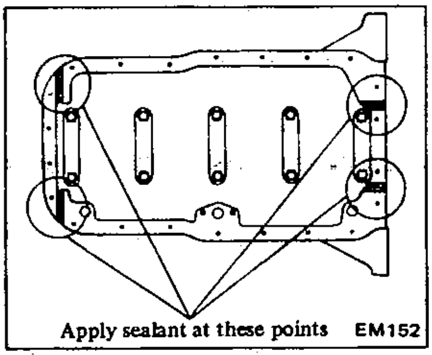
(1) Front side of cylinder block:
Mating surface with front cover and top of front cover.



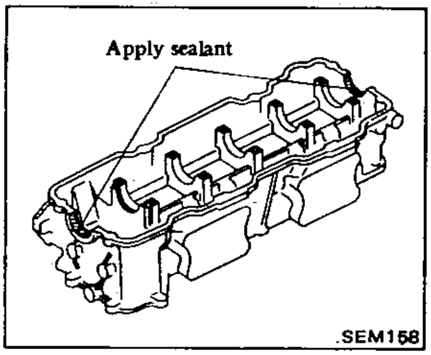
(2) Rear side of cylinder block:
Each side of rear main bearing cap and each corner of cylinder block.



(3) Bottom side of cylinder block:
Step portions at four mating surfaces (cylinder block to front chain cover and cylinder block to rear main bearing cap).



(4) Front and rear side of cylinder head:
Mating surfaces with rubber plug.

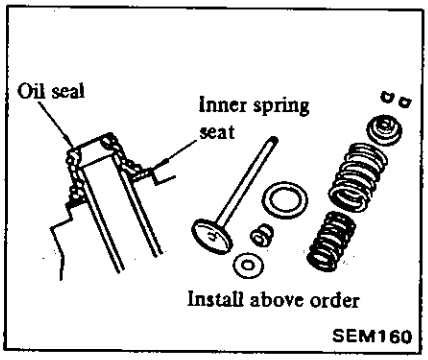


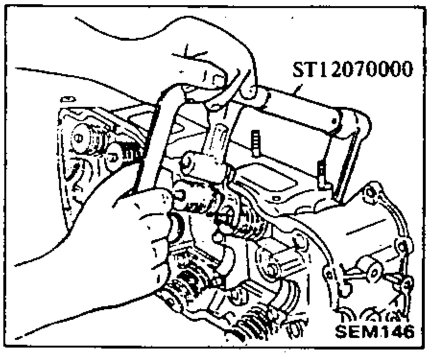
ASSEMBLING CYLINDER HEAD

1. Install valve and valve spring.

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

(2) Install valve, valve spring inner and outer, valve spring retainer. Compress springs and fit valve spring collets by using Tool.

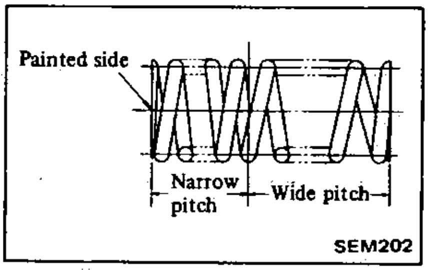




a. When installing valve, apply engine oil on the valve stem and lip of valve oil seal.

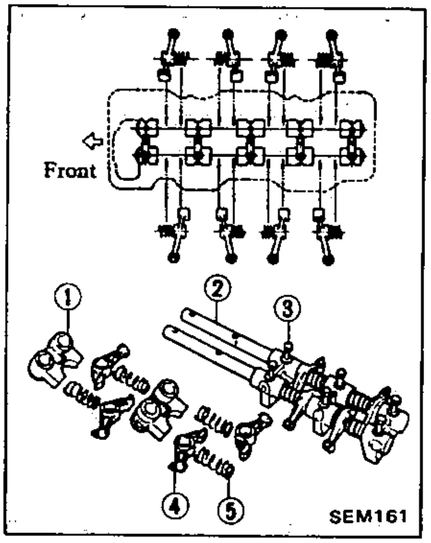
b. Check whether the valve face is free from foreign matter.

c. Inner and outer valve springs are of an uneven pitch type. Install valve spring with its narrow pitch side (painted) at cylinder head side.



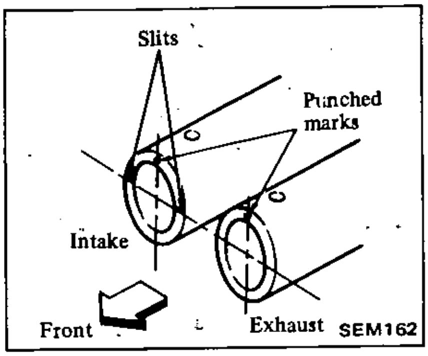
2. Make up valve rocker shaft assembly.

Install rocker shaft bracket, valve rocker, and spring on valve rocker shaft, observing the following.



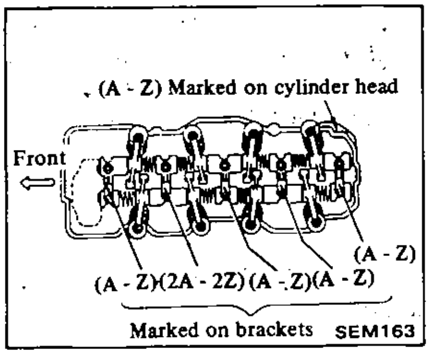
1 Rocker bracket
2 Rocker shaft
3 Bolt
4 Spring
5 Rocker arm

(1) Intake rocker shaft has identification mark (slit on front surface), but exhaust rocker shaft does not.
(2) Both rocker shafts should be assembled so that punched marks on front surfaces come to upside. Marks are used to identify oil hole direction.



SEM162

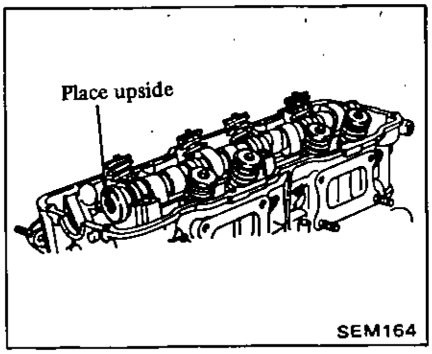
(3) Valve rocker is same for intake and exhaust and also No.1 and No.3 cylinder, and provides identification mark "1". Similarly, the one for No.2 and No.4 cylinder provides mark "2".
(4) Be careful not to miss original location of rocker shaft brackets. For this purpose, identification marks are provided on each bracket and cylinder head.



SEM163

To prevent rocker shaft brackets from slipping out of rocker shafts, insert bracket bolts (any bolt will do) into bolt holes of No.1 and No.5 rocker shaft bracket.

3. Mount camshaft onto cylinder head, placing dowell pin at front end to top position.

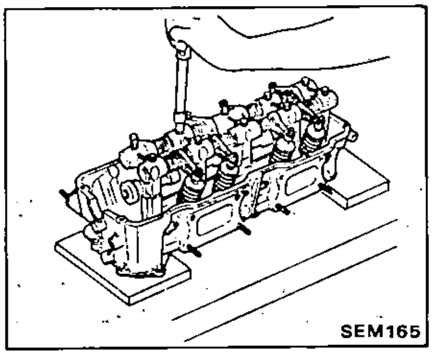


SEM164

4. Mount valve rocker shaft assembly on cylinder head by accommodating to knock pin of the head. Then, tighten to the specified torque.

Ⓣ : **Rocker shaft bracket bolt**
15 - 25 N·m
(1.5 - 2.5 kg-m,
11 - 18 ft-lb)

a. Tighten bolts gradually, in two to three stages outwardly from center bracket.
b. When tightening bolts, make space under cylinder head since some valves will open and interfered.

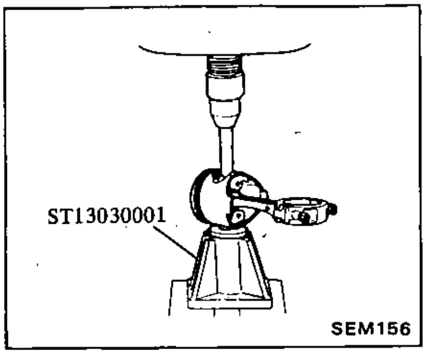

SEM165

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

ASSEMBLING PISTON AND CONNECTING ROD

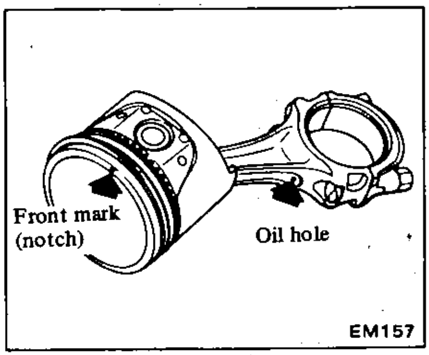
1. Assemble pistons, piston pins and connecting rods of the designated cylinder.

a. Piston pin is pressed into connecting rod, and fitting force is from 4.9 to 14.7 kN (0.5 to 1.5 t, 0.6 to 1.7 US ton, 0.49 to 1.48 Imp ton) and the aid of Tool is necessary.
When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.



SEM156

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

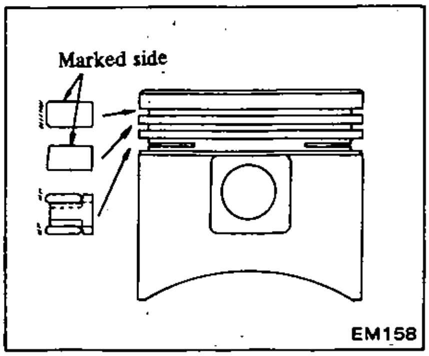


EM157

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

2. Install piston rings.
Install so that stamped mark on ring faces upward.

a. Top ring is chromium-plated on liner contacting face.
b. Second ring has larger taper surface than top ring.
c. In the combined oil ring, upper rail is the same as lower one.



EM158

ASSEMBLING INTAKE MANIFOLD

Assemble in the reverse order of disassembly and with the specified torque if designated.

Refer to Disassembling Intake Manifold.

a. When installing thermostat and its housing, refer to Section LC.

b. When installing emission control system parts and fuel system parts, refer to Sections EC and EF respectively.

ASSEMBLING ENGINE OVERALL

INSTALLING BODY PARTS

1. In the first place, mount cylinder block on work stand. (refer to engine overall disassembly).

2. Install baffle plate and steel net into crankcase.

3. Install crankshaft.

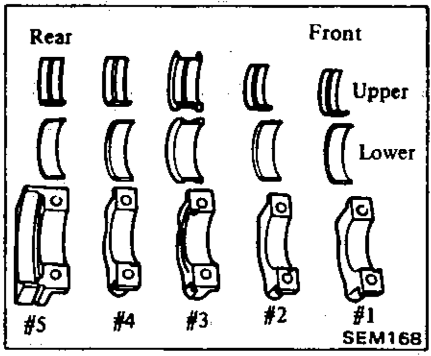
(1) Set upper main bearings at the proper portion of cylinder block.

a. Only center bearing (No. 3) is a flanged type.

b. All inter-bearings (No. 2 and No. 4) are the same type.

c. Front bearing (No. 1) is also the same type as rear bearing (No. 5).

d. Upper and lower bearings are not interchangeable. Upper ones have oil groove.



SEM168

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

(3) Install crankshaft.

(4) Install lower main bearings and caps and tighten bolts to specified torque.

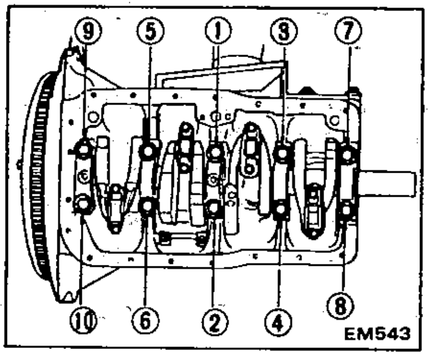
Ⓣ: Main bearing cap bolt
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

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 outwardly from center bearing in sequence.

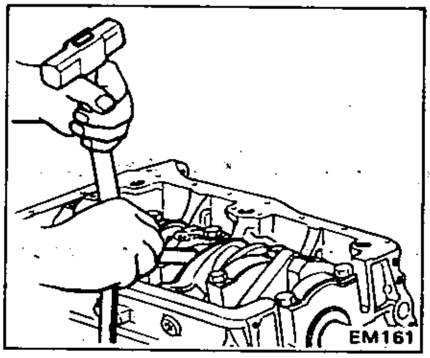


EM543

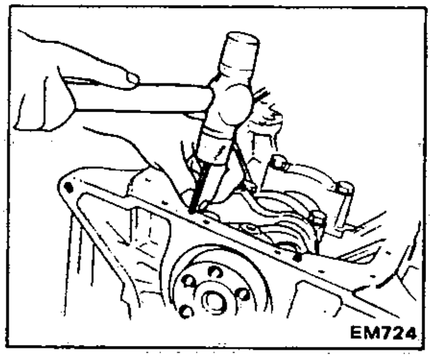
e. After securing bearing cap bolts, ascertain that crankshaft turn smoothly.

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

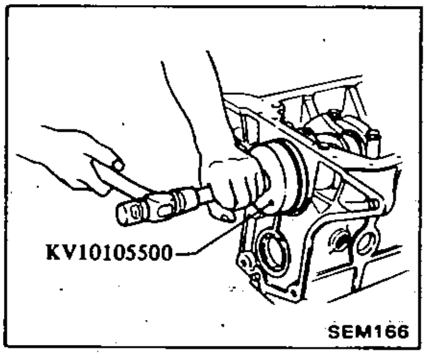
Crankshaft end play:
Limit 0.3 mm (0.012 in)


EM161

4. Apply sealant to side oil seals. Then install those into rear main bearing cap.


EM724

5. Install rear oil seal using Tool.



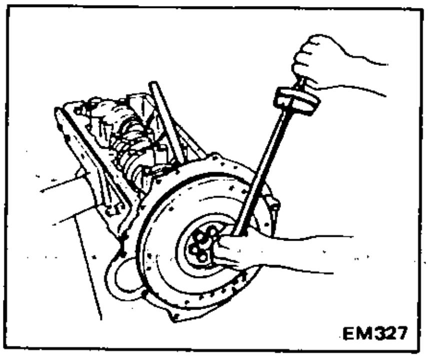
SEM166

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

b. Install oil seal with its dust seal lip at outside.

6. Install rear end plate and flywheel.

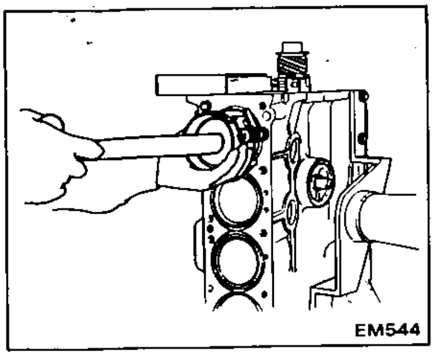
Ⓣ: Flywheel fixing bolt
137 - 157 N·m
(14 - 16 kg-m,
101 - 116 ft-lb)


EM327

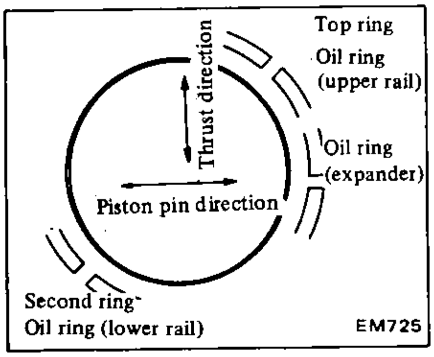
When installing flywheel, wipe oil or foreign matter away from fitting surfaces.

7. Install pistons with connecting rod.

(1) Install them into corresponding cylinder using Tool.


EM544

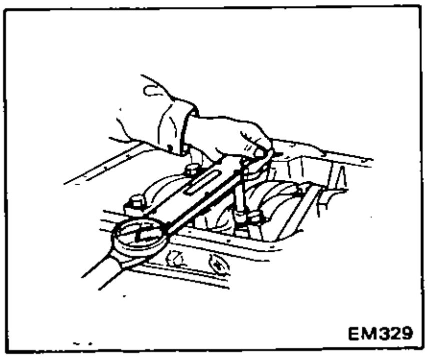
- **a. Apply engine oil to sliding parts.**
- **b. Arrange so that the front mark on piston head faces to the front of engine.**
- **c. Install piston ring as shown below.**



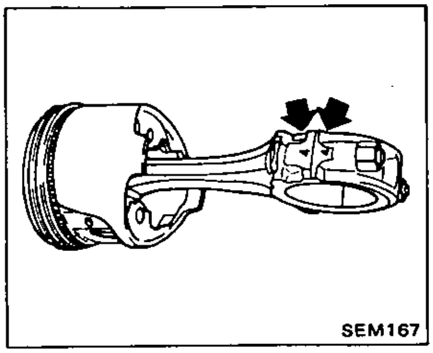
EM725

(2) Install connecting rod bearing caps.

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


EM329

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


SEM167

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

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

(1) Thoroughly clean cylinder block and head surface.

Do not apply sealant to mating surface of cylinder block and head.

(2) Turn crankshaft until No. 1 piston is at T.D.C. on its compression stroke.

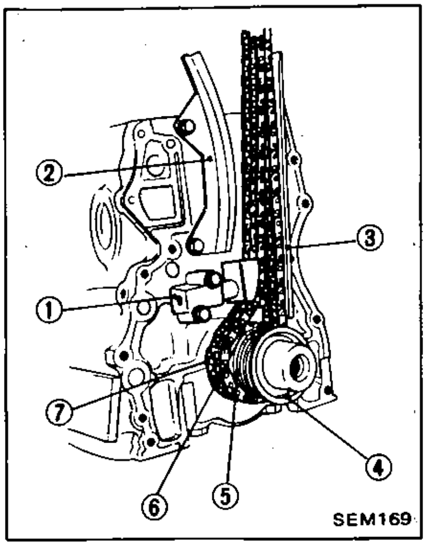
(3) When installing cylinder head, make sure that all valves are apart from head of pistons. If necessary, loosen adjusting screws of rocker arm to draw valves in.

(4) Temporarily tighten two center bolt.

Ⓣ : Cylinder head bolt (Temporary)
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 head of pistons.**
- **c. Always use new cylinder head gasket.**

9. Install front side parts.



SEM169

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

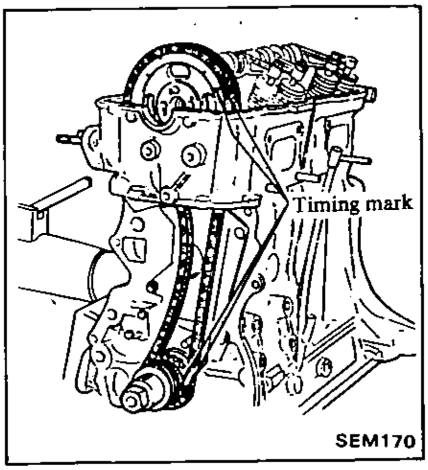
(1) Install crankshaft sprocket, oil pump drive gear and oil thrower.

- **a. Make sure that the mating marks of crankshaft sprocket faces to the front.**
- **b. Install oil pump drive gear so that large chamfered inner side faces rearward.**

(2) Install chain guide to cylinder block.

(3) Set chain on camshaft sprocket and crankshaft sprocket by aligning each mating mark. Then install camshaft sprocket to camshaft.

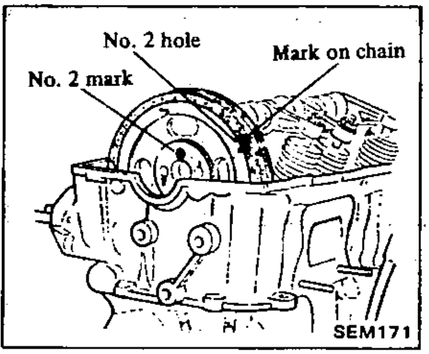
Ⓣ : Camshaft sprocket bolt
118 - 157 N·m
(12 - 16 kg-m,
87 - 116 ft-lb)



SEM170

a. Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket on the right hand side.

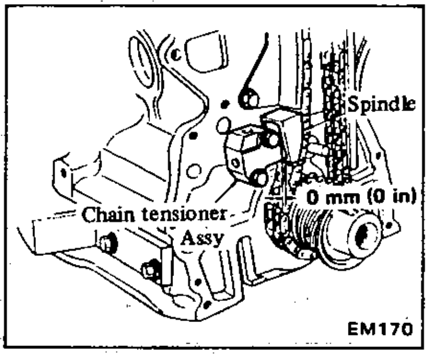
b. Camshaft sprocket should be installed by accommodating its No. 2 hole to knock pin of camshaft.



(4) Install chain guide and chain tensioner.

Ⓣ : Chain guide and tensioner bolt
5.9 - 9.8 N·m
(0.6 - 1.0 kg-m, 4.3 - 7.2 ft-lb)

Adjust the protrusion of chain tensioner spindle to 0 mm (0 in) with slack side chain guide.



(5) Install front cover with gaskets, observing the following:

a. Before installing front cover, press new oil seal in the cover with dust seal lip at outside.

b. Apply sealant to the sealing portions designated. Refer to Precautions.

c. Apply lithium grease to sealing lip of oil seal.

d. 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).

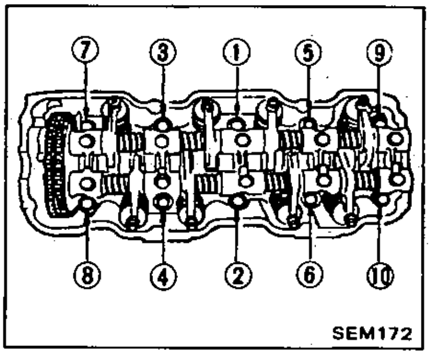
e. Note that different length of bolts are used.

Ⓣ : Front cover bolt
Size M8
10 - 16 N·m
(1.0 - 1.6 kg-m,
7 - 12 ft-lb)
Size M6
3.9 - 9.8 N·m
(0.4 - 1.0 kg-m,
2.9 - 7.2 ft-lb)

(6) Install crankshaft pulley.

Ⓣ : Crankshaft pulley bolt
118 - 157 N·m
(12 - 16 kg-m,
87 - 116 ft-lb)

10. Tighten cylinder head bolts to the specified torque in several steps and in the sequence shown below.



Ⓣ : Cylinder head bolt
69 - 78 N·m
(7.0 - 8.0 kg-m,
51 - 58 ft-lb)

a. Be sure to tighten bolts securing cylinder head to front cover.

b. After engine has been operated for several minutes, retighten if necessary.

11. Adjust valve clearance to cold specifications, referring to Section MA.

Valve clearance (*Cold)
Intake 0.21 mm (0.008 in)
Exhaust 0.23 mm (0.009 in)
***At ambient temperature 20°C (68°F).**

After engine has been assembled, finally adjust clearance to hot specifications.

12. Install valve rocker cover with gasket.

Ⓣ : Valve rocker cover bolt
7.8 - 9.8 N·m
(0.8 - 1.0 kg-m,
5.8 - 7.2 ft-lb)

a. Rocker cover bolts should be tightened in criss-cross fathion.

b. Always use new rocker cover gasket.

13. Install oil strainer and oil pan with gasket.

Ⓣ : Oil strainer bolt
10 - 16 N·m
(1.0 - 1.6 kg-m,
7 - 12 ft-lb)
Oil pan bolt
5.9 - 9.8 N·m
(0.6 - 1.0 kg-m,
4.3 - 7.2 ft-lb)

a. Apply sealant to the designated portions. Refer to Precautions.

b. Oil pan should be tightened in criss-cross pattern.

c. Always use new oil pan gasket.

INSTALLING OUTER PARTS

14. Install following parts in the reverse order of disassembly and with the specified torque if designated.

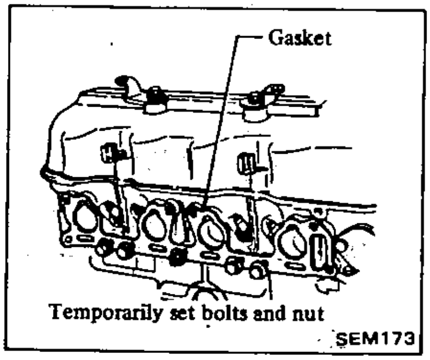
Refer to Disassembling Outer Parts and S.D.S. for tightening torque.

(1) Engine bottom side parts.

When installing oil pump and distributor driving spindle in front cover, refer to Section LC.

(2) Engine right side parts.

a. When installing intake manifold, to facilitate work, previously set the securing bolts and nut with washers at lower and center side as illustrated.



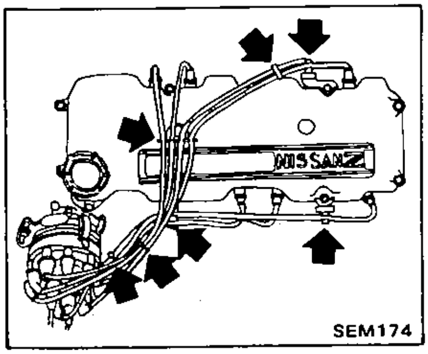
b. When connecting vacuum pipes, refer to Section EC.

c. When installing oil filter, refer to Section LC.

(3) Engine left side parts.

a. When installing distributor, temporarily tighten ignition timing adjust screws at center of adjusting holes.

b. When installing high tension cables, clamp those as illustrated.



SEM174

(4) Engine front side parts.

DISMOUNTING ENGINE FROM WORK STAND

15. Dismount engine in the reverse order of mounting and install engine right side and rear side parts remained with the specified torque if designated.

Refer to Mounting Engine on Work Stand and S.D.S. for tightening torque.

When installing clutch assembly, use Tool KV30100100.

16. Fill engine oil and coolant to the specified level, after engine has been installed on car. Refer to Section MA.

ENGINE TUNE-UP

17. Referring to Section MA, finally adjust following items:

(1) Drive belts deflection.

(2) Valve clearance.

Warm up engine until water temperature indicator points to middle of gauge, then adjust clearance to hot specifications.

Valve clearance (Hot)
Intake 0.30 mm (0.012 in)
Exhaust 0.30 mm (0.012 in)

(3) Ignition timing.

(4) Idle rpm.

SERVICE DATA AND SPECIFICATIONS

INSPECTION AND ADJUSTMENT

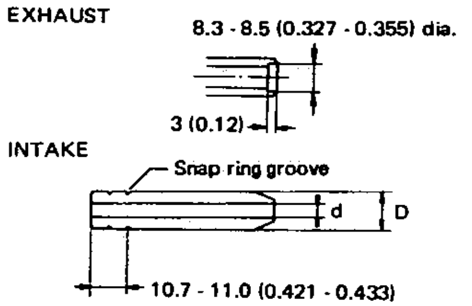
CYLINDER HEAD

Cylinder head

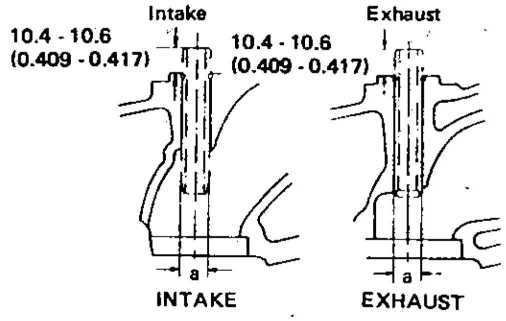
	Limit
Head surface flatness mm (in)	0.1 (0.004)

Valve guide

Unit: mm (in)



SEM175



EM116

	Standard	Service
Valve guide Outer diameter "D"	12.023 - 12.034 (0.4733 - 0.4738)	12.223 - 12.234 (0.4812 - 0.4817)
Valve guide Inner diameter "d" [Finished size]	8.000 - 8.018 (0.3150 - 0.3157)	
Cylinder head valve guide hole diameter "a"	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)	

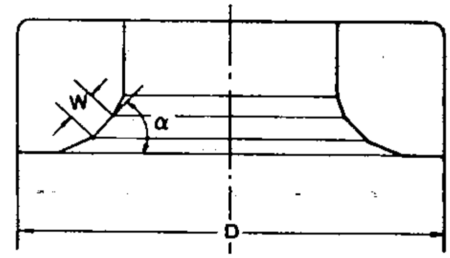
		Standard	Limit
Stem to guide clearance	In.	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
	Ex.	0.040 - 0.073 (0.0016 - 0.0029)	
Stem end deflection		–	0.2 (0.008)

Valve seat

Seat insert dimensions

"Intake"

Unit: mm (in)

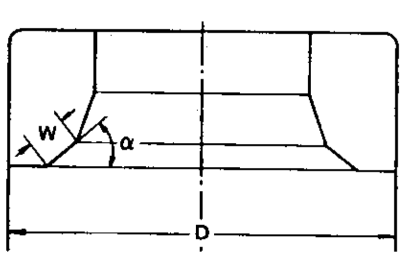


SEM177

Contacting face angle "α"		45°
Contacting width "W"	Standard	1.2 - 1.8 (0.047 - 0.071)
Outer diameter "D"	Standard	45.097 - 45.113 (1.7755 - 1.7761)
	Service	45.597 - 45.613 (1.7952 - 1.7958)

"Exhaust"

Unit: mm (in)



SEM178

Contacting face angle "α"		45°
Contacting width "W"	Standard	1.5 - 1.9 (0.059 - 0.075)
Outer diameter "D"	Standard	40.080 - 40.096 (1.5779 - 1.5786)
	Service	40.597 - 40.613 (1.5983 - 1.5989)

Cylinder head seat recess diameter

Unit: mm (in)

In.	For standard insert	45.000 - 45.016 (1.7717 - 1.7723)
	For service insert	45.500 - 45.516 (1.7913 - 1.7920)
Ex.	For standard insert	40.000 - 40.016 (1.5748 - 1.5754)
	For service insert	40.500 - 40.516 (1.5945 - 1.5951)

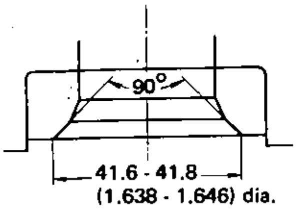
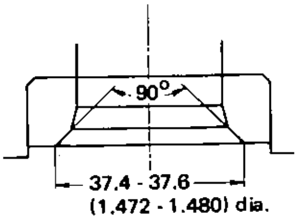
Interference fit of seat insert

Unit: mm (in)

In.	Standard	0.081 - 0.113 (0.0032 - 0.0044)
	Service	
Ex.	Standard	0.064 - 0.096 (0.0025 - 0.0038)
	Service	0.081 - 0.113 (0.0032 - 0.0044)

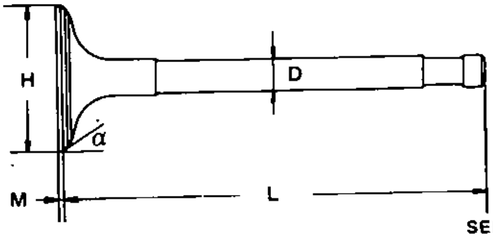
Machining dimensions of seat

Unit: mm (in)

Intake	Exhaust
 SEM179	 SEM180

VALVE

Unit: mm (in)



SEM181

		Standard	Limit
Valve head diameter "H"	In.	42.0 - 42.2 (1.654 - 1.661)	–
	Ex.	38.0 - 38.2 (1.496 - 1.504)	–
Valve length "L"	In.	122.8 - 123.1 (4.835 - 4.846)	–
	Ex.	123.6 - 123.9 (4.866 - 4.878)	–
Valve stem diameter "D"	In.	7.965 - 7.980 (0.3136 - 0.3142)	–
	Ex.	7.945 - 7.960 (0.3128 - 0.3134)	–
Valve face angle "α"	In.	45°30′	–
	Ex.		
Valve head margin "M"	In.	1.3 (0.051)	0.5 (0.020)
	Ex.	1.5 (0.059)	0.5 (0.020)
Grinding of valve stem end	In.	–	0.5 (0.020)
	Ex.		

VALVE SPRING

Following data are common to both intake and exhaust.

Unit: mm (in)

		Standard	Limit
Free height	Outer	49.77 (1.9594)	–
	Inner	44.10 (1.7362)	–
Assembled height/ tension	Outer mm/N (kg), (in/lb)	40.0/226 (23.0) (1.575/50.7)	40.0/189 (19.3) (1.575/42.6)
	Inner mm/N (kg), (in/lb)	35.0/108 (11.0) (1.3783/24.3)	35.0/87 (8.9) (1.3783/19.6)
Out of square	Outer	–	2.2 (0.087)
	Inner	–	1.9 (0.075)

ROCKER ARM AND ROCKER SHAFT

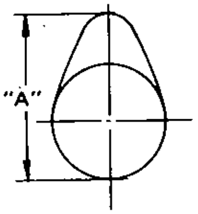
Unit: mm (in)

	Standard
Rocker arm to shaft clearance	0.007 - 0.049 (0.0003 - 0.0019)

CAMSHAFT AND CAMSHAFT BEARING

Camshaft

Unit: mm (in)

		Standard	Limit
Outer diameter of camshaft journal		32.935 - 32.955 (1.2967 - 1.2974)	–
Camshaft bend at center journal (Total indicator reading)		–	0.10 (0.0039)
Camshaft end play		–	0.2 (0.008)
 EM671			
Cam height "A"	In.	38.477 - 38.527 (1.5148 - 1.5168)	0.25 (0.0098)
	Ex.		

Camshaft bearing

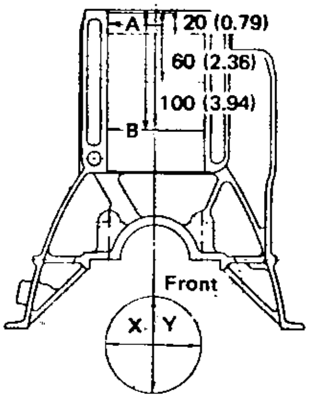
Unit: mm (in)

	Standard	Limit
Inner diameter	33.000 - 33.025 (1.2992 - 1.3002)	–
Camshaft journal to bearing clearance [Oil clearance]	0.045 - 0.090 (0.0018 - 0.0028)	0.1 (0.004)

CYLINDER BLOCK

Cylinder block

Unit: mm (in)



EM422

		Standard	Limit
Surface flatness		—	0.1 (0.004)
Cylinder bore	Inner diameter	85.000 - 85.050 (3.3465 - 3.3484)	*0.2 (0.008)
	Out-of-round (X-Y)	Less than 0.015 (0.0006)	–
	Taper (A-B)	Less than 0.015 (0.0006)	–
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	0.2 (0.008)
Piston to cylinder clearance		0.025 - 0.045 (0.0010 - 0.0018)	–
Feeler gauge extracting force N (kg, lb) [with gauge thickness 0.04 mm (0.0016 in)]		2.0 - 14.7 (0.2 - 1.5, 0.4 - 3.3)	–

*Wear limit

Cylinder liner for service

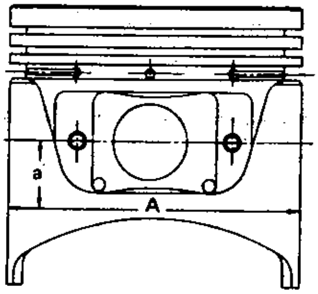
Unit: mm (in)

Outside diameter	4.0 (0.157) Undersize	89.00 - 89.05 (3.5039 - 3.5059)
	4.5 (0.177) Undersize	89.50 - 89.55 (3.5236 - 3.5256)
	5.0 (0.197) Undersize	90.00 - 90.05 (3.5433 - 3.5453)
Interference fit of cylinder liner		0.08 - 0.09 (0.0031 - 0.0035)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



a: About 20 (0.79)

EM714

Piston diameter "A"	Standard	84.985 - 85.035 (3.3459 - 3.3478)
	0.50 (0.0197) Oversize	85.465 - 85.515 (3.3648 - 3.3667)
	1.00 (0.0394) Oversize	85.965 - 86.015 (3.3844 - 3.3864)

Side clearance of piston ring

Unit: mm (in)

	Standard	Limit
Top ring	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Second ring	0.030 - 0.063 (0.0012 - 0.0025)	
Oil ring	—	—

Ring gap

Unit: mm (in)

	Standard	Limit
Top ring	0.25 - 0.40 (0.0098 - 0.0157)	1.0 (0.039)
Second ring	0.15 - 0.30 (0.0059 - 0.0118)	
Oil ring	0.30 - 0.90 (0.0118 - 0.0354)	

Piston pin

Unit: mm (in)

	Standard
Piston pin outside diameter	20.993 - 20.998 (0.8265 - 0.8267)
Piston pin hole diameter	21.001 - 21.008 (0.8268 - 0.8271)
Piston pin to piston clearance	0.006 - 0.013 (0.0002 - 0.0005)
Interference fit of piston pin to connecting rod	0.015 - 0.035 (0.0006 - 0.0014)

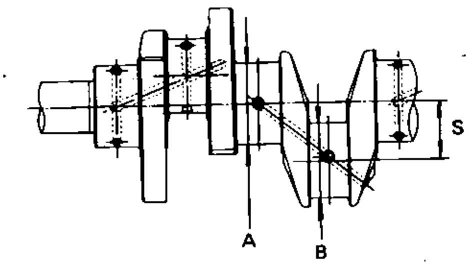
CONNECTING ROD

Unit: mm (in)

	Standard	Limit
Connecting rod bend or torsion [per 100 mm (3.94 in) length]	0.03 (0.0012)	0.05 (0.0020)
Bid end play	0.2 - 0.3 (0.008 - 0.012)	0.6 (0.024)

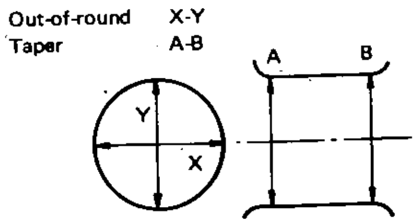
CRANKSHAFT

Unit: mm (in)



EM790

Journal diameter "A"	54.942 - 54.955 (2.1631 - 2.1636)
Pin diameter "B"	49.961 - 49.974 (1.9670 - 1.9675)
"S"	42.97 - 43.03 (1.6917 - 1.6941)



EM715

	Standard	Limit
Taper of journal and pin "A-B"	Less than 0.01 (0.0004)	0.03 (0.0012)
Out-of-round of journal and pin "X-Y"	Less than 0.01 (0.0004)	0.03 (0.0012)
Crankshaft bend (Total indicator reading)	Less than 0.05 (0.0020)	0.10 (0.0039)
Crankshaft free end play	0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)
Pilot bushing inserting distance	4.0 (0.157)	

BEARING

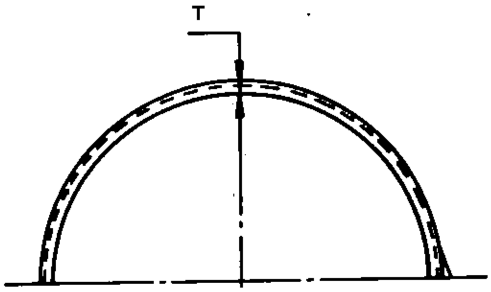
Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.020 - 0.062 (0.0008 - 0.0024)	0.12 (0.0047)
Connecting rod bearing clearance	0.025 - 0.055 (0.0010 - 0.0022)	0.12 (0.0047)

Main bearing undersize

Unit: mm (in)



EM738

	Bearing top thickness "T"	Crank journal diameter
STD	1.822 - 1.835 (0.0717 - 0.0722)	54.942 - 54.955 (2.1631 - 2.1636)
0.25 (0.0098) Undersize	1.947 - 1.960 (0.0767 - 0.0772)	54.692 - 54.705 (2.1532 - 2.1537)
0.50 (0.0197) Undersize	2.072 - 2.085 (0.0816 - 0.0821)	54.442 - 54.455 (2.1434 - 2.1439)
0.75 (0.0295) Undersize	2.197 - 2.210 (0.0865 - 0.0870)	54.192 - 54.205 (2.1335 - 2.1341)
1.00 (0.0394) Undersize	2.322 - 2.335 (0.0914 - 0.0919)	53.942 - 53.955 (2.1237 - 2.1242)

Connecting rod bearing undersize

Unit: mm (in)

	Bearing top thickness "T"	Crankpin diameter
STD	1.493 - 1.506 (0.0588 - 0.0593)	49.961 - 49.974 (1.9670 - 1.9675)
0.25 (0.0098) Undersize	1.618 - 1.631 (0.0637 - 0.0642)	49.711 - 49.724 (1.9571 - 1.9576)
0.50 (0.0197) Undersize	1.743 - 1.756 (0.0686 - 0.0691)	49.461 - 49.474 (1.9473 - 1.9478)
0.75 (0.0295) Undersize	1.868 - 1.881 (0.0735 - 0.0741)	49.211 - 49.224 (1.9374 - 1.9379)

MISCELLANEOUS COMPONENTS

Camshaft sprocket

Runout (Total indicator reading)	mm (in)	Limit 0.1 (0.004)

Flywheel

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

ENGINE TUNE-UP

Valve clearance

Unit: mm (in)

	Hot	*Cold
Intake	0.30 (0.012)	0.21 (0.008)
Exhaust	0.30 (0.012)	0.23 (0.009)

*At ambient temperature 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

TIGHTENING TORQUE

Engine front side

Unit	N·m	kg-m	ft-lb
Front cover bolt M8	10 - 16	1.0 - 1.6	7 - 12
M6	3.9 - 9.8	0.4 - 1.0	2.9 - 7.2
Chain guide bolt	5.9 - 9.8	0.6 - 1.0	4.3 - 7.2
Chain tensioner bolt	5.9 - 9.8	0.6 - 1.0	4.3 - 7.2
Water pump bolt M6	3.9 - 9.8	0.4 - 1.0	2.9 - 7.2
M8	10 - 16	1.0 1.6	7 - 12
Crankshaft pulley bolt	118 - 157	12 - 16	87 - 116

Engine right side

Water inlet bolt	10 - 16	1.0 - 1.6	7 - 12
Water outlet bolt	10 - 16	1.0 - 1.6	7 - 12
Intake manifold bolt and nut	16 - 21	1.6 - 2.1	12 - 15
Alternator bracket bolt	39 - 59	4.0 - 6.0	29 - 43
Alternator to adjusting bar bolt	20 - 29	2.0 - 3.0	14 - 22
Engine mounting bracket bolt (Same for left side).	29 - 39	3.0 - 4.0	22 - 29

Engine left side

Unit	N·m	kg-m	ft-lb
Distributor support bolt	3.9 - 7.8	0.4 - 0.8	2.9 - 5.8
Exhaust manifold bolt and nut	16 - 21	1.6 - 2.1	12 - 15
E.G.R. tube nut	34 - 44	3.5 - 4.5	25 - 33
E.A.I. tube nut	34 - 44	3.5 - 4.5	25 - 33
Air conditioner compressor bracket bolt	44 - 54	4.5 - 5.5	33 - 40

Engine top side

Cylinder head bolt	69 - 78	7.0 - 8.0	51 - 58
Cylinder head to front cover bolt	3.9 - 7.8	0.4 - 0.8	2.9 - 5.8
Rocker shaft bracket bolt	15 - 25	1.5 - 2.5	11 - 18
Camshaft sprocket bolt	118 - 157	12 - 16	87 - 116
Rocker cover bolt	7.8 - 9.8	0.8 - 1.0	5.8 - 7.2
Spark plug	15 - 20	1.5 - 2.0	11 - 14
Rocker arm nut	16 - 22	1.6 - 2.2	12 - 16

Engine bottom side

Main bearing cap bolt	44 - 54	4.5 - 5.5	33 - 40
Connecting rod big end nut	44 - 54	4.5 - 5.5	33 - 40
Oil strainer bolt	10 - 16	1.0 - 1.6	7 - 12
Oil pan bolt	5.9 - 9.8	0.6 - 1.0	4.3 - 7.2
Oil pan drain plug	20 - 29	2.0 - 3.0	14 - 22
Oil pump bolt	11 - 15	1.1 - 1.5	8 - 11
Gusset to cylinder block bolt	43 - 58	4.4 - 5.9	32 - 43

Engine rear side

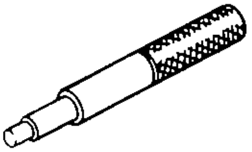
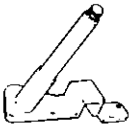
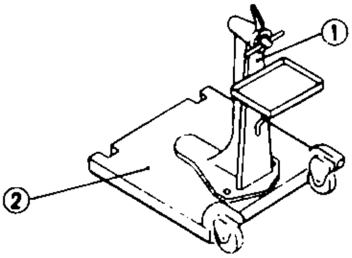
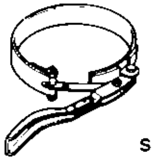
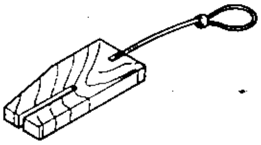
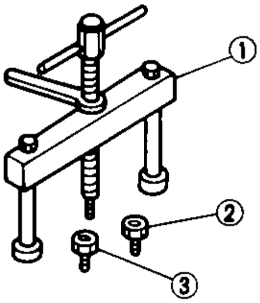
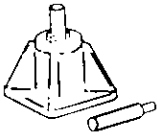
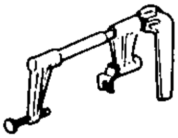
Flywheel bolt (M/T)	137 - 157	14.0 - 16.0	101 - 116
Drive plate bolt (A/T)	137 - 157	14.0 - 16.0	101 - 116
Clutch cover bolt (M/T)	16 - 21	1.6 - 2.1	12 - 15
Torque converter bolt (A/T)	39 - 49	4.0 - 5.0	29 - 36
Starter motor bolt	29 - 39	3.0 - 4.0	22 - 29
Transmission to cylinder block bolt	43 - 58	4.4 - 5.9	32 - 43
Transmission to gusset bolt	43 - 58	4.4 - 5.9	32 - 43

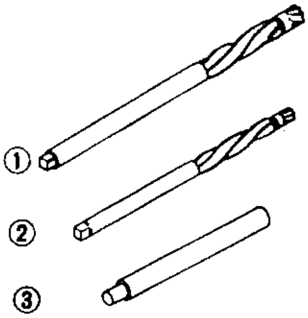
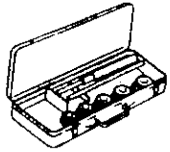
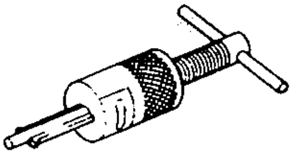
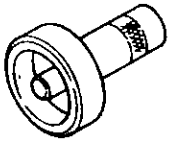
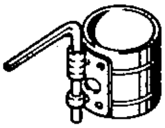
TROUBLE DIAGNOSES AND CORRECTIONS

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

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

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV30100100 (–)	Clutch aligning bar 
KV10105001 (–)	Engine attachment 
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
ST19320000 (J25664)	Oil filter wrench 
KV10105800 (J25660-B)	Chain stopper 
KV101041S0 (J25647) ① ST16511000 (–) ② ST16512001 (–) ③ ST16701001 (–)	Crankshaft main bearing cap puller Crankshaft main bearing puller Adapter Adapter 
ST13030001 (J25634)	Piston pin press stand 
ST12070000 (J25631)	Valve lifter 

Tool number (Kent-Moore No.)	Tool name
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 (0.315 in)] dia. Drift 
ST11650001 (–)	Valve seat cutter set 
ST16610001 (J23907)	Pilot bushing puller 
KV10105500 (J25640-01)	Crankshaft rear oil seal drift  SEM183
EM03470000 (–)	Piston ring compressor 

DATSUN 200SX **Model S110 Series**

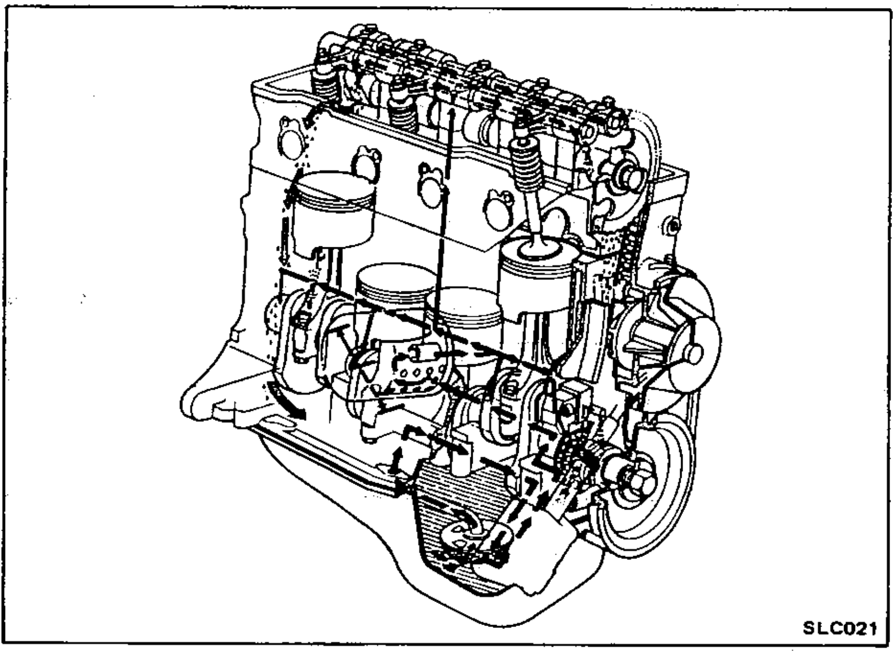
SECTION LC

ENGINE LUBRICATION & COOLING SYSTEMS

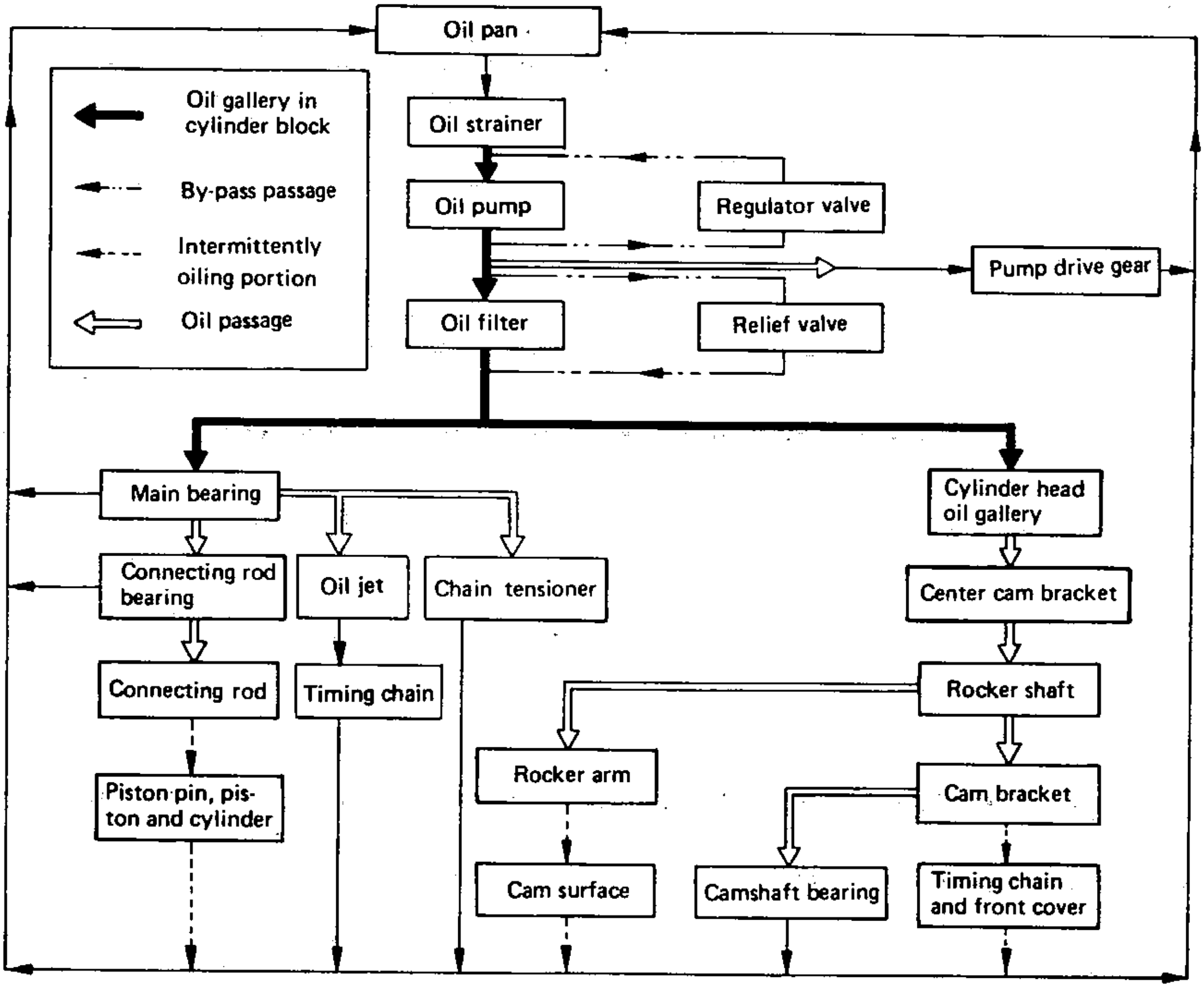
CONTENTS

ENGINE LUBRICATION SYSTEM

LUBRICATION CIRCUIT



SLC021



SLC022

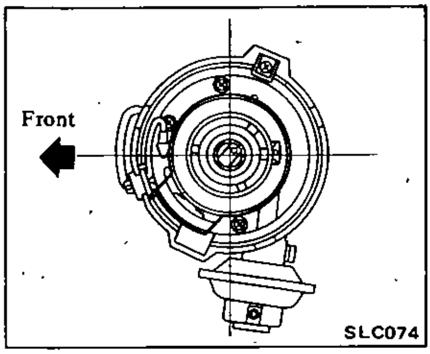
OIL PUMP

REMOVAL

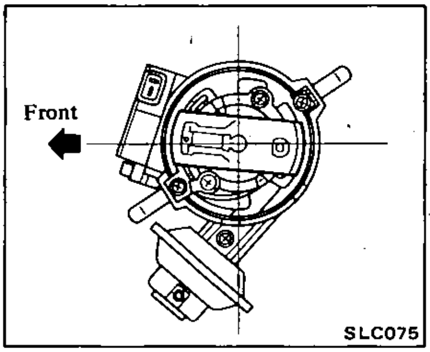
1. Remove distributor cap.
2. Turn crankshaft so that No. 1 piston is at T.D.C. on its compression stroke by ascertaining the position of distributor head rotor and timing mark on crank pulley.

Remember position of head rotor under above condition.

California models:



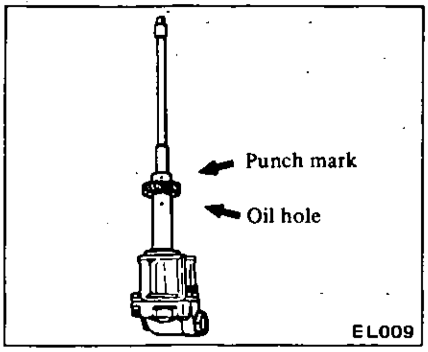
Non-California models:



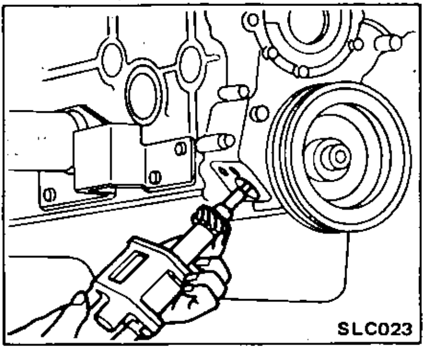
3. Remove oil pump body with drive spindle assembly.

INSTALLATION

1. Make sure that distributor head rotor is in the same position as it was before removal of oil pump.
2. Fill pump housing with engine oil, then align punch mark of drive spindle with hole in oil pump.



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

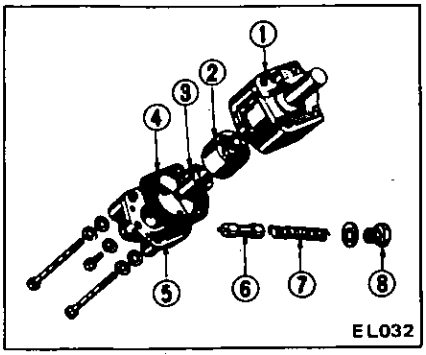


4. Make sure that the tip of the drive spindle fits distributor fitting hole securely.
5. Tighten bolts securing oil pump to front cover.

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

6. Install distributor cap.

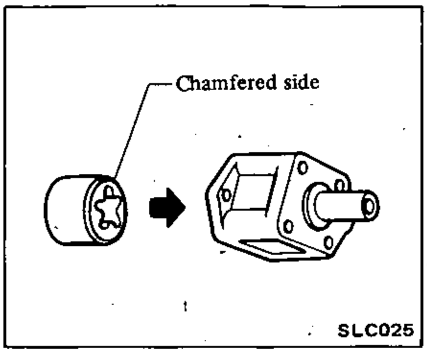
DISASSEMBLY AND ASSEMBLY



1	Oil pump body	5	Oil pump cover
2	Outer rotor	6	Regulator valve
3	Inner rotor and shaft	7	Regulator spring
4	Gasket	8	Regulator cap

Ⓣ : Oil pump cover bolts
6.9 - 9.8 N·m
(0.7 - 1.0 kg-m,
5.1 - 7.2 ft-lb)

a. Always replace with a new gasket.
b. Outer rotor should be assembled so that the chamfered side faces to oil pump body.

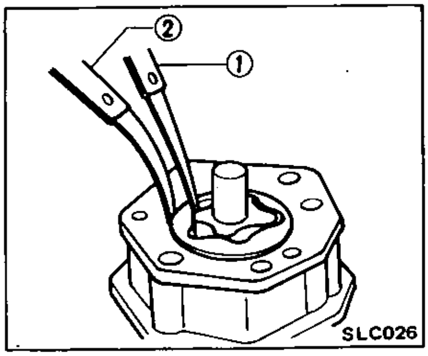


INSPECTION

1. Inspect the following for wear or damage.
- Pump body and cover
- Pump rotors and rotor shaft

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

Wear limit:
Rotor tip clearance ①
0.20 mm (0.0079 in)
Outer rotor to body clearance ②
0.50 mm (0.020 in)

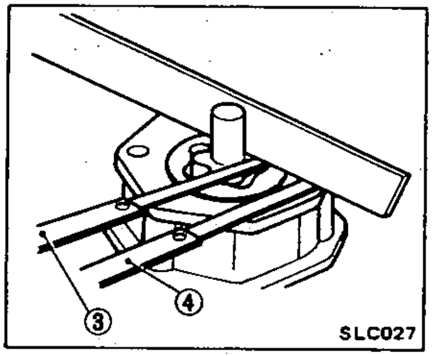


3. Using a feeler gauge and a straight edge, check the following gap ③ or ④ without gasket.

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)

Then, rotor side clearance (rotor to bottom cover clearance) with gasket should satisfy the following specification.

Wear limit:
Rotor side clearance
0.20 mm (0.0079 in)



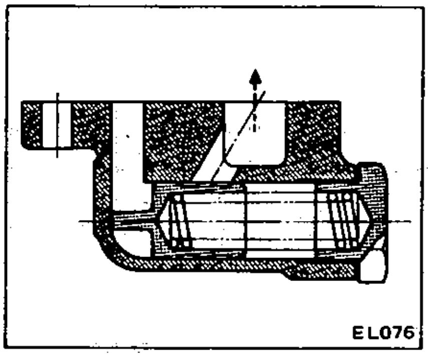
SLC027

Pump rotors and body are not serviced separately. If pump rotors or body are damaged or worn, replace pump rotor set or entire oil pump assembly.

OIL PRESSURE REGULATOR VALVE

INSPECTION

Check valve sliding surface and valve spring, and replace entire valve assembly if necessary.



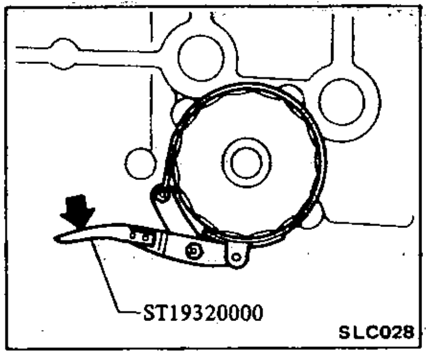
EL076

OIL FILTER

REMOVAL AND INSTALLATION

When removing oil filter, use Tool. When installing it, lightly coat oil on oil seal and fasten it by hand.

Do not overtighten filter, or oil leakage may occur.

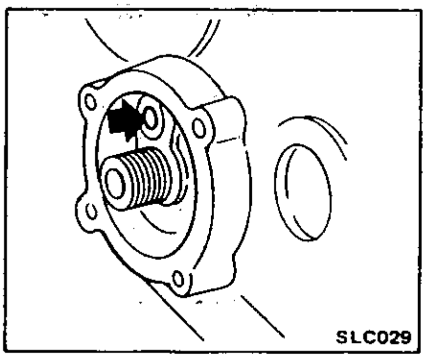


SLC028

OIL PRESSURE RELIEF VALVE

INSPECTION

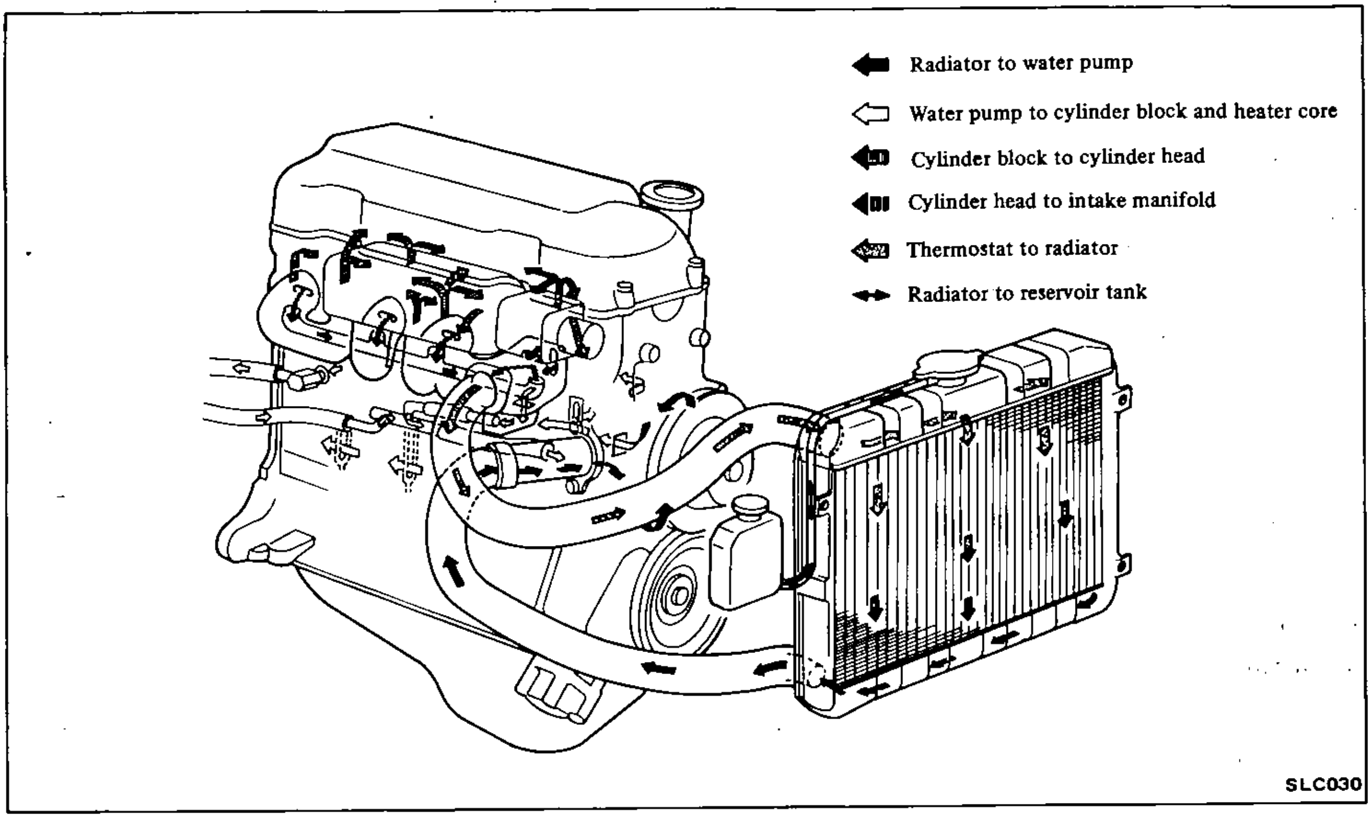
With oil filter removed, check valve unit for operation. Inspect for a cracked or broken valve. If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.

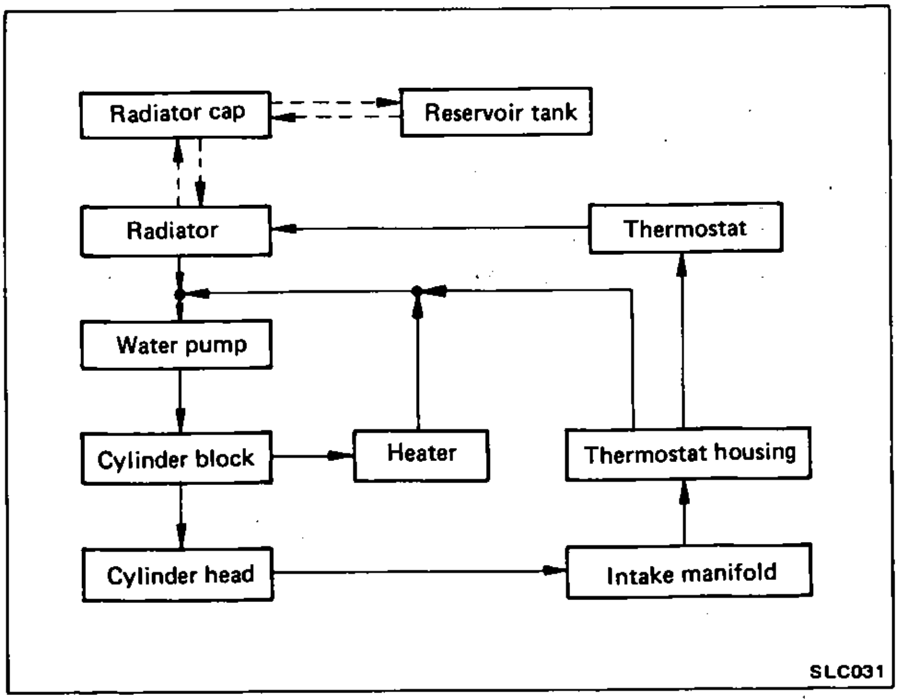


SLC029

COOLING SYSTEM

COOLING CIRCUIT



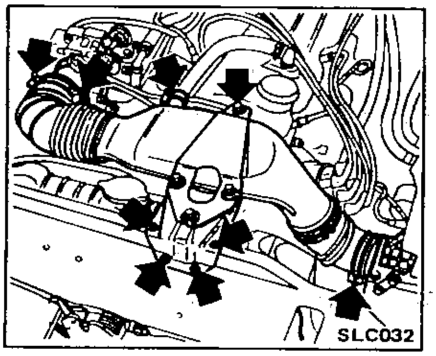


WARNING:
To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.
If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

RADIATOR

REMOVAL AND INSTALLATION

1. Drain coolant into a clean container.
2. Remove air cleaner inlet pipe.
3. Remove air duct with bracket after loosening clamps and screws at portion illustrated.



4. Disconnect radiator upper and lower hoses, and reservoir tank hose.
5. Remove radiator shroud attaching screws and place radiator shroud close to engine. (Radiator shroud can be removed after removing radiator.)
6. On a car with automatic transmission, disconnect cooler inlet and outlet lines from radiator.
7. Remove radiator.
8. Install radiator in the reverse sequence of removal and refill cooling system with coolant to specified level. (Refer to Section MA.)

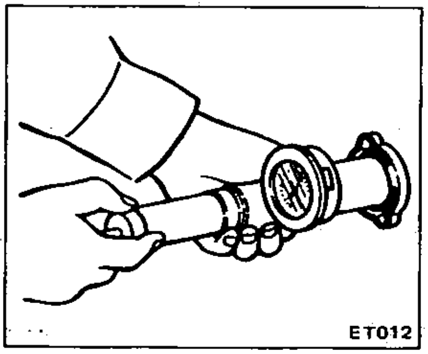
INSPECTION

Inspect radiator cap and water leakage using cap tester.

1. Inspection of radiator cap.

First, check rubber seal on cap for tears, cracks or deterioration after cleaning it. Then, install radiator cap on a tester. If cap does not hold or will not release at the specified pressure, replace cap.

Cap relief pressure:
88 kPa (0.9 kg/cm^2, 13 psi)

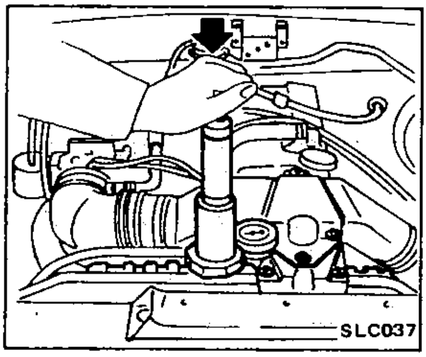


2. Inspection of water leakage.

With radiator cap removed, apply test pressure to radiator on a car.

If leakage is detected, repair or replace radiator.

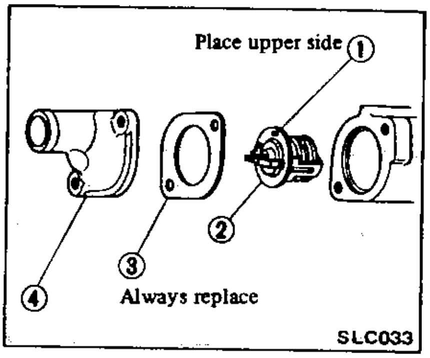
Leakage test pressure:
157 kPa (1.6 kg/cm^2, 23 psi)



THERMOSTAT

REMOVAL AND INSTALLATION

1. When removing, drain coolant partially and disconnect upper radiator hose at water outlet.
2. Install thermostat and water outlet as illustrated.

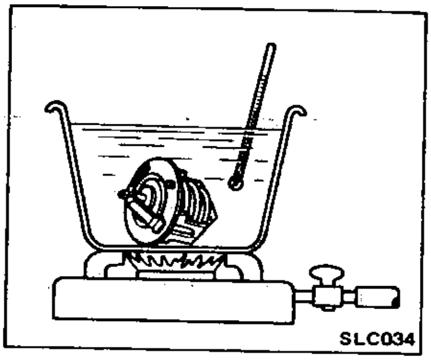


1 Jiggle valve	3 Gasket
2 Thermostat	4 Water outlet

INSPECTION

Inspect thermostat for the following and replace if necessary.

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



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 in engine.

WATER PUMP

DISASSEMBLY

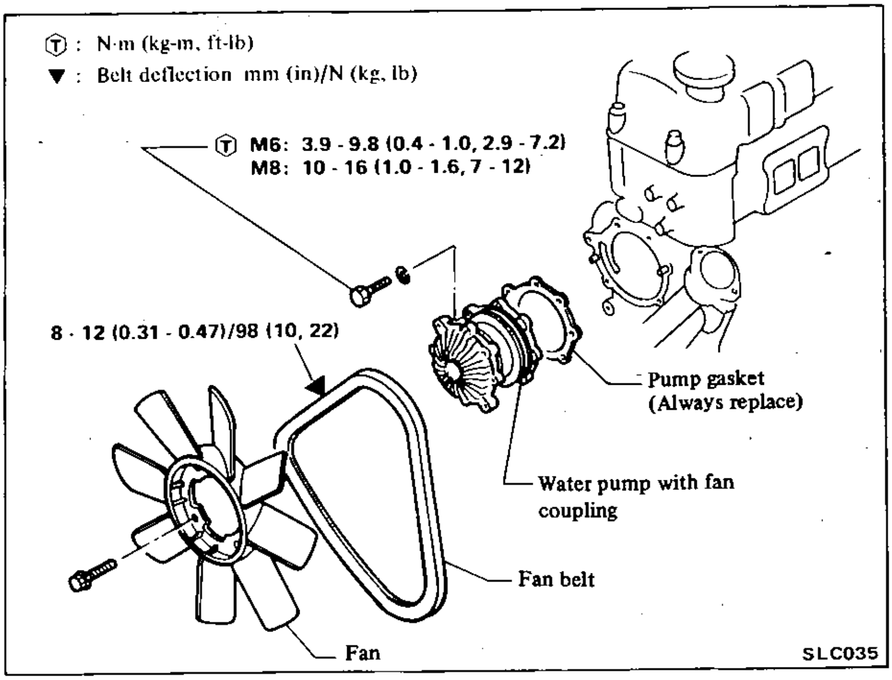
Water pump is made of aluminum and its bearing outer race is of a press fit type. For this reason, water pump should not be disassembled.

INSPECTION

Inspect pump assembly for the following conditions and replace if necessary.

1. Badly rusted or corroded body assembly and vane.
2. Excessive end play or roughness of bearings in operation.

If excessive mechanical seal squeak occurs when engine is running, use suitable water pump seal lubricant to prevent squeak.



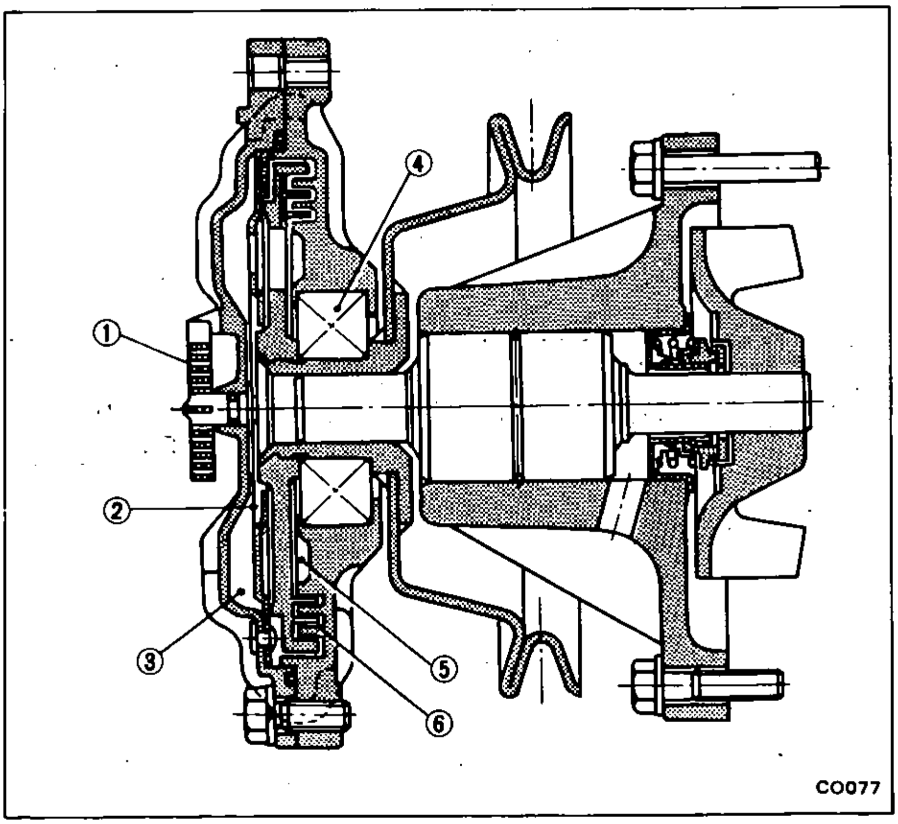
TEM-COUPLING

DISASSEMBLY

The coupling is so designed that it cannot be disassembled.

INSPECTION

Inspect the coupling for oil leakage or bend of bimetal. If necessary, replace as a pump assembly.



1 Bi-metal thermostat
2 Slide valve
3 Reserve chamber for "OFF"
4 Bearing
5 Driving chamber for "ON"
6 Coupling part (Labyrinth)

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Oil pump	Trochoid type
Oil filter	Full-flow and cartridge type
Oil pressure relief valve Valve opening pressure kPa (kg/cm^2, psi)	58.8 - 73.6 (0.60 - 0.75, 8.5 - 10.7)
Radiator	Down flow, corrugated fin and tube type
Thermostat	Wax type
Water pump	Centrifugal type
Tem-coupling Fan speed (at water pump speed 4,000 rpm) rpm/°C (°F)	2,150/60 (140) Less than 1,650/below 50 (122)

INSPECTION AND ADJUSTMENT

OIL PUMP

Unit: mm (in)

	Standard	Wear limit
Rotor tip clearance	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor-to-body clearance	0.15 - 0.21 (0.0059 - 0.0083)	0.50 (0.197)
Rotor side clearance (rotor to bottom cover)	0.04 - 0.08 (0.0016 - 0.0031)	0.20 (0.0079)

OIL PRESSURE REGULATOR VALVE

Regulator valve spring	Free length mm (in)	52.5 (2.067)
	Installed length/ load mm (in)/N (kg, lb)	34.8 (1.370)/77.5 - 85.3 (7.9 - 8.7, 17.4 - 19.2)
Regulator valve opening pressure kPa (kg/cm^2, psi)/rpm		343 - 412 (3.5 - 4.2, 50 - 60)/3,000

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)

THERMOSTAT

	Standard	Frigid type	Tropical type
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)

WATER PUMP

Fan belt deflection mm (in)/N (kg, lb)	8 - 12 (0.31 - 0.47)/98 (10, 22)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump mounting bolts	11 - 15	1.1 - 1.5	8 - 11
Oil pump cover bolts	6.9 - 9.8	0.7 - 1.0	5.1 - 7.2
Regulator valve cap	39 - 49	4 - 5	29 - 36
Water pump securing bolt			
M6	3.9 - 9.8	0.4 - 1.0	2.9 - 7.2
M8	10 - 16	1.0 - 1.6	7 - 12

TROUBLE DIAGNOSES AND CORRECTIONS

LUBRICATION SYSTEM

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

COOLING SYSTEM

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

Condition	Probable cause	Corrective action
Poor circulation	Restriction in system.	Check hoses for crimps, and clear the system of rust and sludge by flushing radiator.
	Insufficient coolant.	Replenish.
	Inoperative water pump.	Replace.
	Loose fan belt.	Adjust.
	Inoperative thermostat.	Replace.
Corrosion	Excessive impurity in water.	Use soft, clean water. (rain water is satisfactory).
	Infrequent flushing and draining of system.	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.	Replace.
	Radiator fin choked with mud, chaff, etc.	Clean out air passage thoroughly by using air pressure from engine side of radiator.
	Incorrect ignition and valve timing.	Adjust.
	Dirty oil and sludge in engine.	Refill.
	Inoperative water pump.	Replace.
	Loose fan belt.	Adjust.
	Restricted radiator.	Flush radiator.
	Inaccurate temperature gauge.	Replace.
	Impurity in water.	Use soft, clean water.
Overcooling	Malfunctioning thermostat.	Replace.
	Inaccurate temperature gauge.	Replace.
Noise	Squeak at water pump mechanical seal.	Use suitable water pump seal lubricant or replace as pump assembly.
	Damaged or worn water pump bearing.	Replace as pump assembly.

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.)	Tool name
ST19320000 (J25664)	Oil filter wrench  SLC036

DATSUN 200SX **Model S110 Series**

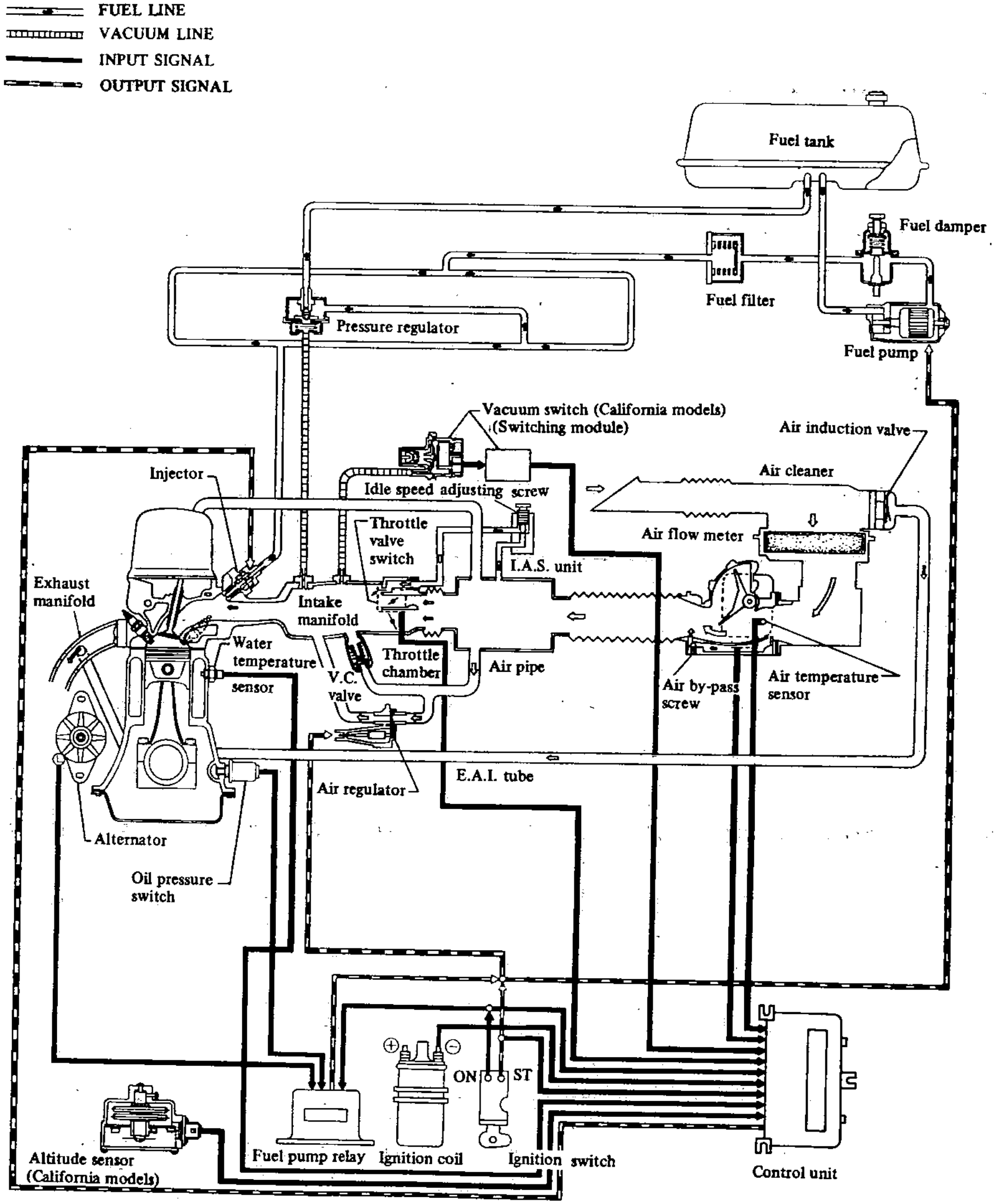
SECTION EF

ENGINE FUEL

CONTENTS

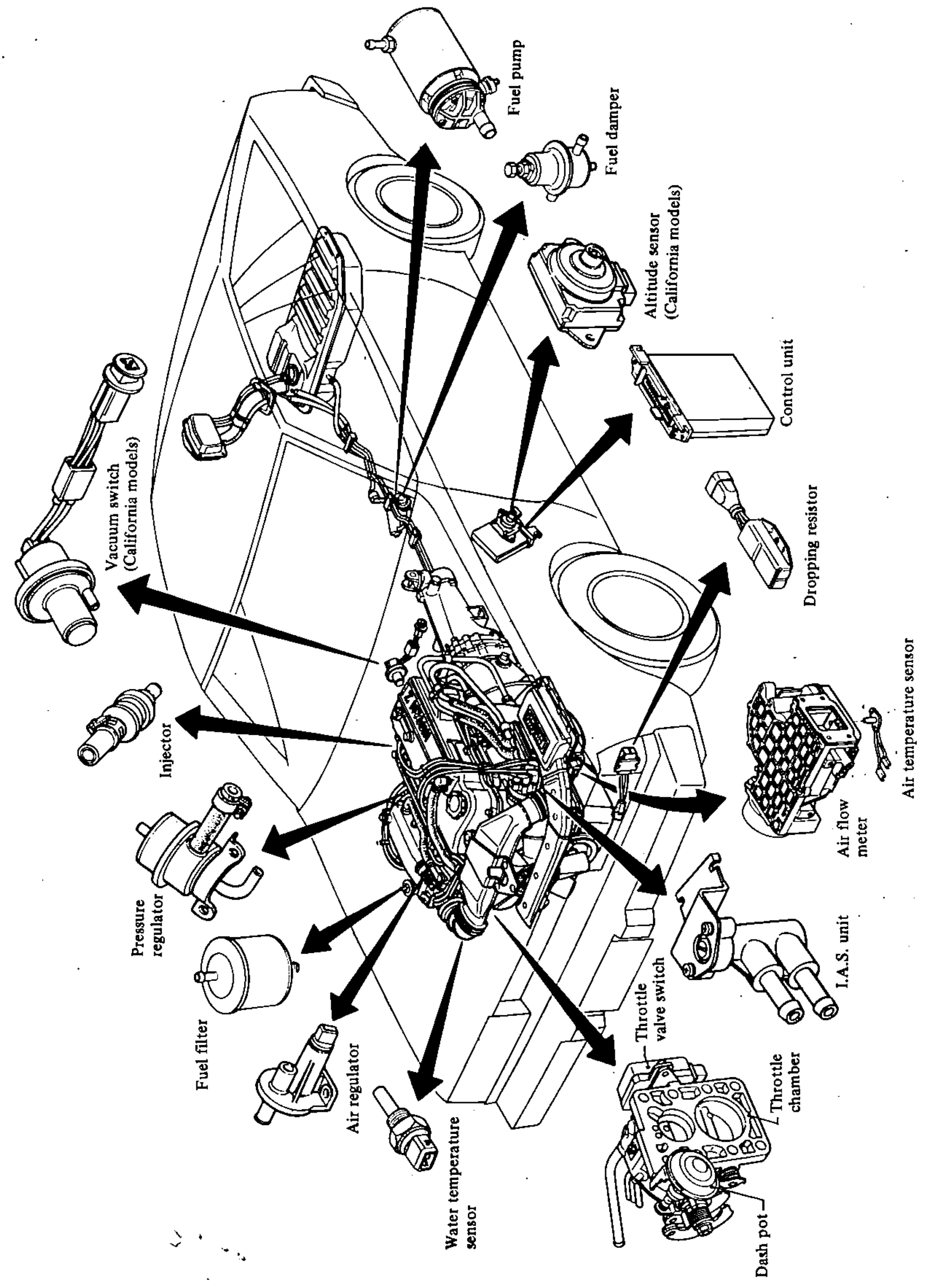
DESCRIPTION

SYSTEM DIAGRAM



SEF081

COMPONENT PARTS LOCATION



SEF082

EFI SYSTEM

The Electronic Fuel Injection (EFI) system is used to control fuel supply electrically, in place of the conventional carburetor system.

The EFI system employs various types of sensors to convert the engine operating conditions into electronic signals. These signals are sent to the control unit where the optimum injector open-valve time period is computed according to the information stored in the memory for control of fuel injection quantity.

Various sensors — For detecting engine operation
↓ Electrical signal
Control unit — For calculating optimum fuel injection
↓ Electrical signal
Injector — For injecting fuel

FEATURES

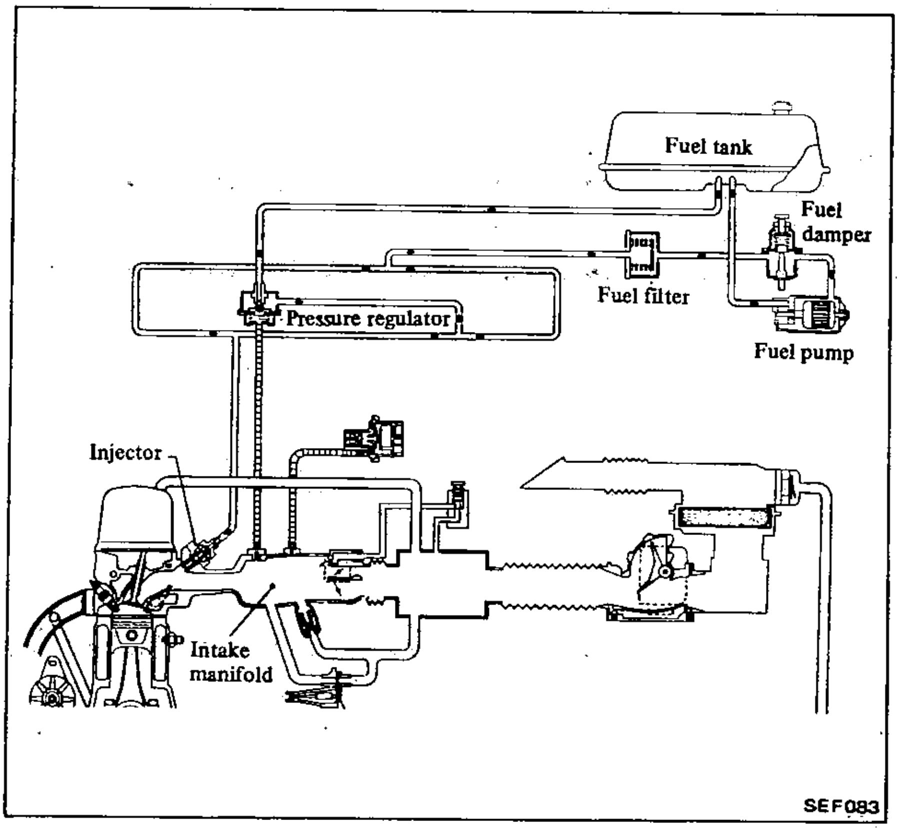
The EFI system utilizes electronic elements such as integrated circuits (ICs), resistors, thermistors, etc. for electrically controlling the amount of fuel injected, corresponding to changes in engine operations. Because of this use of electronic components, this system is able to provide a quick response to changes in operating conditions, and serves to improve the engine performance and to reduce fuel consumption and harmful gases.

EFI SYSTEM OPERATION

FUEL FLOW SYSTEM

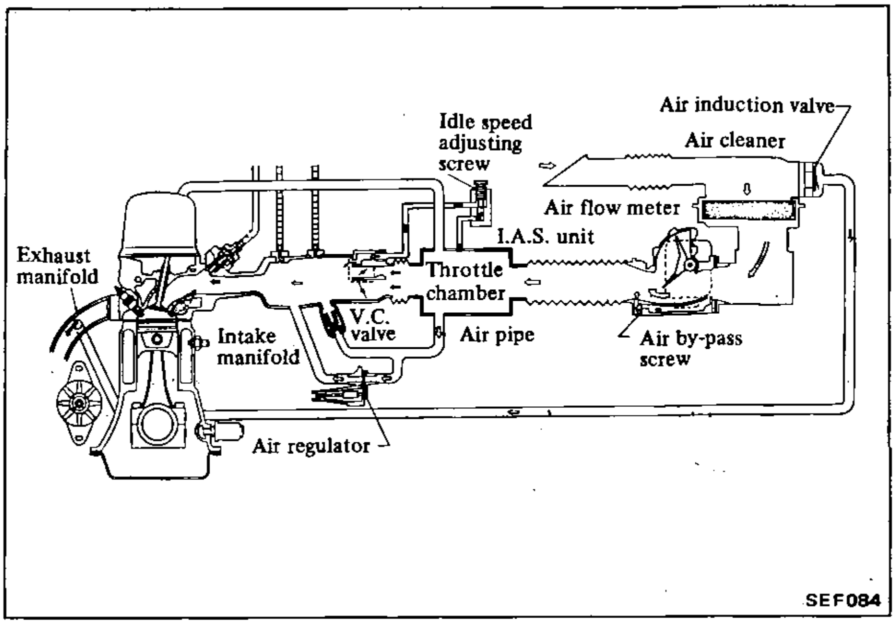
Fuel is sucked from the fuel tank into the fuel pump, from which it is discharged under pressure. As it flows through the mechanical fuel damper, pulsation in the fuel flow is damped. Then, the fuel is filtered in the fuel filter, goes through the fuel line, and is injected into the intake manifold cylinder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

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 kPa (2.55 kg/cm^2, 36.3 psi).



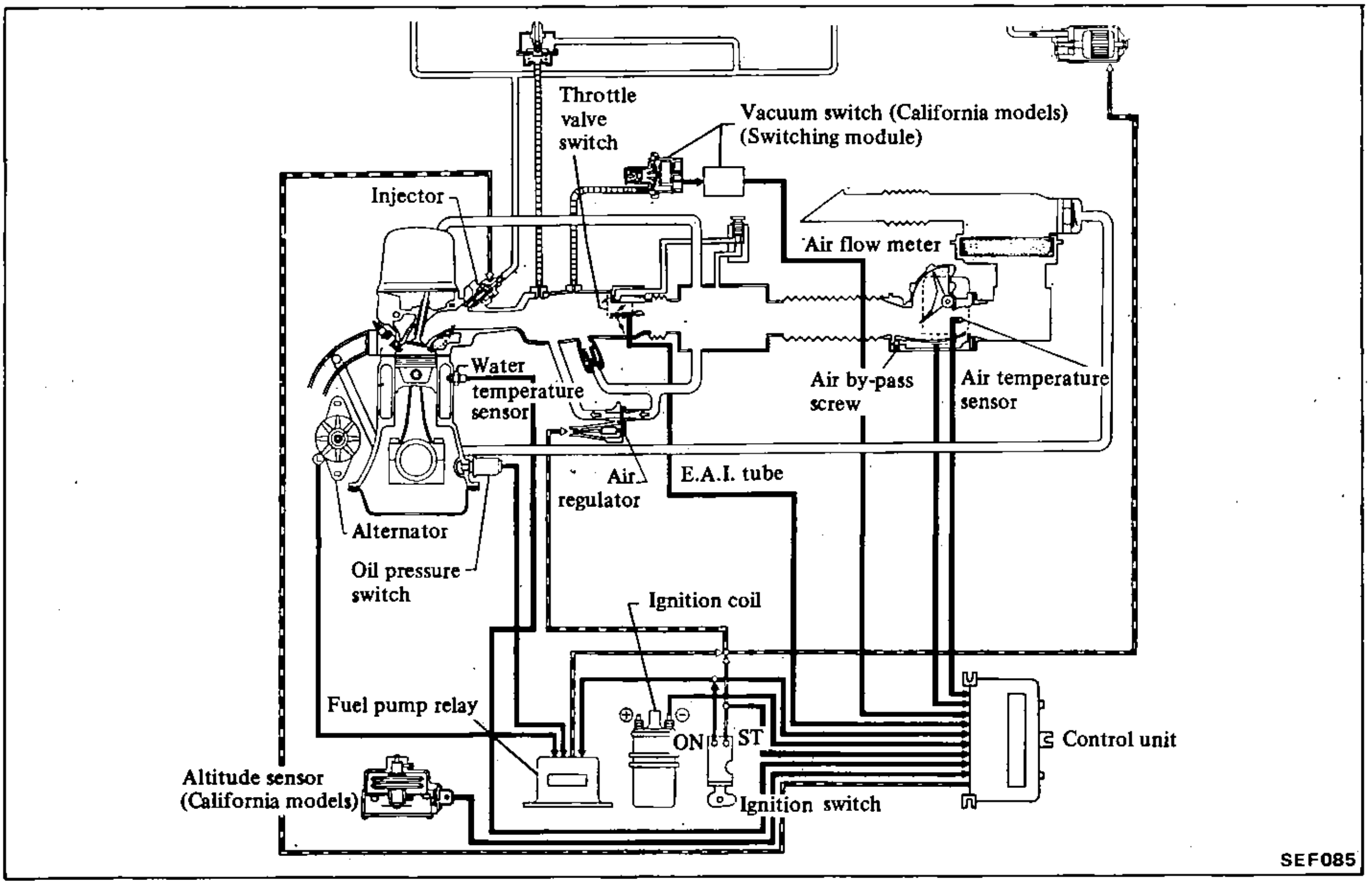
AIR FLOW SYSTEM

Intake air from the air cleaner is metered at the air flow meter, flows through the throttle chamber and into the intake manifold, and then flows through each intake manifold branch into the cylinder. Air flow during driving is controlled by the throttle valve located in the throttle chamber. During idling operation, the throttle valve is in the almost closed position, and the air is led through the by-pass line between air pipe and throttle chamber. In this case, the quantity of suction air is adjusted by means of the idle speed adjusting screw. During warming-up operation, the air flow is bypassed through the air regulator to increase engine rpm.



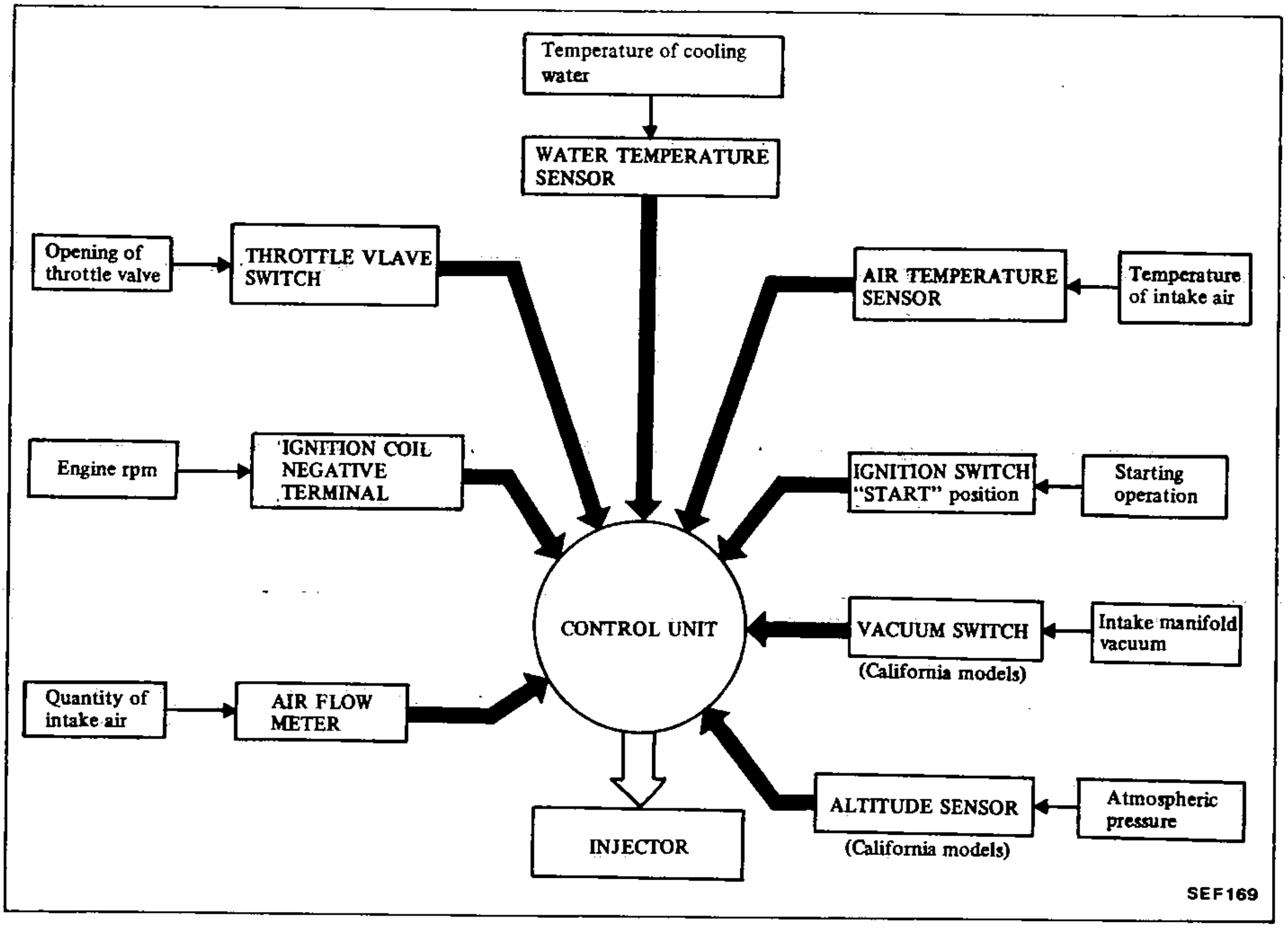
ELECTRICAL FLOW SYSTEM

The suction air flow varies with the movement of the air flow meter, and the quantity of fuel to be injected should be controlled correctly in correspondence with the present air flow. In the EFI system, the injection pressure is held constant at 250 kPa (2.55 kg/cm^2, 36.3 psi) and the area of the injector nozzle hole is also constant. Therefore, the fuel injection quantity can be determined by the injector open-valve time period. The control unit of the EFI system determines this pulse width duration according to information (electrical signals) from various types of sensors, thereby controlling the fuel injection quantity.



SIGNALS FOR CONTROL UNIT

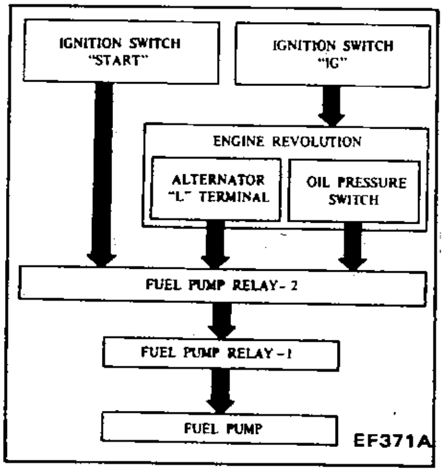
An electrical signal from each sensor is introduced into the control unit for computation. The open-valve time period of the injector is controlled by the duration of the pulse computed in the control unit.



SEF169

INDEPENDENT SIGNALS OF CONTROL UNIT

Fuel pump operation

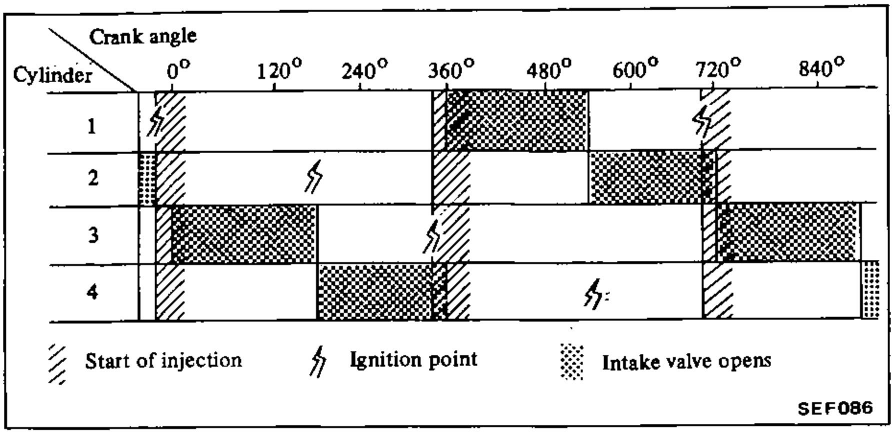


EF371A

- When starting the engine, the fuel pump is operated by the current supplied through fuel pump relays -2 and -1. After the engine starts, the fuel pump continues to operate using current supplied from fuel pump relay-2 monitoring the engine revolution and fuel pump relay-1.
  If the engine stalls for some reason, fuel pump relay-2 receives the "engine stall" signal, and stops feeding current, thereby stopping the operation of the fuel pump.
- Rotation of the engine is detected by monitoring both the generation of the alternator and the engine oil pressure. Because of this dual monitoring system, fuel pump operation can be assured during engine rotation, even if one of these monitor units should fail.
  If the engine stalls completely due to a malfunction, the supply of fuel is stopped at once; this system improves safety in case of engine malfunction.

FUEL INJECTION CONTROL

FUEL INJECTION TIMING



The engine has a repetitive four-stroke cycle: suction → compression → combustion → exhaust. Fuel injection is made just prior to the beginning of the suction stroke in each cylinder. However, this situation is not the same for the EFI system.

The fuel injectors are electrically connected, in parallel, in the control unit. All injectors receive the injection signal from the control unit simultaneously. Therefore, injection is made independently of the engine stroke cycle (suction, compression, combustion, and exhaust). In the four-cylinder engine, injection is made once after receiving the ignition signal from the ignition coil two times.

The required fuel quantity is attained after fuel injection is made twice during one stroke cycle (suction, compression, combustion, exhaust). In other words, one injection of fuel provides only half the fuel quantity necessary for operation of one stroke cycle of the engine.

Fuel in this EFI system is not injected directly into the cylinder, but is injected into the outside portion of the intake valve. Therefore, the air-fuel mixture is sucked into the cylinder when the intake valve opens to start the suction stroke. In other strokes, the air-fuel mixture is kept outside the intake valve.

FUEL INJECTION QUANTITY

The fuel injection quantity is the sum of the "basic injection quantity" which is the basis of the injection quantity and the "enrichment" that is used to correct the basic injection quantity in correspondence with the various conditions.

Fuel injection quantity = **Basic injection quantity** + **Enrichment**

BASIC INJECTION QUANTITY

The "engine rpm" information and "load state" information are created by two signals which provide for the rotation of the engine. One of these two signals is sent out from the ignition coil that detects the engine rpms. The other one is the signal sent from the air flow meter which monitors the suction air quantity. The injection quantity determined by these signals is called the "basic injection quantity."

ENRICHMENT

The basic injection quantity is used as the basis for providing engine rotation, but the injector is not controlled by this factor alone. For example, the fuel should be enriched when starting the engine or in the full-throttle position. For providing this enrichment, the control unit computes the quantity of fuel to be added to the basic injection quantity by using signals sent from each sensor. It causes the total quantity of fuel to be injected.

"Warm-up" enrichment

Fuel is increased according to the cooling water temperature monitored by the water temperature sensor. This enrichment is zero when the cooling water temperature is above 40 to 60°C (104 to 140°F).

Enrichment ratio is changed by "ON" or "OFF" of idle contact.

"Intake air temperature" enrichment

Fuel injection is increased according to the intake air temperature monitored by the air temperature sensor. This enrichment is zero when the intake air temperature is above 40°C (104°F).

"Cold start" enrichment

"Cold start" enrichment providedes improved starting ability in cold weather, with the ignition switch on "START" during the cranking operation and when the water temperature is lower than 40°C (104°F). The elapsed time and amount of this enrichment is determined by the water temperature and cranking speed.

"Start" enrichment

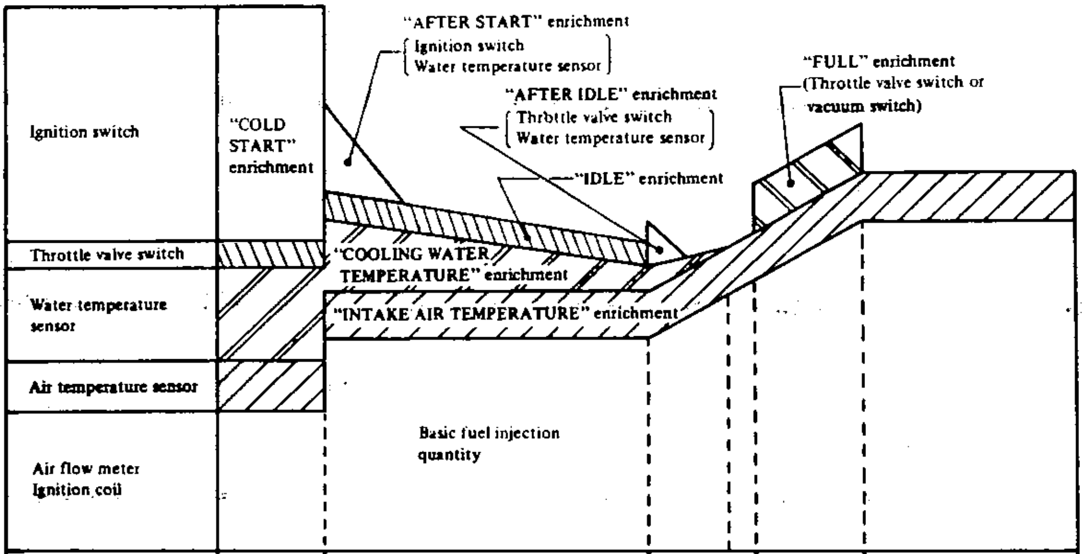
When the ignition switch is in the "START" position during cranking operation, a constant amount of fuel is increased irrespective of the cooling water temperature.

When "Cold start" enrichment reaches zero, this "START" enrichment will then occur.

EXAMPLE OF FUEL INJECTION QUANTITY

Cold start

------ Intake air temperature at 0°C (32°F) (constant) and water temperature rises from 0°C (32°F)

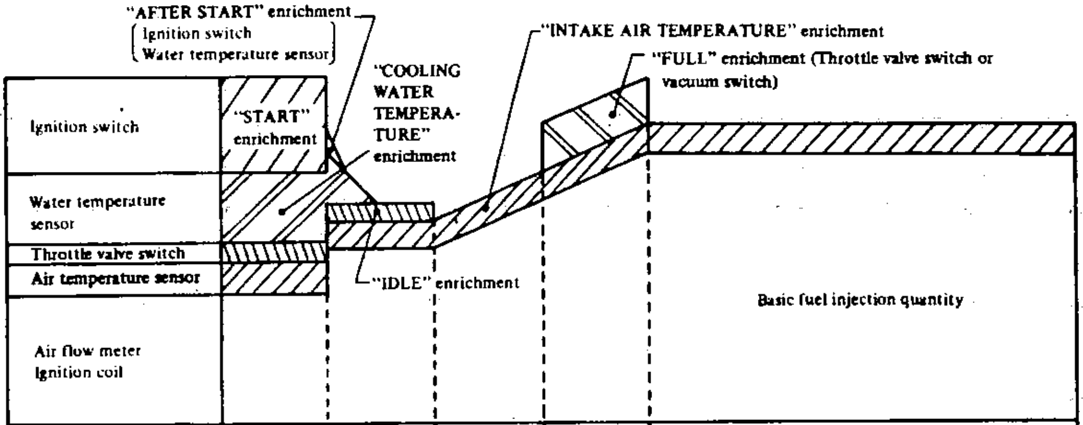


Vehicle condition	Cranking	Idling	Vehicle starting	Full throttle	Constant-speed driving
Ignition switch	"START"	"ON"			
Throttle valve switch	"IDLE" contact ON		OFF	"FULL THROTTLE" contact ON	OFF
Vacuum switch (California models)	OFF			ON*	OFF
Water temperature	0°C (32°F)	20°C (68°F) 40°C (104°F) 60°C (140°F)	80°C (176°F)		80°C (176°F) (Constant)
Intake air temperature	0°C (32°F) (Constant)				

*: On California models, the "Full" enrichment is activated when the vacuum switch is "ON" or when the "Full" throttle contact is "ON".

Hot restart

----- Intake air temperature at 15°C (59°F) (constant) and water temperature rises from 60°C (140°F)



Vehicle condition	Cranking	Idling	Vehicle starting	Full throttle	Constant-speed driving
Ignition switch	"START"	"ON"			
Throttle valve switch	"IDLE" contact ON		OFF	"FULL THROTTLE" contact ON	OFF
Vacuum switch (California models)	OFF			ON*	OFF
Water temperature	60°C (140°F)	80°C (176°F)	80°C (176°F) (Constant)		
Intake air temperature	15°C (59°F) (Constant)				

*: On California models, the "Full" enrichment is activated when the vacuum switch is "ON" or when the "Full" throttle contact is "ON".

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"After start" enrichment

When the ignition switch is turned from the "START" to "ON" position after cranking operation, the "start" or "cold start" enrichment becomes zero. The "after start" enrichment is provided to compensate for this sudden decrease in fuel quantity. The "after start" enrichment decreases gradually as time passes, finally becoming zero, and is determined by cooling water temperature.

"Idle" enrichment

When the engine is idling, that is, when the accelerator pedal is not depressed, the throttle valve switch idle contact is "ON" to provide additional fuel injection.

"After idle" enrichment

The "after idle" enrichment provides smooth acceleration when the accelerator pedal is depressed to start the vehicle.

The "after idle" enrichment decreases gradually as time passes, finally becoming zero, and is determined by cooling water temperature.

"Full" enrichment

The "full" enrichment provides smooth full throttle driving performance.

California models:

The "full" enrichment is activated when the intake manifold vacuum is below 21.3 kPa (160 mmHg, 6.30 inHg) or when the throttle valve opening is more than 45°.

Non-California models:

The "full" enrichment is activated when the throttle valve opening is more than 45°.

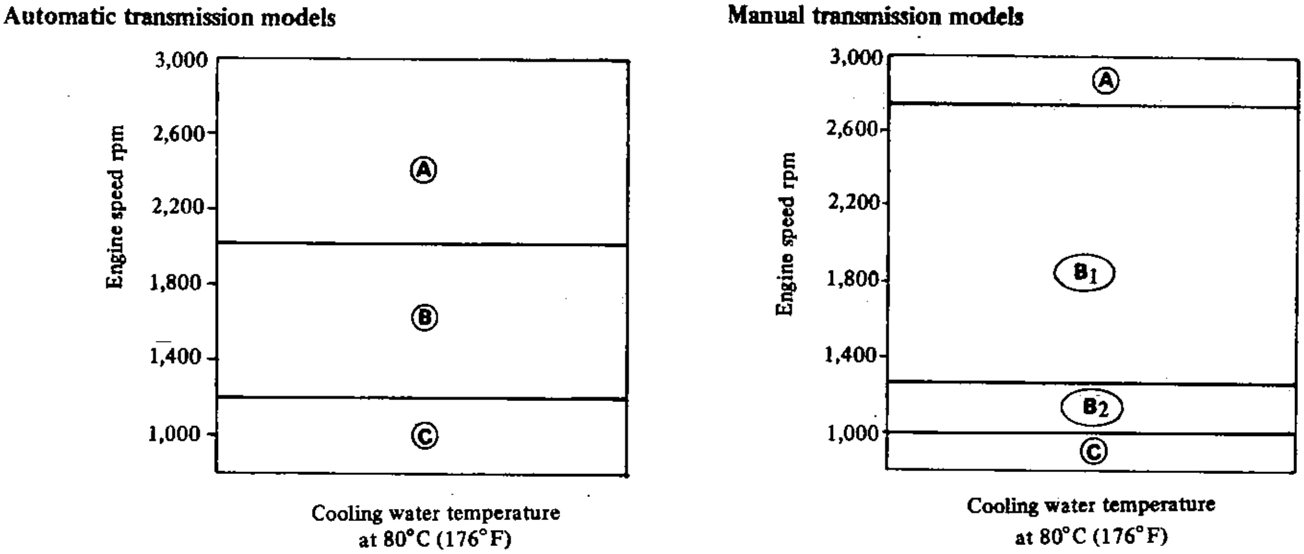
ENRICHMENT SIGNAL AND SIGNAL SOURCE CHART

Sensor & switch / Fuel enrichment	Water temperature sensor	Air temperature sensor	Throttle valve switch		Vacuum switch (California models)	Ignition switch "START"	Ignition coil negative terminal	Remarks
			Idle contact	Full throttle contact				
Cold start	O					O	O	
Start						O		
After start	O					O*1		*1: Ignition switch "START" → "ON"
Idle			O					
After idle	O		O*2					*2: Idle contact "ON" → "OFF"
Full				O	O			
Warm-up	O		O					
Intake air temperature		O						

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.



Automatic transmission models

Manual transmission models

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.

Deceleration from zone "A"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "B1"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "B2"	Fuel is not shut off.
Deceleration from zone "C"	Fuel is not shut off.
Engine rpm increased in order of "C", "B2", "B1" and "A". (Idle switch ON, downhill driving, etc.)	Fuel is not shut off in zones "C", "B2", and "B1"; in zone "A", fuel is shut off.

SEF095

ALTITUDE COMPENSATION (California models)

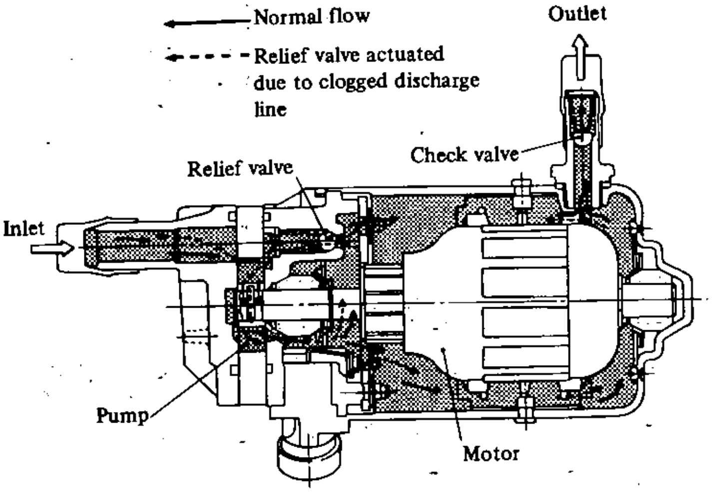
The density of air becomes thin in proportion to the altitude, so that the air fuel ratio becomes richer at high altitude.

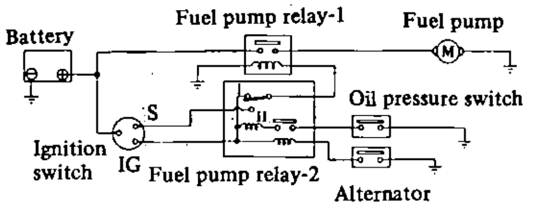
The altitude compensator is a device to correct air-fuel mixture to an optimum ratio automatically.

EFI SYSTEM COMPONENT PARTS CONSTRUCTION AND FUNCTION

FUEL FLOW SYSTEM

FUEL PUMP





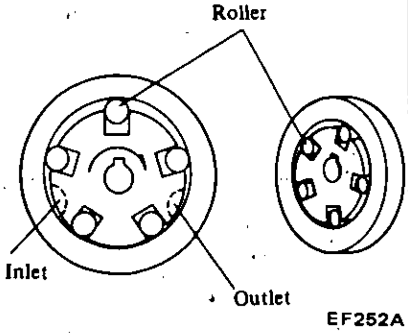
Normal switch position

	When engine is stopped	When engine is in operation
Alternator "L" terminal	ON	OFF
Oil pressure switch		

IGN. SW. position	Alternator	Oil pressure	Fuel pump relay -1	Fuel pump relay -2	Fuel pump
START	Not generate	No pressure	ON	II	Actuate
ON	Generate	Normal	ON	I	Actuate
ON	Failure	Normal	ON	I	Actuate
ON	Generate	Failure	ON	I	Actuate
ON	Failure	Failure	OFF	II	Not actuate
OFF	Not generate	No pressure	OFF	I	Not actuate

SEF096

The fuel pump employs a wet type construction where a vane pump with roller is directly coupled to a motor filled with fuel. This construction provides superior coupling characteristics between the pump and motor, and greater safety in case of fire.



EF252A

In the vane pump, the roller is pushed outward by centrifugal force when the pump rotates, and is pressed against the outer wall. This rotary portion and surrounding wall are not coaxial, and pumping is performed by the change in clearance between the wall and the rotary portion. Thus, when the clearance is large, fuel is sucked in; when it decreases, fuel is discharged.

The 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/cm^2, 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.

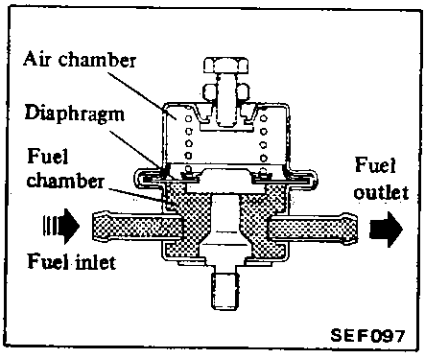
Operation

When the ignition switch is turned to the "START" position for cranking operation, the fuel pump is actuated irrespective of the conditions of the alternator and the engine oil pressure switch.

After starting the engine (the ignition switch is "ON"), the alternator operates and the engine oil pressure switch is open through rotation of the engine, thereby actuating the fuel pump.

If the alternator stops and the engine oil pressure decreases for some reason, the fuel pump relay-2 contact is turned to "II", and the fuel pump relay-1 is turned "OFF". Then the fuel pump is stopped, through the ignition switch remains in the "ON" position. In this manner, fuel supply is cut off for safety purposes when the engine accidentally stops during driving.

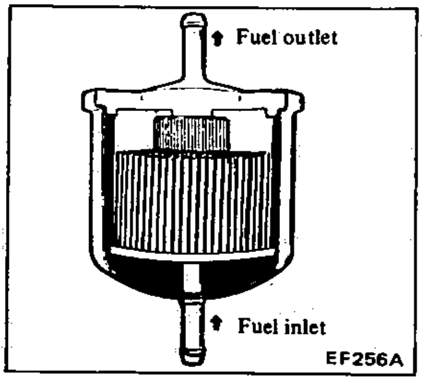
FUEL DAMPER



The fuel damper is provided to suppress pulsation in fuel flow discharged from the fuel pump. No adjustment is allowed on this damper.

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

FUEL FILTER

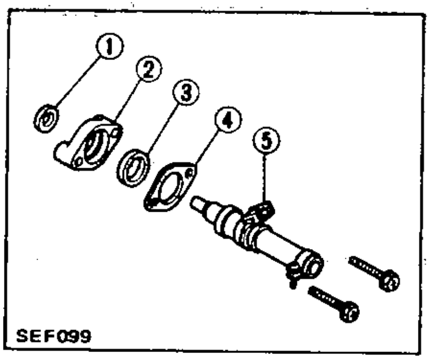


The fuel filter is placed between the fuel damper and the injector, and is used to remove foreign matter in the fuel. Water in the fuel is collected at the bottom of the filter casing.

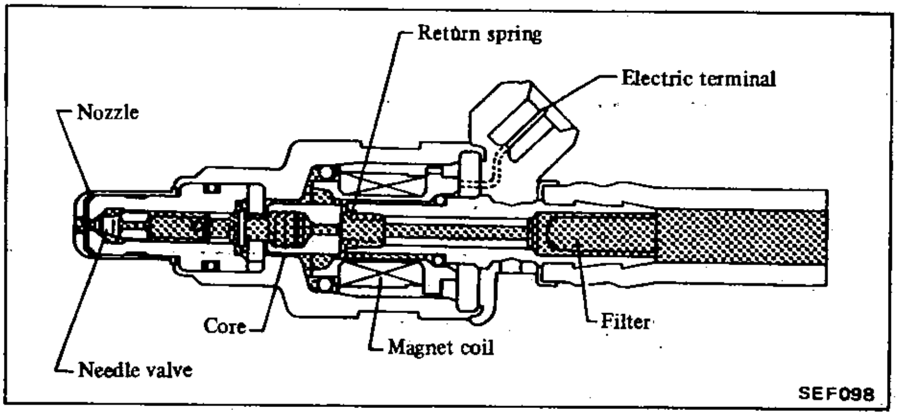
INJECTOR

The injector receives the pulse signal from the control unit, and injects the fuel toward the intake valve in the cylinder head.

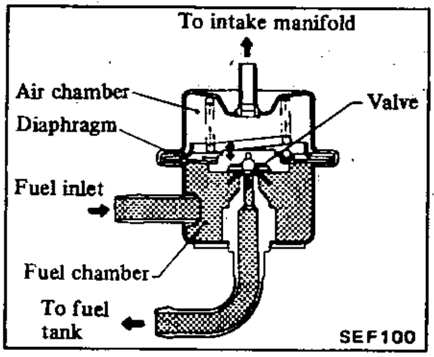
The injector operates on the solenoid valve principle. When a driving pulse is applied to the coil built into the injector, the plunger is pulled into the solenoid, thereby opening the needle valve for fuel injection. The quantity of injected fuel is in proportion to the duration of the pulse applied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



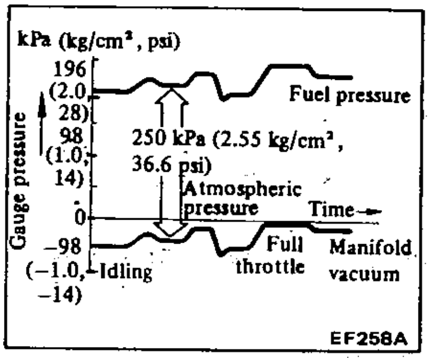
1 Injector lower rubber insulator
2 Injector lower holder
3 Injector upper rubber insulator
4 Injector upper holder
5 Injector



PRESSURE REGULATOR

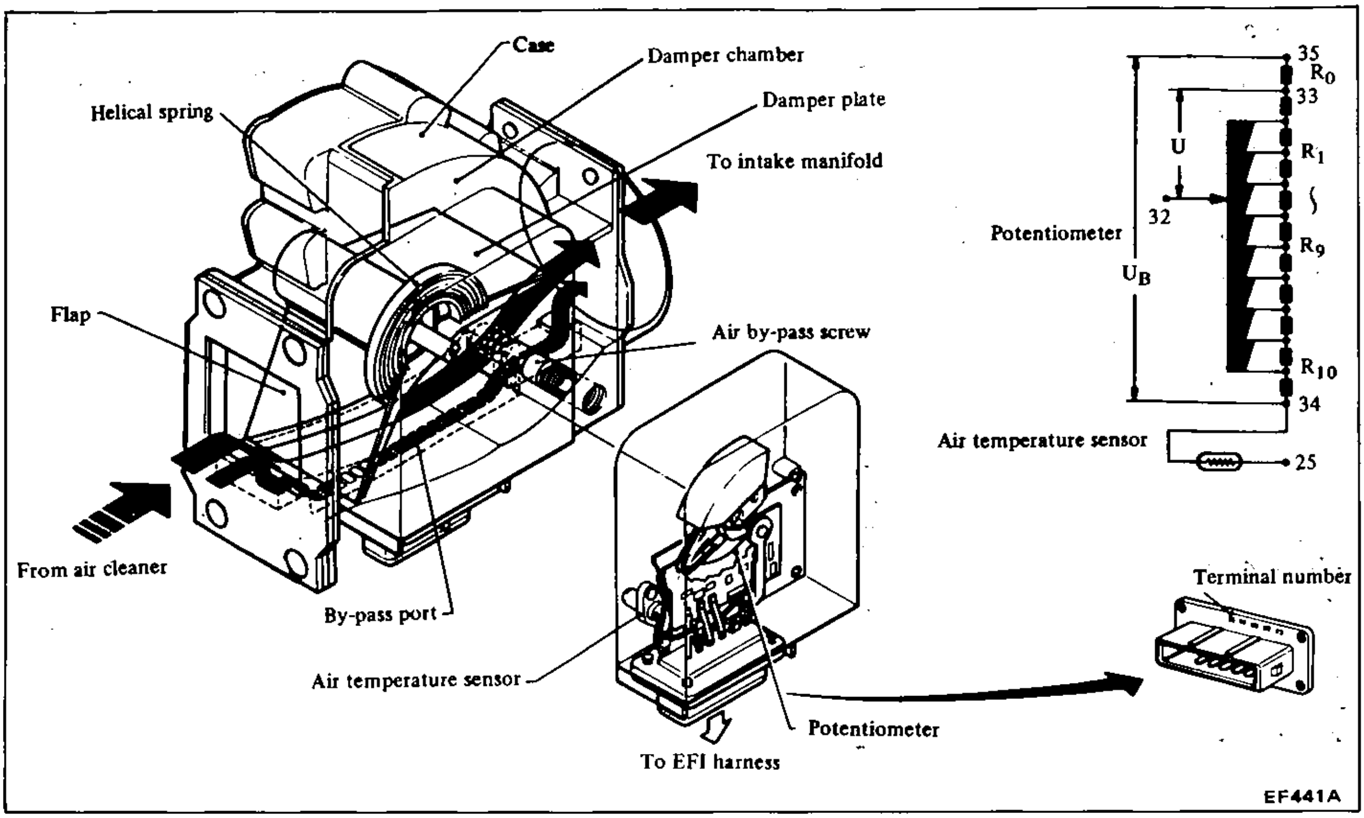


The pressure regulator controls the pressure of fuel so that a pressure difference of 250 kPa (2.55 kg/cm², 36.3 psi) can be maintained between the fuel pressure and intake manifold vacuum. The pressure regulator is divided into the air chamber and fuel chamber by the diaphragm. Intake manifold vacuum 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.



AIR FLOW SYSTEM

AIR FLOW METER



EF441A

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 is electronically monitored to count the air flow rate.

More specifically, the angle of rotation of the flap is monitored by a potentiometer provided inside as a potential difference U. When the flap deflects along with a change in the intake air flow rate, the terminal ㉜ mounted to the flap shaft slides on the variable resistor R from R1 to R9, causing the voltage across terminals ㉜ and ㉝ to change.

A constant voltage U_B (battery voltage) is applied across terminals ㉞ and ㉟ . Then the air flow rate is converted into the voltage ratio signal U/U_B, which in turn is sent to the control unit for computation.

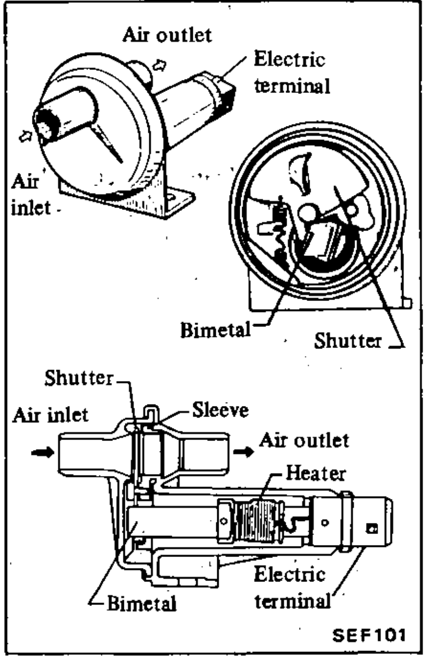
The flap is able to rotate to an angle where an equilibrium between the air flow pressure and the return torque of the coil spring can be maintained. The damper chamber and damper plate are provided as a damper for the flap so that the flap will not be disturbed by pulsation in manifold vacuum during operation.

The damper plate is interlinked with the flap, and as the flap rotates, the compensating plate rotates in the damper chamber keeping a very small clearance between the chamber wall.

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.

The air passage is provided with the air temperature sensor, and the by-pass port has the air by-pass screw which regulates the idle mixture ratio.

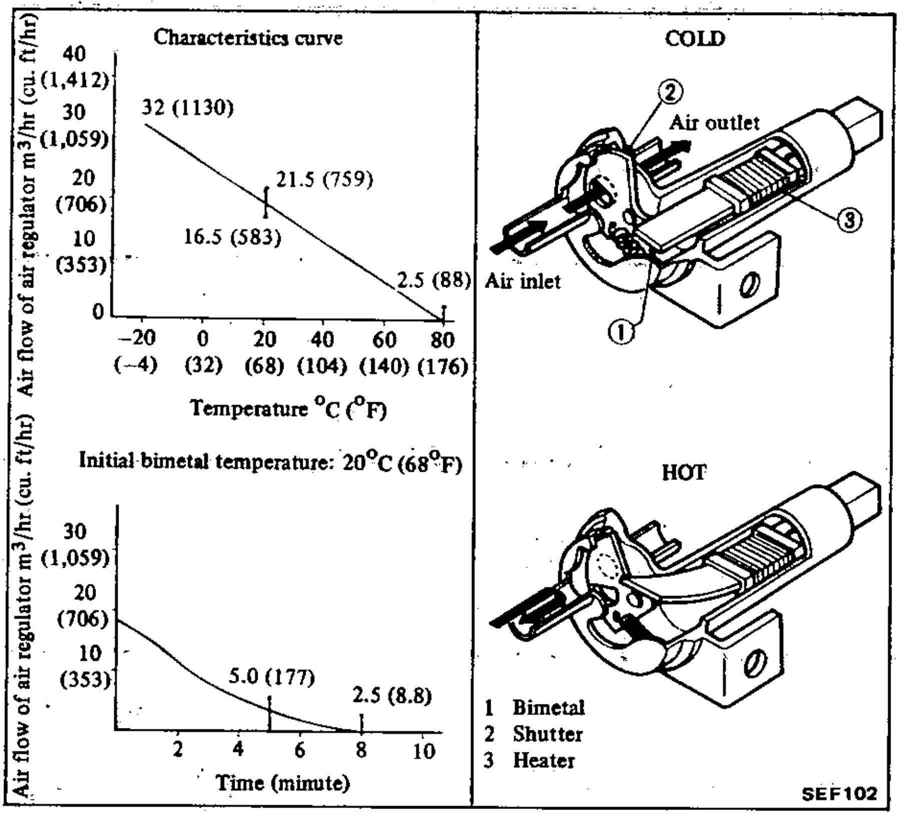
AIR REGULATOR



SEF101

The air regulator bypasses 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 80°C (176°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 80°C (176°F).



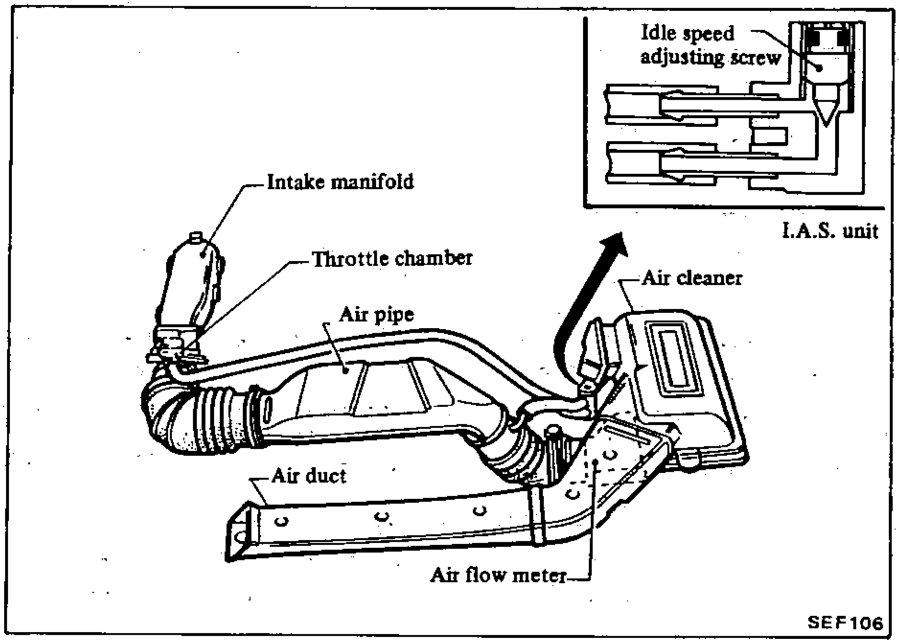
SEF102

I. A. S. UNIT (Idle speed adjusting screw unit)

Throttle valve remains closed during engine idling, and the air required for idling passes through by-pass line between air pipe and throttle chamber. Idle adjustment is made by the idle speed adjusting screw at the I.A.S. unit.

AIR PIPE

The air pipe, located on the line between the air flow meter and the throttle chamber prevents the pulsating of the intake air.



SEF106

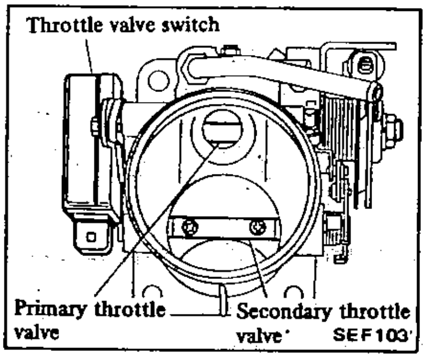
THROTTLE CHAMBER

The throttle chamber, located between the air flow meter and the intake manifold, is equipped with a valves. This valve controls the intake air flow in response to accelerator pedal movement.

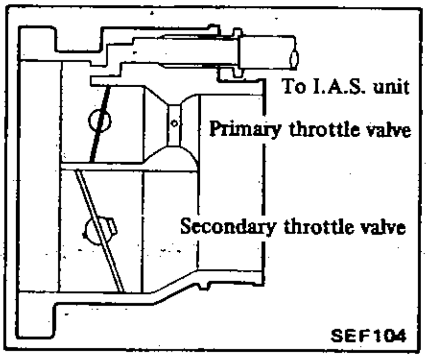
The air passage is a two-barrel type which consists of a primary side and a secondary side. A venturi is provided on the primary side.

When the opening angle of the primary throttle valve reaches 35°, the secondary throttle valve will be opened by a linkage which is connected to the primary throttle valve.

The rotary shaft of the primary throttle valve is connected to the throttle valve switch.



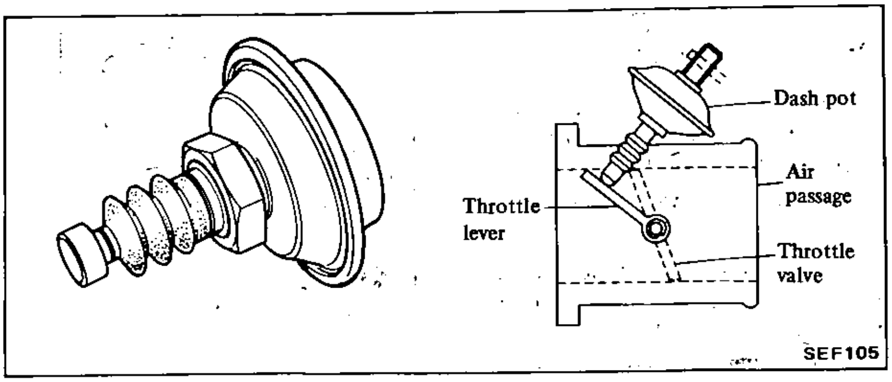
SEF103



SEF104

DASH POT (Automatic transmission models)

The dash pot is attached to the throttle chamber. The dash pot prevents the throttle valve from closing abruptly, and thus stalls the engine. The throttle valve will gradually return to the idle opening position during deceleration.



SEF105

ELECTRICAL SIGNAL SYSTEM

WATER TEMPERATURE SENSOR

The water temperature sensor, built into the thermostat housing, monitors change in cooling water temperature and transmits a signal for the fuel enrichment to change the pulse duration during the warm-up period.

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

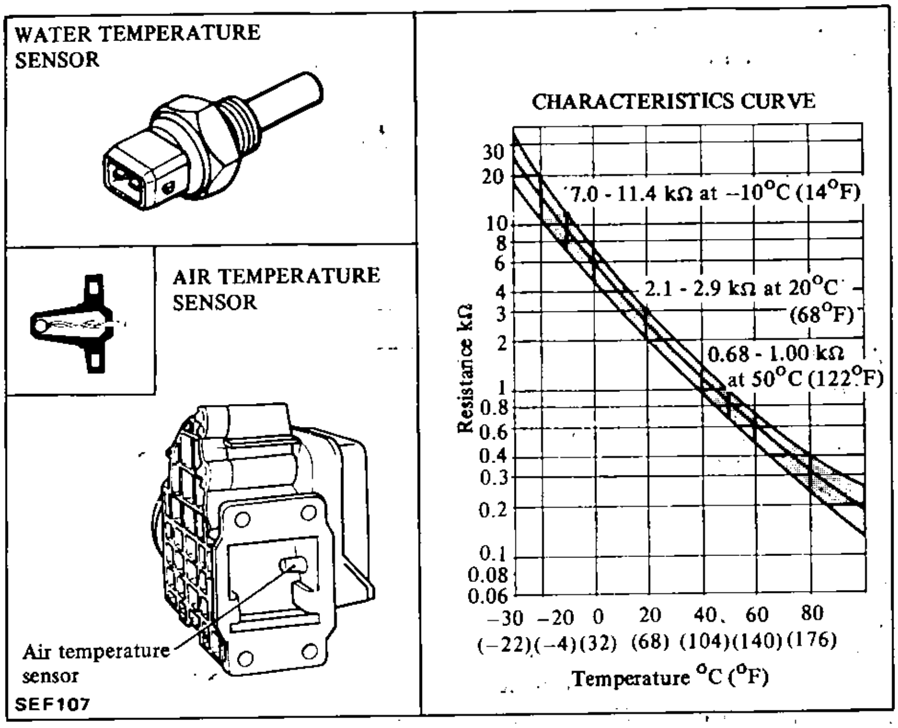
The electrical resistance of the thermistor decreases in response to the water temperature rise.

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 the air temperature rise.



SEF107

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.

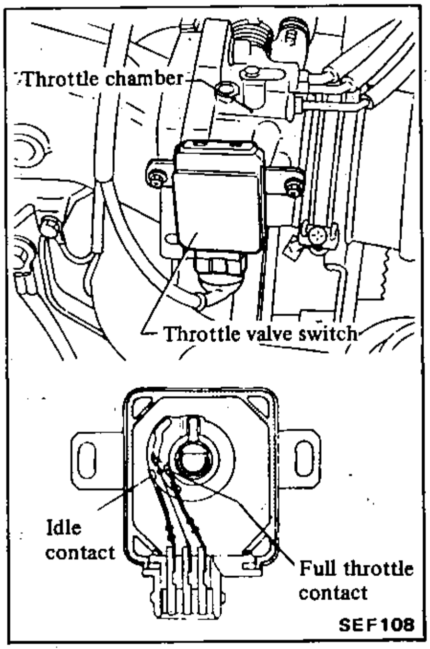
Idle contact

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 "idle", "warm-up" and "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 45 degree opening of the throttle valve). The contact is open while the throttle valve is at any other position.

The full contact compensates for "full" enrichment.

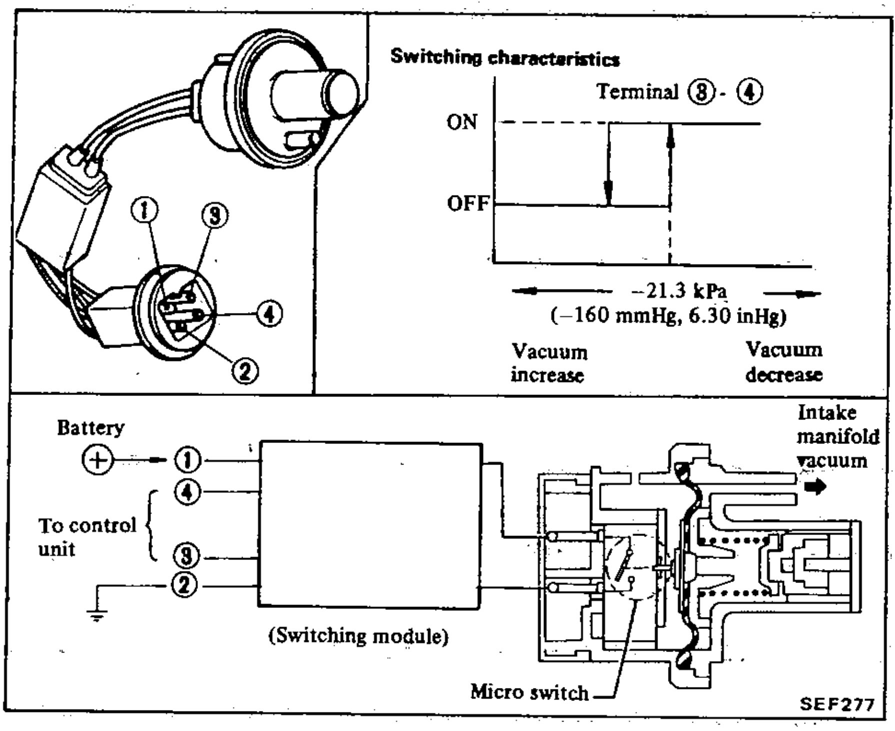


SEF108

VACUUM SWITCH (California models)

The vacuum switch compensates for the "full" enrichment by controlling the intake manifold vacuum. This switch consists of a vacuum diaphragm and a microswitch.

When the intake manifold vacuum lowers during acceleration, the tension of the spring will push the diaphragm back and open the contact of the microswitch. This will cause the switching module to transmit an "ON" signal to the control unit.



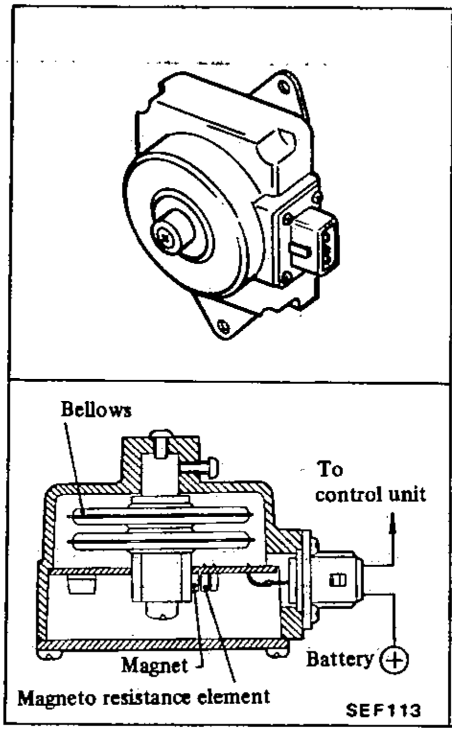
SEF277

ALTITUDE SENSOR (California models)

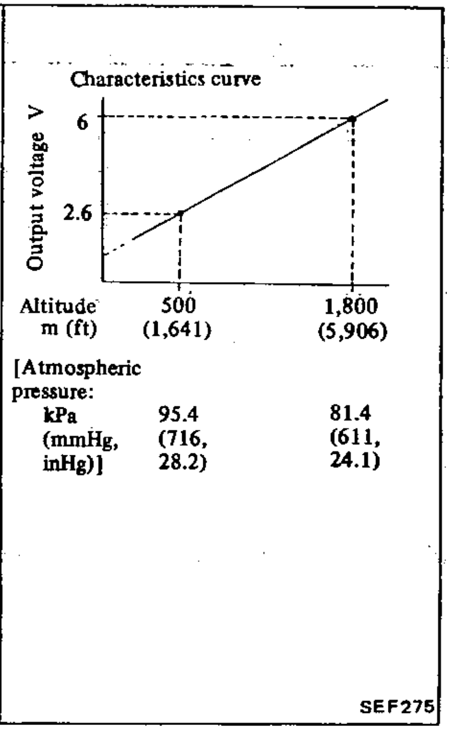
This altitude sensor is a device to obtain the electric signal in proportion to altitude for the electronic control unit.

This altitude sensor is composed of the bellows, the magnet and the magneto-resistance element. At high altitude, the bellows extends and changes the position of the magnet installed at the tip of bellows. The magneto-resistance element senses the position of the magnet and transforms to the electric signal.

The electric signal from the altitude sensor is transmitted to the electronic control unit and the injection duration of the injectors is determined to obtain the optimum air-fuel ratio by the electronic control unit.



SEF113



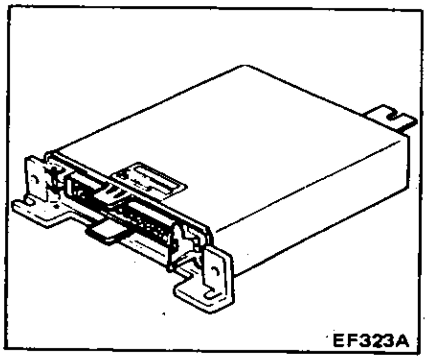
SEF275

CONTROL UNIT

The control unit is connected to the EFI harness by means of a multi-connector, and the EFI 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.

The control unit consists mainly of three integrated circuits formed on the printed circuit board. This construction provides superior control unit reliability.

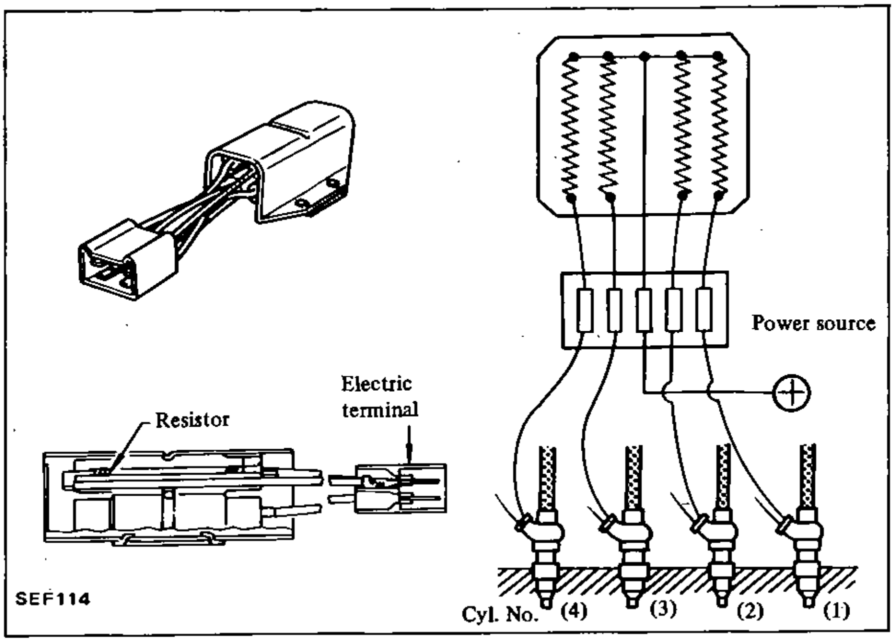


EF323A

DROPPING RESISTOR

The dropping resistor is used to lower the source voltage to a level suitable for the injector.

The dropping resistor is connected in series with the injector. It reduces the source voltage to approximately 1/4 of the source voltage. These resistors protect the injectors from alternator voltage surges and from the effects of other components in the vehicle's electrical system.



SEF114

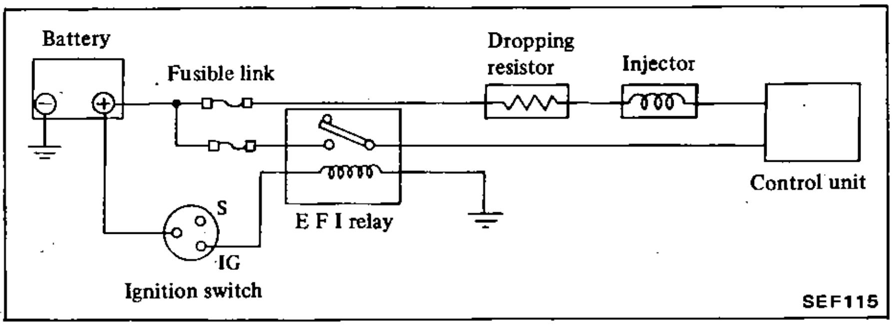
RELAY

EFI relay

The EFI relay serves to activate the electronic fuel injection system through the ignition switch.

Fuel pump relay -1 and -2

The fuel pump relay serves to activate the fuel pump. For operation of the fuel pump, refer to Fuel Pump.



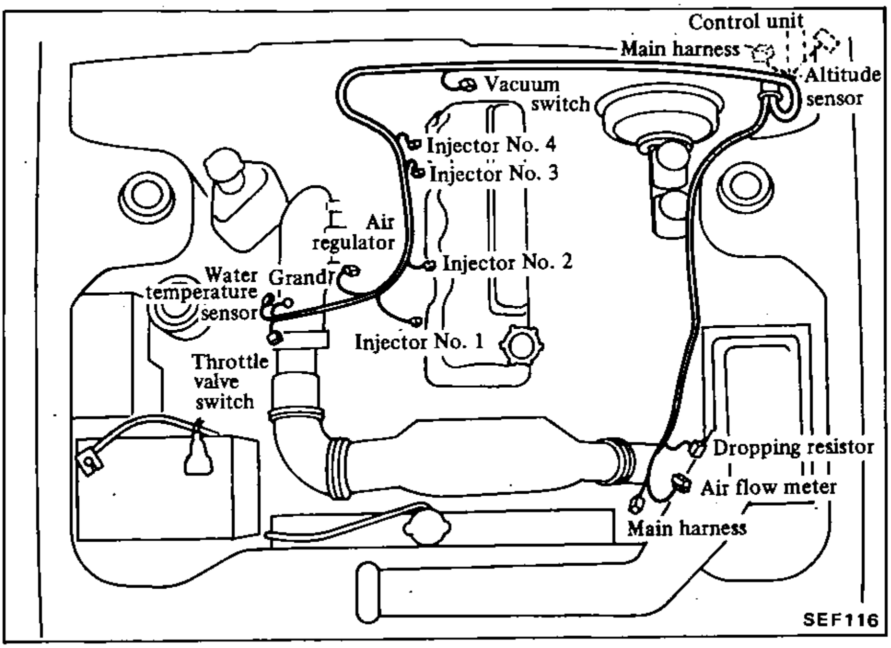
SEF115

EFI HARNESS

One wiring harness is used to connect lines between the control unit and the related major units.

The 35-pin connector of the EFI harness is connected to the control unit, and runs to the engine compartment. The harness runs to various units: the air flow meter, throttle valve switch, vacuum switch, air regulator, altitude sensor, water temperature sensor, dropping resistor and injector, etc.

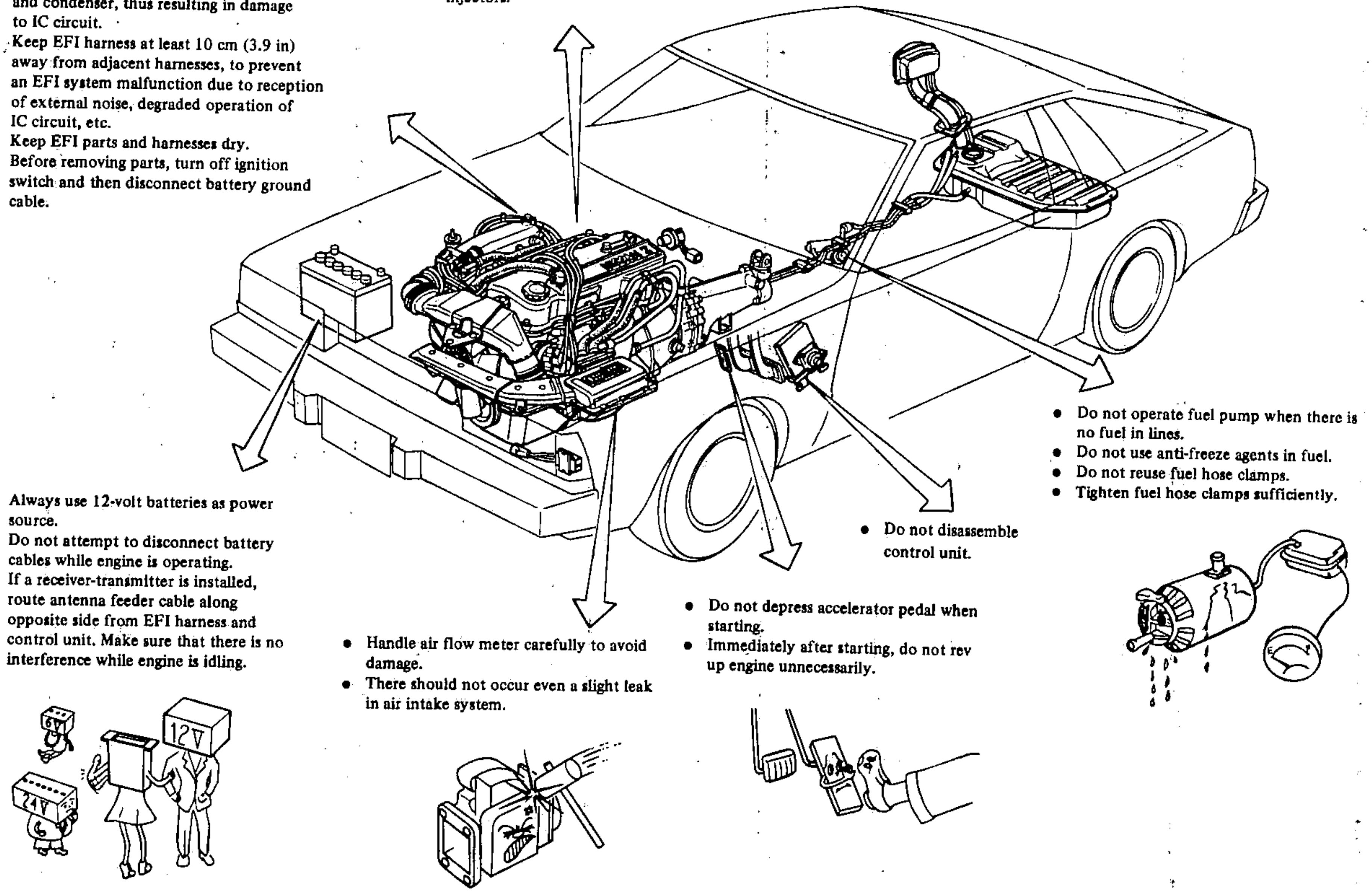
Battery supplies power to injector and control unit through fusible link designed especially for EFI.



SEF116

PRECAUTIONS FOR AN EFI ENGINE

Pay close attention to the following points when inspecting or servicing an EFI car.



- Securely connect EFI 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 EFI harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an EFI system malfunction due to reception of external noise, degraded operation of IC circuit, etc.
- Keep EFI parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

- Do not apply battery power directly to injectors.

- 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 EFI harness and control unit. Make sure that there is no interference while engine is idling.

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

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

- Do not disassemble control unit.

- Do not operate fuel pump when there is no fuel in lines.
- Do not use anti-freeze agents in fuel.
- Do not reuse fuel hose clamps.
- Tighten fuel hose clamps sufficiently.

SEF162

REMOVAL AND INSTALLATION

INJECTOR AND FUEL PIPE

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.

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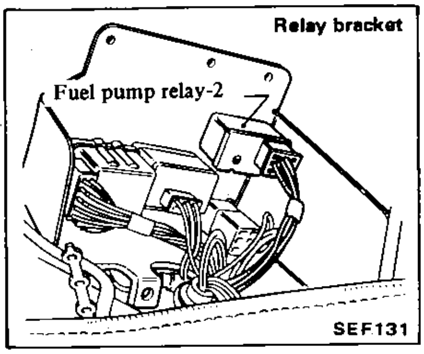
(1) Start the engine.

(2) Disconnect the harness connector of fuel pump relay-2 while the engine is running.



SEF131

(3) After the engine stalls, crank the engine two or three times.

(4) Turn the ignition switch "OFF"

(5) Reconnect the harness connector of fuel pump relay-2.

If the engine will not start, remove fuel pump relay-2 harness connector and crank the engine for about 5 seconds.

Then turn the ignition switch "OFF".

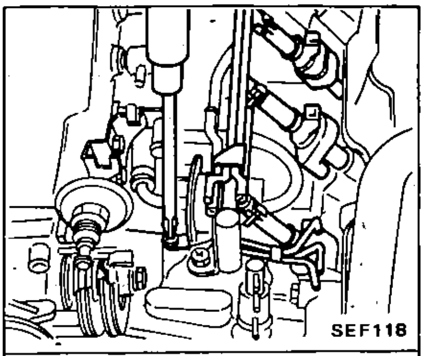
2. Remove or disconnect the following parts and connectors.
- Accelerator wire.
- Injector harness connector.
- V.C. valve hose and air regulator hoses.
- Air regulator and its harness connector.
- Vacuum hose at the fuel pipe connection end.

3. Disconnect fuel feed hose and fuel return hose from fuel pipe.

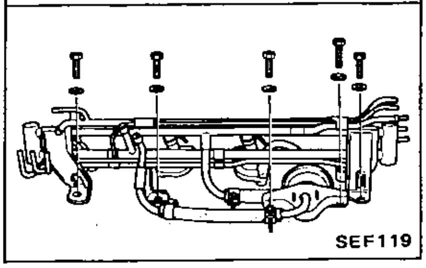
Place a rag under fuel pipe to prevent splashing of fuel.

4. Remove vacuum hose connecting pressure regulator to intake manifold.

5. Remove bolts securing fuel pipe and pressure regulator.

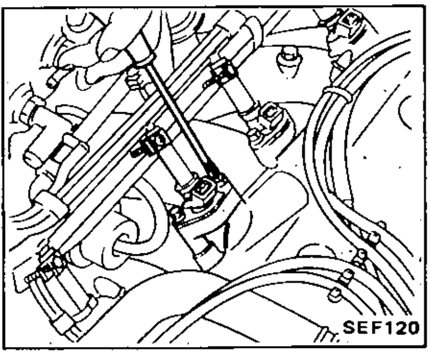


SEF118



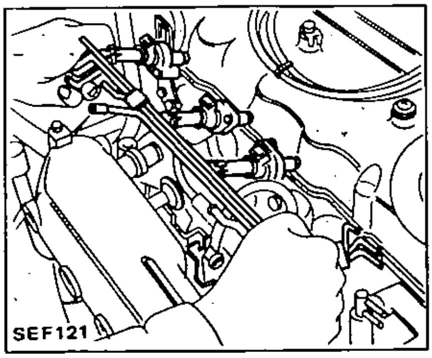
SEF119

6. Remove screws securing fuel injectors.



SEF120

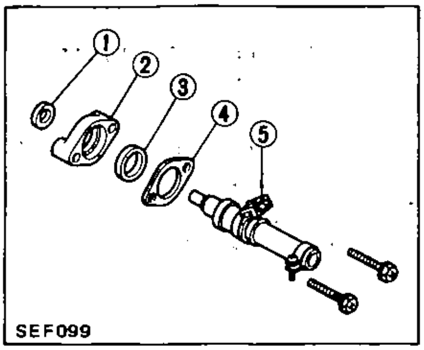
7. Remove fuel pipe assembly, by pulling out fuel pipe, injector and pressure regulator as an assembly.



SEF121

8. 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.



SEF099

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

9. To install injector and fuel pipe, reverse the order of removal.

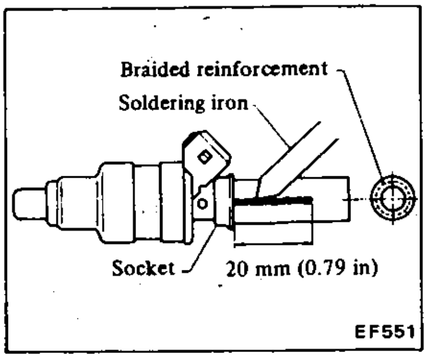
a. When installing injector, check that there are no scratches or abrasion at lower rubber insulator, and securely install it, making sure it is air-tight.

b. For installation of fuel hose, refer to Fuel Hose.

INJECTOR RUBBER HOSE

If necessary, replace injector rubber hose, proceed as follows:

Removal



EF551

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

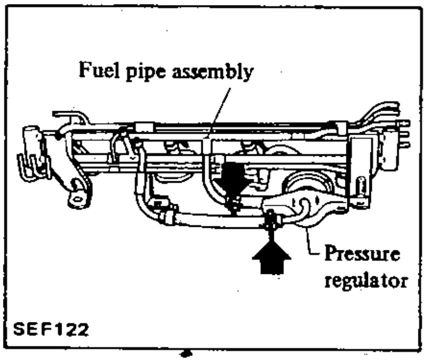
1. Clean exterior of injector tail piece.
2. Wet inside of new rubber hose with fuel.
3. Push end of rubber hose with hose socket onto injector tail piece by hand as far as they will go.

Clamp is not necessary at this connection.

CAUTION:

After properly connecting fuel hose to injector, check connection for fuel leakage.

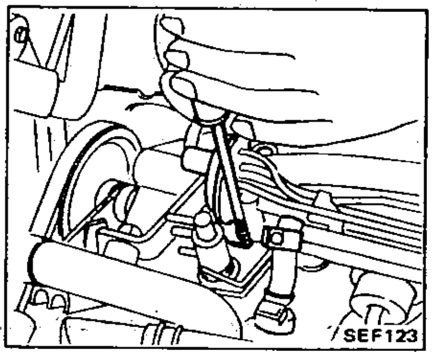
PRESSURE REGULATOR



1. Remove the fuel injector, fuel pipe and pressure regulator as an assembly, from the intake manifold. Refer to Injector and Fuel Pipe for removal.
2. Remove pressure regulator from fuel pipe assembly.
3. To install pressure regulator, reverse the order of removal.

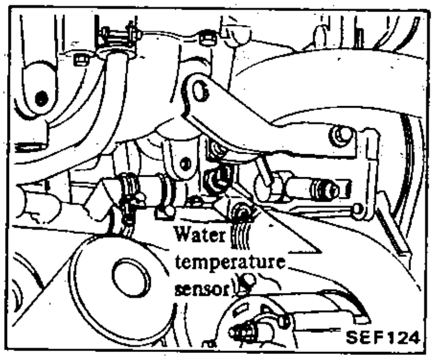
For installation of fuel hose, refer to Fuel Hose.

AIR REGULATOR



1. Disconnect ground cable from battery.
2. Unfasten clamp on each side of hose, and disconnect hose.
3. Remove setscrews, and remove air regulator.
4. Disconnect electric connector from air regulator.
5. To install air regulator, reverse the order of removal.

WATER TEMPERATURE SENSOR



1. Disconnect battery ground cable.
2. Remove radiator cap. Drain coolant by opening drain plug.

CAUTION:

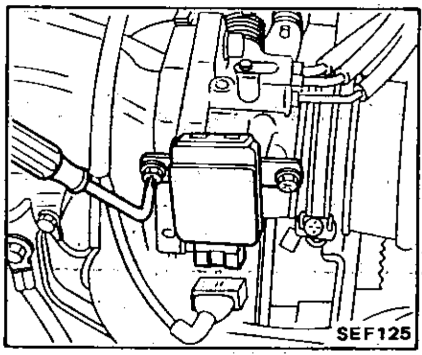
The coolant should not be drained until it has cooled off completely. Otherwise, burns may be incurred.

---

3. Remove air pipe to facilitate removal of water temperature sensor.
4. Disconnect water temperature sensor harness connector and then remove water temperature sensor by turning it counterclockwise.
5. To install water temperature sensor, reverse the order of removal.

Be sure to install copper washer when installing water temperature sensor.

THROTTLE VALVE SWITCH



1. Disconnect battery ground cable.
2. Disconnect throttle valve switch harness connector.
3. Remove screws securing throttle valve switch to throttle chamber.
4. Slowly pull throttle valve switch toward you.
5. To install throttle valve switch, reverse the order of removal.
6. After installation, adjust position of throttle valve switch.

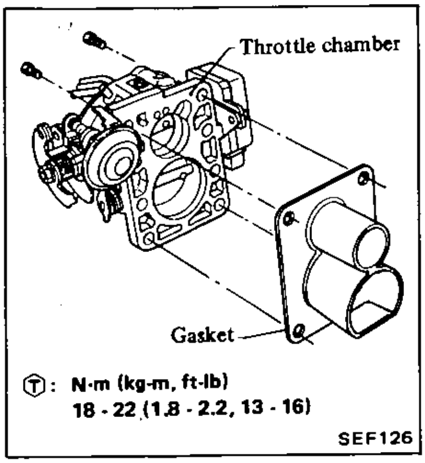
Refer to Throttle Valve Switch, under the heading Component Parts Inspection.

THROTTLE CHAMBER

1. Disconnect battery ground cable.
2. Remove hoses, tube and air duct from throttle chamber.
3. Disconnect throttle valve switch harness connector.
4. Remove accelerator wire from throttle lever.
5. Remove bolts securing throttle chamber to intake manifold. The throttle chamber can be removed.

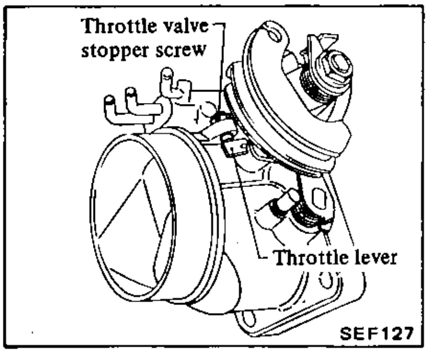
6. To install throttle chamber, reverse the order of removal.

Gasket should be replaced by new one each time the throttle chamber is removed.



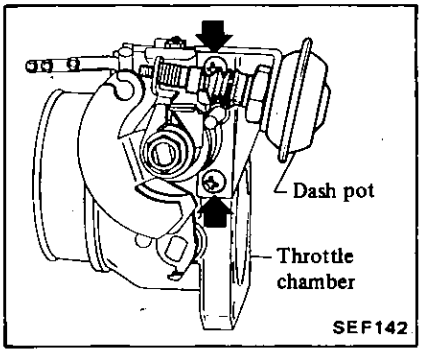
SEF126

Do not adjust throttle valve stopper screw as it is properly adjusted at factory.



SEF127

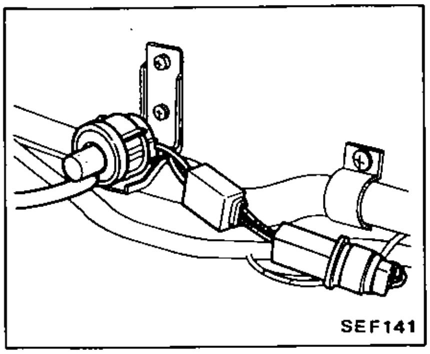
DASH POT



SEF142

1. Remove throttle chamber.
   Refer to throttle chamber for removal.
2. Remove dash pot from throttle chamber.
3. To install dash pot, reverse the order of removal.
4. After installation, adjust dash pot touch speed. Refer to Dash Pot, under the heading of Component Parts Inspection.

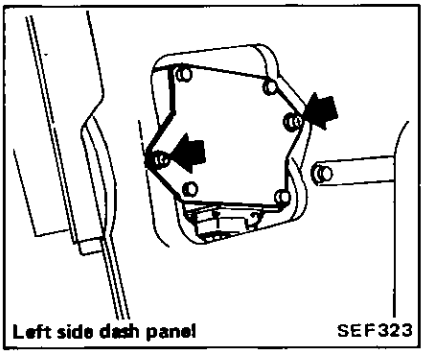
VACUUM SWITCH



SEF141

1. Disconnect battery ground cable.
2. Disconnect vacuum hose and harness connector from vacuum switch.
3. Remove vacuum switch from bracket.
4. To install vacuum switch, reverse the order of removal.

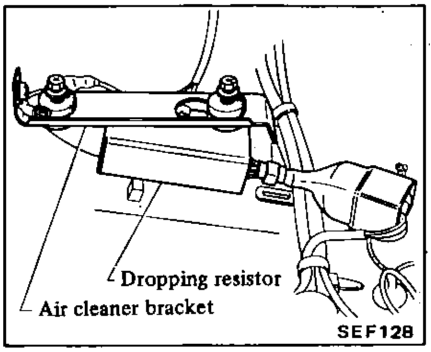
ALTITUDE SENSOR



Left side dash panel SEF323

1. Disconnect ground cable from battery.
2. Remove control unit.
   Refer to Control Unit for removal.
3. Remove altitude sensor attaching bolts.
4. Disconnect harness connector from altitude sensor.
5. To install altitude sensor, reverse the order of removal.

DROPPING RESISTOR

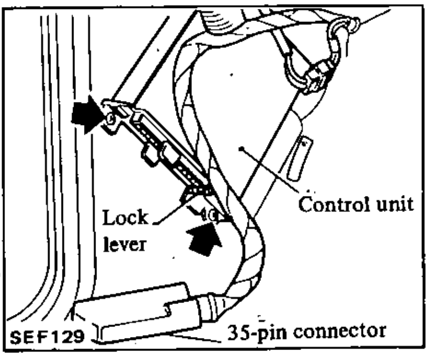


SEF128

1. Disconnect ground cable from battery.
2. Remove air cleaner and air flow meter as an assembly. Refer to Air Cleaner for removal.
3. Disconnect harness connector from dropping resistor.
4. Remove dropping resistor attaching screw.
5. To install dropping resistor, reverse the order of removal.

CONTROL UNIT

The control unit is mounted on the left side dash panel.



SEF129

1. Turn ignition switch "OFF" and then disconnect ground cable from battery.

CAUTION:

Before disconnecting EFI harness at 35-pin connector, be sure to turn ignition switch "OFF" and then disconnect ground cable from battery to prevent control unit from being damaged.

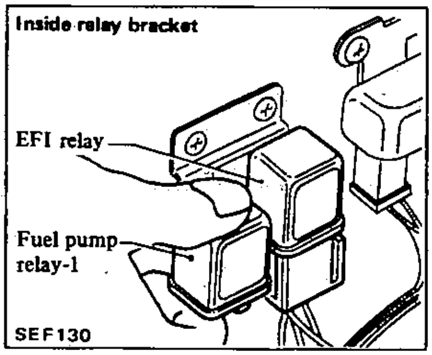
2. Remove L.H. dash side finisher.
3. Pull lock lever back, and disconnect 35-pin connector from control unit.
4. Remove bolt which secures control unit to L.H. dash side panel, and remove control unit.
5. To install control unit, reverse the order of removal.

CAUTION:

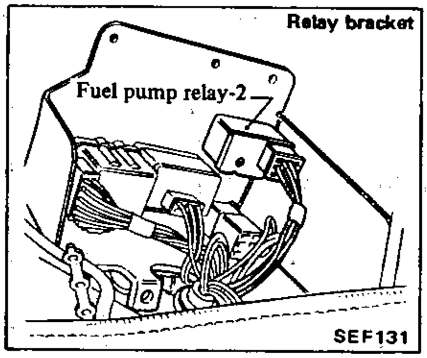
When inserting 35-pin connector into control unit, be careful not to bend or break terminals.

RELAY

The relays are installed on the relay bracket.



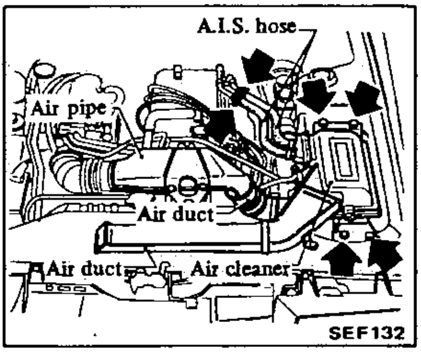
SEF130



SEF131

1. Disconnect battery ground cable and remove relay bracket.
2. Disconnect harness connector.
3. Remove relay from relay bracket.
4. To install relay, reverse the order of removal.

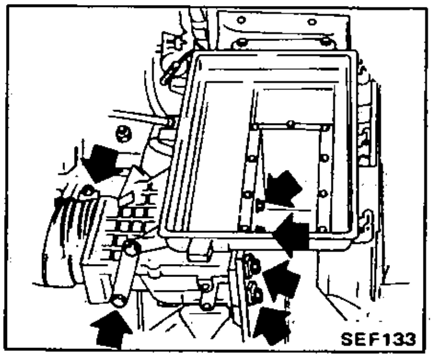
AIR CLEANER



SEF132

1. Disconnect ground cable from battery.
2. Disconnect air ducts and hoses connecting air cleaner and air flow meter.
3. Remove I.A.S. unit from air cleaner.
4. Remove bolts securing air cleaner to air cleaner bracket, and detach air cleaner with air flow meter as an assembly.
5. Disconnect air flow meter harness connector.
6. Remove air flow meter from air cleaner. Refer to Air Flow Meter for removal.
7. To install air cleaner, reverse the order of removal.

AIR FLOW METER



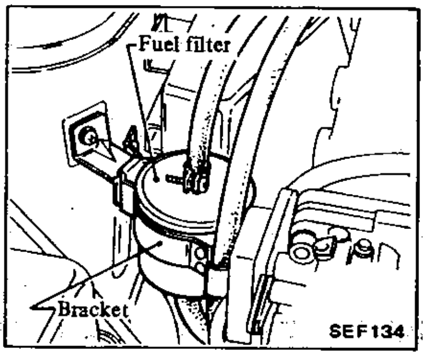
SEF133

1. Disconnect battery ground cable.
2. Disconnect air ducts and hoses connecting air cleaner and air flow meter.
3. Remove air cleaner cover.
4. Remove bolts securing air flow meter.
5. Disconnect harness connector, and remove air flow meter.
6. To install air flow meter, reverse the order of removal.

AIR TEMPERATURE SENSOR

The air temperature sensor is built into the air flow meter and **cannot be removed as a single unit.** When replacement of air temperature sensor is necessary, the entire air flow meter assembly should be replaced.

FUEL FILTER



SEF134

1. Reduce fuel line pressure to zero. Refer to item 1, under the heading Injector and Fuel Pipe.
2. Unfasten clamps securing fuel hoses to the outlet and inlet sides of fuel filter, and disengage fuel hoses.

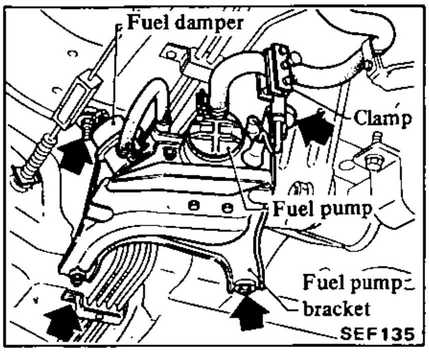
Be careful not to spill fuel over engine compartment. Place a rag to absorb fuel.

3. Remove fuel filter.
4. To install fuel filter, reverse the order of removal.
5. For installation of fuel hose, refer to Fuel Hose.

FUEL PUMP AND FUEL DAMPER

1. Disconnect ground cable from battery.
2. Reduce fuel line pressure to zero. Refer to item 1, under the heading Injector and Fuel Pipe.
3. Raise the rear portion of car with a jack, and block wheels.
4. Temporarily clamp hose between fuel tank and fuel pump.
5. Unfasten clamps and the suction side of fuel pump and outlet side of fuel damper, and disconnect fuel hoses.

Be sure to receive fuel into a suitable container.



SEF135

6. Disconnect fuel pump harness connector.
7. Remove bolts which secure fuel pump bracket to body, and remove fuel pump and fuel damper as an assembly from bracket.
8. Fuel pump and fuel damper can be removed.
9. To install fuel pump and fuel damper, reverse the order of removal.
10. 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.

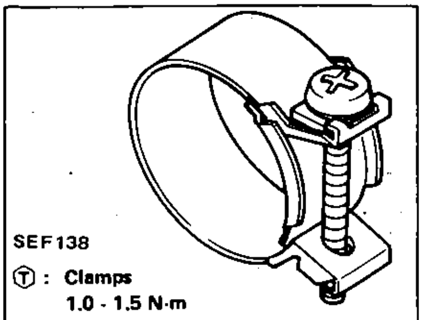
When removing or installing high pressure fuel hose, observe the following.

CAUTION:

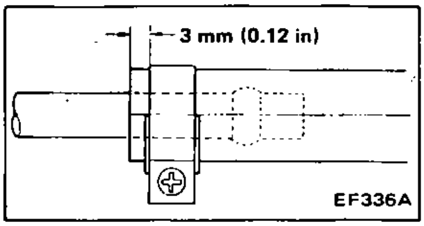
a. Do not reuse fuel hose clamps after loosening.

b. Clean dust and dirt from parts with compressed air when assembling.

c. 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.


SEF138

Ⓣ : Clamps
1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)



EF336A

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

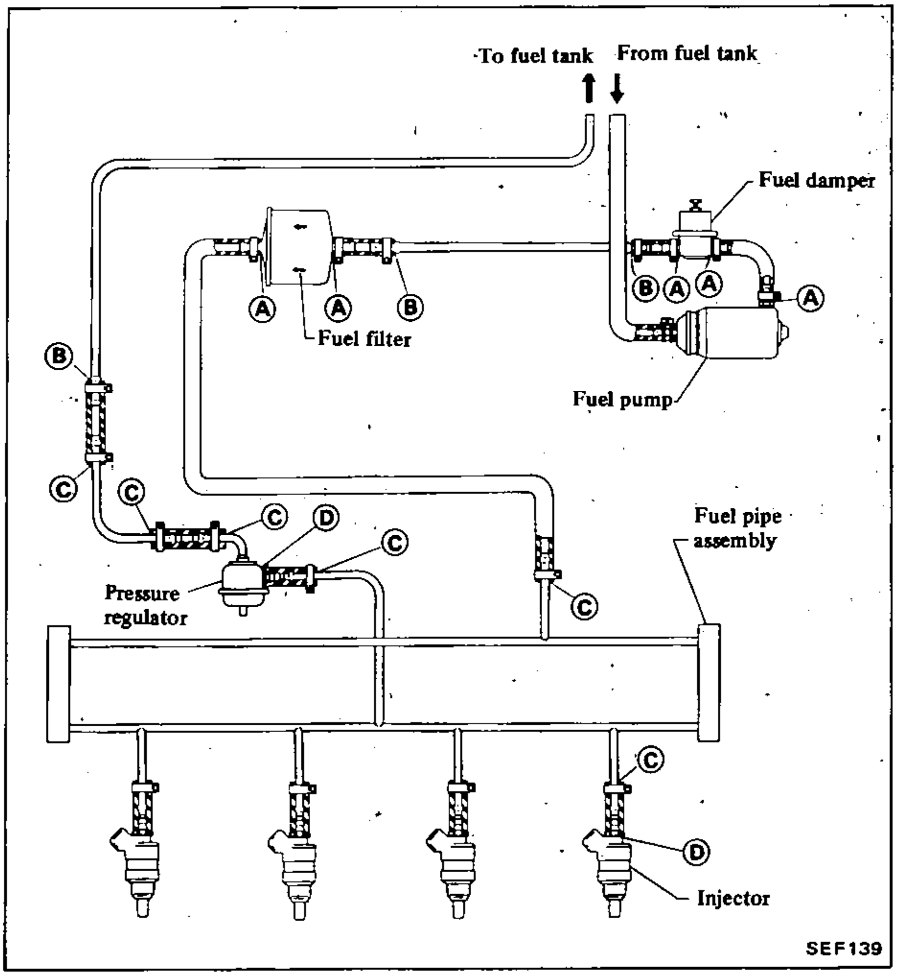
Insert high pressure fuel hoses into their proper positions as instructed below.

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 injector rubber hose onto fuel pipe until it is 28 mm (1.10 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.



SEF139

ELECTRICAL SYSTEM INSPECTION

DESCRIPTION

Electrical system inspection can be performed by using the EFI ANALYZER (J-25400).

CAUTION:
When checking the electrical system with EFI 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 vacuum switch harness connector. (California models)
5. Arrange so that air flow meter flap can be pushed manually from air cleaner side.
6. Disconnect 35-pin EFI harness connector from control unit.

CAUTION:
a. Before disconnecting EFI 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.

INSPECTION

To inspect the electrical system, use a circuit tester. Continuity test can be performed easily by measuring resistance and voltage between terminals of 35-pin EFI harness connector installed on car.

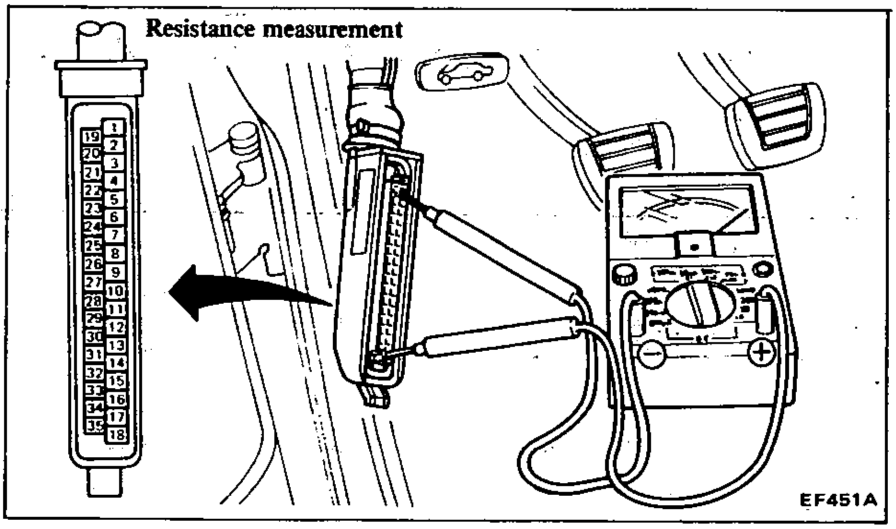
CAUTION:
Do not touch the circuit tester probe to any unnecessary pin on the 35-pin connector. Doing so could cause damage to the circuit tester.

For items to be checked, refer to Inspection Procedure Table.

RESISTANCE MEASUREMENT

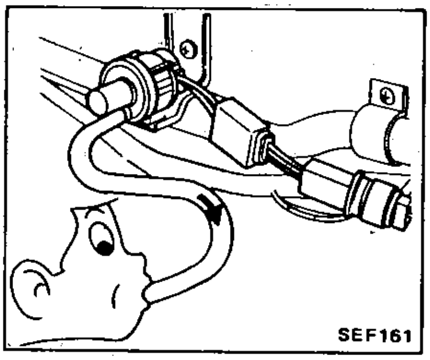
1. Set circuit tester in the Ohm "R" range.
2. Check continuity between terminals Ⓐ and Ⓑ shown in the Inspection Procedure table.

Body ground should be made by connecting unpainted metal such as bolt.



EF451A

3. After steps 1 through 11 above have all been completed, proceed to step 12 only for California models.
1) Connect the vacuum switch harness connector, and disconnect the hose in the line between the vacuum switch and the intake manifold.
2) Disconnect the throttle valve switch and altitude sensor harness connector.
3) Check continuity when no pressure is applied to vacuum switch.
4) Apply a pressure below –21.3 kPa (–160 mmHg, –6.30 inHg) to vacuum switch by orally sucking port back and check continuity.



SEF161

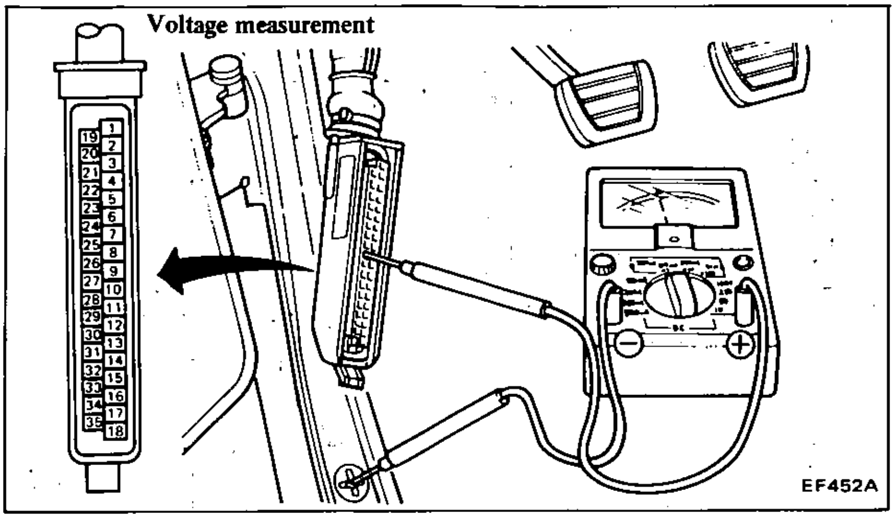
5) Bring back vacuum switch, altitude sensor, and throttle valve switch to their original condition.

VOLTAGE MEASUREMENT

1. Set circuit tester in the DC Volt (DC "V") range.
2. Securely connect battery ground cable.
3. Connect negative probe of circuit tester to body metal.

Body earth should be made by connecting with unpainted metal such as bolt.

4. Contact positive probe of circuit tester to terminal Ⓐ shown in the Inspection Procedure table.



5. Inspection with ignition switch in "START" position.

(1) Set ignition switch on "START" and measure voltage in each step of Inspection Procedure Table from 13 to 14.

(2) Turn ignition switch "OFF".

(3) Connect lead wire to "S" terminal of starter motor.

(4) Set ignition switch on "START" and measure voltage in step 15.

6. Inspection with ignition switch in "ON" position.

(1) Turn ignition switch "ON" and measure voltage in each step of Inspection Procedure Table from 16 to 22.

(2) Turn ignition switch "OFF".

(3) Disconnect oil pressure switch harness connector.

(4) Turn ignition switch "ON" and measure voltage in step 23.

(5) Turn ignition switch "OFF".

(6) Connect oil pressure switch harness connector.

(7) Disconnect alternator 2-pin connector ("L" and "S" terminals).

(8) Turn ignition switch "ON" and measure voltage in step 24.

7. Turn ignition switch "OFF".
8. Connect EFI harness connector to control unit.
9. Connect 2-pin alternator connector.
10. Bring air flow meter back to its original condition.

INSPECTION PROCEDURE TABLE

HOW TO USE

1. After measuring, compare measured values with standard values to determine whether circuits/parts are malfunctioning or not.
2. When a malfunctioning circuit is located, again check measurements involved in that circuit. In this case, check ignition switch, circuit tester range, probe, etc. to be certain they are set at proper positions.

CAUTION:

a. Before connecting EFI harness at 35-pin connector, ensure that ignition switch is in the "OFF" position.

b. When inserting 35-pin connector into control unit, insert slowly, securely and straight, being careful not to bend or break 35-pin terminals.

INSPECTION PROCEDURE TABLE

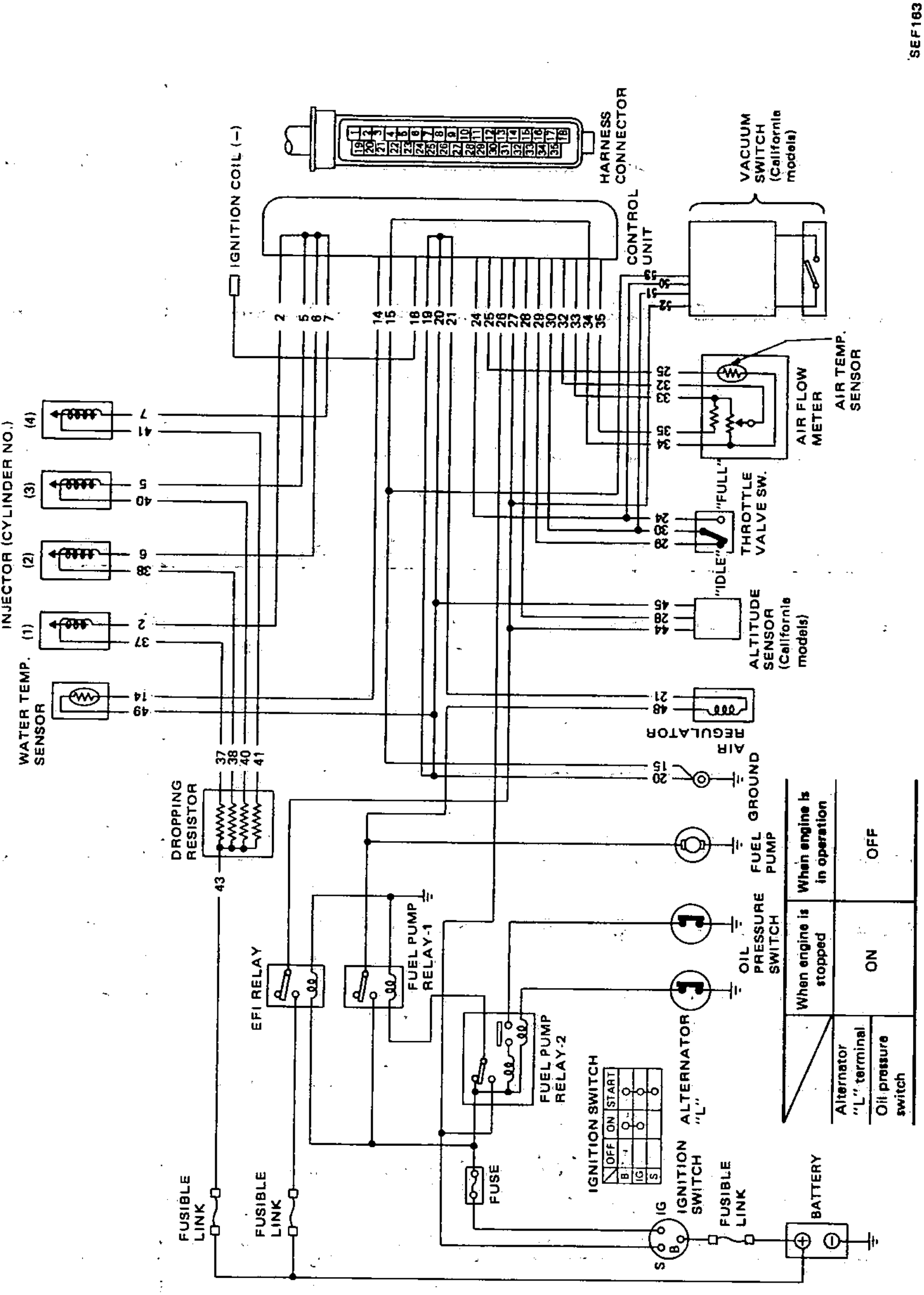
Step	Inspection circuit	Ignition switch	Circuit tester range	Check terminals		Auxiliary operation or condition		Standard value	Measured value	Judgment
				A ⊕	B ⊖					
1. Disconnect battery negative terminal, starter motor "S" terminal, 35-pin EFI harness connector from control unit. 2. Disconnect vacuum switch harness connector (California models) 3. Arrange so that air flow meter flap can be pushed from air cleaner side.										
1	Air flow meter (potentiometer) sliding resistor and circuit	OFF	Ω	32	34	Push air flow meter flap.		Except 0 and ∞ Ω		
2	Ground circuit			15	E			0Ω		
3				19	E					
4				20	E					
5	Throttle valve switch idle contact and circuit			29	30	Accelerator pedal	Fully depressed	∞ Ω		
							Released	0 Ω		
6	Throttle valve switch full throttle contact and circuit			24	30		Fully depressed	0 Ω		
							Released	∞ Ω		
7	Water temperature sensor and circuit			14	E	Water temperature	20°C (68°F) or above	Below 2.9kΩ		
							Below 20°C (68°F)	2.1kΩ or above		
8	Air temperature sensor and circuit			25	34	Intake air temperature	20°C (68°F) or above	Below 2.9kΩ		
							Below 20°C (68°F)	2.1kΩ or above		
9	Air flow meter (potentiometer) resistor and circuit			33	34			100 to 400 Ω		
10				35	34			200 to 500 Ω		
11	Circuit between air regulator and fuel pump			21	E			25 to 90 Ω		
California models: 1. Connect vacuum switch harness connector, and disconnect hose (vacuum switch to intake manifold) at intake manifold side. 2. Disconnect throttle valve switch and altitude sensor harness connector.										
12	Vacuum switch and circuit	OFF	Ω	15	30	No pressure is applied to vacuum switch.		50 to 300 kΩ		
				15	24			50 to 300 kΩ		
				15	27			∞ Ω		
						Apply a pressure below −21.3 kPa (−160 mmHg, −6.30 inHg) to vacuum switch by orally sucking port back.		400 to 600 Ω		
California models: Bring back vacuum switch, throttle vavel switch and altitude sensor to their original condition.										
Connect battery negative terminal.										
13	Circuit between ignition switch and control unit power source	START	V	26	E			Battery voltage*		
14	Circuit between ignition switch, fuel pump relay-1 and air regulator			21						

Note: a. Before disconnecting and connecting electrical connectors and terminals, ensure that ignition switch is in "OFF" position.
b. E: Body Earth
***: Although voltage may drop slightly below battery voltage, this is not an indication of abnormality.**

Step	Inspection circuit		Ignition switch	Circuit tester range	Check terminals		Auxiliary operation or condition	Standard value	Measured value	Judgment
					A ⊕	B ⊖				
Connect starter motor "S" terminal. **CAUTION: Exercise care in performing step 15 as it involves turning engine.**										
15	Ignition coil trigger circuit		START	V	18	E		Pointer deflects.		
16	Battery, dropping resistor and injector circuits	Injector 1	ON		2			Battery voltage		
17		Injector 2			6					
18		Injector 3			5					
19		Injector 4			7					
20	Battery, EFI relay and control unit power source circuits				27					
21	Altitude sensor and circuit (California models)				28			Above 0.5V		
22	Circuit between battery, ignition switch, fuel pump relay-2, alternator and oil pressure switch. Check alternator and oil pressure switch for operation.				21			0V		
Disconnect oil pressure switch harness connector.										
23	Battery, ignition switch, fuel pump relay-2 and air regulator circuits. Check fuel pump relay-2 for operation.		ON	V	21	E		Battery voltage*		
1. Connect oil pressure switch harness connector. **2.** Disconnect alternator 2-pin connector ("L" and "S" terminals).										
24	Battery, ignition switch, fuel pump relay-2 and air regulator circuits. Check fuel pump relay-2 for operation.		ON	V	21	E		Battery voltage*		
1. Connect alternator 2-pin connector "L" and "S" terminals). **2.** Bring air flow meter back to its original condition.										

Note: **a. Before disconnecting and connecting electrical connectors and terminals, ensure that ignition switch is in "OFF" position.**
b. E: Body Earth
***: Although voltage may drop slightly below battery voltage, this is not an indication of abnormality.**

EFI CIRCUIT DIAGRAM



	When engine is stopped	When engine is in operation
Alternator "L" terminal Oil pressure switch	ON	OFF

COMPONENT PARTS INSPECTION

FUEL PRESSURE CHECK

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.

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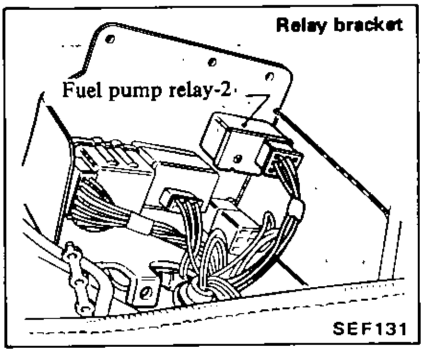
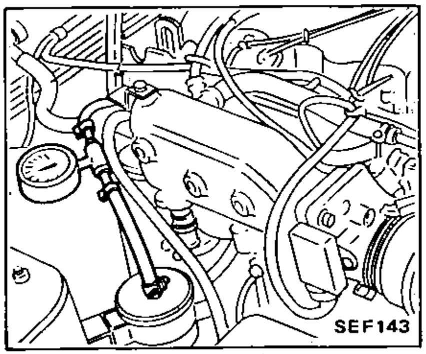
(1) Start the engine.
(2) Disconnect the harness connector of fuel pump relay-2 while the engine is running.



SEF131

(3) After the engine stalls, crank the engine two or three times.
(4) Turn the ignition switch "OFF".
(5) Reconnect the harness connector of the fuel pump relay-2.
2. Connect a fuel pressure gauge between fuel pipe and fuel hose of fuel filter.



SEF143

3. Start engine and read fuel pressure gauge.

- **At idling:**
  Approximately
  206 kPa
  (2.1 kg/cm^2, 30 psi)
- **The moment accelerator pedal is fully depressed:**
  Approximately
  255 kPa
  (2.6 kg/cm^2, 37 psi)

4. 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.

FUEL PUMP

FUNCTIONAL TEST

After disconnecting alternator "L" terminal or oil pressure switch connector, set ignition switch at "ON" position. Then make sure that fuel pump operating sound is heard. If not, check all fuel pump circuits. If all circuits are checked out OK, replace fuel pump.

FUEL DAMPER

If noise from fuel pump is abnormally loud, replace fuel damper and recheck for noise.

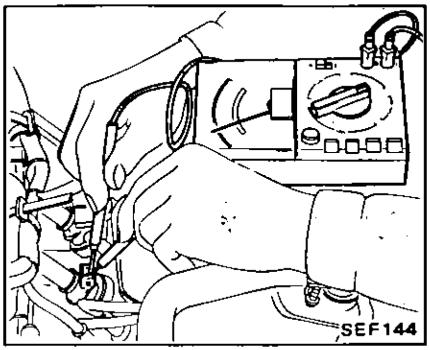
FUEL FILTER

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

INJECTOR

CONTINUITY CHECK

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.

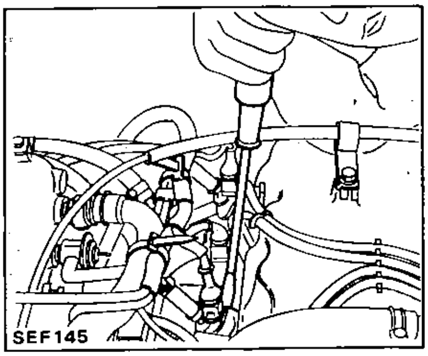


SEF144

OPERATING SOUND CHECK

Engine can run

1. Start the engine and run it at idle. Attach the tip of a screwdriver to each injector to ensure that it sounds while operating.
2. All injectors are functioning properly if "click" sound is heard at regular intervals. Note, however, that as engine speed increases, "click" intervals shorten.



SEF145

Engine cannot run

1. Crank the engine and check that injectors produce operating sounds to indicate operation.

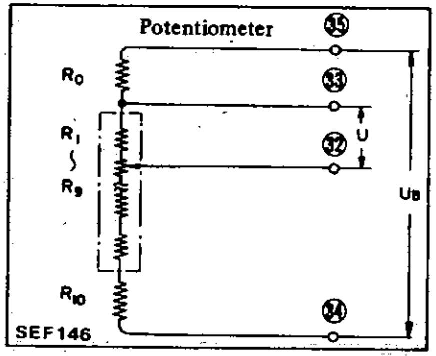
2. If a different sound is produced from any particular injector, that injector is faulty.
3. If no sound is heard from all injectors, check harnesses referring to Electrical System Inspection.
4. If harnesses are normal, check operation of control unit.

PRESSURE REGULATOR

Refer to Fuel Pressure Check for inspection.

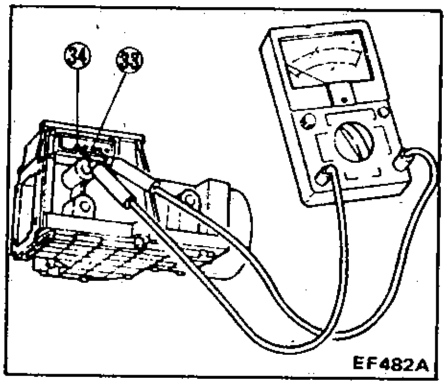
AIR FLOW METER

CHECKING POTENTIOMETER



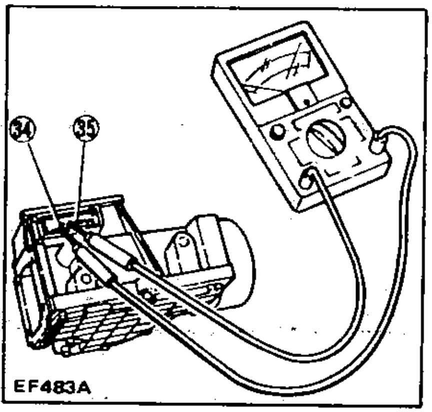
SEF146

1. Measure the resistance between terminals ㉝ and ㉞. The standard resistance is 100 to 400 ohms.



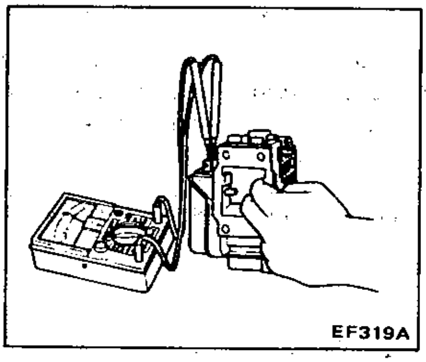
EF482A

2. Measure the resistance between terminals ㉞ and ㉟. The standard resistance is 200 to 500 ohms.



EF483A

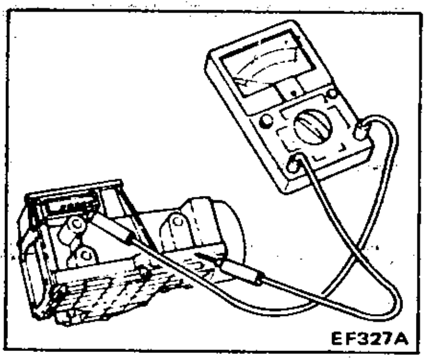
3. While sliding flap, measure resistance between terminals ㉜ and ㉞. If resistance is at any value other than 0 and ∞ ohm, air flow meter is normal.



EF319A

CHECKING INSULATION RESISTANCE

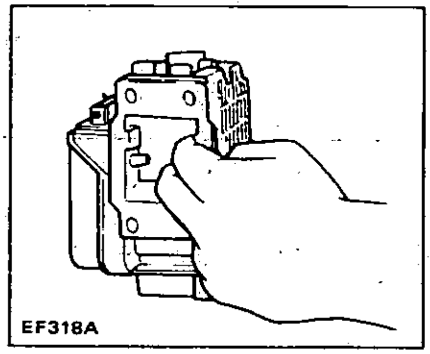
Check insulation resistance between the air flow meter body and any one of the terminals ㉜, ㉝, ㉞ and ㉟. If continuity exists, the air flow meter is out of order.



EF327A

CHECKING FLAP

Fully open the flap by hand to check that it opens smoothly without binding. If it doesn't, it is out of order.

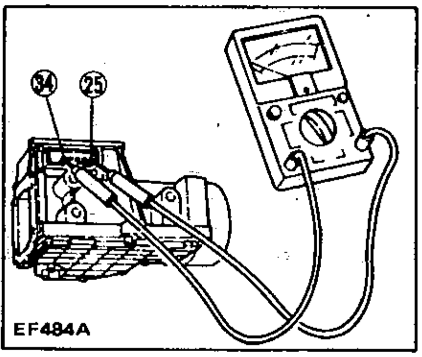


EF318A

AIR TEMPERATURE SENSOR

CHECKING CONTINUITY

1. Measure the outside air temperature.
2. Measure resistance between terminals ㉕ and ㉞ of the air flow meter connector.

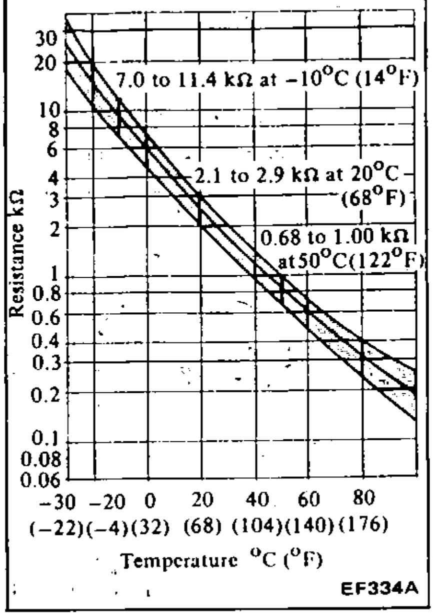


EF484A

3. The relationship between the outside air temperature and resistance is shown in the following graph.

WATER TEMPERATURE SENSOR AND AIR TEMPERATURE SENSOR

CHARACTERISTIC CURVE

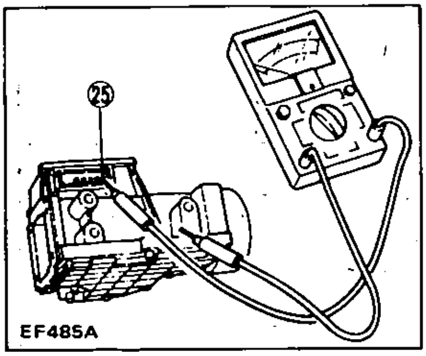


EF334A

If test results are far from the range indicated in the graph, the air temperature sensor is out of order. The air temperature sensor should be replaced as an air flow meter assembly.

CHECKING INSULATION RESISTANCE

Check insulation resistance between terminal ㉕ and air flow meter body. If continuity exists, the air temperature sensor is out of order. The air temperature sensor and air flow meter should be replaced as an assembly.

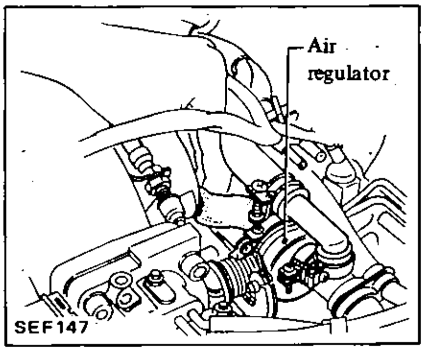


EF485A

AIR REGULATOR

1. Starting engine, and pinch rubber hose between intake manifold and air regulator.

- Engine speed decreases during warm-up. . . . . OK
- Engine speed remains unchanged after warm-up. . . . . OK



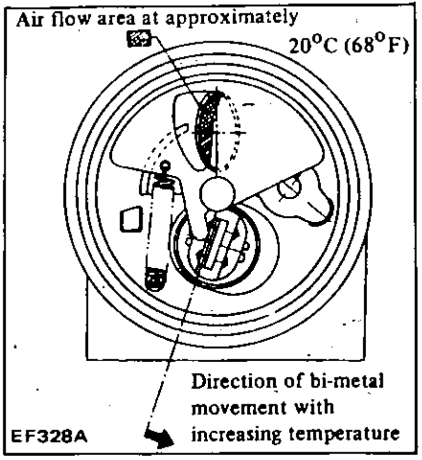
SEF147

Shutter is opened during engine warm-up, thereby increasing quantity of intake air causing engine speed to increase. Engine speed decreases when passage is narrowed by pinching hose during warm-up. After warm-up, shutter closes. Therefore, engine speed remains unchanged when passage is narrowed by pinching hose after warm-up.

2. Disconnect electric connector of air regulator, and check continuity. Continuity should exist. If not, air regulator is faulty.

3. Disconnect hoses from both ends of air regulator, and visually check to see if air regulator shutter opens.

The shutter opening at a temperature of 20°C (68°F) is as shown in following figure.



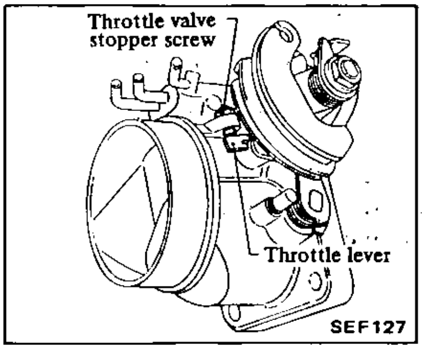
EF328A

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 not, replace.

THROTTLE CHAMBER

1. Make sure that throttle valve moves smoothly when throttle lever is manipulated.
2. Make sure that by-pass port is free from obstacles and is clean.

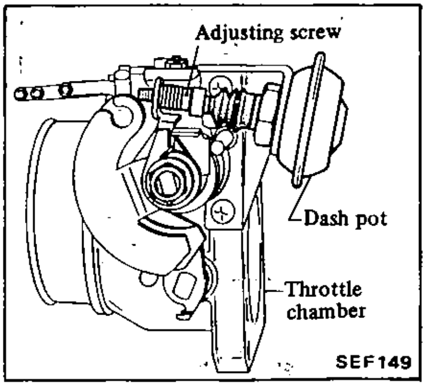
Do not adjust throttle valve stopper screw as it is factory-adjusted.



SEF127

DASH POT

1. Set engine speed to 1,500 rpm under no-load.
2. Check the dash pot to make sure that the rod end comes in contact with the adjusting screw when the rod is fully extended or when no back pressure is present at the diaphragm.



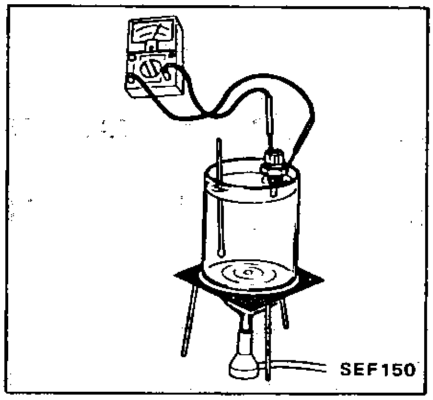
SEF149

3. If necessary, adjust the adjusting screw so that the rod end comes into contact with the adjusting screw.

WATER TEMPERATURE SENSOR

CHECKING INSULATION RESISTANCE

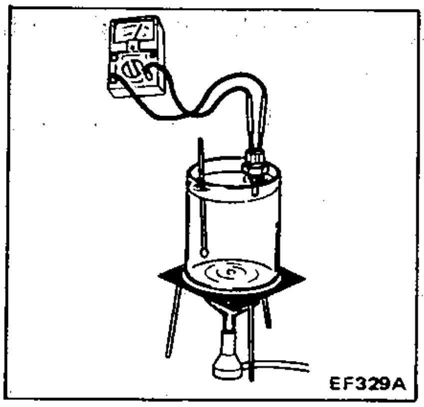
1. Check continuity between the sensor body and each of the terminals at sensor.



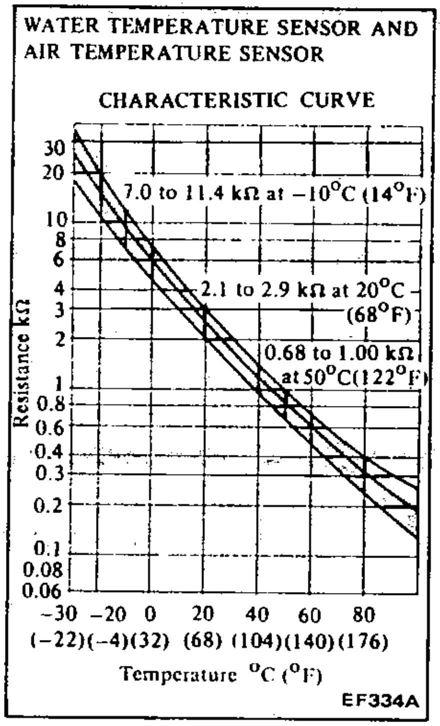
2. If continuity exists, the sensor is out of order.

CHECKING CONTINUITY

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



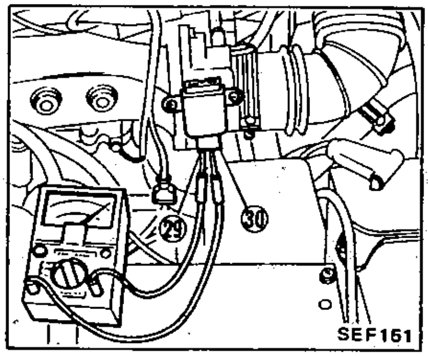
2. If the sensor resistance with respect to the coolant temperature is not held within the range specified in the graph, the water temperature sensor may be out of order.



THROTTLE VALVE SWITCH

ADJUSTING SWITCH POSITION

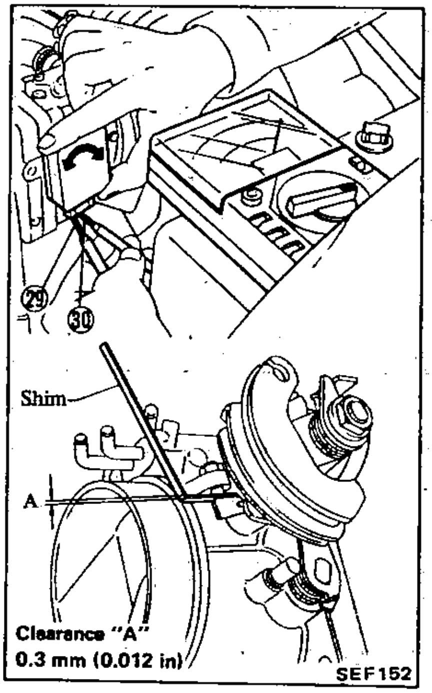
1. Disconnect throttle valve switch connector.
2. Connect ohmmeter between terminals ㉙ and ㉚, and make sure continuity exists.
3. Adjust throttle valve switch position, with retaining screw, so that idle switch may be changed from "ON" to "OFF" when engine speed is specified idle rpm + 70 rpm (M/T: Neutral, A/T: "N" position) under no load.



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".

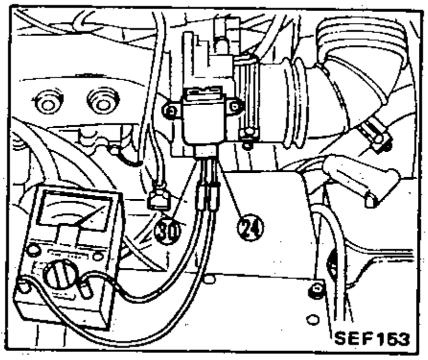
If clearance between throttle valve stopper screw and throttle valve shaft lever is 0.3 mm (0.012 in), engine speed will become specified rpm.



Changing idle switch from "ON" to "OFF" corresponds to change from 0 to ∞ (infinite) ohms in resistance between terminals ㉙ and ㉚.

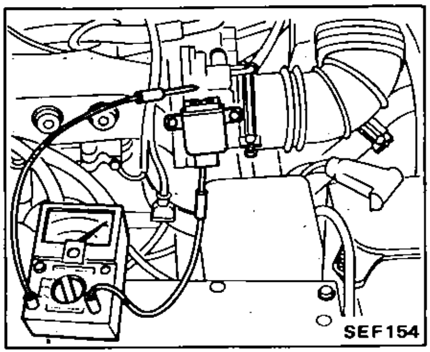
CHECKING FULL THROTTLE CONTACT

1. Connect ohmmeter between terminals ㉔ and ㉚, and make sure continuity does not exist.



2. Depress accelerator pedal to floor. If continuity exists between terminals ㉔ and ㉚, full throttle contact is functioning properly.

CHECKING INSULATION RESISTANCE



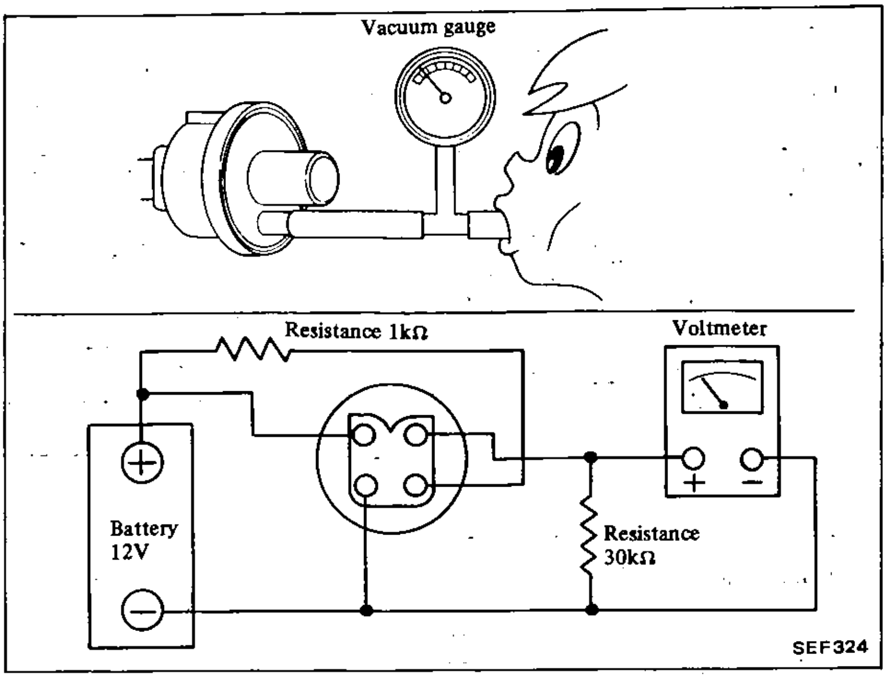
Connect ohmmeter between engine and terminals ㉔, ㉙ and ㉚. Ohmmeter reading should be infinite.

VACUUM SWITCH

1. Remove vacuum switch.
2. Connect the test lead wire as follows.
3. Measure the output voltage.

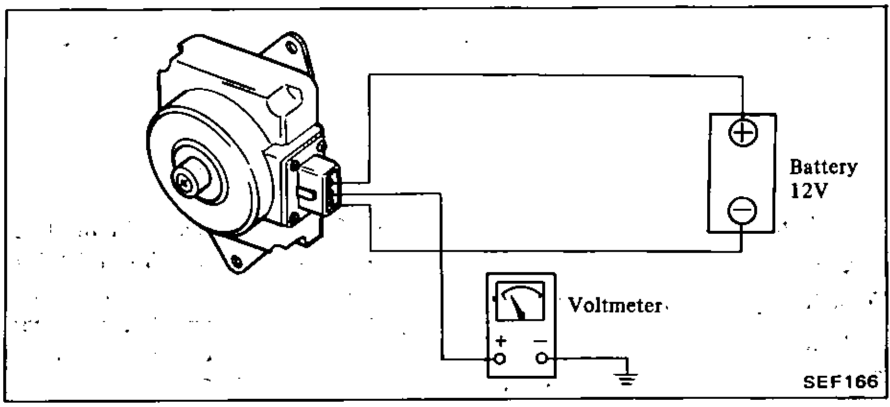
Conditions	Output voltage
No pressure is applied to vacuum switch.	Approximately battery voltage
Apply a pressure below −21.3 kPa (−160 mmHg, −6.30 inHg) to vacuum switch by orally sucking port back.	0V

4. If the test results are not the specifications, the vacuum switch is malfunctioning.



ALTITUDE SENSOR

1. Connect the test lead wires as follows.



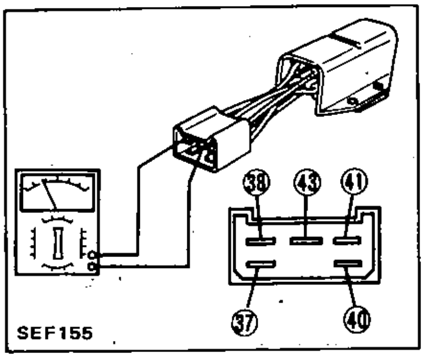
2. Measure the output voltage.
More than 0.5V . . . . O.K.
3. If the test results are not the specification, the altitude sensor is malfunctioning.

DROPPING RESISTOR

Conduct resitance checks on dropping resistor between the following points.

- 43 and 41 (No. 4 cylinder)
- 43 and 40 (No. 3 cylinder)
- 43 and 38 (No. 2 cylinder)
- 43 and 37 (No. 1 cylinder)

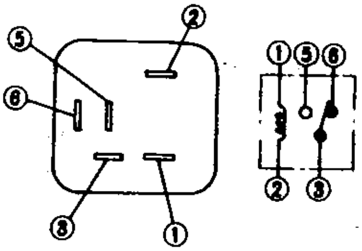
The resistance should be approximately 6 ohms. . . . . O.K.



RELAY

1. Disconnect battery ground cable.
2. Remove relay from car.
3. Test continuity through relay with an ohmmeter in accordance with the following chart.

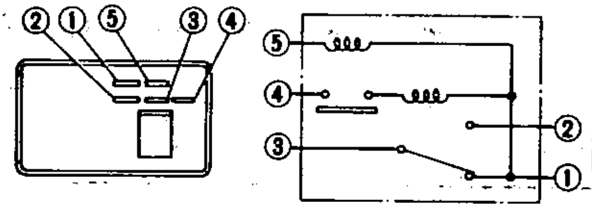
EFI relay and fuel pump relay-1



Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
	Test results: Continuity	
① - ②	Yes	–
③ - ⑤	No	Yes
③ - ⑥	Yes	No

Yes : Continuity should exist.
No : Continuity should not exist.

Fuel pump relay-2



Check terminals	Normal condition	12V direct current is applied between terminals ① and ⑤ *	
		Not grounded ④	Grounded ④
	Test results: Continuity		
① - ③	Yes	Yes	No
② - ③	No	No	Yes
① - ④	No	Yes	–
① - ⑤	Yes	–	–

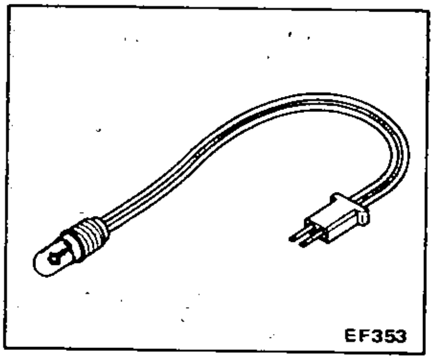
Yes: Continuity should exist.
No: Continuity should not exist.
*: ① .... Connect positive (+) terminal
⑤ .... Connect negative (–) terminal

SEF156

CONTROL UNIT

CHECKING ELECTRIC SIGNAL TO INJECTORS

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



EF353

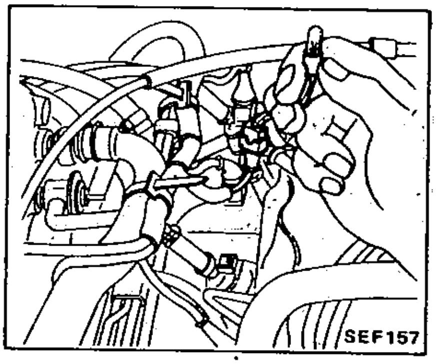
Make inspection lamp as follows:

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.



SEF157

4. 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.

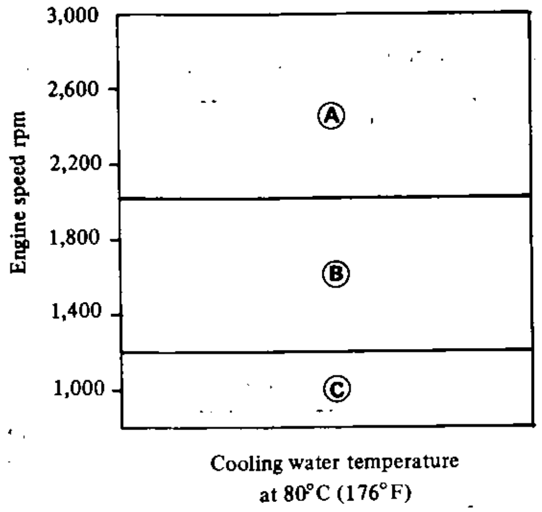
CHECKING FUEL SHUT-OFF FUNCTION

1. Warm up engine sufficiently.
2. Connect inspection lamp to injector harness connector.
3. Increase engine speed to each zone, respectively, and release accelerator pedal. Check inspection lamp illumination.

Check inspection lamp with engine speed in each zone, as shown in chart below.

While inspection lamp is off, fuel shut-off is operational.

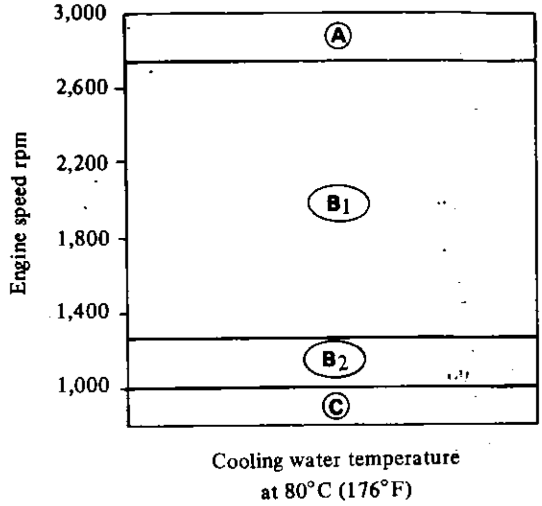
Automatic transmission models



	"A"	"B"	"C"
Deceleration from zone "A"	OFF	OFF	ON
Deceleration from zone "B"	–	OFF	ON
Deceleration from zone "C"	–	–	ON
Engine rpm increases in order of "C", "B" and "A". (Idle switch ON, downhill driving, etc.)	OFF	ON	ON

ON: Lamp on
OFF: Lamp off

Manual transmission models



	"A"	"B1"	"B2"	"C"
Deceleration from zone "A"	OFF	OFF	OFF	ON
Deceleration from zone "B1"	–	OFF	OFF	ON
Deceleration from zone "B2"	–	–	ON	ON
Deceleration from zone "C"	–	–	–	ON
Engine rpm increases in order of "C", "B2", "B1" and "A". (Idle switch ON, downhill driving, etc.)	OFF	ON	ON	ON

SEF158

CHECKING AIR LEAKAGE IN AIR INTAKE SYSTEM

Make sure even a slight air leak does not occur.

When inspecting the electronic fuel injection system, pay particular attention to hose connections, dipstick, oil filler cap, etc. for any indication of air leaks.

Since the air flow meter used in the electronic fuel injection system directly measures the quantity of intake air to permit the supply of the optimum fuel quantity for each cylinder.

CHECKING FUEL HOSES

Check fuel hoses for leakage, loose connections, cracks or deterioration.

Retighten loose connections and replace any damaged or deformed parts. Replace any fuel hose whose inner surface is deformed, scratched or chafed.

For replacement of high pressure fuel hose, refer to Fuel Hose under the heading Removal and Installation.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Fuel pump	Design voltage	V	12
	Cut-off discharge pressure	kPa (kg/cm², psi)	294 - 441 (3.0 - 4.5, 43 - 64)
	Design current	A	5.1
Pressure regulator	Regulated pressure	kPa (kg/cm² psi)	250 (2.55, 36.3)
Air flow meter	Design voltage	V	12
Air regulator	Design voltage	V	12
	Air flow quantity [At 20°C (68°F)]	m³ (cu ft)/hr	19.0 (671)
Control unit	Design voltage	V	12
	Consumption wattage At idling	W	15
	At full throttle	W	140

Dash pot	Touch speed	rpm	Approx. 1,500
Vacuum switch	Manifold vacuum when vacuum switch is changed from "OFF" to "ON"		Approx. 21.3 kPa (160 mmHg, 6.30 inHg)
Altitude sensor	Output voltage	V	Above 0.5
Dropping resistor	Resistance (Per resistor)	Ω	Approx. 6

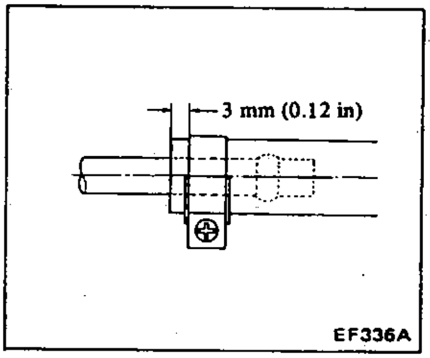
INSPECTION AND ADJUSTMENT

Fuel pressure (measuring point between fuel filter and fuel pipe)	At idling	kPa (kg/cm², psi)	Approx. 206 (2.1, 30)
	The moment accelerator pedal is fully depressed	kPa (kg/cm², psi)	Approx. 255 (2.6, 37)
Fuel injector	Coil resistance	Ω	2.35
Air flow meter (Potentiometer resistance)	㉝ – ㉞	Ω	100 - 400
	㉞ – ㉟	Ω	200 - 500
	㉜ – ㉞	Ω	Except 0 and ∞
Air temperature sensor, water temperature sensor thermistor resistance	At –10°C (14°F)	kΩ	7.0 - 11.4
	At 20°C (68°F)	kΩ	2.1 - 2.9
	At 50°C (122°F)	kΩ	0.68 - 1.0
Air regulator	Heater coil resistance	Ω	25 - 90
Throttle valve switch	Engine speed when idle switch is changed from "ON" to "OFF"	rpm	Specified idle rpm + 70 [in "Neutral" M/T, in "N" position A/T]

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Throttle chamber	18 - 22	1.8 - 2.2	13 - 16
Fuel hose clamp	1.0 - 1.5	0.1 - 0.15	0.7 - 1.1

Fuel hose clamping position



EF336A

TROUBLE DIAGNOSES AND CORRECTIONS

TROUBLE-SHOOTING CHART

The EFI system can be checked in accordance with the trouble-shooting chart.

If any abnormality is found in any inspection item, refer to the "Inspection" section and carry out further inspection following the procedures described therein.

Note that any component part, excepting some, of the EFI system must be replaced as an assembly if it is found to be faulty, since no repairing is allowed.

Checks before Inspection

Before attempting any test, check the following items to ensure that nothing has been overlooked.

1. The greatest problem source with a system of this type lies in the connections between components.

Save time by performing a quick check if all harness connectors (especially the 35-pin connector and air flow meter connector) are securely in place. Connector terminals are free from corrosion and deformation.

Pull all connectors off and reconnect after inspecting terminals.

2. Since the EFI system accurately meters the intake air flow through an air flow meter, even a slight air leak will cause an improper air-fuel ratio, resulting in faulty engine operation due to excessive air.

For this reason, a thorough inspection for leaks should be made at the oil filler cap, dipstick, blow-by hoses, air flow meter to throttle chamber air duct, etc.

3. Make sure the ignition and starting systems are satisfactory and the battery is in good condition.

Inspection Instructions

Before checking the EFI system, be sure to observe the instructions below. Failure to do so could result in damage to the control unit or cause fuel line leakage.

CAUTION:

When connecting or disconnecting EFI harness connector to or from any EFI 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.

Replace fuel hoses if they are deformed, scratched or chafed. Do not reuse fuel hose clamps after removal.

Condition	Probable cause	Check and corrective action
Engine will not start or hard to start.	Improper ignition system.	Disconnect high tension cable from one spark plug and check for hot spark.
	Intake air leakage at following points: • P.C.V. valve, V.C. valve, dipstick seal, oil filler cap, blow-by hoses • Air flow meter hoses and clamps • Manifold gaskets, etc.	Check for intake air leaks and repair or replace if necessary.
	Fuel pump does not work.	Disconnect starter motor "S" terminal and ignition switch in "START" position. Listen for fuel pump and pressure regulator operating sound. If no sound is heard, check fuel pump control circuit. Then proceed to the following checks: • Fuel pump • Alternator "L" terminal • Oil pressure switch • Fuel pump relays-1 and -2
	Improper ignition signal input.	Check ignition signal input.

Condition	Probable cause	Check and corrective action
	Malfunctioning EFI relay or control unit or injector.	Connect a lead wire to ignition coil negative terminal. With ignition switch "ON", attach other end of lead wire to engine body for a short period, and repeat it rapidly. Listen to each injector sound with a screwdriver. Results: a) Injectors click every second break, check the following circuits. • Water temperature sensor • Air flow meter potentiometer • "Start" signal circuit • Air regulator b) Injectors do not click, check the following circuits. • Control unit power input circuit • Ignition coil trigger input circuit • Control unit ground circuit • Injector circuit
	Problem in the following circuits: • Water temperature sensor • Air flow meter potentiometer • "Start" signal circuit	Check each circuit. Then proceed to "Component checks".
	Poorly charged battery.	Check charge circuit. Recharge battery if necessary.
Engine starts, then stalls.	Improper ignition signal input.	Check ignition signal input.
	Malfunctioning EFI relay or control unit or injector.	Connect a lead wire to ignition coil negative terminal. With ignition switch "ON", attach other end of lead wire to engine body for a short period, and repeat it rapidly. Listen to each injector sound with a screwdriver. Results: a) Injectors click every second break, check fuel pump circuit. b) Injectors do not click, check the following circuits. • "Start signal circuit • Control unit power input circuit • Ignition coil trigger input circuit • Control unit ground circuit • Injector circuit
	Fuel pump does not work.	With ignition switch in "ON" position, disconnect oil pressure switch harness connector alternator "L" terminal. Listen for fuel pump and pressure regulator operating sound. If no sound is heard, check fuel pump control circuit.

Condition	Probable cause	Check and corrective action
		Then proceed to the following checks: ● Fuel pump ● Alternator "L" terminal ● Oil pressure switch ● Fuel pump relays-1 and -2.
	Improper water temperature sensor circuit.	Check circuit.
	Malfunctioning air regulator.	Check air regulator and replace if necessary. **Note: If these tests are satisfactory, proceed to "Engine will not start".**
Engine idles too fast – cannot be adjusted with idle speed adjusting screw or engine idle is unstable.	Improper intake and exhaust valve clearance.	Adjust valve clearance.
	Malfunctioning throttle valve.	Check that plate is closing when throttle is released and replace if necessary.
	Malfunctioning air regulator.	To check air regulator, proceed to the following steps: ● Start engine. ● Pinch off hose to air regulator. Results: a) If idle speed drops, perform circuit test. If no fault is found, replace air regulator. b) If idle speed remains high or unstable, perform the following checks. Check for manifold vacuum leaks, including at P.C.V. valve, V.C. valve, dipstick and oil filler cap seals. If no problem is found, perform the following circuit tests. ● Throttle valve switch (idle contact and full throttle contact) ● Vacuum switch ● Air temperature sensor ● Water temperature sensor ● Control unit ground circuit ● Air flow meter potentiometer ● Air regulator and fuel pump circuit ● Ignition coil trigger input circuit ● Control unit power input circuit ● Injector circuit Then proceed to "Component checks".
Engine misfires.	Improper ignition circuit.	Check ignition circuit.
	Improper EFI harness connectors.	Pull EFI harness connectors apart and check for looseness and corrosion (including ground circuits). Do not forget ignition input lead.
	Improper fuel line.	Check fuel line for blockage. ● Tank strainer ● Fuel filter ● Injectors ● Fuel pipes

Condition	Probable cause	Check and corrective action
	Malfunctioning control unit.	Tap control unit while driving to see if this aggravates or alleviates the problem. If so, try another control unit.
	Improper fuel pressure.	Perform fuel pressure test.
	Improper EFI circuit.	Perform all circuit tests. Then perform "Component checks".
Engine will not revolve – lack of power.	Improper ignition system.	Check IC ignition unit, pick-up coil and ignition coil.
	Malfunctioning throttle valve.	Make sure throttle plate is opening fully when accelerator is fully depressed.
	Malfunctioning air flow meter.	Check air flow meter mechanical movement. Using a finger, push flap open, checking that it opens smoothly and fully.
	Improper fuel line.	Check fuel line for blockage. • Tank strainer • Fuel filter • Fuel pipes
	Improper fuel pressure.	Perform fuel pressure test.
	Problem in the following circuits: • Ignition coil trigger input circuit • Control unit power input circuit • Injector circuit • Air flow meter potentiometer • Throttle valve switch, idle contact and full throttle contact • Vacuum switch • Air temperature sensor • Water temperature sensor • Altitude sensor • Air regulator and fuel pump circuit	Check each circuit. Then perform "Component checks".
Hesitation – stumble on acceleration.	Improper ignition system.	Check ignition system.
	Malfunctioning air flow meter.	Check air flow meter mechanical movement. Using a finger, check for smooth flap movement.
	Intake air leakage at following points: • P.C.V. valve • V.C. valve • Dipstick and oil filler cap seals • Manifold gaskets • Air flow meter hoses, etc.	Check for intake air leaks.
	Improper fuel pressure.	Perform fuel pressure test.
	Improper idle CO% adjustment.	Check idle CO%, if necessary adjust it.
	Improper EFI circuit.	Perform complete circuit test. Then perform "Components checks".

Condition	Probable cause	Check and corrective action
Poor gas mileage, or "CO" reading too high.	Improper ignition timing or ignition system.	Check ignition timing. Check ignition system for hot spark.
	Improper air cleaner filter.	Check air cleaner filter and replace if necessary.
	Improper fuel pressure.	Perform fuel pressure test.
	Problem in the following circuits: • Water temperature sensor • Air temperature sensor • Throttle valve switch, idle contact and full throttle contact • Vacuum switch • Air flow meter potentiometer • Air regulator and fuel pump circuit • Injector circuits	Check each circuit. Then proceed to "Component checks".
Surge.	Malfunctioning air flow meter.	Check air flow meter mechanical movement. Using a finger, check flap movement for smooth operation.
	Intake air leakage at the following points: • P.C.V. valve • Dipstick and oil filler cap seals • Manifold gaskets • Air flow meter hoses, etc.	Check for intake air leaks.
	Improper fuel pressure.	Perform fuel pressure test.
	Improper idle "CO"% adjustment.	Check idle "CO"%; if necessary, adjust it.
	Problem in the following circuits: • Throttle valve switch, idle contact and full throttle contact • Vacuum switch • Air flow meter potentiometer • Control unit ground circuit • Air temperature sensor • Water temperature sensor • Altitude sensor • Air regulator and fuel pump circuit • Ignition coil trigger input circuit • Control unit power input circuit • Injector circuit	Check each circuit. Then proceed to "Component checks".
Backfiring.	Intake air leakage at the following points: • P.C.V. valve • V.C. valve • Dipstick and oil filler cap seals • Manifold gaskets • Air flow meter hoses, etc.	Check for intake air leaks.
	Improper fuel pressure.	Perform fuel pressure test.
	Improper idle CO% adjustment.	Check idle CO%; if necessary, adjust it.

Condition	Probable cause	Check and corrective action
	Problem in the following circuits: • Throttle valve switch, idle contact and full throttle contact • Vacuum switch • Air flow meter potentiometer • Air temperature sensor • Water temperature sensor • Altitude sensor • Ignition coil trigger input circuit • Control unit power input circuit • Injector circuit	Check each circuit. Then proceed to the "Component checks".
Afterfire or afterburning.	Problem in the following circuits: • Throttle valve switch, idle contact and full throttle contact. • Vacuum switch • Air flow meter potentiometer • Air temperature sensor • Water temperature sensor • Injection circuit • "START" signal input	Check each circuit. Then proceed to "Component checks".

COMPONENT CHECKS

(To be performed only after circuit tests are completed)

Problem	Injector sound	Air regulator	Relay	Control unit replacement	Air flow meter		Fuel system	
					Flap operation	Resistance means.	Fuel pressure test	Injector leakage
Engine will not start	X	X	X	X	X	X	X	X
Idle too high or too rough	X	X					X	X
Engine misfires	X			X	X	X	X	
Lack of power – engine will not rev.	X				X	X	X	X
Hesitation – stumble					X	X	X	X
Poor gas mileage, or "CO" too high				X	X	X	X	X
Engine surges				X	X	X	X	X
Backfiring				X	X	X	X	
Afterburning				X	X	X	X	X

CHECKING AND ADJUSTING IDLE RPM, IGNITION TIMING AND MIXTURE RATIO

PRECAUTION

a. To discourage tampering with the idle mixture adjusting screw on California models, it is sealed with steel blind plug after adjustment of idle mixture at factory. So the blind plug should not be removed during routine maintenance except that case as directed by official inspections to lower exhaust emission.

b. Adjusting mixture using other than the method below may violate Federal and/or California or other state and provincial laws.

Preparation

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

- Battery
- Ignition system
- EFI harness connectors
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge etc.)

2. Connect engine tachometer and timing light in their proper positions.

3. When measuring CO%, insert probe into tail pipe more than 0.4 m (16 in).

4. Use "CO"-meter after it is fully warmed up.

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

6. 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. When racing engine on automatic transmission equipped models, make sure that shift lever is in "N" or "P" position and depress brake pedal 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 shocks.

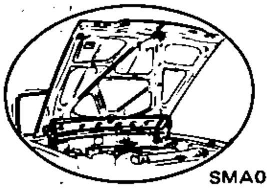
Inspection procedure

START

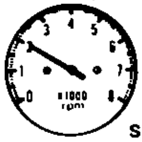
Start engine and warm up engine until water temperature indicator points to the middle of gauge.

SMA020

- Open engine hood.
- Run engine at about 2,000 rpm for about 2 minutes under no-load.



SMA021



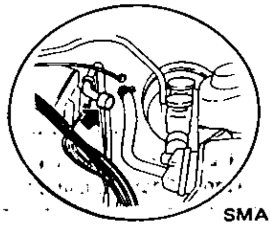
SMA022

Run engine at idling speed.

For Canada

For U.S.A.

Disconnect hose from air induction pipe, and install proper cap on air induction pipe.



