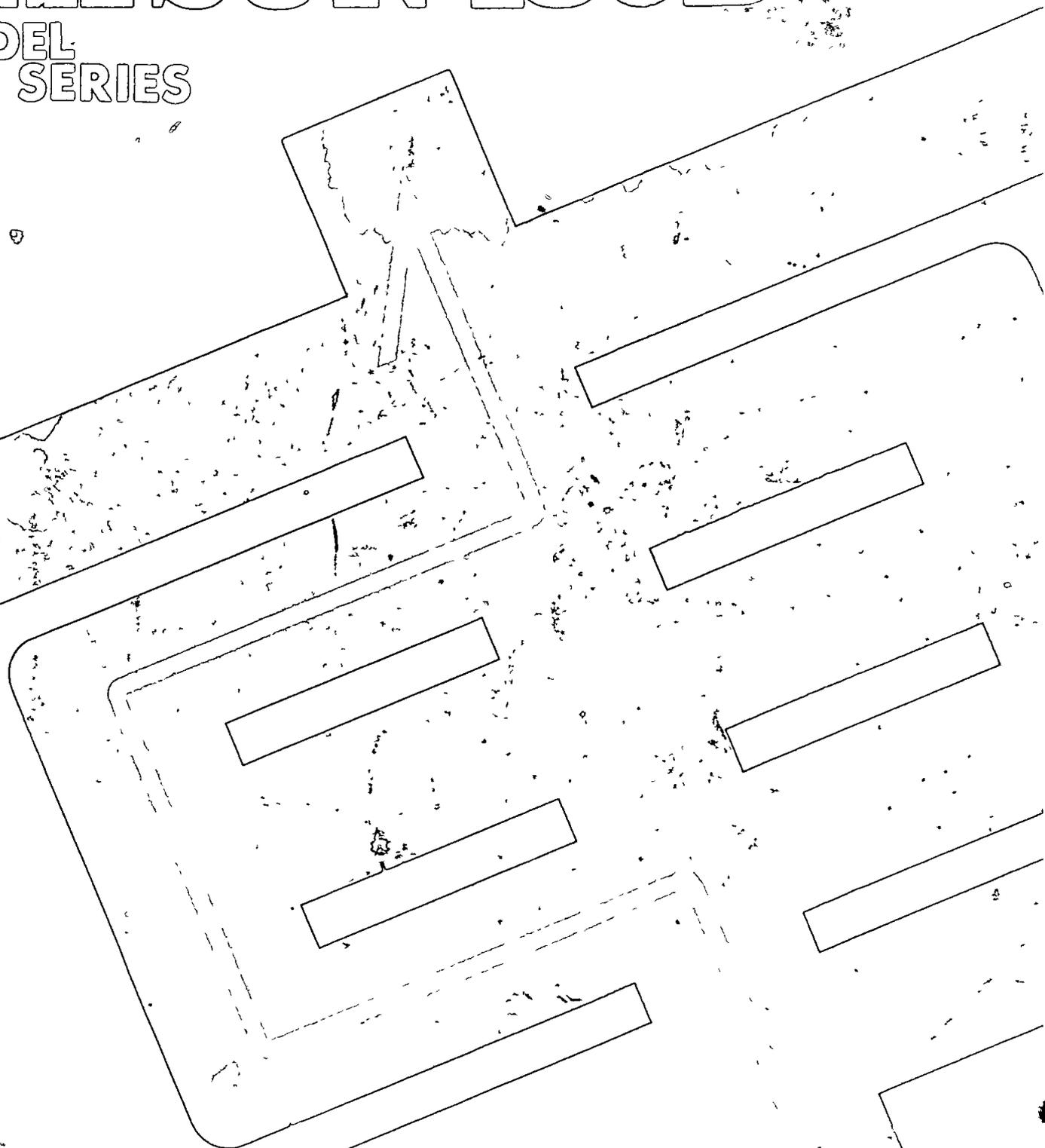
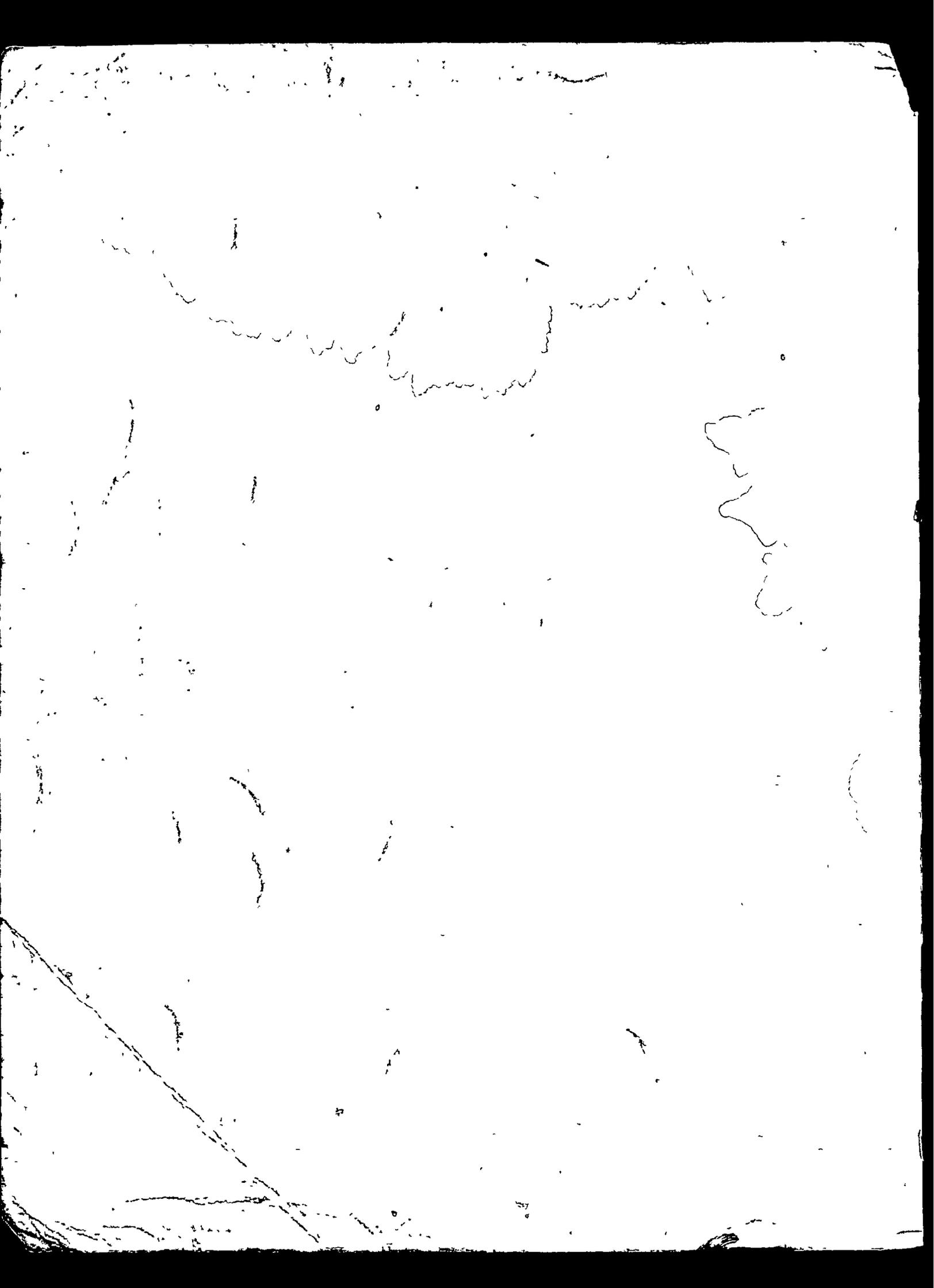


SERVICE MANUAL

DATSUN 180B

MODEL
610 SERIES





DATSUN

SERVICE MANUAL

**MODEL
610 SERIES**



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

QUICK REFERENCE INDEX

GENERAL INFORMATION	GI
ENGINE TUNE-UP	ET
ENGINE MECHANICAL	EM
ENGINE LUBRICATION SYSTEM	EL
COOLING SYSTEM	CO
ENGINE FUEL	EF
EMISSION CONTROL SYSTEM	EC
ENGINE ELECTRICAL SYSTEM	EE
ENGINE REMOVAL & INSTALLATION	ER
CLUTCH	CL
TRANSMISSION	TM
AUTOMATIC TRANSMISSION	AT
PROPELLER SHAFT & DIFFERENTIAL CARRIER	PD
FRONT AXLE & FRONT SUSPENSION	FA
REAR AXLE & REAR SUSPENSION	RA
BRAKE SYSTEM	BR
WHEEL AND TIRE	WT
STEERING SYSTEM	ST
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS	FE
BODY	BF
BODY ELECTRICAL SYSTEM	BE

FOREWORD

This service manual has been prepared for the purpose of assisting service personnel of authorized NISSAN/DATSUN dealers in providing effective service and maintenance of the Datsun 180B

Since proper maintenance and service are absolutely essential in satisfying the Datsun owners, this manual should be kept in a handy place for ready reference and should be carefully studied

This manual includes procedures for maintenance adjustments, minor service operations, removal and installation, and for disassembly and assembly of components

Some of these service operations require the use of Special Tools especially designed for effective performance of service operations

As you read through the maintenance procedures in this service manual, you will occasionally come across paragraphs headed NOTE or CAUTION. A NOTE is supplemental information that is important to a particular procedure. CAUTION warns of steps that must be followed to prevent personal injury and/or damage to some part of your DATSUN.

The Quick Reference Index on the first page enables the user to quickly locate the desired section. At the beginning of each individual section is a table of contents, which gives the page number on which each major subject begins. An index is placed at the beginning of each major subject within the section.

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

Rights for alteration at any time of specifications and methods are reserved.

Liability for any personal injury or property damage occasioned by the use of this service manual in effecting maintenance or repair of your Datsun is in no way assumed by Nissan Motor Co., Ltd.

Accordingly, anyone using a service procedure or tool which is 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.

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

APPROXIMATE REFILL CAPACITY

	Liter	US measure	Imp measure
Fuel tank			
Sedan and Hardtop	55	14 ½ gal	12 ½ gal
Station Wagon	52	13 ¾ gal	11 ½ gal
Engine cooling system *1	6.5	6 ¾ qt	5 ¾ qt
Engine crank case *2	4.3	4 ½ qt	3 ¾ qt
Manual transmission			
4-speed	2.0	4 ¼ pt	3 ½ pt
5-speed	1.7	3 ⅝ pt	2 ¾ pt
Automatic transmission case *3	5.5	5 ¾ qt	4 ¾ qt
Final drive case housing			
Sedan and Hardtop	0.8	1 ¾ pt	1 ⅝ pt
Station Wagon	1.3	2 ¾ pt	2 ¼ pt
Steering gear box	0.28	⅝ pt	½ pt

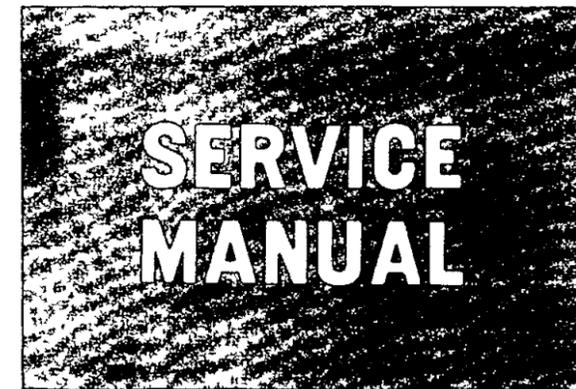
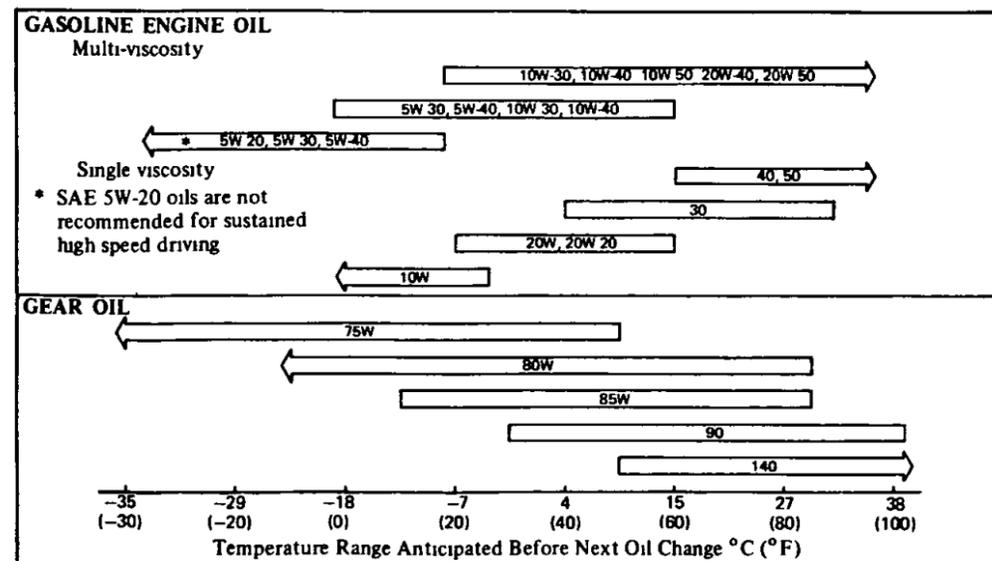
- *1 Includes 0.5 liter (½ US qt, ½ Imp qt) for heater
- *2 Includes 0.5 liter (½ US qt, ½ Imp qt) for oil filter
- *3 Includes 4.0 liters (4¼ US qt, 3½ Imp qt) for torque converter

RECOMMENDED FUEL

Use a proper grade gasoline of above 88 octane rating

RECOMMENDED LUBRICANTS

RECOMMENDED SAE VISCOSITY NUMBER



DATSUN MODEL 610 SERIES

SECTION GI

GI

GENERAL INFORMATION

MODEL VARIATION	GI- 2
IDENTIFICATION NUMBERS	GI- 3
APPROXIMATE REFILL CAPACITY	GI- 4
RECOMMENDED FUEL	GI- 4
RECOMMENDED LUBRICANTS	GI- 4
LIFTING POINTS AND TOWING	GI- 6

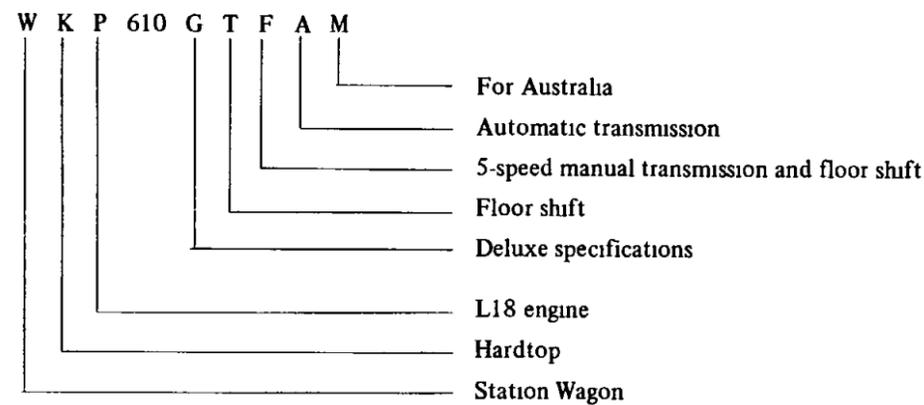


NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

MODEL VARIATION

	Model	Engine model	Transmission model
Hardtop	KP610GFM	L18	FS5W63A (5-speed)
	KP610GATM	L18	3N71B (3-speed)
Sedan	P610TM	L18	F4W63L (4-speed)
	P610ATM	L18	3N71B (3-speed)
Station Wagon	WP610TM	L18	F4W63L (4-speed)
	WP610ATM	L18	3N71B (3-speed)

The meaning of prefix and suffix



IDENTIFICATION NUMBERS

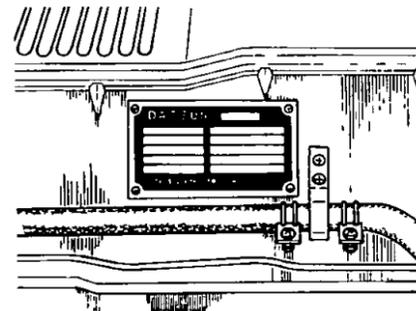
The unit and car numbers are stamped and registered at the factory.

The engine and car identification numbers are used on legal documents. These numbers are used for factory communication such as Technical Report, Warranty Claim, Service Journal and other information.

Car	Engine model	Chassis number
Sedan Hardtop Station Wagon	L18	P610 - xxxxxx

CAR IDENTIFICATION PLATE

The car identification plate is located at the center of the cowl top. The plate contains the car type, engine capacity, maximum horse-power, wheelbase and engine serial and chassis numbers.

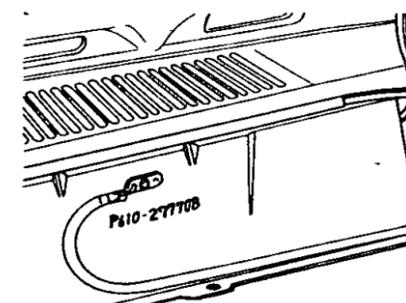


SP064

Fig GI-1 Identification plate location

CHASSIS NUMBER

The chassis number is stamped on the left side of the cowl top and is broken down as shown in the following chart according to the type of the car.



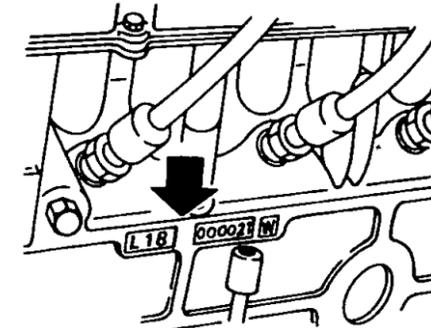
SP065

Fig GI-2 Chassis number location

ENGINE SERIAL NUMBER

The engine serial number is stamped on the right-hand side of the cylinder block. The number is broken down as shown in the following chart according to the type of the engine.

Engine model	Engine number
L18	L18 - xxxxxx

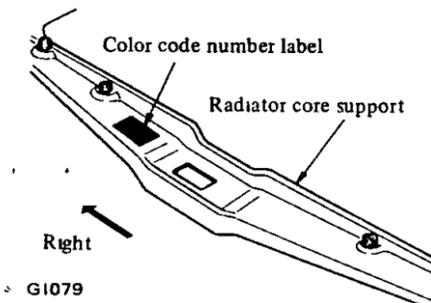


SP066

Fig GI-3 Engine serial number location

COLOR CODE NUMBER

The color code number label is stuck on the right hand side of the radiator core support as shown in the following figure.



GI079

Fig GI-4 Color code number label location

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION GI

GI

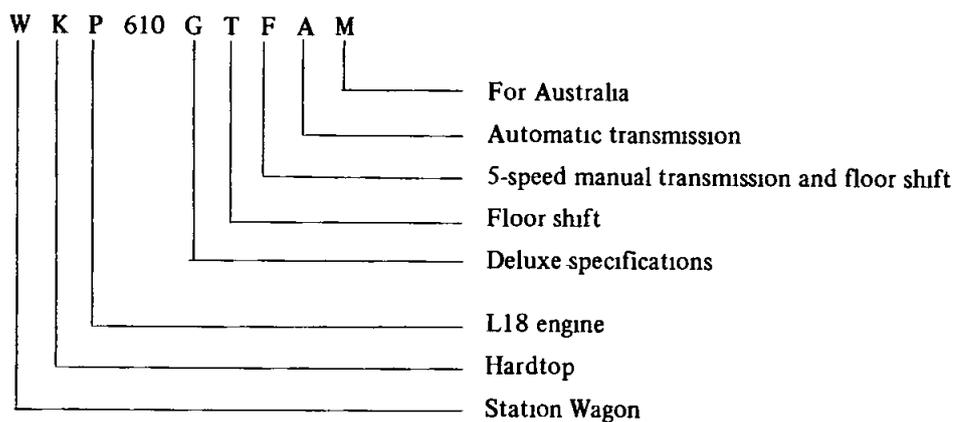
GENERAL INFORMATION

MODEL VARIATION	GI- 2
IDENTIFICATION NUMBERS	GI- 3
APPROXIMATE REFILL CAPACITY	GI- 4
RECOMMENDED FUEL	GI- 4
RECOMMENDED LUBRICANTS	GI- 4
LIFTING POINTS AND TOWING	GI- 6

MODEL VARIATION

	Model	Engine model	Transmission model
Hardtop	KP610GFM	L18	FS5W63A (5-speed)
	KP610GATM	L18	3N71B (3-speed)
Sedan	P610TM	L18	F4W63L (4-speed)
	P610ATM	L18	3N71B (3-speed)
Station Wagon	WP610TM	L18	F4W63L (4-speed)
	WP610ATM	L18	3N71B (3-speed)

The meaning of prefix and suffix



IDENTIFICATION NUMBERS

The unit and car numbers are stamped and registered at the factory

The engine and car identification numbers are used on legal documents. These numbers are used for factory communication such as Technical Report, Warranty Claim, Service Journal and other information

CAR IDENTIFICATION PLATE

The car identification plate is located at the center of the cowl top. The plate contains the car type, engine capacity, maximum horse-power, wheelbase and engine serial and chassis numbers

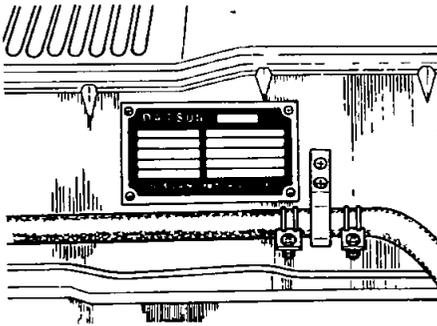


Fig GI-1 Identification plate location

CHASSIS NUMBER

The chassis number is stamped on the left side of the cowl top and is broken down as shown in the following chart according to the type of car

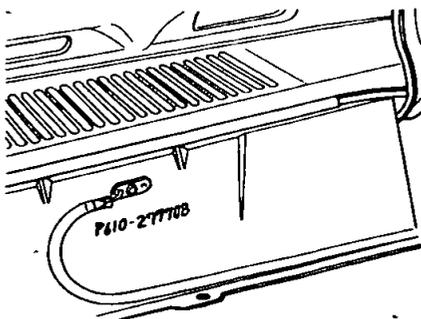


Fig GI-2 Chassis number location

Car	Engine model	Chassis number
Sedan Hardtop Station Wagon	L18	P610 - xxxxxx

ENGINE SERIAL NUMBER

The engine serial number is stamped on the right-hand side of the cylinder block. The number is broken down as shown in the following chart according to the type of the engine

Engine model	Engine number
L18	L18 - xxxxxx

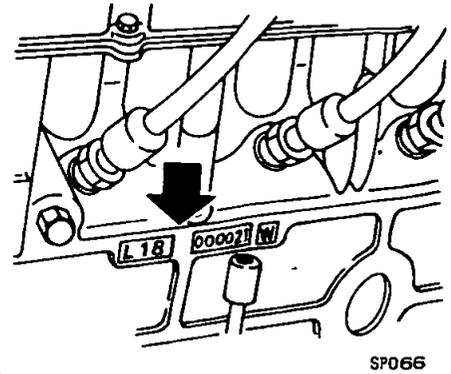


Fig GI-3 Engine serial number location

COLOR CODE NUMBER

The color code number label is stuck on the right hand side of the radiator core support as shown in the following figure

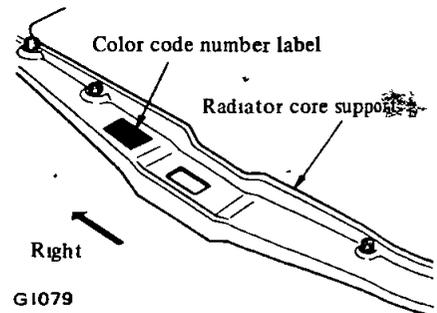


Fig GI-4 Color code number label location

APPROXIMATE REFILL CAPACITY

	Liter	US measure	Imp measure
Fuel tank			
Sedan and Hardtop	55	14 $\frac{1}{2}$ gal	12 $\frac{1}{2}$ gal
Station Wagon	52	13 $\frac{3}{4}$ gal	11 $\frac{1}{2}$ gal
Engine cooling system *1	6.5	6 $\frac{1}{2}$ qt	5 $\frac{3}{4}$ qt
Engine crank case *2	4.3	4 $\frac{1}{2}$ qt	3 $\frac{3}{4}$ qt
Manual transmission			
4-speed	2.0	4 $\frac{1}{4}$ pt	3 $\frac{1}{2}$ pt
5-speed	1.7	3 $\frac{3}{8}$ pt	2 $\frac{1}{2}$ pt
Automatic transmission case *3	5.5	5 $\frac{1}{2}$ qt	4 $\frac{1}{2}$ qt
Final drive case housing			
Sedan and Hardtop	0.8	1 $\frac{3}{4}$ pt	1 $\frac{3}{8}$ pt
Station Wagon	1.3	2 $\frac{3}{4}$ pt	2 $\frac{1}{4}$ pt
Steering gear box	0.28	$\frac{1}{2}$ pt	$\frac{1}{4}$ pt

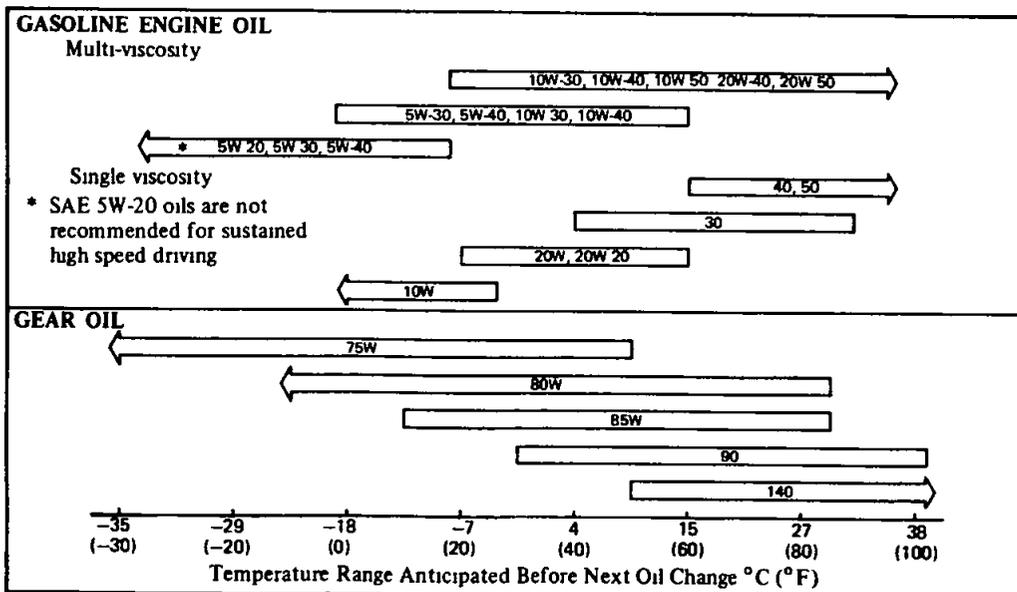
- *1 Includes 0.5 liter ($\frac{1}{2}$ US qt, $\frac{1}{2}$ Imp qt) for heater
- *2 Includes 0.5 liter ($\frac{1}{2}$ US qt, $\frac{1}{2}$ Imp qt) for oil filter
- *3 Includes 4.0 liters (4 $\frac{1}{4}$ US qt, 3 $\frac{1}{2}$ Imp qt) for torque converter

RECOMMENDED FUEL

Use a proper grade gasoline of above 88 octane rating

RECOMMENDED LUBRICANTS

RECOMMENDED SAE VISCOSITY NUMBER



RECOMMENDED LUBRICANTS

Item		Specifications	Remarks
Engine oil	Gasoline	SAE Classification SD or SE (MIL-L-2104B)	Refer to Recommended SAE Viscosity Chart
	Gear oil	Transmission and Steering	
Differential		API GL-5 (MIL-L-2105B)	
Automatic T/M		Type DEXRON	—
Multi-purpose grease		N L G I 2	Lithium soap base
Brake and Clutch fluid		DOT 3 (F M V S S No 116)	F M V S S Federal Motor Vehicle Safety Standard
Antifreeze		—	Permanent antifreeze (Etylene glycol base)

LIFTING POINTS AND TOWING

PANTOGRAPH JACK

Place the pantograph jack furnished with the car under the position indicated below in a safe manner

Notes

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

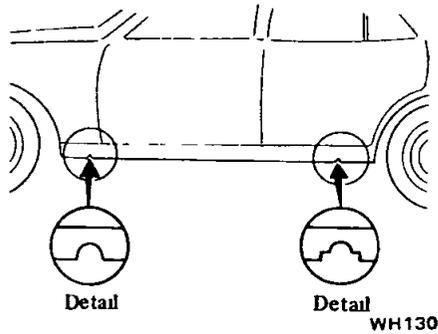


Fig GI-8 Jack-up points

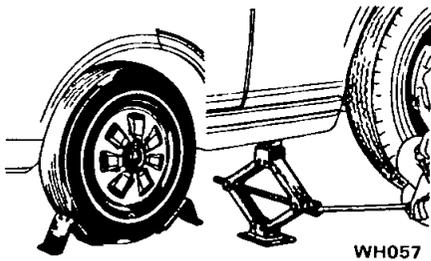


Fig GI-9 Wheel chocks and jack (Sedan and Hardtop)

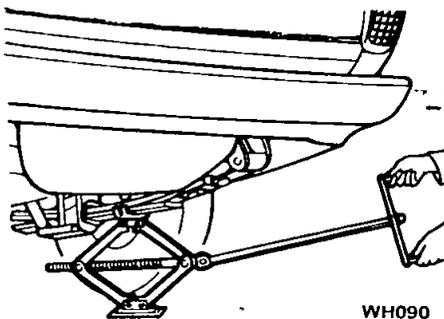
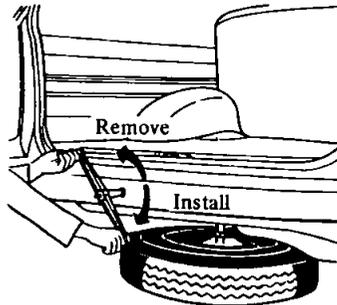
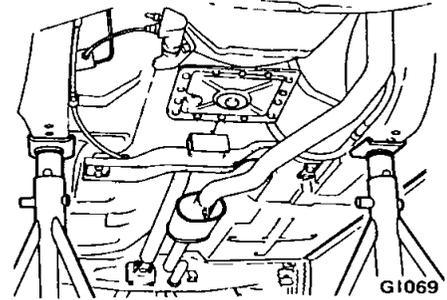


Fig GI-10 Jack (Station Wagon)



WH097

Fig GI-11 Lowering spare tire (Station Wagon)



G1069

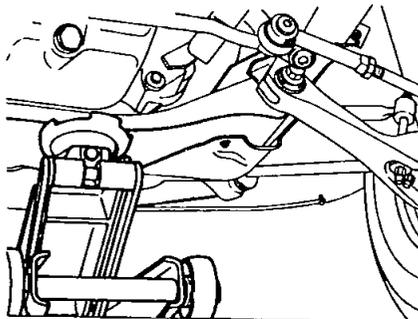
Fig GI-13 Front supportable points

GARAGE JACK

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

FRONT SIDE

- 1 When jacking up the front of the car, place the chocks behind the rear wheels to hold them
- 2 Apply the garage jack under the front suspension member. Be sure not to lift up the engine oil pan located just behind the suspension member
- 3 Jack up the car gently just high enough to place the safety stands under both the side members. Place the stands at the position indicated in Figure GI-12
- 4 Release the jack slowly

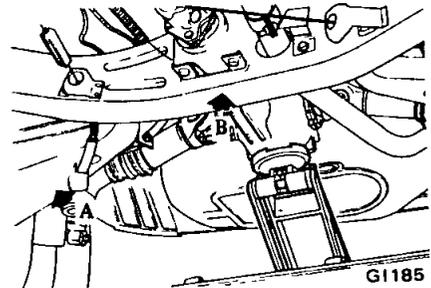


G1068

Fig GI-12 Front jack-up point

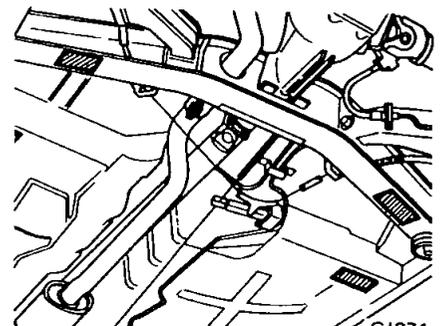
REAR SIDE

- 1 When jacking up the rear of the car, place the chocks at the front side of the front wheels to hold them
- 2 Apply the garage jack under the differential carrier (all models), the suspension arm (A) (Sedan) or suspension member (B) (Sedan)
- 3 Jack up the car gently just high enough to place the safety stands under the rear suspension member or body (Sedan), or under the rear axle case (Station Wagon)
- Place the stands at the positions indicated below
- 4 Release the jack slowly



G1185

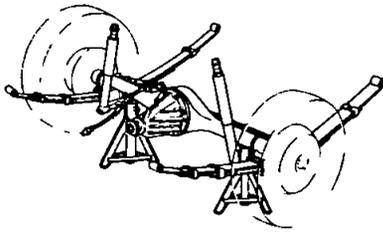
Fig GI-14 Rear jack-up points (Sedan and Hardtop)



G1071

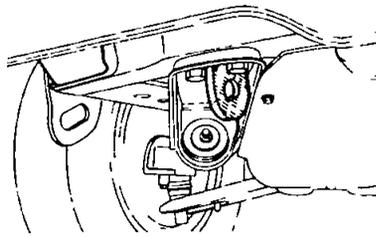
Fig GI-15 Rear supportable points (Sedan and Hardtop)

General Information



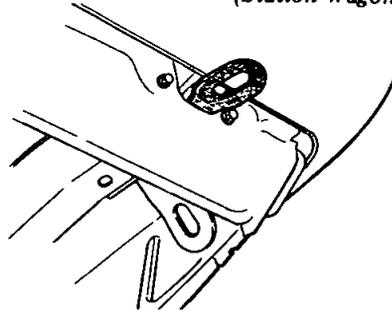
G1072

*Fig GI-16 Rear supportable points
(Station Wagon)*



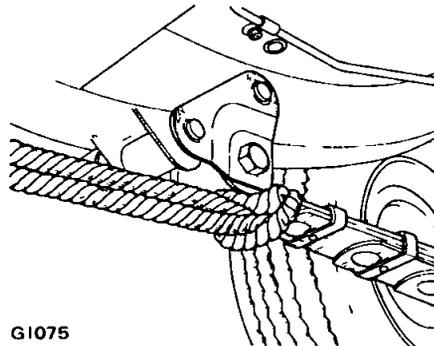
WH169

*Fig GI-18 Front towing hook
(Station Wagon)*



WH193

*Fig GI-19 Rear towing hook
(Sedan and Hardtop)*



G1075

*Fig GI-20 Rear towing hook
(Station Wagon)*

TOWING

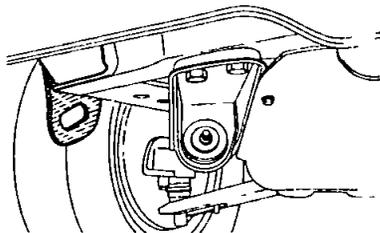
MANUAL TRANSMISSION MODEL

When the car is towed forward, connect the rope securely to the hook shown in Figures GI-17 and GI-18

To tow another car, connect a rope to the hook shown in Figures GI-19 and GI-20

A towing rope should not be connected to any positions than those described above

Note Do not attempt to apply load to a rope suddenly to prevent damage



WH168

*Fig GI-17 Front towing hook
(Sedan and Hardtop)*

AUTOMATIC TRANSMISSION MODEL

The car may be towed safely on its rear wheels on the ground with the select lever in "N" (Neutral) position of at speeds of less than 30 km/h (19 MPH) However, the propeller shaft must be disconnected or the car must be towed on its front wheels on the ground under the following conditions

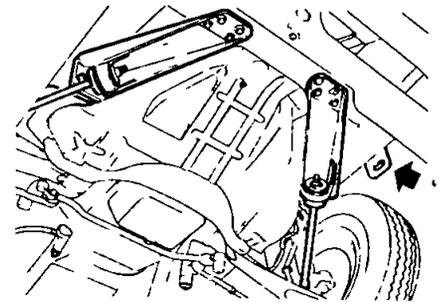
- 1 Tow speed of more than 30 km/h (19 MPH)

- 2 Car must be towed for a long distance [over 10 km (6 miles)]
- 3 Transmission is not operating properly

If car is towed on its front wheels on the ground, the steering wheel should be secured to maintain a straight ahead position

TIE-DOWN

The front tie-down hook is located as shown in Figure GI-21

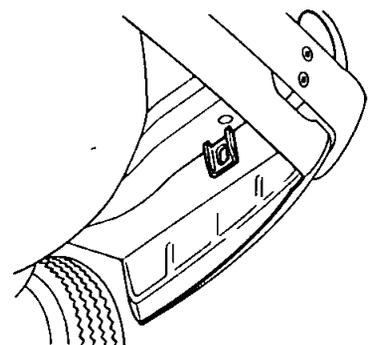


G1269

Fig GI-21 Front tie-down hook

There are two rear tie-down hooks on Sedan and Hardtop Each hook is located as shown in Figure GI-22

Note Do not use the rear hooks as a towing hook.



G1077

*Fig GI-22 Rear tie-down hook
(Sedan and Hardtop)*

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION ET

ET

ENGINE TUNE-UP

ENGINE TUNE-UP	ET- 2
SERVICE DATA AND SPECIFICATIONS	ET-11
TROUBLE DIAGNOSES AND CORRECTIONS	ET-12
EMISSION TROUBLE-SHOOTING	ET-19



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

ENGINE TUNE-UP

CONTENTS

DESCRIPTION	ET- 2	CHECKING FUEL LINES (Hoses, piping, connections, etc)	ET- 6
EMISSION CONTROL SYSTEM COMPONENTS	ET- 2	ADJUSTING CHOKE MECHANISM (Choke plate and linkage)	ET- 6
BASIC MECHANICAL SYSTEM	ET- 4	ADJUSTING CARBURETOR IDLE RPM AND MIXTURE RATIO	ET- 6
RETIGHTENING CYLINDER HEAD BOLTS, MANIFOLD NUTS AND CARBURETOR SECURING NUTS	ET- 4	LUBRICANT AND COOLING SYSTEMS	ET- 7
ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCES	ET- 4	REPLACING OIL FILTER	ET- 7
CHECKING AND ADJUSTING DRIVE BELT	ET- 4	CHANGING ENGINE OIL	ET- 7
IGNITION AND FUEL SYSTEM	ET- 4	CHANGING ENGINE COOLANT (Permanent anti-freeze coolant)	ET- 7
CHECKING AND REPLACING SPARK PLUGS	ET- 4	CHECKING FOR COOLANT, OIL AND FUEL LEAKS	ET- 8
CHECKING IGNITION WIRING	ET- 4	EMISSION CONTROL SYSTEM	ET- 8
REPLACING DISTRIBUTOR BREAKER POINTS	ET- 5	CHECKING AND REPLACING P C V VALVE	ET- 8
CHECKING VACUUM FITTINGS, HOSES AND CONNECTIONS	ET- 5	CHECKING VENTILATION HOSES	ET- 8
CHECKING DISTRIBUTOR CAP, ROTOR AND CONDENSER	ET- 5	CHECKING ELECTRIC ADVANCE CONTROL SYSTEM	ET- 8
CHECKING AND ADJUSTING IGNITION TIMING	ET- 5	INSPECTING BOOST CONTROLLED DECELERATION DEVICE (B C D D)	ET- 9
REPLACING AIR CLEANER FILTER (Viscous type)	ET- 6	CHECKING VAPOR LINES (Hoses, connections, etc) AND FUEL VAPOR CONTROL VALVE	ET- 9
REPLACING FUEL FILTER	ET- 6	CHECKING FUEL TANK VACUUM RELIEF VALVE	ET-10

DESCRIPTION

To keep the engine in top running condition at all times, proper maintenance (tune-up) is necessary. Moreover, it is important that the engine be tuned-up in accordance with the maintenance schedule. The results of proper engine maintenance are, among others, minimum exhaust emissions

This section describes proper maintenance procedures

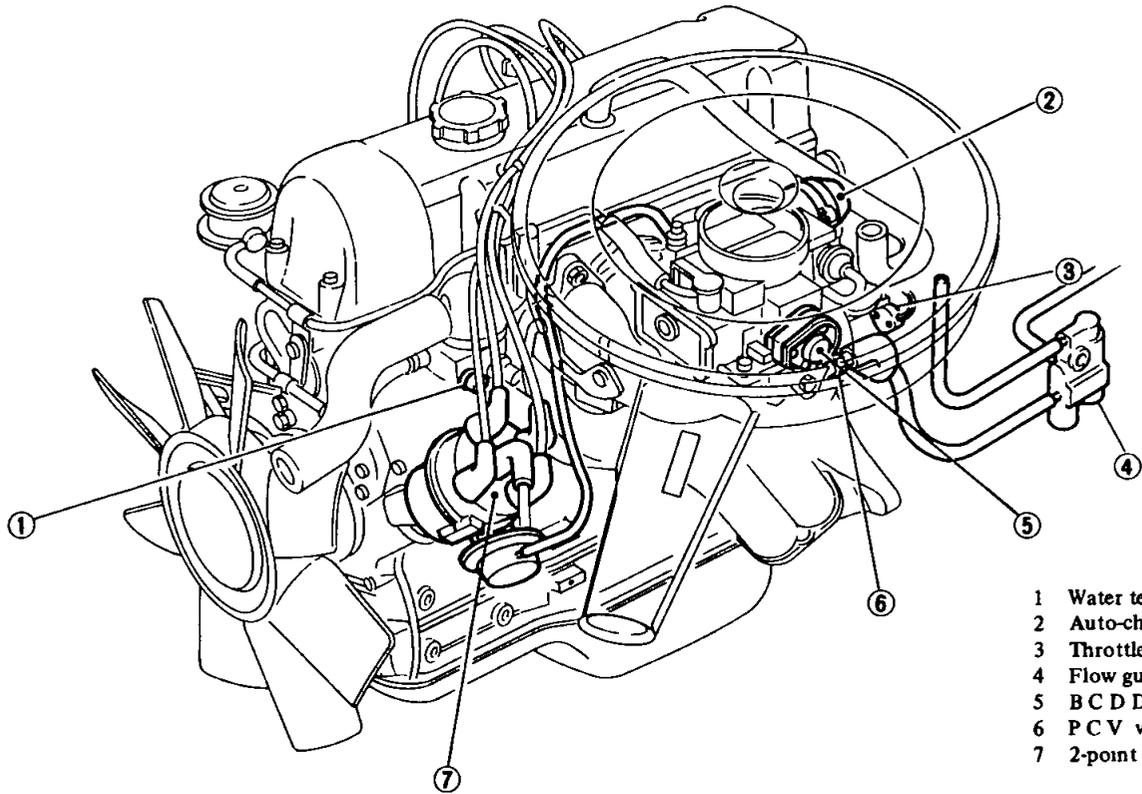
EMISSION CONTROL SYSTEM COMPONENTS

The emission control system con-

sists of a spark advance control system, a B C D D (Boost Controlled Deceleration Device), an Evaporative Emission Control system and a P C V (Positive Crankcase Ventilation)

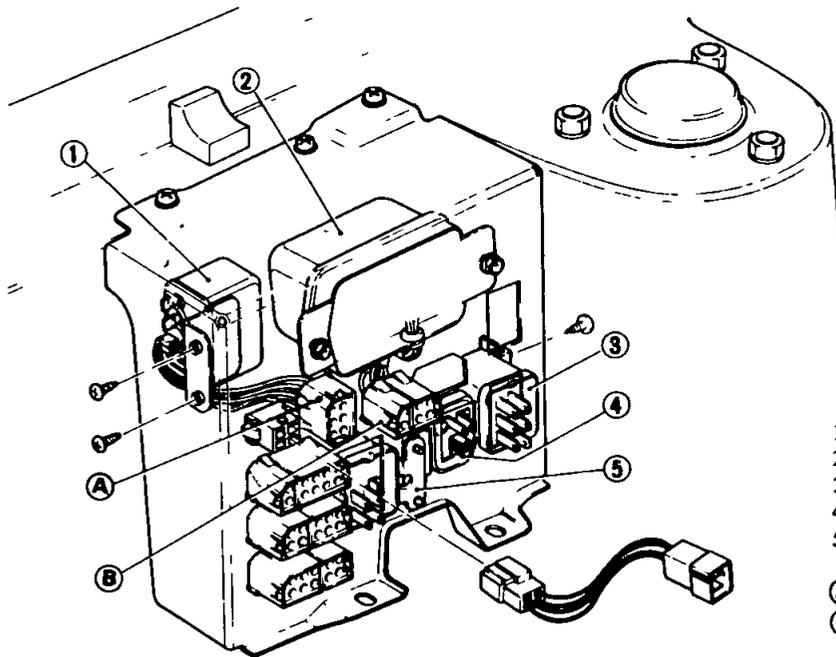
These devices reduce HC, CO and NOx emissions sufficiently to meet Australia exhaust emission regulations

Engine Tune-up



G1287

- 1 Water temperature switch
- 2 Auto-choke heater
- 3 Throttle switch
- 4 Flow guide valve
- 5 BCDD
- 6 PCV valve
- 7 2-point distributor



- 1 Auto-choke relay
- 2 Voltage regulator
- 3 2-point relay
- 4 Horn relay
- 5 Light relay
- A Connector for auto-choke relay
- B Connector for voltage regulator

Fig ET-1 Location of emission control components

BASIC MECHANICAL SYSTEM

RETIGHTENING CYLINDER HEAD BOLTS, MANIFOLD NUTS AND CARBURETOR SECURING NUTS

Refer to the following tightening torque specifications

Tightening torque

Cylinder head bolts	7.0 to 8.5 kg-m
Manifold nuts	1.2 to 1.6 kg-m
Carburetor nuts	0.5 to 1.0 kg-m

Notes

- a. When engine is cold, bolts should be tightened in two or three steps, in the sequence shown in Figure ET-2, starting from center and working out toward ends
- b. Retighten cylinder head bolts after engine has warmed up

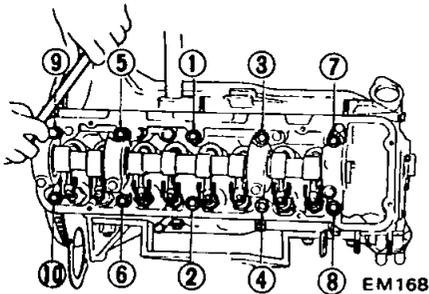


Fig ET-2 Retightening cylinder head bolt

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCES

Valve clearance adjustment cannot be made while engine is in operation. To adjust, proceed as follows

1. Start engine and run it until it reaches operating temperature, or engine oil temperature is more than 80°C, then stop engine
2. Rotate crankshaft to bring No 1 cylinder to top dead center of its compression stroke

3 Remove valve rocker cover

Loosen pivot locking nut and turn pivot screw until specified clearance is obtained while engine is cold

Using service tool, tighten pivot locking nut securely after adjustment, and recheck clearance

- (1) Exhaust valve of No 1 cylinder
- (2) Intake valve of No 1 cylinder
- (3) Intake valve of No 2 cylinder
- (5) Exhaust valve of No 3 cylinder

4. Again, rotate crankshaft one turn so that No 4 piston is at top dead center of its compression stroke. Adjust the following valves

- (4) Exhaust valve of No 2 cylinder
- (6) Intake valve of No 3 cylinder
- (7) Intake valve of No 4 cylinder
- (8) Exhaust valve of No 4 cylinder

Adjustment should be made while engine is hot

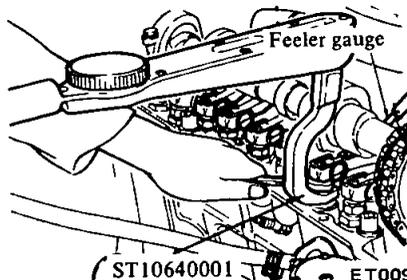


Fig ET-3 Adjusting valve clearance

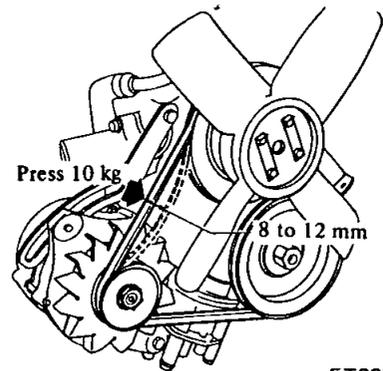
Valve clearance

		Unit mm
Cold	Intake	0.20
	Exhaust	0.25
Warm	Intake	0.25
	Exhaust	0.30

CHECKING AND ADJUSTING DRIVE BELT

1. Check for cracks or damage. Replace if necessary
2. Adjust drive belt tension. It is correct if deflection is as indicated in chart when thumb pressure of 10 kg is applied midway between fan pulley and alternator pulley

Slackness 8 to 12 mm



ET007

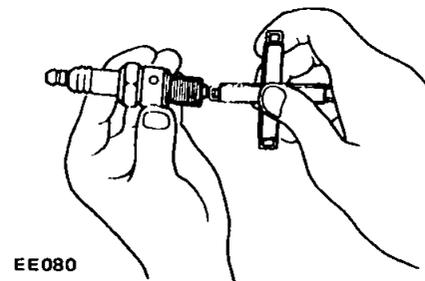
Fig ET-4 Drive belt tension

IGNITION AND FUEL SYSTEM

CHECKING AND REPLACING SPARK PLUGS

Remove and clean plugs in a sand-blast cleaner. Inspect each spark plug. Make sure that they are of the specified heat range. Inspect insulator for cracks or chips. Check both center and ground electrodes. If they are excessively worn, replace with new spark plugs. File center electrode flat.

Tightening torque
Spark plug
2.0 to 3.0 kg-m



EE080

Fig ET-5 Checking spark plug point gap

Spark plug specifications
Heat range BP6ES (L45PW)
Plug gap 0.8 to 0.9 mm

CHECKING IGNITION WIRING

Distributor breaker points

Make sure they are properly aligned and that point dwell and gap are correct

Ignition wiring

Use an ohmmeter to check resistance of secondary cables. Disconnect cables from spark plugs.

Remove distributor cap and secondary cables as an assembly. Do not remove cables from cap.

Check resistance of one cable at a time. Connect ohmmeter between spark plug side and corresponding electrode inside cap. If resistance is more than 30,000 ohms, remove cable from cap and check cable resistance only. If resistance is still more than 30,000 ohms, replace cable assembly.

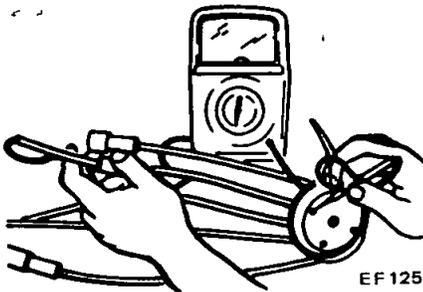


Fig ET-6 Spark plug wire

REPLACING DISTRIBUTOR BREAKER POINTS

Check distributor breaker points for abnormal pitting and wear. Replace points periodically. After replacing points, make sure they are in correct alignment for full contact and that point dwell and gap are correct. Clean and apply distributor grease to cam lobes.

Note Do not apply excess amount of grease.

The distributor has two contact points. Each point can be replaced independently. Both points, however, are usually replaced at the same time.

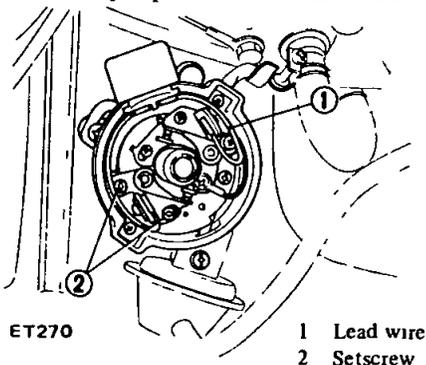


Fig ET-7 Breaker point

- 1 Loosen lead wire setting screws and remove lead wire from contact point set.
- 2 Remove two setscrews on each point set. Point assembly can then be taken out.
- 3 Install new contact point in the reverse sequence of removal.

Notes

- a. Coat cam heel with a light coating of grease.
- b. Adjust contact point gap properly by measuring point gap with a feeler gauge before setscrews are tightened securely.

Distributor point gap
0.45 to 0.55 mm
Distributor dwell angle
49 to 55 degrees

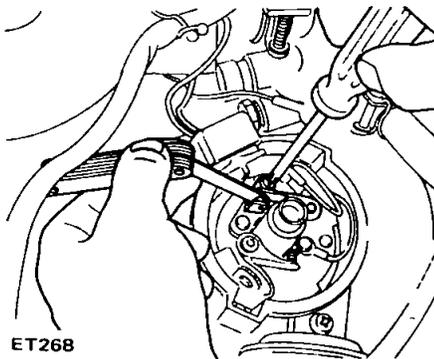


Fig ET-8 Adjusting point gap

CHECKING VACUUM FITTINGS, HOSES AND CONNECTIONS

Check fittings and hoses for loose connections. Retighten as necessary, replace any faulty parts.

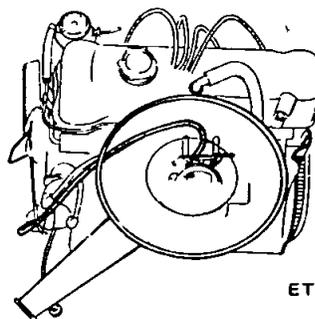


Fig ET-9 Connecting vacuum passage lines

CHECKING DISTRIBUTOR CAP, ROTOR AND CONDENSER

Note This operation should be performed while checking distributor points. Inspect distributor cap for cracks and flashover.

External surfaces of all parts of secondary system must be cleaned to reduce possibility of voltage loss. All wires should be removed from distributor cap and coil so that terminals can be inspected and cleaned. Burned or corroded terminals indicate that wires are not fully seated, which causes arcing between end of wire and terminal. When replacing wires in terminal, make sure that they are fully seated before pushing rubber nipple down over tower. Check distributor rotor for damage, and distributor cap for cracks.

Condenser

- 1 Clean outlet of condenser lead wire, and check for loose setscrew. Retighten if necessary.
- 2 Check condenser with a condenser tester. Refer to Distributor in service manual for engine.

CHECKING AND ADJUSTING IGNITION TIMING

- 1 Check spark plugs and distributor breaker points for condition.
- 2 Thoroughly remove dirt and dust from timing mark on crank pulley and timing indicator on front cover.
- 3 Warm up engine sufficiently.
- 4 Install a timing light on No. 1 cylinder spark plug wire, and install a tachometer.
- 5 Set idling speed to the following specifications.
- 6 With a timing light, check that ignition timing is at the specified value.

Note There are two ignition timings "Retard" and "Advance". The ignition timing adjustment should be carried out on the "Retard" side.

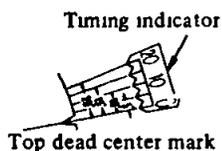


Fig ET-10 Checking ignition timing

Ignition timing

	M/T	A/T
Timing BTDC/rpm	6°/700	6°/800 (N position)

Ignition timing is on "Retard" side

If necessary, adjust it as follows

- (1) Loosen setscrew until distributor can be moved by hand See Figure ET-11
- (2) Adjust ignition timing to the following specifications
- (3) Lock distributor setscrew, and make sure that timing is correct

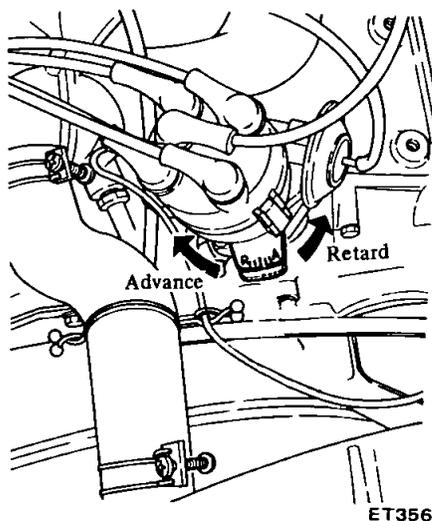


Fig ET-11 Adjusting ignition timing

REPLACING AIR CLEANER FILTER (Viscous type)

Air cleaner employs a wet paper type cleaner element (viscous type) As this element has been specially treated at factory, it need not be cleaned before ultimate replacement Even if cleaner element should look dirty, do not attempt to clean it Cleaning performance is constantly maintained even though it looks contaminated Care must be taken not to damage cleaner element

Replace element at recommended intervals, or more often under dusty driving conditions

REPLACING FUEL FILTER

Check for a contaminated element and water deposit

All engines use a cartridge type fuel filter replaceable as an assembly

The fuel filter is located in the engine compartment

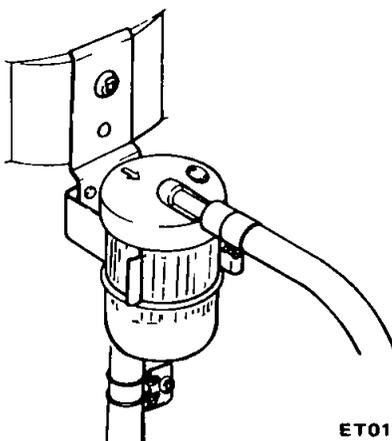


Fig ET-12 Fuel filter

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

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

ADJUSTING CHOKE MECHANISM (Choke plate and linkage)

Check choke valve and mechanism for free operation, and clean or replace if necessary Binding can result from petroleum gum formation on choke shaft or from damage

- 1 Check bi-metal cover setting Index mark on bi-metal cover is usually set at center of scale

Note When somewhat over-choked, turn bi-metal cover clockwise slightly.

- 2 Before starting engine, depress the accelerator pedal to see if choke valve closes automatically

If it fails to close, probable cause is that link movement is unsmooth, or that bi-metal is out of order Refer to Automatic choke in Section EF

ADJUSTING CARBURETOR IDLE RPM AND MIXTURE RATIO

Idle adjustment is made by throttle adjusting screw and idle adjusting screw after engine is warmed up See Figure ET-13

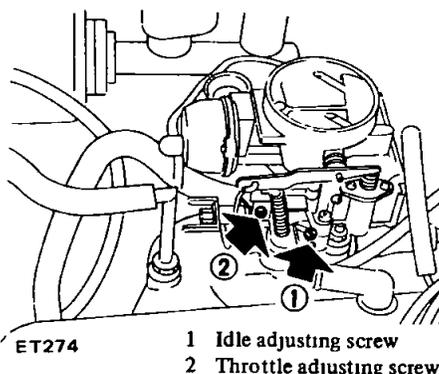


Fig ET-13 Throttle and idle adjusting screws

With CO meter

CO meter is very useful tool for idle mixture adjustment When preparing to adjust idle mixture, it is essential that meter be thoroughly warmed and calibrated

- 1 Warm up engine sufficiently and apply wheel chocks
- 2 Continue engine operation for one minute at idling speed
- 3 Adjust throttle adjusting screw so that engine speed is at the specified value listed below

Transmission model	Adjusting value (rpm)
M/T	700
A/T	800 (In "N" position)

- 4 Check ignition and if necessary adjust it to specifications

Engine Tune-up

5 Adjust idle adjusting screw so that "CO" percentage is at the specified value, check with CO meter

Note On automatic transmission equipped models, make sure that adjustment is made with selector lever in "N" position

CO% 2.0% ± 0.5

6 Repeat procedures described in items 3 and 5 above until "CO" percentage and engine speed are both at the specified value

Note Do not attempt to screw down idle adjusting screw completely. This may cause damage to tip, which in turn will tend to cause malfunctions

Without CO meter

- 1 Warm up engine completely. Check to be sure that float level and ignition timing are correct while engine is at idle speed
- 2 Turn out throttle adjusting screw gently until specified engine speed is approximately obtained

TABLE I SPECIFIED ENGINE IDLING SPEED

M/T	750
A/T	850 (In "N" position)

- 3 Turn idle adjusting screw in or out until engine runs smoothly at the highest speed
- 4 Turn out throttle adjusting screw until specified engine speed (table I) is obtained
- 5 Readjust idle adjusting screw until engine runs smoothly at the highest speed (with the highest vacuum reading)
- 6 Repeat steps 4 and 5 until engine speed does not rise in spite of adjusting idle adjusting screw
- 7 Finally, turn idle adjusting screw in until the final specified engine speed (table II) is attained

Notes

- a Do not attempt to screw idle ad-

justing screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions

- b On automatic transmission models, adjustment should be made in "N" position

TABLE II FINAL ENGINE IDLING SPEED

	M/T	A/T
Idle speed rpm	700	800 (In "N" position)

LUBRICANT AND COOLING SYSTEMS

REPLACING OIL FILTER

The oil filter is a cartridge type and can be removed with Oil Filter Wrench ST19320000

- 1 Check for oil leaks past gasket flange. If leakage is found, retighten just enough to stop leakage. If retightening is no longer effective, replace filter as an assembly
- 2 When installing oil filter, tighten by hand

Notes

- a Do not overtighten oil filter, or oil leak may occur
- b. When assembling, lightly apply oil to seal ring

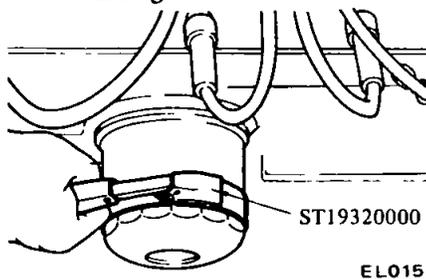


Fig ET-14 Removing oil filter

CHANGING ENGINE OIL

- 1 Check if oil is diluted with water or gasoline. Drain and refill oil if necessary

Notes

- a. Milky oil indicates presence of cooling water. Isolate cause and take corrective measure

- b Oil with extremely low viscosity indicates dilution with gasoline
- c Make sure that car is on a level surface while engine is being drained, filled and checked

- 2 Check oil level. If below specified level, raise it up to H level

Engine oil capacity
(Including oil filter) 4.9 liters

CHANGING ENGINE COOLANT

(Permanent anti-freeze coolant)

Permanent anti-freeze coolant is an ethylene glycol base product containing chemical inhibitors to protect the cooling system from rusting and corrosion. The anti-freeze does not contain any glycerine, ethyl or methyl alcohol. It will not evaporate or boil away and can be used with either high or low temperature thermostat. It flows freely, transfers heat efficiently, and will not clog the passages in the cooling system. The anti-freeze must not be mixed with other products. This coolant can be used throughout the seasons of the year.

Whenever coolant is changed, the cooling system should be flushed and refilled with a new coolant. Check the level. See the instructions attached to the anti-freeze as to the ratio of an anti-freeze and water.

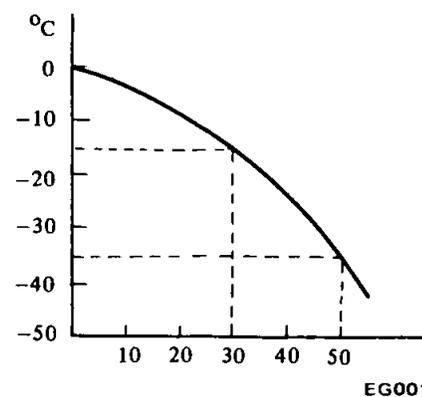


Fig ET-15 Protection concentration

Water refill capacity
(With heater) 6.8 liters

Engine Tune-up

Percent concentration	Boiling point		Freeze protection
	Sea level	0.9 kg/cm ² cooling system pressure	
30%	106°C	124°C	-15°C
50%	109°C	127°C	-35°C

CHECKING FOR COOLANT, OIL AND FUEL LEAKS

Check coolant hoses and fittings for loose connection or deterioration

Retighten or replace if necessary

Check cylinder head, front chain cover, oil pan, rocker cover, oil filter gasket, etc for signs of leaks past their gasketed surfaces. If necessary, replace gaskets or faulty parts. After maintenance has been done, check replaced parts to see if any leaks occur.

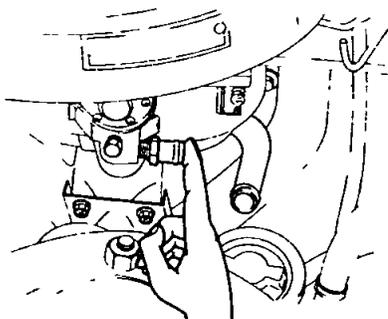
Check carburetor, fuel pump, fuel filter, and fuel lines for leaks, loose connections, cracks or deterioration. Retighten loose connections and replace any damaged or deformed parts.

EMISSION CONTROL SYSTEM

CHECKING AND REPLACING P.C.V. VALVE

Check P.C.V. valve as follows:

With engine running at idle, remove ventilator hose from P.C.V. valve. If valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



ET330

Fig ET-16 Checking P.C.V. valve

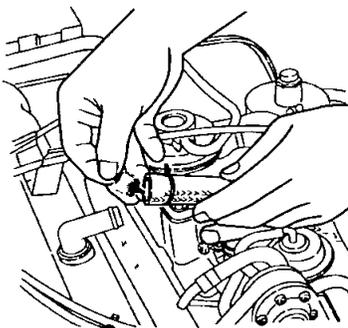
CHECKING VENTILATION HOSES

1 Check hoses and hose connections for leaks

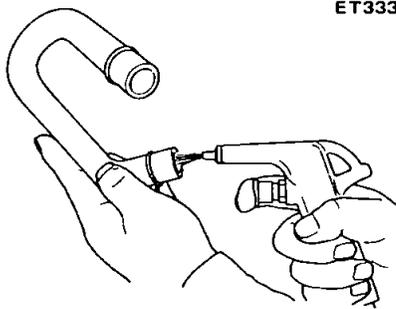
2 Disconnect all hoses and clean with compressed air

If any hose cannot be freed of obstructions, replace

Be sure that flame arrester is properly inserted in hose between air cleaner and rocker cover.



ET333



ET277

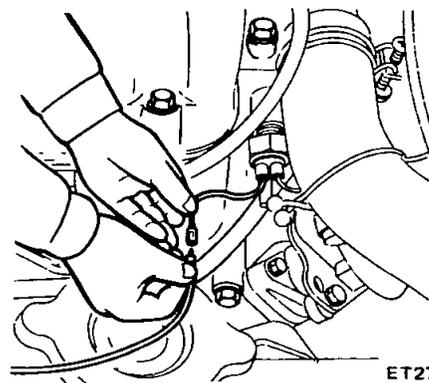
Fig ET-17 Cleaning ventilation hose

CHECKING ELECTRIC ADVANCE CONTROL SYSTEM

1 Start engine and check ignition timing change with a timing scope before engine warms up

2 Disconnect lead wire of water temperature switch at connector

It is correct if ignition timing advances about 6 degrees. Then reconnect lead wire to its original position.

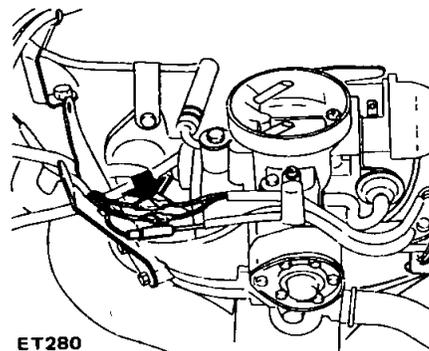


ET279

Fig ET-18 Disconnecting water temperature lead wire

3 After engine warms up, disconnect a pair of throttle switch lead wires located beside carburetor. Check ignition timing change when harness side terminals for throttle switch are connected to each other.

It is correct if ignition timing advances about 6 degrees.



ET280

Fig ET-19 Throttle switch lead wire

4 If any malfunction is found by the check mentioned above, any of the following may be the cause:

- (1) Loose connection or broken harness
- (2) Malfunctioning throttle switch
- (3) Malfunctioning water temperature switch
- (4) Malfunctioning water temperature relay
- (5) Malfunctioning 2-point type distributor

Refer to Emission Control Section

INSPECTING BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.)

Check B C D D operating pressure. If not correct, adjust it.

To properly set the B C D D operating pressure, proceed as follows:

1 Connect vacuum gauge to intake manifold. A service plug is installed on intake manifold, so remove plug and install adapter for vacuum gauge.

Note: A quick-response boost gauge such as Bourdon's tube is recommended. Do not use manometer.

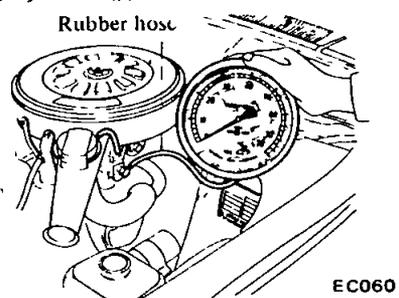
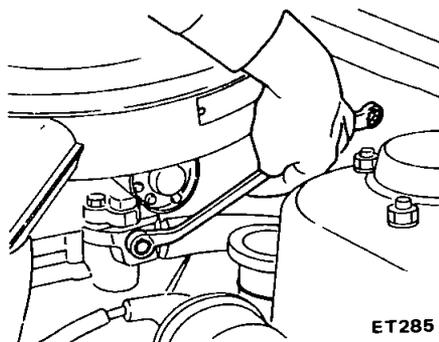


Fig ET-20 Connecting vacuum gauge

- 2 Start engine and continue warming-up until engine reaches its normal operating temperature.
- 3 Check ignition timing and idling speed.

	M/T	A/T
Engine idling rpm/timing	700/6°	800 ("N" position)/6°
B T D C		

4 Place gearshift lever in "Neutral" for manual transmission, and in "N" or "P" position for automatic transmission.

5 Run engine under no load. Increase engine rpm to 3,000 to 3,500 rpm, then quickly close throttle valve.

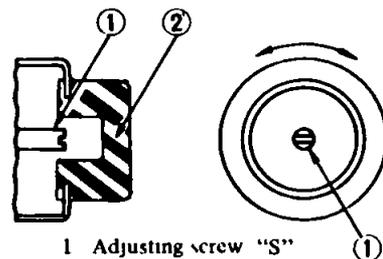
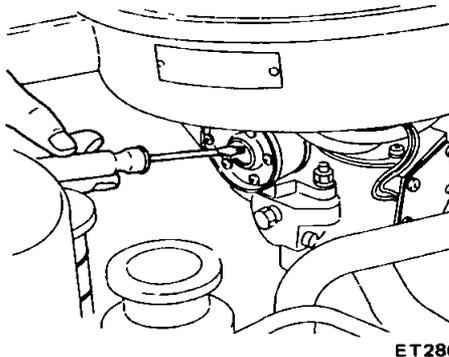
At this time, manifold vacuum pressure will increase abruptly to -600 mmHg (approx) or above and then gradually decrease to level set at idling. In decreasing, the manifold vacuum will maintain a constant pressure for a while. That is the operating pressure.

B C D D set pressure
-560 mmHg ± 10 mmHg

Characteristic curve is same as that for throttle opener.

7 If it is higher than the set level, turn adjusting screw clockwise until correct adjustment is made.

If it is lower than the set level, turn adjusting screw counterclockwise.



1 Adjusting screw "S"
2 Cover "C"

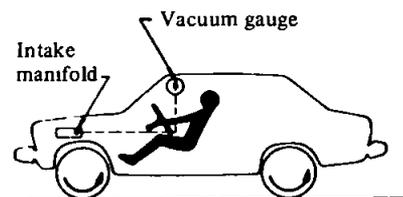
ET037

Fig ET-21 Adjusting set pressure

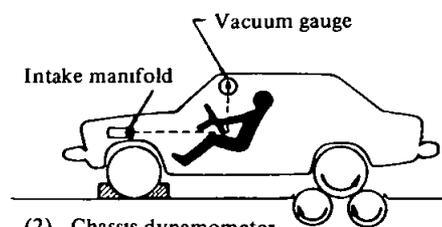
8 Race engine and check that adjustment is correct.

Note: When the operating pressure can not be observed clearly, it is necessary to reduce the negative idling pressure of the manifold to lower than the set pressure of the B C D D. (The engine speed will not drop to idling speed when the negative idling pressure is higher than the set pressure of the B C D D.)

In this case, the engine must be labored by (1) road test or (2) chassis dynamometer, accelerating the car to 60 to 80 km/h in top gear (manual transmission) or in "D" position (automatic transmission), and then releasing the accelerator pedal and letting the car decelerate. After doing this, check whether the B C D D operating pressure is at the predetermined value or not.



(1) Road test



(2) Chassis dynamometer

Fig ET-22 Road test

CHECKING VAPOR LINES (Hoses, Connections, etc.) AND FUEL VAPOR CONTROL VALVE

Checking fuel tank, fuel liquid separator and vapor vent line

- 1 Check all hoses and fuel tank filler cap.
- 2 Disconnect the vapor vent line connecting flow guide valve to fuel liquid separator.
- 3 Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way change cock) to the end of the vent line.
- 4 Supply fresh air into the vapor vent line through the cock little by little until the pressure becomes 400 mmAq.
- 5 Shut the cock completely and leave it that way.
- 6 After 25 minutes, measure the height of the liquid in the manometer.

- 7 Variation in height should remain within 25 mmAq
- 8 When the 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 the filler cap is removed, it is the cause of the stuffy

hose

Note 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

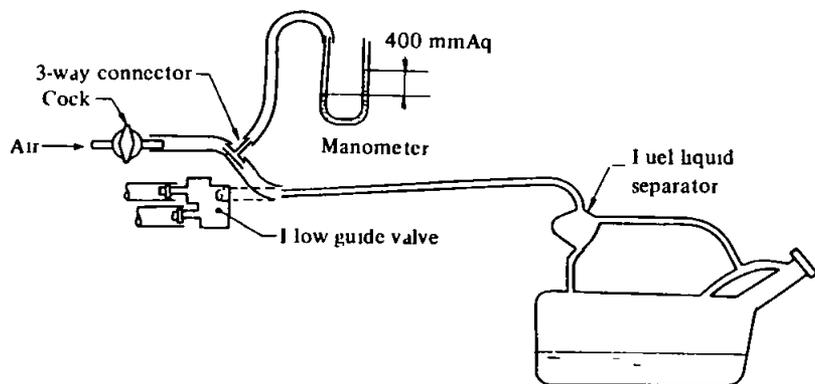


Fig ET-23 Checking evaporative emission control system

ET341

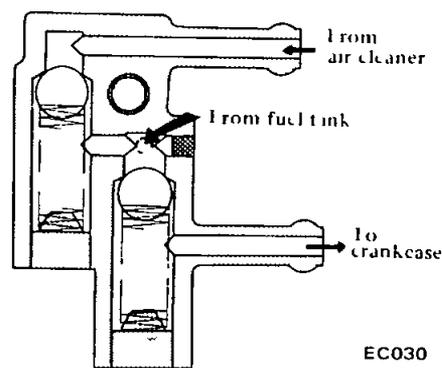
Checking flow guide valve

- 1 Disconnect all hoses connected to the flow guide valve
- 2 While lower pressure air is pressed into the flow guide valve from the ends of vent line of fuel tank side, the air should go through the valve and flow to crankcase side. If the air does not flow, the valve should be replaced. But when the air is blown from crank-

case side, it should never flow to the other two vent lines

- 3 While the air is pressed into the flow guide valve from the carburetor air cleaner side, it flows to the fuel tank side and/or crankcase side

- 4 This valve opens when the inner pressure is 10 mmHg. In case of improper operations or breakage, replace it



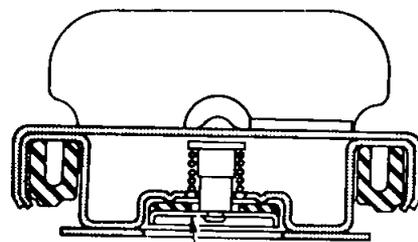
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Fig ET-24 Flow guide valve

CHECKING FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly as follows

- 1 Wipe clean valve housing and have it in your mouth
- 2 Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air the resistance should be disappeared with valve clicks
- 3 If valve seems to be clogged, or if no resistance is felt, replace cap as an assembled unit



Pressure relief valve EF132

Fig ET-25 Fuel filler cap

SERVICE DATA AND SPECIFICATIONS

Basic mechanical system

Valve clearance			
Cold	Intake	mm	0.20
	Exhaust	mm	0.25
Hot	Intake	mm	0.25
	Exhaust	mm	0.30
Drive belt tension		mm	8 to 12
Tightening torque			
Cylinder head bolts		kg-m	7.0 to 8.5
Manifold nuts		kg-m	1.2 to 1.6
Carburetor nuts		kg-m	0.5 to 1.0
Spark plugs		kg-m	2.0 to 3.0
Engine oil capacity			
Maximum (H)		liters	4.4
Minimum (L)		liters	3.4
Cooling system capacity with heater		liters	6.8
Engine compression pressure at rpm			
Standard		kg/cm ² /rpm	12.0/350
Minimum		kg/cm ² /rpm	9.0/350

Ignition and fuel system

Ignition and idle adjustment		degree/rpm	
(M/T)			6° B T D C /700 (Retard side)
(A/T)			6° B T D C /800 (Retard side) (Retard side, "N" position)
Distributor			
Point gap		mm	0.45 to 0.55
Dwell angle		degree	49 to 55
Condenser capacity		μF	0.05 (Retard side) 0.22 (Advance side)
Condenser insulation resistance		MΩ	5
Spark plug gap		mm	0.8 to 0.9
"CO" percentage at idle speed		%/rpm	
(M/T)			2 ± 0.5/700
(A/T)			2 ± 0.5/800 (in "N" position)
Operating pressure of B C D D		mmHg	-550 to -570

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
CANNOT CRANK ENGINE OR SLOW CRANKING	Improper grade oil	Replace with proper grade oil
	Discharged battery	Charge
	Faulty battery	Replace
	Malfunction in charge system	Inspect
	Wiring connection loose in starting circuit	Correct
	Faulty ignition switch	Repair or replace
	Faulty starter motor	Repair or replace

(Trouble-shooting procedure on starting circuit)

Switch on starting motor with lights "ON"

When lights go off or dim considerably,

- a Check battery
- b Check connection and cable
- c Check starter motor

When lights stay bright

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

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

In this case, the following may be the source of the problem. In most cases the trouble lies in ignition system or fuel system

Trouble in ignition system

Trouble in fuel system

Valve mechanism does not work properly

Low compression

(*Trouble-shooting procedure*)

First check spark plug as follows

Disconnect high tension cable from one spark plug and hold it about 10 mm from engine metal part and crank engine

Good spark occurs

- a Check spark plug
- b Check ignition timing
- c Check fuel system
- d Check cylinder compression

No spark occurs

Very high current

Check current flow in primary circuit

Inspect primary circuit for short

Check breaker point operation

Engine Tune-up

Condition	Probable cause	Corrective action
Ignition system out of order	Low or no current	Check for loose terminal or disconnection in primary circuit Check for burned points
	Burned distributor point	Repair or replace
	Improper point gap	Adjust
	Faulty condenser	Replace
	Leak at rotor cap and rotor	Clean or replace
	Faulty spark plug.	Clean, adjust plug gap or replace
	Improper ignition timing	Adjust
	Faulty ignition coil	Replace
	Disconnection of high tension cable	Replace
Fuel system out of order	Loose connection or disconnection in primary circuit	Repair or replace
	Lack of fuel	Supply
	Dirty fuel strainer	Replace
	Dirty or clogged fuel pipe	Clean
	Fuel pump will not work properly	Repair or replace
	Carburetor choke will not work properly	Check and adjust
	Improper adjustment of float level	Correct.
	Improper idling	Adjust
	Dirty or clogged carburetor	Disassemble and clean
Low compression	Clogged fuel tank breather pipe	Repair and clean
	Malfunctioning anti-dieseling solenoid valve	Check for loose terminal or wire harness
	Incorrect spark plug tightening or faulty gasket	Tighten to normal torque or replace gasket
	Improper grade or low viscosity engine oil	Replace with proper grade oil
	Incorrect valve clearance	Adjust
	Compression leak from valve seat	Remove cylinder head and lap valves
	Sticky valve stem	Correct or replace valve and valve guide
	Weak or damaged valve springs	Replace
	Compression leak at cylinder head gasket	Replace gasket
Sticking or damaged piston ring	Replace	
Worn piston ring or cylinder	Overhaul engine	
(Trouble-shooting procedure) Pour engine oil into plug hole, and then measure cylinder compression		
Compression increases		Malfunctioning cylinder or piston ring
Compression does not change		Compression leaks from valve, cylinder head or head gasket

Engine Tune-up

Condition	Probable cause	Corrective action
IMPROPER ENGINE IDLING Fuel system out of order	Clogged or damaged carburetor jets	Clean or replace
	Incorrect idle adjustment	Adjust
	Clogged air cleaner filter	Replace element
	Damaged manifold gaskets or carburetor insulator	Replace gasket or insulator
	Improper float level adjustment	Adjust
	Loose air hoses or carburetor air-fuel mixture hoses	Check for loose connections
	Malfunctioning carburetor choke	Check and adjust
Low compression		Previously mentioned
Others	Incorrect valve clearance	Adjust
	Extremely low rpm	Adjust
	Malfunction in ignition system (spark plug, high tension cable, breaker point, ignition coil, etc)	Replace
	Incorrect basic ignition timing	Adjust
	Malfunction in choke valve or linkage	Adjust
	Incorrect idle adjustment	Adjust idle speed
	Clogged air cleaner filter	Replace
	Loose manifold and cylinder head bolts	Retighten
High engine idle speed	Dragged accelerator linkage	Check and correct accelerator linkage
	Incorrect idle adjustment	Adjust idle speed
	Malfunction of B C D D system or throttle opener	Check for loose vacuum hose and harness connections Adjust or replace if necessary

Engine Tune-up

Condition	Probable cause	Corrective action
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned
Ignition system out of order	Incorrect ignition timing Damaged spark plugs Worn distributor points Malfunction in electric advance control system	Adjust Clean, adjust or replace plugs Dress, or replace points Also check condenser Check and correct
Fuel system out of order	Malfunction in choke system Clogged fuel pipe or floating valve Dirty or clogged fuel strainer Fuel pump will not work properly Clogged carburetor jets	Adjust Clean Replace Repair or replace Disassemble and clean
Air intake system out of order	Clogged air cleaner Air sucking around manifold gasket or carburetor gasket	Replace element Replace gasket
Overheating	Insufficient coolant Worn or oiled fan belt Inoperative thermostat Worn water pump Clogged or leaky radiator Worn radiator filler cap Air in cooling system Incorrect ignition timing Clogged carburetor (lean mixture)	Refill Replace Replace Replace Flush, repair or replace Replace Retighten each part of cooling system Adjust Overhaul carburetor
Overcooling	Inoperative thermostat	Replace
Others	Improper octane fuel Improper tire pressure Dragging brake Clutch slipping	Replace with specified octane fuel Inflate to specified pressure Adjust Adjust

Engine Tune-up

Condition	Probable cause	Corrective action
NOISY ENGINE		
Car knocking	Overloaded engine Carbon knocking Timing knocking Fuel knocking Preignition (misuse of spark plug)	Use proper gear in driving Disassemble cylinder head and remove carbon Adjust ignition timing Use specified octane fuel Use specified spark plug
Mechanical knocking		
Crankshaft bearing knocking	Crankshaft bearing This strong dull noise increases when engine is accelerated To locate the place, cause a misfire on each cylinder If noise stops as a result of the misfire, this cylinder generates the noise	This is caused by worn or damaged bearings, or an unevenly worn crankshaft Replace bearings and adjust or change crankshaft Check lubrication system
Connecting rod bearing knocking	This is a little higher-pitched noise than the crankshaft knocking, and also increases when engine is accelerated Cause a misfire on each cylinder and if the noise diminishes almost completely, this crankshaft bearing generates the noise	Same as in the case of crankshaft bearings
Piston and cylinder noise	When you hear an overlapping metallic noise which increases in magnitude with engine rpm 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 abnormal wearing of cylinder and lower compression, which in turn will cause lower output power and excessive oil consumption Overhaul engine
Piston pin noise	This noise is heard at top and bottom dead ends of piston To locate the place cause a misfire on each cylinder	This may cause wear on piston pin, or piston pin hole Replace 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
Others	Improper adjustment of valve clearance Noise from timing chain Excessive end play on crankshaft Note This noise will be heard when clutch is disengaged Wear on clutch pilot bushing Note This noise will be heard when clutch is disengaged	Adjust Adjust tension of chain Disassemble engine and replace main bearing Replace bushing and adjust drive shaft

Engine Tune-up

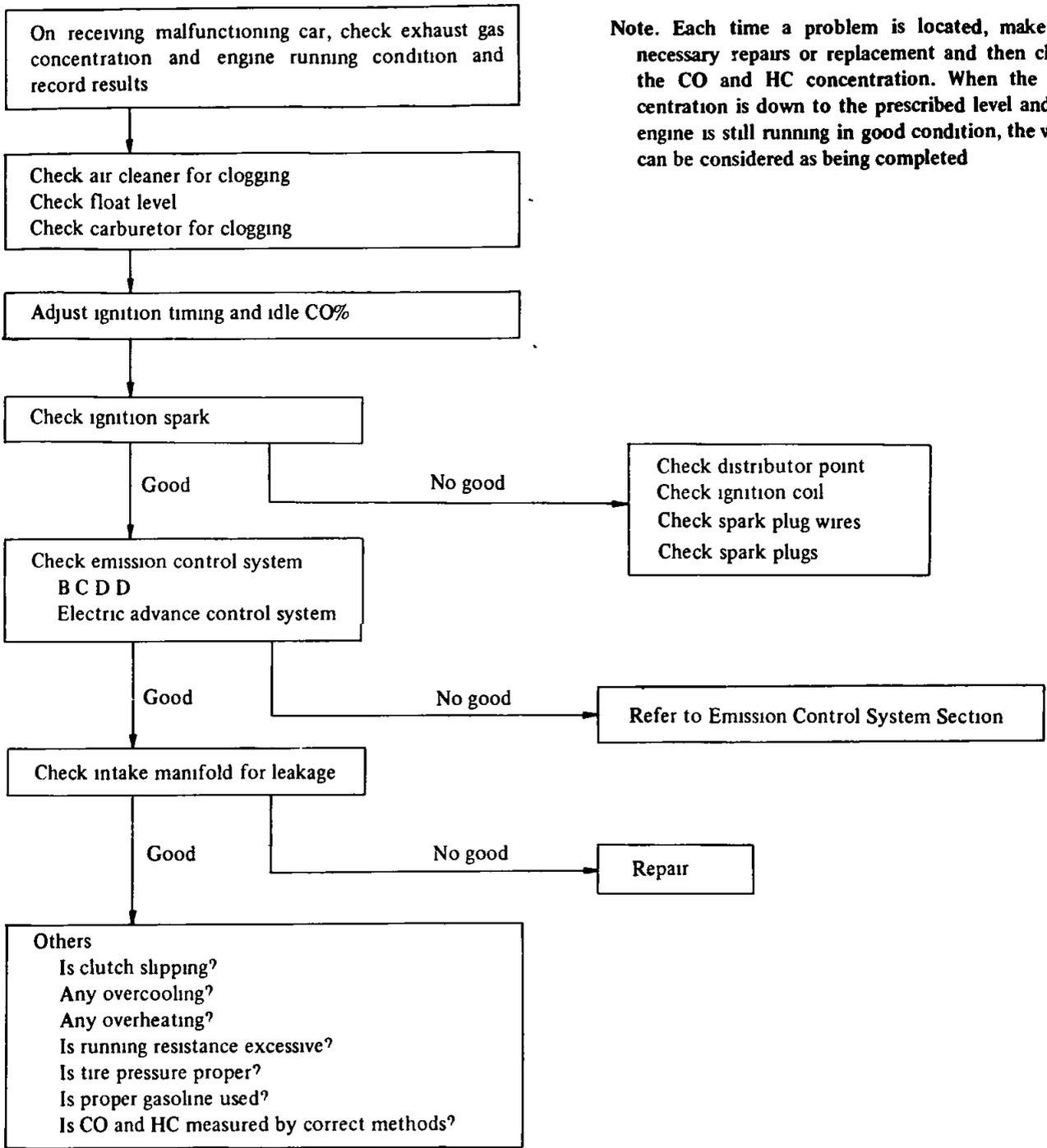
Condition	Probable cause	Corrective action
<p>ABNORMAL COMBUSTION (backfire, afterfire run-on, etc)</p> <p>Improper ignition timing</p> <p>Fuel system out of order</p> <p>Faulty cylinder head</p>	<p>Improper ignition timing</p> <p>Improper heat range of spark plugs</p> <p>Damaged carburetor or manifold gasket (Backfire, afterfire)</p> <p>Clogged carburetor jet</p> <p>Malfunctionmg float</p> <p>Uneven idling (Run-on)</p> <p>Malfunction of anti-dieseling solenoid valve</p> <p>Malfunction of automatic choke</p> <p>Improperly adjusted valve clearance</p> <p>Excess carbon in combustion chamber</p> <p>Damaged valve spring (Backfire, afterfire)</p>	<p>Adjust ignition timing</p> <p>Use specified spark plugs</p> <p>Replace them with new parts</p> <p>Disassemble carburetor and check it</p> <p>Adjust lever, and check needle valve</p> <p>Adjust</p> <p>Check or replace</p> <p>Adjust</p> <p>Adjust</p> <p>Remove head and get rid of carbon</p> <p>Replace</p>
<p>EXCESSIVE OIL CONSUMPTION</p> <p>Oil leakage</p>	<p>Loose oil drain plug</p> <p>Loose or damaged oil pan gasket</p> <p>Loose or damaged chain cover gasket</p> <p>Worn oil seal in front and rear of crankshaft</p> <p>Loose or damaged rocker cover gasket</p> <p>Improper tightening of oil filter</p> <p>Loose or damaged oil pressure switch</p>	<p>Tighten it</p> <p>Replace gasket or tighten it</p> <p>Replace gasket or tighten it</p> <p>Replace oil seal</p> <p>Replace gasket or tighten it (but not too much)</p> <p>Replace gasket and tighten it to proper torque</p> <p>Replace oil pressure switch or tighten it</p>

Engine Tune-up

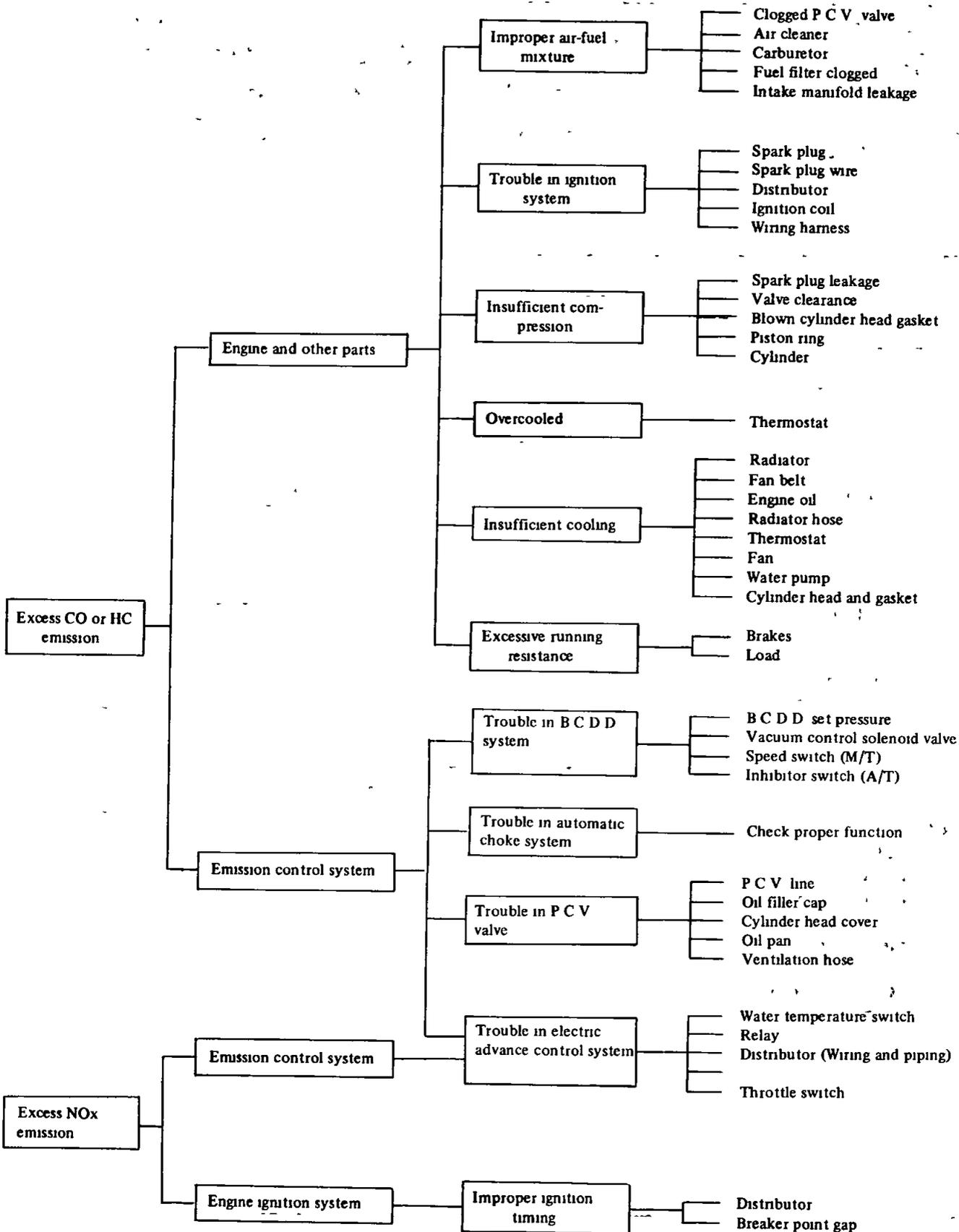
Condition	Probable cause	Corrective action
Excessive oil consumption Others	Cylinder and piston wear Improper location of piston ring gap or reversely assembled piston ring Damaged piston rings Worn piston ring groove and ring Fatigue of valve oil seal lip Worn valve stem Inadequate engine oil quality Engine overheats	Overhaul cylinder and replace piston Remount piston rings Replace rings Repair or replace piston and cylinder Replace piston and piston ring Replace seal lip Replace valve or guide Use designated oil Previously mentioned
POOR FUEL ECONOMY See explanation for power loss Others	Too high idling rpm Inoperative acceleration recovery Fuel leakage	Adjust it to designated rpm Adjust it Repair or tighten fuel pipe connections
PROBLEM IN OTHER AREAS Reduced oil pressure Excessive wear on sliding parts Scuffing of sliding parts	Inadequate oil quality Overheating Worn oil pump regulator valve Functional deterioration of oil pump Blocked oil filter Increased clearance in various sliding parts Blocked oil strainer Inoperative oil gauge pressure switch Oil pressure decreases Improper quality or contamination of oil Damaged air cleaner Overheating or overcooling Improper fuel mixture Reduced oil pressure Insufficient clearances Overheating Improper fuel mixture	Use designated oil Previously mentioned Disassemble oil pump and repair or replace it Repair or replace Replace it Disassemble and replace worn parts with new ones Clean it Replace Previously mentioned Exchange oil for proper one and change element Change element Previously mentioned Check fuel system Previously mentioned Readjust to designated clearances Previously mentioned Check fuel system

EMISSION TROUBLE-SHOOTING

EXCESS HC OR CO EMISSION IN EXHAUST GASES



MAIN CAUSES FOR EXCESS CO, HC AND NO_x IN EXHAUST GASES



SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EM

EM

ENGINE MECHANICAL

GENERAL DESCRIPTION	EM- 2
ENGINE DISASSEMBLY	EM- 4
INSPECTION AND REPAIR	EM- 7
ENGINE ASSEMBLY	EM-20
SERVICE DATA AND SPECIFICATIONS	EM-26
TROUBLE DIAGNOSES AND CORRECTIONS	EM-33

GENERAL DESCRIPTION

CONTENTS

MODEL L18 ENGINE	EM-2	CAMSHAFT	EM-3
CYLINDER BLOCK	EM-3	VALVE MECHANISM	EM-3
CRANKSHAFT	EM-3	CAMSHAFT DRIVE	EM-3
PISTON AND CONNECTING ROD	EM-3	MANIFOLDS	EM-3
CYLINDER HEAD	EM-3		

MODEL L18 ENGINE

The L18 engine features OHC valves, wedge-shaped combustion chamber, aluminum head and a fully

balanced 5-bearing crankshaft to turn out smooth, dependable power

The cylinder block is cast as a single unit, and features deep skirting This engine is equipped with a single, 2-barrel downdraft carburetor

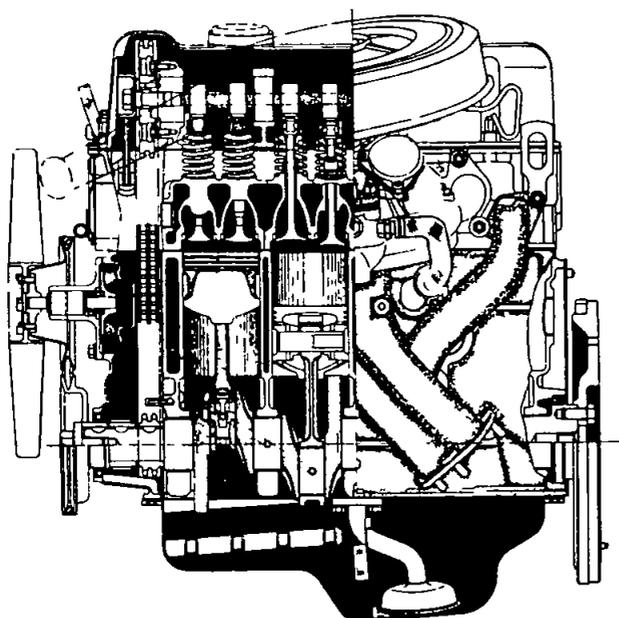


Fig EM-1 Cross sectional view

CYLINDER BLOCK

The cylinder block, a monoblock special casting structure, employs a five-bearing-support system for quietness and higher durability

The cylinder bores are surrounded by cooling jackets and machined directly in the block The oil ways in the block are arranged so that the full-flow oil filter is directly attached to the right hand side of the block

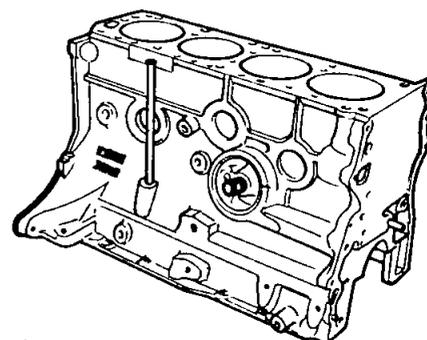


Fig EM-2 Cylinder block

Main specifications

		L18
Displacement	cc (cu in)	1,770 (108)
Bore x stroke	mm (in)	85 x 78 (3 35 x 3 07)
Compression ratio		8 5
Ignition timing Degree B T D C /rpm	M/T	6/700
	A/T	6/800 in "N" position

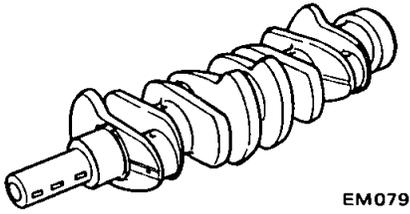
M/T Manual Transmission A/T Automatic Transmission
Ignition timing is on "Retard" side

CRANKSHAFT

The crankshaft is a special steel forging Fully balanced, it turns out smooth, dependable power at high speed

The L18 engine uses eight balance weights

Main bearings are lubricated by oil pumped through the main oil gallery and the oil holes which run in parallel with cylinder bores There are oilways drilled in the crankshaft for the lubricating oil The center main bearing is equipped with thrust washers to take up end thrust of the crankshaft



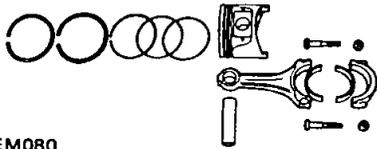
EM079

Fig EM-3 Crankshaft

PISTON AND CONNECTING ROD

The pistons are of a special aluminum casting and have struts to control thermal expansion, two compression rings and one combined oil ring. The piston heads are slightly dished. The piston pins are a special hollow steel shaft. They are full-floating fit to the piston and press fit to the connecting rods.

The connecting rods are of a special forged steel. Oil is sprayed to the connecting rod small ends through drilled passages in the large ends of rod. Oil holes in the connecting rods are located so as to insure optimum lubrication under heavy load.

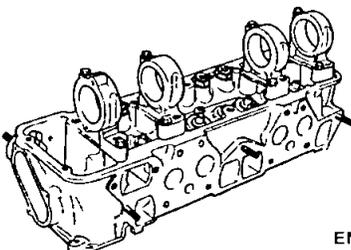


EM080

Fig EM-4 Piston and connecting rod

CYLINDER HEAD

The cylinder head is made of a light, strong aluminum alloy with good cooling efficiency, it contains wedge type combustion chambers.



EM407

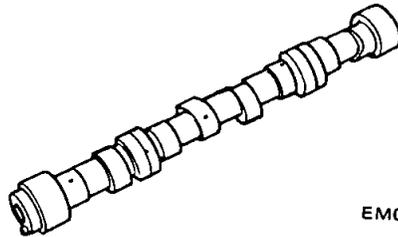
Fig EM-5 Cylinder head

CAMSHAFT

The camshaft is made of a special cast iron and is located inside the rocker cover. Four aluminum alloy brackets support it. Camshaft bearings are lubricated from oil holes which lead to the main oil gallery of the cylinder head.

Concentric passages are drilled in the front and rear parts of the camshaft.

Oil to each cam lobe is supplied through an oil hole drilled in the base circle of each lobe. Lubricant is supplied to the front oil gallery from the 2nd camshaft bearing and to the rear oil gallery from the 3rd camshaft bearing. These holes on the base circle of the lobe supply lubricant to the cam pad surface of the rocker arm and to the valve tip end. The cams feature a long-overlap profile to reduce NOx emission.



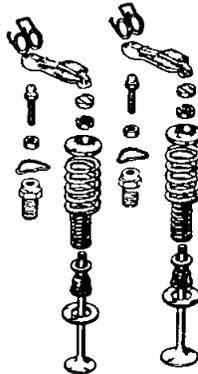
EM082

Fig EM-6 Camshaft

VALVE MECHANISM

The valve system has the pivot type rocker arms that are activated directly by the cam mechanism, this has made its moving parts considerably lighter and provides ideal high speed performance.

Dual type valve springs are installed.

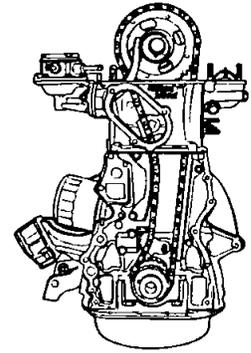


Exhaust Intake EM084

Fig EM-7 Valve mechanism

CAMSHAFT DRIVE

The camshaft is driven by a double row roller chain driven by the crankshaft. The tension of the chain is controlled by a chain tensioner which is operated by spring and oil pressure. The rubber shoe type tensioner damps vibration of the chain and controls its tension.



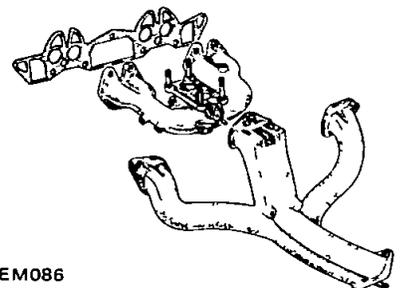
EM537

Fig EM-8 Chain driving system

MANIFOLDS

The intake manifold is of an aluminum cast alloy.

The exhaust manifold is of a dual design. The exhaust pipe is connected to the flanged surface of the exhaust manifold.



EM086

Fig EM-9 Intake and exhaust manifolds

ENGINE DISASSEMBLY

CONTENTS

PRELIMINARY CLEANING AND INSPECTION
DISASSEMBLY

EM-4
EM-4

PISTONS AND CONNECTING RODS
CYLINDER HEAD

EM-6
EM-6

PRELIMINARY CLEANING AND INSPECTION

Before disassembling engine, observe the following items

1 Fuel, oil or water may leak past cylinder head and block. Prior to disassembling, check cylinder head, front chain cover, oil pan and oil filter gaskets and crankshaft and water pump seals for sign of leak past their gasketed surfaces.

2 Check carburetor and fuel pump for condition, fuel hoses for deterioration, cracks or otherwise leakage of fuel past their jointed or connected surfaces.

3 Remove air cleaner, alternator, distributor and starter, and plug up carburetor air-horn and distributor hole to prevent entry of foreign matter.

4 Wipe dust and mud off engine.

5 Inspect block, rocker cover front chain cover, oil pan and all other outer parts for visual defects and broken or missing parts such as bolts and nuts.

6 Test all pipings and electrical circuits for discontinuity or broken or damaged insulation.

DISASSEMBLY

To remove engine from vehicle, refer to relative topic under "Engine Removal and Installation" in Chassis and Body Service Manual, Section ER.

1 Remove transmission from engine.

2 Thoroughly drain engine oil and coolant by removing drain plugs.

3 Place engine assembly on the engine stand.

(1) Remove fan and fan pulley.

(2) Remove engine mounting RH.

(3) Remove oil filter using special tool "Oil Filter Wrench ST19320000".

(4) Remove oil pressure switch.

(5) Install engine attachment to cylinder block using bolt holes securing alternator bracket and water drain-plug.

(6) Set engine on the stand.

"Engine Attachment ST05260001"
"Engine Stand ST0501S000"

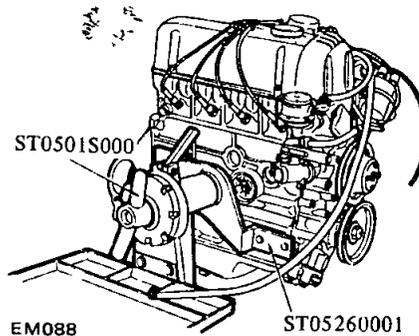


Fig EM-13 Engine on engine stand

- 4 Remove oil level gauge
- 5 Remove clutch assembly
- 6 Remove high tension cable
- 7 Remove spark plugs
- 8 Remove thermostat housing

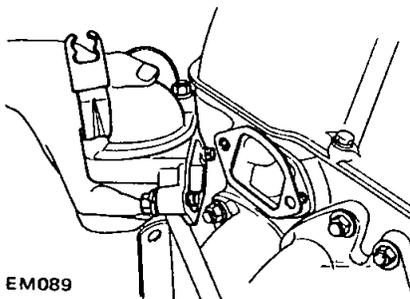


Fig EM-14 Removing thermostat housing

- 9 Remove rocker cover
- 10 Remove carburetor
- 11 Remove intake and exhaust manifolds

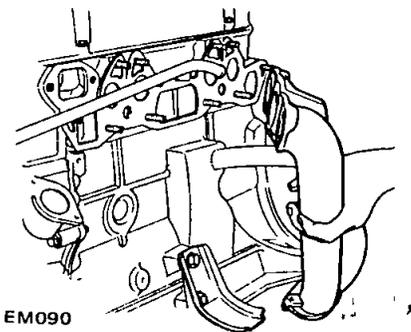


Fig EM-15 Removing manifolds

- 12 Remove engine mounting LH
- 13 Remove crank pulley
- 14 Remove water pump
- 15 Remove fuel pump
- 16 Remove fuel pump drive cam
- 17 Remove camshaft sprocket

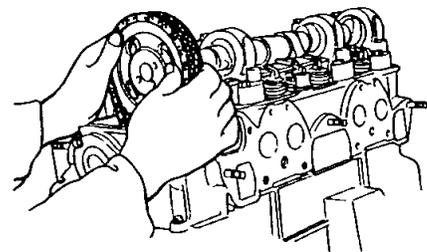


Fig EM-16 Removing camshaft sprocket

- 18 Remove cylinder head assembly. Use special tool "Cylinder Head Bolt Wrench ST10120000" to remove cylinder head bolts. Loosen bolts from ① to ⑩ as shown in Figure EM-18.

Engine Mechanical

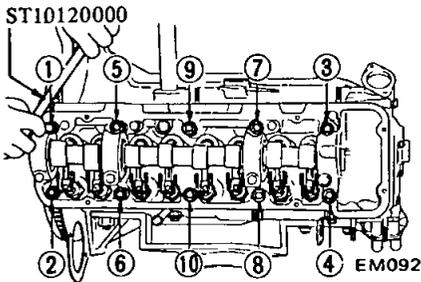


Fig EM-18 Cylinder head bolt loosening sequence

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

- a Turn crankshaft until No 1 piston is at TDC on its compression stroke
 - b Remove rocker cover and fuel pump
 - c To facilitate assembling operation, scribe a mark on timing chain and camshaft sprocket with paint before removal
 - d Loosen camshaft bolt and remove fuel pump drive cam
 - e Support timing chain by utilizing Chain Stopper ST17420001 between timing chains as shown in Figure EM-19
- This operation eliminates the problem of realigning timing marks on timing chain and crankshaft sprocket

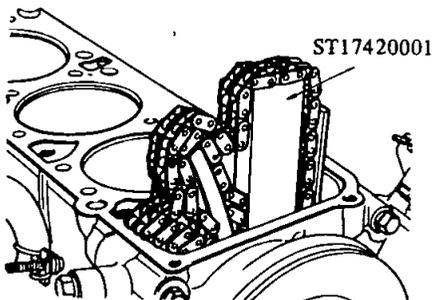


Fig EM-19 Supporting timing chain

- f Remove camshaft sprocket
- g Loosen cylinder head bolts and remove cylinder head

- 19 Invert engine
- 20 Remove oil pan and oil strainer

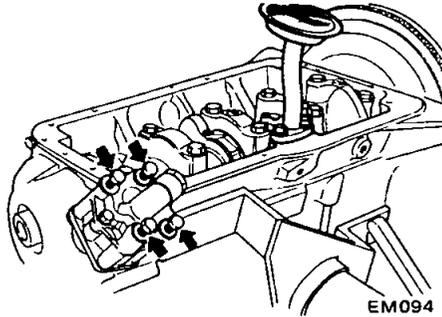


Fig EM-20 Removing oil strainer and oil pump

- 21 Remove oil pump and its drive spindle See Figure EM-20
- 22 Remove front cover
- 23 Remove chain tensioner and chain slack side guide

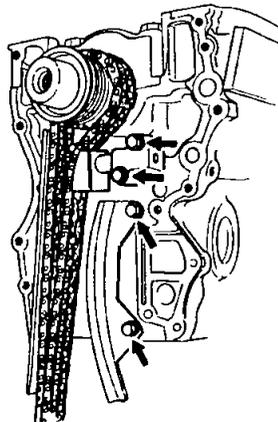


Fig EM-21 Removing chain tensioner and timing chain

- 24 Remove timing chain See Figure EM-21
- 25 Remove oil thrower, crankshaft worm gear and chain drive sprocket

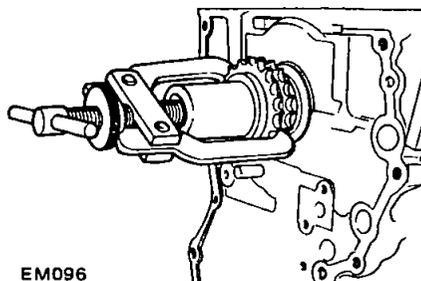


Fig EM-22 Removing chain drive sprocket

- 26 Remove piston and connecting rod assembly Extract connecting rod bearings, keeping them in order

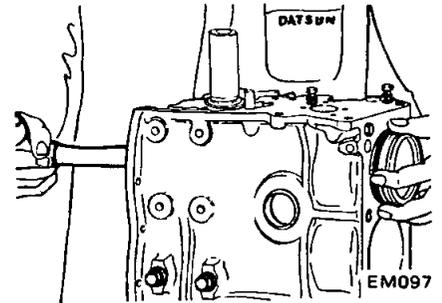


Fig EM-23 Removing piston and connecting rod assembly

- 27 Remove flywheel and rear plate Be careful not to drop them

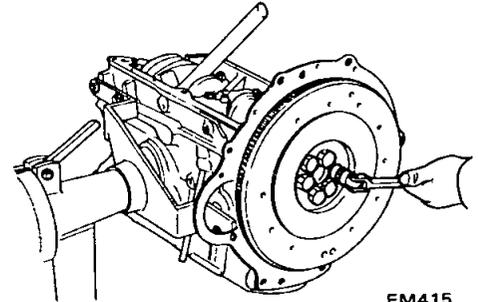


Fig EM-24 Removing flywheel

- 28 Remove main bearing caps Use Crankshaft Main Bearing Cap Puller ST1651S000 to remove center and rear main bearing caps Keep them in order

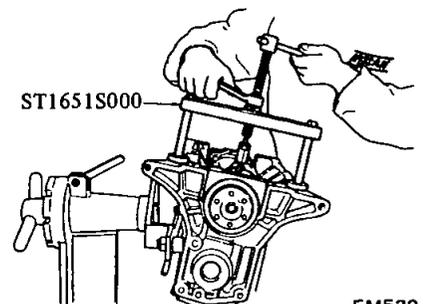
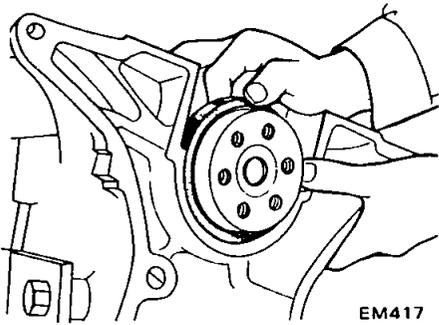


Fig EM-25 Removing rear main bearing cap

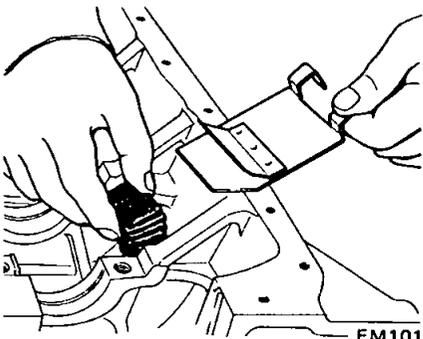
- 29 Remove two side seals from rear main bearing cap
- 30 Remove rear oil seal



EM417

Fig EM-26 Removing rear oil seal

- 31 Remove crankshaft
- 32 Remove baffle plate and cylinder block net

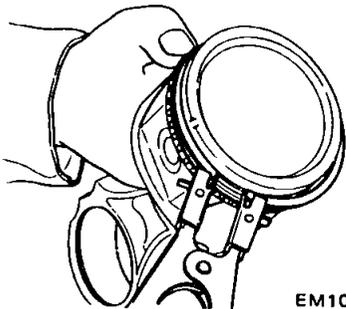


EM101

Fig EM-27 Removing baffle plate and net

PISTONS AND CONNECTING RODS

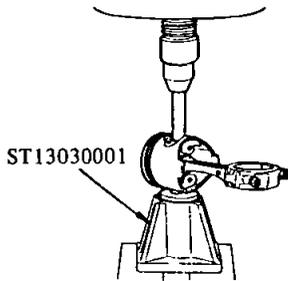
- 1 Remove piston rings with a ring remover



EM102

Fig EM-28 Removing piston rings

- 2 Press piston pin out with Piston Pin Press Stand ST13030001



ST13030001

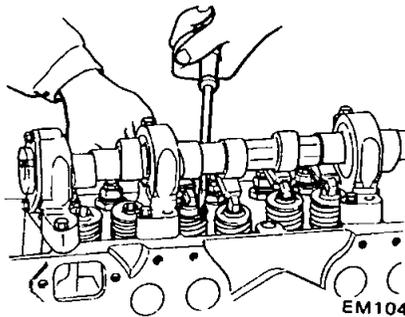
EM103

Fig EM-29 Removing piston pin

- 3 Keep disassembled parts in order

CYLINDER HEAD

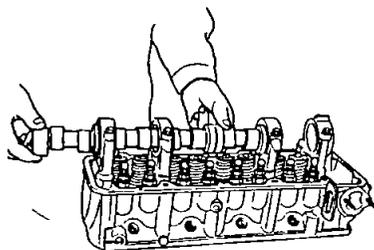
- 1 Remove valve rocker springs
Loosen valve rocker pivot lock nut and remove rocker arm by pressing valve spring down



EM104

Fig EM-30 Removing rocker arms

- 2 Remove locate plate, and remove camshaft

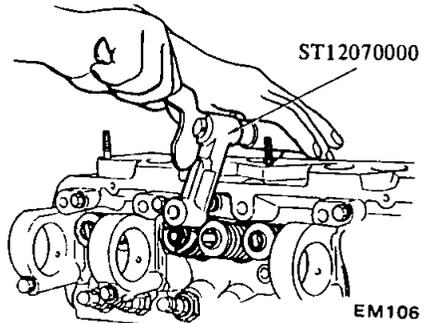


EM105

Fig EM-31 Removing camshaft

Note Be careful not to damage camshaft bearings and cam lobes

- 3 Remove valves using Valve Lifter ST12070000



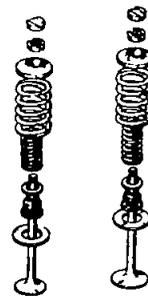
ST12070000

EM106

Fig EM-32 Removing valves

Notes

- a Take care not to lose valve spring seat, oil seal, valve collet, and valve rocker guide
- b Be sure to keep camshaft bearings intact, or the bearing center is liable to come out of alignment



Exhaust

Intake

EM107

Fig EM-33 Valve components

INSPECTION AND REPAIR

CONTENTS

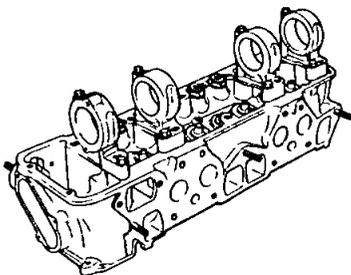
PREPARATION FOR INSPECTION	EM- 7	PISTONS, PISTON PINS AND	
CYLINDER HEAD AND VALVE	EM- 7	PISTON RINGS	EM-14
CHECKING CYLINDER HEAD MATING		CONNECTING ROD	EM-15
FACE	EM- 7	CRANKSHAFT	EM-15
VALVE ASSEMBLY	EM- 7	BUSHING AND BEARING	EM-16
VALVE SPRING	EM- 8	MEASUREMENT OF MAIN BEARING	
ROCKER ARM AND VALVE ROCKER		CLEARANCE	EM-16
PIVOT	EM- 9	MEASUREMENT OF CONNECTING ROD	
VALVE GUIDE	EM- 9	BEARING CLEARANCE	EM-17
VALVE SEAT INSERTS	EM-10	FITTING BEARINGS	EM-17
CAMSHAFT AND CAMSHAFT BEARING	EM-11	MISCELLANEOUS COMPONENTS	EM-18
CAMSHAFT BEARING CLEARANCE	EM-11	CRANKSHAFT AND CAMSHAFT	
VALVE TIMING	EM-11	SPROCKETS	EM-18
CAMSHAFT ALIGNMENT	EM-12	CHAIN TENSIONER AND CHAIN GUIDE	EM-19
CYLINDER BLOCK	EM-12	FLYWHEEL	EM-19
HOW TO MEASURE CYLINDER BORE	EM-12	FRONT COVER AND REAR OIL SEAL	EM-19
CYLINDER BORING	EM-13		

PREPARATION FOR INSPECTION

- 1 Before cleaning, check for signs of water and oil leaks in cylinder block and head
- 2 Clean oil, carbon deposits and sealant from all parts. Remove gasket
- 3 Clean all oil holes with solvent and dry with compressed air. Make sure that they are not restricted

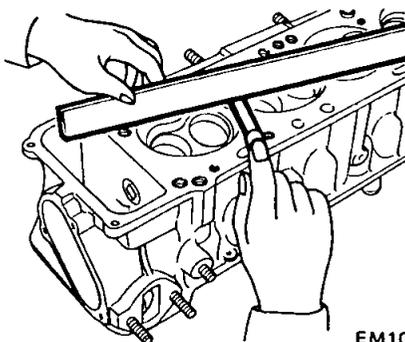
CYLINDER HEAD AND VALVE

CHECKING CYLINDER HEAD MATING FACE



EM407

Fig EM-34 Cylinder head



EM108

Fig EM-35 Checking cylinder head surface

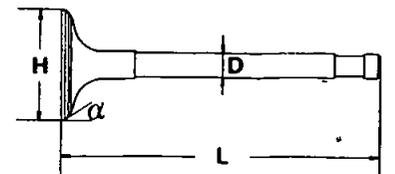
Head surface flatness

Standard	Maximum
less than 0.05 mm (0.0020 in)	0.1 mm (0.0039 in)

- 1 Make a visual check for cracks and flaws
- 2 Measure the surface of cylinder head (on cylinder block side) for warpage. If it is found to be beyond the limit designated below, regrind the affected surface with a surface grinder

VALVE ASSEMBLY

- 1 Check each intake and exhaust valve for worn, damaged or deformed valve caps or stems. Correct or replace any valve that is faulty
- 2 Valve face or valve stem end surface should be refaced with a valve grinder



EM109

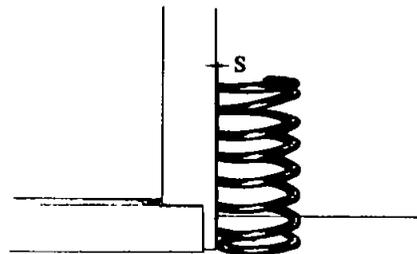
Fig EM-36 Intake and exhaust valve dimensions

Engine Mechanical

H	Valve head diameter mm (in)	In	42 0 to 42 2 (1 654 to 1 661)
		Ex	35 0 to 35 2 (1 378 to 1 386)
L	Valve length mm (in)	In	114 9 to 115 2 (4 524 to 4 535)
		Ex	115 7 to 116 0 (4 555 to 4 567)
D	Valve stem diameter mm (in)	In	7 965 to 7 980 (0 3136 to 0 3142)
		Ex	7 945 to 7 960 (0 3128 to 0 3134)
α	Valve seat angle Intake and Exhaust	In	45°30'
		Ex	45°30'

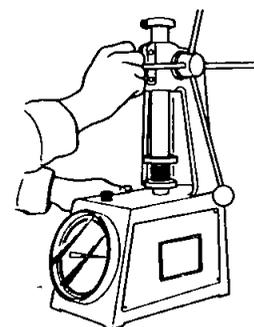
VALVE SPRING

- 1 Check valve spring for squareness using a steel square and surface plate. If spring is out of square "S" more than 1 6 mm (0 063 in), replace.
- 2 Measure the free length and tension of each spring. If the measured value exceeds specified limit, replace spring.



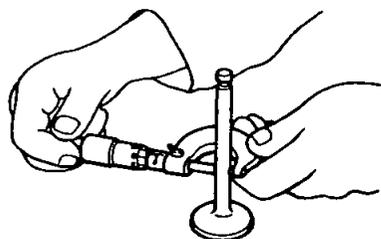
EM296

Fig EM-39 Measuring spring squareness



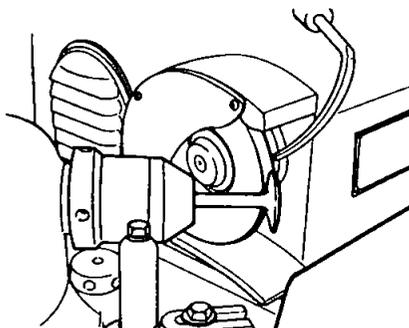
EM113

Fig EM-40 Measuring spring tension



EM110

Fig EM-37 Checking valve stem diameter



EM111

Fig EM-38 Regrinding valve face

Note When valve head has been worn down to 0 5 mm (0 0197 in) in thickness, replace the valve. Grinding allowance for valve stem end surface is 0 5 mm (0 0197 in) or less.

Spring specifications

Valve spring free length	mm (in)	
Intake and exhaust		
Outer		49 98 (1 968)
Inner		44 85 (1 766)
Valve spring pressured length (valve open)	mm/kg (in/lb)	
Intake and exhaust		
Outer		29 5/49 0 (1 161/108)
Inner		24 5/25 5 (0 965/56 2)
Valve spring assembled height (valve close)	mm/kg (in/lb)	
Intake and exhaust		
Outer		40 0/21 3 (1 575/47 0)
Inner		35 0/12 3 (1 378/27 1)

ROCKER ARM AND VALVE ROCKER PIVOT

Check pivot head and cam contact and pivot contact surfaces of rocker arm for damage or wear. If damage is found, replace them. A faulty pivot must be replaced together with its corresponding rocker arm.

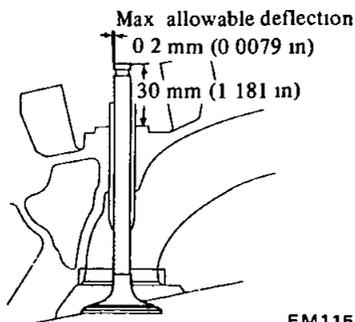
VALVE GUIDE

Measure clearance between valve guide and valve stem. If clearance exceeds designated limit, replace 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.

	Intake valve	Exhaust valve
Stem to guide clearance mm (in)	0.020 to 0.053 (0.0008 to 0.0021)	0.040 to 0.073 (0.0016 to 0.0029)
Maximum limit of above clearance mm (in)	0.1 (0.0039)	

As an emergency expedient, a valve can be pushed into valve guide and moved to the right and left. If its tip deflects about 0.2 mm (0.0079 in) or more, it indicates that the clearance between stem and guide exceeds the maximum limit of 0.1 mm (0.0039 in).

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



EM115
Fig EM-42 Measuring clearance between valve stem and valve guide

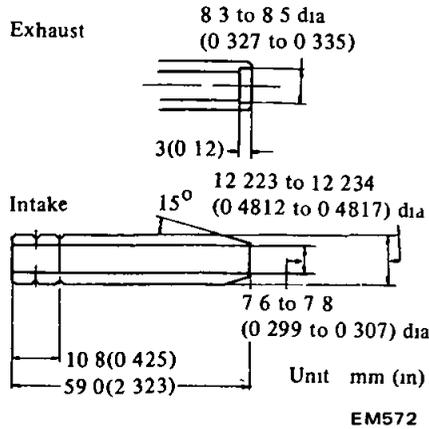


Fig EM-41 Service valve guide

Replacement of valve guide

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

Drive them out from combustion chamber side toward rocker cover. Heated cylinder head will facilitate the operation.

2 Ream cylinder head side guide hole at room temperature.

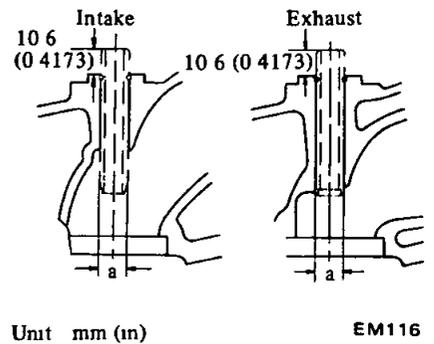


Fig EM-43 Valve guide hole

Guide hole inner diameter "a" mm (in)	For factory standard valve guide	11.985 to 11.996 (0.4718 to 0.4723)
	For service valve guide	12.185 to 12.196 (0.4797 to 0.4802)

3 Carefully press new valve guide into valve so that it will fit smoothly after heating cylinder head to 150 to 200°C (302 to 392°F).

Valve guide of 0.2 mm (0.0079 in) oversize diameter is available for service as indicated above.

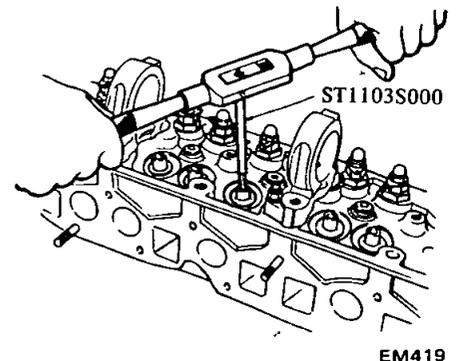
Interference fit of valve guide to guide hole

0.027 to 0.049 mm
(0.0011 to 0.0019 in)

4 Ream bore with valve guide pressed in, using Valve Guide Reamer Set ST1103S000.

Reaming bore

8.000 to 8.018 mm
(0.3150 to 0.3157 in)



EM419
Fig EM-44 Reaming valve guide

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 excessively

Valve seat insert of 0.5 mm (0.0197 in) oversize is available for service as shown below

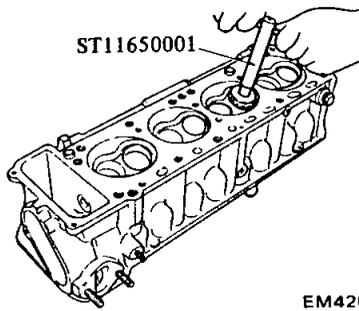


Fig EM-45 Correcting valve seat

Replacing valve seat insert

- 1 Old insert can be removed by boring it out until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in cylinder head.
- 2 Select a suitable valve seat insert and check its outside diameter.
- 3 Machine cylinder head recess to the concentric circles in valve guide center so that insert will have the correct fit.
- 4 Heat cylinder head to a temperature of 150 to 200°C (302 to 392°F).
- 5 Fit insert ensuring that it beds on the bottom face of its recess, and caulk more than 4 points.
- 6 Newly fitted valve seats should be cut or ground at the specified dimensions as shown in Figure EM-47.
- 7 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.

Intake	
Unit mm (in)	EM573
Exhaust	
Unit mm (in)	EM573

Fig EM-46 Service valve seat dimensions

Cylinder head recess diameter

Unit mm (in)

Intake	For factory standard insert	45 000 to 45 016 (1 7717 to 1 7723)
	For service insert	45 500 to 45 516 (1 7913 to 1 7920)
Exhaust	For factory standard insert	37 000 to 37 016 (1 4567 to 1 4573)
	For service insert	37 500 to 37 516 (1 4764 to 1 4770)

Interference fit mm (in)	Intake	0.081 to 0.113 (0.0032 to 0.0044)
	Exhaust	0.064 to 0.096 (0.0025 to 0.0038)

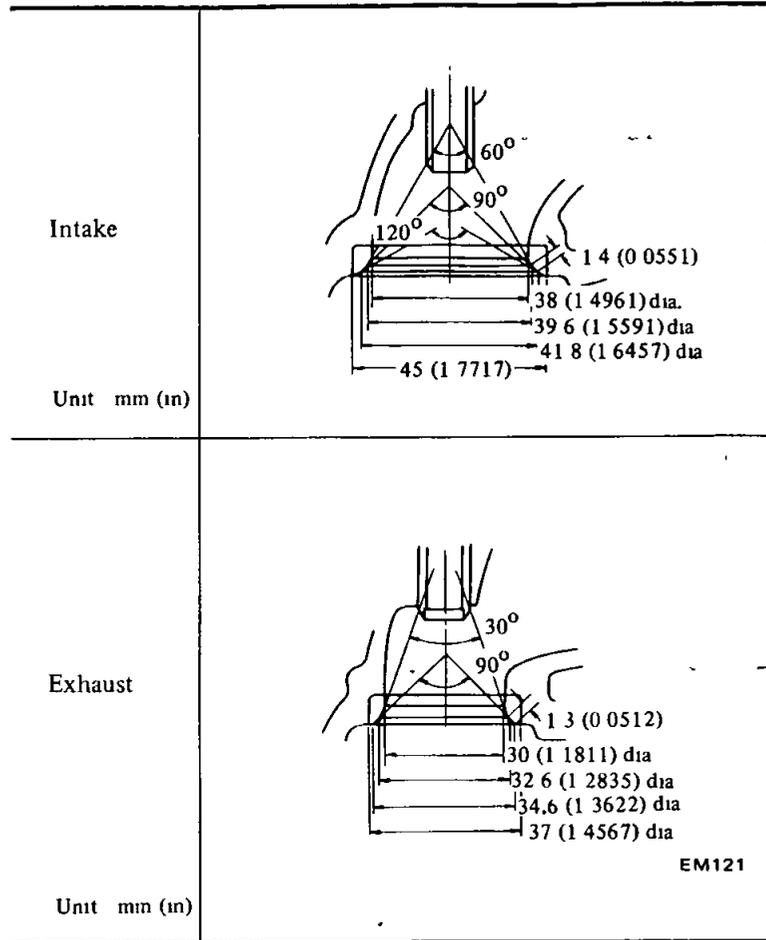
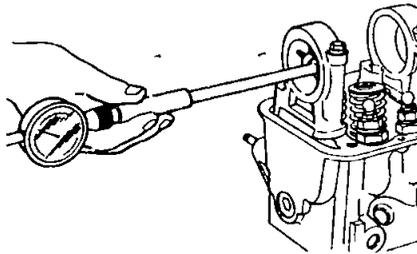


Fig EM-47 Standard valve seat dimensions

CAMSHAFT AND CAMSHAFT BEARING

CAMSHAFT BEARING CLEARANCE

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

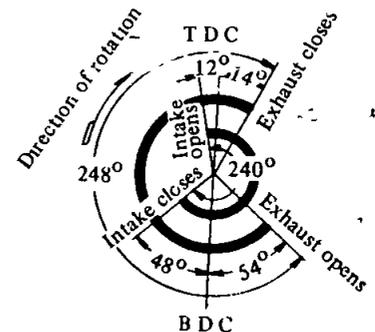


EM119

Fig EM-48 Checking camshaft bearing

VALVE TIMING

This diagram applies to all cylinders. If any valve is found out of specifications, one possibility is that cam lobe is worn or damaged. This calls for replacement of camshaft.



EM421

Fig EM-49 Valve timing diagram

Camshaft journal to bearing clearance

	Standard	Wear limit
Oil clearance mm (in)	0.038 to 0.067 (0.0015 to 0.0026)	0.1 (0.0039)
Inner diameter of camshaft bearing mm (in)	48.000 to 48.016 (1.8898 to 1.8904)	—

	Standard	Bend limit
Camshaft bend mm (in)	0.02 (0.0008)	0.05 (0.0020)

CAMSHAFT ALIGNMENT

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

2 A bend value is one-half of the reading obtained when camshaft is turned one full revolution with a dial gauge applied to 2nd and 3rd journals.

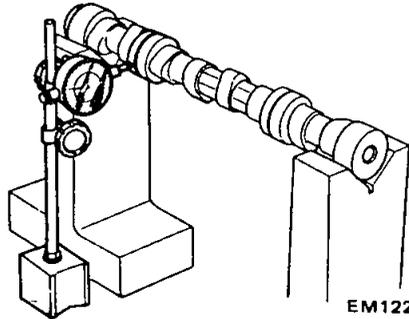


Fig EM-50 Checking camshaft bend

Standard height of cam mm (in)	Intake	40.30 to 40.35 (1.5866 to 1.5886)
	Exhaust	
Wear limit of cam height	mm (in)	0.25 (0.0098)
Allowable difference in diameter between max worn and min worn parts of camshaft journal	mm (in)	0.05 (0.0020)
Maximum tolerance in journal diameter	mm (in)	0.1 (0.0039)
Camshaft end play	mm (in)	0.08 to 0.38 (0.0031 to 0.0150)

	Standard	Maximum tolerance
Surface flatness mm (in)	less than 0.05 (0.0020)	0.10 (0.0039)

CYLINDER BLOCK

1 Visually check cylinder block for cracks or flaws.

2 Measure top of cylinder block (cylinder head mating face) for warpage. If warpage exceeds limits, correct it.

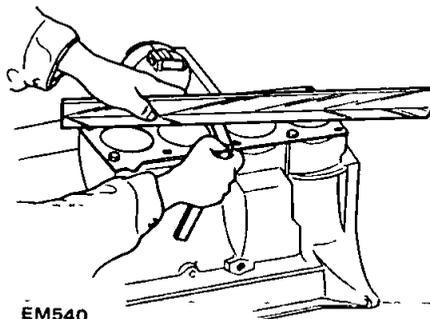


Fig EM-51 Checking cylinder block surface

3 Using a bore gauge, measure cylinder bore for out-of-round or taper. If out-of-round or taper is excessive, re-bore cylinder walls with a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round. See Figure EM-52.

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

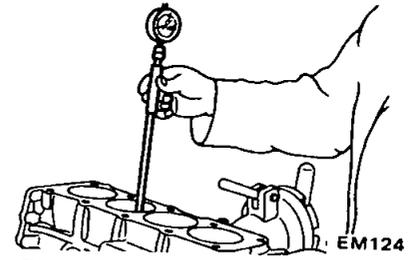


Fig EM-52 Measuring cylinder bore diameter

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

HOW TO MEASURE CYLINDER BORE

A bore gauge is used. Measure cylinder bore at top, middle and bottom positions toward A and B directions as shown in Figure EM-53 and record the measured values.

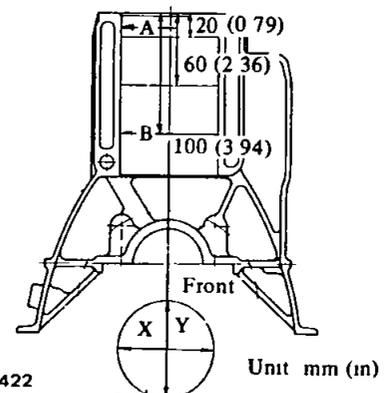


Fig EM-53 Cylinder bore measuring positions

		Standard	Wear limit
Cylinder bore mm (in)	Inner diameter	85 000 to 85 050 (3 3465 to 3 3484)	0.2 (0.0079)
	Out-of-round	0.015 (0.0006)	
	Taper	0.015 (0.0006)	
Difference in cylinder bore mm (in)		0.05 (0.0020)	0.2 (0.0079)

CYLINDER BORING

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

2 Determine piston oversize according to amount of wear of cylinder

Oversize pistons specifications

Piston diameter mm (in)	
Service standard	84 985 to 85 035 (3 3459 to 3 3478)
0.50 (0.0197) Oversize	85 465 to 85 515 (3 3648 to 3 3667)
1.00 (0.0394) oversize	85 965 to 86 015 (3 3844 to 3.3864)

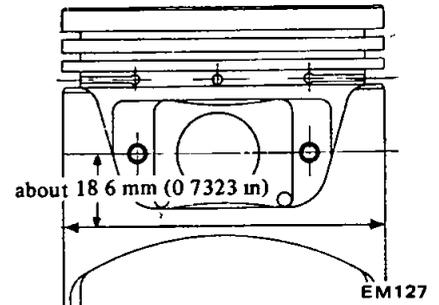


Fig EM-55 Measuring piston skirt diameter

Rebored size calculation

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

where,

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

3 The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the largest piston diameter (at piston skirt in thrust direction)

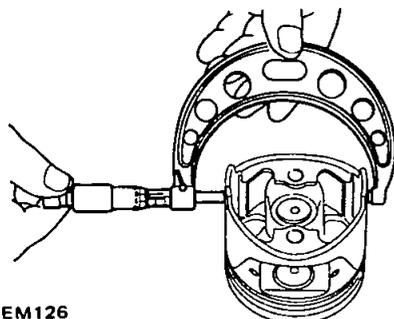
Standard clearance	mm (in)	0.025 to 0.045 (0.0010 to 0.0018)
Feeler gauge	mm (in)	0.04 (0.0016)
Extracting force	kg (lb)	0.2 to 1.5 (0.44 to 3.31)

Notes

- 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.

- 5 Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat
- 6 As a final step, cylinders should be honed to size
- 7 Measure the finished cylinder bore for out-of-round or tapered part
- 8 Measure piston-to-cylinder clearance

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



EM126

Fig EM-54 Measuring piston diameter

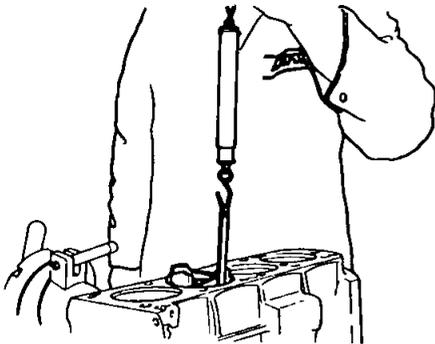
4 Do not cut too much out of cylinder bore at a time Cut only 0.05 mm (0.0020 in) or so in diameter at a time

Notes

- 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)

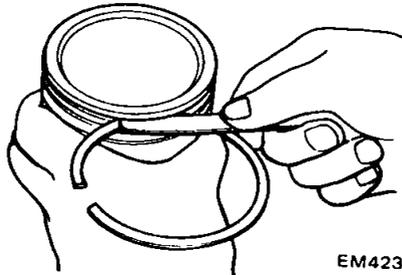
**PISTONS,
PISTON PINS AND
PISTON RINGS**

- 1 Remove carbon from piston and ring grooves with a carbon scraper and a curved steel wire. Clean out oil slots in bottom land of oil ring groove.
- 2 Check for damage, scratches and wear. Replace if necessary.
- 3 Measure side clearance of rings in ring grooves as each ring is installed. Side clearance should be as follows:



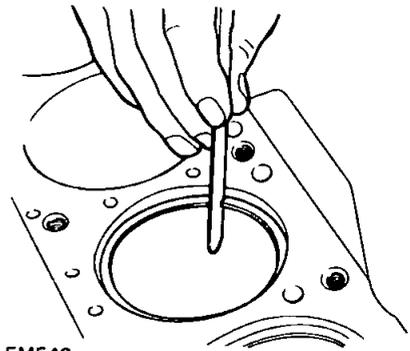
EM541

Fig EM-56 Measuring piston fit in cylinder



EM423

Fig EM-57 Measuring piston ring side clearance



EM542

Fig EM-58 Measuring ring gap

Notes

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

Oversize

- 0.5 mm (0.0197 in) and
- 1.0 mm (0.0394 in)

- 5 Measure piston pin hole in relation to outer diameter of pin. If wear exceeds limit, replace each piston pin together with the piston on which it is installed.
- 6 Determine the fitting of piston pin into piston pin hole to such an extent that it can be finger pressed at room temperature. This piston pin must be a tight press fit into connecting rod.

Side clearance

Unit mm (in)

	Standard	Wear limit
Top ring	0.040 to 0.073 (0.0016 to 0.0029)	0.1 (0.0039)
Second ring	0.030 to 0.070 (0.0012 to 0.0028)	
Oil ring	—	—

- 4 Push ring into cylinder with piston so as to place it squarely in cylinder, measure ring gap with a

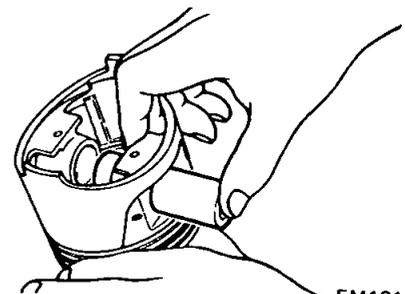
feeler gauge.

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

Ring gap

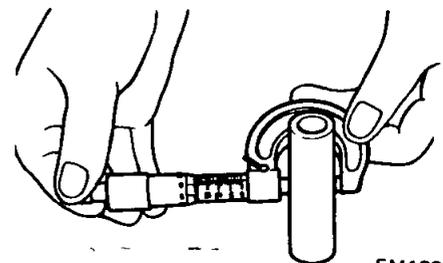
Unit mm (in)

	Standard	Wear limit
Top ring	0.25 to 0.40 (0.0098 to 0.0157)	1.0 (0.0394)
Second ring	0.30 to 0.50 (0.0118 to 0.0197)	
Oil ring	0.30 to 0.90 (0.0118 to 0.0354)	



EM131

Fig EM-59 Piston pin fitting



EM132

Fig EM-60 Measuring piston pin diameter

Unit mm (in)

Piston pin outside diameter	20 993 to 20 998 (0 8265 to 0 8267)
Piston pin hole diameter	21 001 to 21 008 (0 8268 to 0 8271)
Piston pin to piston clearance	0 003 to 0 015 (0 0001 to 0 0006)
Interference fit of piston pin to connecting rod	0 015 to 0 035 (0 0006 to 0 0014)

CRANKSHAFT

1 Whenever crankshaft is removed from engine, it should be cleaned thoroughly in a suitable solvent. After cleaning, check crankshaft journal and crank pin for score, bias wear or cracks. Repair or replace as required. If damage is minor, dress with fine crocus cloth.

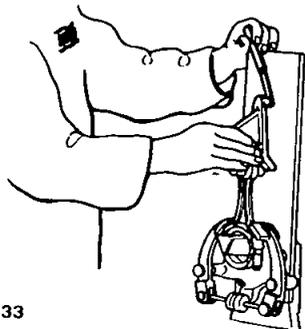
2 Check journals and crank pins for taper and out-of-round with a micrometer. Measurement should be taken along journals for taper and around journals for out-of-round. See Figure EM-63 for detailed information.

If journals or crank pins are tapered or out-of-round beyond limits, replace with a new shaft.

CONNECTING ROD

1 If a connecting rod has any flaw on either side of the thrust face or 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.



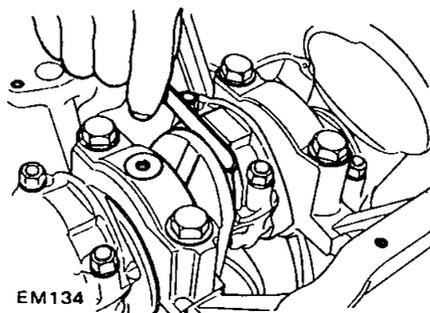
EM133

Fig EM-61 Checking rod alignment

	Standard	Maximum
Connecting rod bend or torsion (per 100 mm or 3 94 in length) mm (in)	0 03 (0 0012)	0 05 (0 0020)

3 When replacing connecting rod, select rod so that weight difference between new and old ones is within 7 gr (0 25 oz).

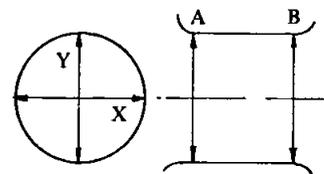
4 Install connecting rods with bearings on to corresponding crank pins and measure thrust clearance. If measured value exceeds limit, replace.



EM134

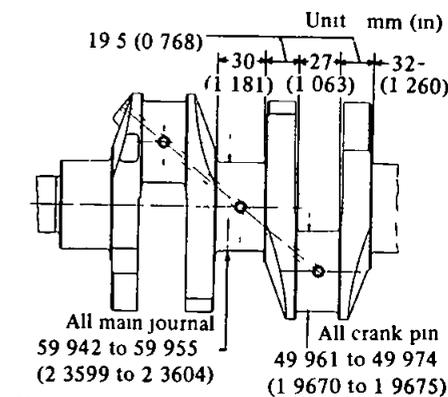
Fig EM-62 Checking big end play

	Standard	Maximum
Big end play mm (in)	0 2 to 0 3 (0 0079 to 0 0118)	0 6 (0 0236)



Out-of-round
Taper

X-Y
A-B



EM424

Fig EM-63 Crankshaft and journal dimensions

Engine Mechanical

	Standard	Maximum
Taper and out-of-round of journal and crank pin mm (in)	less than 0 01 (0 0004)	0 025 (0 0010)

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

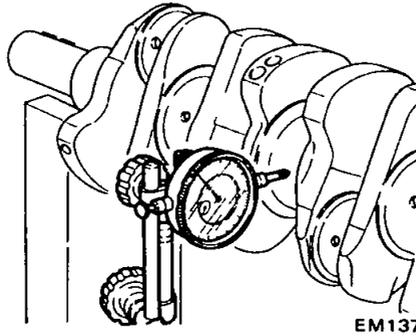


Fig EM-64 Checking crankshaft bend

	Standard	Maximum
Crankshaft bend mm (in)	less than 0 05 (0 0020)	0 10 (0 0039)

Note When measuring bend, use a dial gauge Bend value is half of the reading obtained when crankshaft is turned one full revolution with a dial gauge attached to its center journal

- 4 After regrinding crankshaft, finish it to the necessary size indicated on page EM-18 by using an adequate undersize bearing according to the extent of required repair
- 5 Install crankshaft in cylinder block and measure crankshaft free end play

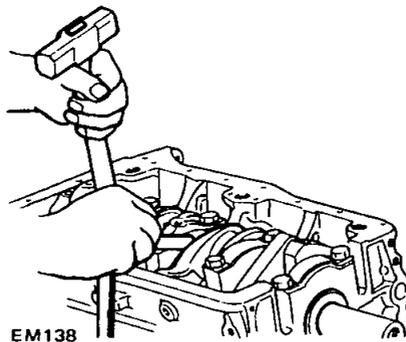


Fig EM-65 Checking crankshaft end play

	Standard	Wear limit
Crankshaft free end play mm (in)	0 05 to 0 18 (0 0020 to 0 0071)	0 3 (0 0118)

6 At the rear end of crankshaft, check crankshaft pilot bushing for wear or damage Replace it if any fault is detected

To replace crankshaft rear pilot bushing, proceed as follows
(1) Pull out bushing using Pilot Bushing Puller ST16610001

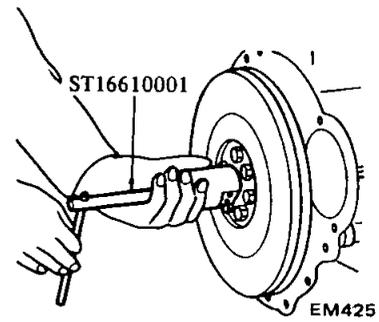


Fig EM-66 Pulling out pilot bushing

(2) Before installing a new bushing, thoroughly clean bushing hole Press fit bushing so that its height above flange end is 4 5 to 5 0 mm (0 177 to 0 197 in) Do not oil bushing

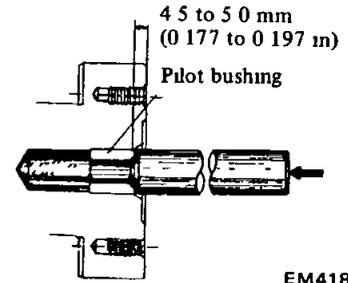


Fig EM-67 Press-fitting new pilot bushing

BUSHING AND BEARING

MEASUREMENT OF MAIN BEARING CLEARANCE

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

Replace bearings if any fault is detected

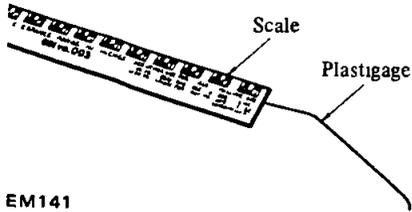
2 Crankshaft journals and bearings should be clean and free from dust and dirt before oil clearance is measured

3 Set main bearing on cap block

4 Cut a plastigage to width of bearing and place it in parallel with crank pin, getting clear of the oil hole Install cap pin on the assembly and tighten them together to the specified torque

Tightening torque

4 5 to 5 5 kg-m (33 to 40 ft-lb)

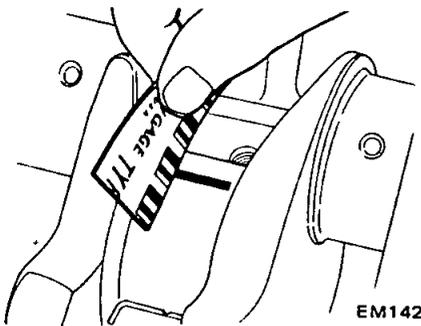


EM141

Fig EM-68 Plastigage

Note Do not turn crankshaft while plastigage is being inserted

5 Remove cap, and compare width of the plastigage at its widest part with the scale printed in plastigage envelope



EM142

Fig EM-69 Measuring bearing clearance

MEASUREMENT OF CONNECTING ROD BEARING CLEARANCE

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

Tightening torque

4.5 to 5.5 kg-m (33 to 40 ft-lb)

Bearing oil clearance

	Standard	Wear limit
Main bearing clearance mm (in)	0.020 to 0.062 (0.0008 to 0.0024)	0.12 (0.0047)
Connecting rod bearing clearance mm (in)	0.025 to 0.055 (0.0010 to 0.0022)	0.12 (0.0047)

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

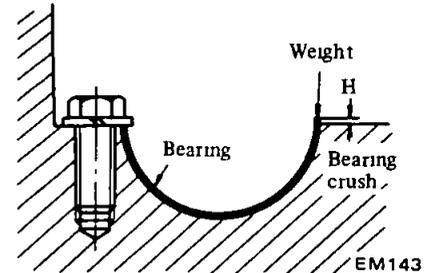
3 Then, measure bearing crush "H" with a feeler gauge. See Figure EM-70. The standard bearing crush value is listed below

FITTING BEARINGS

Bearings are manufactured with crush to make bearing snug down into its bore. To measure this, proceed as follows

1 Set main bearing in main bearing cap recess or cylinder block bearing recess correctly

2 Lock one side of bearing and press other side until bearing back surface touches the recess



EM143

Fig EM-70 Checking bearing crush

Bearing crush

All main bearings	mm (in)	0 to 0.03 (0 to 0.0012)
All connecting rod bearings	mm (in)	0.015 to 0.045 (0.0006 to 0.0018)

4 Handle connecting rod bearing in the same manner as above

Main bearing -undersize

Unit mm (in)

	Bearing top thickness	Crank journal diameter
STD	1.827 to 1.835 (0.0719 to 0.0722)	59.942 to 59.955 (2.3599 to 2.3604)
0.25 (0.0098) Undersize	1.952 to 1.960 (0.0769 to 0.0772)	59.692 to 59.705 (2.3501 to 2.3506)
0.50 (0.0197) Undersize	2.077 to 2.085 (0.0818 to 0.0821)	59.442 to 59.455 (2.3402 to 2.3407)
0.75 (0.0295) Undersize	2.202 to 2.210 (0.0867 to 0.0870)	59.192 to 59.205 (2.3304 to 2.3309)

Connecting rod bearing undersize

Unit mm (in)

	Bearing top thickness	Crank pin diameter
STD	1 493 to 1 506 (0 0588 to 0 0593)	49 961 to 49 974 (1 9670 to 1 9675)
0 25 (0 0098) Undersize	1 618 to 1 631 (0 0637 to 0 0642)	49 711 to 49 724 (1 9571 to 1 9576)
0 50 (0 0197) Undersize	1 743 to 1 756 (0 0686 to 0 0691)	49 461 to 49 474 (1 9473 to 1 9478)
0 75 (0 0295) Undersize	1 868 to 1 881 (0 0735 to 0 0741)	49 211 to 49 224 (1 9374 to 1 9379)

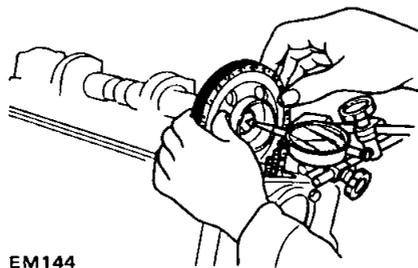
MISCELLANEOUS COMPONENTS

CRANKSHAFT AND CAMSHAFT SPROCKETS

1 Check tooth surface for flaws or wear. Replace sprocket if fault is found.

2 Install camshaft sprocket in position and check for runout. If it exceeds 0.1 mm (0.0039 in) total indicator reading, replace camshaft sprocket. Also check for end play.

Camshaft end play
0.08 to 0.38 mm
(0.0032 to 0.0150 in)



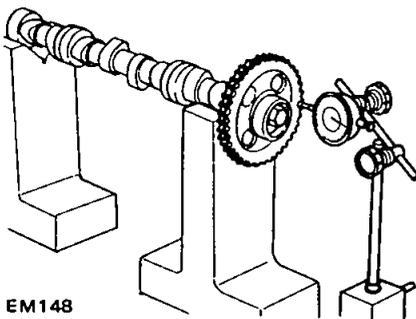
EM144

Fig EM-72 Checking camshaft end play

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

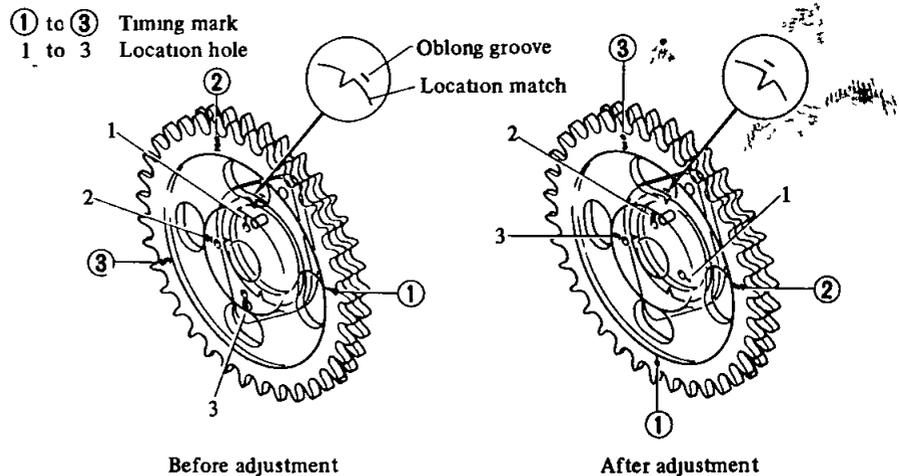
4 To properly adjust chain tension (or valve timing), camshaft sprocket has a cam locating plate and three location holes (Nos 1, 2 and 3).

Camshaft sprocket is preset at No 1 hole at the factory. If chain becomes loose, adjust it by setting camshaft sprocket at No 2 hole. If chain is too loose, adjust it by setting camshaft sprocket at No 3 hole.



EM148

Fig EM-71 Checking camshaft sprocket runout



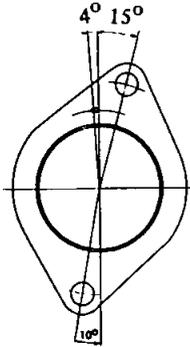
Before adjustment

After adjustment

EM311

Fig EM-73 Adjusting camshaft sprocket location

(1) Turn engine until No 1 piston is at TDC on its compression stroke Determine whether camshaft sprocket location notch comes off the left end of the oblong groove on camshaft locating plate (If the location notch is off the left end of the oblong groove, chain stretch is beyond limits)

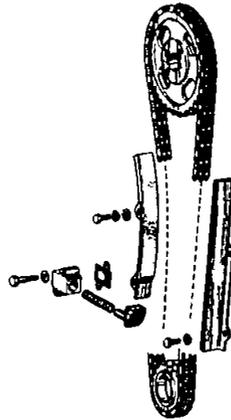


EM146

Fig EM-74 Camshaft locating plate

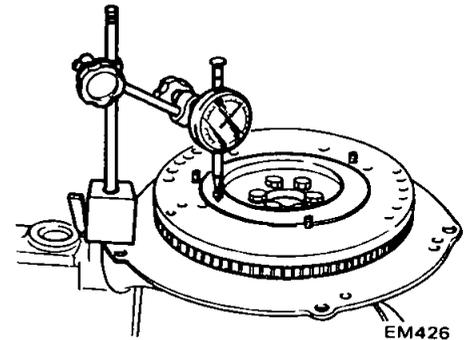
CHAIN TENSIONER AND CHAIN GUIDE

Check for wear and breakage Replace if necessary



EM147

Fig EM-75 Camshaft drive mechanism



EM426

Fig EM-76 Checking flywheel deviation

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

FRONT COVER AND REAR OIL SEAL

First check front cover and rear oil seal for worn or folded over sealing lip or oil leakage If necessary, install a new seal When installing a new seal, pay attention to mounting direction

Note It is good practice to replace oil seal whenever engine is overhauled

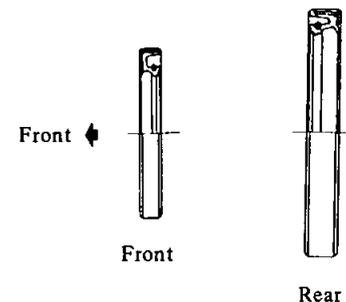
(2) Turn engine until No 1 piston is at TDC on its compression stroke, setting camshaft on No 2 location hole in camshaft sprocket This No 2 notch should then be on the right end of the oblong groove When No 2 hole is used, No 2 timing mark must also be used The amount of the modification is a 4° rotation of crankshaft

(3) When modification becomes impossible even by transferring camshaft location hole, replace chain assembly

FLYWHEEL

1 Check clutch disc contact surface with flywheel for damage or wear Repair or replace if necessary

2 Measure runout of clutch disc contact surface with a dial gauge If it exceeds 0.15 mm (0.0059 in) total indicator reading, replace it



EM150

Fig EM-77 Oil seals of crankshaft

ENGINE ASSEMBLY

CONTENTS

PRECAUTIONS
CYLINDER HEAD

EM-20
EM-20

PISTON AND CONNECTING ROD
ENGINE ASSEMBLY

EM-21
EM-21

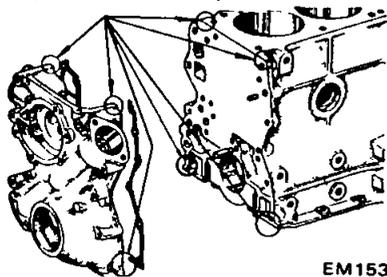
PRECAUTIONS

- 1 Use thoroughly cleaned parts Especially, make sure that oil holes are clear of foreign matter
- 2 When installing sliding parts such as bearings, be sure to apply engine oil to them
- 3 Use new packings and oil seals
- 4 Do not reuse lock washers
- 5 Keep tools and work benches clean
- 6 Keep necessary parts and tools near at hand
- 7 Be sure to follow specified tightening torque and order
- 8 Applying sealant*

Use sealant to eliminate water and oil leaks Parts requiring sealant are

- (1) Front cover and corners of cylinder block See Figure EM-78

Apply sealant at these points



EM153

Fig EM-78 Applying sealant (Front cover and cylinder block)

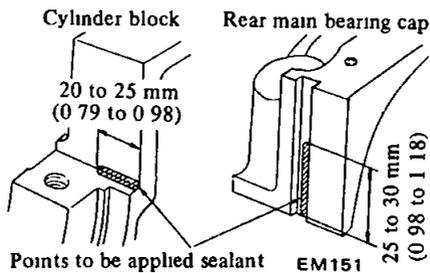
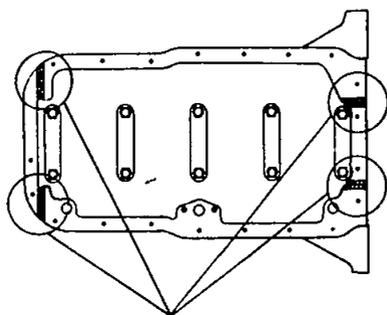


Fig EM-79 Applying sealant (Main bearing cap and cylinder block)

- (3) Cylinder block Step portions at four mating surfaces (cylinder block to front chain cover and cylinder block to rear main bearing cap) See Figure EM-80

Note Do not apply too much sealant



Apply sealant at these points

EM152

Fig EM-80 Applying sealant (Cylinder block)

CYLINDER HEAD

- 1 Valve assembly and valve spring
Using Valve Lifter ST12070000, set valve spring seat in position, and fit valve guide with oil seal

Assemble valve in the order shown below valve, inner and outer valve springs, spring retainer, valve collet and valve rocker guide

- (2) Main bearing cap and cylinder block Each side of rear main bearing cap and each corner of cylinder block See Figure EM-79

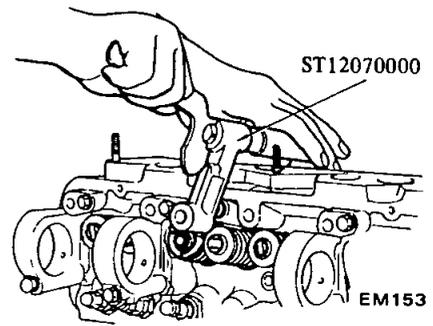


Fig EM-81 Installing valves

Notes

- a Ensure that valve face is free from foreign matter
- b The L18 engine uses double type valve springs

2 Valve rocker pivot assembly

Screw valve rocker pivots joined with lock nuts into pivot bushing

3 Camshaft assembly

Set locating plate and carefully install camshaft in cylinder head Do not damage the bearing inside Oblong groove of locating plate must be directed toward front side of engine

Camshaft bracket tightening torque

1.8 to 2.0 kg-m (13 to 15 ft-lb)

- 4 Install camshaft sprocket on camshaft and tighten it together with fuel pump drive cam to specified torque

Tightening torque

12 to 16 kg-m (87 to 116 ft-lb)

At this time, check camshaft end play

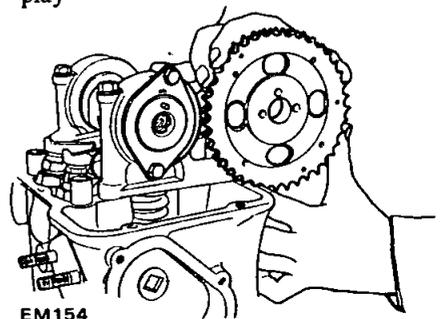
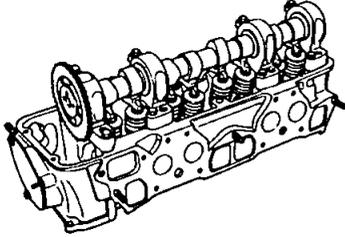


Fig EM-82 Installing camshaft sprocket

- 5 Install rocker arms by pressing valve springs down with a screwdriver
- 6 Install valve rocker springs
- 7 After assembling cylinder head, turn camshaft until No 1 piston is at T D C on its compression stroke

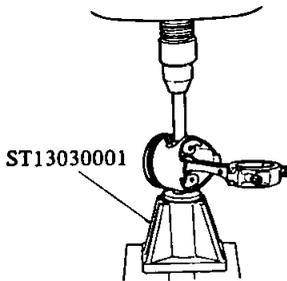


EM155

Fig EM-83 Assembling cylinder head

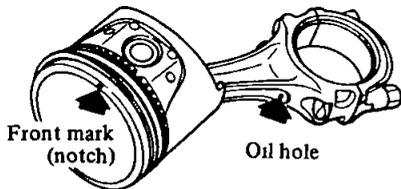
PISTON AND CONNECTING ROD

- 1 Assemble pistons, piston pins and connecting rods on the designated cylinder



EM156

Fig EM-84 Installing piston pin



EM157

Fig EM-85 Assembling piston and connecting rod

Notes

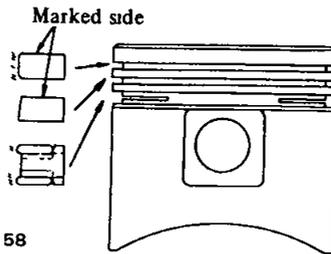
- a Piston is pressed into connecting rod, with fitting force of 0.5 to 1.5 tons, aid of Piston Pin Press Stand ST13030001 is necessary. When pressing piston pin into connecting rod, apply engine oil to pin and small end of connecting rod

- b Arrange so that oil jet of connecting rod big end is directed toward right side of cylinder block
- c Be sure to install piston in cylinders with notch mark of piston head toward front of engine

- 2 Install piston rings
Install top and second rings in right position, with marked side up

Notes

- 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

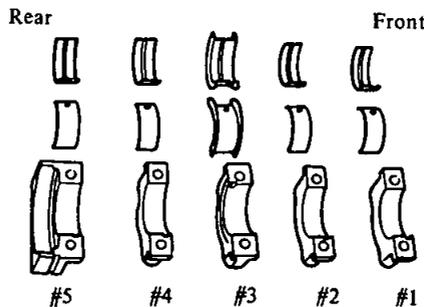
Fig EM-86 Installing piston rings

- 3 Fix bearings on connecting rod and connecting rod cap

Note Clean back side of bearing carefully

ENGINE ASSEMBLY

- 1 The first step in engine assembly is to bolt Engine Attachment ST05260001 to right hand side of cylinder block. Next, install block on another Engine Stand ST0501S000 with engine bottom up
- 2 Set main bearings at the proper portion of cylinder block



EM159

Fig EM-87 Main bearings

- 3 Install baffle plate including cylinder block net

Notes

- 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). The difference is that an oil hole is provided in the front bearing.
- d All upper and lower bearings are interchangeable

- 4 Apply engine oil to main bearing surfaces on both sides of cylinder block and cap and then install crankshaft

- 5 Install main bearing cap and tighten bolts to specified torque

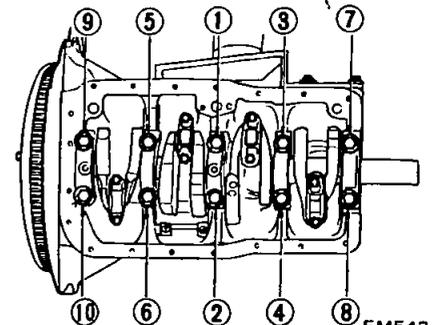
Tightening torque

4.5 to 5.5 kg-m (33 to 40 ft-lb)

Notes

- a Apply sealant to each side of rear main bearing cap and each corner of cylinder block as shown in Figure EM-79
- b Arrange parts so arrow mark on bearing cap faces toward 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 two to three stages outwardly from center bearing in the sequence as shown in Figure EM-88

- e After securing bearing cap bolts, ascertain that crankshaft turns smoothly



EM543

Fig EM-88 Torque sequence of cap bolts

Engine Mechanical

6 Make sure that crankshaft has proper end play

Crankshaft end play
0.05 to 0.18 mm
(0.0020 to 0.0071 in)

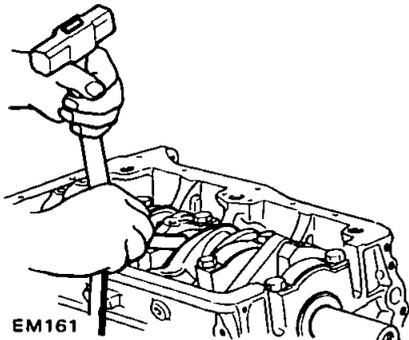


Fig EM-89 Checking crankshaft end play

7 Install side oil seals into rear main bearing cap. Prior to installing, apply sealant to seals

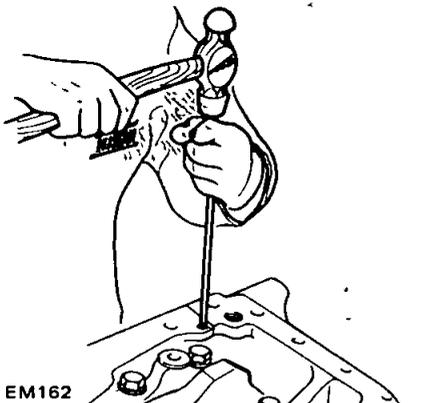


Fig EM-90 Driving side oil seal

8 Install rear oil seal using Crankshaft Rear Oil Seal Drift ST15310000

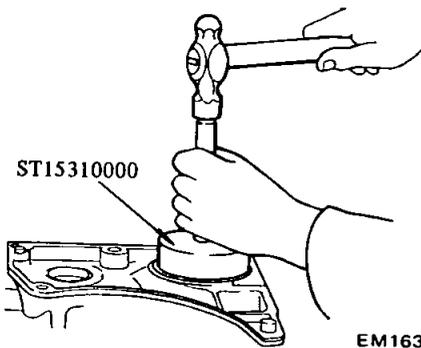


Fig EM-91 Installing rear oil seal

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

9 Install rear end plate
10 Install flywheel securely, and tighten bolts to specified torque

Tightening torque
14 to 16 kg-m
(101 to 116 ft-lb)

11 Insert pistons in corresponding cylinder using Piston Ring Compressor EM03470000

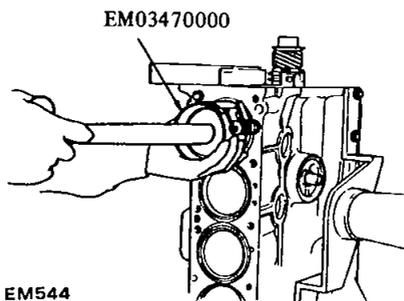


Fig EM-92 Installing piston-rod assembly

Notes

- a Apply engine oil to sliding parts
- b Arrange so that notch mark on piston head faces to front of engine
- c Install piston rings at 180° to each other, avoiding their fit in the thrust and piston pin directions

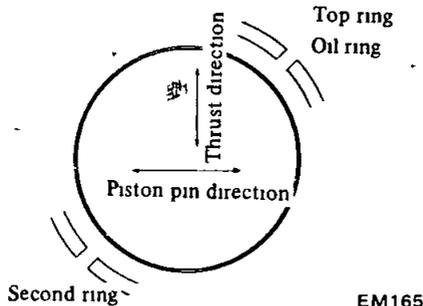


Fig EM-93 Piston ring direction

12 Install connecting rod caps
Tightening torque
4.5 to 5.5 kg-m (33 to 40 ft-lb)

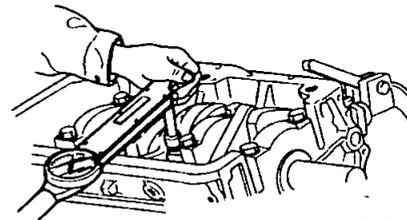


Fig EM-94 Installing connecting rod cap

Note Install connecting rods and connecting rod caps so that their assigned numbers are positioned on the same side and in the same direction with respect to cylinders

13 Make sure that connecting rod big end has proper end play

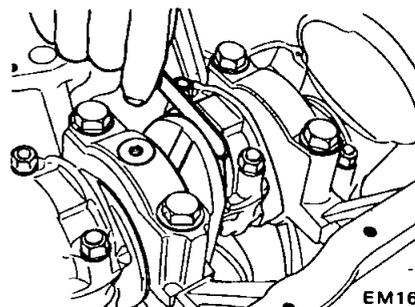


Fig EM-95 Checking big end play

Big end play
0.2 to 0.3 mm
(0.008 to 0.012 in)

14 Install cylinder head assembly

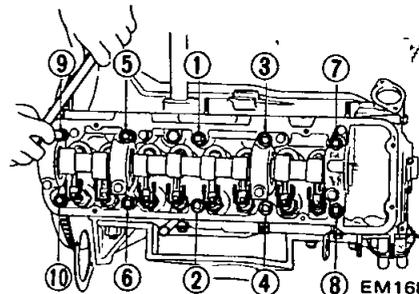


Fig EM-96 Tightening sequence of cylinder head bolts

- (1) Thoroughly clean cylinder block and head surface
- Do not apply sealant to any other part of cylinder block and head surface

Engine Mechanical

- (2) Turn crankshaft until No 1 piston is at TDC on its compression stroke
- (3) Make sure that camshaft sprocket location notch and plate oblong groove are aligned at their correct positions
- (4) When installing cylinder head, make sure that all valves are apart from heads of pistons
- (5) Do not rotate crankshaft and camshaft separately, or valves will hit heads of pistons
- (6) Temporarily tighten two bolts ①, ② shown in Figure EM-96

Tightening torque

2 kg-m (14 ft-lb)

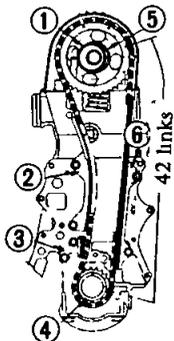
- 15 Install crankshaft sprocket and oil pump drive gear, and fit oil thrower

Note Make sure that mating marks of crankshaft sprocket face to front

- 16 Install timing chain

Notes

- a Make sure that crankshaft and camshaft keys point upwards



- 1 Fuel pump drive cam
- 2 Chain guide
- 3 Chain tensioner
- 4 Crank sprocket
- 5 Cam sprocket
- 6 Chain guide

EM439

Fig EM-97 Installing timing chain

- b Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket at the right hand side. There are forty-four chain links between two mating marks of timing chain
- c No 2 hole is factory adjusted. When chain stretches excessively, adjust camshaft sprocket at No 3 hole
- d Use a set of timing marks and location hole numbers

- 17 Install chain slack side guide to cylinder block
- 18 Install chain tensioner

Note Adjust protrusion of chain tensioner spindle to 0 mm (0 in)

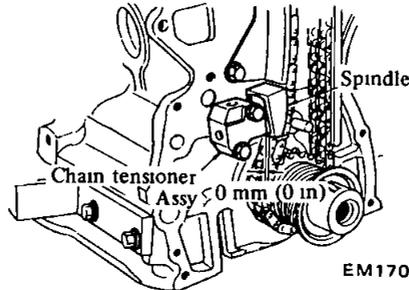


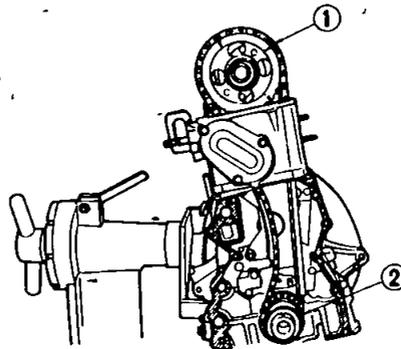
Fig EM-98 Installing chain tensioner

- 19 Press new oil seal in front cover

Notes

- a Front cover oil seal should be replaced when front cover is disassembled
- b Before pressing oil seal into front cover, give coating of engine oil to periphery of oil seal
- c This oil seal is a threaded seal type which has improved sealing characteristics. Do not apply grease to sealing lip

- 20 Install front cover with gasket in place



- 1 Timing mark
- 2 Timing mark

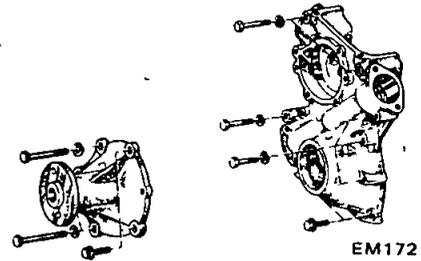
EM545

Fig EM-99 Installing front cover

Notes

- a Apply sealant to front cover and corners of upper section of cylinder block as shown in Figure EM-78

- b Install front cover with head gasket in place
- c Check height difference between cylinder block upper face and front cover upper face. Difference must be less than 0.15 mm (0.0059 in).
- d Note that different types of bolts are used
- e Before installing front cover on cylinder block, apply coating of engine oil to sealing lip of oil seal



EM172

Fig EM-100 Front cover bolts

Tightening torque

Size M8 (0.315 in)

1.0 to 1.3 kg-m (7.2 to 9.4 ft-lb)

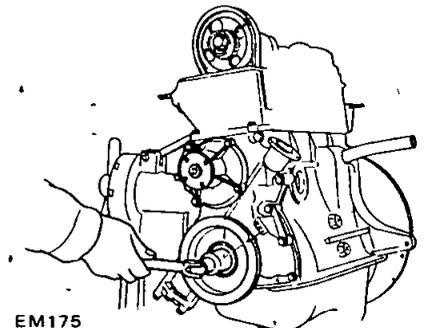
Size M6 (0.236 in)

0.4 to 0.6 kg-m (2.9 to 4.3 ft-lb)

- 21 Install crankshaft pulley and water pump assembly, then set No 1 piston at TDC on its compression stroke

Crankshaft pulley nut tightening torque

12 to 16 kg-m (87 to 116 ft-lb)



EM175

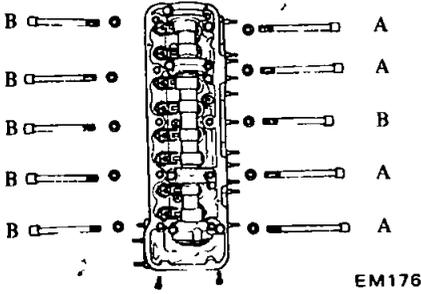
Fig EM-101 Installing crankshaft pulley and water pump

- 22 Finally, tighten head bolts to the specified torque in three steps according to the tightening sequence shown in Figure EM-96

Note that two types of bolts are used

Special tool Cylinder Head Bolt Wrench ST10120000

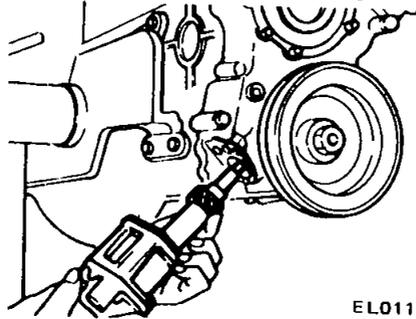
- Tightening torque**
- 1st turn
4.0 kg-m (29 ft-lb)
 - 2nd turn
6.0 kg-m (43 ft-lb)
 - 3rd turn
7.0 to 8.5 kg-m
(51 to 61 ft-lb)



EM176
Fig EM-102 Cylinder head bolts



EL009
Fig EM-103 Setting distributor driving spindle



EL011
Fig EM-104 Installing oil pump

- Tightening torque**
- Oil strainer bolts
0.8 to 1.1 kg-m (5.8 to 8.0 ft-lb)
 - Oil pan bolts
0.6 to 0.9 kg-m (4.3 to 6.5 ft-lb)

- Notes**
- a Apply sealant to the step portions at four mating surfaces as shown in Figure EM-80.
 - b Oil pan should be tightened in criss-cross pattern to a final torque of 0.6 to 0.9 kg-m (4.3 to 6.5 ft-lb)

26 Adjust valve clearance to the specified dimensions

Special tool
Pivot Adjuster ST10640001

- Tightening torque**
- 5.0 to 6.0 kg-m (36 to 43 ft-lb)

- Notes**
- a First set clearance to the cold specifications

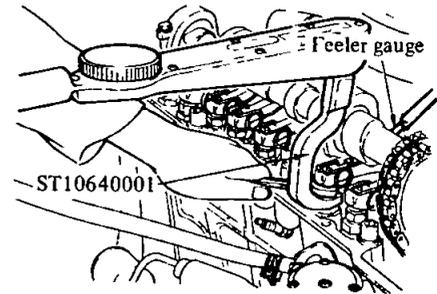


Fig EM-105 Adjusting valve clearance

- b After engine has been assembled, run it for at least several minutes, and finally adjust clearance to the warm specifications

- Notes**
- a Be sure to tighten two small bolts
 - b After engine has been operated for several minutes retighten if necessary

23 Install oil pump and distributor driving spindle in front cover

Tightening torque

- 1.1 to 1.5 kg-m
(8.0 to 10.8 ft-lb)

24 Install fuel pump, water inlet elbow and front engine slinger in their positions

Fuel pump tightening torque

- 1.2 to 1.8 kg-m
(8.7 to 13.0 ft-lb)

Note Do not forget to install fuel pump spacer and packing between spacer and block, spacer and fuel pump

25 Install oil strainer, oil pan gasket and oil pan

- Notes**
- a Assemble oil pump and drive spindle, aligning driving spindle face with oil pump hole
 - b Install oil pump together with drive spindle so that the projection on its top is located at the 11.25 a.m. position. At this point, the smaller bow-shape will be facing toward the front.
 - c Do not forget to install gasket

Valve clearance mm (in)	Cold	Intake	0.20 (0.0079)
		Exhaust	0.25 (0.0098)
	Warm	Intake	0.25 (0.0098)
		Exhaust	0.30 (0.0118)

27 Install cooler compressor bracket to cylinder block, if so equipped

Tightening torque

- 1.5 to 2.0 kg-m
(11 to 14 ft-lb)

28 Install rear engine slinger, exhaust manifold and intake manifold

Engine Mechanical

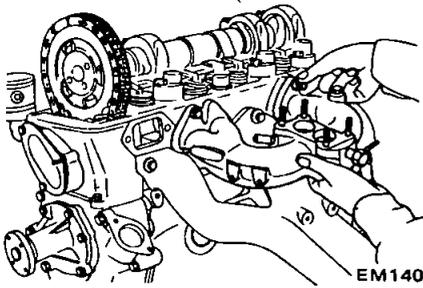


Fig EM-106 Installing manifolds

- 29 Install distributor assembly
- 30 Install carburetor assembly and carburetor insulator with stamp facing upward

Tightening torque
0.5 to 1.0 kg-m
(3.6 to 7.2 ft-lb)

- 31 Install fuel pipes and vacuum hose

All pipes and hoses should be clamped securely, being careful not to allow them to interfere with adjacent or surrounding parts

- 32 Install thermostat housing, thermostat and water outlet in their positions. Do not forget to install gasket
- 33 Install rocker cover

- 34 Install spark plugs
- 35 Connect distributor to plug high tension lead wire
- 36 Install left engine mount bracket
- 37 Install clutch assembly on flywheel with Clutch Aligning Bar ST20660000

Tightening torque
1.2 to 2.2 kg-m
(8.7 to 15.9 ft-lb)

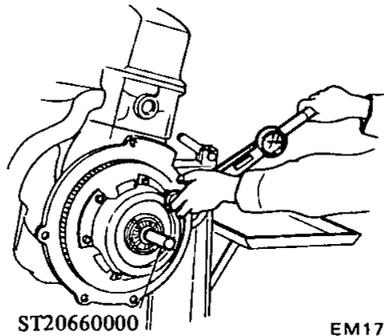


Fig EM-107 Installing clutch assembly

- 38 Using an overhead hoist and lifting cable, hoist engine up a way from engine stand and then down onto engine carrier

- 39 Install alternator bracket, adjusting bar, alternator, fan pulley, fan and fan belt in this order. Then, check to be sure that deflection of fan belt is held within 8 to 12 mm (0.315 to 0.472 in) when thumb pressure is applied midway between pulleys [A pressed force is about 10 kg (22.0 lb)]

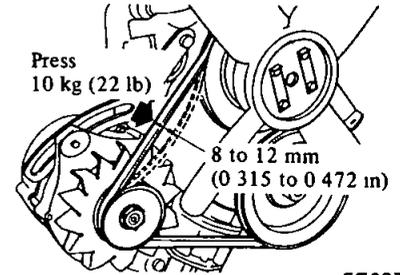


Fig EM-108 Fan belt tension

- 40 Install right engine mount bracket, oil filter, oil pressure switch, oil level gauge and water drain plug. When installing an oil filter, fasten it on cylinder block by hand

Note Do not overtighten filter, or oil leakage may occur.

- 41 Power engine oil up to specified level

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine model		L18
Cylinder arrangement		4, in-line
Displacement	cc (cu in)	1,770 (108 0)
Bore and stroke	mm (in)	85 x 78 (3 35 x 3 07)
Valve arrangement		O H C
Firing order		1-3-4-2
Engine idle	rpm	
Manual transmission		700
Automatic transmission (in "N" position)		800
Compression ratio		8 5
Oil pressure (Warm at 2,000 rpm)		
	kg/cm ² (psi)	3 5 to 4 0 (50 to 57)

SPECIFICATIONS

a) Valve mechanism

Valve clearance (Warm)	mm (in)	
Intake		0 25 (0 0098)
Exhaust		0 30 (0 0118)
Valve clearance (Cold)	mm (in)	
Intake		0 20 (0 0079)
Exhaust		0 25 (0 0098)
Valve head diameter	mm (in)	
Intake		42 0 to 42 2 (1 654 to 1 661)
Exhaust		35 0 to 35 2 (1 378 to 1 386)
Valve stem diameter	mm (in)	
Intake		7 965 to 7 980 (0 3136 to 0 3142)
Exhaust		7 945 to 7 960 (0 3128 to 0 3134)
Valve length	mm (in)	
Intake		114 9 to 115 2 (4 524 to 4 535)
Exhaust		115 7 to 116 0 (4 555 to 4 567)
Valve lift	mm (in)	
Intake		10 0 (0 394)
Exhaust		10 5 (0 413)
Valve spring out-of-square	mm (in)	less than 1 6 (0 063)
Valve spring free length	mm (in)	
Intake and exhaust	Outer	49 98 (1 968)
	Inner	44 85 (1 766)

Engine Mechanical

Valve spring pressured length (valve open)	mm/kg (in/lb)	
Intake and exhaust		
Outer		29 5/49 0 (1 161/108)
Inner		24 5/25 5 (0 965/56 2)
Valve spring assembled height (valve close)	mm/kg (in/lb)	
Intake and exhaust		
Outer		40 0/21 3 (1 575/47 0)
Inner		35 0/12 3 (1 378/27 1)
Valve guide length	mm (in)	
Intake and exhaust		59 0 (2 323)
Valve guide height from head surface	mm (in)	10 6 (0 417)
Valve guide inner diameter	mm (in)	
Intake and exhaust		8 000 to 8 018 (0 3150 to 0 3157)
Valve guide outer diameter (service parts)	mm (in)	
Intake and exhaust		12 223 to 12 234 (0 4812 to 0 4817)
Valve guide to stem clearance	mm (in)	
Intake		0 020 to 0 053 (0 0008 to 0 0021)
Exhaust		0 040 to 0 073 (0 0016 to 0 0029)
Valve seat width	mm (in)	
Intake		1 4 (0 0551)
Exhaust		1 3 (0 0512)
Valve seat angle		
Intake and exhaust		45°
Valve seat interference fit	mm (in)	
Intake		0 081 to 0 113 (0 0032 to 0 0044)
Exhaust		0 064 to 0 096 (0 0025 to 0 0038)
Valve guide interference fit	mm (in)	0 027 to 0 049 (0 0011 to 0 0019)
b) Camshaft and timing chain		
Camshaft end play	mm (in)	0 08 to 0 38 (0 0032 to 0 0150)
Camshaft lobe lift	mm (in)	
Intake and exhaust		7 0 (0 276)
Camshaft journal diameter	mm (in)	
1st, 2nd, 3rd and 4th		47 949 to 47 962 (1 8877 to 1 8883)
Camshaft bend	mm (in)	0 02 (0 0008)
Camshaft journal to bearing clearance	mm (in)	0 038 to 0 067 (0 0015 to 0 0026)
Camshaft bearing inner diameter	mm (in)	
1st, 2nd, 3rd and 4th		48 000 to 48 016 (1 8898 to 1 8904)

Engine Mechanical

c) Connecting rod

Center distance	mm (in)	130 35 (5 1319)
Bearing thickness (Standard)	mm (in)	1 493 to 1 506 (0 0588 to 0 0593)
Big end play	mm (in)	0 20 to 0 30 (0 008 to 0 012)
Connecting rod bearing clearance	mm (in)	0 025 to 0 055 (0 0010 to 0 0022)
Connecting rod bend or torsion (per 100 mm or 2 937 in)	mm (in)	less than 0 03 (0 0012)

d) Crankshaft and main bearing

Journal diameter	mm (in)	59 942 to 59 955 (2 3599 to 2 3604)
Journal taper & out-of-round	mm (in)	less than 0 01 (0 0004)
Crankshaft free end play	mm (in)	0 05 to 0 18 (0 0020 to 0 0071)
Wear limit of dittoed play	mm (in)	0 3 (0 0118)
Crank pin diameter	mm (in)	49 961 to 49 974 (1 9670 to 1 9675)
Crank pin taper & out-of-round	mm (in)	less than 0 01 (0 0004)
Main bearing thickness (Standard)	mm (in)	1 827 to 1 835 (0 0719 to 0 0722)
Main bearing clearance	mm (in)	0 020 to 0 062 (0 0008 to 0 0024)
Wear limit of dittoed clearance	mm (in)	0 12 (0 0047)
Crankshaft bend	mm (in)	0 05 (0 0020)
Flywheel runout at clutch disc contact face	mm (in)	less than 0 15 (0 0059)

e) Piston

Piston diameter (Service standard)	mm (in)	84 985 to 85 035 (3 3459 to 3 3478)
0 50 (0 0197) Oversize	mm (in)	85 465 to 85 515 (3 3648 to 3 3667)
1 00 (0 0394) Oversize	mm (in)	85 965 to 86 015 (3 3844 to 3 3864)
Ring groove width	mm (in)	
Top		2 030 to 2 050 (0 0799 to 0 0807)
Second		2 020 to 2 040 (0 0795 to 0 0803)
Oil		4 015 to 4 040 (0 1581 to 0 1591)
Piston to bore clearance	mm (in)	0 025 to 0 045 (0 0010 to 0 0018)
Piston pin hole off-set	mm (in)	0 95 to 1 05 (0 0374 to 0 0413)
Piston pin hole diameter	mm (in)	21 001 to 21 008 (0 8268 to 0 8271)

f) Piston pin

Pin diameter	mm (in)	20 993 to 20 998 (0 8265 to 0 8267)
Pin length	mm (in)	72 25 to 73 00 (2 8445 to 2 8740)
Piston pin to piston clearance	mm (in)	0 003 to 0 015 (0 0001 to 0 0006)
Interference fit of piston pin to connecting rod bushing	mm (in)	0 015 to 0 035 (0 0006 to 0 0014)

Engine Mechanical

g) Piston ring

Ring height	mm (in)	
Top and second		1 977 to 1 990 (0 0778 to 0 0783)
Side clearance	mm (in)	
Top		0 040 to 0 073 (0 0016 to 0 0029)
Second		0.030 to 0 070 (0 0012 to 0 0028)
Ring gap	mm (in)	
Top		0 25 to 0 40 (0 0098 to 0 0157)
Second		0 30 to 0 50 (0 0118 to 0 0197)
Oil		0 30 to 0 90 (0 0118 to 0 0354)

h) Cylinder block

Cylinder bore inner diameter	mm (in)	85.000 to 85.050 (3 3465 to 3 3484)
Wear limit of dittoed inner diameter	mm (in)	0 2 (0 0079)
Cylinder bore taper and out-of-round	mm (in)	0.015 (0 0006)
Difference in cylinder bore	mm (in)	0 05 (0 0020)
Surface flatness	mm (in)	less than 0 05 (0 0020)

i) Cylinder head

Surface flatness	mm (in)	less than 0 05 (0 0020)
------------------	---------	-------------------------

TIGHTENING TORQUE

Cylinder head bolts	kg-m (ft-lb)	7 0 to 8 5 (51 to 61)
Connecting rod big end nuts	kg-m (ft-lb)	4 5 to 5 5 (33 to 40)
Flywheel fixing bolts	kg-m (ft-lb)	14 to 16 (101 to 116)
Main bearing cap bolts	kg-m (ft-lb)	4 5 to 5 5 (33 to 40)
Camshaft bracket bolts	kg-m (ft-lb)	1 8 to 2 0 (13 to 15)
Camshaft sprocket bolt	kg-m (ft-lb)	12 to 16 (87 to 116)
Oil pan bolts	kg-m (ft-lb)	0 6 to 0 9 (4 3 to 6 5)
Oil pump bolts	kg-m (ft-lb)	1 1 to 1 5 (8 0 to 10 8)
Oil strainer bolts	kg-m (ft-lb)	0 8 to 1 1 (5 8 to 8 0)
Oil pan drain plug	kg-m (ft-lb)	2 0 to 3 0 (14 to 22)
Rocker pivot lock nuts	kg-m (ft-lb)	5 0 to 6 0 (36 to 43)
Camshaft locating plate bolts	kg-m (ft-lb)	0 6 to 0 9 (4 3 to 6 5)
Carburetor nuts	kg-m (ft-lb)	0 5 to 1 0 (3 6 to 7 2)
Manifold bolts	kg-m (ft-lb)	1 5 to 2 0 (11 to 14)
Fuel pump nuts	kg-m (ft-lb)	1 2 to 1 8 (8 7 to 13 0)
Crank pulley bolt	kg-m (ft-lb)	12 to 16 (87 to 116)
Water pump bolts	kg-m (ft-lb)	0 4 to 0 5 (2 9 to 3 6)
Front cover bolts	kg-m (ft-lb)	8 mm (0 315 in) dia 1 0 to 1 3 (7 2 to 9 4) 6 mm (0 236 in) dia 0 4 to 0 6 (2 9 to 4 3)

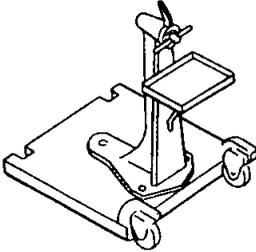
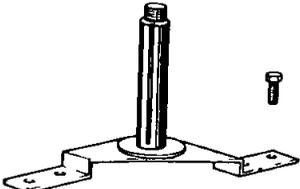
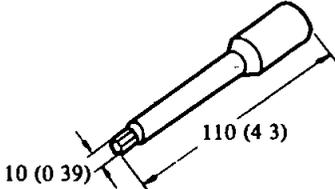
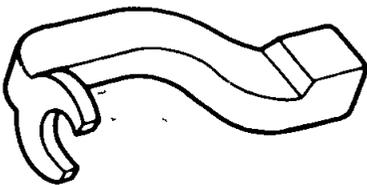
TROUBLE DIAGNOSES AND CORRECTIONS

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

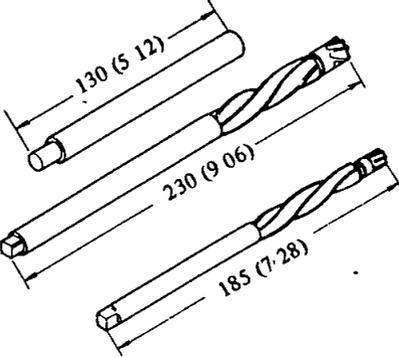
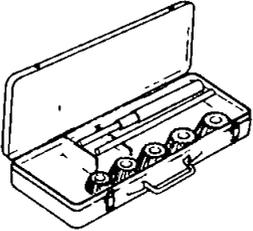
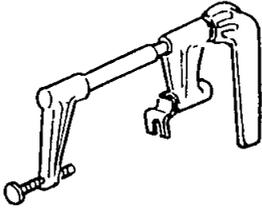
Engine Mechanical

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

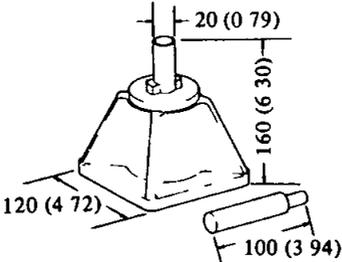
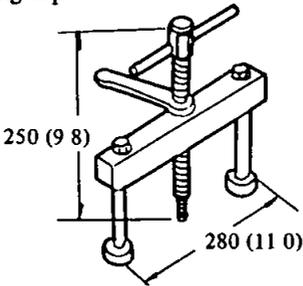
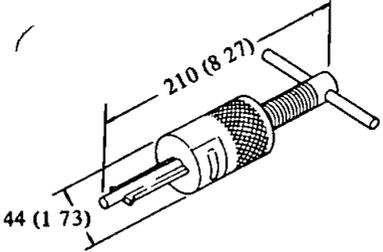
SPECIAL SERVICE TOOL

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	<p>ST0501S000 Engine stand assembly</p> <ul style="list-style-type: none"> — ST05011000 Engine stand — ST05012000 Base 	<p>This engine stand assembly is used for disassembling or assembling engine block or differential carrier throughout 360° in all directions</p>  <p style="text-align: right;">SE184</p>	All models	Fig EM-13 Page EM-21
2	<p>ST05260001 Engine attachment</p>	<p>This engine attachment is installed to engine stand ST0501S000 in disassembling or assembling engine</p>  <p style="text-align: right;">SE185</p>	L18	Fig EM-13 Page EM-21
3	<p>ST10120000 Cylinder head bolt wrench</p>	<p>Special hollow set bolts are used in tightening cylinder heads in L-series engines. This wrench is used to torque cylinder head bolts and its head can be inserted into the torque wrench</p>  <p style="text-align: right;">SE186</p>	All L-series	Fig EM-18 Page EM-24
4	<p>ST10640001 Pivot adjuster</p>	<p>This tool is used together with a torque wrench in tightening pivot lock nut for valve clearance adjustment</p>  <p style="text-align: right;">SE187</p>	All L-series	Fig EM-105

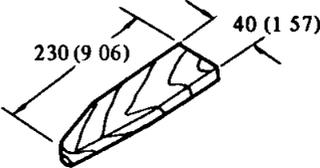
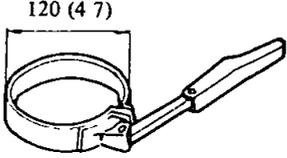
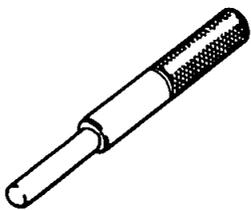
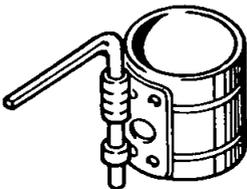
Engine Mechanical

No	Tool number & tool name	Description	Unit mm (in)	For use on, Reference page or Figure No
5	<p>ST1103S000 Valve guide reamer set</p> <ul style="list-style-type: none"> — ST11031000 Reamer (12.2 mm dia) — ST11032000 Reamer (8.0 mm dia) — ST11033000 Drift 	<p>This guide is used for</p> <ul style="list-style-type: none"> ● Pressing used guide out of place ● Driving a new guide into place ● Finishing the bore of new guide  <p style="text-align: right;">SE 192</p>		All L-series Fig EM-44
6	ST11650001 Valve seat cutter set	<p>This valve seat cutter set is used to or refinish a valve seat</p>  <p style="text-align: right;">SE 193</p>		All L-series Fig EM-45
7	ST12070000 Valve lifter	<p>This tool is used to compress valve spring by the combined action of its cam and lever, thereby facilitating the removal or installation of valve collet (for general use)</p>  <p style="text-align: right;">SE 194</p>		All models Fig EM-32 Fig EM-81

Engine Mechanical

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
8.	ST13030001 Piston pin press stand	<p>This tool is used with a press to drive pin into, or out of, connecting rod</p>  <p style="text-align: right;">SE 188</p>	All L-series	Fig EM-29 Fig EM-84
9.	ST15310000 Crankshaft rear oil seal drift	<p>This tool is used to push a lip type rear oil seal for L-series engine into place by giving hammer blows</p>  <p style="text-align: right;">SE 189</p>	All L-series	Fig EM-91
10	ST1651S000 Crankshaft main bearing cap puller ST16511000 Body ST16512001 Adapter	<p>This tool is used to remove the cap from main bearing When using this tool, turn its adapter into the threaded hole in main bearing cap</p>  <p style="text-align: right;">SE 190</p>	All L-series	Fig EM-25
11	ST16610001 Pilot bushing puller	<p>This tool is used to pull pilot bushing out of place</p>  <p style="text-align: right;">SE 191</p>	L18	Fig EM-66

Engine Mechanical

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
12	ST17420001 Chain stopper	<p>This tool is used to prevent chains from falling out of place in removing cylinder heads or cam gears and shafts</p>  <p style="text-align: right;">SE195</p>	All L-series	Fig EM-19
13	ST19320000 Oil filter wrench	<p>This tool is used to take oil filter out of place. In tightening the filter, do not use this tool, to prevent excess tightening</p>  <p style="text-align: right;">SE197</p>	All models	Page EM-4
14	ST20660000 Clutch aligning bar	<p>This tool is used to install clutch assembly to engine</p>  <p style="text-align: right;">SE001</p>	L20B	Fig EM-107
15	EM03470000 Piston ring compressor	<p>This tool is used to compress piston rings while piston is being inserted into cylinder</p>  <p style="text-align: right;">SE199</p>	All models	Fig EM-92

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EL

ENGINE LUBRICATION SYSTEM

EL

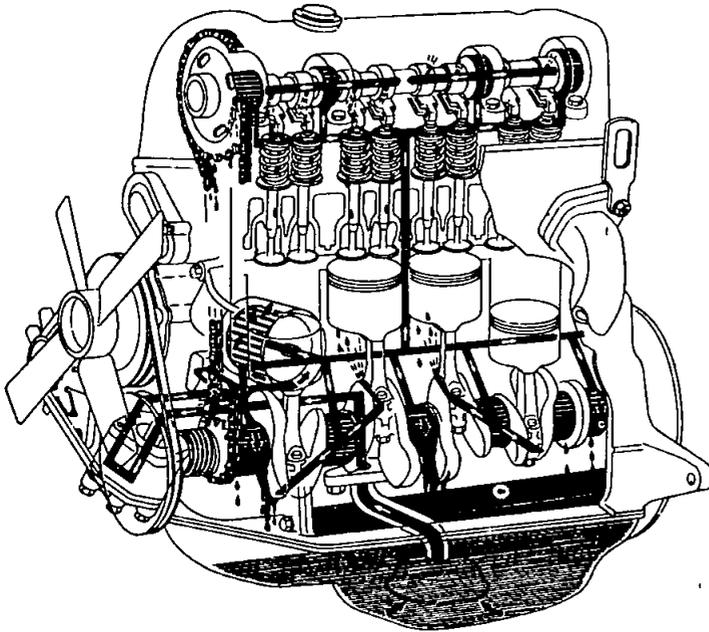
ENGINE LUBRICATION SYSTEM	EL- 2
SERVICE DATA AND SPECIFICATIONS	EL- 5
TROUBLE DIAGNOSES AND CORRECTIONS	EL- 5

ENGINE LUBRICATION SYSTEM

ENGINE LUBRICATION SYSTEM

CONTENTS

LUBRICATION CIRCUIT	EL-2	Inspection	EL-3
OIL PUMP	EL-2	OIL PRESSURE REGULATOR VALVE	EL-4
Removal	EL-2	OIL FILTER	EL-4
Installation	EL-2	RELIEF VALVE	EL-4
Disassembly and assembly	EL-3		



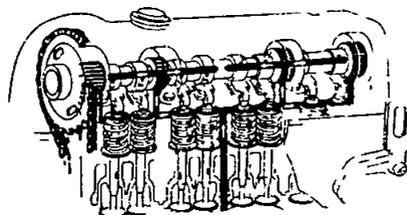
EL007

Fig EL-1 Lubricating circuit

LUBRICATION CIRCUIT

The pressure lubrication of the engine is accomplished by a trochoid-type oil pump. This pump draws the oil through the oil strainer into pump housing and then forces it through the full flow type oil filter into the main oil gallery. Part of the oil is supplied to all crankshaft bearings, chain tensioner and timing chain. Oil supplied to crankshaft bearings is fed to connecting rod bearings through the drilled passages in the crankshaft. Oil injected from jet holes on connecting rods lubricates the cylinder walls and piston pins. The other part of the oil is brought to the oil gallery in the

cylinder head to provide lubrication of the valve mechanism and timing chain as shown in Figure EL-2.



EL008

Fig EL-2 Lubricating cylinder head

From this gallery, oil holes go directly to all camshaft bearings through cam brackets.

Oil supplied through the No 2 and No 3 camshaft bearings is then fed to the rocker arm, valve and cam lobe through the oil gallery in the camshaft and the small channel at the base circle portion of each cam.

OIL PUMP

The oil pump is located in the bottom of the front cover by four bolts and driven by the oil pump drive spindle assembly which is driven by the helical gear on the crankshaft.

The oil pump assembly consists of an oil pressure regulator valve and outer and inner rotors.

The spring-loaded oil pressure regulator valve limits the oil pressure to a maximum of 5.6 kg/cm² (80 psi).

Removal

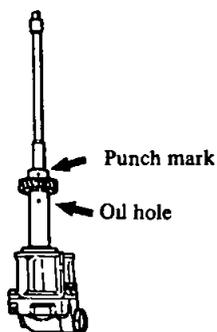
- 1 Remove distributor
- 2 Drain engine oil
- 3 Remove front stabilizer
- 4 Remove splash shield board
- 5 Remove oil pump body with drive spindle assembly

Installation

- 1 Before installing oil pump in engine, turn crankshaft so that No 1 piston is at TDC.

ENGINE LUBRICATION SYSTEM

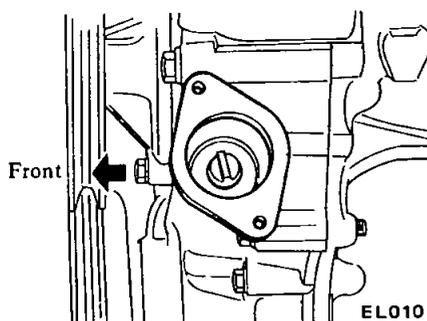
2 Fill pump housing with engine oil, then align punch mark of spindle with hole in oil pump as shown in Figure EL-3



EL009

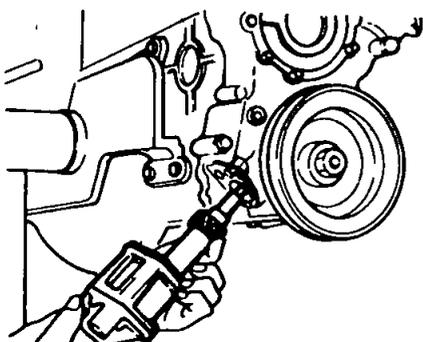
Fig EL-3 Aligning punch mark and oil hole

3 Using a new gasket, install oil pump and drive spindle assembly so that the projection on its top is located in 11 25 a.m. position, at this time, the smaller bow-shape will be placed toward the front as shown in Figure EL-4



EL010

Fig EL-4 Setting drive spindle



EL011

Fig EL-5 Installing oil pump

Ascertain whether the engagement is in order or not by checking the top

of spindle through distributor fitting hole

4. Tighten bolts securing oil pump to front cover

Disassembly and assembly

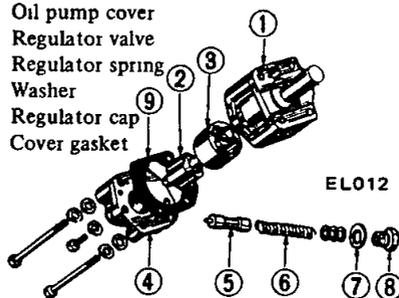
1. Remove pump cover attaching bolts, pump cover and cover gasket, and slide out pump rotors

2 Remove regulator cap, regulator valve and spring

3 Install pressure regulator valve and related parts

4 Install outer rotor, inner rotor and shaft in pump body and do not turn cover gasket up

- 1 Oil pump body
- 2 Inner rotor and shaft
- 3 Outer rotor
- 4 Oil pump cover
- 5 Regulator valve
- 6 Regulator spring
- 7 Washer
- 8 Regulator cap
- 9 Cover gasket



EL012

Fig EL-6 Oil pump

Inspection

Wash all parts in cleaning solvent and dry with compressed air

1 Inspect pump body and cover for cracks or excessive wear

2 Inspect pump rotors for damage

or excessive wear

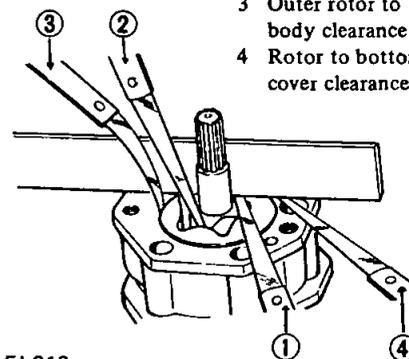
3. Check inner rotor shaft for looseness in pump body

4 Inspect regulator valve for wear or scoring

5 Check regulator spring to see that it is not worn on its side or collapsed

6 Using a feeler gauge, check tip clearance and outer rotor-to-body clearances shown in Figure EL-7

- 1 Side clearance
- 2 Tip clearance
- 3 Outer rotor to body clearance
- 4 Rotor to bottom cover clearance



EL013

Fig EL-7 Checking rotor clearances

7 Place a straight edge across the face of pump as shown in Figure EL-7 Check side clearance (outer to inner rotor) and gap between body and straight edge

The gap should be -0.03 to 0.06 mm (-0.0012 to 0.0024 in), then rotor to bottom cover clearance with gasket should satisfy the specifications

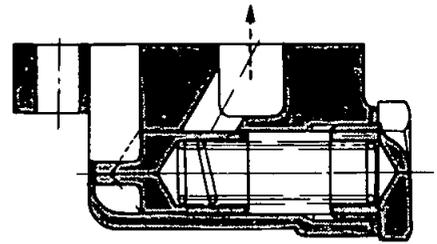
		Standard	Wear limit
Rotor side clearance (outer to inner rotor)	mm (in)	0.04 to 0.08 (0.0016 to 0.0031)	0.20 (0.0079)
Rotor tip clearance	mm (in)	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0197)
Rotor to bottom cover clearance	mm (in)	0.03 to 0.13 (0.0012 to 0.0051)	0.20 (0.0079)

ENGINE LUBRICATION SYSTEM

Note: Pump rotors and body are not serviced separately. If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

OIL PRESSURE REGULATOR VALVE

The oil pressure regulator valve is not adjustable. At the released position, the valve permits the oil to by-pass through the passage in the pump cover to the inlet side of the pump. Check regulator valve spring to ensure that spring tension is correct.



