DATSUN PICK-UP

SERVICE MANUAL

1978

DATSUN PICK-UP

SERVICE MANUAL

MODEL 620 SERIES

WWW.THE620.COM

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
MANUAL TRANSMISSION	MT
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 & EHAUST SYSTEMS	FE
BODY & FRAME	BF
BODY ELECTRICAL SYSTEM	BE
AIR CONDITIONING	AC

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 1978 DATSUN PICK-UP.

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.
The special tools are presented at the end of each section.

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

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.

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 vehicle's safety will be jeopardized by the service method selected.

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

 Printed in Japan

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION GI

GI

GENERAL INFORMATION

GENERAL INFORMATION ....GI- 2

GENERAL INFORMATION

CONTENTS

MODEL VARIATION GI-2
IDENTIFICATION NUMBERS GI-4
LIFTING POINTS AND TOWING GI-5
  LIFTING POINTS GI-5
  SUPPORTABLE POINTS GI-6
  TOWING GI-6
  TIE DOWN GI-6
SPECIAL SERVICE TOOLS GI-6
APPROXIMATE REFILL CAPACITIES GI-7
RECOMMENDED FUEL GI-7
RECOMMENDED LUBRICANTS GI-7
  RECOMMENDED SAE VISCOSITY NUMBER GI-7
  LUBRICANT SPECIFICATIONS GI-8

MODEL VARIATION

<table>
<tr><th colspan="2">Destination</th><th>Class</th><th colspan="2">Model</th><th>Engine</th><th>Transmission</th><th>Differential carrier model and gear ratio</th><th>Pay load kg (lb)</th></tr>
<tr><td rowspan="18">U.S.A.</td><td rowspan="9">California and high altitude counties</td><td rowspan="3">Standard wheelbase</td><td rowspan="9">California models</td><td>HL620TUV</td><td rowspan="18">L20B</td><td>F4W71B</td><td rowspan="18">H190
4.375</td><td rowspan="18">500 (1,100)</td></tr>
<tr><td>HL620FTUV</td><td>FS5W71B</td></tr>
<tr><td>HL620KTUV</td><td>3N71B</td></tr>
<tr><td rowspan="3">Long wheelbase</td><td>HLG620TUV</td><td>F4W71B</td></tr>
<tr><td>HLG620FTUV</td><td>FS5W71B</td></tr>
<tr><td>HLG620KTUV</td><td>3N71B</td></tr>
<tr><td rowspan="3">Deluxe Cab</td><td>KHL620TUV</td><td>F4W71B</td></tr>
<tr><td>KHL620FTUV</td><td>FS5W71B</td></tr>
<tr><td>KHL620KTUV</td><td>3N71B</td></tr>
<tr><td rowspan="9">All low altitude counties except California</td><td rowspan="3">Standard wheelbase</td><td rowspan="9">Non California models</td><td>HL620TU</td><td>F4W71B</td></tr>
<tr><td>HL620FTU</td><td>FS5W71B</td></tr>
<tr><td>HL620KTU</td><td>3N71B</td></tr>
<tr><td rowspan="3">Long wheelbase</td><td>HLG620TU</td><td>F4W71B</td></tr>
<tr><td>HLG620FTU</td><td>FS5W71B</td></tr>
<tr><td>HLG620KTU</td><td>3N71B</td></tr>
<tr><td rowspan="3">Deluxe Cab</td><td>KHL620TU</td><td>F4W71B</td></tr>
<tr><td>KHL620FTU</td><td>FS5W71B</td></tr>
<tr><td>KHL620KTU</td><td>3N71B</td></tr>
</table>

Destination	Class	Model		Engine	Transmission	Differential carrier model and gear ratio	Pay load kg (lb)
Canada	Standard wheelbase	Non-California models	HL620TUN	L20B	F4W71B	H190 4.375	500 (1,100)
			HL620KTUN		3N71B		
	Long wheelbase		HLG620TUN		F4W71B		
			HLG620KTUN		3N71B		
	Deluxe Cab		KHL620TUN		F4W71B		
			KHL620FTUN		FS5W71B		
			KHL620KTUN		3N71B		

Model identification

K H L G 620 K T U V

Suffix:

- V : California model
- N : Canada model
- U : Destined for U.S.A. and Canada
- T : Floor shift vehicle
- K : Automatic transmission
- F : 5-speed manual transmission
- □ : 4-speed manual transmission

Prefix:

- G : Long wheelbase model
- □ : Except long wheelbase model
- L : Left-hand drive
- H : Equipped with L20B engine
- K : Deluxe Cab model

Note: □ means no indication.

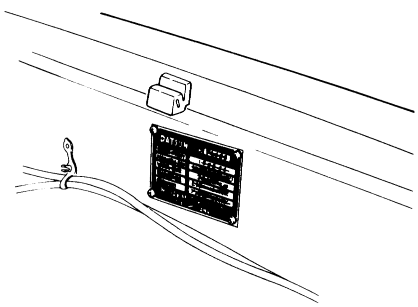
IDENTIFICATION NUMBERS

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

The engine and vehicle identification numbers are used on legal documents. These numbers are used for factory communications such as Technical Reports, Warranty Claims, Service Journals and other information.

Vehicle identification plate

The vehicle identification plate is located at the hood ledge in the engine compartment.



SP029

Fig. GI-1 Vehicle identification plate location

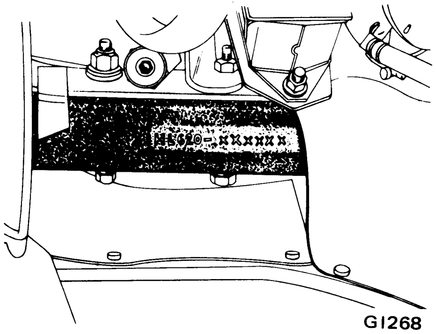
Vehicle serial number

The vehicle serial number is stamped on the upper face of the right side member. The number is identified by the following figures as a serial number.

HL620-XXXXXX

Serial number

Vehicle model



G1268

Fig. GI-2 Vehicle serial number location

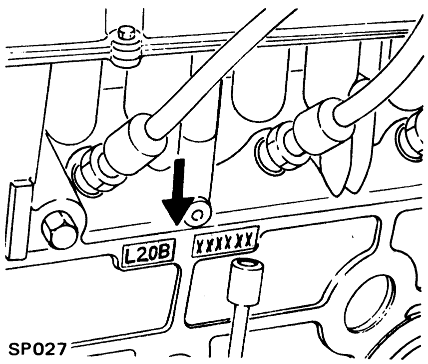
Engine serial number

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

L20B-XXXXXX

Serial number

Engine model

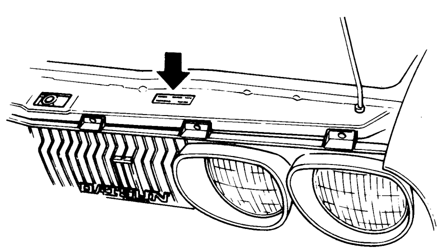


SP027

Fig. GI-3 Engine serial number location

Color code number

The color code number label is stuck on the radiator support.

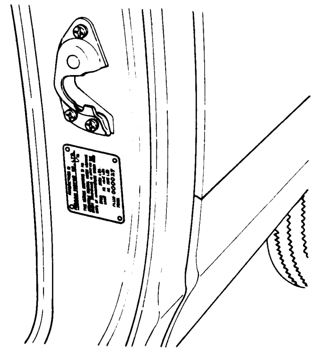


G1326

Fig. GI-4 Color code number label location

M.V.S.S. certification label

The M.V.S.S. certification label is located at the driver side lock pillar.

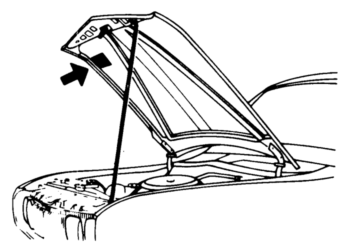


SP031

Fig. GI-5 M.V.S.S. certification label location

Vehicle emission control information label

The vehicle emission control information label is stuck on the inside of the hood panel.



SP076

Fig. GI-6 Vehicle emission control information label location

Manual transmission number

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

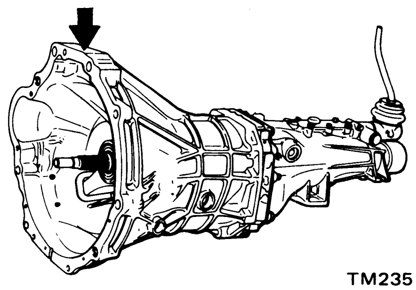
(Number system)

X X XXXXX

Serial number (monthly)

Month of manufacture (1, 2, ... 9, X, Y, Z)

Line code of manufacture



TM235

Fig. GI-7 Manual transmission number location

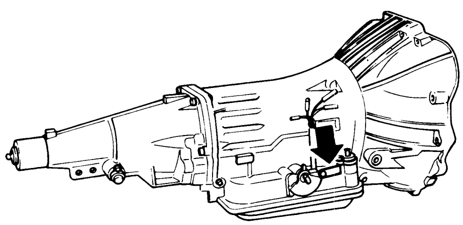
Automatic transmission number

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

(Numbering system)

X X XXXXX

- Serial number (monthly)
- Month of manufacture (1, 2, ... 9, X, Y, Z)
- Last figure of year of manufacture



AT344

Fig. GI-8 Automatic transmission number location

LIFTING POINTS AND TOWING

LIFTING POINTS

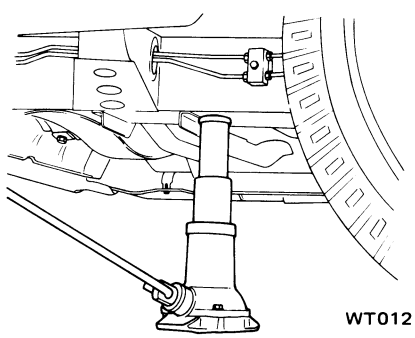
Screw jack

Before using the jack, proceed as follows:

Apply parking brake firmly and block rear wheels if the front of the vehicle is to be raised.

WARNING:
a. Never get under the vehicle while it is supported only by the jack.
Always use safety stands to support frame or rear axle case when you have to get beneath the vehicle.
b. In no event should the jack be applied to any points except the following specified portions.

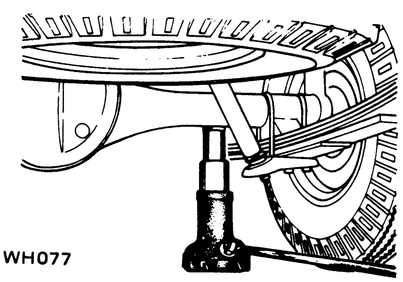
When jacking up the front side, place a screw jack under side frame [about 520 mm (20.5 in) at rear of front axle center].



WT012

Fig. GI-9 Front lifting point

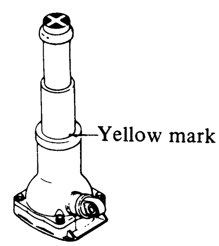
When jacking up the rear side, place a screw jack under rear axle case close to the side of rear spring.



WH077

Fig. GI-10 Rear lifting point

CAUTION:
a. When the yellow mark appears on the screw jack, it indicates the maximum permissible height. Do not jack up further.
b. When the jack is at lower limit, do not add large force downward.



WH080

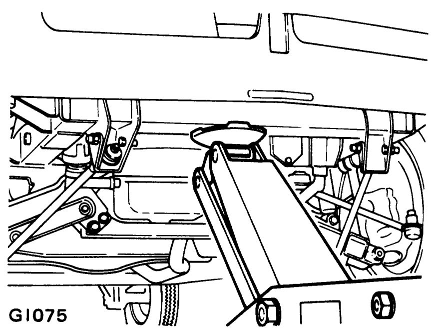
Fig. GI-11 Warning against over-stroke

Garage jack

WARNING:
When carrying out operations with a garage jack, be sure to support the vehicle with stands in a safe manner.

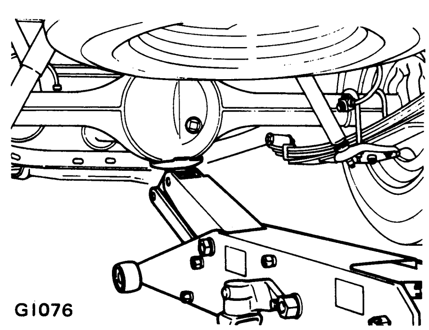
When jacking up the front end, apply garage jack to front cross-member or center portion of suspension member.

When jacking up the rear end, apply the jack to rear axle case.



GI075

Fig. GI-12 Front lifting point



GI076

Fig. GI-13 Rear lifting point

SUPPORTABLE POINTS

The front supportable points are under frame side member.

The rear supportable points are under rear axle case.

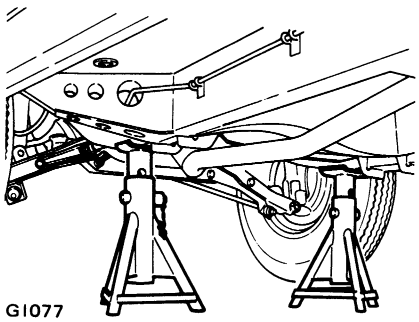


Fig. GI-14 Front supportable points

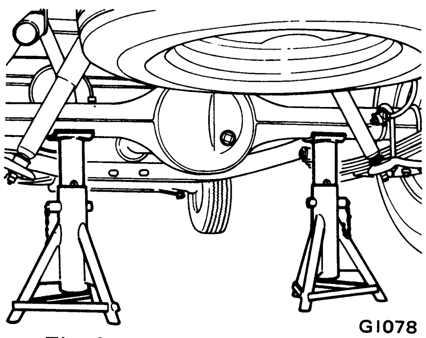


Fig. GI-15 Rear supportable points

TOWING

When the vehicle is to be towed forward, connect a rope securely to the hook under the 1st crossmember. Before towing, make sure the parking brake is released.

To tow another car, connect the rope to rear leaf spring shackle.

CAUTION:

a. A towing rope should not be connected to any position other than as described above.

b. Avoid applying load suddenly to a towing rope, as it may cause damage.

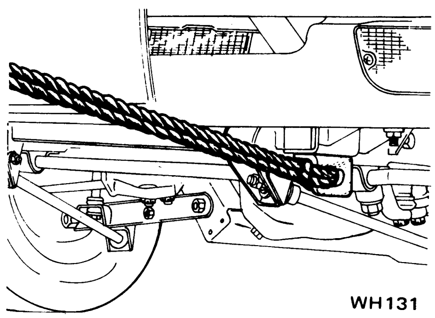


Fig. GI-16 Front towing point

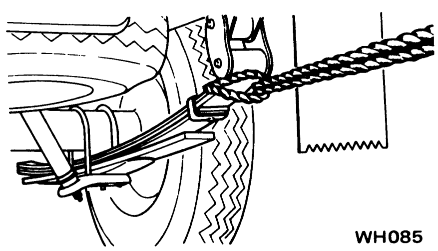


Fig. GI-17 Rear towing point

Manual transmission

Before towing, make sure the transmission is in neutral gear.

If the rear axle or transmission is inoperative, the vehicle should be towed with its rear wheels off the ground, or the propeller shaft must be removed.

Automatic transmission

When the vehicle is towed on its rear wheels, make sure the transmission is in "N" (Neutral) position. Don't exceed 30 km/h (20 MPH) and a distance of 10 km (6 miles). If the rear axle or transmission is inoperative, or if the speed exceeds the above conditions, the vehicle must be towed with its rear wheels off the ground, or the propeller shaft must be removed.

CAUTION:

When the vehicle is towed with its front wheels on the ground, the steering wheel should be secured to maintain a straight ahead position.

TIE-DOWN

The front two tie-down hooks are located under the 1st crossmember.

The hook is available as a towing hook. For rear tie-down, the rear leaf spring shackle be used. This point is also used as a towing point.

SPECIAL SERVICE TOOLS

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

The working times listed in the column under FLAT RATE TIME in FLAT RATE SCHEDULE are computed based on the use of Special Tools.

The identification code of maintenance tools is made up of 2 alphabetical letters and 8-digital figures.

The heading two letters roughly classify tools or equipment as:

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

APPROXIMATE REFILL CAPACITIES

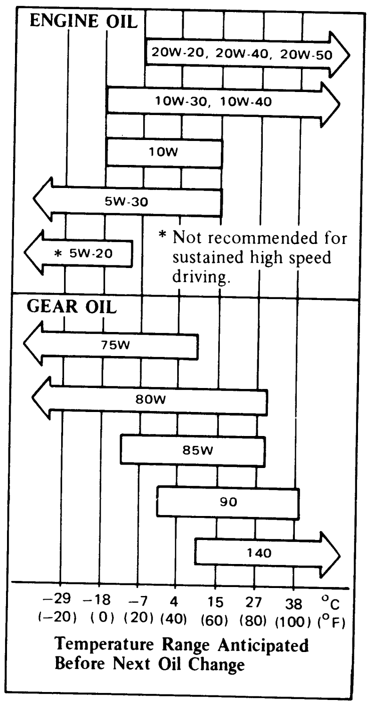
			Liter	US measure	Imp measure
Fuel tank			45	11 ⅞ gal	9 ⅞ gal
Coolant (including engine and reservoir tank)					
	Manual transmission	With heater	8.9	9 ⅜ qt	7 ⅞ qt
		Without heater	8.3	8 ¾ qt	7 ¼ qt
	Automatic transmission	With heater	8.7	9 ¼ qt	7 ⅝ qt
		Without heater	8.1	8 ⅝ qt	7 ⅛ qt
Engine		With oil filter	4.3	4 ½ qt	3 ¾ qt
		Without oil filter	3.8	4 qt	3 ⅜ qt
Transmission	M/T	4-speed	1.7	3 ⅝ pt	3 pt
		5-speed	2.0	4 ¼ pt	3 ½ pt
	A/T		5.5	5 ⅞ qt	4 ⅞ qt
Differential carrier			1.0	2 ⅛ pt	1 ¾ pt
Steering gear			0.33	¾ pt	⅝ pt
Windshield washer tank			1.7	1 ¾ qt	1 ½ qt
Air condition system		Compressor oil	0.1	3.4 fl oz	3.5 fl oz
		Refrigerant	0.7 to 0.9 kg	1.5 to 2.0 lb	1.5 to 2.0 lb

RECOMMENDED FUEL

Use an unleaded or low-lead gasoline with a minimum octane rating of 91 RON (Research Octane Number). For California models, use only unleaded gasoline to protect the catalytic converter from contamination.