SMA055

Race engine two or three times under no-load.
Then run engine for one minute at idle speed.

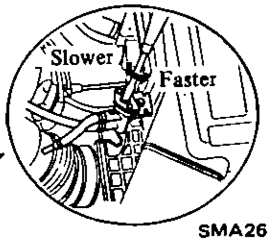
Check idle speed.

M/T: 700±100 rpm
A/T: 700±100 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning idle speed adjusting screw.



SMA263

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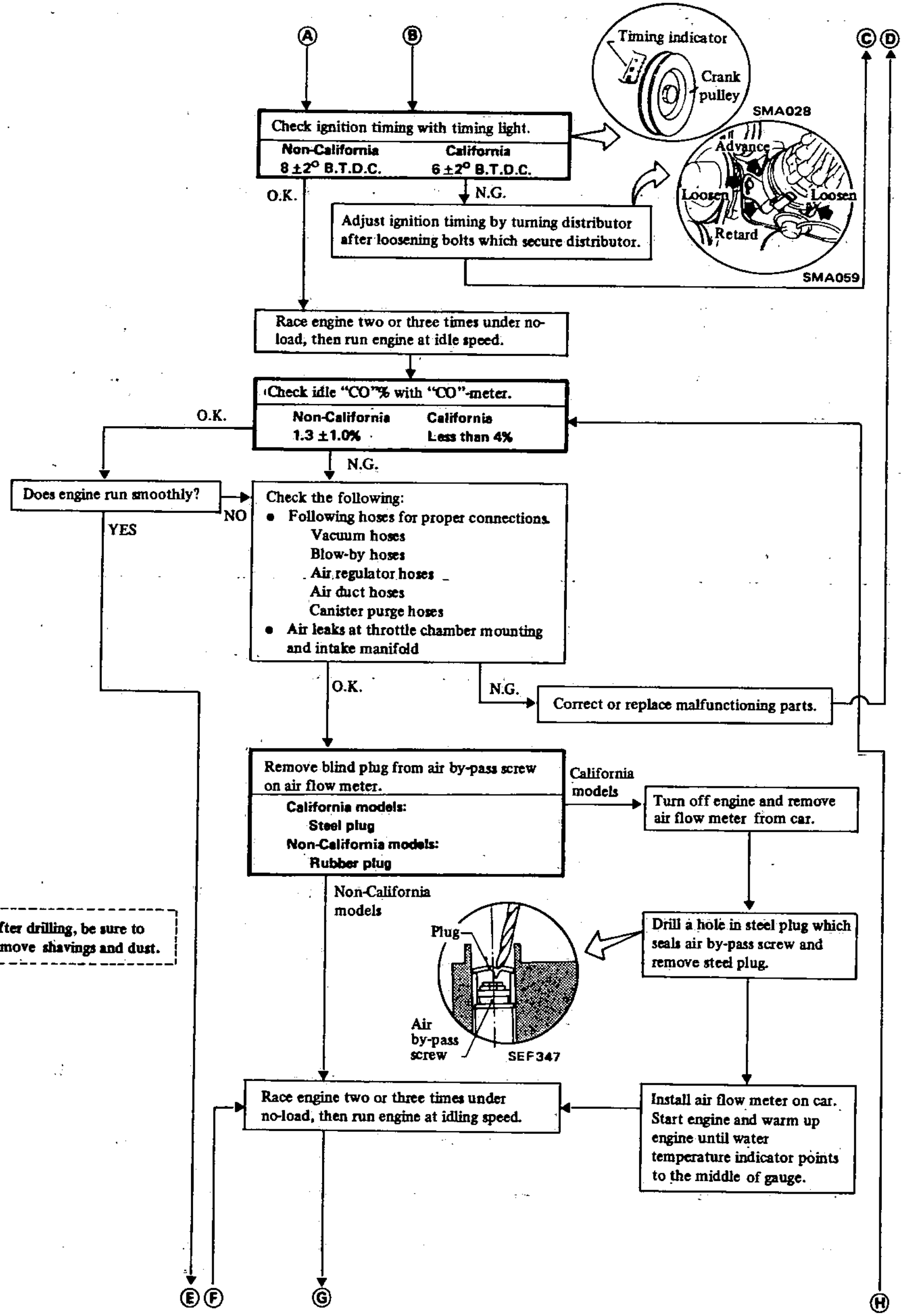

Check ignition timing with timing light.

Non-California	California
8 ±2° B.T.D.C.	**6 ±2° B.T.D.C.**

Adjust ignition timing by turning distributor after loosening bolts which secure distributor.

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

Check idle "CO"% with "CO"-meter.

Non-California	California
1.3 ±1.0%	**Less than 4%**

Does engine run smoothly?

Check the following:

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

Correct or replace malfunctioning parts.

Remove blind plug from air by-pass screw on air flow meter.

California models:
Steel plug
Non-California models:
Rubber plug

Turn off engine and remove air flow meter from car.

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

Note: After drilling, be sure to remove shavings and dust.

Install air flow meter on car. 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 idling speed.

Only for non-California models:
When adjusting idle "CO"% at high altitude, adjust to obtain following values.

Unit: m (ft)

Altitude	Idle CO%
600 - 1,200 (2,000 - 4,000)	2.7%
1,200 - 1,800 (4,000 - 6,000)	3.8%
Above 1,800 (6,000)	5.0%

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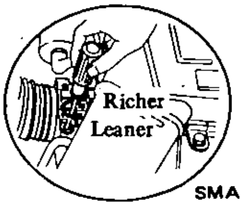
Adjust "CO"% by turning air by-pass screw on air flow meter.

Idle "CO"%: 1.3 ±1.0%



SMA061

N.G.

Not adjustable in this case.
Correct or replace air flow meter or other malfunctioned parts of fuel injection system.

O.K.

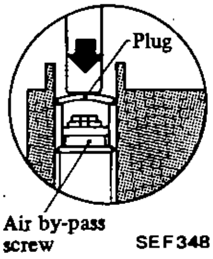
Install blind plug on air flow meter.

California: New steel plug.
Non-California: Original rubber plug.

California models

Turn off engine and remove air flow meter from car.

Insert new steel plug (furnished as a service part) with its convex side up into air by-pass screw. Tap steel plug with suitable bar, thereby installing steel plug on air flow meter.



SEF348

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

Non-California models

For U.S.A.

For Canada

For Canada

For U.S.A.

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

Start engine.

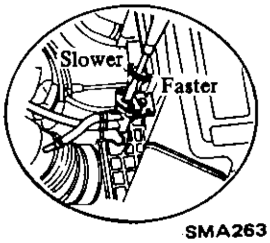
Race engine two or three times under no-load, then run engine at idle.

Check idle speed.

M/T: 700 ± 100 rpm
A/T: 700 ± 100 rpm (in "D" position)

N.G.

Adjust idle speed by turning idle speed adjusting screw.



SMA263

O.K.

END

SECTION EC

EMISSION CONTROL SYSTEM

CONTENTS

EMISSION CONTROL DEVICES

Engine model		Z20E					
Car model		S110					
Transmission		California models		Non-California models for U.S.A.		Canada models	
Item		M/T	A/T	M/T	A/T	M/T	A/T
Air inlet system	Fresh air duct	X	X	X	X	X	X
	Air pipe	X	X	X	X	X	X
Air/Fuel system	Air flow meter	X	X	X	X	X	X
	Throttle chamber (2-barrel)	X	X	X	X	X	X
	Air temperature sensor	X	X	X	X	X	X
	Throttle valve switch	X	X	X	X	X	X
	Vacuum switch	X	X	–	–	–	–
	Air regulator	X	X	X	X	X	X
	Water temperature sensor	X	X	X	X	X	X
	Altitude sensor	X	X	–	–	–	–
Ignition system	IC ignitor (for 1 plug)	–	–	X	X	X	X
	IC ignitor (for 2 plugs)	X	X	–	–	–	–
	Water temperature control	X	X	X	X	–	–
A.I.S.	Exhaust air induction system (Type-A)	X	X	–	–	–	–
	Exhaust air induction system (Type-B)	–	–	X	X	–	–
E.G.R. system	E.G.R. system with V.V.T. valve (Type-1)	–	–	X	X	–	–
	E.G.R. system with V.V.T. valve (Type-2)	X	X	–	–	–	–
	E.G.R. system with B.P.T. valve (Type-3)	–	–	–	–	X	X
Catalyzer	Catalytic converter	X	X	X	X	X	X
Evaporator system	Canister	X	X	X	X	X	X
Crankcase ventilation system	Positive crankcase ventilation (P.C.V.) valve	X	X	X	X	X	X

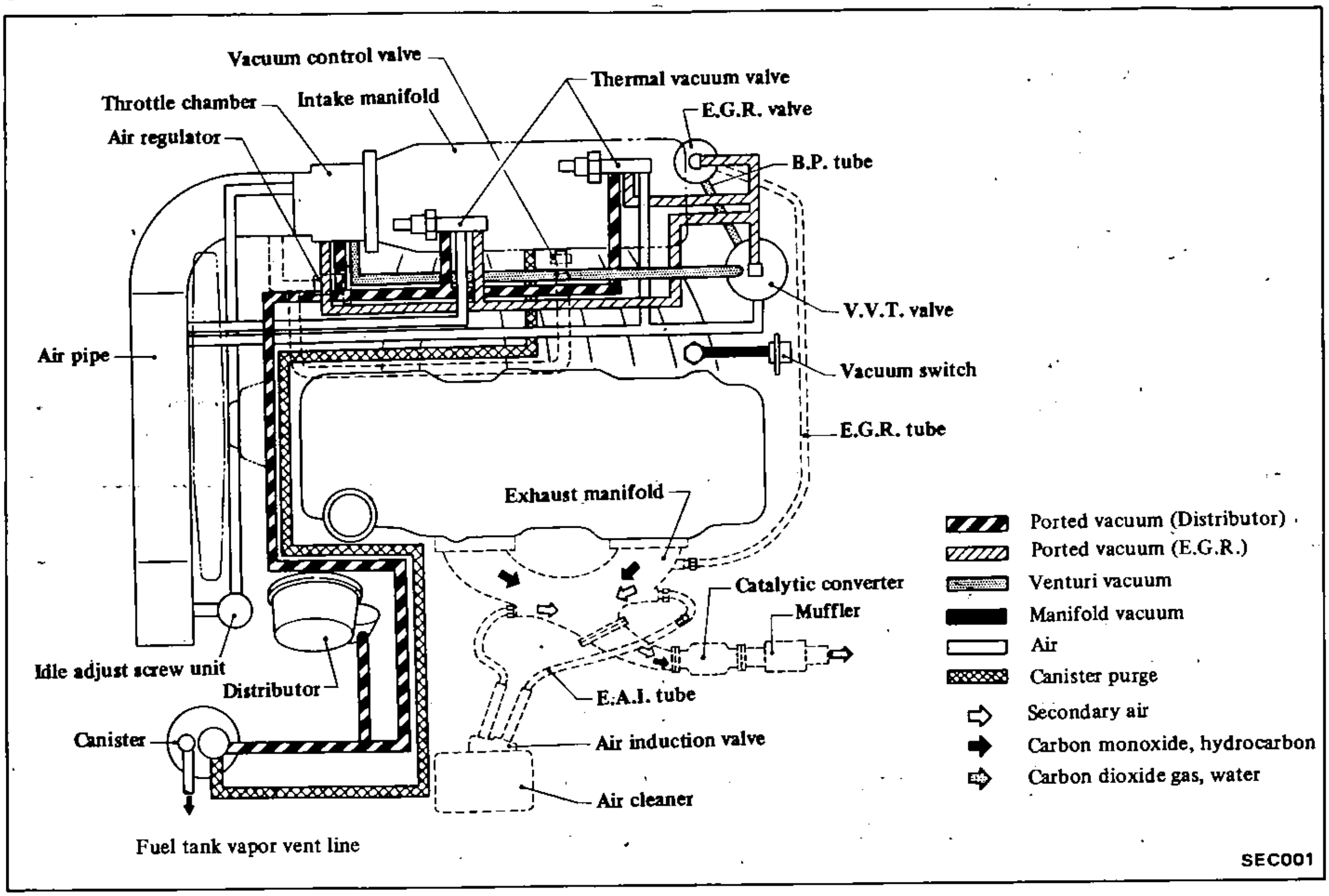
GENERAL DESCRIPTION

There are three types of control systems which are as follows:

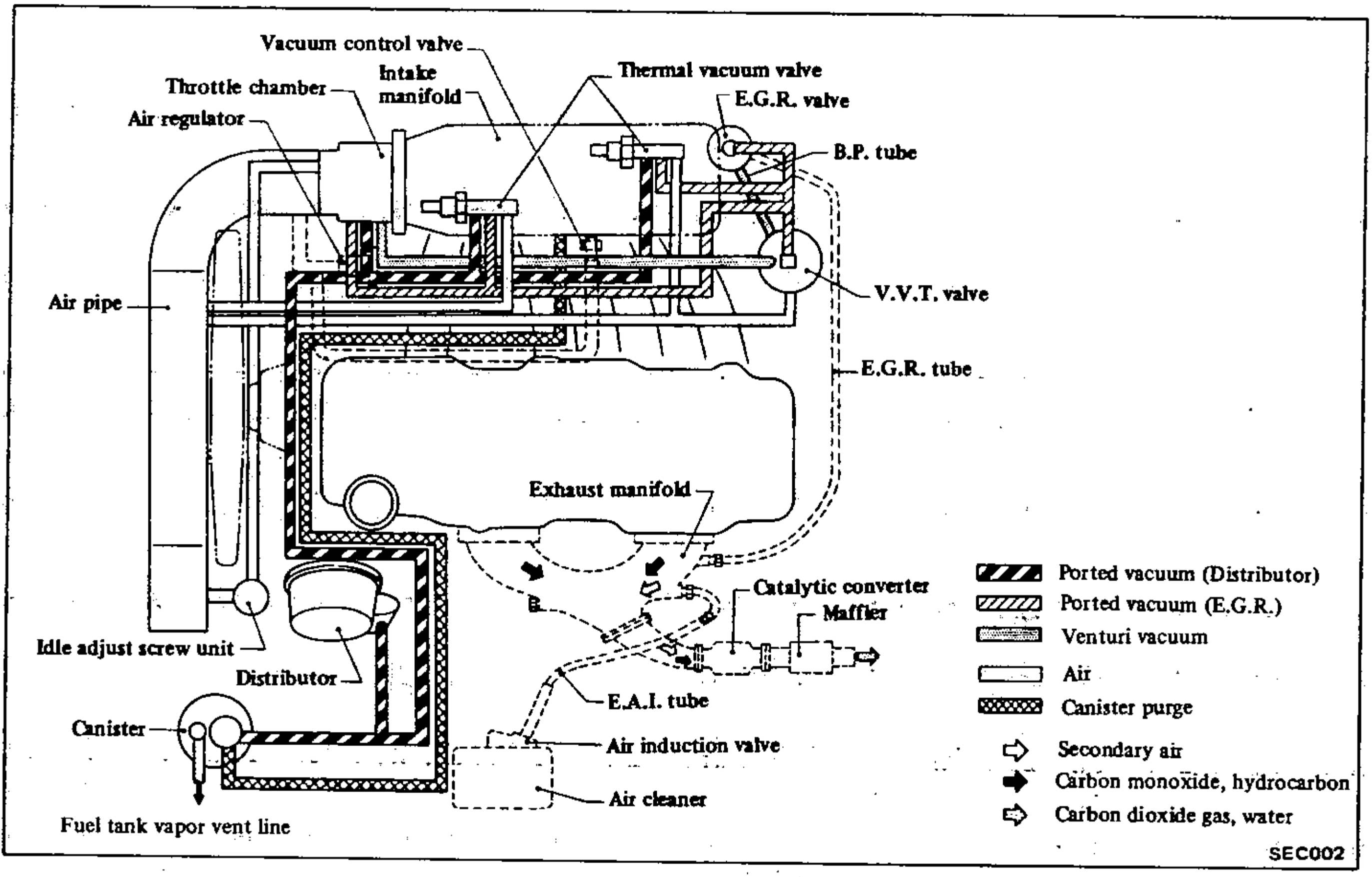
1. Closed type crankcase emission control system
2. Exhaust emission control system
3. Evaporative emission control system

Periodic inspections and necessary servicing of these systems should be performed to keep harmful emissions to a minimum.

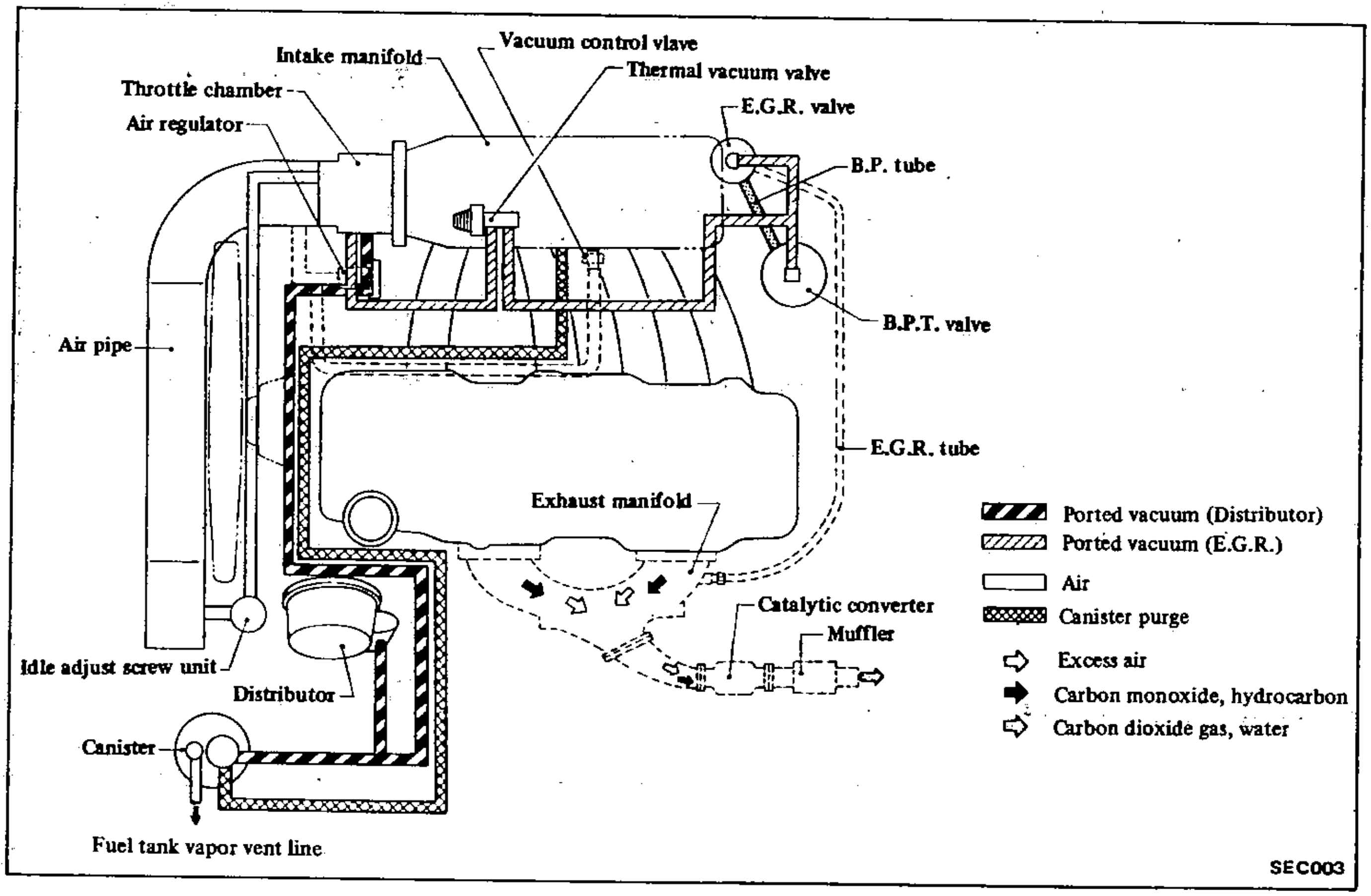
CALIFORNIA MODELS



NON-CALIFORNIA MODELS (For U.S.A.)



CANADA MODELS



CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

This system returns blow-by gas to both the intake manifold and air pipe.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

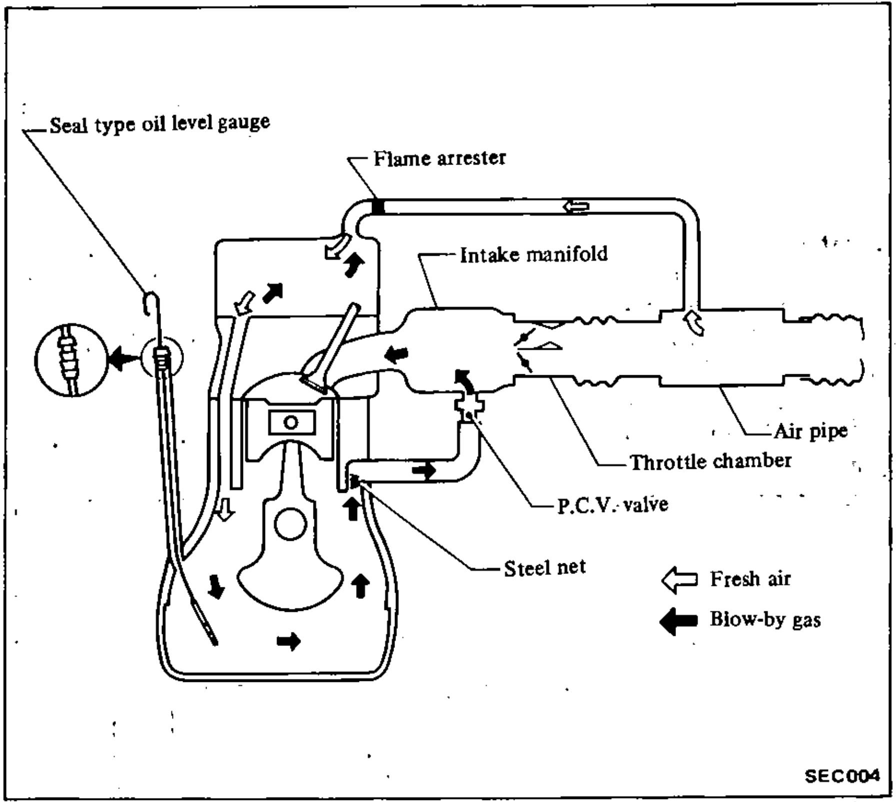
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

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 through the tube connecting air pipe to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the 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 pipe under all conditions.

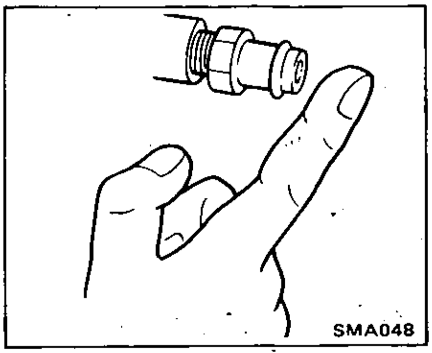


SEC004

INSPECTION

P.C.V. VALVE AND FILTER

With engine running at idle, remove the ventilator hose from P.C.V. valve. if the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



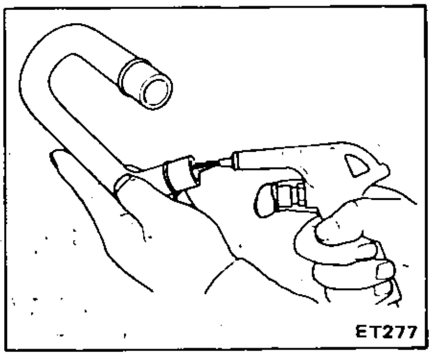
SMA048

VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between air pipe and rocker cover.



ET277

EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION

The exhaust emission control system is made up of following:

Emission control system	California models	Non-California models for U.S.A.	Canada models
Air induction system	(Type-A) ● Air induction valve ● E.A.I. tube	(Type-B) ● Air induction valve ● E.A.I. tube	——
E.G.R. system	(Type-2) ● E.G.R. valve ● Thermal vacuum valve (3-port type -Type-A2, A3) ● V.V.T. valve	(Type-1) ● E.G.R. valve ● Thermal vacuum valve (3-port type Type-A1, A3) ● V.V.T. valve	(Type-3) ● E.G.R. valve ● Thermal vacuum valve (2-port type) ● B.P.T. valve
Spark timing control system	● Thermal vacuum valve (3-port type -Type-A2, A3)	● Thermal vacuum valve (3-port type -Type-A1, A3)	——
Catalyst	● Catalytic converter	● Catalytic converter	● Catalytic converter

AIR INDUCTION SYSTEM (A.I.S.)

DESCRIPTION

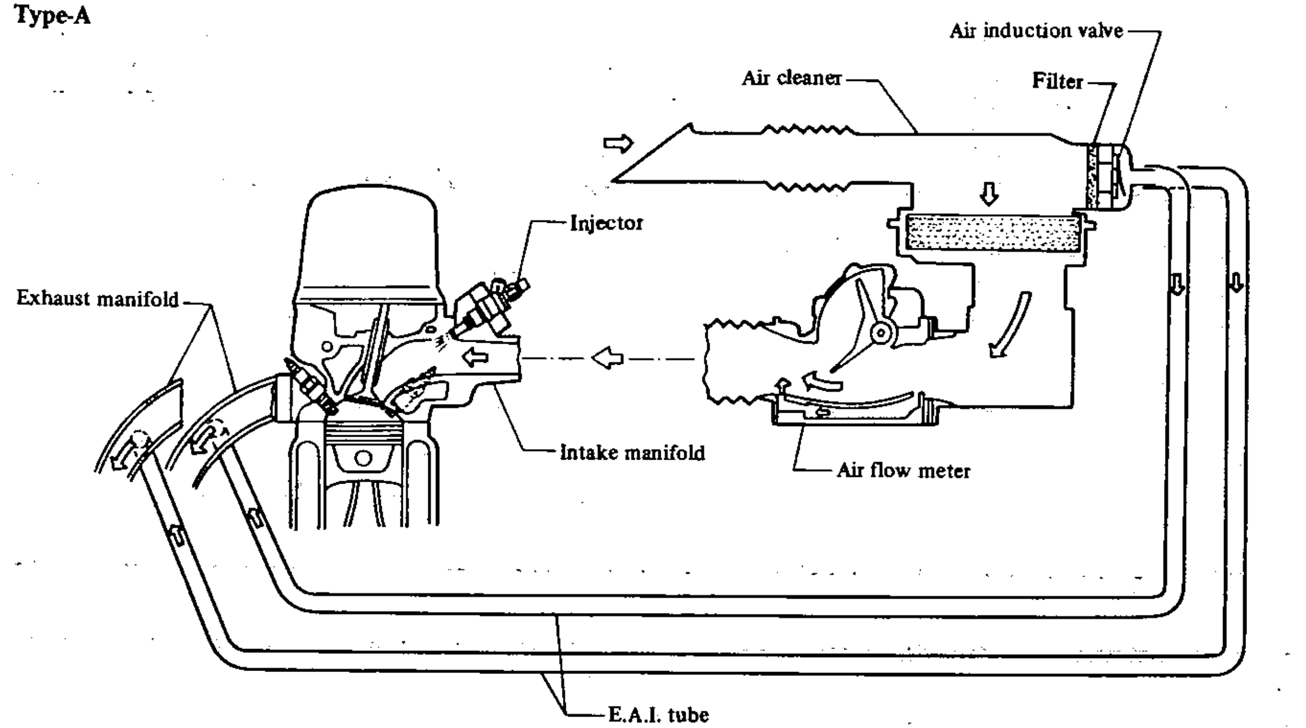
The air induction system (A.I.S.) is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

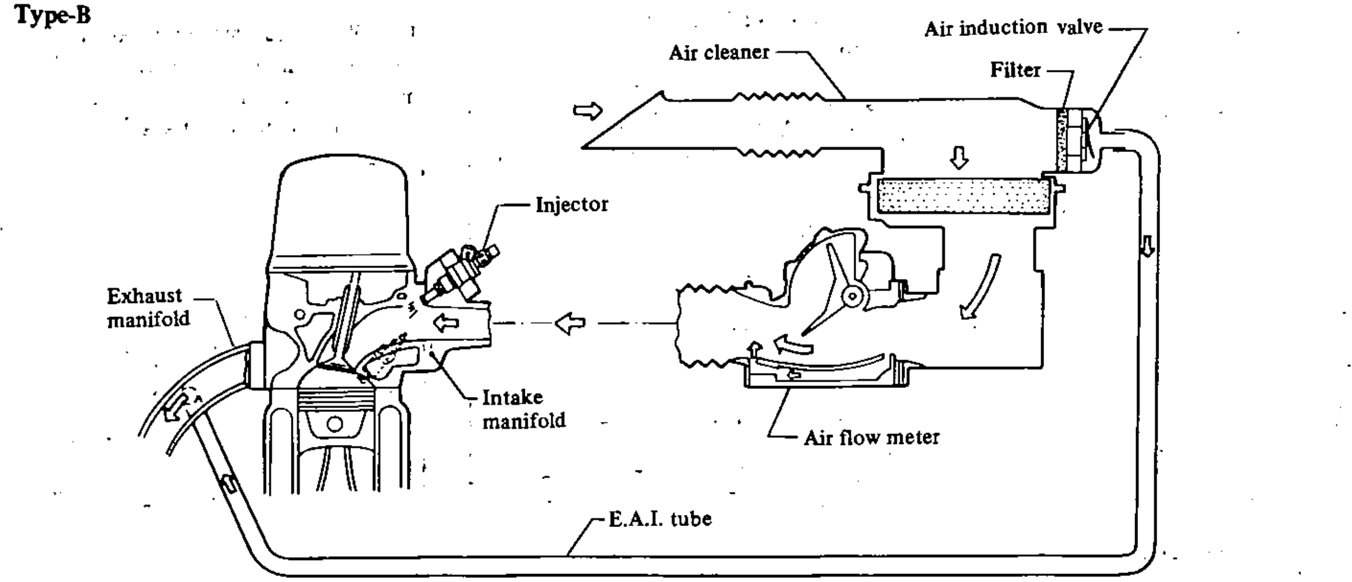
If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

Therefore, the air induction system (A.I.S.) reduces CO and HC emissions in exhaust gases. The system consists of two air induction valves, a filter, and hoses.

Type-A



Type-B



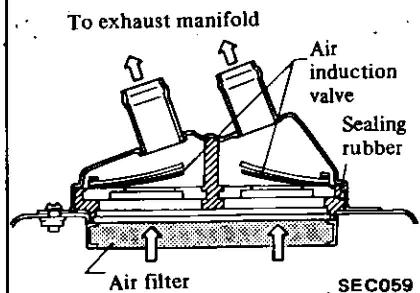
SEC006

Air induction valve case

The air induction valve case, which consists of two reed valves, a valve case and a filter, is attached to the air cleaner.

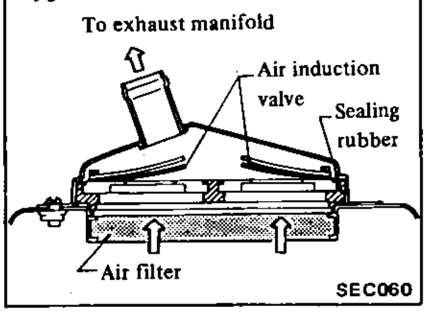
There are two types of air induction valve cases. The type-A is equipped with two hose connectors and is installed on California models, and the type-B is equipped with one connector and is installed on all non-California models except Canada.

Type-A



SEC059

Type-B

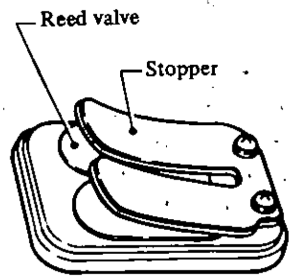


SEC060

Air induction valve

Two reed valves are installed in the air cleaner. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold.

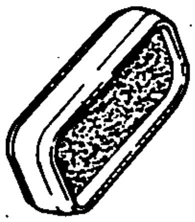
When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.



SEC009

Air induction valve filter

The air induction valve filter is installed at the dust side of the air cleaner. It purifies secondary air to be sent to the exhaust manifold.

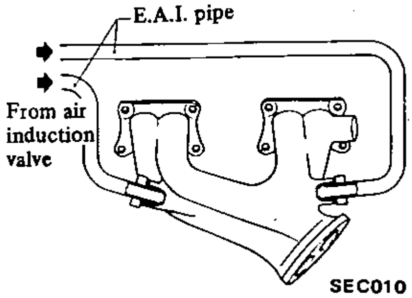


EC921

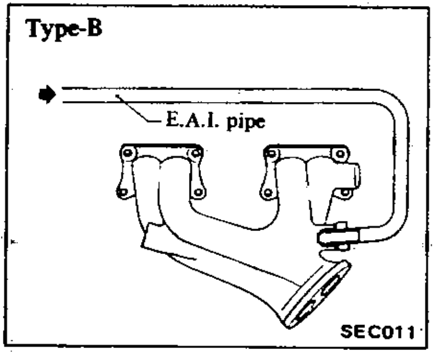
Air induction pipe

The secondary air fed from the air induction valve goes through the E.A.I. tube to the exhaust manifold.

Type-A



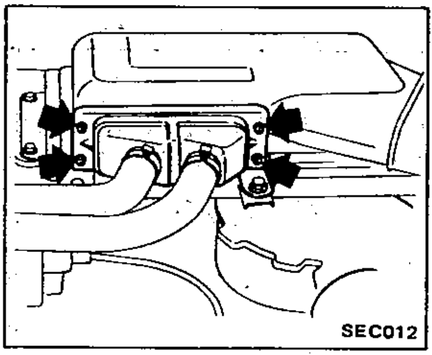
SEC010



REMOVAL AND INSTALLATION

Air induction valve and filter

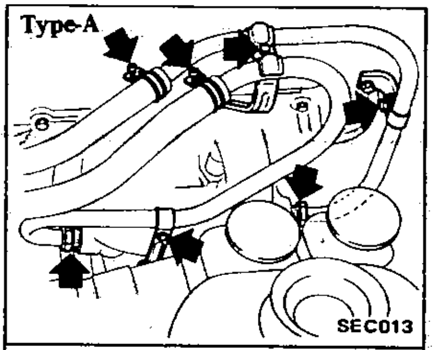
Remove the valve and filter on the air cleaner. The air induction valve and valve filter can then be taken out easily. Installation is in the reserve sequence of removal.

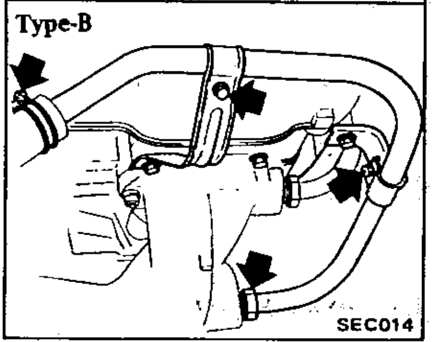


Air induction pipe

Remove nut securing the pipe to the exhaust manifold. At the same time, remove the screws securing the bracket and rubber hose clamp.

The air induction pipe can then be taken out. Installation is in the reverse sequence of removal.





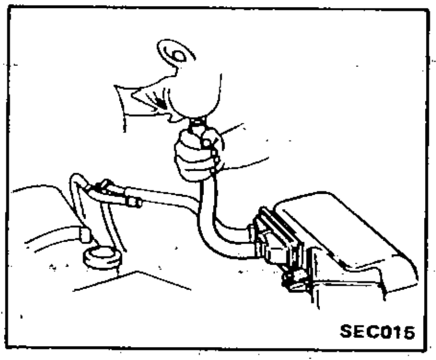
INSPECTION

Preliminary inspection

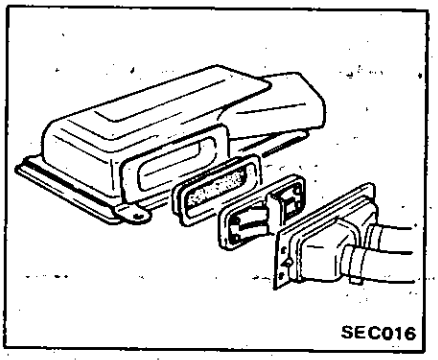
Check hose for looseness, flatting, damage or faulty connections, and each part for proper installation. If necessary, replace.

Air induction valve and filter

1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flows only on the air induction pipe side.



2. Check air induction valve for binding or damage. At the same time, check filter for damage or plugging. If necessary, replace. Filter should be replaced periodically in accordance with Maintenance Schedule.

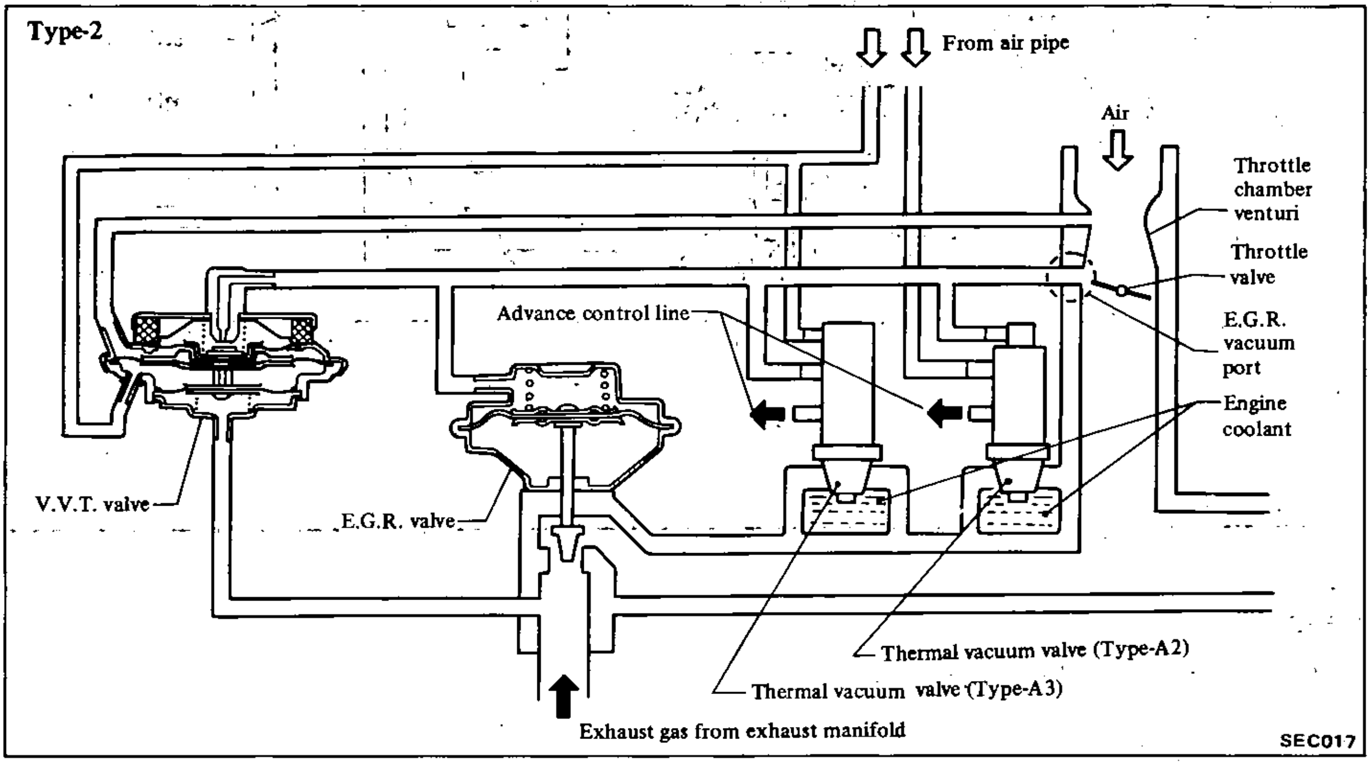


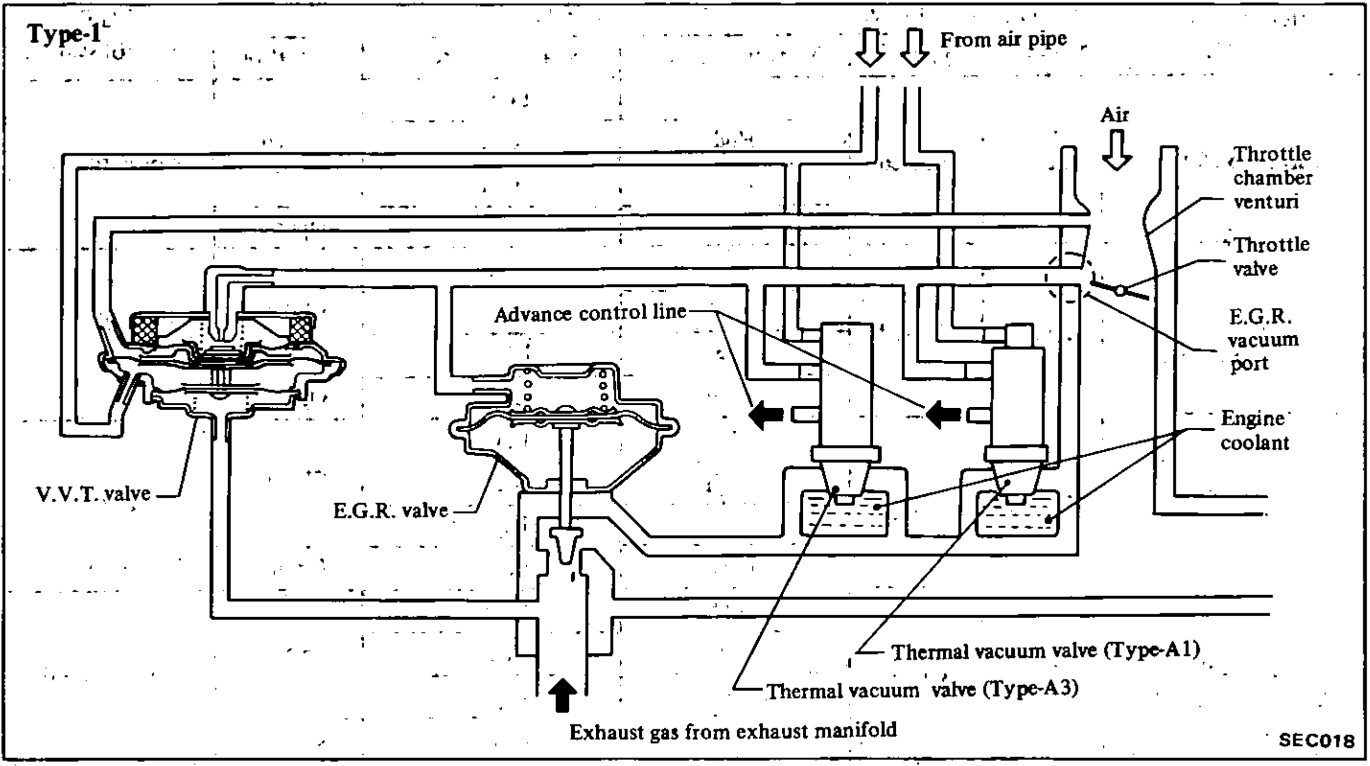
EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

DESCRIPTION

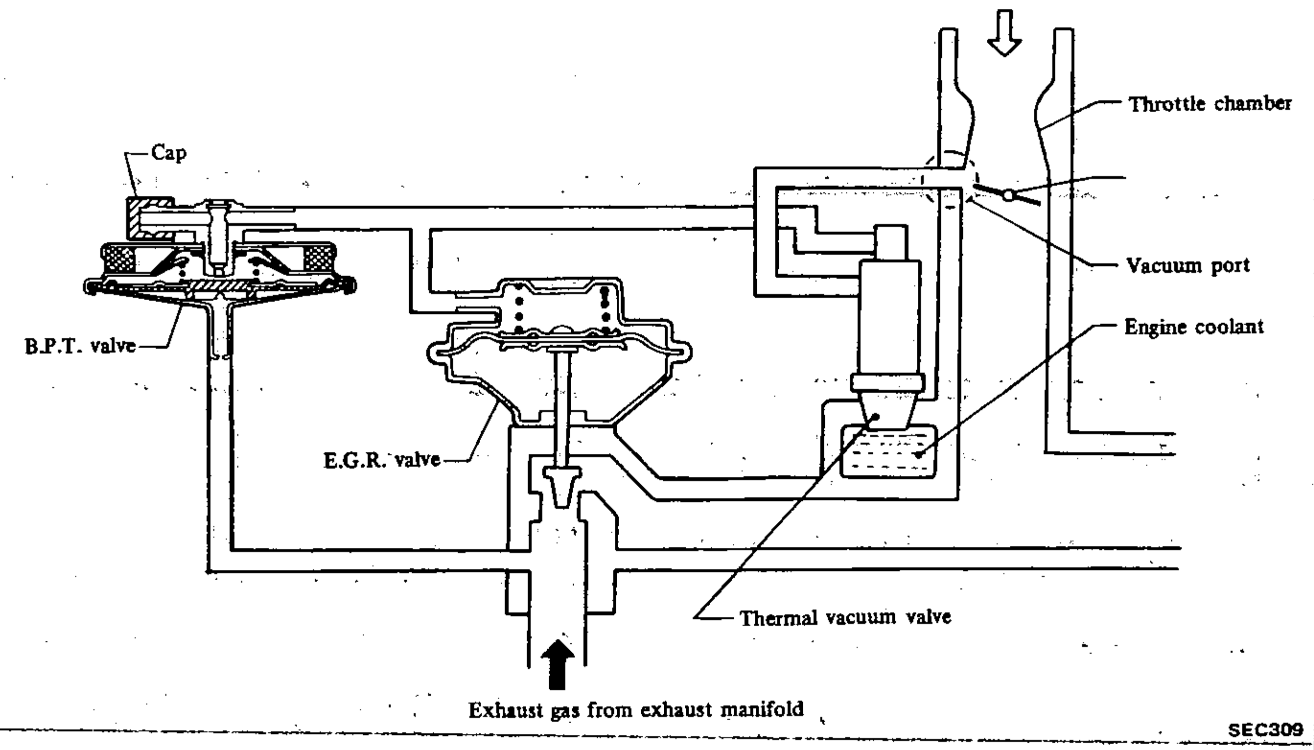
In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of the nitrogen oxide (NOx) content in the exhaust gas.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. chamber. The exhaust gas is then controlled in quantity by the E.G.R. valve, and is introduced into the intake manifold.





Type-3



OPERATION

The operation of the system is as follows:

Type-2

Water temperature °C (°F)	Thermal vacuum valve		V.V.T. valve			E.G.R. control system
	Type-A2	Type-A3	Venturi vacuum	Exhaust gas pressure	Operation	
Below 15 (59)	Open	Closed	High	Low	Closed	Not actuated
			High	High		
			Low	High		
			Low	Low	Open	
15 - 60 (59 - 140)	Leak	Closed	High	Low	Closed	Slightly actuated
			High	High		
			Low	High		
			Low	Low	Open	Not actuated
60 - 95 (140 - 203)	Closed	Closed	High	Low	Closed	Actuated
			High	High		
			Low	High		
			Low	Low	Open	Not actuated
Above 95 (203)	Closed	Open	High	Low	Closed	Not actuated
			High	High		
			Low	High		
			Low	Low	Open	

Type-1

Water temperature °C (°F)	Thermal vacuum valve		V.V.T. valve			E.G.R. control system
	Type-A1	Type-A3	Venturi vacuum	Exhaust gas pressure	Operation	
Below 60 (140)	Open	Closed	High	Low	Closed	Not actuated
			High	High		
			Low	High		
			Low	Low	Open	
60 - 95 (140 - 203)	Closed	Closed	High	Low	Closed	Actuated
			High	High		
			Low	High		
			Low	Low	Open	Not actuated
Above 95 (203)	Closed	Open	High	Low	Closed	Not actuated
			High	High		
			Low	High		
			Low	Low	Open	

Type-3

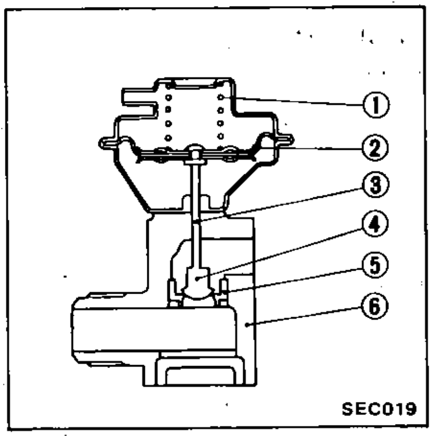
Water temperature °C (°F)	Thermal vacuum valve	B.P.T. valve		E.G.R. control system
		Exhaust gas pressure kPa (mmH_2O, in H_2O)	Operation	
Below 50 (122)	Closed	Below 0.206 - 0.324 (21 - 33, 0.82 - 1.30)	Open	Not actuated
		Above 0.206 - 0.324 (21 - 33, 0.82 - 1.30)	Closed	
Above 50 (122)	Open	Below 0.206 - 0.324 (21 - 33, 0.82 - 1.30)	Open	Not actuated
		Above 0.206 - 0.324 (21 - 33, 0.82 - 1.30)	Closed	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 (operation of the thermal vacuum valve) and V.V.T. valve or B.P.T. valve.

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.

E.G.R. control valve construction and type vary with transmission type and car destination. For identification purposes, the part number is stamped on the recessed portion at the top of the valve.



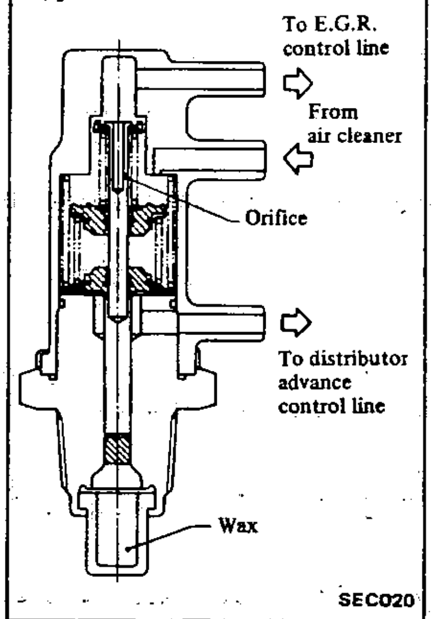
1 Diaphragm spring
2 Diaphragm
3 Valve shaft
4 Valve
5 Valve seat
6 Valve chamber

Thermal vacuum valve (3-port type)

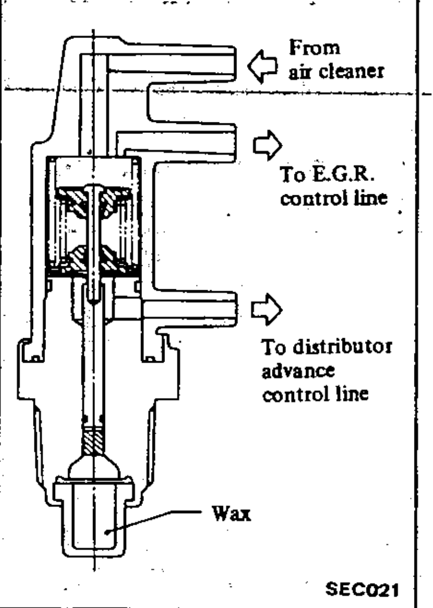
Two thermal vacuum valves are installed, one on the upper side of the intake manifold, and the other on the lower side. These thermal vacuum valves detect the temperature of the engine cooling water. The valve shaft is pushed up or down by the thermal expansion force of wax which depends on the temperature. This action opens and closes the valve, which causes the E.G.R. control vacuum line to be opened or closed to the atmosphere.

When the valve opens, air from the throttle chamber vacuum signal line is introduced, and while the venturi vacuum transducer (V.V.T.) valve control orifice and E.G.R. valve diaphragm are exposed to the atmosphere, the E.G.R. operation will not function.

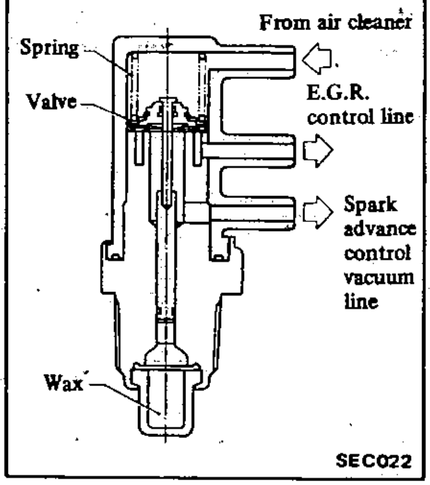
Type-A2



Type-A1



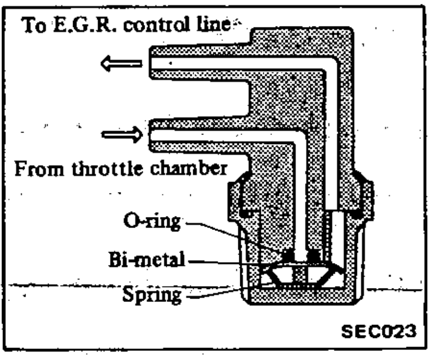
Type-A3



Thermal vacuum valve (2-port type)

The 2-port type thermal vacuum valve is mounted on the engine thermostat housing. It detects engine coolant temperature by means of a built-in bi-metal, and opens or closes the vacuum passage in the thermal vacuum valve.

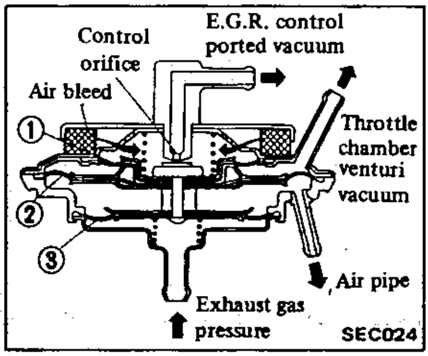
When the vacuum passage is open, the throttle chamber vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.



Venturi vacuum transducer (V.V.T.) valve

The V.V.T. valve monitors the pressure of the exhaust gas which actuates the diaphragm ③ and the venturi vacuum which in turn activate the diaphragm ①, ②. This valve controls the throttle vacuum in order to activate the E.G.R. control valve.

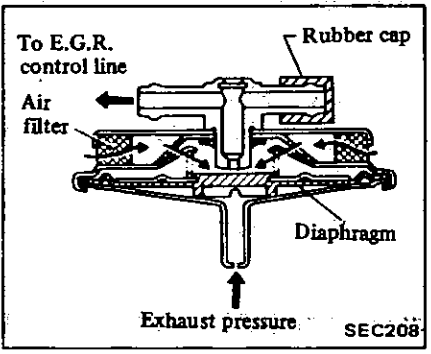
In other words, the amount of recirculated exhaust gas varies with the position of the E.G.R. valve regulated by the operating condition of the engine.



1 Diaphragm
2 Diaphragm
3 Diaphragm

B.P.T. valve

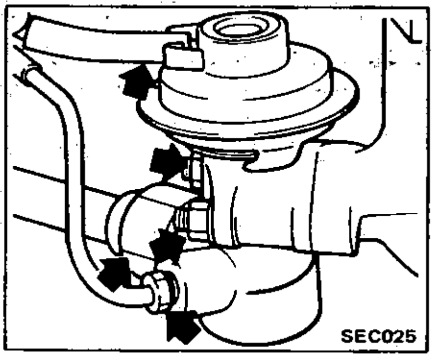
The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling throttle chamber vacuum applied to the E.G.R. control valve. In other words, the amount of recirculated exhaust gas varies with the position of the E.G.R. valve regulated by the operating condition of the engine.



REMOVAL AND INSTALLATION

E.G.R. control valve and E.G.R. tube

1. Remove nuts which secure E.G.R. tube and B.P. tube to E.G.R. valve, and disconnect tubes from valve.
2. Disconnect vacuum hose and remove nuts securing E.G.R. control valve to Intake Manifold. The E.G.R. control valve can then be taken out.



CAUTION:
Pay attention not to give damage to packing of E.G.R. control valve.

3. Installation is in the reverse sequence of removal.

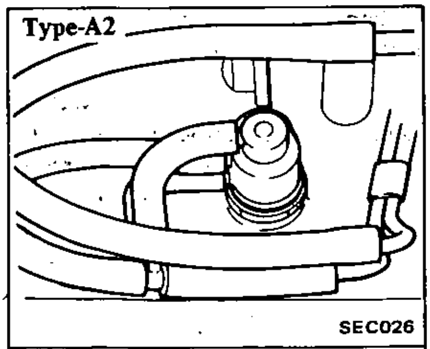
a. When installing a new E.G.R. valve, verify it is of the same type (model number and identification mark, etc.) as that which was previously installed.
b. Always install a new gasket.

Thermal vacuum valve

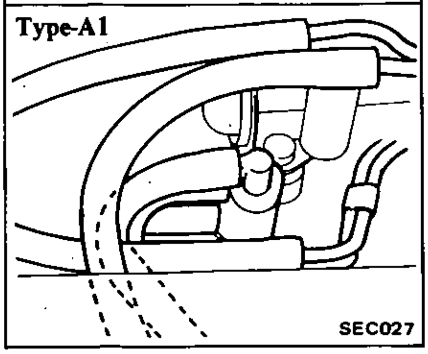
The thermal vacuum valve is made of plastic. Consequently care should be taken to avoid damaging it. On U.S.A. models, two valves are located on the intake manifold. One is located on the front side of the intake manifold. The other is located under the rear end of the intake manifold. On Canada models, the valve is located on the intake manifold.

1. Drain engine coolant about one liter.
2. Disconnect vacuum hoses and unscrew the thermal vacuum valve. Then, the valve can be removed.
3. Installation is in the reverse sequence of removal.

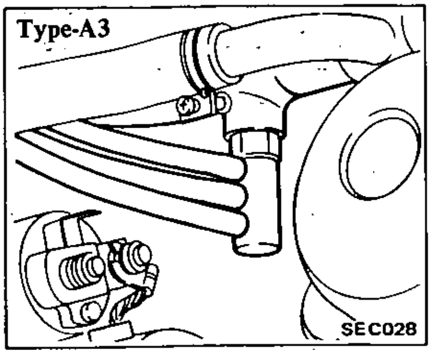
a. Be sure to apply sealer to threads of the valve prior to installing a new valve.
b. When installing a new thermal vacuum valve, be sure that color and shape are correct.



SEC026



SEC027

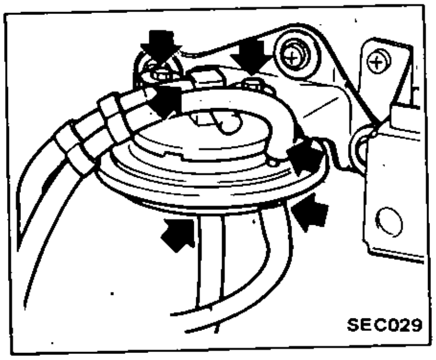


SEC028

V.V.T. valve

1. Disconnect vacuum tubes on the V.V.T. valve.
2. Disconnect screws which secure V.V.T. valve to bracket.
3. Disconnect back pressure tube from V.V.T. valve.

The V.V.T. valve can then be taken out.



SEC029

4. Installation is in the reverse sequence of removal.

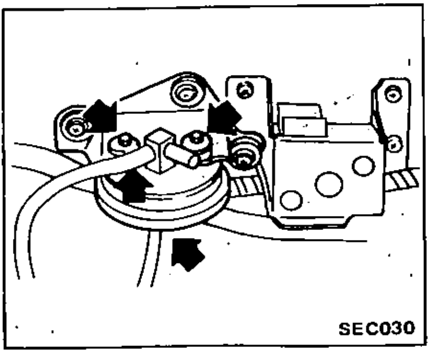
When replacing the V.V.T. valve with a new one, verify that the type number on the new part is the same as that on the former one.

Ⓣ : V.V.T. valve mounting screw
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

B.P.T. valve

1. Remove vacuum tube on the B.P.T. valve.
2. Remove screws securing B.P.T. valve to the bracket.
3. Disconnect back pressure tube from B.P.T. valve.

The B.P.T. valve can then be taken out.



SEC030

4. Installation is in the reverse sequence of removal.

When replacing the B.P.T. valve with new one, confirm that the type number on new part is the same as that on former one.

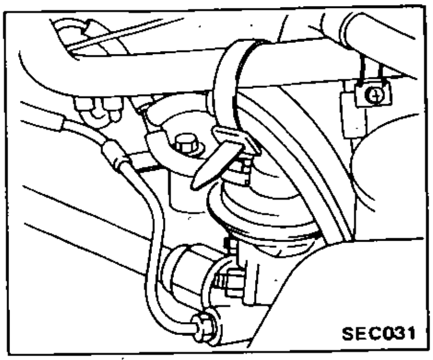
Ⓣ : B.P.T. valve mounting screw
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

INSPECTION

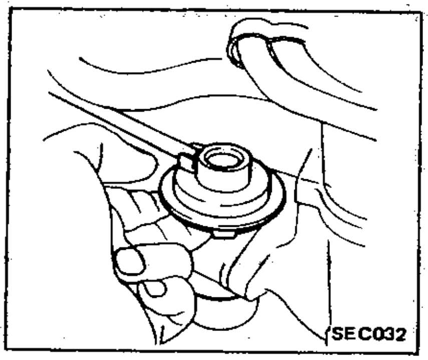
Entire system

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.
3. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.

Place your finger on diaphragm of E.G.R. control valve to ensure that the valve functions as described below.



SEC031



(1) When temperature of the engine coolant is low:

[Below 15°C (59°F)] .... California models
[Below 60°C (140°F)] .... Non-California models
[Below 50°C (122°F)] .... Canada models

Make sure that E.G.R. control valve does not operate when engine speed is increased from idle to 2,000 – 2,500 rpm.

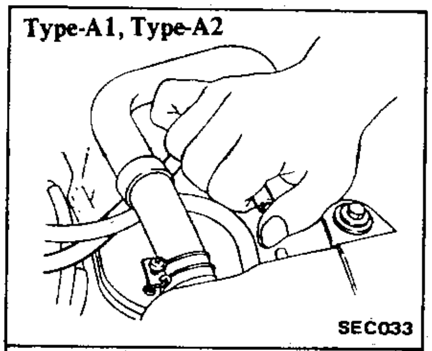
(2) When temperature of the engine coolant is high:

[Above 15°C (59°F)] .... California models
[Above 60°C (140°F)] .... Non-California models
[Above 50°C (122°F)] .... Canada models

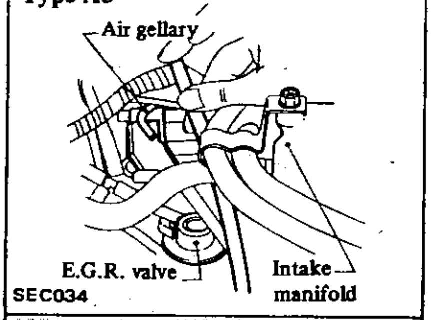
1) Make sure that E.G.R. control valve operates when engine speed is increased from idle to 2,000 – 2,500 rpm.
2) If E.G.R. control valve does not operate properly, check it as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose which connects 3-way connecter to E.G.R. control valve.
- Increase engine speed from idle to 2,000 – 2,500 rpm.
- Make sure that thermal vacuum valve is closed, and that throttle vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

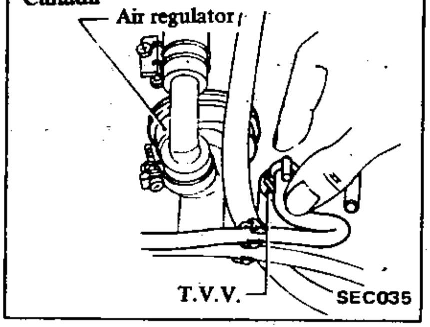
Type-A1, Type-A2



Type-A3



Canada



If vacuum pressure is either weak or nonexistent, replace thermal vacuum valve. If vacuum pressure is detected, replace E.G.R. valve.

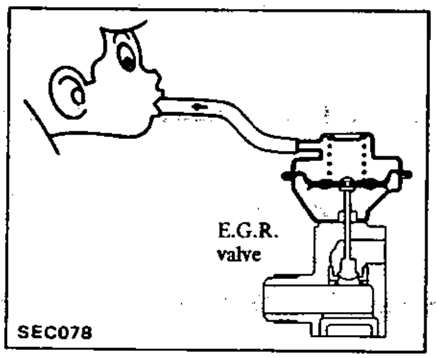
If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

E.G.R. control valve

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.

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.

Thermal vacuum valve

Dismount thermal vacuum valve from engine.

Before dismounting, drain engine coolant from engine.

Apply vacuum to thermal vacuum valve and check to be sure that thermal vacuum valve opens or closes in response to engine coolant temperature as specified.

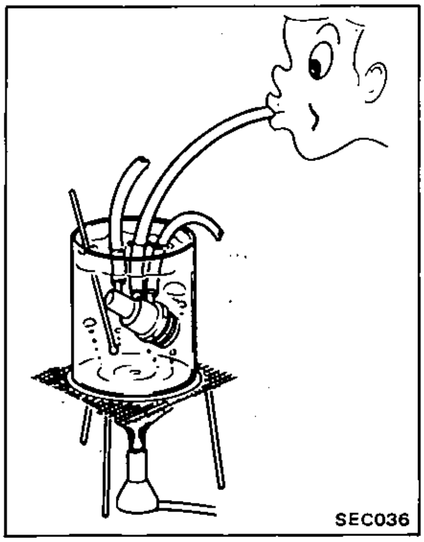
Thermal vacuum valve should open or close at a temperature specified below, completing the vacuum passage.

Thermal vacuum valve operating temperature:

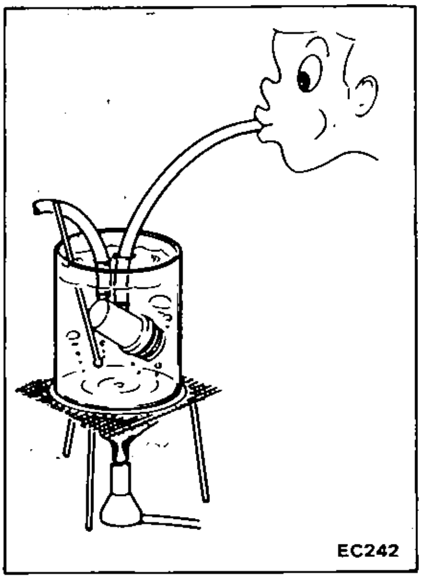
Type	Operating temperature °C (°F)			Applied model
	Leak	Open	Close	
Wax (Type-A1)	—	60 - 95 (140 - 203)	Below 60 (140) Above 95 (203)	Non-California for U.S.A.
Wax (Type-A2)	15 - 60 (59 - 140)	60 - 95 (140 - 203)	Below 15 (59)	California
Wax (Type-A3)	—	Above 95 (203)	Below 95 (203)	U.S.A.
Bi-metal	—	Above 50 (122)	Below 50 (122)	Canada

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

U.S.A.

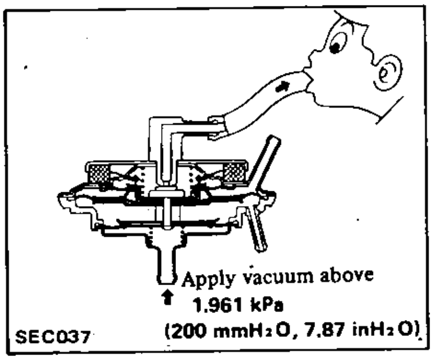


Canada

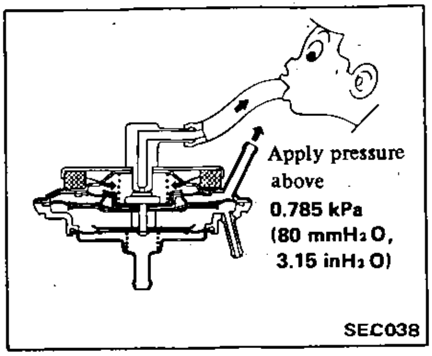


V.V.T. valve

1. Apply a pressure above 1.961 kPa (200 mmH$_2$O, 7.87 inH$_2$O) to V.V.T. valve and check it for leakage as shown below. If a leak is noted, replace valve.


Apply vacuum above 1.961 kPa (200 mmH$_2$O, 7.87 inH$_2$O)

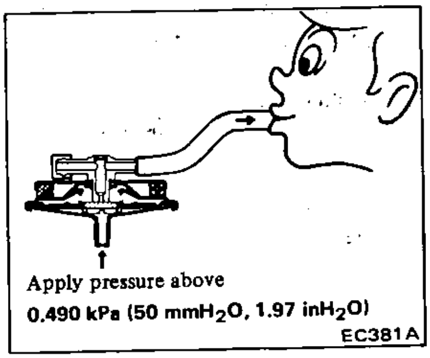
2. Apply vacuum pressure above 0.785 kPa (80 mmH$_2$O, 3.15 inH$_2$O) to V.V.T. valve and check for leakage as shown below. If a leak is discovered, replace valve.


Apply pressure above 0.785 kPa (80 mmH$_2$O, 3.15 inH$_2$O)

B.P.T. valve

1. Disconnect two vacuum hoses on B.P.T. valve.
2. Plug one of two ports of B.P.T. valve.

Apply a pressure above 0.490 kPa (50 mmH$_2$O, 1.97 inH$_2$O) to B.P.T. valve and orally suck back other port of B.P.T. valve as shown below to check for leakage. If a leak is noted, replace valve.


Apply pressure above 0.490 kPa (50 mmH$_2$O, 1.97 inH$_2$O)

SPARK TIMING CONTROL SYSTEM

DESCRIPTION

The spark timing control system is designed to control the distributor vacuum advance under varying driving conditions so as to reduce HC and NOx emissions.

OPERATION

The operation of the system is as follows.

Water temperature °C (°F)	Thermal vacuum valve		Spark timing control system
	Type-A1, A2	Type-A3	
Below 15 (59)	Closed	Closed	Actuated
15 - 60 (59 - 140)	Open	Closed	Not actuated
60 - 95 (140 - 203)	Closed	Closed	Actuated
Above 95 (203)	Closed	Open	Not actuated

This system does not operate with the engine at idle.

REMOVAL AND INSTALLATION

Thermal vacuum valve

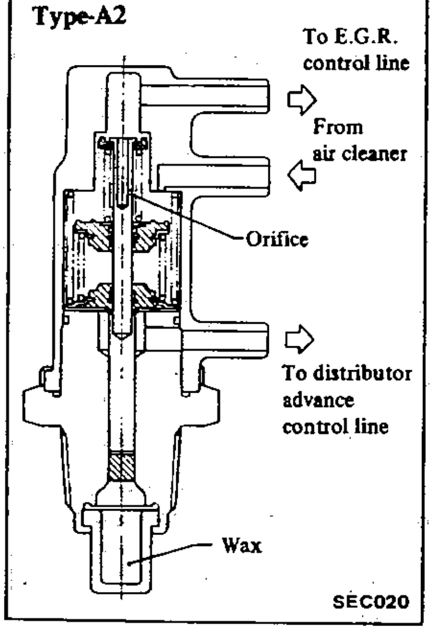
The thermal vacuum valve designs are exactly the same as those used in the E.G.R. control system. Refer to the instructions under the heading "E.G.R. control system" for removal and installation procedures.

Thermal vacuum valve (3-port type)

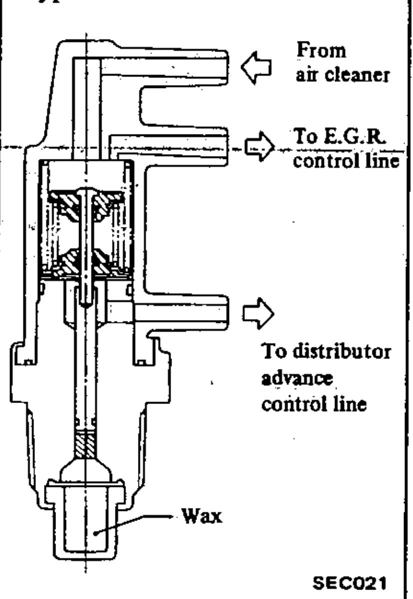
Two thermal vacuum valves are installed, one on the upper side of the intake manifold, and the other on the lower side. These thermal vacuum valves detect the temperature of the engine cooling water. The valve shaft is pushed up or down by the thermal expansion force of wax which depends on the temperature. This action opens and closes the valve, which causes the distributor vacuum line to be opened or closed to the atmosphere.

When the valve opens, the vacuum signal line will open to the atmosphere, stopping the distributor vacuum from advancing.

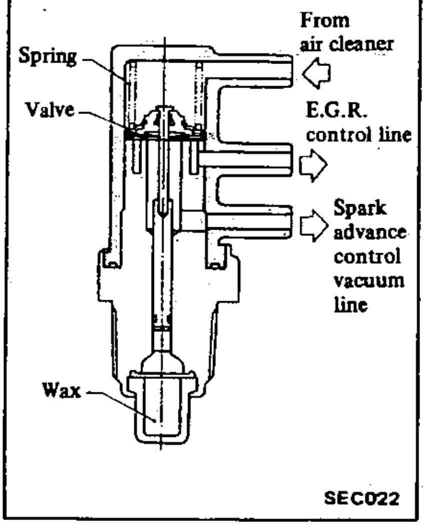
Type-A2



Type-A1



Type-A3

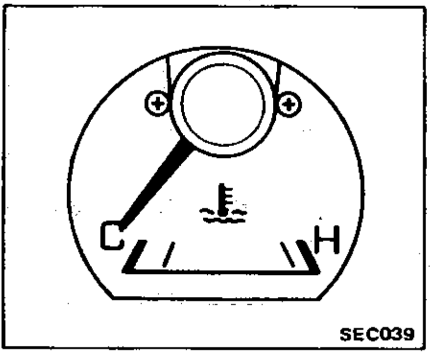


INSPECTION

Entire system

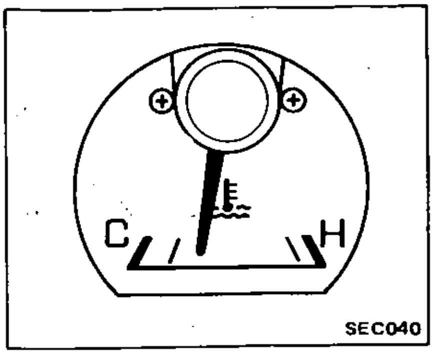
1. Ensure that vacuum hoses are properly connected to their connectors.
2. Make sure that distributor vacuum controller functions properly.
3. Set timing light.
4. Check thermal vacuum valve, beginning with a cold engine.

(1) Using a timing light, check the spark timing while temperature gauge is in the C-position.



(2) Using a timing light, ensure that the spark timing retards from its previous position when temperature gauge changes from the C-position to the middle position.

(3) Warm up the engine until coolant temperature gauge pointer moves to middle position of scale. Ensure that the spark timing advances from its previous position.



If spark timing does not change, replace thermal vacuum valve.

To check for operation of thermal valve, proceed as follows:

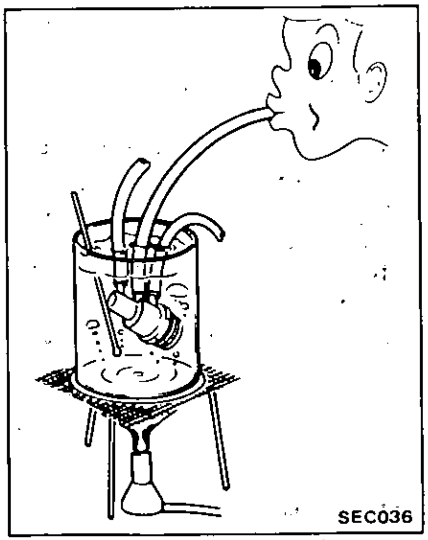
Thermal vacuum valve

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:

Type	Operating temperature °C (°F)	
	Open	Close
Wax (Type-A1, A2)	15 - 60 (59 - 140)	Below 15 (59) Above 60 (140)
Wax (Type-A3)	Above 95 (203)	Below 95 (203)

CAUTION:
Do not allow water to enter the thermal vacuum valve.



DECELERATION CONTROL SYSTEM (Intake manifold vacuum control type)

DESCRIPTION

The deceleration control system is designed to control the intake manifold vacuum under decelerating driving condition so as to reduce the oil consumption.

OPERATION

This system is used to force air directly into the intake manifold when the preset vacuum level has been attained, thus preventing excessive increases in the intake manifold vacuum during deceleration. Air is directed from the 3 way connector through the air hose and vacuum control valve. To keep oil consumption low, as the air enters, the intake manifold vacuum will be maintained at less than the specified level.

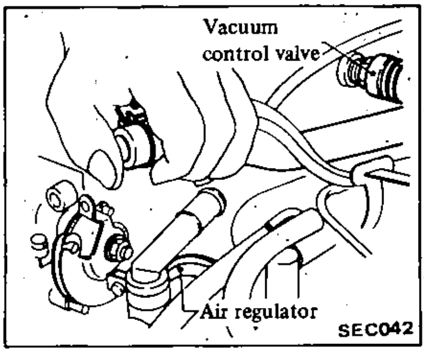
Vacuum control valve (V.C.V.)

To check for operating, proceed as follows:

1. Disconnect one end (Air regulator side) of air hose connecting 3 way connector to V.C.V.
2. Make sure that vacuum control valve operates when engine speed is decreased from 3,500 – 4,000 to idle.

Place fingers on the hose end to check for valve operation.

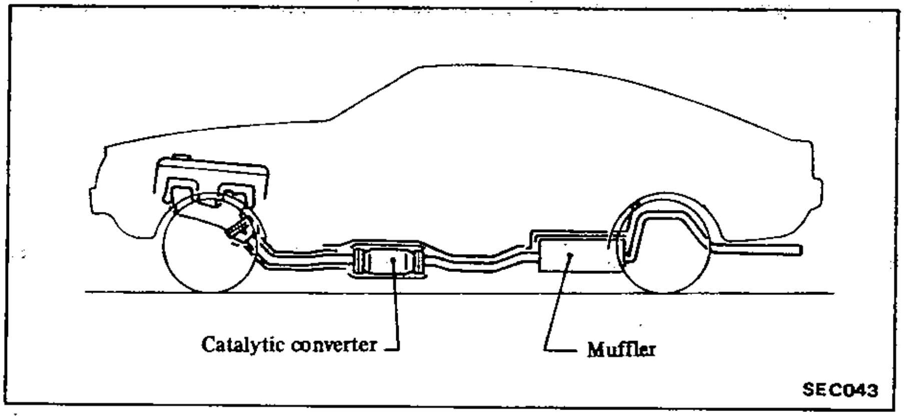
3. If the intake manifold vacuum is not present at the end of air hose, replace vacuum control valve.



CATALYTIC CONVERTER

DESCRIPTION

The catalytic converter accelerates the chemical reaction of hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas, and changes them into non-harmful carbon dioxide (CO_2) and water (H_2O). This chemical reaction process requires the proper amount of air, which is induced by the air induction valve (Refer to the item "A.I.S."). This air is called "secondary air".



SEC043

OPERATION

Exhaust gas emitted from the engine contains some harmful substances due to incomplete combustion in the combustion chamber. The air induction system is designed to reduce the content of such substances in the exhaust gas. In this system, the secondary air is led from the air induction valve and injected into the exhaust manifold. With this injection of the secondary air, hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas are gradually oxidized with oxygen (O_2) in the secondary air and converted into non-harmful carbon dioxide (CO_2) and water (H_2O).

The catalytic converter further cleans engine exhaust gas. Through catalytic action, it changes residual hydrocarbons and carbon monoxide contained in exhaust gas into carbon dioxide and water before exhaust gas is discharged to the atmosphere.

REMOVAL AND INSTALLATION

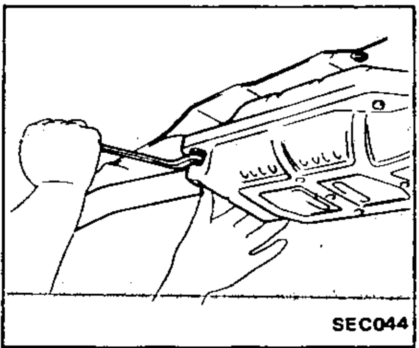
1. Jack up the car.

Apply parking brake and place wheel chocks.

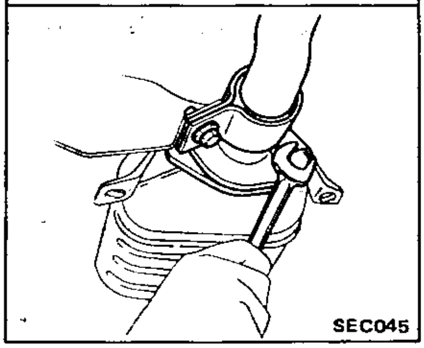
2. Remove screws securing lower shelter of catalytic converter.

Loosen flange bolts connecting catalytic converter to front and rear exhaust tubes.

Catalytic converter assembly can then be taken out.



SEC044



SEC045

3. Installation is in the reverse sequence of removal.

CAUTION:

a. Be careful not to damage catalytic converter when handling.

b. Never wet catalyzer with water, oil, etc.

Ⓣ : Lower shelter bolt
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)
Catalytic converter bolt
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)

INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary.

Refer to Air Induction System for inspection.

Catalytic converter

Whether catalytic converter is normal or not can be checked by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "Neutral" (for manual transmission) and "N" or "P" (for automatic transmission) position.

California 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%, recheck A.I.S. and replace air induction valve. Then, perform inspection steps 5 and 6.
9. If CO percentage is still over 0.3% in step 8, catalytic converter is malfunctioning. Replace catalytic converter.

Non-California models.

1. Visually check catalytic converter for damage or crack.
2. Adjust engine idle speed and CO percentage. Refer to Adjusting Idle RPM and Mixture Ratio for adjustment.

3. Race engine (1,500 to 2,000 rpm) two or three times under no load and make sure that specified CO percentage is obtained.
4. Remove cap and connect air hose to air induction valve.

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 4 has been completed, wait for one minute before making CO percentage measurement.
7. If CO percentage measured in step 5 is less than 0.3%, the catalytic converter is normal.
8. If CO percentage measured in step 5 is over 0.3%, recheck A.I.S. and replace air induction valve. Then, perform inspection steps 4 and 5.
9. If CO percentage is still over 0.3% in step 7, catalytic converter is malfunctioning. Replace catalytic converter.

EVAPORATIVE EMISSION CONTROL SYSTEM

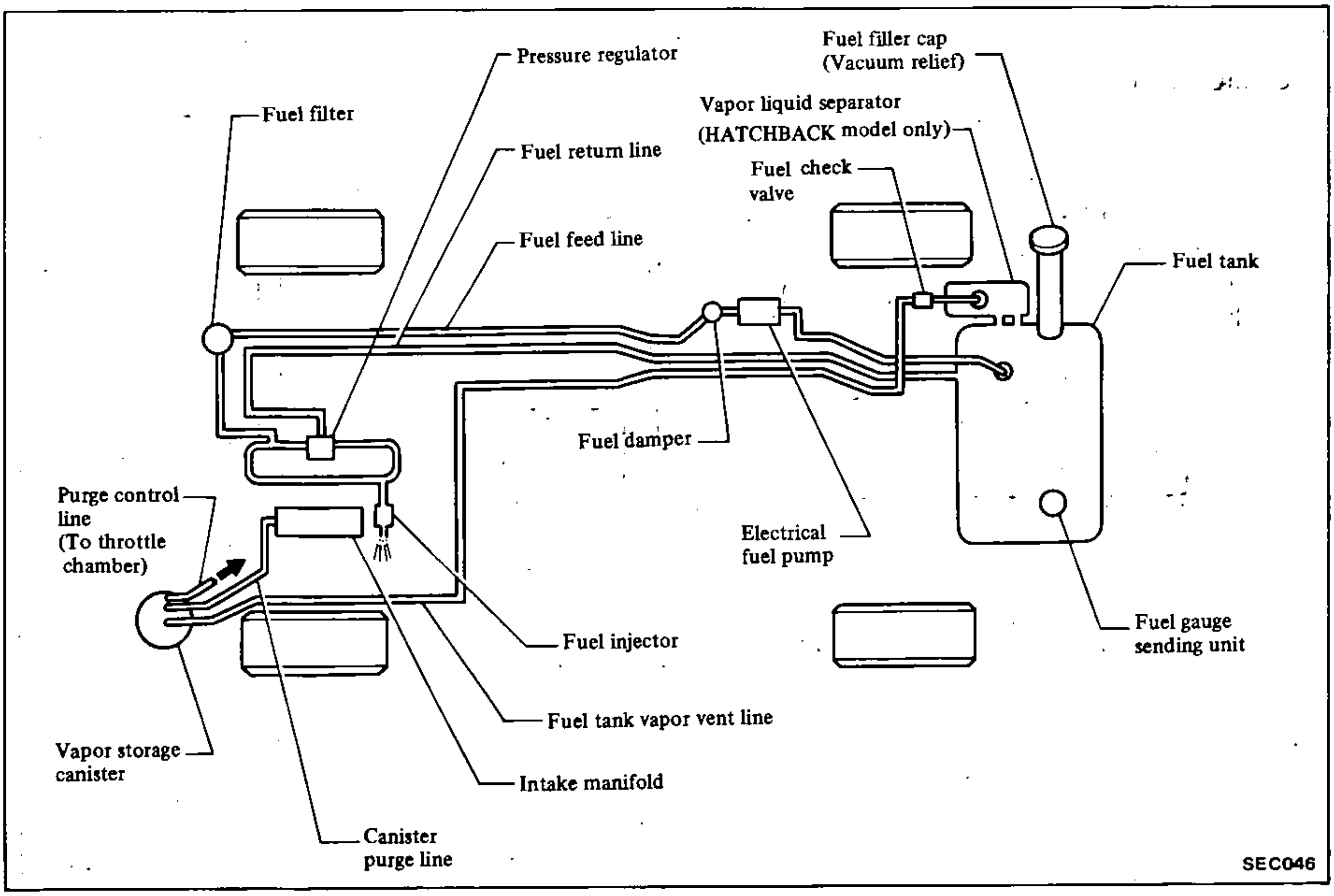
DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

This system is made up of the following:

1. Fuel tank with positive sealing filler cap
2. Fuel check valve
3. Vapor vent line
4. Carbon canister
5. Vacuum signal line
6. Canister purge line
7. Vapor liquid separator (Hatchback models).

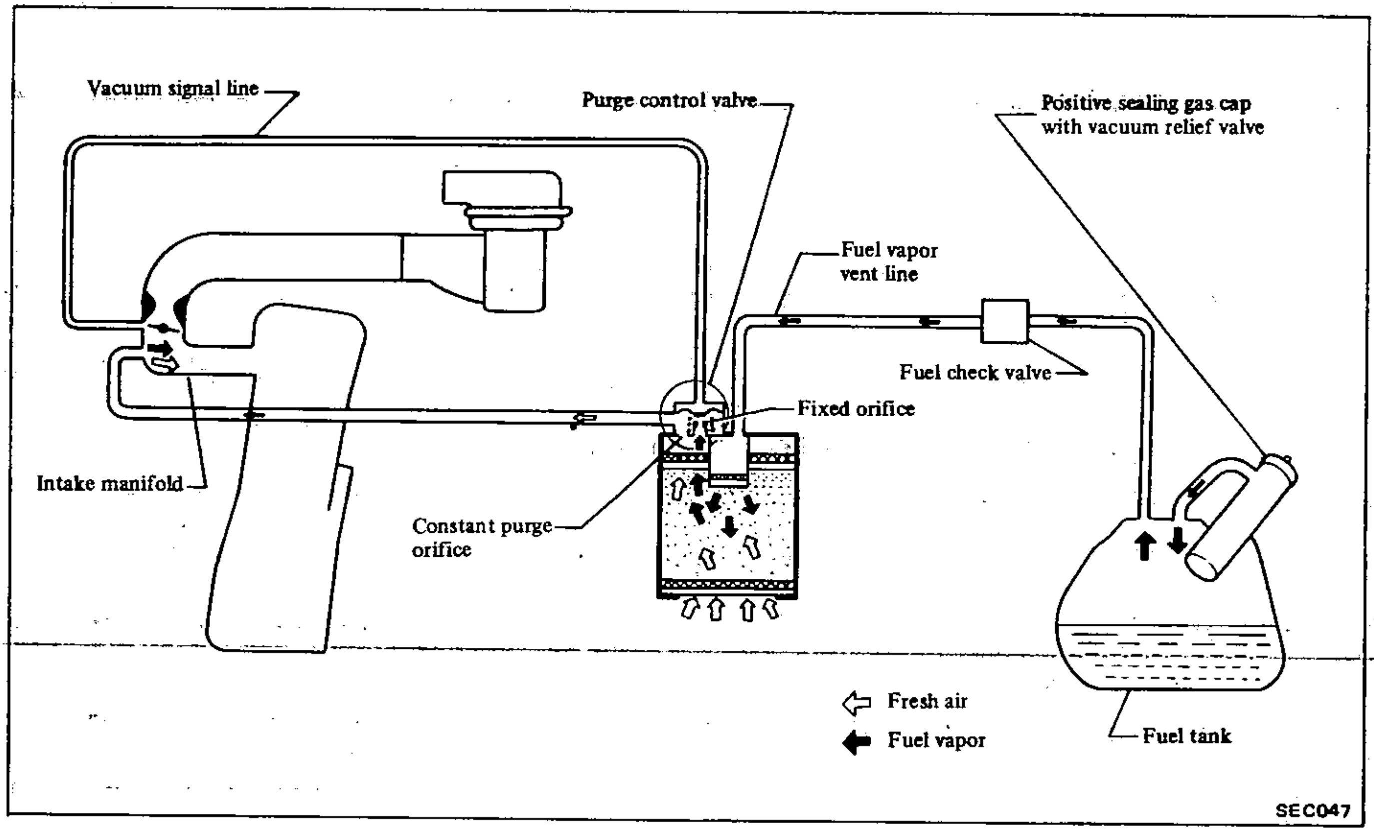
Removal and installation of above components are described in Section FE.



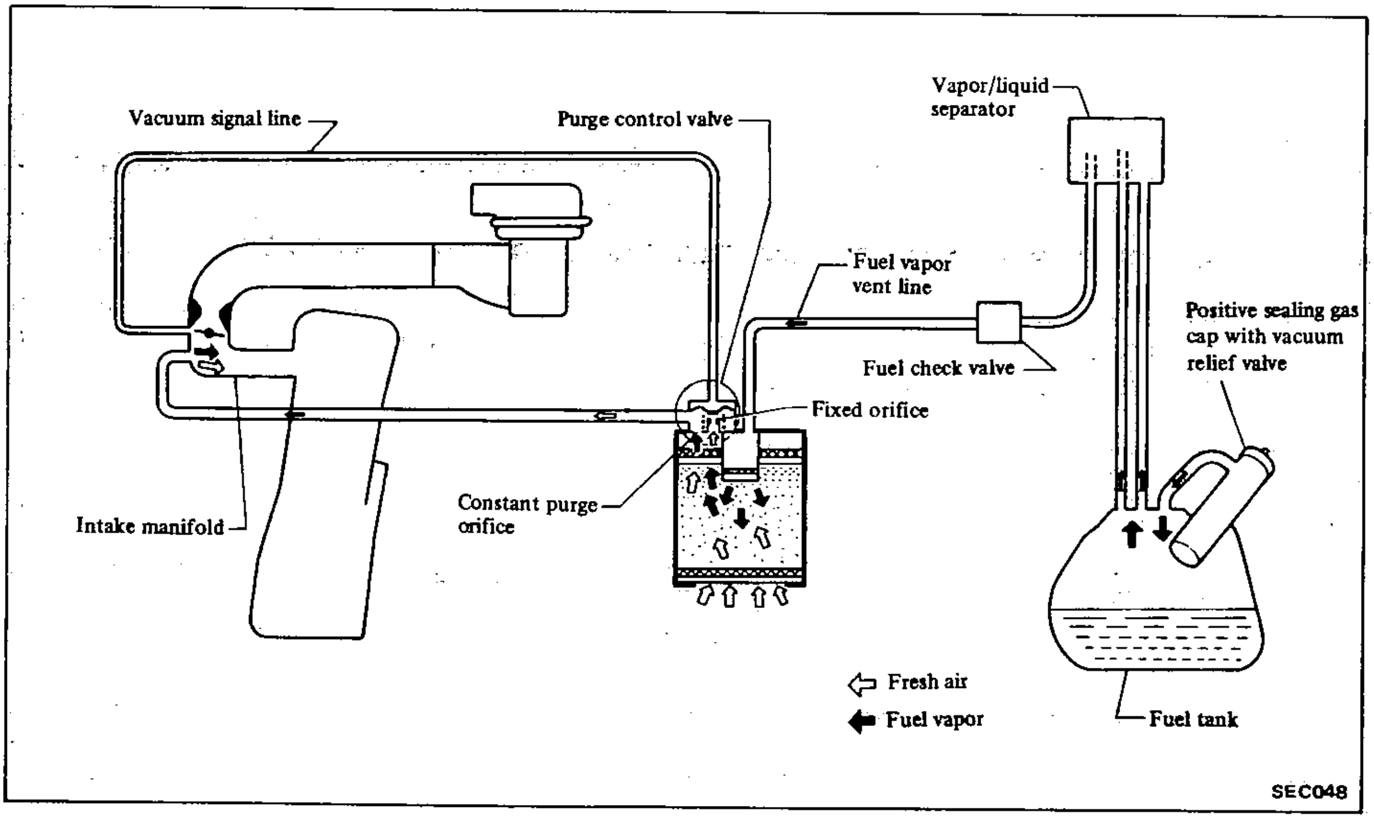
OPERATION

Fuel vapors from the sealed fuel tank are directed to the carbon canister which is filled with activated charcoals and stored there when the engine is not running.

HARDTOP models

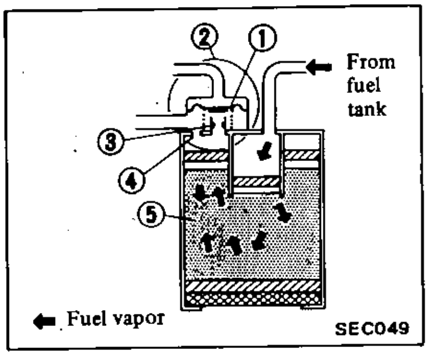


HATCHBACK models



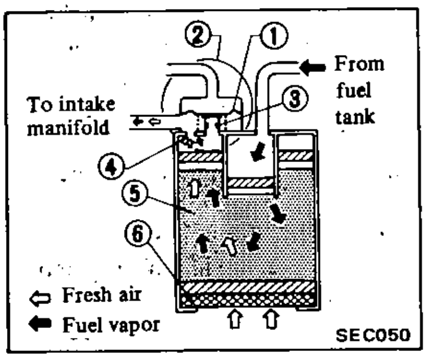
The canister retains the vapor until it is purged by the air drawn through the purge line towards the intake manifold while the engine is operating. When the engine runs at idle, the purge control valve is closed. Only a small amount of purge air flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the ported vacuum rises higher, the purge control valve opens and the vapor is drawn into the intake manifold through both the fixed orifice and the constant purge orifice.

(1) Engine does not operate:



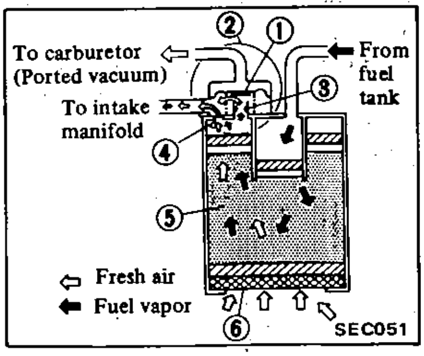
1 Diaphragm
2 Purge control valve
3 Fixed orifice
4 Constant fixed orifice
5 Activated carbon

Engine operates at idle:



1 Diaphragm
2 Purge control valve
3 Fixed orifice
4 Constant fixed orifice
5 Activated carbon
6 Filter

(3) Engine speed increases:

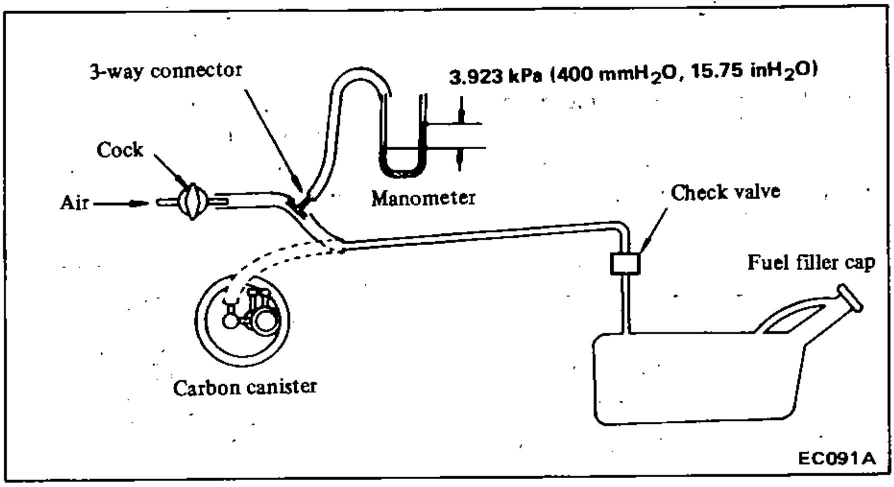


1 Diaphragm
2 Purge control valve
3 Fixed orifice
4 Constant fixed orifice
5 Activated carbon
6 Filter

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 mmH_2O, 15.75 inH_2O).



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 with 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
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, it is the cause of a stuffy hose.

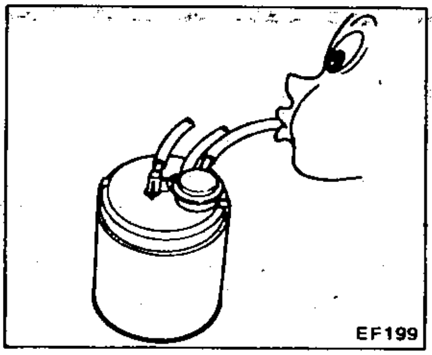
In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.

CARBON CANISTER PURGE CONTROL VALVE

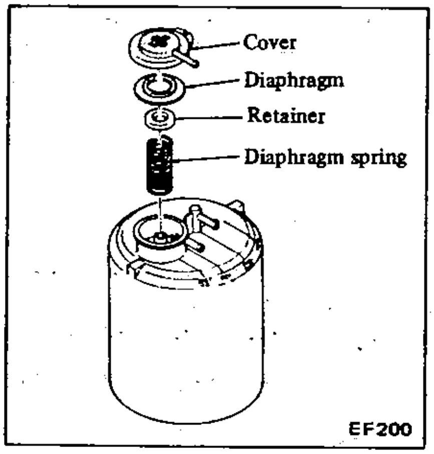
Check for fuel vapor leakage, in the distributor vacuum line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.


EF199

3. 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).



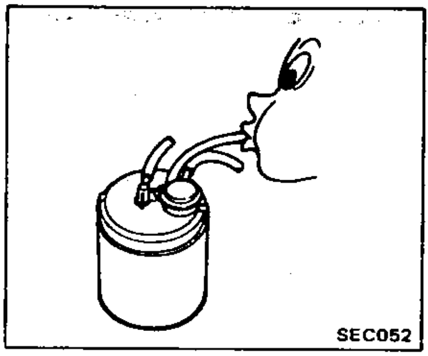
EF200

CARBON CANISTER CONSTANT PURGE ORIFICE

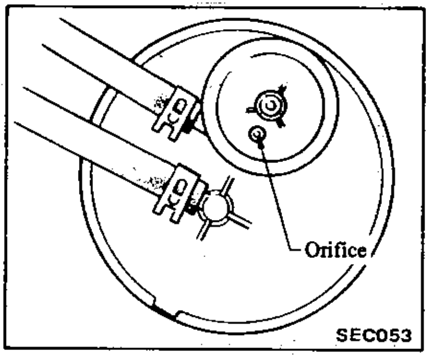
Check the constant purge flow in the intake manifold vacuum line, at the constant purge orifice of carbon canister.

To check the purge flow, proceed as follows:

1. Disconnect the rubber hose on the line between the steel pipe of the engine and canister.
2. Force air into the opening of the rubber hose which runs to the carbon canister and ensure that there are leaks.


SEC052

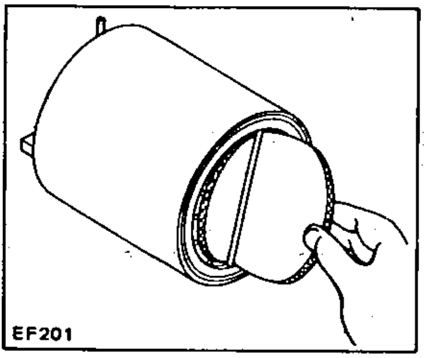
3. If there are no leaks, remove purge control valve and check the constant purge orifice for leak. If necessary, clean the constant purge orifice.



SEC053

CARBON CANISTER FILTER

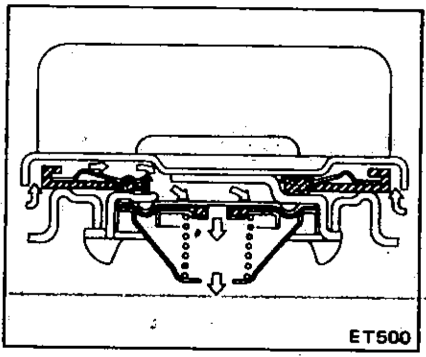
Check for a contaminated element. Element can be removed at the bottom of canister installed on car body.


EF201

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 as valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.


ET500

FUEL CHECK VALVE

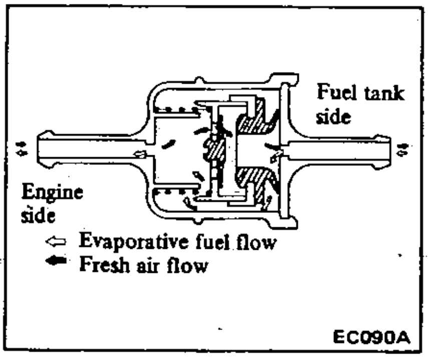
1. Blow air through connector on fuel tank side.

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.



EC090A

SERVICE DATA AND SPECIFICATIONS

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
E.A.I. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Thermal vacuum valve	Less than 22	Less than 2.2	Less than 1.6

Unit	N·m	kg-m	ft-lb
V.V.T. valve mounting screw	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
B.P.T. valve mounting screw	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Catalytic converter bolt	31 - 42	3.2 - 4.3	23 - 31

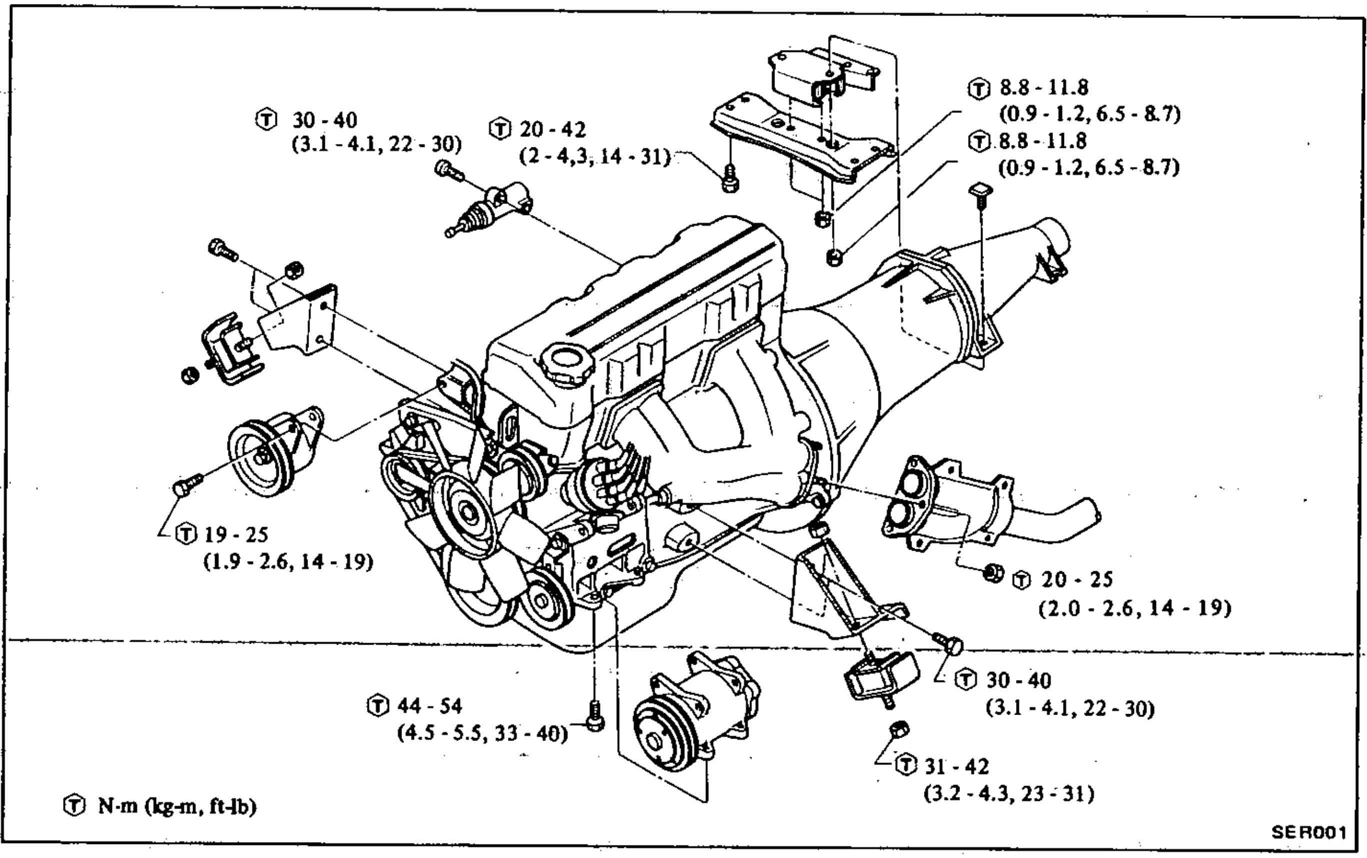
SECTION ER

ENGINE REMOVAL & INSTALLATION

CONTENTS

ENGINE REMOVAL AND INSTALLATION

CONSTRUCTION



REMOVAL

It is much easier to remove engine and transmission as a single unit than to remove them separately. After removal, engine can be separated from transmission assembly.

WARNING:

a. Place wheel chocks in front of front wheels and in rear of rear wheel.

b. Be sure to hoist engine and jack up transmission in a safe manner.

c. You should not remove the engine until the exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.

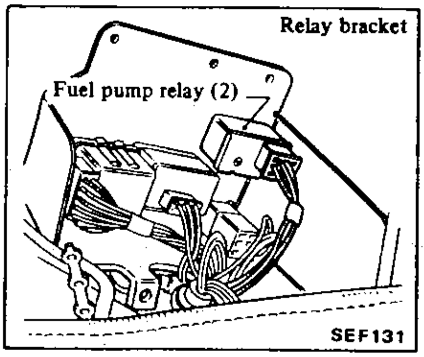
1. Follow the procedure below to reduce fuel pressure to zero.

CAUTION:

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

(1) Start the engine.

(2) Disconnect the harness connector of fuel pump relay-2 while the engine is running.



(3) After the engine stalls, crank the engine two or three times.

(4) Turn the ignition switch OFF.

(5) Reconnect the harness connector of fuel pump relay-2.

Fender covers should be used to protect car body.

2. Disconnect the negative battery cable.

On air conditioner equipped models destined for California, remove the battery to facilitate this operation.

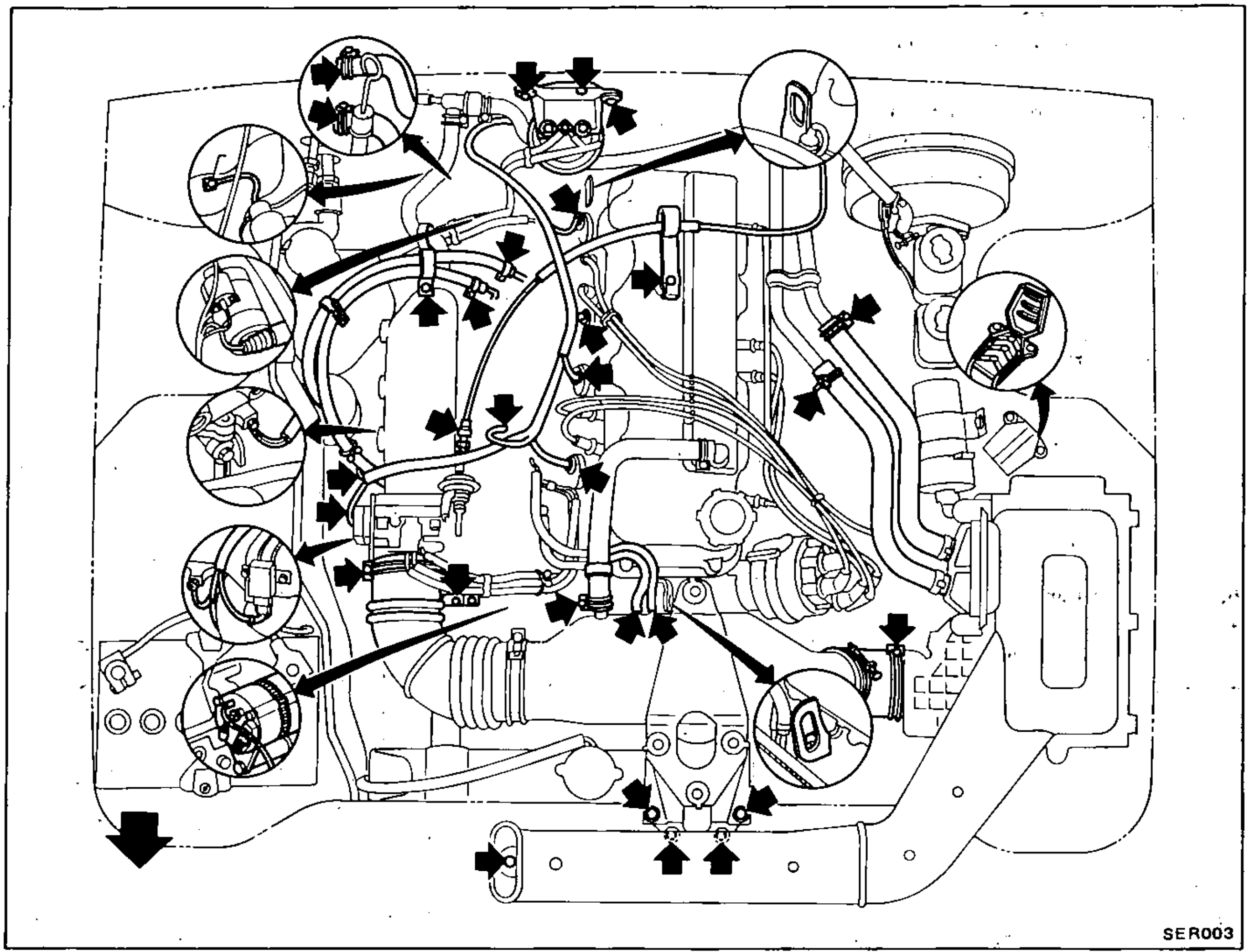
3. Drain engine coolant.
4. Remove hood.

Mark the location of hood hinges on hood to facilitate correct reinstallation.

CAUTION:

Have an assistant help you so as to prevent damage to body.

5. Remove all wires and hoses where indicated by the arrows in the figure below.

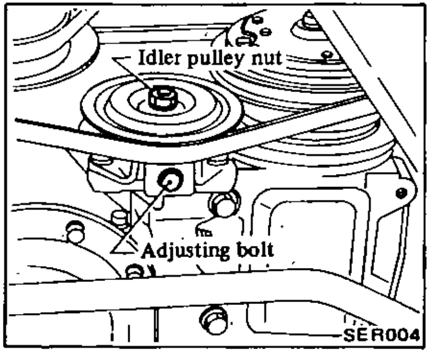


Air conditioner equipped models

Remove compressor following the procedures below:

(1) Remove compressor drive belt.

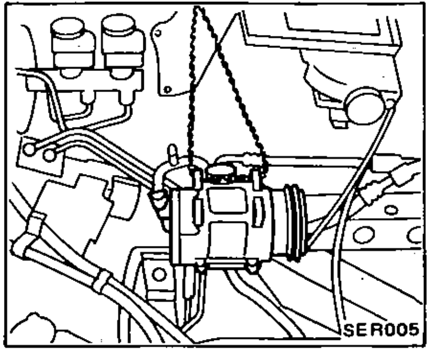
To remove this belt, loosen both idler pulley nut and adjusting bolt.



(2) Remove compressor.

Place removed compressor as shown below:

Never discharge gas from compressor while service/repair work is being performed.

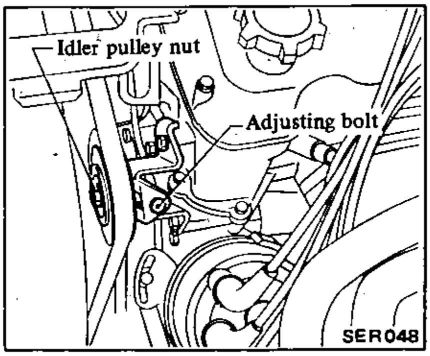


Power steering equipped models

Remove power steering oil pump following the procedures below:

(1) Remove oil pump drive belt.

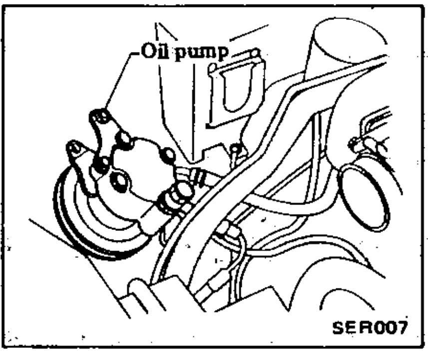
To remove this belt, loosen both idler pulley nut and adjusting bolt.



(2) Remove oil pump.

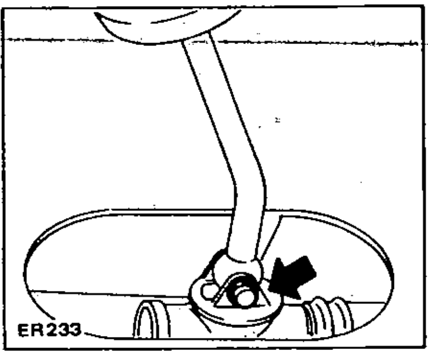
Place removed oil pump as shown below:

Never drain oil from oil pump while service/repair work is being performed.

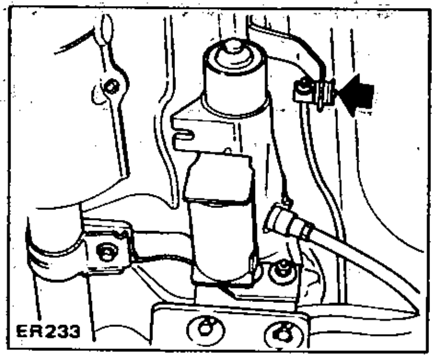


6. Remove transmission control linkage as follows:

(1) Manual transmission

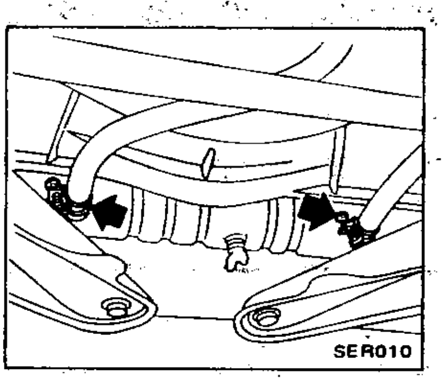


(2) Automatic transmission



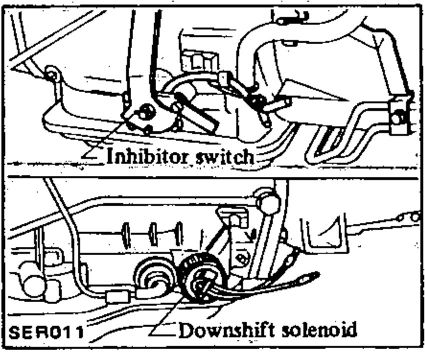
7. Remove radiator and radiator shroud.

On air conditioner equipped models, remove oil cooler hose.

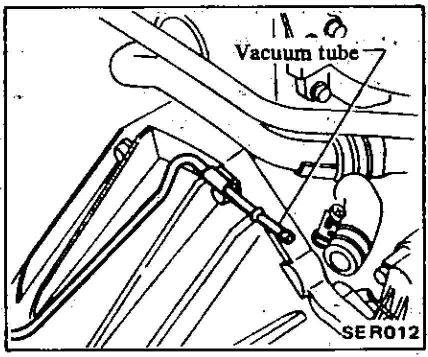


8. Disconnect speedometer cable.

9. Disconnect down shift solenoid wire and inhibitor switch wire. (A/T only).

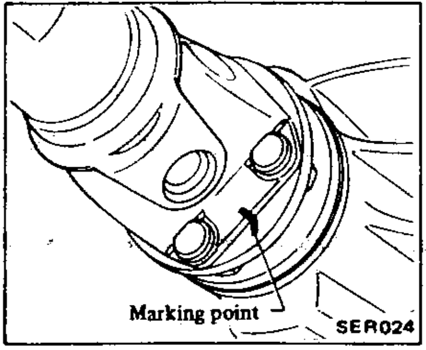


10. Disconnect vacuum hose (A/T only).

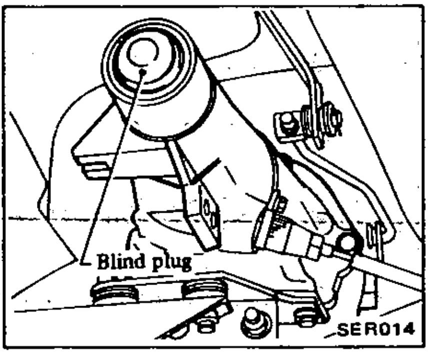


11. Remove clutch operating cylinder, front exhaust tube and propeller shaft.

Place marks on propeller shaft before removal to facilitate reinstallation.



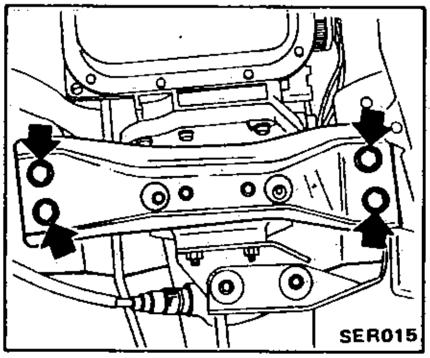
Plug open holes in rear extension housing as shown.



12. Attach suitable wires to engine slingers and raise engine using a hoist to take the weight off front and rear mount insulators.

WARNING:
Before raising engine, try loosening wires two or three times to make sure it is safe to do so.

13. Remove rear engine mounting support-to-body attaching bolts.



14. Remove front engine mounting bolts.
15. Raise engine and transmission and remove them from car as a single unit.

WARNING:
When raising engine, be especially careful not to knock it against adjacent parts.

16. Set engine and transmission on an engine stand.

INSTALLATION

Install in the reverse order of removal, observing the following:

When installing, be sure to check that electrical harness are correctly connected.

1. When installing, first secure rear engine support bracket to rear mounting insulator.
2. Refer to pertinent section when installing and adjusting any parts.
   - Adjust accelerator control system. Refer to Engine Control System (Section FE) for adjustment.
   - Install air conditioner compressor and adjust belt.
     Refer to Engine Maintenance (Section MA) for checking and adjusting drive belts.
   - Install power steering oil pump and adjust belt.
     Refer to Pump Belt Adjustment (Section ST) for adjustment.
3. When installing exhaust front tube on exhaust manifold, be sure to install a new gasket.
4. When reinstalling the hood follwing engine installation, be sure that it is properly centered and that hood lock operates securely. Refer to Hood (Section BF) for adjustment.
5. Add the correct amount of engine coolant.
6. For automatic transmission models, add the same amount of automatic transmission fluid as was drained.

SERVICE DATA AND SPECIFICATIONS

TIGHTENING TORQUE

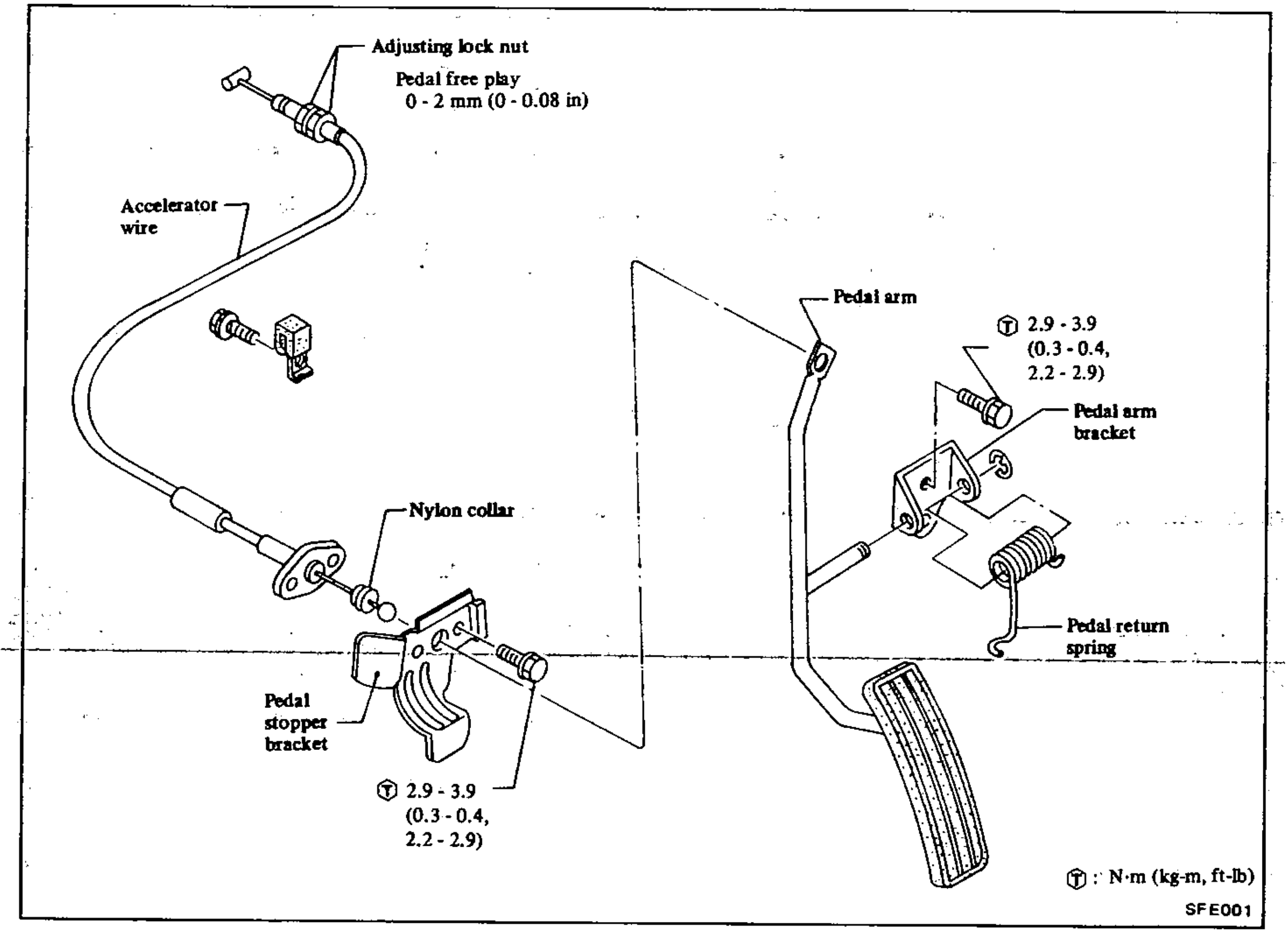
Unit	N-m	kg-m	ft-lb
Front engine support bracket to cylinder block	30 - 40	3.1 - 4.1	22 - 30
Front engine support bracket to mounting insulator	31 - 42	3.2 - 4.3	23 - 31
Front mounting insulator to body	31 - 42	3.2 - 4.3	23 - 31
Compressor to bracket	44 - 54	4.5 - 5.5	33 - 40
Steering oil pump to bracket	19 - 25	1.9 - 2.6	14 - 19
Rear mounting insulator to transmission	8.8 - 11.8	0.9 - 1.2	6.5 - 8.7
Rear mounting insulator to mounting member	8.8 - 11.8	0.9 - 1.2	6.5 - 8.7
Mounting member to body	20 - 42	2 - 4.3	14 - 31
Exhaust maniflold to exhaust tube	20 - 25	2.0 - 2.6	14 - 19
Clutch operating cylinder to engine	30 - 40	3.1 - 4.1	22 - 30

SECTION FE

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

CONTENTS

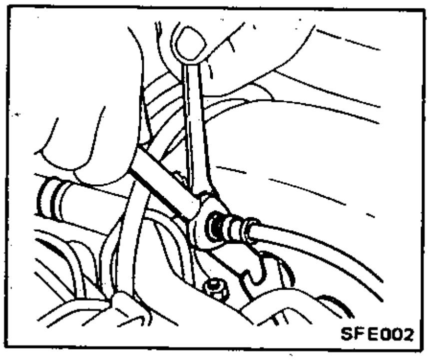
ENGINE CONTROL SYSTEM

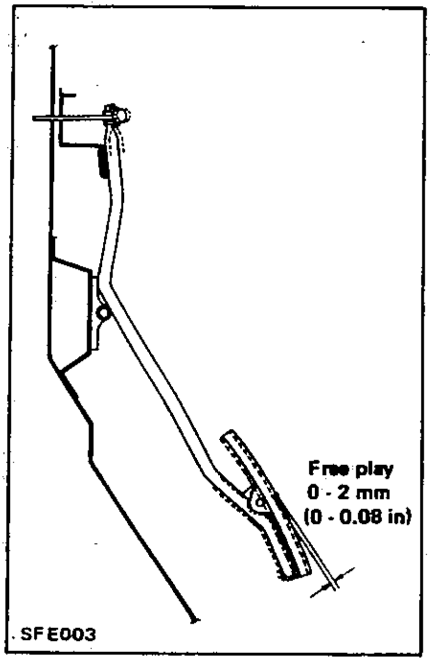


ADJUSTMENT

ACCELERATOR WIRE

Adjust accelerator pedal free play to specification, using adjusting nuts.





a. Depress accelerator pedal to make sure its linkage moves smoothly without jamming or dragging; release pedal to make sure it returns to its original position smoothly.

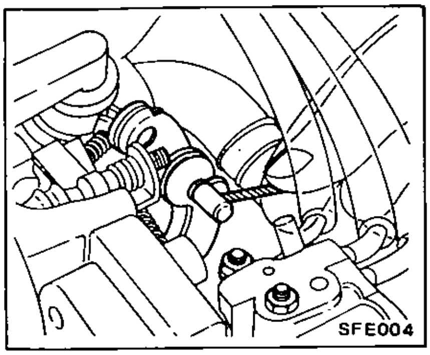
b. Check to see if throttle valve fully opens when accelerator pedal is completely depressed and if it returns to idle when released.

c. Pedal height adjustment is not necessary, since its height is determined by stopper.

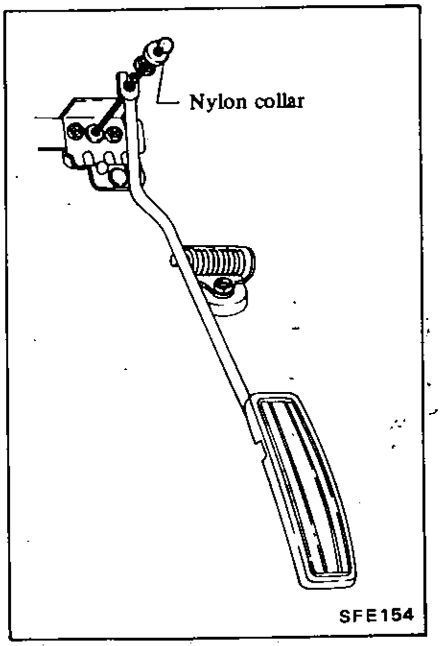
REMOVAL

ACCELERATOR WIRE

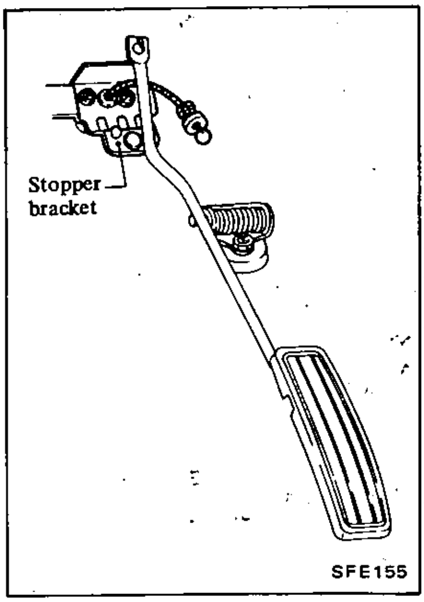
1. Loosen adjusting lock nuts and disconnect accelerator wire from carburetor.



2. Remove nylon collar by pushing it toward wire end and disconnect accelerator wire from pedal arm.



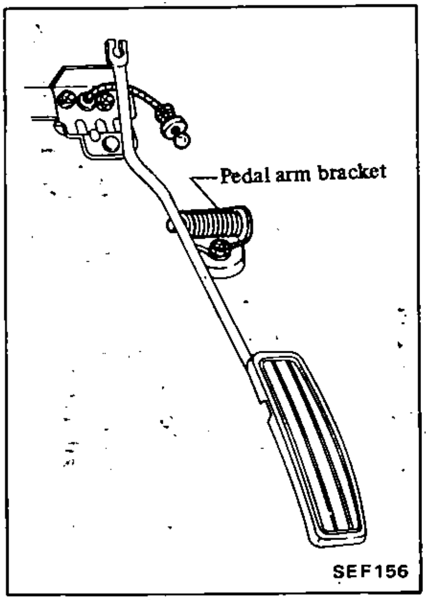
3. Remove pedal stopper bracket, and extract accelerator wire toward passenger compartment.



ACCELERATOR PEDAL

Remove nylon collar, and disconnect accelerator wire from tip of pedal arm.

Then remove pedal arm assembly by removing pedal arm bracket retaining bolts.



INSPECTION

1. Check pedal return spring for rust, fatigue or damage. Replace if necessary.
2. Check accelerator wire, cases, socket and fastening locations for rust, damage or looseness. Repair or replace if necessary.

INSTALLATION

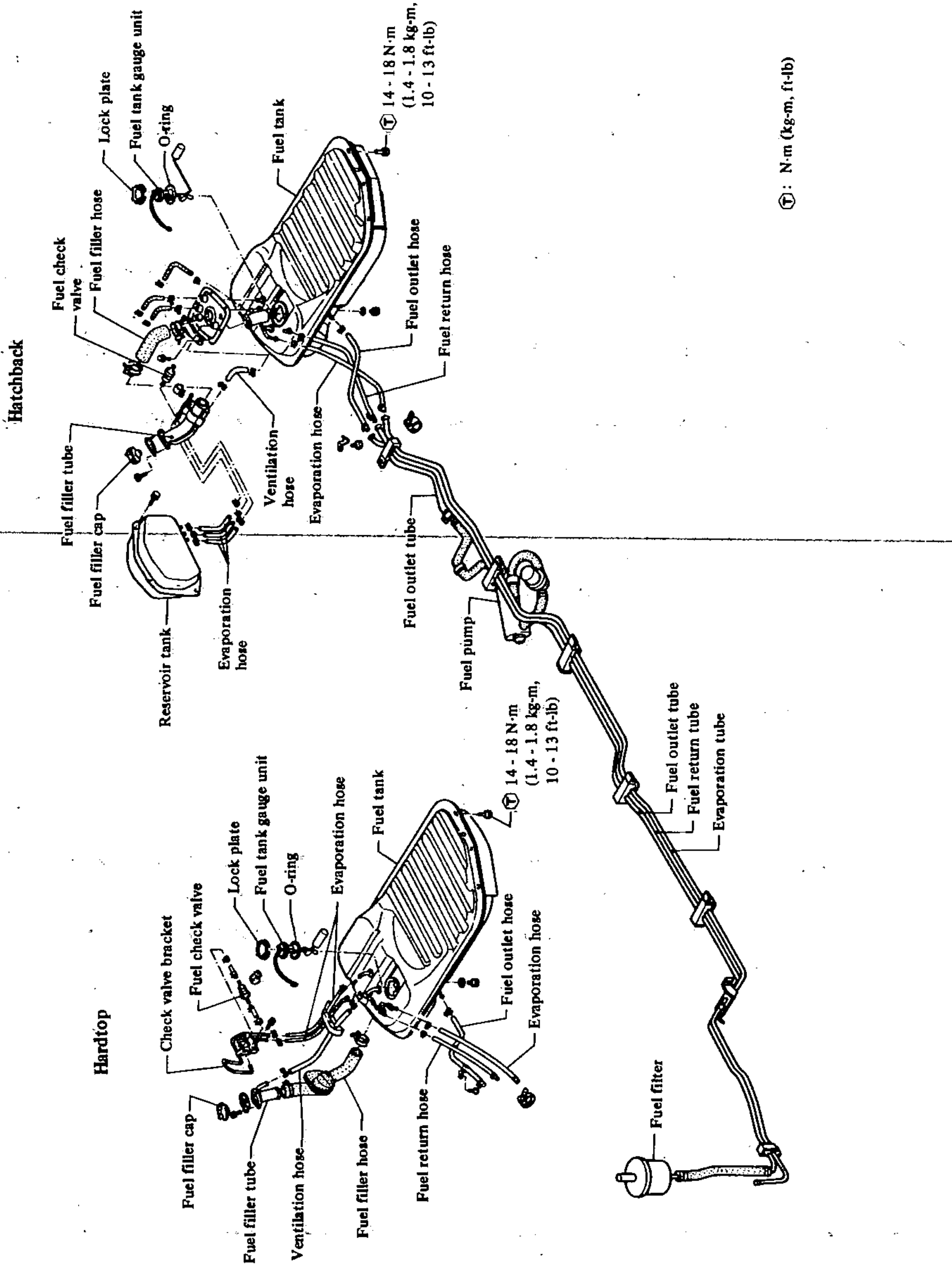
To install, reverse the order of removal.

a. Check accelerator control parts for improper contact with any adjacent parts.

b. When connecting accelerator wire, be careful not to twist or scratch its inner wire.

c. On automatic transmission models, depress accelerator pedal to make sure that kickdown switch turns on when throttle valve is fully open and that push rod moves properly.

FUEL SYSTEM



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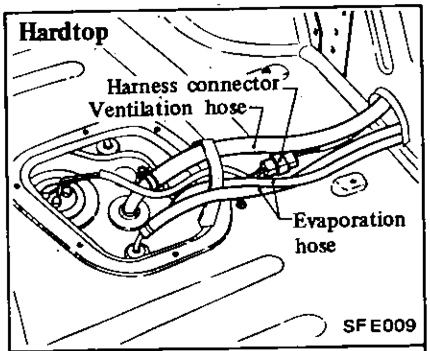
REMOVAL

WARNING:
When replacing fuel line parts, be sure to observe the following:
a. put a "CAUTION: INFLAMMABLE" sign in workshop.
b. Be sure to furnish workshop with an asphyxiator.
c. Be sure to disconnect battery ground cable before conducting operations.
d. Put drained fuel in an explosion-proof container and put on lid securely.

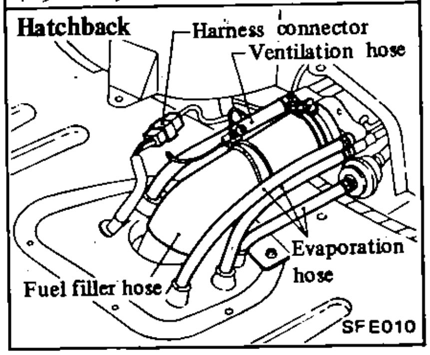
FUEL TANK

1. Remove battery ground cable.
2. Drain fuel from fuel tank.
3. Remove protector from luggage compartment, and then remove the following parts:

- Harness connector for fuel tank gauge unit
- Ventilation hose
- Evaporation hoses
- Fuel filler hose (Hatchback)



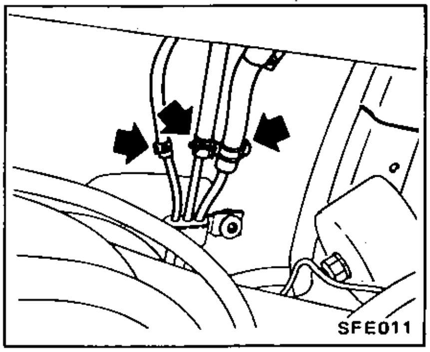
SFE009



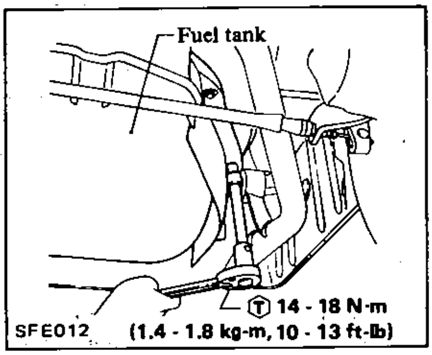
SFE010

4. Remove the following parts from underside of floor.

- Fuel outlet hose
- Fuel return hose
- Evaporation hose
- Fuel filler hose (Hardtop)


SFE011

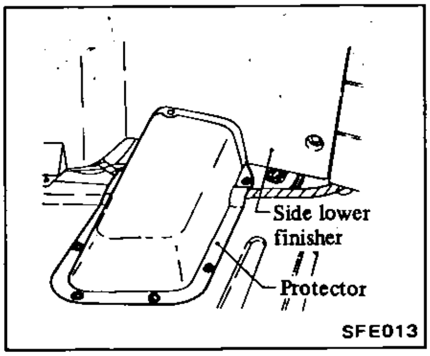
5. Remove bolts which secure fuel tank in place, and dismount fuel tank.



SFE012

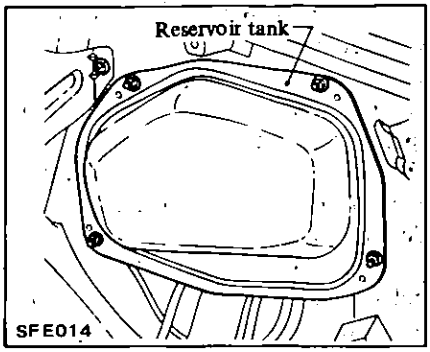
RESERVOIR TANK (Hatchback)

1. Remove battery ground cable.
2. Remove protector from luggage compartment. Also remove R.H. speaker and side lower finisher.



SFE013

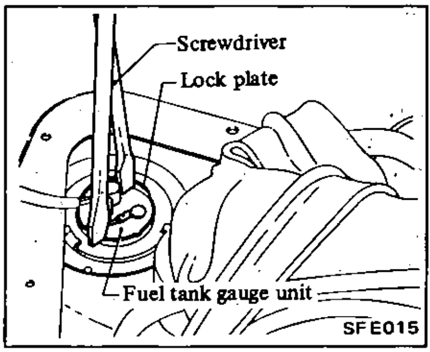
3. Remove evaporation hoses, and then remove reservoir tank.



SFE014

FUEL TANK GAUGE UNIT

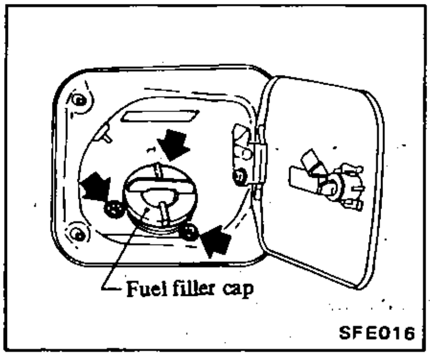
1. Disconnect battery ground cable.
2. Remove protector from luggage compartment, and disconnect harness for fuel tank gauge unit. Also remove rubber grommet.
3. Turn lock plate counterclockwise, and extract fuel tank gauge unit.



SFE015

FUEL FILLER TUBE AND HOSE

1. Disconnect battery ground cable.
2. Drain fuel if fuel overflows when disconnecting both fuel filler tube and hose.
3. Open fuel filler lid, remove fuel filler cap, and remove fuel filler attaching bolt.



SFE016

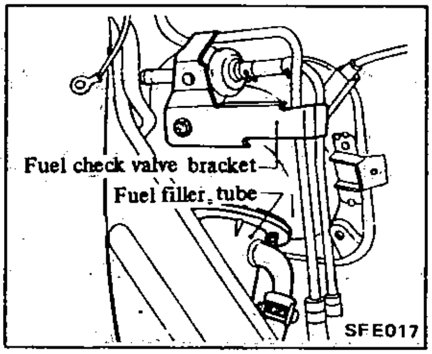
4. Remove fuel filler tube and hose as follows:

- Hardtop

(1) Disconnect fuel filler hose from fuel tank underside of floor.

(2) Remove protectors from luggage compartment, and disconnect ventilation hose.

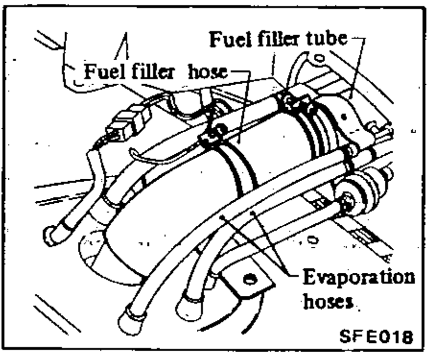
Remove fuel check valve bracket, and then extract both fuel filler tube and hose.



SFE017

- Hatchback

Remove protectors from luggage compartment. Also remove rear speaker and side lower finisher from right side of luggage compartment. Disconnect evaporation hoses, ventilation hose and fuel filler hose from fuel tank, and then remove fuel filler tube and hose.

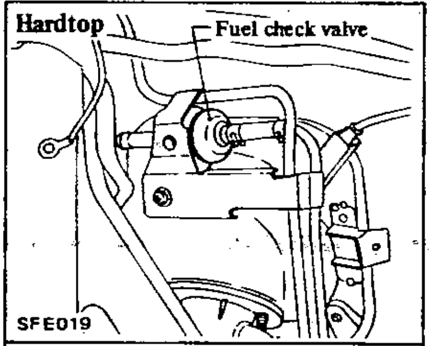


SFE018

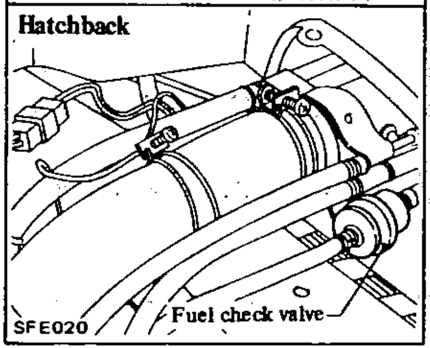
FUEL CHECK VALVE

Remove fuel check valve as follows:

Remove protectors from luggage compartment. Disconnect fuel check valve from evaporation hose.



SFE019



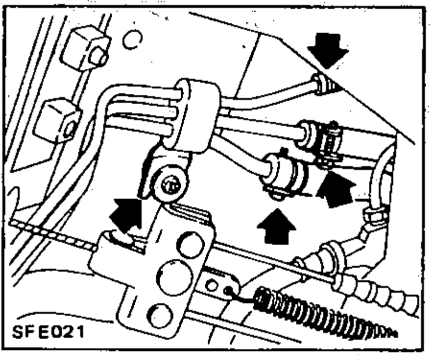
SFE020

FUEL TUBE

Fuel tubes are serviced as an assembly. However, do not disconnect any fuel line unless absolutely necessary.

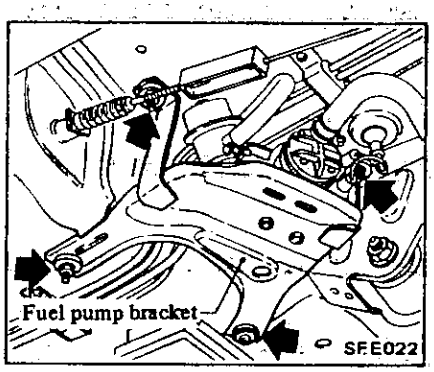
1. Disconnect battery ground cable.
2. Drain fuel from fuel tank.
3. Loosen fuel hose clamps and disconnect fuel tube at each end.

Plug hose and tube openings to prevent entry of dust or dirt while removing.



SFE021

4. Remove fuel tube clamps and fuel pump bracket from underbody. Remove fuel tubes and fuel pump as an assembly. Leave brake tube on underbody.



SFE022

FUEL PUMP, DAMPER AND FILTER

Refer to Section EF.

INSPECTION

FUEL TANK

Check fuel tank for cracks or deformation. If necessary, replace.

FUEL TANK GAUGE UNIT

Refer to Fuel Tank Gauge Unit for inspection (Section EL).

FUEL FILLER TUBE AND HOSE

Inspect all hoses and tubes for cracks, fatigue, sweating or deterioration.

Replace any hose or tube that is damaged.

FUEL CHECK VALVE

Refer to Fuel Check Valve for inspection (Section EC).

FUEL TUBE

Replace any fuel tube that is cracked, rusted, collapsed or deformed.

FUEL PUMP, FUEL DAMPER AND FUEL FILTER

Refer to Fuel Pump, Fuel Damper and Fuel Filter for component parts inspection (Section EF).

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).

Ⓣ : Fuel tank retaining bolt
14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)

a. Install hose clamps securely. Do not tighten excessively to avoid damaging hoses.

b. Fasten fuel tube clamps on underbody securely. Failure to follow this caution could result in damage to the surface of fuel tube.

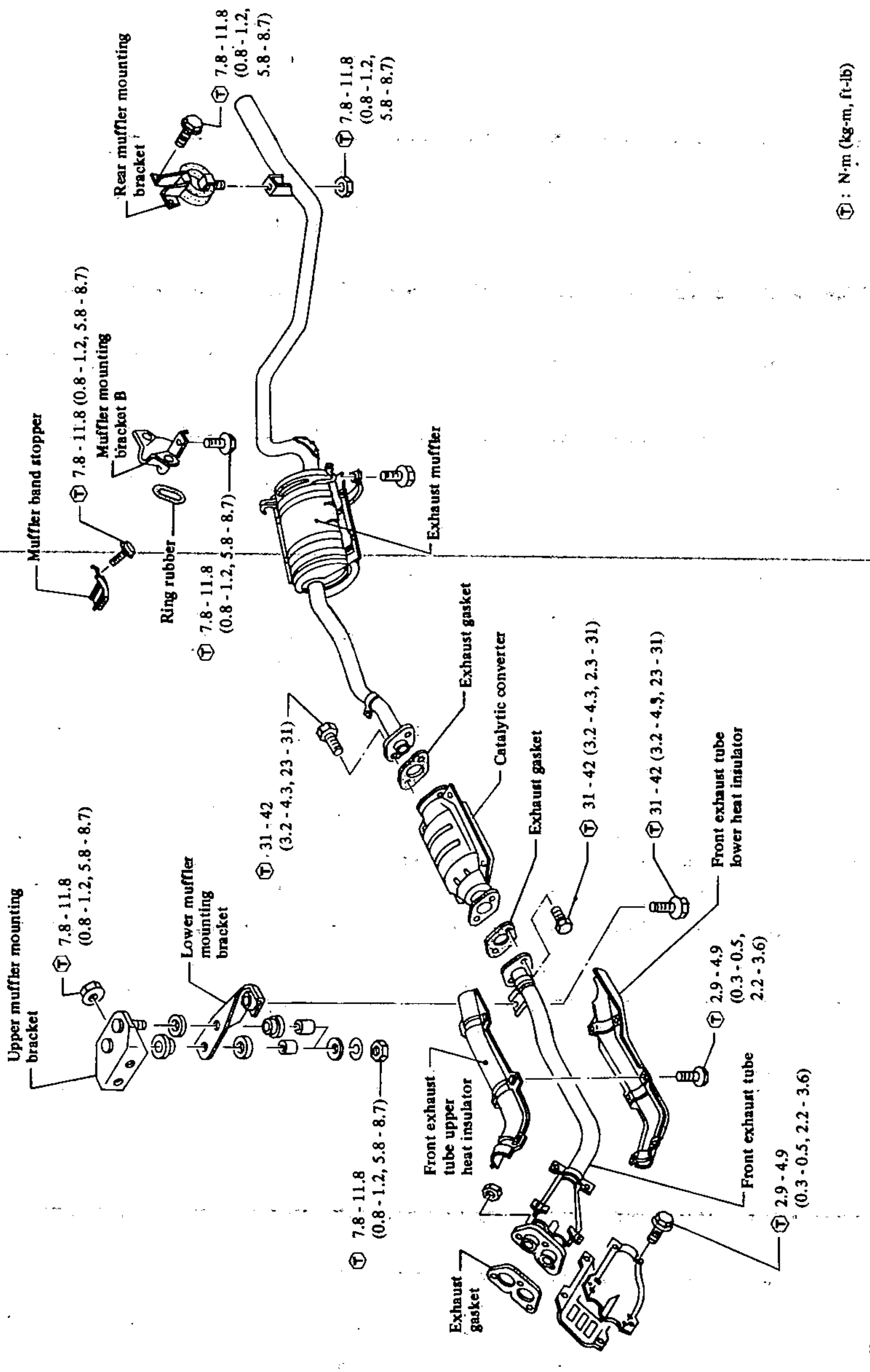
c. Do not kink or twist hose and tube when they are routed.

d. Run the engine and check for leaks at connections.

e. Fuel tank
Install fuel filler hose after fuel tank has been mounted in place. Failure to follow this rule could result in leakage from around hose connections. Do not twist or smash ventilation and evaporation hoses when they are routed. Be sure to retain them with clips securely.

f. Fuel tank gauge unit
When installing fuel tank gauge unit, align the projection of fuel tank gauge unit with the notch in fuel tank and tighten it securely. Be sure to install fuel tank gauge unit with O-ring in place.

EXHAUST SYSTEM

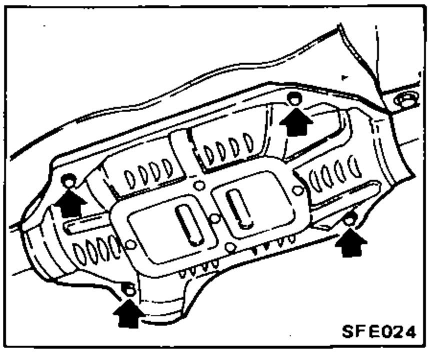


SFE023

REMOVAL

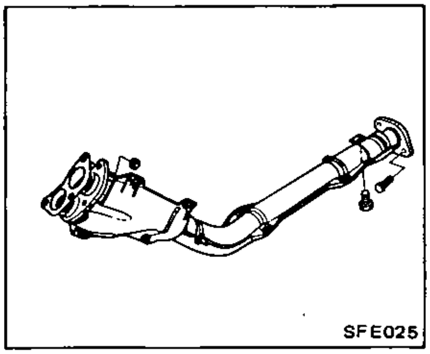
FRONT TUBE

1. Remove catalytic converter lower shelter.



SFE024

2. Remove bolts or nuts attaching front exhaust tube to exhaust manifold and front tube mounting bracket. Front tube can then be removed.



SFE025

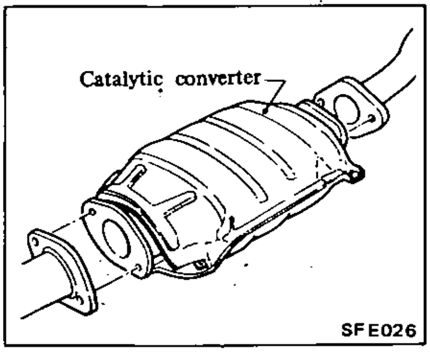
CATALYTIC CONVERTER

Remove catalytic converter lower shelter and remove catalytic converter.

CAUTION:

a. Be careful not to damage catalytic converter when handling.

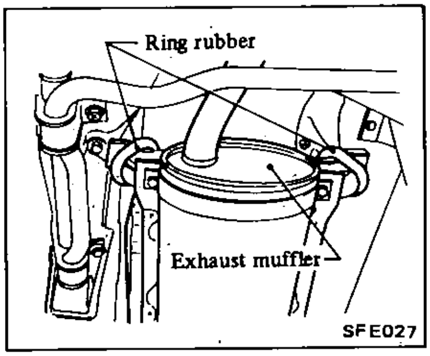
b. Never wet catalytic converter with water, oil, etc.



SFE026

EXHAUST MUFFLER

1. Lift up car with a frame hoist.
2. Remove catalytic converter lower shelter.
3. Remove bolts attaching exhaust muffler to catalytic converter; remove rear muffler mounting nut and rubber rings. Dismount exhaust muffler through underbody and rear axle case.



SFE027

INSPECTION

1. Check muffler and tubes for cracks, damage or corrosion.

Replace any parts that is damaged beyond limits.

2. Replace bracket and hanger rubber parts that are cracked, fatigued or sweated.

INSTALLATION

Install the exhaust system parts in the reverse order of removal.

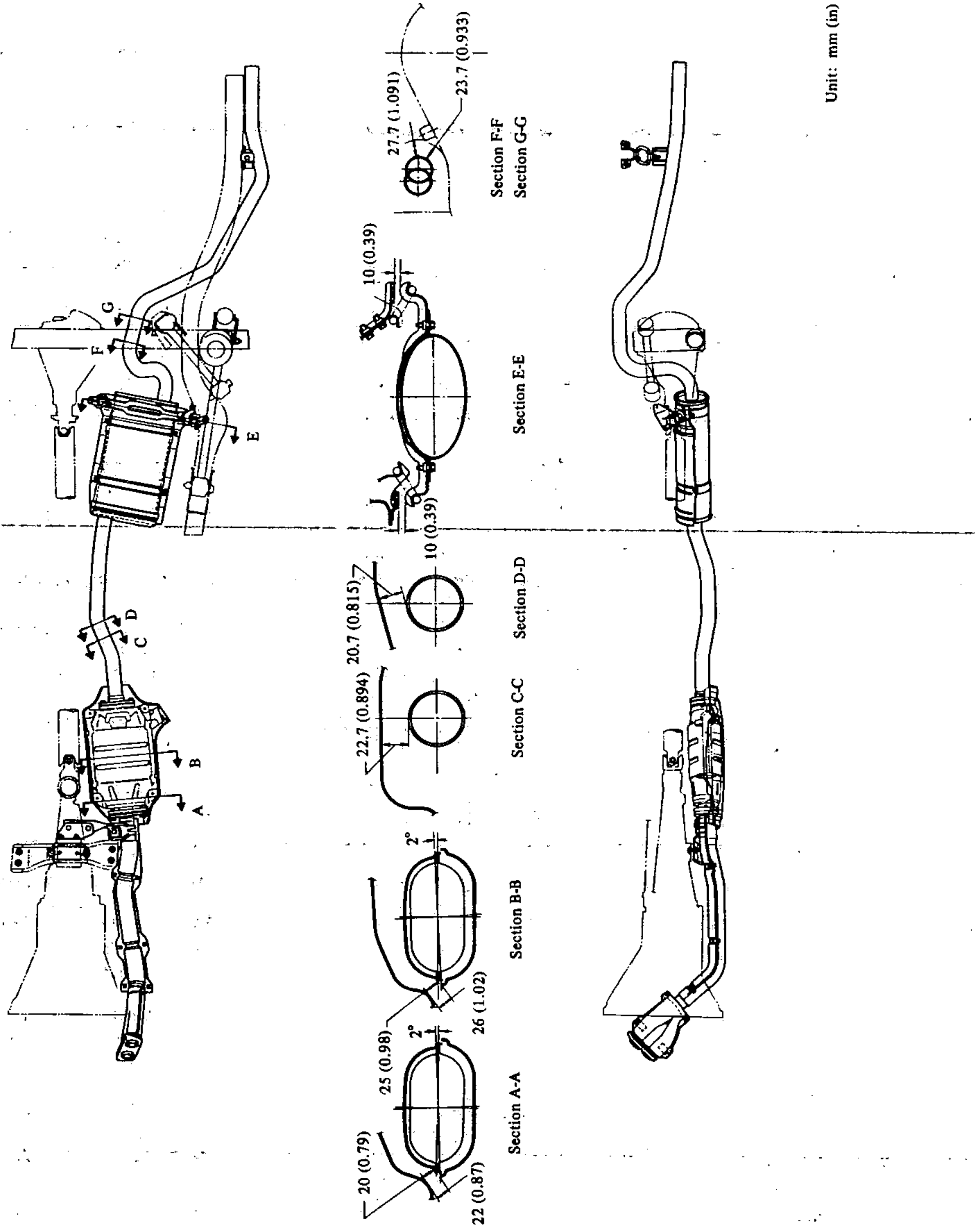
Ⓣ : Exhaust manifold to front tube nuts
26 - 31 N·m
(2.7 - 3.2 kg-m,
20 - 23 ft-lb)
Front tube mounting bracket nuts
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Catalytic converter attching bolts
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)
Rear muffler mounting insulator nut
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Muffler band stopper attaching bolts
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Muffler mounting bracket B
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Heat shield plate securing bolts
2.9 - 4.9 N·m
(0.3 - 0.5 kg-m,
2.2 - 3.6 ft-lb)

a. Keep sufficient clearance between exhaust system components and underbody adjacent parts.

b. Replace gaskets for catalytic converter and for front tube with new one when removed.

c. After installation, check that mounting brackets and mounting rubbers are free from undue stress. If any of the above parts is not installed properly, excessive noises or vibrations may be transmitted to the car body.

d. With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.


Unit: mm (in)
A
B
C
D
E
F
G
Section F-F
Section G-G
27.7 (1.091)
23.7 (0.933)
10 (0.39)
10 (0.39)
Section E-E
20.7 (0.815)
Section D-D
22.7 (0.894)
Section C-C
2°
26 (1.02)
Section B-B
25 (0.98)
2°
20 (0.79)
22 (0.87)
Section A-A

SFE028

SECTION CL

CLUTCH

CONTENTS

Refer to Section MA (Clutch) for:

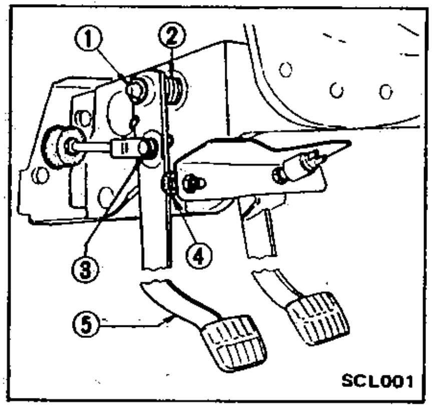
- CHECKING CLUTCH PEDAL HEIGHT AND FREE PLAY

HYDRAULIC CLUTCH CONTROL

CLUTCH PEDAL

REMOVAL

1. Remove instrument lower cover.
2. Pry off snap pin and take out clevis pin.



1 : E-ring
2 Return spring
3 Clevis pin
4 Stopper bolt
5 Clutch pedal

3. Remove stopper bolt.
4. Remove E-ring on fulcrum pin, then remove clutch pedal and return spring.

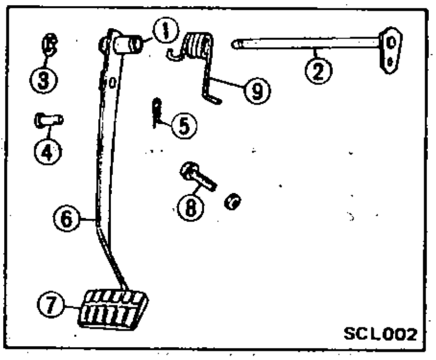
INSPECTION

Inspect the following parts: If abnormalities are found, repair or replace the affected parts.

1. Clutch pedal bushing ① at boss, fulcrum pin ② and E-ring ③ for wear, deformation or damage.

Bushing is press-fitted. If it shows sign of abnormality, replace pedal assembly.

2. Clevis pin ④ for wear or damage, and snap pin ⑤ for any deformation.
3. Pedal ⑥, pedal pad ⑦ and pedal stopper ⑧ (or clutch switch) for deformation or damage.
4. Return spring ⑨ for fatigue or damage.

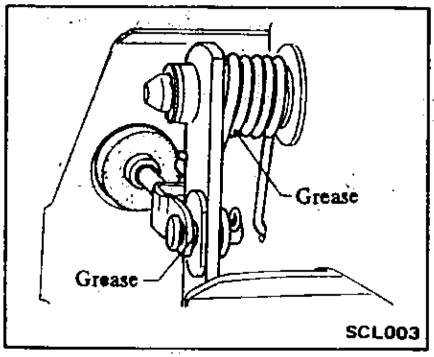


INSTALLATION

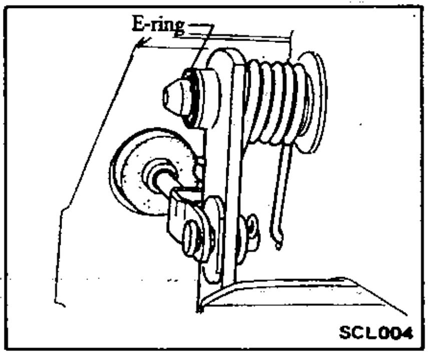
1. Install clutch pedal in reverse order of removal.

Observe following:

a. Apply grease to boss of clutch pedal, return spring and fulcrum pin.



b. Firmly attach E-ring to fulcrum pin.



c. Install clevis pin on the left of clutch pedal and attach snap pin securely.

d. Install return spring as shown in bottom Figure on this page.

2. After assembly, adjust clutch pedal height and free play.

Refer to Checking Clutch Pedal Height and Free Play (Section MA).

Ⓣ : Pedal stopper lock nut
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)

CLUTCH MASTER CYLINDER

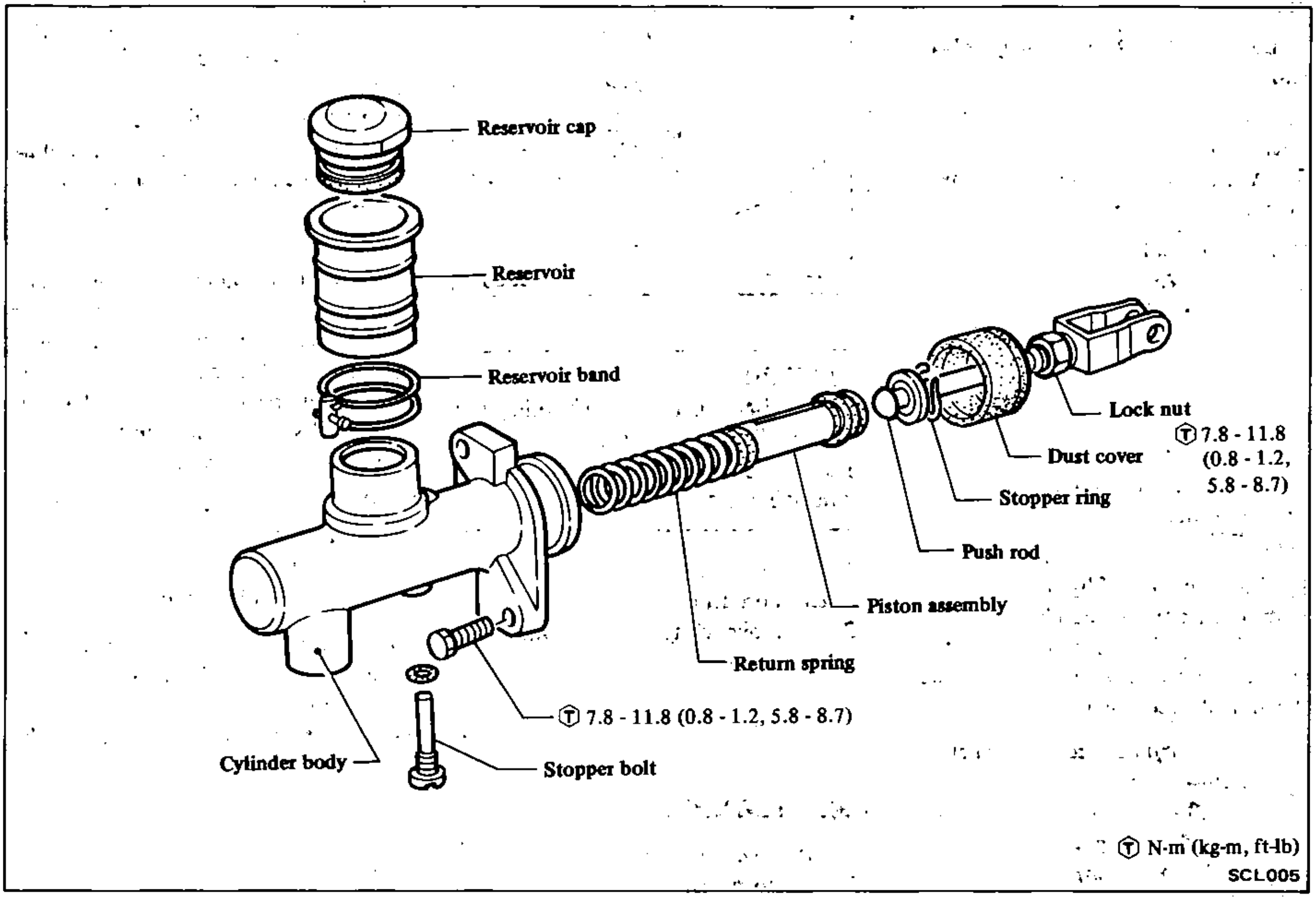
REMOVAL

1. Remove snap pin from clevis pin.
2. Pull out clevis pin.
3. Disconnect clutch tube.
4. Remove master cylinder.

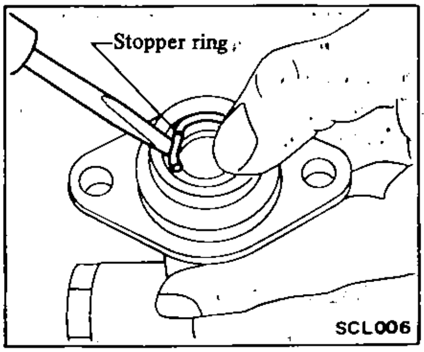
When disconnecting clutch tube, be sure to receive draining clutch fluid into a container. Use of rags is also suggested to keep adjacent parts and area clean.

CAUTION:
When disconnecting clutch tube, use suitable flare nut wrench.
Never use an open end wrench or adjustable wrench.

DISASSEMBLY



1. Remove dust cover and take off stopper ring.



2. Then, the push rod and stopper can be taken out.
3. Loosen stopper bolt and take it out.
4. The piston, spring seat, and return spring can be taken out.

Discard piston cup and dust cover.

CAUTION:
Never detach reservoir. If it is removed for any reason, discard it and install new one.

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 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 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

1. Apply grease to cylinder body, sliding part and piston cup.

2. Install piston assembly to cylinder body.

Be careful not to damage piston cup.

4. Make sure that master cylinder operates normally.
5. Make sure that piston can move maximum stroke smoothly.

Ⓣ : Stopper bolt
1.5 - 2.9 N·m
(0.15 - 0.3 kg-m,
1.1 - 2.2 ft-lb)

INSTALLATION

Install clutch master cylinder in reverse order of removal. Observe following:

1. Bleed air out of hydraulic system. Refer to Bleeding Clutch System.
2. Adjust pedal height and pedal free play. Refer to Checking Clutch Pedal Height and Free Play (Section MA).

Ⓣ : Master cylinder to dash panel securing nut
7.8 - 11.8 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Clutch tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
Push rod lock nut
7.8 - 11.8 N·m,
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)

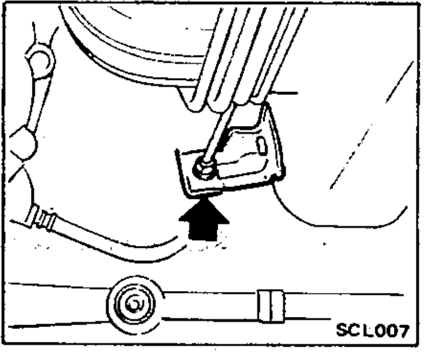
CAUTION:
When connecting clutch tube, use Tool GG94310000.

When tightening flare nut, hold pipe by hand to prevent it from twisting.

OPERATING CYLINDER

REMOVAL

1. Loosen clutch tube flare nut 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.

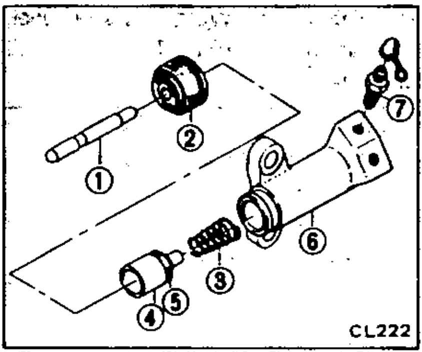
2. Remove lock spring, then disengage hose from bracket.
3. Remove clutch hose from operating cylinder.
4. Remove operating cylinder.

DISASSEMBLY

1. Remove dust cover and push rod.
2. Remove piston and piston cup as an assembly.

Discard piston cup and dust cover.

3. Remove bleeder screw.



1	Push rod	5	Piston cup
2	Dust cover	6	Operating cylinder
3	Piston spring	7	Bleeder screw
4	Piston		

INSPECTION

Visually inspect all disassembled parts and replace parts which are worn or damage.

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 condition of piston cup and dust cover. Always replace them after disassembly.
4. Check bleeder hole to be sure that it is clean.

ASSEMBLY

Assemble operating cylinder in reverse order of disassembly. Observe 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.
2. Dip cylinder and piston in clean brake fluid before assembly.

INSTALLATION

Install operating cylinder in reverse order of removal. Observe following:

Bleed air thoroughly from clutch hydraulic system. Refer to Bleeding Clutch System.

a. 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.

b. Exercise care not to warp or twist clutch hose: Be sure to install clutch hose away from exhaust tube.

c. When tightening flare nut, hold pipe by hand to prevent it from twisting.

CAUTION:
When connecting clutch tube, use Tool 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
17 - 21 N·m
(1.7 - 2.1 kg-m,
12 - 15 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. Install clutch tube.

(1) Connect clutch tube to master cylinder with flare nut.
(2) Fix clutch tube to dash panel with clamp.
(3) Then tighten flare nut.

Ⓣ : **Clutch hose to master cylinder**
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.

Use new gasket.

Ⓣ : **Clutch hose to operating cylinder**
17 - 21 N·m
(1.7 - 2.1 kg-m,
12 - 15 ft-lb)

3. Engage opposite end of hose with bracket. Install lock spring fixing hose to bracket.

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.

Ⓣ : **Flare nut**
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)

5. Check distance between clutch line and adjacent parts (especially between hose and exhaust tube).
6. Bleed air out of hydraulic system.

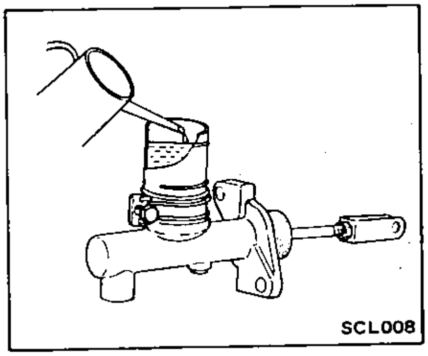
Refer to Bleeding Clutch System for adjustment.

CAUTION:
When tightening flare nut, use Tool GG94310000.

BLEEDING CLUTCH SYSTEM

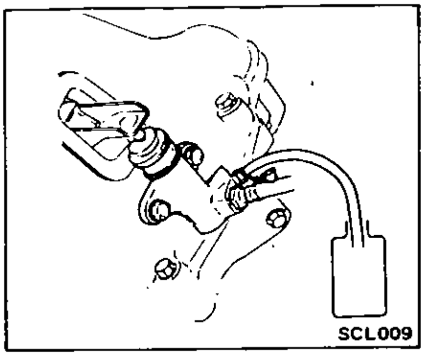
The hydraulic clutch system must be bled whenever clutch line has been disconnected or air has entered it.

1. Remove cap of reservoir and top up with recommended brake fluid.

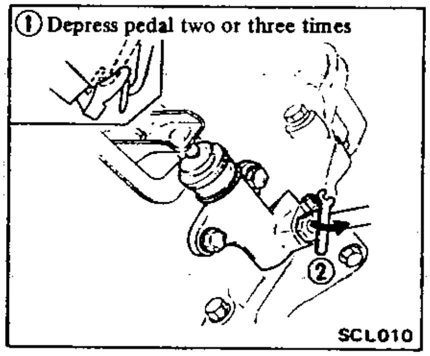

SCL008

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.


SCL009

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.

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. Add brake fluid to reservoir only up to the specified level. Do not overfill.

CAUTION:

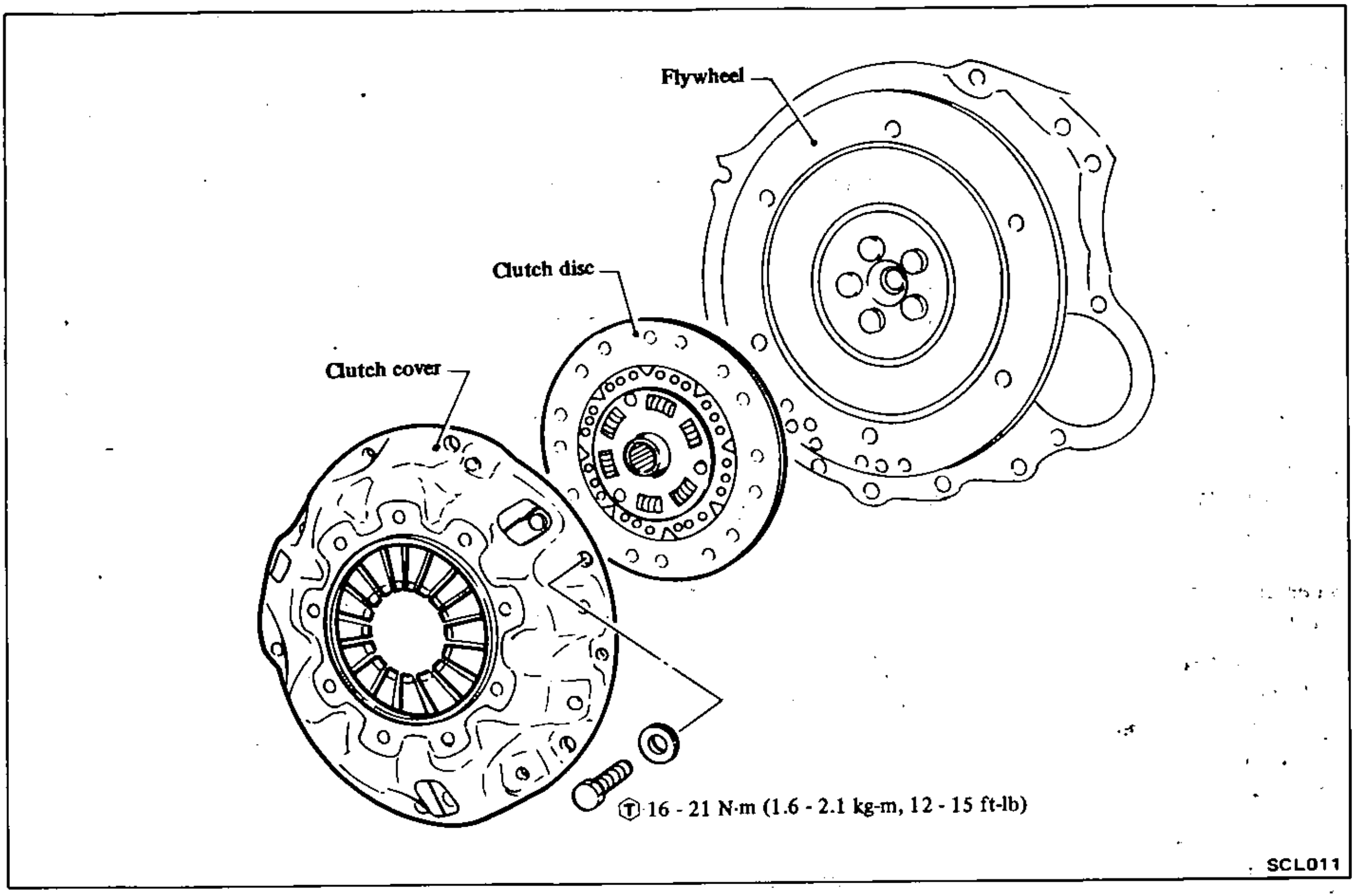
a. Do not re-use brake fluid drained during bleeding operation.

b. Exercise care not to splash brake fluid on exterior finish as it will damage the paint.

c. When tightening flare nut, use Tool GG94310000.

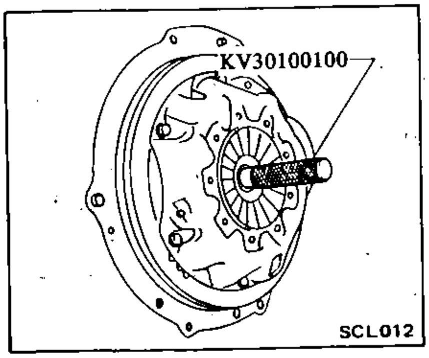
CLUTCH UNIT

CLUTCH DISC AND COVER

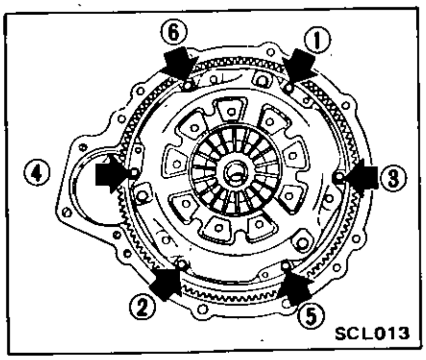


REMOVAL

1. Remove transmission from engine. Refer to Removal (Section MT).
2. Insert Tool into clutch disc hub.



3. Loosen bolts attaching clutch cover to flywheel, one turn each at a time, until spring pressure is released. Be sure to turn them out in a crisscross fashion.



4. Remove clutch disc and cover assembly.

INSPECTION

Wash all disassembled parts except disc assembly in suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.

Flywheel and pressure plate

Check friction surface of flywheel and pressure plate for scoring or roughness. Slight roughness may be smoothed by using fine emery cloth. If surface is deeply scored or grooved, the part should be replaced.

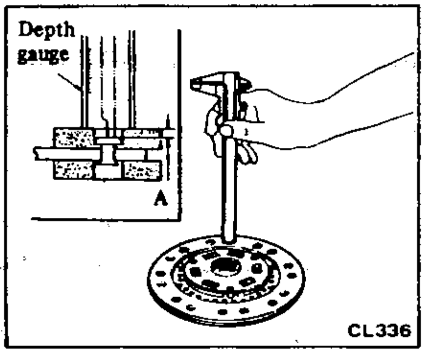
Clutch disc assembly

Inspect clutch disc for worn or oily facings, loose rivets and broken or loose torsional springs.

1. If facings are oily, disc should be replaced. In this case, inspect transmission 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)

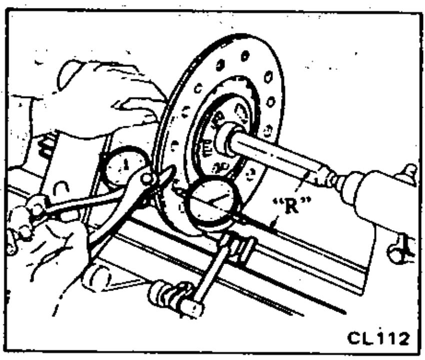


CL336

3. Check disc plate for runout whenever the old disc or a new one is installed.
4. If runout exceeds the specified value at outer circumference of facing, replace or repair disc.

Runout limit:
(total indicator reading)
Less than 0.5 mm (0.020 in)
"R" (from hub center):
95 mm (3.74 in)

CAUTION:
When repairing disc plate, never hold it forcibly with pliers or bend it excessively; otherwise facing will be damaged.



CL112

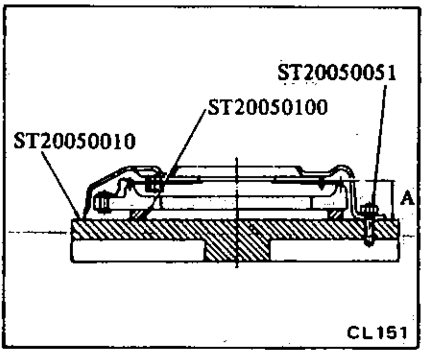
5. Check fit of disc hub on transmission main drive gear splines for smooth sliding. If splines are worn, clutch disc or main drive gear should be replaced; that is, backlash exceeds the specified value at outer edge of clutch disc.

Backlash:
Less than 0.4 mm (0.016 in)

Clutch cover assembly

1. Check end surface of diaphragm spring for wear. If excessive wear is found, replace clutch cover assembly.
2. Measure height of diaphragm springs as outlined below:

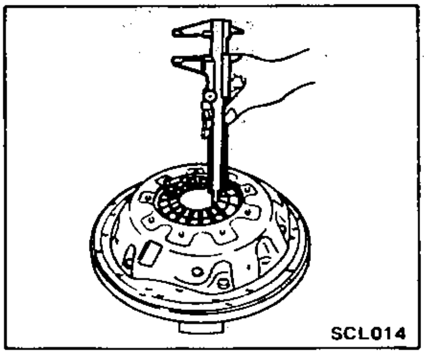
(1) Place Tool ST20050100 on Tool ST20050010 and then tighten clutch cover assembly on base plate by using Tool ST20050051.



CL151

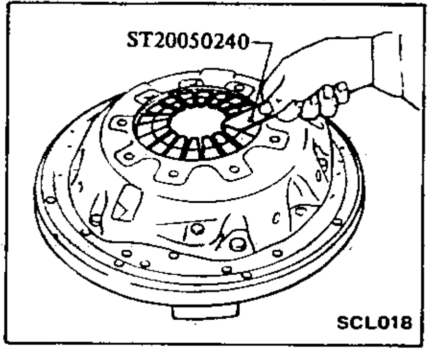
(2) Measure height "A" at several points with a vernier caliper depth gauge.

Diaphragm spring height "A":
31.6 - 33.6 mm
(1.244 - 1.323 in)



SCL014

If height "A" of spring end is beyond specified value, adjust spring height with Tool ST20050240. If necessary, replace clutch cover assembly.



SCL018

Also, unevenness of diaphragm spring toe height should be within the specified limit.

Unevenness of diaphragm spring toe height:
Less than 0.5 mm (0.020 in)

If unevenness of diaphragm spring toe height is beyond specified value, adjust spring height with Tool ST20050240.

3. Inspect thrust rings for wear or damage. As these parts are invisible from outside, shake cover assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replacement as a complete assembly.

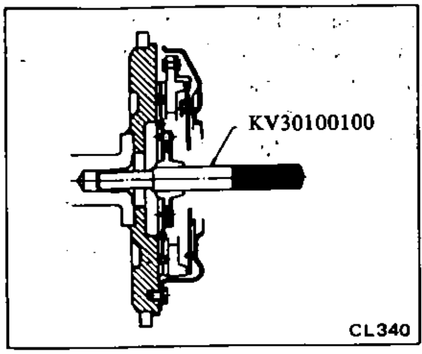
INSTALLATION

1. Apply a light coat of 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.

Take special care to prevent grease or oil from getting on clutch facing.

2. Reinstall clutch disc and clutch cover assembly. Support clutch disc and cover assemblies with Tool KV30100100.

Be sure to keep disc facings, flywheel and pressure plate clean and dry.



CL340

3. Install clutch cover assembly. Each bolt should be tightened one turn at a time in a crisscross fashion.

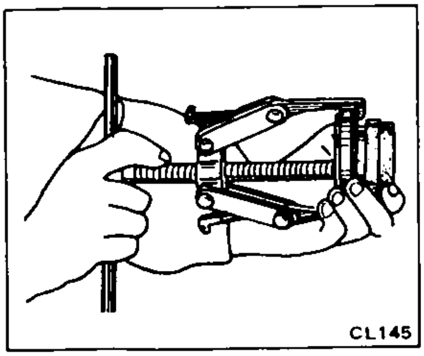
Ⓣ : **Clutch cover bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

4. Remove clutch aligning bar.
5. Reinstall transmission. Refer to Installation (Section MT).

RELEASE BEARING

REMOVAL

1. Remove transmission from engine. Refer to Removal (Section MT).
2. Disconnect holder 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

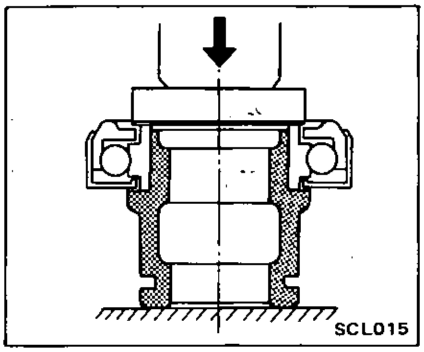
INSPECTION

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.

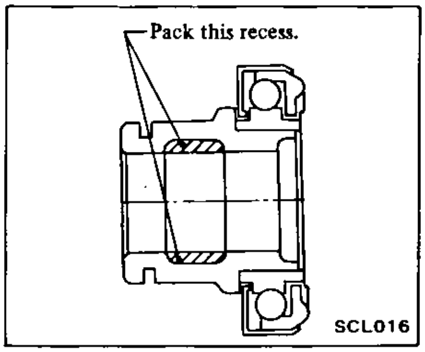


SCL015

Do not depress outer race.

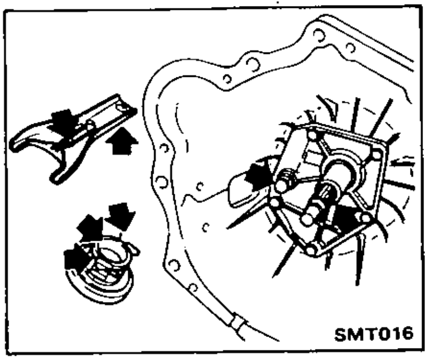
2. Before or during assembly, lubricate the following points with a light coat of multi-purpose grease.

(1) Inner groove of release bearing sleeve.



SCL016

(2) Contact surfaces of withdrawal lever, lever ball pin and bearing sleeve.
(3) Bearing sleeve sliding surface of transmission case front cover.

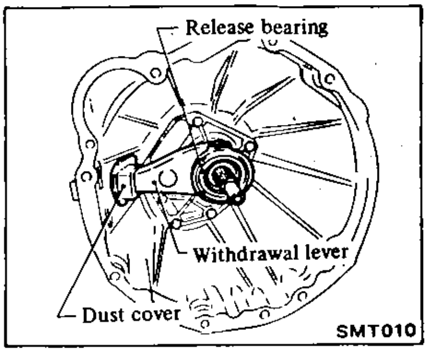


SMT016

(4) Transmission main drive gear splines. (Use grease including molybdenum disulphide.)

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 holder spring.



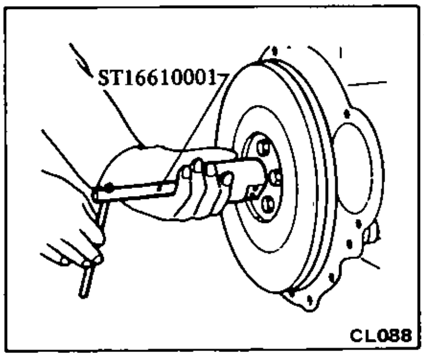
SMT010

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.
3. Remove pilot bushing in crankshaft with Tool.



CL088

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.

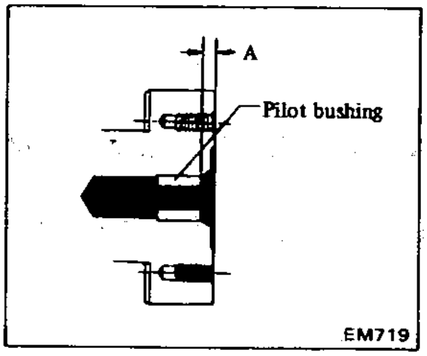
INSTALLATION

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

Distance "A":
4.0 mm (0.157 in)

Do not oil bushing.

When inserting pilot bushing, be careful not to damage edge of pilot bushing.



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

GENERAL SPECIFICATIONS

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic

CLUTCH MASTER CYLINDER

Inner diameter mm (in)	15.88 (5/8)

CLUTCH OPERATING CYLINDER

Type	Non-adjustable
Inner diameter mm (in)	17.46 (11/16)

CLUTCH DISC

Type	200CBL
Facing size Outer dia. x Inner dia. x Thickness mm (in)	200 x 130 x 3.5 (7.87 x 5.12 x 0.138)
Thickness of disc assembly Free mm (in) Installed mm (in)	 8.50 - 9.20 (0.3346 - 0.3622) 7.6 - 8.0 (0.299 - 0.315)
Number of torsion springs	6

CLUTCH COVER

Type	C200S
Full load N (kg, lb)	3,923 (400, 882)

INSPECTION AND ADJUSTMENT

CLUTCH PEDAL

Pedal height "H" mm (in)	168 - 174 (6.61 - 6.85)
Pedal free play "A" mm (in)	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)

Model	200CBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit	0.5 (0.020)
Distance of runout checking point (from the hub center)	95 (3.74)
Maximum backlash of spline (at outer edge of disc)	0.4 (0.016)

CLUTCH COVER

Unit: mm (in)

Model	C200S
Diaphragm spring height	31.6 - 33.6 (1.244 - 1.323)
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 bolt lock nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Master cylinder push rod lock nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Master cylinder stopper bolt	1.5 - 2.9	0.15 - 0.3	1.1 - 2.2
Master cylinder securing nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Clutch tube flare nut	15 - 18	1.5 - 1.8	11 - 13
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
Operating cylinder securing bolt	30 - 40	3.1 - 4.1	22 - 30
Clutch hose to operating cylinder securing nut	17 - 21	1.7 - 2.1	12 - 15
Clutch cover securing bolt	16 - 21	1.6 - 2.1	12 - 15

TROUBLE DIAGNOSES AND CORRECTIONS

CLUTCH SLIP

Slipping of clutch may be noticeable when any of the following symptoms is encountered during operation.

(1) Car will not respond to engine speed during acceleration.
(2) Insufficient car speed.
(3) Lack of power during uphill driving.
(4) Increasing of fuel consumption.

Some of the above conditions may also be attributable to engine problem. First determine whether engine or clutch is causing the problem.

If slipping clutch is left unheeded, wear and/or overheating will occur on clutch facing to such an extent that it is no longer serviceable.

TO TEST FOR SLIPPING CLUTCH, proceed as follows:

Inspection

Insure that parking brake is engaged. Disengage clutch and shift transmission gears into TOP. Gradually increase engine speed while simultaneously engaging clutch. If engine stops while clutch is being engaged, clutch is functioning properly. If car does not move and the engine does not stop, clutch is slipping.

Probable cause	Corrective action
• Clutch facing hardened or wet with oil	Repair or replace
• Clutch facing excessively worn	Replace (Replace if engine/ transmission oil seal is faulty)
• Diaphragm spring weak or damaged	Replace
• Flywheel or pressure plate warped	Repair or replace
• Particles in return port of master cylinder; Piston fails to return to its original position	Clean or replace faulty parts
• Clutch tube deformed or crushed	Replace

CLUTCH DRAGS

Dragging clutch is particularly noticeable when shifting gears, especially into low gear.

TO TEST FOR DRAGGING CLUTCH, proceed to inspection.

Inspection

Disengage clutch and shift gears into Reverse. Shift gears into Neutral, gradually increasing engine speed. After a short intermission, shift gears into Reverse. If noise is heard while gears are being shifted, clutch is dragging.

Probable cause	Corrective action
• Clutch disc hub splines worn or rusted	Replace (or remove rust) and coat with grease
• Oil leakage at master cylinder, operating cylinder, tube or hose	Replace faulty parts
• Air in hydraulic system	Bleed air
• Insufficient pedal stroke	Adjust
• Clutch disc runout or warped	Replace
• Diaphragm spring fatigued	Replace
• Piston cup deformed or damaged	Replace
• Lack of grease on pilot bushing	Coat with grease
• Clutch facing wet with oil	Replace (Replace if engine/transmission oil seal is faulty)

CLUTCH CHATTERS

Clutch chattering is usually noticeable when car is just rolled off with clutch partially engaged.

Probable cause	Corrective action
• Oil on clutch facing	Replace
• Diaphragm spring fatigued	Replace
• Clutch facing hardened	Replace
• Clutch facing warped	Repair or replace
• Pressure plate worn or warped	Replace
• Engine mounting loose or rubber deteriorated	Tighten or replace
• Clutch facing rivets loose	Replace

NOISY CLUTCH

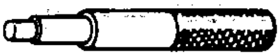
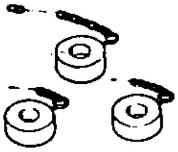
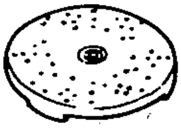
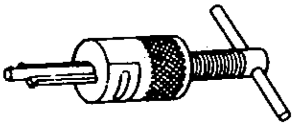
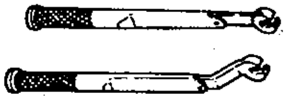
Probable cause	Corrective action
• Release bearing/sleeve damaged or improperly lubricated	Replace
• Pilot bushing worn, jammed or damaged	Replace
• Clutch facing rivets loose	Replace
• Disc plate cracked	Replace
• Clutch disc torsion springs fatigued	Replace

RABBIT-HOPPING CLUTCH

When "rabbit-hopping" of clutch occurs, car will not roll off smoothly from a standing start or clutch will be engaged before clutch pedal is fully depressed.

Probable cause	Corrective action
• Oil on clutch facing	Replace
• Clutch facing worn or rivets loose	Replace
• Flywheel/pressure plate warped or worn	Replace
• Mounting bolts on engine or power train loose	Tighten
• Diaphragm spring fatigued	Replace

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV30100100 (–)	Clutch aligning bar 
ST20050100 (–)	Distance piece 
ST20050010 (–)	Base plate 
ST20050051 (–)	Set bolt 
ST20050240 (–)	Diaphragm spring adjusting wrench 
ST16610001 (J23907)	Pilot bushing puller 
GG94310000 (–)	Flare nut torque wrench 

DATSUN 200SX Model S110 Series

SECTION MT

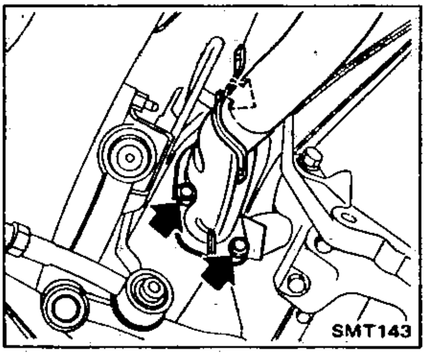
MANUAL TRANSMISSION

CONTENTS

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect battery ground cable.
2. Remove accelerator linkage.
3. Jack up car and support its weight on safety stands. Use a hydraulic hoist or open pit, if available.
   Make sure that safety is insured.
4. Disconnect front exhaust tube.


SMT143

5. Disconnect wires from reverse (back-up) lamp, Top and O.D. gear (if so equipped) switches.
6. Disconnect speedometer cable.
7. Remove propeller shaft.
   Refer to Propeller Shaft (Section PD) for removal.

Plug up opening in rear extension to prevent oil from flowing out.

8. Remove clutch operating cylinder.
9. Support engine by placing a jack under oil pan with a wooden block used between oil pan and jack.

CAUTION:
Do not place jack under oil pan drain plug.

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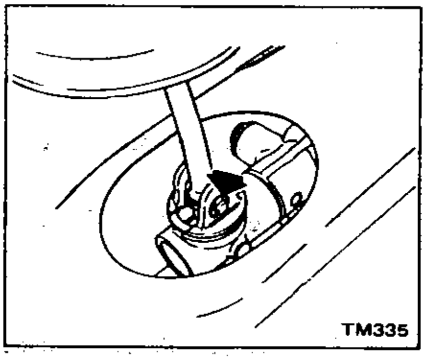
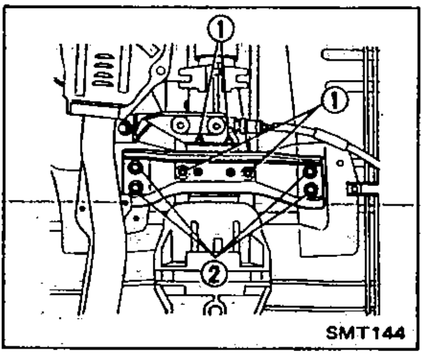
10. Support transmission with a transmission jack.
11.
(1) Remove console box. Refer to Console Box (Section BF) for removal.
(2) Place transmission control lever in neutral position and remove E-ring and control lever.


TM335

12. Loosen rear engine mount securing nuts ① temporarily and remove crossmember mounting nuts ② .



SMT144

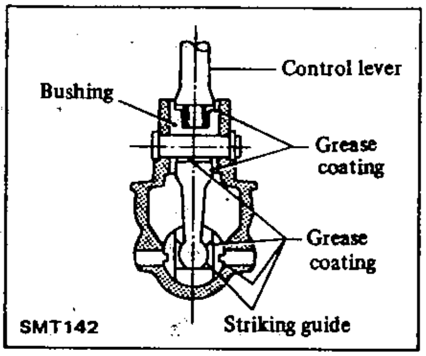
13. Remove starter motor.
14. Remove bolts securing transmission to engine.
    Then support the engine and transmission with jacks, and slide transmission rearward away from engine and remove from the car.

CAUTION:
Take care in dismounting transmission not to strike any adjacent parts and main drive gear.

INSTALLATION

Install the transmission in 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. When installing control lever, be sure to apply multi-purpose grease to sliding parts as shown below.



SMT142

4. Remove filler plug and fill transmission with recommended gear oil to the level of the plug hole.

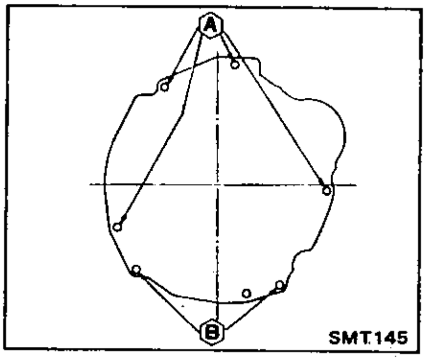
Oil capacity:
2.0 liters
(4-1/4 US pt, 3-1/2 Imp pt)

5. 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)

6. Tighten bolts securing transmission to engine.

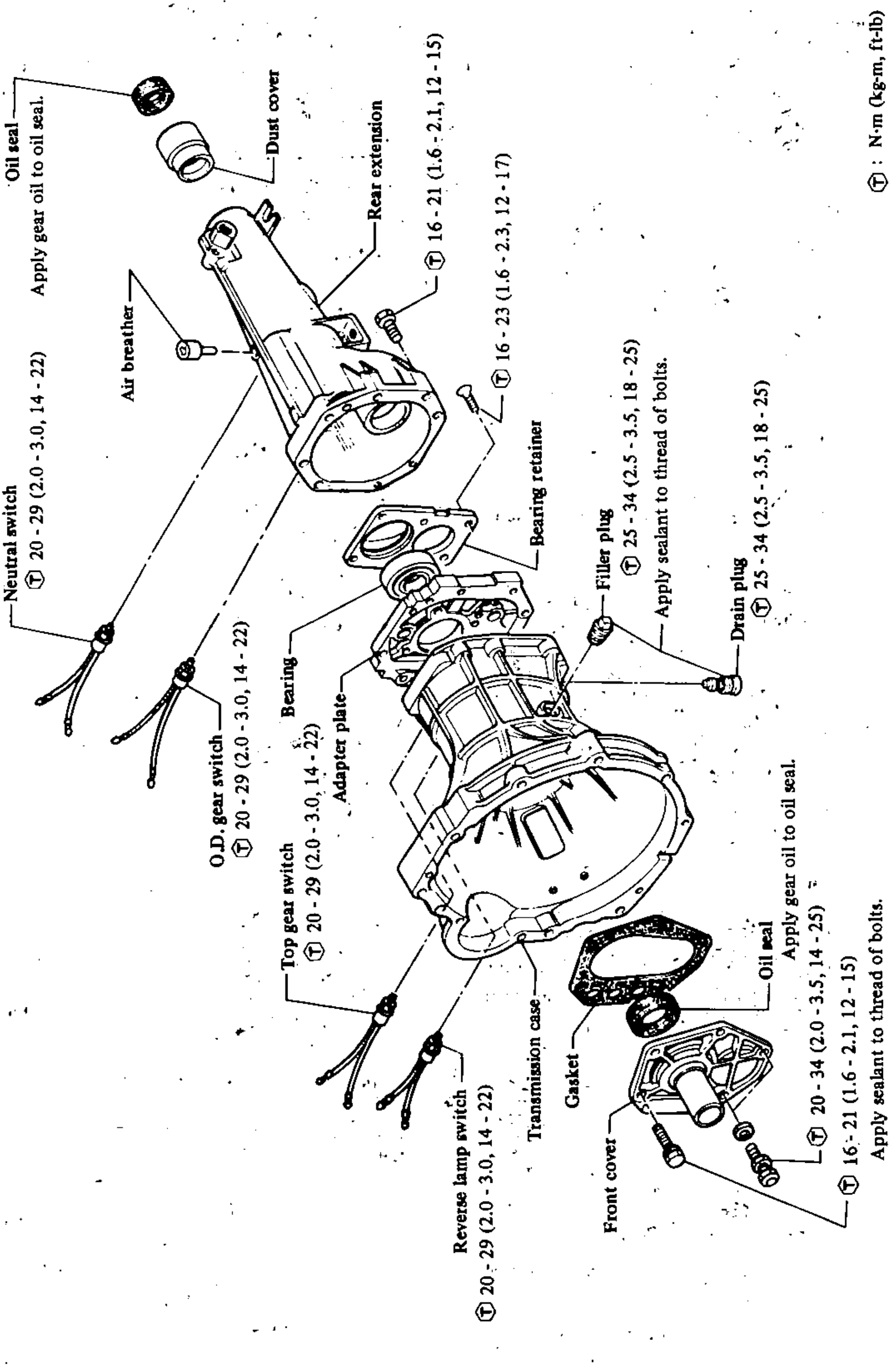
Ⓣ : Ⓐ **43 - 58 N·m**
(4.4 - 5.9 kg-m,
32 - 43 ft-lb)
Ⓑ **25 - 35 N·m**
(2.6 - 3.6 kg-m,
19 - 26 ft-lb)



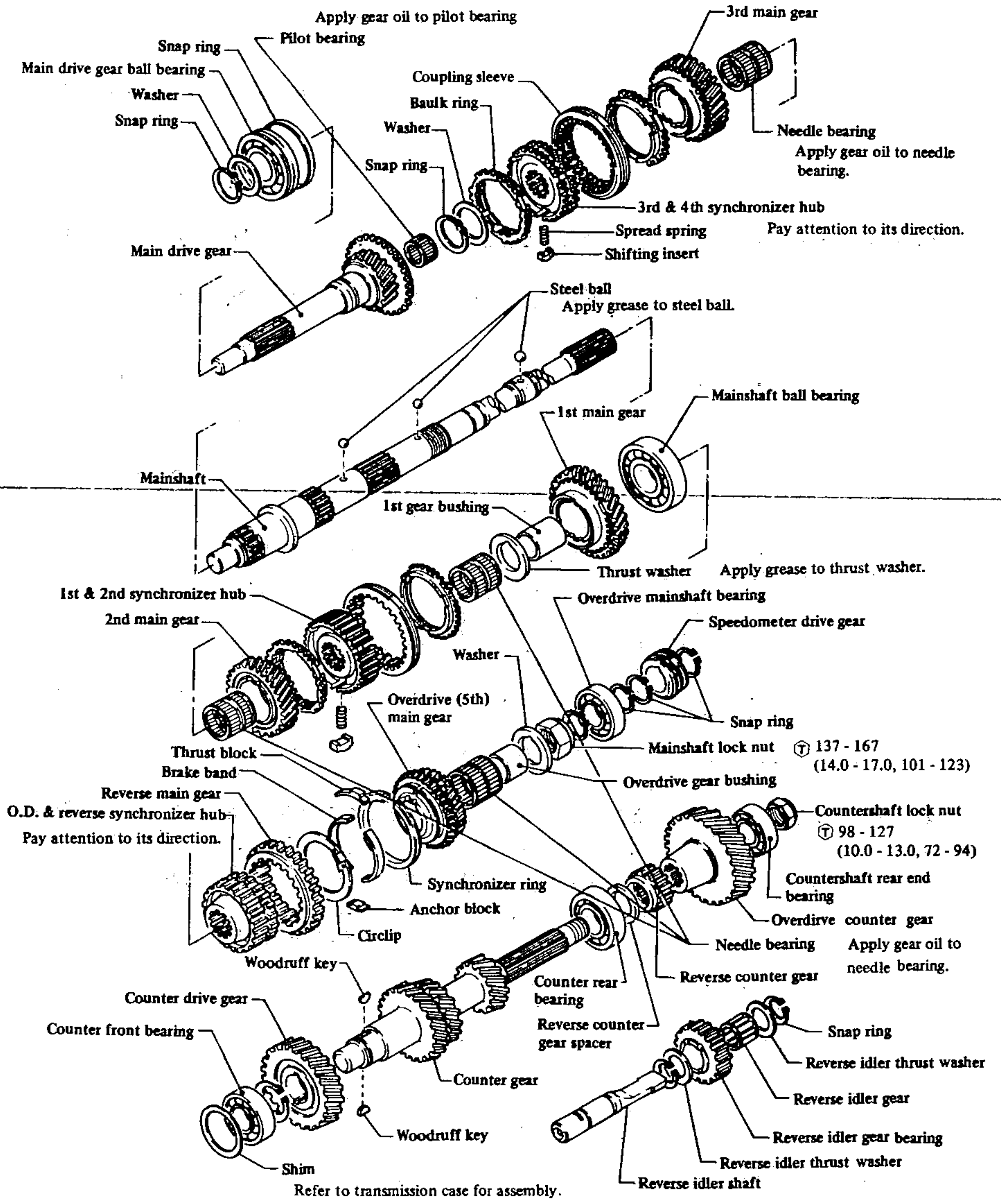
SMT145

7. Lubricate oil seal lip and bushing on rear extension with gear oil for initial lubrication.

5-SPEED TRANSMISSION (Model : FS5W71B)

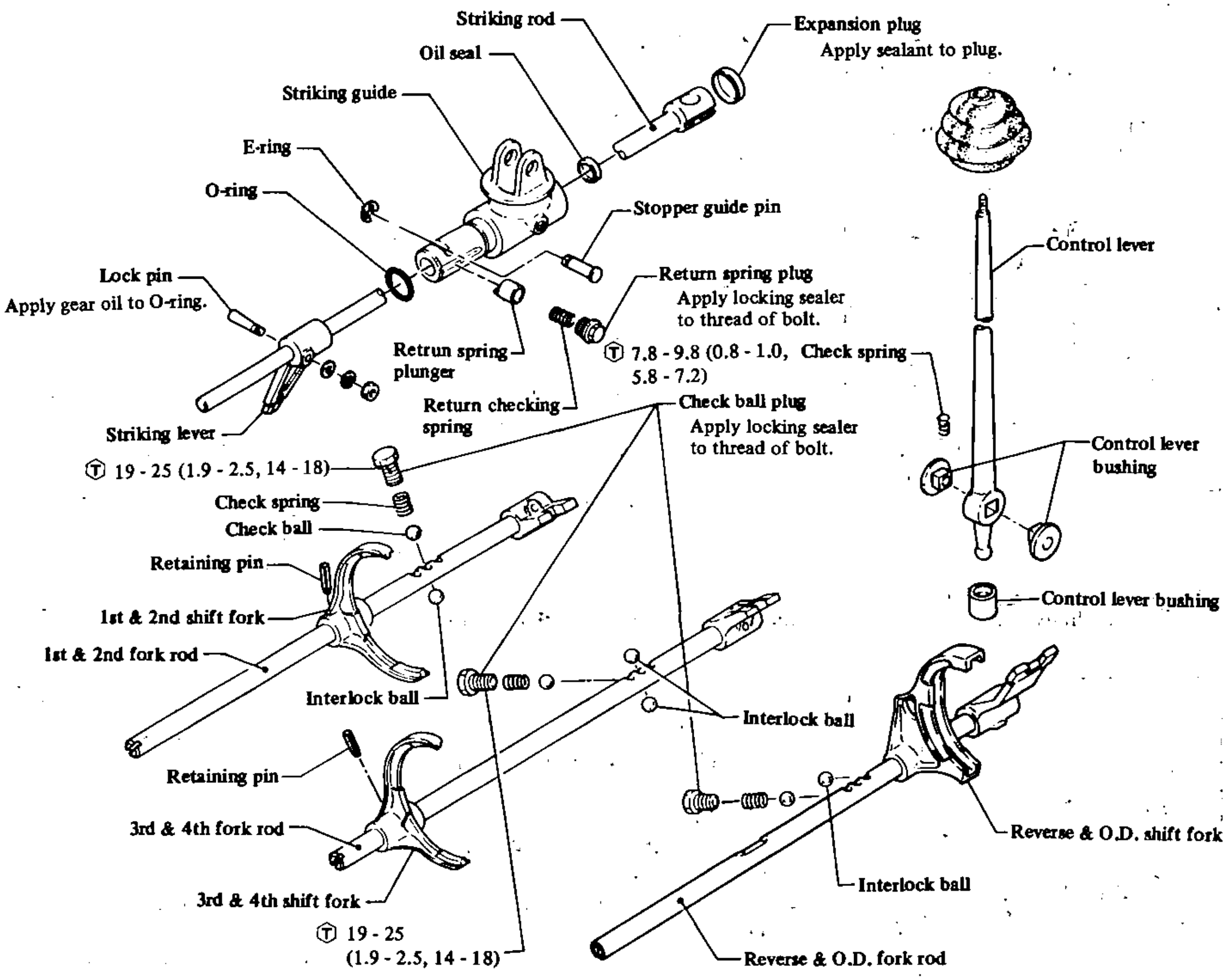


SMT149



Ⓣ : N·m (kg-m, ft-lb)

SMT040



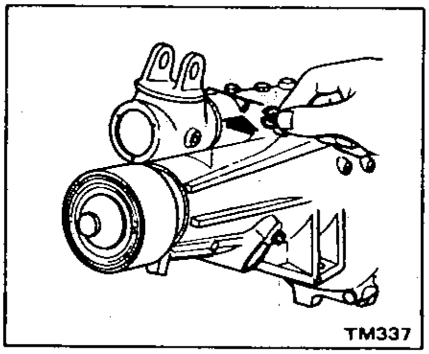
Ⓣ : N·m (kg-m, ft-lb)

SMT150

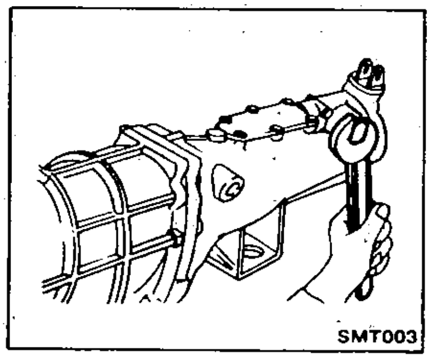
REAR EXTENSION

DISASSEMBLY

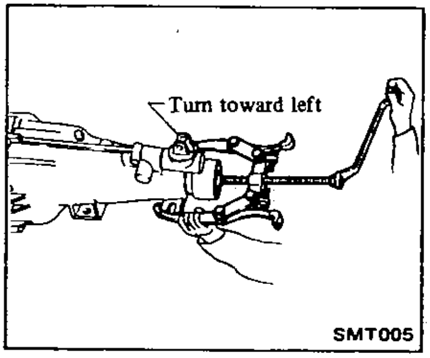
1. Wipe off dirt and grease.
2. Drain oil.
3. Remove O.D. gear switch (if so equipped).
4. Remove E-ring and stopper guide pin.


TM337

5. Remove return spring plug, return spring, and plunger from rear extension.

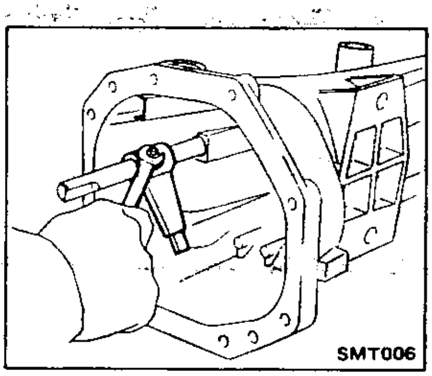

SMT003

6. Remove rear extension.



SMT005

7. Remove lock pin and then remove striking rod.


SMT006

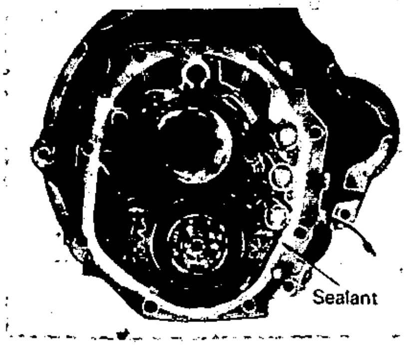
INSPECTION

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.

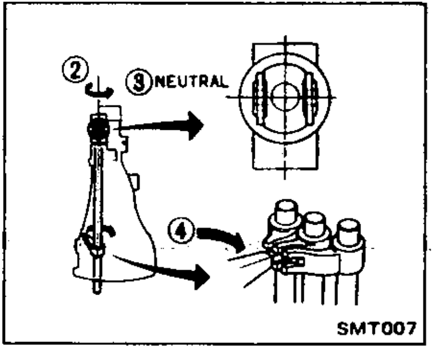
If rear extension bushing is worn or cracked, replace it as an assembly of bushing and rear extension housing.

ASSEMBLY

1. Stand transmission case assembly on wooden plates of more than 20 mm (0.79 in) thick.
2. Clean mating surfaces of adapter plate and rear extension.
3. Apply sealant to mating surface of adapter plate.

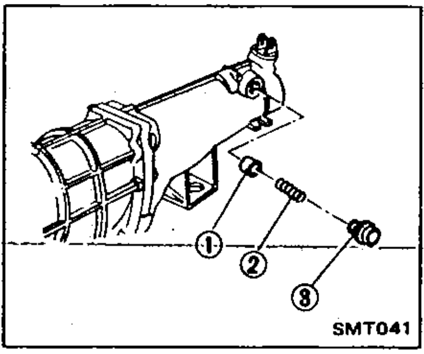


4. Install rear extension as follows:
(1) Set gears at Neutral.
(2) Turn striking guide counterclockwise.
(3) Set striking guide at Neutral.
(4) Aligh end of striking lever with cutout portion of fork rod.



SMT007

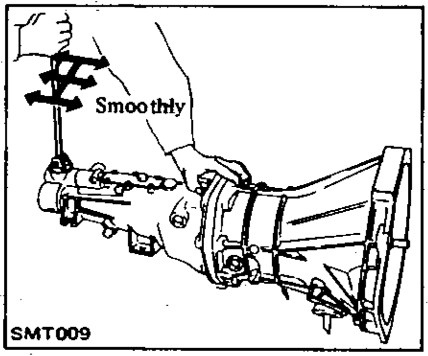
5. Install plunger, return spring, and return spring plug.



SMT041

1 Plunger
2 Return spring
3 Return spring plug

6. Apply sealant to stopper guide pin, then install stopper guide pin and E-ring.
7. Install O.D. gear switch (if so equipped).
8. Make sure that gears operate smoothly.



SMT009

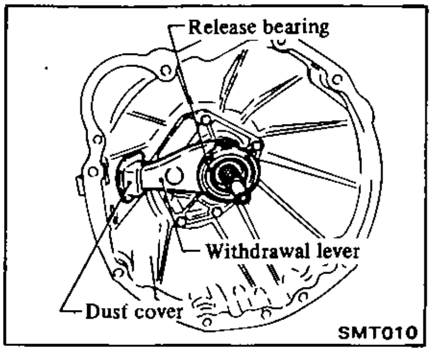
9. Install drain plug.

Ⓣ : **25 - 34 N·m**
(2.5 - 3.5 kg-m,
18 - 25 ft-lb)

TRANSMISSION CASE

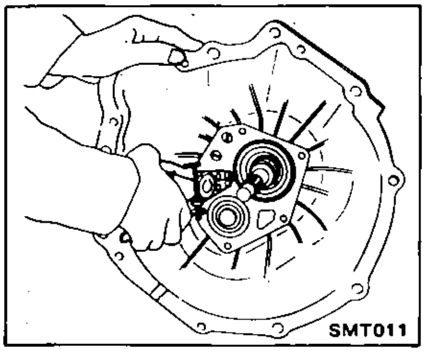
DISASSEMBLY

1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove dust cover, release bearing and withdrawal lever.

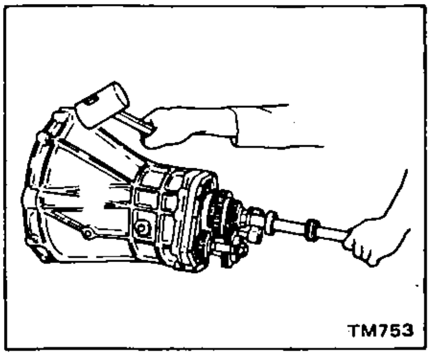


SMT010

3. Remove front cover and gasket. Detach countershaft front bearing shim.
4. Remove main drive bearing snap ring.


SMT011

5. Separate transmission case from adapter plate.

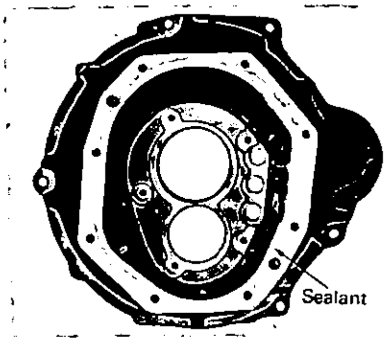

TM753

INSPECTION

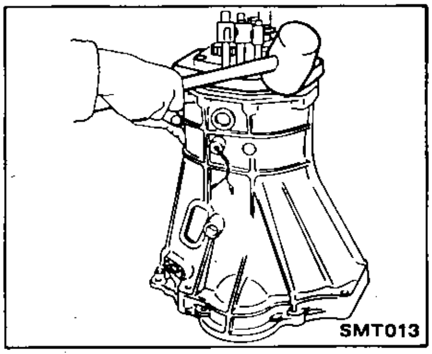
1. Clean with solvent and check for cracks or pits by means of dyeing test.
2. Check mating surface of transmission case for small nicks, projection or sealant.

ASSEMBLY

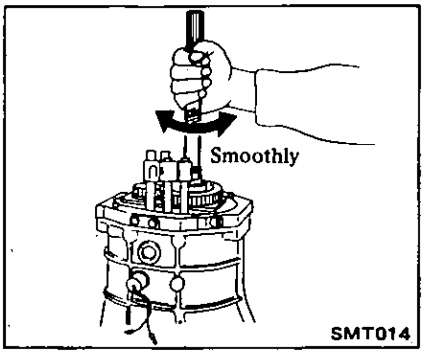
1. Clean mating surfaces of adapter plate and transmission case.
2. Stand transmission case on wooden plates of more than 20 mm (0.79 in) thick.
3. Apply sealant to mating surface of transmission case.



4. Slide gear assembly onto adapter plate by lightly tapping with a soft hammer.


SMT013

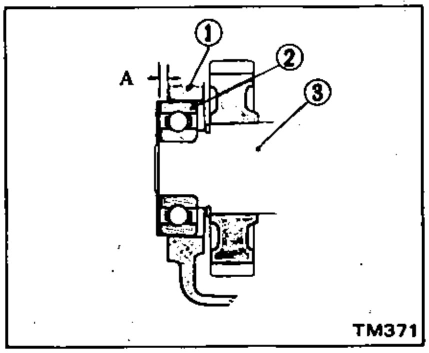
5. Make certain that mainshaft rotates freely.



SMT014

6. Fit main drive bearing snap ring.
7. Select countershaft front bearing shim as follows:

(1) Measure height "A".



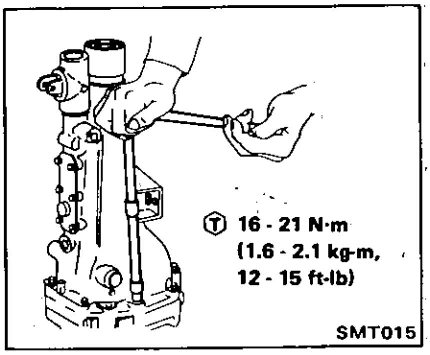
TM371

1 Transmission case
2 Counter gear front bearing
3 Counter gear

(2) Select a shim of thickness "A" measured:

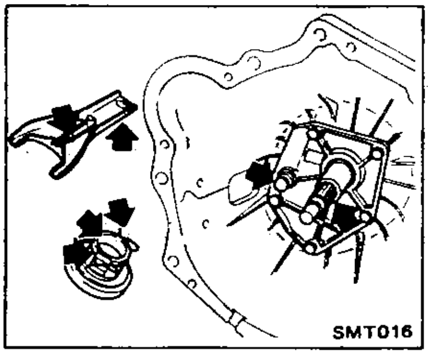
Counter gear front bearing shim:
Refer to S.D.S.

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. Apply sealant to threads of through-bolts and tighten them to transmission case.



SMT015

12. Apply a light coat of multi-purpose grease.

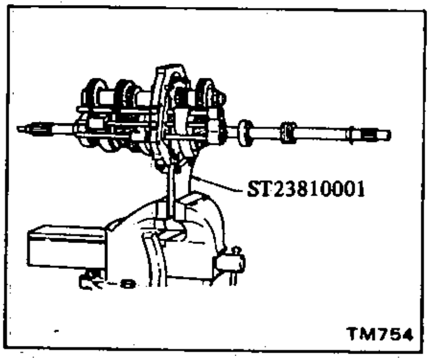


13. Install dust cover, release bearing and withdrawal lever.
14. Assemble Rear Extension. Refer to Rear Extension for assembly.

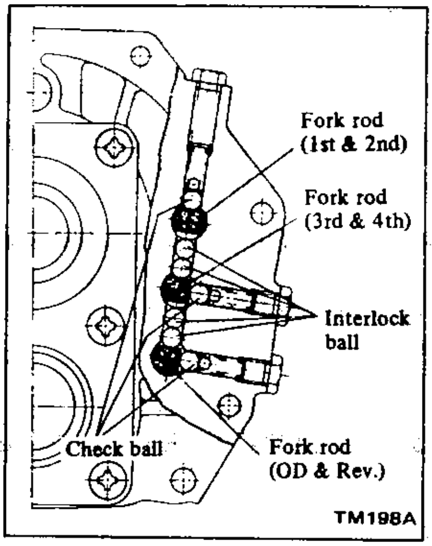
FORKS AND FORK RODS

DISASSEMBLY

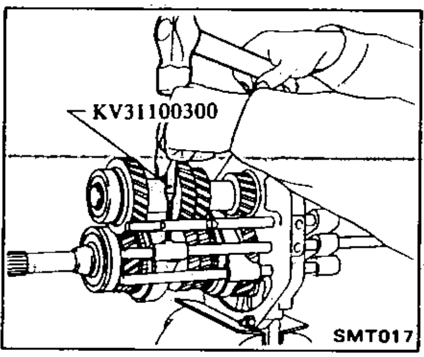
1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove transmission case. Refer to Transmission Case for disassembly.
3. Set up Tool on adapter plate.
4. Place above assembly in a vise.



5. Remove check ball plugs and check springs.



6. Drive out retaining pins.

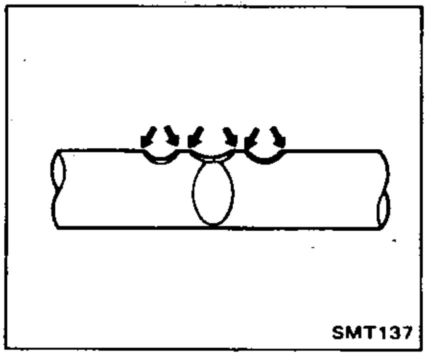


7. Drive out fork rods and remove interlock balls and check balls.

Be careful not to lose three (3) check balls and four (4) interlock balls.

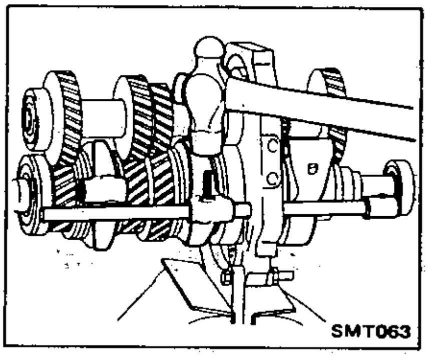
INSPECTION

Clean with solvent and check for wear, scratches, projection, damage or other faulty conditions. Replace any part which is worn or damaged.

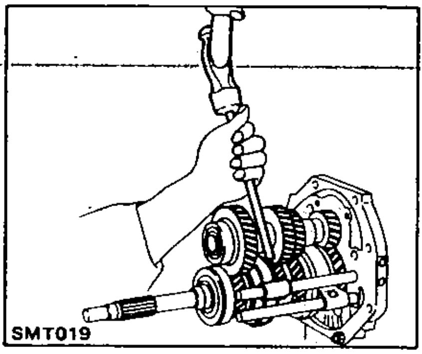


ASSEMBLY

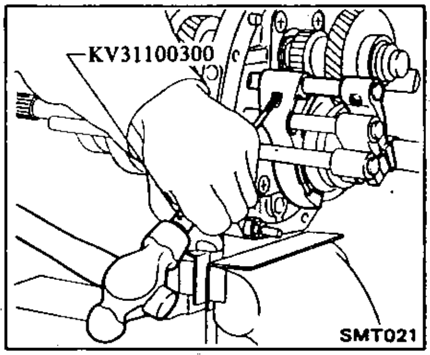
1. Install 1st & 2nd, 3rd & 4th and O.D. & Rev. shift forks and 1st & 2nd fork rod, then secure with retaining pin.



2. Install two (2) interlock balls.
3. Install 3rd & 4th fork rod, then secure with retaining pin.



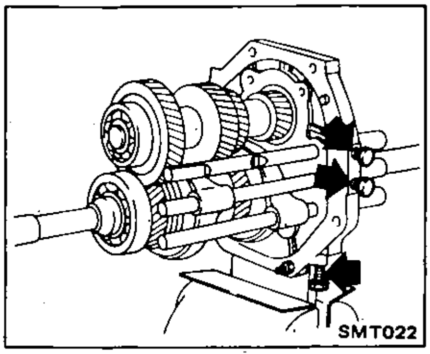
4. Install two (2) interlock balls.
5. Install O.D. & Rev. shift fork and fork rod, then secure with retaining pin.



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)


SMT022

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.**

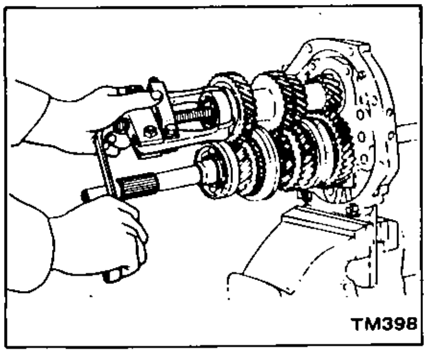
8. Apply gear oil to all sliding surfaces and check to see that shift rods operate correctly and gears are engaged smoothly.
9. Install transmission case. Refer to Transmission Case for assembly.
10. Install rear extension. Refer to Rear Extension for assembly.

GEARS AND SHAFTS

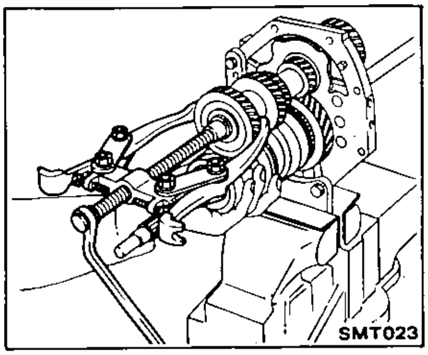
DISASSEMBLY

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.


TM398

6. Remove counter drive gear snap ring.
7. Draw out counter drive gear with main drive gear.


SMT023

When drawing out main drive gear assembly, be careful not to drop pilot needle bearing and baulk ring.

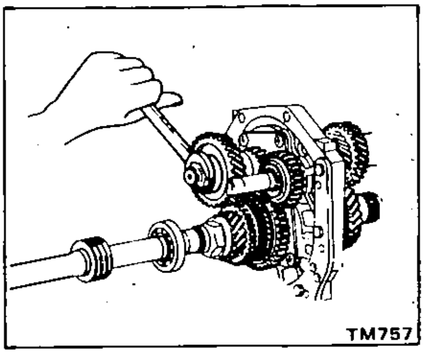
3rd main gear

1. Remove snap ring and thrust washer.
2. Draw out 3rd & 4th synchronizer and 3rd gear.

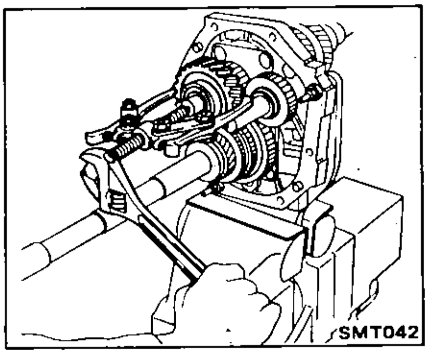
O.D. gear and reverse gear

1. Remove main drive and counter drive gears. Refer to Gears and Shafts for disassembly.
2. Remove 3rd main gear. Refer to Gears and Shafts for disassembly.
3. **Measure O.D. gear end play.** Refer to Gears and Shafts for inspection.
4. 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.


TM757

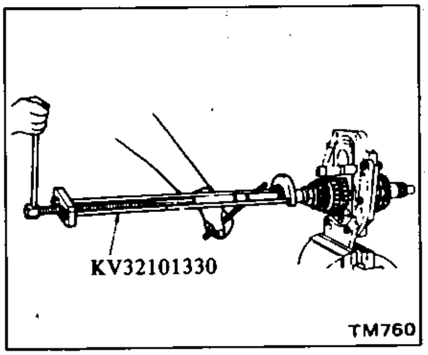
5. Drive out counter O.D. gear and bearing.


SMT042

6. Remove reverse counter gear and spacer.

Remove snap ring from reverse idler shaft, and remove reverse idler gear.

7. Remove snap rings, steel ball, speedometer gear and bearing.



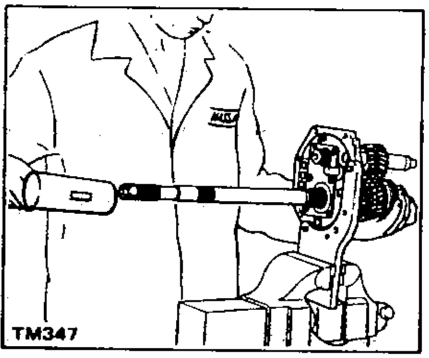
TM760

8. Remove mainshaft nut, thrust washer, reverse main gear, O.D. synchronizer and O.D. gear.

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.

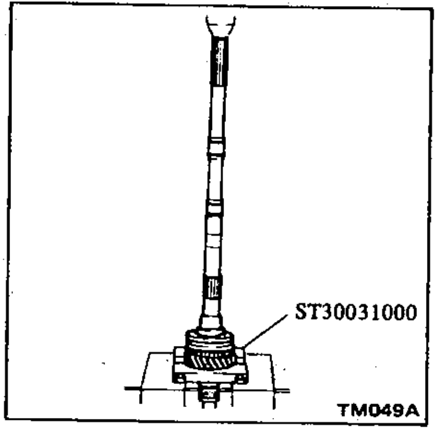


2. Remove thrust washer, steel ball, 1st gear and needle bearing.

Be careful not to lose steel ball retaining thrust washer.

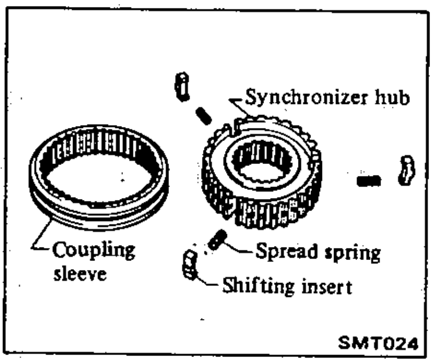
3. Press out 1st gear mainshaft bushing together with 2nd gear and 1st & 2nd synchronizer.

When pressing out bushing, hold mainshaft by hand so as not to drop it.



Synchronizer (1st & 2nd and 3rd & 4th)

Disassemble synchronizer.



Synchronizer (O.D.)

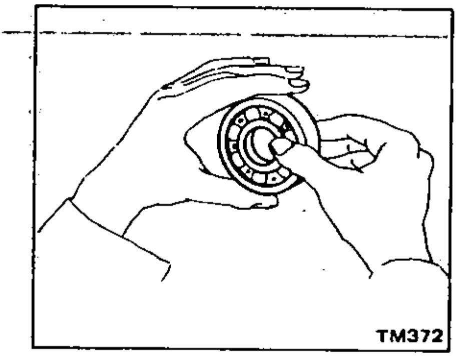
1. Remove circlip with snap ring plier.
2. Remove synchro ring, band brakes, anchor block and thrust block.

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.

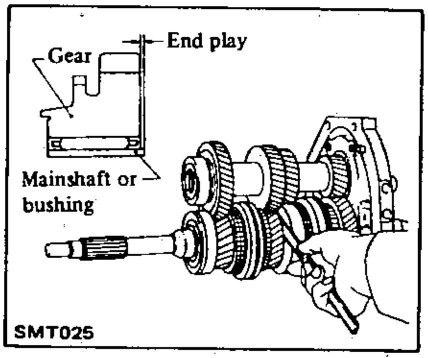


2. When race and ball surfaces are worn or rough, or when balls are out-of-round or rough, replace bearing with a new one.
3. Replace needle bearing if worn or damaged.

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:**

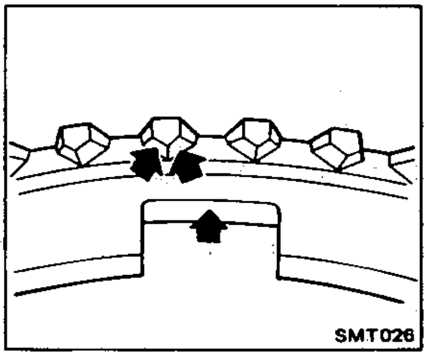
- It is necessary to measure end play before disassembling mainshaft and after reassembling mainshaft.
- Tighten mainshaft lock nut to specified limit and measure end play to insure that it is within specified limit.
- If end play is not within specified limit, disassemble and check parts for condition.
- Replace any part which is worn or damaged.



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
0.10 - 0.17 mm
(0.0039 - 0.0067 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.

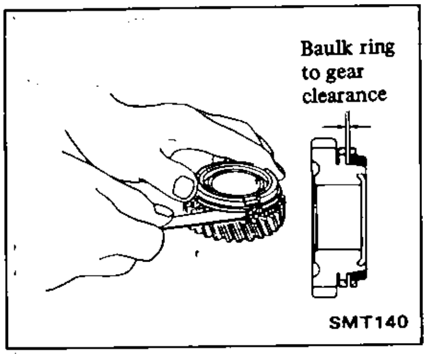


2. Place baulk ring in position on gear cone.

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.

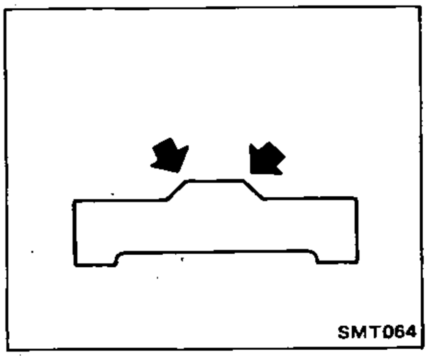
Baulk ring to gear clearance:
Standard
1.20 - 1.60 mm
(0.0472 - 0.0630 in)
Wear limit
Less than 0.8 mm
(0.031 in)



SMT140

Shifting insert

Replace, if worn excessively, worn unevenly, deformed, or damaged.



SMT064

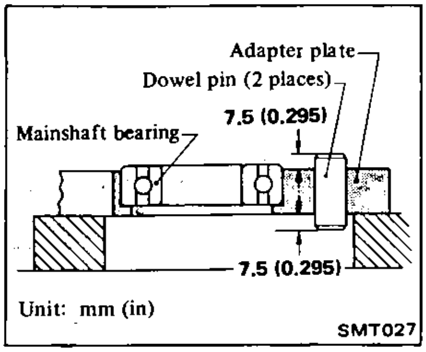
Oil seals

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

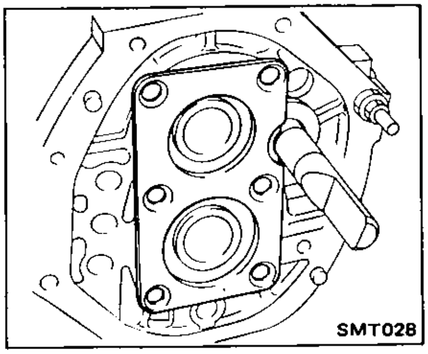
Adapter plate

1. Place new dowel pin, mainshaft bearing on adapter plate and tap them.



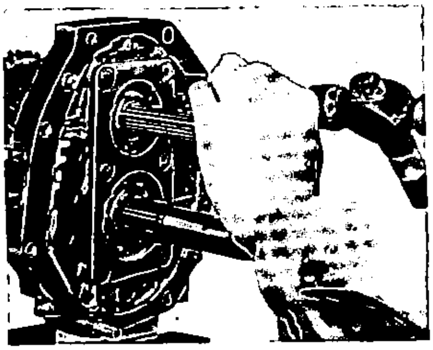
SMT027

2. Insert reverse idler shaft.
3. Install bearing retainer.



SMT028

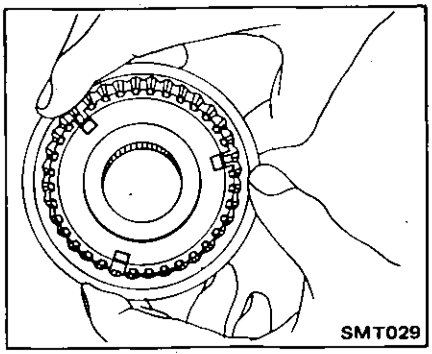
4. Tighten each screw, then stake it at two points.



5. Install counter rear bearing with a soft hammer.

Synchronizer (1st & 2nd and 3rd & 4th)

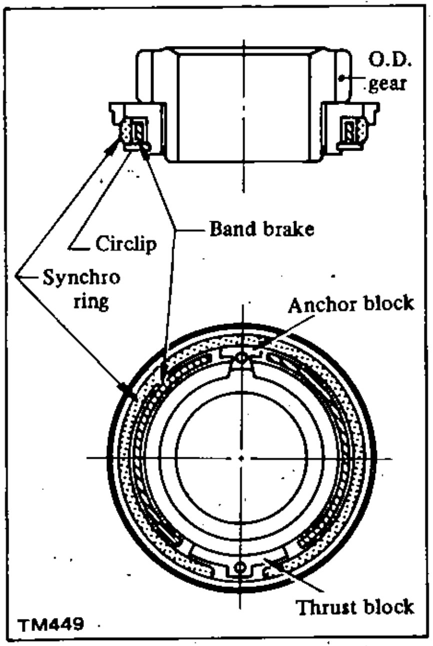
1. Assemble coupling sleeve and hub.
2. Position spread springs and shifting inserts in three slots in synchronizer hub; put coupling sleeve on synchronizer hub.



SMT029

Synchronizer (O.D.)

Position synchronizer ring, band brake, thrust block and anchor block on overdrive clutch gear; install circlip.

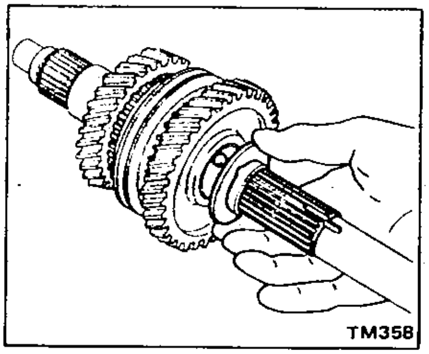


TM449

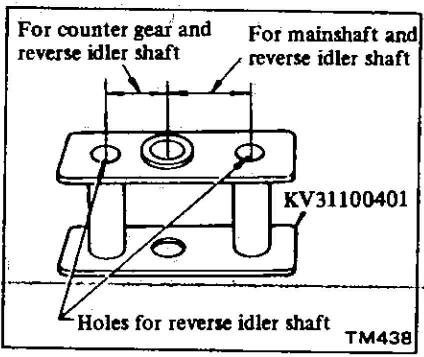
1st and 2nd main gear

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.

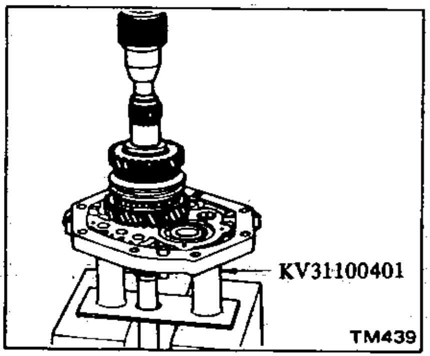
Before installing steel ball and thrust washer, apply grease to them.