EL014

Fig EL-8 Regulator valve

Tightening torque

Oil pump mounting bolts	kg-m (ft-lb)	1.1 to 1.5 (8 to 11)
Oil pump cover bolts	kg-m (ft-lb)	0.7 to 1.0 (5 to 7)
Regulator valve cap nut	kg-m (ft-lb)	4 to 5 (29 to 36)

Specifications

Oil pressure at idling	kg/cm ² (psi)	0.8 to 2.8 (11 to 40)
Regulator valve spring		
Free length	mm (in)	52.5 (2.067)
Pressured length	mm (in)	34.8 (1.370)
Regulator valve opening pressure	kg/cm ² (psi)	3.5 to 4.2 (50 to 60)

OIL FILTER

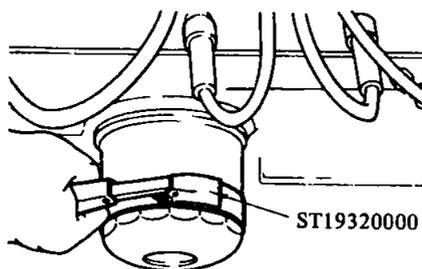
The oil filter is of a cartridge type. The oil filter element should be replaced periodically with the use of Oil Filter Wrench ST19320000.

When installing an oil filter, fasten it on cylinder block by hand.

Note: Do not overtighten filter, or oil leakage may occur.

RELIEF VALVE

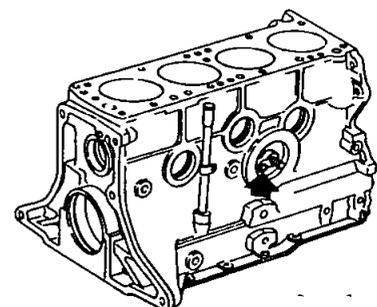
The relief valve located at the center portion securing oil filter in the cylinder block by-passes the oil into the main gallery when the oil filter element is excessively clogged.



EL015

Fig EL-9 Removing oil filter

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.



EL016

Fig EL-10 Relief valve

ENGINE LUBRICATION SYSTEM

SERVICE DATA AND SPECIFICATIONS

Oil pump

		Standard	Wear limit
Rotor side clearance (outer to inner rotor)	mm (in)	0.04 to 0.08 (0.0016 to 0.0031)	0.20 (0.0079)
Rotor tip clearance	mm (in)	less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0197)
Rotor to bottom cover clearance	mm (in)	0.03 to 0.13 (0.0012 to 0.0051)	0.20 (0.0079)

Oil pressure regulator valve

Oil pressure at idling	kg/cm ² (psi)	0.8 to 2.8 (11 to 40)
Regulator valve spring		
Free length	mm (in)	52.5 (2.067)
Pressured length	mm (in)	34.8 (1.370)
Regulator valve opening pressure	kg/cm ² (psi)	3.5 to 4.2 (50 to 60)
Tightening torque		
Oil pump mounting bolts	kg-m (ft-lb)	1.1 to 1.5 (8 to 11)
Oil pump cover bolts	kg-m (ft-lb)	0.7 to 1.0 (5 to 7)
Regulator valve cap nut	kg-m (ft-lb)	4 to 5 (29 to 36)

TROUBLE DIAGNOSES AND CORRECTIONS

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

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CO

COOLING SYSTEM

CO

COOLING SYSTEM	CO- 2
SERVICE DATA AND SPECIFICATIONS	CO- 5
TROUBLE DIAGNOSES AND CORRECTIONS	CO- 6

COOLING SYSTEM

CONTENTS

DESCRIPTION	CO-2	Fan belt adjustment	CO-3
Coolant level	CO-2	THERMOSTAT	CO-3
Draining and flushing the cooling system	CO-2	Removal and installation	CO-3
WATER PUMP	CO-2	Inspection	CO-3
Removal	CO-3	RADIATOR	CO-4
Disassembly	CO-3	Removal and installation	CO-4
Inspection	CO-3	Inspection	CO-4
Installation	CO-3		

DESCRIPTION

The cooling system is of the conventional pressure type. A centrifugal pump built into the front cover serves to circulate the coolant.

The pressure type radiator filler cap installed on the radiator operates the cooling system at higher than atmospheric pressure. The higher pressure raises the boiling point of the

coolant and increases the cooling efficiency of the radiator.

When the thermostat is closed, the coolant remains in the cylinder head and block for swift warming up of the engine. After reaching normal operating temperature, the coolant circulates through the radiator

CAUTION

To avoid serious personal injury, never remove radiator cap quickly when the engine is hot. Sudden release of cooling system pressure is very dangerous.

If it is necessary to remove the radiator cap when the radiator is hot, turn the cap slowly counterclockwise to first stop. After all pressure in cooling system is released, then turn the cap past the stop and remove it.

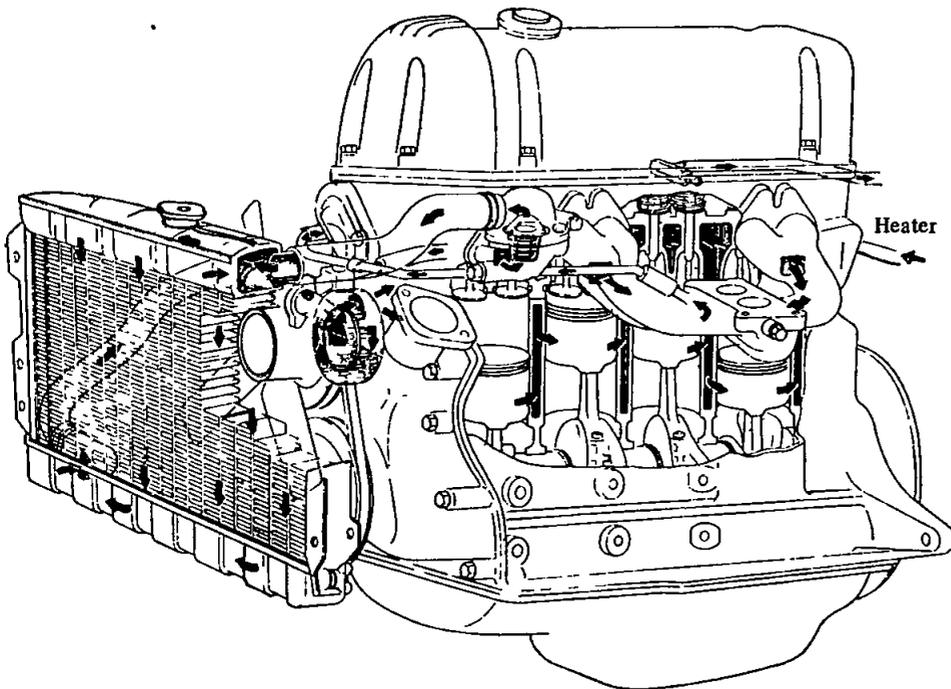


Fig CO-1 Cooling system

Draining and flushing the cooling system

To drain the cooling system, remove the radiator cap, release the drain cock at the bottom of the radiator and a drain plug on the right side of the cylinder block. If the heater system is installed, set the heater temperature control valve at open position.

After the coolant is drained completely, close the drain cock and plug and refill the system with clean water.

Coolant level

The radiator coolant level should be checked and maintained 25.4 mm (1 in) below the bottom of the filler

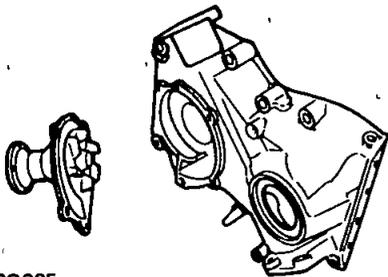
neck when the engine is cold. The expansion and contraction of the coolant will cause the level to drop by overflow.

WATER PUMP

The water pump is of a centrifugal type, which is mounted on the engine front cover. The fan and pulley are bolted at the pulley hub.

The pump shaft is supported by a double row ball bearing press fit in an aluminum die cast pump body. The bearings are permanently lubricated and sealed to prevent loss of lubricant entry of dirt.

The pump contains an impeller that turns on a steel shaft which rotates in the ball bearings, and the volute chamber is built in the front cover assembly. The inlet of the pump is connected to the radiator lower tank by a hose.

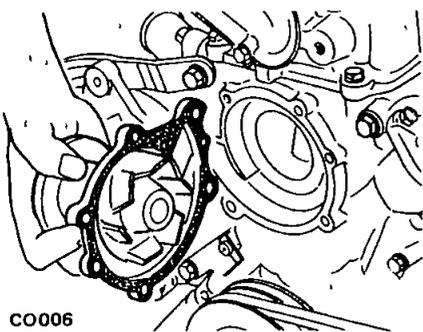


CO005

Fig CO-2 Water pump and front cover

Removal

- 1 Drain coolant into a clean container
- 2 Loosen four bolts retaining fan shroud to radiator and remove shroud
- 3 Loosen belt, then remove fan blade and pulley from hub
- 4 Remove five bolts, pump assembly, and gasket from front cover



CO006

Fig CO-3 Removing water pump

Disassembly

The water pump is made of aluminum, and its bearing outer race is press fit. For this reason, the body, shaft bearing should not be disassembled.

Inspection

Inspect pump assembly for the following conditions, and replace it if necessary:

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

Installation

- 1 Make sure to clean the gasket surfaces on pump and front cover. Always use new gasket when installing pump assembly. Be sure to tighten bolts uniformly.
- 2 Fill cooling system and check for leaks at pump.
- 3 Install fan pulley and fan blade, and tighten fixing bolts securely. Install belt and adjust for proper tension.

Fan belt adjustment

The fan belt should be properly adjusted at all time. A tight belt serves wear of alternator and water pump bearings. A loose belt cause improper cooling fan, water pump and alternator operation.

Check the belt slack between alternator and fan pulley by pressing a force of 10 kg (22 lb).

Slackness of fan belt

8 to 12 mm

(0.31 to 0.47 in)

If adjustment is necessary, loosen bolt retaining alternator adjusting bar to alternator. Move alternator toward or away from engine until the correct tension is obtained.

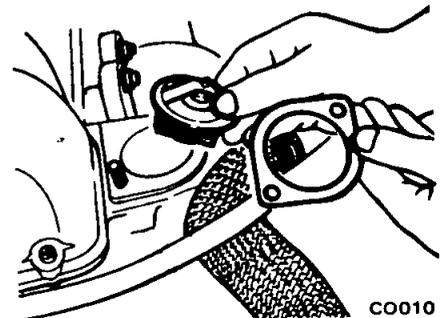
THERMOSTAT

A wax pellet type thermostat is mounted in the thermostat housing at the cylinder head water outlet adjacent to the inlet manifold. The

function of thermostat is to control the flow of coolant, facilitating fast engine warm up and regulating coolant temperature. The thermostats are designed to open and close at predetermined temperatures and if not operating properly should be removed and tested as listed below.

Removal and installation

- 1 Drain coolant partially
- 2 Disconnect upper radiator hose at water outlet
- 3 Loosen two securing nuts and remove water outlet, gasket, and thermostat from thermostat housing
- 4 After checking thermostat satisfactorily, reinstall, replacing with a new housing gasket
- 5 Reinstall water outlet and tighten securing nuts
- 6 Replenish coolant and check for leaks



CO010

Fig CO-4 Removing thermostat

Inspection

A sticking thermostat will prevent the cooling system from functioning properly. If the thermostat sticks in the open position, the engine will warm up very slowly. If thermostat sticks in the closed position, overheating will result. Therefore, the thermostat should be inspected so as to make sure that it is in good condition.

1. Submerge thermostat in hot water 5°C (9°F) above the temperature specified in the following table.

Cooling System

	Standard	For cold areas	For tropical areas
Valve opening temperature °C (°F)	80.5 to 83.5 (177 to 183)	86.5 to 89.5 (187 to 193)	75 to 78 (167 to 172)
Maximum valve lift mm/°C (in/°F)	above 8/95 (0.315/203)	above 8/100 (0.315/212)	above 8/90 (0.315/194)

Note. It is necessary to check a new thermostat before installing it in the engine

- 2 Measure the lift height of valve by inserting a screwdriver marked at the point about 8 mm (0.315 in) from its tip
- 3 Remove thermostat and place in water 5°C (9°F) below temperature stamped on the frame
- 4 Under the above condition, valve should be closed completely. In this case, agitate water thoroughly.

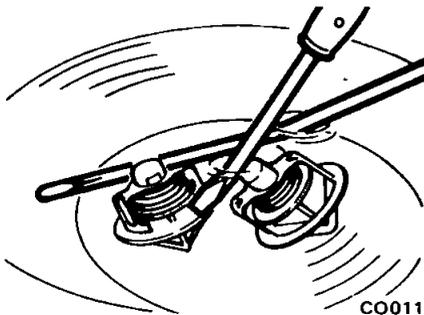


Fig CO-5 Inspecting thermostat

If thermostat does not operate at the above specified temperatures, it must be replaced because it can not be repaired

RADIATOR

The radiator is a conventional down flow type having the top and bottom tanks to distribute the coolant flow uniformly through the vertical tube of the radiator core

The radiator filler cap is designed to maintain a pre-set pressure [0.9 kg/cm² (13 psi)] above atmospheric pressure. The relief valve consisted of a blow-off valve and a vacuum valve, helps to prevent coolant loss from boiling for by raising the pressure on the coolant. On the contrary, as the pressure is reduced below atmospheric pressure the vacuum valve allows air to re-enter the radiator, preventing the formation of vacuum in the cooling system.

The bottom tank on cars equipped with the automatic transmission incorporates an oil cooler for the transmission fluid.

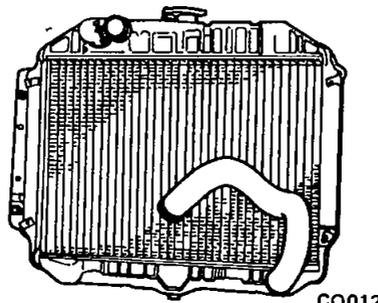


Fig CO-6 Radiator for manual transmission

Removal and installation

- 1 Drain coolant into a clean container
- 2 Remove front grille
- 3 Disconnect radiator upper and lower hoses. On a vehicle with automatic transmission, disconnect cooler inlet and outlet lines from radiator
- 4 Remove bolts retaining radiator from radiator side supports and remove radiator upwards
- 5 Install radiator in reverse sequence of removal

Inspection

Radiator cap should be checked for pressure at regular tune up intervals. 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 pressure or will not release at the proper pressure, replace cap.

Also, inspect radiator for water leakage using the cap tester under applying a pressure of 1.6 kg/cm² (22.8 psi). If such fault is detected, repair or replace radiator.

SERVICE DATA AND SPECIFICATIONS

Thermostat

		Standard	For cold areas	For tropical areas
Valve opening temperature	°C (°F)	80.5 to 83.5 (177 to 183)	86.5 to 89.5 (187 to 193)	75 to 78 (167 to 172)
Maximum valve lift	mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)

Radiator

Type		Corrugated fin type
Manual transmission		Corrugated fin type equipped with oil cooler
Automatic transmission		
Cap relief pressure	kg/cm ² (psi)	0.9 (13)

Cooling system

Leakage testing pressure	kg/cm ² (psi)	1.6 (22.8)
Capacity		
With heater	liters (US qt, Imp qt)	6.5 (6 7/8, 5 3/4)
Without heater	liters (US qt, Imp qt)	6.0 (6 3/8, 5 1/4)

Fan

Number of blades x outer diameter	mm (in)	4 x 350 (14)
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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Loss of water	Damaged radiator seams Leaks at heater connections or plugs Leak at water temperature gauge Loose joints Damaged cylinder head gasket Cracked cylinder block Cracked cylinder head Loose cylinder head bolts	Repair Repair Tighten Tighten Replace Check engine oil for contamination and refill as necessary Replace Check engine oil in crankcase for mixing with water by pulling oil level gauge Replace Tighten
Poor circulation	Restriction in system Insufficient coolant Inoperative water pump Loose fan belt Inoperative thermostat	Check hoses for crimps, and clear the system of rust and sludge by flushing radiator Replenish Replace Adjust Replace
Corrosion	Excessive impurity in water Infrequent flushing and draining of system	Use soft, clean water (Rain water is satisfactory) Cooling system should be drained and flushed periodically Permanent anti-freeze (Ethylene glycol base) can be used throughout the seasons of the year, and change periodically at intervals recommended
Overheating	Inoperative thermostat Radiator fin choked with mud, chaff, etc Incorrect ignition and valve timing Dirty oil and sludge in engine Inoperative water pump Loose fan belt Restricted radiator Inaccurate temperature gauge Impurity in water	Replace Clean out air passage thoroughly by using air pressure from engine side of radiator Adjust Refill Replace Adjust Flush radiator Replace Use soft, clean water
Overcooling	Inoperative thermostat Inaccurate temperature gauge	Replace Replace

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION EF

ENGINE FUEL

EF

FUEL STRAINER	EF- 2
FUEL PUMP	EF- 2
TWO-BARREL CARBURETOR	EF- 4

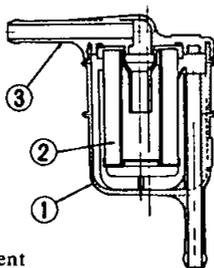


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FUEL STRAINER

DESCRIPTION

The fuel strainer is of a cartridge type. It uses a paper element which can be checked for condition from the outside. This strainer should be replaced periodically.



- 1 Body
- 2 Paper element
- 3 Cover

EF005

Fig EF-1 Sectional view of cartridge type fuel strainer

REMOVAL

Disconnect inlet and outlet fuel lines from fuel strainer, and remove fuel strainer.

Note Before disconnecting fuel lines, use a container to receive the remaining fuel in lines.

FUEL PUMP

CONTENTS

DESCRIPTION

FUEL PUMP TESTING

- Static pressure test
- Capacity test

EF-2 REMOVAL AND DISASSEMBLY

EF-3

EF-2 INSPECTION

EF-4

EF-3 ASSEMBLY

EF-4

EF-3

DESCRIPTION

The fuel pump transfers fuel from the tank to the carburetor in sufficient quantity to meet the engine requirements at any speed or load.

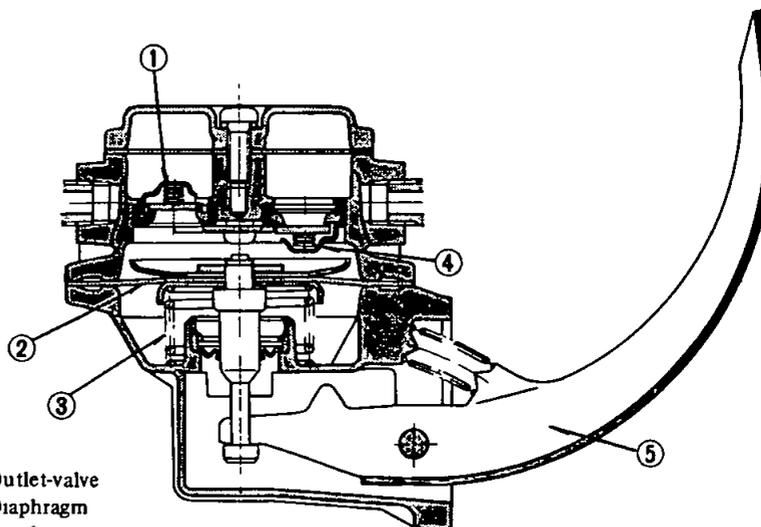
The fuel pump is of a pulsating type designed for easy maintenance. It consists of a body, rocker arm assembly, fuel diaphragm, fuel diaphragm spring, seal inlet- and outlet-valve. Figure EF-2 shows a cross-sectional view of the pump.

The fuel diaphragm consists of specially treated rubber, which is not affected by gasoline and held in place by two metal discs and a pull rod.

This type of fuel pump is used in the L14, L16 and L18 engines.

the engine's requirements at all speeds. Pressure and capacity must be determined by two tests, while the

pump is still mounted on the engine. Be sure there is fuel in the tank when carrying out the tests.



- 1 Outlet-valve
- 2 Diaphragm
- 3 Diaphragm spring
- 4 Inlet-valve
- 5 Rocker arm

EF006

Fig EF-2 Schematic view of fuel pump

FUEL PUMP TESTING

A fuel pump is operating properly when its pressure is within specifications and its capacity is equal to

Static pressure test

The static pressure test should be conducted as follows

- 1 Disconnect fuel line between carburetor and fuel pump
- 2 Connect a rubber hose to each open end of a T-connector, and connect this connector-hose assembly between carburetor and fuel pump

Note Locate this T-connector as close to carburetor as possible

3 Connect a suitable pressure gauge to the opening of T-connector, and fasten the hose between carburetor and T-connector with a clip securely

4 Start and run the engine at varying speeds

5 The pressure gauge indicates static fuel pressure in the line. The gauge reading should be within the following range

0.18 to 0.24 kg/cm²
(2.6 to 3.4 psi)

Note If the fuel in the carburetor float chamber has run out and engine has stopped, remove clip and pour fuel into carburetor. Fasten clip securely and repeat static pressure test

Pressure below the lower limit indicates extreme wear on one part or a small amount of wear on each

working part. It also indicates ruptured diaphragm, worn, warped, dirty or gumming valves and seats, or a weak diaphragm return spring. Pressure above the upper limit indicates an excessively strong tension of diaphragm return spring or a diaphragm that is too tight. Both of these conditions require the removal of pump assembly for replacement or repair.

Capacity test

The capacity test is conducted only when static pressure is within the specification. To conduct this test, proceed as follows

1 Disconnect pressure gauge from T-connector and, in its vacant place, install a suitable container as a fuel sump

2 Start engine and run at 1,000 rpm

3 The pump should deliver 1,000 cc (2.11 US pts) of fuel in one minute or less

If little or no fuel flows from the open end of pipe, it is an indication that fuel line is clogged or pump is malfunctioning

REMOVAL AND DISASSEMBLY

Remove fuel pump assembly by unscrewing two mounting nuts and disassemble in the following order

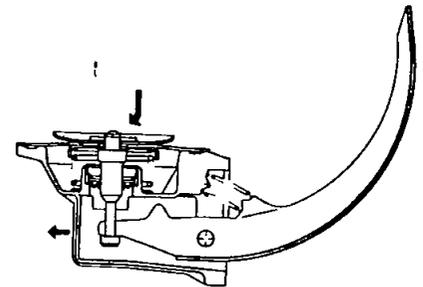
1 Separate upper body and lower body by unscrewing body set screws

2 Take off cap and cap gasket by removing cap screws

3 Unscrew elbow and connector

4 Take off valve retainer by unscrewing two valve retainer screws and two valves are easily removed

5 To remove diaphragm, press down its center against spring force. With diaphragm pressed down, tilt it until the end of pull rod touches the inner wall of body. Then, release the diaphragm to unhook push rod. Use care during this operation not to damage diaphragm or oil seal



EF007

Fig EF-3 Removing pull rod

6 Drive out rocker arm pin by using a press or hammer

INSPECTION

- 1 Check upper body and lower body for cracks
- 2 Check valve assembly for wear on valve and valve spring. Blow valve assembly with breath to examine its function
- 3 Check diaphragm for small holes, cracks or wear
- 4 Check rocker arm for wear at the portion in contact with camshaft
- 5 Check rocker arm pin for wear. A worn pin may cause oil leakage
- 6 Check all other components for any abnormalities and replace with new parts if necessary

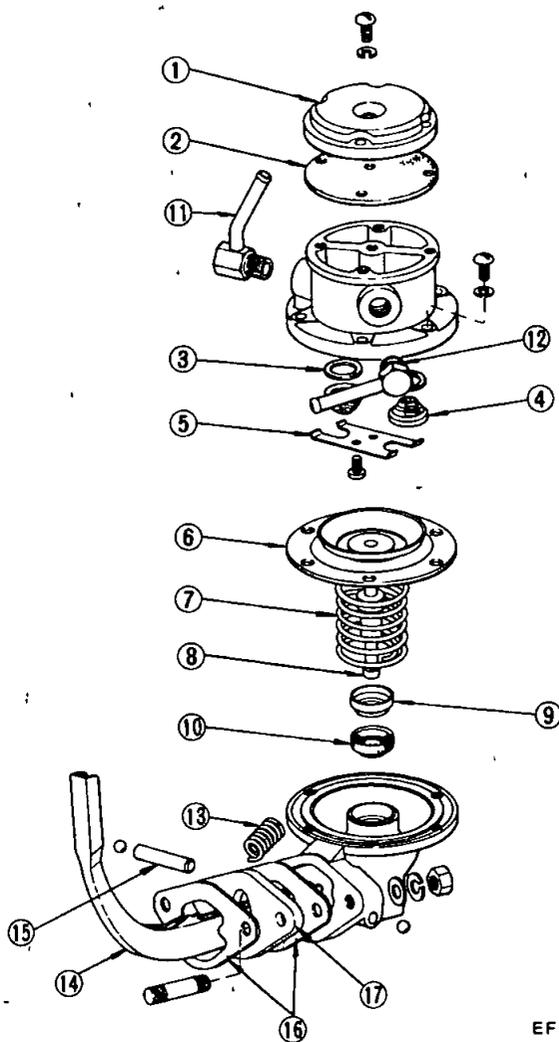
ASSEMBLY

Reverse the order of disassembly. Closely observe the following instructions

- 1 Use new gaskets
- 2 Lubricate rocker arm, rocker arm link and rocker arm pin before installation
- 3 To test the function, proceed as follows

Position fuel pump assembly about 1 meter (3.3 ft) above fuel level of fuel strainer and connect a pipe from strainer to fuel pump

Operate rocker arm by hand. If fuel is drawn up soon after rocker arm is released, fuel pump is functioning properly



- 1 Fuel pump cap
- 2 Cap gasket
- 3 Valve packing assembly
- 4 Fuel pump valve assembly
- 5 Valve retainer
- 6 Diaphragm assembly
- 7 Diaphragm spring
- 8 Pull rod
- 9 Lower body seal washer
- 10 Lower body seal
- 11 Inlet connector
- 12 Outlet connector
- 13 Rocker arm spring
- 14 Rocker arm
- 15 Rocker arm side pin
- 16 Fuel pump packing
- 17 Spacer-fuel pump to cylinder block

EF008

Fig EF-4 Structure of fuel pump

TWO-BARREL CARBURETOR

CONTENTS

DESCRIPTION	EF- 5	TROUBLE DIAGNOSES AND	
STRUCTURE AND OPERATION	EF- 5	CORRECTIONS	EF-10
Primary system	EF- 6	SPECIFICATIONS AND SERVICE DATA	EF-11
Secondary system	EF- 7	AUTOMATIC CHOKE	EF-12
Float system	EF- 8	Description	EF-12
ADJUSTMENT	EF- 8	Inspection	EF-13
Fuel level adjustment	EF- 8	Trouble diagnoses and corrections	EF-13
Dash pot adjustment (A/T only)	EF- 8	Auto-choke heater	EF-13
MAJOR SERVICE OPERATION	EF- 9	Auto-choke relay and wiring	EF-14
Removal	EF- 9	Adjustment	EF-14
Disassembly	EF- 9	IDLE COMPENSATOR	EF-16
Cleaning and inspection	EF- 9	Description	EF-16
Assembly and installation	EF-10	Inspection	EF-16
JETS	EF-10	Replacement	EF-16

DESCRIPTION

Carburetor type	Applied engine
21A304-03	L18 with manual transmission
21A304-04	L18 with automatic transmission

As almost all the mechanism of these carburetors are quite similar, the general explanation applies with all except for some variations

These are downdraft type and are designed to increase power and fuel economy

These carburetors present several distinct features of importance to the car owners

A summary of features is as follows

1 Secondary throttle valve is operated by the diaphragm which is actuated by the vacuum so that the higher power and better acceleration are achieved as compared with the mechanical throttle valve type

2 The power valve mechanism, so-called vacuum piston type, affords high speed performance

3 Accelerating pump gives excellent acceleration

4 The carburetor for automatic transmission is equipped with so-called dash pot, that is, it makes smooth deceleration without engine stall at any operating condition

5 BCDD is installed in order to reduce HC emission during deceleration

6 An automatic choke system is adopted

7 Anti-dieseling solenoid is also added

These carburetors are almost similar in appearance as explained above except the dash pot for the automatic transmission models

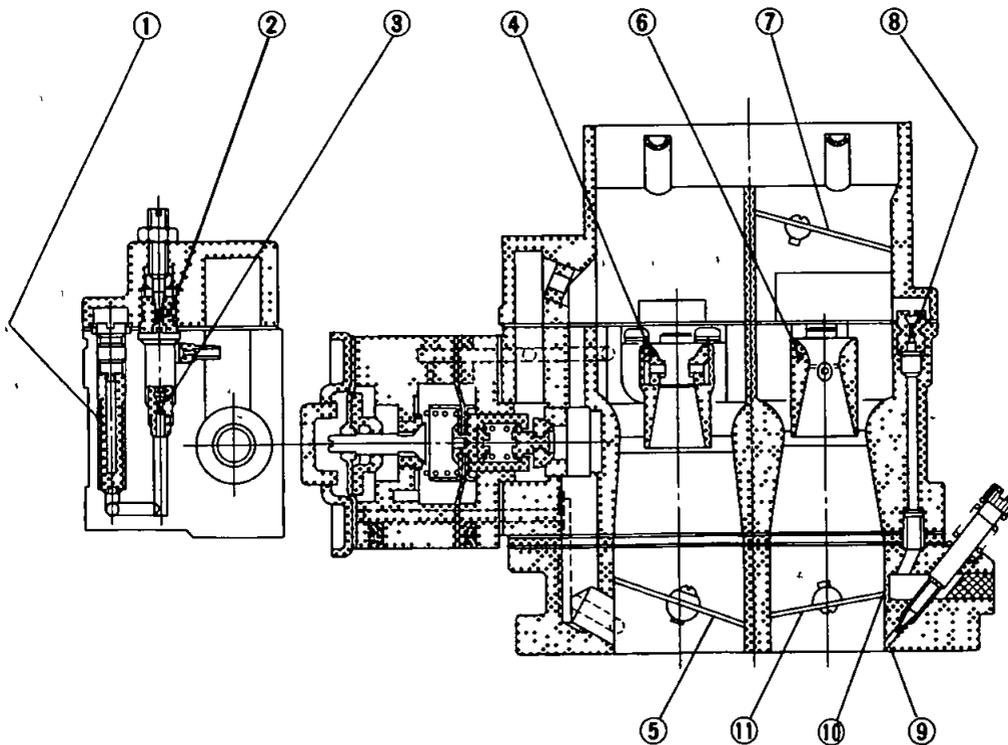
The differences in performance are explained in the following specifications table

STRUCTURE AND OPERATION

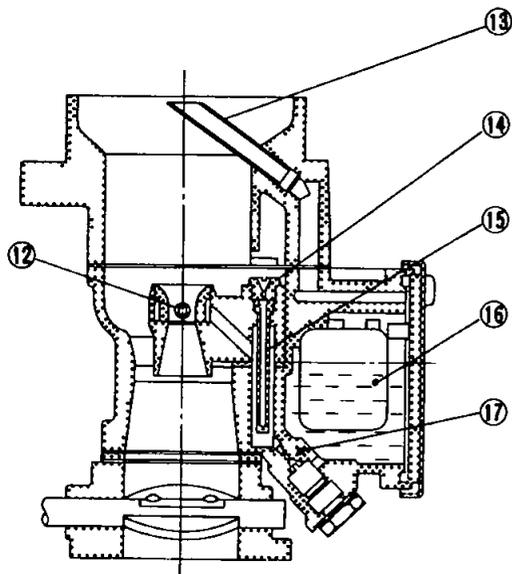
These carburetors consist of the primary system for normal running and the secondary system for full load running

The float system which is commonly used by primary and secondary systems, the secondary switchover mechanism, the starting mechanism, accelerating mechanism, etc are also attached

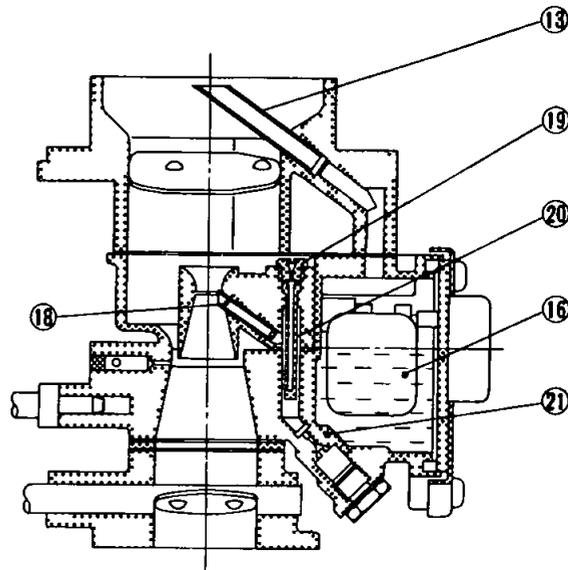
On these carburetors, both primary and secondary main systems adopt Stromberg type nozzle



- 1 Coasting air bleed (1st)
- 2 Coasting air bleed (2nd)
- 3 Coasting jet
- 4 S small venturi
- 5 S throttle valve
- 6 P small venturi
- 7 Choke valve
- 8 Slow air bleed
- 9 Idle nozzle
- 10 By-pass hole
- 11 P throttle valve



Secondary



Primary

- | | |
|---------------------|---------------------|
| 12 S main nozzle | 17 S main jet |
| 13 Air vent pipe | 18 P main nozzle |
| 14 S main air bleed | 19 P main air bleed |
| 15 S emulsion tube | 20 P emulsion tube |
| 16 Float | 21 P main jet |

EF644

Fig EF-5 Sectional view of two-barrel carburetor

Primary system

1 Primary main system

The primary main system is of Stromberg type. Fuel flows through the main jet, mixing with air which comes in from the main air bleed and passes through the emulsion tube, and is pulled out into the venturi through the main nozzle. See Figure EF-5.

2 Idling and slow system

During low engine speed, as shown in Figure EF-5, fuel flows through the slow jet located in the rear left side of the main jet, mixing with air coming from the slow air bleed, and passes through the slow economizer jet, mixing with air coming from the slow air bleed and then is pulled out into the engine through the idle hole and bypass hole.

Adoption of the submerged type of slow jet eliminates such hesitation as occurs on sudden deceleration of the car.

Slow economizer system is useful to obtain smooth deceleration at high speed. Models 21A304-03 and -04 are equipped with the idle nozzle as shown in Figure EF-5. Through this nozzle, idling mixture is further atomized by air stream below throttle valve and ensures the stable idling.

Small opening of the throttle valve in idling or partial load creates a large negative pressure in the intake manifold.

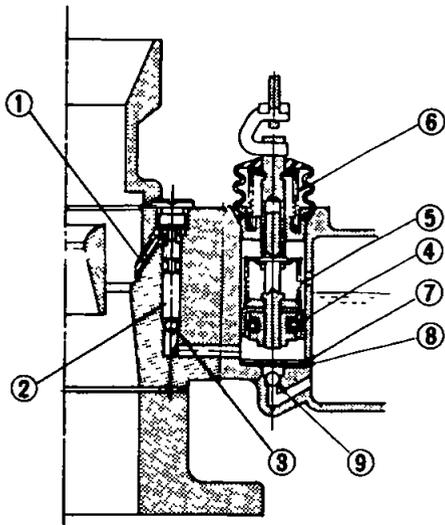
By this negative pressure, fuel is measured through the slow jet located behind the main jet. And air coming from the economizer bleed is mixed

with fuel in the emulsion hole.

This mixture is further mixed and atomized with air coming from the slow air bleed. The atomized mixture is supplied to the engine from the idle hole and bypass hole via the slow system passage.

3 Accelerating mechanism

The carburetor is equipped with the piston type accelerating mechanism linked to the throttle valve. When the primary throttle valve is closed, the piston goes up, and fuel flows from the float chamber through the inlet valve into the space under the piston. When the throttle valve is opened, the piston goes down, opening the outlet valve, and fuel is forced out through the injector. See Figure EF-6.



- 1 Pump injector
- 2 Weight
- 3 Outlet valve
- 4 Piston
- 5 Damper spring
- 6 Piston return spring
- 7 Clip
- 8 Strainer
- 9 Inlet valve

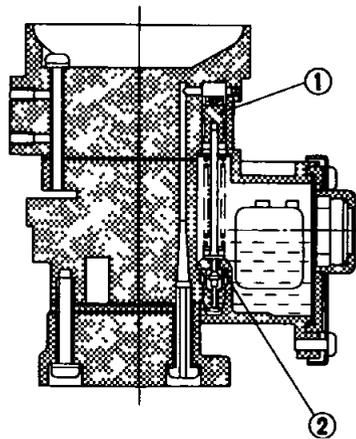
EF645

Fig EF-6 Acceleration mechanism

4 Power valve mechanism

The power valve mechanism, so-called vacuum piston type, utilizes the vacuum below the throttle valve

When the throttle valve is slightly opened during light load running, a high vacuum is created in the intake manifold. This vacuum pulls the vacuum piston upward against the spring, leaving the power valve closed. When the vacuum below the throttle valve is lowered during full load or accelerating running, the spring pushes the vacuum piston downward, opening the power valve to furnish fuel.



- 1 Vacuum piston
- 2 Power jet

EF646

Fig EF-7 Power valve mechanism

5 Dash pot device

The dash pot device is provided only for model 21A304-04 carburetor for an automatic transmission.

A dash pot is interlocked with the primary throttle valve through a link mechanism. The dash pot, which is exclusively installed on cars equipped with automatic transmission, is intended to prevent engine stall that would result from quick application of the brake immediately after driving the car, or from the quick release of the accelerator pedal after treading it slightly.

When the primary throttle valve is closed at 11° point from fully closed position, a throttle lever strikes against the dash pot stem and makes the primary throttle valve gradually close, thus keeping the engine running.

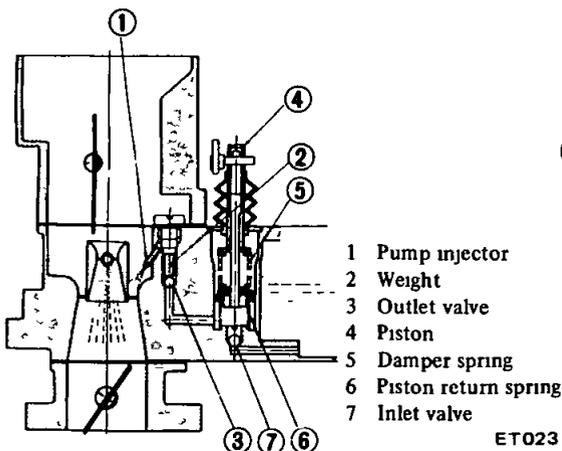
Secondary system

1 Secondary main system

The secondary main system is of Stromberg type.

Fuel-air mixture produced by the functions of the main jet, main air bleed and emulsion tube, in the same manner as in the primary system, is pulled out through the main nozzle into the small venturi.

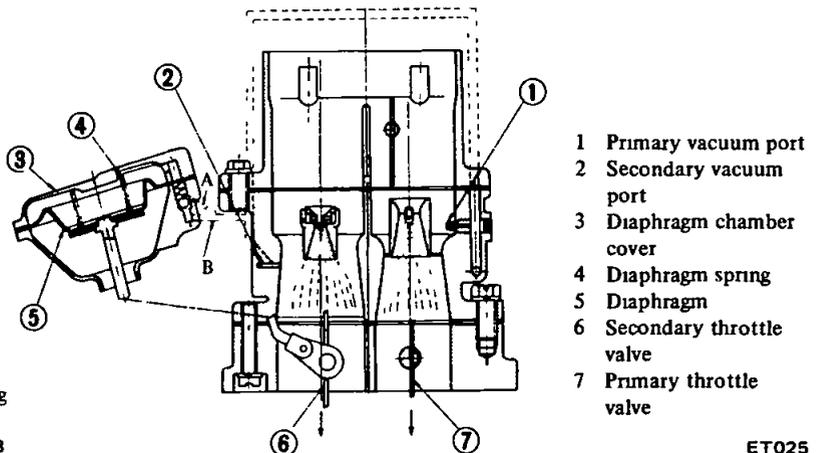
The structure is almost the same as the primary side, but emulsion tube and venturi are different. Take care not to assemble improperly.



- 1 Pump injector
- 2 Weight
- 3 Outlet valve
- 4 Piston
- 5 Damper spring
- 6 Piston return spring
- 7 Inlet valve

ET023

Fig EF-8 Full throttle at low speed



- 1 Primary vacuum port
- 2 Secondary vacuum port
- 3 Diaphragm chamber cover
- 4 Diaphragm spring
- 5 Diaphragm
- 6 Secondary throttle valve
- 7 Primary throttle valve

ET025

Fig EF-9 Full throttle at high speed

Engine Fuel

2 Step system

The construction of this system may correspond to the idling and slow system of the primary system

This system aims at the proper filling up of the gap when fuel supply is transferred from the primary system to the secondary one. The step port is located near the secondary throttle valve edge in its fully closed state.

3 Secondary switchover mechanism

The secondary throttle valve is linked to the diaphragm which is actuated by the vacuum created in the venturi. A vacuum jet is provided at each of the primary and secondary venturies, and the composite vacuum of these jets actuates the diaphragm.

As the linkage, shown in Figure EF-8, causes the secondary throttle valve not to open until the primary throttle valve opening reaches approximately 50°, fuel consumption during normal operation is not excessive.

During high speed running, as shown in Figure EF-9, as the vacuum at the venturi is increased, the diaphragm is pulled against the diaphragm spring force, and then secondary throttle valve is opened.

The other side, during low speed running (as the primary throttle valve opening does not reach 50°), the secondary throttle valve is locked to close completely by the locking arm which is interlocked with primary throttle arm by linkage.

When the primary throttle valve opening reaches wider position than 50°, the secondary throttle valve is ready to open, because the locking arm revolves and leaves from the secondary throttle arm.

Float system

There is only one float chamber, while two carburetor systems, primary and secondary, are provided.

Fuel fed from the fuel pump flows through the filter and needle valve into the float chamber. A constant fuel level is maintained by the float and needle valve.

Because of the inner air vent type of the float chamber ventilation, the

fuel consumption will not be influenced by some dirt accumulated in the air cleaner.

The needle valve includes special hard steel ball and will not wear for all its considerably long use. Besides, the insertion of a spring will prevent the flooding at rough road running.

ADJUSTMENT

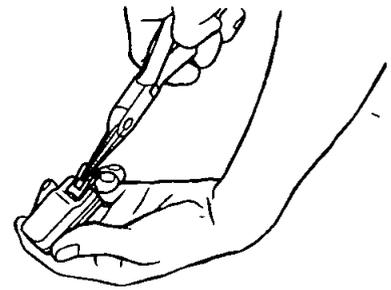
Fuel level adjustment

A constant fuel level is maintained by float level and ball valve.

If the fuel level is in accord with level gauge line, float level is properly set. If float level is not correct, adjust it by bending float seat as shown in Figure EF-10.

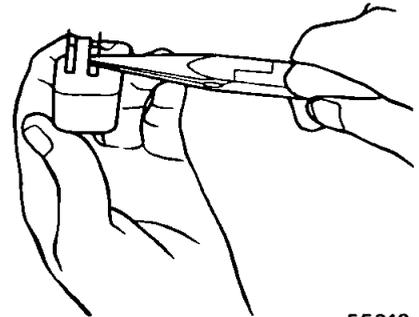
Approximately *H mm is required for effective stroke of needle valve. So adjust gap between valve stem and float seat to *H mm with float fully lifted up by bending float stopper.

*H 1.0 mm (0.039 in)



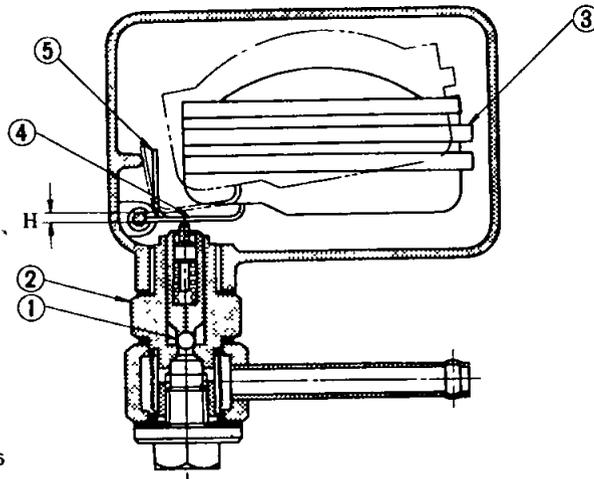
EF017

Fig EF-10 Adjusting float seat



EF018

Fig EF-11 Adjusting float stopper



EF016

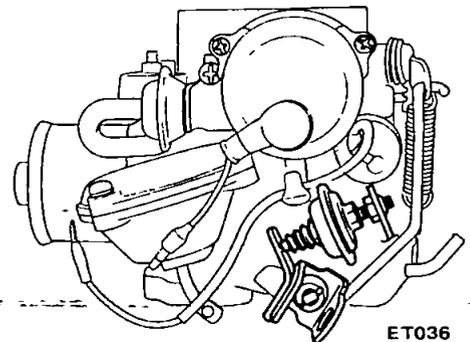
- 1 Ball valve
- 2 Valve seat
- 3 Float
- 4 Float arm
- 5 Float stopper

Fig EF-12 Adjusting fuel level

Dash pot adjustment (A/T only)

Proper contact between throttle lever and dash pot stem provides normal dash pot performance. Adjustment of the proper contact can be made by dash pot setscrew.

If normal set can not be obtained between dash pot stem and throttle arm, rotate dash pot to the proper position.



ET036

Fig EF-13 Dash pot adjustment

Engine Fuel

- 1 It is necessary that the idling speed of engine and mixture have been well tuned up and engine is sufficiently warm
- 2 Turn throttle valve by hand, and read engine speed when dash pot just touches the stopper lever
- 3 Adjust the position of dash pot by turning nut until engine speed is in the range of 1,650 to 1,850 rpm
- 4 Then fasten loosened lock nut
- 5 Make sure that the engine speed is smoothly reduced from 2,000 to 1,000 rpm in about three seconds

MAJOR SERVICE OPERATION

The perfect carburetor delivers the proper fuel and air ratios for all speeds of the particular engine for which it was designed. By completely disassembling at regular intervals, which will allow cleaning of all parts and passages, the carburetor can be returned to its original condition and it will then deliver the proper ratios as it did when new.

To maintain the accurate carburetion of passages and discharge holes, extreme care must be taken in cleaning.

Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed instrument to clean as calibration of carburetor will be affected.

Removal

- 1 Remove air cleaner
- 2 Disconnect fuel line, vacuum line and electrical wires from carburetor.
- 3 Remove throttle lever
- 4 Remove four nuts and washers retaining carburetor to manifold
- 5 Lift carburetor off manifold
- 6 Remove and discard the gasket used between carburetor and manifold. Replace it, if necessary.

Disassembly

- 1 Main jets and slow jets on both primary and secondary sides are accessible from outside carburetor for disassembly.

- 2 Auto-choke heater housing can be removed by loosening three set screws.

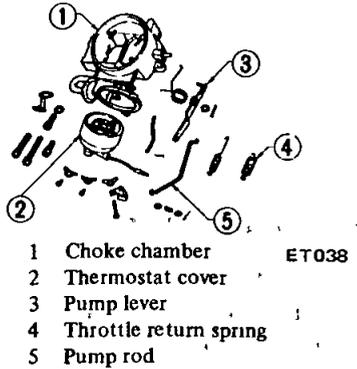


Fig EF-14 Removing auto-choke heater housing

- 3 Primary and secondary emulsion tubes can be disassembled for a check by removing main air bleed on respective sides.
- 4 To check accelerator pump, pump arm can be removed.

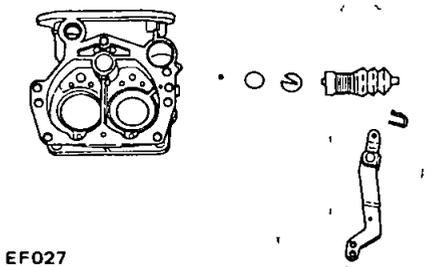


Fig EF-15 Removing accelerator pump

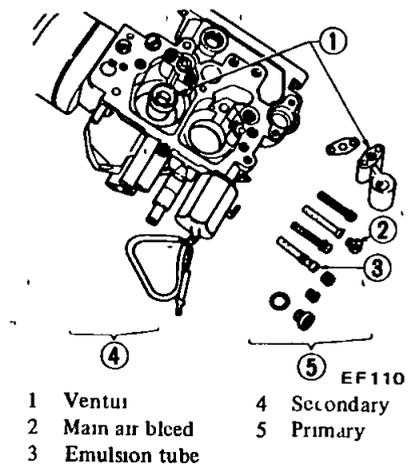


Fig EF-16 Removing emulsion tubes

- 5 Throttle chamber can be detached from float chamber by removing rod linking diaphragm with the secondary throttle valve, and loosening three set screws that hold it.

It is preferable to leave throttle valve intact unless otherwise required.

If throttle valve must be disassembled to remedy a defect, secondary throttle valve must be installed to be gap free.

Otherwise, stable idling and slow speed performance will not be obtained.

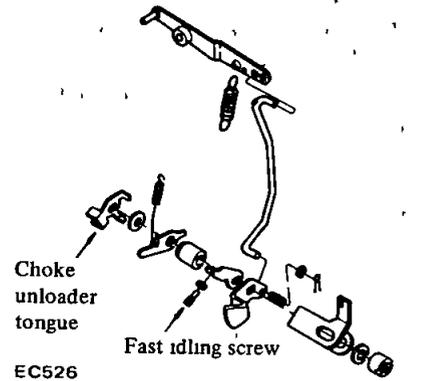


Fig EF-17 Removing throttle valve

- 6 To check float, float chamber cover can be removed as instructed in a separate paragraph.

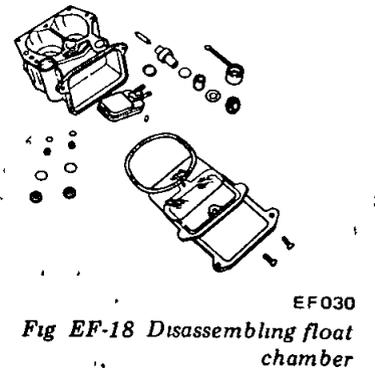


Fig EF-18 Disassembling float chamber

- 7 Diaphragm can be disassembled by removing three set screws that hold diaphragm chamber and other three set screws that hold diaphragm chamber cover. In reassembling it, take care so that edge of diaphragm will not be turned up.

- 8 In disassembling and reassembling interlocking links, take care so that each linkage has a smooth action, and that it is not fitted in any forced position.

Cleaning and inspection

Dirt, gum, water or carbon contamination in or on exterior moving

Engine Fuel

parts of a carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1 Blow all passages and castings with compressed air and blow off all parts until dry.

Note Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

2 Check all parts for wear. If wear is noted, defective parts must be replaced. Note especially the following:

(1) Check float needle and seat for wear. If wear is noted, assembly must be replaced.

(2) Check throttle and choke shaft bores in throttle chamber and choke chamber for wear or out-of-roundness.

(3) Inspect idle adjusting needle for burrs or ridges. Such a condition requires replacement.

3 Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted. If any such condition is noted, they must be replaced.

4 Check filter screen for dirt or lint. Clean, and if it is distorted or remains plugged, replace.

5 Check linkage for operating condition.

6 Inspect operation of accelerating pump. Pour fuel into float chamber and make throttle lever operate. And

check condition of fuel injection from the accelerating nozzle.

7 Push connecting rod of diaphragm chamber and block passage of vacuum by finger. And when connecting rod becomes free, check for leakage of air and damage of diaphragm.

Assembly and installation

Follow disassembly and removal procedures in reverse.

Replace gaskets, if necessary.

In disassembling and reassembling interlock link and related components, be careful not to bend or deform any of components.

Careful reassembly will restore smooth operation of all interlock parts.

JETS

The carburetor performance depends on jets and air bleeds. That is why these components must be fabricated with utmost care. To clean them, use cleaning solvent and blow air on them. Larger inner numbers stamped on the jets indicate larger diameters. Accordingly, main and slow jets with larger numbers provide richer mixture, and the smaller numbers the leaner mixture. Inversely, the main and slow air bleeds, which are for air to pass through, make the fuel leaner if they bear larger numbers, and the smaller numbers the richer fuel.

Replacement of designated jets to meet the service condition of the vehicle must be carried out keeping in mind the above directions. To cite a practical example, when it becomes necessary to economize fuel at a limited sacrifice of output to meet frequent light-load operation, use smaller main jets or slow jets, or larger main air bleeds or slow air bleeds than regularly specified. This should meet the purpose. Inversely, when increase in output is desired at the limited sacrifice of fuel consumption, use larger main jets or slow jets, or smaller main air bleeds or slow air bleeds, and that should bring a satisfactory result.

Carburetor secondary jets such as secondary main jet, secondary main air bleed, step jet and step air bleed could be distinguished by their white color painting from jets or air bleed of primary system.

TROUBLE DIAGNOSES AND CORRECTIONS

In the following table, the symptoms and causes of carburetor troubles and remedies for them are listed to facilitate quick repairs.

There are various causes of engine troubles. It sometimes happens that the carburetor which has no defect seems apparently to have some troubles, when electric system is defective. Therefore, whenever the engine has troubles, electric system must be checked first before taking to carburetor adjustment.

Condition	Probable cause	Corrective action
Overflow	Dirt accumulated on needle valve Fuel pump pressure too high Needle valve seat improper	Clean needle valve Repair pump Lap or replace
Excessive fuel consumption	Fuel overflow Each main jet, slow jet too large Each main air bleed clogged Choke valve does not fully open Outlet valve seat of accelerator pump improper Linked opening of secondary throttle valve too early	See above item Replace Clean Adjust Lap Adjust

Engine Fuel

Condition	Probable cause	Corrective action
Power shortage	Each main jet clogged Each throttle valve does not fully open Idling adjustment incorrect Fuel strainer clogged Vacuum jet clogged Air cleaner clogged Diaphragm damaged Power valve operated improperly	Clean Adjust Repair Clean Clean Clean Replace Adjust
Improper idling	Slow jet clogged Each throttle valve does not close Secondary throttle valve operated improperly Each throttle valve shaft worn Packing between manifold/carburetor defective Manifold/carburetor tightening improper Fuel overflow	Clean Adjust Overhaul and clean Replace Replace packing Correct tightening See the first item
Engine hesitation	Main jet or slow jet clogged By pass hole, idle passage clogged Emulsion tube clogged Idling adjustment incorrect Secondary throttle valve operated improperly	Clean Clean tube Clean Correct adjustment Overhaul and clean
Engine does not start	Fuel overflows No fuel Idling adjustment incorrect Fast idle adjustment incorrect	See the first item Check pump, fuel pipe and needle valve Adjust Adjust

SPECIFICATIONS AND SERVICE DATA

Carburetor type		21A304-03 21A304-04
Applied engine		L18
		Primary Secondary
Outlet diameter	mm	30 34
Venturi diameter	mm	23 30 16 x 8 18 x 9
Main jet		#102 #165
Main air bleed		# 60 # 60
Slow jet		# 48 # 80

Slow air bleed		#160	#100
Slow economizer	mm	1 8	—
Slow economizer bleed		#100	—
Power jet		# 41	
Float level	mm	22	
Fuel pressure	kg/cm ²	0 24	
Main nozzle	mm	2 6	2 5

AUTOMATIC CHOKE

DESCRIPTION

The automatic choke serves to open the choke plate automatically under varying engine conditions

This system consists of an auto-choke heater, an unloader mechanism and some electrical wiring, as illustrated in the following figure

When the engine is cold, the choke plate closes fully

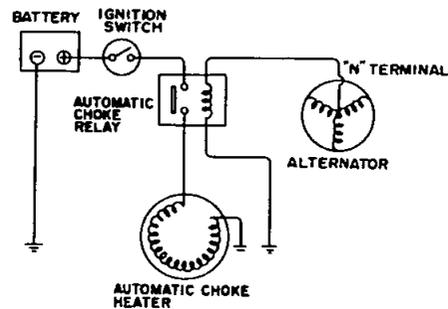
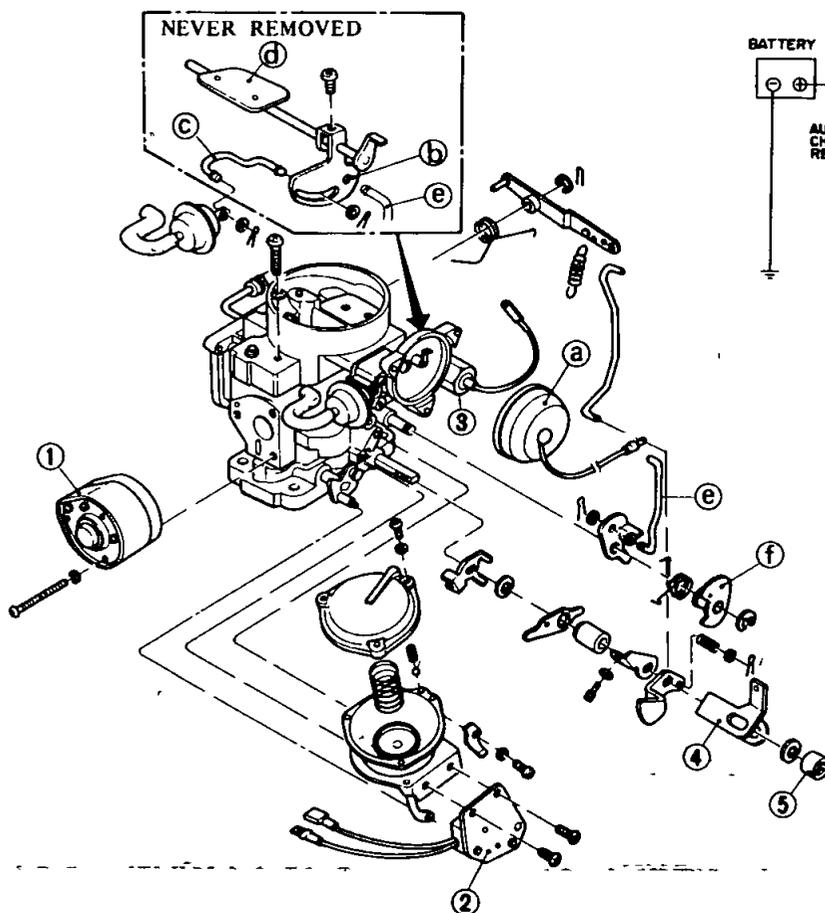
The auto-choke heater is located in the thermostat cover and electric current flows into the heater through the auto-choke relay

The auto-choke relay is located in the relay bracket of the engine compartment and is actuated by the alternator "N" terminal voltage

Consequently, the auto-choke heater actuates only while the engine is running

The bi-metal in the thermostat cover is heated by the heater and opens the choke plate in proportion to its own temperature

The choke unloader mechanism slightly opens the choke plate at wide open throttle



EC431

- 1 B C D D
- 2 Throttle switch
- 3 Anti-dieseling solenoid
- 4 Throttle shaft lever
- 5 Throttle shaft nut

Automatic choke

- a. Thermostat cover (heater with bi-metal)
- b Choke piston lever
- c Choke piston rod
- d Choke plate
- e Choke connecting rod
- f Fast idling cam

EC518

Fig EF-19 Automatic choke

INSPECTION

- 1 Before starting engine, fully depress accelerator pedal to ensure that choke plate closes properly
- 2 Push choke plate with a finger and check for binding in choke plate

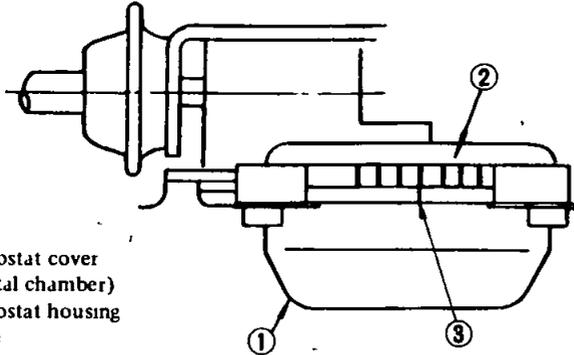
linkage

- 3 Check to be sure that thermostat cover is set to meet score marks on the thermostat housing and cover

about 20°C

If it isn't, replace thermostat cover

Note Remove air cleaner to facilitate this operation



- 1 Thermostat cover (Bi-metal chamber)
- 2 Thermostat housing
- 3 Groove

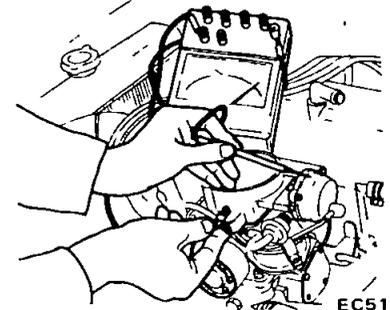
ET034

Fig EF-20 Bi-metal setting

- 4 Check auto-choke heater source wiring for secure fitting
- 5 Start engine and check that choke plate progressively opens as engine

warms up

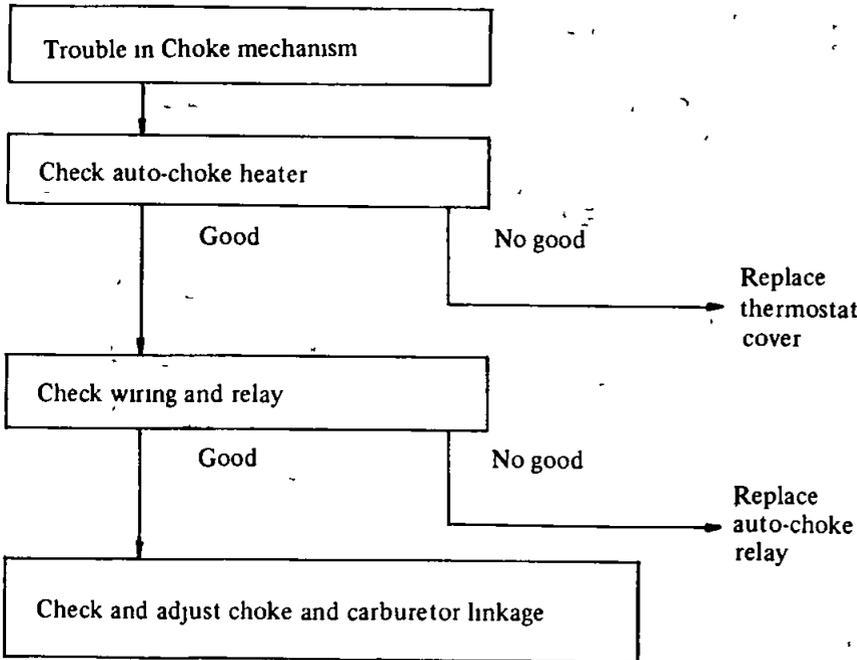
If it doesn't, there is a problem in the auto-choke mechanism So proceed with trouble diagnoses



EC519

Fig EF-21 Measuring resistance of auto-choke heater

TROUBLE DIAGNOSES AND CORRECTIONS



AUTO-CHOKE HEATER

Inspection

Measure the resistance of auto-

choke heater with a low reading ohm-meter

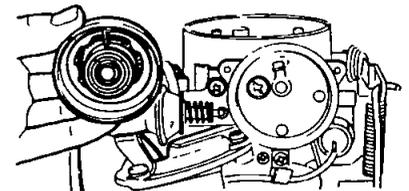
Ensure that resistance between auto-choke heater terminal and thermostat housing is $8.6\Omega \pm 0.3$ at

Replacement

The auto-choke heater is installed in the thermostat cover The cover is secured to the thermostat housing with three screws

- 1 Remove three screws retaining thermostat cover The cover can then be taken out easily

Note Each screw has a small retainer Be careful not to lose them



EC520

Fig EF-22 Removing thermostat cover

- 2 Install new cover with three screws In installing cover, bi-metal must be set

- 3 Set thermostat cover score mark to the score mark on thermostat housing Refer to Figure EF-20

- 4 Secure the three screws

AUTO-CHOKE RELAY AND WIRING

Inspection

1 Turn ignition switch "ON" and check the voltage of harness side terminal of auto-choke heater with a low reading voltmeter. No voltage should exist. If voltage exists, auto-choke relay is out of order. Thus check relay.

Note The harness for auto-choke heater is blue (L).

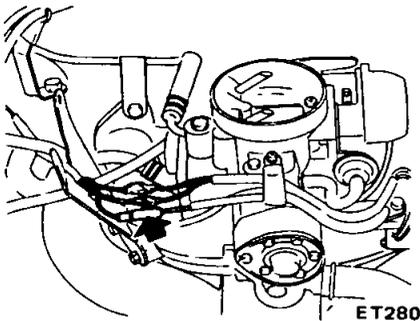


Fig EF-23 Auto-choke heater connector

2 Start engine and check the voltage of harness side terminal of auto-choke heater with a low reading voltmeter as in step 1.

If a voltage of 12V exists, the relay is in good condition.

If it doesn't, check auto-choke relay.

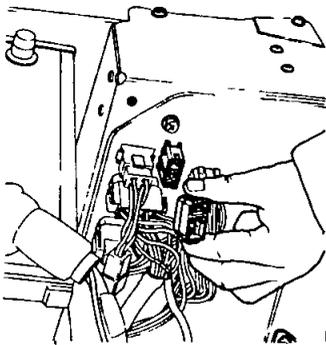


Fig EF-24 Checking auto-choke relay

3 Disconnect connector for auto-choke relay and check the continuity through auto-choke relay. In the normal condition, continuity should not exist between ① and ②.

When 6V direct current is applied between ③ and ④, continuity between ① and ② should exist. If it doesn't, replace auto-choke relay.

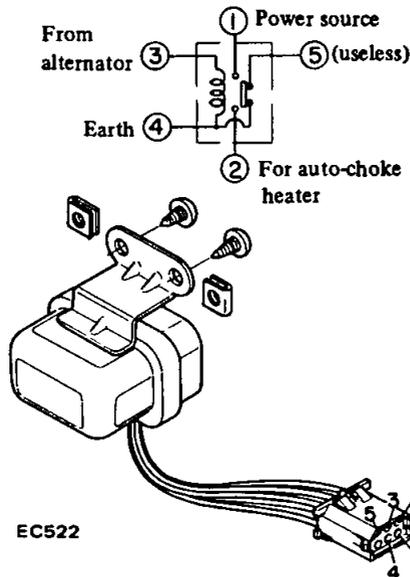


Fig EF-25 Auto-choke relay

Replacement

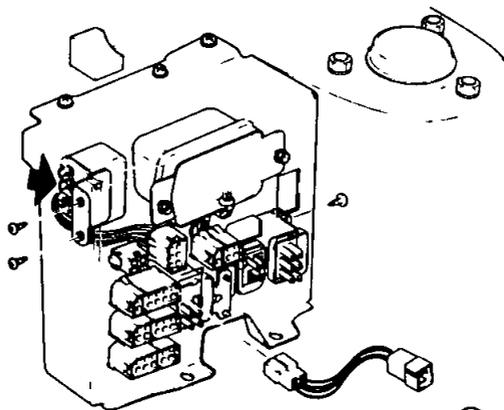
The auto-choke relay is installed behind the relay bracket in the engine compartment (R/H).

1 Remove screws retaining relay bracket to dash side panel (R/H).

Note Three screws are at upper end of bracket and other two at bottom.

2 Remove screw retaining auto-choke relay to relay bracket. Relay can then be taken out.

3 Install new relay in the reverse sequence of removal.



- 1 2-point relay
- 2 Voltage regulator
- 3 Auto-choke relay
- 4 Light relay
- 5 Horn

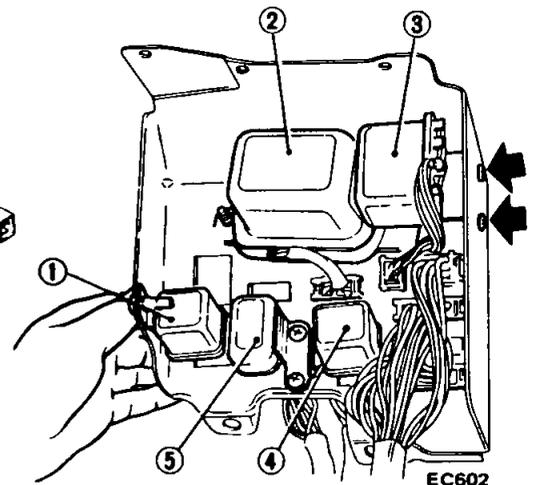


Fig EF-26 Removing auto-choke relay

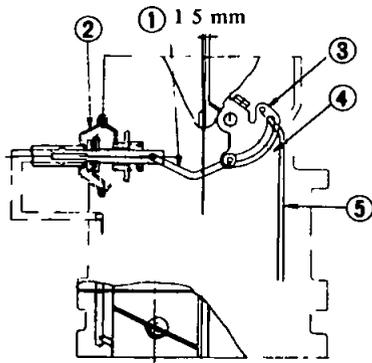
ADJUSTMENT

Vacuum break adjustment

1 Completely close choke valve.
2 Hold choke valve close by stretching a rubber band between choke piston lever and stationary part of carburetor.

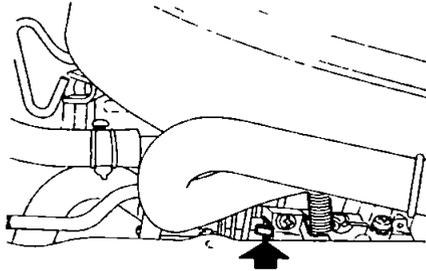
3 Grip vacuum break rod with pliers, and pull straight fully.

4 Under this condition, adjust the gap between choke valve and carburetor body to 15 mm by bending vacuum break rod. See Figures EF-27 and EF-28.

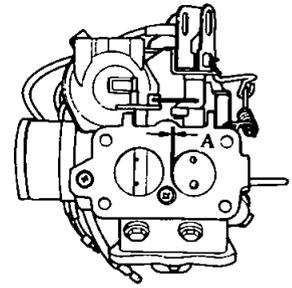


- ET033
- 1 Choke piston rod
 - 2 Diaphragm
 - 3 Choke piston lever
 - 4 Choke valve
 - 5 Choke connecting rod

Note Make sure that throttle valve opens when carburetor is mounted on the car
If throttle valve fails to open, unloader becomes inoperative, resulting in poor acceleration after engine is started



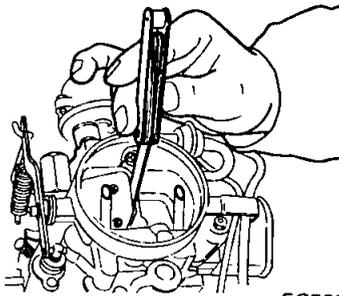
EC525



EC527

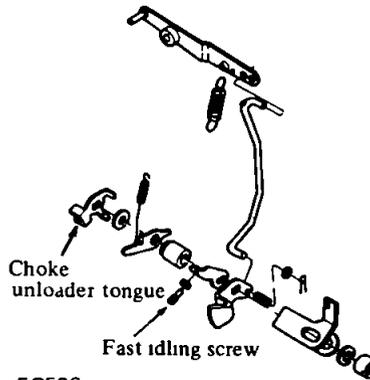
View from the bottom of carburetor

Fig EF-30 Measuring throttle valve clearance



EC523

Fig EF-27 Vacuum break adjustment



EC526

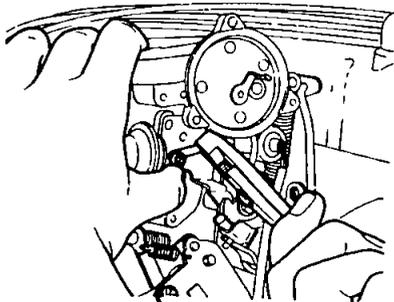
Fig EF-29 Adjusting choke unloader

Fast idling cam steps



EC528

Fig EF-31 Fast idling cam



EC524

Fig EF-28 Adjusting vacuum break rod

Fast idling adjustment (Carburetor removed)

If a new or reconditioned carburetor is being installed, tune as follows
1 With carburetor assembly removed from engine, measure throttle valve clearance ("A" in Figure EF-30) with a wire gauge, placing the upper side of fast idling screw on the second step of the fast idling cam

2 The clearance should be specified value in the following table

M/T	0.76 mm
A/T	0.98 mm

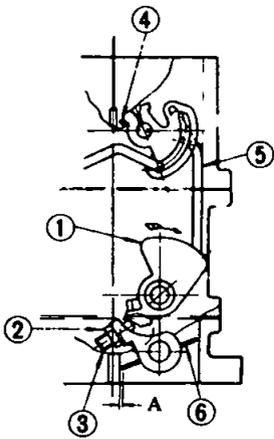
If it isn't, adjust the clearance by fast idling screw

Choke unloader adjustment

- 1 Close choke valve completely
- 2 Hold choke valve close by stretching a rubber band between choke piston lever and stationary part of carburetor
- 3 Open throttle lever all the way

Under this condition, adjust the clearance between choke plate and carburetor body to 2.5 mm by bending unloader tongue. See Figure EF-29

	Throttle opening (degree)	Clearance "A" mm	Engine revolution (rpm)
			L18
Manual Transmission	11 ± 0.5	0.76 ± 0.05	2,000 ± 100
Automatic Transmission	13 ± 0.5	0.98 ± 0.05	2,400 ± 100



ET033

- 1 Fast idling cam
- 2 Nut
- 3 Fast idling screw
- 4 Choke valve
- 5 Choke connecting rod
- 6 Throttle valve

Fig EF-32 Adjusting the clearance of throttle valve

- 3 Install carburetor on engine
Start engine and ensure that fast idling screw is on the second step
- 4 After warming up, measure engine rpm. It should be at the specified value
- 5 To adjust fast idle rpm, turn fast idling screw clockwise to increase and counterclockwise to decrease

Fast idling adjustment (Carburetor installed)

If fast idling speed is too high or too low, adjust fast idling

1. Warm up engine thoroughly
- 2 Stop engine and adjust fast idling screw

Turn fast idling screw clockwise to increase, or counterclockwise to decrease, engine speed. See Figure EF-32

3. Start engine and place upper side of fast idling screw on second step of fast idling cam. See Figure EF-31

Ensure that engine speed is within the specified range

If not, repeat above operation to obtain correct engine speed

IDLE COMPENSATOR

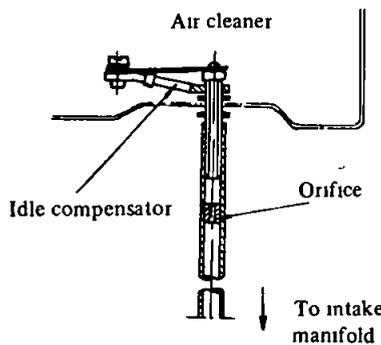
DESCRIPTION

The idle compensator is basically a thermostatic valve which functions to introduce the air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperature

The bi-metal attached to the idle compensator detects the temperature of intake air, and opens or closes the valve

The idle compensator operates in response to the underhood air temperature as shown below

Intake air temperature	Bi-metal function
Below 50°C	Fully close
50°C to 65°C	Close to open
Above 65°C	Fully open



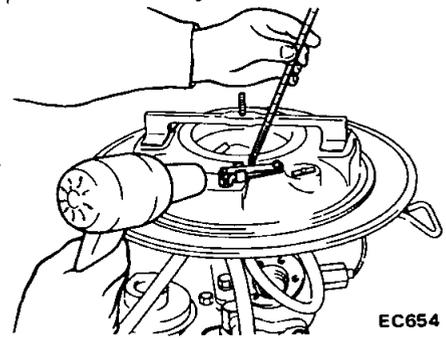
EF004

Fig EF-33 Construction of idle compensator

INSPECTION

- 1 Warm up engine completely
- 2 Open engine hood and remove air cleaner cover
- 3 Direct warm air to idle compensator with a heat gun

And measure operating temperature of idle compensator



EC654

Fig EF-34 Checking idle compensator for operation

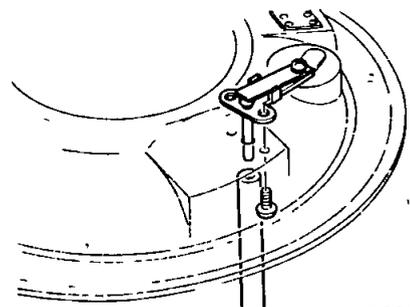
Notes

- a. Engine operation is not stabilized due to warm air flow before idle compensator reaches 50 to 65°C. As idle compensator reaches its operating temperature, secondary air is introduced into intake manifold and engine operation becomes stabilized.
- b. Locate stick temperature gauge as close to sensor as possible so that warm air from dryer is directed to these parts evenly.

- 4 Idle compensator is in good order if a "hissing" sound is heard when its temperature reaches 50 to 65°C. If not, replace idle compensator

REPLACEMENT

- 1 Remove air cleaner
- 2 Disconnect hose from idle compensator
- 3 Remove two setscrews from back of air cleaner lower cover. Idle compensator can then be taken out easily



EC618

Fig EF-35 Removing idle compensator (L24 and L26 engines)

- 4 Installation is in the reverse sequence of removal

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EC

EMISSION CONTROL SYSTEM

EC

GENERAL DESCRIPTION	EC- 2
CRANKCASE EMISSION CONTROL SYSTEM	EC- 2
EXHAUST EMISSION CONTROL SYSTEM	EC- 3
EVAPORATIVE EMISSION CONTROL SYSTEM	EC-11

GENERAL DESCRIPTION

There are three types of control system

They are

- (1) Crankcase emission control system
- (2) Exhaust emission control system
- (3) Evaporative emission control system

CRANKCASE EMISSION CONTROL SYSTEM

CONTENTS

DESCRIPTION	EC-2	Ventilation hose	EC-2
INSPECTION	EC-2	REPLACEMENT	EC-3
P C V valve	EC-2		

DESCRIPTION

This system returns blow-by gas to both the intake manifold and carburetor air cleaner

The positive crankcase ventilation (P C V) valve is provided to conduct crankcase blow-by gas to the intake manifold

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P C V valve

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air

The ventilating air is then drawn from the clean side of the carburetor air cleaner, through the tube connecting the carburetor air cleaner to the rocker cover, into the crankcase

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the tube connection in the reverse direction

On cars with an excessively high blow-by, some of the flow will go through the tube connection to the carburetor air cleaner under all conditions

INSPECTION

P.C.V. valve

Check P C V valve in accordance with the following method

With engine running at idle, remove ventilation hose from P C V valve, if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet Replace P C V valve in accordance with the Maintenance Schedule

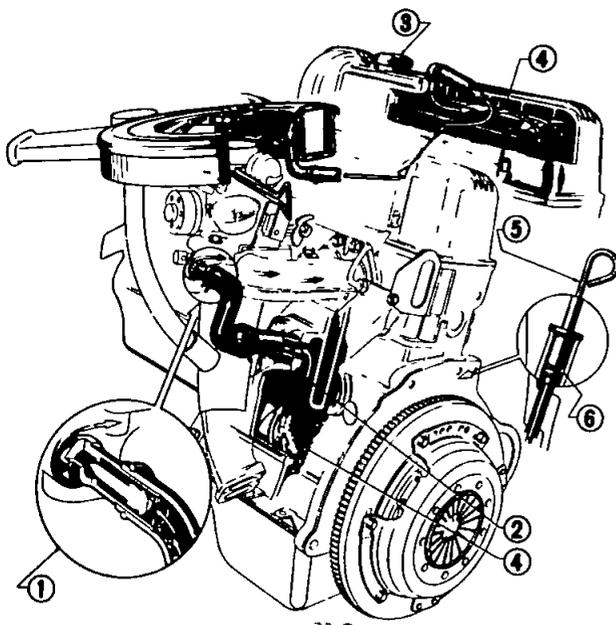


Fig EC-1 Crankcase emission control system

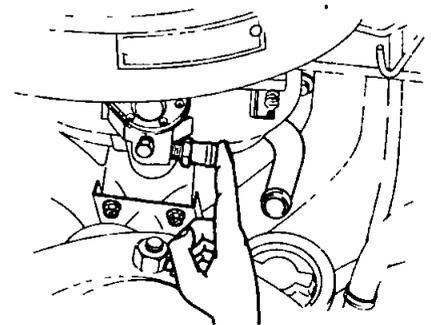
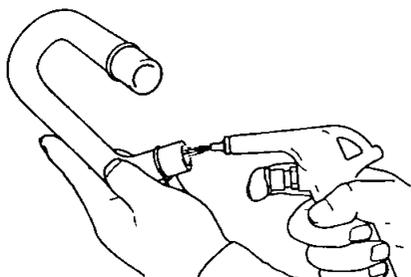


Fig EC-2 Checking P C V valve

Ventilation hose

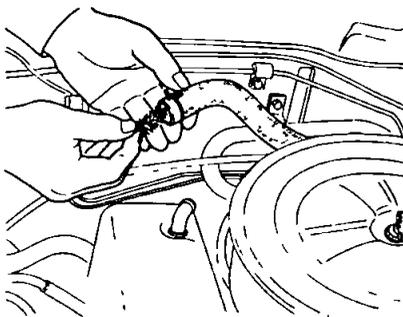
- 1 Check hoses and hose connections for leaks
- 2 Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace

Emission Control System



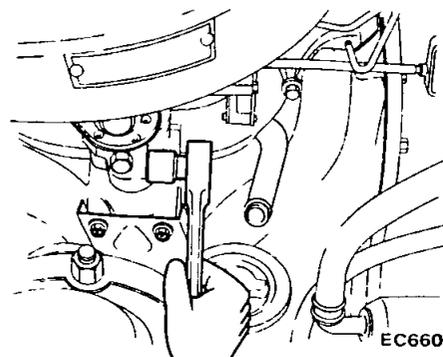
ET277

Fig EC-3 Checking ventilation hose



EC598

Fig EC-4 Checking flame arrester



EC660

Fig EC-5 Removing P C V valve

3 Ensure that flame arrester is securely inserted in hose between air cleaner and rocker cover

REPLACEMENT

- 1 Disconnect ventilation hose from P C V valve
- 2 Remove P C V valve from intake manifold See Figure EC-5

3 To install, reverse the removal procedure

Notes

- a After installing P C V valve on intake manifold, ensure that there is no air leakage

Tightening torque

3 0 to 4 0 kg-m

- b. If ventilation hose clamp is fatigued, replace

EXHAUST EMISSION CONTROL SYSTEM

CONTENTS

SPARK ADVANCE CONTROL SYSTEM	EC- 3	DISTRIBUTOR (2-point type)	EC- 8
DESCRIPTION	EC- 3	BOOST CONTROLLED DECELERATION	
INSPECTION	EC- 4	DEVICE (B C D D)	EC- 8
TROUBLE DIAGNOSES AND CORRECTIONS	EC- 5	DESCRIPTION	EC- 8
WATER TEMPERATURE SWITCH	EC- 5	INSPECTION	EC- 9
2-POINT RELAY	EC- 5	ADJUSTMENT	EC- 9
THROTTLE SWITCH	EC- 7	REPLACEMENT	EC-10

SPARK ADVANCE CONTROL SYSTEM

DESCRIPTION

The spark advance control system serves to change ignition timing under varying car running conditions so as to reduce HC and NOx emissions

This system consists of a throttle switch, a two-point distributor and some electrical wiring and sensors as illustrated in the following figure The main component of this system is the distributor, which has two breaker points One is for advance – optimum ignition timing and the other for retard – delayed by 6° from optimum timing

When the car is running in wide open throttle, the advance timing (optimum one) is used in order to improve fuel consumption Conversely, the retard timing is used when the car is running in urban areas The throttle switch detects such running conditions by monitoring the throttle valve opening

Emission Control System

The advance and retard timings are changed by a relay which monitors whether the throttle opens more than 40° or less than 40°. But when the

engine is cold, the optimum timing is always obtained with the aid of the water temperature switch

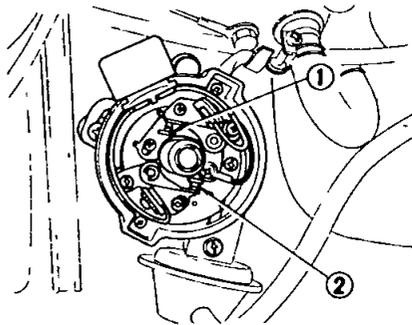
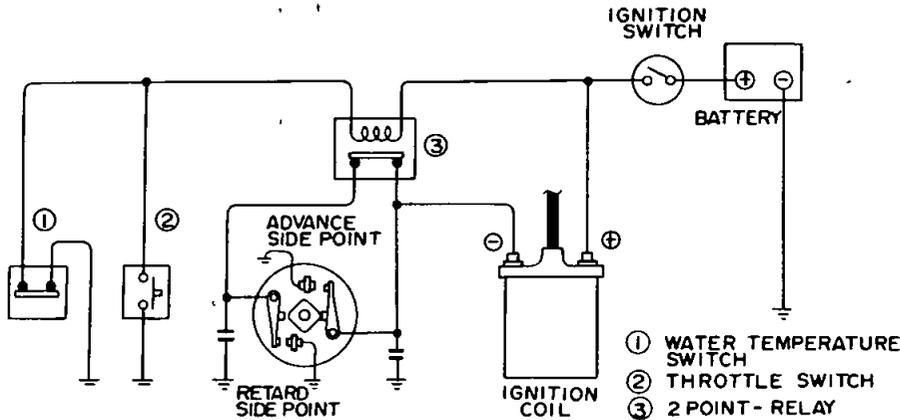


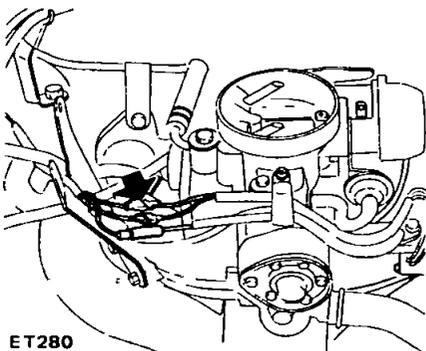
Fig EC-6 Throttle control system

INSPECTION

1 Warm up engine completely and then turn it off

2 Disconnect pair of wires from throttle switch installed beside carburetor

Note To facilitate disconnecting these wires, remove air cleaner



ET280

Fig EC-7 Disconnecting throttle switch wire

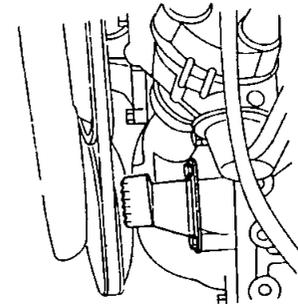
3 Start engine and keep it at idling speed

Check ignition timing while repeatedly connecting and disconnecting the two harness side lead wires which were connected to throttle switch

4 If the results are as below, the system is in good condition

- Connect two harness wires → Advance timing
- Disconnect two harness wires → Retard timing

Note Difference between "Advance" and "Retard" is about 6°.



EC482

Fig EC-8 Ignition timing mark

5 If not, proceed with trouble diagnoses

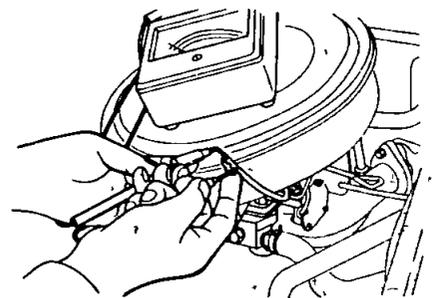
If the system is in good condition, proceed as follows

6 After stopping engine, check continuity between two lead wires of throttle switch with an ohmmeter or test lamp

- When accelerator pedal is depressed more than half its stroke, continuity should exist
- Conversely, when accelerator is released, continuity should not exist

If above test does not produce proper results, replace or adjust throttle switch

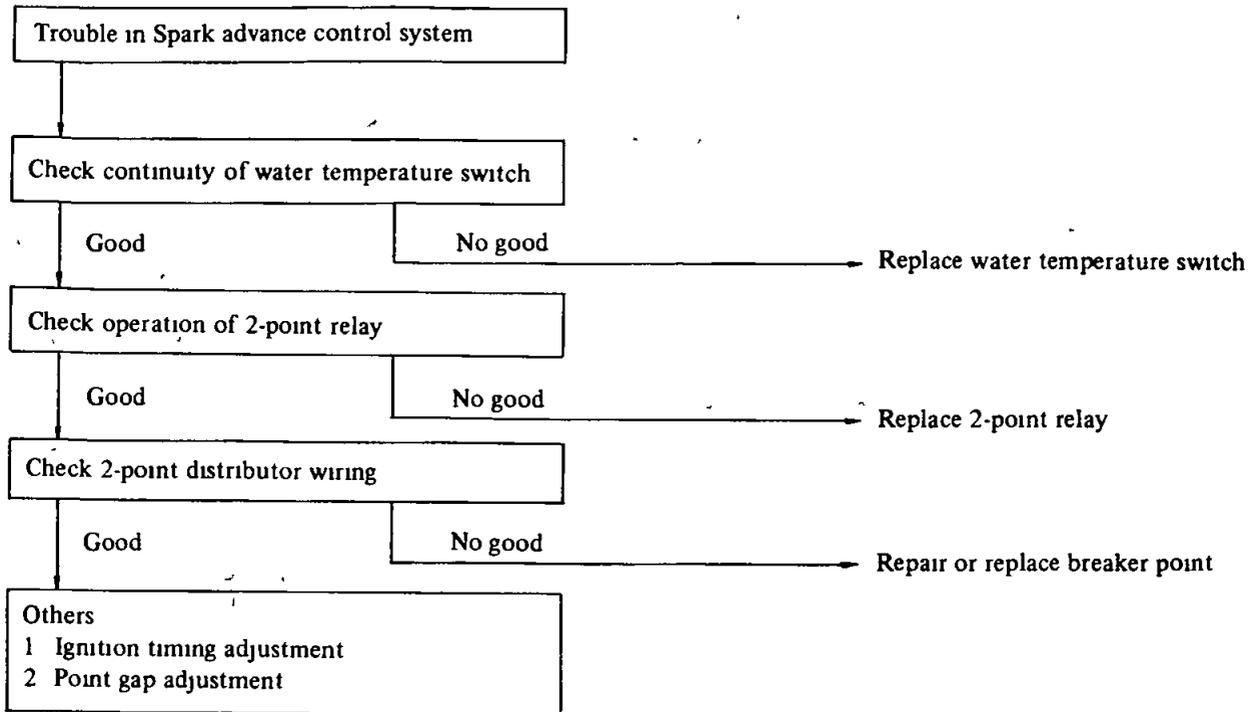
Accelerator pedal	Continuity
Depressed	Yes
Released	No



EC483

Fig EC-9 Checking throttle switch

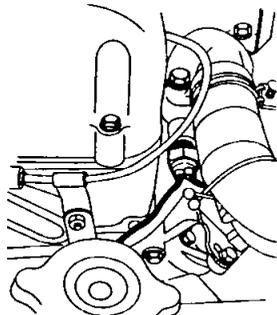
TROUBLE DIAGNOSES AND CORRECTIONS



WATER TEMPERATURE SWITCH

The water temperature switch, equipped with a pair of lead wires, is installed on the thermostat housing

One lead wire is connected to the harness wire and the other is for body earth. When the engine is warmed up (coolant is above 50°C), there is no continuity. Conversely, when the engine is cold (coolant is below 50°C), there is continuity between the two terminals.



EC484

Fig EC-10 Water temperature switch

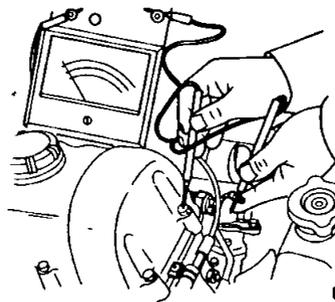
Inspection

- 1 Disconnect water temperature switch lead wires from harness wire

- 2 Check continuity between the terminal and engine body with an ohmmeter or test lamp

There should be no continuity when engine is sufficiently warmed up (coolant temperature is above 50°C). If continuity exists, replace water temperature switch.

Note After engine has cooled down, ensure that there is continuity in the switch.



EC485

Fig EC-11 Checking continuity of water temperature switch

Replacement

- 1 Disconnect pair of lead wires from water temperature switch
- 2 Remove water temperature switch from thermostat housing

Note Some coolant will flow out when switch is removed, so have a rag handy.

- 3 Install new water temperature switch

Tightening torque
2.0 to 3.0 kg-m

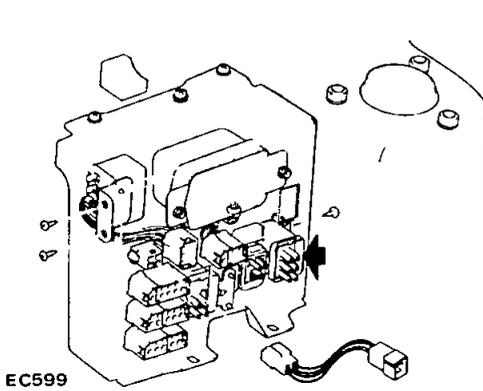
Note Prior to installing switch to thermostat housing, be sure to apply sealer to thread of new switch.

2-POINT RELAY

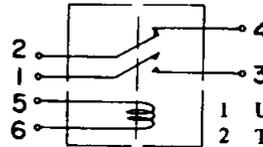
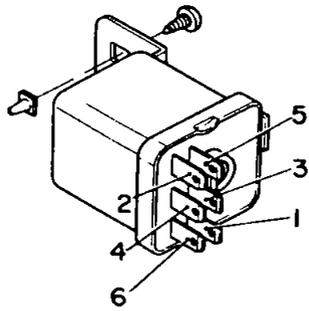
The 2-point relay is installed on the relay bracket and is connected to the engine compartment harness.

This relay changes the ignition timing by breaking or not breaking the retard side point circuit.

In the normal condition, the retard side point circuit is alive. When the engine is warmed up and the throttle valve is opened wide, this 2-point relay breaks the retard side point circuit. Then the ignition timing is changed to the advance side (optimum) timing.



EC599



- 1 Useless
- 2 To advance point
- 3 Useless
- 4 To retard point
- 5 Power source
- 6 To water temperature switch & throttle switch

EC487

Fig EC-12 2-point relay

Inspection

- 1 Turn ignition switch on

Note It is unnecessary to start engine

- 2 Disconnect pair of distributor lead wires at connector

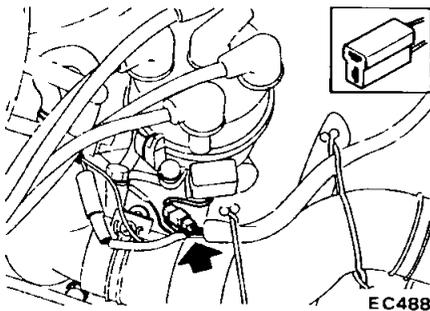
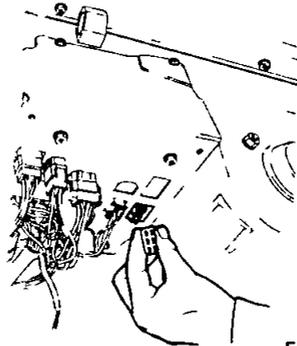


Fig EC-13 Disconnecting distributor lead wire

Replacement



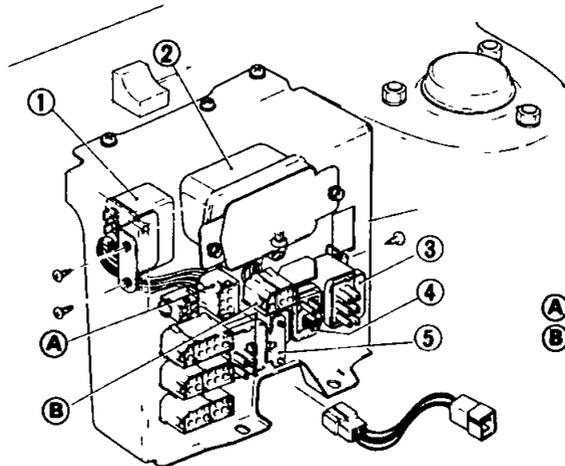
EC600

Fig EC-14 Disconnecting 2-point relay

The 2-point relay is installed behind the relay bracket in the engine compartment

- 1 Disconnect battery ground cable and relay connector
- 2 Remove screws retaining relay bracket and pull bracket out a little

Note. Three screws are at upper side of bracket and other two are at the bottom.



- 1 Auto-choke relay
- 2 Voltage regulator
- 3 2-point relay
- 4 Horn relay
- 5 Light relay

- (A) Connector for auto-choke relay
- (B) Connector for voltage regulator

- 3 Check continuity between harness side terminals in the connector disconnected in step 2

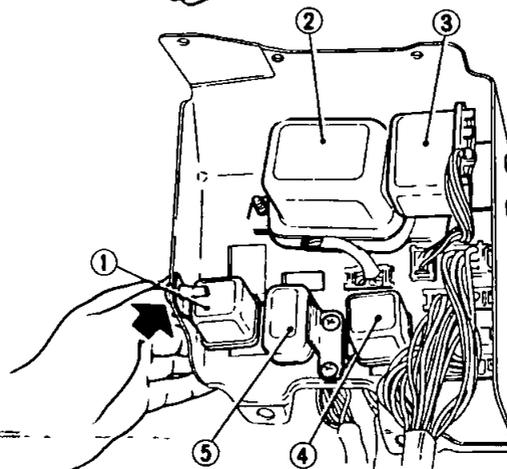
When engine is warm enough, continuity should exist. If not, replace 2-point relay

Note When engine is cold, disconnect water temperature switch terminal

- 4 Then depress accelerator pedal more than half its stroke, and check continuity as in step 3

If continuity does not exist, 2-point relay is in good condition

If it does, replace 2-point relay



- 1 2-point relay
- 2 Voltage regulator
- 3 Automatic choke
- 4 Light relay
- 5 Horn

EC601

Fig EC-15 2-point relay replacement

- 3 After removing 2-point relay retaining screw, relay can easily be taken out
- 4 Install new relay in the reverse sequence of removal

THROTTLE SWITCH

Inspection

- 1 Check continuity between two lead wires of throttle switch with an ohmmeter or test lamp
 - o When accelerator pedal is depressed more than half its stroke, continuity should exist
 - o When accelerator is released, continuity should not exist

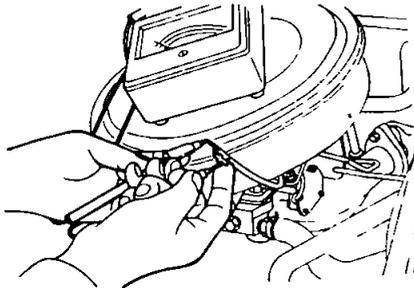


Fig EC-16 Checking continuity of throttle switch

- 2 If above conditions are not met, replace or adjust throttle switch

Replacement

The throttle switch is installed on the rear side of the carburetor

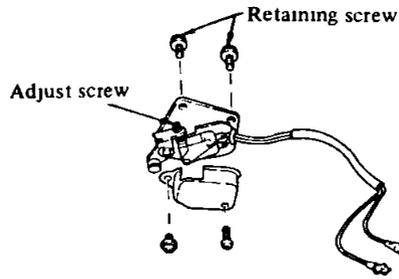
Whenever the throttle switch is removed from the carburetor, the throttle switch touch point must be readjusted

- 1 Remove air cleaner housing
- 2 Disconnect two throttle switch lead wires
- 3 Remove two screws retaining throttle switch to carburetor

Throttle switch can then be taken out

- 4 Installation can be carried out in the reverse sequence of removal

Note In reinstalling throttle switch, some adjustment is necessary. Refer to the following section, Adjustment



EC491

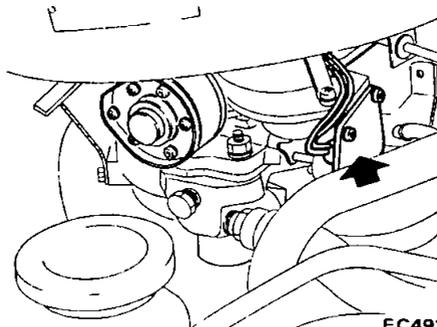
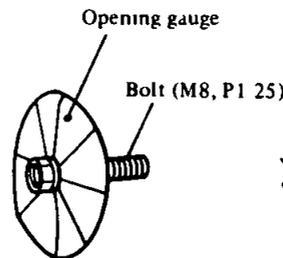


Fig EC-17 Throttle switch



EC493

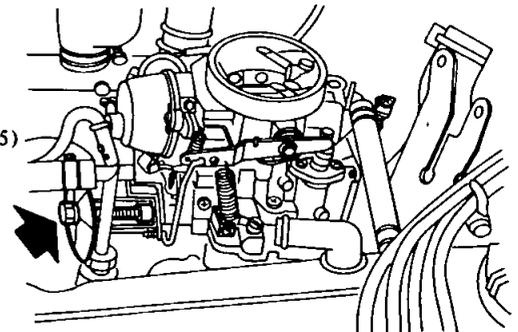
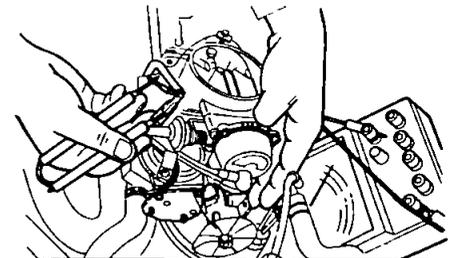


Fig EC-18 Installing throttle opening gauge

- 3 Then pull throttle lever shaft by hand and confirm that touch point is at 40° opening of throttle valve. If not, adjust touch point by adjusting throttle switch adjusting screw

Notes

- a Touch point can be detected with ohmmeter or test lamp.
- b. The throttle switch also clicks at touch point



EC494

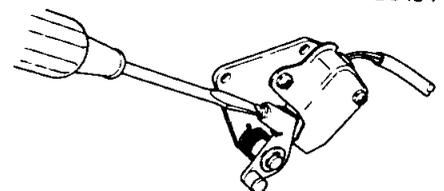


Fig EC-19 Adjusting touch point of throttle switch

Adjustment

The throttle switch should operate at the throttle valve opening of about 40°

Consequently, touch point adjustment of the throttle switch is necessary

- 1 Disconnect accelerator torsion shaft from carburetor. Torsion shaft can be disconnected by pulling pin securing stopper
- 2 Install a "bolt with opening gauge" onto throttle shaft nut of carburetor as in the following figure

Notes

- a Opening gauge can be made with a conventional M8 bolt and paper. On the paper, mark the 40° point
- b Indicator is also necessary. Indicator should be installed on static part of carburetor

DISTRIBUTOR (2-point type)

The 2-point type distributor has two breaker points and condensers located opposite to each other with a phase difference of 6°

Other than the dual point mechanism, the construction of the distributor follows the conventional design

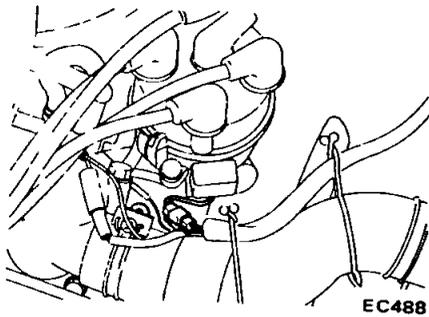


Fig EC-20 Distributor

When point surface is rough, remove irregularities with fine sandpaper of #500 or #600 or with oil stone.

When wear on contact points is noticeable, replace points together with contact arm

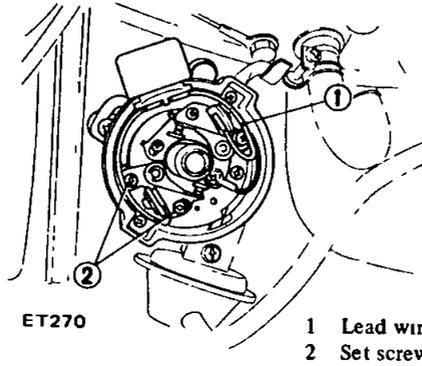


Fig EC-21 Breaker

<< Vacuum advance mechanism mechanical parts >>

If vacuum advance mechanism fails to operate properly, check for the following items and correct the malfunction as required

1 Check vacuum inlet for signs of leakage at its connection. If necessary, retighten or replace

2 Check vacuum diaphragm for air leak

If leak is found, replace vacuum controller assembly

3 Inspect breaker plate for smooth movement

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

Inspection

<< CAP AND ROTOR HEAD >>

The cap and rotor head must be inspected at regular intervals. In addition, point replacement and point gap adjustment also should be carried out at regular intervals

1 Remove cap and clean all dust and carbon deposits from cap and rotor

If cap is cracked or leaking, replace it

2 Check insulator of point lead wires

If insulator is cracked or deteriorated, replace it

<< Contact point adjustment >>

Contact point should be replaced in accordance with the Maintenance Schedule

Standard point gap is 0.45 to 0.55 mm. If size is off the standard, adjustment can be made by loosening point screws. Gap gauge is required for adjustment

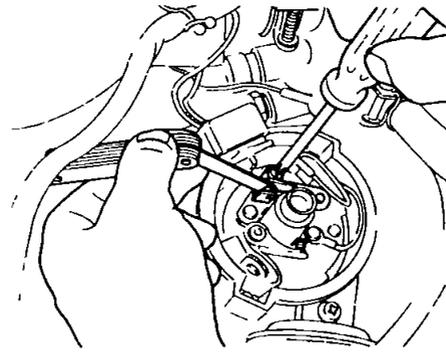


Fig EC-22 Adjusting point gap

<< Contact point replacement >>

First turn out setscrews 1 to 1.5 turns at contact arm and primary lead wire connection just far enough to pull out primary lead terminal

Referring to Figure EC-21, unscrew two contact set fixing screws and remove lead wire

Holding contact arm with fingers, pull contact set out toward you by raising it slightly. Contact point and arm can then be removed together

Install new contact point and arm assembly in reverse sequence of removal. Apply a light coating of grease to cam

<< Condenser >>

Satisfactory performance of condenser depends on capacity and degree of insulation. Thus ensure that terminals are clean and setscrews are tight

Condenser should be checked with a condenser tester

BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.)

DESCRIPTION

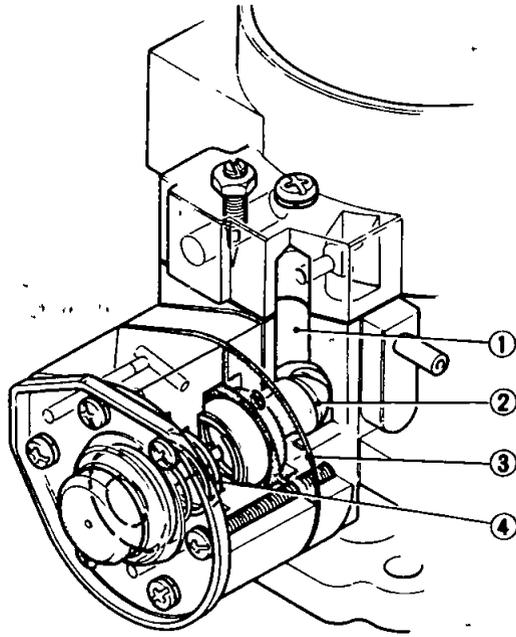
The B.C.D.D. serves to reduce HC emissions during coasting

The high manifold vacuum during coasting prevents the complete combustion of the mixture gas due to the reduced amount of mixture gas available

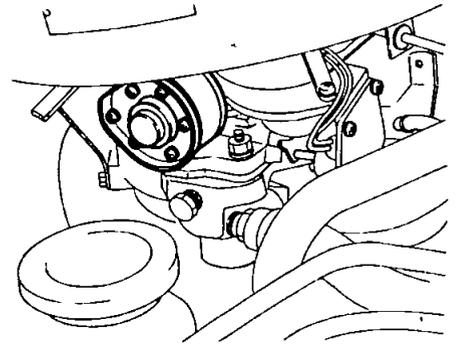
As a result, an excess amount of HC is emitted into the atmosphere

When manifold vacuum exceeds the set value, this B.C.D.D. operates to supply additional mixture gas of optimum mixture ratio

Complete combustion of fuel is assisted by this additional mixture, and HC emissions are thereby reduced



- 1 Air passage
- 2 Mixture control valve
- 3 Diaphragm-II
- 4 Vacuum control valve

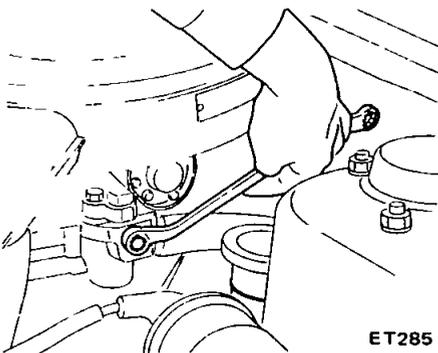


EC514

Fig EC-23 Boost controlled deceleration device

INSPECTION

- 1 Connect vacuum gauge to intake manifold

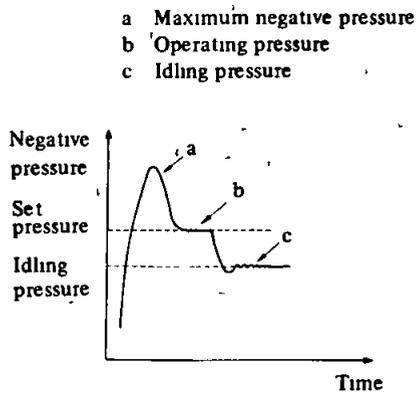


ET285

Fig EC-24 Connecting vacuum gauge

- a It will suddenly rise-up to about -600 mmHg
- b It will decrease gradually to -560 mmHg and stay there for a while
- c It will drop to idle boost pulse

BCDD remains inoperative and negative pressure decreases with no sustained plateaus while it is falling. See diagram (A). In such a case, adjust operating pressure as follows.



Characteristic curve of BCDD

EC502

Fig EC-25 Characteristic curve of BCDD

Note A service plug is installed on intake manifold. Remove this plug and install an attachment which is equipped with a vacuum gauge

- 2 Start engine and observe vacuum gauge while flooring and releasing accelerator pedal abruptly

Note This operation simulates the engine coasting condition

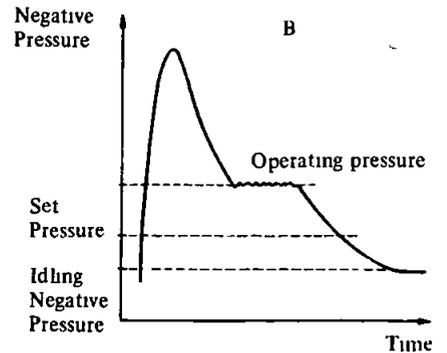
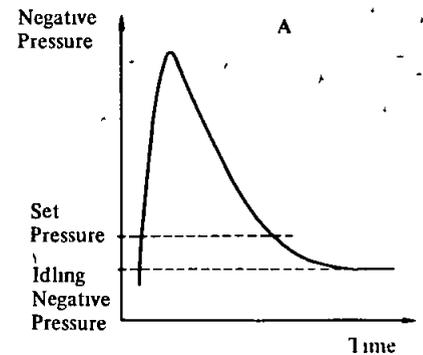
- 3 If BCDD is in good condition, vacuum gauge will indicate the following phenomena

- 4 If it does not react as described above, set pressure must be adjusted. In such a case, refer to Adjustment

ADJUSTMENT

« High operating pressure »

When operating pressure is too high,



EC503

Fig EC-26 Characteristic curve (high operating pressure)

« Low operating pressure »

When operating pressure is too low, engine rpm will not fall to idle speed

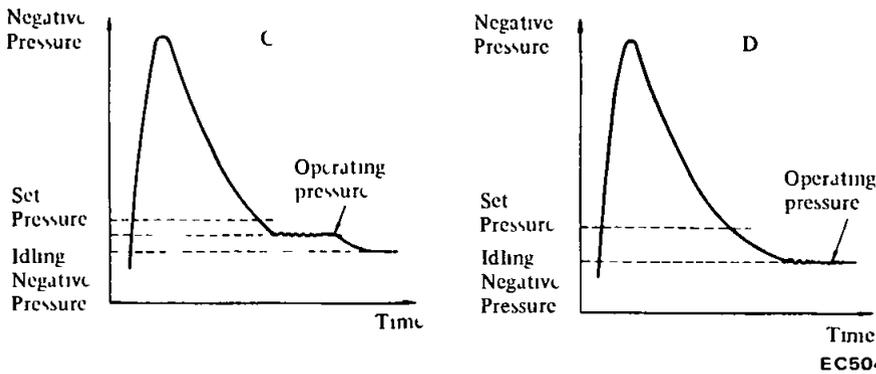


Fig EC-27 Characteristic curve (low operating pressure)

- 1 Remove rubber cap at bottom of B C D D
- 2 Turn adjusting screw slightly
Then, race engine and confirm that operating pressure is at the specified value

B C D D set pressure
-560 ± 10 mmHg

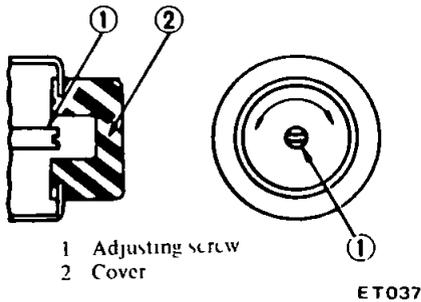


Fig EC-28 Adjusting control valve

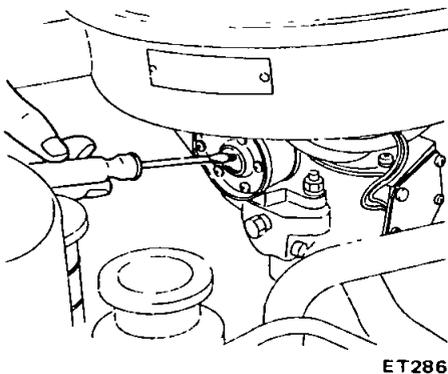


Fig EC-29 Adjusting setscrew

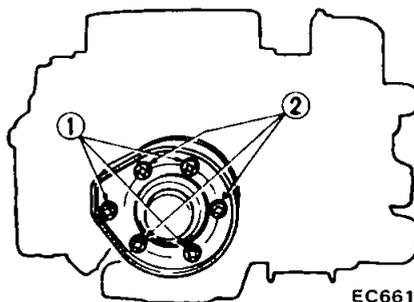
Notes

- a Turning adjusting screw one quarter rotation will cause a change in operation pressure of about 20 mmHg
 - b. Do not fit tip of screwdriver tightly into screw slot
- 3 After adjustment has been completed, install rubber hose and service plug in their original position

REPLACEMENT

- 1 Remove three B C D D securing screws, B C D D assembly can then be taken out from carburetor

Note There are six screws at the bottom of B C D D Three of them are B C D D securing screws and others are B C D D assembly screws



- 1 Securing screws
- 2 Assembly screws

Fig EC-30 Removing B C D D

- 2 New B C D D assembly can be installed in the reverse sequence of removal

Tightening torque
0.2 to 0.4 kg-m

Note After securing three securing screws, rescrew other three B C D D assembly screws in order to avoid warping B C D D body

EVAPORATIVE EMISSION CONTROL SYSTEM

CONTENTS

DESCRIPTION	EC-11	Checking fuel tank vacuum relief valve	
INSPECTION	EC-13	operation	EC-13
Checking fuel tank, fuel liquid separator and vapor vent line	EC-13	REPLACEMENT	EC-13
Checking flow guide valve	EC-13	Flow guide valve	EC-13
		Fuel liquid separator (Sedan and Hardtop)	EC-14
		Fuel liquid separator (Station Wagon)	EC-14

DESCRIPTION

This system is adopted to prevent fuel vapor from evaporating into the atmosphere. The fuel vapor from the sealed fuel tank is led into the crankcase of engine.

This system consists of four basic elements indicated below.

- 1 Fuel tank with positive sealing filler cap

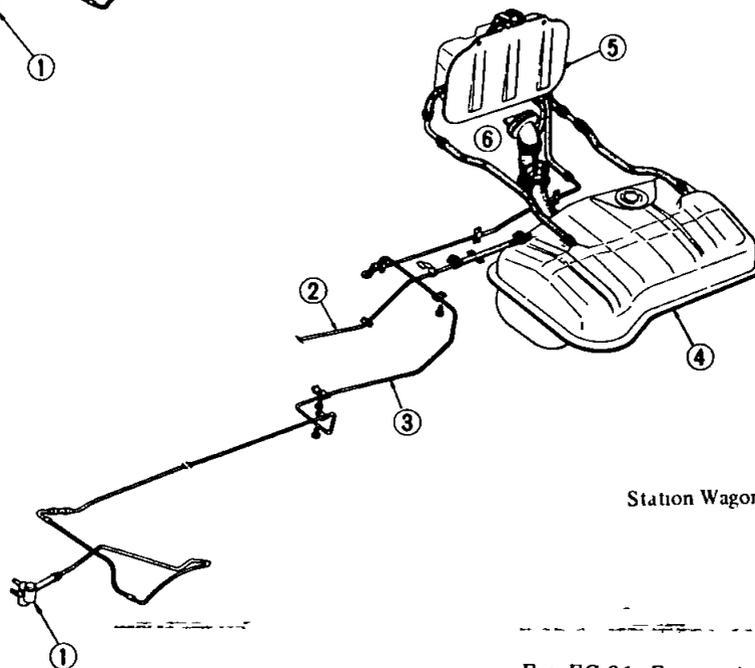
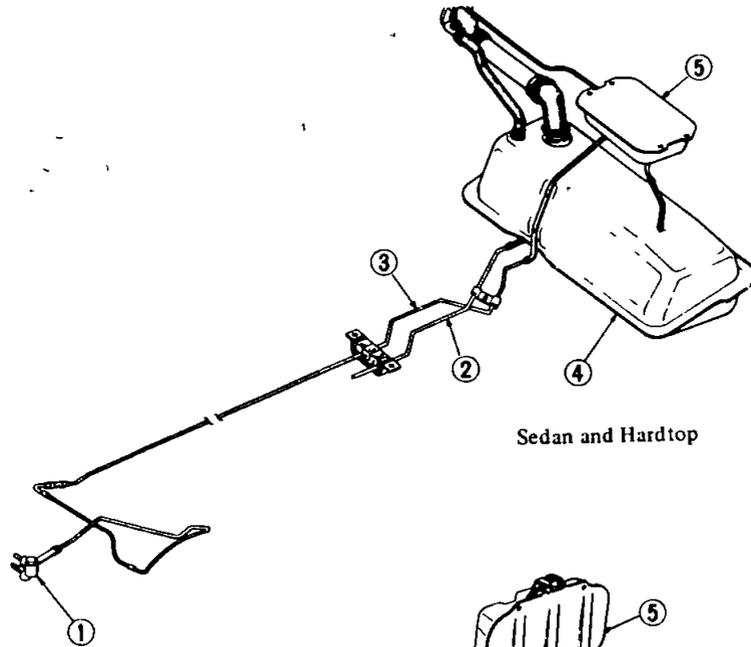
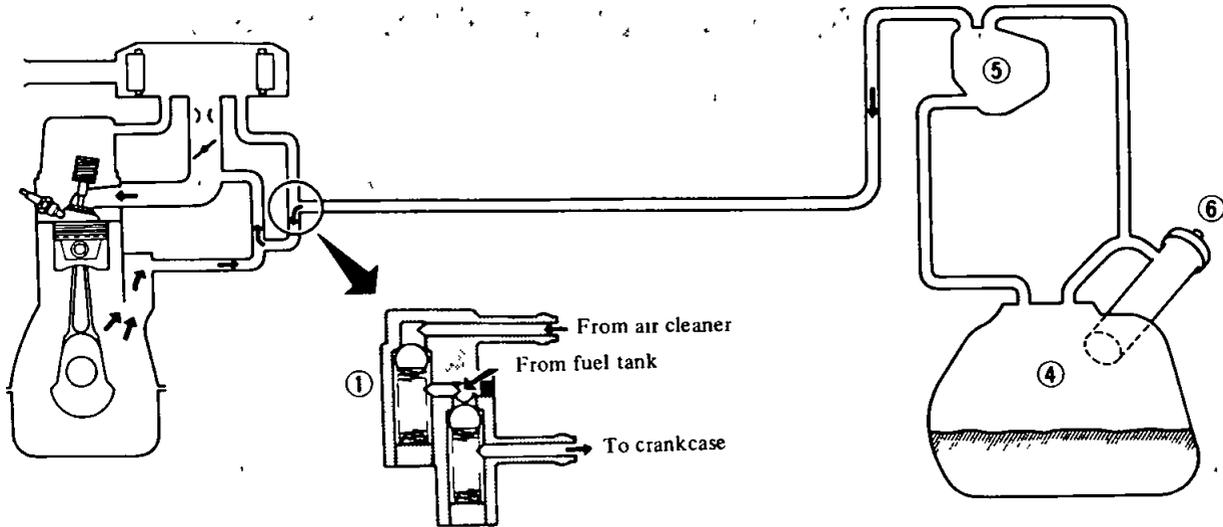
- 2 Fuel liquid separator
- 3 Vapor vent line
- 4 Flow guide valve

The flow guide valve prevents blow-by gas from flowing into the fuel tank and guides fresh air into it, preventing gasoline vapor from escaping into the carburetor air cleaner.

While the engine is stopped, the evaporative gas opens the flow guide

valve and is led to the crankcase. Once the engine starts, the gas evaporating in the crankcase, is sucked into the manifold for combustion. When the pressure of the sealed type fuel tank, fuel liquid separator and vapor vent line becomes negative by decreasing the fuel, the flow guide valve opens to send fresh air from the carburetor air cleaner to the fuel tank.

Emission Control System



- 1 Low guide valve
- 2 Fuel pipe
- 3 Vent line
- 4 Fuel tank
- 5 Fuel liquid separator
- 6 Fuel tank with positive sealing filler cap

EF609

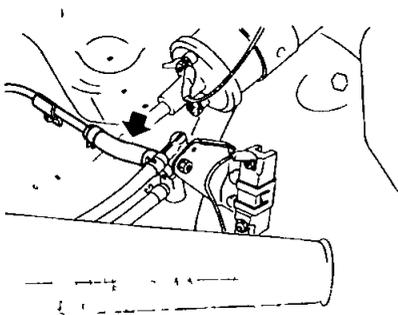
Fig EC-31 Evaporative emission control system

Emission Control System

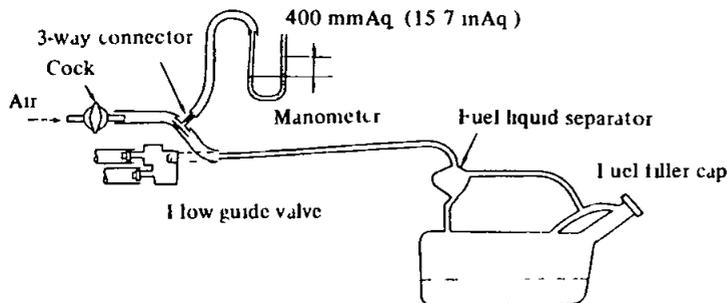
INSPECTION

Checking fuel tank, fuel liquid separator and vapor vent line

- 1 Check all hoses and fuel tank filler cap
- 2 Disconnect the vapor vent line connecting flow guide valve to fuel liquid separator



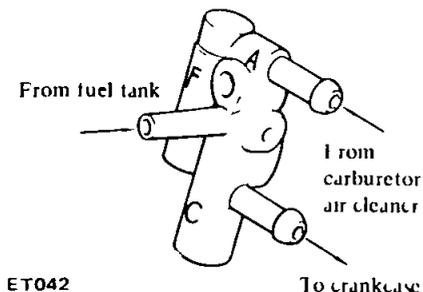
EF610
Fig EC-32 Disconnecting vapor vent line



EC029
Fig EC-33 Checking evaporative emission control system

Checking flow guide valve

This valve is mounted in the engine compartment. Marks A, F and C are engraved in the body of the valve to indicate the connection of the vapor vent line.



ET042

Fig EC-34 Checking flow guide valve

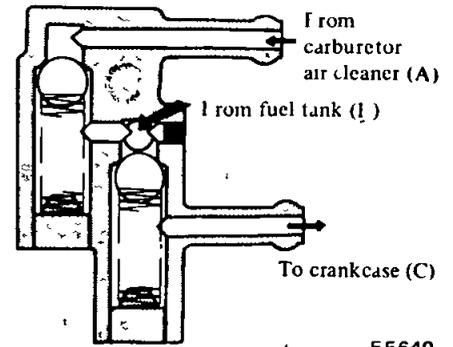
- 3 Connect a 3-way connector, a manometer and a clamp (or an equivalent 3-way change cock) to end of vent line
- 4 Supply fresh air into vapor vent line through cock little by little until pressure becomes about 400 mm Aq (Water height). Then, leave clamp and cock closed for 2.5 minutes
- 5 After 2.5 minutes, measure height of liquid in manometer

Variation in height should remain within 25 mm Aq (Water height)

If height should drop to zero in a short time, some piping may be damaged

- 6 If height does not drop to zero in short time when filler cap is removed, hose is stuffy

Note In case vent line is stuffy, 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.



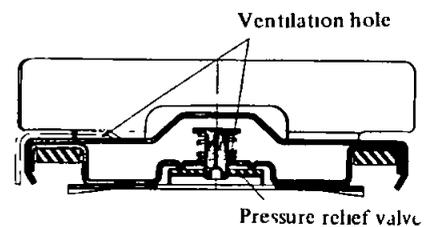
EF640

Fig EC-35 Flow guide valve

Checking fuel tank vacuum-relief valve operation

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, resistance should be disappeared with valve clicks
- 3 If valve is clogged, or if no resistance is felt, replace cap as an assembled unit



ET072

Fig EC-36 Fuel filler cap

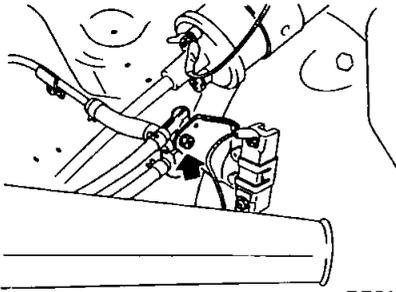
REPLACEMENT

Flow guide valve

The flow guide valve is secured to the bracket in the engine compartment

Remove bolt securing flow guide valve to bracket. Valve can then be taken out easily. Installation is in the reverse sequence of removal.

Emission Control System



EF611

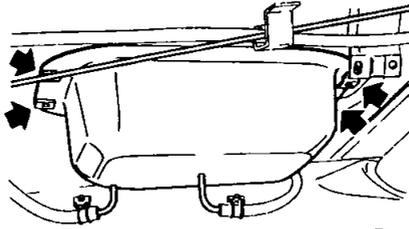
Fig EC-37 Removing flow guide valve

Fuel liquid separator (Sedan, Hardtop)

On the Sedan or Hardtop model, the fuel liquid separator is located on the lower side of the parcel shelf

- 1 Remove rear parcel shelf finisher by removing rivets
- 2 Remove four bolts securing fuel liquid separator to parcel shelf panel

- 3 Fuel liquid separator can then be taken out in the trunk room
- 4 Installation is in the reverse sequence of removal



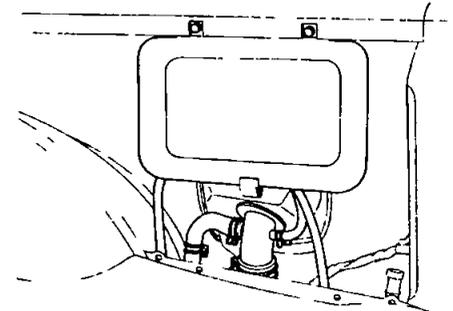
EF612

Fig EC-38 Removing fuel liquid separator (Sedan)

Fuel liquid separator (Station Wagon)

- 1 Remove R H side body trim by removing rivets

- 2 Loosen three screws retaining fuel liquid separator
- 3 Taking out fuel liquid separator, disconnect fuel vapor hoses Fuel liquid separator can then be taken out easily
- 4 Installation is in the reverse sequence of removal



EF613

Fig EC-39 Removing fuel liquid separator (Station Wagon)

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EE

ENGINE ELECTRICAL SYSTEM

EE

BATTERY	EE- 2
STARTING MOTOR	EE- 3
CHARGING CIRCUIT	EE-11
ALTERNATOR	EE-13
REGULATOR	EE-19
IGNITION CIRCUIT	EE-25
DISTRIBUTOR	EE-26
IGNITION COIL	EE-31
SPARK PLUG	EE-32

ENGINE ELECTRICAL SYSTEM

BATTERY

CONTENTS

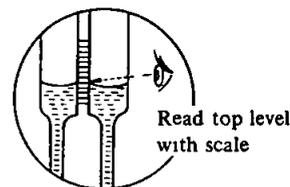
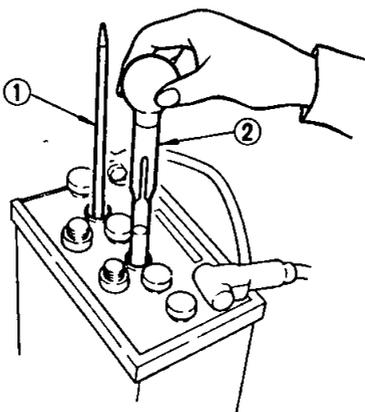
REMOVAL
CHECKING ELECTROLYTE LEVEL
CHECKING SPECIFIC GRAVITY

EE-2 Battery freezing
EE-2 CHARGING
EE-2 INSTALLATION

... EE-3
EE-3
EE-3

REMOVAL

- 1 Disconnect negative and positive terminals
- 2 Remove nuts from battery clamps, take out clamps
- 3 Remove battery



1 Thermal gauge
2 Hydrometer
EE001

Fig EE-1 Checking specific gravity

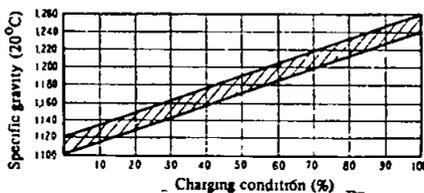
$$St + 0.0007(t - 20)$$

Where

- St Specific gravity of electrolyte at t°C
S20 Specific gravity of electrolyte corrected at 20°C (68°F)
t Electrolyte temperature

For example A hydrometer reading of 1.260 at 30°C (86°F) would be 1.267 corrected to 20°C (68°F), indicating fully charged battery. On the other hand, a hydrometer reading of 1.220 at -10°C (14°F) would be 1.199 corrected to 20°C (68°F), indicating a partially charged battery.

The state of charge of battery can be determined by the following table if the specific gravity of electrolyte is known. Before checking, check to be sure that cells are filled to correct level.



EE002

Fig EE-2 Charging condition

CHECKING ELECTROLYTE LEVEL

Remove six filler plugs and check the electrolyte level in each filler. If necessary, add only distilled water to bring the level to the indicator in each filler opening. Do not overfill.

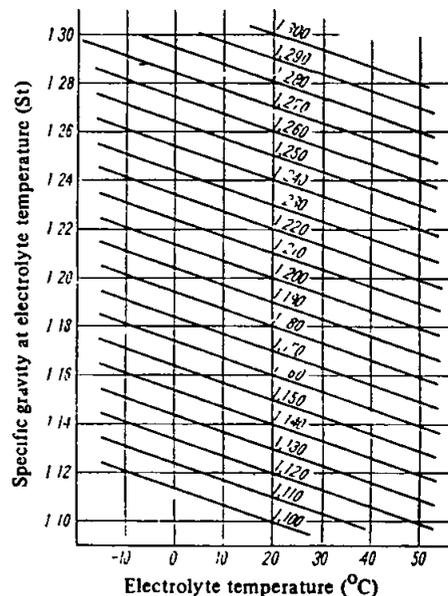
CHECKING SPECIFIC GRAVITY

Specific gravity of battery electrolyte is tested by a hydrometer. If the state of charge of battery is 60% full, or specific-gravity reading is below 1.20 [as corrected at 20°C (68°F)], battery must be recharged or battery-electrolyte concentration adjusted.

Add or subtract gravity points according to whether the electrolyte temperature is above or below 20°C (68°F) standard.

The gravity of electrolyte changes 0.0007 for every 1°C (1.8°F) temperature. A correction can then be made by using the following formula:

Converted specific gravity (S20)



EE003

Fig EE-3 Specific gravity at electrolyte temperature

ENGINE ELECTRICAL SYSTEM

Battery freezing

Temperatures at which battery electrolyte freezes vary with acid concentration or its specific gravity. A battery with an insufficient state of charge will freeze at lower temperatures. If specific gravity of a

battery falls below 1.1, the indication is that the battery is completely discharged and will freeze readily when temperatures fall below freezing.

Note Use extreme caution to avoid freezing battery since it will generally ruin the battery.

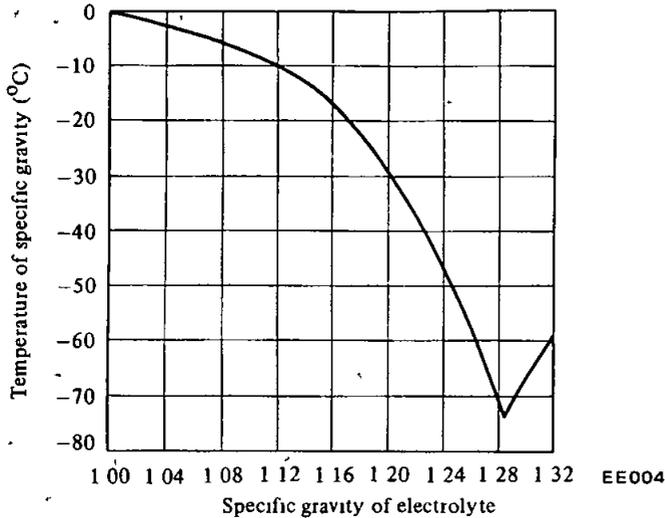


Fig EE-4 Freezing point of electrolyte

CHARGING

Battery must be recharged when electrolyte-gravity reading falls below 1.20 with electrolyte level being satisfactory. If battery is quick-

charged to bring it up to full charge, the operation should be carried out with negative terminal removed.

Prior to charging, corroded ter-

minals should be cleaned with a brush and common baking-soda solution. In addition, the following items should be observed during recharging battery:

- 1 Be sure that electrolyte level is above top of each plate.
- 2 Keep removed plugs in a safe location.
- 3 Do not allow electrolyte temperature to go over 45°C (113°F).
- 4 After recharging, check to be certain that specific gravity does not exceed 1.260 [at 20°C (68°F)]. Correction can be made by adding distilled water into cells as necessary.
- 5 Keep battery away from open flame while it is being recharged.
- 6 After all vent plugs have been tightened, clean all spraying of electrolyte off upper face of battery.

INSTALLATION

- 1 Install and tighten clamps securely.
- 2 After clamps have been tightened, clean battery cable terminals and apply grease to retard formation of corrosion.

STARTING MOTOR

CONTENTS

SPECIFICATIONS	EE- 4
DESCRIPTION	EE- 4
OPERATION	EE- 4
CONSTRUCTION	EE- 5
REMOVAL	EE- 5
DISASSEMBLY	EE- 5
CLEANING AND INSPECTION	EE- 6
Terminal	EE- 6
Field coil	EE- 6
Brushes and brush lead wire	EE- 7
Brush spring tension	EE- 7
Armature assembly	EE- 7

Over-running clutch assembly	EE- 8
Brush holder test for ground	EE- 8
Pinion case bearing metal	EE- 8
Magnetic switch assembly	EE- 8
ASSEMBLY	EE- 8
TEST	EE- 8
Performance test	EE- 8
Diagnosis of test	EE- 9
Magnetic switch assembly test	EE- 9
SERVICE DATA	EE-10
TROUBLE DIAGNOSES AND CORRECTIONS	EE-10

ENGINE ELECTRICAL SYSTEM

SPECIFICATIONS

Type	HITACHI S114-103P
Voltage	12 volts
Output	1 0 KW
Starting current (voltage)	Less than 480 amps (6 volts)
No load current (voltage)	Less than 60 amps (12 volts)
No load starter revolution	More than 7,000 rpm
Shift type of pinion gear	Magnetic shift
Number of teeth on pinion gear	9
Number of teeth on ring gear	120
Weight	5 1 (11) kg (lb)

DESCRIPTION

The function of the starting system, consisting of the battery, ignition switch, starting motor and solenoid, is to crank the engine. The electrical energy is supplied from the battery,

the solenoid completes the circuit to operate the starting motor, and then the motor carries out the actual cranking of the engine.

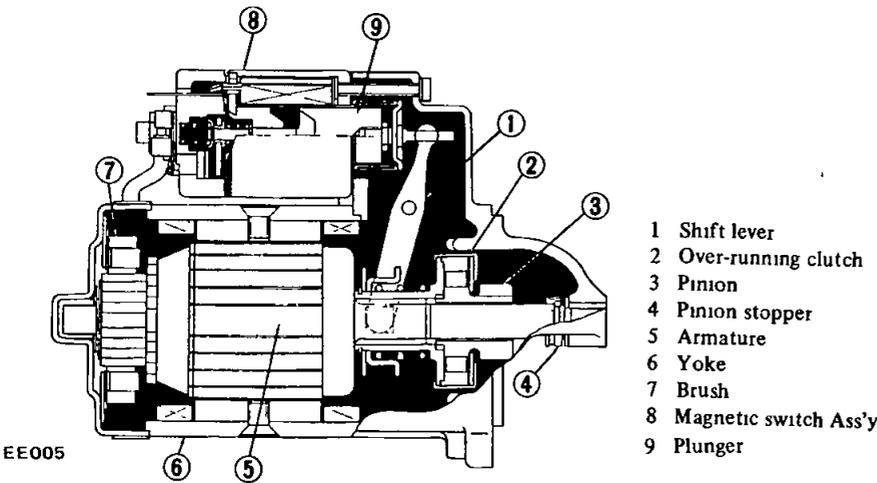


Fig EE-5 Sectional view of starting motor

OPERATION

When the ignition switch is turned fully clockwise to the START position, battery current flows through "series" and "shunt" coils of the solenoid, magnetizing the solenoid. The plunger is pulled into the solenoid so that it operates the shift lever to move the drive pinion into the flywheel ring gear. Then the solenoid switch contacts close after the drive pinion is partially engaged with the

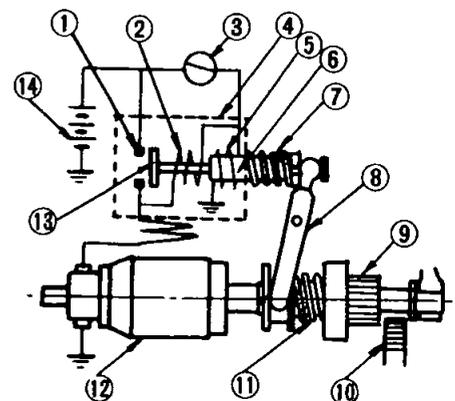
ring gear.

Closing of the solenoid switch contacts causes the motor to crank the engine and also cut out the "series" coil of the solenoid, the magnetic pull of the "shunt" coil being sufficient to hold the pinion in mesh after the shifting has been performed.

After the engine starts running, the driver releases the ignition key and it automatically returns to the ON

position.

This breaks the solenoid circuit so that reverse current flows through the series coil, and the magnetic field builds up in the direction in which the plunger moves back. As this happens, the resultant force of the magnetic fields in the shunt coil and the series coil becomes zero. The return spring then actuates the shift lever to pull the plunger, which allows to open the solenoid switch contacts. Consequently, the starting motor stops.



- | | | | |
|---|--------------------|----|----------------------|
| 1 | Stationary contact | 8 | Shift lever |
| 2 | Series coil | 9 | Drive pinion |
| 3 | Ignition switch | 10 | Ring gear |
| 4 | Solenoid | 11 | Pinion sleeve spring |
| 5 | Shunt coil | 12 | Armature |
| 6 | Plunger | 13 | Movable contactor |
| 7 | Return spring | 14 | Battery |

Fig EE-6 Starting motor circuit

ENGINE ELECTRICAL SYSTEM

More positive meshing and demeshing of the pinion and the ring gear teeth are secured by means of the over-running clutch. The over-running clutch employs a shift lever to slide

the pinion along the armature shaft, into or out of mesh with the ring gear teeth. The over-running clutch is designed to transmit driving torque

from the motor armature to the ring gear, but permit the pinion to over-run the armature after the engine has started.

CONSTRUCTION

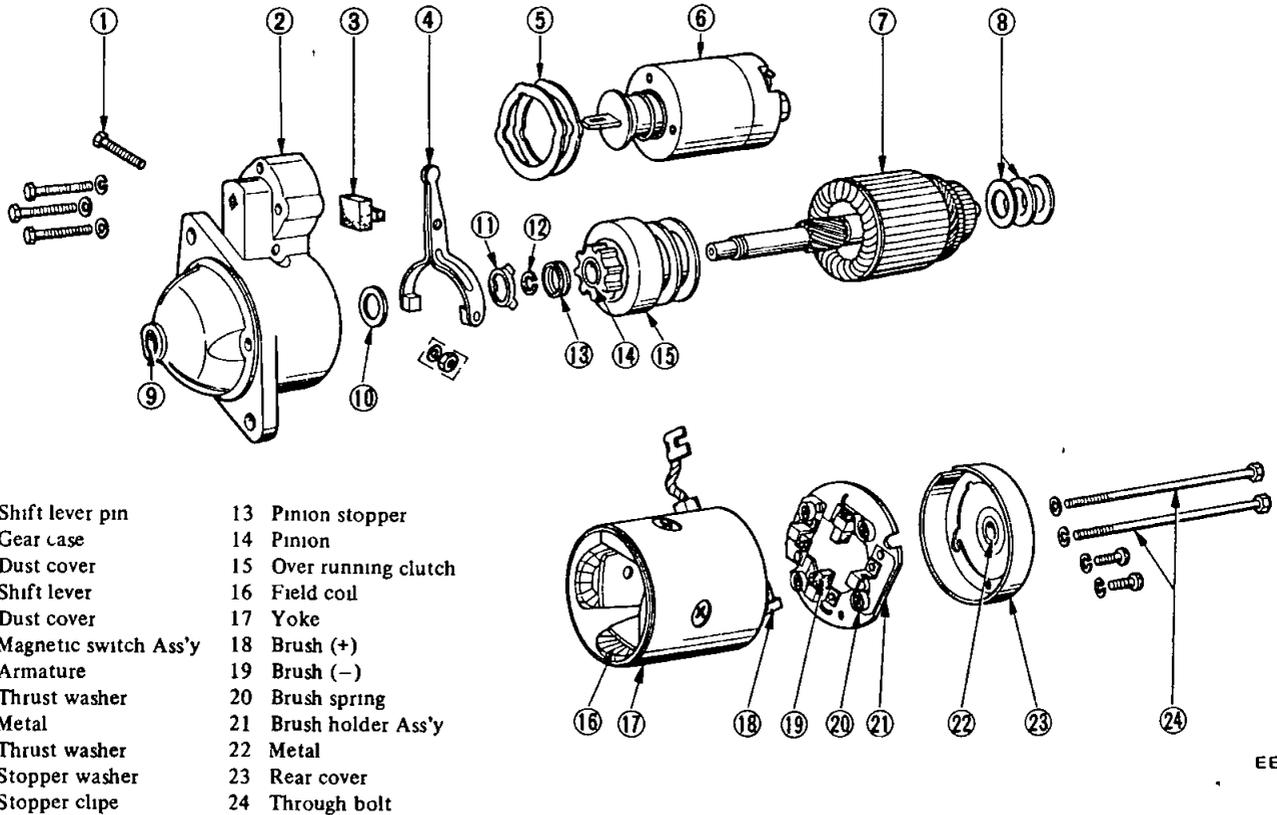


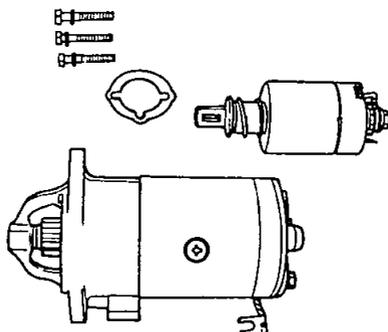
Fig EE-7 Exploded view of starting motor

REMOVAL

- 1 Disconnect battery ground cable. Disconnect black wire with yellow tracer from magnetic switch terminal, and black battery cable from battery terminal of magnetic switch.
- 2 Remove two bolts securing starting motor to gear case. Pull starter assembly forward and remove starting motor.

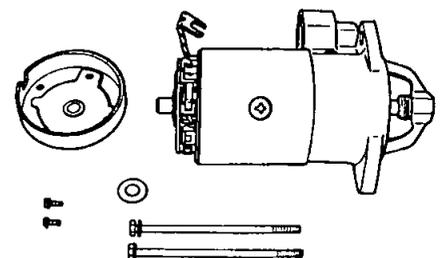
magnetic switch and remove magnetic switch assembly

2 Remove two through bolts and brush cover assembly



EE008

Fig EE-8 Removing magnetic switch assembly



EE009

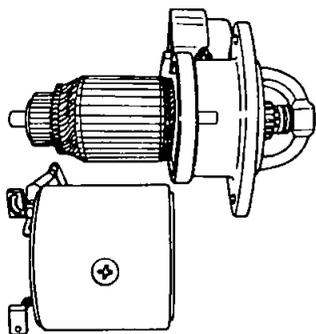
Fig EE-9 Removing brush cover

DISASSEMBLY

- 1 Loosen nut securing connecting plate to magnetic switch "M" terminal. Remove three screws securing

ENGINE ELECTRICAL SYSTEM

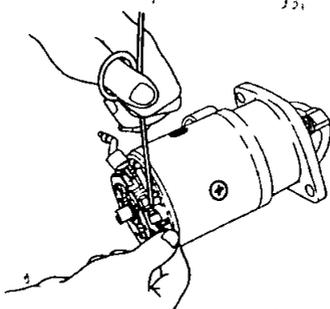
3 Remove yoke assembly by hitting lightly with a wooden hammer



EE010

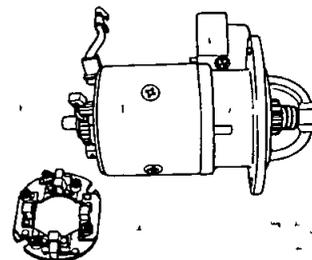
Fig EE-10 Removing yoke assembly

6 Unsolder brushes, using a soldering-iron and remove each brush



EE013

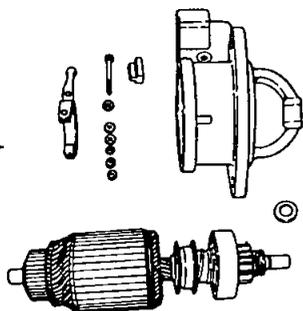
Fig EE-13 Removing brush



EE014

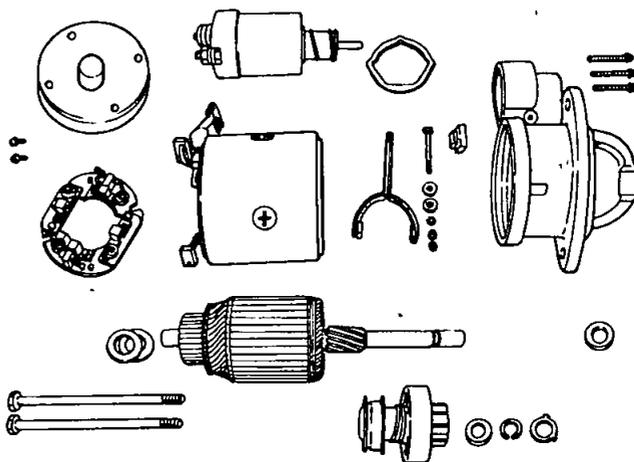
Fig EE-14 Removing brush holder

4 Withdraw armature assembly and shift lever



EE011

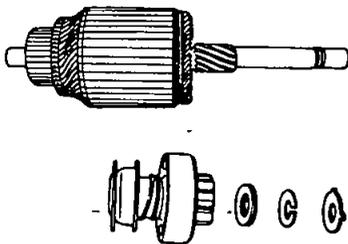
Fig EE-11 Removing armature assembly and shift lever



EE015

Fig EE-15 Disassembly

5 Remove pinion stop ring located at the end of armature shaft. To remove stop ring, first push stop ring to clutch side and then, after removing snap ring, remove stop ring with over-running clutch. Withdraw over-running clutch assembly from armature shaft.



EE012

Fig EE-12 Removing over-running clutch assembly

CLEANING AND INSPECTION

Clean all disassembled parts, but do not use grease dissolving solvents for cleaning over-running clutch, armature assembly, magnetic switch assembly and field coils since such a solvent would dissolve grease packed in clutch mechanism and would damage coils or other insulators.

Check them for excessive damage or wear, and they should be replaced if necessary.

Terminal

Check terminal for damage, and wear, and replace if necessary.

Field coil

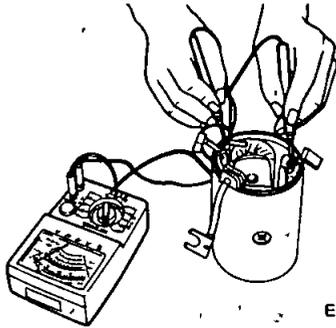
Check field coil for insulation. If the insulation of coil is damaged or worn it should be replaced.

Testing field coil for continuity:

Connect the probe of a circuit tester or an ohmmeter to field coil positive terminal and positive brush holder.

If tester shows no conduction field circuit or coil is open.

ENGINE ELECTRICAL SYSTEM



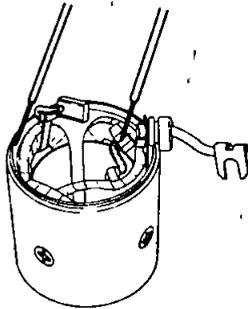
EE016

Fig EE-16 Testing field coil for continuity

Testing field coil for ground:

Place one probe of circuit tester onto yoke and the other onto field coil lead (positive terminal)

If very little resistance is read, field coil is grounded



EE017

Fig EE-17 Testing field coil for ground

Field coil tester for short:

Unsolder the connecting portion of each coil and proceed to the same mentioned above

If a defective coil is found, it should be replaced

Brushes and brush lead wire

Check the surface condition of brush-contact and wear of brush. If a less than 6.0 mm (0.236 in), replace be replaced

If brush is worn and its height is less than 6.0 mm (0.236 in), replace

Check the connection of lead clip and lead wire

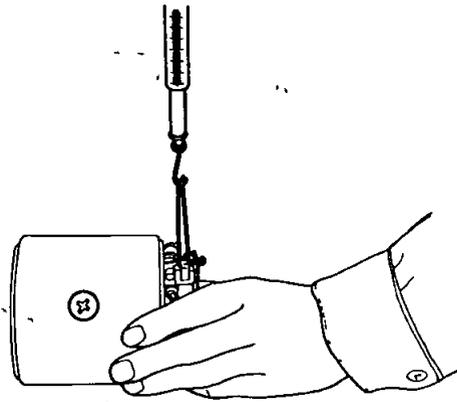
Check brush holders and spring clip to see if they are not deformed or bent, and will properly hold brushes against the commutator

If brushes or brush holders are dirty, they should be cleaned

Brush spring tension

Check brush spring tension by a spring scale as shown in Figure EE-18. The reading should be 1.6 kg (3.5 lb)

Replace spring if tension is lower than 1.4 kg (3.1 lb)



EE018

Fig EE-18 Inspecting brush spring tension

Armature assembly

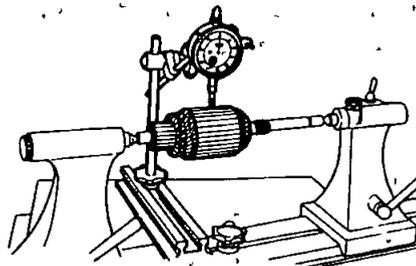
Check external appearance of armature and commutator

1. Measure armature shaft for bend by a dial gauge. Replace armature shaft if the bend exceeds 0.08 mm (0.0031 in)

from commutator surface. Commutator (armature) should be turned in a lathe, so that the out-of-round is less than 0.05 mm (0.0020 in). Insulating mica should also be undercut so that the depth of it is from 0.5 to 0.8 mm (0.0197 to 0.0315 in)

The wear limit of commutator diameter is 2 mm (0.079 in). If commutator is beyond repair, replace

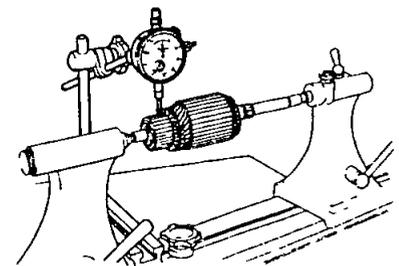
Note It is recommended to replace commutator as an assembly if worn or damaged



EE019

Fig EE-19 Inspecting armature shaft for bend

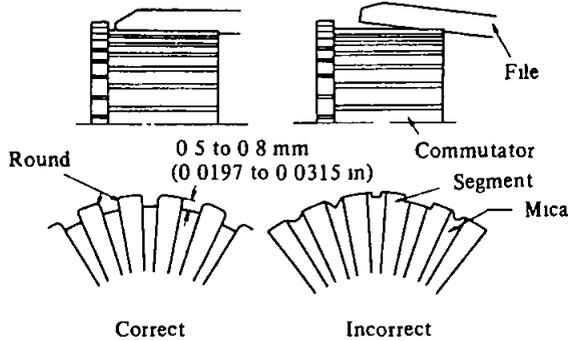
2. Inspect commutator. If the surface of commutator is rough, it must be sanded lightly with a No. 500 emery paper. Commutator must be checked also for out-of-round. If the out-of-round is more than 0.2 mm (0.0079 in), or the depth of insulating mica is less than 0.2 mm (0.0079 in)



EE020

Fig EE-20 Inspecting commutator

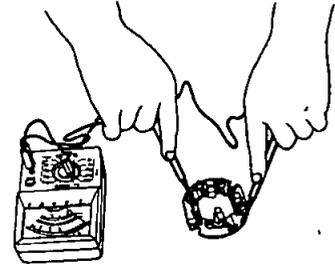
ENGINE ELECTRICAL SYSTEM



EE021

Fig EE-21 Undercutting insulating mica

tester shows conduction, brush holder is shorted to ground. Replace an insulator or brush holder.



EE025

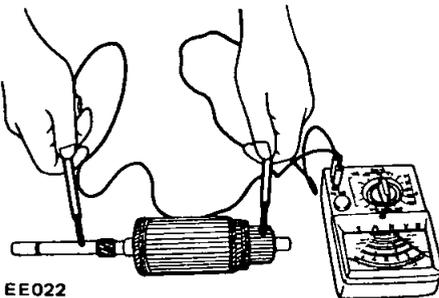
Fig EE-25 Testing brush for ground

3 Inspect soldered connection of armature lead and commutator. If loose connection is found, solder it using rosin flux.

4 Armature test for ground

Using a circuit tester, place one test probe onto armature shaft and other onto each commutator bar.

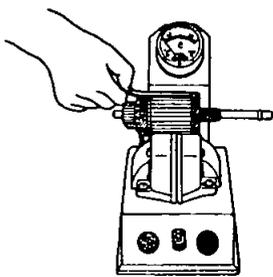
If tester shows conductive, armature is grounded and must be replaced.



EE022

Fig EE-22 Testing armature for ground

5 Check armature for short by placing on armature tester (glora) and with a piece of iron over armature core, rotate armature. If the plate vibrates, armature is shorted.



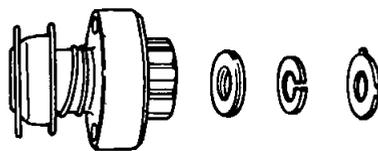
EE023

Fig EE-23 Testing armature for short

6 Check armature for continuity by placing probes of tester on two segments side by side. If tester shows no conduction, the circuit is open.

Over-running clutch assembly

Inspect pinion assembly and screw sleeve. Screw sleeve must slide freely along armature shaft splines. If damages are found or resistance would be felt when sliding, it must be repaired. Inspect pinion teeth. If excessive rubbing would be found on teeth, it should be replaced. Flywheel ring gear also must be inspected.



EE024

Fig EE-24 Over-running clutch assembly

Brush holder test for ground

Using a circuit tester, place one test probe onto negative side brush holder and another onto positive side. If

Pinion case bearing metal

Inspect bearing metal for wear or side play. If the clearance between bearing metal and armature shaft is more than 0.2 mm (0.0079 in), replace metal. Press in a new bearing and adjust the clearance 0.03 to 0.10 mm (0.0012 to 0.0039 in). Bearing metal should be so pressed in that the end of the bearing metal would be equal to gear case end plane.

Magnetic switch assembly

Inspect magnetic switch contacts. If a rough welding be found on the contact, it should be repaired.

ASSEMBLY

Reassemble starting motor in reverse sequence of disassembly.

When assembling, make sure to apply grease to gear case and rear cover bearing metal, and apply oil to pinion slightly.

TEST

Performance test

Starter motor should be subjected to a "no-load" test whenever it has been overhauled to ensure that its performance will be satisfactory when installed to engine. Starter motor

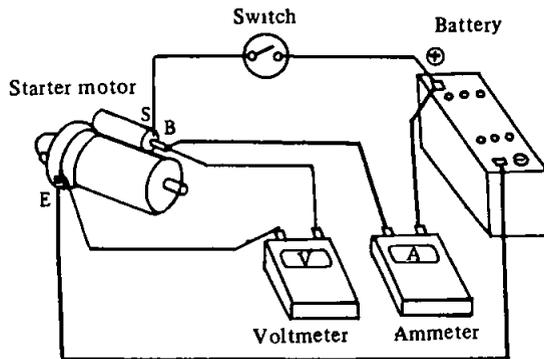
ENGINE ELECTRICAL SYSTEM

should also be subjected to the test when the cause of abnormal operation is to be determined. A brief outline of the test is given below.

No-load test

Connect starting motor in series with specified (12 volts) battery and an ammeter capable of indicating 1,000 amperes.

Specified current draw and revolution in these test are shown in "specification".



EE026

Fig EE-26 No-load testing

Diagnosis of test

1 Low speed with no-load and high current draw may result from the following causes:

- (1) Tight, dirty or worn bearings
- (2) Bent armature shaft or loosened field probe
- (3) Shorted armature, Check armature further
- (4) A ground armature or field,
 - a Remove input terminal
 - b Raise two negative side brushes from commutator
 - c Using a circuit tester, place one probe onto input terminal and the other onto yoke
 - d If tester indicates conduction, raise the other two brushes and check field and armature separately to determine whether field or armature is grounded

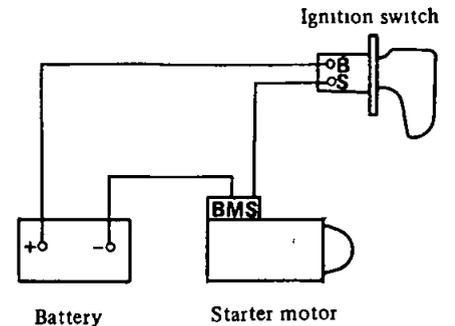
2 Failure to operate with high current draw may result from the

following items:

- (1) A grounded or open field coil. Inspect the connection and trace circuit by a circuit tester.
- (2) Armature coil does not operate. Inspect commutator for excessive burning. In this case, arc may occur on defective commutator, when motor is operated with no-load.
- (3) Burned out commutator bar. Weak brush spring tension, broken brush spring, rubber bush, thrust out of mica in commutator or a loose contact between brush and commutator would cause to burn commutator bar.

3 Low current draw and low no-load speed would cause high internal resistance due to loose connections, defective leads, dirty commutator and causes listed on item 2-(3).

Magnetic switch assembly test

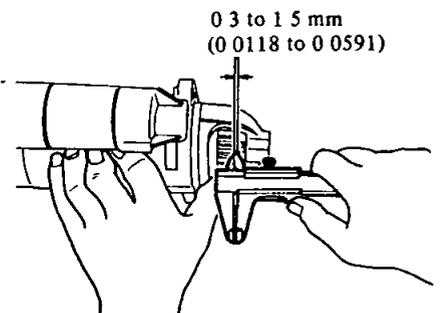


EE027

Fig EE-27 Circuit of magnetic switch assembly test

If the starting motor check is "OK," check magnetic switch assembly. Connect cables between "negative" battery terminal and starting motor "M" terminal, "positive" battery terminal and starting motor "S" terminal connecting ignition switch in series as shown in Figure EE-27.

With ignition switch on, measure the gap "ℓ" between pinion front edge and pinion stopper.



EE028

Fig EE-28 Measuring gap "ℓ"

ENGINE ELECTRICAL SYSTEM

SERVICE DATA

< S114-103P >

Armature shaft diameter (pinion side)	mm (in)	10 950 to 10 968 (0 4311 to 0 4318)
Armature shaft diameter (rear end)	mm (in)	11 450 to 11 468 (0 4508 to 0 4515)
Amendment limit of shaft diameter	mm (in)	0 1 (0 0039)
Amendment limit of shaft bent	mm (in)	0 08 (0 0031)
Clearance between shaft and bush	mm (in)	0 03 to 0 1 (0 0012 to 0 0039)
Amendment limit of dittoed clearance	mm (in)	0 2 (0 0079)
Outer diameter of commutator	mm (in)	35 0 (1 378)
Wear limit of commutator diameter	mm (in)	2 0 (0 079)
Brush length	mm (in)	18 5 (0 728)
Wear limit of dittoed length	mm (in)	6 0 (0 236)
(remaining brush should be more than)	mm (in)	12 5 (0 492)
Brush spring tension	kg (lb)	0 8 (1 8)
Front bracket metal inner diameter	mm (in)	11 000 to 11 018 (0 4331 to 0 4338)
Rear cover metal inner diameter	mm (in)	11 500 to 11 521 (0 4528 to 0 4536)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Starting motor will not operate	Discharged battery Defective solenoid switch Loosen connections of terminal Defective brushes Defective starting motor	Charge or replace battery Repair or replace solenoid switch Clean and tighten terminal Replace brushes Remove starting motor and make test
Noisy starting motor	Loose securing bolt Worn pinion gear Poor lubrication Worn commutator Worn brushes	Tighten bolt Replace pinion gear Fill in oil Disassemble motor Replace brushes
Starting motor cranks slowly	Discharged battery Loose connection of terminal Worn brushes Locked brushes	Charge or replace battery Clean and tighten terminal Replace brushes Inspect brush spring tension-or-repair brush holder

ENGINE ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
Starting motor cranks slowly	Dirty or worn commutator Armature rubs field coil Defective solenoid switch	Clean and repair Replace assembly Repair or replace switch
Starting motor operates but does not crank engine	Worn pinion Locked pinion guide Worn ring gear	Replace pinion Repair pinion guide Replace ring gear
Starting motor will not disengage even ignition switch is turned off	Defective solenoid switch Defective gear teeth	Repair or replace solenoid switch Replace defective gear

CHARGING CIRCUIT

The charging circuit consists of the battery, alternator, regulator and necessary wiring to connect these parts. The purpose of this system is to convert mechanical energy from the engine into electrical energy which is used to operate all electrically operated units and to keep the battery fully charged.

When the ignition switch is set to "ON," current flows from the battery to ground through the ignition switch, voltage regulator IG terminal, primary side contact point "P1," movable contact point "P2," voltage regulator "F" terminal, alternator "F" terminal, field coil and alternator "E" terminal, as shown in Figure EE-29 by full line arrow marks. Then the rotor in the alternator is excited. On the other hand, current flows from the battery to ground through the ignition switch, warning lamp, voltage regulator "L" terminal, lamp side contact point "P4," movable contact point "P5," and voltage regulator "E" terminal, as shown by dotted line arrow marks.

Then, the warning lamp lights.

When the alternator begins to operate, three-phase alternating current is induced in the armature. This alternating current is rectified by the positive and negative silicon diodes. The rectified direct current output reaches the alternator "A" and "E" terminals.

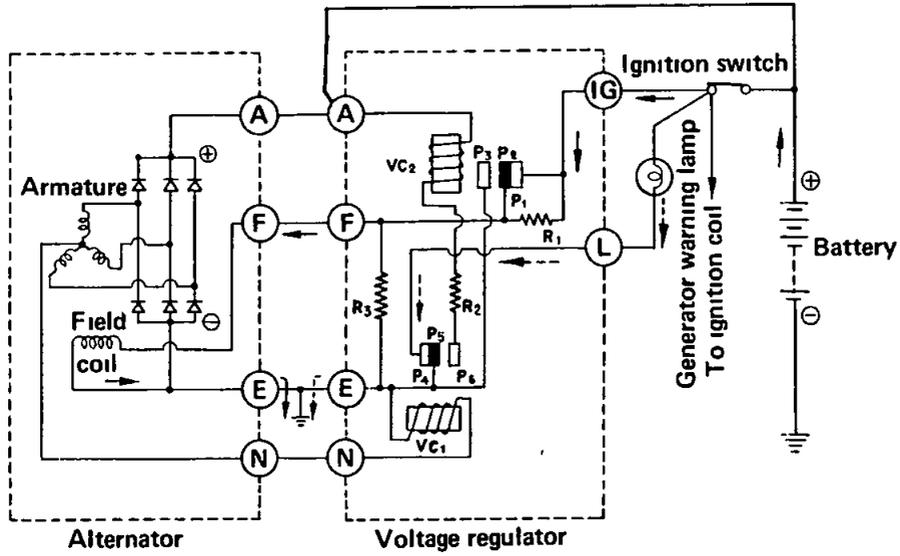
On the other hand, the neutral point voltage reaches "N" and "E" terminals (nearly a half of the output voltage), and current flows from voltage regulator "N" terminal to "E" terminal or ground through the coil "VC1" as shown in Figure EE-30 by the dotted line arrow marks. Then, the coil "VC1" is excited, and the movable contact point "P5" comes into contact with voltage winding side contact point "P6." This action causes to turn off the warning lamp and complete the voltage winding circuit, as shown by the full line arrow marks.

When the alternator speed is increased or the voltage starts to rise excessively, the movable contact point

"P2" is separated from the primary side contact "P1" by the magnetic force of coil "VC2." Therefore, resistor "R1" is applied into the field circuit and output voltage is decreased. As the output voltage is decreased, the movable contact point "P2" and primary side contact "P1" comes into contact once again, and the alternator voltage increases. Thus, the rapid vibration of the movable contact point "P2" maintains an alternator output voltage constant.

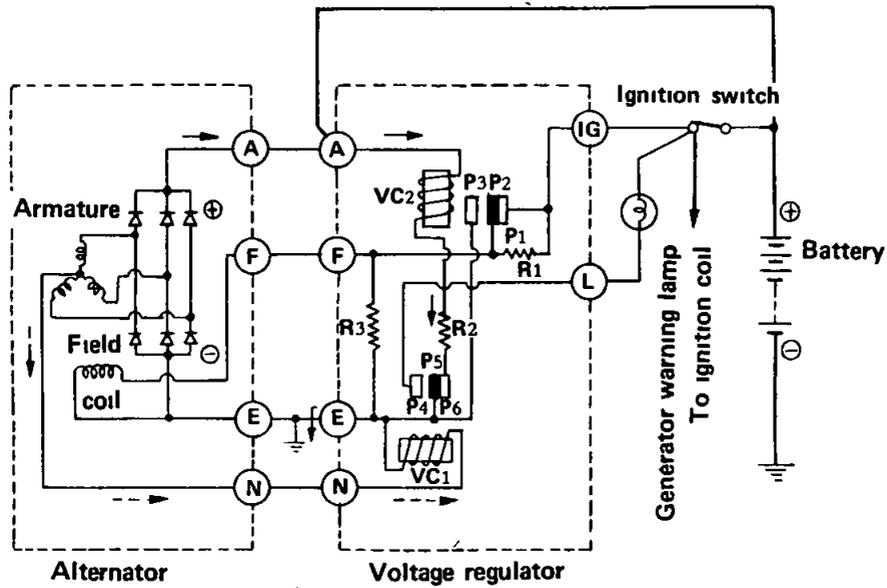
When the alternator speed is further increased or the voltage starts to rise excessively, the movable contact point "P2" comes into contact with secondary side contact point "P3." Then, the field current is shut off and alternator output voltage is decreased immediately. This action causes to separate movable contact "P2" from secondary contact "P3." Thus, the rapid vibration of the movable contact point "P2" or breaking and completing the field circuit maintains an alternator output voltage constant.

ENGINE ELECTRICAL SYSTEM



EE029

Fig EE-29 Charging circuit (I)



EE030

Fig EE-30 Charging circuit (II)

ENGINE ELECTRICAL SYSTEM

ALTERNATOR

CONTENTS

DESCRIPTION	EE-13	Inspection of brush	EE-16
REMOVAL	EE-14	Spring pressure test	EE-17
DISASSEMBLY	EE-14	REASSEMBLY	EE-17
INSPECTION AND REPAIR	EE-15	ALTERNATOR TEST	EE-17
Rotor inspection	EE-15	SPECIFICATIONS AND SERVICE DATA	EE-18
Inspection of stator	EE-15	Specifications	EE-18
Inspection of diode	EE-15	Service data	EE-18

DESCRIPTION

In the alternator, a magnetic field is produced by the rotor which consists of alternator shaft, field coil, pole pieces, and slip rings. The slip rings pressed in the shaft conduct only a small field current. Output current is

generated in the armature coils located in the stator. The stator has three windings and generates three-phase alternating current. Silicon diodes act like a one-way valve for electricity so that charging current passes easily but

reverse current is shut out. In this alternator, six diodes (three negative and three positive), are installed in positive and negative plates as an assembly.

Pack-type silicon diodes are used in this alternator. These diodes are direct-soldered at their tips, and constructed with positive and negative conjunction. They are mounted on the two plates which combine the function of heat-dissipating plate and positive/negative terminals and are light in weight and easy to service.

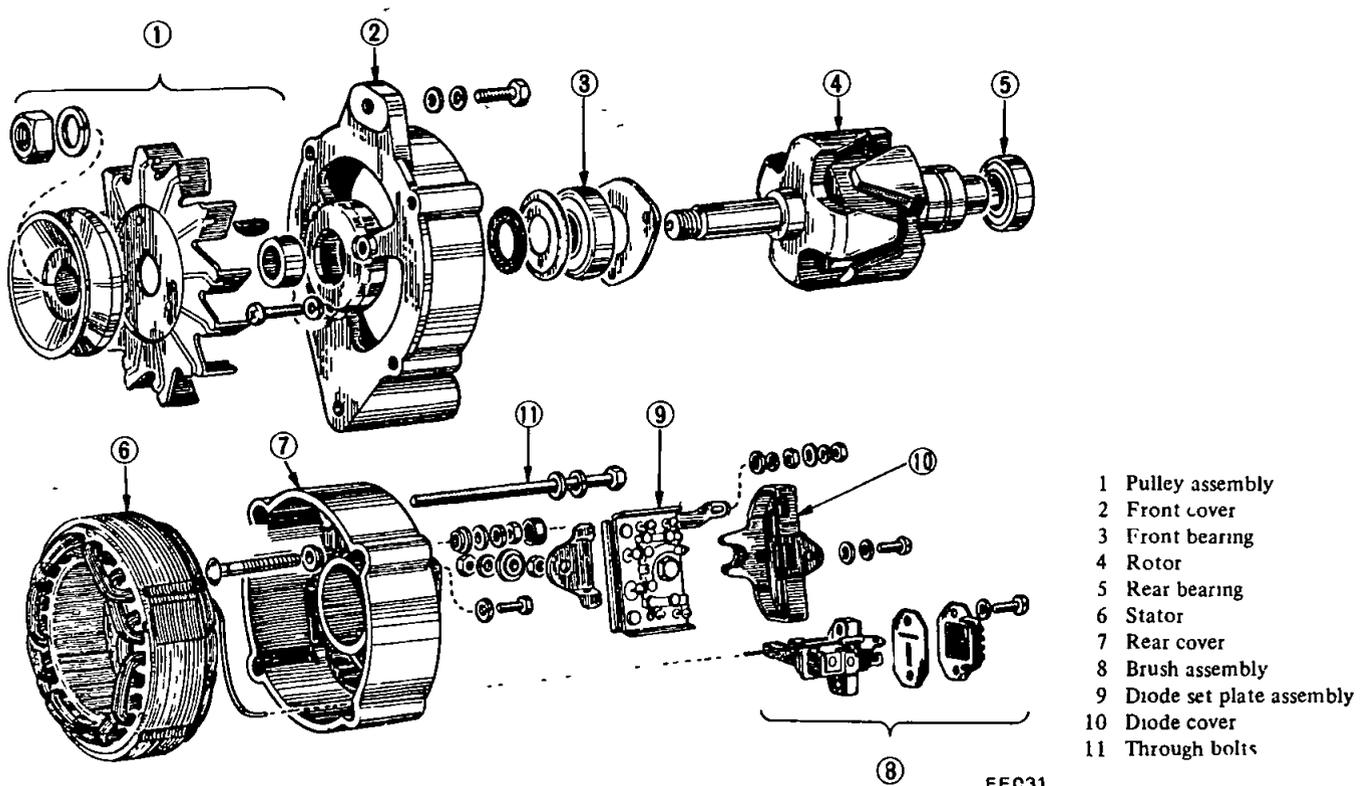
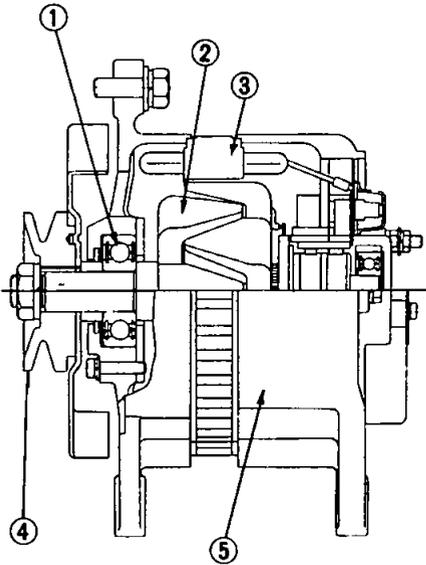
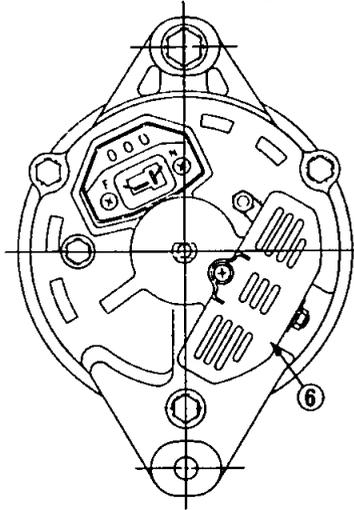


Fig EE-31 Exploded view of alternator

ENGINE ELECTRICAL SYSTEM



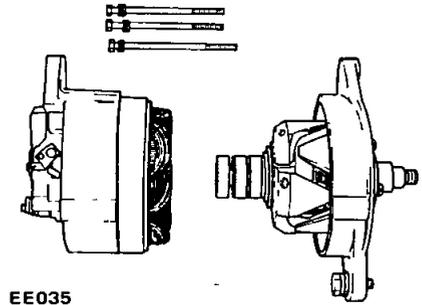
- 1 Front bearing
- 2 Rotor
- 3 Stator



EE032

- 4 Pulley
- 5 Front cover
- 6 Encased diode

Fig EE-32 Sectional view of alternator



EE035

Fig EE-35 Separating front cover with rotor from rear cover

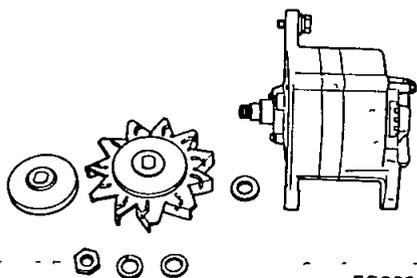
- 4 Remove three set screws from bearing retainer, and separate rotor from front cover

REMOVAL

- 1 Disconnect negative battery terminal
- 2 Disconnect two lead wires and connector from alternator
- 3 Loosen adjusting bolt
- 4 Remove alternator drive belt.
- 5 Remove parts associated with alternator from engine
- 6 Remove alternator from vehicle

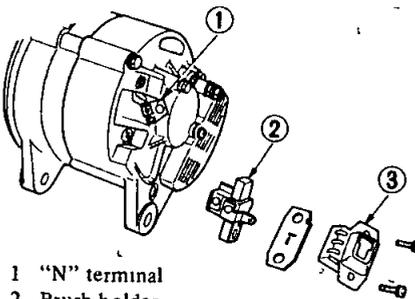
DISASSEMBLY

- 1 Remove pulley nut, pulley rim, fan and spacer



EE033

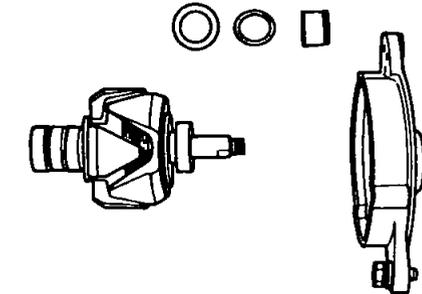
Fig EE-33 Removing pulley and fan



EE034

Fig EE-34 Removing brush

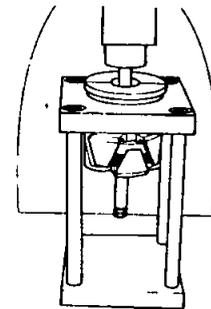
- 3 Loosen and remove through bolts. Separate front cover with rotor from rear cover with stator by lightly tapping front bracket with a wooden mallet



EE036

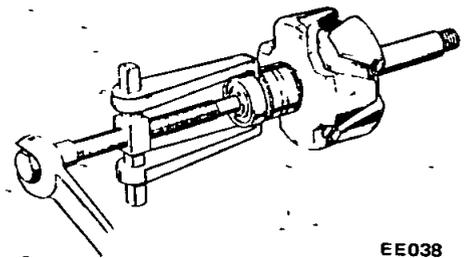
Fig EE-36 Removing rotor

- 5 Pull out rear bearing from rotor assembly with a press or bearing puller



EE037

Fig EE-37 Pulling out of rear bearing (I)



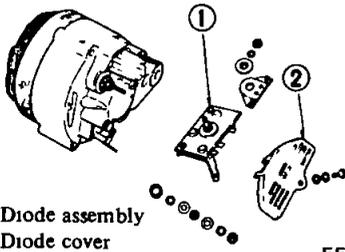
EE038

Fig EE-38 Pulling out of rear bearing (II)

ENGINE ELECTRICAL SYSTEM

6 Remove diode cover fixing screw, and remove diode cover. Disconnect three stator coil lead wires from diode terminal with a soldering iron.

7 Remove A terminal nut and diode installation nut, and remove diode assembly.



1 Diode assembly
2 Diode cover

EE039

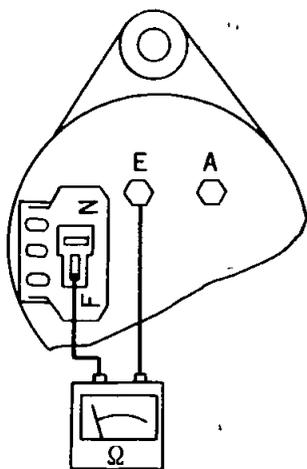
Fig EE-39 Removing diode assembly

Note Use care in handling diode assembly to prevent an undue stress on it.

INSPECTION AND REPAIR

Remove alternator from vehicle and apply tester between lead wire F (white with black tracer) and lead wire E (black color).

When the resistance is approximately 5Ω , the condition of brush and field coil is satisfactory. When no conduction exists in brush or field coil, or when resistance differs remarkably between those parts, disassemble and inspect.



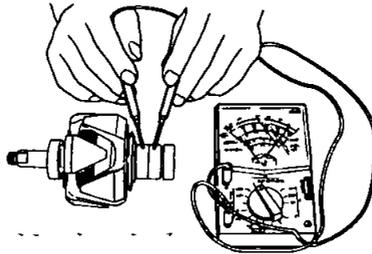
EE040

Fig EE-40 Inspecting alternator

Rotor inspection

1 Conduction test of rotor coil

Apply tester between slip rings of rotor as shown in Figure EE-41. If there is no conduction, discontinuity of field coil may exist. When resistance is approximately 4.4Ω at normal ambient temperature, condition is satisfactory.

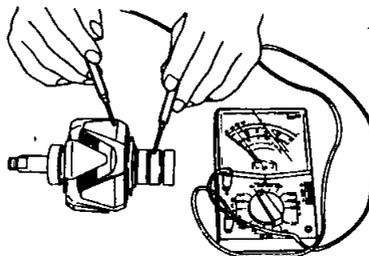


EE041

Fig EE-41 Conduction test of rotor coil

2 Ground test of rotor coil

Check conduction between slip ring and rotor core. If conduction exists, replace rotor assembly, because field coil or slip ring may be grounded.



EE042

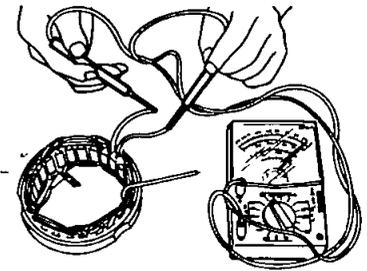
Fig EE-42 Testing rotor coil for ground

Inspection of stator

1 Conduction test

Stator is normal when there is conduction between individual stator coil terminals. When there is no conduction between individual terminals, cable is broken.

Replace with stator assembly

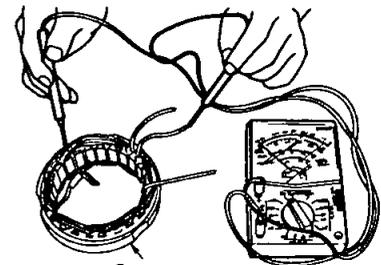


EE043

Fig 43 Testing stator for conduction

2 Ground test

If each lead wire of armature coil (including neutral wire) is not conductive with stator core, condition is satisfactory. If there is conduction, stator coil is grounded.



Stator core

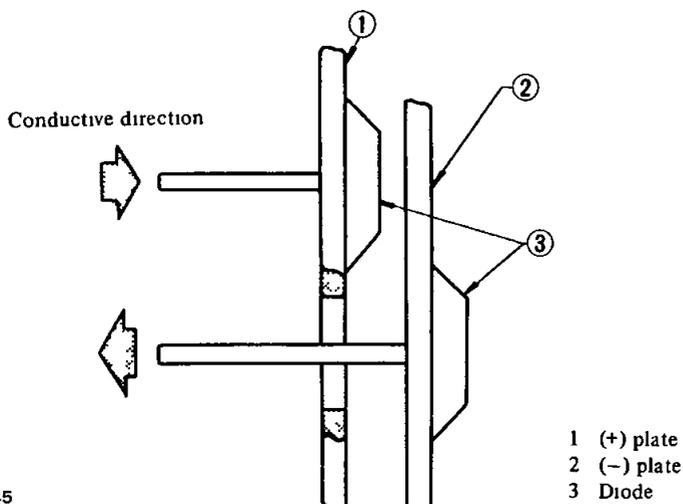
EE044

Fig EE-44 Testing stator for ground

Inspection of diode

Perform a conduction test on diodes in both directions, using an ohmmeter. A total of six diodes are used, three are mounted on the positive \oplus plate, and other three are on the negative \ominus plate. The conduction test should be performed on each diode, between the terminal and plate.

ENGINE ELECTRICAL SYSTEM

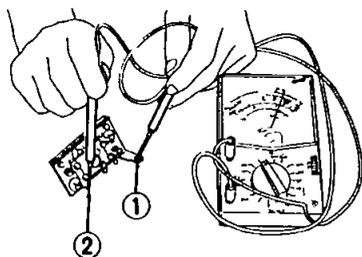


EE045

Fig EE-45 Conductive direction of diode

If current flows toward both positive and negative directions, diode is short-circuited. If current flows in the same direction only, diode is in good condition. These diodes are unserviceable. If there is a defective diode, replace all diodes (six diodes) as an assembly. (See below table.)

Diode installed on \oplus plate is a positive diode which allows current flowing from terminal to \oplus plate only. In other words, current does not flow from \oplus plate to terminal.

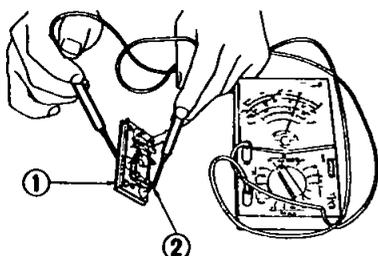


1 (+) plate
2 Terminal

EE046

Fig EE-46 Inspecting positive diode

Diode installed on \ominus plate is a negative diode which allows current flowing from \ominus plate to terminal only. In other words, current does not flow from terminal to \ominus plate.



1 (-) plate
2 Terminal

EE047

Fig EE-47 Inspecting negative diode

Test probe of a circuit tester		Conduction
\ominus	\oplus	
terminal	\oplus plate	X
\oplus plate	terminal	-
terminal	\ominus plate	-
\ominus plate	terminal	X
\ominus plate	\oplus plate	X
\oplus plate	\ominus plate	-

Fig EE-48 Inspecting diodes

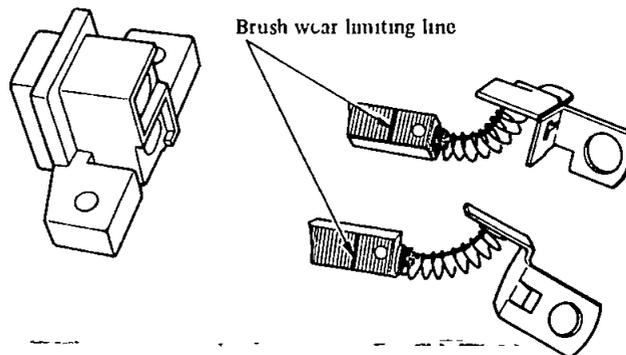
Inspection of brush

Check movement of brush and if movement is unsmooth, check brush holder and clean it.

Check brush for wear. If it is worn

down to less than the specified limit, replace brush assembly.

Check brush pig tail and, if found defective, replace.



EE048

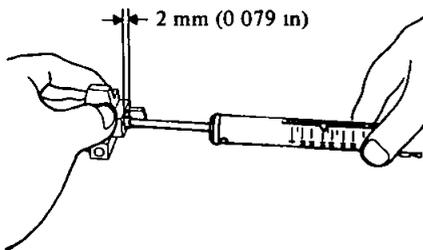
Fig EE-49 Brush wear limit

ENGINE ELECTRICAL SYSTEM

Spring pressure test

With brush projected approximately 2 mm (0.079 in) from brush holder, measure brush spring pressure by the use of a spring balance. Normally, the rated pressure of a new brush spring is 255 to 345 g (9.0 to 12.2 oz).

Moreover, when brush is worn, pressure decreases approximately 20 g (0.7 oz) per 1 mm (0.039 in) wear.



EE049

Fig EE-50 Measuring spring pressure

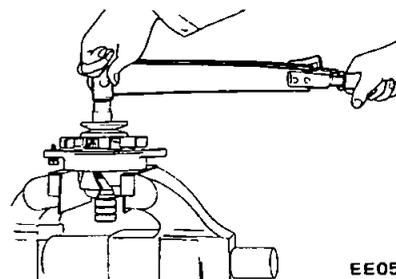
REASSEMBLY

Reassemble alternator in the reverse sequence of disassembly noting following matters:

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 bush and insulating tube correctly.

3 Tighten pulley nut with tightening torque of 350 to 400 kg-cm (303 to 347 in-lb). When pulley is tightened, make sure that deflection of V-groove is less than 0.3 mm (0.0118 in).



EE051

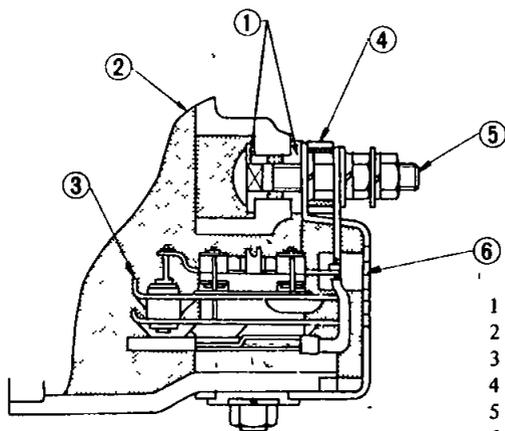
Fig EE-52 Tightening pulley nut

ALTERNATOR TEST

Before conducting an alternator test, make sure that the battery is fully charged.

To conduct a test, it is necessary to use a 30-volt voltmeter and suitable test probes.

Set up a test circuit as shown in Figure EE-53 and test alternator in the manner indicated in the flow chart below.



EE050

- 1 Insulating bush
- 2 Rear cover
- 3 Diode assembly
- 4 Insulating tube
- 5 A terminal bolt
- 6 Diode cover

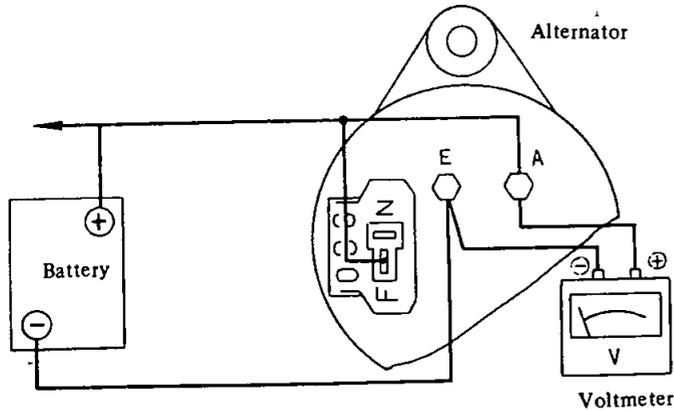
Fig EE-51 Sectional view of diode and A terminal

- 1 Disconnect connectors at alternator
- 2 Connect one test probe from voltmeter positive terminal to "N" terminal or "BAT" terminal. Connect the other test probe to ground. Make sure that voltmeter registers battery voltage.
- 3 Turn on headlights and switch to Main Beam.
- 4 Start engine.
- 5 Increase engine speed gradually until it is approx 1,100 rpm, and take the voltmeter reading.

Measured value Below 12.5 volts
Alternator is in trouble remove and check it for condition

Measured value Over 12.5 volts
Alternator is in good condition

ENGINE ELECTRICAL SYSTEM



Notes

- a Do not run engine at the speed of more than 1,100 rpm while test is being conducted on alternator
- b. Do not race engine

EE052

Fig EE-53 Testing alternator

SPECIFICATIONS AND SERVICE DATA

Specifications

Item	Model	LT150-05B
Applicable to		610 all models
Maker		HITACHI
Nominal rating		12V-50A
Ground polarity		Negative
Revolution		1,000 to 13,500 rpm
Minimum revolution under no load		Less than 1,000 rpm
Output current		37.5A (14V, 2,500 rpm)
Pulley ratio		2.25

Service data

Stator coil

Resistance per a phase Ω 0.17 [at 20°C (68°F)]

Rotor coil

Resistance Ω 4.4 [at 20°C (68°F)]

Brush

Brush length mm (in) 14.5 (0.571)

Wear limit mm (in) 7 (0.276)

Spring pressure kg (lb) 0.25 to 0.35 (0.55 to 0.77)

ENGINE ELECTRICAL SYSTEM

Slip ring

Outer dia	mm (in)	31 (1 22)
Reduction limit	mm (in)	1 (0 039)
Repair accuracy	mm (in)	0 05 (0 0020)

REGULATOR

CONTENTS

DESCRIPTION	EE-19	Charging relay	EE-22
MEASUREMENT OF REGULATOR VOLTAGE	EE-20	SPECIFICATIONS AND SERVICE DATA	EE-23
ADJUSTMENT	EE-22	TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator)	EE-24
Voltage regulator	EE-22		

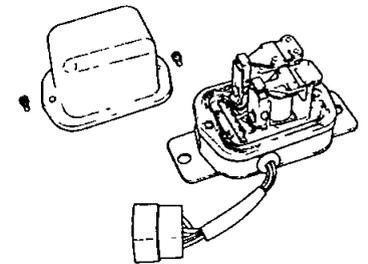
DESCRIPTION

The regulator consists basically of a voltage regulator and a charge relay. The voltage regulator has two sets of contact points, a lower set and upper set, to control alternator voltage. An armature plate placed between the two sets of contacts, moves upward or downward or vibrates. The lower contacts, when closed, complete the

field circuit direct to ground, and the upper contacts, when closed, complete the field circuit to ground through a resistance (field coil), and produces alternator output.

The charge relay is similar in construction to the voltage regulator.

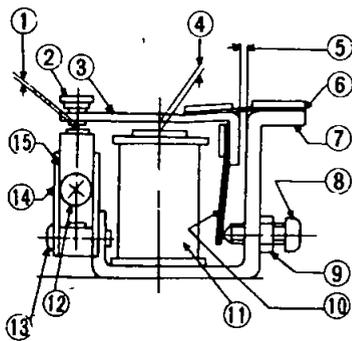
When the upper contacts are closed, ignition warning lamp goes on.



EE053

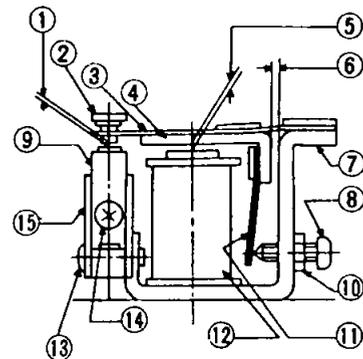
Fig EE-54 View of removing cover

As for the construction, the voltage regulator is very similar to the charge relay as shown in Figure EE-55.



- | | |
|---------------------|------------------------------|
| 1 Point gap | 10 Adjust spring |
| 2 Lower contact | 11 Coil |
| 3 Armature | 12 3 mm (0 118 in) dia screw |
| 4 Core gap | 13 4 mm (0 157 in) dia screw |
| 5 Yoke gap | 14 Contact set |
| 6 Connecting spring | 15 Upper contact |
| 7 Yoke | |
| 8 Adjusting screw | |
| 9 Lock nut | |

(a) Construction of voltage regulator



- | | |
|-----------------------------|------------------------------|
| 1 Point gap | 10 Lock nut |
| 2 Charge relay contact | 11 Adjust spring |
| 3 Connecting spring | 12 Coil |
| 4 Armature | 13 3 mm (0 118 in) dia screw |
| 5 Core gap | 14 4 mm (0 157 in) dia screw |
| 6 Yoke | 15 Contact set |
| 7 Yoke | |
| 8 Adjusting screw | |
| 9 Voltage regulator contact | |

EE054

*(b) Construction of charge relay
Fig EE-55 Structural view*

ENGINE ELECTRICAL SYSTEM

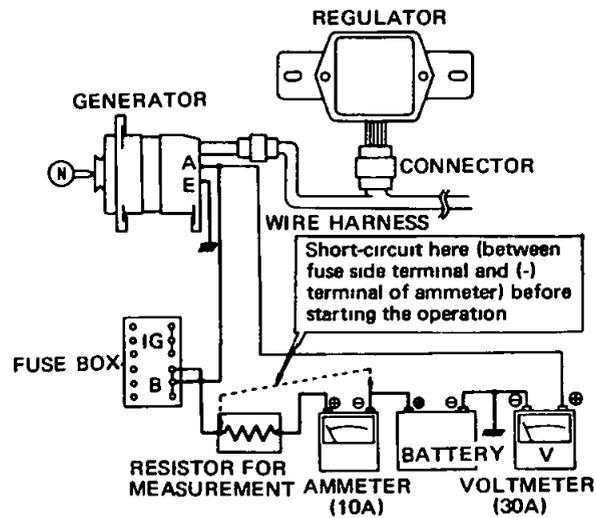
MEASUREMENT OF REGULATOR VOLTAGE

Regulator voltage is measured with regulator assembled with alternator. When measuring voltage with regulator mounted on vehicle, it is necessary to rotate engine at high speed.

Connect DC voltmeter (15-30V), DC ammeter (15-30A), battery and resistor (0.25 ohms) with cables as shown.

(1) Check to be sure that all electrical loads such as lamps, air conditioner, radio etc are disconnected.

(2) Before starting engine, be sure to make short circuit with a cable between fuse side terminal of resistor (0.25Ω) and negative side terminal of ammeter. Failure to follow this caution causes needle of ammeter to swing violently and reversely, resulting in a damaged ammeter.

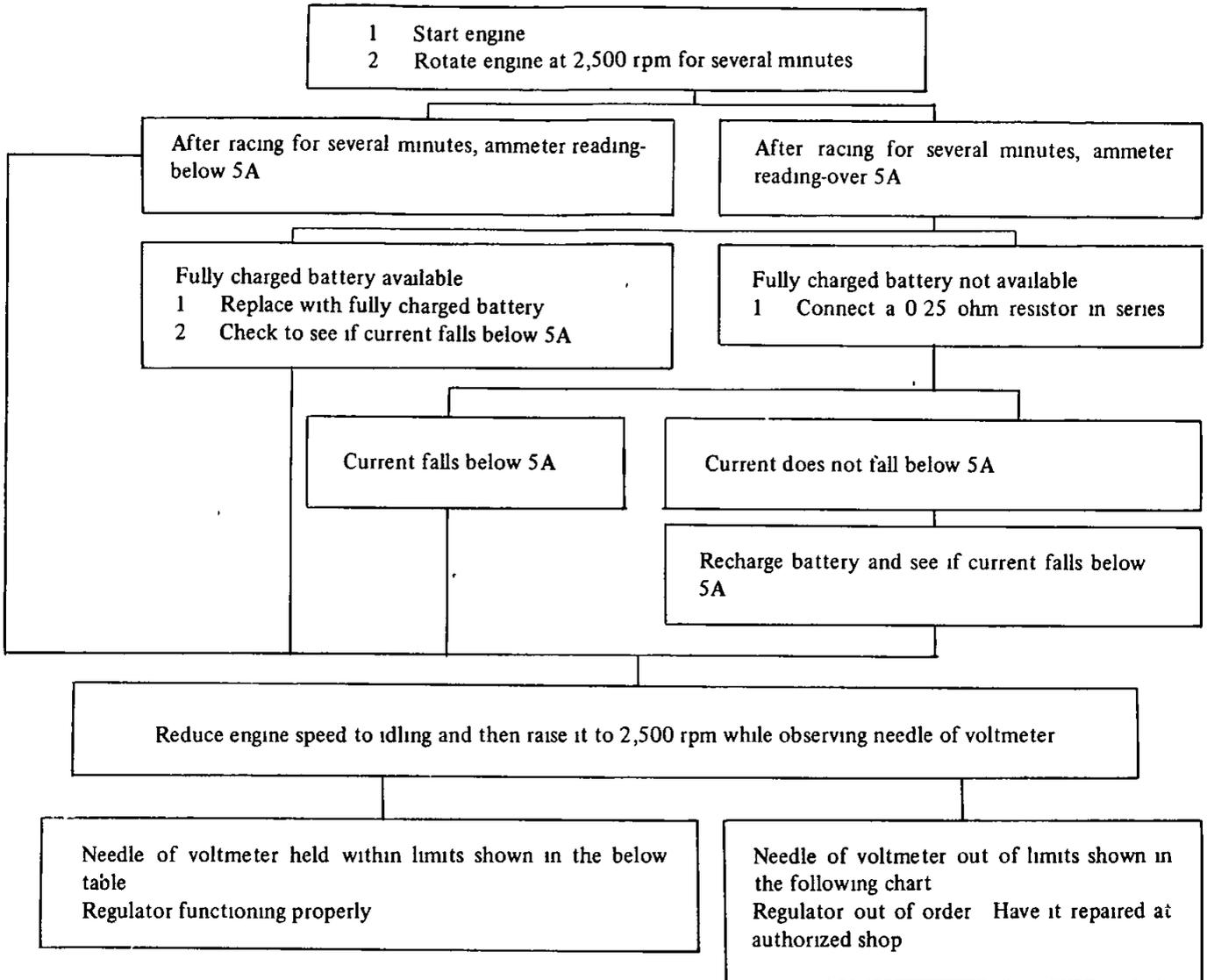


EE055

Fig EE-56 Measuring regulator voltage with regulator on vehicle

(3) Refer to the following chart to determine if regulator and relative parts are in good condition.

ENGINE ELECTRICAL SYSTEM



Regulator model TL1Z-58B (HITACHI)

Temperature °C (°F)	Voltage V
-10 (14)	14.75 to 15.25
0 (32)	14.60 to 15.10
10 (50)	14.45 to 14.95
20 (68)	14.30 to 14.80
30 (86)	14.15 to 14.65
40 (104)	14.00 to 14.50

- speed
- c Voltage may be approx 0.3 V higher than the rated for two to three minutes after engine is started, or more specifically, when regulator becomes self-heated. Measurements should then be made within one minute after starting engine, or when regulator is cold.
- d The regulator is of a temperature-compensating type. Before measuring voltage, be sure to measure surrounding temperature and correct measurements according to the table in the left hand side.

Notes

a Do not measure voltage immediately after driving. Do this while

regulator is cold
b To measure voltage, raise engine speed gradually from idling to rated

ENGINE ELECTRICAL SYSTEM

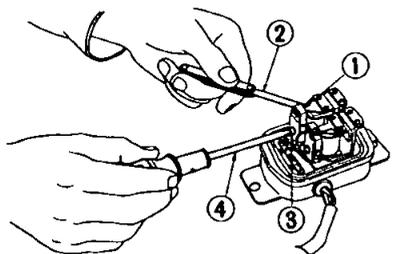
ADJUSTMENT

Voltage regulator

As the result of above measurement, when regulating voltage is deviated from rated value, adjust regulator in accordance with the following instructions

- 1 Inspect contact surface, and if rough, lightly polish surface with fine emery paper (#500 or 600)
- 2 Measure each gap, and adjust if necessary Adjust core gap and point gap in that order No adjustment is required for yoke gap
- 3 Adjusting core gap

Loosen screw [4 mm (0 157 in) diameter] which is used to secure contact set on yoke, and move contact upward or downward properly (See Figure EE-57)

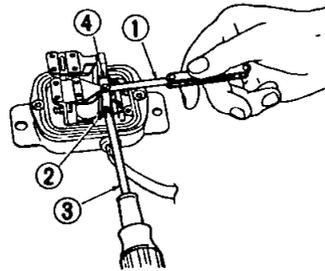


- 1 Contact set
- 2 Thickness gauge
- 3 4 mm (0 157 in) dia screw
- 4 Crosshead screwdriver

Fig EE-57 Adjusting core gap

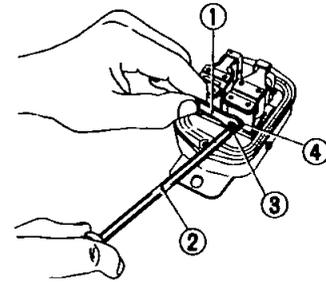
4 Adjusting point gap

Loosen screw [3 mm (0 118 in) diameter] used to secure upper contact, and move upper contact upward or downward adequately (See Figure EE-58)



- 1 Thickness gauge
- 2 3 mm (0 118 in) dia screw
- 3 Crosshead screwdriver
- 4 Upper contact

Fig EE-58 Adjusting point gap



- 1 Wrench
- 2 Crosshead screwdriver
- 3 Adjusting screw
- 4 Lock nut

Fig EE-59 Adjusting regulating voltage

Charging relay

Normal relay operating voltage is 8 to 10V as measured at alternator "A" terminal Relay itself, however, operates at 4 to 5 V

Use a DC voltmeter, and set up a circuit as shown in Figure EE-60

5 Adjusting voltage

Adjust regulating voltage as follows

Loosen lock nut securing adjusting screw Turn this screw clockwise to increase, or counterclockwise to decrease, regulating voltage (See Figure EE-59)

- 1 Connect positive terminal of voltmeter to regulator lead connector "N" terminal with negative terminal grounded
- 2 Start engine and keep it idle
- 3 Take voltmeter reading

0 Volt

- 1 Check for continuity between "N" terminals of regulator and alternator
- 2 Alternator circuit defective if continuity exists

Below 5 2 Volt

- (Pilot lamp remains lit)
- 1 Check fan belt tension
 - 2 If correct, remove regulator and adjust as necessary

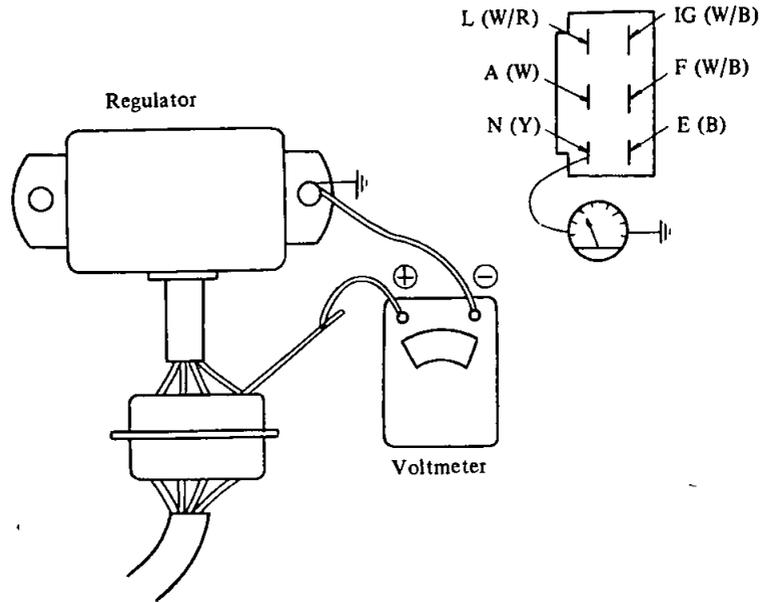
Over 5 2 Volt

- (Pilot lamp remains lit)
- Pilot lamp relay coil or contact points out of order
- Replace regulator

Over 5 2 Volt

- (Pilot lamp does not lit)
- Pilot lamp relay assembly is in good condition

ENGINE ELECTRICAL SYSTEM



EE059

Fig EE-60 Testing charging relay

SPECIFICATIONS AND SERVICE DATA

Voltage regulator

Model		TL1Z-58B
Regulating voltage (with fully charged battery)	V	*14.3 to 15.3 [at 20°C (68°F)]
Voltage coil resistance	Ω	10.5 [at 20°C (68°F)]
Rotor coil inserting resistance	Ω	10
Voltage coil series resistance	Ω	31
Smoothing resistance	Ω	40
Core gap	mm (in)	0.6 to 1.0 (0.0236 to 0.0394)
Point gap	mm (in)	0.35 to 0.45 (0.014 to 0.018)

Charge relay

Release voltage	V	4.2 to 5.2 at "N" terminal
Voltage coil resistance	Ω	37.8 [at 20°C (68°F)]
Core gap	mm (in)	0.8 to 1.0 (0.0315 to 0.0394)
Point gap	mm (in)	0.4 to 0.6 (0.0157 to 0.0236)

*Standard temperature gradient -0.015V/°C

ENGINE ELECTRICAL SYSTEM

TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator)

Condition	Probable cause	Corrective action
No output	Sticking brushes Dirty brushes and slip rings Loose connections or broken leads Open stator winding Open rotor winding Open diodes Shorted rotor Shorted stator Grounded "BAT" terminal Broken fan belt	Correct or replace brushes and brush springs Clean Retighten or solder connections Replace leads if necessary Repair or replace stator Replace rotor Replace diodes Replace rotor Repair or replace stator Replace insulator Replace belt
Excessive output	Broken neutral wire (color of wire is white) Defective voltage regulator Poor grounding of alternator and voltage regulator "E" terminal Broken ground wire (color of wire is black)	Replace wire Check regulator operation and repair or replace as required Retighten terminal connection Replace wire
Low output	Loose or worn fan belt Sticking brushes Low brush spring tension Defective voltage regulator Dirty slip rings Partial short, ground, or open in stator winding Partially shorted or grounded rotor winding Open or defective diode	Retighten or replace belt Correct or replace brushes and springs if necessary Replace brush springs Check regulator operation and repair or replace as required Clean Replace stator Replace rotor Replace diode
Noisy alternator	Loose mounting Loose drive pulley Defective ball bearing Improperly seated brushes	Retighten mounting bolts Retighten pulley correctly Replace bearing Seat brushes correctly

ENGINE ELECTRICAL SYSTEM

IGNITION CIRCUIT

The ignition circuit consists of the ignition switch, coil, distributor, wiring, spark plugs and battery

The circuit is equipped with a resistor. During cranking, electrical current bypasses the resistor, thereby connecting the ignition coil directly to battery. This provides full battery voltage available at coil and keeps ignition voltage as high as possible.