RECOMMENDED LUBRICANTS

RECOMMENDED SAE VISCOSITY NUMBER



LUBRICANT SPECIFICATIONS

<table>
<tr><th colspan="2">Lubricant</th><th>Specifications</th><th>Remarks</th></tr>
<tr><td colspan="2">Gasoline engine oil</td><td>API SE</td><td rowspan="3">Further details, refer to recommended SAE viscosity chart.</td></tr>
<tr><td rowspan="2">Gear oil</td><td>Transmission and steering</td><td>API GL-4</td></tr>
<tr><td>Differential</td><td>API GL-5</td></tr>
<tr><td colspan="2">Automatic T/M fluid</td><td>Type DEXRON</td><td>——————</td></tr>
<tr><td colspan="2">Multi-purpose grease</td><td>NLGI 2</td><td>Lithium soap base</td></tr>
<tr><td colspan="2">Brake and clutch fluid</td><td>DOT 3</td><td>——————</td></tr>
<tr><td colspan="2">Anti-freeze</td><td>——————</td><td>Permanent anti-freeze (Ethylene glycol base)</td></tr>
</table>

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ET

ET

ENGINE TUNE-UP

EMISSION CONTROL DEVICES .... ET- 2

BASIC MECHANICAL SYSTEM .... ET- 3

IGNITION AND FUEL SYSTEM .... ET- 5

EMISSION CONTROL SYSTEM .... ET- 9

SERVICE DATA AND SPECIFICATIONS ET-12

TROUBLE DIAGNOSES AND CORRECTIONS ET-14

SPECIAL SERVICE TOOLS ET-20

EMISSION CONTROL DEVICES

Part name		Engine model	L20B					
		Vehicle model	Pick-up					
			U.S.A.				Canada	
			California		Non-California			
		Transmission	M/T	A/T	M/T	A/T	M/T	A/T
AIR CLEANER	A.T.C. air cleaner (With air pump relief valve)		–	–	X	X	X	X
	A.T.C. air cleaner (Without air pump relief valve, with altitude compensator)		X	X	–	–	–	–
	Idle compensator (Dual type)		X	X	X	X	X	X
	Fresh air duct (For introducing outside air)		X	X	X	X	–	–
ENGINE PROPER	Intake manifold (Hot water heating)		X*	X*	X*	X*	X*	X*
	Cylinder head exhaust port liner		X*	X*	X*	X*	X*	X*
CARBURETOR	P.T.C. auto-choke		X	X	X	X	X	X
	B.C.D.D. (Without solenoid valve)		–	–	X	X	X	X
	Fuel shut-off valve		X	X	–	–	–	–
	Dashpot	Standard type	X	X	X	X	X	X
		Combination type (Air conditioner equipped models)	X*	X*	X*	X*	X*	X*
	Altitude compensator (With pipe for use in air bleed)		X	X	–	–	–	–
IGNITION SYSTEM	Transistor ignition unit, distributor		X	X	X*	X*	X*	X*
A.I.S.	Air pump, A/P air cleaner, check valve, A.B. valve		X	X	X	X	X	X
	C.A.C. valve (Combined air control valve)		X	X	–	–	–	–
	Relief valve		–	–	X	X	X	X
E.G.R. SYSTEM	E.G.R. control valve		X	X	X	X	X	X
	B.P.T. valve		X*	X*	X*	X*	X*	X*
	T.V.V. (Thermal vacuum valve)		X	X	X	X	X	X
	V.D.V. (Vacuum delay valve)		X*	X*	–	–	–	–
CATALYZER	Catalytic converter		X	X	–	–	–	–
	Floor temperature warning system		X	X	–	–	–	–
OTHERS	Carbon canister		X	X	X	X	X	X
	Fuel filler cap with vacuum relief valve		X	X	X	X	X	X
	P.C.V. valve		X	X	X	X	X	X

*: Newly equipped in 1978 models
Remarks: X . . . Available
– . . . Not available

M/T : Manual transmission
A/T : Automatic transmission
A.T.C. : Automatic temperature control
P.T.C. : Positive temperature coefficient
T.V.V. : Thermal vacuum valve
C.A.C. : Combined air control

B.C.D.D. : Boost controlled deceleration device
B.P.T. : Back pressure transducer
A.I.S. : Air injection system
A.B. valve. Anti-backfire valve
E.G.R. : Exhaust gas recirculation
V.D.V. : Vacuum delay valve

BASIC MECHANICAL SYSTEM

CONTENTS

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE ET-3
CHECKING AND ADJUSTING DRIVE BELTS ET-3
CHANGING ENGINE OIL ET-3
REPLACING OIL FILTER ET-4
CHANGING ENGINE COOLANT ET-4
PERMANENT ANTI-FREEZE COOLANT ET-4
CHECKING COOLING SYSTEM HOSES AND CONNECTIONS ET-4
INSPECTION OF RADIATOR CAP ET-4
COOLING SYSTEM PRESSURE TEST ET-4
CHECKING ENGINE COMPRESSION ET-4

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Note:
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, at least, engine oil temperature is more than 80°C (176°F); then stop engine.
2. Rotate crankshaft to bring No. 1 cylinder to top dead center of its compression stroke.
3. Remove valve rocker cover.
4. Using Pivot Adjuster ST10640001, loosen pivot locking nut and turn pivot screw until specified clearance is obtained.

Tighten pivot locking nut securely after adjustment, and recheck clearance.

Order of valve clearance adjustments is as follows:

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

(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

5. 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.

(T) Tightening torque:
Pivot lock nut
5.0 to 6.0 kg-m
(36 to 43 ft-lb)

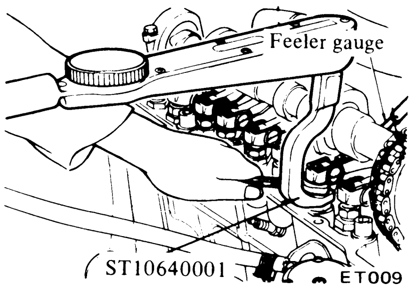


Fig. ET-1 Adjusting Valve Clearance

Valve clearance

Unit: mm (in)

Hot	Intake	0.25 (0.010)
	Exhaust	0.30 (0.012)

CHECKING AND ADJUSTING DRIVE BELTS

1. Check for cracks or damage. Replace if necessary.
2. Normal drive belt deflection is shown in figure below, when moderate thumb pressure is applied midway between pulleys.

Thumb pressure: 10 kg (22 lb)

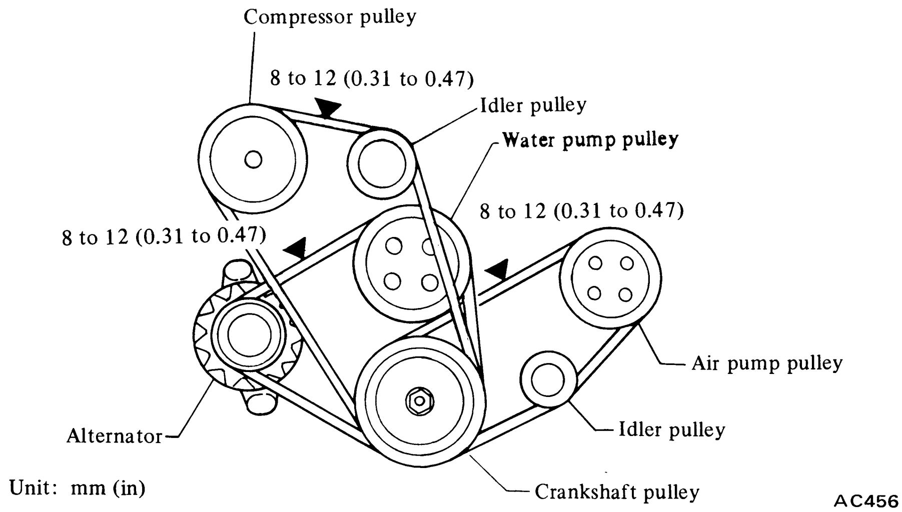


Fig. ET-2 Drive belt tension

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

CHANGING ENGINE OIL

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

2. Check oil level. If below the specified level, raise it up to the H level.
3. Change engine oil in accordance with the maintenance schedule.

Engine oil capacity:
With oil filter
4.3 liters
(4 ½ US qt, 3 ¾ Imp qt)
Without oil filter
3.8 liters
(4 US qt, 3 ⅜ Imp qt)

REPLACING OIL FILTER

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

1. Check for oil leaks past gasketed 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.

Note:
Do not overtighten oil filter, lest leakage should occur.

CHANGING ENGINE COOLANT

PERMANENT ANTI-FREEZE COOLANT

Note:
The 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 or ethyl alcohol. It will not evaporate or boil away and can be used with either high or low temperature thermostats. 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 product. This coolant can be used throughout the seasons of the year.

Whenever coolant is changed, the cooling system must be flushed and refilled with a new coolant. Check the coolant level.

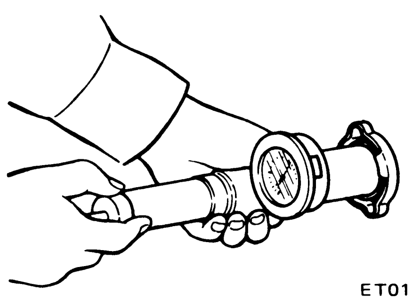
See instructions attached to the anti-freeze container for mixing ratio of anti-freeze to water.

CHECKING COOLING SYSTEM HOSES AND CONNECTIONS

Check hoses and fittings for loose connections or deterioration. Retighten or replace if necessary.

INSPECTION OF RADIATOR CAP

Apply reference pressure [0.9 kg/cm^2 (13 psi)] to radiator cap by means of a cap tester to see if it is satisfactory. Replace cap assembly if necessary.



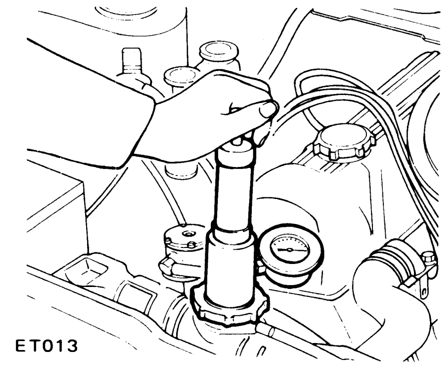
ET012

Fig. ET-3 Testing Radiator Cap

COOLNG SYSTEM PRESSURE TEST

With radiator cap removed, apply reference pressure [1.6 kg/cm^2 (23 psi)] to the cooling system by means of a tester to detect any leakage.

Water capacity:
Without heater
7.8 liters
(8 ¼ US qt, 6 ⅞ Imp qt)
With heater
8.4 liters
(8 ⅞ US qt, 7 ⅜ Imp qt)



ET013

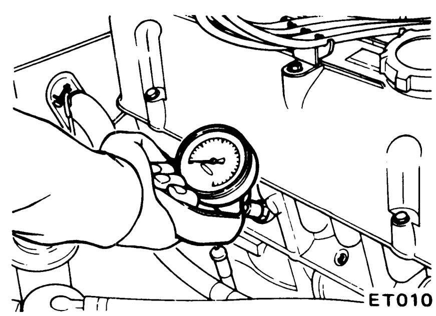
Fig. ET-4 Cooling System Pressure Test

CHECKING ENGINE COMPRESSION

Note:

a. To check cylinder compression, it is essential to remove all spark plugs. The purpose of this test is to determine whether there is excessive leakage past piston rings, head gasket, etc. To test, engine should be heated to the operating temperature and throttle valve opened.
b. Cylinder compression in cylinders should not be less than 80% of the highest reading. Different compression in two or more cylinder usually indicates an improperly seated valve or broken piston ring.
c. Low compression in cylinders can result from worn piston rings. This trouble may usually be accompanied by excessive fuel consumption.

1. Warm up engine sufficiently.
2. Disconnect all spark plugs.
3. Disconnect anti-dieseling solenoid valve connector.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.



ET010

Fig. ET-5 Testing Compression Pressure

5. Depress accelerator pedal to open throttle and choke valves.

Note:
Do not "pump" pedal.

6. Start engine as quickly as possible.

Compression pressure:

	kg/cm^2 (psi)/at rpm
Standard	**12.0 (171)/350**
Minimum	**9.0 (128)/350**

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

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

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

IGNITION AND FUEL SYSTEM

CONTENTS

CHECKING BATTERY ET-5
CHECKING AND ADJUSTING IGNITION TIMING ET-6
CHECKING AND REPLACING SPARK PLUGS ET-6
CHECKING IGNITION WIRING ET-6
CHECKING AND ADJUSTING CARBURETOR IDLE RPM AND MIXTURE RATIO ET-7
CHECKING CHOKE MECHANISM (Choke plate and linkage) ET-8
REPLACING FUEL FILTER ET-8
CHECKING FUEL LINES (Hoses, piping, connections, etc.) ET-8
REPLACING AIR CLEANER FILTER ET-8
CHECKING AUTOMATIC TEMPERATURE CONTROL AIR CLEANER ET-8

CHECKING BATTERY

1. Remove six vent plugs and check electrolyte level in each battery cell. If necessary, pour distilled water.

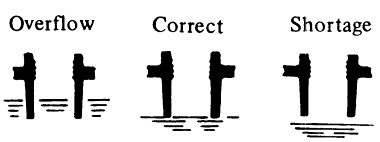
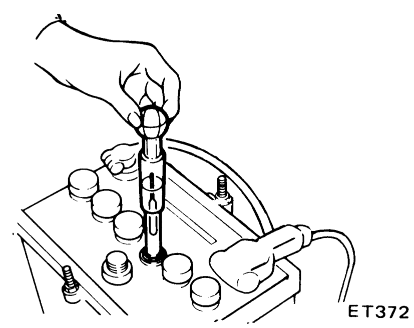


Fig. ET-6 Checking Electrolyte Level

2. Measure the specific gravity of battery electrolyte.



Fie. ET-7 Checking Specific Gravity of Battery Electrolyte

Note:

a. **Clean top of battery and terminals with a solution of baking soda and water. Rinse off and dry with compressed air. Top of battery must be clean to prevent current leakage between terminals and from positive terminal to hold-down clamp.**
b. **In addition to current leakage, prolonged accumulation of acid and dirt on top of battery may cause blistering of the material covering connector straps and corrosion of straps.**
c. **After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.**

	Permissible value	Full charge value [at 20°C (68°F)]
Frigid climates	Over 1.22	1.28
Other climates	Over 1.20	1.26

CAUTION:
If the battery cables are disconnected, they should be tightly clamped to the battery terminals to secure a good contact.

CHECKING AND ADJUSTING IGNITION TIMING

1. Check spark plugs for condition.
2. Thoroughly remove dirt and dust from crank pulley at timing mark location and front cover at timing indicator.
3. Warm up engine sufficiently.
4. Connect engine tachometer and timing light in their proper positions.
5. Adjust idling speed to the specified value.

Idling speed:
Manual transmission
600 rpm
Automatic transmission
600 rpm
(in "D" position)

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

6. Check ignition timing with a timing light to ensure that it is adjusted to specifications indicated below.

Ignition timing:
Manual transmission
12°B.T.D.C./600 rpm
Automatic transmission
(in "D" position)
12°B.T.D.C./600 rpm

If necessary, adjust it as follows:
(1) Loosen set screw until distributor can be moved by hand.
(2) Adjust ignition timing to specifications.
(3) Lock distributor set screw, and make sure that timing is correct.

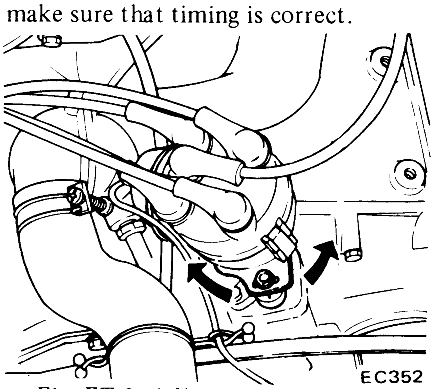


Fig. ET-8 Adjusting Ignition Timing

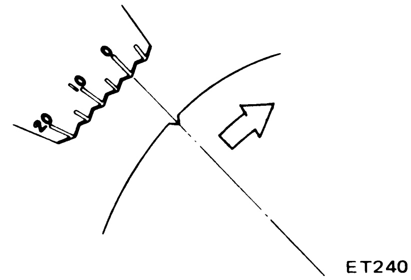


Fig. ET-9 Ignition Timing Indicator

CHECKING AND REPLACING SPARK PLUGS

1. Remove and clean plugs in a sand blast cleaner. Inspect each spark plug. Make sure that they are of the specified heat range.
2. Inspect insulator for cracks or chips. Check both center and ground electrodes.
3. If they are excessively worn, replace with new spark plugs.
4. Replace spark plugs in accordance with the maintenance schedule.

Type	U.S.A. models	Standard	BP6ES-11, L45PW-11
		Hot type	BP4E-11, BP5ES-11 L46PW-11, L47PW-11
		Cold type	BP7ES-11 L44PW-11
	Canada models	Standard	BPR6ES
		Hot type	BPR4ES, BPR5ES
		Cold type	BPR7ES
Plug gap mm (in)	U.S.A. models		1.0 to 1.1 (0.039 to 0.043)
	Canada models		0.8 to 0.9 (0.031 to 0.035)
Tightening torque kg-m (ft-lb)			1.5 to 2.0 (11 to 14)

CHECKING IGNITION WIRING

Use an ohmmeter to check resistance on high tension cables.
1. Disconnect cables from spark plugs and remove distributor together with high tension cables.

Note:
Do not remove cables from cap.

2. Connect the ohmmeter between cable terminal on the spark plug side and the corresponding electrode inside cap.
3. If the resistance is more than 30,000 ohms, remove cable from cap and check the cable resistance only. If resistance is still more than 30,000 ohms, replace cable assembly.

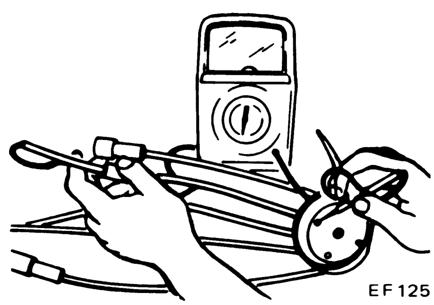


Fig. ET-10 Checking High Tension Cable

CHECKING AND ADJUSTING CARBURETOR IDLE RPM AND MIXTURE RATIO

WARNING:

a. On automatic transmission models, checks should be performed with the lever shifted to the "D" position. Be sure to engage parking brake and to lock both front and rear wheels with wheel chocks.

b. Depress brake pedal while accelerating the engine to prevent forward surge of car.

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

CAUTION:

Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

Note:

a. When measuring CO percentage, insert probe into tail pipe more than 40 cm (15.7 in).

b. In the case of air conditioner equipped models, the idle adjustment should be carried out while the air conditioner is "OFF".

"CO" idle adjustment with CO-meter

Idle mixture adjustment requires the use of a CO-meter (especially for California models). When preparing to adjust idle mixture, it is essential to have the meter thoroughly warmed up and calibrated.

1. Check carburetor pipes for proper connection.
2. Warm up engine until water temperature indicator points to the middle of gauge. The procedure to warm up engine is not specifically recommended. Either driving vehicle or operating engine at no load will be good.
3. Make sure that water temperature indicator points to the middle. Further keep engine running at about 2,000 rpm for about 5 minutes without applying load to engine in order to stabilize engine condition. Engine hood should be open.
4. Run engine for about 10 minutes at idling speed. During this 10 minutes, proceed as described in steps 5 to 9 below.
5. Remove air hose between 3-way connector and air check valve as shown in Figure below. Plug the disconnected hose at air check valve side. air check valve side.

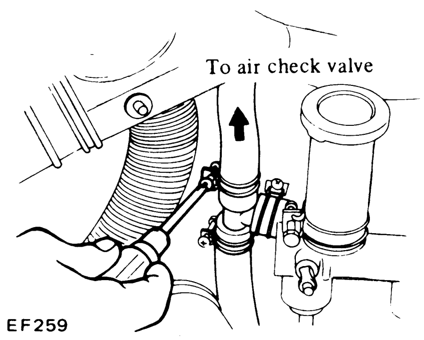


Fig. ET-11 Disconnecting Air Hose

6. Race engine (1,500 to 2,000 rpm) two or three times under no load, then run engine for one minute at idling speed.
7. Adjust throttle adjusting screw until engine is at specified speed.

Engine speed:
Manual transmission
600 rpm
Automatic transmission (in "D" position)
600 rpm

8. Check ignition timing. If necessary, adjust it to specifications.

This operation need not be carried out at 1,600 km (1,000 miles) service.

Ignition timing:
Manual transmission
12° B.T.D.C./ 600 rpm
Automatic transmission (in "D" position)
12° B.T.D.C./600 rpm

9. At about 10 minutes after engine is run at idling speed, adjust idle adjusting screw so that CO percentage is at specified level.