2. Set Tool and place adapter plate assembly on it.

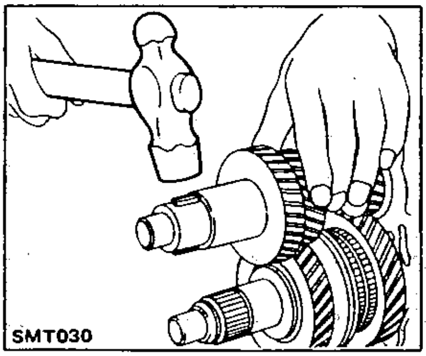


3. Press mainshaft assembly to adapter plate.

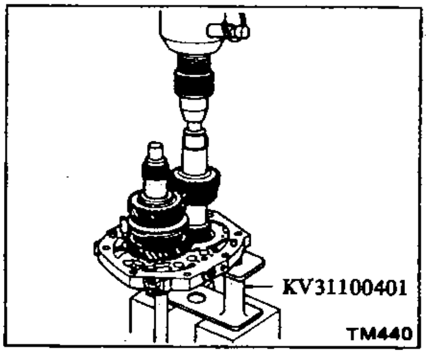


3rd main and counter gear

1. Tap new woodruff keys until they are seated securely.

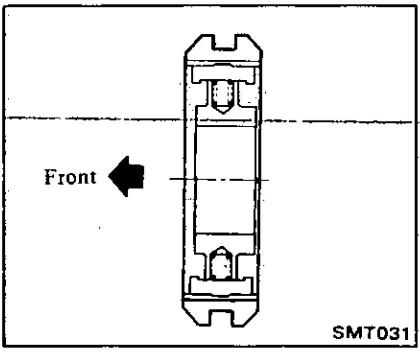


2. Press counter gear into adapter plate.



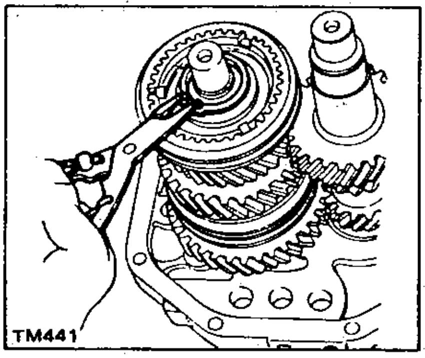
3. Position needle bearing, 3rd main gear, baulk ring and 3rd & 4th synchronizer assembly on the front of mainshaft.

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.

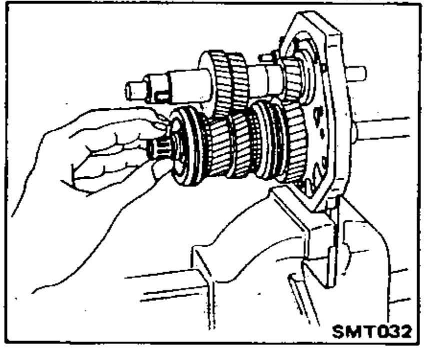


Main drive and counter drive gear

1. Install baulk ring on synchronizer.

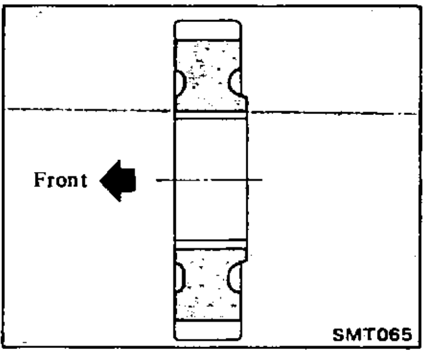
Be sure to align grooves of baulk ring with inserts.

2. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

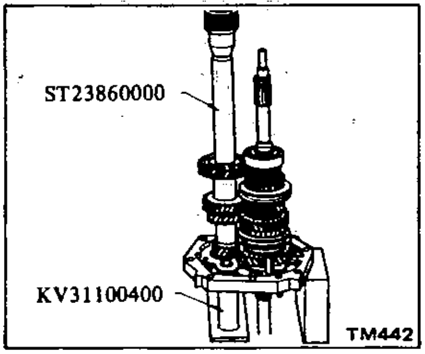


3. Install main drive gear with counter drive gear.

Assemble counter drive gear, paying attention to its direction.



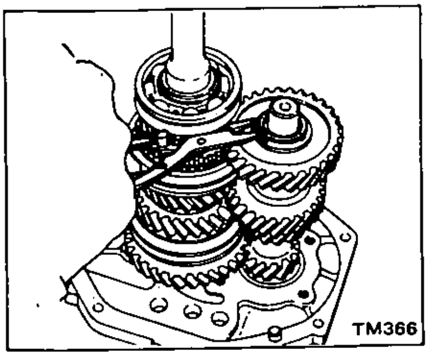
4. Press counter drive gear onto counter gear.



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.

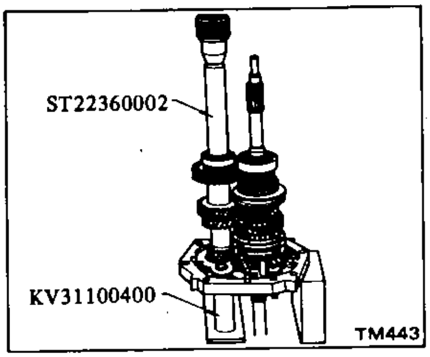
Counter drive gear snap ring:
Refer to S.D.S.

5. Secure counter drive gear with snap ring that will minimize clearance of groove in countershaft.



TM366

6. Press counter gear front bearing onto counter gear.

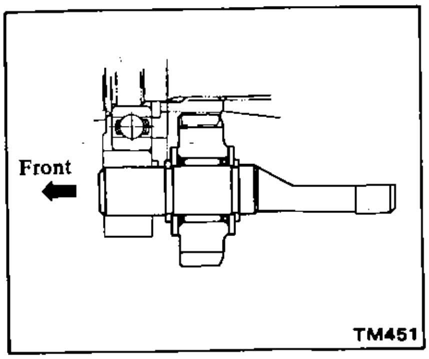


TM443

ASSEMBLY

O.D. gear and reverse gear

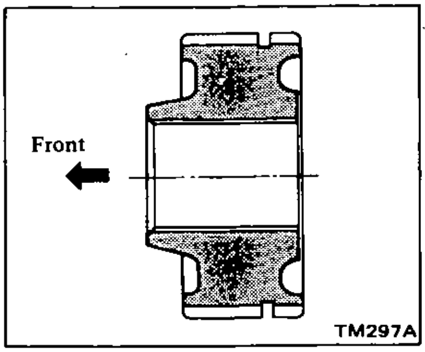
1. After front side is assembled, assemble reverse counter spacer, snap ring, spacer, needle bearing, reverse idler gear, spacer and snap ring.



TM451

2. Assemble O.D.-reverse synchronizer hub, reverse gear, O.D. gear bushing, needle bearing, O.D. gear assembly, steel ball and thrust washer on mainshaft rear side. Before installing a steel ball, apply grease to it.

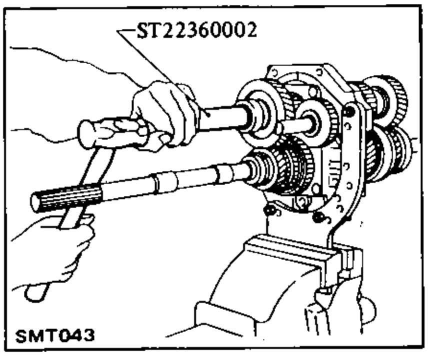
a. Assemble O.D.-reverse synchronizer hub, paying attention to its direction.



TM297A

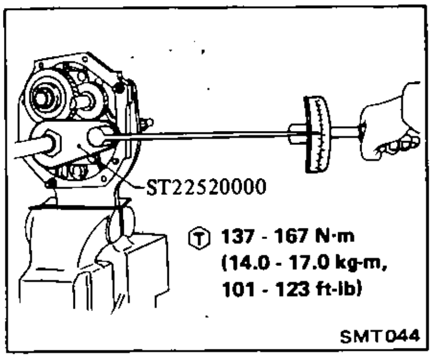
b. Main O.D. gear and counter O.D. gear should be handled as a matched set.
When replacing main O.D. gear and counter O.D. gear, be sure to replace as a set of main O.D. and counter O.D. gears.

3. Assemble reverse counter gear, overdrive counter gear.
4. Assemble new mainshaft nut, and tighten it temporarily.
5. Install bearing.



SMT043

6. Mesh 2nd and reverse gear and tighten mainshaft lock nut and counter gear lock nut.



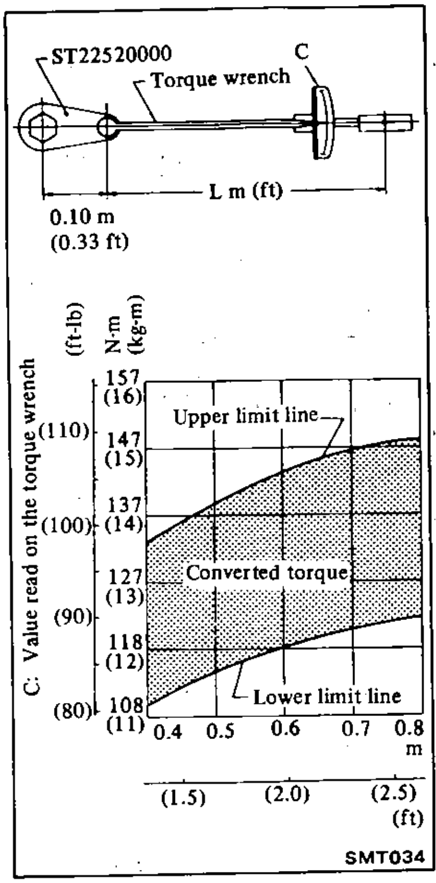
SMT044

Ⓣ : Counter gear lock nut
98 - 127 N·m
(10.0 - 13.0 kg-m,
72 - 94 ft-lb)

Conversion of torque

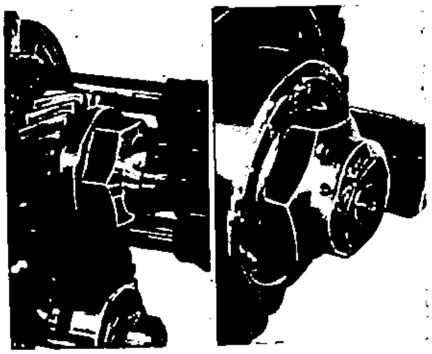
Mainshaft nut should be tightened to specified torque with Tool. When doing so, the amount of torque to be read on wrench needle should be modified according to the following chart.

Ⓣ : 137 - 167 N·m
(14 - 17 kg-m,
101 - 123 ft-lb)



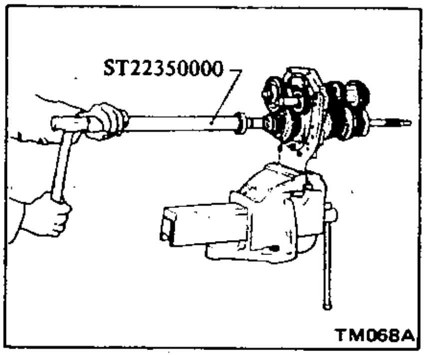
SMT034

7. Stake mainshaft lock nut and counter gear lock nut with a punch.



8. **Measure gear end play.** Refer to Gears and Shafts for inspection.

9. Fit snap ring, then assemble mainshaft rear bearing.



10. Fit thick snap ring to mainshaft rear bearing to eliminate end play.

Mainshaft rear bearing snap ring: Refer to S.D.S.

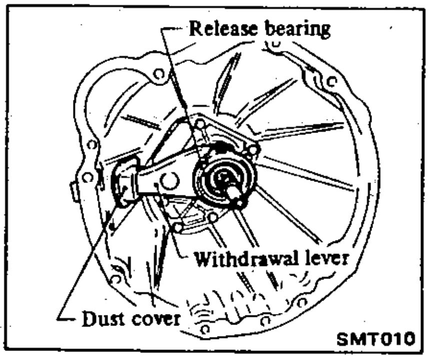
11. Assemble snap rings, steel ball and speedometer drive gear.
12. Install forks and fork rods. Refer to Forks and Fork Rods for assembly.
13. Install transmission case. Refer to Transmission Case for assembly.
14. Install rear extension. Refer to Rear Extension for assembly.

REPLACEMENT OF OIL SEALS

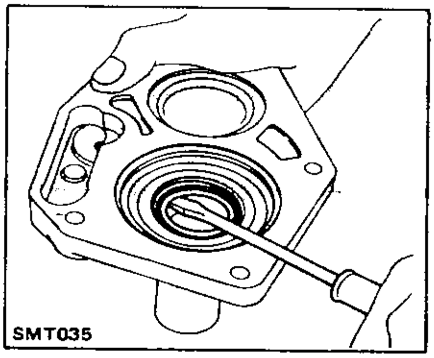
FRONT COVER OIL SEAL

It is necessary to remove transmission unit from car. Replace oil seal as follows:

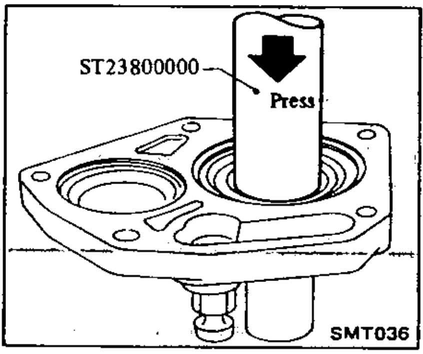
1. Remove transmission. Refer to Removal.
2. Wipe off dirt and grease.
3. Drain oil.
4. Remove dust cover, release bearing and withdrawal lever.



5. Remove front cover.
6. Remove oil seal.



7. Apply coat of gear oil to oil seal surface, then drive new seal into place.

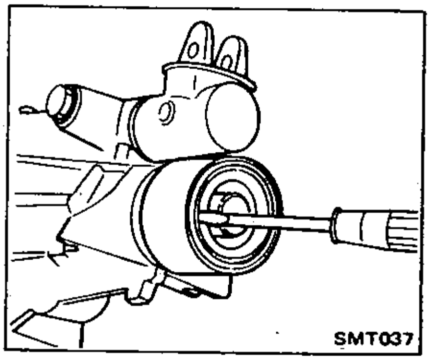


8. Lubricate seal lip and main drive shaft with gear oil.
9. Install front cover in reverse order of removal.

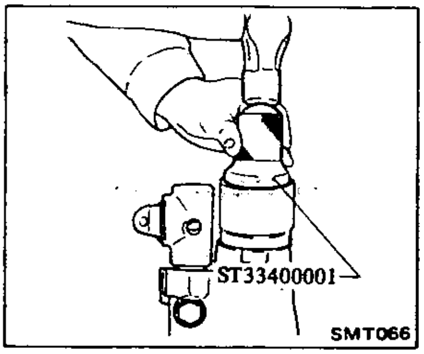
REAR EXTENSION OIL SEAL

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.

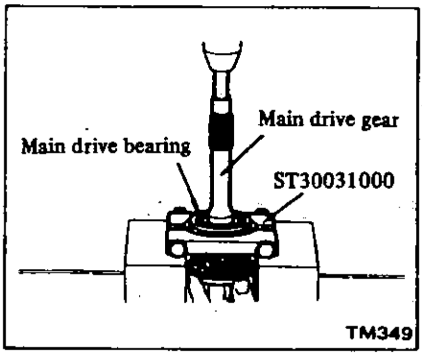


4. Install propeller shaft. Refer to Propeller Shaft (Section PD) for installation.

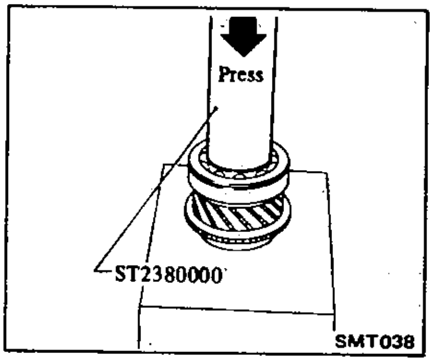
REPLACEMENT OF BEARINGS

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.



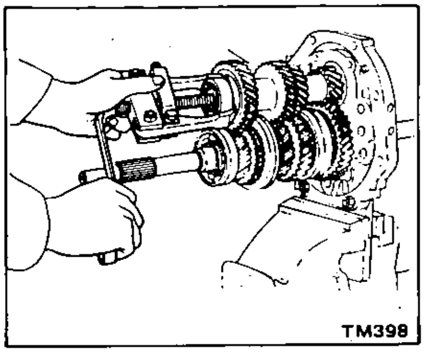
4. Press new main drive bearing.



5. Place main drive bearing spacer on main drive bearing and secure main drive bearing with thicker snap ring that will eliminate end play.

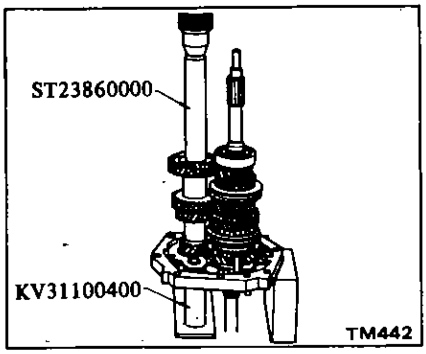
Main drive gear snap ring:
Refer to S.D.S.

6. Mesh 2nd and reverse gear, then draw out counter front bearing.



TM398

7. Press counter gear front bearing onto counter gear.

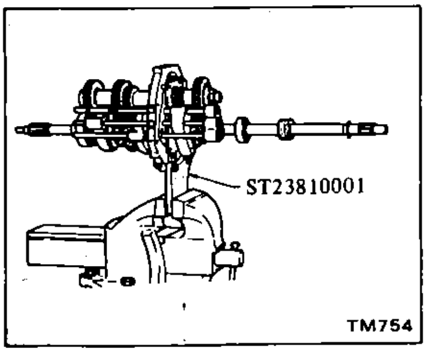


TM442

8. Install main drive and counter drive gear. Refer to Gears and Shafts for assembly.

MAINSHAFT AND COUNTER REAR

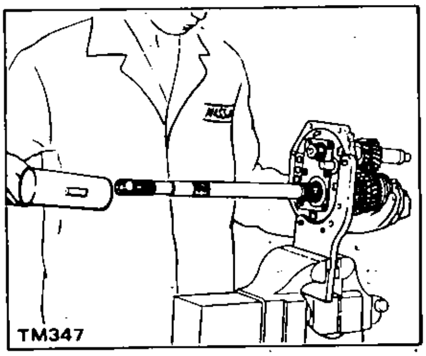
1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove transmission case. Refer to Transmission Case for disassembly.
3. Set up Tool on adapter plate.
4. Place above assembly in a vise.



TM754

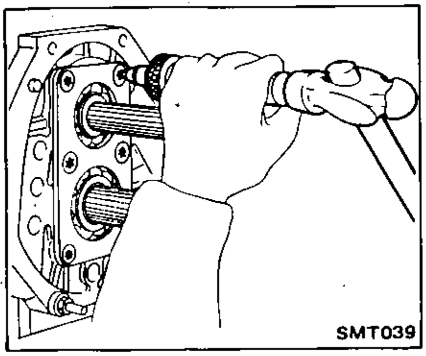
5. Remove main drive and counter drive gear. Refer to Gears and Shafts for disassembly.
6. Remove reverse main gear. Refer to Gears and Shafts for disassembly.
7. Draw out mainshaft assembly together with counter gear, by tapping rear end of mainshaft and counter gear.

Hold front of mainshaft assembly by hand, being careful not to drop counter gear.



TM347

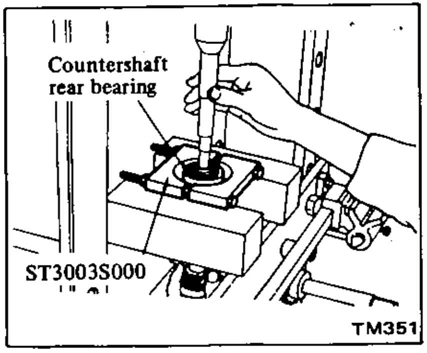
8. Remove bearing retainer.



SMT039

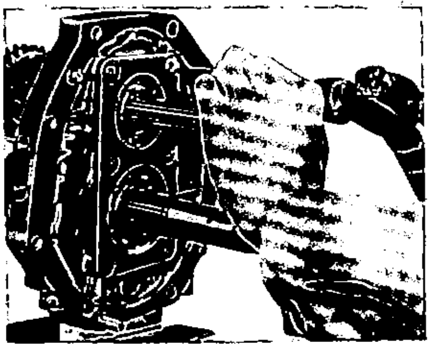
9. Replace mainshaft bearing by new one.
10. Press out countershaft rear bearing.

CAUTION:
When pressing out bearing gear, hold shaft by hand so as not to drop it.



TM351

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.



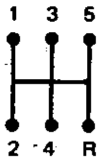
15. Install main drive and counter drive gear. Refer to Gears and Shafts for assembly.
16. Install reverse main gear. Refer to Gears and Shafts for assembly.
17. Install transmission case. Refer to Transmission Case for assembly.
18. Install rear extension. Refer to Rear Extension for assembly.

MAINSHAFT REAR AND COUNTER REAR END

Refer to Gears and Shafts for disassembly and assembly.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Transmission model			FS5W71B
No. of speed			5
Synchromesh type			1 to 4th: Warner 5th: Servo
Shift type			
Gear ratio		1st	3.321
		2nd	2.077
		3rd	1.308
		4th	1.000
		5th	0.864
		Rev.	3.382
Number of teeth	Mainshaft	Drive	22
		1st	33
		2nd	28
		3rd	26
		5th	19
		Rev.	36
	Counter-shaft	Drive	31
		1st	14
		2nd	19
		3rd	28
		5th	31
		Rev.	15
	Rev. idler shaft		23
Speedometer gear ratio			18/6
Oil capacity ℓ (US pt, Imp pt)			2.0 (4-1/4, 3-1/2)

INSPECTION AND ADJUSTMENT

GEAR END PLAY

Unit: mm (in)

Model Position	FS5W71B
1st main gear	0.27 - 0.34 (0.0106 - 0.0134)
2nd main gear	0.12 - 0.19 (0.0047 - 0.0075)
3rd main gear	0.13 - 0.37 (0.0051 - 0.0146)
5th main gear	0.10 - 0.17 (0.0039 - 0.0067)
Rev. idler gear	0.05 - 0.50 (0.0020 - 0.0197)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	All models
Standard	1.20 - 1.60 (0.0472 - 0.0630)
Wear limit	0.8 (0.031)

AVAILABLE SNAP RING

Main drive gear bearing

Thickness mm (in)	Part number
1.73 (0.0681)	32204 78005
1.80 (0.0709)	32204 78000
1.87 (0.0736)	32204 78001
1.94 (0.0764)	32204 78002
2.01 (0.0791)	32204 78003
2.08 (0.0819)	32204 78004

Mainshaft front

Thickness mm (in)	Part number
1.4 (0.055)	32263 E9000
1.5 (0.059)	32263 E9001
1.6 (0.063)	32263 E9002

Mainshaft rear end bearing

Thickness mm (in)	Part number
1.1 (0.043)	32228 20100
1.2 (0.047)	32228 20101
1.3 (0.051)	32228 20102
1.4 (0.055)	32228 20103

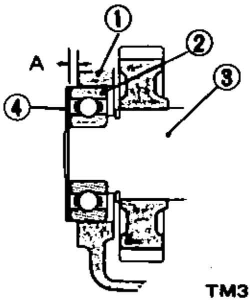
Counter drive gear

Thickness mm (in)	Part number
1.4 (0.055)	32215 E9000
1.5 (0.059)	32215 E9001
1.6 (0.063)	32215 E9002

AVAILABLE SHIM

Counter front bearing

Unit: mm (in)



TM371

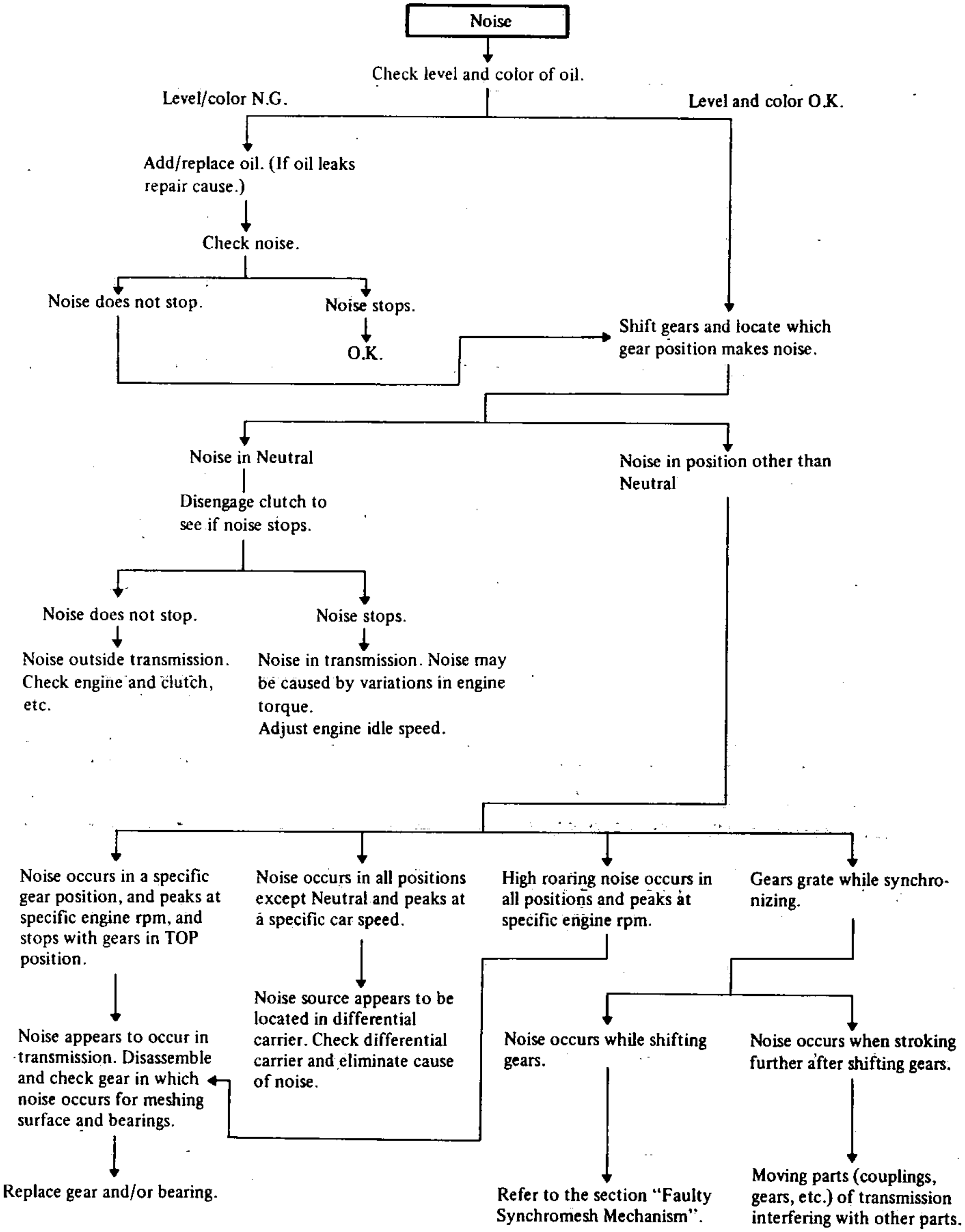
1 Transmission case
2 Counter gear front bearing
3 Counter gear
4 Shim

"A"	Thickness of shim	Part number
3.42 - 3.51 (0.1346 - 0.1382)	0.1 (0.004)	32218 E9000
3.32 - 3.41 (0.1307 - 0.1343)	0.2 (0.008)	32218 E9001
3.22 - 3.31 (0.1268 - 0.1303)	0.3 (0.012)	32218 E9002
3.12 - 3.21 (0.1228 - 0.1264)	0.4 (0.016)	32218 E9003
3.02 - 3.11 (0.1189 - 0.1224)	0.5 (0.020)	32218 E9004
2.92 - 3.01 (0.1150 - 0.1185)	0.6 (0.024)	32218 E9005

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Transmission installation			
Clutch operating cylinder	30 - 40	3.1 - 4.1	22 - 30
Transmission to engine	43 - 58	4.4 - 5.9	32 - 43
Gusset to transmission transmission	25 - 35	2.6 - 3.6	19 - 26
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
Gear assembly			
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	8.8 - 11.8	0.9 - 1.2	6.5 - 8.7
Check ball plug	19 - 25	1.9 - 2.5	14 - 18
Speedometer sleeve installation	3.9 - 4.9	0.4 - 0.5	2.9 - 3.6
Back-up lamp switch	20 - 29	2.0 - 3.0	14 - 22
Return spring plug	7.8 - 9.8	0.8 - 1.0	5.8 - 7.2

TROUBLE DIAGNOSES AND CORRECTIONS



Noise

Check level and color of oil.

Level/color N.G.

Add/replace oil. (If oil leaks repair cause.)

Check noise.

Noise does not stop.

Noise stops.

O.K.

Level and color O.K.

Shift gears and locate which gear position makes noise.

Noise in Neutral

Disengage clutch to see if noise stops.

Noise does not stop.

Noise outside transmission. Check engine and clutch, etc.

Noise stops.

Noise in transmission. Noise may be caused by variations in engine torque.
Adjust engine idle speed.

Noise in position other than Neutral

Noise occurs in a specific gear position, and peaks at specific engine rpm, and stops with gears in TOP position.

Noise appears to occur in transmission. Disassemble and check gear in which noise occurs for meshing surface and bearings.

Replace gear and/or bearing.

Noise occurs in all positions except Neutral and peaks at a specific car speed.

Noise source appears to be located in differential carrier. Check differential carrier and eliminate cause of noise.

High roaring noise occurs in all positions and peaks at specific engine rpm.

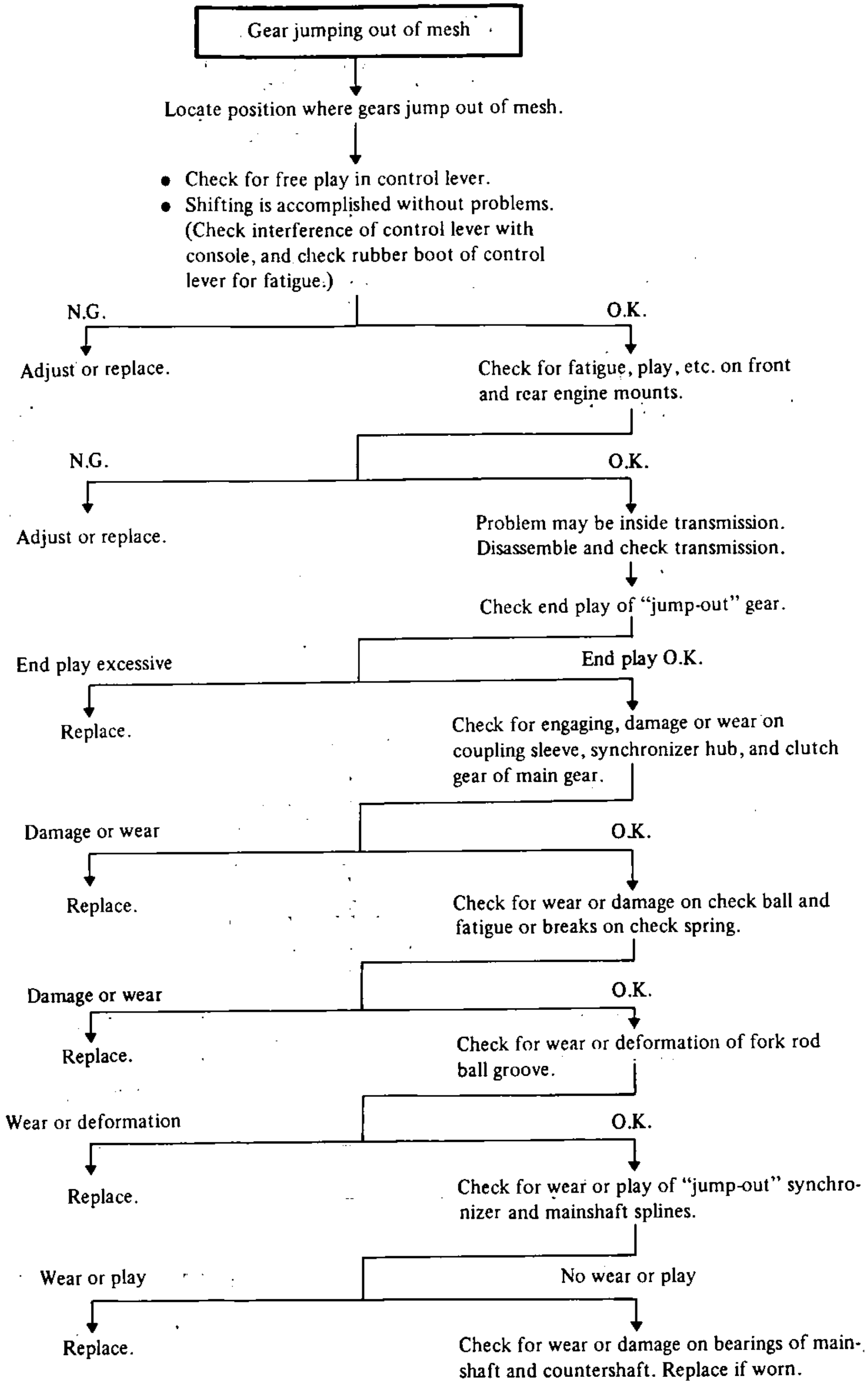
Gears grate while synchronizing.

Noise occurs while shifting gears.

Refer to the section "Faulty Synchromesh Mechanism".

Noise occurs when stroking further after shifting gears.

Moving parts (couplings, gears, etc.) of transmission interfering with other parts.



Gear jumping out of mesh

Locate position where gears jump out of mesh.

- Check for free play in control lever.
- Shifting is accomplished without problems. (Check interference of control lever with console, and check rubber boot of control lever for fatigue.)

N.G.

Adjust or replace.

O.K.

Check for fatigue, play, etc. on front and rear engine mounts.

N.G.

Adjust or replace.

O.K.

Problem may be inside transmission. Disassemble and check transmission.

Check end play of "jump-out" gear.

End play excessive

Replace.

End play O.K.

Check for engaging, damage or wear on coupling sleeve, synchronizer hub, and clutch gear of main gear.

Damage or wear

Replace.

O.K.

Check for wear or damage on check ball and fatigue or breaks on check spring.

Damage or wear

Replace.

O.K.

Check for wear or deformation of fork rod ball groove.

Wear or deformation

Replace.

O.K.

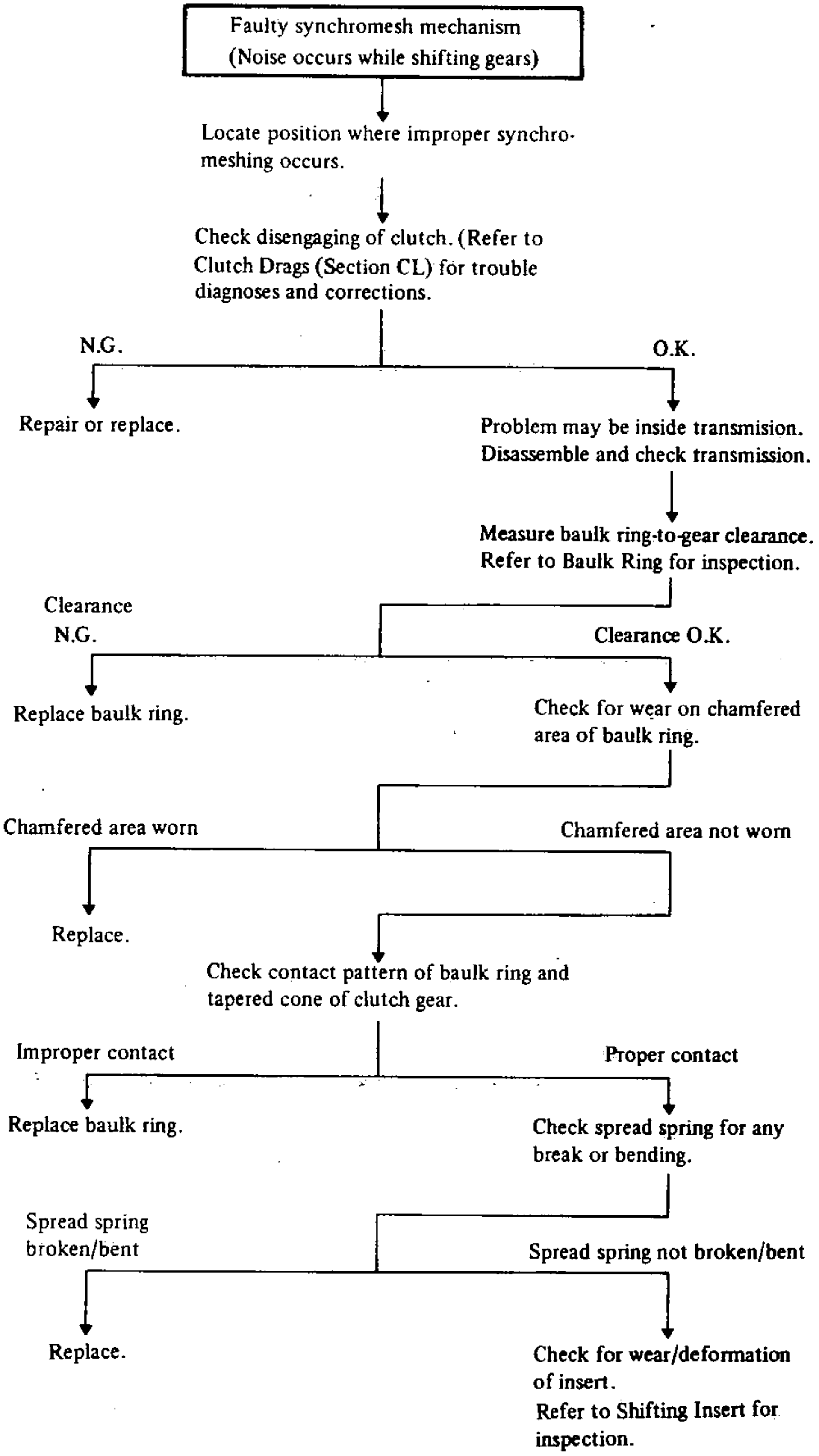
Check for wear or play of "jump-out" synchronizer and mainshaft splines.

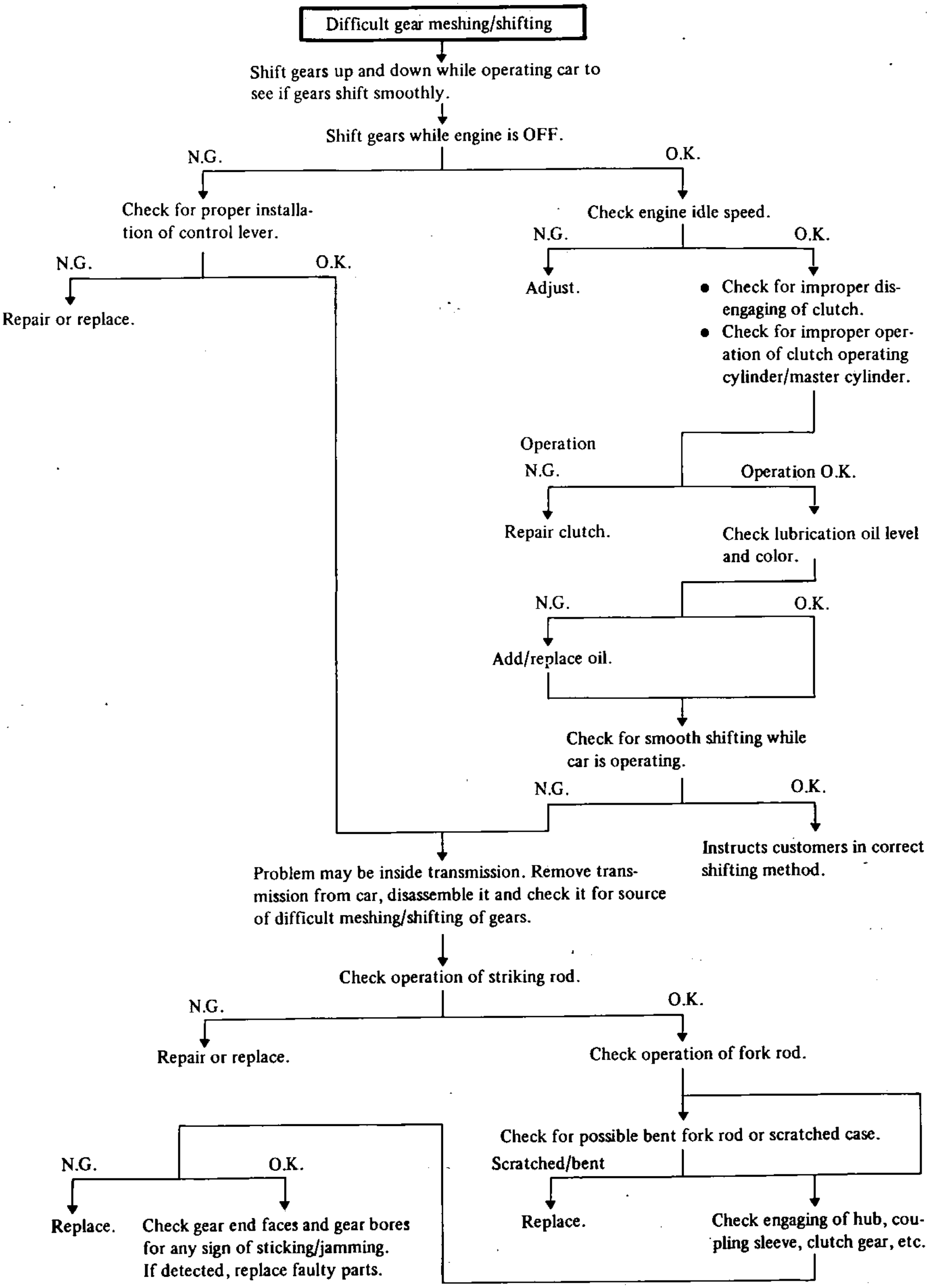
Wear or play

Replace.

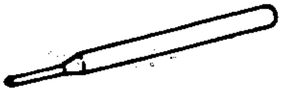
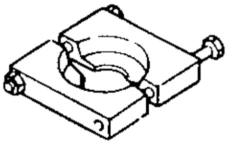
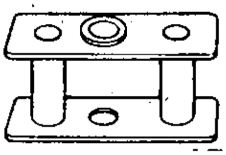
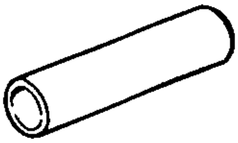
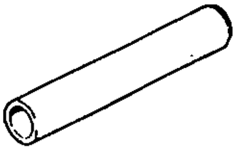
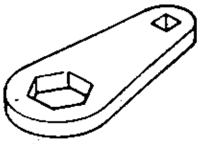
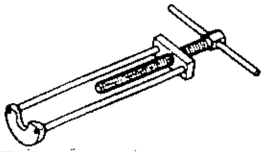
No wear or play

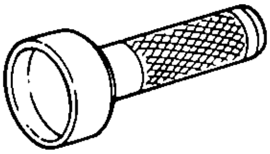
Check for wear or damage on bearings of mainshaft and countershaft. Replace if worn.


Faulty synchromesh mechanism
(Noise occurs while shifting gears)
Locate position where improper synchromeshing occurs.
Check disengaging of clutch. (Refer to Clutch Drags (Section CL) for trouble diagnoses and corrections.
N.G.
O.K.
Repair or replace.
Problem may be inside transmision. Disassemble and check transmission.
Measure baulk ring-to-gear clearance. Refer to Baulk Ring for inspection.
Clearance N.G.
Clearance O.K.
Replace baulk ring.
Check for wear on chamfered area of baulk ring.
Chamfered area worn
Chamfered area not worn
Replace.
Check contact pattern of baulk ring and tapered cone of clutch gear.
Improper contact
Proper contact
Replace baulk ring.
Check spread spring for any break or bending.
Spread spring broken/bent
Spread spring not broken/bent
Replace.
Check for wear/deformation of insert.
Refer to Shifting Insert for inspection.


Difficult gear meshing/shifting
Shift gears up and down while operating car to see if gears shift smoothly.
Shift gears while engine is OFF.
N.G.
O.K.
Check for proper installation of control lever.
Check engine idle speed.
N.G.
O.K.
N.G.
O.K.
Repair or replace.
Adjust.
• Check for improper disengaging of clutch.
• Check for improper operation of clutch operating cylinder/master cylinder.
Operation N.G.
Operation O.K.
Repair clutch.
Check lubrication oil level and color.
N.G.
O.K.
Add/replace oil.
Check for smooth shifting while car is operating.
N.G.
O.K.
Instructs customers in correct shifting method.
Problem may be inside transmission. Remove transmission from car, disassemble it and check it for source of difficult meshing/shifting of gears.
Check operation of striking rod.
N.G.
O.K.
Repair or replace.
Check operation of fork rod.
Check for possible bent fork rod or scratched case.
Scratched/bent
Replace.
Check engaging of hub, coupling sleeve, clutch gear, etc.
N.G.
O.K.
Replace.
Check gear end faces and gear bores for any sign of sticking/jamming. If detected, replace faulty parts.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST23810001 (J25693)	Adapter setting plate 
KV31100300 (–)	Fork rod pin punch 
ST30031000 (J25733-1)	Bearing puller 
KV31100401 (–)	Transmission press stand 
ST23860000 (–)	Counter gear drift 
ST22360002 (J25679)	Bearing drift 
ST22520000 (–)	Wrench 
ST23800000 (J25691)	Transmission drift 
KV32101330 (–)	Bearing puller 
ST22350000 (J25678)	Mainshaft bearing drift 

Tool number (Kent-Moore No.)	Tool name
ST33400001 (J26082)	Oil seal drift 

DATSUN 200SX **Model S110 Series**

SECTION AT

AUTOMATIC TRANSMISSION

CONTENTS

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.

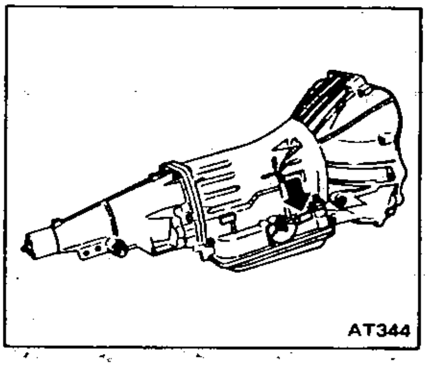
FLUID RECOMMENDATION

Use "DEXRON" type automatic transmission fluid only.

IDENTIFICATION NUMBER

Stamped position:

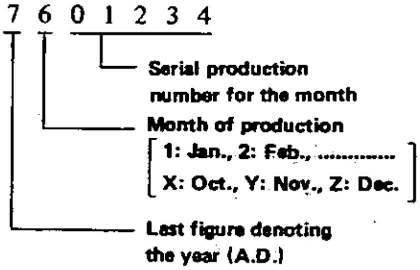
The plate is attached to the right hand side of transmission case.

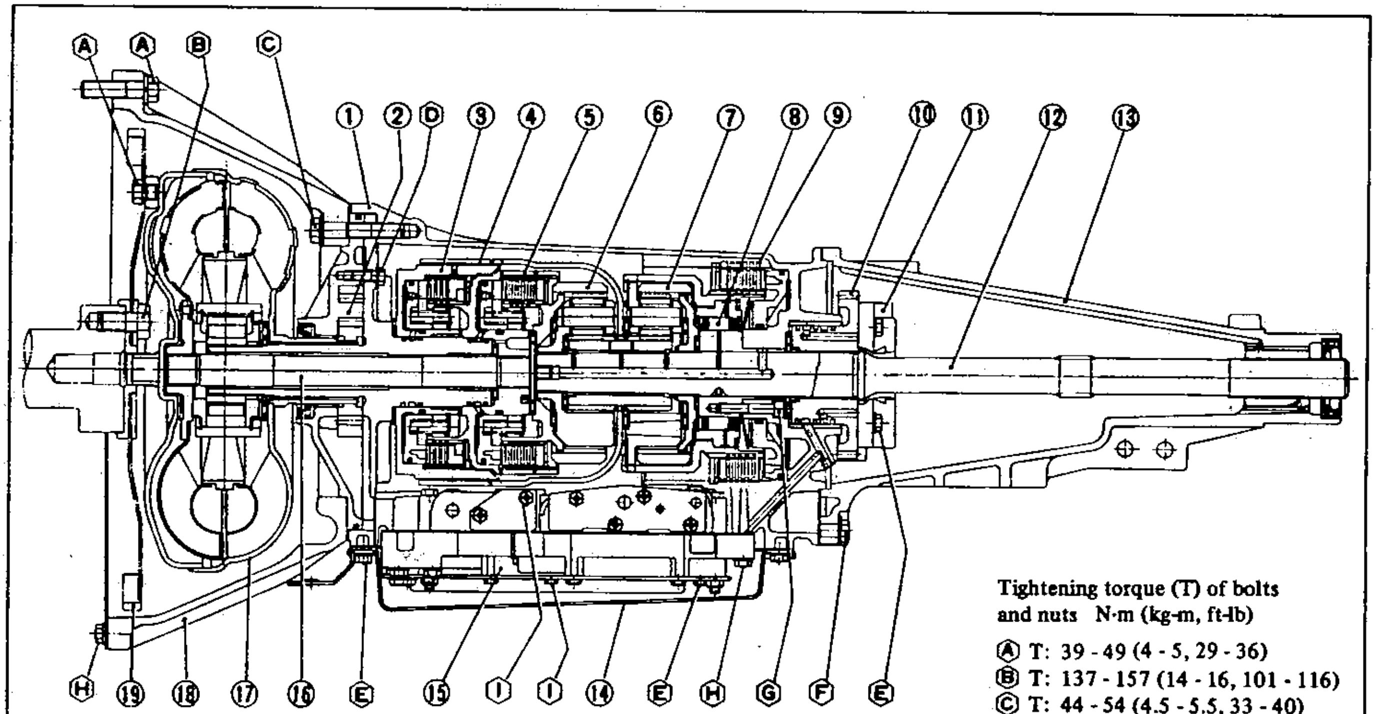

AT344

Identification of number arrangements:

JAPAN AUTOMATIC TRANSMISSION CO.,LTD
MODEL X01-23
NO. 7601234

Number designation





1 Transmission case
2 Oil pump
3 Front clutch
4 Band brake
5 Rear clutch
6 Front planetary gear
7 Rear planetary gear
8 One-way clutch
9 Low & Reverse brake
10 Oil distributor
11 Governor
12 Output shaft
13 Rear extension
14 Oil pan
15 Control valve
16 Input shaft
17 Torque converter
18 Converter housing
19 Drive plate

Tightening torque (T) of bolts and nuts N·m (kg-m, ft-lb)

Ⓐ T: 39 - 49 (4 - 5, 29 - 36)
Ⓑ T: 137 - 157 (14 - 16, 101 - 116)
Ⓒ T: 44 - 54 (4.5 - 5.5, 33 - 40)
Ⓓ T: 5.9 - 7.8 (0.6 - 0.8, 4.3 - 5.8)
Ⓔ T: 4.9 - 6.9 (0.5 - 0.7, 3.6 - 5.1)
Ⓕ T: 20 - 25 (2.0 - 2.5, 14 - 18)
Ⓖ T: 13 - 18 (1.3 - 1.8, 9 - 13)
Ⓗ T: 5.4 - 7.4 (0.55 - 0.75, 4.0 - 5.4)
Ⓘ T: 2.5 - 3.4 (0.25 - 0.35, 1.8 - 2.5)

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.

2-3 Timing valve

For 2-3 shifts, a restrictive orifice slows the application fluid to the front clutch, while the slower reacting band is allowed to release. This prevents a hard 2-3 or 3-2 shift. Under heavy load, however, the engine will tend to run away during the 2-3 or 3-2 shift pause, therefore a 2-3 timing valve, using throttle and governor pressure, is used to bypass the restrictive orifice during such heavy load conditions.

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.

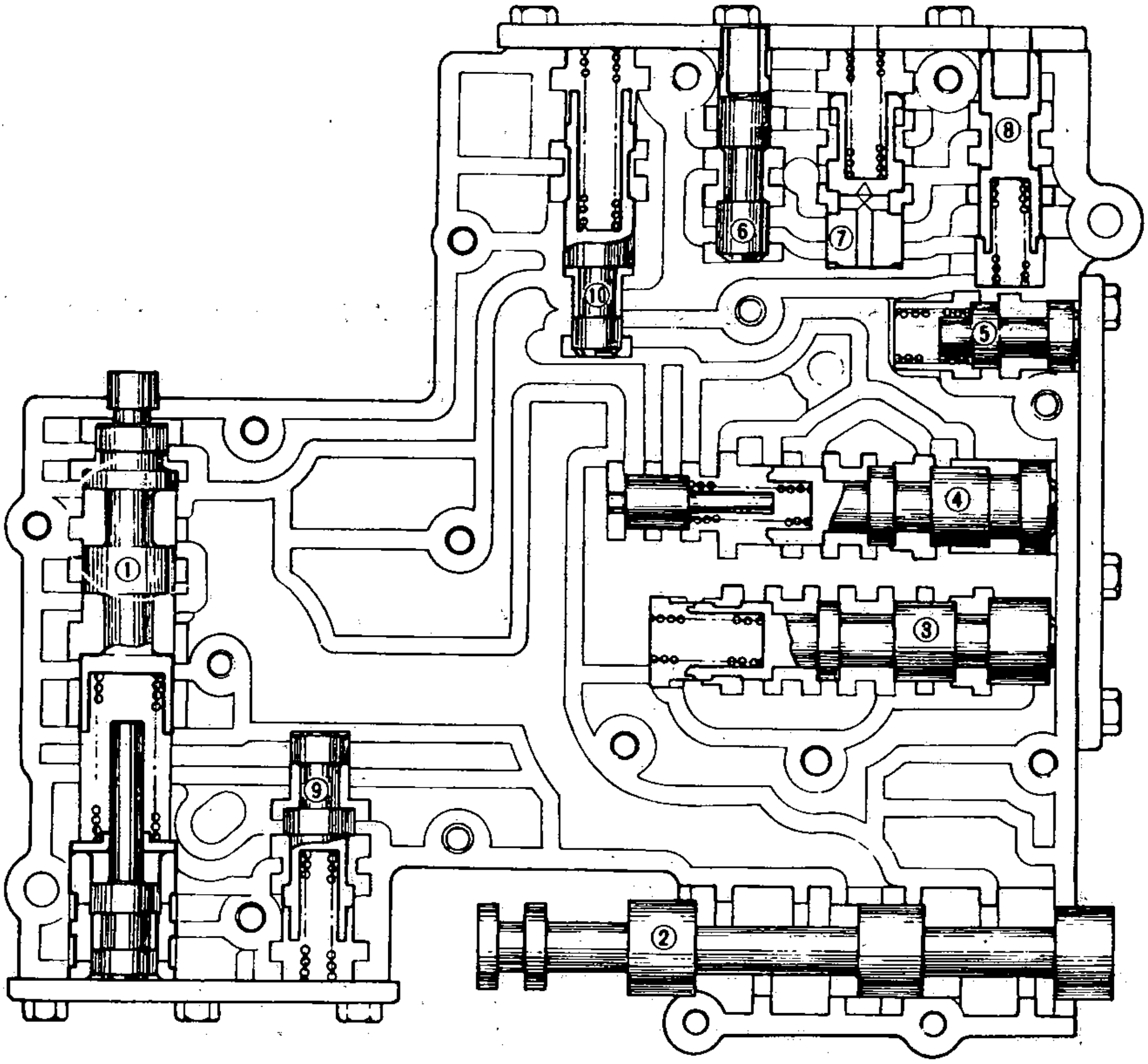
Second lock valve

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 “D_2”, “D_3” and “1_2” 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



AT094

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
10 2-3 timing 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.

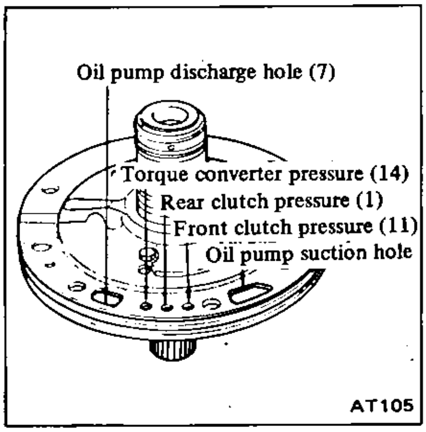
Auxiliary line pressure: 13

Torque converter pressure: 14

Governor pressure: 15

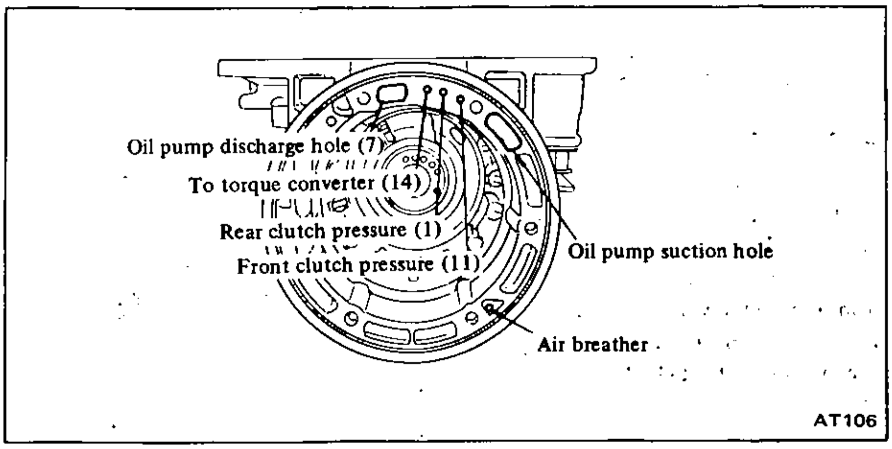
Throttle system pressure:
16, 17, 18, 19.

Oil Channels in Oil Pump



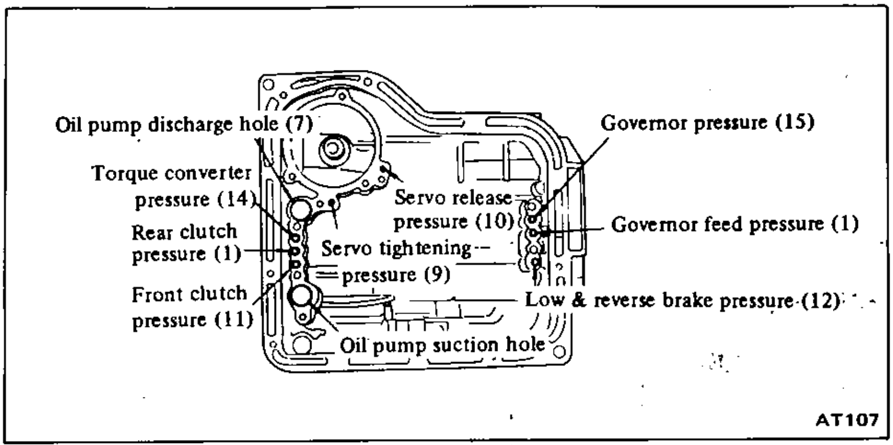
AT105

Oil Channels in Case Front Face



AT106

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
				Front	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 "1_1" range to prevent free wheeling when coasting and allows engine braking.

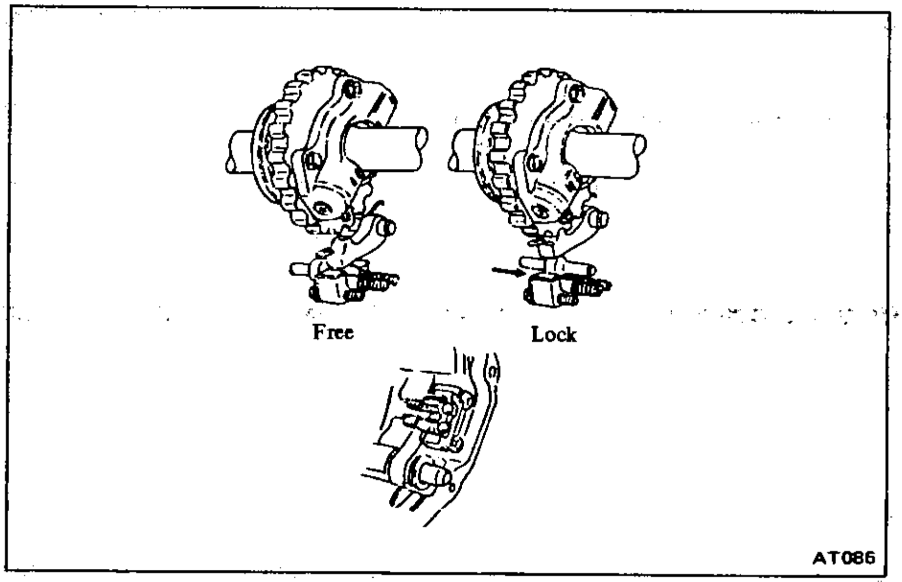
HYDRAULIC CONTROL CIRCUITS

"P" RANGE (PARK)

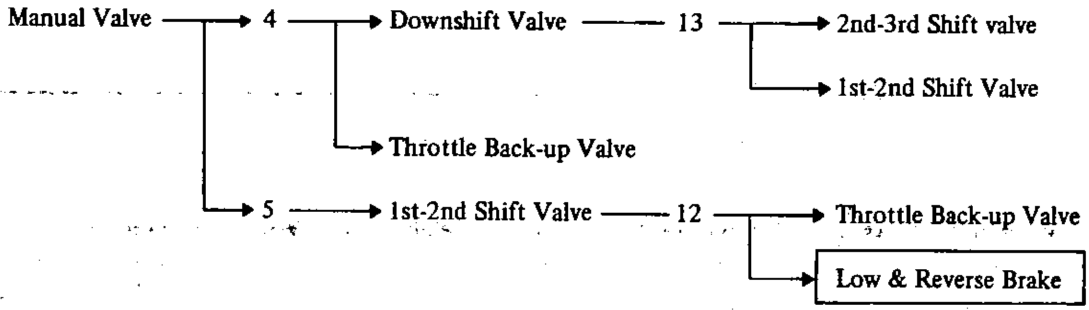
Power flow

In "P" range, the shift linkage actuated parking pawl meshes in a gear splined to the output shaft, preventing movement of the car. When the engine is running, the low and reverse brake is applied by pressure from the manual valve passing through the 1-2 shift valve.

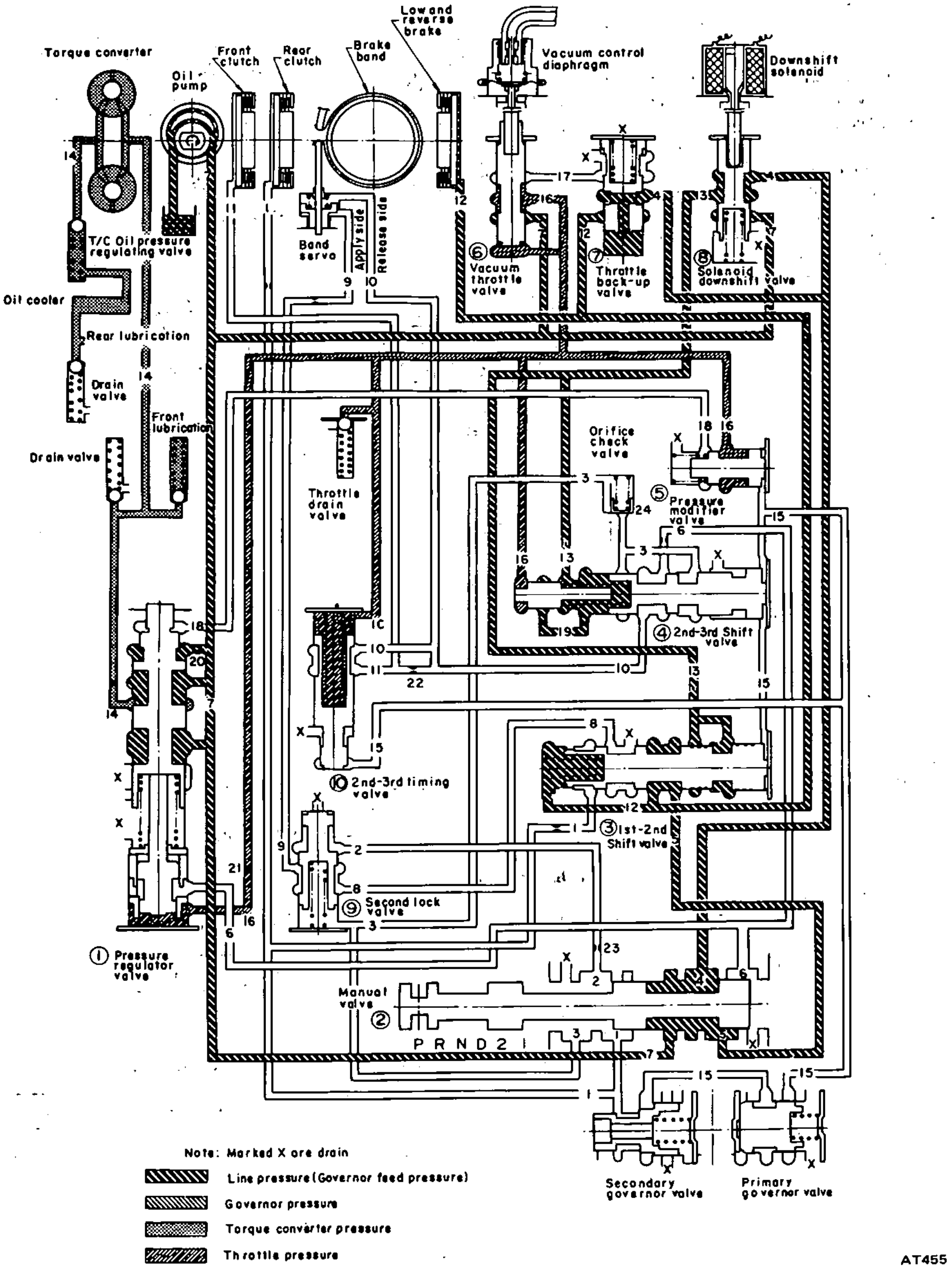
Parking Mechanism



Fluid flow



Oil Pressure Circuit Diagram – "P" range (Park)



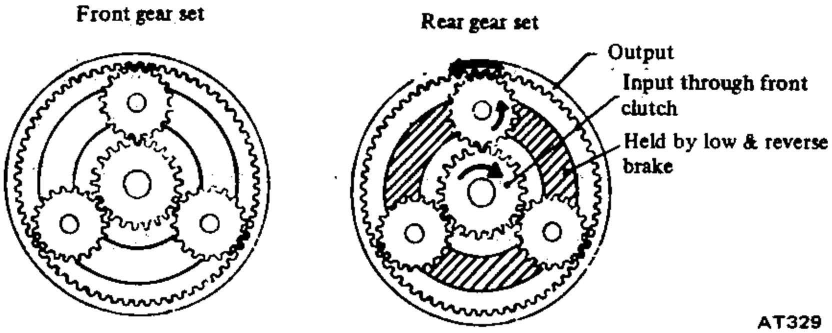
AT455

"R" RANGE (REVERSE)

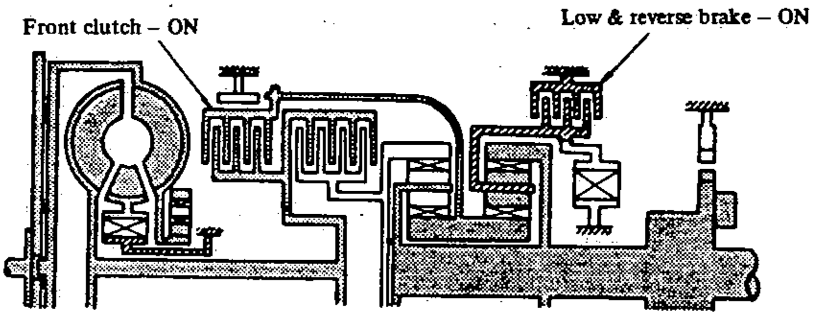
Power flow

With the selector lever in "R" range, the front clutch is applied to transmit clockwise engine torque through the connecting shell to the sun gear. The clockwise rotation of the sun gear causes the planet gears to rotate counterclockwise. With the low and reverse brake holding the rear planet carrier, the rear internal gear, splined to the output shaft, turns counterclockwise in a reduction ratio of approximately 2.18 to 1.

Mechanical Operation during "R" Range



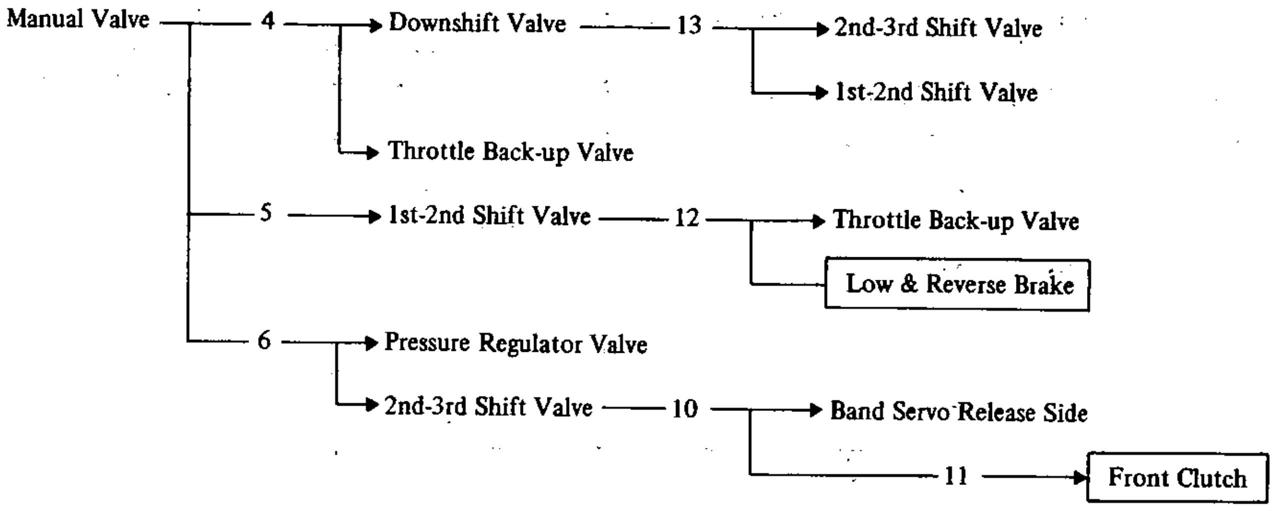
AT329



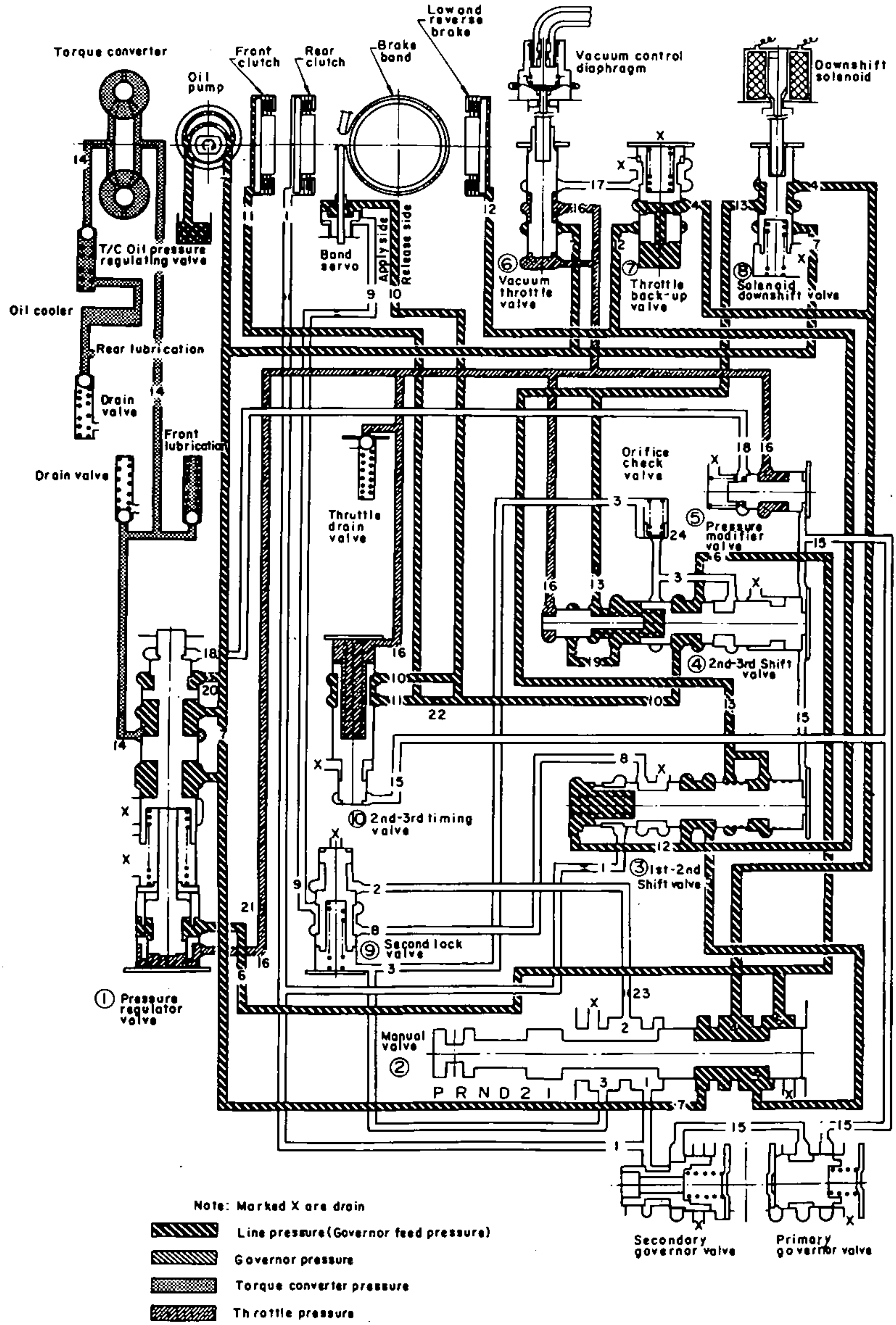
Front clutch	ON
Rear clutch	OFF
Low and reverse brake	ON
Brake band servo	OFF - Pressure release
One-way clutch	Overrunning

AT085

Fluid flow



Oil Pressure Circuit Diagram – "R" range (Reverse)



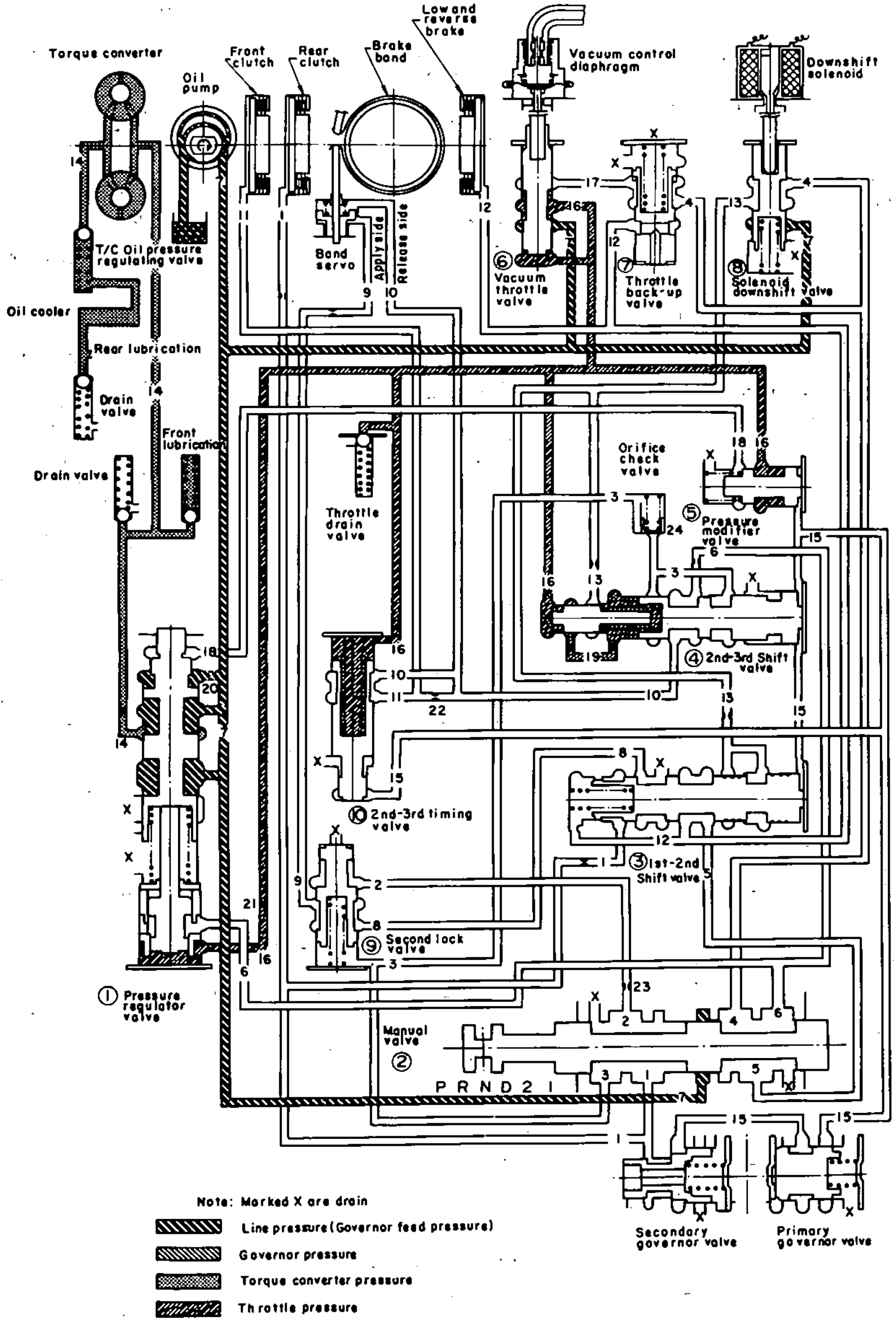
AT456

"N" RANGE (NEUTRAL)

Power flow

In "N" range no friction elements are in use, thus no power is transmitted to the output shaft.

Oil Pressure Circuit Diagram – "N" range (Neutral)



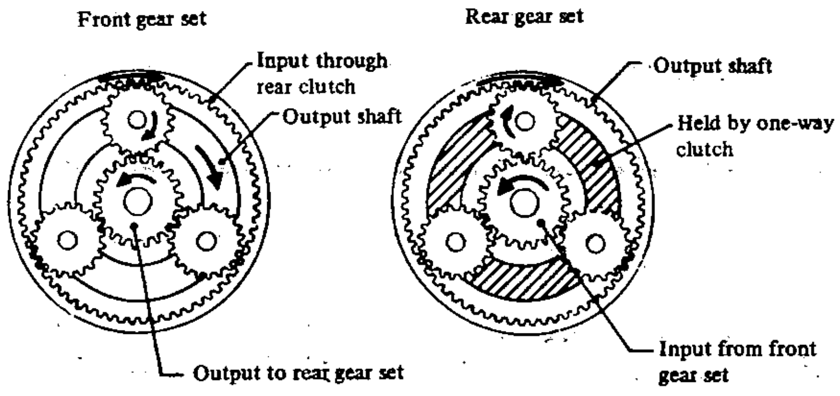
AT457

"D_1" RANGE (LOW GEAR)

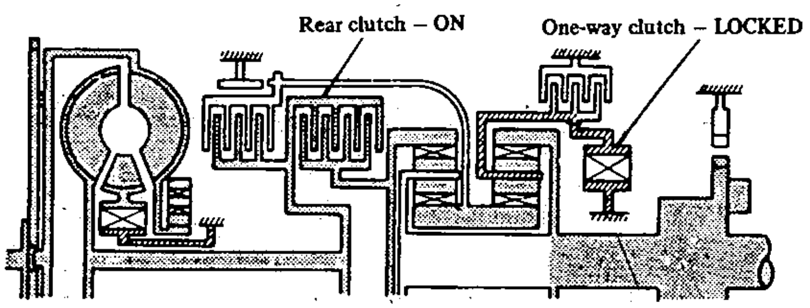
Power flow

With the shift selector in "D" (low gear), engine torque is transmitted, through the applied rear clutch, to the internal gear of the front gear set. The clockwise rotation of the front internal gear causes the front planet gears to rotate clockwise, driving the compound sun gear counterclockwise. The front planetary carrier is splined to the output shaft. This causes the planet gears to drive the sun gear instead of "walking" around the sun gear. This counterclockwise rotation of the sun gear causes the rear planet gears to rotate clockwise. With the one-way clutch holding the rear planet carrier, the rear planetary gears turn the rear internal gear and output shaft clockwise in a reduction ratio of approximately 2.46 to 1.

Mechanical Operation during "D_1" Range



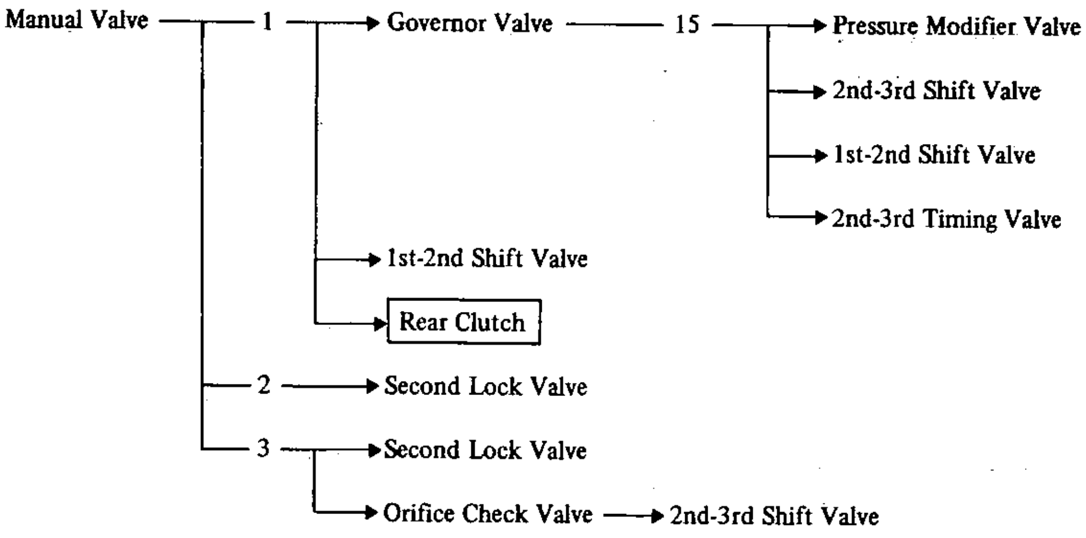
AT330



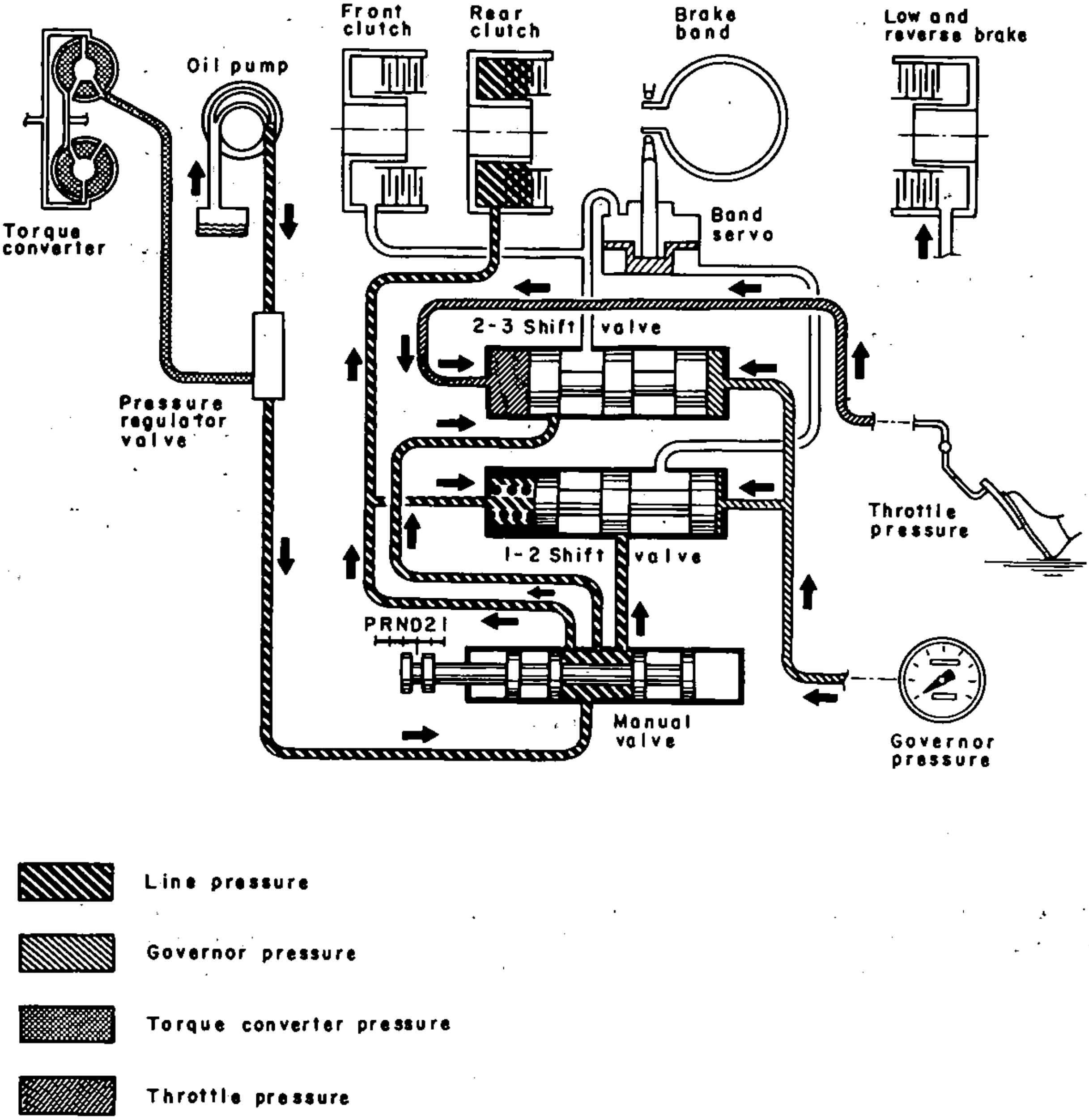
Front clutch	OFF
Rear clutch	ON
Low and reverse brake	OFF
Brake band servo	OFF
One-way clutch	HOLDING

AT081

Fluid flow



Oil Pressure Circuit Diagram – "D_1" range (Low gear)



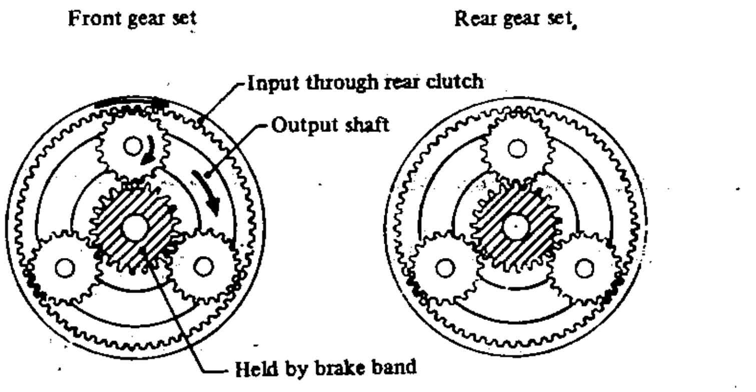
AT446

"D_2" RANGE (2ND GEAR)

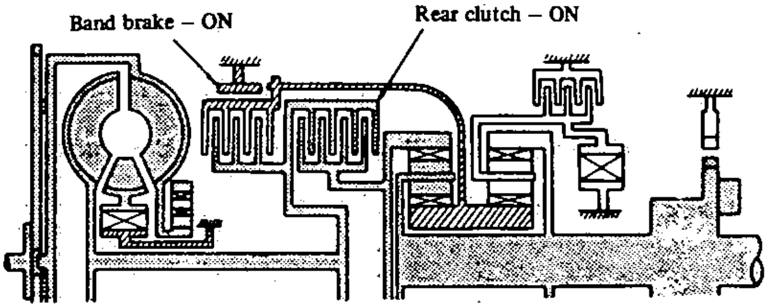
Power flow

In "D_2" range, the brake band is applied to hold the connecting shell and sun gear stationary. Engine torque, through the applied rear clutch is delivered to the internal gear of the front gear set in a clockwise rotation. Clockwise rotation of the internal gear causes the planet gears to "walk" around the stationary sun gear in a clockwise direction. This causes the output shaft, which is splined to the front planet carrier to turn in a clockwise direction with a reduction ratio of about 1.46 to 1.

Mechanical Operation during "D_2" Range



AT331

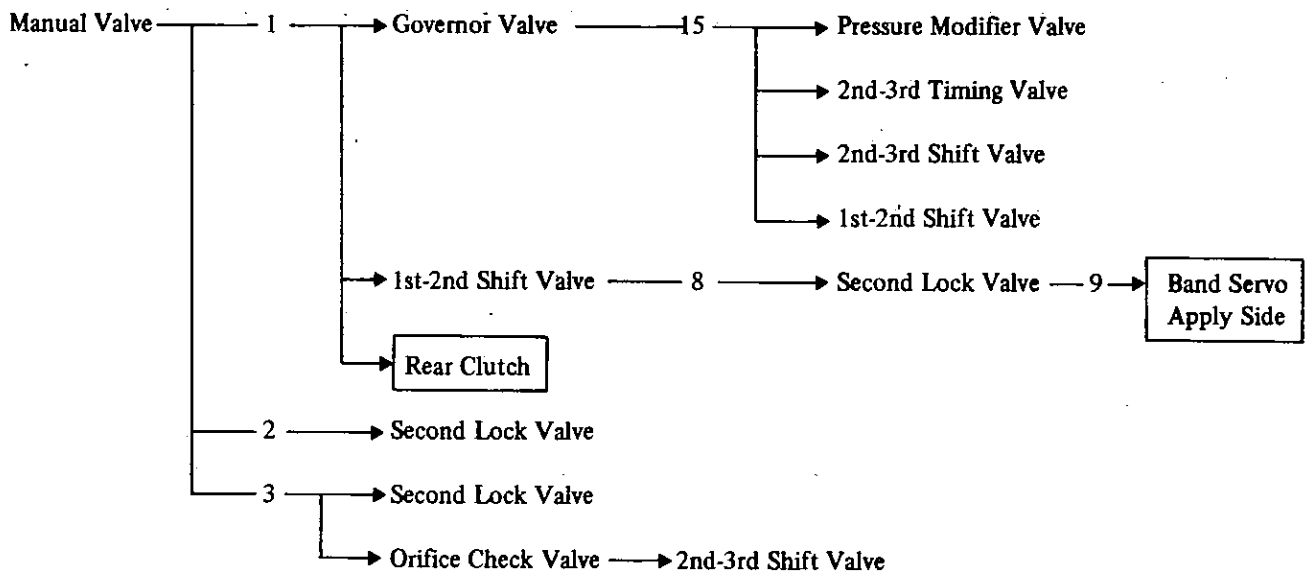


Front clutch	OFF
Rear clutch	ON
Low and reverse brake	OFF
Brake band servo	ON
One-way clutch	OFF

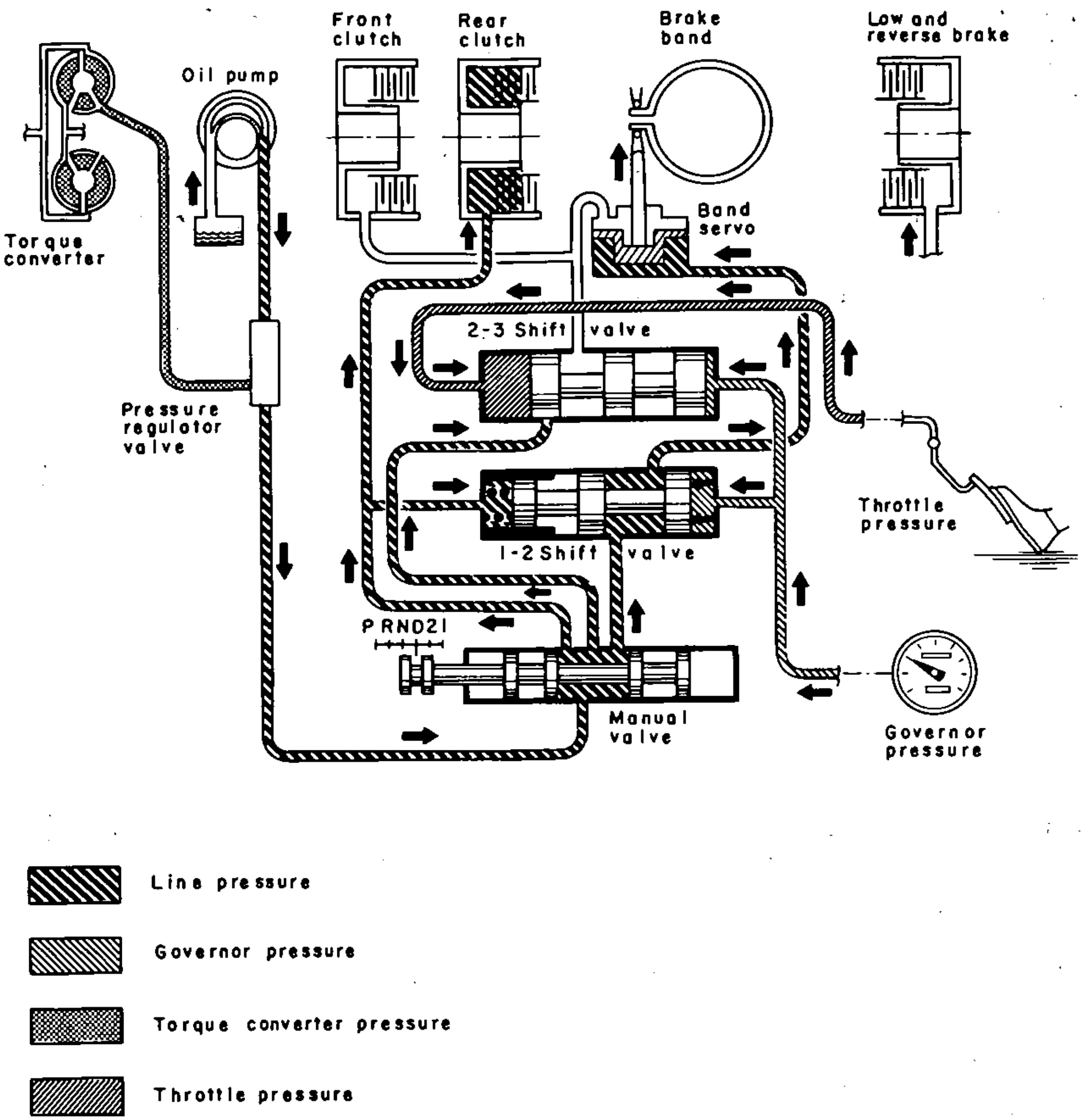
AT079

Fluid flow

As car speed and governor pressure increase, the governor pressure acting on the end of the 1-2 shift valve overcomes the force of the 1-2 shift valve spring and line pressure. This allows the 1-2 shift valve to move to the upshift position which directs line pressure through the 2nd lock valve and on to the brake band.



Oil Pressure Circuit Diagram – "D$_2$" range (2nd gear)



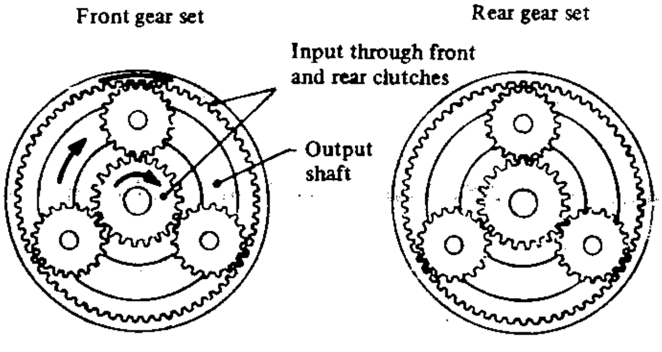
AT448

"D3" RANGE (3RD GEAR)

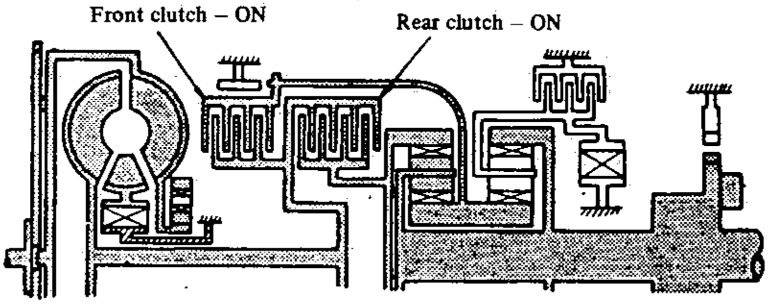
Power flow

In "D3" range, engine torque is transmitted through both clutches. The front clutch turns the internal gear of the forward gear set clockwise. The rear clutch turns the sun gears in a clockwise direction also. With both the internal gear and the sun gear of the forward gear set turning in the same direction at the same speed, the planet gears are locked in position, and turn as a unit. The output shaft, splined to the forward planet carrier, turns at a ratio of 1 : 1.

Mechanical Operation during "D3" Range



AT332

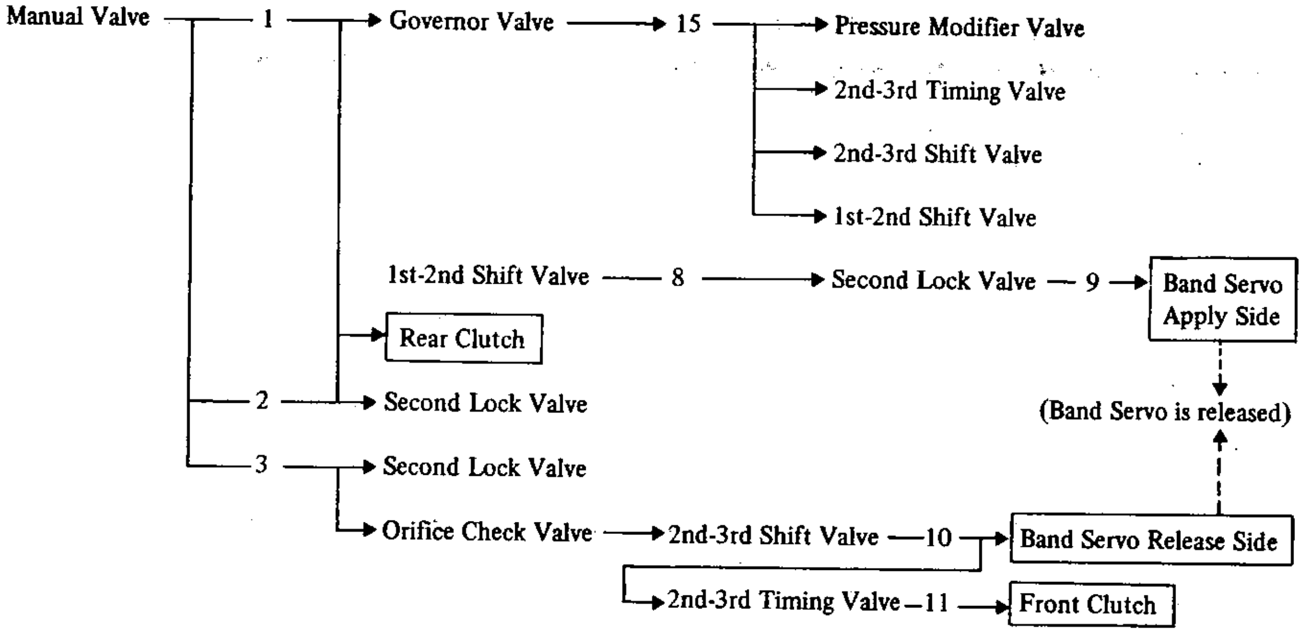


AT083

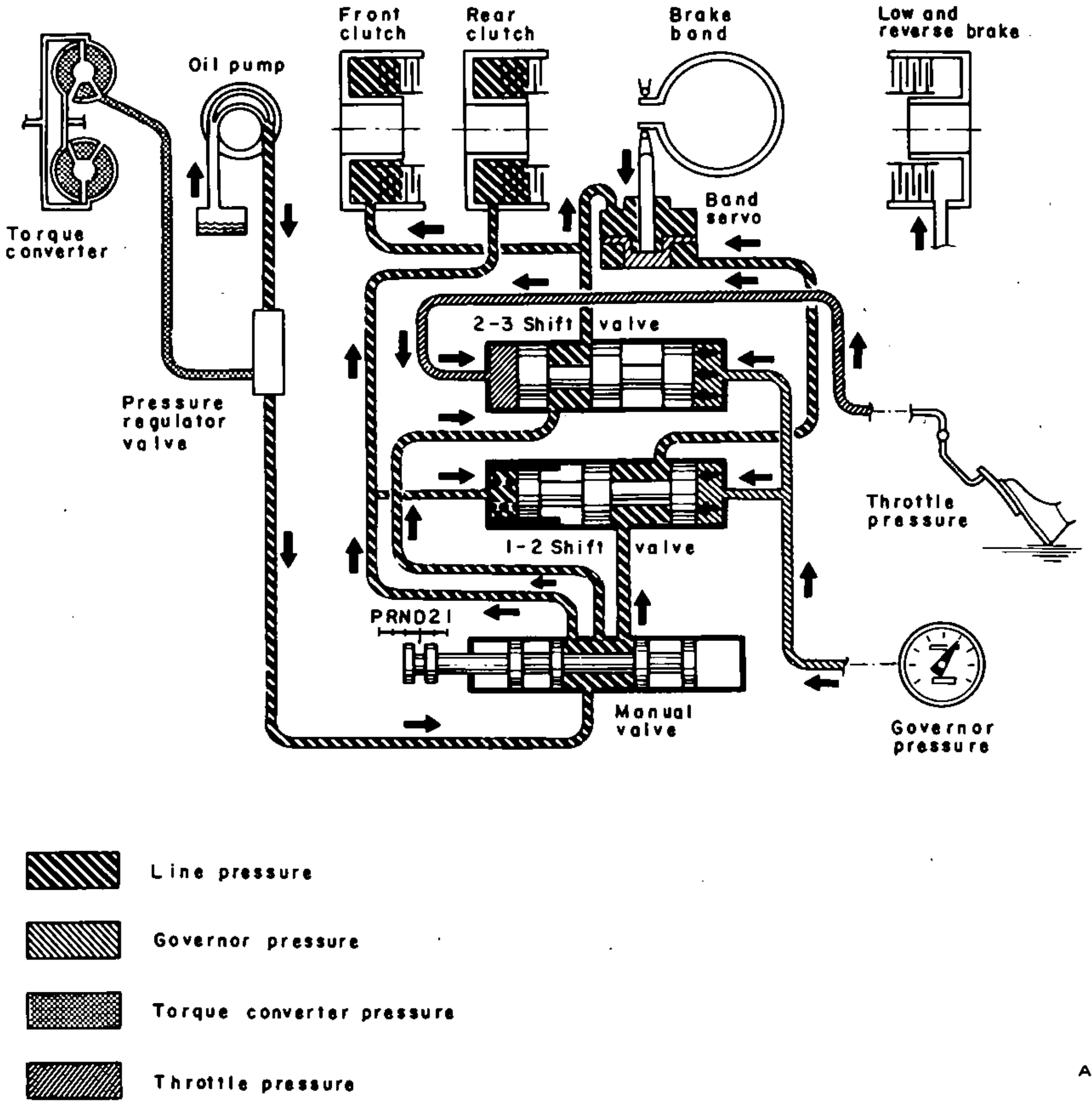
Front clutch	ON
Rear clutch	ON
Low and reverse brake	OFF
Brake band servo	OFF - Pressure release
One-way clutch	OFF

Fluid flow

Governor pressure increases to the point that it can overcome the combined forces of spring and throttle pressure and move the 2nd-3rd shift valve. When the 2nd-3rd shift valve opens, pressure passes through the valve lands to the 2-3 timing valve and on to apply the front clutch and release the brake band. The car is now in D_3 or direct drive (the rear clutch was already applied).



Oil Pressure Circuit Diagram – "D$_3$" range (3rd gear)

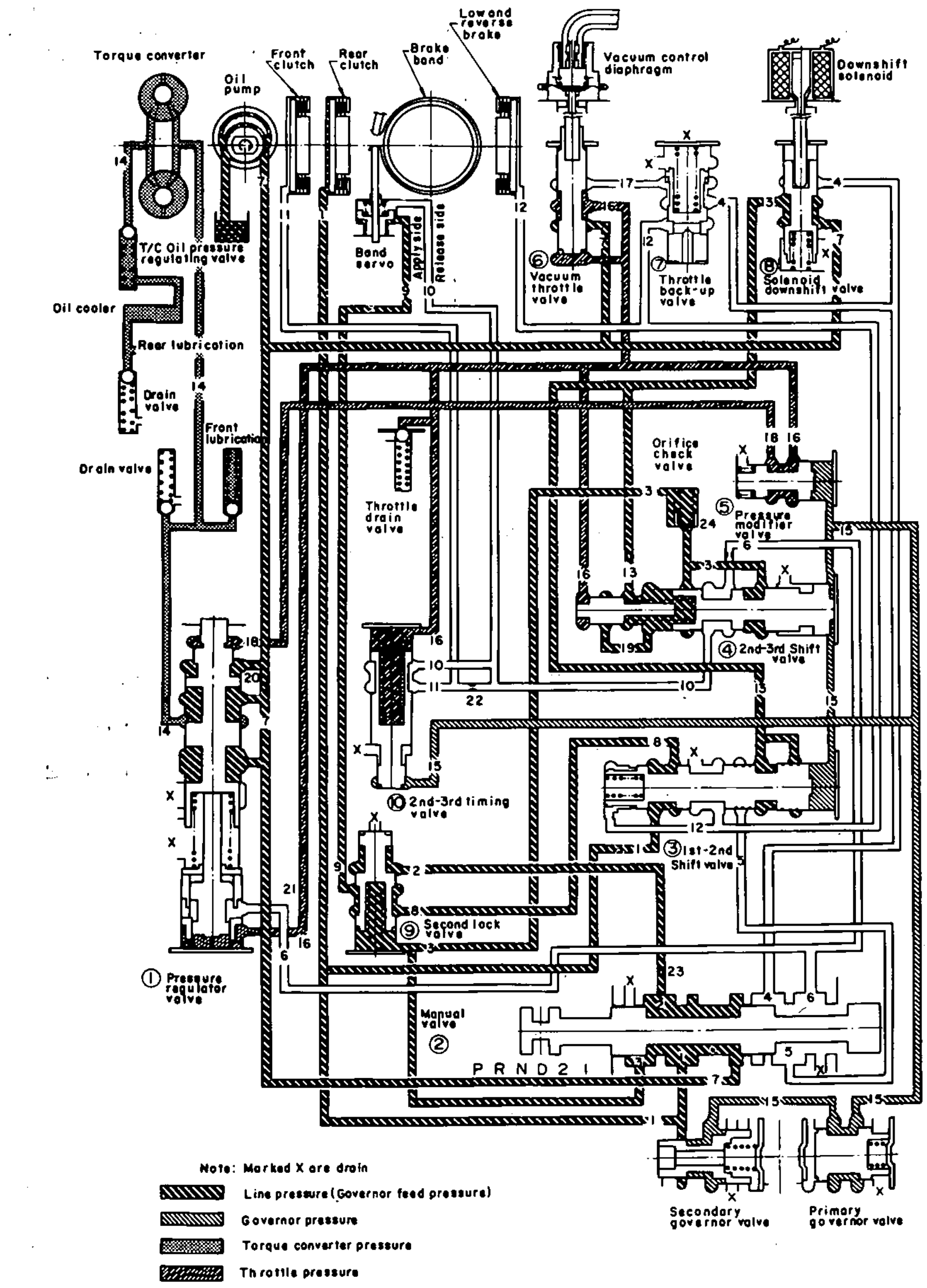


AT449

"D" RANGE KICKDOWN

To achieve a forced downshift from 3rd to 2nd, the car speed must be under approximately 100 km/h (60 MPH); from 2nd to 1st, it must be under approximately 50 km/h (30 MPH). Fully depressing the accelerator pedal energizes the downshift solenoid, which opens the solenoid downshift valve. Oil pressure is then exerted against the shift valves. Between 50 and 100 km/h (30 and 60 MPH), this pressure will close the 2nd-3rd shift valve against governor pressure and the car downshifts. When the car speed is below 50 km/h (30 MPH), the 1st-2nd shift valve will be closed and the transmission will be in 1st gear. As car speed and governor pressure increase, the shift valves automatically reopen.

Oil Pressure Circuit Diagram – "D" range kickdown (shift valves in 2nd gear position)



"2" RANGE (2ND GEAR)

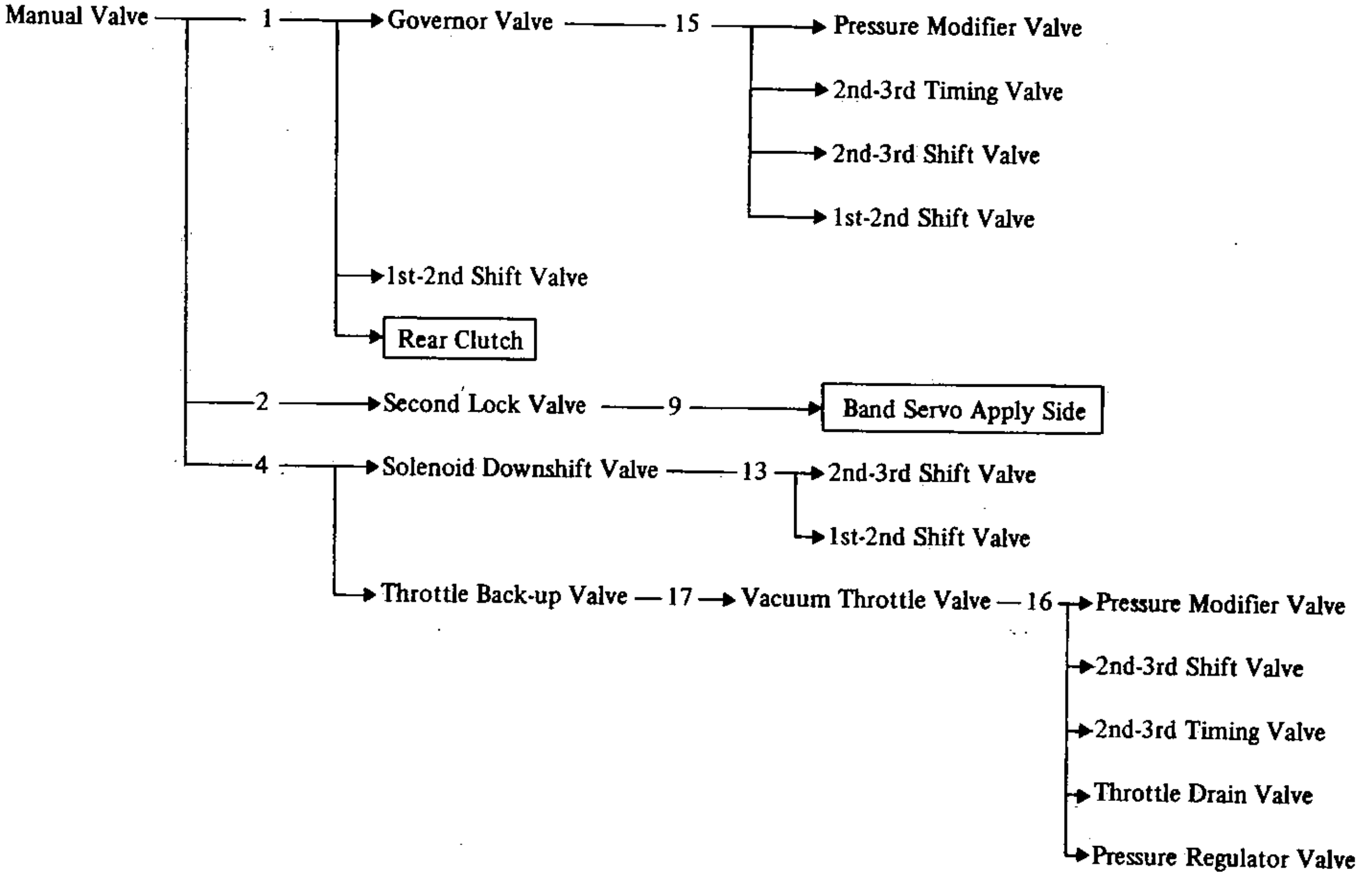
The range "2" position is used to lock the car in 2nd gear, preventing upshifts or downshifts under any conditions.

Power flow

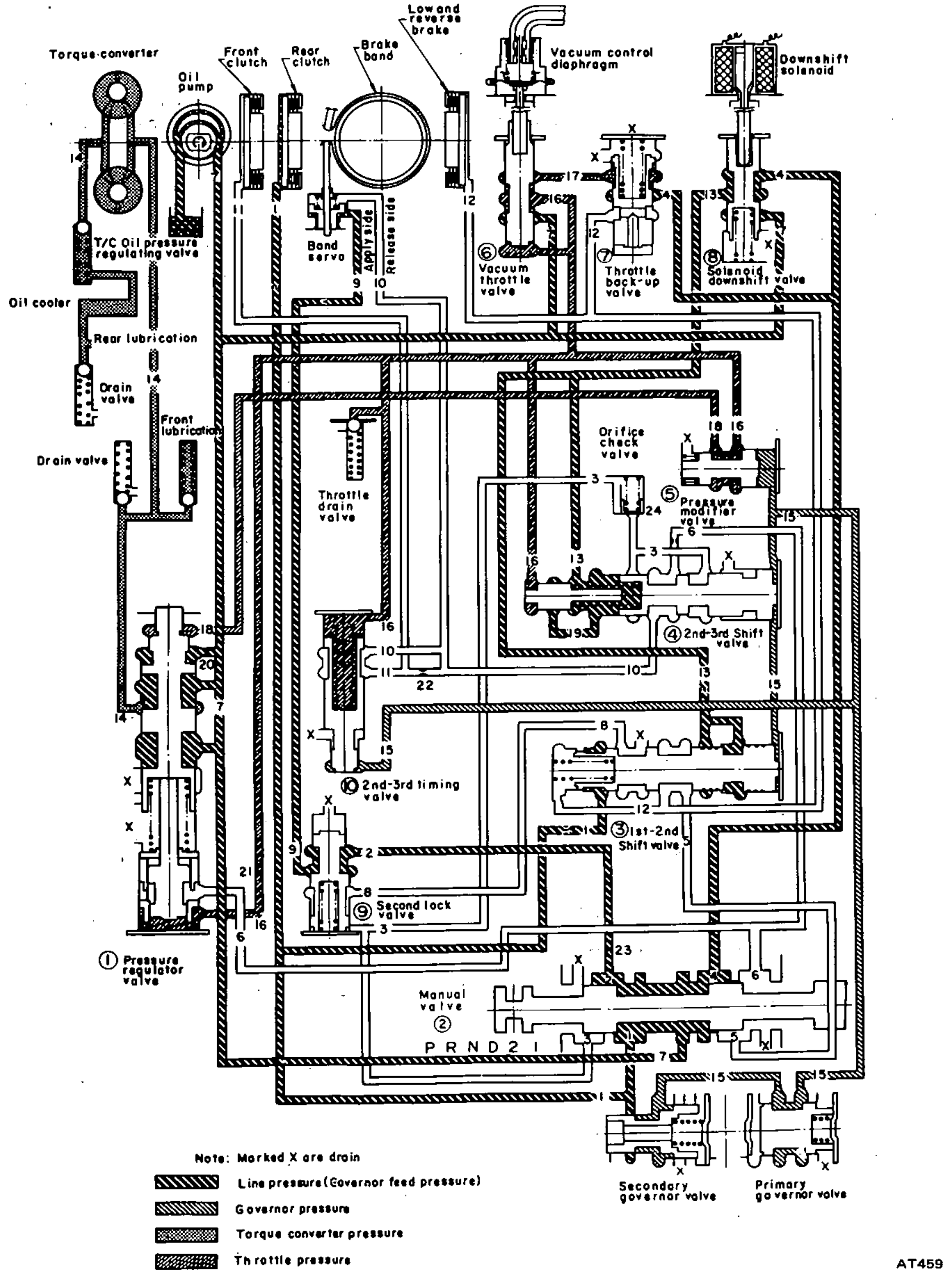
Power flow in "2" range is the same as in "D_2" range.

Fluid flow

Line pressure from the manual valve opens the second lock valve against spring pressure. As this valve opens, pressure then passes to apply the band servo. Line pressure also flows to the throttle back-up valve, opening the valve and allowing pressure to pass into the line of the throttle valve, thus assuring adequate throttle pressure, even during deceleration. The downshift solenoid valve is used as a passage for line pressure to lock the 1-2 and 2-3 shift valves.



Oil Pressure Circuit Diagram – "2" range (2nd gear)



"1" RANGE (LOW AND 2ND GEAR)

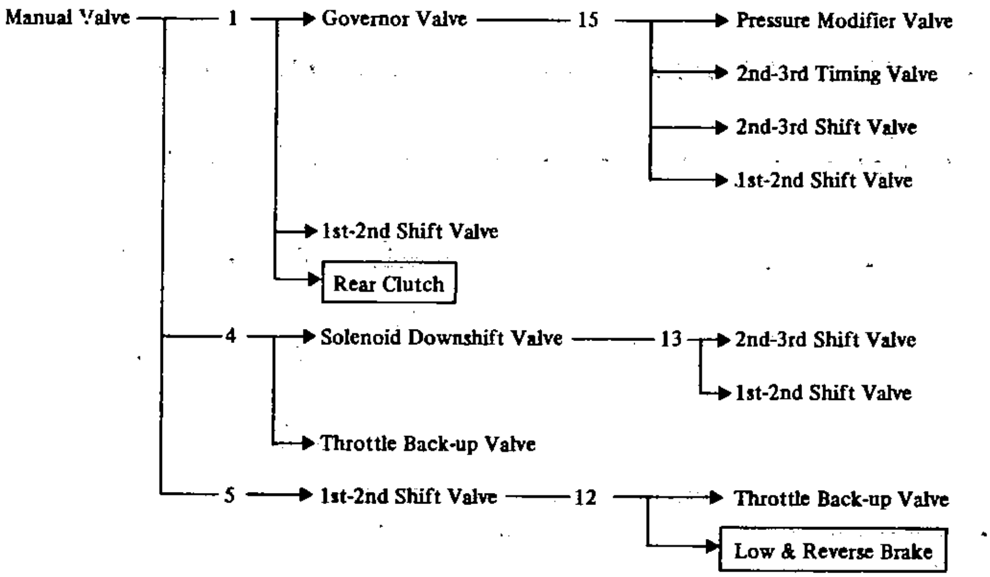
The range "1" position is used to lock the car in 1st gear, preventing any upshifts. If the selector lever is moved to the "1" position while the car is moving at high speeds, the transmission will not shift into first gear until car speed slows to approximately 50 km/h (30 MPH). Instead it will shift to second (1_2), as governor pressure prevents the 1-2 shift valve from closing.

Power flow

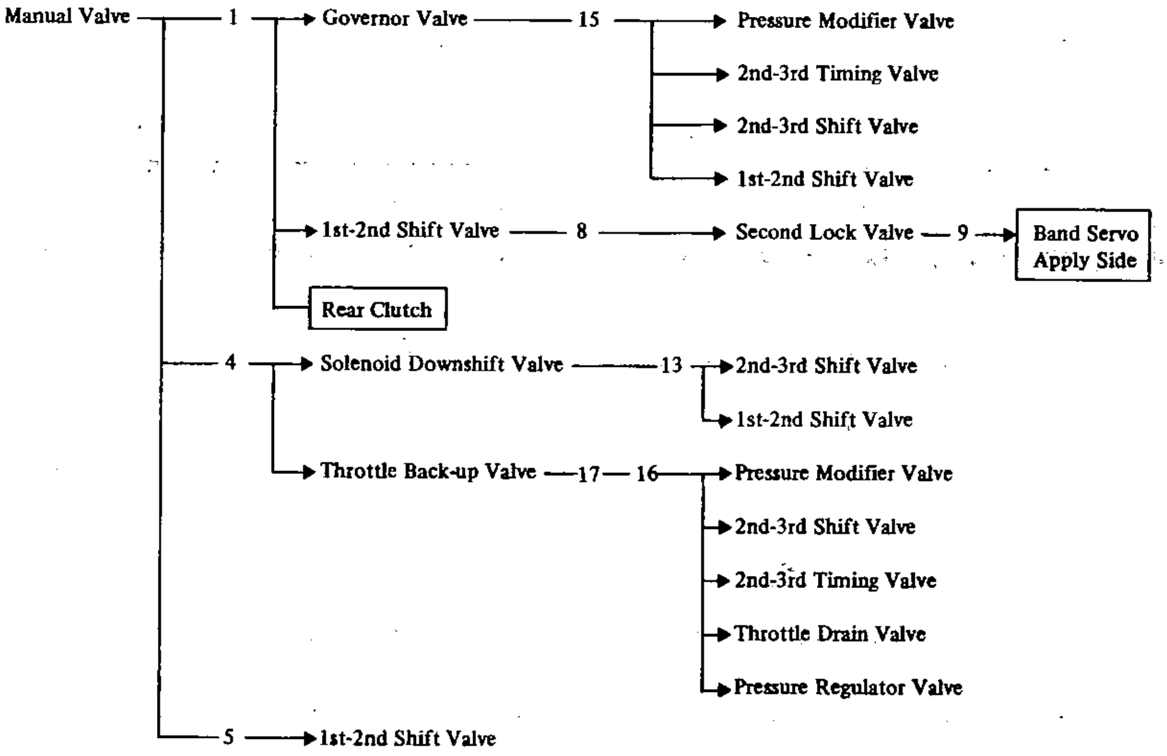
The power flow in 1_1 differs slightly from D_1 in that the low and reverse band is applied to hold the rear gear set planet carrier, providing engine braking. Power flow in 1_2 is the same as in D_2.

Fluid flow (Low gear)

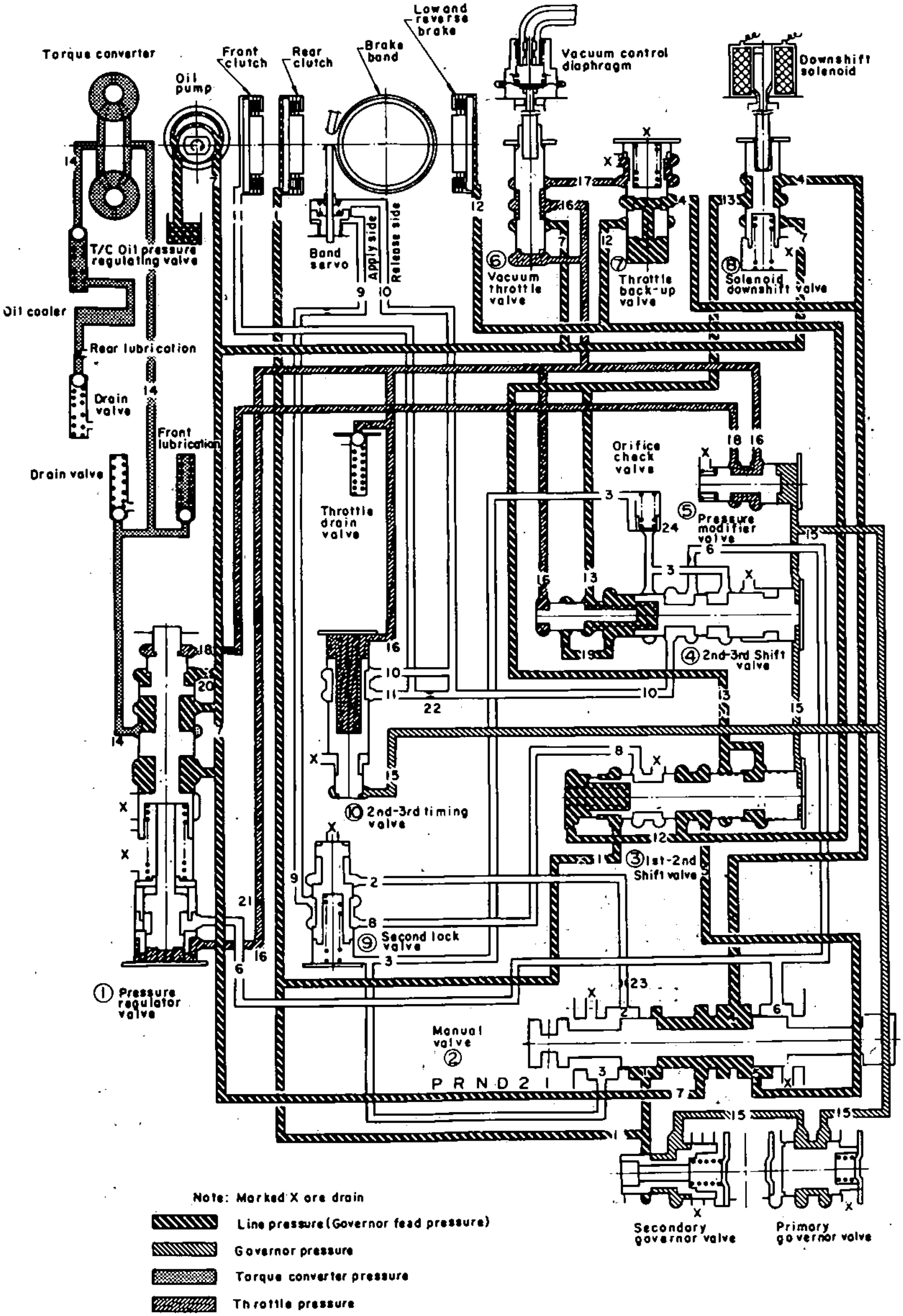
Manual pressure passing through the 1-2 shift valve is used to close the 1-2 shift valve, preventing a 1-2 upshift. Manual pressure passing through the downshift valve locks the 2-3 shift valve closed, along with applying additional closing pressure to the 1-2 shift valve.



Fluid flow (2nd gear)

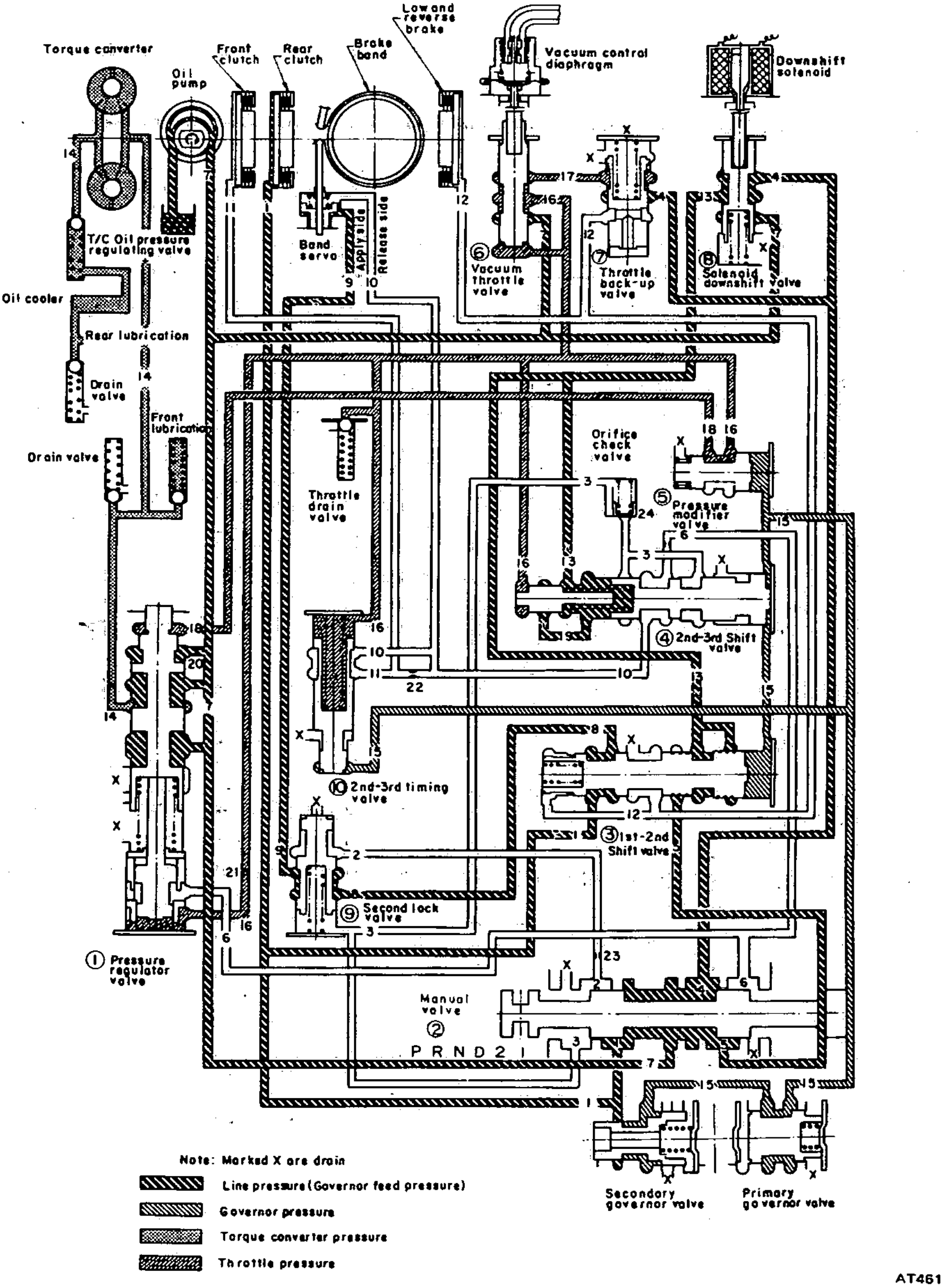


Oil Pressure Circuit Diagram – "1_1" range (Low gear)



AT460

Oil Pressure Circuit Diagram – "1_2" range (2nd gear)



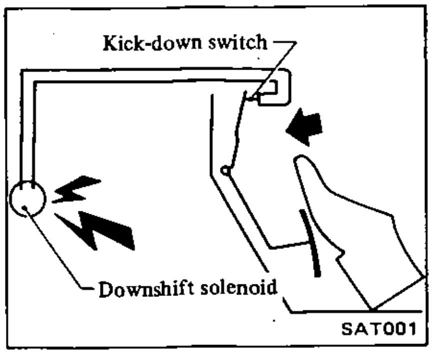
AT461

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.



SAT001

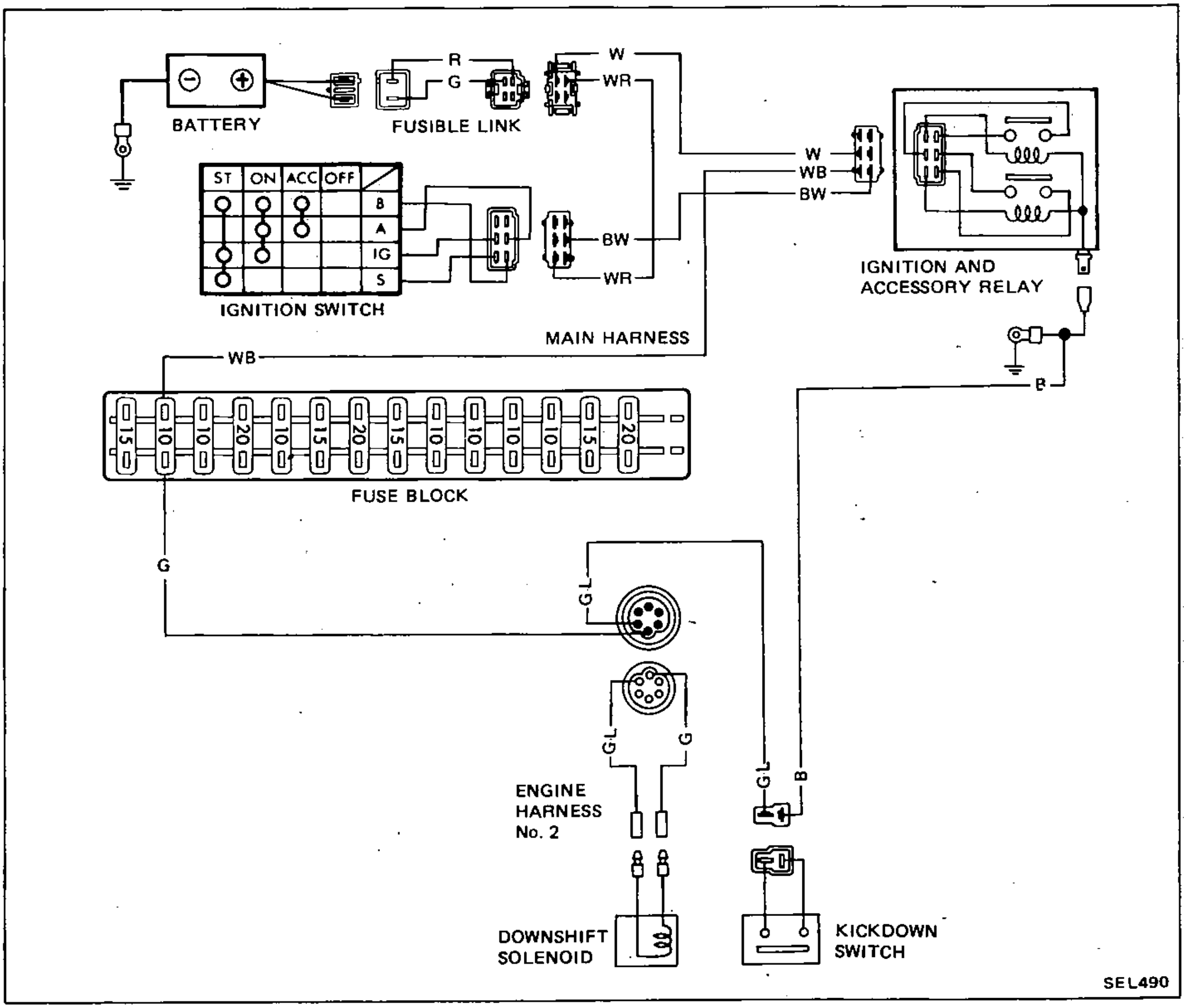
Do not allow the switch to make contact too soon. This would cause the transmission to downshift on part throttle.

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



SEL490

INHIBITOR SWITCH ADJUSTMENT

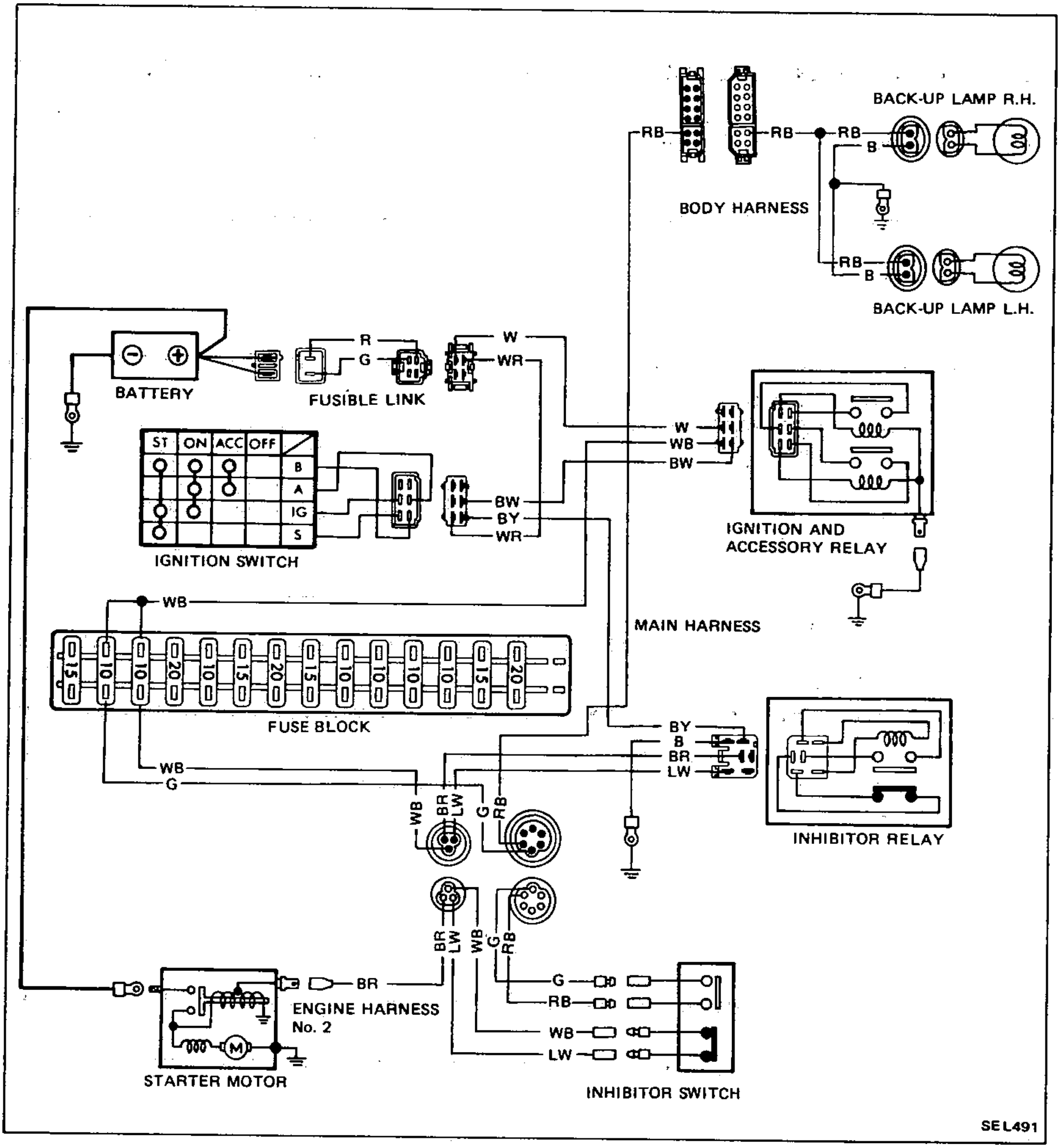
The inhibitor switch has two major functions. It allows the back-up lights to illuminate when the shift lever is placed in the reverse range. It also acts as a neutral safety switch allowing current to pass from the starter only when the lever is placed in the "P" or "N" range.

A continuity tester may be used to check the inhibitor switch for proper operation.

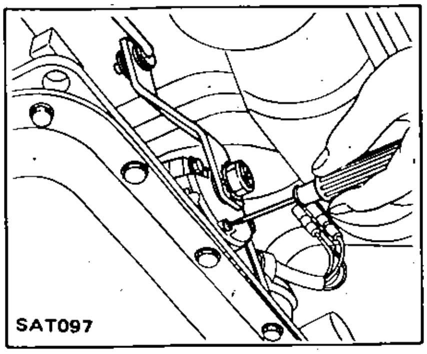
The two black and yellow (B-Y) wires should have continuity when the lever is in the "P" and "N" positions.

Red and black (R-B) wires should have continuity when the shift lever is moved to "R" range.

Wiring Diagram

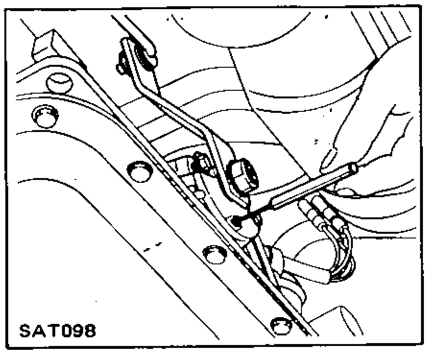


1. Place the manual valve in Neutral (vertical position).
2. Remove the screw as illustrated.



SAT097

3. Loosen the attaching bolts.
4. Using an aligning pin, move the switch until the pin falls into the hole in the rotor.



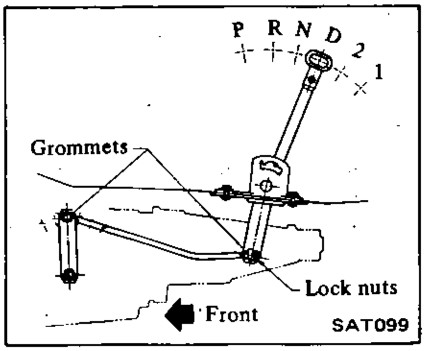
SAT098

5. Tighten the attaching bolts.
6. Recheck for continuity. If faulty, replace the switch.

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.



SAT099

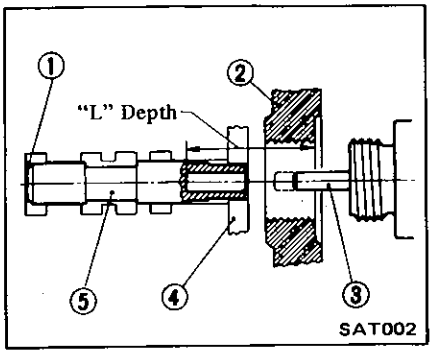
1. Place shift lever in "D" range.
2. Loosen locknuts and move shift lever until "D" is properly aligned and car is in "D" range.
3. Tighten locknut.

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.



SAT002

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

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 dismounting the automatic transmission from a car, pay attention to the following points:

1. Before dismounting 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 dismounting the automatic transmission from a car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. 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.
3. Remove propeller shaft.

Plug up the opening in the rear extension to prevent oil from flowing out.

4. Disconnect front exhaust tube.
5. Disconnect selector range lever from manual shaft.
6. Disconnect wire connections at inhibitor switch.
7. Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid.
8. Disconnect speedometer cable from rear extension.
9. Disconnect oil charging pipe.
10. Disconnect oil cooler inlet and outlet tubes at transmission case.
11. Support engine by locating a jack under oil pan with a woden 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.

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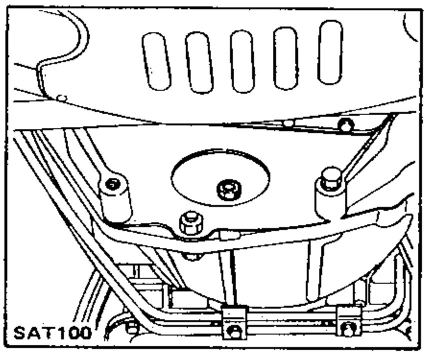
12. Detach converter housing dust cover. Remove bolts securing torque converter to drive plate.



SAT100

Before removing torque converter, inscribe chalk marks on two parts so that they may be replaced in their original positions at assembly.

13. Remove rear engine mount securing bolts and crossmember mounting bolts.
14. Remove starter motor.
15. 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 dismounting transmission not to strike any adjacent parts.

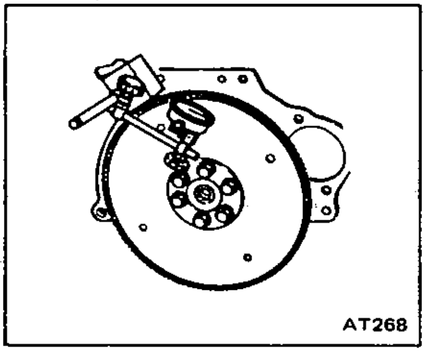
INSTALLATION

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 indicating finger of a dial gauge rested against plate.

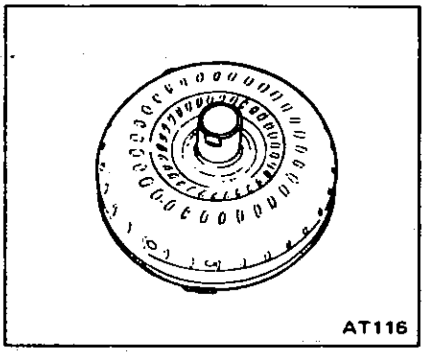
   Maximum allowable runout:
   0.5 mm (0.020 in)



AT268

2. Installation of torque converter

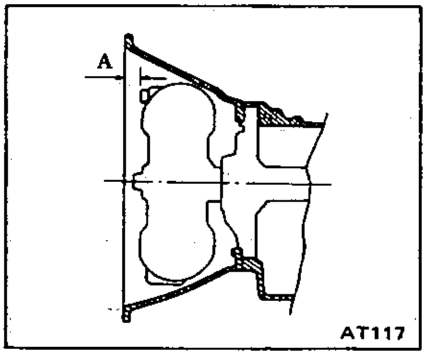
   Line up notch in torque converter with that in oil pump. Be extremely careful not to put undue stress on parts when installing torque converter.



AT116

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)



AT117

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-26 and 27 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.

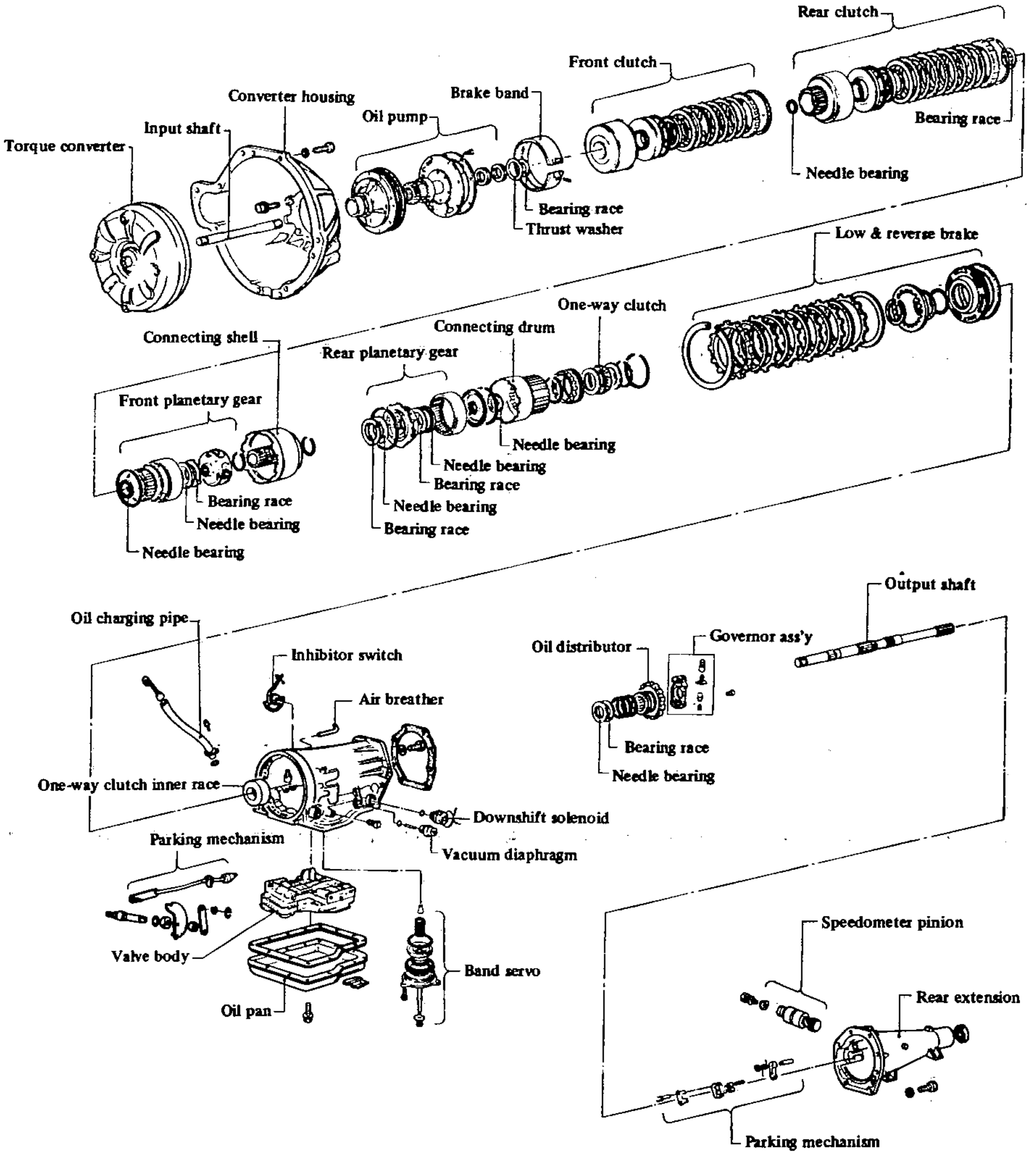
10. Check fluid level in transmission. For detailed procedure, see page AT-51.
11. Move selector lever through all positions to be sure that transmission operates correctly.

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-52 for Checking Engine Idle.

12. Check to be sure that line pressure is correct. To do this, refer to page AT-54 for Line Pressure Test.
13. Perform stall test as described in page AT-55.

MAJOR OVERHAUL OPERATIONS



SAT101

SERVICE NOTES FOR DISASSEMBLY

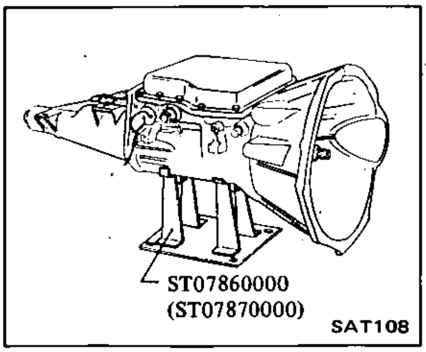
Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts of the transmission from becoming contaminated by dirt or other foreign matter.

Disassembly should be done in a clean work area.

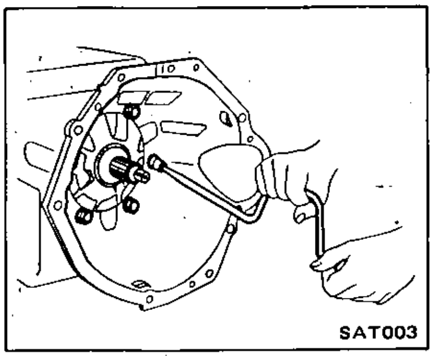
Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transmission's operation.

DISASSEMBLY

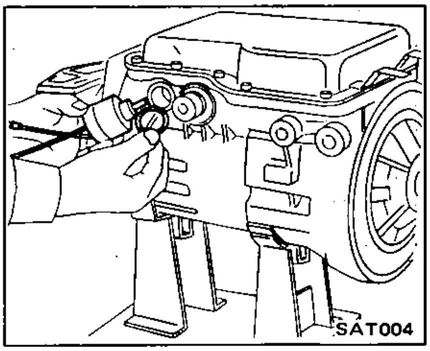
1. Remove torque converter, drain transmission fluid through end of rear extension, and place transmission on Tool.



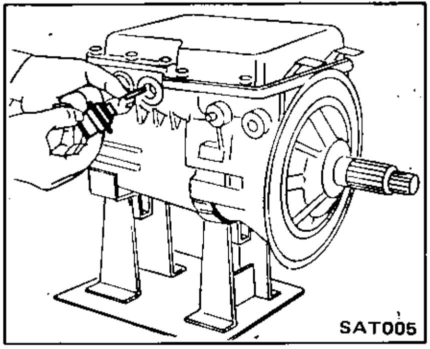
2. Remove converter housing.



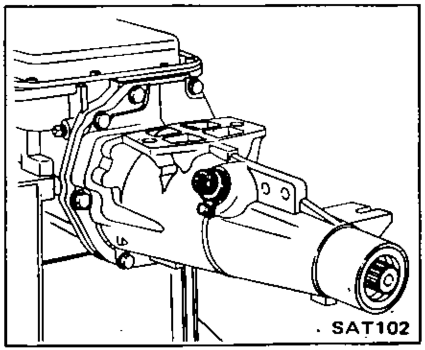
3. Unscrew and remove downshift solenoid and O-ring.



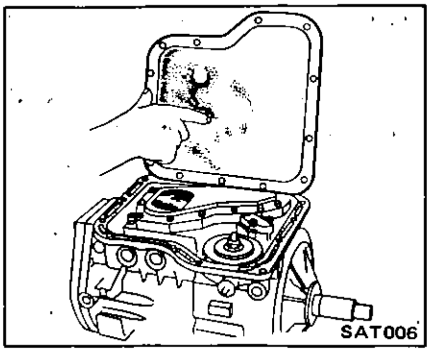
4. Unscrew and remove vacuum diaphragm, diaphragm rod and O-ring.



5. Remove speedometer lock plate retaining bolt. Remove speedometer pinion.



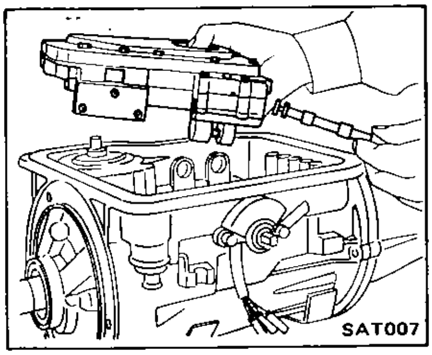
6. Remove oil pan and inspect its contents. An analysis of any foreign matter can indicate the types of problems to look for. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band.) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



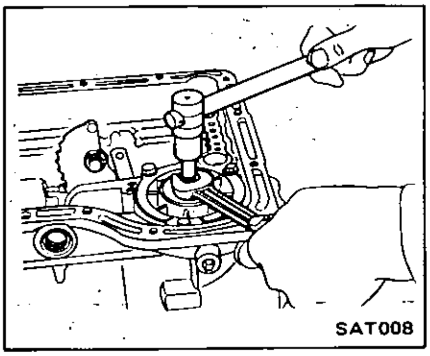
7. Remove control valve body.

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.



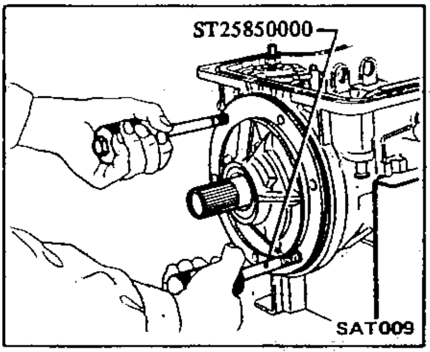
8. Loosen band servo piston stem locknut and tighten piston stem to prevent front clutch drum from dropping out when removing front pump.



9. Remove input shaft from pump.

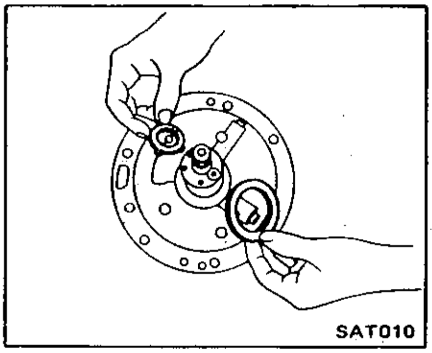
Attach Tool to pump and remove pump. Do not allow front clutch to come out of position and drop onto floor.

Take care that shaft is not inserted backwards during reassembly.



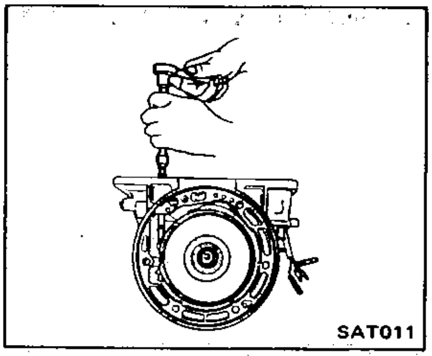
SAT009

10. Remove front clutch thrust washer and bearing race.



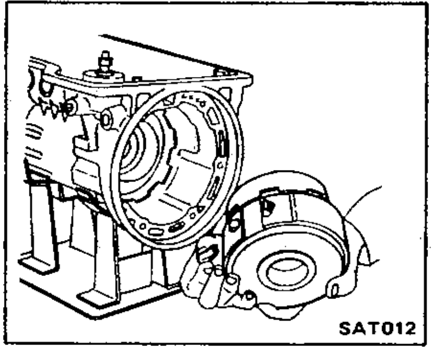
SAT010

11. Back off band servo piston stem to release band.



SAT011

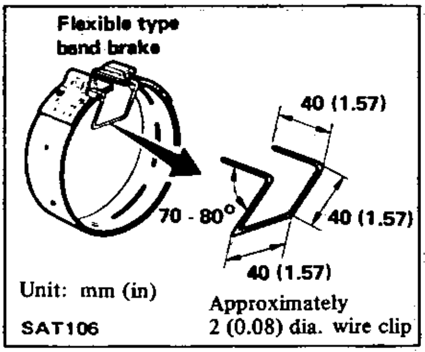
12. Remove brake band strut. Brake band, front and rear clutch assemblies may be removed together.



SAT012

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.

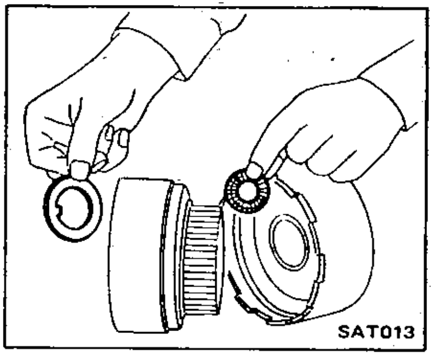
Leave the clip in position after removing the brake band.



Unit: mm (in)

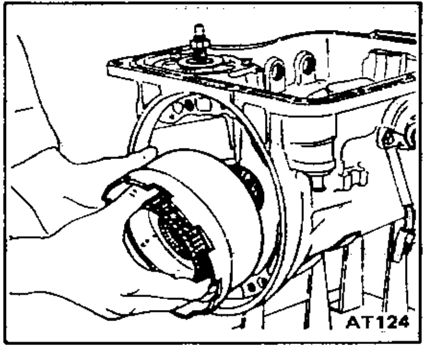
SAT106

13. Remove pump thrust bearing and rear clutch thrust washer.



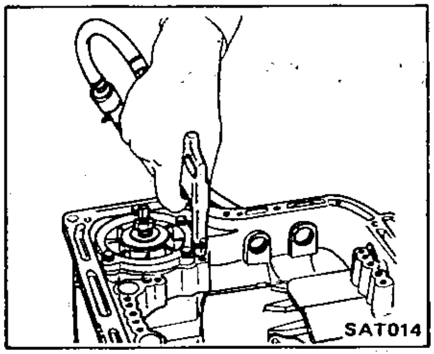
SAT013

14. Remove rear clutch hub, front planetary carrier and connecting shell, rear clutch thrust bearing, front planetary carrier thrust washer and thrust bearing.



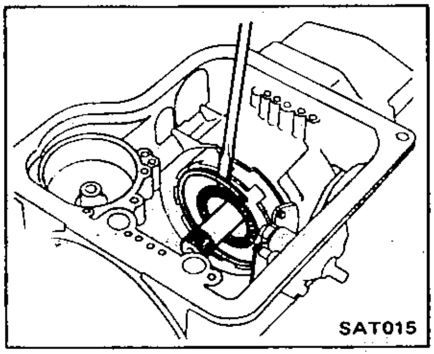
AT124

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.



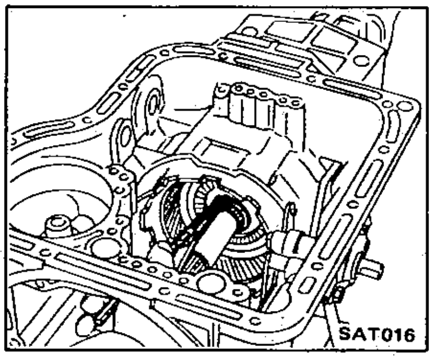
SAT014

16. Remove rear planetary carrier snap ring and rear planetary carrier.



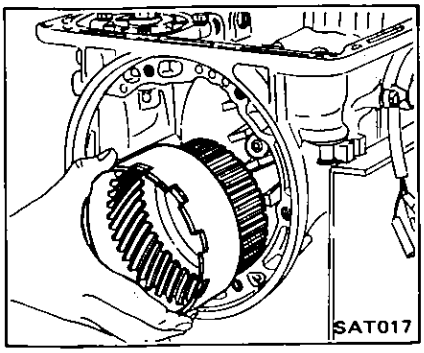
SAT015

17. Remove output shaft snap ring.

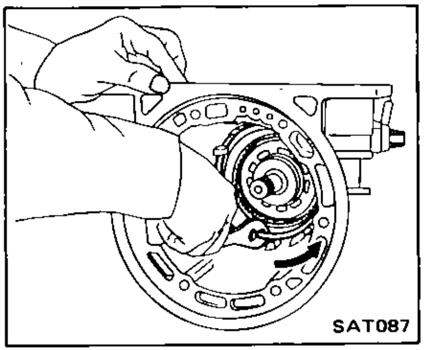


SAT016

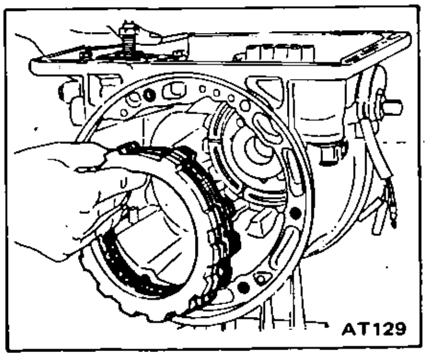
18. Remove rear connecting drum with internal (annulus) gear.


SAT017

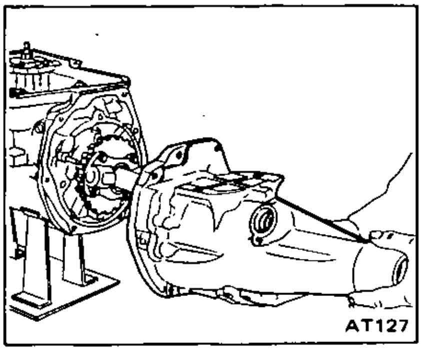
19. Pry off one end of snap ring with a screwdriver. Remove snap ring from low and reverse brake assembly while applying plier force in direction of arrow.


SAT087

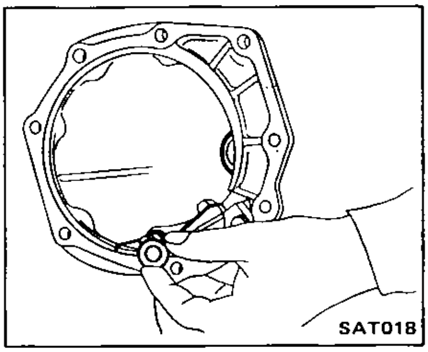
20. Tilt extension housing upward and remove low and reverse brake clutch assembly.


AT129

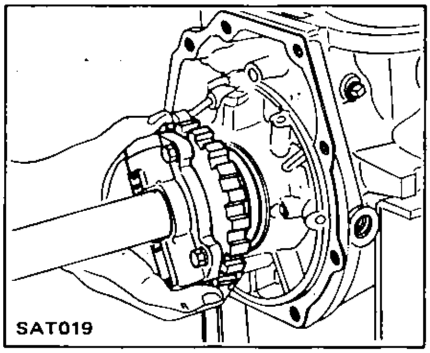
21. Remove rear extension.


AT127

22. Be careful not to lose parking pawl, spring and retainer washer.

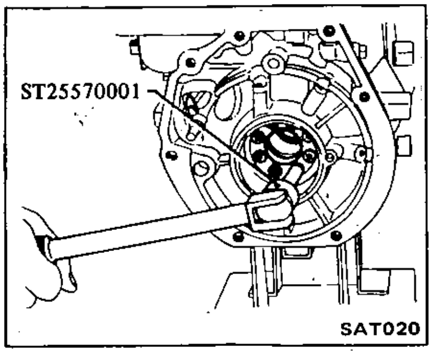

SAT018

23. Remove output shaft with governor.


SAT019

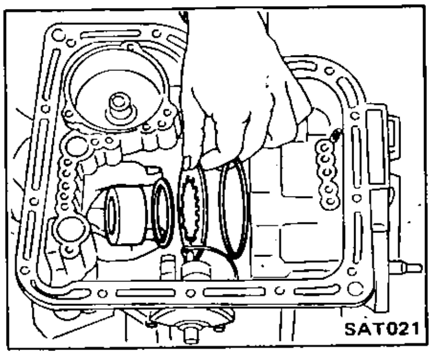
24. Remove governor thrust washer and needle bearing.

Remove one-way clutch inner race attaching hex-head slotted bolts using Tool.

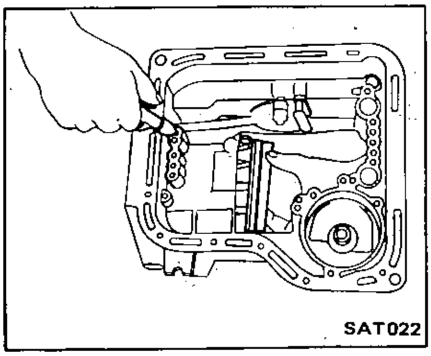


SAT020

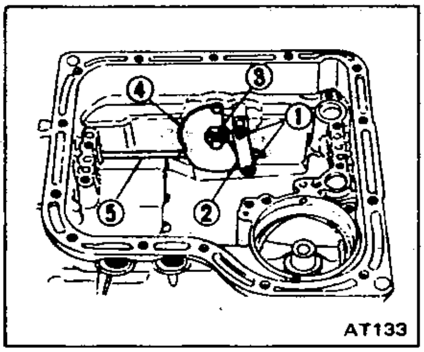
25. Remove one-way clutch inner race, return thrust washer, low and reverse return spring, and spring thrust ring.


SAT021

26. Using an air gun with a tapered rubber tip, carefully apply air pressure to remove low and reverse brake piston.


SAT022

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.



AT133

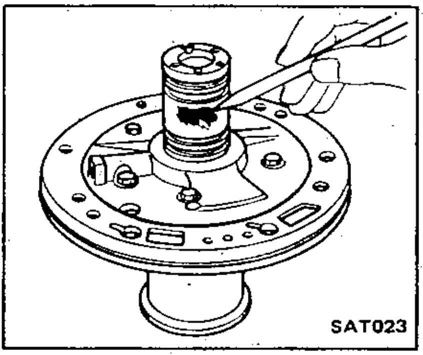
28. Remove inhibitor switch and manual shaft by loosening two securing bolts.

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.

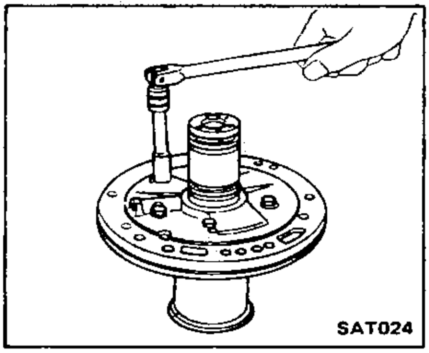
OIL PUMP

1. Remove front pump gasket and O-ring. Inspect pump body, pump shaft and ring groove areas for wear.



SAT023

2. Remove pump cover from pump housing.

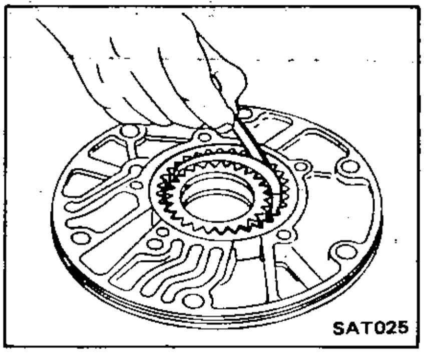


SAT024

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).**

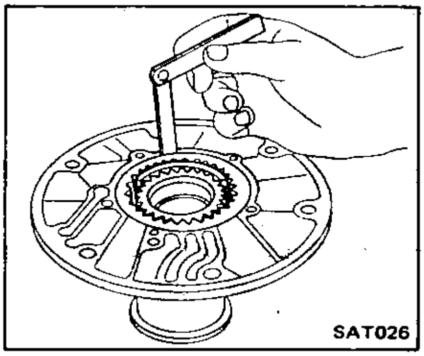


SAT025

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).**

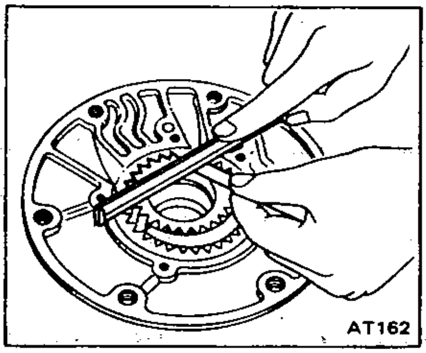


SAT026

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).**



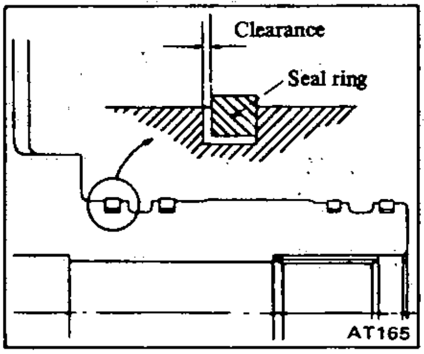
AT162

7. Measure clearance between seal ring and ring groove.

Standard clearance:
0.04 - 0.16 mm
(0.0016 - 0.0063 in)

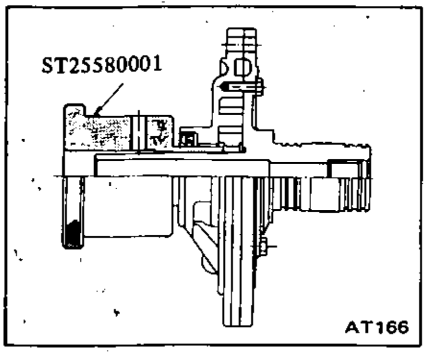
Replace if the clearance exceeds **0.16 mm (0.0063 in).**

Of course, it is good practice to replace all seal rings during an overhaul.



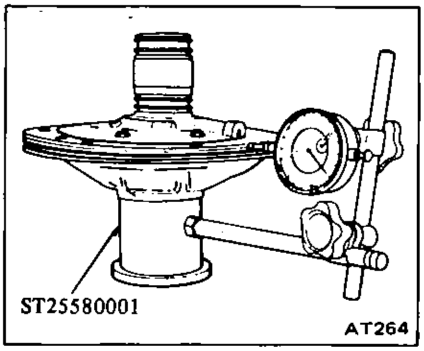
AT165

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.



9. Set run-out of the cover to within specified total indicator reading.

Total indicator reading:
Less than 0.07 mm
(0.0028 in)

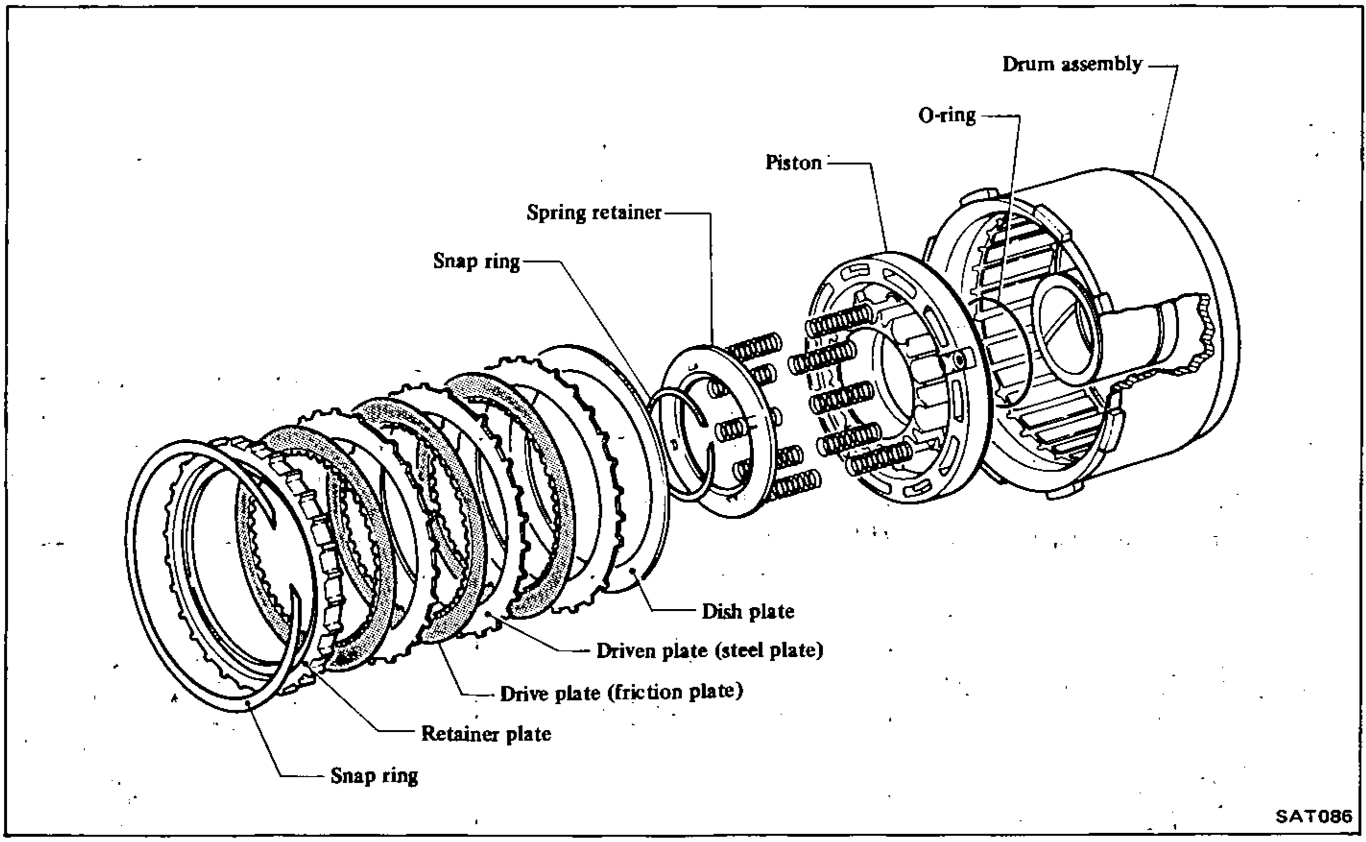


10. Tighten pump securing bolts to specified torque.

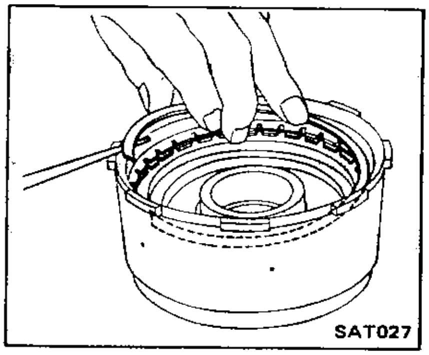
Ⓣ : Oil pump housing to oil pump cover
5.9 - 7.8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

Recheck run-out. Replace O-ring and gasket.

FRONT CLUTCH

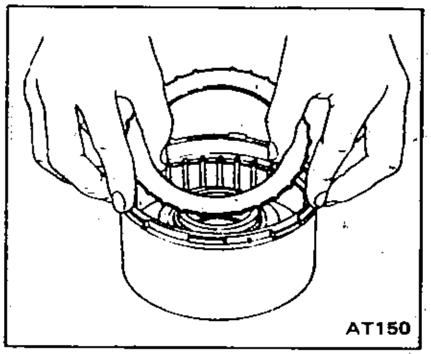


1. Using a screwdriver, remove large clutch retaining plate snap ring.



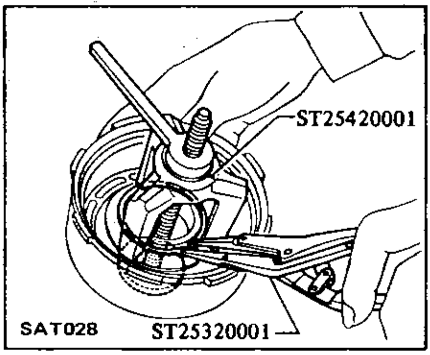
SAT027

2. Remove clutch plate assembly.



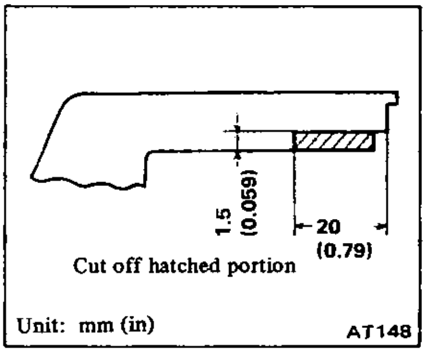
AT150

3. Compress clutch springs and remove snap ring from spring retainer.



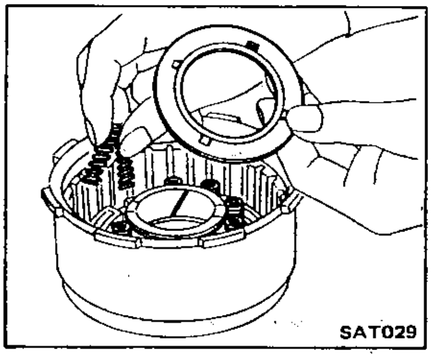
SAT028

When Tool is to be used, cut toe-tips of three legs with a grinding wheel.



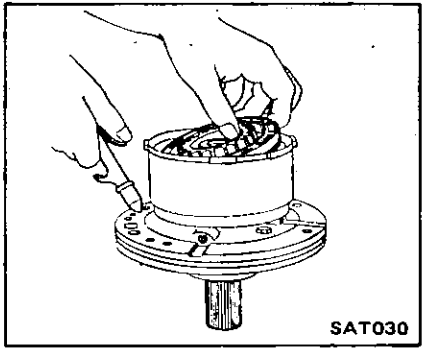
AT148

4. Remove spring retainer and springs.



SAT029

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.



SAT030

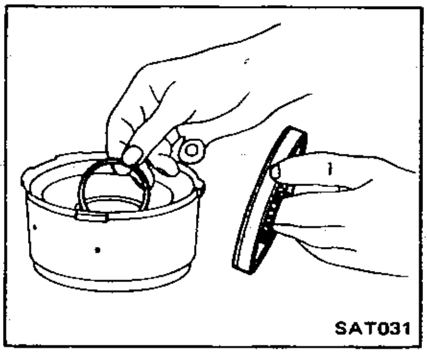
6. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than **1.4 mm (0.055 in)**.

Standard drive plate thickness:
1.50 - 1.65 mm
(0.0591 - 0.0650 in)

7. Check for wear on snapring, weak or broken coil springs, and warped spring retainer.

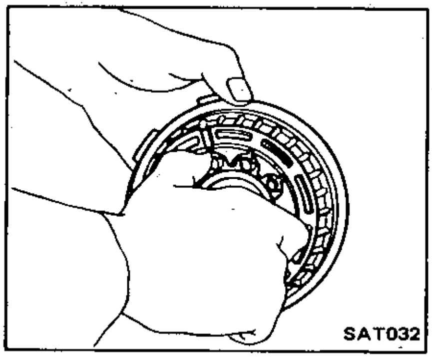
8. Lubricate clutch drum hub and seals, and install inner seal and piston seal as illustrated. *Be careful not to stretch seals during installation.*

Never assemble clutch dry; always lubricate its components thoroughly.



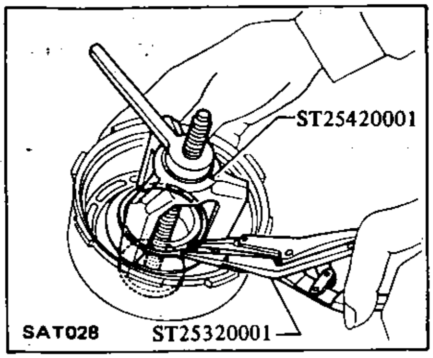
SAT031

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.

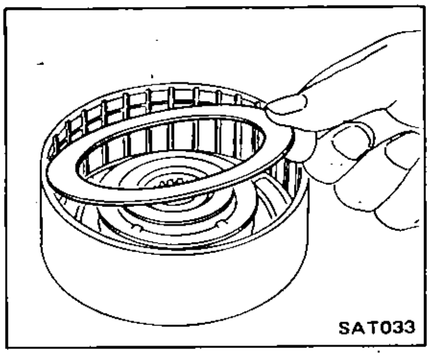


SAT032

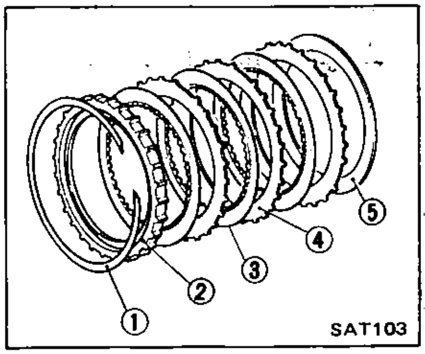
10. Reassemble spring and retainer. Reinstall snap ring. Be sure snap ring is properly seated.



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

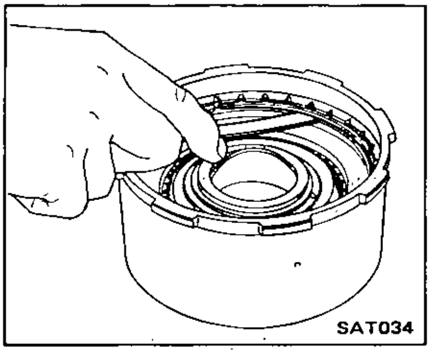
13. Measure clearance between retainer plate and snap ring.

Specified clearance:
1.6 - 2.0 mm (0.063 - 0.079 in)

If necessary, try other retaining plates having different thicknesses until correct clearance is obtained.

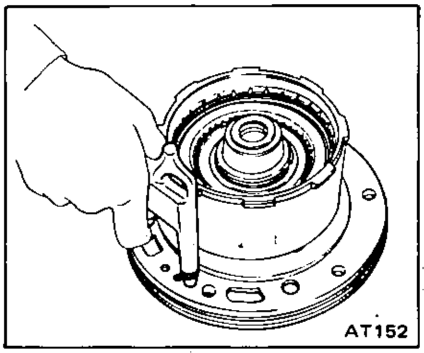
Available retaining plate

Thickness mm (in)	Part number
10.6 (0.417)	31537-X0100
10.8 (0.425)	31537-X0101
11.0 (0.433)	31537-X0102
11.2 (0.441)	31537-X0103
11.4 (0.449)	31537-X0104
11.6 (0.457)	31537-X0105

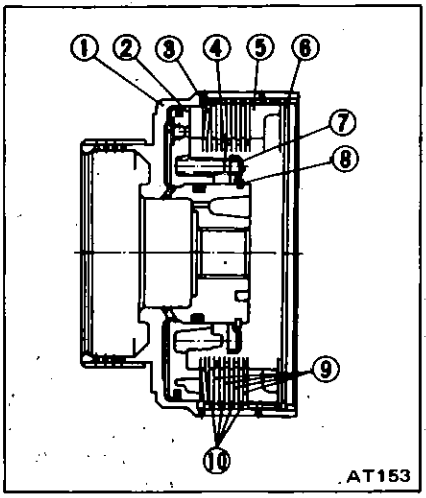


14. Testing front clutch

With front clutch assembled on oil pump cover, direct a jet of air into hole in clutch drum for definite clutch operation.



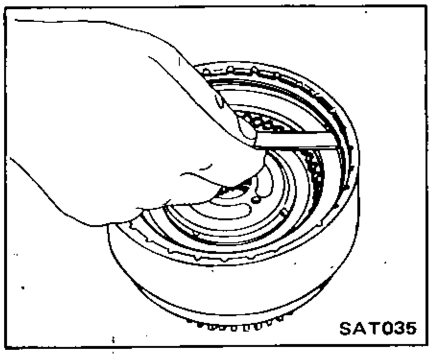
REAR CLUTCH



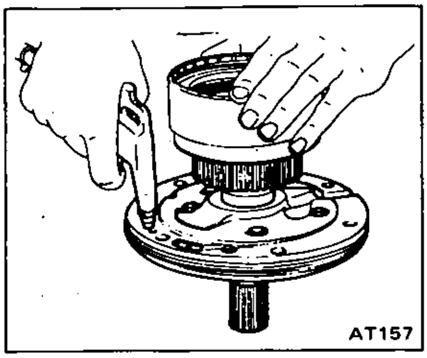
1 Rear clutch drum
2 Piston
3 Dished plate
4 Coil spring
5 Retaining plate
6 Snap ring
7 Spring retainer
8 Snap ring
9 Drive plate
10 Driven plate

Service procedures for rear clutch are essentially the same as those for front clutch, with the following exception:

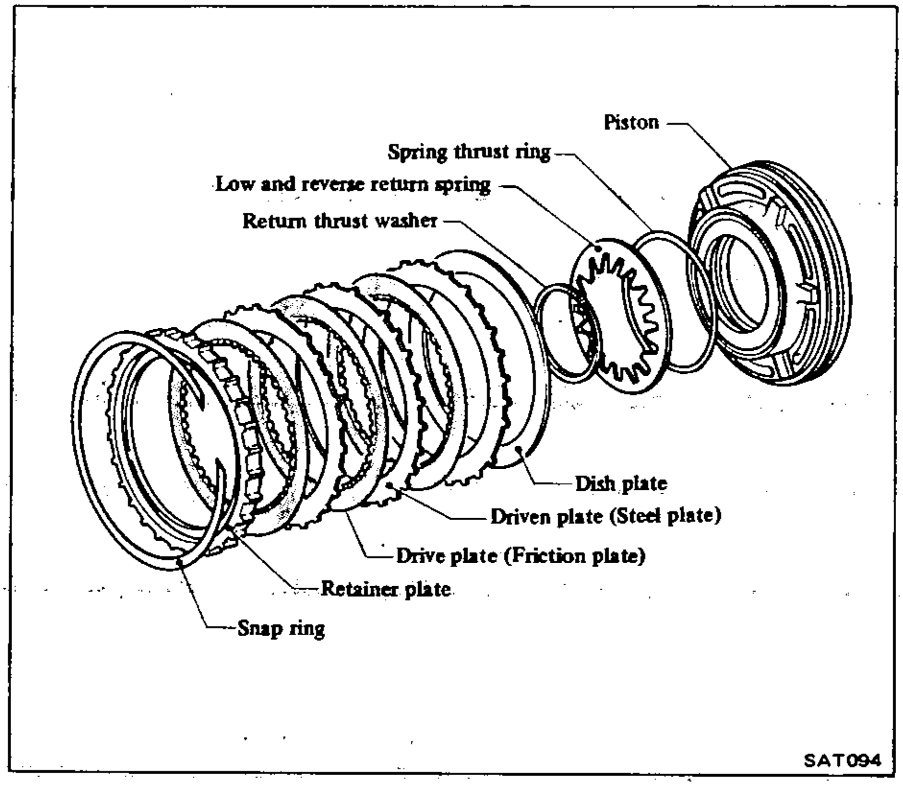
Specified clearance between retainer plate and snap ring:
0.8 - 1.6 mm
(0.031 - 0.063 in)



Test rear clutch



LOW & REVERSE BRAKE

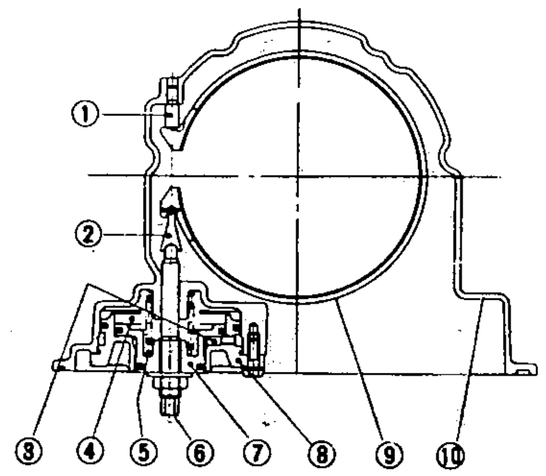


- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

Drive plate thickness:
Standard
1.90 - 2.05 mm
(0.0748 - 0.0807 in)
Allowable limit
1.8 mm (0.071 in)

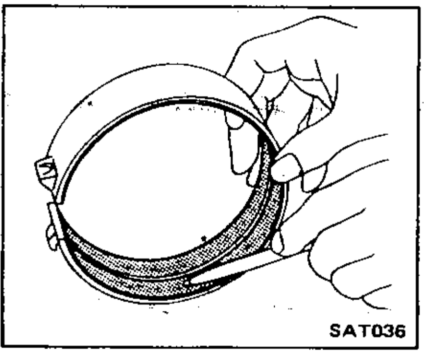
- Test piston return spring for weakness. Discard if it is too weak.

BRAKE BAND AND BAND SERVO

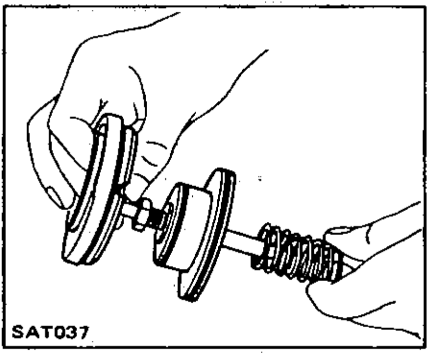


1 Anchor end pin
2 Band strut
3 Apply
4 Release
5 Return spring
6 Band servo piston stem
7 Band servo piston
8 Servo retainer
9 Brake band assembly
10 Transmission case

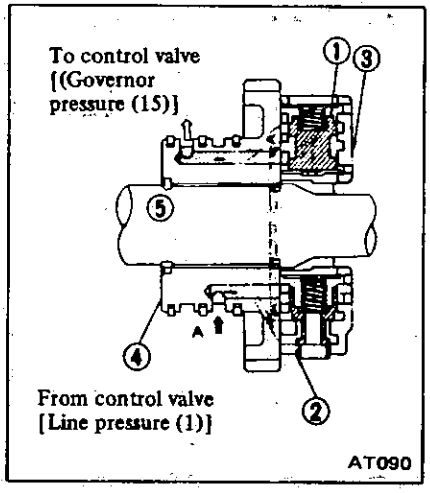
- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.



- Check band servo components for wear and scoring. Replace piston O-rings and all other components as necessary.



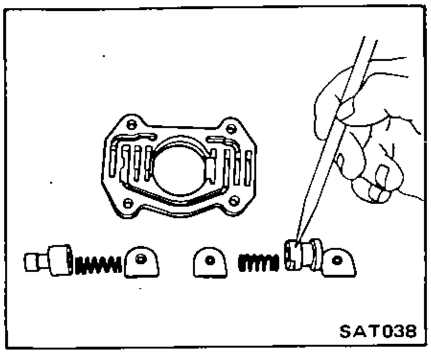
GOVERNOR



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

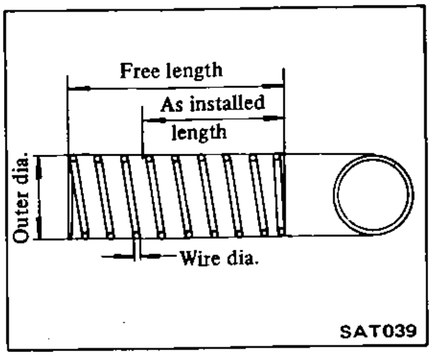
- Disassemble governor and check valves for indication of burning or scratches. Inspect springs for weakness or burning. Replace parts as necessary and reassemble.

Do not interchange components of primary and secondary governor valves.



SAT038

Governor valve spring chart



SAT039

- Assemble governor on oil distributor.

Ⓣ : **Governor valve body to oil distributor**

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

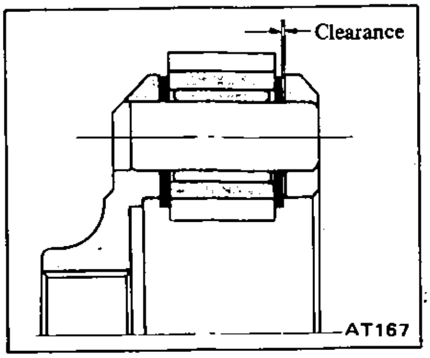
The planetary carrier cannot be divided into its individual components.

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.

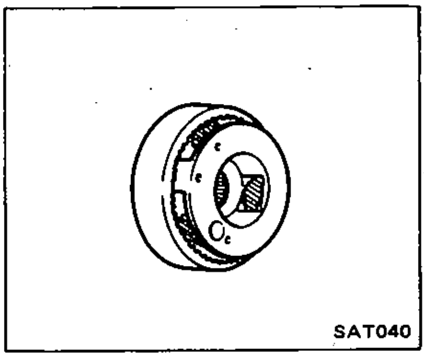
Standard clearance:
0.20 - 0.70 mm
(0.0079 - 0.0276 in)

Replace if the clearance exceeds **0.80 mm (0.0315 in).**



AT167

- Check planetary gear sets for damaged or worn gears. Gear sets that have been damaged by overheating will have a blue discoloration.

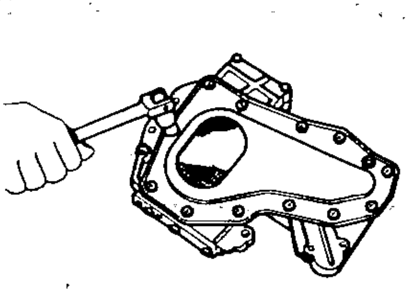


SAT040

CONTROL VALVE BODY

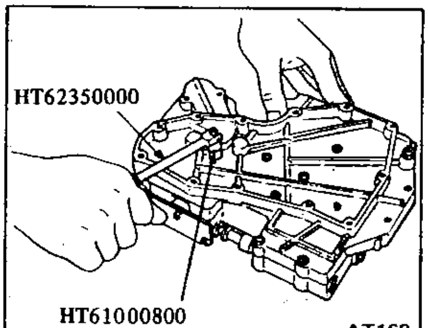
The valve body contains many precision parts and requires extreme care when parts are removed and serviced. Place removed parts on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.

1. Remove oil strainer and its attaching screws, nuts and bolts.

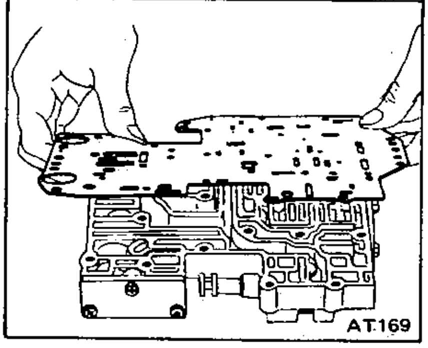


SAT041

2. Disassemble valve body and its remaining attaching bolts and nuts to carefully separate lower body, separator plate and upper body.



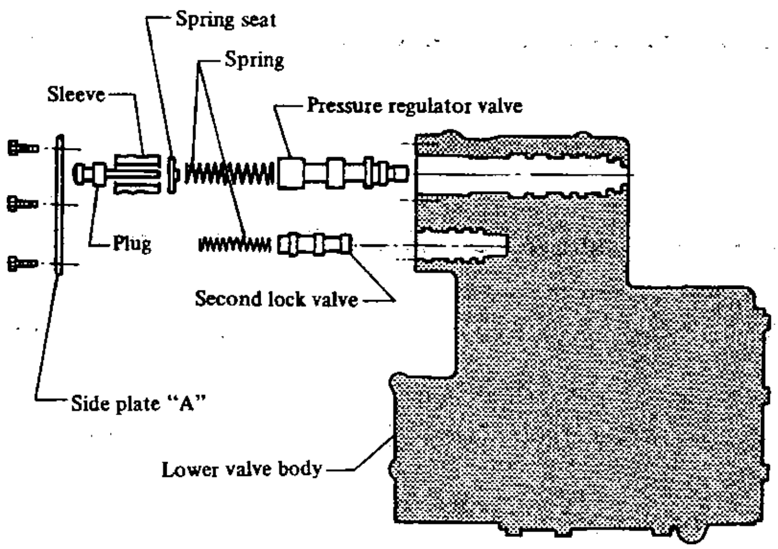
AT168



AT169

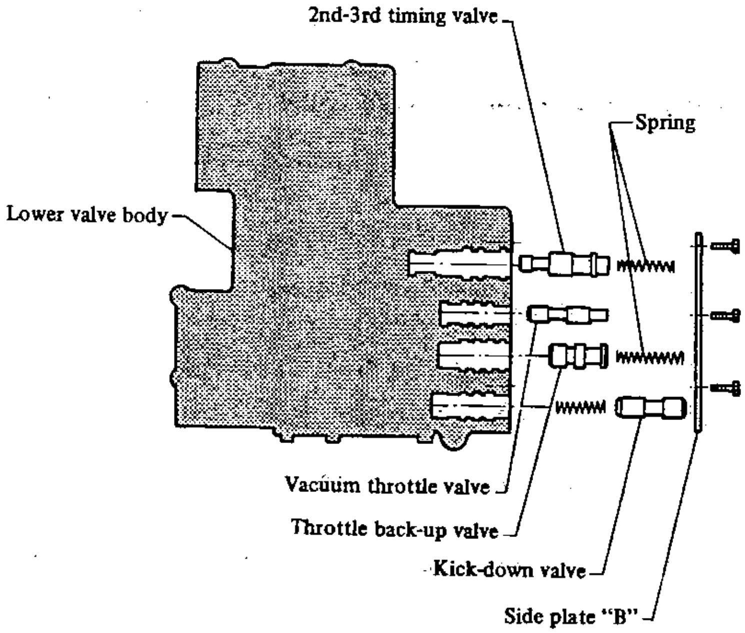
3. During valve body separation, do not scatter or lose orifice check valve, servo orifice check valve, and throttle relief check valve (ball) and related springs.

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.



SAT042

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.

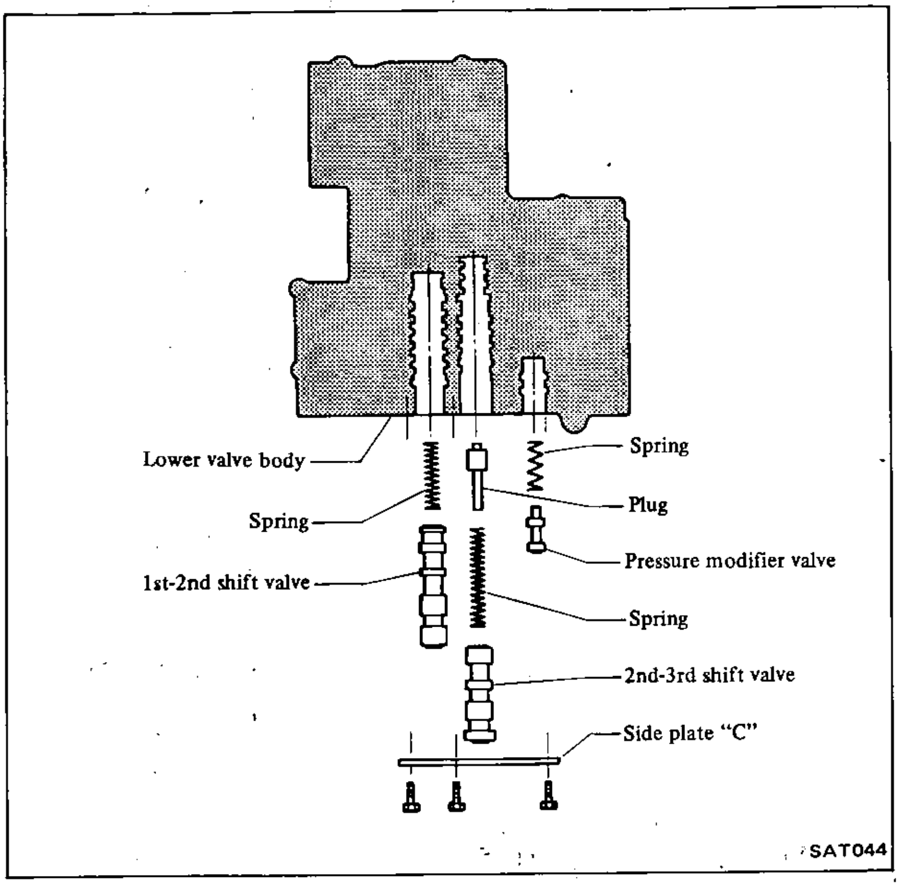


SAT043

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.



SAT044

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.

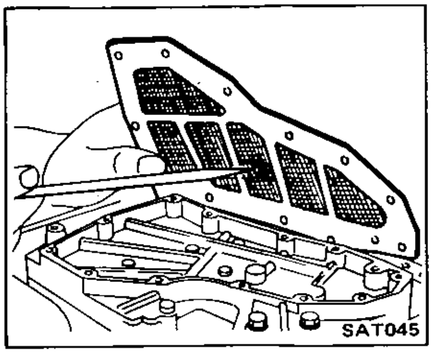
During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, entry is provided for dirt or foreign matter to work into the sides of the valves and hinder valve movement.

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.

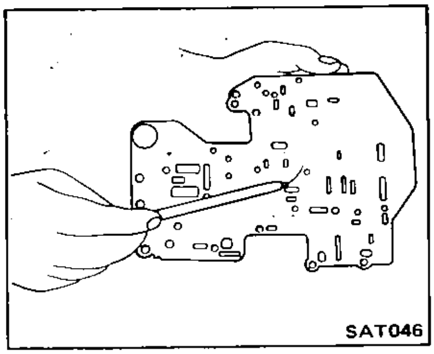
7. Check valves for signs of burning. Replace if beyond clean-up.

8. Check oil strainer for general condition. Replace if necessary.



SAT045

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.

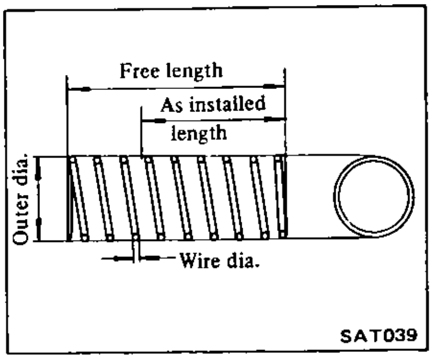


SAT046

10. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.

11. Test valve springs for weakened load condition. Refer to Valve Body Spring Chart for spring specifications.

Valve body spring chart

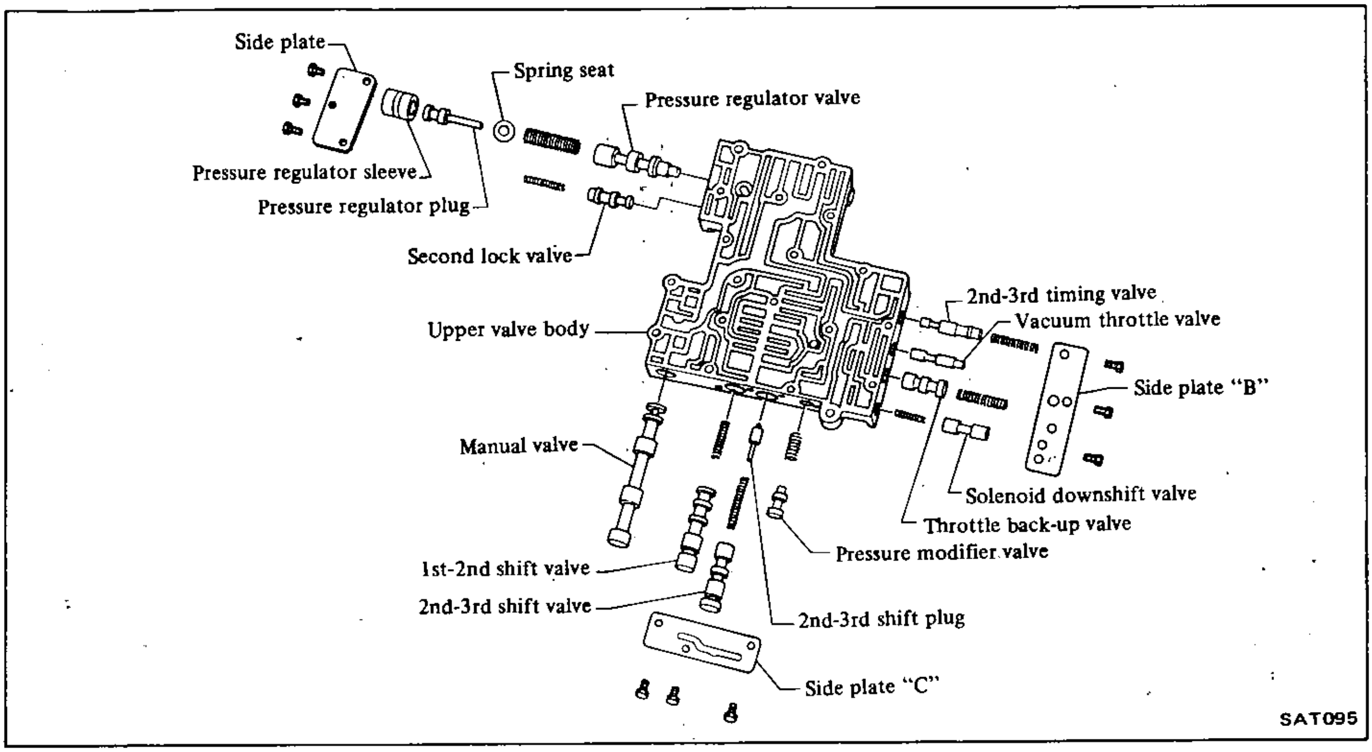


SAT039

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	0.4 (0.016)	8.4 (0.331)	5	18.5 (0.728)	9.0 (0.354)	1.0 (0.1, 0.2)
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)
2nd - 3rd timing valve	0.7 (0.028)	6.2 (0.244)	15	32.5 (1.280)	27.0 (1.063)	5.39 (0.55, 1.21)
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	0.9 (0.035)	6.5 (0.256)	14	26.8 (1.055)	19.0 (0.748)	21.48 (2.19, 4.83)
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						

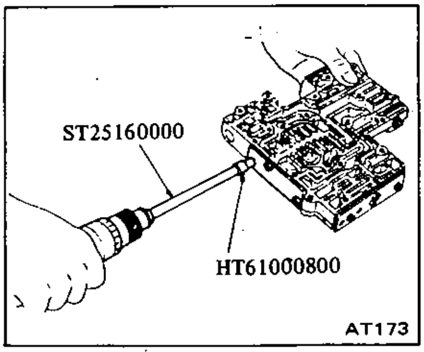
12. Assemble side plate A group of parts into lower valve body. Reinstall side plate and finger tighten screws.

- Assemble side plate B group and side plate C group in same manner as A group.

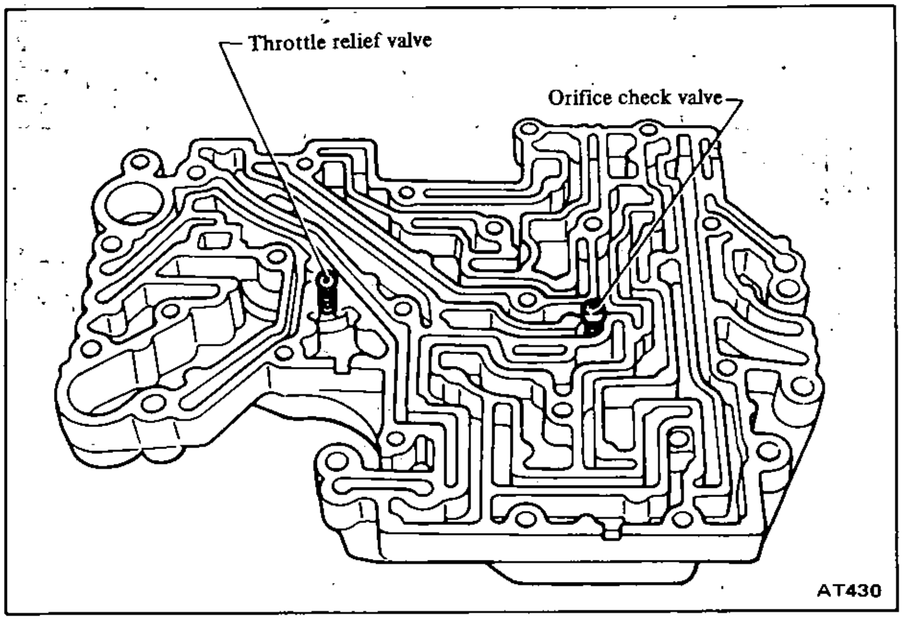


13. Tighten screws.

Ⓣ : **Side plate to valve body**
2.5 - 3.4 N·m
(0.25 - 0.35 kg-m,
1.8 - 2.5 ft-lb)

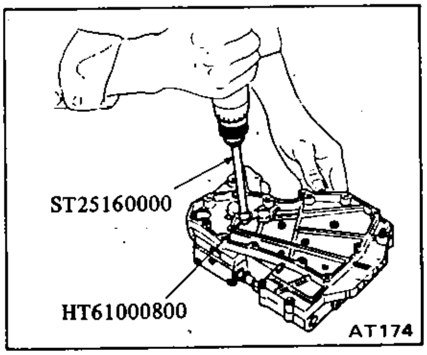


14. Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.



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)



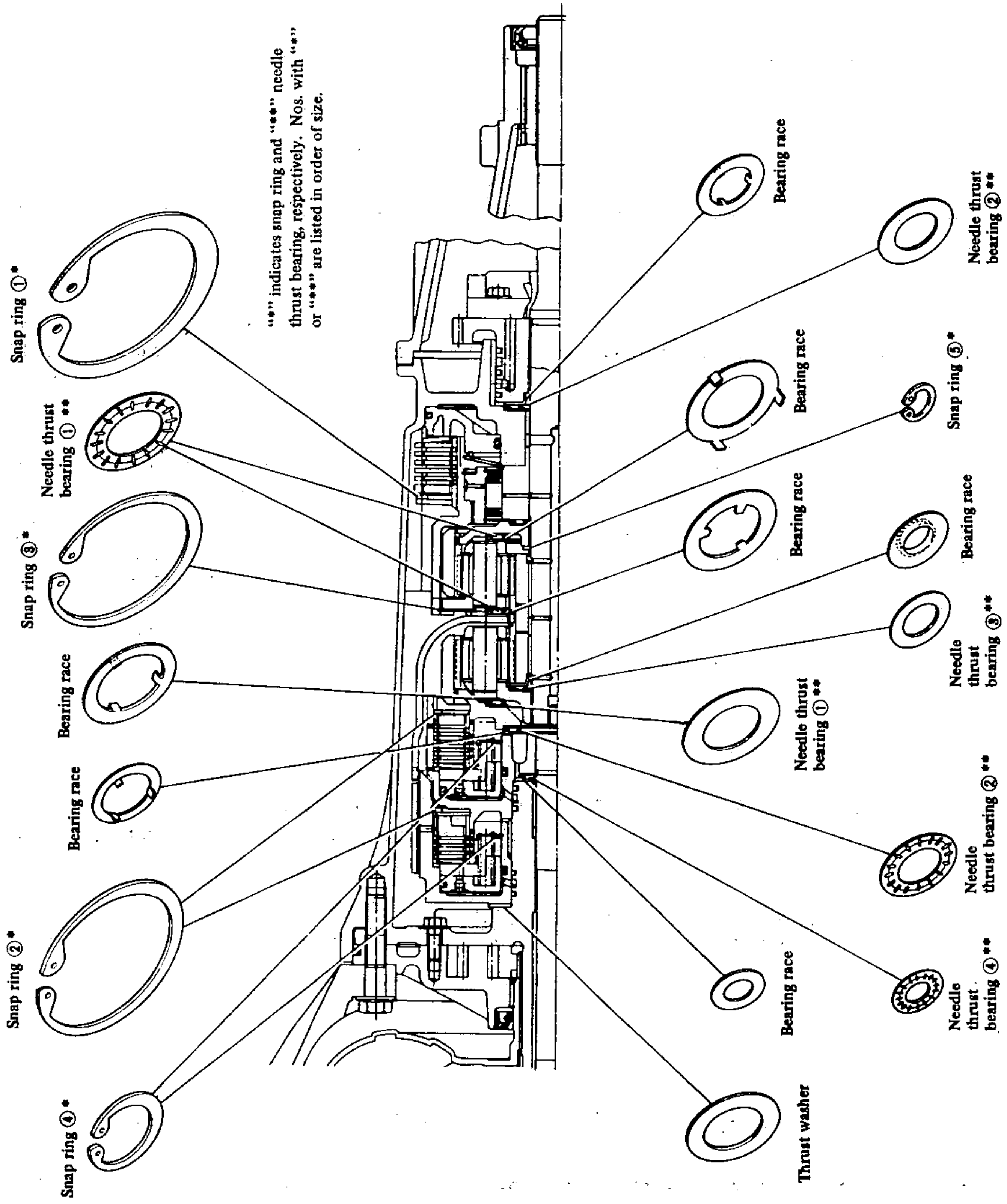
16. Install oil strainer.

Ⓣ : **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.

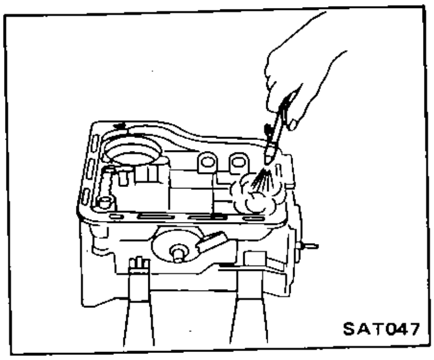


"*" indicates snap ring and "**" needle thrust bearing, respectively. Nos. with "*" or "**" are listed in order of size.

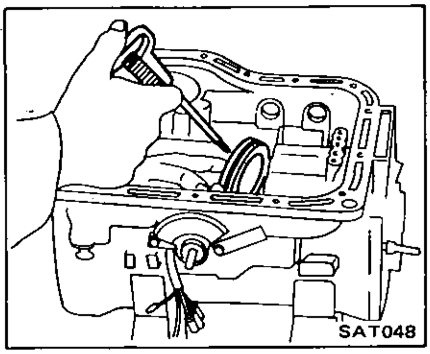
SAT089

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.

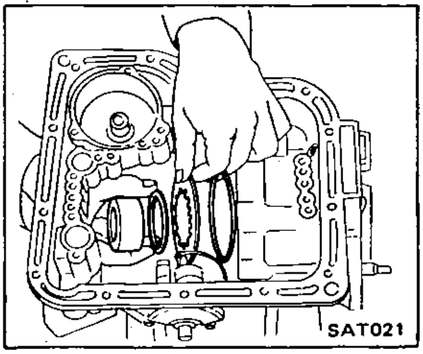
Petroleum jelly can be used to secure washers during installation. All new seals and rings should have been installed before beginning final assembly.


SAT047

2. Lubricate and install low and reverse piston into the case.


SAT048

3. Install thrust ring, piston return spring, thrust washer and one-way clutch inner race.

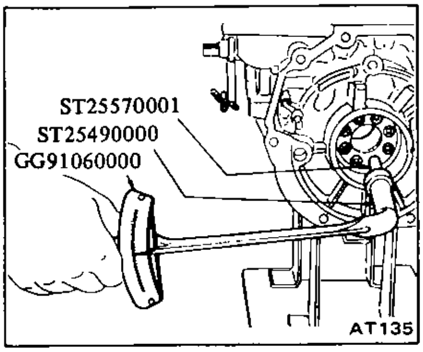

SAT021

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.

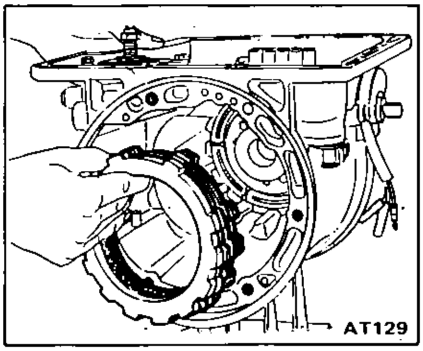
Tighten the bolts

Ⓣ : **One-way clutch inner race to transmission case**
13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)



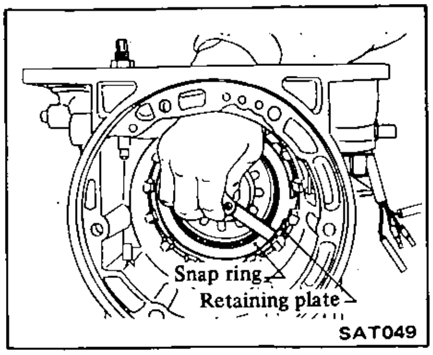
AT135

5. Install steel dished plate first, then steel and friction plates, and, finally, retaining plate and snap-ring.


AT129

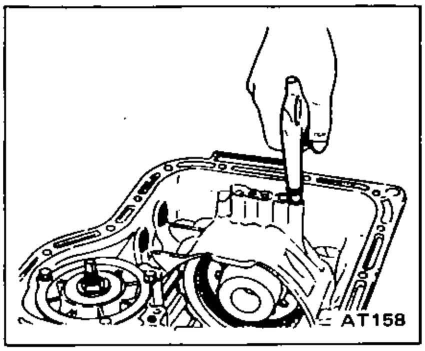
6. After low and reverse brake has been completely assembled, measure clearance between snapring and retainer plate. If measurement exceeds specifications it can be adjusted by replacing retainer plate with one of a different thickness.

Low and reverse brake clearance:
0.80 - 1.25 mm
(0.0315 - 0.0492 in).

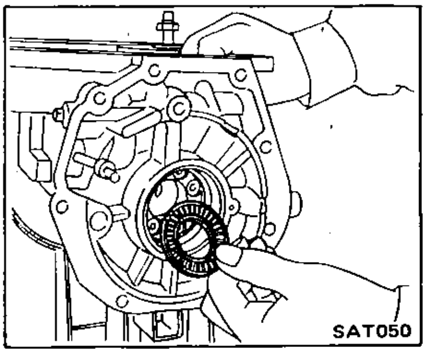


SAT049

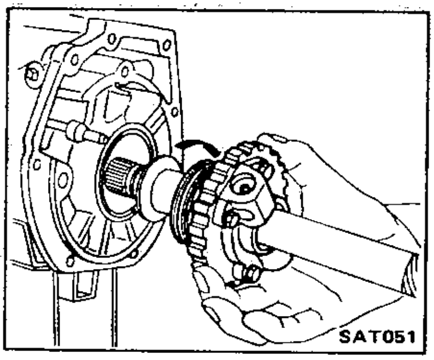
7. Using an air gun with a tapered rubber tip, check low and reverse brake operation.


AT158

8. Install governor thrust washer and needle bearing.


SAT050

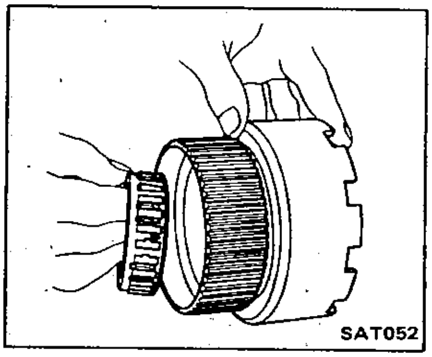
9. Slide governor distributor assembly on output shaft from front of shaft. Install shaft and governor distributor into case, using care not to damage distributor rings.



SAT051

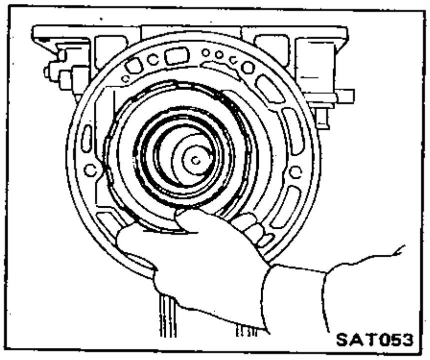
10. Install one-way sprag into one-way clutch outer race (attached to connecting drum).

Arrow on sprag must face front of transmission.



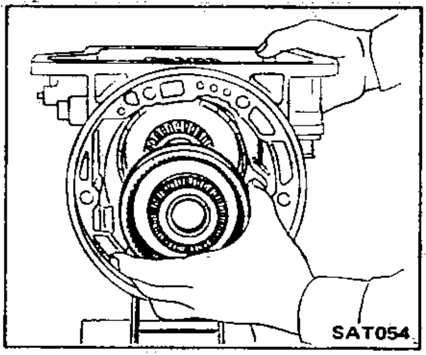
SAT052

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.



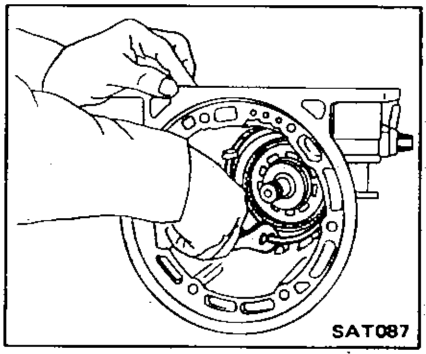
SAT053

12. Install rear internal gear.



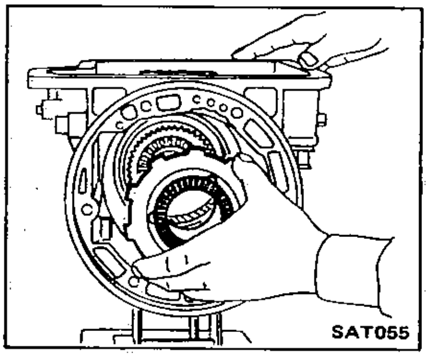
SAT054

13. Install snap-ring on shaft.



SAT087

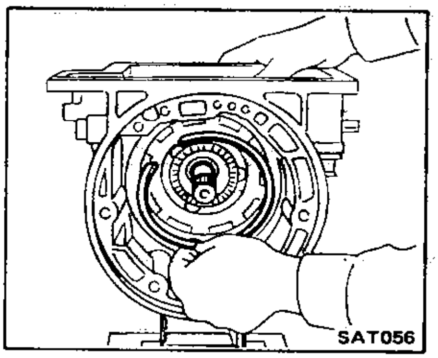
14. Secure thrust bearing and thrust washer with petroleum jelly and install rear planetary carrier.



SAT055

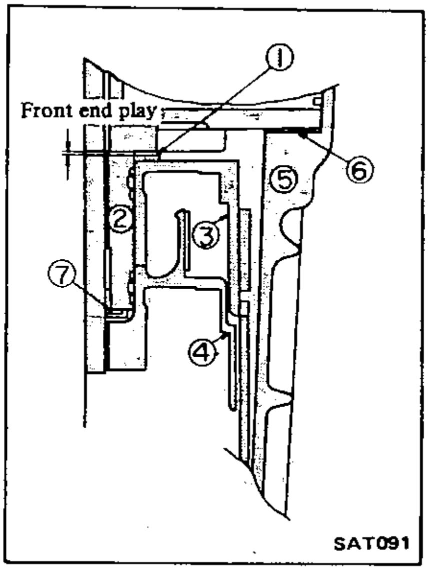
15. Install rear planetary carrier snap ring.

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.



SAT056

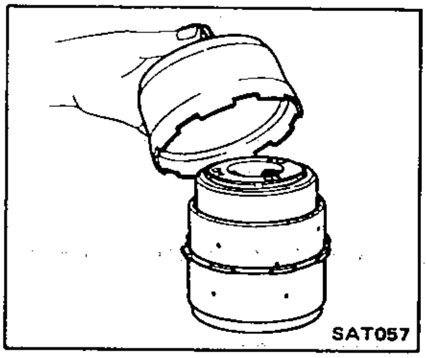
16. Adjust front end play as follows:



SAT091

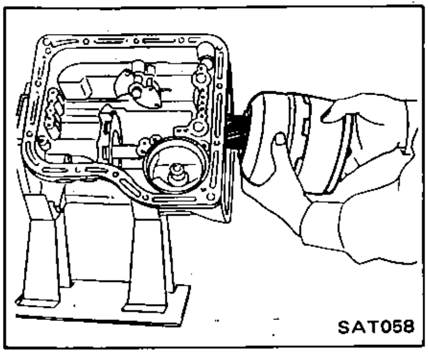
1 Front clutch thrust washer
2 Oil pump cover
3 Front clutch
4 Rear clutch
5 Transmission case
6 Oil pump gasket
7 Oil pump cover bearing race

(1) Assemble front and rear clutches, front internal gear, front planetary carrier and connecting shell. Secure thrust bearings with petroleum jelly.

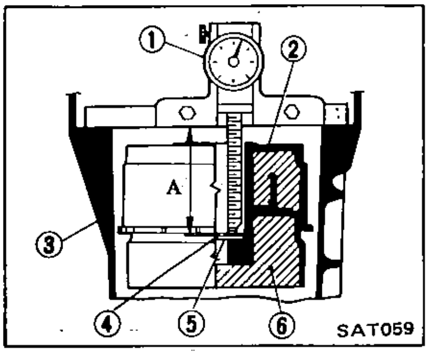


SAT057

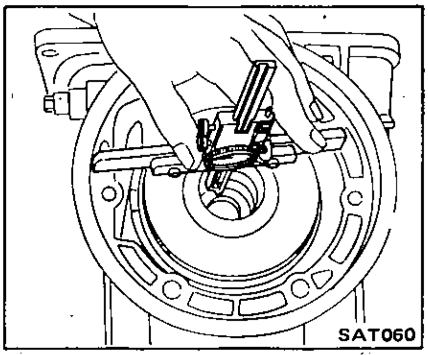
(2) Install assembly into transmission case. Check that parts are properly seated before proceeding with measurements.



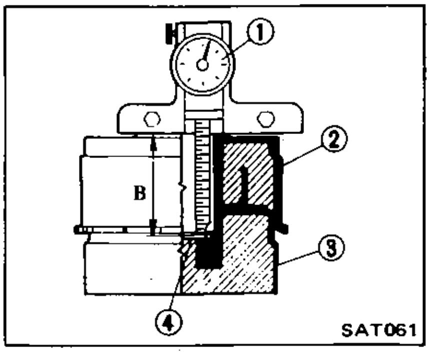
(3) Using a dial gauge or caliper with a seven inch base, measure from rear hub thrust bearing race to case (dimension A).



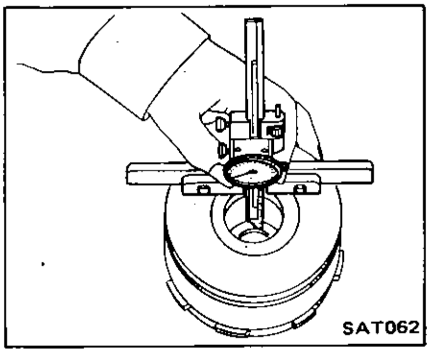
1 Dial gauge
2 Front clutch drum
3 Transmission case
4 Bearing race
5 Thrust bearing
6 Rear clutch drum



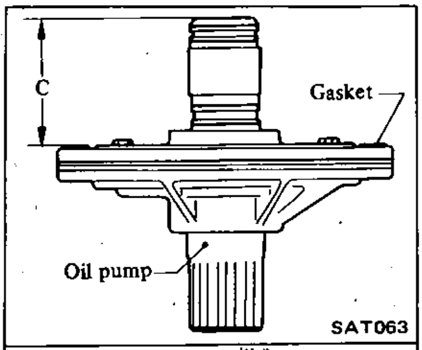
(4) Assemble front and rear clutch drum assemblies together and lay them flat on bench. Be sure rear hub thrust bearing is properly seated. Measure from face of clutch drum to top of thrust bearing race (dimension B).

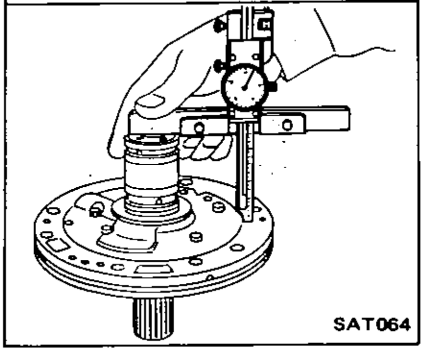


1 Depth gauge
2 Front clutch drum
3 Rear clutch drum
4 Thrust bearing

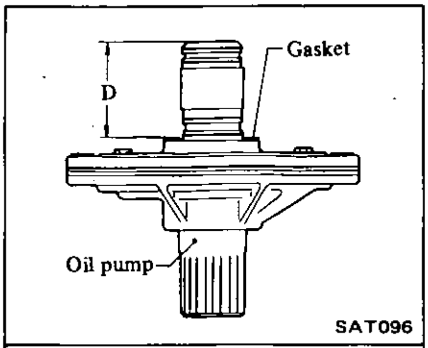


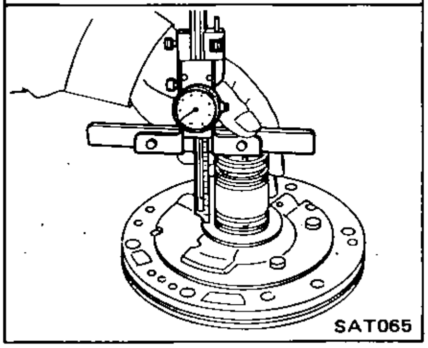
(5) Measure from top of oil pump shaft to gasket installed (dimension C).





(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)

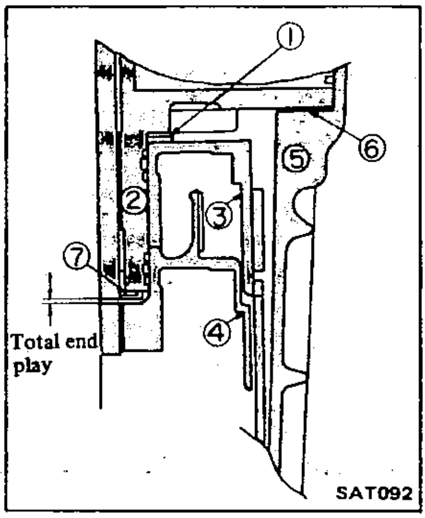
Front end play can be adjusted with front clutch thrust washers of different thickness.

Available front clutch 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

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 Front clutch thrust washer
2 Oil pump cover
3 Front clutch
4 Rear clutch
5 Transmission case
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.

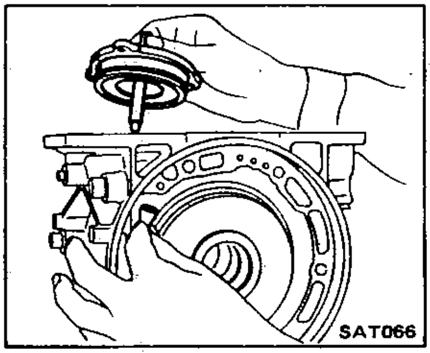
Specified total end play:
0.25 - 0.50 mm
(0.0098 - 0.0197 in)

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

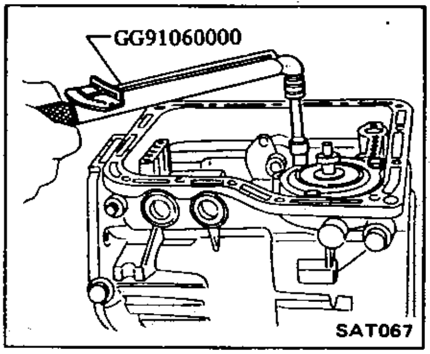
Thickness mm (in)	Part number
1.2 (0.047)	31556 X0100
1.4 (0.055)	31556 X0101
1.6 (0.063)	31556 X0102
1.8 (0.071)	31556 X0103
2.0 (0.079)	31556 X0104
2.2 (0.087)	31556 X0105

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 reassembling.**

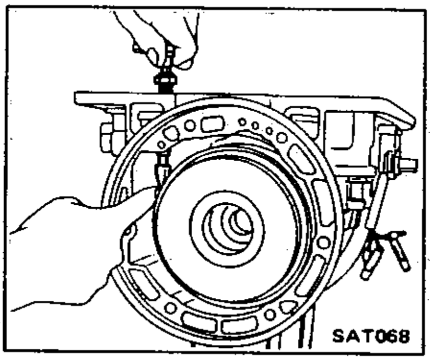


19. Install and torque the retainer bolts. Loosen piston stem.

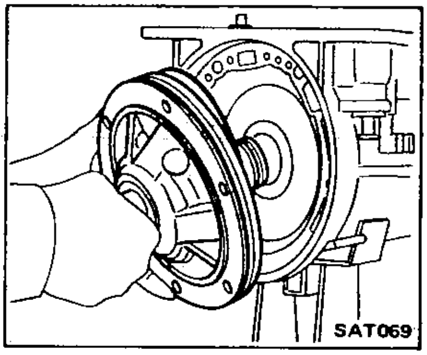
Ⓣ : **Servo piston retainer bolt**
4.9 - 6.9 N·m
(0.5 - 0.7 kg-m,
3.6 - 5.1 ft-lb)



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.

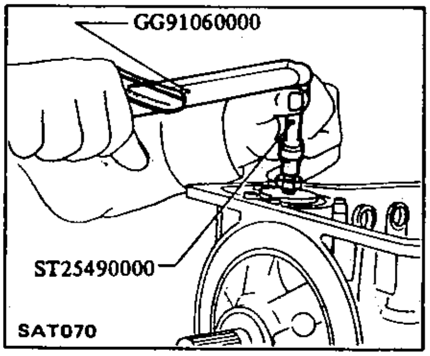


21. Mount oil pump gasket on oil pump with petroleum jelly. Align pump to transmission case and install.



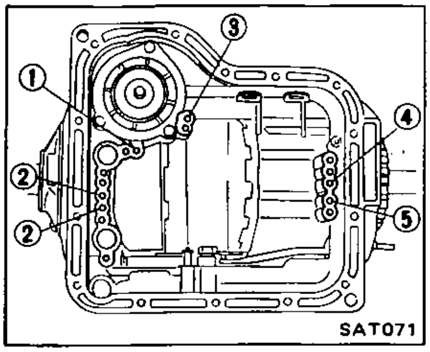
22. Adjust band. Make sure that brake band strut is correctly installed. Torque piston stem to specified value. Back off two full turns and secure with lock nut.

Ⓣ : **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.

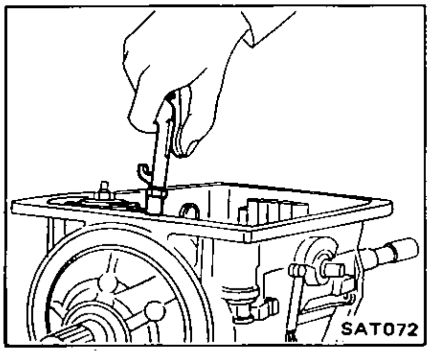
Air check point



SAT071

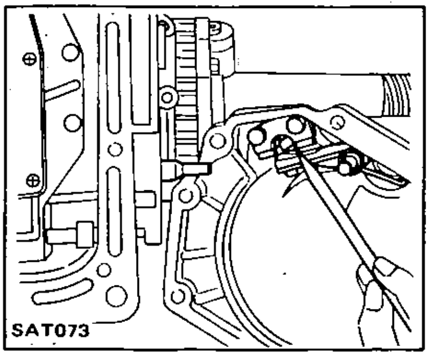
1 Band servo apply (9)
2 Rear clutch (1)
Front clutch (11)
3 Band servo release (10)
4 Governor feed (1)
5 Low & reverse brake (12)

24. Using an air gun with a tapered rubber tip, perform air checks.



SAT072

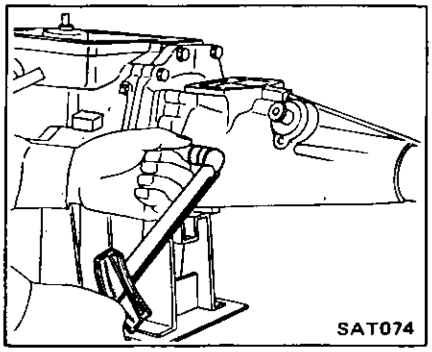
25. Check that parking pawl, pin, spring and washer are assembled correctly.



SAT073

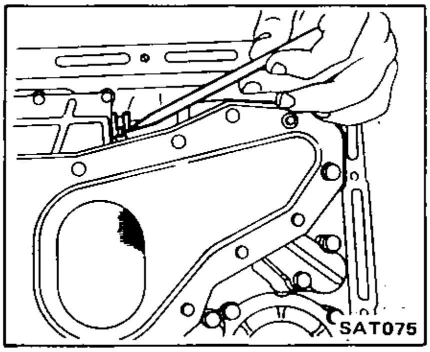
26. Install rear extension.

Ⓣ : Rear extension to transmission case
20 - 25 N·m
(2.0 - 2.5 kg-m,
14 - 18 ft-lb)



SAT074

27. Install control valve body. Be sure manual valve is in alignment with selector pin.

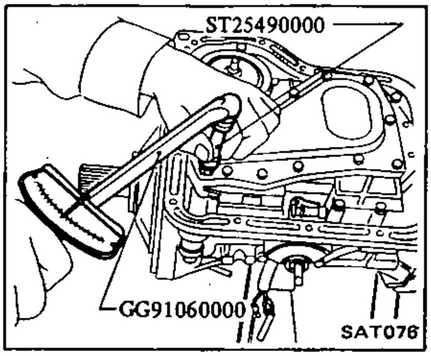


SAT075

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)

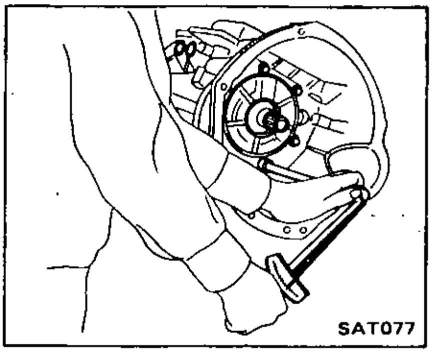
Control valve body attaching bolts vary in length. Care must be taken to ensure that each bolt is returned to correct hole.



SAT076

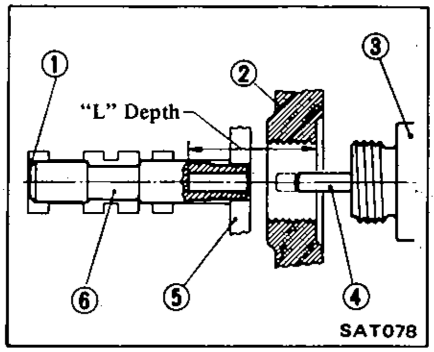
29. Check pump to transmission alignment and install converter housing.

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



SAT077

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.



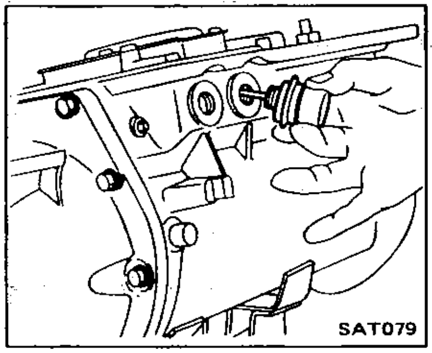
SAT078

1 Note seated valve body
2 Transmission case wall
3 Vacuum diaphragm
4 Diaphragm rod
5 Valve body side plate
6 Vacuum throttle valve

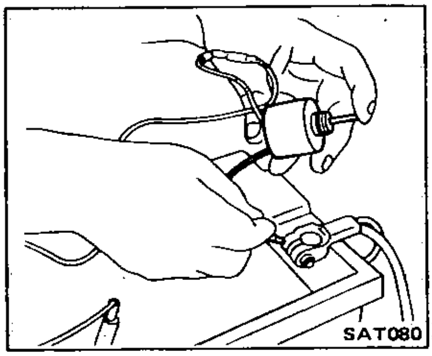
Throttle modulator valve rod selection

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

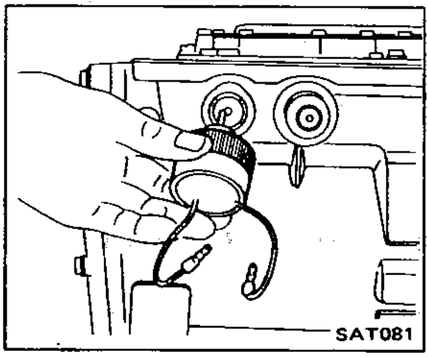
31. Install vacuum diaphragm.


SAT079

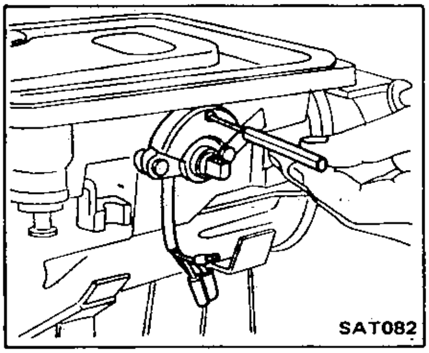
32. Before installing down shift solenoid, check to verify that it is operating properly. Use a hot lead and ground to check solenoid.


SAT080

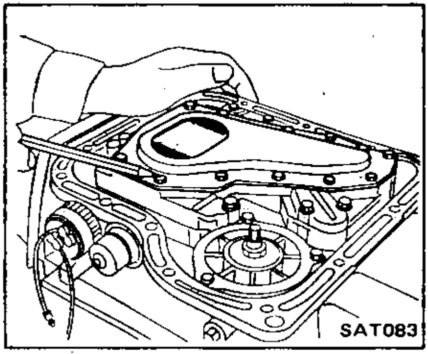
33. Install down shift solenoid.


SAT081

34. Install inhibitor switch. Check for proper operation in each range using a circuit tester. Refer to Minor Adjustment.

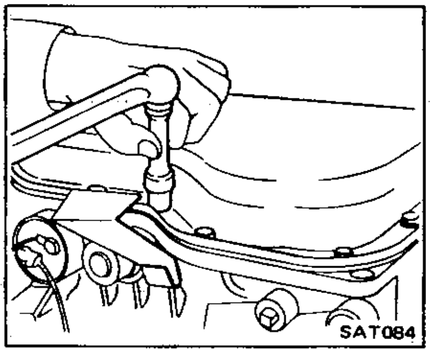

SAT082

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.

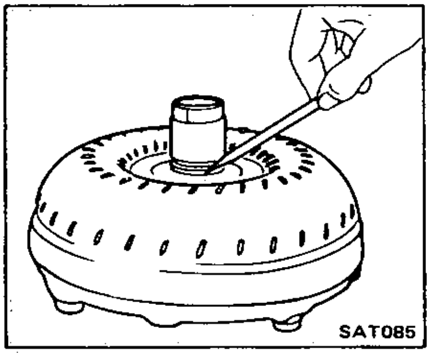

SAT083

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)

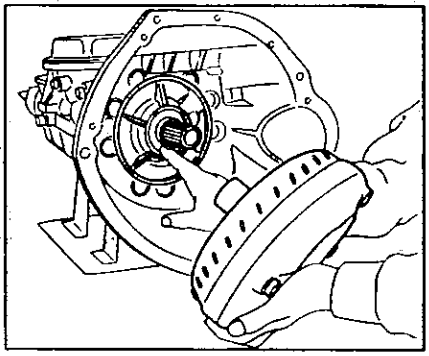

SAT084

37. Carefully inspect torque converter for damage. Check converter hub for grooves caused by hardened seals. Also check bushing contact area.


SAT085

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.