The low voltage current is supplied by the battery or alternator and flows through the primary circuit. It consists of the ignition switch, resistor, primary winding of the ignition coil, distributor contact points, condenser and all connecting low tension wiring.

The high voltage current is produced by the ignition coil and flows through the secondary circuit, resulting in high voltage spark between the electrodes of the spark plugs in engine cylinders. This circuit contains the secondary winding of the ignition coil, coil to distributor high tension cables, distributor rotor and cap.

When the ignition switch is turned on and the distributor contact points are closed, the primary current flows through the primary winding of the coil and through the contact points to ground. This flowing produces a magnetic field around the coil winding and then electrical energy in the coil.

When the contact points are opened by the revolving distributor cam, the magnetic field built up in the primary winding of the coil moves through the secondary winding of the coil inducing high voltage. The high voltage is produced every time the contact points open.

This system consists of a throttle switch, a two-point distributor and some electrical wiring and sensors as illustrated in the following figure. The main component of this system is the distributor, which has two breaker points. One is for advance – optimum ignition timing and the other for retard – delayed by 6° from optimum timing.

When the car is running in wide open throttle, the advance timing (optimum one) is used in order to improve fuel consumption. Conversely, the retard timing is used when the car is running in urban areas. The throttle switch detects such running conditions by monitoring the throttle valve opening.

The advance and retard timings are changed by a relay which monitors whether the throttle opens more than 40° or less than 40° . But when the engine is cold, the optimum timing is always obtained with the aid of the water temperature switch.

The high voltage current flows through the high tension cable to the distributor cap, then the rotor distributes the current to one of the spark plug terminals in the distributor cap.

Then the spark obtains while the high voltage current jumps the gap between the insulated electrode and the ground side electrode of the spark plug. This process is repeated for each power stroke of the engine.

The distributor contact points and spark plugs require periodic service. That is, the breaker points should be inspected, cleaned and regapped at tune up or replaced if necessary. In addition, lubricate distributor shaft and cam heel every suitable maintenance period. Spark plugs should be removed, inspected and maintained to obtain good firing.

The remainder of the ignition component parts should be inspected for only their operation, tightness of electrical terminals, and wiring condition.

The ignition circuit is shown below.

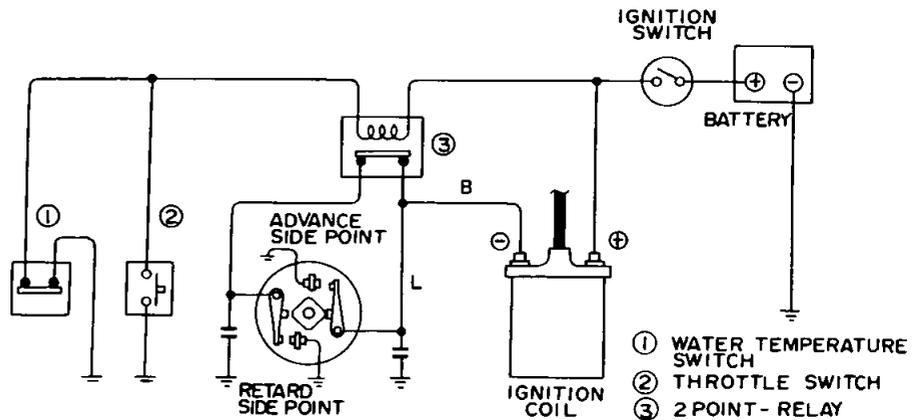


Fig EE-61 Ignition system circuit diagram

ENGINE ELECTRICAL SYSTEM

DISTRIBUTOR

CONTENTS

CONSTRUCTION	EE-26	Advance mechanism	EE-28
CHECKING AND ADJUSTMENT	EE-26	DISASSEMBLY AND ASSEMBLY	EE-28
Cap and rotor head	EE-26	Disassembly	EE-28
Point	EE-26	Assembly	EE-29
Replacing distributor breaker points	EE-27	SPECIFICATIONS AND SERVICE	
Checking and adjusting ignition timing	EE-27	DATA	EE-30
Condenser	EE-28		

CONSTRUCTION

Distributor model	Applied engine
D4B4-02	L18

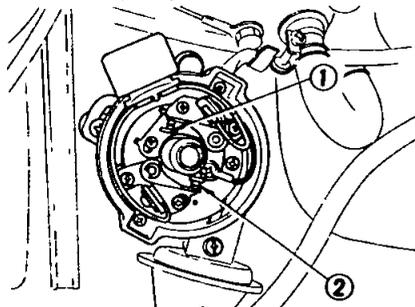
The distributor for the L18 engine has two breaker points, located opposite each other with a phase difference

The difference in phase can be adjusted by turning the adjusting screw

A phase difference of 6° crank angles is adopted. Two breaker points, which consist of advance and retard breakers, are placed in parallel with each other in the primary ignition circuit

The retard breaker point works when the relay is switched "ON" and the advance breaker point works when the relay is switched "OFF"

The relay switches OFF when water temperature switch is turned on (if the engine is cold), or when throttle switch is placed in the ON position (when the throttle valve is open more than 40 degrees)



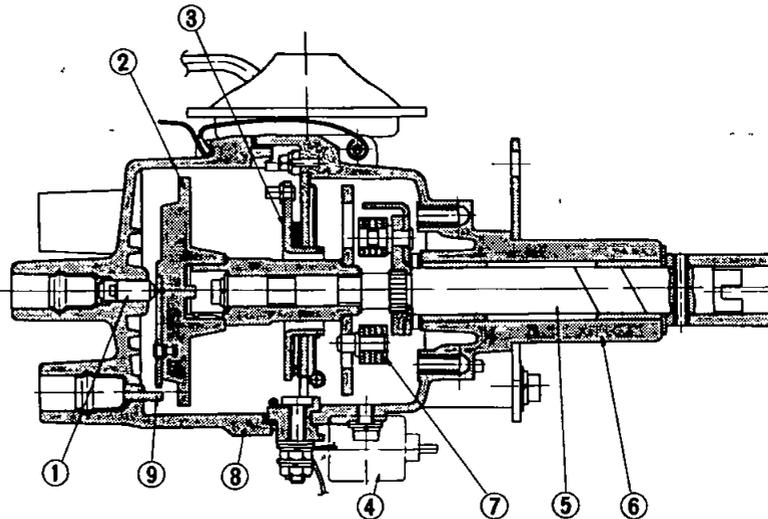
1 Advanced breaker point
2 Retarded breaker point

EE462

Fig EE-62 External view of dual points

The distributor follows the conventional design except for the dual points, i.e., breaker plate with contact points, centrifugal advance mechanism, vacuum unit, drive shaft and rotor. Figure EE-63 shows a sectional view of the unit.

anism, vacuum unit, drive shaft and rotor. Figure EE-63 shows a sectional view of the unit.



EE463

- | | | |
|---------------------------|-------------|-------------------|
| 1 Center carbon | 4 Condenser | 7 Governor weight |
| 2 Rotor head | 5 Shaft | 8 Cap |
| 3 Breaker plate (Contact) | 6 Housing | 9 Side plug |

Fig EE-63 Construction

CHECKING AND ADJUSTMENT

Cap and rotor head

Cap and rotor head must be inspected at regular intervals. In addition, remove cap and clean all dust and carbon deposits from cap and rotor from time to time. If cap is cracked or is leaking, replace with a new one.

Point

Standard gap of retarded points is 0.45 to 0.55 mm and standard gap of advanced points is 0.40 to 0.60 mm. If the gap is off the standard, adjustment should be made by loosening point screws. Gap gauge is required for adjustment.

Point gaps must be checked from time to time.

Point gap

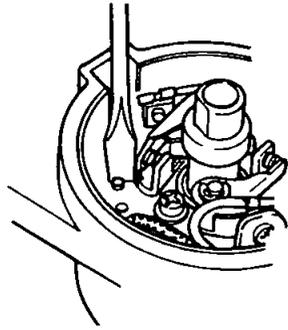
0.45 to 0.55 mm (Retard side)

0.40 to 0.50 mm (Advance side)

Dwell angle

49° to 55°

ENGINE ELECTRICAL SYSTEM



EE464

Fig EE-64 Measuring point gap

If point gap is adjusted by examining dwell angle, install distributor on engine and proceed as follows

- 1 Disconnect wiring harness of distributor from engine harness
- 2 Using a lead wire, connect B (black) of engine harness and L (blue) of distributor harness (advance side)
- 3 Adjust dwell angle of advance side by loosening point screw
- 4 Disconnect lead wire from B (black) of distributor harness and then connect it to G (green) of distributor (Retard side)
- 5 Adjust dwell angle of retard side by loosening point screw
- 6 After adjustment, disconnect lead wire then connect engine harness and distributor harness securely

When point surface is rough, take off any irregularities with fine sand paper of No 500 or 600 or with oil stone

At this time, grease must be supplied to camshaft and cam heel

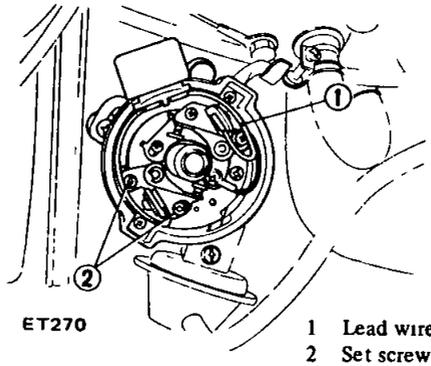
When wear on breaker points is noticeable, replace points together with contact set

Replacing distributor breaker points

Check distributor breaker points for abnormal pitting and wear. Replace points periodically. After replacing points, make sure they are in correct alignment for full contact and that point dwell and gap are correct. Clean and apply distributor grease to cam lobes

Note Do not apply excess amount of grease

The distributor has two contact points. Each point can be replaced independently. Both points, however, are usually replaced at the same time



ET270

- 1 Lead wire
- 2 Set screw

Fig EE-65 Breaker point

- 1 Loosen lead wire setting screws and remove lead wire from contact point set
- 2 Remove two set screws on each point set. Point assembly can then be taken out
- 3 Install new contact point in the reverse sequence of removal

Notes

- a Coat cam heel with a light coating of grease
- b Adjust contact point gap properly by measuring point gap with a feeler gauge before set screws are tightened securely

Distributor point gap
0.45 to 0.55 mm
(Retard side)
0.40 to 0.50 mm
(Advance side)

Distributor dwell angle
49 to 55 degrees

Checking and adjusting ignition timing

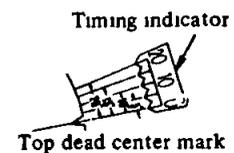
- 1 Check spark plugs and distributor breaker points for condition
- 2 Thoroughly remove dirt and dust from timing mark on crank pulley and timing indicator on front cover
- 3 Warm up engine sufficiently

4 Install a timing light on No 1 cylinder spark plug wire, and install a tachometer

5 Set idling speed to the following specifications

6 With a timing light, check that ignition timing is at the specified value

Note There are two ignition timings "Retard" and "Advance". The ignition timing adjustment should be carried out on the "Retard" side



EE465

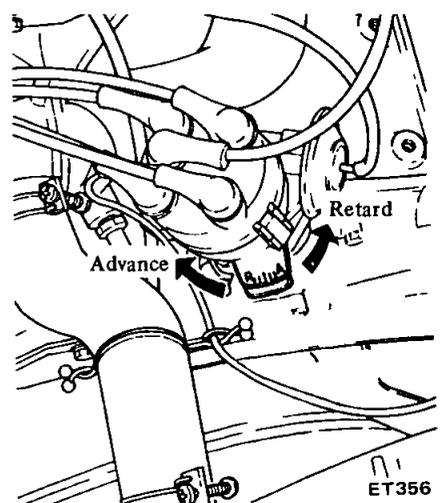
Fig EE-66 Checking ignition timing

Ignition timing

Transmission	Ignition timing	
	M/T	A/T
Timing BTDC/rpm	6°/700	6°/800 (N position)

*Ignition timing is on "Retard" side

- If necessary, adjust it as follows
- (1) Loosen set screw until distributor can be moved by hand
 - (2) Adjust ignition timing to the following specifications. See Figure EE67
 - (3) Lock distributor set screw, and make sure that timing is correct



ET356

Fig EE-67 Adjusting ignition timing

ENGINE ELECTRICAL SYSTEM

Inspection and adjustment of phase difference

To check phase difference, install distributor on engine and proceed as follows

- 1 Disconnect wiring harness of distributor from engine harness
- 2 Using a lead wire, connect B (black) of engine harness and G (green) of distributor harness (Retard side) Refer to Figure EE-68

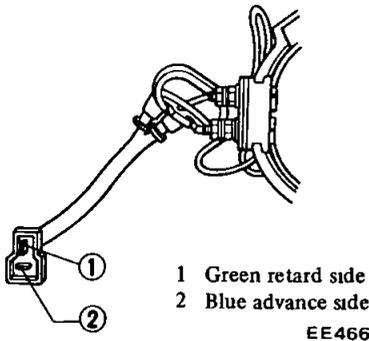


Fig EE-68 Connecting wire

- 3 With engine idling, adjust ignition timing by rotating distributor to specifications ($6^{\circ}/700$ rpm M/T, $6^{\circ}/800$ rpm A/T, retard side)

- 4 Disconnect lead wire from G (green) of distributor harness and then connect it to L (blue) of distributor harness (Advance side)

- 5 With engine still idling, check to determine that phase delay is 6 degrees in terms of crank shaft angular displacement

To correct, further proceed as follows

- (1) Referring to Figure EE-69, turn out adjuster plate set screw $1/2$ to 2 turns Adjuster plate is located on advance side

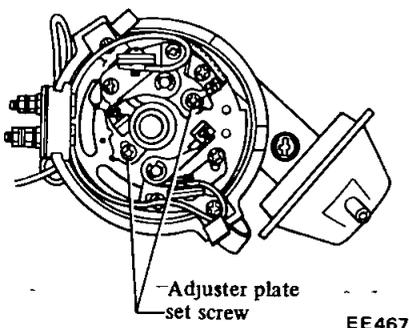


Fig EE-69 Adjuster plate set screws

- (2) Using a notch in adjuster plate as a hold, turn adjuster plate as required until correct phase difference is obtained

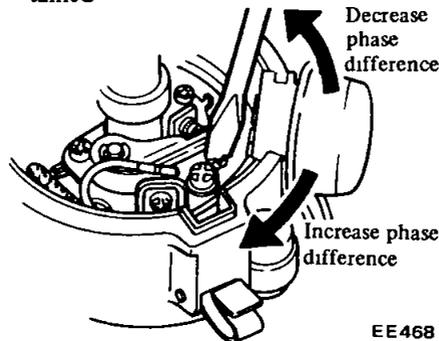


Fig EE-70 Adjusting phase difference

- (3) Tighten adjuster plate set screws to secure the adjustment

- (4) Make sure that the ignition timing of retard side is at the specified value

- (5) After adjustment, remove lead wire and connect wiring harness of distributor to engine harness securely

Condenser

Satisfactory performance of condenser depends on capacity and degree of insulation, requiring attention to be sure that terminals are clean and set screws are tight

Checking of condenser is made by a capacity tester This can also be made by a circuit tester with its range set to high resistance reading When needle of tester swings violently and then moves back to infinite gradually, it is an indication that condenser is in good condition

If needle shows any steady reading or if it registers zero, the likelihood is that transformer is out of order, calling for replacement

Advance mechanism

◀ Vacuum advance mechanism - mechanical parts ▶

-If vacuum advance mechanism fails to operate properly, check for the following items and correct the

trouble as required

- 1 Check vacuum inlet for signs of leakage at its connection If necessary, retighten or replace with a new one

- 2 Check vacuum diaphragm for air leak

If leak is found, replace vacuum control assembly with a new one

- 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 trouble is traced to centrifugal advance mechanical part, use distributor tester to check its characteristic

When nothing is wrong with its characteristic, conceivable causes are defectiveness or abnormal wearing-out of driving part or others

So do not disassemble it In case of improper characteristic, take off switch on-off part and check closely cam assembly, governor weight, shaft and governor spring, etc

In case centrifugal advance mechanical part is reassembled, be sure to check advance characteristic by distributor tester

DISASSEMBLY AND ASSEMBLY

Disassembly

To disassemble, follow the below procedure

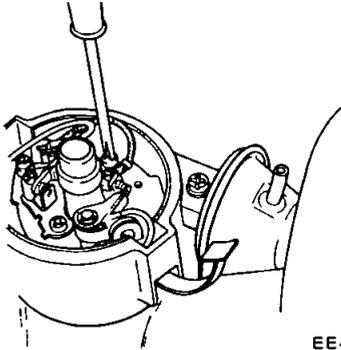
- 1 Take off cap and disconnect rotor head

- 2 Remove contact set

---Refer to Figure EE-65, when contact set is removed

- 3 Remove vacuum controller

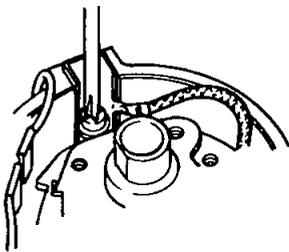
ENGINE ELECTRICAL SYSTEM



EE469

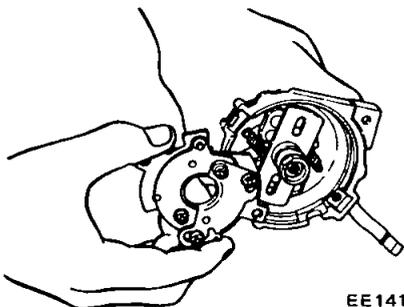
Fig EE-71 Disassembling vacuum controller

- 4 Remove terminal assembly
- 5 Unscrew two contact breaker set screws and remove contact breaker assembly



EE470

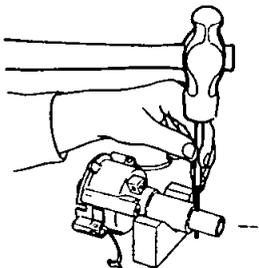
Fig EE-72 Unscrewing breaker set screws



EE141

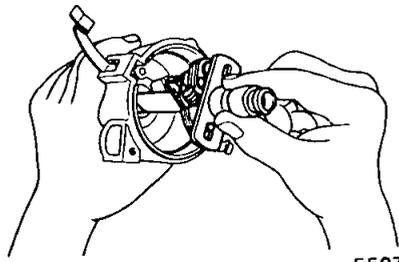
Fig EE-73 Removing contact breaker

- 6 Pull knock pin out and disconnect collar to remove the entire rotating parts



EE073

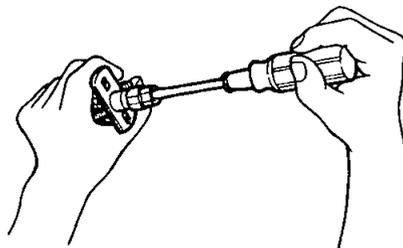
Fig EE-74 Removing knock pin



EE074

Fig EE-75 Removing rotation parts

- 7 When cam is to be removed, first remove set screw since shaft head is fastened by the screw to hold cam down. Put match mark across cam and shaft so that original combination can be restored at assembly.



EE075

Fig EE-76 Removing cam

- 8 When governor weight and spring are disconnected, be careful not to stretch or deform governor spring.

After disassembling, apply grease to governor weights.

Assembly

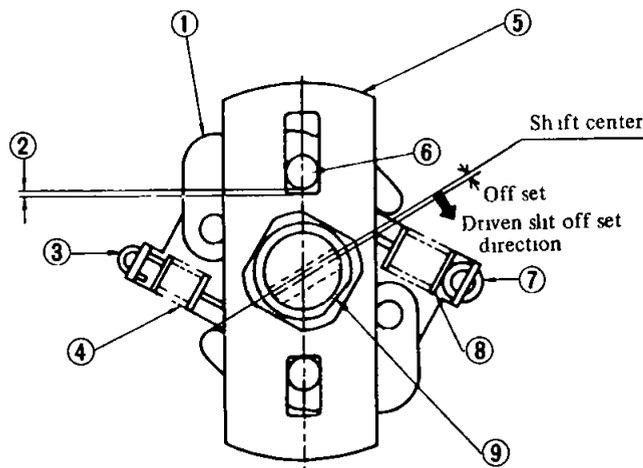
Assembly can be made in reverse sequence of disassembly. Refer to Figure EE-77 for replacement and reassembly of governor spring and cam.

When assembling shaft and cam set, the driven slit offset direction and rotor head positioning tip should be as shown in Figure EE-77. The governor spring circular hook must be attached to the side of the rotor head positioning tip at the cam.

Then weight pin for governor spring A with circular hook comes in long rectangular hole.

After assembly, check operation of governor before installing it on engine.

Ignition timing should be tested with unit mounted on engine.



EE077

- 1 Governor weight
- 2 Clearance for start and end of advancing angle
- 3 Rectangular hook
- 4 Governor spring (B)
- 5 Cam plate
- 6 Weight pin
- 7 Circular hook
- 8 Governor spring (A)
- 9 Rotor positioning tip

Fig EE-77 Setting governor spring and cam

ENGINE ELECTRICAL SYSTEM

SPECIFICATIONS AND SERVICE DATA

Distributor type	D4B4-02
Make	HITACHI
Applied engine (car)	L18 (610)
Firing order	1-3-4-2
Rotating direction	Counterclockwise
Ignition timing (degree) (Retard side)	6° (B T D C)
Phase difference (degree)	6° at crank angle
Idling adjustment	
M/T	6°/700 rpm
A/T	6°/800 rpm in "N" position
Dwell angle (degree)	49° to 55°
Condenser capacity (μ F)	
Advance side	0.2 to 0.24
Retard side	0.05 \pm 15%

ENGINE ELECTRICAL SYSTEM

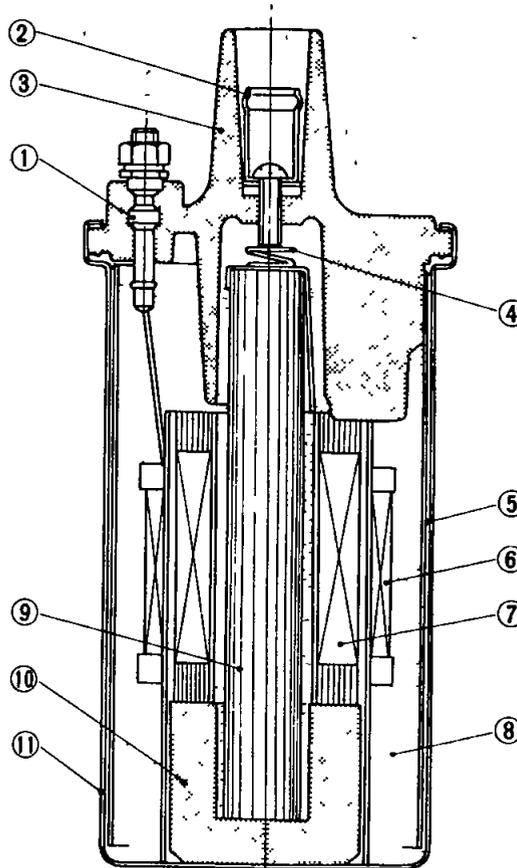
IGNITION COIL

The ignition coil is of an oil-filled type. The ignition coil case is filled with oil which has good insulating and heat-radiating characteristics.

High sparking voltage is produced

from starting to engine high revolution by the resistor which is used in the ignition coil circuit. The internal resistor limits to a maximum safe flow of the primary current through the

coil and distributor contact points. Thus, it protects the contact points during slow speed operation when they are closed for long intervals.



- 1 Primary terminal
- 2 Secondary terminal
- 3 Cap
- 4 Spring
- 5 Side core
- 6 Primary coil
- 7 Secondary coil
- 8 Insulator oil
- 9 Center core
- 10 Segment
- 11 Case

EE078

Fig EE-78 Construction

SPECIFICATIONS

Make and type		HITACHI (C6R-206)
Primary voltage	V	12
Spark gap	mm (in)	More than 7 (0.2756)
Primary resistance at 20° (68°F)	Ω	1.5 to 1.7
Secondary resistance at 20° (68°F)	KΩ	9.5 to 11.6
Resistor	Ω	1.6

ENGINE ELECTRICAL SYSTEM

SPARK PLUG

CONTENTS

DESCRIPTION	EE-32	SPECIFICATIONS AND SERVICE DATA	EE-33
INSPECTION	EE-32	TROUBLE DIAGNOSES AND	
CLEANING AND REGAP	EE-32	CORRECTIONS	EE-33

DESCRIPTION

The spark plugs are of the resistor type, having 14 mm threads and 0.8 to 0.9 mm gap. The inspection and cleaning should be made periodically as specified in the "Maintenance Schedule"

Note All spark plugs installed on an engine, must be of the same brand and number of heat range

Overheating White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose

spark plugs, low fuel pump pressure, wrong selection of fuel, a hotter plug, etc. It is advisable to replace with plugs having colder heat range

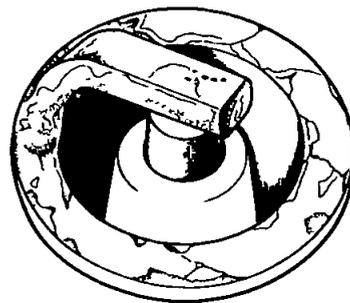
INSPECTION

- 1 Remove spark plug wire by pulling on boot, not on wire itself
- 2 Remove spark plugs
- 3 Check electrodes and inner and outer porcelains of plugs, noting the type of deposits and the degree of electrode erosion. Refer to Figure EE-79

Normal Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range

Carbon fouled Dry fluffy carbon deposits on the insulator and electrode were mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc. It is advisable to replace with plugs having hotter heat range

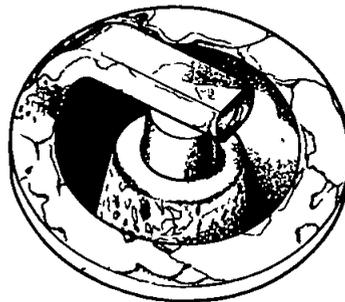
Oil fouled Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug



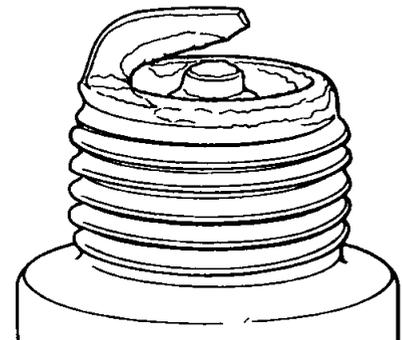
Normal



Carbon fouled



Overheating



Life

EE079

Fig EE-79 Spark plug

4 After cleaning, dress electrodes with a small fine file to flatten the surfaces of both center and side electrodes in parallel. Set spark plug gap to specification

5 Install spark plugs and torque each plug to 1.5 to 2.0 kg-m (11 to 14 ft-lb)

6 Connect spark plug wires

CLEANING AND REGAP

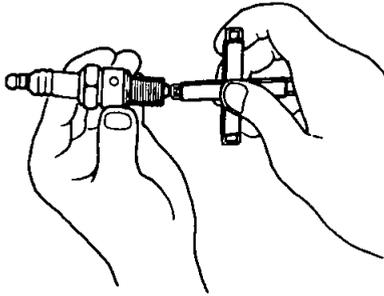
Clean spark plugs in a sand blast

type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain. If deposits are too stubborn, discard plugs

After cleaning spark plugs, renew firing surface of electrodes with file mentioned above. Then gap spark plugs to 0.8 to 0.9 mm (0.0315 to 0.0354 in) using a round wire feeler gauge. All spark plugs new or used should have the gap checked and reset by bending ground electrode

ENGINE ELECTRICAL SYSTEM

SERVICE DATA AND SPECIFICATIONS



EE080

Fig EE-80 Setting spark plug gap

Item	Make	NGK
	Model	BP-6ES
Applied engine	L18 (with single carb)	
Size (screw dia x reach) mm	14 x 19	
Plug gap mm	0.8 to 0.9	
Tightening torque kg-m	2.0 to 3.0	

TROUBLE DIAGNOSES AND CORRECTIONS

1 When engine does not start
If there is no trouble in fuel system, ignition system should be checked. This can be easily done by detaching a

high tension cable from spark plug, starting engine and observing condition of spark that occurs between

high tension cable and spark plug terminal. After checking this, repair as necessary.

Spark length	Location	Probable cause	Corrective action
No sparks at all	Distributor	Defective insulation of condenser	Replace
		Breakage of lead-wire on low tension side	Repair
		Defective insulation of cap and rotor head	Replace
Point does not open or close		Repair	
Ignition coil	Wire breakage or short circuit of coil	Replace with new one	
	High tension cable	Wire coming off	Repair
Defective insulation		Replace	
1 to 2 mm (0.0394 to 0.0787 in) or irregular	Distributor	Point gap too wide	Correct
		Oil sticking on point	Clean
		Point burnt too much	Replace
Less than 6 mm (0.2362 in)	Spark plugs	Electrode gap too wide	Correct or replace
		Too much carbon	Clean or replace
		Broken neck of insulator	Replace
		Expiry of plug life	Replace

ENGINE ELECTRICAL SYSTEM

2 When engine rotates but does not run smoothly
In this case, there are many causes

resulting from the ignition system and other engine conditions not related to ignition Therefore, first complete

inspection of ignition system should be carried out

Condition	Location	Probable cause	Corrective action
Engine misses	Distributor	Dirty point	Clean
		Improper point gap	Correct
		Leak of electricity of cap and rotor head	Repair or replace
		Defective insulation of condenser	Replace
Engine misses	Distributor	Defective arm.	Oil shaft
		Defective spring of arm	Replace assembly
		Breakage of lead wire	Replace
		Worn out or shaky breaker plate	Replace assembly
Engine misses	Distributor	Worn out or shaky distributor shaft	Replace assembly
		Ignition coil	Layer short circuit or use of inferior quality
		High tension code	Deterioration of insulation and leak of electricity
		Spark plugs	Dirty
Engine misses	Spark plugs	Leak of electricity at upper porcelain insulater	Clean
			Repair or replace
Engine causes knocking very often	Distributor	Improper and advance timing	Correct the fitting
		Coming off or breakage of governor spring	Correct or replace
Engine causes knocking very often	Spark plugs	A pin or a hole of governor portion worn out	Replace
		Burnt too much	Replace
Engine does not give enough power	Distributor	Improper and retarded timing	Correct the fitting
		Defective function of governor	Replace assembly
		Dirty point	Clean
		Point gap too narrow	Correct
Engine does not give enough power	Spark plugs	Dirty	Clean

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION ER

ENGINE REMOVAL & INSTALLATION

ER

ENGINE REMOVAL AND
INSTALLATION

ER- 2



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

ENGINE REMOVAL AND INSTALLATION

CONTENTS

REMOVAL
INSTALLATION

ER-2	ENGINE MOUNTING INSULATOR	ER-4
ER-4	FRONT INSULATOR	ER-4
	REAR INSULATOR	ER-4

REMOVAL

It is much easier to remove engine and transmission as a single unit than to remove only engine from the engine compartment. After removal, the engine can be separated from the transmission assembly.

Notes

- a Be sure to hoist engine and jack up transmission in a safe manner
- b Fender covers should be used to prevent damaging car body
- c Place wheel chocks in front of front wheels and in rear of rear wheels

- 1 Disconnect battery ground cable from battery terminal
- 2 Remove hood as follows
 - (1) Mark hood hinge locations on hood to facilitate proper reinstallation
 - (2) Support hood with hand and remove bolts securing it to hood hinge, taking care not to let hood slip when bolts are removed. See Figure ER-1

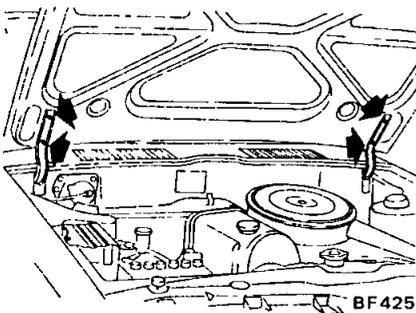
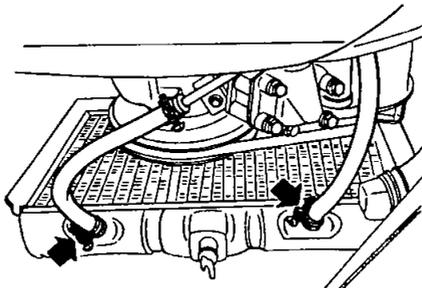


Fig ER-1 Removing hood securing bolts

- (3) Remove hood from hood hinge with the help of an assistant
- 3 Drain engine coolant and engine oil
- 4 Remove radiator grille
- 5 Disconnect upper and lower hoses from radiator

Notes On automatic transmission equipped cars

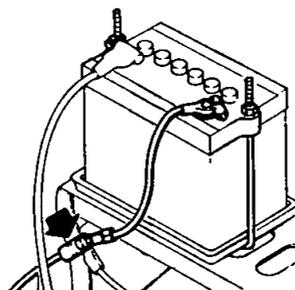
- a Remove splash board
- b Disconnect oil cooler hoses at oil cooler installed at the lower end of radiator. See Figure ER-2



ER121

Fig ER-2 Removing oil cooler hoses

- c Disconnect vacuum hose
 - d Disconnect wire connections at inhibitor switch and at downshift solenoid
- 6 Remove four bolts securing radiator to body and detach radiator and radiator shroud (if so equipped)
 - 7 Disconnect engine ground cable at the body connection end. See Figure ER-3



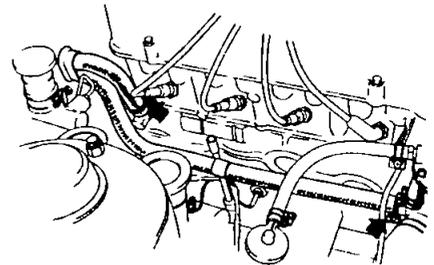
ER176

Fig ER-3 Disconnecting engine ground cable

- 8 Disconnect hose(s) from air cleaner and remove air cleaner

- 9 Disconnect
 - (1) Fuel hose at fuel pump
 - (2) Accelerator linkage

- 10 Remove high tension cable from ignition coil
- 11 Disconnect wiring harnesses for starter, alternator, back-up lamp, oil pressure switch and thermal transmitter at two connector plugs of engine compartment main harness
- 12 Disconnect vacuum hose of Master-Vac at intake manifold, if so equipped
- 13 Disconnect heater inlet and outlet hoses, if so equipped. See Figure ER-4



ER340

Fig ER-4 Removing heater inlet and outlet hoses

- 14 Remove clutch operating cylinder from clutch housing. See Figure ER-5

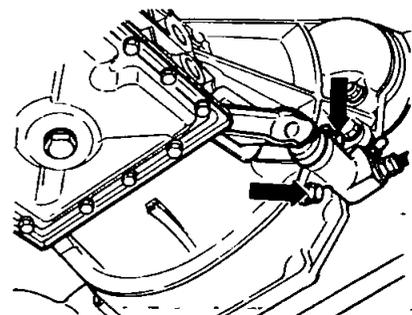
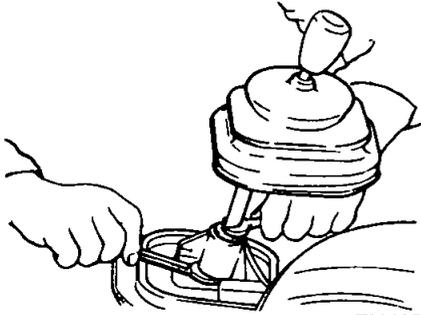


Fig ER-5 Removing clutch operating cylinder

Engine Removal & Installation

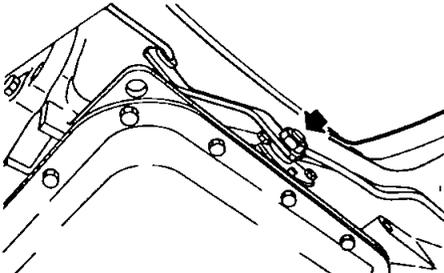
- 15 Disconnect speedometer cable from rear extension housing
- 16 Disconnect parking brake cable at cable adjuster
- 17 Remove transmission control linkage
 - (1) For cars equipped with manual transmission, remove gear shift control lever See Figure ER-6



TM415

Fig ER-6 Removing gear shift control lever

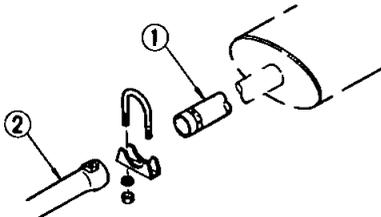
- (2) For cars equipped with automatic transmission, disconnect selector range lever from manual shaft See Figure ER-7



ER124

Fig ER-7 Disconnecting selector range lever

- 18 Disconnect exhaust front tube from exhaust manifold
 - Loosen rear tube connector, and remove front tube assembly



ER180

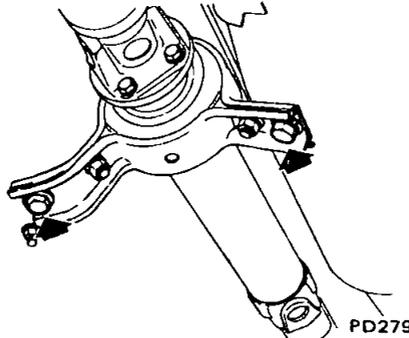
- 1 Front tube
- 2 Rear tube

Fig ER-8 Disconnecting exhaust front tube from rear tube

- 19 Disconnect propeller shaft at companion flange of gear carrier

Note Put match marks on both the shaft and companion flange so that shaft can be reinstalled in the original position

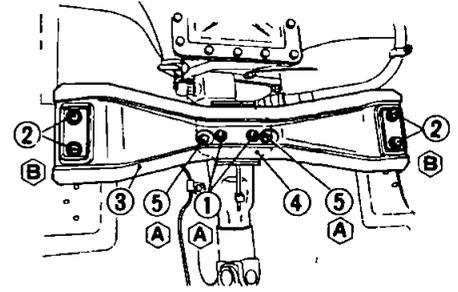
- 20 For cars equipped with 3-joint propeller shaft, remove center bearing bracket attaching bolts and remove center bearing support from floor panel See Figure ER-9



PD279

Fig ER-9 Remove center bearing support

- 21 Withdraw sleeve yoke from rear extension housing Plug up rear end of rear extension housing to prevent oil leakage
- 22 Support transmission with jack
- 23 Remove two rear engine mounting nuts ① as shown in Figure ER-10
- 24 Remove four rear engine mounting member securing bolts ② as shown in Figure ER-10 and detach mounting member



ER125

- 1 Rear engine mounting nut
- 2 Rear engine mounting member securing bolt
- 3 Rear engine mounting member
- 4 Rear engine mounting insulator
- 5 Rear engine mounting insulator to transmission securing bolt

Tightening torque (T) of bolts or nuts kg-m (ft-lb)

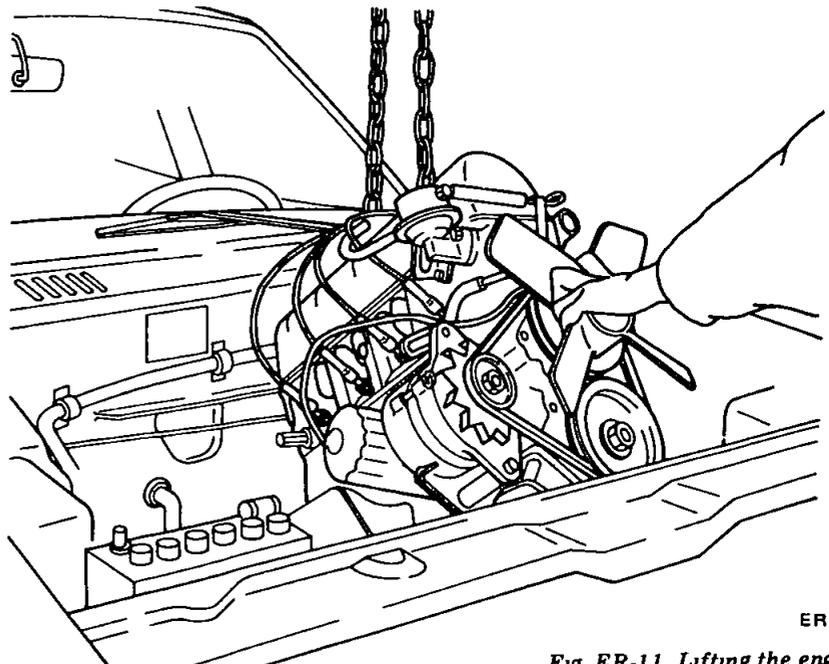
Ⓐ T 0.9 to 1.2 (7 to 9)

Ⓑ T 1.9 to 2.6 (14 to 19)

Fig ER-10 Removing rear engine mounting member

- 25 Connect suitable wires to engine slingers and raise engine to take weight off front mounting insulators
- 26 Remove bolts securing engine support to front mounting insulators
- 27 Raise engine and transmission, and remove from car as a single unit See Figure ER-11

Note Be careful not to allow the unit to hit against any adjacent parts



ER126

Fig ER-11 Lifting the engine

INSTALLATION

Install in the reverse order of removal, observing the following instructions

- 1 When installing, first secure rear engine mounting member to body
- 2 Refer to applicable section when installing and adjusting any parts
- 3 When installing hood following engine installation, be sure that it is properly centered and that hood lock operates securely Refer to Section BF for Adjustment

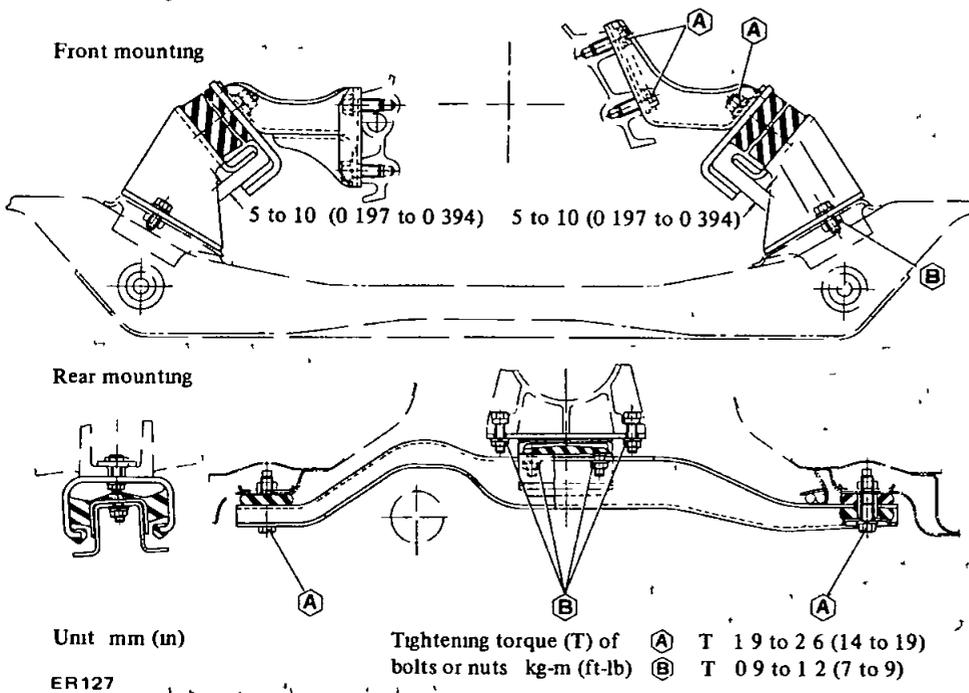


Fig ER-12 Structure view of engine mounting

FRONT INSULATOR

Right and left front insulators are identical, and are interchangeable See Figure ER-13

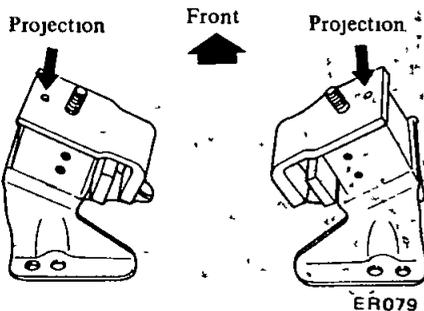


Fig ER-13 Front insulator

Removal

- 1 Support engine with a jack

ENGINE MOUNTING INSULATOR

Three insulators are used to mount the engine and transmission, two located at left and right front ends of cylinder block and one at transmission rear extension housing

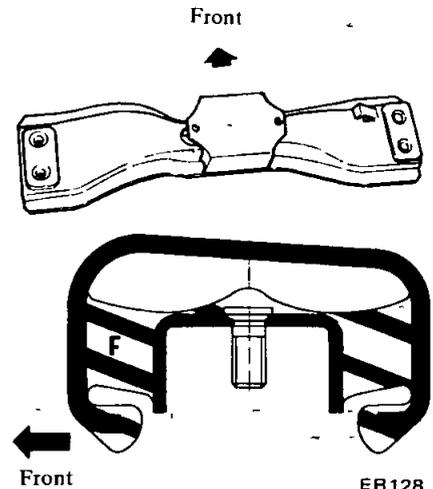
Replace insulator if it shows signs of separation or deterioration

Be sure to keep insulator free from oil or grease See Figure ER-12

Front insulator can be adjusted sideways After mounting the engine on front insulators, make sure that the engine is properly aligned

Note When connecting front insulator to engine mounting bracket, align the projection on front insulator with the notch in engine mounting bracket

REAR INSULATOR



ER128

Fig ER-14 Rear insulator

Removal

- 1 Support the transmission with a jack
- 2 Remove nuts securing rear engine mounting insulator to mounting member
- 3 Remove bolts connecting rear engine mounting insulator to transmission rear extension housing
- 4 Raise transmission slightly, and remove insulator

Inspection

If there is damage, deterioration or separation of bounded surface, replace

Installation

Install rear engine mounting insulator in the reverse order of removal, observing the following instructions

Install insulator in place with the direction of mounted insulator the same as that in Figure ER-14

Inspection

If there is damage, deterioration or separation of bounded surface, replace

Installation

Install front insulator in the reverse order of removal, observing the following instructions

SERVICE DATA AND SPECIFICATIONS

Tightening torque	kg-m (ft-lb)
Rear mounting member to body	1.9 to 2.6 (14 to 19)
Rear insulator to rear mounting member	0.9 to 1.2 (7 to 9)
Transmission to rear insulator	0.9 to 1.2 (7 to 9)
Front insulator to front suspension member	0.9 to 1.2 (7 to 9)
Front insulator to engine support bracket	1.9 to 2.6 (14 to 19)
Engine to engine support bracket	1.9 to 2.6 (14 to 19)
Cylinder block gusset to automatic transmission	2.7 to 3.3 (20 to 24)

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CL

CLUTCH

CL

CLUTCH	CL- 2
CLUTCH CONTROL	CL- 5
SERVICE DATA AND SPECIFICATION	CL- 9
TROUBLE DIAGNOSES AND CORRECTIONS	CL-10
SPECIAL SERVICE TOOLS	CL-12

CLUTCH**CONTENTS**

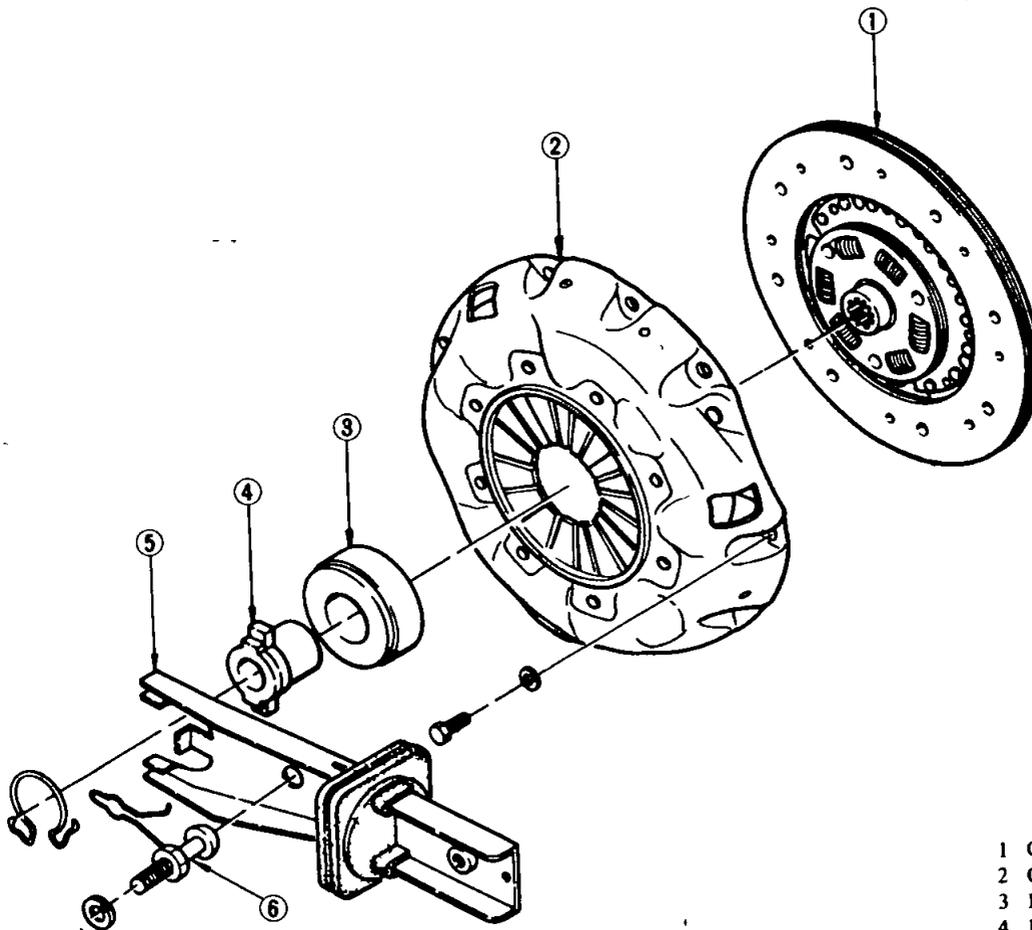
DESCRIPTION	CL-2	INSPECTION AND ADJUSTMENT	CL-3
REMOVAL	CL-2	ASSEMBLY	CL-4
DISASSEMBLY	CL-2	INSTALLATION	CL-4

DESCRIPTION

The clutch (C200S Type) is a single dry disc type using a diaphragm spring

It consists of the clutch disc, pressure plate, diaphragm spring, thrust

rings, clutch cover, and clutch release bearing



- 1 Clutch disc assembly
- 2 Clutch cover assembly
- 3 Release bearing
- 4 Release sleeve
- 5 Withdrawal lever
- 6 Withdrawal lever ball pin

CL149

Fig CL-1 Exploded view of clutch assembly

REMOVAL

- 1 Remove transmission from engine Refer to Section TM for Removal Procedure
- 2 Loosen bolts attaching clutch cover to flywheel, one turn at a time each, until spring pressure is released

Be sure to turn them out in a criss-cross fashion

- 3 Remove clutch disc and cover assembly

Notes

- a Be careful not to allow grease or oil to get on clutch linings

- b Be careful not to drop clutch disc or clutch cover assembly

DISASSEMBLY

- 1 Clutch cover assembly cannot be disassembled since diaphragm spring is

Clutch

securely riveted to clutch cover and clutch cover assembly is balanced

If necessary, replace clutch cover assembly as a complete unit

2 Remove clutch release mechanism as follows

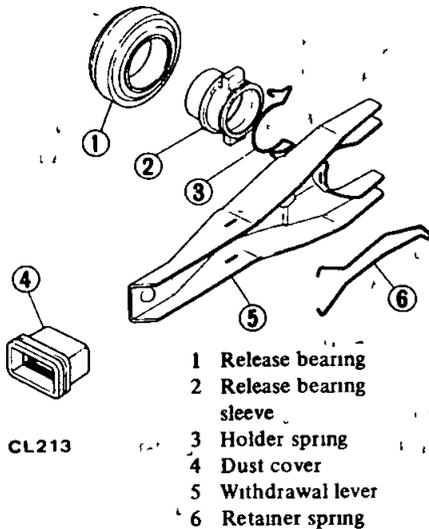


Fig CL-2 Exploded view of clutch release mechanism

(1) Remove dust cover from clutch housing

(2) Using a flat-head screwdriver, remove retaining spring from ball pin in front cover of transmission

(3) Remove withdrawal lever together with clutch release bearing and holder spring

(4) Remove holder spring from withdrawal lever, and detach clutch release bearing from withdrawal lever

At this time, remove retainer spring from withdrawal lever

3 Remove clutch release bearing from bearing sleeve, using a universal puller See Figure CL-3

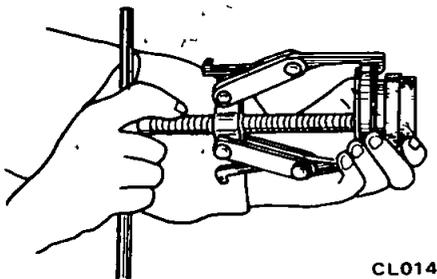


Fig CL-3 Disassembling release bearing

4 Remove pilot bushing in crankshaft, using a Pilot Bushing Puller ST16610001, if necessary See Figure CL-4

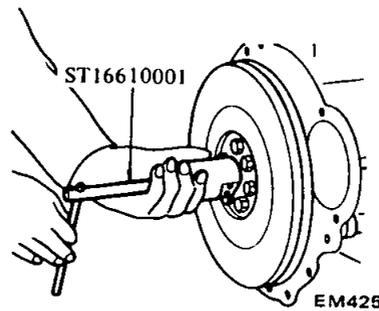


Fig CL-4 Pulling out pilot bushing

INSPECTION AND ADJUSTMENT

Wash all the disassembled parts except release bearing and 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 torsion springs

1 If facings are oily, the 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 less than 0.3 mm (0.012 in) at rivets

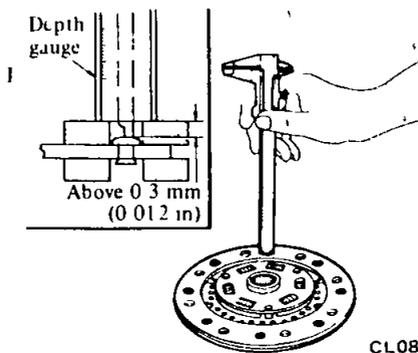


Fig CL-5 Measuring clutch lining

3 Check disc plate for runout whenever the old disc or a new one is installed

4 If runout exceeds 0.5 mm (0.020 in) at the outer circumference of facing 95 mm (3.74 in) from the center, replace or repair disc assembly

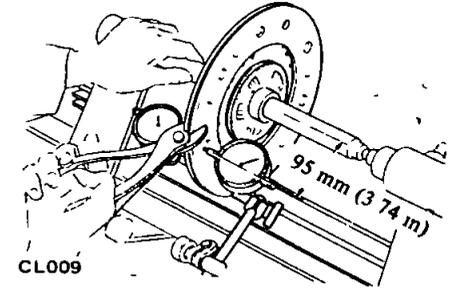


Fig CL-6 Measuring disc runout

5 Check the fit of disc hub on transmission main drive gear splines for smooth sliding. If splines are worn, that is, backlash exceeds 0.4 mm (0.016 in) at the outer edge of clutch disc, clutch disc or main drive gear should be replaced

Clutch cover assembly

1 Check the end surface of diaphragm spring for wear. If excessive wear is found, replace clutch cover as an assembly

2 Measure the height of diaphragm spring as outlined below

(1) Place Distance Piece ST20050100 on Base Plate ST20500010, and then tighten clutch cover assembly on the base plate by using Set Bolts ST20050051 See Figure CL-7

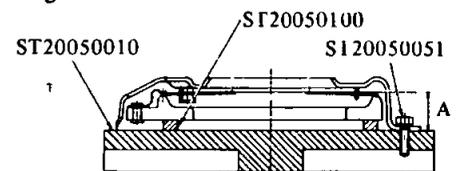


Fig CL-7 Measuring the height of diaphragm spring

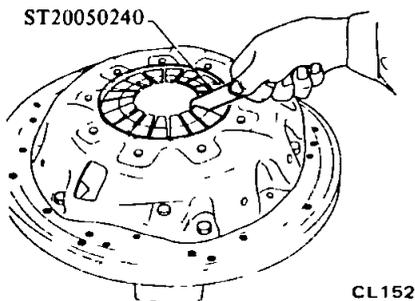
(2) Measure the height "A" at several points with a vernier caliper depth gauge See Figure CL-7

If the height "A" of spring end is beyond the specified value, adjust the spring height with Diaphragm Spring Adjusting Wrench ST20050240 See Figure CL-8

Height "A"

31 0 to 33 0 mm
(1 220 to 1 229 in)

If necessary, replace clutch cover as an assembly Also, unevenness of diaphragm spring toe height should be less than 0 5 mm (0 020 in) on 62 mm (2 44 in) diameter of diaphragm spring



CL152

Fig CL-8 Adjusting spring height

3 Inspect thrust rings for wear or damage

As these parts are invisible from outside, shake cover assembly up and down to listen for clattering noise, or hammer lightly on rivets and listen for a slightly cracked noise Any of these noises indicates necessity for replacement as a complete assembly

Release bearing and sleeve

1 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

Pilot bushing

Check the fit of pilot bushing in the bore of crankshaft

Check pilot bushing in crankshaft for wear, roughness or bell-mouthed condition

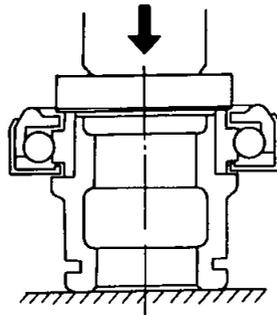
If necessary, replace it When bushing is not suitable for further use, be sure to check transmission main drive gear at the same time

ASSEMBLY

Release bearing and sleeve

1 When installing release bearing on sleeve, use a press and seat bearing securely on sleeve

Note Do not press outer race See Figure CL-9

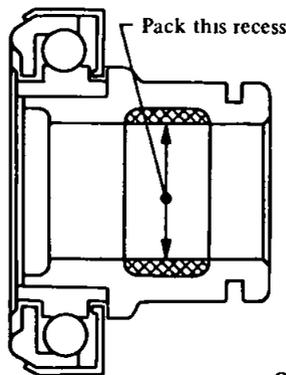


CL215

Fig CL-9 Installing release bearing

2 Before or during assembly; lubricate the following points with a light coat of multi-purpose grease

(1) Inner groove of release bearing sleeve

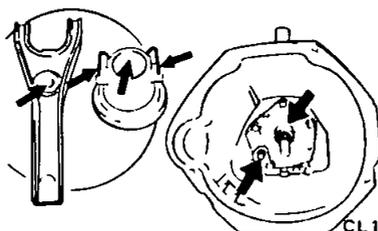


CL216

Fig CL-10 Lubricating recess of bearing sleeve

(2) Contact surfaces of withdrawal lever, lever ball pin and bearing sleeve

(3) Contact surfaces of transmission front cover See Figure CL-11



CL111

Fig CL-11 Lubricating points of withdrawal lever and front cover

(4) Contact surface of transmission main drive gear splines [grease (including Molybdenum Disulphide)]

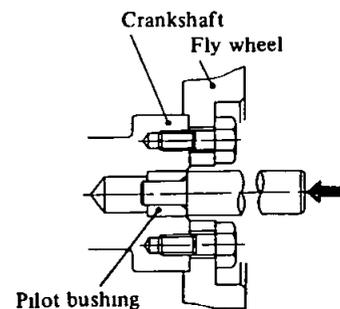
Note A very small amount of grease should be applied to the above points If too much lubricant is applied, it will run out on the friction plates when hot, resulting in damage to clutch disc facings

3 After lubricating, connect withdrawal lever to holder spring and release bearing and bearing sleeve assembly to holder spring After installing them on clutch housing, install dust cover

Pilot bushing

Before installing a new bushing, thoroughly clean bushing hole Install bushing in crankshaft using a soft hammer

Bushing need not be oiled See Figure CL-12



CL217

Fig CL-12 Installing pilot bushing

INSTALLATION

1 Apply a light coat of grease (including Molybdenum Disulphide) to transmission main drive gear splines

Slide clutch disc on main drive gear several times

Remove clutch disc and wipe off excess lubricant pushed off by disc hub

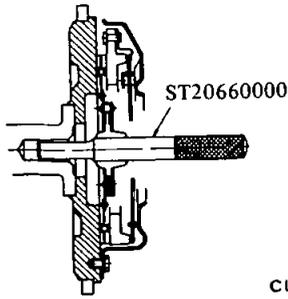
Note Take special care to prevent grease or oil from getting on clutch facing.

2 Reinstall clutch disc and clutch cover assembly

Support clutch disc and cover assembly with Clutch Aligning Bar ST20660000 See Figure CL-13

Note Be sure to keep disc facings, flywheel and pressure plate clean and dry

Clutch



CL153
Fig CL-13 Installing clutch cover assembly

3 Install bolts to securely tighten clutch cover assembly to flywheel. Each bolt should be tightened one turn at a time in a criss-cross fashion to the specified torque, 1.6 to 2.1 kg-m (12 to 15 ft-lb).

Note Dowels are used to properly locate clutch cover on flywheel.

4 Remove Clutch Aligning Bar
5 Install transmission in engine
6 Install clutch operating cylinder to clutch housing

CLUTCH CONTROL

CONTENTS

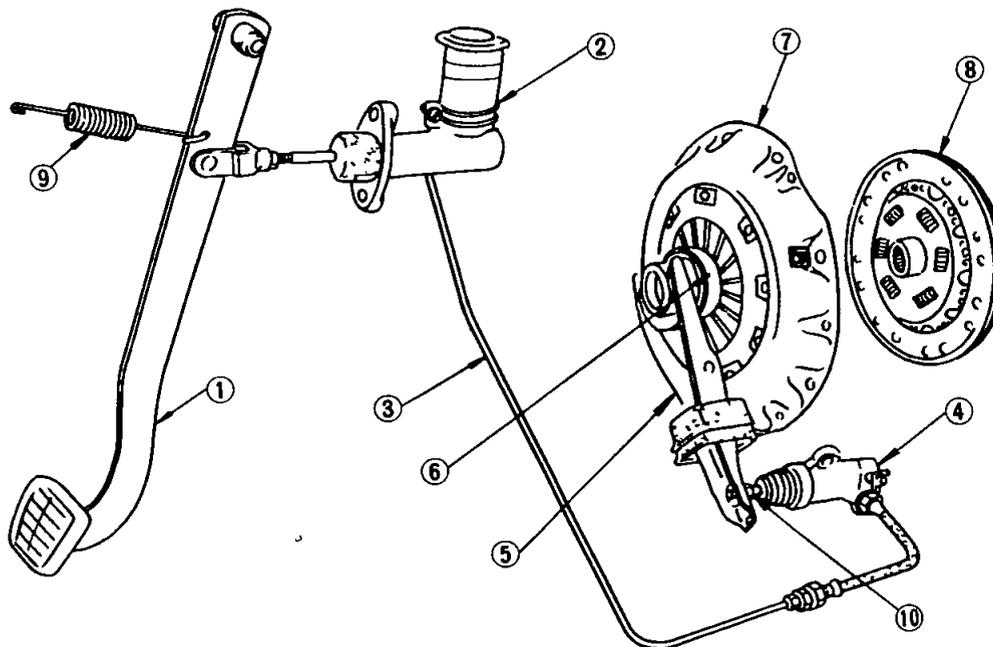
DESCRIPTION	CL-5	ASSEMBLY	CL-7
CLUTCH PEDAL	CL-6	INSTALLATION	CL-7
REMOVAL	CL-6	OPERATING CYLINDER	CL-8
INSPECTION	CL-6	REMOVAL	CL-8
INSTALLATION	CL-6	DISASSEMBLY	CL-8
ADJUSTMENT	CL-6	INSPECTION	CL-8
CLUTCH MASTER CYLINDER	CL-7	ASSEMBLY	CL-8
REMOVAL	CL-7	INSTALLATION	CL-8
DISASSEMBLY	CL-7	BLEEDING CLUTCH SYSTEM	CL-8
INSPECTION	CL-7		

DESCRIPTION

The hydraulic clutch control consists of a pendent pedal, a master cylinder, an operating cylinder and a withdrawal lever.

When the clutch pedal is depressed, the piston of the master cylinder forces clutch fluid to the operating cylinder via a pipe line. The movement

of the operating cylinder piston is transmitted to the withdrawal lever through the push rod, thus disengaging the clutch.

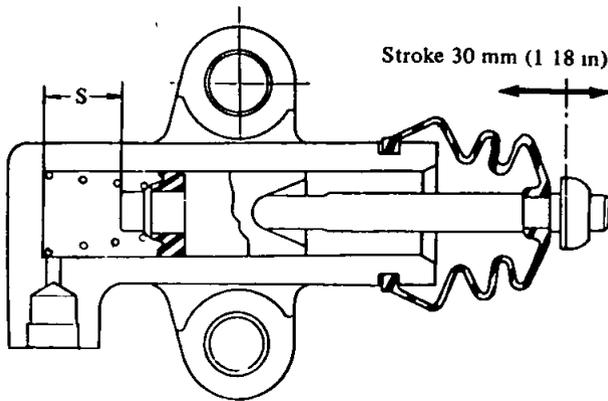


- 1 Clutch pedal
- 2 Clutch master cylinder
- 3 Clutch piping
- 4 Operating cylinder
- 5 Withdrawal lever
- 6 Release bearing
- 7 Clutch cover
- 8 Clutch disc
- 9 Return spring
- 10 Push rod

CL097

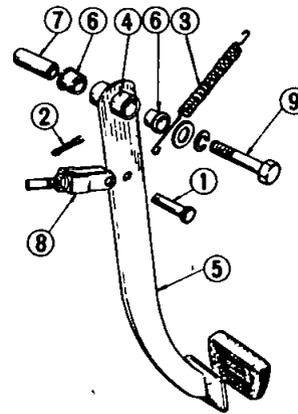
Fig CL-14 Clutch operating system

Clutch



CL098

Fig CL-15 Non-adjustable operating cylinder



- 1 Clevis pin
- 2 Cotter pin
- 3 Return spring
- 4 Pedal boss
- 5 Pedal assembly
- 6 Bush
- 7 Sleeve
- 8 Push rod
- 9 Fulcrum pin

CL099

Fig CL-16 Exploded view of clutch pedal

The operating cylinder is a non-adjustable type that uses no return spring. In this unit, the withdrawal-to-push rod play adjustment is not necessary since the "S" as shown in Figure CL-15 serves to automatically compensate for clutch disc wear.

INSTALLATION

To install, reverse the order of removal. Apply multi-purpose grease to the friction surfaces of the disassembled parts as shown in Figure CL-19.

Note Refer to Figure CL-17 for the correct direction of return spring.

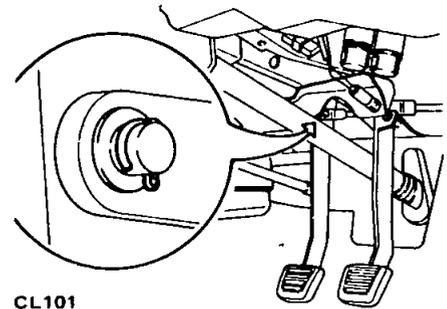


Fig CL-18 Bending clevis pin

CLUTCH PEDAL

REMOVAL

- 1 Pry off cotter pin and take out clevis pin, disconnect push rod from pedal assembly.
- 2 Unhook return spring. Back off fulcrum pin and remove pedal assembly.

Note Before removing clutch pedal, note toe board clearance at pedal pad.

INSPECTION

Clean the following parts in cleaning solvent and check for wear, damage or other abnormal condition. Replace faulty parts.

- 1 Return spring
- 2 Pedal sleeve
- 3 Pedal boss, etc

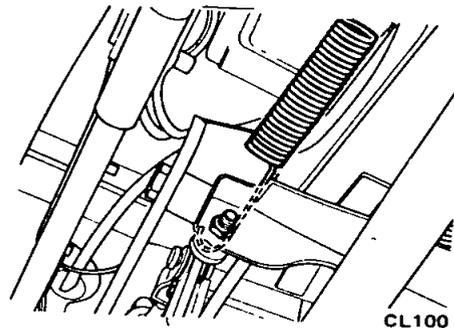


Fig CL-17 Hooking return spring

ADJUSTMENT

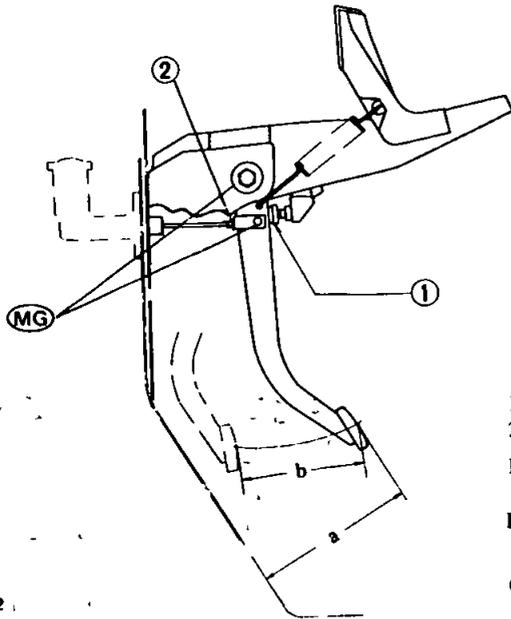
- 1 Adjust pedal height to 175 mm (6.89 in) by adjusting pedal stopper and tighten lock nut "A" to specified torque.
- 2 Turn in or out push rod adjusting screw until a play of 1 to 5 mm (0.04 to 0.20 in) at clevis pin is obtained. Then tighten lock nut "B" to specified torque.

Notes

- a Exercise care in adjusting the play so as not to block the port on master cylinder. A blocked port may result if there is too small a play at clevis pin.
- b Bend clevis pin completely.

Tightening torque:

- Pedal installation bolt (Fulcrum pin)**
3.06 to 4.14 kg-m
(22 to 30 ft-lb)
- Lock nut "A", "B"**
0.79 to 1.07 kg-m
(6 to 8 ft-lb)



CL102

- 1 Lock nut "A"
- 2 Lock nut "B"
- Pedal height a
175 mm (6 89 in)
- Pedal full stroke b
135 mm (5 31 in)
- (MG) Multi-purpose grease

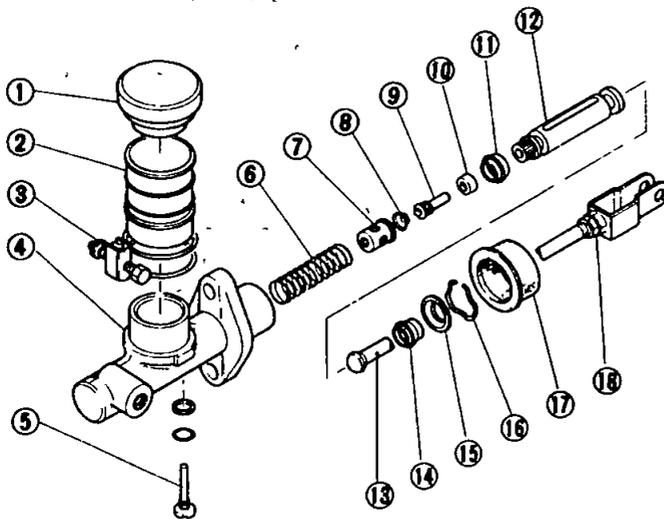
Fig CL-19 Adjusting pedal height

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

CLUTCH MASTER CYLINDER

REMOVAL

- 1 Pry off snap ring on clevis pin
- 2 Remove clevis pin at push rod
- 3 Disconnect clutch tube from master cylinder and drain brake fluid
- 4 Remove nuts securing master cylinder to dash panel and disconnect master cylinder



- | | | | |
|------------------------|--------------------|------------------|-----------------|
| 1 Reservoir cap | 6 Return spring | 11 Primary cup | 16 Stopper ring |
| 2 Reservoir | 7 Spring seat | 12 Piston | 17 Dust cover |
| 3 Reservoir band | 8 Valve spring | 13 Push rod | 18 Lock nut |
| 4 Cylinder body | 9 Supply valve rod | 14 Secondary cup | |
| 5 Supply valve stopper | 10 Supply valve | 15 Stopper | |

CL265

Fig CL-20 Exploded view of clutch master cylinder

DISASSEMBLY

- 1 Remove dust cover and take off stopper ring from body
- 2 Remove push rod and piston assembly
- 3 Remove spring seat from piston and take off piston cup, if necessary See Figure CL-20

Note Discard piston cup if it is removed from piston assembly

INSPECTION

Note 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 and piston for uneven wear or damage, and replace if necessary
- 2 Renew piston cup when disassembled It must also be replaced when wear or deformation due to fatigue or damage is found
- 3 Damaged dust cover, oil reservoir or cap, should be replaced Return spring and valve spring must also be replaced when they are broken or weak

ASSEMBLY

Assemble clutch master cylinder in the reverse procedures of disassembly, observing closely the following instructions

- 1 Dip piston cup in brake fluid before installing Make sure that it is correctly faced in position
- 2 Apply a coating of brake fluid to cylinder and piston when assembling

INSTALLATION

Install clutch master cylinder in the reverse procedures of removal, observing closely the following instructions

- 1 Adjust the pedal height by changing the length of push rod, referring to Installation and Adjustment
- 2 Bleed air out of hydraulic system, referring to Bleeding Clutch System

Clutch

Tightening torque

Master cylinder to dash panel
securing nut

0.79 to 1.07 kg-m
(6 to 8 ft-lb)

Clutch tube connector

1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Note When installing clutch tube, use
Flare Nut Torque Wrench
GG94310000

OPERATING CYLINDER

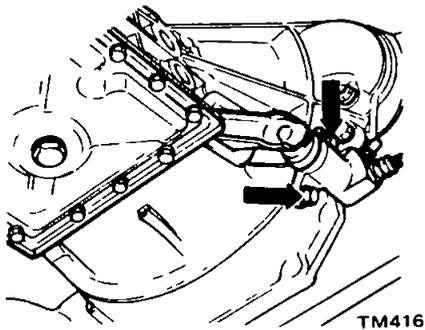


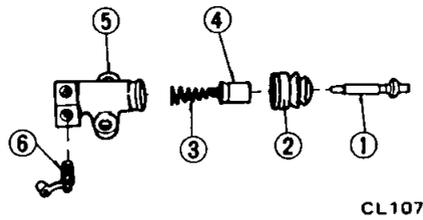
Fig CL-21 Removing operating cylinder

REMOVAL

- 1 Detach clutch hose from operating cylinder
- 2 Remove two bolts securing operating cylinder to clutch housing

DISASSEMBLY

- 1 Remove push rod with dust cover
- 2 Remove piston assembly and piston spring
- 3 Remove bleeder screw



- | | |
|-----------------|----------------------|
| 1 Push rod | 4 Piston |
| 2 Dust cover | 5 Operating cylinder |
| 3 Piston spring | 6 Bleeder screw |

Fig CL-22 Exploded view of operating cylinder

INSPECTION

Visually inspect all disassembled parts, replacing those worn or damaged beyond specifications

ASSEMBLY

Assemble in the reverse order of disassembly. Closely observe the following instructions

- 1 Prior to assembly, dip piston cup in clean brake fluid

When installing cup, pay particular attention to its direction

- 2 Dip cylinder and piston in clean brake fluid before assembly

Note Be sure to install piston assembly with piston spring in place

INSTALLATION

Install in the reverse order of removal. Closely observe the following instructions

Notes

- a Bleed air thoroughly from clutch hydraulic system

- b Do not install return spring, or clutch will not disengage properly

Tightening torque

Operating cylinder
securing bolt

2.5 to 3.0 kg-m
(18 to 22 ft-lb)

Bleeder screw

0.7 to 0.9 kg-m
(5 to 7 ft-lb)

BLEEDING CLUTCH SYSTEM

To bleed clutch system, use the same procedure as described in Brake System

- 1 Fill oil reservoir of operating cylinder with brake fluid
- 2 Detach cap from bleeder screw on operating cylinder and, in its place, connect a vinyl tube
- 3 Pour a small amount of brake fluid into a clean container and insert the open end of the vinyl tube into it
- 4 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
5. Tighten bleeder screw and release the pedal
- 6 Repeat above steps until no air bubbles appear in vinyl tube

Notes

- a. Always keep brake fluid in oil reservoir so that it flows continuously into the line
- b Use care not to allow brake fluid to come into contact with painted surfaces
- c Make sure that no leak occurs at connections
- d Pour brake fluid into oil reservoir up to the specified level

SERVICE DATA AND SPECIFICATIONS

Clutch cover

Diaphragm spring-to-flywheel distance	mm (in)	31 0 to 33 0 (1 220 to 1 229)
Unevenness of diaphragm spring toe height	mm (in)	less than 0 5 (0 020)
Full pressure	kg (lb)	450 (992)
Outer of flatness of pressure plate	mm (in)	0 05 (0 0020)
Allowable refacing limit	mm (in)	1 0 (0 039)

Clutch disc

Facing size

Outer dia × inside dia × thickness	mm (in)	200 × 130 × 3 5 (7 87 × 5 12 × 0 138)
Total friction area	cm ² (sq in)	362 (56 1)
Thickness of disc assembly		
Free	mm (in)	8 5 to 9 2 (0 335 to 0 362)
Compressed	mm (in)	7 6 to 8 0 (0 299 to 0 315)
Number of torsion springs		6
Allowable minimum depth of rivet head from surface	mm (in)	0 3 (0 012)
Allowable facing runout	mm (in)	0 5 (0 020)
Allowable free play of spline (at the outer edge of disc)	mm (in)	0 4 (0 016)

Clutch pedal

Pedal height	mm (in)	175 (6 89)
Play at clevis pin	mm (in)	1 to 5 (0 04 to 0 20)
Full stroke	mm (in)	135 (5 31)
Pressing strength at full stroke	kg (lb)	10 4 (22 9)

Master cylinder-clutch

Diameter of master cylinder	mm (in)	15 87 ($\frac{5}{8}$)
Allowable maximum clearance between cylinder and piston	mm (in)	0 15 (0 0059)

Clutch operating cylinder

Diameter of operating cylinder	mm (in)	19 05 ($\frac{3}{4}$)
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Tightening torque

Clutch mounting bolt	kg-m (ft-lb)	1 6 to 2 2 (12 to 16)
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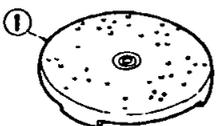
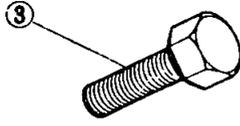
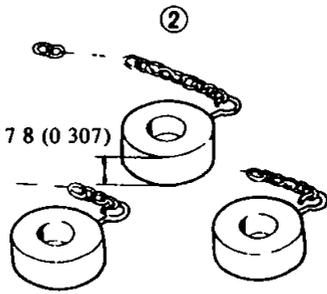
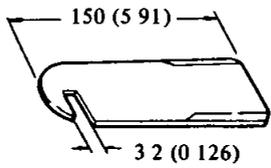
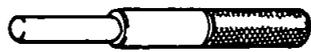
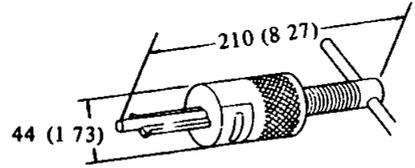
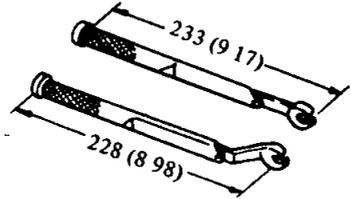
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause and testing	Corrective action
Slipping clutch	<p>Slipping of the clutch is obvious when any of the following symptoms is encountered during operation</p> <ol style="list-style-type: none"> (1) Car will not respond to engine speed during acceleration (2) Insufficient car speed (3) Lack of power during uphill driving <p>Some of the above conditions are also experienced when engine problem occurring First determine whether engine or clutch is causing the problem</p> <p>If slipping clutch is left unheeded, wear and/or overheating will occur on clutch facing until it is no longer serviceable</p> <p>TO TEST THE CLUTCH FOR SLIPPING, proceed as follows</p> <p>During upgrade travelling, open throttle until engine is running at about 40 to 50 km/h (25 to 30 MPH) with gear shift lever in 3rd speed position Now, shift into top gear and at the same time rev up engine If clutch is slipping, car will not respond soon to the operation of accelerator pedal</p>	
	<ul style="list-style-type: none"> ● Clutch facing worn excessively ● Oil or grease on clutch facing ● Warped clutch cover or pressure plate 	<p>Replace</p> <p>Replace</p> <p>Repair or replace</p>
Dragging clutch	<p>Grabbing clutch is particularly obvious when shifting gears, especially into low gear</p> <p>TO TEST THE CLUTCH FOR DRAGGING OR GRABBING, proceed as follows</p> <ol style="list-style-type: none"> (1) Start up engine Disengage clutch Shift into reverse gear, and then into Neutral Under this condition, gradually increase engine speed, and again shift into reverse gear If clutch is dragging, gear "grating" is heard when shifting from Neutral into Reverse (2) Stop engine and shift gears (Conduct this test at each gear position) (3) In step (2), gears are shifted smoothly except 1st speed position at idling <ol style="list-style-type: none"> a If dragging is encountered at the end of shifting, check condition of transmission synchro-mechanism b If dragging is encountered at the beginning of shifting, proceed to step (4) below (4) Push change lever toward Reverse side, depress pedal to check for free play <ol style="list-style-type: none"> a If the pedal can be depressed further, check clutch condition b If the pedal cannot be depressed further, proceed to step (5) below (5) Check clutch control (pedal height, free play, etc) If no abnormal condition exists and if pedal cannot be depressed further, check clutch condition 	
	<ul style="list-style-type: none"> ● Clutch disc runout or warped ● Wear or rust on hub splines in clutch disc ● Diaphragm spring toe height out of adjustment or toe tip worn ● Worn or improperly installed parts 	<p>Repair or replace</p> <p>Clean and lubricate with grease, or replace</p> <p>Adjust or replace</p> <p>Repair or replace</p>

Clutch

Condition	Probable cause and testing	Corrective action
Pulsating clutch	Pulsating clutch pedal is usually noticeable when car just starts off and clutch is partially engaged	
	<ul style="list-style-type: none"> ● Weakened or broken clutch disc torsion spring ● Oil or grease on clutch facing ● Clutch facing out of proper contact or clutch disc runout ● Loose rivets ● Warped pressure plate or clutch cover surface ● Unevenness of diaphragm spring toe height ● Loose engine mounting or deteriorated rubber 	<p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Repair or replace</p> <p>Adjust or replace</p> <p>Retighten or replace</p>
Noisy clutch	<p>A noise is heard after clutch is disengaged</p> <ul style="list-style-type: none"> ● Damaged release bearing 	Replace
	<p>A noise is heard when clutch is disengaged</p> <ul style="list-style-type: none"> ● Insufficient grease on the sliding surface of bearing sleeve ● Clutch cover and bearing are not installed correctly 	<p>Apply grease</p> <p>Adjust</p>
	<p>A noise is heard when the car is suddenly started off with clutch partially engaged</p> <ul style="list-style-type: none"> ● Faulty pilot bushing 	Replace
Rabbit-hopping clutch	When "rabbit-hopping" of clutch occurs, car will not start off smoothly from a standing start or clutch is engaged before clutch pedal is fully depressed	
	<ul style="list-style-type: none"> ● Oil or grease on clutch facing ● Clutch facing worn or loose rivets ● Wear or rust on splines in drive shaft and clutch disc ● Warped flywheel or pressure plate ● Loose mountings for engine or power train units 	<p>Replace</p> <p>Replace</p> <p>Clean or replace</p> <p>Repair or replace</p> <p>Retighten</p>

SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	ST20050010 Base plate		710 610 510 C110 C130 230 C30	Fig CL-7
2	ST20050051 Set bolt			
3	ST20050100 Distance piece 7.8 mm (0.307 in)			
4	ST20050240 Diaphragm spring adjusting wrench		710 610 510 C110 C130 230 C30	Fig CL-8
5	ST20660000 Clutch aligning bar	<p data-bbox="406 1123 1181 1186">This tool is used to conduct disc centering by inserting the tool into pilot bushing in flywheel, when installing clutch assembly to flywheel</p> 		Page CL-4 Fig CL-13
6	ST16610001 Pilot bushing puller		G20 G18 L24 L18 L16 L14	Fig CL-4
7	GG94310000 Flare nut torque wrench	<p data-bbox="406 1659 1061 1690">This tool is used to tighten and loosen clutch tube flare nut</p> 	All models	Page CL-8

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION TM

TRANSMISSION

TM

4-SPEED TRANSMISSION (TYPE : F4W63L)	TM- 2
5-SPEED TRANSMISSION (TYPE: FS5W63A)	TM-10
SERVICE DATA AND SPECIFICATIONS	TM-22
TROUBLE DIAGNOSES AND CORRECTIONS	TM-24
SPECIAL SERVICE TOOLS	TM-25

4-SPEED TRANSMISSION (TYPE: F4W63L)

CONTENTS

DESCRIPTION	TM-2	BAULK RINGS	TM-6
REMOVAL	TM-3	OIL SEAL	TM-6
DISASSEMBLY	TM-3	ASSEMBLY	TM-6
GEAR DISASSEMBLY	TM-4	FRONT COVER	TM-6
MAINSHAFT DISASSEMBLY	TM-4	REAR EXTENSION HOUSING	TM-7
MAIN DRIVE SHAFT DISASSEMBLY	TM-5	GEAR ASSEMBLY	TM-7
SYNCHROMESH DISASSEMBLY	TM-6	MAIN DRIVE GEAR ASSEMBLY	TM-8
INSPECTION	TM-6	REVERSE IDLER GEAR ASSEMBLY	TM-8
TRANSMISSION CASE AND	TM-6	COUNTER GEAR ASSEMBLY	TM-8
REAR EXTENSION HOUSING	TM-6	TRANSMISSION ASSEMBLY	TM-9
BEARINGS	TM-6	INSTALLATION	TM-9
GEARS AND SHAFTS	TM-6		

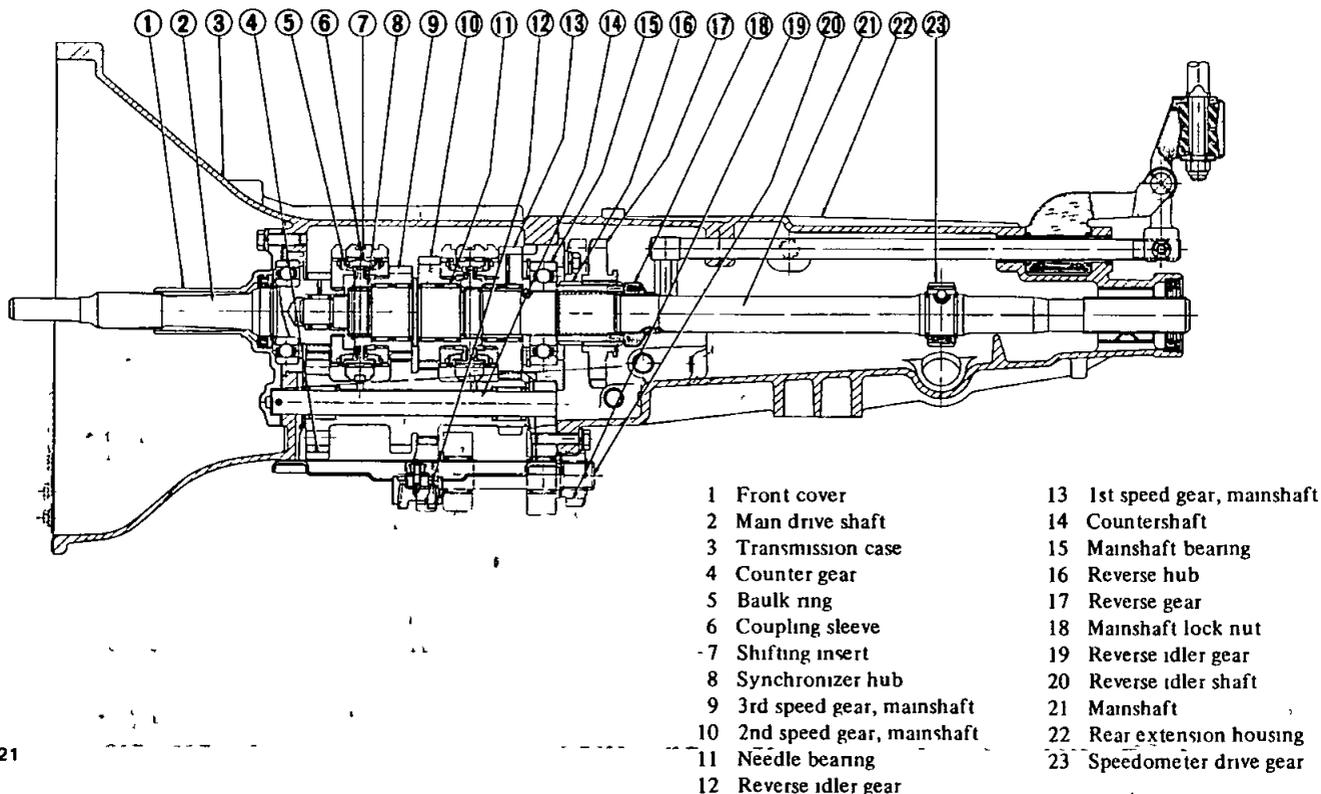
DESCRIPTION

The transmission is a fully synchronized 4-speed type that uses helical gears. The reverse gear is a sliding mesh type using spur gears. In construction, the main drive gear is meshed with the counter drive gear. The forward speed gears provided on the countershaft are in constant mesh with the main gears. Each of the main gears rides on the mainshaft through the needle roller

bearing, thus rotating freely on the mainshaft. When the transmission is shifted, the action causes the coupling sleeve to slide on the synchronizer hub. This engages its inner teeth with the outer teeth formed on the mainshaft gear.

The synchronizer hub is fitted to the mainshaft by spline so they turn together as a unit as the mainshaft is rotated. The transmission is of a

Warner type. On Warner type, the baulk rings synchronize the coupling sleeve with the mainshaft gear. Placing the speed control lever in the reverse position throws the mainshaft reverse gear into engagement with the reverse idler gear, the transmission is reversed. The transmission consists of two major elements, a complete transmission case and a rear extension. The case contains all gears and gear shafts.



TM821

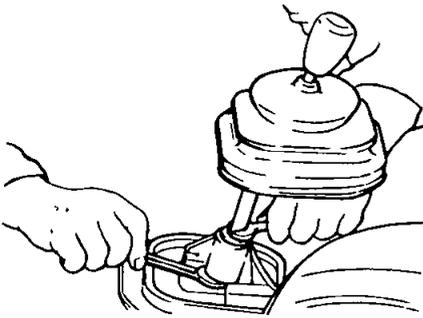
Fig TM-1 Sectional view of F4W63L transmission

Transmission

REMOVAL

To dismantle the transmission from the car, proceed as follows

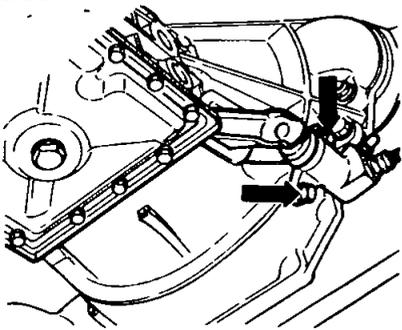
- 1 Disconnect battery ground cable
- 2 Jack up the car and support its weight on safety stands Make sure that safety is insured
- 3 Loosen off control lever securing nut and remove lever See Figure TM-2



TM415

Fig TM-2 Removing control lever

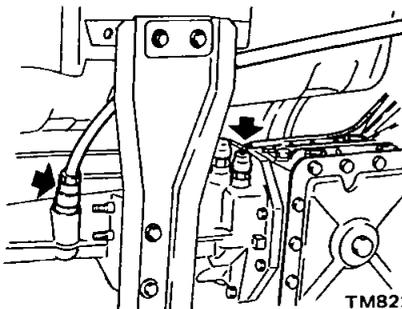
- 4 Disconnect front exhaust tube
- 5 Disconnect wires from reverse lamp switch (back-up lamp switch) at connections
- 6 Remove clutch operating cylinder from transmission case See Figure TM-3



TM416

Fig TM-3 Removing clutch operating cylinder

- 7 Disconnect speedometer cable from rear extension housing See Figure TM-4



TM822

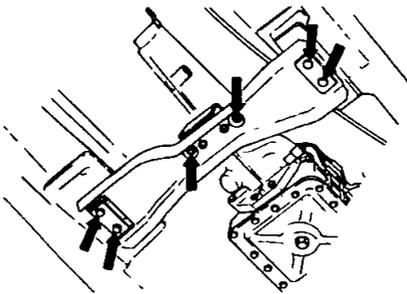
Fig TM-4 Disconnecting wires and cables

- 8 Disengage propeller shaft Refer to the section "Propeller Shaft "

Note Plug up the opening in rear extension housing to prevent oil from flowing out

- 9 Support the engine by locating a jack under oil pan with a wooden block used between oil pan and jack
- 10 Support the transmission by means of a jack

- 11 Remove two bolts securing transmission to rear engine mounting insulator, and remove four cross-member mounting bolts See Figure TM-5

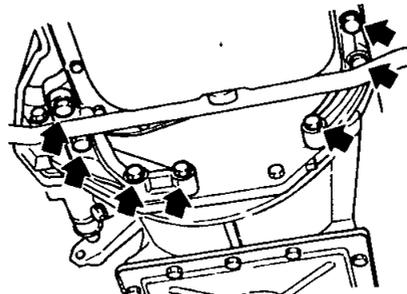


TM984

Fig TM-5 Removing crossmember

- 12 Lower jack so that transmission can be dismantled from the car easily
- 13 Remove starter motor from transmission case
- 14 Remove four bolts securing engine to gussets

Remove three bolts securing gussets to engine rear plate and transmission case, and separate gussets from engine block and transmission case See Figure TM-6



TM533

Fig TM-6 Removing gusset

Note These gussets are not used in the Station Wagon equipped with a 3-joint propeller shaft

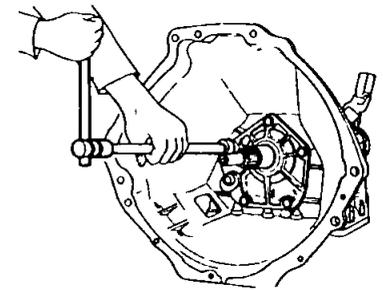
- 15 Remove bolts securing transmission to engine, and move transmission backward and away from the car

Note Take care in dismantling the transmission not to strike any adjacent parts and main drive shaft

DISASSEMBLY

- 1 Thoroughly wipe clean dirt and grease from each component parts of transmission Drain out oil in transmission case Place the transmission on the suitable stand securely

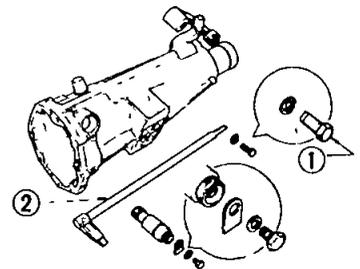
- 2 Detach dust cover from transmission case Remove withdrawal lever and release bearing Remove five bolts securing front cover to transmission case, and detach front cover See Figure TM-7



TM241

Fig TM-7 Removing front cover

- 3 Detach bottom cover from transmission case
- 4 Remove reverse lamp switch and speedometer gear assembly from rear extension
- 5 Move gear to Neutral position
- 6 Pull out striking rod pin ① See Figure TM-8



TM243

Fig TM-8 Disassembling rear extension

- 7 Remove six bolts securing rear extension to transmission case Detach rear extension housing by lightly tapping it with a soft hammer as shown in Figure TM-9

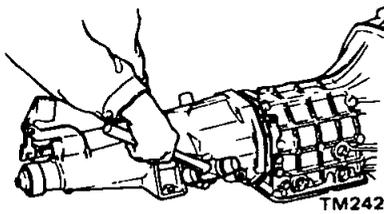


Fig TM-9 Removing rear extension housing

8 Draw out striking rod ② See Figure TM-8

GEAR DISASSEMBLY

1 Back off check ball plugs, and remove three locking springs and check balls. Take care not to lose these parts. See Figure TM-10

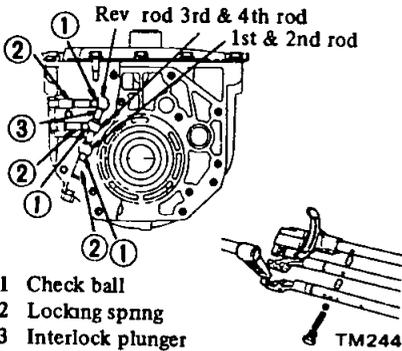


Fig TM-10 Layout of check balls and interlock plungers

2. Using Fork Rod Pin Punch ST23540000, drive out retaining pins from fork rod. See Figure TM-11. Take care not to lose two plungers when drawing out fork rods

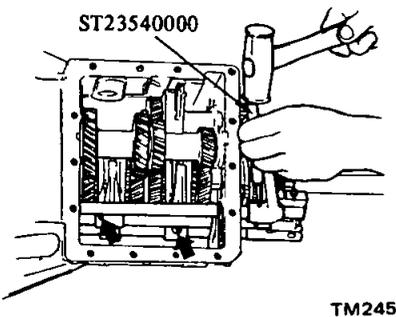


Fig TM-11 Removing retaining pins

3 Remove snap ring and speedometer drive gear. Take care not to lose steel ball retaining speedometer drive gear

4 Mesh gear at two places. Remove lock nut from mainshaft, and take out reverse gear and reverse gear hub

5 Using Countershaft Guide ST23100000, push out countershaft from the transmission case as shown in Figure TM-12. Take care not to drop needle bearings into case

Remove counter gear together with needle bearings and washers from transmission case

Note Make sure that washers used between counter gear and transmission case are removed

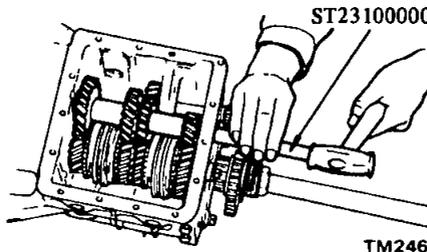


Fig TM-12 Pushing out countershaft

6 Pry off snap ring retaining reverse idler gear in place. Withdraw idler gear shaft from the rear of transmission case. See Figure TM-13

Note Do not remove needle bearing

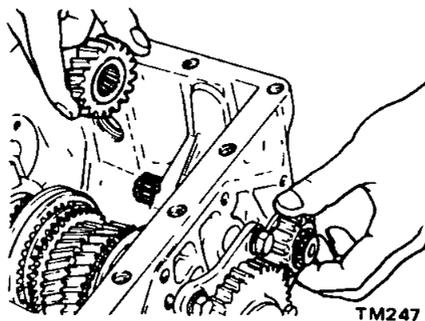


Fig TM-13 Removing reverse idler shaft

7 Remove bolts securing mainshaft bearing retainer, and withdraw mainshaft assembly from the rear of transmission case. See Figure TM-14

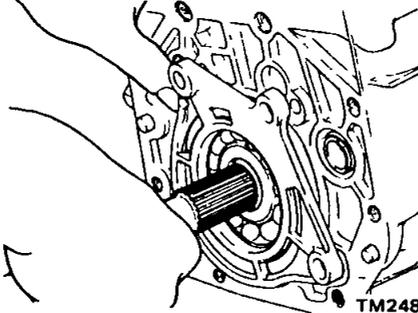


Fig TM-14 Removing mainshaft assembly

8 Take out pilot bearing located between mainshaft and main drive gear

9 Drive out main drive gear as shown using the wooden handle of a hammer. See Figure TM-15

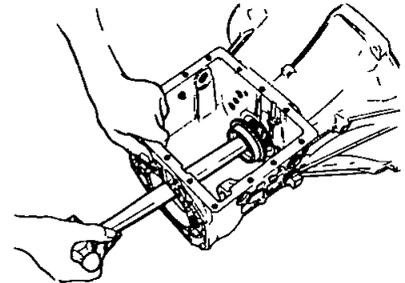


Fig TM-15 Removing main drive gear assembly

MAINSHAFT DISASSEMBLY

1 Pry off snap ring on the front end of mainshaft, and remove 3rd & 4th synchromesh assembly and 3rd gear. See Figure TM-16

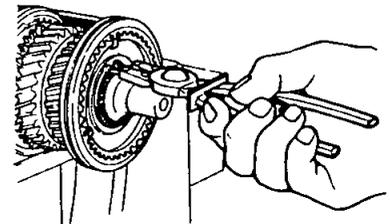


Fig TM-16 Removing snap ring

2 Pry off snap rings, and remove speedometer drive gear

3 Remove lock nut from mainshaft, and take out reverse gear, reverse gear hub

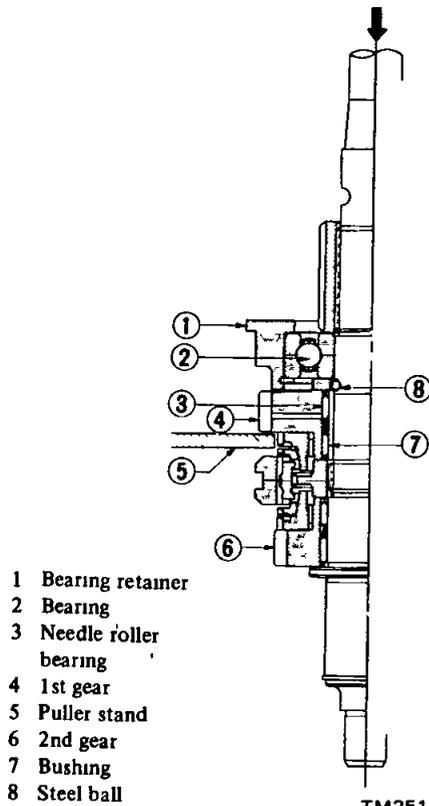
4 Attach a suitable tool to the front side of 1st gear, and press out 1st gear together with ball bearing and retainer. See Figure TM-17

Notes

a Do not attach this tool to 2nd gear. This may damage 1st gear mainshaft bushing

b Be careful not to remove needle bearing together with 1st bearing, otherwise, needle bearing may interfere with steel ball, resulting in damaged bearing

Transmission



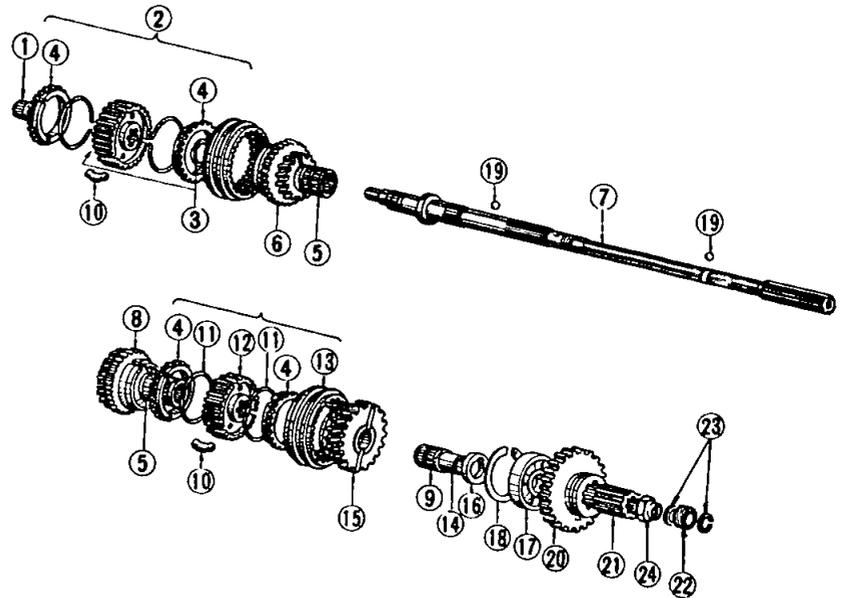
- 1 Bearing retainer
- 2 Bearing
- 3 Needle roller bearing
- 4 1st gear
- 5 Puller stand
- 6 2nd gear
- 7 Bushing
- 8 Steel ball

TM251

Fig TM-17 Drawing out mainshaft bearing

5 Then attach a proper puller stand to the front side of 2nd gear in the same manner as step 3, and press out 1st gear bushing together with 1st & 2nd synchronesh assembly and 2nd gear

Note Before conducting this operation, be sure to remove steel ball.



- 1 Pilot bearing
- 2 3rd & 4th synchronesh assembly
- 3 Snap ring
- 4 Baulk ring
- 5 Needle bearing
- 6 3rd speed gear, mainshaft
- 7 Mainshaft
- 8 2nd speed gear, mainshaft
- 9 1st & 2nd synchronesh assembly
- 10 Shifting insert
- 11 Spread spring
- 12 Synchronizer hub

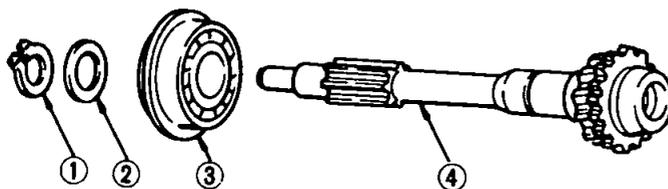
- 13 Coupling sleeve
- 14 Bush, 1st gear
- 15 1st speed gear, mainshaft
- 16 Thrust washer, mainshaft
- 17 Mainshaft bearing
- 18 Snap ring, mainshaft bearing
- 19 Steel ball
- 20 Reverse gear
- 21 Reverse hub
- 22 Speedometer drive gear
- 23 Lock plate
- 24 Nut

TM829

Fig TM-18 Exploded view of mainshaft assembly (F4W63L transmission)

MAIN DRIVE SHAFT DISASSEMBLY

1 Pry off snap ring and remove spacer See Figure TM-19

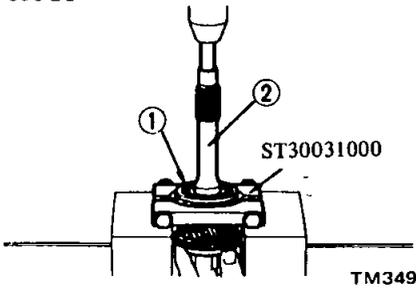


- 1 Snap ring
- 2 Spacer
- 3 Main drive bearing with snap ring
- 4 Main drive gear

Fig TM-19 Exploded view of main drive shaft

Transmission

2 Press out main drive shaft bearing with the use of an ordinary bearing puller and a suitable press See Figure TM-20

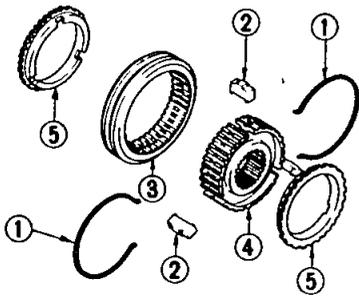


- 1 Main drive bearing
- 2 Main drive gear

Fig TM-20 Driving out main drive shaft bearing

SYNCHROMESH DISASSEMBLY

1 Remove spread springs (1), and take out shifting inserts (2)
2 Separate coupling sleeve (3) from synchro hub (4) See Figure TM-21



- 1 Spread spring
- 2 Shifting insert
- 3 Coupling sleeve
- 4 Synchro hub
- 5 Baulk ring

TM255

Fig TM-21 Exploded view of synchromesh assembly

INSPECTION

Wash clean all parts in an approved solvent, and check for wear or damage

TRANSMISSION CASE AND REAR EXTENSION HOUSING

Wash clean with an approved solvent and check for any crack which may be the cause of oil leak

If rear extension bush is worn or cracked, replace it as an assembly of bush and rear extension housing

BEARINGS

1 Wipe clean oil or grease on bear-

ings and dry these parts with compressed air

2 Check balls, outer race and inner race for wear, burr or damage Also check for smooth operation If necessary, replace See Figure TM-22

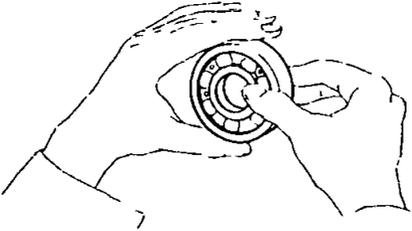


Fig TM-22 Checking ball bearing

GEARS AND SHAFTS

1 Check gears for wear, crack or damage and, if necessary, replace
2 Check shafts for wear, crack or bending If necessary, replace
3 Check gears for end play See Figure TM-23

Standard end play

- 1st gear
0.32 to 0.42 mm
(0.0126 to 0.0165 in)
- 2nd gear
0.22 to 0.32 mm
(0.0087 to 0.0126 in)
- 3rd gear
-0.05 to 0.15 mm
(0.0020 to 0.0059 in)

Reverse idler gear

- 0.10 to 0.30 mm
(0.0039 to 0.0118 in)

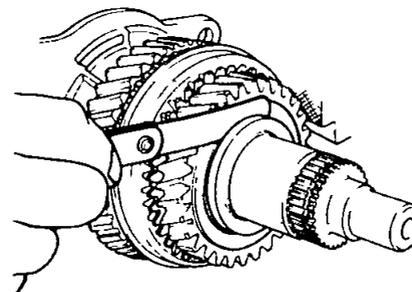


Fig TM-23 Measuring gear end play

4 Measure backlash in gears

- Standard backlash
0.05 to 0.20 mm
(0.0020 to 0.0079 in)

If the backlash exceeds the specified value, replace drive and driven gears as a set See Figure TM-24

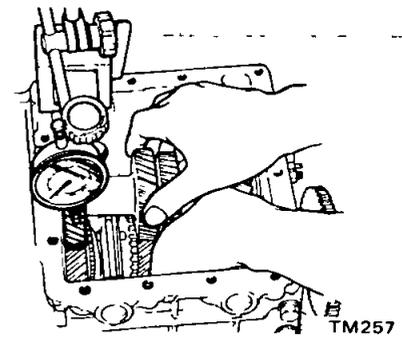


Fig TM-24 Measuring gear backlash

BAULK RINGS

1 Replace any baulk ring which is deformed or cracked
2 Position baulk ring in place on gear cone, and measure the baulk ring-to-gear clearance with baulk ring pushed toward gear See Figure TM-25

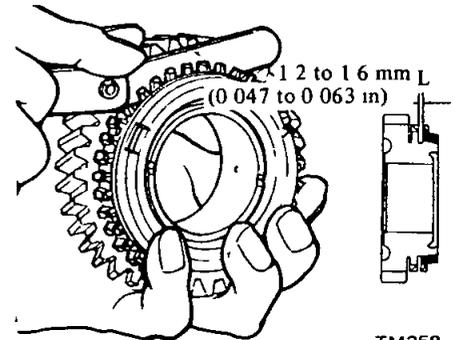


Fig TM-25 Baulk ring to cone gap

OIL SEAL

It is advisable not to reuse oil seals that have been removed Always install new oil seals

Replace oil seal if sealing lip is deformed or cracked Also discard oil seal if spring is out of position Check the oil seal lip contacting face on shaft, if necessary replace the seal and the shaft as a set

ASSEMBLY

To assemble, reverse the order of disassembly

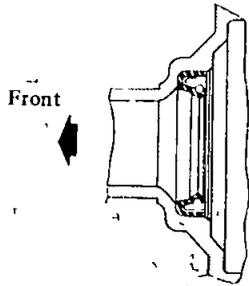
FRONT COVER

1 Make sure that seal mating surface is clean

Using a press, drive new seal into place on front cover

Transmission

2 Lubricate seal lip and main drive shaft with gear oil when installing oil seal See Figure TM-26

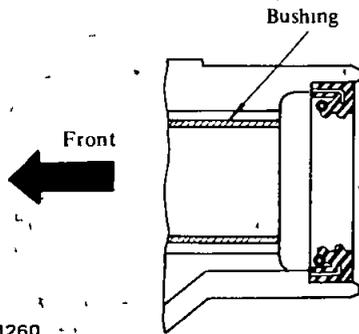


TM354

Fig TM-26 Location of front cover oil seal

REAR EXTENSION HOUSING

1 Clean rear extension housing and press oil seal into position Apply a coating of gear oil to sealing lip when installing oil seal See Figure TM-27



TM260

Fig TM-27 Location of rear extension housing oil seal

2 Install striking rod in place on rear extension housing

GEAR ASSEMBLY

1 Wash clean all parts and dry with compressed air

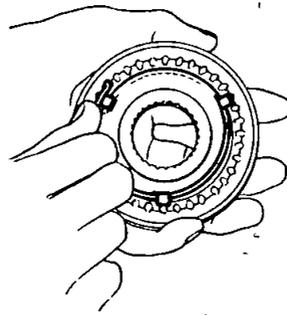
2 Assemble synchromesh assembly

(1) Place synchro-hub into coupling sleeve

(2) Fit shifting inserts in three grooves in synchronizer hub

(3) Locate one spread spring on the lower side of shifting inserts to secure them to the inner side of coupling sleeve

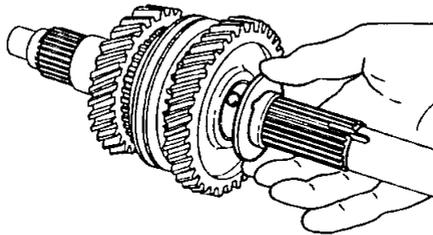
Install the other spring on the opposite side of coupling sleeve properly Make sure that they are installed opposite to each other See Figure TM-28



TM077

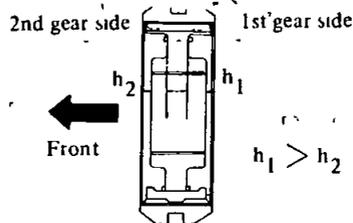
Fig TM-28 Installing spread spring

3 Install the following parts to mainshaft in the order listed 2nd gear needle roller bearing, 2nd gear, 2nd gear baulk ring, 1st & 2nd speed synchromesh assembly Then fit 1st gear bushing onto mainshaft by using a proper brass drift And install 1st gear baulk ring, needle bearing 1st gear, steel ball and thrust washer See Figures TM-29 and TM-30



TM078

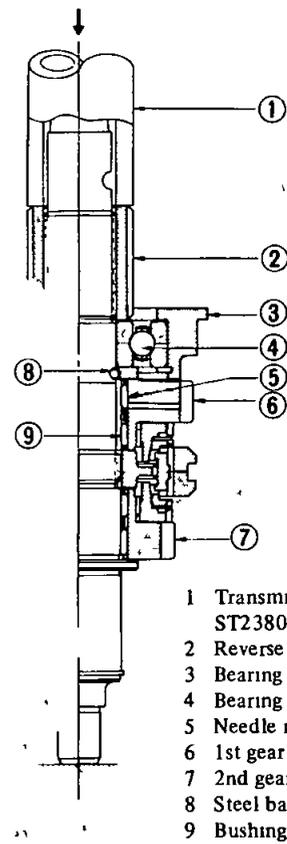
Fig TM-29 Installing thrust washer



TM262

Fig TM-30 Installing synchro hub

4 Using Transmission Adapter ST23800000 as shown in Figure TM-31, install mainshaft bearing together with reverse hub to mainshaft



TM534

Fig TM-31 Installing mainshaft bearing

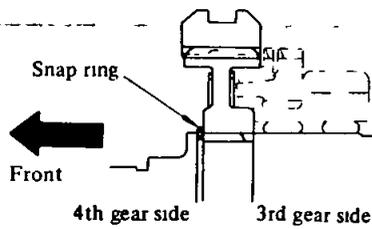
- 1 Transmission adapter ST23800000
- 2 Reverse gear hub
- 3 Bearing retainer
- 4 Bearing
- 5 Needle roller bearing
- 6 1st gear
- 7 2nd gear
- 8 Steel ball
- 9 Bushing

5 Install 3rd gear needle roller bearing, 3rd baulk ring, 3rd & 4th speed synchromesh assembly to mainshaft
6 Fit a suitable snap ring in place so that there exists a minimum clearance between the end face of hub and ring groove See Figure TM-32

Refer to the following chart as a guide in selecting a suitable snap ring

Available synchro hub snap ring

No	Thickness mm (in)	
1	1 40 to 1 45	(0 0551 to 0 0571)
2	1 45 to 1 50	(0 0571 to 0 0591)
3	1 50 to 1 55	(0 0591 to 0 0610)
4	1 55 to 1 60	(0 0610 to 0 0630)
5	1 60 to 1 65	(0 0630 to 0 0650)



TM264

Fig TM-32 Installing synchro hub snap ring

7 Insert mainshaft assembly into position from the rear side of transmission case, and secure to transmission case with mainshaft bearing retainer mounting bolts

Mainshaft bearing retainer
Tightening torque
0.8 to 1.0 kg-m
(6 to 7 ft-lb)

MAIN DRIVE GEAR ASSEMBLY

- 1 Using Mainshaft Bearing Drift ST22452000, press main drive bearing onto main drive shaft
- 2 Install a set of suitable spacer and snap ring into groove so that there exists a minimum clearance between the groove and end face of spacer See Figure TM-33 Be sure to install pilot bearing in place when installing main drive gear assembly to transmission case

Standard reverse idler gear end play
0.10 to 0.30 mm
(0.0039 to 0.0118 in)

Available snap ring

No	Thickness mm (in)
1	1.15 to 1.25 (0.0453 to 0.0492)
2	1.35 to 1.45 (0.0531 to 0.0571)
3	1.25 to 1.35 (0.0492 to 0.0531)
4	1.45 to 1.55 (0.0571 to 0.0610)
5	1.05 to 1.15 (0.0413 to 0.0453)

Chart-Snap ring thickness

No	Thickness mm (in)
1	1.49 to 1.55 (0.0587 to 0.0610)
2	1.56 to 1.62 (0.0614 to 0.0638)
3	1.62 to 1.68 (0.0638 to 0.0661)
4	1.68 to 1.74 (0.0661 to 0.0685)
5	1.74 to 1.80 (0.0685 to 0.0709)
6	1.80 to 1.86 (0.0709 to 0.0732)
7	1.86 to 1.92 (0.0732 to 0.0756)

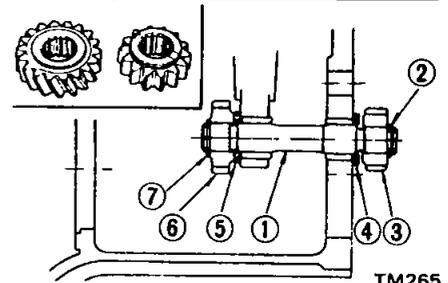


Fig TM-35 Assembling reverse idler gear assembly

Note Install thrust washers ④ and ⑤ so that grooved sides are facing toward gears

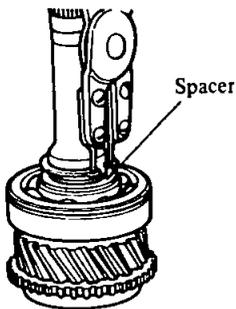
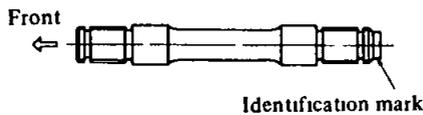


Fig TM-33 Installing snap ring

REVERSE IDLER GEAR ASSEMBLY

1 Insert reverse idler shaft ① into place in transmission case from rear with identification mark facing toward rear See Figure TM-34



TM249

Fig TM-34 Installing reverse idler shaft

- 2 Referring to Figure TM-35, assemble thrust washer ⑤ and reverse idler gear ⑥ (herical gear) Seat snap ring ⑦ in groove in top of reverse idler shaft
 - 3 Insert a 0.1 mm (0.004 in) thickness gauge between herical gear ⑥ and thrust washer ⑤
- With shaft ① pushed fully toward rear, install thrust washer ④ and spur gear ③, then, fit snap ring ② of proper thickness so that specified end play is obtained for reverse idler gear

COUNTER GEAR ASSEMBLY

1 To install needle roller bearing ③, washer ② and Countershaft Guide ST23100000 into counter gear, proceed as follows (See Figure TM-36)

- (1) Apply grease to all needle roller bearings
- (2) Install washer ② to counter gear, then assemble needle bearings coated with grease in counter gear

Notes

- a Be careful not to damage needle roller bearings
 - b Use 42 needle roller bearings (21 – on each side)
 - c After attaching needle roller bearings in place, apply grease thickly so that bearings will not come off
- (3) Install washer ②

Transmission

(4) Insert Countershaft Guide ST23100000 into counter gear

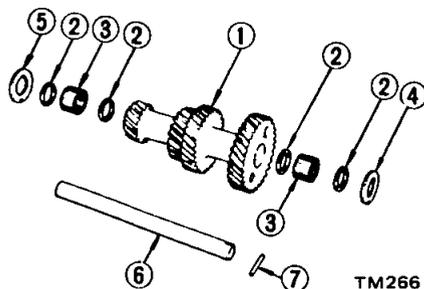


Fig TM-36 Exploded view of counter gear assembly

2 Install these parts together with washers ④ and ⑤ to transmission case, and insert countershaft ⑥ into counter gear through the hole of case, and retaining pin ⑦ into its hole on the front side of countershaft
3 Select and install rear thrust washer ⑤ of the suitable thickness until proper counter gear end play is obtained

Standard counter gear end play

0.05 to 0.15 mm
(0.0020 to 0.0059 in)

Rear thrust washer

No	Thickness mm (in)
1	2.35 to 2.40 (0.0925 to 0.0945)
2	2.40 to 2.45 (0.0945 to 0.0965)
3	2.45 to 2.50 (0.0965 to 0.0984)
4	2.50 to 2.55 (0.0984 to 0.1004)
5	2.55 to 2.60 (0.1004 to 0.1024)

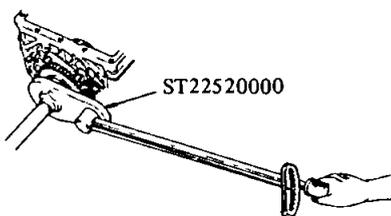
TRANSMISSION ASSEMBLY

1 Install reverse gear hub, reverse gear and new mainshaft nut and tighten temporarily

2 With gears meshed at two positions, tighten mainshaft nut to a torque of 8.0 to 11.0 kg-m (58 to 80 ft-lb) using Wrench ST22520000 See Figure TM-37

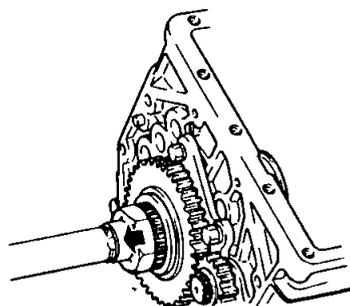
3 Stake mainshaft and countershaft nuts to groove of mainshaft with a punch See Figure TM-38

4 Install speedometer drive gear and snap rings



TM831

Fig TM-37 Tightening mainshaft nut



TM832

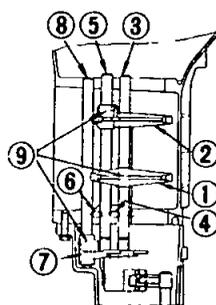
Fig TM-38 Staking mainshaft nut

5 Align 1st & 2nd shift fork ① and 3rd & 4th shift fork ② with the grooves on coupling sleeves respectively

Insert 1st & 2nd shift rod ③ and drive in pin ⑨ securely

With 1st & 2nd shift rod in Neutral position, install interlock plunger ④ and insert 3rd & 4th shift rod ⑤ into position, and drive in pin ⑨ securely

3 Place 3rd & 4th shift rod ⑤ into Neutral position, and install interlock plunger ⑥ Install reverse shift rod ⑧ through reverse shift fork ⑦, and secure with retaining pin ⑨ See Figure TM-39



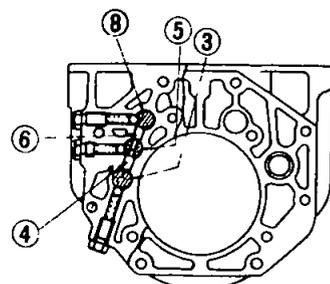
TM420

Fig TM-39 Installing shift rod & shift fork

6 Install check balls and locking springs at three places in the transmission case, and tighten with plugs Before tightening these plugs, apply sealant to plugs

Plug tightening torque
1.7 to 2.1 kg-m
(12 to 15 ft-lb)

See Figure TM-40



TM421

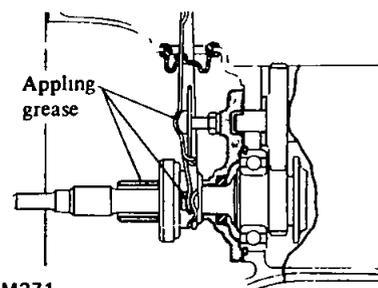
Fig TM-40 Interlock mechanism

7 Apply gear oil to all sliding parts, and make sure that gears are meshed smoothly in their positions

8 Make sure that gears are placed into Neutral positions, and install extension housing to transmission case by properly aligning striking lever with shift rod brackets

9 Install front cover on transmission case

Install release bearing, withdrawal lever and dust cover in their positions Then apply grease (including molybdenum disulphide) as shown in Figure TM-41



TM271

Fig TM-41 Applying grease

10 Install bottom cover to transmission case

11 Make sure that main drive shaft rotates smoothly at a force of 120 kg-cm (100 in-lb) with transmission in Neutral

INSTALLATION

To install, reverse the order of removal

Remove filler plug at the inspection hole, and fill the transmission case with gear oil to the level of the filler hole [Approximately 1.7 liters (3 3/4 US pt, 3 Imp pt)]

5-SPEED TRANSMISSION (TYPE: FS5W63A)

CONTENTS

DESCRIPTION	TM-10	GEARS AND SHAFTS	TM-16
REMOVAL	TM-11	BAULK RINGS	TM-16
DISASSEMBLY	TM-11	OIL SEALS	TM-16
TRANSMISSION CASE DISASSEMBLY	TM-11	ASSEMBLY	TM-16
DISASSEMBLY OF GEAR ASSEMBLY	TM-12	FRONT COVER ASSEMBLY	TM-16
REAR EXTENSION DISASSEMBLY	TM-15	REAR EXTENSION ASSEMBLY	TM-17
ADAPTER PLATE DISASSEMBLY	TM-16	ADAPTER PLATE ASSEMBLY	TM-17
INSPECTION	TM-16	ASSEMBLY OF GEAR	
TRANSMISSION CASE AND		ASSEMBLY	TM-17
REAR EXTENSION HOUSING	TM-16	TRANSMISSION ASSEMBLY	TM-21
BEARING	TM-16	INSTALLATION	TM-22

DESCRIPTION

The transmission is a 5-speed forward with overdrive (4 + OD - speed), fully synchronized constantmesh type that uses helical gears

The reverse gear is a sliding mesh type using spur gear provided on the outer side of 1st & Reverse coupling sleeve

In construction, the main drive gear is meshed with the counter drive gear. The forward speed gears provided on the countershaft are in constant mesh with the main gears which ride on the mainshaft freely through the needle

bearings

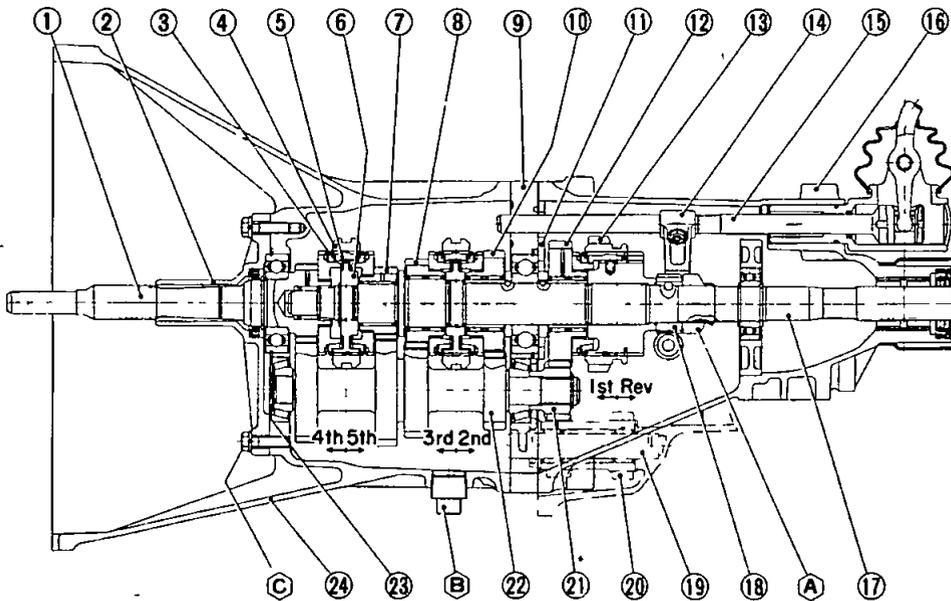
When the transmission is shifted, the action causes the coupling sleeve to slide on the synchronizer hub. This engages its inner teeth with the other teeth formed on the mainshaft gear. The synchronizer hub is fitted to the mainshaft by splines so they turn together as a unit as the mainshaft is rotated. The transmission is a Warner type. On Warner types, the baulk rings synchronize the coupling sleeve with the mainshaft gear. When the transmission is shifted into reverse position, the mainshaft reverse gear provided on the outer side of 1st & Reverse

coupling sleeve, moves to mesh with the reverse idler gear, the transmission is reversed

The transmission assembly consists of three main parts, a transmission case with clutch housing, an adapter plate to which all gears and shafts are installed, and a rear extension

The cast-iron adapter plate supports the mainshaft, countershaft, reverse idler shaft and three fork rods, and is bolted at the front to the transmission case and, at the rear, to the rear extension by means of through-bolts

By removing these through-bolts all gears and shafts are stripped



- 1 Main drive gear
- 2 Front cover
- 3 Baulk ring
- 4 Coupling sleeve
- 5 Shifting insert
- 6 Synchronizer hub
- 7 5th gear, mainshaft
- 8 3rd gear, mainshaft
- 9 Adapter plate
- 10 2nd gear, mainshaft
- 11 Bearing retainer
- 12 1st gear, mainshaft
- 13 Reverse gear, mainshaft
- 14 Striking lever
- 15 Striking rod
- 16 Rear extension
- 17 Mainshaft
- 18 Speedometer drive gear
- 19 Reverse idler shaft
- 20 Reverse idler gear
- 21 1st counter gear
- 22 Counter gear
- 23 Counter gear bearing shim
- 24 Transmission case

Tightening torque (T) of bolts and nut kg-m (ft-lb)

(A) T 14 to 17 (101 to 123)

This nut should be tightened by referring to page TM-27

(B) T 2.5 to 3.5 (18 to 25)

(C) T 1.3 to 1.8 (9 to 13)

TM544

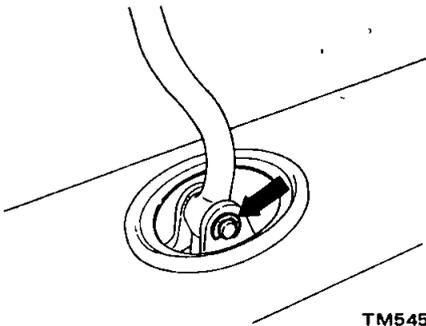
Fig TM-42 Sectional view of FS5W63A transmission

Transmission

REMOVAL

To dismount transmission from the car, proceed as follows

- 1 Disconnect battery ground cable from terminal
- 2 Disengage torsion shaft from accelerator linkage
- 3 Place transmission control lever in neutral position
- 4 Remove E-ring and control lever pin from transmission striking rod guide, and remove control lever See Figure TM-43



TM545

Fig TM-43 Removing control lever

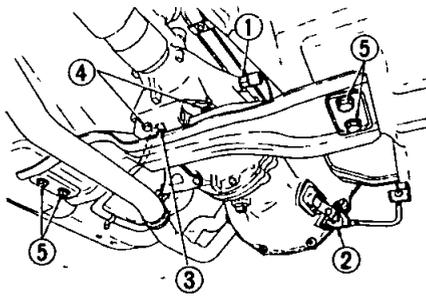
- 5 Jack up the car and support its weight on safety stands Use a hydraulic hoist or open pit, if available

Confirm that safety is insured

- 6 Disconnect front exhaust tube
- 7 Disconnect wires from reverse lamp switch ① See Figure TM-44
- 8 Remove clutch operating cylinder ② from transmission case See Figure TM-44
- 9 Disconnect speedometer cable ③ from rear extension housing See Figure TM-44
- 10 Remove propeller shaft
Refer to Section PD (Page PD-3) for Removal

Note Plug up the opening in the rear extension housing to prevent oil from flowing out

- 11 Support engine by locating a jack under oil pan with a wooden block placed between oil pan and jack
- 12 Support transmission with a transmission jack
- 13 Remove rear engine mount securing bolts ④ and crossmember mounting bolts ⑤ See Figure TM-44



TM546

Fig TM-44 Bottom view of car

- 14 Remove starter motor
- 15 Remove bolts securing transmission to engine

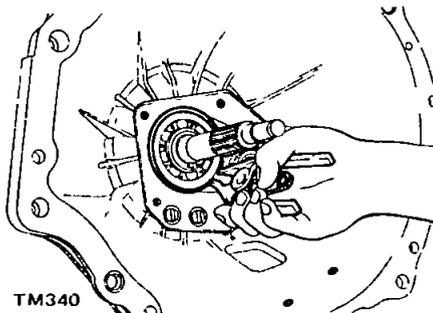
After removing these bolts, support the engine and transmission with jacks, and then slide transmission rearward away from engine and remove from the car

Note Take care in dismounting transmission not to strike any adjacent parts or main drive shaft

DISASSEMBLY

TRANSMISSION CASE DISASSEMBLY

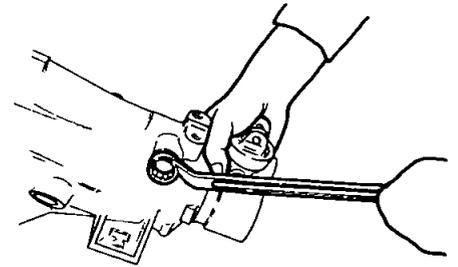
- 1 Prior to disassembling transmission, thoroughly wipe off dirt and grease from it
- 2 Drain oil thoroughly
- 3 Remove dust cover from transmission case
Remove release bearing and withdrawal lever
- 4 Remove reverse lamp switch
- 5 Remove speedometer pinion and pinion sleeve by taking off lock plate
- 6 Remove front cover securing bolts and remove front cover
Detach countershaft front bearing shim
- 7 Remove main drive bearing snap ring See Figure TM-45



TM340

Fig TM-45 Removing main drive bearing snap ring

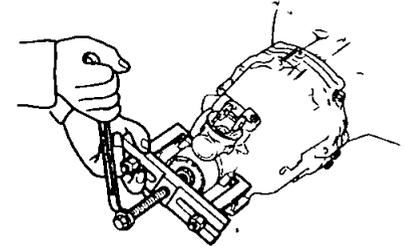
- 8 Remove reverse select return plug, reverse select return spring and plunger from rear extension See Figure TM-46



TM547

Fig TM-46 Removing reverse select return plug

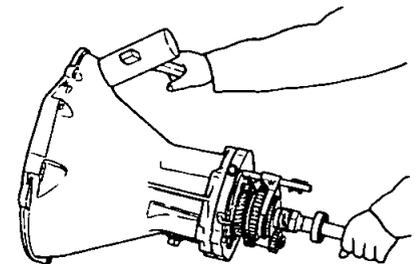
- 9 Remove rear extension securing bolts Extract rear extension backward using a standard puller See Figure TM-47



TM548

Fig TM-47 Removing rear extension

- 10 Separate transmission case from adapter plate with a soft hammer See Figure TM-48

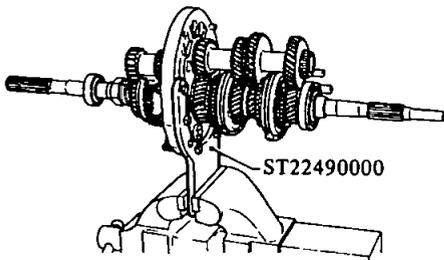


TM549

Fig TM-48 Removing transmission case

- 11 Set up Setting Plate Adapter ST22490000 on adapter plate
With countershaft side up, place the above assembly in a vise See Figure TM-49

Transmission



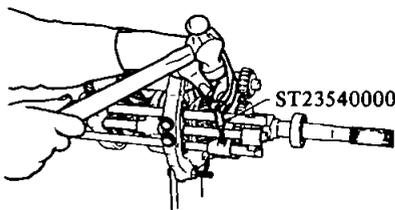
TM550

Fig TM-49 Attaching gear assembly to special tool

DISASSEMBLY OF GEAR ASSEMBLY

Shift forks and fork rods

1 Drive out retaining pins from each fork rod with Fork Rod Pin Punch ST23540000 See Figure TM-50



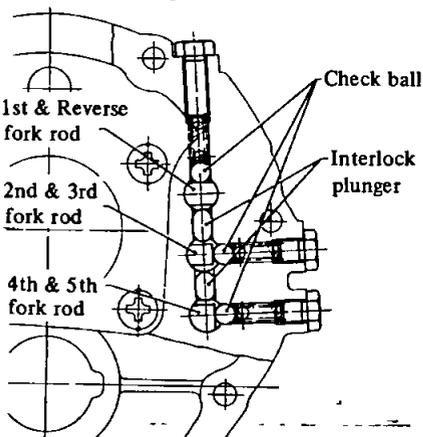
TM551

Fig TM-50 Drive out retaining pins

2 Remove three(3) check ball plugs, and drive out fork rods from adapter plate by lightly tapping on the front end

Be careful not to lose the three(3) check balls and two(2) interlock plungers See Figure TM-51

Note Each gear and shaft can be detached from adapter plate without removing each fork rod

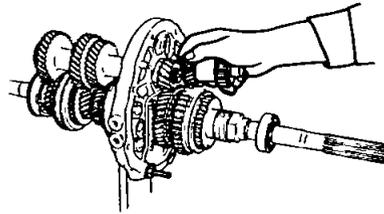


TM552

Fig TM-51 Layout of check ball and interlock plunger

Gear assembly

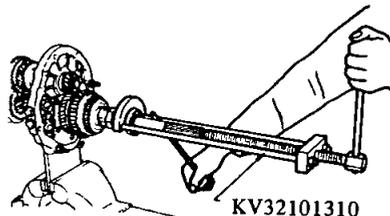
1 Remove reverse idler gear together with shaft See Figure TM-52



TM553

Fig TM-52 Removing reverse idler gear

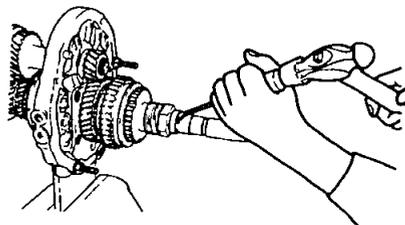
2 Remove snap ring of mainshaft end bearing Draw out bearing using Bearing Puller KV32101310 Remove other snap ring of mainshaft end bearing See Figure TM-53



TM554

Fig TM-53 Removing mainshaft end bearing

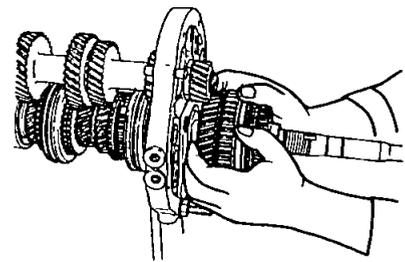
3 With 1st and 2nd gears doubly engaged, release caulking on mainshaft nut and loose it See Figure TM-54



TM555

Fig TM-54 Releasing caulking on mainshaft nut

4 Remove mainshaft nut, and take out speedometer drive gear, synchro hub with reverse gear and 1st gear together with needle bearing Remove thrust washer Be careful not to lose steel ball retaining speedometer drive gear and thrust washer See Figure TM-55

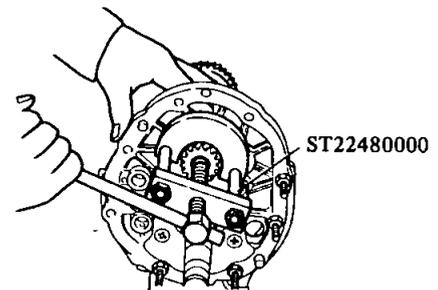


TM556

Fig TM-55 Removing reverse and 1st gears

5 Remove snap ring and thrust washer from rear end of 1st counter gear

Draw out 1st counter gear using Gear Puller ST22480000 See Figure TM-56

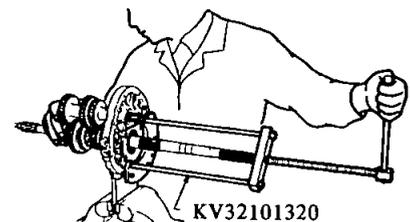


TM557

Fig TM-56 Removing 1st counter gear

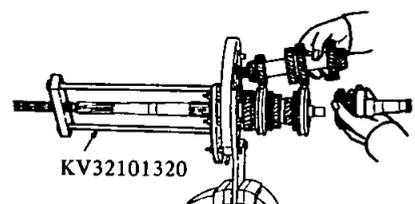
6 Draw out mainshaft gear assembly using Mainshaft Puller KV32101320

Remove main drive gear and counter gear then draw out mainshaft about 10 mm (0.39 in) See Figures TM-57 and TM-58



TM558

Fig TM-57 Removing mainshaft gear



TM559

Fig TM-58 Removing main drive gear and counter gear

Transmission

Note Be careful not to drop off gears

Note When pressing out bushing, hold mainshaft by hand so as not to drop it

3 Pry off snap ring on the front end of mainshaft, and remove 4th & 5th speed synchronizer and 5th gear See Figure TM-60

Mainshaft

1 Remove thrust washer, steel ball, 2nd gear and needle bearing Be careful not to lose steel ball retaining thrust washer

2 Press out 2nd gear mainshaft bushing together with 3rd gear and 2nd & 3rd speed synchronizer using Bearing Puller ST30031000 See Figure TM-59

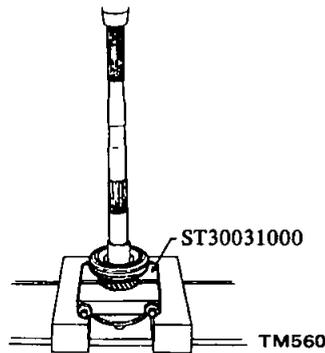
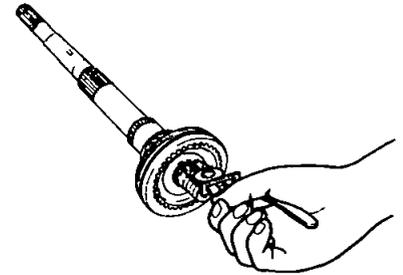
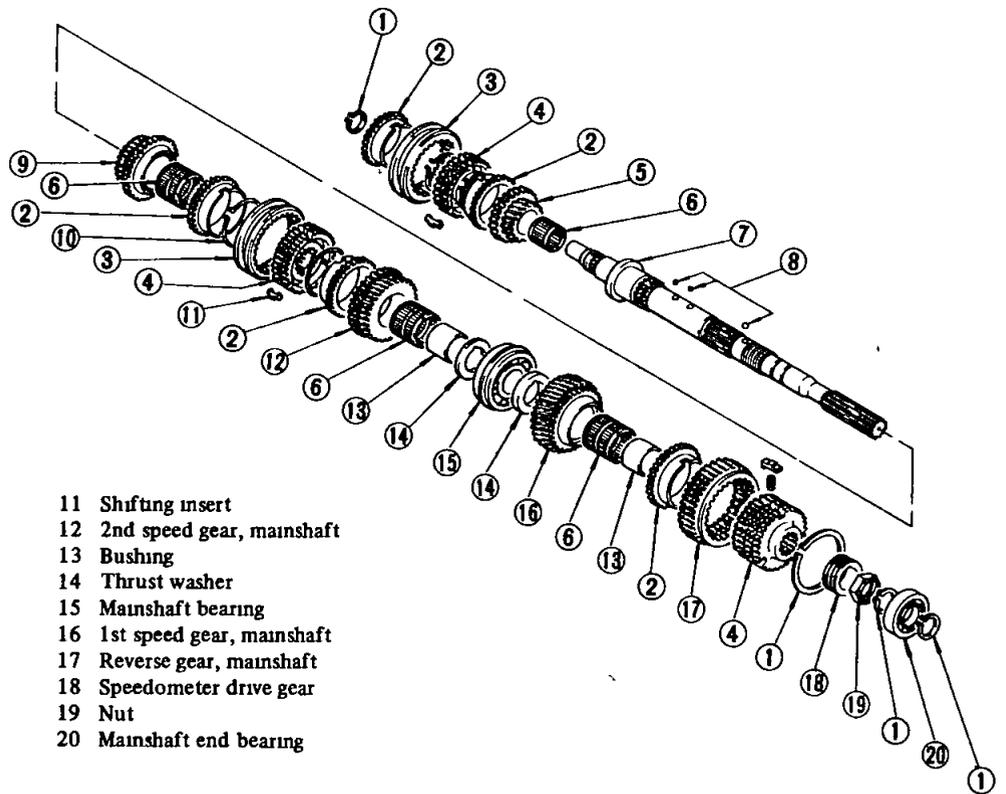


Fig TM-59 Removing 2nd gear mainshaft bushing



TM561

Fig TM-60 Removing snap ring



- | | |
|-----------------------------|------------------------------|
| 1 Snap ring | 11 Shifting insert |
| 2 Baulk ring | 12 2nd speed gear, mainshaft |
| 3 Coupling sleeve | 13 Bushing |
| 4 Synchronizer hub | 14 Thrust washer |
| 5 5th speed gear, mainshaft | 15 Mainshaft bearing |
| 6 Needle bearing | 16 1st speed gear, mainshaft |
| 7 Mainshaft | 17 Reverse gear, mainshaft |
| 8 Steel ball | 18 Speedometer drive gear |
| 9 3rd speed gear, mainshaft | 19 Nut |
| 10 Spread spring | 20 Mainshaft end bearing |

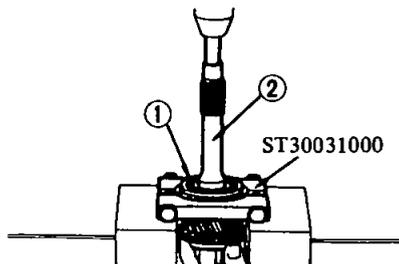
TM562

Fig TM-61 Exploded view of mainshaft assembly

Main drive gear

1 Pry off snap ring and remove spacer

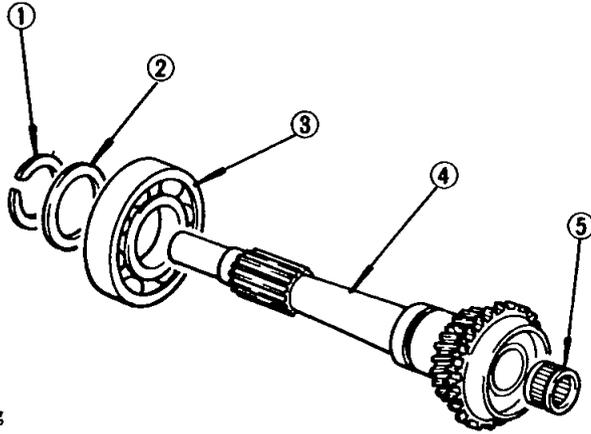
2 Press out main drive bearing using Bearing Puller ST30031000 See Figure TM-62



- | |
|----------------------|
| 1 Main drive bearing |
| 2 Main drive gear |

Fig TM-62 Removing main drive bearing

Note When pressing out bearing, hold gear by hand so as not to drop gear onto floor



- 1 Snap ring
- 2 Spacer
- 3 Main drive bearing with snap ring
- 4 Main drive gear
- 5 Pilot bearing

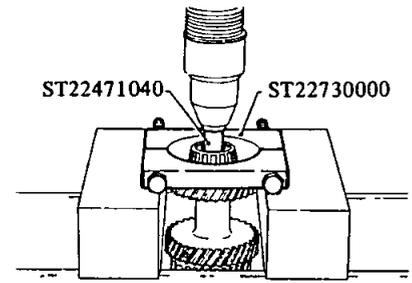
TM563

Fig TM-63 Exploded view of main drive gear assembly

Counter gear

1 Press out counter gear front bearing using Bearing Puller ST22730000 and Adapter ST22471040 See Figure TM-64

Note When pressing out bearing, hold gear by hand so as not to drop gear onto floor

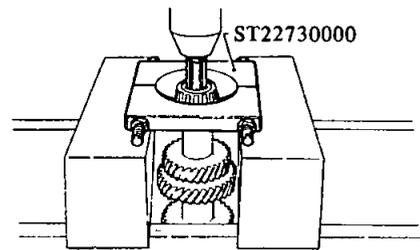


TM564

Fig TM-64 Removing counter gear front bearing

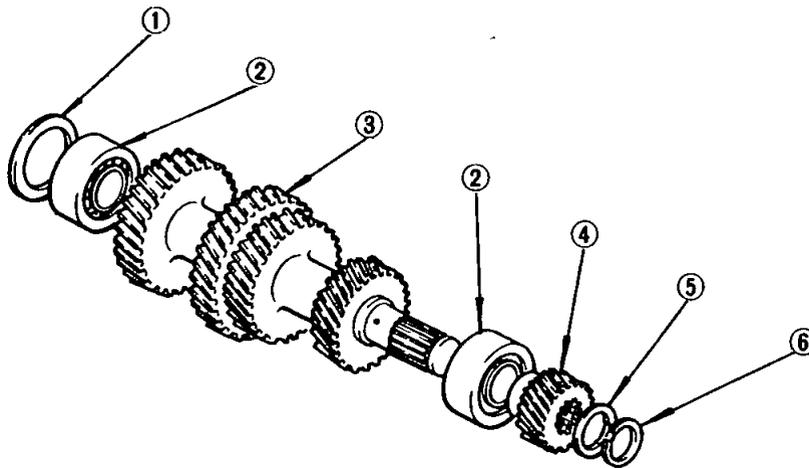
2 Press out counter gear rear bearing using Bearing Puller ST22730000 See Figure TM-65

Note Be careful not to drop off counter gear



TM565

Fig TM-65 Removing counter gear rear bearing



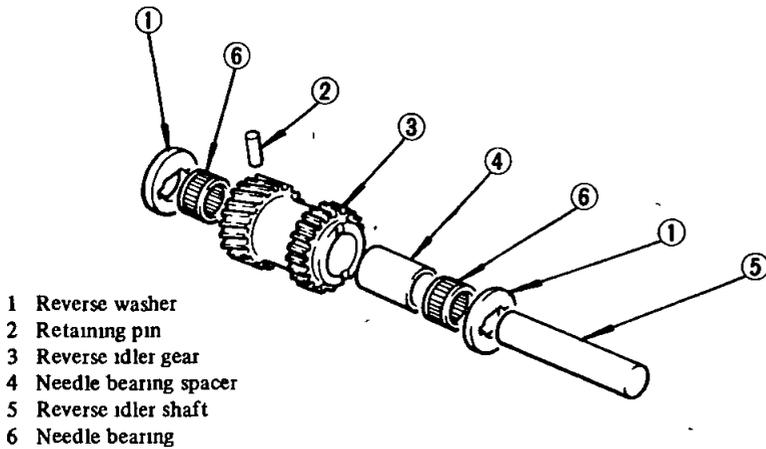
- 1 Shim
- 2 Bearing
- 3 Counter gear
- 4 1st counter gear
- 5 Spacer
- 6 Snap ring

TM566

Fig TM-66 Exploded view of counter gear assembly

Reverse idler gear

Disassemble reverse idler gear assembly See Figure TM-67



- 1 Reverse washer
- 2 Retaining pin
- 3 Reverse idler gear
- 4 Needle bearing spacer
- 5 Reverse idler shaft
- 6 Needle bearing

TM567

Fig TM-67 Exploded view of reverse idler gear assembly

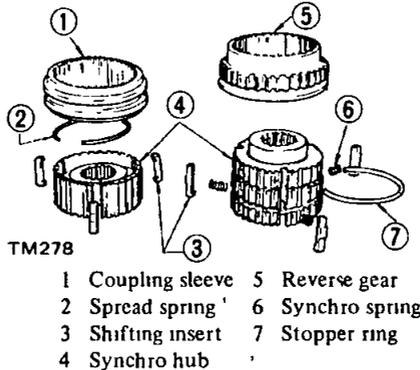
Synchronizer

1 2nd & 3rd, 4th & 5th speed synchronizer

Remove spread springs (2) and take out shifting inserts (3) Separate coupling sleeve (1) from synchronizer hub (4) See Figure TM-68

2 1st & reverse synchronizer

Separate reverse main gear (5) from synchronizer hub (4) Take out shifting inserts (3) and synchro springs (6) Pry off stopper ring (7) See Figure TM-68



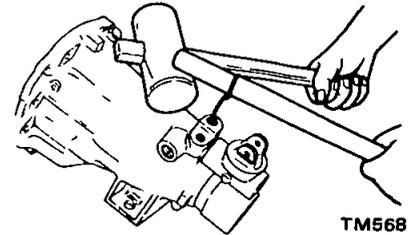
TM278

- 1 Coupling sleeve
- 2 Spread spring
- 3 Shifting insert
- 4 Synchro hub
- 5 Reverse gear
- 6 Synchro spring
- 7 Stopper ring

Fig TM-68 Exploded view of synchronizer assembly

REAR EXTENSION DISASSEMBLY

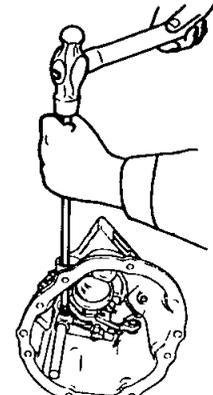
1 Remove screw and stopper pin from rear extension See Figure TM-69



TM568

Fig TM-69 Removing stopper pin

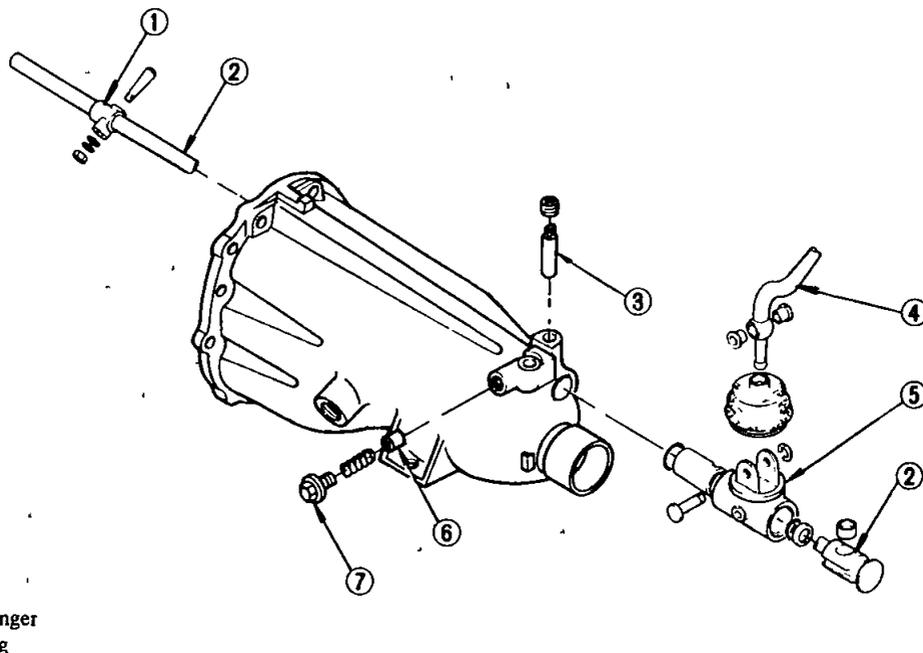
2 Remove lock pin from striking lever, and remove striking rod See Figure TM-70



TM569

Fig TM-70 Removing lock pin

Note Do not disassemble rear extension bush from rear extension



- 1 Striking lever
- 2 Striking rod
- 3 Stopper pin
- 4 Control lever
- 5 Striking rod guide
- 6 Reverse select plunger
- 7 Reverse select plug

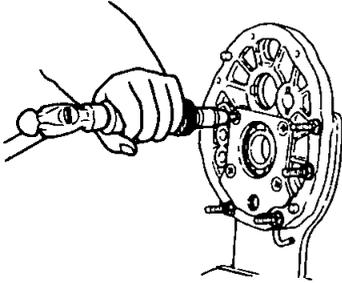
TM570

Fig TM-71 Exploded view of shifting mechanism

Transmission

ADAPTER PLATE DISASSEMBLY

- 1 Remove four bearing retainer attaching screws with an impact driver and remove bearing retainer from adapter plate See Figure TM-72



TM571

Fig TM-72 Removing screws

- 2 Remove mainshaft bearing from the rear extension side
- 3 To remove outer race of counter gear rear bearing, apply a brass drift to race side surface, and withdraw it by tapping the top of drift with a hammer

INSPECTION

Wash all parts in a suitable cleaning solvent and check for wear, damage or other faulty conditions

Notes

- a Be careful not to damage any parts with scraper
- b Do not clean, wash or soak oil seals in solvent

TRANSMISSION CASE AND REAR EXTENSION HOUSING

- 1 Clean thoroughly with solvent and check for cracks which might cause oil leak or other faulty conditions

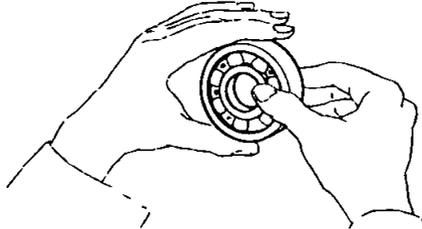
- 2 Check mating surface of case to engine or adapter plate for small nicks, projection or sealant

Remove all nicks, projection or sealant with a fine stone

- 3 If rear extension bush is worn or cracked, replace it as an assembly of bush and rear extension housing

BEARING

- 1 Thoroughly clean bearing and dry with compressed air
- 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 See Figure TM-73



TM372

Fig TM-73 Inspecting ball bearing

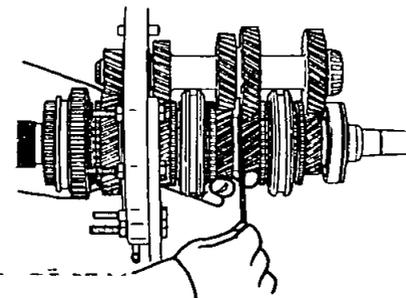
- 3 Replace needle bearing and taper roller bearing if worn or damaged

GEARS AND SHAFTS

- 1 Check all gears for excessive wear, chips or cracks, replace as required
- 2 Check shaft for bending, cracks, wear, or worn spline, if necessary, replace
- 3 Measure gear end play See Figure TM-74

Standard end play

- 1st gear
0.32 to 0.42 mm
(0.0126 to 0.0165 in)
- 2nd gear
0.22 to 0.32 mm
(0.0087 to 0.0126 in)
- 3rd and 5th gear
0.05 to 0.15 mm
(0.0020 to 0.0059 in)



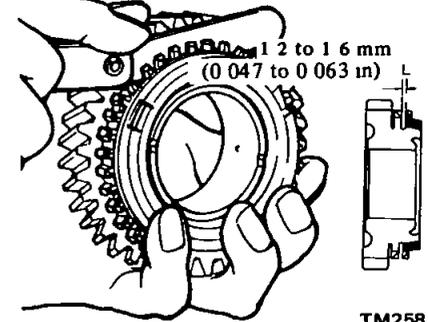
TM572

Fig TM-74 Measuring end play

- 4 Check for stripped or damaged speedometer pinion gear. If necessary, replace

BAULK RINGS

- 1 Replace any baulk ring which is deformed or cracked
- 2 Position baulk ring in place on gear cone, and measure the baulk ring-to-gear clearance with baulk ring pushed toward gear See Figure TM-75



TM258

Fig TM-75 Baulk ring to cone gap

OIL SEALS

It is advisable not to reuse oil seals that have been removed. Always install new oil seals.

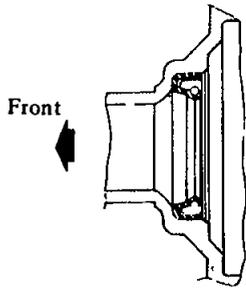
Replace oil seal if sealing lip is deformed or cracked. Also discard seal if spring is out of position. Check the oil seal lip contacting face on shaft, if necessary replace seal and shaft as a set.

ASSEMBLY

To assemble, reverse the order of disassembly. Observe the following instructions.

FRONT COVER ASSEMBLY

- 1 Wipe clean seal seat in front cover, then press fit oil seal in place. Coat oil seal with gear oil to provide initial lubrication. See Figure TM-76



TM354

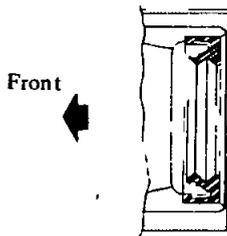
Fig TM-76 Front cover oil seal

2 Apply sealant to withdrawal lever ball pin screw. Install withdrawal lever ball pin to front cover and tighten screw to 3.0 to 5.0 kg-m (22 to 36 ft-lb) torque.

REAR EXTENSION ASSEMBLY

1 Wipe clean seal seat in rear extension housing, press fit oil seal in place.

Coat oil seal and bushing with gear oil for initial lubrication. See Figure TM-77.



TM355

Fig TM-77 Rear extension oil seal

2 Apply multi-purpose grease to O-ring and plunger grooves in striking rod.

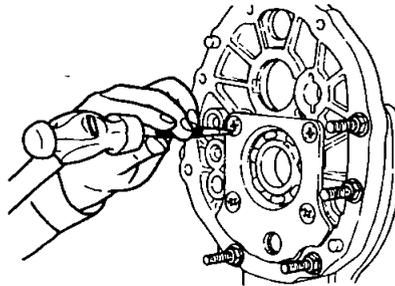
Insert striking rod with striking rod guide through rear extension.

3 Install striking lever on front end of striking rod. Install lock pin and torque screw to 0.9 to 1.2 kg-m (7 to 9 ft-lb).

ADAPTER PLATE ASSEMBLY

- 1 Install outer race of counter gear rear bearing by lightly tapping around it with a brass drift and a hammer.
- 2 Install mainshaft bearing by lightly tapping around it with a soft hammer.
- 3 Install bearing retainer in adapter plate.

Torque screws to 0.8 to 1.3 kg-m (6 to 9 ft-lb) and stake each screw at two points with a punch. See Figure TM-78.



TM573

Fig TM-78 Staking screw

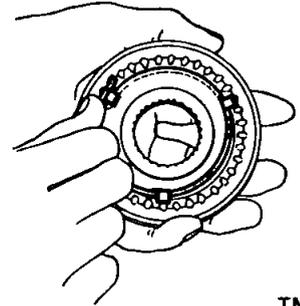
ASSEMBLY OF GEAR ASSEMBLY

Clean all parts in solvent and dry with compressed air.

Synchronizers

- 1 2nd & 3rd, 4th & 5th speed synchronizers
 - (1) Place synchro-hub into coupling sleeve.

- (2) Fit shifting inserts in three grooves in synchronizer hub.
- (3) Locate one spread spring on the lower side of shifting inserts to secure them to the inner side of coupling sleeve. Properly install the other spring on the opposite side of coupling sleeve. Make sure that they are installed opposite to each other. See Figure TM-79.



TM077

Fig TM-79 Installing spread spring

- 2 1st & reverse synchronizer
 - (1) Position shifting insert springs and shifting inserts in three(3) slots in synchronizer hub.
 - (2) Put coupling sleeve on synchronizer hub.

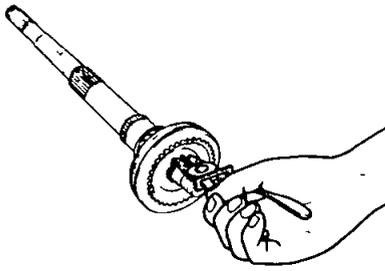
Mainshaft

- 1 Position 5th gear needle bearing, mainshaft 5th gear, baulk ring and 4th & 5th speed synchronizer on the front of mainshaft.
- 2 Fit snap ring of proper thickness so that it will fit the groove in mainshaft. See Figure TM-80.

Available snap ring

No	Thickness mm (in)
1	1.40 to 1.45 (0.0551 to 0.0571)
2	1.45 to 1.50 (0.0571 to 0.0591)
3	1.50 to 1.55 (0.0591 to 0.0610)
4	1.55 to 1.60 (0.0610 to 0.0630)
5	1.60 to 1.65 (0.0630 to 0.0650)

Transmission

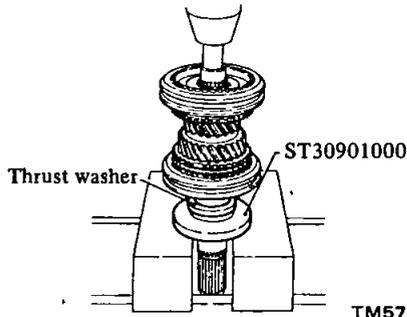


TM574

Fig TM-80 Installing snap ring

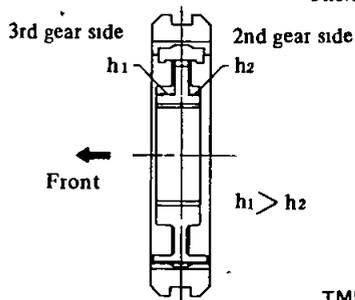
3 Install the following parts on mainshaft in the order listed 3rd gear needle roller bearing, 3rd gear, 3rd gear baulk ring, 2nd & 3rd speed synchronizer Then fit 2nd gear bushing onto mainshaft using Base ST30901000 and mainshaft bearing thrust washer See Figure TM-81 And install 2nd gear baulk ring, needle bearing, 2nd gear, steel ball and thin thrust washer

Note Assemble 2nd & 3rd speed Synchronizer, paying attention to its direction See Figure TM-82



TM575

Fig TM-81 Installing 2nd gear bushing

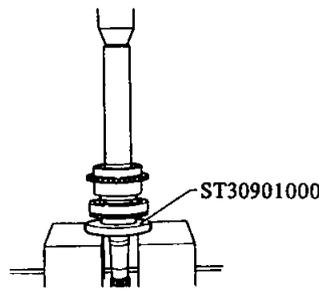


TM576

Fig TM-82 Installing 2nd & 3rd speed synchronizer

Main drive gear

1 Press main drive bearing onto the shaft of main drive gear using Base ST30901000 Make sure that snap ring groove on shaft clears bearing See Figure TM-83



TM577

Fig TM-83 Installing main drive bearing

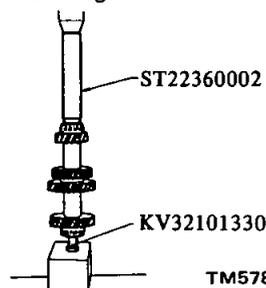
2 Place main drive bearing spacer on main drive bearing and secure main drive bearing with a new thicker snap ring that will eliminate end play

Available snap ring

No	Thickness mm (in)
1	1 49 to 1 55 (0 0587 to 0 0610)
2	1 56 to 1 62 (0 0614 to 0 0638)
3	1 62 to 1 68 (0 0638 to 0 0661)
4	1 68 to 1 74 (0 0661 to 0 0685)
5	1 74 to 1 80 (0 0685 to 0 0709)
6	1 80 to 1 86 (0 0709 to 0 0732)
7	1 86 to 1 92 (0 0732 to 0 0756)

Counter gear

1 Press counter gear front bearing onto counter gear using Drift ST22360002
2 Press counter gear rear bearing onto counter gear using Drift ST22360002 and Adapter KV32101330 See Figure TM-84



TM578

Fig TM-84 Installing counter gear rear bearing

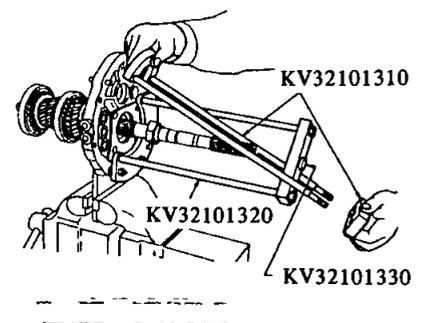
Reverse idler gear

Assemble reverse idler gear assembly

Note When positioning thrust washers on shaft, make sure that the brown surfaces are facing toward gears

Gear assembly

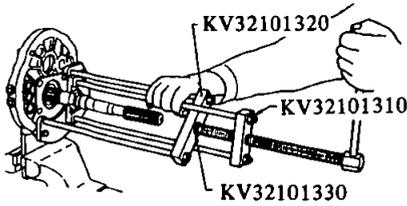
1 Attach Setting Plate Adapter ST22490000 to adapter plate and place it in a vise
2 Place mainshaft assembly into adapter plate assembly Place mainshaft nut onto mainshaft
3 Pull mainshaft assembly into adapter plate using Mainshaft Puller KV32101310, Bearing Puller KV32101320 and Adapter KV32101330 until the thrust washer-to-bearing clearance reaches approximately 10 mm (0 39 in) See Figures TM-85 and TM-86



TM579

Fig TM-85 Setting special tools

Transmission



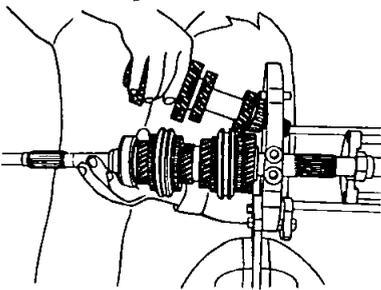
TM580

Fig TM-86 Installing mainshaft assembly

4 Position baulk ring on cone surface of main drive gear. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

Assemble main drive gear assembly on the front end of mainshaft.

Assemble counter gear assembly on mainshaft and main drive gear. See Figure TM-87.

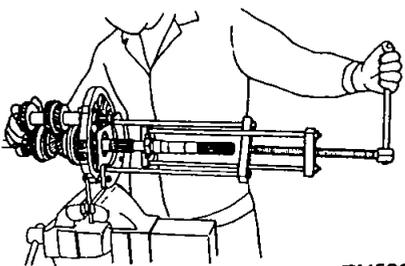


TM581

Fig TM-87 Installing main drive gear and counter gear

5 Pull mainshaft assembly into adapter plate together with main drive gear and counter gear.

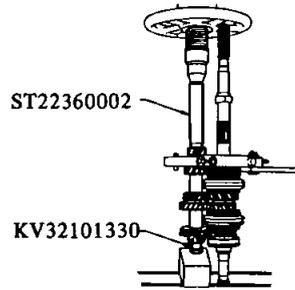
When installing mainshaft, hold gears carefully by hand and do not drop gears on floor. See Figure TM-88.



TM582

Fig TM-88 Installing mainshaft assembly

6 Press 1st counter gear onto counter shaft using Drift ST22360002 and Adapter KV32101330. See Figure TM-89.



TM583

Fig TM-89 Installing 1st counter gear

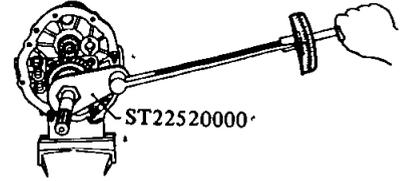
7 Place spacer on the rear end of 1st counter gear and secure it with a new snap ring.

8 Install the following parts to the rear of mainshaft in the order listed: Steel ball, thick thrust washer, 1st gear bushing, needle bearing, 1st gear, 1st gear baulk ring, 1st synchronizer together with reverse main gear, steel ball, speedometer drive gear and mainshaft nut.

Tighten mainshaft nut temporarily.

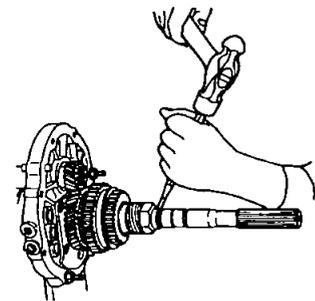
9 With 1st and 2nd gears doubly engaged, tighten mainshaft nut to the converted torque "C" (See Figure TM-92) using Wrench ST22520000.

Stake mainshaft nut to groove of mainshaft with a punch. See Figures TM-90 and TM-91.



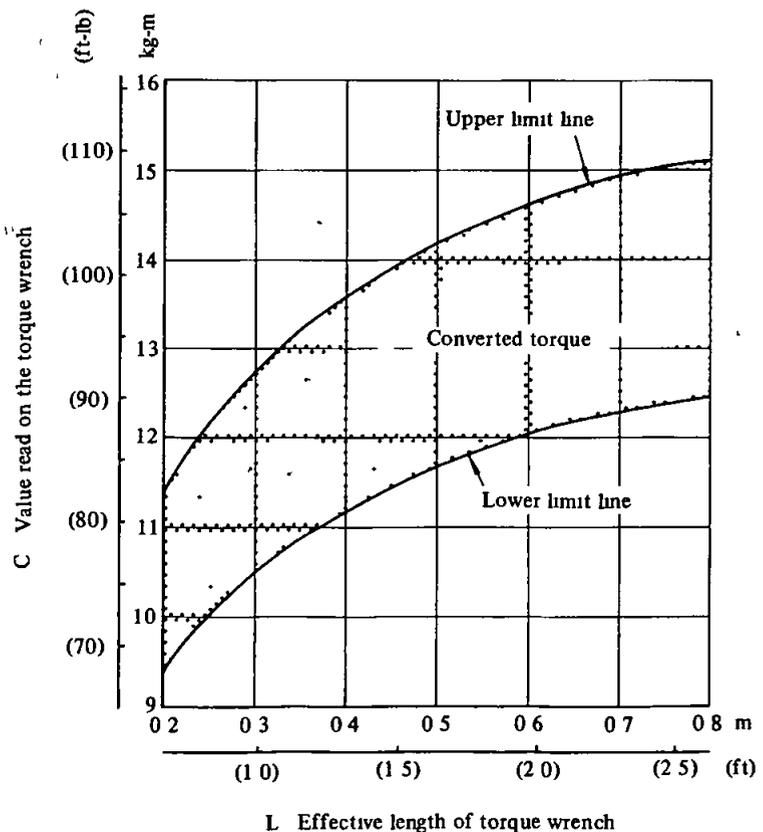
TM584

Fig TM-90 Tightening mainshaft nut



TM585

Fig TM-91 Staking mainshaft nut



TM586

Fig TM-92 Converted torque

Transmission

Explanation of converted torque

Mainshaft nut should be tightened to 14 to 17 kg-m (101 to 123 ft-lb) torque with the aid of Wrench ST22520000. When doing so, the amount of torque to be read on wrench needle should be modified according to the following formula

$$C \text{ kg-m} = 14 \times \left(\frac{L}{L+0.1} \right) \text{ to}$$

$$17 \times \left(\frac{L}{L+0.1} \right)$$

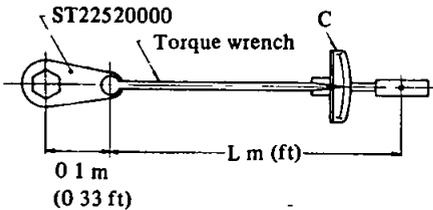
or

$$C \text{ (ft-lb)} = 101 \times \left(\frac{L}{L+0.33} \right) \text{ to}$$

$$123 \times \left(\frac{L}{L+0.33} \right)$$

Where,

- C Value read on the torque wrench kg-m (ft-lb)
- L Effective length of torque wrench m (ft)



TM587

Fig TM-93 Setting wrench

Example,

When a 0.4 m-long torque wrench is used, the "C" in Figure TM-92 will be 11.2 to 13.6 kg-m (81 to 98 ft-lb)

10 Measure gear end play

Make sure that they are held within the specified values

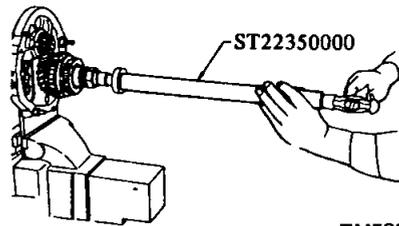
For details, refer to Page TM-24 for Inspection

11 Fit 1.1 mm (0.043 in) thick snap ring to the front side of mainshaft end bearing

12 Install mainshaft end bearing using Bearing Drift ST22350000. Fit thick snap ring to the rear side of bearing to eliminate end play

Available snap ring

No	Thickness mm (in)
1	1.1 (0.043)
2	1.2 (0.047)
3	1.3 (0.051)
4	1.4 (0.055)



TM588

Fig TM-94 Installing mainshaft end bearing

13 Install reverse idler gear assembly

Shift forks and fork rods

1 Place three(3) shift forks in groove in each coupling sleeve. Be careful not to drop off shift forks

2 Install 1st & reverse fork rod through 1st & reverse shift fork and adapter plate

Secure 1st & reverse fork rod to shift fork with new retaining pin

3 Install check ball, check ball spring, and check ball plug. Prior to

tightening check ball plug, apply sealant to check ball plug

Align center notch in 1st & reverse fork rod with check ball

Note Ball plug for 1st & reverse fork rod is longer than those for 2nd & 3rd fork rod and 4th & 5th fork rod. See Figure TM-51

4 Install interlock plunger on adapter plate. See Figure TM-51

5 Install 2nd & 3rd fork rod through adapter plate, 2nd & 3rd shift fork and 4th & 5th shift fork, and secure with new retaining pin

6 Install check ball and check ball spring

Apply sealant to check ball plug and install it in place

Align center notch in 2nd & 3rd fork rod with check ball

7 Install interlock plunger on adapter plate

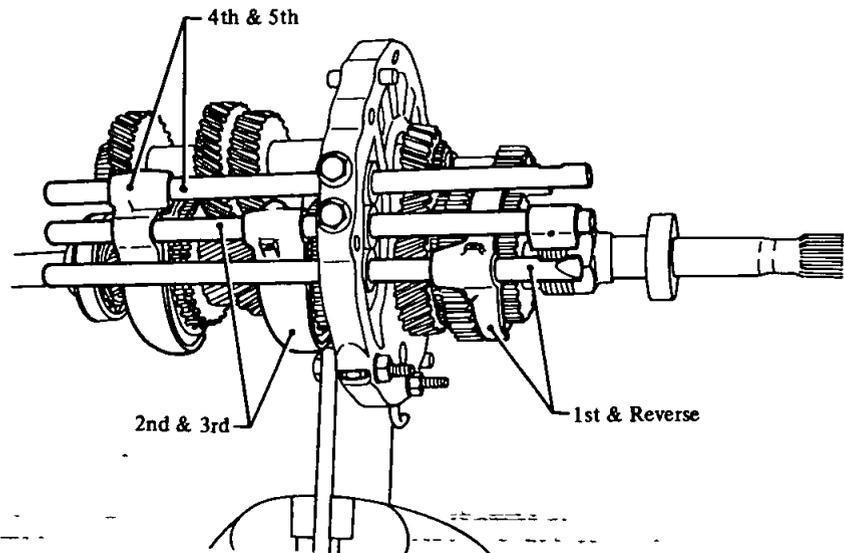
8 Install 4th & 5th fork rod through adapter plate and 4th & 5th shift fork, and secure with new retaining pin

9 Install check ball and check ball spring

Apply sealant to check ball plug and install it in place

10 Torque each check ball plug to 1.6 to 2.2 kg-m (12 to 16 ft-lb)

11 Apply gear oil to all sliding surfaces and check to see that shift rods operate correctly and gears engage smoothly



TM589

Fig TM-95 Installing shift forks and fork rods

TRANSMISSION ASSEMBLY

Rear extension assembly

- 1 Clean mating surfaces of adapter plate and rear extension
Apply sealant to mating surfaces of adapter plate and rear extension
- 2 With fork rods in their 5th positions, gradually slide rear extension onto adapter plate

Notes

- a Use care when installing, not to come shift arm off striking lever pin
 - b Install shift arm onto 4th & 5th fork rod, and then fit striking lever pin into other fork rods
- 3 Check to see that shift rods operate correctly

Transmission case assembly

- 1 Clean mating surfaces of adapter plate and transmission case
Apply sealant to mating surfaces of adapter plate and transmission case
- 2 Slide transmission case onto adapter plate by lightly tapping with a soft hammer until case presses against adapter plate
Carefully install main drive bearing and countershaft front bearing
Make certain that mainshaft rotates freely
- 3 Install washers and through-bolts and torque to 1.3 to 1.8 kg-m (9 to 13 ft-lb)
- 4 Fit main drive bearing snap ring to groove in main drive bearing See Figure TM-96

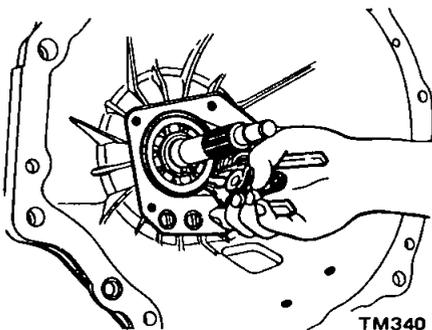


Fig TM-96 Fitting main drive bearing snap ring

Front cover assembly

- 1 Select countershaft front bearing shim as follows
 - (1) Support transmission assembly with its front side up
 - (2) Place Counter Bearing Setting Gauge ST22500000 on countershaft front bearing, and turn main drive shaft until bearing is settled down
 - (3) Measure the clearance (B) between the setting gauge and the front end of transmission case, using a thickness gauge See Figures TM-97 and TM-98

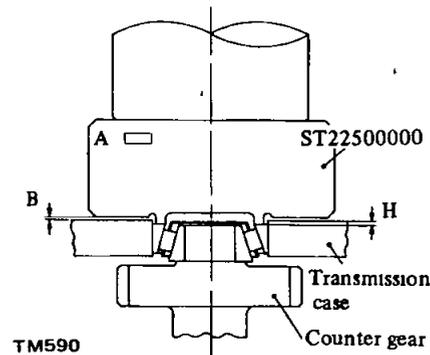


Fig TM-97 Adjusting countershaft front bearing shim

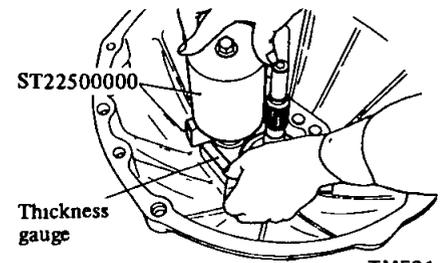


Fig TM-98 Measuring clearance

- (4) The depth (H) can be obtained from the following formula

$$H = A - B$$

Where,

- H Depth from front, end of transmission case to countershaft front bearing mm (in)
- A Figure marked on the setting gauge mm (in)
- B Measured value using thickness gauge mm (in)

- (5) Select a shim of thickness "H" measured

Available shim

No	"H" mm (in)	Thickness of countershaft front bearing shim mm (in)
1	1 200 to 1 225 (0 0472 to 0 0482)	1 350 (0 0531)
2	1 225 to 1 250 (0 0482 to 0 0492)	1 375 (0 0541)
3	1 250 to 1 275 (0 0492 to 0 0502)	1 400 (0 0551)
4	1 275 to 1 300 (0 0502 to 0 0512)	1 425 (0 0561)
5	1 300 to 1 325 (0 0512 to 0 0522)	1 450 (0 0571)
6	1 325 to 1 350 (0 0522 to 0 0531)	1 475 (0 0581)
7	1 350 to 1 375 (0 0531 to 0 0541)	1 500 (0 0591)
8	1 375 to 1 400 (0 0541 to 0 0551)	1 525 (0 0600)
9	1 400 to 1 425 (0 0551 to 0 0561)	1 550 (0 0610)
10	1 425 to 1 450 (0 0561 to 0 0571)	1 575 (0 0620)
11	1 450 to 1 475 (0 0571 to 0 0581)	1 600 (0 0630)
12	1 475 to 1 500 (0 0581 to 0 0591)	1 625 (0 0640)
13	1 500 to 1 525 (0 0591 to 0 0600)	1 650 (0 0650)
14	1 525 to 1 550 (0 0600 to 0 0610)	1 675 (0 0659)
15	1 550 to 1 575 (0 0610 to 0 0620)	1 700 (0 0669)
16	1 575 to 1 600 (0 0620 to 0 0630)	1 725 (0 0679)
17	1 600 to 1 625 (0 0630 to 0 0640)	1 750 (0 0689)
18	1 625 to 1 650 (0 0640 to 0 0650)	1 775 (0 0699)

Transmission

Example,

$$A = 1.75 \text{ mm}, B = 0.22 \text{ mm}$$

$$H = A - B \\ = 1.75 - 0.22 \\ = 1.23 \text{ mm}$$

The correct shim is 1.375 mm thick

2 Clean mating surfaces of front cover and transmission case

Apply grease to shim selected to retain it on countershaft front bearing, install front cover to transmission case. Apply sealant to both surfaces of front cover and transmission case before installation

Install through-bolts with washers under them and tighten to 1.3 to 1.8 kg-m (9 to 13 ft-lb) torque

Apply sealant to threads of through-bolts before installation

3 Apply grease to reverse select

return plunger, install it in rear extension

Install reverse select return springs, and install reverse select return plug with sealant in place and torque to 0.8 to 1.0 kg-m (6 to 7 ft-lb)

4 Install speedometer pinion assembly on rear extension. After making sure that lock plate is lined up with groove in speedometer pinion sleeve, install through-bolts and torque to 0.3 to 0.4 kg-m (2 to 3 ft-lb)

5 Install back-up lamp switch and torque to 2.0 to 3.0 kg-m (14 to 22 ft-lb)

6 Apply a light coat of multi-purpose grease to withdrawal lever, release bearing and bearing sleeve, install them on clutch housing

After connecting them with holder spring, install dust cover on clutch housing

7 Install control lever temporarily, and shift control lever through all gears to make sure that gears operate smoothly

INSTALLATION

Install the transmission in the reverse order of removal paying attention to the following points

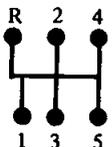
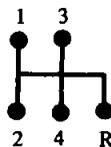
1 Before installing, clean mating surfaces of engine rear plate and transmission case

2 Before installing, lightly apply grease to spline parts of clutch disc and main drive gear

3 Remove filler plug and fill transmission with recommended gear oil to the level of the plug hole [Approximately 1.7 liters (3 5/8 US pt, 3 Imp pt)]

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Item	Car model	Hardtop	Sedan	Station Wagon
	Transmission model		FS5W63A	F4W63L
No of speeds		5	4	
Synchromesh type		Warner	Warner	
Shift type		Floor 	Floor 	
Gear ratio	1st	3.382	3.382	
	2nd	2.013	2.013	
	3rd	1.312	1.312	
	4th	1.000	1.000	
	5th	0.854	—	
	Rev	3.570	3.364	
Oil capacity	liter (US pt, Imp pt)	1.7 (3 5/8, 3)		

Transmission

TIGHTENING TORQUE

Unit kg-m (ft-lb)

Transmission type	FS5W63A	F4W63L
Item		
Engine to transmission installation bolt	3.7 to 5.0 (27 to 36)	4.0 to 4.8 (29 to 35)
Clutch operating cylinder installation bolt	2.5 to 3.0 (18 to 22)	2.5 to 3.0 (18 to 22)
Propeller shaft to differential companion flange nut	2.4 to 3.3 (17 to 24)	2.4 to 3.3 (17 to 24)
Center bracket installation bolt	3.6 to 4.8 (26 to 35)	—————
Rear mounting insulator to transmission installation bolt	0.9 to 1.2 (7 to 9)	0.9 to 1.2 (7 to 9)
Crossmember mounting bolt	1.9 to 2.6 (14 to 19)	1.9 to 2.6 (14 to 19)
Mainshaft retainer to transmission case	0.8 to 1.3 (6 to 9)	0.8 to 1.0 (6 to 7)
Mainshaft nut	14 to 17 (101 to 123)	8.0 to 11.0 (58 to 80)
Check ball plug	1.6 to 2.2 (12 to 16)	1.7 to 2.1 (12 to 15)
Rear extension installation bolt	1.3 to 1.8 (9 to 13)	1.4 to 1.8 (10 to 13)
Front cover installation bolt	1.3 to 1.8 (9 to 13)	0.8 to 1.0 (6 to 7)
Bottom cover installation bolt	—————	0.8 to 1.0 (6 to 7)
Reverse select return plug	0.8 to 1.0 (6 to 7)	—————

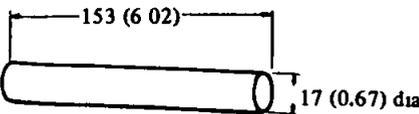
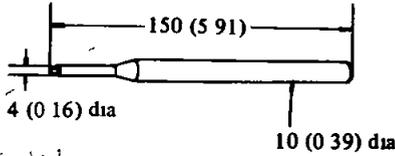
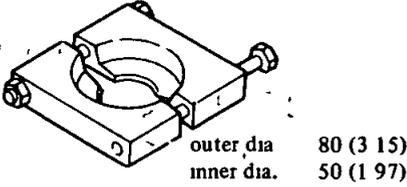
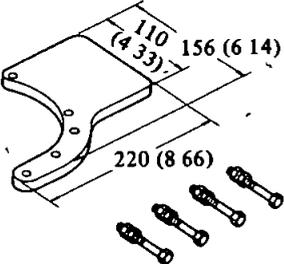
SPECIFICATIONS

Transmission type	FS5W63A	F4W63L	
Item			
Gear backlash mm (in)	1st	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	2nd	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	3rd	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	5th	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	Rev	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	Drive	0.05 to 0.20 (0.0020 to 0.0079)	0.05 to 0.20 (0.0020 to 0.0079)
	Gear end play mm (in)	1st	0.32 to 0.42 (0.0126 to 0.0165)
2nd		0.22 to 0.32 (0.0087 to 0.0126)	0.22 to 0.32 (0.0087 to 0.0126)
3rd		0.05 to 0.15 (0.0020 to 0.0059)	0.05 to 0.15 (0.0020 to 0.0059)
5th		0.05 to 0.15 (0.0020 to 0.0059)	0.05 to 0.15 (0.0020 to 0.0059)
Rev Idler		0.15 to 0.40 (0.0059 to 0.0157)	0.10 to 0.30 (0.0039 to 0.0118)
Counter gear		—————	0.05 to 0.15 (0.0020 to 0.0059)
Clearance between balk ring and gear mm (in)	-standard	1.2 to 1.6 (0.047 to 0.063)	1.2 to 1.6 (0.047 to 0.063)
	-limit	0.5 (0.020)	0.5 (0.020)
Counter bearing adjusting shim mm (in)	1.350 to 1.775 (0.0531 to 0.0699) Every 0.025 (0.0010)	—————	

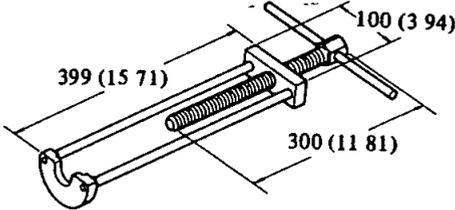
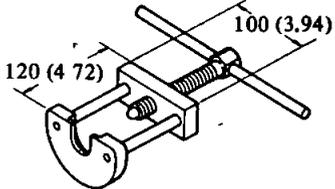
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
<p>Difficult to intermesh gears Causes for difficult gear shifting are classified to troubles concerning control system and transmission. When gear shift lever is heavy and it is difficult to shift gears, clutch disengagement may also be unsmooth. First, make sure that clutch operates correctly, and inspect transmission.</p>	<p>Worn gears, shaft, and/or bearing Insufficient operating stroke due to worn or loose sliding part Worn or damaged synchronizer</p>	<p>Replace Repair or replace Replace</p>
<p>Gear slips out of mesh In most cases, this trouble occurs, when interlock ball, check ball, and/or spring is worn or weakened, or when control system is faulty. In this case, the trouble cannot be corrected by replacing gears, and therefore, trouble shooting must be carried out carefully. It should also be noted that gear slips out of mesh due to vibration generated by weakened front and rear engine mounts.</p>	<p>Worn interlock plunger Worn check ball and/or weakened or broken spring Worn fork rod ball groove Worn or damaged bearing Worn or damaged gear</p>	<p>Replace Replace Replace Replace Replace</p>
<p>Noise When noise occurs with engine idling and ceases when clutch is disengaged, or when noise occurs while shifting gears, it is an indication that the noise is from transmission.</p> <p style="font-size: 2em; vertical-align: middle;">(</p> <p style="margin-left: 2em;">Transmission may rattle during engine idling Check air-fuel mixture and ignition timing After above procedure, readjust engine idling</p> <p style="font-size: 2em; vertical-align: middle;">)</p>	<p>Insufficient or improper lubricant Oil leaking due to damaged oil seal or sealant, clogged breather, etc Worn bearing (High humming occurs at a high speed) Damaged bearing (Cyclic knocking sound occurs also at a low speed) Worn spline Worn bushing</p>	<p>Add oil or replace with designated oil Clean or replace Replace Replace Replace Replace, as a rear extension housing assembly</p>

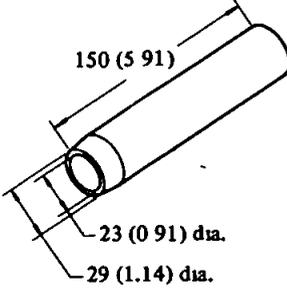
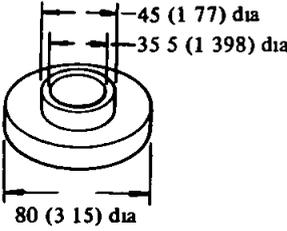
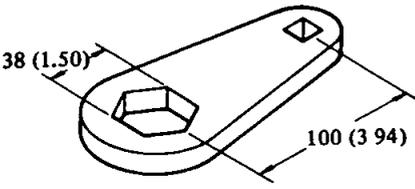
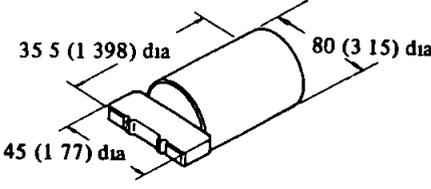
SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	ST23100000 Countershaft guide	For prevention of needle bearing from falling off when countershaft is removed from, or inserted into, the transmission case 	63L, 65L & F60A T/M	Fig TM-12 Page TM-8 Page TM-9
2.	ST23540000 Fork rod pin punch	For removal and assembly of fork rod retaining pin. 	63A, 63L & 71B T/M	Fig TM-11 Fig TM-50
3	ST30031000 Bearing puller	For replacing bearing 	63A, 65L, 63L & 71B T/M	Fig TM-20 Fig TM-59 Fig TM-62
4	ST22490000 Adapter setting plate	For setting adapter plate in a vise 	63A T/M	Fig TM-49 Page TM-18

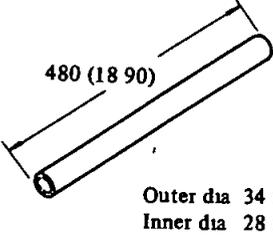
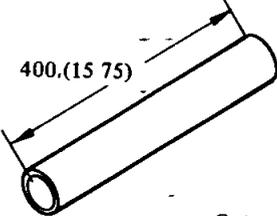
Transmission

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
5	KV321013S0 Puller set	For assembly of mainshaft assembly. (This set does not include screw shaft for ST22460001 Bearing Puller)	(63A T/M)	Fig. TM-85 Fig TM-86
	KV32101310 Bearing puller	For removal of mainshaft end bearing, counter overdrive gear and bearing  SE308	63A & FS5W71B T/M	Fig TM-53 Fig. TM-85 Fig TM-86
	KV32101320 Mainshaft puller KV32101330 Adapter	For removal of mainshaft assembly (63A T/M)	Fig TM-57 Fig TM-58 Fig TM-84 Fig TM-85 Fig TM-86 Fig TM-89	
6	ST22480000 Gear puller	For removal of 1st counter gear.  SE310	(63A T/M)	Fig. TM-56
7	ST22730000 Bearing puller	For removal of counter gear bearing. 63A T/M	Fig TM-64 Fig TM-65	

Transmission

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No.
8	ST22360002 Bearing drift	For assembly of counter gear bearing and 1st counter gear.  SE307	63A & 71B T/M	Fig TM-84 Fig TM-89
9	ST30901000 Base	For assembly of main drive bearing and 2nd gear mainshaft bushing.  SE041	63A T/M	Fig TM-81 Fig. TM-83
10	ST22520000 Wrench [38 mm (1.50 in)]	For removal and assembly of mainshaft nut.  SE313	63L & 63A T/M	Fig TM-37 Fig TM-90 Fig. TM-93
11	ST22500000 Counter bearing setting tool	This tool is used to adjust counter bearing  SE312	63A T/M	Fig TM-97 Fig. TM-98

Transmission

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
12	ST22350000 Mainshaft bearing drift	For assembly of mainshaft end bearing  <p style="text-align: center;">480 (18.90)</p> <p style="text-align: center;">Outer dia 34 (1.34) Inner dia 28 (1.10)</p> <p style="text-align: right;">SE037</p>	56A, 60 & 71B T/M	Fig TM-94
13	ST22452000 Mainshaft bearing drift	For assembly of main bearing  <p style="text-align: center;">400 (15.75)</p> <p style="text-align: center;">Outer dia 45 (1.77) Inner dia 36 (1.42)</p> <p style="text-align: right;">SE429</p>	63L	Page TM-8

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION AT

AUTOMATIC TRANSMISSION

AT

DESCRIPTION	AT- 2
CONSTRUCTION AND OPERATION	AT- 3
HYDRAULIC CONTROL SYSTEM	AT-10
REMOVAL AND INSTALLATION	AT-39
MAJOR REPAIR OPERATION	AT-44
TROUBLE DIAGNOSES AND ADJUSTMENT	AT-58
SERVICE DATA AND SPECIFICATIONS	AT-70
SPECIAL SERVICE TOOLS	AT-73

DESCRIPTION

The model 3N71B automatic transmission is a fully automatic unit consisting primarily of 3-element hydraulic torque converter and two planetary gear sets. Two multiple-disc clutches, a multiple-disc brake, a band brake and a one-way sprag clutch provide the friction elements required to obtain the desired function of the two planetary gear sets.

The two planetary gear sets give three forward ratios and one reverse. Changing of the gear ratios is fully automatic in relation to vehicle speed and engine torque input. Vehicle speed and engine manifold vacuum signals are constantly fed to the transmission to provide the proper gear ratio for maximum efficiency and performance at all throttle openings.

The model 3N71B has six selector positions P, R, N, D, 2, 1.

"P" – Park position positively locks the output shaft to the transmission case by means of a locking pawl to prevent the vehicle from rolling in either direction.

This position should be selected whenever the driver leaves the vehicle.

The engine may be started in Park position.

"R" – Reverse range enables the vehicle to be operated in a reverse direction.

"N" – Neutral position enables the engine to be started and run without driving the vehicle.

"D" – Drive range is used for all normal driving conditions.

Drive range has three gear ratios, from the starting ratio to direct drive.

"2" – "2" range provides performance for driving on slippery surfaces. "2" range can also be used for engine braking.

"2" range can be selected at any vehicle speed, and prevents the transmission from shifting out of second gear.

"1" – "1" range can be selected at any vehicle speed and the transmission will shift to second gear and remain in second until vehicle speed is reduced to approximately 40 to 50 km/h (25 to 31 MPH).

"1" range position prevents the transmission from shifting out of low gear. This is particularly beneficial for maintaining maximum engine braking when continuous low gear operation is desirable.

The torque converter assembly is of welded construction and can not be disassembled for service.

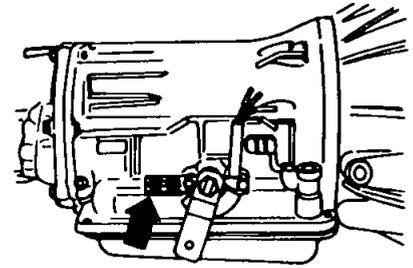
FLUID RECOMMENDATION

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

IDENTIFICATION NUMBER

Stamped position:

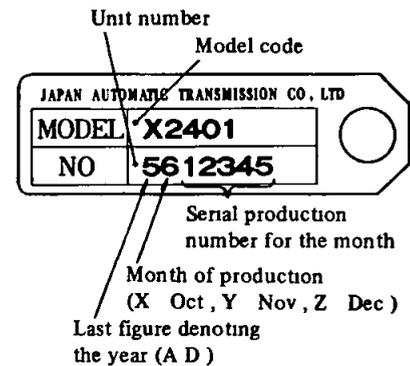
The plate is attached to the right hand side of transmission case as shown in Figure AT-1.



AT057

Fig AT-1 Identification number

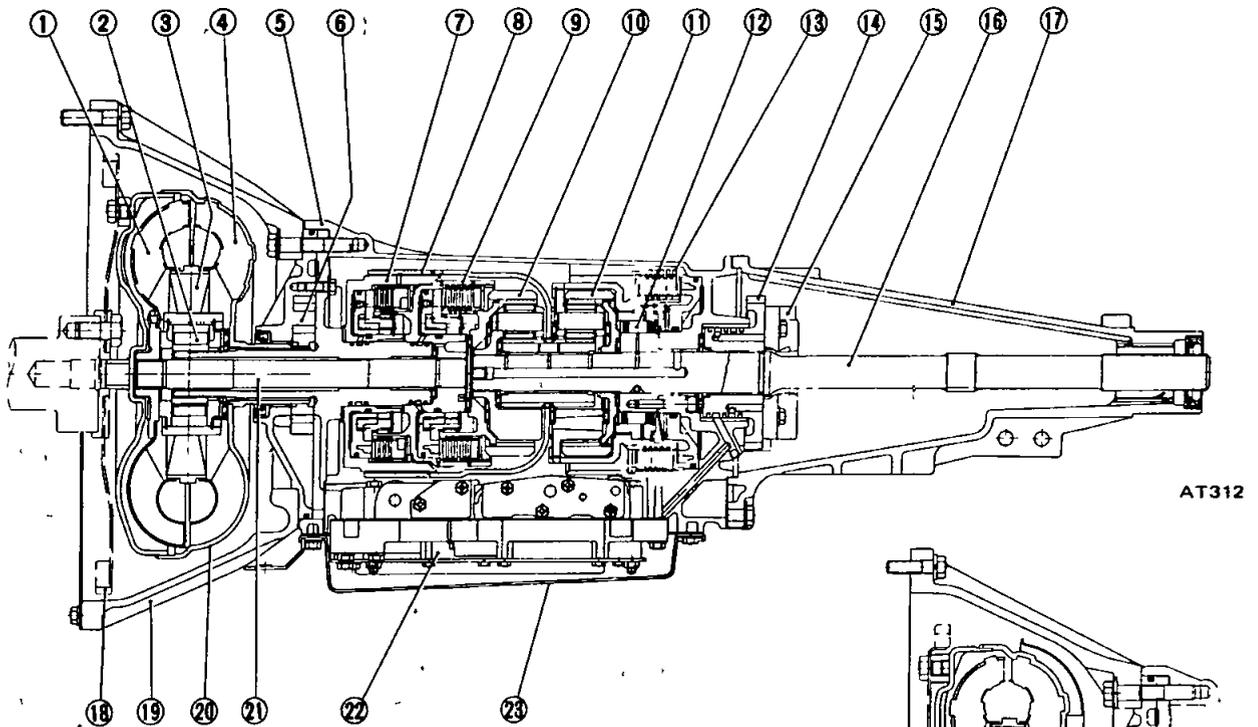
Identification of number arrangements:



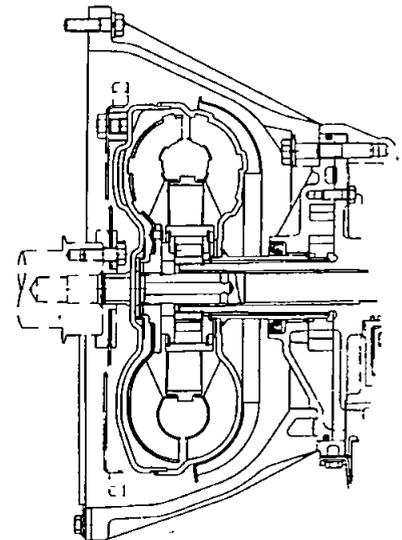
CONSTRUCTION AND OPERATION

CONTENTS

TORQUE CONVERTER	AT-4	BAND BRAKE	AT-8
TRANSMISSION	AT-6	LOW AND REVERSE BRAKE	AT-9
OIL PUMP	AT-7	PLANETARY GEAR	AT-9
FRONT CLUTCH	AT-7	ONE-WAY CLUTCH	AT-9
REAR CLUTCH	AT-8		



- | | |
|-------------------------|------------------------|
| 1 Turbine runner | 13 Low & reverse brake |
| 2 One-way clutch | 14 Oil distributor |
| 3 Stator | 15 Governor |
| 4 Pump impeller | 16 Output shaft |
| 5 Transmission case | 17 Rear extension |
| 6 Oil pump | 18 Drive plate |
| 7 Front clutch | 19 Converter housing |
| 8 Band brake | 20 Torque converter |
| 9 Rear clutch | 21 Input shaft |
| 10 Front planetary gear | 22 Control valve |
| 11 Rear planetary gear | 23 Oil pan |
| 12 One-way clutch | |



(For B210 models)

AT304

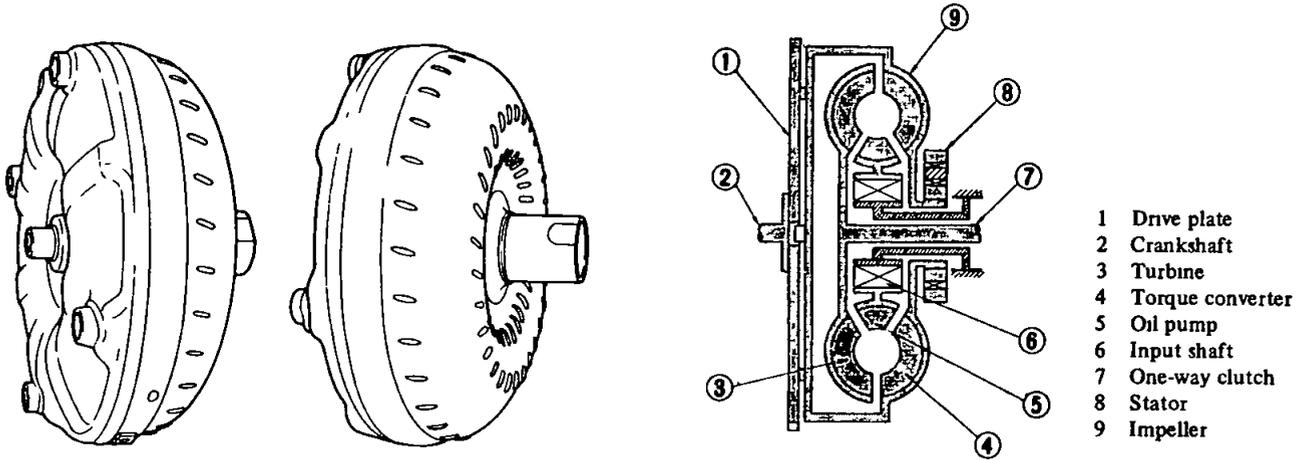
Fig AT-2 Cross-sectional view of 3N71B automatic transmission

TORQUE CONVERTER

The torque converter consists of

one impeller connected to the engine crankshaft through the drive plate, one turbine splined to the transmission input shaft, and one stator connected

to the transmission case through a one-way clutch. The converter assembly is welded together and cannot be disassembled for service.



AT316

AT063

Fig AT-3 Torque converter

The operation of a torque converter is characterized by the fact that besides merely rotating the turbine runner by the action of the pump impeller, it increases the engine torque and transmits it to the transmission. This torque-multiplying function is the most outstanding feature of a torque converter, and for that reason, it is distinguished from an ordinary fluid-coupling mechanism. The torque-multiplying action is effected by the presence of a stator located in the converter. Figures AT-5 and AT-6 show the direction of the oil flow taking place in a torque converter.

1 The oil which has been introduced at the center of pump impeller is thrown outward by the centrifugal force of the impeller as it rotates.

The direction of oil flow is so regulated by the blades of pump impeller that it will properly strike the blades of turbine runner.

The oil first strikes the surface of turbine runner, and then flows through the runner towards its back side.

2 The blades of turbine runner are so shaped as to obstruct the flow of oil. Therefore, the force of oil flow is

converted into the torque that tends to rotate the turbine runner itself.

3 The direction of the flow of oil which has been discharged from the back side of the turbine runner is changed by the stator blades, and the oil again enters the pump impeller. The oil thus circulates through a closed circuit which is constituted by the pump impeller, turbine runner and stator. In this closed circuit, the sum of action and reaction becomes zero.

Figure AT-7 analytically shows the action of oil and the direction of rotation of each blade, by parallelly placing the blades. It will be noted from the diagram that the flow of oil which has passed through the pump impeller and turbine runner will exert a force to rotate the stator. But, by the action of a one-way clutch which is equipped in the stator, the stator is allowed only to rotate in the opposite direction, and will not rotate in the direction of force exerted by the oil. The oil which has left the stator enters the pump impeller and flows through a circulating circuit, and during this circulation of oil, the torque T_1 exerted by the oil in the pump im-

PELLER and the torque T_3 exerted by the oil in the stator act in the same direction. Thus, there exists the following relation between these torques and the torque T_2 exerted by the oil in the turbine runner:

$$T_1 + T_3 = T_2$$

For this reason, the torque exerted on the turbine runner is increased by the amount of the torque which is exerted on the stator. This is why torque is multiplied in a torque converter.

When the revolution speed of the turbine runner increases and approaches near that of the pump impeller, the direction of oil which has left the pump impeller is changed and begins to strike the opposite side of the stator blade, giving the stator a free rotation in the direction which is not locked by the one-way clutch. The waste of engine power is thus avoided. This relation is shown in Figure AT-8, and the characteristic curve of the torque converter is shown in Figure AT-4.