CO percentage:
Manual transmission
1% $^{+1}_{-0.7}$ at 600 rpm
Automatic transmission (in "D" position)
1% $^{+1}_{-0.7}$ at 600 rpm

10. Repeat procedures as described in steps 6, 7 and 9 above so that CO percentage is at specified level. Checking idle CO in step 9 can be carried out right after step 7.
11. Race engine (1,500 to 2,000 rpm) two or three times under no load and make sure that specified CO percentage is obtained.
12. Remove plug and connect air hose to connector.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

"CO" idle adjustment without CO-meter (Non-California models)

If CO-meter is not available, the following procedures may be used:

1. Check carburetor pipes for proper connection.
2. Warm up engine until water temperature indicator points to the middle of gauge. The procedure to warm up engine is not specifically recommended. Either driving vehicle or operating engine at no load will be good.
3. Make sure that water temperature indicator points to the middle. Further keep engine running at about 2,000 rpm for about 5 minutes without applying load to engine in order to stabilize engine condition. Engine hood should be open.
4. Run engine for about 10 minutes at idling speed. During this 10 minutes, proceed as described in steps 5 to 9 below.
5. Remove air hose between 3-way connector and air check valve shown in Fig. ET-11. Plug the disconnected hose at air check valve side.
6. Race engine (1,500 to 2,000 rpm) two or three times under no load, then run engine for one minute at idling speed.
7. Adjust throttle adjusting screw so that engine speeds are as indicated

below.

Engine speed:
Manual transmission
650 rpm
Automatic transmission
(in "D" position)
650 rpm

8. Check ignition timing, if necessary adjust it to the value required by specifications. This operation need not be carried out at 1,600 km (1,000 miles) service.
9. At about 10 minutes after engine is run at idling speed, adjust idle adjusting screw until maximum rpm is obtained.
10. Repeat procedures as described in steps 6, 7 and 9 above until engine speed, at best idle mixture, is as specified in step 7. Adjustment in step 9 can be carried out right after step 7.
11. Turn the idle adjusting screw clockwise until engine speed drops by value shown below.

Engine speed drops:
45 to 55 rpm
(M/T, A/T – "D" position)

12. Remove plug, and connect air hose to connector.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

Idle limiter cap

Do not remove this idle limiter cap unless necessary. If this unit is removed, it is necessary to readjust it at the time of installation. To adjust proceed as follows:

1. After adjusting throttle or idle speed adjusting screws, check to be sure that the amount of "CO" contained in exhaust gases meets the established standard.
2. Install idle limiter cap in position, making sure that the adjusting screw further turns 1/8 rotation in the "CO-RICH" direction.

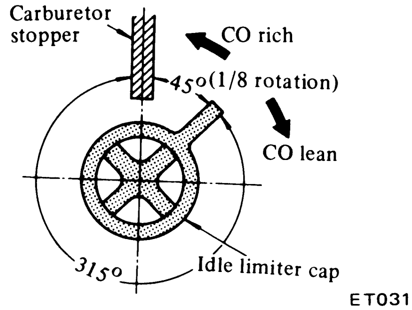
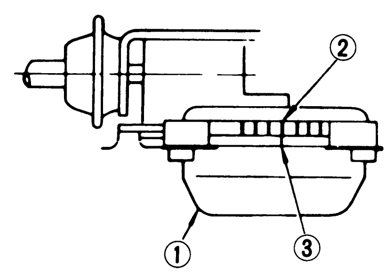


Fig. ET-12 Setting Idle Limiter Cap

CHECKING CHOKE MECHANISM (Choke plate and linkage)

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

Note:
Do not set bi-metal cover index mark at any position except the center of choke housing index mark.



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

ET034

Fig. ET-13 Bi-metal Setting

REPLACING FUEL FILTER

1. Check for a contaminated filter, and water deposit.

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

2. Replace fuel filter in accordance with the maintenance schedule.

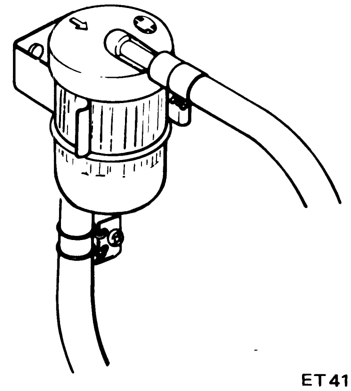


Fig. ET-14 Fuel Filter

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

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

REPLACING AIR CLEANER FILTER

Viscous paper type air cleaner filter does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted.

Replace air cleaner filter in accordance with the maintenance schedule.

CHECKING AUTOMATIC TEMPERATURE CONTROL AIR CLEANER

1. Check that vacuum hoses (Intake manifold to 3-way connector, 3-way connector to temperature sensor, 3-way connector to idle compensator, temperature sensor to vacuum motor) are securely connected in correct posi-

tion.

2. Check each hose for cracks or distortion.

3. Check A.T.C. system for function by proceeding as follows.

Confirm that engine is cold before starting test.

With engine stopped, disconnect fresh air duct if so equipped.

Place a mirror at the end of air cleaner inlet pipe as shown, and check to see if air control valve is in correct position.

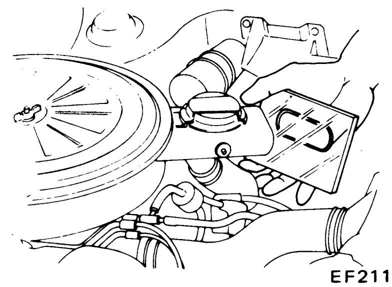


Fig. ET-15 Inspecting Valve Position

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

4. Start engine and keep idling.

Immediately after engine starting, check air control valve for correct position as described above. In this case, correct position of air control valve is the reverse of step 3; underhood air inlet is closed, and hot air inlet is open.

5. Check that air control valve gradually opens to cold air inlet side as engine warms up. When environmental temperature around temperature sensor is low, spend more time for engine warning up operation to facilitate smooth operation of air control valve.

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

EMISSION CONTROL SYSTEM

CONTENTS

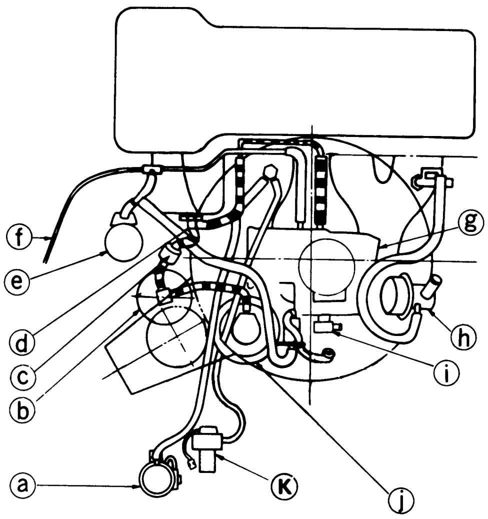
CHECKING VACUUM FITTING HOSES AND CONNECTIONS .... ET- 9
REPLACING AIR PUMP AIR CLEANER FILTER ET-10
REPLACING P.C.V. VALVE AND FILTER ET-10
CHECKING VENTILATION HOSES ET-11
CHECKING VAPOR LINES ET-11
CHECKING FUEL TANK VACUUM RELIEF VALVE ET-11
REPLACING CARBON CANISTER FILTER ... ET-12

CHECKING VACUUM FITTING HOSES AND CONNECTIONS

Check fittings and hoses for loose connections or damage. Retighten loose parts or replace parts that are not suitable for further use.

- Carburetor to vacuum tube
- Vacuum tube to thermal vacuum valve
- Thermal vacuum valve to B.P.T. valve (Non-California models)
- Thermal vacuum valve to vacuum delay valve (California models)
- Vacuum delay valve to B.P.T. valve (California models)
- B.P.T. valve to E.G.R. control valve
- Carburetor to vacuum tube
- A.B. valve to intake manifold
- Intake manifold to C.A.C. valve (California models)
- Vacuum tube to carbon canister
- Intake manifold to Master-Vac
- Intake manifold to dash pot (Air conditioner equipped models)
- Vacuum tube to canister

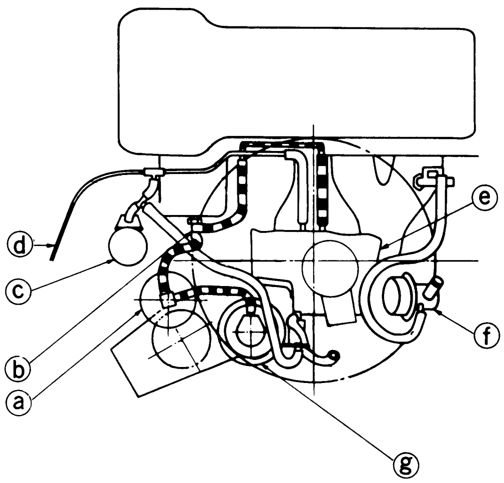
California models



a C.A.C. valve
b B.P.T. valve
c Vacuum delay valve
d Thermal vacuum valve
e Distributor
f To canister purge control valve
g Carburetor
h A.B. valve
i Intake manifold vacuum take-out port
j E.G.R. valve
k Fuel shut-off vacuum switch

EC130A

Non-California models



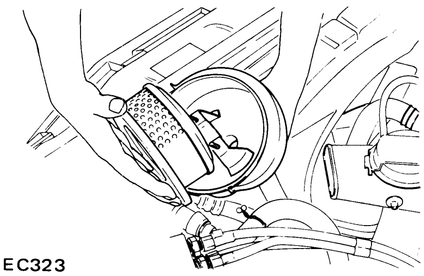
a B.P.T. valve
b Thermal vacuum valve
c Distributor
d To canister purge control valve
e Carburetor
f A.B. valve
g E.G.R. valve

EC131A

Fig. ET-16 Vacuum Fitting Hose

REPLACING AIR PUMP AIR CLEANER FILTER

Remove air hose, then detach air cleaner from hoodlege. Air cleaner filter and air cleaner lower body are built into a unit construction. Replace air cleaner filter and lower body as an assembly.



EC323

Fig. ET-17 Replacing Air Cleaner Filter

REPLACING P.C.V. VALVE AND FILTER

1. Checking P.C.V. valve in accordance with the following method.

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

2. Replace P.C.V. valve and filter in accordance with the maintenance schedule.

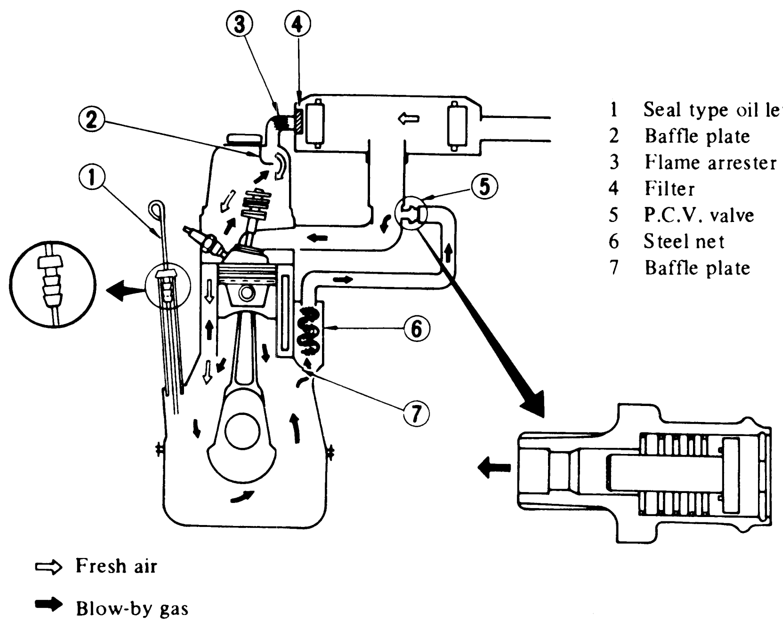


Fig. ET-18 Crankcase Emission Control System

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 free of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between air cleaner and rocker cover.

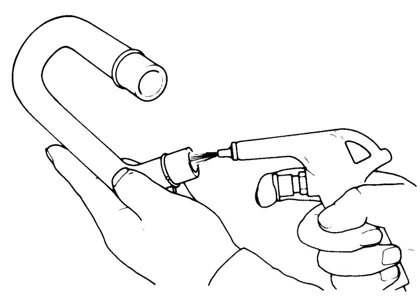


Fig. ET-19 Cleaning Ventilation Hose

CHECKING VAPOR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 400 mmH_2O (15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain with 25 mmH_2O (0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

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.

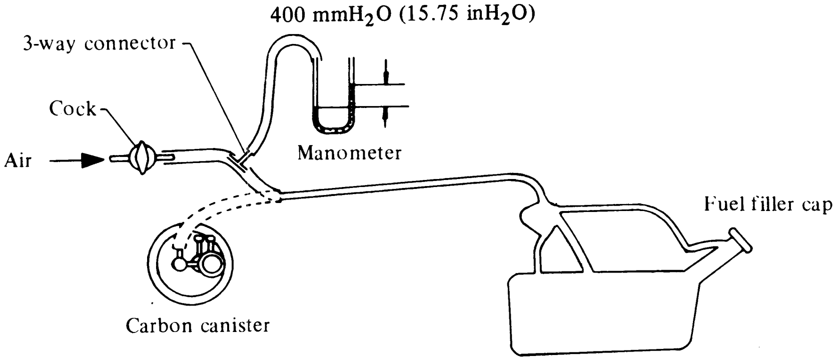
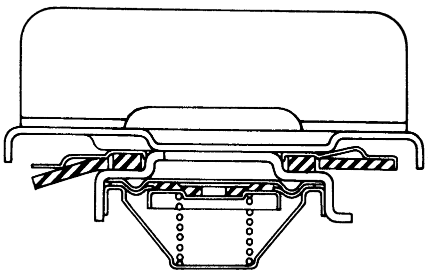


Fig. ET-20 Checking Evaporative Emission Control System

CHECKING FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

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

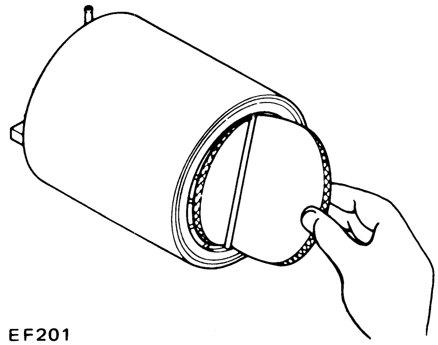


ET369

Fig. ET-21 Fuel Filler Cap

REPLACING CARBON CANISTER FILTER

1. Check for a contaminated filter. Filter can be removed at the bottom of canister installed on car body.
2. Replace filter in accordance with the maintenance schedule.



EF201

Fig. ET-22 Replacing Carbon Canister Filter

SERVICE DATA AND SPECIFICATIONS

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance		
Hot Intake	mm (in)	0.25 (0.010)
Exhaust	mm (in)	0.30 (0.012)
Drive belt deflection		
Fan	mm (in)	8 to 12 (0.31 to 0.47)
Air pump	mm (in)	8 to 12 (0.31 to 0.47)
Air conditioner compressor	mm (in)	8 to 12 (0.31 to 0.47)
Applied thumb pressure	kg (lb)	10 (22)
Engine oil capacity		
With oil filter	liters (US qt, Imp qt)	4.3 (4 1/2, 3 3/4)
Without oil filter	liters (US qt, Imp qt)	3.8 (4, 3 3/8)
Radiator cap relief pressure	kg/cm^2 (psi)	0.9 (13)
Cooling system leakage testing pressure	kg/cm^2 (psi)	1.6 (23)
Water capacity		
Without heater:	liters (US qt, Imp qt)	7.8 (8 1/4, 6 7/8)
With heater:	liters (US qt, Imp qt)	8.4 (8 7/8, 7 3/8)
Compression pressure at 350 rpm		
Standard	kg/cm^2 (psi)	12.0 (171)
Minimum	kg/cm^2 (psi)	9.0 (128)
Battery specific gravity at 20°C (68°F)		
Frigid climates		1.28
Other climates		1.26

Ignition and fuel system

Ignition timing		
Manual transmission models	degree/rpm	12°B.T.D.C./600
Automatic transmission models (in "D" position)	degree/rpm	12°B.T.D.C./600
Spark plug		
Gap U.S.A. models	mm (in)	1.0 to 1.1 (0.039 to 0.043)
Canada models	mm (in)	0.8 to 0.9 (0.031 to 0.035)
High tension cable resistance	ohm	less than 30,000
"CO" percentage at idling speed (No air)		
Manual transmission models	%/rpm	$1^{+1}_{-0.7}$ /600
Automatic transmission models (in "D" position)	%/rpm	$1^{+1}_{-0.7}$ /600

Evaporative emission control system

Supplied pressure	mmH_2O (inH_2O)	400 (15.75)
Pressure variation	mmH_2O (inH_2O)	less than 25 (0.98)

TIGHTENING TORQUE

Pivot lock nut	kg-m (ft-lb)	5.0 to 6.0 (36 to 43)
Spark plug	kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

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 battery.
	Faulty battery.	Replace.
	Loose fan belt.	Adjust.
	Malfunction in charging system.	Inspect.
	Wiring connection loose in starting circuit.	Correct.
	Faulty ignition switch	Repair or replace.
	Faulty starting motor.	Repair or replace.

(Trouble-shooting procedure on starting circuit)
Switch on the starting motor with light "ON".

When light goes off or dims considerably,

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

When light stays bright,

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

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

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

Ignition system in trouble
Fuel system in trouble
Valve mechanism does not work properly
Low compression

(Trouble-shooting procedure)

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

Good spark occurs.

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

No spark occurs. — Check the current flow in primary circuit.

Very high current. — Inspect primary circuit for short.

Condition	Probable cause	Corrective action
	Low or no current.	Check for loose terminal or disconnection in primary circuit.
Ignition system out of order	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.
	Loose connection or disconnection in primary circuit.	Repair or replace.
Fuel system out of order	Lack of fuel.	Supply.
	Dirty fuel filter.	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.
	Clogged breather pipe of fuel tank.	Repair and clean.
	Malfunctioning anti-dieseling solenoid valve.	Check for loose terminal or wire harness.
Low compression	Incorrect spark plug tightening or faulty gasket.	Tighten to normal torque or replace gasket.
	Improper grade engine oil or low viscosity.	Replace with proper grade oil.
	Incorrect valve clearance.	Adjust.
	Compression leak from valve seat.	Remove cylinder head and lap valves.
	Sticky valve stem.	Correct or replace valve and valve guide.
	Weak or damaged valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.
	Sticking or damaged piston ring.	Replace piston rings.
	Worn piston ring or cylinder.	Overhaul engine.
	(Trouble-shooting procedure) Pour the engine oil from plug hole, and then measure cylinder compression.	
	Compression increases.	Malfunctioning cylinder or piston ring.
	Compression does not change.	Compression leaks from valve, cylinder head or head gasket.

Condition	Probable cause	Corrective action
IMPROPER ENGINE IDLING (Low engine idle speed)		
Fuel system out of order	Clogged or damaged carburetor jets.	Clean or replace.
	Incorrect idle adjustment.	Adjust.
	Clogged air cleaner filter.	Replace filter.
	Damaged manifold gaskets or carburetor insulator.	Replace gasket or insulator.
	Improper float level adjustment.	Adjust.
	Loose or cracked vacuum hoses or air hoses from carburetor and intake manifold.	Check for loose connections or cracks.
	Malfunctioning carburetor choke.	Check and adjust.
	Malfunctioning anti-backfire valve.	Check for loose connection of vacuum hose.
	Malfunctioning A.T.C. air cleaner.	Check A.T.C. air cleaner for loose hoses or faulty components.
	Inoperative idle compensator.	Check for connection of idle compensator hose or replace idle compensator.
	Carbon canister purge line hose damaged or disconnected.	Correct or replace.
Low compression		Previously mentioned.
Others	Incorrect valve clearance.	Adjust.
	Extremely low revolution.	Adjust.
	Malfunction of the ignition system (spark plug, high tension cable, ignition coil, etc.).	Replace.
	Incorrect basic ignition timing.	Adjust.
	Malfunction of E.G.R. control valve.	Clean or replace.
	Loose manifold and cylinder head bolts.	Retighten bolts.
IMPROPER ENGINE IDLING (High engine idle speed)	Dragged accelerator linkage.	Check and correct accelerator linkage.
	Incorrect idle adjustment.	Adjust idle speed.
	Malfunction of B.C.D.D. (Non-California models)	Adjust operating pressure of B.C.D.D. Adjust or replace if necessary.
	Malfunctioning carburetor choke	Check and adjust.
	Improper dashpot adjustment.	Check and adjust.