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:

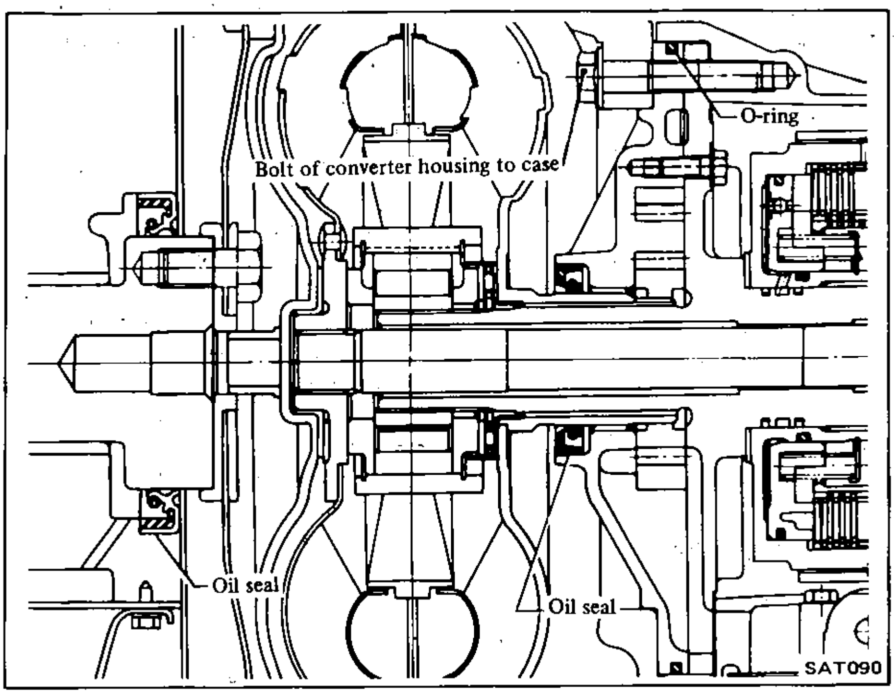
1) Raise car.
2) Clean area suspected of leaking.
3) Start engine, apply foot brake, place gear selector in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

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.

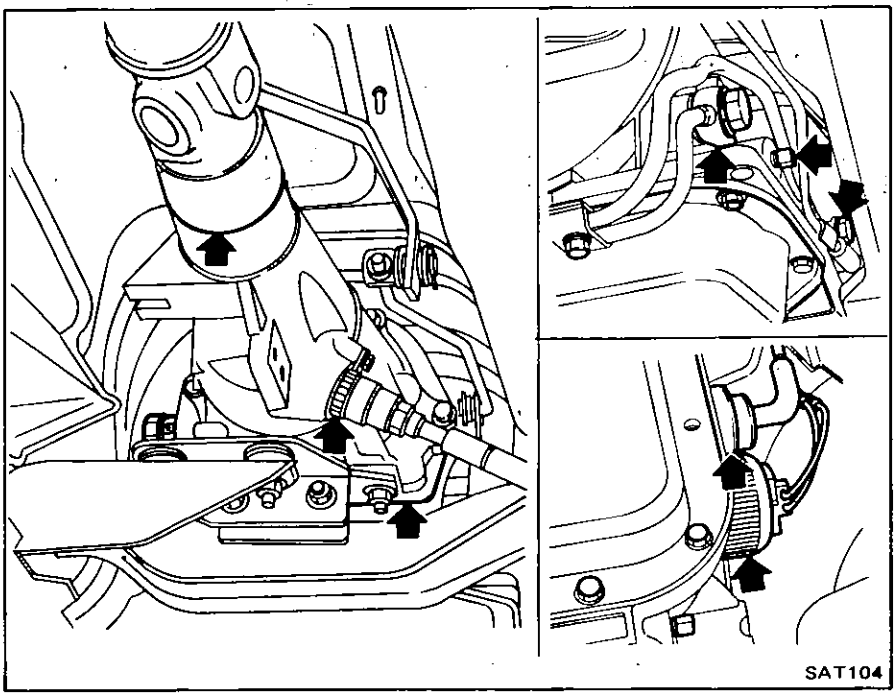
To aid in locating leaks, use the following list of seals and gaskets.

1) Converter housing
- Rubber O-ring of oil pump housing.
- Oil pump housing oil seal (transmission front seal).
- Crankshaft oil seal.
- Bolts of converter housing to case.



SAT090

2) Transmission and rear extension.
- Junction of transmission and rear extension.
- Oil cooler tube connectors.
- Oil pressure inspection ports.
- Vacuum diaphragm and downshift solenoid.
- Speedometer pinion sleeve.
- Rear extension oil seal.



SAT104

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
700 ± 100 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-59. 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-56.

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 50 km/h (30 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

Intake manifold vacuum –kPa (–mmHg, –inHg)	Gearshift	Car speed * km/h (MPH)	Propeller shaft revolutions rpm	Line pressure kPa (kg/cm², psi)
0 (Kickdown)	$D_1 \rightarrow D_2$	60 - 68 (38 - 42)	1,970 - 2,220	530 - 686 (5.4 - 7.0, 77 - 100)
	$D_2 \rightarrow D_3$	107 - 115 (66 - 71)	3,480 - 3,730	
	$D_3 \rightarrow D_2$	105 - 97 (65 - 60)	3,410 - 3,160	
	$D_2 \rightarrow D_1$	53 - 45 (33 - 28)	1,720 - 1,470	
13.3 (100, 3.94)	$D_1 \rightarrow D_2$	23 - 31 (14 - 19)	750 - 1,000	441 - 598 (4.5 - 6.1, 64 - 87)
	$D_2 \rightarrow D_3$	63 - 70 (39 - 44)	2,040 - 2,290	
	$D_3 \rightarrow D_2$	40 - 32 (25 - 20)	1,300 - 1,050	
	$D_2 \rightarrow D_1$	11 - 18 (7 - 11)	350 - 600	
0 (Full throttle)	$1_2 \rightarrow 1_1$	54 - 46 (33 - 29)	1,750 - 1,500	549 - 706 (5.6 - 7.2, 80 - 102)
40.0 (300, 11.81)	$1_2 \rightarrow 1_1$	54 - 46 (33 - 29)	1,750 - 1,500	549 - 706 (5.6 - 7.2, 80 - 102)

***Car speed can be calculated by the following formula.**

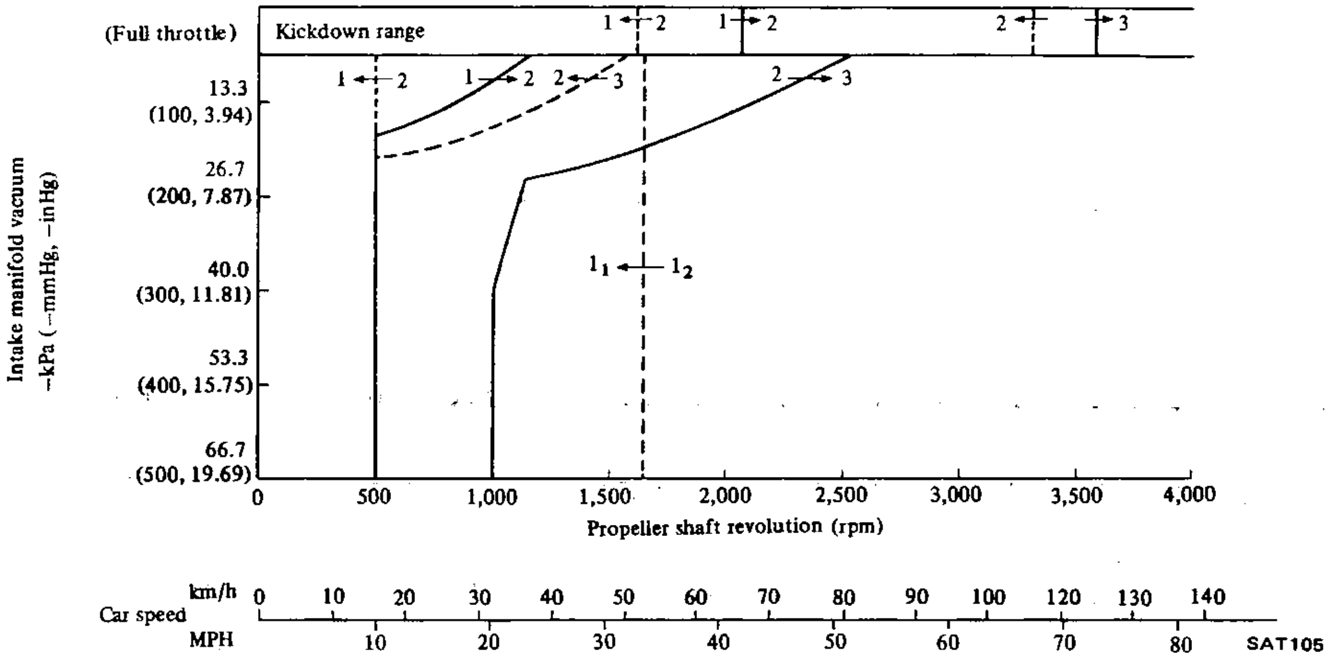
$$V = \quad 0.0307 \times Np \quad \left(= \frac{2 \times \pi \times r \times Np \times 60}{R_F \times 1{,}000} \right)$$

where, V : Car speed (km/h)
Np : Propeller shaft revolution (rpm)
R_F : Final gear ratio (3.700)
r : Tire effective radius (m), 185/70 SR14 (0.301 m)
(π : The ratio of circumference of a circle to its diameter : 3.14)

$$V = \quad 0.01905 \times Np \quad \left(= \frac{2 \times \pi \times r \times Np \times 60}{R_F \times 63{,}360} \right)$$

where, V : Car speed (MPH)
Np : Propeller shaft revolution (rpm)
R_F : Final gear ratio (3.700)
r : Tire effective radius (in), 185/70 SR14 (11.85 in)
(π : The ratio of circumference of a circle to its diameter : 3.14)

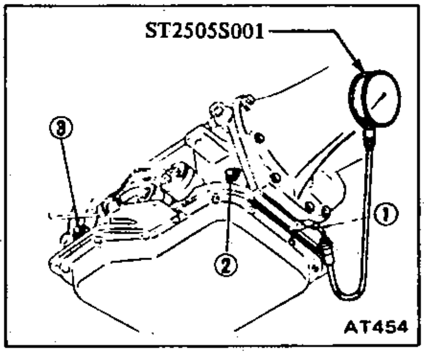
Shift schedule



SAT105

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.



AT454

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

Range	Line pressure kPa (kg/cm², psi)
R	412 - 549 (4.2 - 5.6, 60 - 80)
D	314 - 373 (3.2 - 3.8, 46 - 54)
2	588 - 1,147 (6.0 - 11.7, 85 - 166)
1	314 - 373 (3.2 - 3.8, 46 - 54)

At stall test

Range	Line pressure kPa (kg/cm², psi)
R	1,402 - 1,589 (14.3 - 16.2, 203 - 230)
D	971 - 1,089 (9.9 - 11.1, 141 - 158)
2	1,000 - 1,147 (10.2 - 11.7, 145 - 166)
1	971 - 1,089 (9.9 - 11.1, 141 - 158)

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, 15 psi). Excessive pressure drop may indicate an internal leak at a servo or clutch seal.

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.

Intake manifold vacuum –kPa (–mmHg, –inHg)	Car speed km/h (MPH)	Propeller shaft revolutions rpm
0 (0, 0)	40 - 48 (25 - 30)	1,310 - 1,560
13.3 (100, 3.94)	20 - 28 (13 - 17)	660 - 910

GOVERNOR PRESSURE

1. Install pressure gauge to governor pressure port. Locate the gauge so it can be seen by driver.
2. Road test car and note pressure at different road speeds. Governor pressure increases directly with road speed, and should always be less than line pressure.

STALL TESTING

The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transmission.

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 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:
1,650 - 1,950 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 rear clutch, one-way clutch of transmission, and sprag clutch of torque converter, are functioning properly.
2. **Stall revolution in "D" range, 1st gear, is above car specified:**
   The rear clutch 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.

	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 control valve	Governor	Band servo	Transmission air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Rear clutch	Front clutch	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transmission one-way clutch	Front clutch 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	.	.	.	.	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	.	⑪	.
Failure to change gear from "2nd" to "3rd".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	.	⑨	.	.	⑩	.	.	.
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 control valve	Governor	Band servo	Transmission air check	Oil quality	Engine adjustment, brake inspection	Rear clutch	Front clutch	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transmission one-way clutch	Front clutch 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	.	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.	1	2	3	.	4	.	6	.	8	7	5	.	.	⑨	.	.	.	⑩	.	⑪
Car braked by gear change from “1st” to “2nd”.	.	.	.	.	.	.	2	.	.	.	1	.	.	④	.	③	.	.	⑤	.
Car braked by gear change from “2nd” to “3rd”.	.	.	.	.	.	.	3	.	2	.	1	.	.	.	④	.	.	.	.	.
Maximum speed not attained. Acceleration poor.	1	2	.	.	4	5	7	.	6	.	3	8	⑪	⑫	⑨	⑩	⑬	.	.	.
Failure to change gear from “3rd” to “2nd”.	.	.	1	.	.	.	3	4	6	5	2	.	.	⑦	⑧	.	.	⑨	.	.
Failure to change gear from “2nd” to “1st” or from “3rd” to “1st”.	.	.	1	.	.	.	3	4	6	5	2	.	.	.	⑦	.	.	.	⑧	.
Gear change shock felt during deceleration by releasing accelerator pedal.	.	1	2	3	4	.	5	6	.	.	.	.	.	.	.	.	.	⑦	.	.
Too high a change point from “3rd” to “2nd”, from “2nd” to “1st”.	.	1	2	3	4	.	5	6	.	.	.	.	.	.	.	.	.	⑦	.	.
Kickdown does not operate when depressing pedal in “3rd” within kickdown car speed.	.	.	2	1	.	.	4	5	.	.	3	.	.	.	⑥	.	.	⑦	.	.
Kickdown operates or engine overruns when depressing pedal in “3rd” beyond kickdown car speed limit.	.	1	2	.	3	.	5	6	.	7	4	.	.	⑧	.	.	.	⑨	.	.
Races extremely 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 control valve	Governor	Band servo	Transmission air check	Oil quality	Rear clutch	Front clutch	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.	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									
		ROUGH	SHIFT TIMING [Mark km/h (MPH)]	NO SHIFT	SHIFT SLIPPAGE	CAR WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ACCELERATION	NOISY	OK	COMMENTS
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	1. Oil level gauge	Check gauge for oil level and leakage before and after each test.
	2. Downshift solenoid	Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON".
	3. Manual linkage	Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.
	4. Inhibitor switch	Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.
	5. Engine idling rpm.	Check whether idling rpm meet standard.
	6. Vacuum pressure of vacuum pipe.	Check whether vacuum pressure is more than 60.0 kPa (450 mmHg, 17.72 inHg) in idling and whether it decreases with increasing rpm.
	7. Operation in each range.	Check whether transmission engages positively by shifting "N" → "D", "N" → "2", "N" → "1" and "N" → "R" range while idling with brake applied.
	8. Creep of car.	Check whether there is any creep in "D", "2", "1" and "R" ranges.
Stall test	1. Oil pressure before testing.	Measure line pressures in "D", "2", "1" and "R" range while idling.
	2. Stall test.	Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation. **Temperature of torque converter oil used in test should be from 60 to 100°C (140 to 212°F) i.e., sufficiently warmed up but not overheated.** **CAUTION:** **To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range. Measurement time must not be more than 5 seconds.**
	3. Oil pressure after testing	Same as item 1.
Road test	1. Slow acceleration, 1st → 2nd 2nd → 3rd	Check car speeds and engine rpm in shifting up 1st → 2nd range and 2nd → 3rd range while running with lever in "D" range and engine vacuum pressure of about 13.3 kPa (100 mmHg, 3.94 inHg).
	2. Quick acceleration, 1st → 2nd 2nd → 3rd	Same as item 1 above except with engine vacuum pressure of 0 kPa (0 mmHg, 0 inHg) (i.e., in position just before kickdown).
	3. Kick-down operation, 3rd → 2nd or 2nd → 1st	Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 37, 43 MPH) in "D_3" range.

Order	Test item	Procedure
	4. Shift down, $D_3 \rightarrow D_2 \rightarrow D_1$	Check car speeds and engine rpm in shifting down from 3rd → 2nd → 1st (sequentially) while coasting with accelerater pedal released in "D_3" range and engine vacuum pressure of about 60.0 kPa (450 mmHg, 17.72 inHg).
	5. Shift down, $D_3 \rightarrow 1_2 \rightarrow 1_1$	Check for shifting down $D_3 \rightarrow 1_2$ and engine braking, and further for shifting down $1_2 \rightarrow 1_1$ and engine braking after shifting the lever into "1" range with the accelerator pedal released and the engine vacuum pressure of 0 kPa (0 mmHg, 0 inHg) while driving at about 50 km/h (30 MPH) in "D_3" range.
	6. Shift down, $D_3 \rightarrow 2$	Check for quick shifting down $D_3 \rightarrow 2$ and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (30 MPH) in "D_3" range. Also, check for locking of the transmission in 2nd gear ratio regardless of car speed.
	7. Shift up, $1_1 \rightarrow 1_2$	Check for failure of the transmission to shift up during acceleration, when starting in "1" range.
	8. Shift up or down when starting in "2" range.	Check the transmission for not shifting up or down during acceleration or deceleration, when starting in "2" range.
	9. Parking.	Confirm that vehicle will not move on grade when shifting to "P" range.
Others	Abnormal shock, oil leakage.	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance.

SERVICE DATA AND SPECIFICATIONS

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) Approximately 2.7 liters (2-7/8 US qt, 2-3/8 Imp qt) in torque converter

Specifications and adjustment

Automatic transmission assembly Model code number		X2305	
Torque converter assembly Stamped mark on the T/C		G	
Front clutch	Number of drive plates	3	
	Number of driven plates	3	
	Clearance mm (in)	1.6 - 2.0 (0.063 - 0.079)	
	Thickness of retaining plate	Thickness mm (in)	Part number
		10.6 (0.417)	31537-X0100
		10.8 (0.425)	31537-X0101
		11.0 (0.433)	31537-X0102
		11.2 (0.441)	31537-X0103
		11.4 (0.449)	31537-X0104
		11.6 (0.457)	31537-X0105
Rear clutch	Number of drive plates	5	
	Number of driven plates	5	
	Clearance mm (in)	0.8 - 1.6 (0.031 - 0.063)	
	Thickness of retaining plate mm (in)	8.35 (0.3287)	
Low & reverse brake	Number of drive plates	5	
	Number of driven plates	5	
	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 Piston size mm (in)	Big dia.	64 (2.52)	
	Small dia.	40 (1.57)	
Control valve assembly Stamped mark on strainer		LRJ	
Governor assembly Stamped mark on governor body		35	

Stall revolution

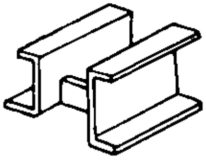
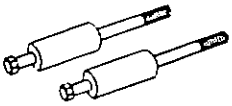
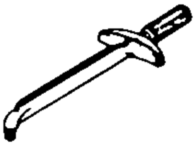
Stall revolution rpm	1,650 - 1,950

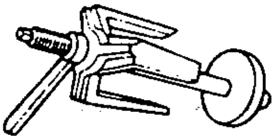
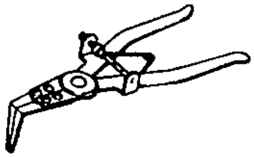
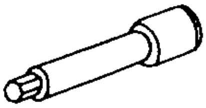
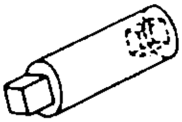
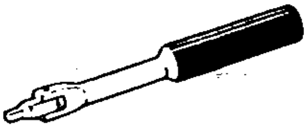
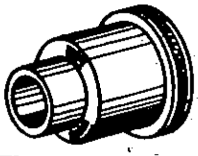
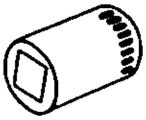
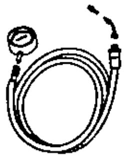
Tightening torque

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
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) (J25607)	Transmission case stand 
ST25850000 (J25721)	Sliding hammer 
GG91060000 (GG93010000) (J25703)	Torque wrench 

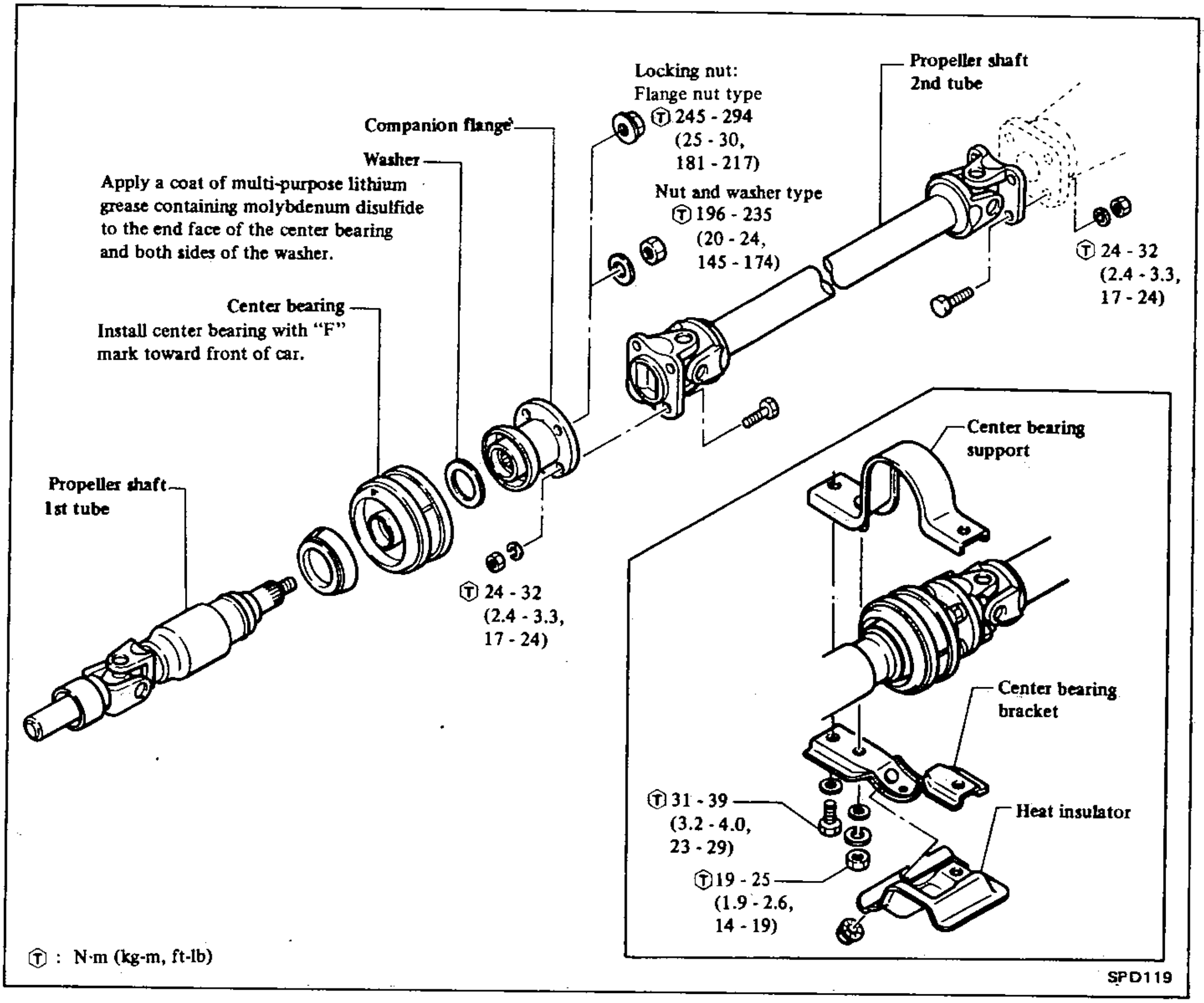
Tool number (Kent-Moore No.)	Tool name
ST25420001 (ST25420000) (J26063)	Clutch spring compressor 
ST25320001 (J25710)	Snap ring remover 
ST25570001 (ST25570000) (J25718)	Hex-head extension 
ST25490000 (ST25512001) (J25713)	Socket extension 
HT62350000 (–)	Spinner handle 
ST25160000 (–)	Torque driver 
ST25580001 (J25719)	Oil pump assembling gauge 
HT61000800 (–)	Hexagon wrench 
ST2505S001 (J25695)	Oil pressure gauge set 

SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

CONTENTS

PROPELLER SHAFT
—Model : 3S63A—



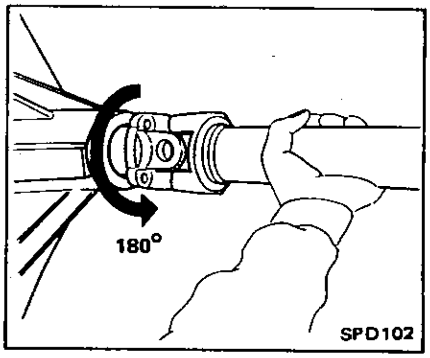
GENERAL INSPECTION

- Inspect propeller shaft tube surface for dents or cracks.
  If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.
- If journal is damaged or worn, replace propeller shaft assembly.

PROPELLER SHAFT VIBRATION

To check and correct an unbalanced propeller shaft, proceed as follows:

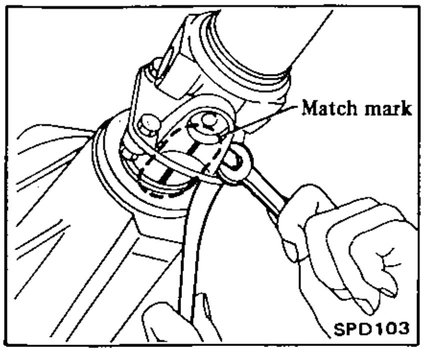
1. Remove undercoating and other foreign material which could upset shaft balance, and check shaft vibration by road test.
2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange **180 degrees** and reconnect propeller shaft.



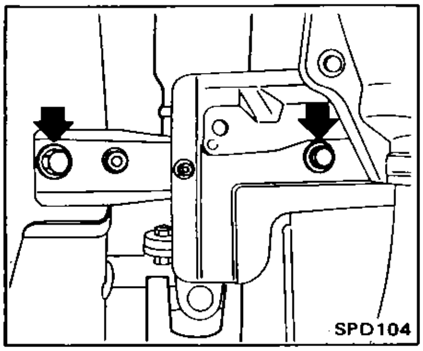
3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

REMOVAL AND INSTALLATION

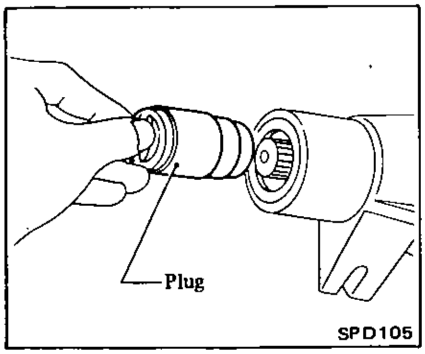
1. **Put match marks** on flanges, and separate propeller shaft from differential carrier.



2. Remove center bearing bracket.

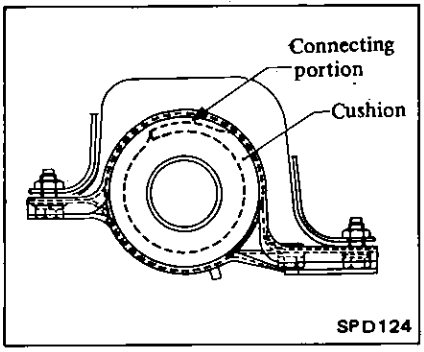


3. Draw out propeller shaft from transmission and **plug up rear end of transmission rear extension housing.**



4. To install, reverse the foregoing procedure using reference marks in removal

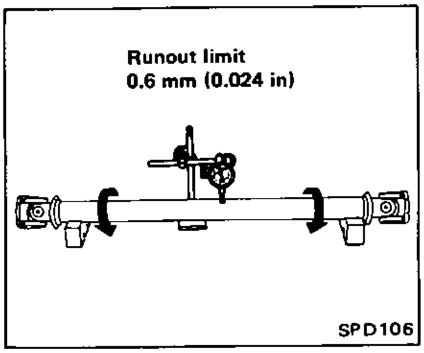
Install the center bearing on the bracket with the contact surface of the cushion facing upward.



INSPECTION

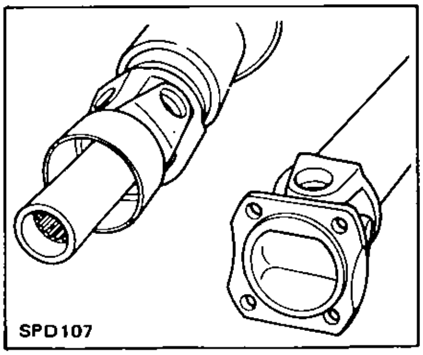
PROPELLER SHAFT RUNOUT

Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.



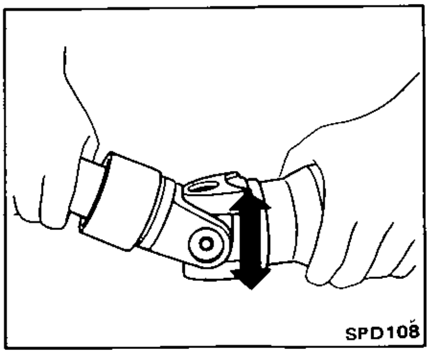
FLANGE YOKE AND SLEEVE YOKE

If flange yoke and sleeve yoke are damaged or worn, replace propeller shaft assembly.



JOURNAL AXIAL PLAY

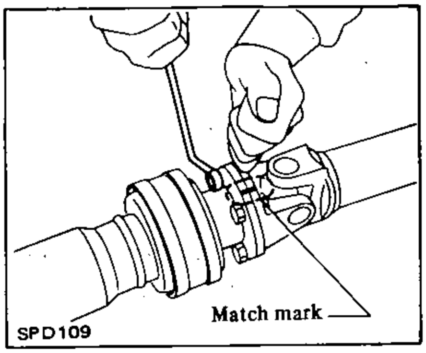
Inspect journal for axial play, if there is play, replace propeller shaft assembly.



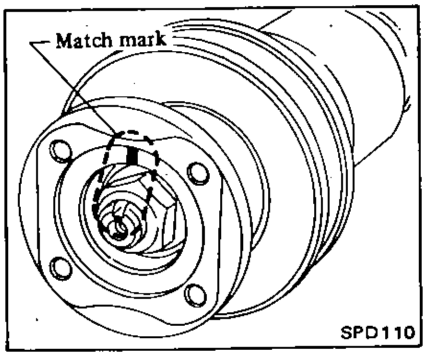
REPAIR

CENTER BEARING

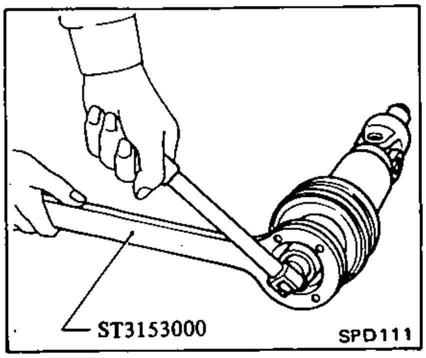
1. **Put match marks** on flanges, and separate 2nd tube from 1st tube.



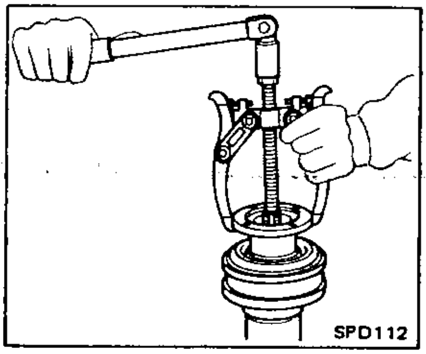
2. **Put match marks** on the flange and shaft.



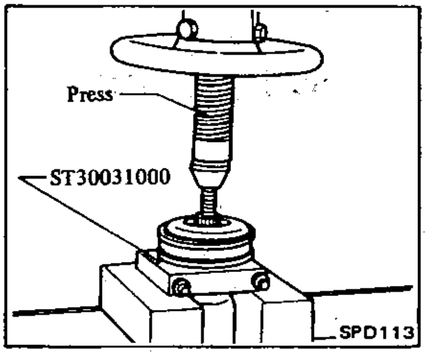
3. Remove locking nut with Tool.



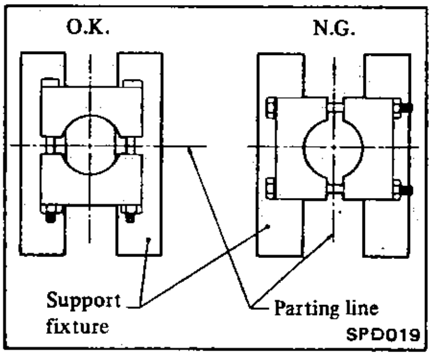
4. Remove companion flange with puller.



5. Remove center bearing with Tool and press.

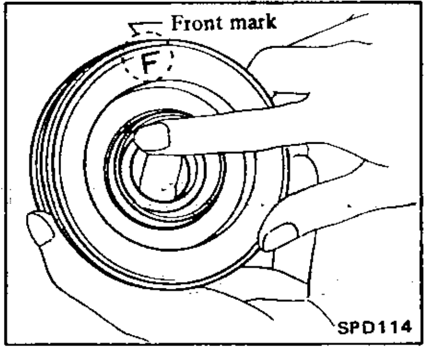


Care should be taken when setting Tool in press to make sure that parting line of Tool is right angle to support fixture of press. This is to prevent Tool from bending.

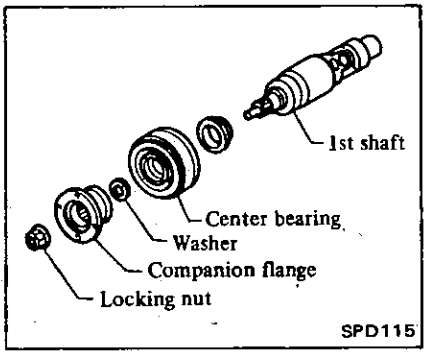


6. Install new center bearing. Be sure to install center bearing with **"F" mark toward front of car.**

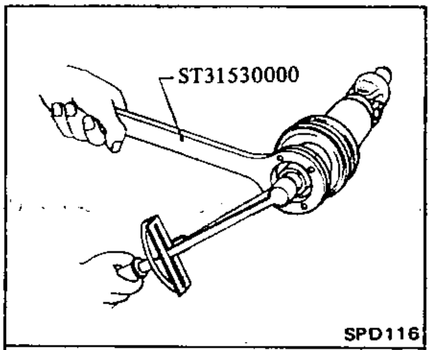
Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.



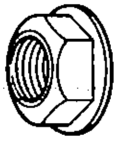
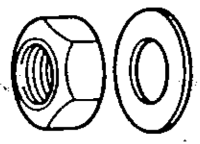
7. Insert the washer into the end of the center bearing. Align the mark on the companion flange and install the companion flange.



8. Tighten locking nut using Tool.

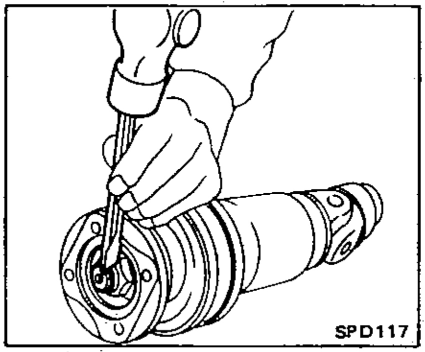


Ⓣ : Center bearing locking nut

Flange nut type	Nut and washer type
245 - 294 N·m (25 - 30 kg-m, 181 - 217 ft-lb)	196 - 235 N·m (20 - 24 kg-m, 145 - 174 ft-lb)
	

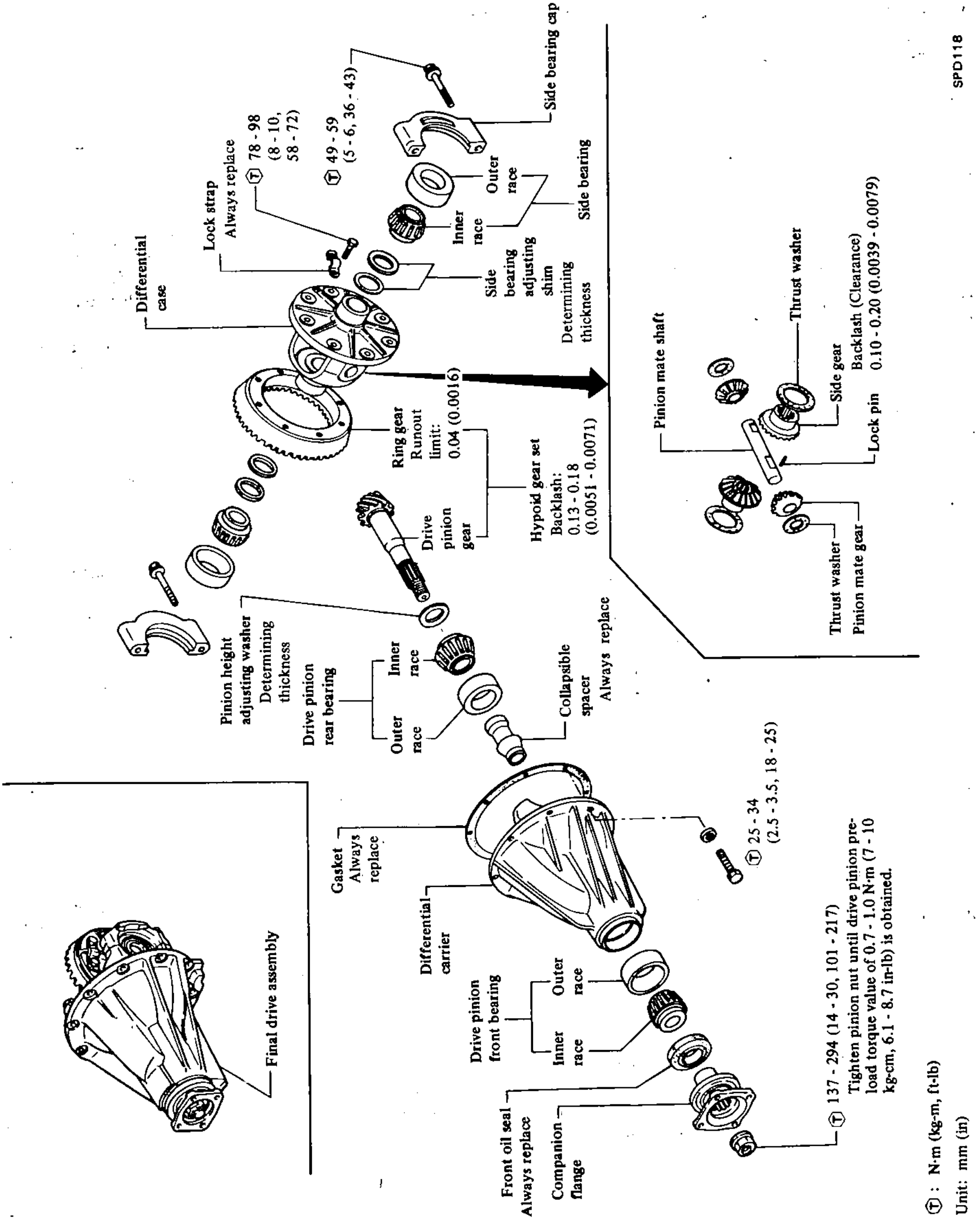
SPD125

9. Stake the nut.



10. Align the mark and connect 1st and 2nd tubes.

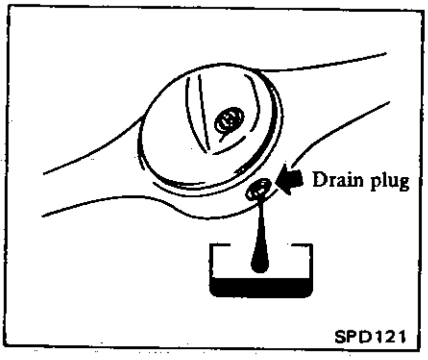
DIFFERENTIAL CARRIER (Final drive)
—Model : H165B—



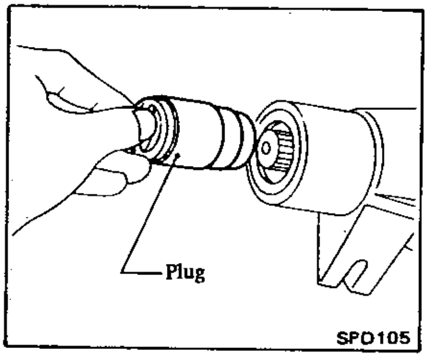
PREPARATION FOR DISASSEMBLY

REMOVAL

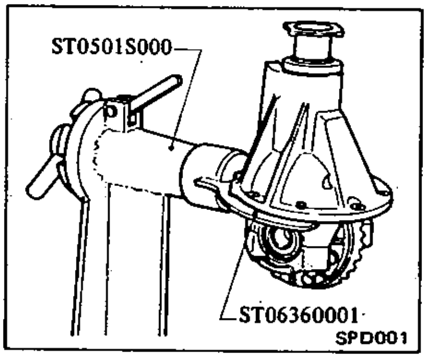
1. Jack up rear of car and support it by placing safety stands under rear axle case, referring to section GI.
2. Remove drain plug and drain gear oil.



3. Remove propeller shaft and rear axle shafts (Refer to Section RA for removal) and **plug up rear end of transmission rear extension housing.**

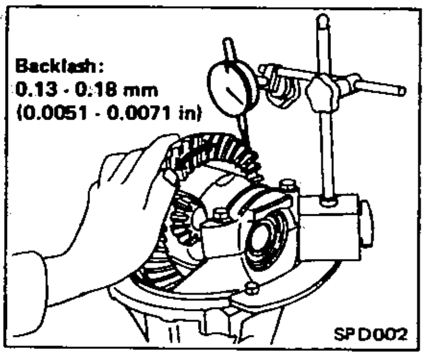


4. Loosen bolts securing differential carrier to rear axle case, and take out differential carrier.
5. Mount differential carrier on Tool.



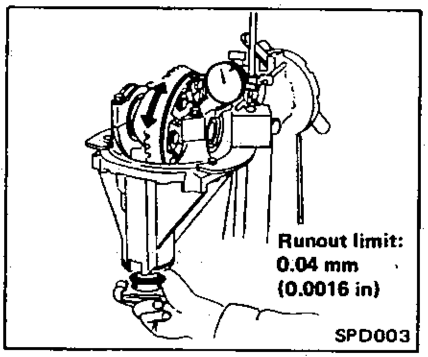
PRE-DISASSEMBLY INSPECTION

1. Check backlash of ring gear with a dial indicator at several points. If it is not within specification, adjust it referring to **SIDE BEARING ADJUSTMENT.**



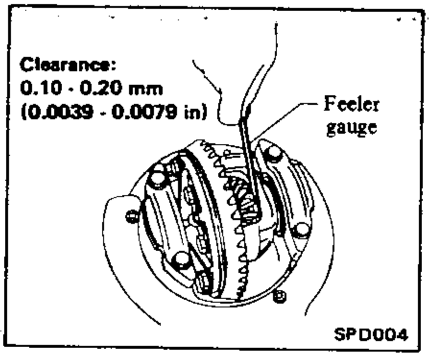
2. Check runout of ring gear with a dial indicator. If it is over specification, hypoid gear set or differential case should be replaced.

When backlash varies excessively in different places, the variance may have resulted from foreign matter caught between ring gear and differential case.



3. Check tooth contact, referring to **TOOTH CONTACT.**
4. Check backlash of side gear. Using a thickness gauge, measure clearance between side gear and differential case.

   If it is not within specification, adjust it by selecting side gear thrust washer (Refer to S.D.S.).



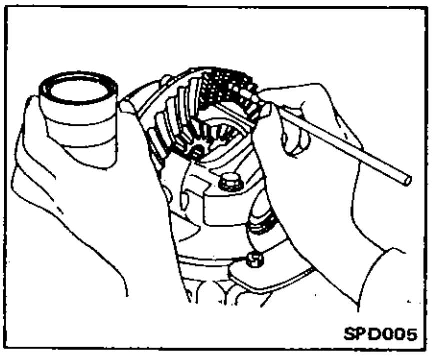
TOOTH CONTACT

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

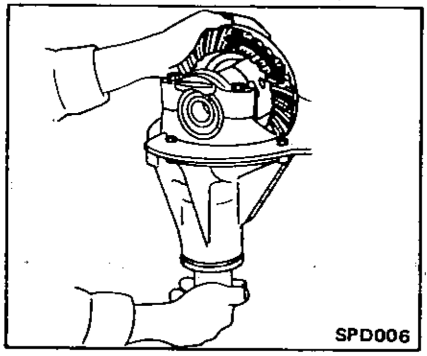
Hypoid gear set which are not positioned properly may be noisy, or have short life or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

Check

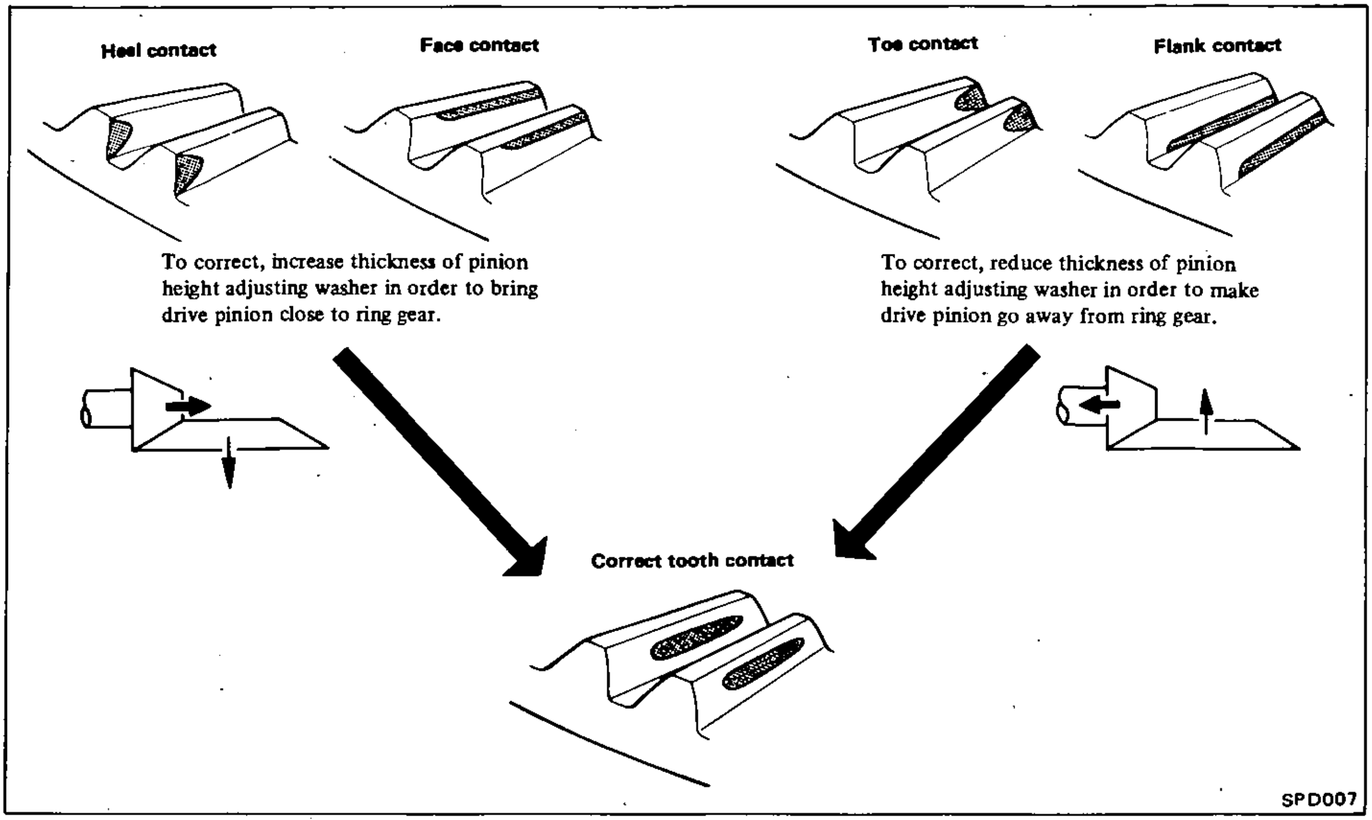
1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear **drive side.**



3. Hold companion flange steady by hand and rotate the ring gear in both directions.



Adjustment



To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear.

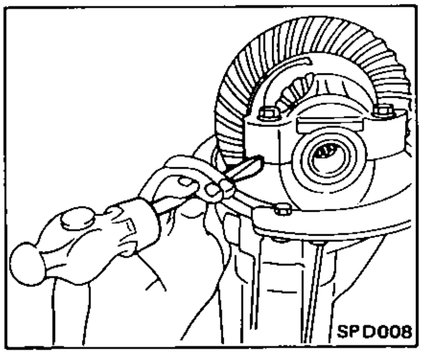
To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear.

DISASSEMBLY

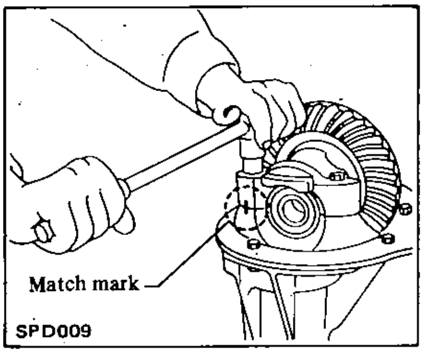
DIFFERENTIAL CARRIER

1. **Put match marks** on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-bored during manufacture and should be put back in their original places.

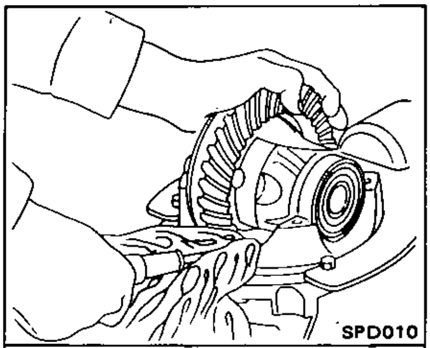


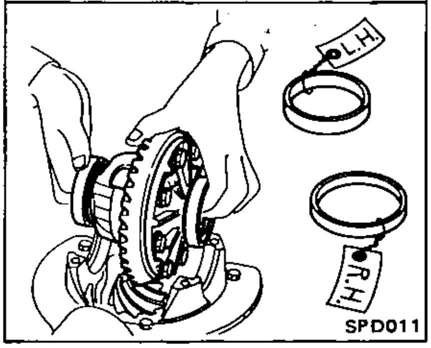
2. Remove side bearing caps.



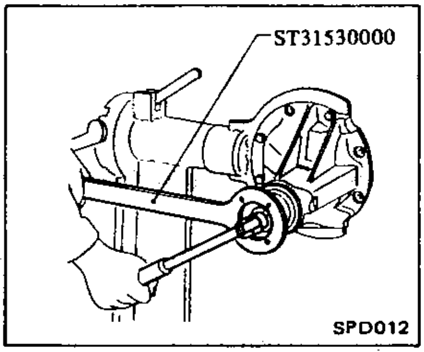
3. Using a pry bar, remove differential case assembly.

Be careful to keep the side bearing outer races together with inner race – don't mix them up.



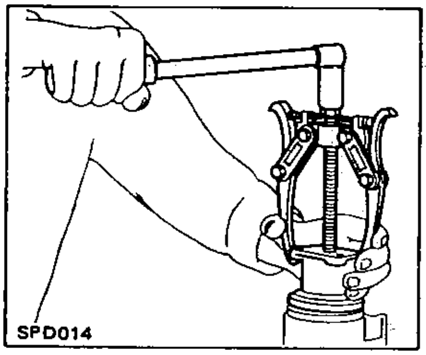


4. Remove drive pinion nut with Tool.



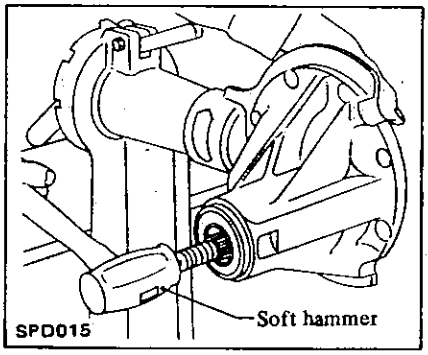
SPD012

5. Remove companion flange with puller.



SPD014

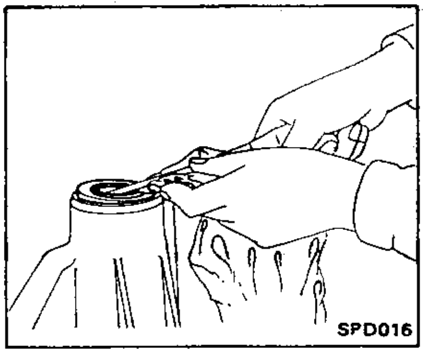
6. Remove drive pinion with soft hammer.



SPD015

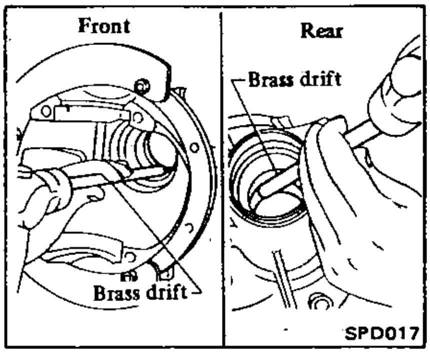
7. Remove oil seal by prying up with a large screwdriver, and remove front pinion bearing inner race.

Do this carefully, so as not to scratch seal bore with screwdriver. Cover end of screwdriver with a rag.



SPD016

8. Remove pinion bearing outer race using a brass drift.

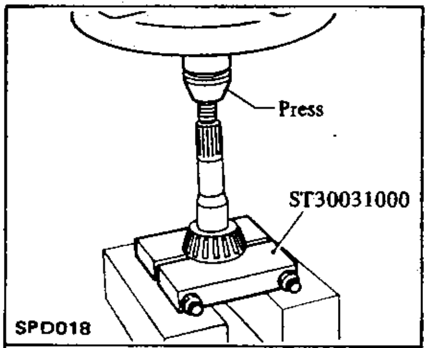


SPD017

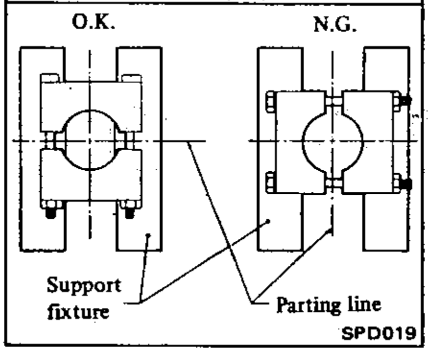
9. Remove collapsible spacer from drive pinion.

10. Pull out rear bearing inner race with a press and Tool.

Care should be taken when setting Tool in press to make sure that parting line of Tool is a right angle to support fixture of press. This is to prevent bending Tool.



SPD018

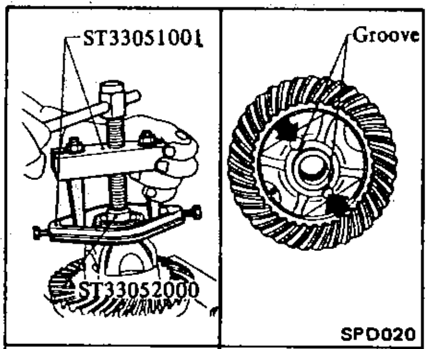


SPD019

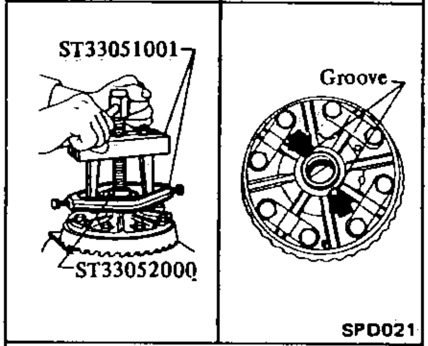
DIFFERENTIAL CASE

1. Remove side bearing inner race with Tool.

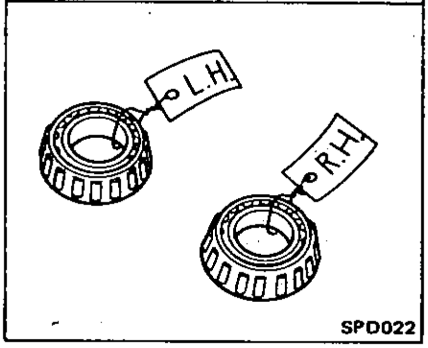
To prevent damage to bearing, engage puller paws with groove. Be careful not to confuse left and right hand parts.



SPD020

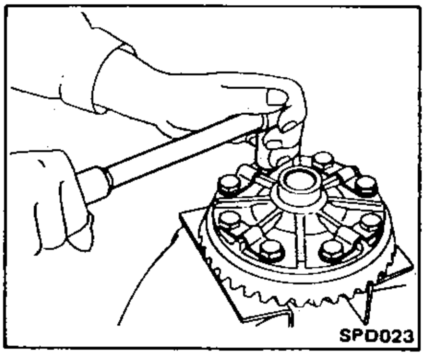


SPD021



SPD022

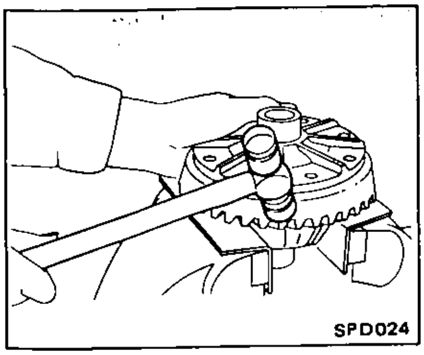
2. Remove ring gear by spreading out lock straps and loosening ring gear bolts in a criss-cross fashion.



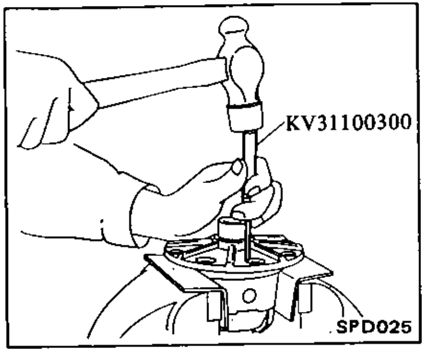
SPD023

3. Tap ring gear off gear case using a soft hammer.

Tap evenly all around to keep ring gear from binding.

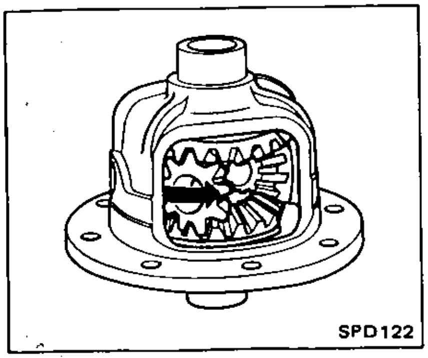

SPD024

4. Drive out pinion mate shaft lock pin, with Tool **from ring gear side.**

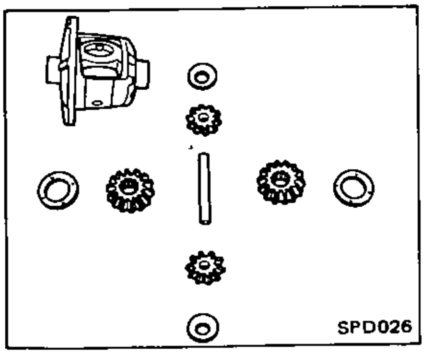


SPD025

5. Draw out pinion mate shaft, and rotate pinion mate gears out of the case and remove side gears and thrust washers.


SPD122

Put marks on gears and thrust washers so that they can be reinstalled in their original positions from which they were removed.

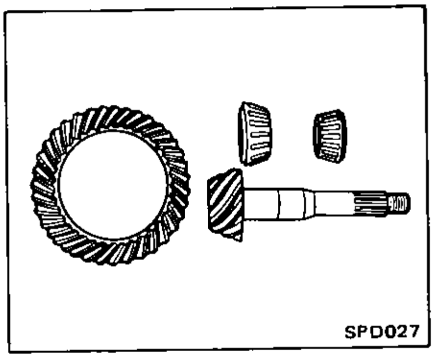

SPD026

INSPECTION

1. Clean disassembled parts completely.

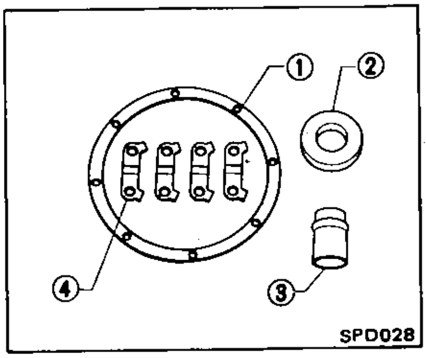
Repair or replace any damaged or faulty parts.

When replacing drive pinion or ring gear, replace with a new hypoid gear set.


SPD027

2. The following parts should be replaced by new ones each time they are removed.

① Gasket
② Front oil seal
③ Collapsible spacer
④ Lock strap



SPD028

ASSEMBLY

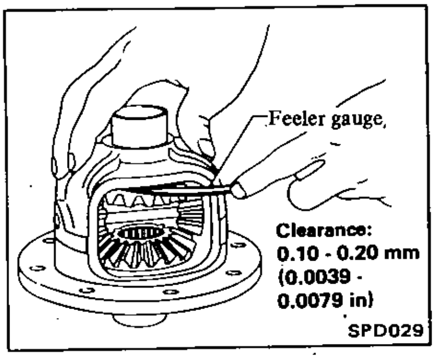
Assembly should be done in the reverse order of disassembly, while making any necessary inspections and adjustments.

PRECAUTION:

a. Arrange shims and washers to install them correctly.
b. Thoroughly clean the surfaces on which shims, washers bearings and bearing caps are installed.
c. Apply gear oil when installing bearings.
d. Pack recommended multi-purpose grease into cavity between lips when fitting oil seal.

DIFFERENTIAL CASE

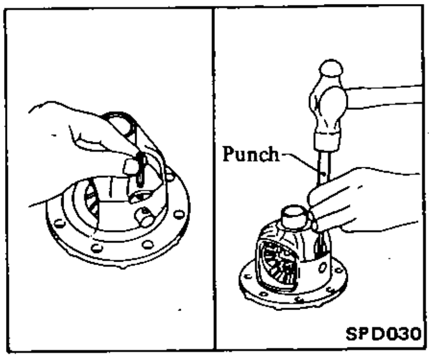
1. Install pinion mate gears, side gears and thrust washers into differential case.
2. Fit pinion mate shaft.
3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer (Refer to S.D.S.).



Clearance:
0.10 - 0.20 mm
(0.0039 -
0.0079 in)
SPD029

4. Install pinion mate shaft lock pin using a punch.

Make sure lock pin is flush with case.

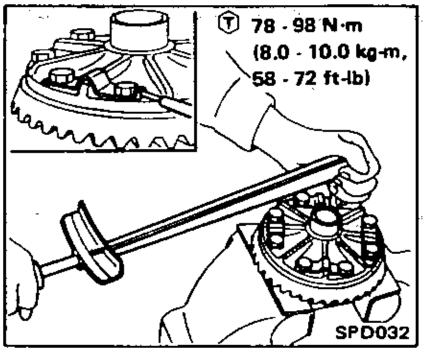


SPD030

5. Place ring gear on differential case and install **new** lock straps and bolts.

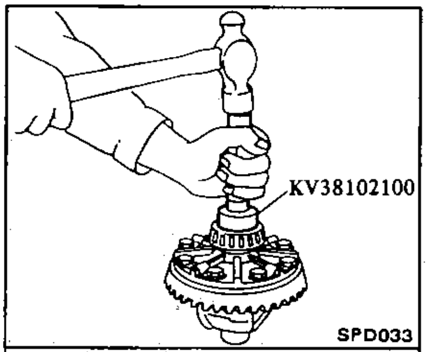
Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

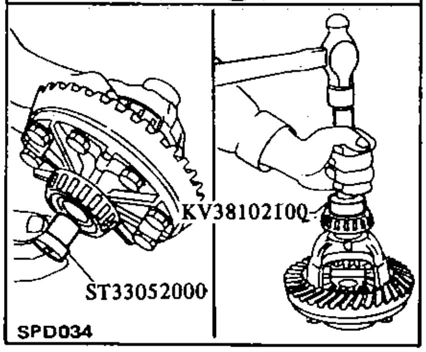
Then bend up lock straps to lock the bolts in place.



6. Select side bearing adjusting shims, referring to **SIDE BEARING ADJUSTMENT**.

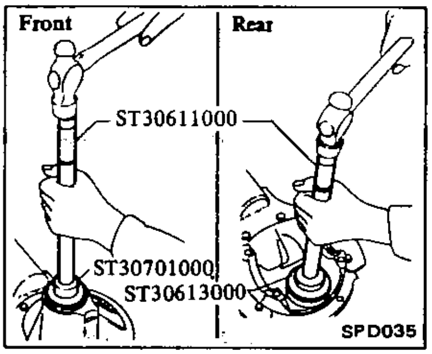
7. Install the shims behind each bearing and press on the bearings, using Tool.





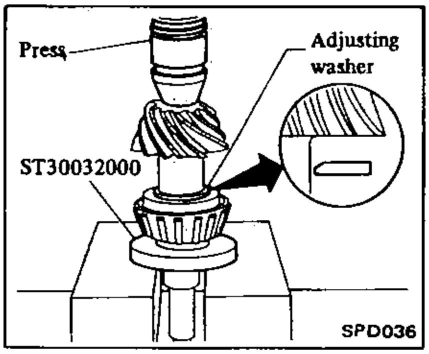
DIFFERENTIAL CARRIER

1. Press fit front and rear bearing outer races using Tools.

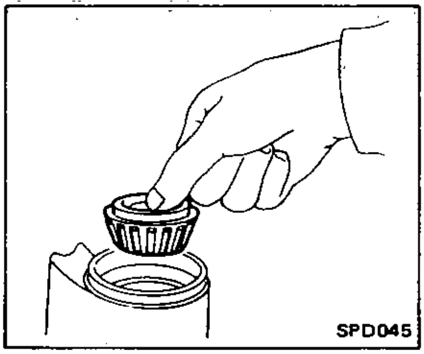


2. Select pinion height adjusting washer, referring to **PINION HEIGHT ADJUSTMENT.**

3. Install pinion height adjusting washer in drive pinion, **bevel side toward gear,** and press fit rear bearing inner race in it, using press and Tool.

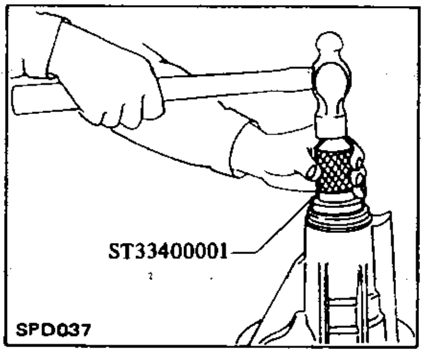


4. **Lubricate** front bearing with gear oil and place it in gear carrier.

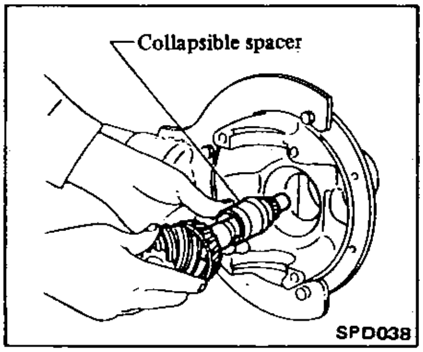


5. Using Tool, carefully fit a **new** oil seal into carrier.

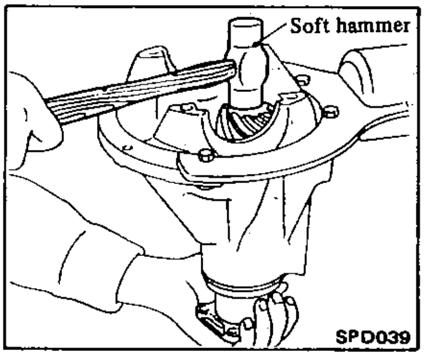
Make sure oil seal is flush with end of carrier and apply multi-purpose grease into cavity between lips.



6. Place a **new** collapsible spacer on drive pinion and **lubricate** rear bearing with gear oil, and insert it in gear carrier.

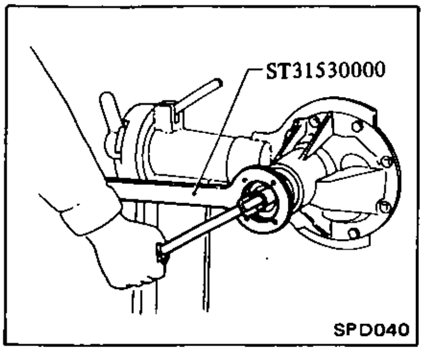


7. Install companion flange and hold it firmly. Insert drive pinion into companion flange by tapping its head with a soft hammer.



8. Hold companion flange with Tool and temporarily tighten pinion nut, until there is no axial play.

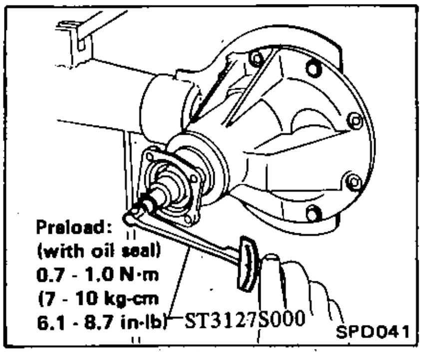
Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.



SPD040

9. Tighten pinion nut by degrees to the specified preload while checking the preload with Tools.

When checking preload, turn drive pinion in both directions several times set bearing rollers.



SPD041

Ⓣ : Drive pinion nut
137 - 294 N·m
(14 - 30 kg-m,
101 - 217 ft-lb)

CAUTION:

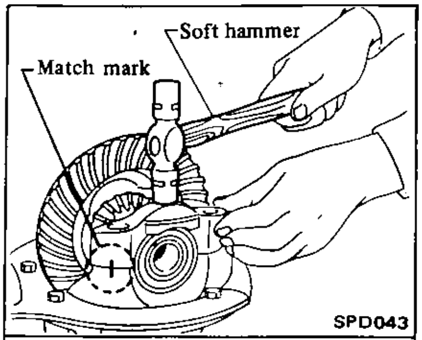
The preload is achieved by using the permanent set of collapsible spacer. So here, if an over-preload results from excessive turning of the pinion nut, the spacer should be replaced by new one.

---

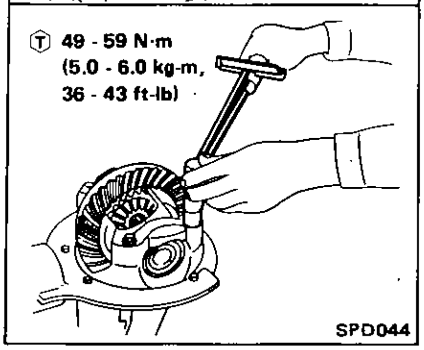
10. Install differential case assembly and side bearing outer races into differential carrier, and install side bearing cap.

Tap on the cap with a soft hammer to settle it in the carrier.

The bearing cap should be installed with the marks put at disassembly aligned.



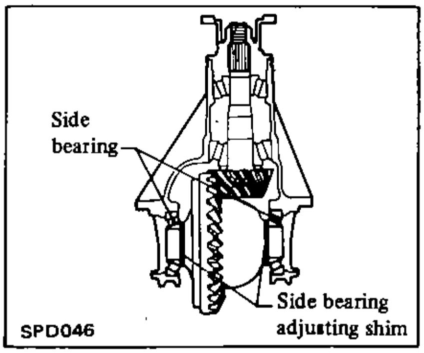
SPD043



SPD044

ADJUSTMENT

SIDE BEARING ADJUSTMENT

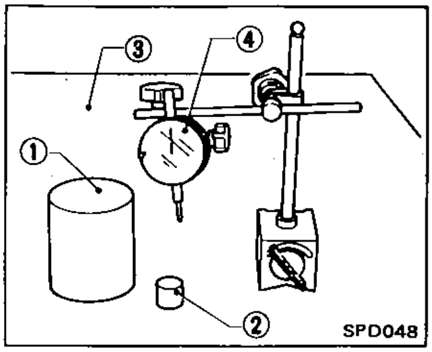


SPD046

When the differential case, side bearing, or gear carrier is replaced, or when the ring gear backlash or side bearing preload is out of specifications, side bearing shims of proper thickness should be installed.

– Required Tools –

① Weight Block (ST32501000)
② Master Gauge (ST33741000)
③ Base Plate
④ Dial Indicator.



SPD048

1. Thickness of shim can be calculated by following equation.

Left side: $$T_1 = (A - C + D - H') \times 0.01 + 0.20 + E$$

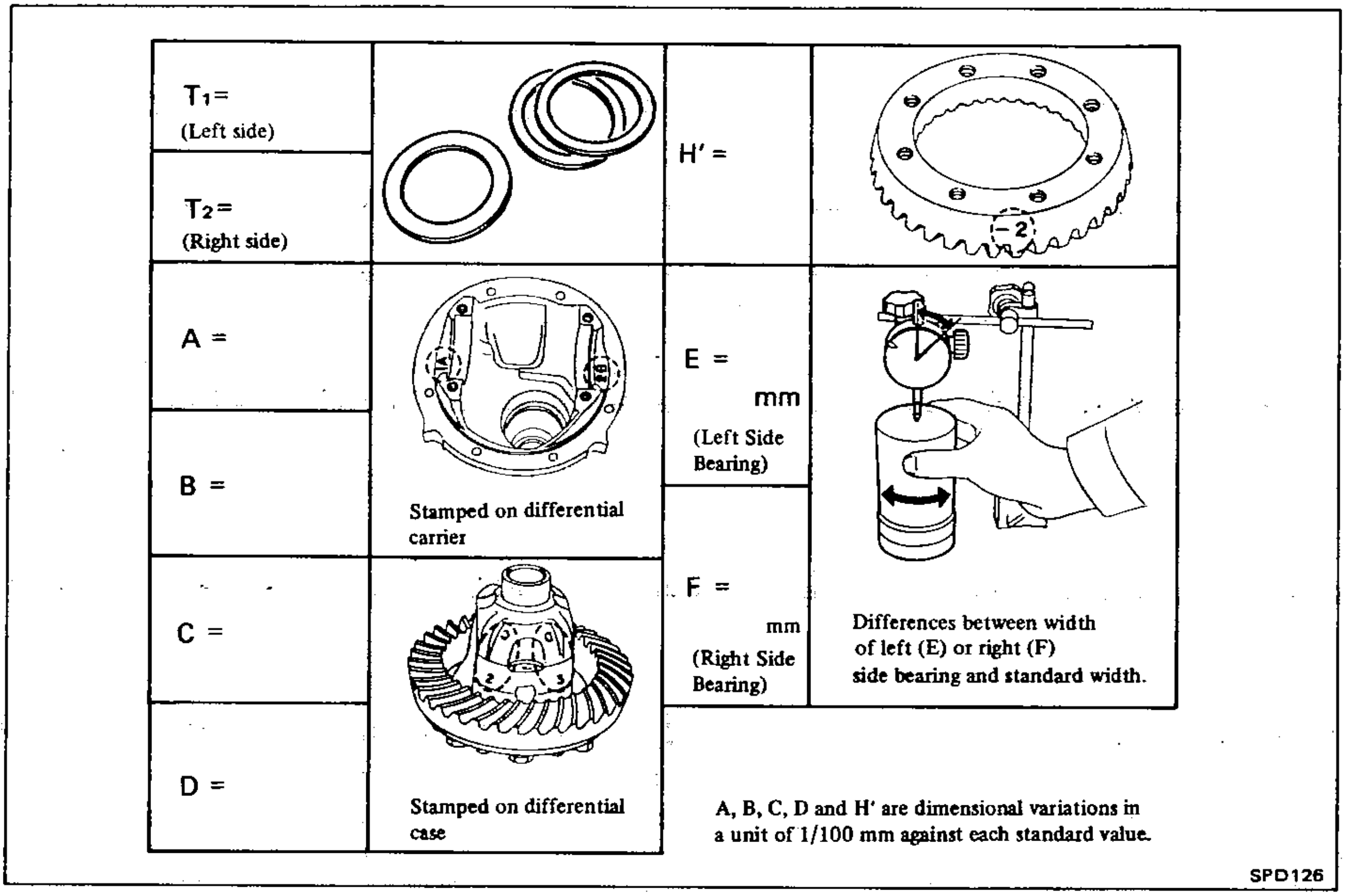
Right side: $$T_2 = (B - D + H') \times 0.01 + 0.09 + F$$

CAUTION:

To avoid any confusion while calculating, it is absolutely necessary to stay with metric system.

If you measure anything in inches, the results should be converted into the metric system.

Where:



A, B, C, D and H' are dimensional variations in a unit of 1/100 mm against each standard value.

SPD126

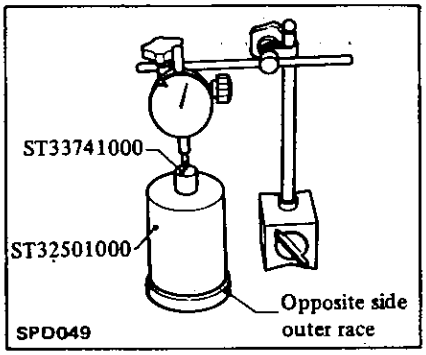
2. Measure values **E** and **F**.

(1) Attach a dial indicator to the base plate.

(2) Place the outer race of the opposite side bearing to be measured.

(3) Place a weight block on that outer race, and a master gauge on that block.

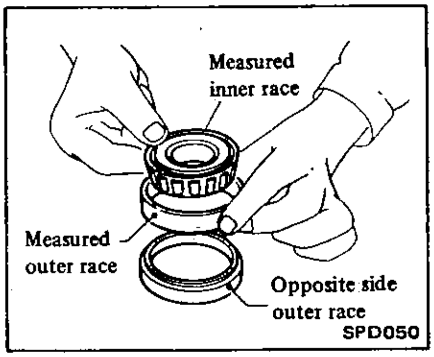
Then adjust the dial indicator scale to zero with its tip on the master gauge.



SPD049

(4) Remove the master gauge and weight block. Place the bearing outer race and inner race to be measured on the opposite side outer race, and place the weight block on that bearing assembly.

If the bearing assembly is placed on the base plate, the bearing width cannot be accurately determined due to its cage being in contact with the base plate.



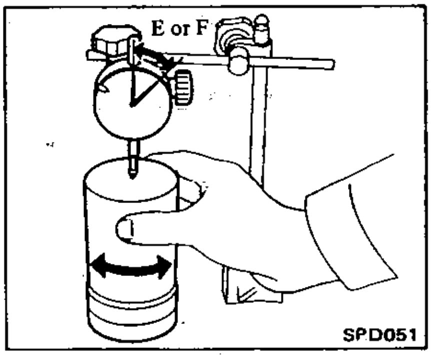
SPD050

(5) Turn the bearing several times to settle it, and then read the indication of the dial indicator.

The indication should be E or F.

Left side bearing: E

Right side bearing: F



SPD051

3. Substitute these values into the equation to calculate the thickness of the shim.

If values signifying A, B, C, D and H' are not given, regard them as zero and calculate.

After assembly, check to see that preload and backlash are specifications. If not, readjust.

Example:

A = 1
B = 2
C = 2
D = 3

H' = −2
E = 0.11
F = 0.20

Left side:

$T_1 = (A - C + D - H') \times 0.01 + 0.20 + E$
$= [1 - 2 + 3 - (-2)] \times 0.01 + 0.20 + 0.11$

(1) A 1
−C .... −2
−1
+D .... +3
2
−H' .... −(−2)
4

(2) 4
× 0.01
0.04

(3) 0.04
+ 0.20
0.24

(4) 0.24
+E .... + 0.11
0.35

$\therefore T_1 = 0.35$ mm

Right side:

$T_2 = (B - D + H') \times 0.01 + 0.09 + F$
$= [2 - 3 + (-2)] \times 0.01 + 0.09 + 0.20$

(1) B 2
−D .... −3
−1
+H' .... +(−2)
−3

(2) −3
× 0.01
−0.03

(3) −0.03
+ 0.09
0.06

(4) 0.06
+F .... + 0.20
0.26

$\therefore T_2 = 0.26$ mm

4. Select the proper shims (Refer to S.D.S.).

If you cannot find the desired thickness of shims, use shims so that the total thickness is the closest to the calculated value.

Example:

Left side

Calculated value ... $T_1 = 0.35$ mm

Used shims

Thickness		Quantity	
0.20	×	1	= 0.20
0.10	×	1	= 0.10
0.05	×	1	= 0.05
Total thickness			0.35 mm

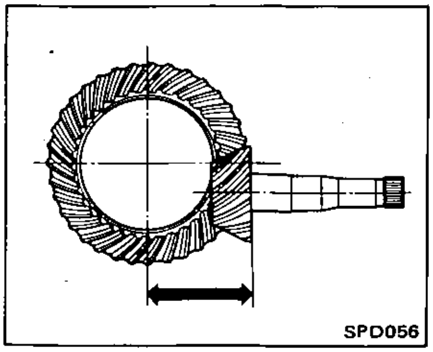
Right side

Calculated value ... $T_2 = 0.26$ mm

Used shims

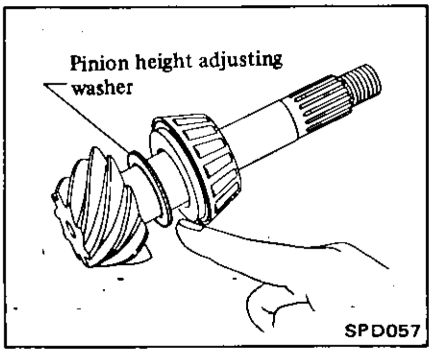
Thickness		Quantity	
0.07	×	3	= 0.21
0.05	×	1	= 0.05
Total thickness			0.26 mm

PINION HEIGHT ADJUSTMENT


SPD056

When replacing the hypoid gear set, drive pinion bearing or gear carrier, be sure to adjust the pinion height.

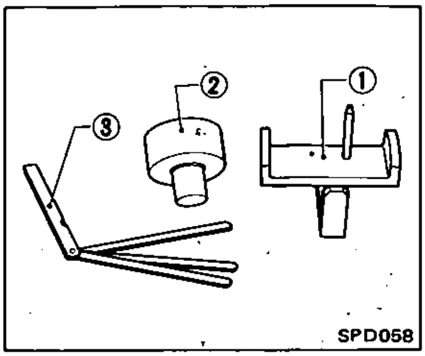
Adjustment of the pinion height can be made by adjusting the washer to be installed between the rear bearing inner race and the drive pinion head.



SPD057

– Required Tools –

① Height Gauge (ST31141000)
② Dummy Shaft (ST31942000)
③ Feeler Gauge.



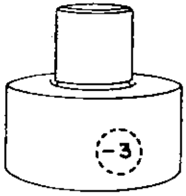
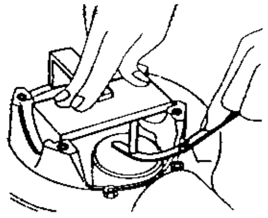
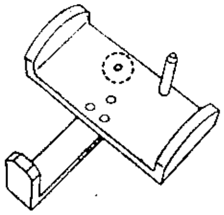
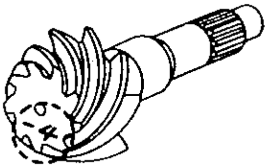
SPD058

1. Thickness of washer can be calculated by following equation.

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$

CAUTION:
To avoid any confusion while calculating, it is necessary to stay with the metric system. If you measure anything in inches, the result should be converted to the metric system.

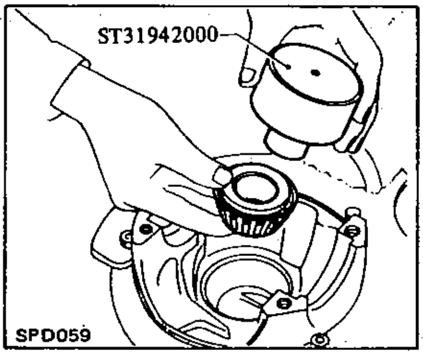
Where:

T = mm		D′=	
N = mm		S =	
H =			

H, D′ and S are dimensional variations in a unit of 1/100 mm against each standard value.

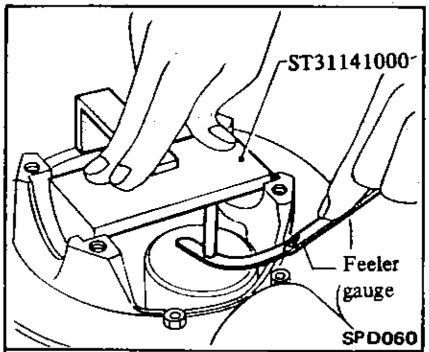
SPD127

2. Assemble Dummy shaft on rear bearing inner race, and fit it into carrier.

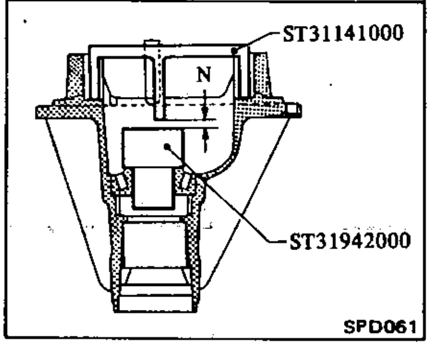


SPD059

3. Attach Height Gauge to carrier.
Using a feeler gauge, measure the clearance between the height gauge tip and the dummy shaft face.



SPD060



SPD061

4. Substitute these values into the equation to calculate the thickness of the washer.

If values signifying H, D′ and S are not given, regard them as zero and calculate.

After assembly, check to see that tooth contact is correct. If not, readjust.

Example:

$N = 0.35$
$H = -4$
$D' = -3$
$S = 0$

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$
$$= 0.35 - [\{(-4) - (-3) - 0\} \times 0.01] + 2.98$$

(1) H .... (–4)
–D' .... –(–3)
–1
–S .... –0
–1

(2) –1
× 0.01
–0.01

(3) N 0.35
–(–0.01)
0.36

(4) 0.36
+2.98
3.34

∴T = 3.34

5. Select the proper washer (Refer to S.D.S.).

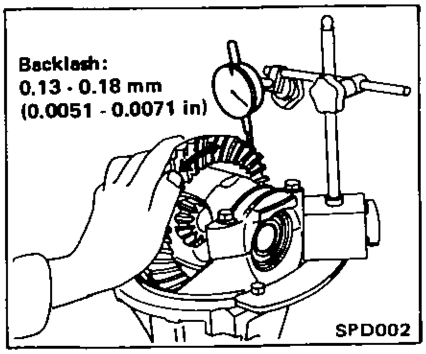
If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculate value.

Example:

Calculated value ... T = 3.34 mm
Used washer ... T = 3.33 mm

FINAL VERIFICATION

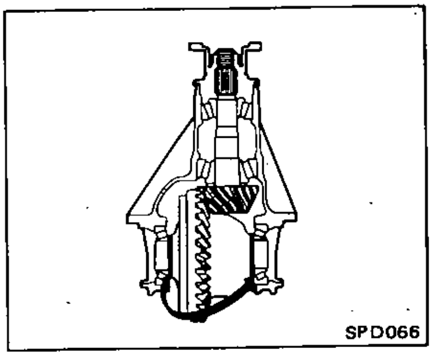
1. Check backlash of ring gear with a dial indicator.


Backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

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.

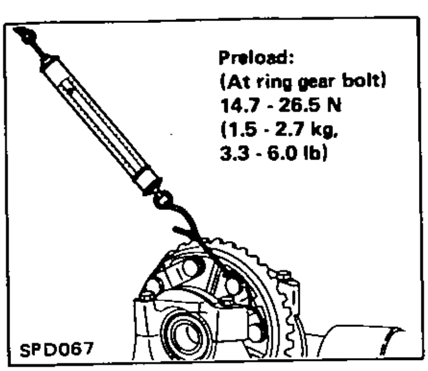
Never add or remove from the total amount of shims or bearing preload will be changed.



2. Check side bearing preload.

Hook the tip of a spring balancer on a ring gear bolt.

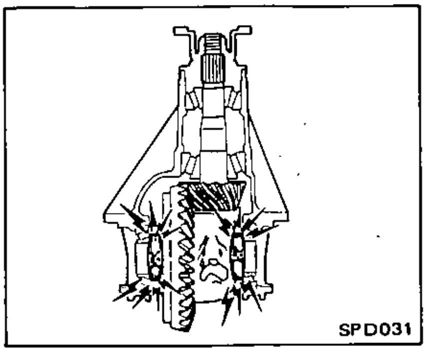
Check the preload by measuring the rotating resistance in a backlash.


Preload:
(At ring gear bolt)
14.7 - 26.5 N
(1.5 - 2.7 kg,
3.3 - 6.0 lb)

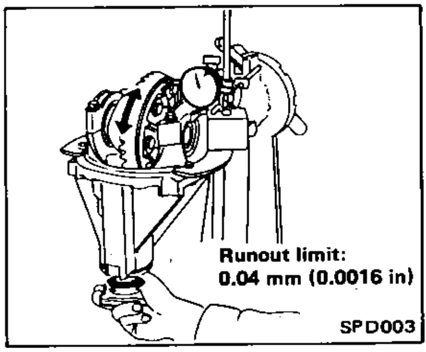
If preload is too great, remove the same amount of shims to each side.

If preload is too small, add the same amount of shims to each side.

Never add or remove different amount of shims to each side or ring gear backlash will be changed.



3. Check runout of ring gear with a dial indicator.


Runout limit:
0.04 mm (0.0016 in)

If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.

If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

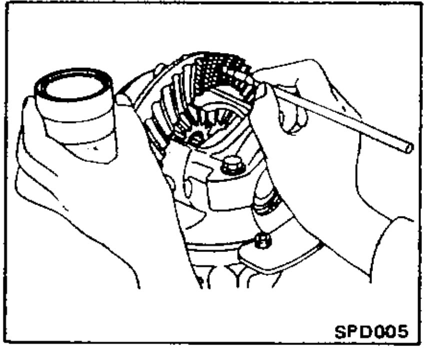
4. Finally, check for tooth contact pattern.

Refer to **TOOTH CONTACT**.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.

However, in extremely rare cases you will have to use trial-and-error processes until you get a good tooth contact pattern.

The tooth pattern is the best indication of how well a differential has been set up.

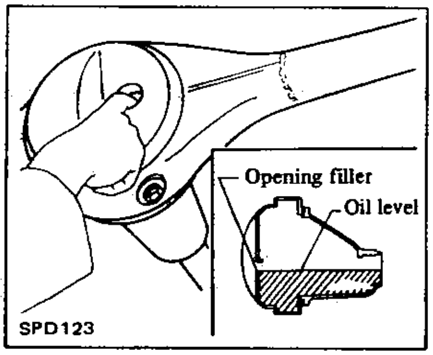


SPD005

5. Install the differential carrier in the car.

Gasket should be replaced by new one each time the differential carrier is removed.

Then fill with gear oil, referring to Recommended Lubricants (Section MA).



SPD123

Ⓣ : **Differential carrier fixing bolt**
25 - 34 N·m
(2.5 - 3.5 kg-m,
18 - 25 ft-lb)
Drain and filler plugs
59 - 98 N·m
(6 - 10 kg-m,
43 - 72 ft-lb)
Gear oil capacity:
1.1 liters
(2-3/8 US pt, 2 Imp pt)

SERVICE DATA AND SPECIFICATIONS

PROPELLER SHAFT

GENERAL SPECIFICATIONS

Unit: mm (in)

Model		3S63A
Number of joints		3
Coupling method with transmission		Sleeve type
Distance between yokes		63 (2.48)
Type of journal bearing		Shell type (Non-Disassembly type)
Shaft length (Spider to spider)	1st	320 (12.60)
	2nd	730 (28.74)
Shaft outer diameter	1st	75.0 (2.953)
	2nd	50.8 (2.000)

SERVICE DATA

Unit: mm (in)

Propeller shaft runout limit	0.6 (0.024)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Flange yoke to companion flange	24 - 32	2.4 - 3.3	17 - 24
Center bearing locking nut			
Flange nut type	245 - 294	25 - 30	181 - 217
Nut and washer type	196 - 235	20 - 24	145 - 174
Center bearing support to bracket	8.8 - 11.8	0.9 - 1.2	6.5 - 8.7
Center bearing bracket to body	25 - 39	2.6 - 4.0	19 - 29

DIFFERENTIAL CARRIER

GENERAL SPECIFICATIONS

Model	H165B
Type	Rigid axle suspension (Banjo type)
Ring gear pitch diameter mm (in)	165 (6.50)
Gear ratio	3.700
Number of teeth (Ring gear/drive pinion)	37/10
Oil capacity ℓ (US pt, Imp pt)	1.1 (2-3/8, 2)

SERVICE DATA

Drive pinion bearing adjusting method		Collapsible spacer
Drive pinion preload (with front oil seal) N·m (kg-cm, in-lb)		0.7 - 1.0 (7 - 10, 6.1 - 8.7)
Side bearing adjusting method		Shim
Backlash	Drive pinion to ring gear mm (in)	0.13 - 0.18 (0.0051 - 0.0071)
	Side gear to pinion mate gear (Clearance between side gear to differential case) mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Ring gear runout limit mm (in)		0.04 (0.0016)
Side bearing preload (at ring gear bolt) N (kg, lb)		14.7 - 26.5 (1.5 - 2.7, 3.3 - 6.0)

Side bearing adjusting shim

Thickness mm (in)	Part No.
0.05 (0.0020)	38453 - 28500
0.07 (0.0028)	38454 - 28500
0.10 (0.0039)	38455 - 28500
0.20 (0.0079)	38456 - 28500
0.50 (0.0197)	38457 - 28500

Pinion height adjusting washer

Thickness mm (in)	Part No.
3.09 (0.1217)	38154-U1500
3.12 (0.1228)	38154-U1501
3.15 (0.1240)	38154-U1502
3.18 (0.1252)	38154-U1503
3.21 (0.1264)	38154-U1504
3.24 (0.1276)	38154-U1505
3.27 (0.1287)	38154-U1506
3.30 (0.1299)	38154-U1507
3.33 (0.1311)	38154-U1508
3.36 (0.1323)	38154-U1509
3.39 (0.1335)	38154-U1510
3.42 (0.1346)	38154-U1511
3.45 (0.1358)	38154-U1612
3.48 (0.1370)	38154-U1513
3.51 (0.1382)	38154-U1514
3.54 (0.1394)	38154-U1515
3.57 (0.1406)	38154-U1516
3.60 (0.1417)	38154-U1517
3.63 (0.1429)	38154-U1518
3.66 (0.1441)	38154-U1519

Side gear thrust washer

Thickness mm (in)	Part No.
0.785 (0.0309)	38424 - 04101
0.835 (0.0329)	38424 - 08000
0.885 (0.0348)	38424 - 08001
1.035 (0.0407)	38424 - 08002
1.185 (0.0467)	38424 - 08003

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Drive pinion nut	137 - 294	14 - 30	101 - 217
Ring gear bolt	78 - 98	8 - 10	58 - 72
Side bearing cap bolt	49 - 59	5 - 6	36 - 43
Drain and filler plugs	59 - 98	6 - 10	43 - 72
Companion flange to propeller shaft	24 - 32	2.4 - 3.3	17 - 24
Differential carrier to rear axle case	25 - 34	2.5 - 3.5	18 - 25

TROUBLE DIAGNOSES AND CORRECTIONS

PROPELLER SHAFT

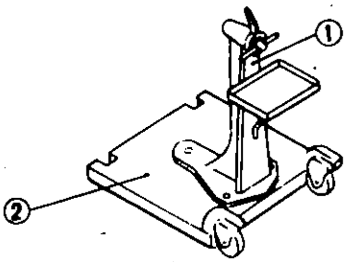
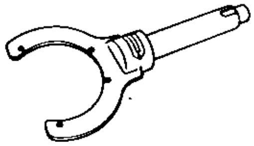
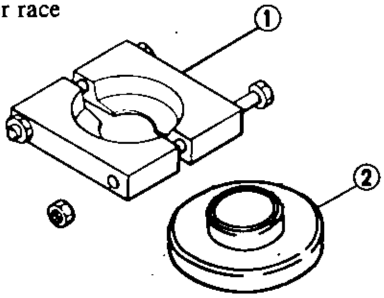
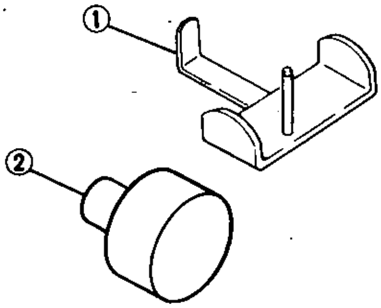
Condition	Probable cause	Corrective action
Vibration during at medium or high speed.	Worn or damaged journal bearing.	Replace propeller shaft assembly.
	Unbalance due to bent or dented propeller shaft.	Replace propeller shaft assembly.
	Loose propeller shaft installation.	Retighten.
	Worn transmission rear extension bushing.	Replace.
	Damaged center bearing.	Replace.
	Undercoating or mud on the shaft causing unbalance.	Clean up shaft.
	Balance weights missing.	Replace propeller shaft assembly
Knocking sound during starting or noise during coasting on propeller shaft.	Worn or damaged journal.	Replace propeller shaft assembly.
	Worn sleeve yoke and mainshaft spline.	Replace propeller shaft assembly.
	Loose propeller shaft installation.	Retighten.
	Loose joint installation.	Replace propeller shaft assembly.
	Damaged center bearing or insulator.	Replace center bearing.
	Loose or missing bolts at center bearing bracket to body.	Replace or tighten bolts.
Scraping noise.	Dust cover on sleeve yoke rubbing on transmission rear extension.	Straighten out dust cover to remove interference.
Whine or whistle.	Damaged center bearing.	Replace center bearing.

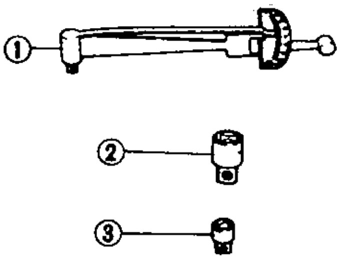
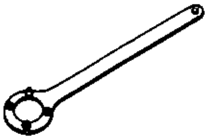
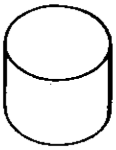
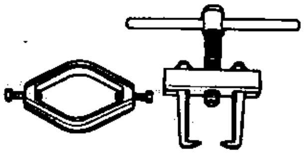
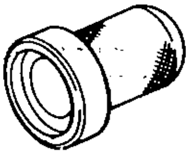
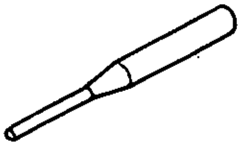
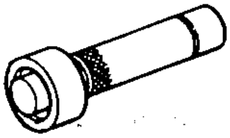
DIFFERENTIAL CARRIER

When a differential carrier is suspected of being noisy, 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 differential carrier. Noise which originates in other places cannot be corrected by adjustment or replacement of parts in differential carrier.

Condition	Probable cause	Corrective action
Noise on drive, coast and float.	Shortage of oil.	Supply gear oil. Rebuild gear carrier if necessary.
	Incorrect tooth contact between ring gear and drive pinion.	Adjust tooth contact or replace the hypoid gear set.
	Incorrect backlash between ring gear and drive pinion.	Adjust backlash or replace the hypoid gear set if necessary.
	Seized up or damaged ring gear and drive pinion.	Replace the hypoid gear set.
	Seized up, damaged or broken drive pinion bearing.	Replace the pinion bearing and faulty parts.
	Seized up, damaged or broken side bearing.	Replace the side bearing and faulty parts.
	Loose clamp bolts or nuts holding ring gear, bearing cap, etc.	Clamp them to specified torque, and replace faulty parts.
Noise on turn.	Seized up, damaged or broken side gear and pinion mate gear.	Replace faulty parts.
	Seized up, damaged or broken side gear and pinion mate gear thrust washers.	Replace faulty parts.
	Pinion mate gears too tight on their shaft.	Replace faulty parts.
Knocking sound during starting or gear shifting.	Excessive backlash.	
	Incorrect backlash ring gear-to-drive pinion or side gear-to-pinion mate gear.	Adjust backlash.
	Worn gears or case.	Replace worn parts.
	Worn rear axle shaft and side gear spline.	Replace worn parts.
	Pinion bearing under preload.	Adjust preload.
	Loose drive pinion nut.	Replace or tighten bolt.
	Loose bolts and nuts, such as ring gear bolts.	Replace faulty parts or tighten bolts.
Seizure or breakage.	Shortage of oil or use of unsuitable oil.	Replace faulty parts and use recommended gear oil.
	Excessively small backlash.	Adjust backlash and replace as required.
	Incorrect adjustment of bearings or gears	Replace faulty parts.
	Severe service due to an excessive loading, improper use of clutch	Replace faulty parts.
	Loose bolts and nuts, such as ring gear bolts.	Replace faulty parts or tighten bolts.
Oil leakage.	Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange.	Replace damaged oil seal. Repair flange with sandpaper or replace if necessary.
	Damaged gasket.	Replace.
	Loose filler or drain plug.	Tighten.
	Clogged or damaged breather.	Repair or replace.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand Engine stand Base 
ST06360001 (–)	Diff. attachment 
ST3003S000 (J25733) ① ST30031000 (J25733-1) ② ST30032000 (J25733-2)	Drive pinion rear bearing inner race puller set Puller Base 
ST30611000 (J25742-1)	Drive pinion bearing outer race drift bar 
ST30613000 (J25742-3)	Drive pinion **rear** bearing outer race drift 
ST30701000 (J25742-2)	Drive pinion **front** bearing outer race drift 
ST3114S000 (See J25269-01) ① ST31141000 ② ST31942000	Drive pinion setting gauge set Height gauge Dummy shaft 

Tool number (Kent-Moore No.)	Tool name	
ST3127S000 (See J25765) ① GG91030000 ② HT62900000 ③ HT62940000	Preload gauge Torque wrench Socket adapter (1/2") Socket adapter (3/8")	
ST31530000 (J25774)	Drive pinion flange wrench	
ST32501000 (J25407-3)	Weight block	
ST33051001 (–)	Diff. side bearing puller	
ST33052000 (J25797-1)	Adapter	
ST33400001 (J26082)	Oil seal fitting tool	
ST33741000 (See J25407-1)	Master gauge [18.5 mm (0.728 in)]	
KV31100300 (–)	Solid punch	
KV38102100 (J25803)	Diff. side bearing drift	

DATSUN 200SX Model S110 Series

SECTION FA

FRONT AXLE & FRONT SUSPENSION

CONTENTS

Refer to Section MA (Front Axle and Front Suspension) for:

- ADJUSTING WHEEL BEARING PRELOAD
- CHECKING WHEEL ALIGNMENT

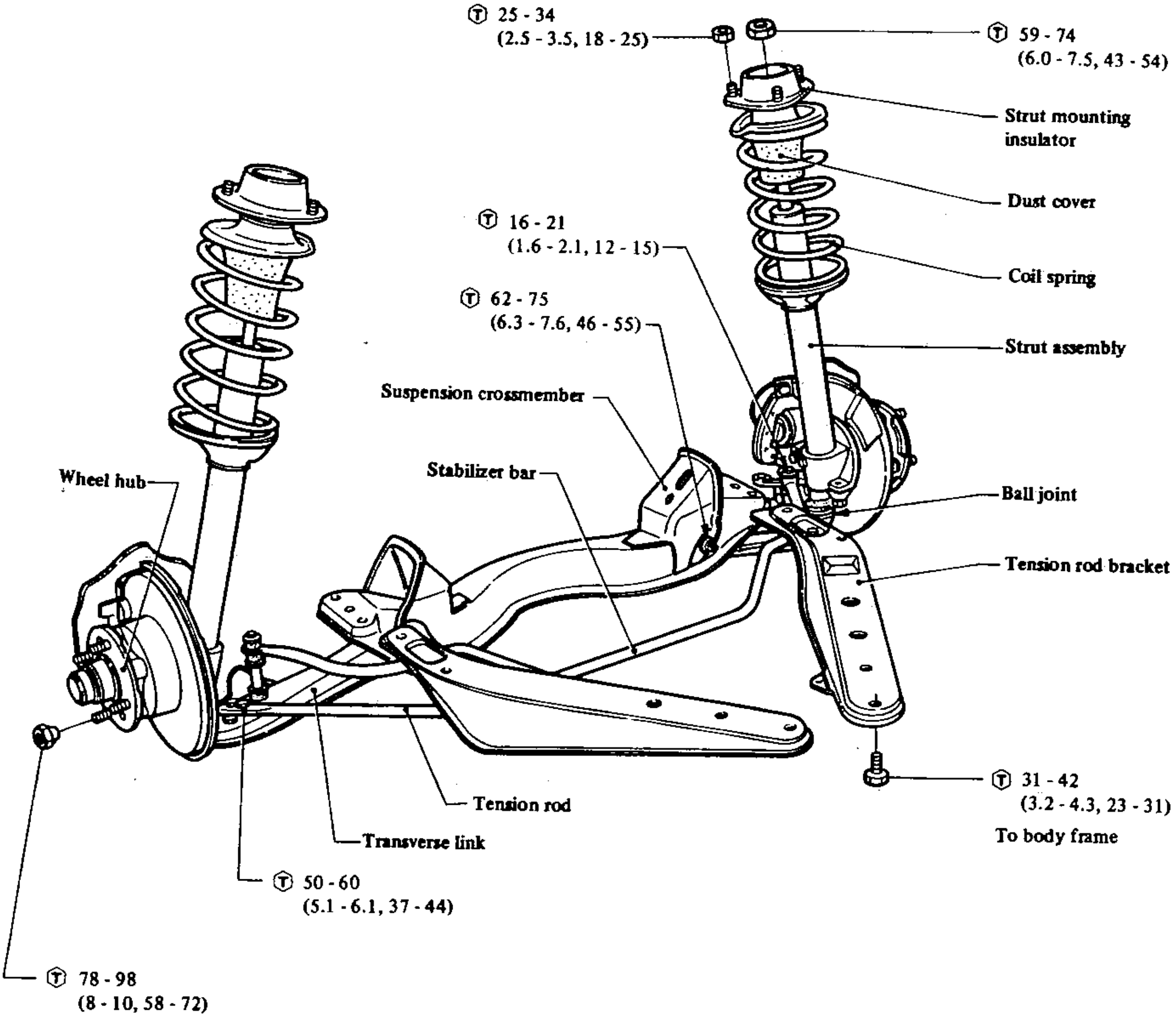
FRONT AXLE AND FRONT SUSPENSION

Wheel alignment

- Camber, caster and kingpin are preset at factory and cannot be adjusted.
- The car requires only toe-in and car posture adjustments.

Toe-in 0 - 2 mm (0 - 0.08 in)
[0° to 0°12′]

Refer to section MA for Wheel Alignment.



Wheel bearing

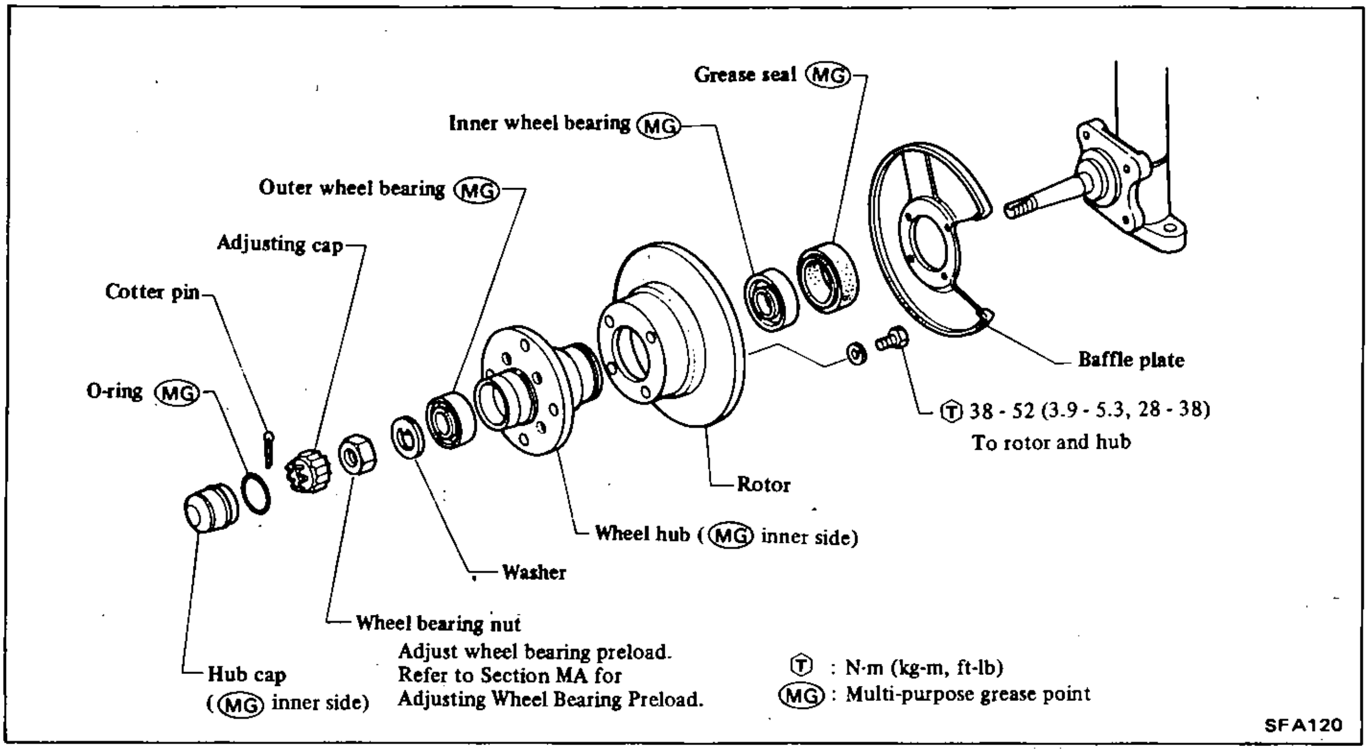
- Do not overtighten wheel bearing nuts, as this can cause wheel bearing seizure.
- Axial play: 0 mm (0 in)
- Preload (As measured at wheel bolt) with used parts
  2.0 - 7.8 N (0.2 - 0.8 kg, 0.4 - 1.8 lb)
- When measuring bearing preload, do not include "dragging" resistance with brake pads.

Refer to Section MA for Adjusting Wheel Bearing Preload.

Ⓣ : N·m (kg-m, ft-lb)

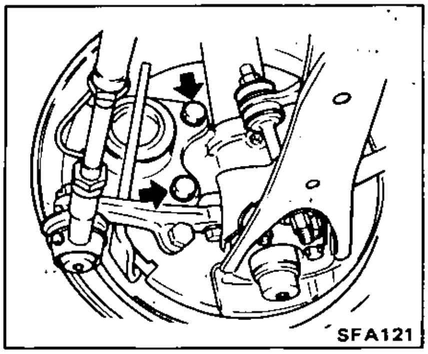
SFA119

FRONT AXLE



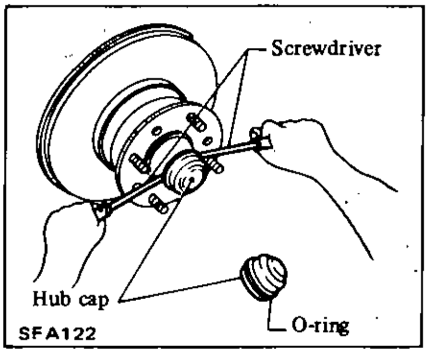
REMOVAL

1. Block rear wheels with chocks and raise front of car, and then **support it with safety stands. Refer to Section GI for Lifting Points and Towing.**
2. Remove wheel and tire assembly.
3. Remove caliper assembly. **Refer to Section BR for removal.**

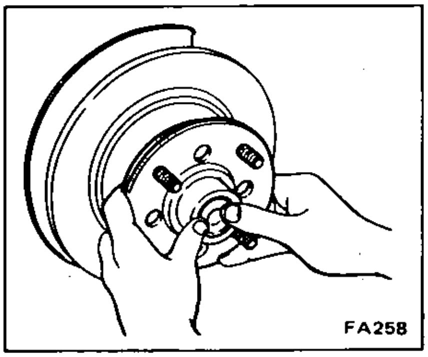


CAUTION:
Make sure brake hose is secured and not twisted.

4. Work off hub cap.

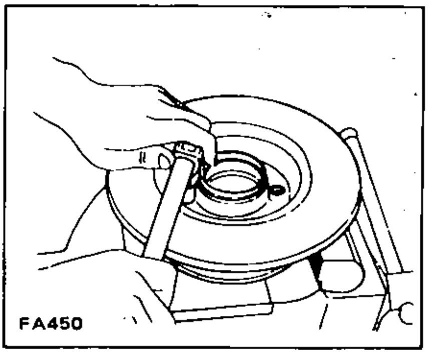


5. Pry off cotter pin; take out adjusting cap and wheel bearing nut. **Cotter pin must not be reused.**
6. Remove wheel hub with disc brake rotor.



CAUTION
Be careful not to drop wheel bearing.

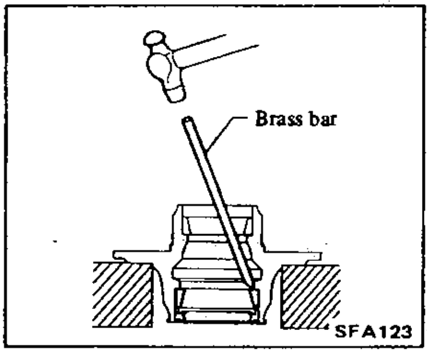
7. Separate outside wheel bearing inner race and washer.
8. Separate brake rotor and hub.



9. Remove inside wheel bearing outer race, grease seal and outside outer race.

CAUTION
Be careful not to drop wheel bearing.

Grease seal must not be reused.



INSPECTION

Thoroughly clean bearing and each part and dry with compressed air.

Wheel bearing

When race, cage or roller sufaces make noise or are cracked, pitted, worn, rough, or out-of-round, replace bearing assembly.

Wheel hub

Check wheel hub for cracks by means of magnetic flaw detecting or dyeing test; replace if necessary.

Knuckle spindle

Also check wheel hub; replace if cracked or damaged. When thread is damaged, replace strut assembly.

Grease seal

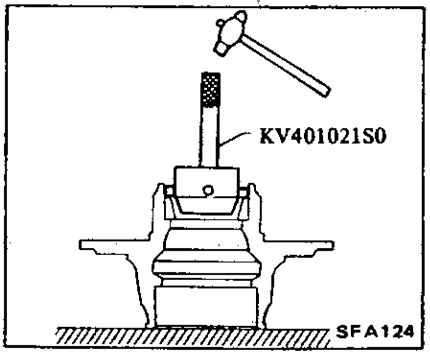
If grease leakage is detected during removal, replace grease seal.

Replace grease seal at every disassembly even if it appears good.

INSTALLATION

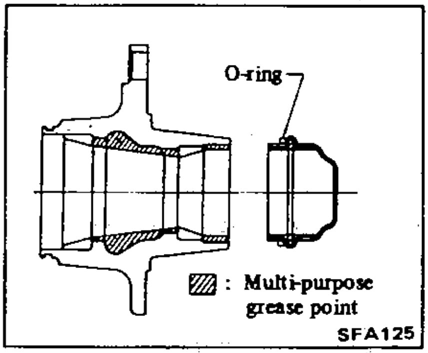
Install front axle in the reverse order of removal as follows:

1. Install bearing outer race with **Tool** until it seats in hub.

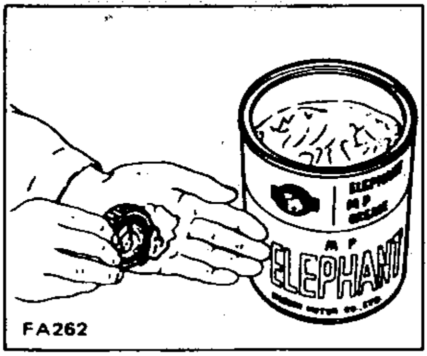


2. Pack hub and hub cap with **recommended multi-purpose grease.**

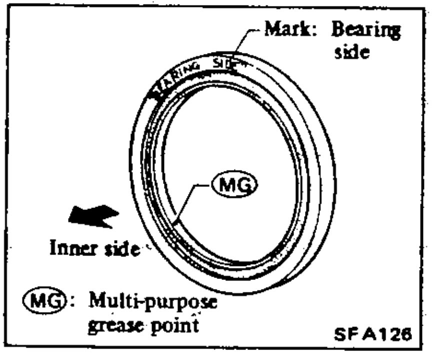
   Coat O-ring with recommended multi-purpose grease.



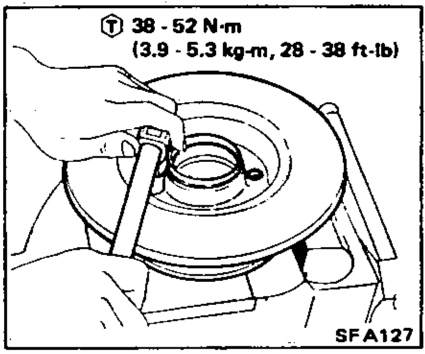
3. Coat each bearing **with recommended multi-purpose grease.**



4. Place inner bearing in hub and install a new grease seal, **coating sealing lips with recommended multi-purpose grease.**



5. Fix brake rotor to hub.



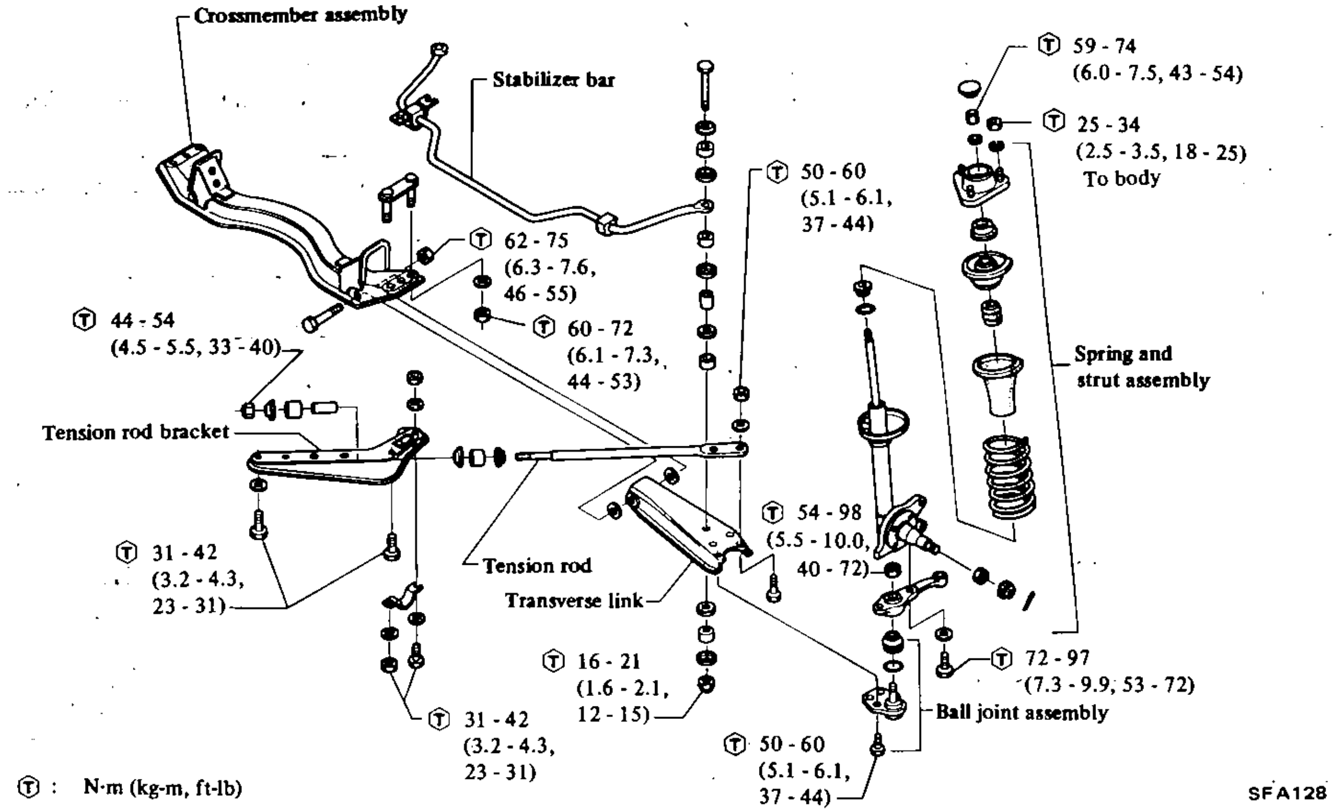
6. Sparingly apply recommended multi-purpose grease to each part.
   - Threaded portion of spindle.
   - Bearing washer to bearing contacting face.
7. Put hub assembly on spindle and then install washer and wheel bearing nut.
8. Adjust wheel bearing preload.

   Refer to Section MA for adjustment.
9. Install hub cap with O-ring on hub.
10. Install brake caliper assembly.

    Refer to Section BR for installation.
11. Install wheel and tire.

Ⓣ: 78 - 98 N·m
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

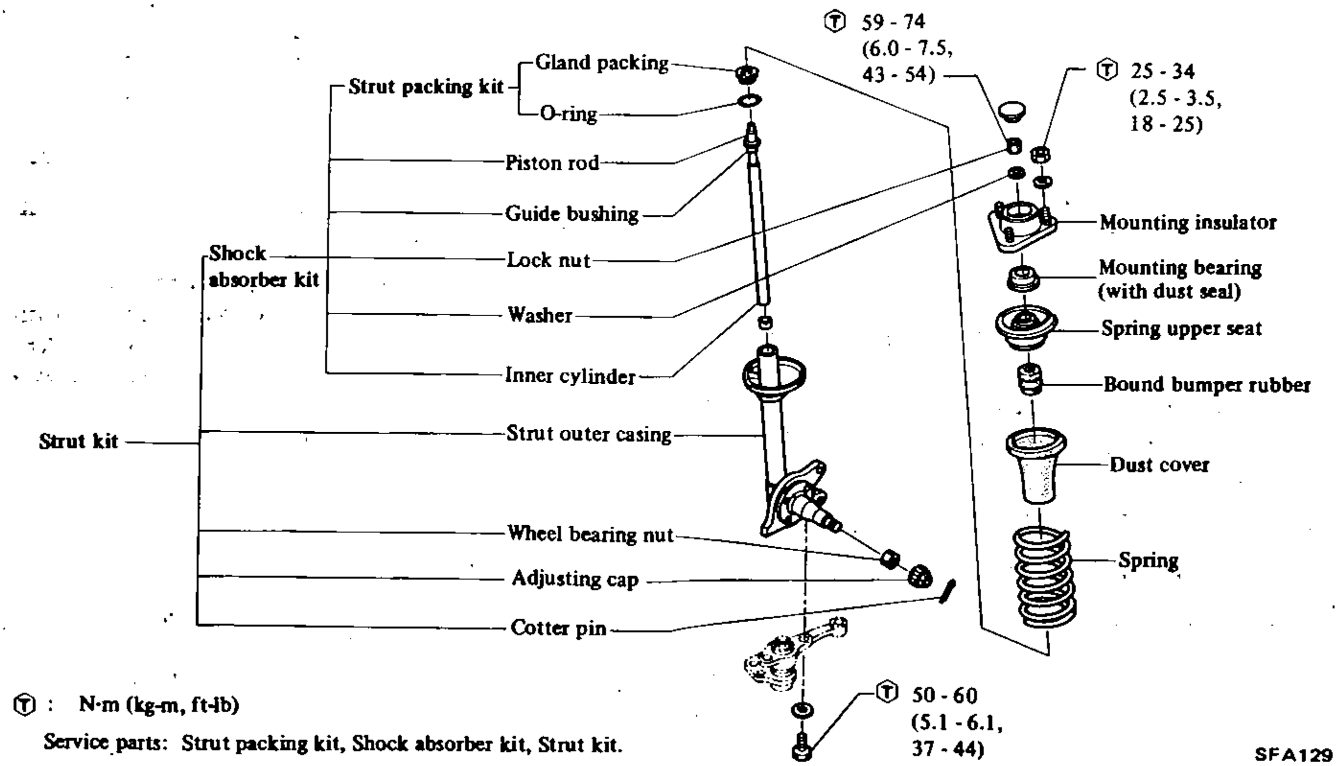
FRONT SUSPENSION



Ⓣ : N·m (kg-m, ft-lb)

SFA128

SPRING AND STRUT ASSEMBLY



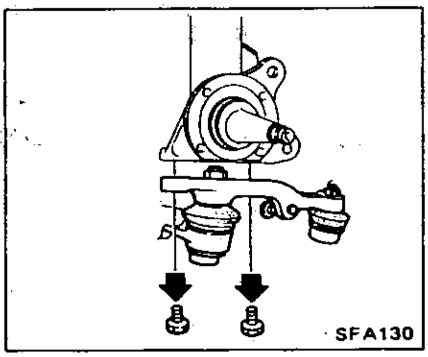
Ⓣ : N·m (kg-m, ft-lb)

Service parts: Strut packing kit, Shock absorber kit, Strut kit.

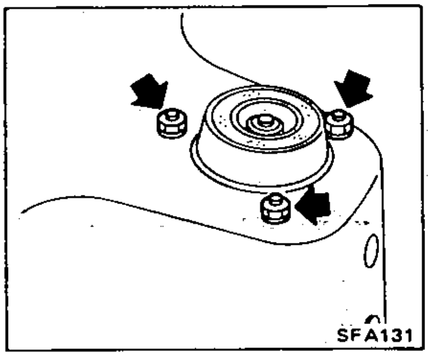
SFA129

REMOVAL AND INSTALLATION

1. Block rear wheels with chocks and raise front of car, and then **support it with safety stands. Refer to Section GI for Lifting Points and Towing.**
2. Remove wheel and tire assembly.
3. Remove brake tube and caliper. **Refer to Front Disc Brake (Section BR).**
4. Remove wheel hub and wheel bearing, if necessary.
5. Separate knuckle arm from strut lower end.


SFA130

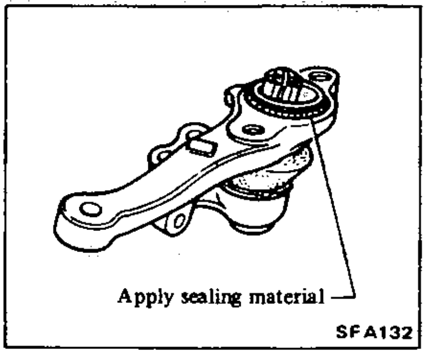
6. Support strut assembly with a suitable stand.
7. Remove strut upper end.


SFA131

8. Draw out strut assembly from car.
9. Install strut and spring assembly in reverse order of removal.

CAUTION:
Make sure brake hose is secured and not twisted.

- When installing steering knuckle arm to the strut assembly, apply suitable sealing material to portion indicated in figure.



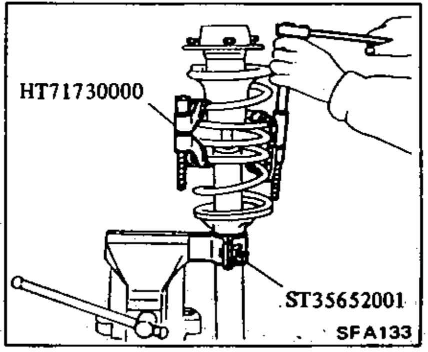
SFA132

Ⓣ : **Strut to hoodledge**
25 - 34 N·m
(2.5 - 3.5 kg-m,
18 - 25 ft-lb)
Strut to knuckle arm
72 - 97 N·m
(7.3 - 9.9 kg-m,
53 - 72 ft-lb)

DISASSEMBLY

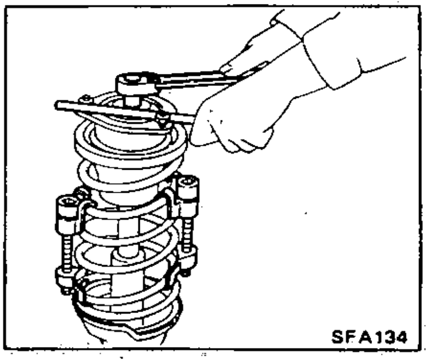
When disassembling strut assembly, extra caution should be exercised to prevent dirt and dust from entering strut.

1. Set up **Tools** on strut assembly. **Compress spring just for enough to permit turning of strut mounting insulator by hand.**



SFA133

2. Remove lock nut from top of piston rod.


SFA134

Separate following parts:
- Strut mounting insulator
- Strut mounting bearing
- Dust seal
- Spring upper seat
- Bound bumper rubber
- Coil spring
- Dust cover

CAUTION:
Pay attention not to damage piston rod.

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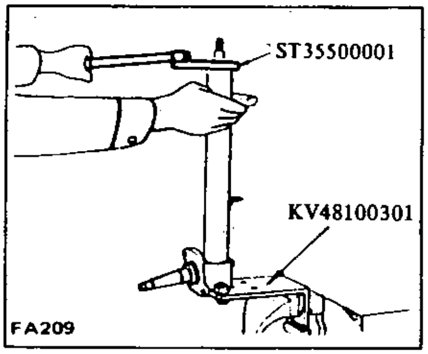
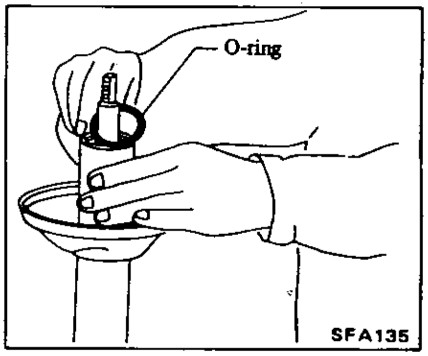
3. Remove gland packing with **Tool. Retract piston rod by pushing it down until it bottoms.**



FA209

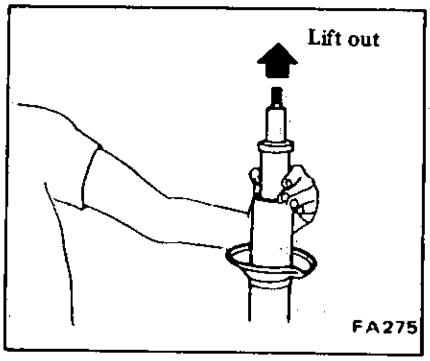
4. Remove O-ring from top of outer casing and draw out guide bushing.



SFA135

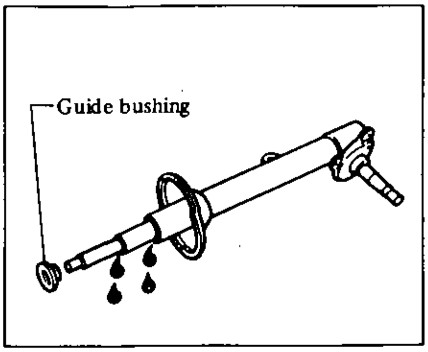
5. Lift out piston rod together with cylinder.

Piston rod, piston rod guide, inner cylinder and bottom valve are adjusted to provide precision mating surfaces and should be handled as a matched it.



FA275

6. Drain fluid thoroughly from inner cylinder and outer casing.



This operation is very important since performance of strut varies with amount of fluid filled within strut.

INSPECTION

- Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.
- Blow dirt and dust off of nonmetallic parts using compressed air.

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 assembly.

b. If shock absorber itself is malfunctioning, replace as shock absorber kit (including pistion rod, cylinder, bottom valve and guide bushing).

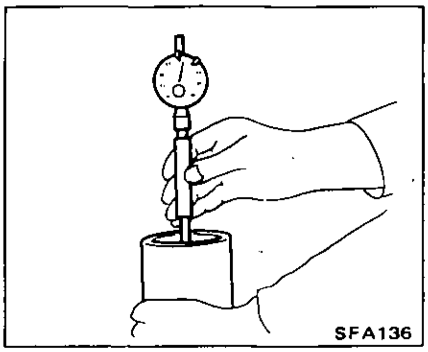
Gland packing, O-ring and fluid

Replace with new gland packing and O-ring or replace with fresh fluid whenever strut is disassembled.

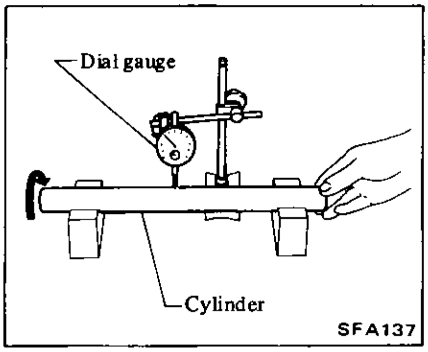
Inner cylinder and outer casing

- Inspect inner cylinder and outer casing for cracks, deformation or other damage. As for inner cylinder, replace shock absorber kit. As for outer casing, replace strut assembly.

Inner diameter:
Inner cylinder
30.02 - 30.10 mm
(1.1819 - 1.1850 in)


SFA136

Maximum runout:
Inner cylinder
Less than 0.2 mm (0.008 in)

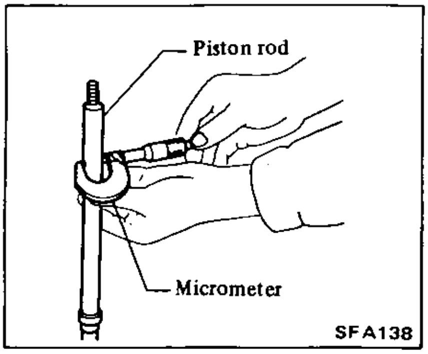


SFA137

Piston rod

- Inspect piston rod for cracks deformation or other damage. Replace shock absorber kit.
- Inspect threads for cracks or other damage. Replace shock absorber kit.

Rod diameter:
19.965 - 19.975 mm
(0.7860 - 0.7864 in)
Maximum runout:
Less than 0.1 mm (0.004 in)



SFA138

Strut mounting insulator

Replace if cemented rubber-to-metal portion are melted or cracked. Rubber parts should also be replaced, if deteriorated.

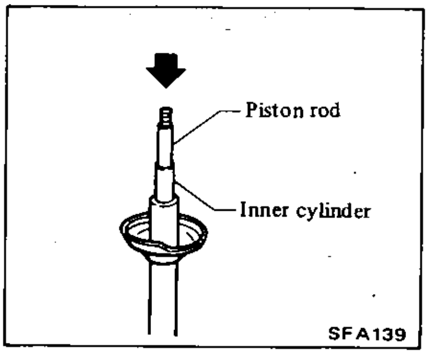
Strut mounting bearing

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

ASSEMBLY

Before assembly, clean away all dirt to prevent any possible entry of dirt into strut assembly.

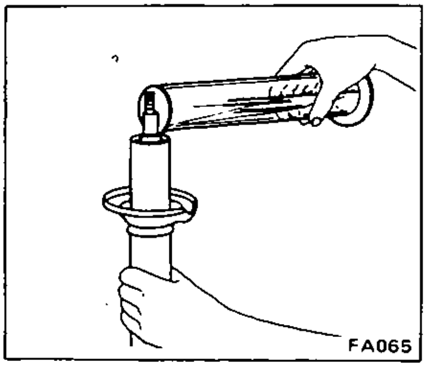
1. Install strut assembly on **Tool** KV48100301.
2. Install piston rod and inner cylinder (shock absorber kit).



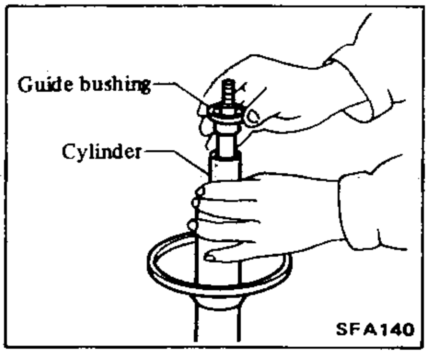
SFA139

3. Pour correct amount of fluid. **Use "NISSAN GENUINE STRUT FLUID" or equivalent.**

Capacity:
325 mℓ
(11.0 US floz, 11.4 Imp fl oz)

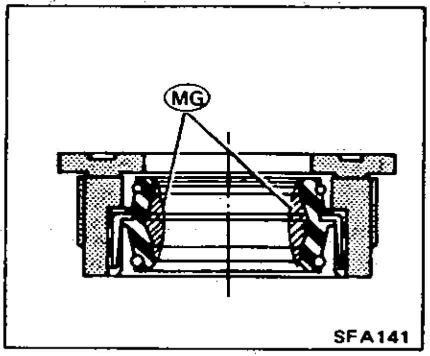

FA065

4. Place guide bushing.



SFA140

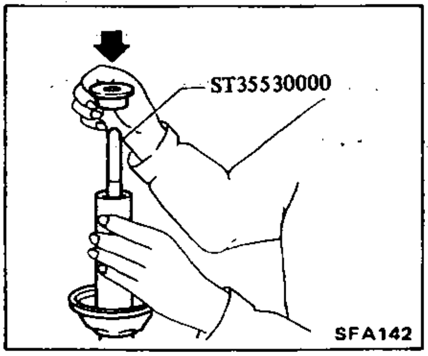
5. Lubricate sealing lip of gland packing.



SFA141

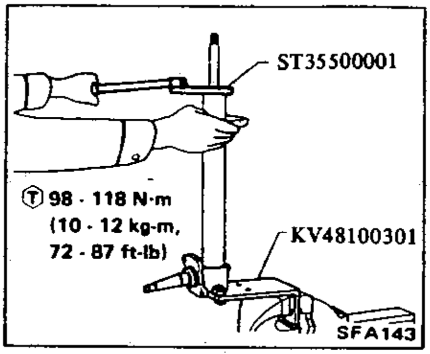
6. Install gland packing using **Tool.**

Be careful not to damage sealing lip.

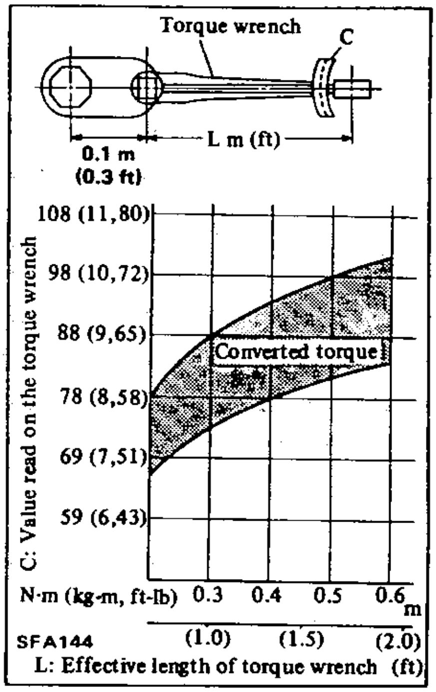


SFA142

7. Tighten gland packing.



SFA143

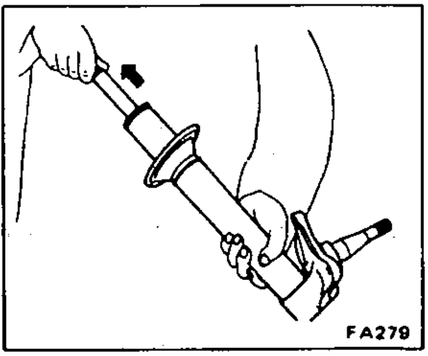


SFA144

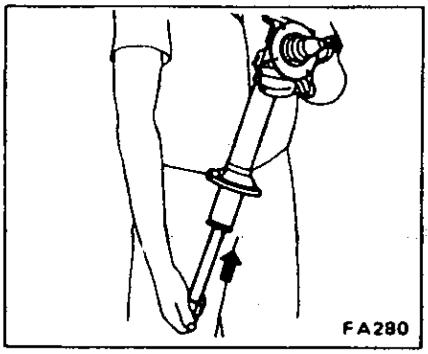
8. Remove strut from **Tool** KV48100301.

9. After the above steps have been completed, air should be removed from shock absorber system.

Repeat above procedures several times so that air will be bled out from strut thoroughly as shown.



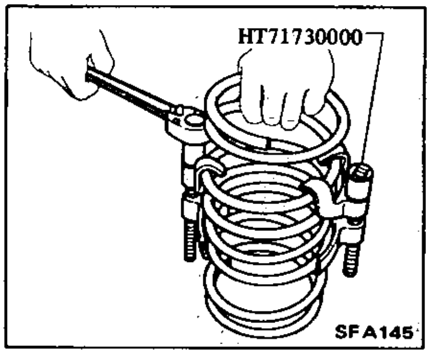
FA279



FA280

10. Reinstall strut on **Tool** KV48100301.

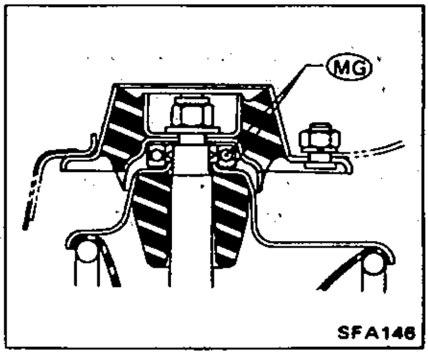
11. Compress coil spring using **Tool.**



SFA145

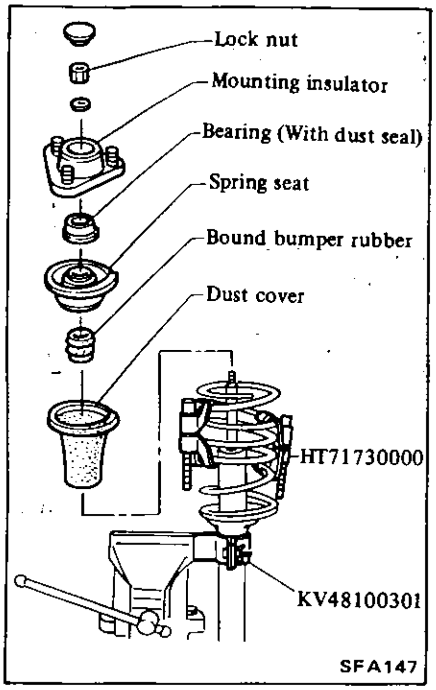
12. Set up coil spring with Tool HT71730000 on spring lower seat of strut.

13. Lubricate parts indicated in figure.



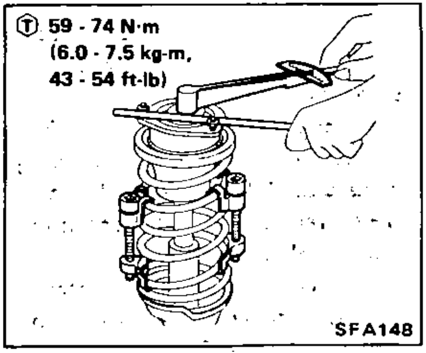
SFA146

14. Mount following part as shown in figure.



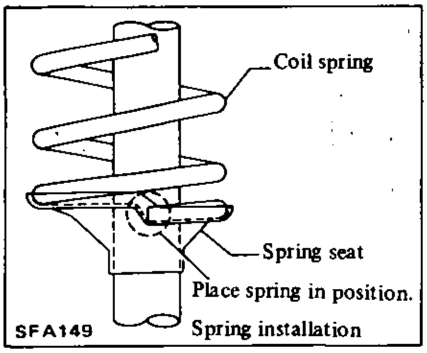
- Install bound bumper rubber in place to prevent piston rod from falling by its own weight.
- Install mounting bearing so that it points in correct direction.

15. Tighten new piston rod self-locking nut.



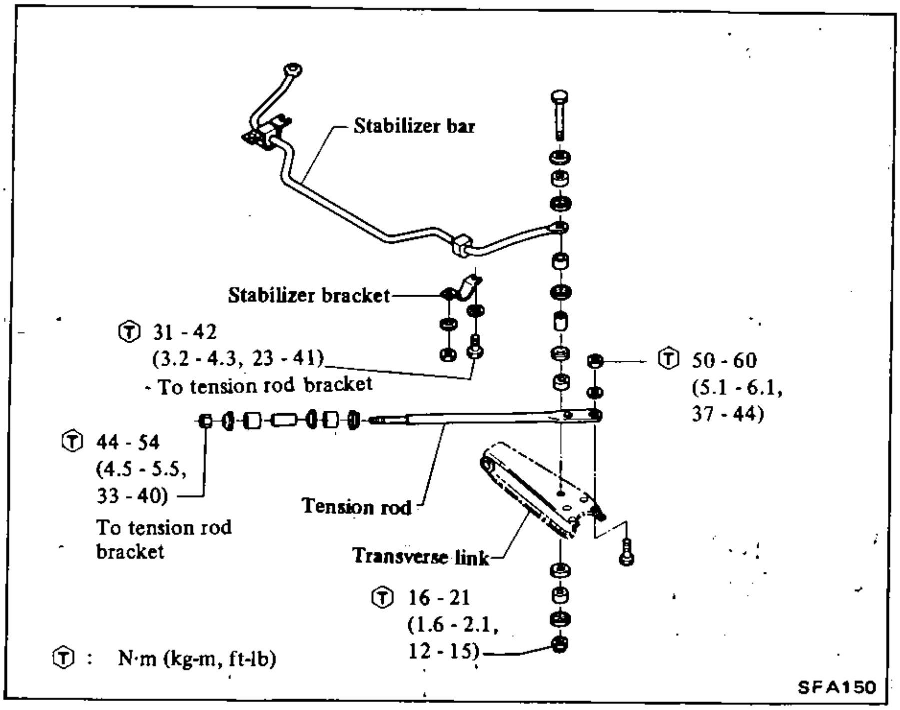
16. Remove **Tool** HT71730000 on strut assembly.

After placing spring in position between upper and lower spring seats, release compressor gradually.

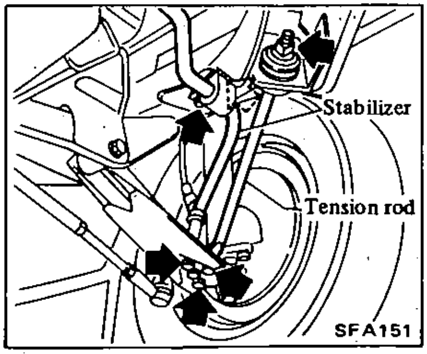


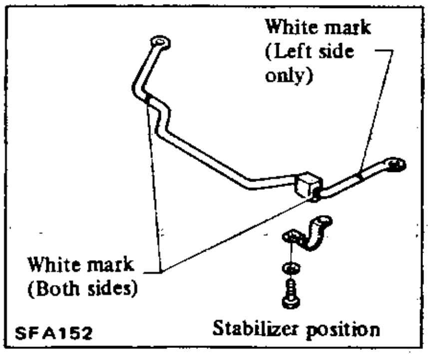
Spring installation

TENSION ROD AND STABILIZER BAR

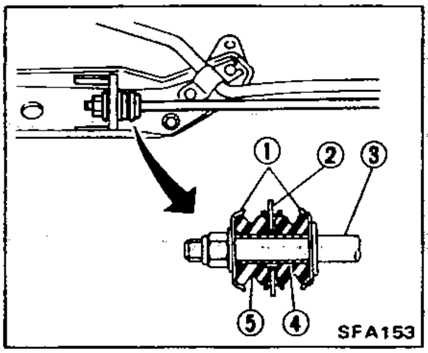


- Remove under cover.
- Set load of car.
- If correctly installed; white mark painted on stabilizer bushing seat can be seen from both sides of car.
- Always install the stabilizer which has the white mark on it on the left transverse link.
- When installing a bushing, do not allow it to project beyond the surface area of the washer.
- Do not allow the bushings and washers to come in contact with grease, oil, soapy water, etc.





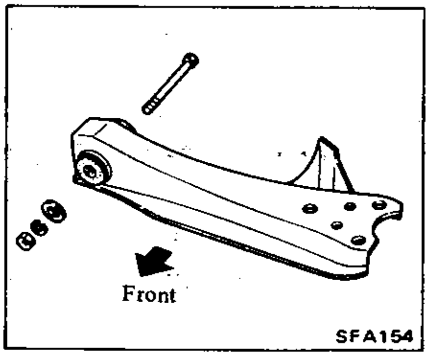
SFA152



SFA153

1 Thrust washer
2 Tension rod bracket
3 Tension rod
4 Collar
5 Bushing

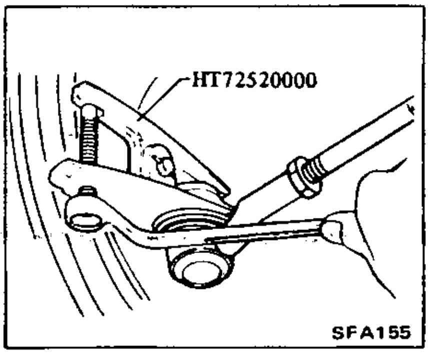
TRANSVERSE LINK AND LOWER BALL JOINT



SFA154

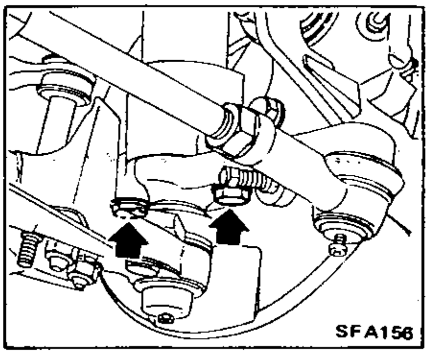
REMOVAL AND INSTALLATION

1. Block rear wheels with chocks, and raise front of car, and then **support it with safety stands. Refer to Section GI for Lifting Points and Towing.**
2. Remove wheel and tire assembly.
3. Separate knuckle arm to side rod using **Tool.**



SFA155

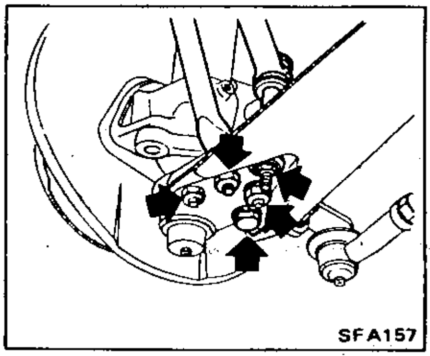
4. Separate strut lower end to knuckle arm.



SFA156

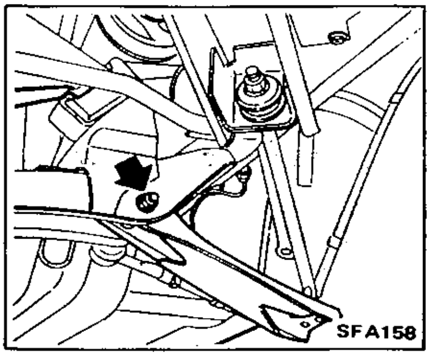
5. Remove following parts from transverse link.

- Ball joint
- Stabilizer
- Tension rod



SFA157

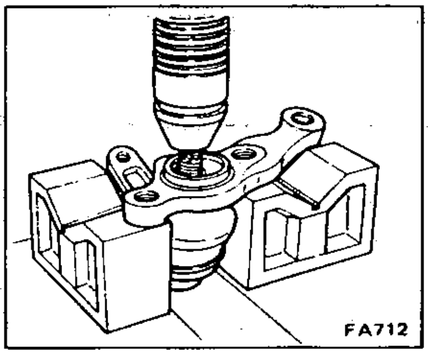
6. Remove transverse link from crossmember.



SFA158

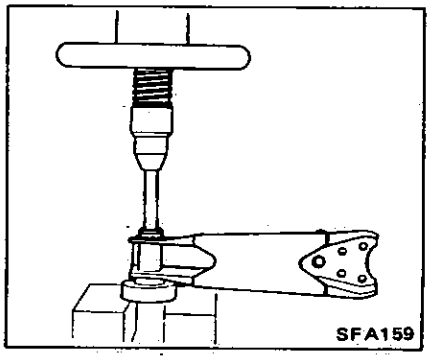
7. Separate following parts.

- Ball joint to knuckle arm using press.



FA712

- Link bushing to transverse link using Set **Tool** ST36720000.



SFA159

8. Install transverse link and lower ball joint in the reverse order of removal, noting the following:

- **When installing transverse link spindle, insert it from rear side of suspension crossmember.**
- **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.**
- **Make sure mating surface of bushing is clean and free from oil and grease.**
- **Install transverse link bushing using set Tool ST36720000.**

Ⓣ: Knuckle arm to strut assembly
72 - 97 N·m
(7.3 - 9.9 kg-m,
53 - 72 ft-lb)

Ball joint to knuckle arm
97 - 120 N·m
(9.8 - 12.2 kg-m,
71 - 88 ft-lb)
Ball joint to transverse link
50 - 60 N·m
(5.1 - 6.1 kg-m,
37 - 44 ft-lb)
Transverse link to crossmember
62 - 75 N·m
(6.3 - 7.6 kg-m,
46 - 55 ft-lb)

INSPECTION

Transverse link

- Check for signs of cracks, distortion or other damage. Replace if any of above conditions are beyond repair.
- If rubber bushing shows evidence of cracking, replace with a new one.

Ball Joint

- Ball joint is assembled at the factory and cannot be disassembled. Check ball stud turning torque with nut in place on ball stud.
  If excessively higher or lower than specifications and ball joint is properly lubricated, replace.

Turning torque:
New parts
3.9 - 9.8 N·m
(40 - 100 kg-cm,
35 - 87 in-lb)
Used parts
2.0 - 7.8 N·m
(20 - 80 kg-cm,
17 - 69 in-lb)

2. Check conditional dust cover. If found to be cracked excessively beyond use, replace ball joint with a new one.
3. Lubricate ball joint with recommended multi-purpose grease regularly.

To lubricate, remove plug and install grease nipple in its place.

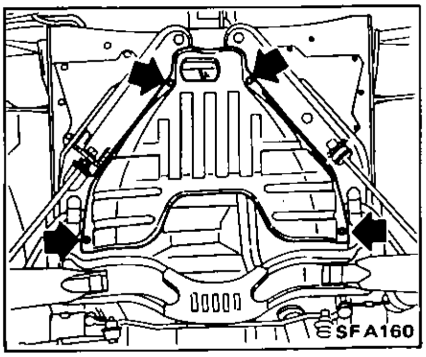
Pump grease slowly until old grease is completely forced out. After greasing, reinstall plug.

When a high-pressure grease gun is used, operate the grease gun carefully so that grease is injected slowly and new grease does not come out from the clamp portion.

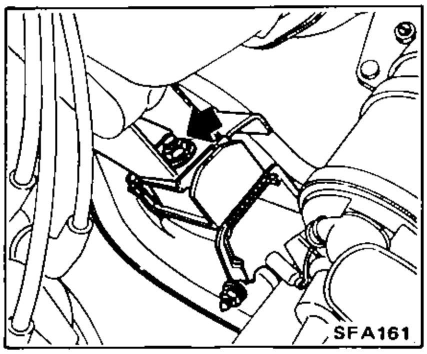
SUSPENSION CROSSMEMBER

REMOVAL AND INSTALLATION

1. Block rear wheels with chocks, and raise front of car, and then **support it with safety stands. Refer to Section GI for Lifting Points and Towing.**
2. Remove wheel and tire assembly.
3. Remove under cover.



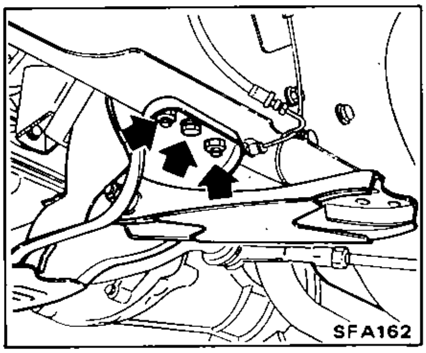
4. Remove transverse link from crossmember. **Refer to Transverse Link and Lower Ball joint.**
5. Separate suspension crossmember from engine mounting insulator.



6. Raise up engine.

Support weight of engine to remove load from engine mounting.

7. Remove suspension crossmember from body frame.



8. Install suspension crossmember in reverse order of removal.

Ⓣ : **Crossmember to transverse link**
62 - 75 N·m
(6.3 - 7.6 kg-m,
46 - 55 ft-lb)
Engine mounting insulator to crossmember
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 -31 ft-lb)
Crossmember to body frame
Bolt (Center)
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)
Nut (Both sides)
60 - 72 N·m
(6.1 - 7.3 kg-m,
44 - 53 ft-lb)

INSPECTION

Check suspension crossmember for evidence of deformation or cracking; if necessary, replace.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

COIL SPRING

Item		Dimension d x D x L*	Color identification	Spring constant
With power steering	Right	12.2 x 130 x 386 (0.480 x 5.12 x 15.20)	Cream 1, White 2	17.16 N/mm (1.75 kg/mm, 98.0 lb/in)
	Left	12.2 x 130 x 392 (0.480 x 5.12 x 15.43)	Pink 1, Yellow 2	
Without power steering		12.2 x 130 x 386 (0.480 x 5.12 x 15.20)	Cream 1, White 2	

*1 d x D x L: Wire diameter [mm (in)] x Coil diameter [mm (in)] x Free length [mm (in)]

STRUT ASSEMBLY

Shock absorber type		Hydraulic
Shock absorber fluid mℓ (US fl oz, Imp fl oz)		325 (11.0, 11.4)
Piston rod diameter mm (in)		19.965 - 19.975 (0.7860 - 0.7864)
Inner cylinder inner diameter mm (in)		30.02 - 30.10 (1.1819 - 1.1850)
Stroke mm (in)		172 (6.77)
Damping force [at 0.3 m (1.0 ft)/sec]	Expansion N (kg, lb)	588 (60, 132)
	Compression N (kg, lb)	343 (35, 77)

STABILIZER BAR

Bar diameter mm (in)	19 (0.75)

INSPECTION AND ADJUSTMENT

WHEEL ALIGNMENT (Unladen *1)

Camber	degree	-40' - 50'
Caster	degree	1°45' - 3°15'
Kingpin inclination	degree	7°25' - 8°55'
Toe-in	mm (in)	0 - 2 (0 - 0.08)
	degree *2	0° - 12'
Front wheel turning angle (Full turn) degree	Inside	33° - 35° *3
	Outside	27° - 29° *3
Front wheel Toe-out turns degree	Inside	20°
	Outside	18.7°

*1: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designed position.

*2: On both sides

*3: 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.

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		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)	6.9 - 14.7 (0.7 - 1.5, 1.5 - 3.3)
		With used grease seal	N (kg, lb)	2.0 - 7.8 (0.2 - 0.8, 0.4 - 1.8)

LOWER BALL JOINT

Turning torque	New parts	N·m (kg-cm, in-lb)	3.9 - 9.8 (40 - 100, 35 - 87)
	Used parts	N·m (kg-cm, in-lb)	2.0 - 7.8 (20 - 80, 17 - 69)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Hub			
Wheel hub nut	78 - 98	8 - 10	58 - 72
Disc brake			
Rotor to hub	38 - 52	3.9 - 5.3	28 - 38
Strut			
Strut to hoodledge	25 - 34	2.5 - 3.5	18 - 25
Piston rod self-locking nut	59 - 74	6.0 - 7.5	43 - 54
Gland packing	98 - 118	10.0 - 12.0	72 - 87
Strut to knuckle arm	72 - 97	7.3 - 9.9	53 - 72
Caliper to strut	72 - 97	7.3 - 9.9	53 - 72
Knuckle arm			
Knuckle arm to side rod ball joint	54 - 98	5.5 - 10.0	40 - 72
Ball joint			
Ball joint to knuckle arm	96 - 120	9.8 - 12.2	76 - 88
Ball joint to transverse link	50 - 60	5.1 - 6.1	37 - 44
Transverse link			
Transverse link to crossmember	62 - 75	6.3 - 7.6	46 - 55
Suspension crossmember			
Cross-member to body frame Nut (Both sides)	60 - 72	6.1 - 7.3	44 - 53
Bolt (Center)	31 - 42	3.2 - 4.3	23 - 31
Engine mounting insulator to crossmember	31 - 42	3.2 - 4.3	23 - 31
Tension rod			
Tension rod to tension rod bracket	44 - 54	4.5 - 5.5	33 - 40
Tension rod to transverse link	50 - 60	5.1 - 6.1	37 - 44
Tension rod bracket to body frame	31 - 42	3.2 - 4.3	23 - 31
Stabilizer bar			
Stabilizer bar bracket to tension rod bracket (or body frame)	31 - 42	3.2 - 4.3	23 - 31
Connecting rod to transverse link or stabilizer bar	16 - 21	1.6 - 2.1	12 - 15

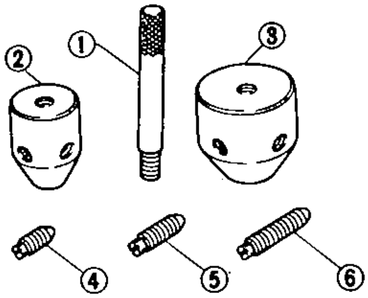
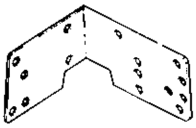
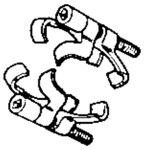
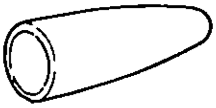
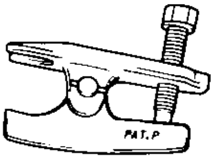
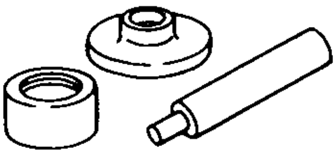
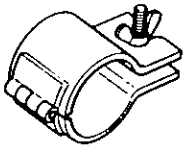
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration, shock and shimmy of steering wheel. **Vibration:** Loose connection of each part 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. **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. **Shimmy:** Abnormal vibration of the front suspension system and the whole steering linkage, which occurs at specific speeds.	Improper tire pressure.	Adjust.
	Imbalance and deformation of road wheel.	Correct the imbalance or replace.
	Unevenly worn tire or insufficient tightening of wheel nuts.	Replace or tighten.
	Improperly adjusted or worn front wheel bearing.	Adjust or tighten.
	Faulty wheel alignment.	Adjust.
	Worn transverse link bushings.	Replace.
	Insufficiently tightened steering gear housing.	Retighten.
	Wear of steering linkage.	Replace faulty parts.
	Worn suspension ball joint.	Replace.
	Excessive backlash due to improper adjustment of the steering gear box.	Adjust correctly.
	Damaged idler arm.	Replace.
	Worn column bearing, weakened column bearing spring, or loose clamp.	Replace or retighten.
	Malfunction of shock absorber (inside the strut) or loose installation bolts.	Replace or retighten.
	Imbalance of car level.	Correct the imbalance.
Car pulls to right or left. When driving with hands off the steering wheel on a flat road, the car gently swerves to right or left. **A faulty rear suspension may also be the cause of this problem and, therefore, see also Section RA.**	Improper tire pressure or insufficient tightening of wheel nuts.	Adjust or tighten.
	Difference in wear and tear of right and left tire treads.	Replace tires.
	Incorrect adjustment or abrasion of front wheel bearing.	Adjust or replace.
	Collapsed or twisted front spring.	Replace.
	Incorrect wheel alignment.	Adjust.
	Incorrect brake adjustment (binding).	Adjust.
	Worn rubber bushings for transverse link and tension rod.	Replace.
	Deformed steering linkage and transverse link and tension rod.	Replace.
	Imbalance of car level.	Correct the imbalance.

Condition	Probable cause	Corrective action
Instability of car.	Improper tire pressure.	Adjust.
	Worn rubber bushings for transverse link and tension rod.	Replace.
	Incorrect wheel alignment.	Adjust.
	Worn or deformed steering linkage and transverse link.	Replace.
	Incorrect adjustment of steering gear.	Adjust.
	Deformed or unbalanced road wheel.	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.	Adjust.
	Insufficient lubricants or mixing impurities in steering gear box or excessively worn steering linkage.	Replenish grease or replace the part.
	Stiff or damaged suspension ball joint, or lack of grease.	Replace.
	Worn or incorrectly adjusted wheel bearing.	Replace or adjust.
	Worn or damaged steering gear and bearing.	Replace
	Incorrectly adjusted steering gear.	Adjust.
	Deformed steering linkage.	Replace.
	Incorrect wheel alignment.	Adjust.
	Damaged strut mounting bearing.	Replace.
	Damaged or stiff piston or shock absorber piston rod (in the strut).	Replace.
	Interference of steering column with turn signal switch.	Replace.
Excessive steering wheel play.	Incorrectly adjusted steering gear housing.	Adjust.
	Worn steering linkage.	Replace.
	Improperly fitted gear housing.	Retighten.
	Incorrectly adjusted wheel bearing.	Adjust.
	Worn transverse link and tension rod bushings.	Replace.
Noises.	Improper tire pressure.	Adjust.
	Insufficient lubricating oil and grease for suspension ball joint and steering linkage, or their breakage.	Replenish lubricating oil and grease, or replace.
	Loose steering gear bolts, linkage and suspension parts.	Retighten.
	Faulty shock absorber (inside the strut).	Replace.
	Faulty wheel bearing.	Replace.
	Worn steering linkage and steering gear.	Replace.
	Worn transverse link and tension rod bushings.	Replace.
	Broken or collapsed coil spring.	Replace.

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 road 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 (Kent-Moore No.)	Tool name
KV401021S0 (–) ① ST35325000 ② KV40102110 ③ KV40102120 ④ KV40102130 ⑤ KV40102140 ⑥ KV40102150	Bearing outer race drift set Drift bar Drift (A) Drift (B) Screw (A) Screw (B) Screw (C) 
KV48100301 (–)	Strut and steering gear housing attachment 
HT71730000 (–)	Coil spring compressor 
ST35500001 (J25825)	Gland packing wrench 
ST35530000 (J25827)	Gland packing guide 
HT72520000 (–)	Ball joint remover 
ST36720000 (J25847)	Transverse link bushing replacer 
ST35652001 (–)	Clamp 

DATSUN 200SX *Model S110 Series*

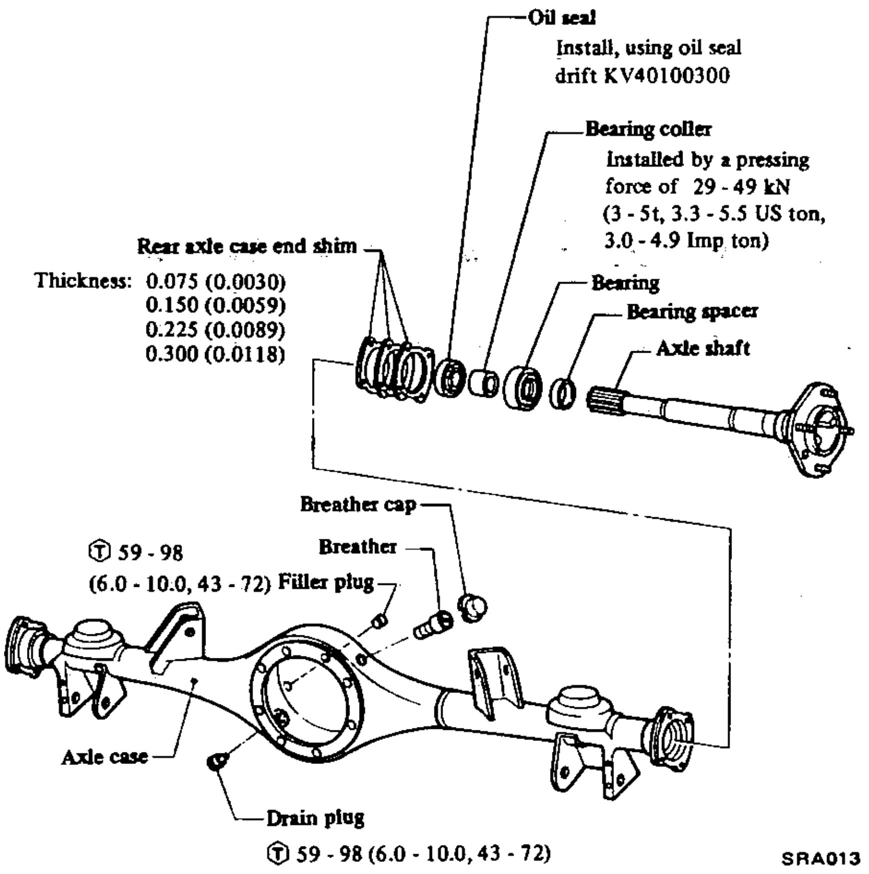
SECTION RA

REAR AXLE & REAR SUSPENSION

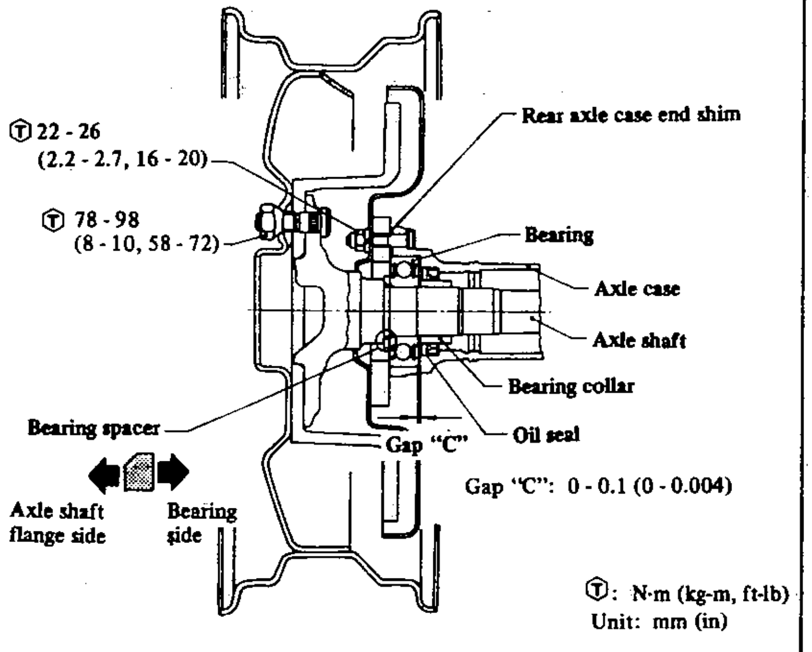
CONTENTS

REAR AXLE

REAR AXLE



SRA013

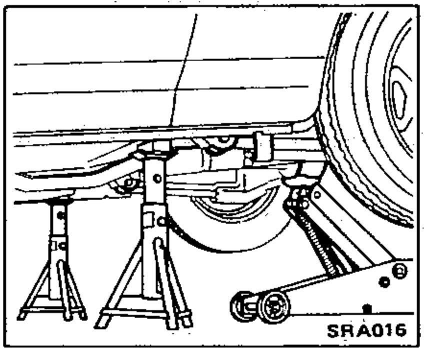


SRA014

REAR AXLE ASSEMBLY

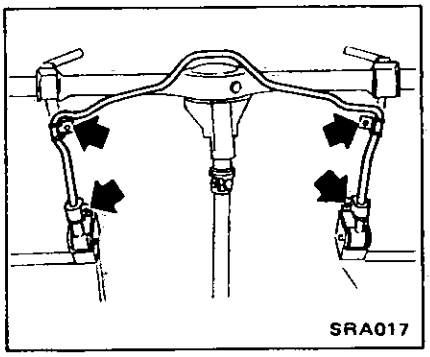
Removal and installation

1. Block front wheels. Place stands. Support under differential carrier with garage jack.



SRA016

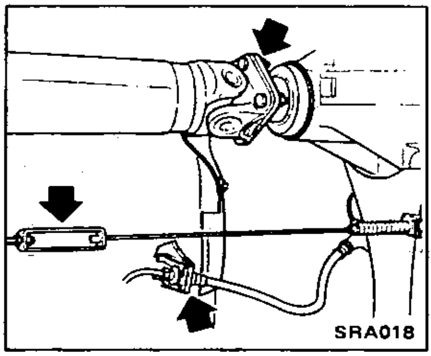
2. Remove stabilizer bar. Refer to Stabilizer Bar for installation.



SRA017

3. Disconnect propeller shaft (Refer to PD section for removal), brake hydraulic line and parking brake cable.

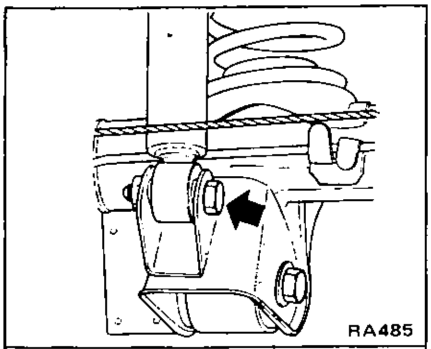
CAUTION:
When removing or installing brake tubes, use Tool GG94310000.



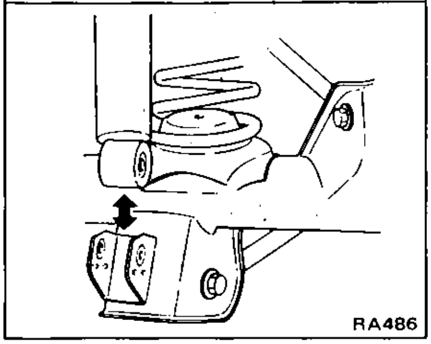
SRA018

4. Disconnect shock absorber lower end on each side.

When removing shock absorber lower end from bracket, squeeze shock absorber and lift it out right above to accommodate embossment inside bracket.

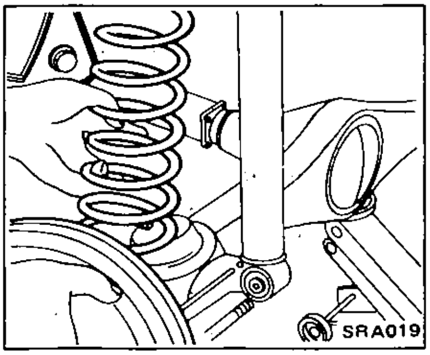


RA485



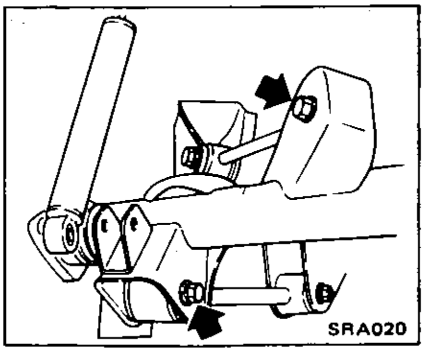
RA486

5. Lower jack and remove coil spring on each side.



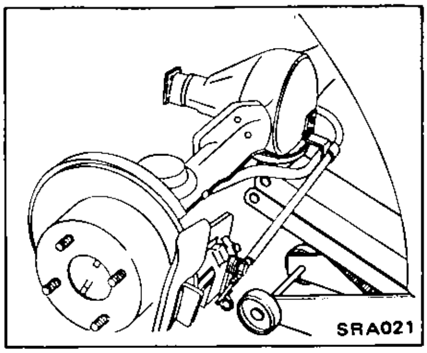
SRA019

6. Raise jack to previous position. Disconnect upper link and lower link at axle case side.



SRA020

7. Release jack and pull it out.



SRA021

Installation is in reverse order of removal.

Refer to Upper Link and Lower Link for installation of upper link and lower link.

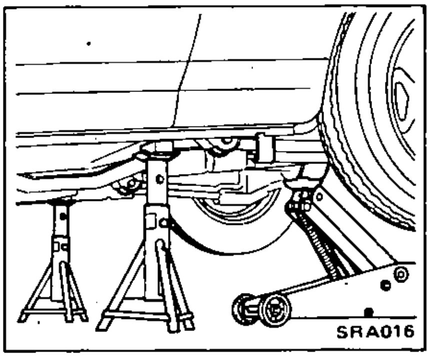
Inspection

Check axle case for yield, deformation or cracks and replace if necessary.

REAR AXLE SHAFT AND WHEEL BEARING

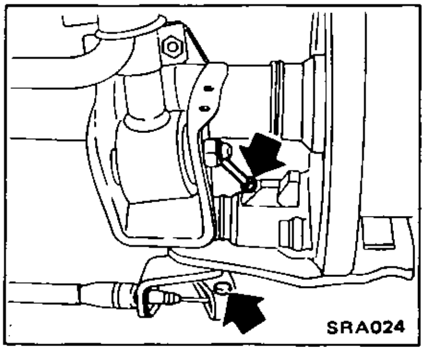
Removal and disassembly

1. Block front wheels. Place stands. Remove rear wheel.



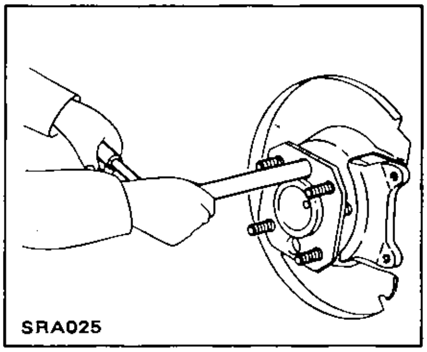
SRA016

2. Disconnect parking brake cable and brake tube.



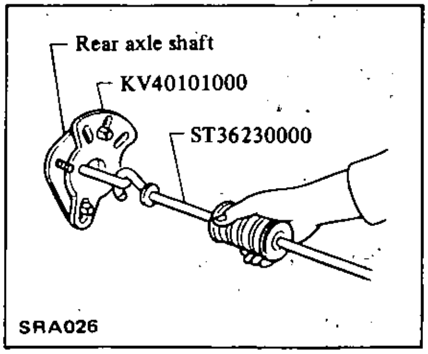
SRA024

3. Remove caliper and rotor. Remove nuts securing baffle plate.



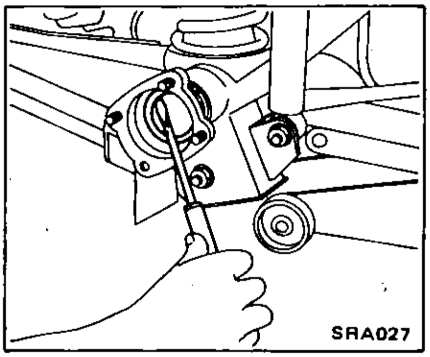
SRA025

4. Draw out axle shaft.



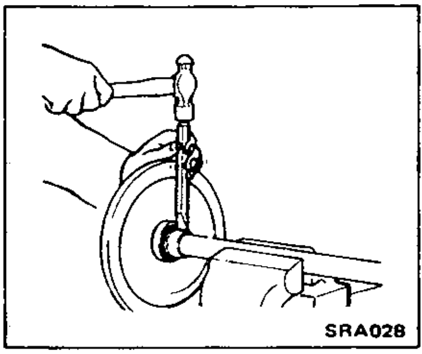
SRA026

5. Remove oil seal.

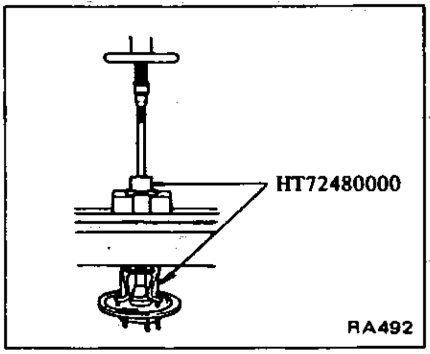


SRA027

6. Cut collar with cold chisel. **Take care not to damage axle shaft.**



7. Remove wheel bearing and collar.

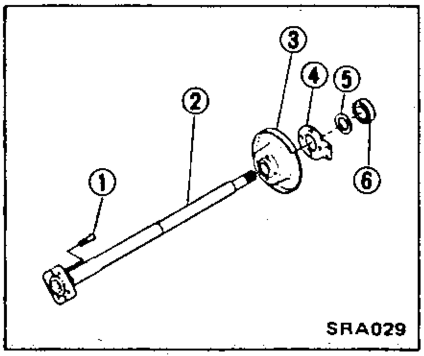


Inspection

- Check axle shaft for straightness, cracks, damage, wear or distortion.
- Check lip of oil seal for damage, deformation or wear.
- Check bearing for wear or damage.

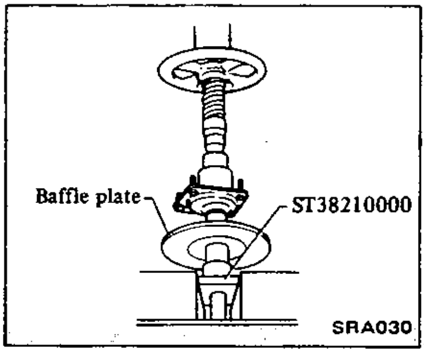
Assembly and Installation

1. Install bearing spacer **with chamfer side facing axle shaft flange.** Insert wheel bearing **with seal side facing axle shaft flange.**

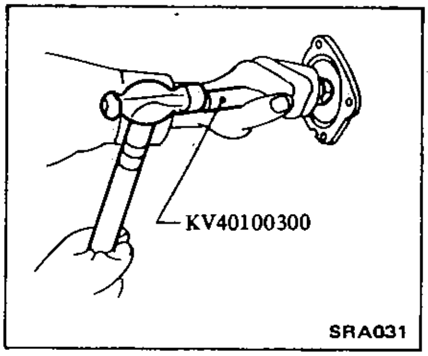


1 Bolt
2 Rear axle shaft
3 Baffle plate
4 Adapter plate
5 Bearing spacer
6 Wheel bearing

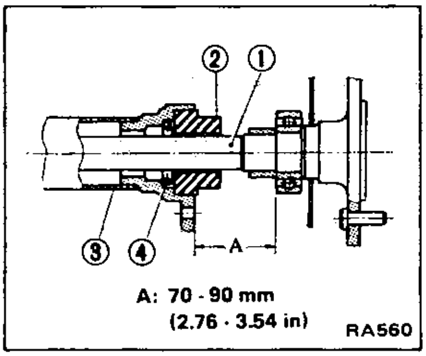
2. Press new bearing collar by a load of 29 to 49 kN (3 to 5 ton, 3.3 to 5.5 US ton, 3.0 to 4.9 Imp ton) tons.



3. Install oil seal, packing cavity between sealing lips with recommended multi-purpose grease.



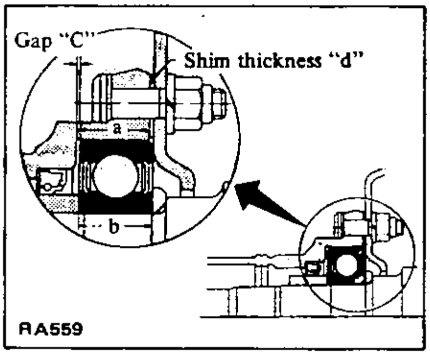
4. Insert axle shaft into axle case applying multi-purpose grease to the outer periphery of bearing collar. Remove guide when distance "A" between axle flange and bearing is 70 to 90 mm (2.76 to 3.54 in).



1 Rear axle shaft
2 Rear axle shaft guide (ST37840000)
3 Rear axle case
4 Oil seal

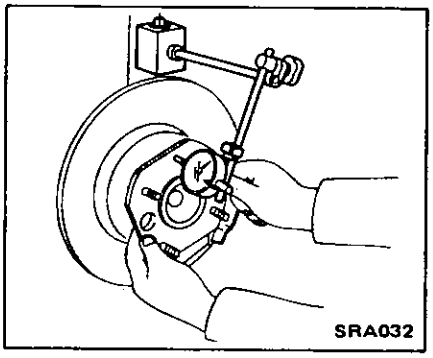
5. Adjust gap "C" between wheel bearing and axle tube end by selecting shim.

Gap "C":
Less than 0.1 mm (0.004 in)



Rear axle case end shim:
Refer to S.D.S.

6. Measure end play of axle shaft.

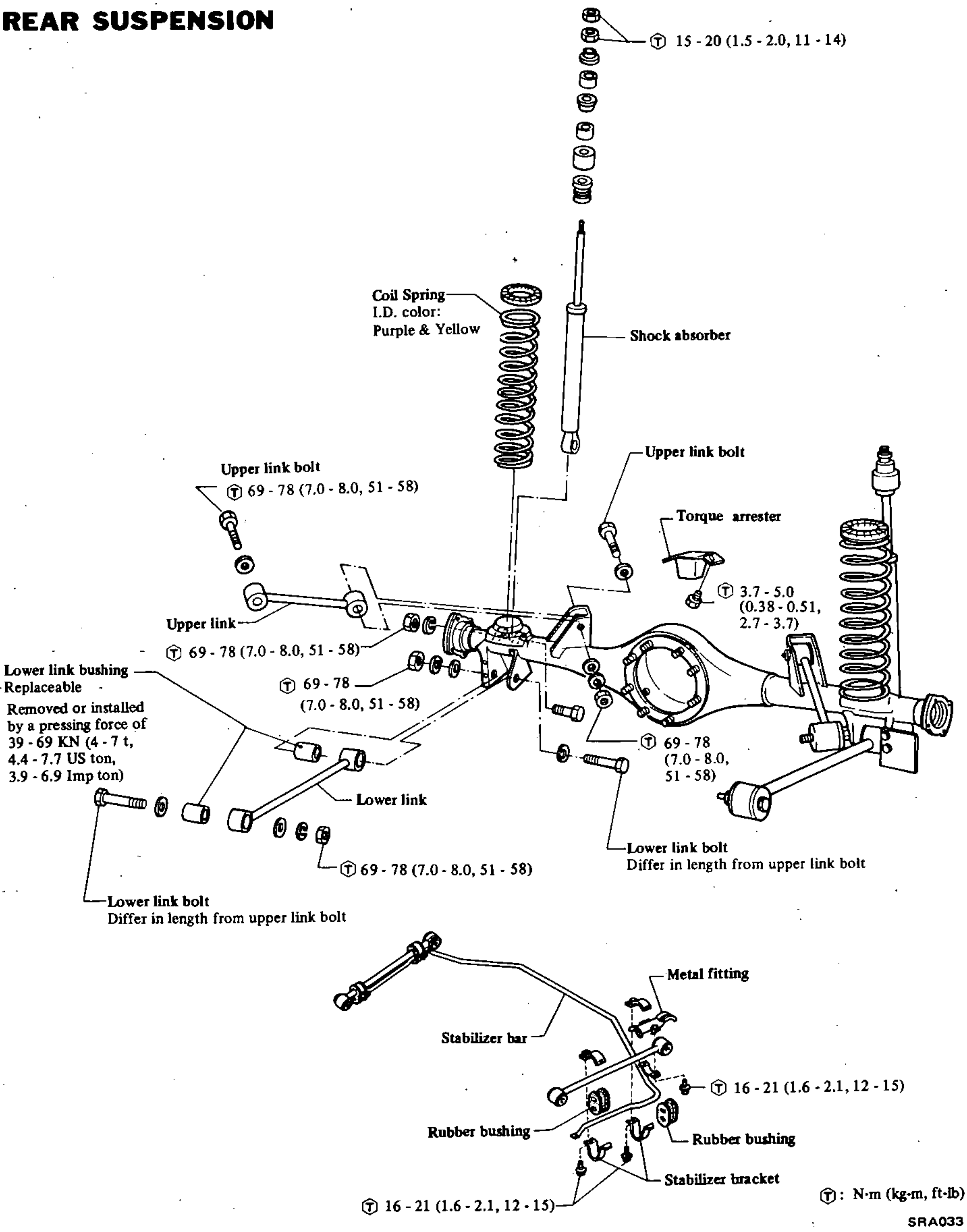


Axial end play:
0.05 - 0.40 mm
(0.0020 - 0.0157 in)

Ⓣ : Differential gear carrier fixing nut
20 - 25 N·m
(2.0 - 2.5 kg-m,
14 - 18 ft-lb)
Oil drain and filler plug
59 - 98 N·m
(6.0 - 10.0 kg-m,
43 - 72 ft-lb)
Brake tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
Brake 3-way connector fixing bolt
17 - 20 N·m
(1.7 - 2.0 kg-m,
12 - 14 ft-lb)
Wheel nut
78 - 98 N·m
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

REAR SUSPENSION

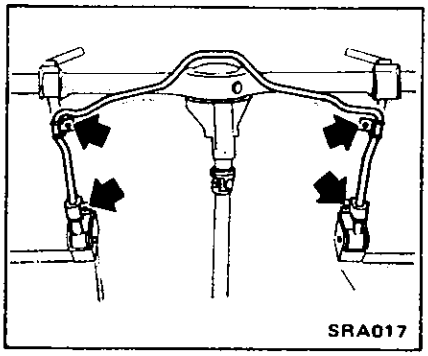
REAR SUSPENSION



STABILIZER BAR

Removal

Remove stabilizer bar.



Inspection

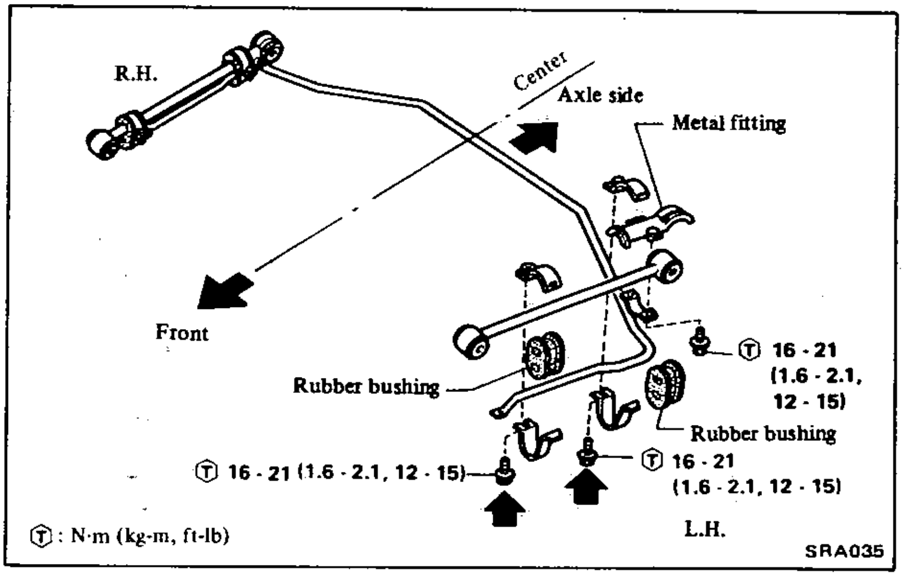
1. Check stabilizer bar for evidence of deformation or cracks, replace if necessary.
2. Check rubber parts to be sure they are not deteriorated or cracked; replace if necessary.

Installation

a. Install stabilizer bar, being careful not to confuse right and left sides.

b. Install rubber bushing with metal fitting on axle case side.

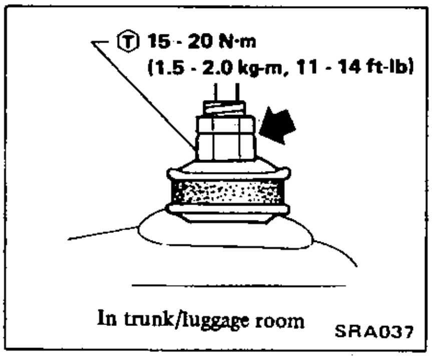
c. Install bolt attaching bushing so that bolt is inside the car.



SHOCK ABSORBER

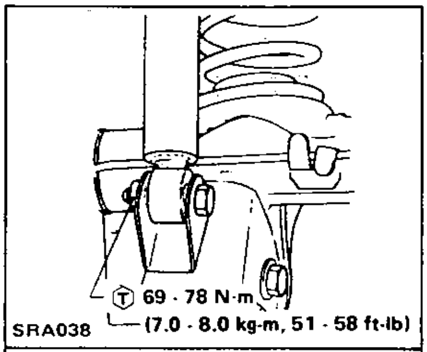
Removal and Installation

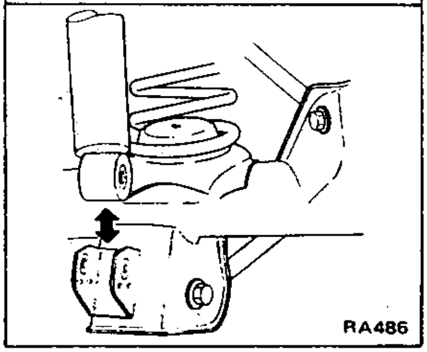
1. Disconnect upper end.



2. Disconnect lower end and remove shock absorber.

Squeeze shock absorber and lift it out right above to accommodate embossment inside bracket.





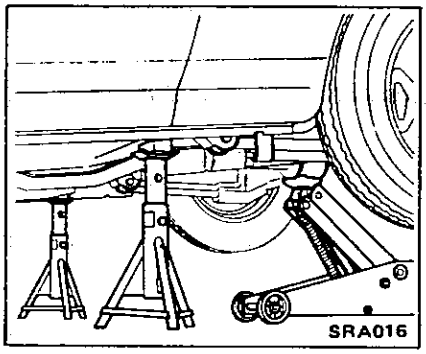
Inspection

- Test shock absorber and compare with specifications given in S.D.S. Replace if necessary.
- Check for oil leakage and cracks. Also, check shaft for bending.
- Inspect rubber bushings for damage, cracks and deformation. Replace parts if necessary.

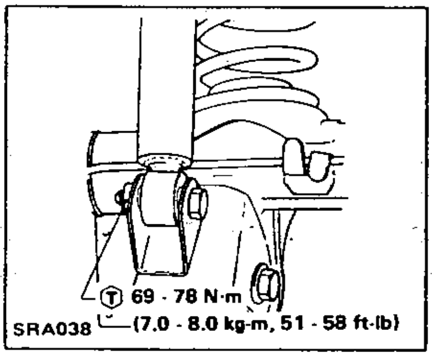
COIL SPRING

Removal and Installation

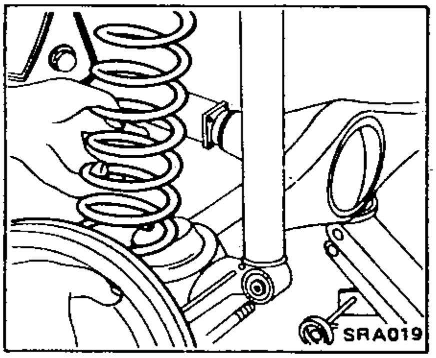
1. Block front wheels. Place stands. Support under differential carrier with garage jack.



2. Disconnect shock absorber lower end.



3. Lower jack slowly and remove coil springs on each side.



Inspection

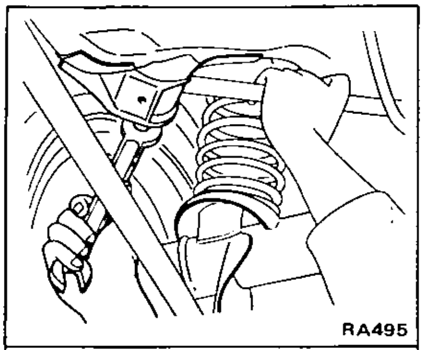
- Check coil spring for yield, deformation or cracks.
- Test spring and compare with specifications given in S.D.S.
- Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.

UPPER LINK AND LOWER LINK

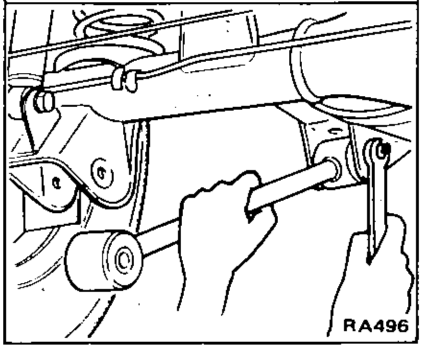
Removal

Remove upper link or lower link alone by removing bolt on each end.

It is possible to remove one link assembly alone from car.



RA495



RA496

Inspection

Check for signs of cracks, distortion or other damage. Replace if beyond repair.

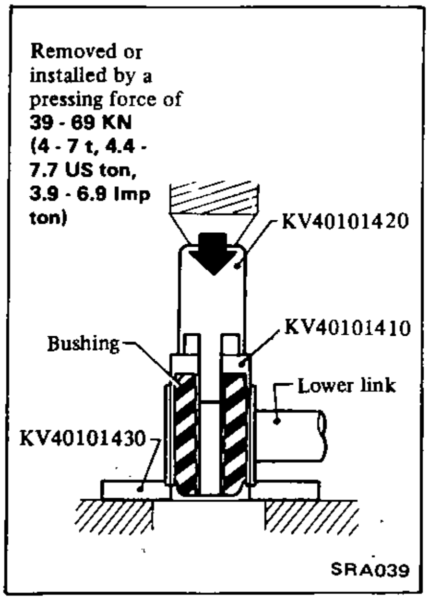
Bushing replacement (For lower link only)

If rubber bushing shows evidence of cracks, replace it using **Tool**.

Upper link bushing is secured by adhesion and cannot be removed. Replace as an assembly as necessary.

CAUTION:

Do not tap end face of bushing directly with a hammer as deformation may result in loose bolt.



SRA039

Installation

a. **Securing bolts for use with lower link differ in length from those for upper link. If used wrong, securing bolts cannot be tightened securely.**

b. **When installing upper link, install one end of upper link on car body, make sure that link is level, and then tighten link securely. Next, install the other end of link on axle side and securely tighten link while tires are on ground.**

c. **When installing lower link, securely tighten link while tires are on ground.**

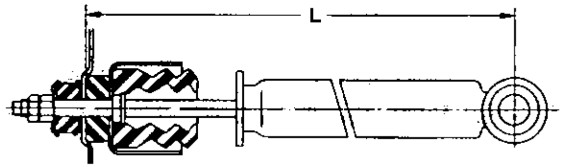
Ⓣ : Shock absorber lower end
69 - 78 N·m
(7.0 - 8.0 kg-m,
51 - 58 ft-lb)
Upper link fixing bolt and nut
69 - 78 N·m
(7.0 - 8.0 kg-m,
51 - 58 ft-lb)
Lower link fixing nut
69 - 78 N·m
(7.0 - 8.0 kg-m,
51 - 58 ft-lb)

SERVICE DATA AND SPECIFICATIONS

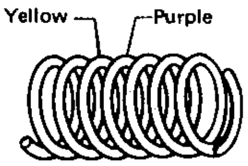
GENERAL SPECIFICATIONS

SHOCK ABSORBER

Unit: mm (in)

Maximum length "L"	525 (20.67)
Stroke	146 (5.75)
 SRA090	

COIL SPRING

Wire diameter mm (in)	10.0 (0.394)
Coil diameter mm (in)	90 (3.54)
Free length mm (in)	362 (14.25)
Effective turns	7.75
Spring constant N/mm (kg/mm, lb/in)	17.46 (1.78, 99.7)
Identification color  SRA040	

INSPECTION AND ADJUSTMENT

SHOCK ABSORBER

SHOCK ABSORBER DAMPING FORCE at 0.3 m (1.0 ft)/s.	
Expansion N (kg, lb)	490 - 686 (50 - 70, 110 - 154)
Compression N (kg, lb)	245 - 402 (25 - 41, 55 - 90)

REAR AXLE

End play mm (in)	0.05 - 0.40 (0.0020 - 0.0157)	
Thickness of rear axle case end shim	Thickness mm (in)	Part number
	0.075 (0.0030)	43036 H5000
	0.150 (0.0059)	43036 H5001
	0.225 (0.0089)	43036 H5002
	0.300 (0.0118)	43036 H5003

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Brake caliper fixing bolt	38 - 52	3.9 - 5.3	28 - 38
Baffle plate fixing nut	22 - 26	2.2 - 2.7	16 - 20
Propeller shaft to companion flange connecting nut	Refer to PD section.		
Wheel nut	78 - 98	8.0 - 10.0	58 - 72
Drain and filler plugs	59 - 98	6.0 - 10.0	43 - 72
Differential carrier-to-axle case nut	20 - 25	2.0 - 2.5	14 - 18
Shock absorber upper end nut	15 - 20	1.5 - 2.0	11 - 14
Shock absorber lower end nut	69 - 78	7.0 - 8.0	51 - 58
Upper link fixing bolt	69 - 78	7.0 - 8.0	51 - 58
Upper link fixing nut	69 - 78	7.0 - 8.0	51 - 58
Lower link fixing nut	69 - 78	7.0 - 8.0	51 - 58

TROUBLE DIAGNOSES AND CORRECTIONS

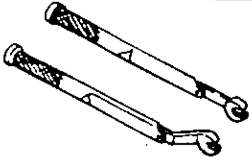
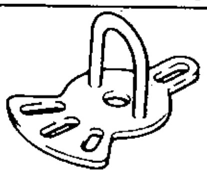
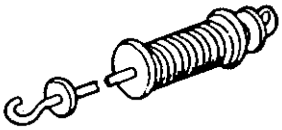
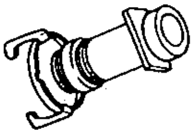
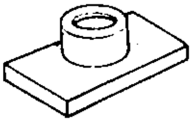
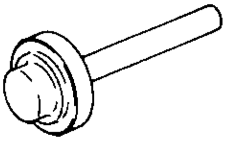
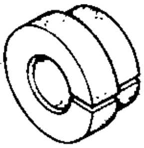
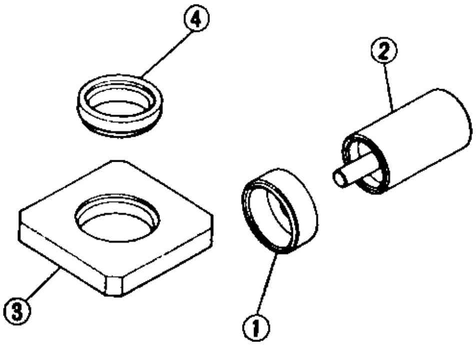
When rear axle and suspension is suspected of being noisy it is advisable to make thorough test to determine whether the noise originates in the tires, road surface, exhaust, propeller shaft, engine, transmission, wheel bearings or suspension.

Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle and rear suspension.

In case of oil leak, first check if there is any damage or restriction in breather.

Condition	Probable cause	Corrective action
Noise (unusual sound)	Loose wheel nuts.	Tighten.
	One or more securing bolts loose.	Tighten to specified torque.
	Lack of lubricating oil or grease.	Lubricate as required.
	Faulty shock absorber.	Replace.
	Incorrect adjustment of rear axle shaft end play.	Adjust.
	Damaged or worn wheel bearing.	Replace.
	Worn spline portion of rear axle shaft.	Replace if necessary.
	Loose journal, connections, etc.	Tighten to torque.
	Unbalance of wheel and tire.	Balance.
	Damage of the rubber parts such as link bushing, shock absorber mounting bushing.	Replace damaged parts.
	Faulty propeller shaft journal.	Replace as a propeller shaft assembly.
	Breakage of coil spring.	Replace.
Instability in driving This problem is also related to the front suspension. For trouble diagnosis, also refer to the FA section.	Loose wheel nuts.	Tighten to specified torque.
	Damaged rear link rubber bushings.	Replace.
	Worn shock absorber.	Replace.
	Incorrect wheel alignment.	Adjust.
	Spring wear.	Replace.
Oil leakage	Damaged oil seal on rear axle shaft.	Replace.
	Oil leakage from the differential carrier.	Replace parts as required.
	Damaged grease seal of rear axle shaft.	Replace.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
GG94310000 (–)	Flare nut torque wrench 
KV40101000 (J 25604-01)	Rear axle stand 
ST36230000 (J 25840)	Sliding hammer 
HT72480000 (–)	Rear axle shaft bearing puller 
ST38210000 (J 25869-01)	Wheel bearing collar press stand 
KV40100300 (J 25405)	Rear axle oil seal drift 
ST37840000 (–)	Rear axle shaft guide 
KV401014S0 (–) ① KV40101410 (–) ② KV40101420 (–) ③ KV40101430 (–) ④ KV40101440 (–)	Link rubber bushing drift Drift Drift Base Ring (useless) 

DATSUN 200SX Model S110 Series

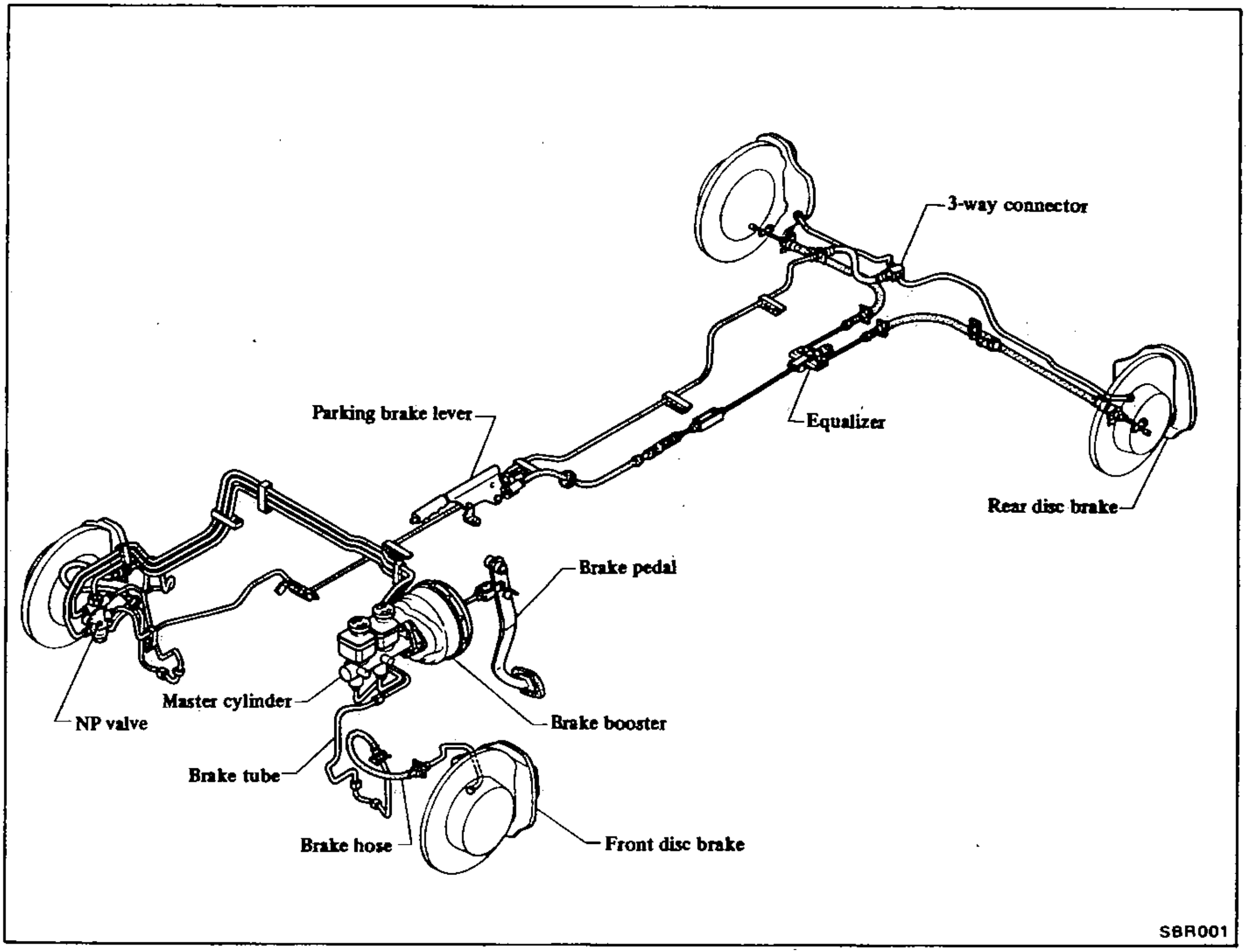
SECTION BR

BRAKE SYSTEM

CONTENTS

Refer to Section MA (Brake System) for:
- CHECKING FOOT BRAKE
- CHECKING PARKING BRAKE

DESCRIPTION



The brake system is a hydraulically controlled, dual line type which operates independently on front and rear wheels.

The brake booster is a power assist device which utilizes engine intake manifold vacuum.

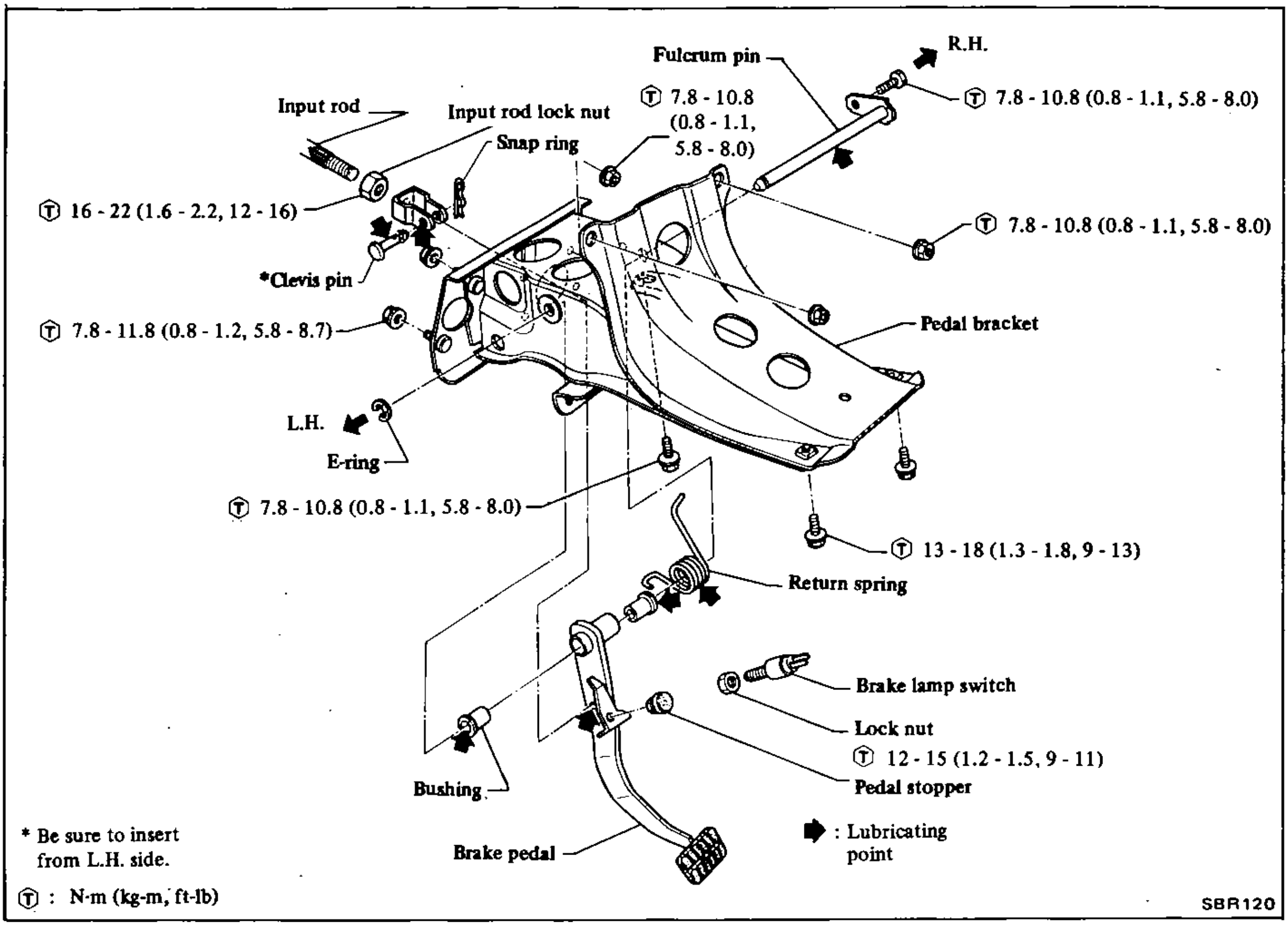
The NP valve is a pressure control device for the rear brakes.

The rear disc brake is equipped with a mechanically operated parking brake mechanism.

The pad clearances of the front and rear brakes are automatically adjusted.

SERVICE BRAKE

BRAKE PEDAL



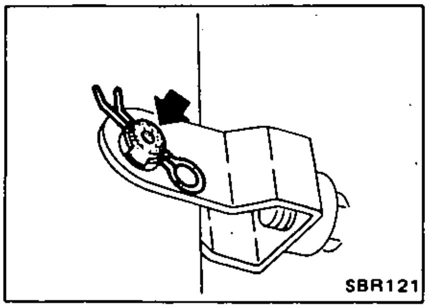
* Be sure to insert from L.H. side.

Ⓣ : N·m (kg-m, ft-lb)

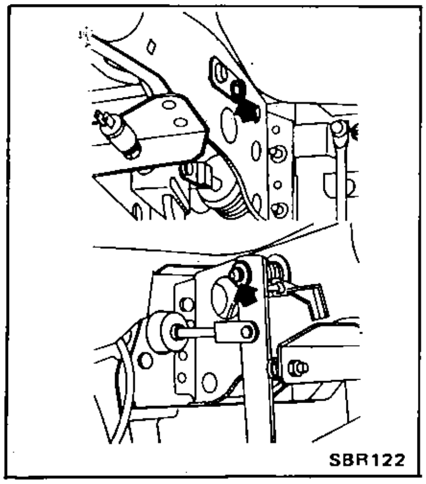
REMOVAL

1. Remove pedal bracket assembly with brake pedal (M/T only).
2. Disconnect clevis from brake pedal.

When removing clevis pin, be careful not to damage clip of the clevis pin.



3. Remove fulcrum pin. Brake pedal can then be taken out.



INSPECTION

Check brake pedal for the following items, servicing as necessary.

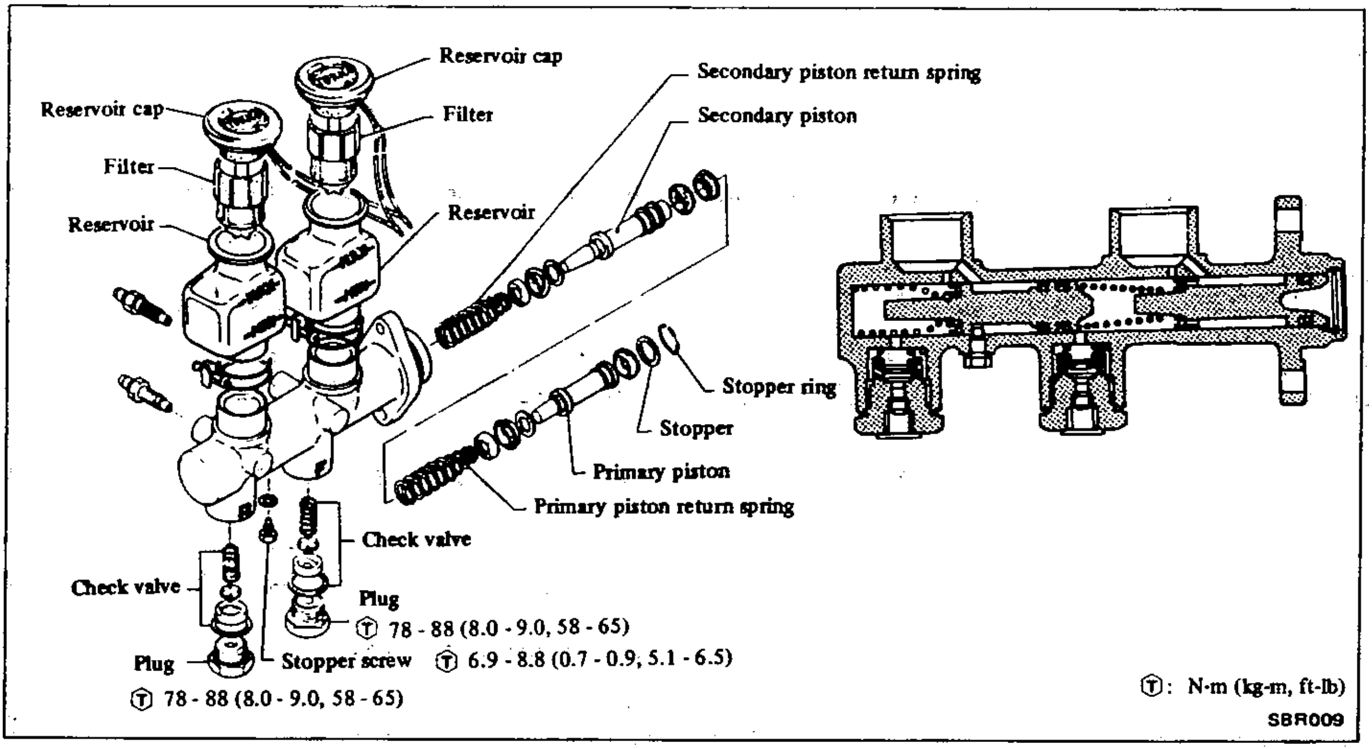
1. Check brake pedal for bend.
2. Check return springs for fatigue.
3. Check clevis for deformation and crack at welded part.

INSTALLTION

1. Apply coating of recommended multi-purpose grease to sliding portion and return coil spring.
2. Adjust brake pedal after installation is completed. Refer to Section MA for adjustment.

Ⓣ : Fulcrum pin fixing bolt
7.8 - 10.8 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Input rod lock nut
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

MASTER CYLINDER



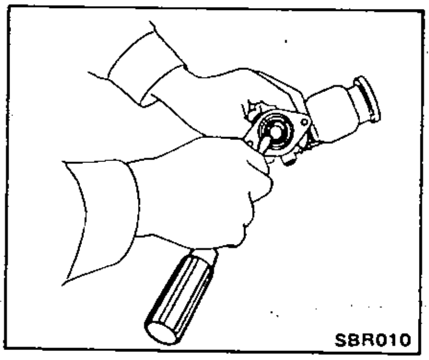
SBR009

DISASSEMBLY

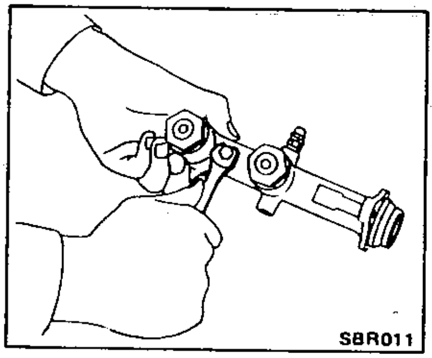
The brake master cylinder is available only in TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.

When replacing the repair kit or component parts, ascertain the brand of the brake master cylinder body. Be sure to use parts of the same make as the former ones.

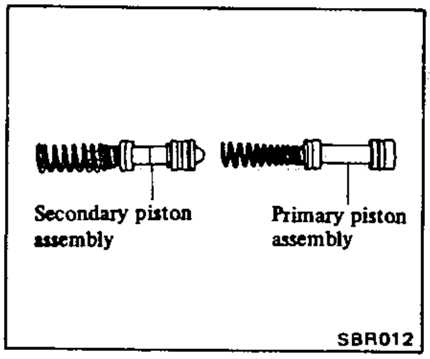
1. Pry off stopper ring.


SBR010

2. Remove stopper screw. Primary and secondary piston assemblies can then be taken out.

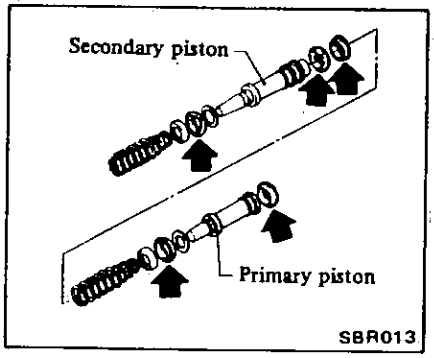

SBR011

3. Disassemble piston assembly.



SBR012

4. Remove piston cups and discard them.



SBR013

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.

Ⓣ : Check valve plug
78 - 88 N·m
(8.0 - 9.0 kg-m,
58 - 65 ft-lb)

BRAKE HYDRAULIC LINE

INSPECTION

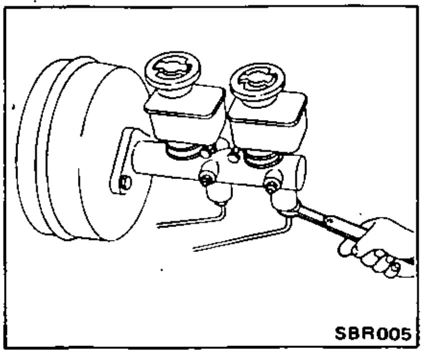
Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any faulty parts.

If leakage occurs at end around joints, re-tighten or, if necessary, replace faulty parts.

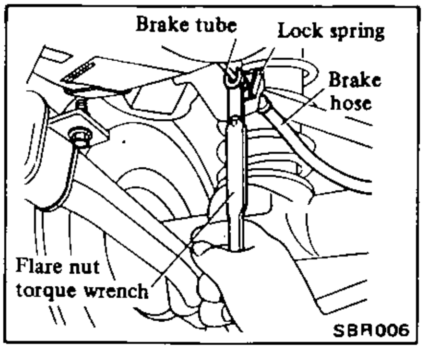
REMOVAL AND INSTALLATION

- To remove brake tube, disconnect flare nuts on both ends, and remove retainers and clips.

CAUTION:
When removing or installing brake tubes, use Tool GG94310000.


SBR005

- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side. **Do not twist brake hose.**



SBR006

- After installation is completed, bleed brake system. Refer to Bleeding Hydraulic System.

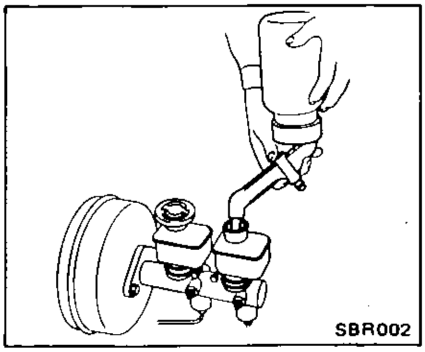
BLEEDING HYDRAULIC SYSTEM

1. Top up reservoir with recommended brake fluid.

a. Do not mix two different brand brake fluids.

b. Carefully monitor brake fluid level at master cylinder during bleeding operation.

c. Do not reuse drained brake fluid.

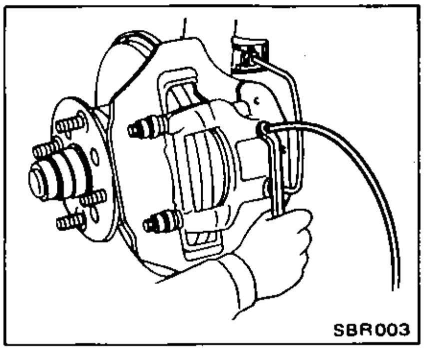

SBR002

2. Install bleeder hose on bleeder valve. With brake pedal fully depressed, open bleeder valve to exhaust air. Then close bleeder valve and allow brake pedal to return. Repeat bleeding operation until no air bubbles show in hose.

a. Be careful not to splash brake fluid on painted areas.

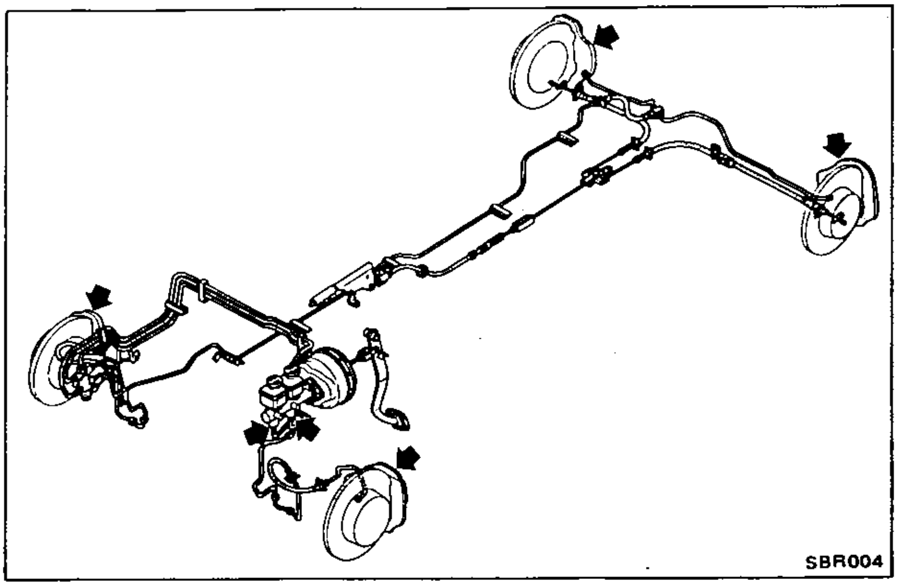
b. Brake fluid containing air is white and contains air bubbles.

c. Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles.

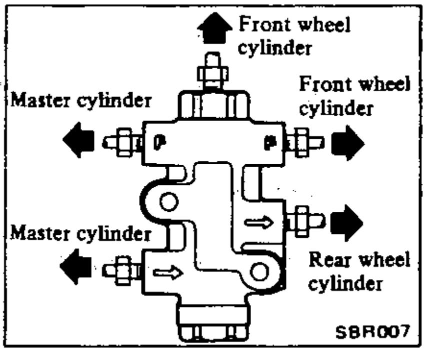

SBR003

3. Bleed air in the following sequence. **Master cylinder → Rear wheel → Front wheel.**

Ⓣ : Air bleeder valve
6.9 - 8.8 N·m
(0.7 - 0.9 kg-m,
5.1 - 6.5 ft-lb)


SBR004

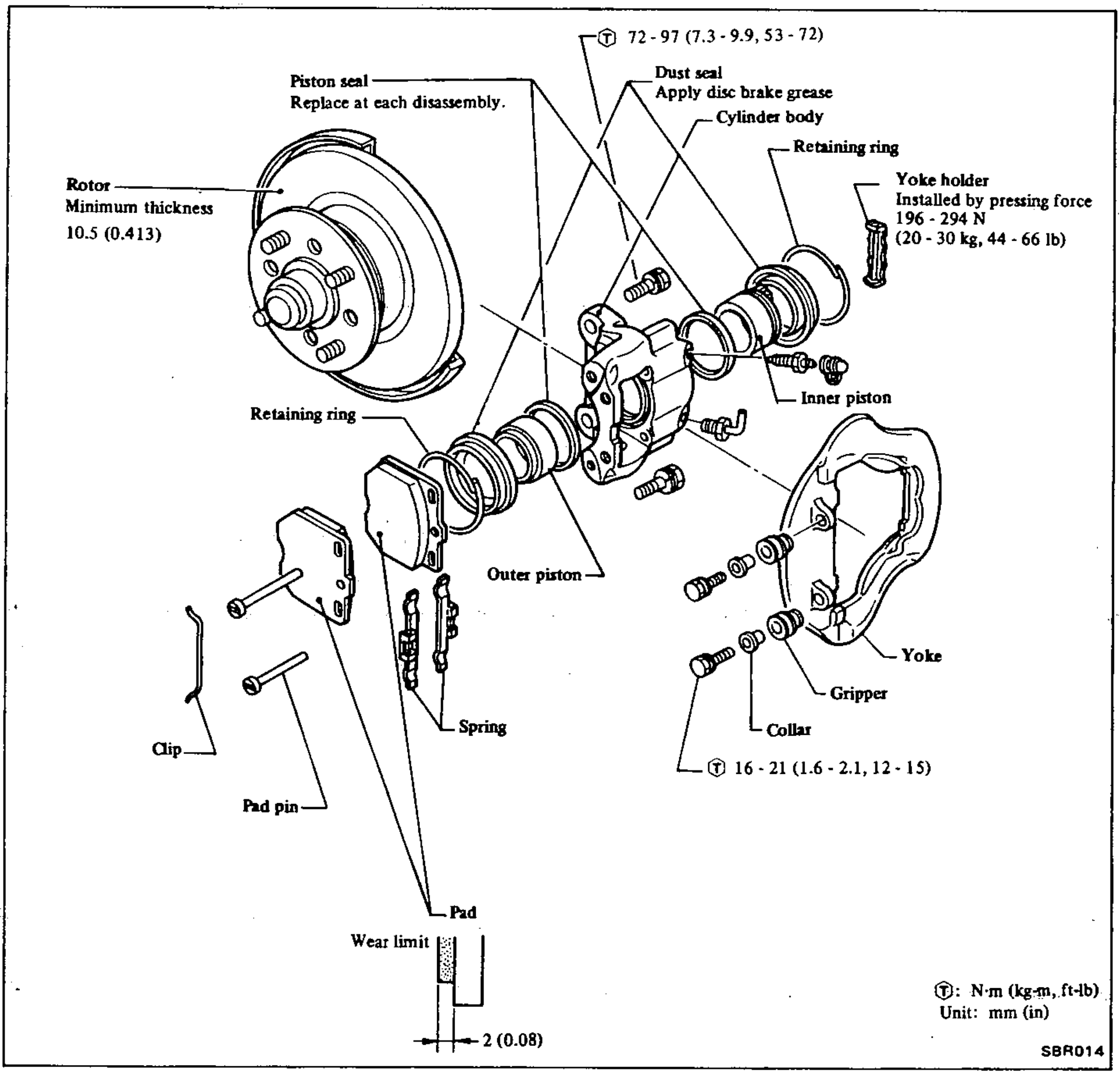
NP VALVE



Do not disassemble NP valve.

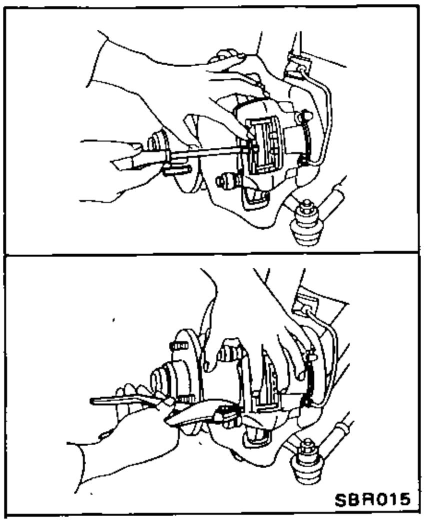
Ⓣ : Brake tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
NP valve to body
3.9 - 4.9 N·m
(0.4 - 0.5 kg-m,
2.9 - 3.6 ft-lb)

FRONT DISC BRAKE —N22—



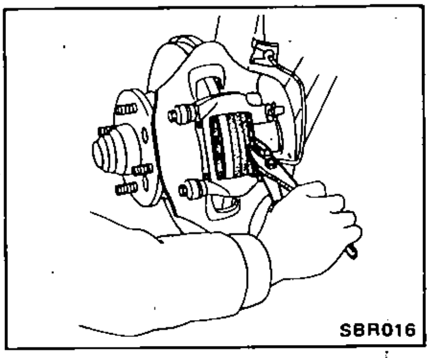
PAD REPLACEMENT

1. Remove clip. Remove pad pins holding springs with finger.

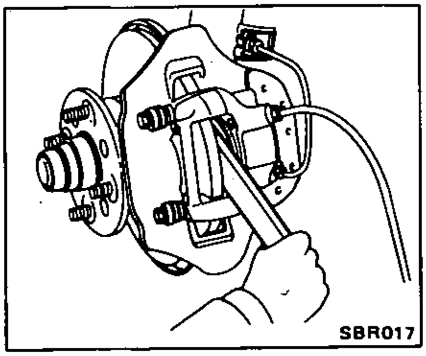

SBR015

2. Detach pads.

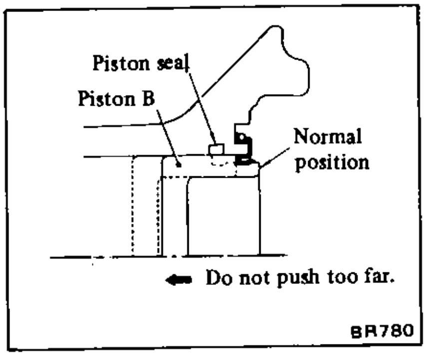
CAUTION:
After removing pads, do not depress brake pedal, or pistons will jump out.


SBR016

3. Open bleeder valve. Push piston B (outer piston) in until dust seal groove of piston B coincides with end surface of retaining ring on dust seal.

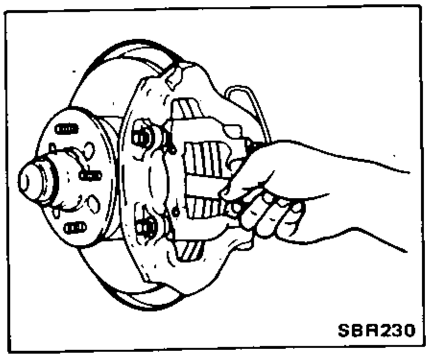

SBR017

CAUTION:
Piston can be easily pushed in by hand, but if pushed too far, groove of piston will go inside of piston seal. At this point, if piston is pressured or moved, piston seal will be damaged. If piston has been pushed in too far, remove caliper assembly and disassemble it. Then, push piston out in direction shown by arrow. Assemble it again, referring to the following.



BR780

4. Install inner pad. Pull yoke to outer side.


SBR230

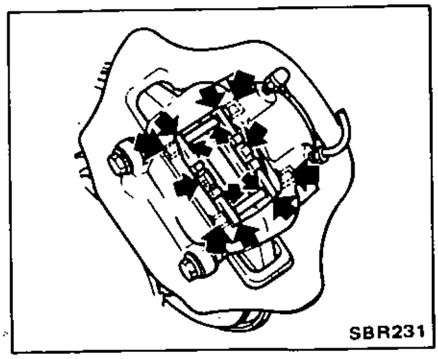
5. Install outer pad.

Coat the following points with recommended pad grease.

- Cylinder body-to-pad clearance
- Pad pin-to-pad clearance
- Pad pin holes of cylinder body

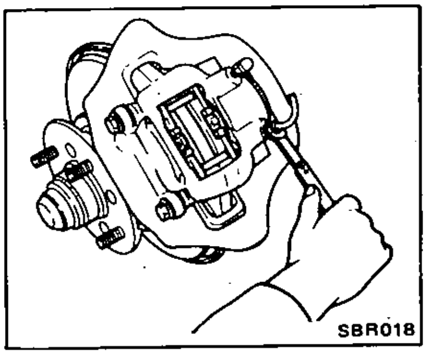
Do not grease friction face of pad.

Then install pad fixing parts previously removed.

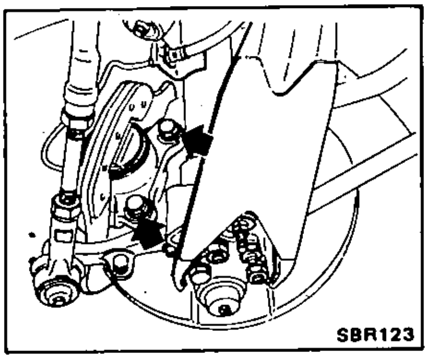

SBR231

REMOVAL

1. Disconnect brake tube.

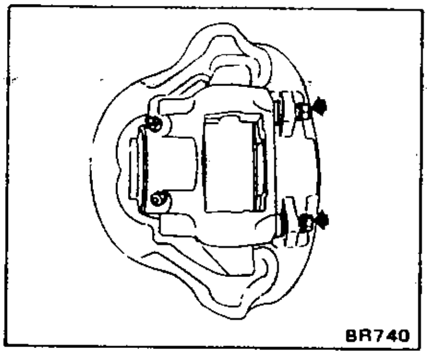

SBR018

2. Remove caliper assembly.

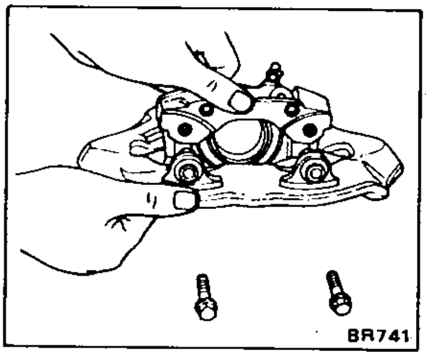

SBR123

DISASSEMBLY

1. Remove pads.
Remove fixing bolt and separate yoke and cylinder body.

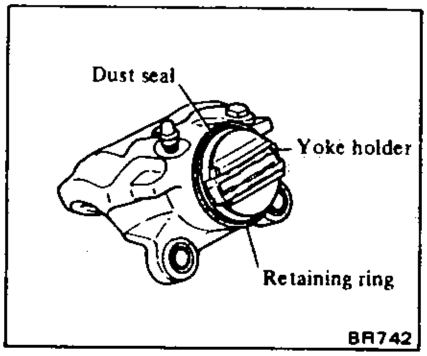


BR740



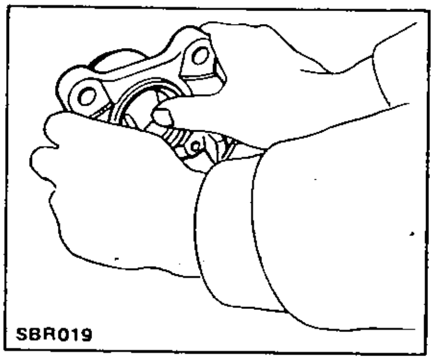
BR741

2. Remove yoke holder, retaining rings and dust seals from both pistons.



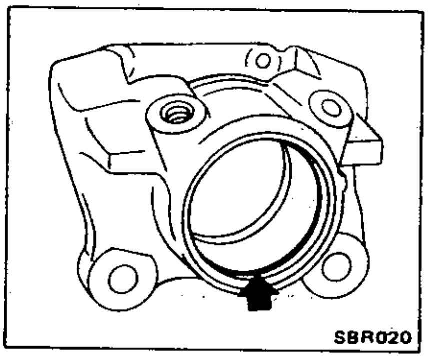
BR742

3. Push out pistons from cylinder.



SBR019

4. Remove piston seals.
Piston seal must be replaced at each disassembly.



SBR020

INSPECTION

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.

Yoke

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.

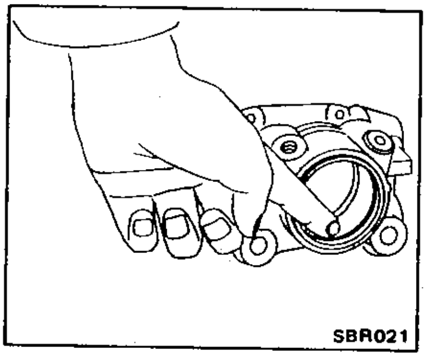
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is sticked on sliding surface.

Gripper and yoke holder

Check for wear, cracks or other damage. Replace if any fault is detected.

ASSEMBLY

1. Apply rubber grease or brake fluid to seal grooves and seals. Install piston seals, taking care not to damage them.

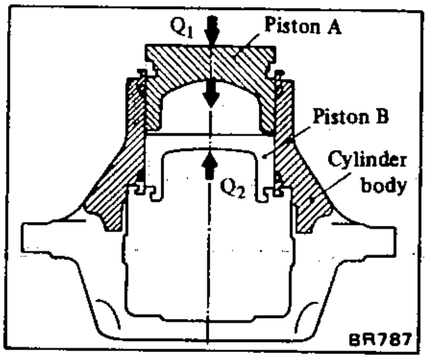


SBR021

2. Apply rubber grease or brake fluid to sliding portions. Insert pistons.

CAUTION:
Insert piston A in direction shown by arrow Q1 and piston B in direction shown by arrow Q2.

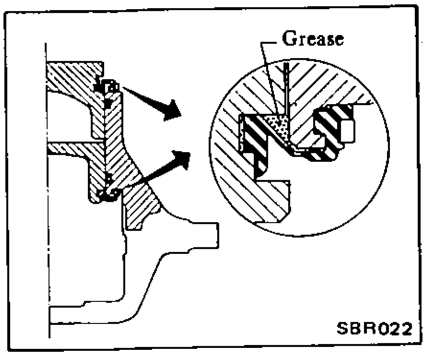
a. When inserting pistons, be careful not to insert too far. Refer to Pad Replacement for assembly.
b. Install piston A so that its yoke groove coincides with yoke groove of cylinder.



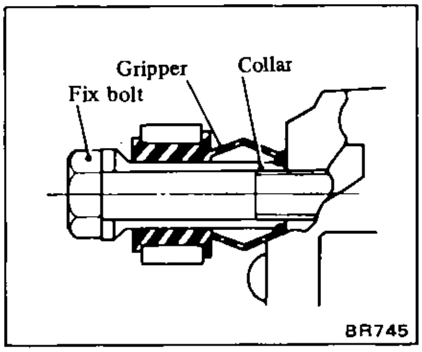
BR787

3. Install dust seal and clamp securely with retaining ring.

a. Apply recommended disc brake grease to sealing surface of dust seal.
b. Be careful not to deform dust seal.
c. Wipe off excess grease with alcohol.

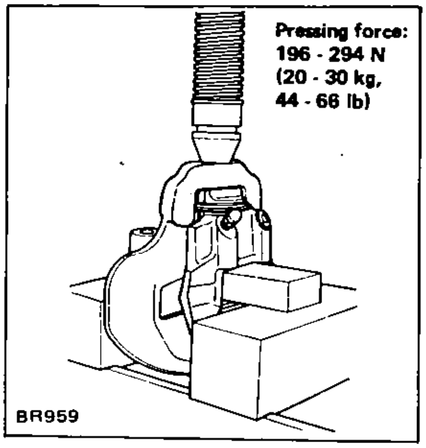


4. Install yoke holder to piston A. Install gripper to yoke. Apply a coating of 1% soap water to inner wall of gripper, and drive in collar.



5. Install yoke to yoke holder and, supporting end of piston B, press yoke into yoke holder by using press or hands.

CAUTION:
When pressing yoke into yoke holder, be sure to insert yoke vertically so as not to crack or chip yoke holder. If yoke holder is damaged or pressing force is out of specification, replace with a new one.



6. Install pads. Refer to Pad Replacement for installation.

FRONT DISC ROTOR

REMOVAL AND INSTALLATION

Refer to section FA.

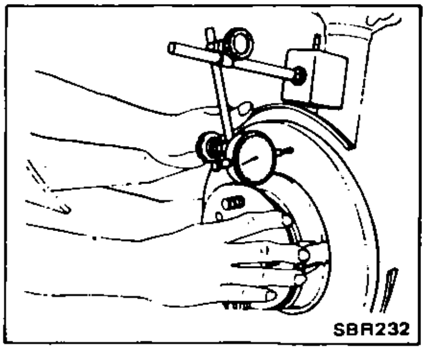
INSPECTION

1. Sliding surface

If there are cracks or considerable chips, repair or replace.

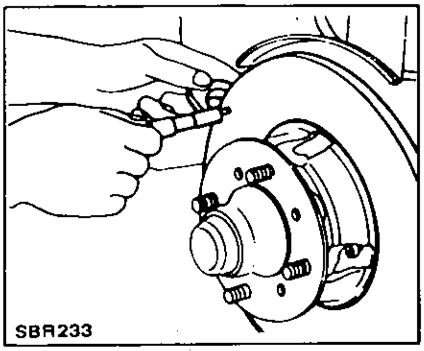
2. Runout

Adjust wheel bearing correctly. Measure runout.



Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface):
0.12 mm (0.0047 in)

3. Parallelism

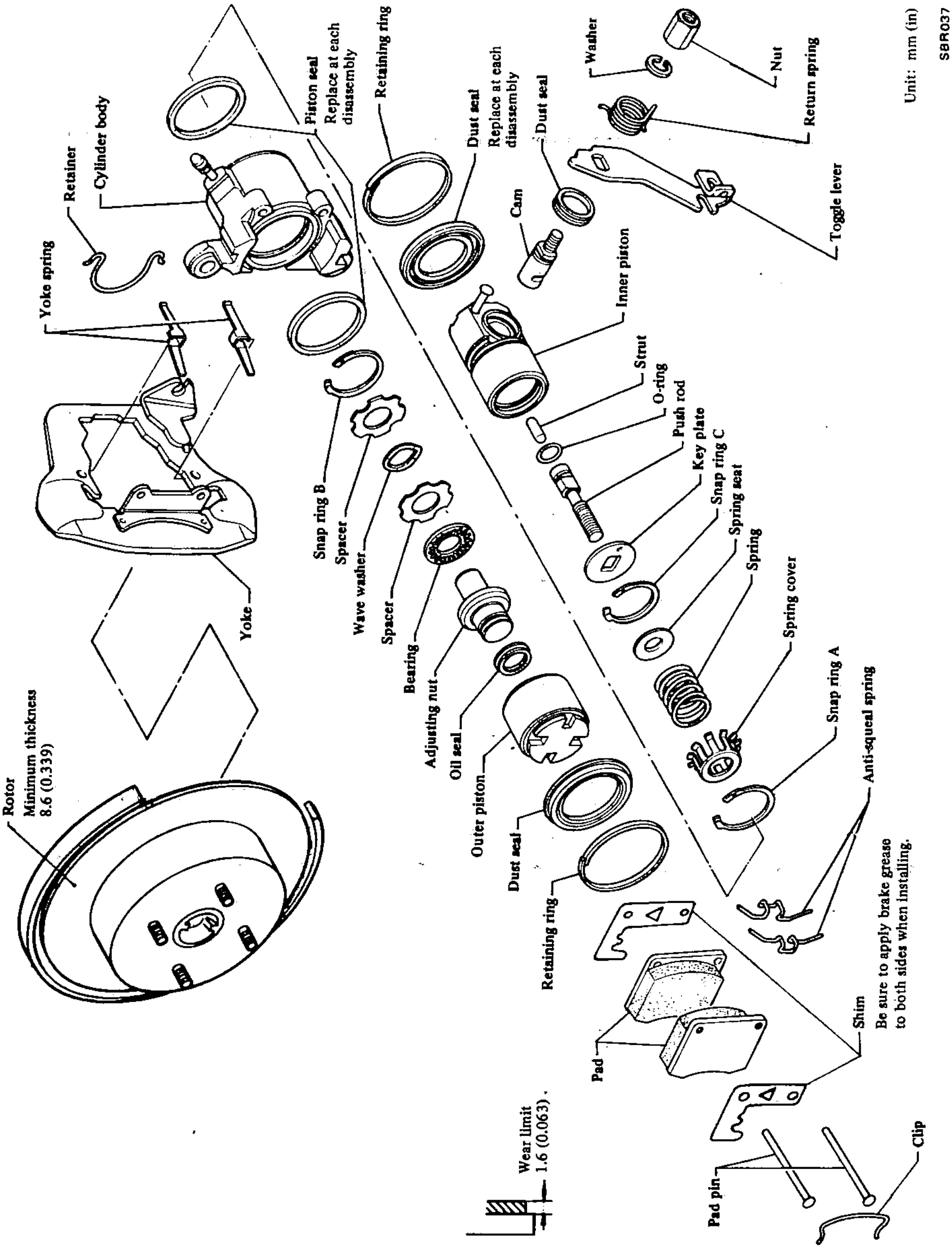


Rotor repair limit:
Maximum parallelism
(Circumferential direction):
0.07 mm (0.0028 in)

4. Thickness

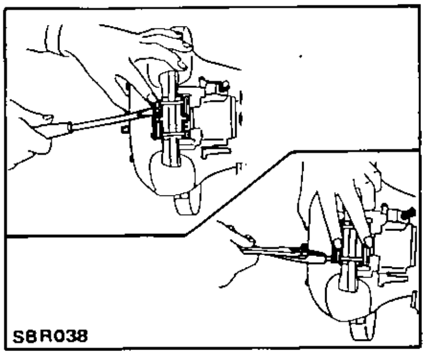
Standard thickness:
12.5 mm (0.492 in)
Rotor repair limit:
Minimum thickness:
10.5 mm (0.413 in)

REAR DISC BRAKE —AN12H—



PAD REPLACEMENT

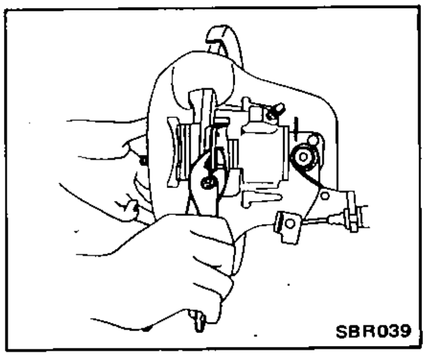
1. Remove clip. Remove pad pins holding springs with finger.



SBR038

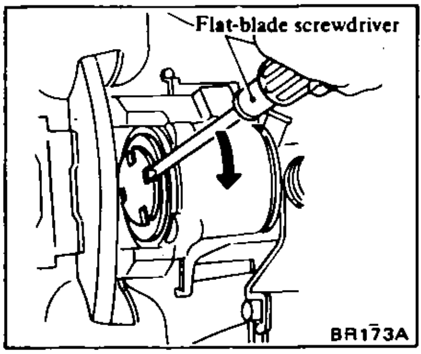
2. Detach pads and shims.

CAUTION:
After removing pads, do not depress brake pedal, or pistons will jump out.



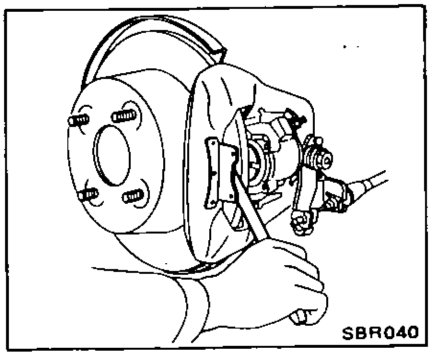
SBR039

3. Retract outer piston into cylinder body by turning it clockwise and pushing it in. **Be careful not to damage dust seal.**



BR173A

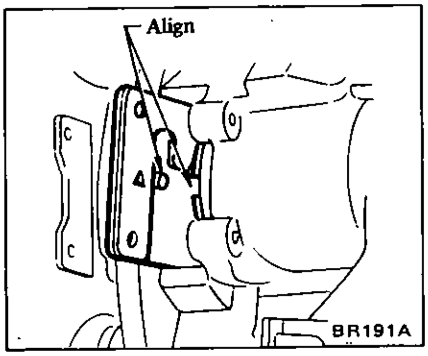
4. Move yoke until clearances to install pads are equal, with a lever placed between rotor and yoke.



SBR040

5. Install pads and shims.

Position outer piston so that portion of cutout is level and install pad by aligning this portion with protrusion at back of pad.

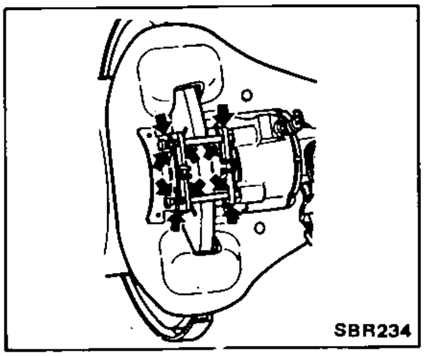


BR191A

6.
(1) Coat the following points with recommended pad grease.

- Cylinder body-to-pad clearance
- Yoke-to-pad clearance
- Pad pin-to-pad clearance
- Pad pin-to-bracket clearance

a. Do not grease friction face of pad.
b. Be sure to apply pad grease to both sides of shims.



SBR234

(2) Check that the following points are coated with silicone based grease. Nissan silicone based grease or equivalent.

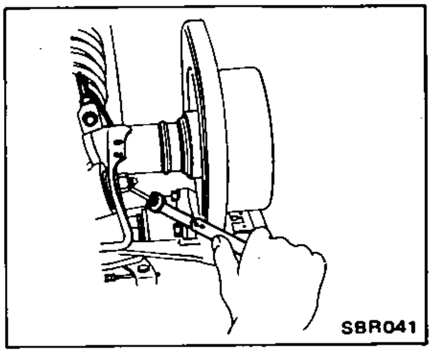
Silicone based greasing points:

- Friction surface of yoke and cylinder body.
- Cylinder body pad pin hole.

Then install pads fixing parts previously removed.

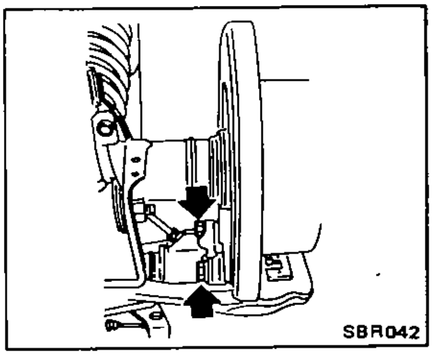
REMOVAL

1. Disconnect brake tube.



SBR041

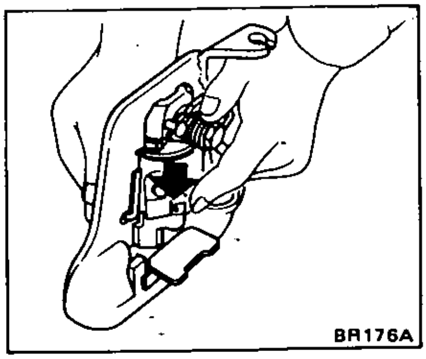
2. Remove caliper assembly.



SBR042

DISASSEMBLY

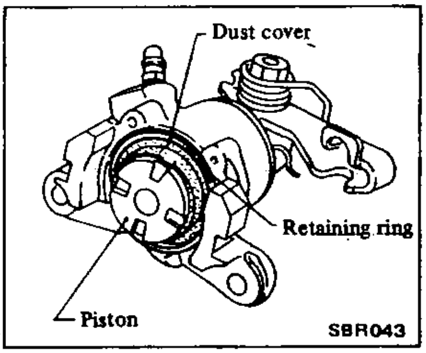
1. Separate cylinder body from yoke by pushing it.



BR176A

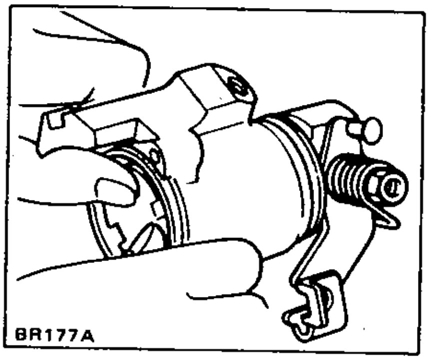
2. Remove retaining rings and dust seals.

Replace dust seals at each disassembly.



SBR043

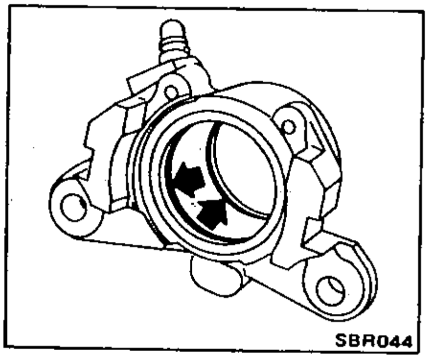
3. Drive out piston assembly by pushing outer piston in.



BR177A

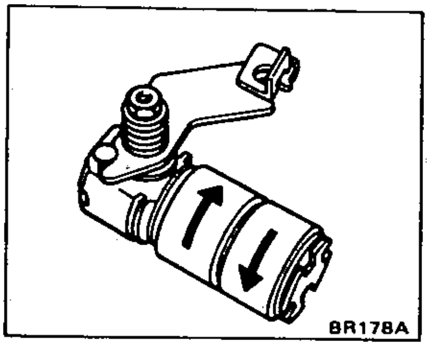
4. Remove piston seals.

Replace piston seals at each disassembly.



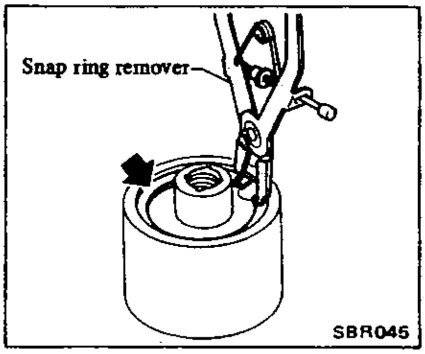
SBR044

5. Disengage piston assembly by turning inner and outer pistons.



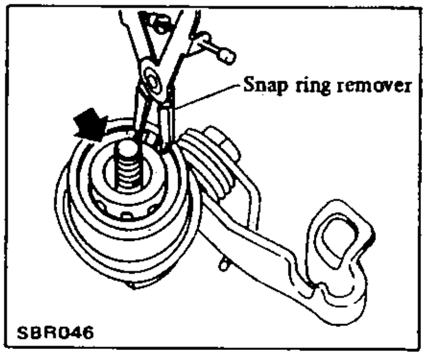
BR178A

6. Disassemble outer piston by removing snap ring B.



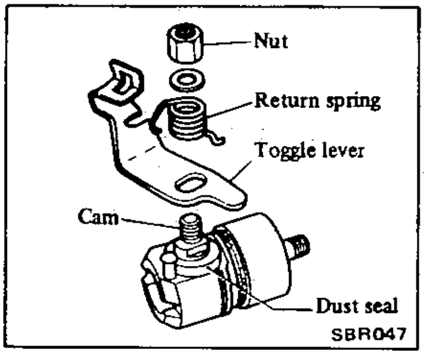
SBR045

7. Disassemble inner piston by removing snap rings A and C.



SBR046

8. Remove hand brake toggle lever by removing return spring and nut. Remove dust seal and cam.



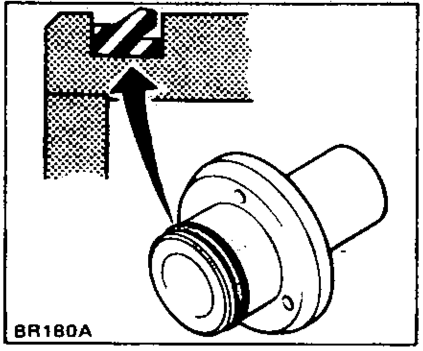
SBR047

ASSEMBLY

1. Before assembling, apply thin coat of rubber grease to the following:

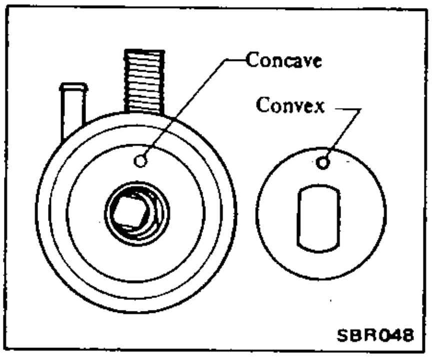
- Groove in push rod and new O-ring
- Strut ends
- Oil seal
- Piston seal
- Inside of dust seal

Securely install oil seal in specified direction.



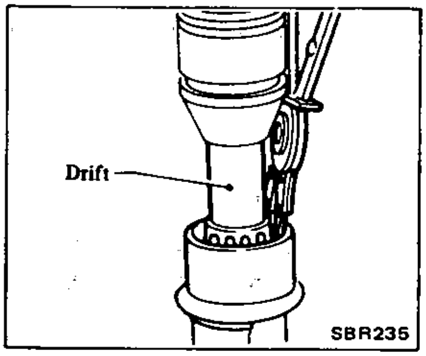
BR180A

2. Engage square hole in key plate with push rod. Also engage convex in key plate in concave in piston.



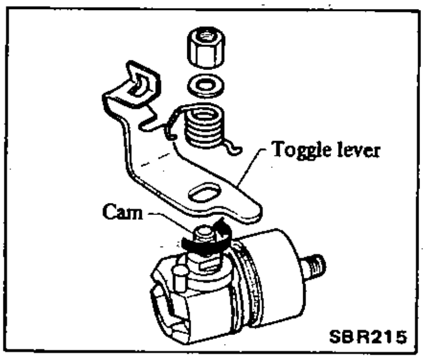
SBR048

3. Install spring seat, spring, spring cover and snap ring A with suitable press and drift.



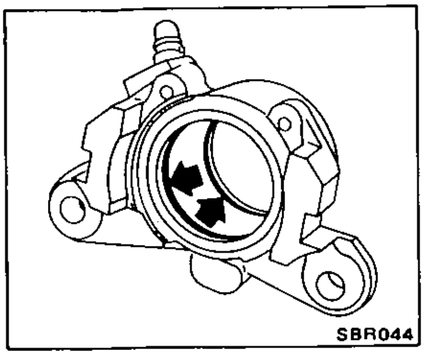
SBR235

4. When installing parking brake toggle lever after assembling piston, turn cam in direction parking brake operates.

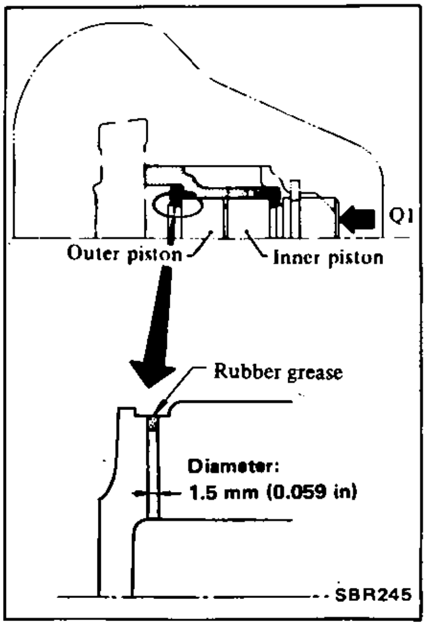


SBR215

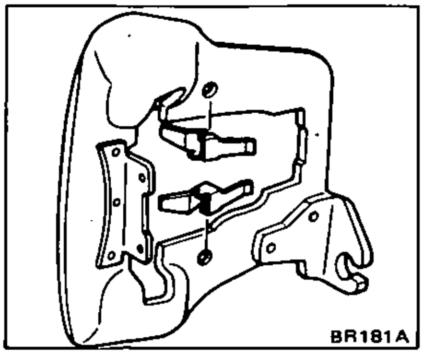
5. Apply rubber grease or brake fluid to seal grooves and seals.
6. Install piston seals.



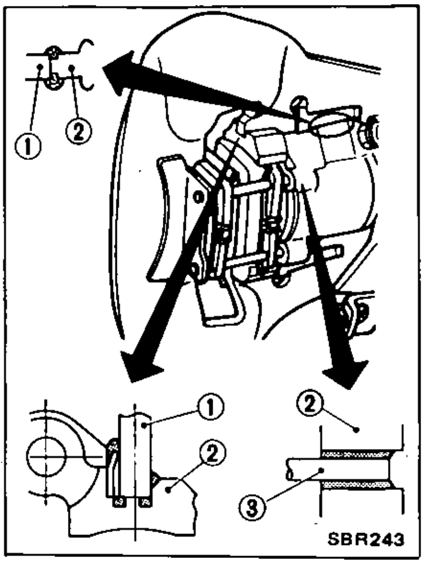
7. Apply rubber grease or brake fluid to sliding portions.
8. Apply rubber grease to one hole [Diameter: 1.5 mm (0.059 in)] of outer piston as the figure shows. Then, insert piston assembly **in direction of arrow Q1.**



9. Install dust seals and clamp securely with retaining rings.
10. Install yoke spring.



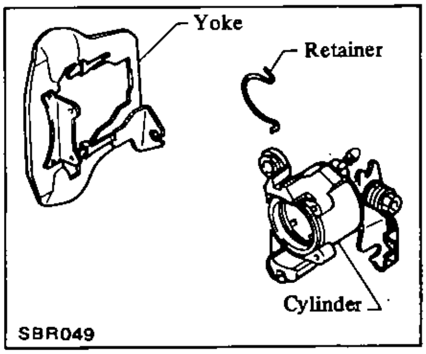
11. Coat the following points with silicone based grease.
- Frictional surfaces of yoke and cylinder body
- Cylinder body pad pin hole



▨ : Silicone based greasing point

1 Yoke	3 Pad pin
2 Cylinder body	

12. Assemble yoke and cylinder with retainer.



13. Install pads. Refer to Pad Replacement for installation.

INSTALLATION

Ⓣ : **Caliper fixing bolt**
38 - 52 N·m
(3.9 - 5.3 kg-m,
28 - 38 ft-lb)

After installation, depress brake pedal few times to properly adjust brake pad-to-rotor clearance, and check for oil leakage. When brake pedal stroke is constant, brake pad-to-rotor clearance is properly adjusted. It will be automatically adjusted by depressing brake pedal.

REAR DISC ROTOR

REMOVAL AND INSTALLATION

Remove caliper and rotor can be taken out.

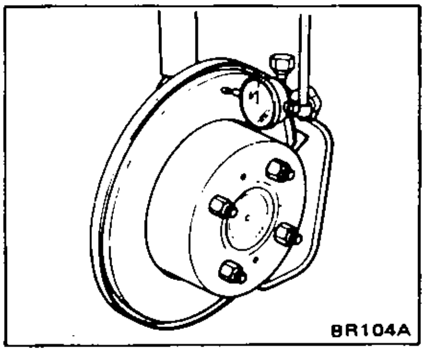
INSPECTION

1. Sliding surface

If there are cracks or considerable chips, repair or replace.

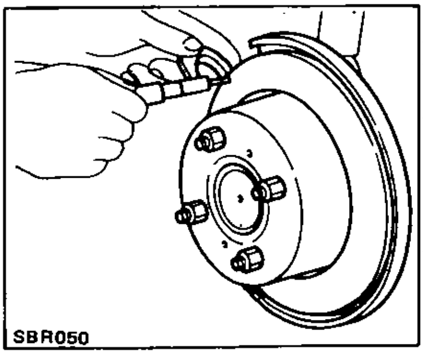
2. Runout

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. Parallelism

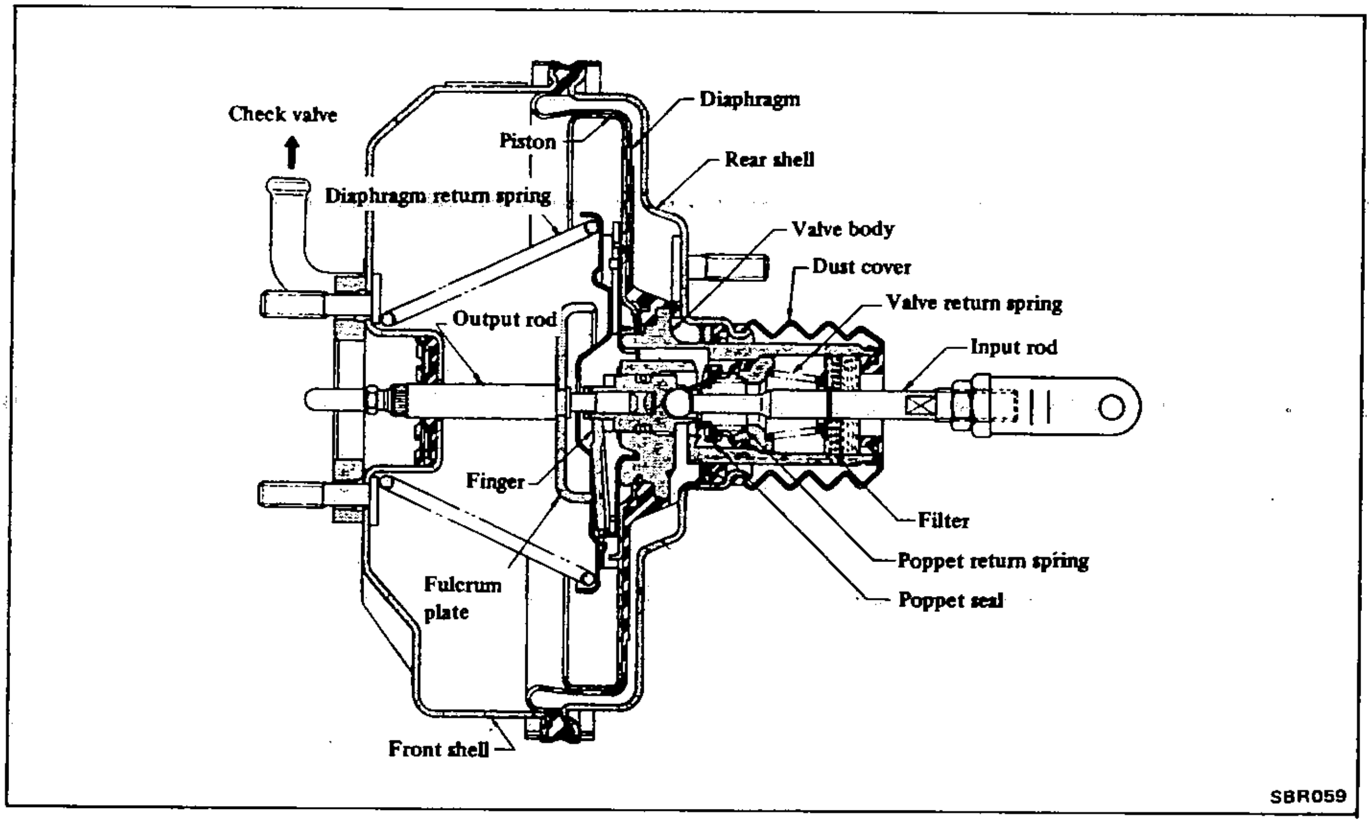


Rotor repair limit:
Maximum parallelism
(Circumferential direction):
0.07 mm (0.0028 in)

4. Thickness

Standard thickness:
9.6 mm (0.378 in)
Rotor repair limit:
Minimum thickness:
8.6 mm (0.339 in)

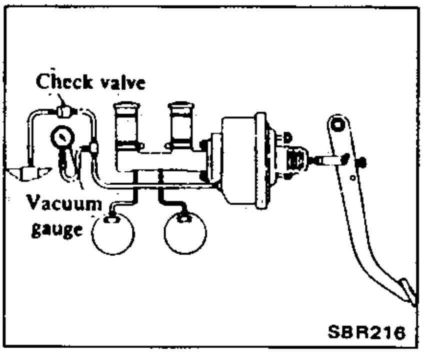
BRAKE BOOSTER



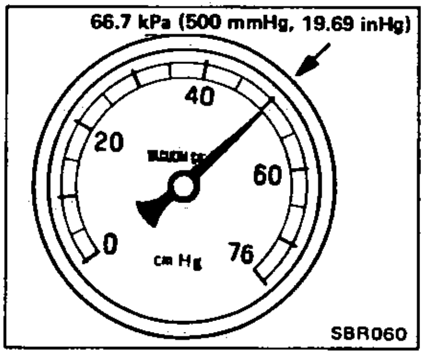
INSPECTION

Air tight test (No load)

1. Connect a vacuum gauge between check valve and brake booster.



2. Start engine and increase engine speed. Stop engine when vacuum is 66.7 kPa (500 mmHg, 19.69 inHg).



3. If vacuum pressure drops more than the specified value, correct the cause in accordance with the following chart.

Maximum vacuum leakage
(15 seconds after engine is stopped):
3.3 kPa
(25 mmHg, 0.98 inHg)

Probable cause	Corrective action
Air leakage at check valve.	Inspect check valve.
Air leakage at output rod seal.	Replace brake booster as an assembly.
Air leakage between valve body and seal.	
Air leakage at valve plunger seat.	
Damaged piping or joints.	Repair or replace.

Air tight test (Under load)

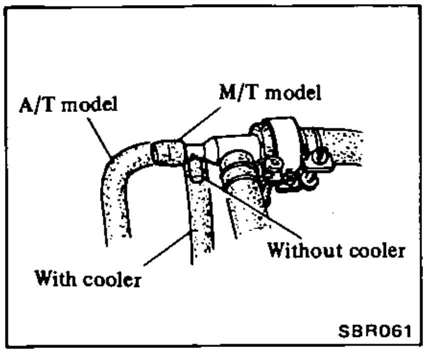
Keep brake pedal fully depressed. Following procedures are same as for no-load conditions.

Maximum vacuum leakage
(15 seconds after engine is stopped):
3.3 kPa
(25 mmHg, 0.98 inHg)

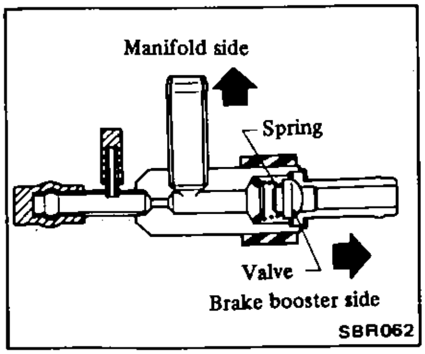
Probable cause	Corrective action
Air leakage at check valve.	Inspect check valve.
Damaged diaphragm.	Replace brake booster as an assembly.
Air leakage at poppet assembly seat and valve body.	

Check valve

1. Remove check valve.



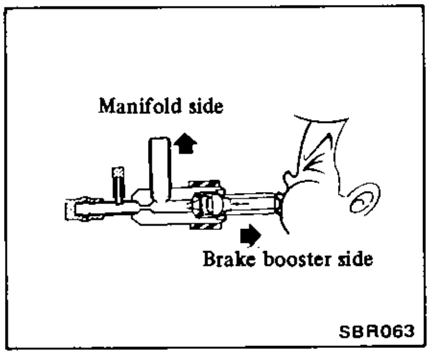
2. Apply a vacuum pressure of 26.7 kPa (200 mmHg, 7.87 inHg) to the port of check valve on the brake booster side.



3. If vacuum pressure drops more than the specified value in 15 seconds, replace check valve with a new one.

Maximum vacuum leakage of check valve:
1.3 kPa
(10 mmHg, 0.39 inHg)

4. When pressure is applied to the brake booster side of check valve and valve does not open, replace check valve with a new one.



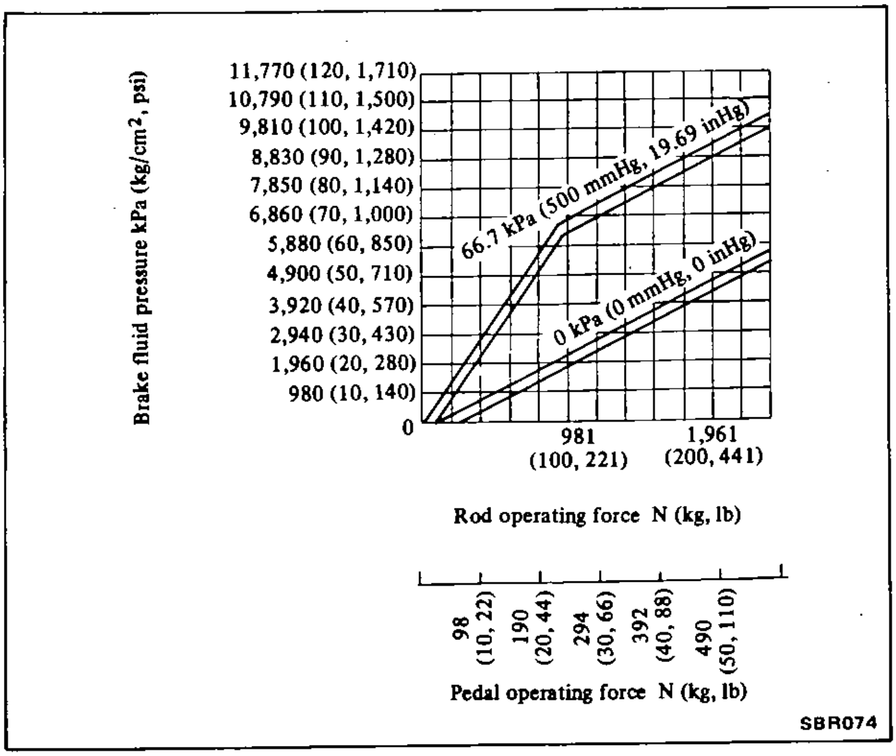
Operating test

1. Connect an oil pressure gauge to brake line, at connection on master cylinder.
2. Install a pedal force gauge on brake pedal.
3. Start engine, and increase engine speed until a vacuum pressure of 66.7 kPa (500 mmHg, 19.69 inHg) is registered on vacuum pressure gauge. With a steady vacuum pressure of 66.7 kPa (500 mmHg, 19.69 inHg), measure oil pressure with respect to each pedal operating force.

Relationship between oil pressure and pedal operating force is illustrated in Fig. If test results are not as specified, check brake booster for condition in manner described under "Inspection" before removal of this unit.

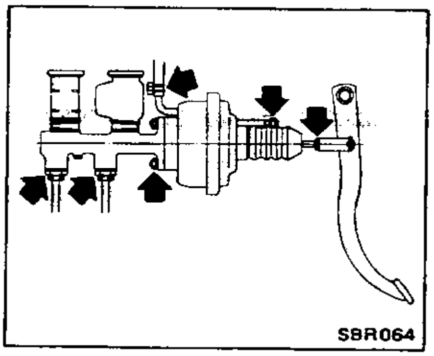
Also check brake line for evidence of fluid leakage.

Determine whether source of problem is in brake booster or check valve. Before you reach a final conclusion, always inspect check valve first.



REMOVAL

To remove brake booster, detach the following points.



SBR064

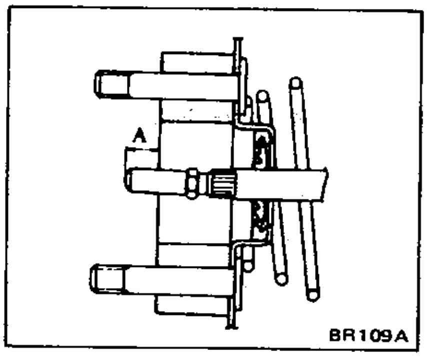
ADJUSTMENT

Output rod length

PV servo cannot be adjusted as output rod thread portion is secured by adhesion.

1. Check length.

Length "A":
9.75 - 10.00 mm (0.384 - 0.394 in)



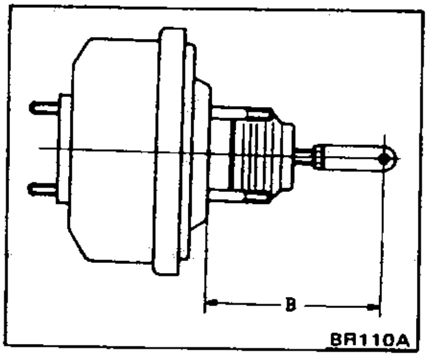
BR109A

2. If length is not within specifications, replace brake booster assembly.

Input rod length

Adjust length by turning clevis.

Length "B":
130 mm (5.12 in)

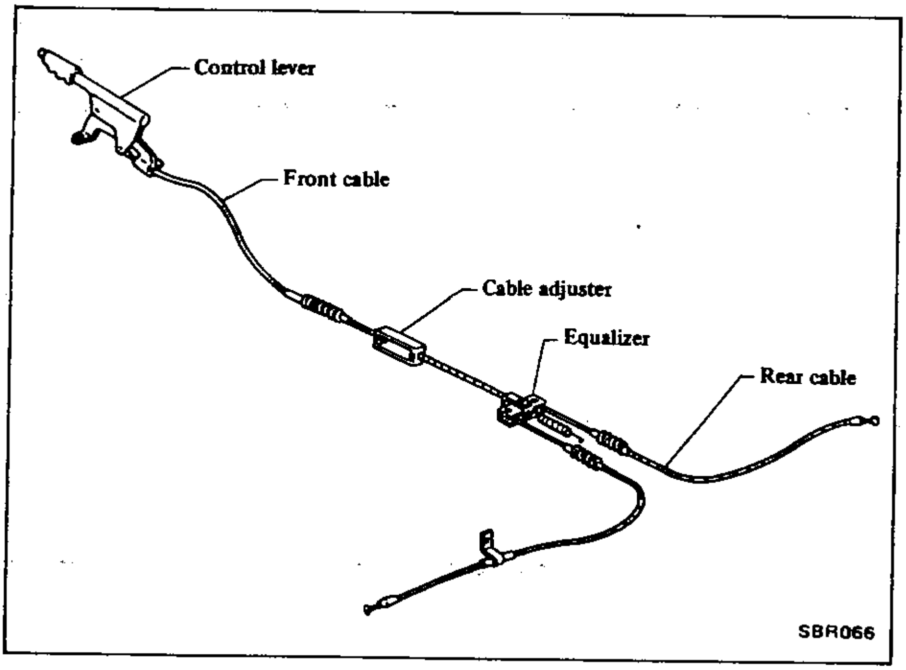


BR110A

INSTALLATION

Ⓣ : Master cylinder to brake booster
7.8 - 10.8 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Brake booster to body
7.8 - 10.8 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Input rod lock nut
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

PARKING BRAKE



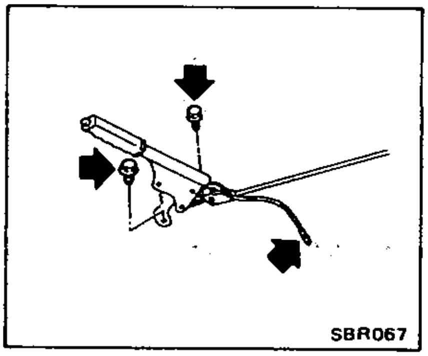
SBR066

PARKING BRAKE

REMOVAL

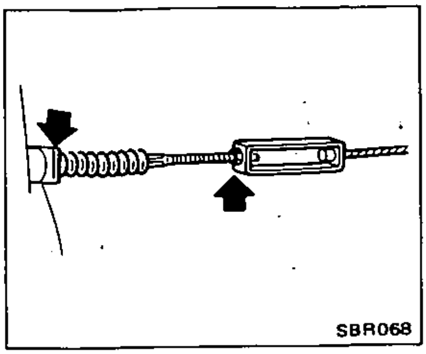
Control lever and front cable

1. Remove console box.
   Disconnect harness connector. Remove control lever.

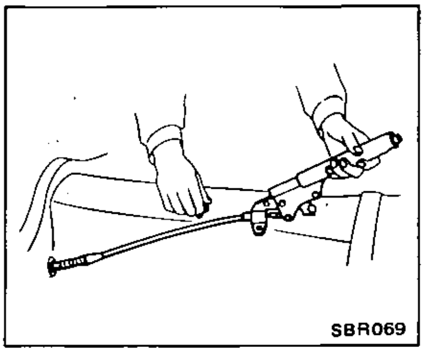


SBR067

2. Remove grommet rubber and lock plate. Disconnect cable adjuster.


SBR068

3. Pull front cable out into driver's compartment.


SBR069

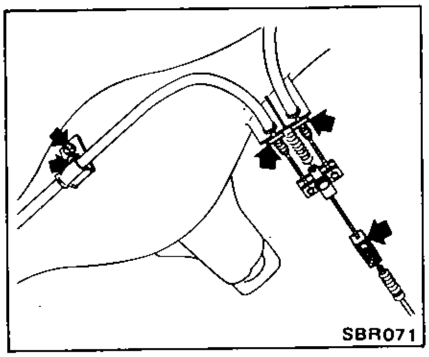
4. If necessary, separate front cable from parking brake lever by breaking pin and replace front cable.

CAUTION:
Be careful not to deform or damage control lever.

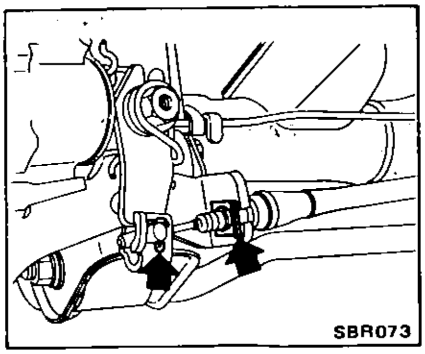
Front cable, clevis pin and cotter pin are available as service parts.

Rear cable

1. Disconnect cable adjuster.
   Remove lock plate and strap or cable clamp.


SBR071

2. Remove lock plate and disconnect rear cable from lever by removing cotter pin.


SBR073

INSPECTION

1. Check control lever for wear or other damage. Replace if necessary.
2. Replace worn or fatigued springs.
3. Check wires for discontinuity or deterioration. Replace if necessary.
4. Replace malfunctioning warning light or switch.
5. Check parts at each connection and, if found deformed or damaged, replace.

INSTALLATION

When installing front cable to lever, use specified clevis pin and cotter pin.

1. Apply a coat of grease to sliding contact surfaces.
2. Adjust parking brake system after installation is completed. Refer to Section MA for adjustment.

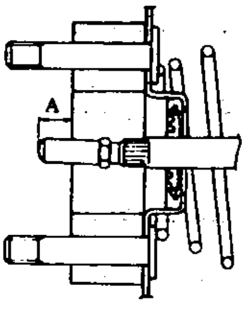
SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

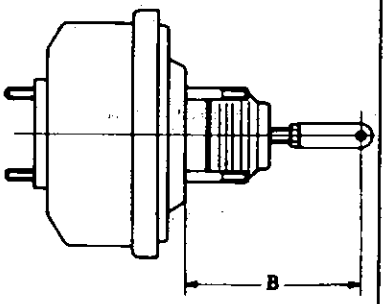
Front	Type	Disc-N22
	Cylinder inner dia. mm (in)	53.98 (2-1/8)
	Pad mm (in) Width x thickness x length	52.9 x 9.7 x 76.2 (2.083 x 0.382 x 3.000)
	Rotor outer dia. mm (in)	253.5 (9.98)
Rear	Type	Disc-AN12H
	Cylinder inner dia. mm (in)	40.46 (1.5929)
	Pad mm (in) Width x thickness x length	42.0 x 10.3 x 56.8 (1.654 x 0.406 x 2.236)
	Rotor outer dia. mm (in)	269 (10.59)
Master cylinder inner dia. mm (in)		22.23 (7/8)
Brake booster type		P75
NP valve Split point kPa (kg/cm², psi) x reducing ratio		2,452 (25, 356) x 0.4

BRAKE BOOSTER

Maximum vacuum leakage (15 seconds after engine is stopped) kPa (mmHg, inHg)	3.3 (25, 0.98)
Output rod length "A" mm (in)	9.75 - 10.00 (0.3839 - 0.3937)
Input rod length "B" mm (in)	130 (5.12)



BR109A



BR110A

INSPECTION AND ADJUSTMENT

BRAKE PEDAL

Unit mm (in)

Pedal play "a"	1 - 5 (0.04 - 0.20)
Depressed height "d"	More than 60 (2.36)
Pedal height "h"	155 - 161 (6.10 - 6.34)

PARKING BRAKE

Pulling force N (kg, lb)	196 (20, 44)
Number of notches	7 - 8
Stroke mm (in)	90 - 100 (3.54 - 3.94)

MASTER CYLINDER

Allowable clearance between cylinder and piston mm (in)	Less than 0.15 (0.0059)

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)

DISC BRAKE

Unit: mm (in)

Type / Item	N22	AN12H
Pad wear limit Minimum thickness	2.0 (0.079)	1.6 (0.063)
Rotor repair limit Maximum runout	0.12 (0.0047)	0.15 (0.0059)
Maximum parallelism	0.07 (0.0028)	
Minimum thickness	10.5 (0.413)	8.6 (0.339)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
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	6.9 - 8.8	0.7 - 0.9	5.1 - 6.5
Fulcrum pin fixing bolt	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Brake booster to body	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Flange to shell cover	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Master cylinder to brake booster	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Front disc caliper fixing bolt	72 - 97	7.3 - 9.9	53 - 72
Front disc rotor fixing bolt	38 - 52	3.9 - 5.3	28 - 38
Rear disc caliper fixing bolt	38 - 52	3.9 - 5.3	28 - 38
Baffle plate fixing bolt	22 - 26	2.2 - 2.7	16 - 20
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
3-way connector bolt	17 - 20	1.7 - 2.0	12 - 14
NP valve to body	3.9 - 4.9	0.4 - 0.5	2.9 - 3.6

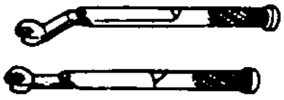
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Excessive pedal travel	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary. Test for source of leakage by examining all lines and connections.
	Leakage in master cylinder.	Overhaul master cylinder.
	Deteriorated check valve.	Replace check valve and bleed system.
	Air in system.	Bleed system.
	Faulty brake adjustment.	Adjust pad-to-rotor clearance. Inspect auto-adjuster operation.
	Excessive lateral play on disc caused by loose or worn wheel bearings or steering parts.	Replace or adjust faulty parts.
Spongy pedal	Low fluid level in master cylinder.	Top with fluid and inspect for leakage.
	Air in system.	Correct as necessary.
	Faulty brake adjustment.	Adjust pad-to-rotor clearance. Inspect auto-adjuster operation.
	Reservoir filler cap vent hole clogged.	Clean and bleed system.
	Swollen hose due to deterioration or use of poor quality hose.	Replace hose and bleed system.
	Distorted brake shoes, or excessively worn or cracked brake drum.	Replace faulty parts.
	Soft or swollen caliper seals.	Drain hydraulic system, flush with alcohol and replace all seals.
	Use of a brake fluid with too low boiling point.	Replace with specified brake fluid and bleed system.
Poor braking effect	Fluid leakage in brake lines.	Check master cylinder, piping and caliper for leaks, and repair.
	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary.
	Air in brake lines.	Bleed system.
	Grease, oil, mud or water on pads.	Clean brake mechanism and check for cause of problem. Replace pads.
	Deterioration of pads.	Replace.
	Local fit of pads.	Shave or replace.
	Pads excessively worn.	Replace.
	Master cylinder or caliper assembly in poor conditions.	Repair or replace.
	Frozen or seized caliper pistons on disc brakes.	Disassemble caliper and free up as required
	Binding mechanical linkage at brake pedal.	Free up as required.

Condition	Probable cause	Corrective action
Unbalanced brakes	Improper tire inflation.	Inflate to correct pressure.
	Improper auto adjustment of pad-to-rotor clearance.	Readjust.
	Grease, oil, mud or water on pads.	Clean brake mechanism and check for cause of problem. Replace pads.
	Mud in rotor.	Clean.
	Deterioration of pads.	Replace.
	Excessive wear of pads.	Replace.
	Caliper cylinder in poor condition.	Repair or replace.
	Looseness of caliper assembly securing bolts.	Fasten or replace.
	Scored or out-of-round rotor.	Recondition or replace rotor as required. Check for improper pad contact with rotor and grind pad if necessary.
	Incorrect adjustment of wheel bearings.	Adjust or replace.
	Incorrect adjustment of wheel alignment.	Adjust.
Brakes fade	Brake fluid has too low boiling point.	Drain and fill system with approved fluid.
	Use of improper pads.	Replace.
	Brake rotor is out-of-round.	Repair or replace as necessary.
	Hydraulic connections, master cylinder and caliper cylinders are corroded or damaged.	Repair as necessary.
	Bleed screw is open.	Close screw and bleed system.
Brakes drag	Pedal linkage is binding or output rod adjustment is too long.	Lubricate linkage, check pedal return spring for condition and adjust output rod as necessary.
	Master cylinder compensator part is obstructed.	Blow out foreign matter with compressed air.
	Seized master cylinder piston.	Disassemble master cylinder and replace piston. Bleed system.
	Poor pad condition.	Clean and repair.
	Poor caliper cylinder condition.	Repair or replace.
	Deformation of piston cups.	Replace.
	Poor condition of caliper because of faulty piston seals.	Replace piston seals.
	Excessive runout of rotor.	Turn rotor on lathe or replace.
	Hand brake will not return.	Check and repair.
	Clogged master cylinder return port.	Clean.
	Clogged brake lines.	Check and clean.
	Incorrect adjustment of wheel bearings.	Adjust or repair.
	Improper pad-to-rotor clearance.	Adjust.
	No free travel in brake pad return.	Adjust pedal height.

Condition	Probable cause	Corrective action
Brake chatters	Groove or out-of-round rotor.	Grind or replace as required.
	Loose or bent support plate.	Tighten support plate bolts to specified torque, or replace plate.
	Distorted pads.	Replace as necessary.
	Grease or brake fluid on pads.	Replace pads.
Brake squeals	Dirty or scored rotor.	Blow out assembly with compressed air or refinish rotor.
	Bend support plate.	Replace faulty unit.
	Glazed or contaminated pads.	Grind pad to eliminate glaze. If it doesn't, replace pad.
Pedal pulsates	Lateral runout of brake rotor is excessive.	Check with dial indicator, turning disc by hand. If runout exceeds specifications, repair or replace disc.
	Excessive variation in thickness of brake rotor surfaces.	Measure around disc face with micrometer. Replace disc as required.
Rear lock (under light brake pedal force)	Improper tire pressures.	Check and adjust.
	Excessive wear of tires.	Check and replace.
	Faulty NP valve.	Replace.
Rear lock (under heavy brake pedal force)	Improper tire pressures.	Check and adjust.
	Excessive wear of tires.	Check and replace.
	Poor front braking effect.	
	• Grease oil, mud or water on pads.	Clean or replace.
	• Excessive wear pads.	Replace.
	• Local fit pads.	Shave or replace.
	• Master cylinder or caliper cylinder in poor condition.	Repair or replace.

SPECIAL SERVICE TOOL

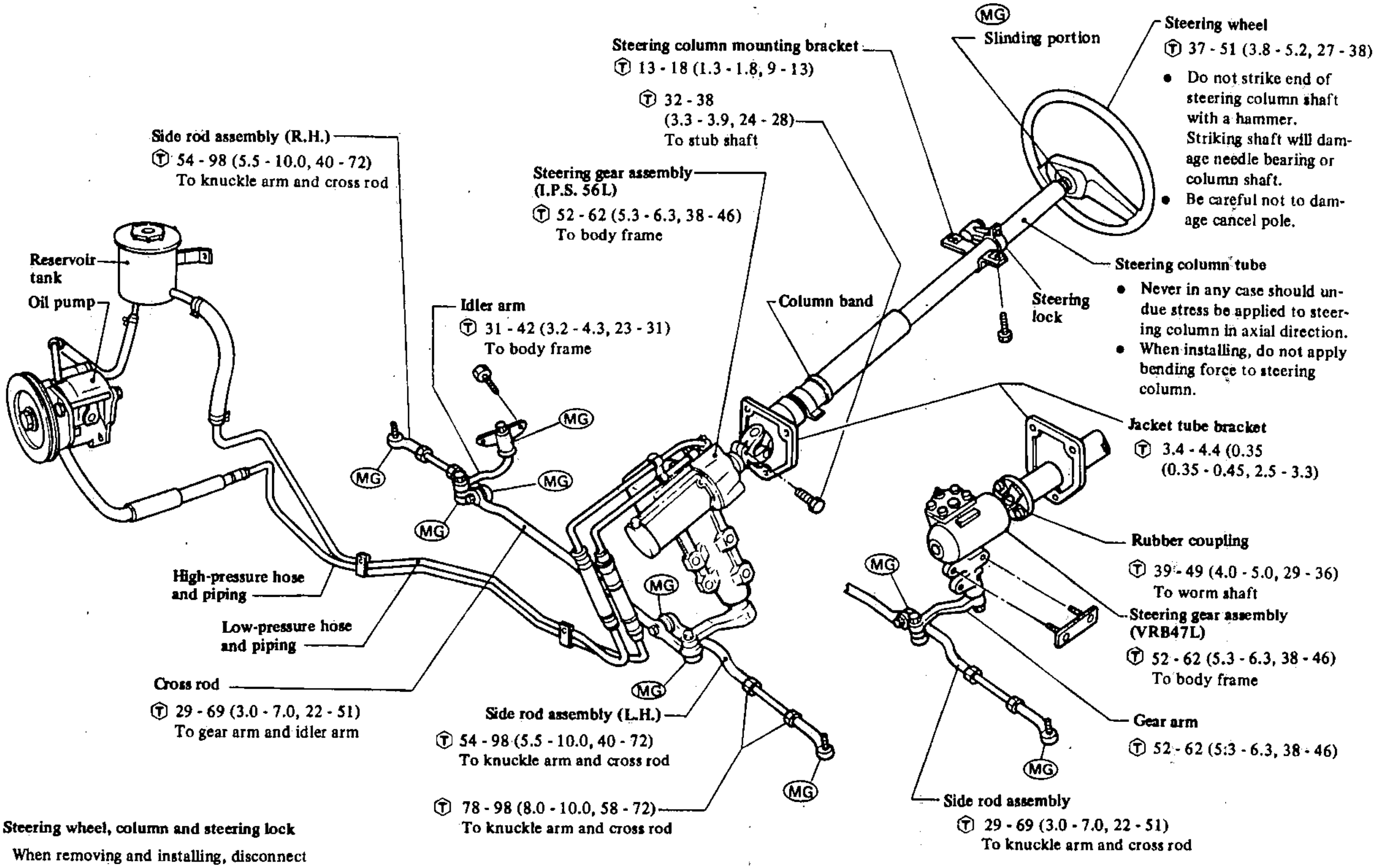
Tool number (Kent-Moore No.)	Tool name
GG94310000 (–)	Flare nut torque wrench 

SECTION ST

STEERING SYSTEM

CONTENTS

STEERING SYSTEM



Steering wheel:

- Do not strike end of steering column shaft with a hammer. Striking shaft will damage needle bearing or column shaft.
- Be careful not to damage cancel pole.

Steering column tube:

- Never in any case should undue stress be applied to steering column in axial direction.
- When installing, do not apply bending force to steering column.

Steering wheel, column and steering lock

When removing and installing, disconnect battery ground cable.

Each dust cover

When removing and installing, be careful not to damage dust cover.

Ⓣ : N·m (kg-m, ft-lb)
Ⓜ︎Ⓖ : Multi-purpose greasing points

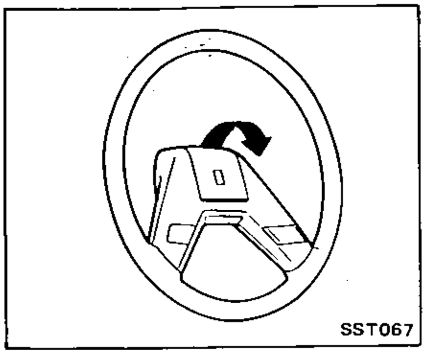
SST180

STEERING WHEEL AND COLUMN

STEERING WHEEL

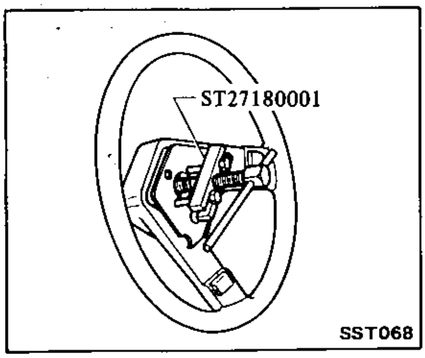
REMOVAL

1. Disconnect battery ground cable.
2. Remove horn pad and steering wheel nut.


SST067

3. Remove steering wheel using **Tool.**

CAUTION:
Do not strike end of steering column shaft with a hammer. Striking shaft will damage bearing or column shaft.

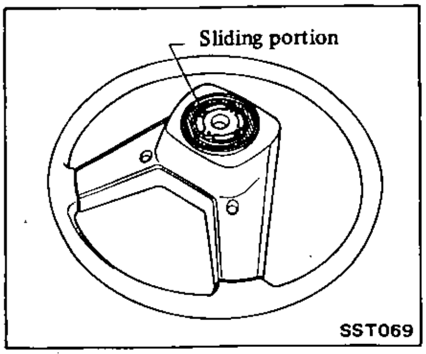


SST068

INSTALLATION

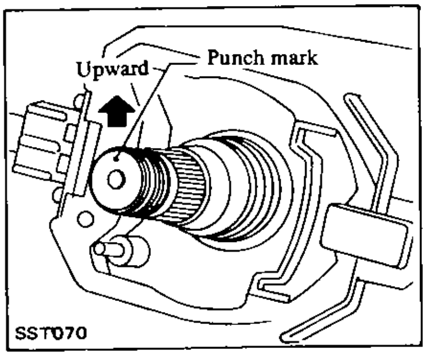
Install steering wheel in the reverse order of removal. Observe the following instructions.

1. Apply grease to sliding portions.



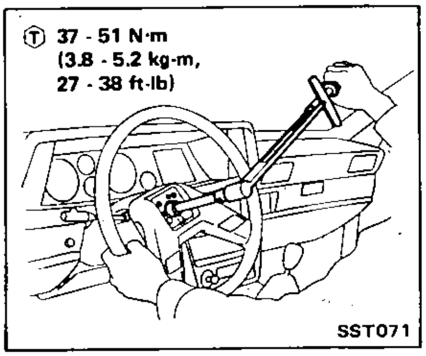
SST069

2. Install steering wheel **on column shaft in a straight-ahead position.**



SST070

3. Tighten steering wheel nut.


Ⓣ 37 - 51 N·m
(3.8 - 5.2 kg-m,
27 - 38 ft-lb)

SST071

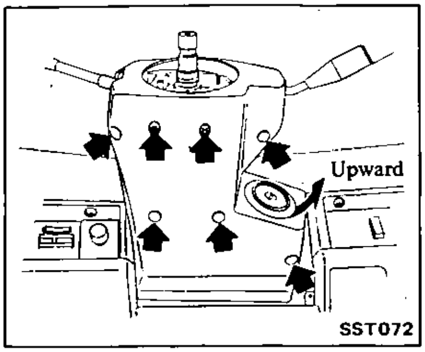
4. After installing steering wheel, **turn it clockwise and counterclockwise, checking for catch or drag. Also check horn operation.**

STEERING LOCK

REMOVAL

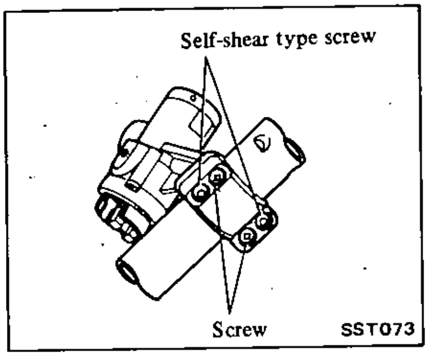
Before removing steering lock, disconnect battery ground cable.

1. Remove steering wheel using **Tool** ST27180001.
2. Remove steering column shell cover.



SST072

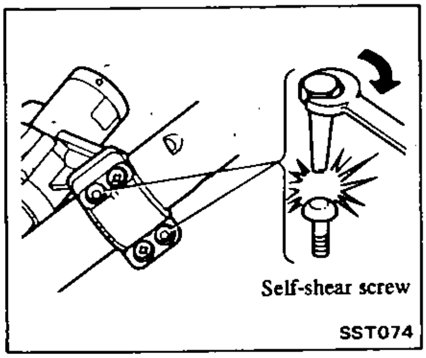
3. Break self-shear type screws **with a drill or other appropriate tool.**
4. Remove screws and disconnect steering lock.



SST073

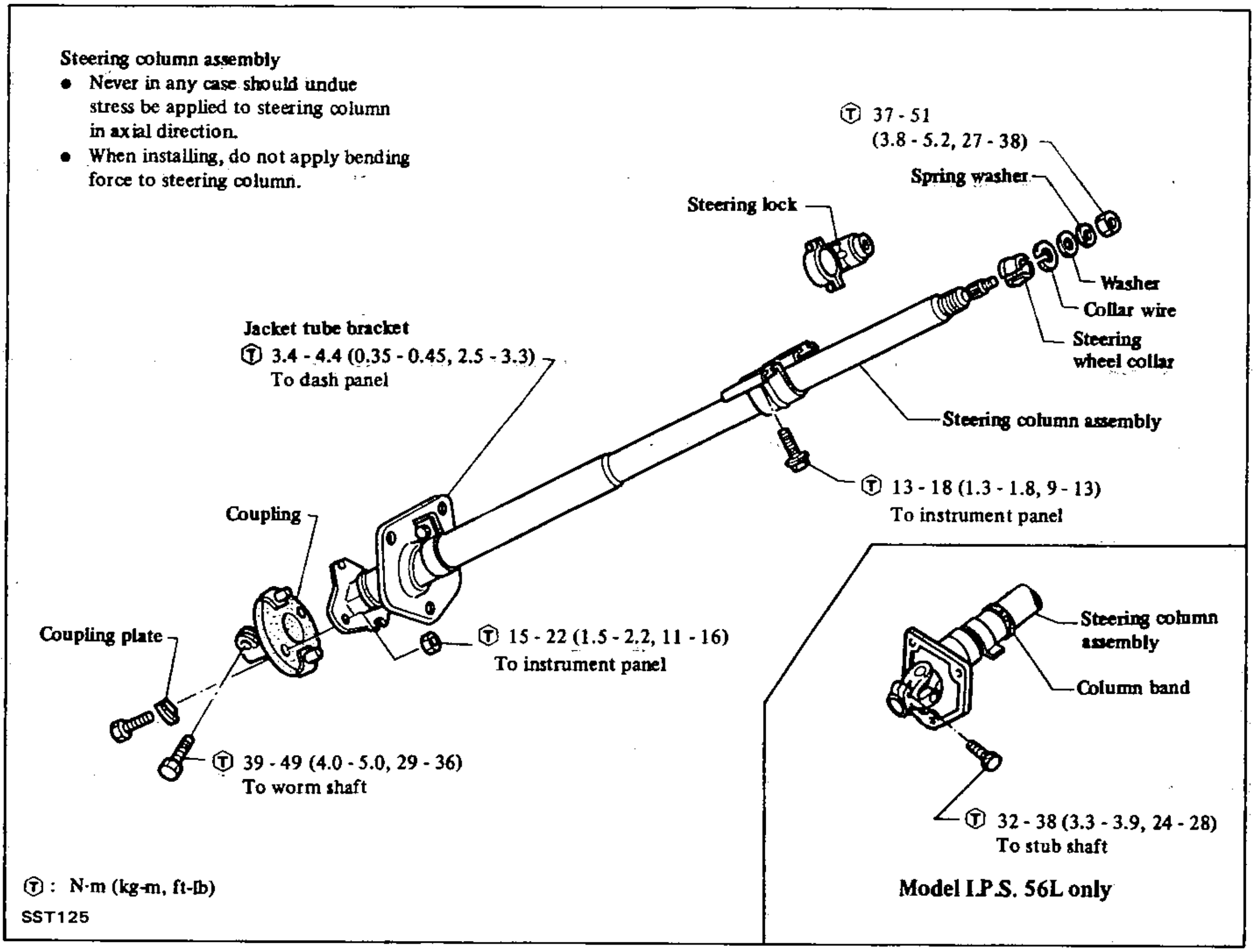
INSTALLATION

1. Align steering lock hole in steering column tube with mating portion of steering lock..
2. Install screws and self-shear type screws and then cut off self-shear type screw heads.



SST074

STEERING COLUMN (Collapsible type)



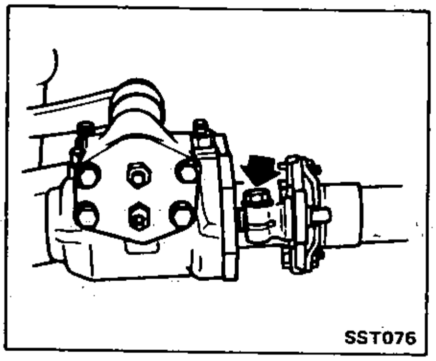
Steering column assembly
- Never in any case should undue stress be applied to steering column in axial direction.
- When installing, do not apply bending force to steering column.

Ⓣ : N·m (kg-m, ft-lb)

SST125

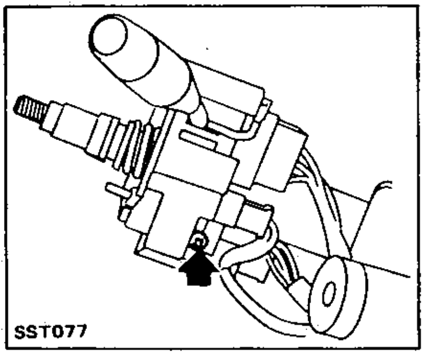
REMOVAL

1. Disconnect battery ground cable.
2. Remove bolt securing stub shaft or worm shaft and universal joint or rubber coupling.



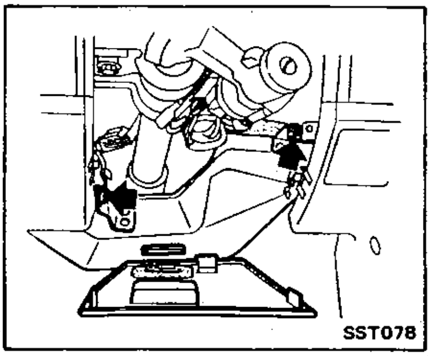
SST076

3. Remove steering wheel. **Refer to Steering Wheel.**
4. Remove steering column shell covers.
5. Remove combination switch assembly.



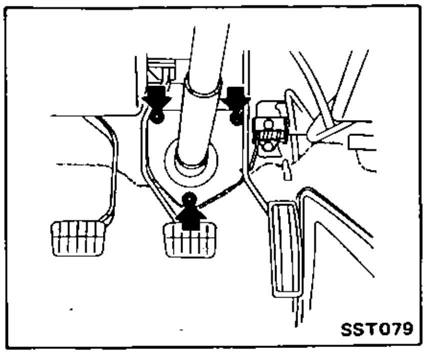
SST077

6. Remove heater duct from dash panel side.

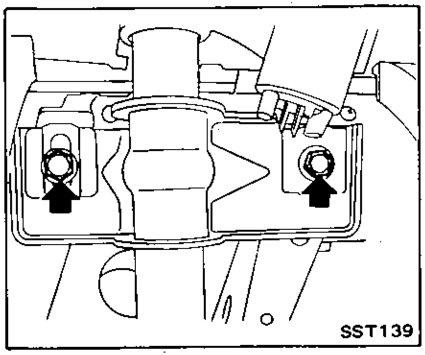


SST078

7. Remove jacket tube bracket from dash panel.



8. Remove column mounting bracket.

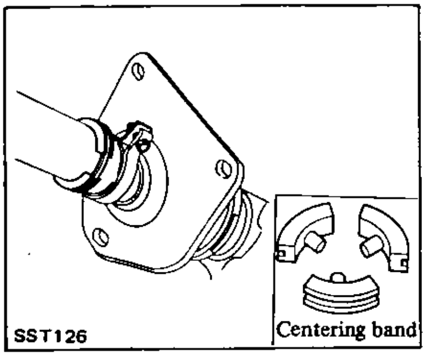


9. Draw out steering column assembly from room side.

INSTALLATION

Install steering column in reverse order of removal.

1. Remove column band and then install centering band. (I.P.S. 56L equipped model only).



2. Set wheels in a straight-ahead position.

3. Fit steering column assembly on to stub shaft or worm shaft.

Carefully install so that punch mark at top end of column shaft faces upward.

4. Tighten stub shaft or worm shaft securing bolts temporarily **to support upper side of steering column assembly.**

5. Tighten column mounting bracket temporarily.

6. After sliding jacket tube bracket to dash panel, tighten nuts to retain it.

Ⓣ : 3.4 - 4.4 N·m
(0.35 - 0.45 kg-m,
2.5 - 3.3 ft-lb)

7. Tighten stub shaft or worm shaft securing bolts and then tighten column mounting bracket securing bolts.

Ⓣ : Worm shaft to coupling
(Model VRB47L)
39 - 49 N·m
(4.0 - 5.0 kg-m
29 - 36 ft-lb)
Stub shaft to universal joint
(Model I.P.S. 56L)
32 - 38 N·m
(3.3 - 3.9 kg-m,
24 - 28 ft-lb)
Column mounting bracket
13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)

CAUTION:

a. Make sure that any undue stress is not applied to rubber coupling.

b. To avoid damaging bolt or serrations, align groove in stub shaft or worm shaft with bolt hole in rubber coupling.

---

9. Remove centering band and then install column band. (I.P.S. 56L equipped model only).

10. 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.

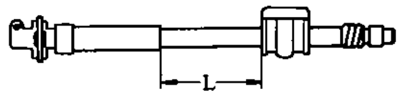
(3) Check column spring, and replace if damaged or weakened.

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.



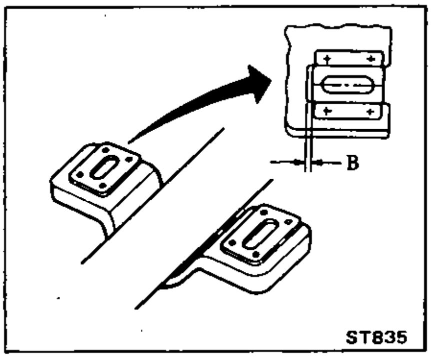
Column length "L":
Model VRB47L
179 mm (7.05 in)
Model I.P.S. 56L
180 mm (7.09 in)

(2) Column mounting bracket

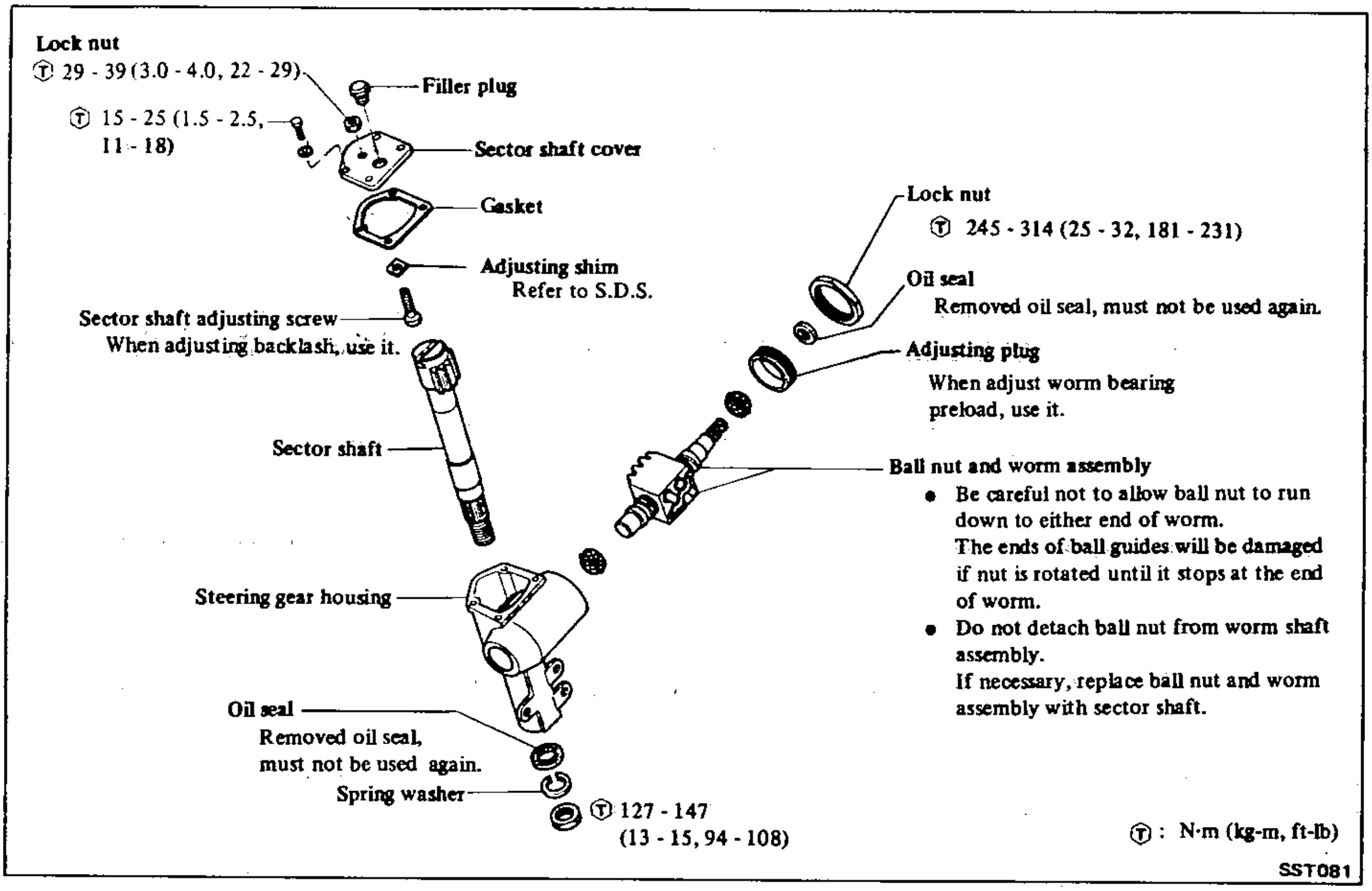
Make sure column mounting bracket touches block.

Standard "B" dimension is 0 mm (0 in).

When jacket is crushed, dimension B is increased.



STEERING GEAR (Model : VRB47L)

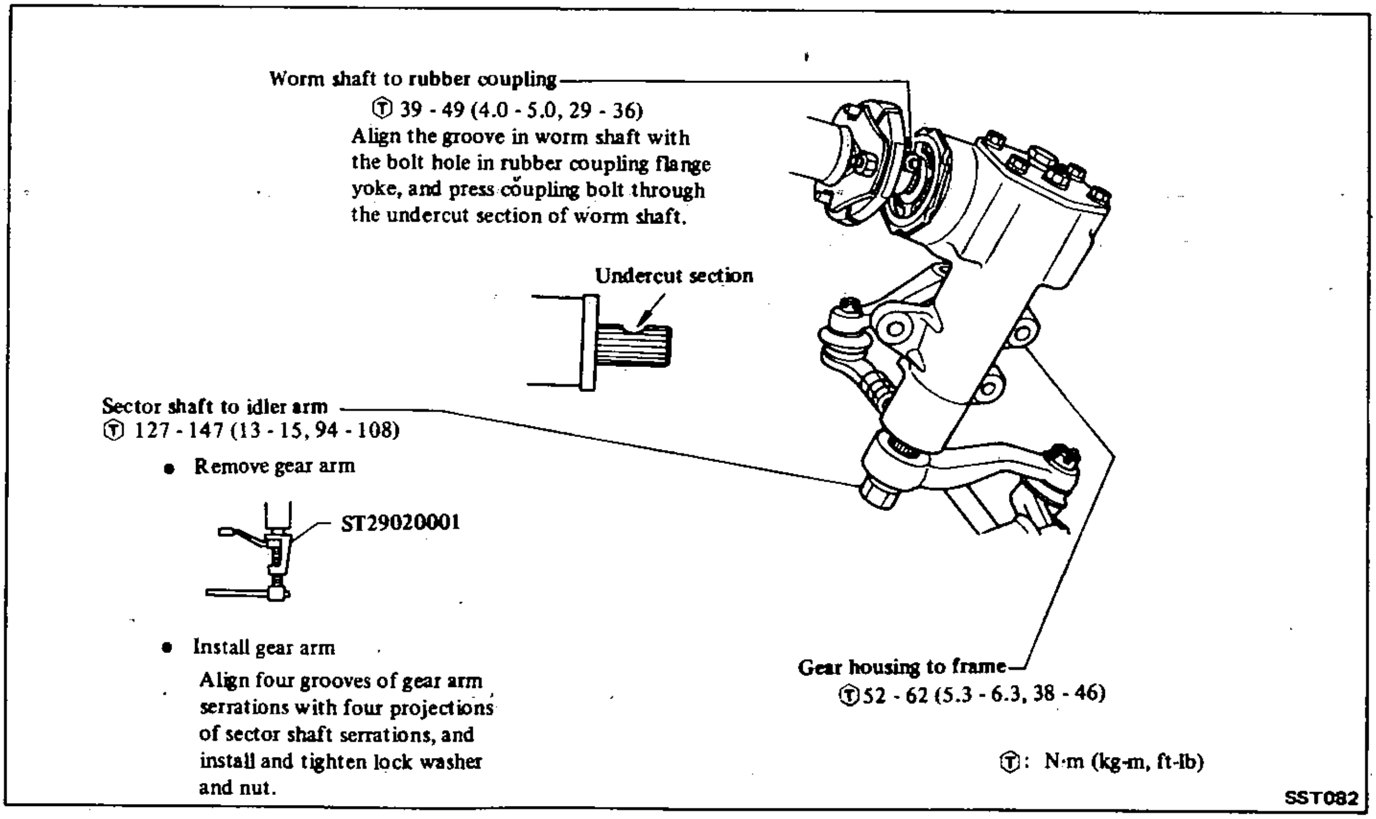


Ball nut and worm assembly

- Be careful not to allow ball nut to run down to either end of worm. The ends of ball guides will be damaged if nut is rotated until it stops at the end of worm.
- Do not detach ball nut from worm shaft assembly. If necessary, replace ball nut and worm assembly with sector shaft.

Ⓣ : N·m (kg-m, ft-lb)

REMOVAL AND INSTALLATION



Worm shaft to rubber coupling

Ⓣ 39 - 49 (4.0 - 5.0, 29 - 36)

Align the groove in worm shaft with the bolt hole in rubber coupling flange yoke, and press coupling bolt through the undercut section of worm shaft.

Sector shaft to idler arm

Ⓣ 127 - 147 (13 - 15, 94 - 108)

- Remove gear arm
- Install gear arm

  Align four grooves of gear arm serrations with four projections of sector shaft serrations, and install and tighten lock washer and nut.

Gear housing to frame

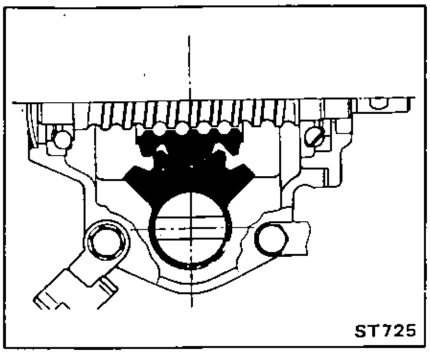
Ⓣ52 - 62 (5.3 - 6.3, 38 - 46)

Ⓣ: N·m (kg-m, ft-lb)

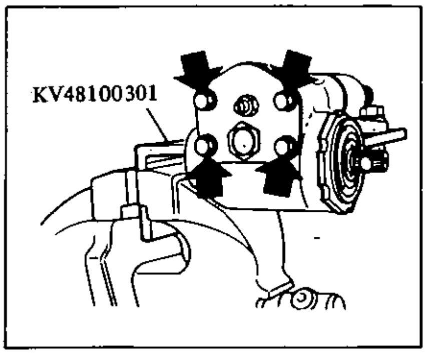
DISASSEMBLY

Before disassembling by hand, make sure external is clean and free from dust and dirt, and thoroughly drain gear fluid by removing filler plug.

1. Place steering gear in a vice using **Tool** KV48100301 in place.
2. Set worm gear in a straight-ahead position.


ST725

3. Remove sector shaft cover fixing bolts.

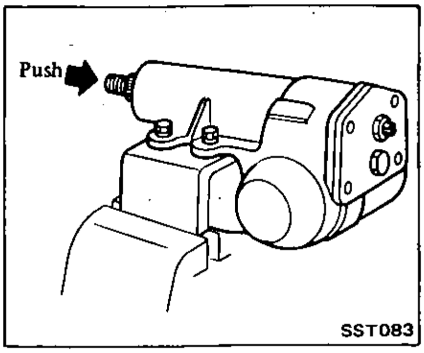


4. Remove sector shaft with sector shaft cover.

CAUTION:

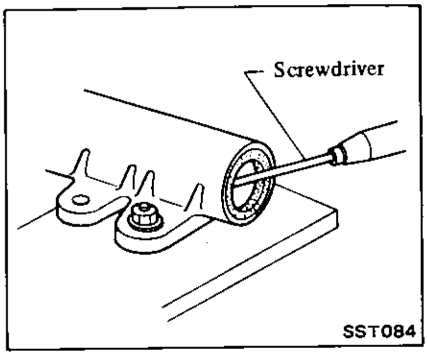
a. When pulling sector shaft out, be careful not to damage oil seal or associated parts.

b. Do not remove sector shaft needle bearings from steering gear housing. If necessary, replace gear housing assembly.



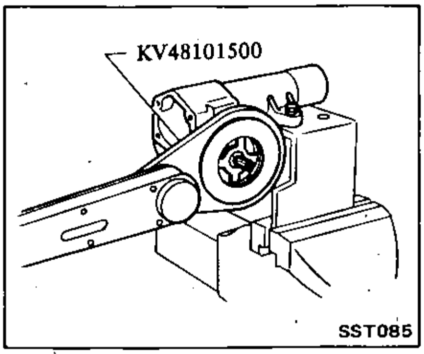
SST083

5. Remove sector shaft cover from sector shaft.
6. Remove sector shaft oil seal, **if necessary.**



SST084

7. Loosen adjusting plug lock nut using **Tool.**



SST085

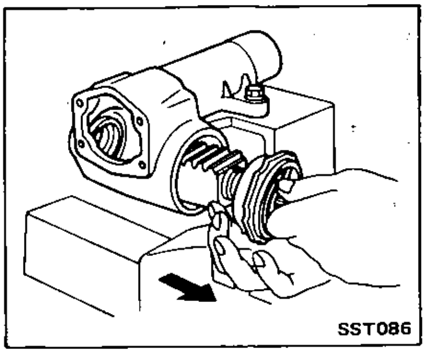
8. Draw out worm gear with worm bearing.

CAUTION:

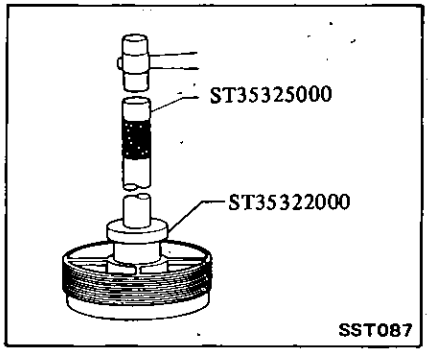
a. Be careful not to allow ball nut to run down to either end of worm. Ends of ball guides will be damaged if nut is rotated until it stops at end of worm.

b. Do not detach ball nut from worm shaft assembly. If necessary, replace entire unit as an assembly.

c. Do not remove sector shaft needle bearings from steering gear housing. If necessary, replace entire gear housing as an assembly.


SST086

9. Remove oil seal from adjusting plug using **Tool.**



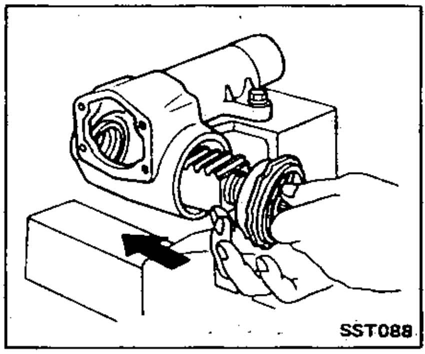
SST087

ASSEMBLY AND ADJUSTMENT

- **Before assembling and adjusting by hand, make sure each part is clean and lubricate with gear fluid.**
- **Fill space between sealing lips of new sector shaft and adjusting plug oil seals with recommended multi-purpose grease.**

Worm bearing preload

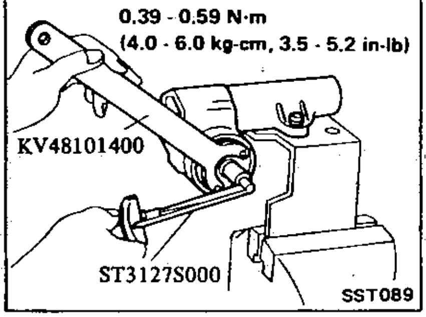
1. Fit worm gear assembly with worm bearing in gear housing.



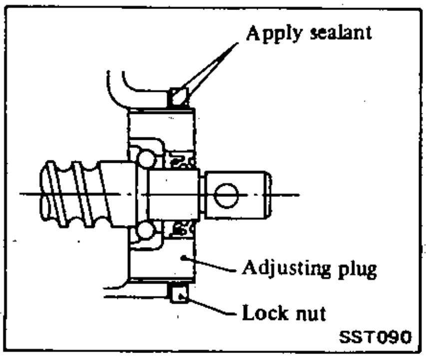
2. Install adjusting plug using **Tool** KV48101400.
3. Adjust worm bearing preload using **Tools.**

CAUTION:
Always adjust worm bearing preload by turning adjusting plug in "tighten" direction.

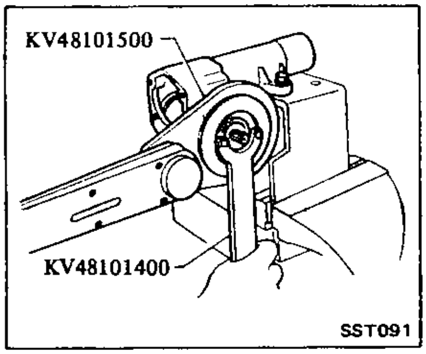
Rotate worm shaft a few turns in both directions to settle down worm bearing and measure preload.


Worm bearing preload (with oil seal):
0.39 - 0.59 N·m
(4.0 - 6.0 kg-cm, 3.5 - 5.2 in-lb)

4. Apply suitable liquid sealant around lock nut inner surface.



5. Tighten lock nut using **Tools.**

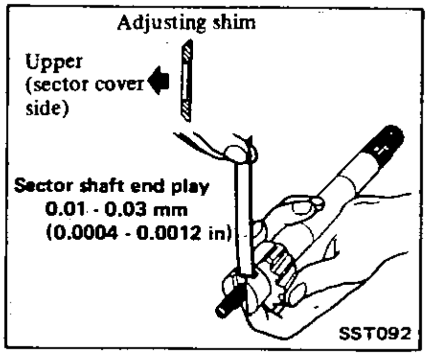


6. After tightening lock nut, check worm bearing preload to make sure it is within specification.

Sector shaft end play

Select suitable adjusting shim and adjust end play between sector shaft and adjusting screw.

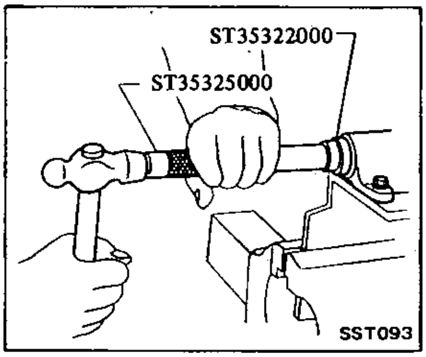
Sector shaft adjusting screw shims:
Refer to S.D.S.


Sector shaft end play
0.01 - 0.03 mm
(0.0004 - 0.0012 in)

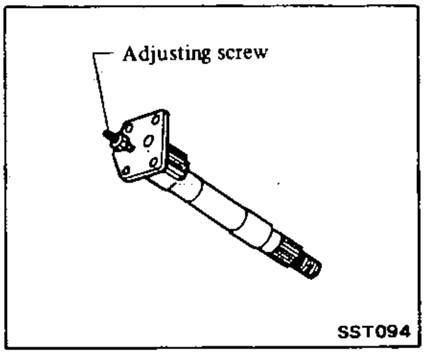
Steering gear preload

1. Press oil seal to steering gear housing using **Tool.**

Before pressing oil seal, coat seal contacting face of oil seal with gear fluid.

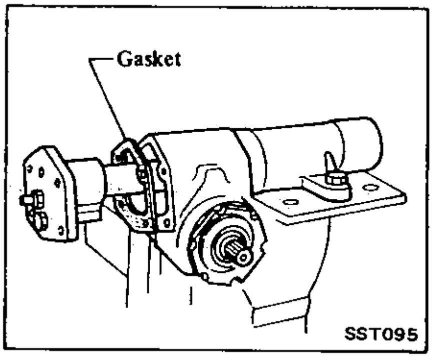


2. Install sector cover on adjusting screw with sector shaft.

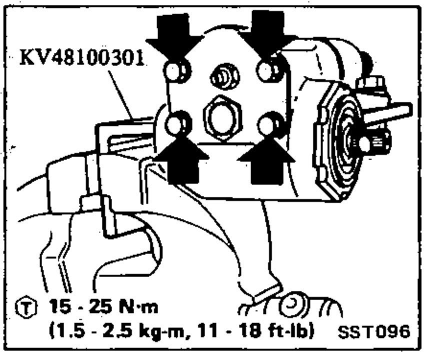


3. Set worm gear in a straight-ahead position.
4. Insert sector shaft and sector cover assembly with gasket into gear housing.

Carefully insert sector shaft in place, using care not to scratch oil seal.



5. Tighten sector cover to gear housing.


Ⓣ 15 - 25 N·m
(1.5 - 2.5 kg-m, 11 - 18 ft-lb)

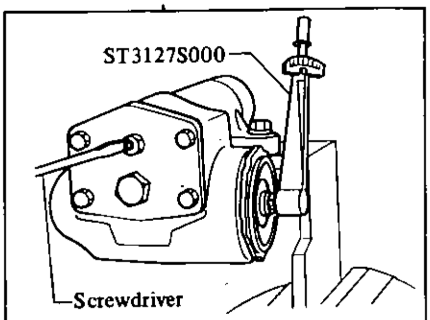
6. Pour recommended gear oil into assembly through filler hole and install filler plug.

Specified refill capacity:
Approximately 0.28 liter
(5/8 US pt, 1/2 Imp pt)

7. Tighten adjusting screw so that gear preload is within specification.

CAUTION:
Always adjust steering gear preload by turning adjusting screw in "tighten" direction.

Rotate worm gear a few turns in both directions to settle down steering gear and then measure steering gear preload in a straight-ahead position.



Steering gear total preload:
(with oil seal)
Less than 1.23 N·m (12.5 kg-cm 10.9 in-lb)
0.4 - 0.6 N·m
(4 - 6 kg-cm, 3.5 - 5.2 in-lb)
higher than at worm bearing preload.

SST097

8. If found to be outside of above steering gear preload specifications, readjust adjusting screw until correct steering gear preload is obtained.

INSPECTION

Wash clean all the disassembled parts in solvent and check for condition.

Sector shaft

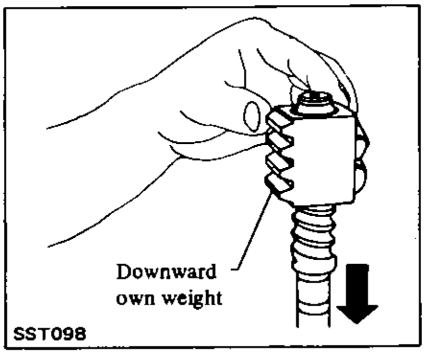
1. Check gear tooth surface for pitting, burrs, cracks or any other damage, and replace if necessary.
2. Check sector shaft for distortion on its serration, and replace if necessary. Also check gear housing for deformation.

Steering worm assembly

1. Inspect ball nut gear tooth surface, and replace if pitting, burrs, wear or any other damage is found.
2. Ball nut must rotate smoothly on worm gear. If found too tight, assembly should be replaced.

Check rotation of ball nut as follows:

(1) Move ball nut to either end of worm gear, and gradually stand worm shaft and ball nut assembly until ball nut moves downward on worm gear under its own weight.



SST098

(2) If ball nut does not move freely over entire stroke, replace assembly.

Be careful not to damage ball nut guide tube while check is being made.

CAUTION:
Be careful not to allow ball nut to run down to either end of worm.

Bearing

1. Inspect worm bearing for wear, pitting or any other damage. Replace as requried.

When replacing worm bearing, replace it as a set of bearing and outer race.

2. If sector shaft needle bearings are worn or damaged, replace as an assembly of gear housing and bearings.

Oil seals

Discard any oil seal which has once been removed. Replace oil seal if sealing lip is deformed or cracked. Also discard oil seal if spring is fatigued or dislocated.

POWER STEERING GEAR (Model : I.P.S. 56L) AND OIL PUMP

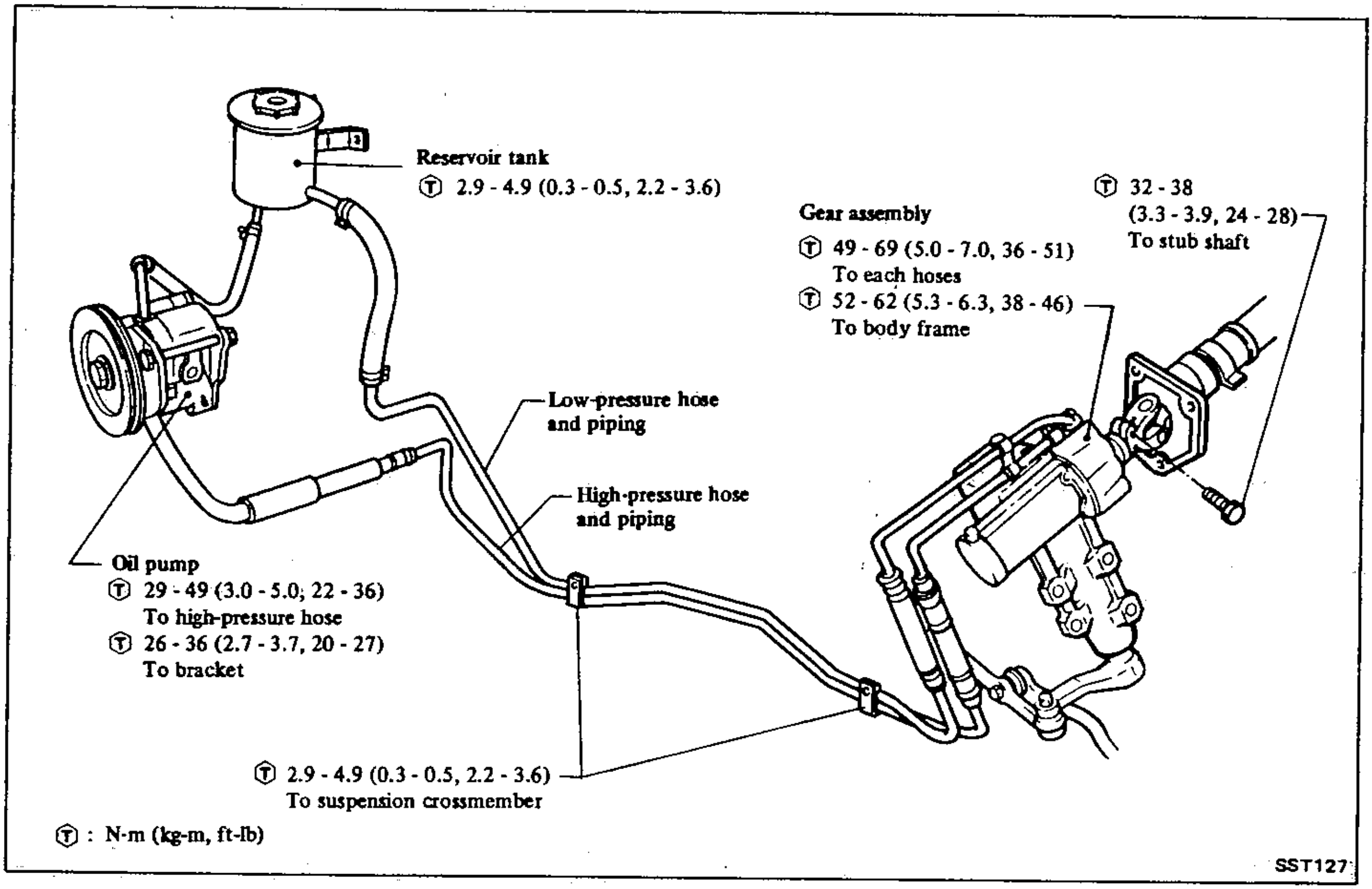
DESCRIPTION

Power steering system

The power steering gear is licensed by ZF company in West Germany.

The integral power steering unit is a gear housing into which a control valve (2-spool valve type) and power cylinder are built compactly. The major components are as follows:

- Oil pump
- Reservoir tank
- Power steering gear
- Oil piping



Power steering gear

The integral power steering gear is an accurate oil pressure mechanism. In disassembling it, be careful to keep dust, iron powder and other foreign particles out of the gear housing.

Only the sealing parts of the gear assembly can be replaced. The remaining parts must be replaced as an gear assembly.

CAUTION:

a. The parts which can be disassembled are strongly restricted, and never disassemble other parts than the specified ones. If parts not indicated in the manual are also disassembled, replace the assembly instead of reassembling those parts.

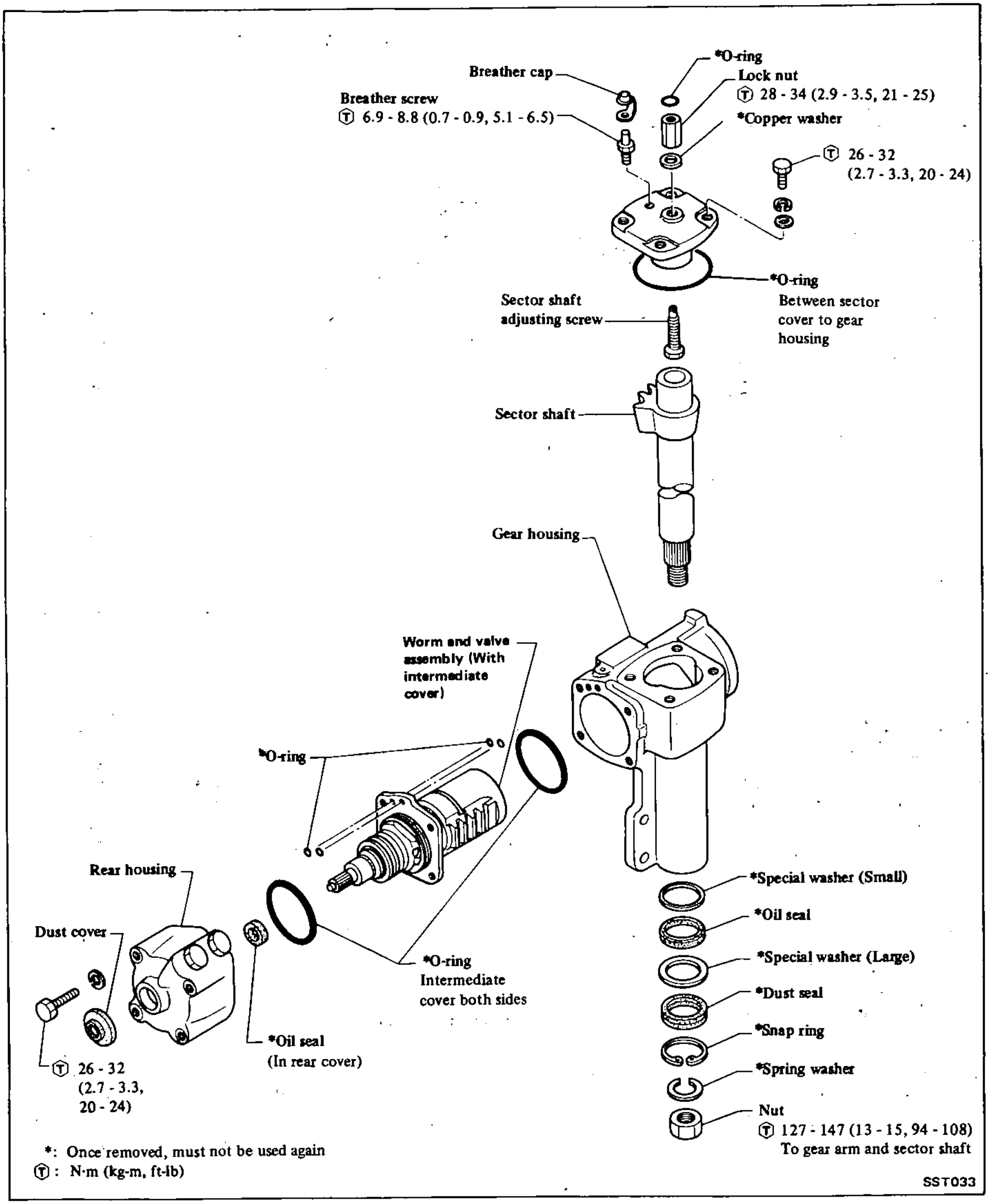
b. Disassembly of integral power steering gear should be performed in a place as clean as possible, although a dust preventing device is not required.

c. Should disassembly of integral power steering gear remain unfinished for any reason, indicate it as "Half Disassembled" and cover parts with a clean cover.

d. Hands should be cleaned immediately before disassembly.

e. Do not use a rag. Be sure to use nylon or paper cloth.

f. Be sure to follow procedures and cautions indicated in the Service Manual.



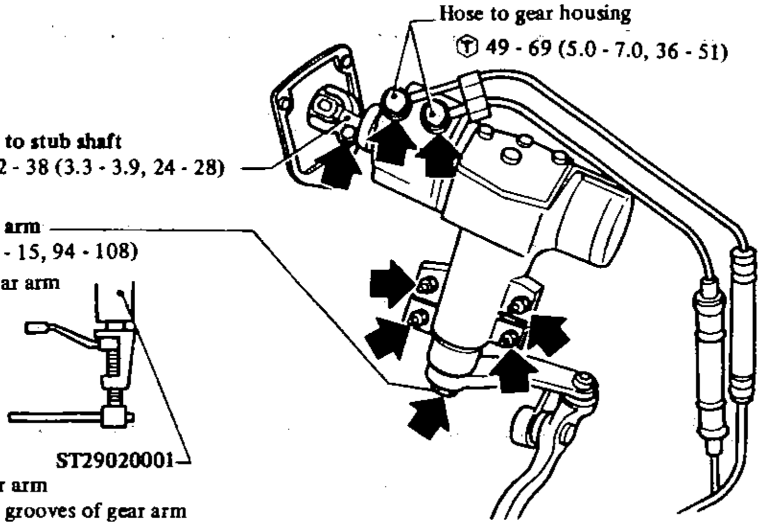
Oil pump and resevoir tank

Malfunctioning (Replace as an oil pump assembly).

REMOVAL

Before removing, clean exteriors of gear housing and oil pump with steam and dry with compressed air.

Steering gear



Hose to gear housing
Ⓣ 49 - 69 (5.0 - 7.0, 36 - 51)

Joint to stub shaft
Ⓣ 32 - 38 (3.3 - 3.9, 24 - 28)

Sector shaft to gear arm
Ⓣ 127 - 147 (13 - 15, 94 - 108)

- Remove gear arm
- Install gear arm
  Align four grooves of gear arm serrations with four projections of sector shaft serrations, and install and tighten lock washer and nut.

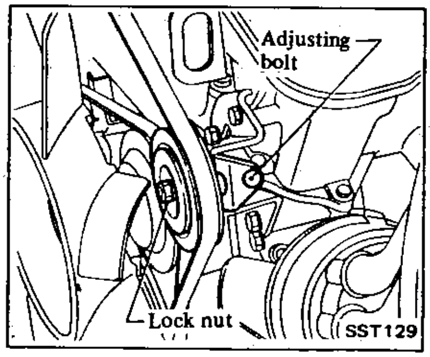
- Plug openings of gear housing, and securely locate hose connectors at a position higher than oil pump and cover with rag.
- Be extremely careful to prevent entry of foreign matter into hoses through connectors.

Ⓣ : N·m (kg-m, ft-lb)
⬅ : Removing points

SST128

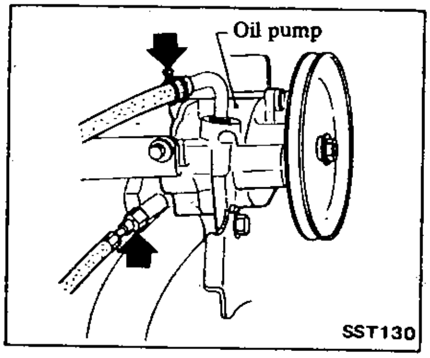
Oil pump, resevoir tank and each hose

1. Remove air duct at cleaner.
2. Loosen oil pump pulley lock nut.
   Turn belt adjusting bolt counter-clockwise.



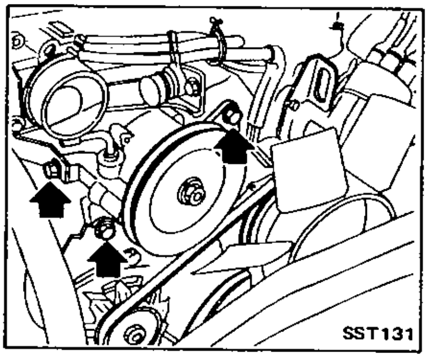
SST129

3. Remove oil pump belt.
4. Loosen (not remove) hoses at pump.

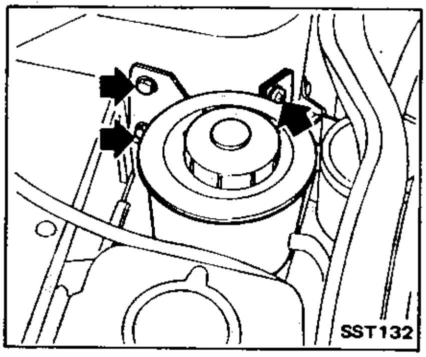


SST130

5. Remove oil pump and reservoir tank.



SST131



SST132

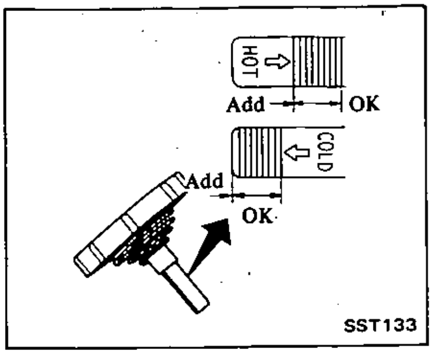
6. Disconnect hoses from oil pump.
7. Remove oil pump brackets and other brackets from engine.
8. Unfasten hose clamps, and remove hoses from suspension crossmember.

INSTALLATION AND ADJUSTMENT

Install steering gear in the reverse order of removal.

Fluid level

1. Check fluid level in oil pump assembly with dipstick whether fluid level is on HOT side at normal operating temperature or on "COLD" side when oil is cold.



SST133

- **Do not overfill with fluid.**
- **Normal operating temperature is 60 to 80°C (140 to 176°F).**
- **When running engine, make sure fluid level variations in opening oil pump are less than 2 mm (0.08 in).**

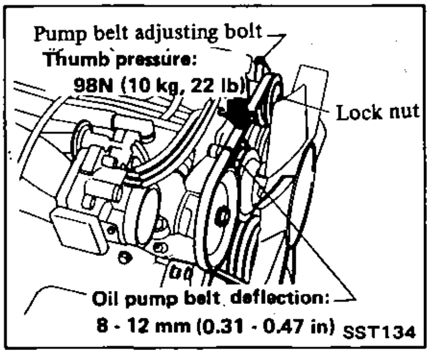
2. Check fluid level and leakage.

Recommended fluid is Automatic Transmission Fluid "Dexron Type".
Refer to Section MA for "Recommended Lubricant".

Fluid capacity (with oil pump, reservoir tank, each hose and steering gear assembly):
Approximately
1.2 ℓ (1-1/4 US qt, 1-1/8 Imp qt)

Pump belt adjustment

Adjust oil pump belt tension.



SST134

Check fluid leakage

1. Run engine at idle speed or 1,000 rpm.
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.
   - Oil seal at rear cover
   - Intermediate cover
   - Adjusting screw lock nut
   - Sector shaft oil seal
   - Sector cover O-ring
   - Oil pressure line connectors
   - Oil pump and reservoir tank

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds at a time.

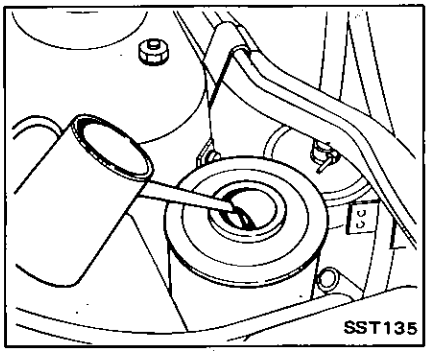
Hydraulic system check

To determine whether problem is in steering gear or oil pump, measure operating pressure.

Before conducting hydraulic system test, carefully check belt tension and condition of driving pulley.

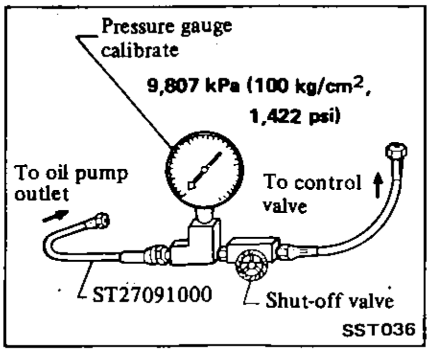
Tires must be inflated to normal pressure.

1. Check fluid level and fluid leakage, **adding oil if necessary.**

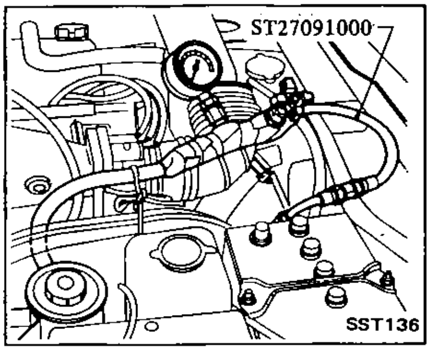


SST135

2. Run engine.
   Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176°F) with a temperature indicator.
3. Stop engine.
4. Set Tool.
   - **Gauge must be between shut-off valve and oil pump.**



SST036



SST136

5. Open shut-off valve at **Tool** ST27091000.
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 oil 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. Slowly close shut-off valve **with steering wheel fully turned in left or right and lightly touch wheel stopper.**

CAUTION:
Do not close shut-off valve for more than fifteen seconds, as this would abnormally increase lubricant temperature and cause undue pump wear.

With valve fully closed, pump pressure should be at maximum.

Normal pressure:
About 5,394 kPa (55 kg/cm², 782 psi) at idling

12. If pressure increases beyond upper limit, pressure relief valve in oil pump is not functioning properly. Replace as oil pump assembly.
13. If, with shut-off valve fully closed, pressure drops, the problem is in pump. Replace as oil pump assembly. pump assembly.

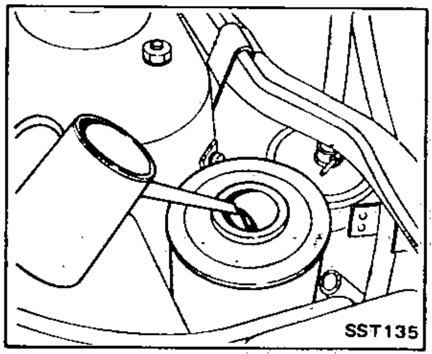
After checking hydraulic system, add fluid as necessary, then completely bleed air out of system.

Bleeding hydraulic system

1. Raise front end of car until wheels clear ground.
2. Run engine.

Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176 °F) with a temperature indicator.

3. Check fluid level, **adding fluid if necessary.**

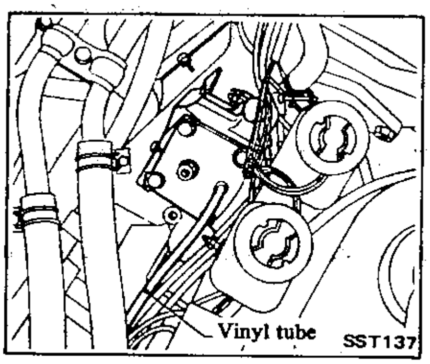


SST135

4. Run engine for 3 to 5 seconds.
5. Stop engine, **adding fluid if nessary.**
6. Quickly turn steering wheel **all the way to right and left ten times and lightly touch wheel stoppers.**
7. Check fluid level, **adding fluid if necessary.**
8. Start engine at idle.

Repeat steps 4 through 8 until air will be bled from pump.

9. With steering wheel fully turned to left, open bleeder screw to expel air, and then tighten bleeder screw.



SST137

- **Operation should be performed, making sure that fluid level is kept within specified limit.**
- **Repeat this operation until air bleeding is completed.**

10. If air cannot be bled completely in steps 1 through 9, proceed as follows:
(1) With engine runing at 1,000 to 1,500 rpm, repeat step 9.
(2) 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.

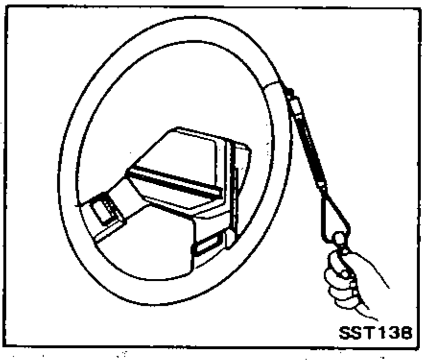
Steering wheel turning torque check

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)].**

- **It is easy to bring power steering fluid up to adequate operating temperature 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 torque when steering wheel has been turned 360° from straight-ahead position.

Steering wheel turning force:
29.4 - 34.3 N
(3.0 - 3.5 kg, 6.6 - 7.7 lb)
at circumference of steering wheel



SST138

INSPECTION AND ADJUSTMENT

Wash clean all disassembled parts in suitable cleaning solvent and check their condition.

Check sealing portion.

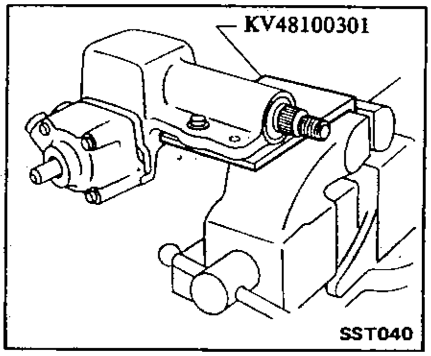
- Adjusting screw nut O-ring.
- Sector shaft cover O-ring
- Sector shaft oil seals
- Rear housing oil seal
- Intermediate cover O-rings

Discard any oil seal and O-ring which have once been removed.

Replace oil seal and O-ring if sealing surface is deformed or cracked.

Steering gear turning torque measurement

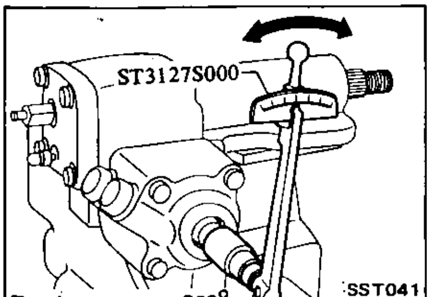
1. Measure turning torque at 360° position.
(1) Install steering gear on **Tool.**



SST040

(2) Turn stub shaft all the way to right and left several times.

(3) Measure turning torque at 360° position from straight-ahead position using **Tool**.



Turning torque at 360°:
Less than 1.2 N·m (12 kg-cm, 10 in-lb)

- **Stub shaft can be turned by wrapping vinyl tape around serration area of stub shaft and fitting wrench socket.**
- **If it is beyond specification, gear must be replaced as an assembly.**

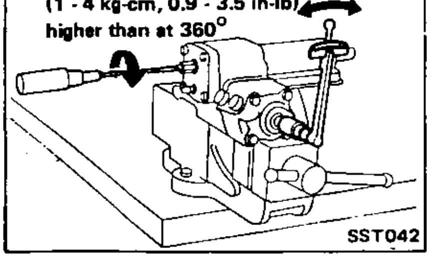
2. Measure turning torque at straight-ahead position.

(1) Set worm gear in a straight-ahead position.

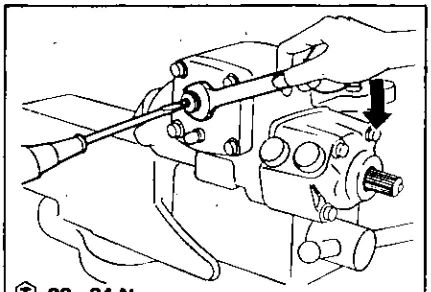
Straight-ahead position is a position where stub shaft is turned two turns by 45° from lock position.

(2) Measure turning torque using **Tool**.

Turning torque at straight-ahead position:
Ⓣ 0.10 - 0.39 N·m
(1 - 4 kg-cm, 0.9 - 3.5 in-lb)
higher than at 360°



5. After adjustment is completed, tighten lock nut.



Ⓣ 28 - 34 N·m
(2.9 - 3.5 kg-m, 21 - 25 ft-lb)

Measure turning torque. If they are not within specifications, replace gear assembly.

DISASSEMBLY

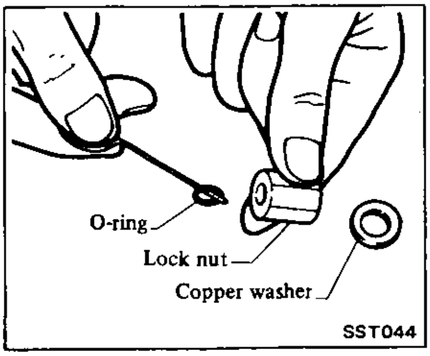
Before disassembly, measure turning torque.

If they are not within specifications, replace steering gear assembly.

CAUTION:
Each oil sealing parts, dust seal, special washers and snap ring once removed must not be used again.

Adjusting screw lock nut seal

Remove adjusting screw lock nut, and replace O-ring.



Sector shaft oil seal

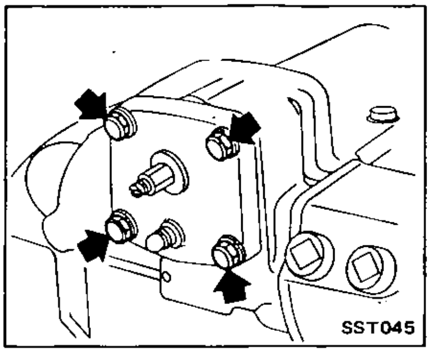
1. Install steering gear on **Tool** KV48100301.
2. Set stub shaft in a straight-ahead position.

Straight-ahead position is a position where stub shaft is turned two turns by 45° from lock position.

3. Disconnect sector shaft cover bolt.

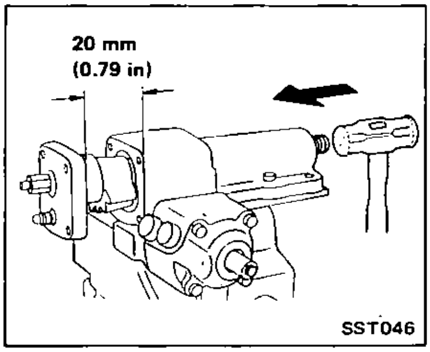
Do not loosen adjusting screw lock nut.

Do not turn lock nut unless necessary; otherwise it will damage O-ring, resulting in an oil leak.



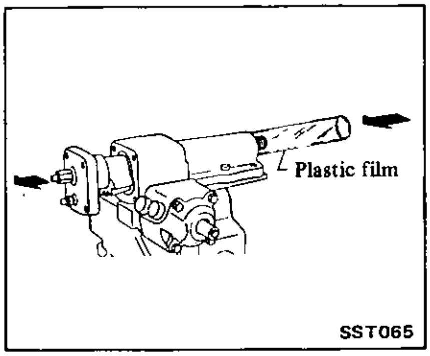
4. Draw out sector shaft.

Knock out end of sector shaft approximately 20 mm (0.79 in).



5. Connect a roll of plastic film to sector shaft.

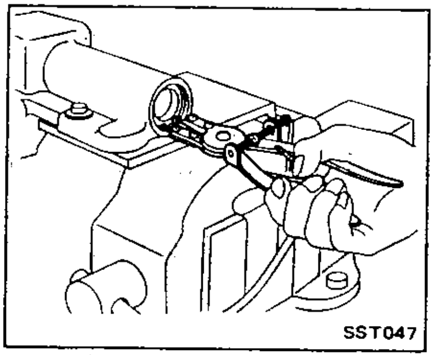
Plastic film:
Thickness 0.1 mm (0.004 in)
Length × width
200 × 200 mm (7.87 × 7.87 in)



6. Pull out sector shaft by hand.

Attach plastic film to two bearings located inside gear housing while simultaneously pulling out sector shaft so that bearings will not drop into housing.

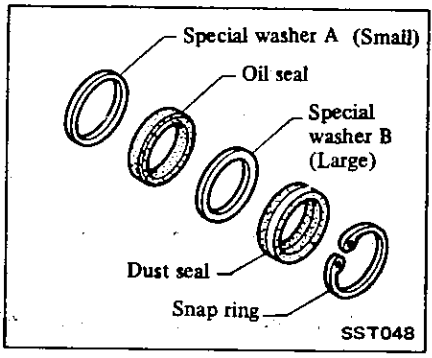
7. Remove snap ring.



SST047

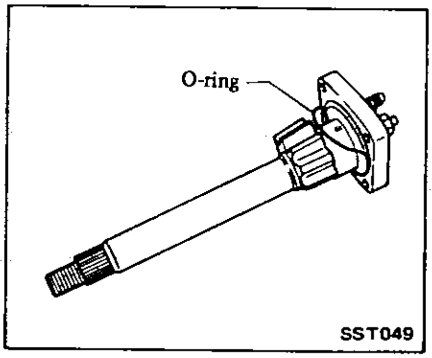
8. Remove dust seal, special washers and oil seal.

Apply blade of screwdriver to oil seal lightly so that it will not damage inner side of gear housing.



SST048

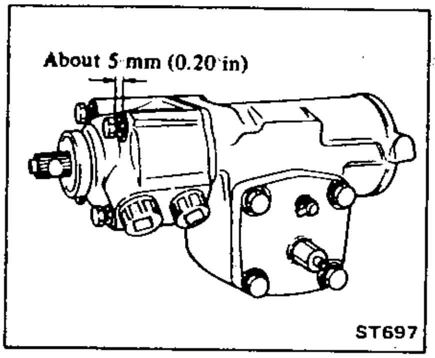
9. Remove O-ring.



SST049

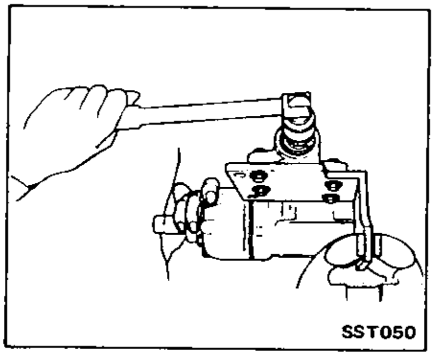
Rear housing seal

1. Install gear on **Tool** KV48100301 in a vise.
2. Loosen (not remove) rear cover bolts.



ST697

3. Turn sector shaft clockwise slightly to raise intermediate cover through piston.

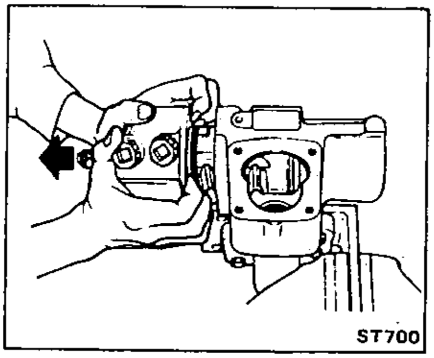


SST050

4. Turn stub shaft counterclockwise and place piston (worm gear) in its straight-ahead position.
5. Remove sector shaft.

Refer to Sector Shaft Seal for disassembly.

6. Remove rear cover bolts.
7. Pull out rear cover, intermediate cover with worm gear assembly.



ST700

CAUTION:

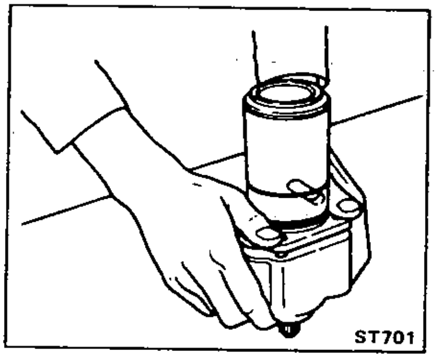
a. When worm assembly is removed, piston may turn and come off under its own weight. Hold piston to prevent it from turning.
If piston-to-intermediate cover clearance exceeds 45 mm (1.77 in) by loosening, recirculating ball will be out of groove of worm; do not reinstall piston but replace the entire assembly.

b. Take care not to damage teflon ring at piston end when removing.

8. Remove rear cover, **turn worm assembly upside down, and lightly tap stub shaft end on top of workbench.**

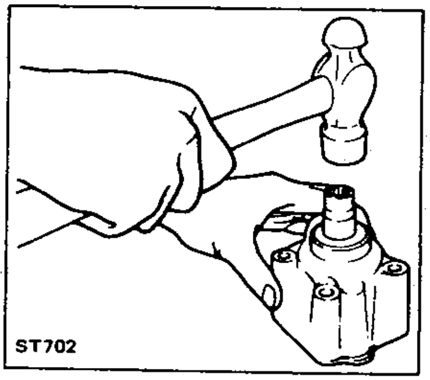
CAUTION:

Do not strike shaft with a hammer or pry it with a screwdriver.



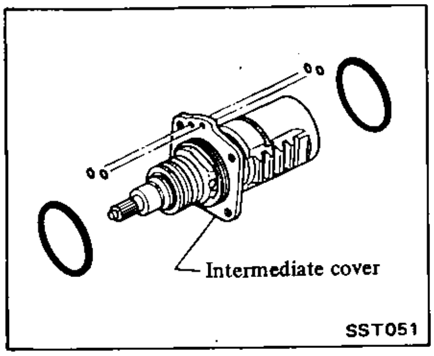
ST701

9. Remove rear housing oil seal.



ST702

10. Remove O-ring on both sides of intermediate cover.

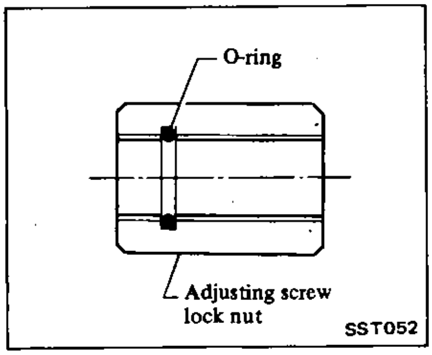


ASSEMBLY

Adjusting screw lock nut seal

Insert new O-ring into adjusting screw lock nut.

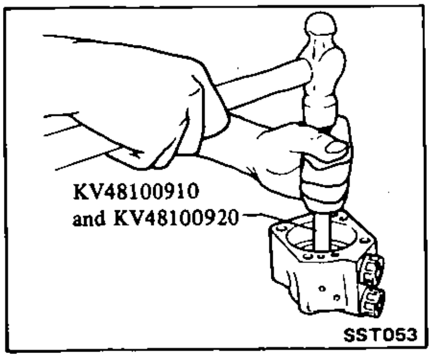
- **Before inserting, apply a thin coat of vaseline to O-ring.**
- **Insert O-ring to make sure it fits into groove.**



Rear housing seal

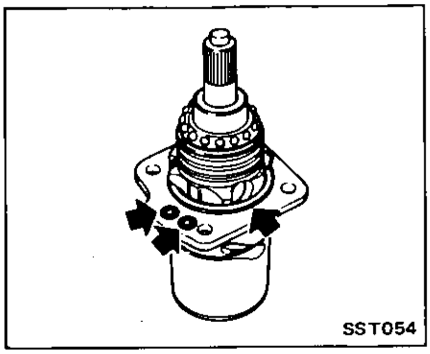
1. Install rear housing oil seal using **Tool.**

Before installing oil seal, apply recommended multi-purpose grease to lips.



2. Install O-rings on both sides of intermediate cover with new ones.

- **Apply a thin coat of vaseline to new O-rings prior to their installation.**
- **Be careful not to install wrong O-rings as some of them resemble in size.**

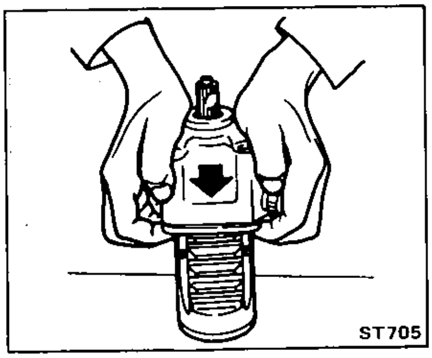


3. Fit rear cover onto intermediate cover with worm gear assembly.

CAUTION:

a. Do not tilt ball bearing.

b. Make sure that O-rings are not protruding or extruding.

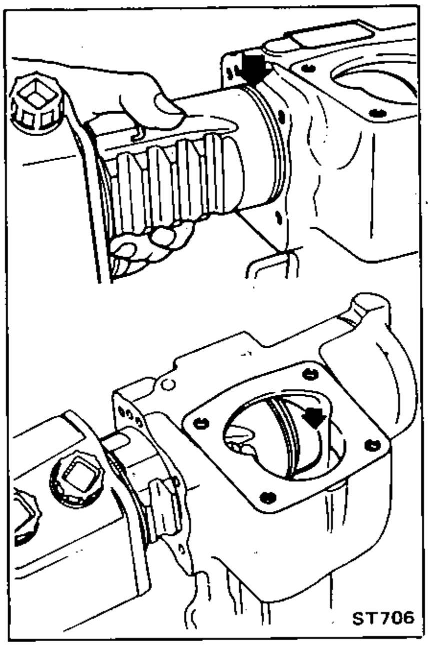


4. Insert worm gear assembly with rear cover and intermediate cover into gear housing.

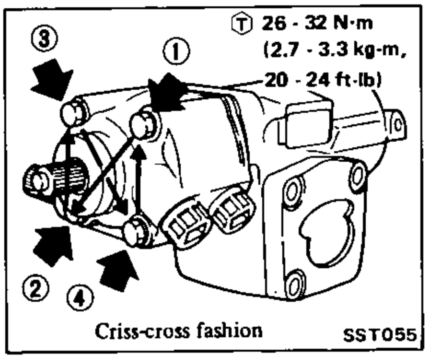
CAUTION:

a. Be careful that teflon ring at piston end is not damaged during insertion of gear housing.

b. When worm assembly is halfway inserted, teflon ring is deflected. Insert remaining part of worm assembly paying particular attention. Take care not to damage teflon ring on corner of sector hole.
Be sure that teflon ring settles in its correct position.



5. Gradually tighten rear housing **bolts in a criss-cross fashion.**



CAUTION:

a. If bolts are tightened while worm assembly is tilted, inner seals will be damaged. Tighten bolts while assembly is level.
If worm assembly is tilted, stub shaft's turning torque will be increased.

b. Check O-rings to ensure that they do not protrude or extrude.

6. Install sector shaft into gear housing.

Refer to Sector Shaft Oil Seal for assembly.

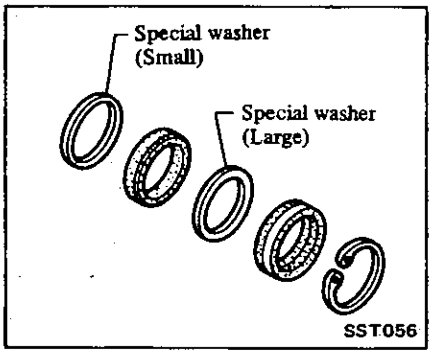
7. Check turning torque.

Refer to Inspection and Adjustment.

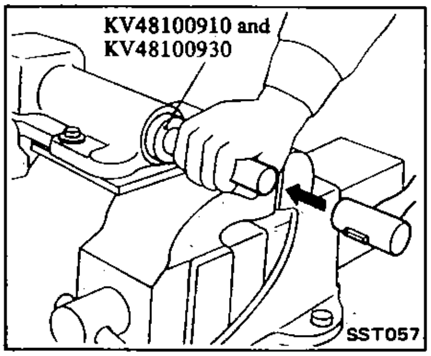
Sector shaft oil seal

1. Press new oil seal and dust cover using **Tool.**

- **When installing, be sure to use new oil seal, dust cover and special washers.**
- **Before installing, apply a thin coat of vaseline to new oil seal and dust seal.**



SST056



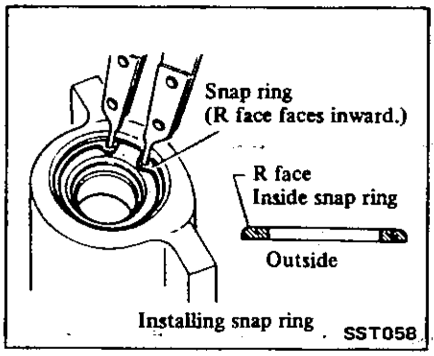
SST057

2. Install a new snap ring into gear housing.

CAUTION:

a. Turn snap ring to make sure it fits into groove.

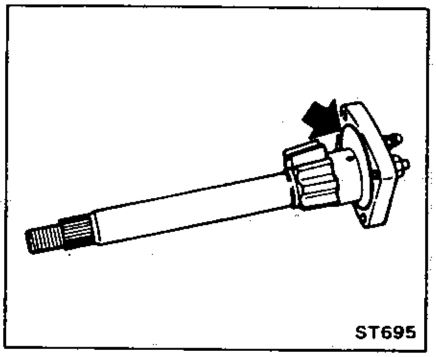
b. Always install snap ring with its rounded edges facing oil seal.



Installing snap ring SST058

3. Fit new O-ring into sector shaft cover.

- **Before installing, apply a thin coat of vaseline to O-ring.**
- **Make certain that O-ring is installed properly, and not damaged by sector shaft.**

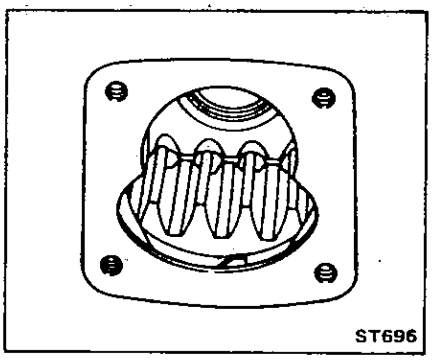


ST695

4. Set piston (worm gear) at straight-ahead position.

Turn piston rack about 10° to 15° toward youself with your finger.

This is for smooth insertion of sector gear.



ST696

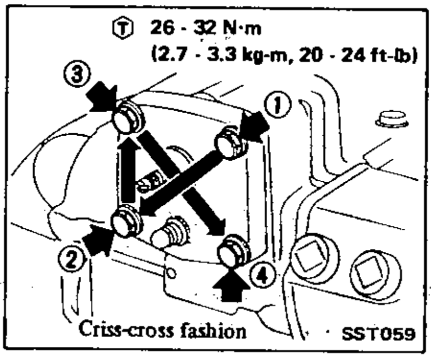
5. Wrap vinyl tape around serration area of sector shaft.

The reason is that vinyl tape prevents oil seal lip from being damaged during insertion.

6. Gradually insert sector shaft into gear housing, being careful not to damage oil seal.

When inserting sector shaft into gear housing, remove plastic film. Be careful not to drop bearings into gear housing.

7. Tighten sector cover bolts.



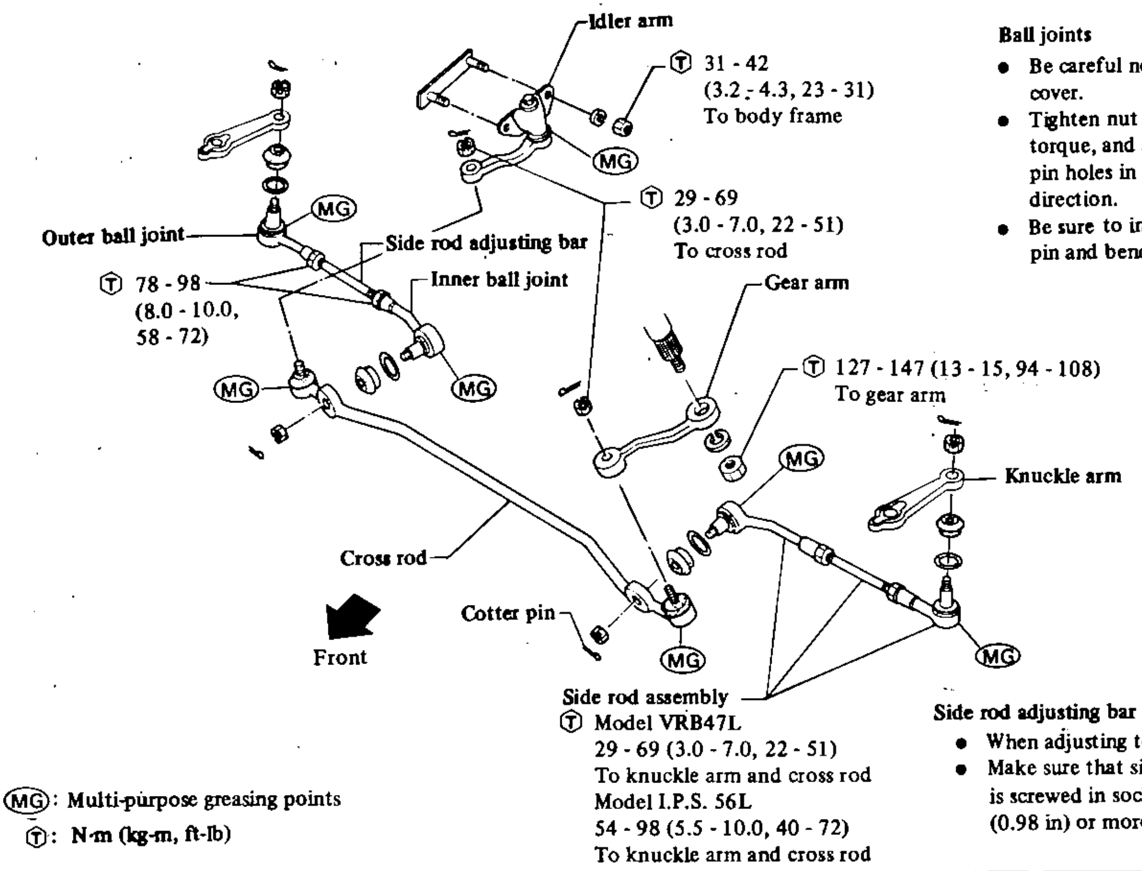
SST059

8. Check steering gear turning torque.

Refer to Inspection and Adjustment.

- **If there is a great difference between values of turning torque before and after disassembly, it must be assumed that some new problem has occurred. It will be necessary to replace the entire assembly.**

STEERING LINKAGE



Ball joints
- Be careful not to damage dust cover.
- Tighten nut to the specified torque, and align the cotter pin holes in the tightening direction.
- Be sure to insert new cotter pin and bend it securely.

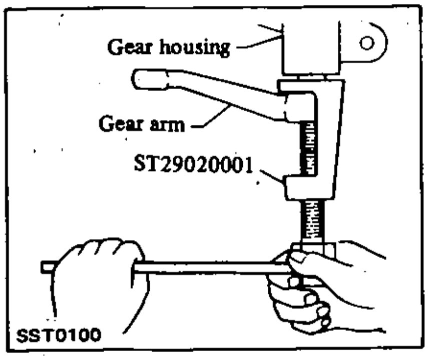
Side rod adjusting bar
- When adjusting toe-in, use it.
- Make sure that side rod bar is screwed in socket 25 mm (0.98 in) or more.

MG: Multi-purpose greasing points
Ⓣ: N·m (kg-m, ft-lb)

SST099

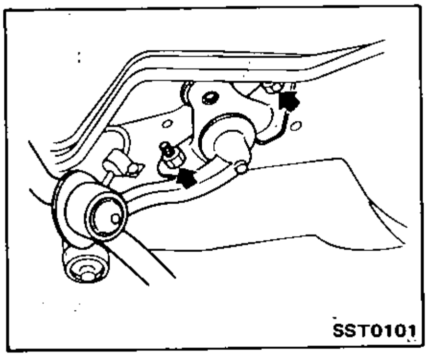
REMOVAL AND INSTALLATION

1. Jack up front of car and support it on the safety stands.
2. Block rear wheels with chocks.
3. Remove gear arm using Tool.



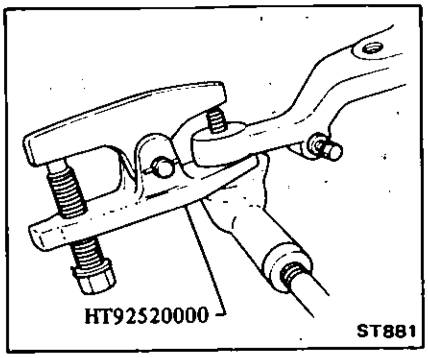
SST0100

4. Remove idler arm assembly.



SST0101

5. Remove side rod from knuckle arm using Tool.



ST881

6. Install steering linkage in the reverse order of removal.

Ⓣ : Gear arm to sector shaft
127 - 147 N·m
(13 - 15 kg-m,
94 - 108 ft-lb)
Idler arm to body frame
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)
Side rod to knuckle arm
Model VRB47L
29 - 69 N·m
(3.0 - 7.0 kg-m,
22 - 51 ft-lb)
Model I.P.S. 56L
54 - 98 N·m
(5.5 - 10.0 kg-m,
40 - 72 ft-lb)

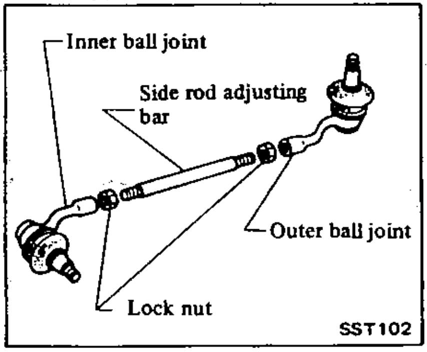
7. After installing steering linkage, check wheel alignment, and if necessary, adjust.

Refer to Section MA for adjustment.

DISASSEMBLY

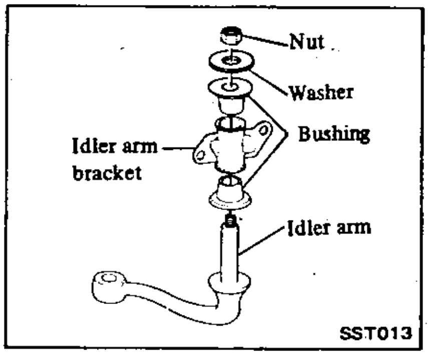
Side rod

1. Remove both side rods from cross rod using **Tool** HT72520000.
2. Separate outer and inner ball joints from side rod adjusting bar.



Idler arm assembly

Remove nut, and separate each part.



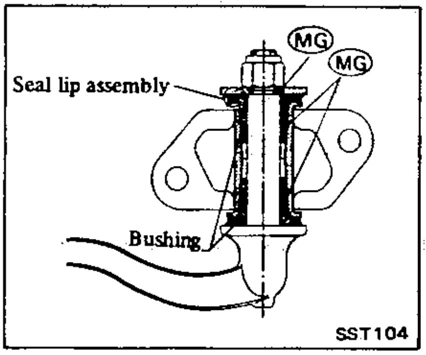
ASSEMBLY

Assemble steering linkage in the reverse order of disassembly, observing the following instructions.

Idler arm assembly

To assemble idler arm, proceed as follows:

1. Apply coat of multi-purpose grease to bushing.



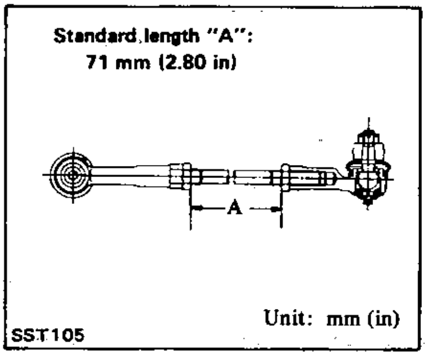
2. Press bushing into idler body, and insert shaft of idler arm bracket carefully until bushing protrudes.

Ⓣ : **54 - 69 N·m**
(5.5 - 7.0 kg-m,
40 - 51 ft-lb)

Cross rod and side rod

1. When side rod ball joints and side rod adjusting bar are separated, adjust side rod length correctly.

Adjustment should be done between lock nuts.



2. Tighten side rod adjusting bar lock nut.

Ⓣ : **78 - 98 N·m**
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

a. Lock side rod adjusting bar lock nut so that ball joint on outer socket is 77° with respect to that on inner socket.

b. Make sure that adjusting bar is screwed in each socket at least 25 mm (0.98 in).

INSPECTION AND REPAIR

Ball joint

1. When ball stud is worn or axial play exists, replace side rod ball joint with a new one.
2. When dust cover is broken or deformed, be sure to replace with a new one.

Initial turning torque:
Ball joint
0.5 - 2.5 N·m
(5 - 25 kg-cm,
4.3 - 21.7 in-lb)
Swivel pin
Less than
2.5 N·m (25 kg-cm, 22 in-lb)

Idler arm assembly

Check rubber bushing of idler arm for breakage, wear or play, and if necessary replace.

Initial turning torque:
Less than
7.8 N·m (80 kg-cm, 69 in-lb)

Apply grease to idler arm assembly at recommended intervals.

Cross rod and side rod

Check side rod and cross rod for breakage, bend or crack, and replace with a new one if necessary.

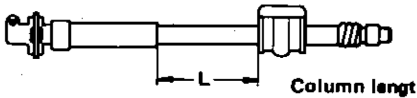
Fixing location

Check fixing location (nuts and cotter pins) for looseness, play or breakage. When looseness or play is found, check for wear on tapered portion of ball stud, gear arm of idler arm.

When reassembling each ball joint, use new cotter pins.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Steering column	Collapsible column
Standard column length "L" mm (in) VRB47L equipped model	179 (7.05)
I.P.S. 56L equipped model	180 (7.09)
 Column length "L": SST080	

Steering gear model	VRB47L	I.P.S. 56L
Turns of steering wheel on the car (Lock-lock)	3.5	3.1
Steering gear ratio	18.0 - 20.5	17.0

INSPECTION AND ADJUSTMENT

	VRB47L	I.P.S. 56L
Front wheel full turning angle Inner wheel degree Outer wheel degree	33° - 35° 27° - 29°	33° - 35°* 27° - 29°*
Minimum turning radius (Wall to wall) m (ft)	5.7 (18.7)	
Steering wheel axial play mm (in)	0 (0)	
Steering wheel play mm (in)	Less than 35 (1.38)	

* On power steering models;
Wheel turning force (at circumference of steering wheel) of 98 - 147 N (10 - 15kg, 22 - 23 lb) with engine at idle

STEERING GEAR

Model VRB47L

Worm bearing preload (With oil seal) N·m (kg-cm, in-lb)	0.4 - 0.6 (4 - 6, 3.5 - 5.2)
Steering gear preload (With oil seal) N·m (kg-cm, in-lb)	Less than 1.23 (12.5, 10.9)
Backlash at gear arm top end (In neutral) mm (in)	0 - 0.1 (0 - 0.004)
End play (Between sector shaft and adjusting screw) mm (in)	0.01 - 0.03 (0.0004 - 0.0012)

Adjusting shim thickness

Thickness mm (in)	Part No.
1.575 - 1.600 (0.0620 - 0.0630)	48213 B0100
1.550 - 1.575 (0.0610 - 0.0620)	48214 B0100
1.525 - 1.550 (0.0600 - 0.0610)	48215 B0100
1.500 - 1.525 (0.0591 - 0.0600)	48216 B0100
1.475 - 1.500 (0.0581 - 0.0591)	48217 B0100
1.450 - 1.475 (0.0571 - 0.0581)	48218 B0100

Oil capacity liters (US pt, Imp pt)	Approx. 0.28 (5/8, 1/2)

Model I.P.S. 56L

Oil pump belt deflection mm (in)	8 - 12 (0.31 - 0.47) at 98 N (10 kg, 22 lb)
Steering wheel turning force (At circumference of steering wheel) N (kg, lb)	29.4 - 34.3 (3.0 - 3.5, 6.6 - 7.7)
Oil pump maximum pressure kPa (kg/cm², psi)	5,394 (55, 782)
Normal operating temperature at fluid °C (°F)	60 - 80 (140 - 176)
Fluid capacity ℓ (US qt, Imp qt)	Approx. 1.2 (1-1/4, 1-1/8)
Steering gear turning torque N·m (kg-cm, in-lb) 360° position from straight-ahead position	Less than 1.2 (12, 10)
Straight-ahead position (As compared with steering wheel turned 360°)	0.10 - 0.39 (1 - 4, 0.9 - 3.5) higher

STEERING LINKAGE

Initial turning torque N·m (kg-cm, in-lb) Ball joint	0.5 - 2.5 (5 - 25, 4.3 - 21.7)
Swivel pin	Less than 2.5 (25, 22)
Idler arm	Less than 7.8 (80, 69)
Standard side rod length mm (in)	71.0 (2.795)

TIGHTENING TORQUE

STEERING COLUMN

Unit	N·m	kg-m	ft-lb
Steering wheel nut	37 - 51	3.8 - 5.2	27 - 38
Jacket tube bracket to dush 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
Jacket tube mounting bracket	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Coupling fixing nut (VRB47L equipped model only)	15 - 22	1.5 - 2.2	11 - 16

STEERING GEAR

Model VRB47L

Unit	N·m	kg-m	ft-lb
Worm shaft to coupling	39 - 49	4 - 5	29 - 36
Steering gear housing to body frame	52 - 62	5.3 - 6.3	38 - 46
Sector shaft to gear arm	127 - 147	13 - 15	94 - 108
Adjusting plug lock nut	245 - 314	25 - 32	181 - 231
Sector shaft cover bolt	15 - 25	1.5 - 2.5	11 - 18
Sector shaft adjusting screw lock nut	29 - 39	3.0 - 4.0	22 - 29

Model I.P.S. 56L

Unit	N·m	kg-m	ft-lb
Stub shaft to joint	32 - 38	3.3 - 3.9	24 - 28
Steering gear housing to body frame	52 - 62	5.3 - 6.3	38 - 46
Sector shaft to gear arm	127 - 147	13 - 15	94 - 108
Rear cover to gear housing	26 - 32	2.7 - 3.3	20 - 24
Sector shaft cover to gear housing	26 - 32	2.7 - 3.3	20 - 24
Sector shaft adjusting screw lock nut	28 - 34	2.9 - 3.5	21 - 25
Oil pump to bracket	26 - 36	2.7 - 3.7	20 - 27
Hose to oil pump	29 - 49	3.0 - 5.0	22 - 36
Oil reservoir tank to engine compartment	2.9 - 4.9	0.3 - 0.5	2.2 - 3.6
Hose to suspension crossmember	2.9 - 4.9	0.3 - 0.5	2.2 - 3.6
Hose to gear housing	49 - 69	5.0 - 7.0	36 - 51

STEERING LINKAGE

Unit	N·m	kg-m	ft-lb
Idler arm to body frame	31 - 42	3.2 - 4.3	23 - 31
*Ball stud and swivel pin	29 - 69	3.0 - 7.0	22 - 51
Idler arm nut	54 - 69	5.5 - 7.0	40 - 51
Side rod bar lock nut	78 - 98	8.0 - 10.0	58 - 72

* I.P.S. 56L equipped model only
Side rod assembly 54 - 69 N·m (5.5 - 7.0 kg-m, 40 - 51 ft-lb)

TROUBLE DIAGNOSES AND CORRECTIONS

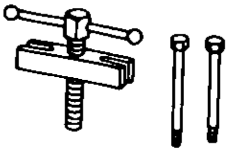
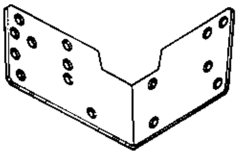
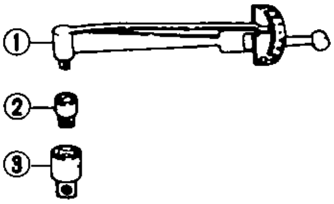
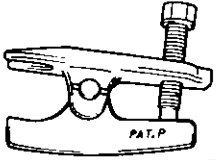
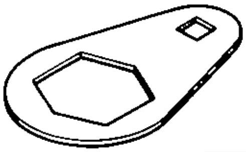
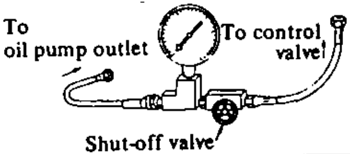
Except for the following probalbe causes and corrective actions, refer to Trouble Diagnoses and Corrections in Front Axle and Front Suspension section.

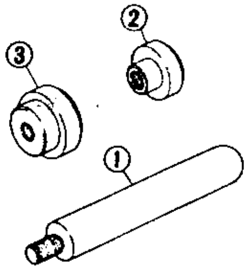
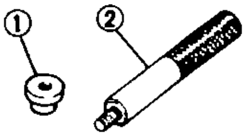
Condition	Probable cause	Corrective action
Excessive wheel play.	Insufficiently tightened or improperly installed steering gear housing.	Retighten.
	Damaged steering linkage or ball joint.	Replace faulty parts.
	Incorrect adjustment of steering gear.	Adjust.
Vibration, shock or shimmying of steering wheel.	Insufficiently tightened or improperly installed steering gear housing.	Retighten.
	Wear of steering linkage.	Replace faulty parts.
	Damaged idler arm.	Replace.
	Worn column bearing, weakened column bearing spring, or loose clamp.	Replace or retighten.
Car pulls to right or left.	Deformed steering linkage and/or suspension link.	Replace.
Stiff or heavy steering wheel.	Insufficient lubricants or mixing impurities in steering linkage or excessively worn steering linkage.	Replenish grease or replace the part.
	Worn or damaged steering gear and bearing.	Replace.
	Incorrectly adjusted steering gear.	Adjust.
	Deformed steering linkage.	Replace.
	Interference of steering column with turn signal switch.	Adjust.

POWER STEERING

Condition	Probable cause	Corrective action
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 gear.
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.* Idler arm dragging.*	Refill. Bleed air. See "Hydraulic system check". Re-align or inflate tires to correct pressure. Replace gear assembly. Repair or replace. Replace. Repair or 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	
		Model VRB47L	Model I.P.S. 56L
ST27180001 (J25726)	Steering wheel puller 		
KV48100301 (J25729)	Strut & steering gear box attachment 	X	X
ST3127S000 (See J25765) ① GG91030000 (See J25765) ② HT62940000 (–) ③ HT62900000 (–)	Preload gauge Torque wrench Socket adapter Socket adapter 	X	X
ST29020001 (J25725)	Steering gear arm puller 	X	X
HT72520000 (–)	Ball joint remover 		
KV48101500 (–)	Lock nut wrench 	X	
KV48101400 (–)	Adjusting plug wrench 	X	
ST27091000 (–)	Pressure gauge 		X

Tool number (Kent-Moore No.)	Tool name	Unit application	
		Model VRB47L	Model I.P.S. 56L
KV481009S0 (J26367) ① KV48100910 (–) ② KV48100920 (–) ③ KV48100930 (–)	Oil seal drift set Drift Adapter Adapter 		X
① ST35322000 (–) ② ST35325000 (–)	Front wheel bearing drift Drift bar 	X	

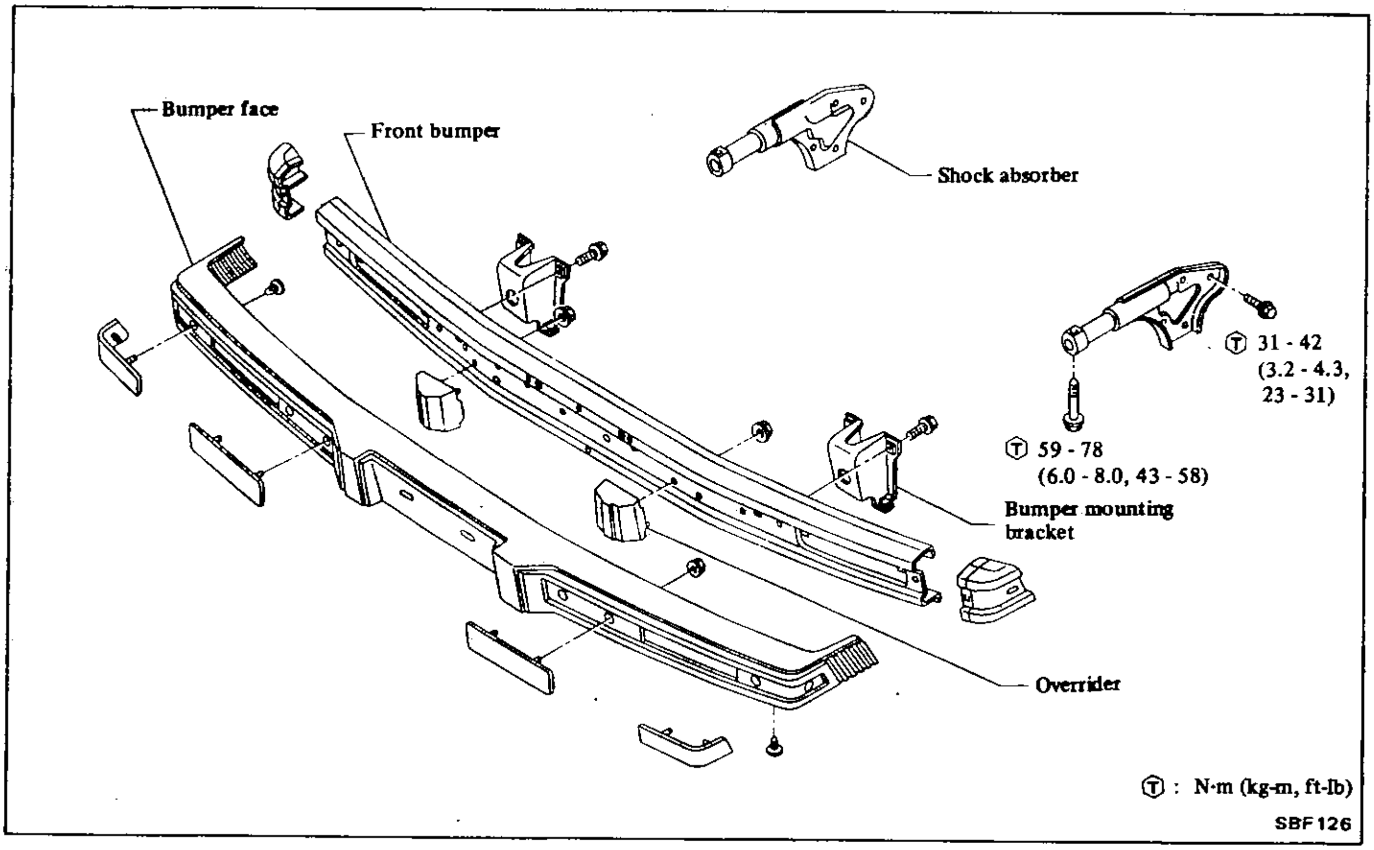
SECTION BF

BODY

CONTENTS

BODY FRONT END

FRONT BUMPER (Shock absorber type)



Ⓣ : N·m (kg-m, ft-lb)

SBF126

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Disconnect front combination lamp connectors.
3. Remove special bolts securing shock absorber to front bumper assembly, then remove front bumper assembly.
4. Remove shock absorber from car body.

CAUTION:

The shock absorber is filled with a high pressure gas and should not be disassembled, drilled or exposed to an open flame.

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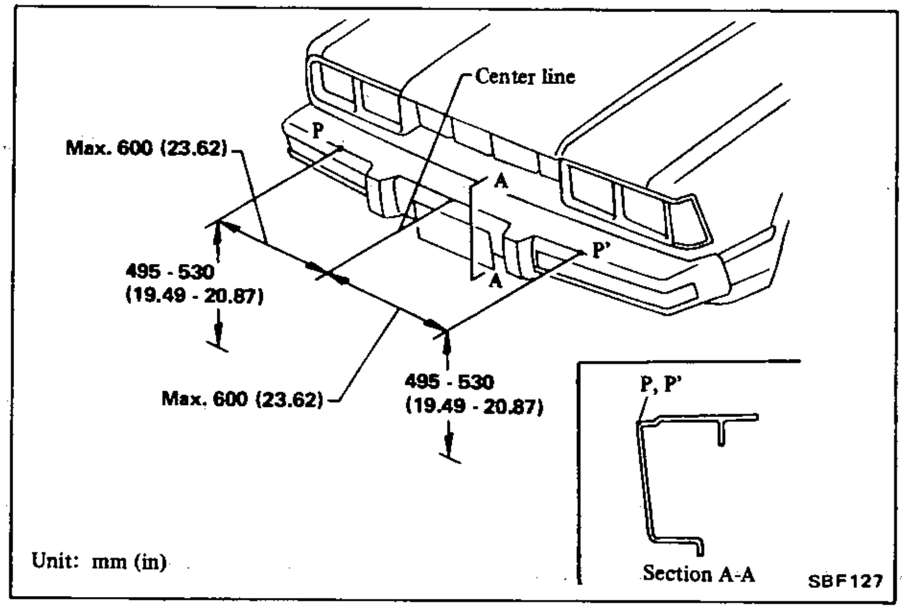
5. Installation is in reverse order of removal.

ADJUSTMENT

Bumper height

1. Adjust bumper height so that distance from top edges to ground meets the specifications.



Unit: mm (in)

SBF127

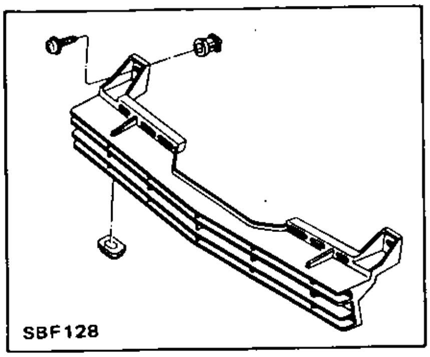
Place car on a flat surface under curb weight conditions. Tires must be inflated to rated pressure.

2. After adjustment, tighten bolts and nuts securely.

RADIATOR GRILLE

REMOVAL AND INSTALLATION

1. Open engine hood.
2. Remove radiator grille.


SBF128

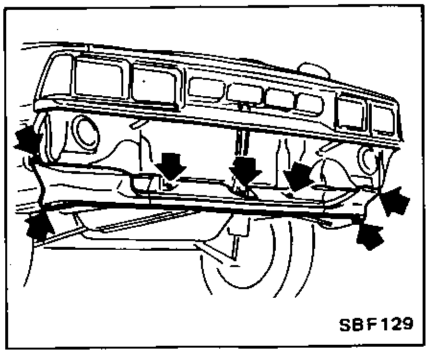
3. Installation is in reverse order of removal.

CAUTION:
- **a. Radiator grille is made of plastic, so do not use excessive force.**
- **b. Take care to keep oil away from radiator grille.**

FRONT APRON

REMOVAL AND INSTALLATION

1. Remove front bumper assembly. Refer to Front Bumper for removal.
2. Remove front apron.


SBF129

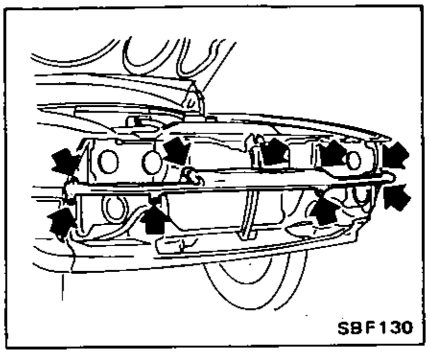
3. Installation is in reverse order of removal.

When installing front apron, be sure to seal mating surface of front fender and front apron.

FRONT SIGHT SHIELD

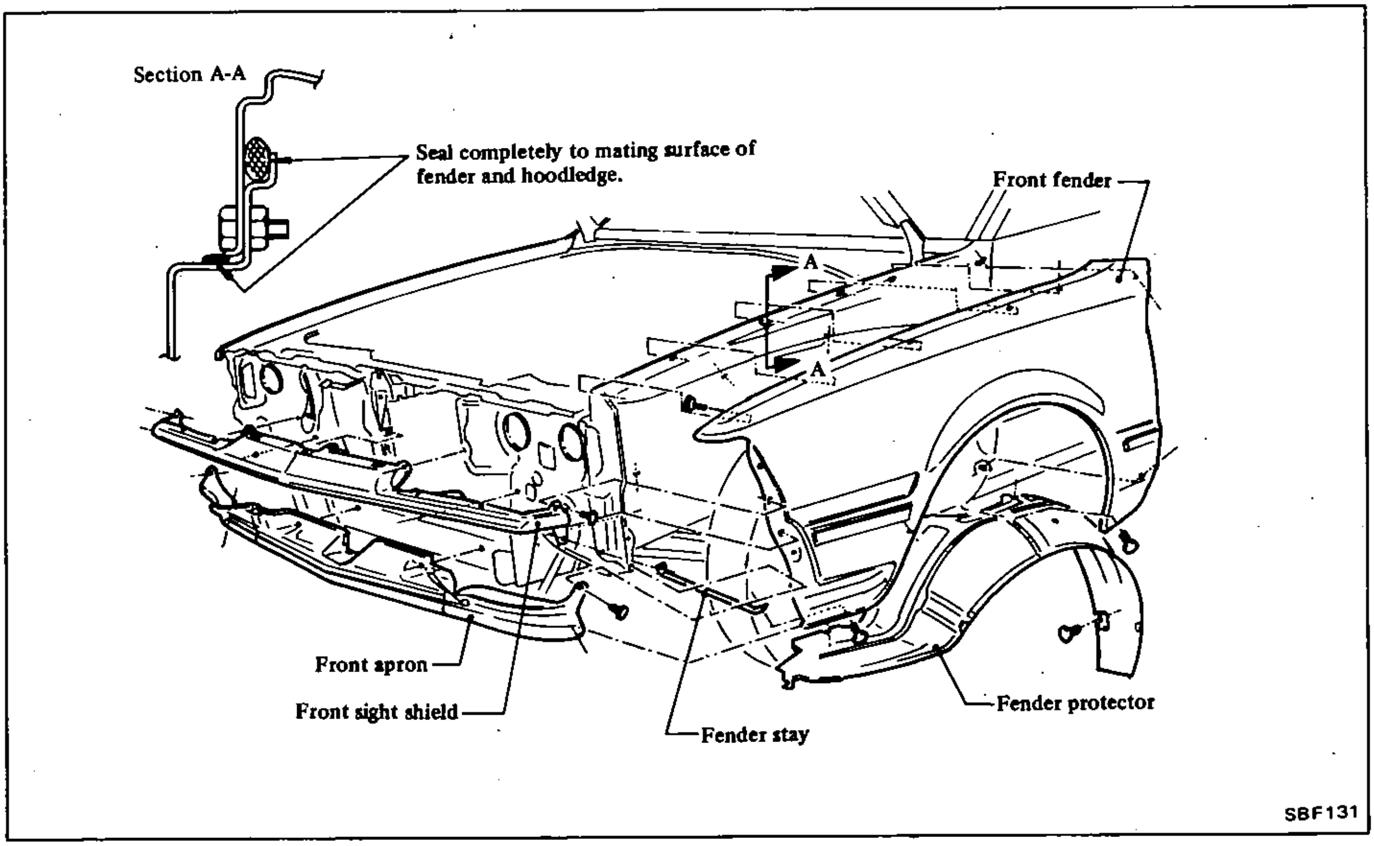
REMOVAL AND INSTALLATION

1. Remove headlamp finisher and headlamp.
2. Remove radiator grille.
3. Remove front bumper assembly.
4. Remove front sight shield.


SBF130

5. Installation is in reverse order of removal.

FRONT FENDER



SBF131

REMOVAL AND INSTALLATION

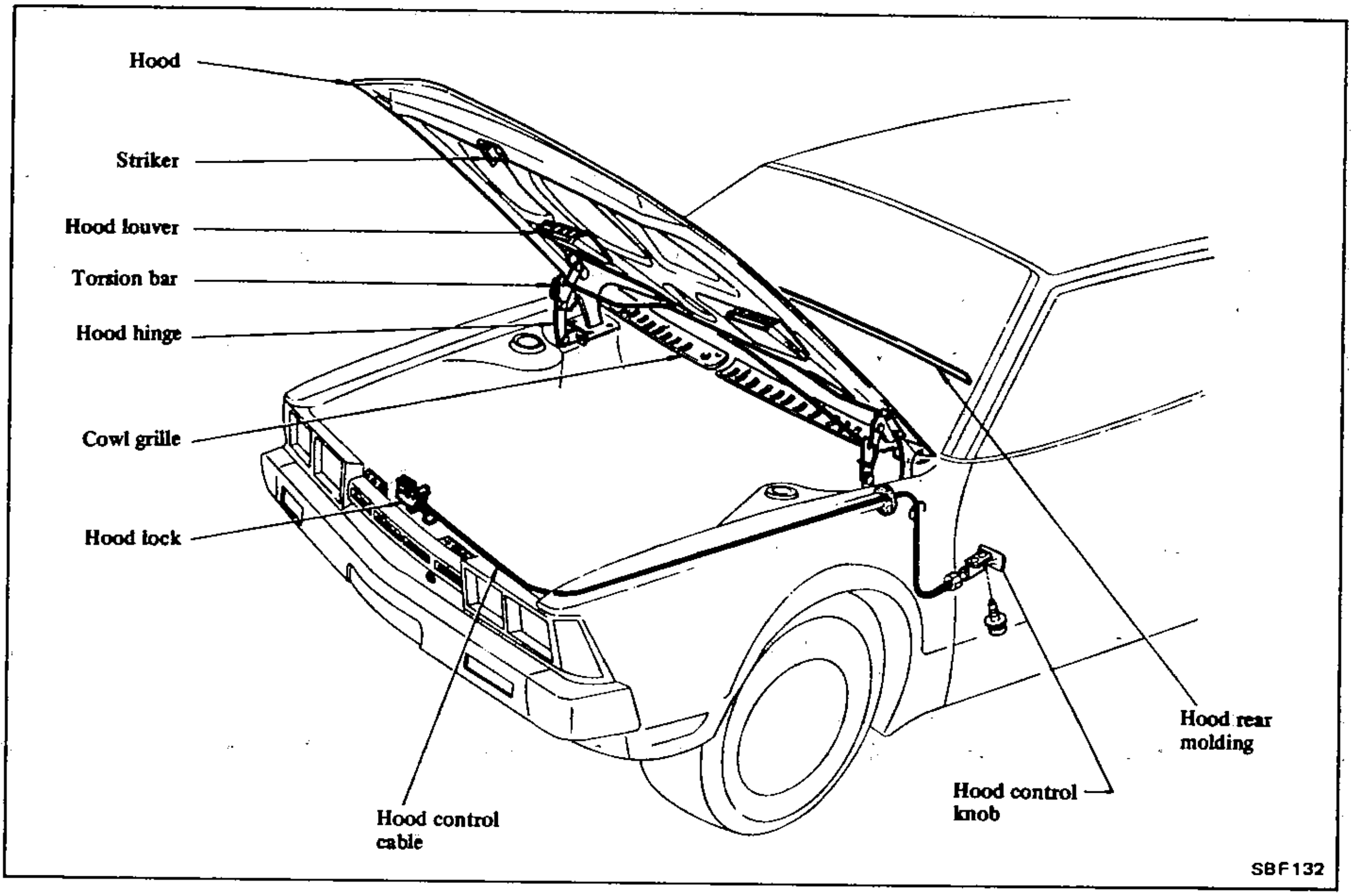
1. Disconnect battery ground cable.
2. Remove front bumper assembly. Refer to Front Bumper Assembly for removal and installation.
3. Remove fender protector, sight shield, front apron and fender stay.
4. Remove bolts attaching front fender, and then remove front fender.

CAUTION:
Fender panel and hoodledge are secured with sealant. Before removing front fender, be sure to remove sealant.

5. Installation is in reverse order of removal.

When installing front fender, apply sealant to mating surface of front fender and hoodledge.

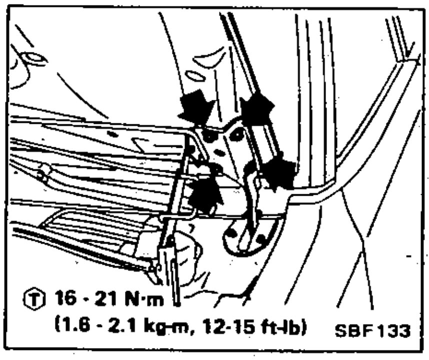
HOOD



REMOVAL AND INSTALLATION

Hood

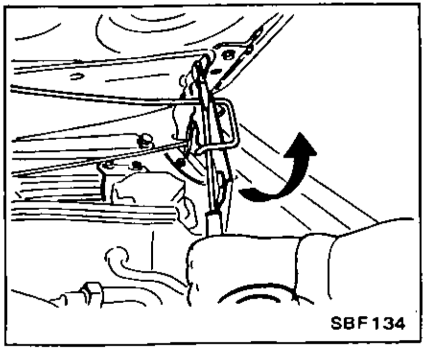
1. Open hood and remove washer tube.
2. Support hood and remove bolts attaching hood hinge, and then remove hood.



3. Installation is in reverse order of removal. Adjust hood. Refer to Adjustment.

Torsion bar

1. Open hood.
2. Support hood and remove each torsion bar by disengaging end of torsion bar from hood hinge. Use a suitable screwdriver.


SBF134

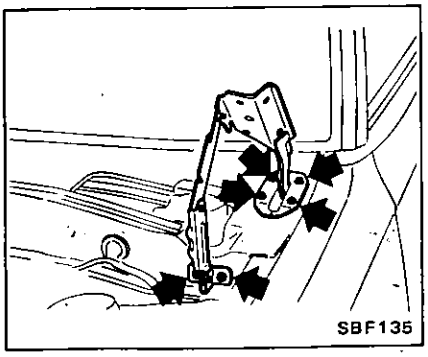
3. Installation is in reverse order of removal.

Lubricate sliding surface of torsion bar.

Hood hinge

1. Remove engine hood.
2. Remove wiper arm, and then remove windshield lower grille.
3. Remove torsion bar and then remove hood hinge.

CAUTION:
Remove hinge only after torsion bar has been removed.

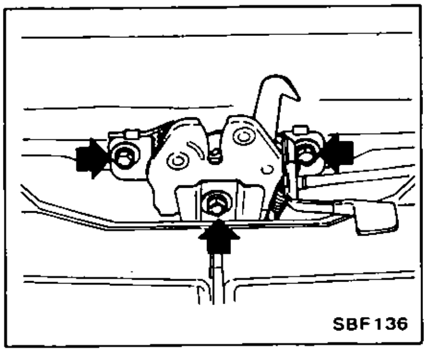

SBF135

4. Installation is in reverse order of removal.

Ⓣ : Hinge attaching bolts
3.9 - 4.9 N·m
(0.4 - 0.5 kg-m,
2.9 - 3.6 ft-lb)

Hood lock and lock control

1. Remove bolts attaching hood lock.
2. Disconnect lock control wire from hood lock, and then remove hood lock.


SBF136

3. Remove left instrument lower cover. Refer to Instrument Lower Cover for removal.
4. Remove hood lock control knob, and then draw cable out through passenger compartment.
5. Installation is in reverse order of removal. Adjust hood. Refer to Hood Adjustment.

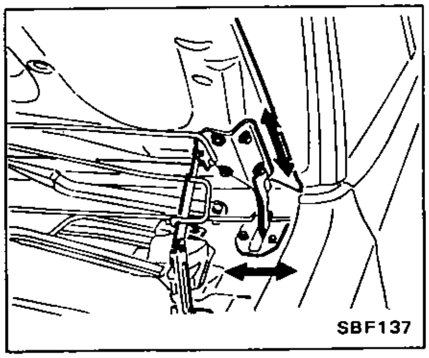
Ⓣ : Hood lock attaching bolts
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

Check hood lock control operation.

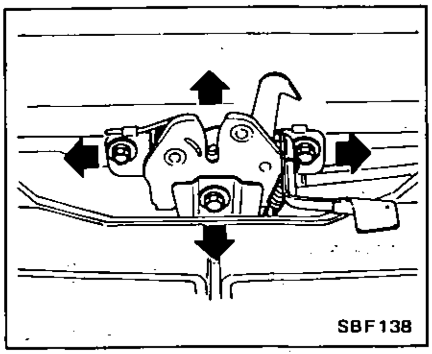
ADJUSTMENT

Hood and lock

1. Loosen bolts attaching hood hinge, and move hood forward or backward and side to side until it is set in optimum position.


SBF137

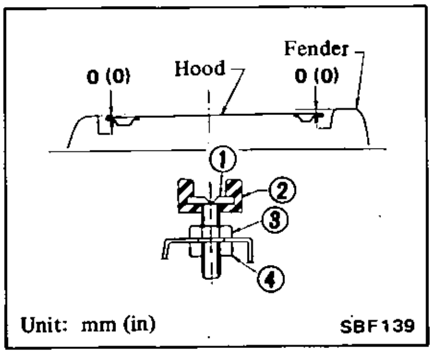
2. Loosen bolts attaching hood lock, and move hood up or down and side to side until it is set in optimum position when opened and closed.


SBF138

After hood adjustment, ensure that clearance between hood and fenders is nearly equal at all points.

Bumper rubber

Raise two hood bumpers until hood is flush with fenders.

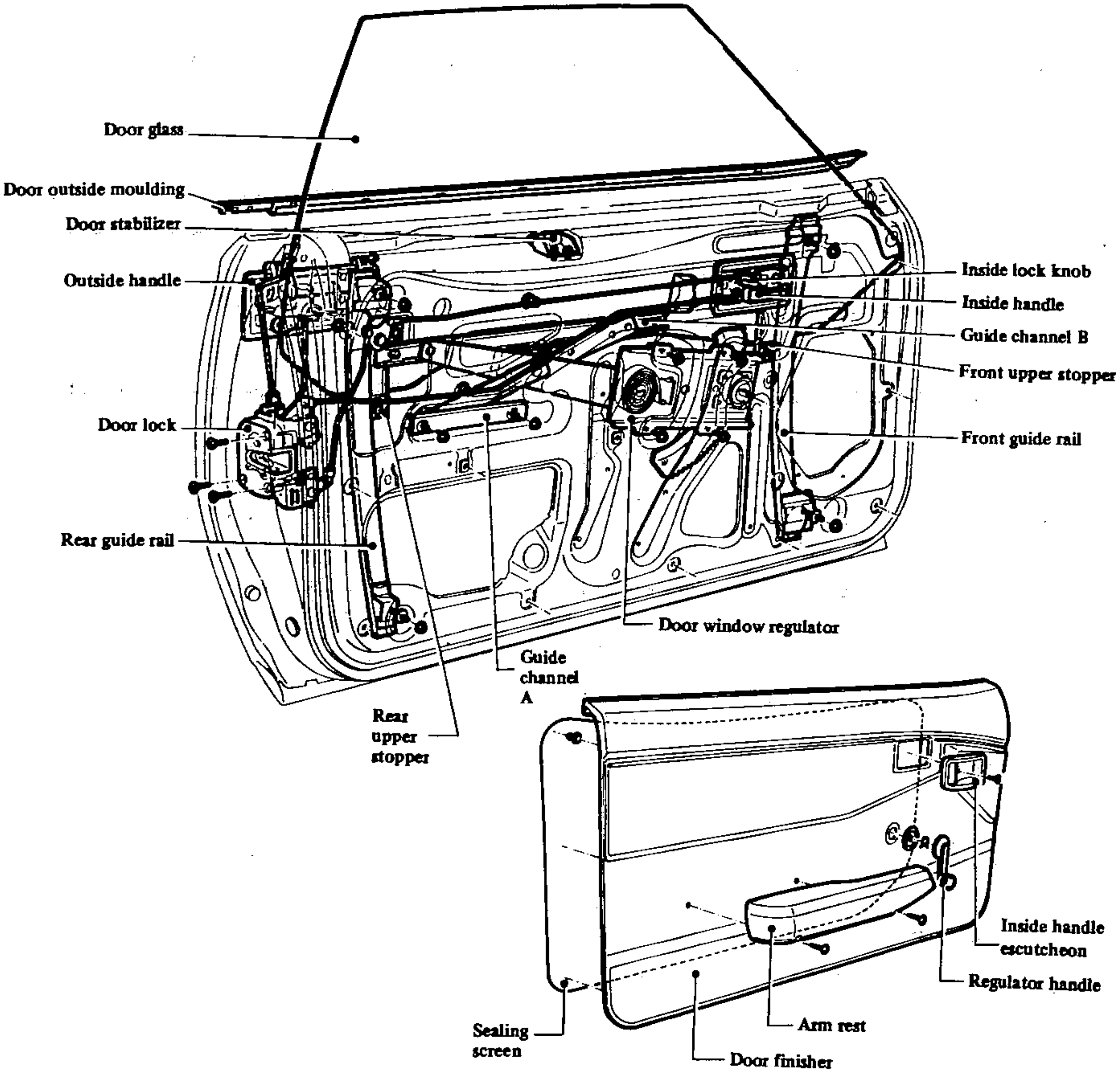


SBF139

1 Adjust bolt
2 Bumper rubber
3 Lock nut
4 Weld nut

Ensure that rubber bumpers come in contact with mating panels.

DOOR


Door glass
Door outside moulding
Door stabilizer
Outside handle
Door lock
Rear guide rail
Rear upper stopper
Guide channel A
Door window regulator
Inside lock knob
Inside handle
Guide channel B
Front upper stopper
Front guide rail
Inside handle escutcheon
Regulator handle
Arm rest
Door finisher
Sealing screen

SBF140

DOOR

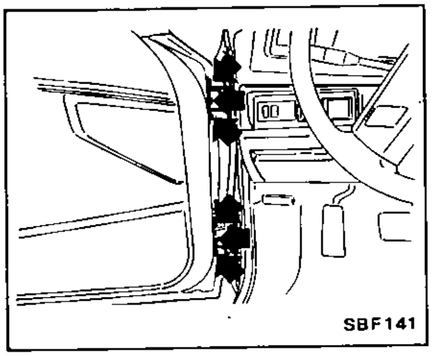
REMOVAL AND INSTALLATION

Door assembly

1. Support door with a stand or jack.

Place a rag between door and stand or jack.

2. Remove door from hinges.



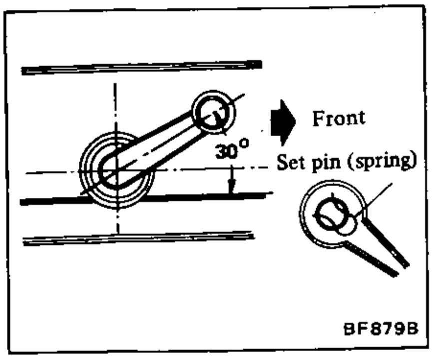
SBF141

3. Installation is in reverse order of removal. Adjust Door. Refer to Adjustment.

Ⓣ : Door hinge securing bolts
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

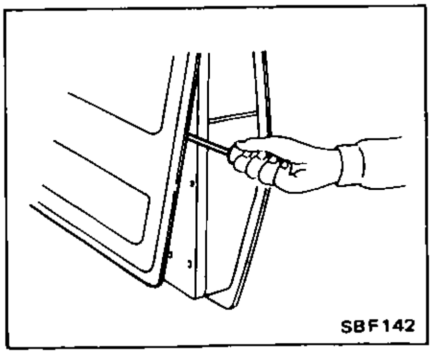
Front door trim

1. Lower door glass fully.
2. Remove arm rest and door inside handle escutcheon.
3. Remove regulator handle by prying out set pin.



BF879B

4. Remove door finisher with suitable tool, and pry door finisher clip off door inner panel.



SBF142

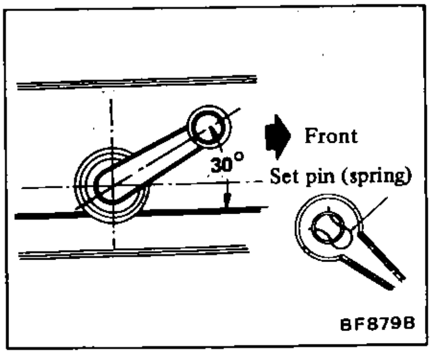
5. Remove sealing screen.

When removing sealing screen, be careful not to allow it to come in contact with adjacent parts.

6. Installation is in reverse order of removal.

a. To prevent water from entering passenger compartment, affix sealing screen firmly with adhesive tape or bonding agent.

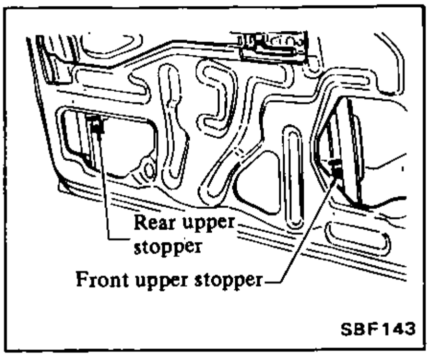
b. With door window closed, use set pins to install regulator handle as shown in Figure below.



BF879B

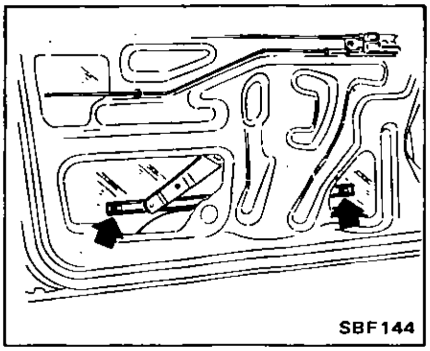
Door glass and regulator

1. Remove door trim.
2. Remove door outer molding.
3. Remove both front and rear upper stoppers.



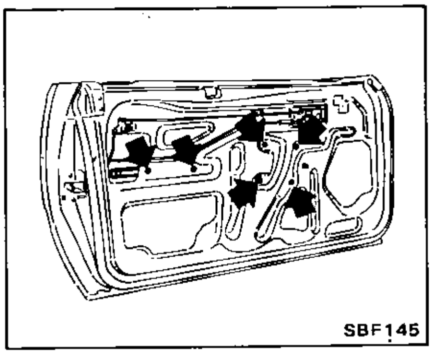
SBF143

4. Remove bolts attaching door window to guide channel.



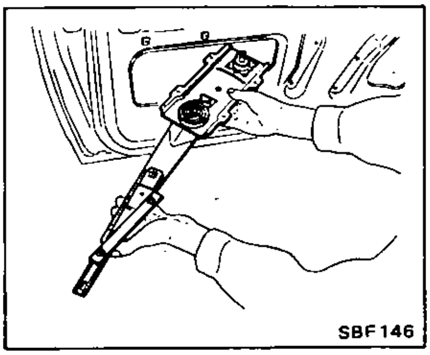
SBF144

5. Remove door stabilizer.
6. Remove door glass by pulling it upwards and away from door.
7. Remove regulator attaching bolts.



SBF145

8. Remove regulator assembly through large access hole in door panel.

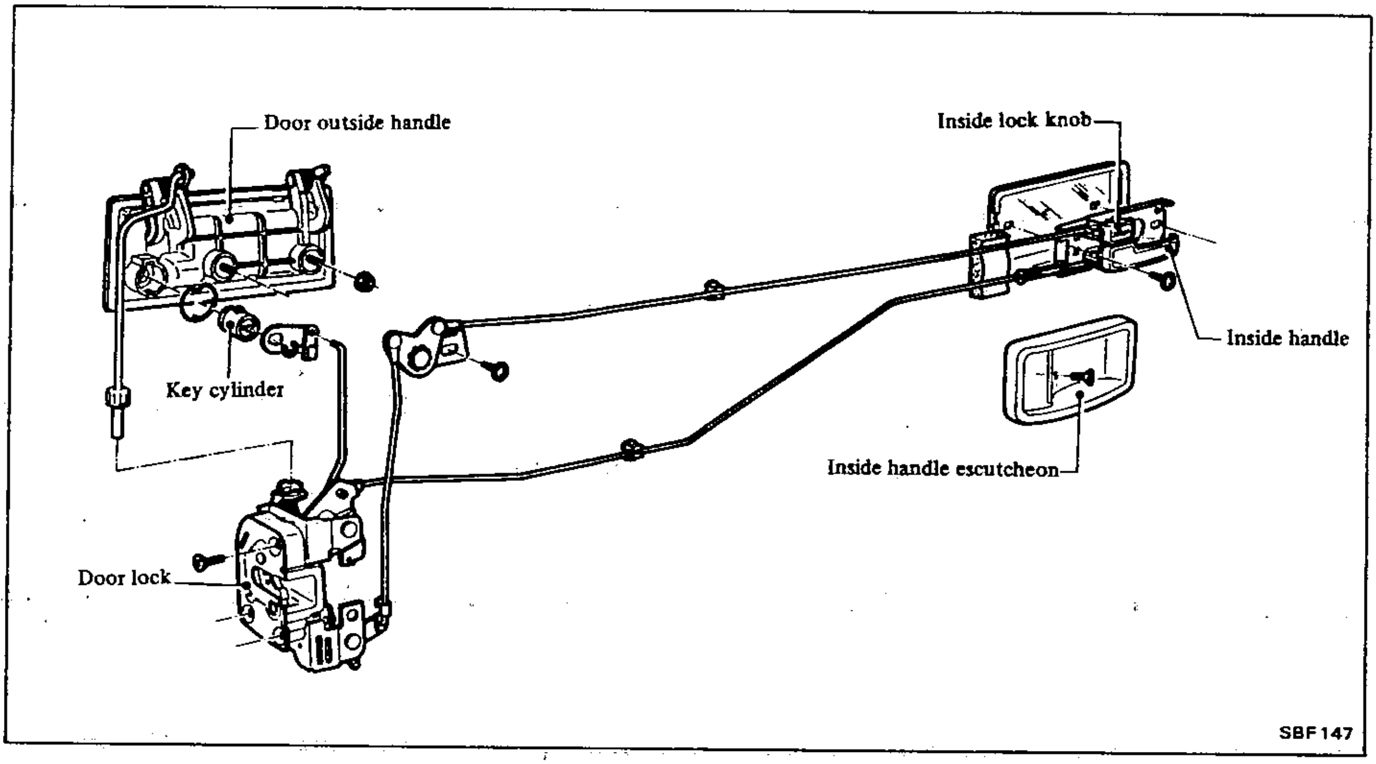


SBF146

9. Installation is in reverse order of removal. Door glass adjustment. Refer to Adjustment.

Apply grease to sliding surfaces of regulator and guide channel.

Door lock and lock control

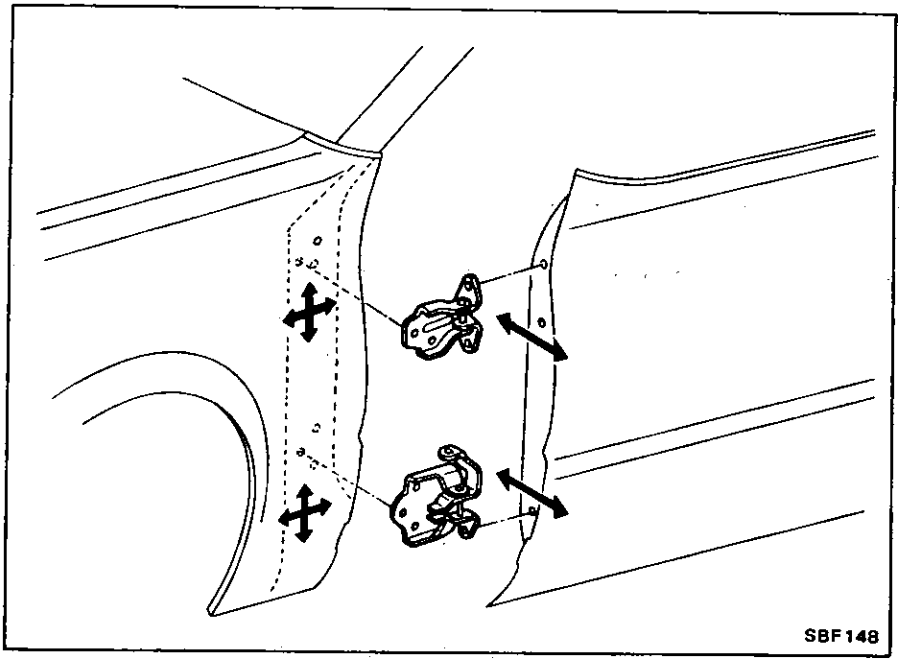


1. Remove door trim.
2. Remove door glass. Refer to Door Glass for removal.
3. Remove door inside handle attaching screws, door lock assembly attaching screws and bell-crank attaching screw.
4. Disconnect key rod from key cylinder, and then remove door lock and lock control.
5. Remove door outside handle.
6. Installation is in reverse order of removal.

Apply grease to sliding surfaces of levers and springs.

ADJUSTMENT

Door assembly



1. Loosen bolts attaching door hinge to body side. Move door up or down and forward or backward until it is correctly positioned.

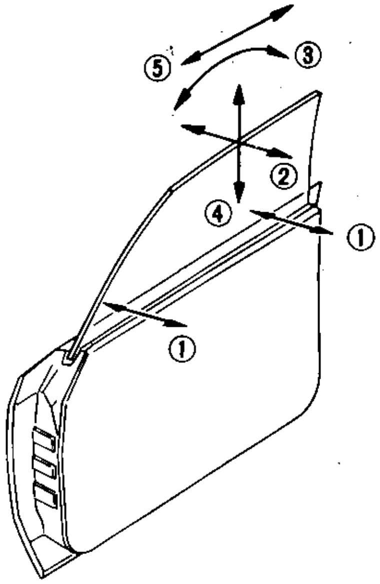
Using an offset wrench, remove bolts attaching hinge to rear of front fender.

2. Loosen bolts attaching door hinge to door side. Move door from side to side until it is set in optimum position.

Door glass

Before adjusting door window glass, check body side weatherstrip to ensure that it is properly positioned, as improper positioning may cause water or dust leaks.

Adjust window glass as follows:

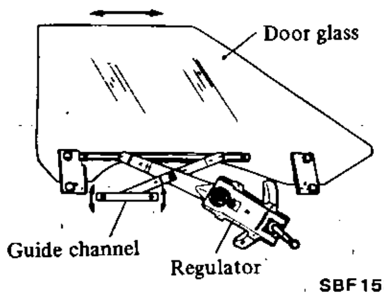


1 In-out adjustment (at waist area)
2 In-out adjustment (upper side of galss)
3 Tilt adjustment (upper side of glass)
4 Glass upper stop adjustment
5 Glass fore and aft adjustment

SBF149

Tilt adjustment (Upper side of glass)

1. Loosen front and rear upper stopper securing bolts and front and rear guide rail securing nuts.
2. Adjust door regulator so that upper side of glass is parallel with body side weatherstrip.

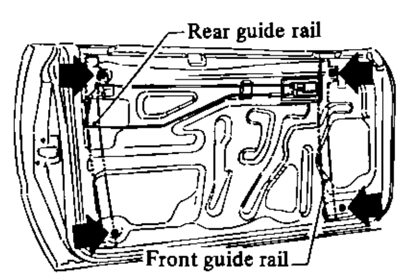


SBF153

3. After adjustment, tighten guide rail securing nuts and guide channel securing bolts.

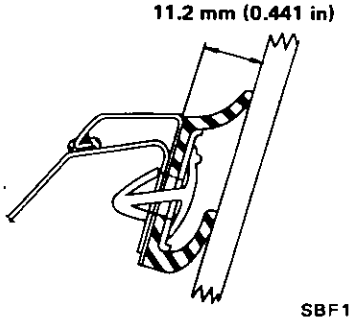
In-out adjustment (At waist area)

1. Loosen nuts securing upper ends of both front and rear guide rails.



SBF150

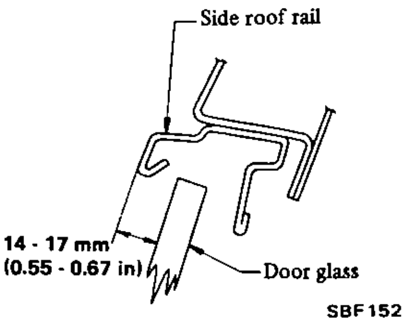
2. Raise window completely.
3. Turn upper adjusting bolts in one direction or the other until distance between glass and rubber seal for door waist molding is 11.2 mm (0.441 in), as shown in Figure below.



SBF151

In-out adjustment (Upper side of glass)

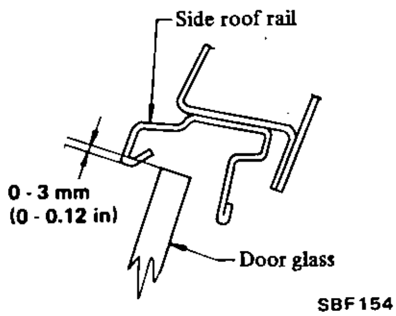
1. Loosen nuts securing lower end of guide rail, and turn adjusting bolts until glass is set in position as shown in Figure below.



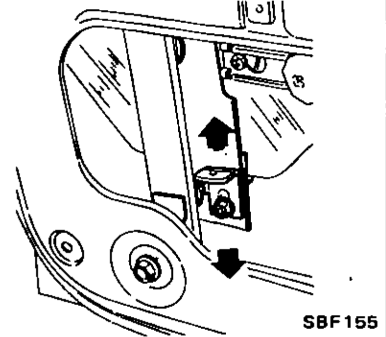
SBF152

Glass upper stop adjustment

1. Adjust rear height of glass by changing upper rear stopper position.

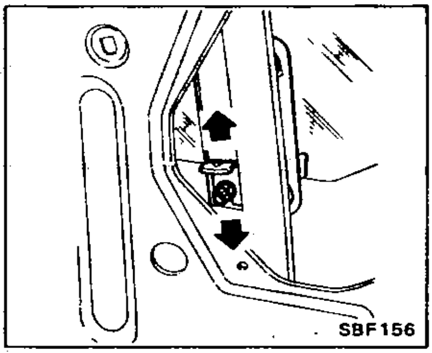


SBF154



SBF155

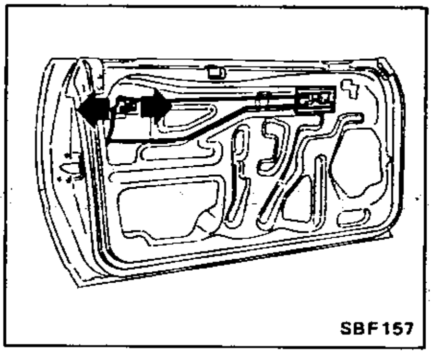
2. Adjust front height of glass by changing upper front stopper position.



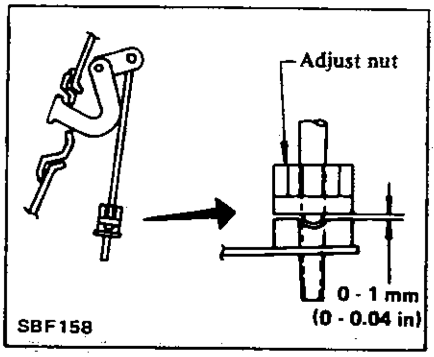
After completing adjustment, ensure that each adjustment is within specified limit.

Door lock and lock control

1. Move bell-crank front and rear until free play of lock knob is minimum. Check lock knob and inside handle to insure that they are flush with each other when lock is engaged. Tighten lock knob attaching screws.



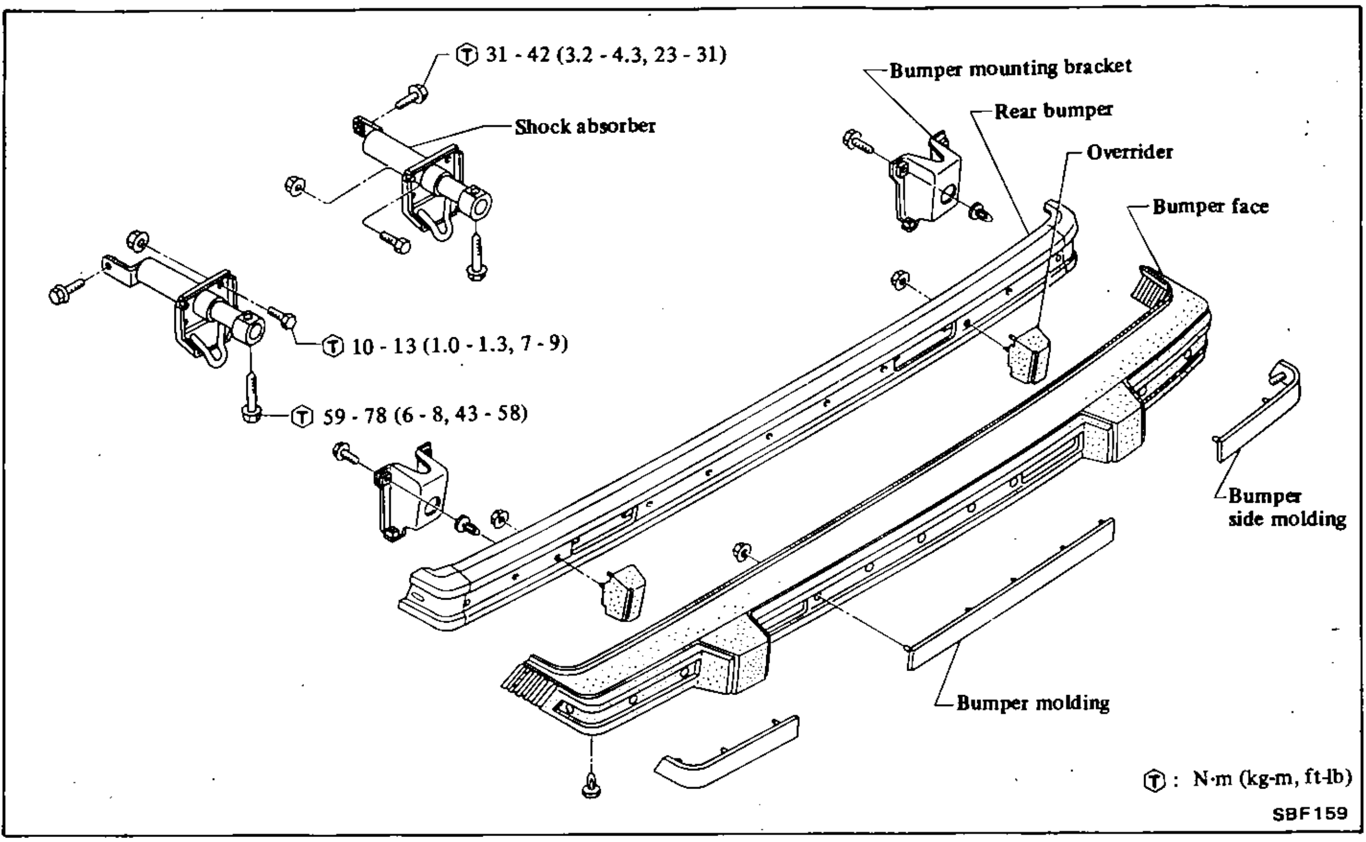
2. Turn adjusting nut until clearance between outside handle rod and door lock lever is 0 to 1 mm (0 to 0.04 in).



After adjustment, check to determine if door lock operates correctly.

BODY REAR END

REAR BUMPER (Shock absorber type)



SBF159

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Disconnect reverse lamp harness.
3. Remove special bolts securing shock absorber to bumper assembly, and detach bumper assembly.
4. Remove shock absorber from car body.

CAUTION:

The shock absorber is filled with a high pressure gas and should not be disassembled, drilled or exposed to an open flame.

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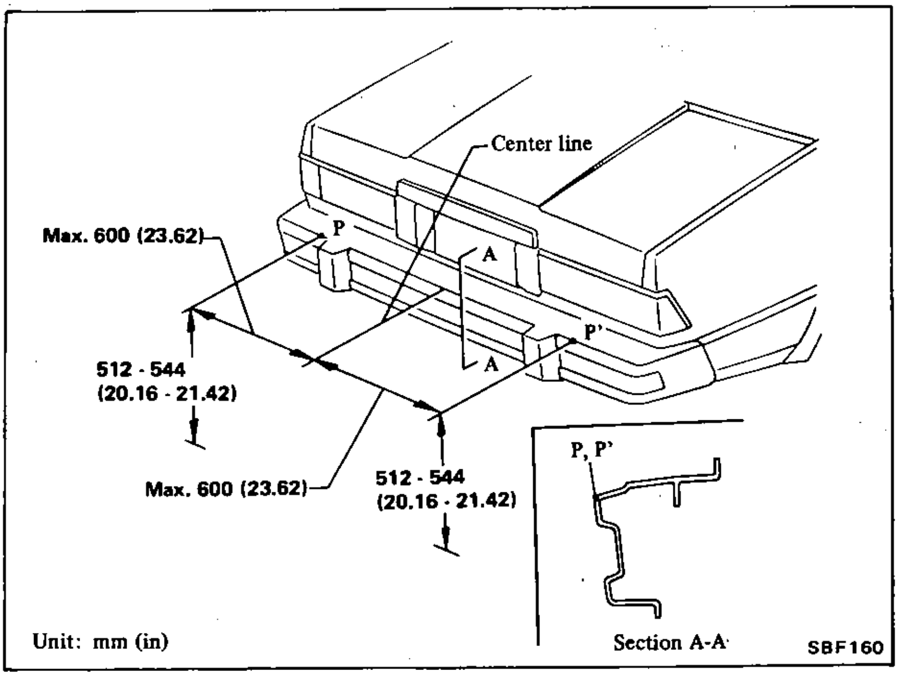
5. Installation is in reverse order of removal.

ADJUSTMENT

Bumper height

1. Adjust bumper height so that distance from top edges to ground meets the specifications.



SBF160

Place car on a flat surface under curb weight conditions. Tires must be inflated to rated pressure.

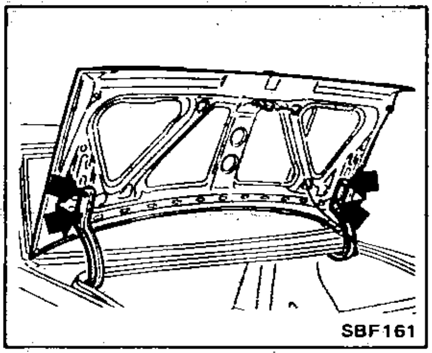
2. After adjustment, tighten bolts and nuts securely.

TRUNK LID (Hardtop)

REMOVAL AND INSTALLATION

Trunk lid

1. Open trunk lid and remove trunk opener cable.
2. Support trunk lid and remove bolts attaching trunk lid to hinge, then remove trunk lid.



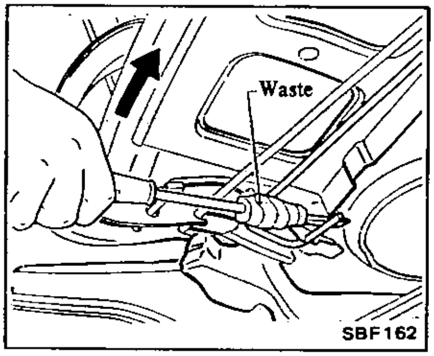
SBF161

3. Installation is in reverse order of removal.
   Adjust trunk lid. Refer to Adjustment.

Ⓣ : **Trunk lid securing bolts**
3.9 - 4.9 N·m
(0.4 - 0.5 kg-m,
2.9 - 3.6 ft-lb)

Torsion bar

1. Open trunk lid.
2. Support trunk lid and remove each torsion bar by disengaging end of torsion bar from trunk lid. Use a suitable screwdriver.

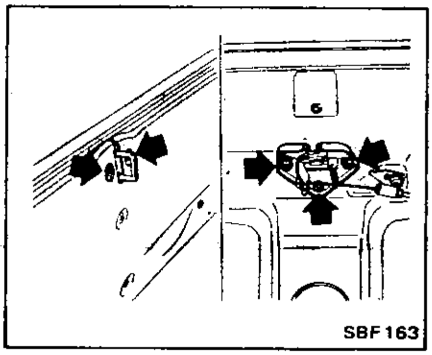


SBF162

3. Installation is in reverse order of removal.

Trunk lid lock and striker

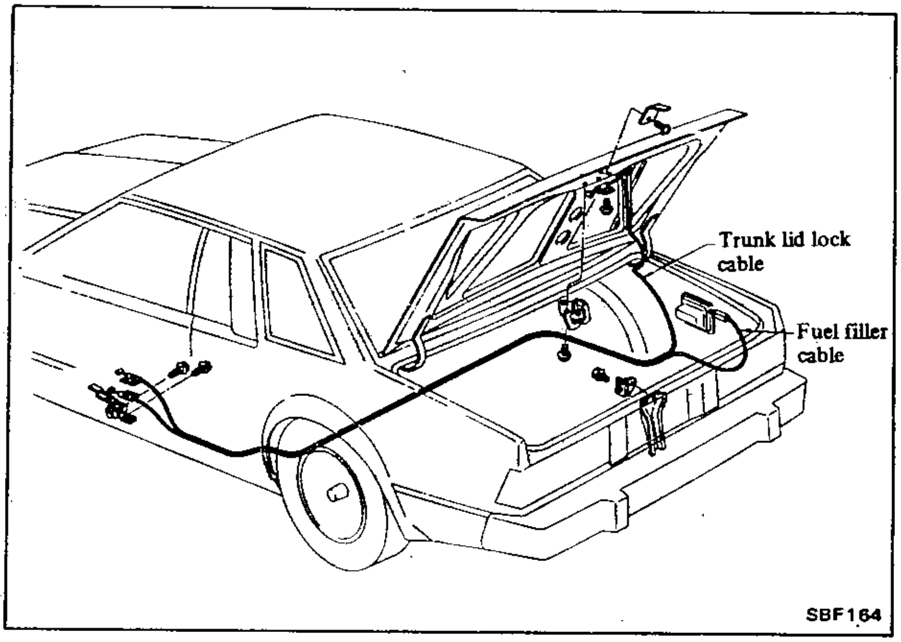
1. Remove trunk rear finisher.
2. Remove trunk lid attaching bolts, and then remove striker.
3. Remove lock attaching bolts, and then remove lock.



SBF163

4. Installation is in reverse order of removal.

Trunk lid opener



SBF164

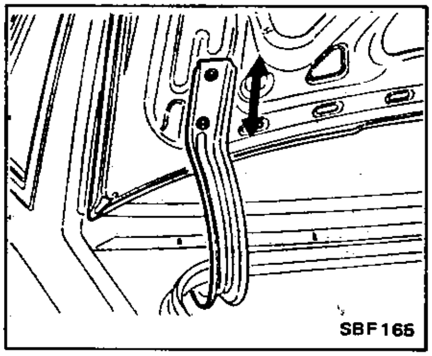
1. Remove rear seat cushion and rear seat back.
2. Remove kicking plate.
3. Remove trunk lid lock attaching bolts and then remove trunk lid lock.
4. Trun up floor carpet near trunk lid opener handle.
5. Remove trunk lid opener handle.
6. Remove trunk lid opener cable.
7. Installation is in reverse order of removal.

Fasten trunk opener cable securely with adhesive tape.

ADJUSTMENT

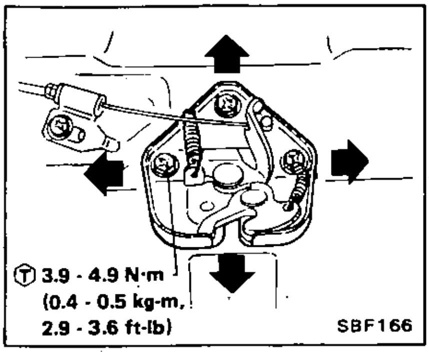
Trunk lid and lock

1. Loosen bolts attaching trunk lid hinges. Move trunk lid forward or backward and side to side until it is set in optimum position.



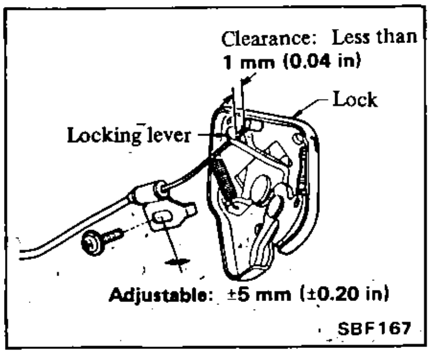
SBF165

2. Loosen bolts attaching trunk lid lock. Move trunk lid lock forward or backward and side to side until it is correctly positioned when opened and closed.



Trunk lid opener

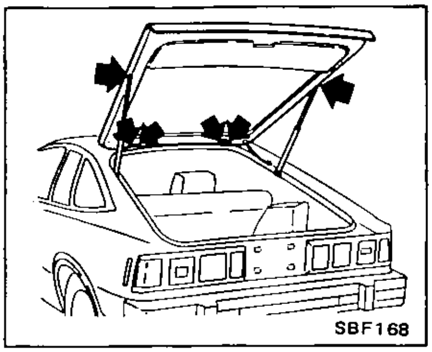
Adjust trunk lid opener until clearance between trunk lid control cable end and control lever is within 1 mm (0.04 in) when trunk lock is engaged.



BACK DOOR (Hatchback)

REMOVAL AND INSTALLATION

Back door



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.

5. Installation is in reverse order of removal.

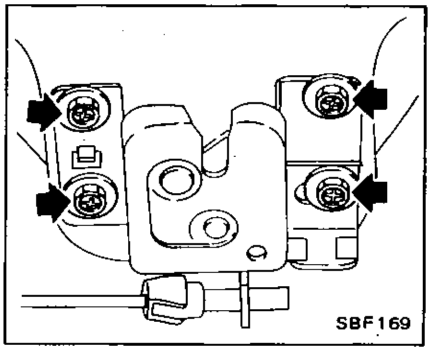
Ⓣ : **Back door stay retaining bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

CAUTION:

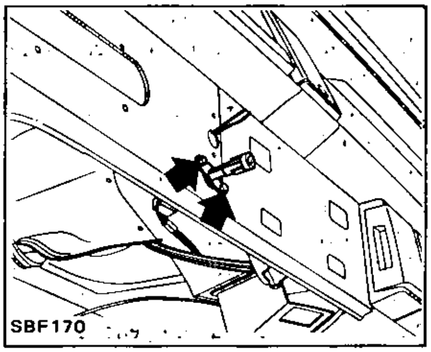
a. Be careful not to scratch back door stay when installing. A scratched stay may cause gas leakage.
b. Back door stay contents are under pressure. Do not take apart, puncture, apply heat or fire.

Back door lock and lock cylinder

1. Open back door.
2. Remove luggage rear finisher.
3. Remove back door lock from rear panel.

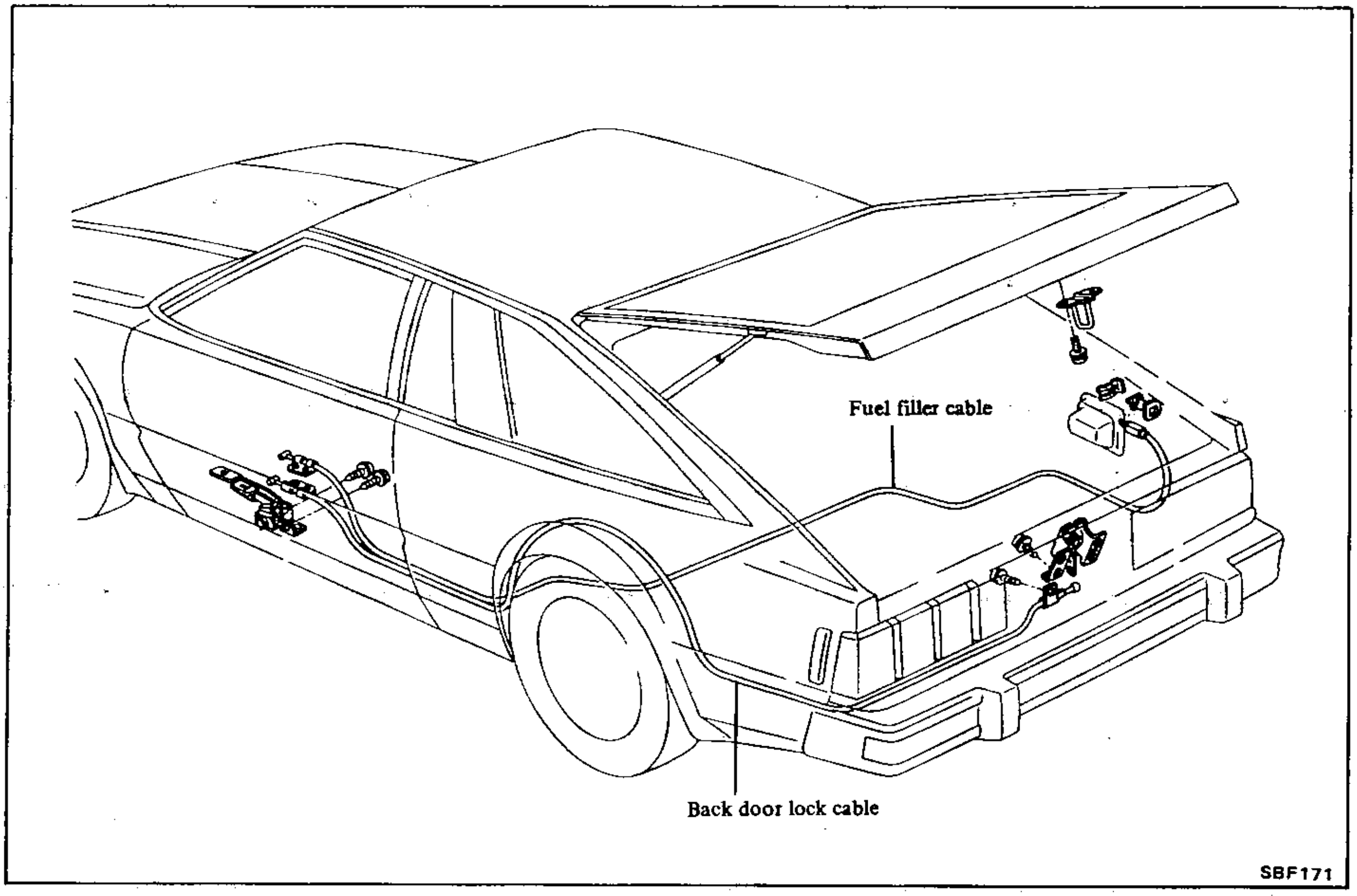


4. Remove rear combination lamp and then remove lock cylinder.



5. Installation is in reverse order of removal. Adjust back door, referring to Back Door for adjustment.

Back door opener



1. Open back door.
2. Remove luggage rear finisher.
3. Remove back door lock from rear panel.
4. Remove rear seat cushion and rear seat back.
5. Remove kicking plate.
6. Turn up floor carpet near back door opener handle.
7. Turn up luggage room carpet and remove back door opener handle.
8. Remove back door opener cable.
9. Installation is in reverse order of removal.

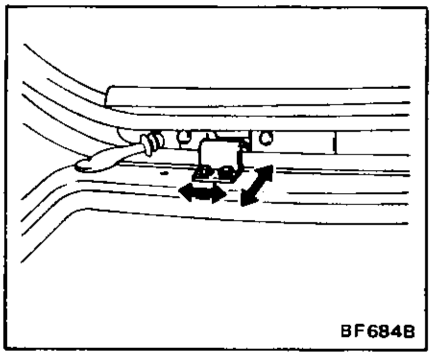
Fasten back door opener control cable securely with adhesive tape.

ADJUSTMENT

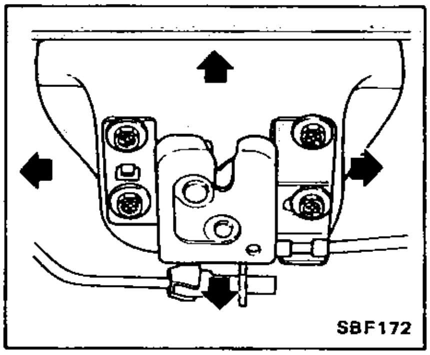
Back door and striker

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.

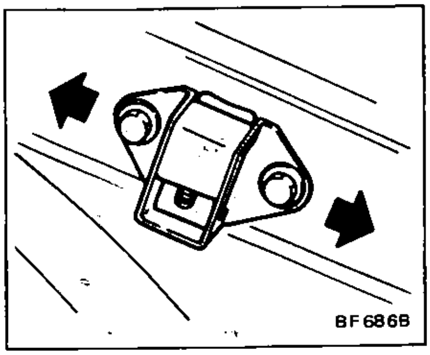


4. After alignment is properly made, tighten bolts securely.
5. To obtain a snug fit between back door and weatherstrip, loosen down stopper securing screws. Loosen back door lock attaching bolts enough to move lock, working lock up or down and from side to side as required.



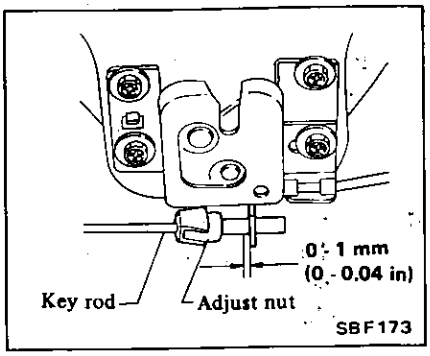
6. After desired adjustment is obtained, tighten back door lock attaching bolts securely.

7. Adjust down stopper to set with hollow of back door, then tighten down stopper securing screws.



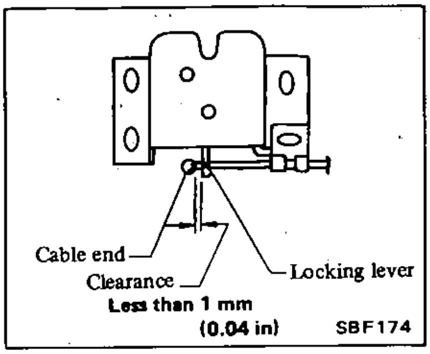
Back door lock

Adjust back door lock and key rod until they are correctly positioned when door lock is engaged, as shown in Figure below.



Back door opener

Adjust clearance between rear door opener cable end and locking plate when door is locked, until it is within range indicated in Figure below.



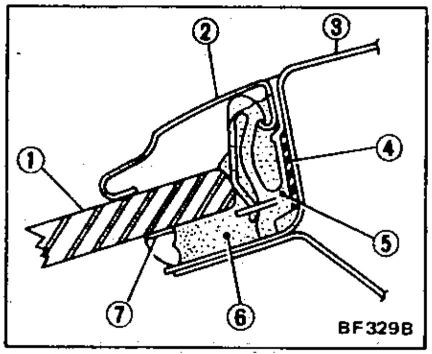
WINDSHIELD AND WINDOWS

WINDSHIELD

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 windshield molding is 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

CAUTION:

a. Use Genuine Nissan Sealant Kit "72891 U7425" 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.

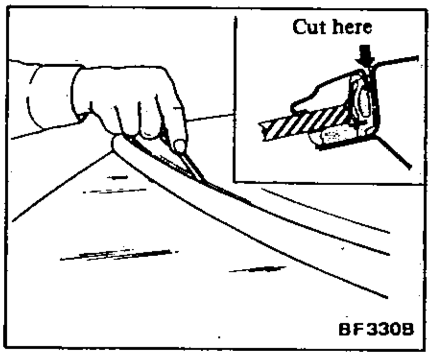
d. Keep Primers and sealant in a cool, dry place. Ideally, sealant should be stored in a refrigerator.

WARNING:
Keep heat or open flames away as Primers are flammable.

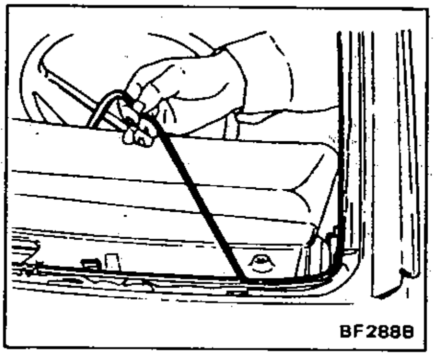
REMOVAL

1. Protect hood, front fenders, instrument panel and front seats with covers.
2. Remove windshield wipers, front pillar garnishes and windshield garnish.

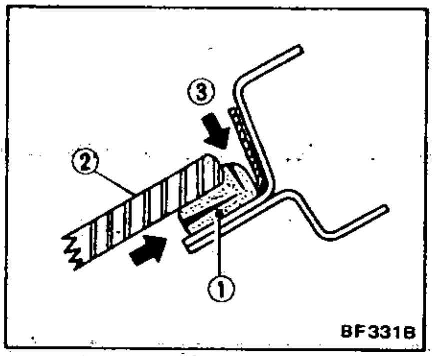
   Refer to Roof Trimming for removal.
3. Remove front pillar moldings.
4. With a sharp cutting knife, cut off caulking material attached to upper and lower moldings. Then remove moldings.



5. Reaching from inside car, strip dam rubber from around windshield glass.



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

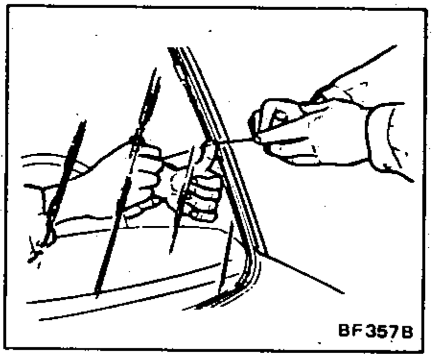
7. Cut off caulking material around entire perimeter of glass as follows:

(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 caukling 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.



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. 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.

INSTALLATION

1. Clean contacting face of body with non-lead gasoline.

CAUTION:

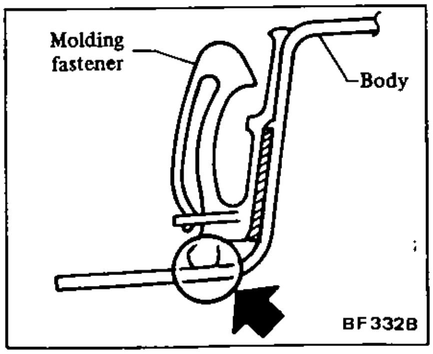
Do not allow oil, grease or water to get on clean surfaces from dirty hands or tools.

2. Install molding fastener on upper windshield opening as follows:

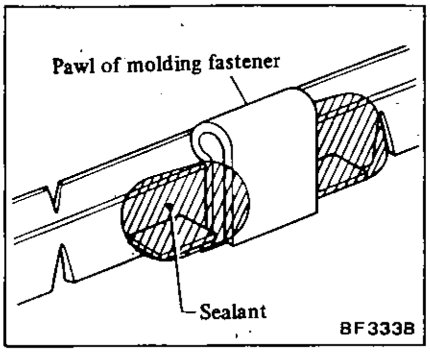
(1) Heat molding fastener and contacting face of body up to about 40°C (104°F) using a heat gun.

(2) Attach molding fastener to body and press it more than 490 kPa (5 kg/cm², 71 psi) using a suitable roller.

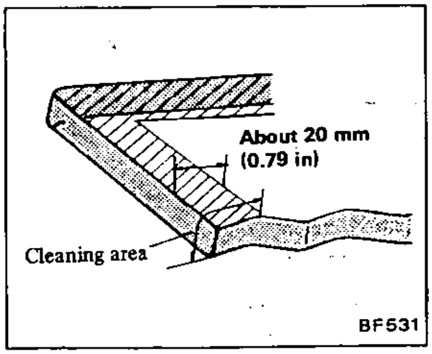
Make certain that molding fastener does not come off from body, as shown.



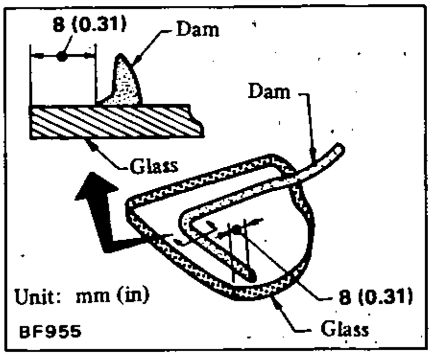
(3) Apply glass sealant beside molding fastener.



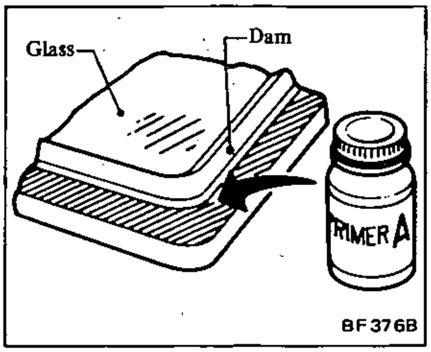
3. Clean glass surface where the sealant will be applied and dam with non-lead gasoline.



4. Install dam rubber to inside of windshield glass 8 mm (0.31 in) inboard from edge of glass and cut off excess amount at its ends.



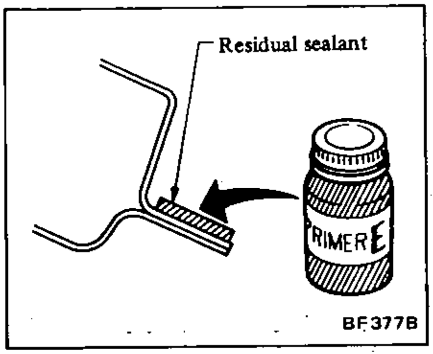
5. With sponge furnished with Primer A, apply a light coat of Primer to cleaned area of glass.



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.

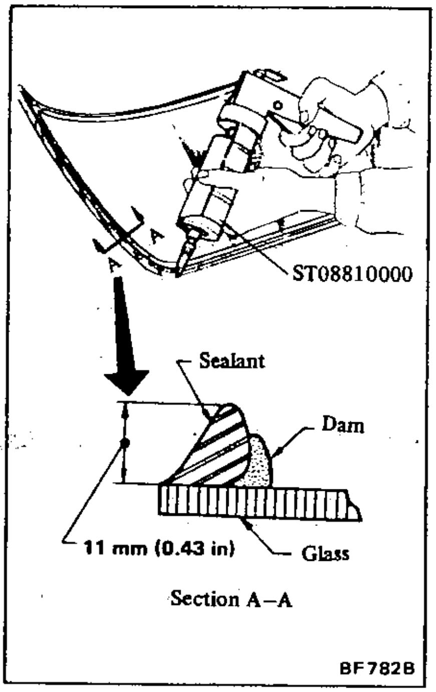


If residual sealant is silicone, remove all traces of it.

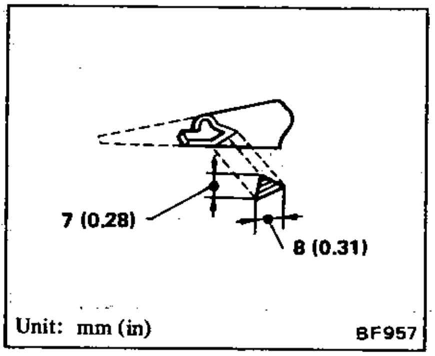
CAUTION:

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.

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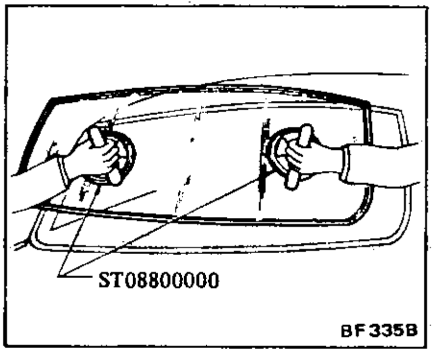
8. Support windshield glass with Sucker ST08800000.
9. Install windshield glass on opening flange so that clearances between windshield glass and body are about 7 mm (0.28 in).



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.

After installing, attach caution label to glass surface.

CAUTION

LEAVE ONE WINDOW
OPEN SLIGHTLY
FOR THREE DAYS.

This is to protect your new windshield installation from pressure-induced leaks before the rubber seal has completely vulcanized.

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.

Reference: Period required for sealant to dry to desired hardness.

Unit: days

Relative humidity % Temperature °C (°F)	90	50	25
25 (77)	1.5	2.5	6
10 (50)	3	5.3	10
−10 (14)	10	17	34

REPAIRING LEAKS

Leaks can be repaired without removing and reinstalling glass in the following manner:

1. To stop leaks, first remove moldings in area of leak.
2. Mark location of leak.

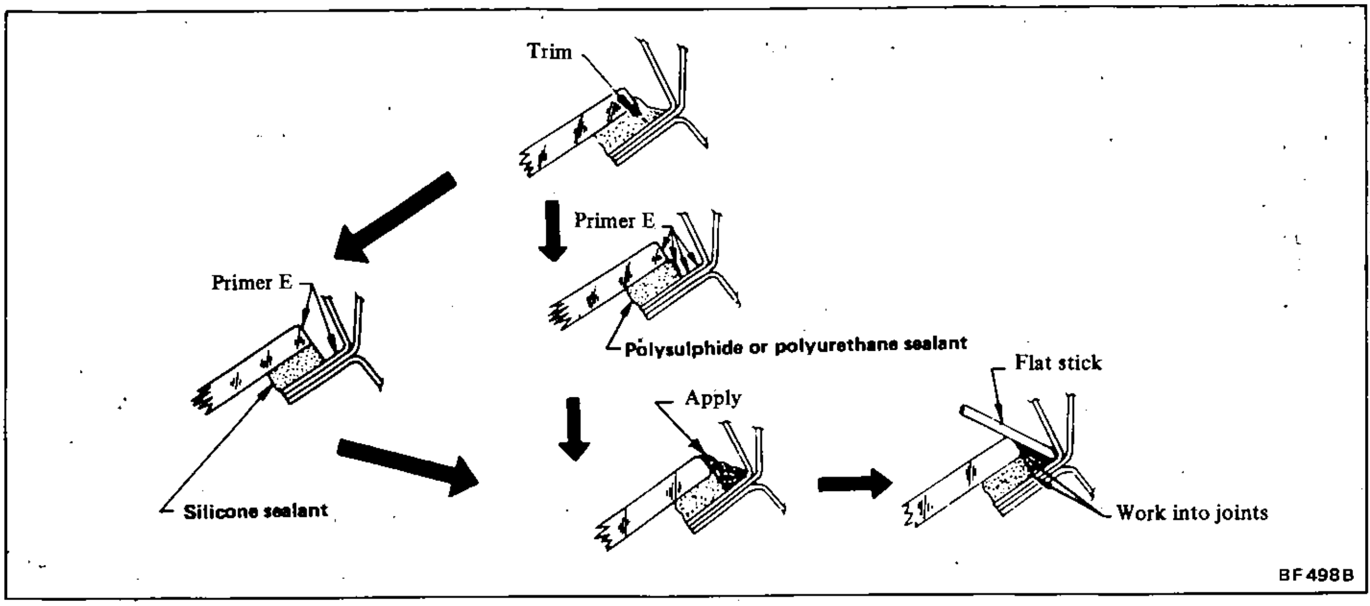
If water is leaking between caulking material and body or between glass and caulking material, determine extent of leak by pushing glass outwards.

Apply water to leak area while pushing on glass.

Mark extent of leak point.

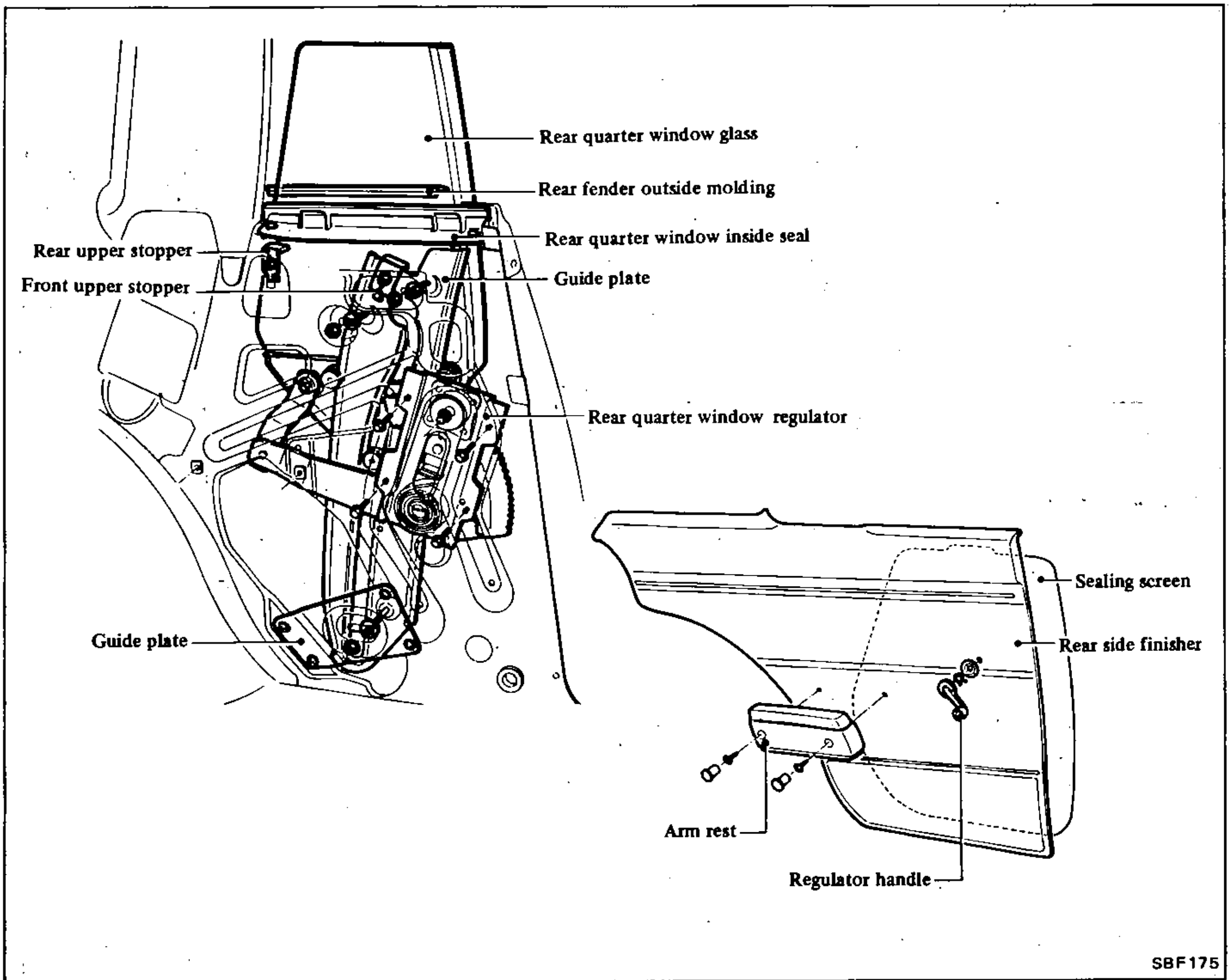
3. Apply Primer and then sealant to leak points, following procedures shown below.

CAUTION:
Do not apply Primer to old silicone sealant.

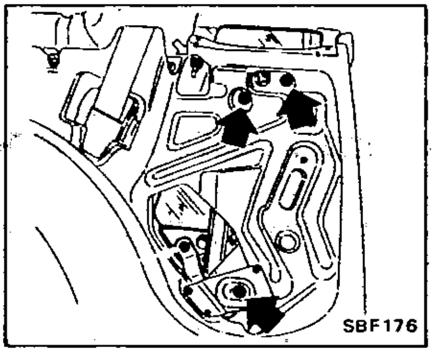


REAR QUARTER WINDOW (Hardtop)

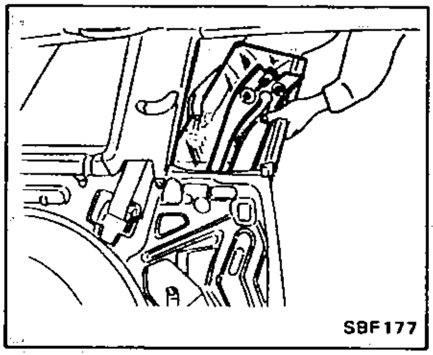
REMOVAL AND INSTALLATION



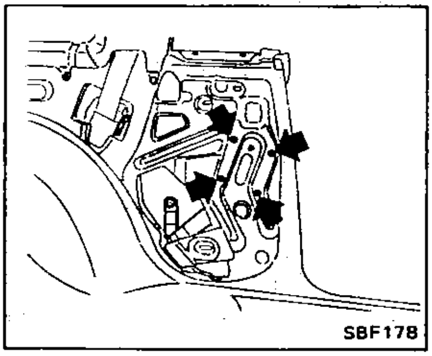
1. Remove rear seat cushion and rear seat back.
2. Remove regulator handle and rear side finisher.
3. Remove air outlet grille and sealing screen.
4. Remove upper stoppers and nuts attaching glass to regulator. Remove guide plate attaching nuts.


SBF176

5. Remove both quarter window glass and guide plate through top opening.


SBF177

6. Remove bolts attaching regulator.


SBF178

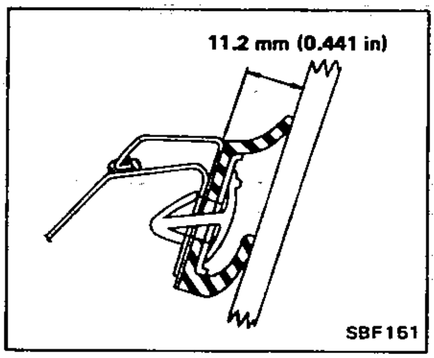
7. Draw out regulator through lower opening.
8. Installation is in reverse order of removal. Glass adjustment, refer to Adjustment.

Apply grease to sliding surfaces of regulator and guide channel.

ADJUSTMENT

In-out adjustment (At waist area)

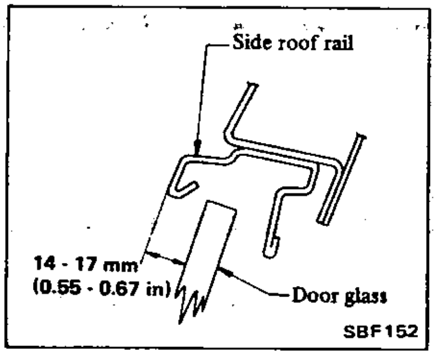
Close rear quarter window completely. Adjust position of adjusting bolt securing upper end of guide plate until distance between glass and rear quarter waist molding rubber seal is 11.2 mm (0.441 in), as shown.



SBF161

In-out adjustment (Upper side of glass)

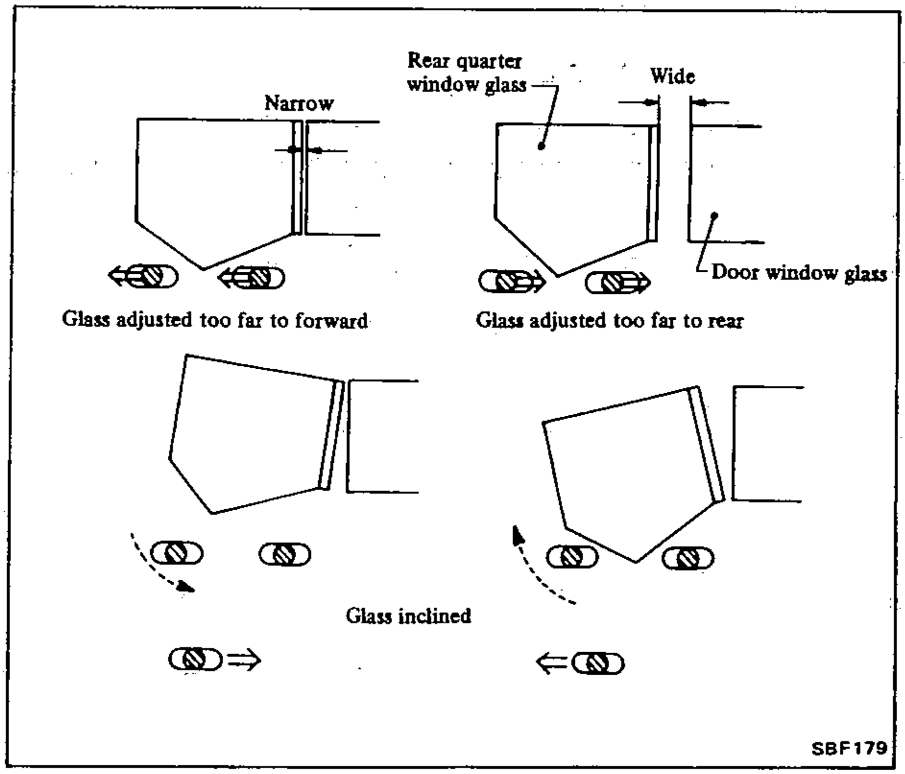
Adjust rear quarter window glass position as shown in Figure below, using adjusting bolt located on lower end of guide plate.