Automatic Transmission

The torque ratio, speed ratio, and the efficiency are expressed as follows

$$\text{Torque ratio} = \frac{\text{Output torque}}{\text{Input torque}}$$

$$\text{Speed ratio} = \frac{\text{Output speed}}{\text{Input speed}}$$

$$\text{Efficiency} = \frac{\text{Output horsepower}}{\text{Input horsepower}}$$

The state of oil circulation in which the stator is locked by the flow of oil is called the "converter range", whereas the state in which the rotor is turned by the oil flow is called the "coupling range"

In the coupling range, the stator only makes idle rotation presenting a state similar to that of a fluid coupling, with no increase in torque. The point where the speed ratio becomes zero, that is, the state in which only the pump shaft (engine side) rotates and the turbine shaft is held stationary (The vehicle being stand-still) is called the "stall". Under this condition, the torque ratio between the turbine shaft and the pump shaft attains a maxi-

imum value, and this torque ratio is called the "stall torque ratio"

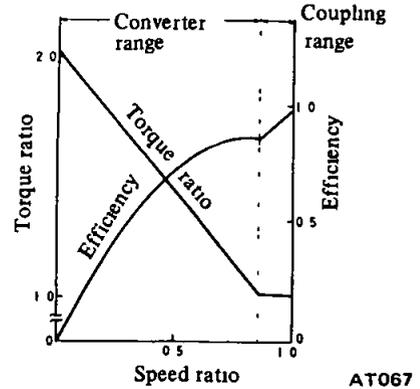


Fig AT-4 Characteristic curve of torque converter

- T_1 = The force exerted by the oil of pump
 - T_2 = The force exerted by the oil of turbine
 - T_3 = The force exerted by the oil of stator
- Oil flow
 - Direction of rotation
 - Direction of force

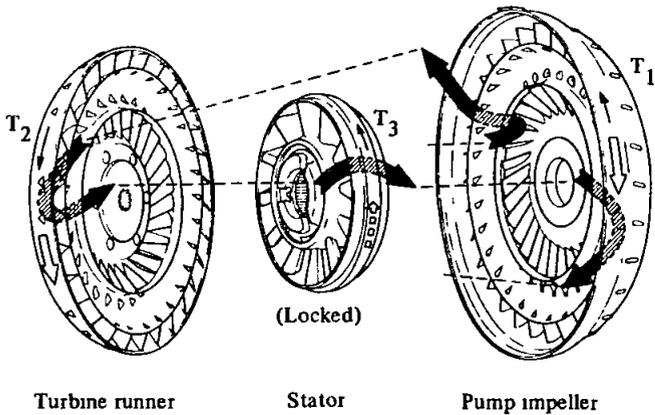


Fig AT-5 Torque converter oil flow (Converter range)

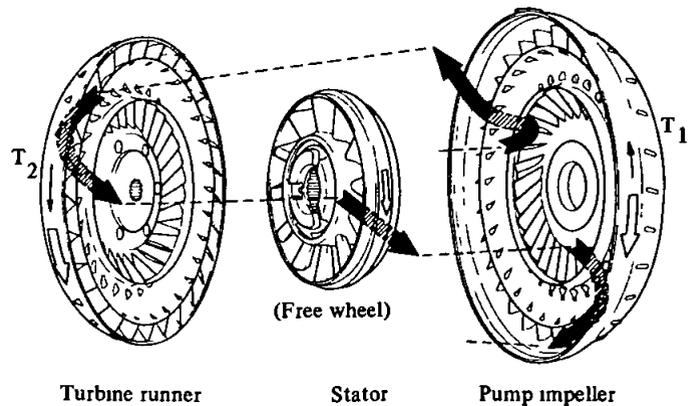


Fig AT-6 Torque converter oil flow (Coupling range)

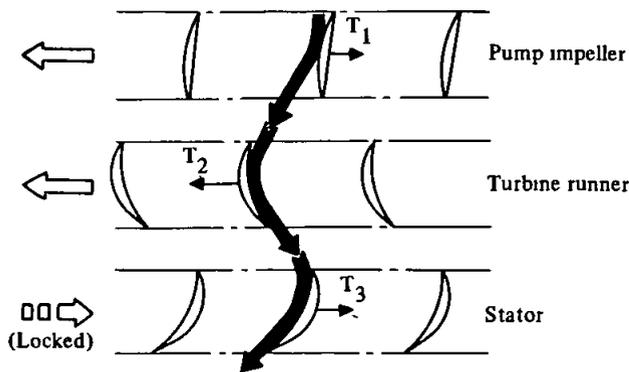


Fig AT-7 Oil flow between each blade (Converter range)

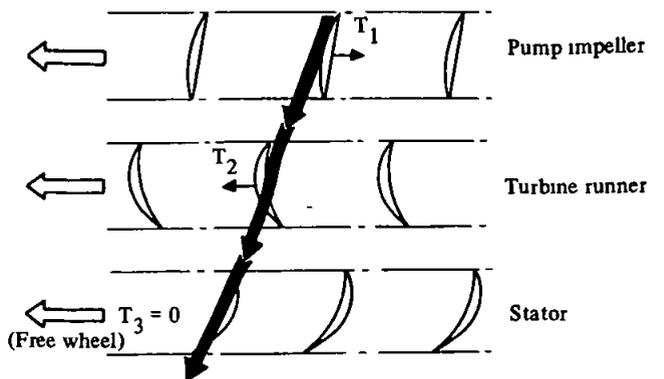


Fig AT-8 Oil flow between each blade (Coupling range)

TRANSMISSION

The transmission is a mechanism which changes the speed of input shaft that is transmitted from the engine through the torque converter, and then transmits the power to the propeller shaft

In the transmission mechanism, a planetary gear is employed. In the planetary gear, a wide range of speed changes is performed by rotating or locking its internal gear, pinion carrier, or sun gear. In model 3N71B automatic transmission, automatic speed change is obtained by combining two simple-type planetary gears in the arrangement of the Simpson gear train. The Simpson gear train is a kind of planetary gear arrangement invented by Howard Simpson, an American engineer.

The transmission comprises the following parts as the principal elements for power transmission:

(A) Clutches and bands (front clutch, rear clutch, low and reverse

brakes, band brake, and one-way clutch)
 (B) Planetary gear

The power is transmitted in the following manner:

The torque of turbine which has been converted by the torque converter is first transmitted to the input shaft through the spline, clutch, and gear. This torque is then transmitted to the rear clutch drum in the transmission.

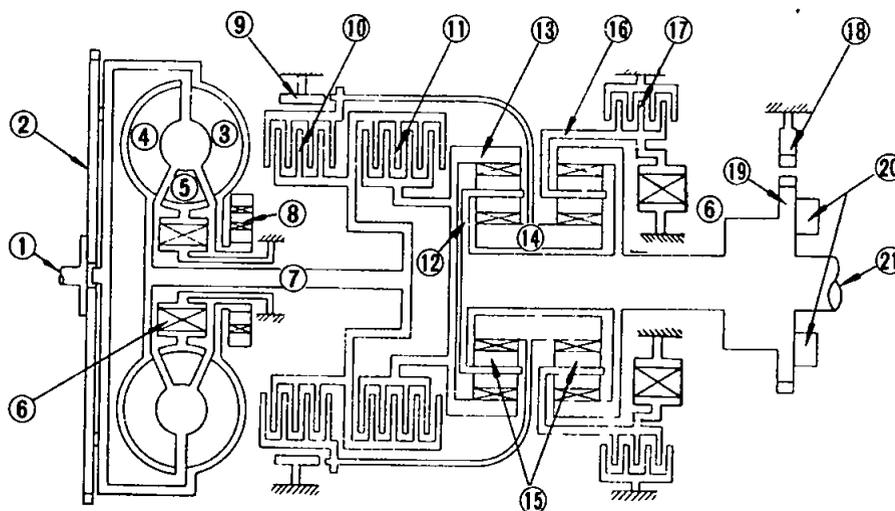
As the clutch plate of the front clutch is connected to the front side of the rear clutch drum by a spline, it rotates at the same speed as the rear clutch drum. (See paragraph under "Clutch") When oil pressure is exerted on the front clutch piston, the clutch plates (drive plate and driven plate) are forced to couple together. Therefore, the rotation of the input shaft is transmitted to the sun gear through both the rear clutch and the connecting shell which is coupled to

the front clutch drum by the clutch plates. On the other hand, when the rear clutch is coupled together, the front internal gear is rotated which is connected to the rear clutch hub through a spline.

When the servo piston of the band brake operates, the rotation of front clutch drum is stopped, and the sun gear which is connected to it by the connecting shell is held stationary. This sun gear is always kept in mesh with the front and rear planetary gears.

The rear planetary gear carrier is connected to the connecting drum on its periphery, and this periphery at the same time serves as the hub of the low and reverse brake.

The engine power is thus transmitted from the output shaft to the propeller shaft after its speed has been changed by the planetary gear in the transmission, and this output shaft is splined to the planetary gear carrier at the front end, and to the internal drive flange at the rear end.



AT069

- | | | |
|---------------------|----------------------------|---------------------------|
| 1 Engine crankshaft | 8 Oil pump | 15 Planetary pinion |
| 2 Drive plate | 9 Brake band | 16 Rear planetary carrier |
| 3 Pump impeller | 10 Front clutch | 17 Low and reverse brake |
| 4 Turbine runner | 11 Rear clutch | 18 Parking pawl |
| 5 Stator | 12 Front planetary carrier | 19 Oil distributor |
| 6 One-way clutch | 13 Internal gear | 20 Governors |
| 7 Input shaft | 14 Sun gear | 21 Output shaft |

Fig AT-9 Schematic drawing showing concept of automatic transmission

Automatic Transmission

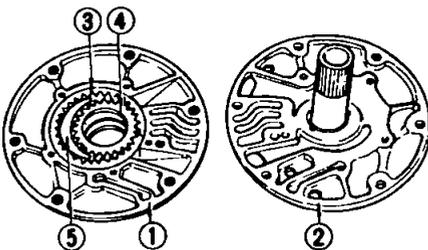
In the 3N71B automatic transmission, each part operates as shown in the following table at each gear select position

OIL PUMP

The oil pump is an internally meshed involute gear pump, and its inner gear is rotated at the same speed as the engine by the drive sleeve which forms a portion of the pump impeller of the torque converter

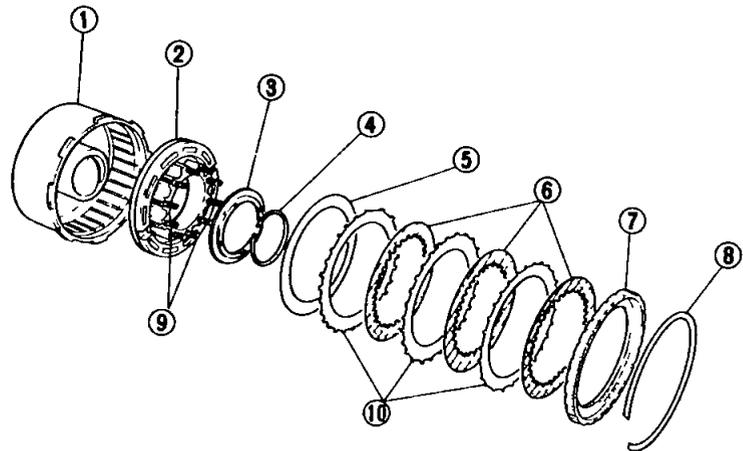
The oil pump serves to supply the oil for the operation of torque converter, to lubricate every mechanism, and to provide oil for the operation of all friction elements (clutches and bands) and the control system

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			



- AT071
- 1 Housing
 - 2 Cover
 - 3 Outer gear
 - 4 Inner gear
 - 5 Crescent

Fig AT-10 Oil pump



- AT321
- 1 Front clutch drum
 - 2 Clutch piston
 - 3 Spring retainer
 - 4 Snap ring
 - 5 Dished plate
 - 6 Drive plate
 - 7 Retaining plate
 - 8 Snap ring
 - 9 Return spring
 - 10 Driven plate

Fig AT-11 Components of front clutch

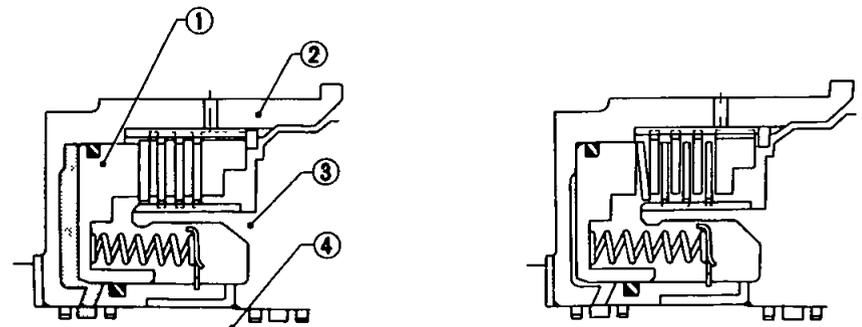
FRONT CLUTCH

Illustration "A" in Figure AT-11 shows the state when oil pressure is exerted on the piston. Under this condition, clutch plates come into rigid contact with each other and the rotation of the hub is transmitted to the clutch drum.

When the oil pressure is released as shown at "B", the return springs move the piston to the released position and the clutch plates are released.

When oil pressure works on the front clutch piston and the clutch plates engage, the sun gear is rotated through the connecting shell which is connected to the front clutch drum.

The front clutch is used only in "Reverse" and in "3rd forward gear" positions.



"A" (clutch ON)

"B" (clutch OFF)

- AT322
- 1 Piston
 - 2 Clutch drum
 - 3 Clutch hub
 - 4 Oil pump cover

Fig AT-12 Operation of clutch

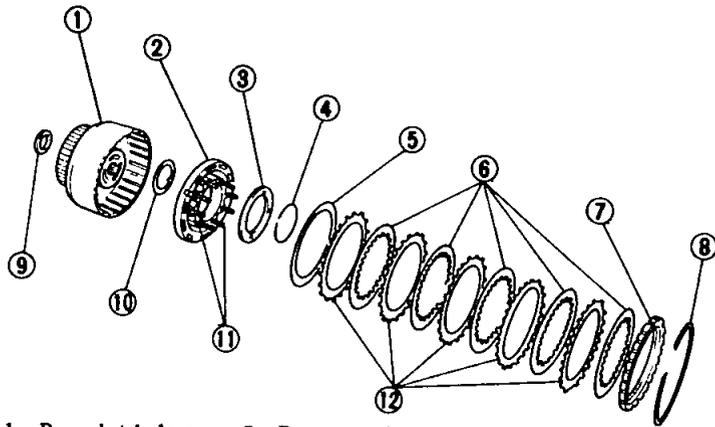
REAR CLUTCH

The rear clutch drum is driven by the input shaft through the spline connection. The rotation of this rear clutch drum drives the steel drive plates in the rear clutch and the lined drive plates in the front clutch.

When the rear clutch piston is applied by oil pressure, the movement of the piston against the return springs locks the steel and lined clutch plates together to drive the rear clutch hub and the front internal gear.

When the oil pressure is released, the return springs move the piston to the released position and the steel and lined clutch plates are released.

This stops the rotation of the rear clutch hub and the front internal gear. The rear clutch is applied in all forward drive gear ranges.



- | | |
|--------------------|-------------------|
| 1 Rear clutch drum | 7 Retaining plate |
| 2 Clutch piston | 8 Snap ring |
| 3 Spring retainer | 9 Needle bearing |
| 4 Snap ring | 10 Bearing race |
| 5 Dished plate | 11 Return spring |
| 6 Drive plate | 12 Drive plate |

AT323

Fig AT-13 Components of rear clutch

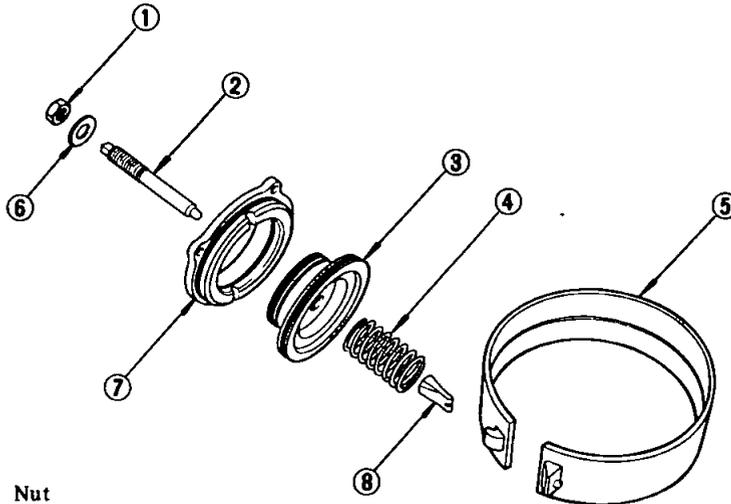
BAND BRAKE

One end of the band brake is locked to the transmission case by the anchor end pin.

When oil pressure is directed to the apply side of the servo piston, the piston moves against the return spring to tighten the brake band around the front clutch drum, connecting shell and sun gear.

To release the servo piston, the oil pressure is directed to the release side of the servo piston. The release pressure is assisted by the compressed return spring to move the servo piston and brake band to the released position.

The band brake is applied only in the 2nd forward speed range.



- | |
|---------------------|
| 1 Nut |
| 2 Piston stem |
| 3 Band servo piston |
| 4 Return spring |
| 5 Brake band |
| 6 Washer |
| 7 Servo retainer |
| 8 Band strut |

AT324

Fig AT-14 Components of band brake

LOW AND REVERSE BRAKE

The steel driven plates of low and reverse brake are locked to the transmission case through the spline connection

When oil pressure is directed to the low and reverse brake piston, the piston moves against the return spring (disc spring)

The piston movement locks the steel and lined plates together. Then, the lined plates lock the connecting shell and sun gear

When the oil pressure is released, the return spring moves back the piston to the released position. The steel and lined plates are now released

The low and reverse brake is applied in the 1st forward speed of "1" range and "R" range

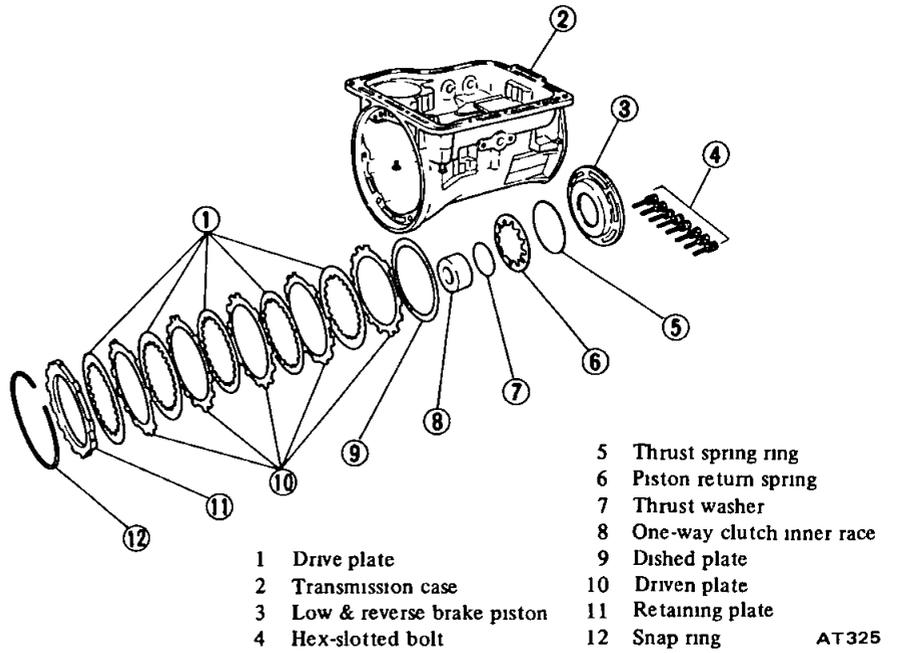


Fig AT-15 Components of low and reverse brake

PLANETARY GEAR

The planetary gear is of non-assembly type and is combined three planet pinions

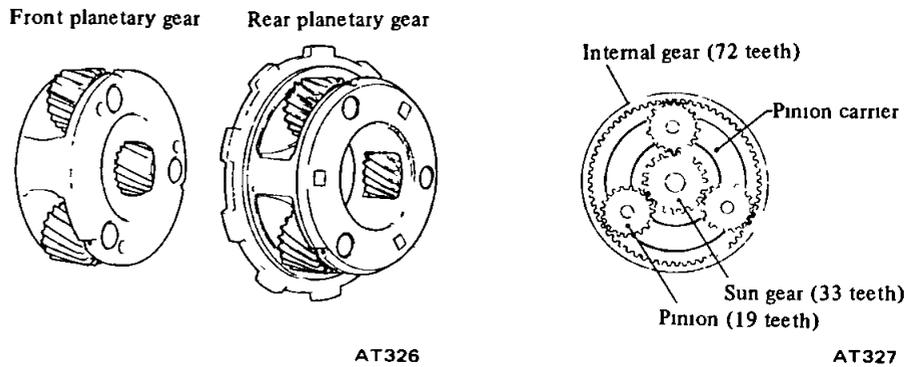


Fig AT-16 Components of planetary gear

ONE-WAY CLUTCH

The one-way clutch adopts the sprag type. In this mechanism the rotation in one direction alone is allowed and that in the opposite direction is prohibited by the difference in the diagonal length of a roller as shown in Figure AT-17

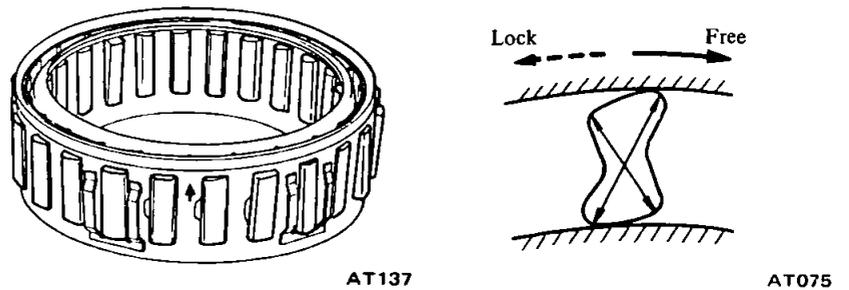


Fig AT-17 One-way clutch

HYDRAULIC CONTROL SYSTEM

CONTENTS

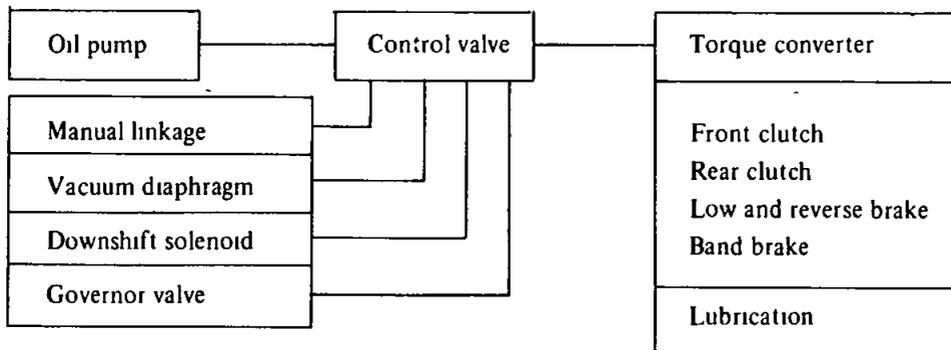
FUNCTIONS OF HYDRAULIC CONTROL UNIT AND VALVES	AT-10	"P" RANGE (PARK)	AT-20
OIL PUMP	AT-10	"R" RANGE (REVERSE)	AT-22
MANUAL LINKAGE	AT-10	"N" RANGE (NEUTRAL)	AT-24
VACUUM DIAPHRAGM	AT-11	"D ₁ " RANGE (LOW GEAR)	AT-26
DOWNSHIFT SOLENOID	AT-11	"D ₂ " RANGE (2ND GEAR)	AT-28
GOVERNOR VALVE	AT-11	"D ₃ " RANGE (TOP GEAR)	AT-30
CONTROL VALVE ASSEMBLY	AT-12	"D" RANGE KICK-DOWN	AT-32
HYDRAULIC SYSTEM AND MECHANICAL OPERATION	AT-18	"2" RANGE (2ND GEAR)	AT-34
		"1 ₁ " RANGE (LOW GEAR)	AT-36
		"1 ₂ " RANGE (2ND GEAR)	AT-38

FUNCTIONS OF HYDRAULIC CONTROL UNIT AND VALVES

The hydraulic control system con-

tains an oil pump for packing up oil from the oil pan through the oil strainer. A shift control is provided by two centrifugally operated hydraulic governors on the output shaft, vacuum control diaphragm and downshift sole-

noid. These parts work in conjunction with valves in the valve body assembly located in the base of the transmission. The valves regulate oil pressure and direct it to appropriate transmission components.



OIL PUMP

The oil pump is the source of control medium (i.e., oil) for the control system.

As shown in Figure AT-18, the oil enters at the suction side and collects in the space at "A", and then by the rotation of the inner and outer gears, is carried and discharged from the portion "B".

The oil flows through the following route:

Oil pan – Oil strainer (bottom of the control valve) – Control valve lower body suction port – Transmission case suction port – Pump housing suction port – Pump gear space – Pump

housing delivery port – Transmission case delivery port – Lower body delivery port – Control valve line pressure circuit

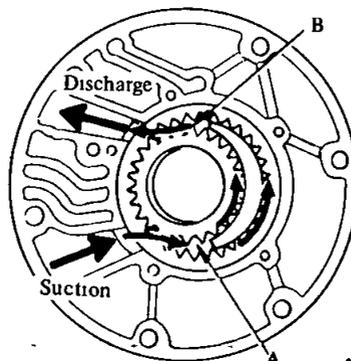


Fig AT-18 Operation of oil pump

AT328

MANUAL LINKAGE

The hand lever motion (the hand lever is located in the driver's compartment), mechanically transmitted from the remote control linkage, is further transmitted to the inner manual lever in the transmission case from the range selector lever in the right center portion of the transmission case through the manual shaft. The inner manual lever is thereby turned.

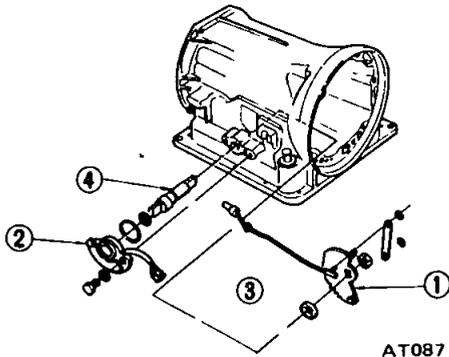
A pin installed on the bottom of the inner manual lever slides the manual valve spool of the control valve, thus positioning the spool opposite the appropriate select position.

The parking rod pin is held in the

Automatic Transmission

groove on the top of the inner manual plate. The parking rod pin operates the rod at "P" range, and operates the mechanical lock system.

The above described manual shaft is further equipped with an inhibitor switch. A rotor inside the inhibitor switch rotates in response to each range. When the range is selected at "P" or "N", the rotor closes the starter magnet circuit so that the engine can be started. When the range is selected at "R", the rotor closes the back-up lamp circuit, and the back-up lamp lights.



- | | |
|--------------------|----------------|
| 1 Manual plate | 3 Parking rod |
| 2 Inhibitor switch | 4 Manual shaft |

Fig AT-19 Manual linkage

VACUUM DIAPHRAGM

The vacuum diaphragm is installed on the left center portion of the transmission case. The internal construction of the vacuum diaphragm is as follows:

A rubber diaphragm forms a partition in the center. The engine intake manifold negative pressure is led through a vacuum tube and spring force is applied to the front surface of the rubber diaphragm while atmospheric pressure is applied to the back surface. The difference between pressure applied to the front and back surfaces causes a vacuum reaction, which activates the throttle valve of the control valve inside the transmission case.

When accelerator pedal is fully depressed and the carburetor is fully opened but the engine speed is not sufficiently increased, the manifold negative pressure lowers (i.e. tends

towards atmospheric pressure) and the vacuum reaction increases since the flow velocity of mixture inside the intake manifold is slow. Contrarily, when the engine speed increases and the flow velocity of the mixture increases or when the carburetor is closed, the manifold negative pressure increases (i.e., tends towards vacuum) and the vacuum reaction is reduced.

Thus, a signal to generate hydraulic pressure perfectly suited to the engine loading at the control valve is transmitted from the vacuum diaphragm, and the most suitable tuning for speed change and line pressure is obtained so that the most proper torque capacity is obtained against the transmitting torque.

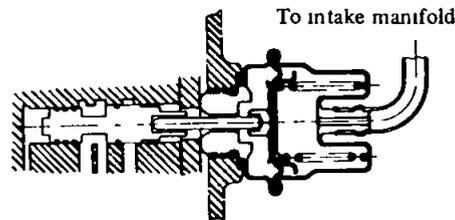
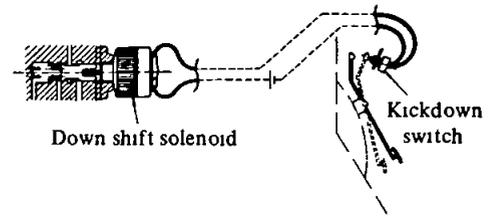


Fig AT-20 Vacuum diaphragm

DOWNSHIFT SOLENOID

The downshift solenoid is of a magnetic type installed on the left rear portion of the transmission case. When a driver requires accelerating power and depresses the accelerator pedal down to the stopper, a kickdown switch located in the middle of the accelerator link is depressed by a push rod, the kickdown switch closes, current flows to the solenoid, the solenoid push rod is depressed, the downshift valve of the control valve inside the transmission case is depressed, and the speed is changed forcibly from "3rd" to "2nd" within a certain vehicle speed limit.

Note Since the kickdown switch closes when the accelerator pedal is depressed from 7/8 to 15/16 of the whole stroke, the accelerator pedal should be correctly adjusted so as to afford a complete stroke. The arrangement of the switch varies according to model.



AT089

Fig AT-21 Downshift solenoid

GOVERNOR VALVE

The primary and secondary governor valves are installed separately on the back of the oil distributor on the transmission output shaft. They operate at the same speed as that of the output shaft (That is, they operate at a speed in proportion to the vehicle speed). The line pressure is applied to those valves as the input from the control valve, through the transmission case, rear flange and oil distributor. The governor pressure [in proportion to the output shaft speed (vehicle speed)] is led to the shift valve of the control valve through the opposite route of the output. In this manner speed change and line pressure are controlled.

Operation of secondary governor valve

The secondary valve is a control valve which receives line pressure (1) and controls the governor pressure.

When the manual valve is selected at "D", "2" or "1" range, line pressure is applied to the ring-shaped area of this valve from circuit (1), and this valve is depressed toward the center. Movement of this valve to a certain position closes the circuit from (1) to (15) while simultaneously making a space from (15) to the center drain port, and pressure in the circuit (15) is lowered.

When the vehicle is stopped and the centrifugal force of this valve is zero, the valve is balanced. At this point a governor pressure which is balanced with the spring force occurs on (15).

When the vehicle is started and the centrifugal force increases, this valve moves slightly to the outside, and as

Automatic Transmission

the space from (1) to (15) increases, space from (15) to the drain port simultaneously decreases. As a result, governor pressure of (15) increases, and the governor pressure is balanced with the sum of centrifugal force and spring force. The governor pressure thus changes in response to the vehicle speed change (centrifugal force)

Operation of primary governor valve

The valve is an ON-OFF valve which closes the governor pressure (15) regulated by the secondary governor valve when the vehicle reaches the minimum speed, and when the vehicle speed exceeds a certain level the governor opens and forwards the governor pressure (15) to the control valve

When the vehicle is stopped, the governor pressure is zero. However, when the vehicle is running slowly, this valve is depressed to the center and the groove to (15) is closed since the governor pressure applied to the ring-shaped area is higher than the centrifugal force of this valve. When the governor speed exceeds a certain revolution, the governor pressure in the circuit (15) also increases. However, as the centrifugal force increases and exceeds the governor pressure, this valve moves toward the outside, and the governor pressure is transmitted to the circuit (15)

Two different valves are employed in the governor so that it will independently control the speed at high and low speeds. That is, within the low speed range, the governor pressure is not generated because of the primary valve, whereas at the high speed range above the breaking point, governor pressure is regulated by the secondary valve

* The breaking point is the point at which the function of one of the governor is transferred to the other as the speed changes from the low-speed to the high-speed range

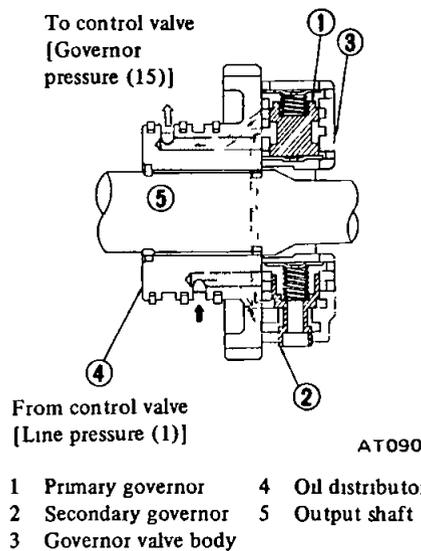


Fig AT-22 Cross-sectional view of governor

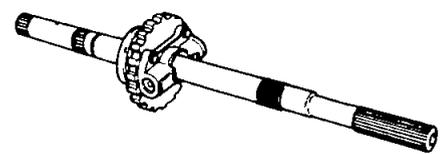


Fig AT-23 Output shaft with oil distributor and governor

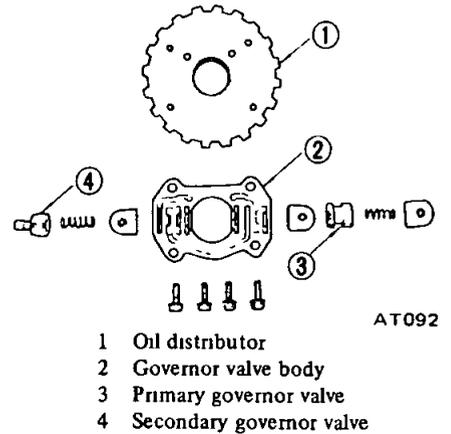
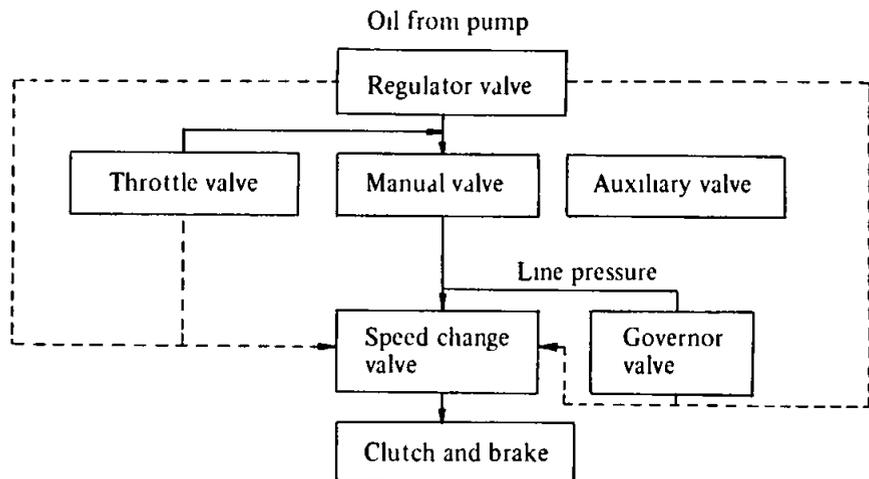


Fig AT-24 Exploded view of governor

CONTROL VALVE ASSEMBLY

Flow chart of control valve system



The control valve assembly receives oil from the pump and individual signals from the vacuum diaphragm, and transmits the individual line pressures to the transmission friction element, torque converter circuit, and lubricating system circuit as outputs. More specifically, the oil from the oil pump is regulated by the regulator valve as line pressure builds up. The line pressure is fed out from the control valve assembly through various

direction changeover valves (including ON-OFF valve) and regulator valves, is newly reformed to a throttle system oil pressure and operates other valves. Finally, the line pressure is transmitted to the required clutch or brake servo piston unit in response to the individual running conditions after receiving signals from the vacuum diaphragm, downshift solenoid, governor valve, and/or manual linkage

The control valve assembly consists of the following valves (See Figure AT-35)

- 1 Pressure regulator valve (PRV)
- 2 Manual valve (MNV)
- 3 1st-2nd shift valve (FSV)
- 4 2nd-3rd shift valve (SSV)
- 5 Pressure modifier valve (PMV)
- 6 Vacuum throttle valve (VTV)
- 7 Throttle back-up valve (TBV)
- 8 Solenoid downshift valve (SDV)
- 9 Second lock valve (SLV)
- 10 2nd-3rd timing valve (TMV)

Pressure regulator valve (PRV)

The pressure regulator valve receives valve spring force, force from the plug created by the throttle pressure (16) and line pressure (7), and force of the throttle pressure (18). With the interaction of those forces, the PRV regulates the line pressure (7) to that most suitable for individual driving conditions.

The oil from the oil pump is applied to the ring-shaped area through orifice (20). As a result, the PRV is depressed downward, and moves from port (7) up to such extent that the space to the next drain port (marked with "X" in Figure AT-25) opens slightly. Thus, the line pressure (7) is balanced with the spring force, thereby balancing the PRV. In this operation, the space from port (7) to the subsequent converter oil pressure (14) circuit has also been opened. As a result, the converter is filled with pressurized oil in circuit (14), and this oil is further used for lubrication of the rear unit. Moreover, part of the oil is branched and used for lubrication of the front unit for the front and rear clutches.

When the accelerator pedal is depressed, the throttle pressure (16) increases as described in the preceding paragraph, oil pressure is applied to the plug through orifice (21), and this pressure is added to the spring force. As a result, the PRV is contrarily forced upward, space to the drain port is reduced, and the line pressure (7) increases.

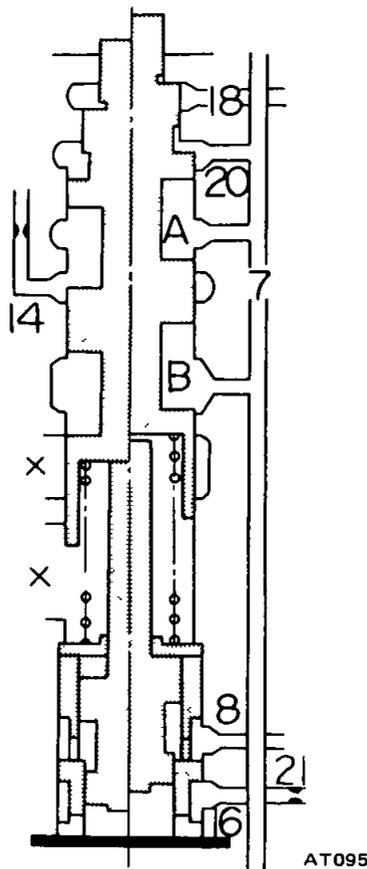


Fig AT-25 Pressure regulator valve

When the range is selected at "R" (Reverse), the line pressure (6) is applied to the plug in a manner identical to the throttle pressure (16) and is added to the spring force. Consequently, the line pressure (7) further increases.

When vehicle speed increases and the governor pressure rises, the throttle pressure (18) is applied to the port on the top of the PRV, and pressure is applied contrarily against the spring force. As a result, the line pressure (7) decreases. Moreover, at individual conditions, the line pressure (7) is equal to

the line pressure (6) and the throttle pressure (16) is equal to (18).

Manual valve (MNV)

The manual lever turning motion is converted to reciprocating motion of the manual valve through a pin, and the MNV is positioned so that the line pressure (7) is distributed to the individual line pressure circuits at each "P", "R", "N", "D", "2" or "1" range as shown below.

- "P" range
(7) - { (4) - SDV and TBV
(5) - FSV (12) - TBV and Low & reverse brake
- "R" range
(7) - { (4) - same as above
(5) - same as above
(6) - PRV and SSV - (F C) and band release
- "N" range (7) - None
- "D" range
(7) - { (1) - Governor valve, FSV, and rear clutch
(2) - SLV
(3) - SLV and SSV
- "2" range
(7) - { (1) - Same as above
(2) - SLV - (9) Band applied
(4) - SDV and TBV
- "1" range
(7) - { (1) - Same as above
(4) - Same as above
(5) - FSV

Moreover, (1), (2), (3), (4), (5), and (6) are always drained at a position where the line pressure is not distributed from (7).

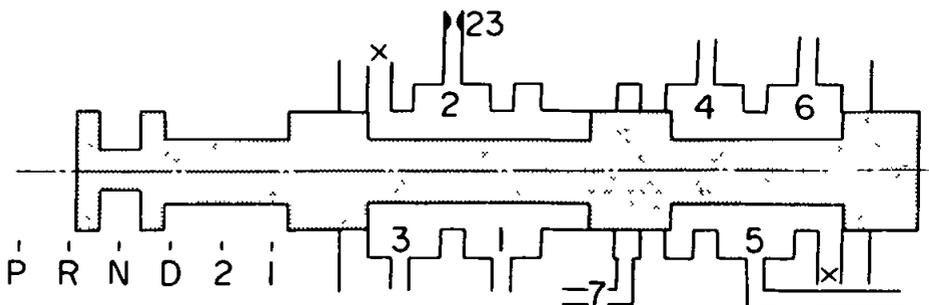


Fig AT-26 Manual valve

1st-2nd shift valve (FSV)

The FSV is a transfer valve which shifts gears from low to second. When the vehicle is stopped, the FSV is depressed to the right side by force of a spring located on the left side, putting the FSV in the "Low" position.

When vehicle speed increases, the governor pressure (15) is applied to the right side of the FSV, and the FSV is forced toward the left. Contrarily, the line pressure (1) together with the spring force forces the FSV toward the right opposing the governor pressure (15).

When the vehicle speed exceeds a certain level, the governor pressure (15) exceeds the sum of the throttle pressure and the spring force, and the FSV is forced toward the left.

When the FSV is depressed to a certain position, the line pressure (1) is closed, and only the spring depresses the FSV toward the right, and it is depressed to the end for a moment. As a result, the line pressure (1) is forwarded to (8), the band servo is engaged through the SLV, and the speed is shifted to "2nd". With the accelerator pedal depressed, the FSV remains in the "Low" position unless the governor pressure (15) increases to a high level corresponding to the line pressure (1), since the line pressure (1) increases when the accelerator pedal is depressed.

Contrarily, when vehicle speed decreases, the governor pressure (15) decreases. However, the gear is not shifted to "Low" unless the governor pressure (15) becomes zero, since the force depressing the FSV toward the right is being delivered only by the spring.

"Low" in range "1" is led to the low and reverse clutch from line pressure (5) through line pressure (12), and is simultaneously led to the left end spring unit. Consequently, although the governor pressure increases, the valve is still forced toward the right, and the SFV is fixed in the "Low" position. When kicked down to the "2nd" speed, the SDV operates, and the line pressure (13) forces the FSV toward the right. Although the

governor pressure (15) is considerably high, the valve is forced completely toward the right, and the FSV is returned to the "Low" position. (This operation is called "Kickdown shift".)

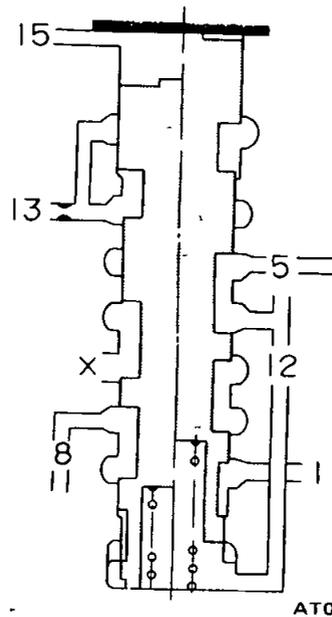


Fig AT-27 "1st-2nd" shift valve

2nd-3rd shift valve (SSV)

The SSV is a transfer valve which shifts gears from "2nd" to "3rd". When the vehicle is stopped, the SSV is forced toward the right by the spring, and is in the "2nd" position. It is so designed, however, that the FSV can decide to shift either to "Low" or "2nd".

When the vehicle is running, the governor pressure (15) is applied to the right end surface, and the SSV is forced toward the left. Contrarily, the spring force, line pressure (3), and throttle pressure (19) force the SSV toward right.

When vehicle speed exceeds a certain level, the governor pressure surpasses the sum of the spring force, line pressure, and throttle pressure, and the valve is forced toward the left. The line pressure (3) is then closed. Consequently, the forces being rapidly unbalanced, the force depressing the SSV toward the right decreases, and thus the SSV is depressed to the left end for a moment. With the SSV depressed toward the left end, the line pressure (3) is connected with the line pressure (10), the band servo is

released, the front clutch is engaged, and speed is shifted to "3rd".

When the accelerator pedal is depressed, both the line pressure (3) and the throttle pressure (19) are high, and the SSV is thus retained in "2nd" unless the governor pressure (15) exceeds the line pressure (3) and the throttle pressure (19).

In the "3rd" position, force depressing the SSV toward the right is retained only by the throttle pressure (16), and the throttle pressure (16) is slightly lower than that toward the right which is applied while shifting from "2nd" to "3rd".

Consequently, the SSV is returned to the "2nd" position at a slightly lower speed. (Shifting from "3rd" to "2nd" occurs at a speed slightly lower than that for "2nd" to "3rd" shifting.)

When kicked down at "3rd", line pressure (13) is led from the SDV, and the SSV is forced toward the right. Although the governor pressure is considerably high, the valve is forced completely toward the right, and the SSV is thus returned to "2nd" position. (This operation is called "Kickdown shift".)

When the shift lever is shifted to "2" or "1" range at the "3rd" speed, the line pressure (3) is drained at the MNV. Consequently, the front clutch and band servo releasing oils are drained. As a result, the transmission is shifted to "2nd" or "Low" speed although the SSV is in the "3rd" position.

When the speed is shifted to the "3rd", a one-way orifice (24) on the top of the SSV relieves oil transmitting velocity from the line pressure (3) to the line pressure (10), and reduces the shock generated from the shifting. Contrarily, when the lever is shifted to "2" or "1" range and the speed is shifted from "3rd" to the "2nd", the orifice checking valve spring (24) is depressed, the throttle becomes ineffective, the line pressure (10) is drained quickly, and delay in shifting speeds is thus eliminated.

The throttle of line pressure (6) transmits the oil transmitting velocity from line pressure (6) to line pressure (10) when the lever is shifted to the "R" range, and transmits drain veloci-

ty from line pressure (10) to line pressure (6) when shifting from "3rd" to "2nd" at "D" range. Thus, the throttle of line pressure (6) reduces the shock generated from shifting.

A plug in the SSV left end readjusts the throttle pressure (16) which varies depending on the engine throttle condition, to a throttle pressure (19) suited to the speed change control. Moreover, the plug is a valve which applies line pressure (13), in lieu of the throttle pressure, to the SSV and the FSV when kickdown is performed.

When the throttle pressure (16) is applied to the left side of this plug, and the plug is depressed toward the right, a slight space is formed from the throttle pressure (16) to (19). A throttle pressure (19) which is lower by the

pressure loss equivalent to this space is generated, the pressure loss is added to the spring force, and the plug is thus forced back from the right to the left. When this pressure (19) increases excessively, the plug is further depressed toward the left, space from the throttle pressure (19) to the drain circuit (13) increases, and the throttle pressure (19) decreases. Thus, the plug is balanced, and the throttle pressure (19) is reduced to a certain value against the throttle pressure (16).

When performing kickdown, the SDV moves, a high line pressure is led to the circuit (19) from the line pressure circuit (13) (which had been drained), the plug is forced toward the left, and circuit (19) becomes equal to the line pressure (13).

Contrarily, when the vehicle speed decreases and the governor pressure (15) decreases, the force toward the right exceeds the governor pressure, the valve is forced back toward the right, and the throttle pressure (18) is drained to the spring unit.

The valve is switched when the throttle pressure and the governor pressure are high or when they are both low.

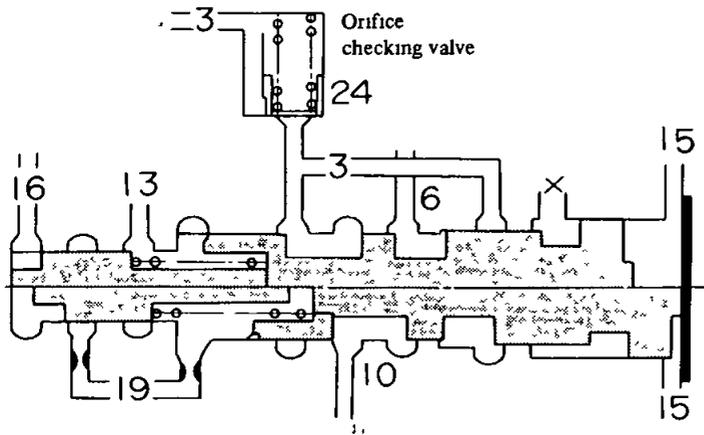


Fig AT-28 "2nd-3rd" shift valve

Pressure modifier valve (PMV)

Compared to the operating pressure required in starting the vehicle, the power transmitting capacity of the clutch (that is, required operating pressure) may be lower when the vehicle is once started. When the line pressure is retained at a high level up to a high vehicle speed, shock generated from the shifting increases, and the oil pump loss also increases. In order to prevent this, the throttle pressure must be changed over with the operation of the governor pressure (15) to reduce the line pressure. The PMV is used for this purpose.

When the governor pressure (15) which is applied to the right side of

the PMV is low, the valve is forced toward the right by the throttle pressure (16) (applied to the area difference of the valve) and the spring force, and the circuit from circuit (16) to circuit (18) is closed. However, when vehicle speed increases and the governor pressure (15) exceeds a certain level, the governor pressure toward the left (which is applied to the right side) exceeds the spring force and the throttle pressure (16) toward the right, the valve is depressed toward the left, and the throttle pressure is led from circuit (16) to circuit (18). This throttle pressure (18) is applied to the top of the PRV, and the force of the line pressure source (7) is reduced

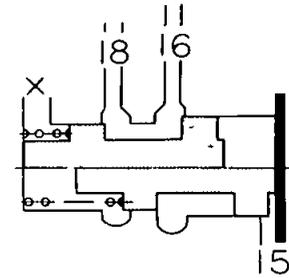


Fig AT-29 Pressure modifier valve

Vacuum throttle valve (VTV)

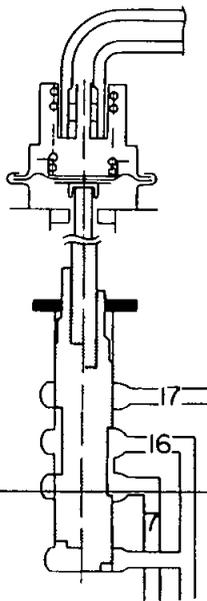
The vacuum throttle valve is a regulator valve which uses the line pressure (7) for the pressure source and regulates the throttle pressure (16) which is proportioned to the force of the vacuum diaphragm. [The vacuum diaphragm varies depending on the engine throttle condition (negative pressure in the intake line)].

When the line pressure (7) is applied to the bottom through the valve hole and the valve is forced upward, space from the line pressure (7) to the throttle pressure (16) is closed, and the space from the throttle pressure (16) to the drain circuit (17) is about to open. In this operation, the throttle pressure (16) becomes lower than the line pressure (7) by the pressure equivalent of the loss of space, and the force depressing the rod of the vacuum diaphragm is balanced with the throttle pressure (16) applied upward to the bottom.

When the engine torque is high, the negative pressure in the intake line rises (tending toward atmospheric pressure), and the force of the rod to depress the valve increases. As a result, the valve is depressed downward, the space from the throttle pressure (16) to the drain (17) decreases, and the

space from the line pressure (7) to the throttle pressure (16) increases

Consequently, the throttle pressure (16) increases, and the valve is balanced. Contrarily, when the engine torque lowers and the negative pressure in the intake line lowers (tending toward vacuum), the force of the rod depressing the valve decreases, and the throttle pressure (16) also decreases. When pressure regulated by the throttle back-up valve (described in the subsequent paragraph) is led to circuit (17), a high pressure is applied through the space from the circuit (17) to the throttle pressure (16). Consequently, the VTV is unbalanced, the throttle pressure (16) becomes equal to the back-up pressure (17), and the valve is locked upward.



AT100

Fig AT-30 Vacuum throttle valve

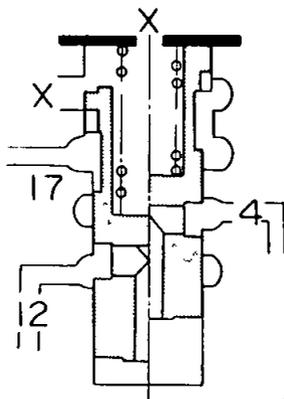
Throttle back-up valve (TBV)

Usually, this valve is depressed downward by the spring force.

As soon as the lever is shifted either to "2" or "1" range, line pressure is led from circuit (4), the line pressure is applied to the area difference of the valve, the valve is forced upward, the space from circuit (4) to circuit (17) is closed, and with the space from circuit (17) to the upper drain about to open, the back-up pressure (17) which is lower than the line pressure (4) by the

pressure loss due to the space from circuit (4) to circuit (17) is balanced with the spring force.

Further, when gear is shifted from "2nd" to "Low" at the range "1", line pressure is led from circuit (12), and the line pressure is applied upward to the bottom of the valve through the valve hole. Consequently, the valve is forced upward, and locked. As a result, the space from the line pressure (4) to the back-up pressure (17) is closed completely, and the back-up pressure (17) is drained upward.



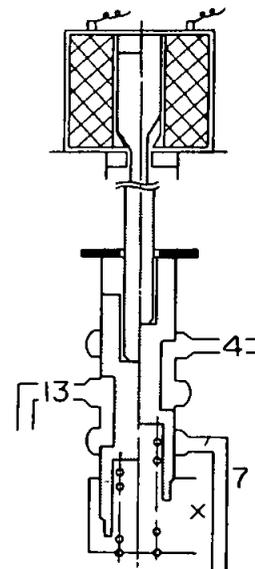
AT101

Fig AT-31 Throttle back-up valve

Solenoid downshift valve (SDV)

This valve is a transfer valve which leads the line pressure (7) to (13) and transmits the same to the FSV and SSV when a kickdown signal is received from the downshift solenoid. Usually, the solenoid push rod and valve are locked upward by the spring in the lower end, and the circuit from line pressure (4) to line pressure (13) is opened.

When kickdown is performed, the push rod operates, the valve is depressed downward, and the circuit from line pressure (7) to line pressure (13) opens. Line pressure (13) opposes the governor pressure (15) at the SSV and FSV, thus accomplishing the downshift operation.



AT102

Fig AT-32 Solenoid downshift valve

Second lock valve (SLV)

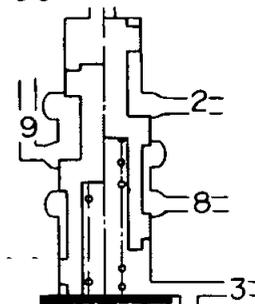
This valve is a transfer valve which assists the shift valve in determining the fixed "2nd" speed at the "2" range.

In the "D" range, the sum of the spring force and line pressure (3) applied upward exceeds the line pressure (2) which is applied to the valve area difference as a downward force. As a result, the valve is locked upward, and the circuit from line pressure (8) to line pressure (9) is opened.

Consequently, the FSV becomes the "2nd" speed condition, and line pressure is led to the band servo engaging circuit (9) only when line pressure (1) is released to line pressure (8).

In the "2" range, the upward force is retained only on the spring, and the downward line pressure (2) exceeds the upward force.

As a result, the valve is locked downward, line pressure (2) is released to (9) regardless of the operating condition of the FSV, and the band servo is engaged.



AT103

Fig AT-33 Second lock valve

Automatic Transmission

2nd-3rd timing valve (TMV)

This valve is a transfer valve which switches the bypass circuit of the orifice (22) in the front clutch pressure circuit (11) in response to vehicle speed and throttle condition. A force created when the governor pressure (15) is applied to the bottom of the TMV constitutes the upward force, and a force created when the spring force and the throttle pressure are applied to the top of the TMV constitutes the downward force.

When the throttle pressure (16) is lower than the governor pressure (15),

the upward force exceeds the downward force, the valve is locked upward, and passage from circuit (10) ("2nd" from the "Top") to circuit (11) is closed. Consequently, the line pressure (10) is led to the front clutch circuit (11) through the orifice (22), and the oil pressure is thus transmitted slowly. However, under normal shifting, the throttle pressure (16) has a pressure exceeding a certain level, and the downward force exceeds the upward force. As a result, the valve is locked downward, the passage from circuit (10) to circuit (11) is opened, and the orifice (22) is bypassed.

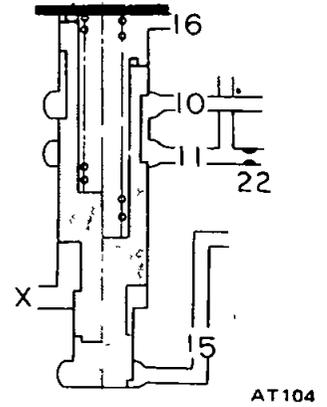
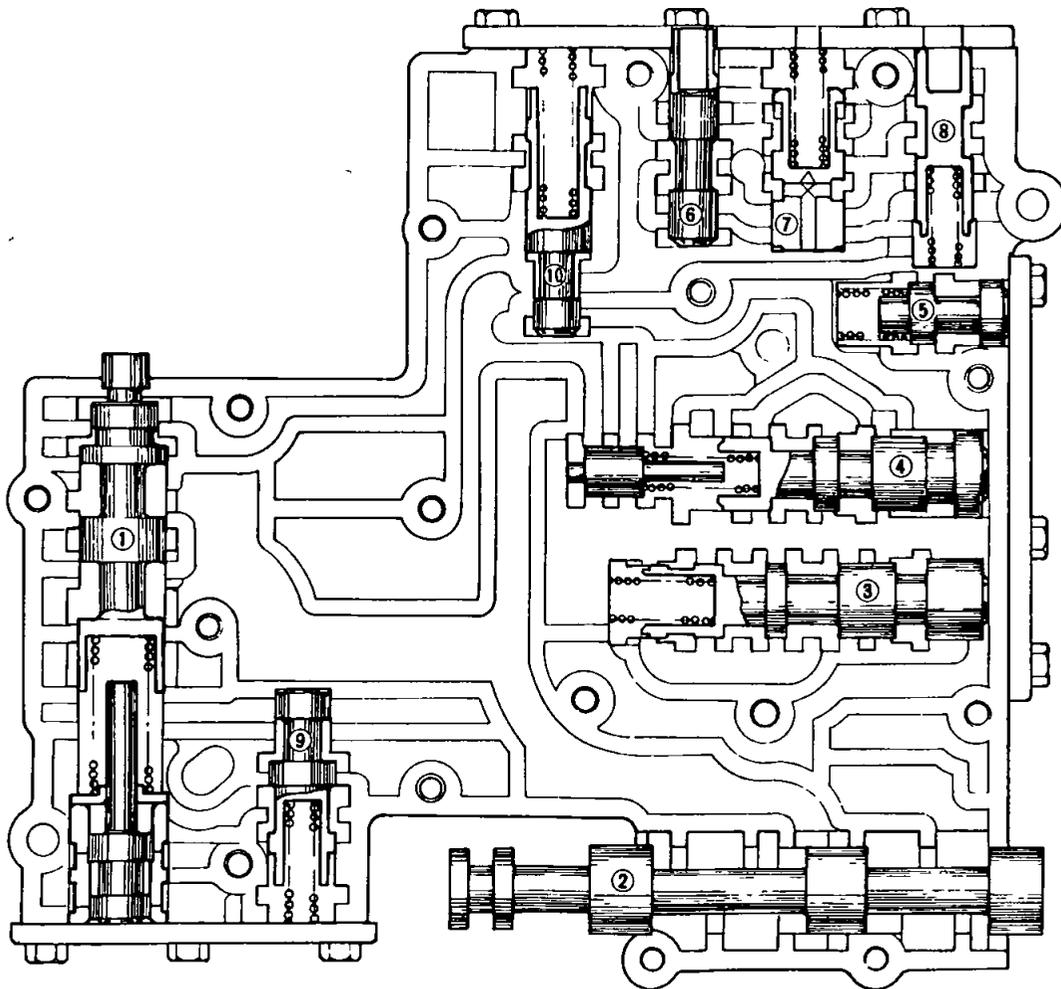


Fig AT-34 "2nd-3rd" timing valve



- | | |
|-----------------------------------|-----------------------------------|
| 1 Pressure regulating valve (PRV) | 6 Vacuum throttle valve (VTV) |
| 2 Manual valve (MNV) | 7 Throttle back-up valve (TBV) |
| 3 1st-2nd shift valve (FSV) | 8 Solenoid down shift valve (SDV) |
| 4 2nd-3rd shift valve (SSV) | 9 Second lock valve (SLV) |
| 5 Pressure modifier valve (PMV) | 10 2-3 timing valve (TMV) |

AT094

Fig AT-35 Control valve

HYDRAULIC SYSTEM AND MECHANICAL OPERATION

The operating system of oil pressure in each range is described below

The oil pressure in each circuit shown in the illustration is classified as follows according to the function (The numerals show the circuit numbers)

Pressure source of the line 7

Operating line pressure for friction elements

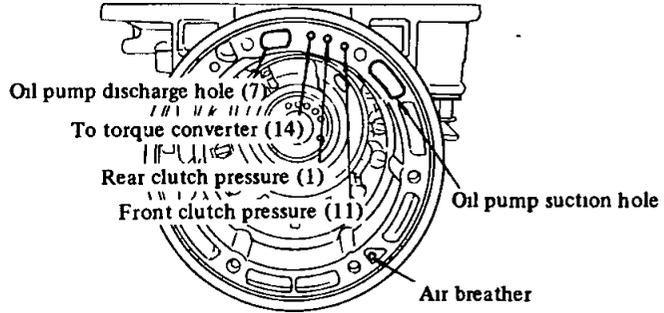
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Auxiliary line pressure 13

Throttle system pressure

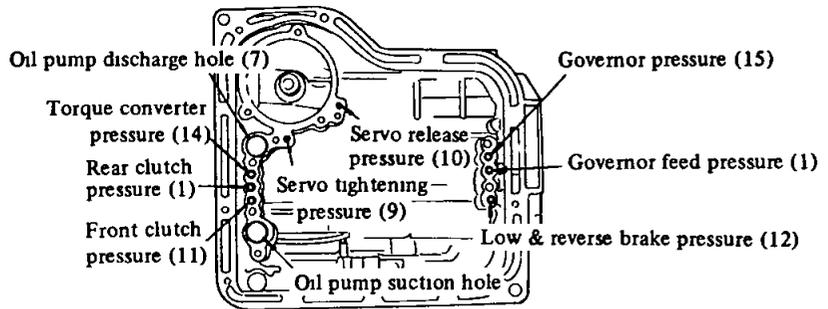
16, 17, 18, 19

Others 14, 15



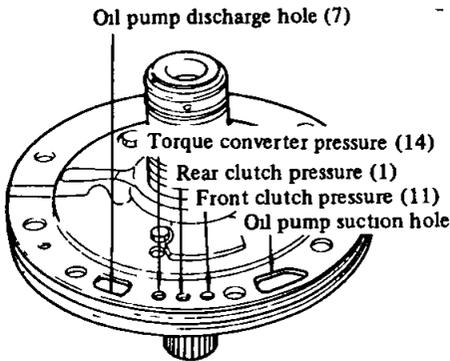
AT106

Fig AT-37 Identification of oil channels in case front face



AT107

Fig AT-38 Identification of oil channels in case face



AT105

Fig AT-36 Identification of oil channels in oil pump

Automatic Transmission

Hydraulic control system

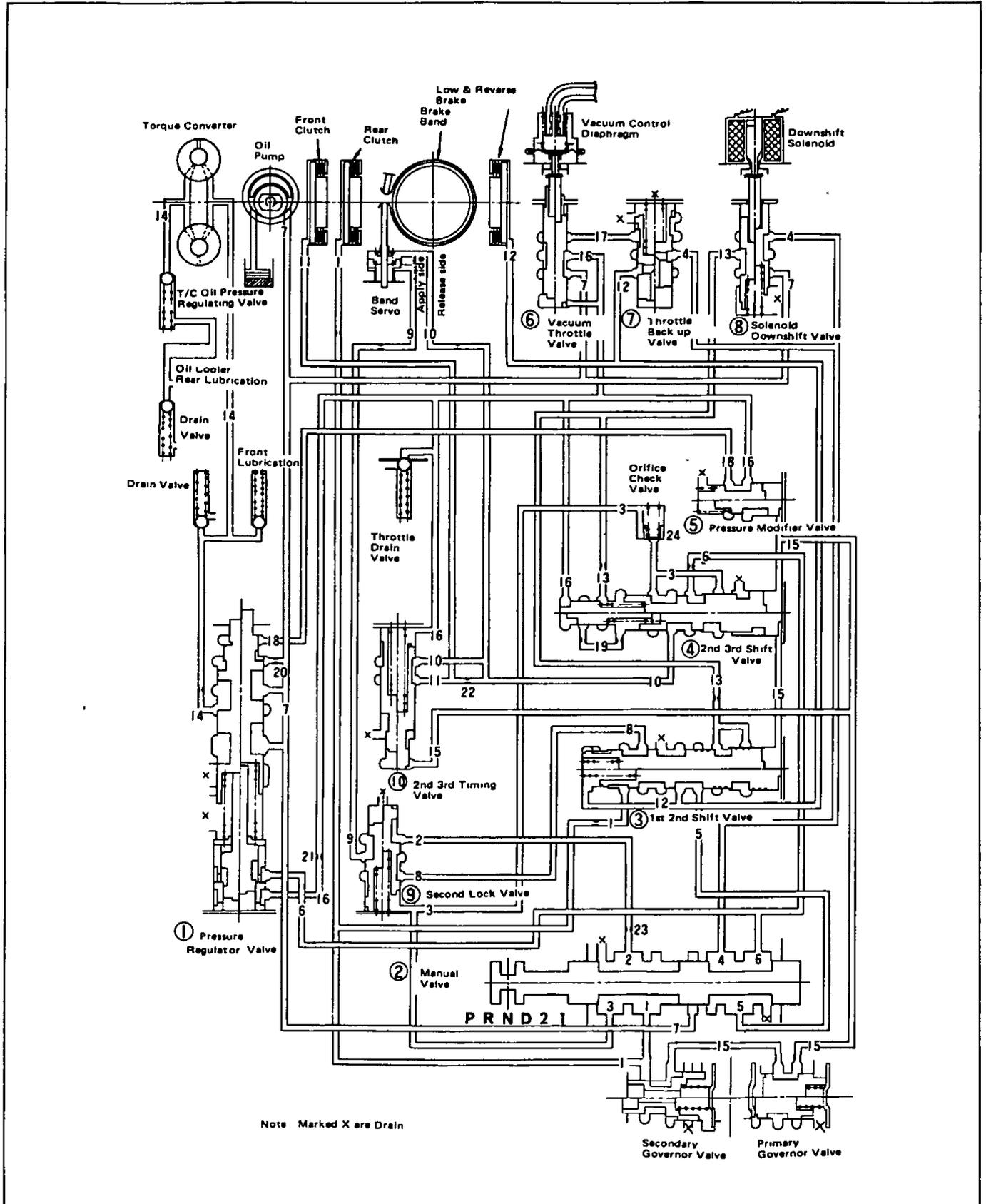


Fig AT-39 Hydraulic control system

"P" RANGE (PARK)

The operation of clutches and band are functionally the same as in "Neutral"

In parking, however, when the parking pawl meshes in a gear which is splined to the output shaft, the output shaft is mechanically locked from rotating

The oil discharged from the oil pump is fed to each part in a similar manner to that of the "N" range. The oil having the line pressure (7) which has been introduced into the manual valve (2) reaches the "1st-2nd" shift valve (3) through the line pressure circuit (5). As the "1st-2nd" shift valve is forced to the right-hand side by the spring, the line pressure (5) and (12) actuates the low and reverse brake through the groove. Also, the parking pawl engages with the outer teeth of the oil distributor by means of the manual lever, mechanically locking the output shaft.

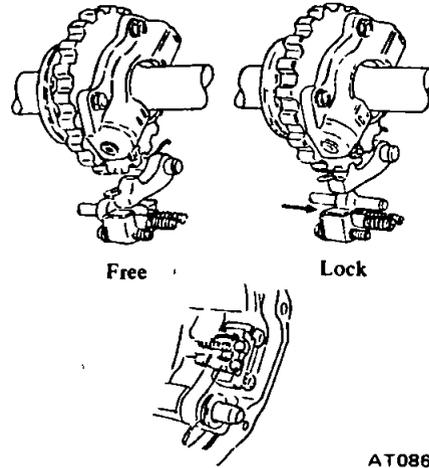


Fig AT-40 Parking mechanism

Automatic Transmission

"P" range (Park)

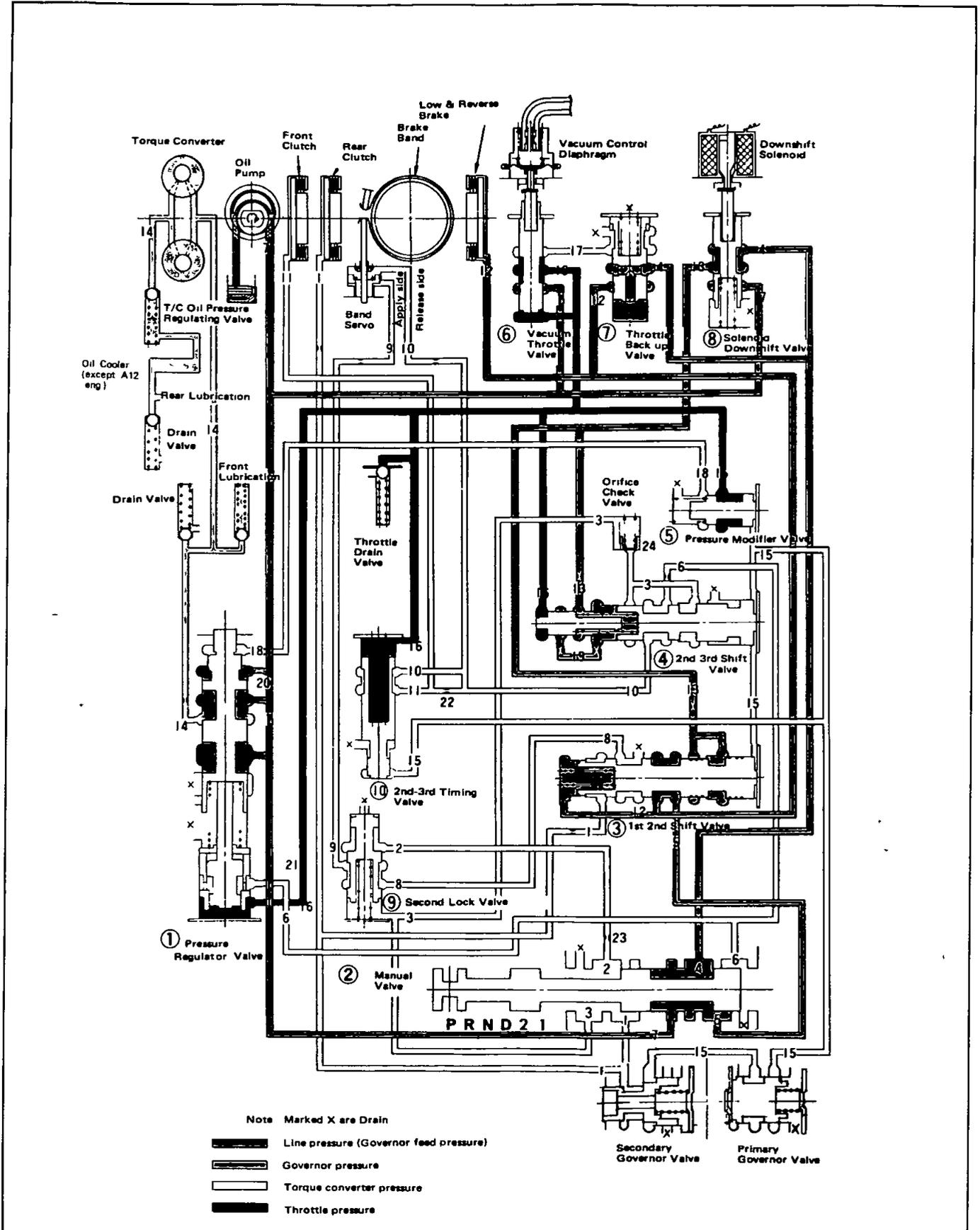
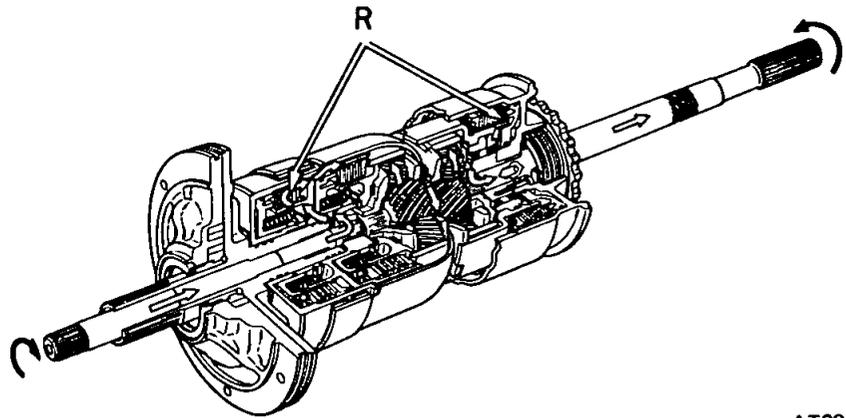


Fig AT-41 Oil pressure circuit diagram — "P" range (Park)

"R" RANGE (REVERSE)

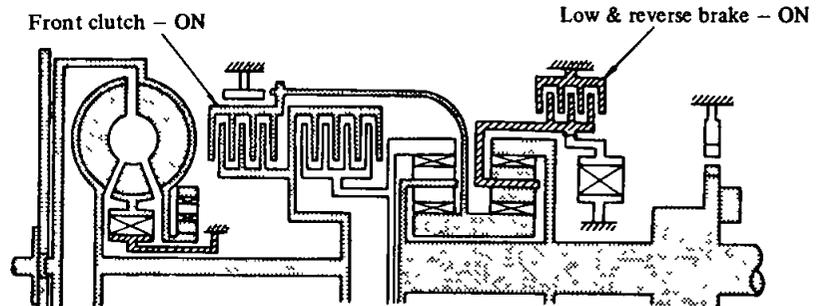
In "R" range, the front clutch and the low and reverse brake are applied. The power flow is through the input shaft, front clutch, and connecting shell to the sun gear. Clockwise rotation of the sun gear causes counterclockwise rotation of the rear planetary gears. With the connecting drum held stationary by the low and reverse brake, the rear planetary gears rotate the rear internal gear and drive the flange counterclockwise. The rear drive flange splined to the output shaft rotates the output shaft counterclockwise at a reduced speed with an increase in torque for reverse gear.



AT084

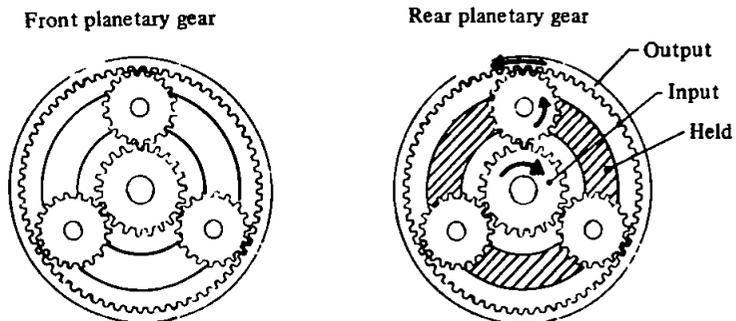
Fig AT-42 Power transmission during "R" range

When the manual valve ② is positioned at "R" range, the oil having the line pressure (7) is directed to line pressure circuits (5) and (6). The pressure in the circuit (5) actuates the low and reverse brake after being introduced into line pressure circuit (12) through the "1st-2nd" shift valve ③. The pressure in the circuit operates the release side of the band servo and the front clutch after being led to line pressure circuit (10) through the "2nd-3rd" shift valve ④. The throttle pressure (16) and the line pressure (6) which vary with the degree of accelerator pedal depression both act on the pressure regulator valve ① and press against its valve ①, increasing line pressure (7). In "R" range, the governor pressure is absent, making all such valves as the "1st-2nd" shift valve ③, "2nd-3rd" shift valve ④, and pressure modifier valve ⑥ inoperative.



AT085

Fig AT-43 Operation of each mechanism during "R" range



AT329

Fig AT-44 Operation of planetary gears during "R" range

Automatic Transmission

"R" range (Reverse)

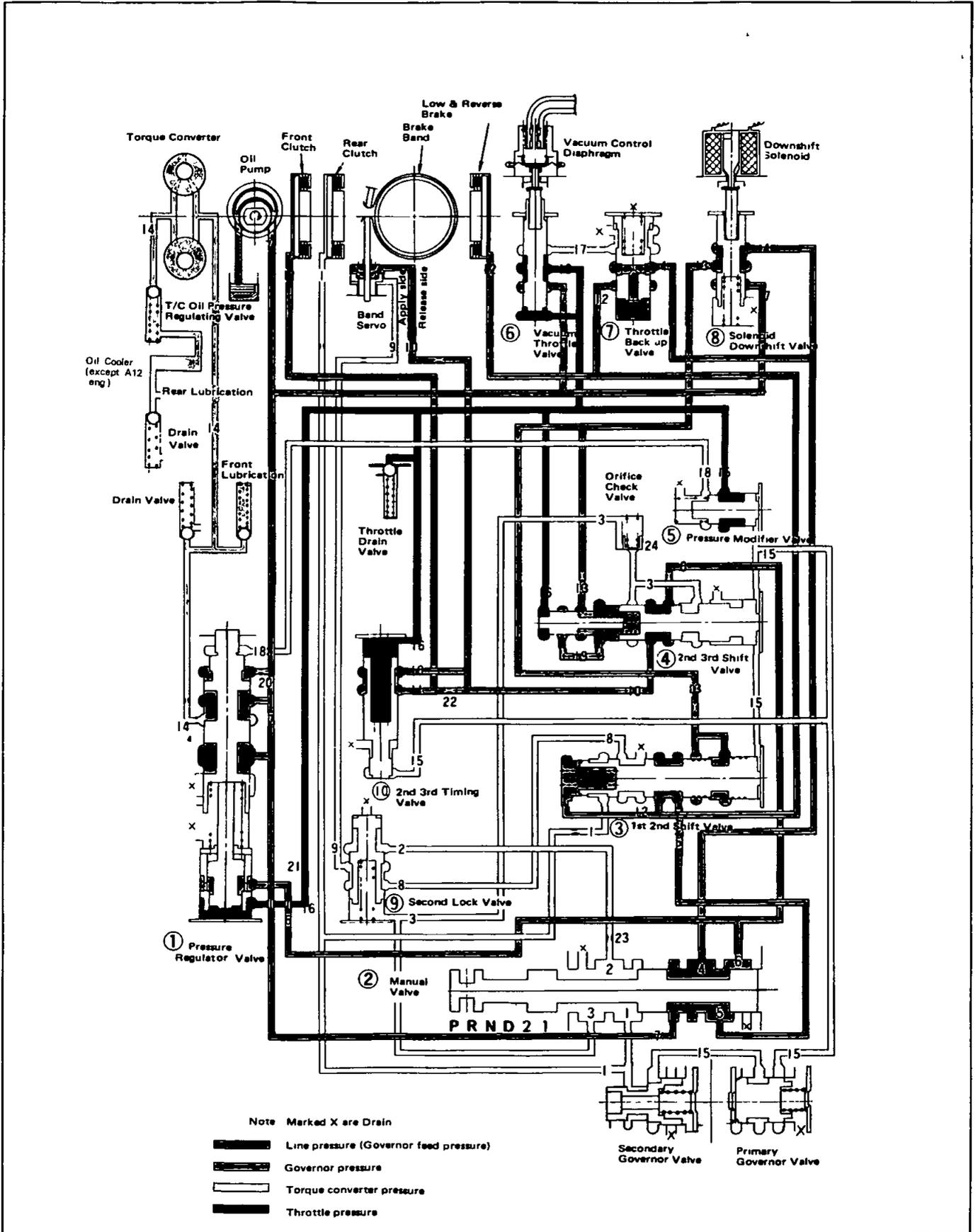


Fig AT-45 Oil pressure circuit diagram — "R" range (Reverse)

"N" RANGE (NEUTRAL)

In "N" range none of the clutches and band are applied, thus no power is transmitted to the output shaft

The pressure of oil discharged from the oil pump is regulated by the pressure regulator valve ① to maintain the line pressure (7), and the oil is led to the manual valve ②, vacuum throttle valve ⑥, and solenoid down-shift valve ⑧. The oil is further introduced into the torque converter at its operating pressure (14), and a portion of this oil is distributed to each part as the front lubricant. The oil which has been discharged from the torque converter is also distributed to each part as the rear lubricant.

As the oil pump rotates at the same speed as the engine, the oil pump discharge increases with engine speed. But the surplus oil is returned to the oil pan by the pressure regulator valve ①.

Automatic Transmission

"N" range (Neutral)

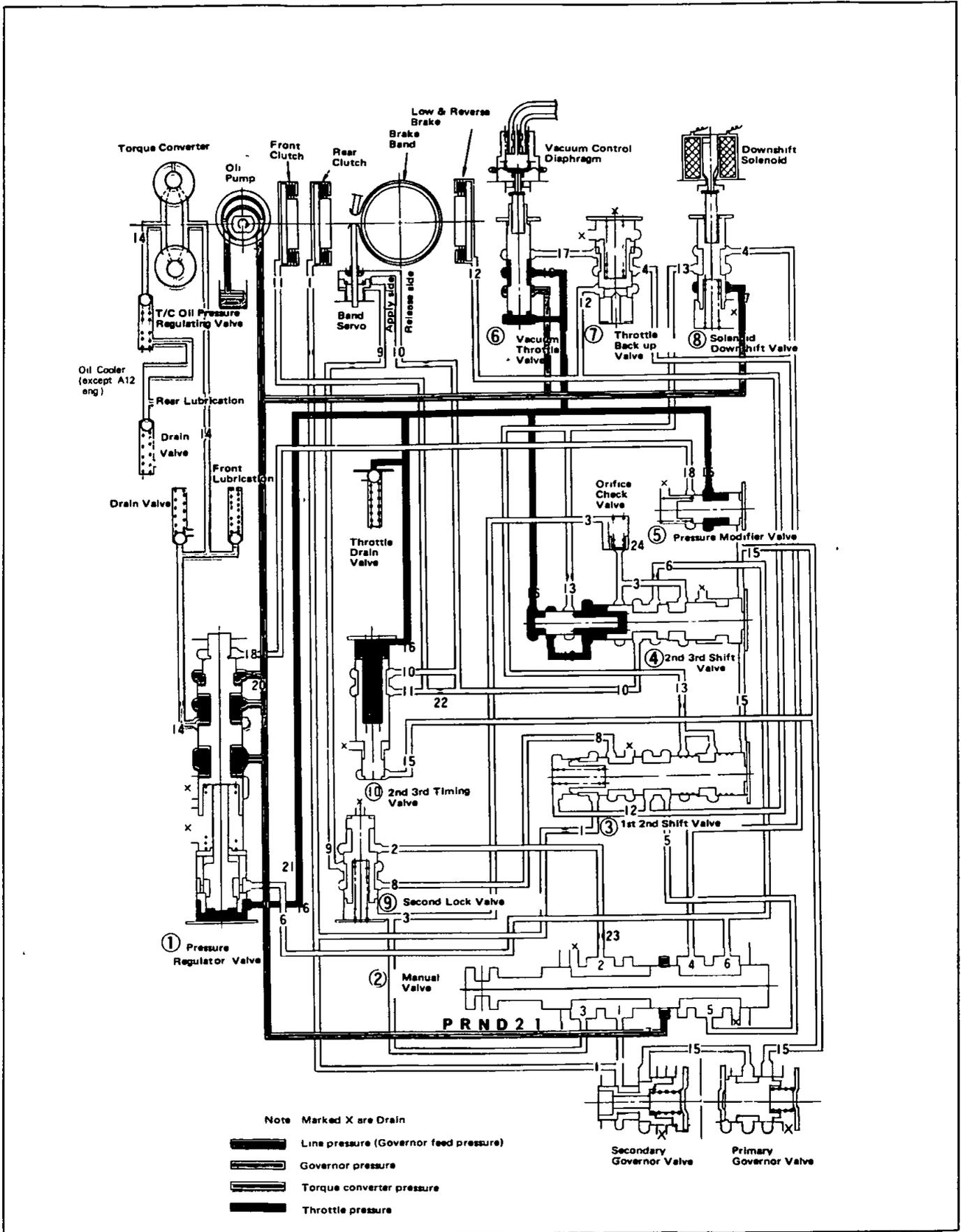


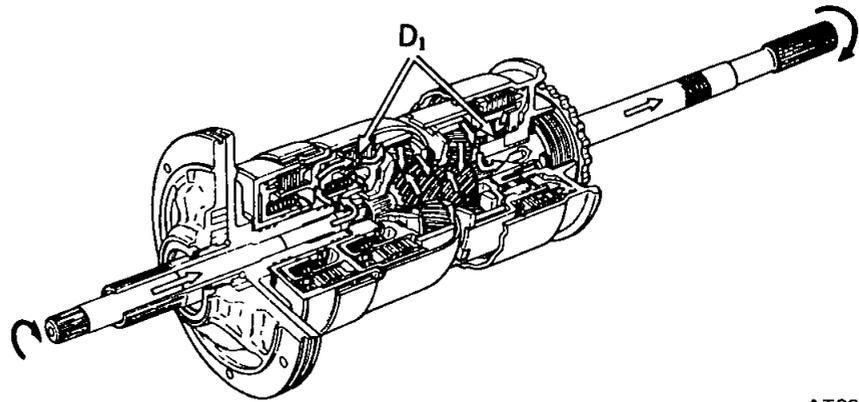
Fig AT-46 Oil pressure circuit diagram — "N" range (Neutral)

"D," RANGE (LOW GEAR)

The low gear in "D" range is somewhat different from that in "1₁" range

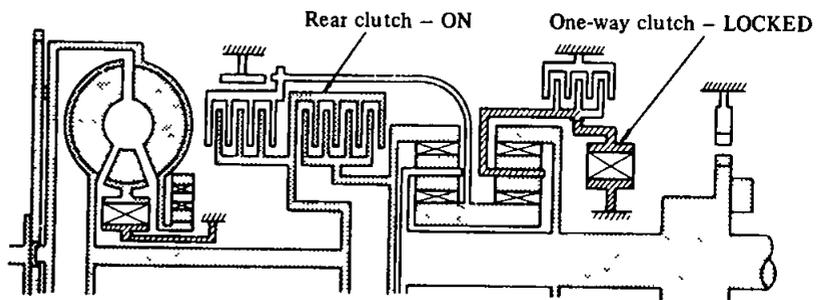
The rear clutch is applied as in "1₁" range, but the one-way clutch holds the connecting drum. The power flow is the same as in "1₁" range. That is, the power flow takes place through the input shaft and into the rear clutch. The input shaft is splined to the rear clutch drum and drives it. Rotation of the rear clutch drives the rear clutch hub and front internal gear.

The front internal gear rotates the front planetary gears clockwise to cause the sun gear to rotate counterclockwise. Counterclockwise rotation of the sun gear turns the rear planetary gears clockwise. With the rear planetary carrier held stationary by the one-way clutch, the clockwise rotation of the rear planetary gears rotates the rear internal gear and drives the flange clockwise. The internal drive flange is splined to the output shaft and rotates the output shaft clockwise.



AT080

Fig AT-47 Power transmission during "D₁" range



AT081

Fig AT-48 Operation of each mechanism during "D₁" range

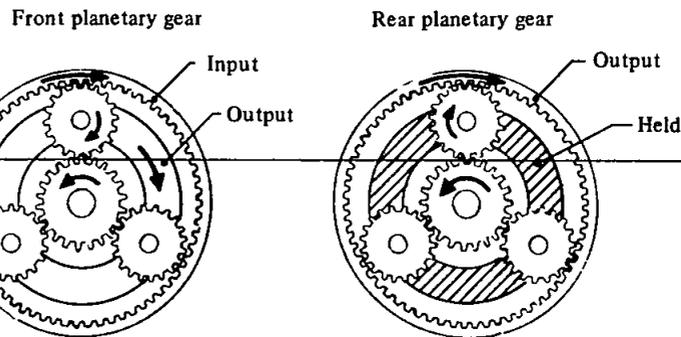
When the manual valve is positioned at "D", the line pressure (7) introduced into the manual valve is led to the line pressure circuits (1), (2) and (3). The pressure in the circuit (1) actuates the rear clutch and the governor, and at the same time, operates the "1st-2nd" shift valve (3) to change the speed. The circuit (2) leads to the second lock valve (9). The circuit (3) actuates the "2nd-3rd" shift valve (4) for the "2nd-3rd" speed change, and at the same time, locks the second lock valve (9).

The throttle pressure (16) which changes with the degree of accelerator pedal depression, presses the pressure regulator valve (1) and increases the line pressure (7). When the speed of the vehicle has increased, the governor pressure (15) introduced from the line pressure circuit (1) actuates the "1st-2nd" shift valve (3), "2nd-3rd" shift valve (4), and pressure modifier valve (5). When the governor pressure is high, the pressure modifier valve (5) acts in such a direction as to compress

the spring, and the throttle pressure is led to the throttle pressure (18). This pressure acts against the force of the spring of the pressure regulator valve (1) and also against the throttle pressure (16), thus lowering the line pressure (7).

The governor pressure also increases with the speed of the vehicle, exerting a pressure on one side of the "1st-2nd" shift valve, and counteracts

the throttle pressure (19), line pressure (1), and the spring which are exerting against the governor pressure. Therefore, when the governor pressure exceeds this pressure, the speed is shifted from the "1st" gear to the "2nd" gear. The further the accelerator pedal is depressed, the higher becomes the throttle pressure (19), increasing the governor pressure and shifting the speed change point to the higher side.

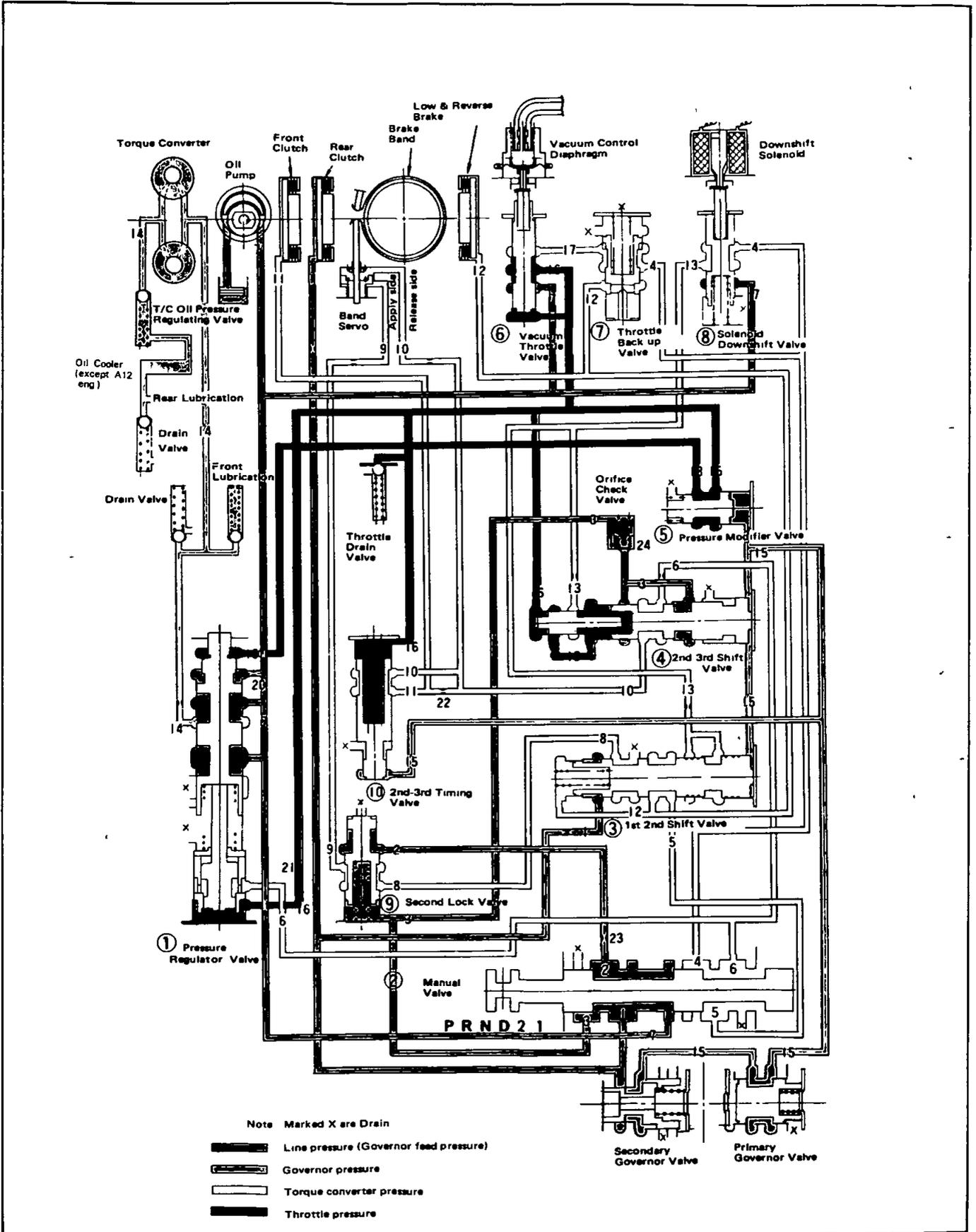


AT330

Fig AT-49 Operation of planetary gears during "D₁" range

Automatic Transmission

"D₁" range (Low gear)



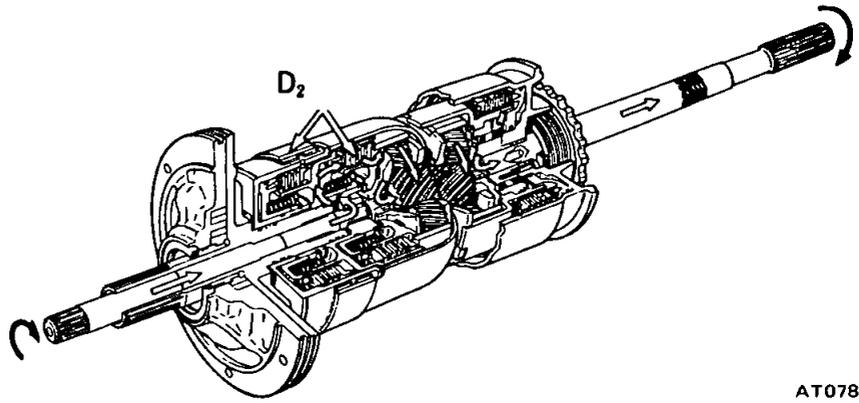
- Note Marked X are Drain
- Line pressure (Governor feed pressure)
 - Governor pressure
 - Torque converter pressure
 - Throttle pressure

Fig AT-50 Oil pressure circuit diagram — "D₁" range (Low gear)

"D₂" RANGE (2ND GEAR)

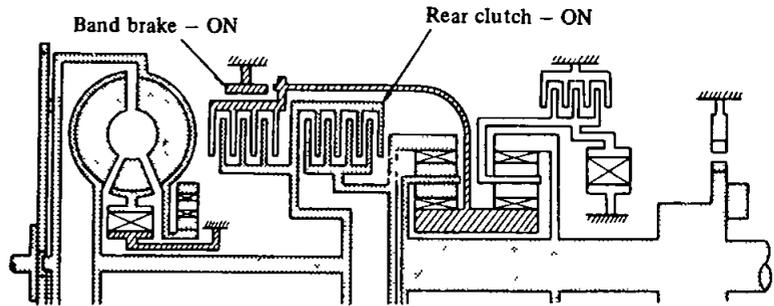
In this case, the rear clutch is applied and the band brake holds the front clutch drum, the connecting shell and the sun gear from rotating

The power flow takes place through the input shaft into the rear clutch and the front internal gear. With the sun gear held stationary, the front planetary gears rotate around the sun gear, carrying the front planet carrier with them. The front planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduced speed compared with the speed of the input shaft, with an increase in torque. As the low and reverse brake is not applied, the clockwise rotation of the output shaft causes clockwise rotation of rear internal gear and the rear planet carrier also rotates around the sun gear in a clockwise direction. The one-way clutch will act to allow the clockwise rotation of connecting drum.



AT078

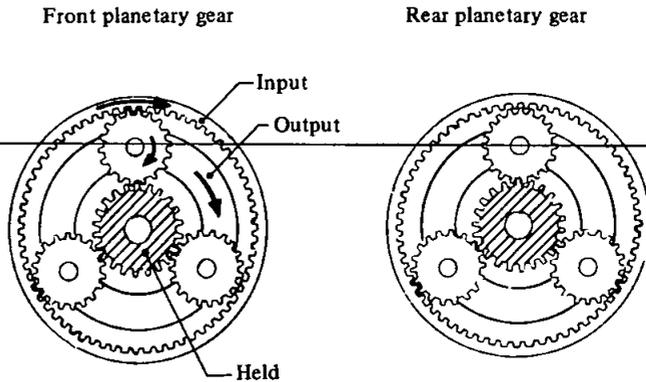
Fig AT-51 Power transmission during "D₂" range



AT079

Fig AT-52 Operation of each mechanism during "D₂" range

When the car speed increases while running at "D₁" range (1st gear), the "1st-2nd" shift valve ③ moves allowing the line pressure (1) to be introduced into the line pressure (8) through itself. The line pressure (8) is further led to the line pressure (9) through the second lock valve ⑨, and by locking the band servo, obtains the "2nd" gear condition.



AT331

Fig AT-53 Operation of planetary gears during "D₂" range

Automatic Transmission

"D₂" range (2nd gear)

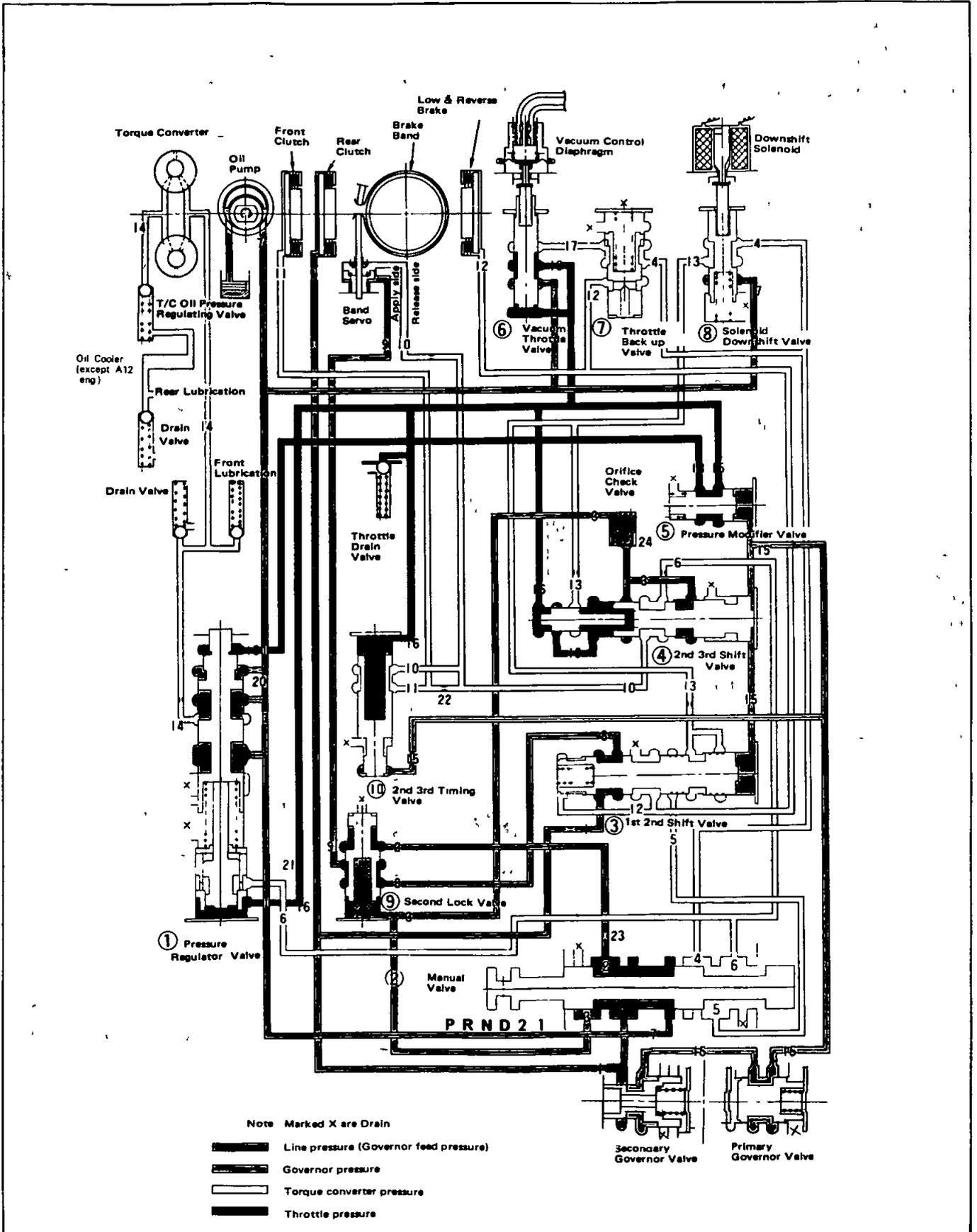


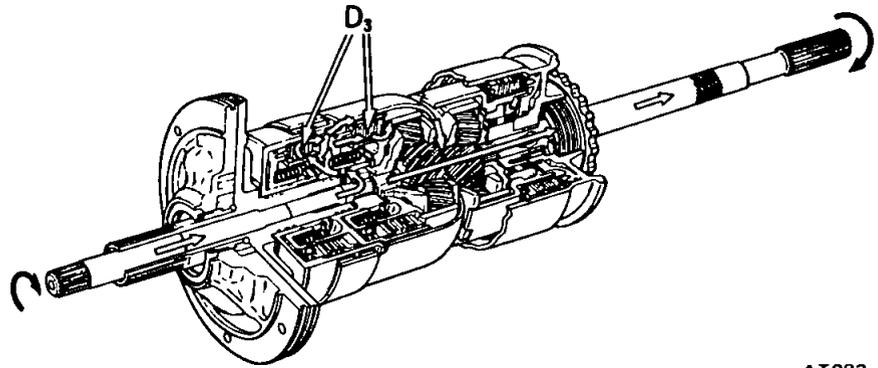
Fig AT-54 Oil pressure circuit diagram — "D₂" range (2nd gear)

"D₃" RANGE (TOP GEAR)

In 3rd gear position, the front and rear clutches are engaged. The power flow takes place through the input shaft into rear clutch drum. The rear clutch drum rotates the steel drive plates of the rear clutch and the lined drive plates of the rear clutch and the lined drive plates of the front clutch. The rear clutch directs the power flow through the rear clutch hub and front internal gear to the front planet carrier.

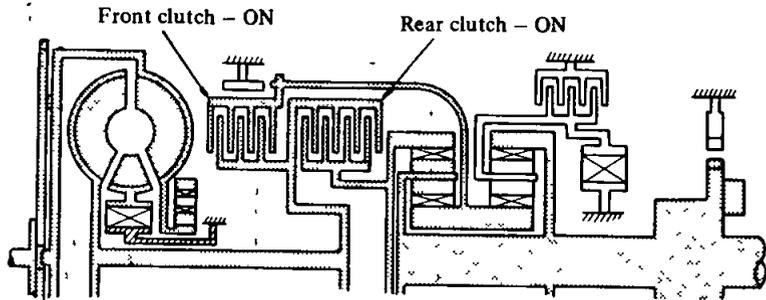
The front clutch directs the power flow through the connecting shell to the sun gear. With the sun gear and the rear clutch hub driven at the same speed, the front planet assembly is forced to rotate the output shaft at the same speed in the direction to provide the top gear.

When the car speed further increases while running at "D₂" range (2nd gear) and the governor pressure (15) exceeds the combined force of the spring of the "2nd-3rd" shift valve (4) and the throttle pressure (19), the "2nd-3rd" shift valve (4) moves, and the line pressure (8) acts to release the front clutch and band servo through the line pressure (10).



AT082

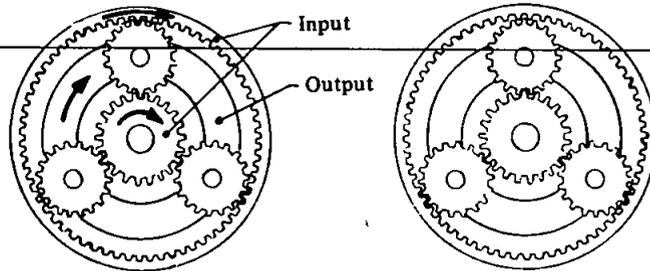
Fig AT-55 Power transmission during "D₃" range



AT083

Fig AT-56 Operation of each mechanism "D₃" range

Front planetary gear Rear planetary gear



AT332

Fig AT-57 Operation of planetary gears during "D₃" range

Automatic Transmission

"D₃" range (Top gear)

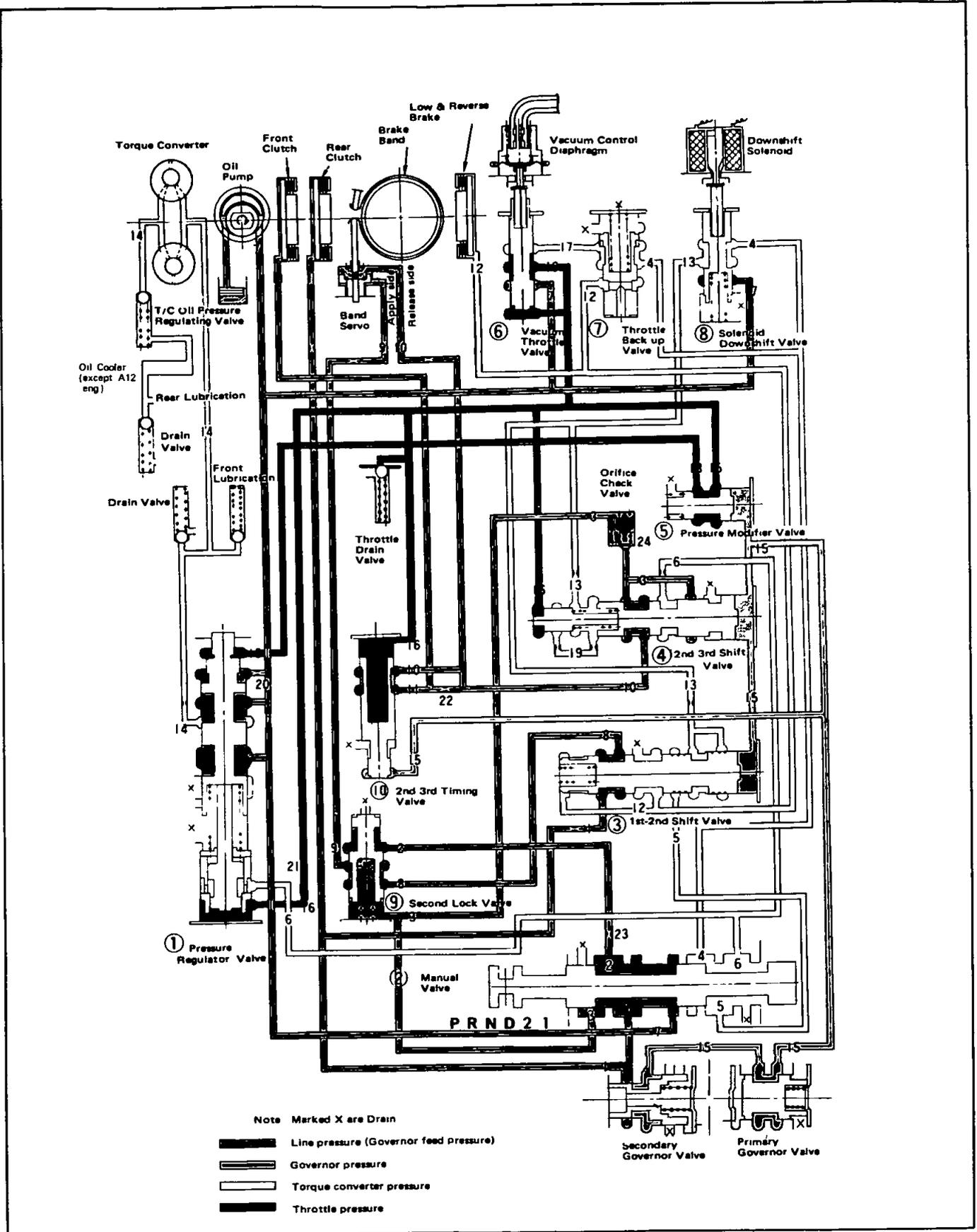


Fig AT-58 Oil pressure circuit diagram — "D₃" range (Top gear)

"D" RANGE KICK-DOWN

While operating at speeds below approximately 80 to 90 km/h (50 to 56 MPH), a kick "3rd-2nd" downshift can be accomplished by fully depressing the accelerator

A kick "3rd-1st" or "2nd-1st" downshift can also be accomplished below approximately 40 to 50 km/h (25 to 31 MPH)

When kickdown is performed, the push rod operates by the solenoid, the valve is depressed downward, and the circuit from the line pressure (7) to the line pressure (13) opens. The line pressure (13), (3) plus the force of the "2nd-3rd" shift valve spring oppose the governor pressure (15) at the "2nd-3rd" shift valve ④, and thus, perform "3rd-2nd" downshift operation

Moreover, the line pressure (13) plus the force of the "1st-2nd" shift valve spring oppose the governor pressure (15) at the "1st-2nd" shift valve ③, and thus, perform "3rd-2nd" or "2nd-1st" downshift operation

Automatic Transmission

"D" range kickdown (Shift valves in 2nd gear position)

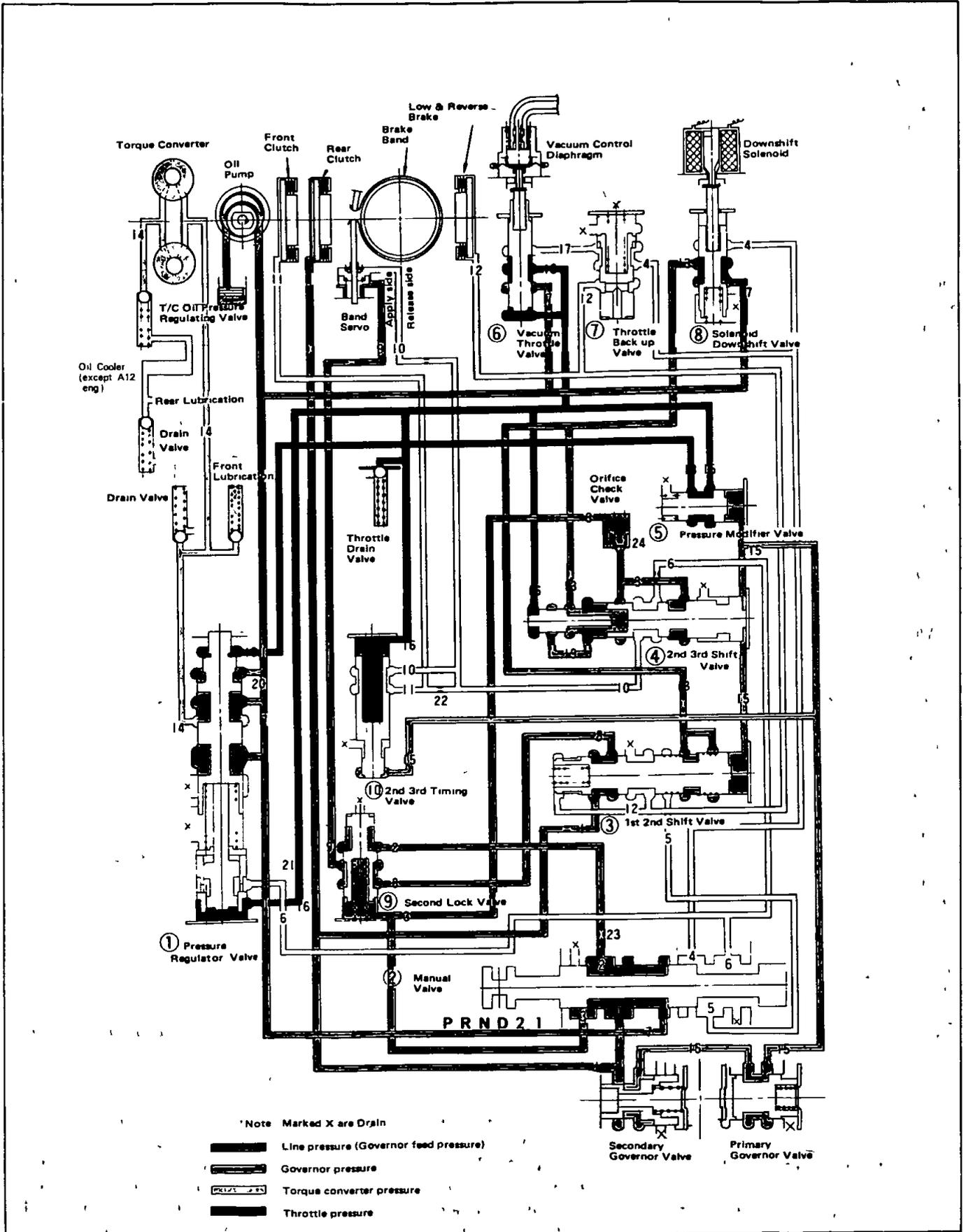


Fig AT-59 Oil pressure circuit diagram — "D" range kickdown (shift valves in 2nd gear position)

"2" RANGE (2ND GEAR)

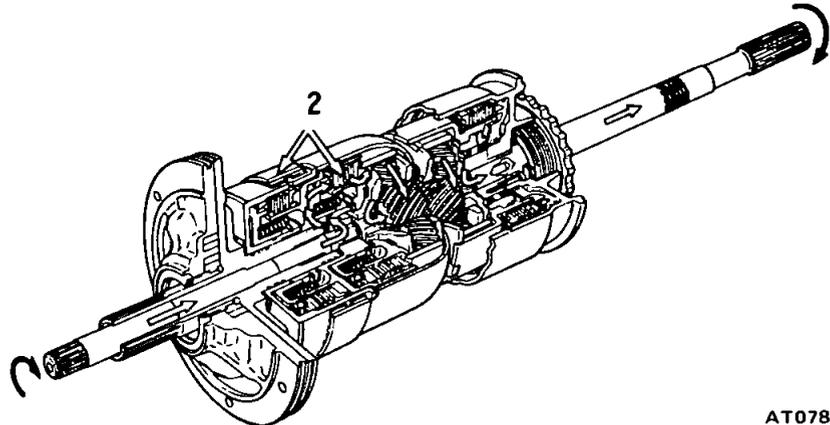
In "2" range the gear ratio is locked in the 2nd forward speed. In this case, the rear clutch is engaged and the band brake holds the front clutch drum, the connecting shell and sun gear from rotating.

The power flow takes place through the input shaft into the rear clutch and the front internal gear. With the sun gear held stationary, the front planetary gears rotate around the sun gear, carrying the front planet carrier with them. The front planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduced speed compared to the speed of the input shaft, with an increase in torque. As the low and reverse brake is not engaged, the clockwise rotation of the output shaft causes clockwise rotation of rear internal gear and the rear planet carrier also rotates around the sun gear in a clockwise direction. The one-way clutch will act to allow clockwise rotation of connecting drum.

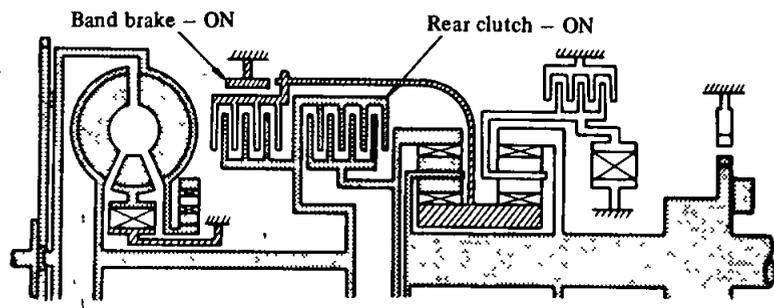
When the manual valve (2) is positioned at "2", the line pressure (7) is introduced into the line pressure circuits (1), (2) and (4). The line pressure (1) is led to the governor, rear clutch and "1st-2nd" shift valve (3) as in the case of "D" range. The line pressure (2) locks the second lock valve (9) and is led to the tightening side of the band servo.

The "2nd" gear is therefore fixed regardless of vehicle speed. When "D₃" (3rd gear) is shifted to "2" range, the line pressure (4) enters the throttle back-up valve (7) and produces a high pressure in the circuit (17), increasing the throttle pressure (16). The line pressure (7) is, therefore, increased and quickly tightens the band.

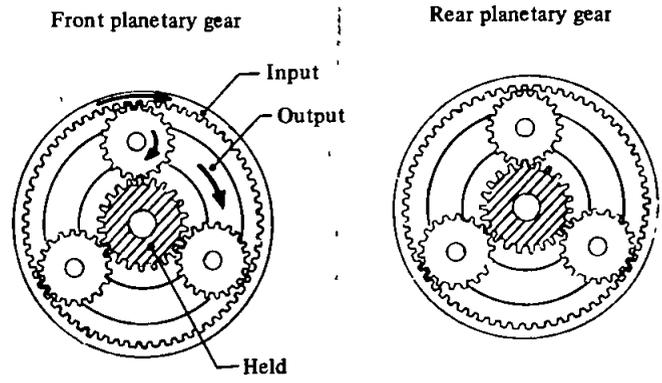
Note "D₃" range (3rd gear) to "2" range.
If "D₃" range (3rd gear) is shifted to "2" range during operation, the manual valve (2) is also shifted to



AT078
Fig AT-60 Power transmission during "2" range



AT079
Fig AT-61 Operation of each mechanism during "2" range



AT331
Fig AT-62 Operation of planetary gears during "2" range

"2" position, causing the line pressure circuit (3) to be drained. Therefore, the line pressure circuit (10) which is situated at the release side of the front clutch and servo is also drained through the "2nd-3rd" shift valve (4), forcing the speed to

decrease from "3rd gear" to "2nd gear". In this case the speed change quickly takes place because the line pressure (7) and other pressure are heightened by the action of the line pressure (4), in the same manner as described under "2" range.

Automatic Transmission

"2" range (2nd gear)

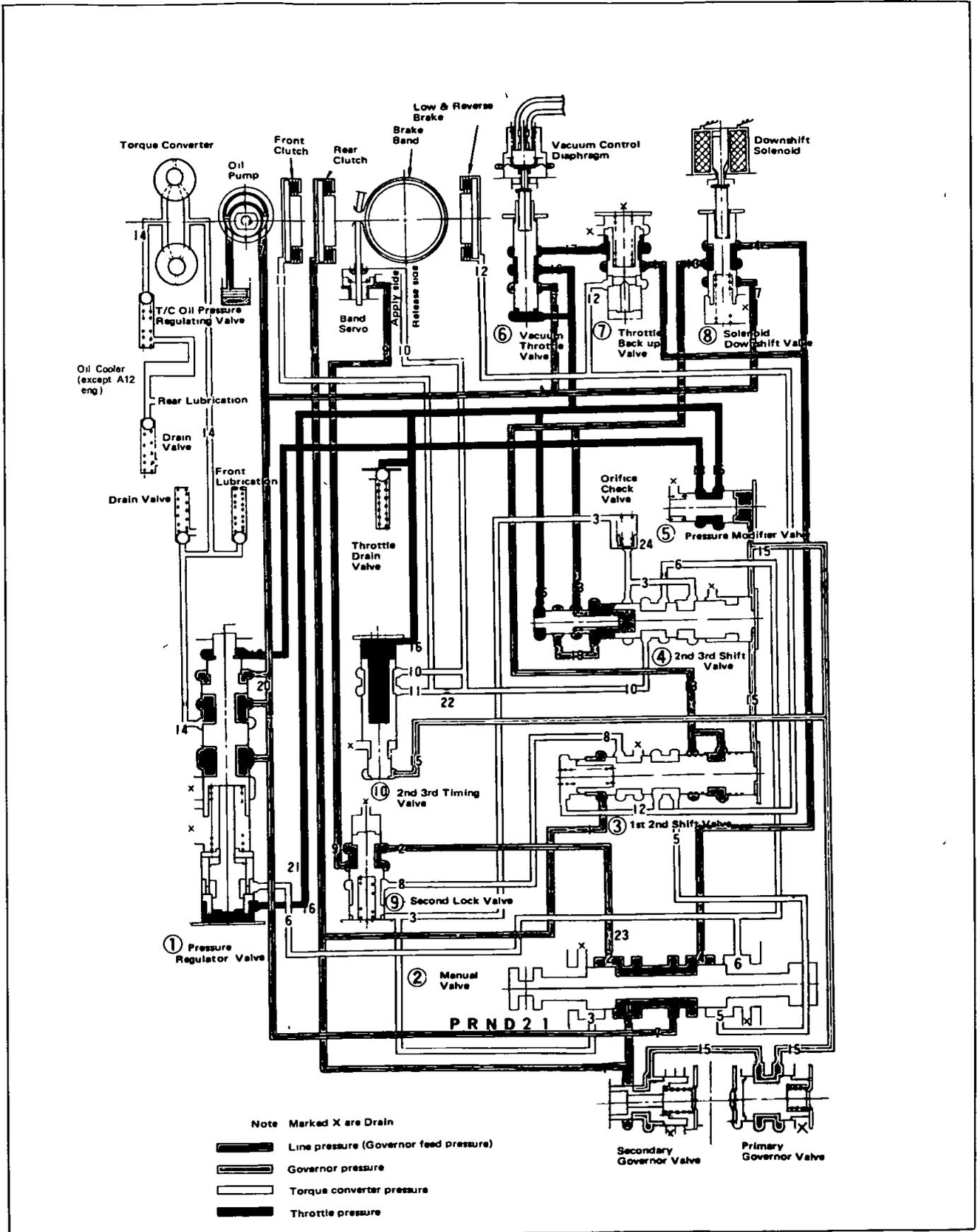


Fig AT-63 Oil pressure circuit diagram — "2" range (2nd gear)

"1," RANGE (LOW GEAR)

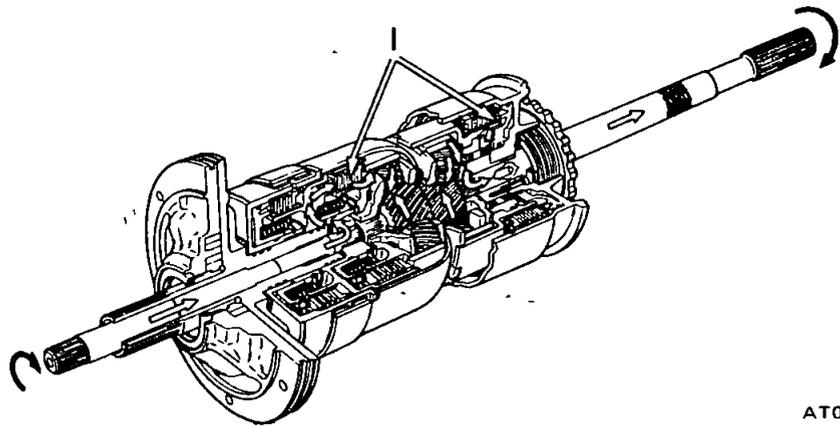
When starting in "1" range, the driving gear is locked to the low gear ratio

In "1" range, the rear clutch is engaged and the low and reverse brake holds the connecting drum and rear planet carrier from rotating. The power flow takes place through the input shaft and into the rear clutch. Rotation of the rear clutch drives the rear clutch hub and front internal gear. The front internal gear rotates the front planetary gears clockwise to cause the sun gear to rotate counterclockwise.

Counterclockwise rotation of the sun gear turns the rear planetary gear clockwise.

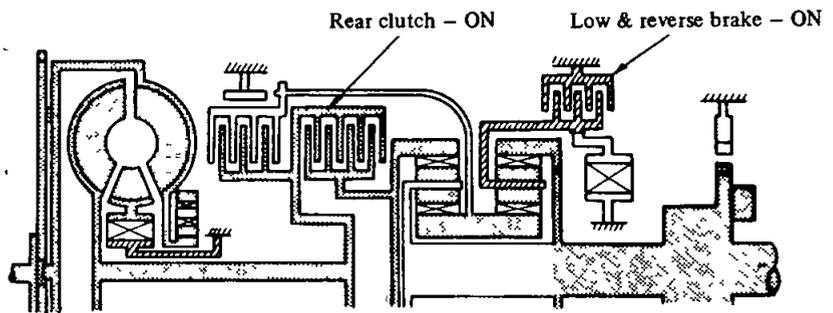
The rear planet carrier splined to the connecting drum is held from rotating by the low and reverse brake.

The clockwise rotation of the rear planetary gears therefore rotates the rear internal gear and internal drive flange. The internal drive flange is splined to the output shaft and rotates the output shaft clockwise. However, the output shaft rotates at a lower speed compared to that of the input shaft. This is caused by the fact that the front planet carrier rotates at the same speed as the output shaft in the same direction since the carrier is splined to the output shaft. The front internal gear and planetary gear assembly are rotating in the same direction, but the planet carrier is rotating at a speed slower than the ring gear. So the gear ratio of this speed range is a combination of the ratios provided by the front and rear planetary gear assemblies.



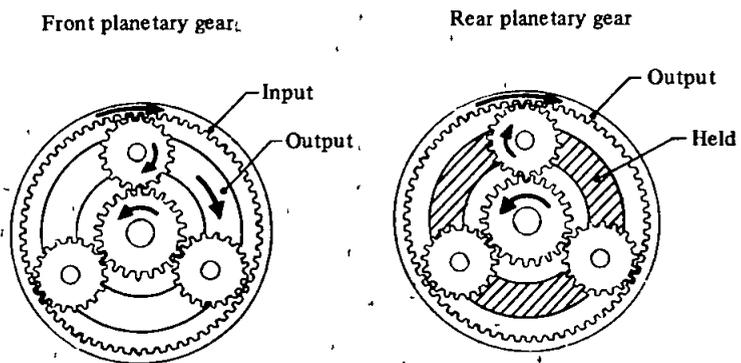
AT076

Fig AT-64 Power transmission during "1," range



AT077

Fig AT-65 Operation of each mechanism during "1," range



AT330

Fig AT-66 Operation of planetary gears during "1," range

When the manual valve ② is positioned at "1", the line pressure (7) is applied into the line pressure circuits (1), (4) and (5). The oil pressure in (5) actuates the low and reverse brake after being introduced into the circuit (12) through the "1st-2nd" shift valve ③, and the line pressure (1) acts on

the rear clutch and governor. The line pressure (4) acts in the same manner as in "2" range.

Similar to that of the "D" range, the line pressure increases with the degree of accelerator pedal depression, and the line pressure decreases with

the increase of car speed. The governor pressure (15) which acts on the "1st-2nd" shift valve does not increase until it overcomes the combined force of the line pressure (12) and the spring, causing no "1st-2nd" speed change.

Automatic Transmission

"1," range (Low gear)

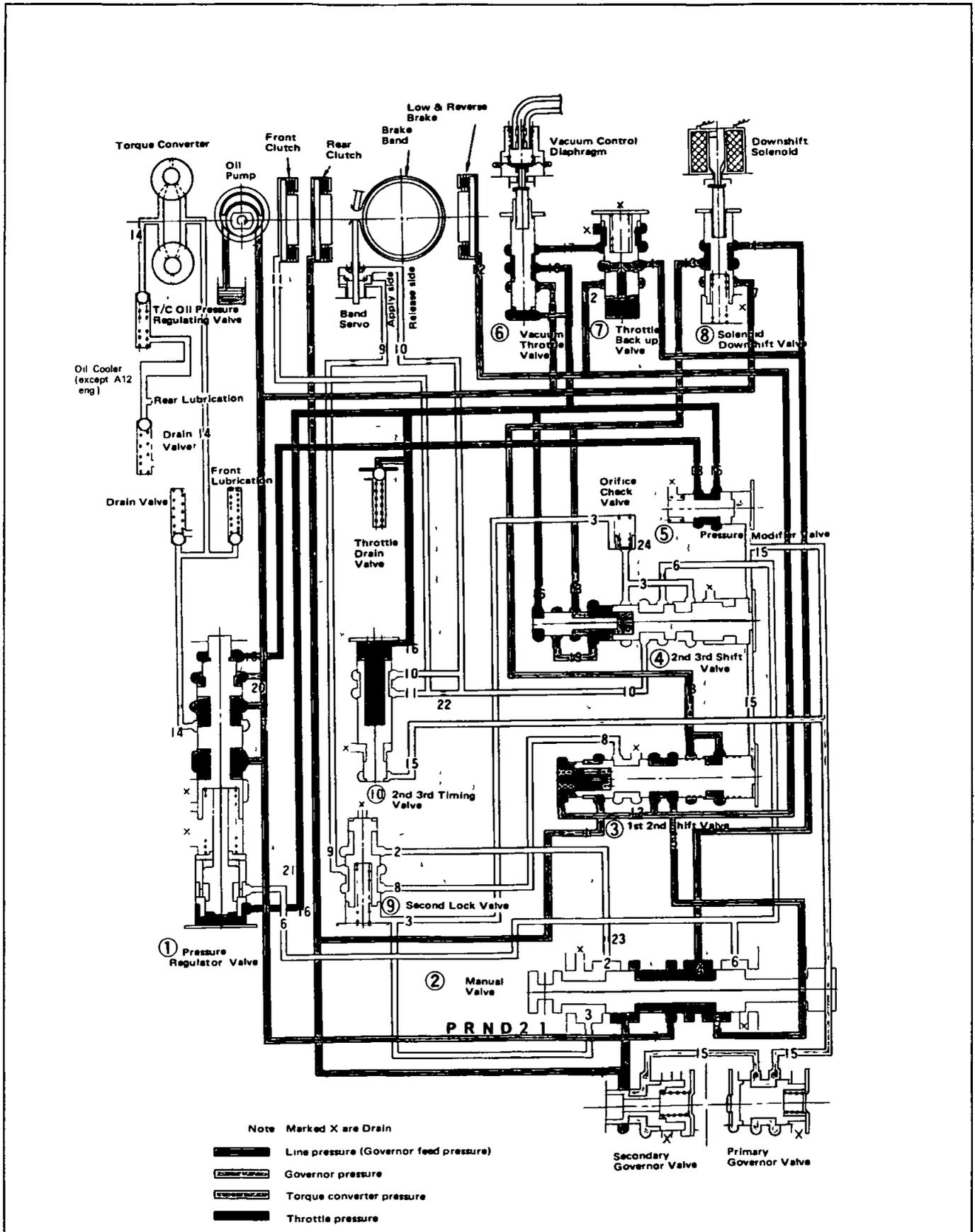


Fig AT-67 Oil pressure circuit diagram — "1," range (Low gear)

Automatic Transmission

"1₂" range (2nd gear)

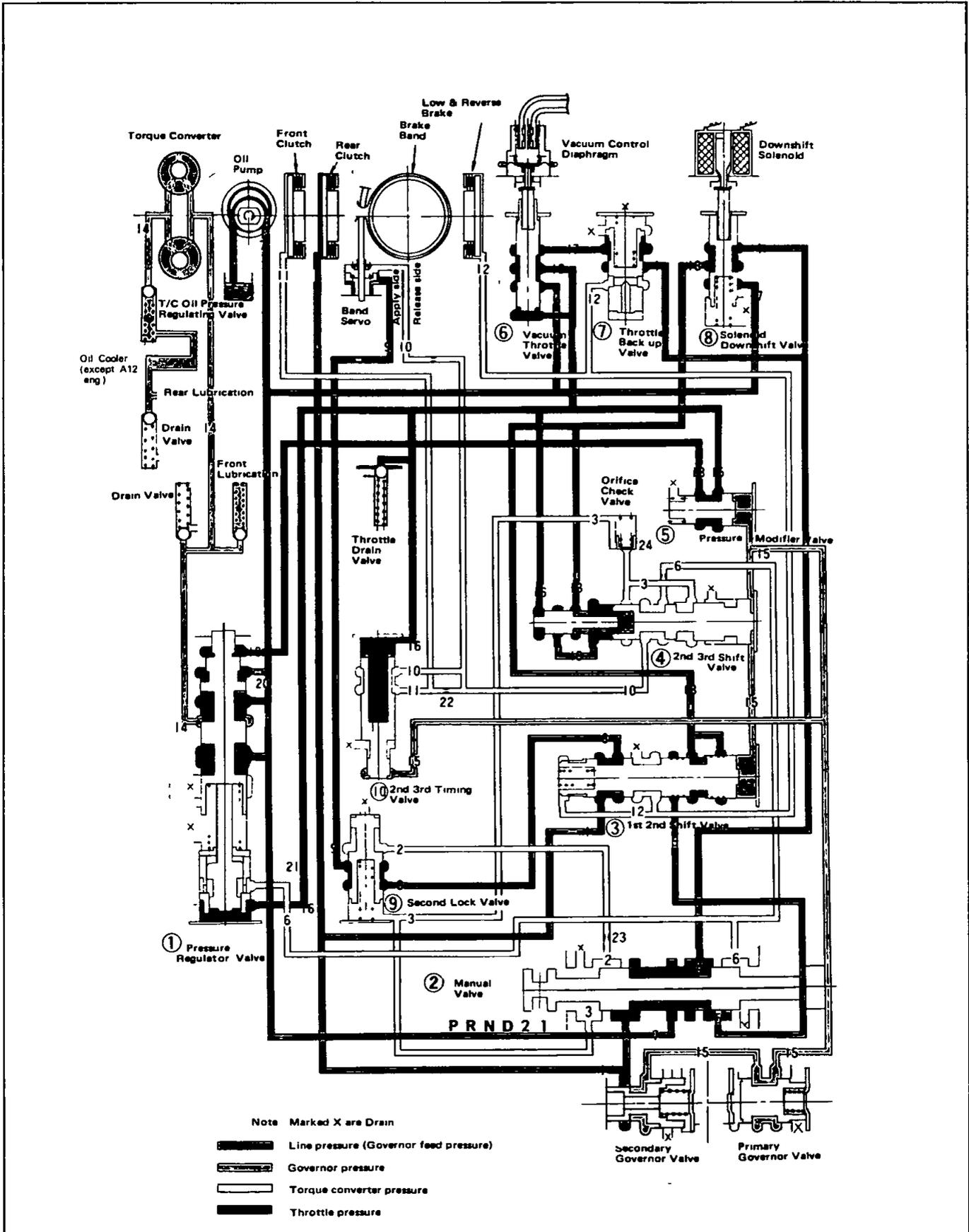


Fig. AT-68 Oil pressure circuit diagram — "1₂" range (2nd gear)

REMOVAL AND INSTALLATION

CONTENTS

TRANSMISSION ASSEMBLY	AT-39	TRANSMISSION CONTROL LINKAGE	AT-41
REMOVAL	AT-39	ADJUSTMENT	AT-41
INSTALLATION	AT-39	OIL COOLER LINES	AT-42

TRANSMISSION ASSEMBLY

When removing the automatic transmission from a vehicle, pay attention to the following points

- 1 Before removing the transmission, inspect it with the aid of the "Trouble Shooting Chart", and remove only when considered to be absolutely necessary
- 2 Remove the transmission with utmost care, and when mounting, observe the tightening torque tables Do not exert excessive force

REMOVAL

In removing automatic transmission from vehicle, proceed as follows

- 1 Disconnect battery ground cable from terminal
- 2 Disengage torsion shaft from accelerator linkage
- 3 Jack up vehicle and support its weight on safety stands A hydraulic hoist or an open pit should be utilized, if available

Ensure that safety precautions are observed

- 4 Remove propeller shaft

Note Plug up the opening in the rear extension to prevent oil from leaking out.

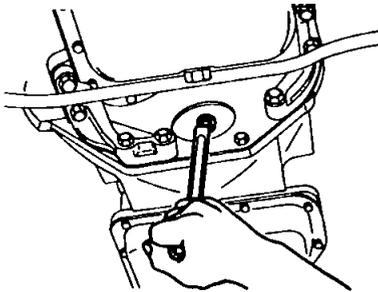
- 5 Disconnect front exhaust tube
- 6 Disconnect selector range lever from manual shaft
- 7 Disconnect wire connections at inhibitor switch
- 8 Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid
- 9 Disconnect speedometer cable from rear extension
- 10 Disconnect oil charging pipe

- 11 Disconnect oil cooler inlet and outlet tubes at transmission case

- 12 Support engine by placing a jack under oil pan, with a wooden block between oil pan and jack

Support transmission by means of a transmission jack

- 13 Detach engine rear plate rubber plug Remove bolts securing torque converter to drive plate See Figure AT-69



AT287

Fig AT-69 Removing torque converter attaching bolts

Note: Before removing torque converter, scribe match marks on two parts so that they may be replaced in their original positions

- 14 Remove rear engine mount securing bolts and crossmember mounting bolts

- 15 Remove starter motor

- 16 Remove bolts securing transmission to engine After removing these bolts, support engine and transmission with jack, and lower the jack gradually until transmission can be removed from under the car

Note Plug up any openings such as oil charging pipe, oil cooler tubes, etc.

INSTALLATION

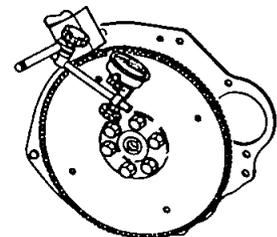
For installation of automatic transmission, reverse the order of removal However, observe the following installation notes

- 1 Drive plate runout

Turn crankshaft one full turn and measure drive plate runout with indicating finger of a dial gauge resting against plate See Figure AT-70

[Replace drive plate if in excess of 0.5 mm (0.020 in.)]

- Maximum allowable runout
0.3 mm (0.012 in.)
Total indicator reading

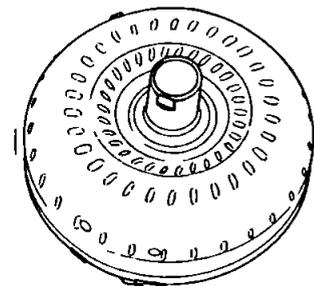


AT288

Fig AT-70 Measuring drive plate runout

- 2 Installation of torque converter

Line up notch in torque converter with that in oil pump Be extremely careful not to cause undue stresses in parts while installing torque converter See Figure AT-71



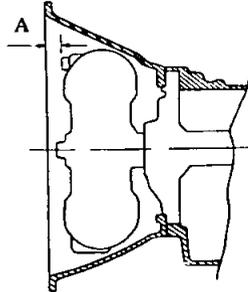
AT116

Fig AT-71 Torque converter aligning cut

Automatic Transmission

Distance "A"

More than 21.5 mm (0.846 in)



AT117

Fig AT-73 Installing torque converter

4 Bolt converter to drive plate

Note Align chalk marks painted across both parts during disassembly process

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 selector range lever to manual shaft. Operation should be carried out with manual and selector levers in "N"

8 Connect inhibitor switch wires

3 When connecting torque converter to transmission, measure distance "A" to ensure that they are correctly assembled. See Figure AT-73

Notes

- Refer to page AT-59 for Checking and Adjusting Inhibitor Switch
- Inspect and adjust switch as detailed 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 level of oil in transmission. For detailed procedure, see page AT-58 for Checking Oil Level

11 Move selector lever through all positions to be sure that transmission operates correctly

With hand brake engaged, rotate engine at idling speed. 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 each time transmission is shifted.

Note See page AT-59 for Checking Engine Idling.

12 Check to ensure that line pressure is correct. To do this, refer to page AT-63 for Testing Line Pressure

13 Perform stall test as described in page AT-60 for Stall Test

TRANSMISSION CONTROL LINKAGE

ADJUSTMENT

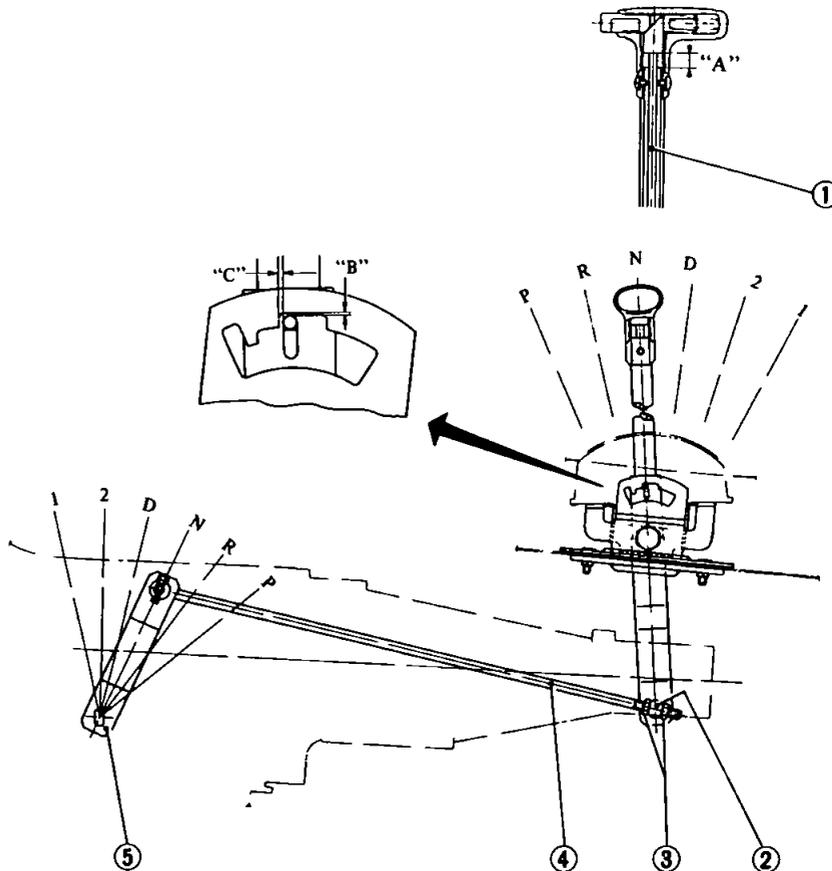
The adjustment of linkage is as important as "Inspection of oil level" for the automatic transmission

Therefore, great care should be exercised because defective adjustment will result in the breakdown of the transmission

1 Prior to installing control knob, set the dimension "A" to 11 to 12 mm (0.433 to 0.472 in)

2 Install control knob on lever. At the same time, check the dimension "B" and adjust it to 0.1 to 1.1 mm (0.0039 to 0.0433 in) by turning pusher ①

3 Loosen adjust nuts ③. Set control lever and selector lever ⑤ at "N" position, moreover, set the clearance "C" to 1 mm (0.039 in) by turning in or out adjusting nuts at trunnion ② which connects selector rod ④



AT 292

Fig AT-74 Control linkage

OIL COOLER LINES

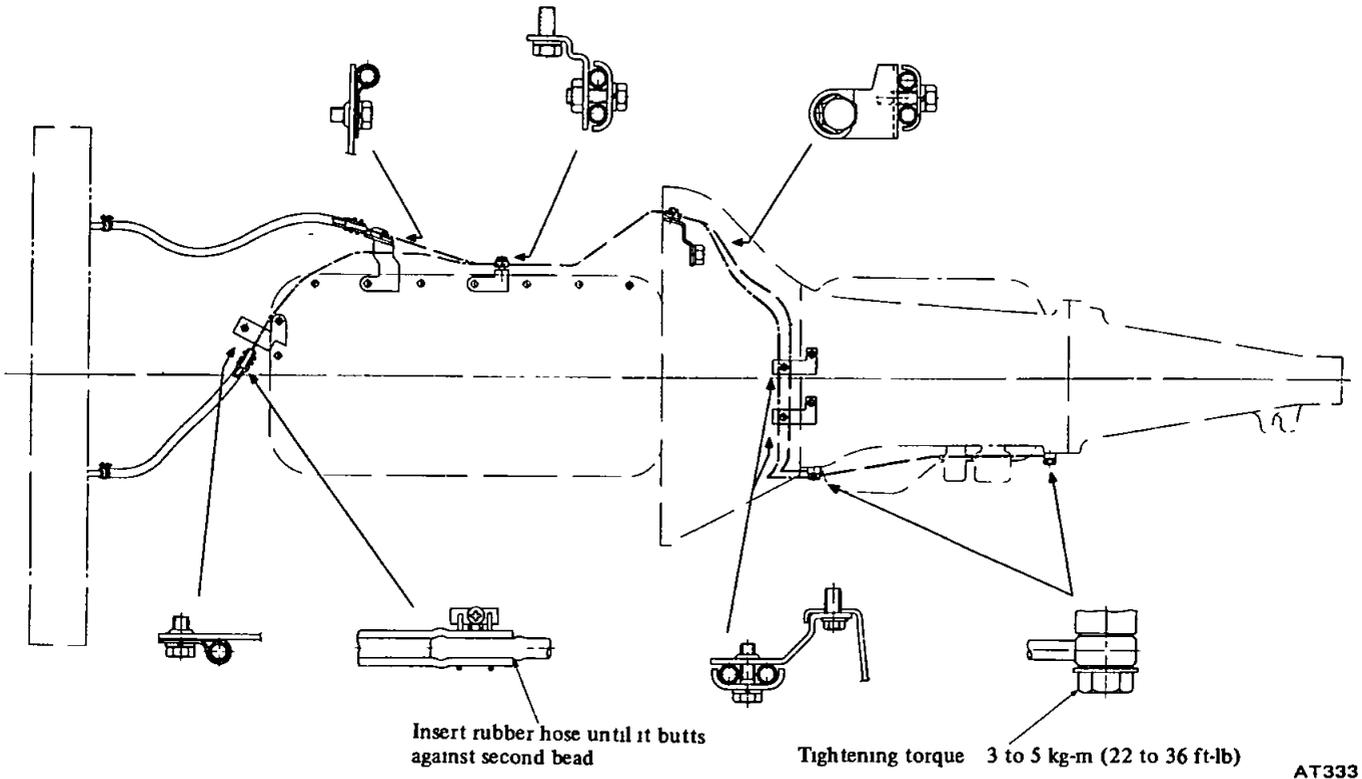


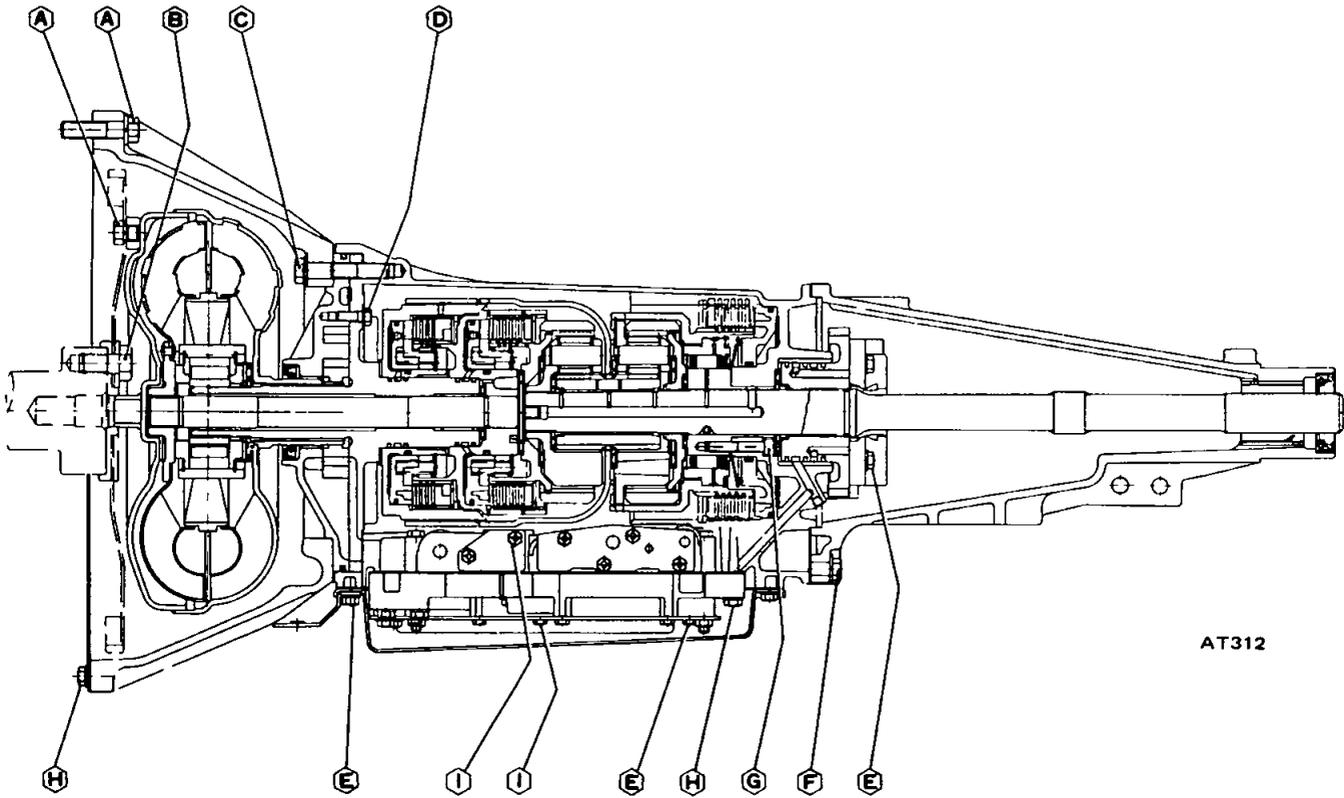
Fig AT-76 Oil cooler lines

MAJOR REPAIR OPERATION

CONTENTS

SERVICE NOTICE FOR DISASSEMBLY
AND ASSEMBLY
TORQUE CONVERTER
INSPECTION
TRANSMISSION
DISASSEMBLY
INSPECTION
ASSEMBLY
COMPONENT PARTS

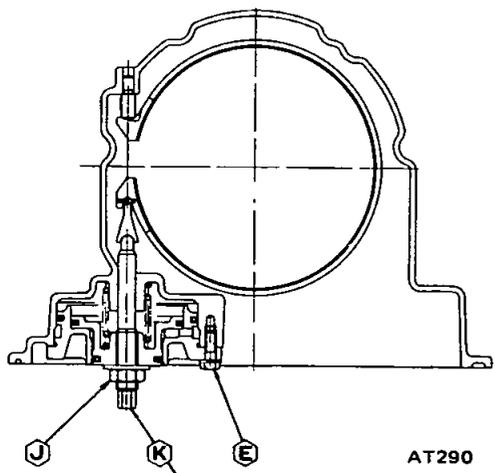
AT-46	FRONT CLUTCH	AT-50
AT-46	REAR CLUTCH	AT-51
AT-46	LOW & REVERSE BRAKE	AT-52
AT-46	SERVO PISTON	AT-52
AT-46	GOVERNOR	AT-53
AT-46	OIL PUMP	AT-53
AT-48	PLANETARY CARRIER	AT-54
AT-48	CONTROL VALVE	AT-54
AT-50		



AT312

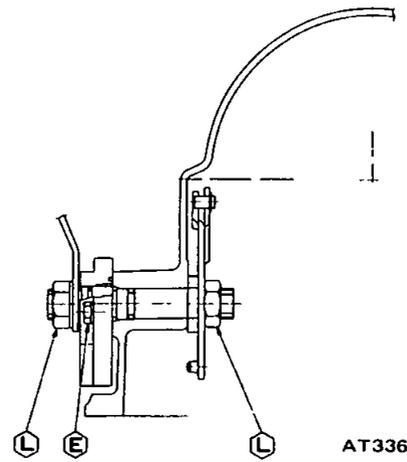
Tightening torque (T) of bolts and nuts kg-m (ft-lb)

Ⓐ T	4 to 5 (29 to 36)
Ⓑ T	14 to 16 (101 to 106) 6.5 to 7.5 (47 to 54) for A12 engine
Ⓒ T	4.5 to 5.5 (33 to 40)
Ⓓ T	0.6 to 0.8 (4.3 to 5.8)
Ⓔ T	0.5 to 0.7 (3.6 to 5.1)
Ⓕ T	2.0 to 2.5 (14 to 18)
Ⓖ T	1.3 to 1.8 (9.4 to 13)
Ⓗ T	0.55 to 0.75 (4.0 to 5.4)
Ⓘ T	0.25 to 0.35 (1.8 to 2.5)
⓵ T	1.5 to 4.0 (11 to 29)
Ⓚ T	1.2 to 1.5 (8.7 to 10.8)
Ⓛ T	3 to 4 (22 to 29)



AT290

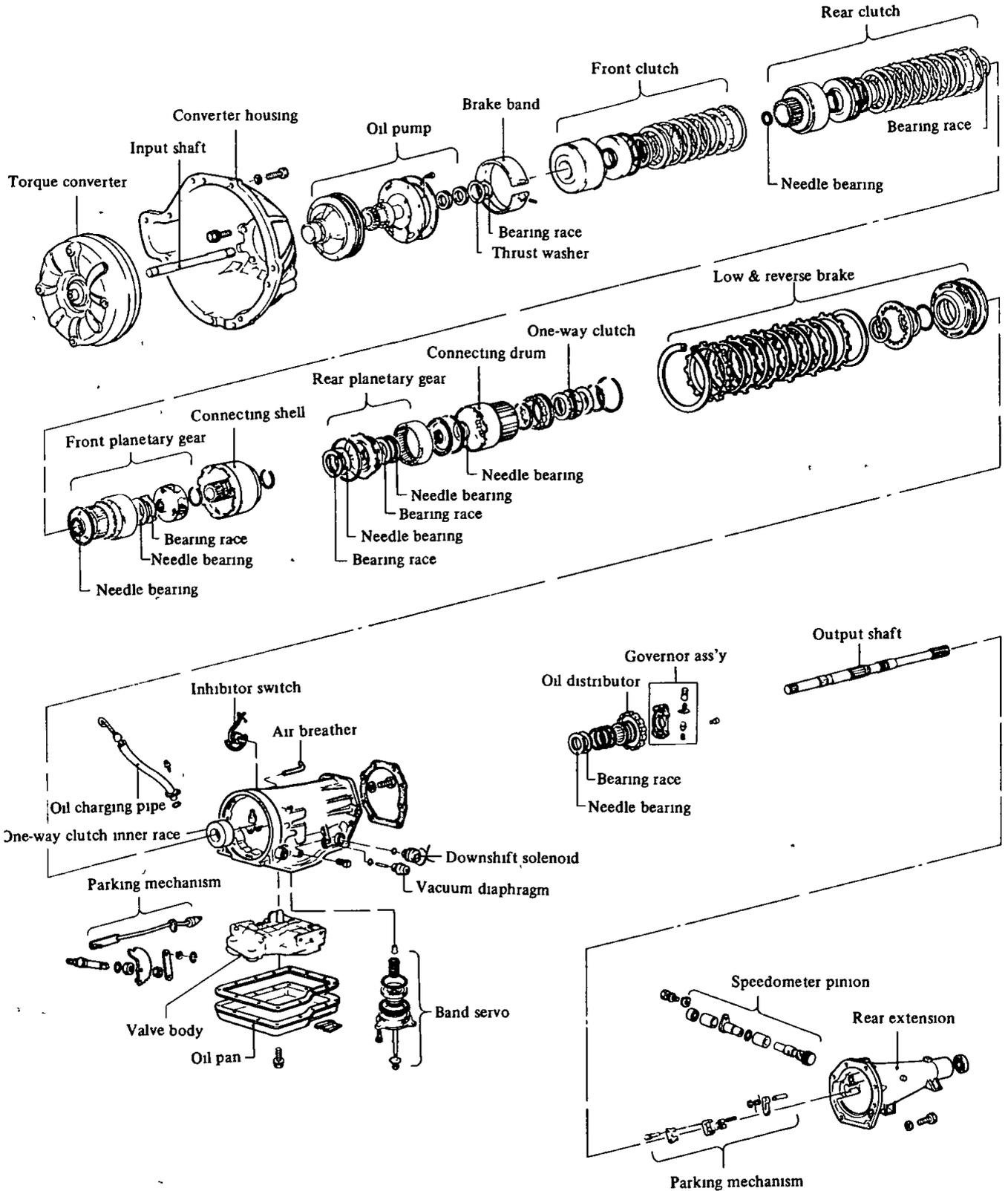
Turn back two turns after tightening



AT336

Fig AT-79 Tightening torque of bolts and nuts

Automatic Transmission



AT337

Fig AT-80 Components of automatic transmission

SERVICE NOTICE FOR DISASSEMBLY AND ASSEMBLY

1 It is advisable that repair operations be carried out in a dust-proof room

2 Due to the differences of the engine capacities, the specifications of component parts for each model's transmission may be different They do, however, have common adjustment and repair procedures as well as cleaning and inspection procedures, outlined hereinafter

3 During repair operations, refer to "Service Data and Specifications" section for the correct parts for each model

4 Before removing any of subassemblies, thoroughly clean the outside of the transmission to prevent dirt from entering the mechanical parts

5 Do not use a waste rag Use a nylon or paper cloth

6 After disassembling, wash all disassembled parts, and examine them to see if there are any worn, damaged or defective parts, and how they are affected Refer to "Service Data" for the extent of damage that justifies replacement

7 As a rule, packings, seals and similar parts once disassembled should be replaced with new ones

TORQUE CONVERTER

The torque converter is a welded construction and can not be disassembled

INSPECTION

1 Check torque converter for any sign of damage, bending, oil leak or deformation If necessary, replace

2 Remove rust from pilots and bosses completely

If torque converter oil is fouled or contaminated due to burnt clutch, flush the torque converter as follows

- (1) Drain oil in torque converter
- (2) Pour non-lead gasoline or kerosene into torque converter [approximately 0.5 liter (1 1/8 US pt, 3/4 Imp pt)]

(3) Blow air into torque converter and flush and drain out gasoline

(4) Fill torque converter with torque converter oil [approximately 0.5 liter (1 1/8 US pt, 3/4 Imp pt)]

(5) Again blow air into torque converter, and drain torque converter oil

TRANSMISSION

DISASSEMBLY

1 Drain oil from the end of rear extension Mount transmission on Transmission Case Stand ST07870000 or ST07860000 Remove oil pan See Figure AT-82

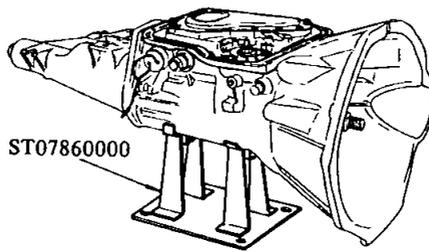
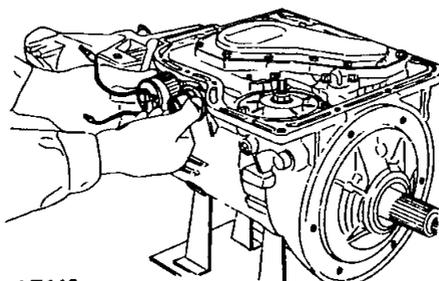


Fig AT-81 Removing oil pan

2 Remove bolts securing converter housing to transmission case Remove torque converter

3 Remove speedometer pinion sleeve bolt Withdraw pinion

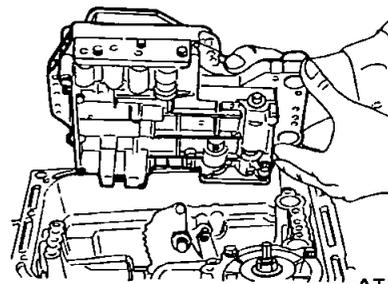
4 Remove downshift solenoid and vacuum diaphragm Do not leave diaphragm rod at this stage of disassembly Rod is assembled in top of vacuum diaphragm See Figure AT-82



AT119

Fig AT-82 Downshift solenoid and vacuum diaphragm

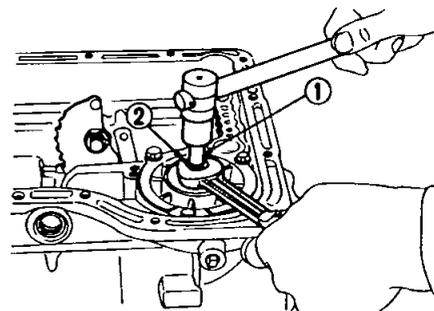
5 Remove bolts which hold valve body to transmission case See Figure AT-83



AT120

Fig AT-83 Removing valve body

6 Loosen lock nut (2) on piston stem (1) as shown in Figure AT-84 Then tighten piston stem in order to prevent front clutch drum from falling when oil pump is withdrawn

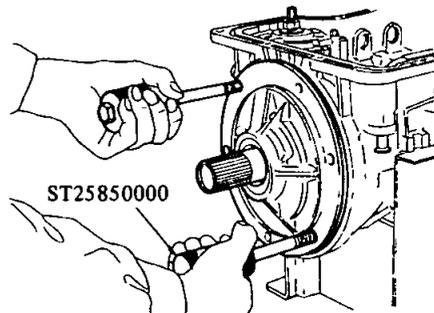


AT121

Fig AT-84 Loosening band servo

7 Pull out input shaft

8 Withdraw oil pump using Sliding Hammer ST25850000 Do not allow front clutch to come out of position and drop onto floor See Figure AT-85



AT122

Fig AT-85 Removing oil pump

9 Remove band strut This can be done by loosening piston stem further See Figure AT-86

Automatic Transmission

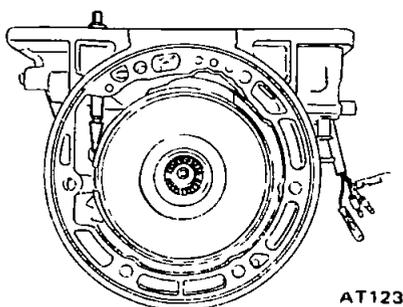


Fig AT-86 Removing band strut

10 Remove brake band, front clutch and rear clutch as an assembled unit

11 Remove connecting shell, rear clutch hub and front planetary carrier as a unit See Figure AT-87

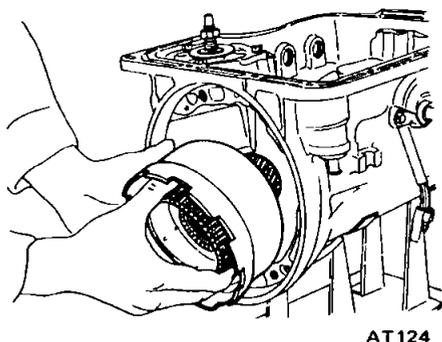


Fig AT-87 Removing connecting shell

12 With the aid of Snap Ring Remover HT69860000, pry snap ring off output shaft See Figure AT-88

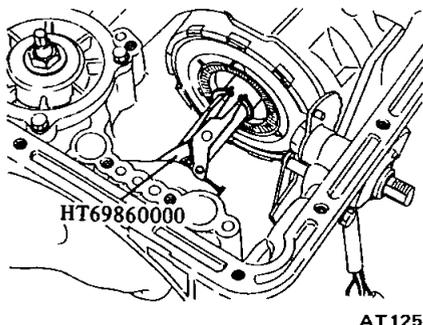


Fig AT-88 Removing snap ring

13 Remove connecting drum and inner gear of rear planetary carrier as an assembly See Figure AT-89

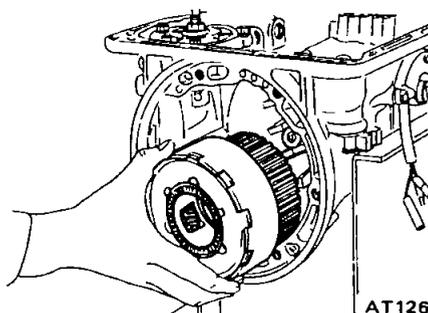


Fig AT-89 Removing connecting drum

14 Remove snap rings and then remove rear planetary carrier, internal gear, connecting drum, one-way clutch outer race and one-way clutch in that order

15 Remove rear extension by loosening securing bolts See Figure AT-90

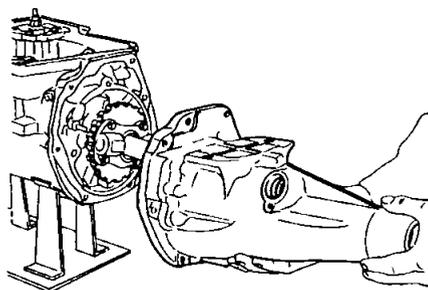


Fig AT-90 Removing rear extension

16 Pull out output shaft, remove oil distributor ② together with governor valve ① See Figure AT-91

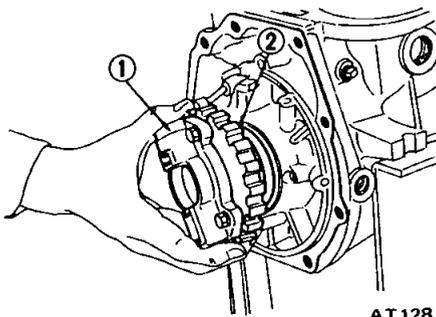


Fig AT-91 Removing governor and oil distributor

17 Pry off snap ring using a pair of pliers Remove retaining plate, drive plate, driven plate and dish plate in that order See Figure AT-92

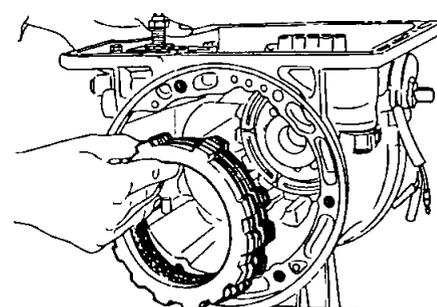


Fig AT-92 Removing drive and driven plates

18 Reaching through back side of transmission case, remove hex-head slotted bolts as shown in Figure AT-93 To do this, use Hex-head Extension ST25570001 (ST25570000) One-way clutch inner race, thrust washer, piston return spring and thrust spring ring can now be removed

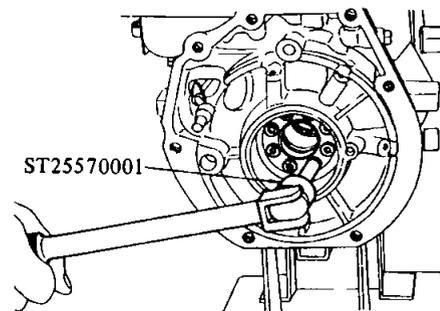


Fig AT-93 Removing hex-head slotted bolt

19 Blow out low and reverse brake piston by directing a jet of air into hole in cylinder See Figure AT-94

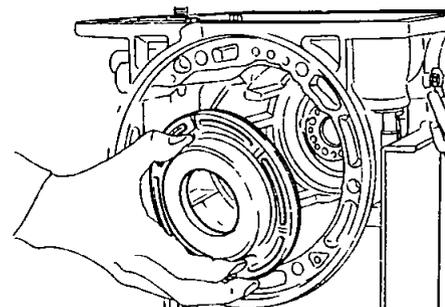
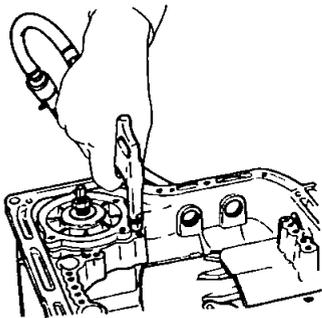


Fig AT-94 Removing piston

20 Remove band servo by loosening attaching bolts

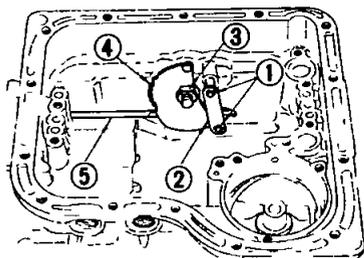
Note If difficulty is encountered in removing retainer, direct a jet of air toward release side as shown in Figure AT-95.



AT132

Fig AT-95 Removing band servo

21 Pry 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. See Figure AT-96.



AT133

Fig AT-96 Removing manual plate

22 Remove inhibitor switch and manual shaft by loosening two securing bolts.

INSPECTION

Torque converter housing, transmission case and rear extension

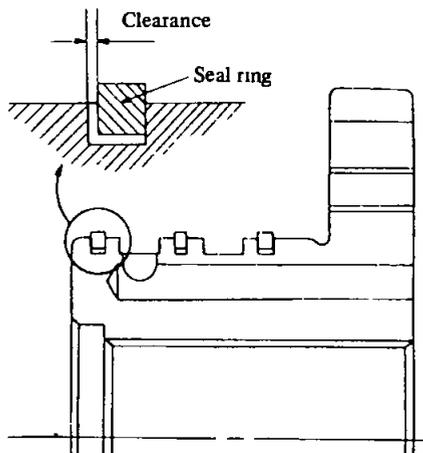
- 1 Check for damage or cracking, if necessary, replace.
- 2 Check for dents or score marks on mating surfaces. Repair as necessary.
- 3 Check for score marks or signs of burning on extension bushing, if necessary, replace.

Gaskets and O-ring

- 1 Always use new gaskets when the units are to be disassembled.
- 2 Check O-rings for burrs or cracking. If necessary, replace with new rings.

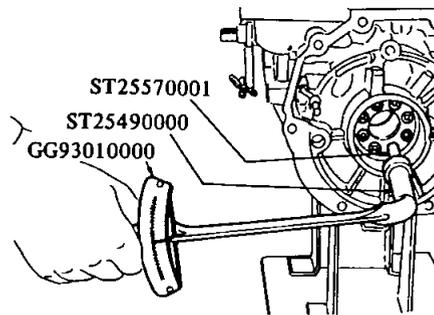
Oil distributor

- 1 Check for signs of wear on seal ring and ring groove, replacing with new ones if found worn beyond use.
- 2 Check that clearance between seal ring and ring groove is correct. If out of specification, replace whichever is worn beyond limits. Correct clearance is from 0.04 to 0.16 mm (0.0016 to 0.0063 in). See Figure AT-97.



AT134

Fig AT-97 Measuring seal ring to ring groove clearance

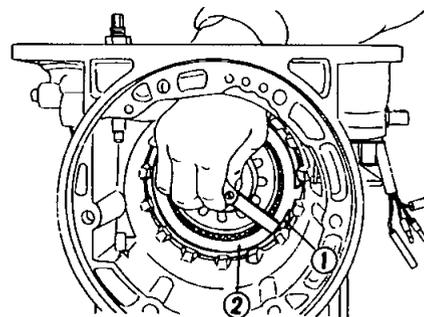


AT135

Fig AT-98 Installing one-way clutch inner race

2 After low and reverse brake has been assembled, measure the clearance between snap ring ① and retaining plate ②. Select proper thickness of retaining plate to give correct ring to plate clearance. See Figure AT-99.

- Low and reverse brake clearance
0.8 to 1.05 mm
(0.031 to 0.041 in)



AT136

Fig AT-99 Measuring ring to plate clearance

ASSEMBLY

Assembly is in reverse order of disassembly. However, observe the following assembly notes:

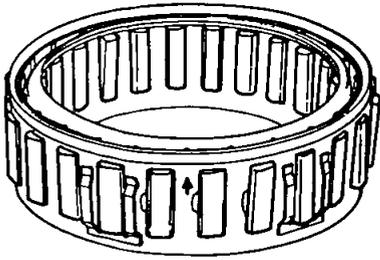
- 1 After installing piston of low and reverse brake, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race. Torque hex-head slotted bolt to 1.3 to 1.8 kg-m (9.4 to 13 ft-lb), using Hex-head Extension ST255710001 (ST25570000), Torque Wrench GG93010000 and Socket Extension ST25490000 (ST25512001). See Figure AT-98.

Available retaining plate

See page AT-71 for Specifications and Adjustment.

For inspection procedure for low and reverse brake, see page AT-52 for Assembly.

- 3 Install one-way clutch so that the arrow mark "→" is toward front of vehicle. It should be free to rotate only in clockwise direction. See Figure AT-100.



AT137

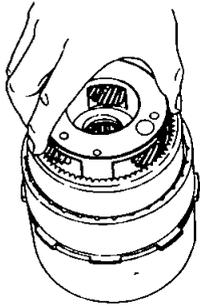
Fig AT-100 One-way clutch

4 After installing rear extension, torque attaching bolts to 2.0 to 2.5 kg-m (14 to 18 ft-lb). Place manual lever in "P" range and check to be sure that rear output shaft is securely blocked.

5 Tighten servo retainer temporarily at this stage of assembly.

6 Place rear clutch assembly with needle bearing on front assembly.

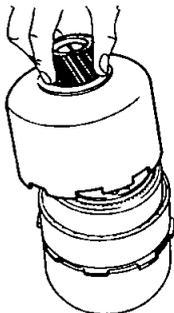
7 Install rear clutch hub and front planetary carrier as shown in Figure AT-101.



AT142

Fig AT-101 Installing planetary carrier

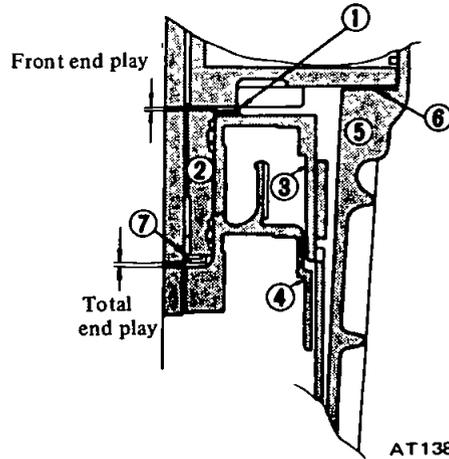
8 Assemble connecting shell and other parts up to front clutch in reverse order of disassembly.



AT143

Fig AT-102 Installing connecting shell

9 Adjust total end play and front end play as follows:

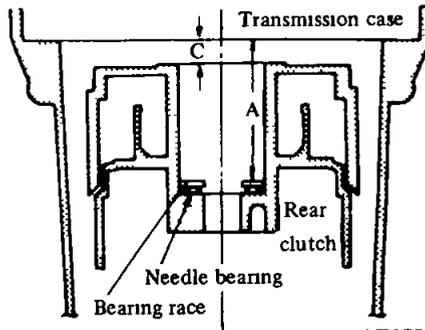


AT138

- | | |
|------------------------------|-------------------------------|
| 1 Front clutch thrust washer | 5 Transmission case |
| 2 Oil pump cover | 6 Oil pump gasket |
| 3 Front clutch | 7 Oil pump cover bearing race |
| 4 Rear clutch | |

Fig AT-103 End play

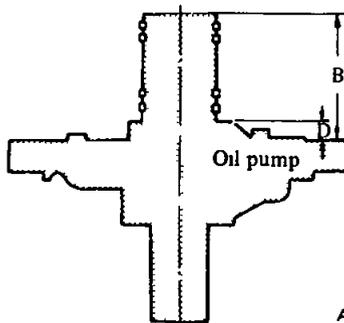
(1) Measure the distances "A" and "C" by vernier calipers as shown in Figure AT-104.



AT139

Fig AT-104 Measuring the distances "A" and "C"

(2) Measure the distances "B" and "D" of oil pump cover as shown in Figure AT-105.



AT140

Fig AT-105 Measuring the distances "B" and "D"

Adjustment of total end play

Select oil pump cover bearing race by calculating the following formula:

$$T_T = A - B + W$$

where,

- T_T Required thickness of oil pump cover bearing race mm (in)
 A Measured distance A mm (in)
 B Measured distance B mm (in)
 W Thickness of bearing race temporarily inserted mm (in)

Available oil pump cover bearing race

Thickness mm (in)
1.2 (0.047)
1.4 (0.055)
1.6 (0.063)
1.8 (0.071)
2.0 (0.079)
2.2 (0.087)

Specified total end play
 0.25 to 0.50 mm
 (0.010 to 0.020 in)

Adjustment of front end play

Select front clutch thrust washer by calculating the following formula:

$$T_F = C - D - 0.2 \text{ (mm)}$$

where,

- T_F Required thickness of front clutch thrust washer mm (in)
 C Measured distance C mm (in)
 D Measured distance D mm (in)

Available front clutch thrust washer

Thickness mm (in)
1.5 (0.059)
1.7 (0.067)
1.9 (0.075)
2.1 (0.083)
2.3 (0.091)
2.5 (0.098)
2.7 (0.106)

Automatic Transmission

Specified front end play
0.5 to 0.8 mm
(0.020 to 0.031 in)

Available diaphragm rod

Distance measured "L" mm (in)	Diaphragm rod length mm (in)
Under 25.55 (1.006)	29.0 (1.142)
25.65 to 26.05 (1.010 to 1.026)	29.5 (1.161)
26.15 to 26.55 (1.030 to 1.045)	30.0 (1.181)
26.65 to 27.05 (1.049 to 1.065)	30.5 (1.201)
Over 27.15 (1.069)	31.0 (1.220)

Notes:

- a. Correct thickness of bearing race and thrust washer is always the one which is nearest the calculated one
- b. Installed thickness of oil pump gasket is 0.4 mm (0.016 in).

10 Check to be sure that brake servo piston moves freely. For detailed procedure, refer to page AT-52 for Servo Piston. Use care to prevent piston from coming out of place during testing since servo retainer is not tightened at this point of assembly.

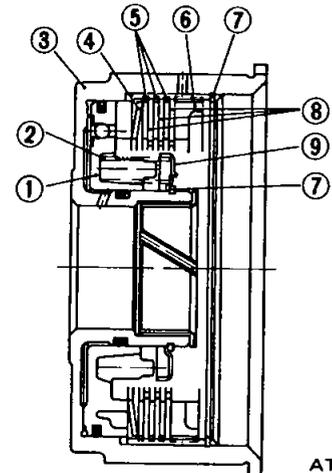
11 Make sure that brake band strut is correctly installed. Torque piston stem to 1.2 to 1.5 kg-m (8.7 to 11 ft-lb), back off two full turns and secure with lock nut. Lock nut tightening torque is 1.5 to 4.0 kg-m (11 to 29 ft-lb).

12. After inhibitor switch is installed, check to be sure that it operates properly in each range. For detailed procedure, refer to page AT-59 for Checking and Adjusting Inhibitor Switch.

13 Check the length "L" between case end to rod end of vacuum throttle valve fully pushed in. Then select adequate diaphragm rod of corresponding measured length. See Figure AT-106.

FRONT CLUTCH

Disassembly



- | | |
|---------------------|-------------------|
| 1 Piston | 6 Retaining plate |
| 2 Coil spring | 7 Snap ring |
| 3 Front clutch drum | 8 Drive plate |
| 4 Driven plate | 9 Spring retainer |
| 5 Dished plate | |

Fig AT-108 Sectional view of front clutch

1 Pry off snap ring ① with a suitable screwdriver or a pair of pliers. Remove a retaining plate ②, drive plate ③, driven plate ④ and dished plate ⑤ in the order listed, as shown in Figure AT-108.

2 Compress clutch springs, using Clutch Spring Compressor ST25420001 (or ST25420000). Remove snap ring ⑥ from spring retainer, using Snap Ring Remover ST25320001. See Figure AT-109.

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 restored in the unit in their proper positions. It is also very important to perform functional test whenever it is designated.

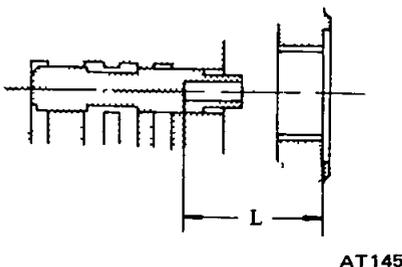
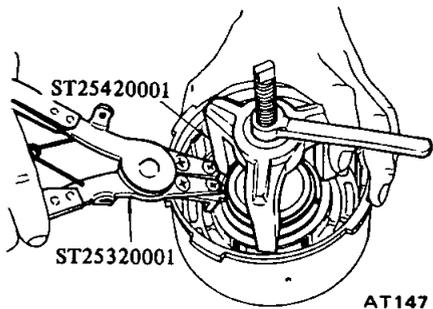


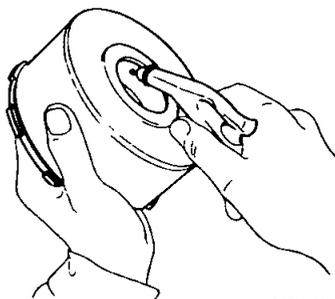
Fig AT-106 Measuring the distance "L"

Automatic Transmission



AT147
Fig AT-109 Removing snap ring

- 3 Take out spring retainer ⑦ and spring ⑧ See Figure AT-108
- 4 Blow out piston by directing a jet of air into hole in clutch drum See Figure AT-110



AT149
Fig AT-110 Blowing out piston

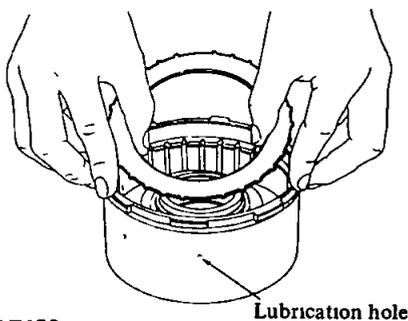
Inspection

- 1 Check for signs of wear or damage to clutch drive plate facing. If found worn or damaged excessively, discard. See "Service Data" for limits.
- 2 Check for wear on snap ring and for weakened or broken coil spring. If necessary, replace with new ones. Spring retainer should also be inspected for warpage.

Assembly

- 1 Assembly is in reverse the order of disassembly. Dip all parts in clean automatic transmission fluid before installing.
- 2 Line up driven plates so that stripped arcs are properly aligned, paying particular attention to the location of oil holes in clutch drum. See Figure AT-111.

Note The number of drive and driven plates varies with the type of vehicle. For detailed information, see "Service Data & Specifications".



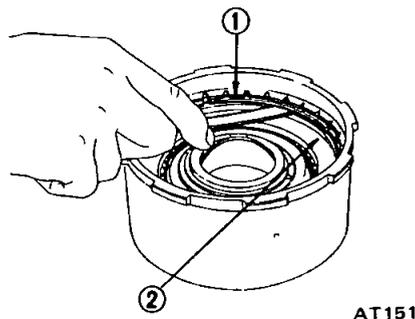
AT150
Fig AT-111 Inserting clutch plate

- 3 After clutch is assembled, make sure that clearance between snap ring ① and retaining plate ② is held within specified limits. If necessary, try with other plates having different thickness until correct clearance is obtained. See Figure AT-112.

Specified clearance
1.6 to 1.8 mm
(0.063 to 0.071 in)

Available retaining plate

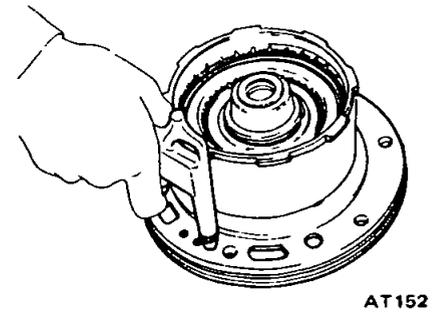
Thickness mm (in)
10.6 (0.417)
10.8 (0.425)
11.0 (0.433)
11.2 (0.441)
11.4 (0.449)
11.6 (0.457)



AT151
Fig AT-112 Measuring ring to plate clearance

4 Testing front clutch

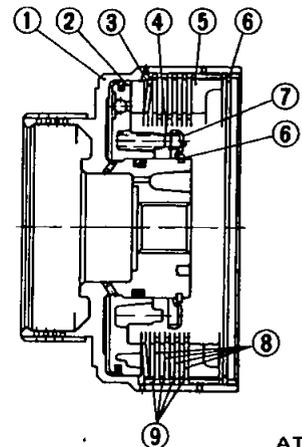
With front clutch assembled on oil pump cover, direct a jet of air into hole in clutch drum. See Figure AT-113.



AT152
Fig AT-113 Testing front clutch

REAR CLUTCH

Disassembly



- AT313
- | | |
|--------------------|-------------------|
| 1 Rear clutch drum | 6 Snap ring |
| 2 Piston | 7 Spring retainer |
| 3 Dished plate | 8 Drive plate |
| 4 Coil spring | 9 Driven plate |
| 5 Retaining plate | |

Fig AT-114 Sectional view of rear clutch

- 1 Take out snap ring ⑥, retaining plate ⑤, drive plate ⑧, driven plate ⑨ and dished plate ③. Same technique can be applied as in disassembling front clutch. See Figure AT-114.
- 2 Remove snap ring from coil spring retainer. See Figure AT-115.

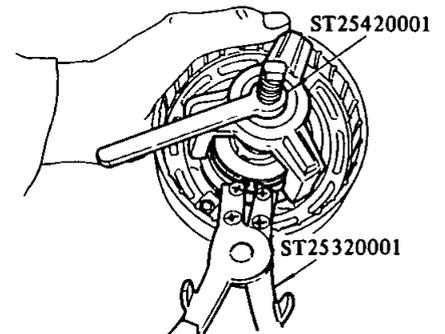
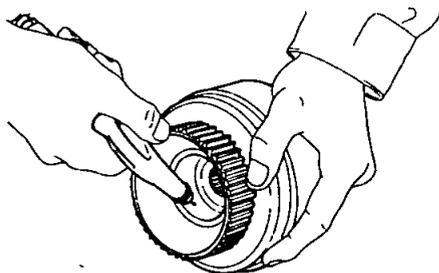


Fig AT-115 Removing snap ring

3 Blow out piston by directing a jet of air into hole in clutch drum See Figure AT-116



AT155

Fig AT-116 Blowing out piston

Inspection

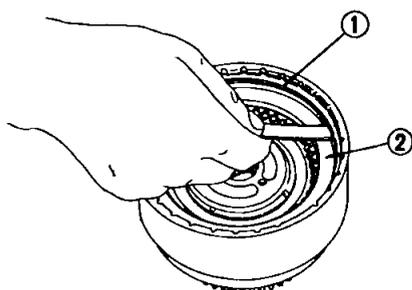
Refer to page AT-51 for Inspection of Front Clutch

Assembly

Assemble in reverse the order of disassembly Dip all parts in clean automatic transmission fluid before assembling Note that the number of drive and driven plates varies with type of vehicle For details, refer to "Service Data & Specifications"

1 After rear clutch is assembled, check to be sure that clearance between snap ring ① and retaining plate ② is held within prescribed tolerances See Figure AT-117

Specified clearance
10 to 15 mm
(0 039 to 0 059 in)



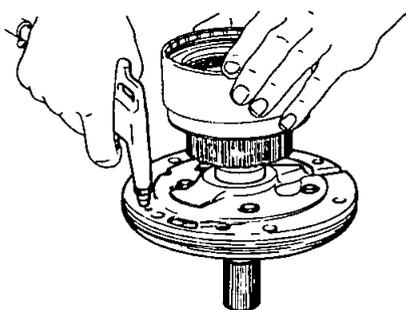
AT156

Fig AT-117 Measuring ring to plate clearance

2 Testing rear clutch

Install rear clutch on oil pump cover

Blow compressed air into oil hole to test for definite clutch operation as shown in Figure AT-118



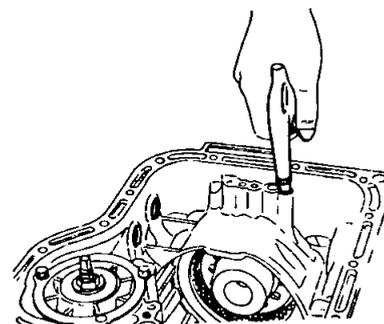
AT157

Fig AT-118 Testing rear clutch

3 Without disturbing the above setting, check to be sure that clearance between snap ring and retaining plate is within specified limits If necessary, use other plates of different thickness until correct clearance is obtained

Specified clearance
0 80 to 1 05 mm
(0 031 to 0 041 in)

4 Blow compressed air into oil hole in low & reverse brake to test for definite brake operation as shown in Figure AT-119



AT158

Fig AT-119 Testing low & reverse brake

LOW & REVERSE BRAKE

Disassembly

- 1 Follow steps as described in page AT-46 for Transmission Disassembly
- 2 Blow out piston by directing a jet of air into oil hole in clutch piston

Inspection

- 1 Check drive plate facing for wear or damage, if necessary, replace Refer to "Service Data & Specifications" for tolerances
- 2 Test piston return spring for weakness Discard if weakened beyond use
- 3 Replace faulty parts with new ones

Assembly

- 1 After low & reverse piston is installed, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race Using Hex-head Extension ST25570001 (ST25570000), torque hex-head slotted bolt to 1 3 to 1 8 kg-m (9 4 to 13 ft-lb)
- 2 Insert dished plate, driven plate, drive plate and retaining plate into transmission case in that order Install snap ring to secure the installation

Note The number of drive and driven plates varies with type of vehicle For detailed information, refer to "Service Data & Specifications"

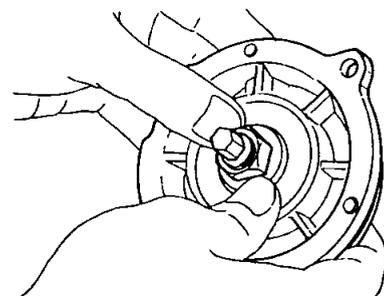
SERVO PISTON

Disassembly

- 1 Blow out piston by directing a jet of air into hole in release-side of piston
- 2 Remove servo piston return spring

Inspection

Check piston for wear, damage or other faults which might interfere with proper brake operation



AT159

Fig AT-120 Removing piston

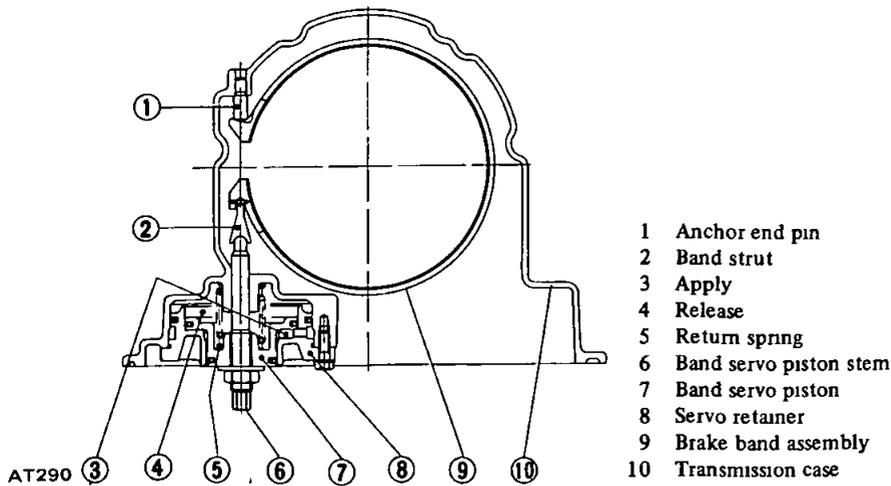
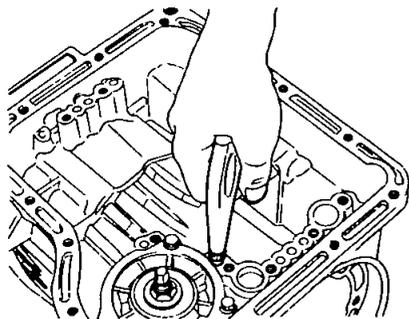


Fig AT-121 Sectional view of servo piston

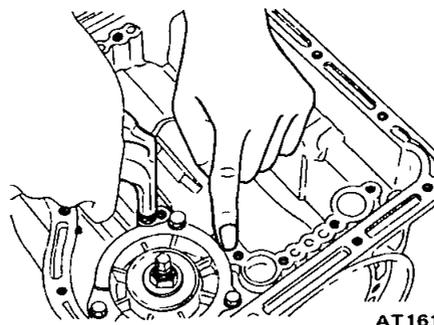
Assembly

- 1 Prior to assembly, dip all parts in clean automatic transmission fluid
Reverse disassembly procedure to assemble brake
- 2 Use extreme care to avoid damaging rubber ring when installing seal lace
- 3 Blow compressed air from apply-side of piston to test for definite piston operation as shown in Figure AT-122



AT160
Fig AT-122 Testing piston (Apply side)

- 4 With apply-side of piston plugged with thumb, blow compressed air into cylinder from release-side as shown in Figure AT-123. If retainer is raised a little, it is an indication that attaching bolts are loose, calling for retightening



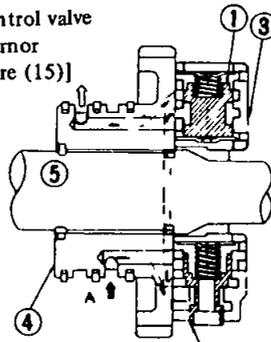
AT161
Fig AT-123 Testing piston (Release side)

GOVERNOR

Disassembly

- 1 Separate governor from oil distributor by unscrewing attaching bolts
- 2 To disassemble secondary governor, remove spring seat, spring and secondary governor valve from valve body in that order as shown in Figure AT-124

To control valve
[Governor pressure (15)]



From control valve
[Line pressure (1)]

- | | |
|-----------------------|-------------------|
| 1 Primary governor | 4 Oil distributor |
| 2 Secondary governor | 5 Output shaft |
| 3 Governor valve body | |

AT090
Fig AT-124 Testing secondary governor

- 3 If primary governor is to be disassembled for any purpose, remove spring seat, primary governor valve, spring and spring seat

Inspection

- 1 Check valve for faulty condition. Replace spring if found weakened beyond use. Faulty piston should also be replaced with a new one.
- 2 Examine to see if primary governor slides freely without binding.
- 3 To determine if secondary governor is in good condition, blow air under light pressure into hole at "A" and listen for noise like that of a model plane.

Assembly

Reverse disassembly procedure to assemble governor

Note Do not confuse primary governor with secondary governor. After installation, check that spring is not deflected.

OIL PUMP

Disassembly

- 1 Free pump cover from pump housing by removing attaching bolts
- 2 Take out inner and outer gears from pump housing

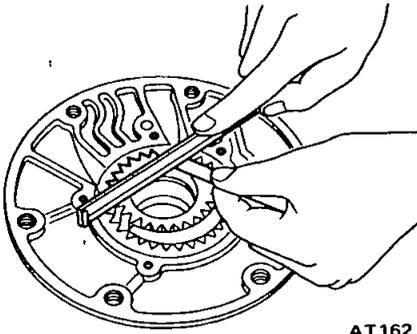
Inspection

- 1 Inspect for wear or damage to gear teeth. Replace rubber ring if found damaged beyond use.
- 2 Using a straight edge and feelers, measure pump and gear clearances as follows

- Clearance between inner (or outer) gear and pump cover. See Figure AT-125

Standard clearance
0.02 to 0.04 mm
(0.0008 to 0.0016 in)

[Replace if over 0.08 mm (0.0031 in)]

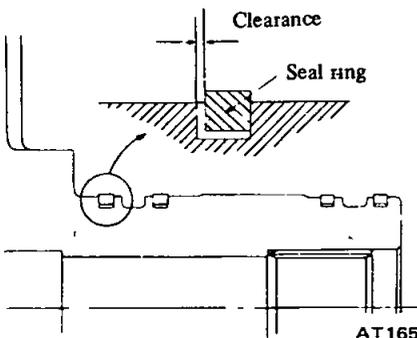


AT162

Fig AT-125 Measuring clearance

- Clearance between seal ring and ring groove See Figure AT-126

Standard clearance
0.04 to 0.16 mm
(0.0016 to 0.0063 in)

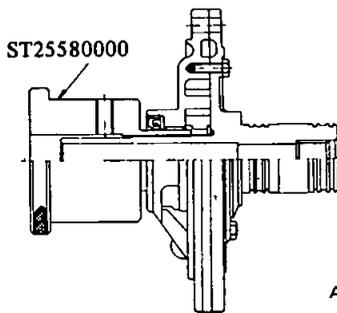


AT165

Fig AT-126 Measuring clearance

Assembly

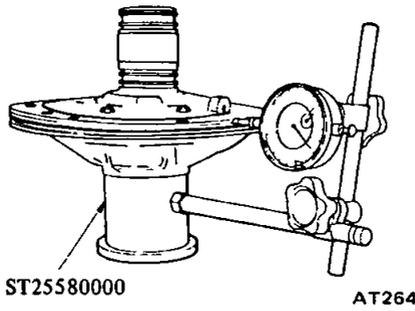
- 1 Set up pump housing with inner and outer pump gears on it
- 2 Using Oil Pump Assembling Gauge ST25580000, install pump cover to pump housing as shown in Figure AT-127



AT166

Fig AT-127 Centering oil pump

- 3 Temporarily tighten pump securing bolts
- 4 Set the runout of oil pump cover within 0.07 mm (0.0028 in) total indicator reading See Figure AT-128



AT264

Fig AT-128 Measuring runout

- 5 Tighten pump securing bolts to specified torque 0.6 to 0.8 kg-m (4.3 to 5.8 ft-lb)

Note Be sure to align converter housing securing bolt holes

- 6 Again, check the runout of oil pump cover

Note When former Oil Pump Assembling Gauge is to be used, make a screw hole in side of it

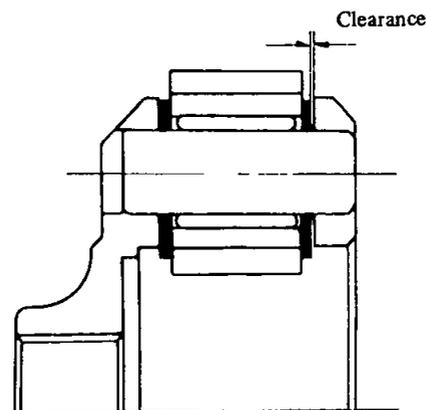
PLANETARY CARRIER

The planetary carrier cannot be divided into its individual components. If any part of component is faulty, replace the carrier as a unit.

Inspection

Check clearance between pinion washer and planetary carrier with a feeler. See Figure AT-129.

- Standard clearance
0.20 to 0.70 mm
(0.008 to 0.028 in)



AT167

Fig AT-129 Measuring pinion washer to carrier clearance

[Replace if over 0.80 mm (0.031 in)]

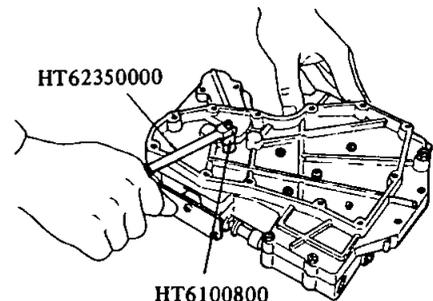
CONTROL VALVE

The control valve assembly consists of many precision parts and requires extreme care when it has to be removed and serviced. It is good practice to place parts in a part rack so that they can be reassembled in valve body in their proper positions. Added care should also be exercised to prevent springs and other small parts from being scattered and lost.

Before assembly, dip all parts in clean automatic transmission fluid and check to be certain that they are free of lint and other minute particles. If clutch or band is burnt or if oil becomes fouled, the control valve assembly should be disassembled and flushed.

Disassembly

- 1 Remove bolts and nuts which retain oil strainer. Bolts may be removed with a screwdriver, but it is recommended that Hexagon Wrench HT61000800 and Spinner Handle HT62350000 be used. See Figure AT-130.



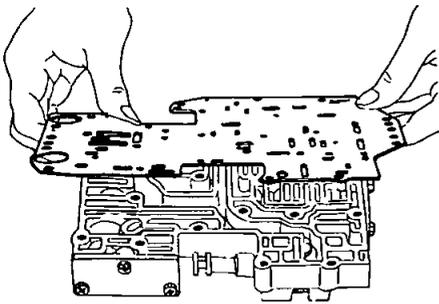
AT168

Fig AT-130 Disassembling valve body

- 2 Remove attaching bolts. With bolts removed, lower valve body, separate plate, and upper valve body are free for removal. See Figure AT-131.

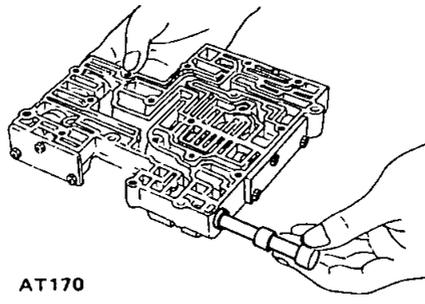
Note Do not allow orifice check valve and valve spring in lower valve body to be scattered and lost when removing separate plate.

Automatic Transmission



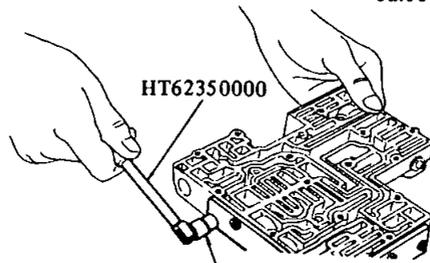
AT169

Fig AT-131 Removing separate plate



AT170

Fig AT-132 Removing manual valve



HT62350000

HT61000800

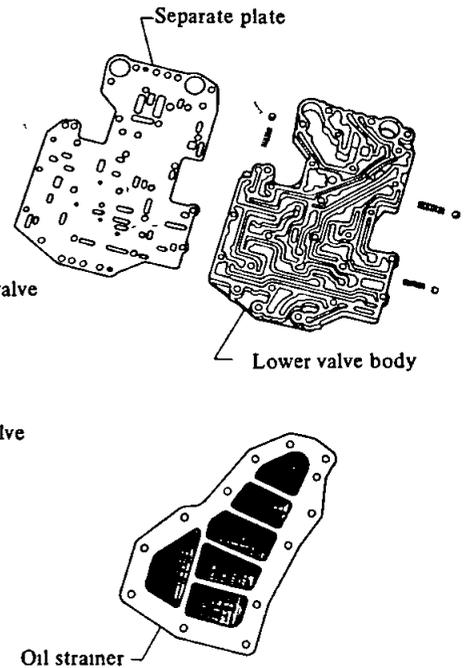
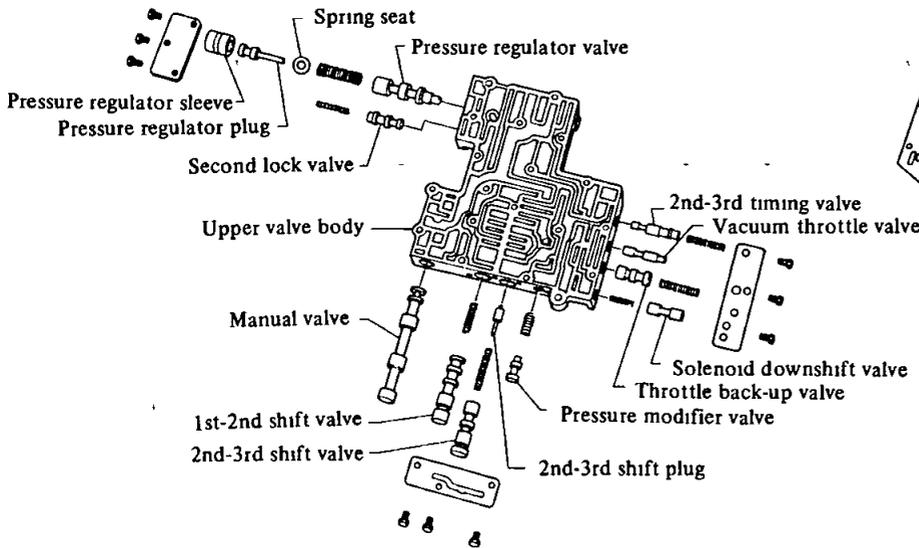
AT171

Fig AT-133 Removing side plate

Note Do not work it off with screwdrivers To avoid damaging machine screws, do not work it off with screwdriver

- 3 Pull out manual valve as shown in Figure AT-132
- 4 Remove side plate Take out "1st-2nd" shift valve, "2nd-3rd" shift valve, pressure modifier valve and three valve springs See Figure AT-133

- 5 Remove side plate, pull out pressure regulator valve, second lock valve, pressure regulator plug and two valve springs
- 6 Remove side-plate With side plate removed, solenoid downshift valve, throttle back-up valve, vacuum throttle valve, "2nd-3rd" timing valve and three valve springs are free for removal



ST338

Fig AT-134 Component parts of control valve

Inspection

- 1 Check valves for sign of burning and, if necessary, replace
- 2 Check to be certain that oil strainer is in good condition If found damaged in any manner, discard
- 3 Test valve springs for weakened

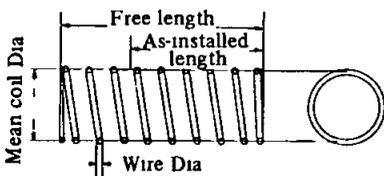
- 4 Examine for any sign of damage or score marks on separate plate If left unheeded, oil will bypass correct oil passages causing many types of abnormalities in the system

- 5 Check oil passages in valve body for sign of damage and other conditions which might interfere with proper valve operation
- 6 Check bolts for stripped threads Replace as required

Automatic Transmission

Valve spring chart

Valve spring	Wire dia mm (in)	Mean coil dia mm (in)	No of active coil	Free length mm (in)	Installed	
					Length mm (in)	Load kg (lb)
Manual detent	1.3 (0.0512)	6.0 (0.2362)	15.0	32.4 (1.276)	26.5 (1.043)	5.5 (12)
Pressure regulator	1.2 (0.0472)	10.5 (0.4134)	13.0	43.0 (1.693)	23.5 (0.925)	2.8 (6.2)
Pressure modifier	0.4 (0.0157)	8.0 (0.3150)	5.0	18.5 (0.728)	9.0 (0.3543)	0.1 (0.2)
1st-2nd shift	0.6 (0.0236)	6.0 (0.2362)	16.0	32.0 (1.260)	16.0 (0.630)	0.625 (1.4)
2nd-3rd shift	0.7 (0.0276)	6.2 (0.2441)	18.0	41.0 (1.614)	17.0 (0.669)	1.40 (3.1)
2nd-3rd timing	0.7 (0.0276)	5.5 (0.2165)	15.0	32.5 (1.280)	27.0 (1.063)	0.55 (1.2)
Throttle back-up	0.8 (0.0315)	6.5 (0.2559)	14.0	36.0 (1.417)	18.8 (0.740)	1.92 (4.2)
Solenoid downshift	0.55 (0.0217)	5.0 (0.1969)	12.0	22.0 (0.866)	12.5 (0.492)	0.60 (1.3)
Second lock	0.55 (0.0217)	5.0 (0.1969)	16.0	33.5 (1.319)	21.0 (0.827)	0.60 (1.3)
Throttle relief	0.9 (0.0354)	5.6 (0.2205)	14.0	26.8 (1.055)	19.0 (0.748)	2.19 (4.8)
Orifice check	0.2 (0.0079)	4.8 (0.1890)	15.0	21.5 (0.846)	11.5 (0.453)	0.01 (0.02)
Primary governor	0.45 (0.0177)	8.3 (0.3268)	5.0	21.8 (0.858)	7.5 (0.2953)	0.215 (0.5)
Secondary governor	0.7 (0.0276)	8.5 (0.3346)	5.5	25.1 (0.988)	10.5 (0.413)	1.10 (2.4)



AT172

Fig AT-135 Valve spring

2 Install side plates using Torque Driver ST25160000 and Hexagon Wrench HT61000800. See Figure AT-136.

Tightening torque
0.25 to 0.35 kg-m
(1.9 to 2.5 ft-lb)

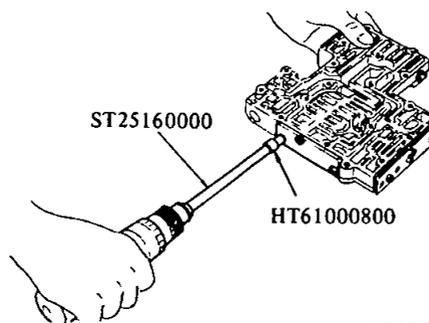
3 Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.

Note Install check valve and spring so that they are properly positioned in valve body. See Figure AT-138.

4 Install upper and lower valves. See Figure AT-137.

Tightening torque
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

Reamer bolt tightening torque
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)



AT173

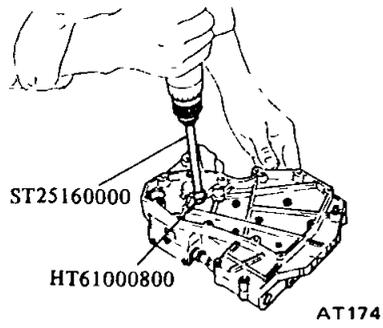
Fig AT-136 Installing side plate

Assembly

Assemble in reverse order of disassembly. However, observe the following assembly notes. Refer to "Valve Spring Chart" and illustration in assembling valve springs. Dip all parts in clean automatic transmission fluid before assembly. Tighten parts to specifications when designated.