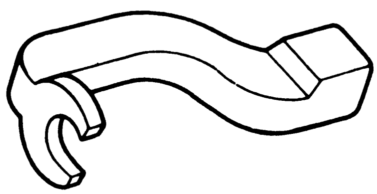
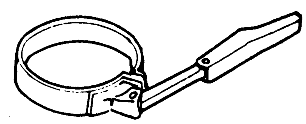
Condition	Probable cause	Corrective action
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system out of order	Incorrect ignition timing.	Adjust.
	Damaged spark plugs.	Clean, adjust or replace plugs.
	Malfunction of spark timing control system.	Check or replace.
Fuel system out of order	Malfunction of choke system.	Adjust.
	Clogged fuel pipe or floating valve.	Clean.
	Dirty or clogged fuel filter.	Replace.
	Fuel pump will not work properly.	Repair or replace.
	Clogged carburetor jets.	Disassemble and clean.
	Malfunction of altitude compensator.	Check or replace.
	Malfunction of A.T.C. air cleaner.	Check or replace.
Air intake system out of order	Clogged air cleaner.	Replace filter.
	Air inhaling from manifold gasket or carburetor gasket.	Replace gasket.
Emission control	Malfunction of E.G.R. valve.	Check and replace.
Overheating	Insufficient coolant.	Replenish.
	Loose fan belt.	Adjust fan belt.
	Worn or oiled fan belt.	Replace.
	Inoperative thermostat.	Replace.
	Worn water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.
	Worn radiator filler cap.	Replace.
	Air in cooling system.	Retighten each part of cooling system.
	Improper engine oil grade.	Replace with proper grade oil.
	Incorrect ignition timing.	Adjust.
	Clogged carburetor (lean mixture).	Overhaul carburetor.
	Disconnected altitude compensator hose.	Connect.
Overcooling	Inoperative thermostat.	Replace.
Others	Improper octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Inflate to specified pressure.
	Dragging brake.	Adjust.
	Clutch slipping.	Adjust.

Condition	Probable cause	Corrective action
NOISY ENGINE		
Car knocking	Overloaded engine.	Use right gear in driving.
	Carbon knocking.	Disassemble cylinder head and remove carbon.
	Timing knocking.	Adjust ignition timing.
	Fuel knocking.	Use specified octane fuel.
	Preignition (misusing of spark plug).	Use specified spark plug.
Mechanical knocking		
Crankshaft bearing knocking	This strong dull noise increases when engine is accelerated. To locate the place, cause a misfire on each cylinder. If the noise stops by the misfire, this cylinder generates the noise.	This is caused by worn or damaged bearings, or unevenly worn crankshaft. Renew bearings and adjust or change crankshaft. Check lubrication system.
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 deminishes almost completely, this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.
Piston cylinder noise	When you hear an overlapping metallic noise which increases its magnitude with the revolution of engine and which decreases as engine is warmed up, this noise is caused by piston and cylinder. To locate the place, cause a misfire on each cylinder.	This may cause an abnormal wearing of cylinder and lower compression which in turn will cause a lower out-put power and excessive consumption of oil. Overhaul engine.
Piston pin noise	This noise is heard at each highest and lowest dead end of piston. To locate the place, cause a misfire on each cylinder.	This may cause a wear on piston pin, or piston pin hole. Renew piston and piston pin assembly.
Water pump noise	This noise may be caused by worn or damaged bearings, or by the uneven surface of sliding parts.	Replace water pump with a new one.
Air pump noise	Damaged air pump.	Repair or replace.
Others	An improper adjustment of valve clearance.	Adjust.
	Noise of timing chain.	Adjust the tension of chain.
	An excessive end-play on crankshaft.	Disassemble engine and renew main bearing.
	Wear on clutch pilot bushing. **Note:** **This noise will be heard when clutch is disengaged.**	Renew bush and adjust drive shaft.

Condition	Probable cause	Corrective action
ABNORMAL COMBUSTION (Backfire, afterfire, run-on, etc.)		
Improper ignition timing	Improper ignition timing.	Adjust ignition timing.
	Improper heat range of spark plugs.	Use specified spark plugs.
Fuel system out of order	Improper idle adjustment.	Adjust.
	Damaged carburetor or manifold gasket. (backfire, afterfire)	Replace them with new parts.
	Clogged carburetor jet.	Disassemble carburetor and check it.
	Improper function of the float.	Adjust the level, and check needle valve.
	Improperly adjusted B.C.D.D. operating pressure.	Adjust.
	Malfunction of fuel shut-off system.	Check anti-dieseling solenoid valve. Check fuel shut-off system.
	Malfunction of auto-choke.	Adjust.
Faulty cylinder head, etc.	Improperly adjusted valve clearance.	Adjust.
	Excess carbon in combustion chamber.	Remove head and get rid of carbon.
	Damaged valve spring (backfire, afterfire).	Replace it with a new one.
Others	Malfunction of A.T.C. air cleaner.	Check for loose vacuum hoses. Replace if necessary.
	Inoperative anti-backfire valve.	Replace.
	Malfunction of C.A.C. valve.	Check for loose hoses. Replace if necessary.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug.	Tighten it.
	Loose or damaged oil pan gasket.	Renew gasket or tighten it.
	Loose or damaged chain cover gasket.	Renew gasket or tighten it.
	Worn oil seal in front and rear of crankshaft.	Renew oil seal.
	Loose or damaged locker cover gasket.	Renew gasket or tighten it (but not too much).
	Improper tightening of oil filter.	Renew gasket and tighten it with the proper torque.
	Loose or damaged oil pressure switch.	Renew oil pressure switch or tighten it.
Excessive oil consumption	Cylinder and piston wear.	Overhaul cylinder and renew piston.
	Improper location of piston ring gap or reversely assembled piston ring.	Remount piston rings.
	Damage piston rings.	Renew rings. Repair or renew piston and cylinder.
	Worn piston ring groove and ring.	Renew piston and piston ring.
	Fatigue of valve oil seal lip.	Replace seal lip with a new one.
	Worn valve stem.	Renew valve or guide.

Condition	Probable cause	Corrective action
Others	Inadequate quality of engine oil. Engine overheat. Malfunction of P.C.V. system.	Use the designated oil. Previously mentioned. Check or replace.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. Reference page or Fig. No.
ST10640001 Pivot adjuster 	J 25615-01 Fig. ET-1	ST19320000 Oil filter wrench 	J 25664 Page ET-4

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EM

EM

ENGINE MECHANICAL

GENERAL DESCRIPTION .... EM- 2
ENGINE DISASSEMBLY .... EM- 4
INSPECTION AND REPAIR .... EM- 9
ENGINE ASSEMBLY EM-21
SERVICE DATA AND SPECIFICATIONS EM-28
TROUBLE DIAGNOSES AND CORRECTIONS EM-33
SPECIAL SERVICE TOOLS EM-35

GENERAL DESCRIPTION

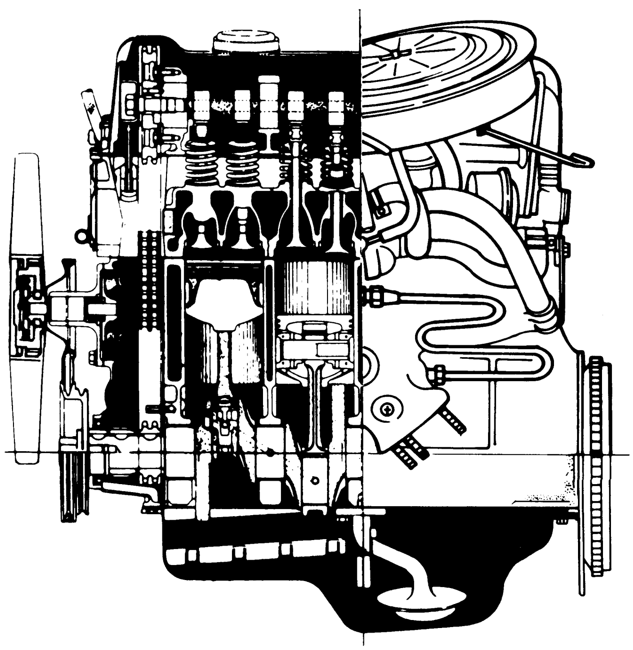
CONTENTS

MODEL L20B ENGINE EM-2
CYLINDER BLOCK EM-2
CRANKSHAFT EM-2
PISTON AND CONNECTING ROD EM-3
CYLINDER HEAD EM-3
CAMSHAFT EM-3
VALVE MECHANISM EM-3
CAMSHAFT DRIVE EM-3
MANIFOLDS EM-3

MODEL L20B ENGINE

The L20B engine features O.H.C. 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 that incorporates a special device to control emissions. See Fig. EM-1.



EM664

Fig. EM-1 Cross Sectional View

Main specifications

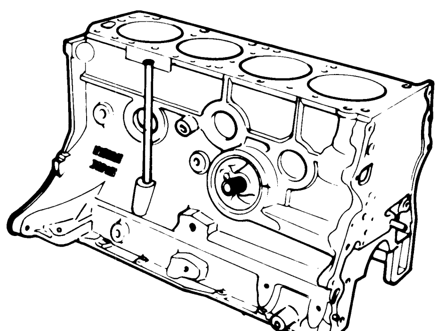
			L20B
Displacement	cc (cu in)		1,952 (119.1)
Bore x stroke	mm (in)		85 x 86 (3.35 x 3.39)
Compression ratio			8.5
Ignition timing Degree B.T.D.C./rpm		M/T	12/600 in "Neutral" position
		A/T	12/600 in "D" position

M/T: Manual Transmission A/T: Automatic Transmission

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.



EM536

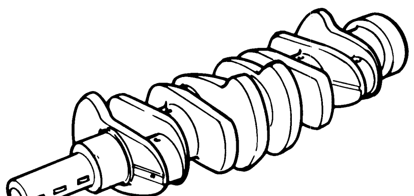
Fig. EM-2 Cylinder Block

CRANKSHAFT

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

The L20B 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.



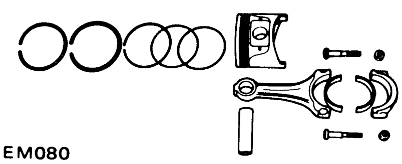
EM079

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.

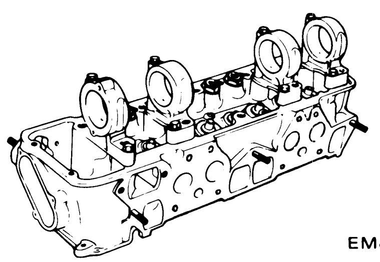


EM080

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. A special aluminum bronze valve seat is used on the intake valve, while a heat resistant steel valve seat is installed on the exhaust valve. These parts are all hot press-fitted.



EM407

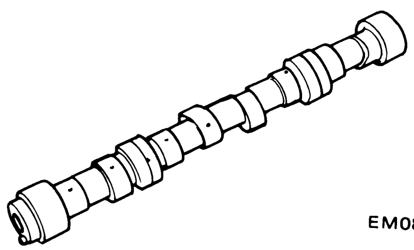
Fig. EM-5 Cylinder Head

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.



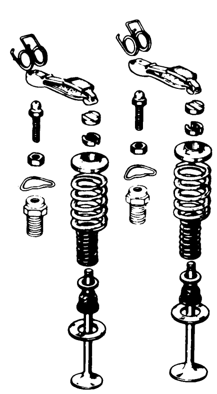
EM082

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.

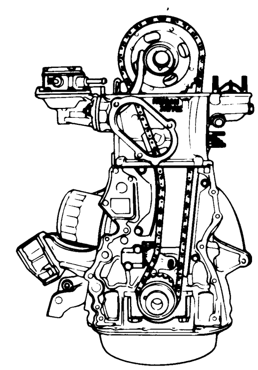


Exhaust Intake EM084

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

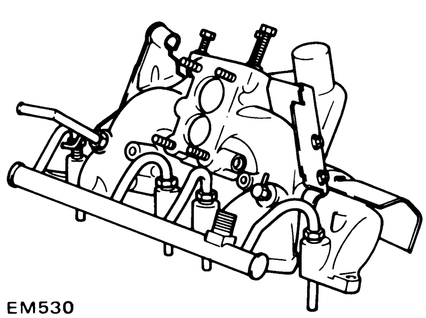
Fig. EM-8 Chain Driving System

MANIFOLDS

The intake manifold is made of cast aluminum alloy. Coolant from the cylinder head passes through the riser portion of the intake manifold, heating this portion and returns to the water pump.

The exhaust manifold is made of cast iron.

The semi-dual system which combines exhaust gas flow at the point of exhaust pipe connection produces good exhausting efficiency.



EM530

Fig. EM-9 Intake and Exhaust Manifolds

ENGINE DISASSEMBLY

CONTENTS

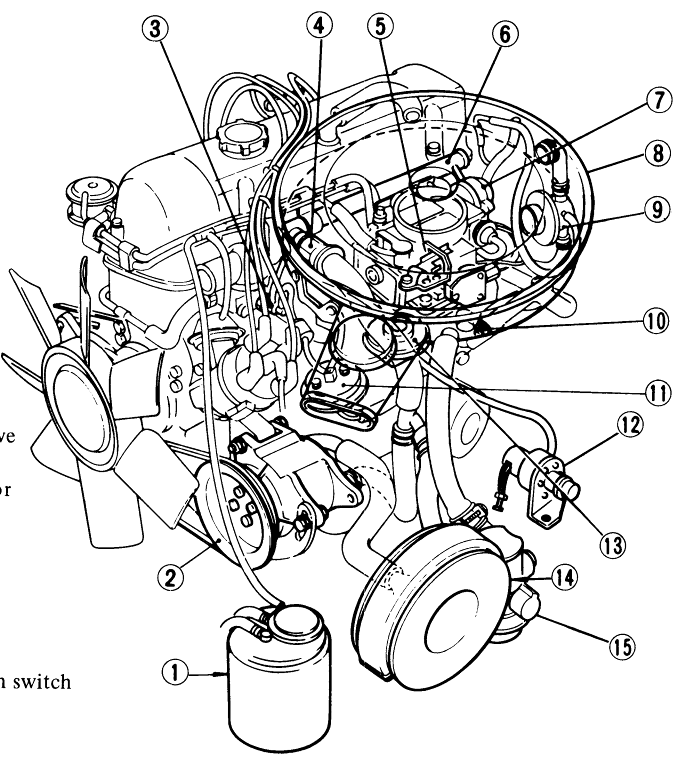
PRELIMINARY CLEANING AND INSPECTION EM-4
DISASSEMBLY EM-5
PISTONS AND CONNECTING RODS EM-7
CYLINDER HEAD EM-8

PRELIMINARY CLEANING AND INSPECTION

Before disassembling engine, note the following:

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 signs of leakage past their gasketed surfaces.
2. Check carburetor and fuel pump for condition; fuel hoses for deterioration, cracks or leakage of fuel past their jointed or connected surfaces. See Figs. EM-10 and EM-11.
3. Remove carburetor air cleaner.
(1) Disconnect hot air duct from air cleaner.
(2) Disconnect air cleaner-to-air pump hose at air cleaner. (Non-California model)
(3) Disconnect air cleaner-to-C.A.C. valve hose at air cleaner. (California model)
(4) Disconnect air cleaner-to-rocker cover hose at rocker cover.
(5) Disconnect air cleaner-to-A.B. valve hose at air cleaner.
(6) Disconnect air cleaner-to-related part vacuum hoses at air cleaner.
(7) Loosen air cleaner band bolt and remove carburetor air cleaner assembly from carburetor.
4. Plug up carburetor air-horn to prevent entry of foreign matter.
5. Remove alternator drive belt, alternator and alternator bracket.
6. Remove air pump drive belt, cooler compressor and idler pulley (if so equipped).
7. Remove starter motor from transmission.
8. Visually inspect cylinder head, cylinder block, rocker cover, front chain cover, oil pan and all other outer parts for oil, water and fuel leaks, breakage or missing parts such as bolts and nuts.
9. Check piping and electrical circuits for deterioration, breakage, fittings, discontinuity or insulation.

California models



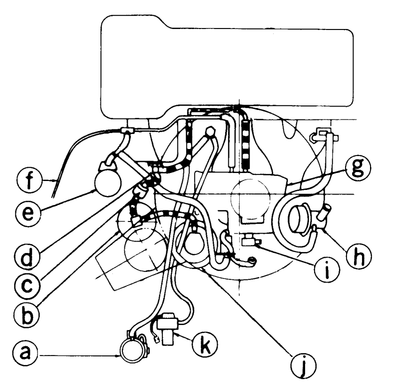
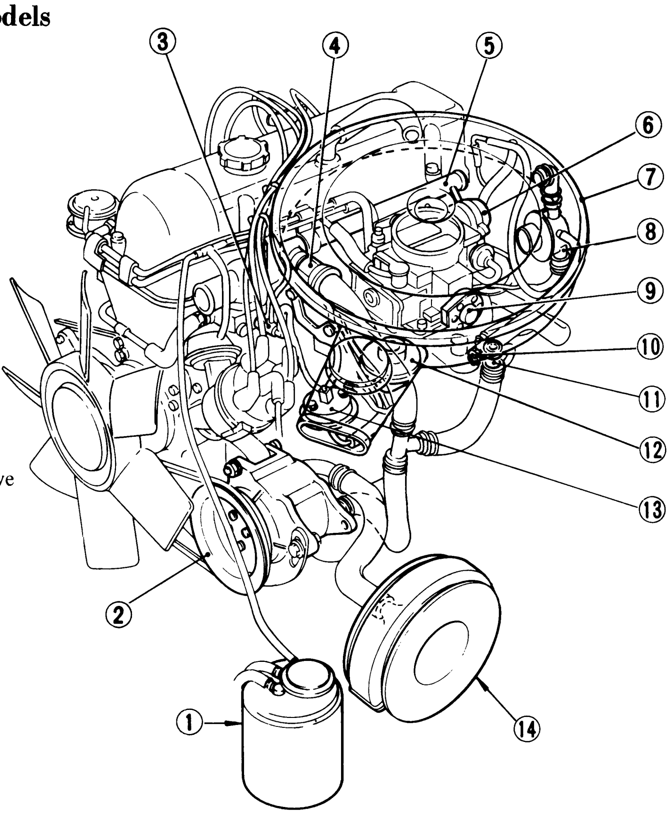


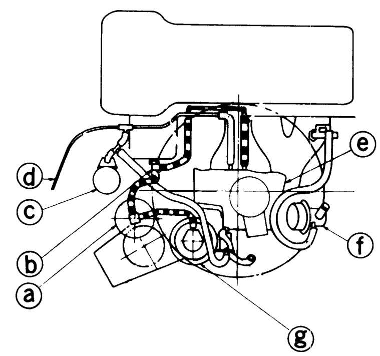
Fig. EM-10

Non-Califronia models



1 Carbon canister
2 Air pump
3 Thermal vacuum valve
4 Check valve
5 Air gallery pipe
6 Autmatic choke
7 A.T.C. air cleaner
8 A.B. valve
9 B.C.D.D.
10 P.C.V. valve
11 Air relief valve
12 E.G.R. control valve
13 B.P.T. valve
14 Air pump air cleaner

EC131A



EC126A

a B.P.T. valve
b Thermal vacuum valve
c Distributor
d To canister purge control valve
e Carburetor
f A.B. valve
g E.G.R. valve

Fig. EM-11

DISASSEMBLY

To remove engine from vehicle, refer to the instructions under the "Engine Removal and Installation" (ER) section.