SBF152

Angle adjustment

Close door glasses and rear quarter window glass completely to ensure that rear quarter window glass is aligned with door glasses and fits body side weatherstripping.



Glass adjusted too far to forward

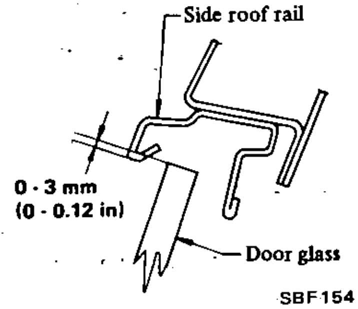
Glass adjusted too far to rear

Glass inclined

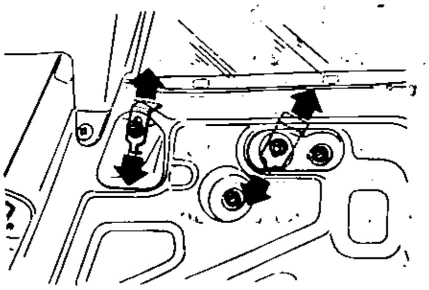
SBF179

Glass upper stop adjustment

Adjust two upper stoppers until glass and side roof rails are set at dimensions (glass fully raised) indicated in Figure below.



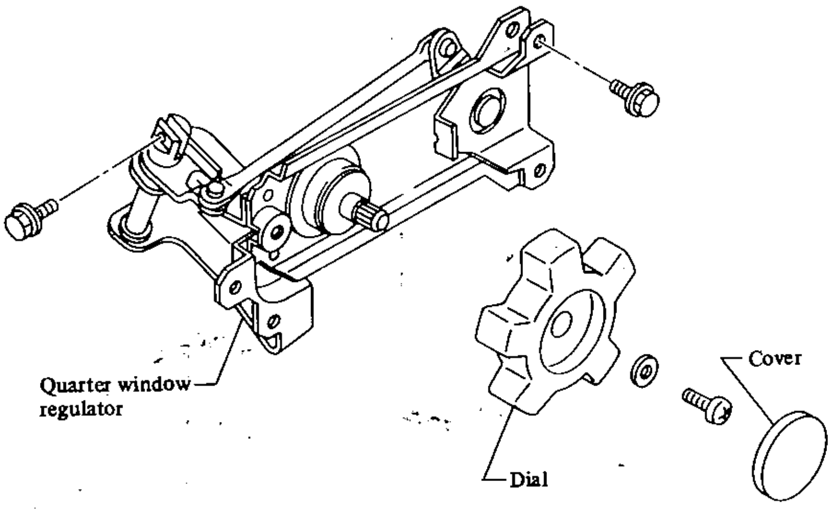
SBF154



SBF180

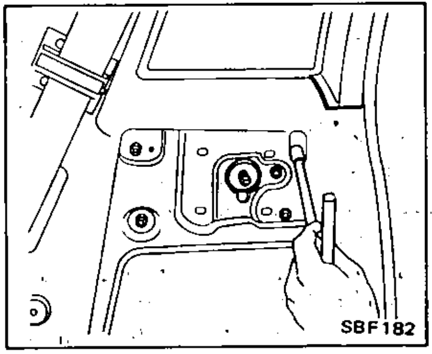
REAR QUARTER WINDOW (Hatchback)

REMOVAL AND INSTALLATION



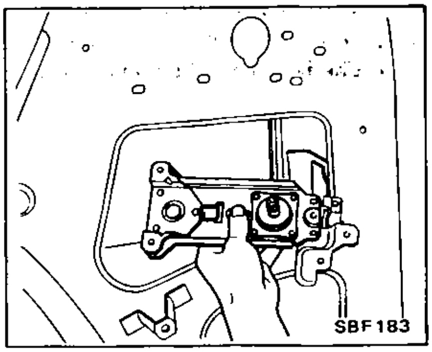
SBF181

1. Remove rear seat cushion and seat back.
2. Remove regulator handle, rear side finisher and top luggage side finisher, and remove sealing screen.
3. Remove bolts attaching glass to regulator.



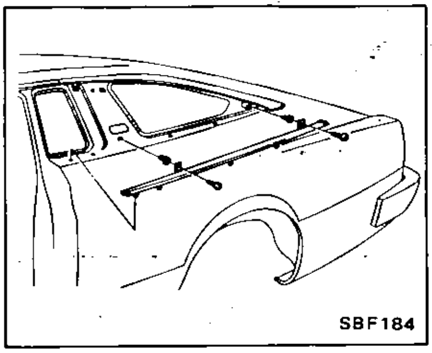
SBF182

4. Remove regulator attaching bolts and detach regulator.



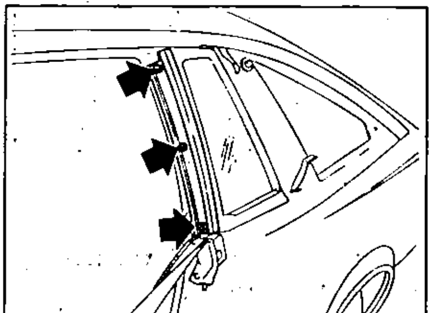
SBF183

5. Remove air outlet grille and rear fender molding.



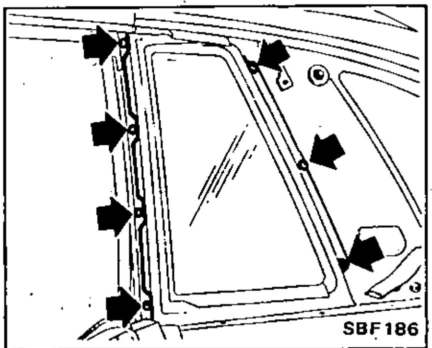
SBF184

6. Remove rear body side retainer.



SBF185

7. Remove quarter window attaching screws, then remove quarter window.



SBF186

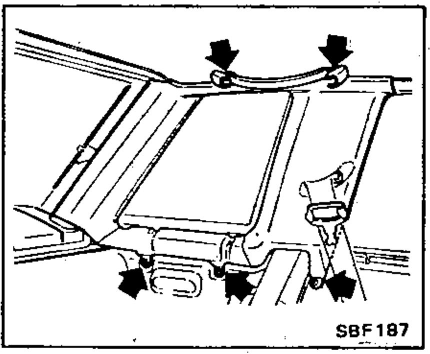
8. Installation is in reverse order of removal.

To prevent water leakage through door, fasten sealing screen securely using adhesive tape or bonding agent.

OPERA WINDOW (Hardtop)

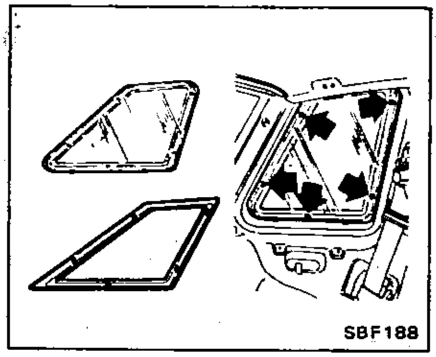
REMOVAL AND INSTALLATION

1. Remove rear seat cushion, seat back and rear side finisher.
2. Remove assist grip and rear corner finisher.



SBF187

3. Remove opera window attaching nuts, then remove window.



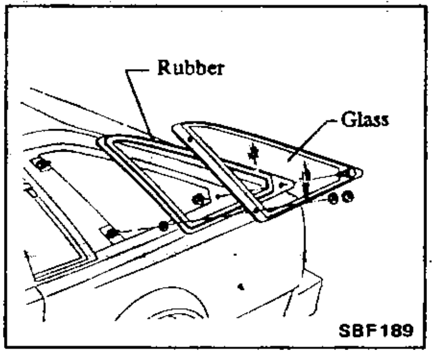
SBF188

4. Installation is in reverse order of removal.

OPERA WINDOW (Hatchback)

REMOVAL AND INSTALLATION

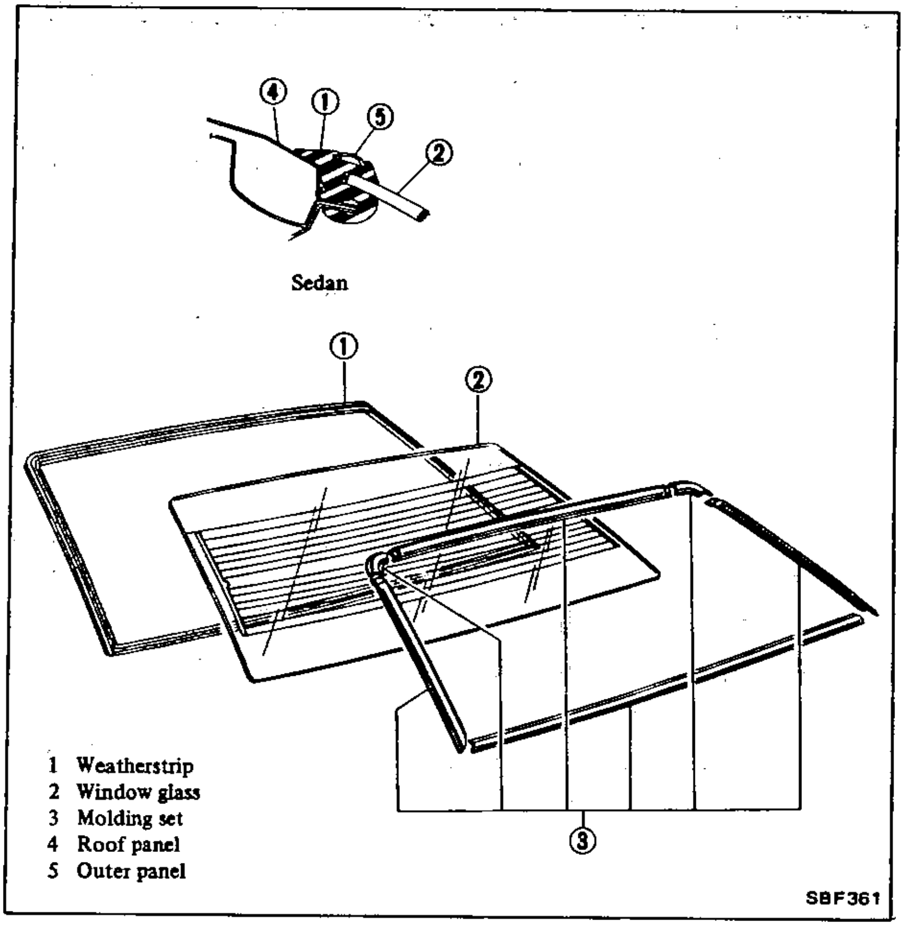
1. Remove rear seat cushion, seat back, rear side finisher and luggage side upper finisher.
2. Remove air outlet grille.
3. Remove opera window attaching nuts, then remove window.



SBF189

4. Installation is in reverse order of removal.

REAR WINDOW (Hardtop)

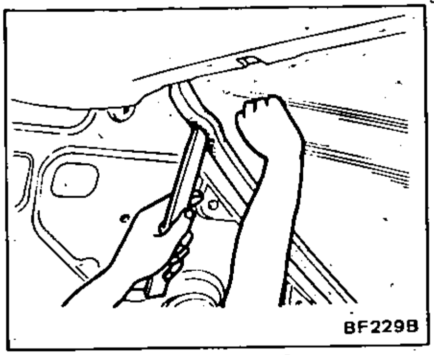


SBF361

REMOVAL

1. Place protective covers on back door and rear fenders.
2. Remove parcel shelf and rear side garnishes after removing rear seat cushion and back from body. Then disconnect rear window defogger harness at connectors. Place protective cover on rear panel.
3. Remove rear window molding by prying out molding.
4. Attach two Suckers ST08800000 to glass beforehand for convenience in lifting out rear window glass.

5. From inside passenger compartment, apply hand pressure to edges of rear window 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.



6. After rear window weatherstrip is free from body flange, with aid of a helper, carefully remove rear window glass with Suckers ST08800000.

INSTALLATION

It is important that rear window opening in body be checked throughly before installation of rear window glass.

Procedure below includes checking of rear window opening in body.

1. Check rear window weatherstrip and rear window opening in body for any irregularities.

2. Stick Suckers ST08800000 on rear window glass. With aid of another person, 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 rear window glass supported and centered in opening in body, check relationship between glass and opening around entire perimeter of glass.

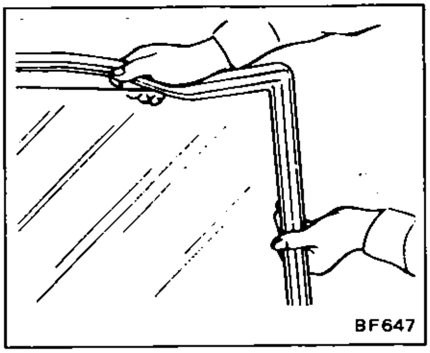
(1) Entire inside surface of glass should be in contact with opening.

(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.

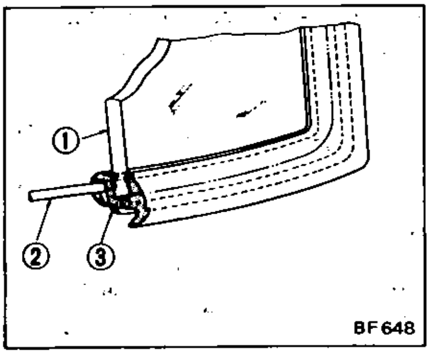
4. Install rear window glass as follows:

(1) Install rear window weatherstrip to glass.



(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.



1 Windshield glass
2 Draw-cord
3 Weatherstrip

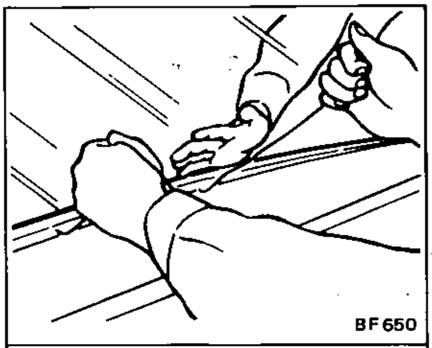
(3) With aid of a helper, carefully position and center rear window glass in opening in body, supporting it with Sucker ST08800000.

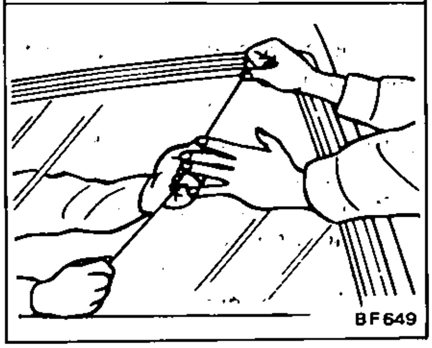
(4) When glass and weatherstrip are properly positioned in opening, slowly pull ends of cord with another person pushing glass from outside, starting from lower center of rear window glass to seal lip of weatherstrip on opening flange.

Cord should be pulled first across bottom of glass, then up each side and finally across top.

(5) Carefully tap around rear window glass to assist in seating weatherstrip on flange.

Never tap or hammer at glass to position.

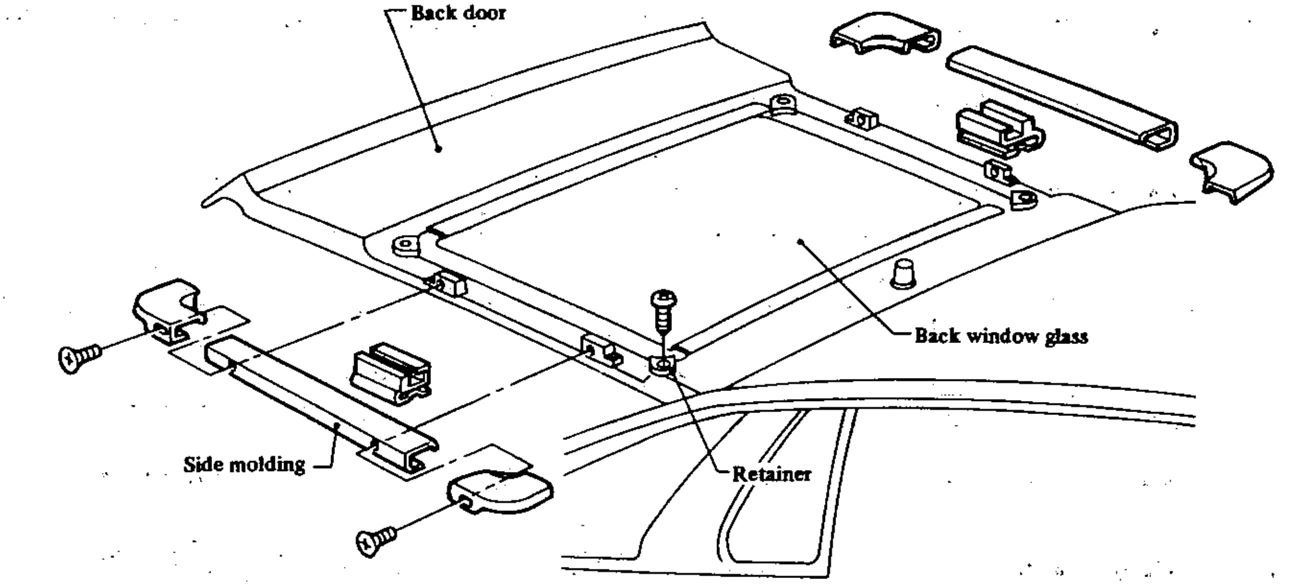




5. Install all previously removed parts.

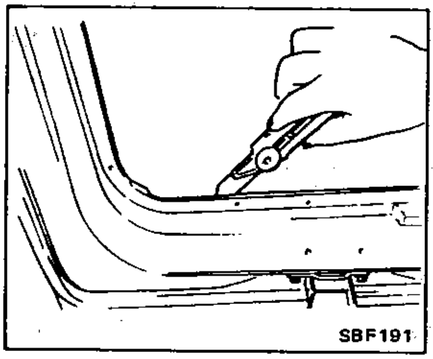
BACK WINDOW (Hatchback)

REMOVAL



SBF190

1. Remove both side molding and corner molding.
2. Remove four glass retainers.
3. Disconnect rear defogger harness (if so equipped).
4. Remove welt from inside passenger compartment.
5. Remove butyl tape with a putty knife, then remove back window glass.

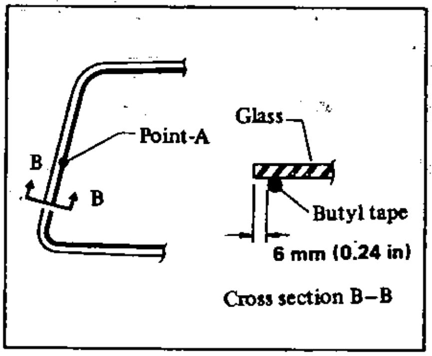


SBF191

INSTALLATION

Use butyl tape of 8 mm (0.31 in) or equivalent when replacing glass.

1. Wipe any trace of butyl tape off glass and door panel, using non-leaded gasoline.
2. Affix butyl tape to entire surface of glass, as shown in Figure below.

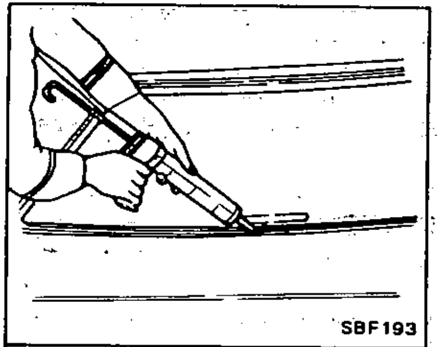


Cross section B–B

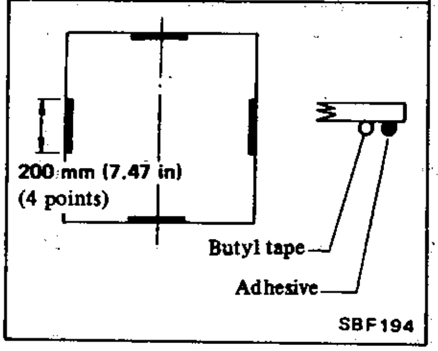
Be sure to affix butyl tape, starting at point A (figure above) and ending at point A and overlap some length of tape at point A.

Use care to avoid touching adhesive side of butyl tape with fingers, as finger prints or stains may reduce adhesive force of tape.

3. Using a heat gun, heat adhesive side of butyl tape to 70°C (158°F).
4. Apply bonding agent to points of glass, as shown in Figures below.



SBF193



SBF194

5. Support rear window glass with Sucker ST08800000.

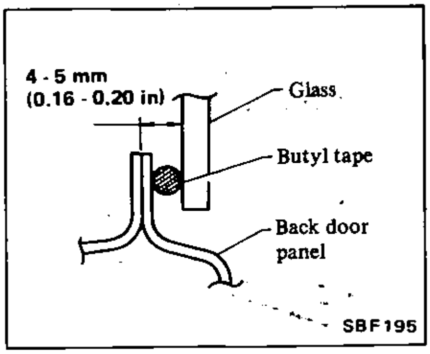
6. With the help of an assistant, bring rear window glass close to opening flange of rear window, and connect rear window defogger harness.

7. Carefully position rear window glass on opening flange of rear window.

Check rear window glass to ensure that all side clearances (upper side, lower side, left side and right side) are equal.

8. Temporarily tighten four retainers, and lightly tap around glass with a rubber-faced hammer until glass fits panel at all points, as shown.

Be careful not to scratch molding.



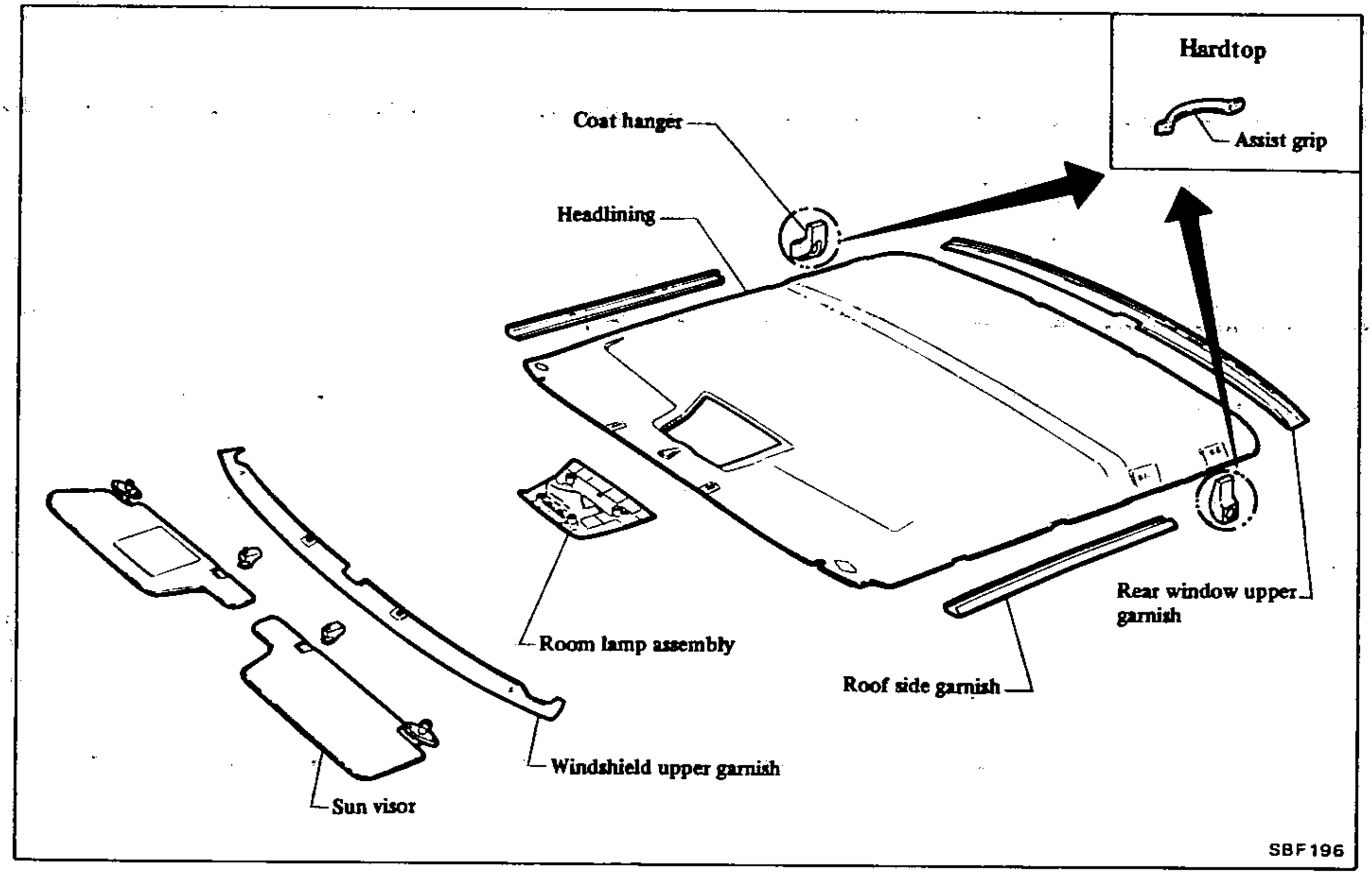
9. Tighten all four retainers securely, and attach corner molding.

10. Do not apply vibration or shocks to glass for at least one hour after glass has been installed. Direct water toward periphery of glass to determine if there is water leak inside passenger compartment.

11. Remove excess or protruded butyl tape.

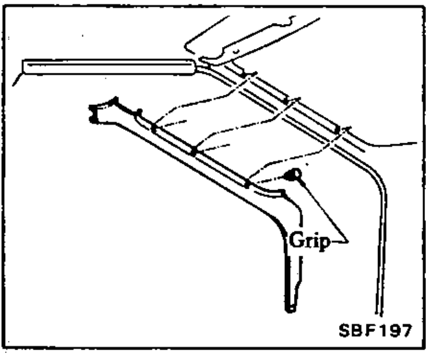
TRIM AND MOLDING

ROOM TRIM

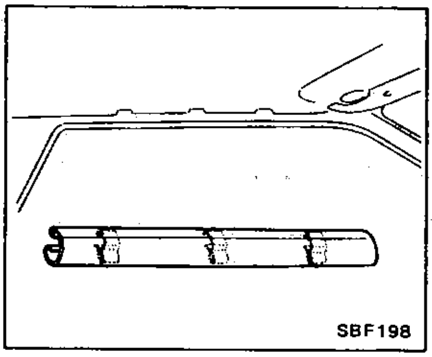


REMOVAL AND INSTALLATION

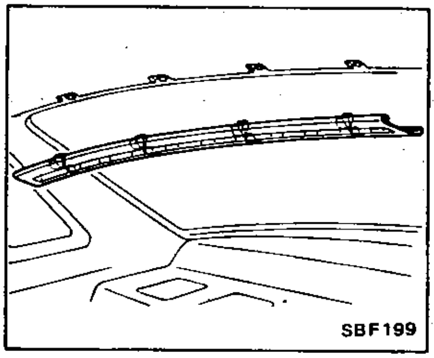
1. Remove front pillar garnish.



2. Remove sun visor and holder.
3. Remove room lamp assembly.
4. Remove roof side garnish.



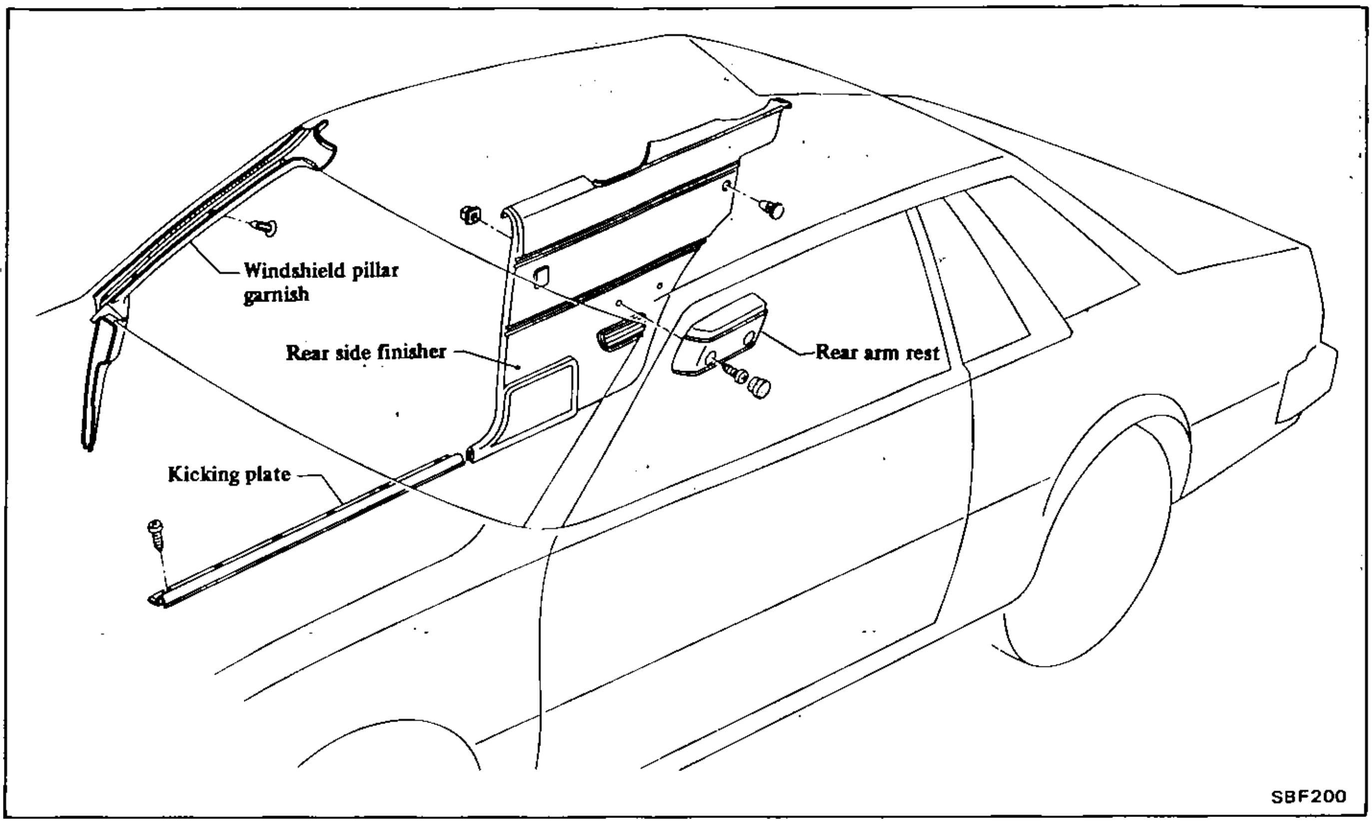
5. Remove rear seat cushion and back.
6. Remove assist grip (Hardtop), or coat hanger (Hatchback).
7. Remove rear side finisher.
8. Remove rear corner finisher (Hardtop) or luggage upper side finisher (Hatchback).
9. Remove rear window upper garnish.



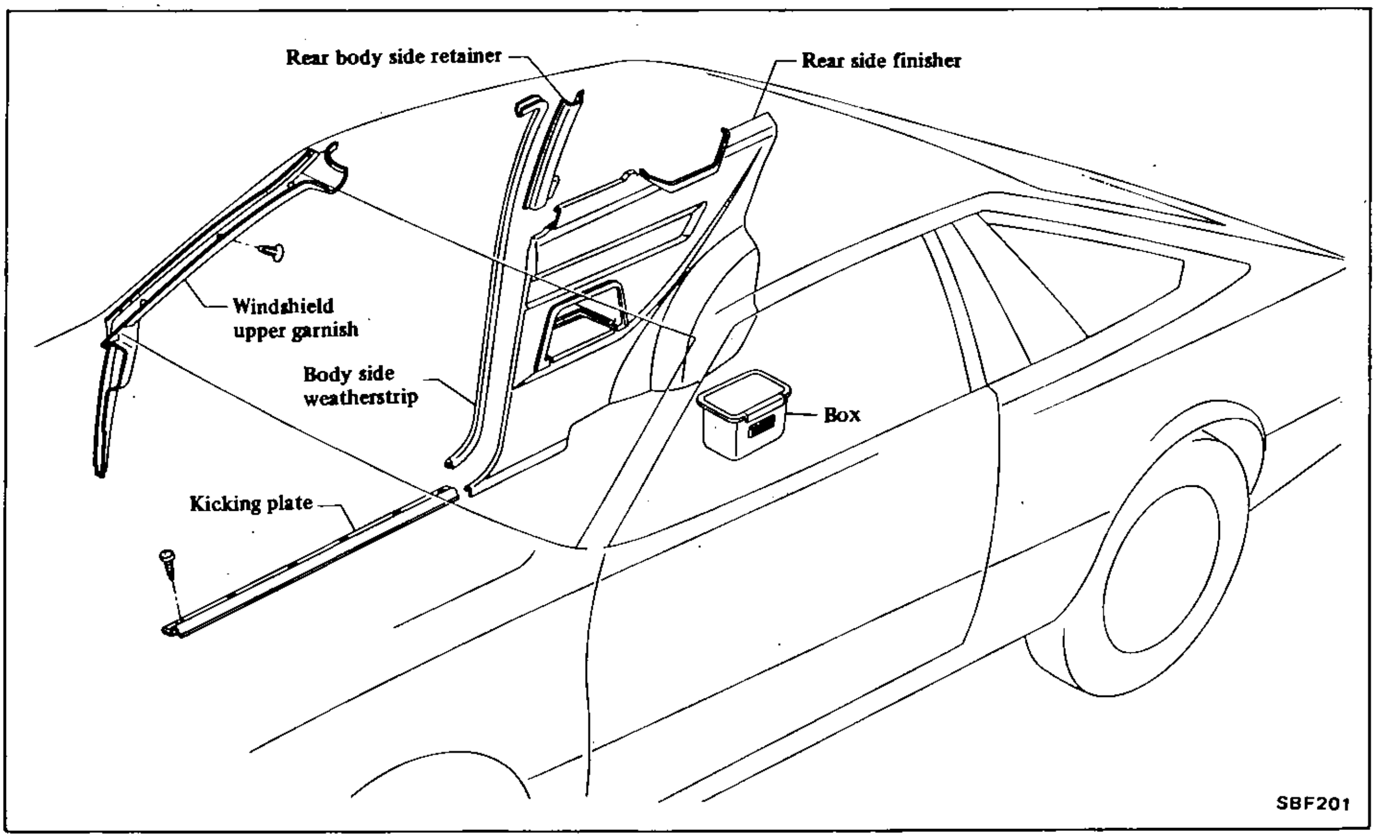
10. Remove head lining.
11. Installation is in reverse order of removal.

BODY SIDE TRIM AND MOLDING

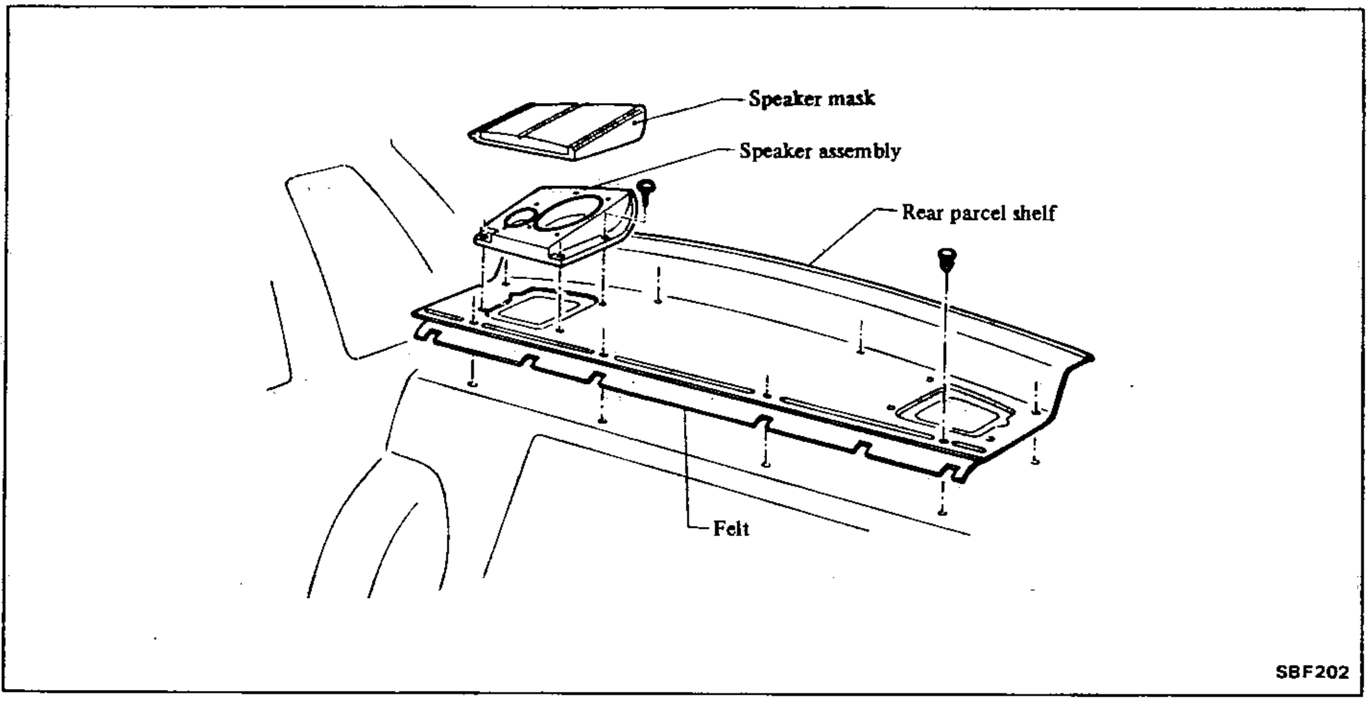
HARDTOP



HATCHBACK

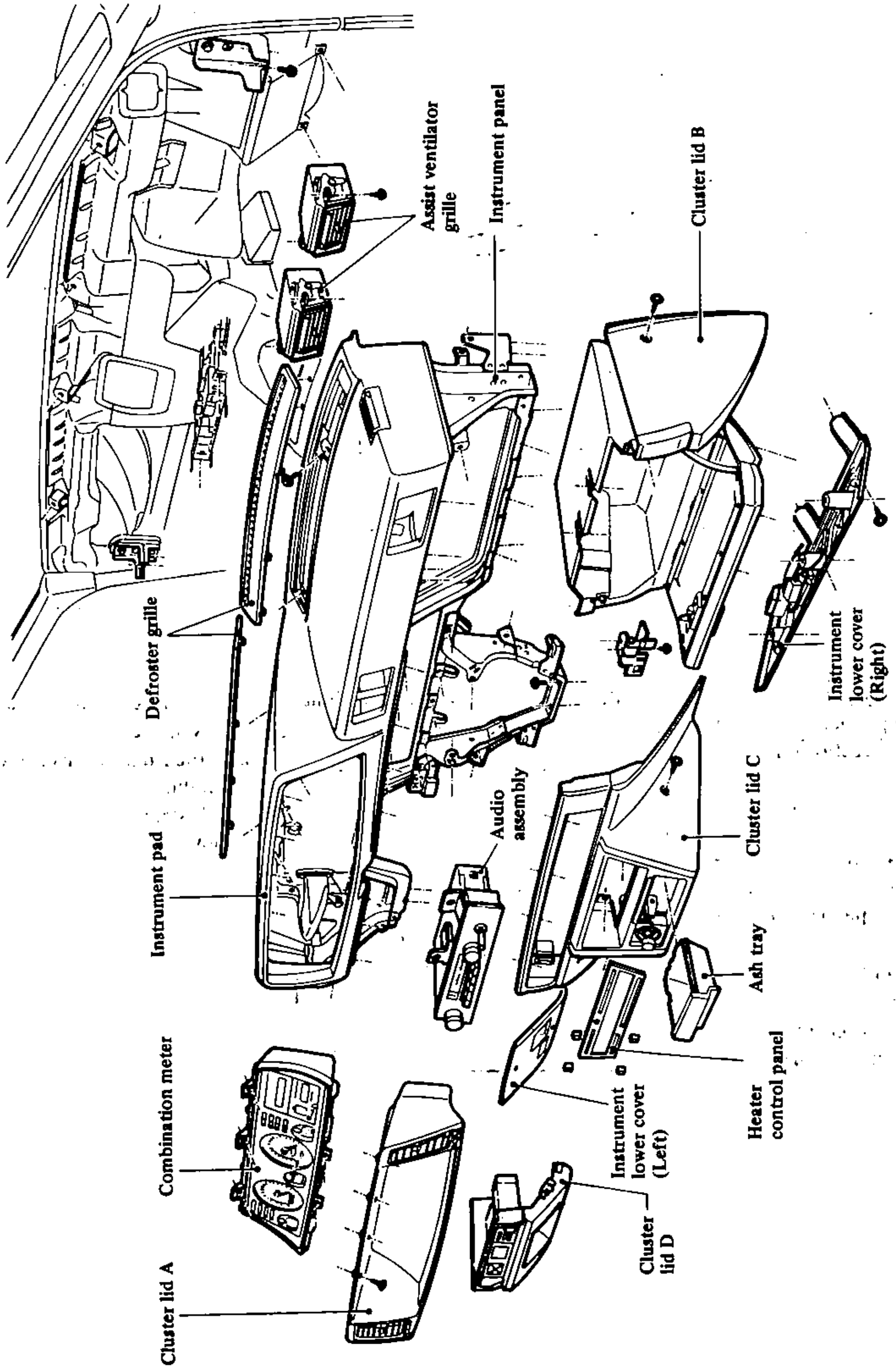


REAR PARCEL SHELF (Hardtop)



INSTRUMENT AND SEAT

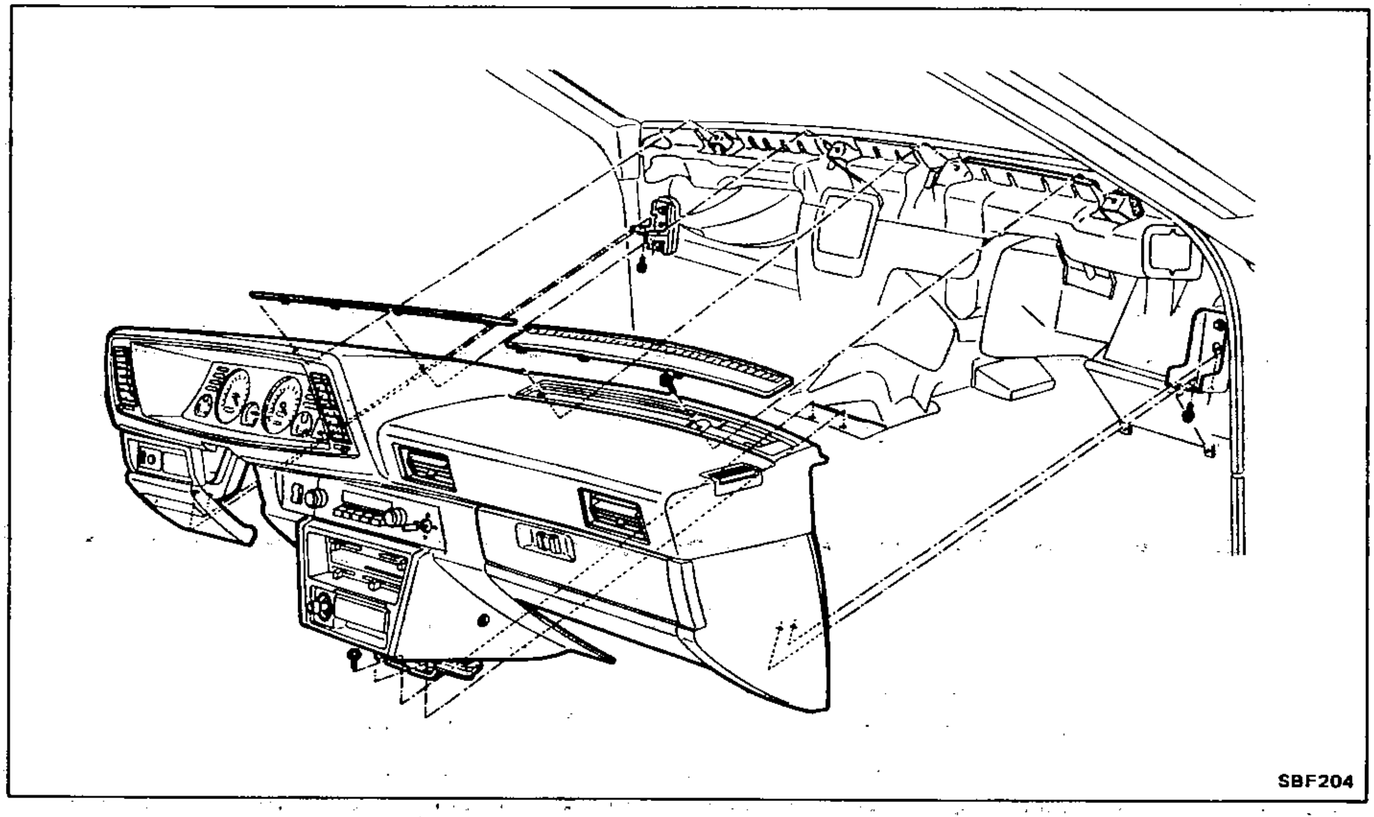
INSTRUMENT



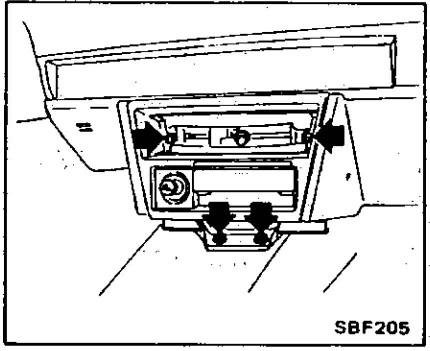
SBF203

REMOVAL AND INSTALLATION

Instrument panel

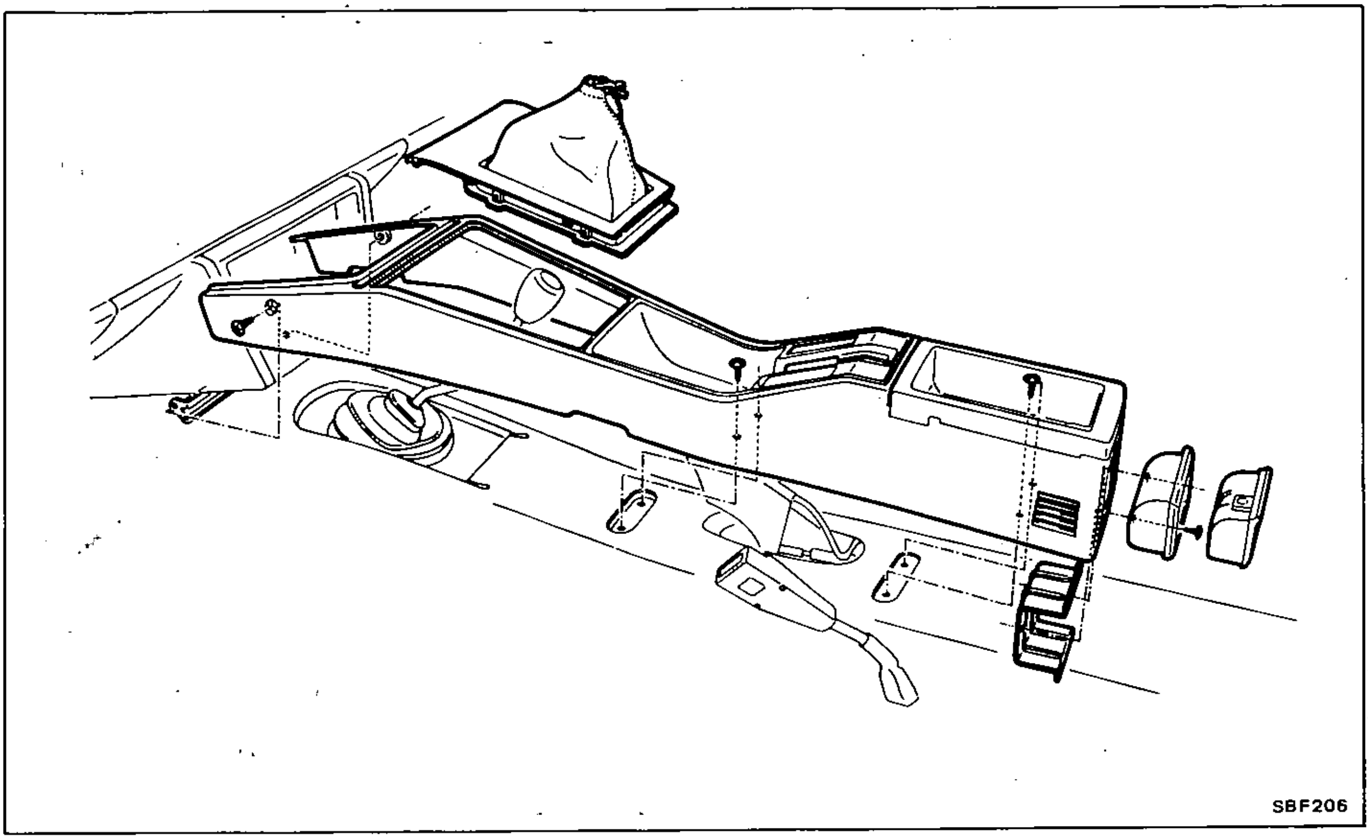


1. Disconnect battery ground cable.
2. Remove steering wheel. Refer to Steering Wheel (ST section) for removal.
3. Remove shell cover and combination switch.
4. Remove instrument lower cover and side ventilator duct.
5. Remove cluster lid D. Remove console box.
6. Disconnect wiring connectors from junction block.
7. Disconnect speedometer cable harness connectors and antenna cable.
8. Remove heater control attaching screws and floor attaching bolts.



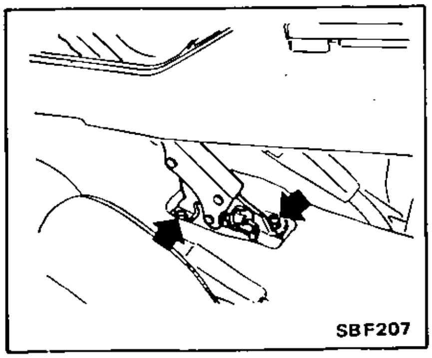
9. Remove defroster grille.
10. Remove instrument securing bolts and then remove instrument assembly by pulling it out.
11. Installation is in reverse order of removal.

CONSOLE BOX


SBF206

REMOVAL AND INSTALLATION

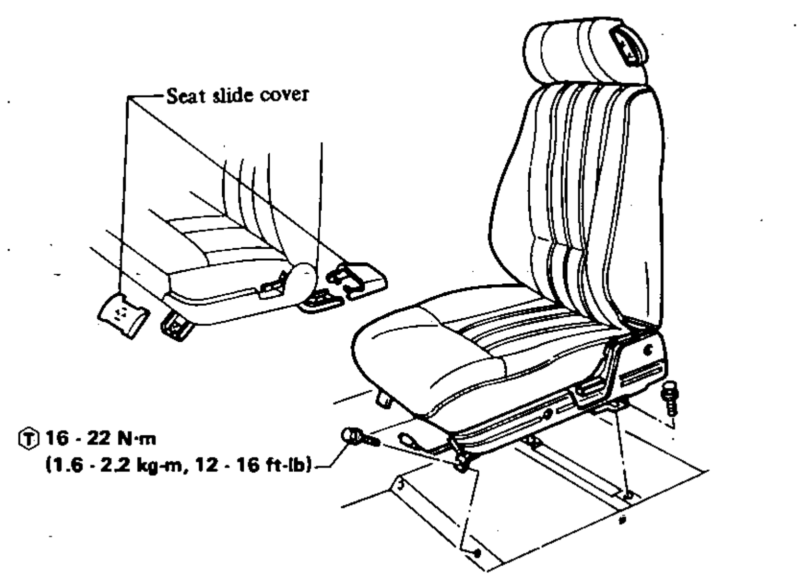
1. Remove screws attaching console box and slide console box rearward.
2. Remove parking brake, and lift out console box.


SBF207

3. Installation is in reverse order of removal.

SEAT

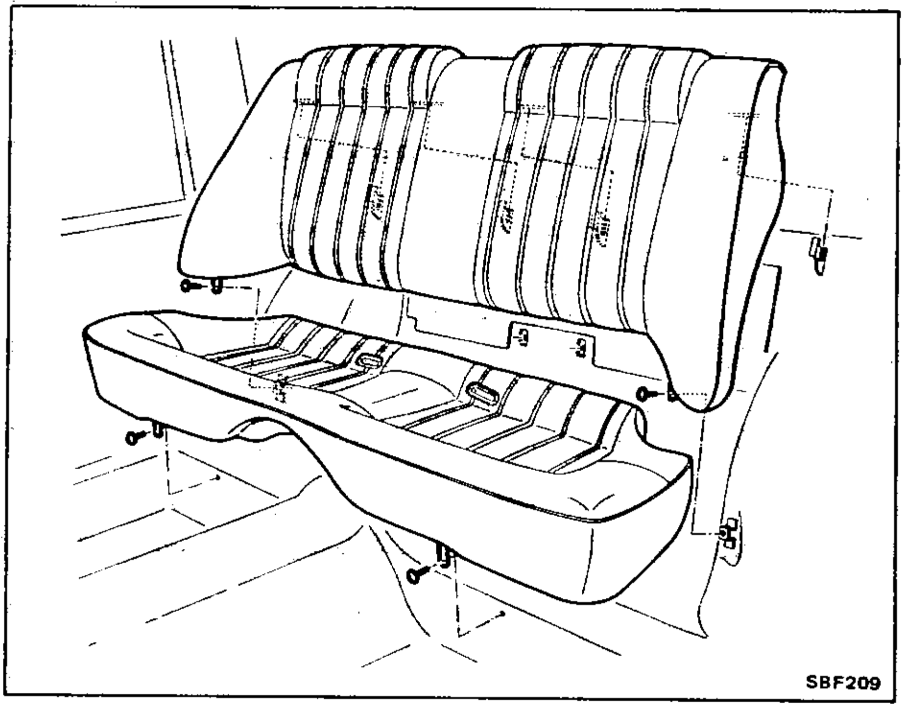
FRONT SEAT



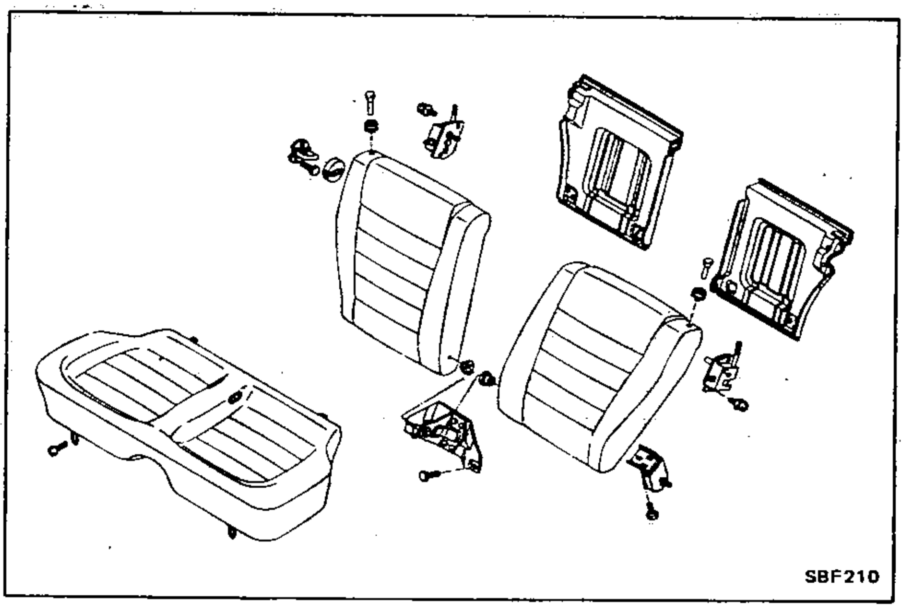
SBF208

REAR SEAT

Hardtop

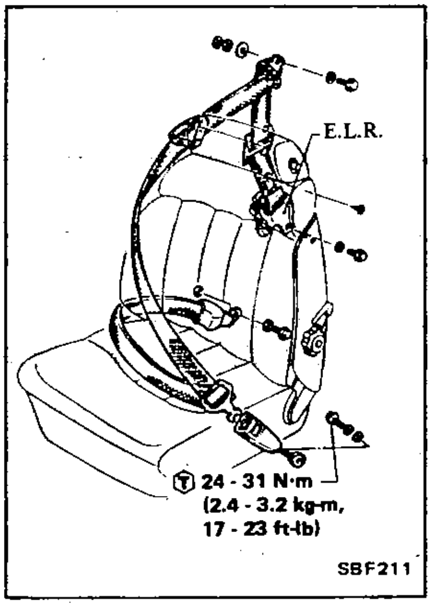


Hatchback



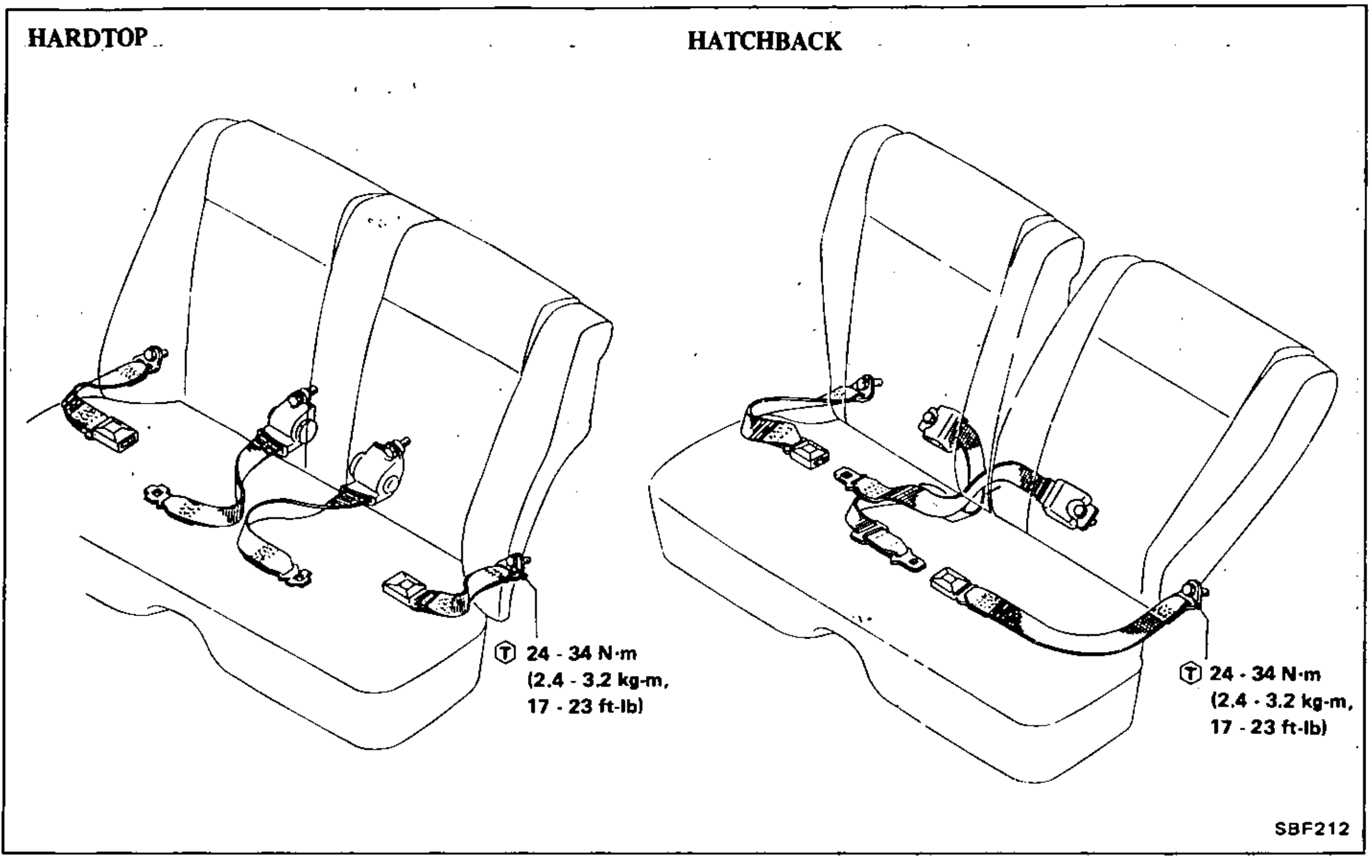
SEAT BELT

FRONT SEAT BELT

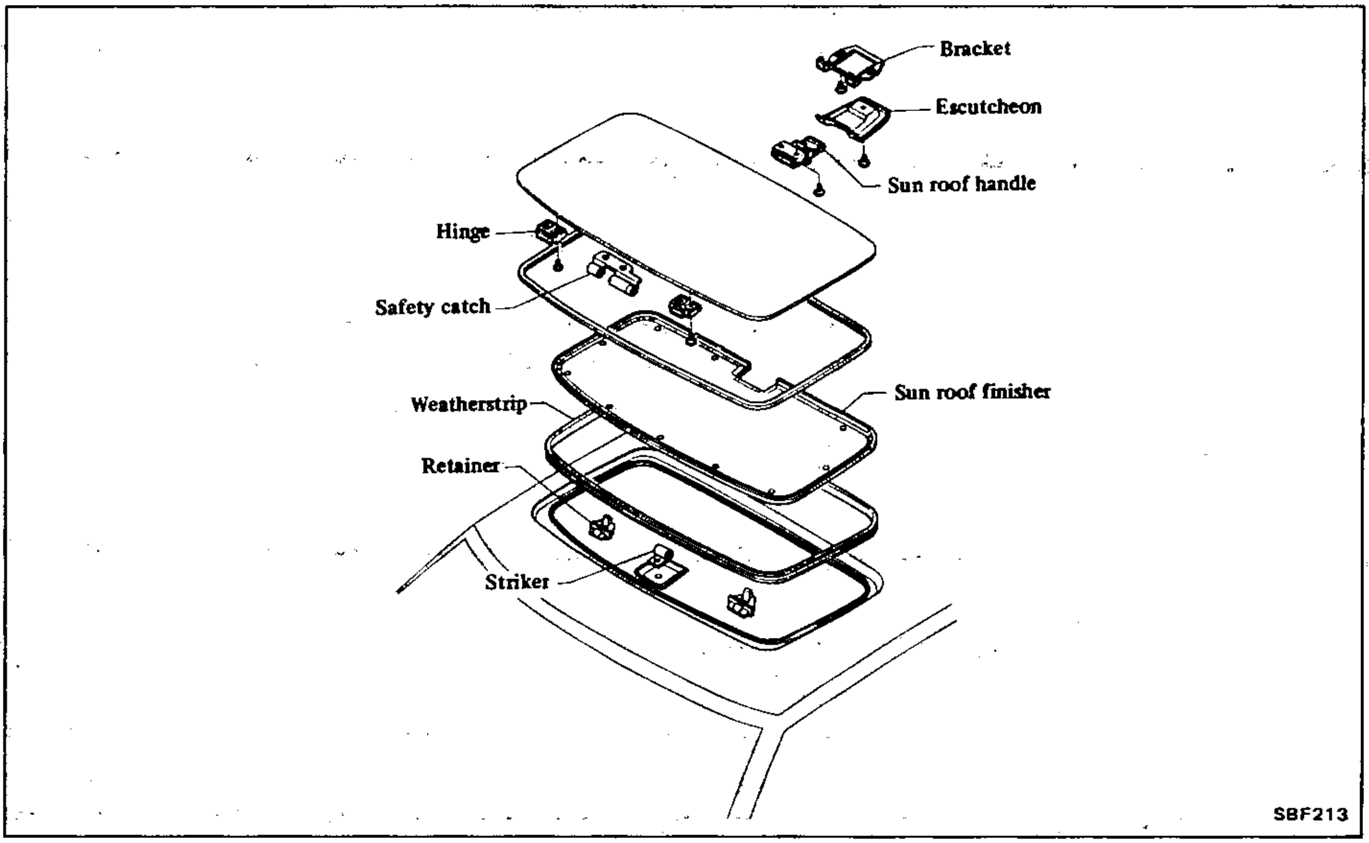


Ⓣ : Seat belt anchorage bolt
24 - 31 N·m
(2.4 - 3.2 kg-m,
17 - 23 ft-lb)

REAR SEAT BELT



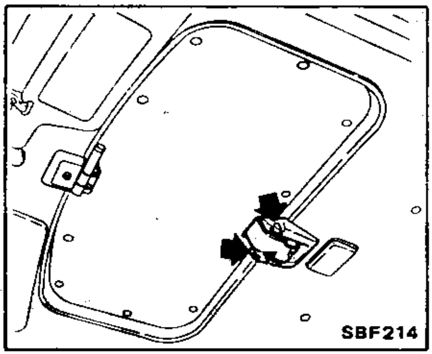
SUN ROOF



REMOVAL AND INSTALLATION

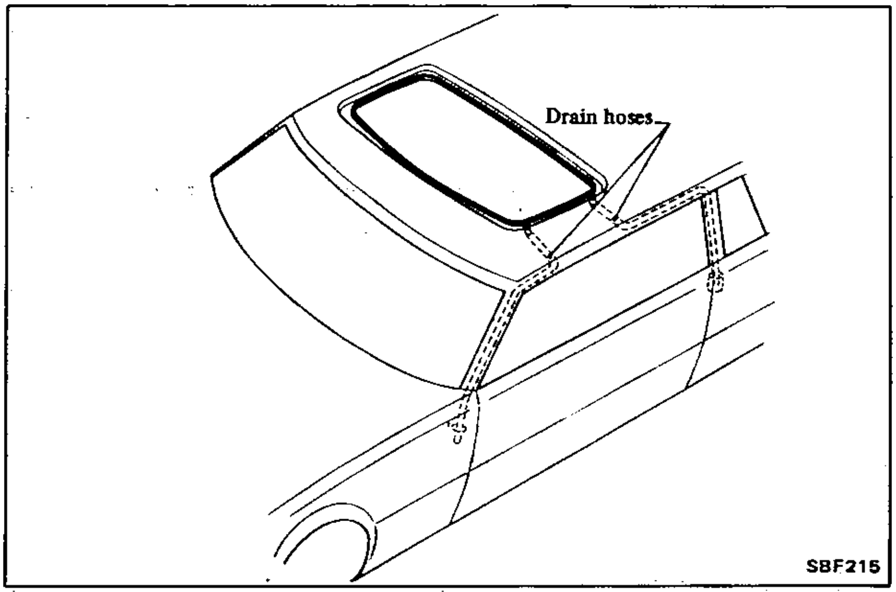
SUN ROOF

1. To unlock safety catch, slide the safety catch knob all the way to the left.
2. Depress sun roof handle knob, and push handle up to disengage it from link.



3. Remove sun roof.
4. Installation is in reverse order of removal.

DRAIN HOSES



SBF214

1. Remove roof trim, front pillar trim, rear pillar trim and dash side trim, and then remove drain hoses.
2. Installation is in reverse order of removal.

After installing drain hoses, ensure that water is properly drained outside car with no seepage into passenger compartment.

BODY ALIGNMENT

DESCRIPTION

DIMENSION LINES

All dimensions indicated in the drawings/illustrations are the standard design values.

1. Black dimension line – Indicates a distance from a phantom line of the car body to a point to be measured and cannot be measured with a measuring tape or tram tracking gauge.
2. Thin line – Indicates a direct (or an actual) distance or length between two points and can be measured with a measuring tape or tram tracking gauge.

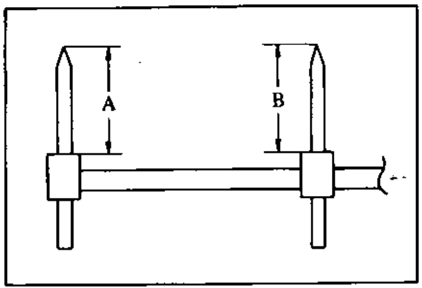
An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.

MEASUREMENT OPERATIONS

When car body measurements are taken in accordance with the thick line, careful consideration should be given to the following points.

1. Measurement method

1) When a tram tracking gauge is used, adjust pointers (A) and (B) to equal lengths as shown in the figure below. Check the pointers and gauge itself to make sure there is no free play.



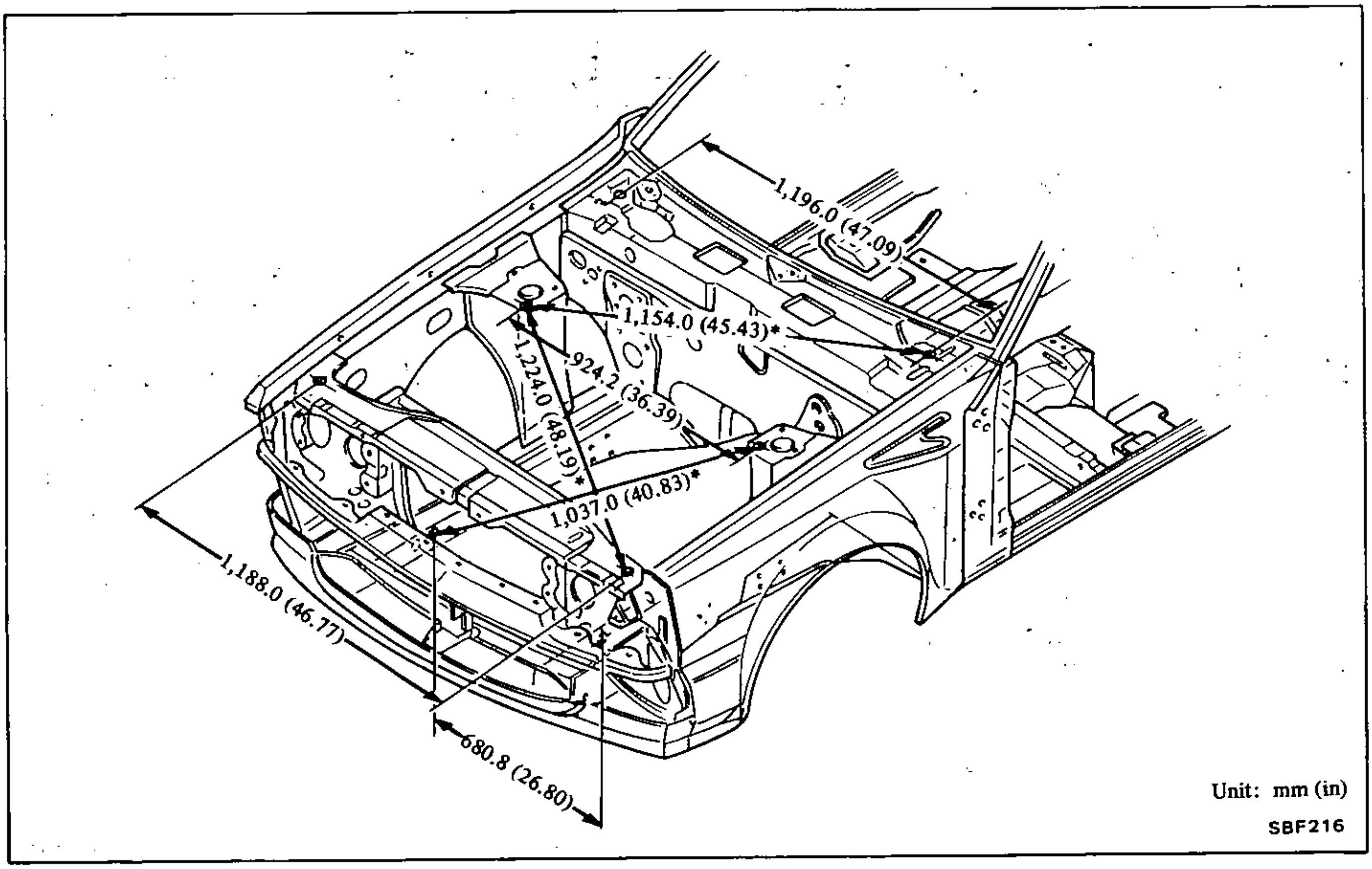
2) When a measuring tape is used, check to be sure there is no elongation, twisting or bending.

If a part or parts of the car body interferes with measurement when using the measuring tape, you cannot measure the distance or length accurately.

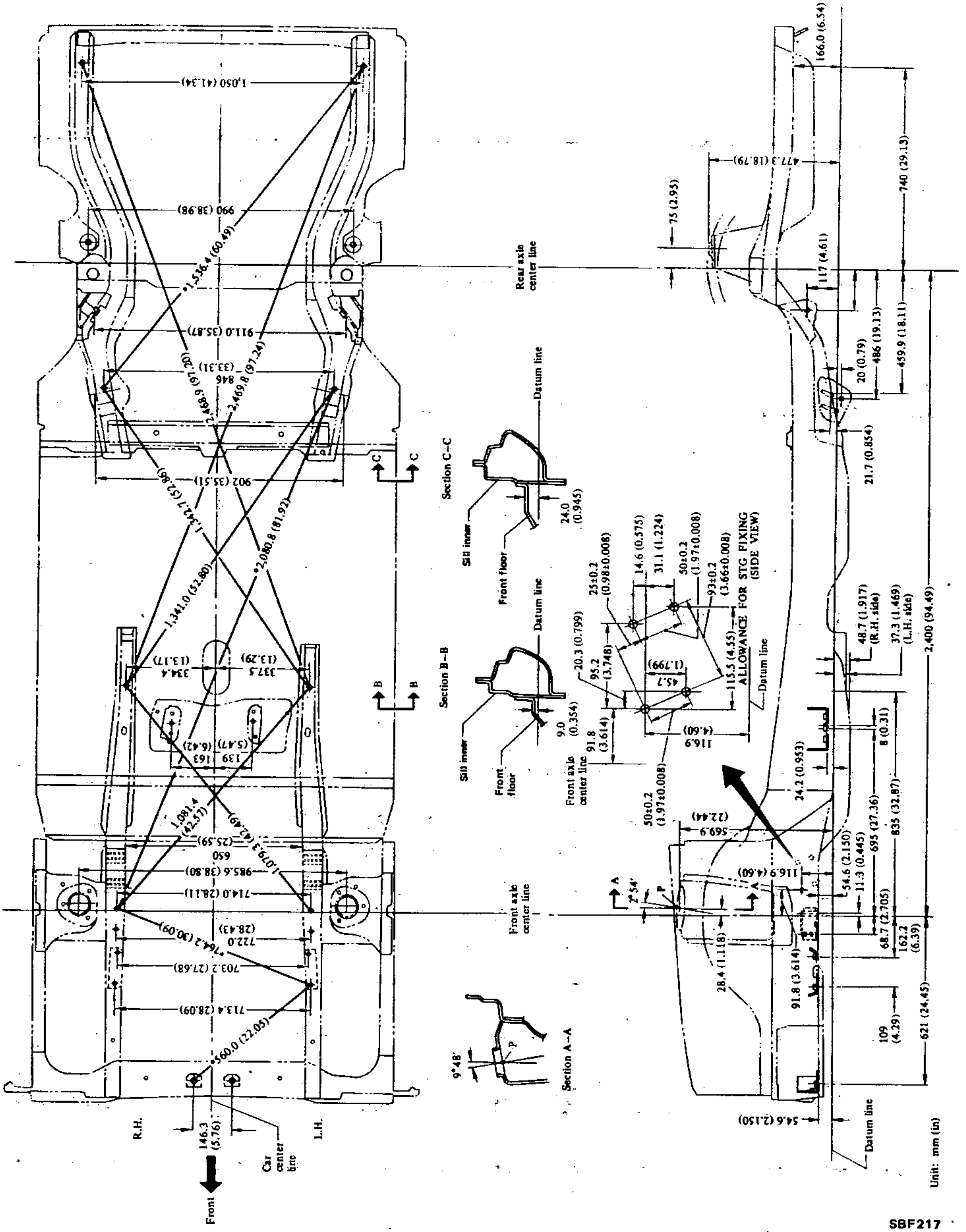
2. Measurement point

Measurements should be taken at the center of mounting holes.

ENGINE COMPARTMENT



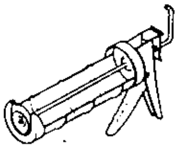
UNDERBODY



Unit: mm (in)

SBF217

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST08800000 (–)	Sucker 
ST08810000 (–)	Caulking hand gun 

SECTION HA

HEATER & AIR CONDITIONER

CONTENTS

HEATER

AIR CONDITIONER

Refer to Section MA (Heater and Air Conditioner) for:

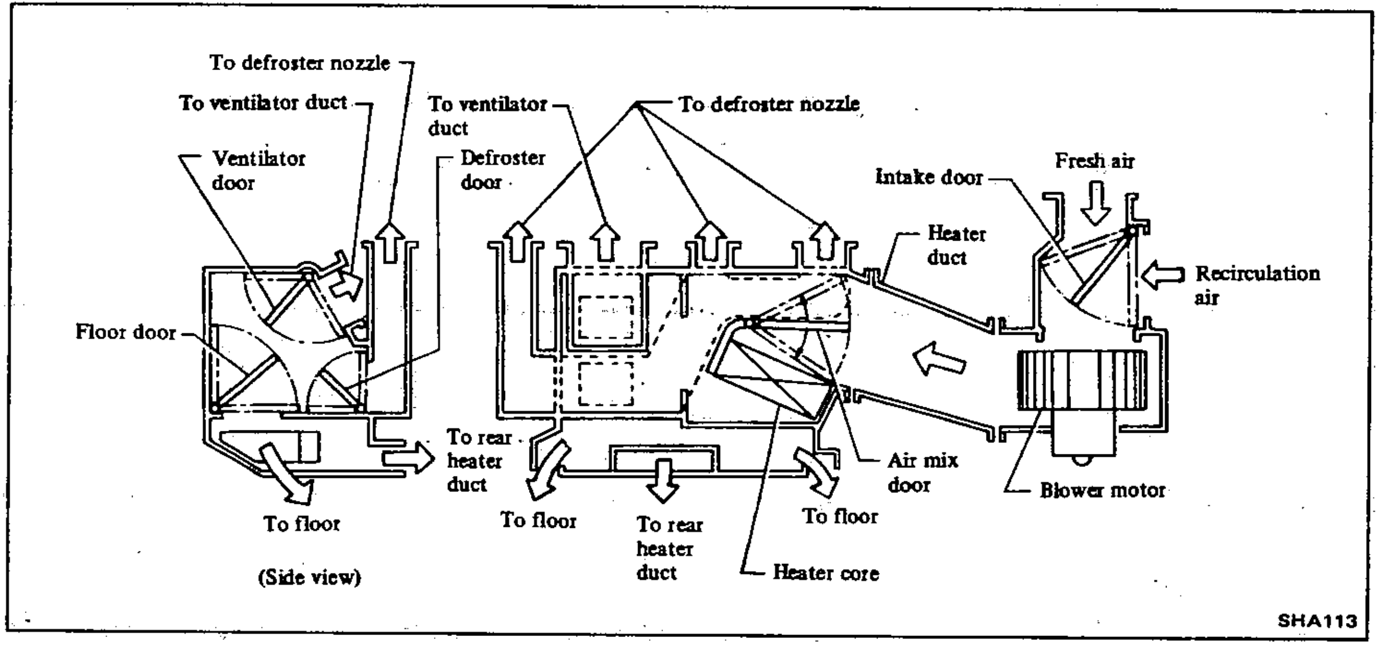
- CHECKING REFRIGERANT LEVEL
- CHECKING REFRIGERANT LEAKS

Refer to Section MA (Basic Mechanical System) for:

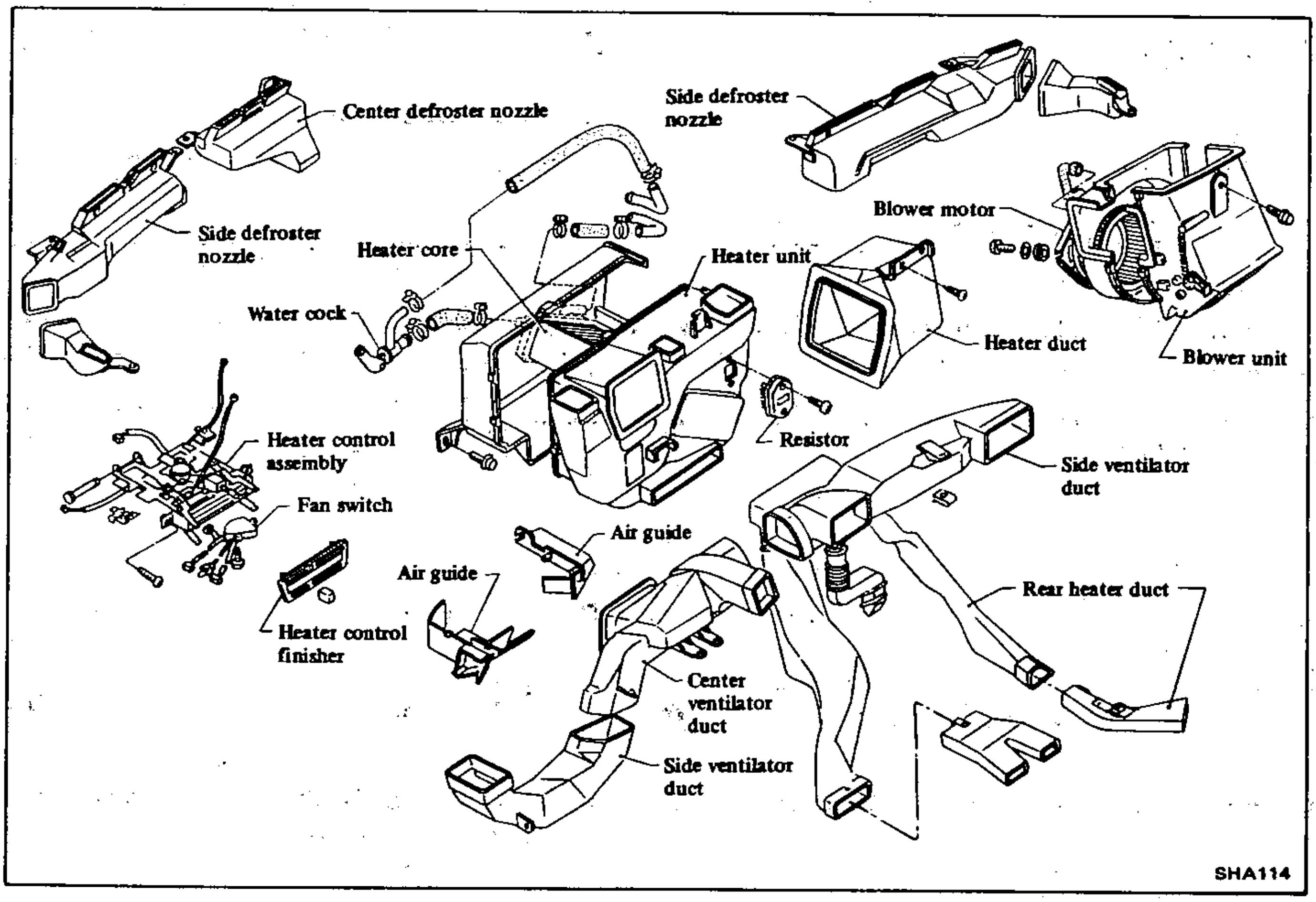
- CHECKING AND ADJUSTING DRIVE BELTS

DESCRIPTION

HEATER SYSTEM

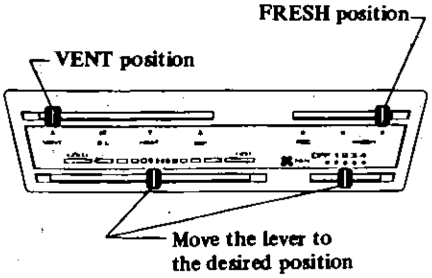


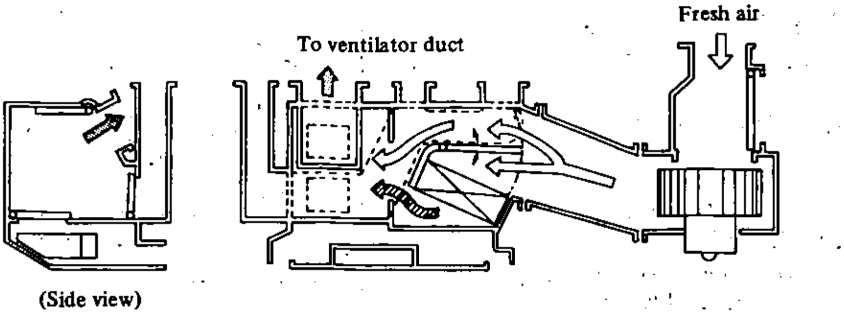
HEATER COMPONENTS



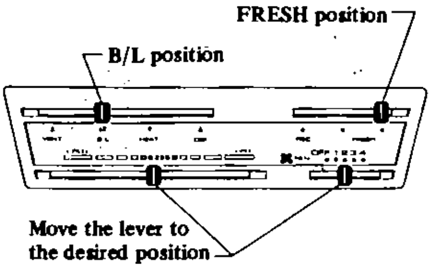
AIR FLOW

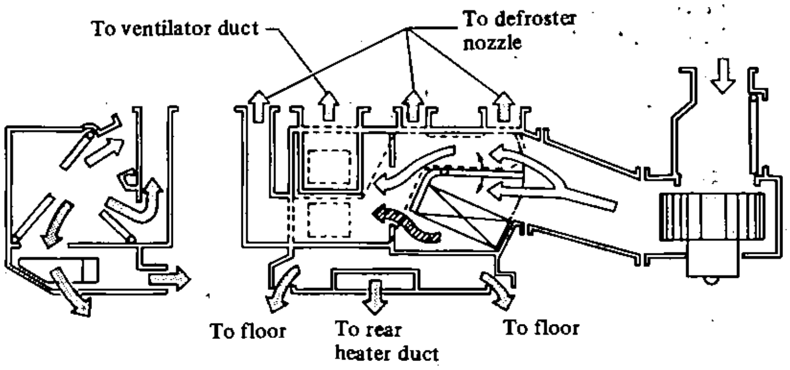
VENT position



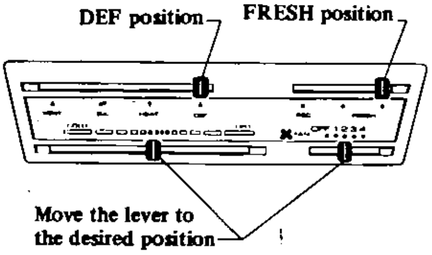


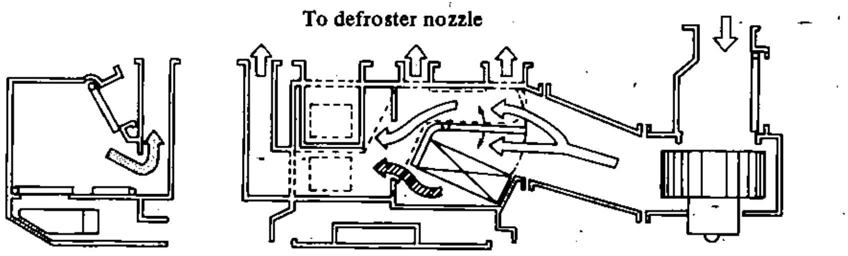
B/L (Bi-level) position



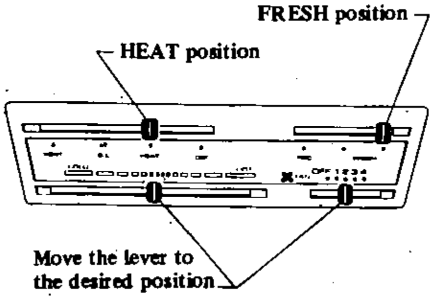


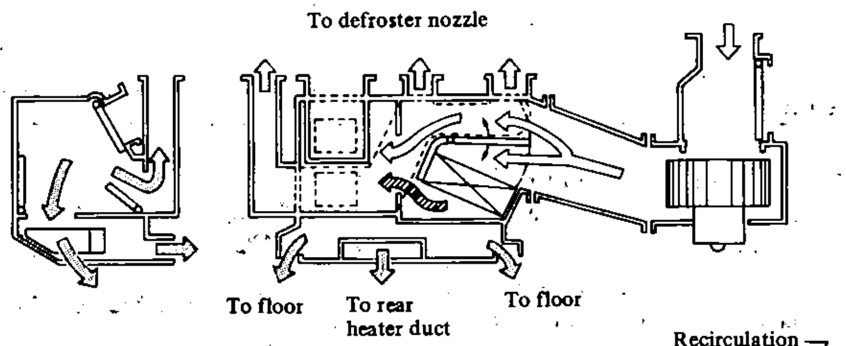
DEF position



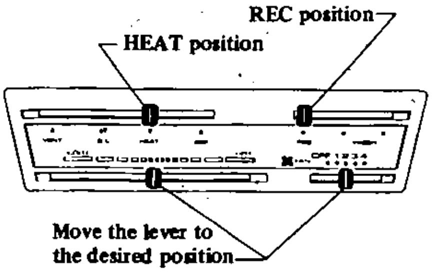


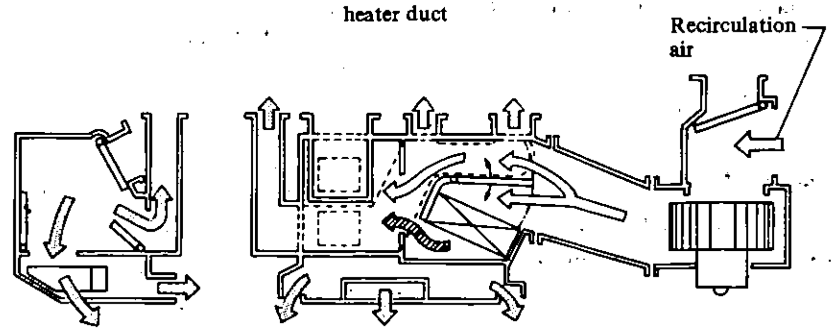
HEAT position





REC position





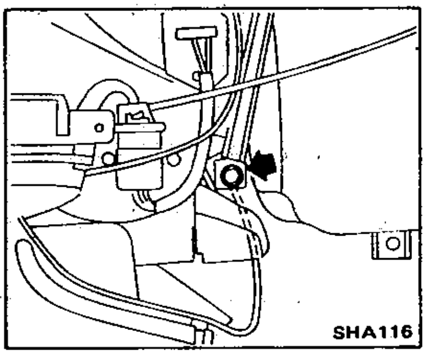
SHA115

SERVICE PROCEDURE

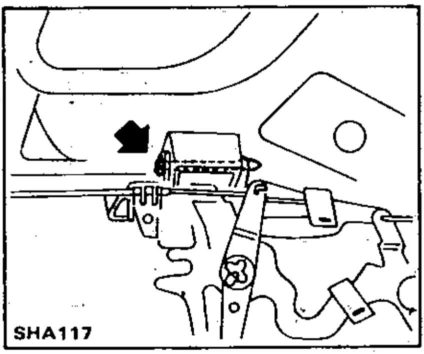
HEATER CONTROL ASSEMBLY

REMOVAL AND INSTALLATION

1. Remove instrument lower covers and cluster lids.
2. Disconnect control cables from heater unit and blower unit.
3. Disconnect harness connectors and ground wire terminal.


SHA116

4. Remove pivot pin.


SHA117

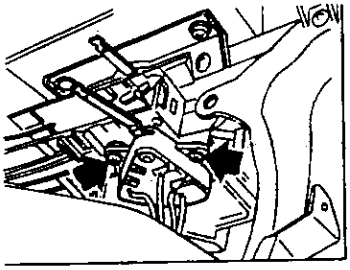
5. Remove heater control assembly.
6. Installation is in the reverse order of removal.

After installing, adjust control cable by referring to Adjusting Heater Control.

INSPECTION

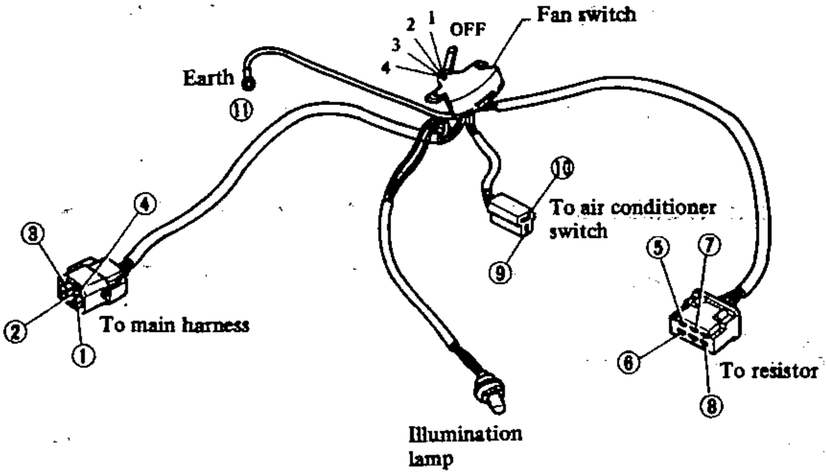
Fan switch

Test continuity through switch with a test lamp or ohmmeter.



Always conduct:

Terminal	①	⑦	④	⑩	②	③
	○—	—○	○—	—○	○—⑪	—○
					(Illumination lamp)	



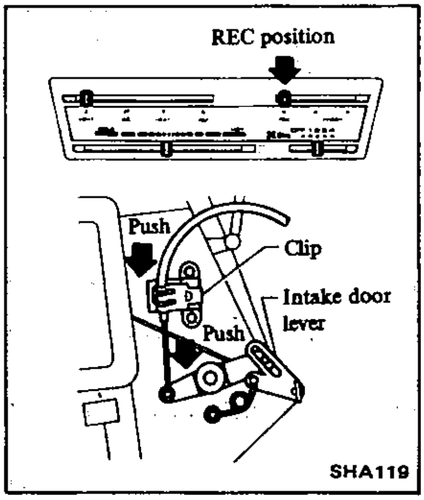
Terminal \ Lever position	OFF	1	2	3	4
⑤		○			
⑥			○		
⑦					○
⑧				○	
⑪		○	○	○	○
⑨		○	○	○	○

SHA118

ADJUSTING HEATER CONTROL

Intake door control cable

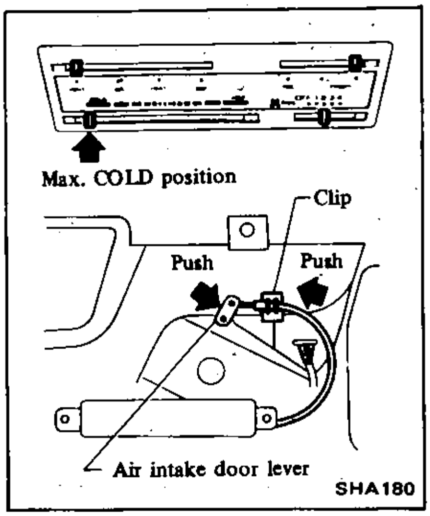
1. Set air intake lever at "REC" position.
2. Connect control cable to air intake door lever while pushing lever to its closed position.
3. Securely clamp the cable while pushing cable outer case in direction of arrow.



SHA119

Air mix door control cable

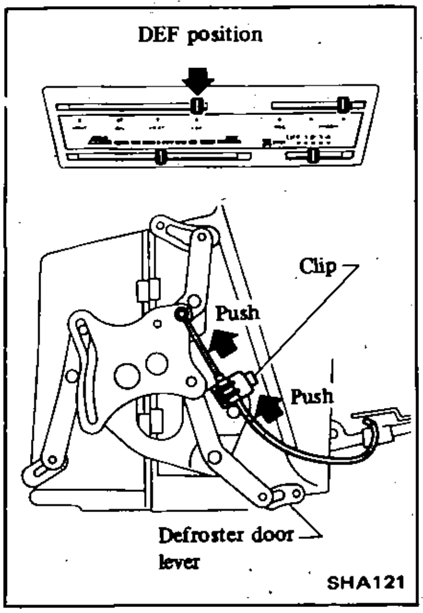
1. Set temperature lever at max. "COLD" position.
2. Connect control cable to air mix door lever while pushing lever to its full open position.
3. Securely clamp the cable while pushing cable outer case in direction of arrow.



SHA180

Air control cable

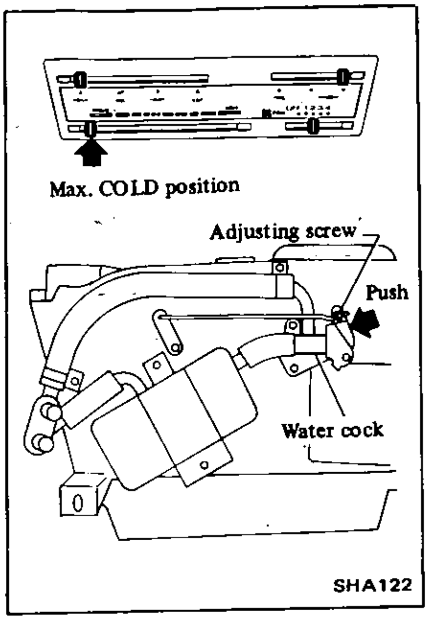
1. Set air control lever at "DEF" position.
2. Connect control cable to side linkage while pushing the linkage in direction of arrow.
3. Securely clamp the cable while pushing cable outer case in direction of arrow.



SHA121

Water cock control linkage

1. Set air mix door lever at max. "COLD" position.
2. Securely clamp control rod while pushing water cock lever to its full closed position.



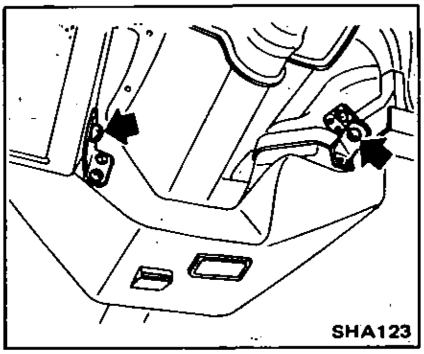
SHA122

HEATER UNIT

REMOVAL AND INSTALLATION

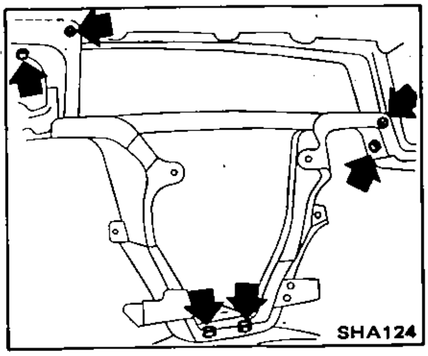
1. Set TEMP lever to max. "HOT" position and drain engine coolant.
2. Disconnect heater hoses from heater unit.
3. Remove following parts.

(1) Front seats
(2) Console box
(3) Floor carpet
(4) Instrument lower covers and cluster lids
(5) Side ventilator duct on the left hand side



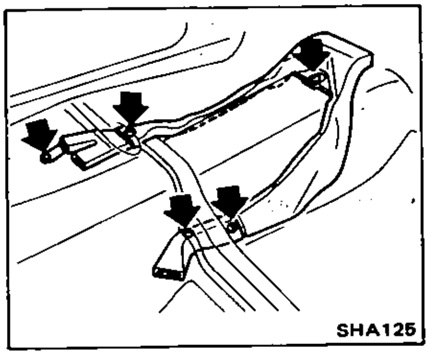
SHA123

(6) Radio, sound balancer and stereo cassette deck
(7) Stay of instrument panel



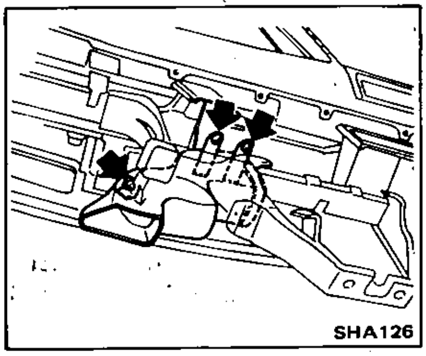
SHA124

(8) Rear heater duct



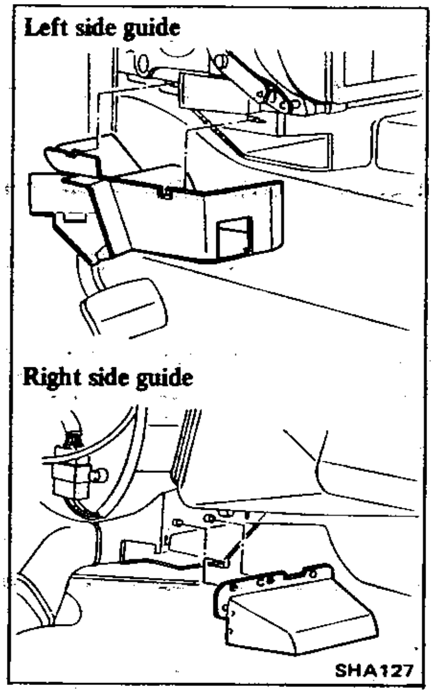
SHA125

(19) Center ventilator duct



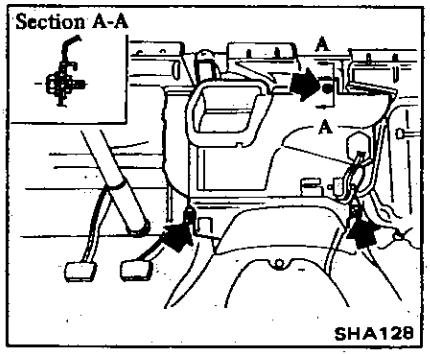
SHA126

(10) Air guides at lower outlets



SHA127

4. Disconnect wire harness connections.
5. Remove heater unit with heater control assembly.



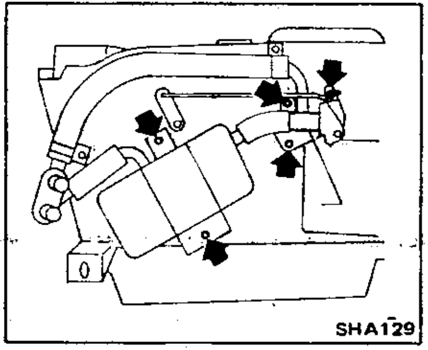
SHA128

6. Remove heater control assembly. Refer to the item on Heater Control Assembly.
7. Installation is in the reverse order of removal.

After installing heater unit, adjust control cable by referring to Adjusting Heater Control.

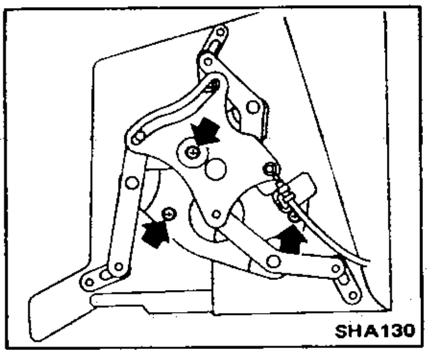
DISASSEMBLY AND ASSEMBLY

1. Remove heater core with water cock.



SHA129

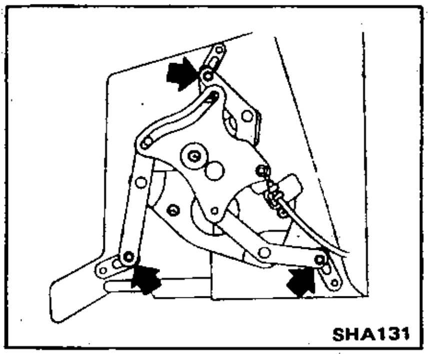
2. Remove air control linkage securing screws.



SHA130

3. Separate heater unit case by removing clips.
4. Assemble heater unit in the reverse order of disassembly.

a. After installing heater core and water cock, adjust water cock control linkage by referring to Adjusting Heater Control.
b. When assembling air control linkage, set it as illustrated.



SHA131

INSPECTION

Case

If it is cracked or deformed, replace.

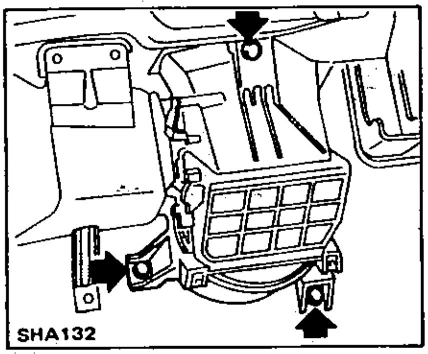
Heater core

Clean fins and check for water leakage.

BLOWER UNIT

REMOVAL AND INSTALLATION

1. Remove instrument lower cover and cluster lid on the right hand.
2. Disconnect control cable and harness connector from blower unit.
3. Remove blower unit.



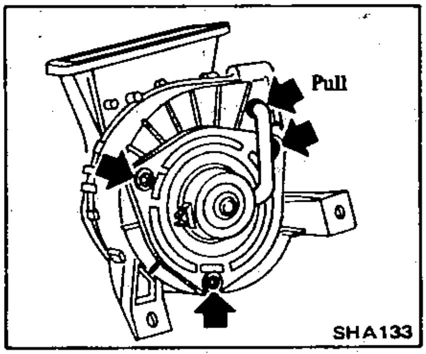
SHA132

4. Installation is in the reverse order of removal.

Adjust intake door control cable by referring to Adjusting Heater Control.

DISASSEMBLY

1. Remove blower motor.



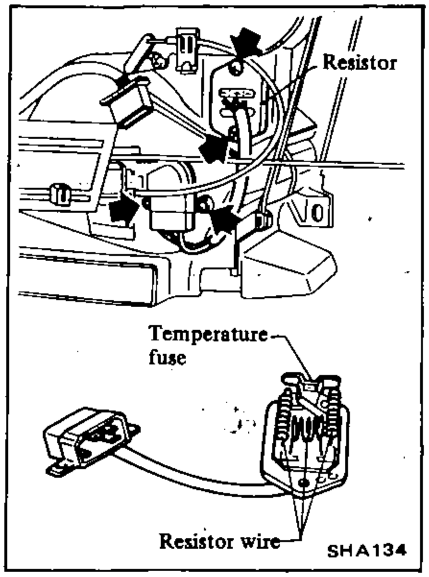
SHA133

2. Separate blower unit case by removing clips.

RESISTOR

REMOVAL AND INSTALLATION

1. Remove instrument cluster lid.
2. Remove resistor from heater unit.

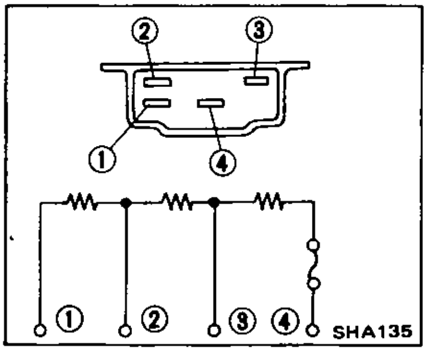


SHA134

3. Install resistor so that temperature fuse locates at upper side.

INSPECTION

Test continuity using a test lamp or ohmmeter.

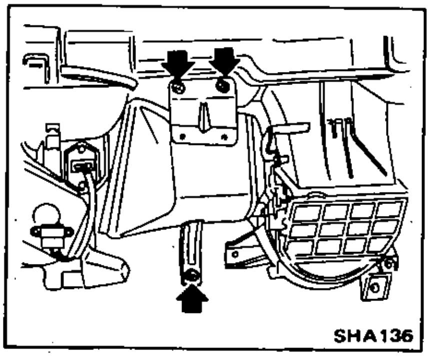


SHA135

HEATER DUCT

REMOVAL AND INSTALLATION

Proceed after removing instrument lower cover and cluster lid on the right hand side.



SHA136

REAR HEATER DUCT

REMOVAL AND INSTALLATION

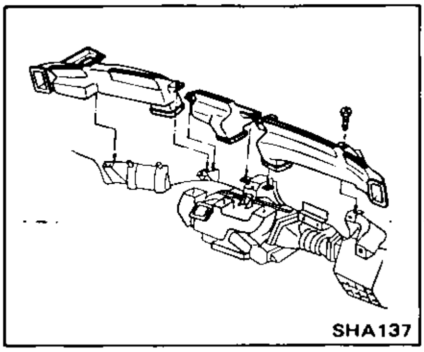
Refer to the item on Heater Unit.

DEFROSTER NOZZLE

REMOVAL AND INSTALLATION

Front window defroster nozzle

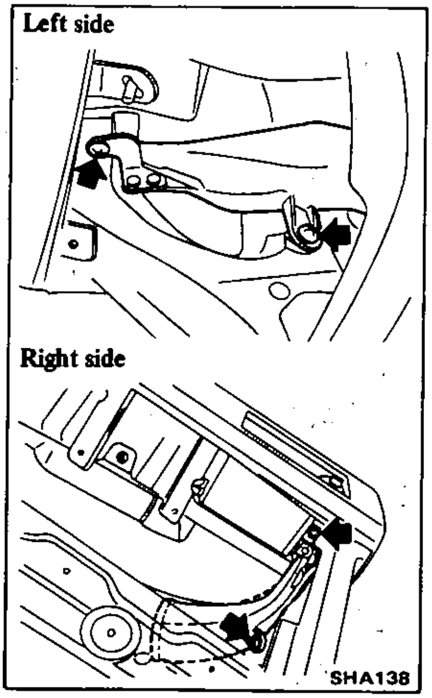
Proceed after removing instrument assembly.



SHA137

Side window defroster nozzle

Proceed after removing instrument lower covers and cluster lids.



SHA138

VENTILATOR DUCT

REMOVAL AND INSTALLATION

Center ventilator duct

Refer to the item on Heater Unit.

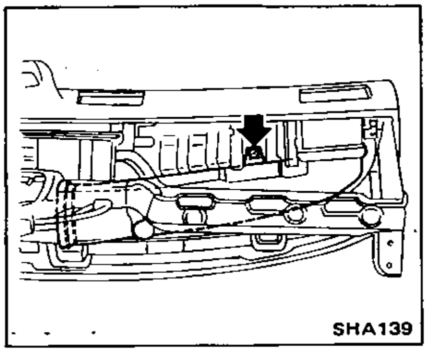
Side ventilator duct

Left side:

Refer to the item on Heater Unit.

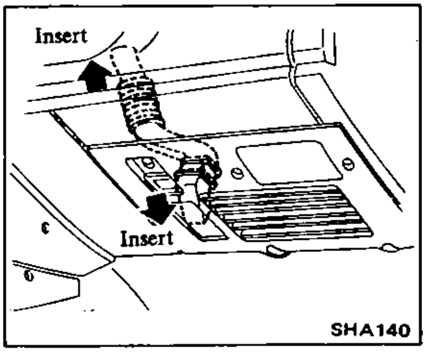
Right side:

Proceed after removing instrument assembly.



SHA139

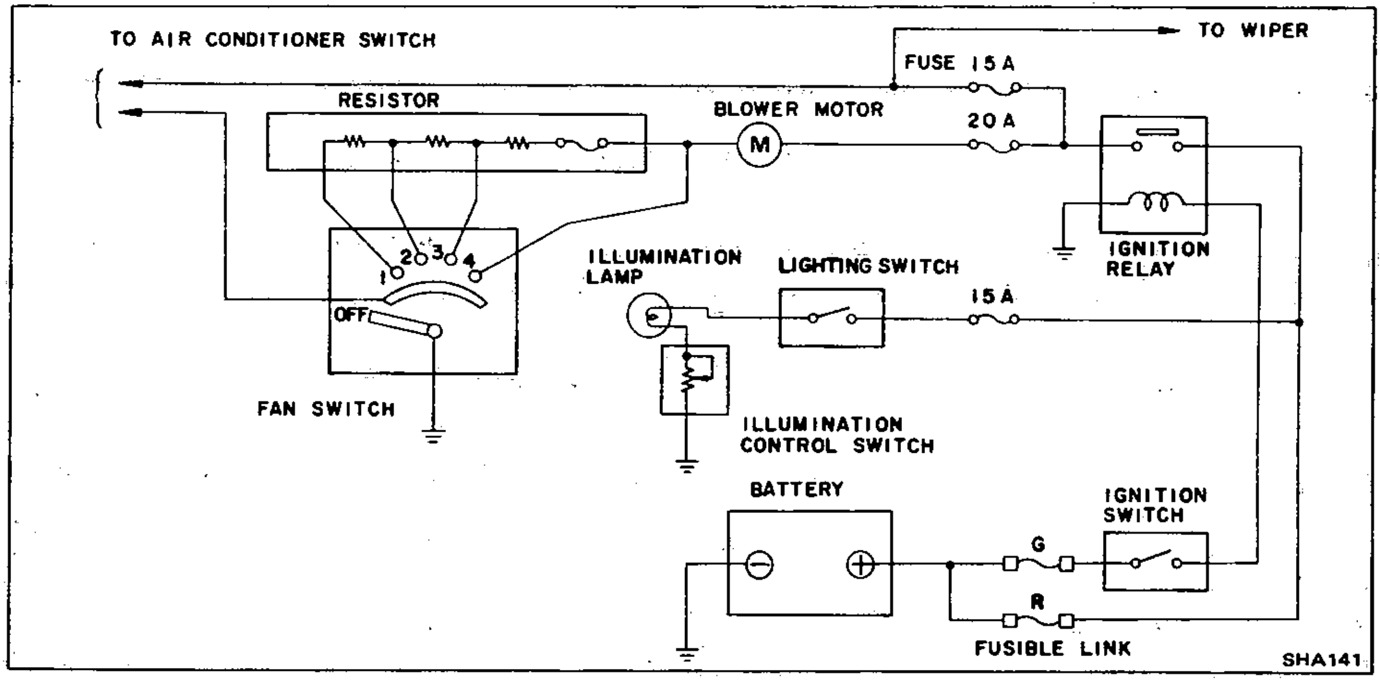
Foot ventilator duct



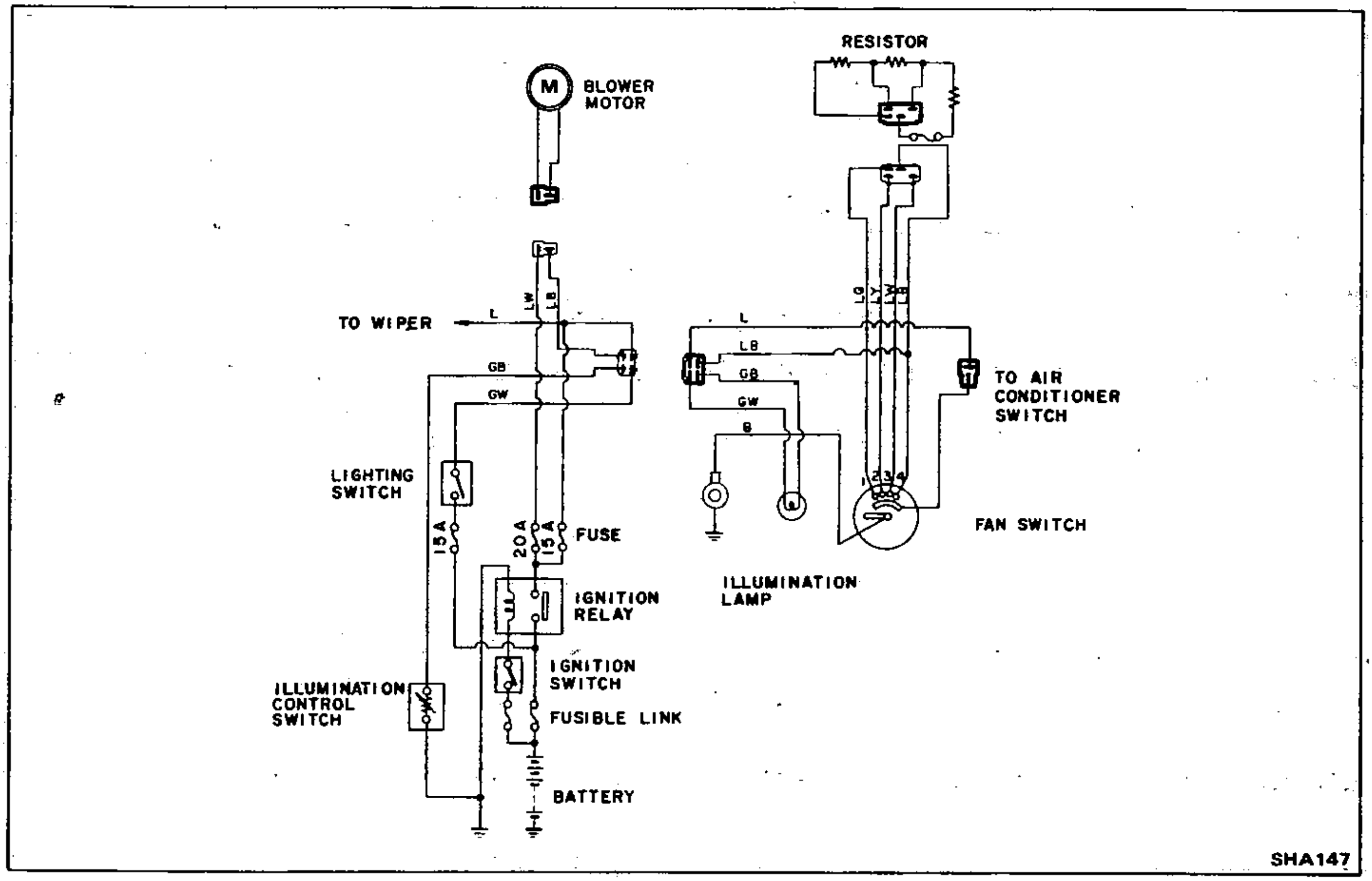
SHA140

ELECTRICAL CIRCUIT

SCHEMATIC



WIRING DIAGRAM

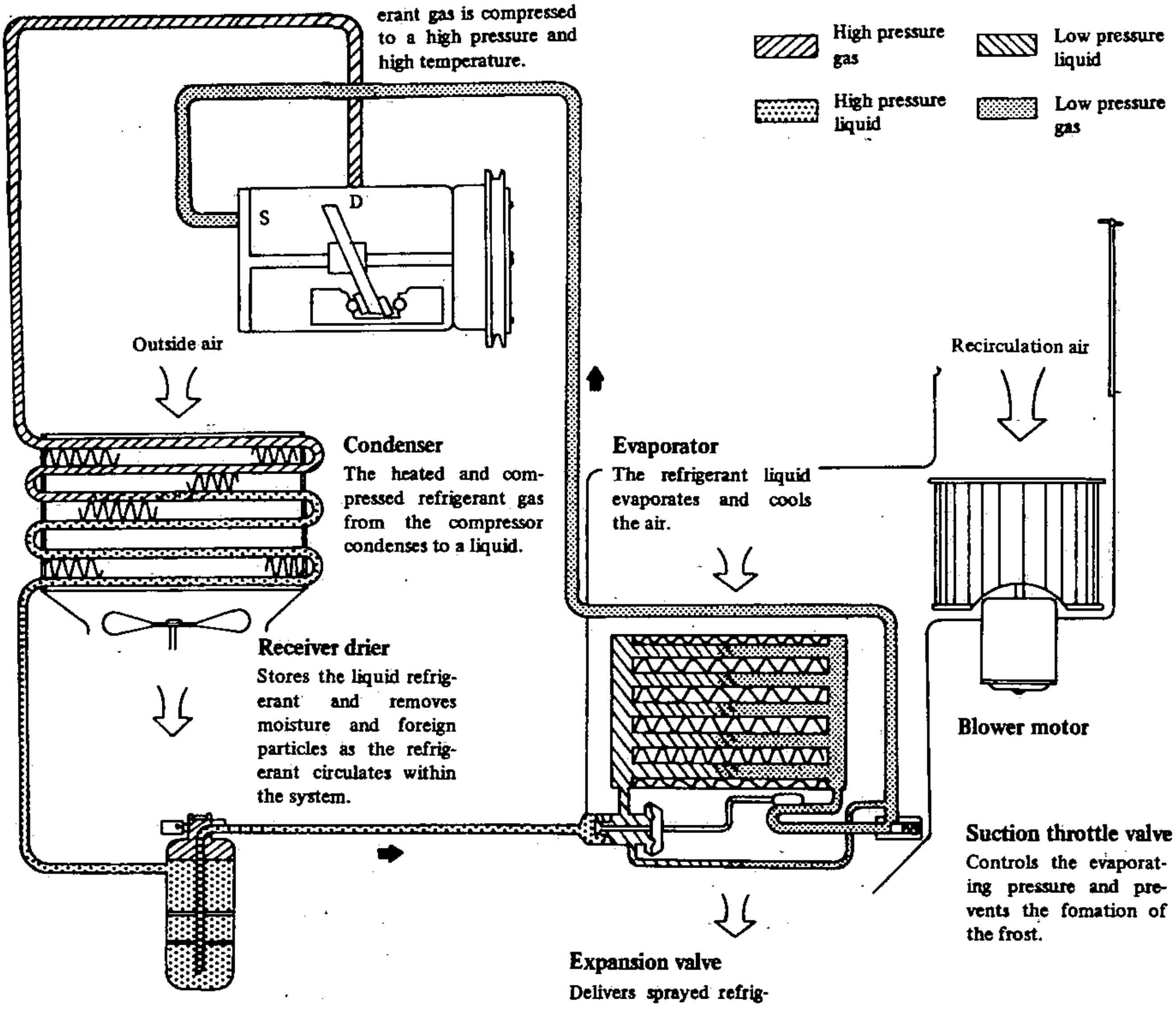


TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Insufficient heating performance. No heated air discharged.	Cooling water temperature too low.	Check thermostat. Replace as necessary.
	Heater core plugged.	Clean.
	Insufficient cooling water level.	Refill.
	Malfunctioning air mix door.	Adjust control cable.
	Malfunctioning water cock.	Adjust control cable. Check water cock. Replace as necessary.
Insufficient air flow to floor.	Blower motor speed too low.	Check motor terminal voltage. Repair poor connection and discontinuity. Replace motor if necessary.
	Malfunctioning floor door.	Adjust control cable.
Insufficient defrosting performance. Cold air discharged.	Refer to "No heated air discharged".	
Insufficient air flow to defroster.	Malfunctioning floor door (or faulty seal).	Adjust control cable.
	Defroster nozzle plugged.	Clean.
	Leak at defroster duct-to-nozzle connection.	Correct.
Heated air discharged with lever in VENT.	Water cock not operating properly.	Adjust control cable. Check water cock. Replace as necessary.
	Mode door not operating properly (or seal damaged).	Adjust control cable.
Blower motor does not operate.	Refer to Trouble Diagnoses and Corrections (Air conditioner).	
Control lever drags.	Inner wire rubbing against outer case end.	Adjust control cable.
	Control cable bent excessively.	Correct.
	Malfunctioning doors, door levers, etc.	Check and correct.
Outside air comes in with AIR control lever REC.	Air intake door not operating properly.	Repair or replace.
	Control cable out of adjustment.	Adjust control cable.
Noise from blower motor.	Loose bolt in blower motor.	Check and tighten loose bolts.

DESCRIPTION

REFRIGERATION CYCLE



Compressor
The low pressure refrigerant gas is compressed to a high pressure and high temperature.

Condenser
The heated and compressed refrigerant gas from the compressor condenses to a liquid.

Receiver drier
Stores the liquid refrigerant and removes moisture and foreign particles as the refrigerant circulates within the system.

Evaporator
The refrigerant liquid evaporates and cools the air.

Suction throttle valve
Controls the evaporating pressure and prevents the fomation of the frost.

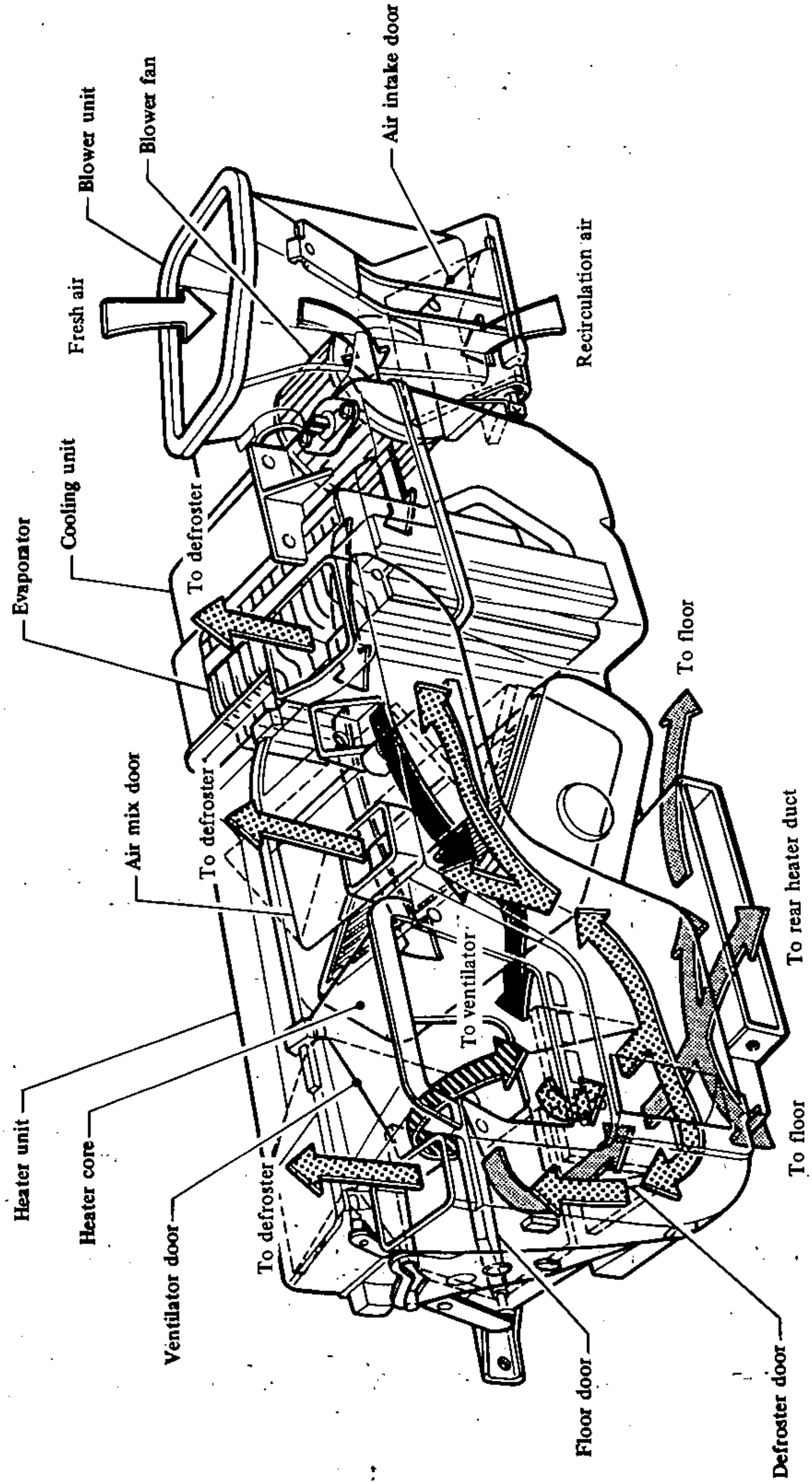
Expansion valve
Delivers sprayed refrigerant to the evaporator to facilitate refrigerant evaporation and controls the amount of refrigerant passing the orifice.

High pressure valve
Discharges refrigerant to atmosphere at pressures above 3,727 kPa (38 kg/cm^2, 540 psi).

Low pressure switch
Turns OFF at pressures below 196 kPa (2 kg/cm^2, 28 psi), cutting compressor power supply.

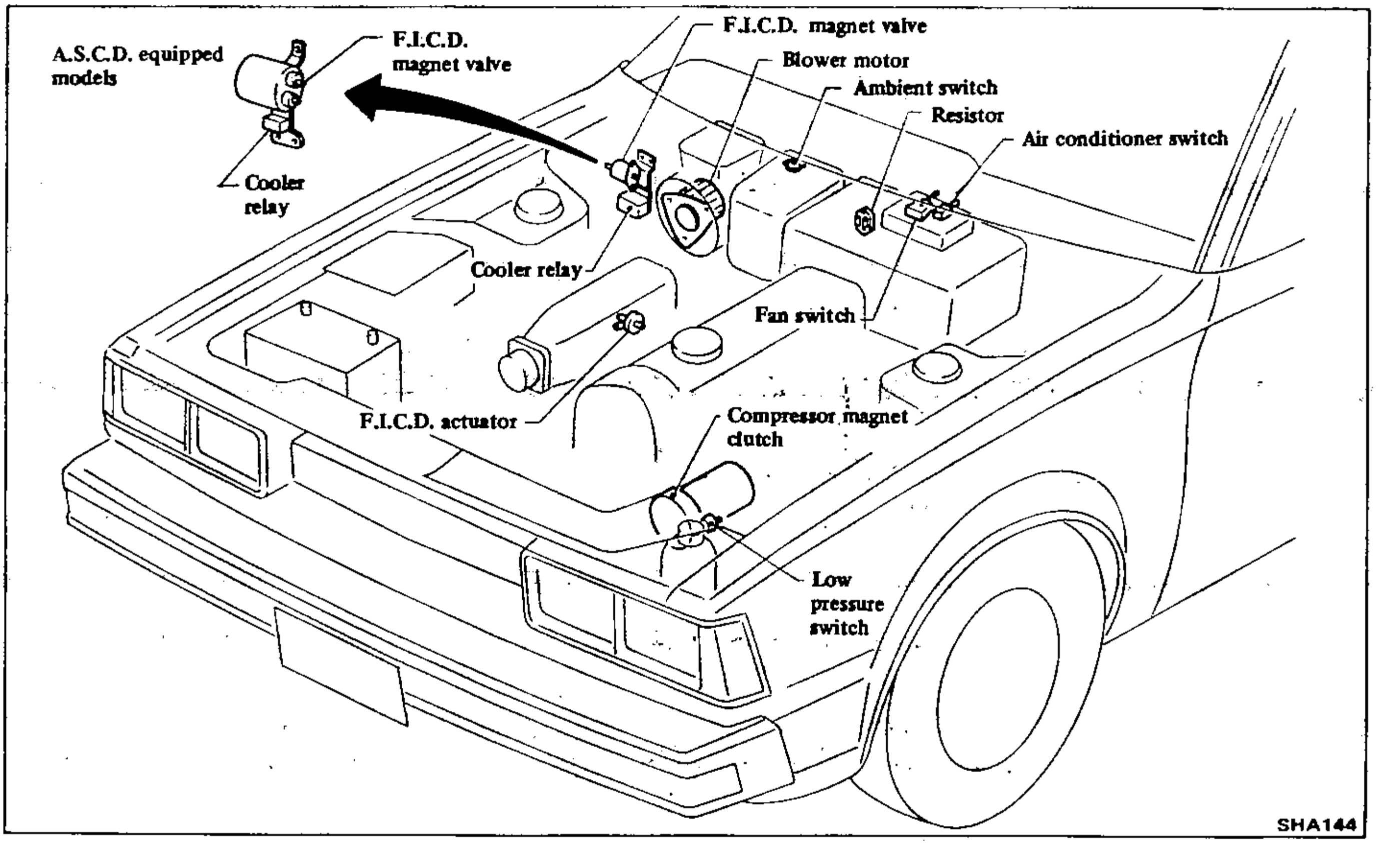
SHA142

AIR CONDITIONING COMPONENTS



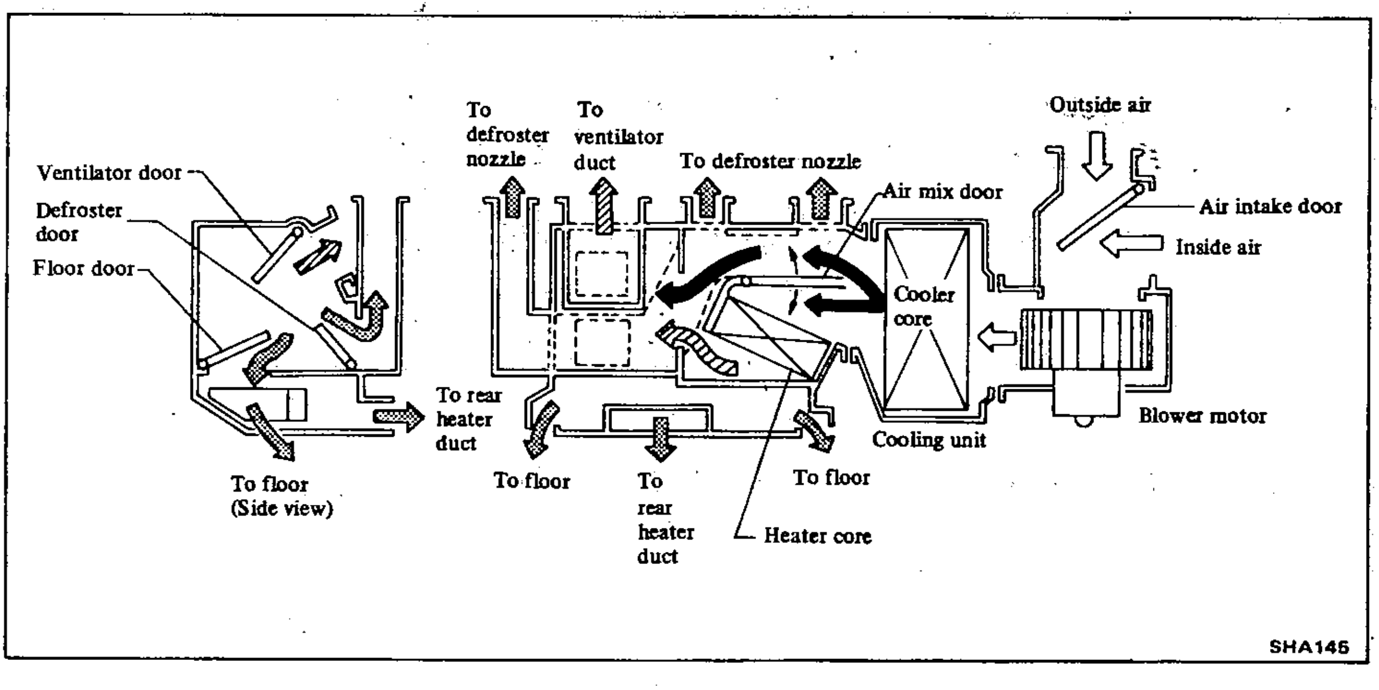
SHA143

LOCATION OF ELECTRICAL AND VACUUM UNIT



AIR FLOW

Air flow at any position (VENT, B/L, HEAT, DEF and REC) is the same as that of HEATER except that all air discharged with blower unit passes through cooling unit.



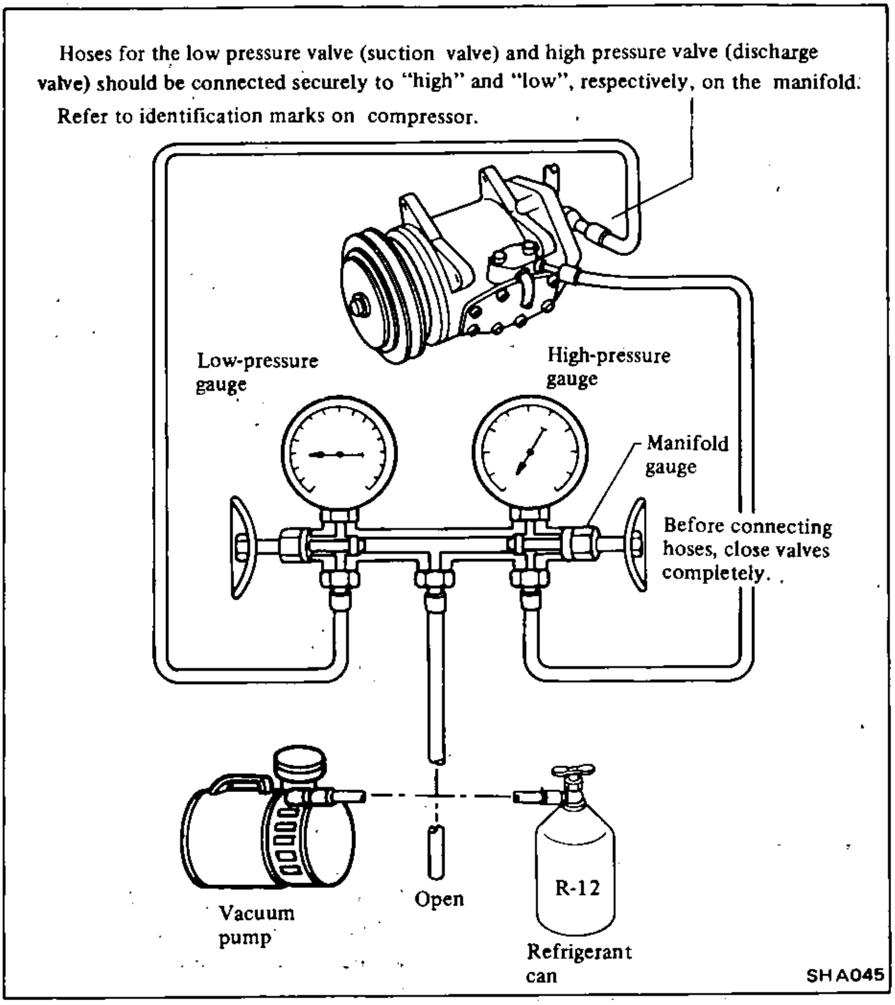
GENERAL SERVICE

PRECAUTIONS

WARNING:

1. **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
2. **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never store it in a hot location [above 52°C (126°F)] or drop it from a high height.**
3. **The refrigerant gas is odorless and colorless and breathing may become difficult due to the lack of oxygen. Since the refrigerant gas is heavier than air and will lay close to the floor, be especially careful when handling it in small, confined spaces.**
4. **The refrigerant itself is nonflammable. However, a toxic gas (phosgene gas) is produced when it contacts fire and special care is therefore required when checking for leaks in the system with a halide torch.**
5. **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**

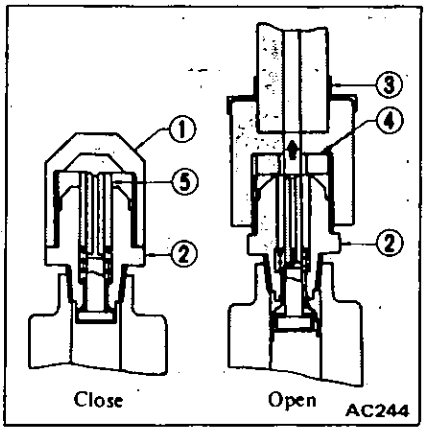
INSTALLING MANIFOLD GAUGE



Hoses for the low pressure valve (suction valve) and high pressure valve (discharge valve) should be connected securely to "high" and "low", respectively, on the manifold. Refer to identification marks on compressor.

Connection to service valve

1. Fully close both valves of manifold gauge. Connect high- and low-pressure charging hoses to manifold gauge.
2. Remove caps from service valves. Connect high- and low-pressure charging hoses to service valves in system.



1 Cap
2 Service valve
3 Charging hose
4 Packing
5 Check valve

Disconnection from service valve

1. Fully close both valves of manifold gauge.
2. Quickly disconnect two charging hoses from service valves and install caps on service valves.

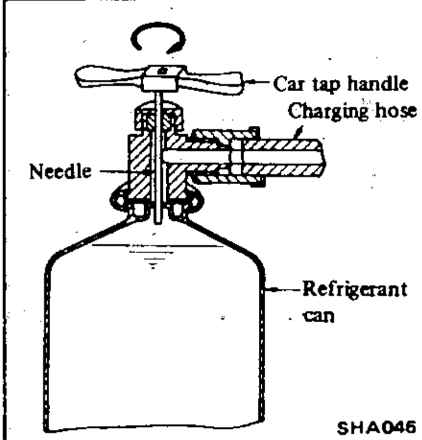
CAUTION:
Do not over-tighten valve cap.

HANDLING REFRIGERANT SERVICE CAN TAP

The following procedures apply to conventional can taps.

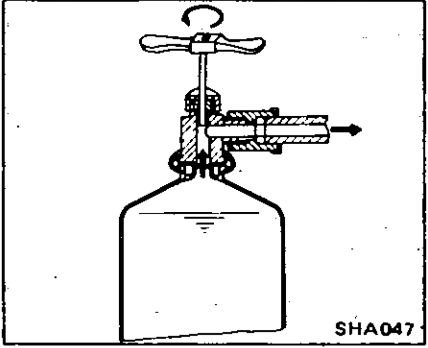
For correct usage, refer to the manufacturer's instructions.

1. Connect charging hose between manifold gauge and can tap.
2. Fully turn in (close) valve stem of manifold gauge.
3. Attach can tap to refrigerant can by turning can tap handle fully counterclockwise.
4. Make a hole in refrigerant can by turning can tap handle clockwise.



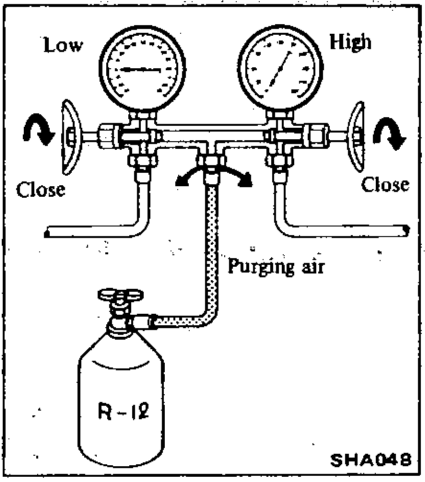
SHA046

5. Turn the handle fully counterclockwise to raise the needle. Refrigerant gas will flow up to the manifold gauge.



SHA047

6. Purge air from charging hose by loosening charging hose nut at manifold gauge.



SHA048

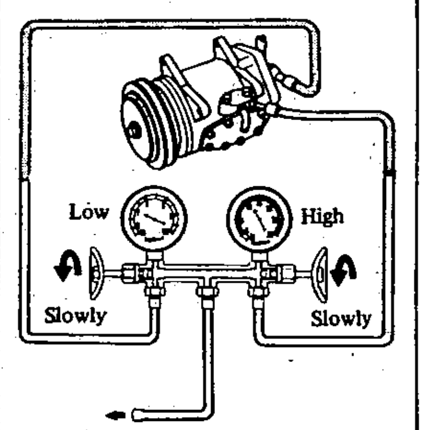
DISCHARGING REFRIGERANT

The pressurized refrigerant gas inside the system must be discharged at a pressure approaching atmospheric pressure prior to evacuating refrigerant inside the system.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service vavles.

WARNING:
Securely connect high pressure (discharge) service valve to that of manifold gauge with a hose; also connect low pressure (suction) service valve to that of manifold gauge.

3. Open both manifold gauge valves and discharge refrigerant from system.



SHA049

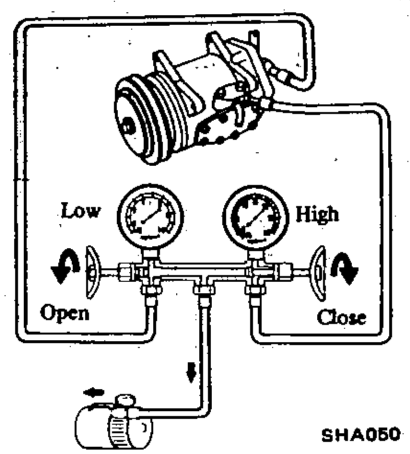
EVACUATING AND CHARGING REFRIGERANT SYSTEM

EVACUATING REFRIGERANT SYSTEM

1. Install manifold gauge on system and discharge refrigerant from system until pressure reaches atmospheric pressure.

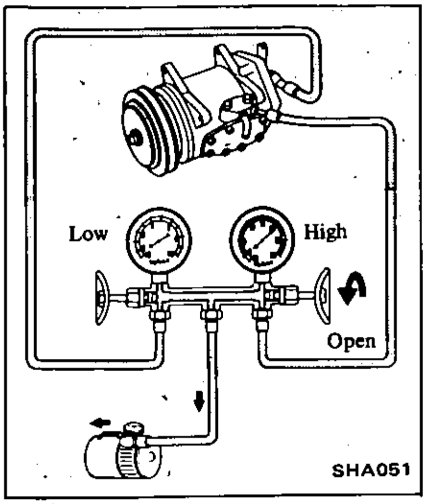
WARNING:
Securely connect high pressure (discharge) service valve to that of manifold gauge with a hose; also connect low pressure (suction) service valve to that of manifold gauge.

2. Connect center charging hose to vacuum pump.
3. Close both valves of manifold gauge fully. Then start vacuum pump.
4. Open low-pressure valve and suck old refrigerant from system.



SHA050

5. When low-pressure gauge reading has reached to approximately 66.7 kPa (500 mmHg, 19.69 inHg), slowly open high-pressure valve.



6. When pressure inside system has dropped to 94.6 kPa (710 mmHg, 27.95 inHg), fully close both valves of manifold gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system * kPa (mmHg, inHg)
0 (0)	94.6 (710, 27.95)
300 (1,000)	91.3 (685, 26.97)
600 (2,000)	88.0 (660, 25.98)
900 (3,000)	84.6 (635, 25.00)

***: Values show reading of the low-pressure gauge.**

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in five minutes.

If the pressure rises or the specified negative pressure can not be obtained, there is a leak in the system. In this case, repair the leak as described in the following.

(1) Charge system with a can of refrigerant [about 0.4 kg (0.9 lb)]. Refer to Charging Refrigerant.

(2) Check for refrigerant leakage with a leak detector. Repair any leakages found. Refer to Checking for Leaks (MA section).

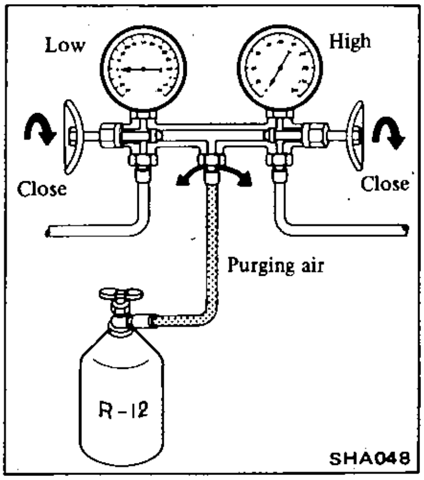
(3) Discharge refrigerant again, and then evacuate system.

CHARGING REFRIGERANT SYSTEM

1. Evacuate refrigerant system.
2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.

(1) Connect center charging hose to refrigerant can through can top.

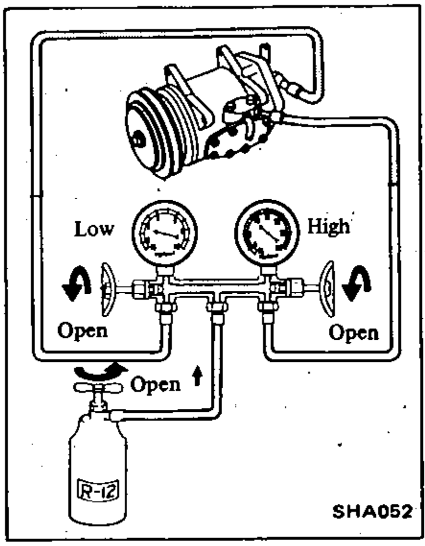
(2) Break seal of refrigerant can and purge air.



4. Charge refrigerant into system.

(1) **In case of charging refrigerant gas**

Open high- and low-pressure valves of manifold gauge and charge refrigerant into system.

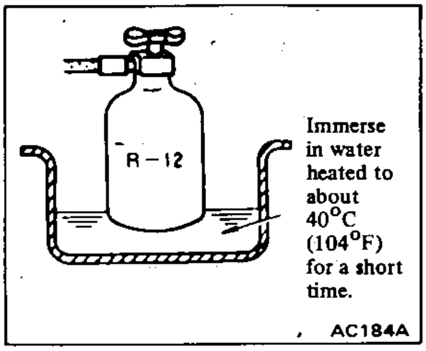


When refrigerant charging speed is slow, immerse refrigerant can in water, heated to a temperature of about 40°C (104°F), for a short time.

WARNING:

a. Under no circumstances the refrigerant can be warmed in water heated to a temperature of over 52°C (126°F).

b. A blow torch or stove must never be used to warm up the can.

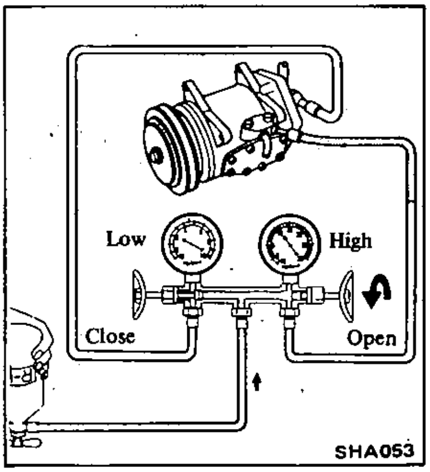


(2) **In case of charging liquefied refrigerant**

Open high pressure valve of manifold gauge and charge liquefied refrigerant into system with can upside down.

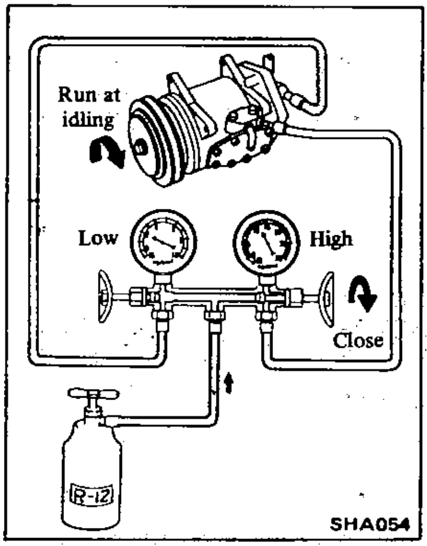
CAUTION:

When charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high pressure (discharge) service valve. After completion of charging, the compressor should always be turned several times manually.



5. **When refrigerant charging speed slows down,** charge it while running the compressor for ease of charging. After having taken the steps up to 3 above, proceed with cahrging in the following order.
(1) Shut off high pressure valve of manifold gauge.
(2) Run the engine at idling speeds below 1,500 rpm.
(3) Set mode dial, temperature dial and fan lever at maximum cool and speed respectively.
(4) Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/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.



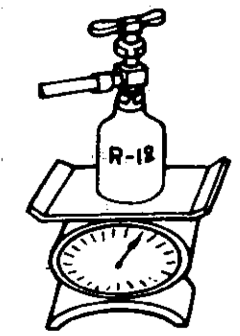
SHA054

6. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can with a new one.

Before charging refrigerant from new can, **purge air from inside charging hose.**

7. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant capacity:
0.9 - 1.1 kg (2.0 - 2.4 lb)



Measure the amount of charged refrigerant with a scale. Make a note of the amount charged from can.

AC252

The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. Refer to Checking Refrigerant Level (Section MA). The amount of charged refrigerant can be correctly judged by means of discharge pressure.

8. Close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap on service valve.

9. Confirm that there are no leaks in system by checking with a leak detector.

Refer to Checking for Leaks (MA section).

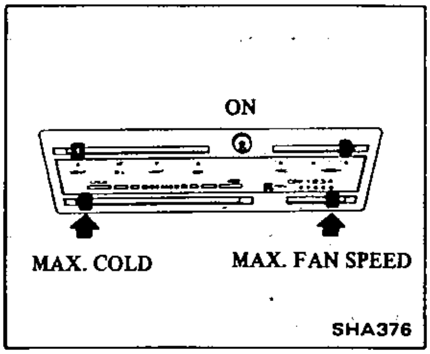
Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to Performance Test.

COMPRESSOR OIL LEVEL CHECK

The oil used to lubricate the compressor circulates into the system from the oil sump while compressor is operating. Therefore, to correctly measure compressor oil, the amount of oil flowing in the system must be considered. **If a considerable amount of leakage of refrigerant gas occurs, the leakage of compressor oil is also considered.**

When checking the level of compressor oil or when replacing any component part of the system, use the following service procedure. This helps to return oil to compressor.

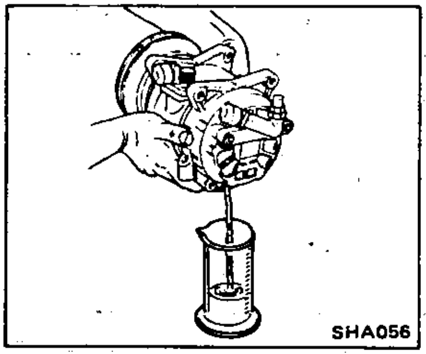
1. Fully open all windows or all doors of car. Operate compressor at engine idling speed (1,000 rpm or below), with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return compressor oil to compressor.



SHA376

2. Stop the engine and discharge refrigerant of system and then remove compressor from the car.

3. Remove compressor drain plug. Drain compressor oil from compressor oil sump and **measure the amount.**


SHA056

Residual oil level:
160 - 190 mℓ
(5.4 - 6.4 US fl oz,
5.6 - 6.7 Imp fl oz)

4. If the amount is below the above values, refrigerant may have leaked. Conduct leak tests on connections of each system, and if necessary repair or replace faulty parts.

5. Check the purity of the oil. If the oil contains chips or other foreign material, clean oil sump with new oil.

6. Discard the used oil and fill with the same amount of new oil as was drained when removing compressor. If the residual oil level is below the minimum level, add additional oil to reach the minimum level.

PERFORMANCE TEST

PERFORMANCE CHART

TEST CONDITION

Testing must be performed as follows.

Car location:	Indoors or in the shade (outside wind velocity: Less than 2 m (7 ft)/sec.)
Doors:	Closed
Door window:	Open
Hood:	Open
MODE dial:	Max. COLD position
TEMP dial:	Max. COLD position
FAN lever:	4 positions
Engine speed:	1,500 rpm (constant)
Manifold gauge:	Connect manifold gauge to high (discharge) and low (suction) service valves.
Measurement of discharge air temperature:	Center outlet grille
Measurement of inside air relative humidity and temperature:	Blower assembly inlet
Measurement of ambient air relative humidity and temperature:	A point 1 m (3 ft) in front of condenser

TEST READING

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C(°F)
Relative humidity %	Air temperature °C (°F)	
40 - 50	15 (59)	4.5 - 5.2 (40 - 41)
	20 (68)	6.5 - 7.5 (44 - 46)
	25 (77)	8.7 - 9.8 (48 - 50)
	30 (86)	10.8 - 12.2 (51 - 54)
	35 (95)	12.9 - 14.5 (55 - 58)
	40 (104)	15.0 - 17.0 (59 - 63)
50 - 60	15 (59)	5.2 - 5.8 (41 - 42)
	20 (68)	7.5 - 8.5 (46 - 47)
	25 (77)	9.8 - 11.0 (50 - 52)
	30 (86)	12.2 - 13.5 (54 - 56)
	35 (95)	14.5 - 16.2 (58 - 61)
	40 (104)	17.0 - 18.9 (63 - 66)
60 - 70	15 (59)	5.8 - 6.5 (42 - 44)
	20 (68)	8.5 - 9.4 (47 - 49)
	25 (77)	11.0 - 12.3 (52 - 54)
	30 (86)	13.5 - 15.2 (56 - 59)
	35 (95)	16.2 - 18.2 (61 - 65)
	40 (104)	18.9 - 21.1 (66 - 70)
70 - 80	15 (59)	6.5 - 7.1 (44 - 45)
	20 (68)	9.4 - 10.3 (49 - 51)
	25 (77)	12.3 - 13.7 (54 - 57)
	30 (86)	15.2 - 17.0 (59 - 63)
	35 (95)	18.2 - 20.2 (65 - 68)
	40 (104)	21.1 - 23.5 (70 - 74)
80 - 90	15 (59)	7.1 - 7.9 (45 - 46)
	25 (68)	10.3 - 11.5 (51 - 53)
	30 (77)	13.7 - 15.0 (57 - 59)
	35 (86)	17.0 - 18.6 (63 - 65)
	40 (95)	20.2 - 22.2 (68 - 72)
	45 (104)	23.5 - 26.0 (74 - 79)

Ambient air		Pressure high (Discharge side) kPa (kg/cm², psi)	Pressure low (Suction side) kPa (kg/cm², psi)
Relative humidity %	Temperature °C (°F)		
40 - 65	15 (59)	500 - 657 (5.1 - 6.7, 73 - 95)	93.2 - 98.1 (0.95 - 1.00, 13.5 - 14.2)
	20 (68)	755 - 834 (7.7 - 8.5, 109 - 121)	103.0 - 112.8 (1.05 - 1.15, 14.9 - 16.4)
	25 (77)	922 - 1,010 (9.4 - 10.3, 134 - 146)	122.6 - 137.3 (1.25 - 1.40, 17.8 - 19.9)
	30 (86)	1,079 - 1,196 (11.0 - 12.2, 156 - 173)	142.2 - 156.9 (1.45 - 1.60, 20.6 - 22.8)
	35 (95)	1,245 - 1,373 (12.7 - 14.0, 181 - 199)	156.9 - 176.5 (1.60 - 1.80, 22.8 - 25.6)
	40 (104)	1,393 - 1,550 (14.2 - 15.8, 202 - 225)	176.5 - 196.1 (1.80 - 2.00, 25.6 - 28.4)
65 - 90	15 (59)	657 - 726 (6.7 - 7.4, 95 - 105)	98.1 - 112.8 (1.00 - 1.15, 14.2 - 16.4)
	20 (68)	834 - 922 (8.5 - 9.4, 121 - 134)	112.8 - 132.4 (1.15 - 1.35, 16.4 - 19.2)
	25 (77)	1,010 - 1,118 (10.3 - 11.4, 146 - 162)	137.3 - 152.0 (1.40 - 1.55, 19.9 - 22.0)
	30 (86)	1,196 - 1,314 (12.2 - 13.4, 173 - 191)	156.9 - 171.6 (1.60 - 1.75, 22.8 - 24.9)
	35 (95)	1,372 - 1,510 (14.0 - 15.4, 199 - 219)	176.5 - 196.1 (1.80 - 2.00, 25.6 - 28.4)
	40 (104)	1,550 - 1,716 (15.8 - 17.5, 225 - 249)	196.1 - 220.7 (2.00 - 2.25, 28.4 - 32.0)

a. The pressure will change in the following manner with changes in conditions:

- **When blower speed is low, discharge pressure will drop.**
- **When the relative humidity of intake air is low, discharge pressure will drop.**

b. The temperature will change in the following manner with changes in conditions:
When the ambient air temperature is low, the outlet air temperature will become low.

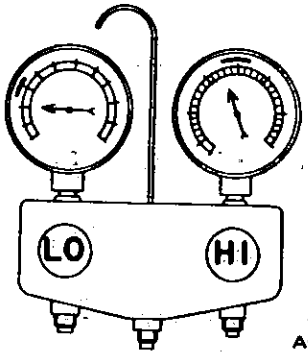
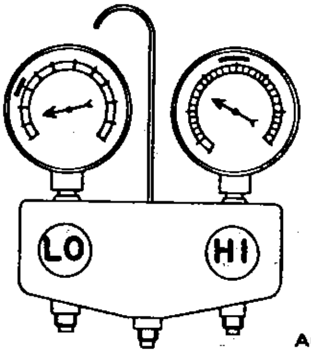
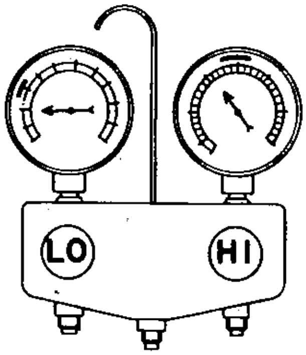
If the test reveals that there is any abnormality in system pressure, isolate the cause and repair. Refer to Performance Test Diagnoses.

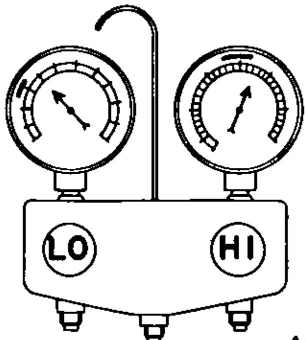
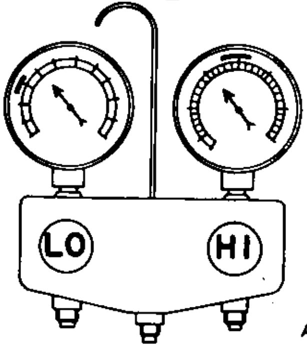
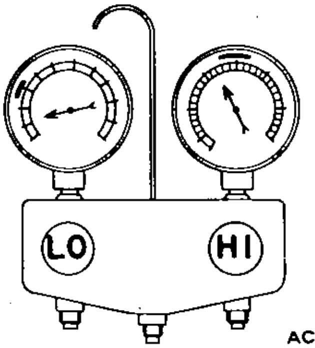
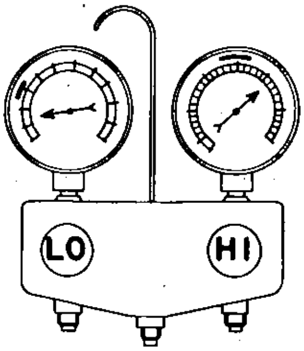
PERFORMANCE TEST DIAGNOSES

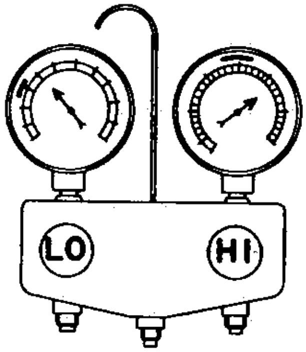
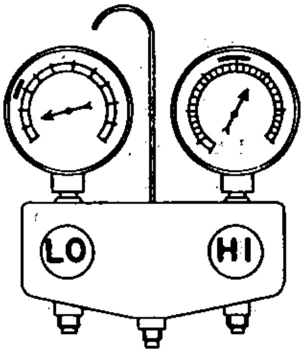
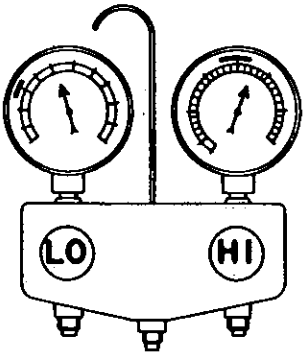
Characteristics revealed on the manifold gauge reading for the air conditioning system are shown in the following.

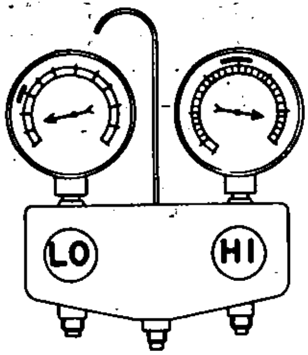
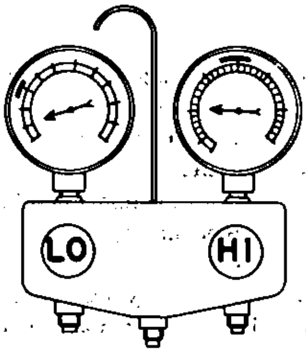
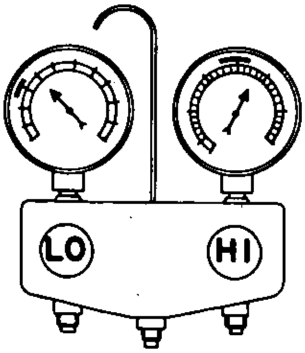
As to the method of a performance test, refer to the item of "Performance Test".

In the following table, the portion smeared with ink on each gauge scale indicates a range based on the assumption that the air conditioning system is in good order. This range is described in PERFORMANCE CHART.

Condition	Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  AC352A Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  AC353A No cooling action. In sight glass appear a lot of bubbles or something like mist.	Serious refrigerant leak.	**Stop compressor immediately.** 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE  AC354A Sight cooling. Sweating or frosted expansion valve inlet.	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition		Probable cause	Corrective action
 AC355A	Insufficient cooling. Sweated suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC356A	No cooling. Sweating or frosted suction line.	Faulty expansion valve.	1. Discharge system. 2. Replace valve. 3. Evacuate and replace system.
FAULTY SUCTION THROTTLE VALVE  AC357A	Insufficient cooling. Frosted evaporator.	Suction throttle valve is inoperative.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
 AC358A	Insufficient cooling.	Suction throttle valve restricts refrigerant flow.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition		Probable cause	Corrective action
AIR IN SYSTEM			
 AC359A	Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM			
 AC360A	After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading shows 39 kPa (0.4 kg/cm², 6 psi) vibration.	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minute evacuating three times.) 4. Recharge system.
FAULTY CONDENSER			
 AC361A	No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Usually a malfunctioning condenser.	• Check fan belt and fluid coupling. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**

Condition		Probable cause	Corrective action
HIGH PRESSURE LINE BLOCKED  AC362A	Insufficient cooling. Frosted high pressure liquid line.	Drier clogged, or restriction in high pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
FAULTY COMPRESSOR  AC363A	Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.
TOO MUCH OIL IN SYSTEM (Excessive)  AC364A	Insufficient cooling.	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to Oil Level Check for correcting oil level.

SERVICE PROCEDURE

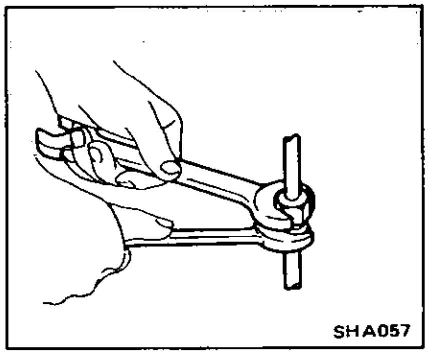
PRECAUTIONS FOR REMOVAL AND INSTALLATION

When replacing refrigerant cycle components, observe the following:

1. Disconnect battery ground cable.
2. Before starting work, be sure to discharge system.

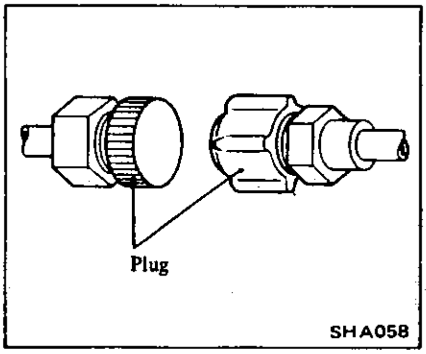
WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

3. When disconnecting or connecting tubes, be sure to use two wrenches on both tubes.



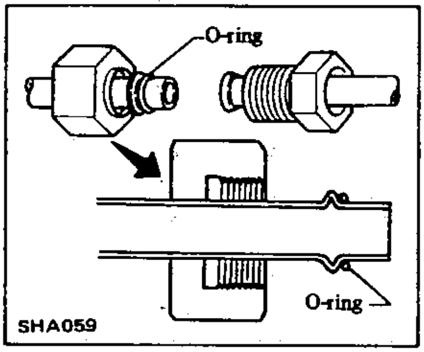
SHA057

4. After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



SHA058

5. Compressed air must never be used to clean dirty line. Clean with refrigerant gas.
6. When connecting tubes, install new O-ring (never reuse used one) into connection and be sure to apply compressor oil to seating surface and O-ring.



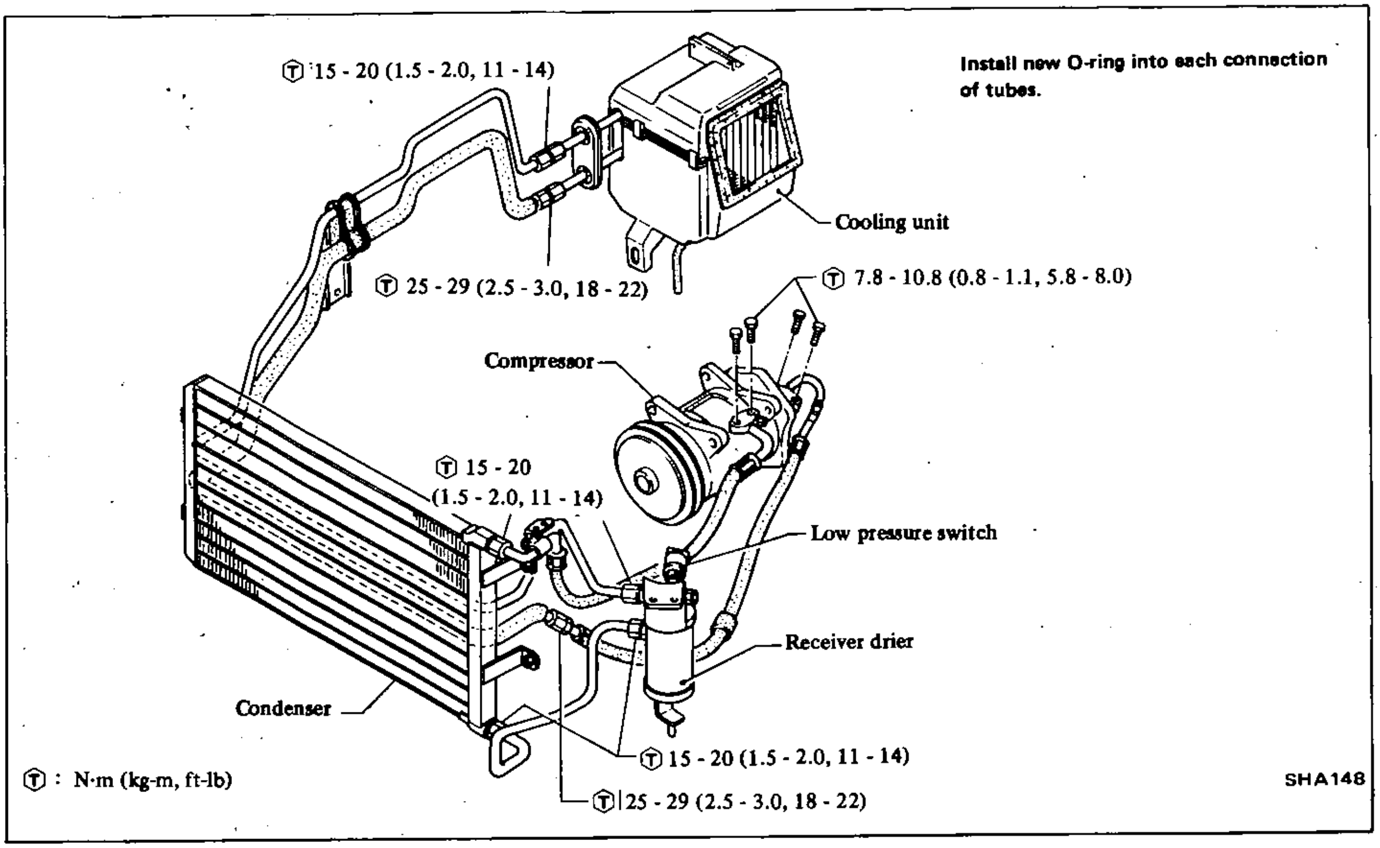
SHA059

7. Check tightening torque of connections to specification.
8. Make sure refrigerant line is clamped securely.

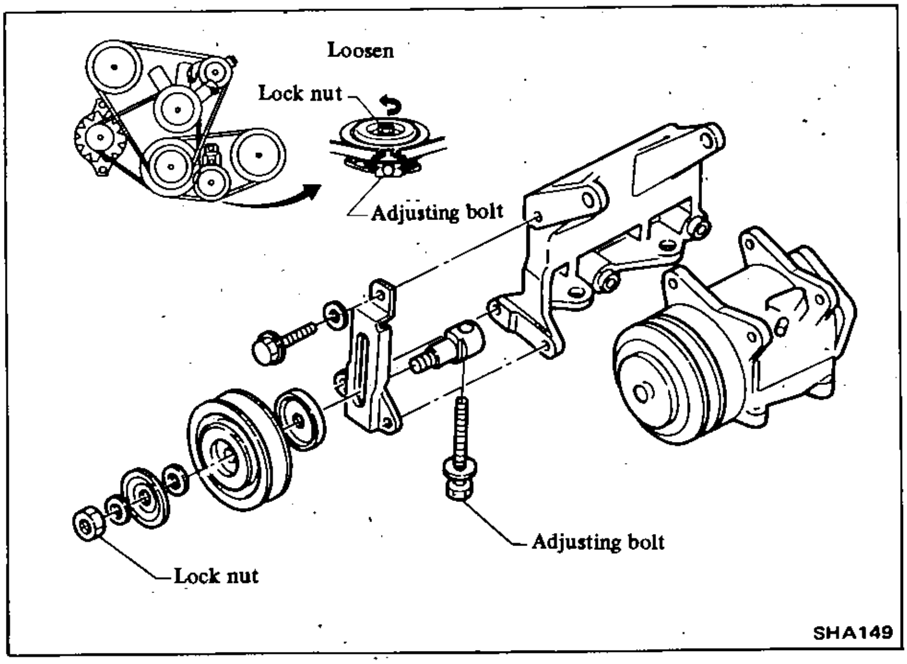
Check all components to insure they are neither damaged nor interfere with adjacent parts.

9. Conduct leak test and make sure that there is no leak from connections.
10. Determine quantity of oil to be charged into compressor by referring to Compressor Oil Level. Check in General Service.

REFRIGERANT LINES



COMPRESSOR IDLER PULLEY

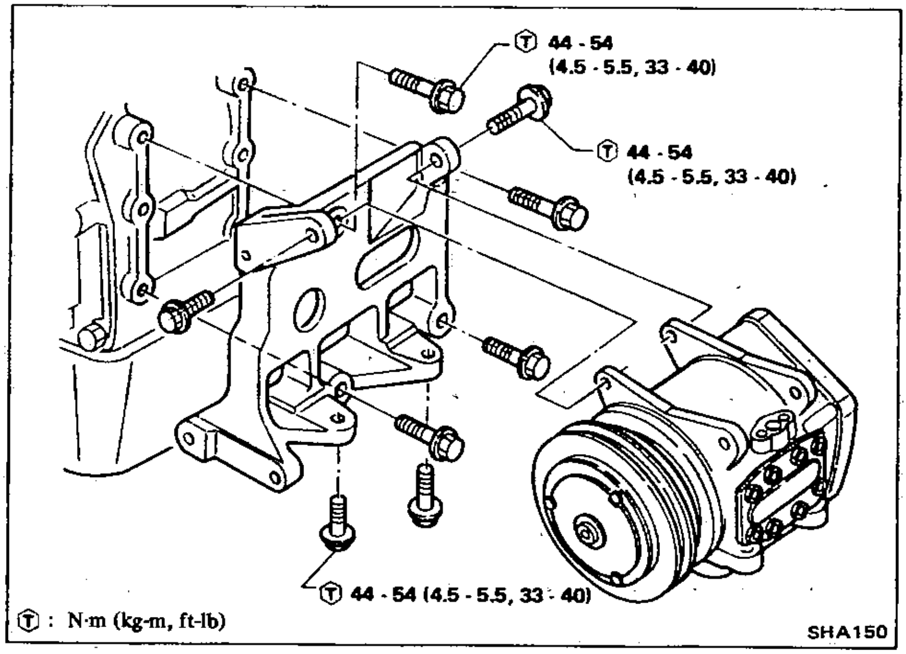


REMOVAL AND INSTALLATION

1. Remove under cover.
2. Loosen idler pulley lock nut and fully loosen adjusting bolt.
3. Remove drive belt.
4. Remove idle pulley assembly.
5. Installation is in the reverse order of removal.

Refer to Section MA for adjusting drive belt.

COMPRESSOR

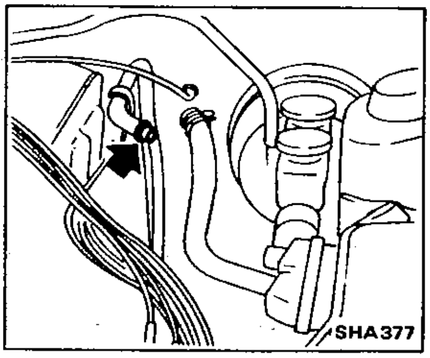


REMOVAL AND INSTALLATION

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. Remove compressor drive belt.

   Refer to the item on Compressor Idler Pulley.
3. Disconnect high (discharge) and low (suction) flexible hoses from compressor.
4. Disconnect compressor clutch harness.
5. Remove compressor.

(1) Disconnect air induction pipe.



(2) Remove ignition coils.

(3) Remove compressor with its 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.

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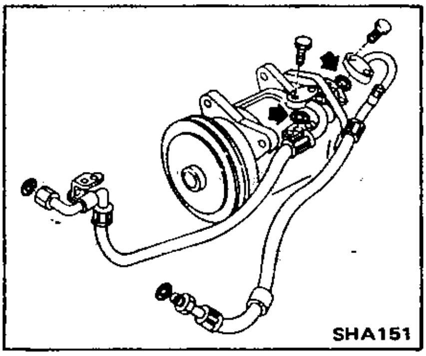
6. Installation is in the reverse order of removal.

When connecting high and low flexible hoses to compressor, install new O-ring into connection.



CONDENSER

REMOVAL AND INSTALLATION

1. Remove radiator grille.
2. Remove stay for hood lock support.
3. Disconnect refrigerant lines from condenser.
4. Remove condenser.
5. Installation is in the reverse order of removal.

INSPECTION

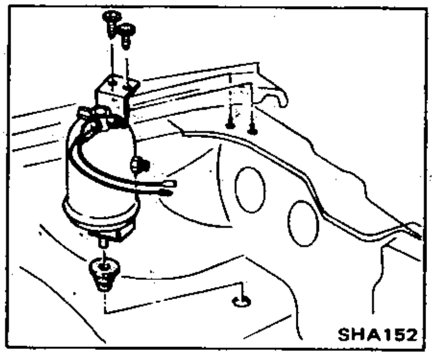
Inspect joints of inlet and outlet pipes for cracks and scratches. Upon finding any problem which may cause gas to leak, repair or replace condenser.

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.

RECEIVER DRIER (Liquid tank)



REMOVAL AND INSTALLATION

1. Disconnect refrigerant line from receiver drier.

CAUTION:

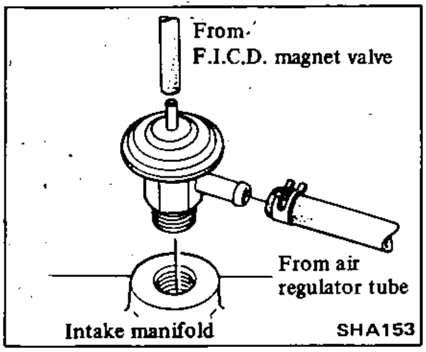
Plug all openings to prevent entrance of dirt and moisture into receiver drier.

2. Disconnect harness for low pressure switch.
3. Remove receiver drier.
4. Installation is in the reverse order of removal.

INSPECTION

Check receiver drier for leaks or damage. If necessary, replace.

FAST IDLE ACTUATOR

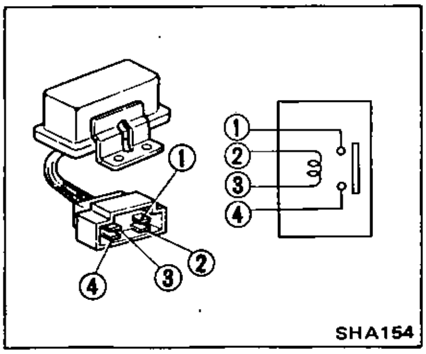


SHA153

INSPECTION

Refer to Trouble Diagnoses and Corrections.

COOLER RELAY

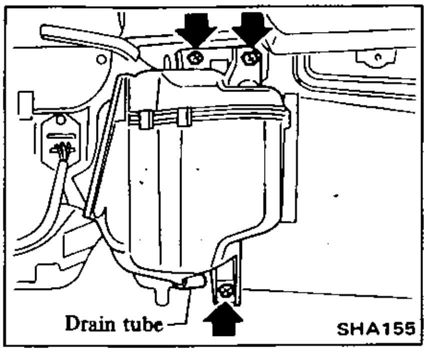


SHA154

COOLING UNIT

REMOVAL AND INSTALLATION

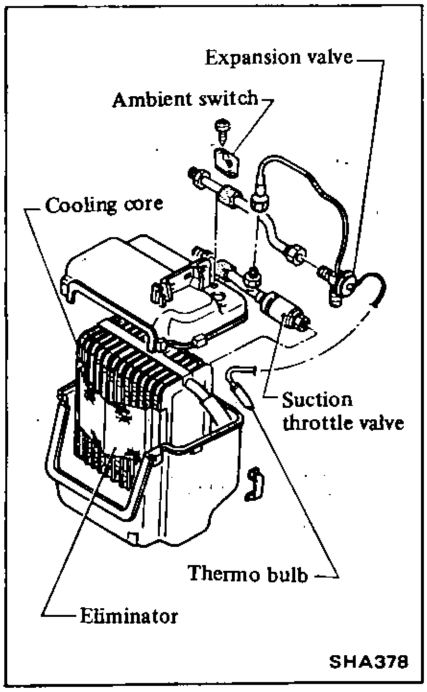
1. Remove instrument lower cover and cluster lid.
2. Disconnect refrigerant lines from cooling unit.
3. Remove cooling unit with drain tube.



SHA155

4. Installation is in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY



SHA378

1. Remove clips fixing upper case to lower case.
2. Withdraw evaporator assembly.
3. Assembly is in the reverse order of disassembly.

INSPECTION

Case

Check for cracked or deformed case.

Evaporator assembly

1. Clean fins and check for corrosion. If fins are corroded, replace.

CAUTION:
Do not clean evaporator with steam. Be sure to use cold water or compressed air.

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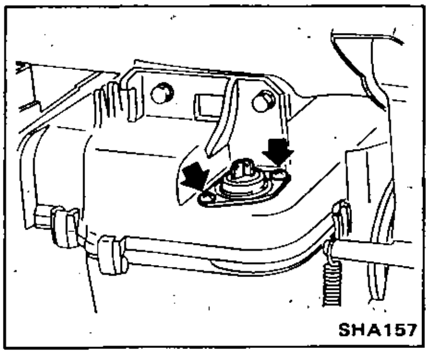
2. Check for gas leaks at expansion valve and suction throttle valve. If there are leaks, retighten or replace the defective part with a new assembly.

AMBIENT SWITCH

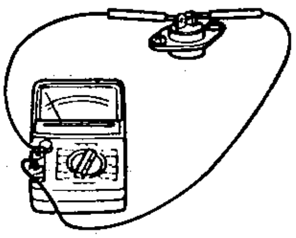
REMOVAL AND INSTALLATION



SHA157

1. Remove instrument lower cover and cluster lid.
2. Disconnect harness connector and remove ambient switch.
3. Installation is in the reverse order of removal.

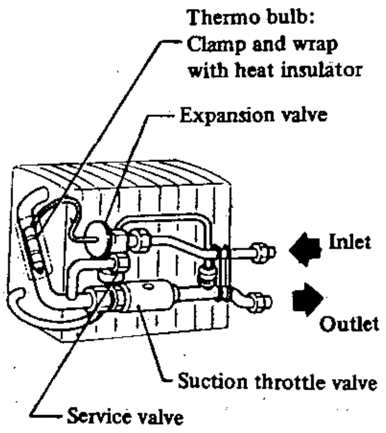
INSPECTION



Ambient temperature	Continuity
Above 2 - 5°C (36 - 41°F)	Yes
Below 0 - 3°C (0 - 37°F)	No

SHA158

EXPANSION VALVE AND SUCTION THROTTLE VALVE



SHA159

Do not disassemble valves. If necessary, replace as assembly.

AIR CONDITIONER CONTROL ASSEMBLY

REMOVAL AND INSTALLATION

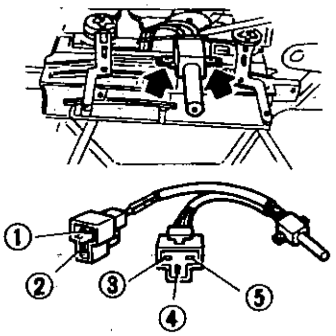
Refer to Heater Control Assembly.

INSPECTION

Fan switch

Refer to Fan Switch in Heater.

Air conditioner switch



Electrical conductivity

A/C switch	①	②	③	④	⑤
ON	○	○	—	—	○
	○	—	○		
		○	—	○	
OFF	○	—	○		
		○	—	○	

Illumination lamp is located between ① and ②

SHA161

BLOWER UNIT

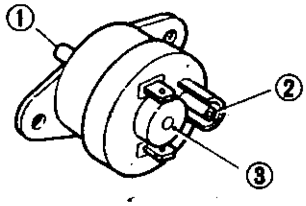
Refer to Blower Unit in Heater.

RESISTOR

Refer to Resistor in Heater.

MAGNET VALVE

INSPECTION

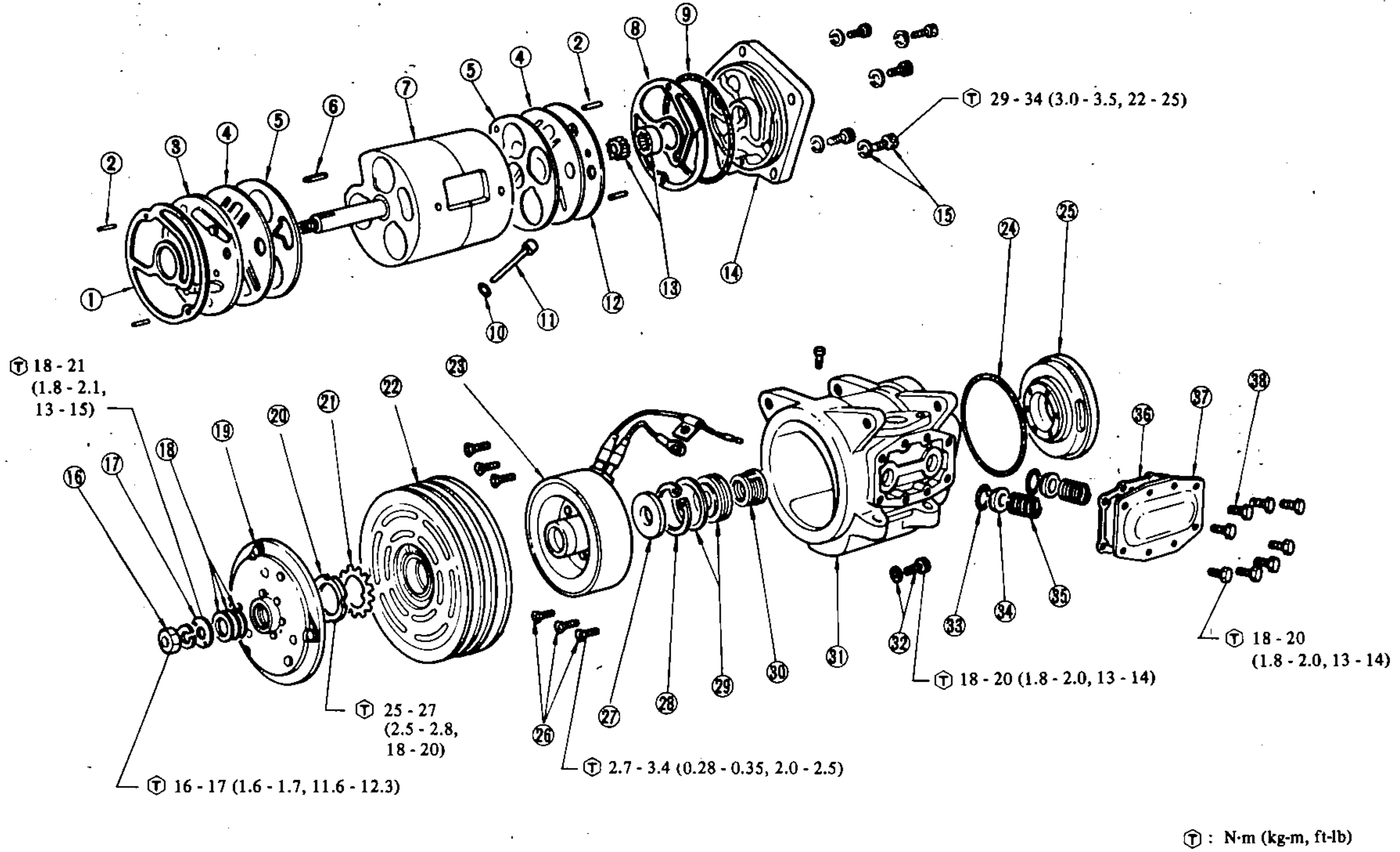


Air passing

Applied voltage	①	②	③
0 V		○	○
12 V	○	○	

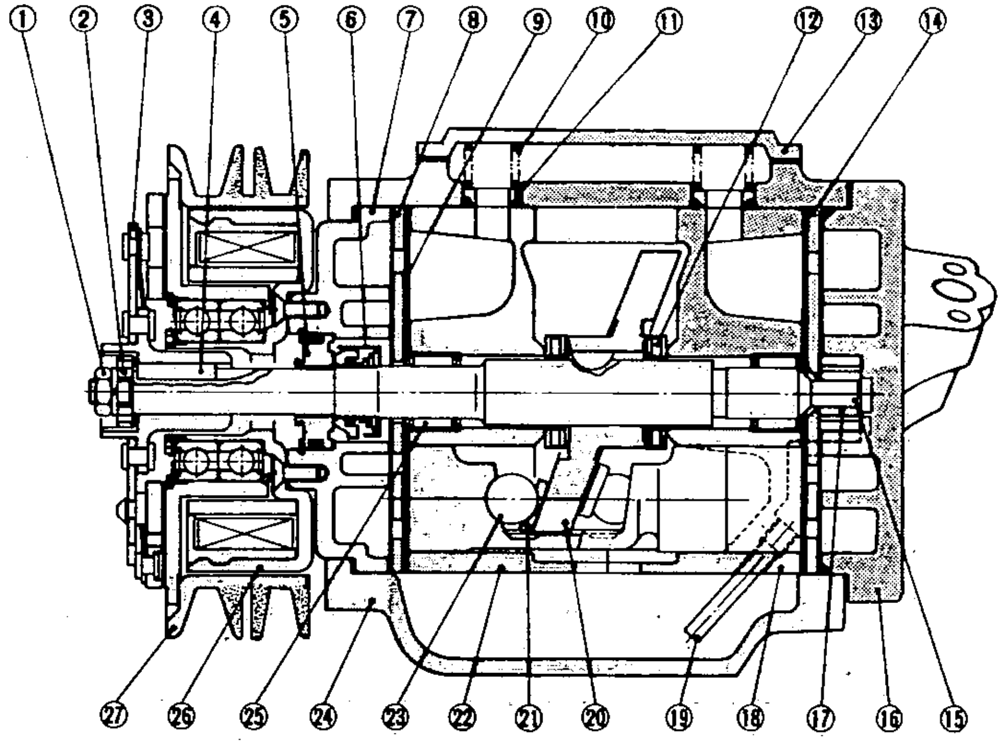
SHA162

COMPRESSOR (SWP167)



1	Gasket
2	Knock pin
3	Front cylinder head
4	Suction valve plate
5	Gasket
6	Key
7	Compressor cylinder assembly
8	Gasket
9	Rear end cover O-ring
10	Oil pipe O-ring
11	Oil pipe
12	Rear cylinder head
13	Gear pump assembly
14	Rear end cover
15	Rear end cover fixing bolt and washer
16	Shaft nut
17	Hub nut
18	Spacer
19	Clutch hub
20	Lock nut
21	Lock washer
22	Pulley and bearing assembly
23	Coil assembly
24	Gasket
25	Front end cover
26	Coil mounting screw
27	Felt
28	Retainer ring
29	Shaft seal seat and O-ring
30	Shaft seal
31	Compressor shell
32	Drain plug and gasket
33	Silencer piece O-ring
34	Silencer piece
35	Silencer spring
36	Gasket
37	Side cover
38	Side cover fixing bolt

SHA163



1 Shaft nut
2 Hub nut
3 Clutch hub
4 Key
5 Shaft seal seat
6 Shaft seal
7 Front end cover
8 Front cylinder head
9 Suction valve plate
10 Silencer spring
11 Silencer piece
12 Thrust bearing
13 Side cover
14 Rear cylinder head
15 Compressor shaft
16 Rear end cover
17 Oil pump
18 Rear cylinder
19 Oil pipe
20 Swash plate
21 Shoe disc
22 Front cylinder
23 Drive ball
24 Shell
25 Needle bearing
26 Clutch coil
27 Pulley and bearing assembly

SHA164

PRECAUTIONS

1. **Plug all openings** in compressor to prevent from entering of moisture and foreign matter.
2. **Do not leave the compressor on its side or upside down for more than 10 minutes, as the lubricating 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.
3. **Before replacing with the new compressor, completely drain oil from the new compressor and fill with an amount of oil equaling that remaining in the old compressor.**
4. When replacing parts or oil, **always replace gaskets, O-ring and oil seal with new ones.**
5. When storing a compressor, be sure to fill it with refrigerant to prevent rusting. Add refrigerant at the low-pressure side and purge air at the high-pressure side.

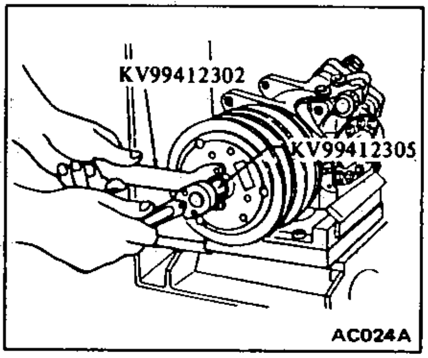
COMPRESSOR CLUTCH

The most common problem is clutch slippage. Service procedures are listed below. Exercise 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.

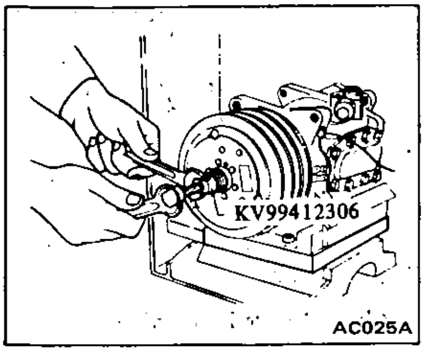
REMOVAL

1. Using Tool KV99412302, hold clutch hub. With suitable socket wrench, remove shaft nut from shaft.
2. Then, using Tool, remove clutch hub nut. Remove spacers.



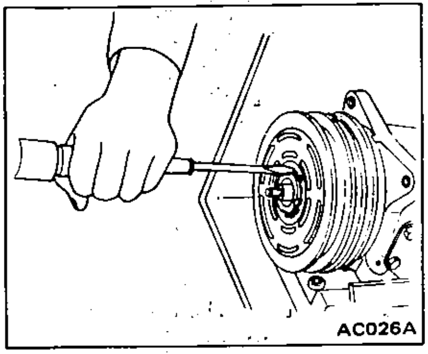
AC024A

3. Using Tool, remove clutch hub. Thread tool into the bore of clutch hub, hold tool with wrench, and then thread in center bolt.



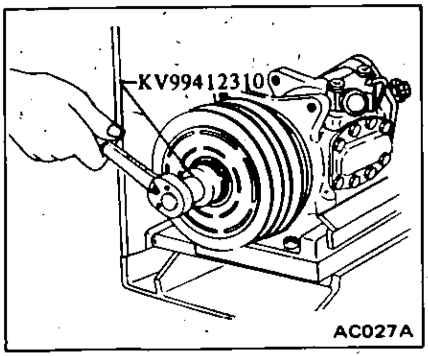
AC025A

4. With an ordinary screwdriver, flatten lock washer tab.



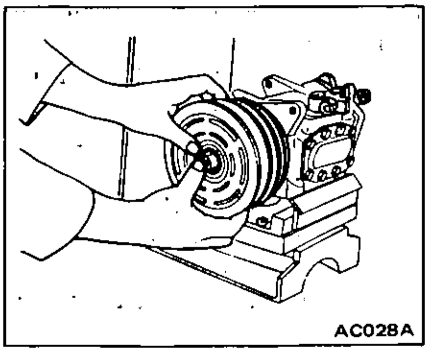
AC026A

5. Using Tool, loosen lock nut. Remove lock nut and lock washer.



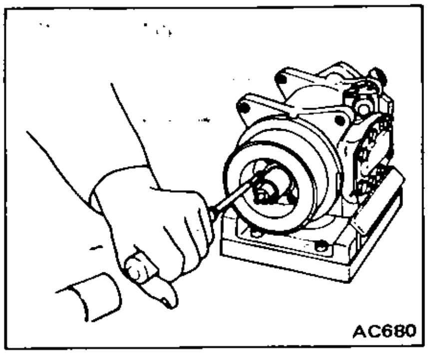
AC027A

6. Remove pulley and bearing assembly. When the assembly can not be removed by hand, use a puller, Tool KV99412313 and Tool KV99412312.



AC028A

7. Using an impact tool, loosen six coil mounting screws. Use of the impact tool is advisable as screws have been calked.



AC680

8. Remove coil mounting screws and separate coil assembly.

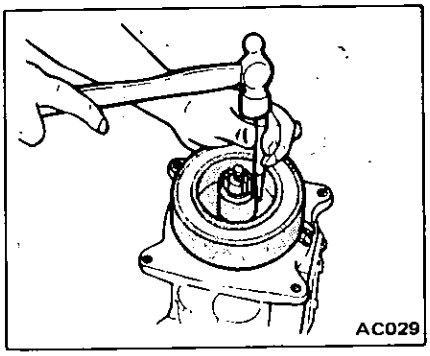
INSPECTION

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, punchlock 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)



AC029

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 Tool 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.

Ⓣ : **Hub nut**
18 - 21 N·m
(1.8 - 2.1 kg-m,
13 - 15 ft-lb)

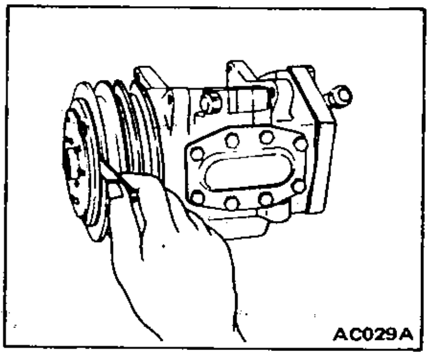
5. Tighten shaft nut with locking agent in place.

Ⓣ : **Shaft nut**
16 - 17 N·m
(1.6 - 1.7 kg-m,
11.6 - 12.3 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.



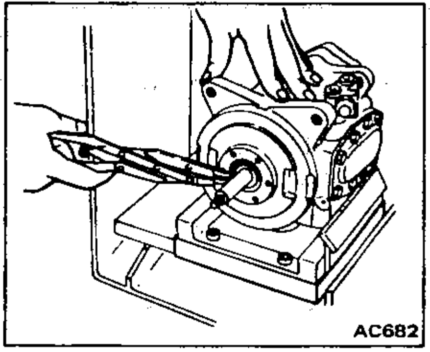
AC029A

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. Remove drain plug, thereby draining the oil.
2. Remove clutch hub, pulley and bearing assembly, and coil assembly. Proceed according to information under "Compressor Clutch".
3. Using snap ring pliers, compress and remove retainer ring.



AC682

4. To remove shaft seal seat, proceed as follows:

(1) Plug high (discharge) and low (suction) pressure openings of compressor using Tool KV994C4548 or blind cover and gasket which are installed on service compressor.

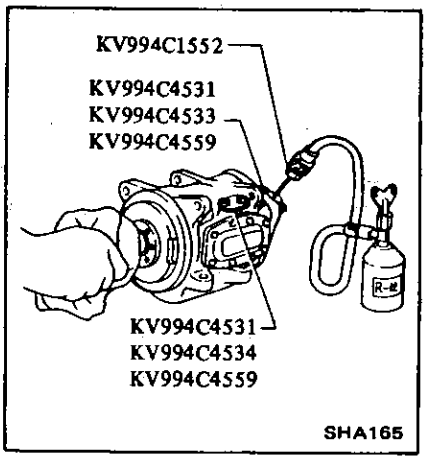
(2) Connect charging hose to refrigerant can. Install Tool KV994C1552 to other end of charging hose and insert it into hole in middle of blind cover at low pressure side.

5. Wrap shaft end with rag. Apply refrigerant pressure of 196 to 490 kPa (2 to 5 kg/cm², 28 to 71 psi) through low pressure line of compressor until shaft seal seat is received at rag.

CAUTION:

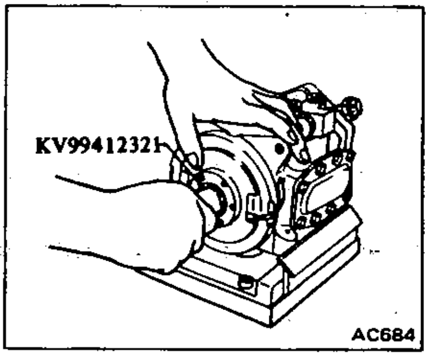
a. Do not use air to prevent entry of moisture, dust, etc.

b. If shaft seal seat is not plucked out, install it again and apply refrigerant pressure.

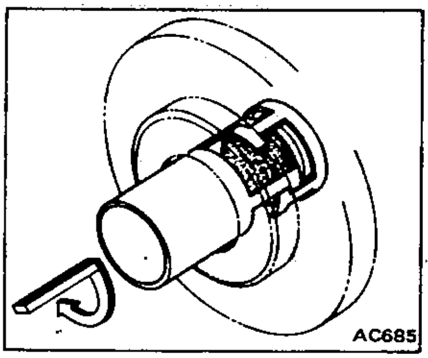


SHA165

6. Insert Tool through the open end of front end 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.



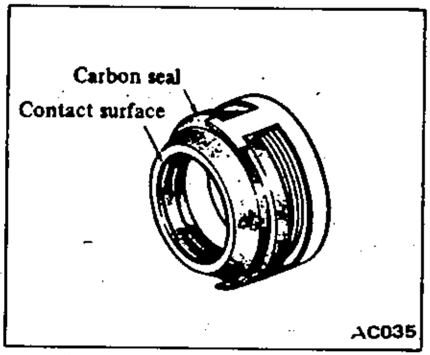
AC684



AC685

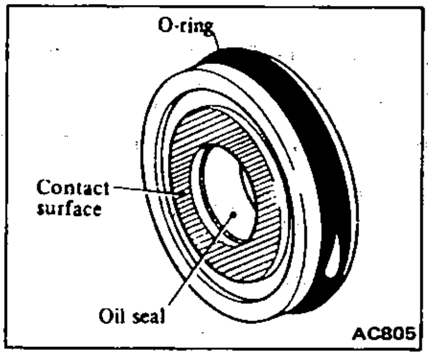
INSPECTION

1. Check the carbon seal surface of shaft seal for damage.



AC035

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 end cover is not damaged.



AC805

INSTALLATION

Do not re-use shaft seal seat and shaft seal.

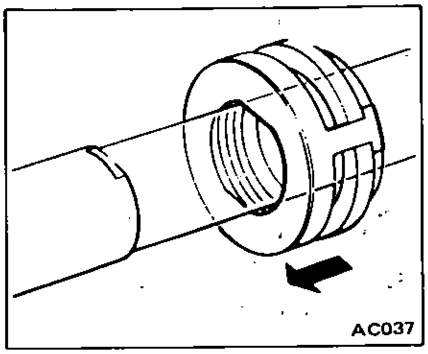
CAUTION:

In placing a new seal on the workbench, make sure that the contact surface faces upward. Take necessary steps to avoid damage.

---

1. Make sure that the shaft seal contact surface is free of dirt and amply lubricated with compressor oil.
2. Cap Tool KV99412322 to the top end of compressor shaft.
3. Using Tool 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.



AC037

4. Fit O-ring to the outside groove of shaft seal seat, making sure that it seats properly.
5. Apply an ample coat of oil to contact surface and shaft seal seat so that seat easily slides on inner side of front end cover.

Also apply a thin coat of grease or oil to shaft. Push shaft seal seat into front end cover until it bottoms up to land.

6. Using snap ring pliers, compress retainer ring and fit it into front end cover. Seat retainer ring firmly in the groove.
7. Install Tool KV99412329 to compressor shaft and turn shaft 5 to 6 turns clockwise. Then, check for gas leakage as follows:

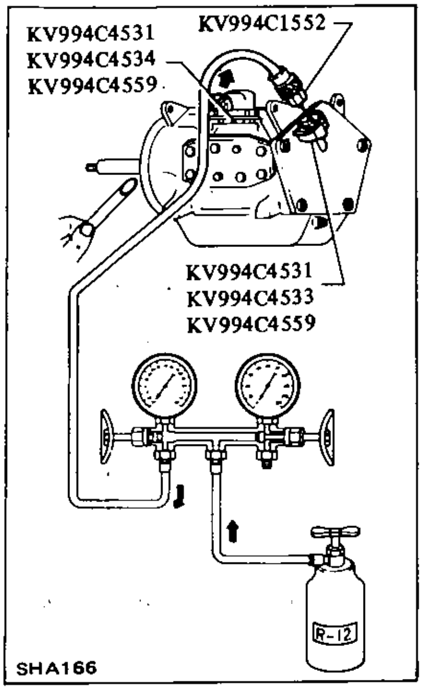
(1) Plug high- and low-pressure joints into compressor Using Tool KV994C4548 or blind cover and gasket which are installed on service compressor.

(2) Connect charging hose to low pressure gauge of manifold gauge. Install Tool KV994C1552 to other end of charging hose and insert it into hole in middle of blind cover at low pressure side.

Connect center hose of manifold gauge to referigerant can.

(3) Open valve of can top, charge refrigerant from low pressure side and purge air from high pressure side by loosening blind cap.

(4) Conduct a leak test. If there is a leak, remove and then install again.

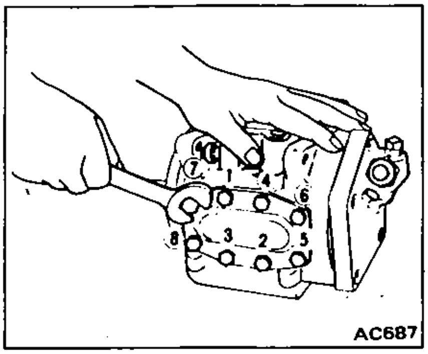


SHA166

SIDE COVER

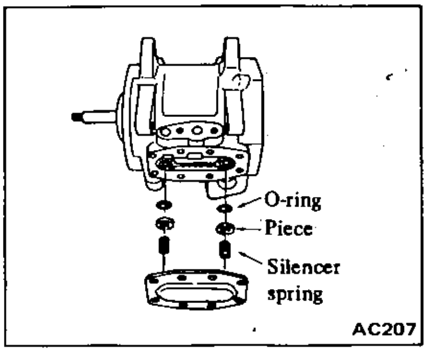
REMOVAL

1. Drain oil.
2. Loosen and remove eight side cover mounting bolts in an alternate pattern. Note that two silencer springs inside the cover will force up side cover.



AC687

3. Remove side cover and side cover gasket. Discard the gasket.
4. Remove silencer springs, pieces, and O-rings. Do not damage O-ring surface of silencer piece during this process. Discard used O-rings.



AC207

INSPECTION

1. Make sure that side cover gasket surface and shell gasket surface are not damaged.
2. Make sure that silencer pieces and shell contact surfaces in contact with O-ring are not damaged.
3. Do not reuse old gasket and O-rings.

INSTALLATION

Do not tap on the compressor shaft.

1. Place the mounting surface of side cover upward.
2. Make sure that holes of cylinder and shell are aligned and install O-rings.
3. Coat O-ring and the area around shell hole with an ample amount of compressor oil. Using Tool KV99412328, install O-ring into the shell hole. Then install silencer piece with Tool KV99412327.
4. Coat the gasket surface of shell with compressor oil and position gasket and side cover.
5. Hold side cover in place by hand and thread in eight mounting bolts. Tighten these bolts evenly in an alternating pattern.

Ⓣ : Side cover bolt
18 - 20 N·m
(1.8 - 2.0 kg-m,
13 - 14 ft-lb)

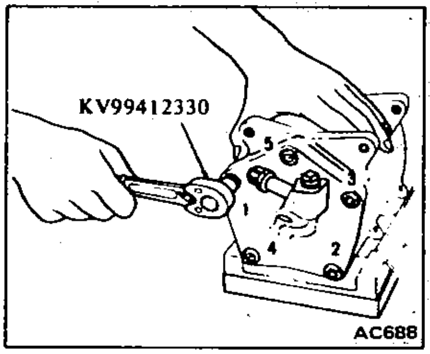
6. Fill with compressor oil.
7. Upon completion of the above operations, conduct a gas leak test by

referring to the item "Installation" under the topic "Shaft Seal".

REAR END COVER AND REAR CYLINDER HEAD

REMOVAL

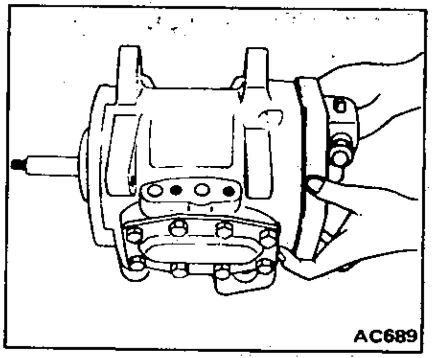
1. Drain oil.
2. Remove five rear end cover mounting bolts with Tool. Starting at the top, loosen all bolts one turn in an alternating pattern. Then remove bolts in turn.



AC688

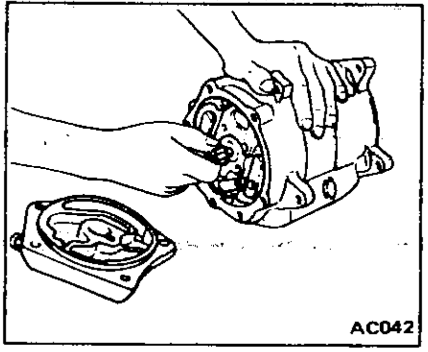
3. Grasp rear end cover and carefully separate it from compressor. Tap the flange lightly and alternately as required with a plastic mallet.

Do not reuse old gasket and O-ring.



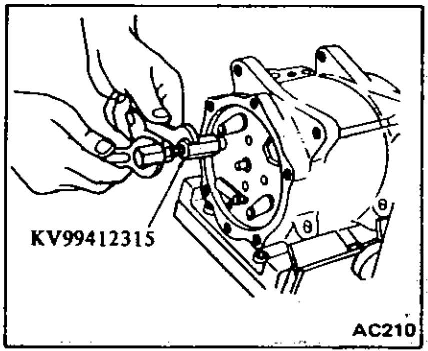
AC689

4. Remove pump gear. Do not allow pump gear to damage the surface.



AC042

5. Remove O-ring, gasket and two pins. Discard the O-ring and gasket.
6. Remove rear cylinder head, suction valve plate and gasket. Discard the gasket. Carefully remove suction valve plate, avoiding deformation.
7. When removal proves difficult, use Tool. 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.



AC210

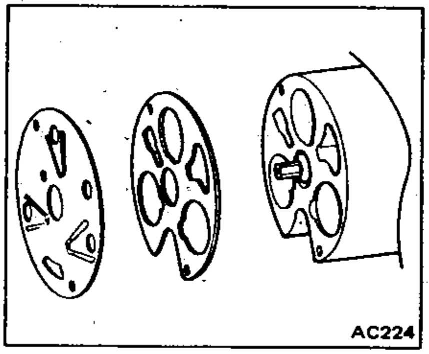
INSPECTION

1. Make sure that the gasket contact surface is free of damage.
2. If replacement of rear end cover connector and check valve is necessary, replace rear end cover with a new one.
3. Check suction valve plate and cylinder head for broken valves.
4. Check pump gear for wear and damage.

INSTALLATION

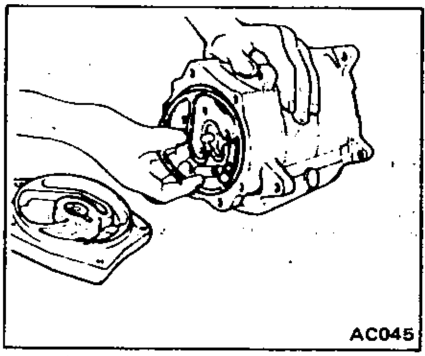
Do not reuse old gasket and O-ring.

1. Using suitable blocks, position compressor with the front face downward and the rear upward.
2. Insert two pins in the rear of cylinder.
3. Coat both surfaces of cylinder head gasket with compressor oil and align gasket with cylinder.
4. Install suction valve plate, making sure that the three valves properly align with cylinders and gasket cutouts.

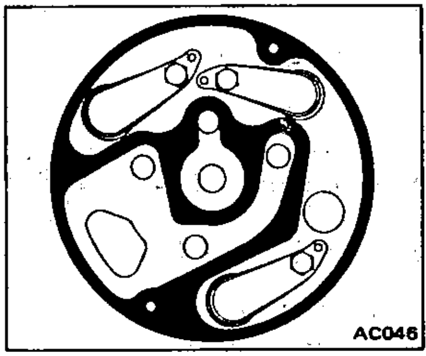


AC224

5. Install cylinder head, gasket, and O-ring in the order listed. Coat gasket and O-ring beforehand with an ample amount of compressor oil.

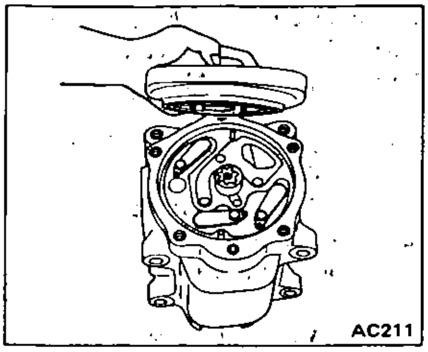


AC045



AC046

6. Fit pump gear to rear end cover.
7. Carefully fit rear end cover to the rear of compressor.


AC211

8. Using Tool KV99412330, tighten up five bolts in an alternating pattern, starting at the top. Do not forget lock washers.

Ⓣ : **Rear end cover bolt**
29 - 34 N·m
(3.0 - 3.5 kg-m,
22 - 25 ft-lb)

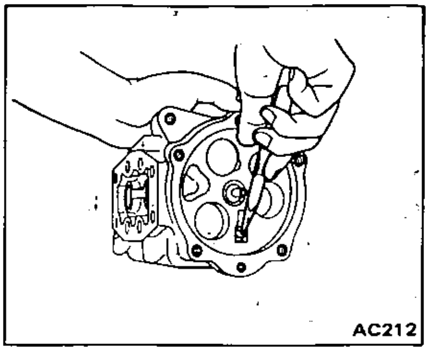
9. Fill with compressor oil.
10. Upon completion of the above operation, conduct a leak test by referring to the topic under "Shaft Seal".

REPLACEMENT OF CYLINDER

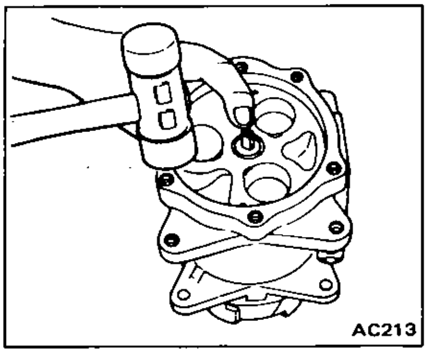
REMOVAL

1. Drain oil.
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 end cover. In fact, this approach facilitates work.
4. Remove side cover. Refer to "Side Cover".
5. Remove rear end cover. Refer to "Rear End Cover and Rear Cylinder Head". Remove O-ring, gasket, two pins, cylinder head, suction valve plate, and gasket in the order listed. This exposes the rear part of cylinder.
6. Using long nose pliers or other suitable tool, pull out oil pipe. Proceed carefully as oil pipe is easily bent.

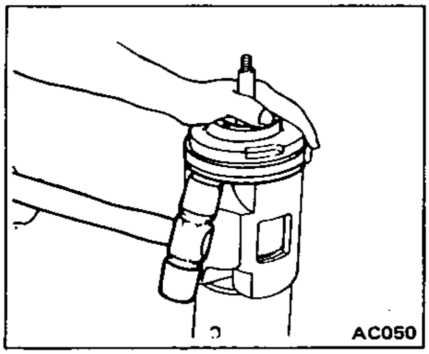
CAUTION:
Unless oil pipe has been removed, do not attempt the following steps.


AC212

7. With the front facing downward support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward. Discard front end cover gasket.


AC213

8. Detach front end cover from cylinder assembly. Using a plastic mallet, drive end cover upward. Refrain from excessive force to avoid cover damage.

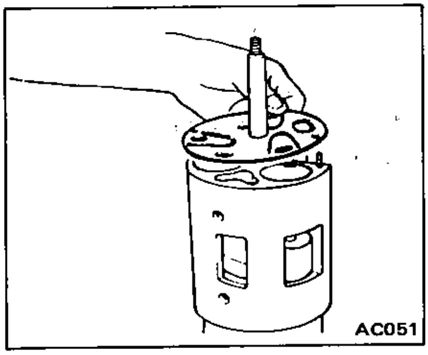

AC050

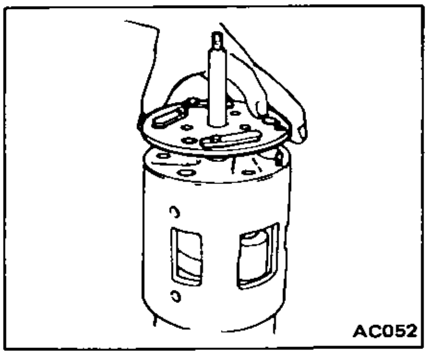
9. Remove shaft seal from the shaft.
10. Remove two pins, gasket, cylinder head, suction valve plate, and gasket. When removing two pins, proceed carefully to avoid cylinder head damage. Do not deform suction valve plate in removing suction valve plate. Discard oil gasket.

CAUTION:
Do not deform suction valve plate when removing it.

INSTALLATION

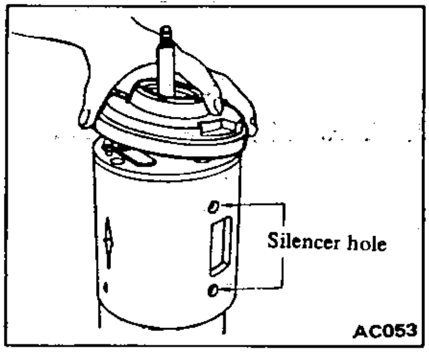
1. Using suitable blocks, face cylinder assembly upward. Insert two pins. Position gasket and suction valve plate in the order listed while making sure that three valves of suction valve plate are aligned with the cylinder and gasket cutouts. Coat gasket with compressor oil prior to assembly. Gaskets and suction valve plates are the same for front and rear. The cylinder head with the smaller numbers of holes goes to the front. Do not mix front and rear parts.


AC051


AC052

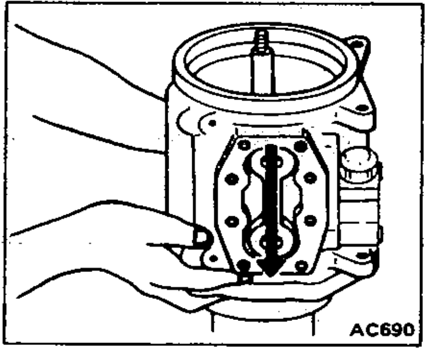
2. Align shaft seal with the shaft cutaway. Firmly seat shaft seal at the shaft land. Attempt to turn shaft seal to the left and right, confirming that it is seated properly.

3. Place gasket on cylinder head and install front end cover. Coat gasket with compressor oil beforehand. Gasket differs for the front and rear. Make sure that the correct gasket is used. After completing this work, gasket protruding from front end cover and cylinder head should be adjusted by hand.



AC053

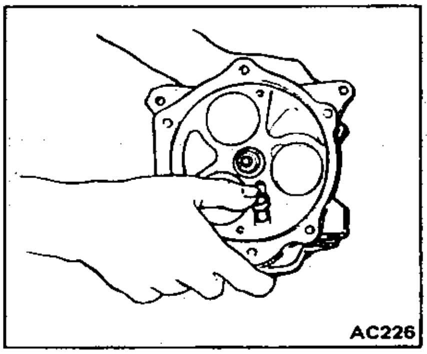
4. Fit gasket to front end cover. Then bring the shell into place over the cylinder assembly. At this time, make sure that the two holes of side cover and the cylinder holes are matched. Note that later adjustment will no longer be possible, as inside and outside diameters of these are not perfectly round. Note that moving the shell up and down may cause the gasket to slip out of place.



AC690

5. Turn over the assembled shell and cylinder assembly, so that the front may face downward.

6. Coat oil pipe and O-ring with an ample amount of oil. Insert oil pipe at the rear of the cylinder. After making sure that the hole lines are matched as specified in step (4), continue with stepp (6) work.



AC226

7. Continue with work up to installation of rear end cover, according to "Installation" under "Rear End Cover and Rear Cylinder Head".

8. Continue with work up to installation of side cover, according to "Installation" under "Side Cover".

9. Install shaft seal seat according to instructions in "Installation" under "Shaft Seal".

10. Install and adjust compressor clutch according to instructions in "Installation" under "Compressor Clutch".

11. Fill with compressor oil, and tighten oil plug with copper gasket in place.

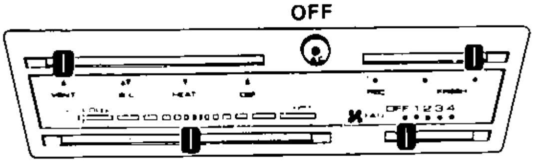
Ⓣ : Oil plug
18 - 20 N·m
(1.8 - 2.0 kg-m,
13 - 14 ft-lb)

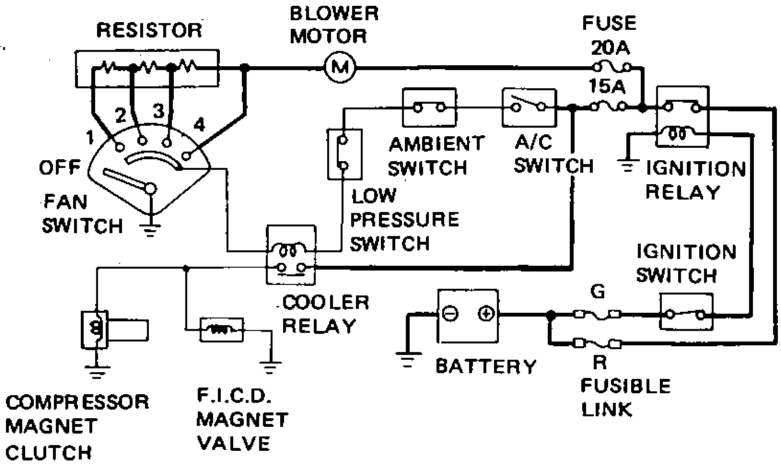
12. Conduct a leak test by referring to the topic under "Shaft Seal".

ELECTRICAL CIRCUIT

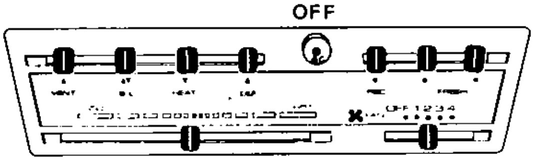
SCHEMATIC

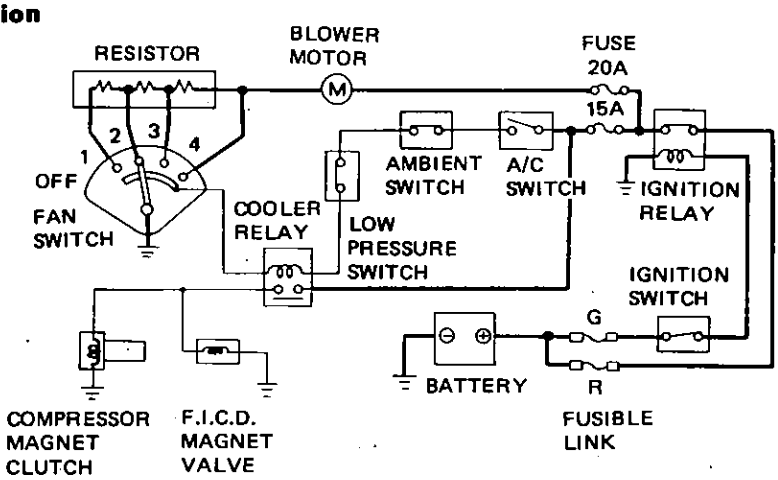
OFF position



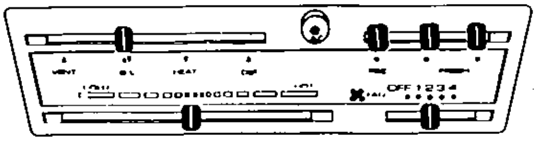


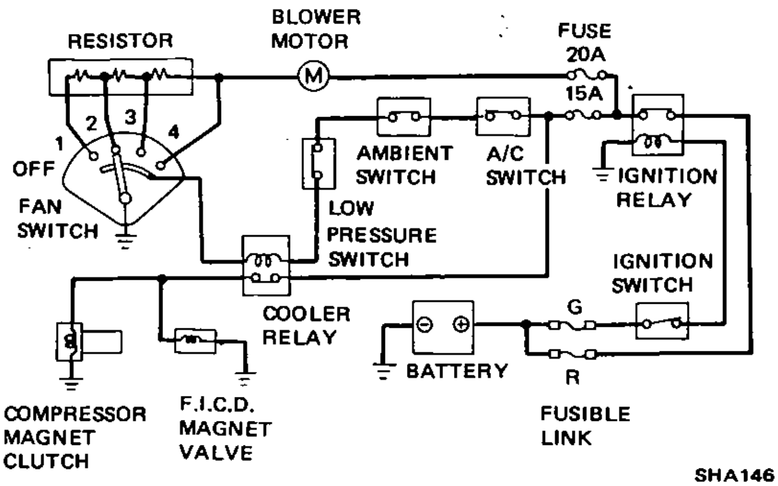
VENT, B/L, HEAT, DEF and RECIRC position





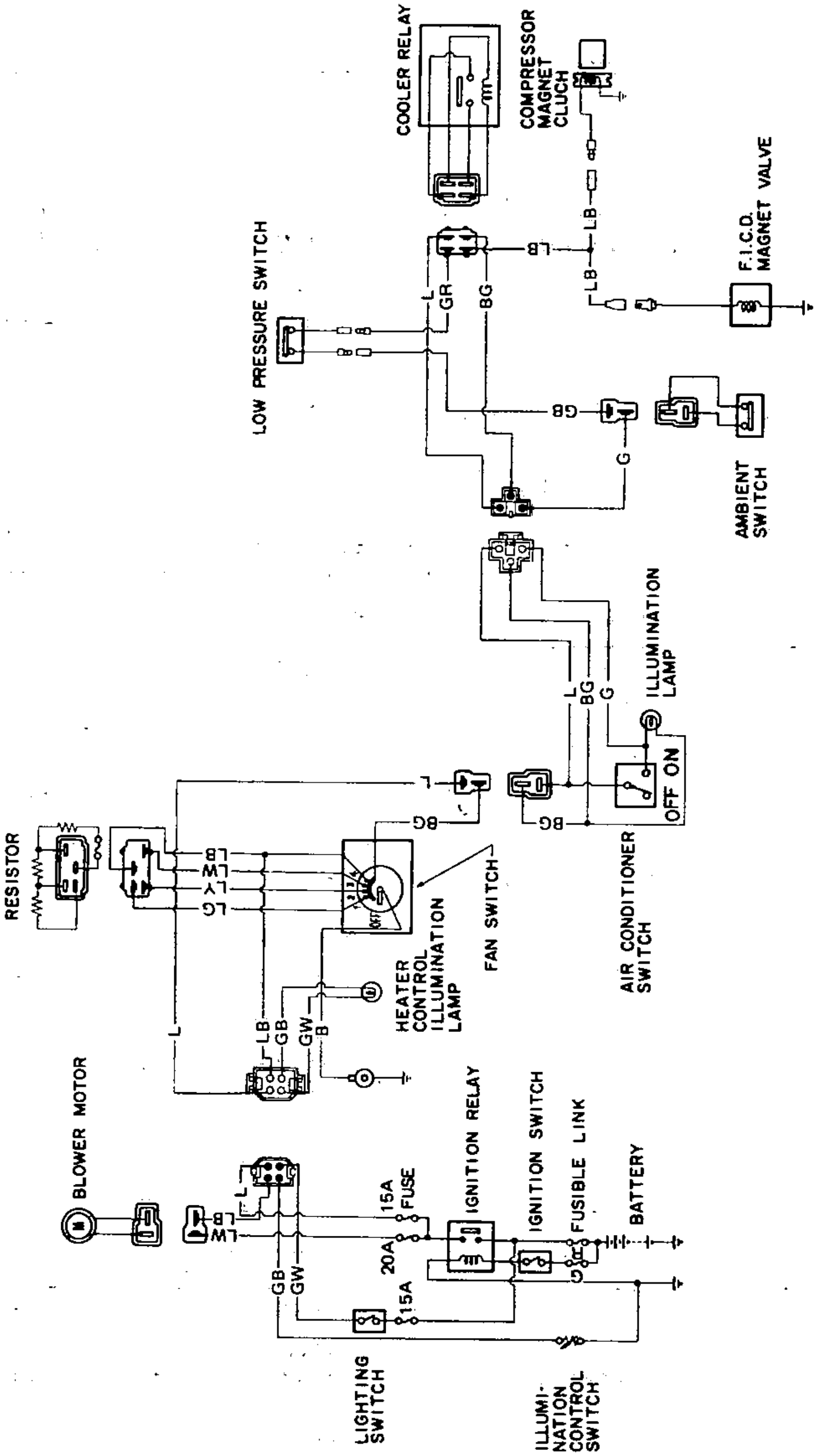
A/C position





SHA146

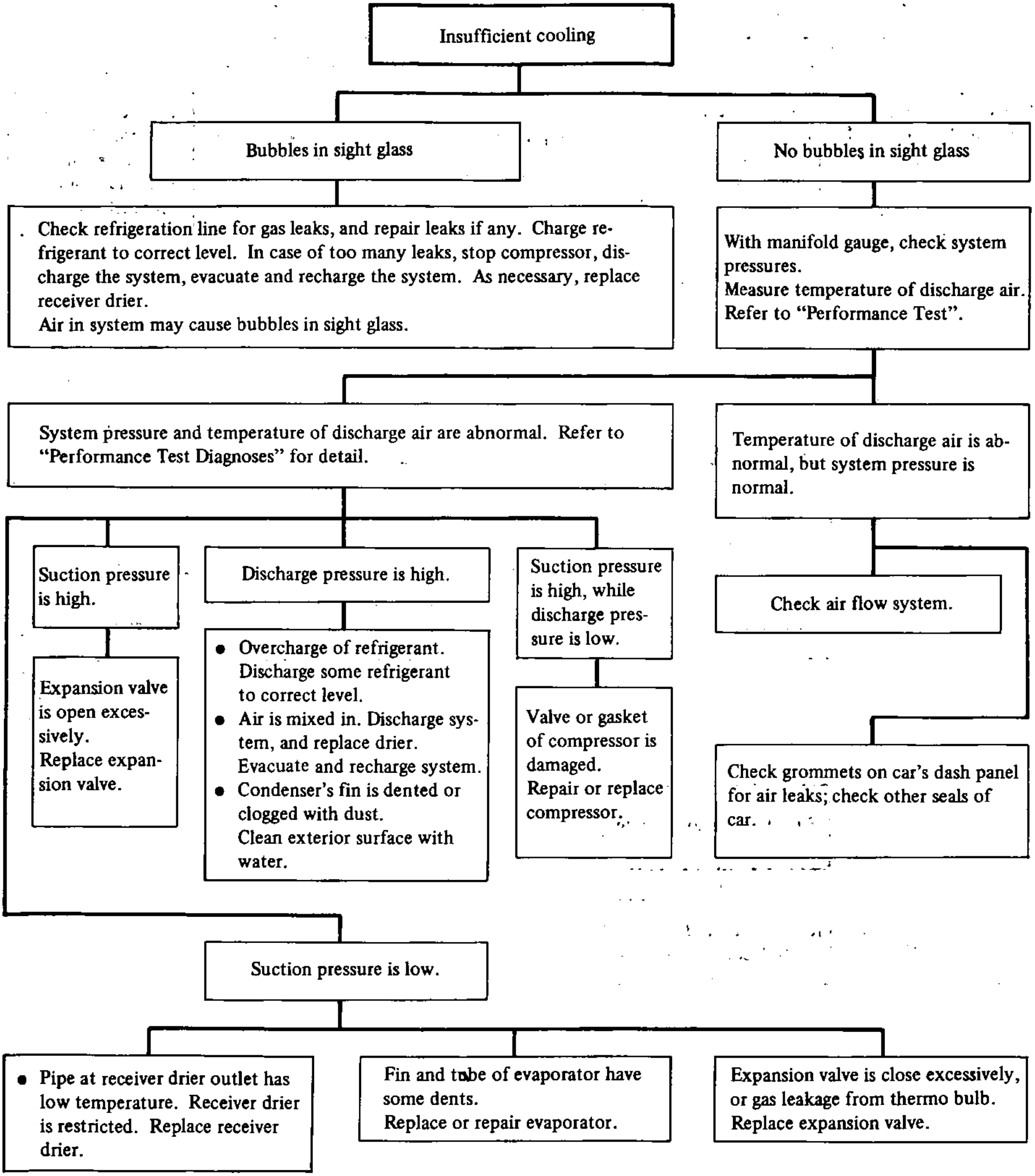
WIRING DIAGRAM



SHA167

TROUBLE DIAGNOSES AND CORRECTIONS

AIR CONDITIONER DIAGNOSES



Insufficient cooling

Bubbles in sight glass

Check refrigeration line for gas leaks, and repair leaks if any. Charge refrigerant to correct level. In case of too many leaks, stop compressor, discharge the system, evacuate and recharge the system. As necessary, replace receiver drier.
Air in system may cause bubbles in sight glass.

No bubbles in sight glass

With manifold gauge, check system pressures.
Measure temperature of discharge air.
Refer to "Performance Test".

System pressure and temperature of discharge air are abnormal. Refer to "Performance Test Diagnoses" for detail.

Temperature of discharge air is abnormal, but system pressure is normal.

Suction pressure is high.

Expansion valve is open excessively.
Replace expansion valve.

Discharge pressure is high.

- Overcharge of refrigerant. Discharge some refrigerant to correct level.
- Air is mixed in. Discharge system, and replace drier. Evacuate and recharge system.
- Condenser's fin is dented or clogged with dust. Clean exterior surface with water.

Suction pressure is high, while discharge pressure is low.

Valve or gasket of compressor is damaged.
Repair or replace compressor.

Check air flow system.

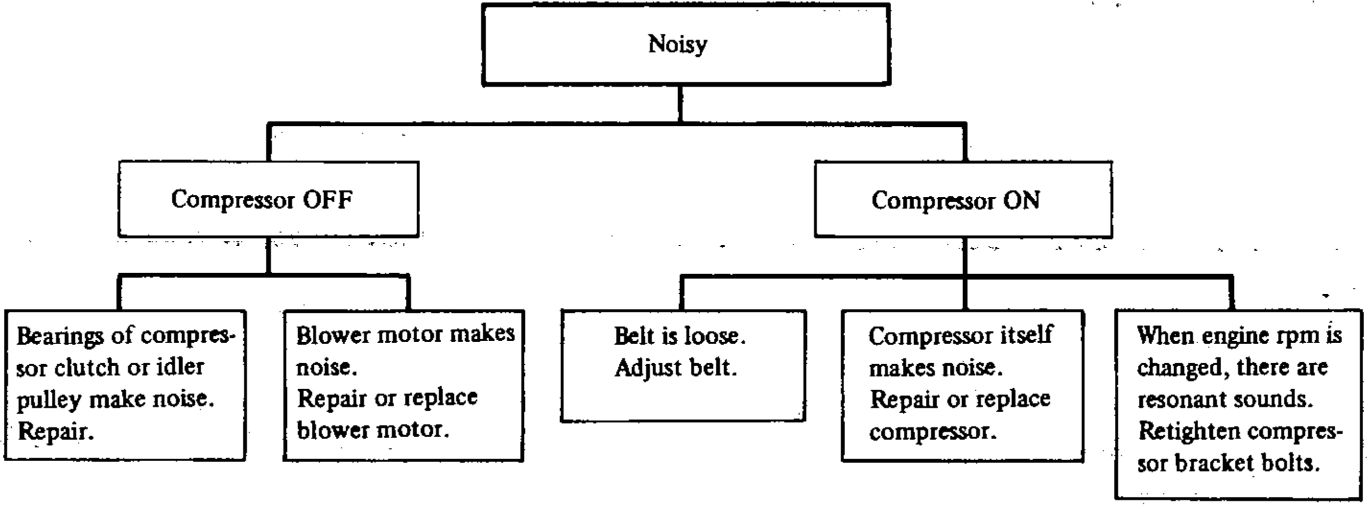
Check grommets on car's dash panel for air leaks; check other seals of car.

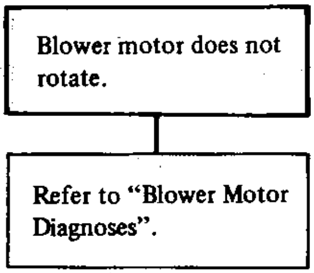
Suction pressure is low.

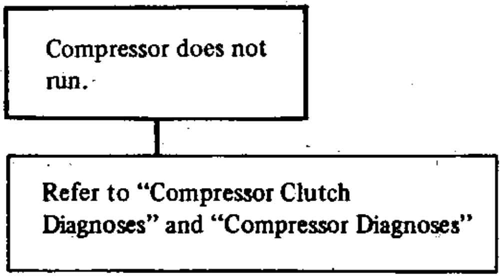
- Pipe at receiver drier outlet has low temperature. Receiver drier is restricted. Replace receiver drier.

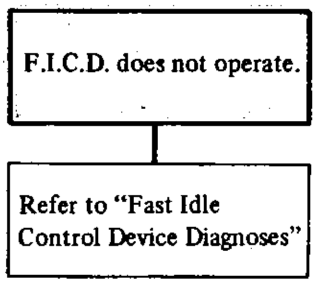
Fin and tube of evaporator have some dents.
Replace or repair evaporator.

Expansion valve is close excessively, or gas leakage from thermo bulb.
Replace expansion valve.


Noisy
Compressor OFF
Compressor ON
Bearings of compressor clutch or idler pulley make noise. Repair.
Blower motor makes noise. Repair or replace blower motor.
Belt is loose. Adjust belt.
Compressor itself makes noise. Repair or replace compressor.
When engine rpm is changed, there are resonant sounds. Retighten compressor bracket bolts.


Blower motor does not rotate.
Refer to "Blower Motor Diagnoses".


Compressor does not run.
Refer to "Compressor Clutch Diagnoses" and "Compressor Diagnoses"


F.I.C.D. does not operate.
Refer to "Fast Idle Control Device Diagnoses"

BLOWER MOTOR DIAGNOSES

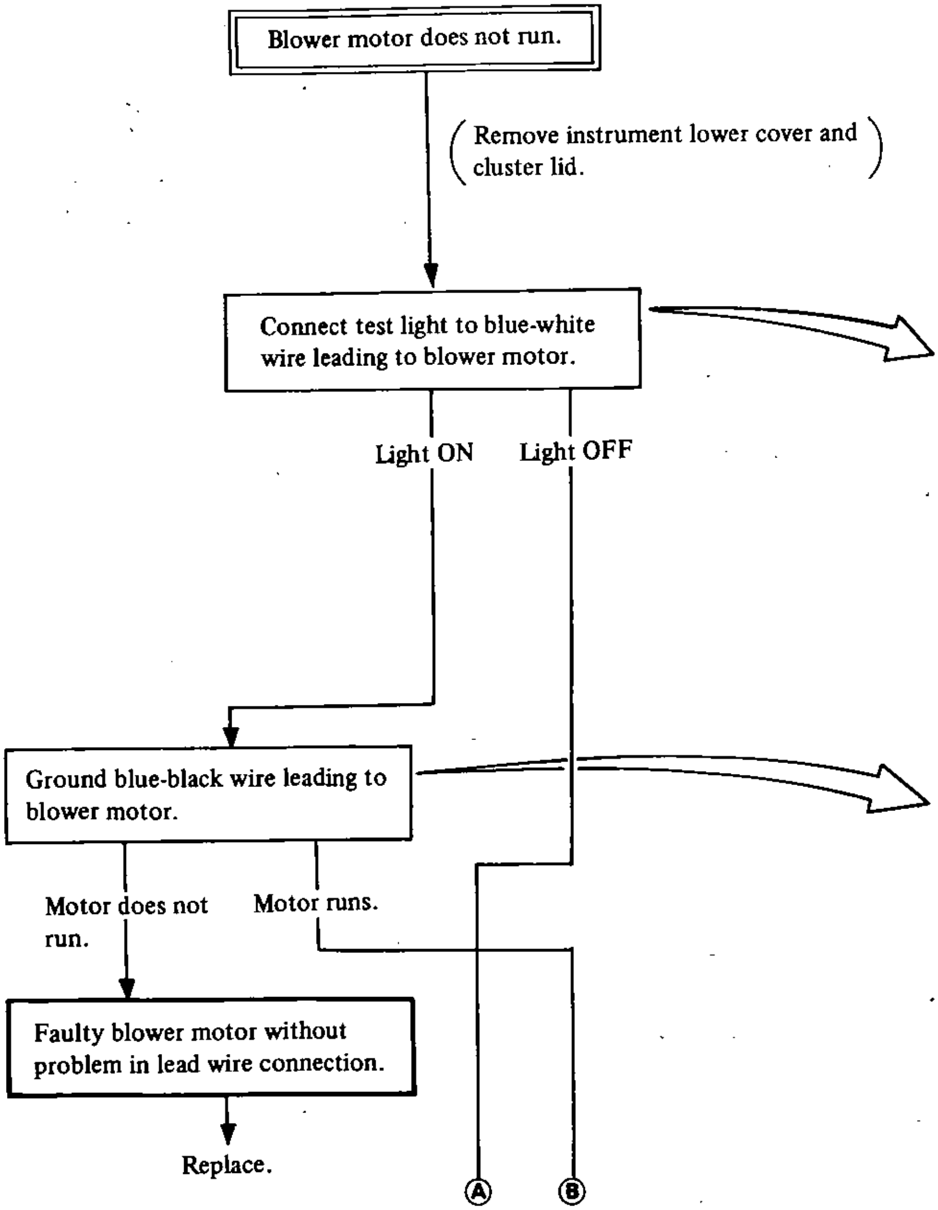
▭ : Condition
▭ : Check
▭ : Probable cause

Test conditions

Battery : O.K.
Fusible link (Red and green) : O.K.
Ignition switch : O.K.
Ignition relay : O.K.
Fuse 20A (in fuse block) : O.K.