1 Slide valve into valve body and be particularly careful that they are not forced in any way.

Automatic Transmission



- 5 Install oil strainer
- Tightening torque
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

Fig AT-137 Installing valve body

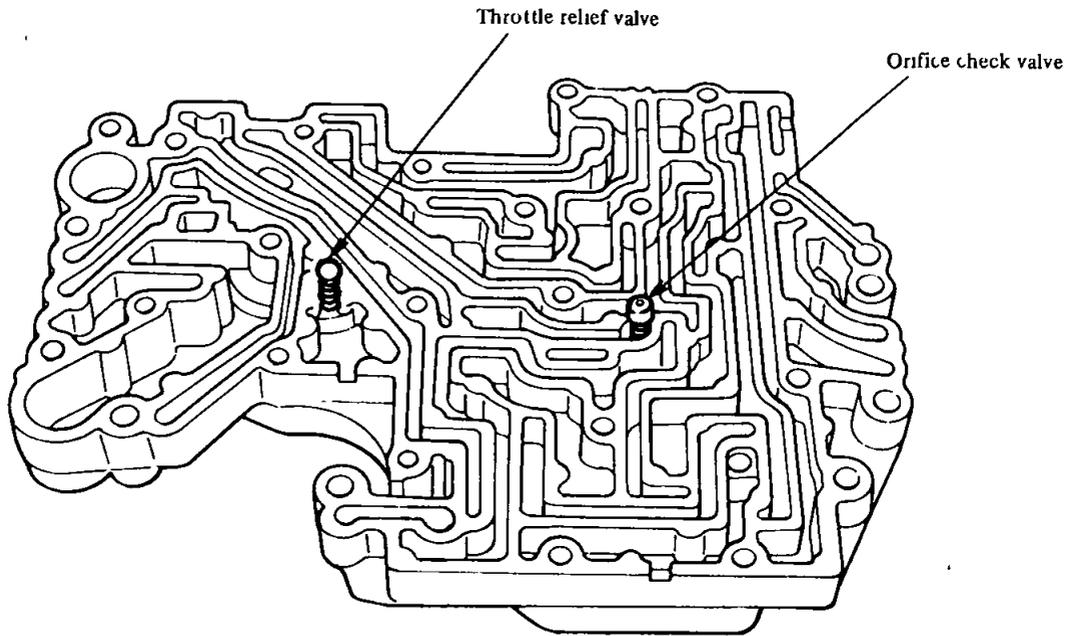


Fig AT-138 Position of check valve and spring

TROUBLE DIAGNOSIS AND ADJUSTMENT

CONTENTS

INSPECTION AND ADJUSTMENT BEFORE TROUBLE DIAGNOSIS	AT-58	ROAD TEST	AT-61
TESTING INSTRUMENT FOR INSPECTION	AT-58	CHECKING SPEED CHANGING CONDITION	AT-61
CHECKING OIL LEVEL	AT-58	CAR SPEED AT GEAR SHIFT	AT-61
INSPECTION AND REPAIR OF OIL LEAKAGE	AT-59	CHECKING ITEMS DURING SPEED CHANGE	AT-62
CHECKING ENGINE IDLING REVOLUTION	AT-59	SHIFT SCHEDULE	AT-62
CHECKING AND ADJUSTING KICKDOWN SWITCH AND DOWNSHIFT SOLENOID	AT-59	LINE PRESSURE TEST	AT-63
INSPECTION AND ADJUSTMENT OF MANUAL LINKAGE	AT-59	LINE PRESSURE (governor feed pressure)	AT-64
CHECKING AND ADJUSTING INHIBITOR SWITCH	AT-59	JUDGEMENT IN MEASURING LINE PRESSURE	AT-64
STALL TEST	AT-60	TROUBLE SHOOTING CHART	AT-64
STALL TEST PROCEDURES	AT-60	INSPECTING ITEMS	AT-64
JUDGEMENT	AT-60	TROUBLE SHOOTING CHART FOR 3N71B AUTOMATIC TRANSMISSION	AT-65
		TROUBLE SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION	AT-68

Since most automatic transmission troubles can be repaired by simple adjustment, do not disassemble immediately

Firstly inspect and adjust the automatic transmission in place utilizing the "Trouble Shooting Chart"

If the trouble can not be solved by this procedure, remove and disassemble the automatic transmission. It is advisable to check, overhaul and repair each part in the order listed in the "Trouble Shooting Chart"

1 In the "Trouble Shooting Chart" the diagnosis items are arranged according to difficulty from easy to difficult, therefore please follow these items. The transmission should not be removed, unless necessary

2 Tests and adjustments should be made on the basis of standard values and the data should be recorded

INSPECTION AND ADJUSTMENT BEFORE TROUBLE DIAGNOSIS

TESTING INSTRUMENT FOR INSPECTION

- 1 Engine tachometer
- 2 Vacuum gauge

3 Oil pressure gauge

It is convenient to install these instruments in a way that allows measurements to be made from the driver's seat

CHECKING OIL LEVEL

In checking the automatic transmission the oil level and the condition of oil around the oil level gauge should be examined every 5,000 km (3,000 miles). This is an easy and effective trouble shooting procedure since some changes in oil condition are often linked with developed troubles

For instance

Lack of oil causes faulty operation by making the clutches and brakes slip, resulting in severe wear

This is because the oil pump sucks air causing oil foaming, thus rapidly deteriorating the oil quality and producing sludge and varnish

Excessive oil is also bad because of oil foaming caused by the gears stirring up the oil. During high speed driving excessive oil in the transmission often blows out from the breather

Measuring oil level

To check the fluid level, start the

engine and run it until normal operating temperatures [oil temperature 50 to 80°C (122 to 176°F). Approximately ten-minute of operation will raise the temperature to this range] and engine idling conditions are stabilized. Then, apply the brakes and move the transmission shift lever through all drive positions and place it in park "P" position. In this inspection, the car must be placed on a level surface

The amount of the oil varies with the temperature. As a rule the oil level must be measured after its temperature becomes sufficiently high

1 Fill the oil to the line "H". The difference of capacities between both "H" and "L" is approximately 0.4 liter ($\frac{1}{4}$ US pt, $\frac{1}{2}$ Imp pt) and, therefore, do not fill beyond the line "H"

2 When topping-up and changing oil, care should be taken to prevent mixing the oil with dust and water

Inspection oil condition

The condition of oil sticking to the level gauge indicates whether to overhaul and repair the transmission or look for the faulty part

If the oil has deteriorated to a varnish-like quality, it causes the con-

Automatic Transmission

trol valve to stick. Blackened oil indicates a burned clutch, brake band, etc. In these cases, the transmission must be replaced.

Notes

- a. In checking oil level, use special paper cloth to handle the level gauge and be careful not to let the scraps of paper and cloth stick to the gauge.
- b. Insert the gauge fully and take it out quickly before splashing oil adheres to the gauge. Then observe the level.
- c. Use automatic transmission fluid having "DEXRON" identifications only in the 3N71B automatic transmission.
- d. Pay attention because the oil to be used differs from that used in the Nissan Full Automatic Transmission 3N71A. Never mix the oils.

INSPECTION AND REPAIR OF OIL LEAKAGE

When oil leakage takes place, the portion near the leakage is covered with oil, presenting difficulty in detecting the spot. Therefore, the places where oil seals and gaskets are equipped are enumerated below.

- 1 Converter housing
 - Rubber ring of oil pump housing
 - Oil seal of oil pump housing
 - Oil seal of engine crankshaft
- 2 Transmission and rear extension
 - Junction of transmission and rear extension
 - Oil cooler tube or oil tube connectors
 - Oil pan
 - Oil-pressure inspection holes (Refer to Figure AT-144)
 - Mounting portion of vacuum diaphragm and downshift solenoid
 - Breather and oil charging pipe
 - Speedometer pinion sleeve
 - Oil seal of rear extension

To exactly locate the place of oil leakage, proceed as follows.

- Place the vehicle in a pit, and by sampling the leaked oil, determine if it is the torque converter oil. The torque converter oil has a color like

red wine, so it is easily distinguished from engine oil or gear oil.

- Wipe off the leaking oil and dust and detect the spot of oil leakage. Use nonflammable organic solvent such as carbon tetrachloride for wiping.
- Raise the oil temperature by operating the engine and shift the lever to "D" to increase the oil pressure. The spot of oil leakage will then be found more easily.

Note As oil leakage from the breather does not take place except when running at high speed, it is impossible to locate this leakage with vehicle stationary.

CHECKING ENGINE IDLING REVOLUTION

The engine idling revolution should be properly adjusted.

If the engine revolution is too low, the engine does not operate smoothly, and if too high, a strong shock or creep develops when changing over from "N" to "D" or "R".

CHECKING AND ADJUSTING KICKDOWN SWITCH AND DOWNSHIFT SOLENOID

When the kickdown operation is not made properly or the speed changing point is too high, check the kickdown switch, downshift solenoid, and wiring between them. When the ignition key is positioned at the 1st stage and the accelerator pedal is depressed deeply, the switch contact should be closed and the solenoid should click. If it does not click, it indicates a fault. Then check each part with the testing instruments. See Figure AT-139.

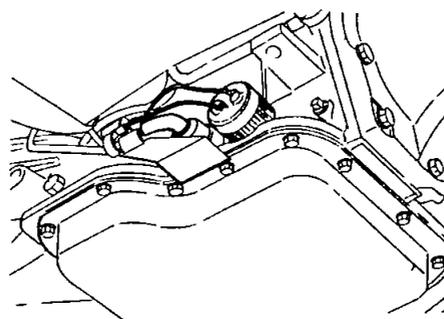


Fig AT-139 Downshift solenoid

Note Watch for oil leakage from transmission case.

INSPECTION AND ADJUSTMENT OF MANUAL LINKAGE

The adjustment of manual linkage is equally important as "Inspection of Oil Level" for the automatic transmission. Therefore, great care should be exercised because incorrect adjustment will result in the breakdown of the transmission.

Inspection

Pull the selector lever toward you and turn it as far as "P" to "1" range, where clicks will be felt by hand. This is the detent of manual valve in the valve body, and indicates the correct position of the lever.

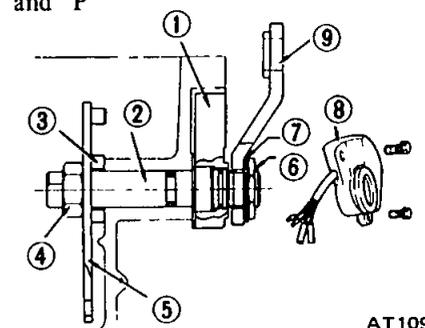
Inspect whether the pointer of selector dial corresponds to this point, and also whether the lever comes in alignment with the stepping of position plate when it is released.

Adjustment

This procedure can be accomplished by referring to page AT-40 for Removal and Installation.

CHECKING AND ADJUSTING INHIBITOR SWITCH

The inhibitor switch lights the reverse lamp in the range "R" of the transmission operation and also rotates the starter motor in the ranges "N" and "P".



- | | |
|--------------------|----------------------|
| 1 Inhibitor switch | 6 Nut |
| 2 Manual shaft | 7 Washer |
| 3 Washer | 8 Inhibitor switch |
| 4 Nut | 9 Range select lever |
| 5 Manual plate | |

Fig AT-140 Construction of inhibitor switch

Check whether the reverse lamp and the starter motor operate normally in these ranges. If there is any problem, first check the linkage. If no fault is found in the linkage, check the inhibitor switch.

Separate the manual lever from the remote control selector rod and turn the range select lever to "N".

Note In the position "N" the slot of the manual shaft is vertical.

Using a tester, check the two black-yellow (BY) wires from the inhibitor switch in the ranges "N" and "P" and the two red-black (RB) wires in the range "R" for continuity. Turn range select lever in both directions from each lever set position and check each continuity range. It is normal if the electricity is on while the lever is within an angle of about 3° on both sides from each lever set line. However, if its continuity range is obviously unequal on both sides, adjustment is required.

If any malfunction is found, unscrew the fastening nut of the range selector lever and two fastening bolts of the switch body and then remove the machine screw under the switch body. Adjust the manual shaft correctly to the position "N" by means of the selector lever. (When the slot of the shaft becomes vertical, the detent works to position the shaft correctly with a clicking sound.)

Move the switch slightly aside so that the screw hole will be aligned with the pin hole of the internal rotor combined with the manual shaft and check their alignment by inserting a 1.5 mm (0.0591 in) diameter pin into the holes. If the alignment is correct, fasten the switch body with the bolts, pull out the pin, tighten up the screw in the hole, and fasten the selector lever as before. Check the continuity again with the tester. If the malfunction still remains, replace the inhibitor switch.

2 Secure the front and rear wheels with chocks and apply the hand brake. Be sure to depress the brake pedal firmly with the left foot before depressing the accelerator pedal.

3 Throw the selector lever into the range "D".

4 Slowly depress the accelerator pedal until the throttle valve is fully opened. Quickly read and record the engine revolution when the engine begins to rotate steadily and then release the accelerator pedal.

5 Shift the selector lever to "N" and operate the engine at approximately 1,200 rpm for more than one minute to cool down the torque converter oil and coolant.

6 Make similar stall tests in ranges "2", "1" and "R".

Note The stall test operation as specified in item (4) should be made within five seconds. If it takes too long, the oil deteriorates and the clutches, brake and band are adversely affected. Sufficient cooling time should be given between each test for the four ranges "D", "2", "1" and "R".

STALL TEST

The purpose of this test is to check the transmission and engine for trouble by measuring the maximum numbers of revolutions of the engine while vehicle is held in a stalled condition. The carburetor is in full throttle operation with the selector lever in ranges "D", "2" and "1" respectively. Compare the measured results with the standard values.

Components to be tested and test items

- 1 Clutches, brake and band in transmission for slipping
- 2 Torque converter for proper functioning
- 3 Engine for overall properly

STALL TEST PROCEDURES

Before testing, check the engine oil and torque converter oil, warm up the engine cooling water to suitable temperature by running at 1,200 rpm with the selector lever in the range "P" for several minutes. Warm up the torque converter oil to suitable temperature [60 to 100°C (140 to 212°F)].

1 Mount the engine tachometer at a location that allows good visibility from the driver's seat and put a mark on specified revolutions on the meter.

JUDGEMENT

1 High stall revolution more than standard revolution

If the engine revolution in stall condition is higher than the standard values, it indicates that one or more clutches in the transmission are slipping and, therefore, no further test is required.

For the following abnormalities, the respective causes are presumed.

- High rpm in all ranges Low line pressure
- High rpm in "D", "2" and "1" and normal rpm in "R" Rear clutch slipping
- High rpm in "D" and "2" and normal rpm in "1" One-way clutch slipping
- High rpm in "R" only Front clutch or low and reverse brake slipping

To determine which is slipping, front clutch or low and reverse brake, a road test is needed.

If, while coasting, after starting with the lever in "1" range, engine braking does not work properly, the low and reverse brake is slipping. Otherwise, the front clutch is slipping.

Slipping of the band brake is difficult to ascertain. However, if it occurs with the lever in "2" range, engine revolution increases up to the same level as in "1st" range. It is impossible to check it in the stall test.

2 Standard stall revolution

If the engine revolution in stall condition is within the standard values, the control elements are normally operating in the ranges "D", "2", "1" and "R".

Also, the engine and one-way clutch of the torque converter are normal in performance and operation.

The one-way clutch of the torque converter, however, sometimes sticks. This is determined in the road test.

3 Lower stall revolution than standard revolution

If the engine revolution in stall condition is lower than the standard values, it indicates that the engine is in abnormal condition or the torque converter's one-way clutch is slipping.

4 Others

(1) If the accelerating performance is poor until vehicle speed of approximately 50 km/h (30 MPH) is attained and then normal beyond that speed, it can be judged that the torque converter's one-way clutch is slipping.

(2) If the torque converter's one-way clutch sticks, vehicle speed can not exceed approximately 80 km/h (50 MPH) in the road test. In such a case, the torque converter oil temperature rises abnormally and so special care is required.

(3) If the transmission does not operate properly at all vehicle speeds, it indicates poor engine performance.

ROAD TEST

An accurate knowledge of the automatic transmission is required for an exact diagnosis.

It is recommended that a diagnosis guide chart with the standard vehicle speeds for each stage of the up- and downshiftings be prepared. Measured vehicle speeds are to be filled in the adjoining column after each testing.

Also it is advisable to mount a stopper for positioning the throttle opening.

CHECKING SPEED CHANGING CONDITION

The driver's feeling during gear changes should also be checked attentively.

1 A sharp shock or unsmoothness is felt during a gear change.

2 A gear change is made with a long and dragging feeling.

These indicate that the throttle pressure is too low or some valve connected to the throttle is faulty.

CAR SPEED AT GEAR SHIFT

Throttle opening (-mmHg)	Gear shift	Propeller shaft revolution rpm
Kickdown (0)	D ₁ → D ₂	1,840 to 2,340
	D ₂ → D ₃	3,340 to 3,840
	D ₃ → D ₂	3,460 to 2,960
	D ₂ → D ₁	1,790 to 1,290
Half throttle (200)	D ₁ → D ₂	330 to 830
	D ₂ → D ₃	1,720 to 2,220
	D ₃ → D ₂ or D ₃ → D ₁	1,350 to 850
	D ₂ → D ₁	700 Max
	Full throttle (0)	i ₂ → i ₁ *
Minimum throttle (450)	i ₂ → i ₁ *	1,860 to 1,360

* Reduce the speed by shifting to "1" range from "D" range (output shaft 2,000 rpm)

Note Car speed can be calculated by the following formula,

$$V = \frac{2 \times \pi \times r \times N_p \times 60}{R_F \times 1,000}$$

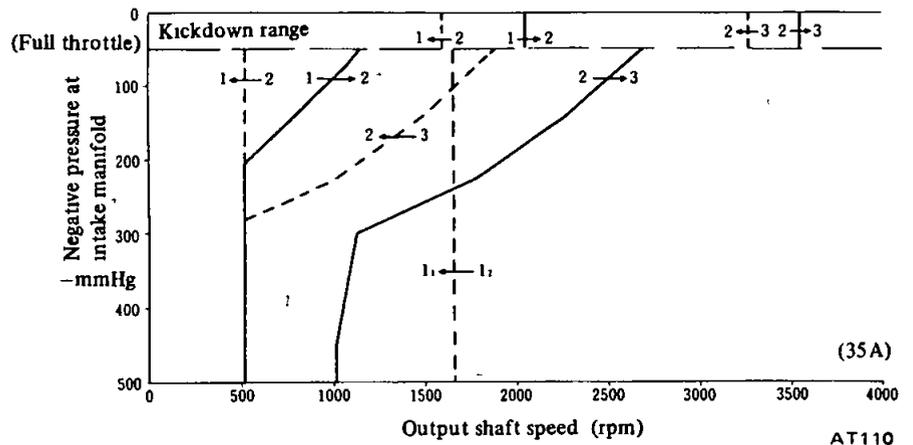
where, V = Car speed (km/h)
 N_p = Propeller shaft revolution (rpm)
 R_F = Final gear ratio
 r = Tire effective radius (m)
 π = The ratio of circumference of a circle to its diameter 3 14

CHECKING ITEMS DURING SPEED CHANGE

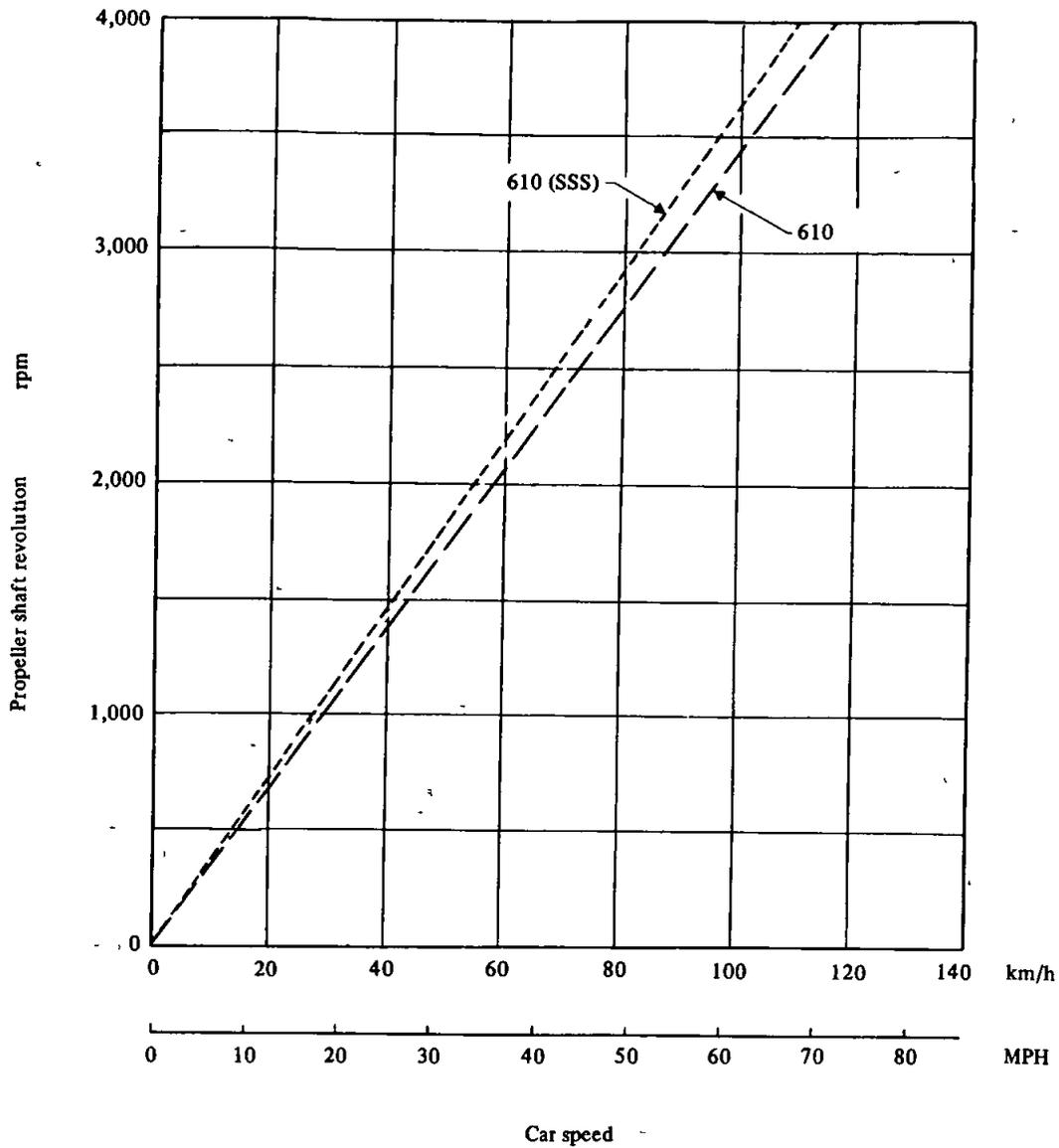
1. In "D" range, gear changes, $D_1 \rightarrow D_2 \rightarrow D_3$ are effected. In "R" range, the speed does not increase.
2. The kickdown operates properly.
3. By moving the lever from "D" to "1", gear changes $D_3 \rightarrow 2(1_2) \rightarrow 1_1$ are effected. In the ranges "1₂" and "1₁", the engine braking works properly.
4. In "1", the speed does not increase.
5. Should be quickly fixed at "2" range.
6. In "P", vehicle can be parked properly.

If any malfunction occurs in second gear during the road test, that is, if vehicle shakes, drags or slings while shifting up from "D₁", directly to "D₃" or in shifting up from "D₁" to "D₂", the brake band should be adjusted. If these problems remain after the brake band is adjusted, check the servo piston seal for oil leakage.

SHIFT SCHEDULE



Car speed-propeller shaft revolution chart (Approximate figures)



AT343
Fig AT-143 Car speed — Propeller shaft revolution chart

LINE PRESSURE TEST

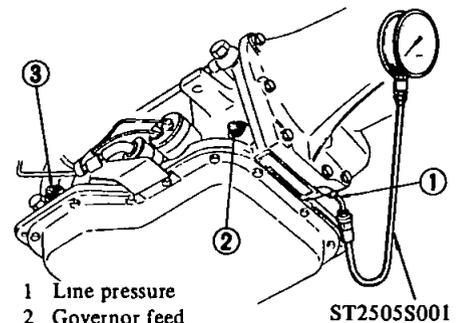
When any slipping occurs in clutch or brake, or the feeling during a speed change is not correct, the line pressure must be checked

Measuring line pressure is done by a pressure gauge attached to two pressure measuring holes after removing blind plugs located at transmission

case See Figure AT-144

The line pressure measurement is begun at idling and taken step by step by enlarging the throttle opening

- 1 A sharp shock in upshifting or too high changing speeds are caused mostly by too high throttle pressure
- 2 Slipping or incapability of operation is mostly due to oil pressure leakage within the gear trains or spool valve



- 1 Line pressure
- 2 Governor feed
- 3 Servo release pressure

AT113
Fig AT-144 Measuring line pressure

Automatic Transmission

LINE PRESSURE (governor feed pressure)

Range	Throttle opening Unit –mmHg		At cut back point [under approximately 15 km/h (9 MPH)] Unit kg/cm ² (psi)	After cut back [over approximately 35 km/h (22 MPH)] Unit kg/cm ² (psi)
	“D”	Full throttle	0	9.4 to 11.0 (134 to 156)
Minimum throttle		450	3.0 to 4.0 (43 to 57)	3.0 to 4.0 (43 to 57)
“2”	Full throttle	0	10.0 to 12.0 (142 to 171)	5.5 to 7.0 (78 to 100)
	Minimum throttle	450	6.0 to 12.0 (85 to 171)	5.5 to 7.0 (78 to 100)
“R”	Full throttle	0	14.0 to 16.0 (199 to 228)	14.0 to 16.0 (199 to 228)
	Minimum throttle	450	3.0 to 5.5 (43 to 78)	3.0 to 5.5 (43 to 78)

- Notes a The line pressure during idling corresponds to the oil pressure before cut down at minimum throttle
b The oil pressure “After cut back” means that after the pressure modifier valve has operated

JUDGEMENT IN MEASURING LINE PRESSURE

1 Low idling line pressure in the ranges “D”, “2”, “1”, “R” and “P”

This can be attributed to trouble in the pressure supply system or too low output of power caused by

- (1) A worn oil pump
- (2) An oil pressure leak in the oil pump, valve body or case
- (3) A sticking regulator valve

2 Low idling, line pressure in certain ranges only

This is presumably caused by an oil leak in the devices or circuits connected to the relevant ranges

- (1) When there is an oil leak in the rear clutch and governor, the line pressure in “D”, “2” and “1” are low but the pressure is normal in “R”
- (2) When an oil leak occurs in the low and reverse brake circuit, the line pressure in “R” and “P” are low but the pressure is normal in “D”, “2” and “1”

3 High idling line pressure

This is presumably caused by an increased vacuum throttle pressure owing to a leak in the vacuum tube or diaphragm or by an increased line pressure due to a sticking regulator valve

Vacuum leakage is checked by directly measuring the negative pressure after removing the vacuum pipe

A puncture of the vacuum diaphragm can be easily ascertained because the torque converter oil is absorbed into the engine and the exhaust pipe emits white smoke

4 Items to be checked when the line pressure is increasing

In this check, the line pressure should be measured with vacuums of 450 mmHg and 0 mmHg in accordance with the stall test procedure

(1) If the line pressure do not increase despite the vacuum decrease, check whether the vacuum rod is incorporated

(2) If the line pressure do not meet the standard, it is caused mostly by a sticking pressure regulating valve, pressure regulating valve plug, or amplifier

TROUBLE SHOOTING CHART

INSPECTING ITEMS

1 Inspection with automatic transmission on vehicle

- A Oil level
- B Range select linkage
- C Inhibitor switch and wiring
- D Vacuum diaphragm and piping
- E Downshift solenoid, kickdown switch and wiring
- F Engine idling rpm
- G Oil pressure (throttle)
- H Engine stall rpm
- I Rear lubrication
- J Control valve (manual)
- K Governor valve
- L Band servo
- M Transmission air check
- N Oil quantity
- O Ignition switch and starter motor
- P Engine adjustment and brake inspection

2 Inspection after inspecting automatic transmission on vehicle

- m Rear clutch
- n Front clutch
- q Band brake
- r Low and reverse brake
- s Oil pump
- t Leakage of oil passage
- u One-way clutch of torque converter
- v One-way clutch of transmission
- w Front clutch check ball
- x Parking linkage
- y Planetary gear

Automatic Transmission

TROUBLE SHOOTING CHART FOR 3N71B AUTOMATIC TRANSMISSION

(The number shown below indicates the sequence in which the checks should be taken up)

Trouble	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	m	n	q	r	s	t	u	v	w	x	y	
Engine does not start in "N", "P" ranges	2	3											1															
Engine starts in other range than "N" and "P"	1	2																										
Sharp shock in shifting from "N" to "D" range				2	1	3			4								⑤											
Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges)	1					2			3															④				
Vehicle 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					
Vehicle 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	
Vehicle will not run in any range	1	2					3		5				6	4									⑦	⑧			⑨	
Clutches or brakes slip somewhat in starting	1	2		6			3		5				7	4									⑧	⑨				
Vehicle runs in "N" range	1								3				2				④											
Maximum speed not attained Acceleration poor	1	2					4	5	7	6			3	8			⑪	⑫	⑨	⑩	⑬							
Vehicle braked by throwing lever into "R" range											3	2	1				④	⑤									⑥	
Excessive creep					1																							
No creep at all	1	2					3		5				4				⑧	⑨					⑥	⑦				
Failure to change gear from "2nd" to "3rd"		1	2	3					5	6	8		7	4					⑨				⑩					
Failure to change gear from "1st" to "2nd"		1	2	3					5	6	8		7	4					⑨				⑩				⑪	
Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd"				1	2	3			5	6			4										⑦					
Gear change directly from "1st" to "3rd" occurs									2	4			3	1					⑤				⑥					

Automatic Transmission

Trouble	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	m	n	q	r	s	t	u	v	w	x	y
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
Vehicle braked by gear change from "1st" to "2nd"										2			1							④	③			⑤			.
Vehicle braked by gear change from "2nd" to "3rd"										3	2		1								④						
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 vehicle speed				2	1					4	5		3				.				⑥		⑦				
Kickdown operates or engine over-runs when depressing pedal in "3rd" beyond kickdown vehicle 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	
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																	

Automatic Transmission

Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y	
No shock at change from "1" to "2" range or engine races extremely	1 2 3	4 1	. 6 . 7 5		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		
Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range	1						②	
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	
Transmission noise in "P" and "N" ranges	1		2			③		
Transmission noise in "D", "2", "1" and "R" ranges	1		2		③	④	⑤	⑥

Automatic Transmission

TROUBLE SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION

Order	Test item	Procedure
Checking	<ol style="list-style-type: none"> 1 Oil level gauge 2 Downshift solenoid 3 Manual linkage 4 Inhibitor switch 5 Engine idling rpm 6 Vacuum pressure of vacuum pipe 7 Operation in each range 8 Creep of vehicle 	<p>Check gauge for oil level and leakage before and after each test</p> <p>Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON"</p> <p>Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever</p> <p>Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only</p> <p>Check whether idling rpm meets standard</p> <p>Check whether vacuum pressure is more than 450 mmHg in idling and whether it decreases with increasing rpm</p> <p>Check whether transmission engages positively by shifting "N"→"D", "N"→"2", "N"→"1" and "N"→"R" range while idling with brake applied</p> <p>Check whether there is any creep in "D", "2", "1" and "R" ranges</p>
Stall test	<ol style="list-style-type: none"> 1 Oil pressure before testing 2 Stall test 3 Oil pressure after testing 	<p>Measure line pressures in "D", "2", "1" and "R" range while idling</p> <p>Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation</p> <p>Notes</p> <p>a Temperature of torque converter oil used in test should be from 60 to 100°C (140 to 212°F) i.e., sufficiently warmed up but not overheated</p> <p>b To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range Measurement time must not be more than 5 seconds</p> <p>Same as item 1</p>
Road test	<ol style="list-style-type: none"> 1 Slow acceleration, 1st → 2nd 2nd → 3rd 2 Quick acceleration, 1st → 2nd 2nd → 3rd 3 Kickdown operation, 3rd → 2nd or 2nd → 1st 	<p>Check vehicle 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 200 mmHg</p> <p>Same as item 1 above except with engine vacuum pressure of 0 mmHg (i.e., in position just before kickdown)</p> <p>Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 38, 44 MPH) in "D₃" range</p>

Automatic Transmission

Order	Test item	Procedure
	<p>4 Shift down, D₃→D₂→D₁</p> <p>5 Shift down, D₃→1₂→1₁</p> <p>6 Shift down, D₃→2</p> <p>7 Shift up, 1₁→1₂</p> <p>8 Shift up or down when starting in "2" range</p> <p>9 Parking</p>	<p>Check vehicle speeds and engine rpm in shifting down from 3rd→2nd→1st (sequentially) while coasting with accelerator pedal released in "D₃" range and engine vacuum pressure of about 450 mmHg</p> <p>Check for shifting down D₃→1₂ and engine braking, and further for shifting down 1₂→1₁ and engine braking, after shifting the lever into "1" range with the accelerator pedal released and the engine vacuum pressure of 0 mmHg while driving at about 50 km/h (31 MPH) in "D₃" range.</p> <p>Check for quick shifting down D₃→2 and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (31 MPH) in "D₃" range Further, check for locking of the transmission in 2nd gear ratio regardless of vehicle speed</p> <p>Check for failure of the transmission to shift up during acceleration, when starting in "1" range</p> <p>Check the transmission for not shifting up or down during acceleration or deceleration, when starting in "2" range</p> <p>Confirm that vehicle will not move on grade when shifting to "P" range</p>
Others	Abnormal shock, oil leakage	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance

SERVICE DATA AND SPECIFICATIONS

General specifications

Torque converter

Type	Symmetrical 3-element 1-stage 2-phase torque converter
Stall torque ratio	2.0 : 1

Transmission

Type	3-speed forward and one-speed reverse with planetary gear train
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Control elements

Multiple-disc clutch	2
Band brake	1
Multiple-disc brake	1
One-way clutch	1

Gear ratio

1st	2.458
2nd	1.458
3rd	1.000
Reverse	2.182

Selector positions

P (Park)	Transmission is placed in neutral Output shaft is fixed Engine can be started
R (Reverse)	Backward running
N (Neutral)	Transmission is in neutral Engine can be started
D (Drive)	Up-or downshifts automatically to and from 1st, 2nd, and top
2 (2nd lock)	Fixed at 2nd
1 (Lock up)	Fixed at low or downshifts from 2nd

Oil pump

Type	Internally intermeshing involute gear pump
Number of pumps	1

Oil

Capacity	Automatic transmission fluid "DEXRON" type 5.5 liters (5 $\frac{3}{8}$ U.S. qt , 4 $\frac{3}{8}$ Imp. qt) except B210 5.0 liters (5 $\frac{1}{4}$ U.S. qt , 4 $\frac{3}{8}$ Imp. qt) on B210 Approximately 2.7 liters (2 $\frac{3}{8}$ U.S. qt , 2 $\frac{3}{8}$ Imp. qt) in torque converter [2.5 liters (2 $\frac{1}{2}$ U.S. qt , 2 $\frac{1}{4}$ Imp. qt) on B210]
----------	---

Hydraulic control system

Controlled by measuring the negative pressure of intake manifold and the revolution of output shaft

Lubrication system

Forced lubrication by an oil pump

Cooling system

Water-cooled by a circulation-type auxiliary cooler (located at the radiator)

Automatic Transmission

Specifications and adjustment

A/T model code number		X2401
Applied car model		710, 610
Engine model		L16, L18
Torque converter assembly		
Stamped mark on the T/C		16 - B
Front clutch		
Number of drive plates		3
Number of driven plates		3
Clearance	mm (in)	1.6 to 1.8 (0.063 to 0.071)
Thickness of retaining plate	mm (in)	10.6 (0.417)
		10.8 (0.425)
		11.0 (0.433)
		11.2 (0.441)
		11.4 (0.449)
		11.6 (0.457)
Rear clutch		
Number of drive plates		4
Number of driven plates		4
Clearance	mm (in)	1.0 to 1.5 (0.039 to 0.059)
Thickness of retaining plate	mm (in)	4.8 (0.189)
Low & reverse brake		
Number of drive plates		4
Number of driven plates		4
Clearance	mm (in)	0.80 to 1.05 (0.031 to 0.041)
Thickness of retaining plate	mm (in)	11.8 (0.465)
		12.0 (0.472)
		12.2 (0.480)
		12.4 (0.488)
		12.6 (0.496)
		12.8 (0.504)
Brake band		
Piston size	mm (in)	
Big dia		64 (2.52)
Small dia		40 (1.58)
Control valve assembly		
Stamped mark on strainer		E
Governor assembly		
Stamped mark on governor body		35

Automatic Transmission

Engine stall revolution

L16 engine (Single carb)	1,800 to 2,000 rpm
L18 engine (Single carb)	1,950 to 2,150 rpm
L18 engine (Twin carb)	1,900 to 2,150 rpm

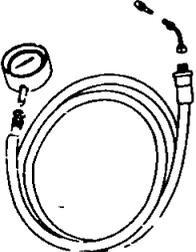
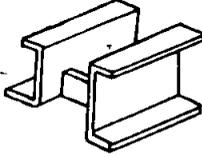
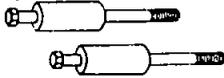
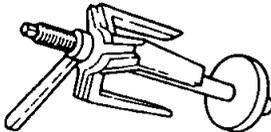
Tightening torque

kg-m (ft-lb)

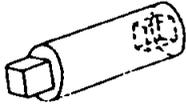
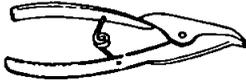
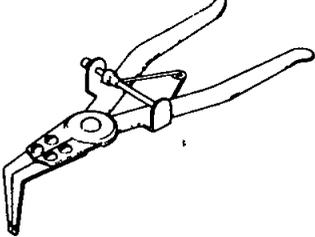
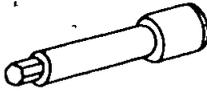
Drive plate to crankshaft	14.0 to 16.0 (101 to 116) 6.5 to 7.5 (47 to 54) for B210
Drive plate to torque converter	4.0 to 5.0 (29 to 36)
Converter housing to engine	4.0 to 5.0 (29 to 36)
Transmission case to converter housing	4.5 to 5.5 (33 to 40)
Transmission case to rear extension	2.0 to 2.5 (14 to 18)
Oil pan to transmission case	0.5 to 0.7 (3.6 to 5.1)
Servo piston retainer to transmission case	0.5 to 0.7 (3.6 to 5.1)
Piston stem (When adjusting band brake)	*1.2 to 1.5 (8.7 to 10.8)
Piston stem lock nut	1.5 to 4.0 (11 to 29)
One-way clutch inner race to transmission case	1.3 to 1.8 (9.4 to 13)
Control valve body to transmission case	0.55 to 0.75 (4.0 to 5.4)
Lower valve body to upper valve body	0.25 to 0.35 (1.8 to 2.5)
Side plate to control valve body	0.25 to 0.35 (1.8 to 2.5)
Nut for control valve reamer bolt	0.5 to 0.7 (3.6 to 5.1)
Oil strainer to lower valve body	0.25 to 0.35 (1.8 to 2.5)
Governor valve body to oil distributor	0.5 to 0.7 (3.6 to 5.1)
Oil pump housing to oil pump cover	0.6 to 0.8 (4.3 to 5.8)
Inhibitor switch to transmission case	0.5 to 0.7 (3.6 to 5.1)
Manual shaft lock nut	3.0 to 4.0 (22 to 29)
Oil cooler pipe or oil pipe to transmission case	3.0 to 5.0 (22 to 36)
Test plug (oil pressure inspection hole)	1.4 to 2.1 (10 to 15)
Support actuator (parking rod inserting position) to rear extension	0.8 to 1.1 (5.8 to 8.0)
Oil charging pipe to case	0.55 to 0.75 (4.0 to 5.4)
Dust cover to converter housing	0.55 to 0.75 (4.0 to 5.4)
Selector range lever to manual shaft	3.0 to 4.0 (22 to 29)

* Turn back two turns after tightening

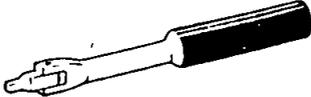
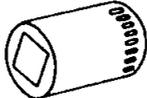
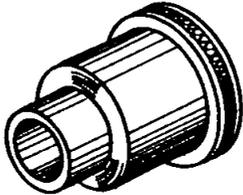
SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description	For use on	Reference page or figure No
1	ST2505S001 Oil pressure gauge set	Use for checking hydraulic pressure  SE119	3N71B and 3N71A A/T	Fig AT-144
2	ST07870000 Transmission case stand	Use for setting transmission  SE120	3N71B A/T	Page AT-46
3	ST25850000 Sliding hammers	Use for removing oil pump  SE121	3N71B and 3N71A A/T	Fig AT-85
4	ST25420001 Clutch spring compressor	Use for assembling or disassembling front and rear clutch  SE122	3N71B and 3N71A A/T	Page AT-50 Fig AT-109 Fig AT-115
5	GG93010000 Torque wrench	Use for tightening correct torque Max. torque 4.6 kg-m (0 33 ft-lb) Drive angle 3/8" square  SE123	3N71B and 3N71A A/T	Fig AT-98

Automatic Transmission

No	Tool number & tool name	Description	For use on	Reference page or figure No
6.	ST25490000 Socket extension	Socket extension to connect torque wrench (GG93010000) with ½" square socket wrench  SE124	3N71B A/T	Fig AT-98
7	ST25160000 Torque driver	Use for tightening correct torque Max. torque 1.04 kg-m (90 ft-lb)  SE125	3N71B A/T and 3N71A	Fig AT-136 Fig AT-137
8.	HT69860000 Snap ring remover	Use for removing and replacing snap ring  SE126	3N71B and 3N71A A/T	Fig AT-88
9.	ST25320001 Snap ring remover	Use for removing and replacing snap ring  SE305	3N71B and 3N71A A/T	Page AT-50 Fig. AT-109 Fig AT-115
10.	ST25570001 Hex-head extension	Use for removing and installing one-way clutch inner race with torque wrench. Drive angle ½" square and 6 mm (across flat width)  SE128	3N71B A/T	Fig AT-93 Fig AT-98 Page AT-52

Automatic Transmission

No	Tool number & tool name	Description	For use on	Reference page or figure No
11	HT62350000 Spinner handle	Use disassembling and assembling control valve  SE129	3N71B and 3N71A A/T	Fig AT-130 Fig AT-133
12	HT61000800 Hexagon wrench	Use for disassembling and assembling control valve  SE130	3N71B and 3N71A A/T	Fig AT-130 Fig AT-133 Fig AT-136 Fig AT-137
13	ST25580000 Oil pump assembling gauge	Use for centering oil pump  SE131	3N71B and 3N71A A/T	Fig AT-127 Fig AT-128

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

PD

PROPELLER SHAFT AND CENTER BEARING	PD- 2
DIFFERENTIAL CARRIER (TYPE R160) FOR SEDAN AND HARDTOP (I.R.S.)	PD- 7
DIFFERENTIAL CARRIER (TYPE H165B) FOR STATION WAGON (RIGID AXLE)	PD-18
TROUBLE DIAGNOSES AND CORRECTIONS	PD-27
SERVICE DATA AND SPECIFICATIONS	PD-29
SPECIAL SERVICE TOOLS	PD-32



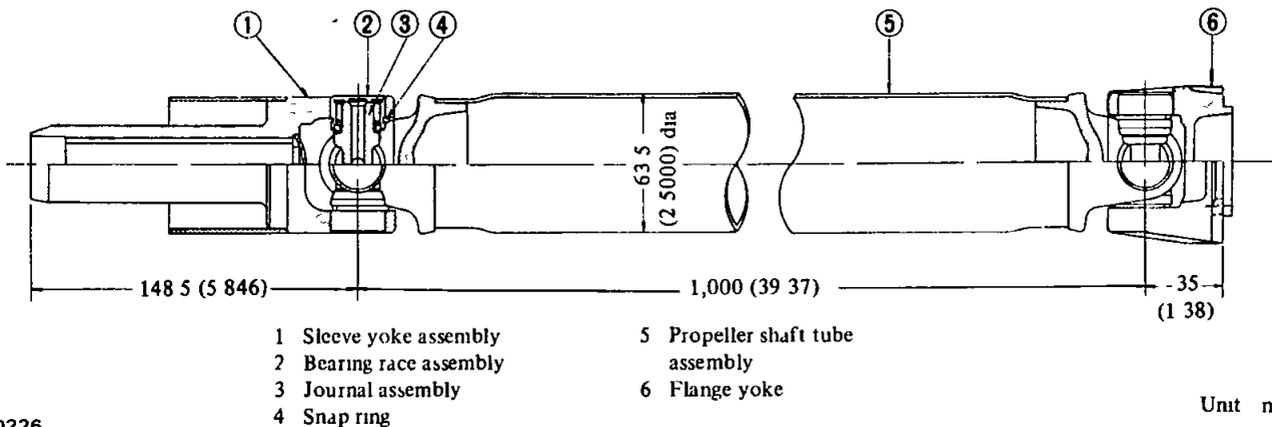
NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

PROPELLER SHAFT AND CENTER BEARING

CONTENTS

DESCRIPTION	PD-3	INSTALLATION	PD-4
REMOVAL	PD-3	CHECKING AND CORRECTING	
DISASSEMBLY	PD-3	UNBALANCED PROPELLER SHAFT	PD-5
CENTER BEARING DISASSEMBLY	PD-3	PROPELLER SHAFT VIBRATION	PD-5
INSPECTION	PD-3	SERVICE DATA	PD-5
ASSEMBLY	PD-3	TROUBLE DIAGNOSES AND	
CENTER BEARING ASSEMBLY	PD-4	CORRECTIONS	PD-6

2-joint type (Sedan)

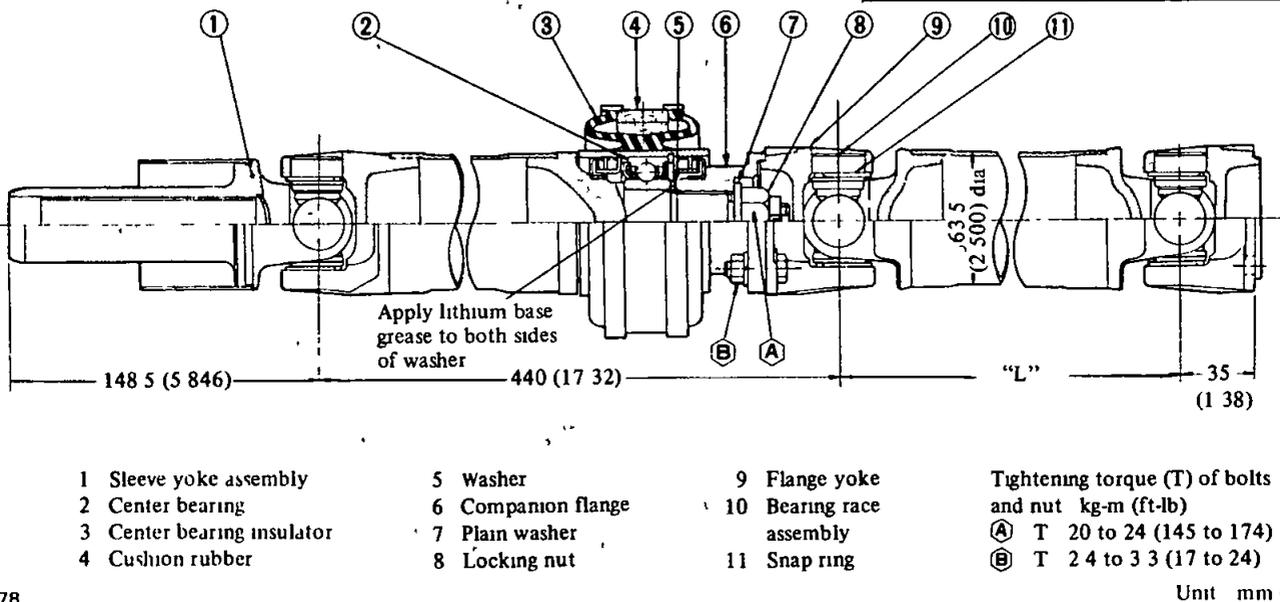


PD226

Fig PD-1 Cross-sectional view of propeller shaft for Sedan

3-joint type (Hardtop and Station Wagon)

"L" mm (in)	Car model
720 (28 35)	Station Wagon
550 (21 65)	Hardtop



PD278

Fig PD-2 Cross-sectional view of propeller shaft for Hardtop and Station Wagon

DESCRIPTION

The propeller shaft is used to transfer the engine power, through the transmission, to the differential and the rear axle, which transmits it to the rear wheels. The propeller shaft has two or three universal joints, center bearing (except 2-joint type) and a sleeve yoke. The splines in the sleeve yoke and on the transmission mainshaft (output shaft) permit the propeller shaft to move forward and rearward.

The propeller shaft and universal joint assembly is carefully balanced during original assembly, that is, the dynamic unbalance is under 35 gr-cm (0.49 in-oz) at 4,000 rpm for Sedan and 35 gr-cm (0.49 in-oz) as 5,800 rpm for Hardtop and Station Wagon.

If the propeller shaft has to be disassembled, it must be made carefully so that the above limit is not exceeded. Therefore, when the car is to be undercoated, cover the propeller shaft and universal joints to prevent application of the undercoating material.

REMOVAL

- 1 Raise car on hoist. Put match marks both on propeller shaft and companion flange so that shaft can be reinstalled in the original position.
- 2 Remove bolts connecting shaft to companion flange. Remove bolts ① retaining center bearing support in case of the 3-joint type. See Figure PD-3.

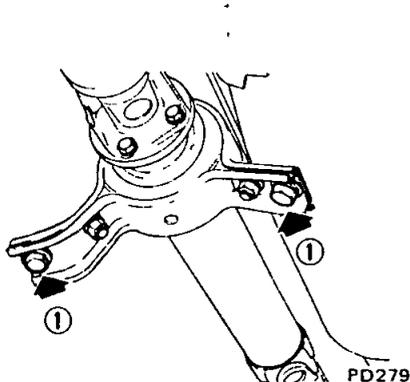


Fig PD-3 Removing center bearing support

- 3 Draw out propeller shaft sleeve yoke from transmission by moving shaft rearward, passing it under rear axle.

Watch for oil leakage from transmission end.

Note Remove propeller shaft carefully so as not to damage the spline, sleeve yoke and rear oil seal.

DISASSEMBLY

Primarily, do not disassemble propeller shaft because it is balanced as an assembly. Check movement of propeller shaft with journal, and if journal does not move smoothly, disassemble.

- 1 Mark propeller shaft and journal so that the original combination can be restored at assembly.
- 2 Remove snap ring with a standard screwdriver.
- 3 Lightly tap base of yoke with a hammer, and withdraw bearing race. See Figure PD-4.

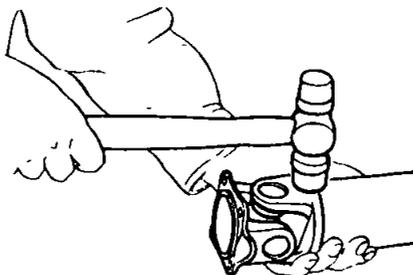


Fig PD-4 Removing bearing

Note When removing journal from yoke, be careful not to damage journal and yoke hole.

CENTER BEARING DISASSEMBLY

When disassembling and repairing center bearing are required, the following procedures are applied:

- 1 Put match marks on flange and front propeller shaft. Remove bolts connecting flange yoke to companion flange.
- 2 Release caulking on locking nut.
- 3 Applying Drive Pinion Flange Wrench ST31530000, loosen off locking nut and remove center bearing. See Figure PD-5.

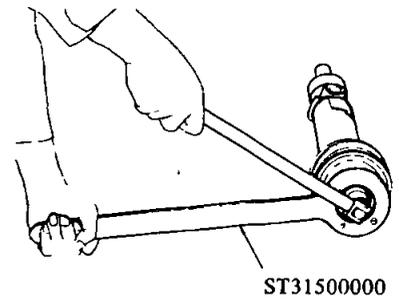


Fig PD-5 Removing lock nut

INSPECTION

- 1 Check journal pin for dent or brinell marks, and yoke hole for sign of wear or damage. Snap ring, bearing and seal ring should also be inspected to see if these are damaged, worn or deformed. Replace if necessary.
- 2 Check center bearing by rotating bearing race. Discard if it is rough, noisy or damaged. Cracked bearing insulator cannot be tolerated here.
- 3 Check propeller shaft tube surface for dent or crack. Change if necessary.

ASSEMBLY

To assemble, reverse the foregoing procedure using reference marks prescribed on page PD-3 for Removal and Disassembly.

New bearing need not be lubricated since it is lubricated for life. Fill joint with recommended multi-purpose grease whenever propeller shaft is overhauled.

Two opposite snap rings should be equal in thickness. Be sure that play is below 0.02 mm (0.0008 in).

Available snap ring

Thickness mm (in)	Color identification
2.00 (0.0787)	White
2.02 (0.0795)	Yellow
2.04 (0.0803)	Red
2.06 (0.0811)	Green
2.08 (0.0819)	Blue
2.10 (0.0827)	Light brown
2.12 (0.0835)	Unpainted
2.14 (0.0843)	Pink

Propeller Shaft & Differential Carrier

Install and assemble components correctly so that joint moves under friction resistance of less than 15 kg-cm (13 in-lb)

When the above steps are complete, place the shaft in a balancing machine and adjust unbalance less than 35 gr-cm (0.49 in-oz) at 4,000 rpm for Sedan, or less than 35 gr-cm (0.49 in-oz) at 5,800 rpm for Hardtop and Station Wagon

CENTER BEARING ASSEMBLY

Center bearing assembling procedures are as follows

- 1 Install center bearing in center bearing insulator
- 2 Install center bearing assembly, washer and companion flange on front shaft using reference marks put in disassembly procedure, and press it by a specified load of 400 to 1,500 kg (882 to 3,307 lb)

Note Apply lithium base grease (including disulphide Molybdenum) to both faces of bearing washer when installing

- 3 Install washer and lock nut on front shaft and tighten nut using Drive Pinion Flange Wrench ST31530000 to specified torque

Tightening torque
20 to 24 kg-m
(145 to 174 ft-lb)

- 4 Using punch, collapse the upper part of lock nut into the groove of shaft

- 5 Join companion flange of front shaft with flange yoke of rear shaft and tighten connecting bolts to specified torque

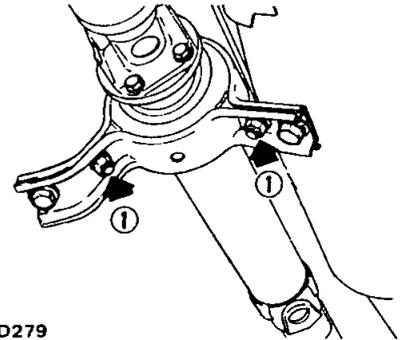
Tightening torque
24 to 33 kg-m
(17 to 24 ft-lb)

- 6 Install center bearing bracket and

support on center bearing and tighten bolts ① to specified torque See Figures PD-6 and PD-7

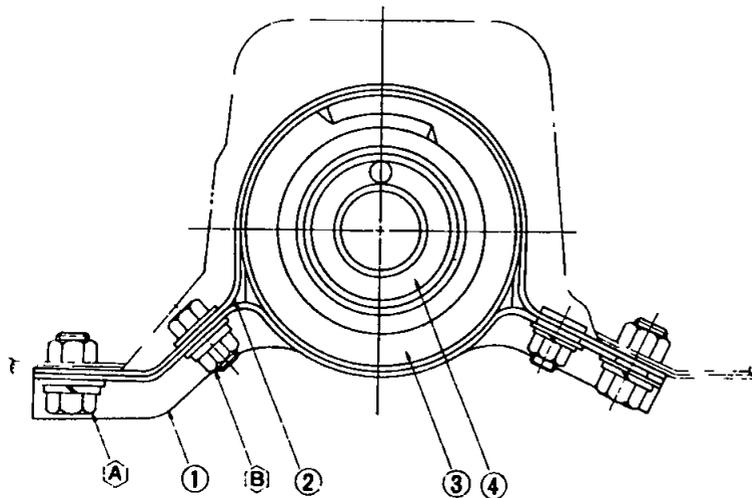
Tightening torque
1.9 to 2.6 kg-m
(14 to 19 ft-lb)

Note When installing center bearing bracket and support, be sure to set the longer portion on support end to right See Figures PD-6 and PD-7



PD279

Fig PD-6 Installing center bearing bracket and support



- 1 Center bearing support
- 2 Center bearing bracket
- 3 Cushion rubber
- 4 Center bearing

Tightening torque (T) of bolts and nuts kg-m (ft-lb)
 (A) T 3.6 to 4.8 (26 to 35)
 (B) T 1.9 to 2.6 (14 to 19)

PD280

Fig PD-7 Cross-sectional view of center bearing

INSTALLATION

To install, reverse the foregoing removal procedure

Align propeller shaft with companion flange using reference marks prescribed in "Removal" procedure and tighten them with bolts

Tightening torque
2.4 to 3.3 kg-m
(17 to 24 ft-lb)

Insert bolts through the holes of center bearing support and plain washers, and torque bolts to retain center bearing on body (See Figure PD-3)

Tightening torque
3.6 to 4.8 kg-m
(26 to 35 ft-lb)

Propeller Shaft & Differential Carrier

CHECKING AND CORRECTING UNBALANCED PROPELLER SHAFT

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 reinstall propeller shaft

3 Align check shaft vibration If vibration still persists, replace propeller shaft assembly

SERVICE DATA

Item		Type	
		2-joint type	3-joint type
Permissible dynamic unbalance	gr-cm (in-oz)	35 (0 49) at 4,000 rpm	35 (0 49) at 5,800 rpm
Axial play of spider journal	mm (in)	less than 0 02 (0 0008)	
Journal swinging torque	kg-cm (in-lb)	less than 15 (13 0)	
Propeller shaft (front and rear) out-of-round	mm (in)	less than 0 6 (0 024)	
Tightening torque	kg-m (ft-lb)		
Shaft to companion flange (gear carrier) bolts		2 4 to 3 3 (17 to 24)	
Companion flange fixing nut (front shaft)		—	20 to 24 (145 to 174)
Flange yoke (rear shaft) to companion flange (front shaft) bolts		—	2 4 to 3 3 (17 to 24)
Center bearing bracket fixing nuts		—	1 9 to 2 6 (14 to 19)
Center bearing bracket to body bolts		—	3 6 to 4 8 (26 to 35)

Propeller Shaft & Differential Carrier

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration during at medium or high speed	Worn or damaged universal joint needle bearing Unbalance due to bent or dented propeller shaft Loose propeller shaft installation Worn transmission rear extension bushing Damaged center bearing or insulator Undercoating or mud on the shaft causing unbalance Tire unbalance Balance weights missing	Replace Replace Retighten Replace Replace Clean up shaft Balance wheel and tire assembly Replace
Knocking sound during starting or noise during coasting on propeller shaft	Worn damaged universal joint Worn sleeve yoke and mainshaft spline Loose propeller shaft installation Loose joint installation Damaged center bearing or insulator Loose or missing bolts at center bearing bracket to body	Replace Replace Retighten Adjust snap ring Replace Replace or tighten bolts
Scraping noise	Dust cover on sleeve yoke rubbing on transmission rear extension Dust cover on companion flange rubbing on differential carrier	Straighten out dust cover to remove interference
Whine or whistle	Damaged center bearing	Replace

DIFFERENTIAL CARRIER (TYPE R160) FOR SEDAN AND HARDTOP (I.R.S.)

CONTENTS

DESCRIPTION	PD- 7	ADJUSTMENT OF DRIVE PINION	
REMOVAL	PD- 9	PRELOAD	PD-11
PRE-DISASSEMBLY INSPECTION	PD- 9	ADJUSTMENT OF DRIVE PINION	
DISASSEMBLY	PD- 9	HEIGHT	PD-12
DISASSEMBLY OF DIFFERENTIAL CASE		ADJUSTMENT OF SIDE RETAINER	
INSPECTION	PD-10	SHIMS	PD-13
ASSEMBLY AND ADJUSTMENT	PD-10	INSTALLATION	PD-15
PRECAUTIONS IN REASSEMBLY	PD-10	REPLACEMENT OF FRONT OIL SEAL	PD-16
ASSEMBLY OF DIFFERENTIAL GEAR CASE	PD-10	SIDE OIL SEAL	PD-17

DESCRIPTION

The differential gear carrier assembly on the 610 series is available in two different types

One type used on Sedan and Hardtop has a hypoid type drive pinion and ring gear set with three different gear ratios, as indicated in the following table

The drive pinion is mounted with one ball bearing and two tapered roller bearings which are preloaded by

pinion bearing adjusting spacer and washer during assembly

The drive pinion is positioned by a washer located between a shoulder of the drive pinion and the rear bearing

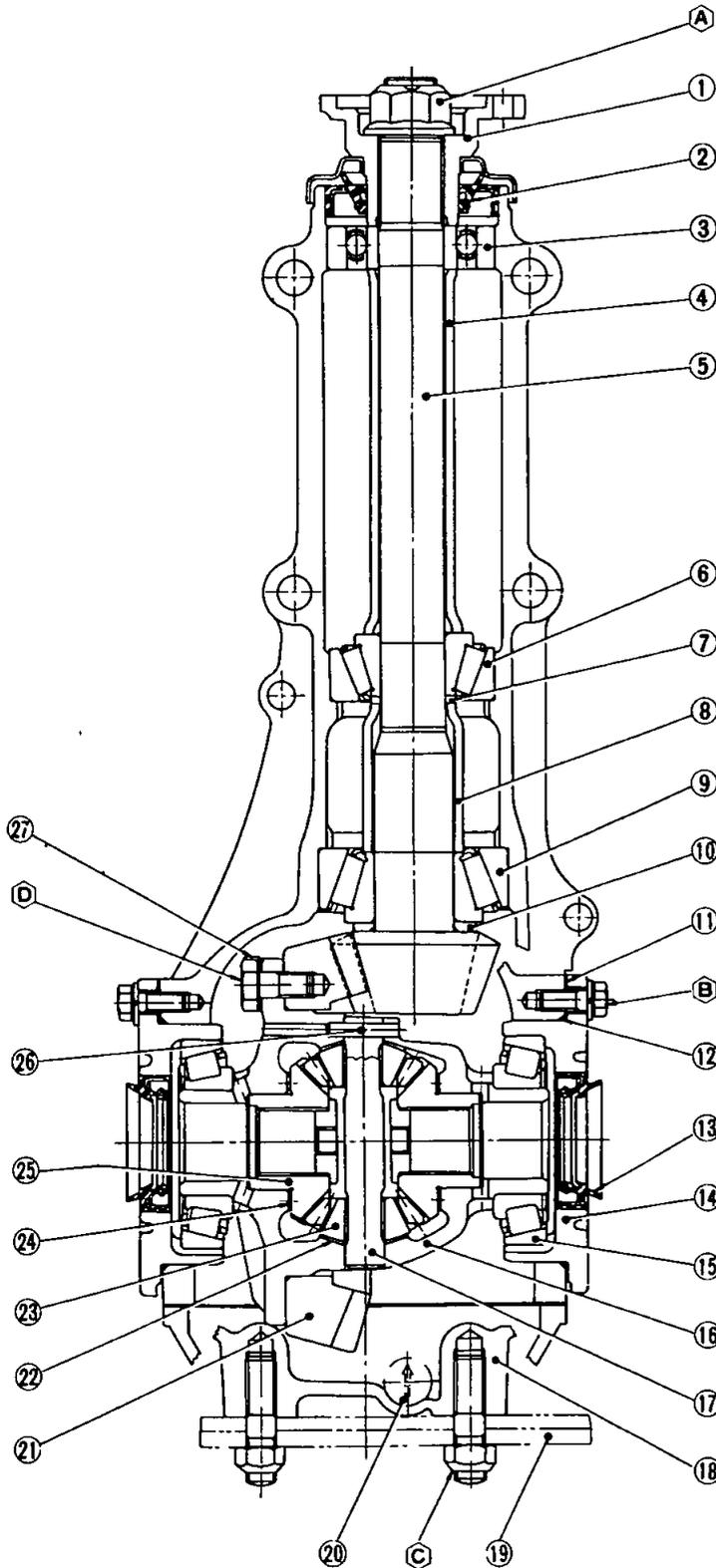
The differential case is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the carrier and the side retainers. The differential case

assembly is positioned for proper ring gear-to-drive pinion backlash by varying these shims. The ring gear is bolted to the differential case. The case houses two side gears in mesh with two pinions mounted on a pinion shaft. The pinion shaft is anchored in the case by lock pin. The pinions and side gears are backed by thrust washers.

Type of gear carrier assembly	R160		H165B
	Gear ratio	3 700	4 111
Engine model	L18	L18	L18
Car model	Sedan	Hardtop	Station Wagon

Propeller Shaft & Differential Carrier

(TYPE R160)



- 1 Companion flange
- 2 Oil seal
Supply multi-purpose grease to oil seal lip when assembling
- 3 Front pilot bearing
- 4 Front pilot bearing spacer
- 5 Drive pinion
- 6 Pinion front bearing
- 7 Pinion bearing adjusting washer
Adjust pinion bearing preload by selecting ⑦ and ⑧
- 8 Pinion bearing adjusting spacer
- 9 Pinion rear bearing
- 10 Pinion height adjusting washer
- 11 Side retainer adjusting shim
Adjust side bearing preload and ring gear-to-drive pinion backlash by selecting ⑪
- 12 O-ring
- 13 Oil seal
Supply multi-purpose grease to oil seal lip when assembling
- 14 Side retainer
- 15 Side bearing
- 16 Differential case
- 17 Pinion mate shaft
- 18 Rear cover
- 19 Differential mounting member
- 20 Breather
- 21 Ring gear
- 22 Thrust washer
- 23 Pinion mate
- 24 Thrust washer
Adjust the pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to 0.1 to 0.2 mm (0.0039 to 0.0079 in) by ⑳
- 25 Side gear
- 26 Lock pin
- 27 Lock strap

- Tightening torque (T) of bolts and nuts kg-m (ft-lb)
- Ⓐ T 17 to 20 (123 to 145)
 - Ⓑ T 0.9 to 1.2 (6.5 to 8.7)
 - Ⓒ T 6 to 8 (43 to 58)
 - Ⓓ T 7 to 8 (51 to 58)

PD317

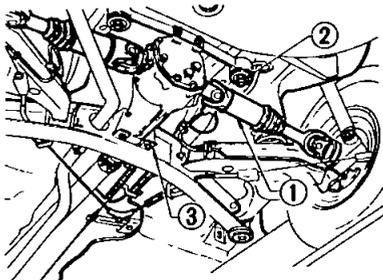
Fig PD-8 Cross-sectional view of differential carrier for Sedan and Hardtop (I R S)

REMOVAL

- 1 Jack up rear of car and support on safety stands
- 2 Disconnect propeller shaft at companion flange
- 3 Disconnect drive shafts ① on the wheel side See Figure PD-9

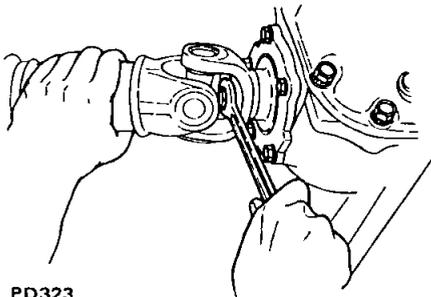
Remove side yoke fixing bolts, and extract side yokes together with drive shafts See Figure PD-10

Note Be careful not to damage side yoke and oil seal when removing



PD318

Fig PD-9 Under view



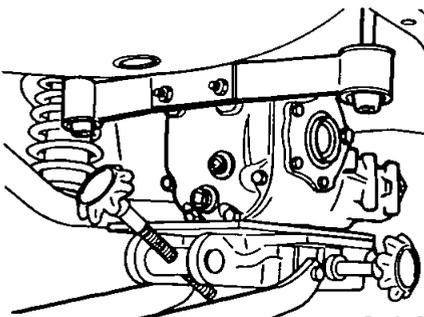
PD323

Fig PD-10 Removing side yoke fixing bolt

4 With differential carrier jacked up, remove nuts ② on both ends of differential member See Figure PD-9

5 Loosen off four fitting bolts ③ that hold differential carrier onto suspension member See Figure PD-9

6 Pull off carrier backward together with jack See Figure PD-11



PD319

Fig PD-11 Removing differential carrier

After carrier assembly is removed, support suspension member on a stand to prevent its insulators being twisted or damaged

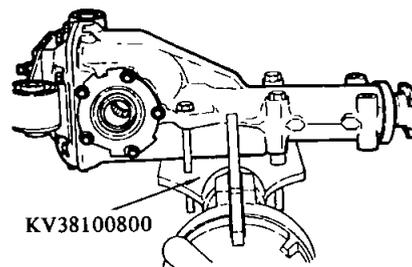
Note Do not place the center of suspension member on the stand before removal operation Otherwise, it will be difficult to extract the gear carrier assembly

PRE-DISASSEMBLY INSPECTION

Differential carrier should be inspected before any parts are removed from it

These inspections are helpful in finding the cause of the trouble and in determining the corrections needed

1 Mount carrier on Gear Carrier Attachment KV38100800 See Figure PD-12 Remove mounting member and rear cover



KV38100800

PD320

Fig PD-12 Holding differential carrier

2 Visually inspect parts for wear or damage

3 Rotate gears to see that there is any roughness which would indicate damaged bearings or chipped gears Check the gear teeth for scoring or signs of abnormal wear Measure preload of drive pinion

4 Set up a dial indicator and check the backlash at several points around ring gear Backlash should be within 0.1 to 0.2 mm (0.0039 to 0.0079 in)

5 Check the gear tooth contact with a mixture of powdered red lead and oil apply sparingly to all ring gear teeth

For the tooth contact pattern, see page PD-15 for Contact Pattern

DISASSEMBLY

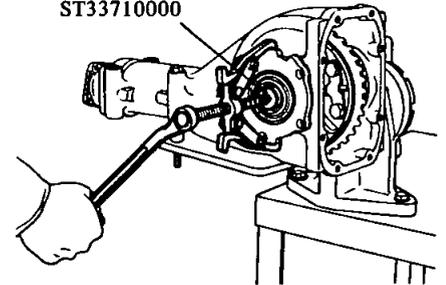
1 Remove side retainers, using Gear

Carrier Side Retainer Attachment ST33710000 and suitable puller See Figure PD-13

Notes

- a Mark right and left side retainers before removal
- b Be careful not to confuse right and left hand side retainers and shims for proper reassembly

ST33710000

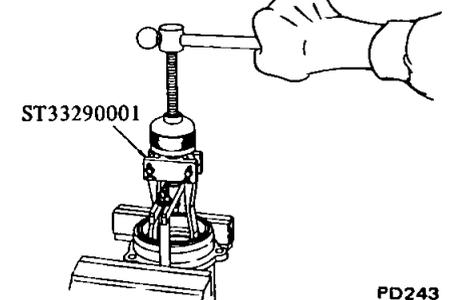


PD177

Fig PD-13 Removing side retainer

2 Extract differential case from carrier

3 When replacing side bearing, extract bearing outer race from side retainer using Gear Carrier Oil Seal Puller ST33290001 See Figure PD-14

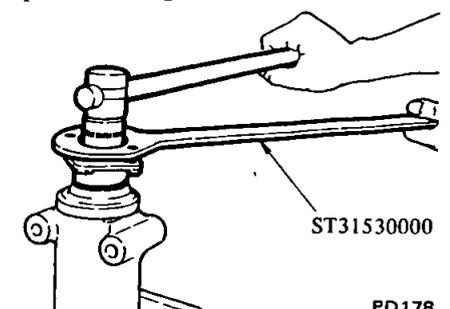


ST33290001

PD243

Fig PD-14 Removing side bearing outer race

4 Loosen drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000 and pull off companion flange using a suitable puller See Figure PD-15



ST31530000

PD178

Fig PD-15 Removing drive pinion nut

- 5 Extract drive pinion from carrier using a press Take out drive pinion together with rear bearing cone, bearing spacer and adjusting washers
- 6 Remove oil seal

Note Oil seal must not be reused

- 7 Remove pilot bearing together with pilot bearing spacer and front bearing cone using Pilot Bearing Drift ST30650001
- 8 Hold rear bearing inner race with Drive Pinion Rear Bearing Inner Race Puller ST30031000 and extract from drive pinion with a press See Figure PD-16

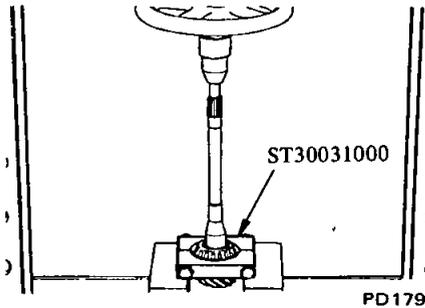


Fig PD-16 Removing pinion rear bearing inner race

- 9 To remove front and rear bearing outer races, put a drift to race surface, and withdraw them by tapping the top of drift with a hammer

DISASSEMBLY OF DIFFERENTIAL CASE

- 1 Extract bearing using Differential Side Bearing Puller ST3306S001 (set of ST33051001 and ST33061000) See Figure PD-17

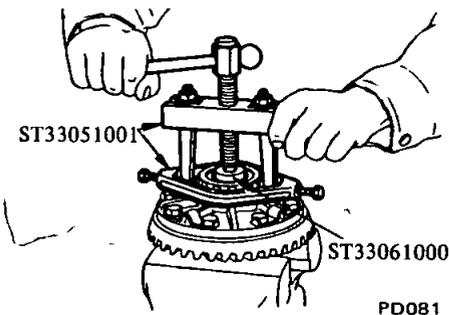


Fig PD-17 Removing side bearing

Notes

- a The puller should be handled with care in catching the edge of bearing inner race
- b Be careful not to confuse the left and right hand parts

- 2 Remove ring gear by unfolding lock strap and loosening ring gear bolts

Note Loosen bolts diagonally

- 3 Punch off pinion mate shaft lock pin from ring gear side using Solid Punch KV31100300

Note Lock pin is caulked at pin hole mouth on differential case Do not punch it off forcibly without checking how it is caulked

- 4 Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers

Note Put marks on gear and thrust washer so that they can be reinstalled in their original positions from which they were removed

- 3 Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear They should be in tiptop condition such as not worn and with mirror-like surfaces Replace if there is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noises and gear seizure

If you need the information on "Visual Serviceability Standard for Taper Roller Bearing", refer to Section FA for Inspection

- 4 Inspect thrust washer faces Small faults can be corrected with sandpaper If pinion mate-to-side gear backlash (or the clearance between side gear and thrust washer) exceeds limits 0.1 to 0.2 mm (0.0039 to 0.0079 in), replace thrust washers

- 5 Inspect carrier and differential case for cracks or distortion If either condition is evident, replace

- 6 As a general rule, oil seal should be replaced at each disassembly

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly The following directions for adjustment and usage of special tools enable to obtain a perfect differential operation

PRECAUTIONS IN REASSEMBLY

- 1 Arrange shims, washers and the like to install them correctly
- 2 Thoroughly clean the surfaces on which shims, washers, bearings and bearing retainers are installed
- 3 Apply gear oil when installing bearings
- 4 Pack recommended multi-purpose grease cavity between lips when fitting oil seal

ASSEMBLY OF DIFFERENTIAL GEAR CASE

- 1 Assemble pinion mates, side gears and thrust washers in differential case

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see that they are worn or damaged, and how they are affected Repair or replace all faulty parts, whichever is necessary

- 1 Check gear teeth for scoring, cracking or chipping, and make sure that tooth contact pattern indicates correct meshing depth If any fault is evident, replace parts as required

Note Drive pinion and drive gear are supplied for replacement as a set, therefore, should either part be damaged, replace as a set

- 2 Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required

Follow the same procedure for side gear and their seats on differential case

Propeller Shaft & Differential Carrier

- 2 Fit pinion shaft to differential case so that it meets lock pin holes
- 3 Adjust side gear-to-pinion mate backlash or adjust the clearance between the rear face of side gear and thrust washer See Figure PD-18

If above procedure is not effective with existing washer, try with other washers available for the purpose

Normal backlash or clearance
0.1 to 0.2 mm
(0.0039 to 0.0079 in)

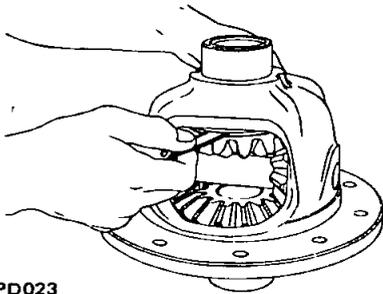


Fig PD-18 Measuring clearance

Side gear thrust washer

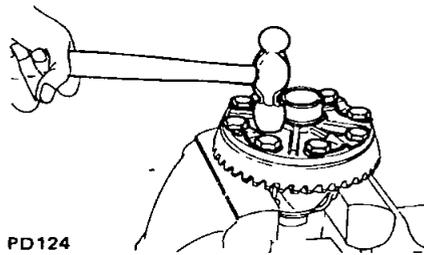
Thickness mm (in)
0.75 to 0.80 (0.0295 to 0.0315)
0.80 to 0.85 (0.0315 to 0.0335)
0.85 to 0.90 (0.0335 to 0.0354)

- 4 Lock pinion shaft lock pin using a punch after it is secured into place
- 5 Apply oil to gear tooth surfaces and thrust surfaces and check if they turn properly
- 6 Place ring gear on differential case and install bolts and lock washers

Tightening torque
7 to 8 kg-m
(51 to 58 ft-lb)

Notes

- a Use only genuine ring gear bolts and new lock washers
- b Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer See Figure PD-19

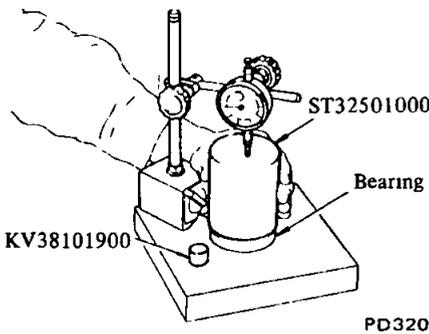


PD124

Fig PD-19 Tapping bolt head

- 7 When replacing side bearing, measure bearing width using Master Gauge KV38101900 and Weight Block ST32501000 prior to installation See Figure PD-20

Standard bearing width
20.00 mm



KV38101900

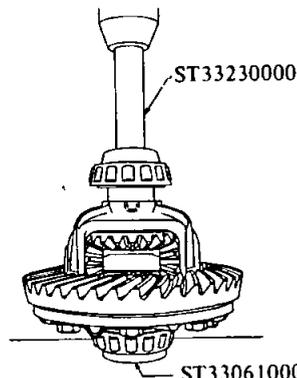
ST32501000

Bearing

PD320

Fig PD-20 Measuring bearing width

- 8 Press fit side bearing cone on differential case using Gear Carrier Side Bearing Drift ST33230000 and Adapter ST33061000 See Figure PD-21



PD244

ST33061000

Fig PD-21 Installing side bearing cone

- 9 Press fit side bearing outer race into side retainer using Drive Pinion Outer Race Drift Set ST30611000 and ST30621000

- 10 Set new oil seal on side retainer using Oil Seal Drift ST33270000 Apply recommended multi-purpose grease cavity between seal lips

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust preload of drive pinion with spacer and washer between front and rear bearing cones, regardless of thickness of pinion height adjusting washer

This adjustment must be carried out without oil seal inserted

- 1 Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30701000 and ST30613000

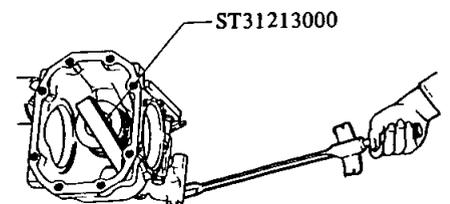
Front ST30611000 and ST30701000

Rear ST30611000 and ST30613000

- 2 Insert pinion height adjusting washer (use 3.09 thickness) and rear bearing cone into Dummy Shaft ST31212000 to make convenient to adjust pinion height See Figure PD-24

Note Reuse the old washer if they have normal tooth contact pattern in a pre-disassembly check

- 3 Fit drive pinion bearing spacer, washer, front bearing cone, Drive Pinion Dummy Collar ST31214000 and companion flange in this order on dummy shaft and tighten drive pinion nut to the specified torque using Stopper ST31213000 See Figure PD-22



PD184

Fig PD-22 Tightening drive pinion nut

Propeller Shaft & Differential Carrier

Measure pinion bearing preload using Preload Gauge ST3127S000, and select washer and spacer that will provide required preload See Figure PD-23

Pinion bearing preload
(Without oil seal)

7 to 10 kg-cm
(6.1 to 8.7 in-lb)

At companion flange bolt hole

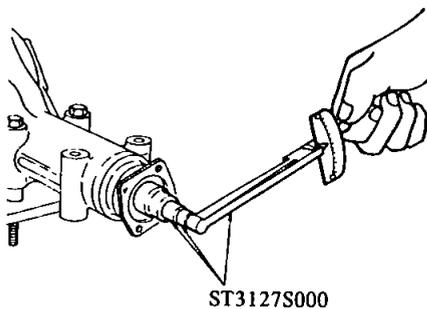
2.0 to 2.9 kg
(4.4 to 6.4 lb)

Tightening torque of pinion nut

17 to 20 kg-m
(123 to 145 ft-lb)

Notes

- Replace bearing washer and spacer with thicker ones if pinion cannot be turned by hand while it is being tightened
- Preload of used bearing is the same value as that of a new bearing



PD245

Fig PD-23 Measuring pinion preload

Pinion bearing adjusting spacer

Length	mm (in)
56.20	(2.2126)
56.40	(2.2205)
56.60	(2.2283)
56.80	(2.2362)
57.00	(2.2441)
57.20	(2.2520)

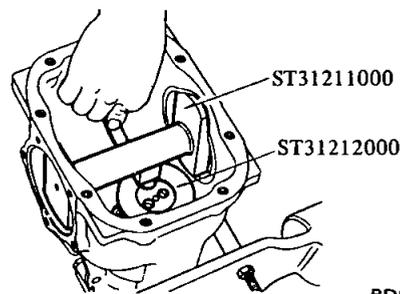
Pinion bearing adjusting washer

Thickness	mm (in)
2.30 to 2.32	(0.0906 to 0.0913)
2.32 to 2.34	(0.0913 to 0.0921)
2.34 to 2.36	(0.0921 to 0.0929)
2.36 to 2.38	(0.0929 to 0.0937)
2.38 to 2.40	(0.0937 to 0.0945)
2.40 to 2.42	(0.0945 to 0.0953)
2.42 to 2.44	(0.0953 to 0.0961)
2.44 to 2.46	(0.0961 to 0.0969)
2.46 to 2.48	(0.0969 to 0.0976)
2.48 to 2.50	(0.0976 to 0.0984)
2.50 to 2.52	(0.0984 to 0.0992)
2.52 to 2.54	(0.0992 to 0.1000)
2.54 to 2.56	(0.1000 to 0.1008)
2.56 to 2.58	(0.1008 to 0.1016)
2.58 to 2.60	(0.1016 to 0.1024)

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust pinion height with washer provided between rear bearing cone and back of pinion gear

- Install Height Gauge ST31211000 on carrier with dummy shaft mounted See Figure PD-25
- Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge See Figure PD-24



PD091

Fig PD-23 Adjusting pinion height

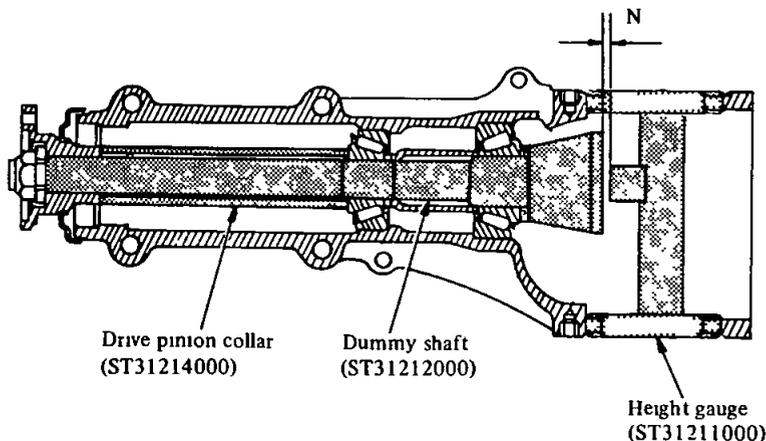
3 The thickness of drive pinion height adjusting washer can be obtained from the following formula

$$T = W + N - [(H - D' - S) \times 0.01] - 0.2$$

Where,

- T Required thickness of rear bearing adjusting washers (mm)
- W Thickness of washers temporarily inserted (mm)
- N Measured value with thickness gauge (mm)
- H Figure marked on the drive pinion gear
- D' Figure marked on the dummy shaft
- S Figure marked on the height gauge

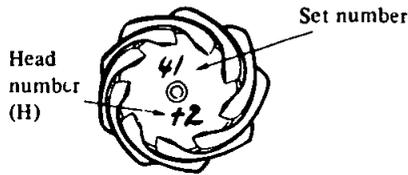
Figures for H, D' and S are dimensional variations in a unit of 1/100 mm against each standard measurement



IPD185

Fig PD-25 Measuring the clearance

Propeller Shaft & Differential Carrier



PD186

Fig PD-26 Variation number on drive pinion

Examples of calculation

Ex 1 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.33 \text{ mm} \\ H &= +2, D' = -1, S = 0 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.2 \\ &= 3.09 + 0.33 - [((+2) - (-1) - (0)) \times 0.01] - 0.2 \\ &= 3.09 + 0.33 - [(2 + 1 - 0) \times 0.01] - 0.2 \\ &= 3.09 + 0.33 - [3 \times 0.01] - 0.2 \\ &= 3.09 + 0.33 - 0.03 - 0.2 \\ &= 3.19 \text{ mm} \end{aligned}$$

The correct washer is 3.18 mm thick

Ex 2 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.28 \text{ mm} \\ H &= -2, D' = +1, S = -1 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.2 \\ &= 3.09 + 0.28 - [((-2) - (+1) - (-1)) \times 0.01] - 0.2 \\ &= 3.09 + 0.28 - [(-2 - 1 + 1) \times 0.01] - 0.2 \\ &= 3.09 + 0.28 - [-2 \times 0.01] - 0.2 \\ &= 3.09 + 0.28 + 0.02 - 0.2 \\ &= 3.19 \text{ mm} \end{aligned}$$

The correct washer is 3.18 mm thick

Ex 3 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.45 \text{ mm} \\ H &= 0, D' = 0, S = 0 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.2 \\ &= 3.09 + 0.45 - [(0 - 0 - 0) \times 0.01] - 0.2 \\ &= 3.09 + 0.45 - [0 \times 0.01] - 0.2 \end{aligned}$$

$$\begin{aligned} &= 3.09 + 0.45 - 0 - 0.2 \\ &= 3.34 \text{ mm} \end{aligned}$$

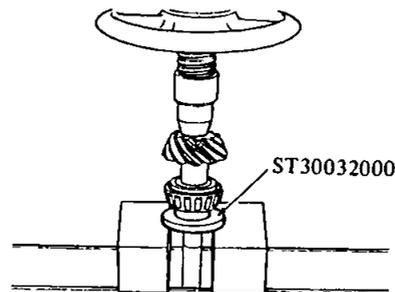
The correct washer is 3.33 mm thick

Note If values signifying H, D' and S are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust. For the tooth contact pattern, see page PD-15 for Contact Pattern.

Pinion height adjusting washer

Thickness	mm (in)
3.09	(0.1217)
3.12	(0.1228)
3.15	(0.1240)
3.18	(0.1252)
3.21	(0.1264)
3.24	(0.1276)
3.27	(0.1287)
3.30	(0.1299)
3.33	(0.1311)
3.36	(0.1323)
3.39	(0.1335)
3.42	(0.1346)
3.45	(0.1358)
3.48	(0.1370)
3.51	(0.1382)
3.54	(0.1394)
3.57	(0.1406)
3.60	(0.1417)
3.63	(0.1429)
3.66	(0.1441)

4 Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing cone in it using Base ST30032000. See Figure PD-27.



PD092

Fig PD-27 Pressing rear bearing cone

5 Lubricate pinion front and rear bearings. Install drive pinion in gear carrier into which drive pinion bearing spacer and washer, front bearing cone and front bearing pilot spacer, moreover, pilot bearing and oil seal are fitted. Fit oil seal using Oil Seal Drift ST30720000.

6 Fit companion flange on drive pinion, and secure it in position by tightening nut to specified torque confirming preload.

Tightening torque

17 to 20 kg-m
(123 to 145 ft-lb)

Preload (with oil seal)
8 to 11 kg-cm
(6.9 to 9.5 in-lb)

At companion flange bolt hole
2.3 to 3.2 kg
(5.1 to 7.1 lb)

Note If drive pinion lock nut is worn, replace it.

ADJUSTMENT OF SIDE RETAINER SHIMS

1 If the hypoid gear set, carrier, differential case, side bearing or side bearing retainer has been replaced with new part, adjust the side bearing preload with adjusting shim. The required thicknesses of the left and right retainer shims can be obtained from the following formulas.

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

Where,

T₁ Required thickness of left side retainer shim (mm)

T₂ Required thickness of right side retainer shim (mm)

A & B Figure marked on the gear carrier. See Figure PD-29.

C & D Figure marked on the differential case. See Figure PD-30.

E & F These are differences in width of left or right side bearing against the standard width (20.00 mm) (mm).

If bearing width is 19.89, the difference will be as follows:

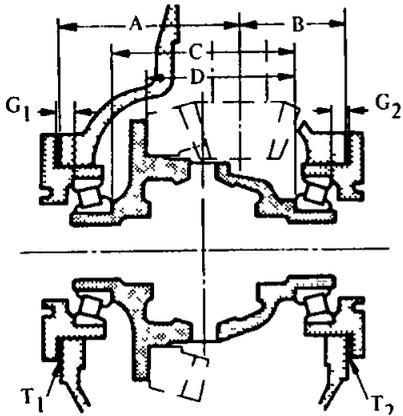
$$20.00 - 19.89 = 0.11$$

Propeller Shaft & Differential Carrier

G₁ & G₂ Figure marked on the left or right side retainer See Figure PD-31

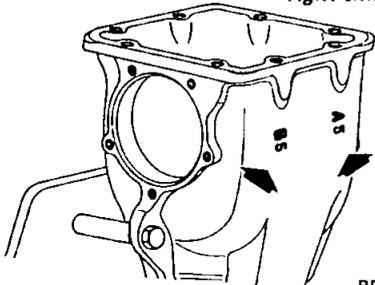
Figures for A, B, C, D, G₁ and G₂ are dimensional variations in a unit of 1/100 mm against each standard measurement

To measure width of side bearing, see differential case assembly procedure



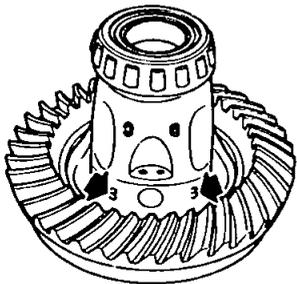
PD093

Fig PD-28 Thickness of left and right shims



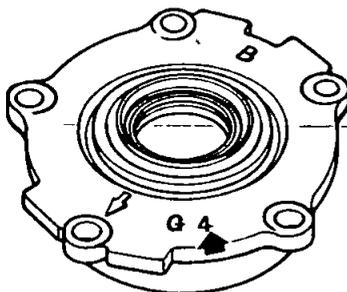
PD187

Fig PD-29 A & B figure



PD188

Fig PD-30 C & D figure



PD189

Fig PD-31 G₁ & G₂ figure

Examples of calculation

Ex 1 ---

$$A = 5, B = 5, C = 3, D = 3, \\ G_1 = 4, G_2 = 1, E = 0.11 \text{ mm}, \\ F = 0.15 \text{ mm}$$

Left side

$$T_1 = (A + C + G_1 - D) \times 0.01 \\ + 0.76 - E \\ = (5 + 3 + 4 - 3) \times 0.01 \\ + 0.76 - 0.11 \\ = 9 \times 0.01 + 0.76 - 0.11 \\ = 0.09 + 0.76 - 0.11 \\ = 0.74 \text{ mm}$$

The correct shims are as follows

Thickness	Quantity	
0.07	x 2	= 0.14
0.10	x 1	= 0.10
0.50	x 1	= 0.50
Total thickness		= 0.74 mm

Right side

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 \\ - F \\ = (5 + 3 + 1) \times 0.01 + 0.76 \\ - 0.15 \\ = 9 \times 0.01 + 0.76 - 0.15 \\ = 0.09 + 0.76 - 0.15 \\ = 0.70 \text{ mm}$$

The correct shims are 0.20 plus 0.50 mm thick

Ex 2 ---

$$A = 2, B = 3, C = 0, D = 3 \\ G_1 = 2, G_2 = 3, E = 0.20 \text{ mm}, \\ F = 0.17 \text{ mm}$$

Left side

$$T_1 = (A + C + G_1 - D) \times 0.01 \\ + 0.76 - E \\ = (2 + 0 + 2 - 3) \times 0.01 \\ + 0.76 - 0.20 \\ = 1 \times 0.01 + 0.76 - 0.20 \\ = 0.01 + 0.76 - 0.20 \\ = 0.57 \text{ mm}$$

The correct shims are 0.07 plus 0.50 mm thick

Right side

$$T_2 = (B + D + G_2) \times 0.01 \\ + 0.76 - F \\ = (3 + 3 + 3) \times 0.01 + 0.76 \\ - 0.17 \\ = 9 \times 0.01 + 0.76 - 0.17 \\ = 0.09 + 0.76 - 0.17 \\ = 0.68 \text{ mm}$$

The correct shims are as follows

Thickness	Quantity	
0.07	x 4	= 0.28
0.20	x 2	= 0.40
Total thickness		= 0.68 mm

Note If values signifying A, B, C, D, G₁ and G₂ are not given, regard them as zero and compute. After assembly, check to see that preload and backlash are correct. If not, readjust.

Side retainer adjusting shim

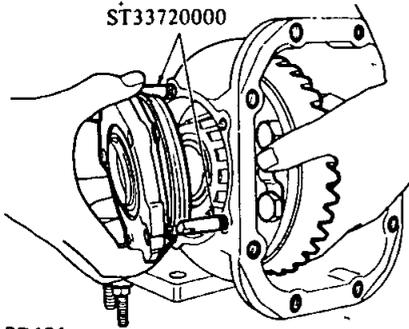
Thickness	mm (in)
0.05	(0.0020)
0.07	(0.0028)
0.10	(0.0039)
0.20	(0.0079)
0.50	(0.0197)

2 Install differential case assembly in gear carrier in reverse order to which it is disassembled

3 Fit given shims and O-ring in both side retainers, and install retainers in carrier using Gear Carrier Side Retainer Guide ST33720000 (See Figure PD-32), and the arrow mark on retain-

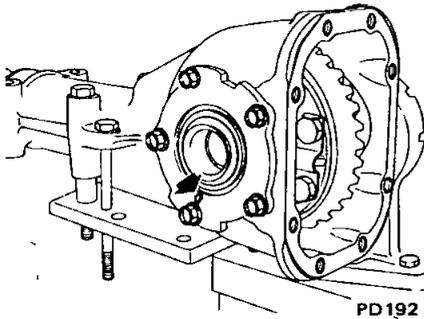
er positioned as shown in Figure PD-33

Note When installing retainers, take care that side bearing outer races are not damaged by roller



PD191

Fig PD-32 Installing side retainer

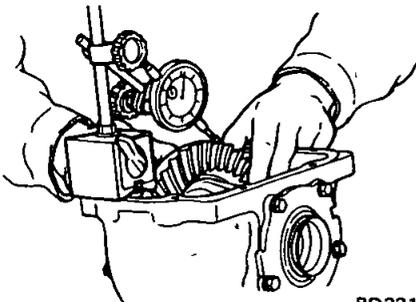


PD192

Fig PD-33 The arrow mark on retainer

4 Measure ring gear-to-drive pinion backlash by using a dial indicator and adjust it to 0.1 to 0.2 mm (0.0039 to 0.0079 in) See Figure PD-34

- If it is below the specified value, move shim from right to left. If it is over it, move it inversely.



PD321

Fig PD-34 Measuring the backlash of ring gear and pinion

5. At the same time, check side bearing preload. Bearing preload should be 9 to 17 kg-cm (7.8 to 14.8 in-lb) of rotating torque at companion flange [2.6 to 4.9 kg (5.7 to 10.8 lb) at companion flange bolt hole]

If preload is not according to this specification, adjust it with side retainer shims

Incidentally, decrease or increase in thickness of shims causes change of ring gear-to-pinion backlash

Thus, check if they have proper backlash

6 Check and adjust the tooth contact pattern of ring gear and drive pinion

(1) Thoroughly clean ring and drive pinion gear teeth

(2) Paint ring gear teeth lightly and evenly with a mixture of powdered red lead and oil of a suitable consistency to produce a contact pattern

(3) Rotate pinion through several revolutions in the forward and reverse direction until a definite contact pattern is developed on ring gear

(4) When contact pattern is incorrect, readjust thickness of adjust shim

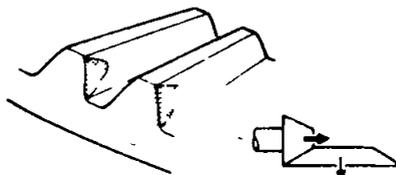
Be sure to wipe off red lead completely upon completion of adjustment

(5) Incorrect contact pattern of teeth can be adjusted in the following manner

Contact pattern

a Heel contact

To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear. See Figure PD-35

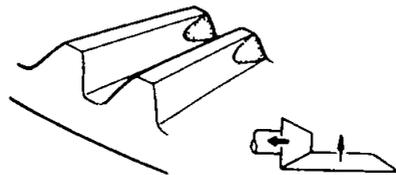


PD193

Fig PD-35 Heel contact

b Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear. See Figure PD-36

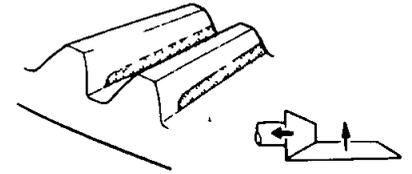


PD194

Fig PD-36 Toe-contact

c Flank contact

Adjust in the same manner as in b. See Figure PD-37

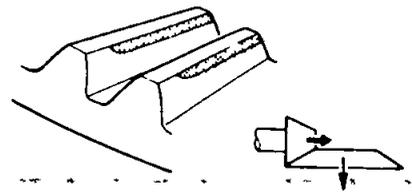


PD195

Fig PD-37 Flank contact

d Face contact

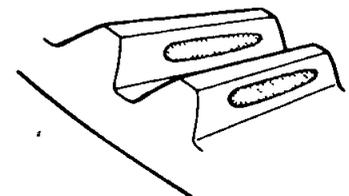
Adjust in the same manner as in a. See Figure PD-38



PD196

Fig PD-38 Face contact

e Correct tooth contact



PD197

Fig PD-39 Correct contact

Note Change in thickness of adjusting washer is accompanied by change in backlash. Check it when installing gear.

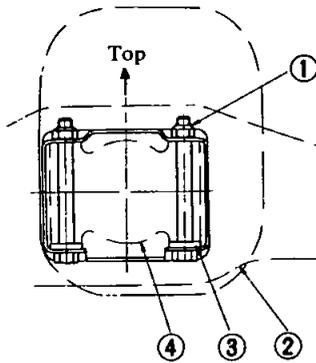
7 Install rear cover

8 Fit differential mounting member, and tighten nuts to specified torque of 6 to 8 kg-m (43 to 58 ft-lb)

INSTALLATION

Install in the reverse order of removal.

1 Position gear carrier assembly onto rear suspension member, and temporarily tighten it with four bolts together with differential mounting spacer. See Figure PD-40



PD242

- 1 Nut
T 5 to 7 kg-m (36 to 51 ft-lb)
- 2 Suspension member
- 3 Spacer
- 4 Diff carrier assembly

Fig PD-40 Layout of spacer

Differential mounting spacer

	Thickness mm (in)
A	45 (0 177)
B	10 (0 039)

2 Fit differential mounting member to fitting bolts by pushing it forwards, and torque nuts to 7 to 10 kg-m (51 to 72 ft-lb)

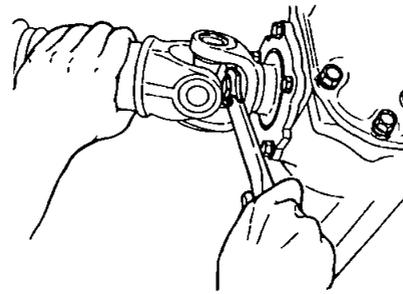
3 Secure gear carrier assembly onto rear suspension member with four bolts

Tightening torque
5 to 7 kg-m
(36 to 51 ft-lb)

4 Install side yokes together with drive shafts to differential gear carrier assembly, and tighten side yoke fixing bolts to specified torque using torque wrench See Figure PD-41

Tightening torque
3.2 to 4.3 kg-m
(23 to 31 ft-lb)

Note Be careful not to damage side yoke and oil seal when installing



PD324

Fig PD-41 Tightening side yoke fixing bolt

5 Join drive shafts with companion flanges of rear axle shafts and tighten connecting bolts to specified torque

Tightening torque
5 to 6 kg-m
(36 to 43 ft-lb)

6 Install other parts in the manner reverse of removal

7 Fill correct gear oil

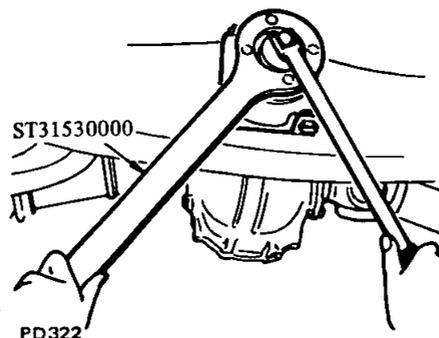
Note Oil quantity 0.8 liter
($\frac{1}{8}$ U.S. qt, $\frac{3}{4}$ Imp qt)

REPLACEMENT OF FRONT OIL SEAL

Replacement of front oil seal with differential gear carrier assembly installed on the car

Procedures are as follows

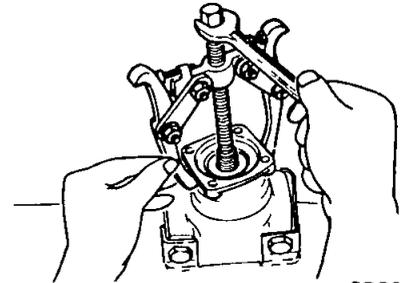
- 1 Drain gear oil
- 2 Raise the rear end of car and support it with safety stands
- 3 Detach propeller shaft from companion flange of carrier
- 4 Remove drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000 See Figure PD-42



PD322

Fig PD-42 Removing drive pinion nut

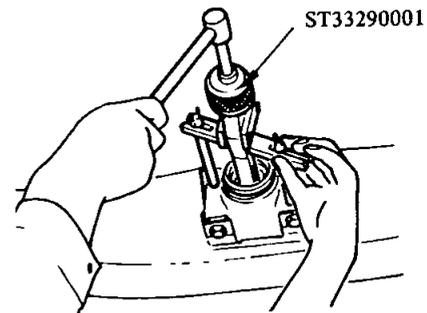
5 Extract companion flange using a standard puller See Figure PD-43



PD264

Fig PD-43 Removing companion flange

6 Remove oil seal using Gear Carrier Oil Seal Puller ST33290001. See Figure PD-44



PD265

Fig PD-44 Removing oil seal

7 Set new oil seal in position using Gear Carrier Oil Seal Drift ST30720000 Apply grease cavity between seal lips

8 Fit companion flange on drive pinion, and secure them in position by tightening nut to specified torque confirming the following preload, using Drive Pinion Flange Wrench ST31530000

Tightening torque of pinion nut
17 to 20 kg-m
(123 to 145 ft-lb)

Pinion bearing preload (with oil seal)
8 to 11 kg-cm
(7.0 to 9.6 in-lb)

At companion flange bolt hole
2.3 to 3.2 kg (5.1 to 7.1 lb)

9 Reinstall propeller shaft by reversing the foregoing removal procedure And fill up gear oil

SIDE OIL SEAL

Side oil seal is replaced by using the following procedures

- 1 Disconnect drive shaft on the wheel side
- 2 Remove side yoke fixing bolt, and extract side yoke together with drive shaft See Figure PD-10

Note Be careful not to damage side yoke and oil seal when removing

- 3 Remove oil seal using Oil Seal Puller ST33290001
- 4 Set in new oil seal using Oil Seal Drift ST33270000

Note Apply grease to cavity between oil seal lips

- 5 Install side yoke together with drive shaft to differential gear carrier assembly, tighten side yoke fixing bolt to specified torque using torque wrench See Figure PD-41

Tightening torque
3.2 to 4.3 kg-m
(23 to 31 ft-lb)

Note Be careful not to damage side yoke and oil seal when installing

- 6 Join drive shaft with companion flange of rear axle shaft and tighten connecting bolt to specified torque

Tightening torque
5 to 6 kg-m
(36 to 43 ft-lb)

Note Check O-ring of side yoke fixing bolt. If necessary, remove universal joint spider located at the side yoke side, and replace O-ring. Refer to Section RA for Disassembly and Assembly.

DIFFERENTIAL CARRIER (TYPE H165B) FOR STATION WAGON (RIGID AXLE)

CONTENTS

DESCRIPTION	PD-18	ASSEMBLY OF DIFFERENTIAL	
REMOVAL	PD-20	GEAR CASE	PD-21
PRE-DISASSEMBLY INSPECTION	PD-20	ADJUSTMENT OF DRIVE PINION	
DISASSEMBLY	PD-20	HEIGHT	PD-22
DISASSEMBLY OF DIFFERENTIAL CASE	PD-20	ADJUSTMENT OF DRIVE PINION PRELOAD	PD-23
INSPECTION	PD-21	ADJUSTMENT OF SIDE BEARING	
ASSEMBLY AND ADJUSTMENT	PD-21	SHIMS	PD-23
PRECAUTIONS IN REASSEMBLY	PD-21	INSTALLATION	PD-25
		REPLACEMENT OF FRONT OIL SEAL	PD-26

DESCRIPTION

The differential gear carrier assembly for Station Wagon is available in type H165B as indicated in the following table

The differential gear carrier assembly has hypoid type drive pinion and ring gear set with a gear ratio of 3.889

The drive pinion is mounted in two tapered roller bearings which are preloaded by a collapsible spacer during assembly

The drive pinion is positioned by a washer located between a shoulder of the drive pinion and the rear bearing

The differential case is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the bearings and the differential case. The differential case assembly is positioned for proper ring gear-to-drive pinion backlash by varying these shims. The ring gear is bolted to the differential case. The

case houses two side gears in mesh with two pinions mounted on a pinion shaft. The pinion shaft is anchored in the case by lock pin. The pinions and side gears are backed by thrust washers.

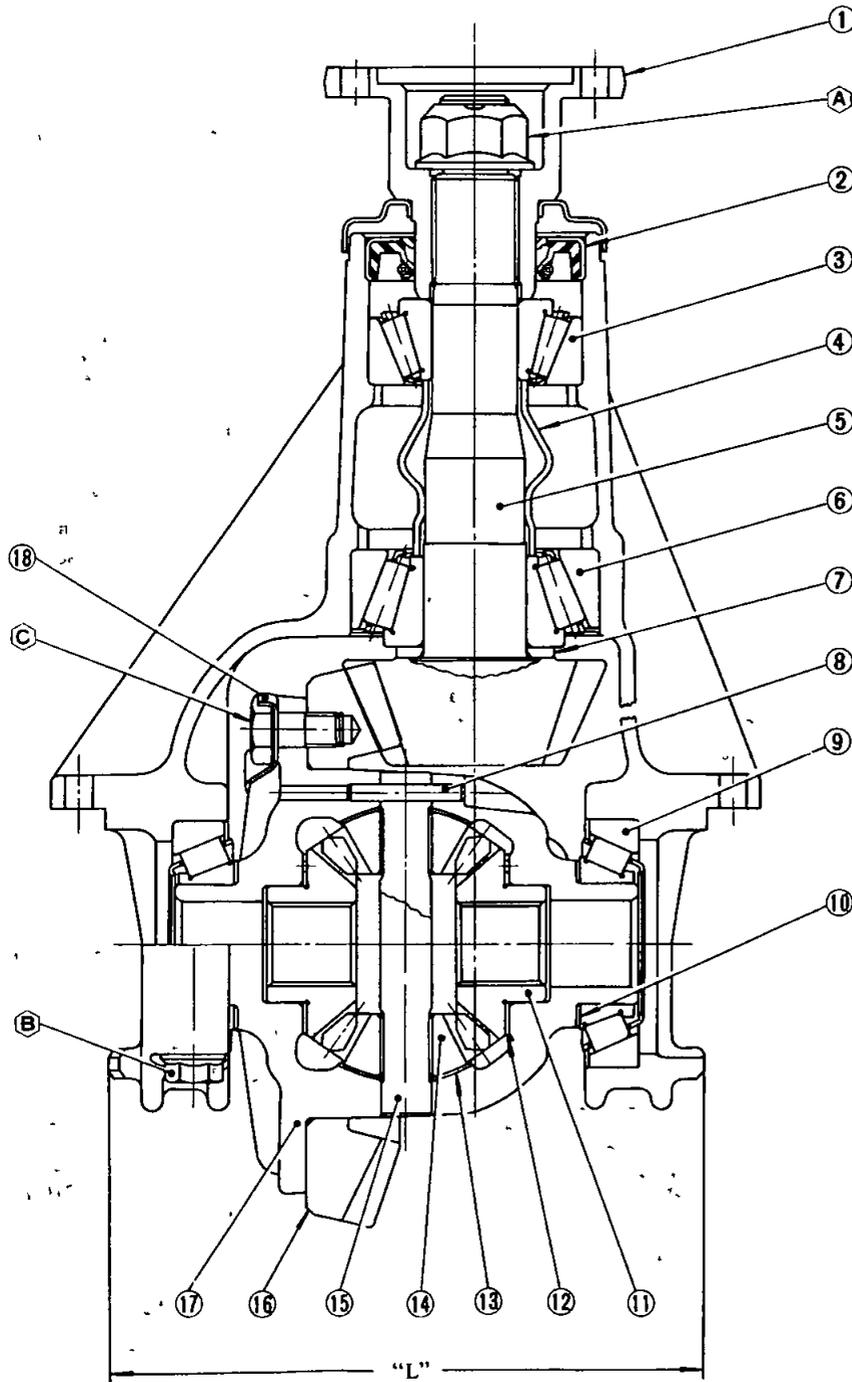
The carrier is of malleable cast iron.

Note: Replacement of front oil seal with differential gear carrier assembly installed on the car must not be allowed due to used collapsible spacer on its model.

Type of gear carrier assembly	R160		H165B
	Gear ratio	3.700	4.111
Engine model	L18	L18	L18
Car model	Sedan	Hardtop	Station Wagon

Propeller Shaft & Differential Carrier

(TYPE H165B)



- 1 Companion flange
- 2 Oil seal
Supply grease to oil seal lip when assembling
- 3 Pinion front bearing
- 4 Collapsible spacer
Adjust pinion bearing preload by this spacer. Procedure can be accomplished by referring to "Adjustment of drive pinion preload"
- 5 Drive pinion
- 6 Pinion rear bearing
- 7 Pinion height adjusting washer
- 8 Lock pin
- 9 Side bearing
- 10 Side bearing adjusting shim
Adjust side bearing preload and ring gear-to-drive pinion backlash by selecting ⑩
- 11 Side gear
- 12 Thrust washer
Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) 0.1 to 0.2 mm (0.0039 to 0.0079 in) by ⑫
- 13 Thrust washer
- 14 Pinion mate
- 15 Differential pinion shaft
- 16 Ring gear
Ring gear-to-drive pinion backlash 0.10 to 0.15 mm (0.0039 to 0.0059 in)
- 17 Differential gear case
- 18 Lock strap

Tightening torque (T) of bolts and nut kg-m (ft-lb)

Ⓐ T More than 14 (101)

This nut should be tightened by referring to "Adjustment of drive pinion preload"

Ⓑ T 5 to 6 (36 to 43)

Ⓒ T 7 to 8 (51 to 58)

L 173.23 to 173.29 mm
(6.8201 to 6.8224 in)

PD316

Fig PD-68 Sectional view of differential carrier for Station Wagon

REMOVAL

- 1 Jack up rear of car and support it by placing a safety stand under rear axle case Drain gear oil
- 2 Remove propeller shaft and rear axle shafts These works can be done as described in Section RA for Removal
- 3 Loosen off nuts securing differential carrier to rear axle case, and take out differential gear carrier assembly

PRE-DISASSEMBLY INSPECTION

Differential case or carrier should be inspected before any parts are removed from it

These inspections are helpful in finding the cause of the problem and in determining the corrections needed

- 1 Mount carrier on Gear Carrier Attachment ST06360001 See Figure PD-69

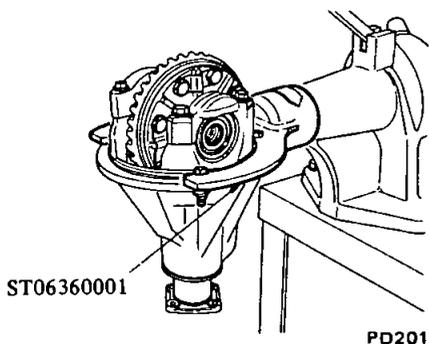


Fig PD-69 Holding differential carrier

- 2 Visually inspect parts for wear or damage
- 3 Rotate gears to see that there is any roughness which would indicate damaged bearings or chipped gears Check the gear teeth for scoring or signs of abnormal wear Measure preload of drive pinion
- 4 Set up a dial indicator and check the backlash at several points around ring gear Backlash should be 0.10 to 0.15 mm (0.0039 to 0.0059 in)
- 5 Check the gear tooth contact with a mixture of powdered red lead and oil applied sparingly to all ring gear teeth

For the tooth contact pattern, see page PD-25 for Contact Pattern

DISASSEMBLY

- 1 Put match marks on side bearing caps and carrier, and remove side bearing caps and take out differential case assembly See Figure PD-70

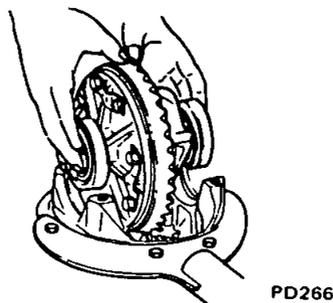


Fig PD-70 Removing differential case assembly

Note Care should be taken not to confuse the left and right hand bearing caps and bearing outer races so that reassembly will be easily carried out with the same parts in the original position

- 2 Remove drive pinion nut using Drive Pinion Flange Wrench ST31530000, and pull off companion flange using a suitable puller See Figure PD-71

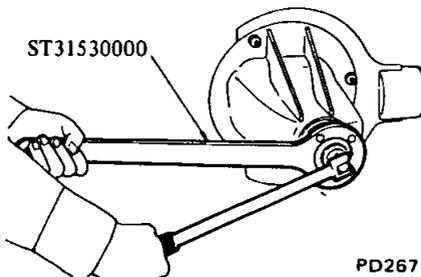


Fig PD-71 Removing drive pinion nut

- 3 Extract drive pinion assembly to the rearwards by tapping the front end with a soft hammer Drive pinion can be taken out together with rear bearing inner race and bearing spacer

- 4 Remove oil seal and take out front bearing inner race

Note Oil seal must not be reused

- 5 Hold rear bearing inner race with Drive Pinion Rear Bearing Inner Race Puller ST30031000 and extract from drive pinion with a press See Figure PD-72

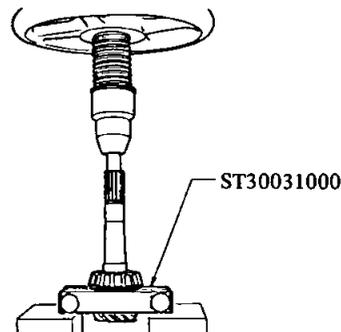


Fig PD-72 Removing pinion rear bearing inner race

- 6 To remove outer races of both front and rear bearing, apply a brass drift to race side surface, and withdraw them by lightly tapping the top of drift with a hammer See Figure PD-73

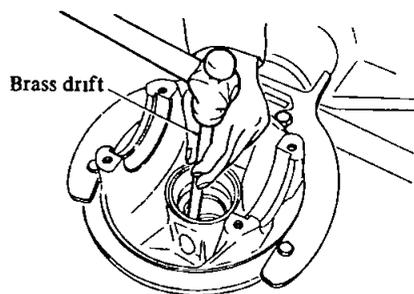


Fig PD-73 Removing pinion front and rear bearing outer races

DISASSEMBLY OF DIFFERENTIAL CASE

- 1 When replacing side bearing, use Gear Carrier Side Bearing Puller ST3305S001 (set of ST33051001 and ST33052000) See Figure PD-74

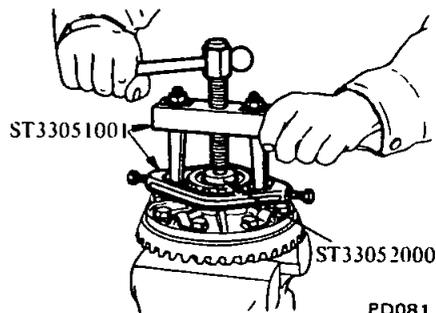


Fig PD-74 Removing side bearing

Notes

- a Puller should be handled with care in catching the edge of bearing inner race
 - b Be careful not to confuse left and right hand parts
- 2 Remove ring gear by spreading out lock strap and loosening ring gear bolts in diagonally
 - 3 Punch off pinion mate shaft lock pin from ring gear side using Solid Punch KV31100300 See Figure PD-75

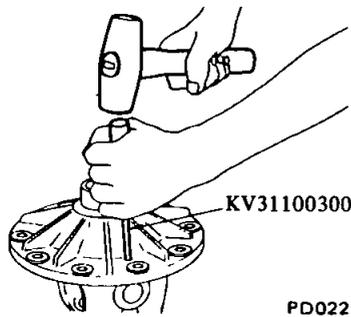


Fig PD-75 Removing lock pin

Note Lock pin is caulked at pin hole mouth on differential case Do not punch it off forcibly without checking how it is caulked

- 4 Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers

Note Put marks on gear and thrust washer so that they can be re-installed in their original positions from which they were removed

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see that they are worn, damaged or otherwise faulty, and how they are affected Repair or replace all faulty parts, whichever is necessary

- 1 Check gear teeth for scoring, cracking or chipping, and make sure that tooth contact pattern indicates correct meshing depth If any fault is evident, replace parts as required

Note Drive pinion and ring gear are supplied for replacement as a set, therefore, should either part be damaged, replace as a set

- 2 Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required

Follow the same procedure for side gear and their seats on differential case

- 3 Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear They should be in tiptop condition such as not worn and with mirror-like surfaces Replace if there is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noises and gear seizure If you need the information on "Visual Serviceability Standard for Taper Roller Bearing", refer to Section FA for Inspection

- 4 Inspect thrust washer faces Small faults can be corrected with sandpaper If pinion mate-to-side gear backlash (or the clearance between side gear and thrust washer) exceeds limits 0.1 to 0.2 mm (0.0039 to 0.0079 in), replace thrust washers

- 5 Inspect carrier and differential case for cracks or distortion If either condition is evident, replace faulty parts

- 6 As a general rule, oil seal should be replaced at each disassembly

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly The following directions for adjustment and usage of special tools enable to obtain a perfect differential operation

PRECAUTIONS IN REASSEMBLY

- 1 Arrange shims, washers and the like to install them correctly
- 2 Thoroughly clean the surfaces on which shims, washers, bearings and bearing caps are installed
- 3 Apply gear oil when installing bearings
- 4 Pack recommended multi-purpose grease cavity between lips when fitting oil seal

ASSEMBLY OF

DIFFERENTIAL GEAR CASE

- 1 Assemble pinion mates, side gears and thrust washers in differential case
- 2 Fit pinion shaft to differential case so that it meets lock pin holes
- 3 Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to 0.1 to 0.2 mm (0.0039 to 0.0079 in) by selecting side gear thrust washer

Side gear thrust washer

Thickness mm (in)
0.785 (0.0309)
0.835 (0.0329)
0.885 (0.0348)
1.035 (0.0407)
1.185 (0.0467)

- 4 Lock pinion shaft lock pin using a punch after it is secured into place
- 5 Apply oil to gear tooth surfaces and thrust surfaces and check if they turn properly
- 6 Place ring gear on differential case and install bolts and lock washers Torque bolts to specification, and bend up lock washers

Tightening torque
7 to 8 kg-m
(51 to 58 ft-lb)

Notes

- a Use only genuine drive gear bolts and new lock washers
- b Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer

- 7 When replacing side bearing, measure bearing width using Master Gauge ST33741000 and a Weight Block ST32501000 prior to installation See Figure PD-76

Standard bearing width
18.5 mm (0.7283 in)

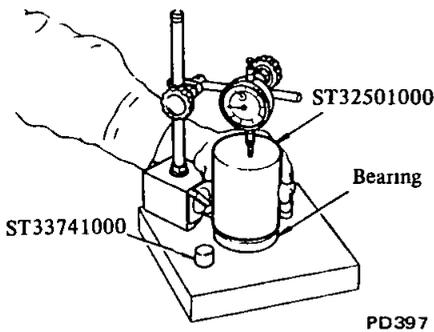


Fig PD-76 Measuring bearing width

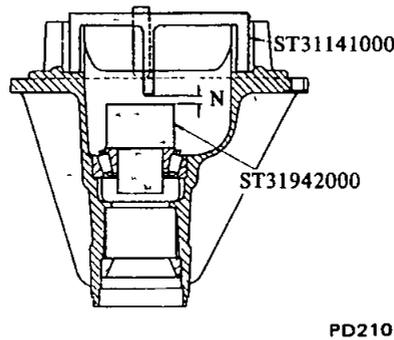


Fig PD-78 Adjusting pinion height

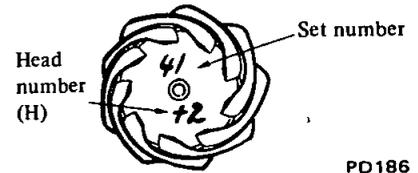


Fig PD-80 Variation number on drive pinion

8 Press fit side bearing cone into differential case using Gear Carrier Side Bearing Drift KV38102100 and Adapter ST33052000 See Figure PD-77

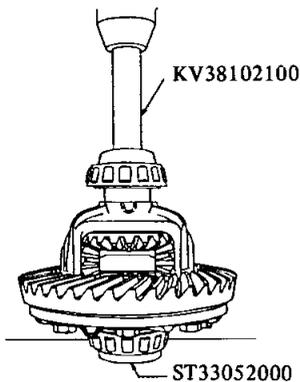


Fig PD-77 Installing side bearing cone

3 Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge See Figure PD-79

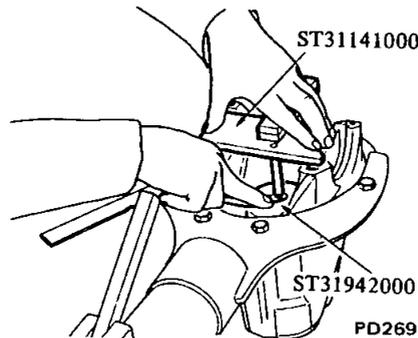


Fig PD-79 Measuring clearance

4 The thickness of drive pinion height adjusting washer can be obtained from the following formula

Examples of calculation

Ex 1 --

$$N = 0.42 \text{ mm}, H = +2, D' = -1 \\ S = +1$$

$$T = N - [(H - D' - S) \times 0.01] + 2.98 \\ = 0.42 - [((+2) - (-1) - (+1)) \times 0.01] + 2.98 \\ = 0.42 - [(2 + 1 - 1) \times 0.01] + 2.98 \\ = 0.42 - [2 \times 0.01] + 2.98 \\ = 0.42 - 0.02 + 2.98 \\ = 3.38 \text{ mm}$$

The correct washer is 3.39 mm thick

Ex 2 --

$$N = 0.35 \text{ mm}, H = -3, D' = +1 \\ S = -2$$

$$T = N - [(H - D' - S) \times 0.01] + 2.98 \\ = 0.35 - [((-3) - (+1) - (-2)) \times 0.01] + 2.98 \\ = 0.35 - [(-3 - 1 + 2) \times 0.01] + 2.98 \\ = 0.35 - [-2 \times 0.01] + 2.98 \\ = 0.35 + 0.02 + 2.98 \\ = 3.35 \text{ mm}$$

The correct washer is 3.36 mm thick

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust the pinion height with washer provided between rear bearing inner race and the back of pinion gear

1 Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30701000 and ST30613000

Front ST30611000 and ST30701000

Rear ST30611000 and ST30613000

2 Fit rear bearing on carrier, and install Dummy Shaft on rear bearing, and place Height Gauge on carrier See Figure PD-78

ST31141000 Height gauge
ST31942000 Dummy shaft

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$

Where,

T Required thickness of rear bearing adjusting washer (mm)

N Measured value with thickness gauge (mm)

H Figure marked on the drive pinion head See Figure PD-80

D' Figure marked on the dummy shaft

S Figure marked on the height gauge

Figures for H, D' and S are dimensional variations in a unit of 1/100 mm against each standard measurement

Ex 3 --

$$N = 0.51 \text{ mm, } H = 0, D' = 0 \\ S = 0$$

$$T = N - [(H - D' - S) \times 0.01] \\ + 2.98 \\ = 0.51 - [(0 - 0 - 0) \times 0.01] \\ + 2.98 \\ = 0.51 - [0 \times 0.01] + 2.98 \\ = 0.51 - 0 + 2.98 \\ = 0.51 + 2.98 \\ = 3.49 \text{ mm}$$

The correct washer is 3.48 mm thick

Note If values signifying H, D' and S are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust. For the tooth contact pattern, see page PD-25 for Contact Pattern.

Pinion height adjusting washer

Thickness mm (in)
3.09 (0.1217)
3.12 (0.1228)
3.15 (0.1240)
3.18 (0.1252)
3.21 (0.1264)
3.24 (0.1276)
3.27 (0.1287)
3.30 (0.1299)
3.33 (0.1311)
3.36 (0.1323)
3.39 (0.1335)
3.42 (0.1346)
3.45 (0.1358)
3.48 (0.1370)
3.51 (0.1382)
3.54 (0.1394)
3.57 (0.1406)
3.60 (0.1417)
3.63 (0.1429)
3.66 (0.1441)

5. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, using Base ST30032000.

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the preload of drive pinion with collapsible spacer.

This procedure has nothing to do with thickness of pinion height adjusting washer.

Note Reuse of a collapsible spacer must not be allowed.

1. After adjusting pinion height, lubricate front bearing with gear oil and place it in carrier.
2. Install a new oil seal in carrier using Oil Seal Drift ST33400001. Lubricate cavity between seal lips with recommended multi-purpose grease when installing.
3. Place a new collapsible spacer on drive pinion and lubricate pinion rear bearing with gear oil.
4. Insert companion flange into oil seal and hold it firmly against pinion front bearing cone. From the rear of the carrier, insert drive pinion into companion flange.
5. Ascertain that threaded portion of drive pinion and a new pinion nut are free from oil or grease.
6. Holding companion flange with Drive Pinion Flange Wrench ST31530000, tighten nut and then drive pinion is pulled into front bearing cone and into flange.

As drive pinion is pulled into front bearing cone, drive pinion end play is reduced. While there is still end play in drive pinion, companion flange and cone will be felt to bottom. This indicates that bearing cone and companion flange have bottomed on collapsible spacer.

From this point, a much greater torque must be applied to turn pinion nut since spacer must be collapsed. From this point, nut should also be tightened very slowly and drive pinion end play checked often so that pinion bearing preload does not exceed the limits.

When the drive pinion end play is eliminated, the specified preload is being approached. Replace collapsible spacer if this specification is exceeded.

When the drive pinion end play is eliminated, the specified preload is being approached. Replace collapsible spacer if this specification is exceeded.

Note Do not decrease preload by loosening pinion nut. This will remove compression between pinion front and rear bearing cones and collapsible spacer and may permit front bearing cone to turn on drive pinion, moreover, nut becomes loose.

7. Turn drive pinion in both directions several times to set bearing rollers. And adjust bearing preload to specifications using Preload Gauge ST3127S000. See Figure PD-81.

- Tightening torque of pinion nut
 - 14 to 17 kg-m (101 to 123 ft-lb)
- Preload (with oil seal)
 - 8 to 11 kg-cm (6.9 to 9.5 in-lb)
- At companion flange bolt hole
 - 2.0 to 2.9 kg (4.4 to 6.4 lb)

Note Preload of used bearing is the same value as that of a new bearing.

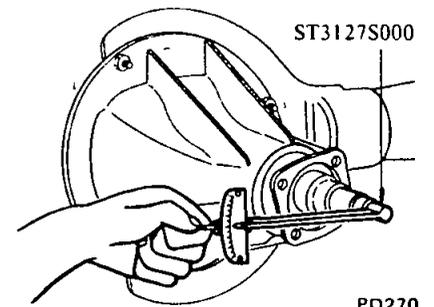


Fig PD-81 Measuring pinion preload

ADJUSTMENT OF SIDE BEARING SHIMS

1. If hypoid gear set, carrier, differential case or side bearing have been replaced with new ones, adjust the side bearing preload with adjusting shim.

The required thickness of adjusting shim can be calculated by the following formulas.

Propeller Shaft & Differential Carrier

$$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$$

$$T_2 = (B - D + H') \times 0.01 + 0.090 + F$$

Where,

T_1 Required thickness of left side bearing adjusting shim (mm)

T_2 Required thickness of right side bearing adjusting shim (mm)

A Figure marked on the left side bearing housing of gear carrier

B Figure marked on the right side bearing of gear carrier

C & D Figure marked on the differential case

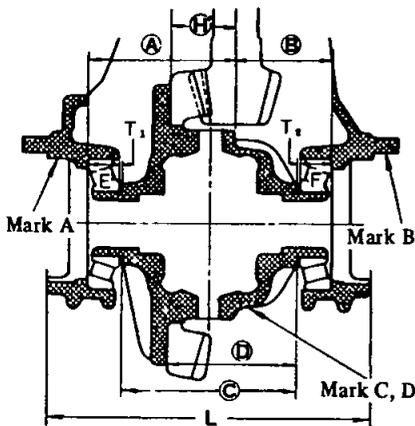
E & F These are differences in width of left or right side bearing against the standard width (18.50 mm) (mm)

If bearing width is 18.39, the difference will be as follows

$$18.50 - 18.39 = 0.11$$

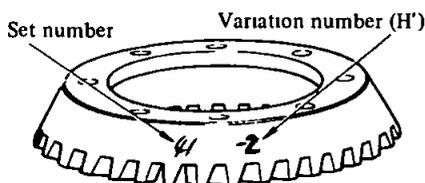
H' Figure marked on the ring gear
See Figures PD-82 and PD-83

Figures for A, B, C, D and H' are dimensional variations in a unit of 1/100 mm against each standard measurement



PD214

Fig PD-82 Thickness of shim on left and right sides



PD190

Fig PD-83 Variation number on ring gear

Examples of calculation

Ex 1 ---

$$A = 1, B = 2, C = 2, D = 3$$

$$E = 0.11 \text{ mm}, F = 0.15 \text{ mm}$$

$$H' = -2$$

Left side

$$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$$

$$= (1 - 2 + 3 - (-2)) \times 0.01 + 0.200 + 0.11$$

$$= (1 - 2 + 3 + 2) \times 0.01 + 0.200 + 0.11$$

$$= 4 \times 0.01 + 0.200 + 0.11$$

$$= 0.04 + 0.200 + 0.11$$

$$= 0.35 \text{ mm}$$

The correct shims are 0.05 plus 0.10 plus 0.20 mm thick

Right side

$$T_2 = (B - D + H') \times 0.01 + 0.090 + F$$

$$= (2 - 3 + (-2)) \times 0.01 + 0.090 + 0.15$$

$$= (2 - 3 - 2) \times 0.01 + 0.090 + 0.15$$

$$= -3 \times 0.01 + 0.090 + 0.15$$

$$= -0.03 + 0.090 + 0.15$$

$$= 0.21 \text{ mm}$$

The correct shims are three pieces of 0.07 mm thick

Ex 2 ---

$$A = 0, B = 3, C = 1, D = 0$$

$$E = 0.20 \text{ mm}, F = 0.17 \text{ mm}$$

$$H' = 2$$

Left side

$$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$$

$$= (0 - 1 + 0 - (+2)) \times 0.01 + 0.200 + 0.20$$

$$= (0 - 1 + 0 - 2) \times 0.01 + 0.200 + 0.20$$

$$= -3 \times 0.01 + 0.200 + 0.20$$

$$= -0.03 + 0.200 + 0.20$$

$$= 0.37 \text{ mm}$$

The correct shims are 0.07 plus 0.10 plus 0.20 mm thick

Right side

$$T_2 = (B - D + H') \times 0.01 + 0.090 + F$$

$$= (3 - 0 + (+2)) \times 0.01 + 0.090 + 0.17$$

$$= (3 - 0 + 2) \times 0.01 + 0.090 + 0.17$$

$$= 5 \times 0.01 + 0.090 + 0.17$$

$$= 0.05 + 0.090 + 0.17$$

$$= 0.31 \text{ mm}$$

The correct shims are as follows

Thickness	Quantity	
0.07	x 3	= 0.21
0.10	x 1	= 0.10
Total thickness		= 0.31 mm

Note If values signifying A, B, C, D and H' are not given, regard them as zero and compute

After assembly, check to see that preload and backlash are correct
If not, readjust

Side bearing adjusting shim

Thickness mm (in)
0.05 (0.0020)
0.07 (0.0028)
0.10 (0.0039)
0.20 (0.0079)
0.50 (0.0197)

2 Fit determined side bearing adjusting shim on differential case, and press fit left and right side bearing inner races on it, using Side Bearing Drift KV38102100 and Adapter ST33052000 See Figure PD-77

3 Install differential case assembly into gear carrier, tapping with a soft hammer

4 Align mark on bearing cap with that on gear carrier, and install bearing cap on carrier. And tighten bolts to specified torque

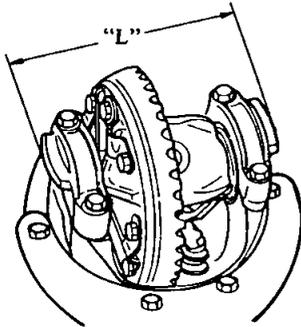
Tightening torque

5 to 6 kg-m
(36 to 43 ft-lb)

Propeller Shaft & Differential Carrier

5 Measure "L" dimension (between left and right bearing cap edges) by a micrometer See Figures PD-68 and PD-84

"L" dimension
173.23 to 173.29 mm
(6.8201 to 6.8224 in)



PD391

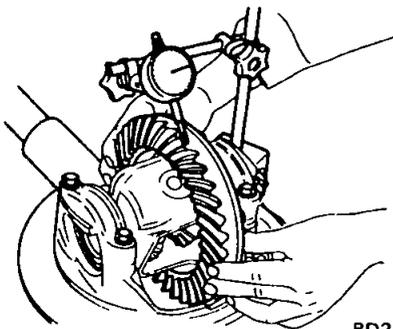
Fig PD-84 Measuring "L" dimension

6 Measure ring gear-to-drive pinion backlash See Figure PD-85

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

Backlash
0.10 to 0.15 mm
(0.0039 to 0.0059 in)



PD272

Fig PD-85 Measuring backlash

7 Check and adjust the tooth contact pattern of ring gear and drive pinion

- (1) Thoroughly clean ring and drive pinion gear teeth
- (2) Paint ring gear teeth lightly and evenly with a mixture of powdered red lead and oil of a suitable consistency to produce a contact pattern

(3) Rotate pinion through several revolutions in the forward and reverse direction until a definite contact pattern is developed on ring gear

(4) When contact pattern is in correct, readjust thickness of adjust shim

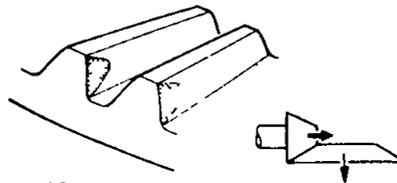
Be sure to wipe off red lead completely upon completion of adjustment

(5) Incorrect contact pattern of teeth can be adjusted in the following manner

Contact pattern

a Heel contact

To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear See Figure PD-86

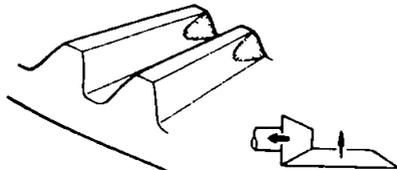


PD193

Fig PD-86 Heel contact

b Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear See Figure PD-87

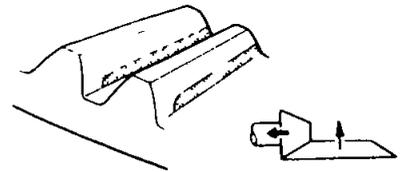


PD194

Fig PD-87 Toe contact

c Flank contact

Adjust in the same manner as in b See Figure PD-88

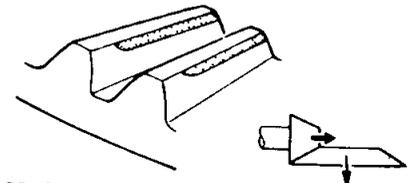


PD195

Fig PD-88 Flank contact

d Face contact

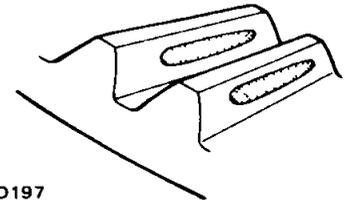
Adjust in the same manner as in a See Figure PD-89



PD196

Fig PD-89 Face contact

e Correct tooth contact



PD197

Fig PD-90 Correct contact

Note Change in thickness of adjusting washer is accompanied by change in backlash Check it when installing gear

INSTALLATION

Installing can be done in the reverse order of removal

Tightening torque

Gear carrier to rear axle case
2.0 to 2.5 kg-m
(14 to 18 ft-lb)

Drain and filler plug
4.2 to 6.9 kg-m
(30 to 50 ft-lb)

Gear oil quantity

1.3 liters
(1 3/8 US qt, 1 1/8 Imp qt)

REPLACEMENT OF FRONT OIL SEAL

When replacing front oil seal, do as follows

1 Remove differential gear carrier assembly and mount it on Gear Carrier Attachment ST06360001

This work can be done by referring to "Removal" procedure

2 Remove side bearing caps and take out differential case assembly Remove drive pinion nut and extract drive pinion assembly Remove oil seal

These works can be done by referring to "Disassembly" procedure

3 Install a new oil seal in carrier using Oil Seal Drift ST33400001

Lubricate cavity between seal lips with recommended multi-purpose grease when installing

4 Place a new collapsible spacer on drive pinion and lubricate pinion rear bearing with gear oil

5 Insert companion flange into oil seal Insert drive pinion into companion flange from the rear of the carrier and secure them in position by tightening nut to the given torque confirming specified preload

These works can be done by referring to "Adjustment of Drive Pinion Preload" procedure

6 Install differential case assembly into gear carrier Measure "L" dimension, backlash with specification, adjust them with side bearing shims

These works can be done by referring to "Adjustment of Side Bearing Shims" procedure

7 Reinstall differential gear carrier assembly, rear axle shafts and propeller shaft Fill up differential carrier with correct gear oil

Notes

- a. Replacement of front oil seal with differential gear carrier assembly installed on the car must not be allowed due to used collapsible spacer on its model
- b. Whenever front oil seal is replaced, collapsible spacer must be replaced

TROUBLE DIAGNOSES AND CORRECTIONS

When a gear 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 gear carrier Noise which originates in other places cannot

be corrected by adjustment or replacement of parts in the rear axle assembly

Condition	Probable cause	Corrective action
Noise on drive, coast and float	<p>Shortage of oil</p> <p>Incorrect tooth contact between ring gear and drive pinion</p> <p>Incorrect backlash between ring gear and drive pinion</p> <p>Seized up or damaged ring gear and drive pinion</p> <p>Seized up, damaged or broken drive pinion bearing</p> <p>Seized up, damaged or broken side bearing</p> <p>Loosen bolts or nuts fixing ring gear, side retainers, bearing cap, etc</p>	<p>Supply gear oil Rebuild gear carrier if necessary</p> <p>Adjust tooth contact or replace the hypoid gear set</p> <p>Adjust backlash or replace the hypoid gear set if necessary</p> <p>Replace the hypoid gear set</p> <p>Replace the pinion bearing and faulty parts</p> <p>Replace the side bearing and faulty parts</p> <p>Clamp them to specified torque, and replace faulty parts</p>
Noise on turn	<p>Seized up, damaged or broken side and pinion gear</p> <p>Seized up, damaged or broken side gear and pinion thrust washer</p> <p>Pinion gears too tight on their shaft</p> <p>Interference between side yoke and differential case (for I R S model)</p>	<p>Replace faulty parts</p> <p>Replace faulty parts</p> <p>Replace faulty parts</p> <p>Repair the part responsible for interference, or replace the side yoke and differential case</p>
Knocking sound during starting or gear shifting	<p>Excessive backlash</p> <p>Incorrect backlash ring gear-to-drive pinion backlash, or side-to-pinion gear</p> <p>Worn gears or case</p> <p>Worn side yoke (or rear axle shaft) and side gear spline</p> <p>Pinion bearing under preload</p> <p>Loosened drive pinion nut</p> <p>Loosen bolts or nuts fixing ring gear, side retainers, bearing cap, etc</p>	<p>Adjust backlash</p> <p>Replace worn parts</p> <p>Replace worn parts</p> <p>Adjust preload</p> <p>Repair or replace</p> <p>Clamp them or replace if necessary</p>

Propeller Shaft & Differential Carrier

Condition	Probable cause	Corrective action
Seizure of breakage	Shortage of oil or use of unsuitable oil Excessively small backlash Incorrect adjustment of bearings or gears Severe service due to an excessive loading, improper use of clutch Loose bolts and nuts, such as ring gear bolts	Replace faulty parts Adjust backlash and replace as required Replace faulty parts Replace faulty parts Replace faulty parts
Oil leakage	Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange Worn, damaged or improperly driven side oil seal, or bruised, dented or abnormally worn slide face of side yoke Loose bolts such as side yoke, side retainer or gear carrier Faulty gasket or O-ring Loose filler or drain plug Clogged or damaged breather	Replace faulty oil seal Repair the affected flange with sandpaper or replace if necessary Treat as above Tighten the bolts to specified torque Replace faulty parts with new ones Tighten the plug Repair or replace

SERVICE DATA AND SPECIFICATIONS

	Sedan and Hardtop (I R S)	Station Wagon
Type	R160	H165B
Gear carrier material	Malleable cast-iron	
Gear ratio	Sedan 3 700 Hardtop 4 111	3 889
Drive pinion preload adjusted by	Shim	Collapsible spacer
Drive pinion Preload kg-cm (in-lb) (without oil seal) (with oil seal) At companion flange bolt hole kg (lb) (without oil seal) (with oil seal)	7 to 10 (6 1 to 8 7) 8 to 11 (6 9 to 9 5) 2 0 to 2 9 (4 4 to 6 4) 2 3 to 3 2 (5 1 to 7 1)	— 7 to 10 (6 1 to 8 7) — 2 0 to 2 9 (4 4 to 6 4)
Thickness of pinion height adjusting washer mm (in)	3 09 (0 1217) 3 12 (0 1228) 3 15 (0 1240) 3 18 (0 1252) 3 21 (0 1264) 3 24 (0 1276) 3 27 (0 1287) 3 30 (0 1299) 3 33 (0 1311) 3 36 (0 1323) 3 39 (0 1335) 3 42 (0 1346) 3 45 (0 1358) 3 48 (0 1370) 3 51 (0 1382) 3 54 (0 1394) 3 57 (0 1406) 3 60 (0 1417) 3 63 (0 1429) 3 66 (0 1441)	3 09 (0 1217) 3 12 (0 1228) 3 15 (0 1240) 3 18 (0 1252) 3 21 (0 1264) 3 24 (0 1276) 3 27 (0 1287) 3 30 (0 1299) 3 33 (0 1311) 3 36 (0 1323) 3 39 (0 1335) 3 42 (0 1346) 3 45 (0 1358) 3 48 (0 1370) 3 51 (0 1382) 3 54 (0 1394) 3 57 (0 1406) 3 60 (0 1417) 3 63 (0 1429) 3 66 (0 1441)
Length of pinion bearing adjusting spacer mm (in)	56 2 (2 2126) 56 4 (2 2205) 56 6 (2 2283) 56 8 (2 2362) 57 0 (2 2441) 57 2 (2 2520)	Non adjustable collapsible spacer

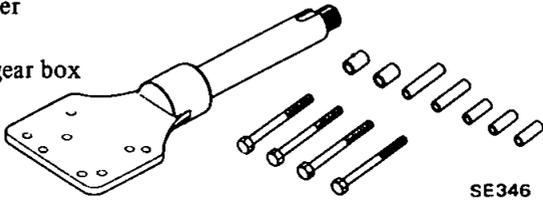
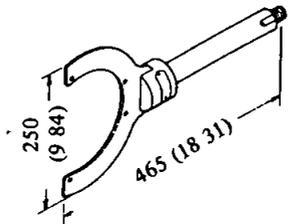
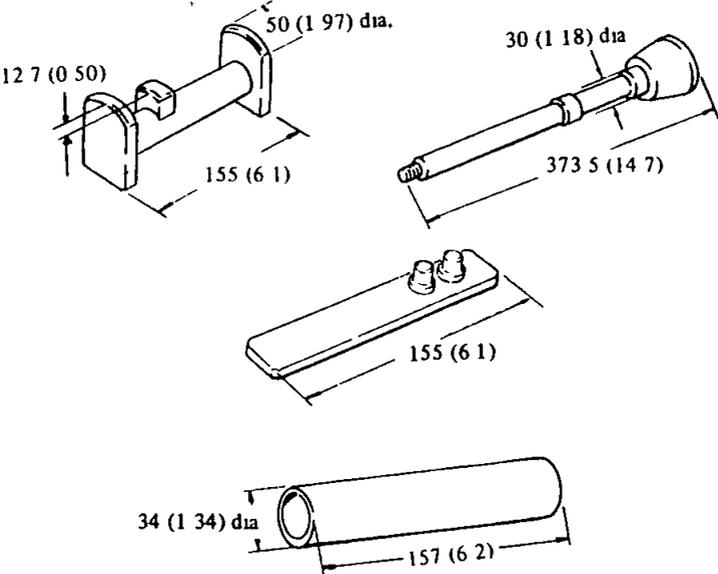
Propeller Shaft & Differential Carrier

	R160	H165B
Thickness of pinion bearing adjusting washer mm (in)	2 30 to 2 32 (0 0906 to 0 0913) 2 32 to 2 34 (0 0913 to 0 0921) 2 34 to 2 36 (0 0921 to 0 0929) 2 36 to 2 38 (0 0929 to 0 0937) 2 38 to 2 40 (0 0937 to 0 0945) 2 40 to 2 42 (0 0945 to 0 0953) 2 42 to 2 44 (0 0953 to 0 0961) 2 44 to 2 46 (0 0961 to 0 0969) 2 46 to 2 48 (0 0969 to 0 0976) 2 48 to 2 50 (0 0976 to 0 0984) 2 50 to 2 52 (0 0984 to 0 0992) 2 52 to 2 54 (0 0992 to 0 1000) 2 54 to 2 56 (0 1000 to 0 1008) 2 56 to 2 58 (0 1008 to 0 1016) 2 58 to 2 60 (0 1016 to 0 1024)	Non adjustable collapsible spacer
Side gear and pinion mate Thickness of side gear thrust washer mm (in)	0 75 to 0 80 (0 0295 to 0 0315) 0 80 to 0 85 (0 0315 to 0 0335) 0 85 to 0 90 (0 0335 to 0 0354)	0 785 (0 0309) 0 835 (0 0329) 0 885 (0 0348) 1 035 (0 0407) 1 185 (0 0467)
Pinion mate-to-side gear backlash (or clearance between side gear and thrust washer) mm (in)	0 1 to 0 2 (0 0039 to 0 0079)	0 1 to 0 2 (0 0039 to 0 0079)
Ring gear Ring gear-to-drive pinion backlash mm (in)	0 1 to 0 2 (0 0039 to 0 0079)	0 10 to 0 15 (0 0039 to 0 0059)
Thickness of side retainer adjusting shim mm (in)	0 05 (0 0020) 0 07 (0 0028) 0 10 (0 0039) 0 20 (0 0079) 0 50 (0 0197)	—
Thickness of side bearing adjusting shim mm (in)	—	0 05 (0 0020) 0 07 (0 0028) 0 10 (0 0039) 0 20 (0 0079) 0 50 (0 0197)
Side bearing standard width mm (in)	20 0 (0 7874)	18 5 (0 7283)
“L” dimension mm (in)	—	173 23 to 173 29 (6 8201 to 6 8224)

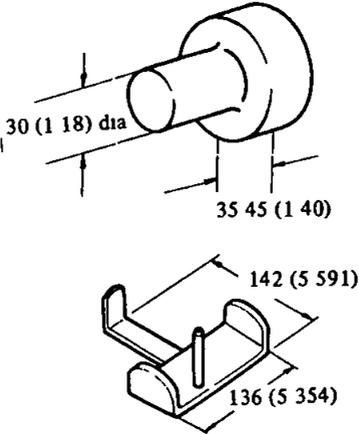
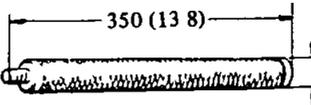
Propeller Shaft & Differential Carrier

	R160	H165B
Tightening torque kg-m (ft-lb)		
Drive pinion nut	17 to 20 (123 to 145)	More than 14 (101)
Ring gear bolt	7 to 8 (51 to 58)	
Side bearing cap bolt	—	5 to 6 (36 to 46)
Differential carrier to axle case	—	2 0 to 2 5 (14 to 18)
Side retainer bolt	0 9 to 1 2 (6 5 to 8 7)	—
Side yoke fixing bolt	3 2 to 4 3 (23 to 31)	—
Rear cover fixing bolt	1 9 to 2 6 (14 to 19)	—
Rear cover to mounting member	6 to 8 (43 to 58)	—
Differential carrier to suspension member	5 to 7 (36 to 51)	—
Drive shaft to rear axle shaft fixing bolt	5 to 6 (36 to 43)	—
Differential mounting member self lock nut	7 to 10 (51 to 72)	—
Companion flange to propeller shaft	2 4 to 3 3 (17 to 24)	
Oil drain and filler plug	4 to 6 (29 to 43)	4 2 to 6 9 (30 to 50)
Oil capacity (about)	0 8 liter ($\frac{3}{8}$ US qt , $\frac{1}{4}$ Imp qt)	1 3 liters (1 $\frac{1}{8}$ US qt , 1 $\frac{1}{2}$ Imp qt)
Adjusting methods	mm (x 0 01)	
Variable numbers expressed by	mm (x 0 01)	
Dummy shaft	Use	
Drive pinion adjusting formula	$T = W + N - [H - D' - S] \times 0 01] - 0 2$	$T = N - [(H - D' - S) \times 0 01] + 2 98$
Side bearing adjusting formula	$T_1 = (A + C + G_1 - D) \times 0 01 + 0 76 - E$ $T_2 = (B + D + G_2) \times 0 01 + 0 76 - F$	$T_1 = (A - C + D - H') \times 0 01 + 0 20 + E$ $T_2 = (B - D + H') \times 0 01 + 0 09 + F$

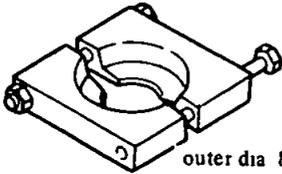
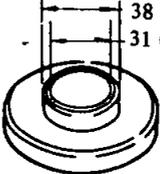
SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	KV38100800 Gear carrier attachment (R160)	This attachment is used with engine stand (ST0501S000) Strut and steering gear box mounting holes are provided with engraved identification marks "D" for gear carrier "S" for strut "G" for steering gear box 	710(SSS) 610 HGC110 KC130 S30 510	Fig PD-12
2	ST06360001 Diff attachment (H165B)	Same as above 	W610 J710 HC110 B120	Fig PD-69 Page PD-26
3	ST3121S000 Drive pinion setting gauge assembly (R160) ST31211000 Height gauge ST31212000 Dummy shaft ST31213000 Stopper ST31214000 Collar	These tools are used to adjust the pinion height 	610 S30 HGC110 KHC130	Fig PD-22 Fig PD-24 Fig PD-25 Page PD-11

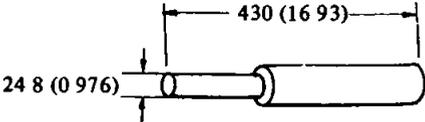
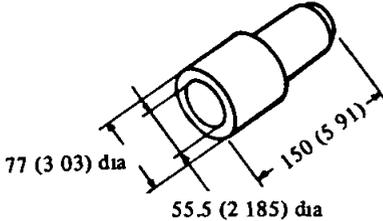
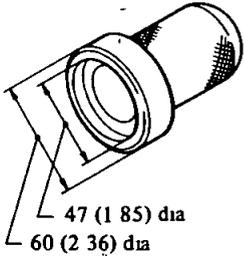
Propeller Shaft & Differential Carrier

No	Tool number & tool name	Description	Unit	Reference page or Figure No
			mm (in)	
4	<p>ST3114S000 Drive pinion setting gauge assembly (H165)</p> <p>ST31942000 Dummy shaft</p> <p>ST31141000 Height gauge</p>	<p>These tools are used to adjust the pinion height</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SE209</p> <p style="text-align: right;">SE210</p>	<p>W610 J710 C110 B120</p>	<p>Fig PD-78 Fig PD-79</p>
5	<p>ST30611000 Bearing drift bar</p>	<p>These tools are used when press fitting bearing outer race</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SE405</p>	<p>710 B210 610 C110 C130 330 S30 B120 620 F20 E20 C240 T40 140</p>	<p>Page PD-11 Page PD-22</p>

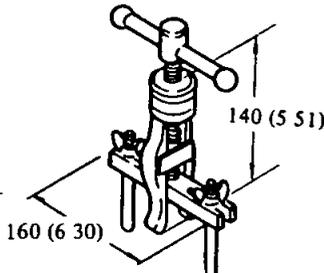
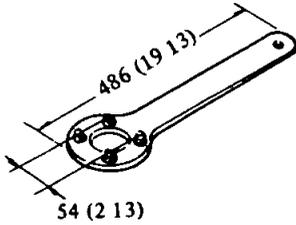
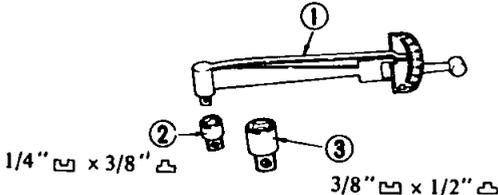
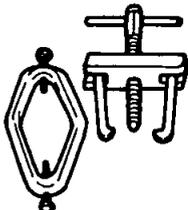
Propeller Shaft & Differential Carrier

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
6	ST30701000 Drift	For drive pinion front bearing outer race  61.5 (2.42) dia SE406	(Front) 710 B210 (H150) 610 W610 HC110 KHC130 B120 620 (Rear) B210 (H145A) B210 (H150)	Page PD-11 Page PD-22
7	ST30613000 Drift	For drive pinion rear bearing outer race  72 (2.83) dia SE407	(Rear) 710 610 C110 B120 620 (Front) VC110 HC130 330 S30 (R200) F20 E20 C240 T40 140	Page PD-11 Page PD-22
8	ST30621000 Drift	For side bearing outer race  79 (3.11) dia SE408	(Side) 710 610 GC110 KC130 (Rear) GC110 VC110 C130 330 S30(All) F20(All) E20(All)	Page PD-11
9	ST3003S000 Drive pinion rear inner bearing puller assembly ST30031000 Puller ST30032000 Base	This assembly clamps rear bearing inner race and pulls it out by a hydraulic press Before insertion, place another drift facing inner race, and then press-fit  outer dia 80 (3.15) inner dia 50 (1.97)  38 (1.50) dia 31 (1.22) dia SE041	610 (All) 710 (All) 510 B210 620 HC110 B120	Fig PD-16 Fig PD-27 Fig PD-72 Page PD-23

Propeller Shaft & Differential Carrier

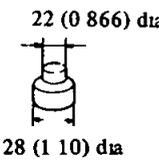
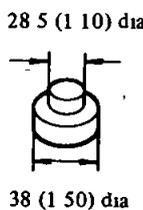
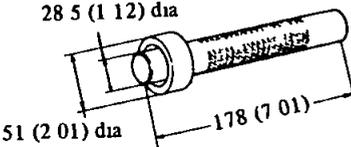
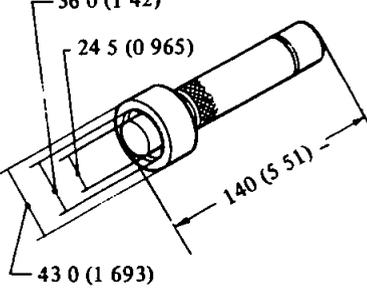
No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
10	ST30650001 Pilot bearing drift	For use when pulling out front pilot bearing After drive pinion has been pulled, insert this tool from behind the gear carrier case, and apply it onto pinion front bearing inner race, and then press out pinion front bearing inner race, front pilot bearing spacer and pilot bearing 	610 (R160) 710 (R160) 510 HGC110 KHC130	Page PD-10
11	ST30720000 Gear carrier front oil seal drift	This tool is used to drive in front oil seal without damaging it 	610 (R160) 710 (R160) 510 W510 HGC110 KHC130	Page PD-13 Page PD-16
12	ST33400001 Front oil seal drift	Same as above 	W610 B210 (All) J710 HC110 B120	Page PD-23 Page PD-26

Propeller Shaft & Differential Carrier

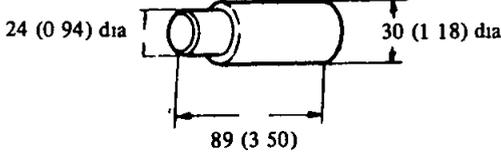
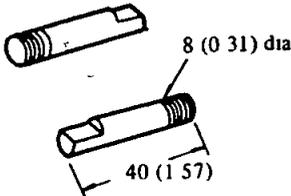
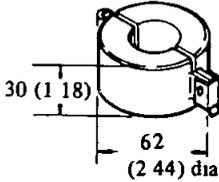
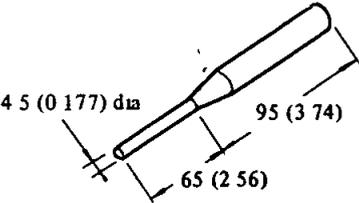
No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
13	ST33290001 Gear carrier oil seal puller	This tool is used to pull out oil seal from gear carrier This tool also enables to remove side bearing outer race from retainer without damaging  A mechanical puller tool with a central threaded rod and a T-shaped handle. It has two adjustable clamping arms. Dimensions: 140 (5 51) mm height, 160 (6 30) mm width.	All models	Fig PD-14 Fig PD-44 Page PD-17
14	ST31530000 Drive pinion flange wrench	This tool is used to hold the flange to ease the operation of tightening and loosening drive pinion nut  A long-handled wrench with a circular flange at the end. Dimensions: 486 (19 13) mm length, 54 (2 13) mm width.	610 710 510 W510 620 330 S30 E20 C110 C130 E20 B120	Fig PD-5 Fig PD-15 Fig PD-42 Fig PD-71 Page PD-23
15	ST3127S000 Preload gauge 1 GG91030000 Torque wrench 2 HT62940000 Socket adapter 3 HT62900000 Socket adapter	This tool is used to measure the preload of pinion bearing  A torque wrench (1) with two socket adapters (2 and 3). Adapter 2 is labeled 1/4" x 3/8" and adapter 3 is labeled 3/8" x 1/2".	610 B210 710 C110 C130 330 S30 B120 620 F20 E20 C240 T40 140 60	Fig PD-23 Fig PD-81
16	ST33051001 Side bearing puller	These tools are used to pull out side bearing  A side bearing puller consisting of a central threaded rod with a T-handle and two adjustable clamping arms.	610 B210 710 C110 C130 330 S30 B120 620 F20 E20	Fig PD-17 Fig PD-74

SE420

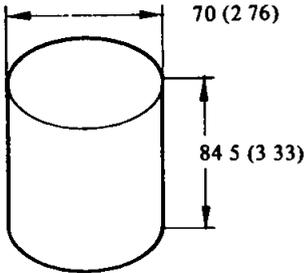
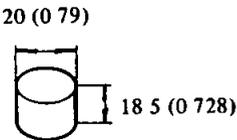
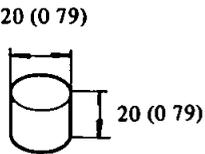
Propeller Shaft & Differential Carrier

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
17	ST33052000 Adapter	 <p style="text-align: center;">22 (0.866) dia 28 (1.10) dia</p> <p style="text-align: right;">SE421</p>	V610 W610 B210 (All) J710 C110 VC110 620	Fig PD-74 Fig PD-77 Fig PD-24
18	ST33061000 Adapter	 <p style="text-align: center;">28.5 (1.10) dia 38 (1.50) dia</p> <p style="text-align: right;">SE422</p>	KP710 610 (R160) HGC110 VC110 C130 S30 KSE20	Fig PD-17 Fig PD-21
19	ST33230000 Diff side bearing drift	<p>Use of this tool makes it possible to drive in bearing without damaging it</p>  <p style="text-align: center;">28.5 (1.12) dia 51 (2.01) dia 178 (7.01)</p>	610 510 W510 KSE20 620 F20 VHC110 C130	Fig PD-21
20	KV38102100 Diff side bearing drift	<p>Use of this tool makes it possible to drive in bearing without damaging it</p>  <p style="text-align: center;">36.0 (1.42) 24.5 (0.965) 140 (5.51) 43.0 (1.693)</p> <p style="text-align: right;">SE217</p>	J710 W610 V610 C110 VC110 B120 620	Fig PD-77 Page PD-24

Propeller Shaft & Differential Carrier

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
21	ST33710000 Gear carrier side retainer attachment	<p>This tool is used to hold the puller drive shaft when removing side retainer by the puller</p> 	610 (R160) 510 710 (R160) HGC110 KHC130	Fig PD-13
22	ST33720000 Gear carrier side retainer guide	<p>This guide bolt is used when attaching retainer to gear carrier Use of this tool prevents damaging O-ring and helps smooth the operation</p> 	610 (R160) 510 710 (R160) HGC110 KHC130	Fig PD-32 Page PD-14
23	ST33270000 Gear carrier oil seal drift	<p>This tool is used when driving in oil seal Using this drift completely eliminates the possibility of damaging oil seal</p> 	610 (R160) 510 S30 710 (R160) HGC110 KHC130	Page PD-11 Page PD-17
24	KV31100300 Solid punch	<p>This tool is used to drive out lock pin of pinion mate shaft</p> 	710(All) 610(All) C110 (All) C130 (All) 330 S30(All) B120 620 F20(All) T20(All) E20(All) C240 T40 140	Fig PD-75 Page PD-10

Propeller Shaft & Differential Carrier

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
25	ST32501000 Weight block	These tools are used to measure difference in width of side bearing against standard width  <div style="text-align: right;">SE417</div>	710 B210 610 C110 C130 330 S30 B120 620 F20 KSE20	Fig PD-20 Fig PD-76 Page PD-21
26	ST33741000 Master gauge [18.5 mm (0.728 in)]	 <div style="text-align: right;">SE418</div>	J710 W610 C110 B120	Fig PD-76 Page PD-21
27	KV38101900 Master gauge [20.0 mm (0.79 in)]	 <div style="text-align: right;">SE419</div>	710 610 V610 VC110 (H190) HGC110 C130 330 S30 (R180) 620 F20 KSE20	Fig PD-20

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION FA

FRONT AXLE & FRONT SUSPENSION

FA

DESCRIPTION	FA- 2
INSPECTION AND ADJUSTMENT	FA- 3
FRONT AXLE	FA- 5
FRONT SUSPENSION	FA- 7
SERVICE DATA AND SPECIFICATIONS	FA-13
TROUBLE DIAGNOSES AND CORRECTIONS	FA-15
SPECIAL SERVICE TOOLS	FA-18



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

DESCRIPTION

All models employ a strut type front suspension in which the shock absorber and spindle are assembled into a single unit. It is supported by a coil spring at the top and by the transverse link at the bottom.

The spindle and outer casing are of an integral design. The ball joint, located at the outer end of the transverse link, serves as a pivot for the movement of the spindle.

These are assembled on the suspension member through a rubber bushing

to avoid metal to metal contact.

The shock absorber is basically a double acting hydraulic ram consisting mainly of an outer casing, an inner casing, a piston and a piston rod.

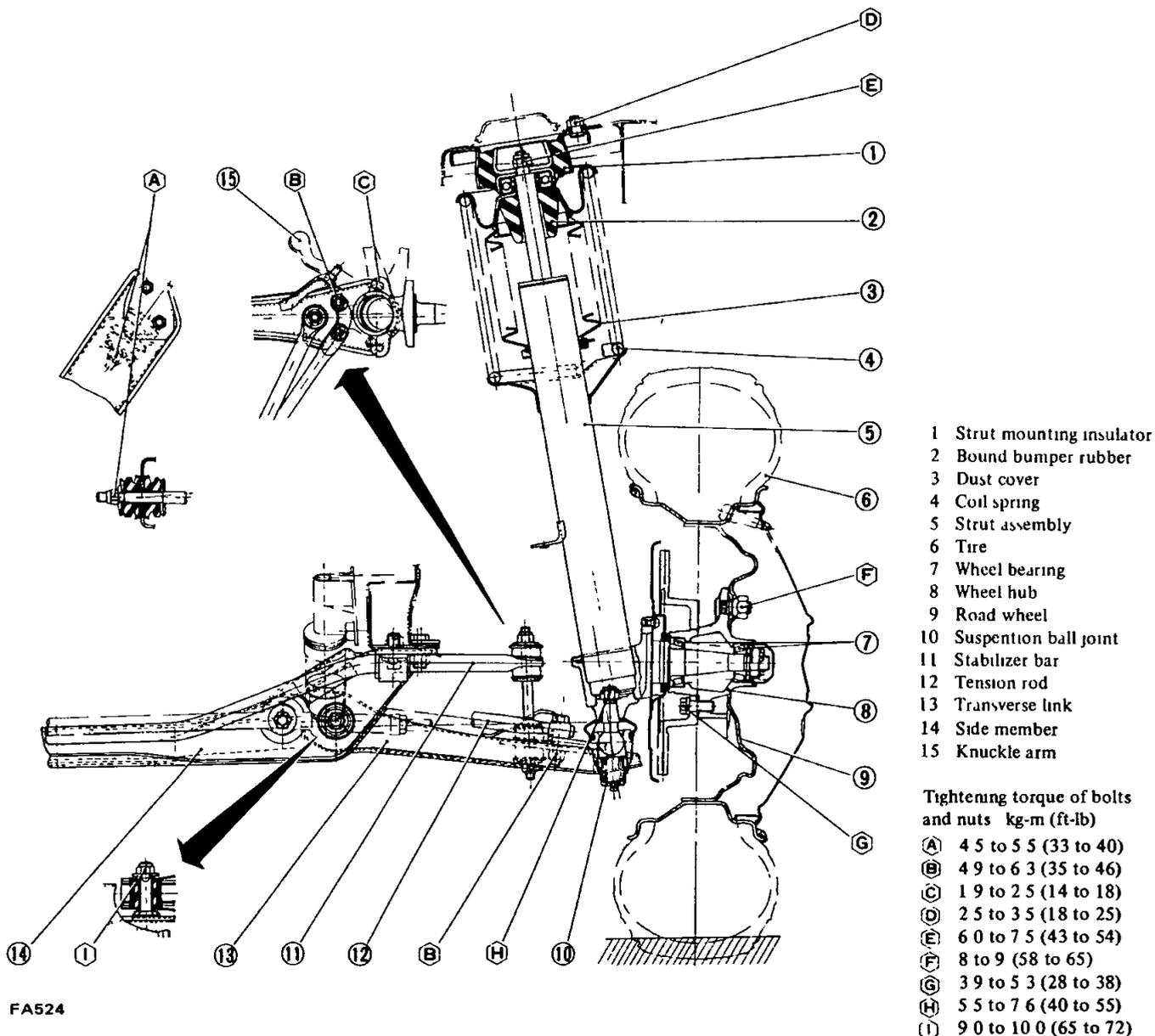
The gland packing and piston guide keep the rod in place as well as prevent leakage.

The coil spring is placed on the piston rod with its seat on the bottom.

The seat is welded to the outer casing. These are mounted on the chassis frame through the thrust bear-

ing at the top. The transverse link, tension rod and rubber bushing take thrusts from front and rear.

The stabilizer uses a torsion bar, it takes thrusts from either side of the car. Thus, the entire suspension handles thrusts from any angle, i.e. those from front and rear by the tension rod, those in a vertical direction with the strut, and those from either side of the car by means of the transverse link.



FA524

Fig FA-1 Front axle and suspension assembly

INSPECTION AND ADJUSTMENT

CONTENTS

INSPECTION	FA-3	WHEEL BEARING	FA 3
SUSPENSION PARTS	FA-3	WHEEL ALIGNMENT	FA 4
ADJUSTMENT	FA-3	CAR LEVEL	FA-4

INSPECTION

Periodically inspect in accordance with a regular maintenance schedule

SUSPENSION PARTS

- 1 Jack up the front of car until front wheels clear the floor
- 2 Shaking each front wheel by grasping the upper and lower surfaces of the tire, check suspension parts for looseness, wear, or damage Tighten all loose bolts and nuts to the specified torque Replace all worn parts as described under "Front Suspension"
- 3 Check wheel bearings If any axial end-play is present, adjust bearings to specifications Replace worn or damaged bearings as described under "Front Axle"
- 4 Check the shock absorbers assembled into strut If these are not in good condition, car posture and wheel alignment may be affected

ADJUSTMENT

WHEEL BEARING

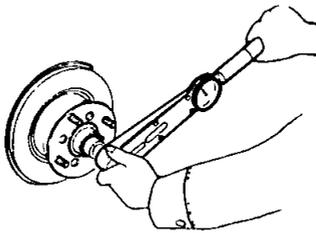
Improper adjustment of wheel bearings causes abnormal wear and score on the bearings and knuckle spindle

To obtain proper preload on wheel bearings, proceed as follows

Note In order to assure correct bearing preload and to extend service life of wheel bearings, be sure to prevent dirt and foreign particles from getting in bearings, grease seal and spindle nut

- 1 Jack up and support car on the stands at the side member in a safe manner, and remove wheel, hub cap, cotter pin and brake pads Refer to Section BR for "Pad Replacement"
- 2 Tighten spindle nut to specifications, using a suitable torque wrench

Tightening torque
2.5 to 3.0 kg-m (18 to 22 ft-lb)



FA263

Fig FA-2 Tightening spindle nut

- 3 Rotate wheel hub a few turns in both directions to seat wheel bearing correctly Then, retighten spindle nut to the above torque
- 4 Loosen spindle nut 60 degrees
Install adjusting cap and loosen within 15 degrees until grooves are aligned with hole in spindle
- 5 Again spin wheel hub several turns in both directions to see if it rotates freely Then, measure bearing preload using a spring balance as follows

Rotation starting torque of wheel bearing

New parts

8.5 kg-cm (7.4 in-lb) or less

As measured at wheel hub bolt

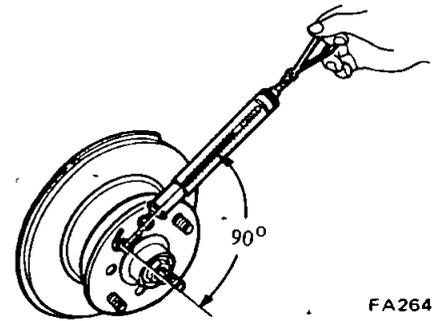
1.5 kg (3.3 lb) or less

Adjustment with old parts

4.5 kg-cm (3.9 in-lb)

As measured at wheel hub bolt

0.8 kg (1.8 lb)



FA264

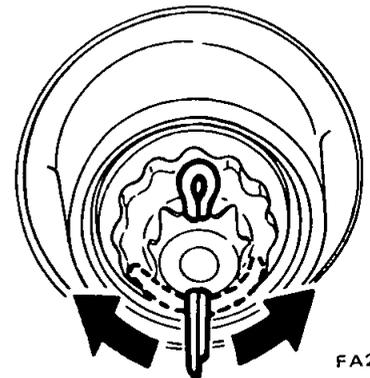
Fig FA 3 Measuring bearing preload

Repeat above procedures until correct preload is obtained

Notes

- a To measure bearing preload, attach a spring balance to hub bolt and pull it at right angle to a line drawn through center of bearing and hub bolt to which it is attached
- b The slightest shaft play cannot be tolerated here

- 6 Insert a new cotter pin with the legs through adjusting cap and spindle, spread legs away from each other against sides of adjusting cap to secure the installation See Figure FA 4



FA265

Fig FA 4 Installing cotter pin

- 7 Install hub cap

WHEEL ALIGNMENT

Correct front wheel alignment assures proper vehicle handling characteristics and minimum steering effort with the least amount of tire wear

Before adjusting front wheel alignment, be sure to carry out a preliminary inspection of the front end parts as follows

- 1 Tire pressure
- 2 Wheel bearings and spindle nuts
- 3 Steering gear play
- 4 Steering gear housing (loose at frame)
- 5 Steering linkage and connections
- 6 Shock absorber action

When using the equipment for front wheel alignment inspection, follow the instructions furnished with the equipment. Moreover, the inspection should be made with the car set level and at curb weight

Camber and caster

Camber and caster are preset at factory and cannot be adjusted

Car requires only toe-in and leveling adjustments

Toe-in

Measure toe-in and adjust if necessary. For adjustment, proceed as follows

- 1 Turn steering wheel so that front wheels are pointed straight ahead. Then, check that steering gear is in straight ahead position
- 2 The length of side adjusting rod (marked with an arrow) should be adjusted to specification by turning both side adjusting rods. See Figure FA-5

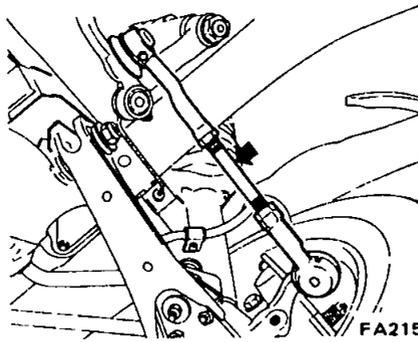


Fig FA-5 Adjusting toe-in

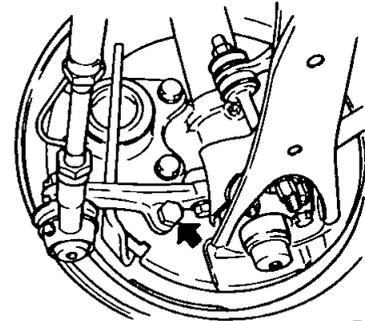
Note Both sides of the side rod ball joint center to center distances should be balanced first

Steering angle

Check steering angle using the following procedures if necessary

- 1 Place front wheels on turn table

- 2 Turn adjusting bolts (indicated by arrow) in or out as required until correct turning angle is obtained. See Figure FA-6
- 3 Put nylon cap on adjusting bolt



FA452

Fig FA-6 Adjusting steering angle

Steering angle

Inner wheel	37° to 38°
Outer wheel	30°42' to 32°42'

CAR LEVEL

Adjustment can be made by selecting spring which will keep car in a normal, level position

FRONT AXLE

CONTENTS

FRONT AXLE
REMOVAL

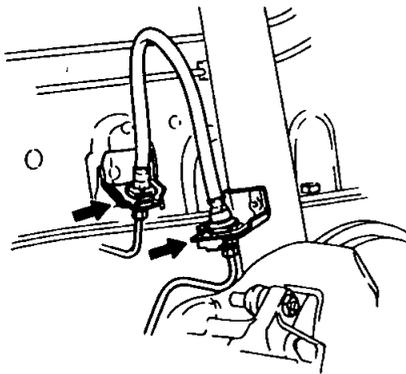
FA-5 INSPECTION
FA-5 INSTALLATION

FA-5
FA-6

FRONT AXLE

REMOVAL

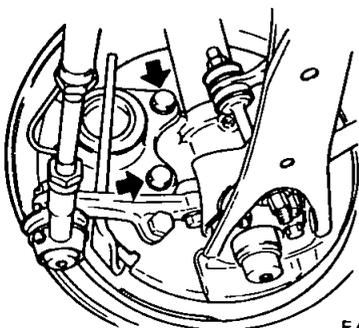
- 1 Jack up car until wheel drops to full down position, remove wheel
- 2 Remove flare nut connecting brake hose to brake tube at the bracket on front strut, take out brake hose lock spring and plug up brake hose opening See Figure FA-7



FA521

Fig FA-7 Removing brake hose

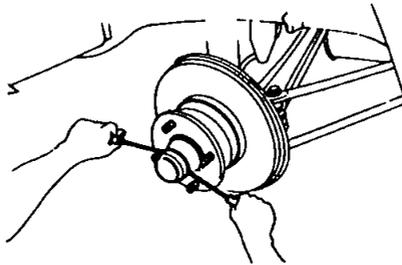
- 3 Remove bolts retaining brake caliper and take out caliper assembly See Figure FA-8



FA454

Fig FA-8 Removing brake caliper installation bolts

- 4 Work off hub cap from end of spindle using two screwdrivers or any other suitable tool as shown in Figure FA-9. If necessary, tap around it with a soft hammer while removing cap

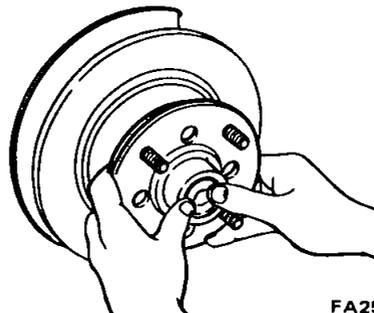


FA038

Fig FA-9 Removing hub cap

Note During this operation, use caution to avoid damaging O-ring

- 5 Pry off cotter pin, take out adjusting cap and wheel bearing lock nut
- 6 Remove wheel hub from spindle with bearing installed
7. Wheel hub may be removed together with disc rotor

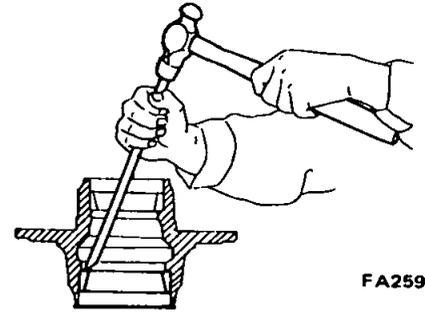


FA258

Fig FA-10 Removing wheel hub

- 8 Utilizing two grooves inside hub, drive out wheel bearing outer race from hub with a brass drift

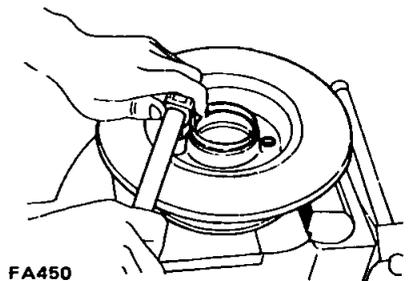
FA-5



FA259

Fig FA-11 Removing wheel bearing outer race

- 9 Loosen four bolts securing brake disc in position, remove disc brake rotor from wheel hub assembly



FA450

Fig FA-12 Removing disc brake rotor

- 10 Loosen screws securing baffle plate in position, take out baffle plate

INSPECTION

Wheel hub

Check hub for cracks by means of a magnetic exploration or dyeing test, and replace if cracked

Front Axle & Front Suspension

Grease seal

If grease leakage is detected during removal, replace seal

Replace grease seal every disassembly even if it appears good

Wheel bearing

Thoroughly clean grease and dirt from wheel bearing with cleaning solvent, and dry with compressed air free of moisture. Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear. Also, check condition of outer race. Removal of outer race from hub is not necessary.

INSTALLATION

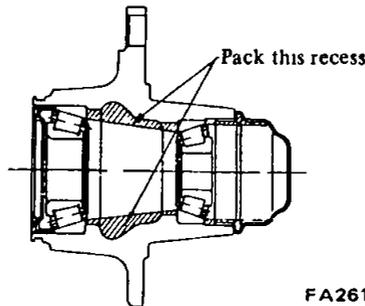
Install front axle in the reverse order of removal, noting the following:

1 Install baffle plate to knuckle spindle

2 Install disc brake rotor to wheel hub, tighten to 3.9 to 5.3 kg-m (28 to 38 ft-lb)

3 Install bearing outer race by tapping its outer periphery with a mallet, or using Front Wheel Bearing Drift ST35300000, until it is bottomed in hub

4 Pack the inside of hub and hub cap with recommended multi-purpose grease to the described level. See Figure FA-13.



FA261

Fig FA-13 Lubricating points of wheel hub

5 Pack cavities of each bearing cone with grease



FA262

Fig FA-14 Filling bearing cone with grease

6 Put inner bearing cone in hub and install a new grease seal. Be sure to lubricate sealing lips of the grease seal before installation.

7 Put hub assembly on spindle and then install outer bearing cone.

8 Apply sparingly grease to washer and threaded parts of spindle and spindle nut. Then, install washer and spindle nut. Adjust the installation as outlined under "Wheel Bearing Adjustment".

Note In order to assure correct bearing preload and to extend service life of wheel bearings, be sure to avoid dirt and foreign particles getting in bearings, grease seal, washer and spindle nut.

9 After lowering car to the ground, tighten wheel nut, bleed brake.

FRONT SUSPENSION

CONTENTS

SPRING AND STRUT ASSEMBLY	FA- 7	INSTALLATION	FA-11
DESCRIPTION	FA- 7	TRANSVERSE LINK AND	
REMOVAL	FA- 7	LOWER BALL JOINT	FA-11
DISASSEMBLY	FA- 8	REMOVAL	FA-11
INSPECTION	FA- 8	INSPECTION	FA-11
ASSEMBLY	FA- 9	INSTALLATION	FA-12
INSTALLATION	FA-10	SUSPENSION CROSSMEMBER	FA-12
TENSION ROD AND STABILIZER BAR	FA-10	REMOVAL	FA-12
REMOVAL	FA-10	INSPECTION	FA-12
INSPECTION	FA-10	INSTALLATION	FA-12

SPRING AND STRUT ASSEMBLY

DESCRIPTION

The front suspension employs struts right and left. Each strut consists of an outer casing, a piston, a piston rod and an inner cylinder.

The cylinder incorporates a piston rod guide at the top and a check valve at the bottom.

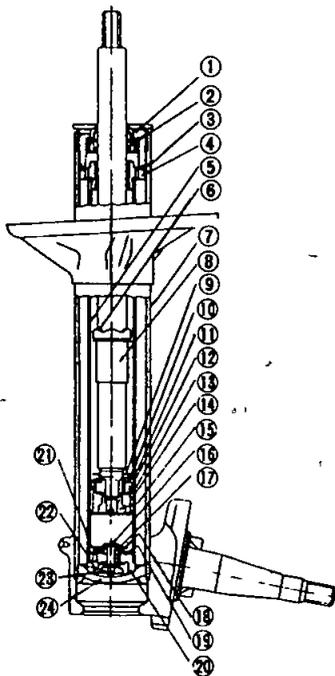
The piston rod, piston rod guide, cylinder and bottom valve should be handled as a matched set.

If any of these parts becomes faulty, all the parts must be replaced as a unit.

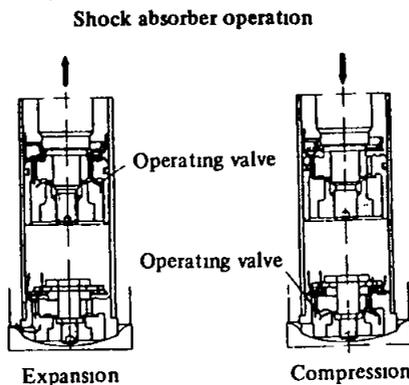
When a spring requires replacement, use the one having the same color identification. If this is not done, the car may not settle in a normal level posture.

REMOVAL

- 1 Jack up car and support it with safety stands. Remove wheel.
- 2 Loosen flare nut connecting brake hose to brake tube at the bracket on front strut. See Figure FA-7. Take out brake hose locking spring. Separate brake hose from brake tube.
- 3 Loosen flare nut securing brake tube to cylinder and then separate from brake cylinder.
- 4 Loosen bolts retaining caliper in place, take out caliper as an assembled unit.
- 5 Remove bolts connecting strut to knuckle arm. See Figure FA-16.

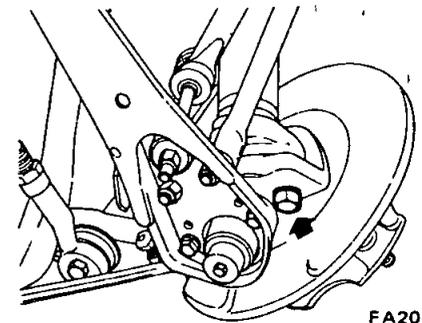


- | | |
|-------------------------------|-----------------------|
| 1 Gland packing assembly | 12 Piston ring |
| 2 Oil seal | 13 Valve plate |
| 3 O-ring | 14 Piston body |
| 4 Piston rod guide assembly | 15 Nut |
| 5 Cylinder | 16 Bolt |
| 6 Rebound stopper | 17 Distance collar |
| 7 Strut-outer casing | 18 Spring retainer |
| 8 Piston rod | 19 Check valve spring |
| 9 Check valve spring retainer | 20 Bottom valve body |
| 10 Check valve spring | 21 Check valve plate |
| 11 Check valve plate | 22 Valve plate |
| | 23 Nut |
| | 24 Bottom plate |



FA268

Fig FA-15 Sectional view of strut assembly



FA204

Fig FA-16 Removing bolts connecting knuckle arm

- 6 Detach knuckle arm from bottom of strut. This can be done by forcing transverse link down with a suitable bar as shown in Figure FA-17.

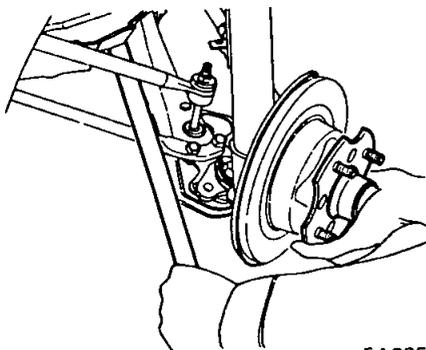
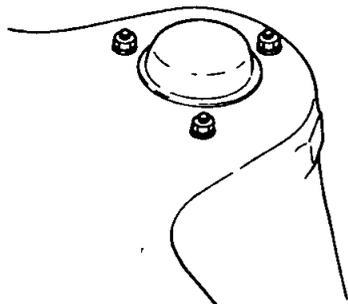


Fig FA-17 Removing knuckle arm

- 7 Place jack under strut to receive its weight when nuts are removed
- 8 Lift engine hood to gain access to nuts holding strut in place on car body See Figure FA-18



FA451

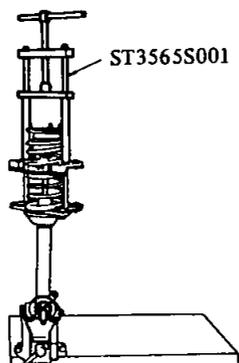
Fig FA-18 Removing strut holding nuts

- 9 With springs attached, lower jack slowly while holding strut by hand, take out strut

DISASSEMBLY

When disassembling a strut, caution should be exercised to prevent dirt and dust from getting inside strut. This dirt and dust is extremely abrasive and, if permitted to enter strut, causes internal leaks and premature wear of moving parts.

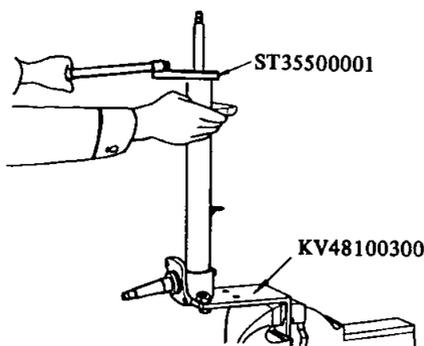
- 1 Install Strut & Steering Gear Housing Attachment KV48100300 on bottom of strut, secure above assembly in jaws of a suitable vise See Figure FA-20.
- 2 Pry snap ring off dust cover
- 3 Set up Spring Compressor ST3565S001 on spring Compress spring just far enough to permit turning of strut insulator by hand Remove self-locking nut See Figure FA-19



FA273

Fig FA-19 Installing strut in vise

- 4 Take out strut insulator, strut bearing, oil seal, upper spring seat and bound bumper rubber in the order listed
- 5 Remove spring from strut with Spring Compressor ST3565S001 left on spring
- 6 Retract piston rod by pushing it down until it bottoms. Without disturbing the above setting, remove gland packing with Gland Packing Wrench ST35500001. See Figure FA-20

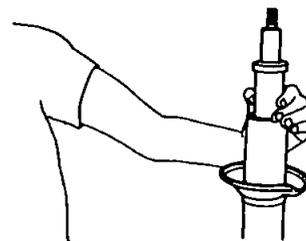


FA274

Fig FA-20 Removing gland packing

Note Clean gland packing of mud and other accumulated foreign particles

7. Remove O-ring from top of piston rod guide
- 8 Lift out piston rod together with cylinder. See Figure FA-21



FA275

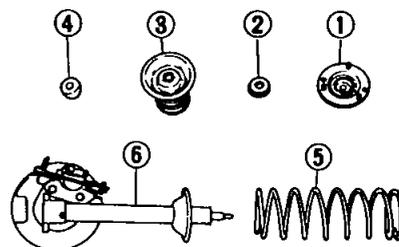
Fig FA-21 Removing piston rod and cylinder

Note Under no circumstances should piston and piston rod guide be removed from cylinder since these are adjusted to each other to provide precision mating surfaces and should be handled as a matched set

- 9 Drain fluid thoroughly from inner cylinder Use a suitable container to receive fluid drained
- 10 Wash all metallic parts in cleaning solvent
- 11 Drain fluid which collects inside outer casing thoroughly

Note This operation is very important since performance of strut varies with amount of fluid initially filled.

INSPECTION



- 1 Strut mounting insulator
- 2 Bearing
- 3 Spring upper seat and dust cover
- 4 Damper rubber
- 5 Coil spring
- 6 Strut assembly

FA337

Fig FA-22 Exploded view of spring and strut assembly

- 1 Replace gland packing, O-ring and fluid with new ones or fresh oil whenever strut is disassembled
- 2 Wash all parts, except for non-metallic parts, with solvent and dry with compressed air
- 3 Blow dirt and dust off of non-metallic parts using compressed air.

Front Axle & Front Suspension

(1) Outer casing

Check outer casing for evidence of deformation, cracking or other damage. If necessary, replace.

(2) Spindle

Check spindle for hair cracks on base and damaged threads. Replace strut if any of above conditions exceed limits.

(3) Strut mounting insulator

Replace if rubber and metal joints are melted or cracked. Rubber parts should be replaced if deteriorated.

(4) Strut mounting bearing

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

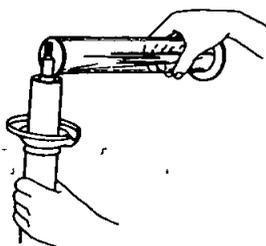
ASSEMBLY

When assembling strut, be careful not to drop or scratch parts since they are precisely machined to very close tolerances. Before assembly, clean away all dirt to prevent any possible entry of dirt into strut.

1 Set Steering Gear Housing Attachment KV48100300 in place on bottom of strut and place attachment in jaws of a suitable vise.

2 Install piston rod and cylinder into place in outer casing.

3 Pour correct amount of fluid into outer casing. See Figure FA-23.



FA330

Fig FA-23 Filling outer casing with fluid

Note It is important that correct amount of fluid be poured into strut to assure correct damping force of shock absorber.

Amount of oil

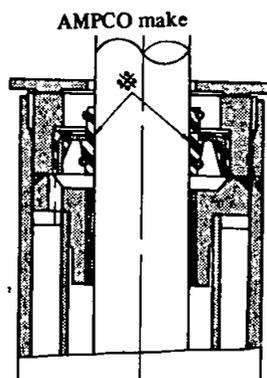
325 cc (19.83 cu in) for AMPCO (ATSUGI) make

332 cc (20.26 cu in) for K.Y.B. (KAYABA) make

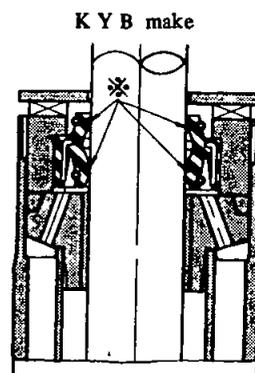
4 Place rod guide on top of piston

rod, install gland packing using Gland Packing Guide ST35530000

Lubricate sealing lip, asterisked in



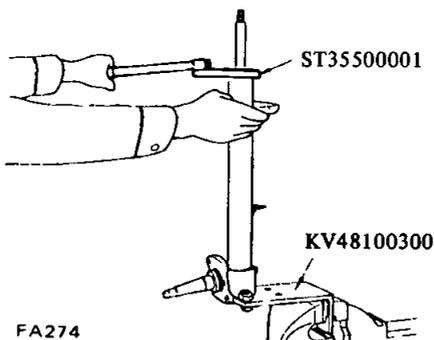
FA221



FA222

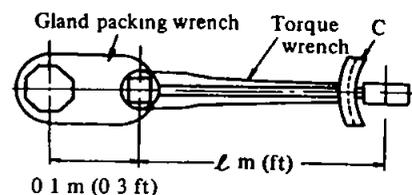
Fig FA-24 Sectional view of gland packing

5 Tighten gland packing to 7 to 13 kg-m (51 to 94 ft-lb) torque. See Figure FA-25.



FA274

Fig FA-25 Tightening gland packing



FA278

Fig FA-26 Gland packing wrench

6 After the above steps have been completed, air should be removed from shock absorber system in the following manner:

(1) Hold strut by hand with its spindle end facing down, without disturbing the above setting, pull out piston rod completely. Then, turn strut upside down so that spindle end is now facing up. Under this condition, retract piston rod all the way. See Figure FA-27.

(2) Repeat the above procedure several times so that air will be completely bled from strut.

(3) If, during the above step, an equal pressure is felt through the hand gripping piston rod on both strokes, it is an indication that air has been completely expelled from strut.

Notes

a When tightening gland packing, it is important that piston rod be extended approximately 120 mm (4.72 in) from end of outer casing to expel most of air out of strut.

b Gland packing should be tightened to 7.0 to 13.0 kg-m (51 to 94 ft-lb) torque with the aid of Gland Packing Wrench ST35500001. When doing so, the amount of torque to be read beneath wrench needle should be modified according to the following formula:

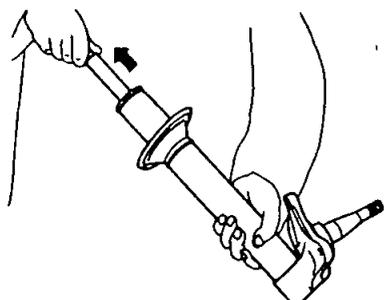
$$C \text{ kg-m} = 7 \times \left(\frac{L}{L + 0.1} \right) \text{ or}$$

$$C \text{ ft-lb} = 51 \times \left(\frac{L}{L + 0.33} \right)$$

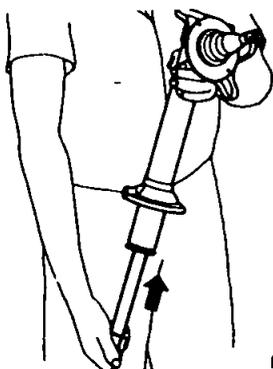
Where,

C .Value read on the torque wrench [kg-m (ft-lb)]

L. Effective length of torque wrench [m (ft)]



FA279



FA280

Fig FA-27 Bleeding air from strut

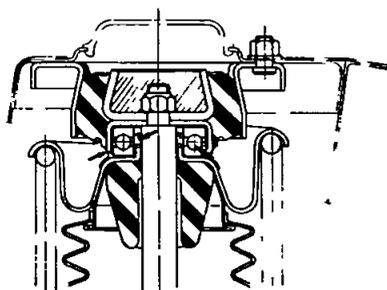
7 Place Strut & Steering Gear Housing Attachment KV48100300 in jaws of a vise

8 Before proceeding any further, pull piston rod all the way out to the limit of its stroke, install bound bumper rubber to prevent piston rod from falling by its own weight

9 Place front spring on lower spring seat and compress spring with Spring Compressor ST3565S001

Install dust cover, upper spring seat, mounting bearing and insulator in the order listed

10 Lubricate parts, indicated by arrow in Figure FA-28, with recommended multi-purpose grease



FA211

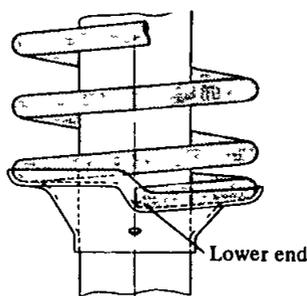
Fig FA-28 Greasing mounting bearing and oil seal

Notes

- a Use care to avoid damaging piston rod during disassembly and assembly Do not use pliers or the like to extract piston rod
- b Install mounting bearing so that it points in correct direction See Figure FA-28.

11 Tighten piston rod self-locking nut to 60 to 75 kg-m (43 to 54 ft-lb) torque

12 After placing spring in position (Figure FA-29) between upper and lower spring seats, release compressor gradually



FA282

Fig FA-29 Installing front spring

- 13 Raise bound bumper rubber to upper spring seat

INSTALLATION

Install the strut and spring assembly in the reverse order of removal, noting the following

Tightening torque

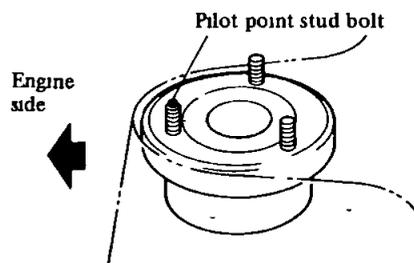
Strut to body nuts
25 to 35 kg-m (18 to 25 ft-lb)

Steering knuckle arm to strut
70 to 100 kg-m (51 to 72 ft-lb)

Notes

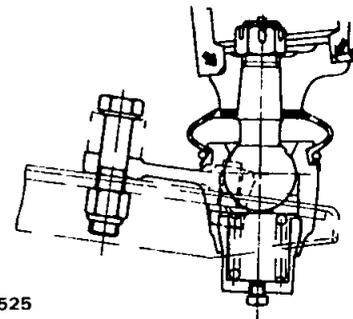
- a When installing strut and spring assembly to body, make sure that the painted mark on strut insulator faces the engine side See Figure FA-30
- b Replace self-locking nuts whenever strut is disassembled
- c. Make sure brake hose is secure and not twisted

- d When installing steering knuckle arm to the bottom of strut assembly, apply the suitable sealing material to the portion indicated in Figure FA-31 so as to prevent ball stud from rust.



FA520

Fig FA-30 Mounting direction of strut insulator



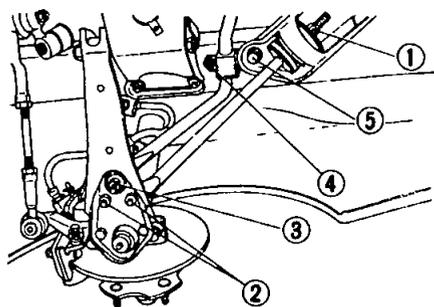
FA525

Fig FA-31 Applying sealing material

TENSION ROD AND STABILIZER BAR

REMOVAL

- 1 Jack up car and support it with safety stands, remove wheel
- 2 Remove splash board
- 3 Back off nut ① securing tension rod to bracket, and remove bolts ② which secure tension rod to transverse link Tension rod can then be taken out
- 4 Remove nut ③ connecting stabilizer connecting rod to transverse link
- 5 Take out bolts ④ securing stabilizer bracket in position Loosen four tension rod bracket bolts ⑤ in advance. Remove stabilizer from car frame See Figure FA-32.



FA338

Fig FA-32 Removing stabilizer and tension rod

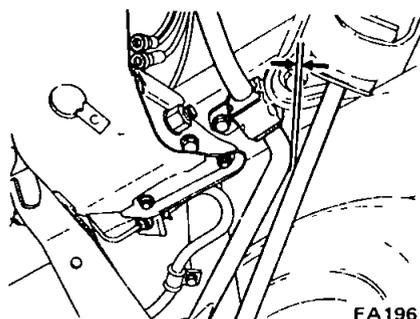
INSPECTION

- 1 Check tension rod and stabilizer for evidence of deformation and cracking, if necessary, replace
- 2 Check rubber parts such as tension rod and stabilizer bushings to be sure they are not deteriorated or cracked

INSTALLATION

Install tension rod and stabilizer bar in the reverse order of removal, noting the following

- 1 Ensure that stabilizer is correctly installed to the portion of the left and right sides
- 2 Check to be sure that tension rod bushing is properly centered in its seat
- 3 Examine if clearance between tension rod and stabilizer bar is equal on both sides See Figure FA-33



FA196

Fig FA-33 Adjusting clearance between tension rod and stabilizer bar

- 4 Be sure that bolt attaching tension bracket is correctly tightened
- 5 Do not tighten transverse link side bolt of tension rod without first tightening bolt securing tension rod to tension rod bracket

Tightening torque

- Stabilizer bar to frame bolt
1.4 to 1.8 kg-m
(10 to 13 ft-lb)
- Stabilizer connecting rod nut
1.2 to 1.7 kg-m
(9 to 12 ft-lb)
- Tension rod bracket bolt
5.1 to 6.9 kg-m
(37 to 50 ft-lb)
- Tension rod installation nut
4.5 to 5.5 kg-m
(33 to 40 ft-lb)
- Tension rod to transverse link bolt
4.9 to 6.3 kg-m
(35 to 46 ft-lb)

TRANSVERSE LINK AND LOWER BALL JOINT

The transverse link is connected to the suspension member through a rubber bushing and to the strut through a ball joint

The lower ball joint is assembled at the factory and cannot be disassembled Lubricate ball joints with recommended multi-purpose grease every recommended maintenance interval

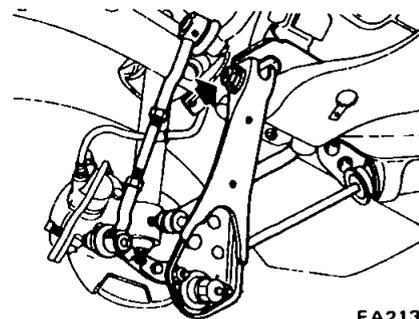
REMOVAL

- 1 Jack up car and support it with safety stands, remove wheel
- 2 Remove splash board
- 3 Pry cotter pin off side rod socket ball joint Remove castle nut and separate side rod socket from knuckle arm with Ball Joint Remover HT72520000
- 4 Loosen bolts holding knuckle arm in place Separate knuckle arm from bottom end of strut For details, refer to "Spring and Strut Assembly"
- 5 Remove tension rod and stabilizer bar

For detail, refer to "Spring and Strut Assembly"

- 6 Remove pin assembly connecting transverse link to suspension cross-member after loosening front and rear nuts

Remove transverse link with suspension ball joint and knuckle arm

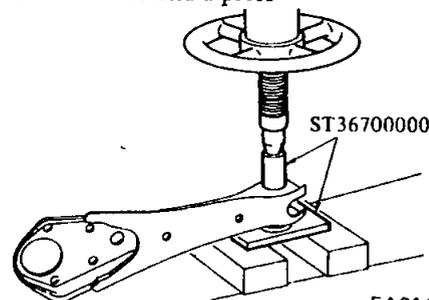


FA213

Fig FA-34 Removing transverse link

7 Place transverse link in a vise, loosen bolt securing ball joint to transverse link and remove ball joint from transverse link with Ball Joint Remover HT72520000

8 Withdraw transverse link bushing from transverse link using Front Transverse Link Bushing Replacer Set ST36700000 and a press



FA214

Fig FA-35 Removing transverse link bushing

INSPECTION

Transverse link

- 1 Check for signs of cracks, distortion or other damage Replace if any of above conditions are beyond repair
- 2 If rubber bushing shows evidence of cracking, replace with a new one

Ball joint

1. Ball joint is assembled at factory and cannot be disassembled Measure force required to keep joint turning If found to be more or less than specifications, discard

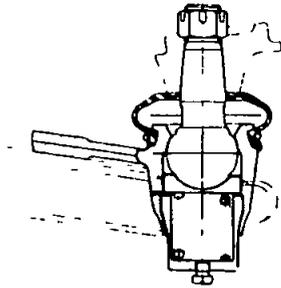
Turning torque

New parts

- 75 to 125 kg-cm
(65 to 109 in-lb)

Used parts

- More than 50 kg-cm (43 in-lb)



FA526

Fig FA-36 Sectional view of lower ball joint

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.

Note. 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.

INSTALLATION

Install transverse link and lower ball joint in reverse order of removal. In rebushing link, use Front Transverse Link Replacer Set ST36700000.

Rebushing should also be in the manner that outer end of bushing is flush with end of link.

To install, first tighten transverse link mounting bolts temporarily. Final tightening should be carried out with vehicle under normal load.

Tightening torque

Ball joint bolt

Socket bolt

1.9 to 2.5 kg-m
(14 to 18 ft-lb)

Tension rod fastening bolt

4.9 to 6.3 kg-m
(35 to 46 ft-lb)

Ball joint castle nut

5.5 to 7.6 kg-m
(40 to 55 ft-lb)

Transverse link to suspension crossmember

9.0 to 10.0 kg-m
(65 to 72 ft-lb)

SUSPENSION CROSSMEMBER

REMOVAL

- 1 Jack up car and support it with safety stands. Remove wheels.
- 2 Remove splash board.
- 3 Remove transverse link. For details, refer to "Transverse Link and Lower Ball Joint".
- 4 With an overhead hoist and lifting cable, support weight of engine to remove load from mountings.
- 5 Remove engine mounting bolts and nuts indicated by arrows in the sketch below. Separate suspension crossmember from engine.

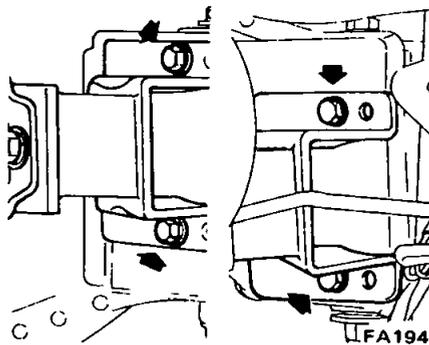


Fig FA-37 Front mounting insulator

- 6 Using floor jack beneath center of suspension crossmember, raise car until wheel falls to full down position. Remove bolt, indicated by arrow, and separate suspension crossmember from car body.

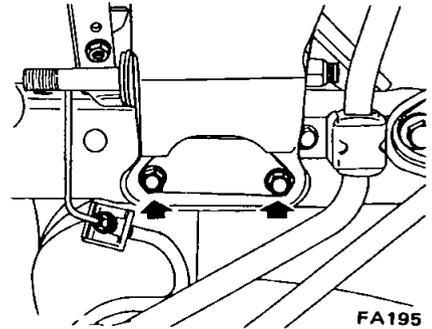


Fig FA-38 Removing suspension crossmember

INSPECTION

- 1 Check suspension crossmember for evidence of deformation and cracking. If necessary, replace.