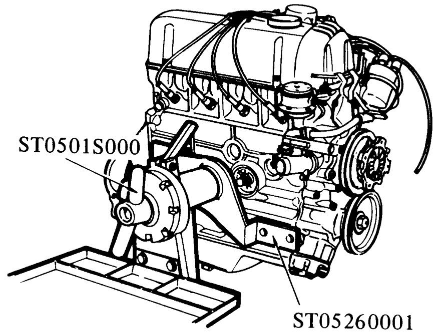
1. Remove transmission from engine.
2. Remove clutch assembly from flywheel.
3. Thoroughly drain engine oil and coolant by removing drain plugs.

Store engine oil and coolant, if they are to be used again.

4. Place engine assembly on engine stand.

(1) Remove cooling fan.
(2) Remove right engine mounting bracket.
(3) Remove oil filter with Oil Filter Wrench ST19320000.
(4) Remove oil pressure switch.
(5) Install engine attachment to cylinder block utilizing bolt holes in alternator bracket and water drain hole.
(6) Set engine on stand.

"Engine Attachment
ST05260001"
"Engine Stand
ST0501S000"



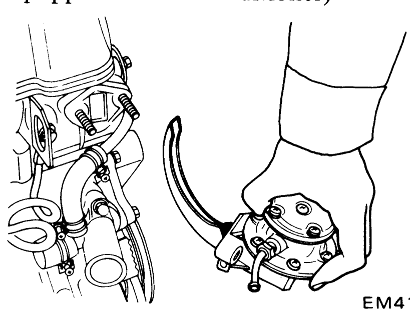
EM410

Fig. EM-12 Engine on Engine Stand

5. Remove oil level gauge.
6. Remove carburetor from intake manifold.

(1) Disconnect cylinder block-to-P.C.V. valve hose at P.C.V. valve.
(2) Disconnect A.B. valve-to-E.G.R. passage hose at E.G.R. passage.
(3) Disconnect vacuum tube-to-carburetor hoses at vacuum tube.
(4) Disconnect fuel hose from carburetor.
(5) Remove dash pot bracket from intake manifold (if so equipped).
(6) Remove carburetor attaching nuts and remove carburetor assembly and gasket.

7. Disconnect distributor high tension cables from spark plugs.
8. Disconnect vacuum hose from distributor and remove distributor assembly.
9. Disconnect fuel hose from fuel pump and remove fuel and vacuum hoses (combined) from cylinder head.
10. Remove fuel pump assembly from cylinder head. (Vehicles not equipped with air conditioner)

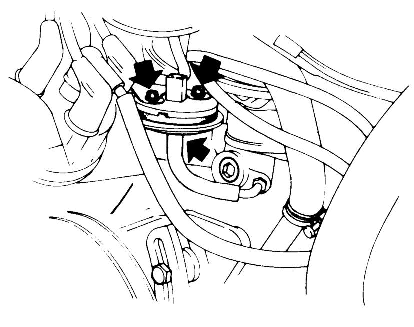


EM412

Fig. EM-13 Removing Fuel Pump

11. Remove intake and exhaust manifolds from cylinder head.

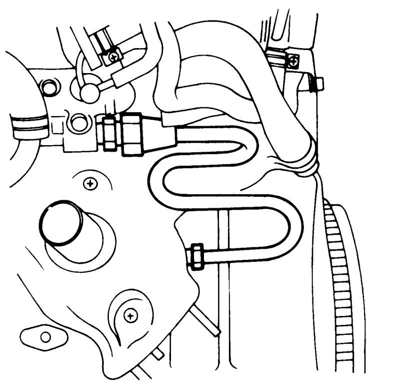
(1) Disconnect vacuum hose from B.P.T. valve and remove B.P.T. valve from air cleaner bracket.



EC082A

Fig. EM-14 Removing B.P.T. Valve

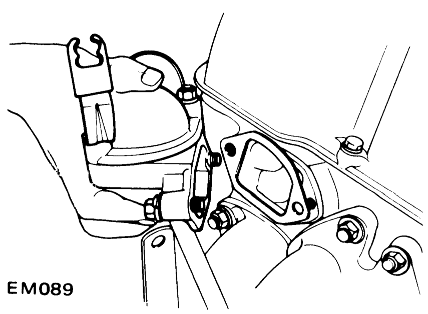
(2) Remove carburetor air cleaner bracket.
(3) Disconnect vacuum hose from E.G.R. valve.
(4) Remove check valve from air gallery pipe.
(5) Disconnect E.G.R. tube from E.G.R. passage and exhaust manifold.
(6) Remove E.G.R. passage and E.G.R. valve from intake manifold.



EM661

Fig. EM-15 Removing E.G.R. Tube and Passage

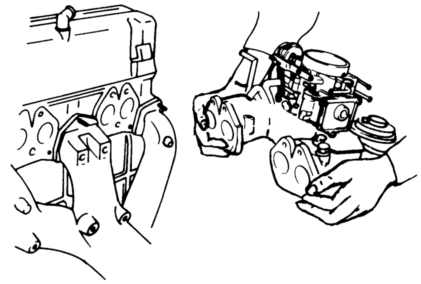
(7) Disconnect vacuum hoses from thermal vacuum valve and remove thermostat housing and gasket from cylinder head.



EM089

Fig. EM-16 Removing Thermostat Housing

(8) Remove cylinder block-to-P.C.V. valve hose (blow-by gas hose) from cylinder block.
(9) Remove manifold attaching bolts and remove intake manifold and gasket from cylinder head.



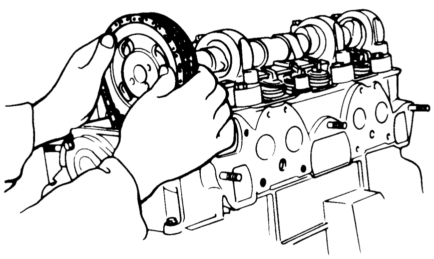
EM662

Fig. EM-17 Removing Intake Manifold

(10) Remove air gallery pipes from exhaust manifold.
(11) Remove exhaust manifold attaching nuts and remove exhaust manifold.

12. Remove left engine mounting bracket from cylinder block.
13. Remove air pump and cooler compressor bracket.
14. Remove crankshaft pulley locking bolt and washer and then remove pulley with a two-jaw puller.
15. Remove water pump assembly.
16. Remove rocker cover.
17. Remove spark plugs.
18. Remove fuel pump drive cam.
19. Remove camshaft sprocket.

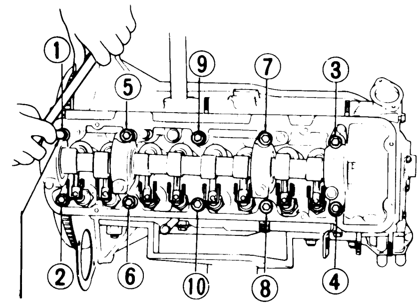
Refer to the following note during operation when removing camshaft sprocket from engine installed on vehicle.



EM091

Fig. EM-18 Removing Camshaft Sprocket

20. Remove cylinder head assembly. Use Cylinder Head Bolt Wrench ST10120000 to remove cylinder head bolts. Loosen bolts from ① to ⑩ as shown in Fig. EM-19.

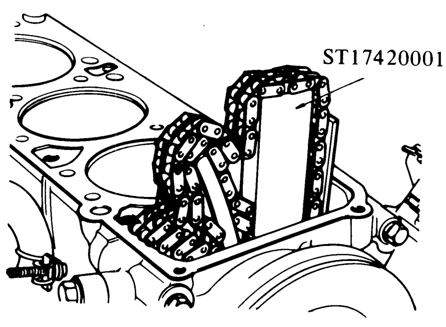


ST10120000 EM092

Fig. EM-19 Cylinder Head Bolt Loosening Sequence

Note: When removing cylinder head from engine installed on vehicle, follow the instructions below.

a. Turn crankshaft until No. 1 piston is at T.D.C. 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 Fig. EM-20.
This operation eliminates the problem of realigning timing marks on timing chain and crankshaft sprocket.



EM538

Fig. EM-20 Supporting Timing Chain

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

21. Invert engine.
22. Remove oil pan and oil strainer.
23. Remove oil pump and its drive spindle.

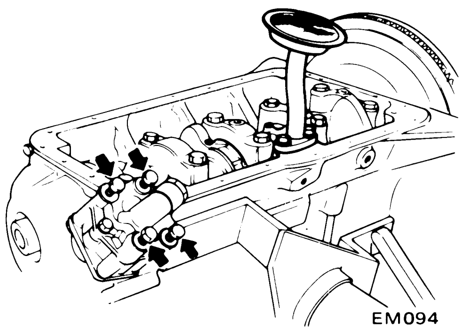


Fig. EM-21 Removing Oil Strainer and Oil Pump

24. Remove front cover.
25. Remove chain tensioner and chain slack side guide.
26. Remove timing chain.

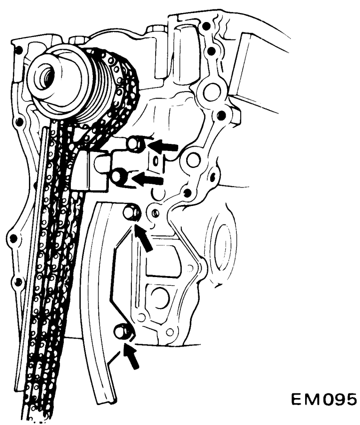


Fig. EM-22 Removing Chain Tensioner and Timing Chain

27. Remove oil thrower, crankshaft worm gear and chain drive sprocket.

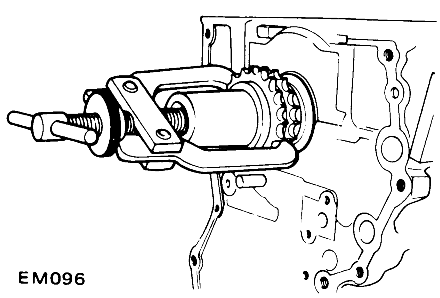


Fig. EM-23 Removing Chain Drive Sprocket

28. Remove piston and connecting rod assembly. Extract connecting rod bearings, keeping them in order.

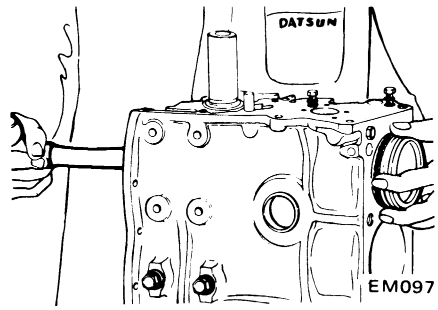


Fig. EM-24 Removing Piston and Connecting Rod Assembly

29. Remove flywheel and rear plate. Be careful not to drop them.

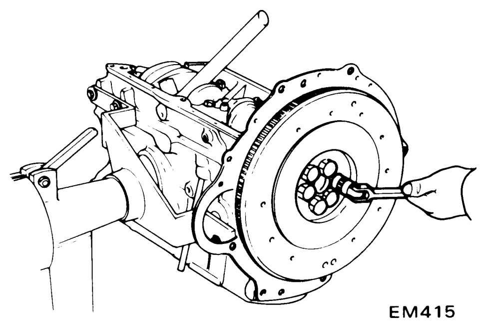


Fig. EM-25 Removing Flywheel

30. Remove main bearing caps.
Use Crankshaft Main Bearing Cap Puller KV101041S0 to remove center and rear main bearing caps. Keep them in order.

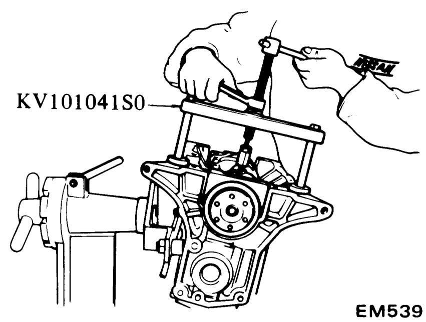


Fig. EM-26 Removing Rear Main Bearing Cap

31. Remove two side seals from rear main bearing cap.
32. Remove rear oil seal.

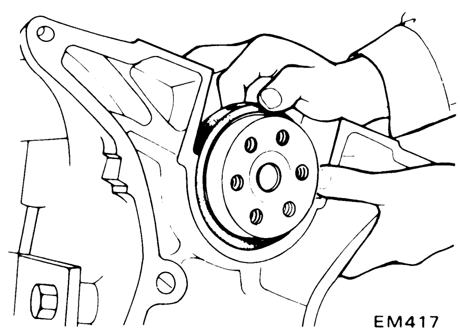


Fig. EM-27 Removing Rear Oil Seal

33. Remove crankshaft.
34. Remove baffle plate and cylinder block net.

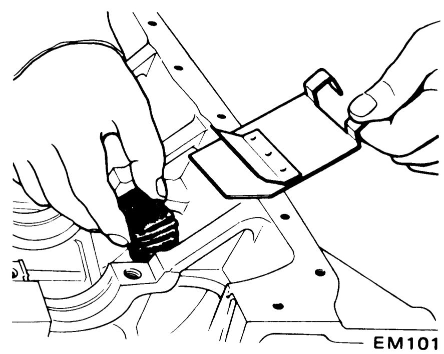


Fig. EM-28 Removing Baffle Plate and Net

PISTONS AND CONNECTING RODS

1. Remove piston rings with a ring remover.

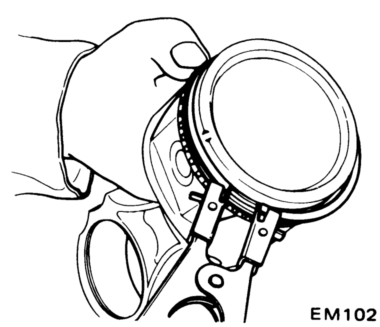


Fig. EM-29 Removing Piston Rings

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

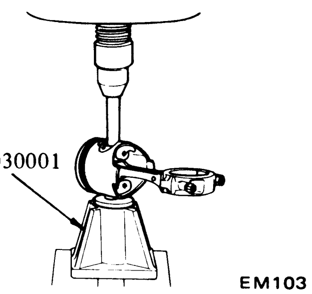


Fig. EM-30 Removing Piston Pin

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.

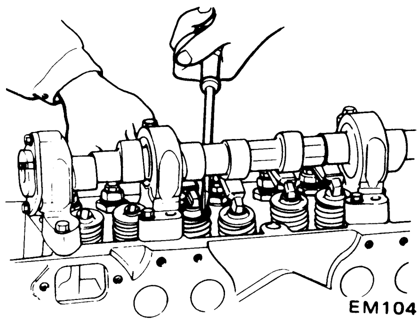


Fig. EM-31 Removing Rocker Arms

2. Remove locate plate, and remove camshaft.

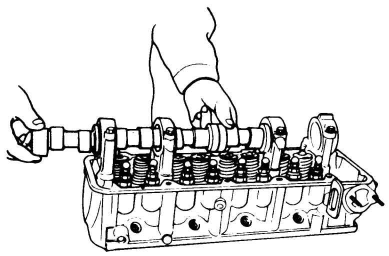


Fig. EM-32 Removing Camshaft

CAUTION:
Be careful not to damage camshaft bearings and cam lobes.

3. Remove valves using Valve Lifter ST12070000.

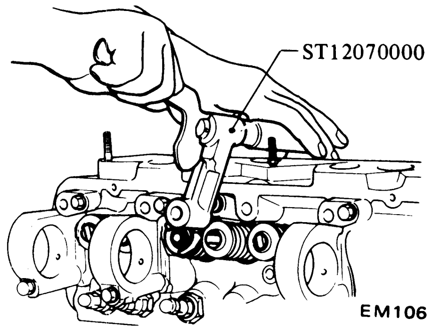


Fig. EM-33 Removing Valves

CAUTION:

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.

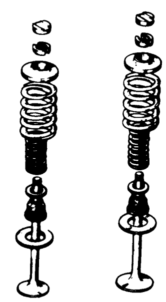


Fig. EM-34 Valve Components

INSPECTION AND REPAIR

CONTENTS

PREPARATION FOR INSPECTION .... EM- 9
CYLINDER HEAD AND VALVE .... EM- 9
CHECKING CYLINDER HEAD MATING FACE .... EM- 9
VALVE ASSEMBLY .... EM- 9
VALVE SPRING EM-10
ROCKER ARM AND VALVE ROCKER PIVOT EM-11
VALVE GUIDE EM-11
VALVE SEAT INSERTS EM-12
CAMSHAFT AND CAMSHAFT BEARING EM-13
CAMSHAFT BEARING CLEARANCE EM-13
VALVE TIMING EM-13
CAMSHAFT ALIGNMENT EM-14
CYLINDER BLOCK EM-14
HOW TO MEASURE CYLINDER BORE ... EM-14
CYLINDER BORING EM-15
PISTONS, PISTON PINS AND PISTON RINGS EM-16
CONNECTING ROD EM-17
CRANKSHAFT EM-17
BUSHING AND BEARING EM-18
MEASUREMENT OF MAIN BEARING CLEARANCE EM-18
MEASUREMENT OF CONNECTING ROD BEARING CLEARANCE EM-19
MISCELLANEOUS COMPONENTS EM-20
CRANKSHAFT AND CAMSHAFT SPROCKETS EM-20
CHAIN TENSIONER AND CHAIN GUIDE . EM-20
FLYWHEEL EM-20
FRONT COVER AND REAR OIL SEAL ... EM-21

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

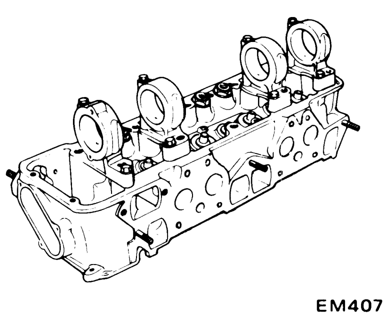


Fig. EM-35 Cylinder Head

CAUTION:
Never remove camshaft bearings unless you have a suitable machine for boring camshaft bearing in line. If you once remove camshaft bearings, bearing centers will come out of alignment; reconditioning is very difficult without center borings.

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.

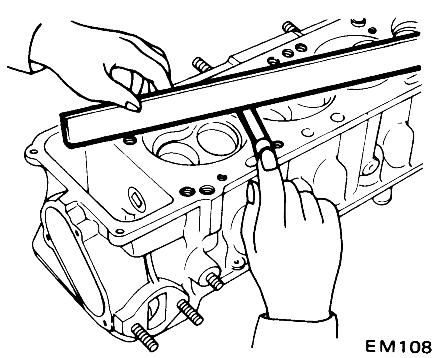


Fig. EM-36 Checking Cylinder Head Surface

Head surface flatness

Standard	Maximum
less than 0.05 mm (0.0020 in)	0.1 mm (0.004 in)

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.