Quick check (Battery, Fusible link, Ignition switch, Ignition relay) : Check that wiper and washer operate. (If they do not operate, check fuse 15A in fuse block at first.)

Position of ignition switch : ACC
Position of fan switch : ON



Blower motor does not run.

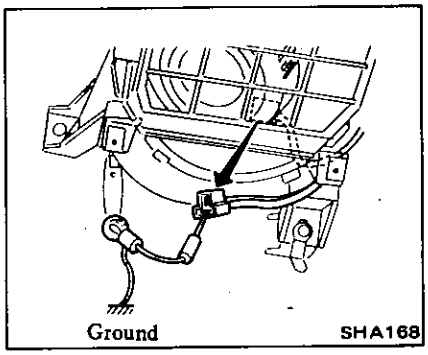
(Remove instrument lower cover and cluster lid.)

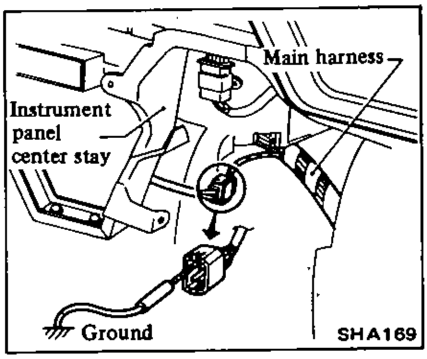
Connect test light to blue-white wire leading to blower motor.

Light ON → Ground blue-black wire leading to blower motor.

- Motor does not run. → Faulty blower motor without problem in lead wire connection. → Replace.
- Motor runs. → Ⓑ

Light OFF → Ⓐ





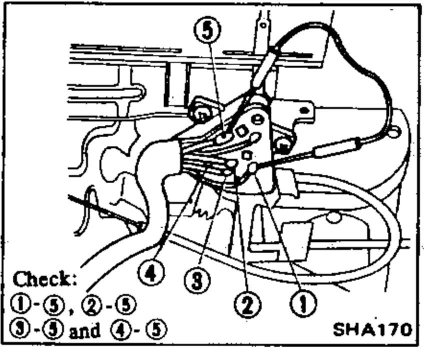
Ⓐ

Broken lead wire between ignition relay and blower motor.

Repair.

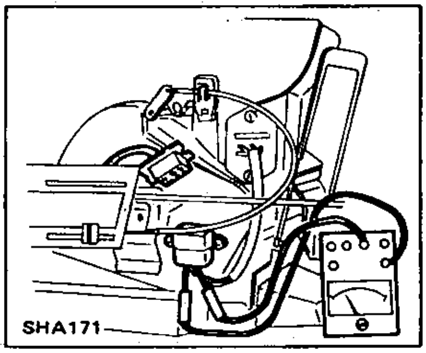
Ⓑ

Check fan switch for conductivity.
Refer to **Fan Switch.**



SHA170

- Motor runs.
  - Faulty fan switch without problem in lead wire connection.
  - Replace.
- Motor does not run.
  - Check resistor for conductivity.
    Refer to **Resistor.**
    - N.G.
      - Faulty resistor without problem lead wire connection.
      - Replace.
    - O.K.
      - Check other lead wire and connection.



SHA171

Speed of blower motor does not change.

(Remove instrument lower cover and cluster lid.)

Check resistor on heater unit.
Refer to **Resistor.**

- N.G.
  - Faulty resistor without problem in lead wire connection.
  - Replace.
- O.K.
  - Check other lead wire and connection.

COMPRESSOR CLUTCH DIAGNOSES

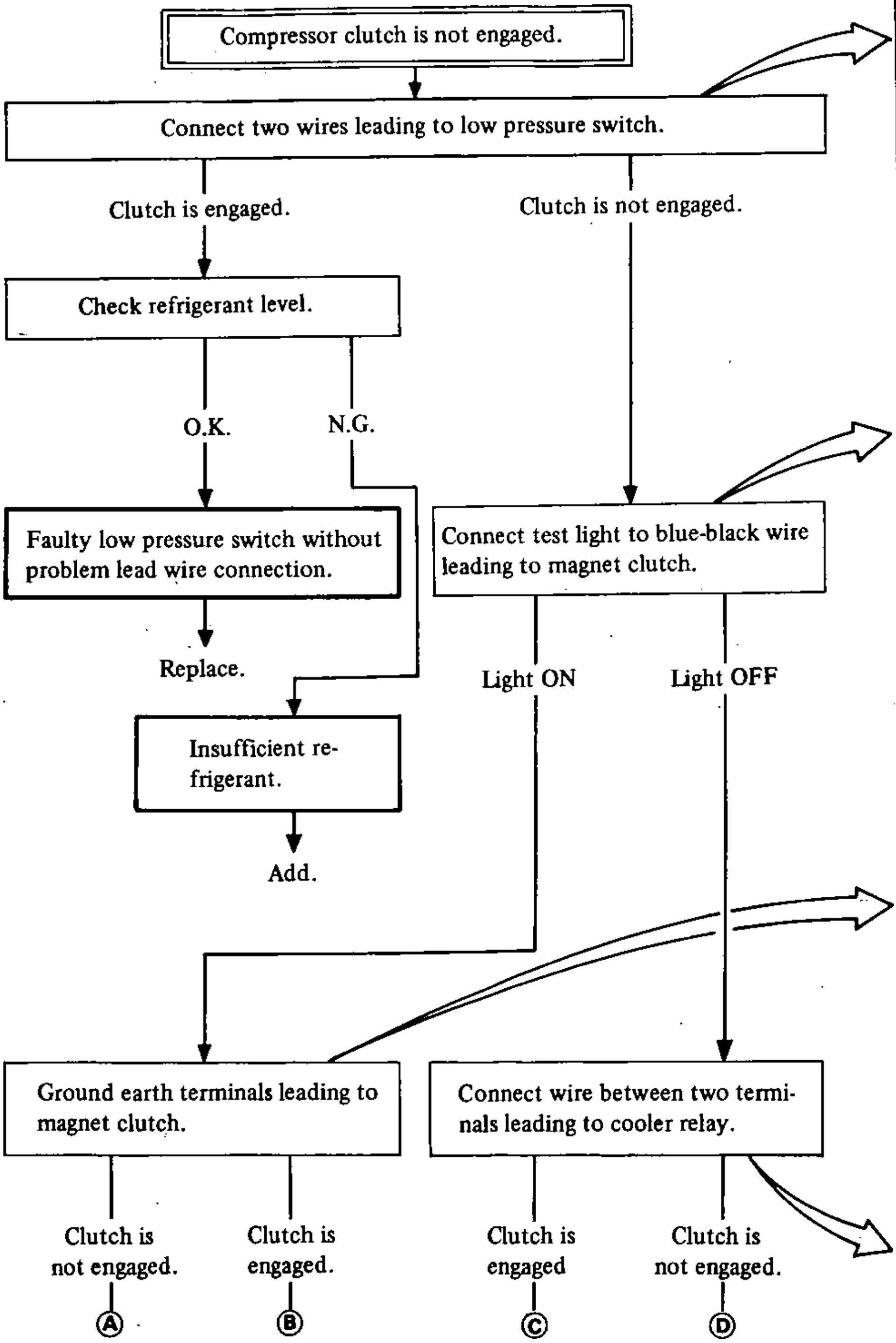
⧈ : Condition
□ : Check
▢ : Probable cause

Test conditions

Battery : O.K.
Fusible link (Red and green) : O.K.
Ignition switch : O.K.
Ignition relay : O.K.
Fuse 15A (in fuse block) : O.K.

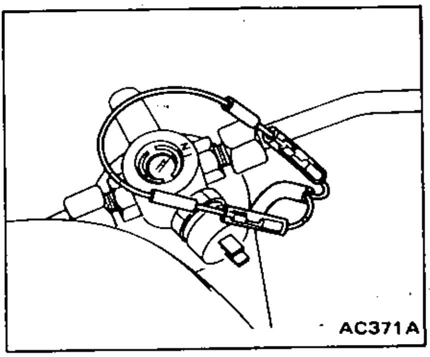
Quick check : Check that wiper and washer operate.

Position of ignition switch : ACC
Position of fan switch : ON
Position of air conditioner switch: ON

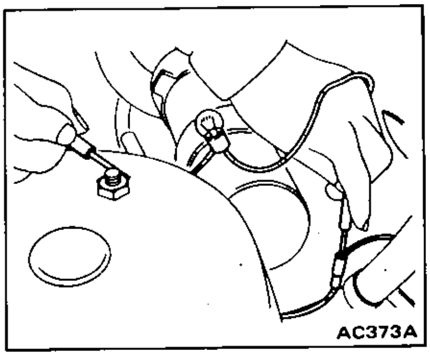


Compressor clutch is not engaged.
↓
Connect two wires leading to low pressure switch.

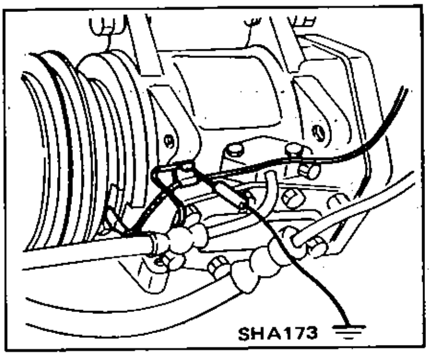
- Clutch is engaged. → Check refrigerant level.
  - O.K. → Faulty low pressure switch without problem lead wire connection. → Replace.
  - N.G. → Insufficient refrigerant. → Add.
- Clutch is not engaged. → Connect test light to blue-black wire leading to magnet clutch.
  - Light ON → Ground earth terminals leading to magnet clutch.
    - Clutch is not engaged. Ⓐ
    - Clutch is engaged. Ⓑ
  - Light OFF → Connect wire between two terminals leading to cooler relay.
    - Clutch is engaged Ⓒ
    - Clutch is not engaged. Ⓓ



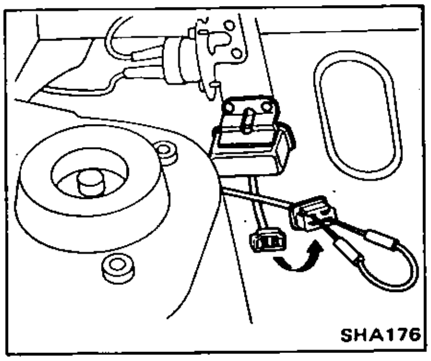
AC371A



AC373A



SHA173



SHA176

Ⓐ Ⓑ Ⓒ Ⓓ

Faulty magnet clutch without problem in lead wire connection.

Repair.

Broken ground wire of magnet clutch.

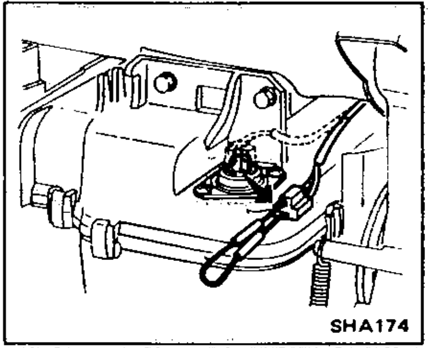
Repair.

Remove instrument lower cover and cluster lid.

Faulty cooler relay without problem in lead wire connection.

Replace.

Connect wire between terminals leading to ambient temperature switch.



SHA174

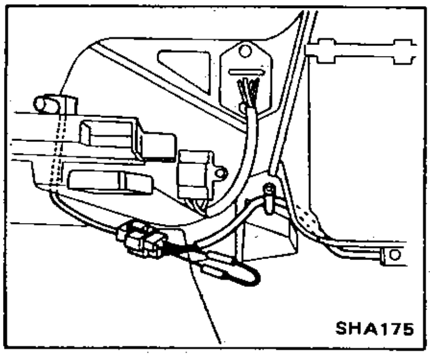
Clutch is engaged.

Clutch is not engaged.

Faulty ambient temperature switch without problem in lead wire connection.

Replace.

Connect wire between green and blue wire leading to air conditioner switch.



SHA175

Clutch is engaged.

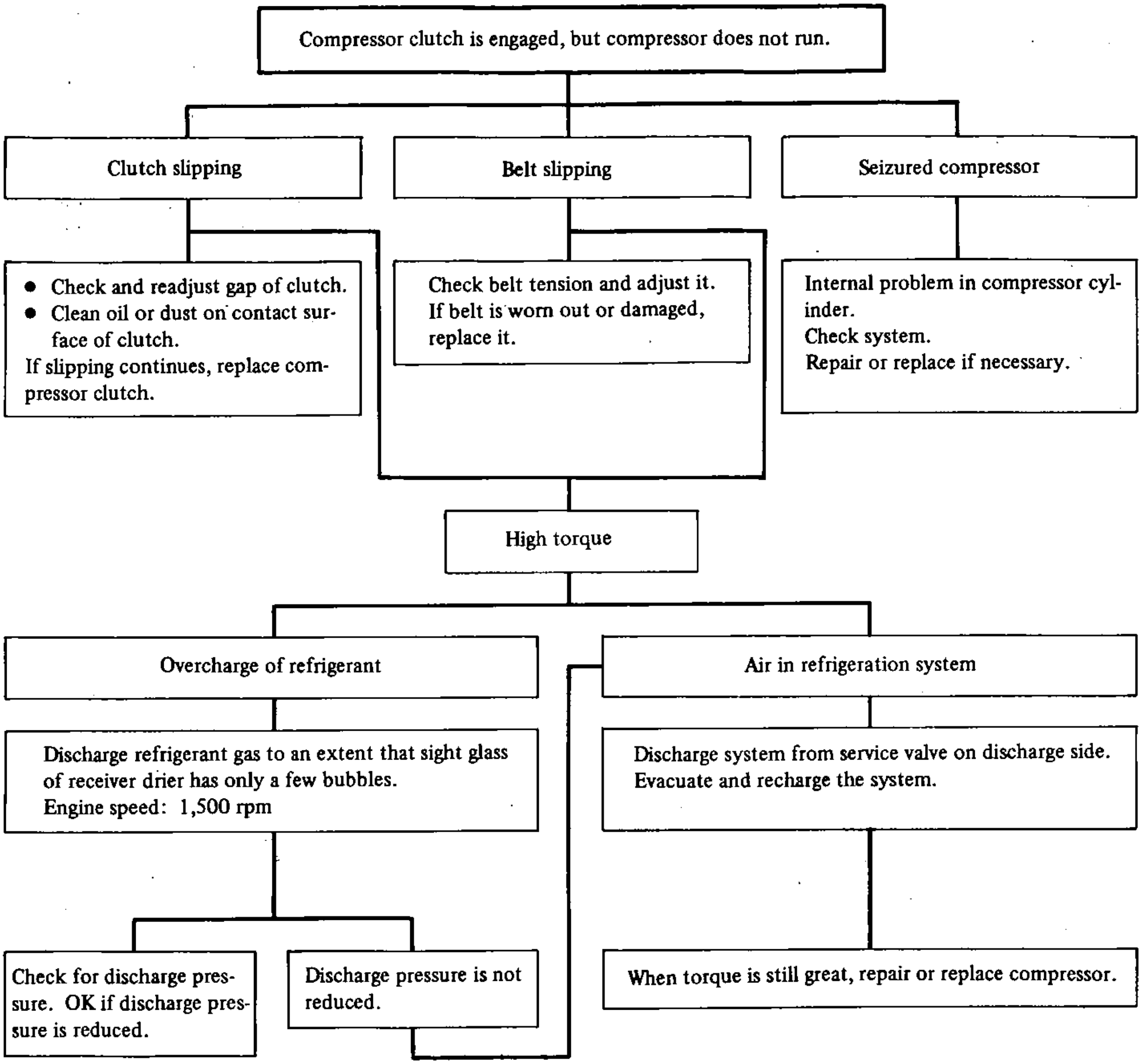
Clutch is not engaged.

Faulty air conditioner switch without problem in lead wire connection.

Replace.

Check other lead wire and connection.

COMPRESSOR DIAGNOSES



Compressor clutch is engaged, but compressor does not run.

Clutch slipping

- Check and readjust gap of clutch.
- Clean oil or dust on contact surface of clutch.

If slipping continues, replace compressor clutch.

Belt slipping

Check belt tension and adjust it.
If belt is worn out or damaged, replace it.

Seizured compressor

Internal problem in compressor cylinder.
Check system.
Repair or replace if necessary.

High torque

Overcharge of refrigerant

Discharge refrigerant gas to an extent that sight glass of receiver drier has only a few bubbles.
Engine speed: 1,500 rpm

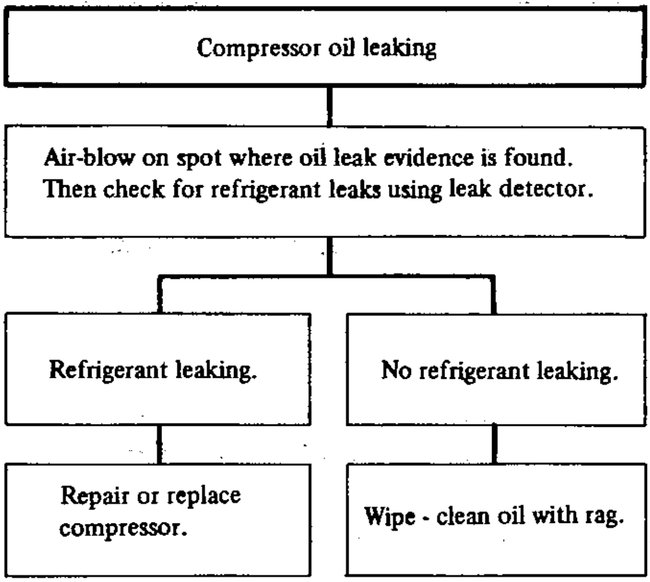
Check for discharge pressure. OK if discharge pressure is reduced.

Discharge pressure is not reduced.

Air in refrigeration system

Discharge system from service valve on discharge side.
Evacuate and recharge the system.

When torque is still great, repair or replace compressor.



Compressor oil leaking

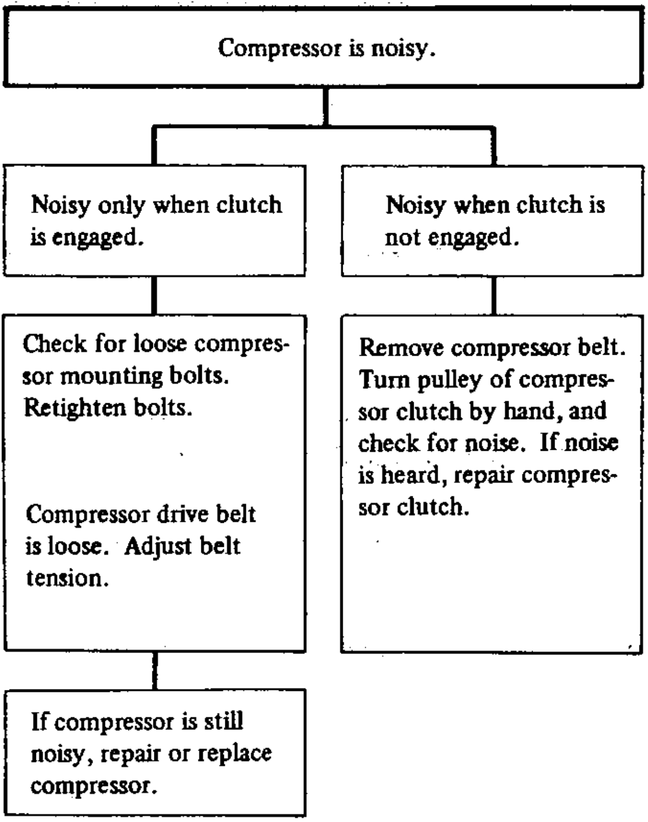
Air-blow on spot where oil leak evidence is found. Then check for refrigerant leaks using leak detector.

Refrigerant leaking.

Repair or replace compressor.

No refrigerant leaking.

Wipe - clean oil with rag.



Compressor is noisy.

Noisy only when clutch is engaged.

Check for loose compressor mounting bolts. Retighten bolts.

Compressor drive belt is loose. Adjust belt tension.

If compressor is still noisy, repair or replace compressor.

Noisy when clutch is not engaged.

Remove compressor belt. Turn pulley of compressor clutch by hand, and check for noise. If noise is heard, repair compressor clutch.

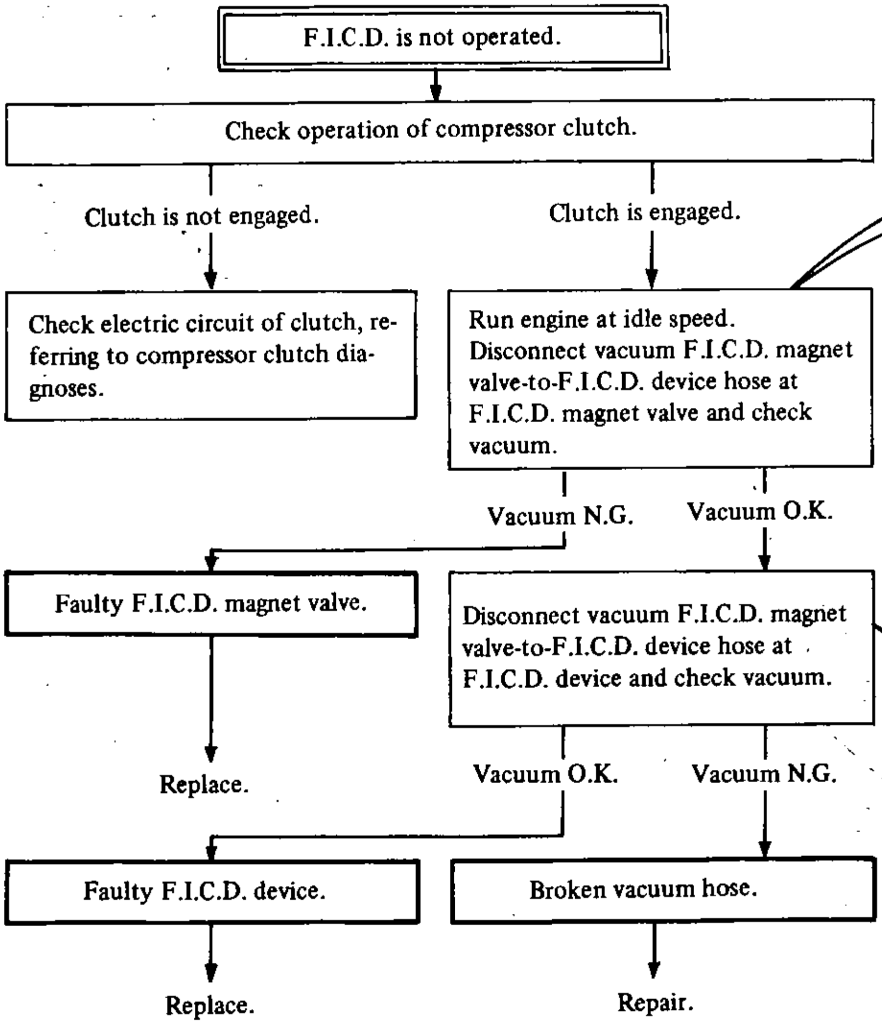
FAST IDLE CONTROL DEVICE DIAGNOSES

▭ : Condition
▭ : Check
▭ : Probable cause

Test condition

Battery : O.K.
Fusible link (Red and green) : O.K.
Ignition switch : O.K.
Ignition relay : O.K.
Fuse 15A (in fuse block) : O.K.
} Quick check : Check that wiper and washer operate.

Position of ignition switch : ACC
Position of fan switch : ON
Position of air conditioner switch: ON



F.I.C.D. is not operated.

Check operation of compressor clutch.

Clutch is not engaged.

Check electric circuit of clutch, referring to compressor clutch diagnoses.

Clutch is engaged.

Run engine at idle speed. Disconnect vacuum F.I.C.D. magnet valve-to-F.I.C.D. device hose at F.I.C.D. magnet valve and check vacuum.

Vacuum N.G.

Faulty F.I.C.D. magnet valve.

Replace.

Vacuum O.K.

Disconnect vacuum F.I.C.D. magnet valve-to-F.I.C.D. device hose at F.I.C.D. device and check vacuum.

Vacuum O.K.

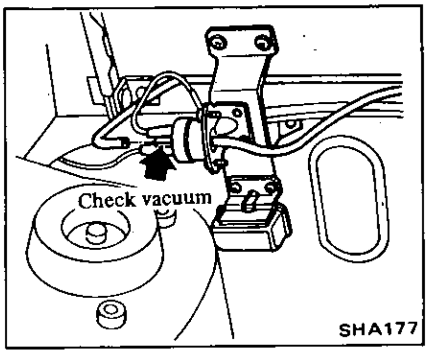
Faulty F.I.C.D. device.

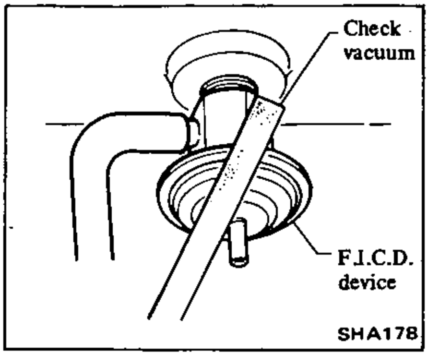
Replace.

Vacuum N.G.

Broken vacuum hose.

Repair.





SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

COMPRESSOR

Model	SWP167
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
Type of driving belt	A type

LUBRICATING OIL

Type	SUNISO 5GS
Capacity ml (US fl oz, Imp fl oz)	270 (9.1, 9.5)

REFRIGERANT

Type	R-12
Capacity kg (lb)	0.9 - 1.1 (2.0 - 2.4)

INSPECTION AND ADJUSTMENT

ENGINE IDLING SPEED

Unit: rpm

Transmission	When A/C is ON
Manual	About 900 (Non-adjustable)
Automatic (At "N" range)	About 1000 (Non-adjustable)

BELT TENSION

Fan belt/Applied pressure mm (in)/N (kg, lb)	8 - 12 (0.31 - 0.47)/ 98 (10, 22)

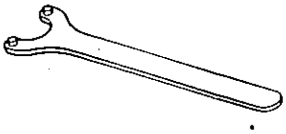
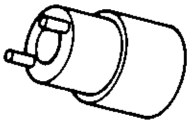
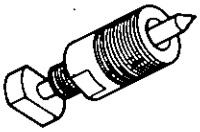
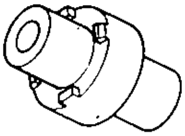
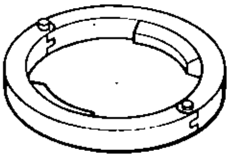
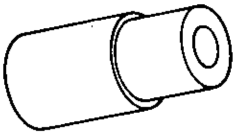
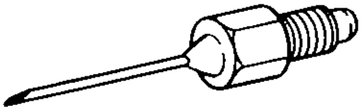
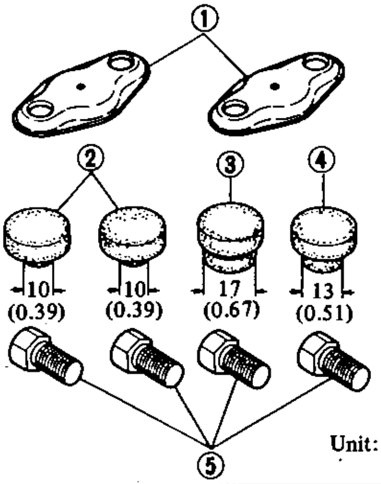
COMPRESSOR

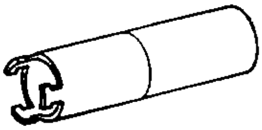
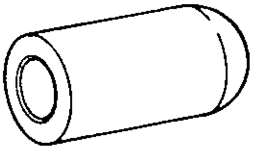
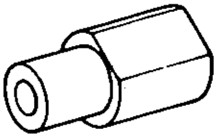
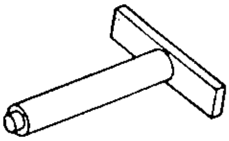
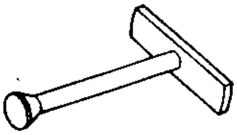
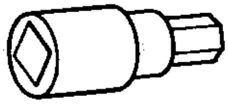
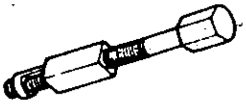
Clutch hub to pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)

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			
Low pressure line	25 - 29	2.5 - 3.0	18 - 22
High pressure line	15 - 20	1.5 - 2.0	11 - 14
Flexible hose to compressor	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Compressor			
Coil mounting screw	2.7 - 3.4	0.28 - 0.35	2.0 - 2.5
Lock nut	25 - 27	2.5 - 2.8	18 - 20
Hub nut	18 - 21	1.8 - 2.1	13 - 15
Shaft nut	16 - 17	1.6 - 1.7	11.6 - 12.3
Side cover bolt	18 - 20	1.8 - 2.0	13 - 14
Rear end cover bolt	29 - 34	3.0 - 3.5	22 - 25
Oil plug	18 - 20	1.8 - 2.0	13 - 14

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV99412302 (J94878-1)	Clutch hub wrench 
KV99412305 (J24878-2)	Hub nut socket 
KV99412306 (J24878-3)	Clutch hub puller 
KV99412310 (J24878-4)	Lock nut socket 
KV99412313 (J26066)	Puller adapter 
KV99412312 (J25472)	Puller pilot 
KV994C1552 (–)	Charge nozzle 
KV994C4548 (–) ① KV994C4531 (–) ② KV994C4532 (–) ③ KV994C4533 (–) ④ KV994C4534 (–) ⑤ KV994C4559 (–)	Blind cover set Blind cover Gasket (Useless) Gasket Gasket Bolt  Unit: mm (in)

Tool number (Kent-Moore No.)	Tool name
KV99412321 (J26067)	Shaft seal remover and installer 
KV99412322 (J25473)	Shaft seal pilot 
KV99412329 (J26072)	Shaft handle socket 
KV99412327 (–)	Silencer piece installer 
KV99412328 (–)	O-ring installer 
KV99412330 (–)	Allen socket 
KV99412315 (–)	Cylinder head remover 

SECTION EL

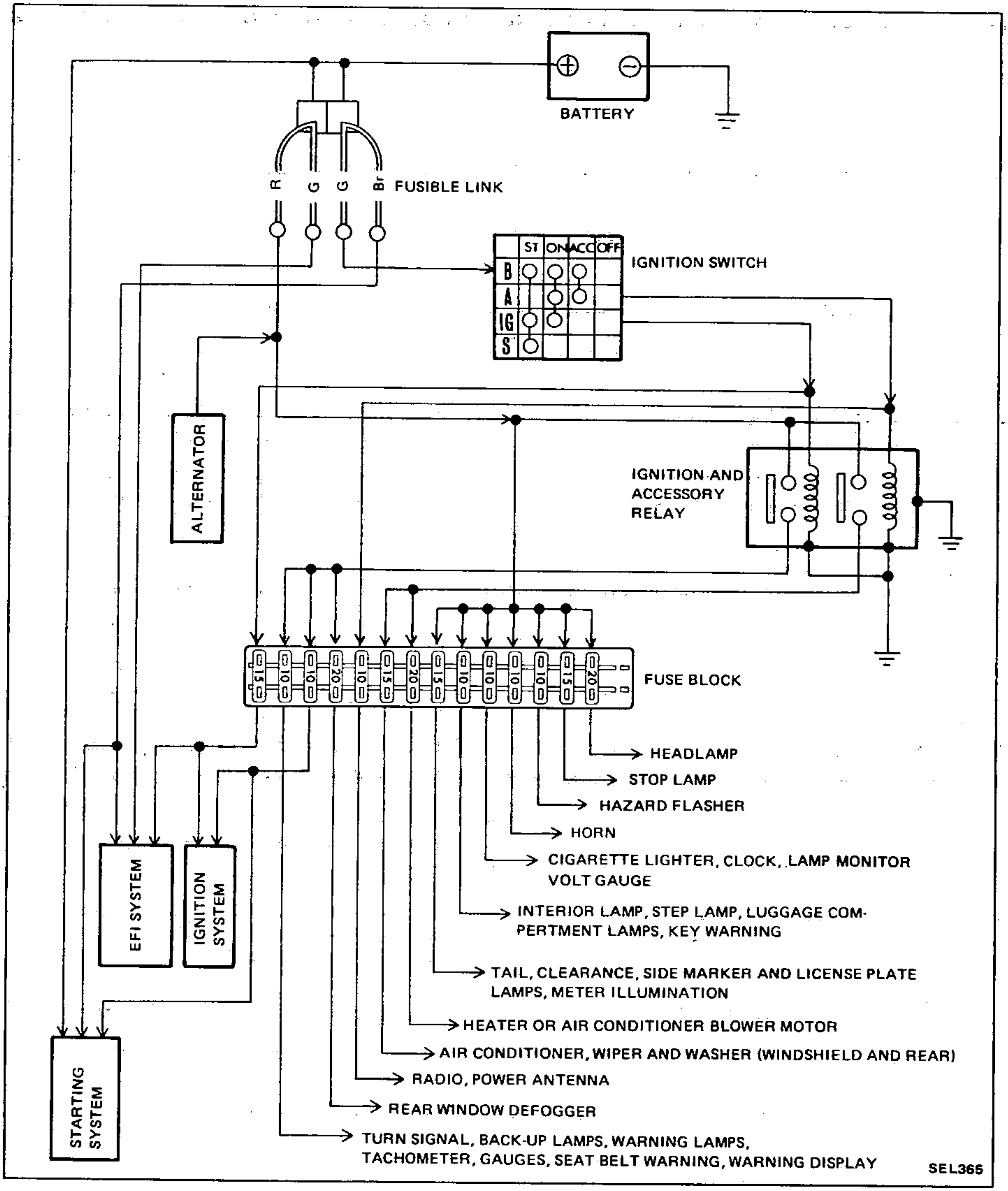
ELECTRICAL SYSTEM

CONTENTS

POWER SUPPLY ROUTING

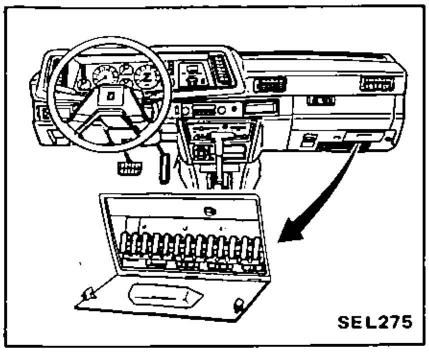
CAUTION: Before starting to work on any electrical system disconnect battery ground cable.

SCHEMATIC/POWER SUPPLY ROUTING

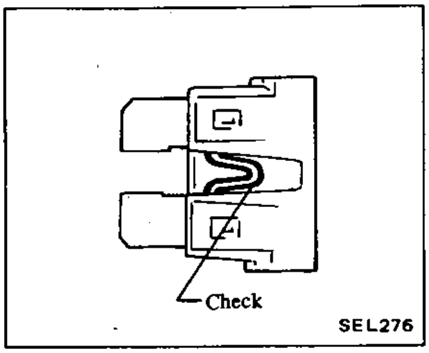


FUSE

LOCATION


SEL275

INSPECTION



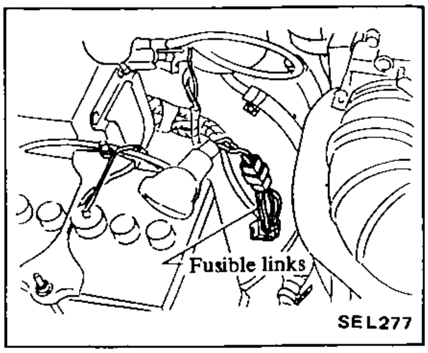
SEL276

a. If fuse is blown, be sure to eliminate cause of the problem before installing new fuse.

b. Never use fuse of more than specified rating.

c. Do not install fuse in oblique direction, always snap it into fuse holder properly.

FUSIBLE LINK



SEL277

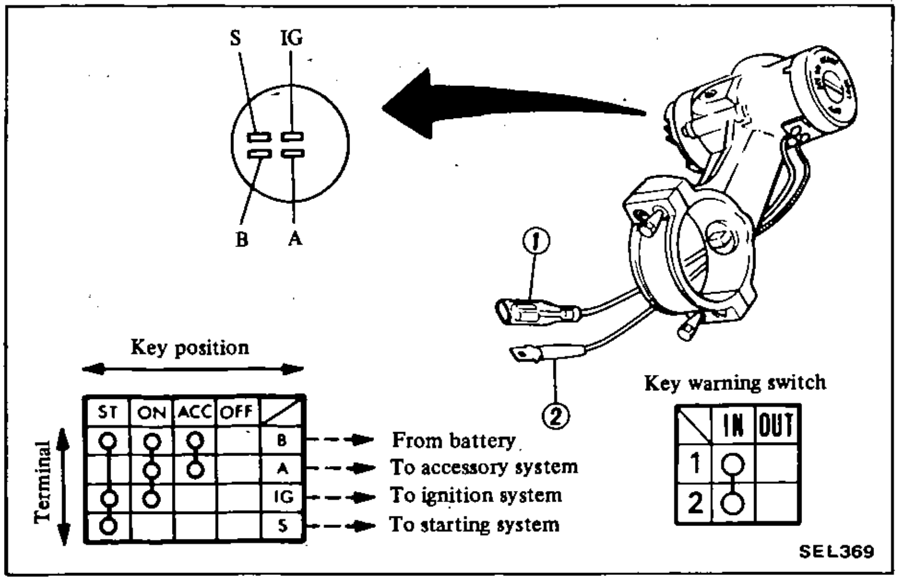
CAUTION:

a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.

b. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

A melted fusible link can be detected either by visual inspection or by feeling with finger-tip. If its condition is questionable, use circuit tester or test lamp.

IGNITION SWITCH



ST	ON	ACC	OFF		
○	○	○		B	From battery
	○	○		A	To accessory system
○	○			IG	To ignition system
○				S	To starting system

Key warning switch

	IN	OUT
1	○	
2	○	

SEL369

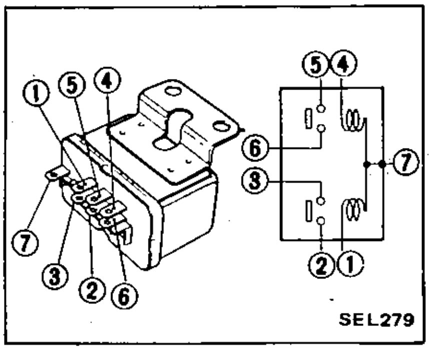
IGNITION AND ACCESSORY RELAY

LOCATION

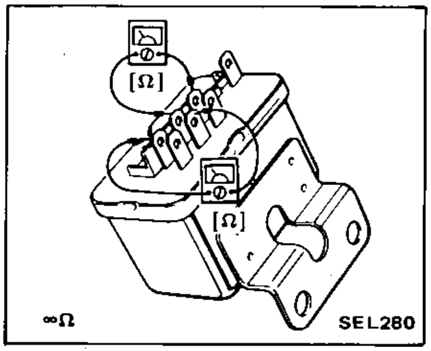
The ignition and accessory relay are located on the right side of the dash panel. Refer to page EL-104.

INSPECTION

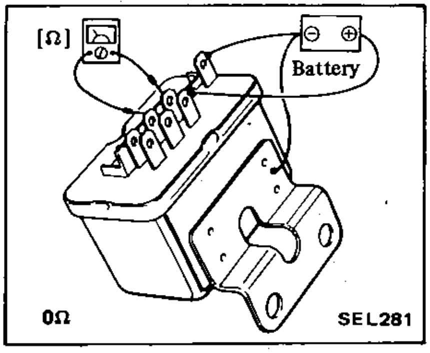
Ground is made at case attaching bolt and terminal ⑦.



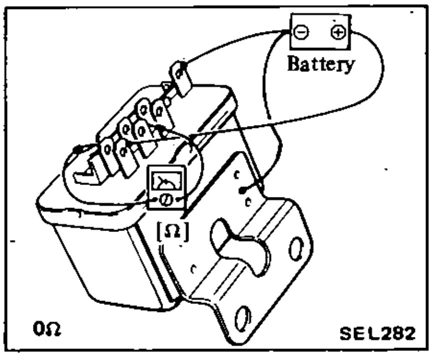
SEL279



SEL280



SEL281



SEL282

BATTERY

WARNING:
Never touch positive and negative terminals at the same time with bare hands. This could result in injury.

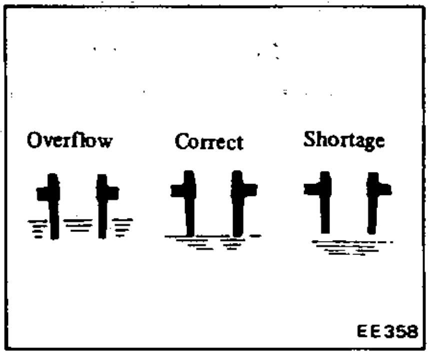
CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, the booster battery voltage must not exceed 12 volts, or the control unit of the fuel injection system and other electric components will be damaged.

b. If the battery cables are disconnected, they should be tightly clamped to the battery terminals to secure a good contact.

CHECKING ELECTROLYTE LEVEL

Check for electrolyte level in **each cell.**

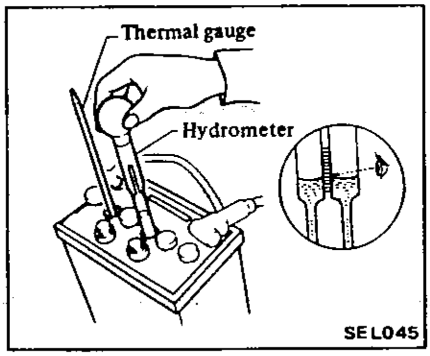


If the level is low, fill with **distilled water.**

CHECKING SPECIFIC GRAVITY

1. Read hydrometer and thermal gauge indications at eye level.

Read top level with scale.



2. Correct **specific gravity at 20°C (68°F).**

$$S_{20} = St + 0.0007 (t - 20)$$

Where,

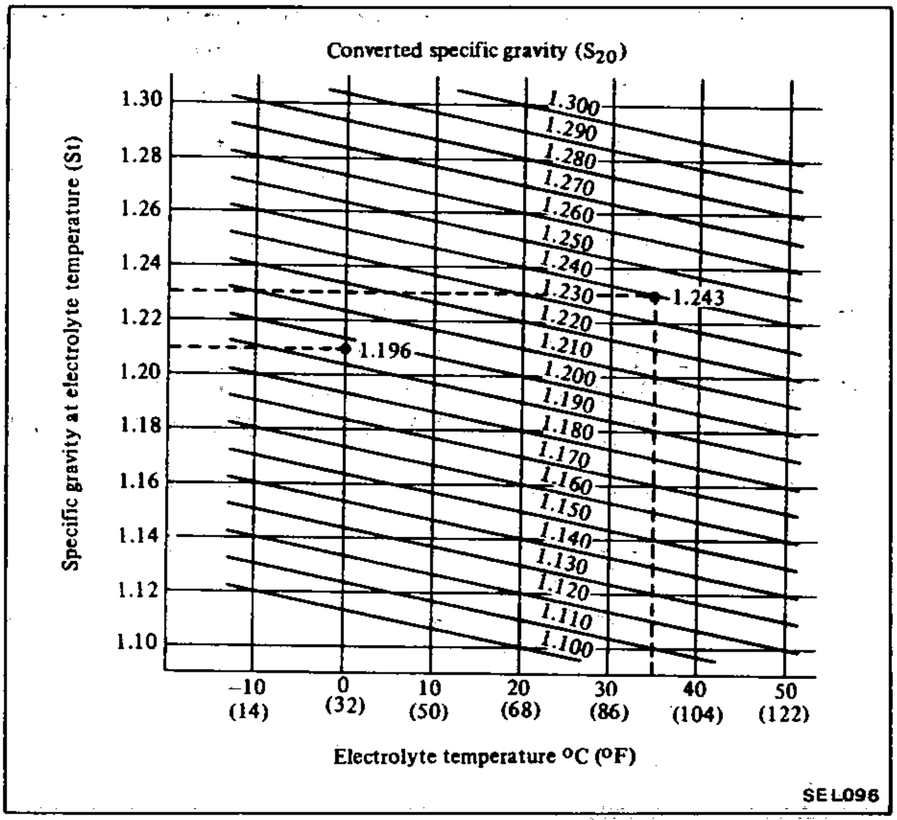
St: Specific gravity of electrolyte at t°C

S_{20}: Specific gravity of electrolyte corrected at 20°C (68°F)

t: Electrolyte temperature

Examples:

1. When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, specific gravity corrected at 20°C (68°F) is 1.243.
2. When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, specific gravity corrected at 20°C (68°F) is 1.196.

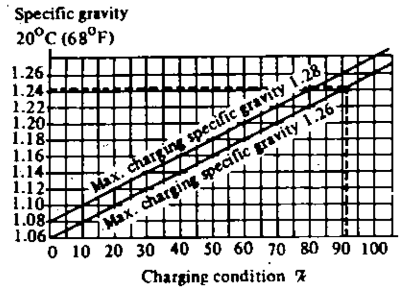


3. Determine charging state of battery.

Examples:

Charging state of battery whose max. charging specific gravity is 1.26, and whose specific gravity corrected at 20°C (68°F) is 1.243, is 92%.

For battery whose max. charging specific gravity is 1.28, charging state is 82% at a corrected specific gravity of 20°C (68°F).



SEL097

4. Recharge battery if its rate drops below 70% of full charge.

CHARGING

CAUTION:

a. Carry out charging with negative cable removed.

b. Do not allow electrolyte temperature to go over 45°C (113°F).

Clean corroded terminal with a brush and common baking-soda solution.

WARNING:

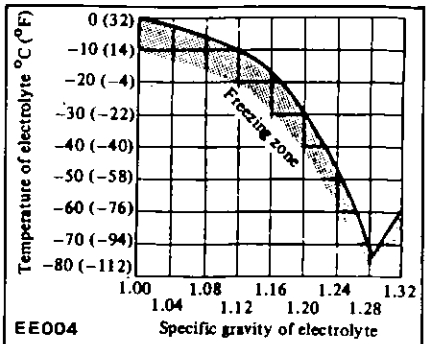
a. Keep battery away from open flame while it is being charged.

b. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

BATTERY FREEZING

CAUTION:

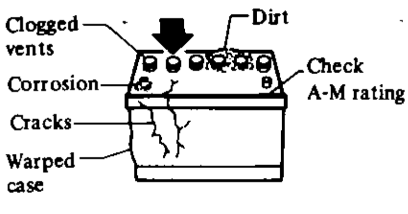
Use extreme caution to avoid freezing battery.



EE004

BATTERY TESTING

1. PRELIMINARY CHECKS: Visual Inspection



SEL046

(1) Check battery rating against that of original factory equipment.

(2) Check for cracks and warpage of the case.

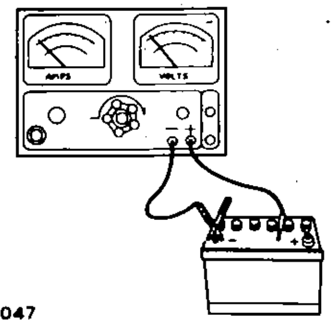
(3) Make sure cables are clean and tight.

(4) Check acid level.

(5) Make sure vents are not clogged.

(6) Make sure top of battery is clean.

2. BATTERY LEAKAGE TEST: Check to make sure battery is not discharging across top, between two posts.



SEL047

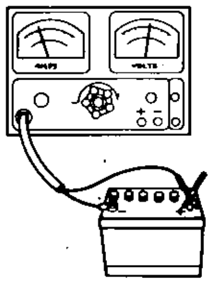
(1) Set voltmeter to low range.

(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.

3. BATTERY CAPACITY TEST



SEL048

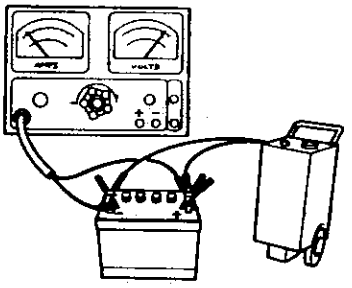
(1) With battery connected to tester as shown, turn load knob until a draw of 3 times the battery rating is shown. (Example: Battery rating 60 AH Turn load to 180 A draw.)

(2) 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.

4. THREE MINUTE CHARGE TEST: To be performed only if battery has failed Capacity Test in step number 3.

(1) Connect a good quality battery. Remove cell caps.

(2) Turn charger to a fast charge rate, not over 40 A.



SEL049

(3) After three minutes, check voltmeter reading. If it is over 15.5 volts (16.5 for Maintenance Free Batteries), battery should be replaced. If it is below 15.5 volts, then proceed to step number 5.

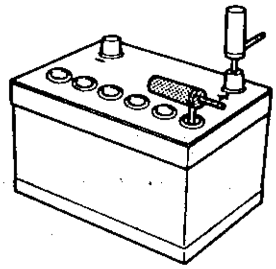
5. CELL TEST UNDER CHARGE: Connect tester and battery charger as in step number 4. Set to fast charge rate (35 - 40 A).

(1) Turn to low range voltmeter.

(2) Attach special cell probes to voltmeter leads.

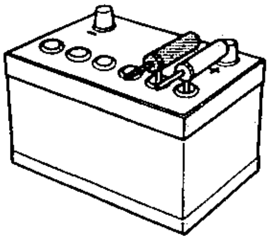
(3) Touch positive probe to battery positive (+) terminal.

(4) Stick black probe in battery cell nearest the battery positive post. WRITE DOWN voltmeter reading.



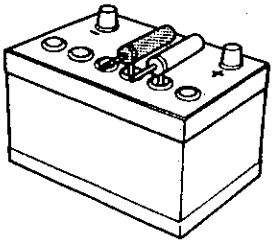
SEL050

(5) Now put positive probe in cell nearest the positive post. Put negative probe in next cell down. Record reading.



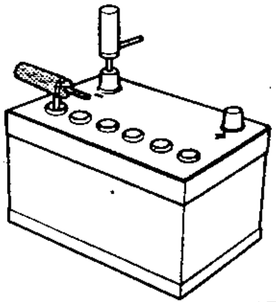
SEL051

(6) Continue on down the battery, recording reading each time.



SEL052

(7) When you get to point where positive probe is in last cell of battery, touch negative probe to negative post. Record this reading.



SEL053

(8) You should now have seven readings. Now add the first reading to the last; this will give you six readings. They should all be within 0.2 (two-tenths) volt of each other. If one cell varies more than this amount from any other, then battery is bad and must be replaced.

2.4*
2.6
2.6 2.4
2.6 0.2
2.6 = 2.6*
2.6
0.2*

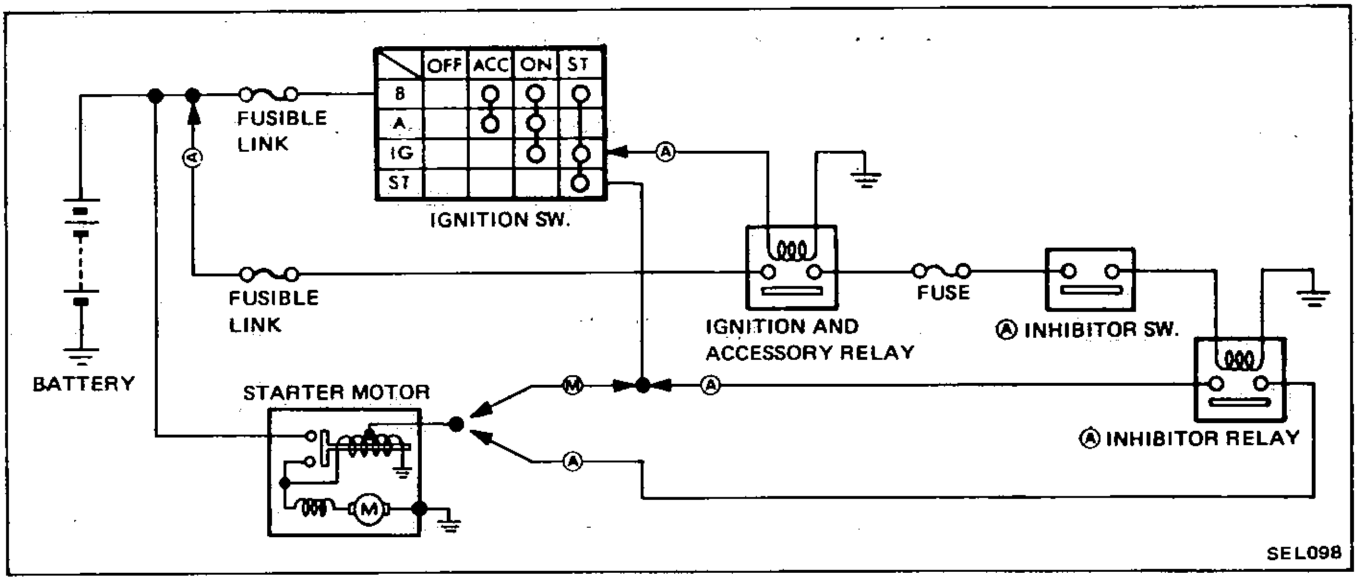
SERVICE DATA AND SPECIFICATIONS

BATTERY

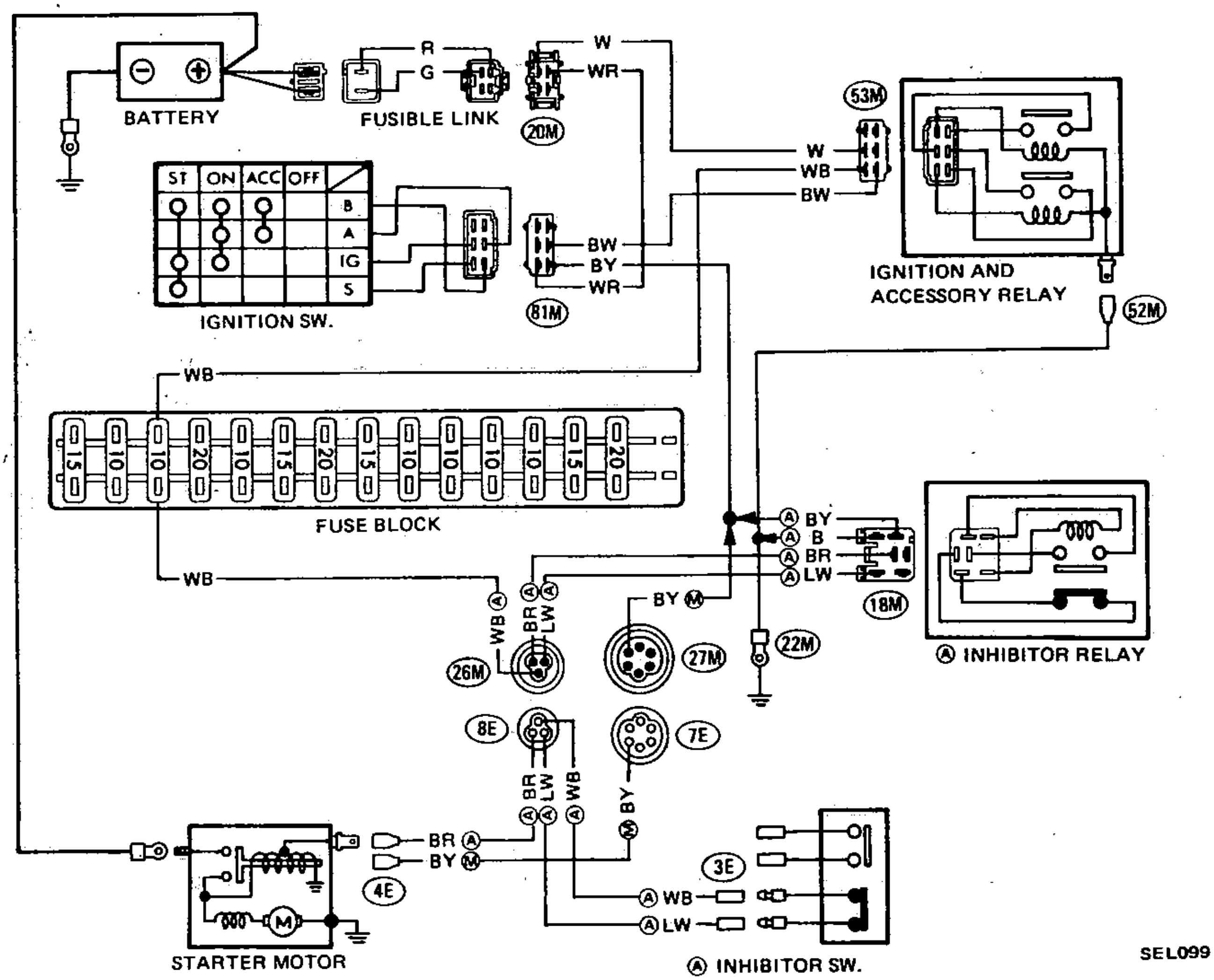
	N50Z	NS70
Applied model	U.S.A.	Canada
Capacity V-AH	12-60	12-65
Full charging specific gravity at 20°C (68°F)	1.26	1.28

STARTING SYSTEM

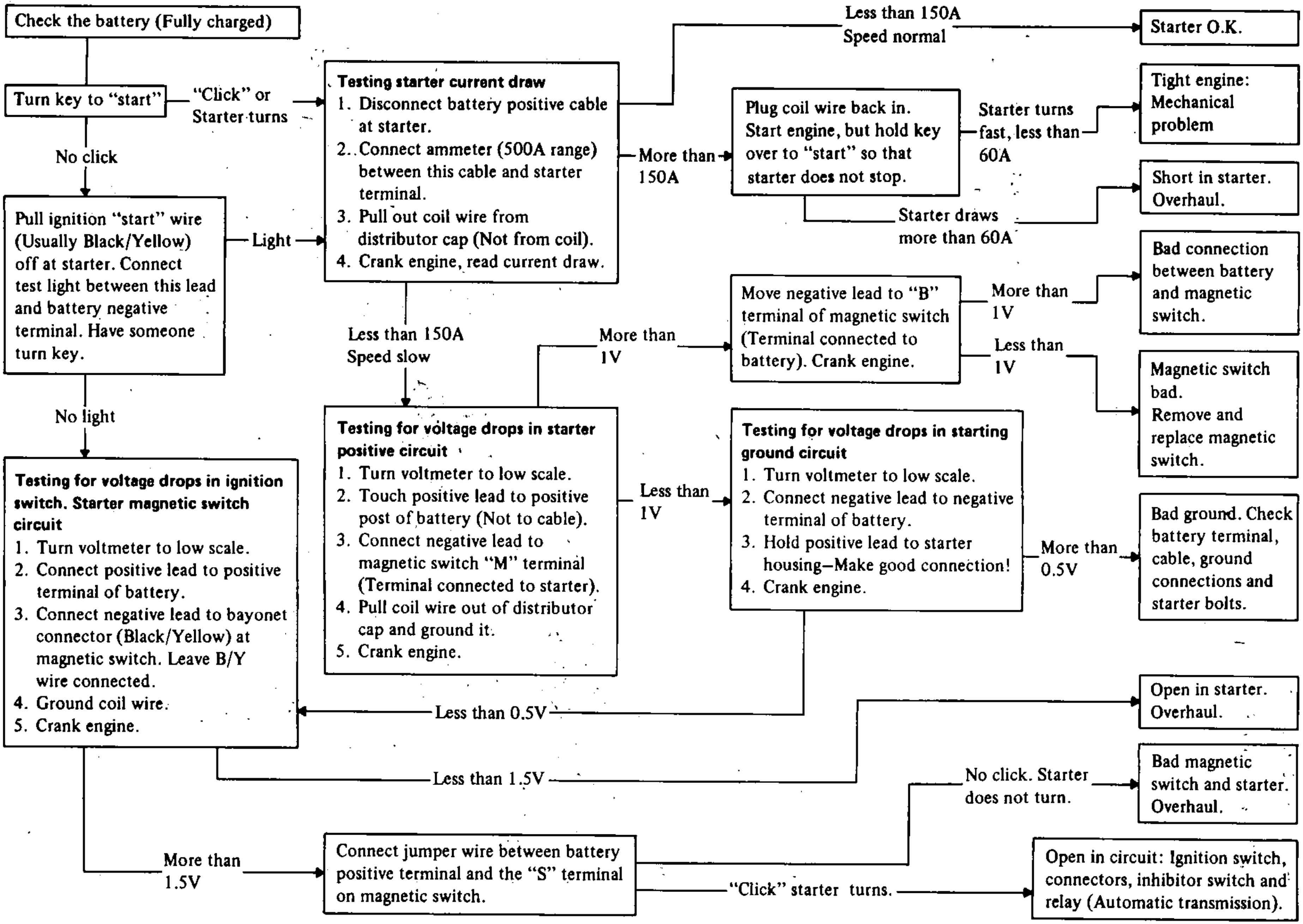
SCHEMATIC



WIRING DIAGRAM

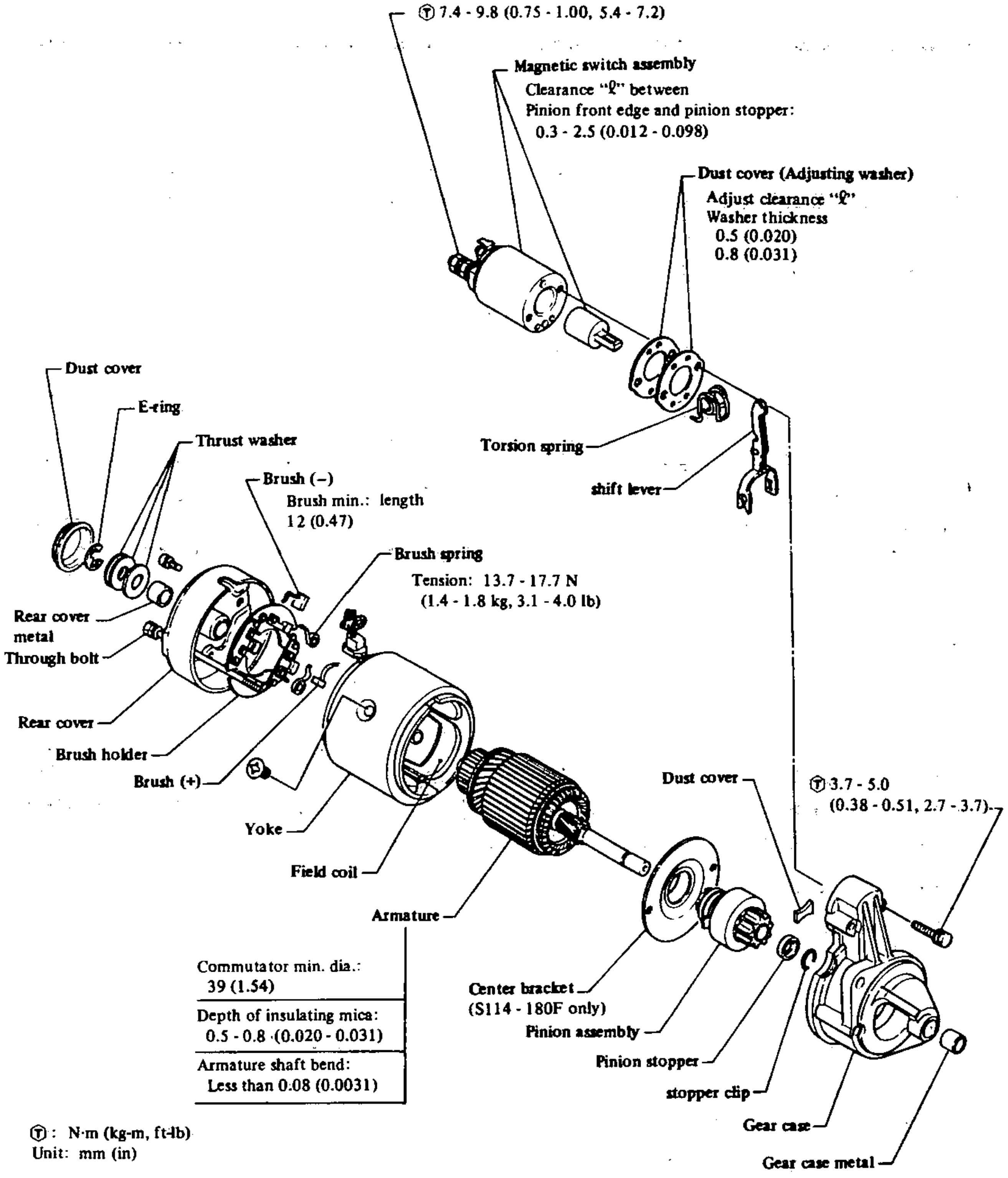


STARTING SYSTEM TROUBLE-SHOOTING



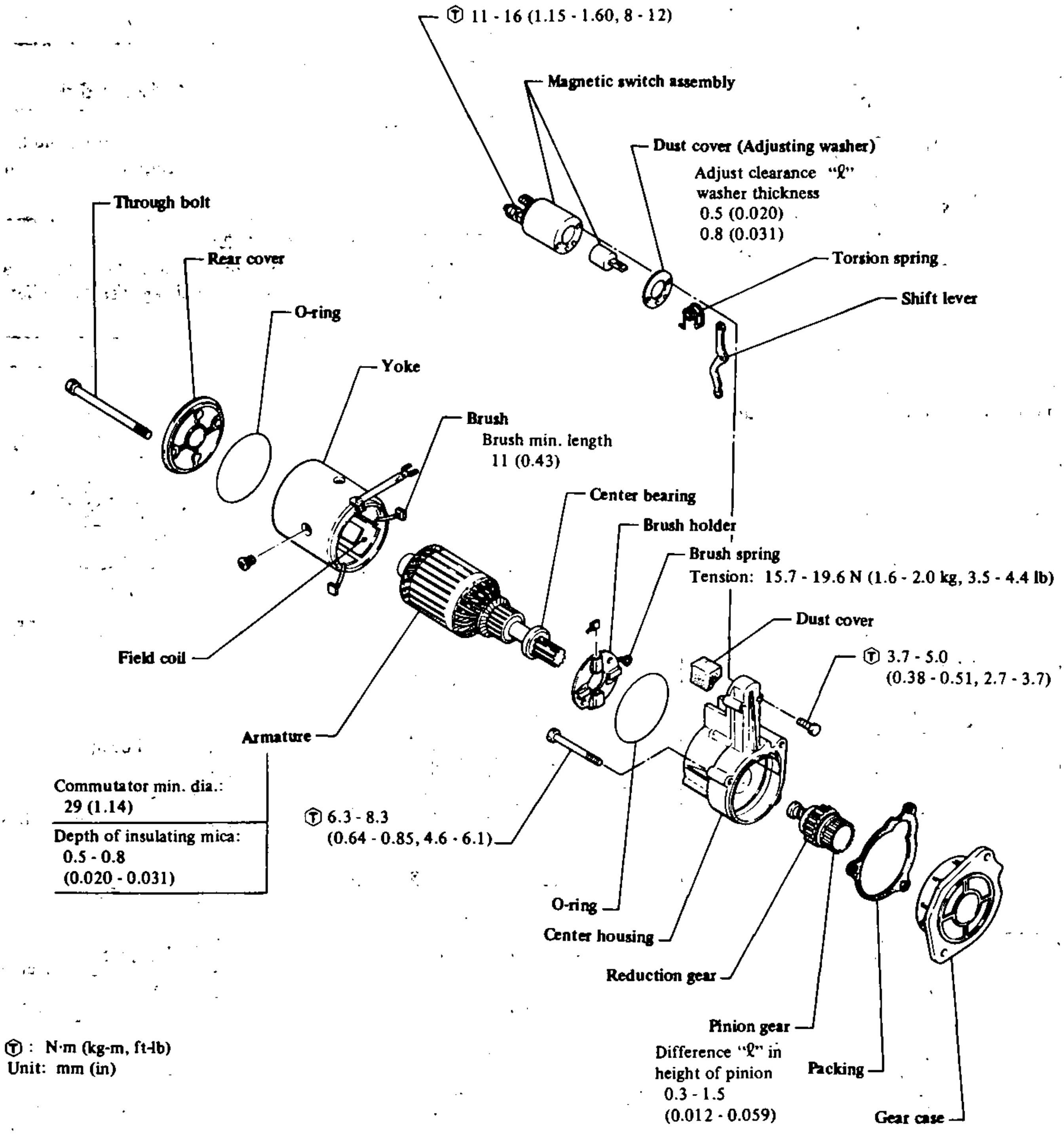
STARTER MOTOR

Non-Reduction gear type



SEL007

Reduction gear type

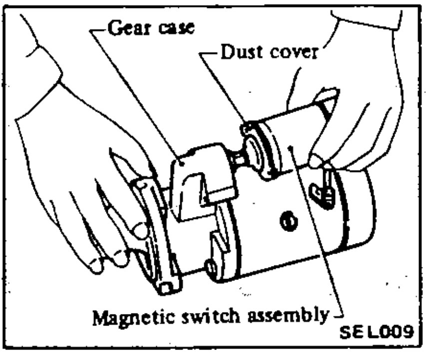


SEL008

DISASSEMBLY

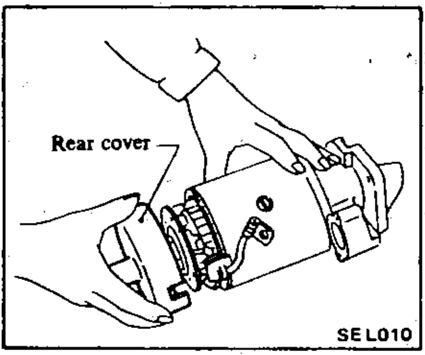
Non-Reduction gear type

1. Remove magnetic switch.

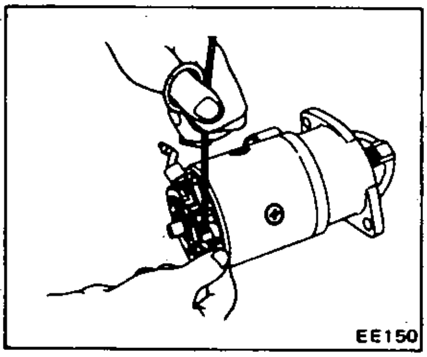


2. Remove rear cover.

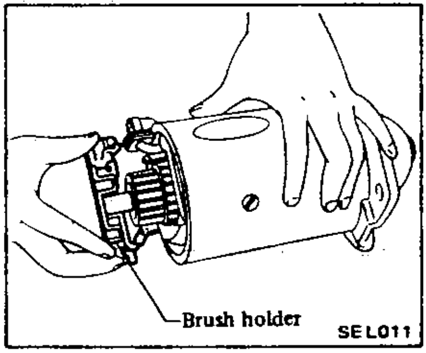
(1) Remove dust cover, E-ring and thrust washer(s).
(2) Remove brush holder setscrews.
(3) Remove through bolts.



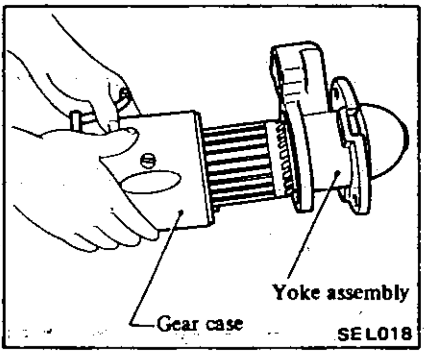
3. Lift up brush springs.



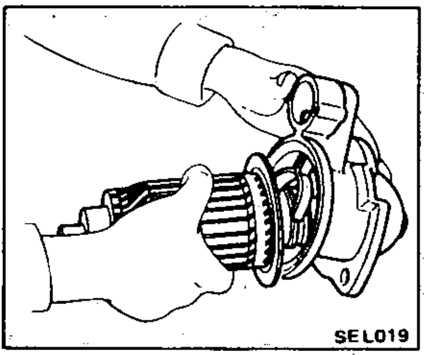
4. Remove brush holder



5. Remove yoke.

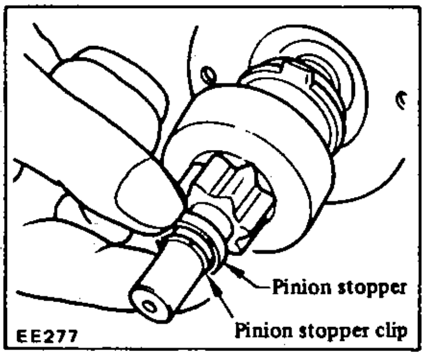


6. Withdraw armature and shift lever.



7. Remove overrunning clutch.

- Remove pinion stopper clip, pushing pinion stopper toward clutch side.



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.

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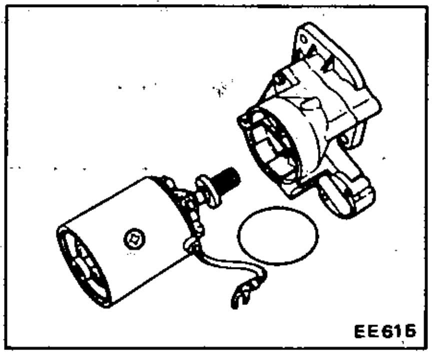
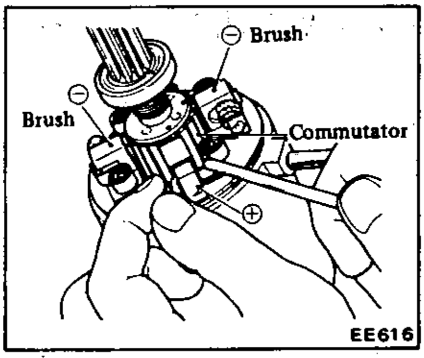
4. Remove yoke, armature and brush holder as an assembly from center housing.

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.

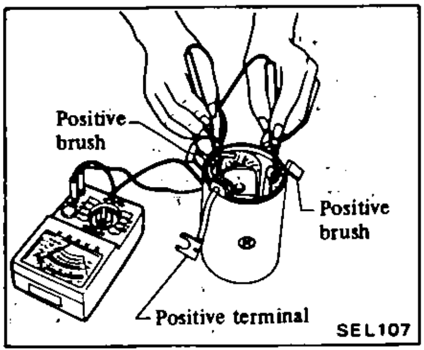


9. Remove brush holder.
10. Remove yoke.

INSPECTION

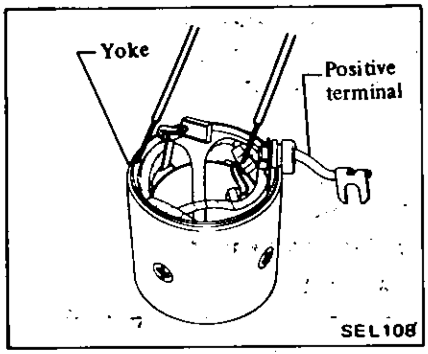
Field coil

1. Continuity test (between field coil positive terminal and positive brushes).



- No continuity ... Replace field coil.

2. Ground test. (between field coil positive terminal and yoke).



- Continuity exists ... Replace field coil.

Brush

Check the surface condition of brush contact.

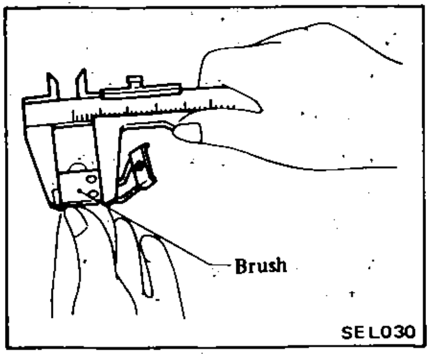
- Loose contact ... Replace.

Check wear of brush.

Minimum length of brush:

Non-reduction gear type:
12 mm (0.47 in)
Reduction gear type:
11 mm (0.43 in)

- Excessive wear ... Replace.

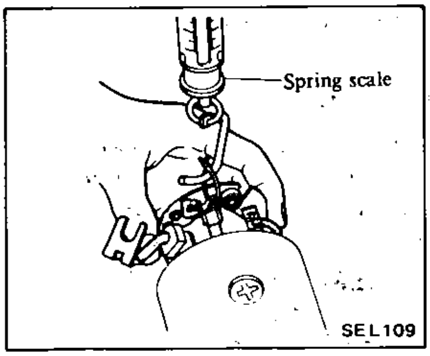


Brush spring

Check brush spring tension.

Spring tension:
Non-reduction gear type
13.7 - 17.7 N
(1.4 - 1.8 kg,
3.1 - 4.0 lb)
Reduction gear type
15.7 - 19.6 N
(1.6 - 2.0 kg,
3.5 - 4.4 lb)

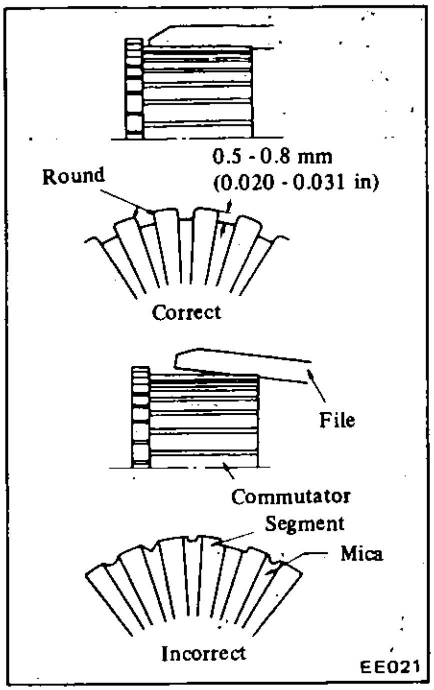
- Not in the specified value. ... Repair or replace.



Armature assembly

1. Check commutator surface.
- Rough ... Sand lightly with No. 500 sandpaper.

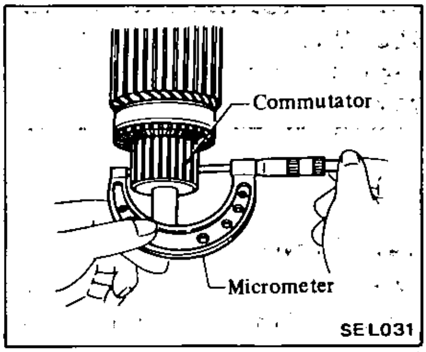
2. Check depth of insulating mica from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)



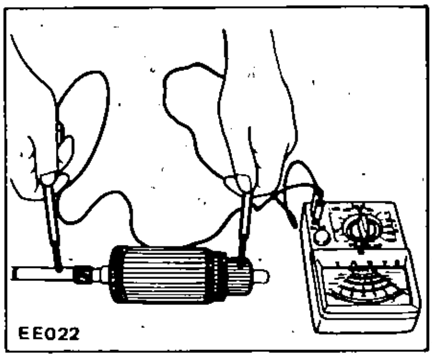
3. Check diameter of commutator.
Commutator minimum diameter:

Non reduction gear type:
32 mm (1.26 in)
Reduction gear type:
29 mm (1.14 in)

- Less than specified value ... Replace.

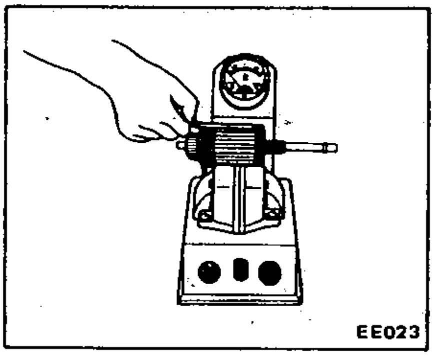


4. Ground test (between each commutator bar and shaft).



- Continuity exists ... Replace.

5. Short test with armature tester (growler) and a piece of iron over armature core.


EE023

- 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.

- Abnormal resistance ... Repair.

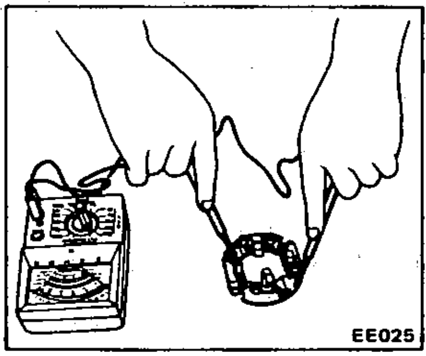
2. Inspect pinion teeth.

- Excessive rubbing ... Replace.

CAUTION:
Flywheel ring gear also must be inspected.

Brush holder

Ground test (between negative side of brush holder and another positive side).


EE025

- Continuity exists ... Replace.

Pinion case bearing metal (Non-reduction gear type)

Check clearance between bearing metal and armature shaft.

Bearing metal to armature shaft clearance:
Less than 0.2 mm (0.008 in)

- More than specified value ... 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.

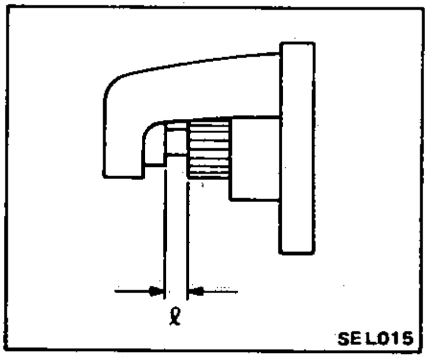
ASSEMBLY

- Apply grease to gear case and rear cover bearing metal, and apply oil to pinion slightly.

(Non-reduction gear type)

With the switch on, push pinion back to remove all slack and measure the clearance "ℓ" between pinion front edge and pinion stopper.

Clearance "ℓ":
0.3 - 2.5 mm
(0.012 - 0.098 in)



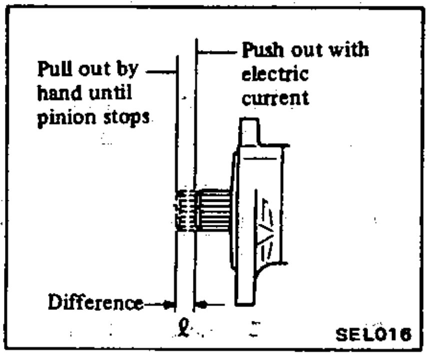
SEL015

- Not in the specified value ... Adjust by adjusting washer(s).

(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)



SEL016

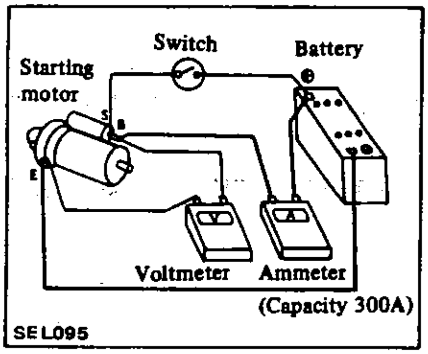
- Not in the specified value ... Adjust by adjusting washer(s).

Adjusting washer thickness:
0.5 mm (0.020 in)
0.8 mm (0.031 in)

TESTING

Performance test

No-load test



SEL095

Specifications

Refer to S.D.S.

Diagnosis of test

1. Low speed with no-load and high current draw.

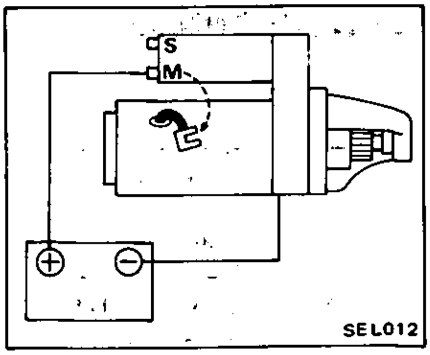
(1) Tight, dirty or worn bearings.
(2) Bent armature shaft or loosened field probe.

(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

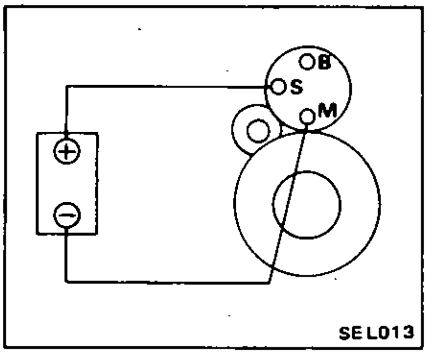
1. Disconnect lead wire from terminal "M" of magnetic switch.
2. Connect terminal "M" and positive ⊕ terminal of battery with a jumper lead wire.
3. Connect starter motor body and negative ⊖ terminal of battery with a jumper lead wire.
4. Pull pinion gear all the way out with your hands.
5. Release your hands from pinion gear.
6. If pinion gear returns to its original position, magnetic switch is properly functioning.



SEL012

Series coil

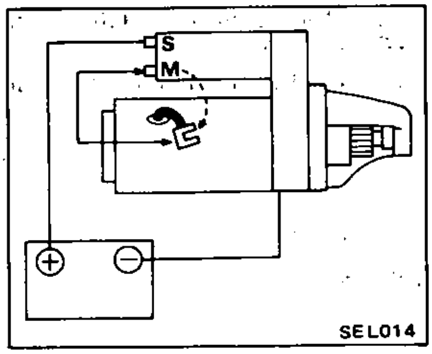
1. Connect terminal "M" of magnetic switch and negative ⊖ terminal of battery with a jumper lead wire.
2. Connect terminal "S" of magnetic switch and positive ⊕ terminal of battery with a jumper wire.
3. With these connections having been made, if plunger is pulled in by force, series coil is properly functioning.



SEL013

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 ⊕ terminal of battery with a jumper wire.
3. Connect negative ⊖ 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.



SEL014

SERVICE DATA AND SPECIFICATIONS

STARTER MOTOR

Type			S114-180F	S114-229E	S114-255A
Applied model			Non-reduction gear type		Reduction gear type
			U.S.A. (A/T)	U.S.A. (M/T)	Canada (A/T, M/T)
System voltage		V	12		
No load	Terminal voltage	V	11.5		11
	Current	A	Less than 60		Less than 100
	Revolution	rpm	More than 6,000	More than 7,000	More than 3,900
Outer diameter of commutator		mm (in)	More than 39 (1.54)		More than 29 (1.14)
Minimum length of brush		mm (in)	12 (0.47)		11 (0.43)
Brush spring tension		N (kg, lb)	13.7 - 17.7 (1.4 - 1.8, 3.1 - 4.0)		15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)
Clearance between bearing metal and armature shaft		mm (in)	Less than 0.2 (0.008)		–
Clearance "ℓ" between pinion front edge and pinion stopper		mm (in)	0.3 - 2.5 (0.012 - 0.098)		–
Difference "ℓ" in height of pinion		mm (in)	–		0.3 - 1.5 (0.012 - 0.059)

CHARGING SYSTEM

DESCRIPTION

The charging circuit consists of a battery, an alternator incorporating an IC voltage regulator and wiring that connects these parts.

With the ignition switch in ON, the circuit between transistor "Tr_1" of the IC voltage regulator and ground is closed. Current from the battery then flows along the route shown by the arrow in Figure, turning on the charge warning lamp and flowing on through terminal "L" to excite the rotor.

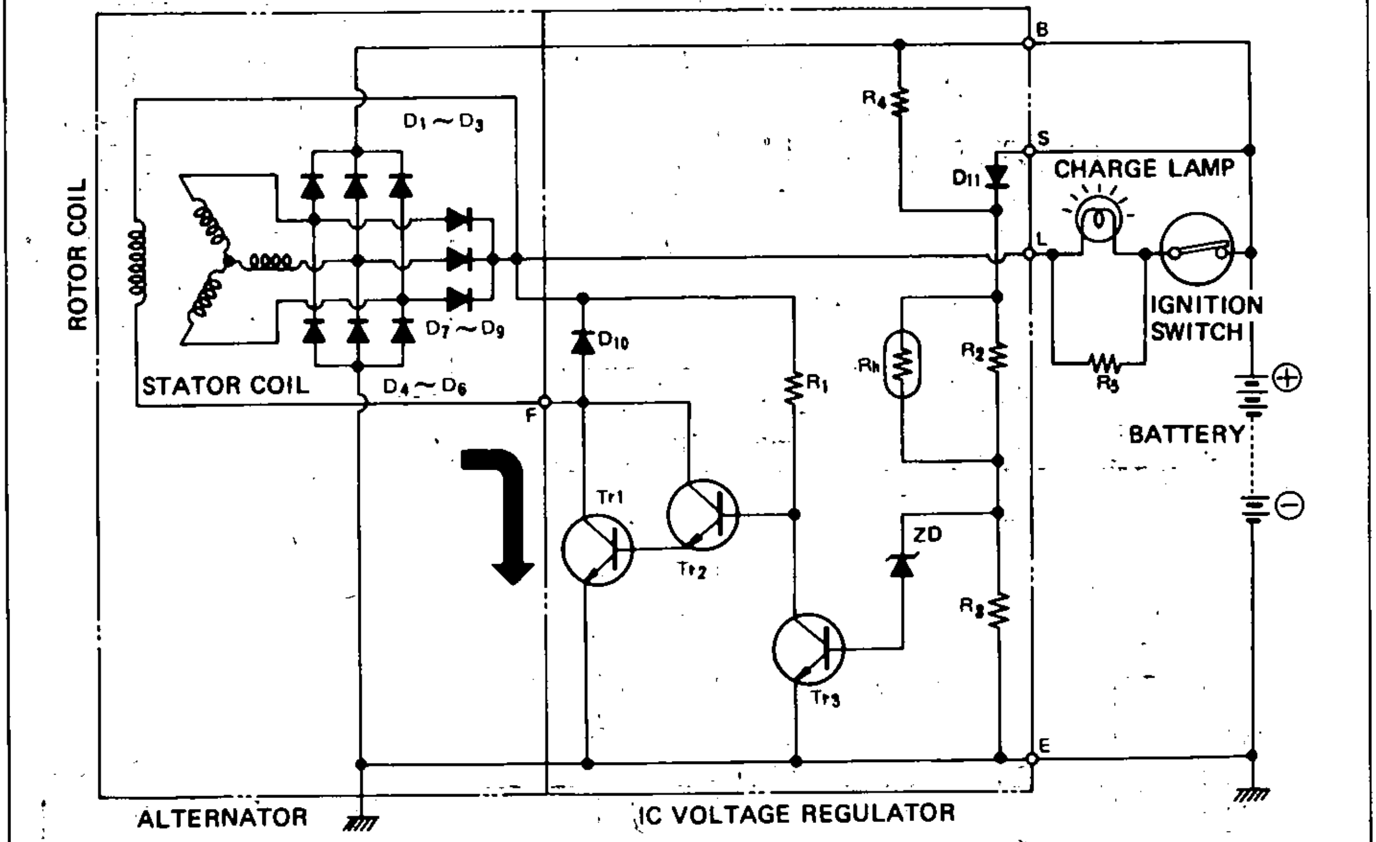
When the alternator begins to operate, three-phase alternating current is produced in the stator coil. This alternating current is rectified by the positive and negative silicon diodes.

When the voltage at terminal "B" is higher than battery voltage, current produced at the stator flows to re-charge the battery. While the battery is being re-charged, the voltage at terminal "L" is equal to that of terminal "B". At this point, there is no voltage differential on either side of the charge warning lamp, which causes the charge warning lamp to turn off. In other words, current does not flow from the battery to terminal "L". Accordingly, current flow through the rotor is taken over by current produced at the stator. The circuit between terminal "F" and "Tr_1" is then closed:

The IC voltage regulator monitors generating voltage to be applied to the battery at terminal "S". When current exceeds the specified value, it then flows through the zener diode (ZD), closing the circuit consisting of transistor "Tr_3" and resistor "R1". At this point, current neither flows through transistor "Tr_1" to ground nor to the rotor, thereby reducing the voltage generated at the stator.

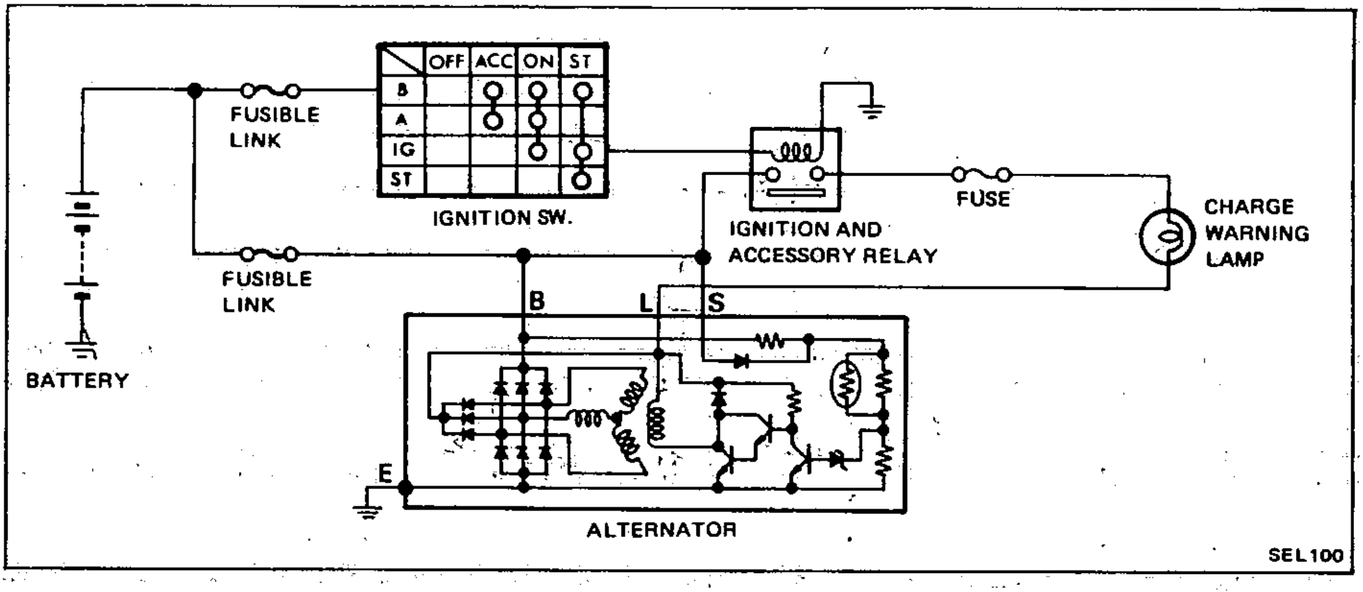
When voltage generated at terminal "S" is reduced to the specified value, transistor allows current to flow through the rotor, increasing the generating voltage.

In this manner, output voltage from the alternator does not rise above the specified value by the ON-OFF operation of the rotor coil through the IC voltage regulator.

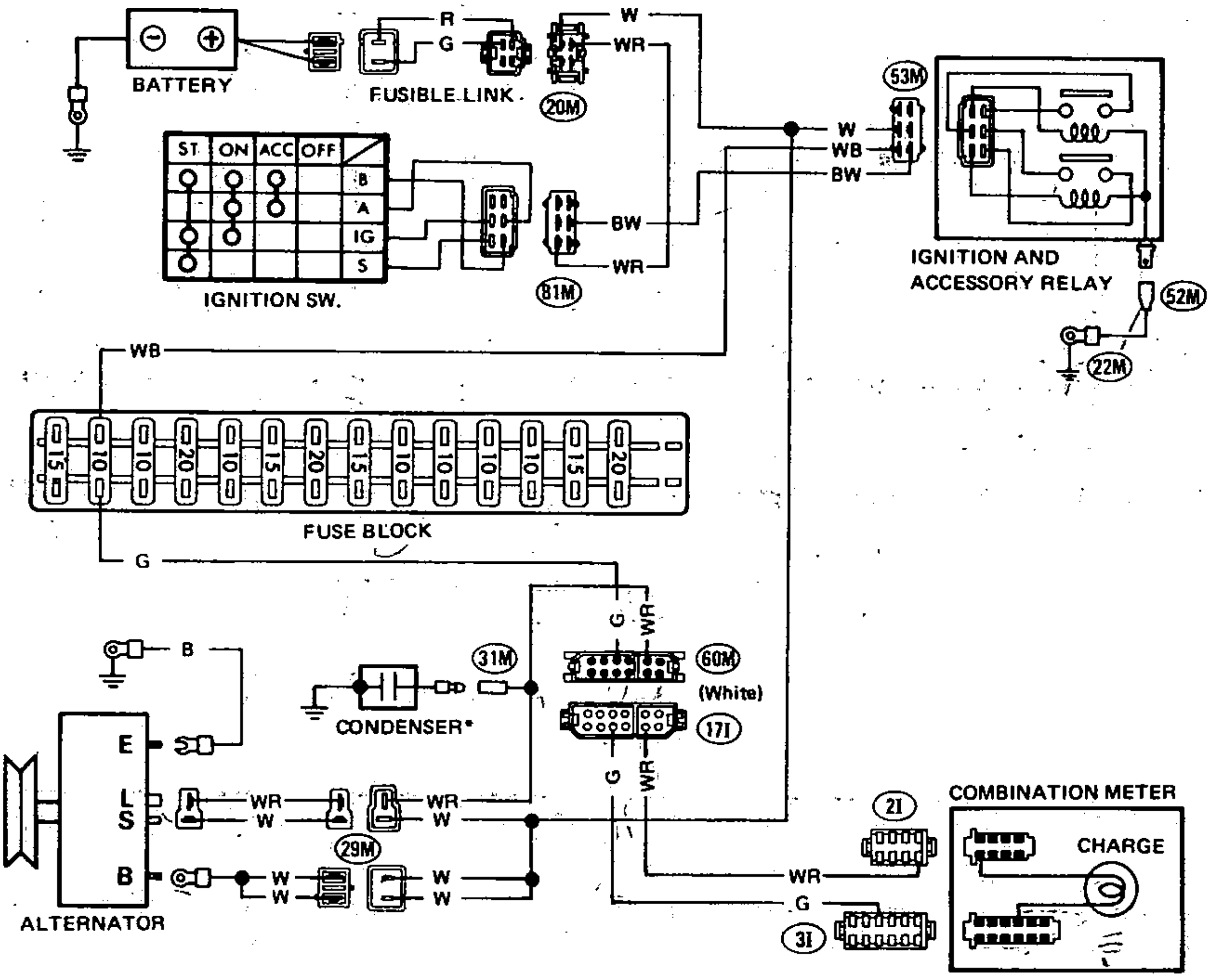


SEL055

SCHEMATIC



WIRING DIAGRAM



*: For radio noise prevention

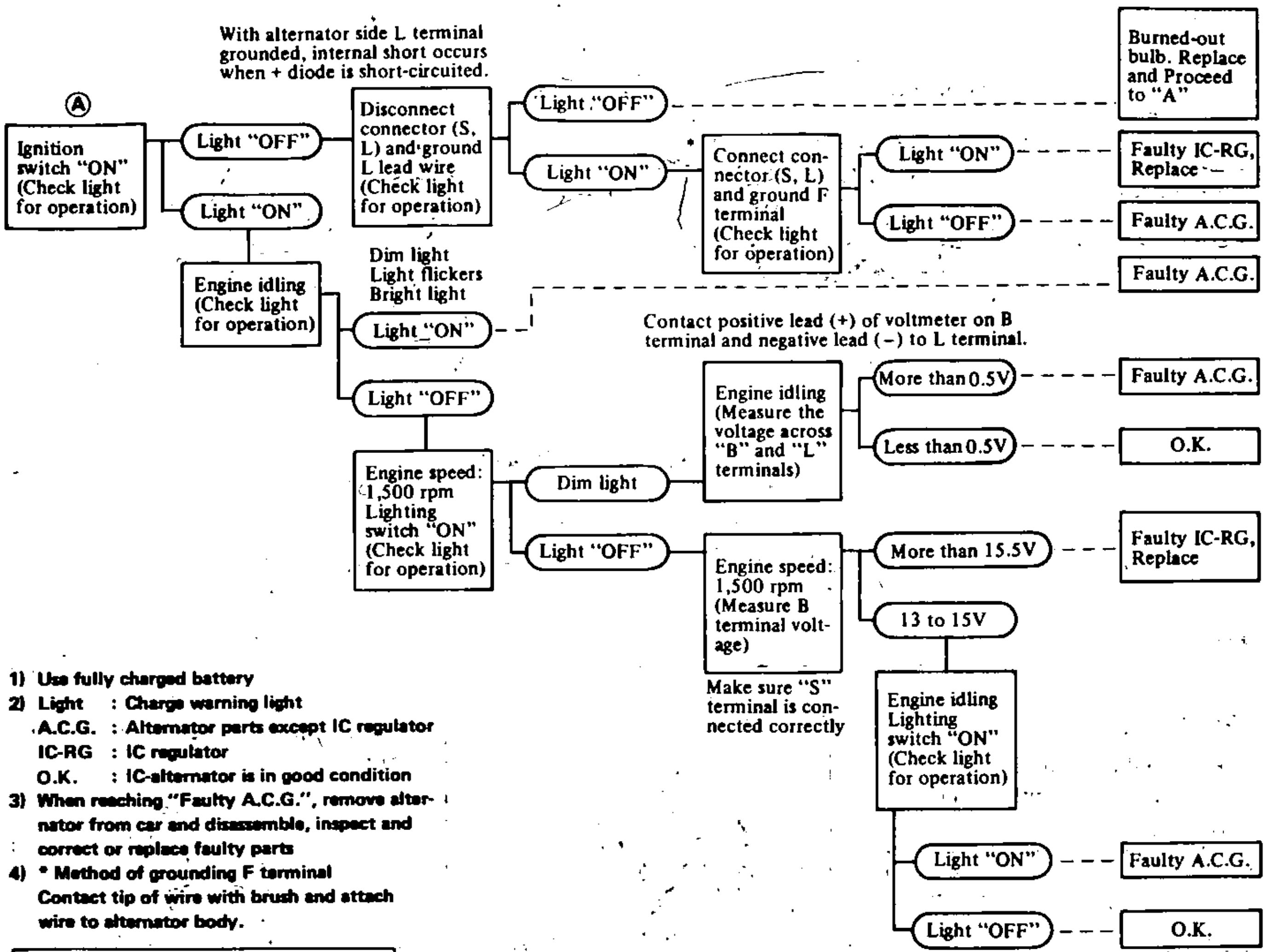
SEL101

CHARGING SYSTEM TROUBLE-SHOOTING

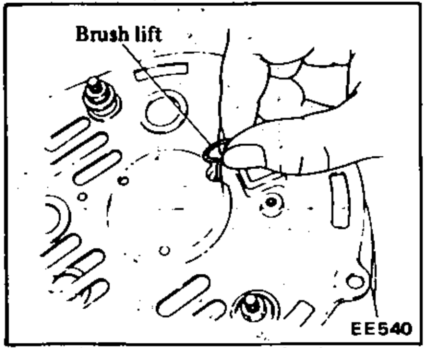
Before conducting an alternator test, make sure that the battery is fully charged.

A 30-Volt voltmeter and suitable test probes are necessary for the test.

The alternator can be checked easily by referring to the Inspection Table.

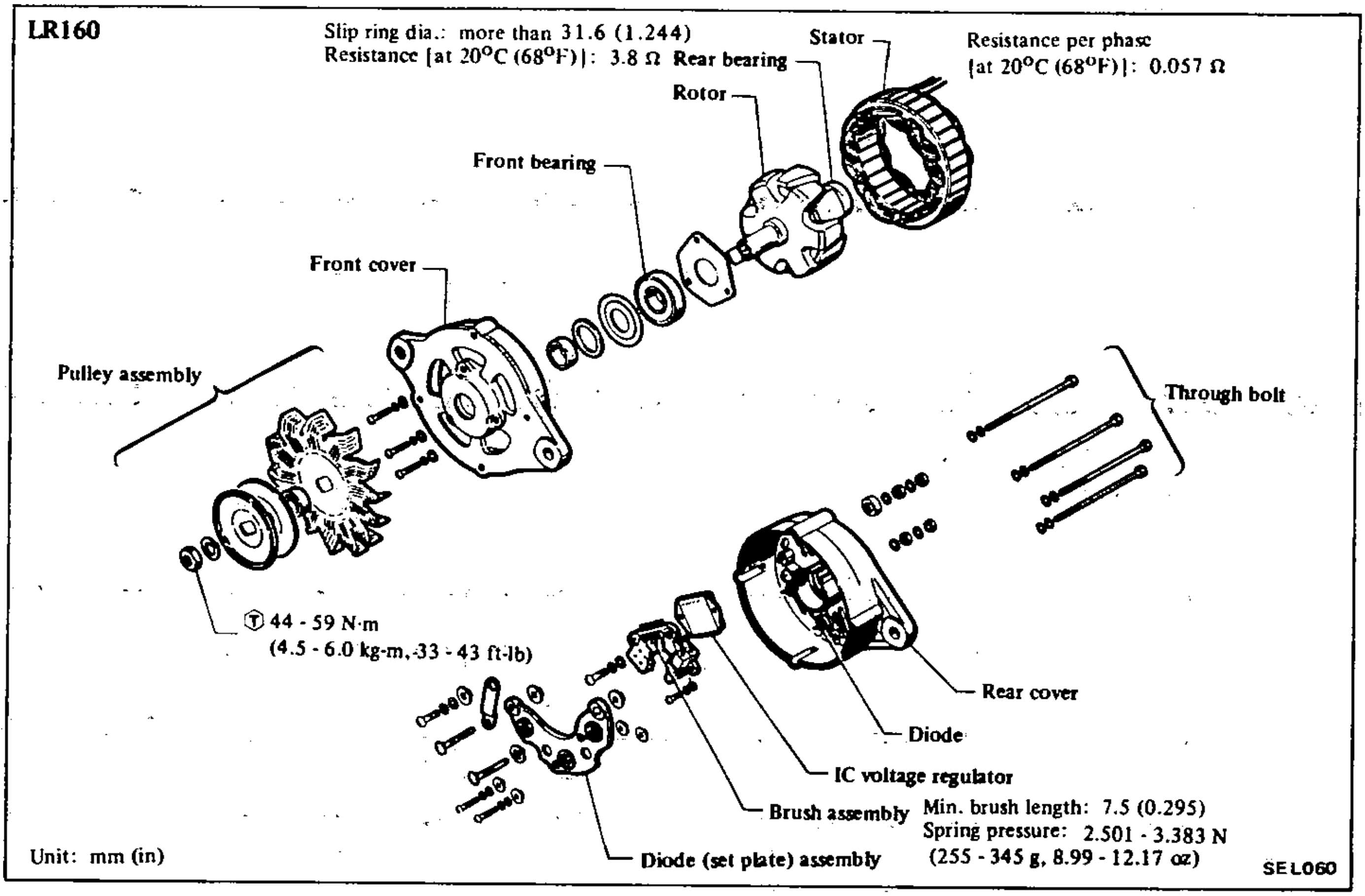


1) Use fully charged battery
2) Light : Charge warning light
A.C.G. : Alternator parts except IC regulator
IC-RG : IC regulator
O.K. : IC-alternator is in good condition
3) When reaching "Faulty A.C.G.", remove alternator from car and disassemble, inspect and correct or replace faulty parts
4) * Method of grounding F terminal
Contact tip of wire with brush and attach wire to alternator body.



5) Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

ALTERNATOR



Slip ring dia.: more than 31.6 (1.244)
Resistance [at 20°C (68°F)]: 3.8 Ω

Resistance per phase
[at 20°C (68°F)]: 0.057 Ω

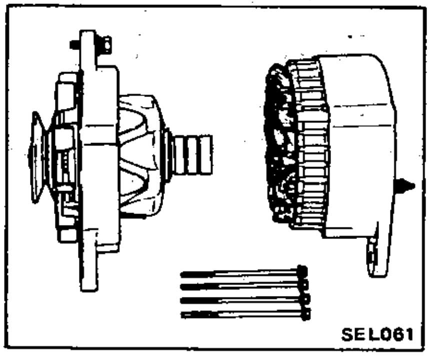
Ⓣ 44 - 59 N·m
(4.5 - 6.0 kg-m, 33 - 43 ft-lb)

Min. brush length: 7.5 (0.295)
Spring pressure: 2.501 - 3.383 N
(255 - 345 g, 8.99 - 12.17 oz)

Unit: mm (in)

DISASSEMBLY

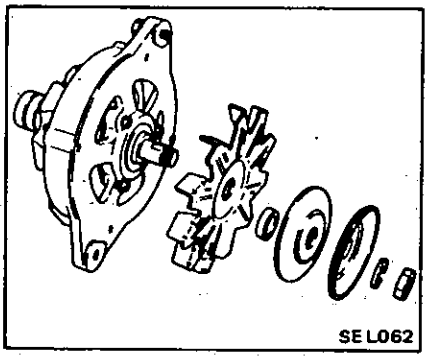
1. Remove through bolts.
2. Separate front cover from rear cover.



3. Remove pulley and fan.

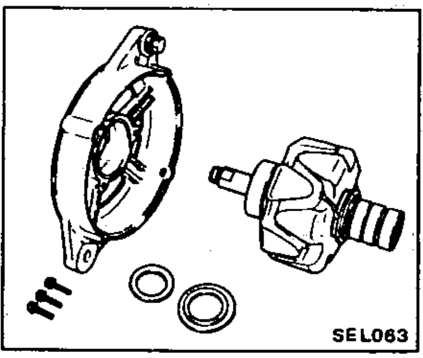
(1) Place rear cover side of rotor in a vice.

(2) Remove pulley nut.

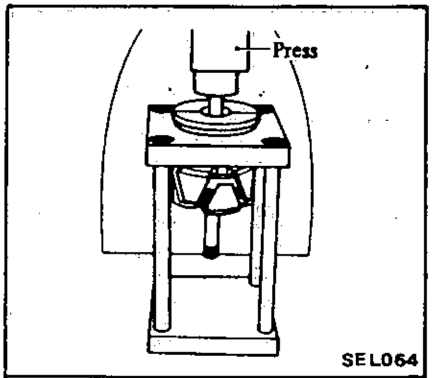


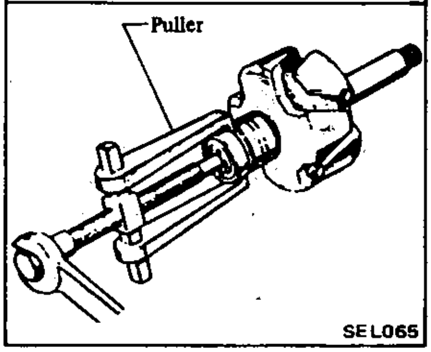
4. Separate rotor front cover.

- Remove setscrews from bearing retainer.

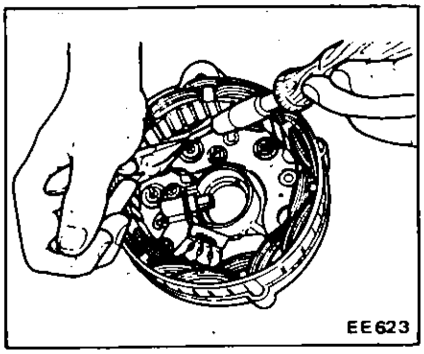


5. Pull rear bearing off rotor assembly.





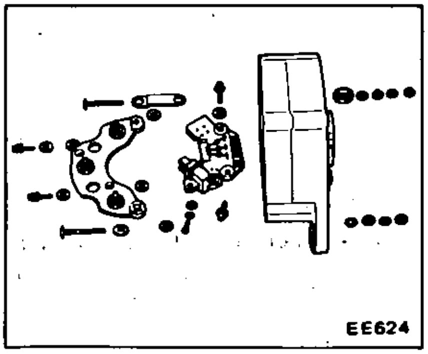
6. Disconnect stator coil lead wires from diode terminals.



EE623

7. Remove brush assembly with IC regulator.
8. Remove diode holder.

CAUTION:
Place packings and insulators in order so that they can be placed back in their original places or locations from which they were removed.

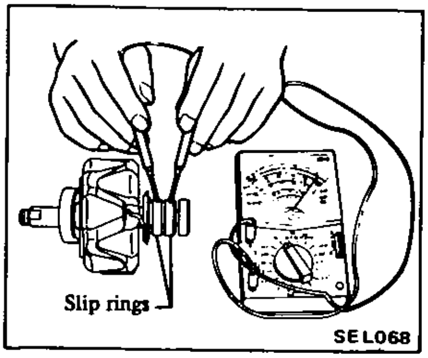


EE624

INSPECTION

Rotor

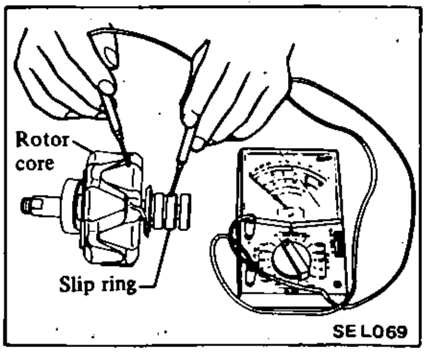
1. Continuity test.



SEL068

- No continuity ... Replace rotor.

2. Ground test

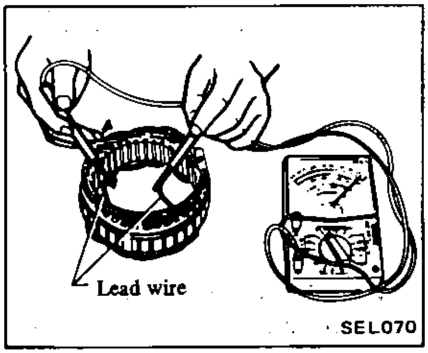


SEL069

- Continuity exists ... Replace rotor.

Stator

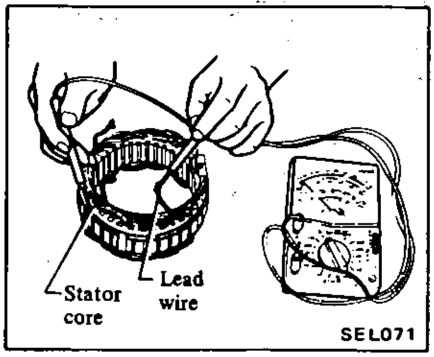
1. Continuity test



SEL070

- No continuity ... Replace stator.

2. Ground test



SEL071

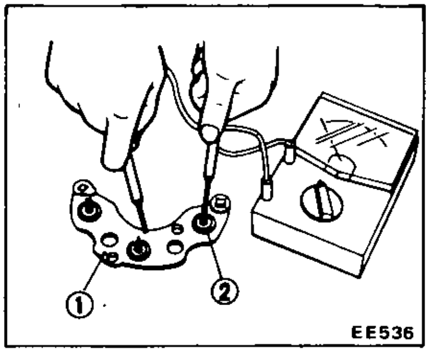
- Continuity exists ... Replace stator.

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

Positive diode

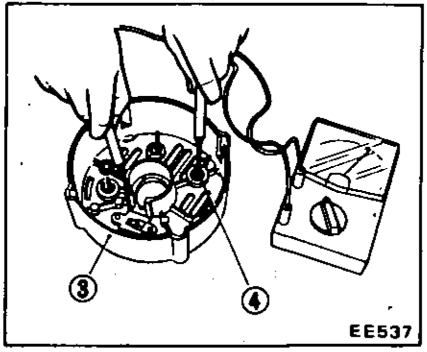


EE536

1 Diode holder plate
2 Positive diode

- Conduction test is N.G. ... Replace diode assembly.

Negative diode

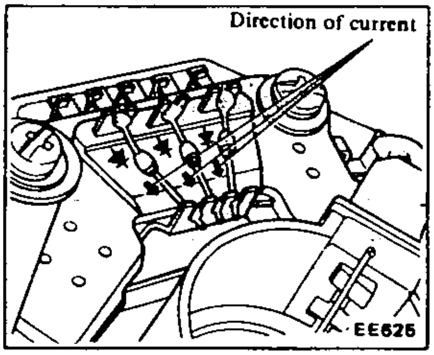


EE537

3 Rear cover
4 Negative diode

- Conduction test is N.G. ... Replace diode assembly.

Sub-diode



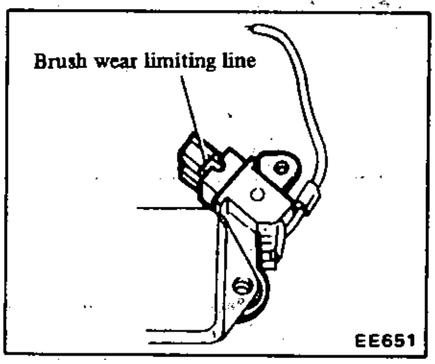
- Conduction test is N.G. ... Replace sub-diode.

CAUTION:
If it is necessary to remove sub-diode, pinch diode lead wire with a pair of pliers to prevent heat transfer from soldering iron to diode when unsoldering connection.

Brush

1. Check smooth movement of brush.
- Not smooth ... Check brush holder and clean.
2. Check brush for wear.

Min. brush length:
7.5 mm (0.295 in)



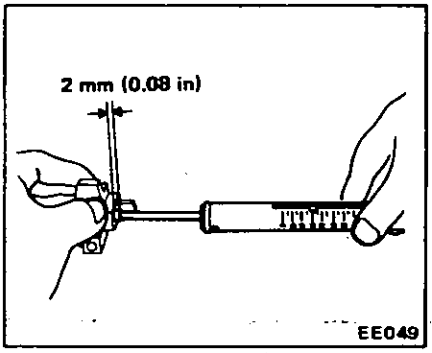
- Less than the specified value ... Replace.

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.

ASSEMBLY

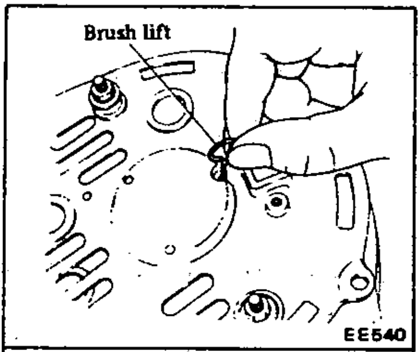
Assemble alternator in the reverse order of disassembly, noting the following:

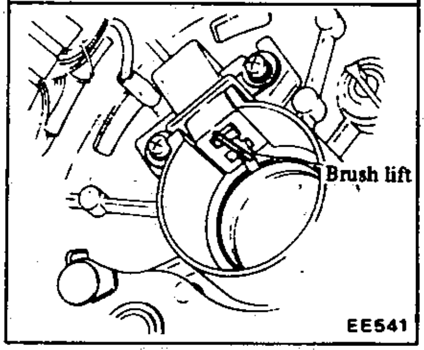
1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When installing diode "A" terminal, install insulating bushing correctly.
3. Tighten pulley nut and make sure that deflection of V-groove is proper.

Ⓣ **: Pulley nut**
44 - 59 N·m
(4.5 - 6.0 kg-m,
33 - 43 ft-lb)

V-groove deflection:
0.3 mm (0.012 in)

4. Before installing front and rear sides of alternator, push brush up with fingers and retain brush, by inserting brush lift into brush lift hole from outside.





5. After installing front and rear sides of alternator, pull brush lift by pushing toward center.

Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.

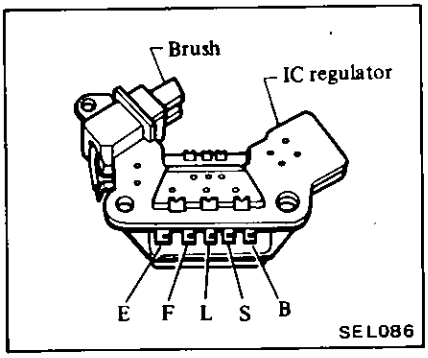
6. Tighten through bolts.

Ⓣ **: Through bolts**
3.4 - 3.9 N·m
(0.35 - 0.40 kg-m,
2.5 - 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. The electronic relay is soldered to the brush assembly inside the alternator. Should any problem with the relay arise, it should be replaced together with the brush assembly. On the charge warning lamp circuit, a diode is attached to the stator coil to monitor 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.



SEL086

INSPECTION

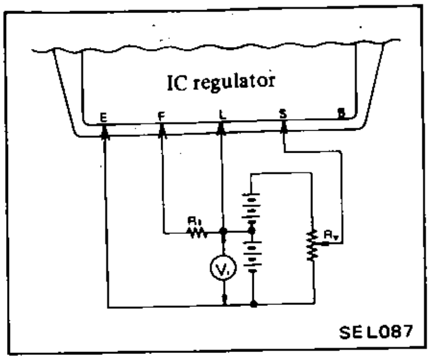
Remove IC regulator and brushes at the same time, as outlined in "Disassembly and Assembly" section under the heading "Alternator".

CAUTION:
When performing test continuously, resistor may generate heat. If it becomes high temperature, stop testing for a while to avoid burning.

1. The following test equipment and accessories are required.

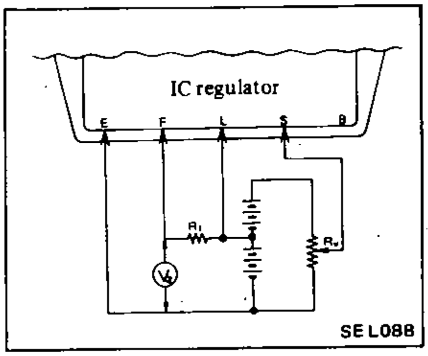
1)	Resistor (R_1), 10 ohms, 20 watts	x 1
2)	Variable resistor (R_v), 0 to 300 ohms, 20 watts	x 1
3)	Batteries (1 and 2), 12 volts	x 2
4)	DC voltmeter, 0 to 30 volts	x 1

2. Measure voltage V_1 at battery.
   Not within 10 to 13 volts: Recharge or replace battery.



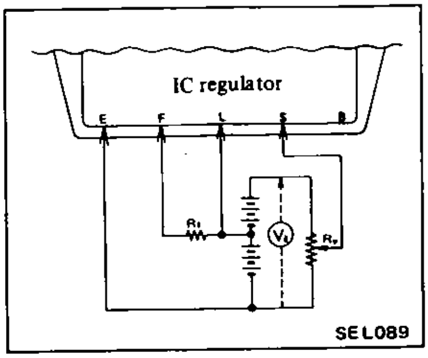
SEL087

3. Measure voltage V_2.
   Below 2.0 volts: Regulator is functioning properly.



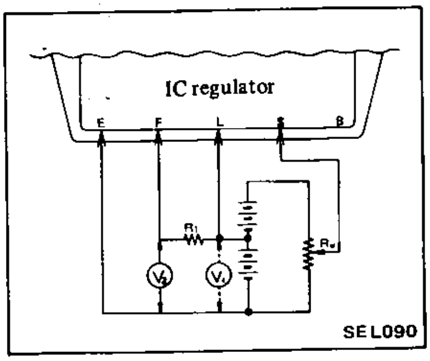
SEL088

4. Measure voltage V_3.
   Not within 20 to 26 volts: Recharge or replace either or both batteries.



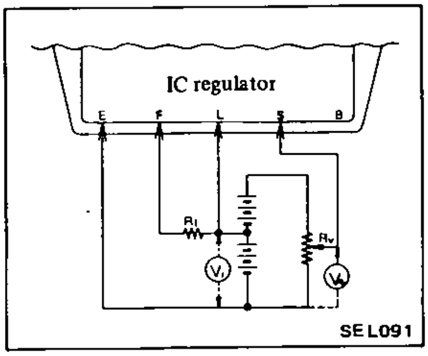
SEL089

5. **Gradually decrease resistance of variable resistor R_v from 300 ohms, and measure voltage V_2 between terminals E and F.**
   Voltage V_2 should increase at a certain point to as high as voltage V_1 (10 to 13 volts).
   - If there is such a variation:
     Regulator is functioning properly.
   - No variation:
     Regulator is out of order.



SEL090

6. Hold variable resistor R_v at the same voltage as V_1(10 to 13 volts).
   - Measure voltage V_4.

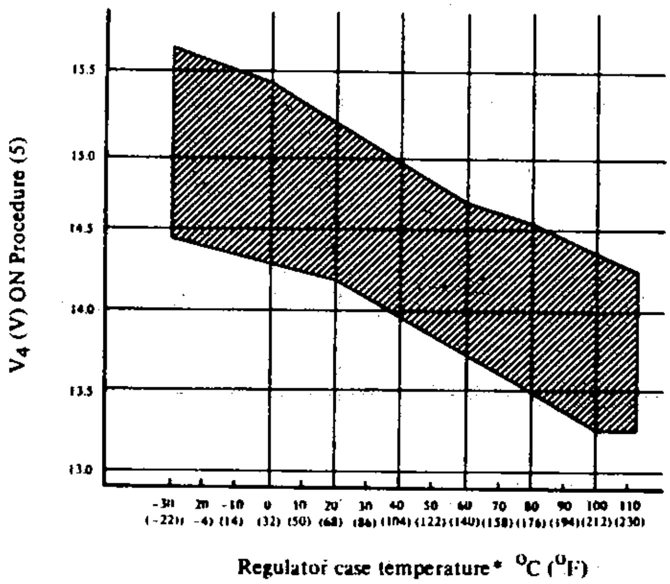


SEL091

- Voltage V_4 is within specified range indicated in Figure.

Example:

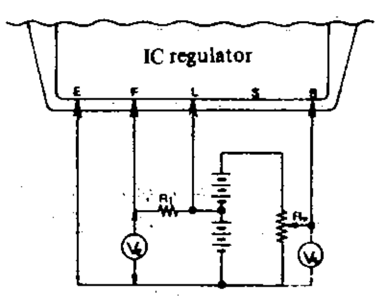
When temperature of regulator case is 40°C (104°F), regulator is normal if voltage V_4 is within range of 14 to 15 volts.



SEL092

7. Reconnect wiring as shown in Fugure, and repeat steps 5 and 6.

If voltage V_4 is 0.5 to 2.0 volts higher than that in step (6), regulator is functioning properly. If it is not, replace.



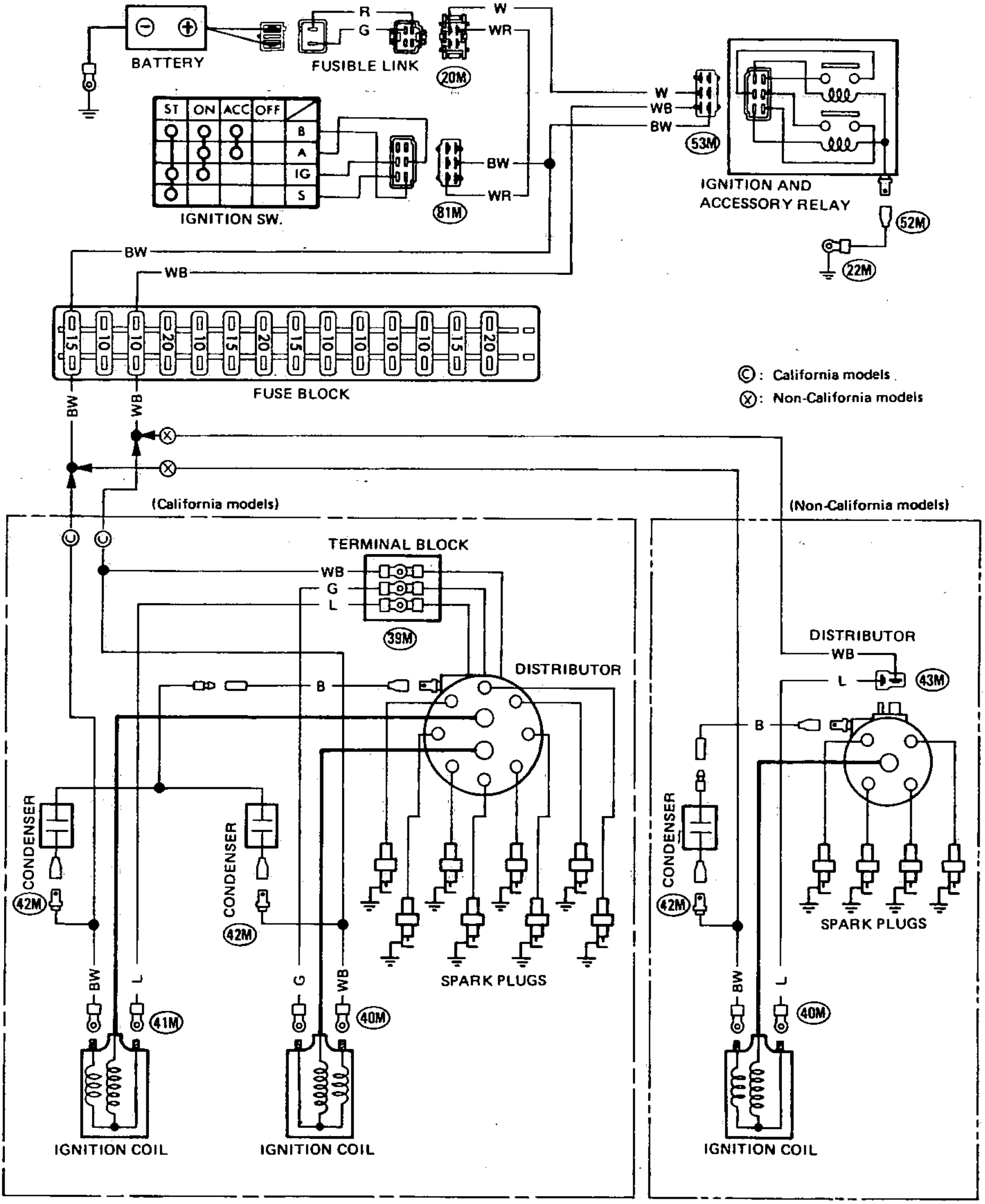
SEL093

SERVICE DATA AND SPECIFICATIONS

ALTERNATOR

Type		LR160-47
Applied model		All
Nominal rating	V-A	12-60
Ground polarity		Negative
Minimum revolution under no-load (When 14 volts is applied)	rpm	Less than 1,050
Hot output current	A/rpm	More than 45/2,500 More than 60/5,000
Pulley ratio		2.09
Regulated output voltage	V	14.4 - 15.0
Minimum length of brush	mm (in)	7.5 (0.295)
Brush spring pressure	N (g, oz)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)
Slip ring outer diameter	mm (in)	31.6 (1.244)

IGNITION SYSTEM



SEL102

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 high tension cable from distributor.
4. 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.

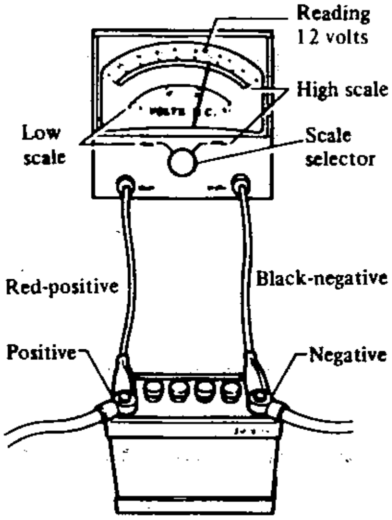
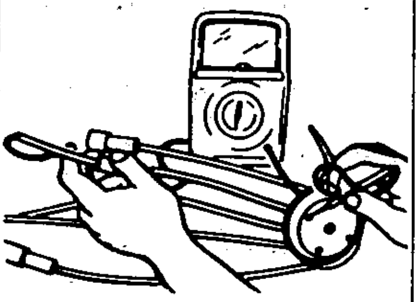
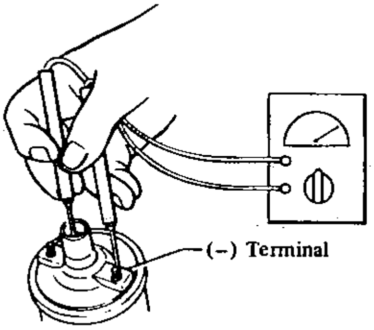
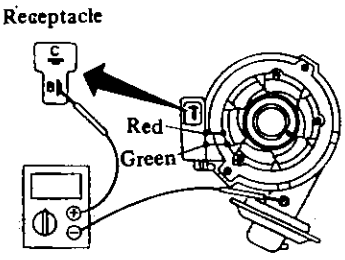
- No spark occurs on sparks are intermittent
  IC ignition system . . . . N.G.
  Proceed with tests below.

Manual testing of IC ignition system using a voltmeter

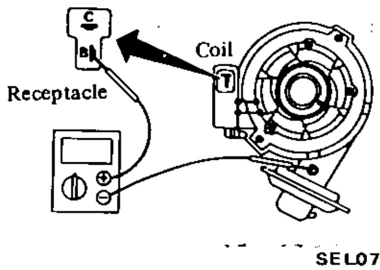
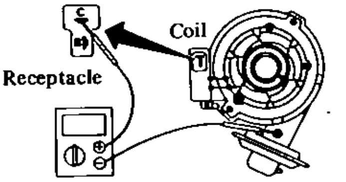
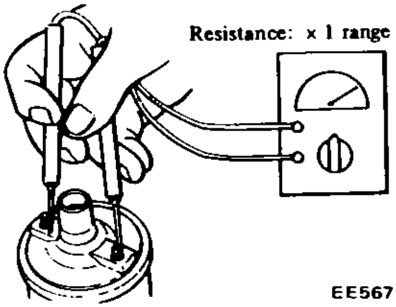
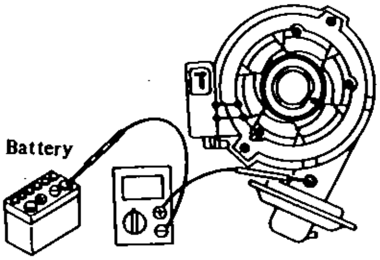
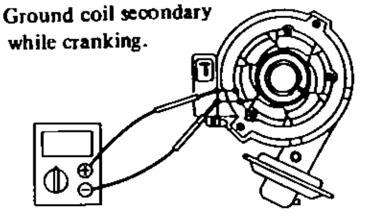
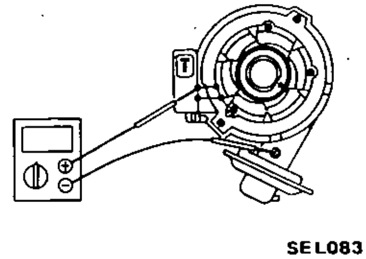
IC Ignition System is best checked using J-26350 Transistor Ignition Analyzer. However, if an analyzer is not available, a volt-ohm-milliammeter (V.O.M.) may be used to diagnose transistor ignition malfunctions.While this method requires more time, it can nevertheless provide accurate results. Follow the steps in the sequence indicated. If a fault is found, correct the problem before continuing. If all tests indicate "O.K." replace the IC Ignition Unit. DO NOT REPLACE THE UNIT UNTILL ALL TESTS HAVE BEEN COMPLETED AND INDICATE "OK".

1. When performing the following tests, use a multitester which can measure accurately in the following ranges; 0 to 20V. D.C.; 0 to 1,000Ω; 0 to 10V A.C.; 0 to 50,000Ω.
2. If possible, start the vehicles and let it run for 5 to 15 minutes with the hood closed. This will bring all components to normal operating temperature, and will make it easier to diagnose intermittent problems.
3. It is not necessary to disconnect the harness connectors when performing the tests which follow. Simply insert the meter probes into the back of appropriate connector cavity.

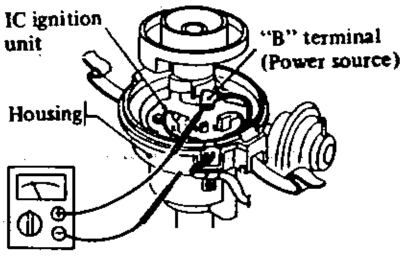
IC IGNITION SYSTEM TROUBLE-SHOOTING

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
1. Battery Voltage (no load)	 SEL103	1. Ignition key in "OFF" position. 2. Connect voltmeter as illustrated and set to appropriate scale. 3. Read and record battery voltage reading. Battery voltage ☐	* 11.5 - 12.5 volts	Proceed to Step 2.
			* Below 11.5 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
2. Battery Cranking Voltage		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Remove coil wire from distributor cap and ground it. 3. Read voltmeter while cranking engine for approximately 15 seconds. 4. Record voltage reading. Battery cranking voltage ☐	* Voltage reading greater than 9.6 volts	Battery O.K. Proceed to Step 3.
			* Voltage reading less than 9.6 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
3. Secondary Wiring	 EF125	1. Connect ohmmeter as illustrated and measure the resistance of each high tension cable.	* Resistance readings less than 30,000 ohms	Distributor cap and high tension cables – O.K. Proceed to Step 4.
			* Resistance readings greater than 30,000 ohms	Replace high tension cable(s) and/or distributor cap as required.
4. Ignition Coil Secondary Circuit	 SEL104	1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	* California models 7,400 - 11,000 ohms * Non-California models 8,200 - 12,400 ohms	Ignition coil secondary windings – O.K. Proceed to step 8 for California
			* Resistance reading not between 7,400 - 11,000 ohms (California models) or 8,200 - 12,400 ohms (Non-California models)	Faulty ignition coil – replace
5. Power Supply Circuit Non-California models only	 SEL078	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Turn ignition key to "ON" position.	* 11.5 - 12.5 volts	Proceed to Step 6.
			* Below 11.5 volts	Check wiring from ignition switch to IC unit.

(Continued next page)

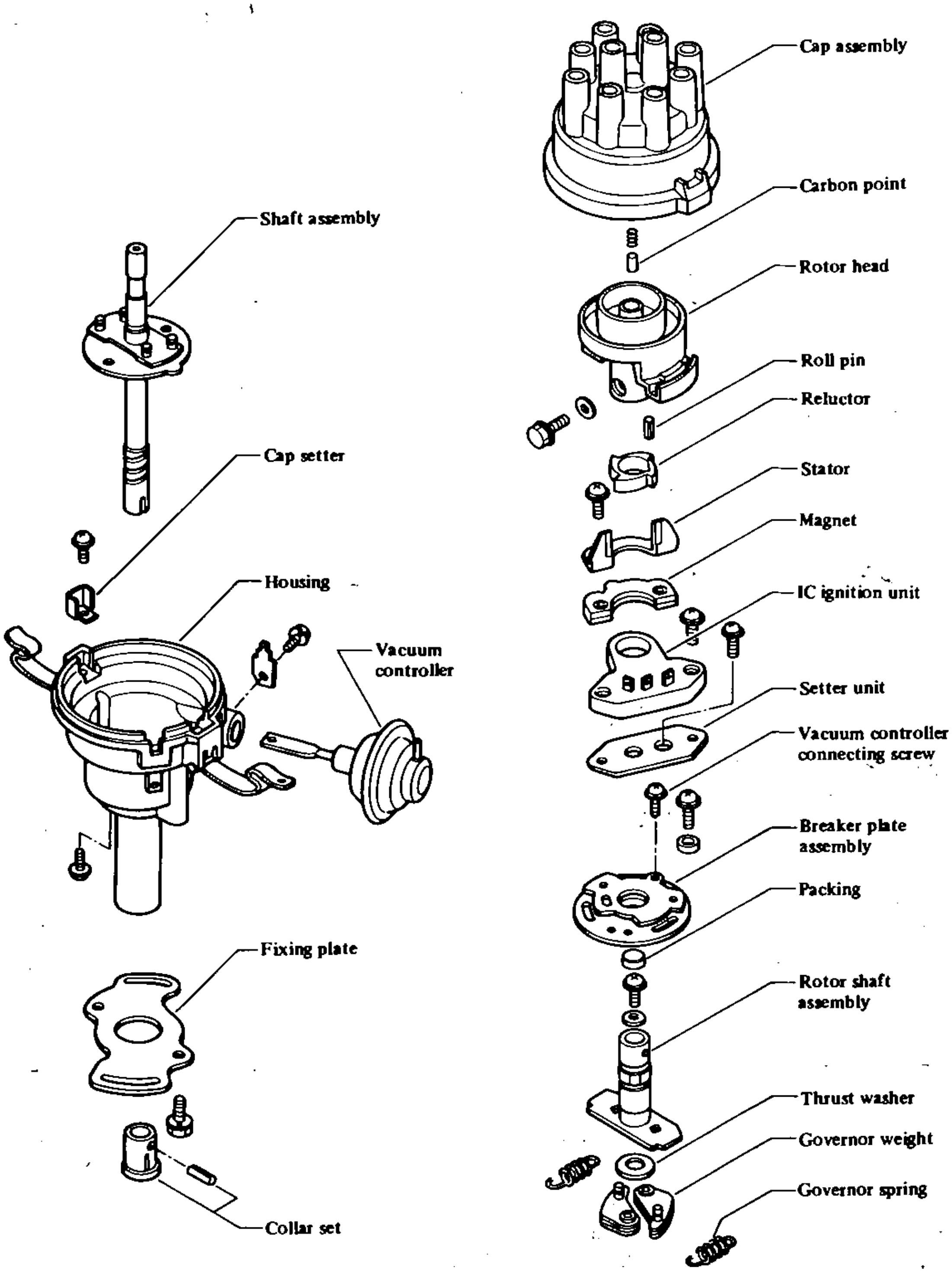
TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
6. Power Supply Circuit (Cranking) Non-California models only	Ground coil output wire while performing test.  SEL079	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	* Voltage reading is less than 1 volt below battery cranking voltage and is greater than 8.6 volts.	Proceed to Step 7.
			* Voltage reading is more than 1 volt below battery cranking voltage and/or is below 8.6 volts.	Check ignition switch and wiring from switch to IC unit.
7. Ignition Primary Circuit Non-California models only	 SEL080	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position.	* 11.5 - 12.5 volts	Proceed to Step 9.
			* Below 11.5 volts	Proceed to Step 8.
8. Ignition Coil Primary Circuit	 EE567	1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	* California models 1.04 - 1.27 ohms * Non-California models 0.84 - 1.02 ohms	Ignition coil primary winding O.K. Check ignition switch and wiring from ignition switch to coil and IC unit.
			* Resistance reading not between 1.04 - 1.27 ohms (California models) or 0.84 - 1.02 ohms (Non-California models)	Faulty ignition coil – replace.
9. I.C. Unit Ground Circuit Non-California models only	 SEL081	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	* 0.5 volts or less	Proceed to Step 10.
			* More than 0.5 volts	Check distributor ground, wiring from chassis ground to battery including battery cable connections.
10. Pick-up Coil Resistance Non-California models only	Ground coil secondary while cranking.  SEL082	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.	* Approximately 400 ohms	Proceed to Step 11.
			* Ohmmeter reading substantially exceeds or falls below the 400 ohms specifications.	Check pick-up coil and wiring to it.
11. Pick-up Coil Output Non-California models only	Ground coil secondary while cranking.  SEL083	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.	* Needle Wavers 	If "No Spark" condition still exists – replace IC ignition unit.
			* Needle steady  SEL105	Check physical condition of pick-up coil and reluctor. Check wiring and connections between pick-up coil and IC ignition unit.

(Continued next page)

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
12. Power Supply Circuit California models only	 SEL084	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Turn ignition key to "ON" position.	* 11.5 - 12.5 volts	
			* Below 11.5 volts	Check wiring from ignition switch to IC unit.

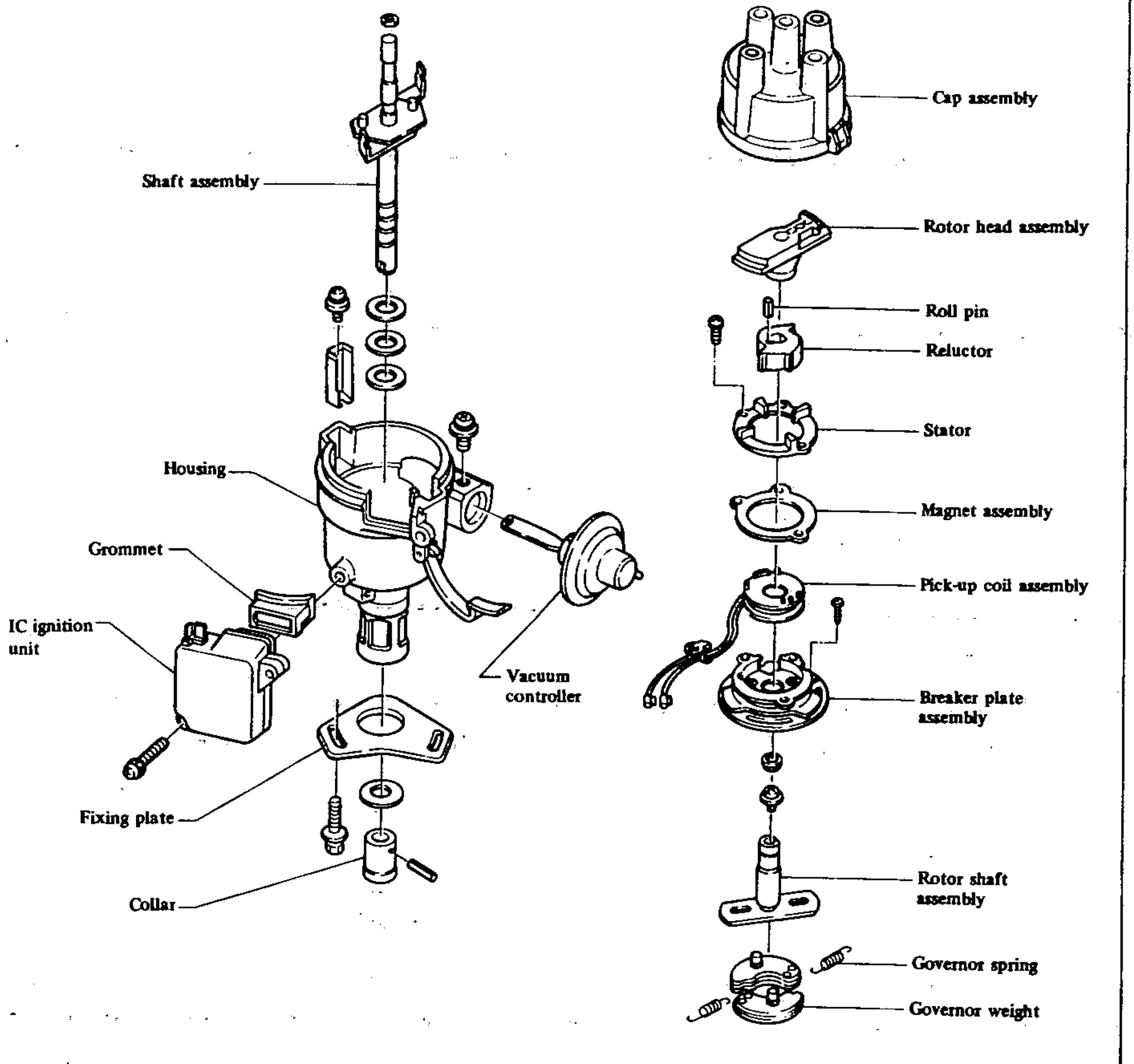
DISTRIBUTOR (IC type)

California models



SEL001

Non-California models



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.

If nothing is wrong with its characteristics, conceivable causes are faulty or abnormal wear of driving part or others. So do not disassemble it.

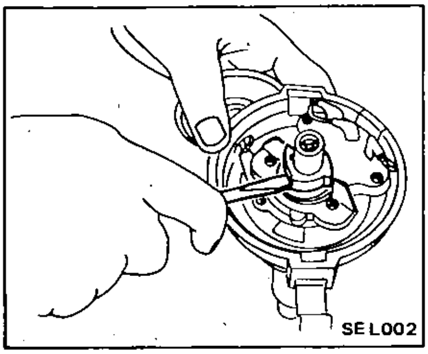
In the event of improper characteristics, check closely rotor shaft assembly, governor weight and shaft.

If any of the above parts are malfunctioning, replace the parts.

DISASSEMBLY

California models

1. Take off cap and remove rotor head.
2. Pry reluctor from shaft.



CAUTION:
When removing reluctor, be careful not to distort or damage the teeth.

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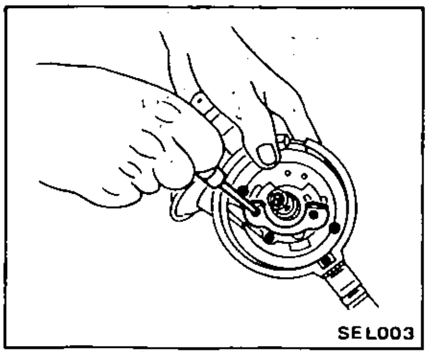
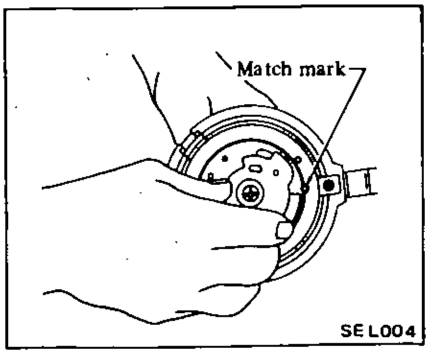
3. Remove IC ignition unit and unit setter.
4. Remove stator and magnet.



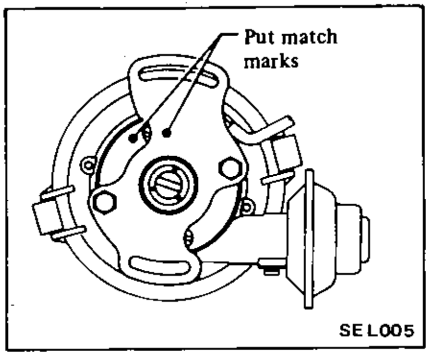
5. Remove vacuum control assembly.
6. Remove braker plate.

Before disassembling, be sure to mark housing and fixing plate.

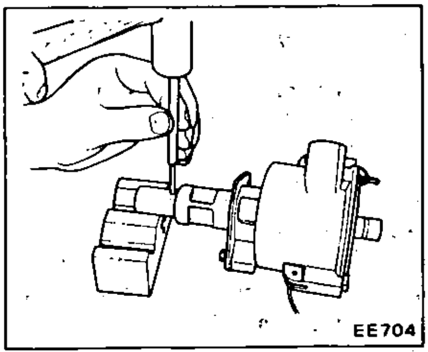


7. Remove fixing plate.

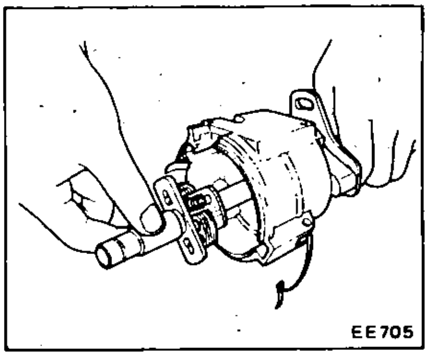
Mark housing and fixing plate.



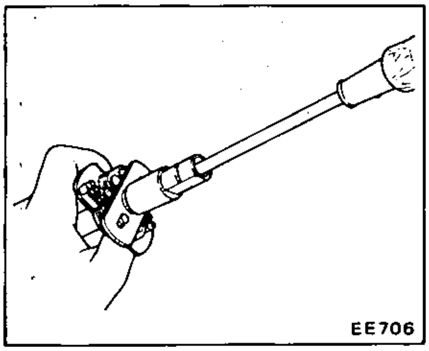
8. Remove collar.



9. Remove rotor shaft and drive shaft.



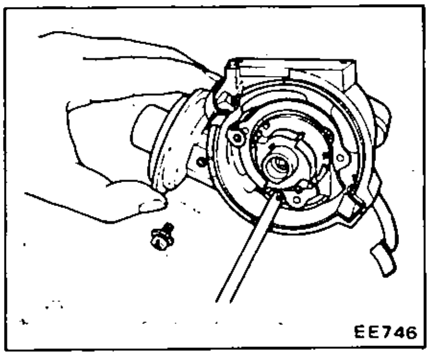
10. Mark rotor shaft and drive shaft. Remove packing from the top of rotor shaft and remove rotor shaft.



11. Mark one of the governor springs and its bracket. Also mark one of the governor weights and its pivot pins.
12. Carefully unhook and remove governor springs.
13. Remove governor weights. Apply grease to governor weights, after disassembling.

Non-California models

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.

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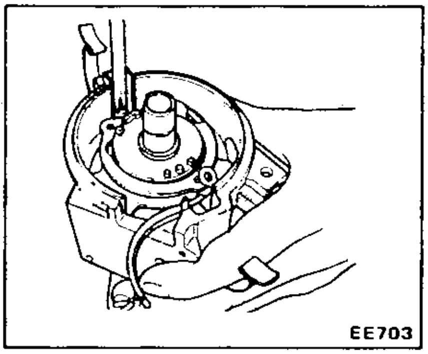
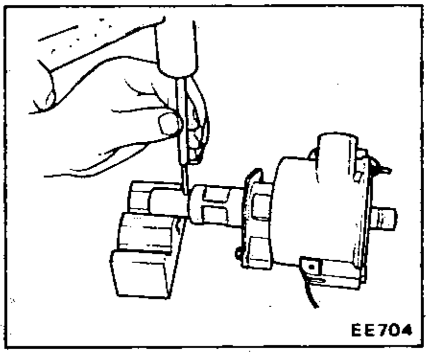
6. Remove roll pin.
7. Remove pick-up coil assembly.

8. Remove breaker plate assembly.



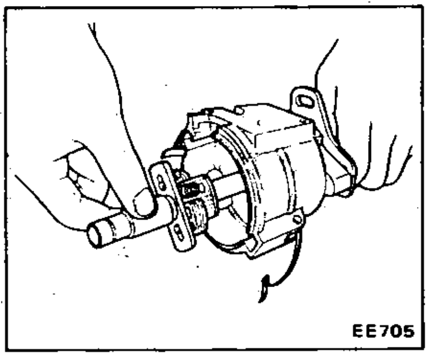
EE703

9. Punch knock pin out and remove pinion.



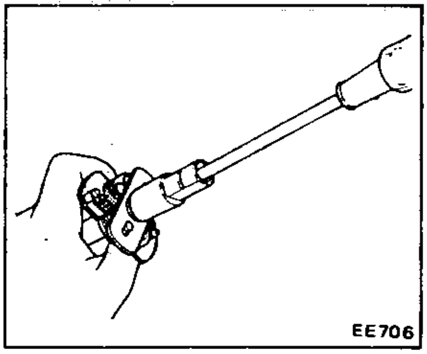
EE704

10. Remove rotor shaft and drive shaft assembly.



EE705

11. Mark rotor shaft and drive shaft. Remove packing from the top of rotor shaft and unscrew rotor shaft setscrew. Remove rotor shaft.



EE706

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.

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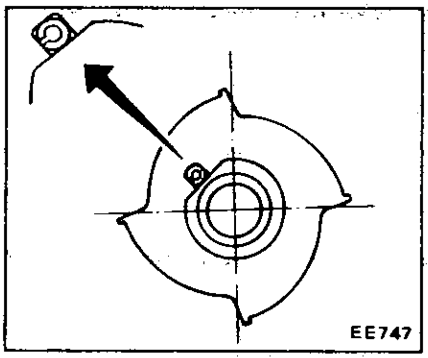
1. Align match marks so that parts are assembled to their original positions.

2. Ensure that reluctor is properly oriented when installing on shaft. Always drive in new roll pin as shown in Figure.



EE747

3. When installing pinion on shaft, be sure to install pinion gear correctly to position where it was installed.

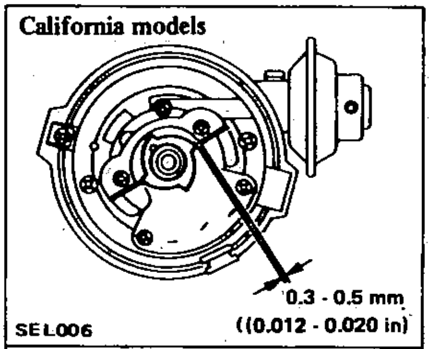
4. Apply grease to the top of rotor shaft as required.

5. Check the operation of governor before installing distributor on engine.

6. properly center stator and reluctor before tightening.

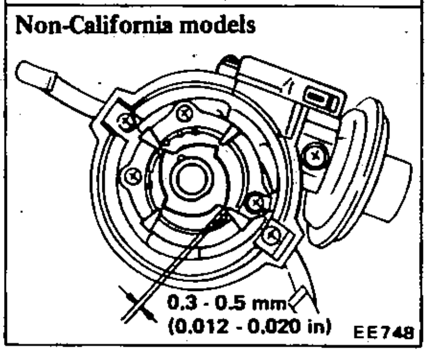
Standard air gap:
0.3 - 0.5 mm
(0.012 - 0.020 in)

California models



SEL006

Non-California models



EE748

7. Adjust ignition timing after distributor is installed on engine.

IC IGNITION UNIT

DESCRIPTION

California models

In the conventional distributor the ignition timing is detected by the cam and breaker arm, while in this distributor it is detected by the reluctor on the shaft and the pick-up coil provided in place of the breaker. The amount of magnetic flux passing through the pick-up coil is changed when the reluctor rotates, and then the electrical signal is generated in the pick-up coil.

This electric signal is conducted into the IC ignition unit, which makes and breaks the primary current running through the ignition coil and generates high voltage in the secondary winding.

The centrifugal and vacuum advance mechanisms employ the conventional mechanical type.

The IC ignition unit utilizes a semiconductor IC device, and is mounted in the distributor.

The IC ignition unit has the following circuits:

1. Spark timing signal monitoring circuit

This circuit detects the ignition signal sent from the distributor pick-up coil, and amplifies the signal.

2. Lock-preventing circuit

This circuit cuts off the ignition coil primary current when the ignition switch is ON and the engine is stationary.

If the ignition coil primary current is allowed to flow under such conditions, excessive current will be drawn because of low internal resistance of the ignition coil.

This can result in an abnormal temperature rise in the ignition coil or discharged battery. These malfunctions can be prevented by this lock-preventing circuit.

3. Duty control circuit

This circuit controls the ratio of the ignition coil primary current ON-OFF time periods, in one cycle of ignition operation.

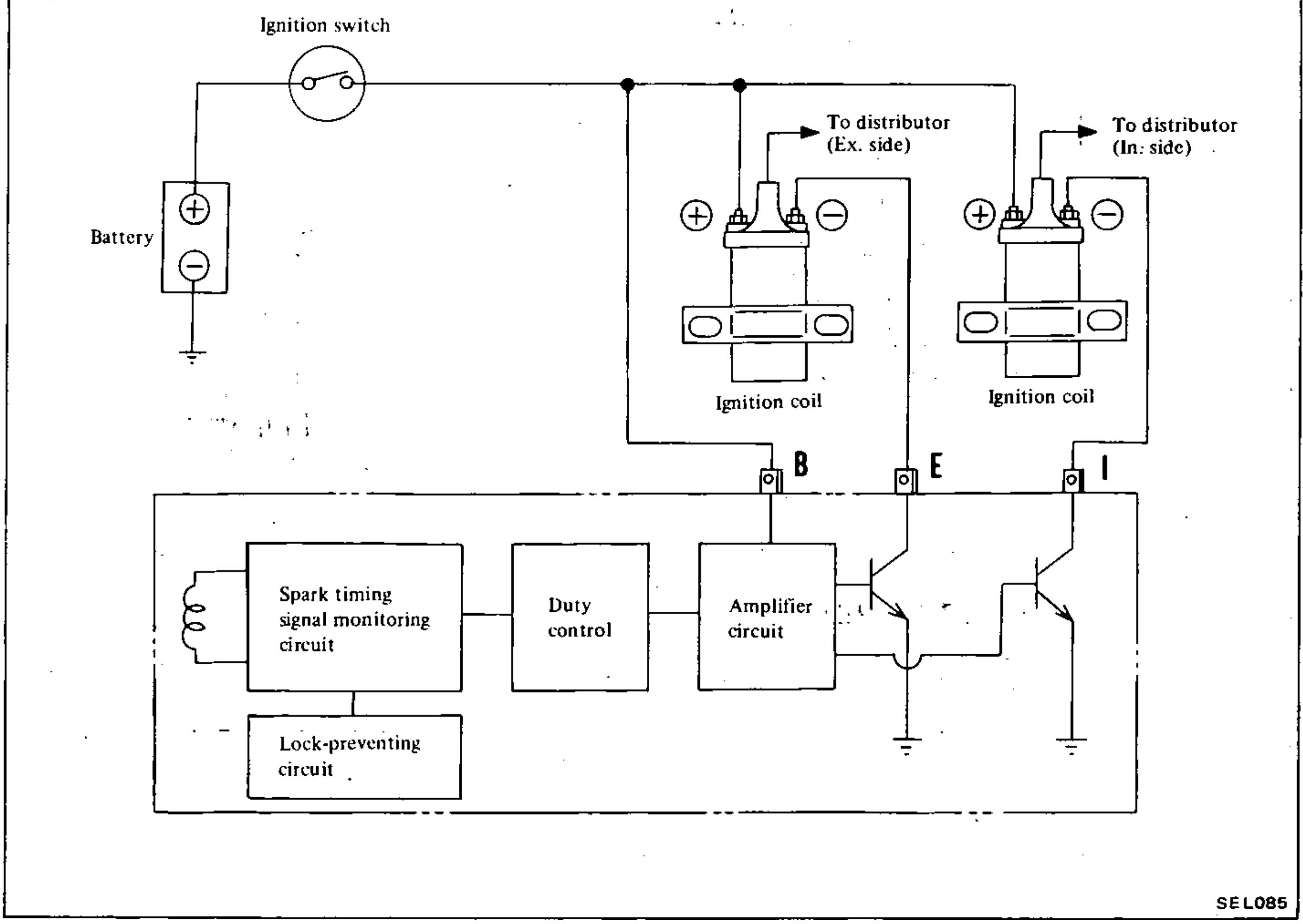
This is equivalent to the dwell angle of the conventional point type distributor. In order to provide high-performance spark firing over a wide-range of driving speeds, this duty can be controlled by the source voltage and the ambient temperature, as well as by the engine rpm.

4. Power switching circuit

This circuit is used to make or break directly the primary circuit current of the ignition coil.

To ensure efficient operation of the IC ignition unit, these four circuits are manufactured in one assembly.

California models



Non-California models

The IC ignition unit utilizes a semi-conductor IC device, and is mounted on the side surface of the distributor.

The IC ignition unit has the following circuits:

1. Spark timing signal monitoring circuit

This circuit detects the ignition signal sent from the distributor pick-up coil, and amplifies the signal.

2. Lock-preventing circuit

This circuit cuts off the ignition coil primary current when the ignition switch is ON and the engine is stationary.

If the ignition coil primary current is allowed to flow under such conditions, excessive current will be drawn because of low internal resistance of the ignition coil. This can result in an abnormal temperature rise in the ignition coil or discharged battery. These malfunctions can be prevented by this lock-preventing circuit.

3. Duty control circuit

This circuit controls the ratio of the ignition coil primary current ON-OFF time periods in one cycle of ignition operation.

This is equivalent to the dwell angle of the conventional point type distributor. In order to provide high-performance spark firing over a wide range of driving speeds, this duty can be controlled by the source voltage and the ambient temperature, as well as by the engine rpm.

4. Power switching circuit

This circuit is used to make or break directly the primary circuit current of the ignition coil.

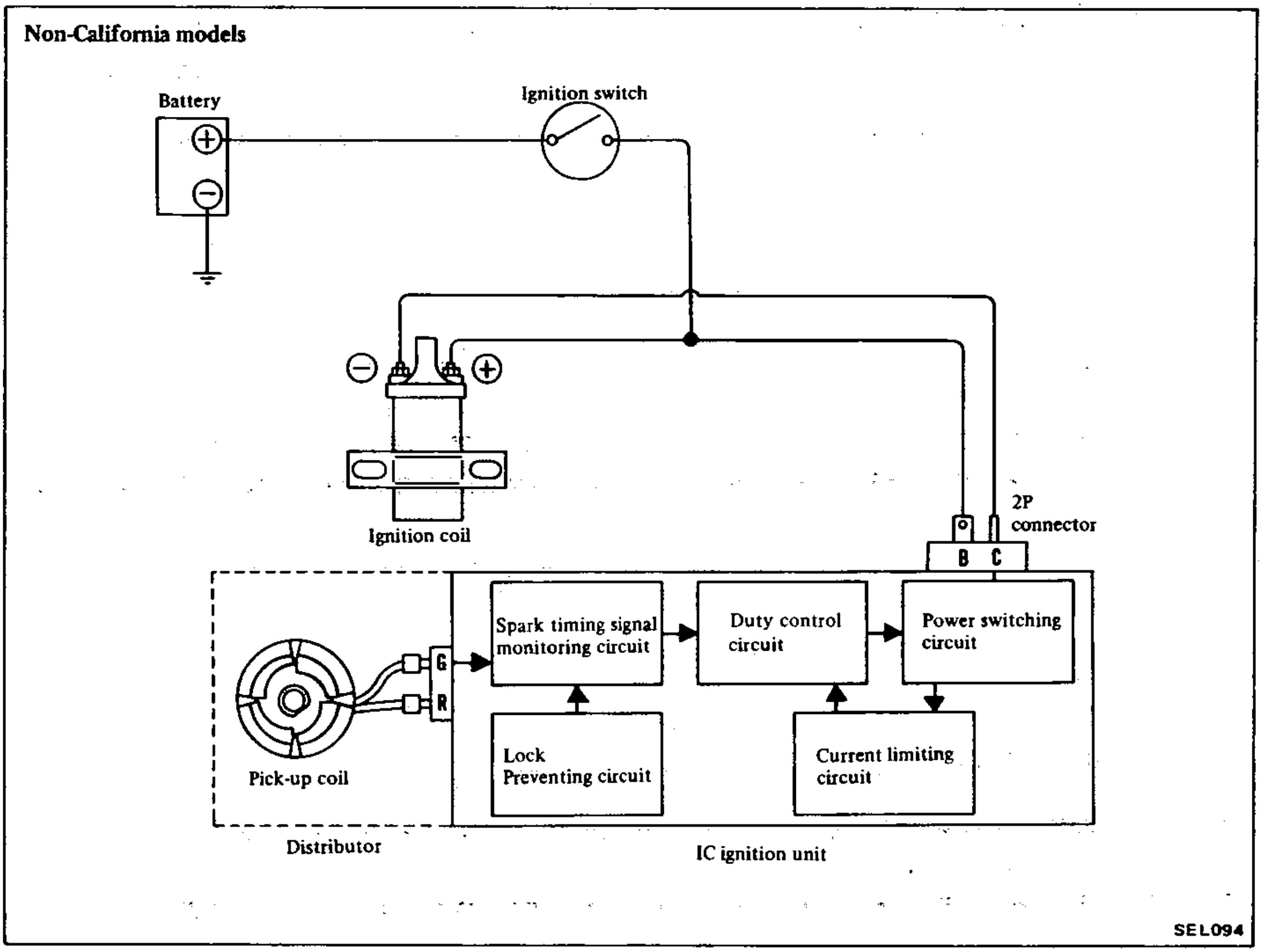
5. Current limiting circuit

This circuit controls the current value so that excessive current will not flow through the power switching circuit.

To ensure efficient operation of the IC ignition unit, these five circuits are manufactured in one assembly.

The semi-conductor IC is utilized for all these circuits, except the power switching circuit. The power switching circuit uses one power transistor, and the circuit is arranged on the ceramic substrate together with resistors, capacitors and diodes.

Each component part of this unit is highly reliable, however, should any part be found faulty, the entire assembly must be replaced.



SERVICE DATA AND SPECIFICATIONS

DISTRIBUTOR

Type	D4N9-05	D4N9-04	D4K9-09	D4K9-10
Applied model	California		Non-California	Canada
Transmission	A/T	M/T	A/T M/T	
Firing order	1-3-4-2			
Rotating direction	Counterclockwise			
Air gap mm (in)	0.3 - 0.5 (0.012 - 0.020)			
Cap insulation resistance MΩ	More than 50			
Rotor head insulation resistance MΩ	More than 50			
Cap carbon point length mm (in)	10 (0.39)		12 (0.47)	
Vacuum advance [Distributor degree/distributor kPa (mmHg, inHg)]	0°/9.3 (70, 2.76) 3.5°/12.0 (90, 3.54) 3.5°/13.3 (100, 3.94) 10°/33.3 (250, 9.84)	0°/9.3 (70, 2.76) 3.5°/12.0 (90, 3.54) 3.5°/13.3 (100, 3.94) 10°/33.3 (250, 9.84)	0°/9.3 (70, 2.76) 2.5°/12.0 (90, 3.54) 2.5°/14.7 (110, 4.33) 10°/33.3 (250, 9.84)	0°/9.3 (70, 2.76) 2.5°/12.0 (90, 3.54) 2.5°/14.7 (110, 4.33) 10°/33.3 (250, 9.84)
Centrifugal advance [Distributor degree/ distributor rpm]	0°/900 5°/1,700	0°/700 3.5°/1,100 5°/1,500	0°/700 3°/1,000 6°/1,600	0°/700 3°/1,000 6°/1,600

IGNITION COIL

Type	CIT-38	CIT-30
Applied model	California	Non-California
Primary voltage V	12	
Spark gap mm (in)	More than 7 (0.28)	
Primary resistance [at 20°C (68°F)] Ω	1.04 - 1.27	0.84 - 1.02
Secondary resistance [at 20°C (68°F)]	7.4 - 11.0	8.2 - 12.4

SPARK PLUG

Applied model		U.S.A.	Canada
Type	Standard	BP6ES	BPR6ES*
	Hot	BP5ES, BP4ES	BPR5ES*, BPR4ES*
	Cold	BP7ES	BPR7ES*
Size (Screw dia. x reach) mm (in)		14 x 19 (0.55 x 0.75)	
Plug gap mm (in)		0.8 - 0.9 (0.031 - 0.035)	

*: Optional for U.S.A.

LIGHTING SYSTEMS

CAUTION: Before starting to work on any part of electrical system, disconnect battery ground cable.

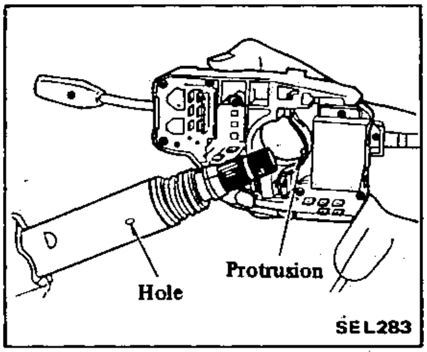
BULB SPECIFICATIONS

Item	Wattage	SAE trade number
Headlamp		
Type I (High)	50	4651
Type II (High/Low)	40/60	4652
Front combination lamps		
Turn signal/Clearance	27/8	1157
Rear combination lamps		
Stop/Tail	27/8	1157
Turn signal	27	1156
Side marker lamp		
Front	3.4	158
Rear	3.4	158
Back-up lamp	27	1156
License plate lamp	8 or 10	67
Interior lamp	10	–
Spot lamp	8	–
Step lamp	5	–
Luggage compartment lamp		
Hatchback	5	–
Hardtop	3.4	158
Combination meter		
Illumination and brake warning lamp	3.4	158
Warning and monitor lamp	2	–
Turn signal and beam indicator lamp	3.4	158
Cigarette lighter illumination lamp	1.4	–
Heater (Air-con) control panel illumination lamp	3.4	158
Glove box lamp	3.4	158
Cruise control switch lamp	1.4	–
Selector lever illumination lamp (AT model)	3.4	158

COMBINATION SWITCH

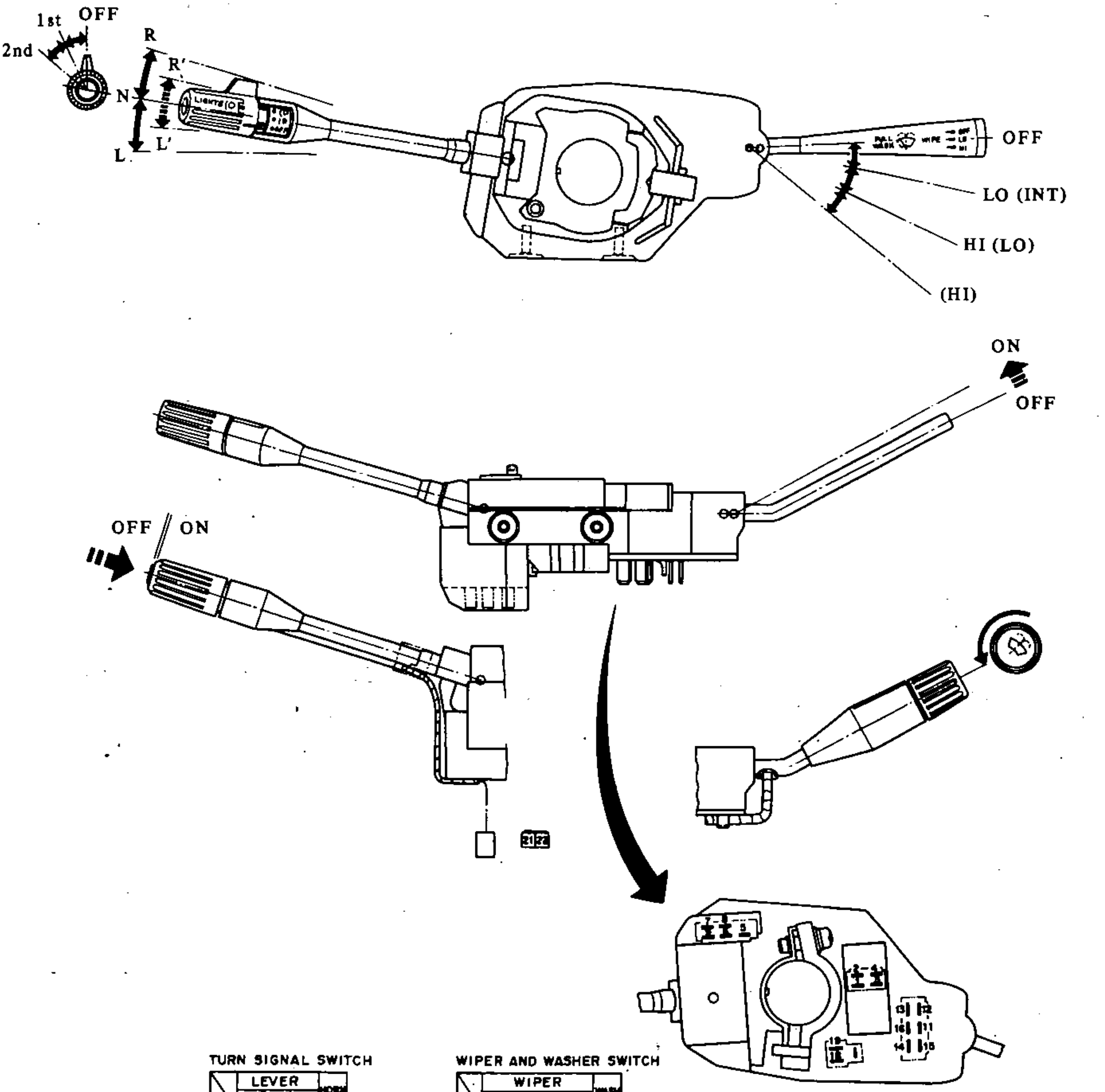
REMOVAL AND INSPECTION

1. Remove steering wheel.
2. Remove steering column cover.
3. Disconnect all combination switch wires.
4. Loosen retaining screw and remove combination switch.
5. To install combination switch, align protrusion on switch body with hole on steering column, and tighten retaining screw.



INSPECTION

Test continuity through switch with a test lamp or ohmmeter.



TURN SIGNAL SWITCH

	LEVER			HORN
	R-R'	N	L-L'	
1	○		○	
2	○		│	
3			○	
4				○

HORN SWITCH

LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○	│	○
7								○	
8				○	○	○	○	○	○
9				○	○	○	○	○	○

WIPER AND WASHER SWITCH

	WIPER				WASH
	OFF	INT	LO	HI	
11					○
12	○	○			│
13	○	○	○		│
14		○	○	○	│
15		│	│	○	│
16		○	○	○	○

(WITH TIME CONTROL)

18 19

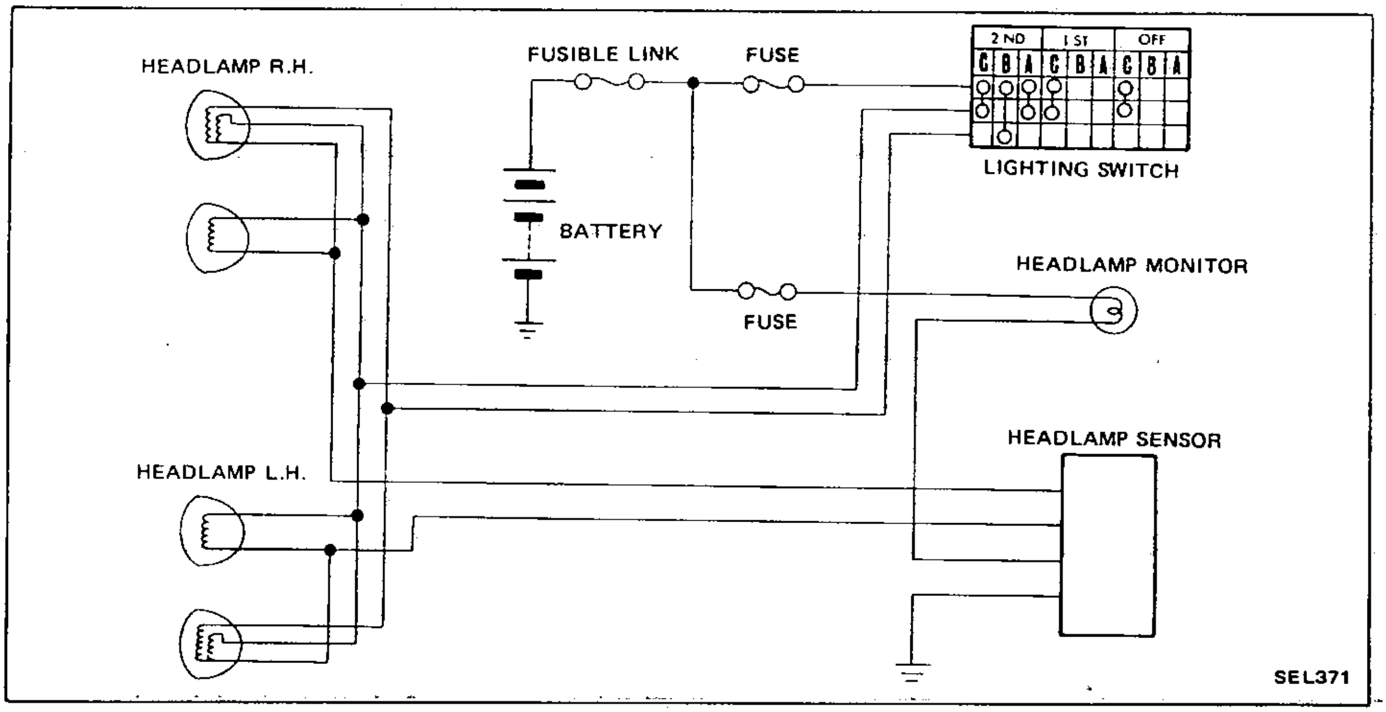
A.S.C.D. SWITCH

	OFF	ON
21		○
22		○

SEL370

HEADLAMP

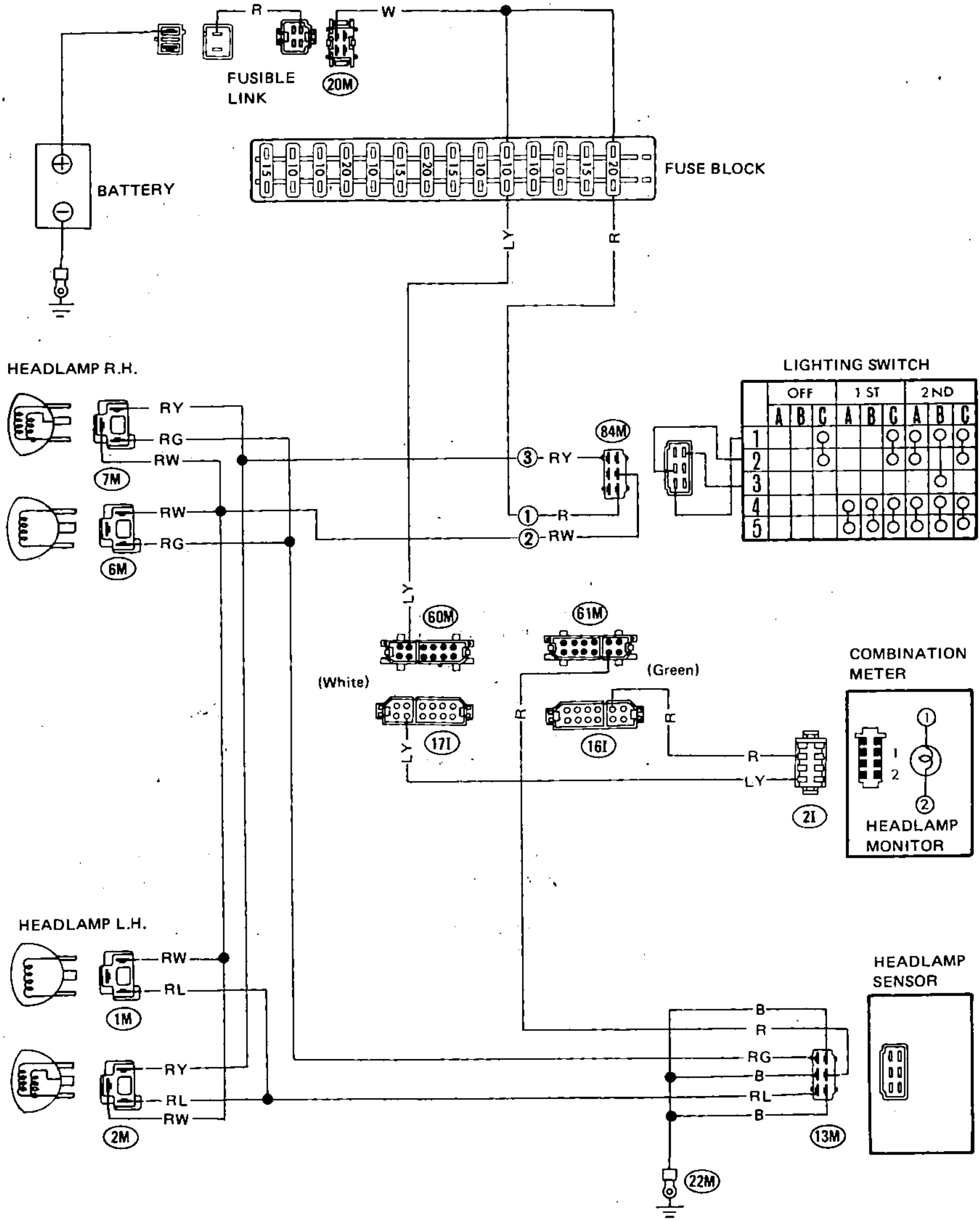
SCHEMATIC/HEADLAMP



TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Headlamps do not come on either high or low beams.	Burnt fusible link. Burnt fuse. Loose connection or open circuit. Faulty lighting switch. [High (low) beam comes on when ① and ② (① and ③) terminals of harness connector to lighting switch are connected with test lead including 10A fuse]. Faulty headlamp sensor. No ground.	Correct cause and replace fusible link. Correct cause and replace fuse. Check wiring and/or repair connection. Replace if necessary. Replace if necessary. Clean and tighten ground terminal.
High beam cannot be switched to low beam or vice versa.	Faulty lighting switch. [High (low) beam comes on when ① and ② (① and ③) terminals of harness connector to lighting switch are connected with test lead including 10A fuse].	Replace if necessary.
Headlamps dim.	Partly discharged or run-down battery. Inoperative charging system. Poor ground or loose connection.	Measure specific gravity of electrolyte and recharge or replace battery if necessary. Measure voltage at headlamp terminals. If it is less than 12.8V, check charging system for proper operation. Clean and/or tighten.
Headlamp lights on only one side.	Loose headlamp connection. Faulty headlamp.	Repair. Replace.

WIRING DIAGRAM/HEADLAMP



	OFF			1 ST			2ND		
	A	B	C	A	B	C	A	B	C
1			○			○	○	○	○
2			○			○	○		○
3								○	
4				○	○	○	○	○	○
5				○	○	○	○	○	○

SEL372

LIGHTING SWITCH

Refer to "Combination Switch".

HEADLAMP SENSOR

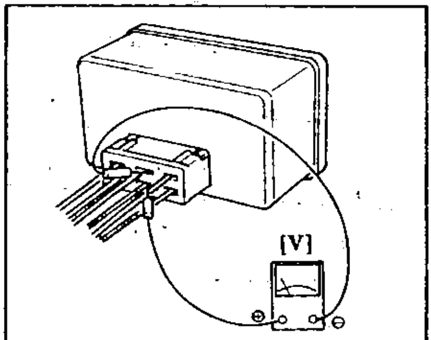
Location

The headlamp sensor is located on the relay bracket. Refer to page EL-105.

Inspection

Light switch on.

Before checking headlamp sensor, ensure that all bulbs meet specifications.

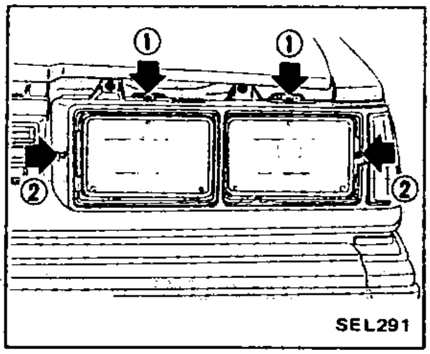


All bulbs in good order	**2 volts**
Bulb removed	**12volts**

SEL373

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.



1 Vertical adjustment
2 Horizontal adjustment

Before making headlamp aiming adjustment, observe the following instructions.

a. Keep all tires inflated to correct pressures.

b. Place car and tester on one and same flat surface.

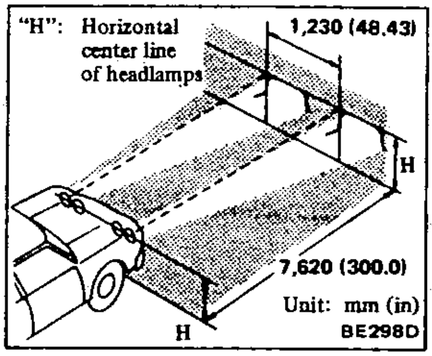
c. See that there is no load in car (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

Low beam

Turn headlamp low beam on.

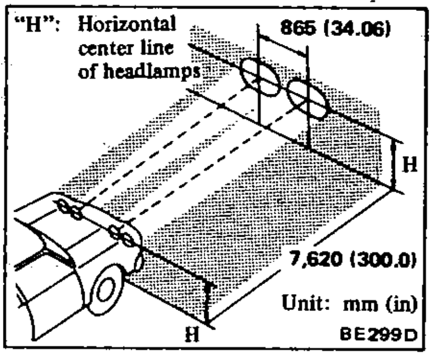


a. Adjust headlamps so that upper edge of hot spot is equal in height to headlamp height.

b. Dotted lines in illustration show center of headlamp.

High beam

With type II unit lamps (outer lamps) covered, turn headlamps to high beam.



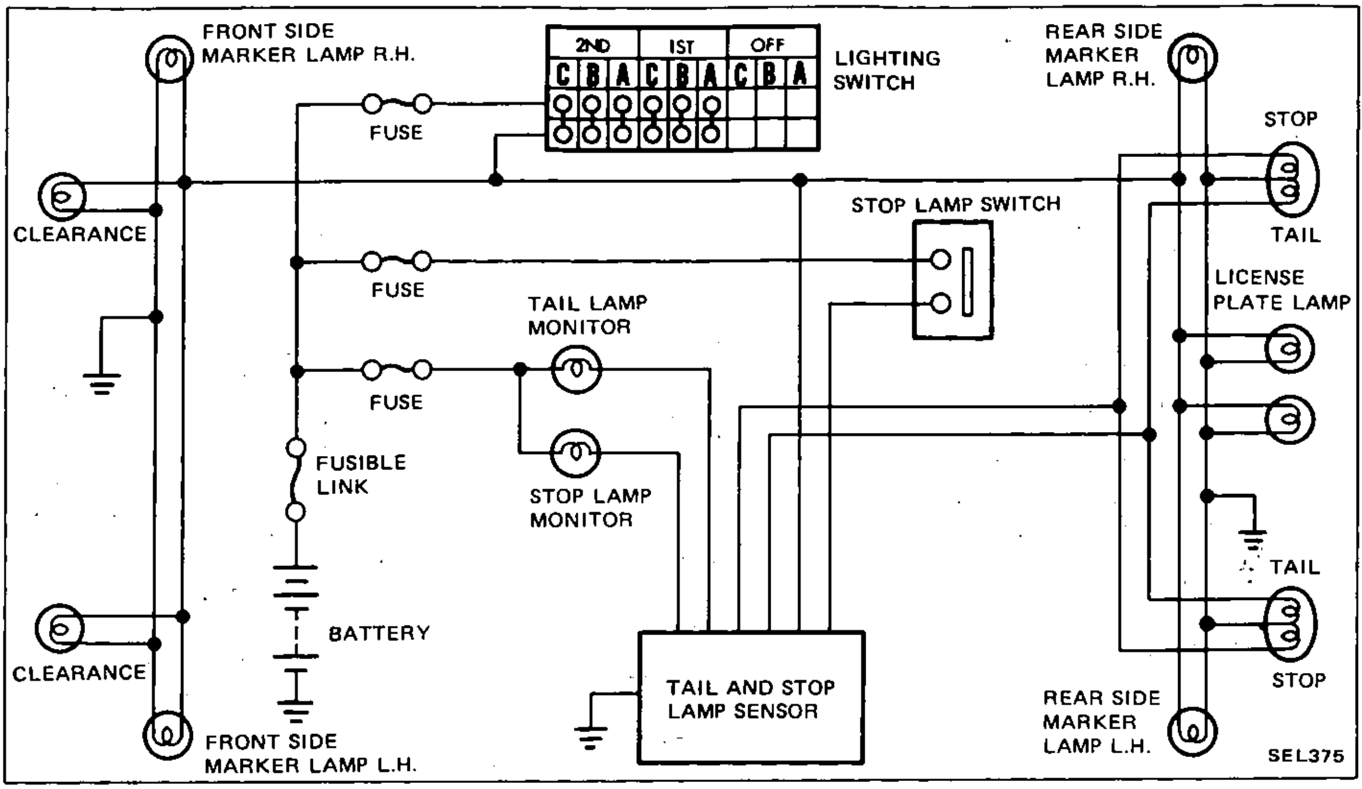
a. Adjust high beams so that main axis of light is parallel to center line of body.

b. Dotted lines in illustration show center of headlamp.

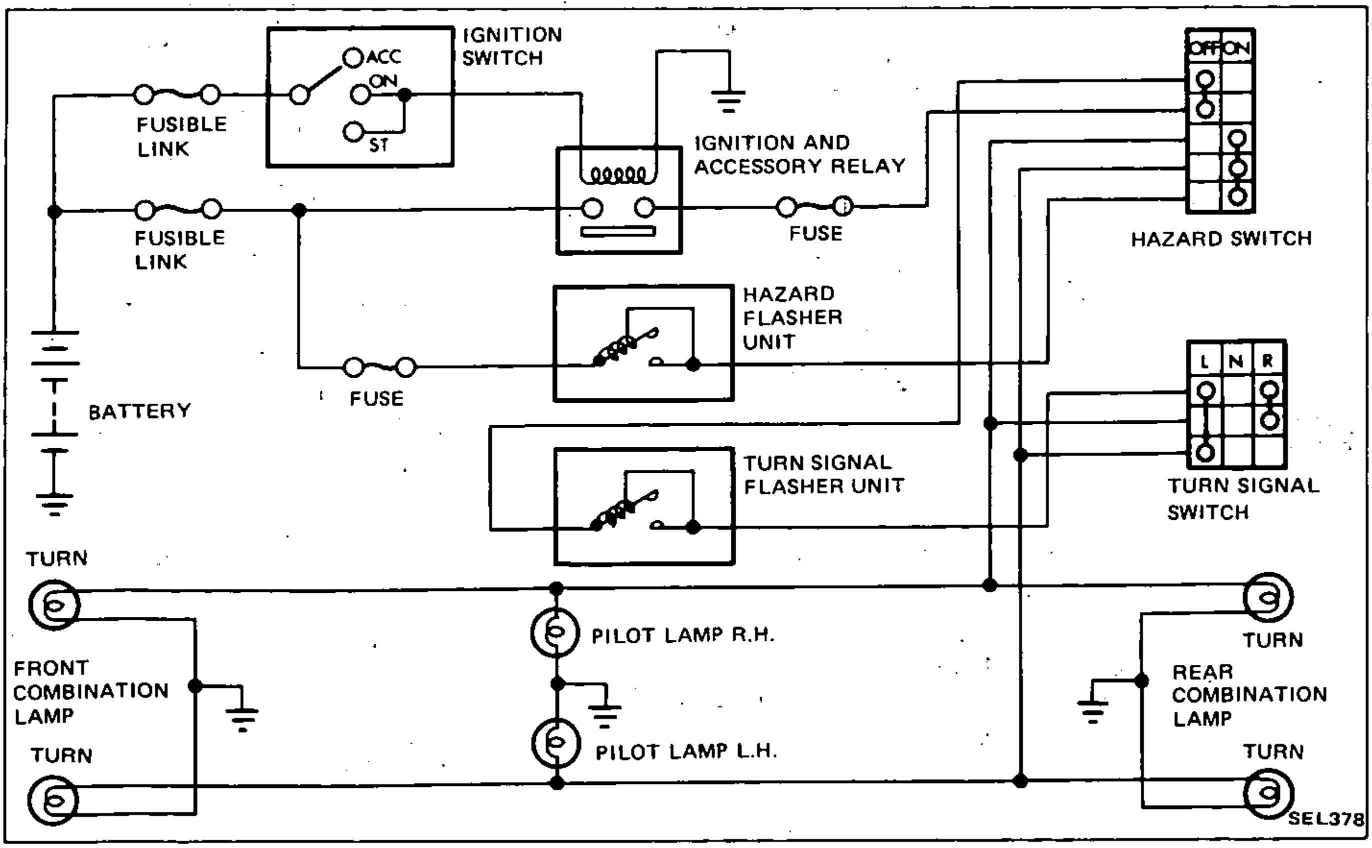
EXTERIOR LAMPS

CAUTION: Do not wipe lens surface using cloth dampered with gasoline.

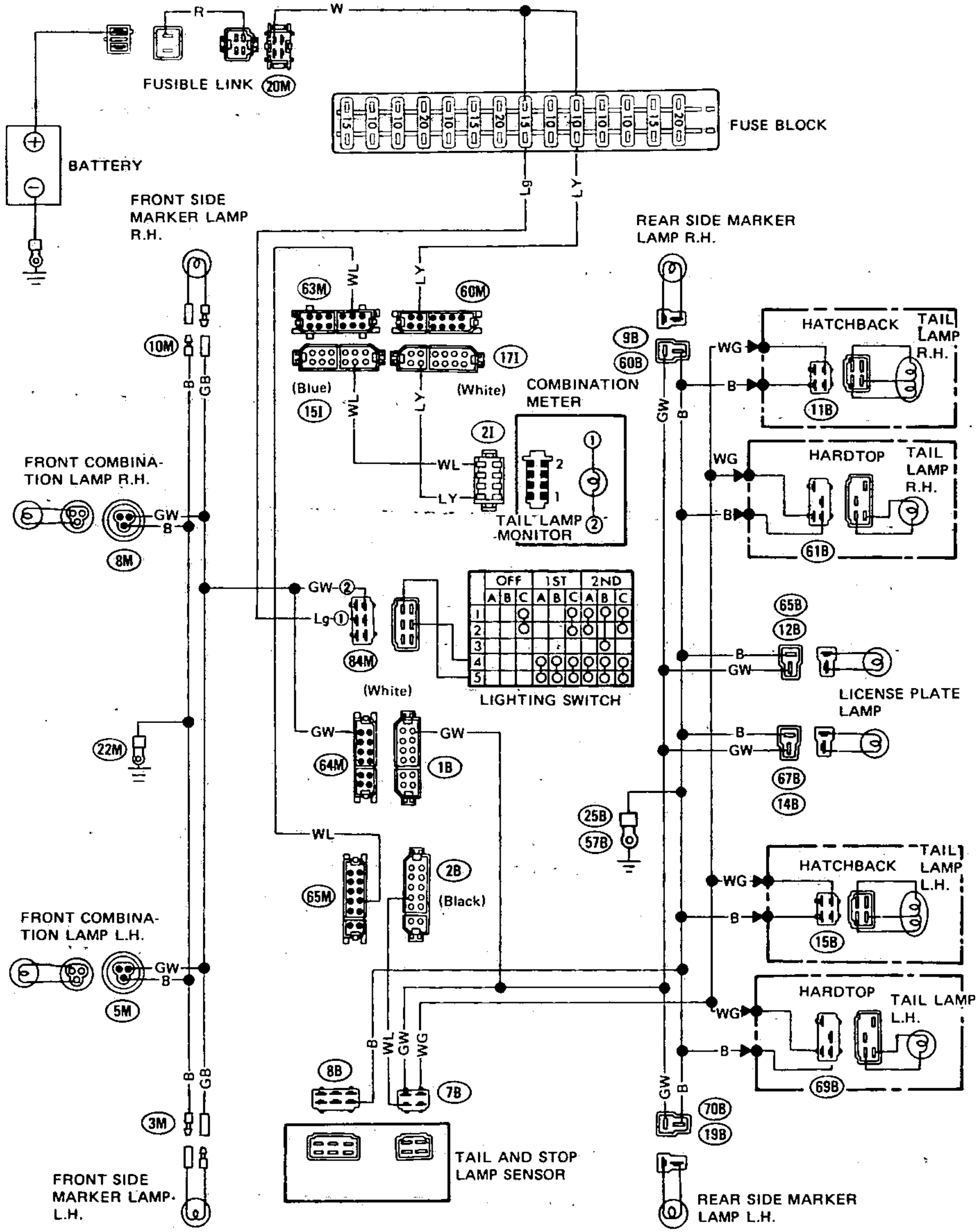
SCHEMATIC/TAIL, CLEARANCE, SIDE MARKER, LICENSE PLATE AND STOP LAMPS



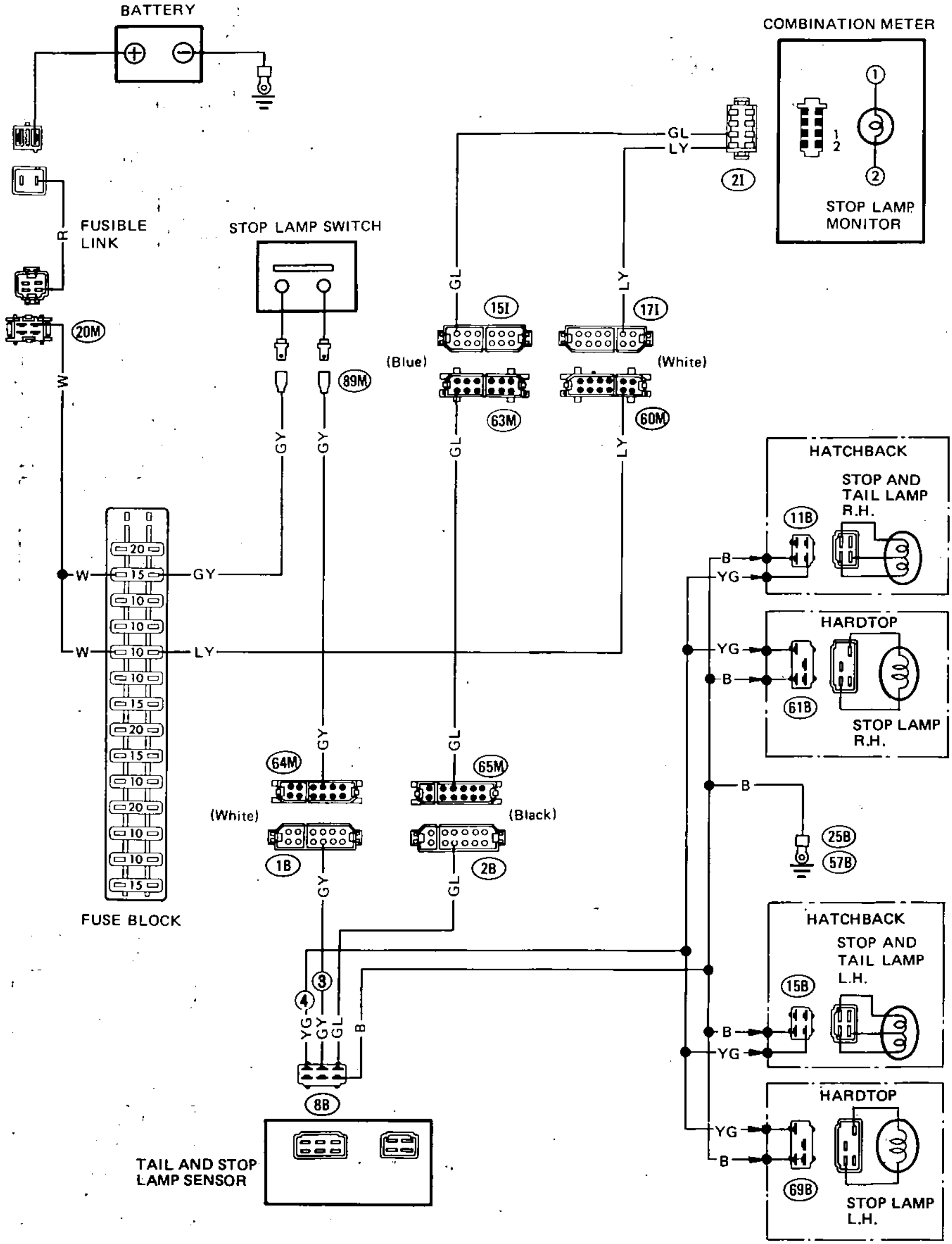
SCHEMATIC/TURN SIGNAL AND HAZARD WARNING LAMPS



WIRING DIAGRAM/TAIL, CLEARANCE, SIDE MARKER AND LICENSE PLATE LAMPS

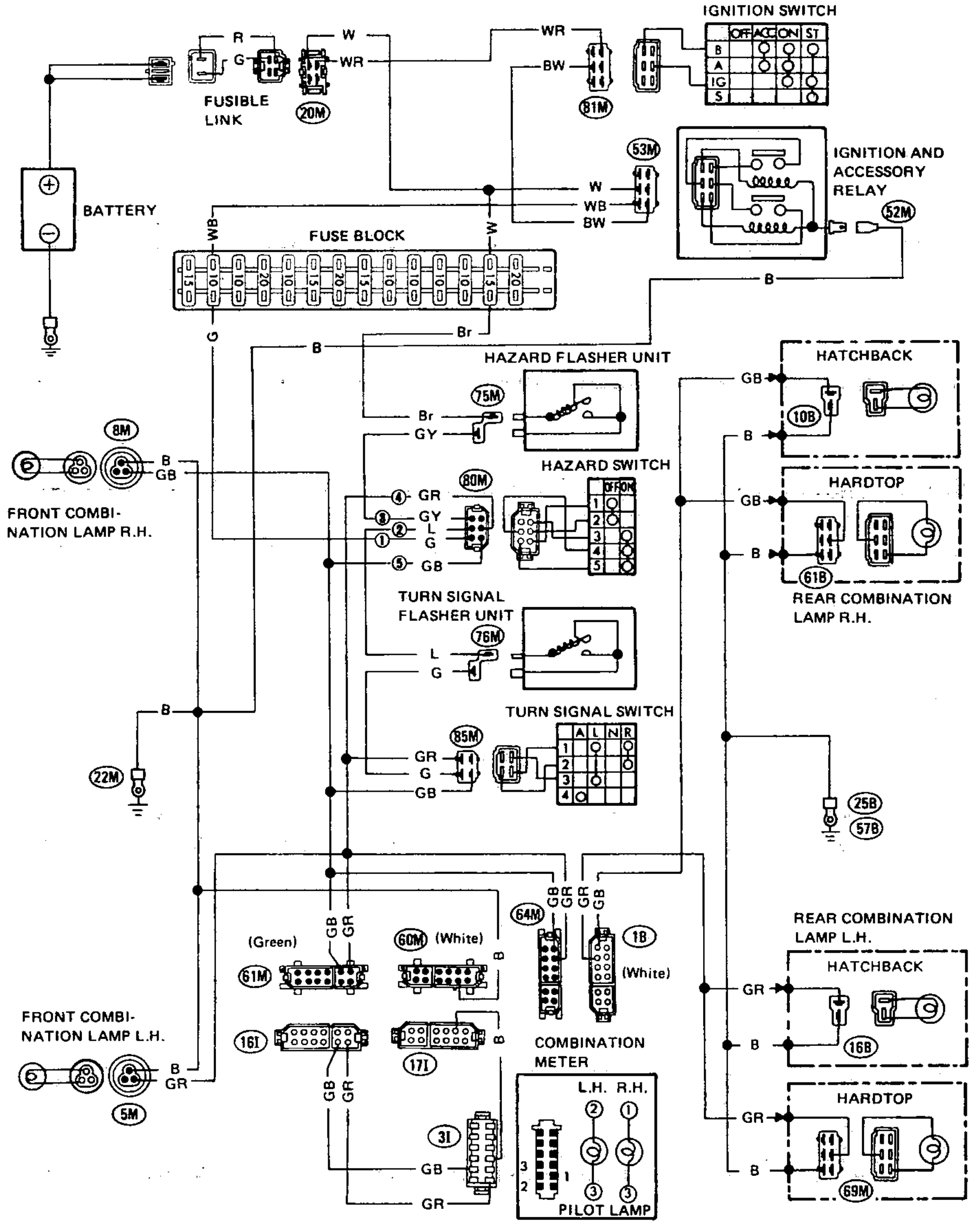


WIRING DIAGRAM/STOP LAMP



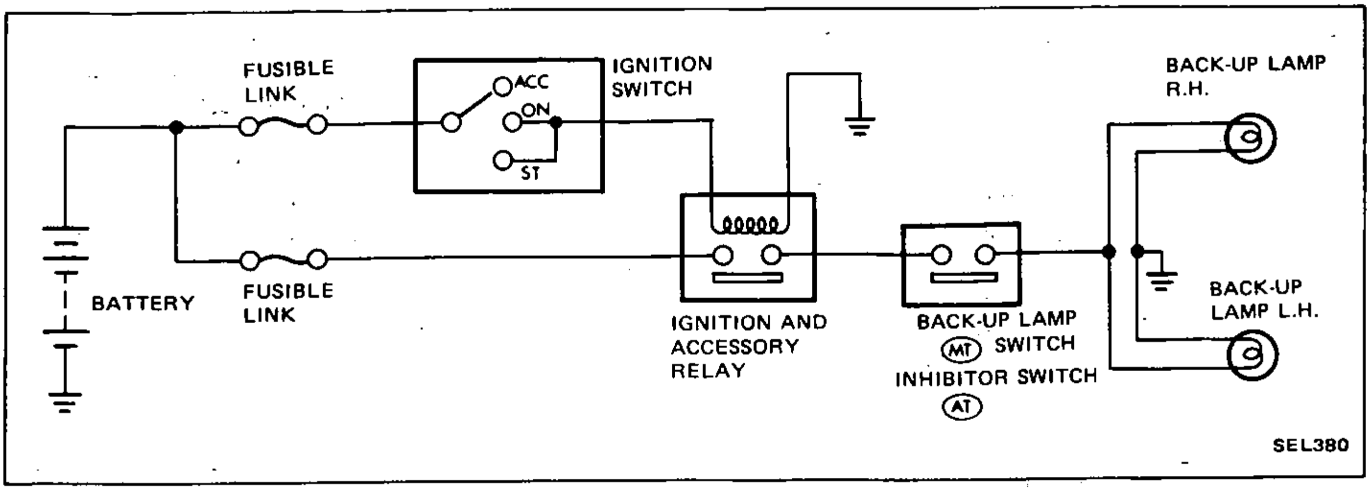
SEL377

WIRING DIAGRAM/TURN SIGNAL AND HAZARD WARNING LAMPS

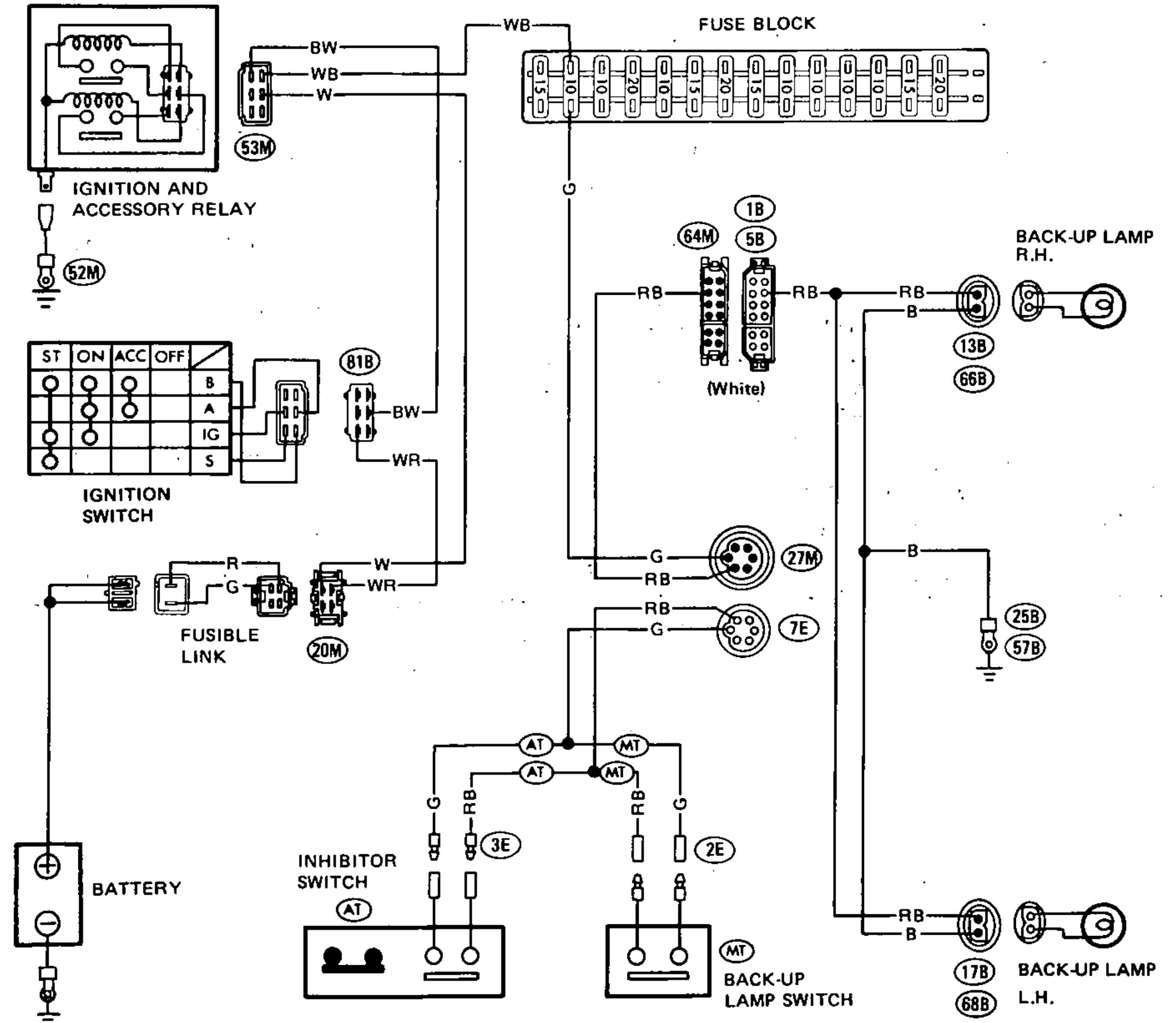


SEL379

SCHEMATIC/BACK-UP LAMP



WIRING DIAGRAM/BACK-UP LAMP



SEL381

TROUBLE DIAGNOSES AND CORRECTIONS

Clearance, side marker, license plate and tail lamps

Condition	Probable cause	Corrective action
Neither left nor right lamp lights.	Burnt fuse.	Correct cause and replace.
	Loose connection or open circuit.	Check wiring and/or repair connection.
	Faulty lighting switch. [Lamps light when ① and ② terminals of harness connector to combination switch are connected with test lead including 15A fues].	Replace if necessary.
	Faulty tail and stop lamp sensor. (Tail lamp only)	Replace tail and stop lamp sensor.
Lamp on only one side lights.	Burnt bulb.	Replace.
	Loose bulb.	Repair lamp socket.
	Loose connection or open circuit.	Check wiring and/or repair connection.

Stop lamps

Condition	Probable cause	Corrective action
Neither left nor right lamp lights.	Burnt fuse.	Correct cause and replace.
	Faulty stop switch.	Conduct continuity test and replace if necessary.
	Faulty tail and stop lamp sensor. [Stop lamps light when ③ and ④ terminals of main harness connector to tail and stop lamp sensor are connected with test lead including 10A fuse].	Replace if necessary.
	Loose connection or open circuit.	Check wiring and/or repair connection.
Lamp on only one side lights.	Burnt bulb.	Replace.
	Loose bulb.	Repair lamp socket.
	Loose connection or open circuit.	Check wiring and/or repair connection.

Turn signal and hazard warning flasher lamps

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, ④ and ⑤ terminals of harness connector to hazard switch are connected with test lead including 10A fuse].	Correct cause and replace. Replace. Replace if necessary.
Turn signals and hazard warning lamps do not operate.	Faulty hazard switch. Loose connection.	Replace if necessary. Reconnect firmly.
No flasher click is heard.	Burnt bulb. Faulty flasher unit. Loose connection.	Replace. Replace flasher unit. 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. Reconnect firmly. Replace flasher unit.
Flashing cycle is irregular.	Burnt bulb. Loose connection. Bulbs other than specified wattage being used. Faulty flasher unit.	Replace. Repair. Replace with one specified. Replace flasher unit.

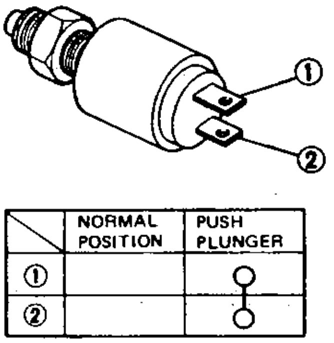
LIGHTING SWITCH AND TURN SIGNAL SWITCH

Refer to "Combination Switch".

STOP LAMP SWITCH

Inspection

Test continuity through switch with an ohmmeter.



SEL368

Adjustment

Refer to MA section.

TAIL AND STOP LAMP SENSOR (Transistor built-in)

Removal and installation

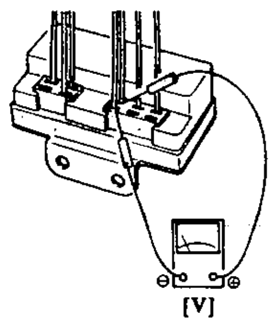
Before removing tail and stop lamp sensor, detach rear wheelhouse finisher. See page EL-105.

Before checking tail and stop lamp sensor, ensure that all bulbs meet specifications.

Inspection

Stop lamp

Stop lamp switch on.

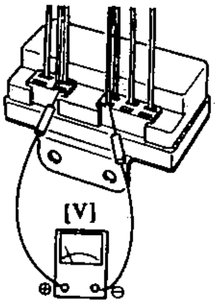


Bulb in good order	**Approx. 2 volts**
Bulb removed	**Approx. 12 volts**

SEL385

Tail lamp

Light switch on.

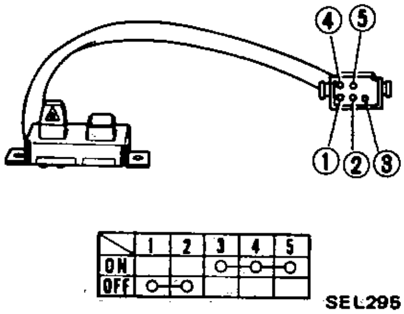


Bulb in good order	**Approx. 2 volts**
Bulb removed	**Approx. 12 volts**

SEL386

HAZARD SWITCH

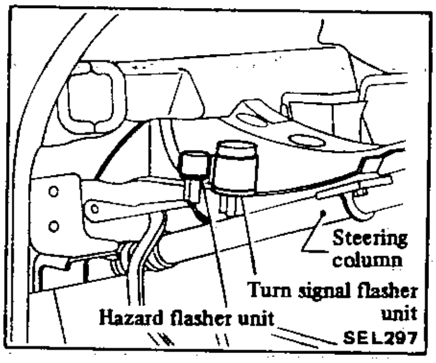
Inspection



SEL295

TURN SIGNAL FLASHER UNIT AND HAZARD FLASHER UNIT

Location



SEL297

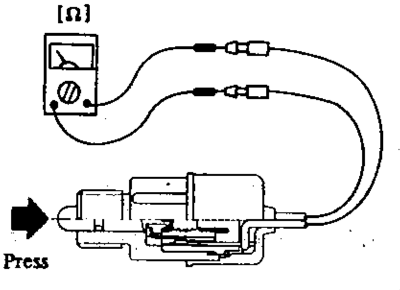
BACK-UP LAMP SWITCH

Automatic transmission

The back-up lamp switch is built into the inhibitor switch. Refer to AT section.

Manual transmission

The back-up lamp switch is installed on the manual transmission case.

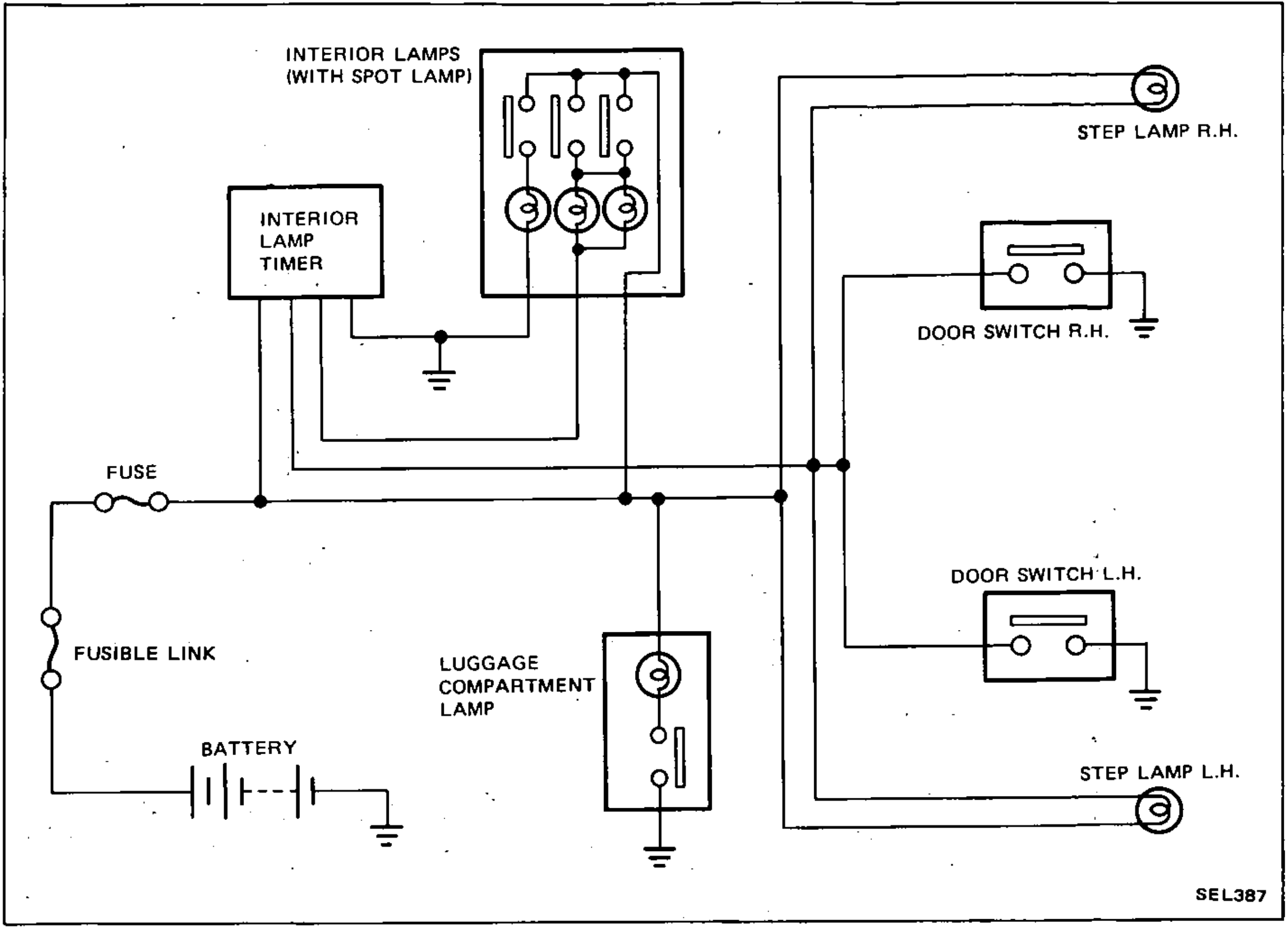


SEL298

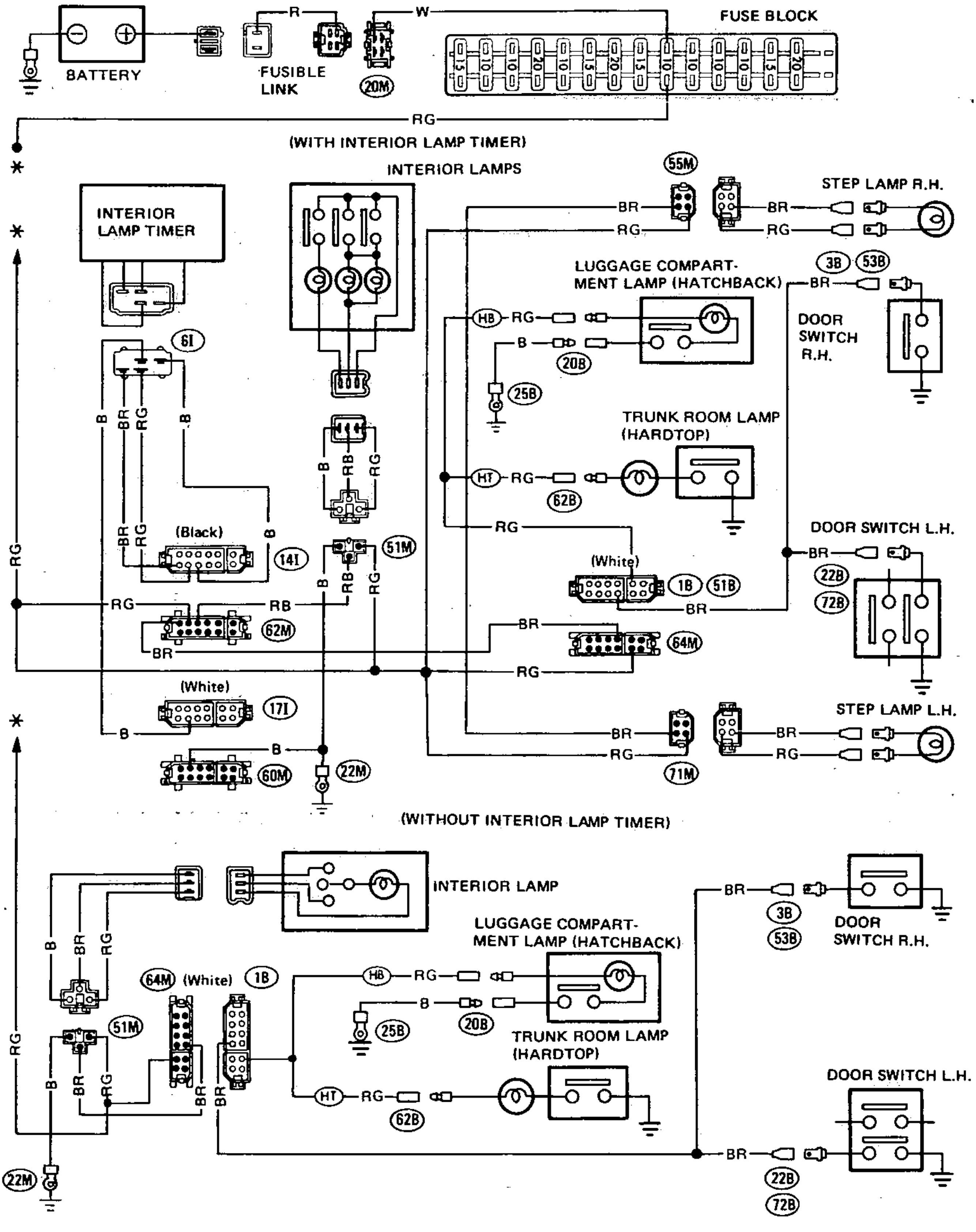
INTERIOR, LUGGAGE COMPARTMENT AND STEP LAMPS

CAUTION: Do not wipe lens surface using cloth dampered with gasoline.

SCHEMATIC/INTERIOR, LUGGAGE COMPARTMENT AND STEP LAMPS (Hatchback model with interior lamp timer)



WIRING DIAGRAM/INTERIOR LAMP, STEP LAMP AND LUGGAGE COMPARTMENT LAMP



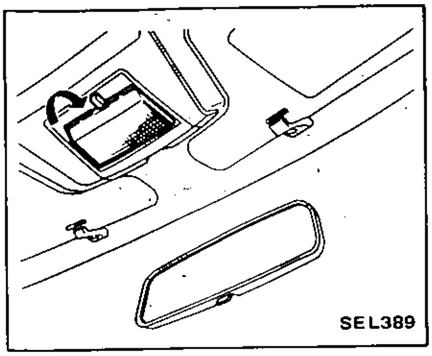
SEL388

INTERIOR LAMP

Bulb replacement

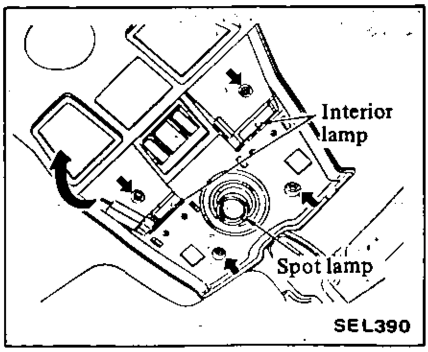
Without spot lamp

Remove lens by inserting a flat-blade screwdriver into switch hole. To avoid lens damage, blade portion should be covered with a cloth before insertion.


SEL389

With spot lamp

1. Open cover with a flat-blade screwdriver inserted into front of cover. To avoid cover damage, blade portion should be covered with a cloth before insertion.
2. Remove attaching bolts and detach interior lamp assembly.

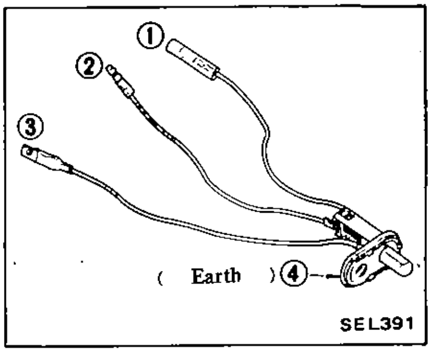


SEL390

DOOR SWITCH

Inspection

Door switch L.H.



SEL391

	DOOR		FOR USE
	CLOSE	OPEN	
1		○	KEY AND LIGHT WARNING
2		○	
3		○	INTERIOR LAMP
4		○	

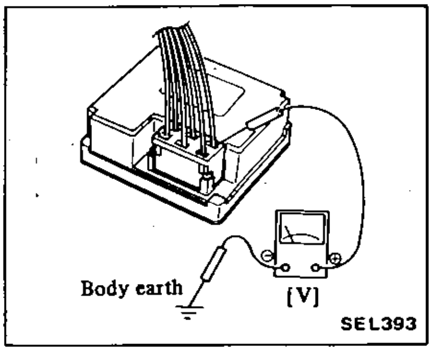
INTERIOR LAMP TIMER (IC built-in)

Location

The interior lamp timer is attached to the upper side of instrument frame.

Refer to page EL-104.

Inspection



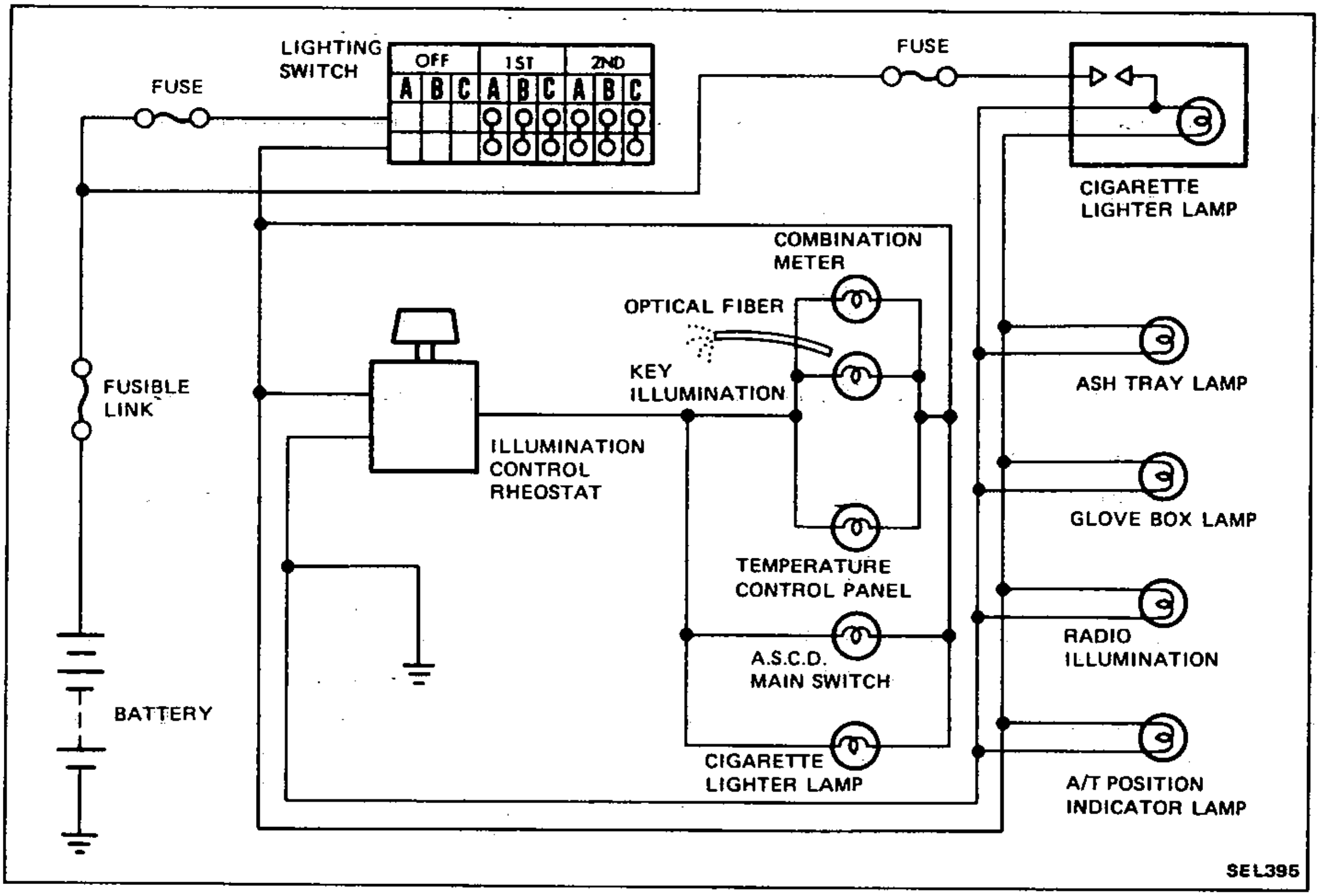
SEL393

Circuit tester indication:

As door is closed, tester indication should linearly increase from 0 to approximately 10 volts after 10 seconds.

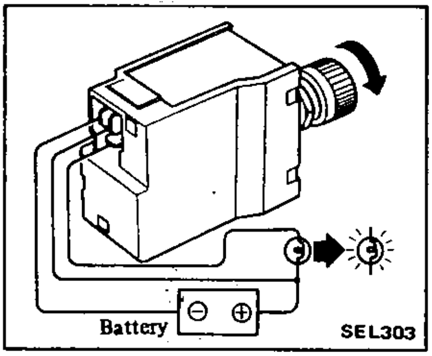
INSTRUMENT PANEL ILLUMINATION

SCHEMATIC/INSTRUMENT PANEL ILLUMINATION AND CIGARETTE LIGHTER

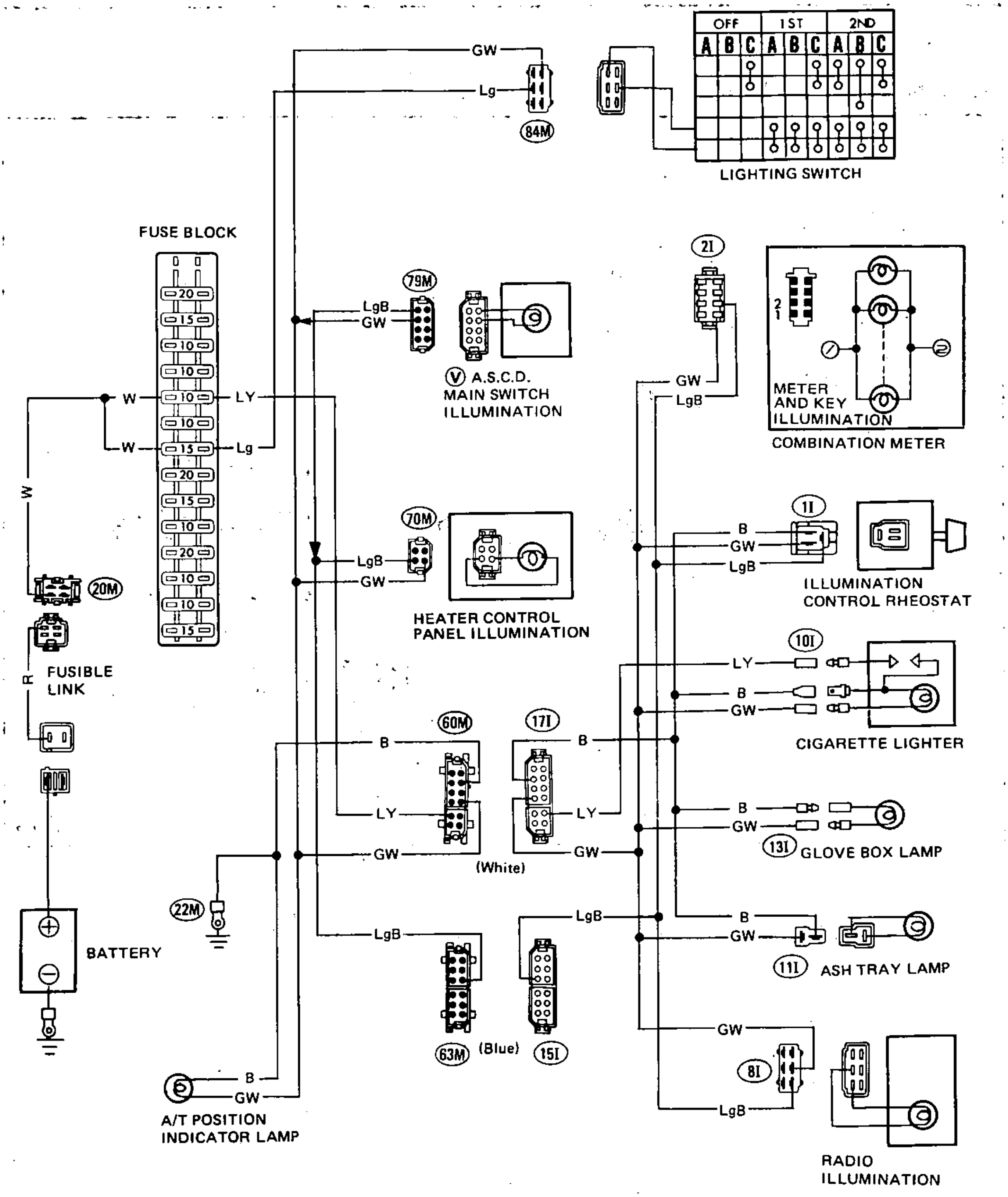


ILLUMINATION CONTROL RHEOSTAT (Transistor buit-in)

Inspection



WIRING DIAGRAM/INSTRUMENT PANEL ILLUMINATION AND CIGALETTE LIGHTER



Ⓥ : A.S.C.D. equipped models

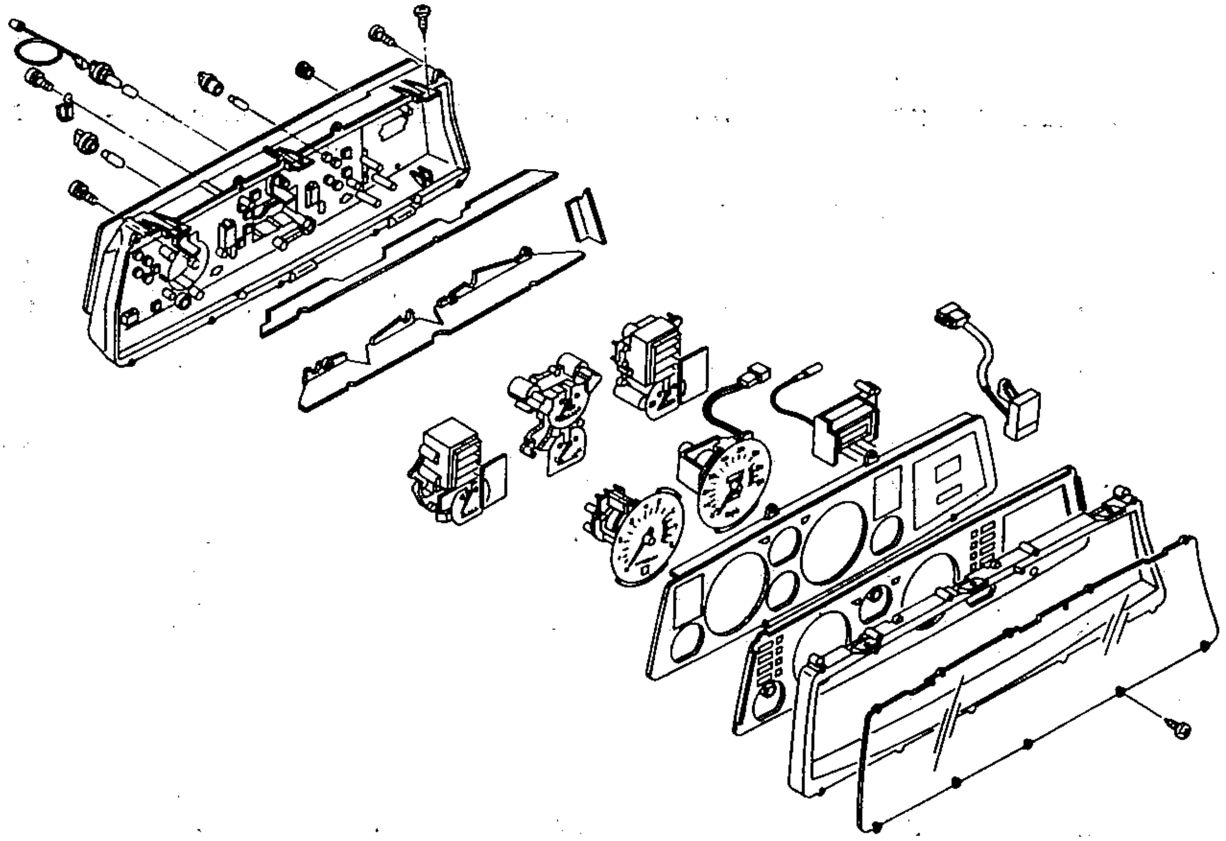
SEL396

METERS, GAUGES AND WARNING SYSTEM

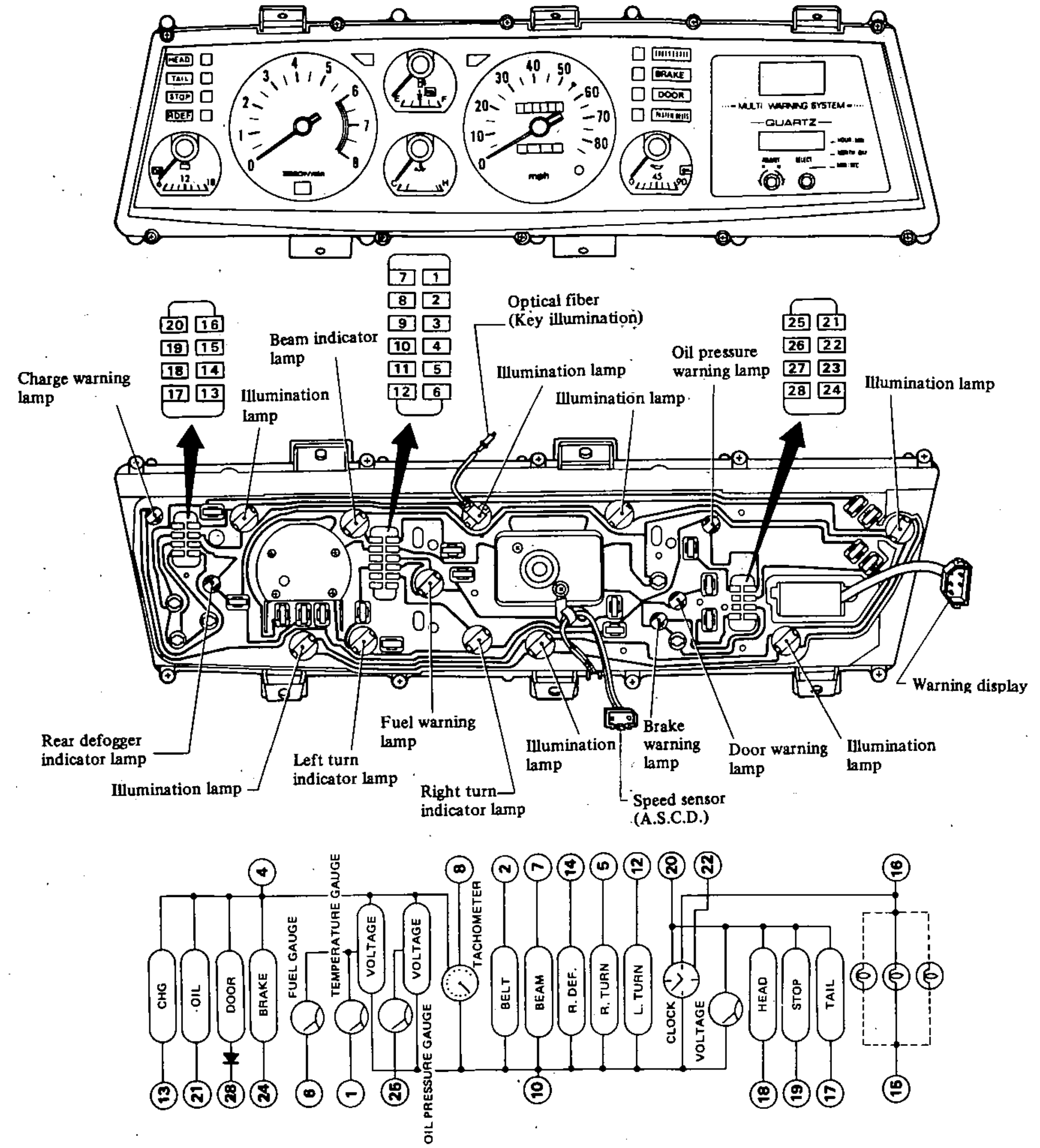
CAUTION: Before starting to work on any part of electrical system, disconnect battery ground cable.