INSTALLATION

Install strut and spring assembly in the reverse order of removal, noting the following:

Tightening torque

Suspension member to frame

4.0 to 5.0 kg-m
(29 to 36 ft-lb)

SERVICE DATA AND SPECIFICATIONS

Suspension type

Independent strut

Shock absorber type

Double-acting hydraulic

Wheel alignment (Unladen)

		All models
Caster	degree	55' to 2°25'
Camber	degree	50' to 2°20'
Toe-in	mm (in)	4 to 6 *2 (0 16 to 0 24)
	degree *1	22' to 33'
Kingpin inclination	degree	6°40' to 8°10'

*1 On both sides

*2 Radial tire 3 to 5 mm (0 12 to 0 20 in)

Front wheel turning angle

Inner wheel	37° to 38°
Outer wheel	30°42' to 32°42'

Coil spring

	Sedan		Hardtop		Station Wagon	
	Right-hand spring	Left-hand spring	Right-hand spring	Left-hand spring	Right-hand spring	Left-hand spring
Wire diameter mm (in)	12 (0 47)		13 (0 51)		12 (0 47)	12 (0 47)
Coil diameter mm (in)	130 (5 12)		130 (5 12)		130 (5 12)	130 (5 12)
Free length mm (in)	386 5 (15 22)		330 (12 99)		386 5 (15 22)	371 5 (14 63)
Effective turn	6 5		6 25		6 5	6 5
Installed height/load mm/kg (in/lb)	200/270 (7 87/595)		200/270 (7 87/595)		200/270 (7 87/595)	185/270 (7 28/595)
Spring constant kg/mm (lb/in)	1 45 (81 2)		2 08 (116 5)		1 45 (81 2)	1 45 (81 2)

Front Axle & Front Suspension

Strut assembly

	Sedan and Station Wagon	Hardtop
Piston rod diameter mm (in)	22 (0 87)	22 (0 87)
Damping force		
Expansion (0 3 m/sec) kg (lb)	32 to 48 (71 to 106)	64 to 96 (141 to 212)
Compression (0 3 m/sec) kg (lb)	20 to 30 (44 to 66)	32 to 48 (71 to 106)
Stroke mm (in)	178 (7 01)	178 (7 01)

Wheel bearing

Rotation starting torque

In case of new parts	kg-cm (in-lb)	8 5 (7 4) or less
At wheel hub bolt	kg (lb)	1 5 (3 3) or less
In case of readjustment	kg-cm (in-lb)	4 5 (3 9) or less
At wheel hub bolt	kg (lb)	0 8 (1 8) or less

Spindle nut returning angle	degree	60
-----------------------------	--------	----

Tightening torque

Suspension member to body	kg-m (ft-lb)	4 0 to 5 0 (29 to 36)
Stabilizer bar to connecting rod nut	kg-m (ft-lb)	1 2 to 1 7 (9 to 12)
Drum brake back plate fixing bolt	kg-m (ft-lb)	2 8 to 4 0 (20 to 29)
Tension rod nut	kg-m (ft-lb)	4 5 to 5 5 (33 to 40)
Tension rod to transverse link	kg-m (ft-lb)	4 9 to 6 3 (35 to 46)
Tension rod bracket bolt	kg-m (ft-lb)	5 1 to 6 9 (37 to 50)
Strut assembly upper support nut	kg-m (ft-lb)	2 5 to 3 5 (18 to 25)
Transverse link to suspension crossmember	kg-m (ft-lb)	9 0 to 10 0 (65 to 72)
Knuckle arm to strut assembly	kg-m (ft-lb)	7 0 to 10 0 (51 to 72)
Ball joint to transverse link	kg-m (ft-lb)	1 9 to 2 5 (14 to 18)
Ball joint to transverse link with tension rod	kg-m (ft-lb)	4 9 to 6 3 (35 to 46)
Ball joint to knuckle arm	kg-m (ft-lb)	5 5 to 7 6 (40 to 55)
Engine mounting bracket bolt	kg-m (ft-lb)	0 9 to 1 2 (7 to 9)
Gland packing	kg-m (ft-lb)	7 0 to 13 0 (51 to 94)
Wheel bearing nut	kg-m (ft-lb)	2 5 to 3 0 (18 to 22)

(Tighten to this torque, then adjust to specified-preload)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
<p>Vibration, shock and shimmying of steering wheel</p> <p>Vibration Loose connection of the serration parts and wear of each part of linkage cause vibration of front wheels, which in turn is transmitted to the steering wheel. This is very noticeable when travelling over rough roads.</p> <p>Shock When the front wheels are travelling over bumpy roads, the play of the steering linkage is transmitted to the steering wheel. This is especially noticeable when travelling on rough roads.</p> <p>Shimmying Abnormal vibration of the front suspension group and the whole steering linkage, which occur when a specific speed is attained.</p>	<p>Improper tire pressure Imbalance and deformation of roadwheel</p> <p>Unevenly worn tire or insufficient tightening</p> <p>Improperly adjusted or worn front wheel bearing</p> <p>Faulty wheel alignment</p> <p>Worn fitting transverse link bushings</p> <p>Insufficiently tightened steering gear housing</p> <p>Wear of steering linkage</p> <p>Worn suspension ball-joint</p> <p>Excessive backlash due to improper adjustment of the retainer parts</p> <p>Damaged idler arm</p> <p>Worn column bearing, weakened column bearing spring, or loose clamp</p> <p>Malfunction of shock absorber (inside the strut) or loose installation bolts</p> <p>Imbalance of vehicle level</p>	<p>Adjust</p> <p>Correct the imbalance or replace</p> <p>Replace or tighten</p> <p>Adjust or tighten</p> <p>Adjust</p> <p>Replace</p> <p>Retighten</p> <p>Replace defective parts</p> <p>Replace</p> <p>Adjust correctly</p> <p>Replace</p> <p>Replace or retighten</p> <p>Replace or retighten</p> <p>Correct the imbalance</p>
<p>Vehicle pulls to right or left</p> <p>When driving with hands off the steering wheel over a flat road, the car gently swerves to right or left.</p> <p>Note A faulty rear suspension may also be the cause of this problem, therefore, see also the chapter dealing with the rear suspension.</p>	<p>Improper tire pressure or insufficient tightening of wheel nuts</p> <p>Difference in height of right and left tire treads</p> <p>Incorrect adjustment or abrasion of front wheel bearing</p> <p>Collapsed or twisted front spring</p> <p>Incorrect wheel alignment</p> <p>Incorrect brake adjustment (binding)</p> <p>Worn rubber bushings for transverse link and tension rod</p> <p>Deformed steering linkage and suspension link</p> <p>Imbalance of car level</p>	<p>Adjust or tighten</p> <p>Replace tires</p> <p>Adjust or replace</p> <p>Replace</p> <p>Adjust</p> <p>Adjust</p> <p>Replace</p> <p>Replace</p> <p>Correct the imbalance</p>

Front Axle & Front Suspension

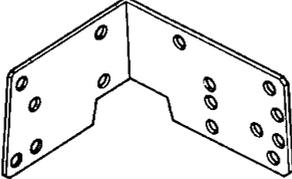
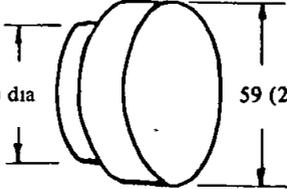
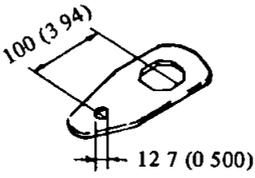
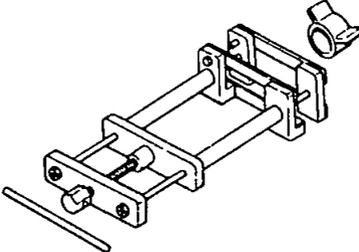
Condition	Probable cause	Corrective action
Instability of car	<p>Improper tire pressure</p> <p>Worn rubber bushings for transverse link and tension rod</p> <p>Incorrect wheel alignment</p> <p>Worn or deformed steering linkage and suspension link</p> <p>Incorrect adjustment of steering gear</p> <p>Deformed or imbalanced wheel</p>	<p>Adjust</p> <p>Replace</p> <p>Adjust</p> <p>Replace</p> <p>Adjust</p> <p>Correct or replace</p>
<p>Stiff steering wheel (check-up procedure)</p> <p>Jack up front wheels, detach the steering gear and operate the steering wheel, and,</p> <p>If it is light, check steering linkage, and suspension groups</p> <p>If it is heavy, check steering gear and steering column groups</p>	<p>Improper tire pressure</p> <p>Insufficient lubricants or mixing impurities in steering linkage or excessively worn steering linkage</p> <p>Stiff or damaged suspension ball-joint, or lack of grease</p> <p>Worn or incorrectly adjusted wheel bearing</p> <p>Worn damaged steering gear and bearing</p> <p>Incorrectly adjusted steering gear</p> <p>Deformed steering linkage</p> <p>Incorrect wheel alignment</p> <p>Damaged strut upper end bearing</p> <p>Damaged or stiff piston or shock absorber rod (in the strut)</p> <p>Interference of steering column with turn signal switch</p>	<p>Adjust</p> <p>Replenish grease or replace the part</p> <p>Replace</p> <p>Replace or adjust</p> <p>Replace</p> <p>Adjust</p> <p>Replace</p> <p>Adjust</p> <p>Replace</p> <p>Replace</p> <p>Adjust</p>
Excessive steering wheel play	<p>Incorrectly adjusted steering gear housing</p> <p>Worn steering linkage</p> <p>Improperly fitted gear box</p> <p>Incorrectly adjusted wheel bearing</p> <p>Worn transverse link and tension rod fitting bushings</p>	<p>Adjust</p> <p>Replace</p> <p>Retighten</p> <p>Adjust</p> <p>Replace</p>
Noises	<p>Improper tire pressure</p> <p>Insufficient lubricating oil and grease for suspension ball joint and steering linkage, or their breakage</p> <p>Loose steering gear bolts, linkage and suspension groups</p> <p>Damaged shock absorber (inside the strut)</p> <p>Damaged wheel bearing</p> <p>Worn steering linkage and steering gear</p> <p>Worn transverse link and tension rod fitting bushings</p>	<p>Adjust</p> <p>Replenish lubricating oil and grease, or replace</p> <p>Retighten</p> <p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Replace</p>

Front Axle & Front Suspension

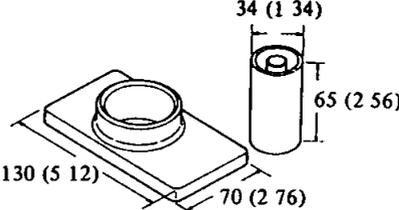
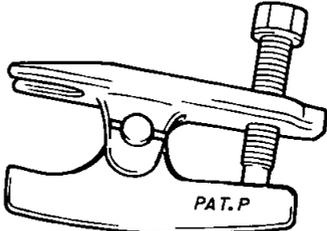
Condition	Probable cause	Corrective action
Noises	Broken or collapsed coil spring Loose strut mounting insulator tightening nuts Loose stabilizer bolt	Replace Retighten Retighten
Grating tire noise	Improper tire pressure Incorrect wheel alignment Deformed knuckle spindle and suspension linkage	Adjust Adjust Replace
Jumping of disc wheel	Improper tire pressure Imbalance wheels Damaged shock absorber Damaged tire Deformed wheel rim	Adjust Adjust Replace Replace Replace
Excessively or partially worn tire	Improper tire pressure Incorrect wheel alignment Worn wheel bearing Incorrect brake adjustment Improper tire shifting (rotation) Rough and improper driving manner	Adjust Adjust Replace Adjust Adjust Drive more gently

Front Axle & Front Suspension

SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	KV48100300 Strut and steering gear housing attachment	<p>This tool is used as an attachment to strut or steering gear box when work is performed in a vise</p> <p>S mark indicates hole for strut G mark indicates hole for steering gear box L mark indicates hole for L H steering gear box</p>  <p style="text-align: right;">SE400</p>	610 All 710 All C110 All C130 All 330 All	Fig FA-20 Fig FA-25
2	ST3530000 Front wheel bearing drift	<p>This tool is used to attach outer race for front wheel bearing</p>  <p style="text-align: center;">width across flats, 55 (2.17)</p>	B210 (For Europe) 710 610 S30 HGC110 C130	Page FA-6
3	ST35500001 Gland packing wrench	<p>This tool is used to remove or install gland packing at the top end of strut</p>  <p style="text-align: center;">width across flats, 55 (2.17)</p> <p style="text-align: right;">SE220</p>	B210 (For Europe) 710 610 C110 C130	Fig FA-20 Fig FA-25
4	ST3565S001 Coil spring compressor ST35651001 Body ST35652001 Clamp	<p>This tool is used to compress coil spring in disassembling or assembling strut assembly</p>  <p style="text-align: right;">SE221</p>	B210 (For Europe) 710 610 C110 C130 S30 B120	Fig FA-19

Front Axle & Front Suspension

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
5	ST36700000 Transverse link bushing replacer	<p>This tool is used to replace transverse link bushing. In its application, align the tool with the bushing center by using a press.</p>  <p style="text-align: right;">SE222</p>	B210 (For Europe) 710 610 S30	Fig FA-35 Page FA-12
6	ST35530000 Gland packing guide	<p>This tool is used as a guide in installing gland packing by covering shock absorber shaft to prevent oil seal from marring in packing.</p>  <p style="text-align: right;">SE093</p>	B210 710 610 C110 C130	Page FA-9
7	HT72520000 Ball joint remover	<p>This tool is used to remove ball stud from knuckle arm.</p>  <p style="text-align: right;">SE399</p>	All models	Page FA-11

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION RA

REAR AXLE & REAR SUSPENSION

RA

REAR AXLE AND REAR SUSPENSION -RIGID AXLE-	RA- 2
REAR AXLE AND REAR SUSPENSION -INDEPENDENT REAR SUSPENSION-	RA- 8
SERVICE DATA AND SPECIFICATIONS	RA-16
TROUBLE DIAGNOSES AND CORRECTIONS	RA-19
SPECIAL SERVICE TOOLS	RA-20



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

REAR AXLE AND REAR SUSPENSION -RIGID AXLE-

CONTENTS

DESCRIPTION	RA- 2	INSPECTION	RA- 6
REAR AXLE ASSEMBLY	RA- 4	INSTALLATION	RA- 6
REMOVAL	RA- 4	REAR SPRING	RA- 6
INSTALLATION	RA- 4	REMOVAL	RA- 6
REAR AXLE SHAFT AND		INSPECTION	RA- 6
WHEEL BEARING	RA- 4	INSTALLATION	RA- 6
REMOVAL	RA- 4	SHOCK ABSORBER	RA- 7
INSPECTION	RA- 5	REMOVAL	RA- 7
INSTALLATION	RA- 5	INSPECTION	RA- 7
REAR AXLE CASE	RA- 6	INSTALLATION	RA- 7
REMOVAL	RA- 6		

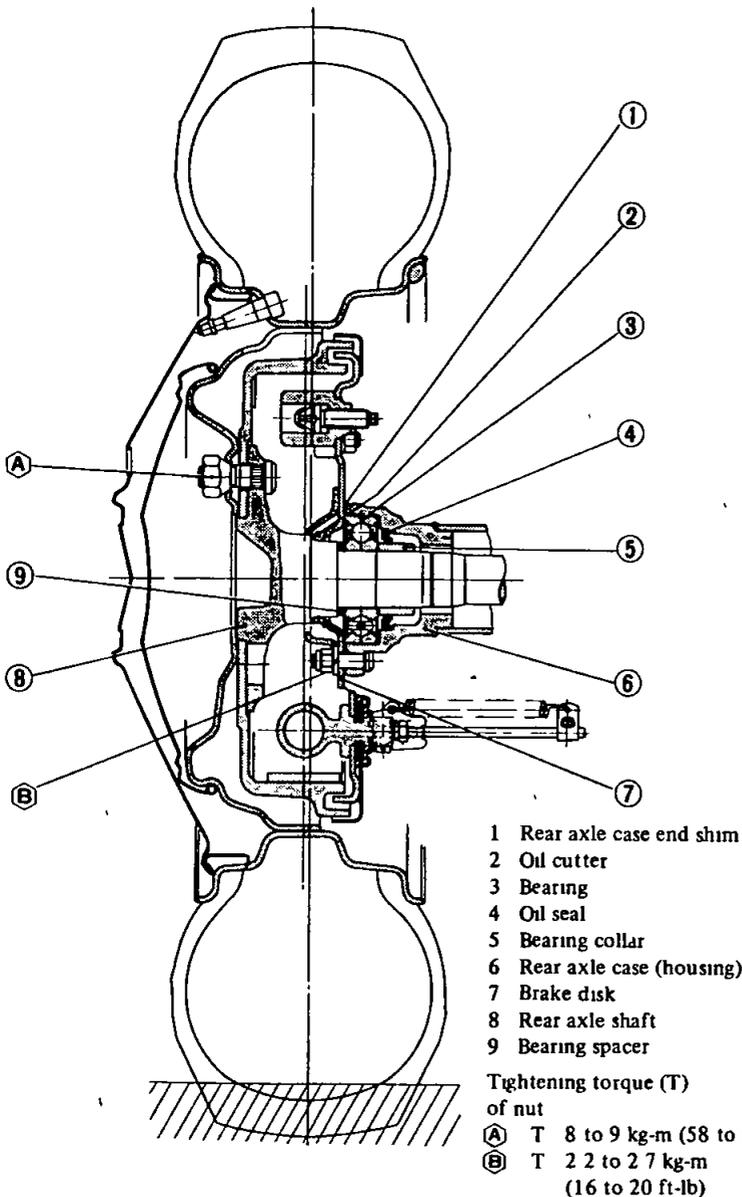


Fig RA-1 Cross-sectional view of rear axle

DESCRIPTION

The rear suspension is integrated with the rear axle assembly

The rear axle assembly is of the semi-floating type in which the car weight is carried on the axle shafts through the bearings in the outer end of the rear axle case. The axle case is a "Banjo" type.

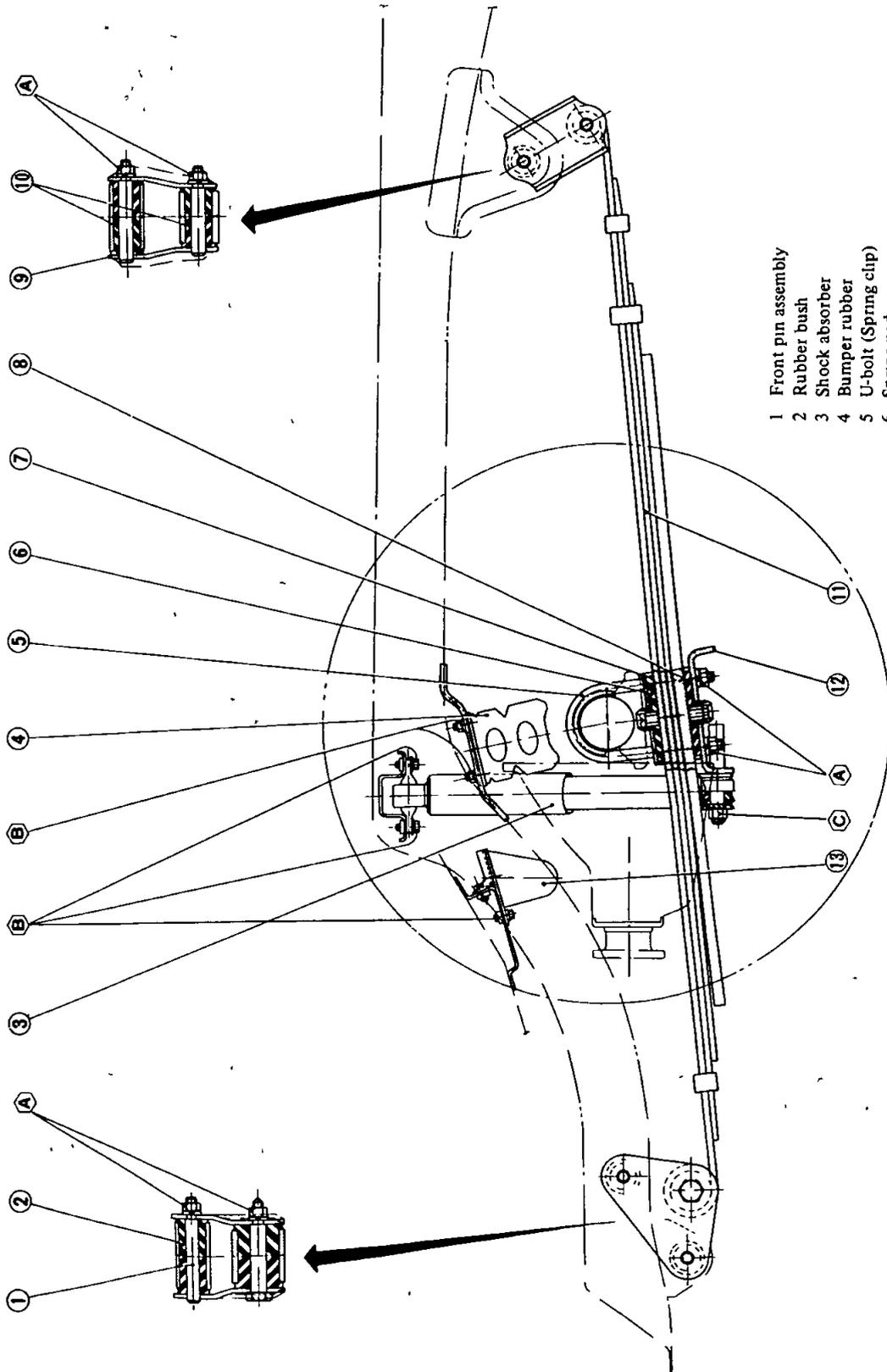
The rear axle assembly is attached to the frame through semi-elliptic leaf springs and shock absorbers.

Rubber bushings at each end of the leaf springs and shock absorbers, spring pad at spring seats, singly, or in combination, effectively absorb vibration and noise.

The rear axle shafts are floating fitted to the differential side gears through splines. The outer ends are supported at the ends of rear axle case by a single set of sealed ball bearings.

The bearings are lubricated with recommended multi-purpose grease. The axle shaft oil seals are located inboard of the bearings. The bearings are secured against shaft shoulders by means of collars.

Rear Axle & Rear Suspension



- 1 Front pin assembly
- 2 Rubber bush
- 3 Shock absorber
- 4 Bumper rubber
- 5 U-bolt (Spring clip)
- 6 Spring pad
- 7 Spring location plate
- 8 Spring seat pad
- 9 Shackle assembly
- 10 Rubber bush
- 11 Leaf spring
- 12 Spring seat
- 13 Torque arrester

Tightening torque of bolts and nuts

	kg-m (ft-lb)
A	6.0 to 6.5 (43 to 47)
B	0.9 to 1.2 (7 to 9)
C	3.6 to 4.8 (26 to 35)

RA310

Fig RA-2 Rear suspension system (Station Wagon)

REAR AXLE ASSEMBLY

REMOVAL

It is not necessary to remove the rear axle assembly for minor repairs.

However, if the axle case is damaged, the rear axle assembly may be removed as follows:

1 Raise rear of car high enough to permit working under it. Place a jack under the center of axle case so it just starts to raise rear axle assembly.

Place stands under body member on both sides. Remove rear wheels.

2 Mark propeller shaft flange and companion flange of differential carrier so that the original combination can be restored at assembly.

3 Withdraw propeller shaft sleeve yoke from transmission by moving the shaft rearward, passing it under rear axle. Watch for oil leakage from transmission end.

Note Remove propeller shaft carefully so as not to damage spline, sleeve yoke and rear oil seal.

4 Disconnect hand brake cable by removing clevis pin ①. See Figure RA-3.

5 Disconnect rear brake hose at body side ②. Cover brake hose and pipe openings to prevent entrance of dirt. See Figure RA-3.

6 Disconnect shock absorbers at lower end ③ and push shock absorbers up out of the way. See Figure RA-3.

7 Lower jack under axle case. Remove U-bolts (spring clips) ④ to separate axle case from spring. See Figure RA-3.

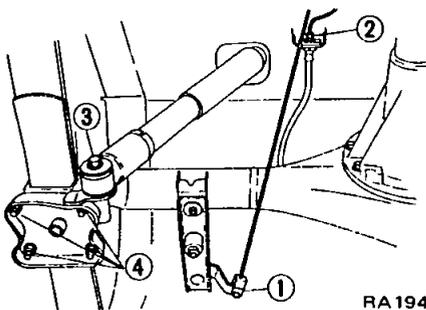


Fig RA-3 Under view

8 Place a jack under the center of axle case. Pass axle case through space above spring, and take it out to the side. See Figure RA-4.

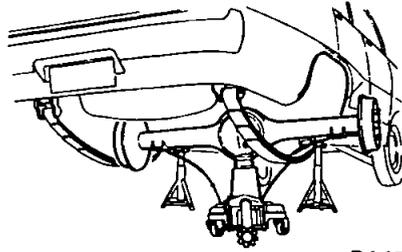


Fig RA-4 Removing rear axle assembly

INSTALLATION

Install the axle case assembly in the reverse order of removal, noting the following instructions:

Tightening torque

U-bolt (Spring clip)
6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Shock absorber lower end nut
3.6 to 4.8 kg-m
(26 to 35 ft-lb)

Propeller shaft-to-companion
flange connecting bolt
2.4 to 3.3 kg-m
(17 to 24 ft-lb)

REAR AXLE SHAFT AND WHEEL BEARING

REMOVAL

1 Raise rear of car and place stands under axle case on both sides. Remove rear wheels.

2 Pull-off spring ① and disconnect cross rod from lever by removing clevis pin ②. See Figure RA-5.

3 Disconnect brake tube at rear brake disc. See Figure RA-5.

Cover brake hose and pipe openings to prevent entrance of dirt.

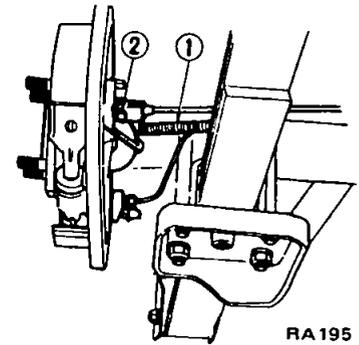
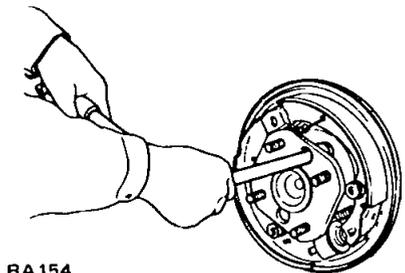


Fig RA-5 Removing brake parts

4 Remove brake drum.

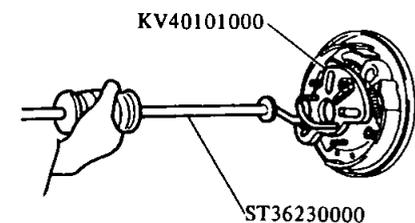
5 Remove nuts retaining brake disc to axle case. See Figure RA-6.



RA154

Fig RA-6 Removing nuts

6 Pull out axle shaft assembly together with brake disc using Rear Axle Stand KV40101000 and Sliding Hammer ST36230000. See Figure RA-7.



RA351

Fig RA-7 Removing rear axle shaft assembly

7 Remove oil seal in axle case if necessary and install new seal. Insure against damaging the seal lip.

8 Cut bearing collar with cold chisel. See Figure RA-8.

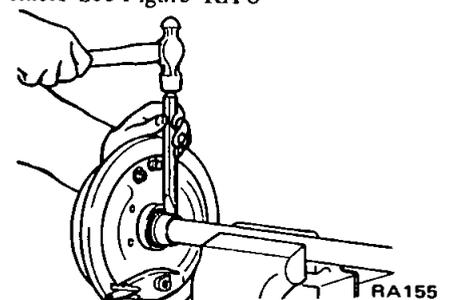


Fig RA-8 Cutting bearing collar

Rear Axle & Rear Suspension

Note Take care not to damage axle shaft with cold chisel during operation

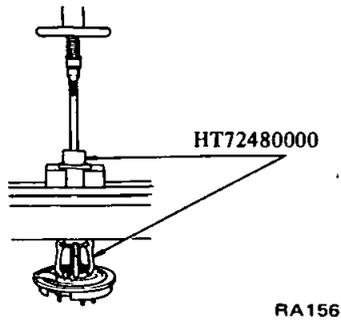


Fig RA-9 Removing wheel bearing

9 Remove wheel bearing and collar using Rear Axle Shaft Bearing Puller HT72480000 Then take out brake disc See Figure RA-9

INSPECTION

Inspect the following parts for fault and replace as necessary

- 1 Check axle shaft for bending, cracks, damage, wear and distortion
- 2 Check the lip of oil seal for damage, deformation and wear
- 3 Check bearing for wear and damage

INSTALLATION

Install in the reverse order of removal

1 Install bearing spacer, bearing and new bearing collar onto axle shaft, and press bearing collar by specified load more than 3 tons using Rear Axle Shaft Lock Collar Inserter ST38210000 See Figure RA-10

Notes

- a A new collar must be used Before installing, clean collar and axle shaft
- b Clean bearing, and pack with recommended multi-purpose grease
- c Insert wheel bearing with seal side toward wheel

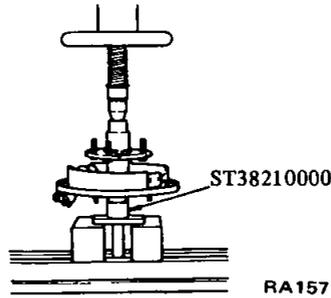


Fig RA-10 Installing wheel bearing

- 2 Install oil seal using Oil Seal Drift KV40100300
- 3 Pack cavity between seal lips with recommended multi-purpose grease when installing

4 Use care not to damage oil seal when installing

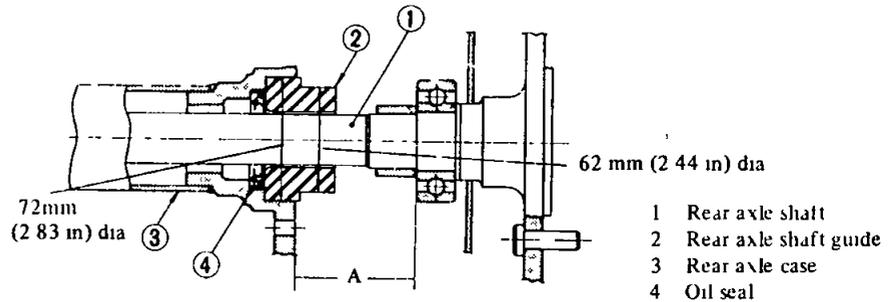
5 When inserting axle shaft into axle case, use Rear Axle Shaft Guide ST37840000 not to damage the sealing lips of oil seal

To insert axle shaft into axle case, proceed as follows

Install Rear Axle Shaft Guide ST37840000 on axle case

Remove the guide when the distance "A" between the axle flange and bearing is 70 to 90 mm (2 76 to 3 54 in) See Figure RA-11

Note Apply multi-purpose grease to the outer periphery of the rear axle shaft bearing collar



RA205

Fig RA-11 Installing rear axle shaft

6 Adjust the gap "C" between wheel bearing and brake disc to within 0 1 mm (0 004 in) by use of shim See Figure RA-12

Rear axle case end shim thickness
0 075 mm (0 0030 in)

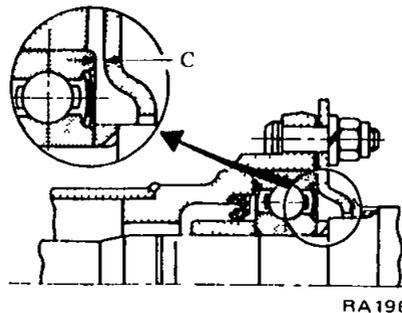


Fig RA-12 Gap "C"

7 Measure axial end play of axle shaft with dial indicator It should be 0 10 to 0 45 mm (0 0039 to 0 0177 in) See Figure RA-13

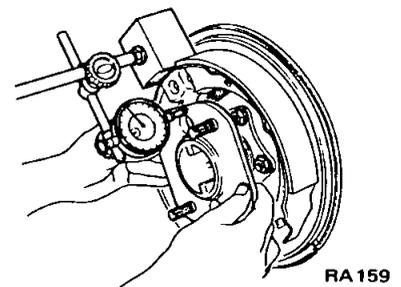


Fig RA-13 Measuring end play

Tightening torque

Brake disc fixing nut
2 2 to 2 7 kg-m
(16 to 20 ft-lb)

Brake tube
1 5 to 1 8 kg-m
(11 to 13 ft-lb)

Wheel nut
8 to 9 kg-m
(58 to 65 ft-lb)

REAR AXLE CASE

REMOVAL

Rear axle case is removed and installed as follows

- 1 Raise rear of car and place stands under body member on both sides
- 2 Remove rear axle assembly (Refer to Removal of Rear Axle Assembly)
- 3 Remove rear axle shaft on both sides (Refer to Removal of Rear Axle Shaft and Wheel Bearing)
- 4 Remove differential gear carrier assembly

An alternate procedure can be followed as listed below

- 1 Raise rear of car and place stands under body member on both sides
- 2 Remove rear axle shaft on both sides
- 3 Remove differential gear carrier assembly
- 4 Remove rear axle case

INSPECTION

Check axle case for deformation or cracks and replace if necessary

INSTALLATION

Installation can be accomplished following the reverse order of removal

Tightening torque

Differential carrier to axle case fix nut
2.0 to 2.5 kg-m
(14 to 18 ft-lb)

Oil drain and filler plug
4.2 to 6.9 kg-m
(30 to 50 ft-lb)

REAR SPRING

REMOVAL

- 1 Raise rear of car and place stands under body member on both sides
- 2 Disconnect shock absorber at lower end ① and remove U-bolts (Spring clips) ② See Figure RA-14

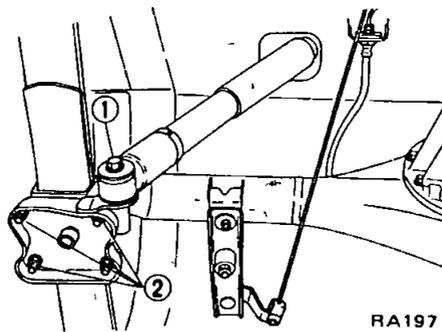


Fig RA-14 Removing shock absorber lower end and U-bolts

- 3 Position jack under rear axle case Raise jack and float axle case from spring
- 4 Disconnect rear spring shackle by removing nuts See Figure RA-15

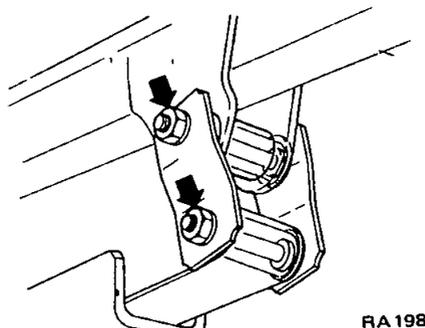


Fig RA-15 Removing spring shackle

- 5 Disconnect spring front pin by removing nuts Disconnecting spring from body See Figure RA-16

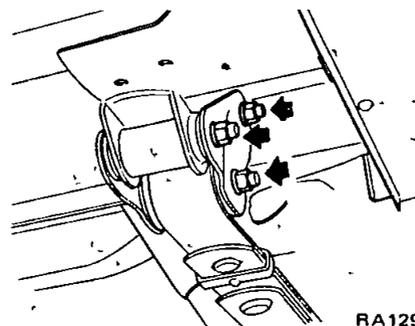


Fig RA-16 Removing spring pin

- 6 Remove rubber bush in spring if necessary and install new bush

INSPECTION

Clean all rust and dirt from spring leaves, using a wire brush if necessary

- 1 Examine spring leaves for fractures or cracks
- 2 Check front bracket and pin, shackle, U-bolts and spring seat for wear, cracks, bending and damaged threads. If defective parts are found, replace with new ones
- 3 Inspect all rubber parts for wear, damage, separation and deformation. Replace them if necessary

INSTALLATION

Use the following procedure when tightening U-bolts (spring clips)

- 1 Apply soapy water to each side of spring pad
- 2 Torque U-bolts to the specified setting, exercising care not to tilt U-bolts sideways

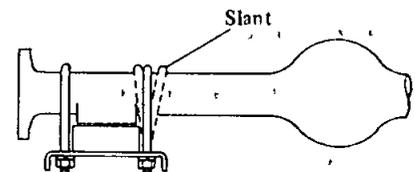


Fig RA-17 Installing U-bolt

- 3 Install four nuts in place by making them snug tight evenly (until the same number of threads is engaged), before tightening with a box wrench securely
- 4 When tightening nuts with a box wrench, alternately turn them one full rotation at a time until the projection of each bolt head is within 3 mm (0.12 in) above the nut. Check again that the four nuts are torqued evenly

Notes

- a Close adherence to the above instructions will add much to increased service life of U-bolts
- b After installation, make sure that location plate and spring seat closely come into contact with each other

Closely observe the following instructions

- c Do not remove any particular U-bolt alone. Be sure to remove adjacent U-bolts too

To install the part other than U-bolts, reverse the order of removal, closely observing the following

Coat rubber bushes with soapy water, prior to assembly

Car weight must be on rear wheels when tightening front pin, shackle and shock absorber lower end bolt in order to clamp rubber bushes in an unloaded position

Tightening torque

Spring front pin nut

6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Spring shackle nut

6.0 to 6.5 kg-m
(43 to 47 ft-lb)

U-bolt

6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Shock absorber lower end bolt

3.6 to 4.8 kg-m
(26 to 35 ft-lb)

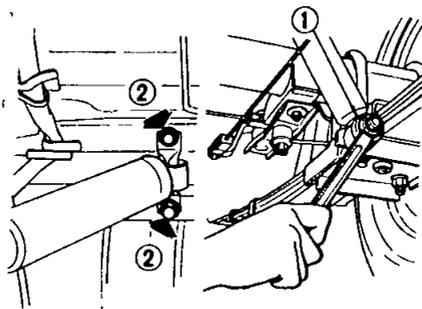
SHOCK ABSORBER

REMOVAL

- 1 Raise rear of car and place stands under axle case on both sides

Use a hoist or open pit if available

- 2 Disconnect lower end of shock absorber by removing bolt ① or nut ① at spring seat. See Figure RA-18
- 3 Disconnect upper end of shock absorber by removing nut ② or bolts ② at frame. See Figure RA-18



RA311

Fig RA-18 Removing shock absorber

INSPECTION

- 1 Test shock absorber and compare with specifications given in "Service Data and Specifications". Replace if necessary

- 2 Check for oil leakage and cracks. Also, check shaft for bending
- 3 Inspect rubber bushings for damage, cracks and deformation. Replace parts if necessary

INSTALLATION

Install shock absorber in the reverse order of removal, noting the following

Note Car weight must be on rear wheels when tightening shock absorber upper and lower ends in order to clamp rubber bushings in an unloaded position

Shock absorber upper end bolt

0.9 to 1.2 kg-m
(7 to 9 ft-lb)

Shock absorber lower end nut

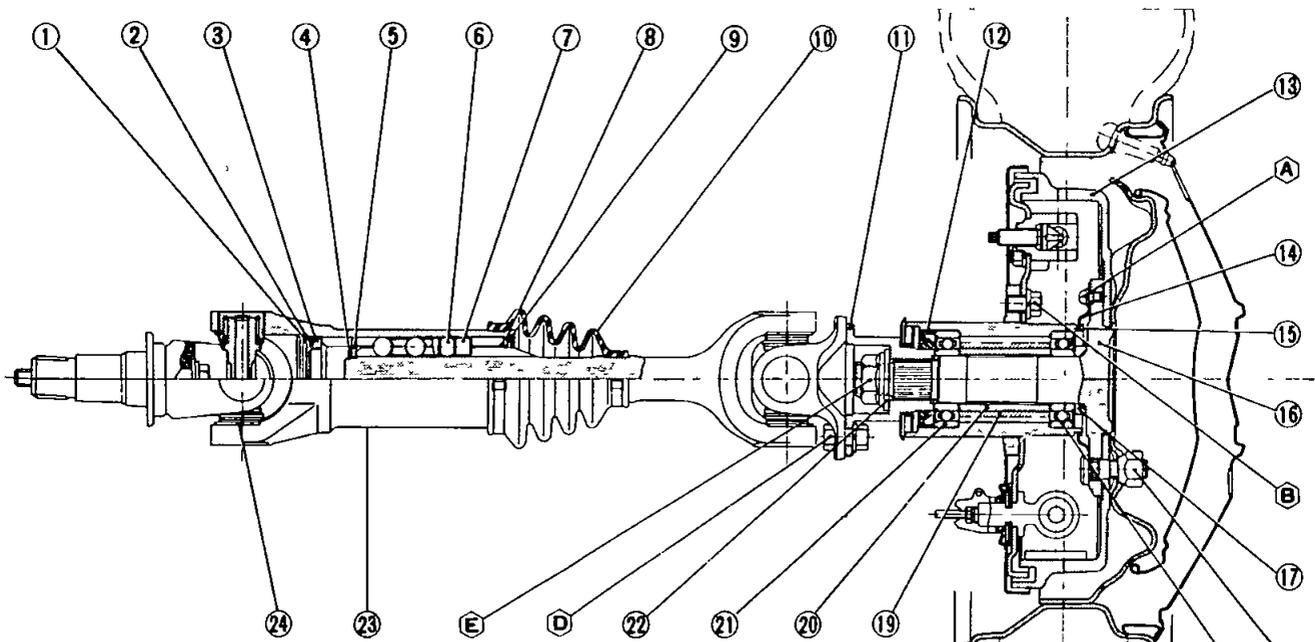
3.6 to 4.8 kg-m
(26 to 35 ft-lb)

Caution Do not open or heat gas filled type shock absorbers which are equipped on some models

REAR AXLE AND REAR SUSPENSION -INDEPENDENT REAR SUSPENSION-

CONTENTS

DESCRIPTION	RA-10	REAR SUSPENSION ARM	RA-12
REAR AXLE & SUSPENSION ASSEMBLY	RA-10	REMOVAL	RA-12
REMOVAL	RA-10	INSPECTION	RA-13
INSPECTION AND REPAIR	RA-10	INSTALLATION	RA-13
INSTALLATION	RA-11	REAR AXLE SHAFT, WHEEL BEARINGS AND SEALS	RA-13
SUSPENSION MEMBER	RA-11	REMOVAL AND DISASSEMBLY	RA-13
REMOVAL	RA-11	INSPECTION	RA-13
INSTALLATION	RA-11	ASSEMBLY AND INSTALLATION	RA-13
SUSPENSION COIL SPRING	RA-12	WHEEL BEARING ADJUSTMENT	RA-14
REMOVAL	RA-12	DRIVE SHAFT	RA-14
INSPECTION AND REPAIR	RA-12	REMOVAL	RA-15
INSTALLATION	RA-12	DISASSEMBLY	RA-15
SHOCK ABSORBER	RA-12	INSPECTION	RA-15
REMOVAL	RA-12	ASSEMBLY	RA-15
INSPECTION	RA-12	INSTALLATION	RA-15
INSTALLATION	RA-12		



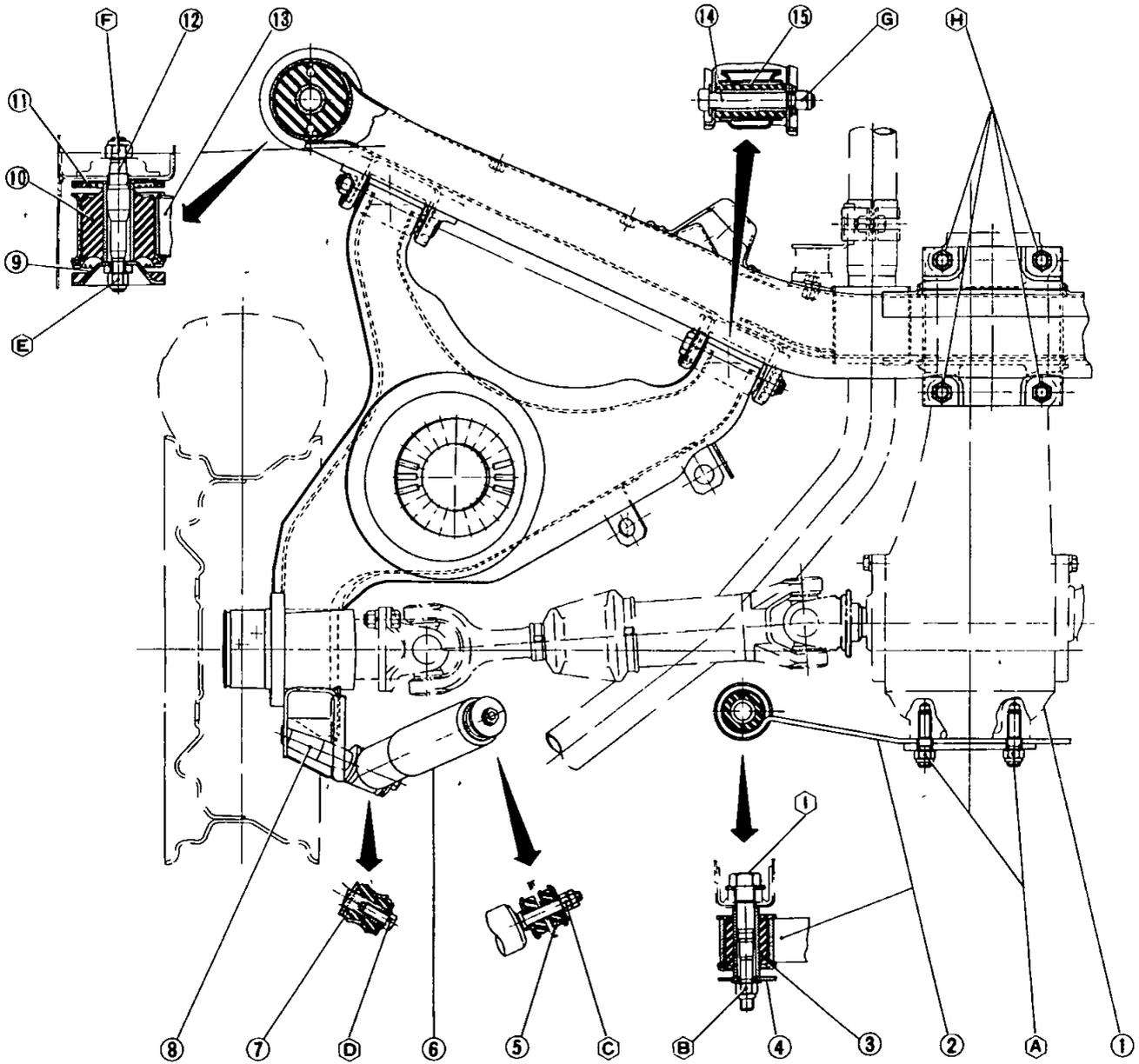
- | | |
|-------------------------|---|
| 1 Snap ring | 15 Suspension arm (Bearing housing) |
| 2 Sleeve yoke plug | 16 Rear axle shaft |
| 3 O-ring | 17 Bearing spacer |
| 4 Drive shaft snap ring | 18 Bearing (outer) |
| 5 Drive shaft stopper | 19 Apply wheel bearing grease to wheel bearings and the surface of distance piece |
| 6 Drive shaft ball | 20 Bearing distance piece |
| 7 Ball spacer | 21 Bearing (inner) |
| 8 Sleeve yoke stopper | 22 Plain washer |
| 9 Snap ring | 23 Drive shaft assembly |
| 10 Rubber boot | 24 Snap ring |
| 11 Rear axle flange | |
| 12 Oil seal | |
| 13 Brake disc | |
| 14 Grease catcher | |

- Tightening torque (T) of bolts and nuts kg-m (ft-lb)
- | | |
|-----|-------------------------|
| (A) | T 0.32 to 0.44 (2 to 3) |
| (B) | T 2.7 to 3.7 (20 to 27) |
| (C) | T 8 to 9 (58 to 65) |
| (D) | T 5 to 6 (36 to 43) |
| (E) | T 13 to 17 (94 to 123) |

RA324

Fig RA-19 Cross-sectional view of rear axle

Rear Axle & Rear Suspension



- 1 Differential gear carrier assembly
- 2 Differential mounting member
- 3 Differential mounting insulator
- 4 Differential mounting lower stopper
- 5 Rubber bushing
- 6 Shock absorber
- 7 Rubber bushing
- 8 Suspension arm assembly
- 9 Suspension member mounting lower stopper

- 10 Suspension member mounting insulator
- 11 Suspension member mounting upper stopper
- 12 Rear suspension front mounting bolt
- 13 Rear suspension member assembly
- 14 Suspension arm pin
- 15 Suspension arm bush

- Tightening torque of bolts and nuts kg-m (ft-lb)
- (A) 5 to 7 (36 to 51)
 - (B) 7 to 10 (51 to 72)
 - (C) Tighten under side nut of double nuts until they will no longer go
 - (D) 1.6 to 2.2 (12 to 16)
 - (E) 7 to 10 (51 to 72)
 - (F) 11 to 15 (80 to 108)
 - (G) 8 to 10 (58 to 72)
 - (H) 5 to 7 (36 to 51)
 - (I) 20 to 30 (145 to 217)

RA313

Fig RA-20 Rear suspension system

DESCRIPTION

The rear suspension is of the semitrailing arm type independent suspension

Primarily, rear wheel is supported with the coil spring and suspension arm, the differential gear carrier is aligned independently and separately from the suspension, and the gear carrier is installed directly on the body with the suspension member and the differential mounting member through four rubber insulators

Coil springs are mounted between the suspension arms and body. The upper end of spring is installed on the body through rubber cushion, and the suspension arm is installed on suspension member with rubber cushion

The rear wheel bearing housing and shock absorber lower bracket are welded to the trailing end of the suspension arm.

Driving power is transmitted to the rear axle shaft with the freely extensible drive shaft through flange yoke on both ends of the differential gear carrier. The rear axle shaft is supported with two ball bearings in the rear wheel bearing housing

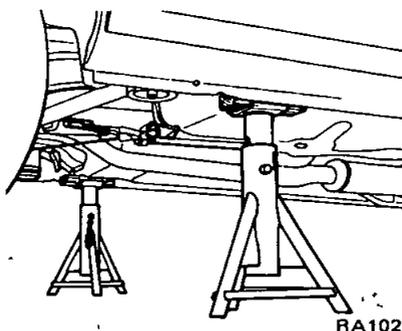


Fig RA-21 Support points

- 2 Remove rear wheels
- 3 Disconnect hand brake cables by removing adjusting nut at adjuster ①, and return spring ② See Figure RA-22

- 4 Remove rear exhaust tube and muffler ③
- 5 Mark rear flange of propeller shaft and pinion flange of differential gear carrier for proper reassembly, then disconnect rear flange from pinion flange by removing four bolts ④
- ④ Remove propeller shaft assembly
- 6 Disconnect rear brake hoses ⑤ at suspension arms on both sides. Cover brake hoses and pipe openings to prevent entrance of dirt
- 7 Position jack under suspension arm and raise jack slightly to relieve tension on shock absorber. Disconnect shock absorbers at lower end ⑥
- ⑥ Carefully lower jack under suspension arm

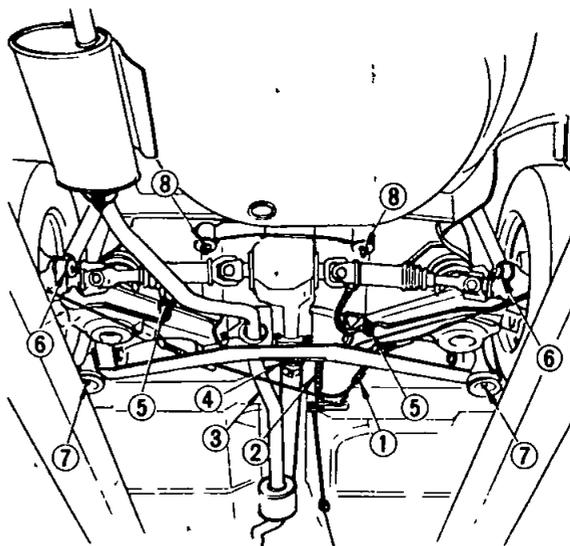


Fig RA-22 Rear suspension removal points

REAR AXLE & SUSPENSION ASSEMBLY

REMOVAL

It is not necessary to remove rear axle and suspension assembly for any normal repairs. However, if the rear suspension member is damaged, the rear axle and the suspension member assembly may be removed and installed using the following procedure

- 1 Raise the rear of car high enough to permit working underneath, and support it on stands. Place stands solidly under body member on both sides

- 8 Support under center of suspension member and differential gear carrier with a jack
- 9 Disconnect suspension member from body by removing two nuts ⑦ at both ends of member
- 10 Disconnect differential mounting member by removing two nuts ⑧ at both ends of member
- 11 Carefully lower jack with suspension assembly, and it out from under car. Support suspension so that it does not tilt and fall off jack

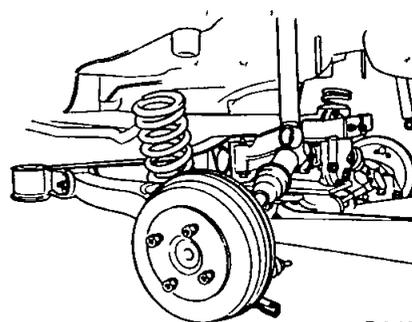


Fig RA-23 Removing rear axle and suspension assembly

INSPECTION AND REPAIR

When the rear suspension has been removed, examine all parts for wear or damage. Particular attention should be given to bushing in suspension arms and bound bumper rubbers. Also check the condition of rubber insulators in the suspension member and the differential mounting member.

Any of these components, if worn, can result noisy and vibration to the interior of car.

Replace rubber insulators of the suspension member using Rear Suspension Member Insulator Replacer ST38290000.

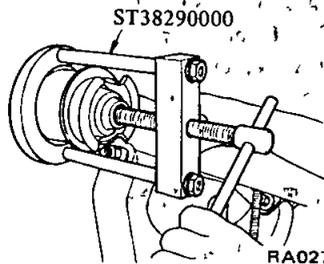


Fig RA-24 Removing insulator from suspension member

Replace rubber insulators of the differential mounting member using Differential Mounting Insulator Drift ST33300010 (for removal), and ST33300020 (for installation).

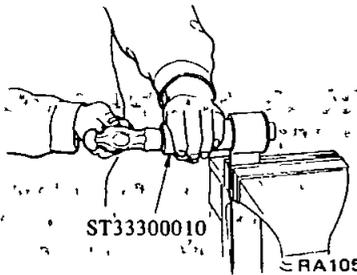


Fig RA-25 Removing insulator from differential mounting member

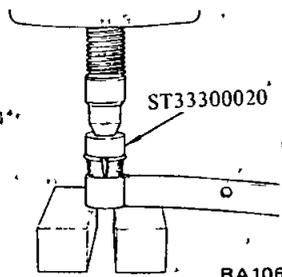
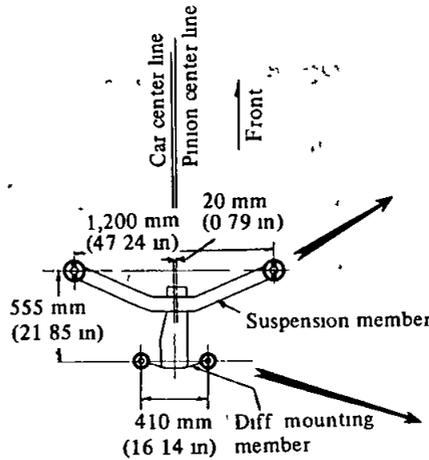


Fig RA-26 Installing insulator to differential mounting member

INSTALLATION

Install the rear axle and the suspension assembly in the reverse order of removal, noting the following points:

1 Ensure suspension member and differential mounting member are correctly lined up.



2 Rubber insulators should be correctly lined up as shown in Figure RA-27 and inserted from the underside of member.

3 Do not use lesser quality or substitute design parts.

4 Tightening torque values must be used as specified during reassembly to assure proper retention of parts.

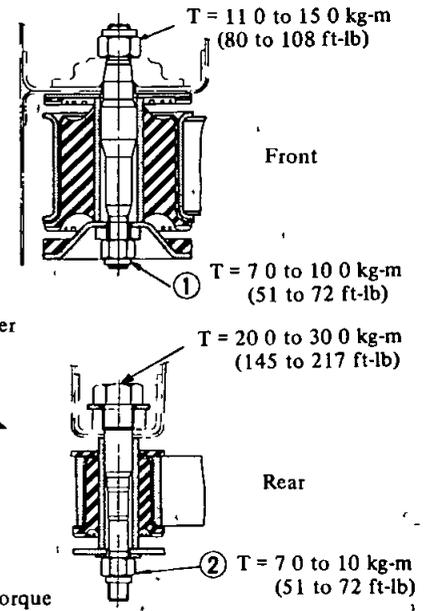


Fig RA-27 Insulator

Tightening torque

- Suspension member mounting nut ①
7 to 10 kg-m (51 to 72 ft-lb)
- Differential mounting member mounting nut ②
7 to 10 kg-m (51 to 72 ft-lb)
- Shock absorber lower end fixing bolt
1.6 to 2.2 kg-m (12 to 16 ft-lb)

center of suspension member. See Figure RA-28.

3 Disconnect suspension arms by removing suspension arm pins ②.

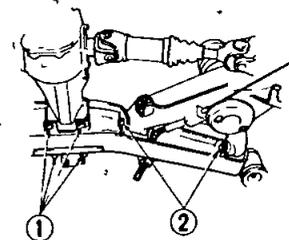


Fig RA-28 Removing suspension member

SUSPENSION MEMBER

REMOVAL

1 Remove rear suspension assembly (See Rear Axle & Suspension, Assembly Removal).

2 Disconnect differential gear carrier by removing four bolts ① at

INSTALLATION

Install the rear suspension member in the reverse order of removal.

Note Car weight must be on rear wheels when tightening suspension arm pins in order to clamp rubber bushings in a neutral on unloaded position.

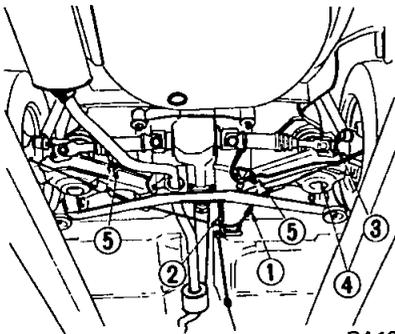
Tightening torque

- Differential gear carrier fitting bolt 5 to 7 kg-m (36 to 51 ft-lb)
- Suspension arm pin $\frac{1}{8}$ to 10 kg-m (58 to 72 ft-lb)

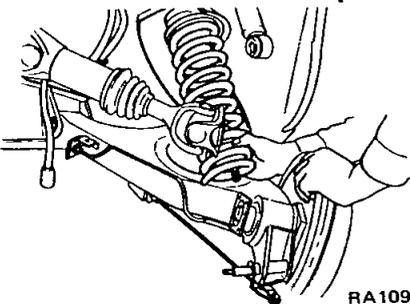
SUSPENSION COIL SPRING

REMOVAL

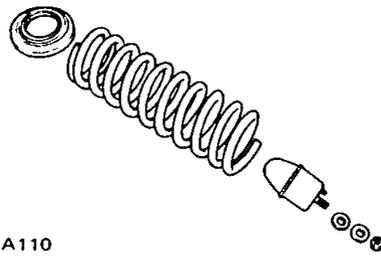
- 1 Raise the rear of car and support it on stands Place stands solidly under body member on both sides
- 2 Remove rear wheels
- 3 Disconnect hand brake cables by removing adjusting nut at adjuster ①, and return spring ② See Figure RA-29
- 4 Remove drive shaft flange nuts ③ on the wheel side, and bound rubber fixing nut ④
- 5 Disconnect rear brake hose ⑤ at suspension arm
- 6 Position jack under suspension arm and raise jack slightly to relieve tension on shock absorber Disconnect shock absorbers at lower end
- 7 Carefully lower jack to fully extend spring after disconnecting shock absorber and remove spring, spring seat and bound rubber



RA103
Fig RA-29 Suspension coil spring removal points



RA109
Fig RA-30 Removing coil spring



RA110

Fig RA-31 Spring and rubbers

INSPECTION AND REPAIR

- 1 Check coil spring for yield, deformation or cracks
- 2 Test spring and compare with the specifications given in Service Data and Specifications
- 3 Check all rubber parts for wear, damage and deformation Replace if necessary

INSTALLATION

Install coil spring in the reverse order of removal, noting the following points

- 1 Install spring seat on top of spring and bound rubber in spring, and ensure that coil spring is correctly in position (flat face of spring is top)
- 2 Tightening torque values must be used as follows

Shock absorber lower end fixing bolt

1 6 to 2 2 kg-m
(12 to 16 ft-lb)

Bound rubber nut

1 6 to 2 2 kg-m
(12 to 16 ft-lb)

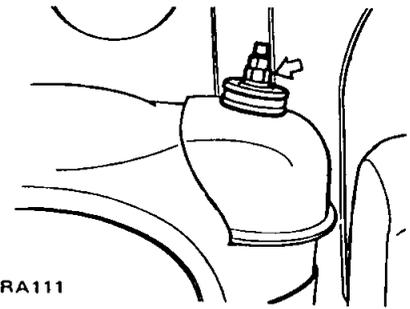
Drive shaft flange bolt

5 to 6 kg-m (36 to 43 ft-lb)

SHOCK ABSORBER

REMOVAL

- 1 Open the trunk and remove trunk finisher assembly
- 2 Remove double nuts which fasten the upper end of rear shock absorber to body
- 3 Disconnect shock absorber by removing bolt at suspension arm



RA111

Fig RA-32 Installation of rear shock absorber upper end

INSPECTION

- 1 Test shock absorber and compare with the specification given in Service Data and Specifications Replace if necessary
- 2 Check for oil leakage and cracks Also check shaft for straightness
- 3 Inspect rubber bushings for damage, cracks and deformation Replace parts if necessary

INSTALLATION

Installation of shock absorber is the reverse order of removal

Note Car weight must be on rear wheels when tightening shock absorber lower end in order to clamp rubber bushings in a neutral or unloaded position

REAR SUSPENSION ARM

The rear axle shaft housing and shock absorber lower mounting bracket are welded suspension arm

REMOVAL

- 1 Raise the rear of car and support under body member on stands
- 2 Remove rear wheel and brake drum
- 3 Disconnect drive shaft from axle shaft
- 4 Disconnect hand brake cable from lever attached to wheel cylinder
- 5 Disconnect brake hose from brake tube by removing lock spring and draw out through connector

Rear Axle & Rear Suspension

Note Cover brake hose and tube opening to prevent entrance of dirt

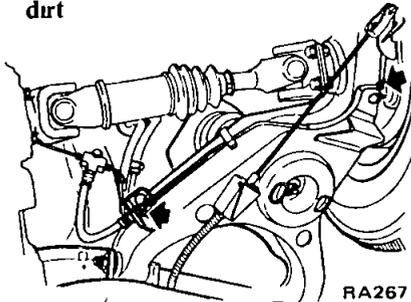


Fig RA-33 Removing brake hose and tube

- 6 Remove wheel bearing lock nut
- 7 Remove rear axle shaft, wheel bearings and oil seal
- 8 Remove rear brake assembly from suspension arm

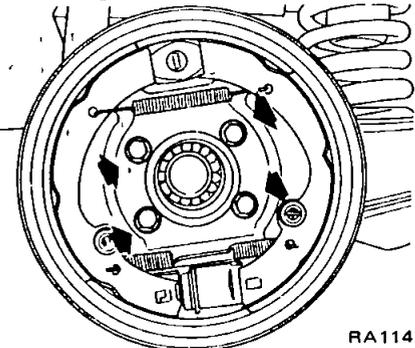


Fig RA-34 Removing rear brake assembly

- 8 After remove bound rubber fixing nut, position jack under suspension arm and raise jack slightly to relieve tension on shock absorber. Disconnect shock absorber at lower end
- 9 Carefully lower jack to fully extend spring after disconnecting shock absorber and remove spring, spring seat and bound rubber
- 10 Disconnect suspension arm by removing suspension arm pins securing suspension arm to suspension member

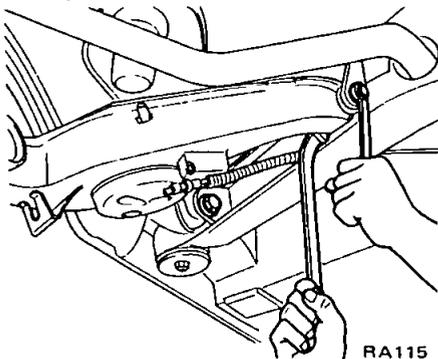


Fig RA-35 Removing suspension arm

- 11 Draw out rubber bushings from suspension arm using Rear Suspension Arm Bush Remover ST38280000

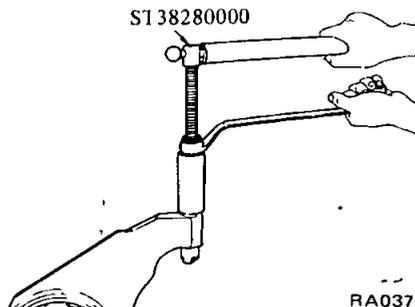


Fig RA-36 Removing rubber bushing

INSPECTION

- 1 Examine suspension arms to ensure they are not deformed or cracked
- 2 Check rubber bushings for wear, damage and separation. Replace if necessary

INSTALLATION

- Install in the reverse order of removal, noting the following points
- 1 Car weight must be on rear wheels when tightening suspension arm pins in order to clamp rubber bushings in a neutral on unloaded position
 - 2 Change self locking nuts at each overhaul

REAR AXLE SHAFT, WHEEL BEARINGS AND SEALS

REMOVAL AND DISASSEMBLY

- 1 Raise the rear of car and support under body member on stands
- 2 Remove rear wheel and brake drum
- 3 Disconnect drive shaft from axle shaft
- 4 Remove wheel bearing lock nut
- 5 Draw out axle shaft assembly using Rear Axle Stand KV40101000 and Sliding Hammer ST36230000. Remove rear axle flange

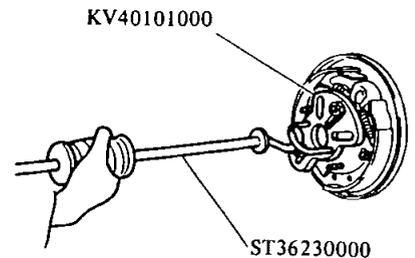


Fig RA-37 Removing rear axle shaft

- 6 Remove oil seal and inner bearing using Rear Axle Shaft Bearing Drift ST37750000

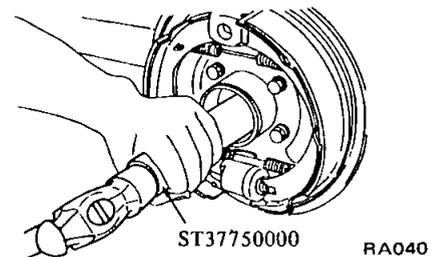


Fig RA-38 Removing oil seal and inner bearing

- 7 Remove grease catcher
- 8 Withdraw outer bearing from rear axle shaft using a standard bearing puller

Note Do not reuse bearing which has been pulled out

INSPECTION

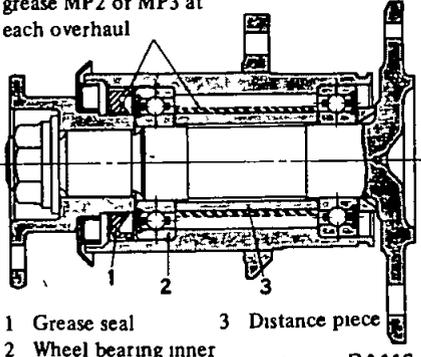
- Inspect the following parts. Replace or repair if necessary
- 1 Check axle shaft for straightness, cracks, wear and distortion
 - 2 Check bearing for excessive wear and damage. Replace if necessary

ASSEMBLY AND INSTALLATION

- Install in the reverse order of removal, noting the following points
- 1 Clean wheel bearings, oil seal and the inside of axle shaft housing
 - 2 Wheel bearings are sealed type. When installing ensure that the sealed side of outer bearing faces the wheel and that the sealed side of inner bearing faces the differential

Rear Axle & Rear Suspension

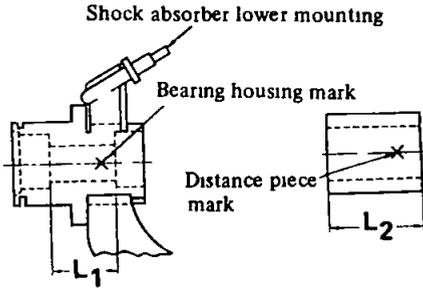
Pack with wheel bearing grease MP2 or MP3 at each overhaul



1 Grease seal 3 Distance piece
2 Wheel bearing inner RA116
Fig RA-39 Sectional view of rear axle

3 When replacing suspension arm, measure the dimensions L1 and L2. See Figure RA-40.

The length of distance piece is 0.05 mm (0.0020 in) shorter than the length of housing. Example: When an axle housing is coded "B", select "B" coded distance piece.



AXLE HOUSING DISTANCE PIECE
RA268

Fig RA-40 Dimension of distance piece and housing

4 Replace wheel bearing grease periodically.

Pack wheel bearings with MP2 or MP3 grease as shown in Figure RA-39. Apply grease to lip seal and wheel bearing.

Notes

- a Change lock nut and oil seal at each overhaul.
- b Reuse of an oil seal must not be allowed. Install oil seal by Rear Axle Grease Seal Drift ST37710000.

WHEEL BEARING ADJUSTMENT

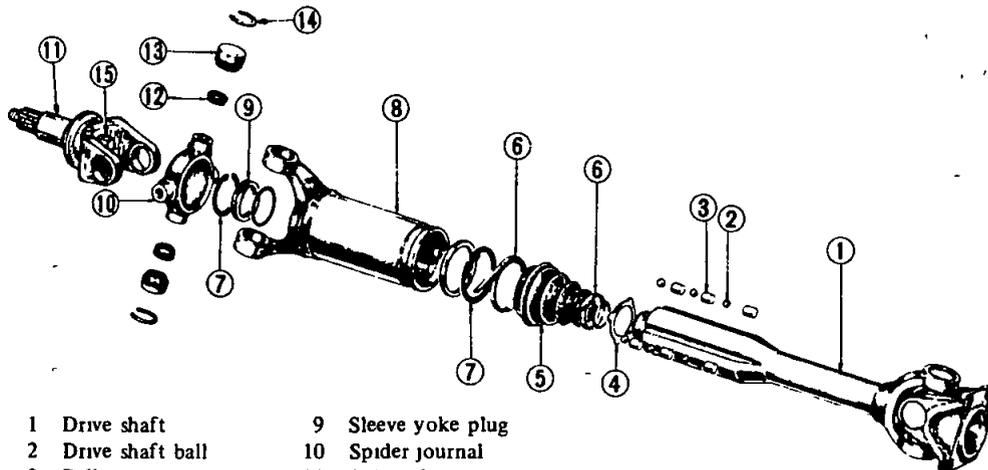
1 After tightening lock nut to specified torque 25 to 33 kg-m (181 to 239 ft-lb), check the rear axle shaft end play. It should be 0 to 0.15 mm (0 to 0.0059 in) and should have a turning torque less than 4.5 kg-cm (3.9 in-lb) or 0.8 kg (1.8 lb) at hub bolt.

2 Lock nut using a punch.

3 If the correct end play or turning torque cannot be obtained, disassemble again and replace distance piece.

Rear axle shaft housing mm (in)		Rear wheel bearing distance piece mm (in)	
Mark	L ₁ length	Mark	L ₂ length
A	59.05 to 59.15 (2.3248 to 2.3287)	A	59.02 to 59.08 (2.3236 to 2.3260)
B	58.59 to 59.05 (2.3067 to 2.3248)	B	58.92 to 58.98 (2.3197 to 2.3220)
C	58.85 to 58.95 (2.3169 to 2.3209)	C	58.82 to 58.88 (2.3157 to 2.3181)

DRIVE SHAFT



- 1 Drive shaft
- 2 Drive shaft ball
- 3 Ball spacer
- 4 Drive shaft stopper
- 5 Rubber boot
- 6 Boot band
- 7 Snap ring
- 8 Sleeve yoke
- 9 Sleeve yoke plug
- 10 Spider journal
- 11 Side yoke
- 12 Oil seal
- 13 Needle bearing
- 14 Snap ring
- 15 Side yoke fitting bolt

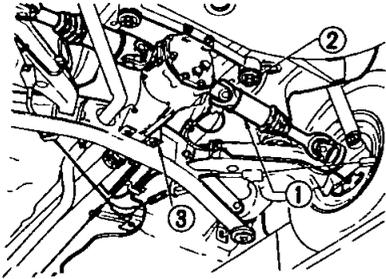
RA269

Fig RA-41 Drive shaft

Rear Axle & Rear Suspension

REMOVAL

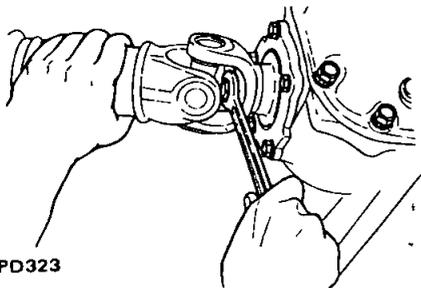
- 1 Jack up rear of car and support on safety stands
- 2 Disconnect drive shafts ① on the wheel side See Figure RA-42



PD318

Fig RA-42 Under view

- 3 Remove side yoke fitting bolts, and extract side yokes together with drive shafts See Figure RA-43



PD323

Fig RA-43 Removing side yoke fitting bolt

DISASSEMBLY

Disassembly should be done only to lubricate ball spline

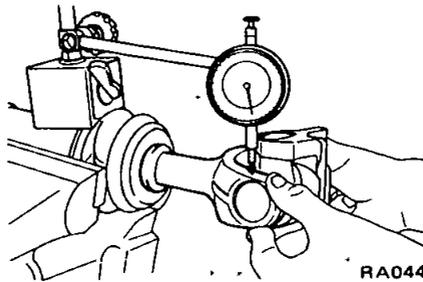
- 1 Remove universal joint spider located at the differential side Refer to the section covering propeller shaft
- 2 Remove bolt together with O-ring, plain washer and spring washer securing drive shaft yoke to the differential
- 3 Remove snap ring which secures sleeve yoke plug and remove plug Compress drive shaft and remove snap ring securing stopper (Figure RA-41, ④)
- 4 Disconnect boot and split drive shaft taking care not to lose balls and spacers

INSPECTION

- 1 Replace boot, O-ring of sleeve yoke plug and O-ring of side yoke, if damaged

- 2 Check drive shaft for straightness, cracks, damage, wear and distortion Replace drive shaft assembly if necessary
- 3 Check steel balls and sleeve yoke for damage, wear and distortion Replace drive shaft assembly if faulty parts are found
- 4 If any abnormal condition is found in universal joints, replace joint
- 5 Wash out old grease from sleeve yoke, drive shaft ball rolling groove and oil groove
- 6 Check the play in drive shaft as shown in Figure RA-44 If the play exceeds 0.1 mm (0.004 in) replace drive shaft assembly

Note The measurement should be taken with drive shaft fully compressed



RA044

Fig RA-44 Measuring play in drive shaft

ASSEMBLY

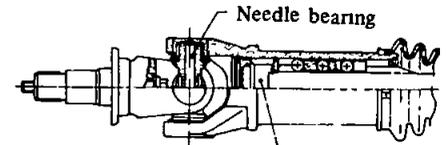
Assemble in the reverse order of disassembly, noting the following points

- 1 Align the yokes and ensure that steel balls and spacers are fitted in the correct sequence
- 2 Use related snap rings of the same thickness and be sure that play is below 0.02 mm (0.0008 in) Snap rings are available in four different thickness

Universal joint snap ring

Thickness	mm (in)
1.49	(0.0587)
1.52	(0.0598)
1.55	(0.0610)
1.58	(0.0622)

- 3 Apply an adequate quantity of multi-purpose grease to the ball rolling groove and oil groove, approximately 10 g (0.35 oz) In addition, apply 35 g (1.23 oz) of grease to the area shown in Figure RA-45



RA270

Apply grease in this area

RA270

Fig RA-45 Sectional view of drive shaft

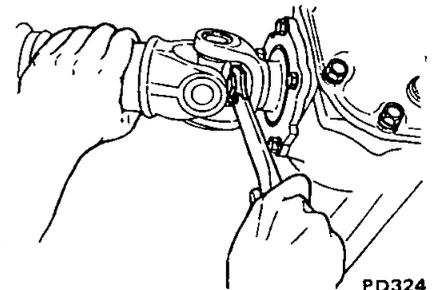
Note Component parts of drive shaft are not available except as an assembly Therefore, if any wear or damage exists in a certain part, drive shaft assembly will have to be replaced

INSTALLATION

- 1 Install side yoke together with drive shafts to differential gear carrier assembly, and tighten side yoke fitting bolts to specified torque using torque wrench See Figure RA-46

Tightening torque

3.2 to 4.3 kg-m
(23 to 31 ft-lb)



PD324

Fig RA-46 Tightening side yoke fitting bolt

Note Be careful not to damage side yoke and oil seal when installing

- 2 Join drive shafts with companion flanges of rear axle shaft and tighten connecting bolts to specified torque

Tightening torque

5 to 6 kg-m (36 to 43 ft-lb)

SERVICE DATA AND SPECIFICATIONS

—RIGID AXLE (Station Wagon)

Axle type		Semi-floating, banjo
Suspension type		Semi-elliptic leaf spring
Shock absorber type		Telescopic double acting
Leaf spring		
Dimension		
Length x Width x Thickness — Number of leaves	mm (in)	1,200 x 60 x 7 - 2 6 - 1 12 - 1 (47 24 x 2 36 x 0 28 - 2) 0 24 - 1) 0 47 - 1)
Free camber	mm (in)	126 (4 96)
Laden camber	mm/kg (in/lb)	15/320 (0 59/706)
Shock absorber		
Stroke x Max length	mm (in)	205 x 510 (8 07 x 20 08)
Damping force at 0 3 m/sec (1 0 ft/sec)		
Expansion	kg (lb)	110 (243)
Compression	kg (lb)	41 (90)
Rear axle shaft		
End play	mm (in)	0 10 to 0 45 (0 0039 to 0 0177)
Thickness of rear axle case end shim	mm (in)	0 075 (0 0030)
Tightening torque		
		kg-m (ft-lb)
Shock absorber upper end bolt		0 9 to 1 2 (7 to 9)
Shock absorber lower end nut		3 6 to 4 8 (26 to 35)
Rear spring U-bolt (clip)		6 0 to 6 5 (43 to 47)
Spring front pin bolt and nut		6 0 to 6 5 (43 to 47)
Spring shackle nut		6 0 to 6 5 (43 to 47)
Leaf spring front bracket fixing nut		6 0 to 6 5 (43 to 47)
Brake disc (back plate) fixing nut		2 2 to 2 7 (16 to 20)
Differential gear carrier-to-axle case nut		2 0 to 2 5 (14 to 18)
Propeller shaft flange bolt		2 4 to 3 3 (17 to 24)
Bumper rubber fixing nut		0 9 to 1 2 (7 to 9)
Drain and filler plug		4 2 to 6 9 (30 to 50)
Wheel nut		8 to 9 (58 to 65)

Rear Axle & Rear Suspension

-INDEPENDENT REAR SUSPENSION (Sedan and Hardtop)

Axle type	Independent
Suspension type	Semi-trailing arms, coil spring
Shock absorber type	Telescopic double acting
Coil spring and shock absorber	

	Sedan		Hardtop	
	R H spring	L H spring	R H spring	L H spring
Coil spring Installed height/load mm/kg (in/lb)	229/602 (9 02/1,327)	215/602 (8 46/1,327)	229/602 (9 02/1,327)	222/602 (8 74/1,327)
Spring constant kg/mm (lb/in)	6 56 (367 4)	6 56 (367 4)	7 82 (437 9)	7 82 (437 9)
Shock absorber Stroke x Max length mm (in)	211 x 585 (8 31 x 23 03)			
Damping force at 0 3 m/sec (1 0 ft/sec)				
Expansion kg (lb)	61 (135)			
Compression kg (lb)	39 (86)			

Items	Applied models	Sedan	Hardtop
Wheel alignment (Unladen)			
Toe-in	mm (in)	4 to 14 (0 16 to 0 55)	2 to 12 (0 08 to 0 47)
Camber	Degree	1°5' to 2°35'	20' to 1°55'

Rear Axle & Rear Suspension

Drive shaft and journal

Sliding resistance	kg (lb)	Less than 20 (44)
Radial play of ball spline	mm (in)	Less than 0.1 (0.004)
Axial play of spider journal	mm (in)	Less than 0.02 (0.0008)
Journal swinging torque	kg-cm (in-lb)	Less than 10 (8.7)

Rear axle shaft

Turning torque	kg-cm (in-lb)	Less than 4.5 (3.9)
	kg (lb)	[0.8 (1.8) at hub bolt]
End play	mm (in)	Less than 0.15 (0.0059)

Tightening torque

	kg-m (ft-lb)
Rear wheel bearing lock nut	13 to 17 (94 to 123)
Brake disc (back plate) fixing bolt	2.7 to 3.7 (20 to 27)
Shock absorber upper end nut	Securely tighten under side nuts of double nuts until they will no longer go
Shock absorber lower end nut	1.6 to 2.2 (12 to 16)
Drive shaft flange bolt	5 to 6 (36 to 43)
Drive shaft side yoke bolt	3.2 to 4.3 (23 to 31)
Bumper rubber fixing nut	1.6 to 2.2 (12 to 16)
Rear suspension member mounting nut	8 to 10 (58 to 72)
Differential mounting member nut	7 to 10 (51 to 72)
Suspension arm-to-suspension member fixing pin	7 to 10 (51 to 72)
Diff -to-suspension member fixing bolt	5 to 7 (36 to 51)
Diff -to-diff mounting member fixing nut	6 to 8 (43 to 58)
Rear suspension mounting bolt (front)	11 to 15 (80 to 108)
Rear suspension mounting bolt (rear)	20 to 30 (145 to 217)
Propeller shaft flange bolt	2.0 to 2.7 (14 to 20)
Wheel nut	8 to 9 (58 to 65)
Drive shaft to differential bolt	3.2 to 4.3 (23 to 31)

TROUBLE DIAGNOSES AND CORRECTIONS

When rear axle and suspension are suspected of being noisy, it is advisable to make thorough test to determine whether the noise originates in the tires, road surface, exhaust, propeller

shaft, engine, transmission, universal joint, wheel bearings or suspension

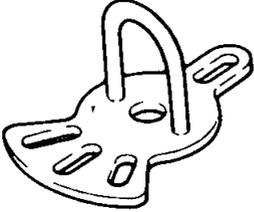
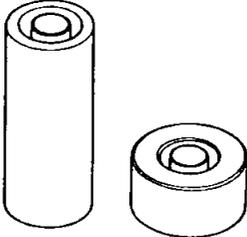
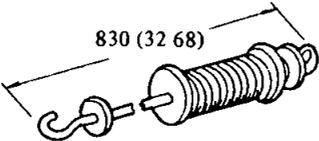
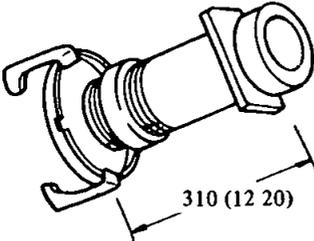
Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the

rear axle and rear suspension

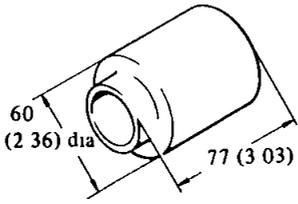
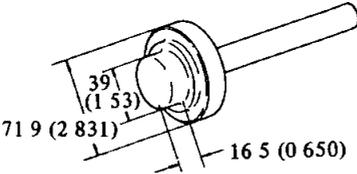
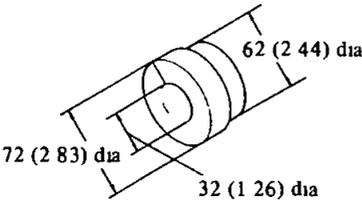
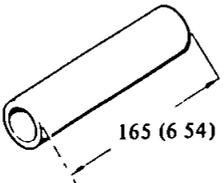
In case of oil leak, first check to see if there is any damage or restriction in breather

Condition	Probable cause	Corrective action
Noise	Loose wheel nuts Loose securing bolts Lack of lubricating oil or grease Damaged shock absorber Incorrect adjustment of rear axle shaft end play Damaged or worn wheel bearing Worn spline portion of rear axle shaft Broken leaf spring Loose journal, connections or so on Imbalance of wheel and tire Damage to rubber parts such as leaf spring bush, suspension arm bush, shock absorber mounting bush Deformed differential mounting member Damaged universal joints Worn or damaged rear suspension member mounting insulator Worn or seized sliding portion of drive shaft ball spline Breakage of coil spring	Tighten wheel nuts Tighten to the specified torque Lubricate as required Replace Adjust Replace Replace if necessary Replace Tighten to the given torque Balance wheel and tire Replace parts as required Replace Adjust or replace Replace suspension member mounting insulators on both sides Replace drive shaft assembly Replace coil spring
Instability in driving	Loose wheel nuts Damaged rear suspension arm rubber bushes Worn shock absorber Faulty wheel alignment 1) Spring wear 2) Worn-out spline portion of drive shaft ball spline	Tighten to the given torque. Replace the rubber bushes Replace worn shock absorber Replace spring Replace drive shaft assembly.
Oil leakage	Damaged or restricted air breather Damaged oil seal on rear axle shaft Oil leakage from the differential carrier Damaged dust cover of drive shaft Damaged grease seal of rear axle shaft	Clean or replace air breather Replace the damaged oil seal Replace as required Replace dust cover Replace grease seal

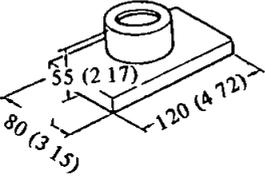
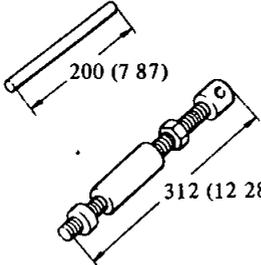
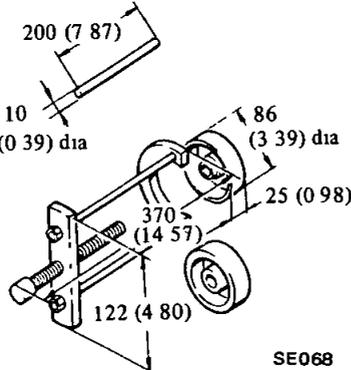
SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description	Unit mm (in)	For use on	Reference page or Figure No
1	KV40101000 Rear axle stand	 SE402	This stand is used together with the sliding hammer (ST36230000) in taking rear axle shaft out of place. The stand is also used to hold the removed rear axle shaft assembly with the vise in taking bearing out of the assembly.	All models	Fig RA-7 Fig RA-37
2	ST33300000 Diff mounting insulator drift	 SE223	(1) Drift O D 39 mm (1.54 in) (ST33300010) To take insulator out of place, use drift (2) Drift O D 52 mm (2.05 in) (ST33300020) To push insulator into place, use this drift together with a press	610 K610 K710 GC110 KC130	Fig RA-25 Fig RA-26
3	ST36230000 Sliding hammer	 SE059	This hammer is used together with rear axle stand in driving axle shaft out of place.	All models	Fig RA-7 Fig RA-37
	HT72480000 Rear axle shaft bearing puller	 SE265	This puller is designed so as to drive out rear axle shaft bearing.	All rigid axle models	Fig RA-9

Rear Axle & Rear Suspension

No	Tool number & tool name	Description	Unit mm (in)	For use on	Reference page or Figure No
5	ST37710000 Rear axle grease seal drift	 <p style="text-align: center;">SE065</p>	This drift is used to set oil seal in its correct position without marring seal	610 K610 K710 GC110 KC130	Page RA-14
6	KV40100300 Rear axle oil seal drift	 <p style="text-align: center;">SE388</p>	This drift is used to install oil seal into rear axle tube end	W610 V610 B210 710 C110 VC110 C130	Page RA-5
7	ST37840000 Rear axle shaft guide	 <p style="text-align: center;">SE066</p>	This tool is used to insert rear axle shaft to rear axle case	W610 V610 B210 710 C110 VC110 C130	Page RA-5 Fig RA-11
8	ST37750000 Rear axle shaft bearing drift	 <p style="text-align: center;">SE066</p>	This drift is used to install wheel bearing onto rear axle shaft or to install inner bearing in bearing housing or to take out of the housing	610 K610 K710 GC110 KC130	Fig RA-38

Rear Axle & Rear Suspension

No	Tool number & tool name	Description	Unit mm (in)	For use on	Reference page or Figure No
9	ST38210000 Rear axle shaft bearing collar press stand	 <p style="text-align: center;">SE226</p>	This tool is used together with a hydraulic press in driving bearing collar (new) into place	W610 V610 B210 710 C110 VC110 C130	Fig RA-10
10	ST38280000 Rear suspension arm bush remover	 <p style="text-align: center;">SE067</p>	This tool is used to remove rear suspension arm bushing	610 K610 K710 GC110 KC130	Fig RA-36
11	ST38290000 Rear suspension member insulator replacer	 <p style="text-align: center;">SE068</p>	This tool is used to install or remove rear suspension member insulator	610 K610 K710 GC110 KC130	Fig RA-24

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BR

BRAKE SYSTEM

BR

BRAKES	BR- 2
FRONT BRAKE	BR-10
REAR BRAKE	BR-14
MASTER-VAC	BR-16
SERVICE DATA AND SPECIFICATIONS	BR-21
TROUBLE DIAGNOSES AND CORRECTIONS	BR-23
SPECIAL SERVICE TOOLS	BR-24

BRAKE SYSTEM

BRAKES

CONTENTS

DESCRIPTION	BR- 2	Inspection	BR- 7
ADJUSTMENT	BR- 2	Assembly	BR- 7
Brake pedal	BR- 2	Installation	BR- 7
Front disc brake	BR- 3	BRAKE LINE	BR- 7
		Removal	BR- 8
Rear brake	BR- 3	Inspection	BR- 8
Hand brake	BR- 3	Installation	BR- 8
Brake warning light	BR- 4	NP-valve	BR- 8
Bleeding hydraulic system	BR- 4		
BRAKE PEDAL	BR- 4		
Removal	BR- 4	HAND BRAKE	BR- 9
Inspection	BR- 4	Removal	BR- 9
Installation	BR- 4	Front cable	BR- 9
MASTER CYLINDER	BR- 5	Inspection	BR-10
Removal	BR- 6	Installation	BR-10
Disassembly	BR- 6		

DESCRIPTION

The front wheels use the model Annette type disc brakes with a rotor of 245 mm (9 65 in) in diameter and the rear wheels use drum brakes of 228 6 mm (9 in) inner diameter.

The NP-valve and brake fluid warning lamp are installed on the car equipped with the disc brakes. The brake fluid warning lamp is operated on the amount of the brake fluid in the reservoir of the master cylinder.

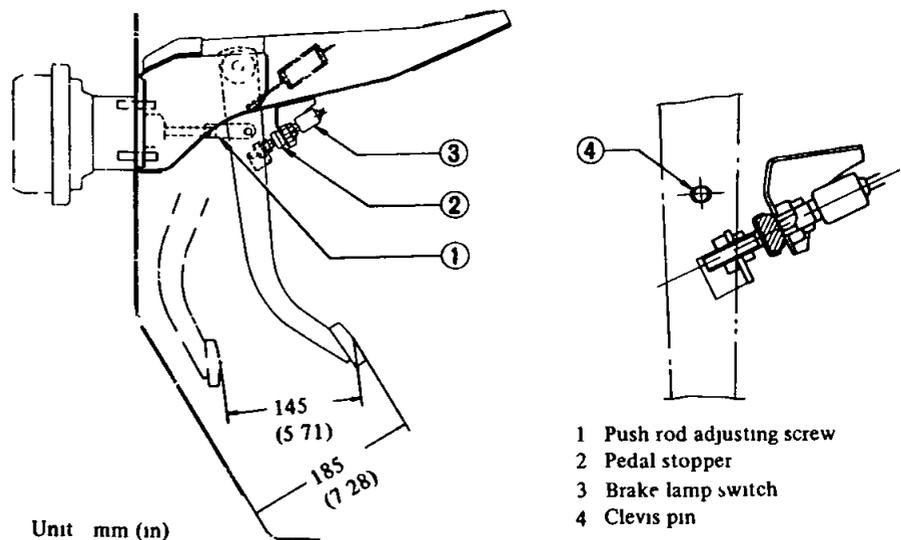
Tandem master cylinder is used on all models. The diameter of the master cylinder is 19 05 mm ($\frac{3}{4}$ in).

The Master-Vac with a diaphragm of 114 3 mm (4 $\frac{1}{2}$ in) in diameter (1 8 ℓ Deluxe model) and 152 4 mm (6 in) in diameter (1 8 ℓ SSS model) is installed on the car equipped with disc brakes.

The hand brake is of a mechanical type, which serves to brake the rear wheels. It is applied or released through the stick-type lever in the driver's compartment. As these brakes are applied, the brake warning lamp, located on the instrument panel, will come on to indicate that the hand brake is in "applied" condition.

ADJUSTMENT

Brake pedal



- 1 Push rod adjusting screw
- 2 Pedal stopper
- 3 Brake lamp switch
- 4 Clevis pin

BR241

Fig BR-1 Adjusting brake pedal

BRAKE SYSTEM

- 1 Adjust brake lamp switch bolt
Then, tighten lock nut securely

Tightening torque
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

- 2 Adjust pedal stopper until pedal pad is positioned 185 mm (7.28 in) above the floor. Then, lock pedal stopper with lock nut

Tightening torque
0.8 to 1.1 kg-m
(6 to 8 ft-lb)

- 3 Adjust the length of push rod until a pedal free play of 1 to 5 mm (0.04 to 0.20 in) is obtained at the pedal pad. Then, tighten lock nut securely

Tightening torque
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

Note Use care not to allow the push rod getting into master cylinder

- 4 After adjustment is made, depress and release brake pedal several times to insure that it travels over its entire stroke [145 mm (5.71 in)] smoothly without showing squeak noise, twisting or interference

Front disc brake

Adjustment is not necessary under normal condition since pad-to-rotor clearance is automatically compensated by elasticity of piston seal

Rear brake

- 1 Make sure that each wheel cylinder lever of parking brake is properly returned to its original position
- 2 Depress brake pedal several times so that brake shoes are settled down in normal positions
- 3 Rotate adjusting cam in the same direction as car drives forward until shoes drag against brake drum

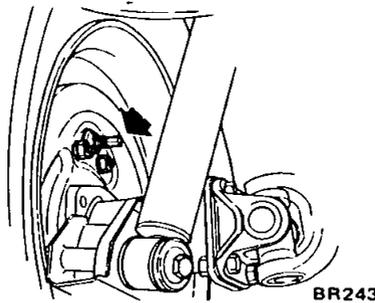


Fig BR-3 Rear brake shoe adjusting cam (Sedan and Hardtop)

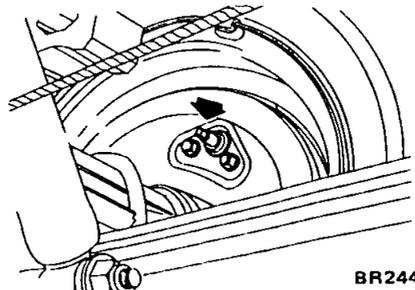


Fig BR-4 Rear brake shoe adjusting cam (Station Wagon)

- 4 Turn out cam a little at a time until brake drum is free from shoe grab

Hand brake

- 1 Adjust rear brake shoe to drum clearance before adjusting hand brake
- 2 Take up all slack in rear cable, tighten lock nut firmly

Note Any slightest pull on wheel cylinder lever cannot be tolerated when adjusted

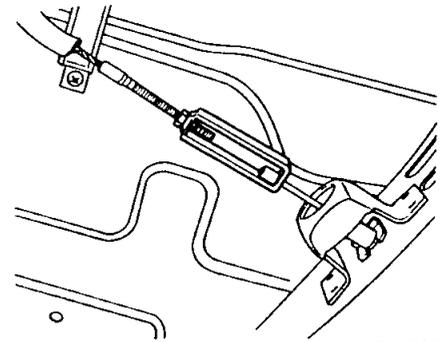
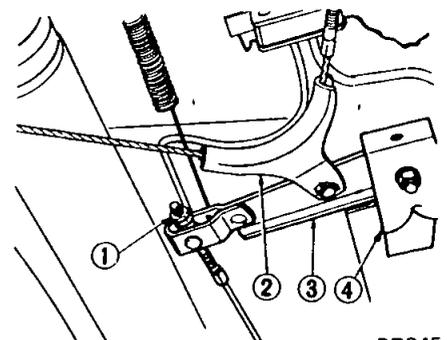


Fig BR-5 Rear cable adjuster

- 3 Adjust front cable so that, when hand brake control lever is pulled by a force of 20 kg (44 lb), a lever stroke of 90 to 100 mm (3.54 to 3.94 in) is obtained. Then, tighten lock nut securely



1 Adjusting nut 3 Center lever
2 Equalizer 4 Center lever bracket

Fig BR-6 Center lever

- 4 Ascertain that each wheel cylinder lever is returned to its original position with hand brake control lever moved back

BRAKE SYSTEM

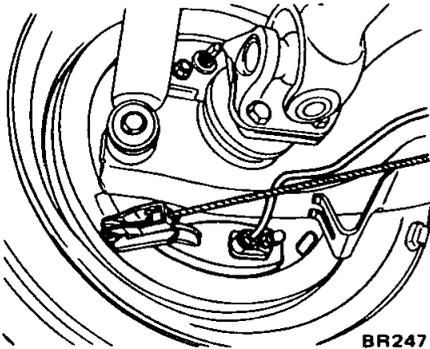


Fig BR-7 Adjusting hand brake

5 Replace front and rear cables if adjustment is no longer effective on their threaded ends

After adjustment

1. Make sure that each wheel cylinder lever is returned to its original position as hand brake lever is moved back. Also check to be sure that inner cable is not slackened excessively

2. Make sure that ratchet is applied positively as hand brake control lever is pulled back. This lever should be released and automatically return to its original position when lever is rotated 60°. It should not show any evidence of bind or noise

Brake warning light

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

Bleeding hydraulic system

Hydraulic brake system must be bled whenever any line has been disconnected or air has in some way entered this system.

When pedal feeling was "spongy" pedal action, it is an indication that air has entered in the system

Bleeding hydraulic system deserves much attention as it is an essential factor for regular brake service operation

1 Clean all dirt around master cylinder reservoir, remove cylinder

cover and top up reservoir with recommended brake fluid

2. Thoroughly clean mud or dust from bleeder valve so that outlet hole is free from any foreign material. Install a bleeder hose to bleeder valve

Put the other end of hose in a container filled with brake fluid.

3. Depress brake pedal two or three times and keep pedal fully depressed.

4 With brake pedal fully depressed, open bleeder valve to exhaust air

Notes:

a. Carefully monitor brake fluid level at master cylinder during bleeding operation.

b Do not re-use brake fluid drained during bleeding operation.

c. Bleed air in the following sequence. Rear wheel → Front wheel

d Exercise care not to splash brake fluid on painted portions

5 Close bleeder valve quickly as brake pedal is on down stroke

6 Allow brake pedal to return slowly with bleeder screw closed

7. Repeat bleeding operations until no air bubbles show in hose

Notes

a Brake fluid containing air is white and contains air bubbles

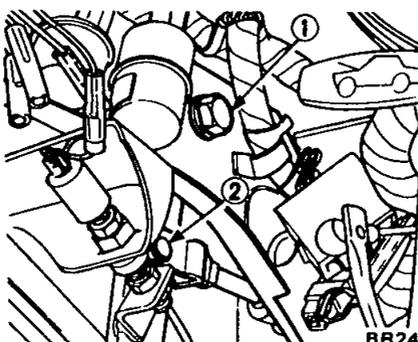
b Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles

8 Repeat above steps on the remaining brake line to expel air

BRAKE PEDAL

Removal

1 Remove pedal return spring



1 Fulcrum pin 2 Cotter pin

Fig BR-8 Brake pedal mounting

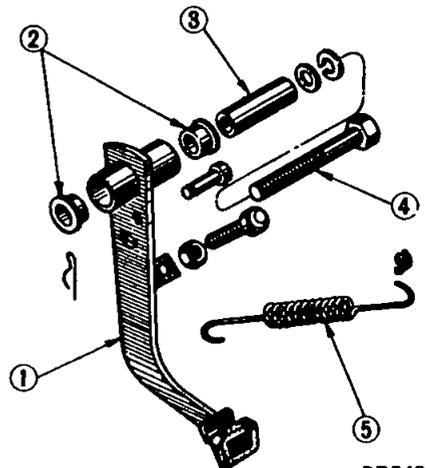
2. Remove cotter pin from clevis pin, and separate pedal from Master-Vac push rod.

3 Remove fulcrum pin and pedal

Note Turn fulcrum pin clockwise to loosen it

Inspection

Check brake pedal for the following items, servicing as necessary



1 Brake pedal 4 Fulcrum pin
2 Pedal bushing 5 Return spring
3 Pedal shaft sleeve

Fig BR-9 Brake pedal

1 Check pedal bushing for wear, deformation or damage

2 Check pedal shaft sleeve for wear or roughness

3 Check for bent brake pedal

4 Check for fatigued return spring

Installation

Install brake pedal in the reverse sequence of removal, paying attention to the following instructions

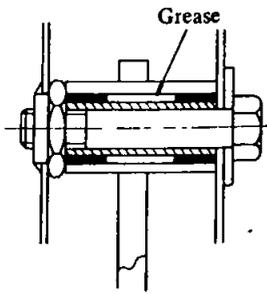
1 Install fulcrum pin from the right side

2 Install clevis pin from the right side

3 Install return spring with the longer hook toward pedal arm

4 Apply a coating of recommended multipurpose grease the inner and outer faces of pedal bushing, clevis pin, and hooks of return spring. Charge the clearances in bushings with grease.

BRAKE SYSTEM



BR250

Fig BR-10 Greasing place

Pedal stopper lock nut
0.8 to 1.1 kg m
(6 to 8 ft-lb)

5 Adjust the brake pedal after installation (Refer to the instructions under "Adjustment.")

Tightening torque

Fulcrum pin
3.6 to 4.2 kg-m
(26 to 30 ft-lb)

MASTER CYLINDER

The master cylinders are of a tandem type, which actuates on the front and rear brake lines independently.

Braking force is constantly maintained when failure occurs in either the front brake system or the rear brake system. Failure in the front brake system will leave the rear brake still operative or failure in the rear

brake system will leave the front brake system still operative.

The brake fluid level gauge is available as an standard equipment for model SSS.

The brake warning light (BRAKE) located on the instrument panel comes on to indicate that the brake fluid level in the cylinder is lower than the minimum allowable level.

Two types of master cylinder are used, one for disc brake and the other for drum brake. They differ from each other in the reservoir capacity and check valve.

	Disc brake
Reservoir capacity	110 cc (6.71 cu in)
Brake warning light goes on when remaining fluid in reservoir reaches the amount of	60 cc (3.66 cu in)

The reservoir is equipped with a retention cap. To remove this cap, proceed as follows:

1 Turn retention ring fully in the REMOVE direction.

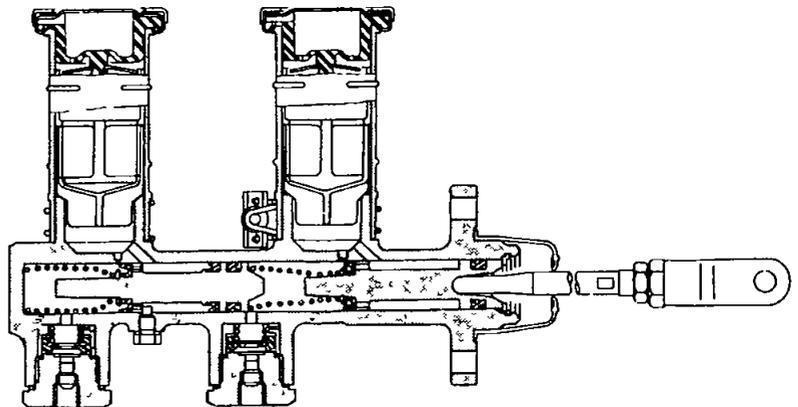
2 Pull out retention cap.

To install it, proceed as follows:

1. Turn retention ring (used in the retention cap) fully in the REMOVE direction.

2 Align the projection in retention ring with the slit in the reservoir tank and push retention cap in the tank.

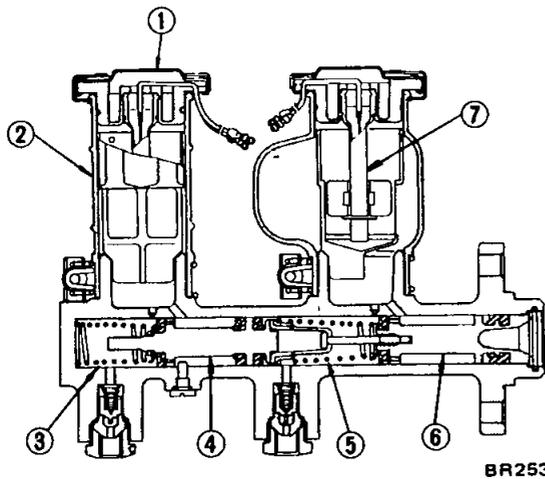
3 Turn retention ring fully in the TIGHTEN direction.



BR252

Fig BR-11 Cross-sectional view of drum brake master cylinder (Made by Tokico)

BRAKE SYSTEM



- | | |
|----------------------------------|--------------------------------|
| 1 Reservoir cap | 5 Primary piston return spring |
| 2 Reservoir tank | 6 Primary piston |
| 3 Secondary piston return spring | 7 Level gauge |
| 4 Secondary piston | |

Fig BR-12 Cross-sectional view of disc brake master cylinder with level gauge
(Made by Nabco)

Removal

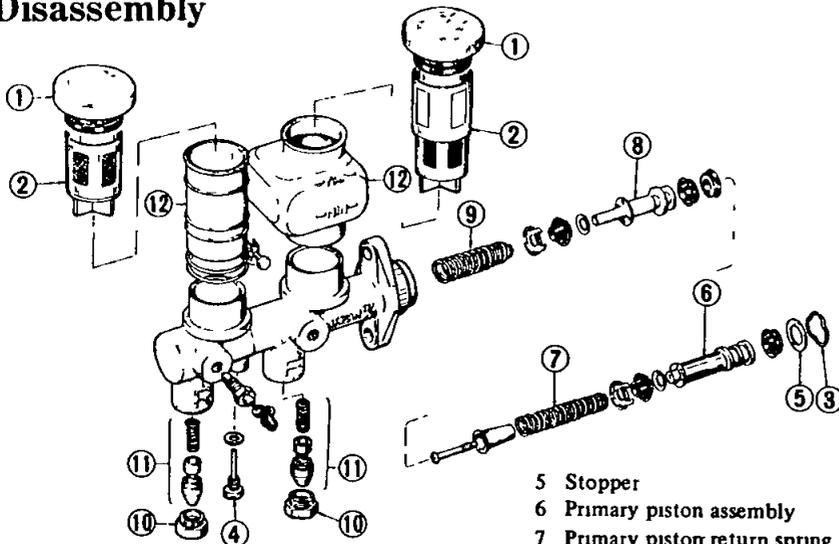
On the car not equipped with the Master-Vac

- 1 Pull out clevis pin, and separate brake pedal from master cylinder push rod
- 2 Disconnect brake tube from master cylinder

- 3 Remove master cylinder securing nuts, and withdraw master cylinder from engine room side

Note Before disconnecting brake tube, be sure to use a container that receives draining brake fluid. Use of a rag is also suggested to keep adjacent parts and place clean at all times

Disassembly



BR254

- | | |
|-----------------|----------------------------------|
| 1 Reservoir cap | 5 Stopper |
| 2 Filter | 6 Primary piston assembly |
| 3 Stopper ring | 7 Primary piston return spring |
| 4 Stopper screw | 8 Secondary piston assembly |
| | 9 Secondary piston return spring |
| | 10 Plug |
| | 11 Check valve |
| | 12 Reservoir |

Fig BR-13 Master cylinder

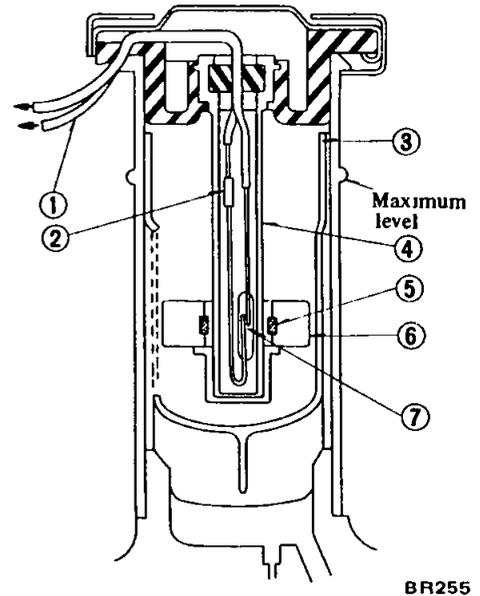
- 1 Remove reservoir cap and filter and drain out brake fluid.
- 2 Pry off stopper ring, using a screwdriver
- 3 Remove stopper screw and take out stopper, primary piston assembly, spring, and secondary piston assembly, in the order shown

Note Discard cup if it is removed from piston assembly and use a new one

- 4 Unscrew plug to gain accessibility of check valve for disassembling

Note Never detach reservoir tank if it is removed for any reason, discard it and install a new one. Do not remove or disassemble brake fluid level gauge

Brake fluid level gauge



- | | |
|-------------|---------------|
| 1 Lead wire | 5 Magnet |
| 2 Resistor | 6 Float |
| 3 Filter | 7 Reed switch |
| 4 Case | |

Fig BR-14 Brake fluid level gauge

Operation The float lowers as level of brake fluid becomes low

As the magnet is close to the reed switch, switch contacts are closed to light the brake warning light

BRAKE SYSTEM

Checking method Raise cap, and ascertain that brake warning light goes on when float comes into contact with stopper

is faulty

Note Do not clean rubber parts with mineral oil, since this will be the sure way of deteriorating parts Use brake fluid or alcohol When alcohol is used for cleaning these parts, do not immerse them in it longer than 30 seconds After parts are cleaned, dry with compressed air

1 Check cylinder and piston for evidence of abnormal wear or damage Replace if found defective.

2 Check piston-to-cylinder clearance If it is more than 0.15 mm (0.0059 in), replace either piston or cylinder

3 Check for weakened, fatigued or damaged springs, replacing as necessary

Inspection

Thoroughly clean all parts in a suitable solvent, and check for worn or damaged parts Replace any part that

Return spring		Primary side		Secondary side	
Maker		Tokico	Nabco	Tokico	Nabco
Free length	mm (in)	55 (2.17)	Do not disassemble	54.5 (2.146)	50.5 (1.988)
Installed load	kg (lb)	1.8 to 2.2 (4.0 to 4.9)		3.6 to 4.4 (7.9 to 9.7)	2.5 to 3.1 (5.5 to 6.8)
Length	mm (in)	35.7 (1.406)		34.5 (1.358)	33.1 (1.303)

4 When master cylinder is disassembled, be sure to discard cups and valves Replace any other parts which show evidence of deformation, wear or otherwise damage

5 Replace damaged oil reservoirs and caps

Brake tube connector
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Assembly

Assemble master cylinder in the reverse sequence of disassembly, paying particular attention to the following notes

Notes

- a Replace gaskets and packings with new ones.
- b Apply brake fluid or rubber grease to sliding contact surfaces of parts to facilitate assembly of master cylinder

Installation

Install master cylinder in the reverse sequence of removal

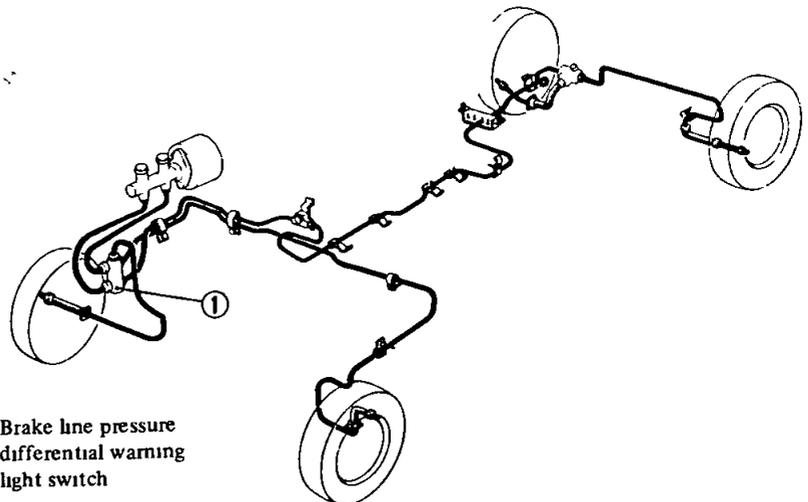
Bleed air out of master cylinder after it is installed in its original position

Tightening torque

Brake master cylinder attaching nut

0.8 to 1.1 kg-m
(6 to 8 ft-lb)

BRAKE LINE



1 Brake line pressure differential warning light switch

BR855

Fig BR-15 Brake line

BRAKE SYSTEM

Removal

- 1 Removing flare nuts on both ends and clips effects the removal of brake tube and brake hose
- 2 Rear brake hose can be removed by disconnecting the tube and then turning round the hose

Inspection

Check brake lines (tubes and hoses) for any evidence of crack, deterioration or other damage. Replace parts which are faulty.

If leakage occurs at and around joints, retighten or, if necessary, replace faulty parts.

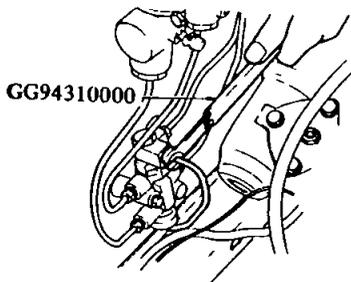
Installation

Pay particular attentions to the following instructions when installing brake lines.

1. Leave a sufficient space between brake lines and adjacent parts so that brake lines are completely imparted from vibration during driving
2. Exercise care not to warp nor twist brake hoses

Extreme care should be taken of brake hoses so that they are kept away from tires and suspension system components.

3. Using Flare Nut Torque Wrench GG94310000, tighten each connector to the specified torque.



BR257

Fig BR-16 Tightening brake tube

Tightening torque

Brake tube and hose connector
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Connector mounting bolt

6 mm diameter bolt
0.5 to 0.7 kg-m
(4 to 5 ft-lb)

8 mm diameter bolt
0.8 to 1.1 kg-m
(6 to 8 ft-lb)

4. Upon completion of installation of brake lines, bleed air out of brake lines.

Front brake hose

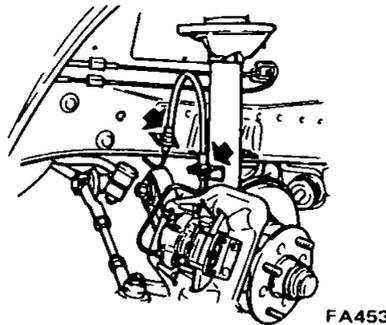
Installing the front brake hose requires the following special cares.

1. Keep the car in straight ahead position and raise the right and left front wheels from ground by placing a jack under crossmember.
2. Connect brake hose to brake tube at the bracket on front strut and secure with lock spring.

Tightening torque

1.7 to 2.0 kg-m
(12 to 14 ft-lb)

3. Install hose to bracket on the body side, and secure with lock spring. Do not twist hose when installing.



FA453

Fig BR-17 Installing front brake hose

Note When replacing hose, always renew copper gasket. Do not allow dirt and water to get into brake hose and tube.

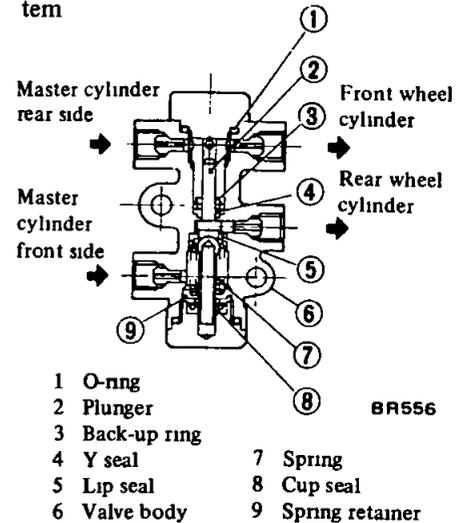
4. The standard assembly clearance is as follows:

Body-to-hose clearance
(Full bound at maximum turn of steering handle)
Approximately 25 mm (0.98 in)

NP-valve

The NP-valve completely separates the front and rear brake lines, allowing them to function independently, and preventing the rear brakes from locking before the front brakes. Conse-

quently, even in emergency braking, the brakes operate safely and effectively. Problem, such as brake line leakage, in either the front or rear brake system will not affect the normal operation of the unaffected system.



BR556

- | | |
|----------------|-------------------|
| 1 O-ring | 7 Spring |
| 2 Plunger | 8 Cup seal |
| 3 Back-up ring | 9 Spring retainer |
| 4 Y seal | |
| 5 Lip seal | |
| 6 Valve body | |

Fig BR-18 Cross-sectional view of NP-valve

Operating test

Conduct following periodic test every scheduled maintenance period.

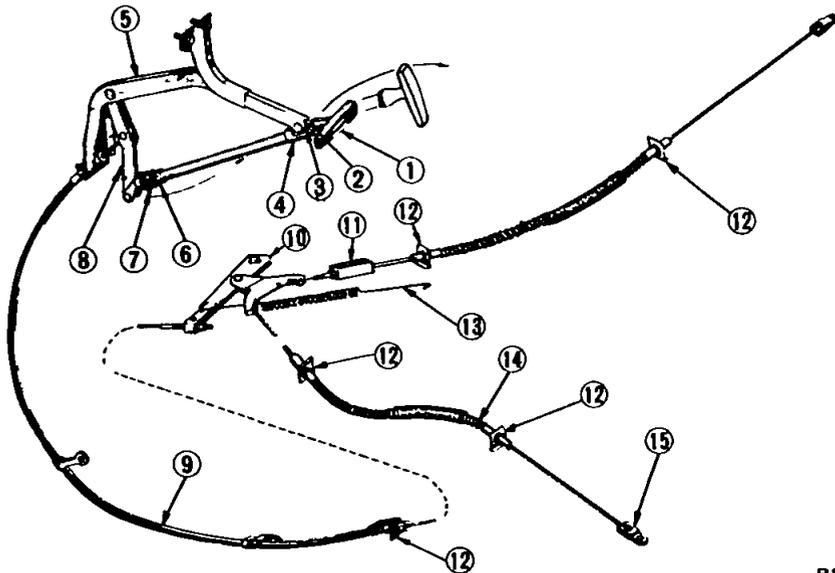
At the test, place the car on dry concrete road with no more than a driver laden and apply a sudden brake at 50 km/h (30 miles/h).

1. NP-valve functions normally when rear wheels lock simultaneously with front wheels or when front wheels lock ahead of rear wheels.

2. If the rear, instead of front, wheels has locked in advance, it may be attributable to malfunctioning of NP-valve. Replace NP-valve with a new one as an assembly.

BRAKE SYSTEM

HAND BRAKE



- | | | |
|--------------------------|-----------------|------------------------|
| 1 Control stem | 6 Control yoke | 11 Rear cable adjuster |
| 2 Control ratchet spring | 7 Lever spring | 12 Cable lock plate |
| 3 Control ratchet | 8 Control lever | 13 Return spring |
| 4 Control guide | 9 Front cable | 14 Rear cable |
| 5 Control bracket | 10 Center lever | 15 Clevis |

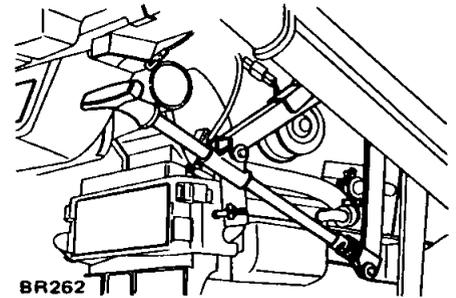
BR261

Fig. BR-20 Hand brake linkage

Removal

Control stem

1. Disconnect terminal from hand brake warning switch
- 2 Remove nuts securing control bracket in place on dash panel
- 3 Pull out lock pin and cotter pin, and then remove control stem assembly,

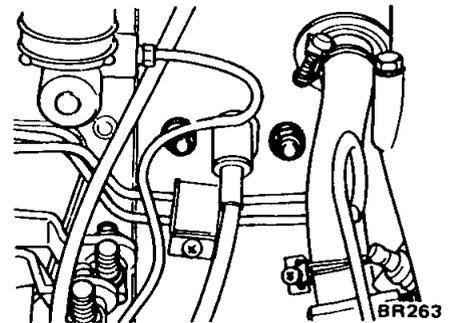


BR262

Fig BR-21 Control stem

Front cable

- 1 Remove return spring, and loosen adjuster lock nut Separate front cable from control stem
2. Remove nuts securing cable to dash panel, and remove cable from the engine compartment side

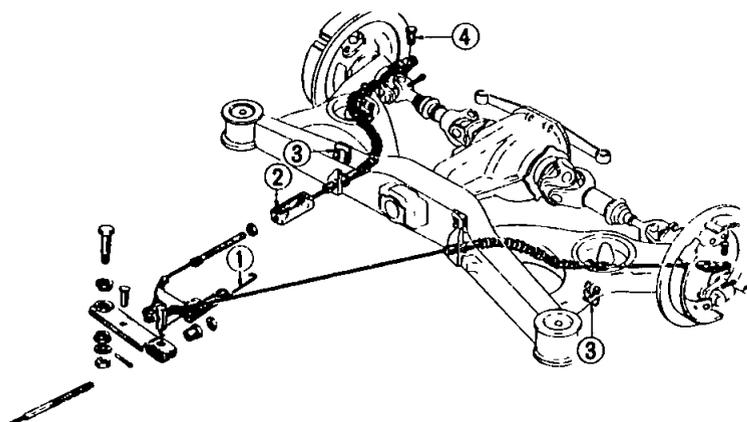


BR263

Fig BR-22 Front cable attaching nut

BRAKE SYSTEM

Rear cable (Sedan and Hardtop)



BR264

- | | |
|------------------|--------------|
| 1 Return spring | 3 Lock plate |
| 2 Cable adjuster | 4 Clevis pin |

Fig BR-23 Rear cable

- 1 Disconnect rear cable at adjuster. Unfasten return spring from center lever.
- 2 Remove cable lock plates from rear suspension.
- 3 Remove clevis from wire attaching to rear wheel cylinder.

- 2 Remove nut securing cross rod balance lever, and detach balance lever from rear axle housing.

Rear cable (Station Wagon and Van)

- 1 Unfasten pull spring. Remove clevis pin on the balance lever side and on the wheel side, and detach cross rod.

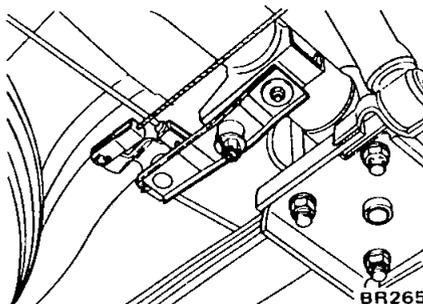


Fig BR-24 Balance lever

Inspection

- 1 Check control stem and ratchet for evidence of wear or other damages. Replace parts which are faulty.
- 2 Replace worn or fatigued springs.
- 3 Check wires for evidence of discontinuity or other deterioration. Replace if necessary.
- 4 Replace faulty warning light and/or switch.
- 5 Check parts at each connection and, if found deformed or damaged, replace.

Installation

Install hand brake assembly in the reverse sequence of removal by closely observing the following instructions:

- 1 When installing, apply a coating of grease to sliding contact surfaces. Make sure that each sliding part functions smoothly without bind.
- 2 Upon completion of installation of hand brake assembly, adjust the entire system as per instructions described under topic "ADJUSTMENT".
- 3 Make sure that each cable is not interfered with by any adjacent parts. Do not apply an undue stress to cables.

FRONT BRAKE

CONTENTS

DISC BRAKE	BR-10	Removal and installation	BR-12
Description	BR-10	Disassembly and assembly	BR-12
Pad replacement	BR-11	Inspection	BR-13

DISC BRAKE

Description

The Annette type disc brake has two pistons on one side of the brake rotor.

With the aid of the yoke, the pads clutch the rotor equally from both sides. Brake adjustment is not neces-

sary because pad clearance is automatically adjusted due to the elasticity of the piston seal.

BRAKE SYSTEM

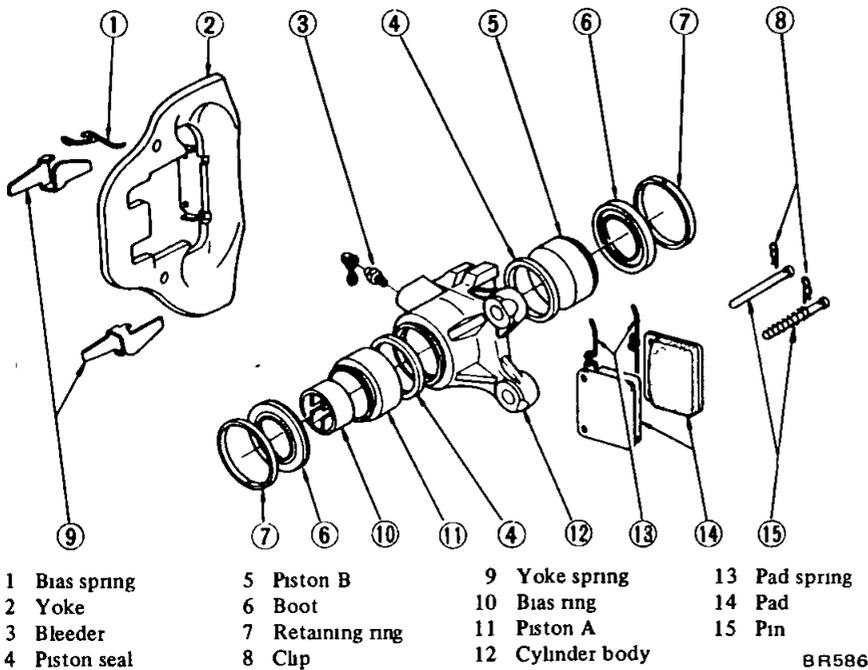


Fig BR-30 Exploded view of Annette type disc brake

Notes

- a Do not use common brake grease
- b Be careful not to get brake grease on rotor and pads

(2) Loosen air bleeder and push piston B (outer piston) in cylinder until the end surface of piston B coincides with the end surface of retaining ring on boot Then inner pad can be installed

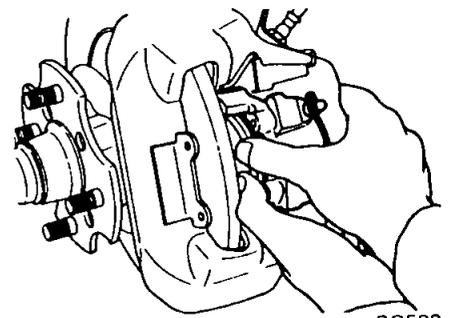


Fig BR-33 Pushing piston

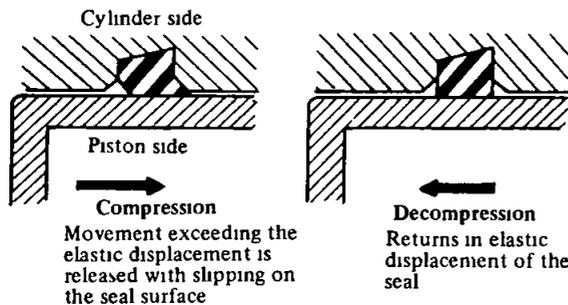


Fig BR-31 Piston seal automatic adjusting operation

Note Piston can be easily pushed in by hand, but if pushed too far, groove of piston will go inside of piston seal as shown in Figure BR-34 At this point, if piston is pressured or moved, piston seal will be damaged If piston has been pushed in too far, remove brake assembly and disassemble it Then, push piston out in the direction shown by arrow

Assemble it again, referring to following section

Pad replacement

Removal

To remove the brake pads, proceed as follows

- 1 Jack up front of car and support it with safety stands Remove front wheels
- 2 Remove clips, and pull out pins, extracting coil spring and pad springs by hand

Note Check to ensure that pad springs rebound easily

- 3 Detach pads from caliper assembly with pliers

Note. After removing pads, do not

depress brake pedal since piston will jump out

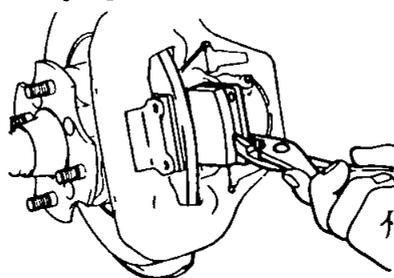


Fig BR-32 Removing pad

4 To install brake pads, proceed as follows

- (1) Clean and apply P B C grease on yoke guide groove of cylinder body, sliding contact portions of yoke, and end surface of piston

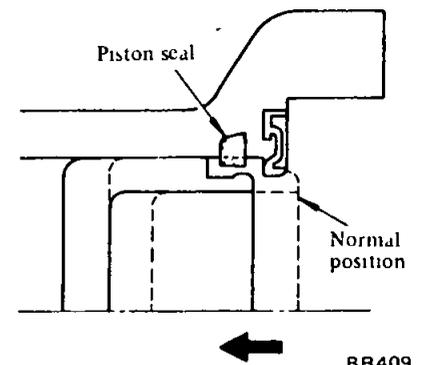
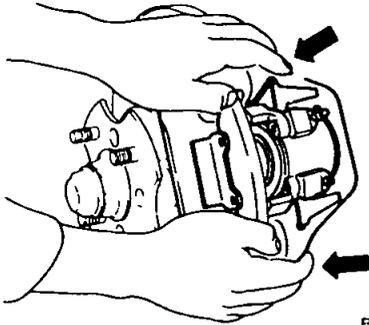


Fig BR-34 Position for pushing piston

- (3) Push piston A (inner piston) in cylinder by pulling yoke as shown in Figure BR-35 The outer pad can then be installed

BRAKE SYSTEM



BR589
Fig BR-35 Pulling in piston A

5 After installing pads, depress brake pedal several times, and pads will settle into proper position

Note When worn out pads are replaced with new ones, brake fluid may overflow reservoir. While replacing pads keep loosening bleeder to release brake fluid

6 Install wheels and lower car to ground

Inspection

Because clearance between pad and rotor is adjusted automatically, pad wear should be checked periodically

1 Clean pads

Note Do not use mineral oil to clean pads

2 If pads are incompletely seated, soiled, greasy, or deteriorated from overheating, replace them

3 If pads are worn to less than 2.0 mm (0.079 in) in thickness (not including metal backing plate), replace all four pads at the same time

Note Always replace pads in full set of four, using genuine parts

4 Check rotor, referring to following section "Inspection"

Removal and installation

Removal

1 Remove pads. Refer to "Pad Replacement"

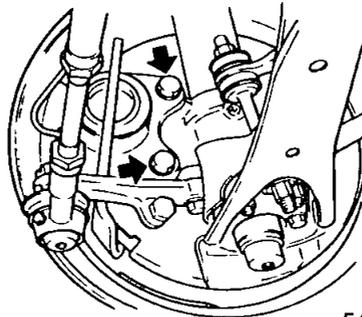
2 Remove brake tube from caliper assembly

Notes

a When removing brake tube, use suitable tube wrench. Never use open end or adjustable wrench

b Plug up hole in the caliper so that brake fluid does not flow out from cylinder body

3 Loosen bolts securing cylinder body to knuckle spindle and remove caliper assembly from strut



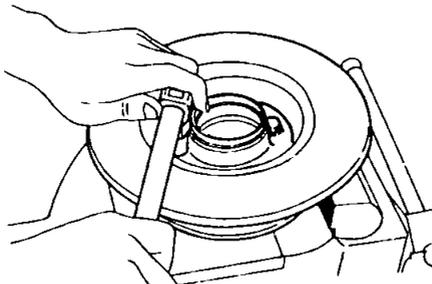
FA454
Fig BR-36 Detaching brake caliper assembly

4 If necessary, remove disc rotor as follows

(1) Remove hub cap and cotter pin

(2) Loosen bearing lock nut and remove wheel hub with disc rotor

(3) Secure wheel hub in a vise, loosen bolts and remove rotor from wheel hub



BR590
Fig BR-37 Removing rotor

Installation

1 Install disc brake assembly and disc rotor in reverse procedure of removal

Note When installing wheel hub to knuckle spindle, refer to Section FA for "Wheel Bearing Adjustment"

2 Tightening torques are as follows

Disc rotor securing bolts
3.9 to 5.3 kg-m
(28 to 38 ft-lb)

Caliper securing bolts
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

Brake tube flare nuts
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Note When installing brake tube, use Pipe Torque Wrench GG94310000

3 After installing pad, bleed air from system

Disassembly and assembly

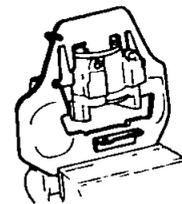
Disassembly

1 Drain brake fluid from top hole of cylinder body

2 Remove air bleeder valve

3 Push both pistons A and B into cylinder. Refer to previous section "Pad Replacement"

4 Place yoke in a vise as sketched below, and tap the top of yoke lightly with a hammer. The cylinder will then separate from yoke. See Figure BR-38



BR591
Fig BR-38 Tapping yoke

5 Remove bias ring from piston A

6 Remove retaining rings and boots at the end of both pistons A and B

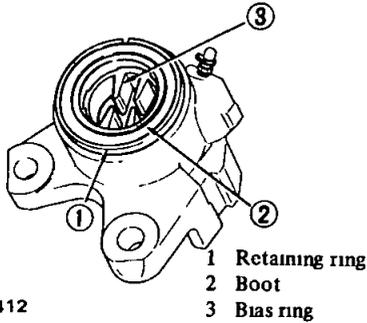
7 Push out pistons in one direction

8 Remove piston seals

Note Be careful not to damage piston and cylinder body

9 Remove yoke spring from yoke

BRAKE SYSTEM



BR412

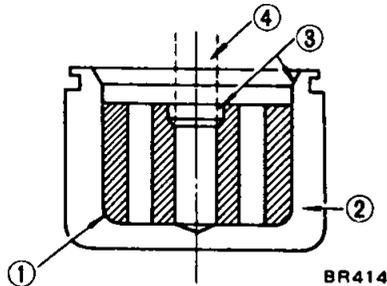
Fig BR-39 Cylinder body and piston

Assembly

- 1 Apply rubber grease to cylinder bore and install piston seal
- 2 Insert bias ring into piston A so that the roundish portion of it faces the bottom of piston A bore See Figures BR-40 and BR-41

Notes

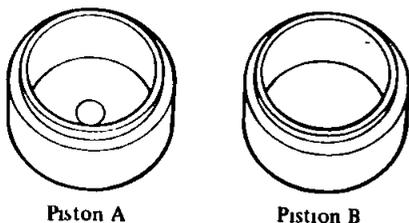
- a Be careful not to mistake piston B for piston A
- b Pistons A and B are distinguished from each other by a dent at the inner bottom of piston A



BR414

- 1 Roundish portion
- 2 Piston A
- 3 Chamfer
- 4 Yoke

Fig BR-40 Assembly of bias ring to piston A



BR415

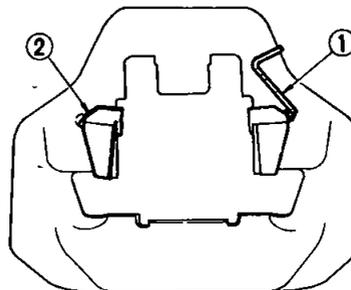
Fig BR-41 Pistons A and B

Note Bias ring must be installed on the original position

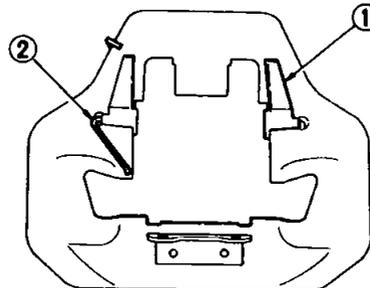
- 3 Apply rubber grease lightly to the sliding portions of pistons and insert into cylinder

Notes

- a When inserting pistons, be careful not to insert too far Refer to "Pad Replacement"
- b. Install piston A so that the yoke groove of bias ring of piston A coincides with the yoke groove of cylinder
- 4 Install boot and retaining ring
- 5 Install yoke springs on yoke



Outer face



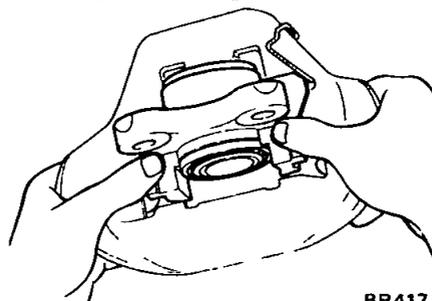
Inner face

BR416

- 1 Bias spring
- 2 Yoke spring

Fig BR-42 Yoke with yoke spring and bias spring

- 6 Install bias spring to yoke
- 7 Apply P B C grease to the yoke sliding part of cylinder Then reposition the bias ring so that the groove of bias ring coincides with yoke
- 8 Leaving yoke springs inserted lightly into cylinder groove, assemble cylinder body and yoke by tapping yoke lightly See Figure BR-43



BR417

Fig BR-43 Assembling yoke and cylinder

- 9 Install air bleeder valve on caliper

Inspection

Caliper, pad and piston

Clean all parts and check for following

Note Clean rubber pads with alcohol or brake fluid, not with mineral oil

1 Cylinder body

(1) Check inside surface of cylinder for score, rust, wear, damage and attached foreign substances If any surface fault is detected, replace cylinder body

(2) Minor damage from rust of foreign substances may be eliminated by polishing the surface with a fine emery cloth If the damage is major, the cylinder assembly must be replaced

2 Check piston for score, rust, wear damage and attached foreign substances, replace if any fault is detected

Note Do not use emery cloth on the piston surface because it is plated

3 Check the sliding portions of yoke for wear and deformation, replace if necessary

Note As a rule, replace piston seals, dust covers and bias ring each disassembly

Piston seal

If brake fluid leakage is found only on piston seal, or pad does not return properly, replace piston seal with a new one in the manner described in previous section "Disassembly and Assembly" Keep component parts clean while disassembling

Rotor

After disc brake assembly has been removed, inspect rotor as follows

- 1 Check rotor for score and damages If excessive, machine reconditioning will be required

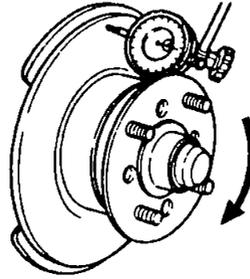
BRAKE SYSTEM

2 Measure run-out of either rotor face

If it exceeds the limited value, machine reconditioning or replacement is required

Limit of reconditioning in thickness is 8.4 mm (0.331 in) Standard rotor thickness is 10 mm (0.39 in)

Run-out of rotor should be less than 0.12 mm (0.0047 in) at total indicator reading



BR571

Fig BR-44 Measuring run out of rotor

3 Measure thickness of rotor, using a micrometer

4 If thickness of rotor is beyond wear limit 8.4 mm (0.331 in), replace rotor

REAR BRAKE

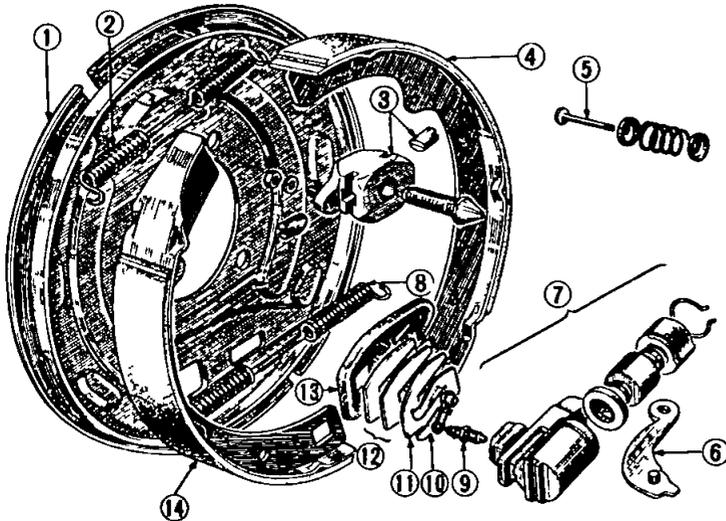
CONTENTS

DESCRIPTION	BR-14	Brake assembly	BR-15
REMOVAL	BR-14	Wheel cylinder	BR-16
Disassembly of wheel cylinder	BR-15	ASSEMBLY AND INSTALLATION	BR-16
INSPECTION	BR-15	Wheel cylinder	BR-16
Brake drum	BR-15	Brake drum	BR-16

DESCRIPTION

The rear brake is of a leading-trailing type. Brake shoe clearance can

be adjusted by turning the end of the adjuster wedge



BR279

- 1 Brake disc
- 2 Return spring adjuster side
- 3 Brake shoe adjuster
- 4 Brake shoe assembly-fore
- 5 Anti-rattle pin
- 6 Lever
- 7 Rear wheel cylinder
- 8 Return spring cylinder side
- 9 Bleeder
- 10 Lock plate A
- 11 Lock plate B
- 12 Lock plate C and D
- 13 Dust cover
- 14 Brake shoe assembly-after

Fig BR-45 Rear brake

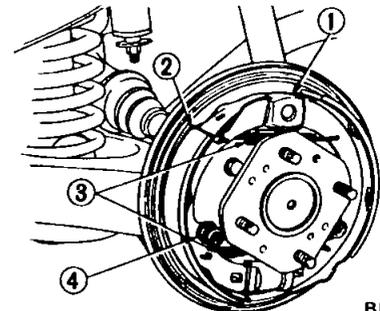
BR-14

REMOVAL

1 Jack up the rear of car, and remove tire and brake drum. If brake drum is hard to remove, use bolts (8 mm diameter, 1.25 mm pitch) to drive it out.

2 Turn pin 90°, and remove anti-rattle spring.

3 Remove return springs and brake shoes.



BR280

- 1 Brake shoe adjuster
- 2 Brake shoe assembly
- 3 Return spring
- 4 Anti-rattle pin

Fig BR-46 Remove shoe assembly

4 Remove bolts securing adjuster, and detach adjuster.

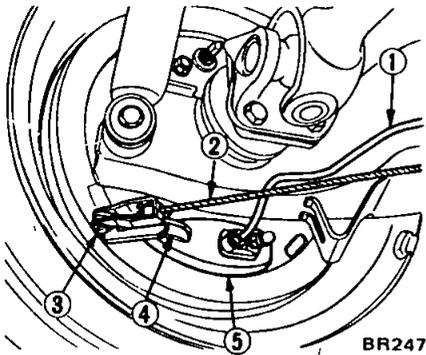
5 Disconnect brake tube.

6 Pull out clevis pin to separate hand brake cable and lever.

BRAKE SYSTEM

7 Remove dust cover, adjusting shims and lock plates, wheel cylinder can then be removed easily

8 Remove and reinstall the brake disc as outlined under "REAR AXLE"



- 1 Brake tube
- 2 Hand brake cable
- 3 Clevis pin
- 4 Lever
- 5 Dust cover

Fig BR-47 Remove wheel cylinder

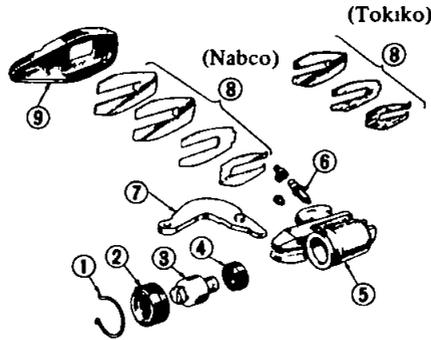
Disassembly of wheel cylinder

1 The wheel cylinder can be disassembled in its mounted condition. Do not remove it unless replacement of the entire master assembly is necessary

2 To disassemble, remove snap ring, dust cover, piston, and piston cup, in the order enumerated

Note Exercise care not to give scratches to sliding contact sur-

faces of cylinder and piston, and piston cup



- 1 Snap ring
- 2 Dust cover
- 3 Piston
- 4 Piston cup
- 5 Cylinder
- 6 Breeder
- 7 Hand brake lever
- 8 Lock plates
- 9 Dust cover

BR282

Fig BR-48 Wheel cylinder

INSPECTION

Brake drum

1 Replace brake drum whose diameter is beyond the limit of 14 mm (0 055 in) with respect to the standard inner diameter of 228 6 mm (9 in)

2 The allowable maximum "out-of-round" of brake drum is 0 02 mm (0 0008 in). Re-condition or replace brake drum if specified limit is exceeded

3 Measure for tapered brake drum. If specified limit of 0 02 mm (0 0008 in) is exceeded as measured at a position where the distance of 40 mm (1 57 in) is kept away from inlet, re-condition or replace brake drum

4 Contact surface with which linings come into contact should be finished to such an extent that it is ground by a No 120 to 150 sandpaper

5 Using a drum racer, finish brake drum by machining if it shows any sign of score marks, partial or stepped wear on its contact surface

Note After brake drum is completely re-conditioned or replaced, check drum and shoes for proper contact pattern

Brake assembly

1 Replace linings which are cracked, worn or oil-stained.

2 Replace linings if their thicknesses are worn down to less than 1 5 mm (0 059 in)

3 Replace shoe return springs which are broken or fatigued

4 Replace fatigued anti-rattle springs, damaged pins and/or retainers

Standard dimensions of shoe springs

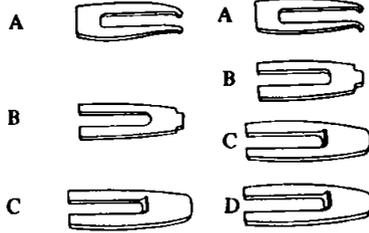
Item	Free length mm (in)	Dia of spring mm (in)	O D of coil mm (in)	No of coils	Installed length/load mm/kg (in/lb)
Cylinder side	120 7 (4 75)	2 (0 08)	12 (0 47)	36	131 5/7 to 8 (5 177/15 to 18)
Adjuster side	120 4 (4 74)	2 (0 08)	10 (0 39)	32 5	122 4/13 5 to 16 5 (4 819/ 29 8 to 36 4)
Anti-rattle	20 5 (0 807)	2 (0 08)	18 (0 71)	5	14 9/7 to 8 (0 587/15 to 18)

BRAKE SYSTEM

Wheel cylinder

- 1 Replace any cylinder or piston which is scratched, scored or worn on its sliding contact surface
- 2 Replace worn parts if piston-to-cylinder clearance is beyond 0.15 mm (0.0059 in)
- 3 Replace piston cup which is worn or damaged
- 4 Replace if contacting face of cylinder and shoe is worn locally or in step
- 5 Replace damaged dust cover, fatigued piston spring or damaged threaded parts
- 6 Replace tube connector which is worn on its threaded portion

Made by TOKIKO Made by NABCO



BR283

Fig BR-49 Lock plate

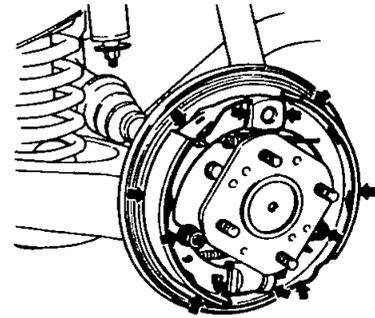


Fig BR-50 Points requiring grease

ASSEMBLY AND INSTALLATION

Wheel cylinder

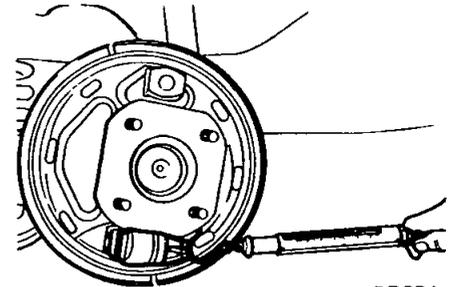
- 1 To assemble, reverse the sequence of disassembly
- 2 Apply rubber grease to rubber parts to facilitate the assembly operation
- 3 To install wheel cylinder, insert hand brake lever into disc, and fit wheel cylinder into position. Then drive in the parts A, B, C and D, in the order shown, using a hammer

Brake drum

- 1 To install, reverse the sequence of removal. Note the following instructions
- 2 Apply a coating of brake grease to the parts indicated in Figure BR-50, wheel cylinder-to-disc sliding surfaces, cylinder lever pivot, adjuster wedge surface and periphery of tappet

Note Apply a thin coating of grease to shoe-to-disc sliding surfaces (6 places), exercising care not to wet lining with grease

- 3 Measuring wheel cylinder sliding resistance using a spring scale
 - Standard sliding resistance
 - 2 to 7 kg (4 to 15 lb)
 - Adjuster mounting nut tightening torque
 - 1.4 to 1.8 kg-m (10 to 13 ft-lb)



BR284

Fig BR-51 Measuring wheel cylinder sliding resistance

MASTER - VAC

CONTENTS

DESCRIPTION	BR-16	Front shell-seal assembly	BR-20
Inspecting vacuum pressure	BR-17	INSPECTION	BR-20
Inspecting check valve	BR-18	ASSEMBLY AND ADJUSTMENT	BR-20
Operation test	BR-18	Rear shell-seal assembly	BR-20
REMOVAL	BR-18	Diaphragm plate assembly	BR-20
DISASSEMBLY	BR-19	Front shell-seal assembly	BR-20
Rear shell-seal assembly	BR-19	Final assembly	BR-20
Diaphragm plate assembly	BR-19	INSTALLATION	BR-21

DESCRIPTION

A vacuum suspended Master-Vac is installed behind the master cylinder. As the brake pedal is depressed, fluid is forced under high pressure through the brake pipes to the wheel cylinders

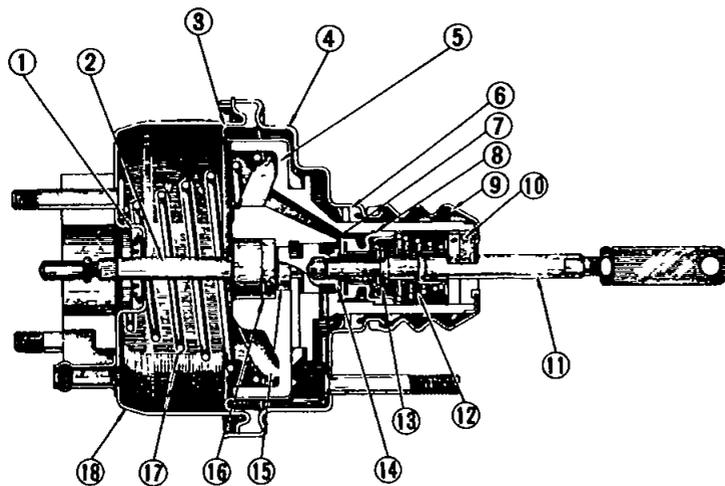
to retard or stop the car

The Master-Vac has a spring loaded diaphragm of 114.3 mm (M45 type, 4½ in) and 152.4 mm (M60 type, 6 in) in diameter. It operates on negative

pressure produced in the engine intake manifold

The tandem master cylinder is capable of producing high pressure even if the Master-Vac is faulty

BRAKE SYSTEM



- 1 Plate and seal
- 2 Push rod
- 3 Diaphragm
- 4 Rear shell
- 5 Diaphragm plate
- 6 Seal
- 7 Vacuum valve
- 8 Poppet assembly
- 9 Valve body guard
- 10 Air silencer filter
- 11 Valve operating rod
- 12 Valve return spring
- 13 Poppet return spring
- 14 Exhaust valve
- 15 Valve plunger
- 16 Reaction disc
- 17 Diaphragm return spring
- 18 Front shell

BR268

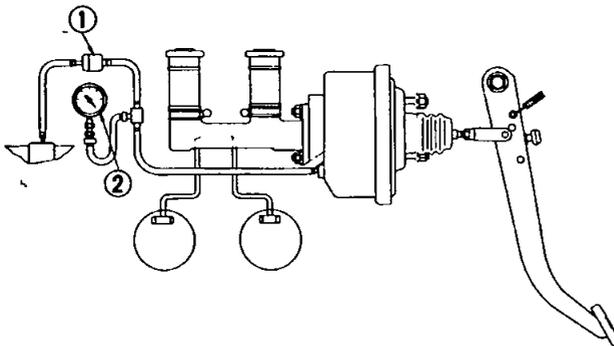
Fig BR-52 Sectional view of Master-Vac

Inspecting vacuum pressure

1 Connect a vacuum gauge, in the line, between check valve and

Master-Vac, as shown in Figure BR-53.

2 Start engine and increase engine speed. Stop engine when vacuum gauge indicates 500 mmHg (19.69 inHg).



BR169

- 1 Check valve
- 2 Vacuum gauge

Fig BR-53 Air-tight test set-up

Air-tight test

1 Fifteen seconds after engine is stopped, observe the rate of drop in air pressure registered by vacuum gauge. If a pressure drop of 25 mmHg (0.98 inHg) is exceeded, refer to the following chart to determine the cause of failure.

Probable cause	Corrective action
1 Air leakage at check valve	Replace check valve
2 Air leakage at push rod seal.	Replace seal
3 Air leakage between valve body and seal	Repair or replace faulty part(s)
4 Air leakage at valve plunger seat	Repair or replace seat
5 Damaged piping or joints	Repair or replace

BRAKE SYSTEM

2 Fifteen seconds after engine is stopped and brake fully applied, observe the rate of drop in air pressure registered by vacuum gauge

If a pressure drop of 25 mmHg (0.98 inHg) is exceeded, refer to the following chart to determine the cause of failure

Note Determine as to whether a malfunction occurs either in Master-Vac or check valve. Always inspect check valve first

Probable cause	Corrective action
1 Air leakage at check valve	Replace check valve
2 Damaged diaphragm	Replace
3 Reaction disc dropped off	Reinstall and check push rod for proper turn
4 Air leakage at poppet assembly seat and valve body	Replace faulty part(s)

Note When replacement of any part is required, be sure to renew Master-Vac as an assembly

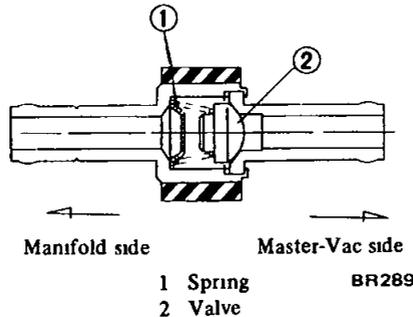


Fig BR-55 Cross-sectional view of check valve

Inspecting check valve

1 Remove clip and disconnect hoses at connections. The check valve can now be removed

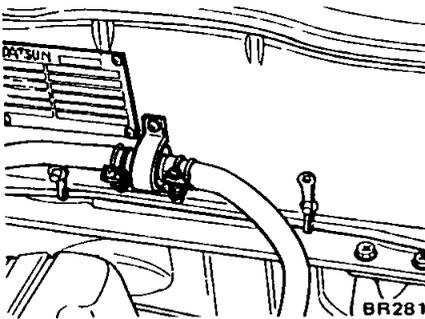


Fig BR-54 Location of check valve

2 Using a Master-Vac tester, apply a vacuum pressure of 500 mmHg (19.69 inHg) to the port of check valve on the Master-Vac side. If a pressure drop of 10 mmHg (0.39 inHg) is exceeded in 15 seconds, replace check valve with a new one.

3. When pressure is applied to the Master-Vac side of check valve and valve does not open, replace check valve with a new one

Operation test

- 1 Connect an oil pressure gauge, in brake line, at connection on master cylinder
- 2 Install a spring scale on brake pedal
- 3 Start engine, and increase engine speed until a vacuum pressure of 500 mmHg (19.69 inHg) is registered on vacuum pressure gauge. With a vacuum pressure of 500 mmHg (19.69 inHg) held, measure an oil pressure with respect to each pedal operating force.

Relationship between oil pressure and pedal operating force is illustrated in Figure BR-56 for M45 and in Figure BR-57 for M60. If test results are not as specified in Figure BR-56 or BR-57, check Master-Vac for condition in a manner as described under "Inspection", before removal of this unit.

Also check brake line for evidence of fluid leakage

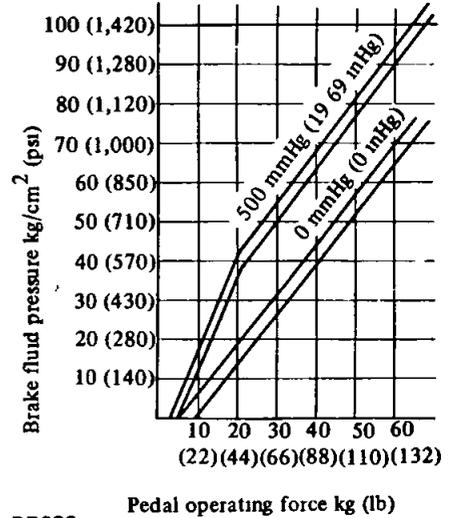


Fig BR-56 Performance curves of Master-Vac (M45)

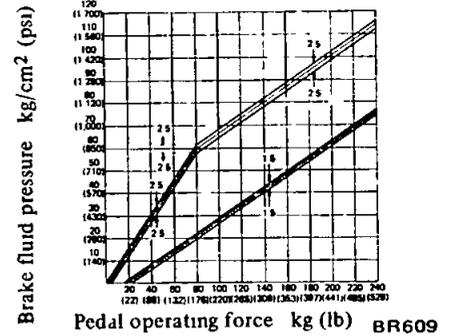
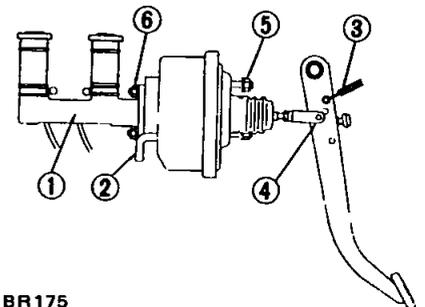


Fig BR-57 Performance curves of Master-Vac (M60)

REMOVAL

Referring to Figure BR-58, remove parts in numerical order enumerated. Install these parts in the reverse sequence of removal.



BR175

Fig BR-58 Removal method of Master-Vac

BRAKE SYSTEM

Note After Master-Vac is properly installed on car, be sure to conduct an air-tight test and operation test described previously in this Section

DISASSEMBLY

When disassembling Master-Vac, observe the following instructions

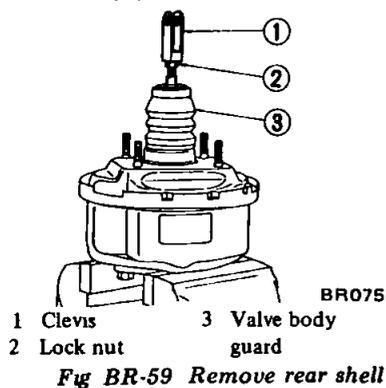
- Thoroughly clean mud or dust from Master-Vac
- Extreme care should be taken not to allow dirt, dust, water or any other foreign matter to get into any component-parts

Be sure to select a clean place before disassembly or assembly

- Mark mating joints so that they may be installed exactly in their original positions
- Keep all disassembled parts arranged properly so that they may readily be assembled at any time
- Clean rubber parts and synthetic resin parts in alcohol
- After all disassembled parts are cleaned in an approved solvent, place on a clean work bench Use care not to allow dirt and dust to come into contact with these parts

1 Install spacer on rear shell spacer temporarily Place Master-Vac in a vise Use of soft jaws is suggested

2 Remove clevis and lock nut Detach valve body guard



3 Identify front shell and rear shell clearly so that they may be reassembled in their original positions from which they were withdrawn (Bolts to be attached on dashboard are not the same in pitch)

4 Using special tool "Master-Vac Wrench ST08080000," remove rear shell-seal assembly, and disassemble diaphragm plate assembly, front shell assembly, diaphragm spring and push rod assembly

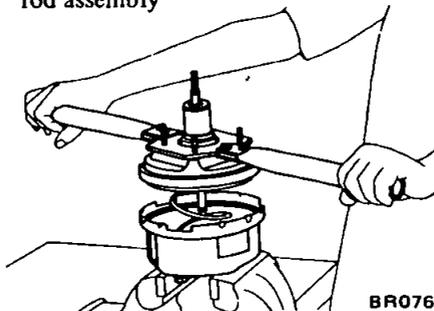


Fig BR-60 Removing rear shell

Rear shell-seal assembly

Pry off retainer with use of a screwdriver as shown and detach bearing and seal

Note. Do not disassemble seal assembly unless absolutely necessary Whenever this is to be removed, use care not to damage it.

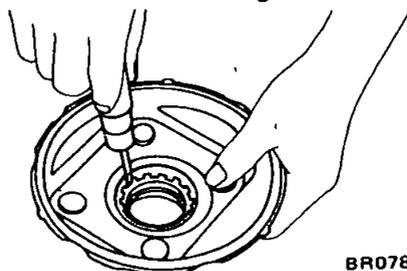


Fig BR-61 Removing retainer

Diaphragm plate assembly

1 Place diaphragm plate assembly on a clean work bench Detach diaphragm from groove in plate as shown

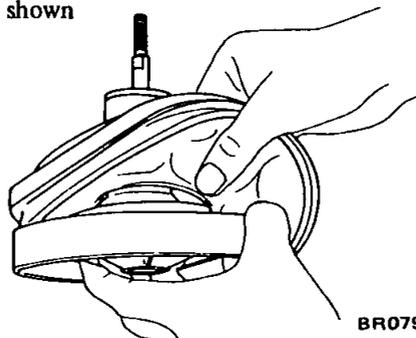


Fig BR-62 Separating diaphragm

2 Using a screwdriver as shown, evenly pry air silencer retainer until it is detached from diaphragm plate assembly

Note Never use a hammer to remove this retainer, since this will be the sure way of damaging it

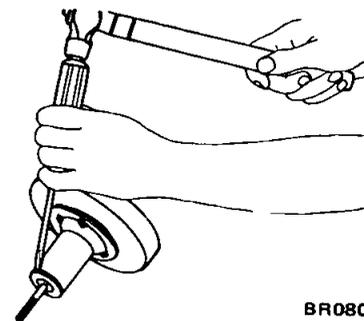


Fig BR-63 Removing air silencer retainer

3 Pull out valve plunger stop key and withdraw silencer and plunger assembly

Note To remove valve plunger stop key properly, proceed as follows. With key hole facing down, lightly push valve operating rod simultaneously while applying vibration to it

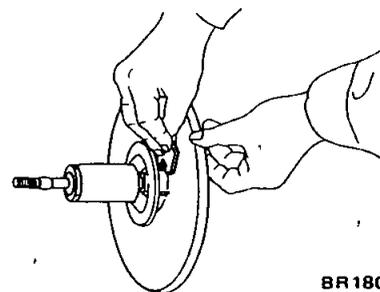


Fig BR-64 Pulling out stop key

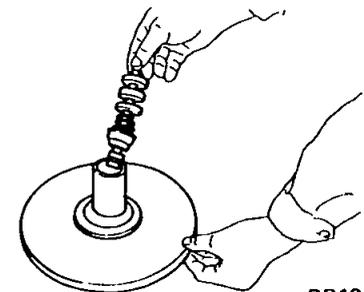
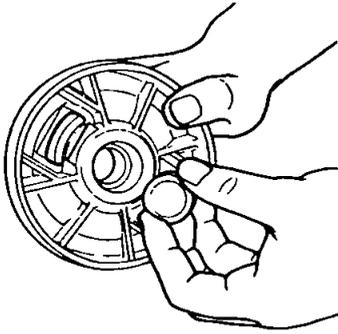


Fig BR-65 Removing valve operating rod assembly

BRAKE SYSTEM

4 Withdraw reaction disc

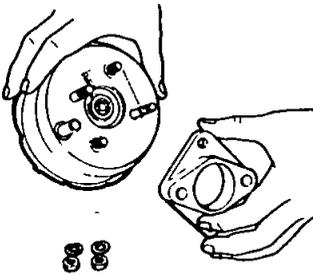


BR286

Fig BR-66 Removing reaction disc

Front shell-seal assembly

1 Detach flange from front shell assembly



BR287

Fig BR-67 Removing flange

2 Withdraw front seal assembly

INSPECTION

1 Check poppet assembly for condition. If it shows evidence of wear or damage, replace it and valve operating rod assembly.

2 Check other component-parts for condition. If any part shows evidence of wear or damage, replace it with a new one.

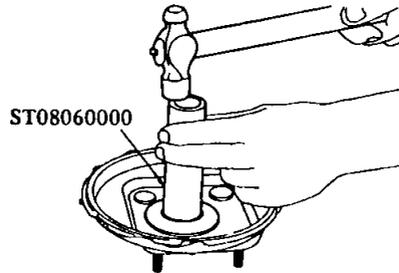
ASSEMBLY AND ADJUSTMENT

Assemble in the reverse sequence of disassembly.

Rear shell-seal assembly

1 Apply a coating of Master-Vac grease to the sealing surface and lip

of seal, and install that seal in rear shell with the use of special tool "Master-Vac Oil Seal Retainer Drift ST08060000"



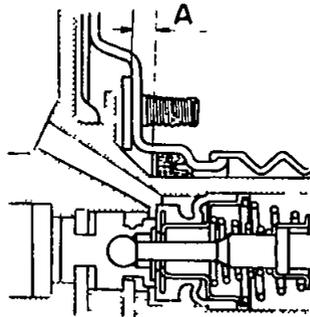
BR084

Fig BR-68 Installing oil seal

Note Referring to Figure BR-69, install seal in place by properly aligning the pawl of special tool with seal hole. Adjustment is correct when specified length at "A" is obtained.

Length "A"

6.7 to 7.0 mm
(0.264 to 0.276 in)

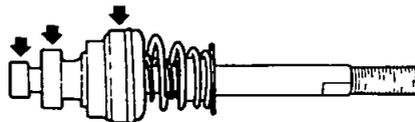


BR185

Fig BR-69 Length at "A"

Diaphragm plate assembly

1 Apply a thin coating of grease to the sliding contact portion on the periphery of plunger assembly.

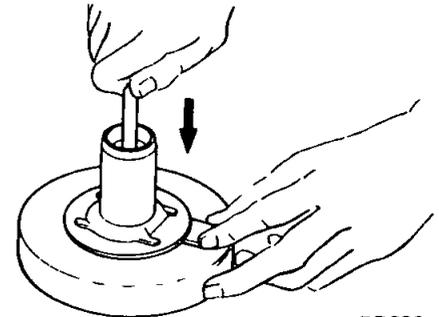


BR186

Fig BR-70 Requiring grease place

2 Install plunger assembly and silencer in diaphragm plate, and lightly push plunger stop key in place.

Note Diaphragm plate is made of bakelite. Exercise care in installing plunger assembly not to damage diaphragm plate.



BR083

Fig BR-71 Inserting stop key

3 Before installing diaphragm into position, apply a thin coating of mica-power to it except outer diameter and seating portion with which shell comes into contact.

4 Before installing reaction disc in place on diaphragm plate, apply a thin coating of Master-Vac grease.

Front shell-seal assembly

Before installing front shell-seal assembly, apply a coating of Master-Vac grease to the inner wall of seal and front shell with which seal comes into contact.

Final assembly

1 Apply a thin coating of Master-Vac grease to the outer edges of diaphragm with which rear and front shells come into contact, before installing diaphragm in position.

2 Before installing push rod assembly in place, apply a coating of Master-Vac grease to the sliding contact surface of diaphragm plate.

3 Align marks scribed in the rear shell and front shell. Carefully turn the special tool "Master-Vac Wrench ST08080000" clockwise until it reaches notch in shell retainer.

BRAKE SYSTEM

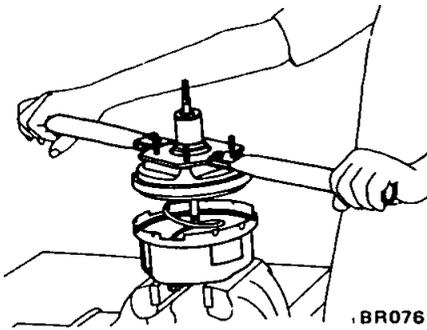


Fig BR-72 Tightening rear shell

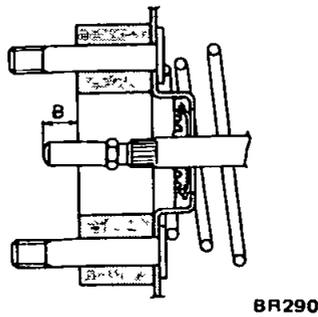


Fig BR-73 Length at "B"

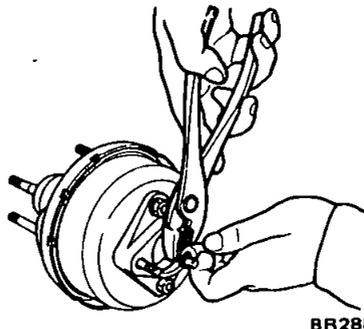


Fig BR-74 Adjusting push rod length

INSTALLATION

Install in the reverse sequence of removal

Note After Master-Vac is properly installed in car, conduct an air-tight and operational tests as previously described.

4 After assembly, adjust the length of push rod to less than the specified value indicated below Length adjustment of push rod is made at the tip of push rod

Length "B"

9 75 to 10 00 mm

(0 3839 to 0 3937 in)

SERVICE DATA AND SPECIFICATIONS

Brake type

Front	Model Annette 14/15AL disc brake
Rear	.	Leading-trailing drum brake
Hand brake	Mechanically-operated on rear wheels

Brake pedal

Free height	mm (in)	185 (7 28)
Full stroke of pedal head	mm (in)	145 (5 71)

Master cylinder

Inner diameter	mm (in)	19.05 (¾)
Allowable maximum clearance between cylinder and piston	mm (in)	0 15 (0.0059) max

Wheel cylinder

Inner diameter		
Front (disc)	mm (in)	51 1 (2 012)
Rear	mm (in)	22 22 (⅞)

BRAKE SYSTEM

Allowable maximum clearance between cylinder and piston	mm (in)	0 15 (0 0059) max
Rear wheel cylinder sliding resistance	kg (lb)	2 to 7 (4 to 15)
Brake rotor and drum		
Rotor (disc) outer diameter	mm (in)	245 (9 65)
Drum brake inner diameter (rear)	mm (in)	228 6 (9)
Rotor (disc) runout	mm (in)	0 12 (0 0047) max
Drum inside out-of-round	mm (in)	0 02 (0 0008) max
Repair limit of rotor in thickness	mm (in)	8 4 (0.331)
Repair limit of drum in diameter (rear)	mm (in)	230 (9 06)
Lining		
Pad (disc) Width × thickness × length	mm (in)	41 2 × 10 × 61 4 (1 622 × 0 39 × 2 417)
Lining (rear) Width × thickness × length	mm (in)	40 × 4 5 × 219 5 (1 57 × 0 177 × 8 642)
Hand brake normal stroke	mm (in)	90 to 100 (3 54 to 3 94)
Tightening torque		
Brake master cylinder attaching nut	kg-m (ft-lb)	0 8 to 1 1 (6 to 8)
Brake tube connection	kg-m (ft-lb)	1 5 to 1 8 (11 to 13)
Brake hose connection	kg-m (ft-lb)	1 7 to 2 0 (12 to 14)
Air bleeder valve	kg-m (ft-lb)	0 7 to 0 9 (5 to 7)
Fulcrum pin of brake pedal	kg-m (ft-lb)	3.6 to 4 2 (26 to 30)
Pedal stopper lock nut	kg-m (ft-lb)	0 8 to 1 1 (6 to 8)
Connector mounting bolt		
6 mm diameter bolt	kg-m (ft-lb)	0 5 to 0 7 (4 to 5)
8 mm diameter bolt	kg-m (ft-lb)	0 8 to 1 1 (6 to 8)
Wheel cylinder mounting bolts		
Small	kg-m (ft-lb)	0 5 to 0 7 (4 to 5)
Large	kg-m (ft-lb)	1 5 to 1 8 (11 to 13)
Caliper fixing bolt	kg-m (ft-lb)	7 3 to 9 9 (53 to 72)
Rotor fixing bolt	kg-m (ft-lb)	3 9 to 5 3 (28 to 38)
NP-valve mounting bolt	kg-m (ft-lb)	0 3 to 0 4 (2 to 3)

BRAKE SYSTEM

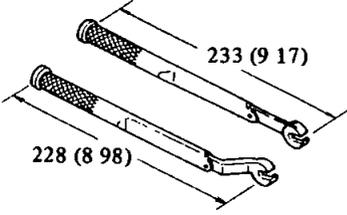
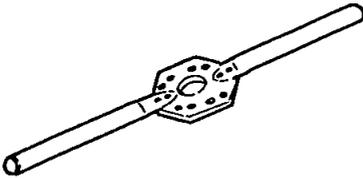
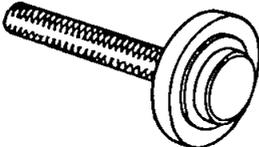
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Spongy pedal	<p>Air in brake lines.</p> <p>Swollen hose due to deterioration or use of poor quality hose</p> <p>Use of a brake fluid of which boiling point is too low.</p> <p>Reservoir filler cap vent hole clogged (This promotes a vacuum in master cylinder that sucks in air through rear seal)</p>	<p>Bleed thoroughly</p> <p>Replace hose and bleed system</p> <p>Change with specified brake fluid and bleed system</p> <p>Clean and bleed system</p>
Pedal yields under slight pressure	<p>Deteriorated check valve</p> <p>External leaks</p> <p>Leakage on master cylinder</p>	<p>Replace check valve and bleed system</p> <p>Check master cylinder, piping and wheel cylinder for leaks and repair</p> <p>Overhaul master cylinder</p>
Excessive pedal travel	<p>Air in system.</p> <p>Shoes out of adjustment</p> <p>Insufficient fluid in master cylinder</p> <p>Thermal expansion of drums because of excessive overheating</p>	<p>Bleed system</p> <p>Adjust shoe-to-drum clearance</p> <p>Fill up with specified brake fluid and bleed system.</p> <p>Allow drums to cool off</p> <p>Check brake shoe linings and drums.</p> <p>Replace damaged parts</p>
All brakes drag	<p>Insufficient shoe-to-drum clearance</p> <p>Weak shoe return springs</p> <p>Brake shoe return no free travel</p> <p>Seized master cylinder piston</p>	<p>Adjust clearance</p> <p>Replace.</p> <p>Adjust pedal height</p> <p>Disassemble master cylinder and replace piston</p> <p>Bleed system</p>
One brake drags	<p>Loose or damaged wheel bearings</p> <p>Weak, broken or unhooked brake shoe return springs</p> <p>Insufficient clearance between brake shoe and drum.</p>	<p>Adjust or replace as required</p> <p>Replace</p> <p>Adjust brakes</p>
Unbalanced brakes	<p>Grease or oil on linings</p> <p>Seized piston in wheel cylinder</p> <p>Improper tire inflation.</p> <p>Loose wheel bearings</p> <p>Faulty front suspension</p>	<p>Clean brake mechanism, check cause of trouble</p> <p>Replace linings</p> <p>Service wheel cylinder and bleed system</p> <p>Inflate to correct pressure</p> <p>Adjust</p> <p>Check and adjust all front suspension parts</p>

BRAKE SYSTEM

Condition	Probable cause	Corrective action
Excessive pedal pressure required, - poor brakes	Grease, mud or water on brake shoe linings Full area of linings not contacting drums Scored brake drums	Remove drums and clean and dry linings or replace Replace shoes Reface drums and install new linings
Brake chatter, squeak or squeal	Dust on drums or oil-stained linings Weak shoe return springs Drum out-of-round Worn linings	Remove and clean drums Check and, if necessary, replace springs Turn drums on lathe Replace

SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description	Unit mm (in)	For use on	Reference page or Figure No
1	GG94310000 Brake pipe torque wrench	 <p style="text-align: center;">SE227</p>	This tool is used to tighten and untighten brake tube flared nut A built-in torque limiting wrench is provided to assure torque accuracy	All models	Fig BR-16
2	ST08080000 Master-Vac wrench	 <p style="text-align: center;">SE073</p>	This tool is used to remove rear shell after aligning rear shell stud bolt with the opening in this tool	610 W610 V610 510 230 S30 C30 C10 GC10	Fig BR-60 Fig BR-72
3	ST08060000 Master-Vac oil seal retainer drift	 <p style="text-align: center;">SE115</p>	This tool is used when rear shell seal is driven into position Note Make sure that this tool is pushed in until rear guide of this tool touches rear shell	610 W610 V610 510 230 S30 C30 C10 GC10	Fig BR-68

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION WT

WHEEL AND TIRE

WT

WHEEL AND TIRE

WT- 2

**TROUBLE DIAGNOSES AND
CORRECTIONS**

WT- 6

WHEEL AND TIRE

CONTENTS

DESCRIPTION	WT-2	WEAR	WT-4
TIRE USAGE	WT-2	RADIAL TIRE	WT-4
RECOMMENDED INFLATION PRESSURE	WT-3	TIRE ROTATION	WT-4
MAINTENANCE AND SERVICE	WT-3	INSPECTION	WT-5
TIRE INFLATION	WT-3	WHEEL BALANCE	WT-5
TIRE REPAIR	WT-3	WHEEL AND TIRE	WT-5

DESCRIPTION

TIRE USAGE

Car model	Tire size	Wheel size
180B Sedan 180B Station Wagon	6 45S-13-4PR 165SR-13	4½J x 13 *1
180B Hardtop	165SR-14	4½J x 14

Remarks *1 Offset 30 mm (1 18 in)

Wheel and Tire

RECOMMENDED INFLATION PRESSURE

Unit psi

Tire size		Car speed			
		Less than 70 MPH (115 km/h)		More than 70 MPH (115 km/h)	
		Front	Rear	Front	Rear
6 45S-13 -4PR	Normal load	24	28	28	32
	Maximum load	28	32	28	32
165SR-13 165SR-14	Normal load	28	28	28	28
	Maximum load	32	32	32	32

- Notes a The tire inflation pressure should be measured when the tire is cold
 b The tubes designed for radial tire should be used exclusively

is possible to detect sharp material in the tread. Also, the above check avoids abnormal wear which invites serious problem. If tires indicate abnormal or uneven wear, the cause of problem should be detected and eliminated.

After inflating tires, leakage in valve should be checked. Without valve caps, leakage will occur due to dirt and water, resulting in underinflation. Accordingly, whenever tire pressure is checked, be sure to tighten valve caps firmly by hand.

TIRE REPAIR

Tubeless tire

In order to inspect a leak, apply soapy solution to tire or submerge tire and wheel in the water after inflating tire to specified pressure. Special inspection for leaks should be carried out around the valve, wheel rim and along the tread. Exercise care to bead and rim where leakage occurs. Wipe out water from area which leaks air bubbles and then mark the place with chalk.

After removing the materials which caused puncture, seal the point. When repairing the puncture, use the tire repair kits which are furnished from tire dealers, following the instructions provided with the kits. In case that a puncture becomes large or there is any other damage on the tire fabric, repair must be carried out by authorized tire dealers.

Tubed tire

In order to inspect a leak, apply soapy solution to tire tube or submerge tire tube in the water after inflating tire tube. Special inspection for leaks should be carried out around the valve. Wipe out water from area where air bubbles exist and then mark the place with chalk.

After removing the materials which caused puncture, seal the point. When repair kits furnished from tire dealers, following the instructions provided with the kits. When a puncture becomes large or there is any other damage on the tire fabric, repair must be carried out by an authorized tire dealer.

MAINTENANCE AND SERVICE

TIRE INFLATION

Correct tire pressure is very important to ease of steering and riding

comfort. This also reduces driving sound to a minimum, resulting in longer tire life, that is, overinflation or underinflation promotes wear at center tread or shoulder of tire.

If all tires are inspected frequently and maintained correct tire pressure, it

Wheel repair

Inspect wheel rim flange for a bend or dent. If any of the above deterioration is detected, repair should be made to secure complete sealing. The flange should be cleaned by a wire brush when rust is found on the flange. Furthermore, if excessive pitting occurs on the rim, eliminate it with a file.

WEAR

Misalignment

When the front wheels align in excessive toe-in or toe-out condition, tires scrape the tread rubber off. The wear of tread appears feathered edge.

Center

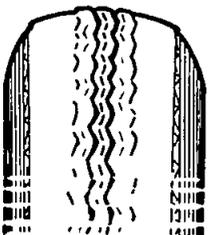
This wear is caused by overinflation of the tire. The inflation pressure must be kept at the specified value.



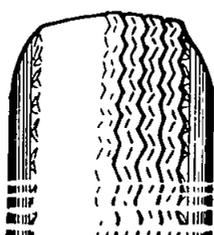
Toe-in or toe-out wear



Overinflation wear



Underinflation wear



Uneven wear

WT004

Fig WT 1 Abnormal tire wear

Shoulder

The wear may be caused by underinflation, incorrect wheel camber, or continuous high speed driving on curves. In general, the former two causes are common. Underinflation wear occurs on both sides of treads, and on the other hand, camber causes wear only on one side of treads. For cornering tread wear, the driver must operate car slowing down on curves.

Uneven

Uneven wear is caused by incorrect camber or caster, malfunctioning suspension, unbalanced wheel, out-of-round brake drum, or other mechanical conditions. To repair this abnormal wear, correct the above faulty parts.

RADIAL TIRE

Tires of radial ply construction will revolve with less camber thrust force and with greater cornering power on turns. This tends to cause local or rapid wear on the treads with excessive toe-in. Exercise special care for front wheel alignment during the life of tires.

Notes

a Radial ply tires should not be

mixed with ordinary tires since their characteristics differ from those of ordinary tires.

- b The same brand radial ply tires should be installed on all wheels.
- c The tubes designed for radial tire should be used exclusively.
- d Snow chain should not be fitted because it damages side wall.

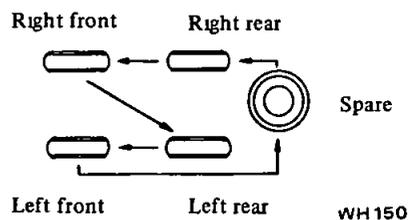
TIRE ROTATION

Tires wear unevenly and become unbalanced according to running distance. Uneven tire wear often results in tire noise which is attributed to rear axle gears, bearing, etc. Meanwhile, the front tires tend to wear unevenly because of improperly aligned front wheel.

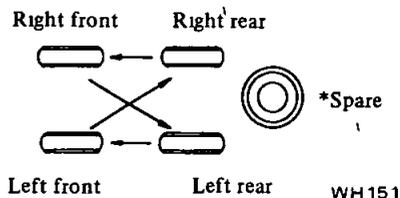
Accordingly, to equalize tire wear, it is necessary to rotate tires periodically as recommended in the "Periodic Maintenance". See Figure WT-2.

Bias and Bias belted tires

- 1 All the tires including the spare tire are of the same type.



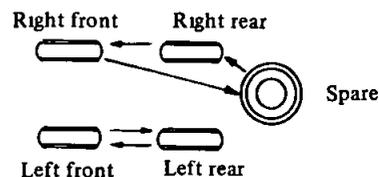
- 2 The spare tire has a different brand from 4 tires on the car.



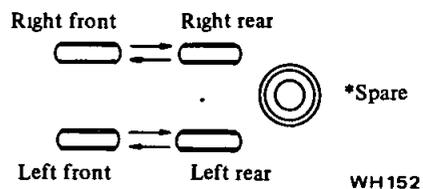
* The spare tire should be used in an emergency only.

Radial ply tires

- 1 All the tires including the spare tire are of the same type.



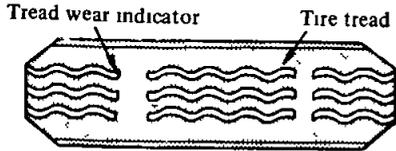
- 2 The spare tire has a different brand from 4 tires on the car.



* Regardless of tire brand the spare tire should be used in an emergency only.

Fig WT-2 Tire rotation

The tires are provided with "tread wear indicator" at six places around tire circumference, indicating 1.6 mm ($\frac{1}{16}$ in) tread depth. When the tires wear and then the marks appear, replace them with new ones. See Figure WT-3.



WH024

Fig WT-3 Tread wear indicator

To change tire with wheel using a jack in the safe manner, observe the following procedures:

- 1 Apply parking brake and block front wheels when rear wheel is being changed.
- 2 Remove wheel cover and loosen wheel nuts.
- 3 Place jack at jacking point as described in Section GI for jack up and raise car until wheel clears ground.
- 4 Remove wheel nuts and wheel from drum.
- 5 To install wheel, reverse the above steps. Tighten wheel nuts in criss-cross fashion to 8.0 to 9.0 kg-m (58 to 65 ft-lb).

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

INSPECTION

WHEEL BALANCE

The wheel and tire assembly should be kept balanced statically and dynamically.

Proper tire balance is necessary when driving the car at high speeds. Consequently, the wheel and tire assembly should be properly rebalanced whenever a puncture is repaired.

The wheel and tire assembly becomes out of balance according to uneven tire wear. Severe acceleration and braking, or fast cornering is the cause of wear on tire, resulting in unbalance of tire and wheel assembly.

The symptom of unbalance appears as tramp, car shake and steering problems.

To correct unbalance, use proper wheel balancer.

Maximum allowable unbalance

177 gr-cm (2.46 in-oz)

Balance weight

10 to 60 gr (0.35 to 2.12 oz)

at 10 gr (0.35 oz) interval

Note Be sure to place the correct balance weights on the inner edge of rim as shown in Figure WT-4.

Do not put more than two weights on each side.

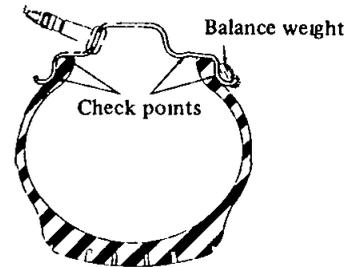
WHEEL AND TIRE

In order to ensure satisfactory steering condition as well as maximum tire life, proceed as follows:

- 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. Thoroughly remove rust, dust, oxidized rubber or sand from wheel rim with wire brush, emery cloth or paper. Use dial gauge to examine wheel rim for lateral and diametral runout. See Figure WT-4.

Lateral runout limit

Less than 1.0 mm (0.039 in) total indicator reading



WT005

Fig WT-4 Wheel rim run-out check points

Note In 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.

- 2 Discard when any of the following problem occurs:

- (1) Broken or damaged bead wire
- (2) Ply or tread separation
- (3) Worn fabric damage on tubeless tire.
- (4) Cracked or damaged side wall, etc.

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Wheel wobbles	Improper tire pressure Damaged tire or distorted wheel rim Unbalanced wheel Loose wheel nuts Worn or damaged wheel bearing, or excessive play of wheel bearing Improper front wheel alignment Worn or damaged ball joint Excessive steering linkage play or worn steering linkage Loose steering linkage connection Broken suspension spring Faulty shock absorber	Measure and adjust Repair or replace Balance Tighten Correct play or replace wheel bearing Align Replace Adjust or replace Tighten nuts to rated torque, or replace worn parts if any Replace Replace
Unevenly or excessively worn tire	Improper tire rotation Improper tire pressure Unbalanced wheel Improperly adjusted brake Improper wheel alignment Excessively distorted or improperly installed suspension link High speed on curves Sudden start and improper speed due to rapid acceleration or improper brake application	Conduct tire rotation periodically Measure and adjust Balance or replace Adjust Align Repair, replace or, if necessary, reinstall Reduce speed Follow correct and proper driving manner
Tire squeals	Improper tire pressure Improper front wheel alignment Distorted knuckle or suspension link	Measure and adjust Align Repair or replace

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION ST

STEERING SYSTEM

ST

STEERING SYSTEM	ST- 2
SERVICE DATA AND SPECIFICATIONS	ST-12
TROUBLE DIAGNOSES AND CORRECTION	ST-13
SPECIAL TOOLS	ST-13



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

STEERING SYSTEM

CONTENTS

DESCRIPTION	ST- 2	REMOVAL	ST- 8
STEERING WHEEL	ST- 3	DISASSEMBLY	ST- 8
REMOVAL	ST- 3	INSPECTION	ST- 8
INSTALLATION	ST- 4	ASSEMBLY AND ADJUSTMENT	ST- 9
STEERING COLUMN	ST- 4	INSTALLATION	ST-10
REMOVAL	ST- 5	STEERING LINKAGE	ST-10
INSPECTION	ST- 5	REMOVAL	ST-10
INSTALLATION	ST- 6	DISASSEMBLY	ST-10
STEERING LOCK	ST- 7	INSPECTION AND REPAIR	ST-11
REMOVAL	ST- 7	ASSEMBLY AND ADJUSTMENT	ST-11
INSTALLATION	ST- 7	INSTALLATION	ST-11
STEERING GEAR	ST- 7		

DESCRIPTION

The steering is the type RB47L which is of the recirculating ball type designed especially for easy operation and high durability, and has a center distance of 47 mm (1 85 in) between the sector shaft and worm shaft

The steering linkage is a relay design

The gear arm is connected to one end of the cross rod

The other end of the cross rod is linked to the idler arm whose bracket

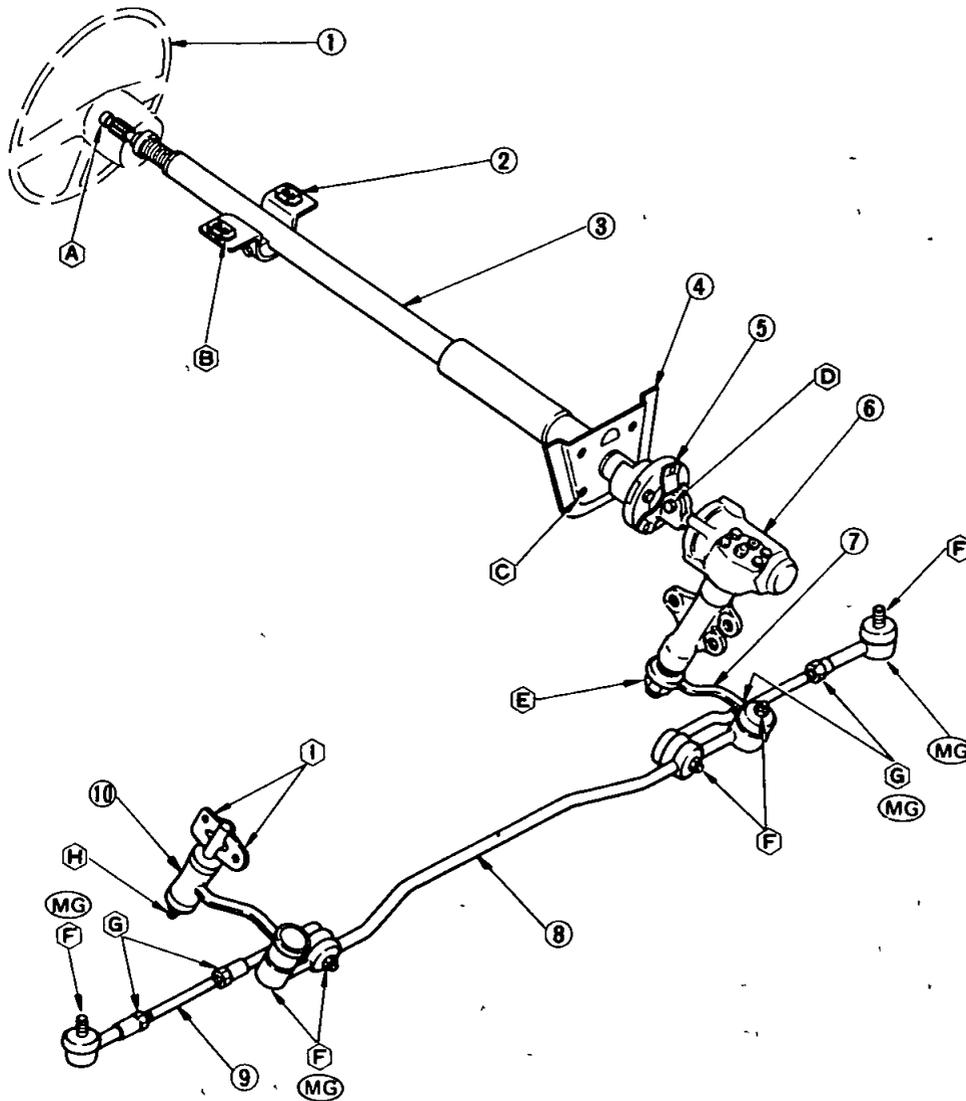
is attached to the side member located on the opposite side of the steering gear

The adjustable side rods connect the cross rod to the steering knuckle arms. The rubber coupling, located between the steering column and the steering gear box, prevents road shocks and linkage vibrations from imparting to the steering wheel during operation

The collapsible steering column is standard equipment, which is a steel

ball type and collapses upon impact. Thus, if the car should become involved in a head-on collision that throws the driver forward, the steering column will absorb the energy of his forward movement and greatly reduce the possibility of his being injured

Steering System



- 1 Steering wheel
- 2 Column clamp
- 3 Steering column
- 4 Jacket tube flange
- 5 Rubber coupling
- 6 Steering gear
- 7 Gear arm
- 8 Cross rod
- 9 Side rod
- 10 Idler arm

Tightening torque (T) of bolts and nuts kg-m (ft-lb)

(A)	T 3.8 to 5.2 (27 to 38)
(B)	T 0.8 to 1.1 (6 to 8)
(C)	T 35 to 45 (30 to 39)*
(D)	T 4.0 to 5.0 (29 to 36)
(E)	T 13 to 15 (94 to 108)
(F)	T 5.5 to 10.0 (40 to 72)
(G)	T 8 to 10 (58 to 72)
(H)	T 4.0 to 5.0 (29 to 36)
(I)	T 4.4 to 6.1 (32 to 44)
(MG)	Multi-purpose grease

* kg-cm (in-lb)

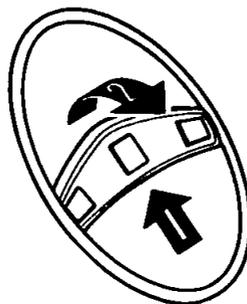
ST492

Fig ST-1 Structural view of steering system

STEERING WHEEL

REMOVAL

- 1 Disconnect battery ground cable
- 2 Disconnect horn wiring
- 3 Remove horn pad as follows according to its type
 - (1) Two-spoke type
Sliding horn pad upward, pull it out. See Figure ST-2
 - (2) Three-spoke type
Pulling up lower spoke first, remove horn pad.



ST493

Fig ST-2 Removing horn pad

- 4 Remove steering wheel nut
- 5 Using Steering Wheel Puller ST27180001, install puller anchor screws in threaded holes in steering wheel. Turn center bolt of the special tool clockwise to remove steering wheel.

See Figure ST-3

Note Do not strike the end of steering column shaft with a hammer. Striking shaft will damage bearing or collapsible shaft.

Steering System

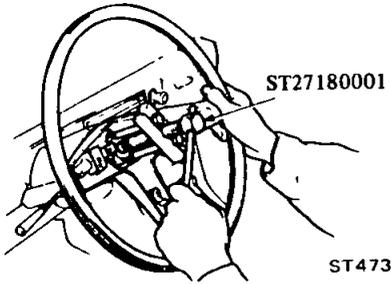


Fig ST-3 Removing steering wheel

INSTALLATION

Install steering wheel in the reverse order of removal. Observe the following instructions:

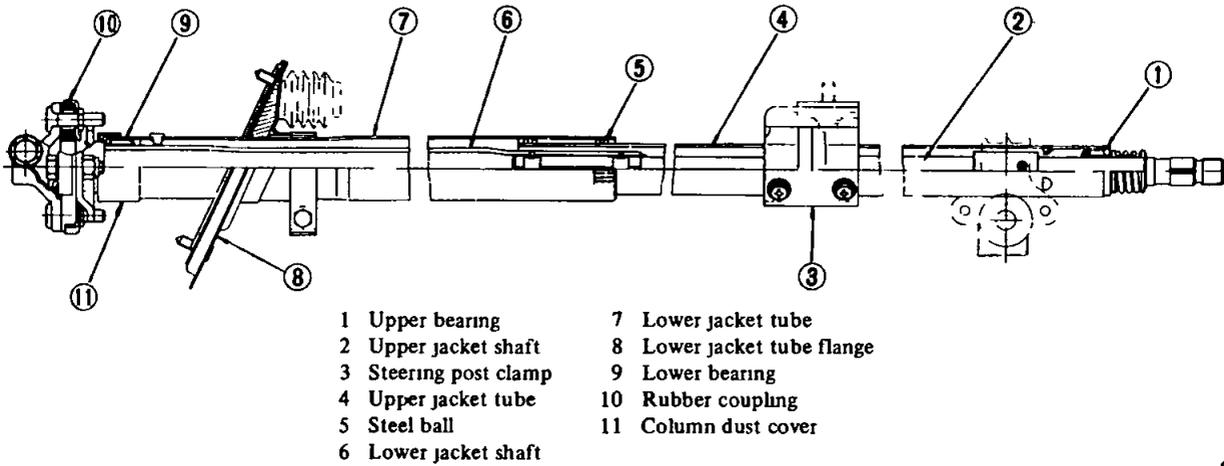
- 1 Apply grease to sliding portion of contact plate
- 2 Install steering wheel on column shaft in a straight ahead position after

facing punch mark on the top of upper column shaft in that direction and tighten steering wheel nut to the specified torque

Tightening torque

3.8 to 5.2 kg-m
(27 to 38 ft-lb)

STEERING COLUMN



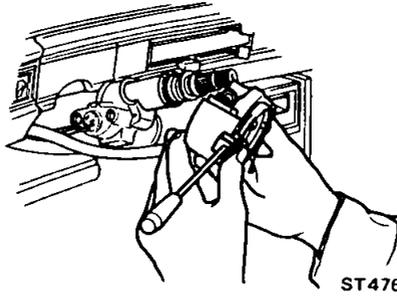
ST182

Fig ST-4 Sectional view of collapsible type steering

Steering System

Instructions for handling collapsible steering column

- 1 Never apply an undue stress to steering column in axial direction
- 2 Do not apply bending force to steering column when installing



ST476

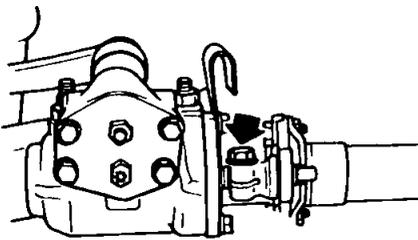
Fig ST-8 Removing turn signal switch assembly

Note When a head-on collision is encountered, inspect steering system as follows

The steering system is very important unit for driving. The collapsible type steering should not be disassembled, and if necessary, replace it as an assembly.

REMOVAL

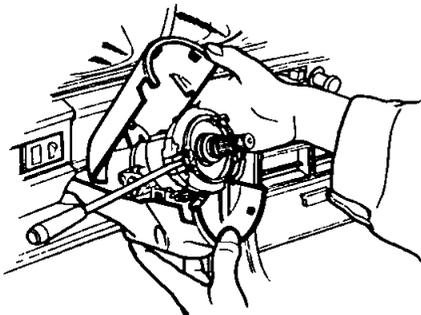
- 1 Remove bolt securing worm shaft and rubber coupling
See Figure ST-6



ST474

Fig ST-6 Removing rubber coupling securing bolt

- 2 Remove steering wheel
Refer to page ST-3 for Removal of Steering Wheel
- 3 Loosen four screws, and remove upper and lower steering column shell covers. See Figure ST-7

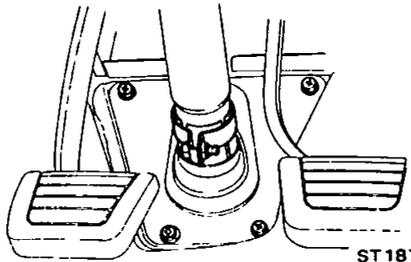


ST475

Fig ST-7 Removing column shell covers

- 4 Remove turn signal switch assembly by loosening two screws

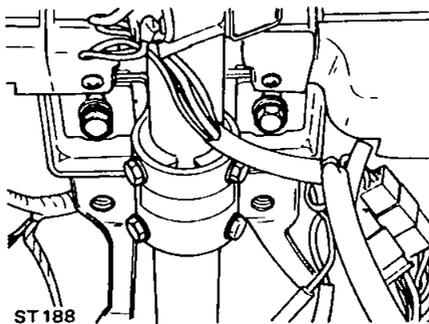
- 5 Remove four bolts securing jacket tube flange to dash panel
See Figure ST-9



ST187

Fig ST-9 Removing jacket tube flange securing bolts

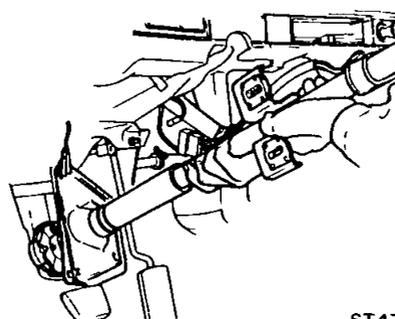
- 6 Remove four bolts securing column clamp to dash panel
See Figure ST-10



ST188

Fig ST-10 Removing column clamp securing bolts

- 7 Draw out steering column assembly from the room side
See Figure ST-11



ST477

Fig ST-11 Drawing steering column assembly

INSPECTION

1 When steering wheel cannot be rotated smoothly but steering gear, steering linkage and suspension system are normal, check the steering system and replace damaged parts

- (1) Check column bearings for damage or unsmoothness

If so, lubricate with recommended multi-purpose grease or replace steering column assembly

- (2) Check jacket tube for deformation or breakage, and replace if necessary

- (3) Check column spring, and replace if damaged and weakened

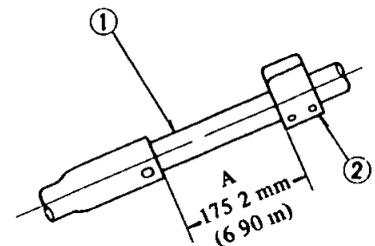
2 When the car equipped with collapsible steering is involved in a light front collision, check the following parts and replace if necessary

- (1) Jacket tube

Measure the dimension A as shown in Figure ST-12

Standard installed dimension is 183.8 mm (7.24 in)

When jacket tube is crushed, dimension A is reduced



ST192

- 1 Jacket tube
- 2 Column clamp

Fig ST-12 Standard dimension between column clamp and the top end of lower jacket tube

Steering System

(2) Column clamp

Measure dimension B as shown in Figure ST-13

Standard B dimension is 0 mm (0 in) When jacket tube is crushed, dimension B is increased

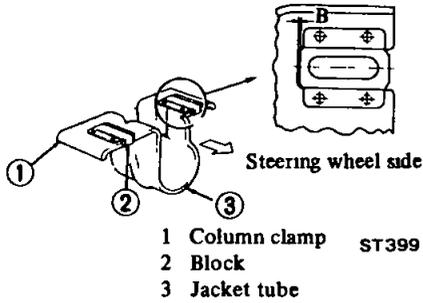


Fig ST-13 Standard dimension B

(3) Steering wheel

Check steering wheel for axial play
When steering jacket shaft is crushed, axial play exists
See Figure ST-14

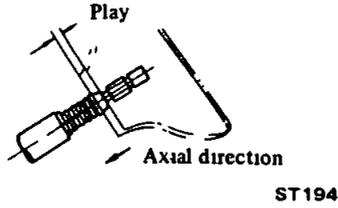


Fig ST-14 Inspecting steering wheel for axial play

(4) Sector shaft

When collision occurs, abnormal strength is applied to gear arm. As a result of this, serration of sector shaft is apt to be distorted. See Figure ST-15

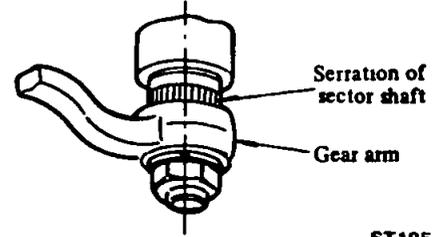


Fig ST-15 Inspecting the serration of sector shaft for deformation

INSTALLATION

Install steering column in the reverse order of removal

Observe the following instructions
See Figure ST-16

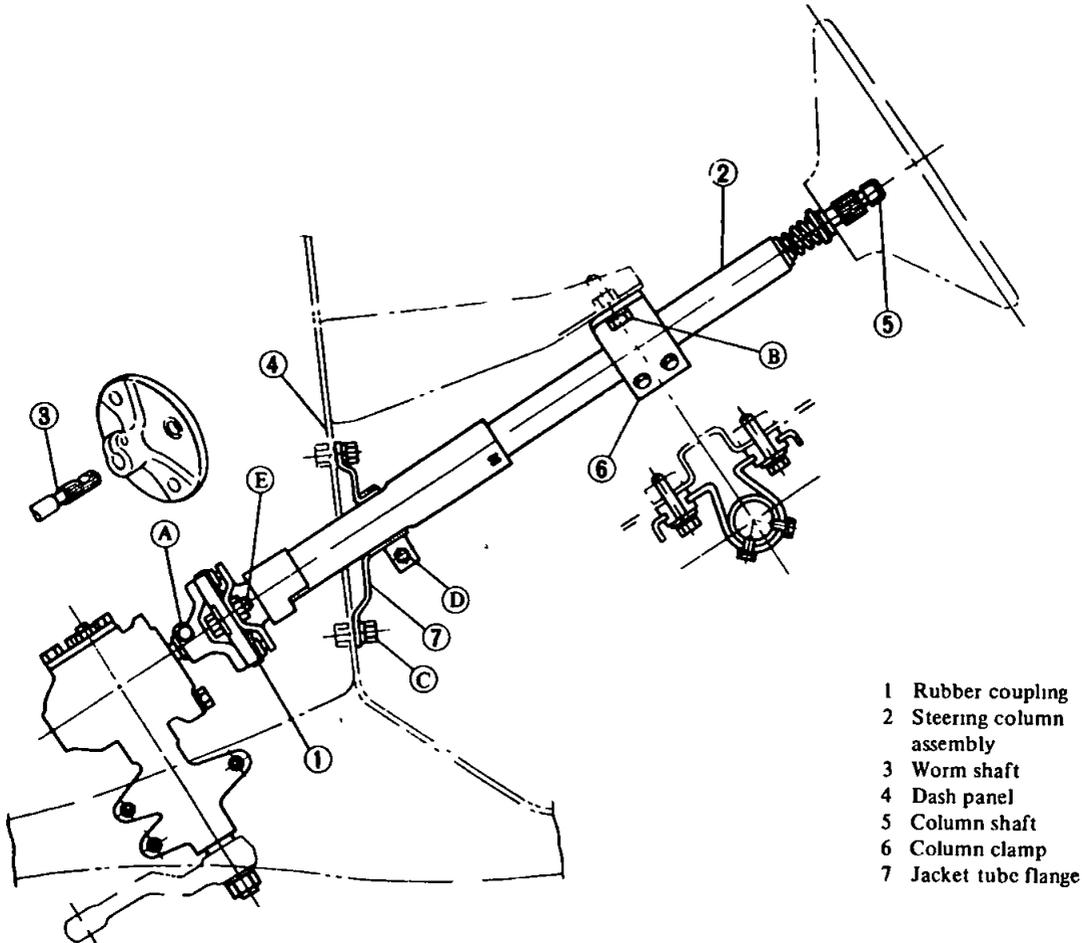


Fig ST-16 Installing steering column assembly

Steering System

- 1 Set the wheel in a straight ahead position
- 2 Fit steering column assembly onto worm shaft serration through dash panel and tighten bolt (A)

Make sure that punch mark at the top end of column shaft is faced up

Tightening torque
4.0 to 5.0 kg-m
(29 to 36 ft-lb)

Note Do not apply any undue stress to rubber coupling

- 3 Install bolts (B) to support the upper side of steering column assembly by means of column clamp

Tightening torque
0.8 to 1.1 kg-m
(6 to 8 ft-lb)

- 4 Loosen bolt (D), and after sliding jacket tube flange to dash panel, tight-

en four nuts (C), and then tighten bolt (D)

Tightening torque
35 to 45 kg-cm
(30 to 39 in-lb)

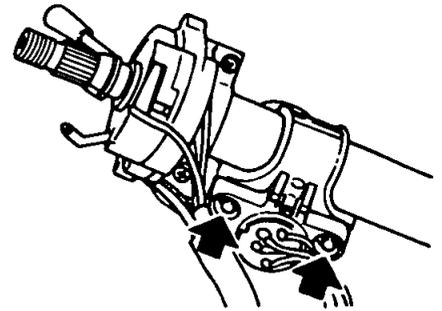
- 5 After installation, make sure that steering wheel turns smoothly

STEERING LOCK

To provide tamper-proof, self-shear type screws are used and their heads are sheared off, when installed so that the steering lock cannot be removed easily

REMOVAL

- 1 Break two self-shear type screws with a drill or other proper tool
- 2 Remove two screws and dismount steering lock from steering jacket tube
See Figure ST-17



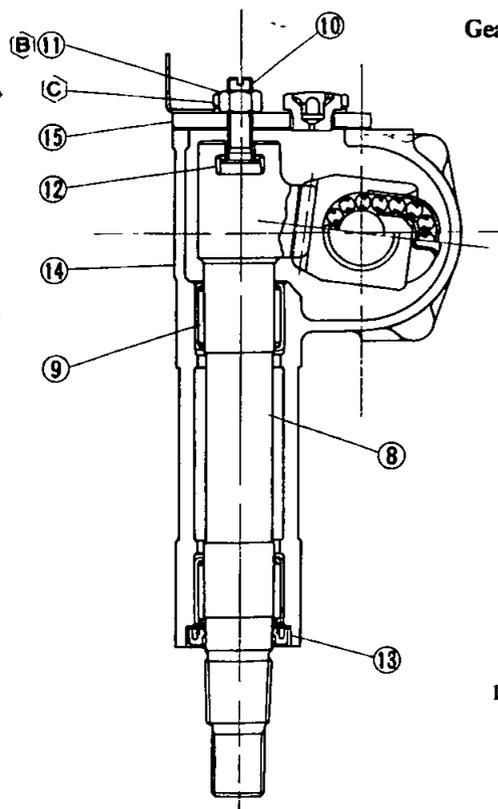
ST478

Fig ST-17 Removing steering lock securing screws

INSTALLATION

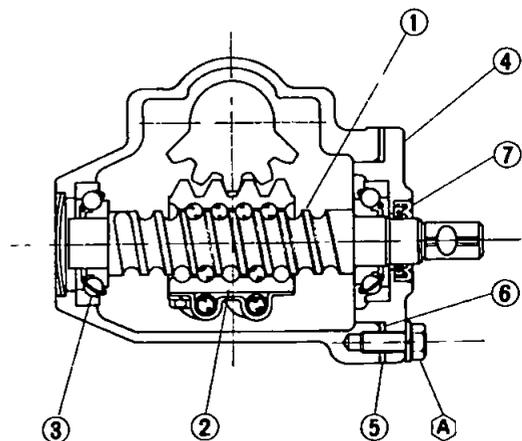
- 1 Align steering lock hole in jacket tube with the mating portion of steering lock
- 2 Install self-shear type screws and cut off their heads

STEERING GEAR (Type: RB47L)



Gear ratio 16.48 : 1

- 1 Worm shaft
- 2 Ball nut
- 3 Worm bearing
- 4 Rear cover
- 5 Bearing shun
- 6 O-ring
- 7 Oil seal
- 8 Sector shaft
- 9 Sector shaft bearing
- 10 Adjusting screw



- 11 Lock nut
 - 12 Adjusting shim
 - 13 Oil seal
 - 14 Steering gear housing
 - 15 Sector shaft cover
- Tightening torque (T) of bolts and nuts kg-m (ft-lb)
- (A) T 1.5 to 2.5 (11 to 18)
(B) T 1.7 to 2.5 (12 to 18)
(C) T 1.5 to 2.5 (11 to 18)

ST479

Fig ST-18 Sectional view of steering gear

Steering System

REMOVAL

- 1 Remove bolt securing worm shaft to rubber coupling
See Figure ST-19

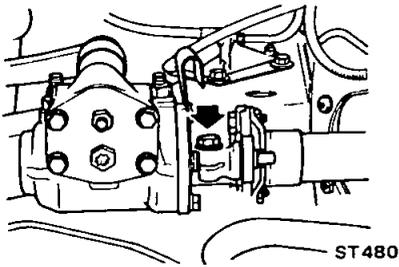


Fig ST-19 Removing rubber coupling securing bolt

- 2 Remove nut and lock washer securing gear arm to sector shaft Using Steering Gear Arm Puller ST29020001, remove steering gear arm from sector shaft See Figure ST-20

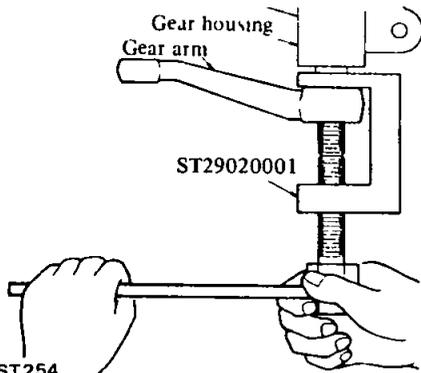


Fig ST-20 Removing steering gear arm

- 3 Remove three bolts securing steering gear housing to body side member, and withdraw steering gear housing from engine compartment See Figure ST-21

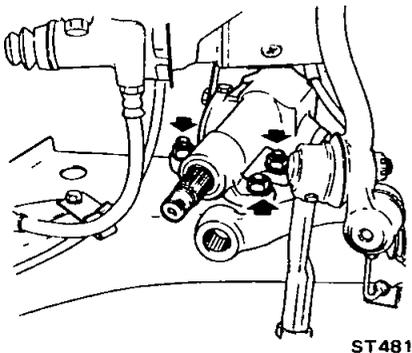


Fig ST-21 Withdrawing steering gear housing

DISASSEMBLY

- 1 Thoroughly drain steering gear oil by removing filler plug ① Place steering gear in a vise with Steering Gear Attachment KV48100300 in place
- 2 Loosen lock nut ② and remove four sector shaft cover attaching bolts ③ After removing sector shaft with cover, remove cover from sector shaft by turning screw clockwise See Figure ST-22

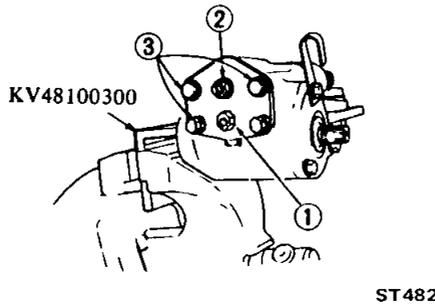


Fig ST-22 Mounting steering gear in a vise

- 3 Turn sector shaft adjusting screw a few turns in clockwise direction and then remove cover and sector shaft See Figure ST-23

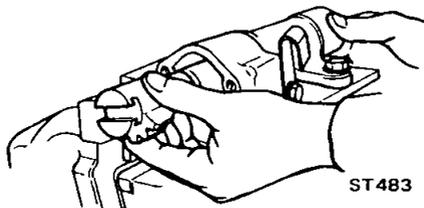


Fig ST-23 Drawing out sector shaft

- 4 Remove three rear cover securing bolts and detach rear cover See Figure ST-24

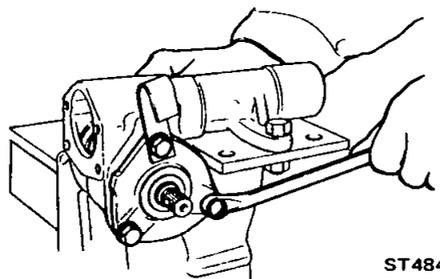


Fig ST-24 Detaching rear cover

- 5 Remove bearing adjusting shim(s), and steering worm assembly See Figure ST-25

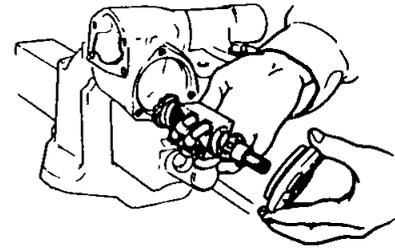


Fig ST-25 Drawing out steering worm assembly

Notes

- a 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
- b Do not detach ball nut from worm shaft assembly If necessary, replace assembly
- c Do not remove sector shaft needle bearings from steering gear housing If necessary, replace gear housing assembly

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, if necessary, replace Also check gear housing and steering worm assembly 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,

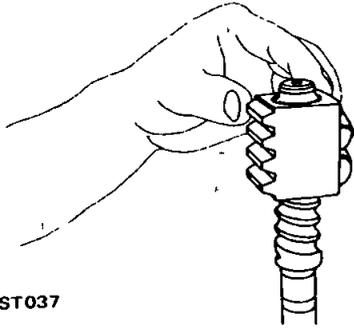
- (1) Move ball nut to either end of worm gear, and gradually stand worm

Steering System

shaft and ball nut assembly until ball nut moves downward on worm gear under its own weight

(2) If ball nut does not move freely over entire stroke, replace assembly

Note Be careful not to damage ball nut guide tube while check is being made



ST037

Fig ST-26 Inspecting worm shaft and ball nut assembly

Bearings

1 Replace worm shaft needle bearing if pitting, wear or any other damage is present

2 If sector shaft needle bearings are found worn or damaged, replace as an assembly of gear housing and bearings

Oil seals

Be sure to use new oil seals at each reassembly

ASSEMBLY AND ADJUSTMENT

Assemble steering gear in the reverse order of disassembly

Observe the following instructions

- 1 Clean all parts
- 2 Lubricate worm bearings, sector shaft bearings, and gear teeth with clean gear oil
- 3 Fill the space between sealing lips of new oil seal with recommended multi-purpose grease, and fit it to gear housing and rear cover

Notes

- a To facilitate installation, coat gear oil to seal contacting face of oil seal
- b Press oil seal into place with its lettered side towards the outside of gear housing

Adjustment of worm bearing preload

4 Place steering worm assembly in position in gear housing with worm bearings. Install rear cover on gear housing with O-ring and worm bearing shims

Tightening torque
1.5 to 2.5 kg-m
(11 to 18 ft-lb)

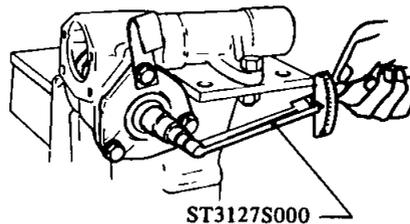
Note Be sure to install thicker shims to gear housing side

Standard shim thickness
1.5 mm (0.059 in)

Available worm bearing shims

No	Thickness mm (in)
1	0.762 (0.0300)
2	0.254 (0.0100)
3	0.127 (0.0050)
4	0.050 (0.0020)

5 Adjust the worm bearing preload by selecting suitable bearing shims so that the initial turning torque is 4.0 to 8.0 kg-cm (3.5 to 6.9 in-lb). Measure the torque using Preload Gauge ST3127S000 and a suitable socket with cloth around the top of the shaft so that the shaft will not slip. See Figure ST-27.