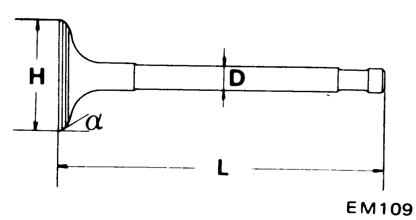


Fig. EM-37 Intake and Exhaust Valve Dimensions

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 (4.52 to 4.54)
		Ex.	115.7 to 116.0 (4.56 to 4.57)
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 face angle Intake and Exhaust	In.	45°30′
		Ex.	45°30′

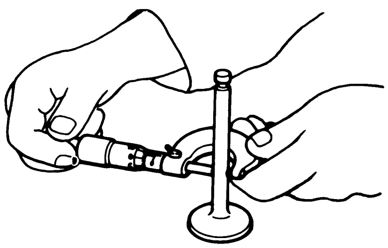


Fig. EM-38 Checking Valve Stem Diameter

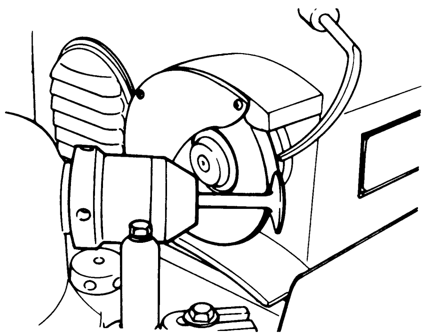


Fig. EM-39 Regrinding Valve Face

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

VALVE SPRING

1. Check valve spring for squareness using a steel square and surface plate. If spring is out of square 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.

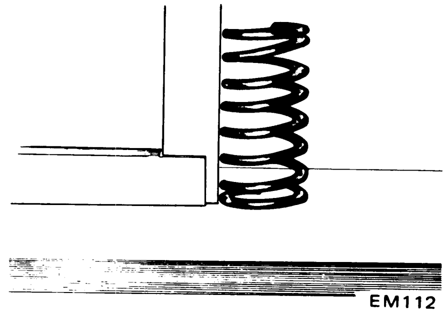


Fig. EM-40 Measuring Spring Squareness

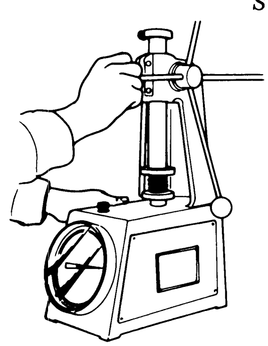


Fig. EM-41 Measuring Spring Tension

Spring specifications

Valve spring free length mm (in)

Intake and exhaust

Outer 49.98 (1.9677)

Inner 44.85 (1.7657)

Valve spring pressured length (valve open) mm/kg (in/lb)

Intake and exhaust

Outer 29.5/49.0 (1.161/108.0)

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.

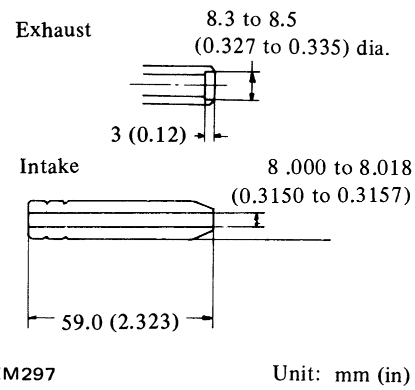


Fig. EM-42 Valve Guide

	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)	0.10 (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 (0.008 in) or more, it indicates that the clearance between stem and guide exceeds the maximum limit of 0.10 mm (0.0039 in).

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

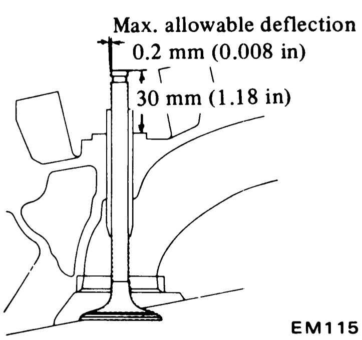


Fig. EM-43 Measuring Clearance between Valve Stem and Valve Guide

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.

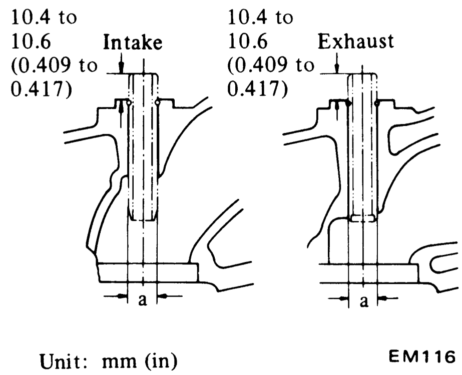


Fig. EM-44 Valve Guide Hole

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 (0.008 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 KV101039S0.

Reaming bore:
8.000 to 8.018 mm
(0.3150 to 0.3157 in)

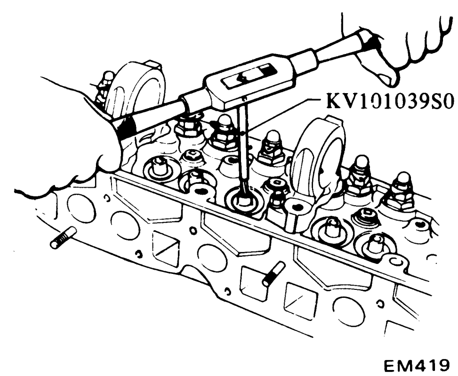


Fig. EM-45 Removing Valve Guide

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 (0.020 in) oversize is available for service as shown below.

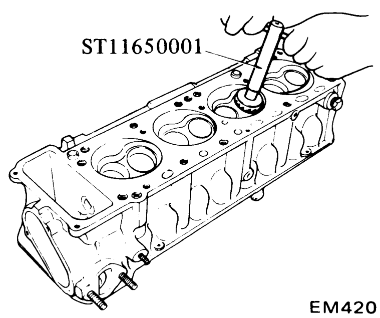


Fig. EM-46 Correcting Valve Seat

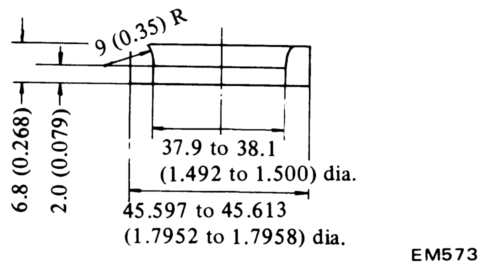
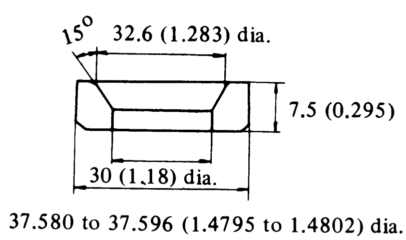
Intake Unit: mm (in)	
Exhaust Unit: mm (in)	

Fig. EM-47 Service Valve Seat Dimensions

Cylinder head recess diameter

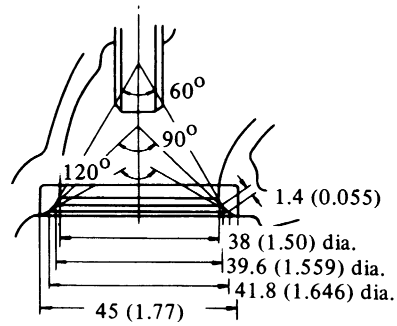
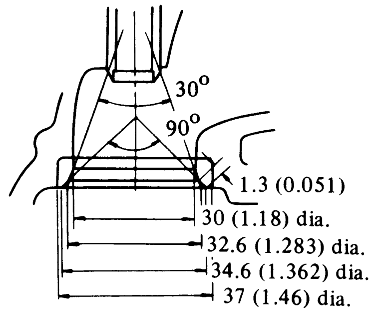
Unit: mm (in)

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)

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 Fig. EM-48.
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)	
Exhaust Unit: mm (in)	

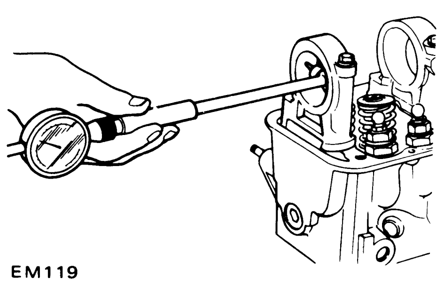
EM121

Fig. EM-48 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

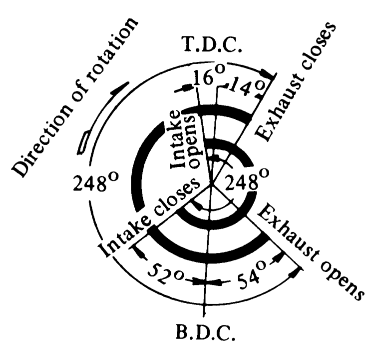
Fig. EM-49 Checking Camshaft Bearing

Camshaft journal to bearing clearance

	Standard	Wear limit
Oil clearance mm (in)	0.038 to 0.067 (0.0015 to 0.0026)	0.10 (0.0039)
Inner diameter of cam shaft bearing mm (in)	48.000 to 48.016 (1.8898 to 1.8904)	——

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-50 Valve Timing Diagram

	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.

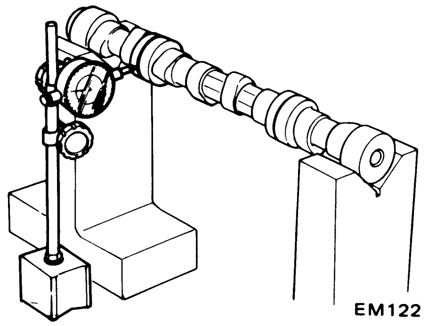


Fig. EM-51 Checking Camshaft Bend

Standard height of cam mm (in)	Intake / Exhaust	40.30 to 40.35 (1.5866 to 1.5886)
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)	0.10 (0.0039)
Camshaft end play	mm (in)	0.08 to 0.38 (0.0031 to 0.0150)

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.

Note: **Surface grinding limit:**
Grinding limit of cylinder block can be determined by cylinder head grinding in an engine.
Depth of cylinder head grinding is "Hh".
Depth of cylinder block grinding is "Hb".

The limit is as follows:
Hh + Hb = 0.20 mm (0.0079 in)

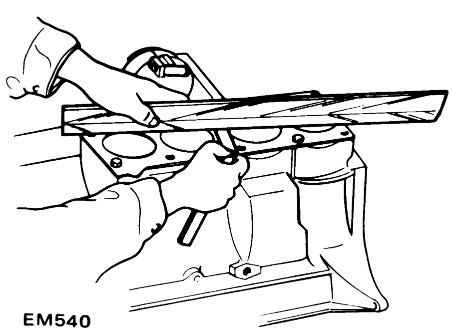


Fig. EM-52 Checking Cylinder Block Surface

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

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

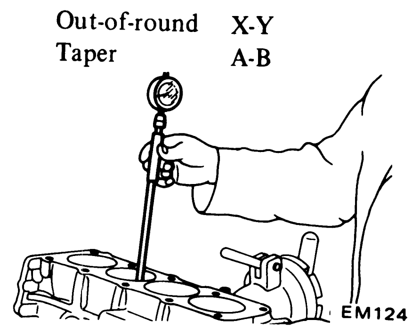


Fig. EM-53 Measuring Cylinder Bore Diameter

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 Fig. EM-54 and record the measured values.

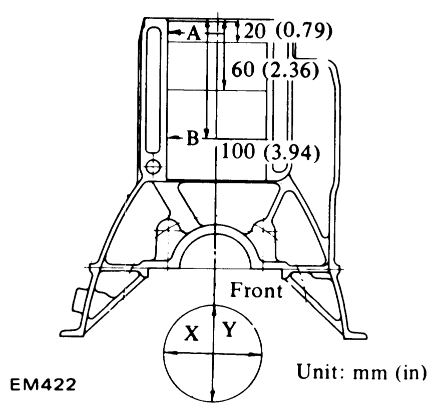


Fig. EM-54 Cylinder Bore Measuring Positions

		Standard	Wear limit
Cylinder bore mm (in)	Inner diameter	85.000 to 85.050 (3.3465 to 3.3484)	0.20 (0.0079)
	Out-of-round	0.015 (0.0006)	
	Taper	0.015 (0.0006)	
Difference in cylinder bore mm (in)		0.05 (0.0020)	0.20 (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)

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).

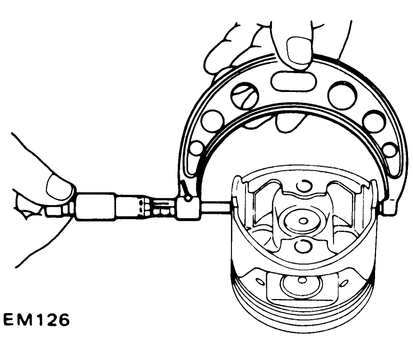


Fig. EM-55 Measuring Piston Diameter

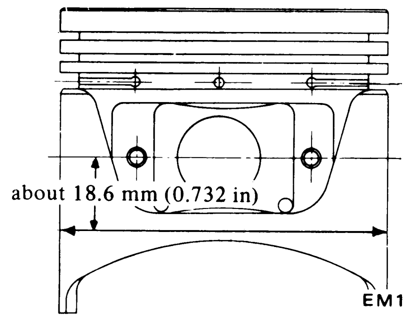


Fig. EM-56 Measuring Piston Skirt Diameter

Rebored size calculation

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

where,

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

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 (0.4 to 3.3)

CAUTION:

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

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

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.

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.

Note:
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).

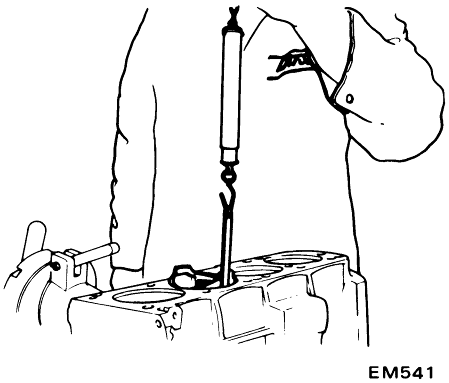


Fig. EM-57 Measuring Piston Fit in Cylinder

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.

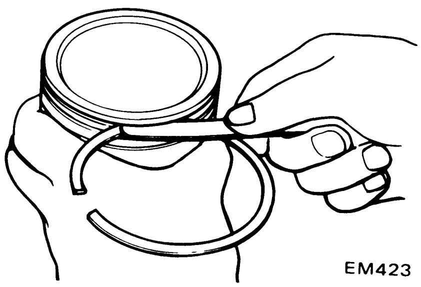


Fig. EM-58 Measuring Piston Ring Side Clearance

Side clearance

Unit: mm (in)

	Standard	Wear limit
Top ring	0.040 to 0.073 (0.0016 to 0.0029)	0.10 (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)	1.00 (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)	

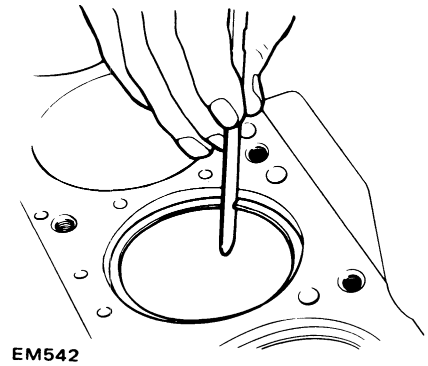


Fig. EM-59 Measuring Ring Gap

Note:
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 (0.020 in) and
1.0 mm (0.039 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.

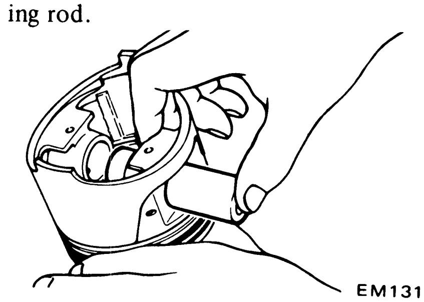


Fig. EM-60 Piston Pin Fitting

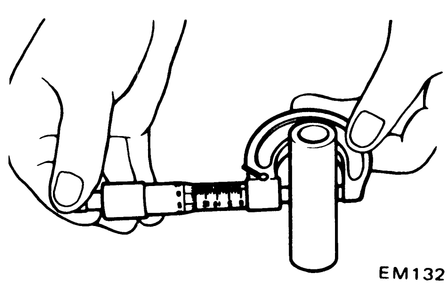


Fig. EM-61 Measuring Piston Pin Diameter

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)

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.

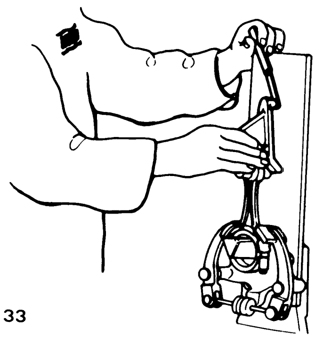


Fig. EM-62 Checking Rod Alignment

2. Check connecting rod for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace.

	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.

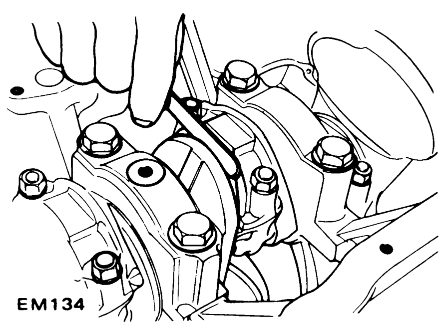


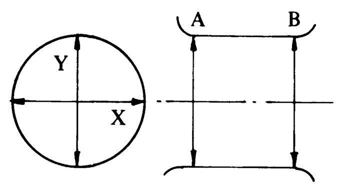
Fig. EM-63 Checking Big End Play

	Standard	Maximum
Big end play mm (in)	0.2 to 0.3 (0.008 to 0.012)	0.6 (0.024)

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 Fig. EM-64 for detailed information.

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



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

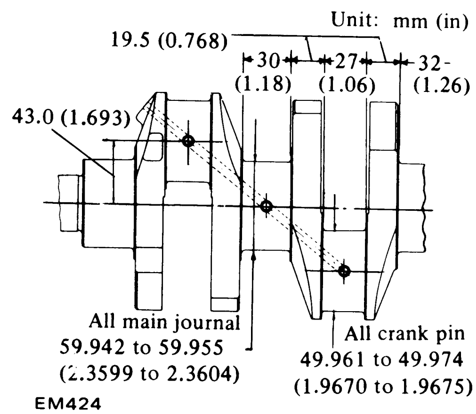


Fig. EM-64 Crankshaft and Journal Dimensions

	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.

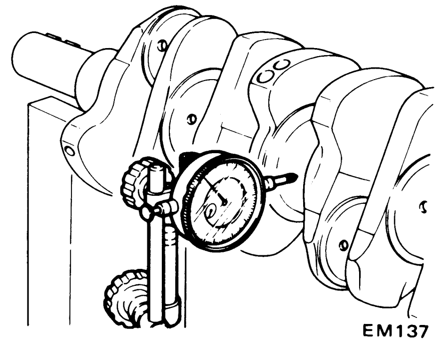


Fig. EM-65 Checking Crankshaft Bend

	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.

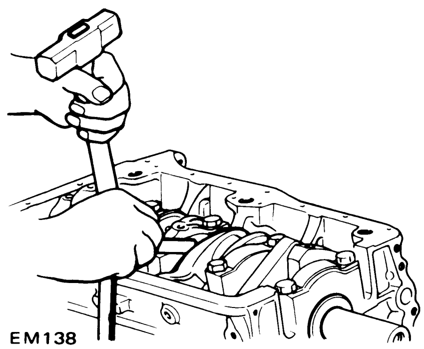


Fig. EM-66 Checking Crankshaft End Play

	Standard	Wear limit
Crankshaft free end play mm (in)	0.05 to 0.18 (0.0020 to 0.0071)	0.30 (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.

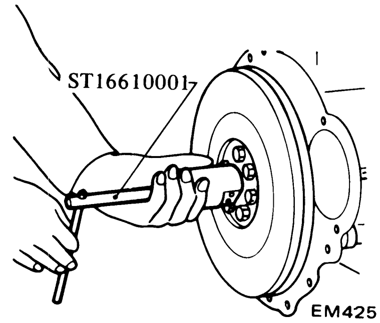


Fig. EM-67 Pulling Out Pilot Bushing

(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.