COMBINATION METER

REMOVAL AND INSTALLATION



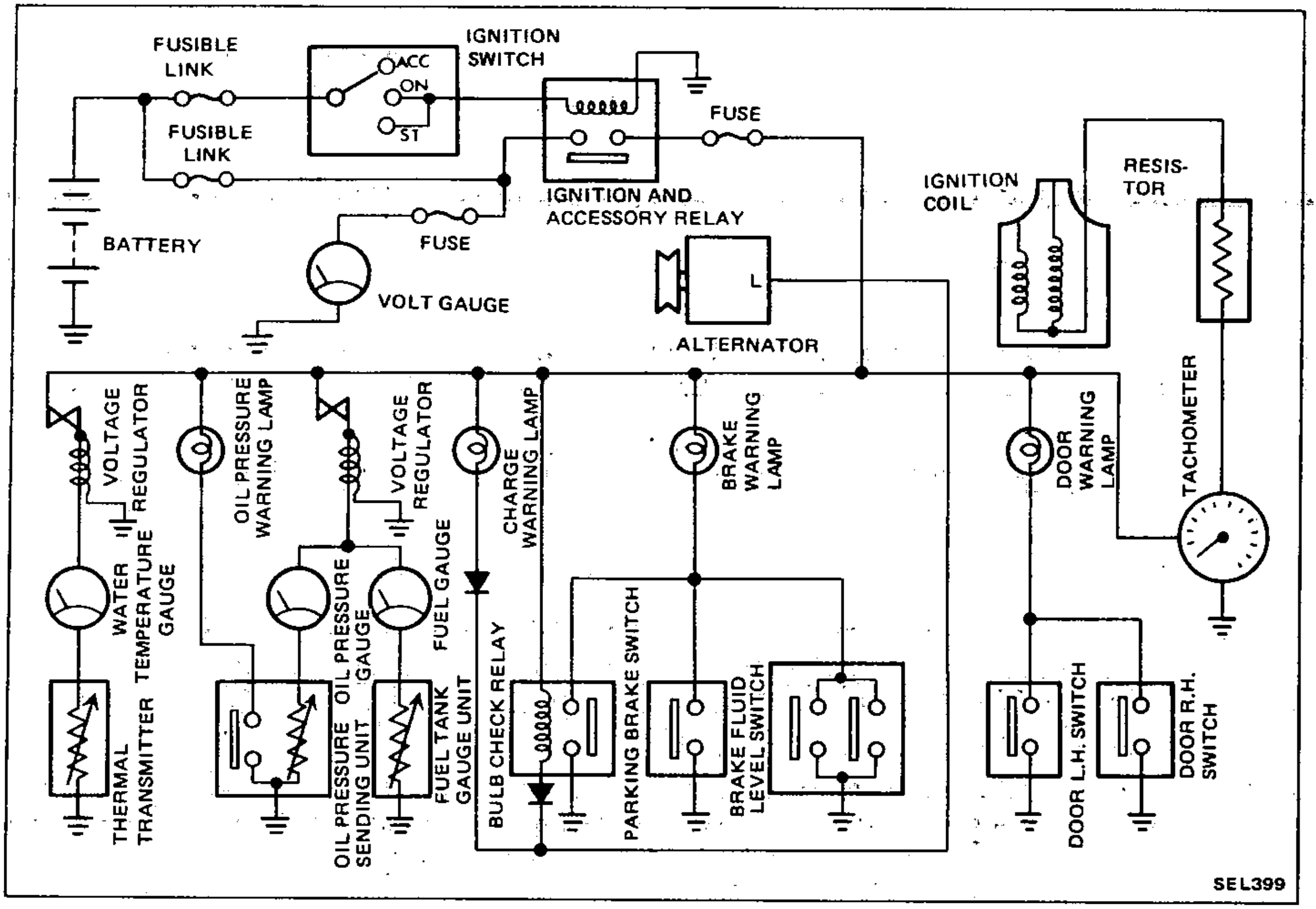
INSPECTION



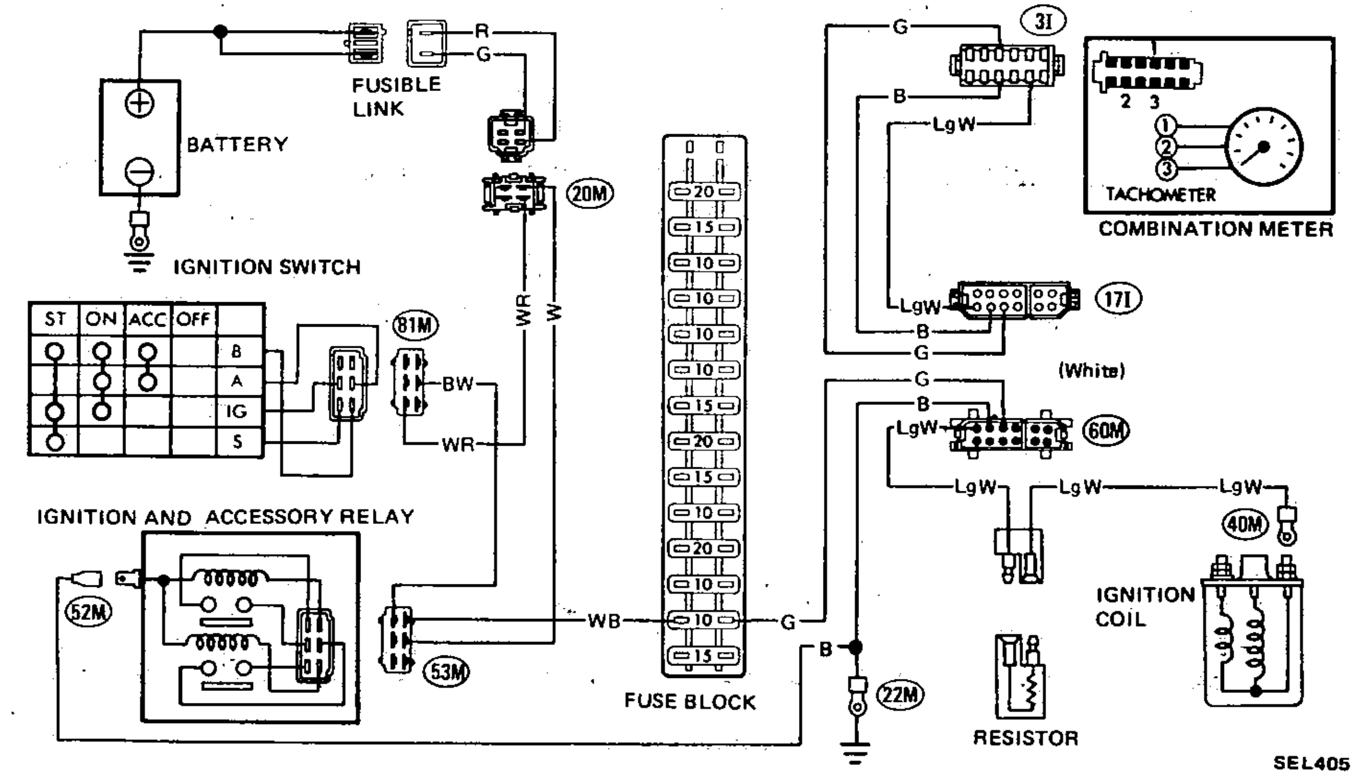
1	Temperature gauge
2	Seat belt warning lamp
4	Power source
5	Right turn indicator lamp
6	Fuel gauge
7	Beam indicator lamp
8	Tachometer (Signal)
10	Ground
12	Left turn indicator lamp
13	Charge warning lamp
14	Rear defogger indicator lamp
15	Illumination lamps
16	Illumination lamps
17	Tail lamp monitor lamp
18	Headlamp monitor lamp
19	Stop lamp monitor lamp
20	Clock (Power source)
21	Oil pressure warning lamp
22	Clock (Illumination)
24	Brake warning lamp
25	Oil pressure gauge
28	Door warning lamp

SEL398

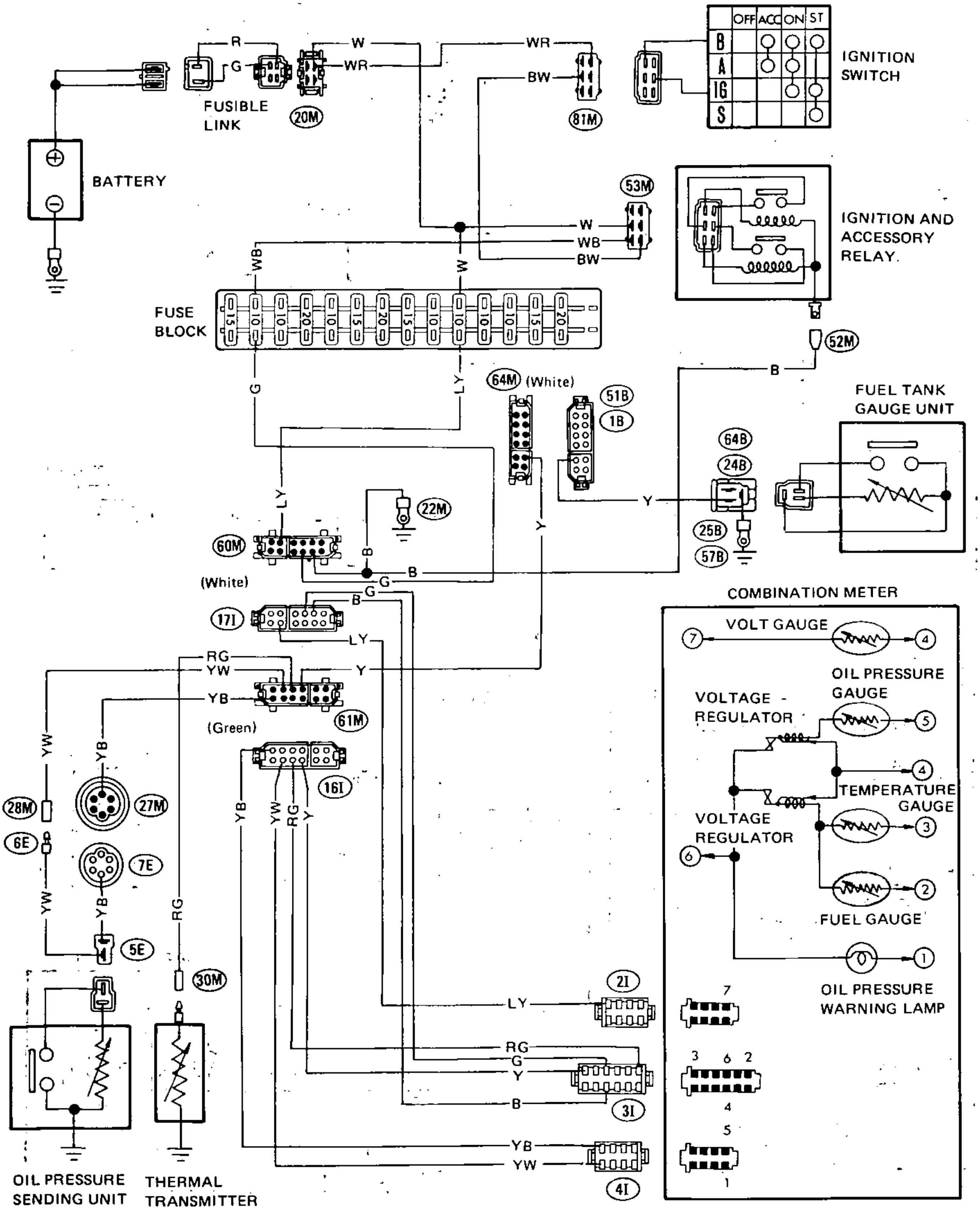
SCHEMATIC/TACHOMETER, GAUGES AND WARNING LAMPS



WIRING DIAGRAM/TACHOMETER

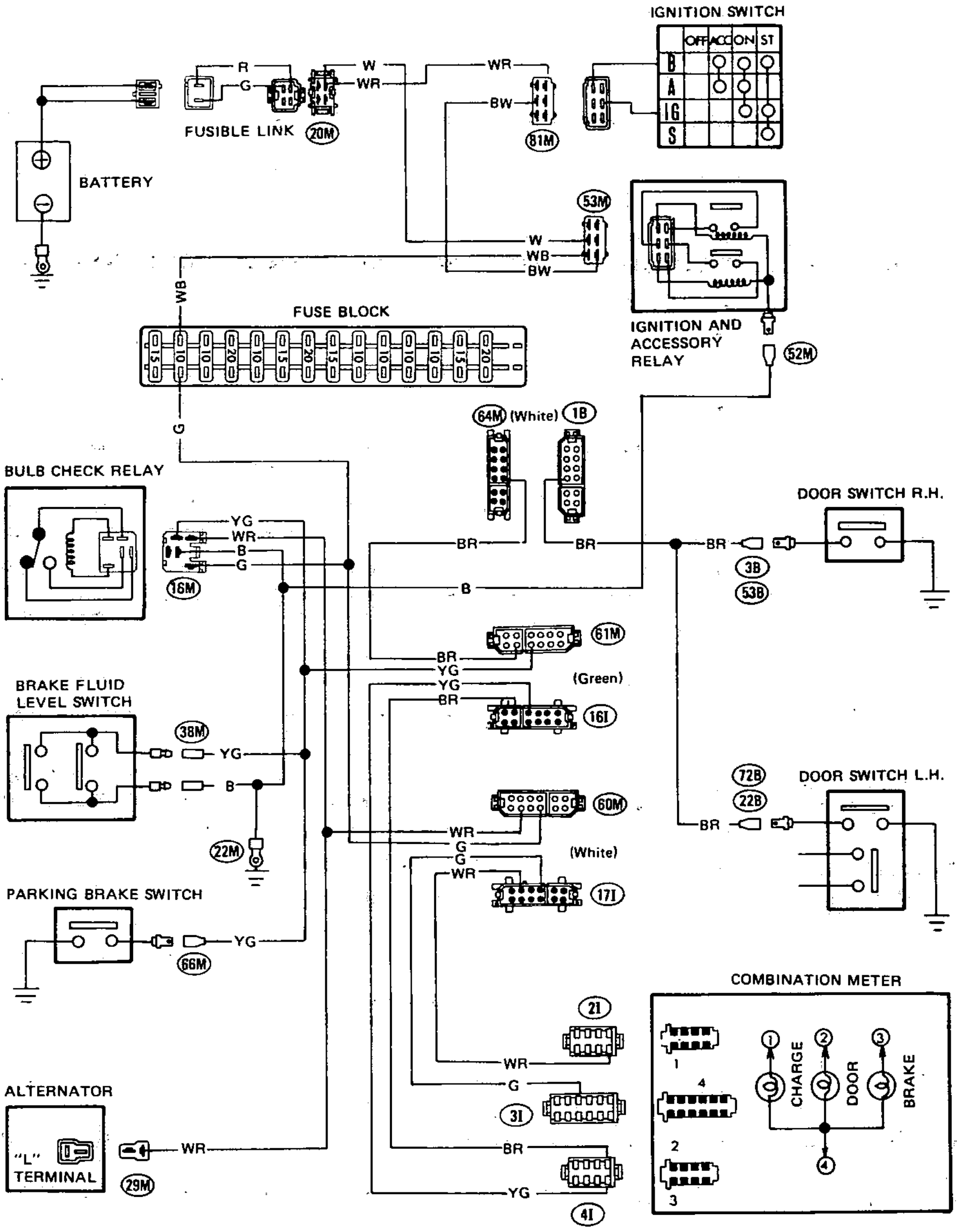


WIRING DIAGRAM/OIL PRESSURE GAUGE AND WARNING LAMP, WATER TEMPERATURE, FUEL, AND VOLT GAUGE



SEL404

WIRING DIAGRAM/CHARGE, DOOR AND BRAKE WARNING LAMP



SEL366

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Water temperature gauge		
Gauge does not operate.	Faulty thermal transmitter or loose terminal connection. (When wire to thermal transmitter is grounded, gauge pointer fluctuates.)	Replace thermal transmitter or correct terminal connection.
	Faulty water temperature gauge.	Replace water temperature gauge.
Gauge indicates only maximum temperature.	Faulty thermal transmitter. (Gauge pointer returns to original position when ignition switch is turned off.)	Replace thermal transmitter.
	Faulty water temperature gauge. (Gauge pointer indicates maximum temperature even after ignition switch is turned off.)	Replace water temperature gauge.
Gauge does not operate accurately.	Faulty water temperature gauge.	Replace water temperature gauge.
	Loose or poor connection.	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.)	Replace.
	Faulty oil pressure gauge. (Gauge pointer indicates maximum pressure even after ignition switch is turned off.)	Replace.
Fuel level gauge		
Fuel level gauge does not operate.	Faulty fuel gauge tank unit. [Pointer deflects when fuel gauge tank unit yellow wire is grounded.]	Replace fuel gauge tank unit.
	Faulty fuel level gauge.	Replace.
	Loose connection or open circuit.	Check wiring and/or repair connection.
Pointer indicates only "F" position.	Faulty fuel gauge tank unit.	Replace.
	Faulty fuel level gauge.	Replace.
Fuel level gauge does not operate accurately.	Faulty fuel gauge tank unit.	Replace.
	Faulty fuel gauge.	Replace fuel level gauge.
	Poor or loose connection.	Correct connector terminal contact.
	Faulty gauge voltage regulator.	Replace gauge assembly.
Volt gauge		
Volt gauge does not operate, or abnormally indicates.	Faulty volt gauge.	Replace.
	Loose or poor connection.	Check wiring and/or repair connection.

Charge and brake warning lamps

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. Faulty alternator.	Replace bulb or correct. Correct connector terminal contacts. Replace. Replace. Repair or replace.
Charge warning lamp Lamp does not go out when engine is started.	Faulty charging system.	Inspect charging system.
Brake warning lamp Lamp does not go out.	Faulty parking brake switch (When parking brake lever is released). Faulty brake fluid level switch (When brake fluid level is normal).	Replace. Replace.

Oil pressure and door warning lamps

Condition	Probable cause	Corrective action
Oil pressure warning lamp Lamp does not light when ignition switch is set to "ON".	Faulty oil pressure sending unit or loose terminal connection. (When lead wire connected to sending unit is grounded, warning lamp lights.) Burnt bulb or loose bulb.	Replace or correct connection. Replace bulb or correct.
Lamp does not go out while engine is being operated.	Lack of engine oil. Oil pressure too low. Faulty oil pressure sending unit.	Check oil level and add oil as required. Inspect engine oil pressure system. Replace.
Door warning lamp Lamp does not glow with door opened and engine running.	Faulty door switch. Burnt bulb or loose bulb.	Replace. Replace bulb or correct.

Tachometer

Condition	Probable cause	Corrective action
Tachometer pointer deflects.	Loose or poor connection. Faulty resistor. Faulty tachometer.	Repair. Replace resistor. Repair or replace tachometer.
Tachometer pointer will not move.	Loose or poor connection. Faulty tachometer.	Repair. Repair or replace tachometer.

Speedometer

Condition	Probable cause	Corrective action
Neither speedometer pointer nor odometer operates.	Loose speedometer cable union nut. Broken speedometer cable (Meter side or Transmission side). Damaged transmission speedometer pinion gear. Faulty speedometer.	Retighten. Replace speedometer cable. Replace transmission speedometer pinion gear. Replace speedometer.
Unstable speedometer pointer.	Improperly tightened or loose speedometer cable union nut. Damaged speedometer cable. Faulty speedometer.	Retighten. Replace speedometer cable. Replace speedometer.
Unusual sound occurs in response to increase in driving speed.	Excessively bent or twisted speedometer cable inner wire or lack of lubrication. Faulty speedometer.	Replace or lubricate. Replace speedometer.
Inaccurate speedometer indication.	Faulty speedometer.	Replace speedometer.
Inaccurate odometer operation.	Faulty speedometer.	Replace speedometer.

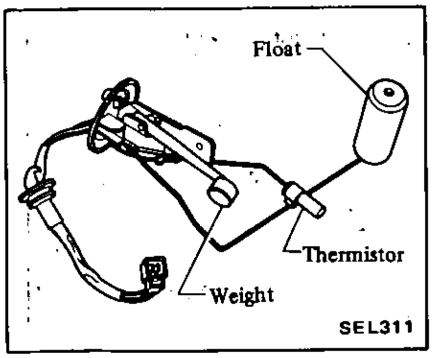
FUEL TANK GAUGE UNIT

Removal and Installation

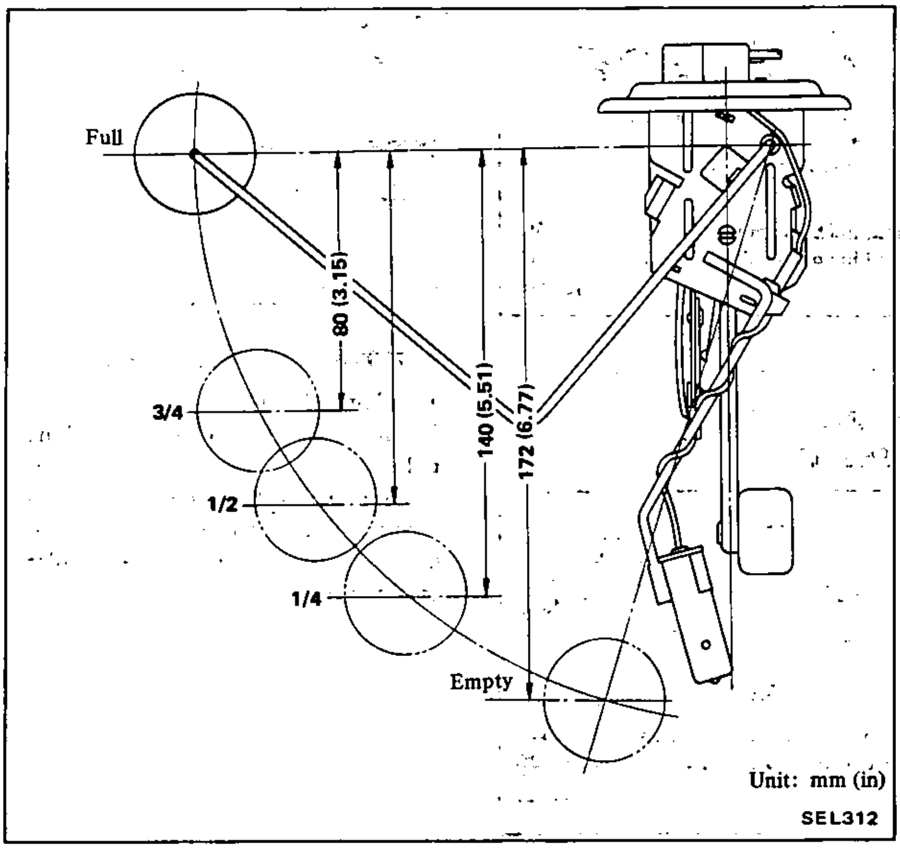
Refer to FE section.

Inspection

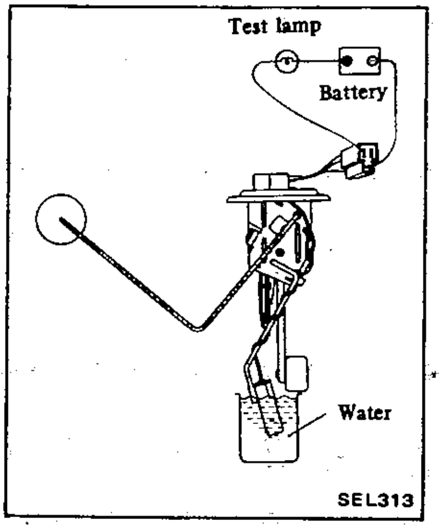
Fuel tank gauge unit has two functions.



(a) Float (For fuel gauge)

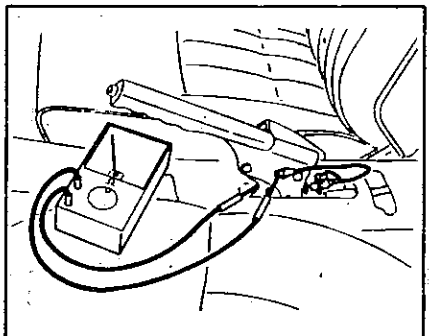


(b) Thermistor (For multi-warning display)



Test lamp should come on in approximately three minutes after removal of thermistor from water.

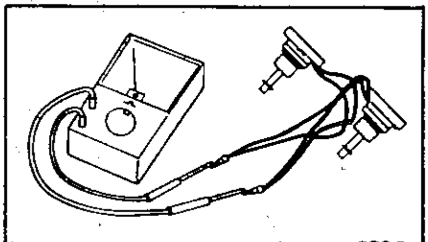
PARKING BRAKE SWITCH



Parking brake pulled 0Ω
Parking brake released . . . . ∞Ω

SEL309

BRAKE FLUID LEVEL SWITCH



Float raised . . . . Approx. 250Ω
Float lowered . . . . Approx. 0Ω

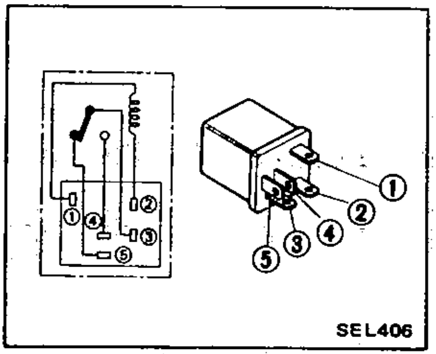
SEL310

BULB CHECK RELAY

Location

The bulb check relay is attached to the relay bracket. Refer to page EL-105.

Inspection



DIODE
(For charge warning lamp)

Location

The diode for charge warning lamp is fastened to harness with tape, on the right side of the dash panel. Refer to page EL-109.

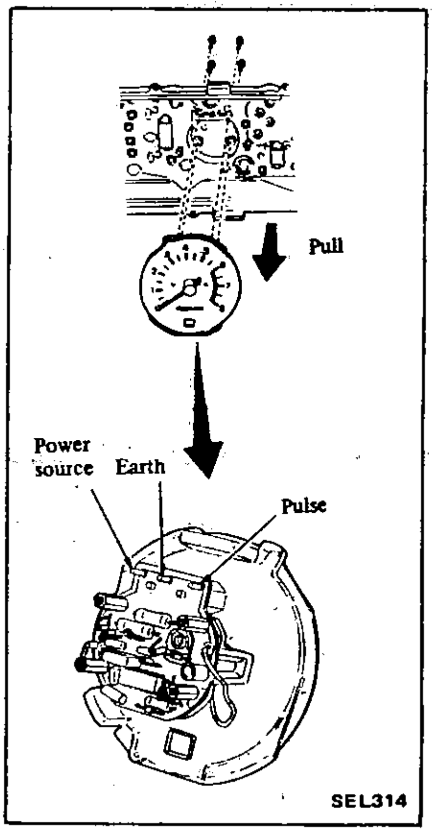
DOOR SWITCH

Refer to page EL-53.

TACHOMETER

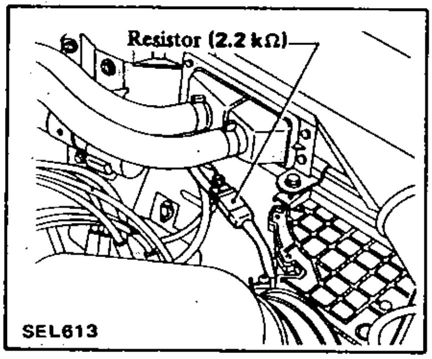
Removal and Installation

1. Remove combination meter.
2. Remove tachometer attaching bolts.
3. Remove tachometer from combination meter lower housing.
4. Installation is in the reverse order of removal.



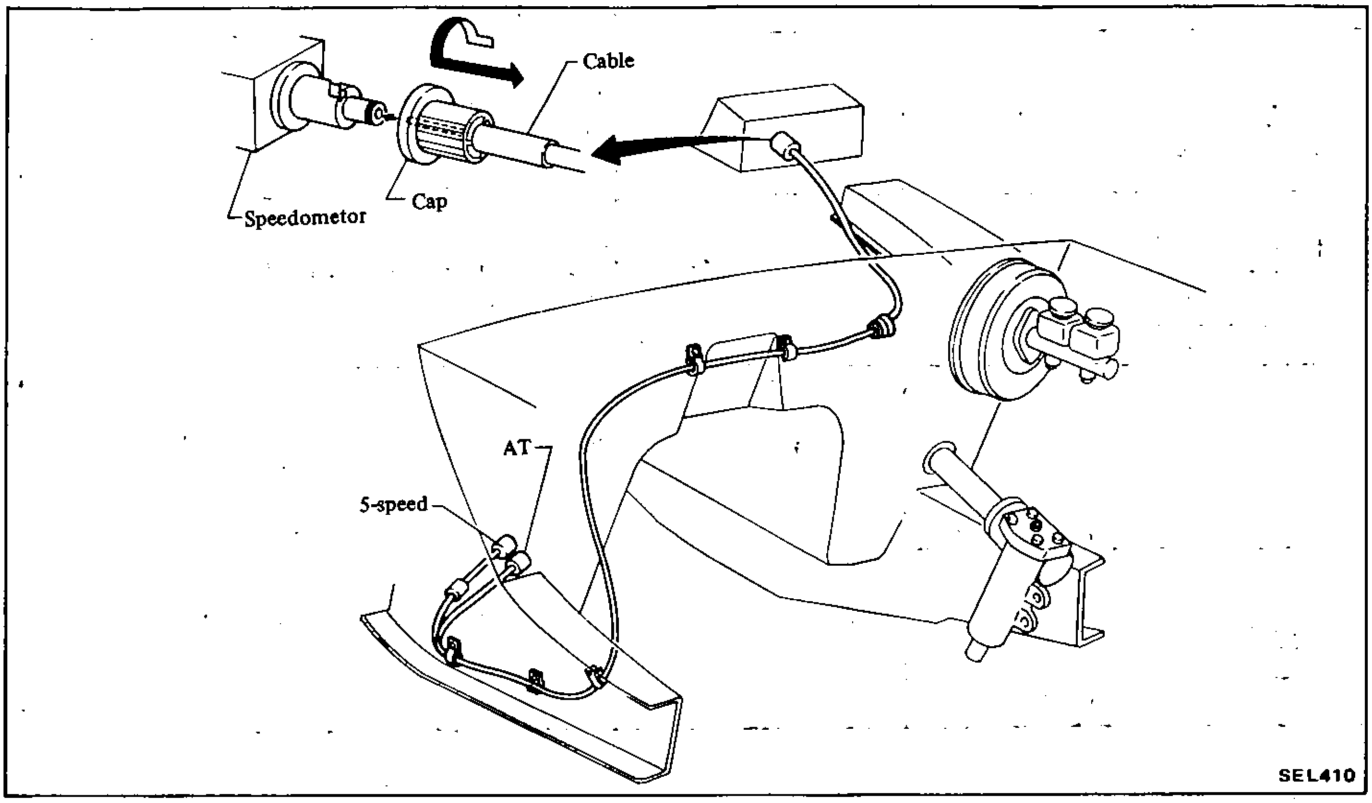
RESISTOR (For tachometer and EFI system)

A 2.2 kΩ resistor for tachometer and EFI system is located near the ignition coil.



SPEEDOMETER

Cable layout



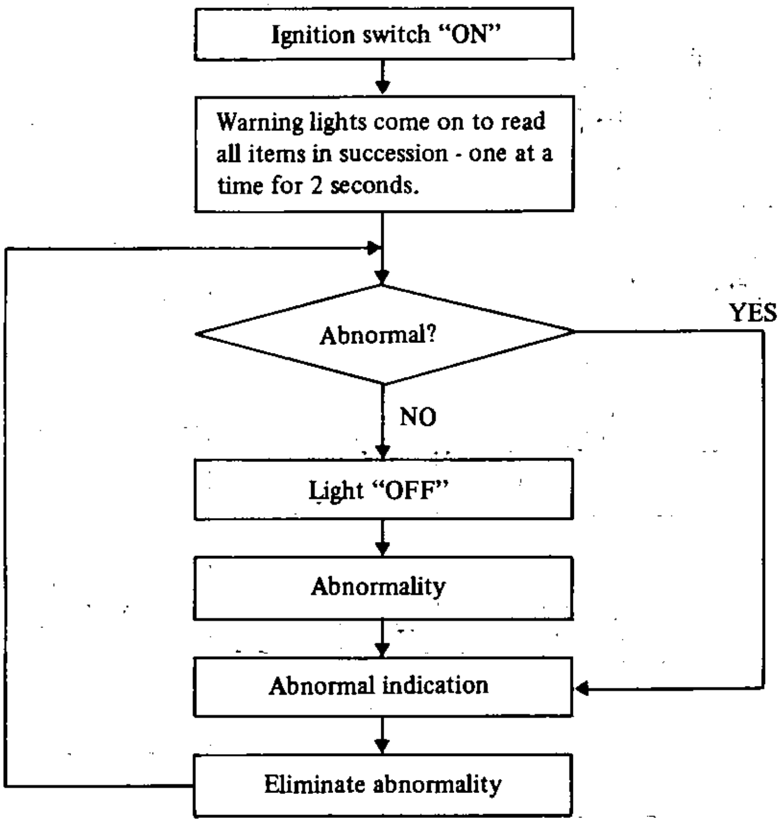
For detailed information regarding speed sensor (A.S.C.D.), refer to page EL-102.

WARNING DISPLAY

DESCRIPTION

The warning display system consists of a warning indicator, a warning display amplifier, and sensors.

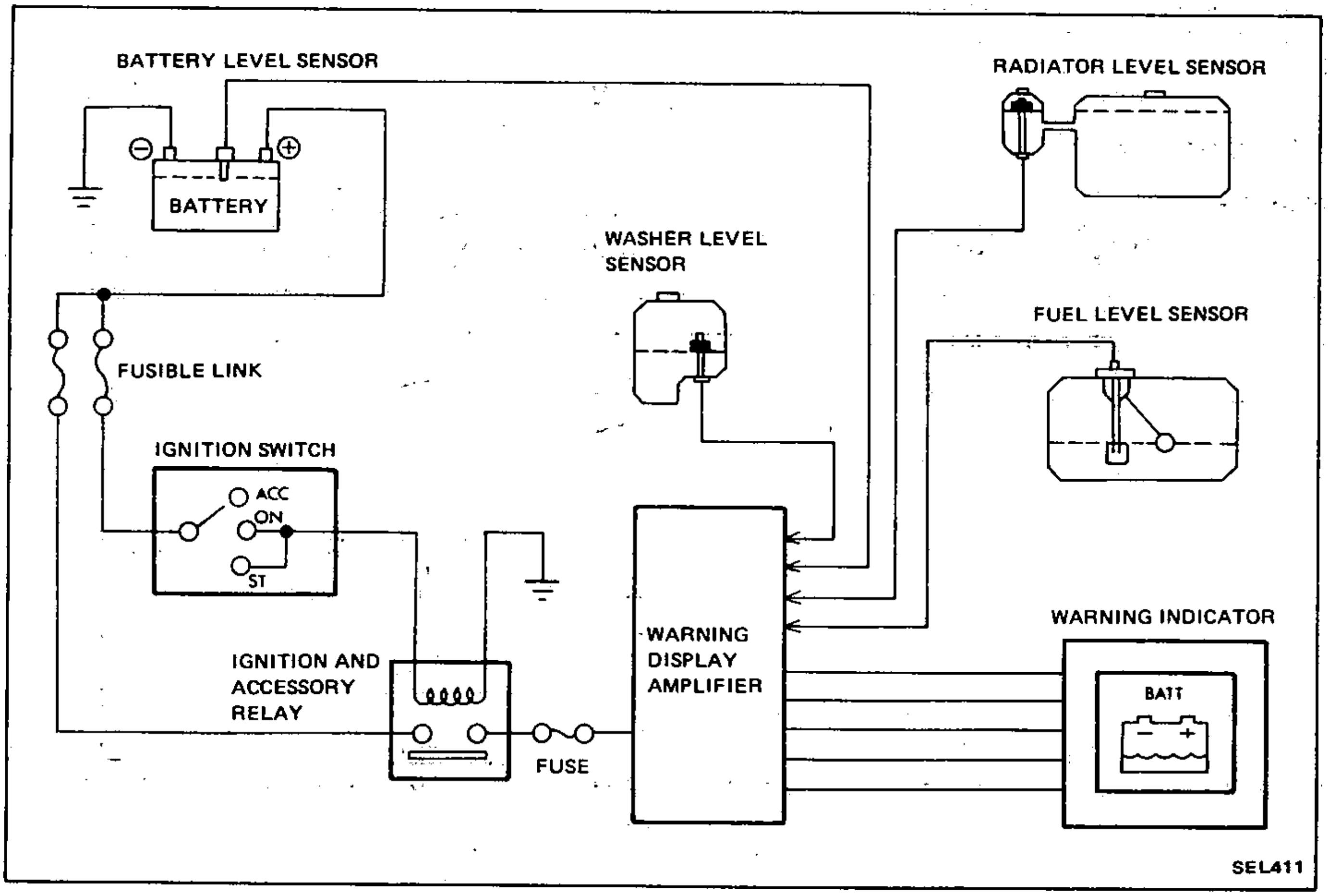
When ignition switch is ON, warning display operates as follows:



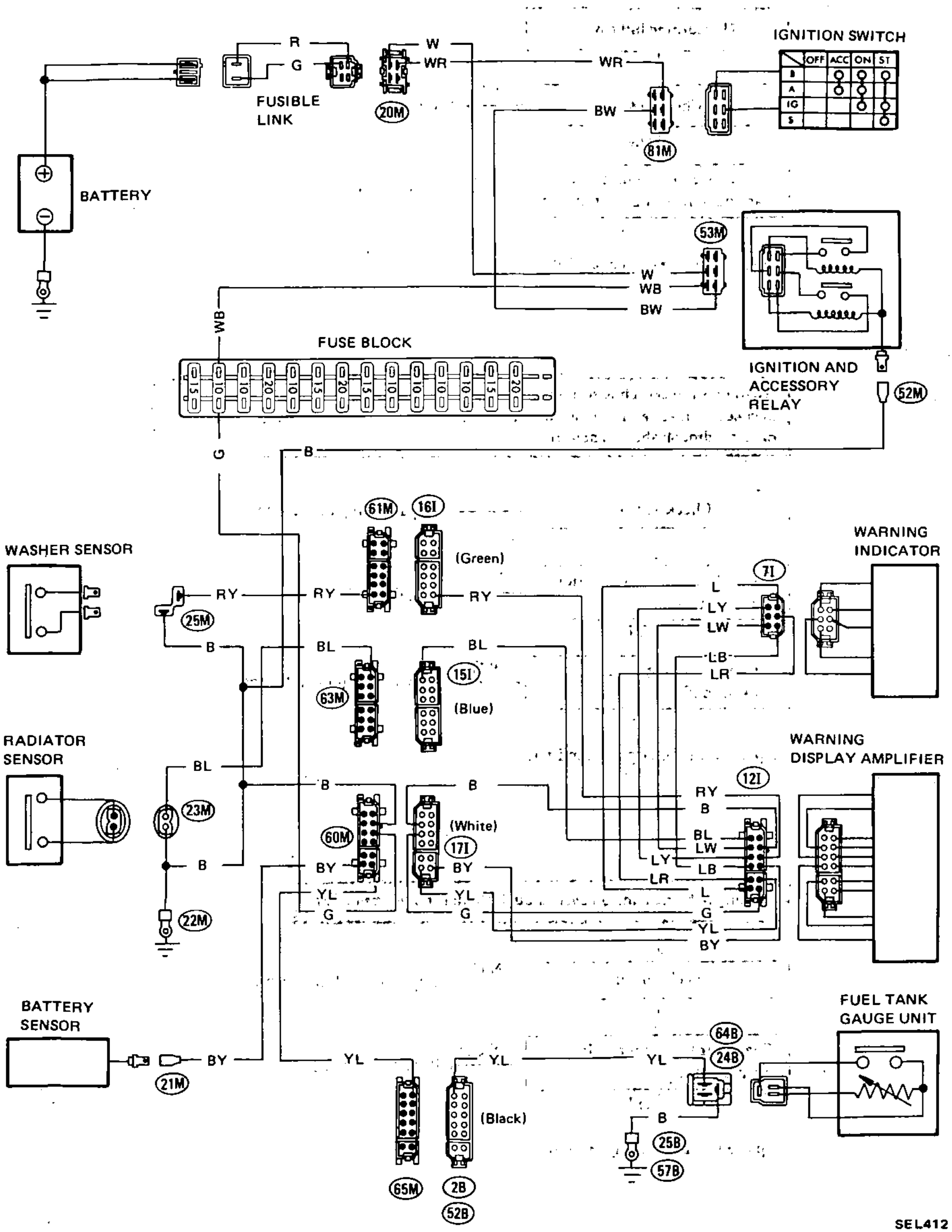
Display modes

Identification	Color	Item	Warning
FUEL	Red	Fuel level warning	Indicates that fuel is less than approximately 10 liters (2-5/8 US gal, 2-1/4 Imp gal).
BATT	Orange	Battery electrolyte level warning	Indicates that battery electrolyte is less than specified level.
WATER	Orange	Coolant level warning	Indicates that engine coolant in radiator reservoir tank is less than specified level.
WASH	Orange	Washer fluid level warning	Indicates that windshield washer fluid is less than specified level.

SCHEMATIC/WARNING DISPLAY

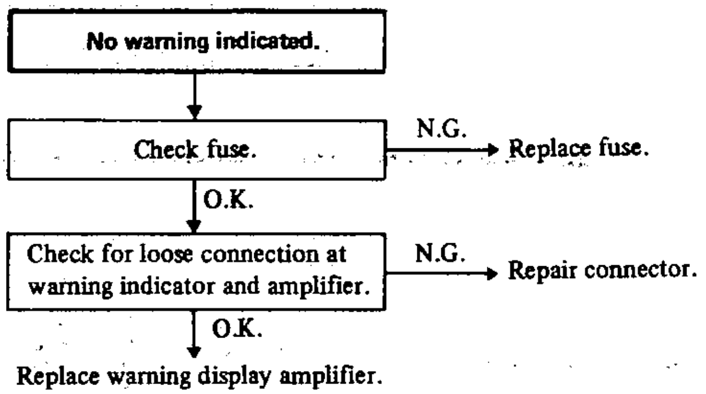


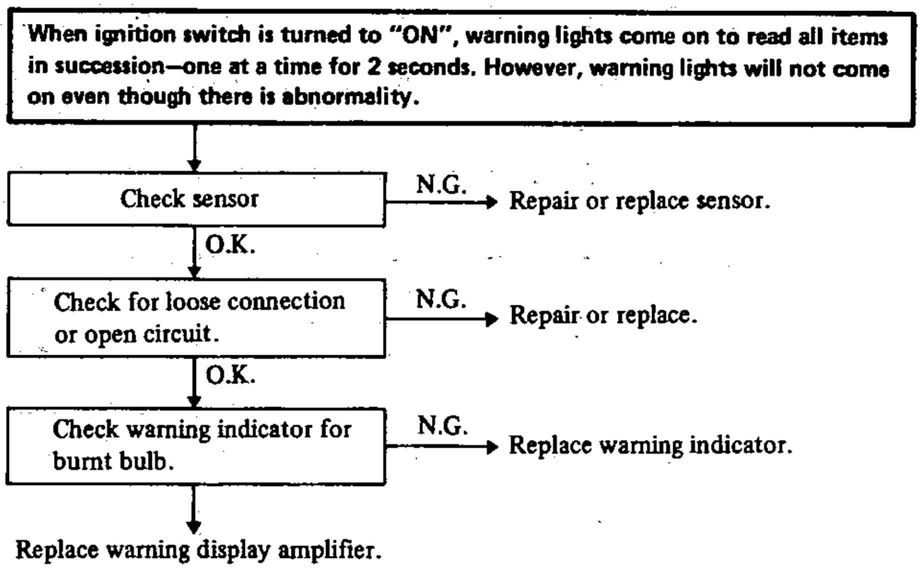
WIRING DIAGRAM/WARNING DISPLAY

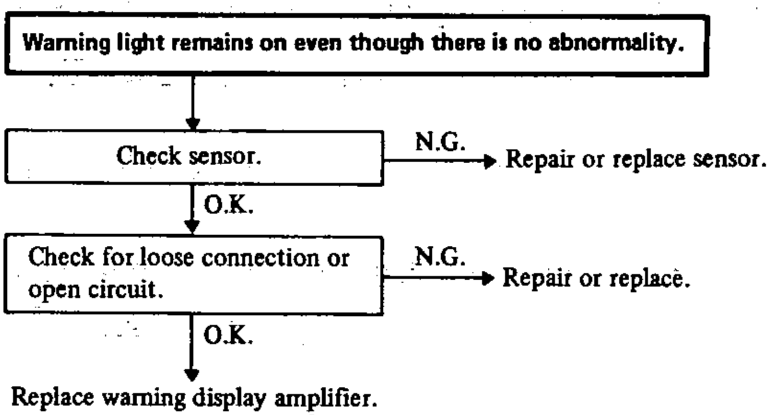


SEL412

TROUBLE DIAGNOSES AND CORRECTIONS





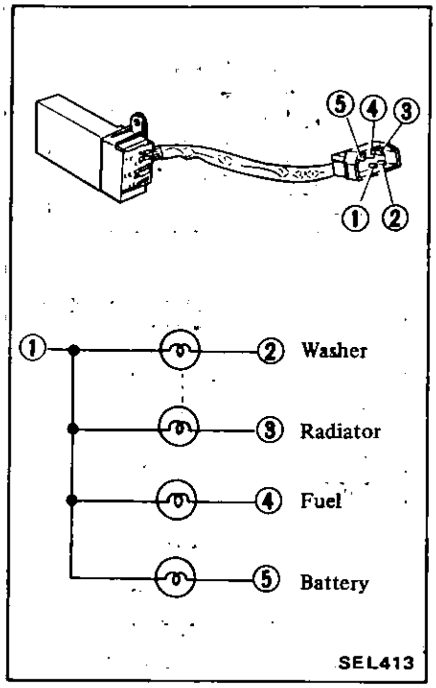


MULTI-WARNING INDICATOR

Location

The multi-warning indicator is located in the combination gauge.

Inspection



SEL413

MULTI-WARNING AMPLIFIER (IC built-in)

Location

The multi-warning amplifier is attached to the instrument panel frame. Before removing it, remove cluster lid C. Refer to page EL-104.

FUEL LEVEL SENSOR

Inspection

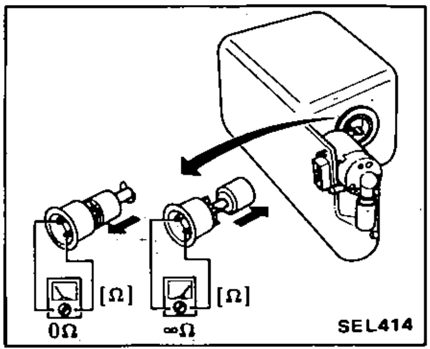
Refer to pages EL 63 and 64.

WASHER LEVEL SENSOR

Location

The washer level sensor is located on the bottom of the washer tank.

Inspection



SEL414

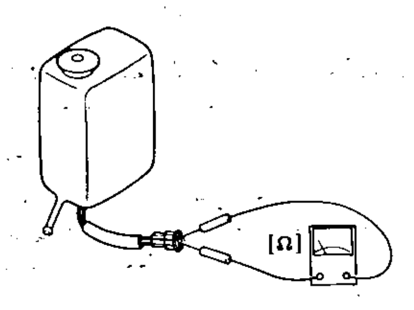
COOLANT LEVEL SENSOR

Location

The coolant level sensor is located on the bottom of the radiator reservoir tank.

Inspection

Coolant level sensor is united with the reservoir tank and cannot be removed alone.



Empty	0Ω
Normal level	∞Ω

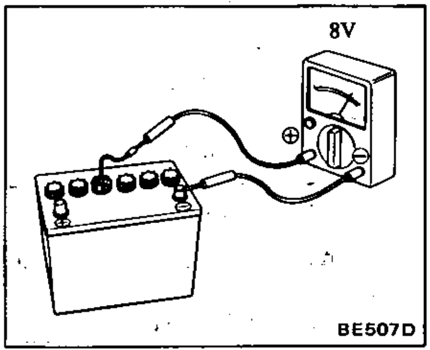
SEL415

BATTERY LEVEL SENSOR

Inspection

Before inspection, make sure that the battery is charged and the fluid is filled up to correct level.

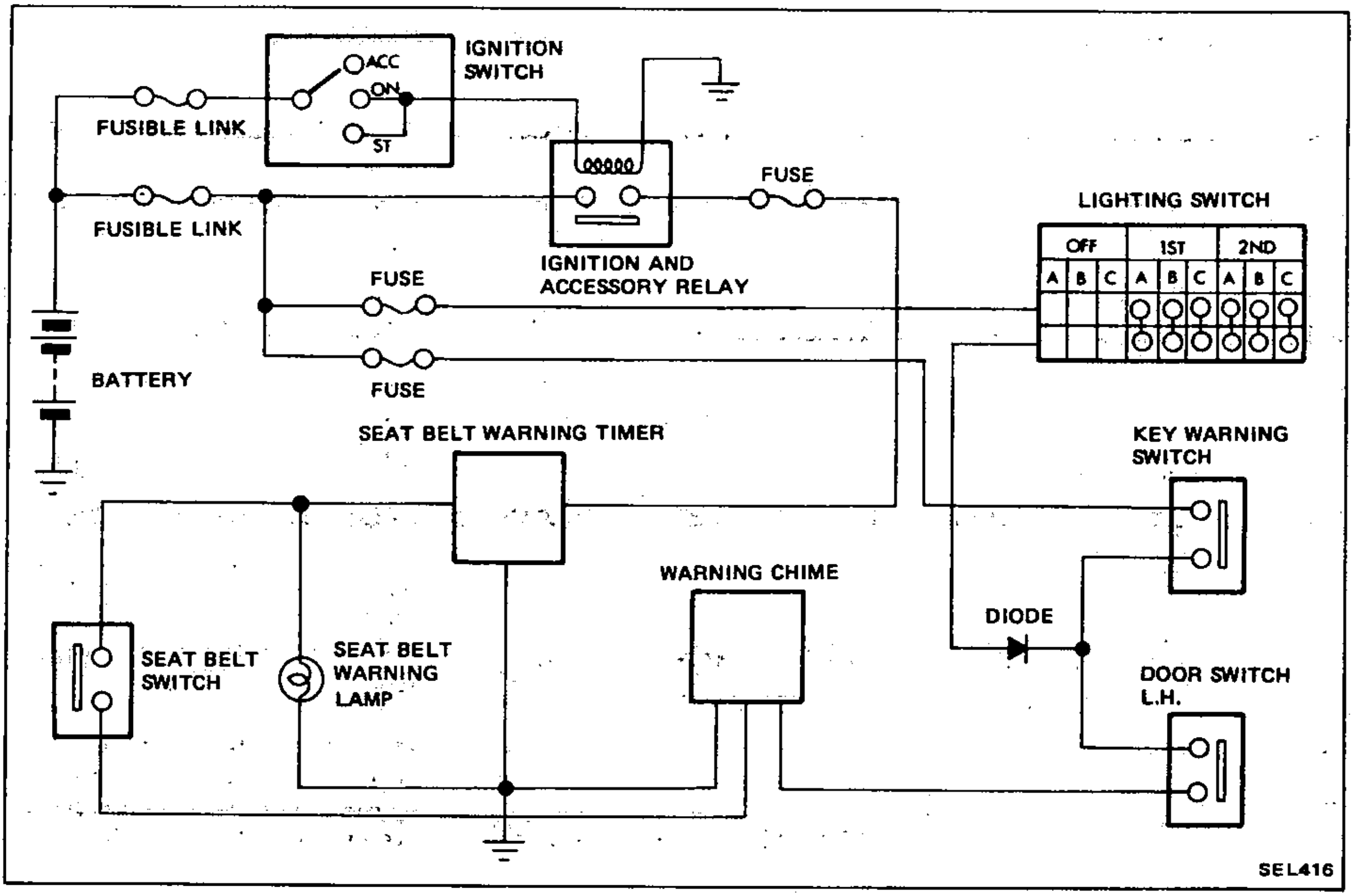
1. Disconnect sensor harness connector.
2. Make sure that there is about 8 volts when voltmeter positive and negative terminals are connected to battery fluid level sensor and battery negative terminals respectively.



BE507D

WARNING CHIME

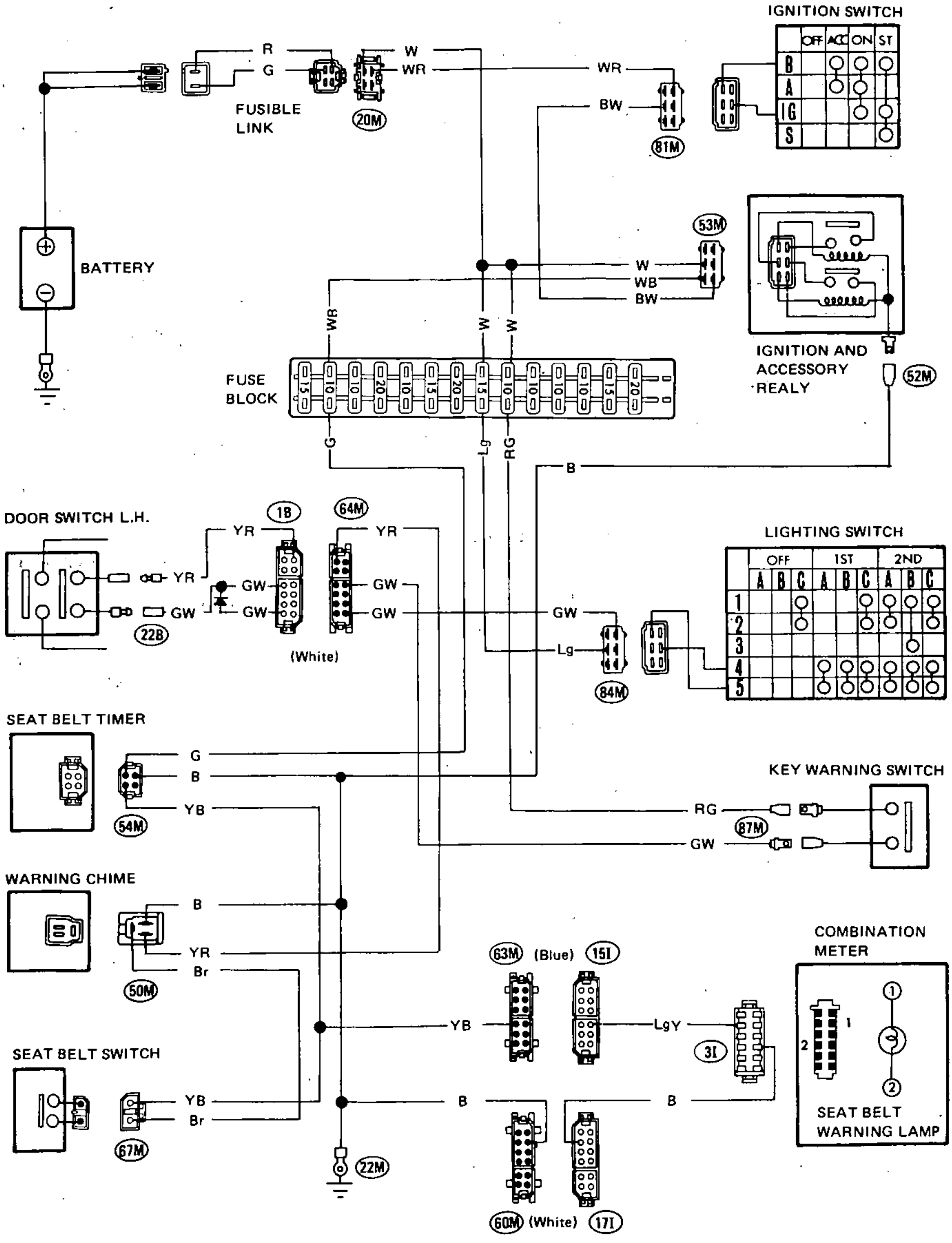
SCEMATIC/SEAT BELT, KEY AND LIGHT WARNING



TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Light and key Warning chime does not sound with ignition key in ignition switch or lighting switch on, when driver side door is open.	Faulty warning chime. Loose connection or open circuit. Faulty door switch. Faulty key warning chime switch. Faulty lighting system. (Clearance lamp does not light.)	Replace. Correct connector terminal contacts. Repair or replace. Repair or replace. Correct.
Seat belt Chime does not sound and warning lamp does not glow with ignition switch on.	Faulty seat belt switch. Faulty seat belt warning timer. Loose connection or open circuit.	Repair or replace. Replace. Correct connector terminal contacts.
Either chime or warning lamp does not operate with proper condition.	Loose connection or open circuit. Burnt bulb. Faulty chime.	Correct connector terminal contacts. Replace. Replace.

WIRING DIAGRAM/SEAT BELT, KEY AND LIGHT WARNING



SEL417

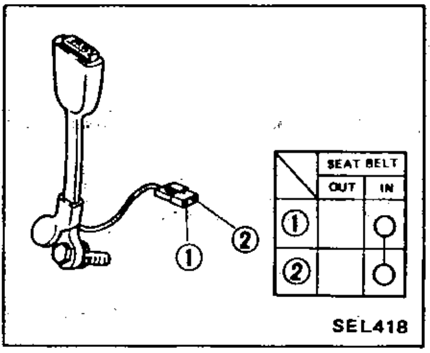
KEY WARNING SWITCH

Refer to "Ignition switch"

DOOR SWITCH L.H.

Refer to page EL-53.

SEAT BELT SWITCH



SEL418

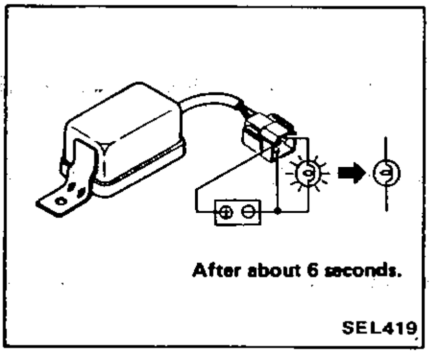
SEAT BELT WARNING TIMER

Location

The seat belt warning timer is located on the back side of the dashboard on the right side.

Refer to page EL-104.

Inspection



After about 6 seconds.

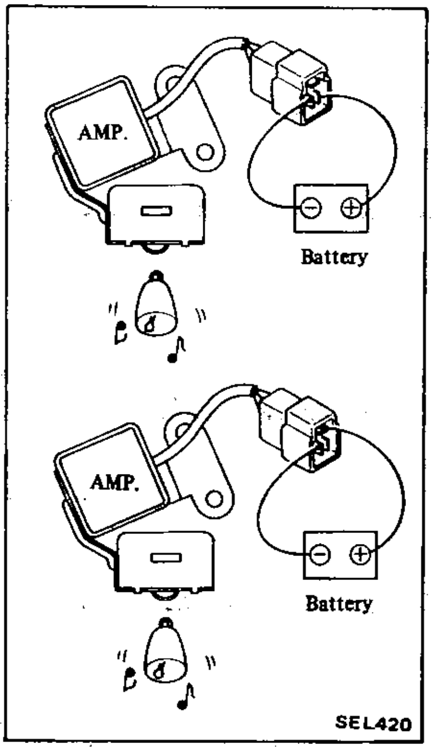
SEL419

WARNING CHIME (IC built-in)

Location

The warning chime is located on the back side of the dashboard on the right side.

Inspection



SEL420

DIODE (For door switch)

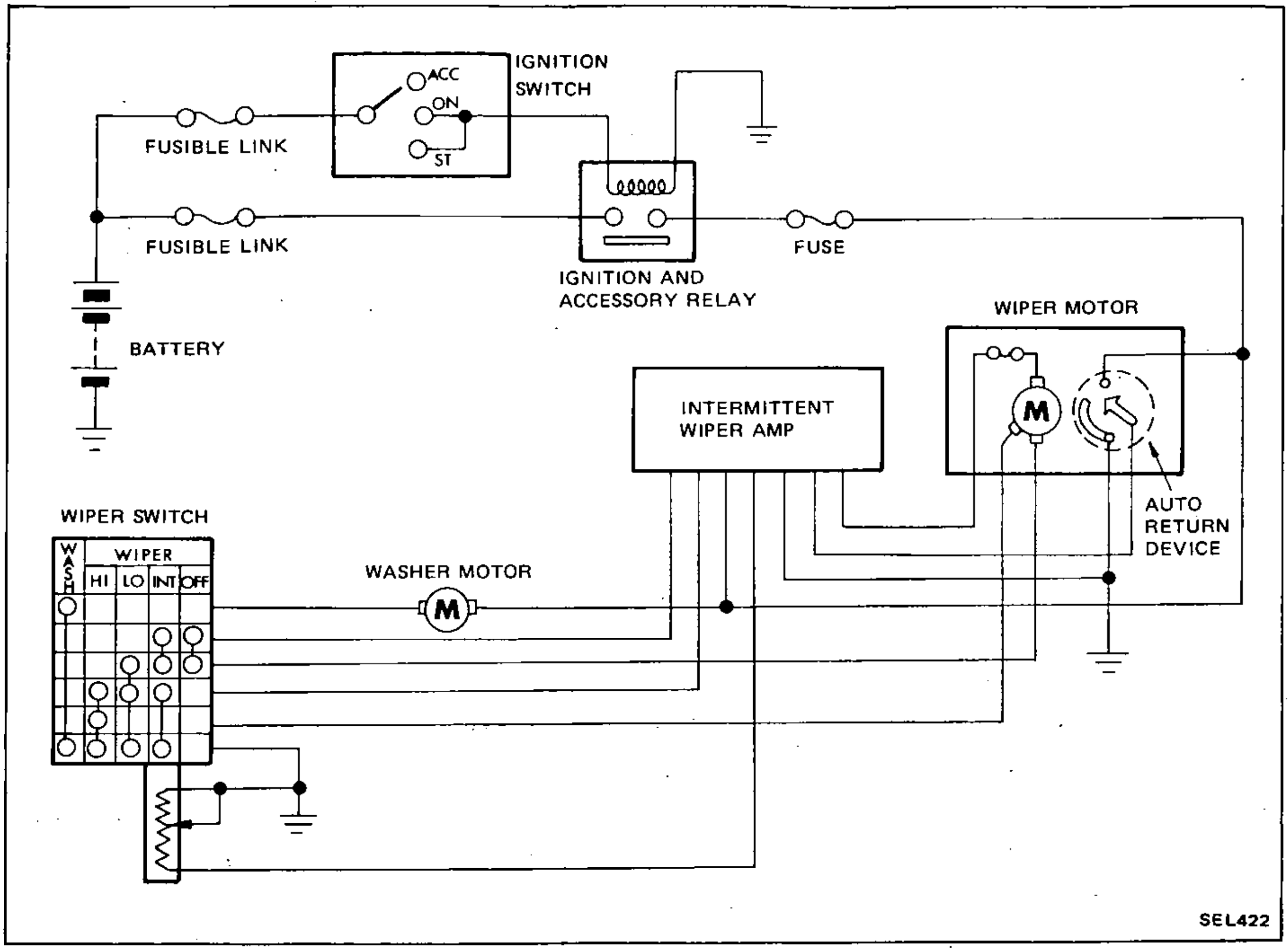
Location

The diode for the door switch is fastened to body harness with tape, near the injection block.

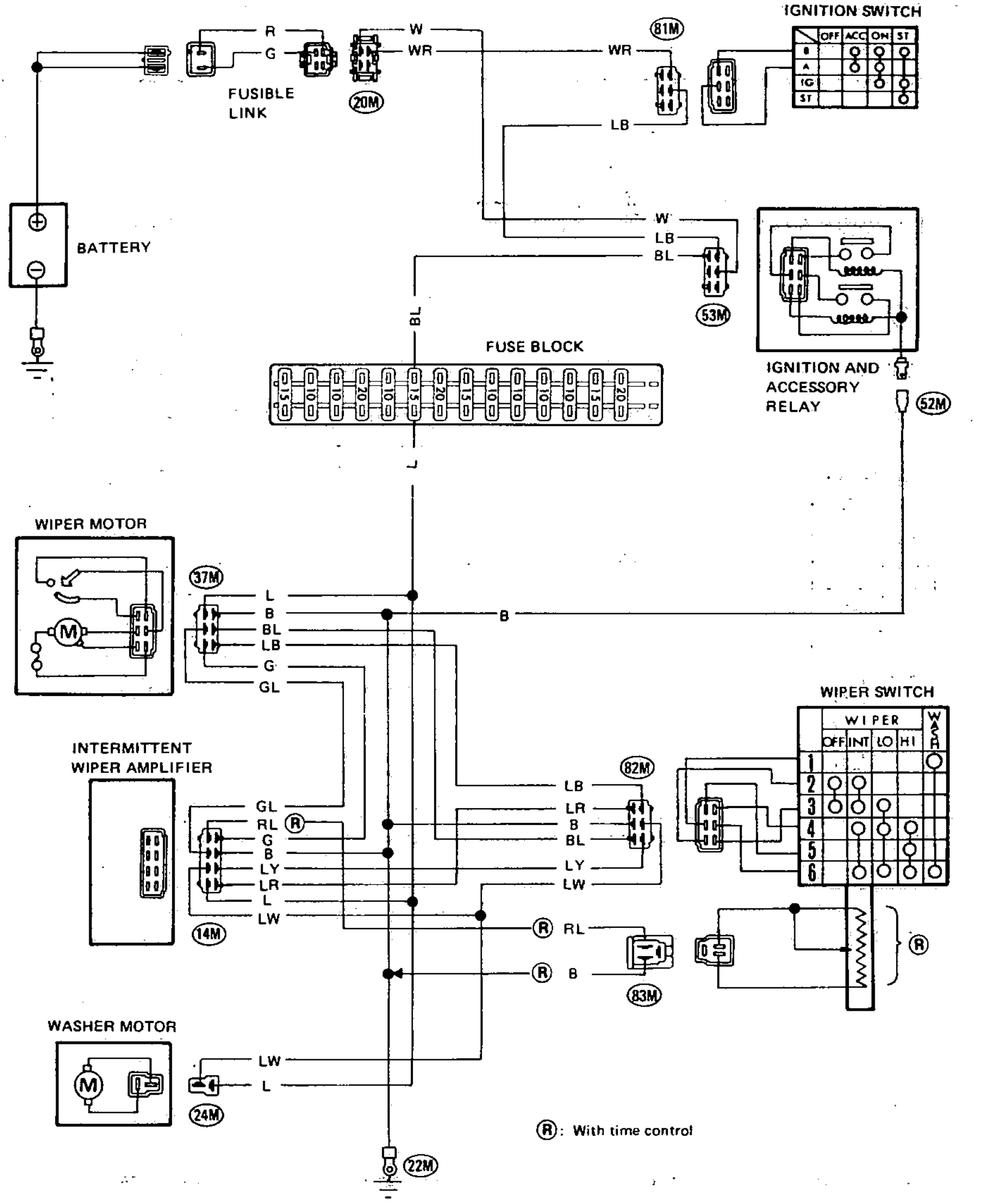
WIPER AND WASHER

CAUTION: Before starting to work on any part of electrical system, disconnect battery ground cable.

SCHEMATIC/WINDSHIELD WIPER AND WASHER (With time control)



WIRING DIAGRAM/WINDSHIELD WIPER AND WASHER



SEL423

TROUBLE DIAGNOSES AND CORRECTIONS

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.	Check short-circuit, burnt component inside motor or other part for operation, and correct problem.
			Loose, open or broken wiring.	Correct.
			Improper grounding.	Correct.
		Switch	Improper switch contact.	Correct.
		Link	Foreign material interrupts movement of link mechanism.	Correct.
			Disconnect link rod.	Correct.
			Seized or rusted arm shaft.	Lubricate or replace arm shaft.
		Circuit breaker	Faulty circuit breaker.	Replace circuit breaker.
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.
		Circuit breaker	Faulty circuit breaker.	Replace circuit breaker.
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-return relay contacts or improper contact due to foreign matter.	Remove auto-return device cover, and clean contacts carefully so as not to deform relay plate.
	Does not stop.	Motor	Incomplete auto-return operation (Contact is not interrupted.)	Remove auto-return device cover, and correct relay plate bending.
Washer motor does not operate when pushing washer switch on.			Burnt fuse.	Correct cause and replace fuse.
			Faulty switch.	Replace.
			Faulty washer motor.	Replace.
			Loose or poor connection contact at motor or switch.	Repair.
Washer motor operates but washer fluid is not ejected.			Clogged washer nozzle.	Clean nozzle or replace.

Intermittent windshield wiper

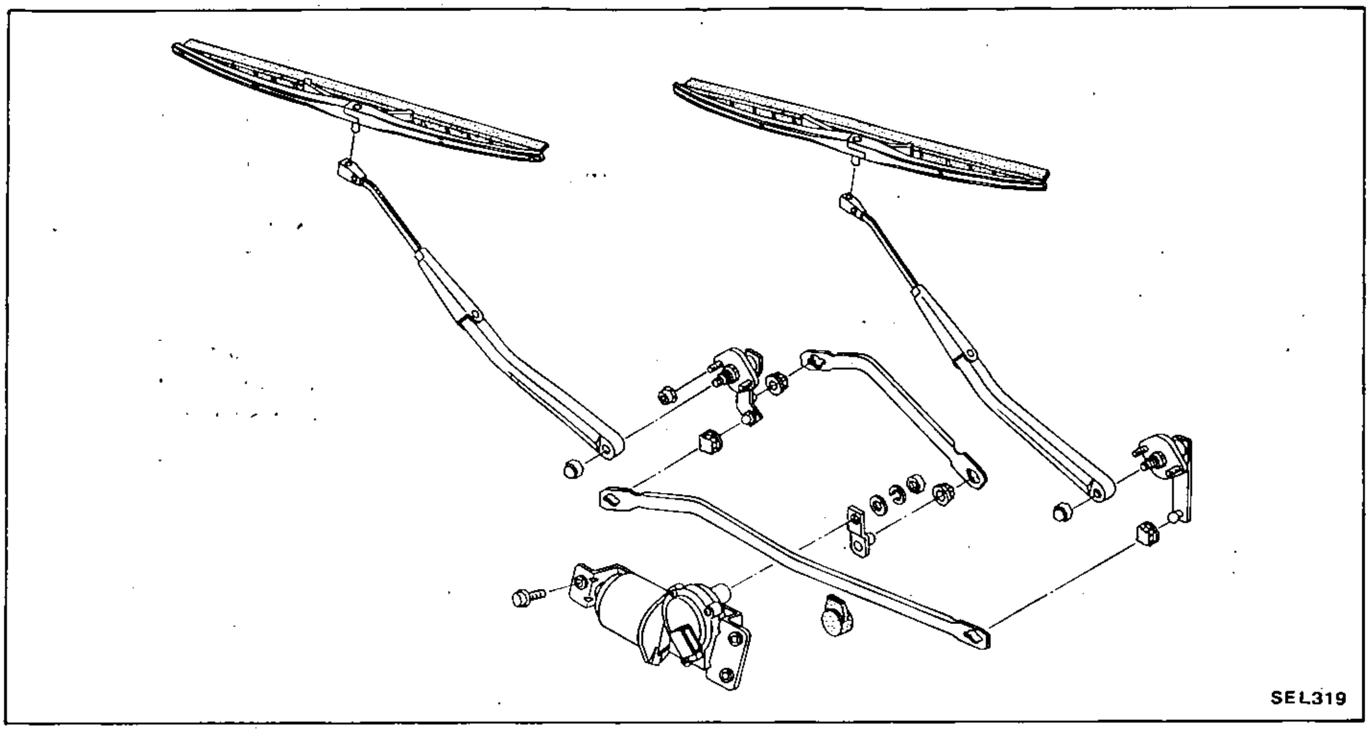
The sign for corrective action

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 operate at Low and High speeds.	Line voltage below 10 volts.	A: Replace if necessary.
	Faulty wiper switch.	B: Correct or replace if necessary.
	Faulty wiring.	A,C: Repair or replace if necessary.
	Faulty intermittent amplifier.	Replace.
	Faulty wiper switch.	Replace.
Intermittent speed is too short for proper wiping.	Line voltage too high.	A: Replace if necessary.
	Faulty wiper motor.	D: Replace if necessary.
	Faulty intermittent amplifier.	Replace.
	Faulty wiper switch.	Replace.
Intermittent speed is too long for proper wiping.	Line voltage below 10 volts.	A: Replace if necessary.
	Faulty wiper switch.	B: Correct or replace if necessary.
	Faulty wiring.	A,C: Repair or replace if necessary.
	Faulty intermittent amplifier.	Replace.
	Faulty wiper switch.	Replace.
Wipers do not shut off.	Faulty wiper motor.	D: Replace if necessary.
	Faulty intermittent amplifier.	Replace.
Wipers operate intermittently with wiper switch OFF.	Faulty wiper switch.	B: Correct or replace. if necessary.
	Faulty wiring.	A,C: Repair or replace if necessary.
	Faulty intermittent amplifier.	Replace.
Intermittent speed is erratic.	Excessive line voltage fluctuation.	E: Correct or replace if necessary.
	Faulty wiper switch.	B: Correct or replace if necessary.
	Faulty wiring.	A,C: Repair or replace if necessary.
	Faulty wiper motor.	D: Replace if necessary.
	Faulty intermittent amplifier.	Replace.
Wipers make a complete wiping stroke only one time with wiper switch ON but do not continue operation.	Line voltage below 10 volts.	A: Replace if necessary.
	Faulty intermittent amplifier.	Replace.
Wiper motor is not interconnected when washer switch is depressed, but intermittent operation is normal.	Poor connections.	C: Repair or replace if necessary.
	Faulty intermittent amplifier.	Replace.
Wipers do not make a complete wiping stroke when washer switch is first turned on and is quickly turned off.	Faulty intermittent amplifier.	Replace.

WINDSHIELD WIPER

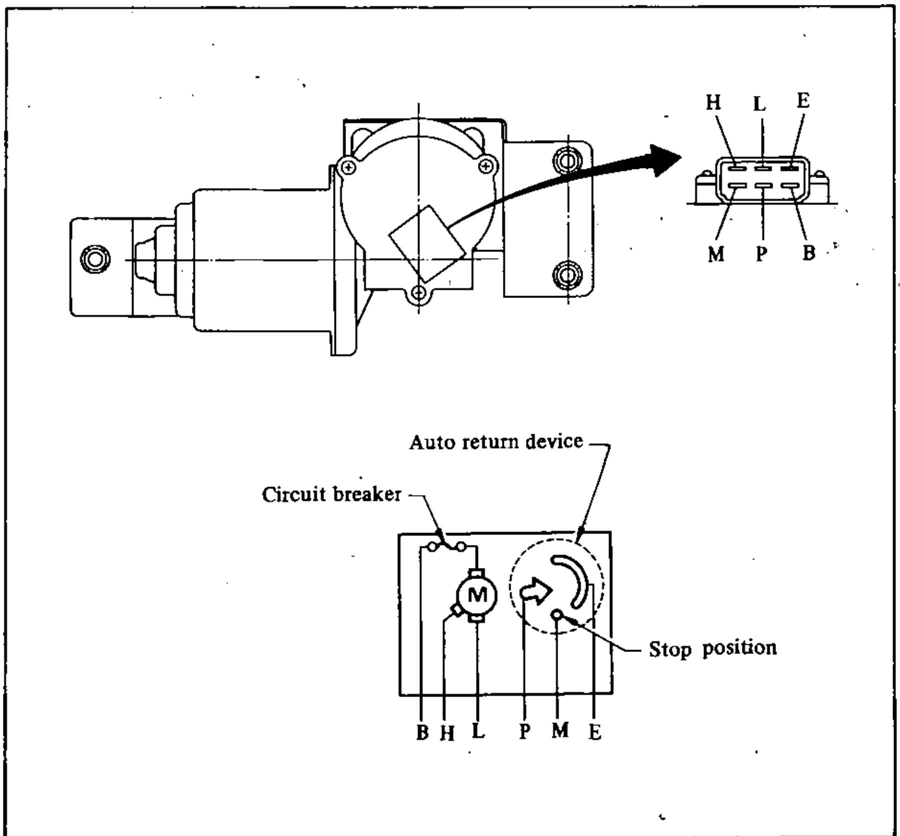
Removal and installation

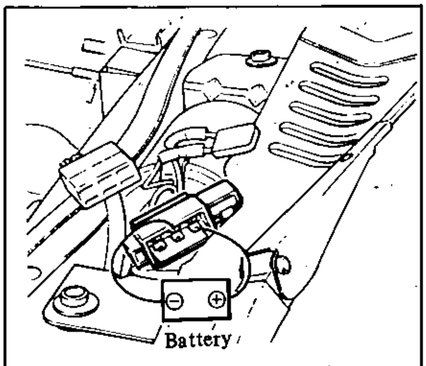


SEL319

CAUTION: Be careful not to bend linkage during removal.

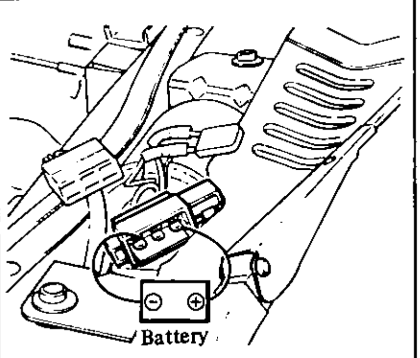
Inspection





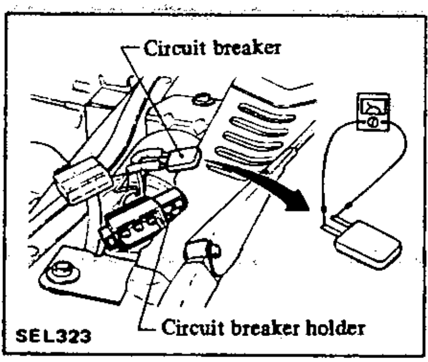
Motor should run at low speed.

SEL321

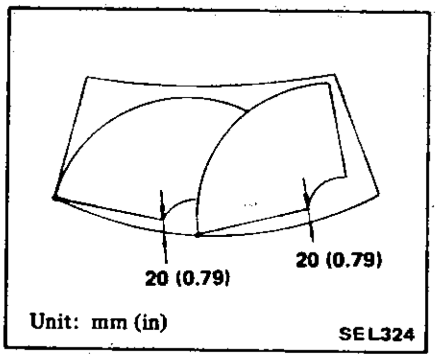


Motor should run at high speed.

SEL322

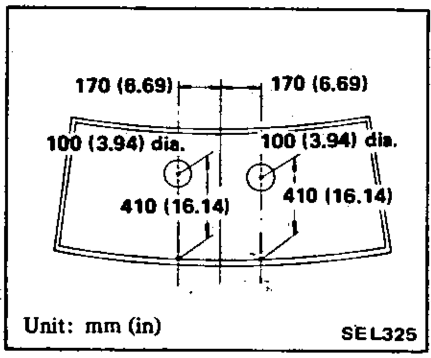


Adjustment



WINDSHIELD WASHER

Washer nozzle adjustment



WIPER AND WASHER SWITCH

Refer to "Combination switch".

INTERMITTENT WIPER AMPLIFIER (IC built-in)

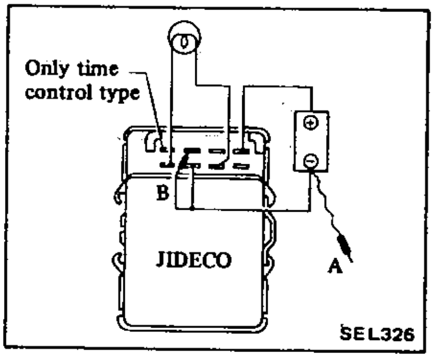
Location

The intermittent wiper amplifier is attached to the relay bracket. Refer to page EL-105.

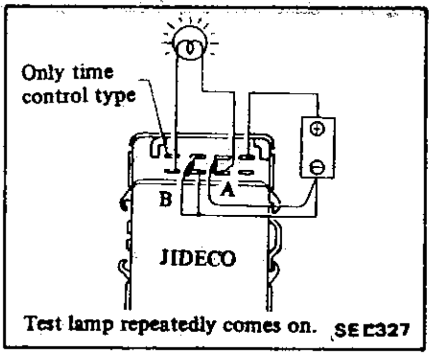
Inspection

Be careful not to connect lead wires to incorrect terminals.

1. Connect test lead wires.



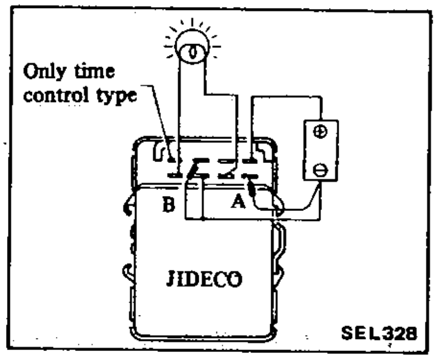
2. Make sure that test lamp comes on when negative lead wire (A) is connected.

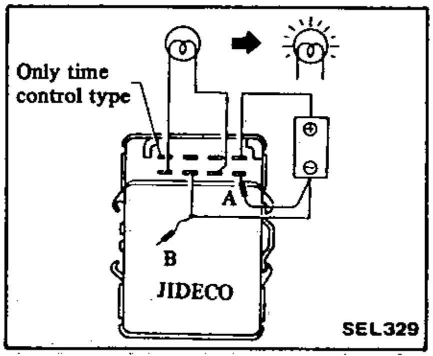


Test lamp repeatedly comes on.

3. Disconnect lead wire (B).

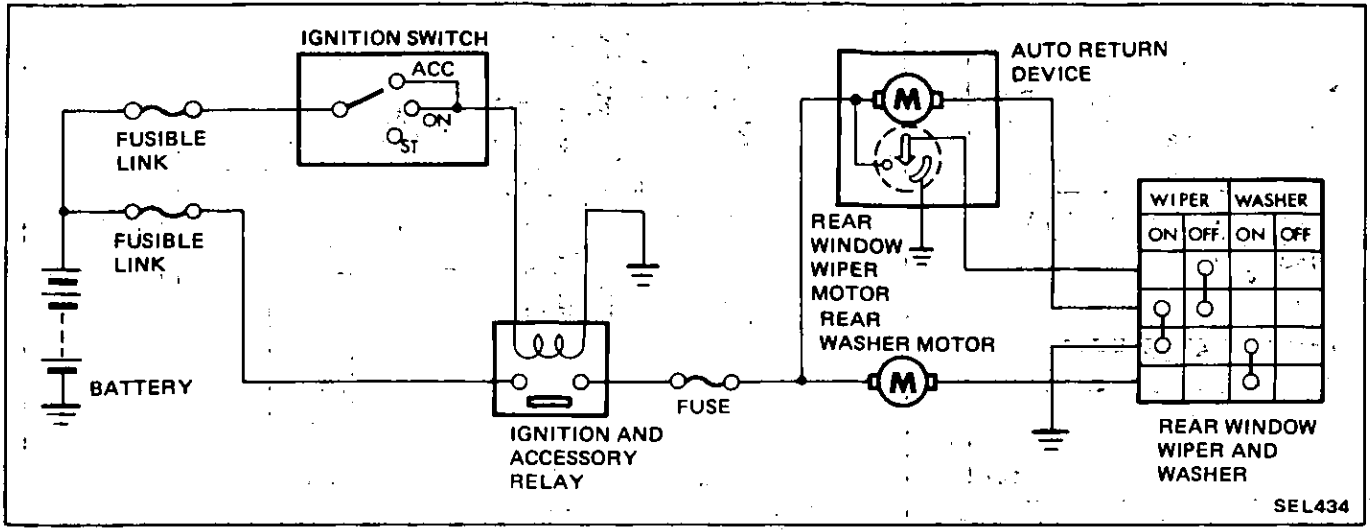
Test lamp should go out and come back on in a few seconds.





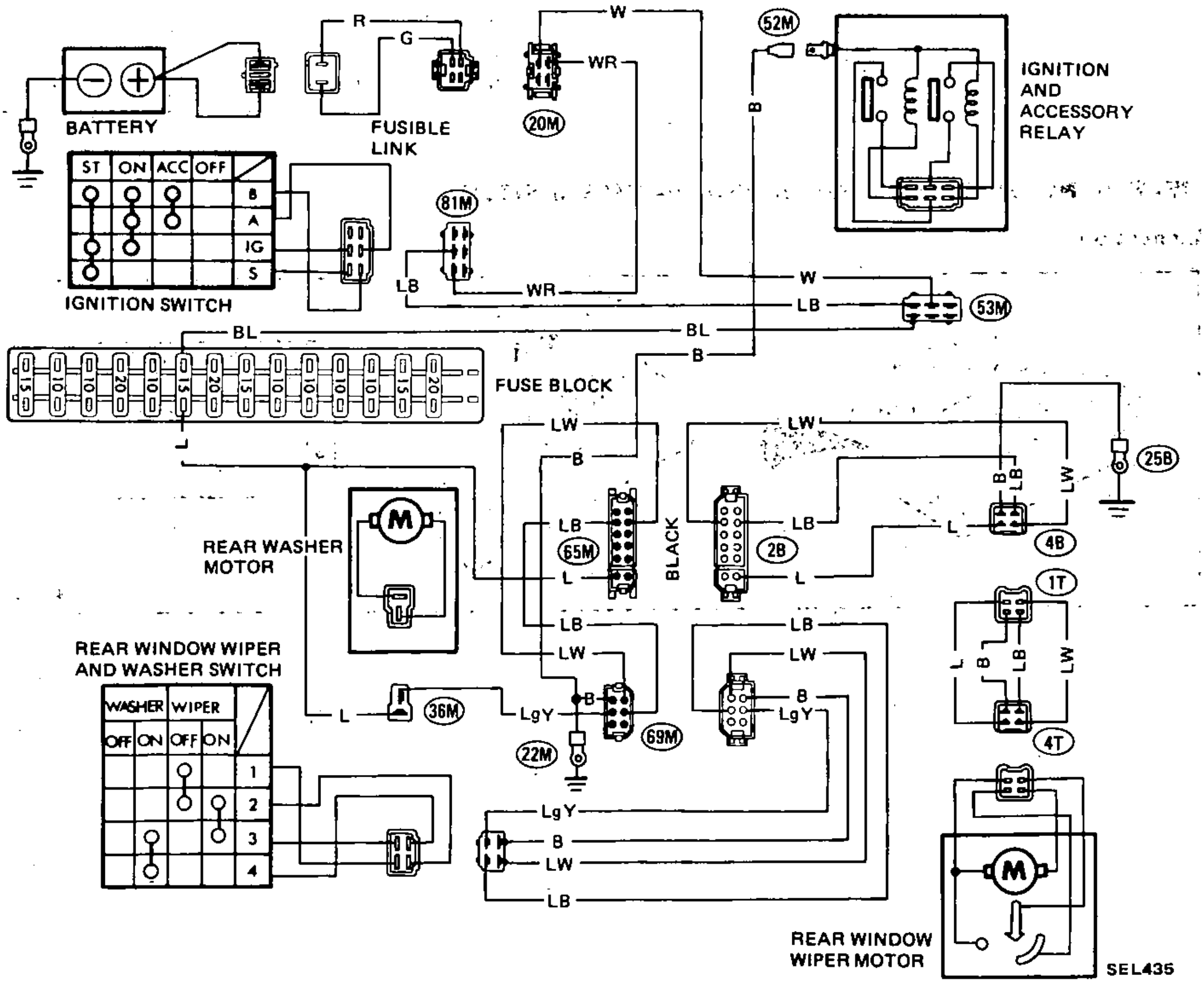
REAR WINDOW WIPER AND WASHER

SCHEMATIC/REAR WINDOW WIPER AND WASHER



SEL434

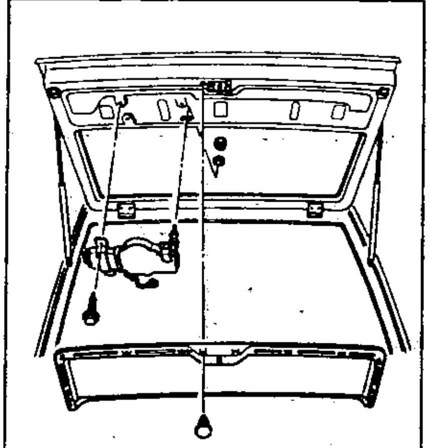
WIRING DIAGRAM/REAR WINDOW WIPER AND WASHER



SEL435

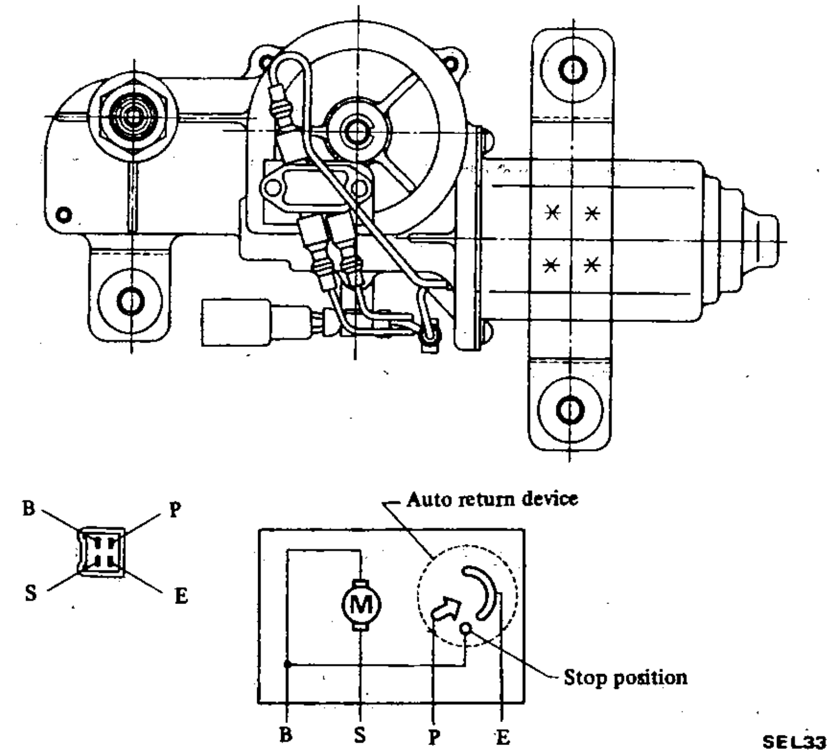
REAR WINDOW WIPER

Removal and installation



SEL367

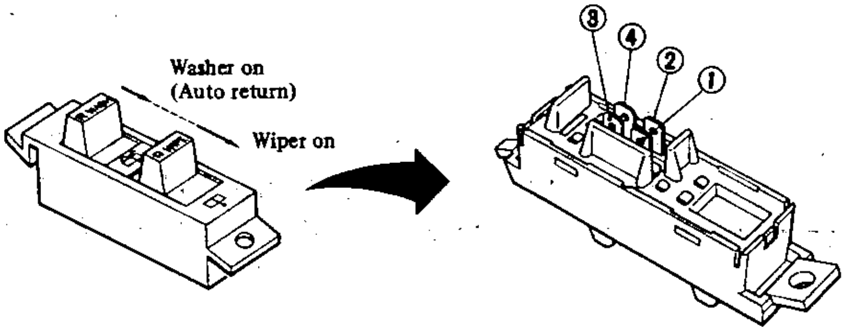
Inspection



SEL332

REAR WINDOW WIPER SWITCH AND WASHER SWITCH

Inspection



	Washer		Wiper	
	OFF	ON	OFF	ON
1			○	
2			○	○
3		○		○
4		○		

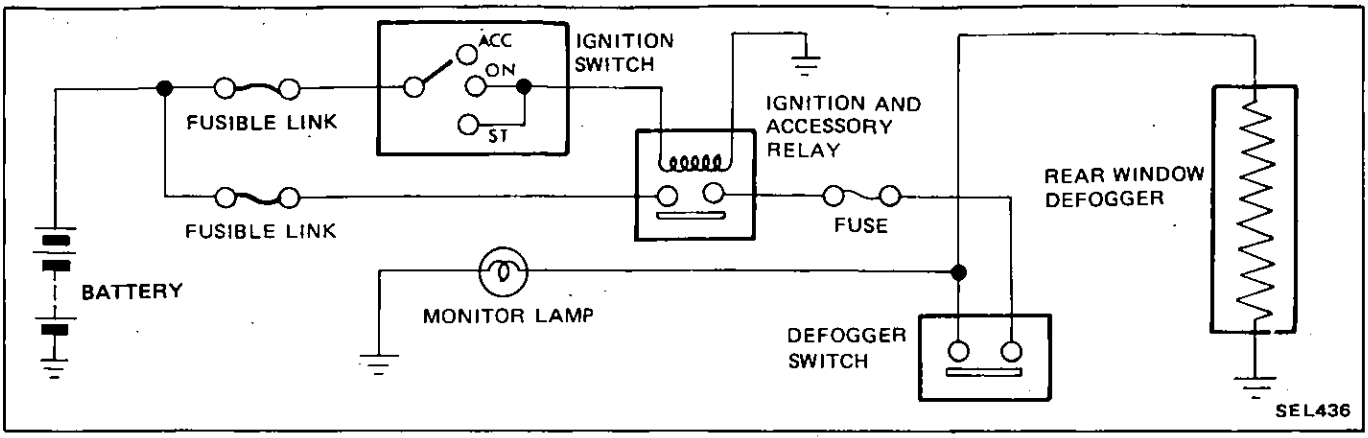
SEL336

ELECTRICAL ACCESSORIES

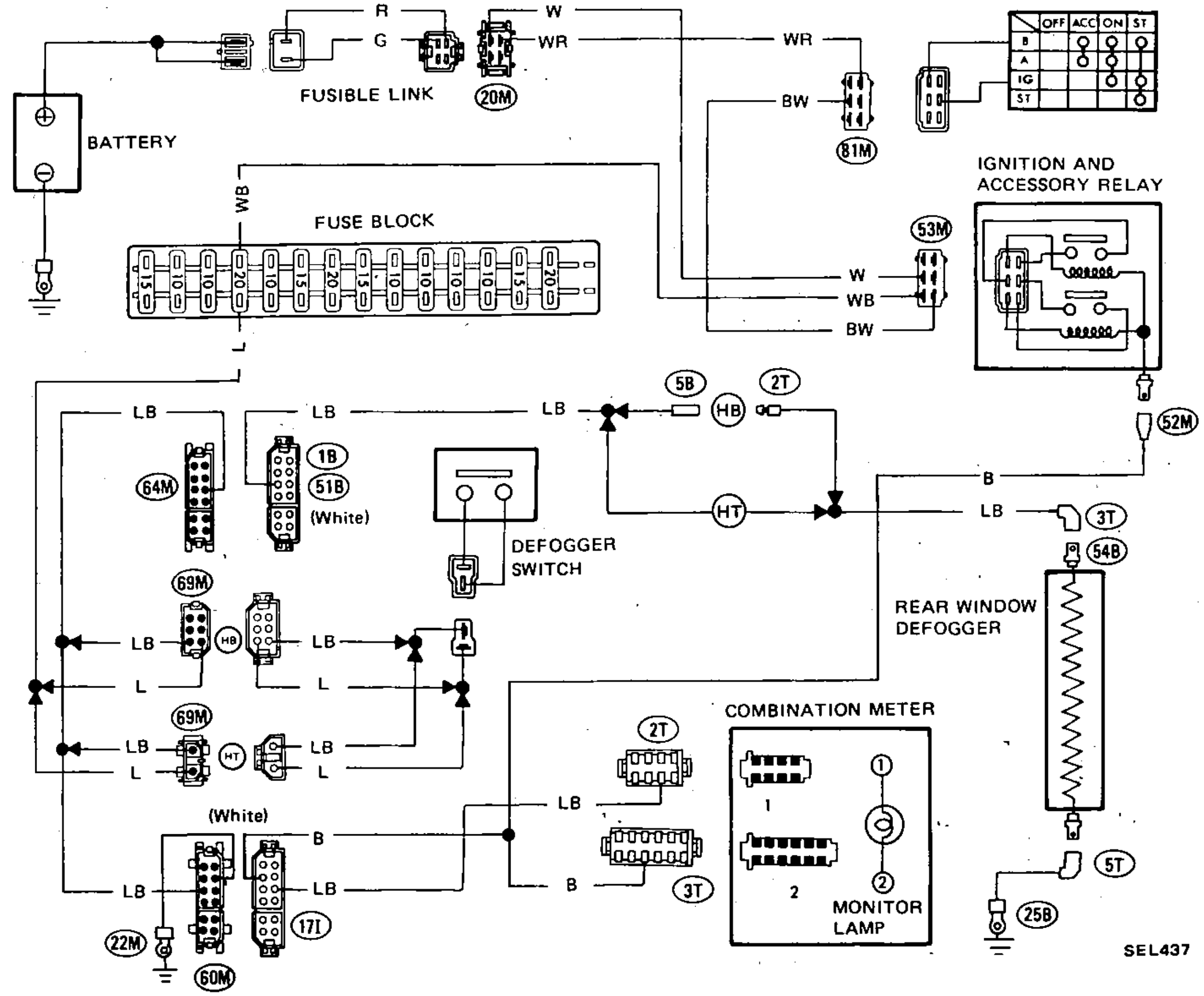
CAUTION: Before starting to work on any part of electrical system, disconnect battery ground cable.

REAR WINDOW DEFOGGER

SCHEMATIC/REAR WINDOW DEFOGGER

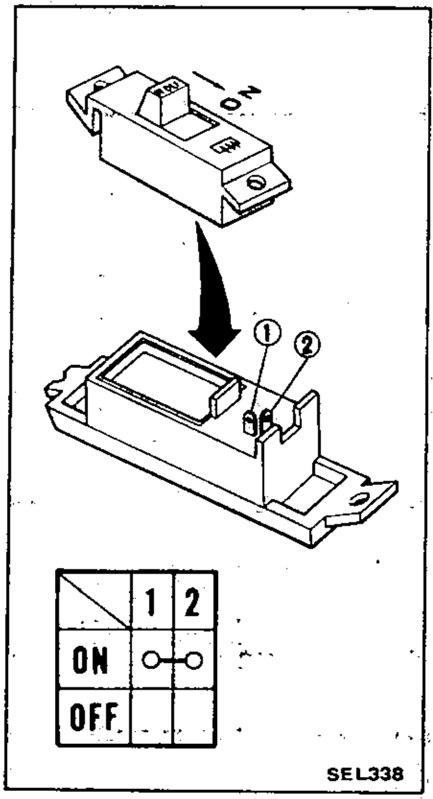


WIRING DIAGRAM/REAR WINDOW DEFOGGER



REAR WINDOW DEFOGGER SWITCH

Inspection

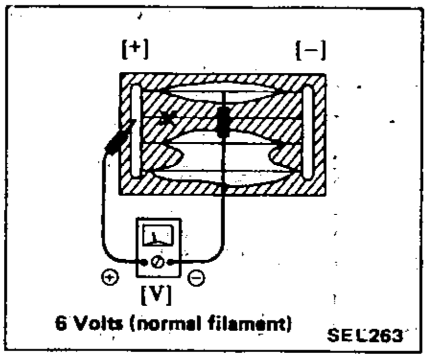


	1	2
ON	○—○	
OFF		

REAR WINDOW DEFOGGER FILAMENTS

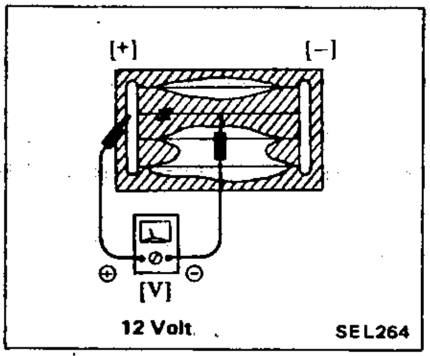
Inspection

1. Attach probe circuit tester (in volt range) to middle portion of each filament.

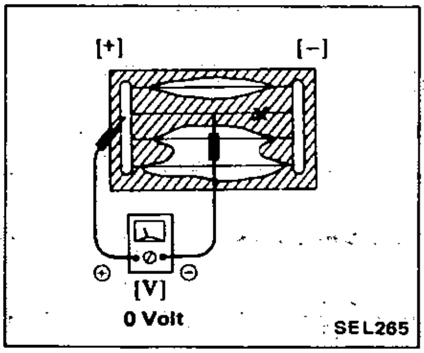


6 Volts (normal filament)

2. If a filament is burned out, circuit tester registers 0 or 12 volts.

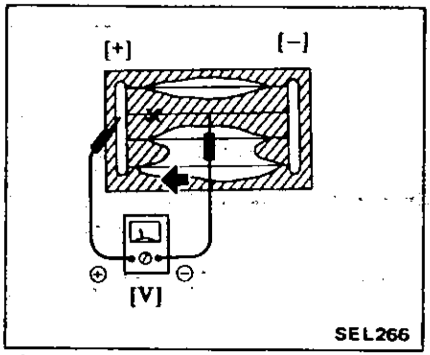


12 Volt



0 Volt

3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.



Filament maintenance

Repair equipment

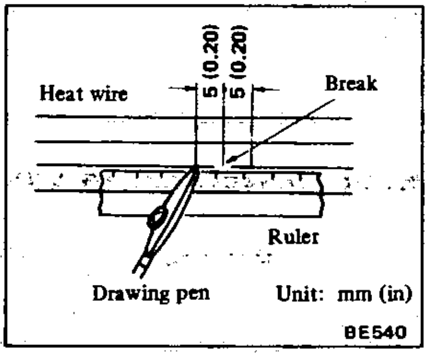
1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler, 30 cm (12 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

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. 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.



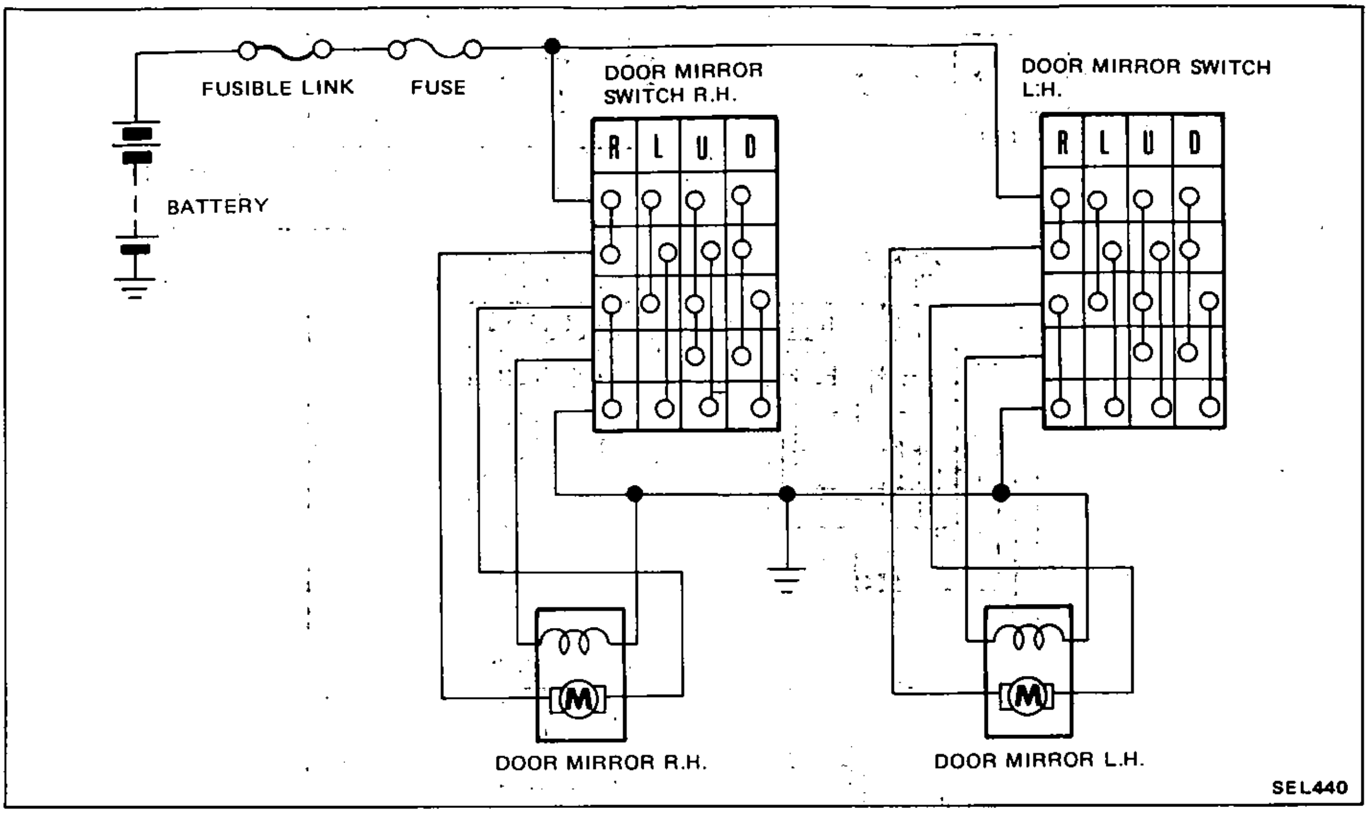
4. Wipe clean silver composition from tip of drawing pen.
5. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

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.

REMOTE CONTROL DOOR MIRROR

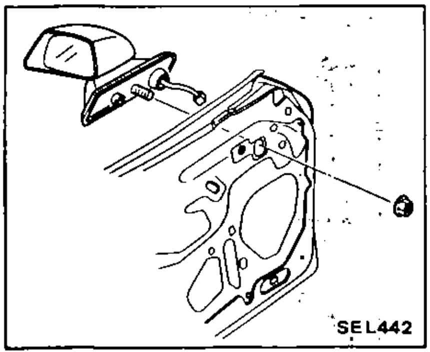
SCHEMATIC/REMOTE CONTROL DOOR MIRROR



DOOR MIRROR

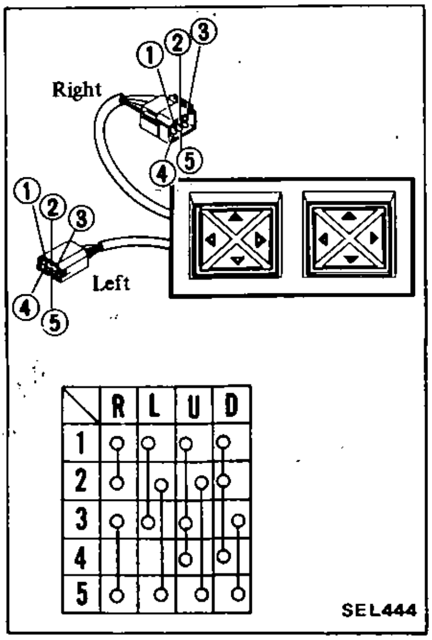
Removal and Installation

Remove door mirror securing bolt and disconnect harness connector.

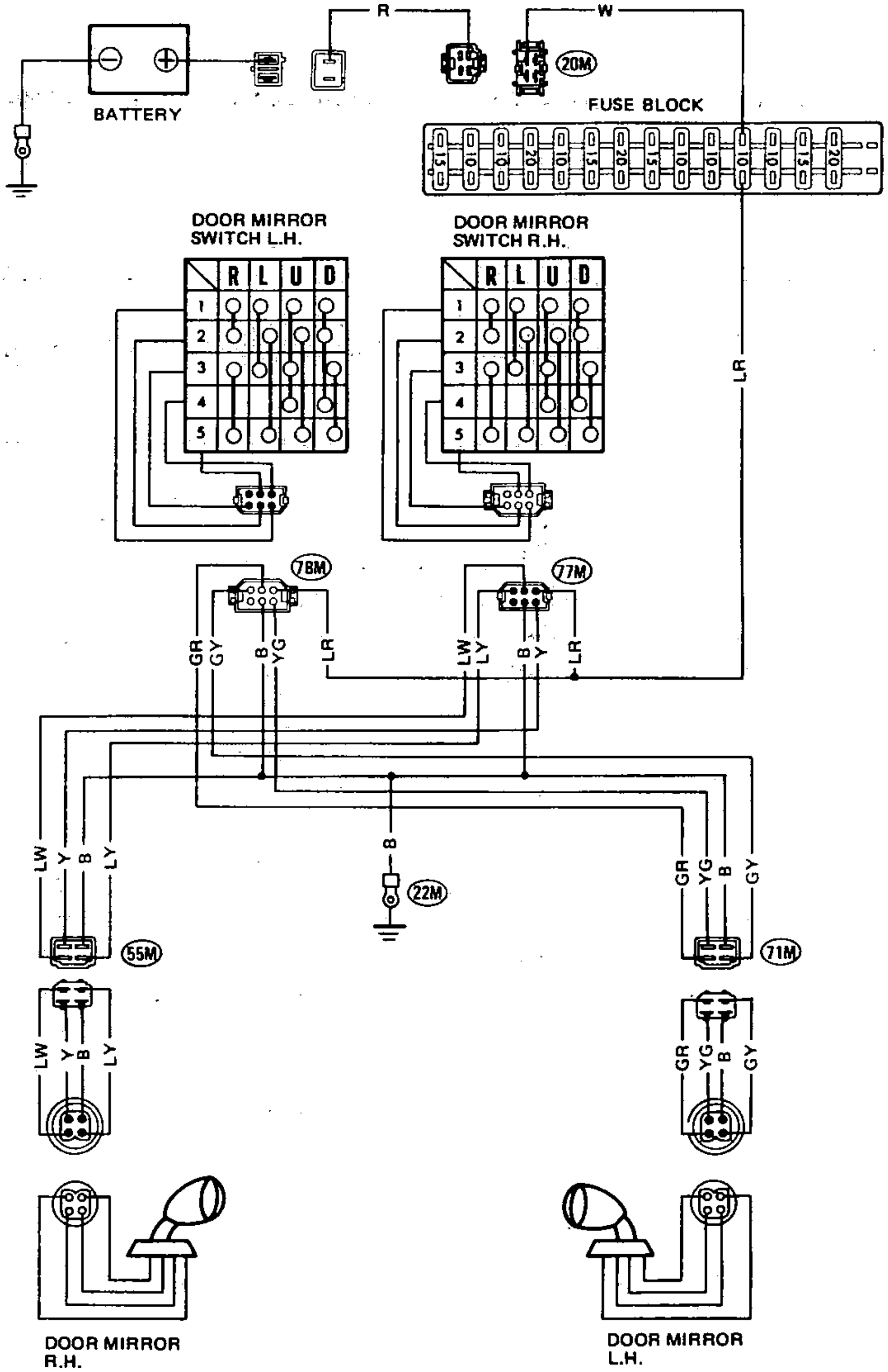


DOOR MIRROR SWITCH

Inspection



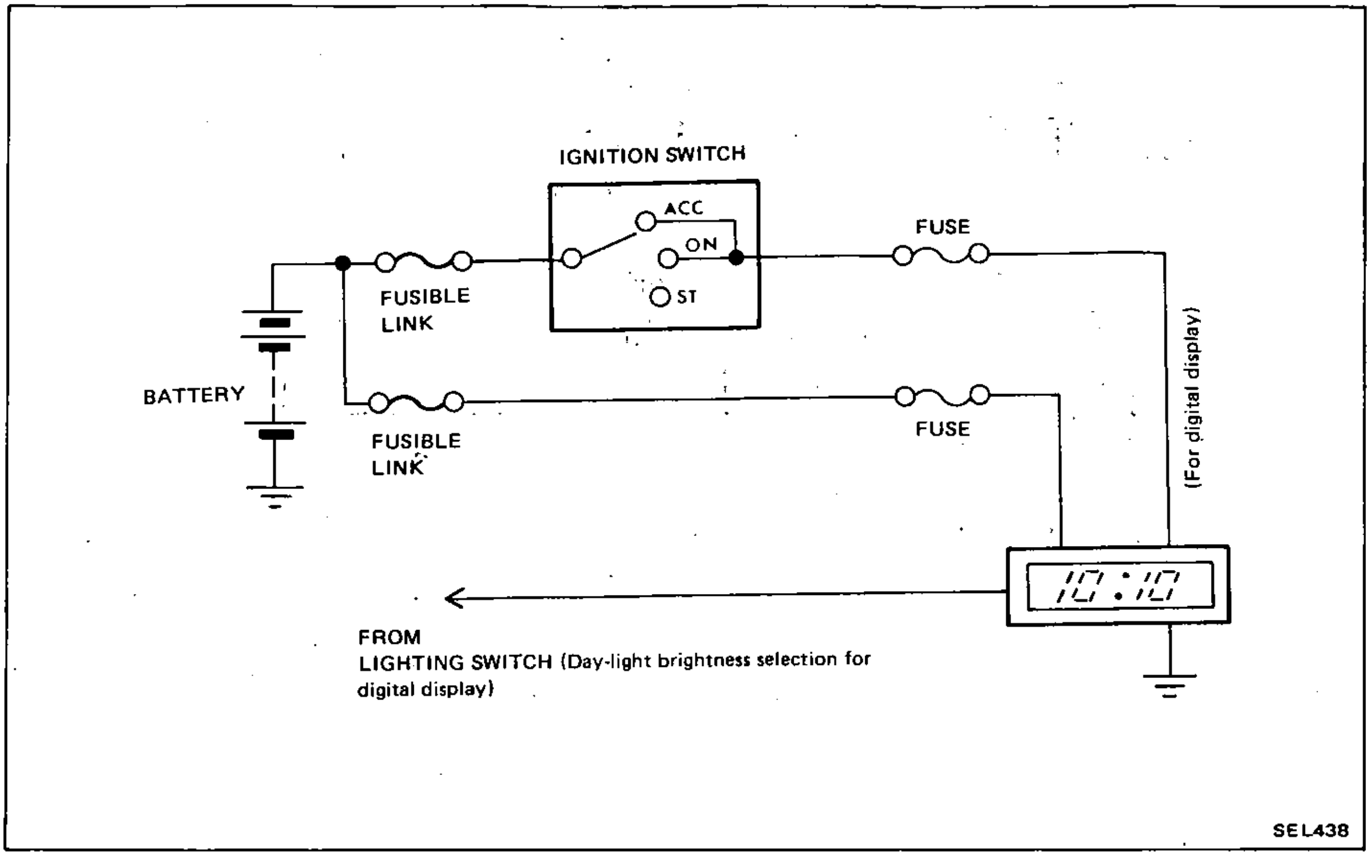
WIRING DIAGRAM/REMOTE CONTROL DOOR MIRROR



SEL441

CLOCK

SCHEMATIC/CLOCK (Digital)



DIGITAL CLOCK

Adjustment

"SELECT" knob

Depress the "SELECT" knob, and display will project "HOUR : MIN", "MONTH : DAY" and "MIN : SEC" in that sequence.

"ADJUST" knob

To adjust the time, first select "HOUR : MIN" with "SELECT" knob, then use the "ADJUST" knob in the following manner.

- Turn it counterclockwise for "hour" adjustment.
- Turn it clockwise for "minute" adjustment.
- Push it to set the time to the nearest hour.

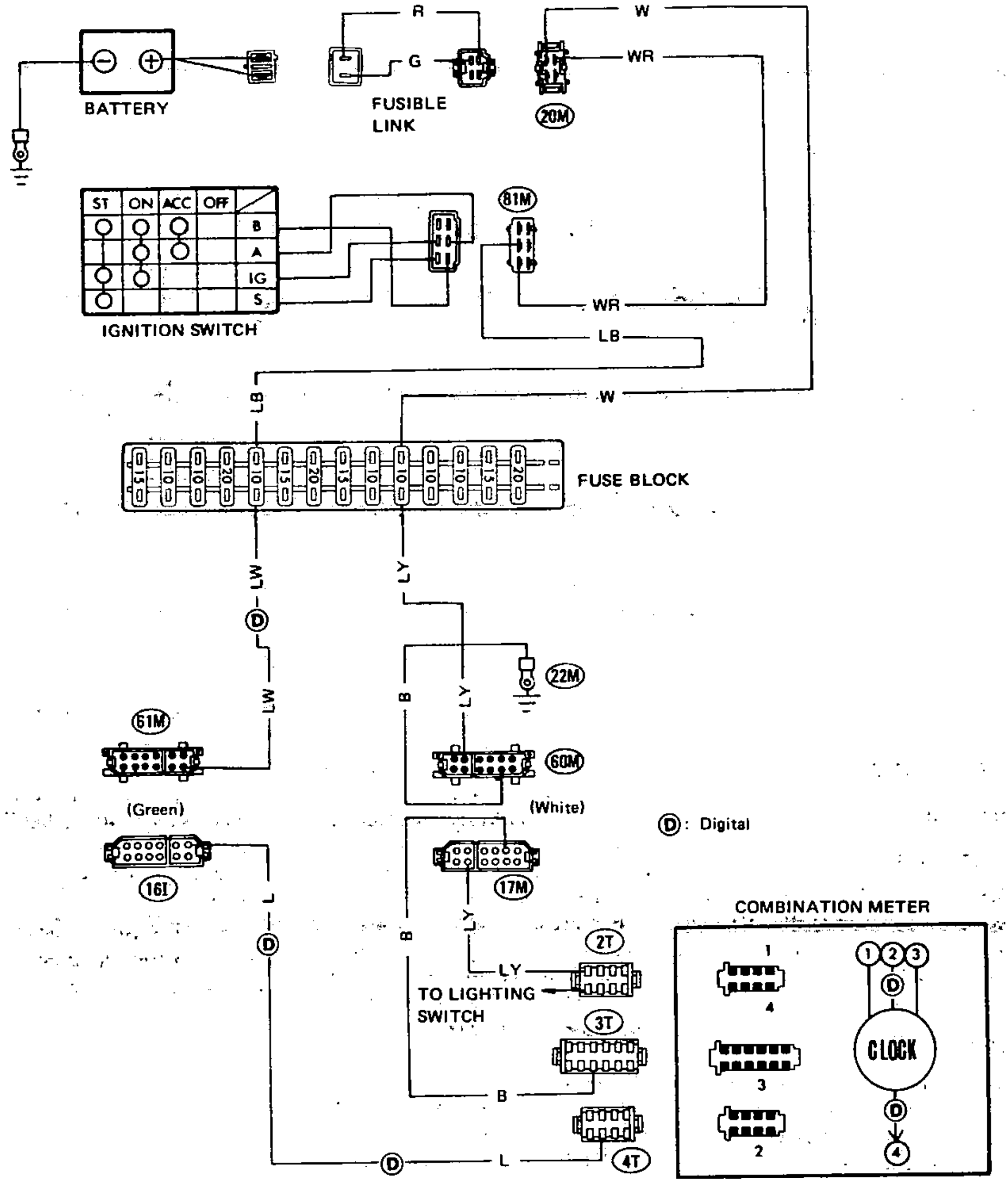
For example, when adjusting the time for 10:00, first set the time between 9:30 and 10:29. Then push the knob simultaneously with the announcement of 10:00.

To adjust the day, first select "MONTH : DAY" with the "SELECT" knob, then turn the "ADJUST" knob counterclockwise for "MONTH" adjustment or clockwise for "DAY" adjustment.

To adjust the current minute and second, select "MIN : SEC" with the "SELECT" knob, and depress the "ADJUST" knob to set the time to 00:00.

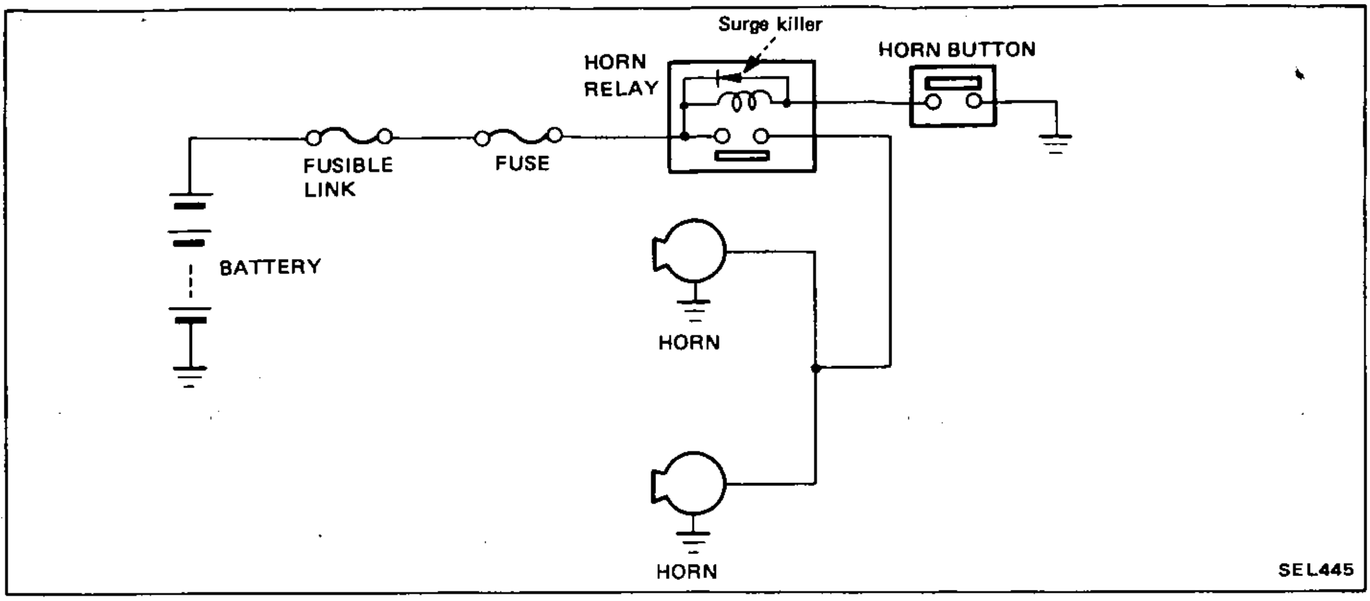
When the battery cable is detached and reinstalled, the display will automatically return to 12:00.

WIRING DIAGRAM/CLOCK

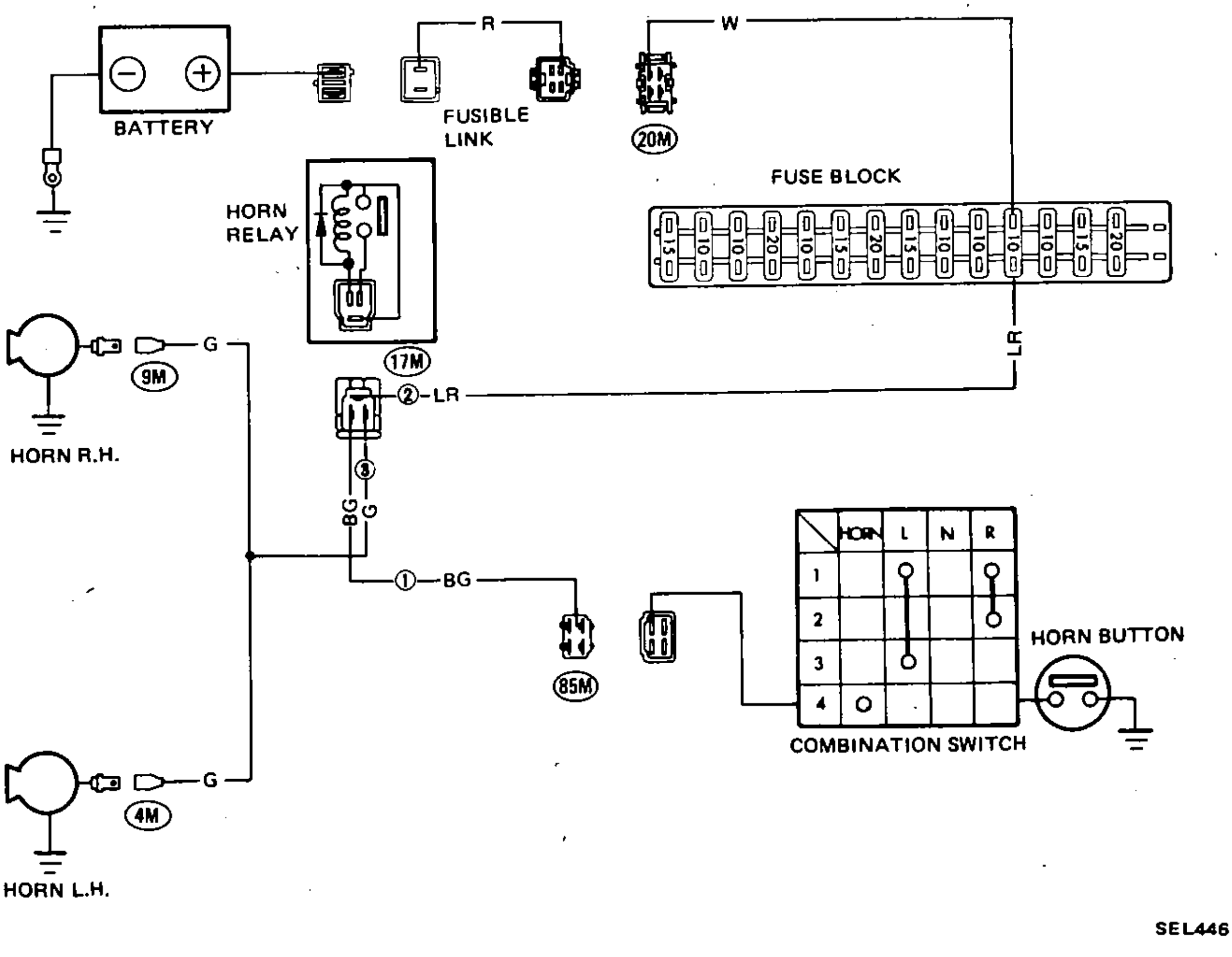


HORN

SCHEMATIC/HORN



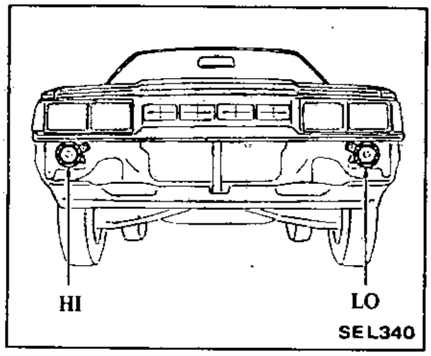
WIRING DIAGRAM/HORN



TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Neither high nor low horn operates.	Burnt fuse.	Correct cause and replace fuse.
	Faulty horn button contact. [Horn sounds when ① terminal of instrument harness connector to combination switch is grounded.]	Repair horn button.
	Faulty horn relay. [Horn sounds when ② and ③ terminals of engine harness to horn relay are connected with a test lead including 10A fuse.]	Replace.
	Loose connection or open circuit.	Check wiring and/or repair connection.
High (Low) horn does not operate.	Faulty horn or loose horn terminal connection.	Correct horn terminal connection or replace horn.
	Break in wire to horn.	Repair.
Horn does not stop to sound.	Short-circuited horn button and/or horn button lead wire. [When instrument harness is disconnected from combination switch, horn stops sounding.]	Repair horn button or its wiring.
	Faulty horn relay.	Replace.
Reduced volume and/or tone quality.	Loose or poor connector contact. (Fuse, relay, horn and/or horn button.)	Repair.
	Faulty horn.	Replace.

HORN

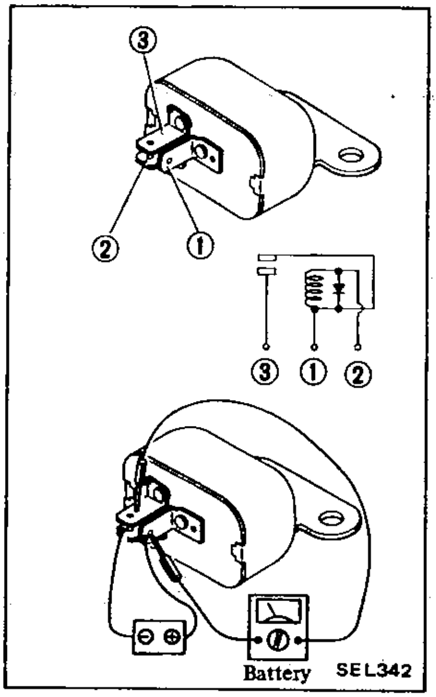


HORN RELAY

Location

The horn relay is located beneath the relay bracket. Refer to page EL-105.

Inspection

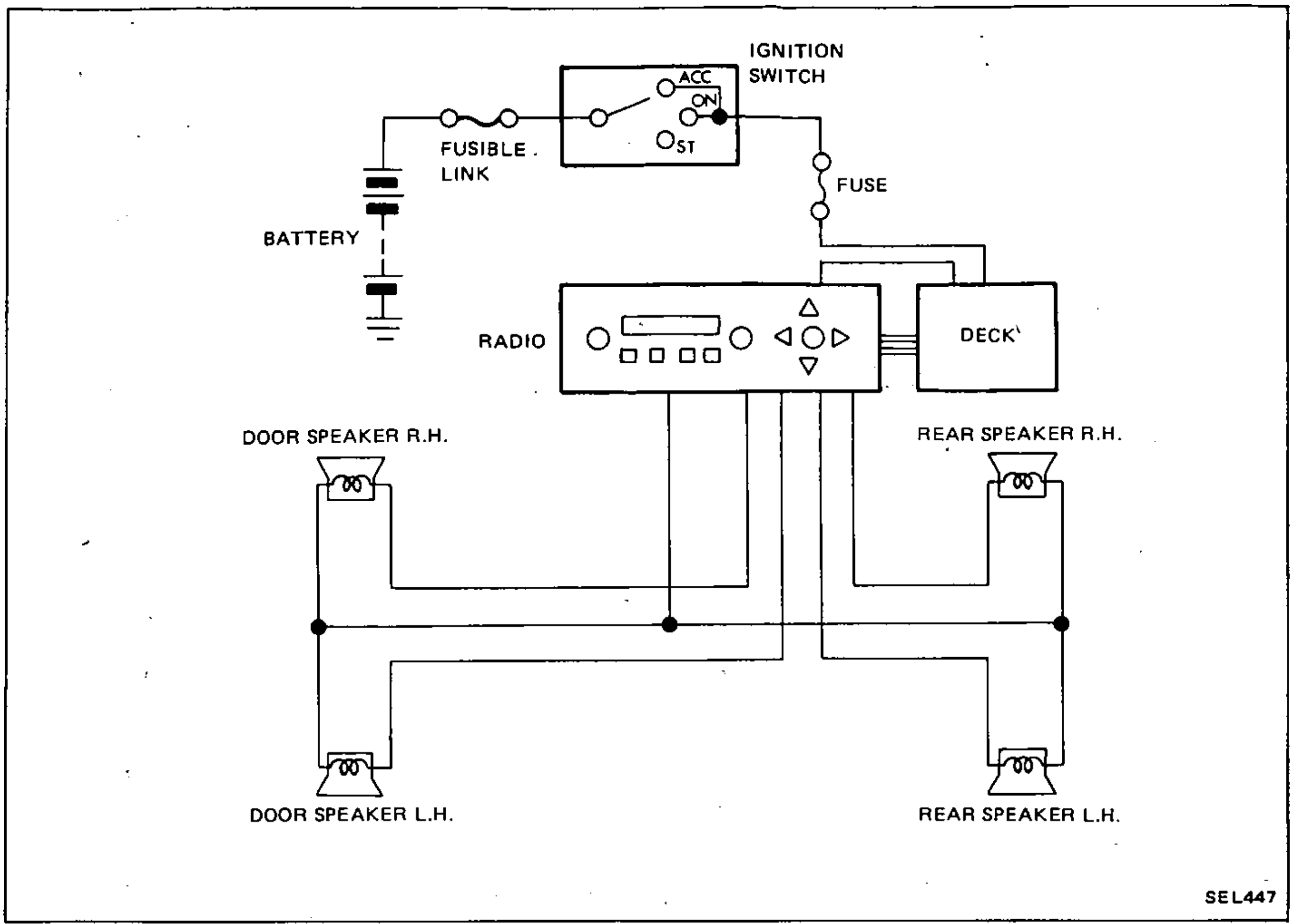


HORN BUTTON

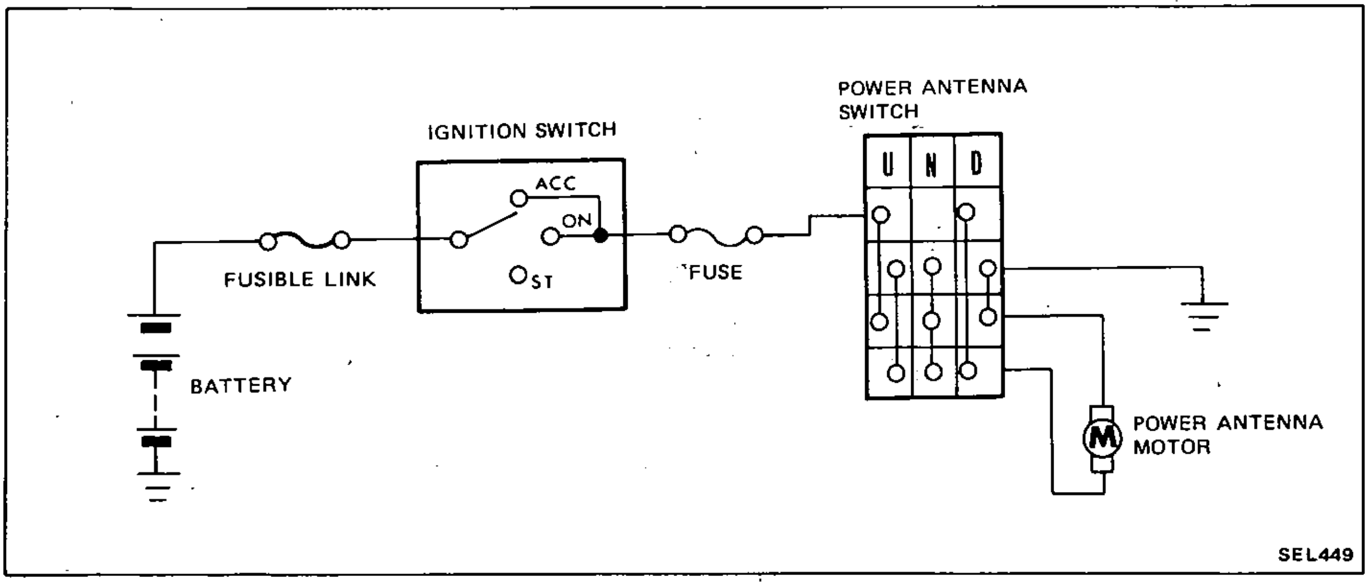
The horn button is attached to the combination switch. Refer to page EL-39.

AUDIO

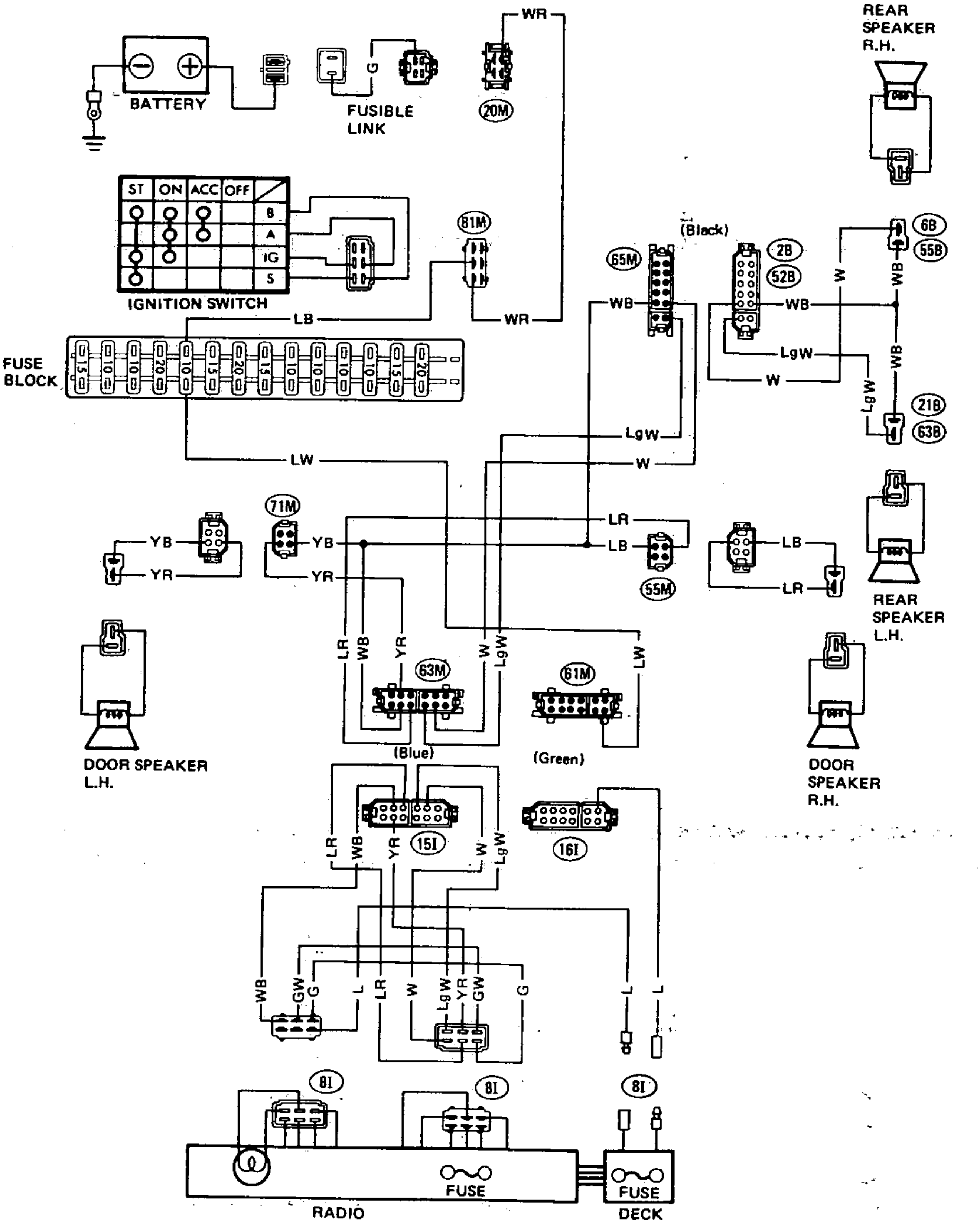
SCHEMATIC/AUDIO



SCHEMATIC/POWER ANTENNA

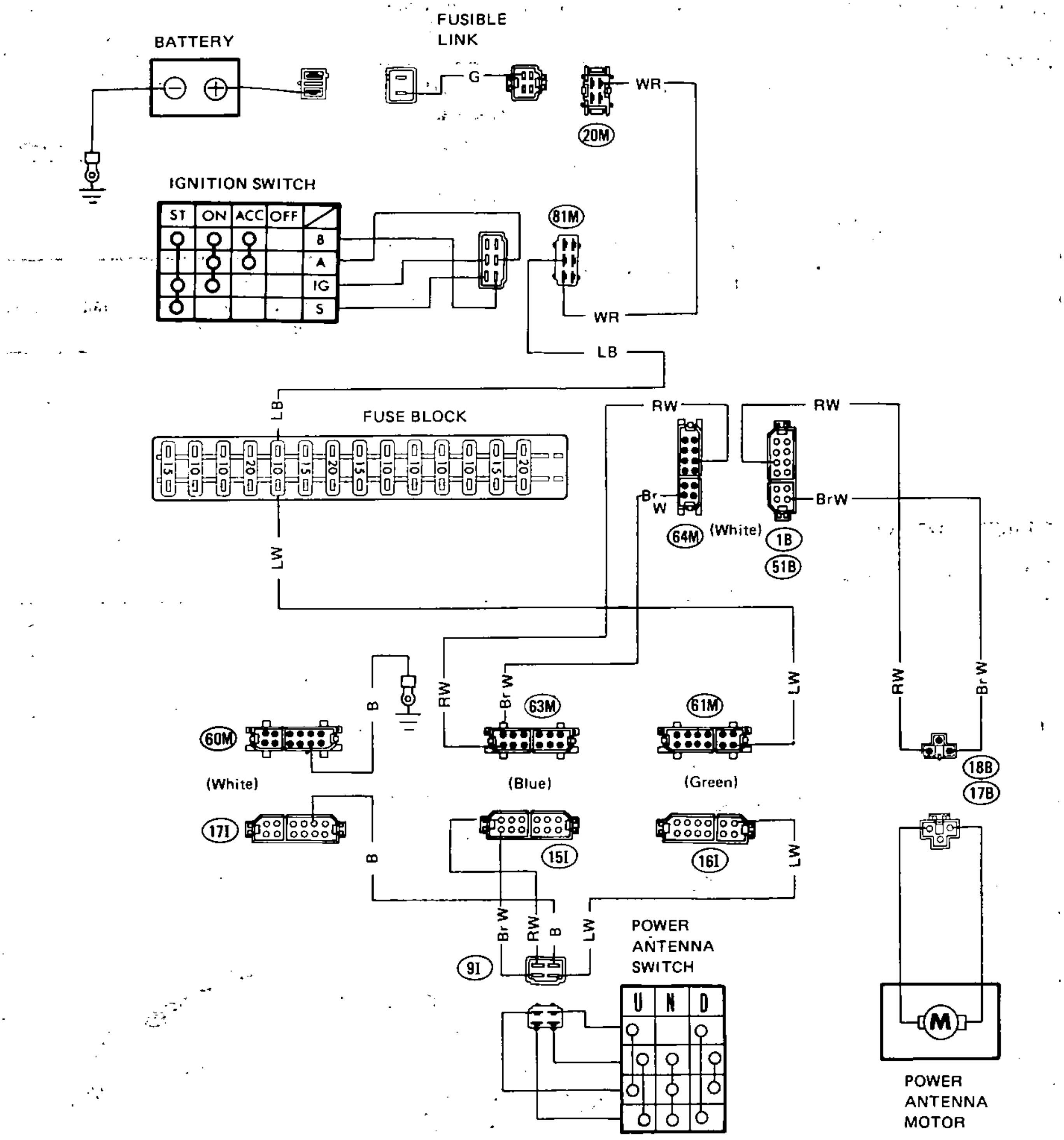


WIRING DIAGRAM/AUDIO



SEL448

WIRING DIAGRAM/POWER ANTENNA



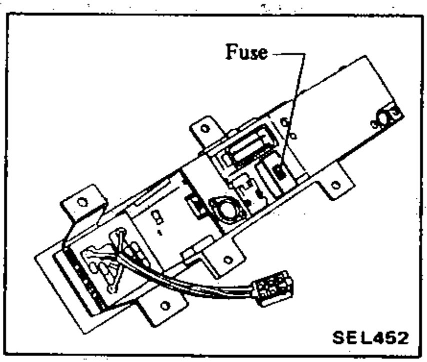
SEL450

RADIO

Removal and installation

Prior to removing radio and sound balancer, remove cluster lid C.

Inspection



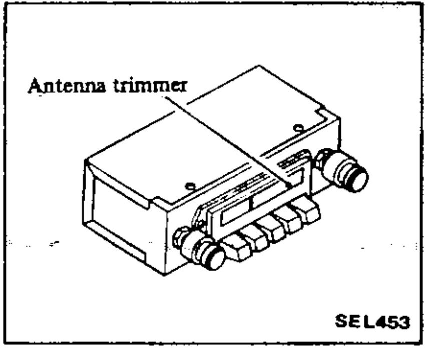
Antenna trimmer adjustment

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.

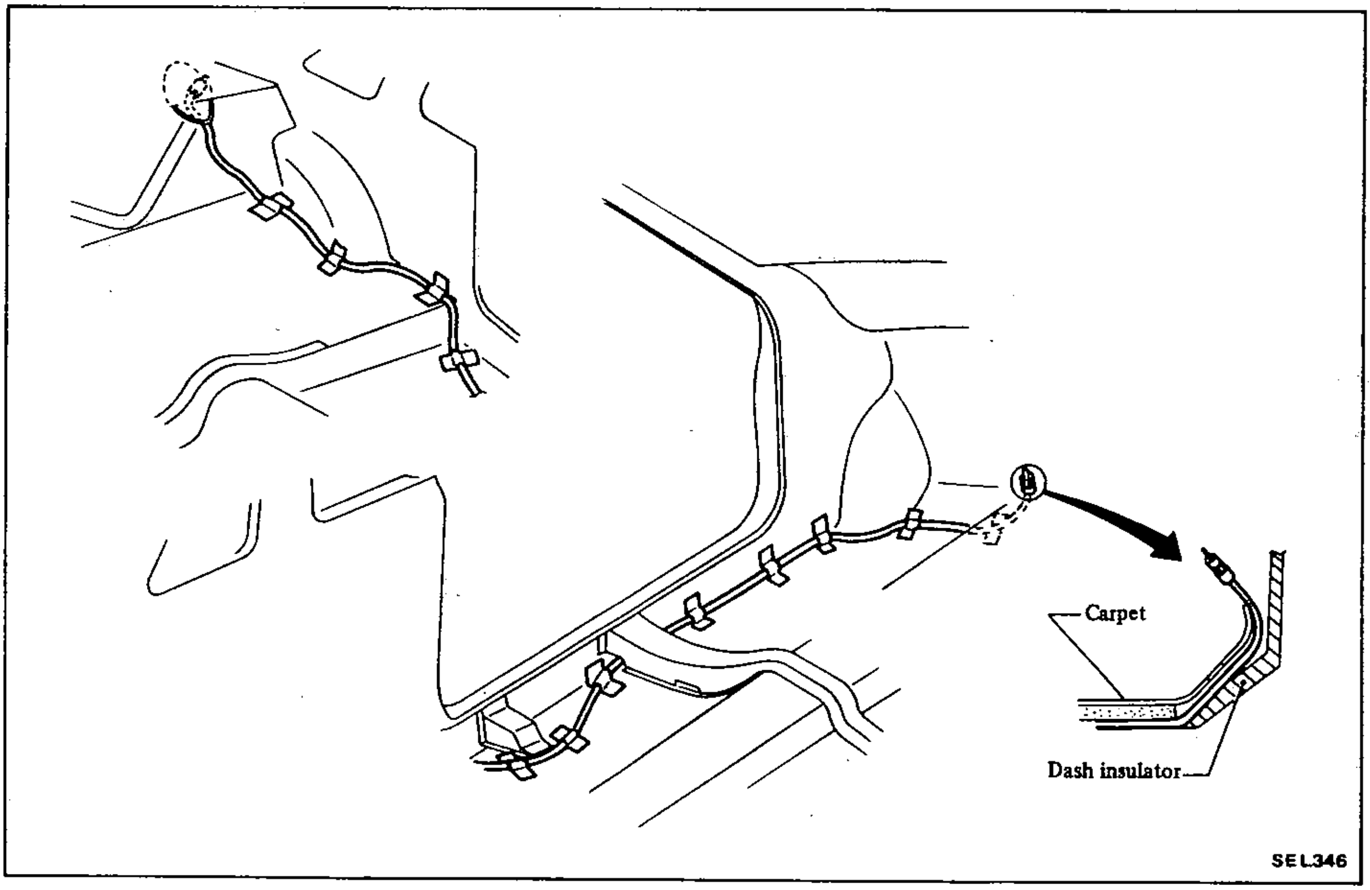
1. Extend antenna completely.
2. Turn radio on, and turn volume control to increase speaker volume.
3. Tune in the weakest station (barely audible) on dial at the range around 14 (1,400 kHz).
4. Turn antenna trimmer to left or right slowly, and set it in the position where reception is strongest.



CAUTION:
Do not turn antenna trimmer more than one-half turn.

POWER ANTENNA

Feeder cable routing



Always route feeder cable away from other harnesses.

SHIP DATE	PARCEL POST	U.P.S.	CUST.PICK-UP	SHIP VIA	TAX YES	TAX NO	DATE SHIPPED
5-2-80		x				x	5/5

QTY. ORDERED	QTY. SHIPPED	DESCRIPTION	PRODUCT CODE	B/O
1	/	200SX Combined manual '80	20082	

D2772/26-93

C 74654

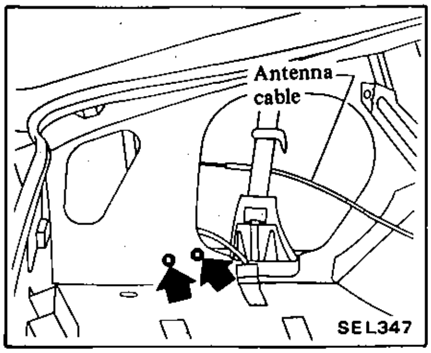
ANY ITEMS NOT SHIPPED ARE IMMEDIATELY BACK ORDERED. NO CLAIMS ALLOWED UNLESS MADE WITHIN 10 DAYS FROM DATE OF INVOICE. NO UNAUTHORIZED RETURNS ACCEPTED. This is to certify that the goods herein were produced in compliance with all provisions of the Fair Labor Standards Act of 1938 as amended. It is our intention to comply, and the prices here invoiced do comply, to the best of our knowledge, with existing price regulations.

PAY THIS AMT.

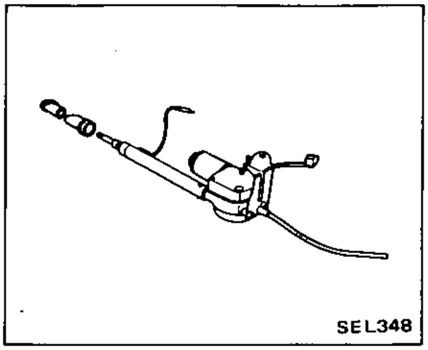
SHIPPING

4-313

Power antenna motor



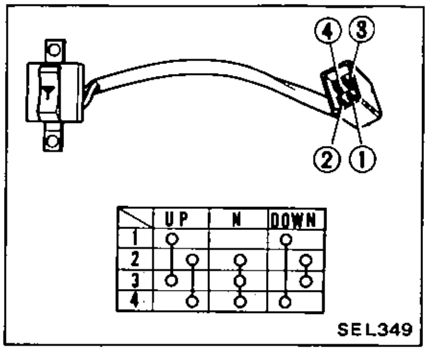
Securely tighten antenna grounding bolts.



CAUTION:
Do not allow motor to keep running when antenna rod is fully extended or retracted.

Power antenna switch

The power antenna switch is located on cluster lid C. Refer to BF section.



NOISE PREVENTION PARTS

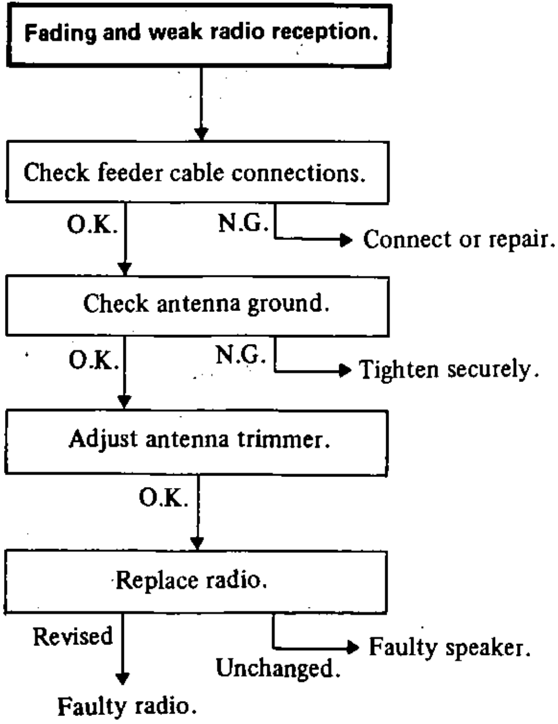
Condenser

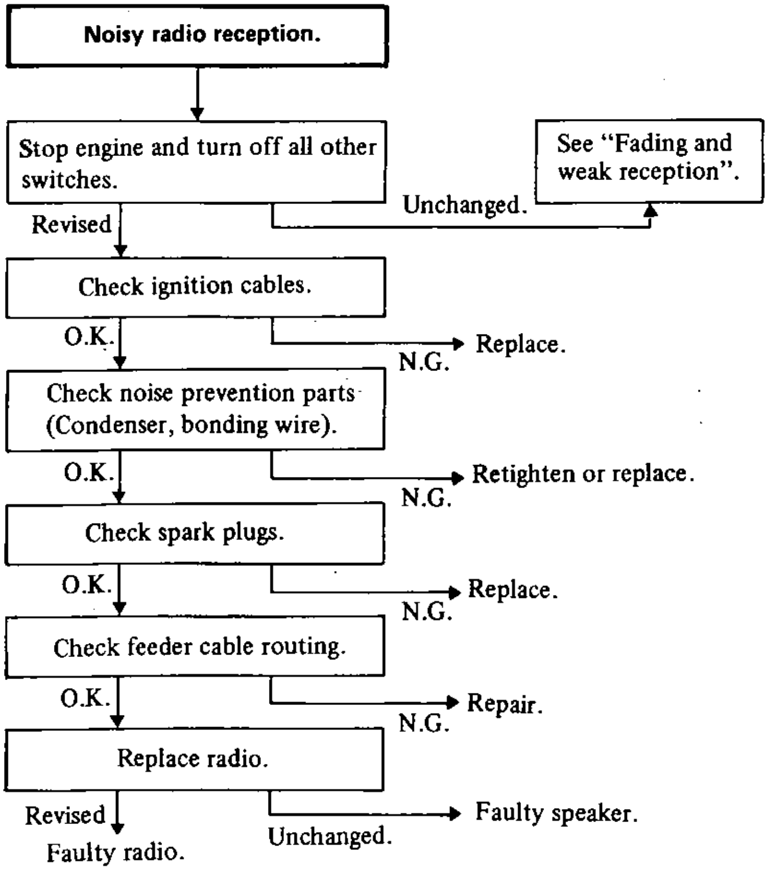
- Ignition coil
- Alternator

Bonding wire

- Body to engine rocker cover

TROUBLE DIAGNOSES AND CORRECTIONS





AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

CAUTION: Before starting to work on any part of electrical system, disconnect battery ground cable.

DESCRIPTION

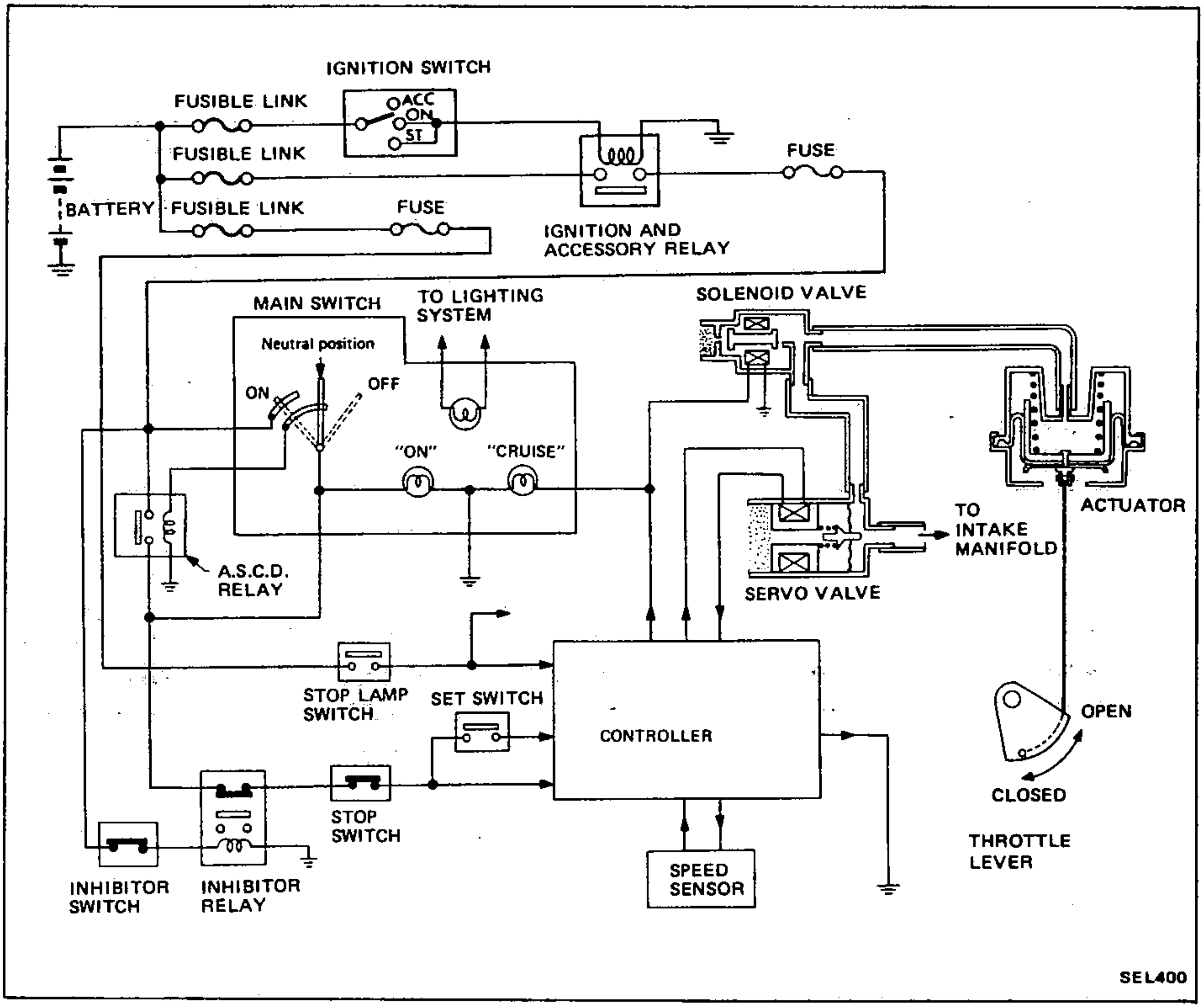
The Automatic Speed Control Device (subsequently referred to as "A.S.C.D.") is a combined unit of electronic circuits with vacuum mechanisms.

The construction of this system and the location of each component part are shown on page EL-104 and 105.

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 operates the actuator which adjusts the throttle valve opening.

SCHEMATIC/A. S. C. D.



FUNCTION AND OPERATION

Main switch

The main switch has a holding type of circuit.

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.

Speed sensor (Contained in speedometer)

The speed sensor is generating two pulses per revolution of the meter cable.

The output voltage range and the duty cycle must be controlled properly.

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.

Release valve

The release 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

The stop switch is used to release the system. When the brake pedal is depressed, this switch cuts off the power supply to the A.S.C.D. circuit.

Stop lamp switch

This switch causes the stop light to operate. At the same time, the operating signal of the stop light circuit is sent to the controller in order to release the system.

Inhibitor relay

The inhibitor relay releases the A.S.C.D. system when the selector is set to "N" or "P" position.

TROUBLE DIAGNOSES

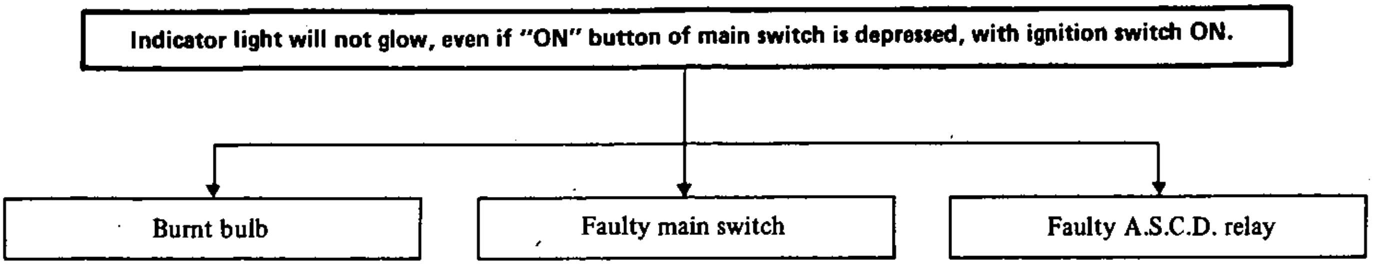
TEST CONDITIONS

If a malfunction is found, be sure to check the following before performing the system test.

1. All wiring harness connectors must be securely connected.
2. A.S.C.D. cable must be securely installed with proper adjustment.
3. Vacuum hoses must be properly attached with no abnormal conditions such as vacuum leakage, sharp bends or kinks.

DIAGNOSIS

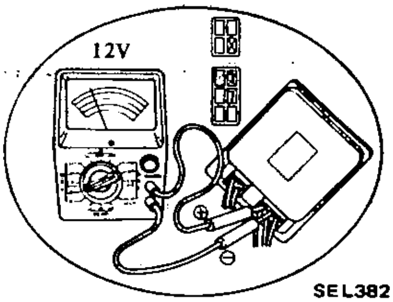
WARNING:
All following system tests can be performed without running engine. Avoid making test while driving car or running engine.



Cruise light 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 main switch ON, battery voltage (12V) is present between terminals ⑧ and ⑦ of harness connector.

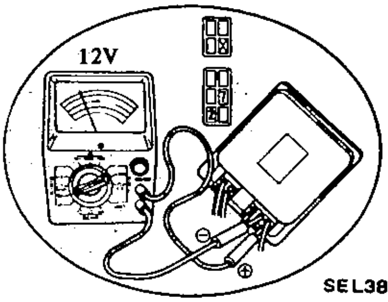
Set automatic transmission selector lever at any position other than "P" and "N" position.



SEL382

- YES → next check (set switch)
- NO → Open circuit.
  - Faulty or unproperly adjusted stop switch.
  - Faulty inhibitor switch.

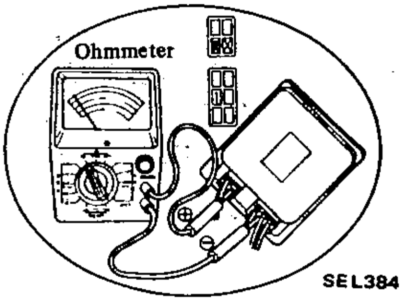
When set switch is depressed with main switch ON, battery voltage (12V) is present between terminals ② and ⑦ of harness connector.



SEL383

- YES → next check (meter cable)
- NO → Faulty set switch.

With main switch ON, manually rotate meter cable slowly.
Continuity between terminals ① and ⑩ of harness connector exists two times a rotation.



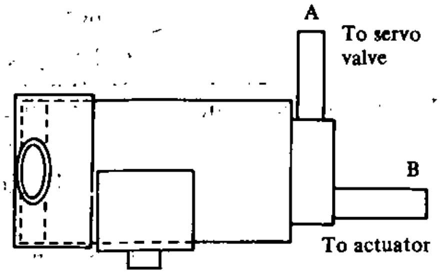
SEL384

- YES → Faulty controller.
- NO → Faulty speed sensor.

Cruise light illuminates when speed setting operation is made, but speed is not actually set.

When battery voltage (12V) is applied to the release valve terminal, the following are possible:

1. With "A" closed, no suction is possible at "B".
2. With "A" opened, suction is begun at "B".



BE089D

YES → Servo valve operates normally. (Refer to Servo Valve for Inspection.).

NO → Faulty release valve.

Servo valve operates normally. (Refer to Servo Valve for Inspection.).

YES → Actuator operates smoothly when actuator vacuum port is suctioned.

NO → Faulty servo valve.

Actuator operates smoothly when actuator vacuum port is suctioned. (This operation must be perfomed with A.S.C.D. cable released.)

YES → Faulty controller.

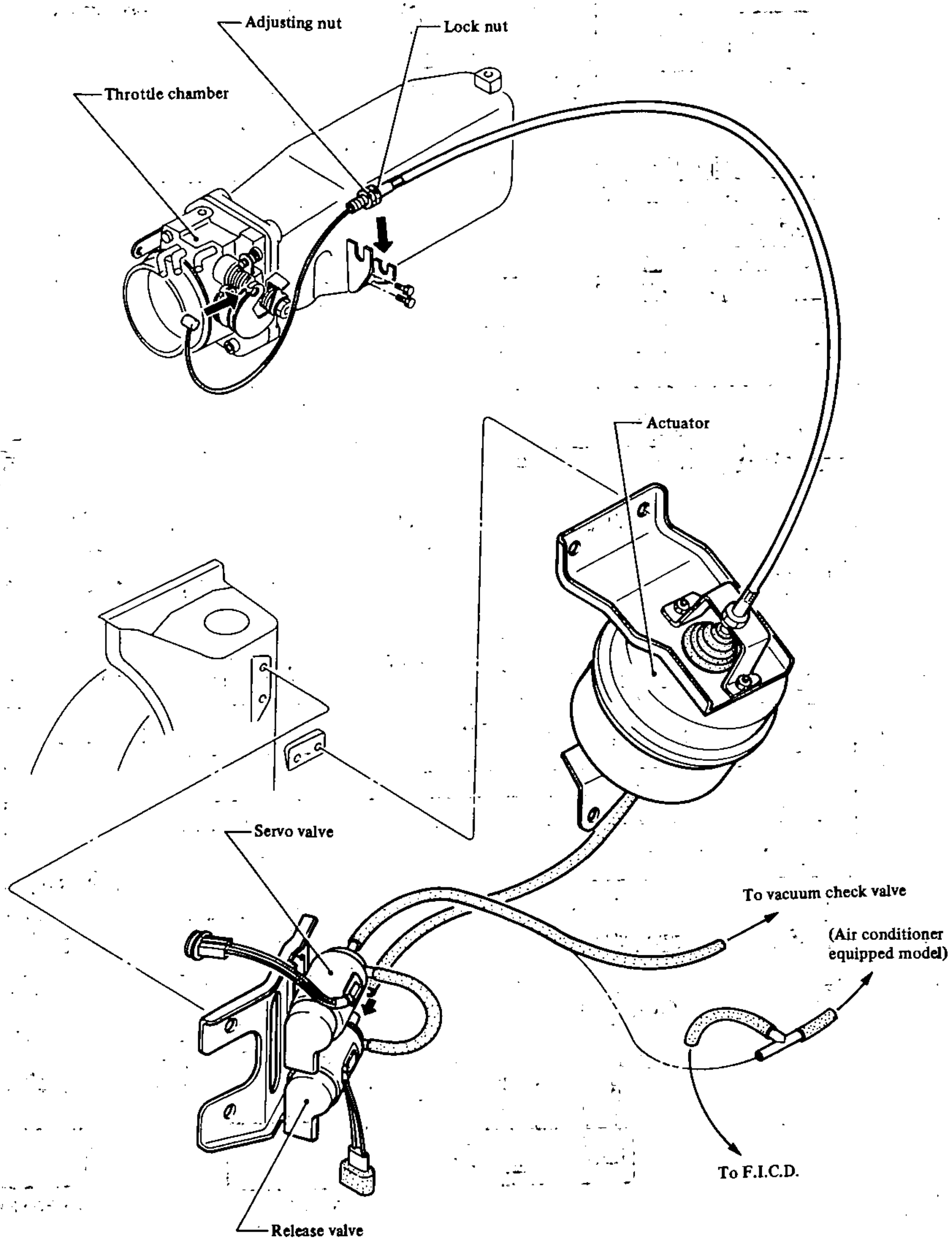
NO → Faulty actuator.

Other malfunction

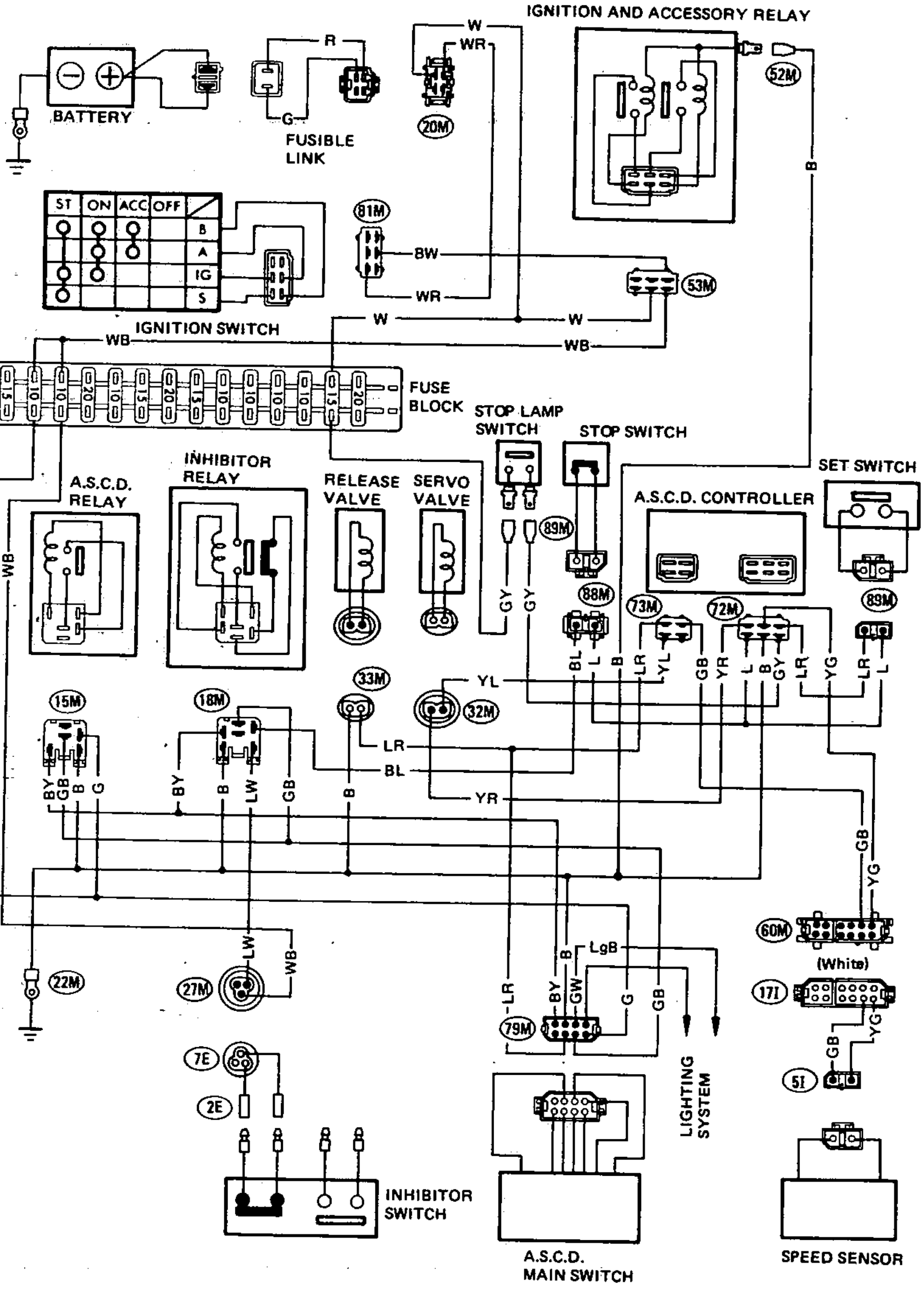
Condition	Probable cause	Corrective action
Set speed is cancelled.	• Bent meter cable (excessive meter needle deflection.). • Faulty controller.	• Check and repair meter cable, or renew cable. • Renew.
Pulsation of set speed.	• Excessive play or binding of A.S.C.D. cable. • Leakage or clogging in vacuum hose. • Binding in actuator. • Faulty servo valve. • Faulty controller.	• Adjust. • Check and repair piping route, or renew hose. • Renew actuator. • Renew servo valve. • Renew controller.
Excessive setting error.	• 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.	• Readjust. • Check and repair piping route, or renew hose. • Renew actuator. • Renew servo valve. • Renew controller. • Renew speed sensor.
Speed drops immediately after setting.	• Excessive play in A.S.C.D. cable. • Leakage or clogging in vacuum hose. • Faulty release valve. • Faulty servo valve. • Faulty controller.	• Readjust. • Check and repair piping route, or renew hose. • Renew release valve. • Renew servo valve. • Renew controller.
Cancel circuit inoperative.	• Faulty controller.	• Renew controller.

COMPONENT PARTS

VACUUM ROUTING



WIRING DIAGRAM/A. S. C. D.

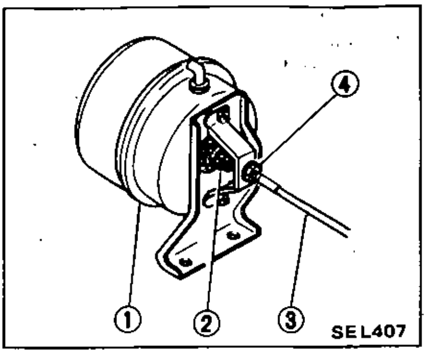


SEL394

A. S. C. D. CABLE

Removal and Installation

1. Disconnect cable from actuator.
(1) Loosen lock nut at actuator.
(2) Remove rubber boots.



1 Actuator
2 Rubber boot
3 Cable
4 Lock nut

2. Loosen lock nut at intake manifold bracket.
3. To install the cable, reverse the order of removal.

Exercise care when removing and installing wire, so as not to deform wire end.

Adjustment

When installing, adjust A.S.C.D. cable as follows:

Without depressing the accelerator pedal, adjust the adjusting nut until cable free play is within specified value at throttle lever.

Then tighten lock nut.

Free play:
2 - 3 mm (0.08 - 0.12 in)

Do not increase tension of cable excessively, as this may cause throttle lever to rotate.

ACTUATOR

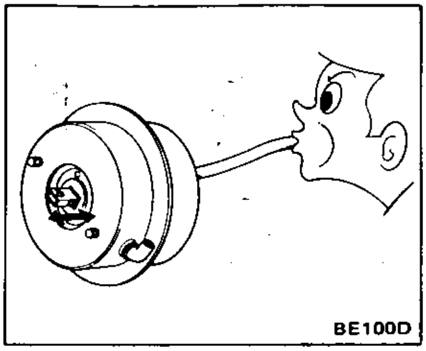
Removal and Installation

1. Disconnect battery ground cable.
2. Disconnect cable from actuator.
Refer to A.S.C.D. cable for removal.
3. Disconnect vacuum hose from A.S.C.D. release valve.
4. Remove bolt attaching actuator to body.
5. To install actuator, reverse the order of removal.

Inspection

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.

RELEASE VALVE

Location

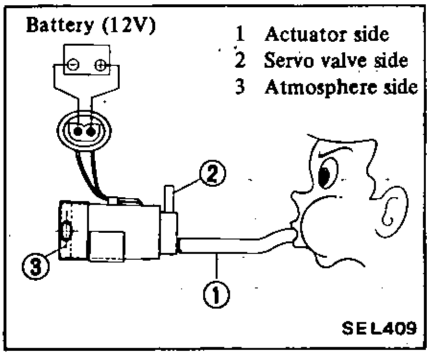
Refer to page EL-99.

Inspection

1. Measure the resistance between terminals.

Circuit tester indication:
25 - 30 Ω

2. Check to be sure that the valve opens or closes by blowing air through port on actuator side.



(1) Normal condition.

Check ports	Air flow
①-② ①-③ ②-③	Yes

(2) 12V direct current is applied between terminals.

Check ports	Air flow
①-②	Yes
①-③ ②-③	No

SOLENOID VALVE

Location

Refer to page EL-99.

Inspection

1. Measure the resistance between terminals.

Circuit tester indication:
25 - 30 Ω

2. Check to be sure that output vacuum of valve is proper:

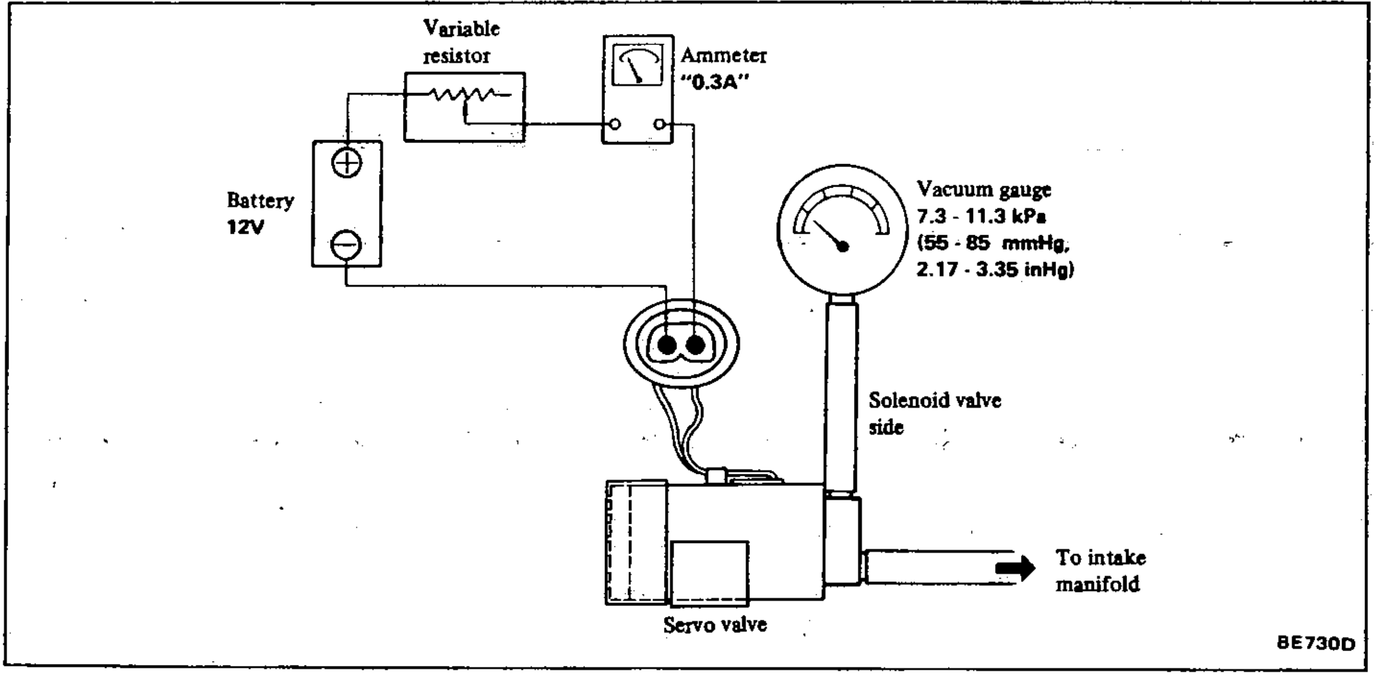
This check should be performed with the valve installed on car.

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 20Ω-5W variable resistor, adjust so that a current of 0.3A will flow.



SPEED SENSOR (Lead switch type)

Location

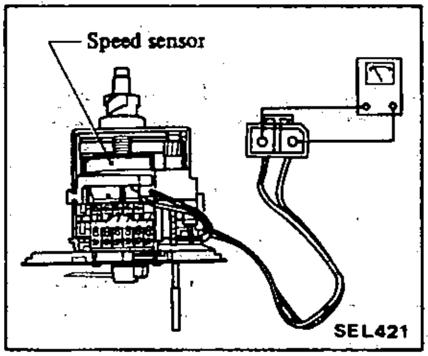
The speed sensor is built into the speedometer.

Inspection

Inspection must be made with speed sensor installed to speedometer.

Turning speedometer slowly by hand, test continuity of speed sensor circuit.

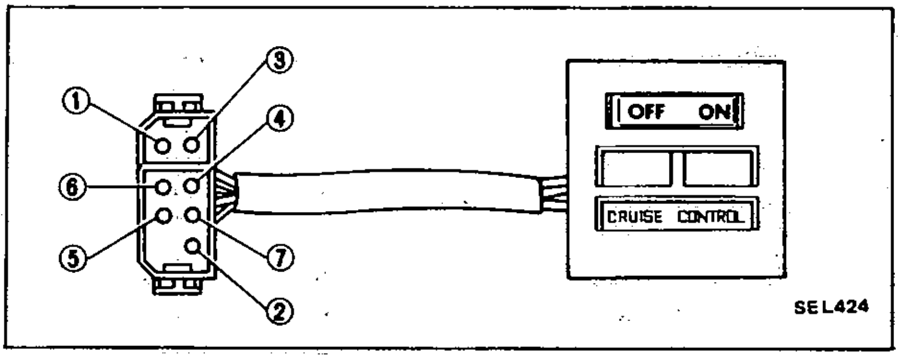
Continuity exists two times a turn .... O.K.



MAIN SWITCH

Inspection

Test continuity through switch or light with an ohmmeter in accordance with the following chart.



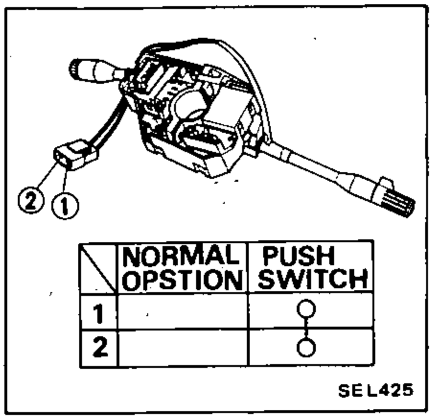
Switch position / Check terminal	Normal	ON	OFF
① - ②	No	Yes	No
① - ⑥	No	Yes	No
② - ⑥	Yes	Yes	No
③ - ④	Yes	–	–
⑤ - ⑦	Yes	–	–
⑥ - ⑦	Yes	–	–

Yes: Continuity should exist.
No: Continuity should not exist.

SET SWITCH

Inspection

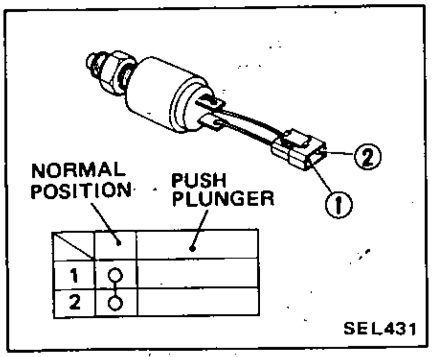
Test continuity through switch with an ohmmeter.



STOP SWITCH

Inspection

Test continuity through switch with an ohmmeter.



Adjustment

Adjustment of the stop switch is the same as the stop lamp switch.

Refer to MA section.

STOP LAMP SWITCH

Inspection

Refer to page EL-50.

Adjustment

Refer to MA section.

A. S. C. D. RELAY

Location

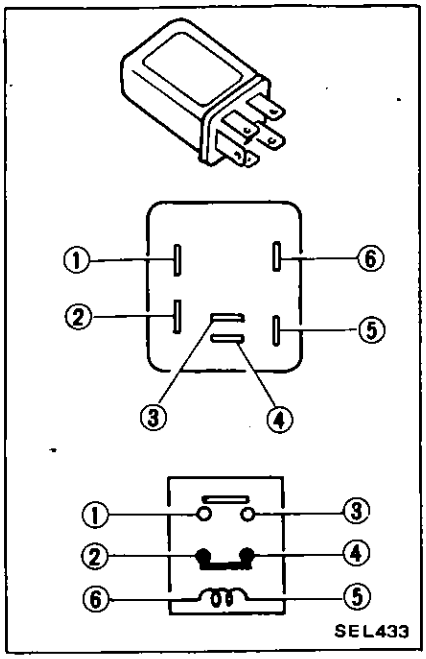
The A.S.C.D. relay is located on the relay bracket. Refer to page EL-105.

INHIBITOR RELAY (For A. S. C. D.)

Location

The inhibitor relay is located on the relay bracket. Refer to page EL-105.

Inspection



Check terminals	Normal condition	12V direct current is applied between terminals ⑤ and ⑥
⑤ · ⑥	Yes	–
② · ④	Yes	No
① · ③	No	Yes

Yes: Continuity should exist.
No: Continuity should not exist.

A. S. C. D. CONTROLLER (IC built-in)

Location

The controller is located on the left dash side panel. Refer to page EL-104.

Inspection

Controller must not be checked as a single part. Check controller for operation as a system, referring to Diagnosis.

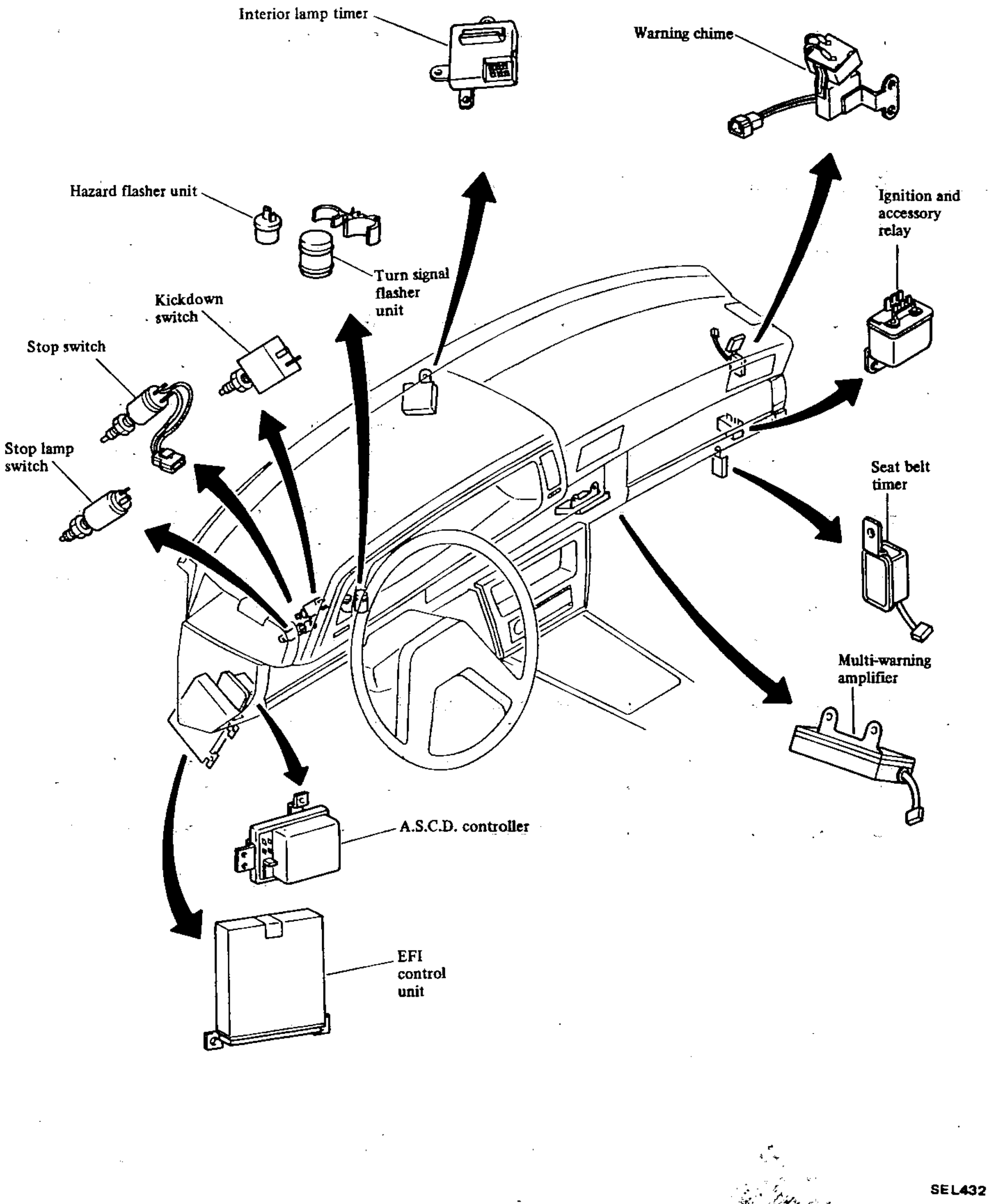
CAUTION:
Do not touch the circuit tester probe to any unnecessary terminal on controller. Doing so could cause damage to controller.

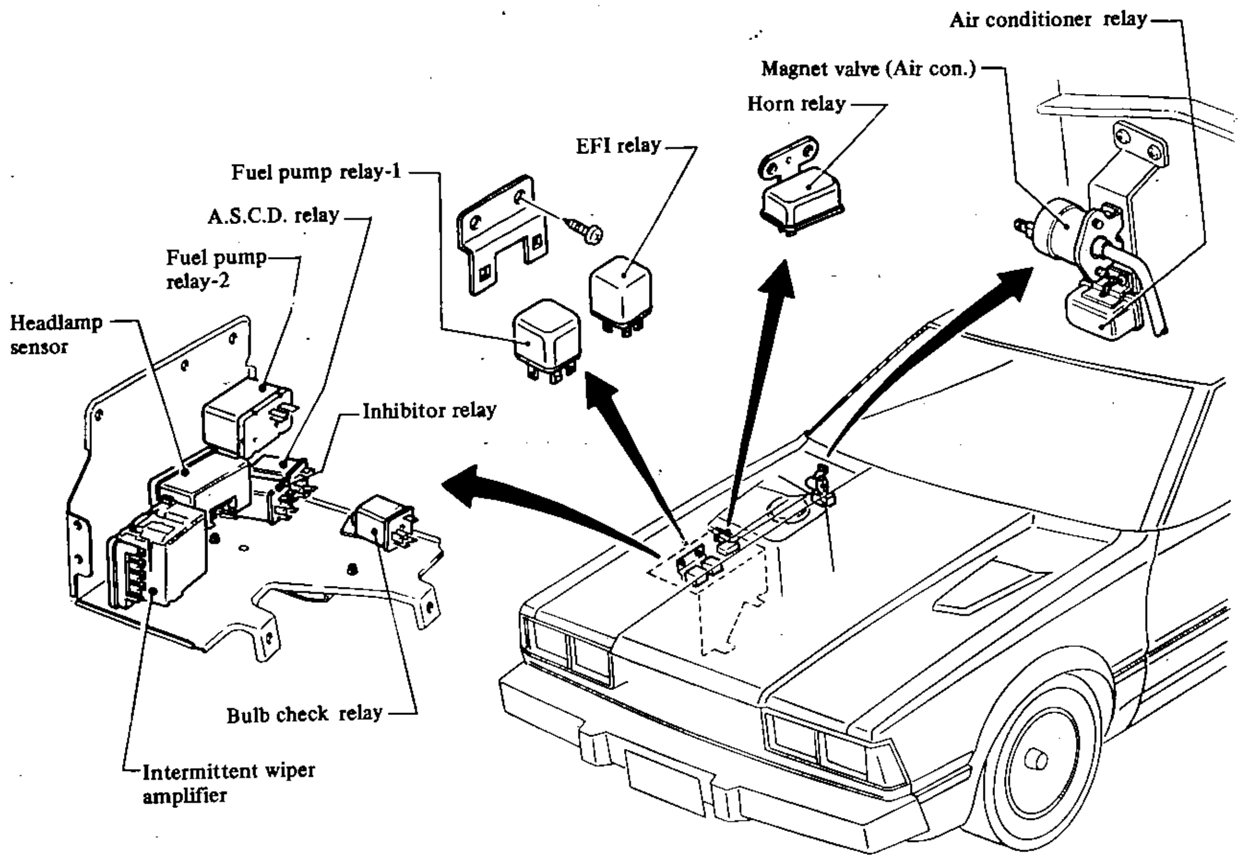
---

a. Handle controller carefully to avoid damage.

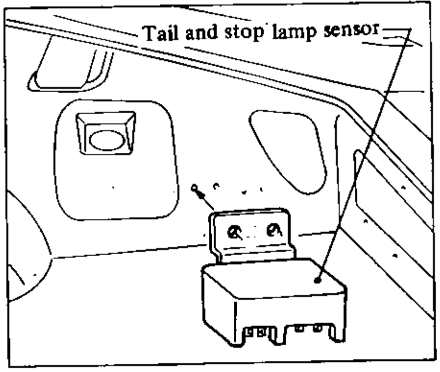
b. Keep controller away from electric noise source to prevent A.S.C.D. system from malfunctioning and IC circuit, etc. from being degraded.

ELECTRICAL UNIT LOCATION

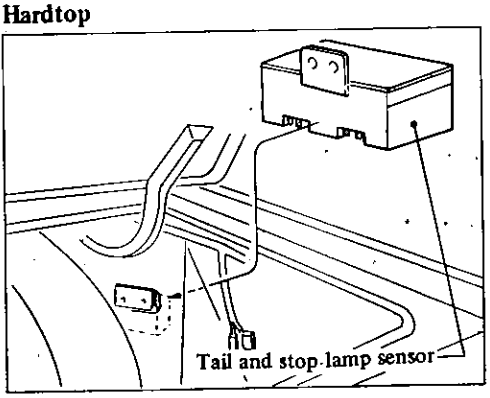


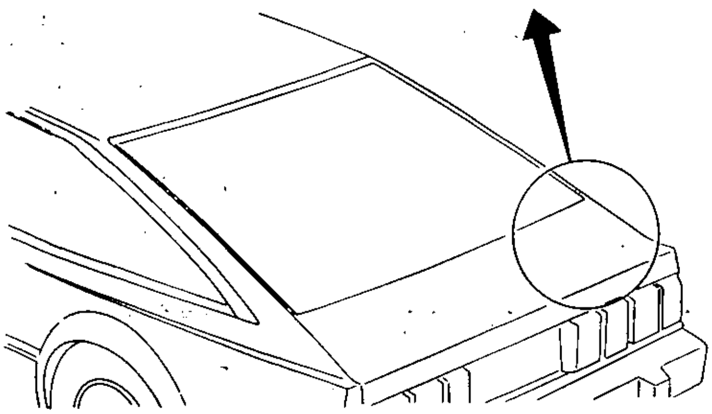


Hatchback



Hardtop





WIRING HARNESS

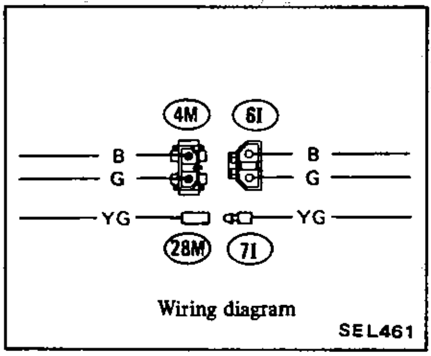
CABLE COLORS

Cable colors are generally used as shown in the following table.

Circuit system	Base 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)

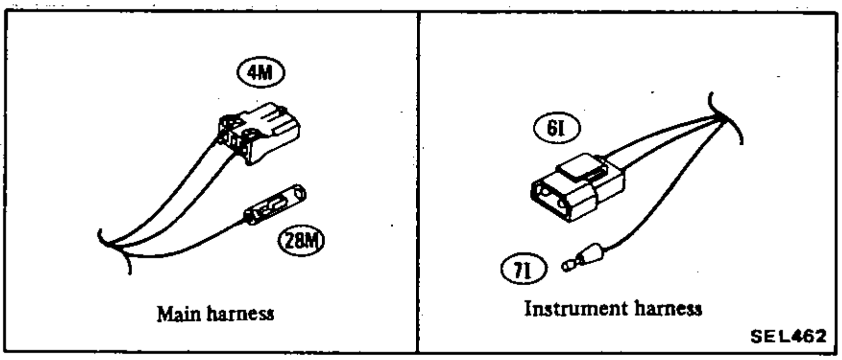
HARNESS LAYOUT

For easy identification, connectors indicated in the system wiring diagram have the same numbers as those used in the harness layout schematic.



Wiring diagram

SEL461

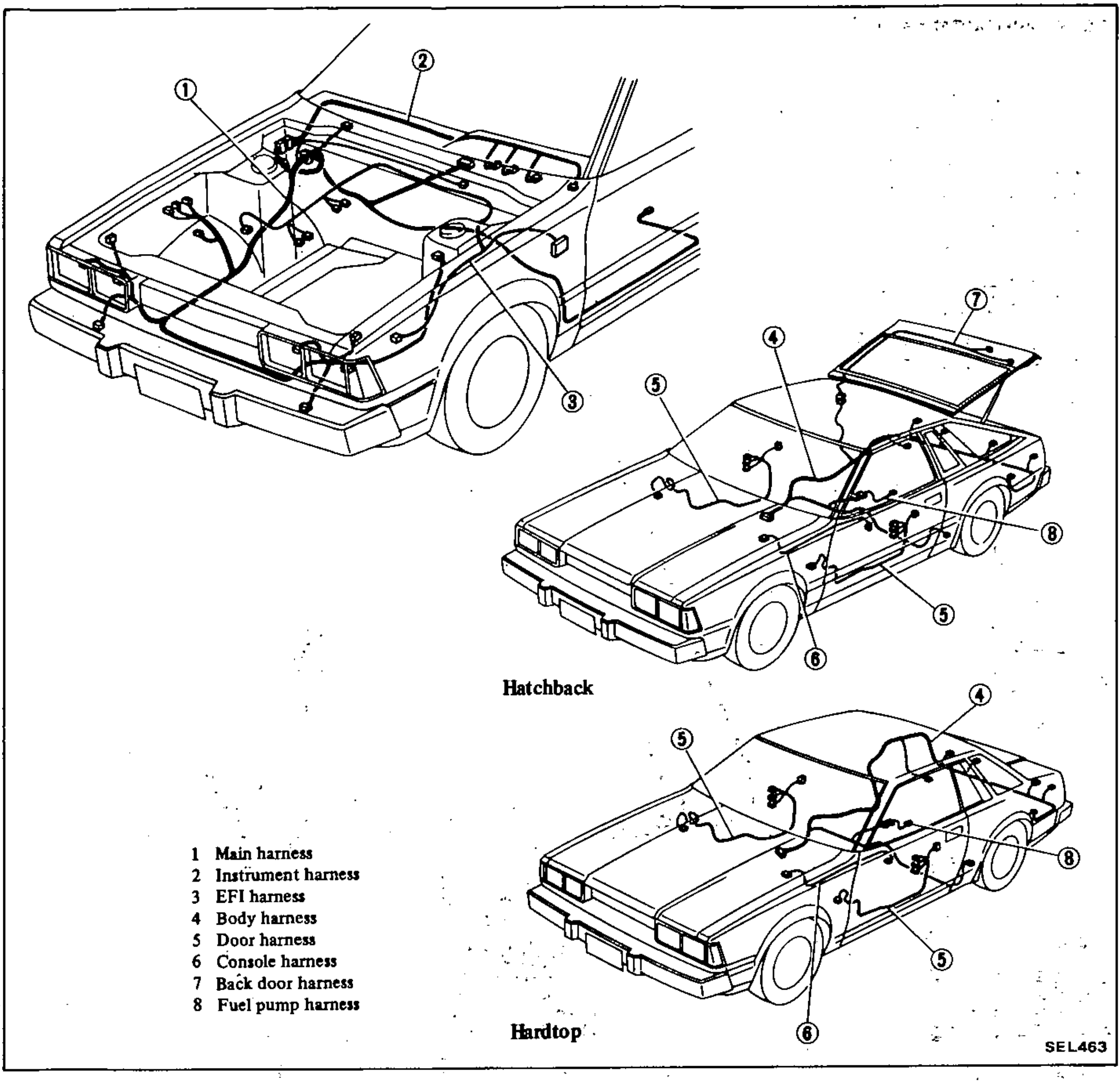


Main harness

Instrument harness

SEL462

SCHEMATIC


①
②
③
④
⑤
⑥
⑦
⑧
Hatchback
Hardtop
1 Main harness
2 Instrument harness
3 EFI harness
4 Body harness
5 Door harness
6 Console harness
7 Back door harness
8 Fuel pump harness
SEL463

MAIN HARNESS

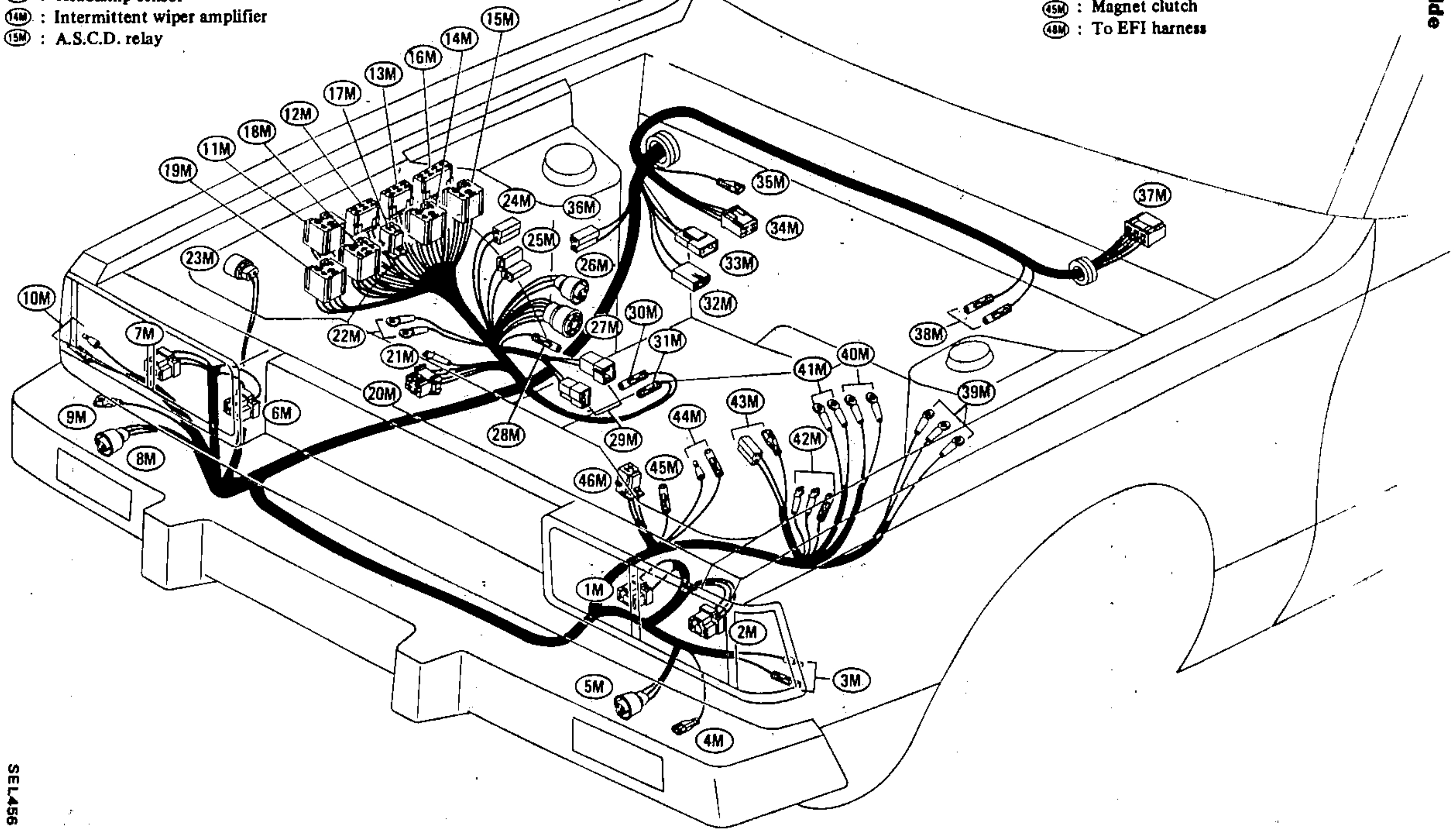
Engine compartment side

(1M) : Headlamp L.H. (Inner)
(2M) : Headlamp L.H. (Outer)
(3M) : Side marker lamp L.H.
(4M) : Horn
(5M) : Front combination lamp L.H.
(6M) : Headlamp R.H. (Inner)
(7M) : Headlamp R.H. (Outer)
(8M) : Front combination lamp R.H.
(9M) : Horn
(10M) : Side marker lamp R.H.
(11M) : EFI relay
(12M) : Fuel pump relay-2
(13M) : Headlamp sensor
(14M) : Intermittent wiper amplifier
(15M) : A.S.C.D. relay

(16M) : Bulb check relay
(17M) : Horn relay
(18M) : Inhibitor relay
(19M) : Fuel pump relay-1
(20M) : Fusible link
(21M) : Battery sensor
(22M) : Body earth
(23M) : Radiator sensor
(24M) : Windshield washer motor
(25M) : Windshield washer sensor

(26M) : To (8E)
(27M) : To (7E)
(28M) : To (6E)
(29M) : Alternator
(30M) : Thermal transmitter
(31M) : Condenser
(32M) : Servo valve (A.S.C.D.)

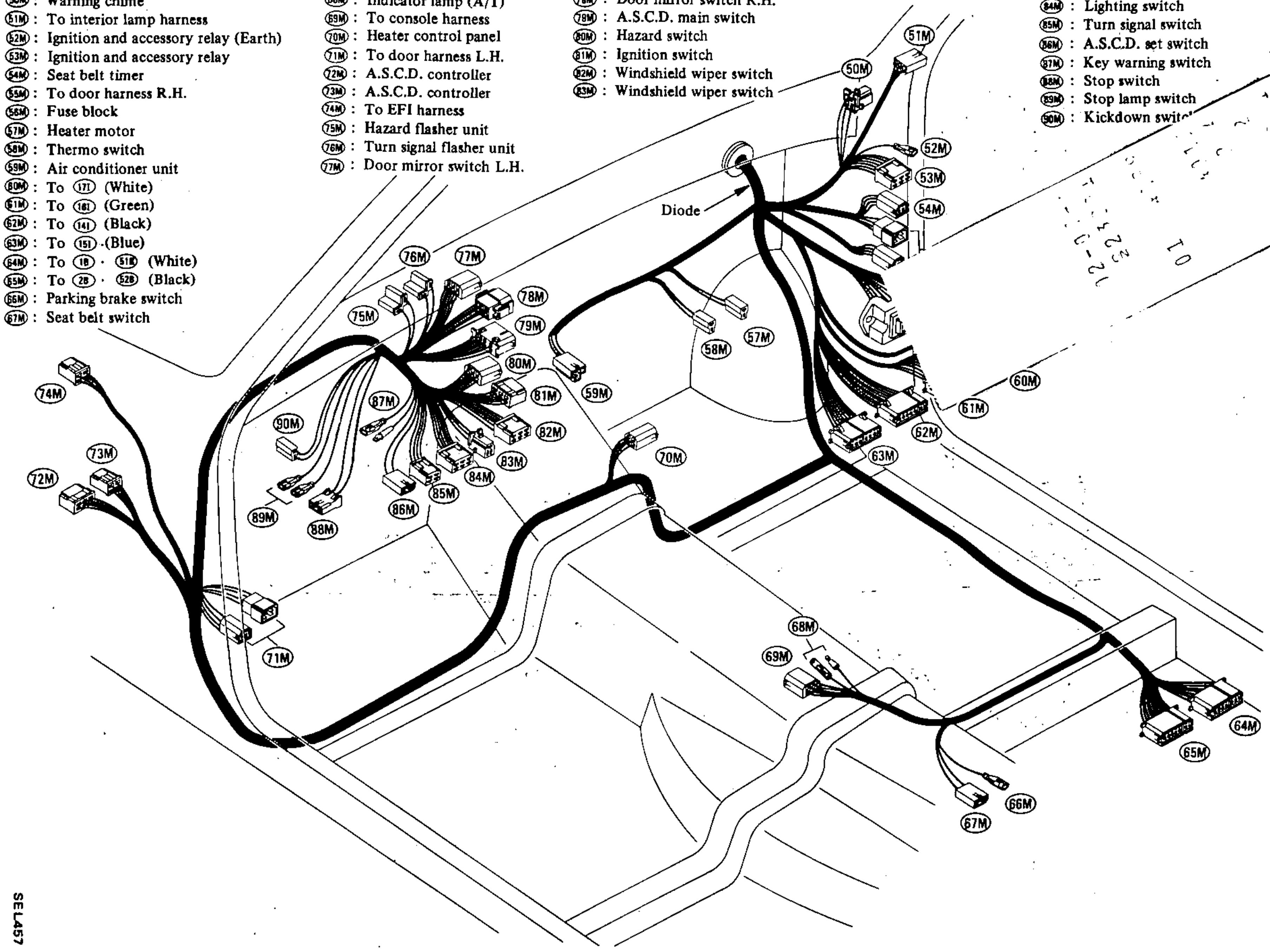
(33M) : Release valve (A.S.C.D.)
(34M) : Air conditioner relay
(35M) : Magnet air valve No. 2 (F.I.C.D.)
(36M) : Rear window washer motor
(37M) : Windshield wiper
(38M) : Brake fluid level switch
(39M) : Terminal block (For California models)
(40M) : Ignition coil 1
(41M) : Ignition coil 2 (For California models)
(42M) : Condenser
(43M) : Distributor
(44M) : Low pressure switch
(45M) : Magnet clutch
(46M) : To EFI harness



SEL456

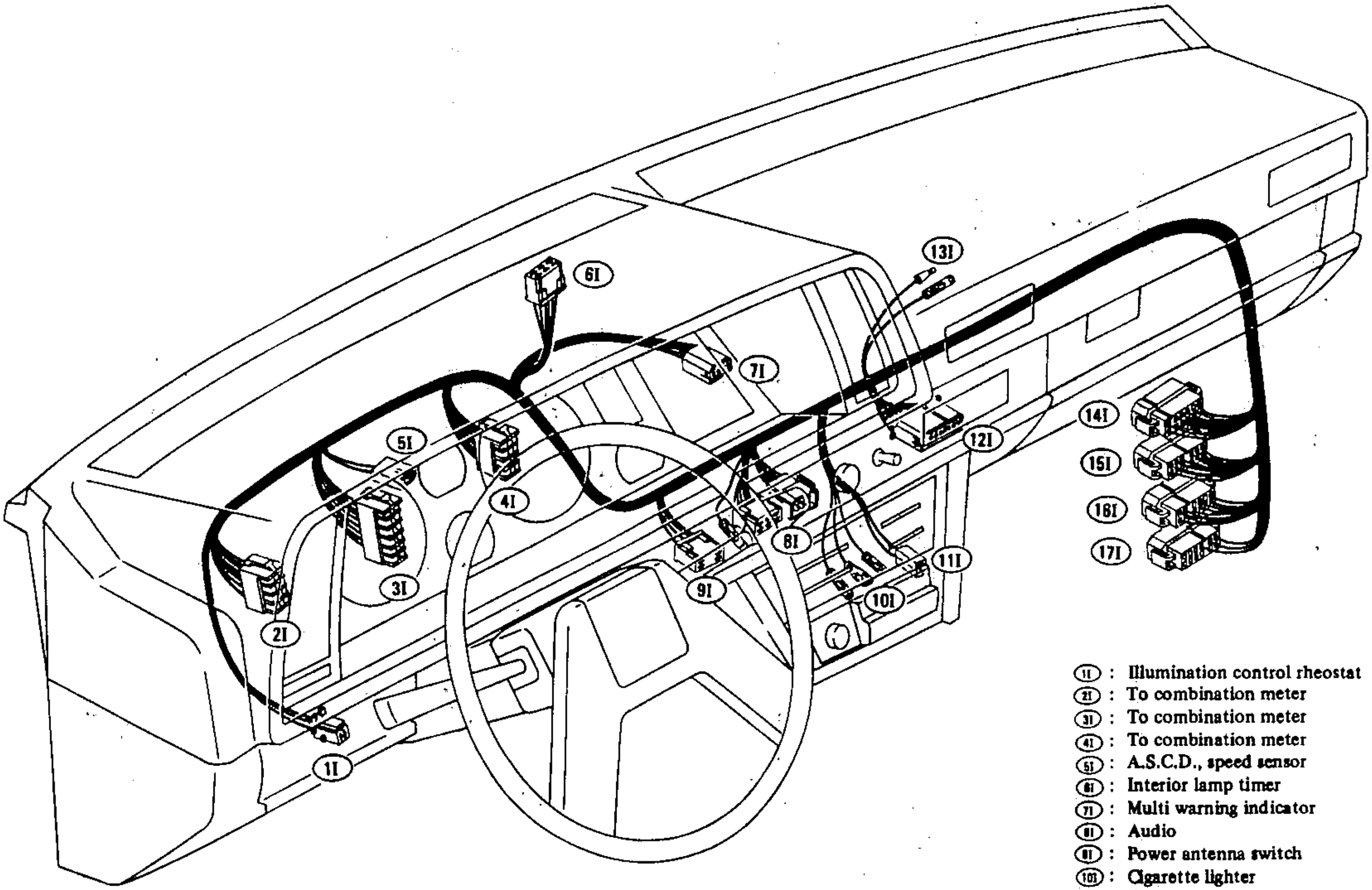
Passeng side

- (50M) : Warning chime
- (51M) : To interior lamp harness
- (52M) : Ignition and accessory relay (Earth)
- (53M) : Ignition and accessory relay
- (54M) : Seat belt timer
- (55M) : To door harness R.H.
- (56M) : Fuse block
- (57M) : Heater motor
- (58M) : Thermo switch
- (59M) : Air conditioner unit
- (60M) : To (17I) (White)
- (61M) : To (16I) (Green)
- (62M) : To (14I) (Black)
- (63M) : To (15I) (Blue)
- (64M) : To (1B) · (51B) (White)
- (65M) : To (2B) · (52B) (Black)
- (66M) : Parking brake switch
- (67M) : Seat belt switch
- (68M) : Indicator lamp (A/T)
- (69M) : To console harness
- (70M) : Heater control panel
- (71M) : To door harness L.H.
- (72M) : A.S.C.D. controller
- (73M) : A.S.C.D. controller
- (74M) : To EFI harness
- (75M) : Hazard flasher unit
- (76M) : Turn signal flasher unit
- (77M) : Door mirror switch L.H.
- (78M) : Door mirror switch R.H.
- (79M) : A.S.C.D. main switch
- (80M) : Hazard switch
- (81M) : Ignition switch
- (82M) : Windshield wiper switch
- (83M) : Windshield wiper switch
- (84M) : Lighting switch
- (85M) : Turn signal switch
- (86M) : A.S.C.D. set switch
- (87M) : Key warning switch
- (88M) : Stop switch
- (89M) : Stop lamp switch
- (90M) : Kickdown switc



SEL457

INSTRUMENT HARNESS

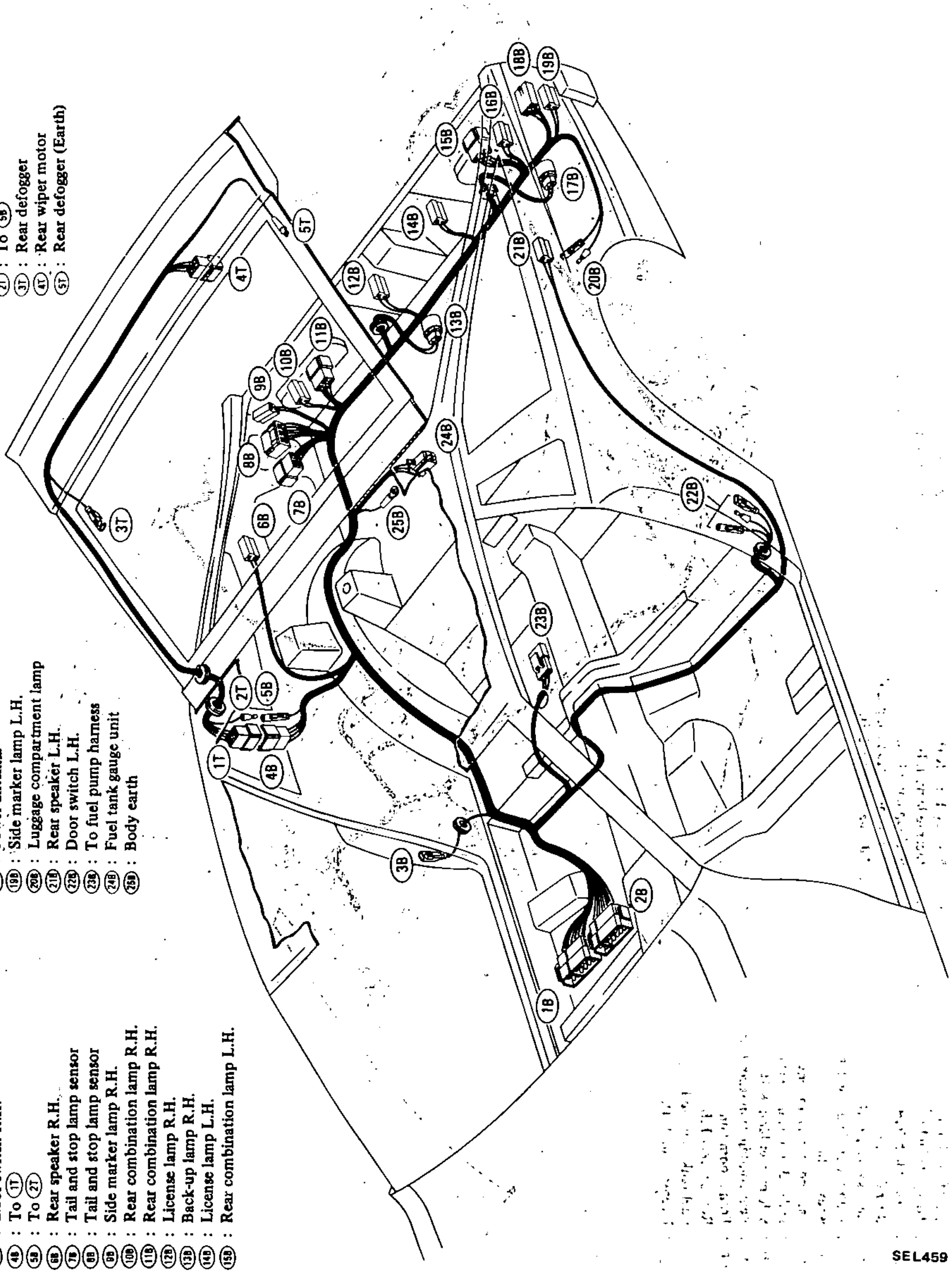


1I : Illumination control rheostat
2I : To combination meter
3I : To combination meter
4I : To combination meter
5I : A.S.C.D., speed sensor
6I : Interior lamp timer
7I : Multi warning indicator
8I : Audio
9I : Power antenna switch
10I : Cigarette lighter
11I : Ash tray illumination
12I : Warning display amplifier
13I : Glove box lamp
14I : To 52M (Black)
15I : To [illegible] (Blue)
16I : To 61M (Green)
17I : To 60M (White)

SEL458

BODY HARNESS

Hatchback



(Back door harness)
- ①T : To ④B
- ②T : To ⑤B
- ③T : Rear defogger
- ④T : Rear wiper motor
- ⑤T : Rear defogger (Earth)

- ①B : To 64M (White)
- ②B : To 65M (Black)
- ③B : Door switch R.H.
- ④B : To ①T
- ⑤B : To ②T
- ⑥B : Rear speaker R.H.
- ⑦B : Tail and stop lamp sensor
- ⑧B : Tail and stop lamp sensor
- ⑨B : Side marker lamp R.H.
- ⑩B : Rear combination lamp R.H.
- ⑪B : Rear combination lamp R.H.
- ⑫B : License lamp R.H.
- ⑬B : Back-up lamp R.H.
- ⑭B : License lamp L.H.
- ⑮B : Rear combination lamp L.H.

- ⑯B : Rear combination lamp L.H.
- ⑰B : Back-up lamp L.H.
- ⑱B : Power antenna
- ⑲B : Side marker lamp L.H.
- ⑳B : Luggage compartment lamp
- (21B) : Rear speaker L.H.
- (22B) : Door switch L.H.
- (23B) : To fuel pump harness
- (24B) : Fuel tank gauge unit
- (25B) : Body earth

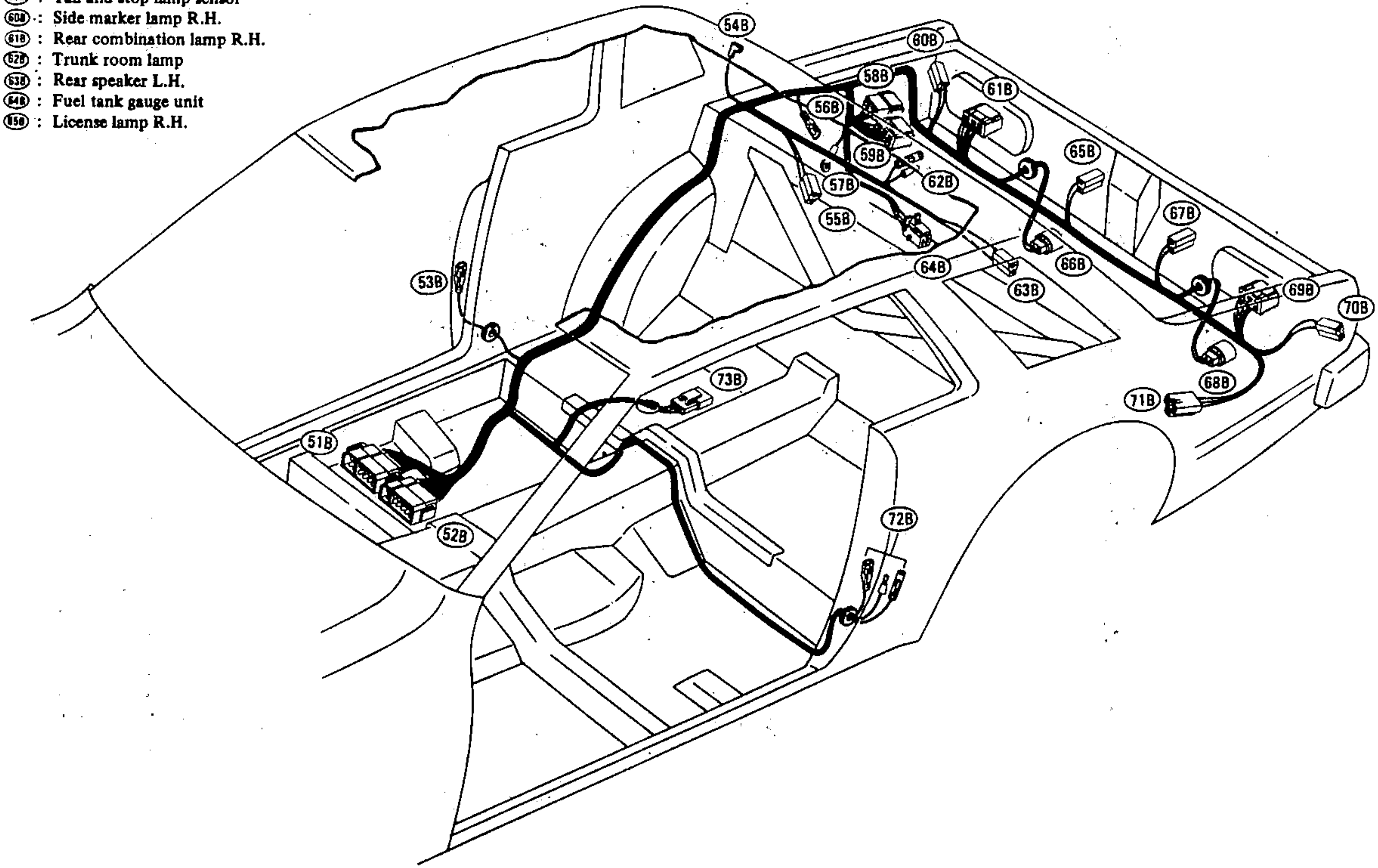
SEL459

Hardtop

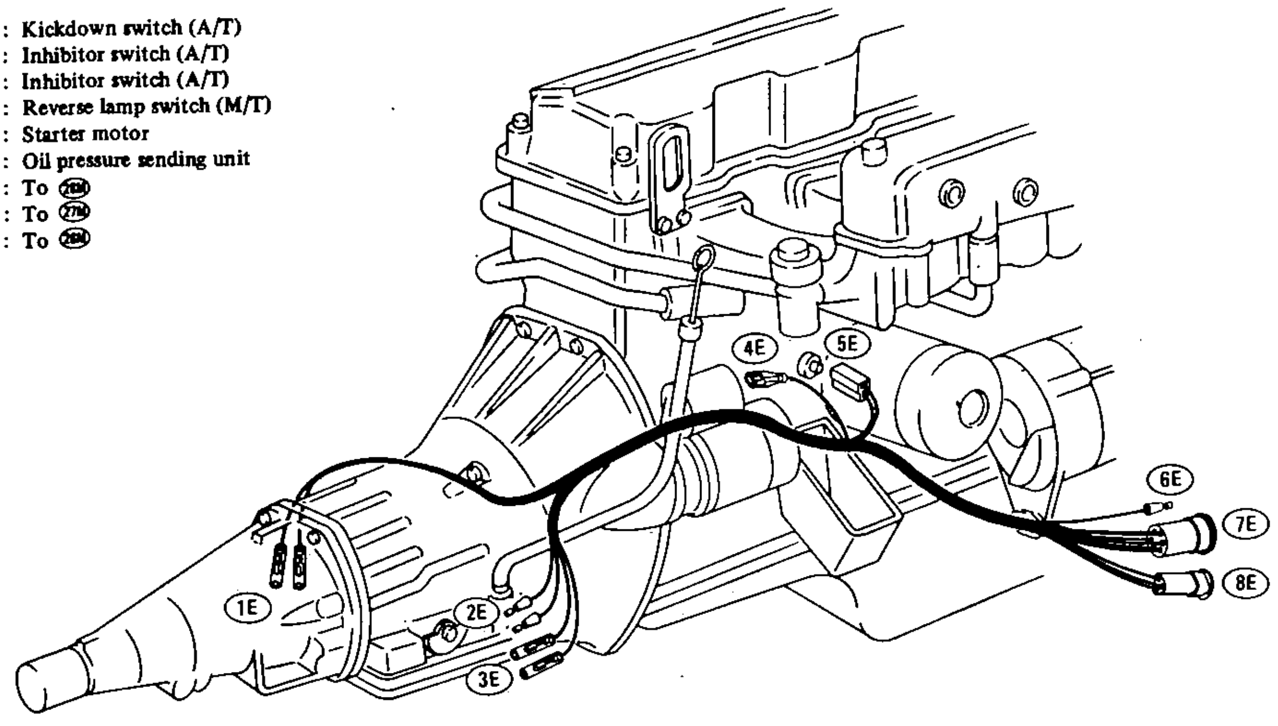
(51B) : To (84M) (White)
(52B) : To (85M) (Black)
(53B) : Door switch R.H.
(54B) : Rear defogger
(55B) : Rear speaker R.H.
(56B) : Trunk room lamp switch
(57B) : Body earth
(58B) : Tail and stop lamp sensor
(59B) : Tail and stop lamp sensor
(60B) : Side marker lamp R.H.
(61B) : Rear combination lamp R.H.
(62B) : Trunk room lamp
(63B) : Rear speaker L.H.
(64B) : Fuel tank gauge unit
(65B) : License lamp R.H.

(66B) : Back-up lamp R.H.
(67B) : License lamp L.H.
(68B) : Back-up lamp L.H.
(69B) : Rear combination lamp L.H.
(70B) : Side marker lamp L.H.

(71B) : Power antenna
(72B) : Door switch L.H.
(73B) : To fuel pump harness

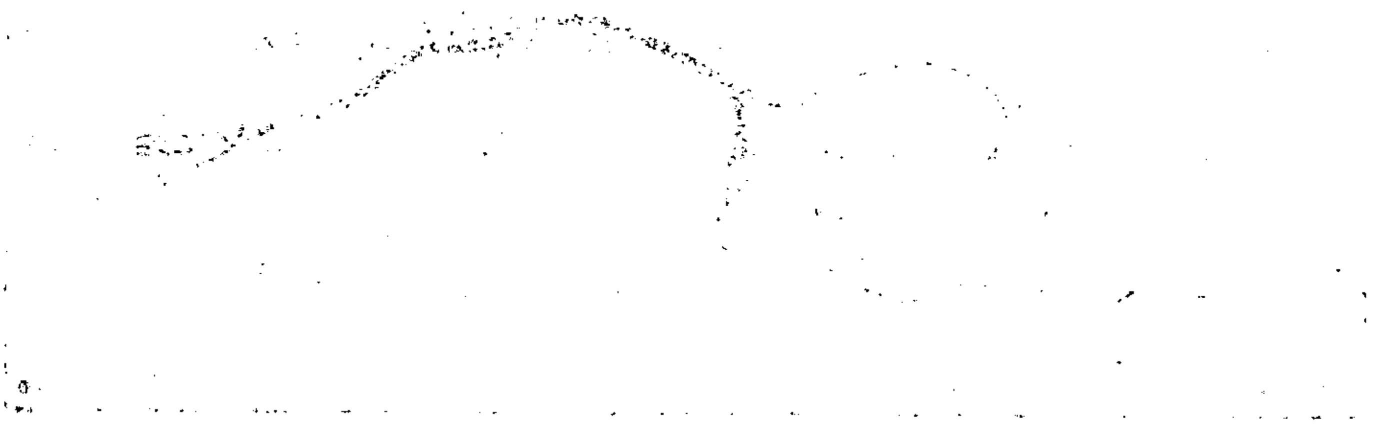


ENGINE ROOM HARNESS NO.2



(1E) : Kickdown switch (A/T)
(2E) : Inhibitor switch (A/T)
(3E) : Inhibitor switch (A/T)
(2E) : Reverse lamp switch (M/T)
(4E) : Starter motor
(5E) : Oil pressure sending unit
(6E) : To (26M)
(7E) : To (27M)
(8E) : To (28M)

SEL460



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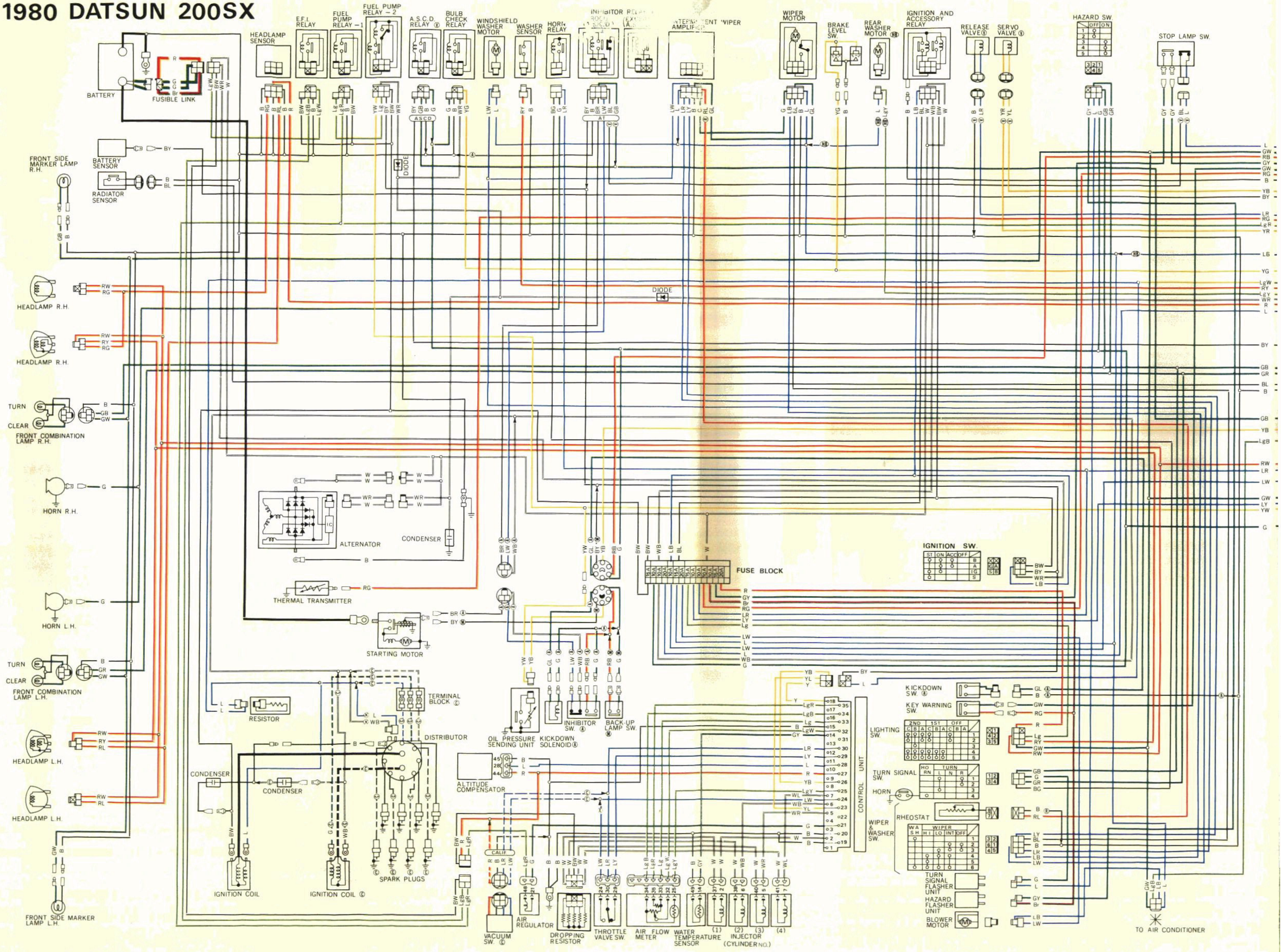
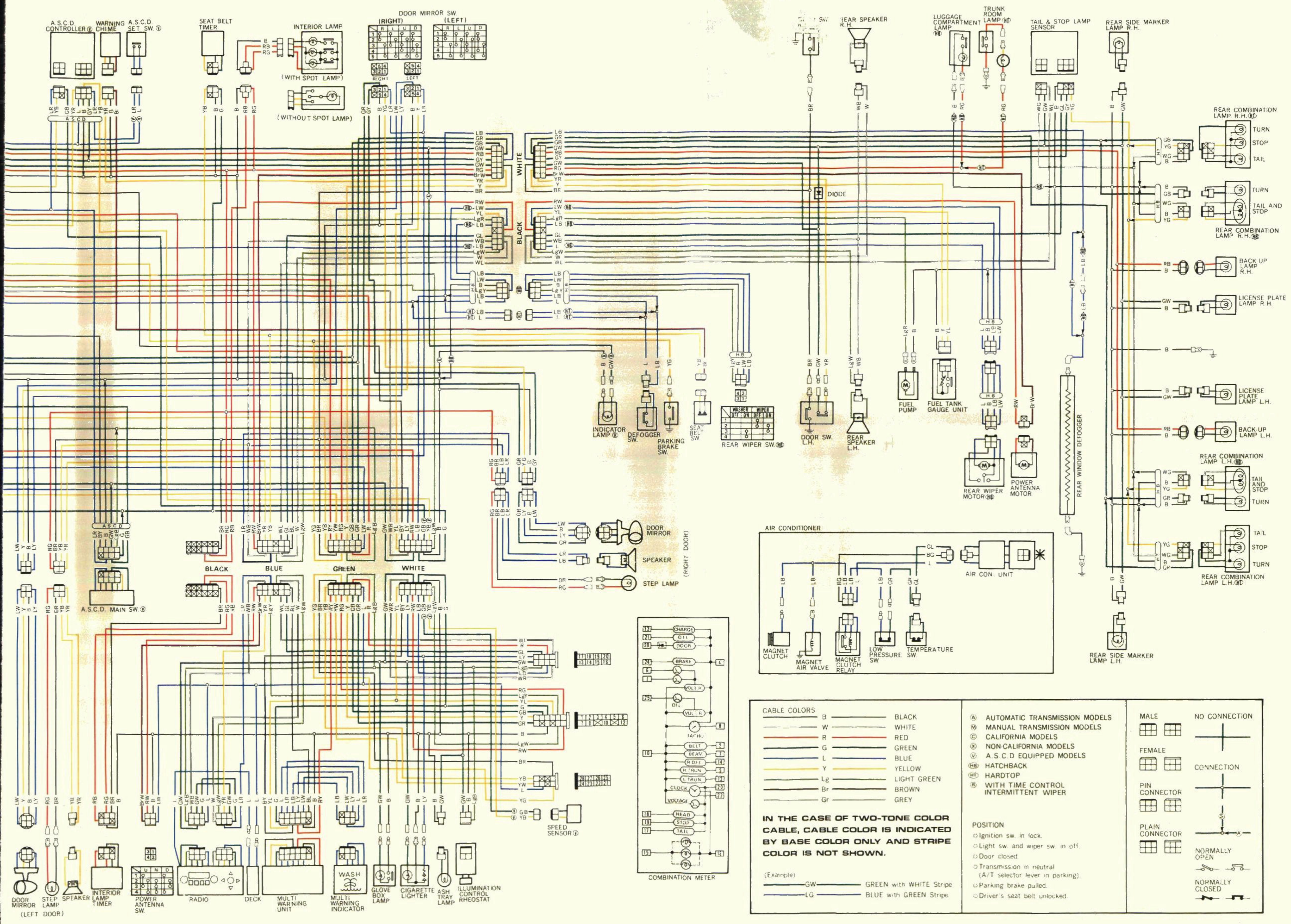
1980 DATSUN 200SX





CABLE COLORS

B	BLACK
W	WHITE
R	RED
G	GREEN
L	BLUE
Y	YELLOW
Lg	LIGHT GREEN
Br	BROWN
Gr	GREY

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

Ⓐ	AUTOMATIC TRANSMISSION MODELS
Ⓜ	MANUAL TRANSMISSION MODELS
Ⓒ	CALIFORNIA MODELS
Ⓧ	NON-CALIFORNIA MODELS
Ⓥ	A.S.C.D EQUIPPED MODELS
ⒽⒷ	HATCHBACK
ⒽⓉ	HARDTOP
Ⓡ	WITH TIME CONTROL INTERMITTENT WIPER

POSITION

- ○ Ignition sw. in lock.
- ○ Light sw. and wiper sw. in off.
- ○ Door closed.
- ○ Transmission in neutral (A/T selector lever in parking).
- ○ Parking brake pulled.
- ○ Driver's seat belt unlocked.

MALE

FEMALE

PIN CONNECTOR

PLAIN CONNECTOR

NO CONNECTION

CONNECTION

NORMALLY OPEN

NORMALLY CLOSED

INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

QUICK REFERENCE CHART: 200SX 1980

ENGINE TUNE-UP DATA

		California	Non-California	
			For U.S.A.	For Canada
Engine model		Z20E		
Firing order		1-3-4-2		
Idle speed rpm	M/T	700 ±100		
	A/T	700 ±100 (in "D" position)		
Ignition timing (degree B.T.D.C. at idle speed)		[illegible]	8 ±2°	
"CO" % at idle (No air) %		Idle mixture screw is preset and sealed at factory.	1.3 ±1.0	
Dash pot Touch speed rpm		1,500		
Valve clearance (Hot) mm (in)	Intake	0.30 (0.012)		
	Exhaust	0.30 (0.012)		
Drive belt deflection [Applied pressed force 98N (10 kg, 22 lb)] mm (in)		8 - 12 (0.31 - 0.47)		
Radiator cap relief pressure kPa (kg/cm², psi)		88 (0.9, 13)		
Cooling system leakage testing pressure kPa (kg/cm², psi)		157 (1.6, 23)		
Compression pressure kPa (kg/cm², psi)/rpm	Standard	1,177 (12.0, 171)/350		
	Minimum	883 (9.0, 128)/350		
High tension cable resistance kΩ		Less than 30		
Spark plug	Type	BP6ES		BPR6ES
	Gap mm (in)	0.8 - 0.9 (0.031 - 0.035)		
Battery				
Type		N50Z		N570
Capacity	V-AH	12 - 60		12 - 65
Full charging specific gravity		1.26		1.28
Distributor				
Vacuum advance [Maximum distributor degree/distributor kPa (mmHg, inHg)]		10°/33.3 (250, 9.84)		7.5°/33.3 (250, 9.84)
Centrifugal advance [Maximum distributor degree/distributor rpm]	M/T	5°/1,500	6°/1,600	
	A/T	5°/1,700		
Tightening torque		N-m	kg-m	ft-lb
Fuel hose clamp		1.0 - 1.5	0.10 - 0.15	0.7 - 1.1
Cylinder head		69 - 78	7.0 - 8.0	51 - 58
Rocker cover bolt		7.8 - 9.8	0.8 - 1.0	5.8 - 7.2
Manifold bolt and nut		16 - 21	1.6 - 2.1	12 - 15

BRAKE

Unit: mm (in)

Disc brake	Front (N22)	Rear (AN12H)
Pad minimum thickness	2.0 (0.079)	
Rotor repair limit		
Runout	Less than 0.12 (0.0047)	Less than 0.15 (0.0059)
Parallelism circumferential direction	Less than 0.07 (0.0028)	
Minimum thickness	10.5 (0.413)	8.6 (0.339)

CLUTCH PEDAL

Unit: mm (in)

Height	168 - 174 (6.61 - 6.85)
Free play	1 - 5 (0.04 - 0.20)

WHEEL ALIGNMENT (Unladen*)

Camber	degree	−40' - 50'
Caster	degree	1°45' - 3°15'
Toe-in	mm (in)	0 - 2 (0 - 0.08)
	degree	0' - 12' (On both sides)
Turning angle	degree	
Toe-out - turns (Inside/Outside)		20°/18.7°
Inside		33° - 35°
Outside		27° - 29°

*: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designed position.

FRONT WHEEL BEARING

Tightening torque	N·m (kg-m, ft-lb)	25 - 29 (2.5 - 3.0, 18 - 22)
Return angle	degree	60°

WHEEL AND TIRE

Tire size	185/70SR14	T135/70D16 (T-type spare tire)
Inflation pressure * psi (kPa)	26 (177)	60 (412)
Wheel nut tightening torque N·m (kg-m, ft-lb)	78 - 98 (8 - 10, 58 - 72)	

*: Tire pressure should be checked when tires are COLD.

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank	Hardtop	53	14 gal
	Hatchback	60	15-7/8 gal
Coolant	With heater	9.5	10 qt
	Without heater	8.8	9-1/4 qt
Engine oil	With oil filter	4.1	4-3/8 qt
	Without oil filter	3.9	4-1/8 qt
Transmission	M/T	2.0	4-1/4 pt
	A/T	5.5	5-7/8 qt
Differential carrier		1.1	2-3/8 pt
Steering gear		0.28	5/8 pt
Power steering system		1.2	1-1/4 qt
Windshield washer tank		2.0	2-1/8 qt
Rear window washer tank		1.0	1-1/8 qt
Air conditioning system	Compressor oil	270 ml	9.1 fl oz
	Refrigerant	0.9 - 1.1 kg	2.0 - 2.4 lb

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