ST560

Fig ST-27 Measuring initial turning torque

Notes

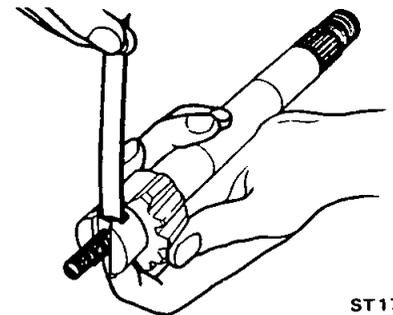
- a Rotate worm shaft a few turns in both directions to settle down worm bearing and measure the preload
- b When readjustment is necessary, initial turning torque should be 4.0 to 8.0 kg-cm (3.5 to 6.9 in-lb).
- c When adjusting worm bearing preload, add or remove shims until correct adjustment is made

Adjustment of sector shaft and adjusting screw

6 Insert adjusting screw into T-shaped groove at sector shaft head, and adjust the end play between sector shaft and adjusting screw until it is within 0.01 to 0.03 mm (0.0004 to 0.0012 in) by choosing suitable adjusting shims

Available sector shaft adjusting shims

No	Thickness mm (in)
1	1.575 to 1.600 (0.0620 to 0.0630)
2	1.550 to 1.575 (0.0610 to 0.0620)
3	1.525 to 1.550 (0.0600 to 0.0610)
4	1.500 to 1.525 (0.0591 to 0.0600)
5	1.450 to 1.475 (0.0571 to 0.0581)

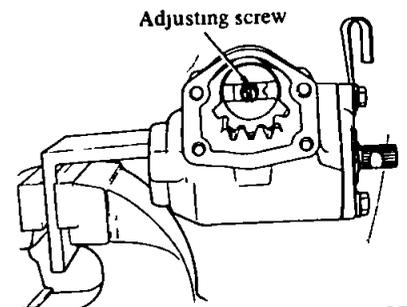


ST174

Fig ST-28 Measuring end play between sector shaft and adjusting screw

7 Rotate worm shaft by hand until ball nut is in the center of travel, then install sector shaft together with adjusting screw in gear housing. Ensure that center gear of sector shaft engages with the center gear of the ball nut. See Figure ST-29.

Note Be careful not to damage sealing lips of oil seal during operation



ST487

Fig ST-29 Installing sector shaft

Steering System

8 Install sector shaft cover on gear housing

Be sure to apply sealant to each face of sector shaft cover packing when installing cover

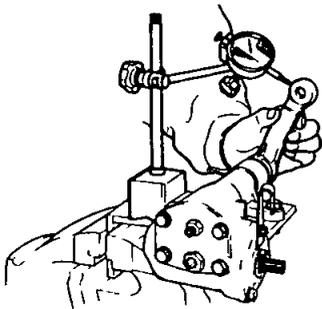
By turning adjusting screw counterclockwise, attach sector shaft cover to gear housing and then temporarily secure it with fixing bolts

9 Pull sector shaft toward cover approximately 2 to 3 mm (0.08 to 0.12 in) after turning adjusting screw counterclockwise and tighten sector shaft cover fixing bolts to 1.5 to 2.5 kg-m (11 to 18 ft-lb)

10 Push sector shaft against ball nut gear by gradually turning adjusting screw clockwise until sector shaft gear lightly meshes with ball nut gear and then temporarily secure adjusting screw with lock nut

11 Install gear arm on sector shaft and move sector shaft several times from the side of gear arm to see that it turns smoothly

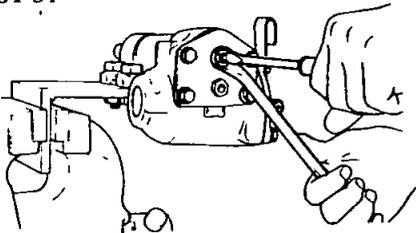
12 Adjust the backlash at the neutral position of gear arm by turning adjusting screw in or out so that the movement of the gear arm top end is less than 0.1 mm (0.004 in) See Figure ST-30



ST488

Fig ST-30 Measuring backlash

13 Turn adjusting screw clockwise approximately 1/8 to 1/6 rotation and then tighten lock nut to 1.7 to 2.5 kg-m (12 to 18 ft-lb) after moving sector shaft several times See Figure ST-31



ST489

Fig ST-31 Tightening lock nut

14 Fill assembly with recommended gear oil of approximately 0.28 liter ($\frac{3}{8}$ US pt, $\frac{1}{2}$ Imp pt) through filler hole and install filler plug

Tighten adjusting screw additionally $\frac{1}{4}$ to $\frac{1}{2}$ turn from fully turned position

Tightening torque

Right-hand drive model

2 to 3 kg-m (14 to 22 ft-lb)

Left-hand drive model

Tighten adjusting screw additionally $\frac{1}{4}$ to $\frac{1}{2}$ turn from fully turned position

INSTALLATION

Install steering gear in the reverse order of removal

Observe the following instructions

STEERING LINKAGE

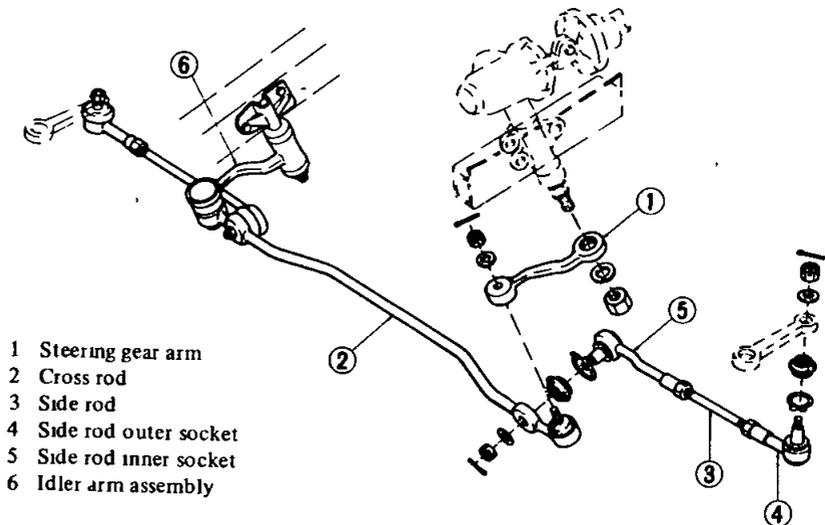


Fig ST-32 Steering linkage

REMOVAL

1 Jack up the front of car and support it on safety stands

2 Remove cotter pins and nuts fastening side rod ball studs to knuckle arms

3 To detach side rod ball studs from knuckle arms, insert Steering Ball Joint Remover ST72520000 between them and strike the top of the tool with a hammer. If this operation must be done without the tool, strike knuckle arm boss with a hammer backing up the opposite side of it with a large hammer and ball stud is free from knuckle arm

1 Position steering gear and rubber coupling in place, then install and tighten bolts securing steering gear housing to body side member. Tighten to 7 to 8 kg-m (51 to 58 ft-lb)

Tighten bolt securing rubber coupling to worm shaft to 4 to 5 kg-m (29 to 36 ft-lb)

Notes

a 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

b Align four grooves of gear arm serrations with four projections of sector shaft serrations, and install and tighten lock washer and nut to the torque of 13 to 15 kg-m (94 to 108 ft-lb)

Note Be careful not to strike the ball stud head, the ball socket of side rod and side rod with a hammer

4 Remove ball stud of cross rod from gear arm, and remove idler arm from cross rod in the same manner as described in step 3 above

5 Remove idler assembly from side member by taking off two fixing bolts

DISASSEMBLY

1 Disconnect both side rods from cross rod, following the procedure for removal of side rod ball joints at knuckle arm sides

Steering System

- Remove idler arm nut and disassemble idler assembly

INSPECTION AND REPAIR

Ball joint

- When ball stud is worn and axial play is too excessive, replace

Axial play

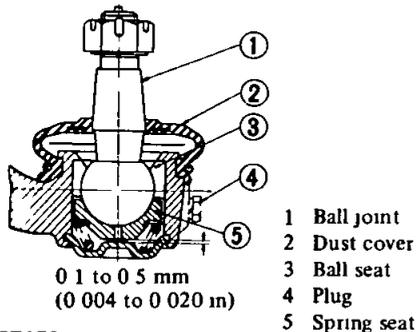
0.1 to 0.5 mm
(0.004 to 0.020 in)

Swing torque

0.5 kg-m (4 ft-lb)

- When dust cover is broken or deformed, replace

Note To renew grease, replace plug with a grease nipple, and apply recommended multi-purpose grease to ball joints, as shown in Figure ST-34, through grease nipple until grease is forced out through dust cover-to-joint socket clearance

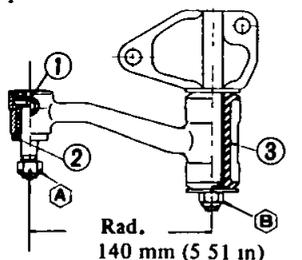


ST179

Fig ST-33 Sectional view of ball stud (side rod)

Idler arm assembly

Check nylon bushing of cross rod joint and rubber bushing of idler arm for breakage, wear or play, and if necessary replace



- Nylon bushing
- Dust cover
- Torsion rubber

Tightening torque

Ⓐ 5.5 to 10 kg-m
(40 to 72 ft-lb)

Ⓑ 4.0 to 5.0 kg-m
(29 to 36 ft-lb)

ST180

Fig ST-34 Sectional view of idler assembly

Cross rod and side rod

Check side rods and cross rod for breakage, bend or crack, and replace if necessary

ASSEMBLY AND ADJUSTMENT

Assemble steering linkage in the reverse order of disassembly

Observe the following instructions

Ball joints

Before installing a new dust cover, be sure to pack with the recommended multi-purpose grease

Tightening torque

Ball stud

5.5 to 10.0 kg-m
(40 to 72 ft-lb)

Notes

- When tightening ball stud, be careful not to allow grease to get on its tapered section
- Align the cotter pin holes in the tightening directions
- Be sure to insert new cotter pin in place and bend it securely

Idler arm assembly

When assembling idler assembly, observe the following instructions

Apply soapy water on the outer circumference of bushing

Carefully press bushing into idler body until it protrudes

Tighten idler nut to 4.0 to 5.0 kg-m (29 to 36 ft-lb)

Cross rod and side rods

- When side rod sockets and side rod adjusting bar are separated, adjust side rod length correctly

Adjustment should be made between ball stud centers. See Figure ST-35

Standard distance between inner and outer ball stud centers
313.2 mm (12.33 in)

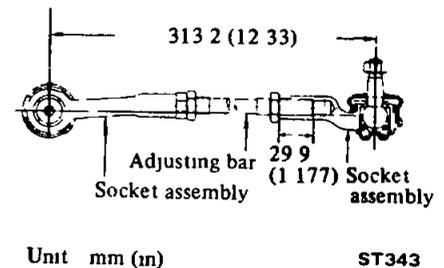
Notes

- Be sure to screw adjusting bar in socket properly
- Make sure that adjusting bar is screwed in socket by 29.9 mm (1.177 in) min

- Tightening torque

Side rod adjusting bar lock nut

8 to 10 kg-m
(58 to 72 ft-lb)



Unit mm (in)

ST343

Fig ST-35 Standard side rod length

INSTALLATION

Install steering linkage in the reverse order of removal

Observe the following instructions

- Tightening torque

Ball stud

5.5 to 10.0 kg-m
(40 to 72 ft-lb)

Idler body to frame bolts

4.4 to 6.1 kg-m
(32 to 44 ft-lb)

Note Align the cotter pin holes in the tightening directions

- Check wheel alignment, and if necessary adjust

See Section FA

SERVICE DATA AND SPECIFICATIONS

Steering gear type		Recirculating ball type
Steering angle	inner wheel	degree
	outer wheel	degree
Turns of steering wheel (lock to lock)		3.6
Ball stud	axial play	mm (in)
	swing torque	kg-m (ft-lb)
Steering wheel play	mm (in)	0.1 to 0.5 (0.004 to 0.020) less than 0.5 (4) less than 35 (1.38) at outer circumference of steering wheel
Worm bearing starting torque	new bearing	kg-cm (in-lb)
	readjusted bearing	kg-cm (in-lb)
		4.0 to 8.0 (3.5 to 6.9) 4.0 to 8.0 (3.5 to 6.9)
Worm bearing shim		
Standard total thickness	mm (in)	1.5 (0.059)

Adjusting shim

No	Thickness mm (in)
1	0.762 (0.0300)
2	0.254 (0.0100)
3	0.127 (0.0050)
4	0.050 (0.0020)

End play between sector shaft and adjusting screw
mm (in)

0.01 to 0.03 (0.0004 to 0.0012)

Adjusting shim

No	Thickness mm (in)
1	1.575 to 1.600 (0.0620 to 0.0630)
2	1.550 to 1.575 (0.0610 to 0.0620)
3	1.525 to 1.550 (0.0600 to 0.0610)
4	1.500 to 1.525 (0.0591 to 0.0600)
5	1.450 to 1.475 (0.0571 to 0.0581)

Gear backlash at gear arm top end mm (in)

less than 0.1 (0.004)

Tightening torque kg-m (ft-lb)

Steering gear

Gear arm nut	13 to 15 (94 to 108)
Rear cover bolts	1.5 to 2.5 (11 to 18)
Sector shaft cover bolts	1.5 to 2.5 (11 to 18)
Sector shaft adjusting screw lock nut	1.7 to 2.5 (12 to 18)
Steering gear housing to body bolts	7.0 to 8.0 (51 to 58)

Steering System

Steering linkage

Idler arm to frame bolts	4 4 to 6 1 (32 to 44)
Ball stud nuts	5 5 to 10 0 (40 to 72)
Side rod lock nuts	8 to 10 (58 to 72)

Column shaft

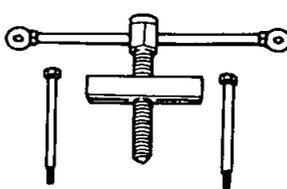
Steering wheel nut	3 8 to 5 2 (27 to 38)
Column clamp bolts	0 8 to 1 1 (61 to 8)
Rubber coupling to worm shaft bolt	4 0 to 5 0 (29 to 36)
Rubber coupling securing bolts	1 5 to 2 2 (11 to 16)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Steering wheel moves heavily	Wheel alignment out of specifications or air pressure in tires too low Steering linkage out of adjustment Steering column out of alignment	Re-align or inflate tires to correct pressure Re-adjust and see relative topic under Front Suspension Repair
Steering wheel returns but sluggishly	Wheels out of alignment or air pressure in tires too low Faulty steering linkage	Repair or inflate tires to correct air pressure Replace and see relative topic under Front Suspension
Car pulls to one side	Wheels out of proper alignment Wheel bearing out of adjustment Faulty steering linkage	Re-align Readjust Replace and see relative topic under Front Suspension

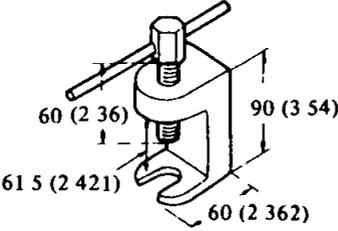
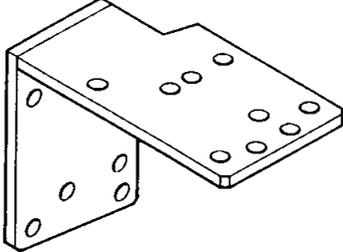
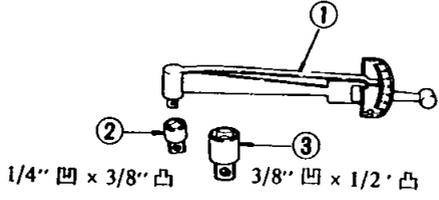
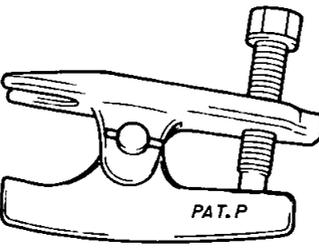
SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description	For use on	Reference page or Figure No
1	ST27180001 Steering wheel puller	This tool is used to drive out steering wheel Caution Do not hammer on steering column shaft	B210 610 710	Fig ST-3



SE116

Steering System

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
2	ST29020001 Steering gear arm puller	<p>This tool is used to remove steering gear arm from steering sector shaft</p> <p>Note Strike the side of the gear arm with double hammer to ease removal</p>  <p style="text-align: right;">SE117</p>	B210 610 710	Fig ST-20
3	KV48100300 Steering gear attachment	<p>This tool is used to mount steering gear in a vise</p>  <p style="text-align: right;">SE428</p>	B210 610 710	Fig ST-22
4	ST3127S000 Preload gauge 1 GG91030000 Torque wrench 2 HT62940000 Socket adapter 3 HT62900000 Socket adapter	<p>This tool is used to measure worm bearing preload</p>  <p style="text-align: right;">SE329</p>	All models	Fig ST-27
5	ST72520000 Steering ball joint remover	<p>This tool is placed between knuckle arm and steering ball joint to facilitate the disengagement of ball-joint section</p> <p>Caution Do not hammer on bolts</p>  <p style="text-align: right;">SE399</p>	B210 610 710	Page ST-11

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION FE

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

FE

ENGINE CONTROL SYSTEM	FE- 2
FUEL SYSTEM	FE- 3
EXHAUST SYSTEM	FE- 6



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

ENGINE CONTROL SYSTEM

CONTENTS

ACCELERATOR SYSTEM
DESCRIPTION
REMOVAL AND INSTALLATION

FE-2 INSPECTION
FE-2 ADJUSTMENT
FE-2

FE-2
FE-2

ACCELERATOR SYSTEM

DESCRIPTION

The accelerator control system is of a linkage type. To align the control linkage, adjustable rod(s) are used.

Smooth and responsive movement of the linkage is accomplished through the use of nylon ball joints. The ball joint should be lubricated with multi-purpose grease at recommended maintenance intervals.

The torsion shaft is supported by bearing which is made from polyacetal resin. The resin bearing and all metal sliding parts should also be lubricated with multi-purpose grease at recommended maintenance intervals.

REMOVAL AND INSTALLATION

Accelerator pedal & pedal arm

- 1 Remove two screws and accelerator pedal.
- 2 Disconnect ball joint at the upper end of pedal arm.
- 3 Remove snap ring, then remove pedal arm from pedal arm bracket.
- 4 To install, reverse the order of removal.

Torsion shaft & torsion shaft support

- 1 Remove return spring.
- 2 Disconnect connecting rod (ball joint assembly) from torsion shaft.
- 3 Remove cotter pin and separate torsion shaft from carburetor throttle lever.
- 4 Remove torsion shaft.

- 5 Remove two mounting bolts and torsion shaft support.
- 6 To install, reverse the order of removal.

Bell-crank bracket

- 1 Remove return spring.
- 2 Disconnect two connecting rods (two ball joint assemblies) from bell-crank.
- 3 Remove three mounting nuts, then remove bell-crank bracket assembly from dash panel.
- 4 To install, reverse the order of removal.

Notes

- a Ball jointed sections can be separated from each other by lightly pulling apart.
- b When removing any parts of accelerator linkage, do not disturb adjusting screw of ball joint assembly to save control linkage adjustment. In case ball joint assembly should be adjusted, refer to page FE-2 or 3 for Adjustment.

INSPECTION

- 1 Check accelerator rods to ensure that they are neither twisted nor bent. Also check ball joints for cracks or wear. Repair or, if necessary, replace.
- 2 Check return spring for fatigue or damage. Replace if necessary.

ADJUSTMENT

Accelerator linkage

1 To facilitate adjustment, first adjust, according to the specifications, the joint-to-joint length of ball joint assemblies A and B.

	Unit mm (in)	
	Screwed length	Joint-to-joint length
Ball joint assembly-A	10 (0.394)	208 (8.19)
Ball joint assembly-B	8 (0.315)	652 (25.7)

2 Adjust length L to the value shown below.

Length "L"
87 mm (3.43 in)

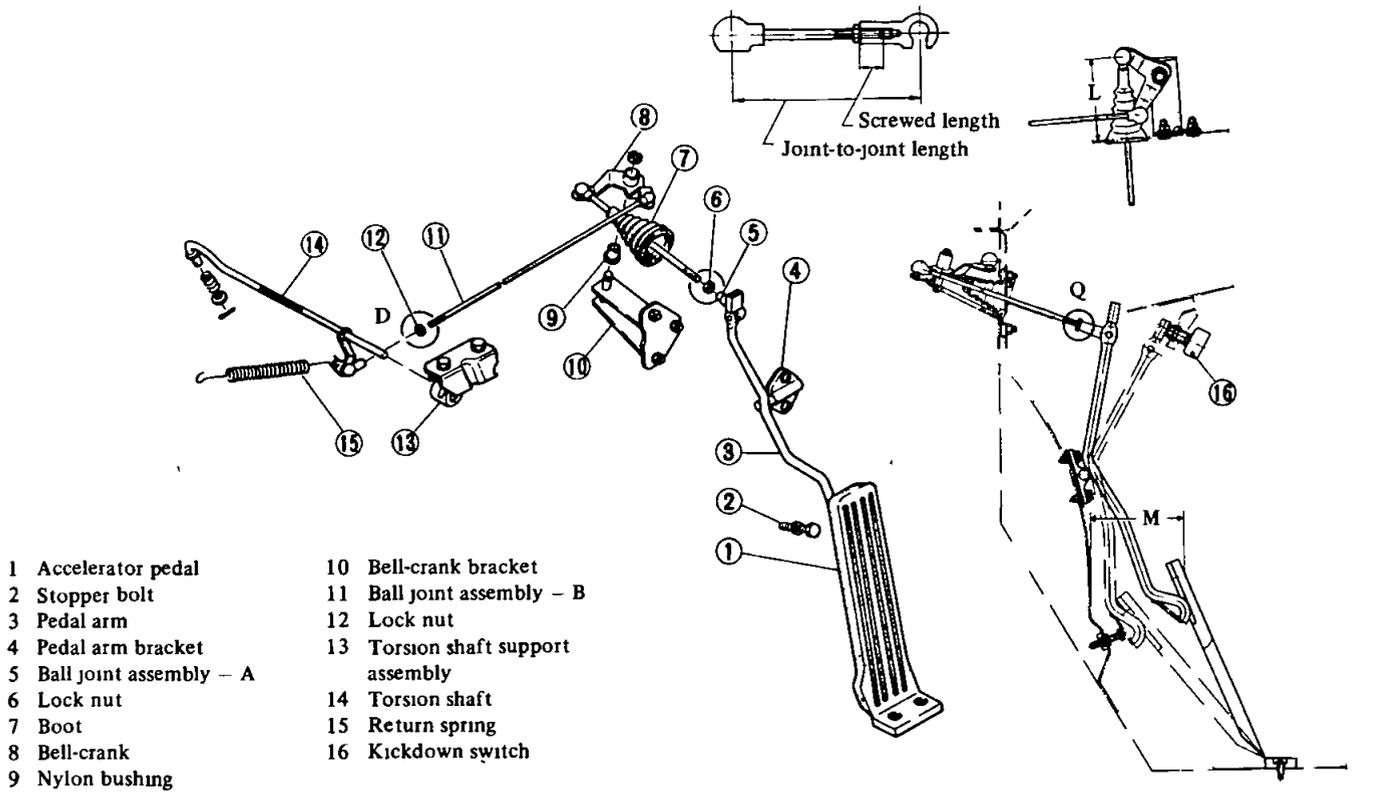
3 Adjust the screw at location Q to the value shown below.

Length "M"
84.5 mm (3.33 in)

4 Adjust the screw at location D so that the carburetor throttle shaft is set at the "IDLE" position.

5 After completing the adjustment as outlined in steps 1 through 4, again check to be sure that dimension M is the specified value. If necessary, readjust the screw at location Q.

6 Depress the accelerator pedal. With the carburetor throttle valve fully opened, adjust the height of the stopper bolt so that it touches the pedal arm. From that position, turn the stopper bolt one full turn and secure the stopper bolt with a lock nut.



FE310

Fig FE-2 Engine control system

- | | |
|---------------------------|-----------------------------------|
| 1 Accelerator pedal | 10 Bell-crank bracket |
| 2 Stopper bolt | 11 Ball joint assembly - B |
| 3 Pedal arm | 12 Lock nut |
| 4 Pedal arm bracket | 13 Torsion shaft support assembly |
| 5 Ball joint assembly - A | 14 Torsion shaft |
| 6 Lock nut | 15 Return spring |
| 7 Boot | 16 Kickdown switch |
| 8 Bell-crank | |
| 9 Nylon bushing | |

Kickdown switch

On automatic transmission models, it is also necessary to adjust kickdown switch. Kickdown switch adjustment is correct if kickdown switch is actuated by stopper located on tip end of pedal

arm when accelerator pedal is depressed fully. Always tighten lock nut securely when proper adjustment is obtained. See Figure FE-2.

FUEL SYSTEM

CONTENTS

DESCRIPTION	FE-3	FUEL PIPING	FE-6
REMOVAL	FE-5	FUEL STRAINER	FE-6
FUEL TANK (Sedan and Hardtop)	FE-5	INSPECTION	FE-6
FUEL TANK (Station Wagon)	FE-5	INSTALLATION	FE-6

DESCRIPTION

There are two types of fuel tank. One type is used on Sedan and Hardtop, and the other used on Station Wagon.

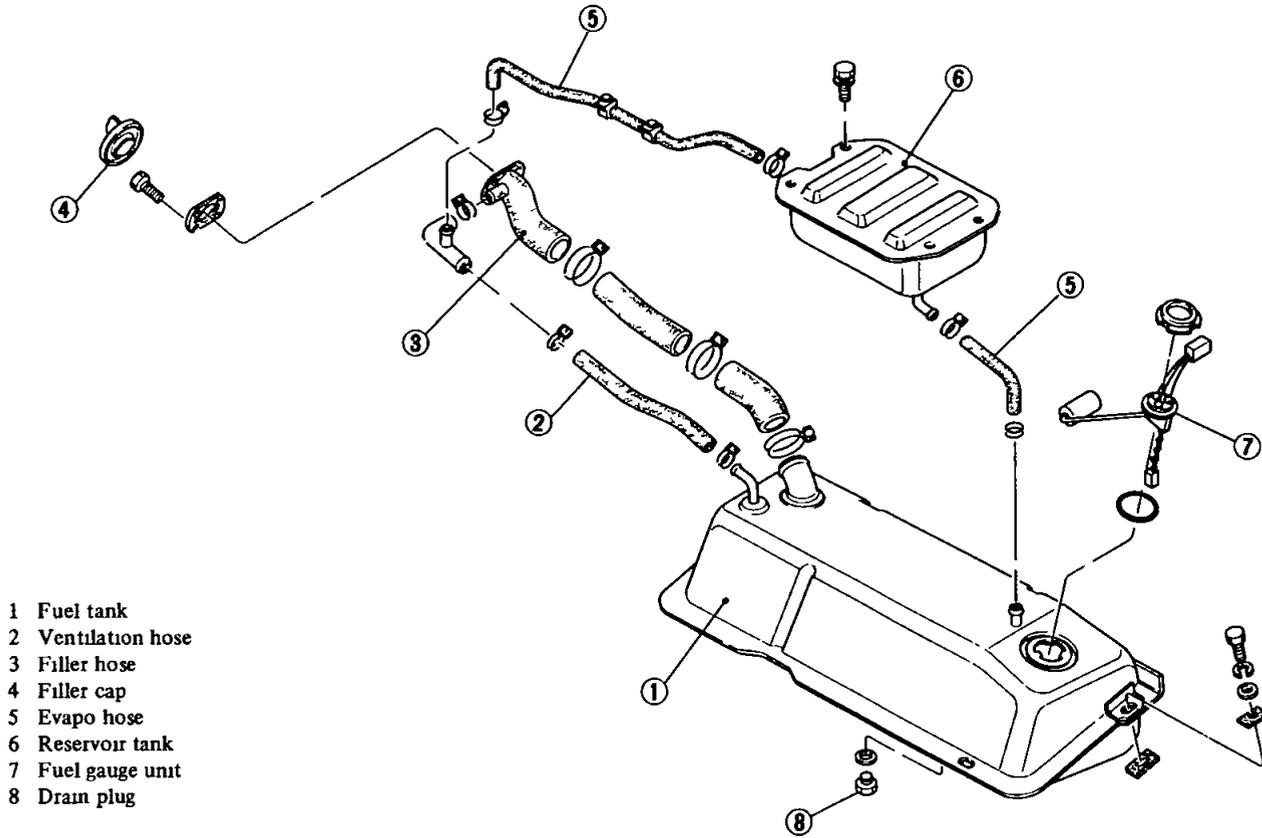
The fuel tank for the Sedan and Hardtop models is 55 liters (14 1/4 US

gal, 12 1/8 Imp gal) in capacity. The tank unit is located to the rear of the seat back and secured in place with a total of four bolts, two on the front and one on each side of the tank.

The capacity of the fuel tank for the Station Wagon model is 52 liters

(13 3/4 US gal, 11 1/2 Imp gal). This unit is located between the front mounting bracket and the rear crossmember and secured in place with four bolts.

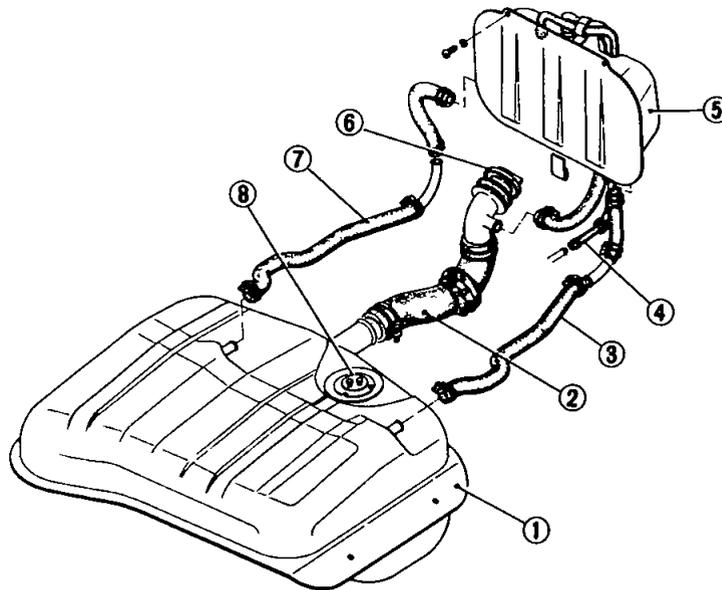
The fuel strainer is of a nylon, cartridge type.



- 1 Fuel tank
- 2 Ventilation hose
- 3 Filler hose
- 4 Filler cap
- 5 Evapo hose
- 6 Reservoir tank
- 7 Fuel gauge unit
- 8 Drain plug

FE356

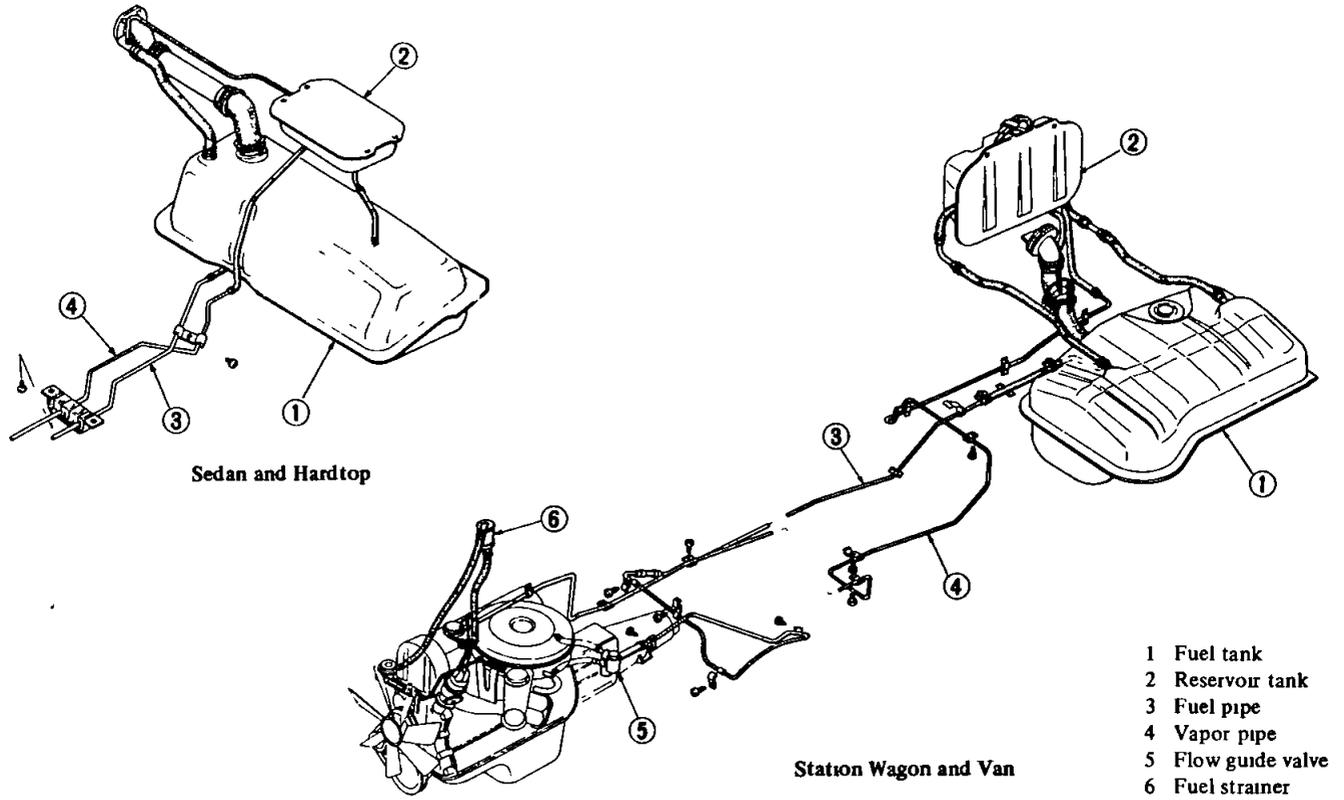
Fig FE-3 Fuel tank (Sedan and Hardtop)



- 1 Fuel tank
- 2 Filler hose
- 3 Ventilation rear hose
- 4 Vapor vent hose
- 5 Reservoir tank
- 6 Filler cap
- 7 Ventilation front hose
- 8 Fuel gauge unit

FE357

Fig FE-4 Fuel tank (Station Wagon)



- 1 Fuel tank
- 2 Reservoir tank
- 3 Fuel pipe
- 4 Vapor pipe
- 5 Flow guide valve
- 6 Fuel strainer

FE 158

Fig FE-5 Fuel piping

REMOVAL

FUEL TANK (Sedan and Hardtop)

- 1 Remove battery ground cable
- 2 Remove trunk front finisher
- 3 Take out spare tire. Place a suitable container under fuel tank drain plug to receive the remaining fuel in tank. Remove plug and then drain plug to drain fuel into the container.

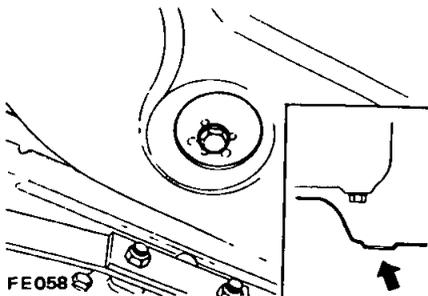


Fig FE-6 Draining fuel

- 4 Disconnect filler hose, ventilation hose, breather hose and outlet hose (tank side)
- 5 Disconnect wires from fuel tank unit gauge

- 6 Detach rear seat cushion and seat back. Remove four bolts (two at the front and one on each side) securing fuel tank in place, and take out fuel tank.

7. The unit gauge is of a bayonet type and can be taken out by turning lock plate counterclockwise with a screwdriver.

8 Reservoir tank removal

Unfasten trim clip and detach rear parcel shelf finish. Disconnect three breather tubes.

Loosen four bolts securing reservoir tank, and take out the tank.

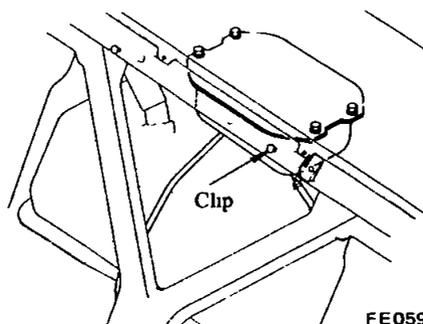


Fig FE-7 Removing reservoir tank

FUEL TANK (Station Wagon)

- 1 Remove battery ground cable
- 2 Remove inspection cover from rear floor. Disconnect wires from unit gauge.

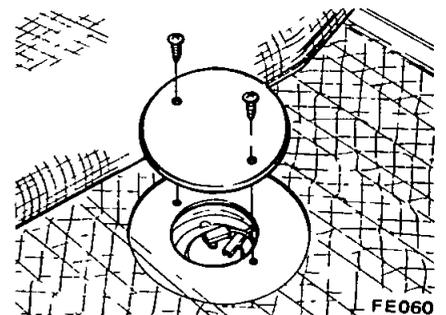


Fig FE-8 Removing inspection cover

3. Take out spare tire
- 4 Loosen drain plug and allow fuel to drain into a suitable container.
5. Disconnect filler hose, ventilation hose and outlet hose (tank side)
- 6 Remove four bolts from fuel tank, and detach fuel tank
- 7 Detach bayonet-type unit gauge by turning lock plate counterclockwise with a screwdriver.

8 Reservoir tank removal

- (1) Remove trim board from the right side of rear body
 - (2) Unfasten three clamps, and disconnect ventilation hoses
 - (3) Remove grommet from vapor hose, and disconnect hose
 - (4) Remove two screws on the top face of reservoir tank
 - (5) Lift up reservoir tank, and unfasten latches at lower flange section
- Slide out reservoir tank

Notes

- a Use care not to spill fuel over trunk room floor
- b Plug filler opening to prevent entry of dust or dirt

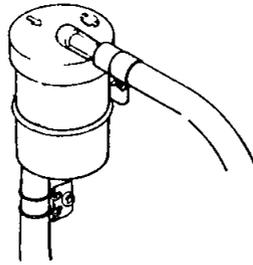
FUEL PIPING

All fuel lines can be easily disconnected by unfastening clamps and clips. Do not disconnect any fuel line unless necessary.

Note Plug hose and tube openings to prevent entry of dust or dirt

FUEL STRAINER

- 1 Disconnect fuel hoses from fuel strainer by removing clamps
- 2 Remove fuel strainer



FE221

Fig FE-9 Fuel strainer

Fuel strainer is of a cartridge type and cannot be cleaned. Always replace with a new one.

INSTALLATION

Install any parts of fuel system in the reverse order of removal. Observe the following notes:

Notes

- a Install hose clamps securely. Do not tighten excessively to avoid damaging hose.
- b Do not kink or twist hoses and tubes when they are routed.
- c Install filler hose after fuel tank has been mounted in place. Failure to follow this rule could result in leakage from around hose connections.
- d Fuel gauge tank unit
When installing fuel gauge tank unit, align the projection of gauge tank unit with the notch in fuel tank and tighten it securely. Be sure to install gauge tank unit with O-ring in place.
- e Run the engine and check for leakage at connections.

INSPECTION

- 1 Fuel tank
Check fuel tank for cracks or distortion. If necessary, replace.
- 2 Fuel hose
Inspect all hoses for cracks, fatigue, sweating or deterioration. Replace any hose that is faulty.
- 3 Fuel tube
Replace any fuel tube that is cracked, rusted, collapsed or distorted.
- 4 Fuel strainer
Replace fuel strainer at recommended maintenance intervals or if it becomes clogged or restricted.

EXHAUST SYSTEM

CONTENTS

DESCRIPTION	FE-6	INSTALLATION	FE-7
REMOVAL	FE-7	SEALING COMPOUND	FE-8
INSPECTION	FE-7		

DESCRIPTION

The exhaust system consists of a front tube with pre-muffler assembly, a rear tube (with main muffler assem-

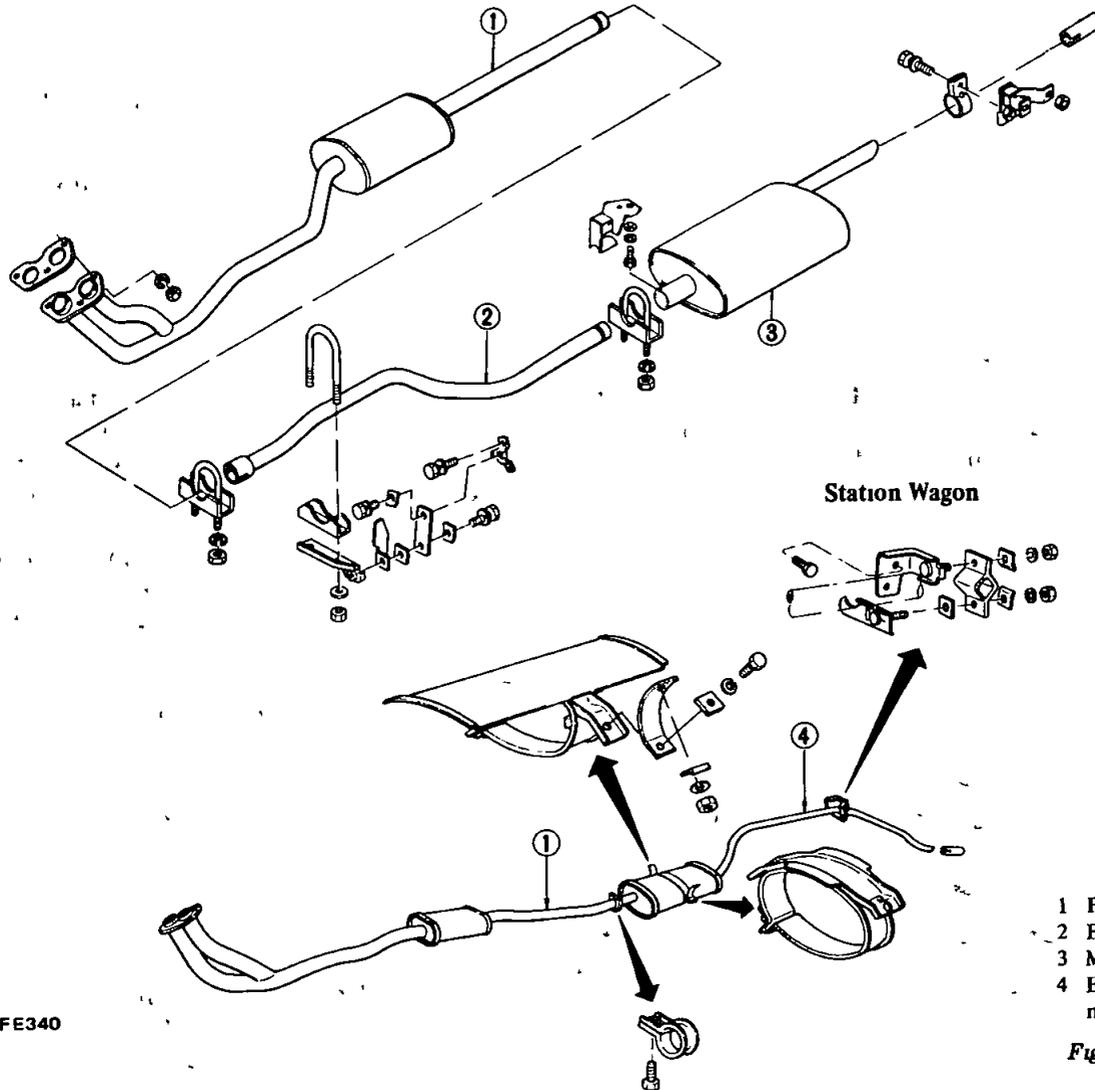
ply for Station Wagon), a main muffler assembly, mounting hangers and brackets.

The spring constant of the mounting insulator is low in the vertical direction, so that exhaust system

vibration is not transmitted to the body.

A protective heat shield is placed over the main muffler to prevent the trunk floor from being heated by the main muffler.

Sedan and Hardtop



- 1 Front tube with pre-muffler
- 2 Exhaust rear tube
- 3 Main muffler assembly
- 4 Exhaust rear tube with main muffler assembly

Fig FE-10 Exhaust system

FE340

REMOVAL

- 1 Remove bolts and nuts from main muffler clamp
- 2 Break old sealant off the joint while lightly tapping around with a hammer, and twist muffler
- 3 Using a rubber hammer, tap the front end of the muffler while pulling it toward rear

The main muffler can then be pulled out.

- 4 Remove bolts and nuts from rear exhaust tube clamp Utilizing the same procedure as for the main muffler, remove rear exhaust tube from front exhaust tube

- 5 Remove nuts securing exhaust manifold to front exhaust tube, and detach front exhaust tube from exhaust manifold See Figure FE-11

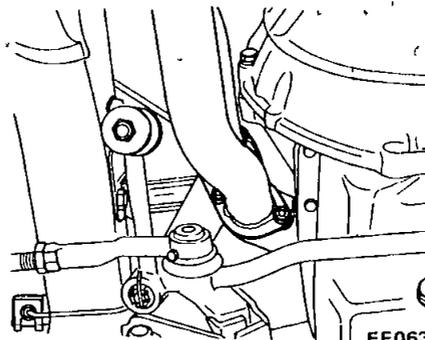


Fig FE-11 Removing front tube

FE063

INSPECTION

- 1 Check muffler and tubes for cracks or damage

Replace any part that is damaged beyond limits

- 2 Replace bracket and hanger rubber parts that are cracked, fatigued, or sweated

INSTALLATION

- 1 Wipe clean all the contact portion, allow them to dry thoroughly
- 2 To install, reverse the order of removal

Notes

- a Make sure that there is a minimum clearance of 18 mm (0.71 in) between body (or frame) and exhaust system component parts
- b Insert each exhaust tube into its place until stopper touches mating tube, and clamp securely See Figure FE-13.

Tightening torque

	kg-m (ft-lb)
Exhaust manifold to front exhaust tube nuts	1.9 to 2.5 (14 to 18)
U-bolt securing nuts	1.4 to 1.6 (10 to 12)
C-clamp securing bolts	1.4 to 1.6 (10 to 12)
Mounting rubber securing bolts	1.2 to 1.4 (9 to 10)

SEALING COMPOUND

If exhaust tubes are separated at connection to renew muffler assembly, etc., use the Genuine Nissan Sealant

“Exhaust Sealant Kit 20720-N2225” (see Figure FE-12) or equivalent to eliminate gas leakage past the joint. Be sure to observe the following procedure

6 Position the nozzle of injector to the guide and press it there firmly. Inject sealant slowly until sealant begins to flow out of the slit of the tube.

This indicates that the bead requires no further sealant. Excessive sealant can cause a clogged tube. See Figure FE-15.

After injecting, wash injector thoroughly in clean water to remove all traces of sealant.

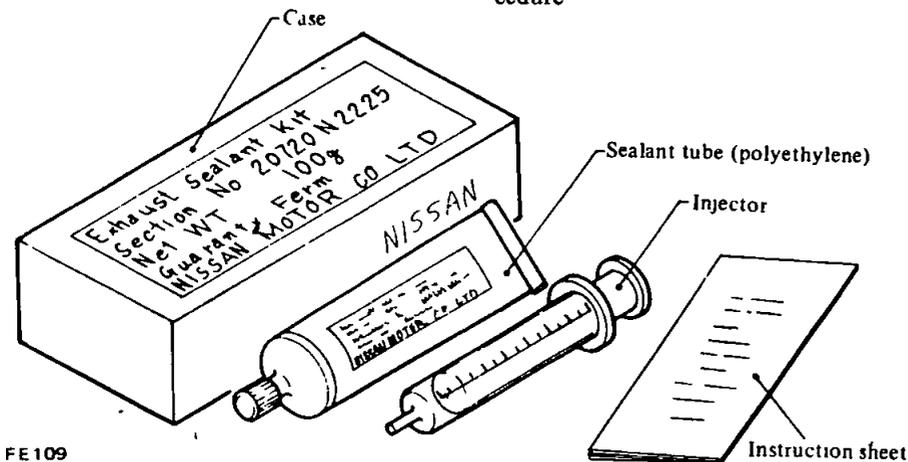
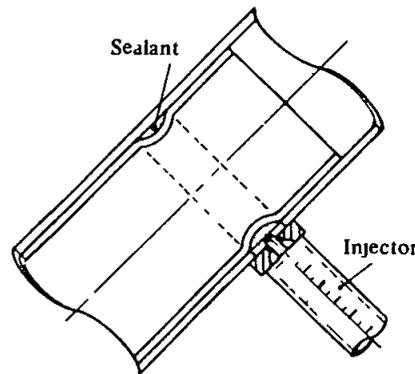


Fig FE-12 Exhaust sealant kit



FE163

Fig FE-15 Injecting sealant

- 1 Wipe clean all the contact portions of tube joints, allow them to dry thoroughly
- 2 Temporarily mount in place muffler assembly (and/or exhaust tube) as an assembled unit on the car
- 3 Insert the male tube into the female tube fully until the front end of the female tube touches the stopper on the male tube. See Figure FE-13

- 4 Torque U-bolt securing nuts and exhaust tube mounting bolts to specifications
- 5 Squeeze 5 to 6 cc (0.31 to 0.37 cu in) of sealant into injector from the sealant tube. See Figure FE-14

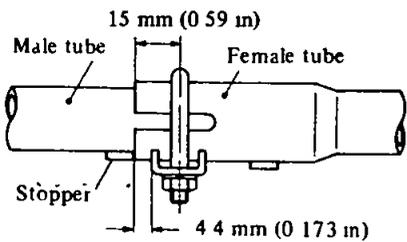
Be sure to place the cap back to the sealant tube since sealant will dry.

- 7 Start the engine and let it idle slowly for ten minutes (minimum) to harden sealant with the heat of exhaust gas
- 8 Check the condition of sealant before driving the car

It is also essential that the car should not be accelerated sharply for 20 to 30 minutes subsequent to this operation.

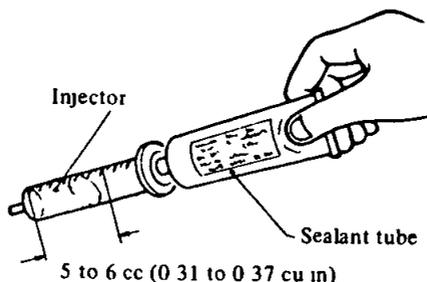
Notes.

- a. The sealant should be used within guaranty term indicated on the kit case
- b. Exposure of sealant to the skin may cause a rash. Wash sealant off the skin with water.



FE110

Fig FE-13 Exhaust tube connections



FE111

Fig FE-14 Squeezing sealant to injector

Engine Control, Fuel & Exhaust Systems

c Do not keep the sealant tube in a place where the ambient temperature is 40°C (104°F) or above. A sealant hardened at 40°C (104°F) or above cannot be used. The most suitable storage tempera-

ture is from 15 to 35°C (59 to 95°F). If sealant becomes hardened because of low temperatures, warm the sealant tube with lukewarm water until the sealant is softened. Do not warm the tube at a tempera-

ture of over 40°C (104°F) for a long period of time
d. Thoroughly read the instruction sheet furnished with the kit before using the sealant.

SERVICE MANUAL

DATSUN
MODEL 610 SERIES

SECTION BF

BODY

GENERAL DESCRIPTION	BF- 2
UNDERBODY ALIGNMENT	BF- 5
BUMPERS	BF- 9
RADIATOR GRILLE AND FRONT APRON	BF-10
FRONT FENDERS	BF-11
ENGINE HOOD AND COWL TOP GRILLE	BF-12
TRUNK LID (Sedan and Hardtop)	BF-14
TAIL GATE (Station wagon)	BF-17
DOOR	BF-19
SEATS	BF-31
WINDSHIELD GLASS (Adhesive caulked glass)	BF-35
INTERIOR TRIMS	BF-39
FLOOR MAT AND CENTER CONSOLE	BF-41
MOULDING	BF-44
SPECIAL TOOLS	BF-50

BF



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

BODY

GENERAL DESCRIPTION

The 610 model series has three body types, Sedan, Hardtop and Station Wagon. Each body is of unitized construction and is robust, light, and safe.

The body has a long nose and short deck. The engine compartment is wide enough to permit easy accessibility. On Sedan and Hardtop models, the trunk has a large capacity because of lowered spare tire compartment.

Insulation between the floor portion and the shock absorber mounting

member, reduces transmission of vibration to the floor panel.

Under coating is applied to the lower surface of the floor. Also, asphalt seats are placed on the upper surface of the floor to reduce interior vibration and noise.

For washing inside, the floor is provided with water drain holes.

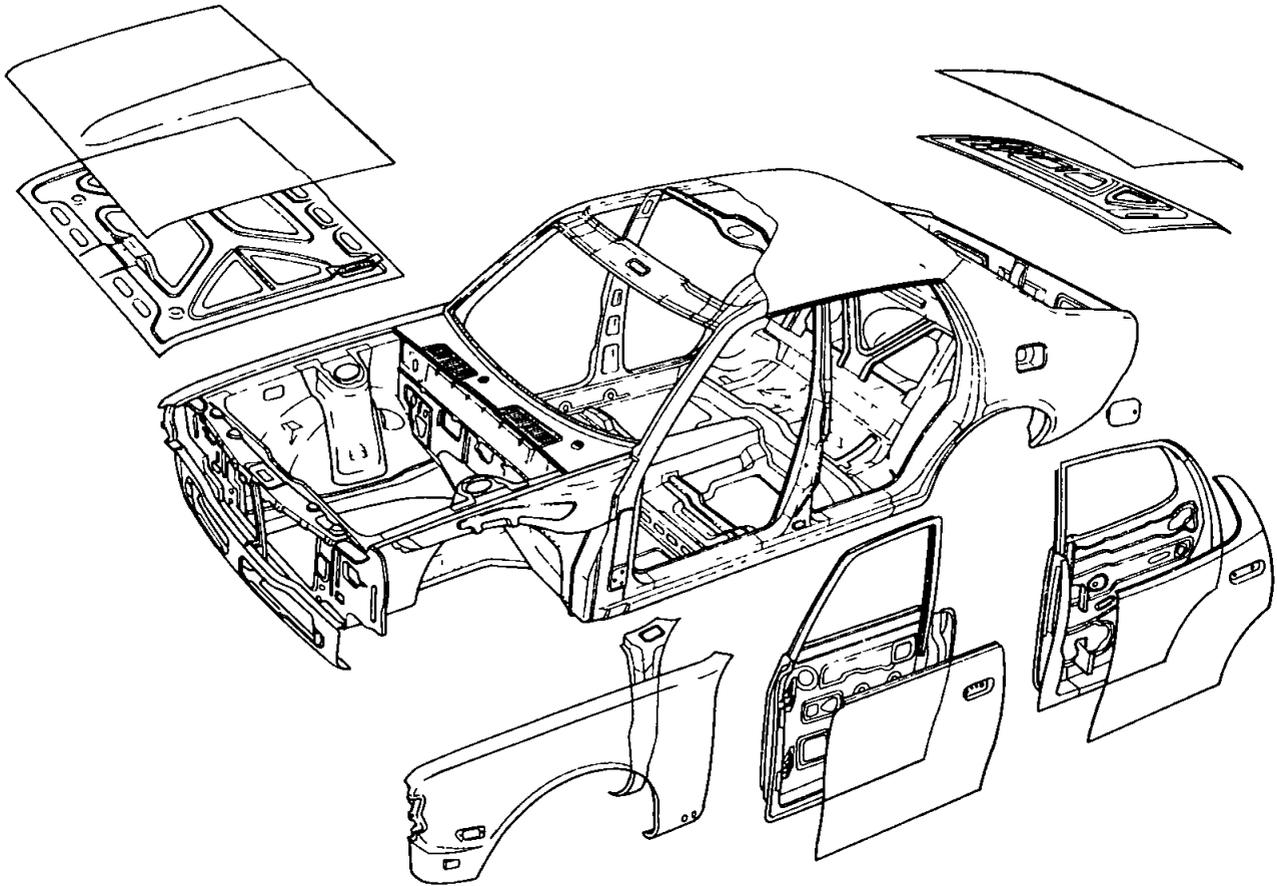
The front and rear ends of the body are constructed so as to absorb impact energy during a crash.

On Hardtop model, the front pillar,

door support, roof rail, and rear quarter are specially reinforced due to a wider door dimension.

Body parts for the Sedan, Hardtop and Station Wagon models are to a great extent interchangeable. For instance, the hood, front fender, hood ledge, front door, and dash board for the Sedan are exactly the same as those for the Station Wagon.

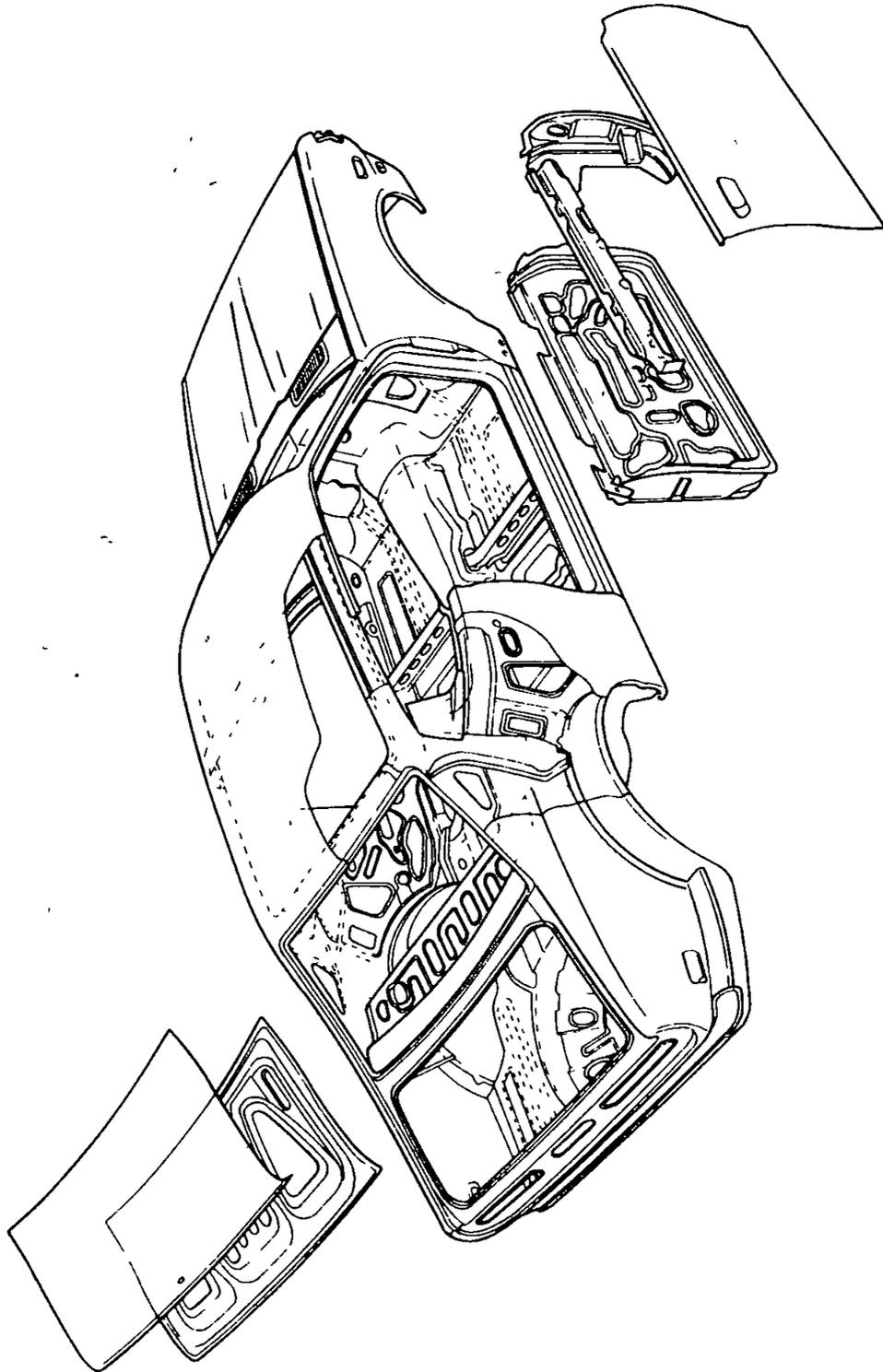
Air and water tightness is improved around the door, weatherstrips, and welded panel portions.



BF420A

Fig BF-1 Body construction of the Sedan

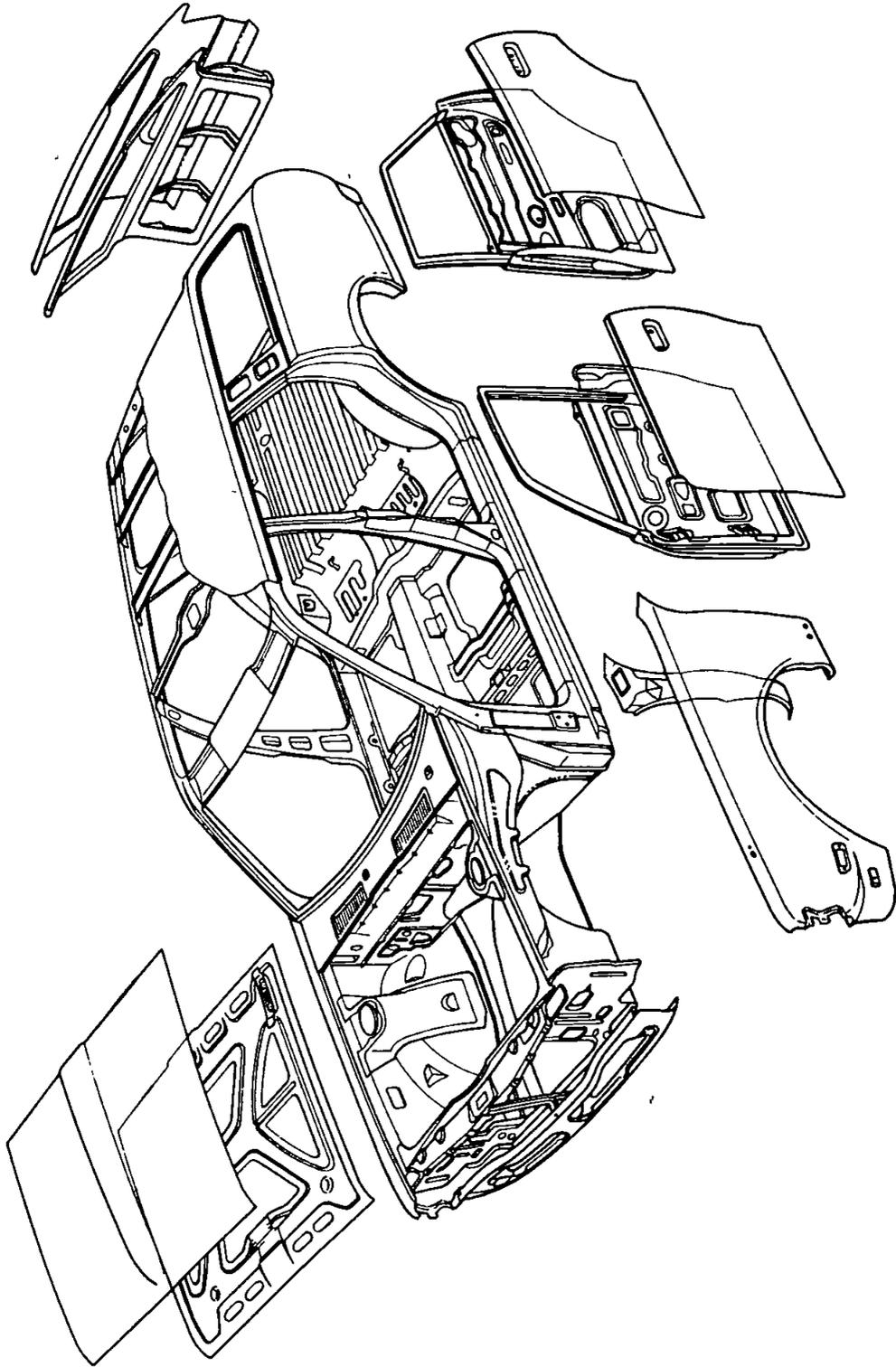
BODY



BF421A

Fig BF-2 Body construction of the Hardtop

BODY



BF422A

Fig BF-3 Body construction of the Station Wagon

UNDERBODY ALIGNMENT

CONTENTS

UNDERBODY GENERAL SERVICE INFORMATION	BF-5	TRAMMING SEQUENCE	BF-5
ALIGNMENT CHECKING PROCEDURE	BF-5	Sedan and Hardtop	BF-6
PRINCIPLES OF TRAMMING	BF-5	Hardtop	BF-7
CAR PREPARATION	BF-5	Station Wagon	BF-8

UNDERBODY GENERAL SERVICE INFORMATION

Since each underbody component directly affects the overall strength of the body, it is essential that proper welding, sealing and rust-proofing techniques be observed during service operations

Whenever the body is repaired, be sure to provide the repaired body parts with rust-proof

When rust-proofing critical underbody component, it is essential that a good quality air dry primer such as corrosion resistant zinc chromate be used

Do not use combination type primer surfacers

ALIGNMENT CHECKING PROCEDURE

Misalignment in the underbody affects the front fender, door, trunk lid and window alignments, and also the tail gate and rear body opening alignments in the case of the Station Wagon Underbody misalignment particularly affects the suspension system, thereby causing various problems that arise from suspension misalignment It is essential that underbody components be aligned within the specified dimensions given in Figures BF-4 through BF-6.

In the event of a collision, it is important that underbody alignment be thoroughly checked and if necessary, realigned to the specified dimensions

There are many tools that may be employed to correct collision damage such as frame straightening machines, external pulling equipment, other standard body jacks

To assist in checking alignment of the underbody components, repairing minor underbody damage or locating replacement parts, the following underbody dimensions and alignment checking information are presented

PRINCIPLES OF TRAMMING

Figures BF-4 through BF-6 show reference locations required to determine the extent of misalignment present in underbody structure, the reference locations are symmetrical about the center line of the car

Tramming underbody correctly calls for two measurements, the vertical dimension from the datum line to the points to be measured, and the horizontal distance between any two points of measurement

Note that precision measurement can be made only when the tramming gauge is parallel to the underbody

If one of the two reference points is in misaligned area, the parallel plane between the body and tram gauge may not exist, indicating the necessity of underbody repair

CAR PREPARATION

Preparing the car for the underbody alignment, check involves the following

- 1 Place the car on a level surface
- 2 The weight of the car should be supported at wheel locations
- 3 A visual damage inspection should be made to eliminate unnecessary measuring Obviously damaged or misaligned areas may often be located visually

TRAMMING SEQUENCE

The tramming sequence will vary depending upon the nature and location of the misaligned area Prior to performing any tramming operation, the accuracy of reference points to be used must be determined A measurement that originates from a reference point included in a damaged area will produce untrue results and confuse the evaluation of the underbody condition Unlike the conventional type of frame design, the unitized type of body construction seldom develops the condition of "diamond" in the floor pan area as a result of front or rear end collision Therefore, underbody alignment checking can usually originate from the body floor pan area If inspection indicates that these locations have been disturbed and are not suitable for measuring, one of the undamaged suspension locations should be used

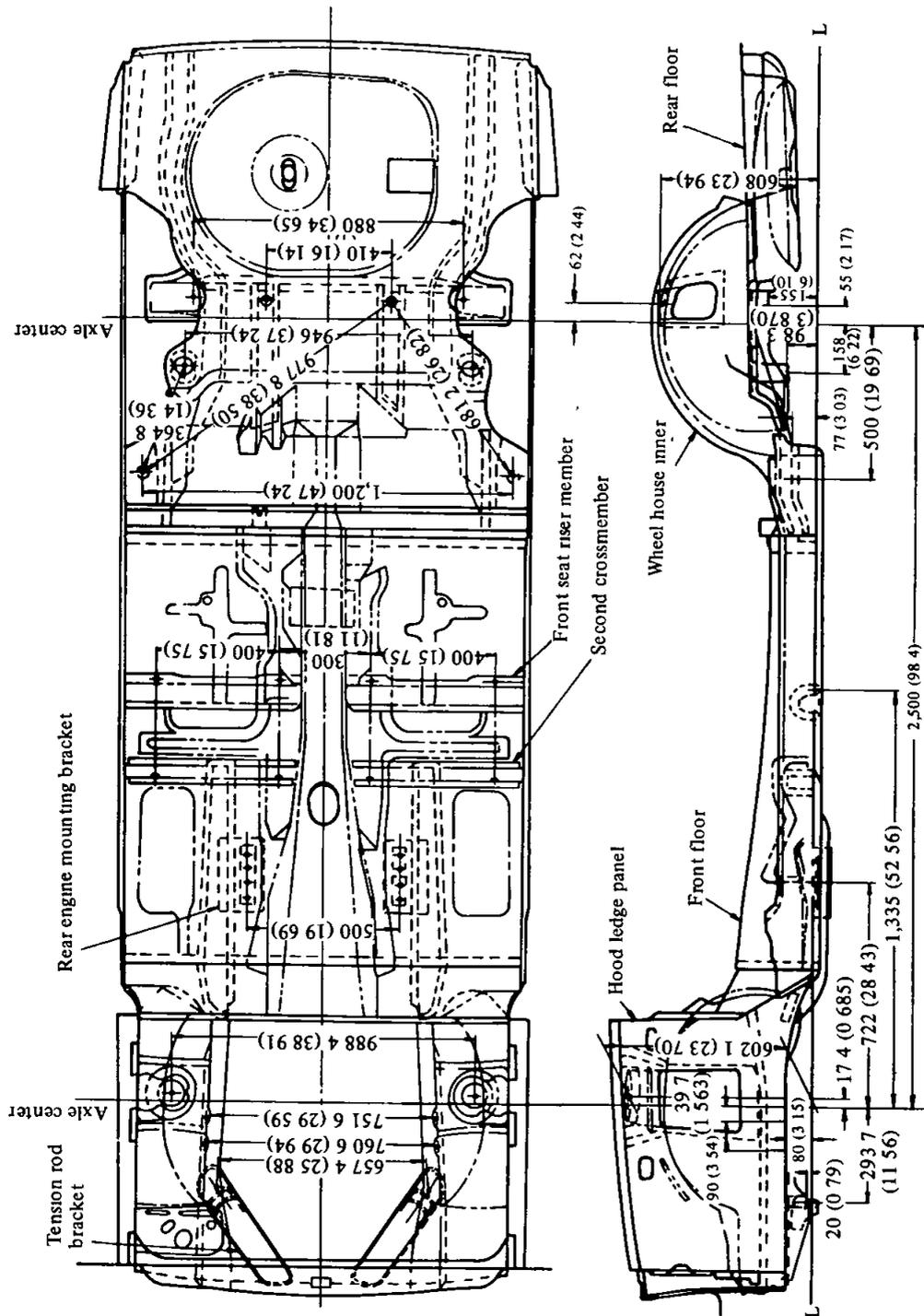
BODY

as an initial reference point. If a rare situation should exist where all of these locations are not suitable as

reference points, repair operations should begin with the body floor pan area. All other underbody com-

ponents should be aligned progressively from this area.

Sedan and Hardtop



Unit mm (in)

BF269A

Fig BF-4 Underbody alignment (Sedan and Hardtop)

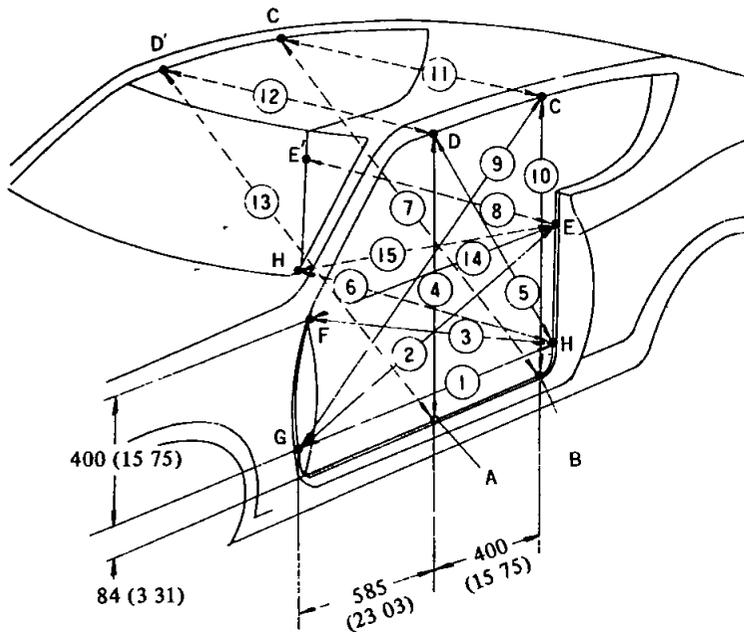
BODY

Hardtop

The body surrounding the door should be repaired according to the

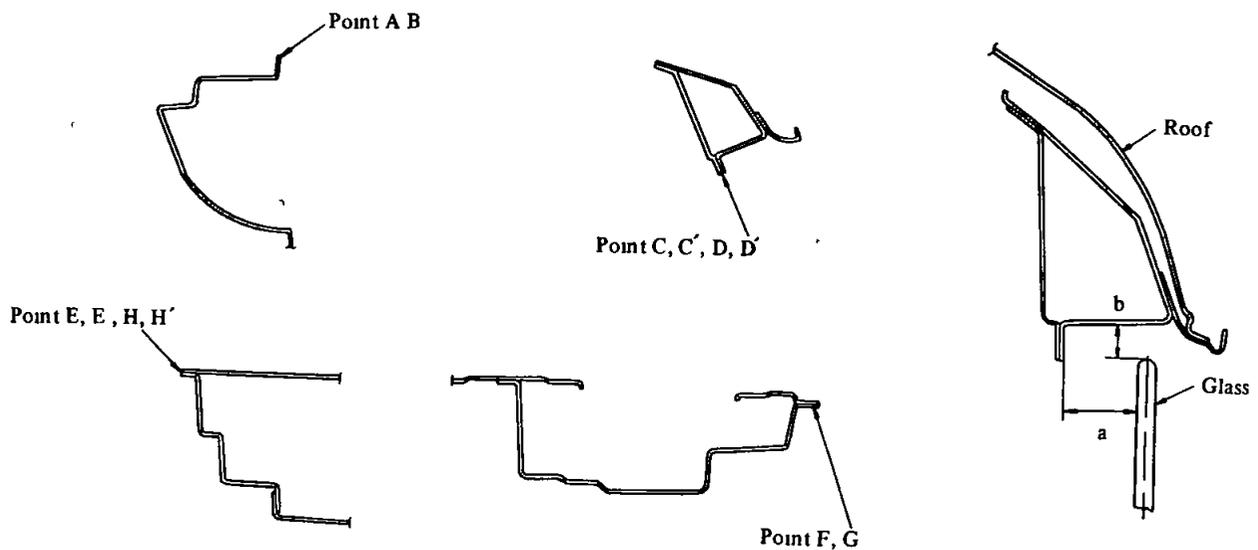
following specifications The body should also be repaired so that the

distance between door glass and the door surrounding panels is equal



No	Measurement position	Length mm (in)
1	G to H	1,046 0 (41 18)
2	G to E	1,137 2 (44 77)
3	F to H	1,090 5 (42 93)
4	A to D	902 2 (35 52)
5	D to H	939 5 (36 99)
6	H to H'	1,336 0 (52 60)
7	B to C	1,516 6 (59 71)
8	E to E'	1,303 0 (51 30)
9	C to G	1,281 5 (50 45)
10	B to C	903 2 (35 56)
11	C to C'	1,116 0 (43 94)
12	D to D'	1,116 6 (43 96)
13	A to D'	1,516 3 (59 70)
14	E to F	1,033 0 (40 67)
15	F to H'	1,374 1 (54 10)

Tolerance error ± 2 mm (0 08 in)

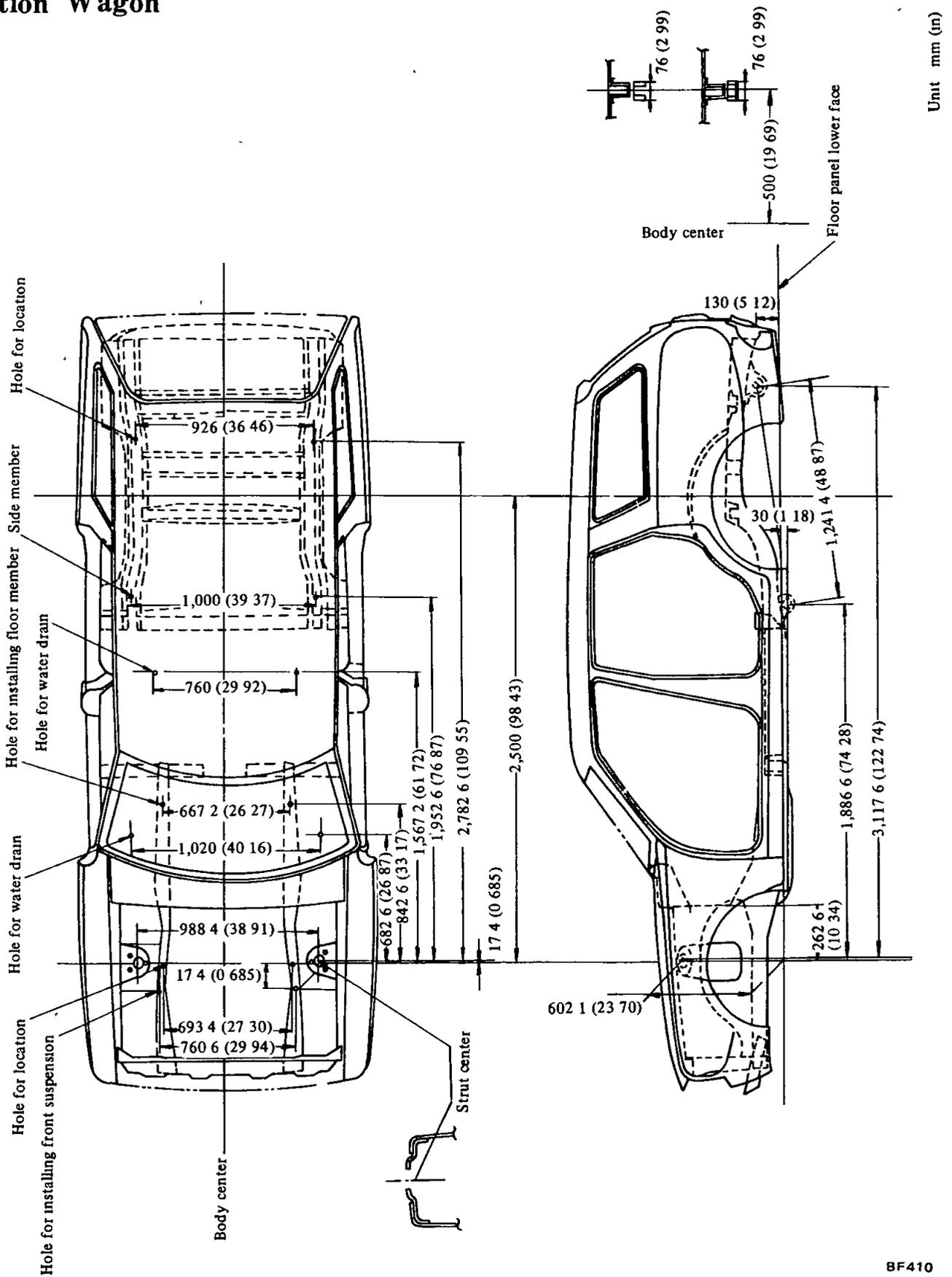


BF409

Fig BF-5 Side body alignment

BODY

Station Wagon



8F410

Fig BF-6 Underbody alignment (Station Wagon)

BODY

BUMPERS

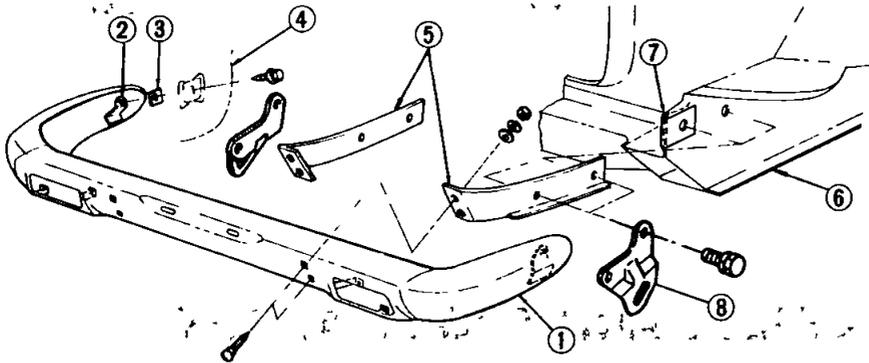
CONTENTS

FRONT BUMPER
Removal
Installation

BF- 9 REAR BUMPER
BF- 9 Removal
BF- 9 Installation

BF- 9
BF- 9
BF-10

FRONT BUMPER Removal

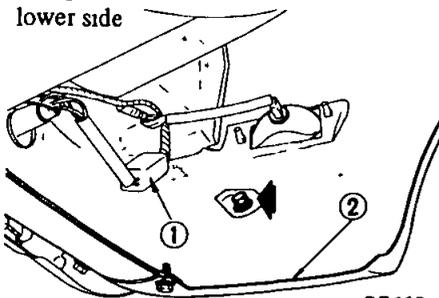


BF423A

- | | |
|-----------------------------|---------------------|
| 1 Front bumper | 5 Front bumper stay |
| 2 Front bumper side bracket | 6 Body side member |
| 3 Shim | 7 Spring nut |
| 4 Front fender | 8 Tie-down hook |

Fig BF-7 Exploded view of front bumper

- 1 Disconnect battery ground cable
- 2 Disconnect front turn signal lamp wire connectors
- 3 Remove bolts retaining front bumper side bracket to front fender lower side

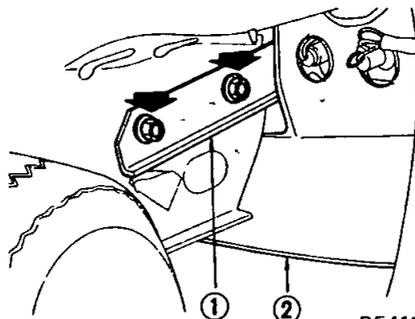


BF412

- | | |
|-------------|----------------|
| 1 Connector | 2 Front fender |
|-------------|----------------|

Fig BF-8 Removing front bumper side bracket installation bolt

- 4 Remove bolts retaining front bumper stay to body side member and draw front bumper out of body



BF413

- | |
|---------------------|
| 1 Front bumper stay |
| 2 Front apron |

Fig BF-9 Removing front bumper stay installation bolts

Installation

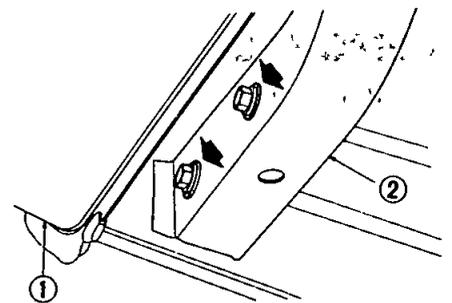
Install front bumper in reverse sequence of removal, noting the following point

Adjust bumper for proper alignment and tighten bolts securing bumper

REAR BUMPER

Removal

- 1 Disconnect battery ground cable
- 2 Disconnect wire connectors of lamp for license number plate. It is not necessary to disconnect them for the Station Wagon
- 3 Remove bolts retaining rear bumper stay to body side member and draw rear bumper out of body



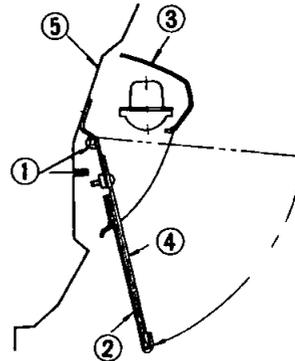
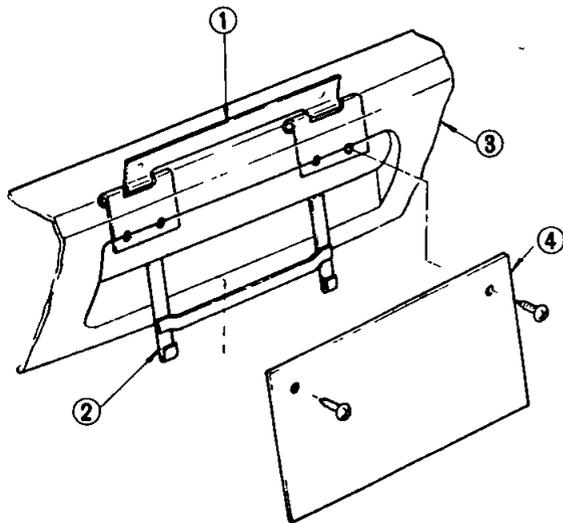
BF414

- | |
|--------------------|
| 1 Rear fender |
| 2 Body side member |

Fig BF-10 Removing rear bumper stay installation bolts

For the Sedan and Hardtop, It is not necessary to remove rear license number plate as it is installed to body independently

BODY



BF415

- 1 License number plate holder
- 2 Hook
- 3 Rear bumper
- 4 License number plate
- 5 Rear panel

Fig BF-11 Exploded view of rear license number plate

Installation

Install rear bumper in reverse sequence of removal

RADIATOR GRILLE AND FRONT APRON

CONTENTS

REMOVAL

BF-10

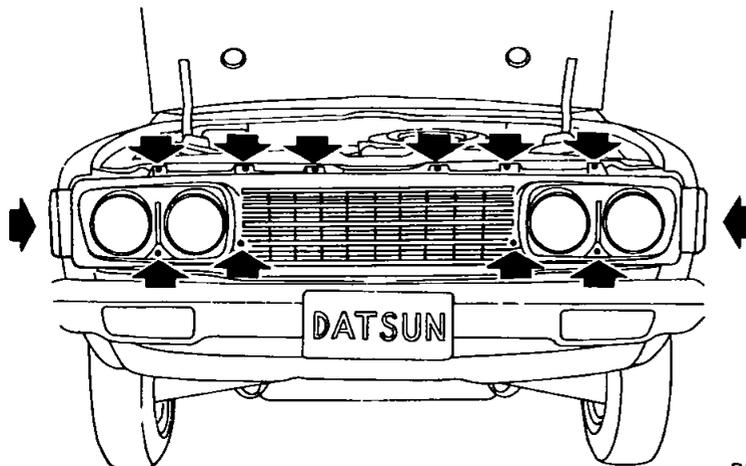
INSTALLATION

BF-11

REMOVAL

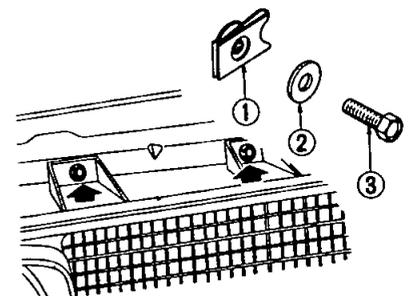
1 Remove front bumper

2 Remove radiator grille attaching screws and remove radiator grille



BF424A

Fig BE-12 Removing screws attaching radiator grille



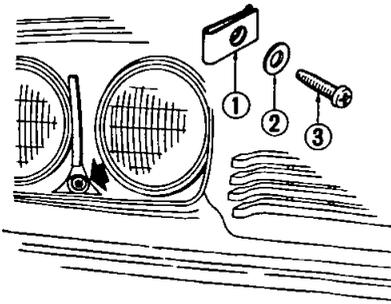
- 1 Spring nut
- 2 Plain washer
- 3 Screw

BF279A

Fig BF-13 Removing upper attaching screw and spring nut

BODY

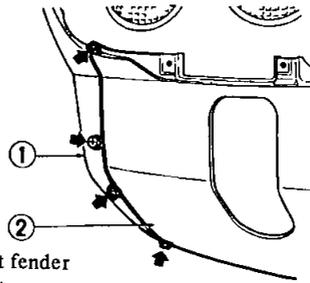
3 Remove screws attaching front apron to front fender



- 1 Spring washer 3 Screw
2 Washer

BF280A

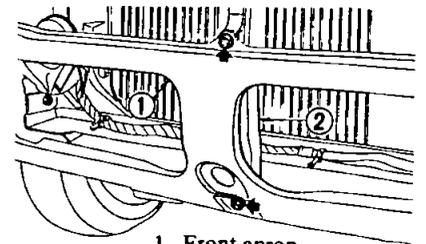
Fig BF-14 Removing lower attaching screw, washer, and spring nut



- 1 Front fender
2 Front apron

BF301A

Fig BF-15 Removing screws attaching front apron to fender



- 1 Front apron
2 Hood lock stay

BF302A

Fig BF-16 Removing screws attaching front apron to hood lock stay

4 Remove screws attaching front apron to hood lock stay and remove front apron

INSTALLATION

Install radiator grille and front apron in reverse sequence of removal

When installing radiator grille, proceed the following manners

1 Install lower center attaching screw first and then install other screws

2 Be careful not to spill brake fluid, engine oil and any other chemical fluids on radiator grille to prevent from damage

FRONT FENDERS

CONTENTS

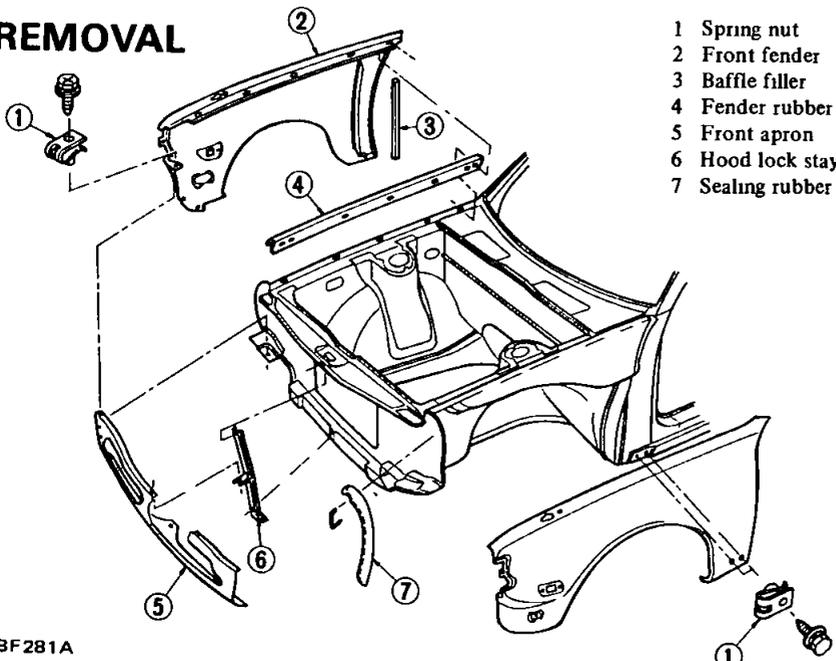
REMOVAL

BF-11

INSTALLATION

BF-12

REMOVAL



BF281A

- 1 Spring nut
2 Front fender
3 Baffle filler
4 Fender rubber
5 Front apron
6 Hood lock stay
7 Sealing rubber

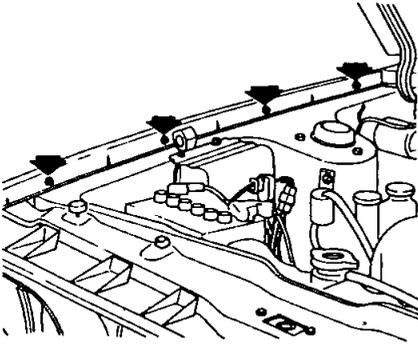
1 Open engine hood and support it in open position with a stay

2 Remove front bumper, side flasher, radiator grille, front apron, windshield wiper blades, cowl top grille and sill mouldings in the order

3 Remove fender attaching screws shown in the following illustrations

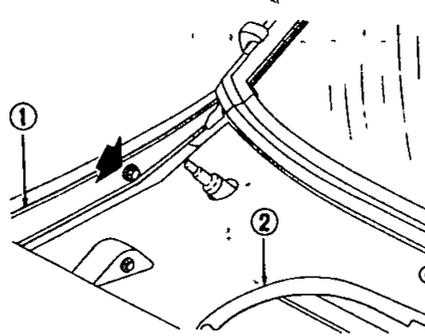
Fig BF-17 Exploded view of front fenders and apron

BODY



BF422

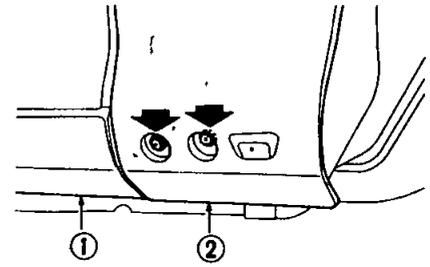
Fig BF-18 Removing screws attaching hood ledge to front fender



BF423

- 1 Front fender
- 2 Cowl top panel

Fig BF-19 Removing screw attaching cowl top panel to front fender



BF424

- 1 Body sill
- 2 Front fender

Fig BF-20 Removing screws attaching body sill to front fender lower end

INSTALLATION

Install front fenders in reverse sequence of removal

ENGINE HOOD AND COWL TOP GRILLE

CONTENTS

ENGINE HOOD

Removal

Installation

HOOD ALIGNMENT

BF-12

COWL TOP GRILLE AND

BF-12

HOOD HINGE

BF-12

Removal

BF-12

Installation

BF-14

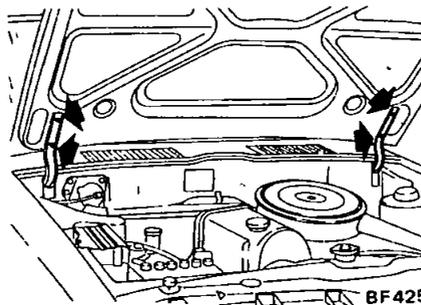
BF-14

BF-14

ENGINE HOOD

Removal

- 1 Open engine hood and protect body with covers to prevent scratch to the paint
- 2 Mark hood hinge locations on hood for proper reinstallation
- 3 Support engine hood with hand and remove bolts securing hood hinge to hood. Be careful not to let hood slip when bolts are removed



BF425

Fig BF-21 Removing bolts attaching hood

- 4 Remove hood from car

Installation

Install hood in reverse sequence of removal

HOOD ALIGNMENT

Hood can be adjusted by bolts attaching hood to hood hinge, hood lock mechanism and hood bumpers. Adjust hood for an even fit between front fenders and for a flush fit with the front of fenders.

BODY

Adjust hood according to the following procedures

1 Adjust hood fore and aft and from side to side by loosening bolts attaching hood to hinge and repositioning hood

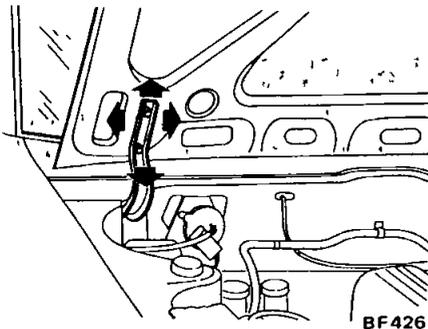


Fig BF-22 Adjusting bolts attaching hood

2 Loosen hood bumper lock nuts and lower bumpers until they do not contact with the front of hood when hood is closed

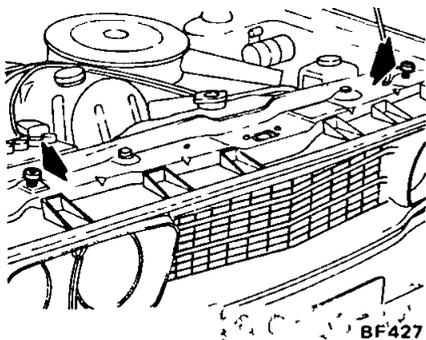
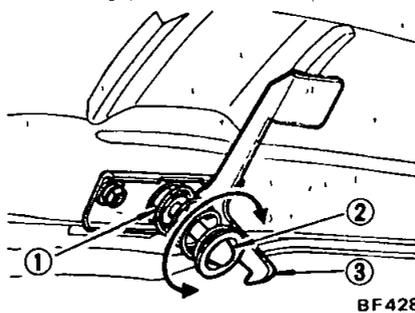


Fig BF-23 Adjusting hood bumper height

3 Adjust hood lock mechanism after hood has been properly aligned. Hood lock male can be moved fore and aft and from side to side to align it with hood lock female by loosening attaching bolts

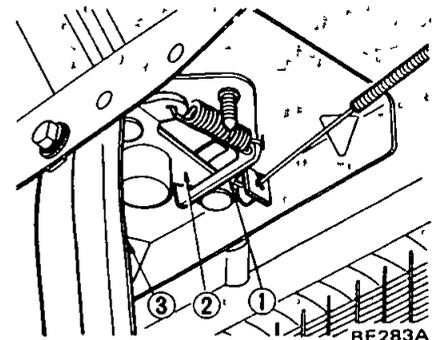
Hood lock male can also be moved up and down

Loosen lock nut of hood lock male part and move it up and down by turning it clockwise or counterclockwise as required



- 1 Lock nut
- 2 Hood lock male
- 3 Safety catch

Fig BF-24 Adjusting hood lock male



- 1 Stopper
- 2 Hood lock female part
- 3 Hood lock stay

Fig BF-25 Adjusting hood lock female part

Notes When inspecting hood lock, note the following

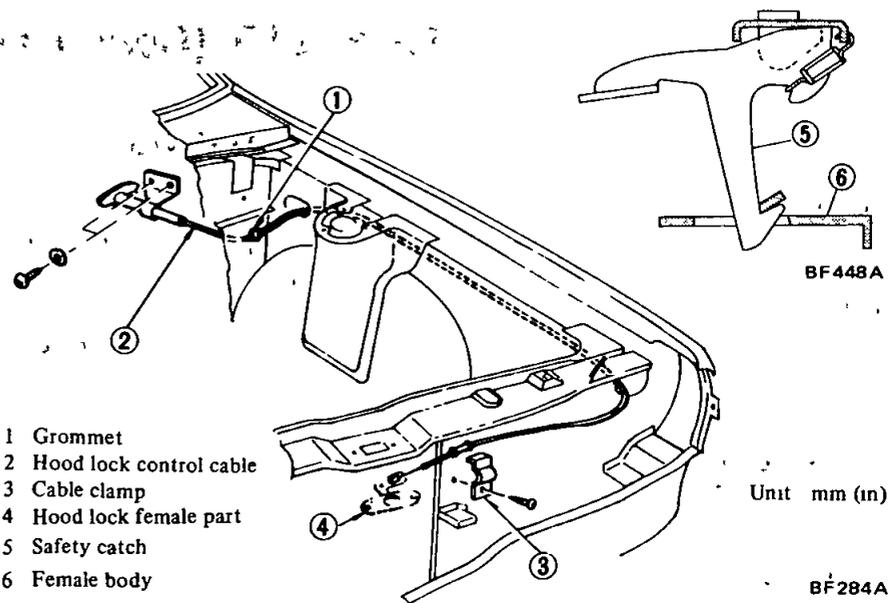
- a Operation of safety catch lever
 - Check caulking portion of safety catch lever for wear
 - Check spring for weakness, and breakdown. If spring is broken, hood may be unlocked and open rapidly during driving
- b Operation of female lever
 - Check female lever for smooth and correct operation
 - Check spring for weakness and breakdown. If female lever does not move smoothly, engaging stroke will be reduced, and it may be disengaged from hood lock

4 Lower engine hood 10 to 30 mm (0.039 to 0.118 in) from the top of front fender by adjusting hood lock male part

5 Raise two hood bumpers until engine hood is flush with fenders

6 Tighten hood lock male part lock nuts after the proper adjustment has been obtained

7 Make sure that female lever locks hood lock male part securely when hood is closed, and also safety catch retains hood properly when hood lock is released (See Figure BF-26)



- 1 Grommet
- 2 Hood lock control cable
- 3 Cable clamp
- 4 Hood lock female part
- 5 Safety catch
- 6 Female body

Unit mm (in)

BF284A

Fig BF-26 Exploded view of hood lock control

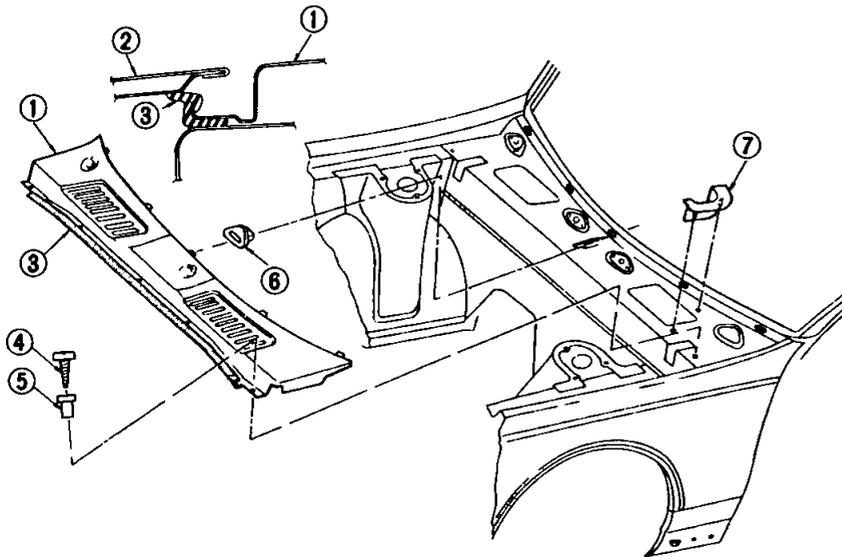
BODY

COWL TOP GRILLE AND HOOD HINGE Removal

- 1 Open engine hood
- 2 Mark hood hinge locations on hood
- 3 Protect body with covers to prevent scratch to the paint

- 4 Remove engine hood from hood hinge
- 5 Remove windshield wiper blades
- 6 Remove attaching screws and grommets which retain cowl top grille front end
- 7 Draw cowl top grille forwards
Cowl top grille can also be removed without removing engine hood

- 8 Remove hood hinge clamp, pull hood hinge pin out of hood hinge bracket and remove hood hinge



- | | |
|---------------------------|-------------------------|
| 1 Cowl top grille | 5 Grommet |
| 2 Engine hood | 6 Cowl top panel cap |
| 3 Cowl top sealing rubber | 7 Cowl top baffle plate |
| 4 Screw | |

BF431

Fig BF-27 Exploded view of cowl top grille

TRUNK LID (Sedan and Hardtop)

CONTENTS

TRUNK LID	BF-14	Removal and installation	BF-16
Removal and installation	BF-14	TRUNK LID LOCK CYLINDER	BF-16
Adjustment	BF-15	Removal	BF-16
TORSION BAR	BF-15	Installation	BF-16
Removal	BF-15	TRUNK LID WEATHERSTRIP	BF-17
Installation	BF-15	Removal and installation	BF-17
TRUNK LID HINGE	BF-16		

TRUNK LID

Removal and installation

- 1 Open trunk lid and cover rear

fenders

- 2 Mark trunk lid hinge locations on trunk lid for proper reinstallation

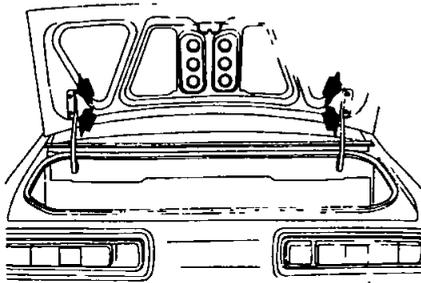
- 3 Support trunk lid by hand and remove bolts attaching trunk lid to hinge and remove trunk lid.

BODY

TORSION BAR

Removal

- 1 Open trunk lid
- 2 Loosen screws attaching trunk room finisher and remove the finisher from the car
- 3 Support trunk lid in the open position and draw end of left torsion bar out of the hole drilled at side panel by hand



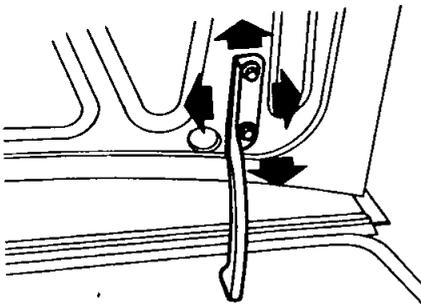
BF 432

Fig BF-28 Removing bolts attaching trunk lid to hinge

- 4 Install trunk lid in reverse sequence of removal

Adjustment

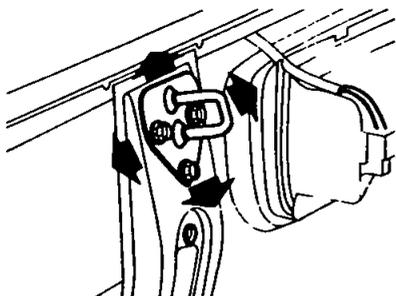
- 1 Loosen bolts attaching trunk lid to hinge and move trunk lid from side to side and fore and aft to align it with striker located on rear panel



BF 433

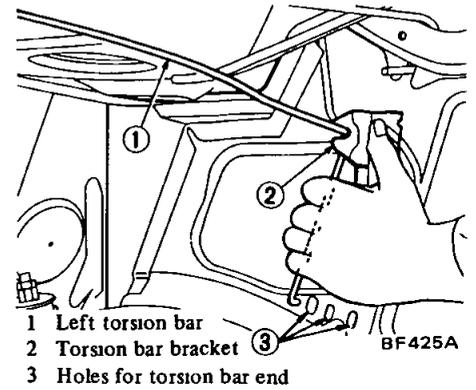
Fig BF-29 Adjusting trunk lid

- 2 To obtain a snug fit between trunk lid and weatherstrip, move striker up or down and from side to side as required



BF 434

Fig BF-30 Adjusting trunk lid lock striker



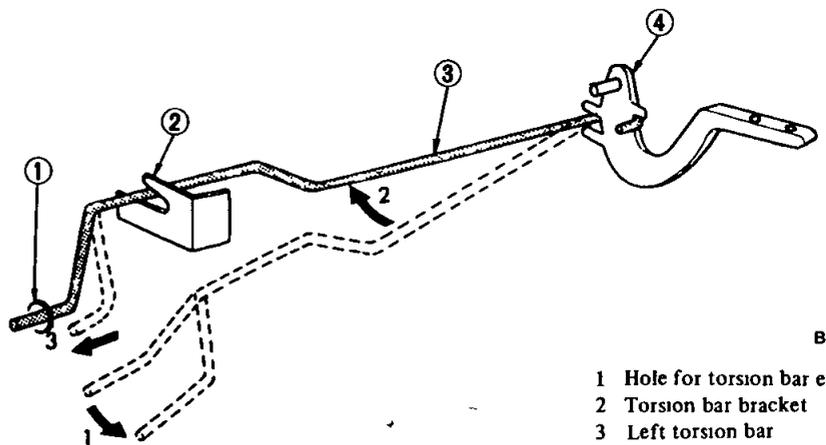
- 1 Left torsion bar
- 2 Torsion bar bracket
- 3 Holes for torsion bar end

BF 425A

Fig BF-31 Drawing out torsion bar end

- 4 Remove torsion bar from torsion bar bracket and hinge
- 5 Remove right torsion bar in the same manner above

Installation



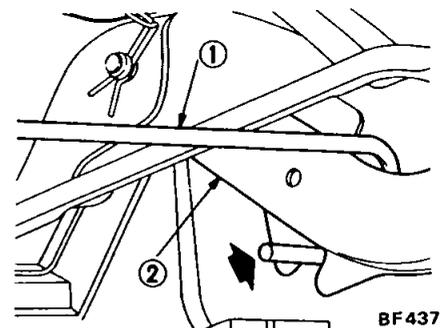
BF 436

- 1 Hole for torsion bar end
- 2 Torsion bar bracket
- 3 Left torsion bar
- 4 Left trunk lid hinge

Fig BF-32 Installing left torsion bar

- 1 Support trunk lid in the open position

- 2 Position the end of right torsion bar first to right trunk lid hinge



BF 437

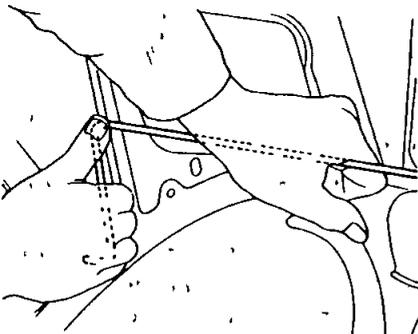
- 1 Torsion bar
- 2 Trunk lid hinge

Fig BF-33 Positioning the end of right torsion bar to hinge

BODY

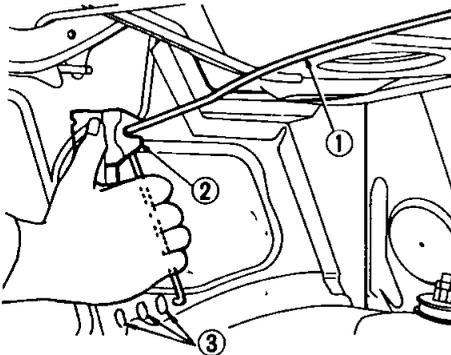
- 3 Twist torsion bar backwards and engage the bar in torsion bar bracket
- 4 Then, insert the end of torsion bar into the hole at side panel

Note Tension of torsion bar can be adjusted properly by selecting holes for torsion bar end



BF438

Fig BF-34 Twisting torsion bar



BF426A

- 1 Right torsion bar
- 2 Torsion bar bracket
- 3 Holes for torsion bar end

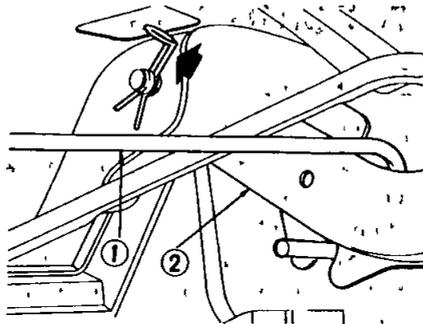
Fig BF-35 Inserting the end of right torsion bar into the hole

5 - Install left torsion bar in the same manner above

TRUNK LID HINGE

Removal and installation

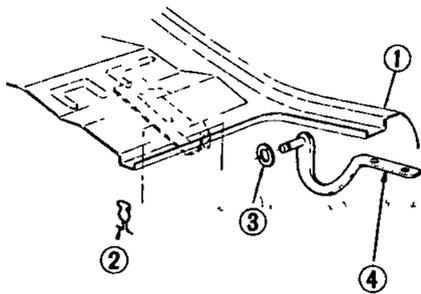
- 1 Open trunk lid and protect body with covers
- 2 Remove trunk lid
- 3 Remove torsion bars
- 4 Pull hinge clamps out of right and left hinges and remove washers and hinges from the car



BF440

- 1 Torsion bar
- 2 Trunk lid hinge

Fig BF-36 Removing trunk lid hinge clamp



BF441

- 1 Rear fender
- 2 Hinge clamp
- 3 Washer
- 4 Trunk lid hinge

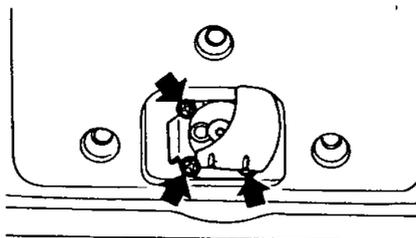
Fig BF-37 Removing trunk lid hinge

5 Install hinges in reverse sequence of removal

TRUNK LID LOCK CYLINDER

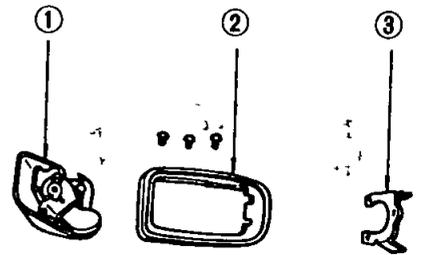
Removal

- 1 Open trunk lid
- 2 Remove trunk lid lock from trunk lid
- 3 Loosen screws retaining cylinder and pull cylinder out of trunk lid



BF442

Fig BF-38 Removing cylinder attaching screws



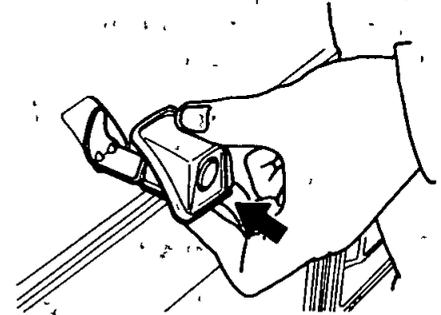
BF443

- 1 Lock cylinder
- 2 Insulator
- 3 Clip

Fig BF-39 Component parts of lock cylinder

Installation

- 1 Assemble lock cylinder and insert and push it into position until clip secures lock cylinder



BF444

Fig BF-40 Pushing lock cylinder into position

BODY

TRUNK LID WEATHERSTRIP

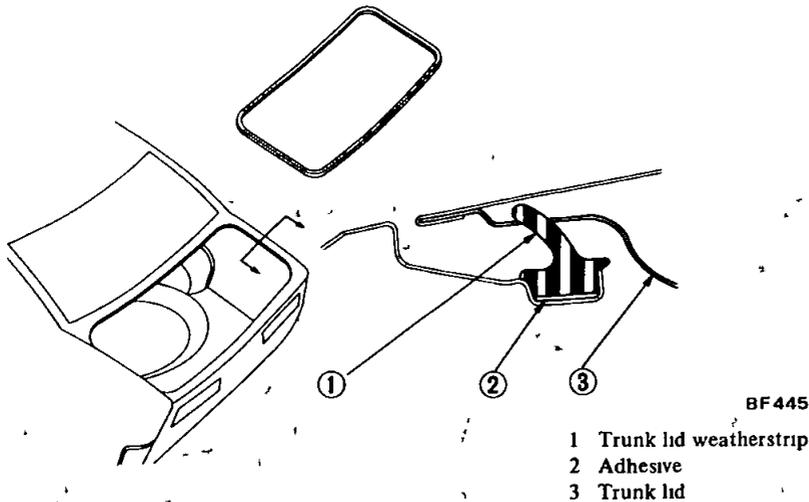


Fig BF-41 Sectional view of trunk lid weatherstrip

Removal and installation

- 1 Remove weatherstrip from body and wipe remaining adhesive away from body with non-lead gasoline, and then wash the surface with water
- 2 Coat body side and weatherstrip with adhesive
- 3 After coating with adhesive, leave it to dry for a while. Install and press the corners first and then press the other parts

TAIL GATE (Station Wagon)

CONTENTS

REMOVAL AND INSTALLATION

TAIL GATE ALIGNMENT

TAIL GATE TORSION BAR

Removal and installation

TAIL GATE HINGE

Removal and installation

BF-17

TAIL GATE LOCK AND

BF-17

STRIKER

BF-18

BF-18

Removal and installation

BF-18

BF-18

Adjustment

BF-18

BF-18

TAIL GATE LOCK CYLINDER

BF-18

BF-18

Removal

BF-18

Installation

BF-18

REMOVAL AND INSTALLATION

1 Open tail gate and support it in open position

2 Remove bolts attaching tail gate to tail gate hinge and remove tail gate from the hinge

3 Install tail gate in reverse sequence of removal

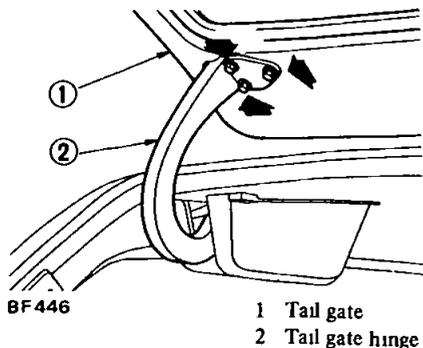


Fig BF-42 Removing tail gate

TAIL GATE ALIGNMENT

Tail gate can be moved up and down and from side to side by loosening bolts attaching tail gate to tail gate hinge. Fore and aft adjustment is obtained by loosening bolts attaching tail gate hinge to body.

Tail gate should be adjusted for an even and parallel fit with the tail gate opening.

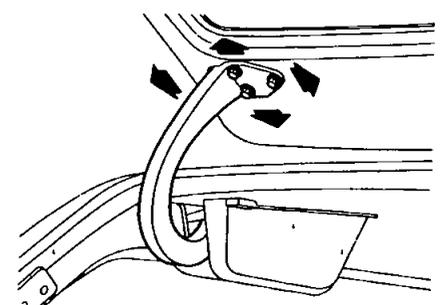
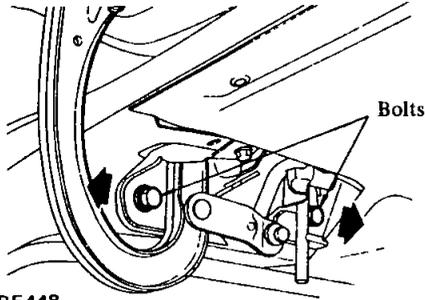


Fig BF-43 Adjusting tail gate up and down and from side to side

BODY



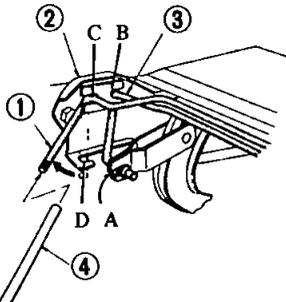
BF44B

Fig BF-44 Adjusting tail gate fore and aft

TAIL GATE TORSION BAR

Removal and installation

- 1 Open tail gate and support it in open position
- 2 Loosen screws attaching tail gate hinge cover and remove it
- 3 Loosen screws attaching head lining rear end and remove head lining rear portion from tail rail panel
- 4 Support tail gate and remove left torsion bar (painted yellow) first from bracket "D" and "C" with a suitable pipe See Figure BF-45



BF449

- 1 Left torsion bar
- 2 Tail gate hinge
- 3 Right torsion bar
- 4 Pipe for removal and installation

Fig BF-45 Removing torsion bars

- 5 Remove right torsion bar in the same manner above
- 6 Install torsion bars in reverse sequence of removal

TAIL GATE HINGE

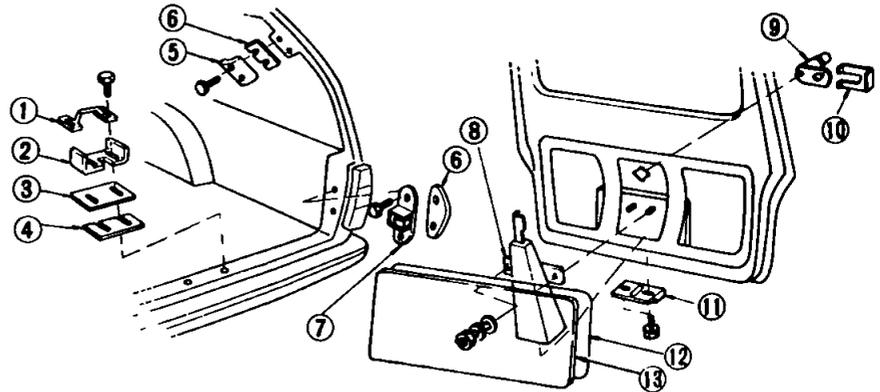
Removal and installation

- 1 Open tail gate and support it in the open position
- 2 Remove tail gate from hinge

- 3 Remove tail gate hinge cover
- 4 Remove head lining rear portion from tail rail panel
- 5 Remove torsion bars
- 6 Loosen bolts attaching hinge and remove it
- 7 Install hinge in reverse sequence of removal

TAIL GATE LOCK AND STRIKER

Removal and installation



BF450

- | | | |
|--------------------|------------------|------------------------------|
| 1 Striker | 6 Shim | 11 Tail gate striker catcher |
| 2 Tab tail striker | 7 Down stopper | 12 Sealing screen |
| 3 Friction plate | 8 Tail gate lock | 13 Tail gate trim |
| 4 Shim | 9 Lock cylinder | |
| 5 Bumper rubber | 10 Clip | |

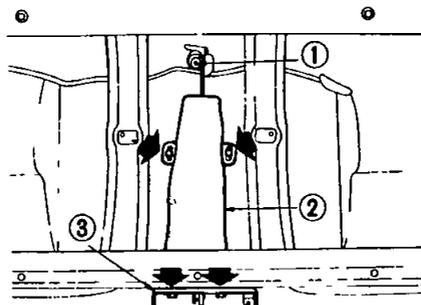
Fig BF-46 Exploded view of tail gate lock and striker

- 1 Open tail gate and support it in the open position
- 2 Remove screws attaching tail gate trim and remove trim and sealing screen from tail gate
- 3 Loosen bolts attaching tail gate lock and remove the lock and striker catcher from tail gate

- 4 Loosen bolts attaching striker and remove it
- 5 Install tail gate lock, striker catcher and striker in reverse sequence of removal

Adjustment

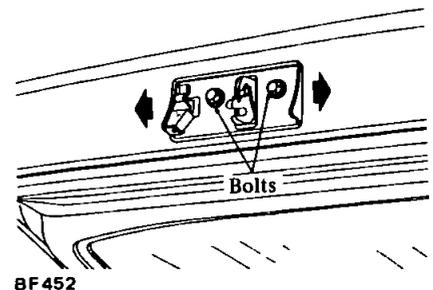
- 1 Striker catcher can be adjusted from side to side, and striker can be adjusted fore and aft. Before adjusting tail gate lock, make sure that tail gate is properly aligned



BF451

- 1 Lock cylinder
- 2 Tail gate lock
- 3 Striker catcher

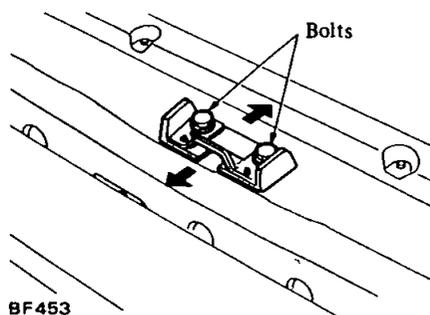
Fig BF-47 Removing tail gate lock



BF452

Fig BF-48 Adjusting striker catcher from side to side

BODY

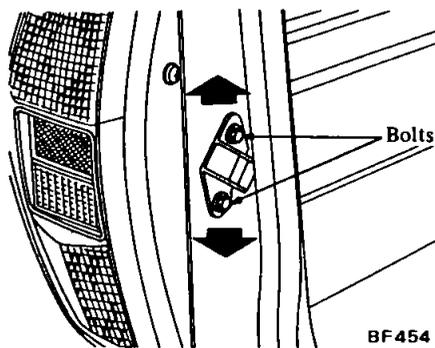


BF453

Fig BF-49 Adjusting striker fore and aft

2 To adjust contact between striker and catcher, loosen attaching bolts and move them as required

3 Loosen down stopper attaching bolts and move down stopper up or down to align it with stopper located on both sides of tail gate
Then, tighten attaching bolts



BF454

Fig BF-50 Adjusting down stopper

TAIL GATE LOCK CYLINDER

Removal

- 1 Open tail gate and support it in open position
- 2 Remove tail gate trim and sealing screen from tail gate
- 3 Pull out spring washer which secures lock cylinder to tail gate outer panel Then, remove lock cylinder from tail gate

Installation

Install lock cylinder in reverse sequence of removal

After installing lock cylinder, make certain that tail gate lock mechanism and lock cylinder are operated properly

DOOR

CONTENTS

REMOVAL AND INSTALLATION

- Front door
 - Rear door
- #### DOOR ALIGNMENT
- #### DOOR TRIMS
- Removal
 - Installation
- #### DOOR LOCK AND STRIKER
- Removal and installation
 - Adjustment
- #### DOOR LOCK CYLINDER
- Removal and installation

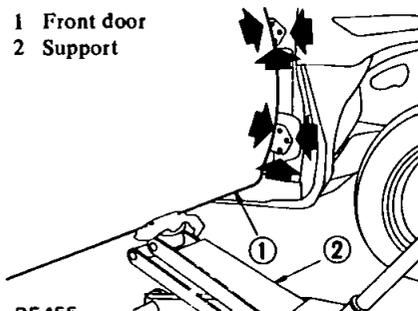
BF-19	DOOR WINDOW GLASS AND	
BF-19	REGULATORS	BF-22
BF-20	Front door	
BF-20	(Sedan and Station Wagon)	BF-22
BF-20	Front door (Hardtop)	BF-24
BF-20	Rear door (Sedan and Station Wagon)	BF-27
BF-20	REAR SIDE WINDOW GLASS	
BF-21	(Hardtop)	BF-28
BF-21	Removal	BF-29
BF-21	Installation and adjustment	BF-29
BF-22	BODY SIDE WEATHERSTRIP (Hardtop)	BF-30
BF-22	Removal	BF-30
	Installation and adjustment	BF-30

REMOVAL AND INSTALLATION

Front door

- 1 Remove front bumper, radiator grille, front apron, windshield wiper blades, cowl top grille and sill moulding in the order
- 2 Remove front fender from the vehicle

- 3 Open front door and place a support under door Use pads between door and a support to protect door
- 4 Loosen bolts attaching door hinge to body and remove front door



BF455

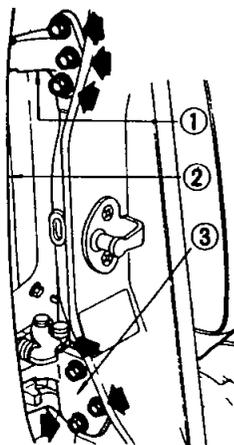
Fig BF-51 Removing bolts attaching door hinge to body

BODY

5 Install front door in reverse sequence of removal

Rear door

- 1 Open front door and keep it open
- 2 Open rear door and place a support under door Use pads between door and support to prevent damage
- 3 Loosen bolts attaching rear door hinges to center pillar and remove rear door



BF456

- 1 Upper hinge
- 2 Rear door
- 3 Lower hinge

Fig BF-52 Removing bolts attaching door hinges to center pillar

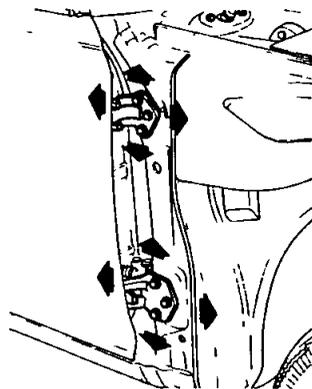
4 Install rear door in reverse sequence of removal

DOOR ALIGNMENT

Proper door alignment can be obtained by adjusting the position of door hinge and door lock striker

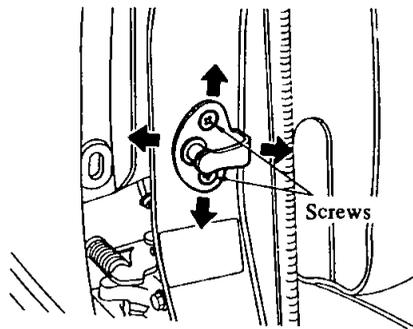
Door hinge and striker can be moved up and down and fore and aft in enlarged holes by loosening attaching bolts Door should be adjusted for an even and parallel fit with the door opening and surrounding body panels

Care should be taken not to distort or mar door or surrounding body panels



BF457

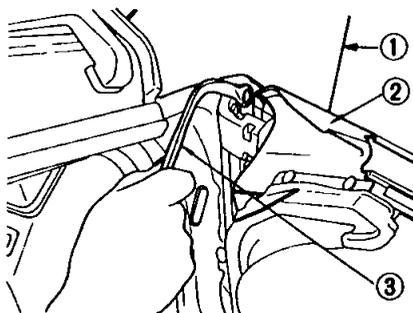
Fig BF-53 Adjusting door hinge



BF458

Fig BF-54 Adjusting door lock striker

Even if front fender is not removed, front door hinge can be adjusted with Door Adjusting Wrench ST08720000



BF459

- 1 Front fender
- 2 Front door
- 3 ST08720000

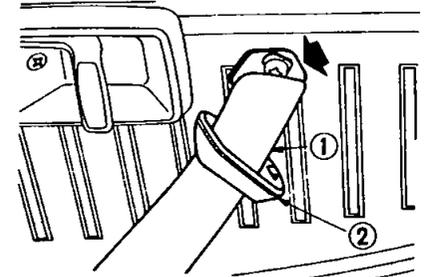
Fig BF-55 Adjusting door hinge

DOOR TRIMS

Removal

- 1 Open door and keep it open
- 2 Raise lock knob, turn it counter-clockwise and remove lock knob and grommet

3 Loosen bolts attaching arm rest and remove it from door

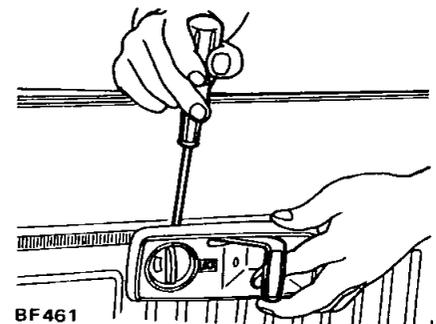


BF460

- 1 Arm rest
- 2 Cover

Fig BF-56 Removing bolts attaching arm rest (Hardtop)

4 Loosen screw attaching inside handle escutcheon and remove door lock dial and escutcheon

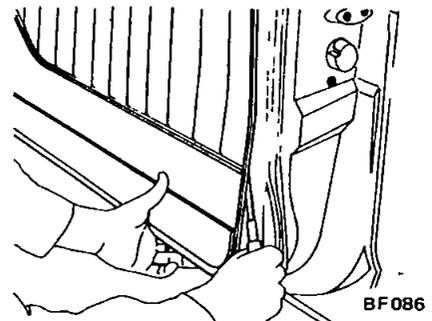


BF461

Fig BF-57 Removing inside handle escutcheon (Hardtop)

5 Remove spring retaining regulator handle and then remove regulator handle and seating washer

6 Remove clips retaining door finisher from door inside panel and remove door finisher



BF086

Fig BF-58 Removing door finisher

7 Remove watertight seal cover from door panel

Installation

Install door trim in reverse sequence of removal

BODY

With door glass up, regulator handle should be installed as shown in Figure BF-59

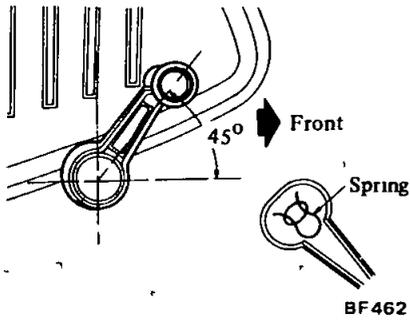


Fig BF-59 Installing regulator handle

DOOR LOCK AND STRIKER

Removal and installation

- 1 Open door and keep it open
- 2 Remove arm rest, inside door handle escutcheon and regulator handle
- 3 Remove lock knob and grommet
- 4 Remove door finisher and water-shield
- 5 Loosen screws attaching inside door handle and remove inside door handle
- 6 Loosen screws attaching remote control and lock knob rod and then remove them

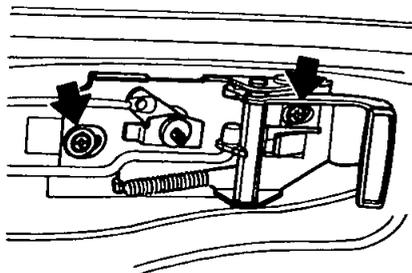


Fig BF-60 Removing inside door handle (Hardtop)

- 7 Loosen nuts attaching outside door handle and remove outside handle

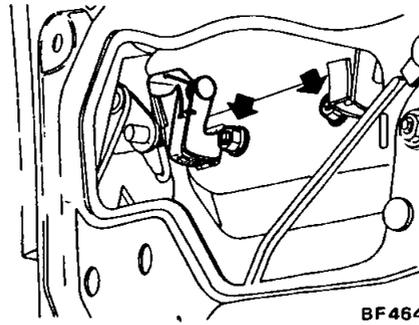
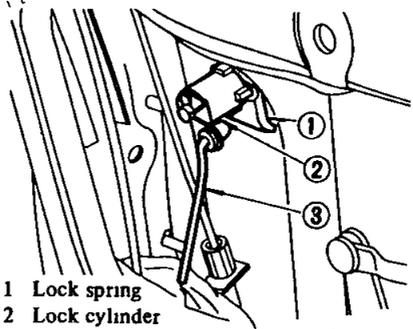


Fig BF-61 Removing nuts attaching outside door handle

- 8 Removing remote control rod from door lock cylinder



- 1 Lock spring
- 2 Lock cylinder
- 3 Remote control rod

Fig BF-62 Removing remote control rod from door lock cylinder

- 9 Loosen screws attaching door lock and remove door lock from door

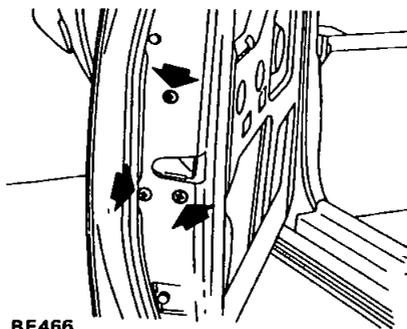


Fig BF-63 Removing screws attaching door lock

- 10 Loosen bolts attaching door lock striker and remove striker from body

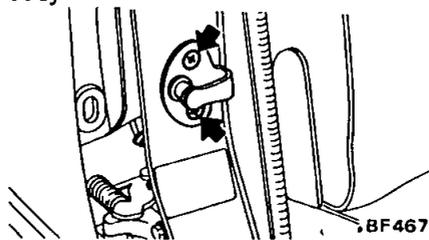


Fig BF-64 Removing door lock striker

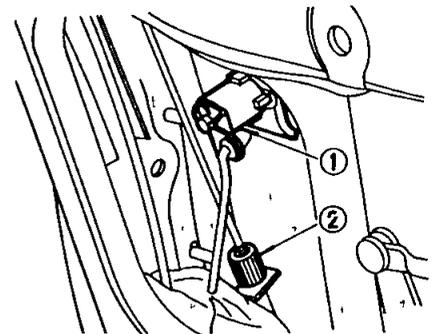
- 11 Install door lock mechanism in reverse sequence of removal

Adjustment

Outside door handle

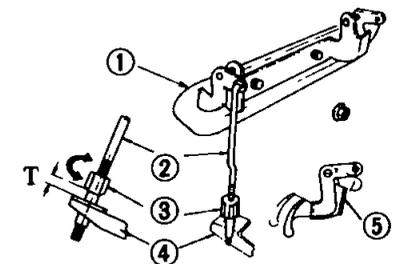
Outside door handle can be adjusted by turning door handle rod nut clockwise or counterclockwise

The proper clearance "T" between door lock lever and adjusting nut is below 1.0 mm (0.039 in). See Figures BF-66 and BF-68



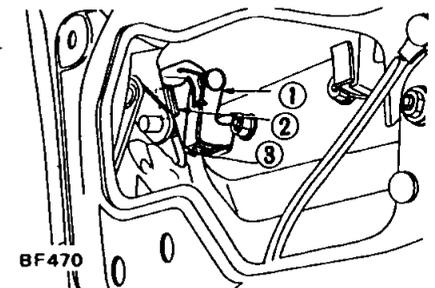
- 1 Door lock cylinder
- 2 Adjusting nut

Fig BF-65 Adjusting handle free play (Front door)



- 1 Outside door handle
- 2 Remote control rod
- 3 Adjusting nut
- 4 Door lock lever
- 5 Stopper

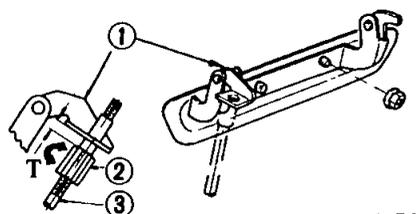
Fig BF-66 Adjusting handle free play (Front door)



- 1 Outside door handle
- 2 Adjusting nut
- 3 Remote control rod

Fig BF-67 Adjusting handle free play (Rear door)

BODY

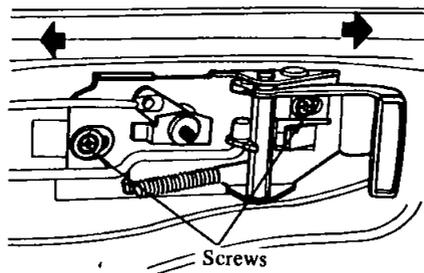


BF471

- 1 Outside door handle 3 Remote control rod
2 Adjusting nut

Fig BF-68 Adjusting handle free play (Rear door)

Do not bend door lock lever connecting to control rod to adjust



BF463

Fig BF-69 Adjusting inside door handle base fore and aft

Inside door handle

To adjust inside door handle free play, move inside door handle base fore and aft in elongated holes as required by loosening attaching screws

The free play should be adjusted below 1.0 mm (0.039 in)

DOOR LOCK CYLINDER

Removal and installation

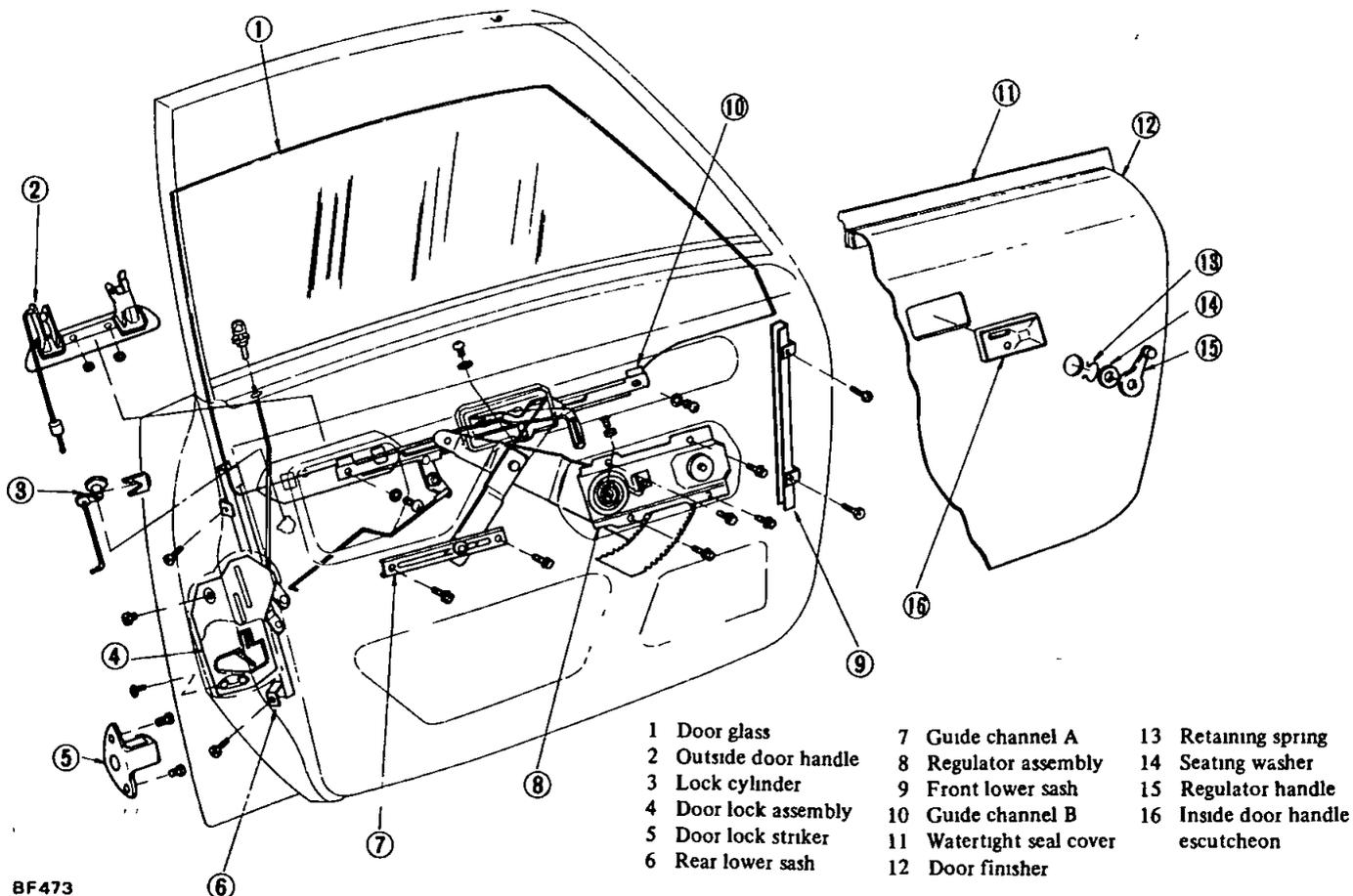
- 1 Remove door finisher and water-tight seal cover
- 2 Disconnect control rod from door lock cylinder
- 3 Remove lock spring securing door lock cylinder to outside door panel and then remove door lock cylinder from door
- 4 Install door lock cylinder in reverse sequence of removal

Door lock striker

Door lock striker can be moved from side to side and up and down to align with door lock latch

DOOR WINDOW GLASS AND REGULATORS

Front door (Sedan and Station Wagon)



BF473

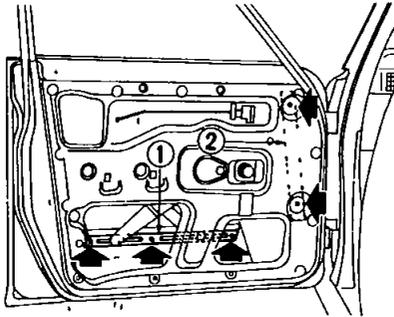
- | | | |
|-----------------------|--------------------------|----------------------------------|
| 1 Door glass | 7 Guide channel A | 13 Retaining spring |
| 2 Outside door handle | 8 Regulator assembly | 14 Seating washer |
| 3 Lock cylinder | 9 Front lower sash | 15 Regulator handle |
| 4 Door lock assembly | 10 Guide channel B | 16 Inside door handle escutcheon |
| 5 Door lock striker | 11 Watertight seal cover | |
| 6 Rear lower sash | 12 Door finisher | |

Fig BF-70 Structural view of front door glass, regulator and door lock mechanism

BODY

Removal and installation

- 1 Lower door glass
- 2 Remove arm rest, regulator handle, inside handle escutcheon, door lock knob, door finisher and watertight cover
- 3 Remove door outside weatherstrip and door lock knob
- 4 Remove screws attaching front lower sash and remove front lower sash from door glass. It is not necessary to draw front lower sash out of door before removing door glass
- 5 Support door glass and remove screws retaining guide channel B to glass back plate



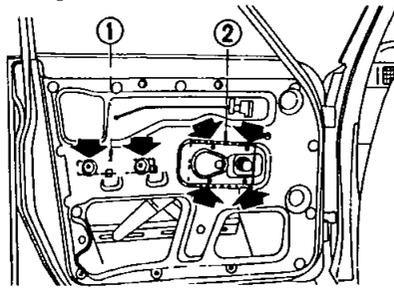
BF474

- 1 Guide channel B
- 2 Front lower sash

Fig BF-71 Removing screws retaining guide channel B to glass back plate and front lower sash

- 6 Draw door glass upwards and remove it from door

- 7 Loosen screws attaching guide channel A and regulator base, remove regulator assembly, and draw it through the lower opening of door inside panel

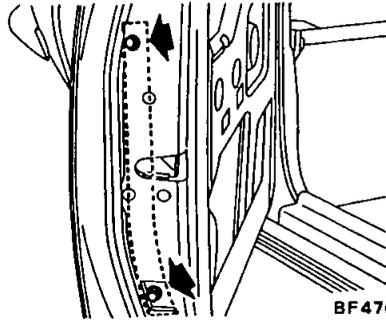


BF475

- 1 Guide channel A
- 2 Regulator base

Fig BF-72 Removing regulator assembly

- 8 Loosen screws attaching rear lower sash and remove rear lower sash



BF476

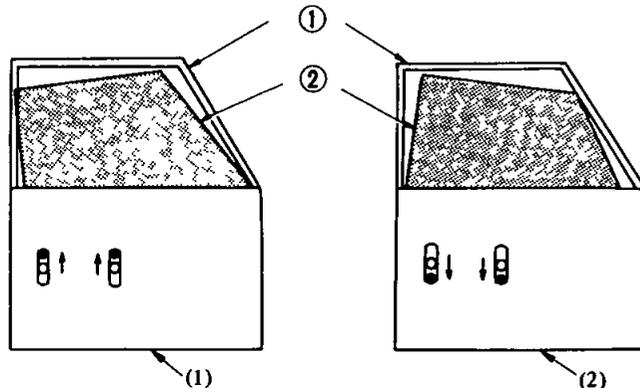
Fig BF-73 Removing rear lower sash

- 9 Remove front lower sash
- 10 Install door glass and regulator in reverse sequence of removal

Adjustment

Door glass alignment can be performed by adjusting front and rear lower sash and guide channel A

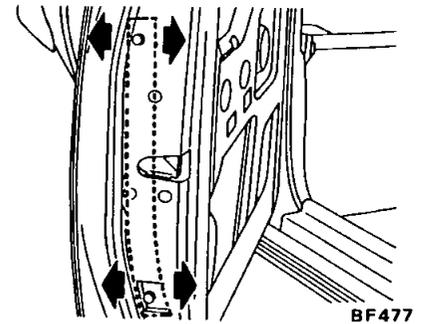
- 1 To obtain proper alignment of glass, temporarily tighten front and rear lower sashes
- 2 With glass in the up position, adjust rear lower sash from side to side to align with glass and front lower sash. Raise and lower glass to assure a good glass fit



BF479

- 1 Door sash
- 2 Glass

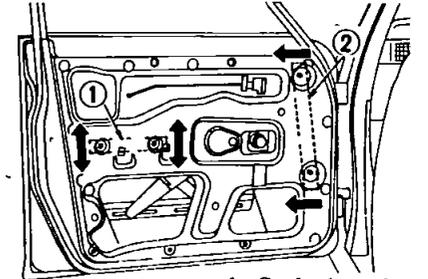
Fig BF-76 Adjusting guide channel A



BF477

Fig BF-74 Adjusting rear lower sash

- 3 With glass up, adjust glass in parallel with the top rail of door sash by moving guide channel A up and down. The sideward free play of glass can be adjusted by moving front lower sash fore and aft



BF478

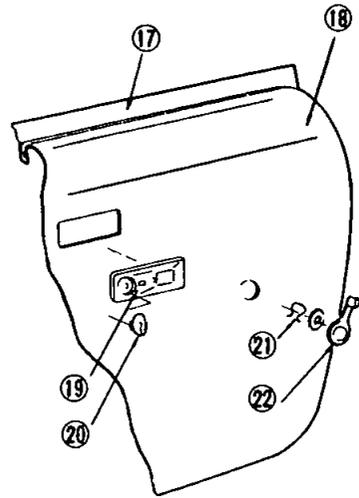
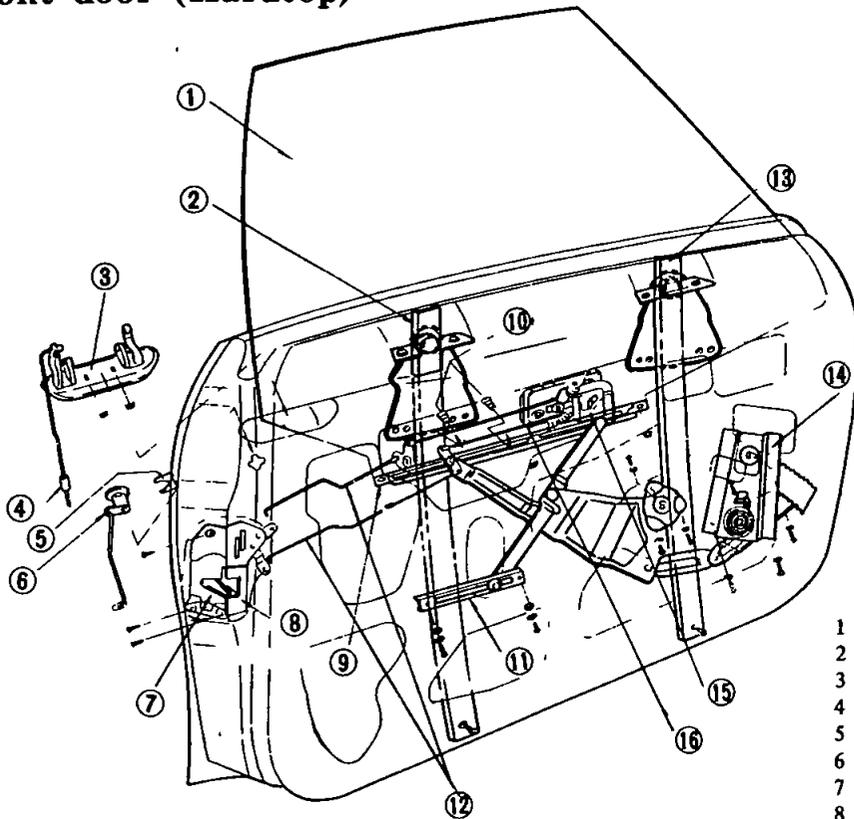
- 1 Guide channel A
- 2 Front lower sash

Fig BF-75 Adjusting front lower sash and guide channel A

Guide channel A adjustments can be performed as follows. When door glass is as in picture (1) of Figure BF-76, move guide channel A up and move it down for the picture (2)

BODY

Front door (Hardtop)



- | | |
|-----------------------|----------------------------------|
| 1 Door glass | 12 Door lock rod |
| 2 Rear guide rail | 13 Front guide rail |
| 3 Outside door handle | 14 Regulator assembly |
| 4 Adjusting nut | 15 Inside door handle |
| 5 Lock spring | 16 Dust cover |
| 6 Lock cylinder | 17 Watertight seal cover |
| 7 Door lock assembly | 18 Door finisher |
| 8 Spacer | 19 Inside door handle escutcheon |
| 9 Guide channel B | 20 Door lock dial |
| 10 Rod holder | 21 Retaining spring |
| 11 Guide channel A | 22 Regulator handle |

BF480

Fig BF-77 Structural view of front glass, regulator and door lock mechanism

Removal

- 1 Lower door glass
- 2 Remove arm rest, regulator handle, inside door handle escutcheon, door finisher and watertight cover
- 3 Remove door outside moulding
- 4 Drive out inner pin of clip retaining outside finish and then remove retaining clip, outside finish and outside weatherstrip from door

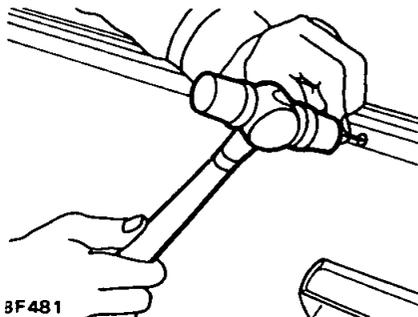
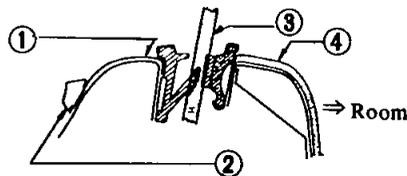


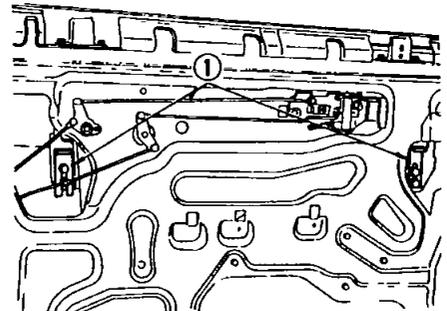
Fig BF-78 Driving out inner pin of outside finish retaining clip



BF482

- 1 Door outside finish
- 2 Door outside moulding
- 3 Glass
- 4 Door finish

Fig BF-79 Sectional view of door outside and inside weatherstrips



BF483

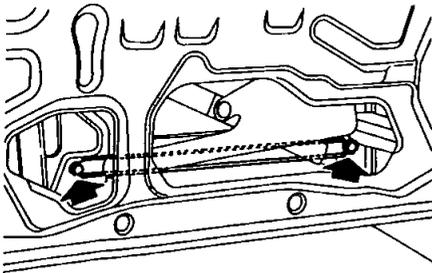
- 1 Glass upper stoppers

Fig BF-80 Removing glass upper stoppers

- 5 Raise door glass until glass upper stoppers appear in the upper openings of inside door panel and remove glass upper stoppers

6 With glass in the full down position, support door glass and remove screws attaching glass back plate to guide channel B

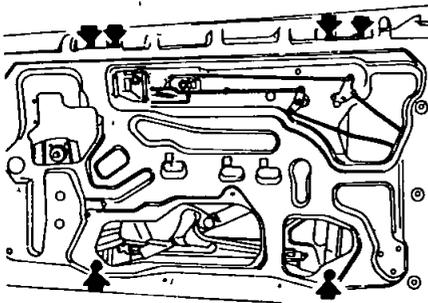
BODY



BF484

Fig BF-81 Removing screws attaching glass back plate to guide channel B

- 7 Raise door glass and draw it upwards
- 8 Loosen bolts adjusting front and rear guide rail and remove guide rails from door

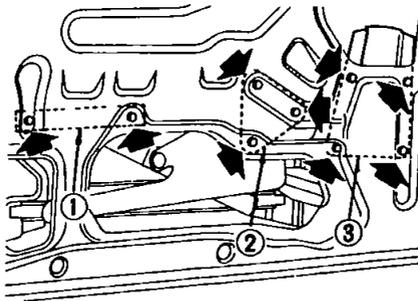


BF485

Fig BF-82 Removing guide rail adjusting bolts

- 9 Remove screws attaching guide channel A, regulator arm base and

regulator base and then remove them through the lower opening of inside door panel



BF486

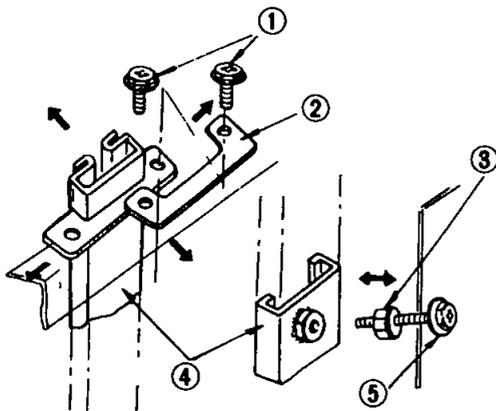
- 1 Guide channel A
- 2 Regulator arm base
- 3 Regulator base

Fig BF-83 Removing regulator assembly

Installation and adjustment

- 1 Install regulator assembly, guide rails, door glass and door lock assembly in reverse sequence of removal
- 2 With door glass up, temporarily tighten upper and lower bolts adjusting guide rail in the neutral position

The neutral position for upper adjusting bolts means the center of the elongated holes. For lower adjusting bolt, tighten it all the way and return nine turns and secure lock nut at that position



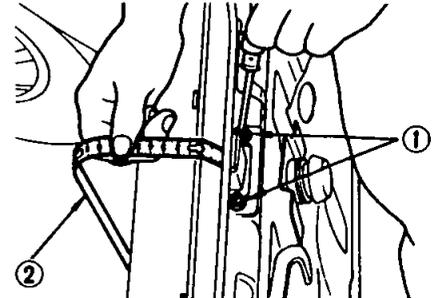
BF487

- 1 Upper adjusting bolts
- 2 Spacer
- 3 Lock nut
- 4 Guide rail
- 5 Lower adjusting bolt

Fig BF-84 Guide rail adjusting mechanism

- 3 Adjust guide rail upper adjusting bolts so that the clearance between door outside panel and glass outside

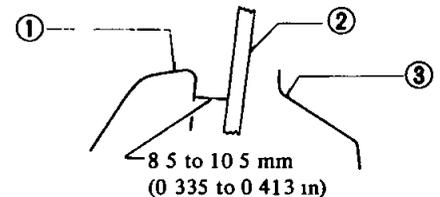
face becomes 85 to 105 mm (0 335 to 0 413 in)



BF488

- 1 Upper adjusting bolts
- 2 Scale

Fig BF-85 Adjusting guide rail upper adjusting bolts



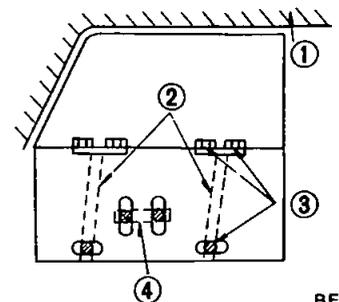
BF489

- 1 Door outside panel
- 2 Glass
- 3 Door inside panel

Fig BF-86 Proper clearance between door outside panel and glass

- 4 Install door outside finish in position and make sure that door outside weatherstrip properly contacts with door glass when door glass is raised and lowered
- 5 Raise door glass to its full up position and align door glass with body weatherstrip to obtain a water-tight seal

Proper glass alignment can be obtained by adjusting guide rails and guide channel A as shown in Figures BF-87 through Figure BF-91

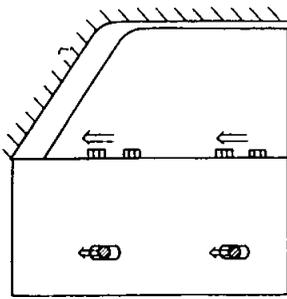


BF490

- 1 Body side weatherstrip
- 2 Guide rail
- 3 Guide rail adjusting bolts
- 4 Guide channel A

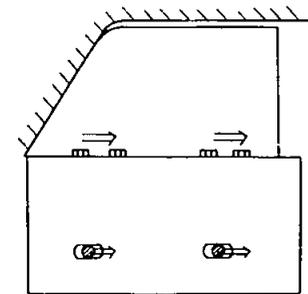
Fig BF-87 Proper glass position

BODY



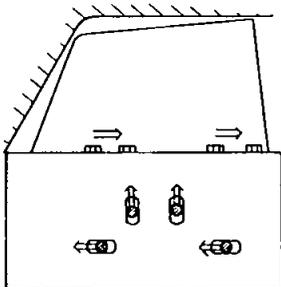
BF491

Fig BF-88 When moving to front



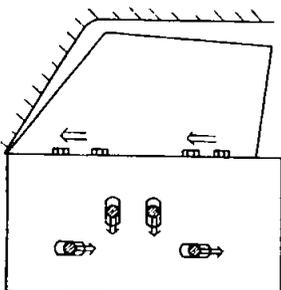
BF492

Fig BF-89 When moving to rear



BF493

Fig BF-90 When moving front up

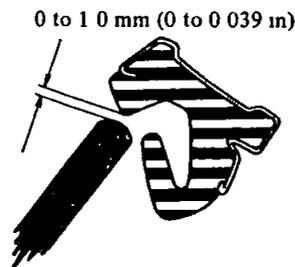


BF494

Fig BF-91 When moving rear up

6 Raise glass to its up position, adjust upper glass stoppers so that the clearance between the top of

glass and body side weatherstrip is 0 to 1.0 mm (0 to 0.039 in)



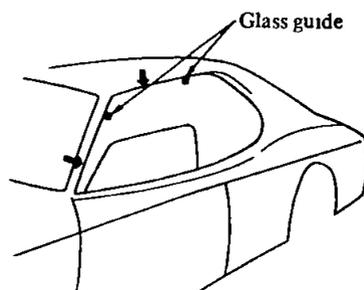
BF495

Fig BF-92 Proper glass clearance when glass stoppers are secured in position

7 With glass up, move top edge of glass to body side weatherstrip to obtain a tight seal by adjusting guide rail lower adjusting bolts evenly

Turn lower adjusting bolts clockwise to release top edge of glass from body side weatherstrip and counterclockwise to tight

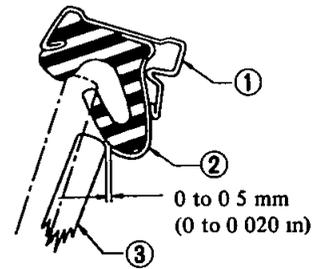
8 Make sure that top edges of glass maintain a tight fit evenly at the positions shown in Figure BF-93



BF496

Fig BF-93 Checking positions for a tight fit

9 Make certain that the clearance between the top of glass and the end of glass guide is 0 to 0.5 mm (0 to 0.020 in) just before door glass contacts door side weatherstrip



BF497

- 1 Weatherstrip retainer
- 2 Glass guide
- 3 Door glass

Fig BF-94 Proper clearance between glass and glass guide

10 Raise and lower door glass to be sure the operation of regulator handle is smooth. The operating force of regulator handle should be performed less than 4 kg (9 lb) at the knob of regulator handle

If proper operating force is still not obtained, adjust regulator mechanism according to the following procedures

- (1) Lubricate guide rollers, guide rails and regulator linkage
- (2) Perform outside and inside door weatherstrip-to-door glass adjustment
- (3) Adjust guide rails in parallel



BF498

Fig BF-95 Improper side view of guide rails

11 Make certain that the location of upper glass stoppers is aligned properly. If necessary, adjust them

12 Install outside door finish and moulding

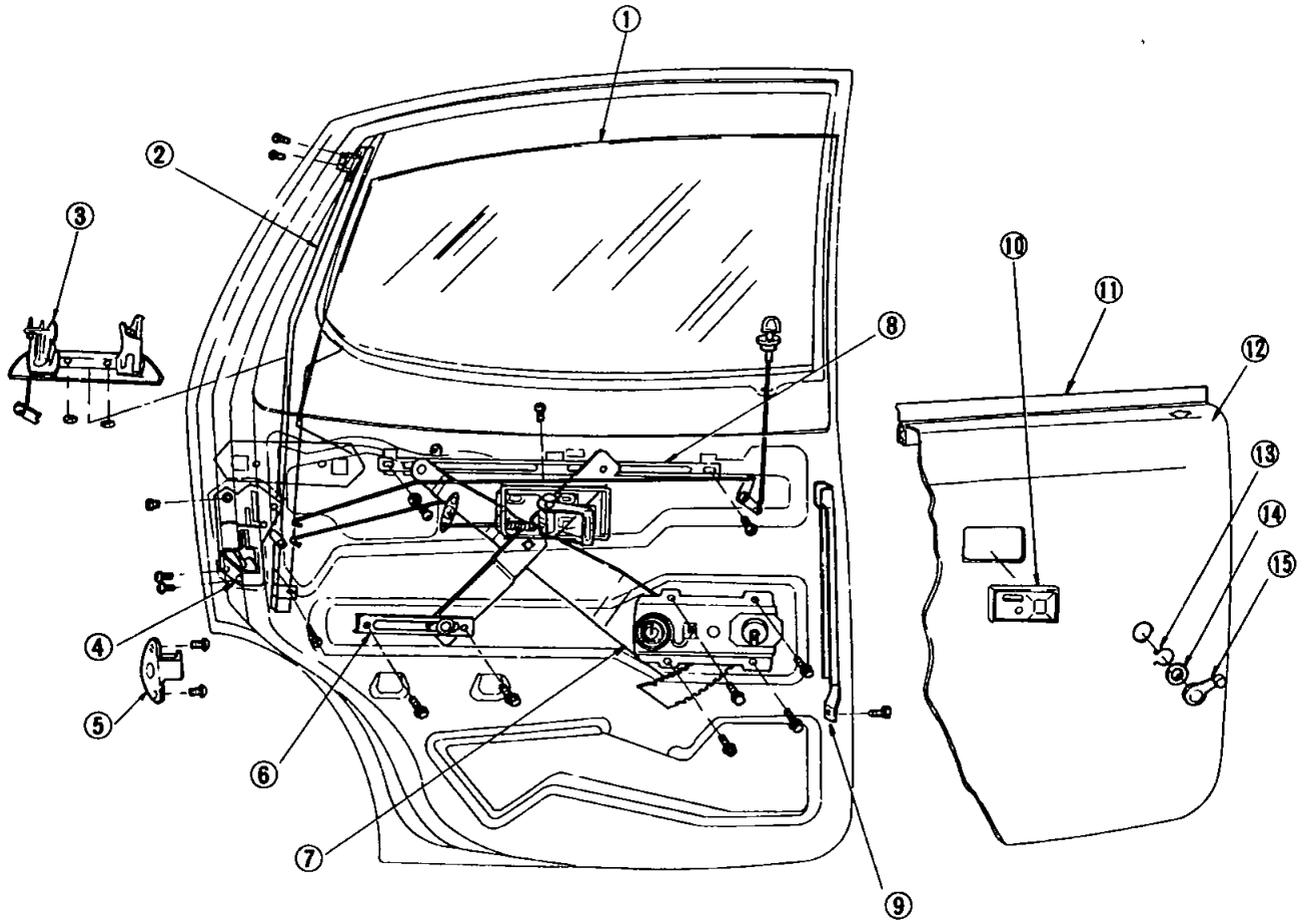
13 Install watertight seal cover and door finisher

14 Install arm rest and regulator handle in position

15 Install door lock (unlocked) with dial facing red mark

BODY

Rear door (Sedan and Station Wagon)



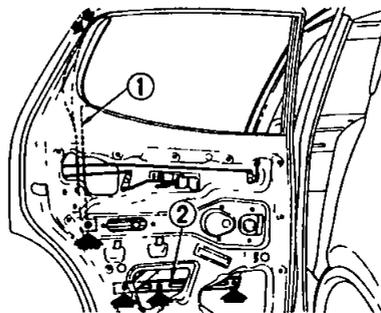
BF499

- | | |
|-----------------------|-----------------------------|
| 1 Door glass | 9 Front lower sash |
| 2 Rear sash | 10 Inside handle escutcheon |
| 3 Outside door handle | 11 Watertight seal cover |
| 4 Door lock assembly | 12 Door finisher |
| 5 Door lock striker | 13 Retaining spring |
| 6 Guide channel A | 14 Seating washer |
| 7 Regulator assembly | 15 Regulator handle |
| 8 Guide channel B | |

Fig BF-96 Structural view of front door glass, regulator and door lock mechanism

Removal

- 1 Lower door glass
- 2 Remove door lock knob and grommet
- 3 Remove arm rest, regulator handle, inside handle escutcheon, door finish and watertight seal cover from door
- 4 Remove door outside weatherstrip and rear sash
- 5 Remove screws attaching guide channel B to glass back plate and draw door glass out of door



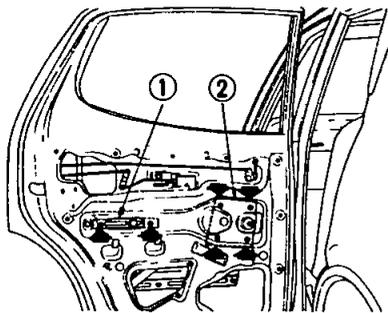
BF500

- 1 Rear sash
- 2 Guide channel B

Fig BF-97 Removing screws attaching rear sash and guide channel B

- 6 Remove rear sash and front lower sash from door
- 7 Loosen screws attaching guide channel A and regulator base, remove regulator assembly, and draw it through the lower opening of door inside panel

BODY



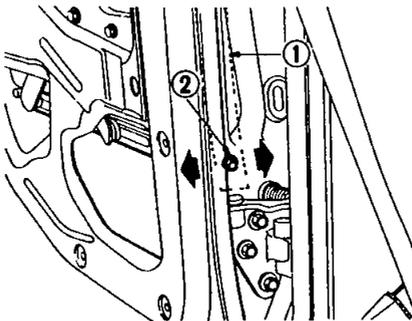
BF501
1 Guide channel A
2 Regulator base

Fig BF-98 Removing regulator assembly attaching screws

8 Install regulator assembly and door glass in reverse sequence of removal

Adjustment

Proper glass alignment can be obtained by adjusting front lower sash, rear sash and guide channel A. Front lower sash must be adjusted in parallel with rear sash by moving from side to side.

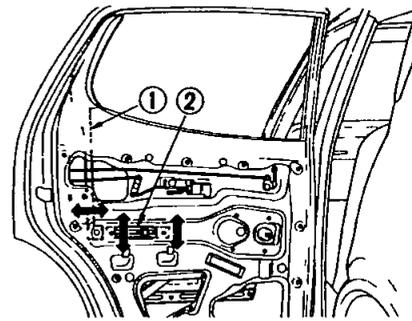


BF502
1 Front lower sash
2 Attaching screw

Fig BF-99 Adjusting front lower sash

To adjust the sideward free play of door glass, move rear sash fore and aft by loosening lower attaching screw.

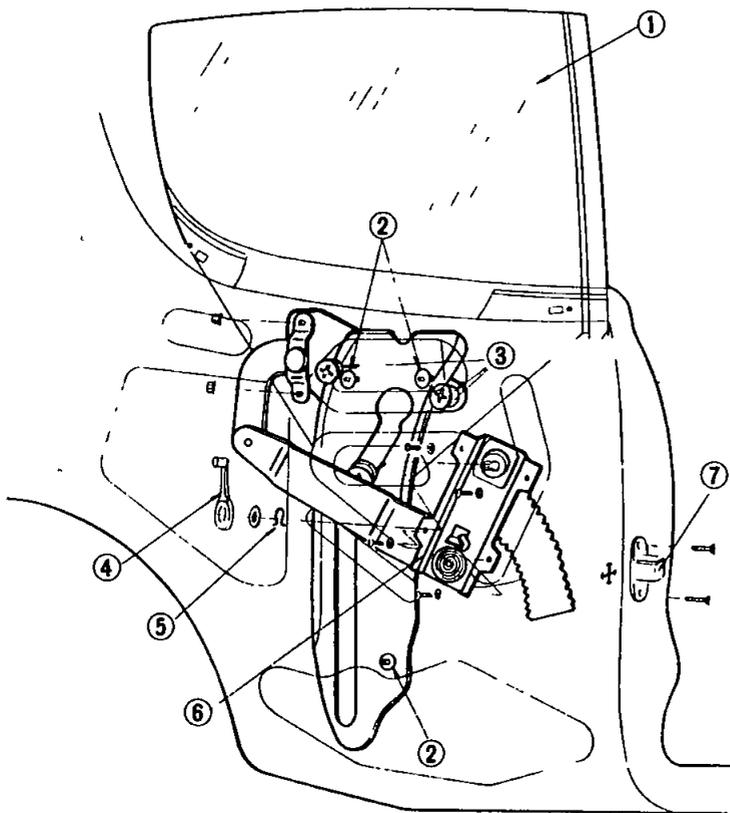
Tilt adjustment of glass can be performed by moving guide channel A up and down.



BF503
1 Rear sash
2 Guide channel A

Fig BF-100 Adjusting rear sash and guide channel A

REAR SIDE WINDOW GLASS (Hardtop)



BF504

- 1 Side window glass
- 2 Guide plate adjusting bolts
- 3 Guide roller
- 4 Regulator handle
- 5 Retaining spring
- 6 Regulator assembly
- 7 Door lock striker

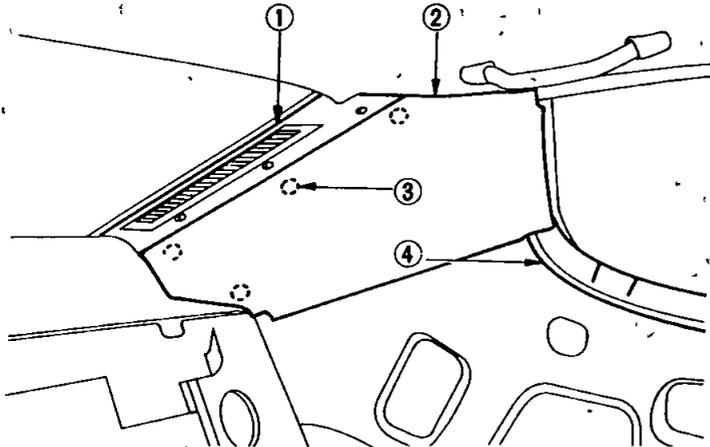
Fig BF-101 Structural view of side window glass and regulator

BODY

Removal

- 1 Remove rear seat cushion and rear seat back from body
- 2 Remove seat belt anchorage if equipped and kicking plate
- 3 Lower side window glass
- 4 Remove arm rest, regulator handle
- 5 Remove rear side finisher and

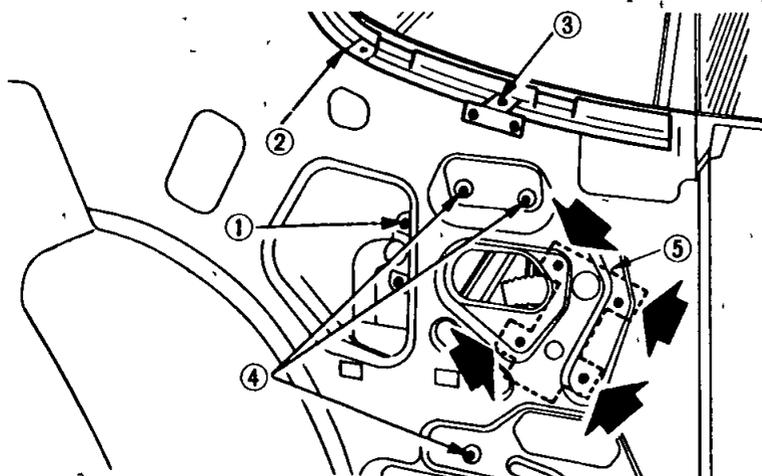
- 6 Remove draughter finisher
- 7 Remove seat belt anchorage if equipped on rear quarter panel
- 8 Remove clips retaining rear corner finisher and remove rear corner finisher
- 9 Remove inner seal and bracket



BF505

- | | |
|------------------------|-------------------|
| 1 Draughter finisher | 3 Retaining clips |
| 2 Rear corner finisher | 4 Inner seal |

Fig BF-102 Removing rear quarter panel inside fittings



BF506

- | | |
|-------------------------|-------------------------------|
| 1 Regulator arm bracket | 4 Guide plate adjusting bolts |
| 2 Inner seal | 5 Regulator base |
| 3 Inner seal bracket | |

Fig BF-103 Removing regulator assembly attaching bolts

- 10 Raise glass until regulator arm bracket appears in the upper opening of inside panel and support glass and remove nuts attaching regulator arm bracket to side window back plate
- 11 Loosen lock nuts of guide plate upper and lower adjusting bolts. Remove adjusting bolts from guide

- 12 Raise window glass with guide panel and remove them toward passenger compartment
- 13 Remove regulator base attaching screws and draw regulator assembly out through lower opening of inside panel

Installation and adjustment

- 1 Install window glass and regulator assembly in reverse sequence of removal
- 2 With window glass down, temporarily tighten guide plate adjusting bolts in the neutral position

The neutral position means the center of the elongated holes

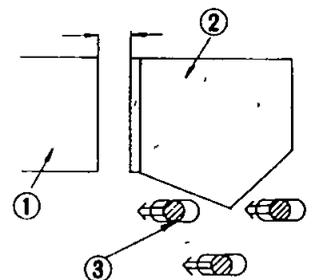
Tighten these adjusting bolts all the way and return eight turns and secure them at that position

- 3 Adjust guide plate upper adjusting bolts to obtain 8.5 to 10.5 mm (0.335 to 0.413 in) clearance from rear fender to window glass outside face

- 4 Install rear fender finish in position and make certain that window glass is properly aligned with weatherstrip when window glass moves up and down

- 5 Close front door and raise door glass and side window glass

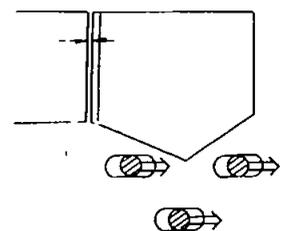
- 6 Align side window glass with door glass and body side weatherstrip by adjusting guide plate adjusting bolts according to the following procedures in Figures BF-104 through BF-107



BF507

- | |
|------------------------------|
| 1 Door glass |
| 2 Side window glass |
| 3 Guide plate adjusting bolt |

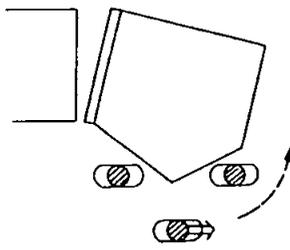
Fig BF-104 When moving to front



BF508

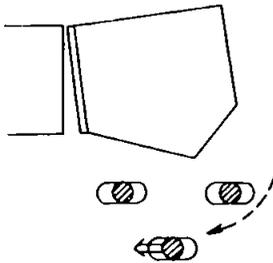
Fig BF-105 When moving to rear

BODY



BF509

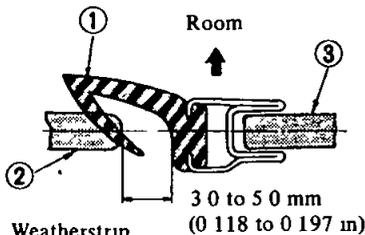
Fig BF-106 When moving rear up



BF510

Fig BF-107 When moving rear down

7 With window glass up, adjust guide plate adjusting bolts so that clearance from window glass to side window weatherstrip is 30 to 50 mm (0 118 to 0 197 in) as shown in Figure BF-108



1 Weatherstrip
2 Door glass
3 Side window glass

BF511

Fig BF-108 Proper clearance from window glass to weatherstrip

8 Align window glass with body side weatherstrip to obtain a tight seal by adjusting guide plate lower adjusting bolt See Door glass adjustment for details

9 Install inner seal and bracket
10 Install rear fender finish
11 Install regulator handle and raise and lower window glass to be sure operation of the handle is smooth The operating force of the handle should be adjusted less than 3 kg (7 lb) at the knob of the handle

handle

See Door glass adjustment for details

12 Install rear corner finisher and draughter finisher

13 Install watertight seal cover and door finisher

14 Install arm rest and regulator handle

15 Position door outside finish and secure it with retaining clips and install door outside moulding

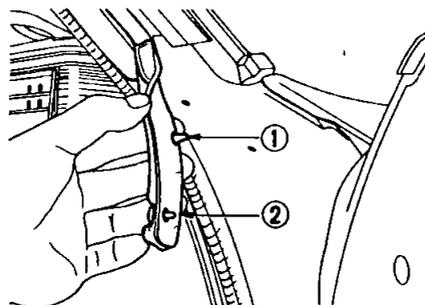
16 Install kicking plate and seat belt anchorage if equipped

17 Install seat back and cushion

BODY SIDE WEATHERSTRIP (Hardtop)

Removal

1 Remove rivets retaining body side weatherstrip to front pillar

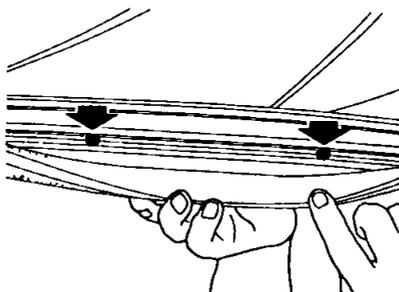


BF512

1 Rivet 2 Weatherstrip

Fig BF-109 Removing body side weatherstrip retaining rivets

2 Remove screws installing weatherstrip retainer to roof side rail

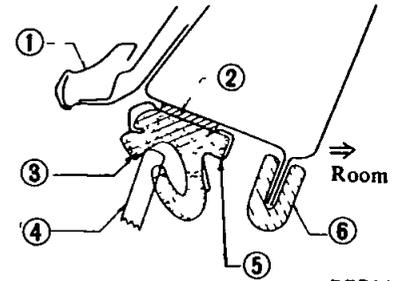


BF513

Fig BF-110 Removing attaching screws of weatherstrip retainer

3 Remove front pillar garnish and then remove body side welts

4 Remove weatherstrip retainer and retainer seal



BF514

1 Roof drip moulding 4 Window glass
2 Weatherstrip retainer 5 Weatherstrip retainer seal
3 Body side weatherstrip 6 Body side welt

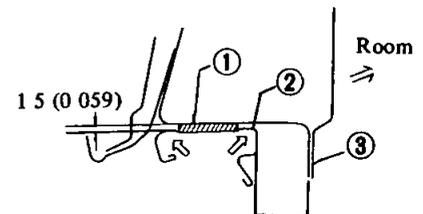
Fig BF-111 Sectional view of body side weatherstrip, retainer seal and body side welt

Installation and adjustment

1 Temporarily attach weatherstrip retainer seal to weatherstrip retainer with an adhesive

2 Position weatherstrip retainer and retainer seal and temporarily tighten attaching screws

3 Make sure that weatherstrip retainer is installed in the position as shown in Figure BF-112 and measure the clearance from body side flange to weatherstrip retainer at the points of (a) through (d) as shown in Figure BF-113 Proper clearance is 13 mm (0 51 in)

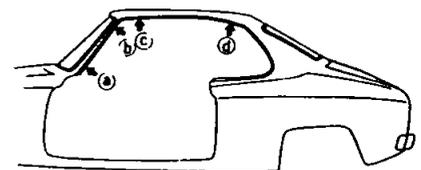


Unit mm (in)

13 (0 51) BF515

1 Weatherstrip 2 Weatherstrip retainer retainer seal 3 Side flange

Fig BF-112 Proper position of weatherstrip retainer



BF516

Fig BF-113 Measuring points of weatherstrip retainer-to-side flange clearance

BODY

4 Tighten weatherstrip attaching screws evenly until the thickness of retainer seal is 1.5 mm (0.059 in)
Make sure that retainer seal is cen-

tered on weatherstrip retainer
5 Install body side weatherstrip
Weatherstrip should be installed evenly without stretching it

6 Install front pillar garnish and body side welts

SEATS

CONTENTS

FRONT SEAT Removal and installation	BF-32	REAR SEAT (Station Wagon) Removal and installation	BF-32
REAR SEAT (Sedan and Hardtop) Removal and installation	BF-32	SEAT BELT ANCHORAGES Installation of child restraint anchorages	BF-32 BF-33

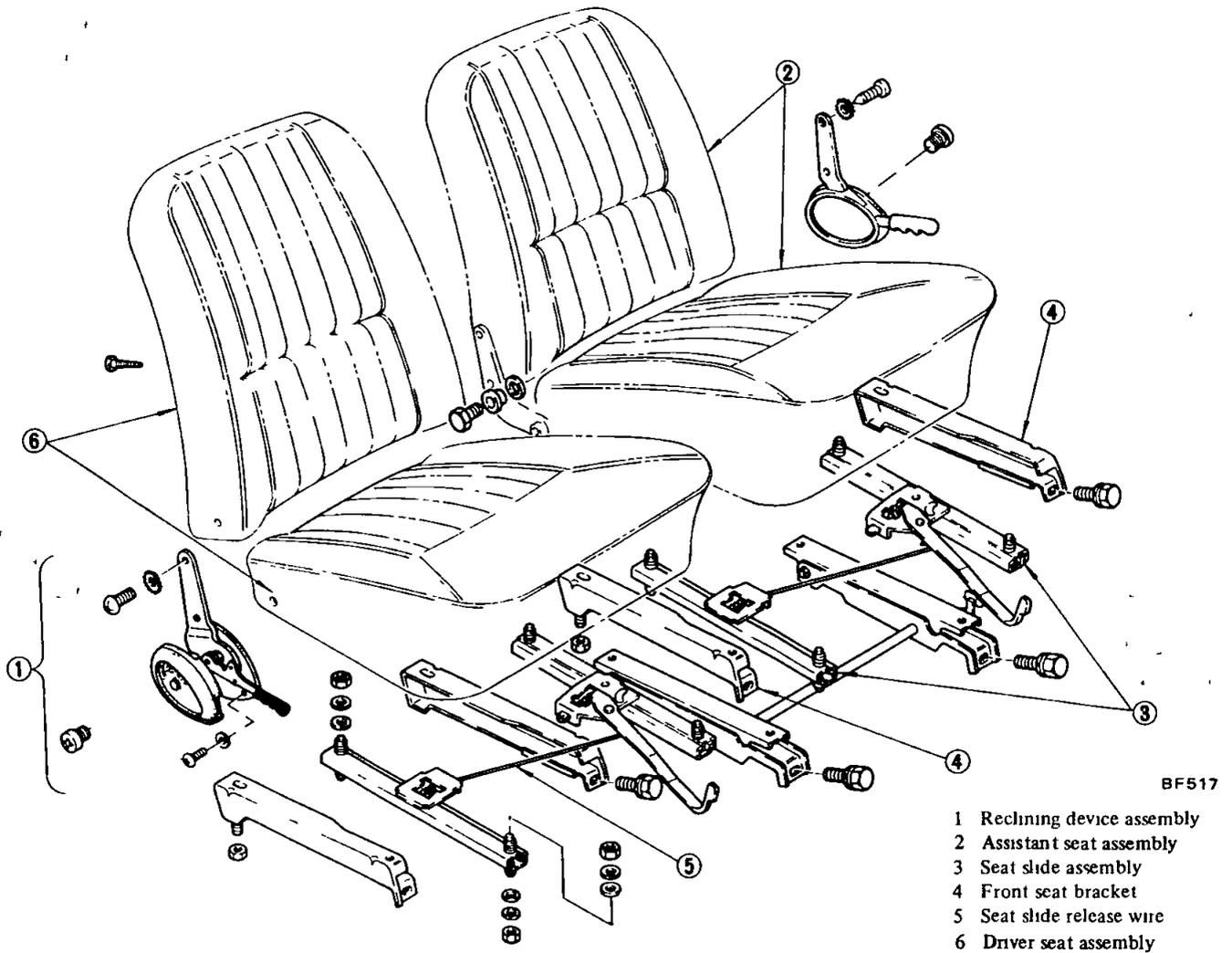


Fig BF-114 Structural view of front seat, seat slide and reclining device

BODY

FRONT SEAT

Removal and installation

- 1 Remove bolts attaching front seat bracket

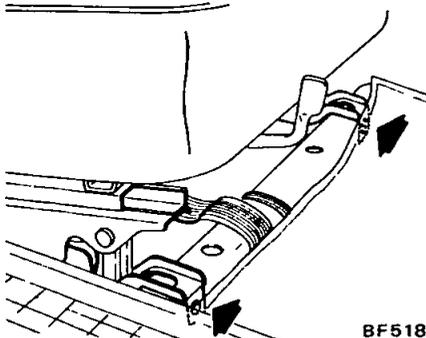


Fig BF-115 Removing front attaching bolts of front seat bracket

- 2 Remove rear attaching nuts from beneath the floor

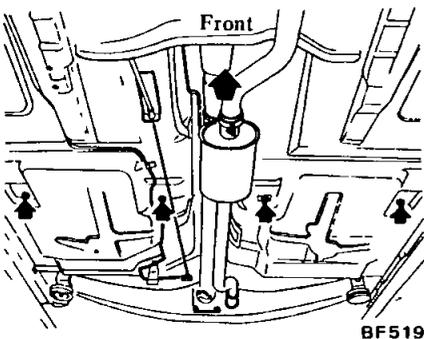


Fig BF-116 Removing attaching nuts of front seat bracket

- 3 Reclining device

Remove reclining device cover and remove screws attaching reclining device to seat and then remove reclining device

- 4 Install front seat assembly in reverse sequence of removal

REAR SEAT (Sedan and Hardtop)

Removal and installation

- 1 Remove screws attaching rear seat front end and remove rear seat cushion
- 2 Remove screws attaching rear seat back and move rear seat back upwards and then remove it from body
- 3 Remove screws attaching head restraint and remove head restraints

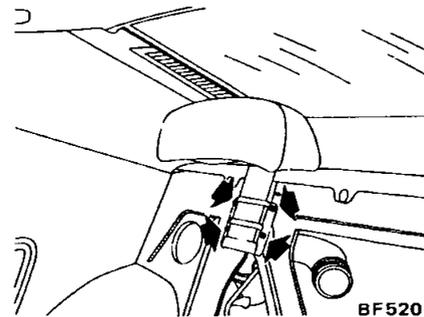


Fig BF-117 Removing head restraint attaching screws

- 4 Install rear seat cushion, rear seat back and head restraints in reverse sequence of removal

REAR SEAT (Station Wagon)

Removal and installation

- 1 Tilt rear seat cushion forwards and remove bolts attaching rear seat hinge and then remove rear seat cushion

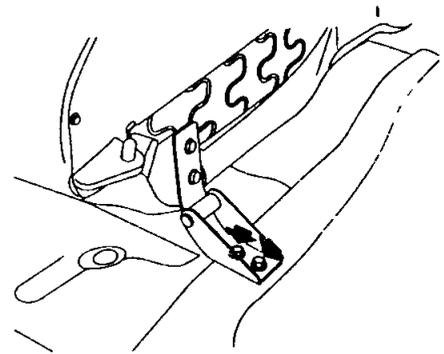


Fig BF-118 Removing rear seat hinge attaching bolts

- 2 Remove rear seat back from catcher and hinge
- 3 Remove rear seat back catcher and hinge bracket from body
- 4 Install rear seat cushion and rear seat back in reverse sequence of removal

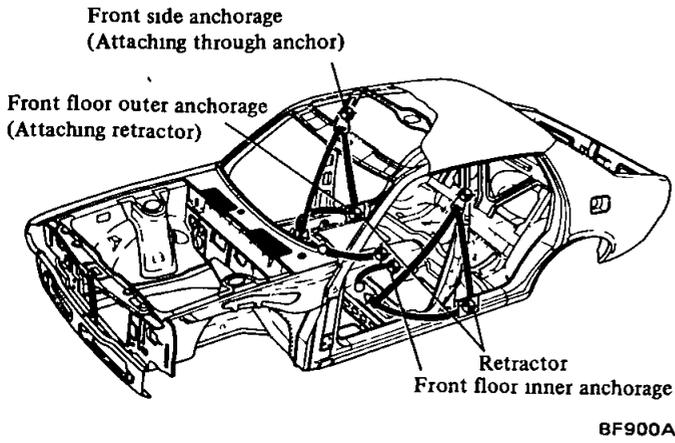
SEAT BELT ANCHORAGES

The seat belt anchorages are as shown in Figures BF-119 through BF-122. Figures BF-121 and BF-122 are the installation procedure of the seat belt anchorages for the child restraint.

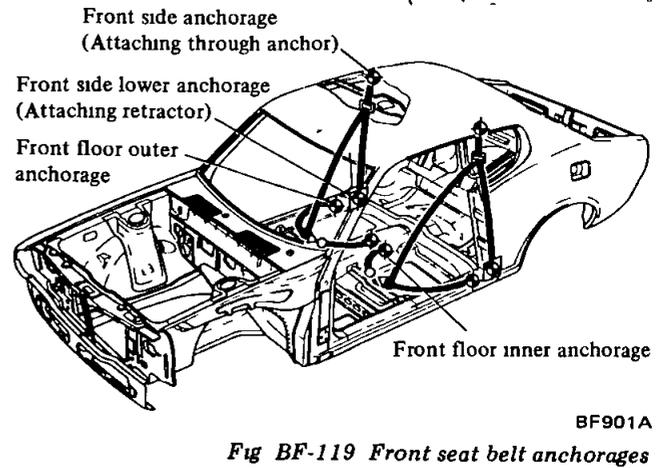
The seat belts should not be installed on any other positions except those designated.

BODY

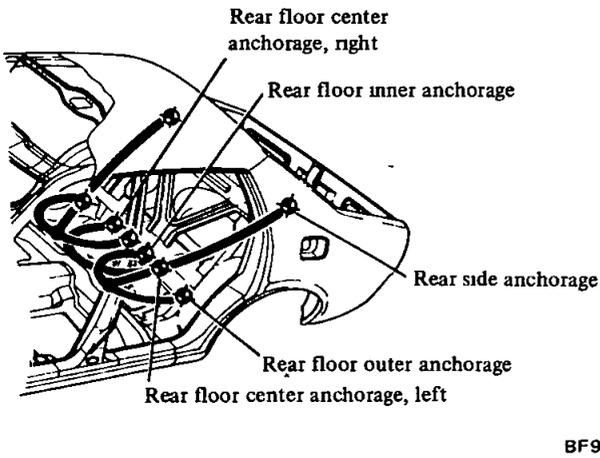
Sedan and Station Wagon



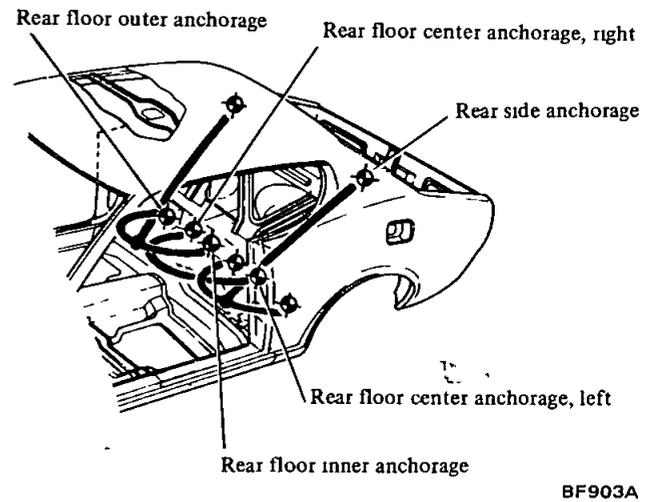
Hardtop



Sedan



Hardtop



Station Wagon

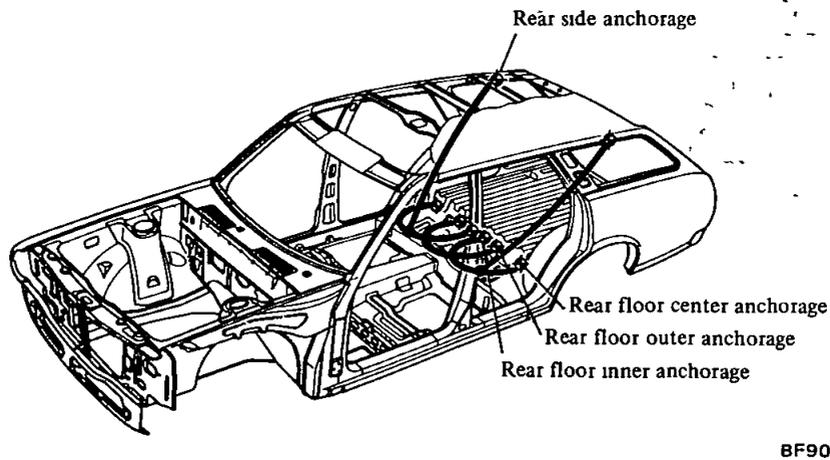
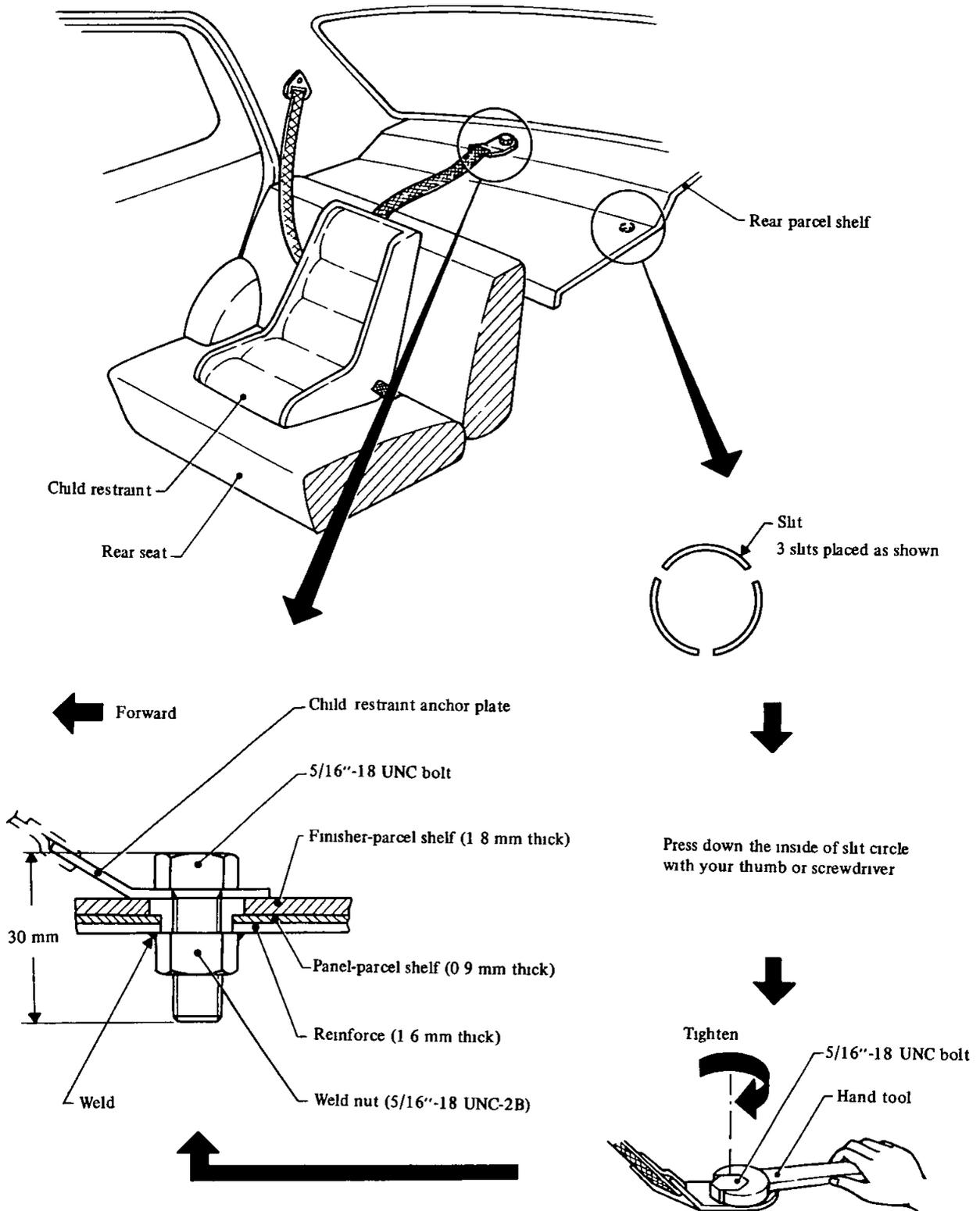


Fig BF-120 Rear seat belt anchorages

BODY

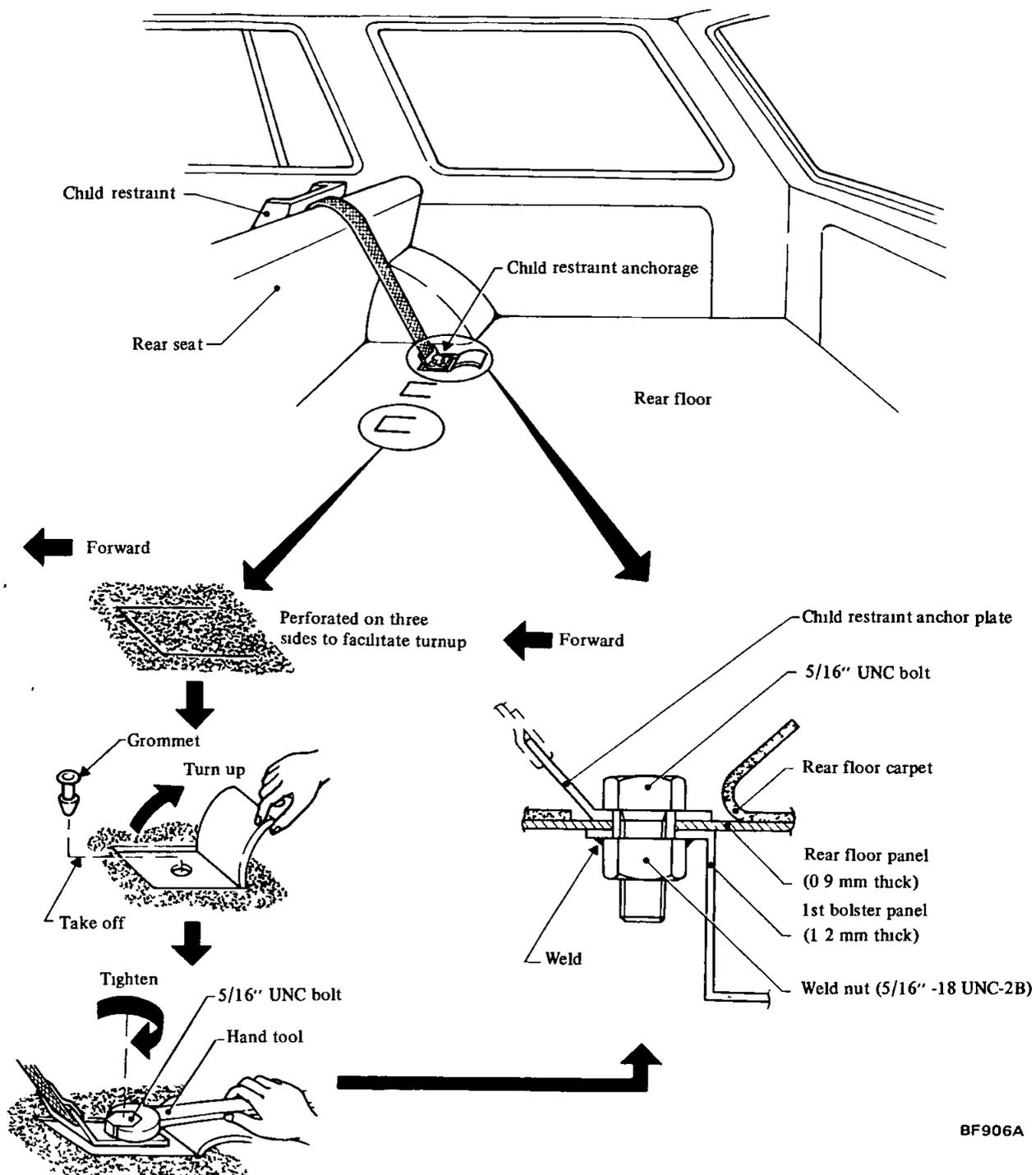
Installation of child restraint anchorages



BF905A

Fig BF-121 Child restraint anchorages (Sedan and Hardtop)

BODY



BF906A

Fig BF-122 Child restraint anchorages (Station Wagon)

WINDSHIELD GLASS (Adhesive caulked glass)

CONTENTS

DESCRIPTION
REMOVAL

BF-36
BF-36

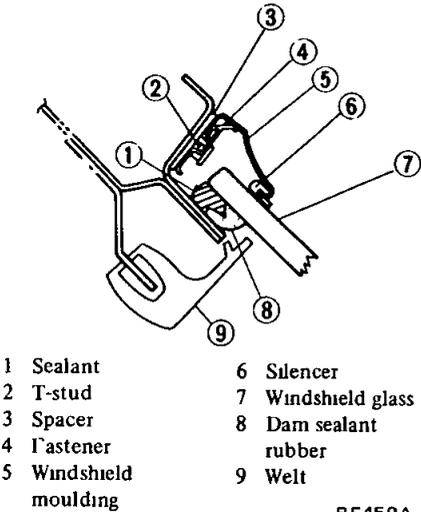
INSTALLATION
REPAIRING LEAKS

BF-36
BF-38

BODY

DESCRIPTION

A pre-mixed, one-part sealant is available as a service part to cement windshield glass to window opening. After using this sealant, the car should be allowed to stand idle for about 24 hours to allow sealant to cure.