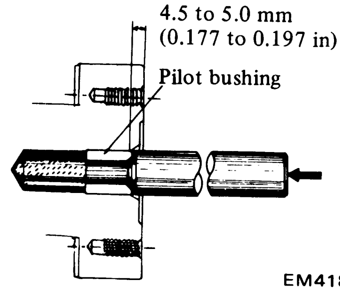


Fig. EM-68 Press-Fitting New Pilot Bushing

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 on the assembly and tighten them together to the specified torque.

Ⓣ **Tightening torque:**
Main bearing cap
4.5 to 5.5 kg-m
(33 to 40 ft-lb)

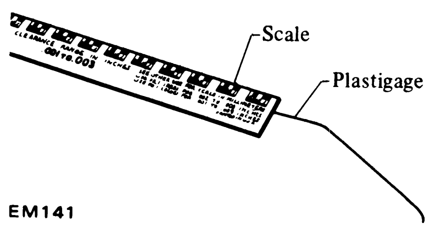


Fig. EM-69 Plastigage

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.

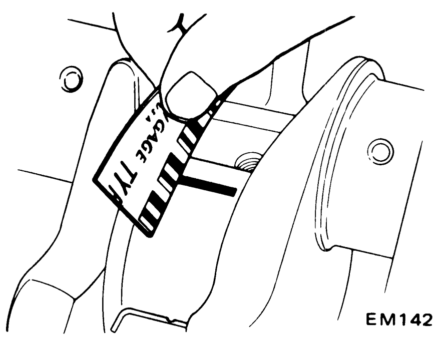


Fig. EM-70 Measuring Bearing Clearance

MEASUREMENT OF CONNECTING ROD BEARING CLEARANCE

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

Ⓣ Tightening torque:
Main bearing cap
4.5 to 5.5 kg-m
(33 to 40 ft-lb)

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

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)

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 0.10 mm (0.0039 in) total indicator reading, replace camshaft sprocket. Also check for end play.

Camshaft end play:
0.08 to 0.38 mm
(0.0031 to 0.0150 in)

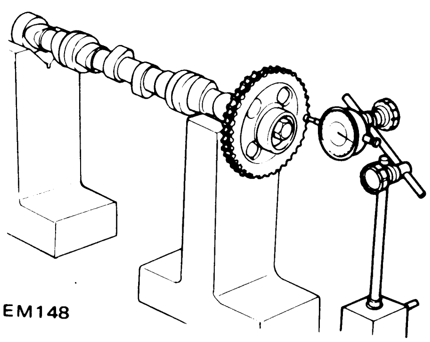


Fig. EM-71 Checking Camshaft Sprocket Runout

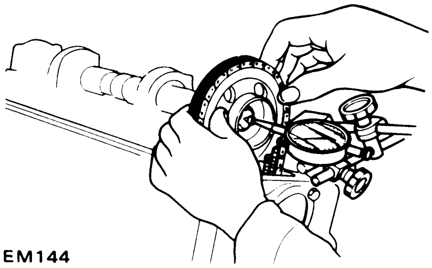


Fig. EM-72 Checking Camshaft End Play

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. 2 hole at the factory. If chain becomes loose, adjust it by setting camshaft sprocket at No. 3 hole.

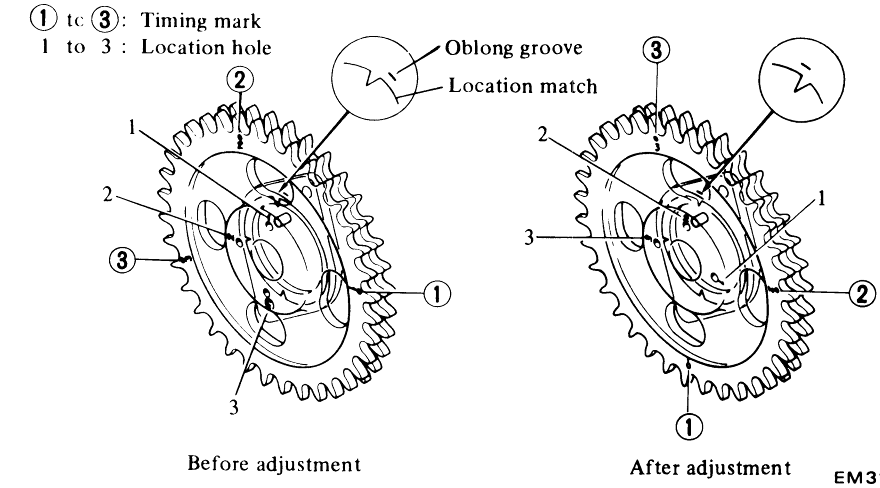


Fig. EM-73 Adjusting Camshaft Sprocket Location

(1) Turn engine until No. 1 piston is at T.D.C. 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.)

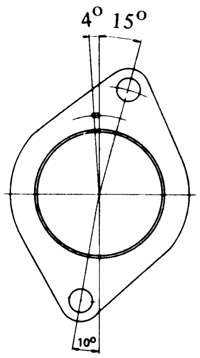


Fig. EM-74 Camshaft Locating Plate

(2) Turn engine until No. 1 piston is at T.D.C. 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.

CHAIN TENSIONER AND CHAIN GUIDE

Check for wear and breakage. Replace if necessary.

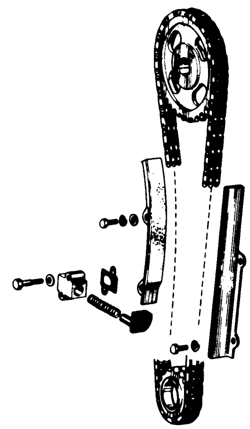


Fig. EM-75 Camshaft Drive Mechanism

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.

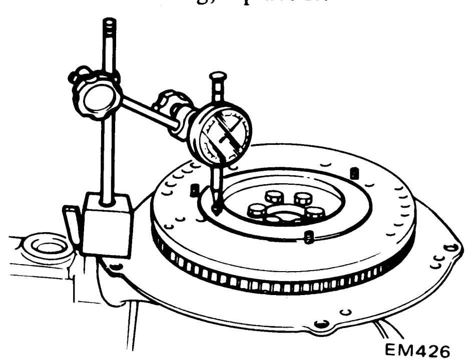


Fig. EM-76 Checking Flywheel Deviation

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

Replace if necessary.

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

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.**

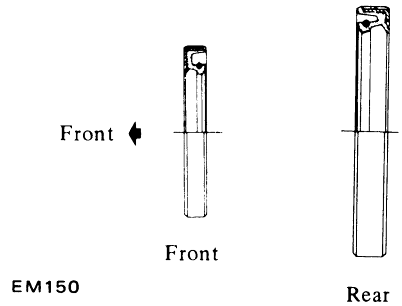


Fig. EM-77 Oil Seals of Crankshaft

ENGINE ASSEMBLY

CONTENTS

PRECAUTIONS EM-21
CYLINDER HEAD EM-21
PISTON AND CONNECTING ROD EM-22
ENGINE ASSEMBLY EM-22

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:

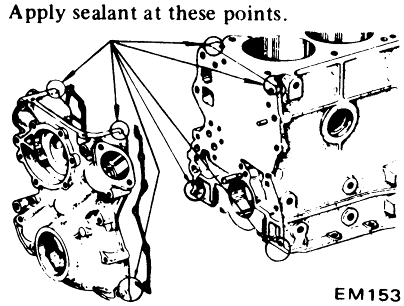


Fig. EM-78 Applying Sealant (Front cover and cylinder block)

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

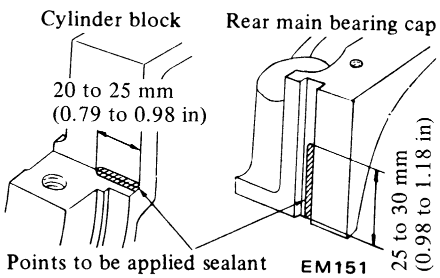


Fig. EM-79 Applying Sealant (Main bearing cap and cylinder block)

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

Note: **Do not apply too much sealant.**

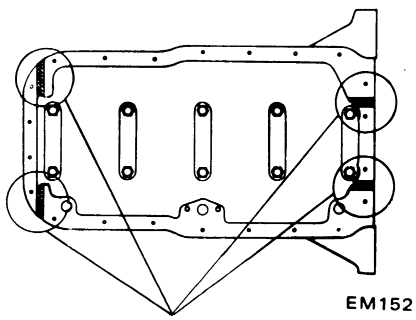


Fig. EM-80 Applying Sealant (Cylinder block)

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.

Ⓣ **Tightening torque:**
Camshaft bracket
1.8 to 2.0 kg-m
(13 to 14 ft-lb)

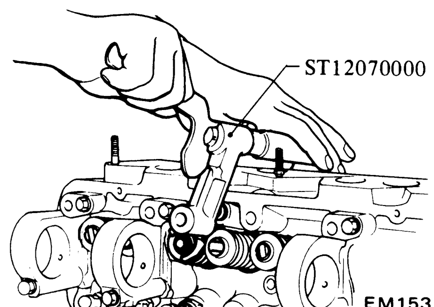


Fig. EM-81 Installing Valves

Note:
a. **Ensure that valve face is free from foreign matter.**
b. **Outer valve spring is of an uneven pitch type.**
Install spring facing painted side to cylinder head surface.

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

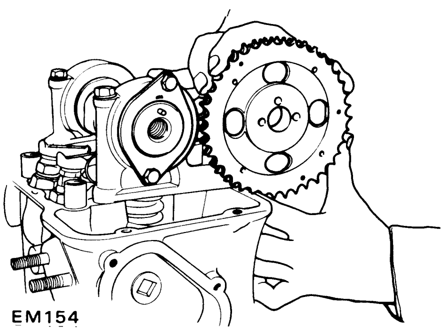


Fig. EM-82 Installing Camshaft Sprocket

Ⓣ **Tightening torque:**
Camshaft bracket
1.8 to 2.0 kg-m
(13 to 14 ft-lb)

At this time, check camshaft end play.

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.

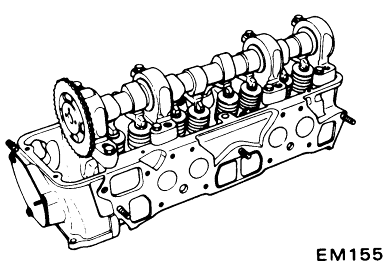


Fig. EM-83 Assembling Cylinder Head

PISTON AND CONNECTING ROD

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

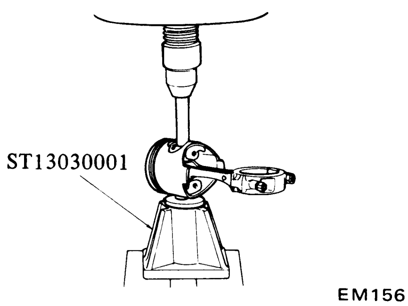


Fig. EM-84 Installing Piston Pin

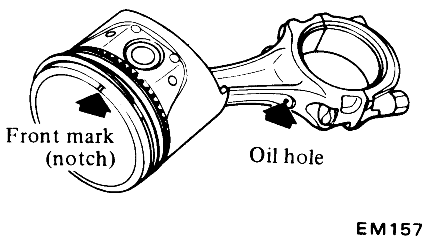


Fig. EM-85 Assembling Piston and Connecting Rod

Note:
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.

Note:
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.**

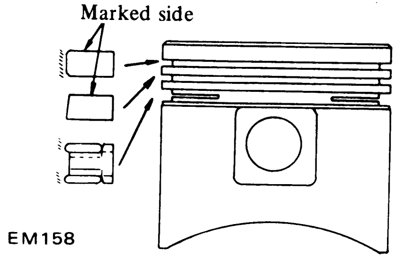


Fig. EM-86 Installing Piston Rings

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.

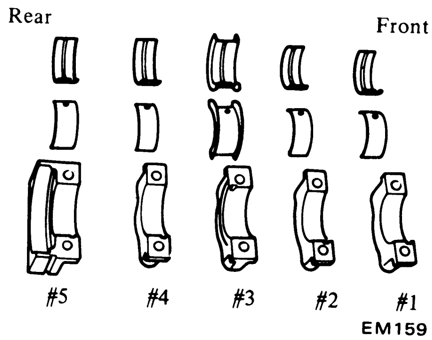


Fig. EM-87 Main Bearings

3. Install baffle plate including cylinder block net.

Note:
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:**
Main bearing cap
4.5 to 5.5 kg-m
(33 to 40 ft-lb)

Note:
a. **Apply sealant to each side of rear main bearing cap and each corner**

of cylinder block as shown in Fig. 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 Fig. EM-88.

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

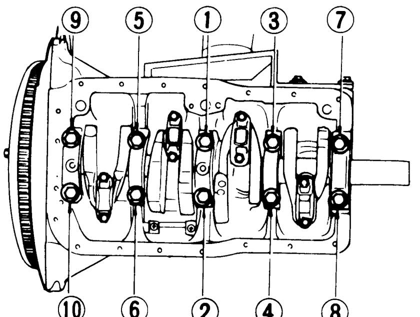


Fig. EM-88 Torque Sequence of Cap Bolts

6. Make sure that crankshaft has proper end play.

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

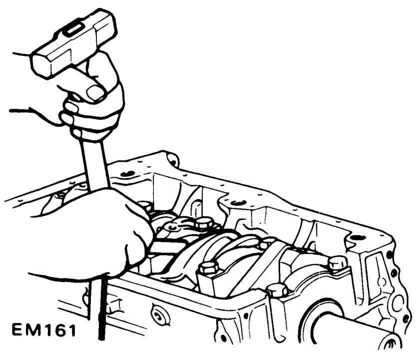


Fig. EM-89 Checking Crankshaft End Play

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

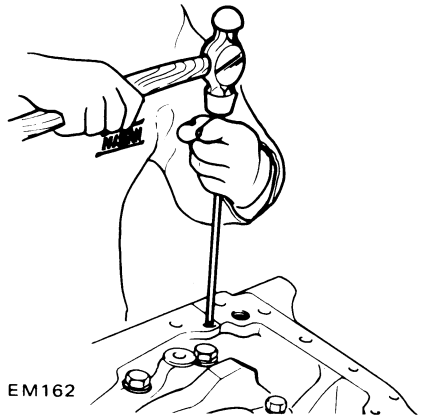


Fig. EM-90 Driving Side Oil Seal

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

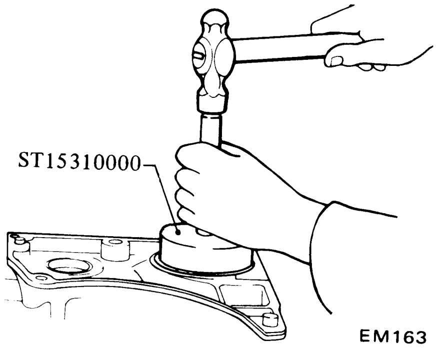


Fig. EM-91 Installing Rear Oil Seal

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:
Flywheel fixing bolts
14 to 16 kg-m
(101 to 116 ft-lb)

11. Insert pistons in corresponding cylinder using Piston Ring Compressor EM03470000.

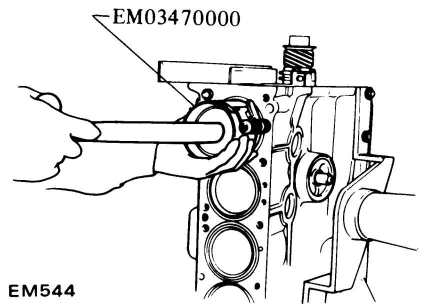


Fig. EM-92 Installing Piston Rod Assembly

Note:

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.

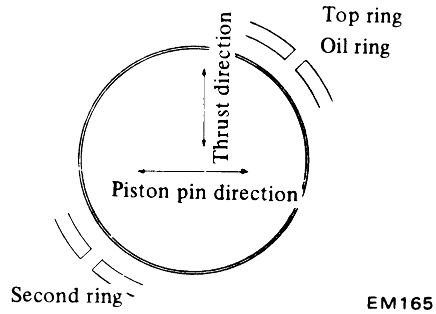


Fig. EM-93 Piston Ring Direction

12. Install connecting rod caps.

Ⓣ Tightening torque:
Connecting rod end nuts
4.5 to 5.5 kg-m
(33 to 40 ft-lb)

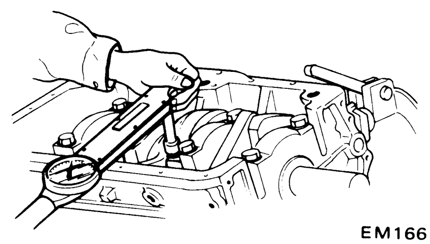


Fig. EM-94 Installing Connecting Rod Cap

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

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

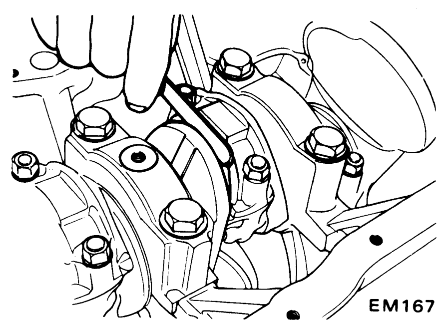


Fig. EM-95 Checking Big End Play

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

14. Install cylinder head assembly.

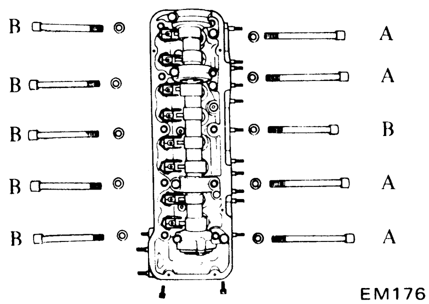


Fig. EM-96 Cylinder Head Bolts

(1) Thoroughly clean cylinder block and head surface.

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

(2) Turn crankshaft until No. 1 piston is at T.D.C. 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 Fig. EM-102.

Ⓣ **Tightening torque:**

Cylinder head bolts

2 kg-m (14 ft-lb)

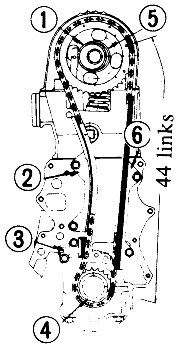
15. Install crankshaft sprocket and oil pump drive gear, and fit oil thrower.

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

16. Install timing chain.

Note:

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).

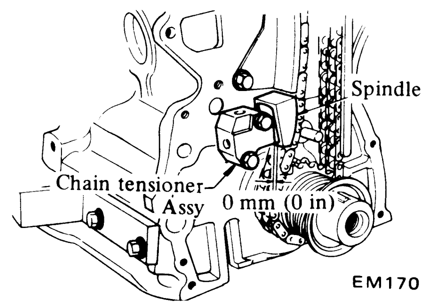


Fig. EM-98 Installing Chain Tensioner

19. Press new oil seal in front cover.

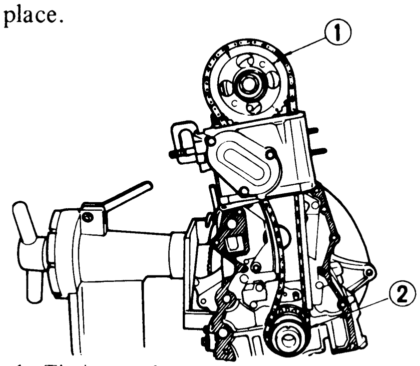
Note:

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

Note:

a. Apply sealant to front cover and corners of upper section of cylinder block as shown in Fig. 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.