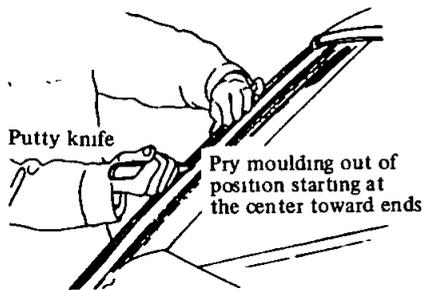


BF450A

Fig BF-123 Sectional view of front adhesive caulked glass

REMOVAL

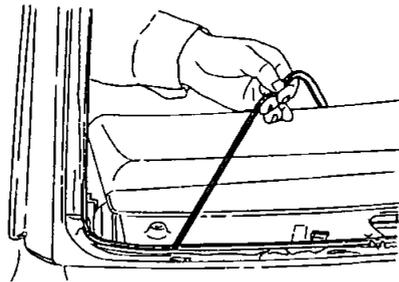
- 1 Protect hood, front fenders, instrument panel and front seats with covers
- 2 Remove windshield wipers, front pillar garnish, instrument garnish and welt (Front windshield glass) Remove rear corner finisher, rear parcel shelf finish welt (Rear window glass)
- 3 Using a putty knife or similar tool, pry mouldings out of position starting at the center and working toward the ends



BF290A

Fig BF-124 Removing moulding

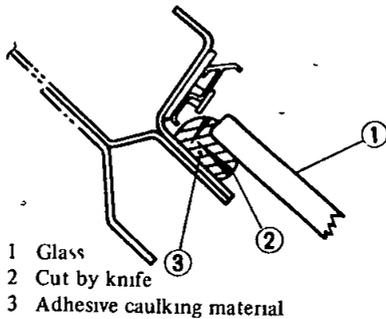
- 4 Reaching from inside car, strip dam from around window glass



BF291A

Fig BF-125 Stripping dam

- 5 With a sharp cutting knife, cut off caulk material along edge of entire window opening



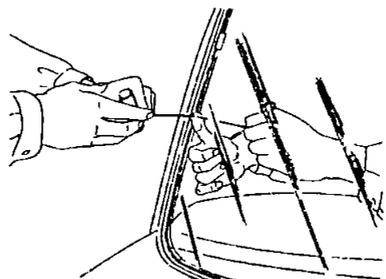
BF479A

Fig BF-126 Cutting off adhesive caulk material

- 6 The following procedure may also be used in removing rear windshield
 - (1) Using a knife, cut through part of caulk material
 - (2) Secure one end of steel music wire [0.5 mm (0.020 in) diameter] to a piece of wood that can serve as a handle

Using long nose pliers, insert other end of wire through caulk 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 caulk material around entire perimeter of window using a sawing motion



BF328

Fig BF-127 Cutting sealant

- 7 From inside car, push glass up and out of window opening.
- 8 Using a razor blade or sharp scraper, remove caulk material along entire edge of window opening, leaving it about 1 to 2 mm (0.04 to 0.08 in) thick

INSTALLATION

- 1 Check moulding for missing retainers
- 2 Clean contacting face of body with nonlead gasoline

Note Do not allow oil, grease or water to get on cleaned surfaces by touching with dirty hand or fouled tool

- 3 Install four spacers on window opening

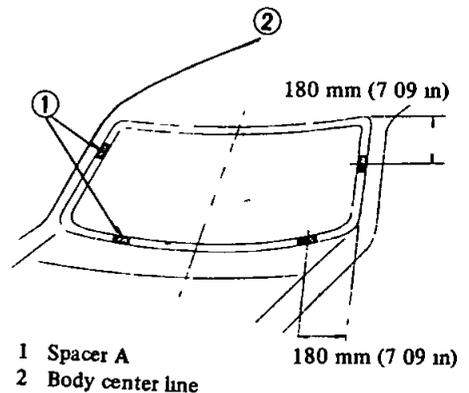
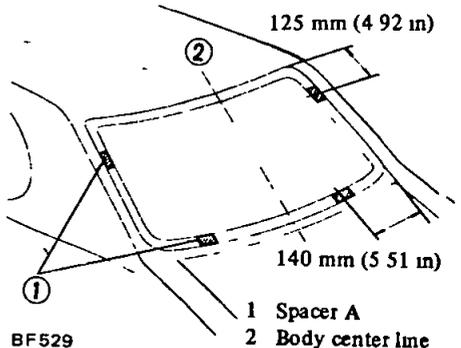


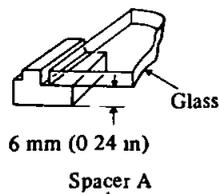
Fig BF-128 Location of spacers (Front)



BF529

Fig BF-129 Location of spacers (Rear)

BODY

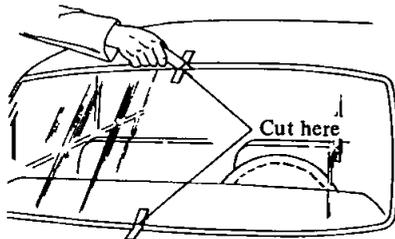


BF530

Fig BF-130 Installing glass on spacer

4 There are two water drain holes in the bottom edge of body opening. In applying caulking material, use care not to plug these two holes.

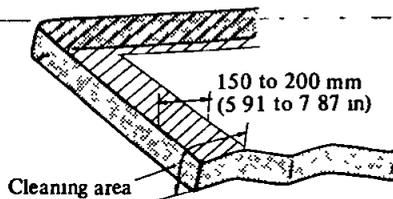
5 To set glass in proper position in window opening, paste two pieces of masking tape at the center top and bottom of glass and panel for alignment.



BF331

Fig BF-131 Aligning glass in window opening

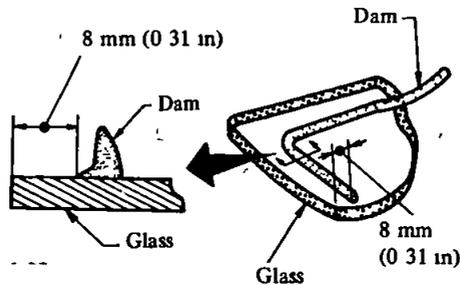
6 Clean glass surface where the sealant is to be applied and dam with non-lead gasoline as shown in Figure BF-132



BF531

Fig BF-132 Cleaning area of glass

7. Install dam tape to inside of windshield glass 8 mm (0 31 in) in-board from edge of glass and cut off excess at ends



BF292A

Fig BF-133 Installing dam

8. With a sponge apply a light coat of primer to original caulking material remaining on window opening flanges

Notes

a It is not necessary to apply primer to old sealant in replacing glass that once has been repaired with 1-part sealant (silicone)

Identification of old adhesive material is accomplished as follows

- 1) Cut a small piece of excess sealant from glass or window opening flanges
- 2) Stick small piece of sealant on the end of a knife or the like, and then hold sealant over flame of match or lighter until it ignites

A Polysulfide burns of white smoke or no smoke at all and its odor is of white smoke or no smoke a tall and its odor is very objectionable (heavy sulfur dioxide)

B Silicone glows with little or no flame and emits white smoke and very little odor. Burnt residue is white ash

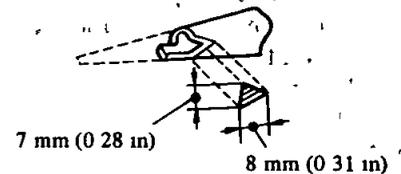
b Allow primer to dry for 10 to 15 minutes, then proceed to the next step

9 Insert cartridge in Caulking Hand Gun ST08810000 and place smooth, continuous bead on glass 10 mm (0 39 in) thick

Notes

a Cut off nozzle end of cartridge as shown

Pierce sealing film with a needle, install cartridge in hand gun



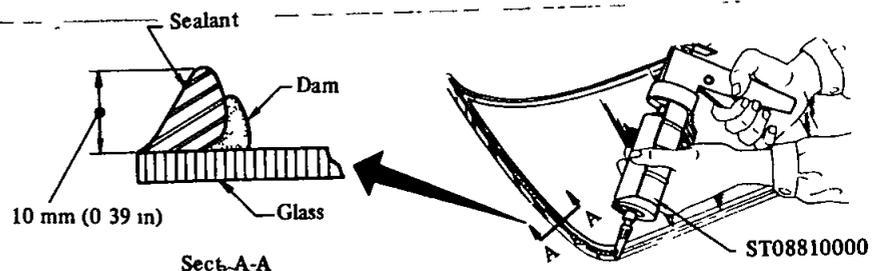
BF293A

Fig BF-135 Cutting nozzle of cartridge

b Sealant starts to harden 15 minutes after it is applied, i.e., window glass should be installed in body within 15 minutes after applying sealant.

10 Support windshield glass with Sucker ST08800000

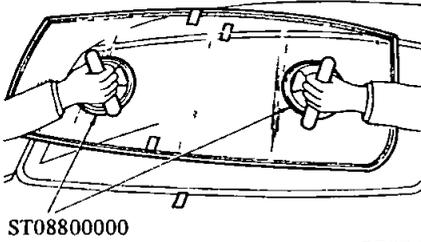
11 Position windshield glass in opening, align the previously placed masking tape and make sure that glass is properly set on spacers located at the glass opening flange



BF333

Fig BF-134 Applying adhesive caulking

BODY



ST08800000

BF334

Fig BF-136 Installing glass

- 12 Push glass to aid in seating on plate
- 13 Wipe excess caulking material off T studs, edges of glass and body
- 14 Remove protective covers
- 15 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.

- 16 Install all previously removed parts

Notes

- a After installing, attach caution label to glass surface. Be sure that it does

not obstruct visibility. A label noting the fact that sealing will be impaired if door is opened or closed with window shut before sealant has dried is furnished with the kit.

- b Advise the owner that car should not be driven on rough roads for the time being.



Fig BF-137 Caution label

Reference Period required for sealant to dry to desired hardness

Relative humidity %	Unit days		
	90	50	25
Temperature °C (°F)			
25 (77)	1.5	2.5	6
10 (50)	3	5.3	10
-10 (14)	10	17	34

REPAIRING LEAKS

Leaks can be repaired without removing and installing glass as follows

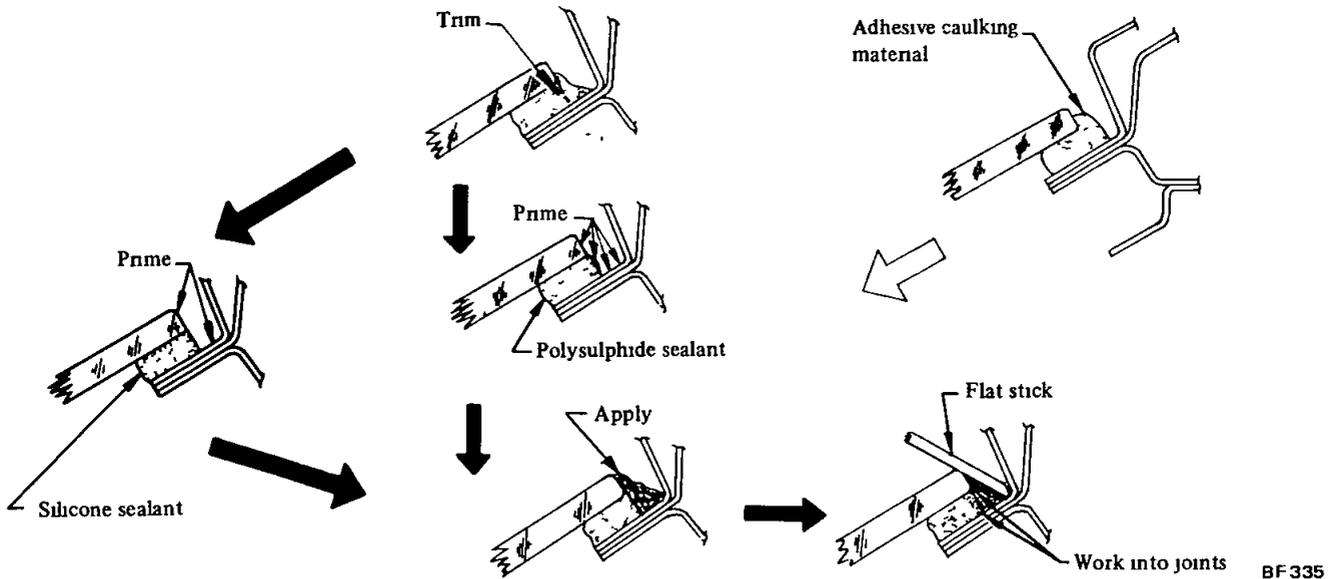


Fig BF-138 Adhesive caulked glass leak repair

- 1 To stop leaks, first remove mouldings in area of leak. It may be necessary to remove garnish moulding or finishing lace to isolate cause of the problem.

- 2 Mark location of leak

Note If water is leaking between caulking material and body or between glass and caulking material, determine the extent of leak by

pushing the glass outwards. Apply water to leak area while pushing on the glass. Mark the extent of leak point.

BODY

INTERIOR TRIMS

CONTENTS

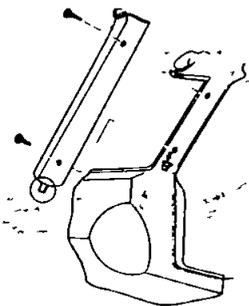
FRONT PILLAR GARNISH	BF-39	Removal and installation (Sedan)	BF-40
Removal and installation	BF-39	Removal and installation (Hardtop)	BF-40
CENTER PILLAR GARNISH	BF-39	REAR PARCEL SHELF	BF-40
Removal and installation	BF-39	Removal and installation	BF-40
REAR DOOR GARNISH	BF-39	HEAD LINING	BF-41
Removal and installation	BF-39	Removal	BF-41
REAR CORNER GARNISH	BF-40	Installation	BF-41

FRONT PILLAR

Removal and installation

1 Remove front pillar garnish attaching screws and then remove the garnish from front pillar.

Be careful not to bend the lower tip of the garnish shown in Figure BF-139



BF532

Fig BF-139 Removing front pillar garnish

2 Install front pillar garnish in reverse sequence of removal

3 Install center pillar garnish in reverse sequence of removal

CENTER PILLAR GARNISH

Removal and installation

1 Remove body side welts which are installed to center pillar flange

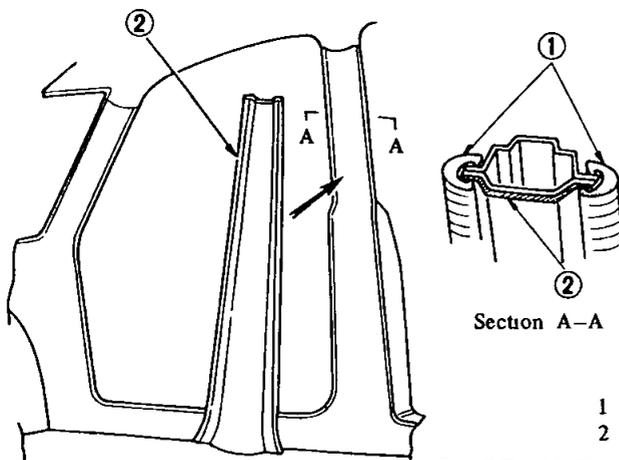
2 Remove center pillar garnish from center pillar

REAR DOOR GARNISH

Removal and installation

1 Remove screws attaching rear door garnish and remove garnish from door sash

2 Install rear door garnish in reverse sequence of removal



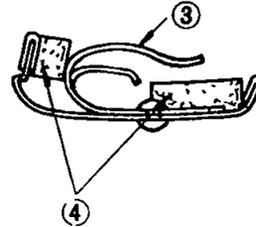
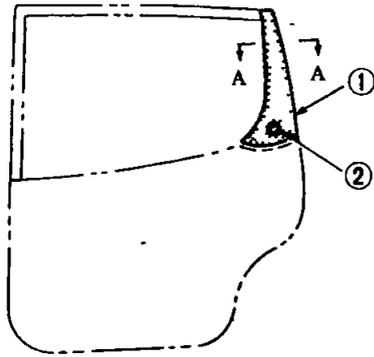
Section A-A

BF533

- 1 Body side welt
- 2 Center pillar garnish

Fig BF-140 Removing center pillar garnish

BODY



- 1 Rear door garnish
- 2 Attaching screw
- 3 Plate spring
- 4 Urethane form

Section A-A

BF534

Fig BF-141 Removing rear door garnish

REAR CORNER GARNISH

Removal and installation (Sedan)

- 1 Remove body side welt which is installed to rear corner flange
- 2 Remove clips retaining rear corner garnish and then remove rear corner garnish

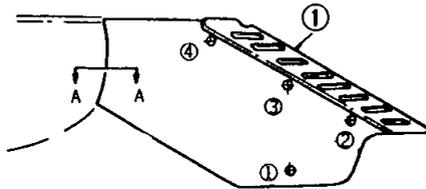
- 3 Install rear corner garnish in reverse sequence of removal

ter finish and remove draughter finish

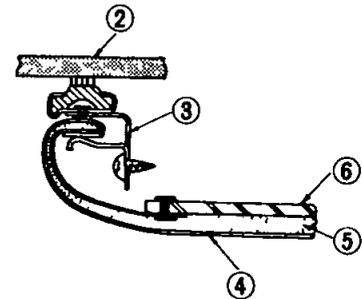
- 2 Remove clips retaining rear corner garnish and then draw rear corner garnish forwards

Removal and installation (Hardtop)

- 1 Remove screws attaching draugh-



- 1 Draughter finish
- 2 Side window glass
- 3 Inner seal
- 4 Vinyl leather
- 5 Urethane form
- 6 Hard board



Section A-A

BF536

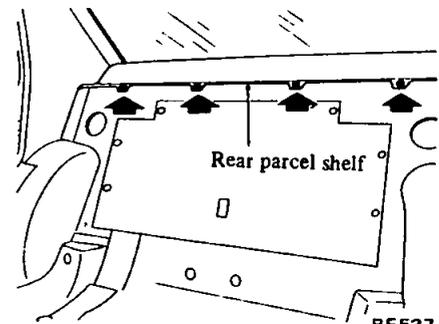
Fig BF-143 Removing rear corner garnish

- 3 Install rear corner garnish in reverse sequence of removal

REAR PARCEL SHELF

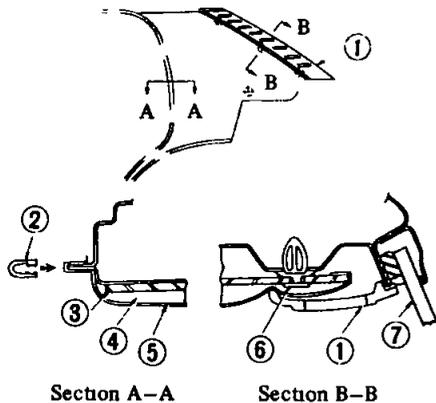
Removal and installation

- 1 Remove rear seat cushion and rear seat back
- 2 Remove clips retaining rear parcel shelf front end and remove rear parcel shelf, pulling it forward.
- 3 Install rear parcel shelf in reverse sequence of removal



BF537

Fig BF-144 Removing rear parcel shelf



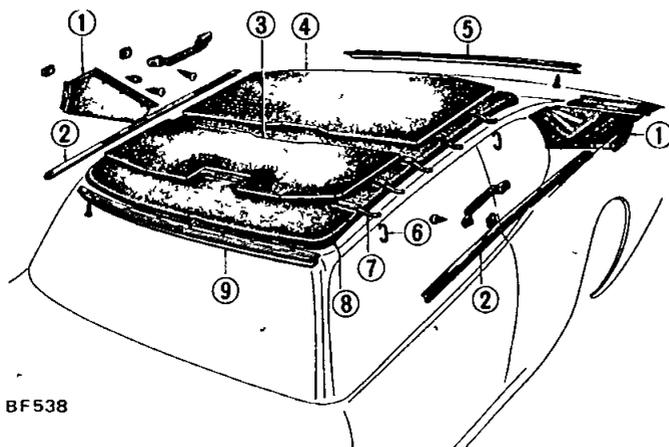
BF535

- 1 Draughter finish
- 2 Welt
- 3 Hard board
- 4 Urethane form
- 5 Vinyl leather
- 6 Retaining clip
- 7 Rear window glass

Fig BF-142 Removing rear corner garnish

BODY

HEAD LINING



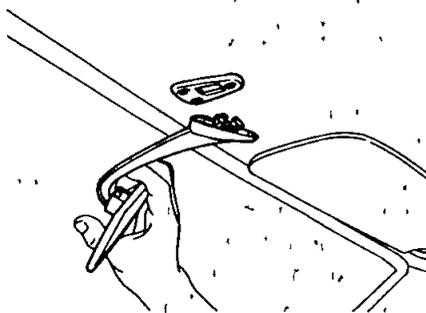
BF538

- 1 Rear corner garnish assembly
- 2 Front and rear windshield welt
- 3 Front roof insulator
- 4 Rear roof insulator
- 5 Rear window welt retainer
- 6 Listing wire hook
- 7 Head lining listing wire
- 8 Head lining cloth
- 9 Front window welt retainer

Fig BF-145 Structural view of head lining (Hardtop)

Removal

1 Pull break-away type inside rearview mirror out of bracket and remove inside rearview mirror bracket



BF134

Fig BF-146 Removing inside, back mirror

- 2 Remove sun visors
- 3 Remove room lamp
- 4 Remove assist straps
- 5 Remove body side welts

- 6 Remove front pillar garnishes
- 7 Remove center pillar garnishes
- 8 Remove rear corner garnishes
- 9 Remove the end of head lining cloth from roof rails
- 10 Remove head lining listing wires from roof rails and remove head lining from roof

Installation

- 1 Apply a trim adhesive to body flange and other body parts before installing head lining
- 2 Starting at front and proceeding toward rear, or vice versa, install listing wires

Notes

- a All fullness must be removed by stretching front and rear listing wires

b. Wrinkles can be removed by prying lining over along lining wire.

- 3 Cement the end of head lining to body flange while pulling it down at sides to remove wrinkles
- 4 Trim the remaining head lining to proper size

Note. In trimming at front pillars, center pillars and rear quarter panels, care should be taken to reserve enough material since head lining must be touched at these parts

- 5 Cut a hole in the head lining material for room lamp and install room lamp assembly
6. Install body side welts to body flanges and other equipments in position

FLOOR MAT AND CENTER CONSOLE

CONTENTS

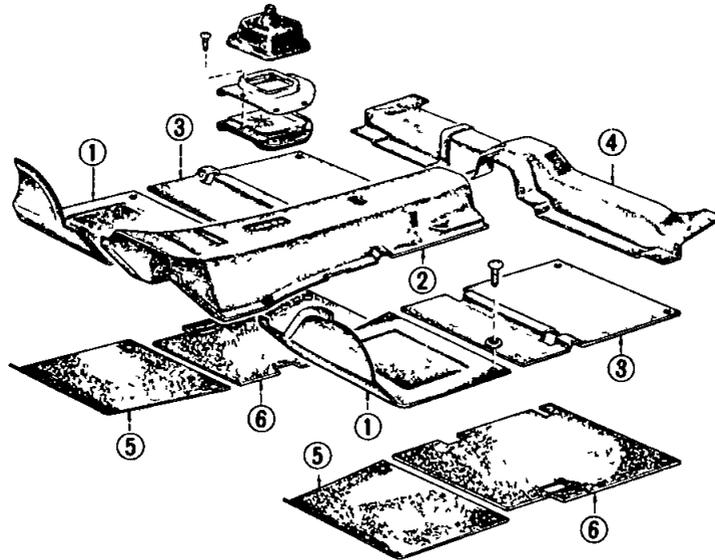
FLOOR MAT
Removal and installation
CENTER CONSOLE

BF-42 Removal and installation
BF-42 INSTRUMENT PANEL
BF-42 Removal and installation

BF-42
BF-43
BF-43

BODY

FLOOR MAT



BF539

- 1 Front floor mat
- 2 Center floor mat
- 3 Rear floor mat
- 4 Rear seat lower mat
- 5 Front floor felt
- 6 Rear floor felt

Fig BF-147 Structural view of floor mat

Removal and installation

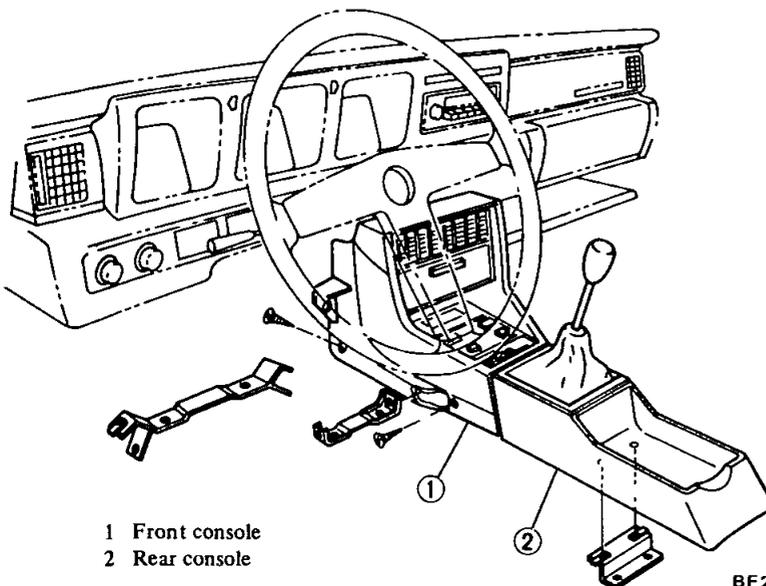
1 Remove floor mats from retaining hooks and remove floor mats

- 2 Remove floor felts from floor
- 3 After removing center console, remove center floor mats and felts
- 4 When installing, attach floor felts to floor with an adhesive and install floor mats and center console

Removal and installation

- 1 Remove transmission shift lever knob
- 2 Remove screws attaching rear console and remove rear console
- 3 Remove front console-to-package tray attaching screws and side attaching screws and then remove front console
- 4 Install front and rear console in reverse sequence of removal

CENTER CONSOLE



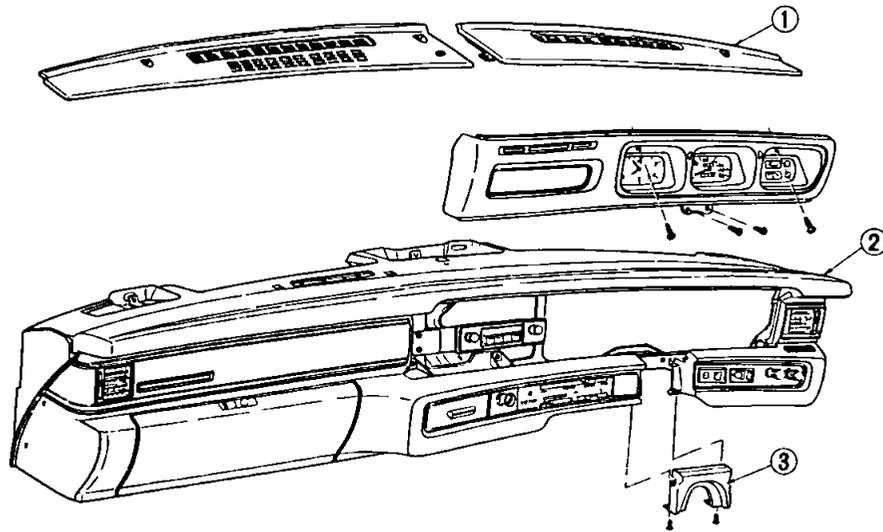
- 1 Front console
- 2 Rear console

BF295A

Fig BF-148 Structural view of center console and brackets

BODY

INSTRUMENT PANEL



- 1 Instrument garnish
- 2 Instrument panel assembly
- 3 Cluster lid cover

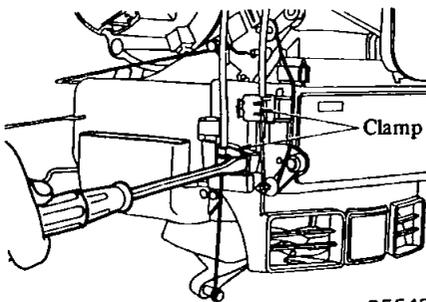
BF296A

Fig BF-149 Structural view of instrument panel

Removal and installation

Instrument panel assembly

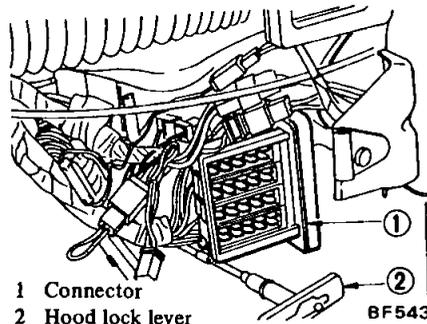
- 1 Disconnect battery ground cable
- 2 Remove horn bar, steering wheel and shell assembly
- 3 Remove heater control cable clamps from heater assembly



BF542

Fig BF-150 Removing heater control cable clamps

- 4 Disconnect speedometer cable behind speedometer
- 5 Disconnect body and instrument harnesses at a connector

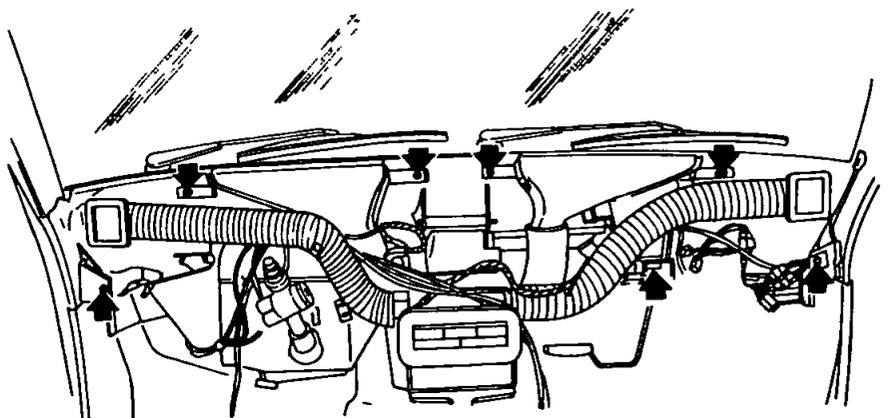


- 1 Connector
- 2 Hood lock lever

BF543

Fig BF-151 Disconnecting instrument harness connector

- 6 Remove instrument garnishes from instrument panel
- 7 Remove cluster lid cover
- 8 Loosen bolts attaching instrument panel and draw instrument panel assembly out backwards



BF298A

Fig BF-152 Removing instrument panel attaching bolts

BODY

- 9 Install instrument panel assembly in reverse sequence of removal

Cluster lid

- 1 Remove steering column shell and cluster lid cover. It is not necessary to remove steering wheel.
- 2 Remove speedometer cable from back side of speedometer.
- 3 Loosen screws attaching cluster lid and draw cluster lid out backwards.

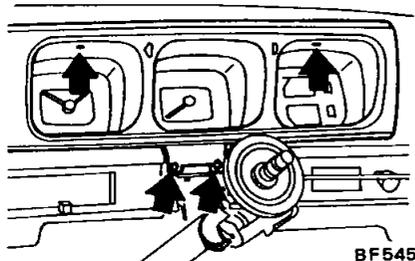


Fig BF-153 Removing cluster lid attaching screws

- 4 Disconnect related wire harnesses from back side of meters.
- 5 Install cluster lid in reverse sequence of removal.

Cluster lid A

- 1 Remove steering column shell and cluster lid cover.

- 2 Remove screws retaining cluster lid A and remove cluster lid A from instrument panel.

Retaining screw "S" which secures cluster lid A to instrument panel, can be removed from the inside of cluster lid A. See Figure BF-154.

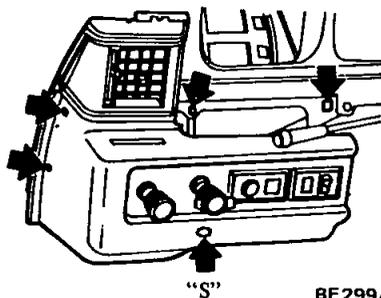


Fig BF-154 Removing cluster lid A retaining screws

- 3 Install cluster lid A in reverse sequence of removal.

Cluster lid B

- 1 Disconnect battery cable.
- 2 Remove steering column shell assembly, cluster lid cover, cluster lid and heater control knobs.
- 3 Remove screws attaching heater control assembly to cluster lid B.
- 4 Remove screws attaching cluster lid B and remove cluster lid B from instrument panel.

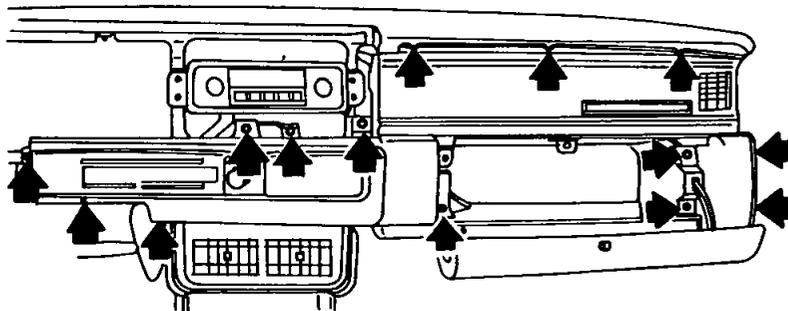


Fig BF-155 Removing cluster lid B attaching screws

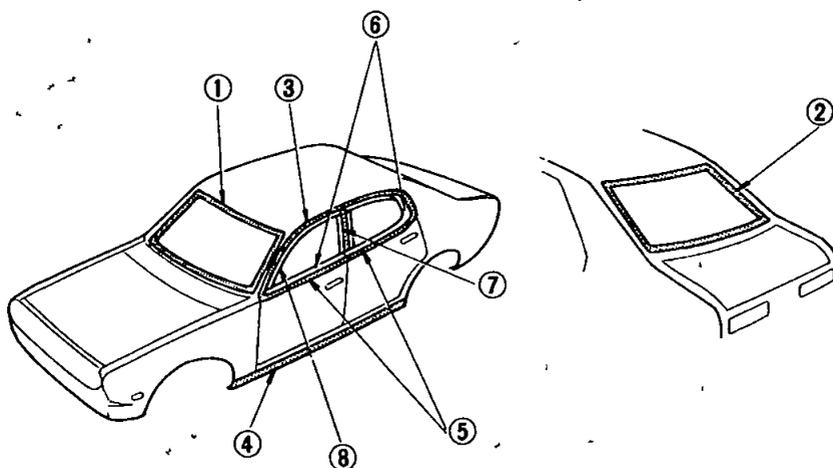
- 5 Install cluster lid B in reverse sequence of removal.

MOULDING

CONTENTS

FRONT WINDSHIELD MOULDING	BF-46	Removal and installation	BF-47
Removal and installation	BF-46	ROOF DRIP MOULDING	BF-48
REAR WINDSHIELD MOULDING	BF-46	DOOR SASH AND CENTER PILLAR	
Removal and installation	BF-46	COVERS	BF-49
SILL MOULDING	BF-46	REAR PANEL AND TRUNK LID	
Removal and installation	BF-47	MOULDINGS	BF-49
DOOR MOULDING AND FINISH	BF-47	Removal and installation	BF-50

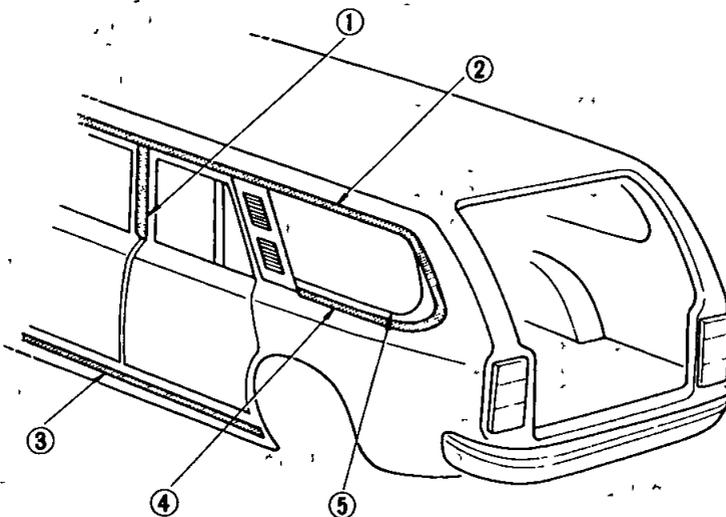
BODY



BF548

- 1 Front windshield moulding
- 2 Rear windshield moulding
- 3 Roof drip moulding
- 4 Sill moulding
- 5 Door outside moulding
- 6 Door outside finisher
- 7 Center pillar cover
- 8 Door sash cover

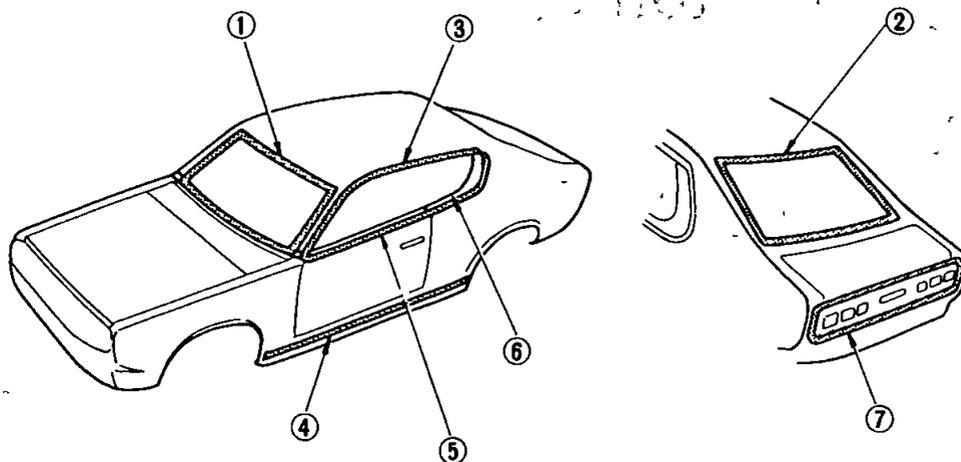
Fig BF-156 Mouldings of the Sedan



BF549

- 1 Center pillar cover
- 2 Roof drip moulding
- 3 Sill moulding
- 4 Body outside moulding
- 5 Body outside finisher

Fig BF-157 Mouldings of the Station Wagon



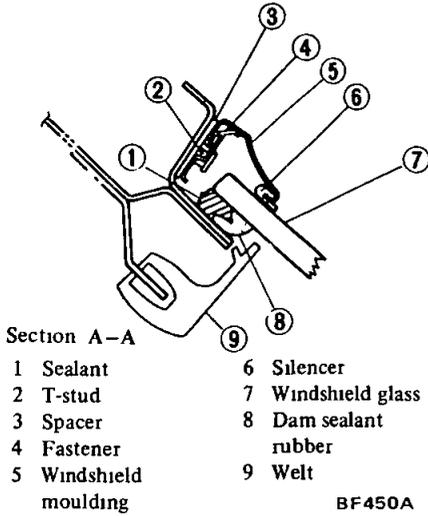
BF550

- 1 Front windshield moulding
- 2 Rear windshield moulding
- 3 Roof drip moulding
- 4 Sill moulding
- 5 Door and rear fender moulding
- 6 Door and rear fender finisher
- 7 Rear panel moulding

Fig BF-158 Mouldings of the Hardtop

BODY

FRONT WINDSHIELD MOULDING



Section A-A

- | | |
|-----------------------|----------------------|
| 1 Sealant | 6 Silencer |
| 2 T-stud | 7 Windshield glass |
| 3 Spacer | 8 Dam sealant rubber |
| 4 Fastener | 9 Welt |
| 5 Windshield moulding | |
- BF450A

Fig BF-159 Sectional view of front windshield moulding

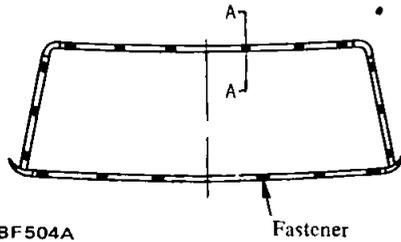
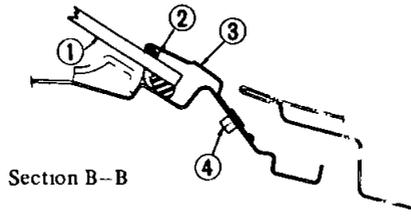


Fig BF-160 Front windshield moulding fasteners

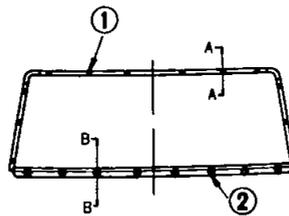
REAR WINDSHIELD MOULDING



Section B-B

- 1 Windshield glass
 - 2 Silencer
 - 3 Lower moulding
 - 4 Fastener for lower moulding
- BF480A

Fig BF-161 Sectional view of rear windshield moulding



- 1 Fastener
 - 2 Fastener for lower moulding
- BF554

Fig BF-162 Rear windshield moulding fasteners

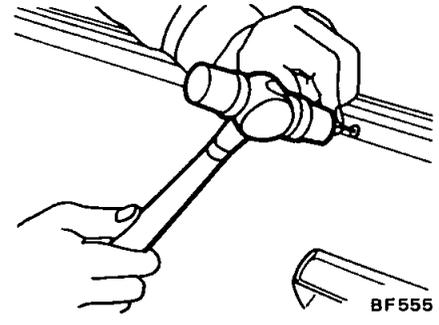
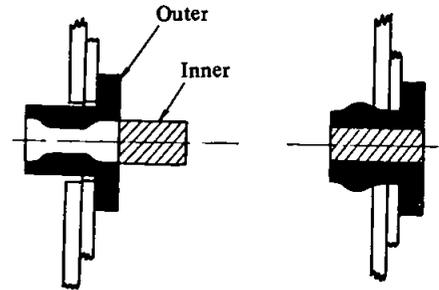


Fig BF-163 Driving out fastener inner pin



BF556

Fig BF-164 Sectional view of fastener

Removal and installation

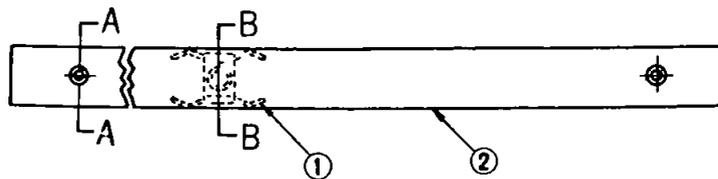
- 1 Open trunk lid
- 2 Drive out inner pin of lower moulding fastener

3. Move side moulding down until separated from corner moulding and remove corner moulding
- 4 Draw side moulding upwards
- 5 Draw upper and lower mouldings sideways
- 6 Install rear window mouldings in reverse sequence of removal

Removal and installation

- 1 Remove front roof drip mouldings
2. Remove screw attaching side windshield moulding and remove side windshield mouldings
- 3 Move side moulding down until separated from corner moulding and remove corner mouldings
- 4 Draw side mouldings upwards
- 5 Draw upper and lower moulding sideways
- 6 Install windshield mouldings in reverse sequence of removal.

SILL MOULDING



BF451A

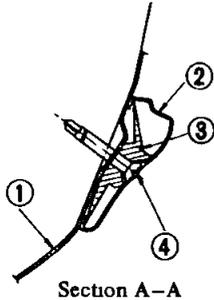
- 1 Clip
- 2 Sill moulding

Fig BF-165 Sill moulding

BODY

Removal and installation

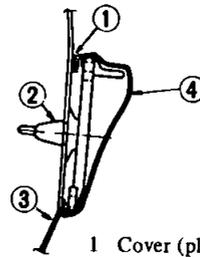
1 Remove screws retaining sill moulding



- 1 Front and rear fenders 3 Spacer
2 Sill moulding 4 Retaining screw

Fig BF-166 Sectional view of retaining screw and spacer

2 Remove retaining clips from body side sill



- Section B-B
BF452A
- 1 Cover (plastics)
2 Clip (plastics)
3 Sill panel
4 Sill moulding

Fig BF-167 Sectional view of retaining clip

3 Install sill moulding in reverse sequence of removal

DOOR MOULDING AND FINISH

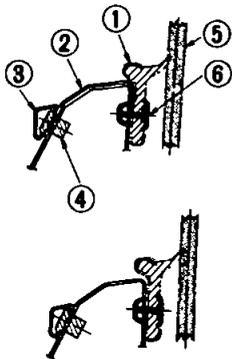
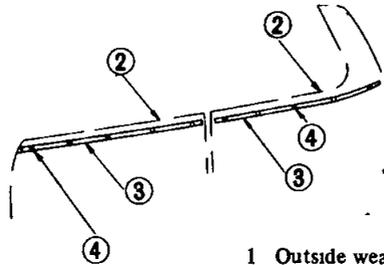
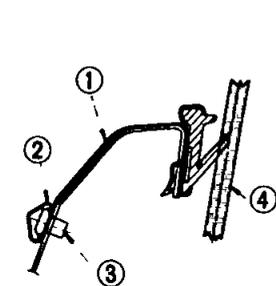


Fig BF-168 Sectional view of door moulding and finisher (Sedan)

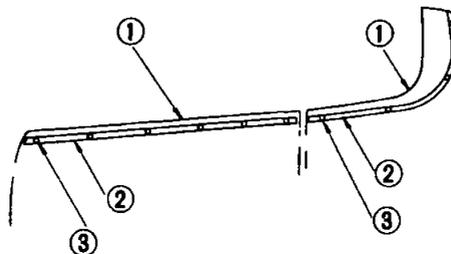


- 1 Outside weatherstrip
2 Finisher
3 Moulding
4 Clip
5 Door glass
6 Weatherstrip clip



BF561

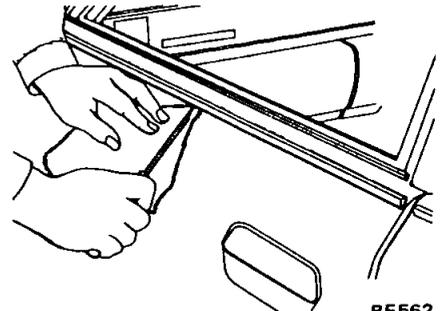
Fig BF-169 Sectional view of door moulding and finisher (Hardtop)



- 1 Finisher
2 Moulding
3 Clip
4 Door glass

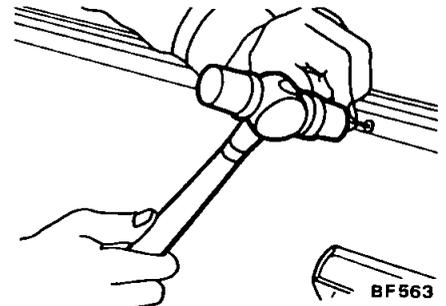
Removal and installation

1 Remove door moulding with a flat-headed driver. Insert a pad between driver and door panel to protect door paint



BF562

2 Remove door finisher and water-tight seal cover and then drive beading clip inner pins out of clip and remove clips from outside door finish



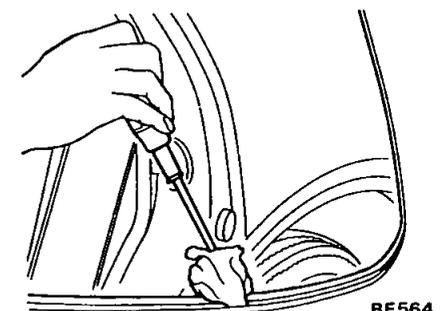
BF563

Fig BF-171 Driving out beading clip inner pin

3 Push door outside weatherstrip toward door glass and remove outside finish

4 Remove door outside weatherstrip anchor clips from door outside panel with a flat-headed driver and then remove outside weatherstrip

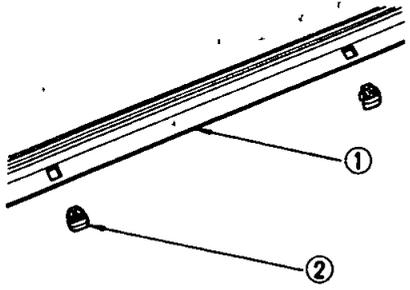
In the Hardtop outside weatherstrip can be removed together with outside door finish



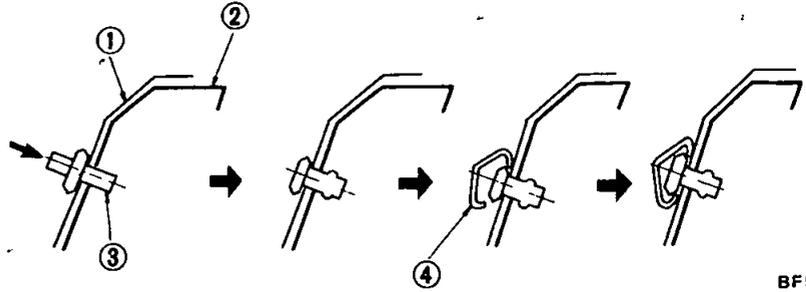
BF564

Fig BF-172 Removing outside weatherstrip

BODY



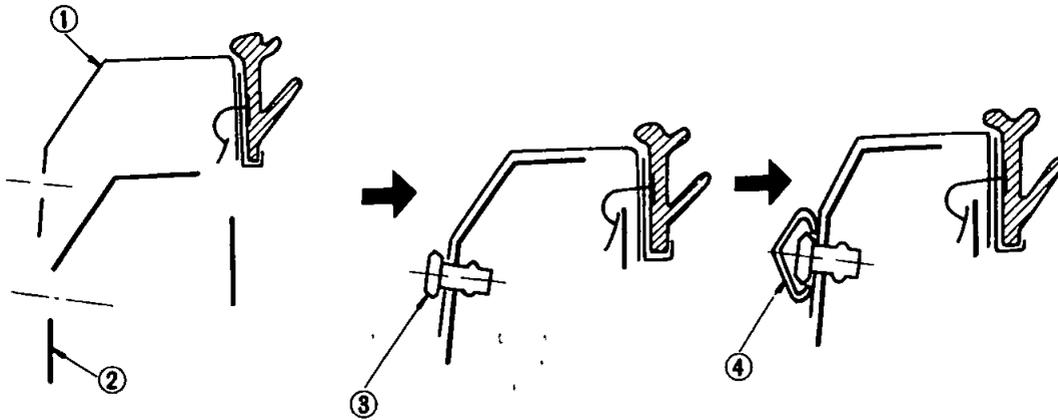
BF565
 1 Door outside weatherstrip
 2 Anchor clip
 Fig BF-173 Anchor clip



BF566
 1 Outside finish
 2 Door panel
 3 Beading clip

Fig BF-174 Installing door outside finish and moulding (Sedan and Station Wagon)

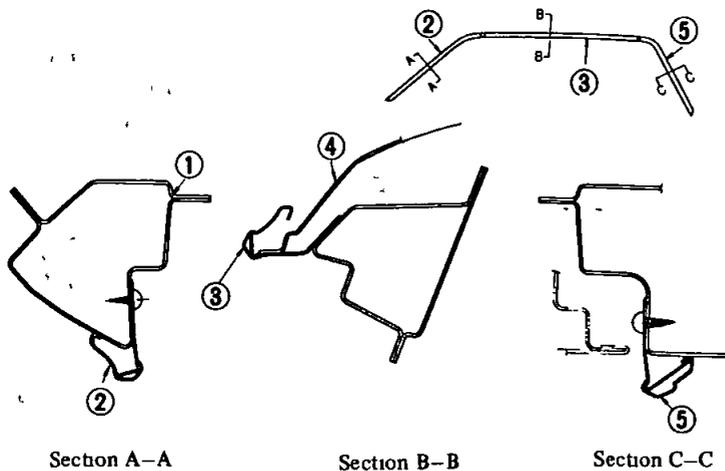
5 Install outside door finish and moulding as follows



BF567
 1 Outside finish
 2 Door panel
 3 Beading clip
 4 Moulding

Fig BF-175 Installing door outside finish and moulding (Hardtop)

ROOF DRIP MOULDING



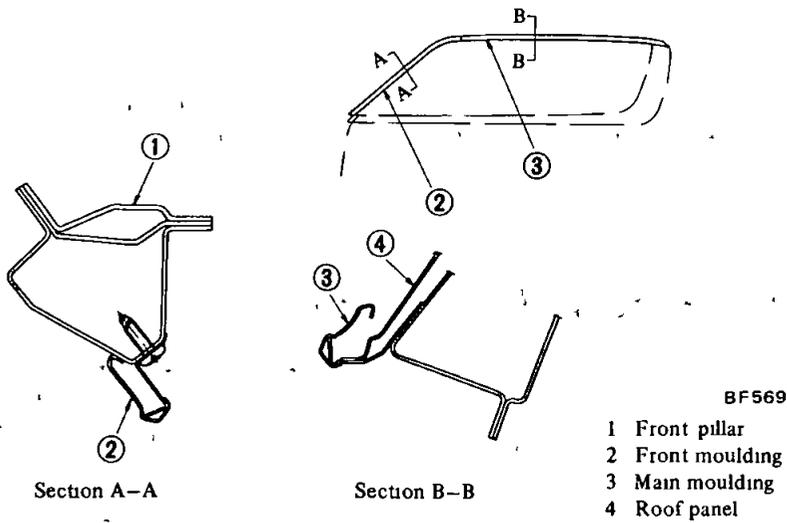
BF568
 1 Front pillar
 2 Front moulding
 3 Center moulding
 4 Roof panel
 5 Rear moulding

Fig BF-176 Roof drip moulding (Sedan)

BODY

DOOR SASH AND CENTER PILLAR COVERS

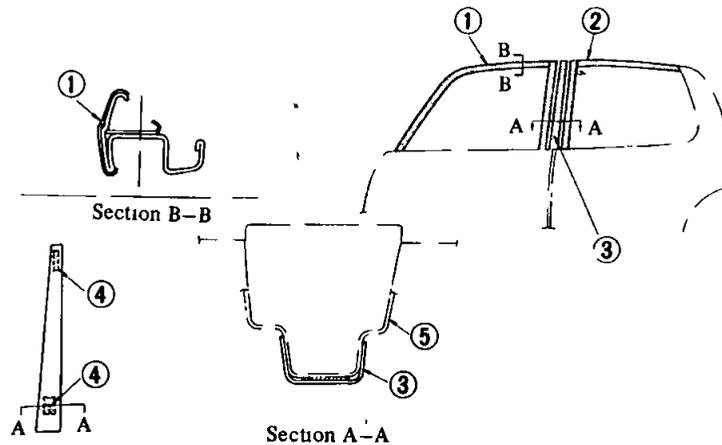
Center pillar cover is attached to center pillar with adhesive tapes as shown in Figure BF-178



BF569

- 1 Front pillar
- 2 Front moulding
- 3 Main moulding
- 4 Roof panel

Fig BF-177 Roof drip moulding (Hardtop)

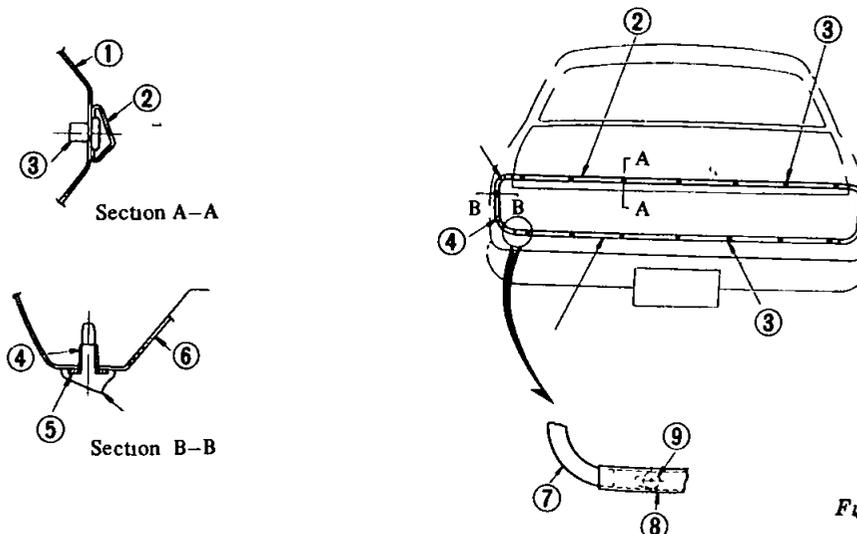


BF570

- 1 Front sash cover
- 2 Rear sash cover
- 3 Center pillar cover
- 4 Adhesive
- 5 Center pillar

Fig BF-178 Sectional view of door sash and center pillar cover

REAR PANEL AND TRUNK LID MOULDING



BF571

- 1 Trunk lid panel
- 2 Trunk lid moulding
- 3 Beading clip
- 4 Clip
- 5 Seal rubber
- 6 Rear fender
- 7 Rear fender moulding
- 8 Rear panel moulding
- 9 Retainer for rear panel moulding

Fig BF-179 Sectional view of rear panel and trunk lid mouldings

BODY

Removal and installation

- | | | |
|--|--|--|
| 1 Remove nuts retaining rear panel moulding and remove rear panel moulding | 2 Remove rear fender mouldings
3 Remove trunk lid moulding from clips | 4 Install trunk lid, rear fender and rear panel mouldings in reverse sequence of removal |
|--|--|--|

SPECIAL SERVICE TOOLS

No	Tool number & tool name	Description Unit mm (in)	For use on	Reference page or Figure No
1	ST08810000 Caulking hand gun	For pushing out the bottom of windshield glass sealer cartridge SE231	710 C110 C130 330 S30	Fig BF-134
2	ST08800000 Sucker	This tool is used to set and secure the windshield glass panel on the spacer It is also used to assure satisfactory adhesion of the glass panel to the body through application of uniform pressure after setting SE345	All models	Fig BF-136
3	ST08720000 Door adjusting wrench	This special wrench is used to make door adjustments without dismantling fender SE232	610	Page BF-20 Fig BF-55

SERVICE MANUAL

DATSUN
MODEL 610 SERIES



NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BE

BODY ELECTRICAL SYSTEM

BODY ELECTRICAL WIRING	BE- 2
FUSE AND FUSIBLE LINK	BE- 4
LIGHTING AND SIGNAL SYSTEM	BE- 5
METERS AND GAUGES	BE-18
IGNITION SWITCH AND STEERING LOCK	BE-26
HORN	BE-27
WINDSHIELD WIPER AND WASHER	BE-29
RADIO	BE-37
HEATER	BE-40

BE

BODY ELECTRICAL SYSTEM

BODY ELECTRICAL WIRING

CONTENTS

DESCRIPTION	BE-2	Inspection	BE-2
Colors of cables	BE-2	Maintenance instructions	BE-2
WIRING HARNESS	BE-2		

DESCRIPTION

Cables used for body electrical wiring are low tension cables. Their conductors are covered with vinyl of various colors. These various colors are intended to represent use of respective cables. In wiring diagram, these colors are indicated by one or two alphabetical letters. With different colors thus used, such cables gathered together in wiring harness easily reveal their origins and destinations. Basic colors, that is, standard colors and

supplementary colors to standard color, are established for cables of respective systems such as starting and ignition system, lighting system and signal system. By designated colors, therefore, you can easily tell circuit systems and starting points of respective cables.

Colors of cables

The system of colors applied to the covering of cable conductors is as shown in the following table

Circuit system	Standard color	Supplementary color	Supplementary color to standard color
Starting and ignition system	B (Black)	W, Y	
Charging system	W (White)	B, R, L	Y
Lighting system	R (Red)	W, B, G, Y, L	
Signal system	G (Green)	W, B, R, Y, L	W, Br (Brown)
Instrument system	Y (Yellow)	W, B, G, R, L	
Others	L (Blue)	W, R, Y	Y, Br, Lg (Light green)
Grounding system	B (Black)		

To covering of individual main cable of each system, standard color or supplementary color to standard color is generally applied. Colors are represented respectively by such letters as G, W and Br. Applied to minor item of each circuit's terminal is two-tone

which is composed of standard and supplementary colors. Each of such two-tone colors is indicated with combination of two letters like RW or GY, and first letter of each combination stands for standard color, and second, supplementary color.

WIRING HARNESS

Inspection

Referring to wiring diagrams or circuit diagrams, inspect entire electrical wiring and connections and insure

- 1 That each electrical component part or cable is securely fastened to its connector or terminal
- 2 That each connection is tight in place and free from rust and dirt
- 3 That each cable covering shows no evidence of cracks, deterioration or otherwise damage
- 4 That each terminal is securely kept away from any adjacent metal parts
- 5 That each cable is fastened to its proper connector or terminal
- 6 That each grounding bolt is planted tight
- 7 That wiring is securely kept away from any adjacent sharp edges of parts or parts (such as exhaust pipe) having high temperature
- 8 That wiring is kept away from any rotating or working parts such as fan pulley, fan belts, etc
9. That cables between fixed portions and resiliently mounted equipment are long enough to withstand shocks and vibratory forces

Maintenance instructions

- 1 Before starting to inspect and repair any part of electrical system or other parts which may lead to a short circuit, be sure to disconnect cables at battery terminals.

BODY ELECTRICAL SYSTEM

Disconnect cables at battery terminals in the following manner

Disconnect cable at negative \ominus terminal, and then disconnect the other cable at positive \oplus terminal

Before connecting cables at battery terminals, be sure to clean terminals with a rag. Fasten cable at positive \oplus

terminal, and then the other cable at negative \ominus terminal. Apply grease to top of these terminals to prevent rust from developing on them.

2 Never use a screwdriver or service tool to conduct a continuity test. **USE TEST LEADS TO CONDUCT THIS CHECK**

3 Never ground an open circuit or circuits under no load. Use a test lamp (12-3W) or circuit tester as a load.

4 Never disconnect cables by pulling them. Be sure to loosen terminals before disconnecting them.

BODY ELECTRICAL SYSTEM

FUSE AND FUSIBLE LINK

CONTENTS

DESCRIPTION	BE-4	Fuse	BE-4
MAINTENANCE INSTRUCTIONS	BE-4	Fusible link	BE-4

DESCRIPTION

The fuse and fusible link are protective device used in an electric circuit. When current increases beyond rated amperage, fusible metal melts and circuit is broken, and thus, cable and electrical equipment are protected from burning. Whenever fuse is melted for one reason or another, use systematic procedure to check and eliminate cause of trouble before installing new fuse in position.

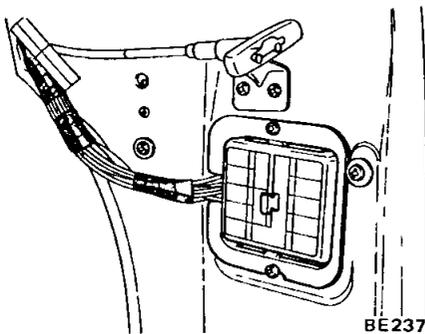


Fig BE-1 Fuse box

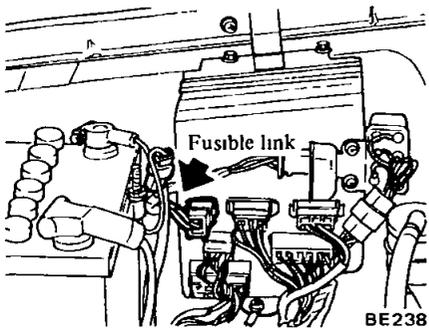


Fig BE-2 Fusible link

MAINTENANCE INSTRUCTIONS

Fuse

In nearly all cases, visual inspection can reveal faulty fuse. If condition of fuse is questionable, conduct continuity test with use of circuit tester or test lamp.

Notes

- a If fuse is blown off, be sure to eliminate the cause before installing new fuse in position.
- b Use fuse of specified rating. Do not use fuse of more than specified rating.

- c Check fuse holders for condition. If much rust or dirt is found thereon, clean metal parts with fine-grained sandpaper until proper metal-to-metal contact is made. Poor contact of any fuse holder will often lead to voltage drop or heating in the circuit and, in the worst case, may result in improper operation of circuit.

Fusible link

Two types of fusible link are in use. Each type is clearly identified by colored covering of conductors, as shown below.

Color	Size mm ² (sq in)	Continuous current	Max current (fuse melts within 5 sec)
Brown	0.3 (0.0005)	11A	Approx 60A
Green	0.5 (0.0008)	20A	Approx 200A
Red	0.85 (0.00132)	26A	Approx 250A

Melted fusible link can be detected by either visual inspection or finger-tip feeling. If its condition is questionable, use circuit tester or test lamp, as required, to conduct continuity test. This continuity test can be performed in same manner as for any conventional fuse.

Notes

- a Fusible link carries current as large as 60 or 250 amperes when it melts in period of less than five seconds. Under no circumstances should any

larger fusible link than that specified be used.

- b Should melting of fusible link occur, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such case, carefully check and eliminate the cause of trouble.
- c Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken of this link so that it does not come into contact with any other wiring harness or vinyl- or rubber-parts.

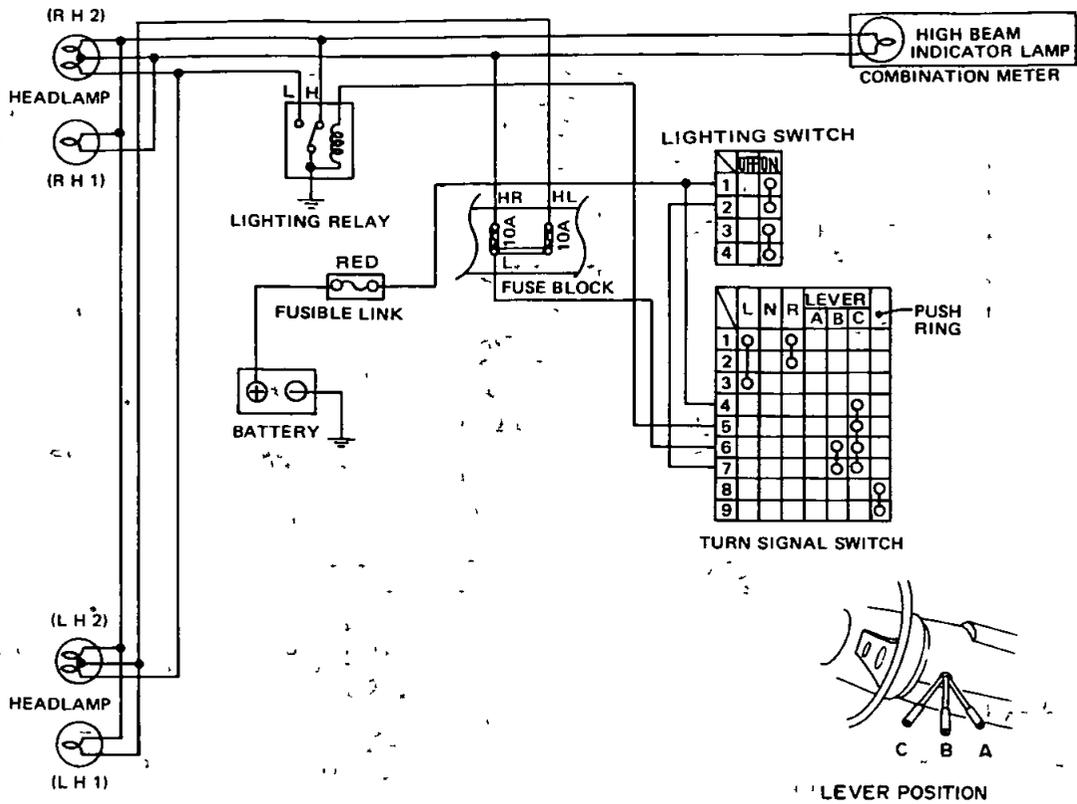
BODY ELECTRICAL SYSTEM

fers to the other side. Even when shifted to position C, lever automatically returns to position B (See Figure BE-3-3)

This movement of relay contact is caused by magnet force which is produced on solenoid of relay. When lever of combination switch is set in posi-

tion C, electric current flows to solenoid of relay, and produces magnet force, which transfers contact to the opposite side.

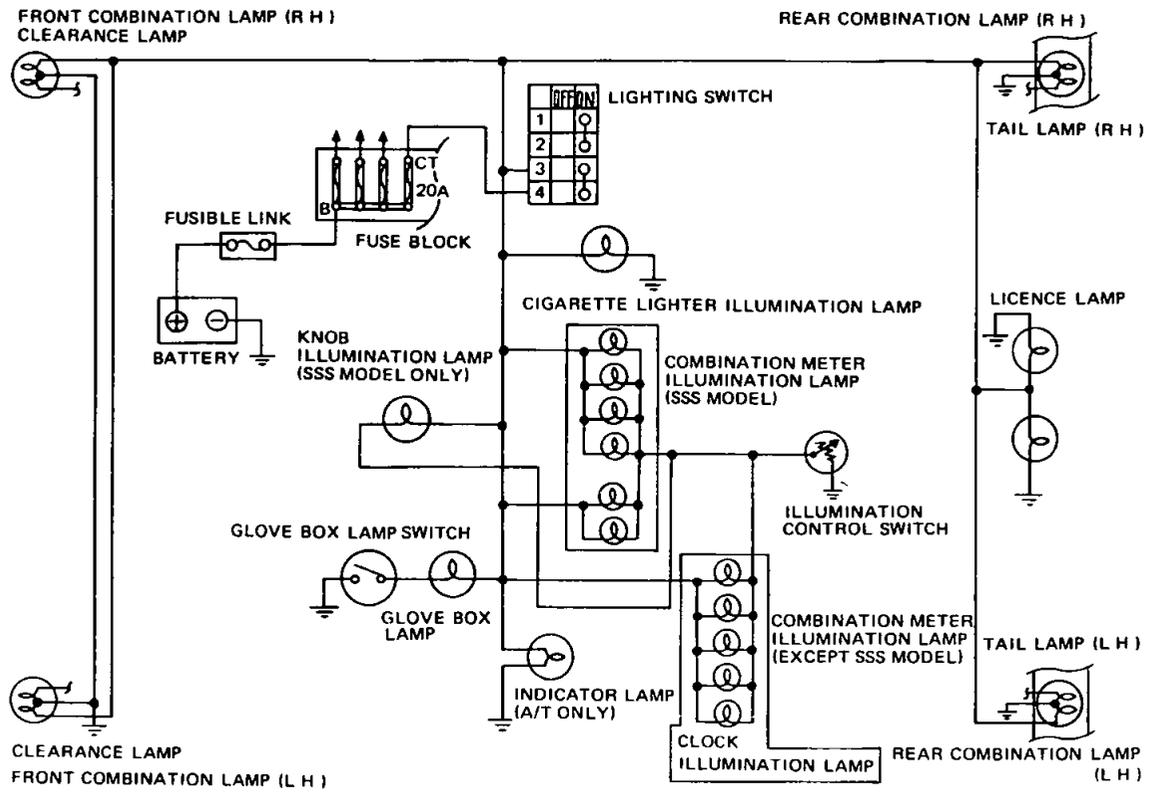
BODY ELECTRICAL SYSTEM



BE290B

Fig BE-6 Circuit diagram for lighting system

BODY ELECTRICAL SYSTEM

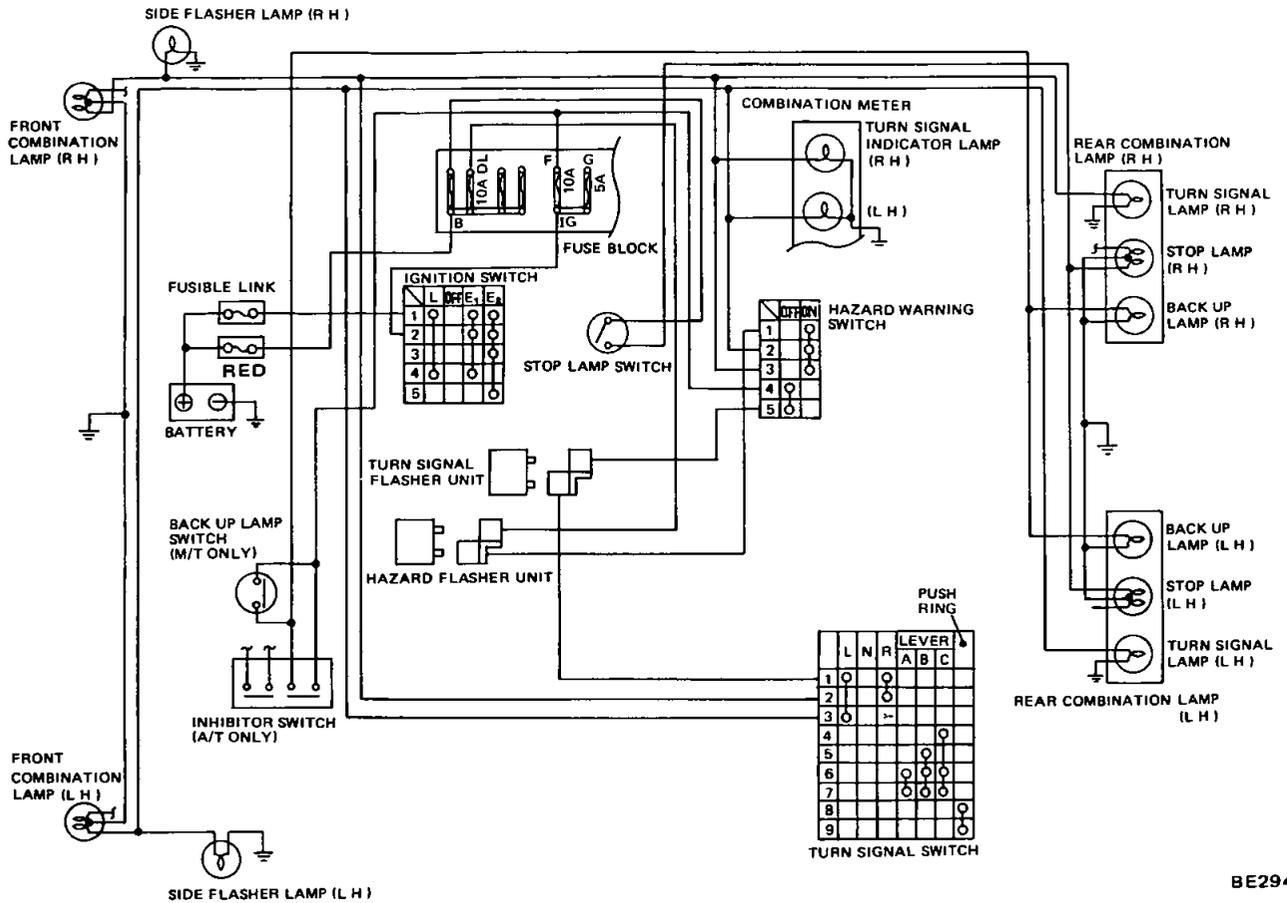


BE293B

Fig BE-9 Circuit diagram for lighting system

BODY ELECTRICAL SYSTEM

Circuit diagram of signal lamp system



BE294B

Fig BE-10 Circuit diagram for back-up lamp, turn signal lamp (hazard warning lamp) and stop lamp system

HEAD LAMP

Head lamp beam replacement

1 Remove retaining screws and remove radiator grille then disconnect side flasher lamp connector

2 Loosen three head lamp retaining ring screws. It may be unnecessary to remove screws

Note Do not disturb aiming adjust screws

3 Remove retaining ring by rotating it clockwise

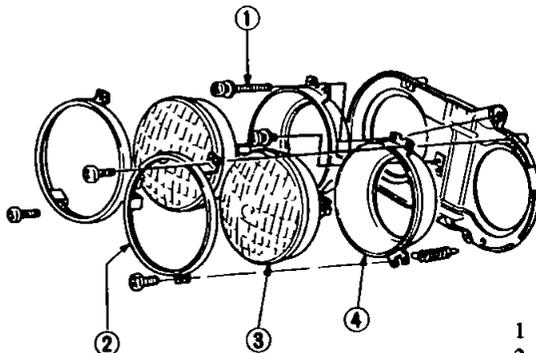
4. Remove head lamp beam from mounting ring and disconnect wiring connector from behind beam

5 Change head lamp beam and connect wiring connector to new beam

6 Place head lamp beam in position so that three location tabs behind beam fit in with three hollows on mounting ring. Make sure that sign "Top" of beam lens is on upper side

7. Install head lamp retaining ring and tighten screws

8 Position radiator grille (or head lamp finisher) in position and install retaining screws



- 1 Aiming adjusting screw
- 2 Headlamp retaining ring
- 3 Headlamp beam
- 4 Headlamp mounting ring

BE221A

Fig BE-11 Exploded view of head lamp

BODY ELECTRICAL SYSTEM

Aiming adjustment

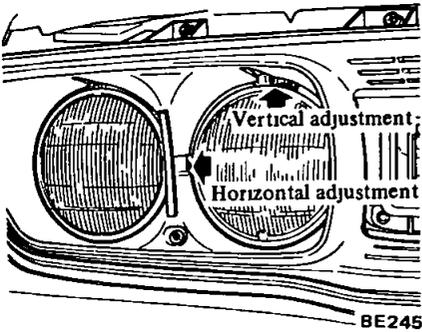


Fig BE-12 Aiming adjustment

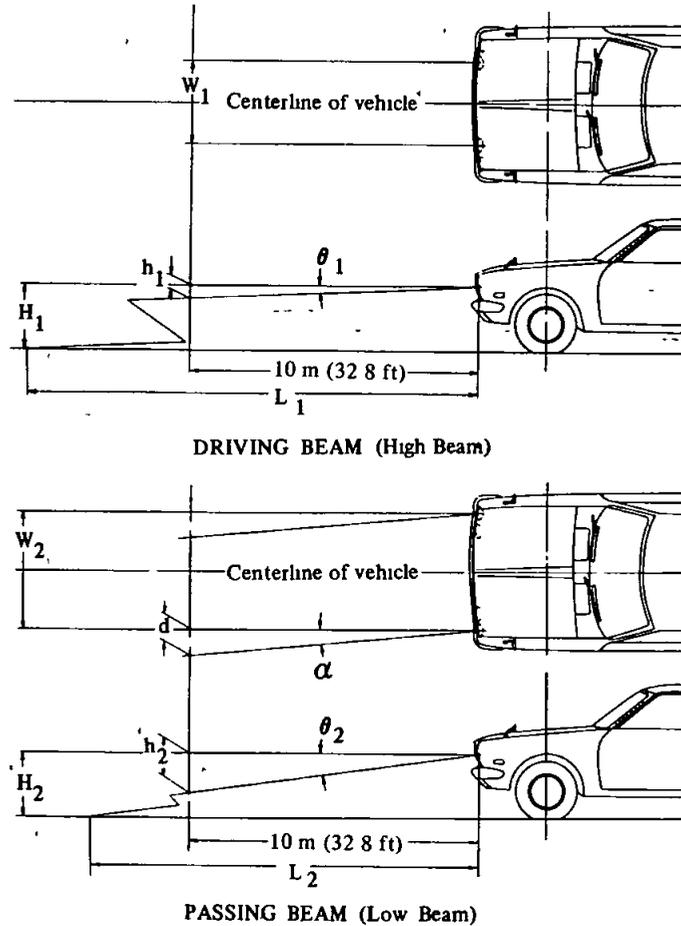
To adjust vertical aim, use adjusting screw on upper side of head lamp, and to adjust horizontal aim, use adjusting screw on side of head lamp

Notes Before making head lamp aiming adjustment, observe the following instructions

- Keep all tires inflated to correct pressures
- Place car and tester on one and same flat surface

- See that there is no load in car
 - Gasoline, radiator and engine oil pan filled up to correct levels
 - Without passenger

When performing head lamp aiming adjustment, use an aiming machine, aiming wall screen or headlight tester. For operating instructions of any aimer, refer to respective operation manuals supplied with the unit



Item	Driving beam (High beam)					Passing beam (Low beam)					d mm (in)	α ($^{\circ}$)
	H_1 mm (in)	W_1 mm (in)	θ_1 ($^{\circ}$)	h_1 mm (in)	L_1 m (ft)	H_2 mm (in)	W_2 mm (in)	θ_2 ($^{\circ}$)	h_2 mm (in)	L_2 m (ft)		
610, K610	655 (25.8)	830 (32.7)	44'	128 (5.0)	51 (16.7)	655 (25.79)	1,180 (46.5)	2 $^{\circ}$ 14'	390 (15.4)	17 (5.6)	349 (13.7)	2 $^{\circ}$
W610	680 (26.8)	830 (32.7)	44'	128 (5.0)	53 (17.4)	680 (26.77)	1,180 (46.5)	2 $^{\circ}$ 14'	390 (15.4)	17.5 (5.7)	349 (13.7)	2 $^{\circ}$

Fig BE-13 Aiming adjustment

BODY ELECTRICAL SYSTEM

FRONT COMBINATION LAMP

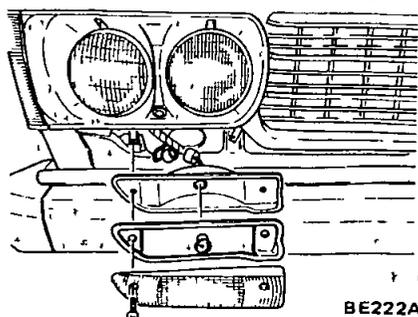


Fig BE-14 Exploded view of front combination lamp

Bulb replacement

- 1 Remove two lens retaining screws and detach lens
- 2 Push in on bulb, turn it counter-clockwise and remove it from socket
- 3 Insert new bulb into socket, making certain that locking pins in bulb base are properly positioned in socket. Press bulb inward, rotate it clockwise, and lock bulb in socket

Lamp assembly replacement

- 1 Remove two lens retaining screws and pull lamp assembly out
- 2 Disconnect lead wires at connector

SIDE FLASHER LAMP

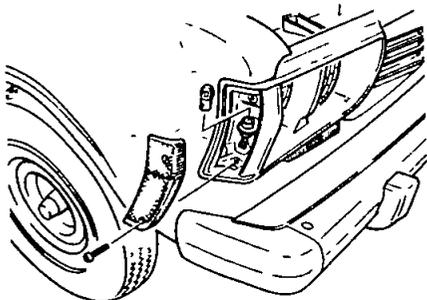


Fig BE-15 Exploded view of side flasher lamp

Lamp assembly replacement

Side marker lamp is secured to RADIATOR GRILLE with three screws

Replace lamp assembly by removing three screws from front of lens and disconnecting wires from connector

Bulb replacement

- 1 Remove two screws securing lens, and detach lens
- 2 Push bulb in, turn it counter-clockwise, and remove bulb
- 3 Install bulb in the reverse order of removal

SIDE MARKER LAMP

Side marker lamp is fixed on fender with two screws. Replacement of lamp assembly can be done by removing two screws from front of lens and disconnecting wires from connector

ROOM LAMP

Room lamp

To replace bulb, remove lamp body and change bulb

To remove lamp body, pull lamp body out of roof and disconnect room lamp wires at connector

Room lamp is held by spring pressure against roof

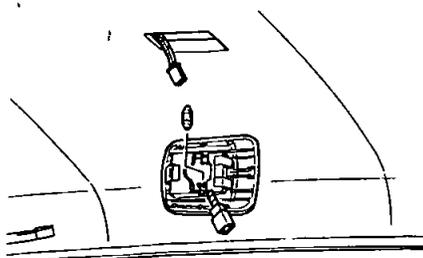
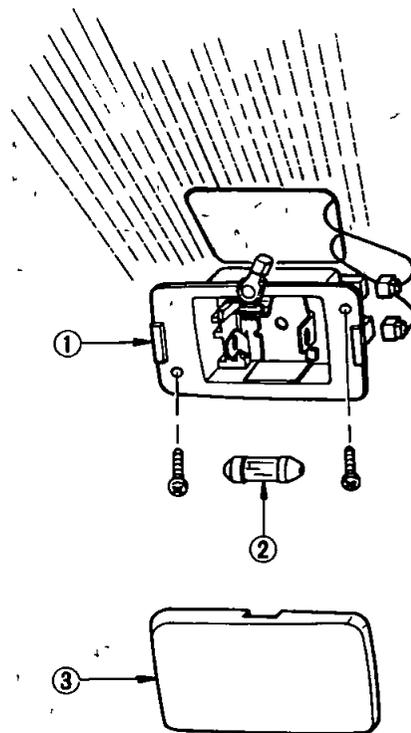


Fig BE-16 Exploded view of room lamp

Rear room lamp



- 1 Lamp body
- 2 Bulb
- 3 Lens

Fig BE-17 Rear room lamp (for Station Wagon)

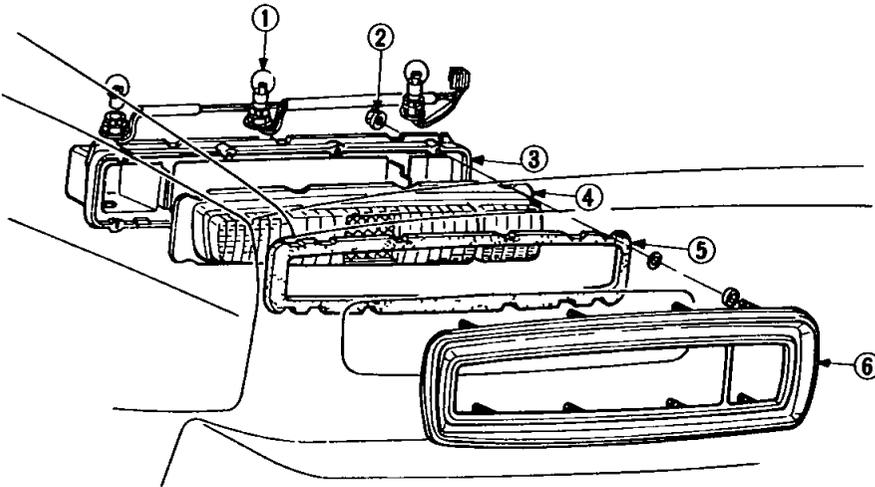
To replace bulb, remove lens and change bulb

To remove lamp body, remove two retaining screws, disconnect lead wires from each connector and withdraw lamp body

BODY ELECTRICAL SYSTEM

REAR COMBINATION LAMP

Combination lamp assembly replacement



- | | |
|----------------|------------|
| 1 Bulb | 4 Lens |
| 2 Flange nut | 5 Packing |
| 3 Lamp housing | 6 Lens rim |

BE251

Fig BE-18 Rear combination lamp

Sedan and Hardtop

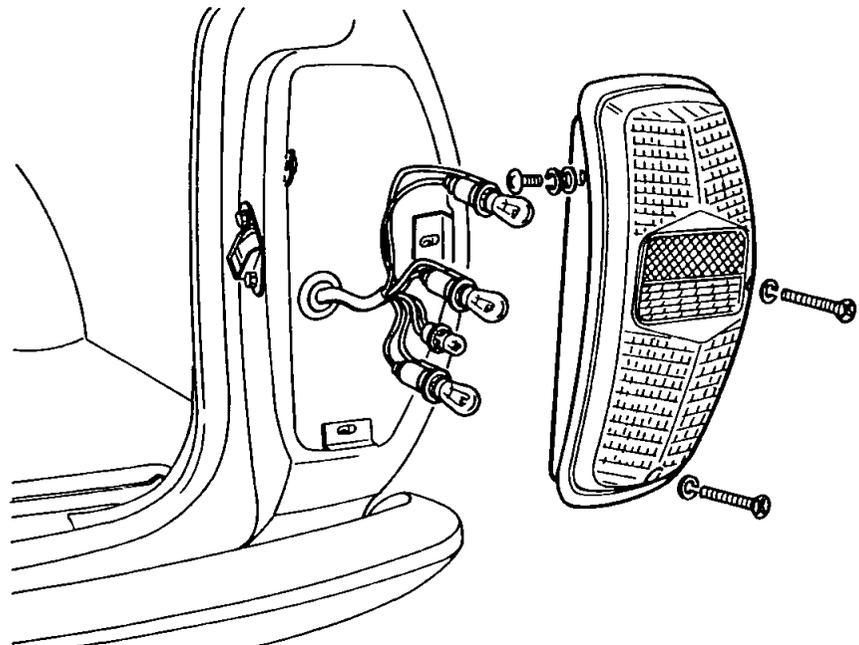
- 1 Disconnect trunk harness at connector.
- 2 Remove eight flange nuts on lamp housing (shade) in trunk
3. Remove lamp housing (shade), lens and packing from rear panel toward inside of trunk. Withdraw lens rim from car
- 4 Install new rear combination lamp assembly in reverse sequence of removal

Station Wagon

- 1 Remove three screws securing lamp assembly to fender
- 2 Remove bulb socket from lamp housing (shade) and then remove lamp assembly
- 3 Install new assembly in reverse sequence of removal

Bulb replacement

- 1 Turn bulb socket counterclockwise and remove socket from lamp housing (shade)
- 2 Push in on bulb, turn it counterclockwise, and remove it from socket
- 3 Insert new bulb into socket making certain that locking pins in base of bulb is in position. Press bulb inward, rotate it clockwise, and lock it in socket
- 4 Insert socket into lamp housing with locking tab in proper position. Rotate socket clockwise to lock it in housing (shade)



BE252

Fig BE-19 Rear combination lamp
(Station Wagon)

BODY ELECTRICAL SYSTEM

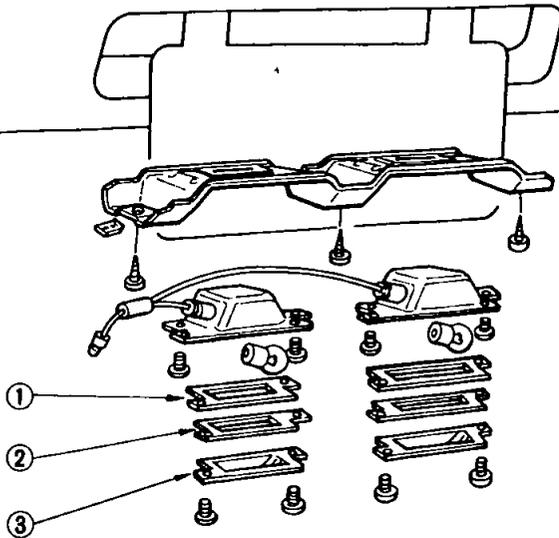
LICENSE LAMP Sedan and Hardtop

License lamp assembly replacement

- 1 Remove three license lamp retaining screws and remove lamp assembly from bumper
- 2 Disconnect lead wire at connector
- 3 Install new license lamp assembly in reverse sequence of removal

Bulb replacement

- 1 Remove two lens cover retaining screws
- 2 Remove lens cover, lens and packing
- 3 Replace bulb with new one
- 4 Install cover, lens and packing in reverse sequence of removal



BE253

- 1 Packing
- 2 Lens
- 3 Lens cover

Fig BE-20 License lamp (Sedan and Hardtop)

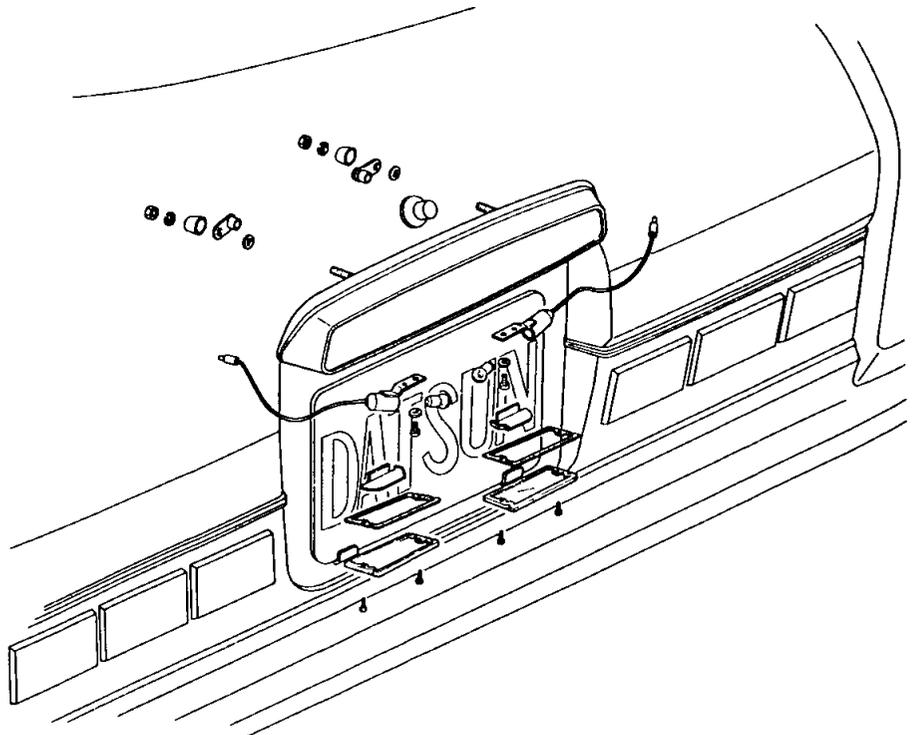
Station Wagon

License lamp assembly replacement

- 1 Remove tailgate trim
- 2 Remove two tailgate handle retaining nuts
- 3 Disconnect lead wire at connector
- 4 Dismount lamp assembly from vehicle

Bulb replacement

- 1 Remove two lens retaining screws
- 2 Remove lens and packing
- 3 Replace bulb with a new one
- 4 Install packing and lens in reverse sequence of removal

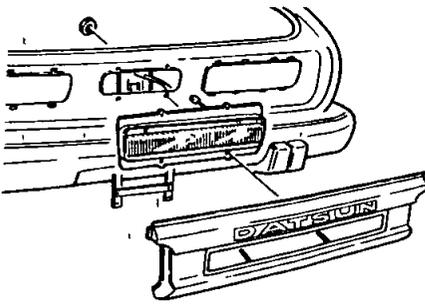


BE254

Fig BE-21 License lamp (Station Wagon)

BODY ELECTRICAL SYSTEM

BACK-UP LAMP



BE228A

Fig BE-22 Exploded view of back-up lamp (Hardtop)

Sedan and Station Wagon

For replacement procedure of bulb and lamp assembly, refer to Rear Combination Lamp Assembly Replacement

Hardtop

- 1 Disconnect wires at connector
- 2 Remove right and left rear combination lamp assemblies.
- 3 Remove four flange nuts
- 4 Remove lamp assembly from rear panel.
- 5 Install new assembly in reverse sequence of removal.

TURN SIGNAL AND LIGHTING SWITCH

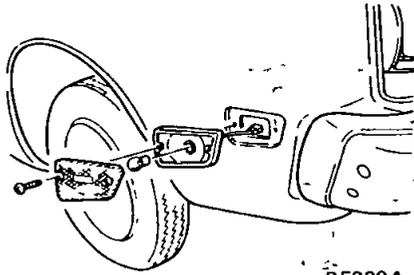
Removal

- 1 Remove horn ring
- 2 Remove steering wheel securing nut and steering wheel
- 3 Remove four shell cover retaining screws and remove upper and lower shell covers
- 4 Disconnect combination switch wires at connectors
- 5 Loosen two retaining screws and remove combination switch assembly

REAR SIDE MARKER LAMP

Lamp assembly replacement

- 1 Remove two screws securing lamp assembly and lens to body
- 2 Disconnect lamp connector and remove lamp assembly



BE229A

Fig BE-23 Exploded view of rear side marker

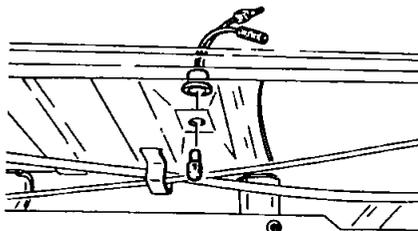
Bulb replacement

- 1 Remove two screws securing lamp assembly and lens to body, and detach lens
- 2 Push bulb in, turn it counterclockwise, and remove bulb
- 3 Install bulb in the reverse order of removal

TRUNK ROOM LAMP

Trunk room lamp assembly replacement

- 1 Disconnect lamp wire
- 2 Pull lamp out downward
- 3 Lift socket out of position



BE230A

Fig BE-24 Trunk room lamp replacement

LIGHTING SWITCH

Removal

- 1 Remove upper and lower shell covers from steering column by loosening four screws.
- 2 Loosen two cluster lid cover retaining screws and remove cluster lid cover.
- 3 Remove five screws from front of cluster A, and remove one screw holding cluster A to instrument panel from behind. Thus cluster A is detached.
- 4 Remove switch knob by depressing it and turning it counterclockwise.
- 5 Remove lighting switch

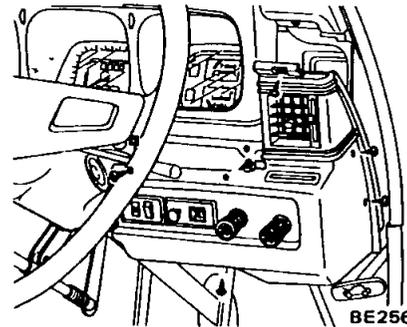


Fig BE-25 Removing cluster A

HAZARD WARNING SWITCH

Removal

- 1 Remove cluster lid A, following the same procedures as "Removal" procedures 1 through 3 for "LIGHTING SWITCH"
- 2 Remove connector from instrument harness.
- 3 Remove switch from cluster lid A, to which switch is attached by means of spring tension. From rear of cluster lid, push switch out forward

BODY ELECTRICAL SYSTEM

STOP LAMP SWITCH

Removal and installation

Stop lamp switch is integral part of brake pedal height

Whenever stop lamp switch is removed, adjustment is required

- 1 Disconnect lead wires at connectors
- 2 Loosen lock nut Switch assembly can then be taken out by rotating switch

- 3 Install in the reverse sequence of removal

Inspection

When plunger is pressed into switch assembly, stop lamp switch contacts are open Contacts are closed when plunger is projected

Test continuity as previously described by using test lamp or ohmmeter

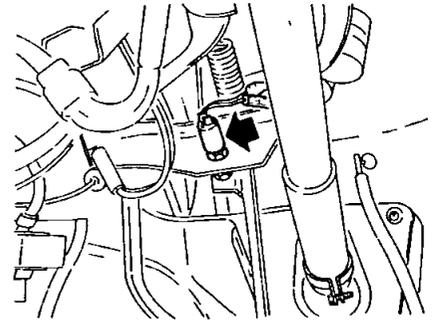


Fig BE-26 Stop lamp switch

BULB SPECIFICATIONS

Item	General areas	
	Wattage	
Head lamp	Outer	37.5/50
	Inner	37.5
Front combination lamp		
Turn signal light		21
Parking light		5
Side flasher lamp		5
Rear combination lamp		
Stop/Tail lamp		21/5
Turn signal lamp		21
Back-up lamp		21
License lamp		7.5
License lamp (Europe)		5
Room lamp		
Room lamp		10
Rear room lamp		10
Trunk room lamp		5
Instrument illumination light and indicator lights		3.4

BODY ELECTRICAL SYSTEM

TROUBLE DIAGNOSES AND CORRECTIONS

Head lamp system

Condition	Probable cause	Corrective action
Head lamps (both of high beam and low beam) do not light Neither high beam nor low beam is lit 1) Even when lighting switch is set to "OFF," and lighting lever switch is switched to operate passing light, it will not do	Fusible link blown off	When fused, detect and eliminate the cause, and replace with new one
	Faulty lighting relay terminal connector	Check connector for contact and repair as required
	Inoperative lighting relay	Conduct continuity test If relay is faulty, replace
2) Passing light is in normal workable condition	Both fuses (right and left side beams) blown off	When fused, detect and eliminate the cause, and replace with new ones
	Faulty terminal connectors (lighting switch and lever switch)	Check connectors for contact and repair as required
	Inoperative lighting switch and lever switch	Conduct continuity test If both switches are faulty, replace
Either high or low beam is lit normally (High and low beams are not switched to each other)	Faulty lighting switch terminal connector	Check connector for contact and repair as required
	Inoperative lighting switch	Conduct continuity test If switch is faulty, replace
Only one head lamp is lit 1) Head lamp on left side is normal, and that on right side is only dimly lit, or vice versa	Faulty terminal connectors (lighting relay and/or lighting lever switch)	Check connectors for contact and repair as required
	Inoperative lighting relay and/or lighting lever switch	Conduct continuity test If any switch is faulty, replace
2) Head lamp on left side is normal, and that on right side does not light	Either of two fuses for head lamps is melted	When fused, detect and eliminate the cause, and replace with a new one
	Faulty head lamp terminal connector	Check connector for contact and repair as required
Head lamps dim	Faulty lamp	Replace with a new one
	Faulty head lamp terminal connector	Check connector for contact and repair as required
1) Head lamps dim when the engine is stopped or idling	Faulty head lamp circuit	Check head lamp circuit for cable about to break or in faulty contact, or check fuse for faulty contact Repair, or replace if required
	Battery partly discharged	Measure specific gravity of electrolyte Charge battery if required
	Faulty battery	Replace battery

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
2) Head lamps still dim with engine running faster than idling	Voltage at head lamp terminals is 12.8 volts or higher Faulty sealed beam unit	Replace sealed beam units
	Voltage less than 12.8 volts Faulty charging system	Check the alternator, regulator, and head lamp circuit

Signal lamp system

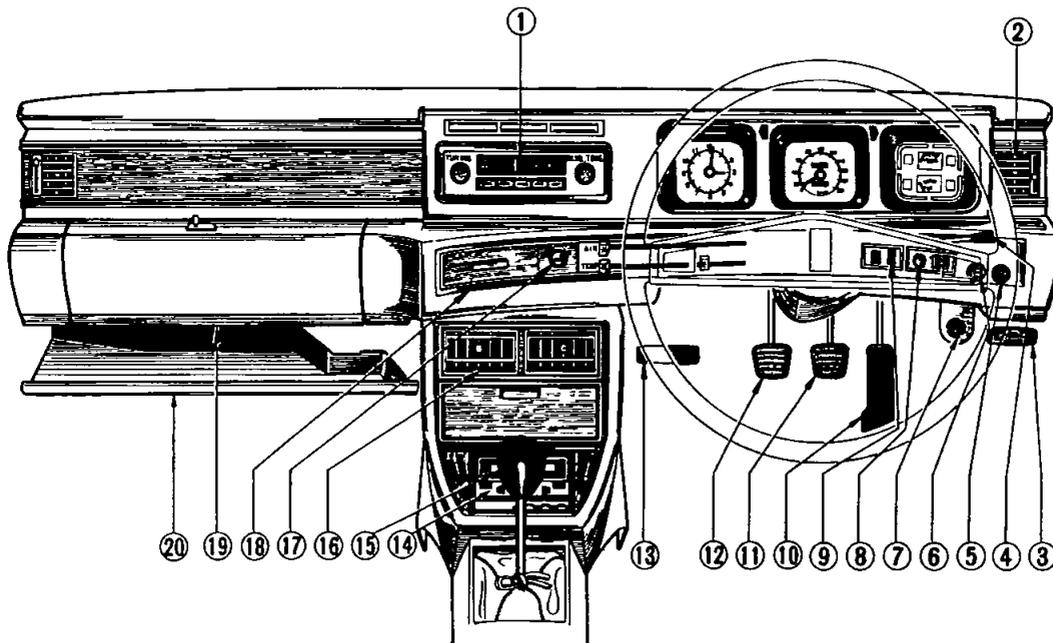
Condition	Probable cause	Corrective action
Turn signal lamps fail to operate properly	<p>When turn signal lever is moved to left, left turn signal lamp will not go on and off regularly (But, when this lever is moved to right, right turn signal lamp will operate properly)</p> <ul style="list-style-type: none"> o Faulty L H turn signal lamp o Trouble in L H turn signal circuit <p>Both turn signal lamps fail to operate properly</p> <ul style="list-style-type: none"> o Inoperative flasher unit 	<p>Replace bulb</p> <p>Check and correct</p> <p>Replace</p>
Turn signal lamps will not be on	<p>Both turn signal lamps fail to light when turn signal lever is moved to left and right</p> <p>1 When stop lamp switch is operated stop lamp will go on properly</p> <ul style="list-style-type: none"> a) Faulty "F" fuse b) Inoperative hazard lamp switch c) Inoperative flasher unit d) Faulty turn signal switch <p>2 When stop lamp switch is operated, stop lamp will not go on</p> <ul style="list-style-type: none"> a) Discharged battery b) Trouble in power supply 	<p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Check and correct</p> <p>Re-charge</p> <p>Check and correct</p>
Hazard warning lamps will not operate properly	<p>Turn signal lamps will operate properly, but hazard warning lamp will not light</p> <ul style="list-style-type: none"> 1 Faulty "C" fuse 2 Inoperative hazard flasher unit 3 Faulty hazard switch <p>Turn signal lamps operate properly, but L H hazard warning lamp will not</p> <ul style="list-style-type: none"> o Faulty hazard warning lamp switch contacts (left side) <p>Turn signal lamps operate properly, but hazard warning lamps will not operate properly (Flashing cycle is too low or high)</p> <ul style="list-style-type: none"> o Inoperative flasher unit 	<p>Replace</p> <p>Replace</p> <p>Replace</p> <p>Replace switch</p> <p>Replace</p>

BODY ELECTRICAL SYSTEM

METERS AND GAUGES

CONTENTS

CLUSTER LID	BE-20	HAND BRAKE WARNING LAMP	BE-22
Removal	BE-20	TACHOMETER	BE-22
SPEEDOMETER	BE-20	Installation	BE-22
Removal	BE-20	CLOCK	BE-22
FUEL METER AND WATER		Installation	BE-22
TEMPERATURE METER	BE-20	TROUBLE DIAGNOSES AND	
Replacement	BE-21	CORRECTIONS	BE-23
OIL PRESSURE WARNING LAMP	BE-21	Speedometer	BE-23
CHARGE WARNING LAMP	BE-21	Water temperature meter and fuel meter	BE-23
		Oil pressure and charge warning lamps	BE-25



- | | |
|---|------------------------|
| 1 Radio | 11 Brake pedal |
| 2 Side ventilator | 12 Clutch pedal |
| 3 Hood release handle | 13 Parking brake lever |
| 4 Turn signal/dimmer passing switch lever | 14 Cassete stereo |
| 5 Wiper and washer switch | 15 Gear control lever |
| 6 Light switch | 16 Heater |
| 7 Illumination control rheostat | 17 Cigarette lighter |
| 8 Hazard warning switch | 18 Ash tray |
| 9 Rear window defroster switch | 19 Glove box |
| 10 Accelerator pedal | 20 Package tray |

BODY ELECTRICAL SYSTEM

CLUSTER LID

Removal

1. Disconnect battery terminals
2. Remove shell covers from steering column by loosening four screws
3. Remove two cluster lid cover retaining screws and remove cluster lid cover
4. Remove two retaining screws as shown in Figures BE-28 and BE-29

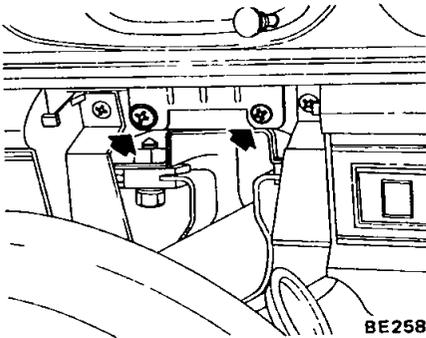


Fig BE-28 Removal of cluster lid

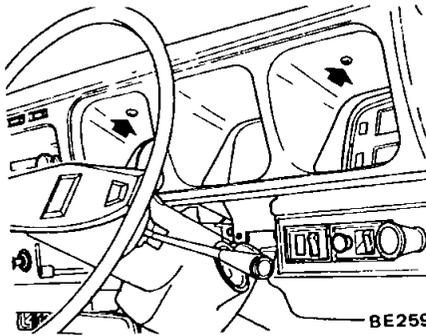


Fig BE-29 Removal of cluster lid

5. Pull instrument panel forward
6. From behind instrument panel, disconnect connector plug (multi-pole) from printed circuit housing
7. Disconnect speedometer cable from speedometer head
8. Disconnect other wires at terminals on printed circuit housing if so equipped
9. Remove cluster lid assembly from instrument panel

SPEEDOMETER

Removal

1. Remove cluster lid
2. Remove odometer knob if so equipped

3. Remove six attaching screws and remove printed circuit housing together with speedometer, water temperature meter and fuel meter
4. Loosen two speedometer retaining screws and remove speedometer from printed circuit housing
5. Install new speedometer in the reverse sequence of removal

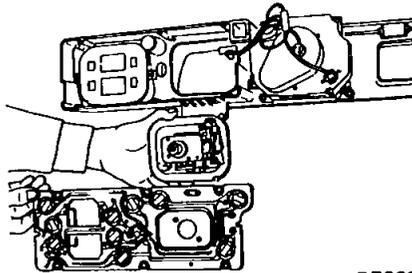


Fig BE-30 Removing speedometer

FUEL METER AND WATER TEMPERATURE METER

The fuel meter consists of a tank unit located in the fuel tank and fuel meter. The tank unit detects fuel level with its float, converts fuel level variation to a resistance of slide resistor installed on the float base, and thus, controls current flowing to the fuel meter.

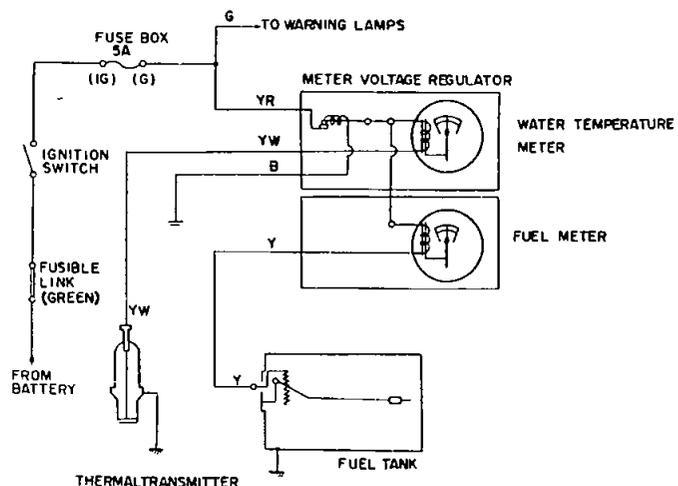
The water temperature meter consists of a meter and thermaltransmitter located in the engine block. The ther-

maltransmitter is equipped with a thermistor element which converts cooling water temperature variation to a resistance, and thus, the thermaltransmitter controls current flowing to the meter.

The fuel meter and water temperature meter are provided with a bimetal arm and heater coil. When the ignition switch is set to "ON," current flows to the heat coil, and the heat coil is heated. With this heat, the bimetal arm is bent, and thus, the pointer connected to the bimetal arm is operated. The characteristics of both meters are the same.

A tolerance may occur on the water temperature meter or fuel meter due to source voltage fluctuation. The voltage regulator is used to supply a constant voltage so that the water temperature meter and fuel meter operate correctly.

The operating part of the regulator consists of a bimetal arm and a heater coil. When the ignition switch is turned on, the bimetal arm is heated and bent by the coil, opening the contact. Consequently, current to the coil is interrupted. As the bimetal cools, the contact closes. The repetition of this operation produces a pulsating voltage of 8 volts which is applied to the temperature and fuel gauges.



BE296B

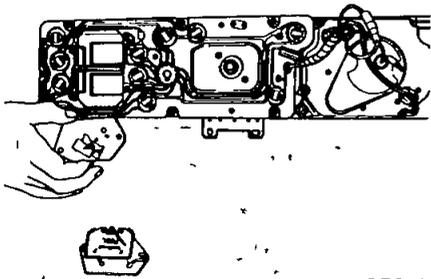
Fig BE-31 Circuit diagram for fuel meter, temperature meter and voltage regulator

BODY ELECTRICAL SYSTEM

If both the water temperature meter and fuel meter become faulty at the same time, this may be attributable to trouble in the voltage regulator

Replacement

- 1 Remove cluster lid
- 2 Remove two meter retaining screws and remove meter from printed circuit housing
- 3 Install new meter in the reverse sequence of removal



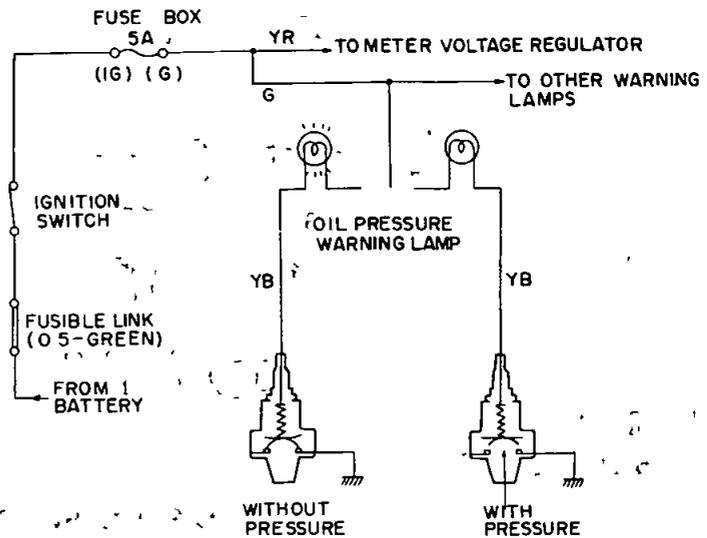
BE262

Fig BE-32 Removing meter

OIL PRESSURE WARNING LAMP

The engine lubricating system incorporates an oil pressure warning lamp which glows whenever engine oil pressure falls below 0.4 to 0.6 kg/cm² (6 to 9 psi). Under normal operation,

when the engine is stationary, the light glows with the ignition switch turned on. When the engine is running and oil pressure reaches the above range, the circuit opens and the light goes out.



BE297B

Fig BE-33 Circuit of oil pressure warning system

CHARGE WARNING LAMP

The charge warning lamp glows when the ignition switch is set to "ON" with the engine shut down, or when the alternator fails, to charge with the engine operated.

When the ignition switch is set to "ON", the charge warning circuit is

closed and current flows from the ignition switch to the warning lamp and grounds through the regulator (Fig BE-34-1). When the engine is started and the alternator comes into operation, the alternator output current from N terminal opposes the

current flowing from the warning lamp, as the current from N terminal increases, the solenoid is more energized and the warning lamp relay contacts are opened, in effect it breaks the warning circuit ground connection, and the lamp goes out (Fig BE-34-2).

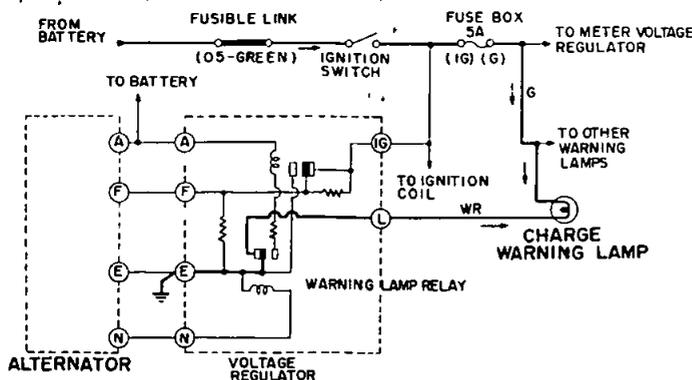
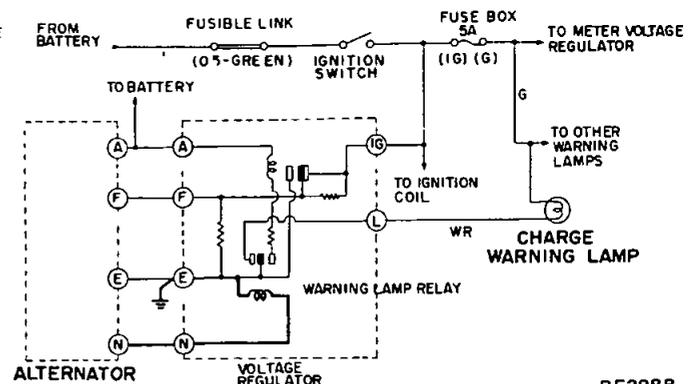


Fig BR-34-1 Circuit of charge warning system



BE298B

Fig BR-34-2 Circuit of charge warning system

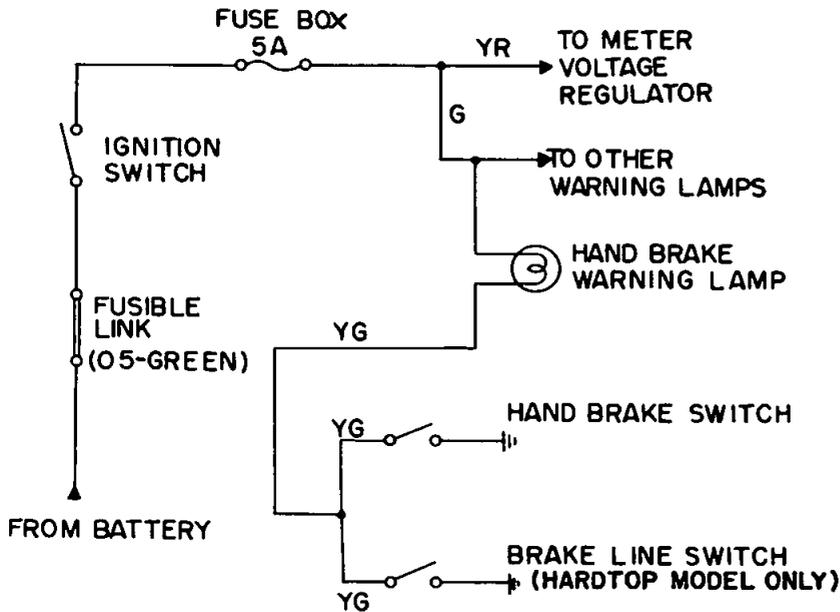
BODY ELECTRICAL SYSTEM

HAND BRAKE WARNING LAMP

The hand brake warning lamp glows when the hand brake is applied

When the ignition switch is set to "ON," current flows from the ignition switch to the warning lamp. When the hand brake is applied, hand brake warning switch is closed and warning lamp glows.

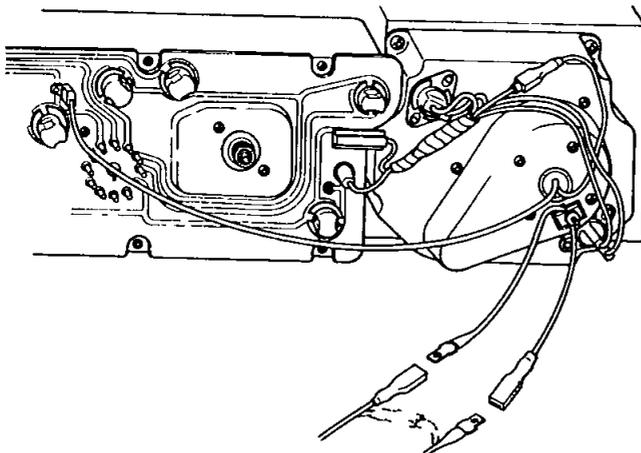
On some vehicles, this lamp is also used as a warning lamp to indicate that there is a leak in the service brake line. When a pressure difference between the front and rear brake lines reaches the limit, the switch in the brake line is actuated by line pressure and the contacts close. As the contacts close, the lamp glows.



BE299B

Fig BE-35 Circuit diagram for brake warning system

TACHOMETER



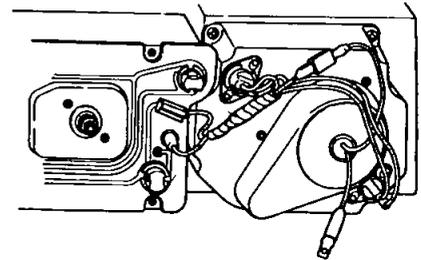
BE266

Fig BE-36 Installing tachometer

Installation

- 1 Remove cluster lid
- 2 Remove mask and install tachometer in place of mask.
- 3 Disconnect black/white-black/green wire (laid along the lower portion of instrument panel) at connector plug
- 4 Connect tachometer lead wires to disconnected plug ends in series
- 5 Connect other lead wires of tachometer to combination meter printed circuit terminals
- 6 Install cluster lid

CLOCK



BE267

Fig BE-37 Installing clock

Installation

- 1 Remove cluster lid
- 2 Remove mask and install clock in place of mask
- 3 Connect lead wire coming out from clock to blue/white wire laid along the lower portion of instrument panel.
- 4 Connect other clock lead wires to terminals on combination meter printed circuit
- 5 Install cluster lid

BODY ELECTRICAL SYSTEM

TROUBLE DIAGNOSES AND CORRECTIONS

Speedometer

Condition	Probable cause	Corrective action
Speedometer pointer and odometer do not operate	Improperly tightened speedometer cable union nut Broken speedometer cable Damaged speedometer drive pinion gear Inoperative speedometer	Retighten Replace Replace Replace
Speedometer pointer deflects excessively	Rapidly bent speedometer cable Damaged speedometer drive pinion gear Inoperative speedometer	Correct or replace Replace Replace
Unstable speedometer pointer	Improperly tightened speedometer cable union nut Faulty speedometer cable Inoperative speedometer	Retighten Replace Replace
Unusual sound occurs in response to increase of driving speed	Excessively bent or twisted speedometer cable inner wire or lack of lubrication Inoperative speedometer	Replace or lubricate Replace
Inaccurate speedometer indication	Inoperative speedometer	Replace
Inaccurate odometer operation	Improperly meshed second and third gear worm gears Faulty feeding due to deformed odometer and pinion carrier	Replace speedometer Replace speedometer

Water temperature meter and fuel meter

Condition	Probable cause	Corrective action
Both water temperature meter and fuel meter do not operate	Blown off fuse, or improper connection Faulty voltage regulator (damaged, fused, or open contact)	Check fuse for fusing and improper contact Replace after correcting cause, if fused Correct contact Replace
Both water temperature meter and fuel meter indicate inaccurately	Faulty voltage regulator (broken heat wire, seized contact and/or improper grounding) Improper cable contact	(In this case meter pointer fluctuates excessively) Replace (In this case, meter pointer fluctuates slightly) Check cable for improper contact, and repair if required

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
<p>Water temperature meter Water temperature meter does not operate</p>	<p>Faulty thermaltransmitter</p> <p>Faulty water temperature meter</p>	<p>Replace thermaltransmitter if pointer deflects when thermaltransmitter yellow/white cable is grounded</p> <p>Replace meter if pointer does not deflect when thermaltransmitter yellow/white cable is grounded</p>
<p>Pointer indicates maximum temperature</p>	<p>Faulty thermaltransmitter</p> <p>Faulty water temperature meter</p>	<p>Pointer moves to low limit when ignition switch is turned off In this case, replace thermaltransmitter</p> <p>Pointer indicates maximum temperature even after ignition switch is turned off In this case, replace meter</p>
<p>Water temperature meter does not operate accurately</p>	<p>Faulty water temperature meter</p> <p>Faulty thermaltransmitter</p> <p>Improper cable contact</p>	<p>Meter is serviceable when a 40Ω resistance is applied between thermaltransmitter yellow/white cable and ground, and meter indicates approximately 80°C (176°F)</p> <p>If meter is normal through the above inspection replace thermaltransmitter</p> <p>If meter indicates a temperature slightly lower than the actual temperature, check cable from meter to thermaltransmitter for cable being about to break, poor contact, and faulty grounding, and repair if necessary</p>
<p>Fuel meter Fuel meter does not operate</p>	<p>Damaged tank unit</p> <p>Inoperative fuel meter</p>	<p>Replace tank unit if pointer deflects when tank unit yellow cable is grounded</p> <p>Replace fuel meter with a new one if pointer does not deflect through the above inspection</p>
<p>Pointer indicates "F" position</p>	<p>Damaged tank unit</p> <p>Inoperative fuel meter</p>	<p>Replace tank unit if pointer lowers below empty limit when ignition switch is turned off</p> <p>Replace fuel meter if pointer still indicates "F" position through the above inspection</p>
<p>Fuel meter functions improperly</p>	<p>Damaged tank unit</p> <p>Inoperative fuel meter</p>	<p>Replace tank unit if pointer indicates a half level when a 32Ω resistance is applied between tank unit yellow cable and ground</p> <p>Replace fuel meter if pointer does not indicate a half level through the above inspection</p>

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
	Improper cable contact	If fuel meter indicates a level slightly lower than actual level, check cable from fuel meter to tank unit for cable being about to break, poor contact, and faulty grounding, and repair as necessary

Oil pressure and charge warning lamps

Condition	Probable cause	Corrective action
Oil pressure warning lamp Lamp does not light when ignition switch is set to "ON"	Blown off fuse or faulty contact. Faulty bulb or faulty cable contact Damaged oil pressure switch	Check fuse for fusing and faulty contact Replace after correcting cause or repair as necessary. If oil pressure switch yellow/black cable is grounded and warning lamp does not light check bulb for burnt out filament, and replace as necessary If warning lamp lights through the above inspection, replace oil pressure switch
Lamp does not go out while engine is being operated	Lack of engine oil Oil pressure too low Faulty oil pressure switch	Check oil level and add oil as required Inspect engine oil pressure system Continuity exists on oil pressure switch when engine is being operated Replace oil pressure switch
Charge warning lamp Lamp does not light when ignition switch is set to "ON"	Blown off fuse or faulty contact Faulty bulb or faulty cable contact	Check fuse for fusing and faulty contact Repair or replace if necessary Pilot lamp does not light when white/red cable in voltage regulator wiring connector is grounded, and ignition switch is set to "ON" Check bulb for burnt out filament, and replace if necessary
Lamp does not go out when engine is started.	Faulty charging system.	Inspect charging system

BODY ELECTRICAL SYSTEM

IGNITION SWITCH AND STEERING LOCK

CONTENTS

IGNITION AND STARTER SWITCH .	BE-26	Steering lock replacement	BE-26
Removal .	BE-26	Ignition switch replacement	BE-27
IGNITION SWITCH WITH STEERING LOCK	BE-26		

IGNITION AND STARTER SWITCH

Key position Terminal (wire color)	OFF	ON	START	ACC
Battery (WR)		○	○	○
Accessory (LB)		○	○	○
Starter (BY)		○	○	
Ignition (BW)		○	○	
Resistance (BG)			○	

Removal

- 1 Remove four screws and remove shell covers
2. Disconnect lead wires at connector
- 3 Remove two screws securing switch assembly to switch clamp
- 4 Remove switch assembly from switch clamp

IGNITION SWITCH WITH STEERING LOCK

Key position Terminal (wire color)	LOCK	OFF	ACC	ON	START
Battery (WR)			○	○	○
Ignition (BW)			○	○	○
Starter (BY)			○	○	○
Accessory (L)			○	○	○
Resistance (BG)					○

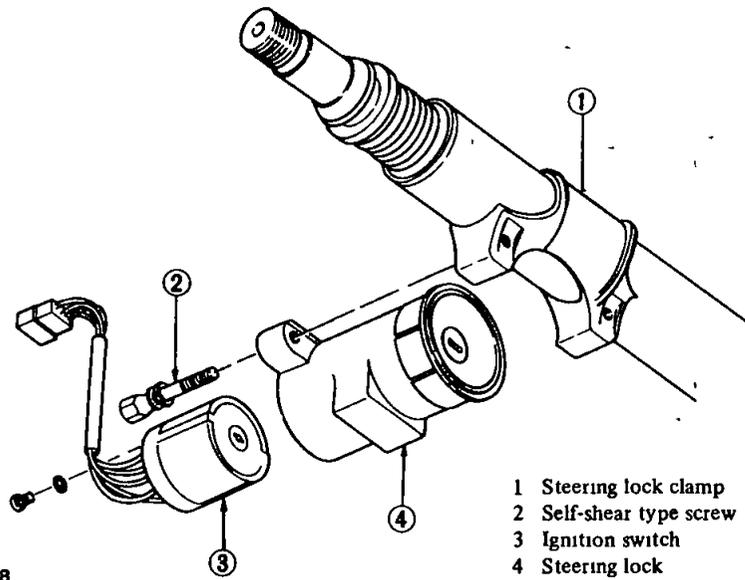
Steering lock replacement

For the purpose of tamper-proof, the self-shear type screws are used, and their heads are sheared off when installed so that the steering lock system cannot be removed easily. Replace the steering lock in accordance with the following instructions when required.

Break two self-shear type screws with a drill or other proper tool. Now, remove the steering lock from the steering lock clamp.

When installing a new steering lock, be sure to tighten two new self-shear type screws to shear off their heads.

BODY ELECTRICAL SYSTEM



- 1 Steering lock clamp
- 2 Self-shear type screw
- 3 Ignition switch
- 4 Steering lock

Fig BE-38 Steering lock installation

Ignition switch replacement

To replace ignition switch from steering lock device, remove shell covers, disconnect ignition switch wires at connector, and remove one retaining screw from back of steering lock device. Install new switch in reverse sequence of removal

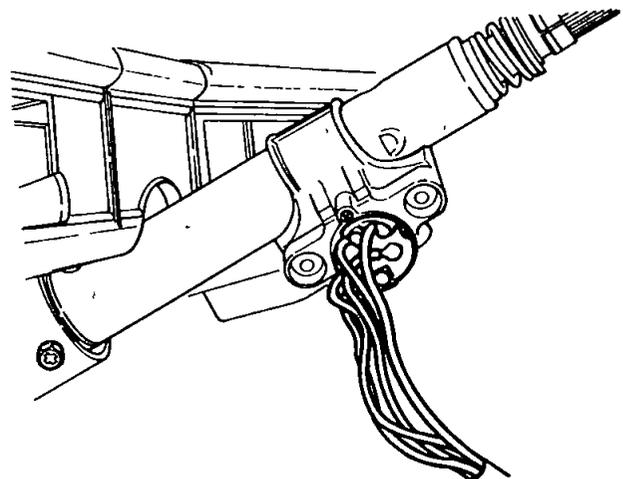


Fig BE-39 Ignition switch

HORN

CONTENTS

DESCRIPTION
INSPECTION

BE-27
BE-28

TRUBLE DIAGNOSES AND
CORRECTIONS

BE-28

DESCRIPTION

The horn circuit includes a horn relay. Current from the battery flows through the fusible link and fuse to the horn relay (terminal B), where it is shunted by the two circuits. In one

circuit (terminal S), the current flow is supplied through the solenoid and horn button to the grounding. In the other circuit (terminal H), the current flow is supplied through the relay contacts to horn (Horn bracket serves

as a grounding)

When the horn button is pressed, current from the battery energizes the solenoid. As the solenoid is energized, the relay contacts close. This allows the current to flow to the horn

BODY ELECTRICAL SYSTEM

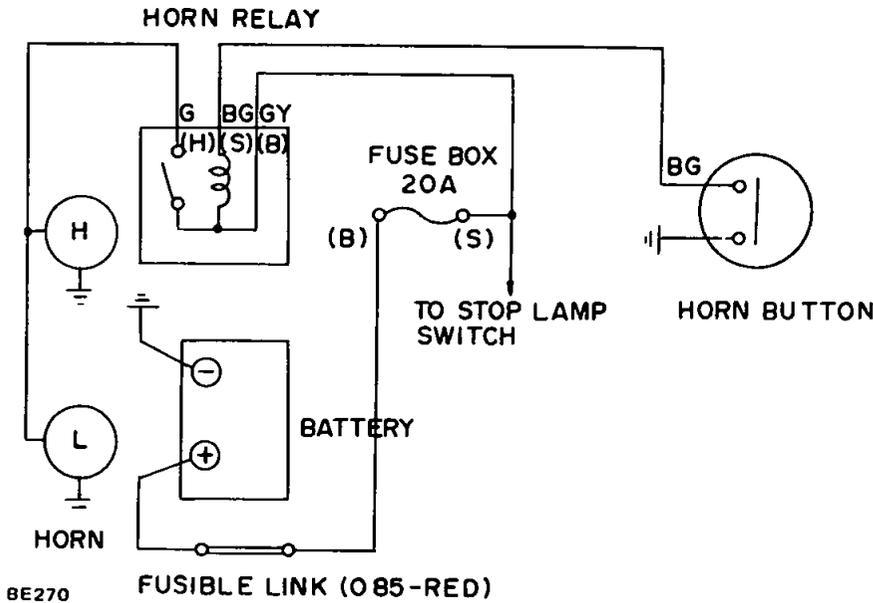


Fig BE-40 Circuit diagram for horn system

INSPECTION

Test system continuity and each unit by using test lamp or ohmmeter Refer to Figures BE-40 and BE-41 for horn system

In testing horn relay, there must be continuity between ① and ②

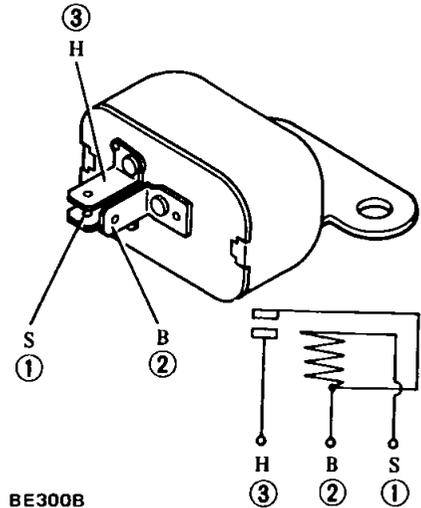


Fig BE-41 Horn relay

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Horn does not operate	Excessively discharged battery	Measure specific gravity of electrolyte Charge if required
	Blown off fuse	Check fuse for fusing and improper contact Replace or repair if required
	Improper horn button contact	In this case horn sounds when horn relay terminal (S) is grounded Check and repair horn button
	Inoperative horn relay	Horn sounds when horn relay terminals (B) and (H) are short-circuited. Replace horn relay
	Faulty horn	Horn does not sound though horn relay terminals (B) and (H) are short-circuited, and horn does not sound though battery (+) terminal is connected to horn terminal directly Replace horn
Horn sound continuously	Inoperative horn relay	Horn does not stop though horn relay (S) terminal is disconnected Replace horn relay
	Short-circuited horn button and horn relay terminal (S)	When horn stops through above disconnection, check horn button unit particularly carefully Repair horn relay terminal (S) Replace horn button

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
Reduced volume and/or tone quality	Improper fuse contact and loose connection	Correct
	Broken cable	Repair or replace if required
	Improper horn button contact	Repair

WINDSHIELD WIPER AND WASHER

CONTENTS

WINDSHIELD WIPER AND WASHER	-BE-29	Inspection	BE-32
Description	BE-29	TRUBLE DIAGNOSES AND	
Removal and installation	BE-30	CORRECTIONS	BE-35

WINDSHIELD WIPER AND WASHER

Description

The windshield wiper consists of a wiper motor unit, a link mechanism, wiper arms, blades, and an intermittent amplifier (the intermittent amplifier is installed on the Hardtop model only) The motor unit is made up of a motor and an auto-stop mechanism.

The wiper motor unit is located on the fire wall in the engine compartment, and the link mechanism is located under the cowl top panel

The intermittent amplifier is installed on the front dash side panel

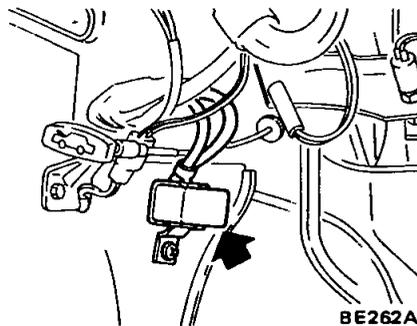


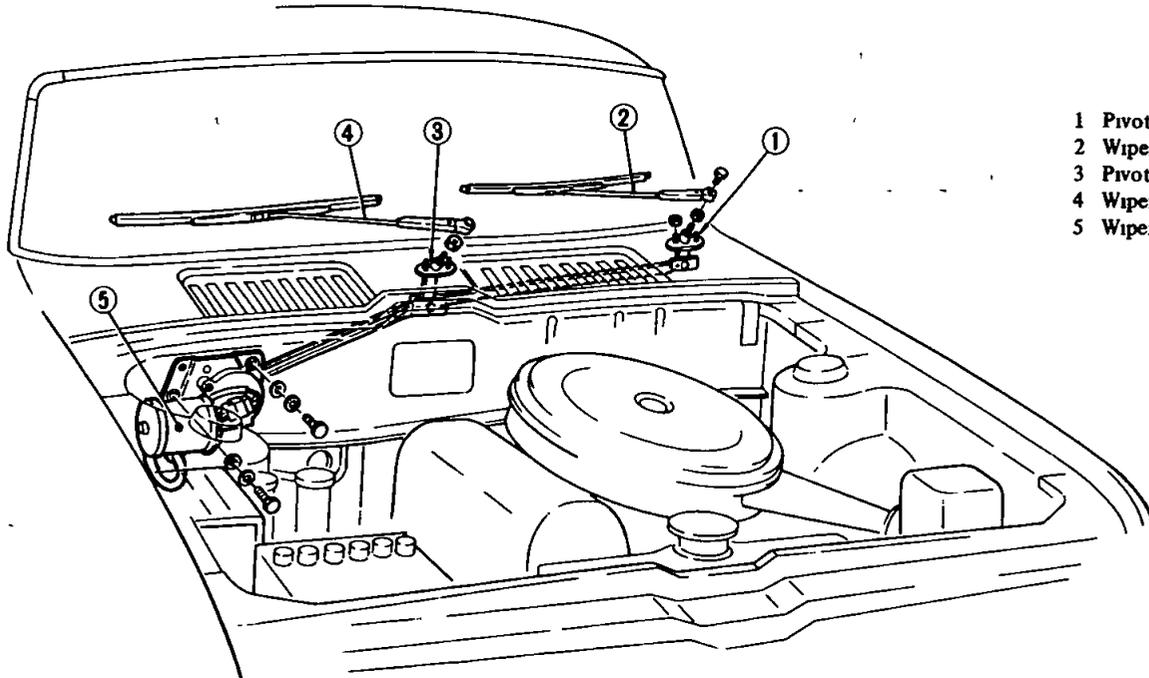
Fig BE-42 Window screen wiper amplifier

The electrically operated windshield washer consists of washing fluid tank (with motor and pump), washer nozzles, and vinyl tube used to connect those components

The windshield washer switch is combined with the windshield wiper switch to a single unit When operating the washer, twist the switch knob

BODY ELECTRICAL SYSTEM

Removal and installation



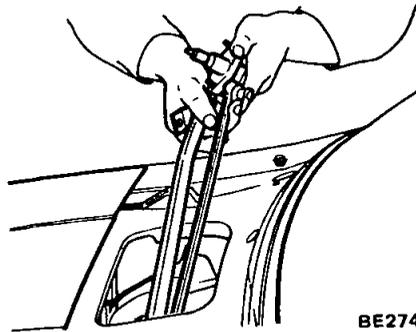
- 1 Pivot (L H)
- 2 Wiper arm (L H)
- 3 Pivot (R H)
- 4 Wiper arm (R H)
- 5 Wiper motor

BE263A

Fig BE-43 Wiper motor and wiper linkage

Wiper motor and wiper linkage

1. Disconnect wiper motor wire connector from wiper motor
2. When removing wiper arm from pivot shaft, raise wiper blade from windshield glass and then remove the base of wiper arm from pivot shaft by loosening attaching nut
3. Remove cowl top grille by removing set screws
4. Remove three wiper motor attaching bolts.
5. Remove ball joint connecting motor shaft to wiper link
6. Remove wiper motor from cowl top panel

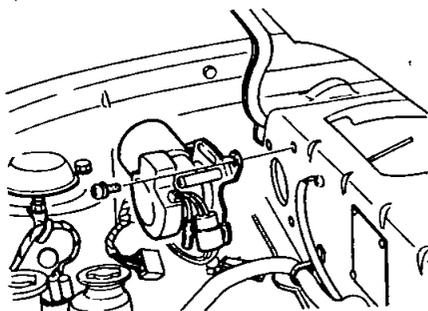


BE274

Fig BE-45 Removing link assembly

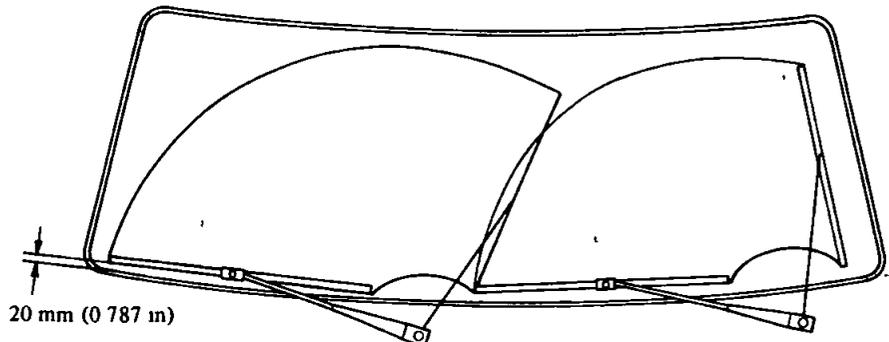
7. Remove two flange nuts attaching pivot to cowl top panel and remove link assembly
8. Install wiper linkage and wiper motor in the reverse sequence of removal

Install wiper blade in correct installation angle to obtain correct sweeping zones



BE264A

Fig BE-44 Removing motor



BE265A

Fig BE-46 Wiper arm installation

BODY ELECTRICAL SYSTEM

Washer nozzle

- 1 Remove washer nozzle fixing screw from cowl top panel
- 2 Remove washer nozzle
- 3 Install washer nozzle in the reverse sequence of removal
- 4 Adjust nozzle direction so that

fluid is sprayed in proper range as shown in Figure BE-48

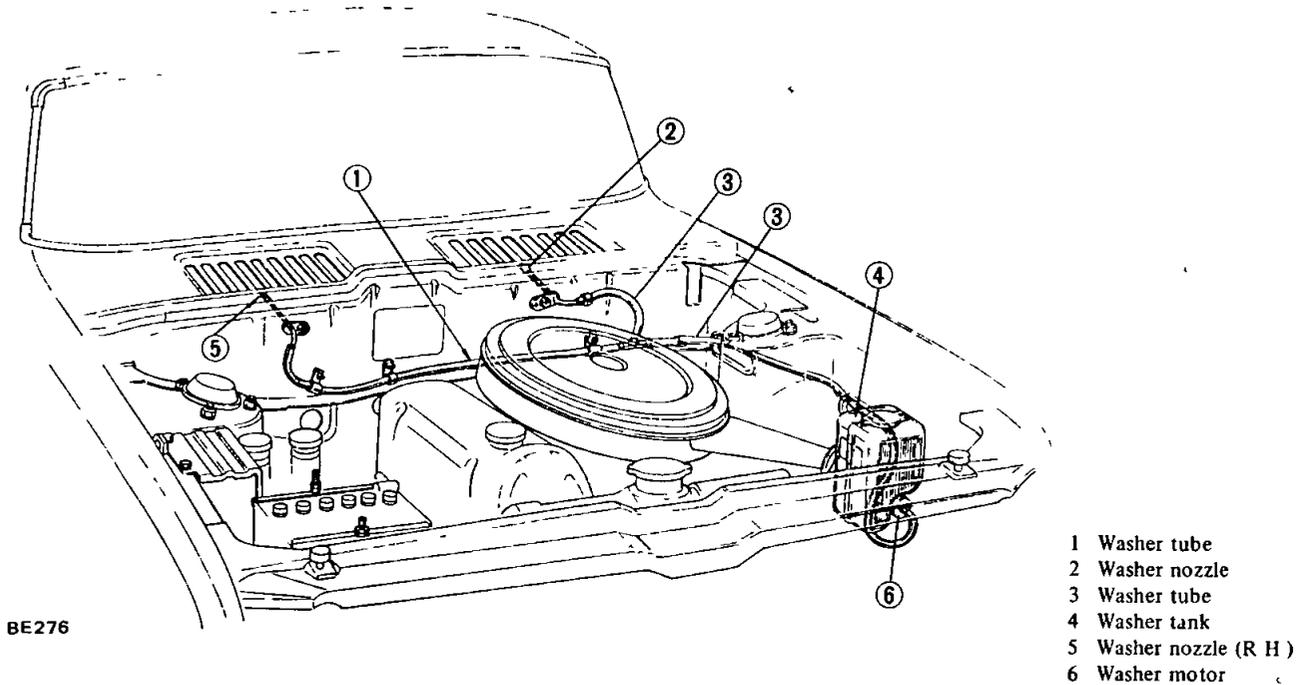


Fig BE-47 Windshield washer

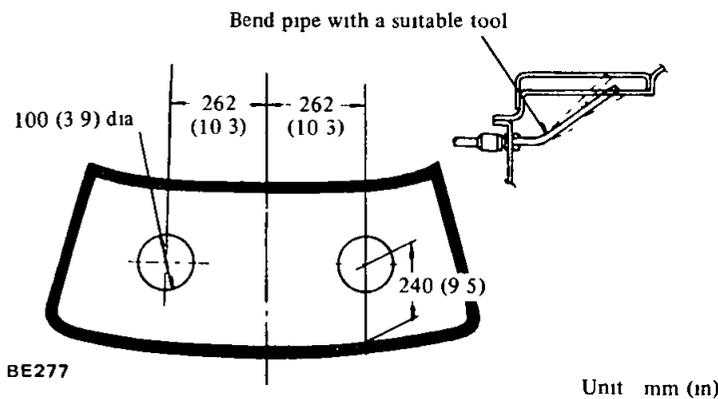


Fig BE-48 Nozzle adjustment

Wiper switch

- 1 Loosen four screws and remove upper and lower shell covers from steering column
- 2 Loosen two cluster lid cover retaining screws and remove cluster lid cover
- 3 Remove five screws from front of cluster A, and remove one screw holding cluster A to instrument panel from behind. Thus cluster A is detached
- 4 Remove switch knob by depressing it and turning it counter-clockwise
- 5 Remove wiper and washer switch, utilizing the same procedure as that for lighting switch

Note In assembling washer motor and washer tank, it is recommended that soapy water be used to facilitate the operation

Cautions for windshield washer operation

- 1 Be sure to use only washing solution

Never mix soap powder or detergent with solution

- 2 Do not operate windshield washer continuously more than 30 seconds or without washer fluid. This often causes improper windshield washer operation. Normally, windshield washer should be operated 10 seconds or less at one time

Intermittent wiper amplifier

The intermittent wiper amplifier is installed on the front dash side

- 1 Remove battery ground cable
- 2 Remove screw securing intermittent amplifier in place
- 3 Disconnect connector and remove amplifier. See Figure BE-42

BODY ELECTRICAL SYSTEM

Inspection

Hardtop model

Wiper and washer switch

To perform continuity tests properly, refer to Figure BE-49 and proceed as follows

Note Use of an ohmmeter is suggested to facilitate continuity tests

- 1 Turn wiper switch to the OFF position, and test continuity between terminals ④ and ⑦
- 2 Pull wiper switch out to 1st position (intermittent wiper operation) Test continuity between terminals ④ and ⑦ and between ③ and ⑤, respectively
- 3 Pull wiper switch out to 2nd position (low-speed wiper operation) Test continuity between terminals ③ and ④, and between ③ and ⑤, respectively
- 4 Pull wiper switch out to 3rd position (high-speed wiper operation) Test continuity between terminals ② and ③, and between ② and ⑤, respectively
- 5 Push wiper switch in all the way to the OFF position, and then twist it With wiper switch held in that position, test continuity between terminals ① and ⑧, and between ③ and ⑥, respectively

If continuity exists in all tests in steps 1 through 5 above, wiper switch is in good order

Wiper motor

Refer to Figure BE-50 and perform continuity tests at the following terminals

Between ⑥ and ②, ① and ②, ⑥ and ④, ⑥ and ⑤, and ⑥ and ⑦

Then connect positive terminal of a 12-volt d-c power supply to terminal ⑥, and ground terminal ⑤ securely With this setup, check whether or not wiper motor runs The motor should run—Next, ground terminal ④. Do not ground terminal ⑤ this time With this setup, check whether or not wiper

motor turns

Ground either terminal ⑤ or ④ to keep wiper motor in running condition Check continuity between terminals ③ and ② If continuity exists, it indicates that the on-off cycle is repeated, and that auto-stop circuit is functioning properly

Ground terminal ⑦, and check to ensure that continuity between terminals ① and ③ exists Undo grounding terminal ⑦ and check that continuity between ① and ③ does not exist If test results are as indicated, wiper motor intermittent relay is functioning properly

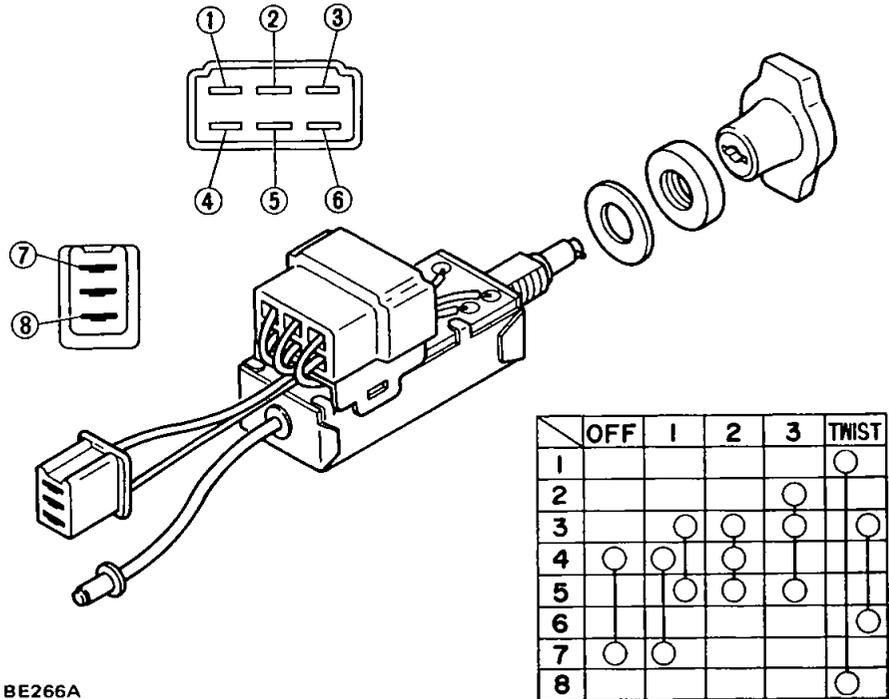
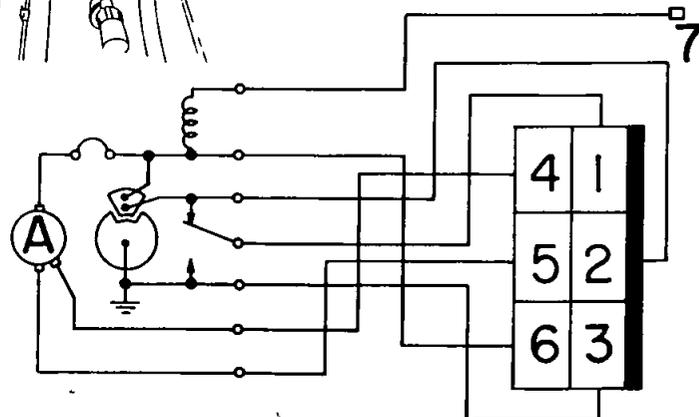
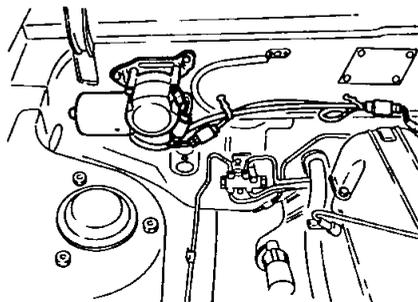


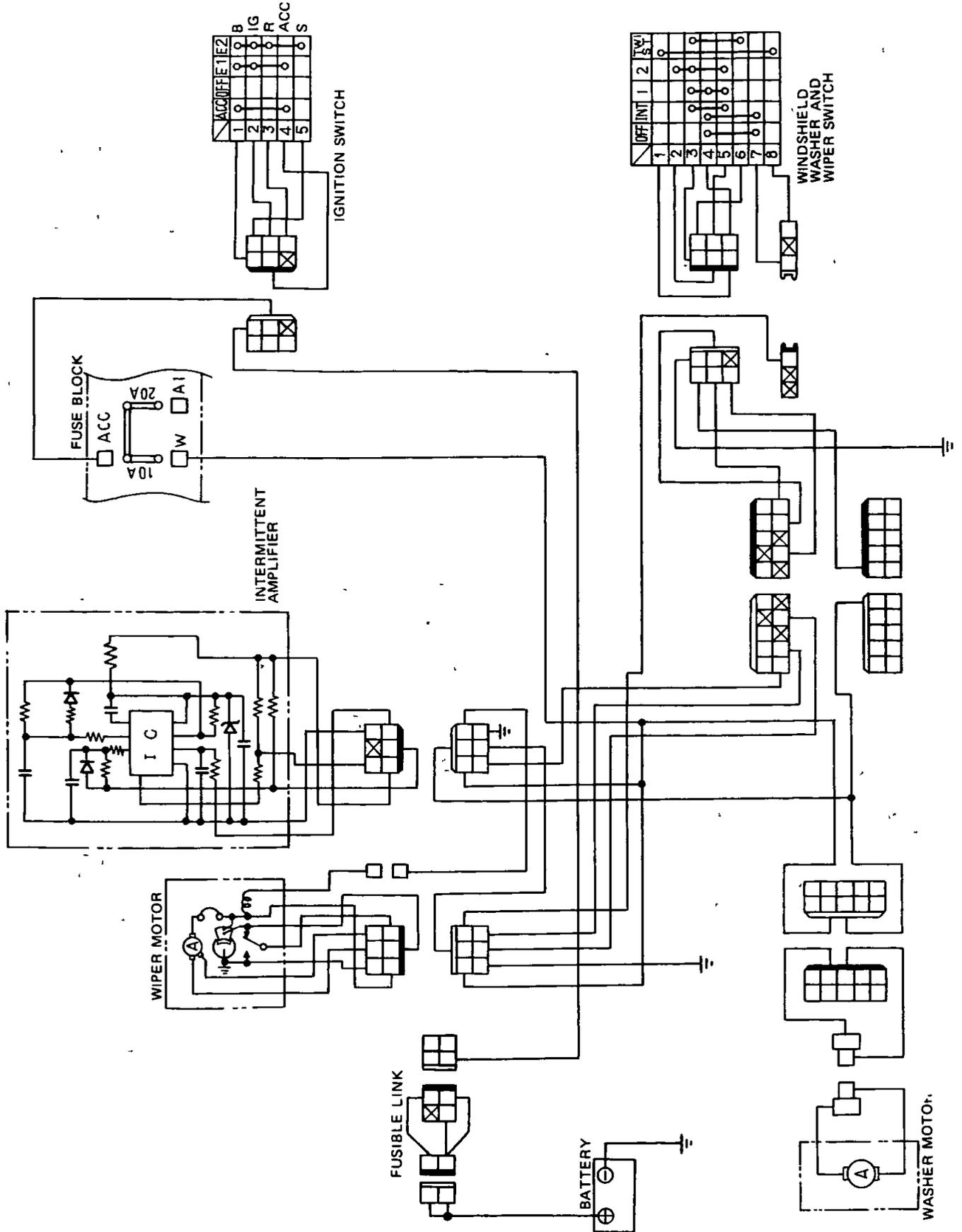
Fig BE-49 Wiper switch



BE301B

Fig BE-50 Wiper motor

BODY ELECTRICAL SYSTEM



BE302B

Fig BE-51 Circuit diagram of wiper and washer system

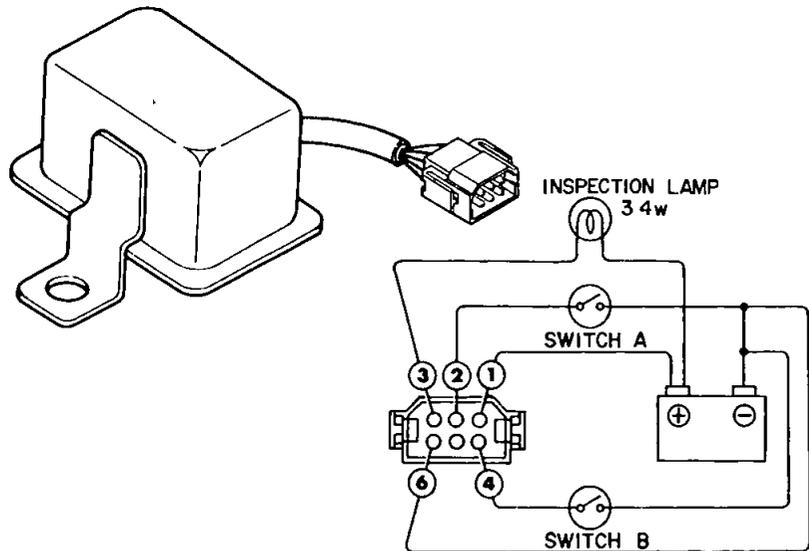
BODY ELECTRICAL SYSTEM

Intermittent amplifier

Set up a test circuit as shown in Figure BE-52, and check intermittent amplifier for operation as follows

- Turn on switch B, making sure that inspection lamp comes on immediately, then blinks at 5 to 7 second intervals
- Next, turn on switch A. Inspection lamp should come on approximately 0.7 second after switch is turned on. When switch is turned off 2 seconds after lamp comes on, lamp should remain on for some another 2.5 seconds

If above tests do not come out positive, replace intermittent amplifier



BE894A

Fig BE-52 Intermittent amplifier

Sedan and Station Wagon

Wiper and washer switch

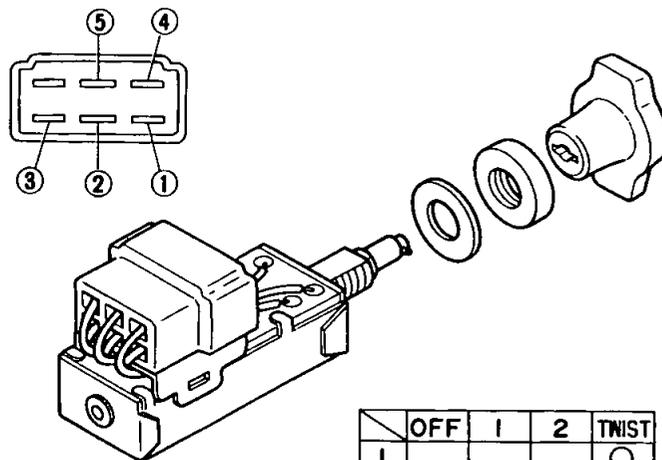
To perform continuity tests properly, refer to Figure BE-53 and proceed as follows

Note Use of an ohmmeter is suggested to facilitate continuity tests

- 1 Turn wiper switch to the "OFF" position, and test continuity between ② and ③
- 2 Pull wiper switch out to "1st" position. Test continuity between terminals ③ and ④
- 3 Pull wiper switch out to 2nd position. Test continuity between terminals ④ and ⑤
- 4 Push wiper switch in all the way to the "OFF" position, and then twist it

With wiper switch held in that position, test continuity between terminals ① and ④

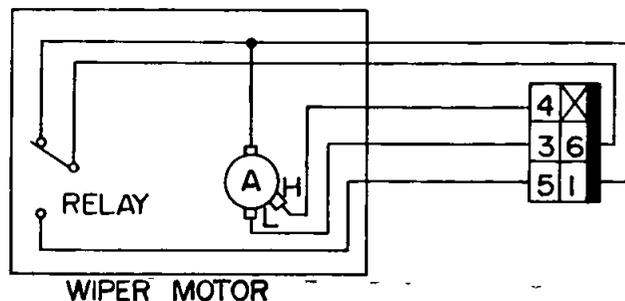
If continuity exists in all tests in steps 1 through 4 above, wiper switch is in good order



BE303B

Fig BE-53 Wiper switch (Sedan and Station Wagon)

Wiper motor



BE304B

Fig BE-54 Wiper motor (Sedan and Station Wagon)

BODY ELECTRICAL SYSTEM

Checking motor

Refer to Figure BE-54 and perform continuity tests at the following terminals

Between ① and ④, and between ① and ③

Then, connect positive terminal of a 12-volt d-c power supply to terminal ① and ground terminal ④. With

terminal ① connected to that voltage source, undo grounding terminal ④, and ground terminal ③.

With each setup, check whether or not wiper motor runs. If it does not, wiper motor is faulty.

Checking auto-stop circuit

Connect positive terminal of a

12-volt d-c power supply to terminal ① and ground terminal ③. With this setup, permit to run wiper motor and measure voltage at terminal ⑤.

If voltmeter pointer deflects from 12 volts to 0 volt then back to 12 volts, auto-stop circuit is functioning properly.

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Windshield wiper does not intermittently operate	Inoperative intermittent amplifier Improper wiper and washer switch contacts Broken armature of wiper motor Inoperative intermittent wiper relay Worn motor brush Motor is overheated due to seized motor shaft Windshield wiper fuse (10A) melts due to short-circuit, layer short-circuit, or motor inside component burnt	Replace Replace switch Replace wiper motor Replace wiper motor Replace wiper motor Replace wiper motor Replace fuse and wiper motor or repair faulty part
Windshield wiper does not operate	No current flows to motor due to Broken armature Worn motor brush Motor is overheated due to seized motor shaft Windshield wiper fuse (10A) is easily fused due to short-circuit, layer short-circuit, or motor inside component burnt Blown out fuse due to trouble of other part in windshield wiper circuit Loose, open or broken wiring Erroneous wiring Improper grounding Improper switch contact Foreign materials interrupts the movement of link mechanism Disconnected link rod Seized or rusted arm shaft	Replace motor Replace motor Replace motor Replace motor or repair short-circuited part Check other part for operation and correct problem Check wiring near motor and connector for connection Correct if necessary Check each wire for color code, and correct if necessary Correct Correct if necessary Correct Correct Lubricate or replace arm shaft

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
<p>Windshield wiper operating speed is too slow</p>	<p>With arm raised, still excessive current flows due to layer short-circuit of motor armature</p> <p>Windshield wiper stops only by lightly holding with hand due to worn motor brush</p> <p>With arm raised, still excessive current flows (3 to 5A) due to seized motor shaft</p> <p>Low source voltage</p> <p>Humming occurs on motor in arm operating cycle due to seized arm shaft</p> <p>Improper switch contact</p> <p>Windshield wiper blade sticks on windshield glass</p>	<p>Replace motor</p> <p>Replace motor</p> <p>Replace motor or lubricate bearing with engine oil</p> <p>Measure voltage, check other electrical parts for operation, and take corrective action for power supply if necessary</p> <p>Lubricate or replace</p> <p>Conduct continuity test, and replace if necessary</p> <p>Raise arm and operate windshield wiper without applying load</p> <p>Clean windshield glass and/or replace wiper blade</p>
<p>Windshield wiper speed cannot be changed correctly.</p>	<p>Motor brush for either low or high speed is worn</p>	<p>Replace motor</p>
<p>Windshield wiper does not stop correctly</p> <p>Stops anywhere.</p> <p>Does not stop</p>	<p>Contaminated auto-stop relay contacts or improper contact due to foreign matter</p> <p>Improper connection between 1st and 2nd switch steps</p> <p>Incomplete auto-stop operation (Contact is not interrupted)</p>	<p>Remove auto-stop device cover, and clean contacts carefully so as not to deform relay plate</p> <p>Remove switch, and make sure that 1st and 2nd steps are not connected at "OFF" position</p> <p>If connected, replace switch</p> <p>Remove auto-stop device cover, and correct relay plate bending</p>

BODY ELECTRICAL SYSTEM

RADIO

CONTENTS

INSTALLATION	BE-37	TROUBLE DIAGNOSES AND	
Radio receiver	BE-37	CORRECTIONS	BE-39
Radio antenna	BE-38	Noise prevention chart	BE-39
ADJUSTING ANTENNA TRIMMER	BE-38		

INSTALLATION

Radio receiver

- 1 Remove instrument panel
- 2 Position speaker to instrument panel and install two flange nuts (See Figure BE-55)
3. Install radio receiver to instrument panel
- 4 Connect speaker wires to instrument harness at connector
5. Connect radio wires to instrument harness at connector
- 6 Install antenna Follow procedure given in "Radio Antenna" in this section
- 7 Install instrument panel.
- 8 Connect antenna feeder to radio receiver cable

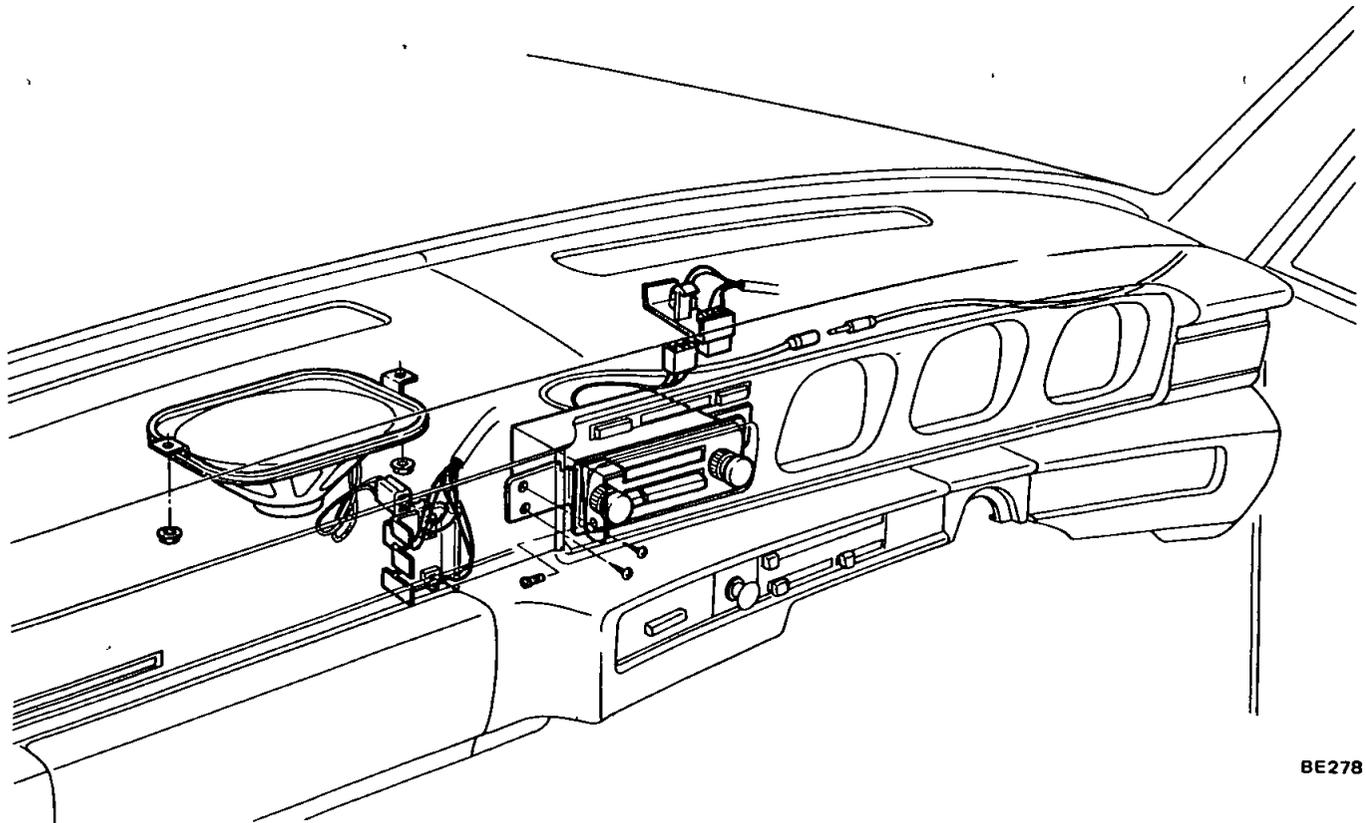
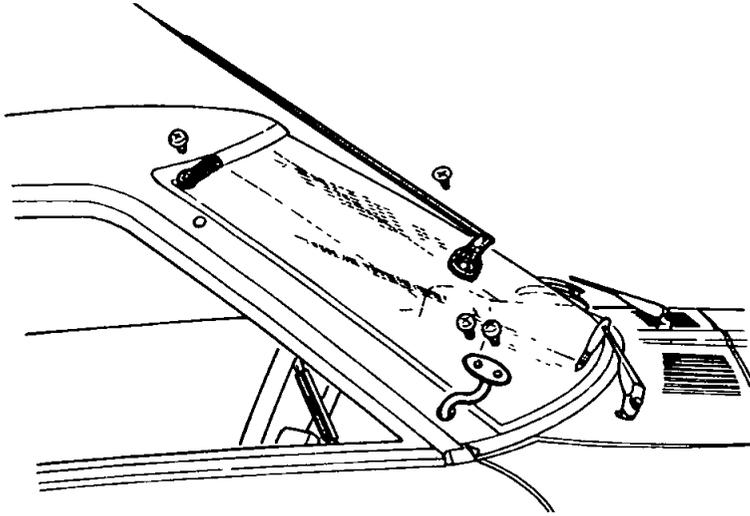


Fig BE-55 Radio

BODY ELECTRICAL SYSTEM

Radio antenna



BE279

Fig BE-56 Radio antenna

1 Insert antenna feeder into antenna mounting opening in front pillar

and route it through dash side panel to radio receiver

- 2 Install two retaining screws and install antenna feeder base to front pillar
- 3 Position antenna support to front pillar in position and install retaining screw
- 4 Install antenna rod assembly

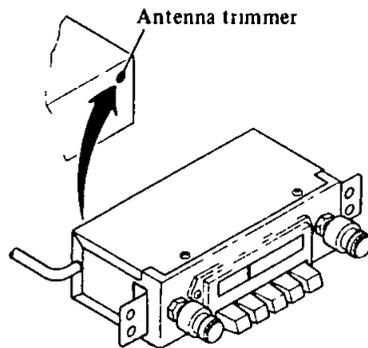
ADJUSTING ANTENNA TRIMMER

When a new radio receiver, antenna or antenna feeder is installed, antenna trimmer should be adjusted

- 1 Extend antenna completely
- 2 Tune in the weakest station between 12 and 16 (1,200 to 1,600 KC) on dial

Noise may be generated but disregard it

- 3 Turn antenna trimmer to left and right slowly and set it at a position where receiving sensitivity is highest



- CLARION MAKE -

BE572

Fig BE-57 Adjusting antenna trimmer

BODY ELECTRICAL SYSTEM

TROUBLE DIAGNOSES AND CORRECTIONS

Noise prevention chart

Position vehicle in an open area away from steel buildings, run engine, extend antenna to its maximum length, set volume control to maximum and set dial at a medium point without catching broadcasting wave

Condition	Probable cause	Corrective action
Ignition system Noise occurs when engine is operated	High tension cable	Install new high tension cable
	Ignition coil	Keep choke wire away from ignition coil Install a 0.5 μ F capacitor to primary side + terminal of ignition coil Note Be careful not to install capacitor to secondary or primary breaker side, otherwise engine becomes improper Connect wire between engine and ignition coil locating area of body Secure ground of ignition coil
	Distributor	Secure contact of carbon electric pole and rotor Eliminate sharp tip on rotor pole or cap pole by scrubbing with a screwdriver Check stagger between rotor and stator
Charging system Sound of alternating current presents When accelerator pedal is depressed or released, noise presents	Alternator	Install a 0.5 μ F capacitor to charging terminal A Note Do not use a larger capacitor If capacitor is installed to terminal F, alternator coil will be damage
	Regulator	Install a 0.5 μ F capacitor to "A" terminal of voltage regulator
Supplement equipment When engine starts, noise presents Noise still presents even after stopping engine Noise presents when horn is blown Noise presents when turn signal lamps are operated	Operative noise of water temperature and fuel meters	Install 0.1 μ F capacitor between terminal and ground wire Note If a capacitor having a larger capacity is used, indication of meter will be deviated
	Horn	Install a 0.5 μ F capacitor to horn relay terminal or horn switch
	Flasher unit	Install a 0.5 μ F capacitor

Notes

- | | | |
|---|--|--|
| a Be sure to locate capacitor as close as to noise source and connect in parallel | b Cut lead wire as short as possible
c. Ground wire should be attached on the body completely
d Make installation and connection | securely
e Carefully identify "+," "-", "IN" or "OUT" marks |
|---|--|--|

BODY ELECTRICAL SYSTEM

HEATER

CONTENTS

DESCRIPTION	BE-40	Heater core	BE-43
Air flow	BE-41	ADJUSTMENT	BE-43
REMOVAL AND INSTALLATION	BE-42	Control assembly	BE-43
Heater unit	BE-42	INSPECTION	BE-43
Heater control	BE-43	Fan motor power supply	BE-43
Air intake box	BE-43	Fan motor	BE-43
Heater motor	BE-43	TROUBLE DIAGNOSES AND CORRECTIONS	BE-44

DESCRIPTION

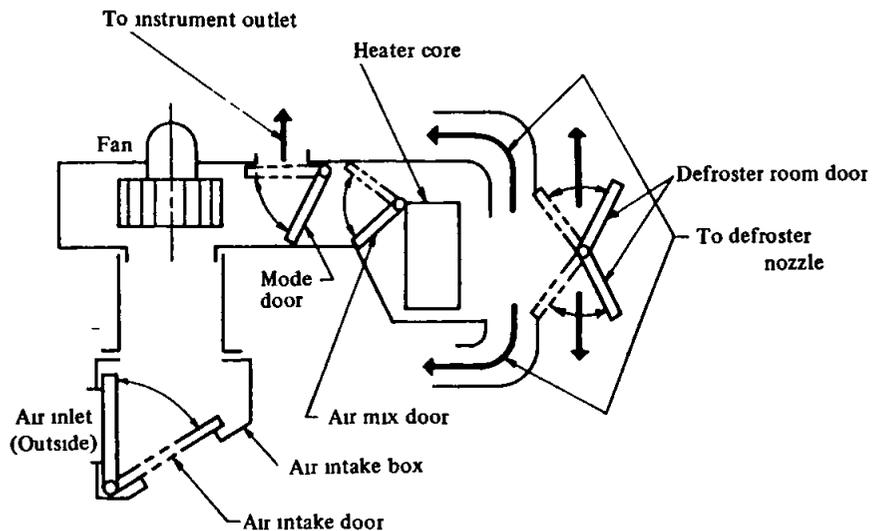
The heater is controlled by three levers – AIR, TEMP and FAN

The AIR lever controls air discharge by means of three doors (air intake, mode and defroster room doors)

- o The air intake door is used to let either outside- or inside-air flow into the heater unit. The outside air is drawn from the cowl top grille and delivered to the air intake box.
- o The mode door serves to supply air flow to the outlet in the instrument panel. This door has three detent positions – open, close, middle
- o The defroster room door controls air flow discharged from heater unit. When the door is open, air is discharged to the floor area with a small amount going to the defroster nozzle. When it is closed, all air is discharged from the defroster nozzle.

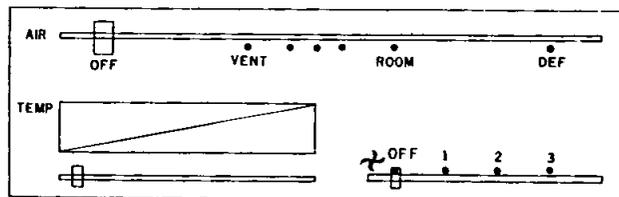
The TEMP lever controls the air mix door and mixes heated air with air bypassing the heater core to obtain the desired air temperature. In this manner, the temperature of air is effectively controlled.

The FAN lever controls switch that is located on the control lever assembly, providing three blower speeds.



BE281

Fig BE-58 Sectional view of heater

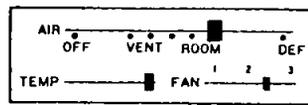


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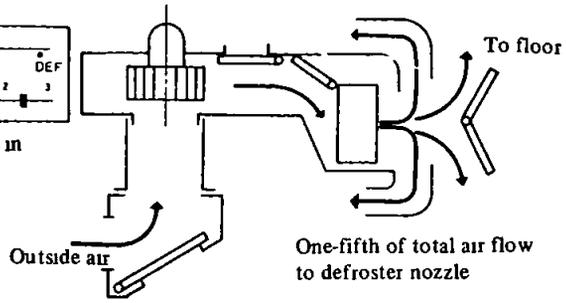
Fig BE-59 Control lever

BODY ELECTRICAL SYSTEM

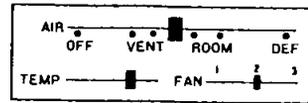
Air flow Heating



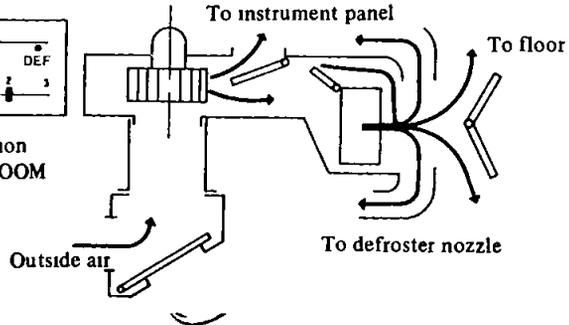
TEMP and FAN levers in any position



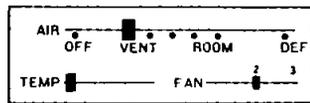
Heating and air ventilating



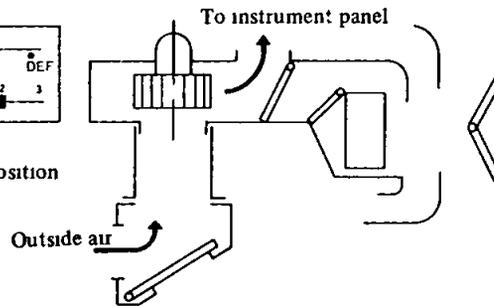
AIR lever in any position between VENT and ROOM



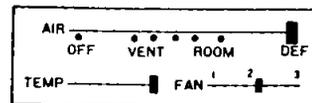
Air ventilating



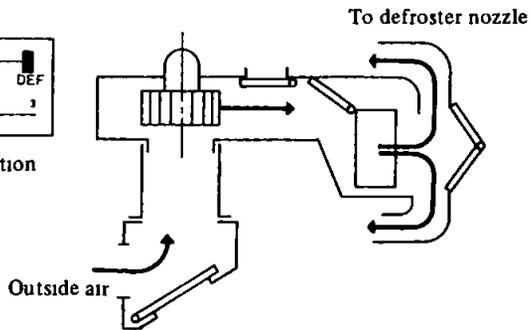
- TEMP lever in OFF
- FAN lever in any position



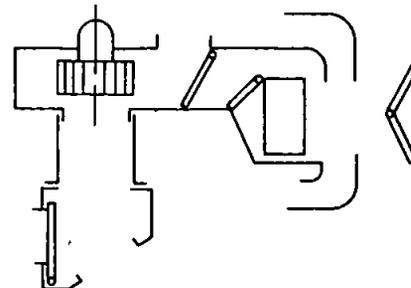
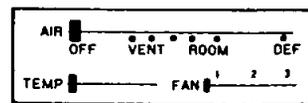
Defrosting



- FAN lever in any position

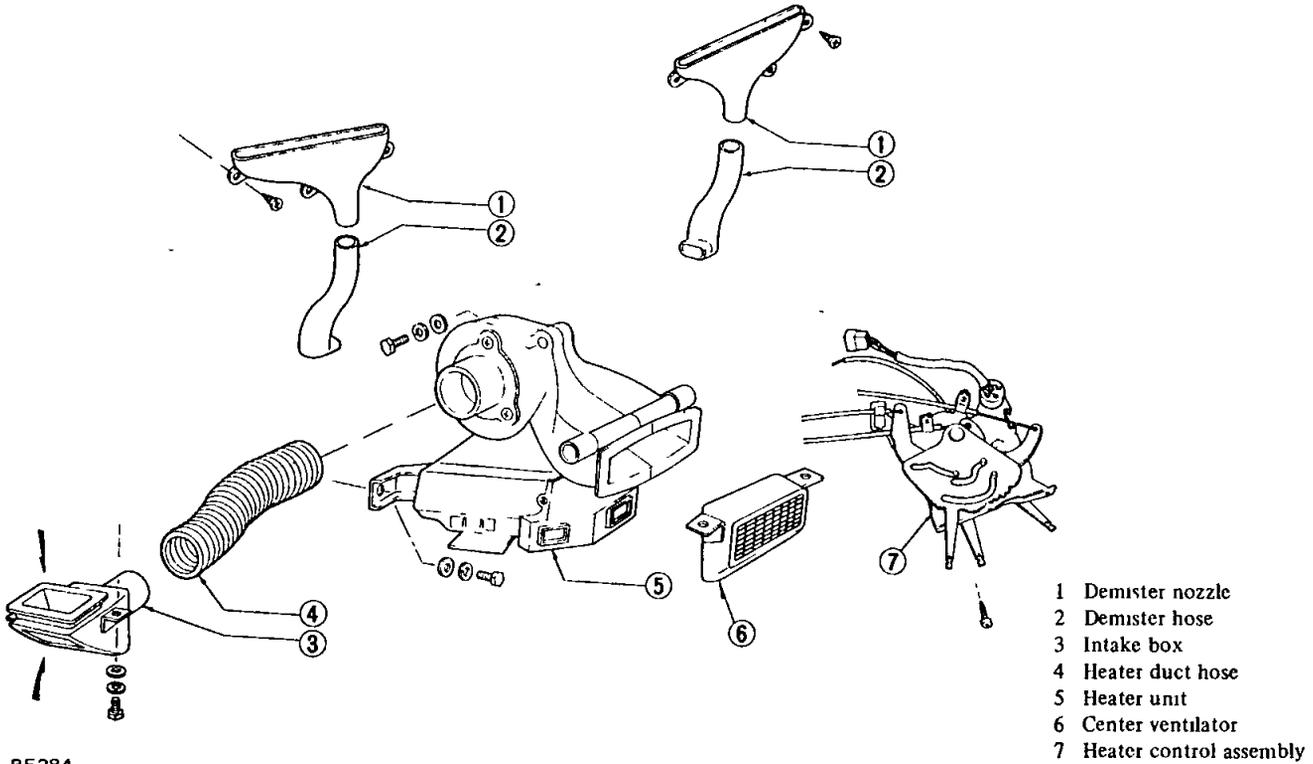


Air conditioning not in use



BODY ELECTRICAL SYSTEM

REMOVAL AND INSTALLATION



BE284

Fig BE-61 Exploded view of heater unit

Heater unit

- 1 Disconnect battery ground cable
- 2 Drain engine coolant
- 3 Remove hose clamps and disconnect inlet and outlet hoses
- 4 Perform the following operations in the driver's compartment side
- 5 Remove center ventilator (and center console box if so equipped)
- 6 Remove heater duct hose

- 8 Remove cable retaining clamps for the air mix door, mode door and defroster room door. Disconnect cables from door control levers

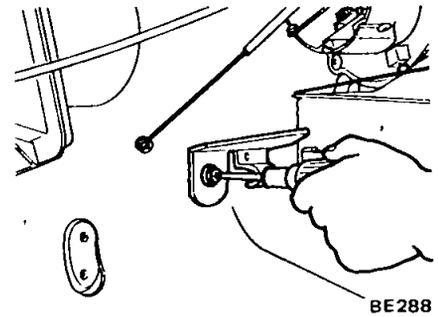


Fig BE-64 Removing unit securing bolt

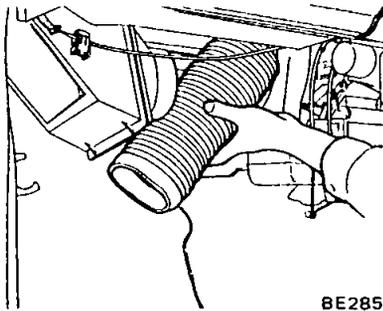


Fig BE-62 Removing heater duct hose

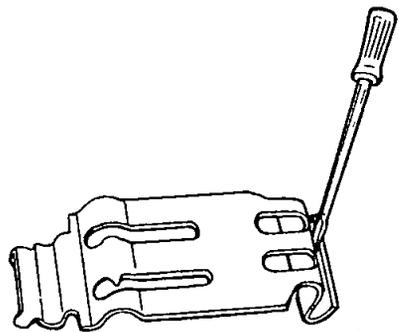


Fig BE-63 Removing cable retaining clamp

- 9 Disconnect lead wires at two connectors
- 10 Remove three bolts (two on each side of heater unit as shown Figure BE-64, and one on the top of this unit as shown Figure BE-65)
- 11 Remove heater unit

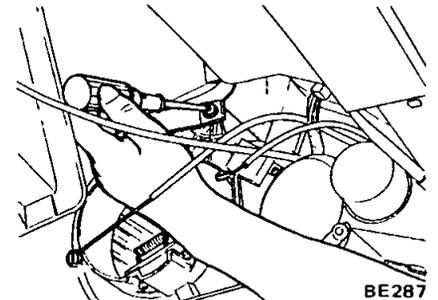


Fig BE-65 Removing unit securing bolt

- 12 To install heater unit, reverse the sequence of removal

BODY ELECTRICAL SYSTEM

Heater control

- 1 Remove heater unit Refer to the "Heater Unit"
- 2 Pull out finisher forward Note that finisher is latched in position
- 3 Remove two retaining screws and remove heater control assembly
- 4 To install, reverse the sequence of removal

Air intake box

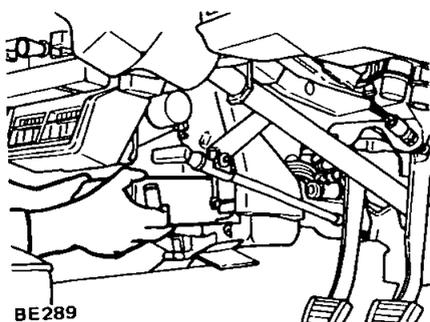
- 1 Remove heater duct hose
- 2 Disconnect control cable from air intake door
- 3 Remove screw securing air intake box in place
- 4 Remove air intake box
- 5 To install, reverse the sequence of removal

Heater motor

- 1 Remove heater unit by referring to the "Heater Unit"
- 2 Remove three screws and remove heater motor
- 3 To install, reverse the sequence of removal

Heater core

- 1 Drain engine coolant
- 2 Remove hose clamps and disconnect inlet and outlet hose from heater unit
- 3 Disconnect two control cables on the sides of heater unit
- 4 Remove clips and remove grille heater box
- 5 Pull out heater core
- 6 To install, reverse the sequence of removal



BE289

Fig BE-66 Removing heater core

ADJUSTMENT

Control assembly

Whenever a new or re-conditioned heater unit is to be installed, adjust control assembly as follows

- 1 Move AIR lever to OFF position
 - Fit cable to door lever of air intake box, and fasten with a cable retaining clamp while pulling outer case of cable with a force of 1 to 2 kg (2 to 4 lb)
- 2 Move AIR lever to DEF position
 - Fit cable to defroster room door lever, and fasten with a cable retaining clamp while pulling outer case with a force of 1 to 2 kg (2 to 4 lb)
 - Fit cable to mode door lever, and fasten with a cable retaining clamp while pulling outer case with a force of 1 to 2 kg (2 to 4 lb)
- 3 Move TEMP lever to left stop
 - Fit cable to air mix door lever, and fasten with a cable retaining clamp while pulling outer case with a force of 1 to 2 kg (2 to 4 lb)

Note Make sure that each control lever moves smoothly over its entire stroke

Control lever	Operating force kg (lb)
AIR Lever	0.3 (0.7), min
TEMP lever	0.3 (0.7), min
FAN lever	1.5 (3.3), min

INSPECTION

Check the following items if fan motor fails to rotate

- 1 Fuse and fusible link
- 2 To check for burned out fuse, use the same procedure as that for ordinary fuses with the use of a circuit tester or test lamp
- 3 Loose wire connection

Fan motor power supply

- 1 Disconnect lead wires at connector
- 2 Move ignition switch to ACC position
- 3 Connect test lamp lead wire to blue/white wire terminal in connector plug on instrument harness side and the other to the ground
- 4 Make sure that test lamp goes on

Fan motor

- 1 Disconnect lead wires at connector
- 2 Move ignition switch to ACC position
- 3 Connect test lead to positive side of fuse block power supply and the other to blue/white wire terminal in connector plug on fan motor side
- 4 Make sure that fan motor operates at each position of fan lever

BODY ELECTRICAL SYSTEM

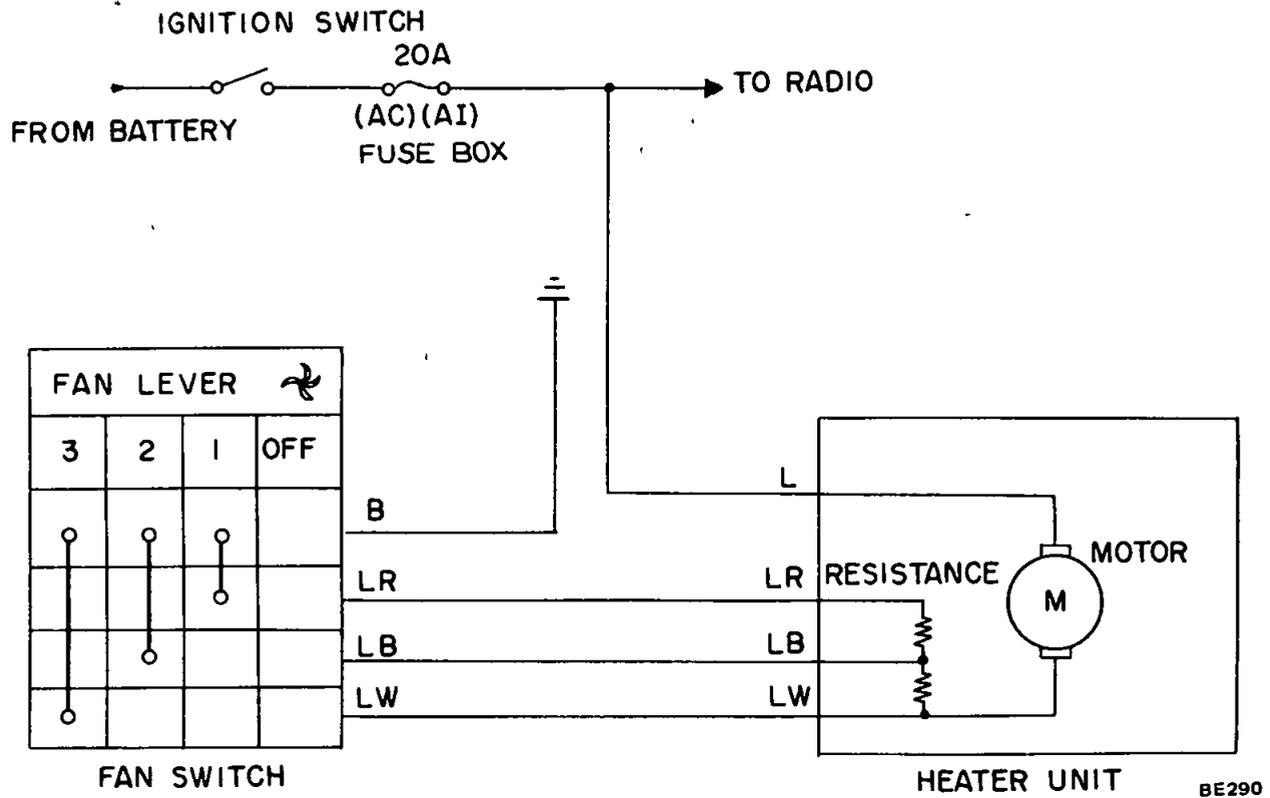


Fig BE-67 Circuit diagram for heater

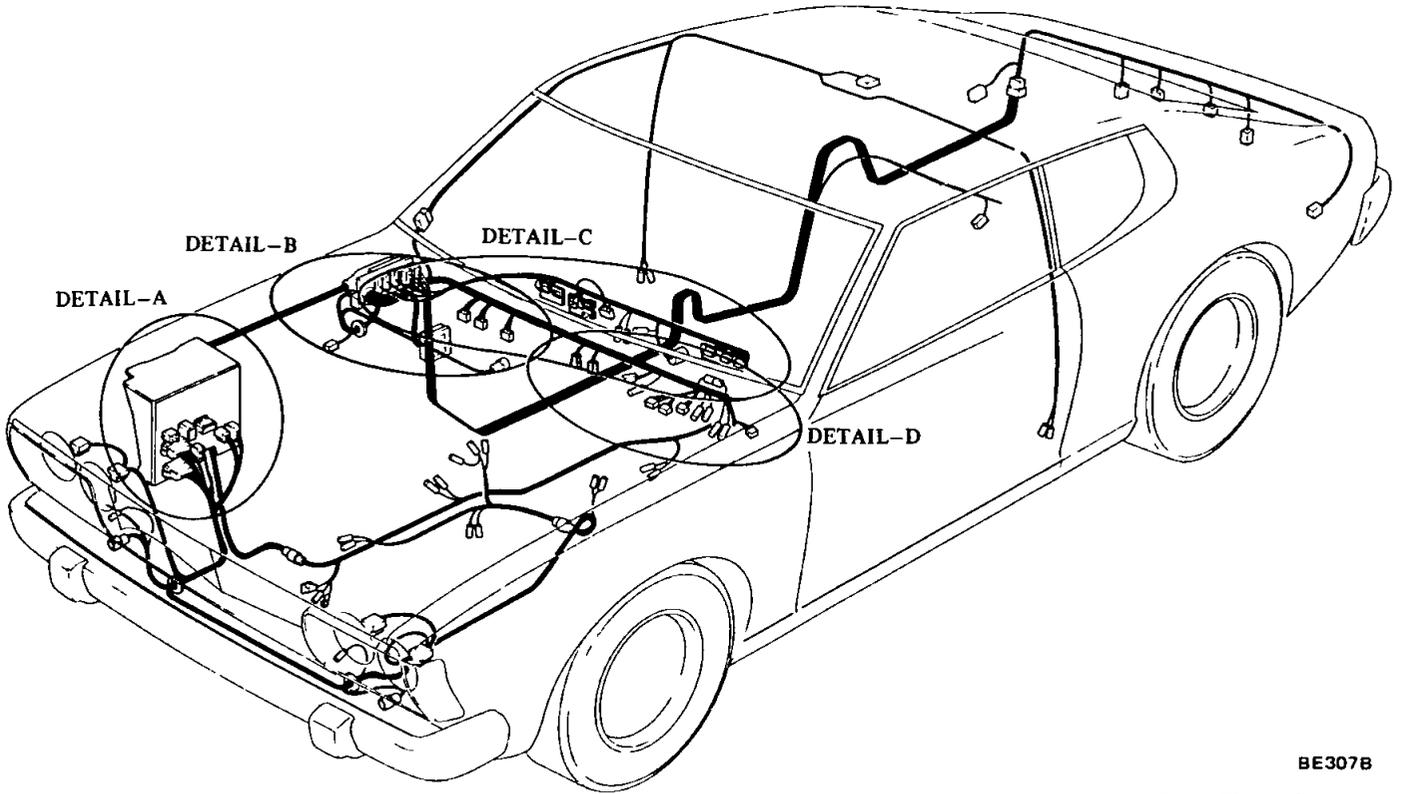
TROUBLE DIAGNOSES AND CORRECTIONS

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
	Water cock out of proper operation	Adjust control cable.
	Air mix door out of proper operation	Adjust control cable
Insufficient air flow to floor	Fan motor speed too low	Check for motor terminal voltage Repair poor connection and discontinuity Replace motor if necessary
	Defroster room door out of proper operation.	Adjust control cable

BODY ELECTRICAL SYSTEM

Condition	Probable cause	Corrective action
<p>Insufficient defrosting performance</p> <p>Cold air discharged</p> <p>Insufficient air flow to defroster</p>	<p>Refer to "No heated air discharged"</p> <p>Defroster room door out of proper operation (or seal damaged)</p> <p>Demister nozzle plugged</p> <p>Leak at demister hose-to-nozzle connection</p>	<p>Adjust control cable</p> <p>Clean</p> <p>Correct</p>
<p>Heated air discharged with lever in VENT</p>	<p>Mode door out of proper operation</p>	<p>Adjust control cable.</p>
<p>No heated air discharged with lever in between VENT and ROOM</p>	<p>Mode door out of proper operation</p>	<p>Adjust control cable Make sure that AIR lever moves smoothly over its entire range</p>
<p>Failure of fan to run</p>	<p>Fuse melted</p> <p>Motor wire connector disconnected.</p> <p>Switch faulty</p> <p>Motor faulty</p>	<p>Replace</p> <p>Correct</p> <p>Replace.</p> <p>Check and correct</p>
<p>Control lever drags</p>	<p>Inner wire rubbing against outer case end</p> <p>Control cable bent excessively</p> <p>Doors, door levers, etc out of proper operation</p>	<p>Adjust control cable.</p> <p>Correct</p> <p>Check and correct</p>
<p>Outside air comes in with fan in OFF.</p>	<p>Air intake door out of proper operation.</p> <p>Control cable out of adjustment</p>	<p>Repair or replace</p> <p>Adjust control cable</p>
<p>Noise from fan motor.</p>	<p>Unusual noise from fan motor</p>	<p>Check and tighten loose bolts</p>

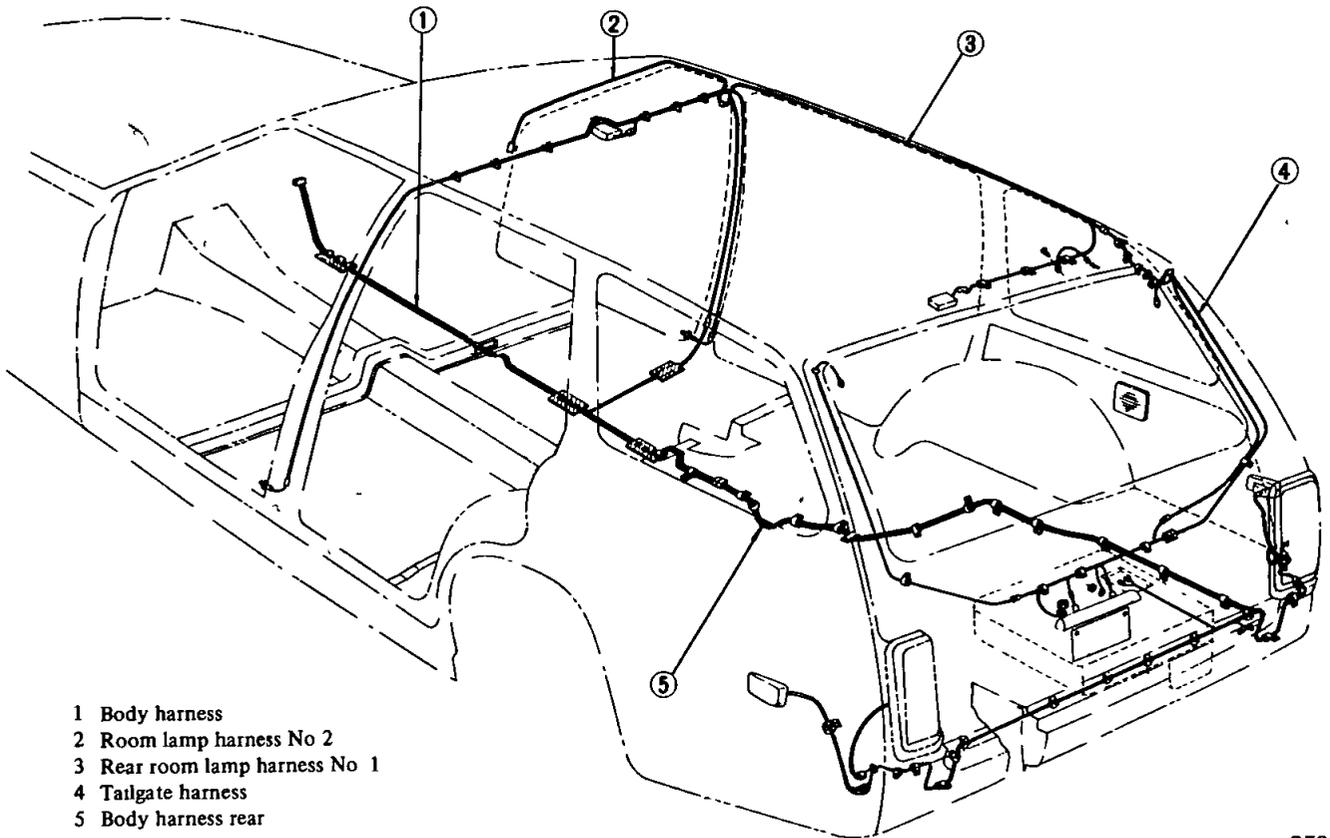
BODY ELECTRICAL SYSTEM



BE307B

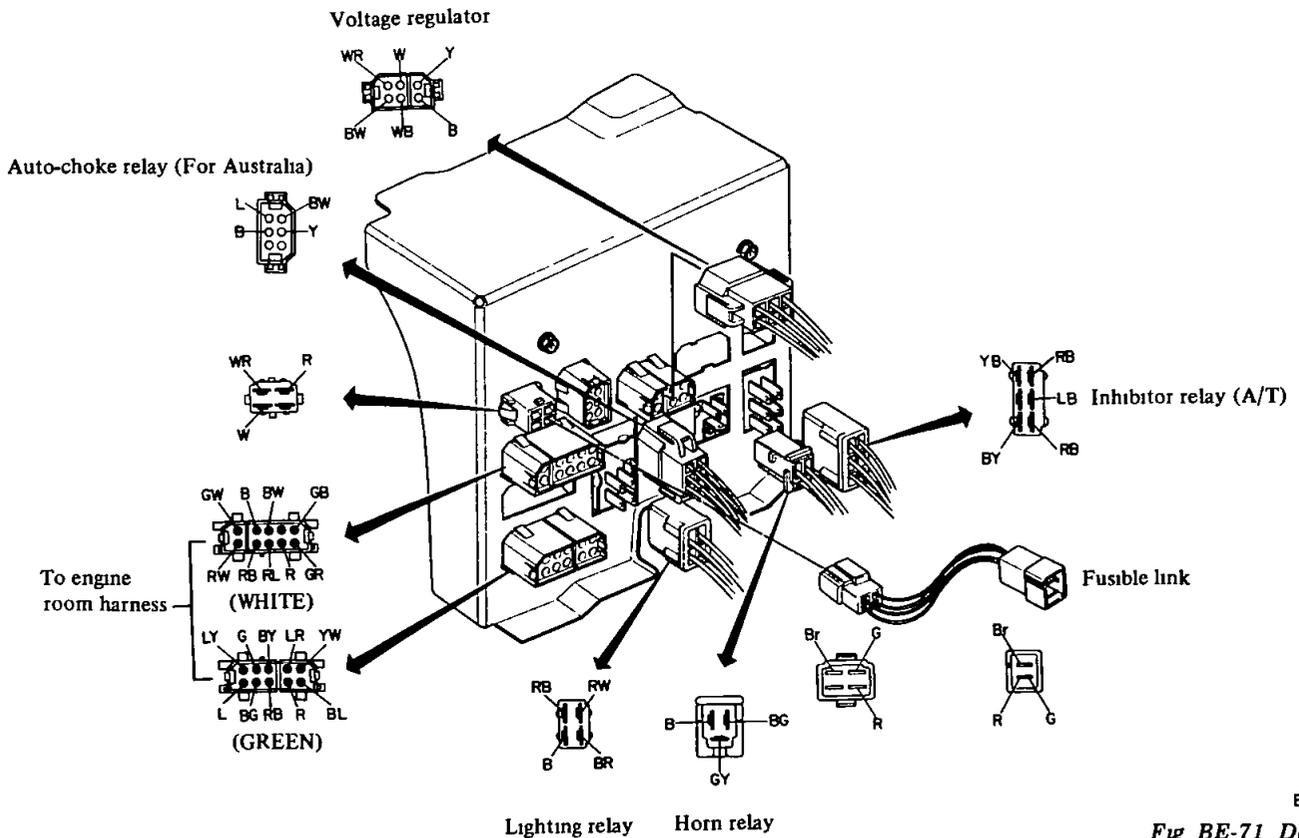
Fig BE-69 Wiring harness

BODY ELECTRICAL SYSTEM



BE955A

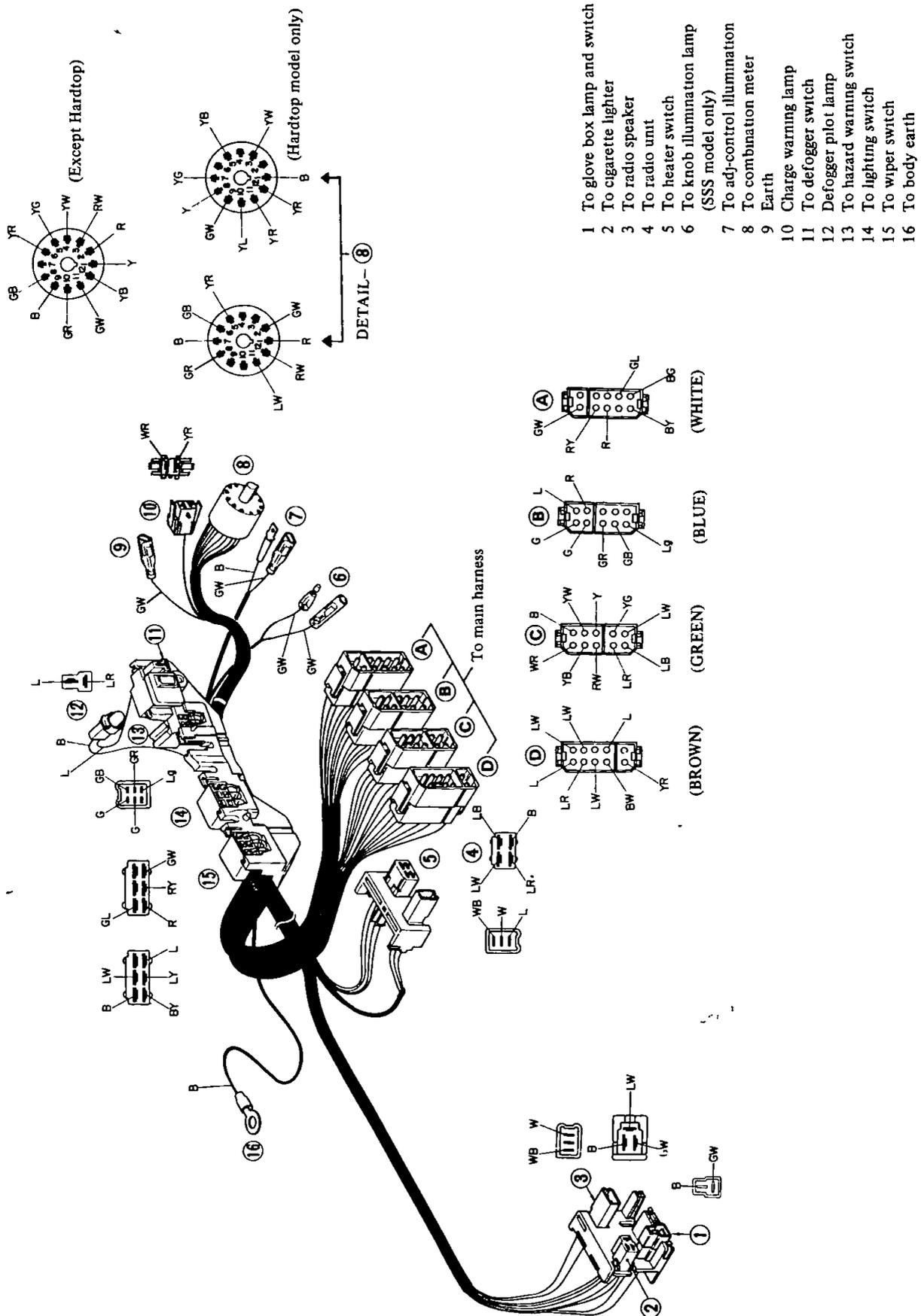
Fig BE-70 Wiring harness (Station Wagon)



BE308B

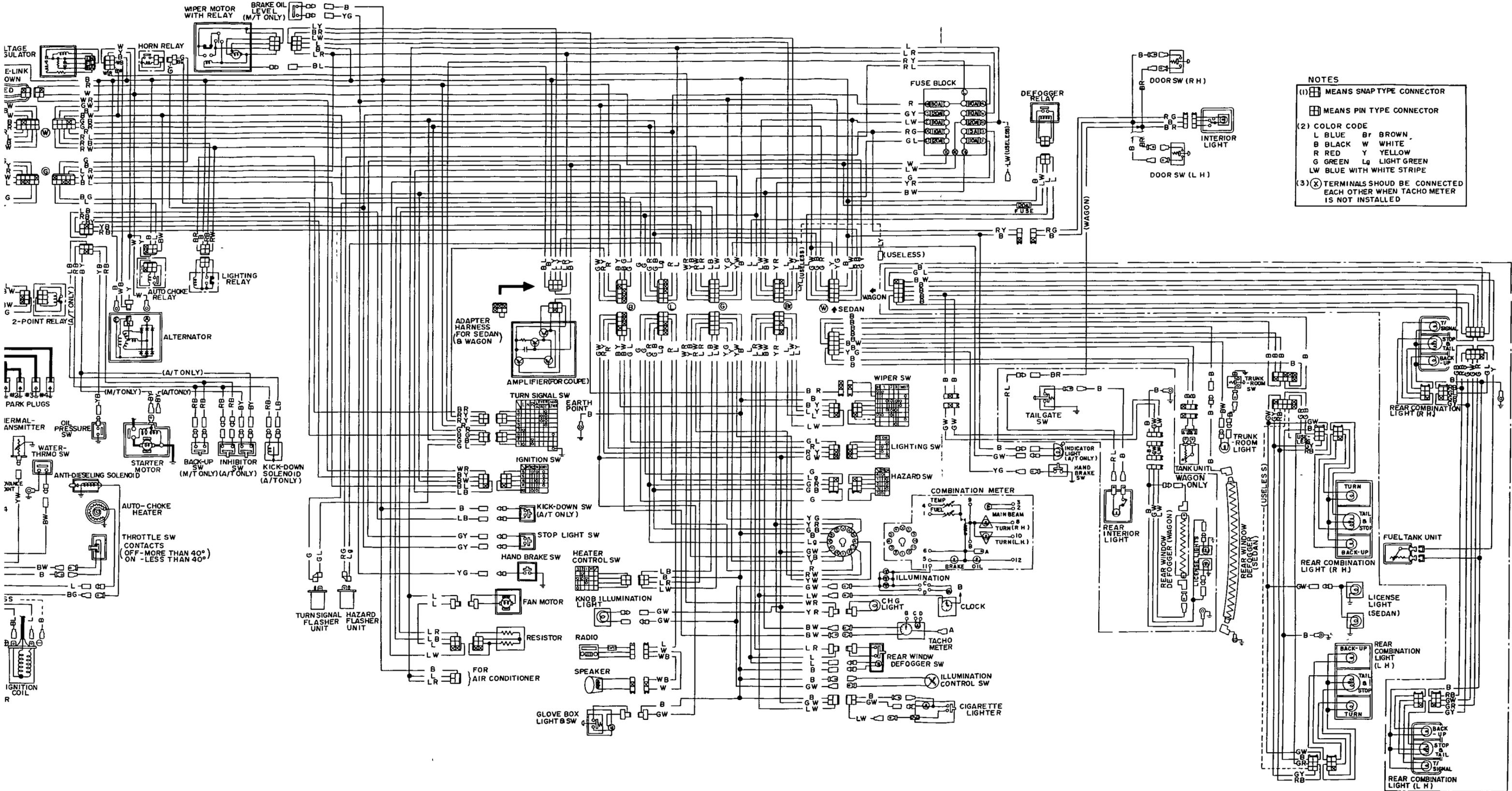
Fig BE-71 Detail A

BODY ELECTRICAL SYSTEM



BE313B
Fig BE-73 Detail C

WIRING DIAGRAM



- NOTES**
- (1)  MEANS SNAP TYPE CONNECTOR
 -  MEANS PIN TYPE CONNECTOR
 - (2) COLOR CODE
 L BLUE Br BROWN
 B BLACK W WHITE
 R RED Y YELLOW
 G GREEN Lg LIGHT GREEN
 LW BLUE WITH WHITE STRIPE
 - (3) (X) TERMINALS SHOULD BE CONNECTED EACH OTHER WHEN TACHOMETER IS NOT INSTALLED