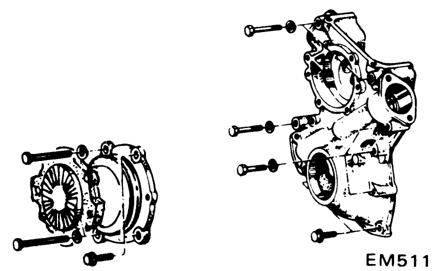


Fig. EM-100 Front Cover Bolts

Ⓣ **Tightening torque:**

Front cover bolts

Size 8 mm

1.0 to 1.3 kg-m

(7 to 9 ft-lb)

Size 6 mm

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 T.D.C. on its compression stroke.

Ⓣ **Tighten torque:**

Crankshaft pulley locking bolt

12 to 16 kg-m

(87 to 116 ft-lb)

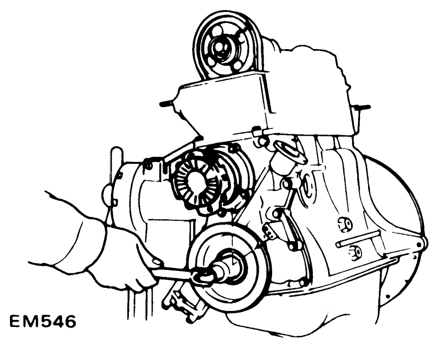


Fig. EM-101 Installing Crankshaft Pulley and Water Pump

22. Finally, tighten head bolts to the specified torque in several steps according to the tightening sequence

shown in Fig. EM-102.

Note that two types of bolts are used.

Special tool Cylinder Head Bolt Wrench ST10120000

Ⓣ **Tightening torque:**
Cylinder head bolts
6.5 to 8.5 kg-m
(47 to 61 ft-lb)

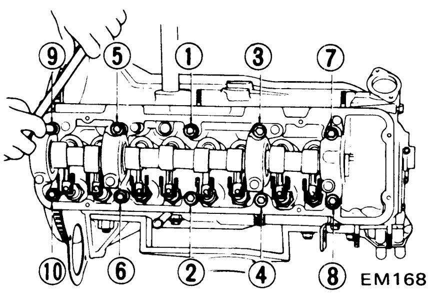


Fig. EM-102 Tightening Sequence of Cylinder Head Bolts

Note:
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:**
Oil pump bolts
1.1 to 1.5 kg-m
(8 to 11 ft-lb)

Note:
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.**

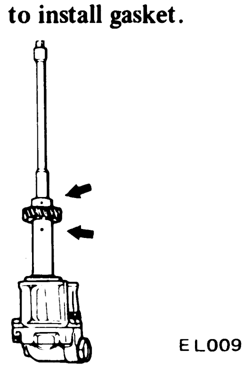


Fig. EM-103 Setting Distributor Driving Spindle

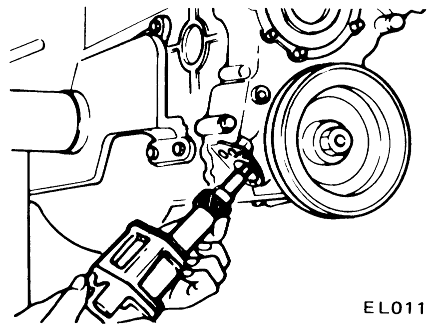


Fig. EM-104 Installing Oil Pump

24. Install fuel pump (on vehicles not equipped with air conditioner), water inlet elbow and front engine slinger in their positions.

Ⓣ **Tightening torque:**
Fuel pump nuts
1.2 to 1.8 kg-m
(9 to 13 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.

Ⓣ **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)

Note:
a. **Apply sealant to the step portions at four mating surfaces as shown in Fig. 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:**
Pivot adjuster locking nut
5.0 to 6.0 kg-m
(36 to 43 ft-lb)

Note:
a. **First set clearance to the cold specifications.**

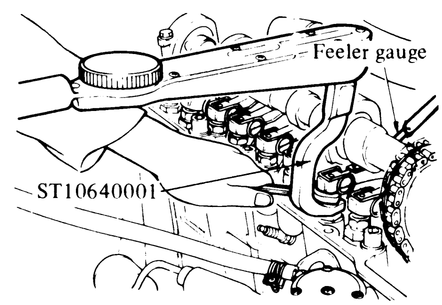


Fig. EM-105 Adjusting Valve Clearance

b. **After engine has been assembled, warm up engine until water temperature indicator points to middle of gauge and finally adjust clearance to hot specifications.**

Valve clearance mm (in)	Cold	Intake	0.20 (0.008)
		Exhaust	0.25 (0.010)
	Hot	Intake	0.25 (0.010)
		Exhaust	0.30 (0.012)

27. Install rocker cover to cylinder head.
28. Install air pump bracket and cooler compressor to cylinder block.
29. Install manifold gasket and exhaust manifold and intake manifold to cylinder head.

Ⓣ **Tightening torque:**
Intake and exhaust manifold securing bolts or nuts
1.2 to 1.6 kg-m
(9 to 12 ft-lb)

CAUTION:
When installing exhaust manifold, be careful that stud bolt is inserted into

center of outermost guide hole in manifold.

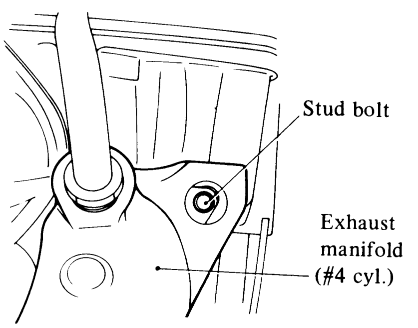


Fig. EM-106 Installing Exhaust Manifold

30. Install coolant hose from intake manifold to water pump.
31. Install air gallery pipe on exhaust manifold.
32. Install heatshield plate on exhaust manifold.
33. Install blow-by gas pipe on cylinder block and tighten with rear engine slinger.
34. Install thermostat housing gasket, thermostat housing and thermostat.
35. Install thermal vacuum valve on thermostat housing. Before installing, apply a liquid packing slightly to the threads.
36. Install E.G.R. passage and E.G.R. valve on intake manifold.
37. Connect E.G.R. tube to E.G.R. tube and exhaust manifold.
38. Install check valve on air gallery pipe.
39. Install air cleaner bracket on intake manifold.
40. Install air control valve on air cleaner bracket (if so equipped).
41. Install vacuum and fuel tubes (combined) on cylinder head.
42. Install distributor assembly.
43. Install heatshield plate, joint seat and carburetor.

Ⓣ Tightening torque:
Carburetor nuts
0.5 to 1.0 kg-m
(3.6 to 7.2 ft-lb)

Note: When installing joint seat, be sure to put the duct into primary hole in intake manifold. (Canada models)

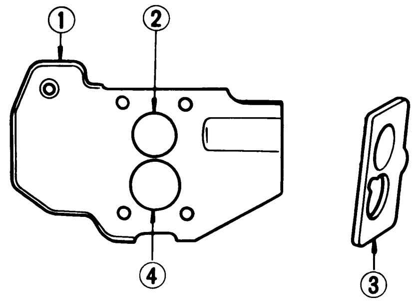


Fig. EM-107 Installing Carburetor Joint Seat

44. Install dash pot bracket and dash pot to intake manifold.
45. Connect all air, vacuum and fuel hoses and then secure with clamps.

Non-California models
(1) Cylinder block-to-P.C.V. valve hose
(2) A.B. valve-to-E.G.R. passage vacuum hose
(3) A.B. valve to E.G.R. passage air hose
(4) Vacuum tube to carburetor vacuum hoses
(5) Fuel tube to carburetor fuel hose
(6) Fuel tube to fuel pump fuel hose
(7) Distributor to vacuum switching valve vacuum hose (If so equipped)
(8) Thermal vacuum valve-E.G.R. to vacuum hose
(9) B.P.T. valve to E.G.R. control valve hose
(10) Carbon canister vacuum hose
(11) Air pump to check valve air hose
(12) Air pump to air pump air cleaner air hose
(13) F.I.C.D. vacuum hose (If so equipped)

California models
(1) Cylinder block to P.C.V. valve hose
(2) A.B. valve to E.G.R. passage vacuum hose
(3) A.B. valve to E.G.R. passage air hose
(4) Vacuum tube to carburetor vacuum hoses
(5) Fuel tube to carburetor fuel hose
(6) Fuel tube to fuel pump fuel hose
(7) Distributor to vacuum switching valve vacuum hose (If so equipped)
(8) C.A.C. valve vacuum hose
(9) Thermal vacuum valve-E.G.R. to vacuum delay valve vacuum hose
(10) Vacuum delay valve to B.P.T. valve vacuum hose
(11) B.P.T. valve to E.G.R. control valve hose
(12) Intake manifold to fuel shut-off valve hose
(13) Carbon canister vacuum hose
(14) Air pump to air check valve air hose
(15) Air pump to air pump air cleaner air hose
(16) C.A.C. valve to 3-way connector air hose
(17) F.I.C.D. vacuum hose (If so equipped)

46. Install carburetor air cleaner on carburetor and then connect air and vacuum hoses as follows:

Non-California models
(1) Air cleaner to rocker cover hose
(2) Air cleaner to A.B. valve hose
(3) Air cleaner to air pump air hose
(4) Other vacuum hoses

California models
(1) Air cleaner to rocker cover hose
(2) Air cleaner to C.A.C. valve air hose
(3) Air cleaner to A.B. valve air hose
(4) Altitude compensator to carburetor air hose
(5) Other vacuum hose

47. Install spark plugs in place.
48. Connect all distributor high tension cables to spark plugs.
49. Install air pump, drive belt, cooler compressor and idler pulley.
50. Install left engine mounting bracket.
51. Install clutch assembly on flywheel with Clutch Aligning Bar KV30100100.

Ⓣ Tightening torque:
Clutch cover securing bolts
1.6 to 2.1 kg-m
(12 to 15 ft-lb)

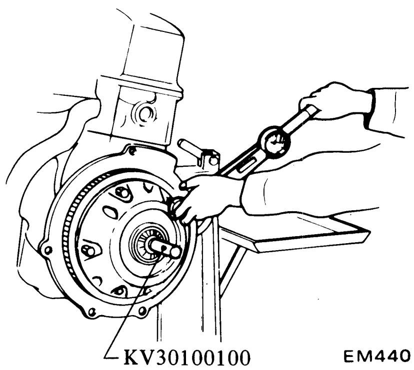


Fig. EM-108 Installing Clutch Assembly

52. Using an overhead hoist and lifting cable, hoist engine away from engine stand and then down onto engine carrier.

53. Install right engine mounting bracket, oil filter, oil pressure switch, oil level gauge and water drain plug. When installing oil filter, fasten it to cylinder block by hand.

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

54. Install alternator bracket adjusting bar, alternator, cooling fan and belt.

55. Adjust the deflection of drive belts when thumb pressure is applied midway between pulleys [A pressed force is above 10 kg (22.0 lb).]

Deflection of drive belts:
8 to 12 mm
(0.31 to 0.47 in)

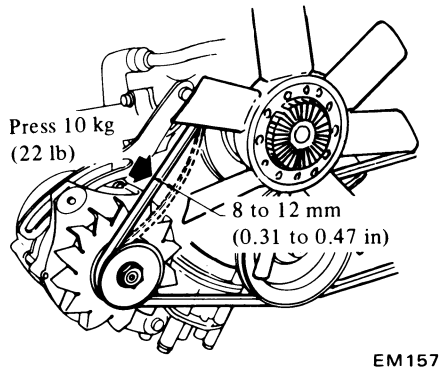


Fig. EM-109 Fan Belt Tension

56. Fill engine oil up to specified level.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine model		L20B
Cylinder arrangement		4, in-line
Displacement	cc (cu in)	1,952 (119.1)
Bore and stroke	mm (in)	85.0 x 86.0 (3.35 x 3.39)
Valve arrangement		O.H.C.
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearing		5
Compression ratio		8.5
Oil pressure (Warm at 2,000 rpm)	kg/cm^2 (psi)	3.5 to 4.0 (50 to 57)
Fan belt size	mm (in)	11.2 x 860 (0.441 x 33.86)
Engine idle	rpm	
U.S.A. models		
Manual transmission		600
Automatic transmission (in "D" position)		600
Canada models		
Manual transmission		600
Automatic transmission (in "D" position)		600

INSPECTION AND ADJUSTMENT

VALVE MECHANISM

Valve clearance (Hot)	mm (in)	
Intake		0.25 (0.010)
Exhaust		0.30 (0.012)
Valve clearance (Cold)	mm (in)	
Intake		0.20 (0.008)
Exhaust		0.25 (0.010)
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 length	mm (in)	
Intake		114.9 to 115.2 (4.52 to 4.54)
Exhaust		115.7 to 116.0 (4.56 to 4.57)

Valve lift	mm (in)	
Intake and exhaust		10.5 (0.413)
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 spring free length	mm (in)	
Intake and exhaust		
Outer		49.98 (1.9677)
Inner		44.85 (1.7657)
Valve spring pressured length (valve open)	mm/kg (in/lb)	
Intake and exhaust		
Outer		29.5/49.0 (1.161/108.0)
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 spring out-of-square	mm (in)	
Outer		2.2 (0.087)
Inner		1.2 (0.047)
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 (Standard)	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 (Oversize)		
Intake		12.223 to 12.234 (0.4812 to 0.4817)
Exhaust		12.223 to 12.234 (0.4812 to 0.4817)
Valve guide interference fit	mm (in)	0.027 to 0.049 (0.0011 to 0.0019)
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 to 1.6 (0.055 to 0.063)
Exhaust		1.8 to 2.2 (0.071 to 0.087)

Valve seat angle	degree	
Intake and exhaust		45°
Valve face angle	degree	
Intake		45°30′
Exhaust		45°30′
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)

CAMSHAFT AND TIMING CHAIN

Camshaft bend	mm (in)	0.02 (0.0008)
Camshaft bearing inner diameter	mm (in)	
1st, 2nd, 3rd and 4th		48.000 to 48.016 (1.8898 to 1.8904)
Camshaft journal to bearing clearance	mm (in)	0.038 to 0.067 (0.0015 to 0.0026)
Camshaft end play	mm (in)	0.08 to 0.38 (0.0031 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)

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)
Maximum limit of dittoed clearance	mm (in)	0.12 (0.0047)
Crankshaft free end play	mm (in)	0.05 to 0.18 (0.0020 to 0.0071)
Wear limit of dittoed play	mm (in)	0.30 (0.0118)
Crank pin diameter	mm (in)	49.961 to 49.974 (1.9670 to 1.9675)
Crank pin out-of-round	mm (in)	less than 0.01 (0.0004)
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)

CONNECTING ROD

Center distance	mm (in)	146 (5.75)
Big end play	mm (in)	0.2 to 0.3 (0.008 to 0.012)
Connecting rod bearing clearance	mm (in)	0.025 to 0.055 (0.0010 to 0.0022)
Connecting rod bend (per 100 mm or 2.937 in)	mm (in)	less than 0.03 (0.0012)

PISTON

Piston diameter (Service standard)	mm (in)	84.985 to 85.035 (3.3459 to 3.3478)
(Service parts)		
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)
Ellipse difference	mm (in)	0.32 to 0.35 (0.0126 to 0.0138)
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)
Pin diameter	mm (in)	20.993 to 20.998 (0.8265 to 0.8267)
Side clearance	mm (in)	
Top ring		0.040 to 0.073 (0.0016 to 0.0029)
Second ring		0.030 to 0.070 (0.0012 to 0.0028)
Ring gap width		
Top ring		0.25 to 0.40 (0.0098 to 0.0157)
Second ring		0.30 to 0.50 (0.0118 to 0.0197)
Oil ring		0.30 to 0.90 (0.0118 to 0.0354)

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)	0.20 (0.0079)
Cylinder bore taper and out-of-round	mm (in)	0.015 (0.0006)
Surface flatness	mm (in)	less than 0.05 (0.0020)

CYLINDER HEAD

Surfaces flatness	mm (in)	less than 0.05 (0.0020)

TIGHTENING TORQUE

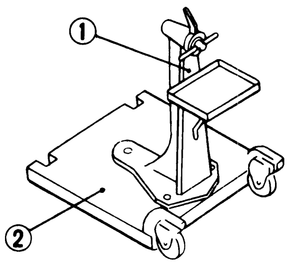
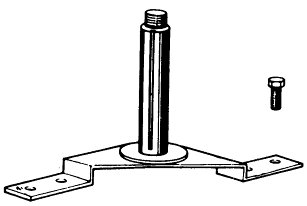
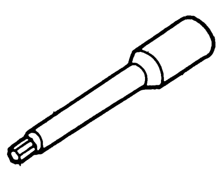
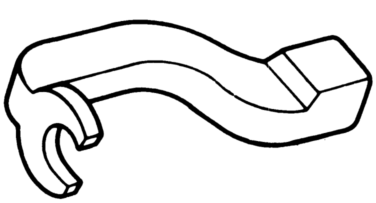
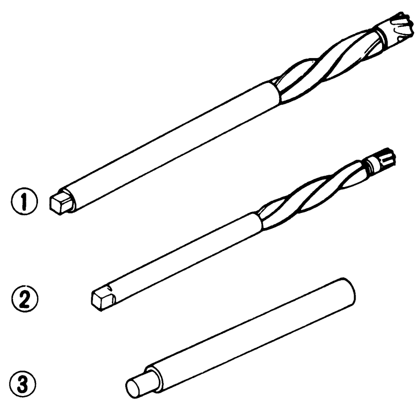
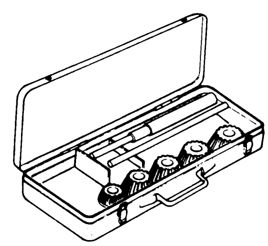
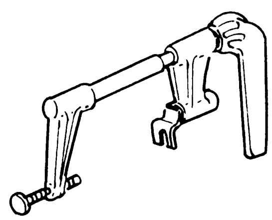
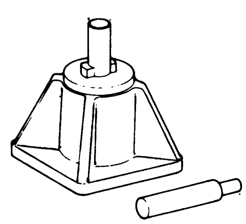
Cylinder head bolts	kg-m (ft-lb)	6.5 to 8.5 (47 to 61)
Connecting rod big end nuts	kg-m (ft-lb)	4.5 to 5.5 (33 to 40)
Flywheel fixing bolts	kg-m (ft-lb)	14 to 16 (101 to 116)
Main bearing cap bolts	kg-m (ft-lb)	4.5 to 5.5 (33 to 40)
Camshaft bracket bolts	kg-m (ft-lb)	1.8 to 2.0 (13 to 15)
Camshaft sprocket bolt	kg-m (ft-lb)	12 to 16 (87 to 116)
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)
Oil pump bolts	kg-m (ft-lb)	1.1 to 1.5 (8 to 11)
Oil strainer bolts	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Oil pan bolts	kg-m (ft-lb)	0.6 to 0.9 (4.3 to 6.5)
Oil pan drain plug	kg-m (ft-lb)	2.0 to 3.0 (14 to 22)
Front cover bolts	kg-m (ft-lb)	
8 mm dia.		1.0 to 1.3 (7 to 9)
6 mm dia.		0.4 to 0.6 (2.9 to 4.3)
Intake and exhaust manifold securing bolts or nuts	kg-m (ft-lb)	1.2 to 1.6 (9 to 12)
Carburetor nuts	kg-m (ft-lb)	0.5 to 1.0 (3.6 to 7.2)
Crankshaft pulley locking bolt	kg-m (ft-lb)	12 to 16 (87 to 116)
Fuel pump nuts	kg-m (ft-lb)	1.2 to 1.8 (9 to 13)
Water pump bolts	kg-m (ft-lb)	0.4 to 0.5 (2.9 to 3.6)
Alternator securing bolts	kg-m (ft-lb)	
Adjusting bar		1.0 to 1.6 (7 to 12)
Mounting bracket		2.0 to 3.0 (14 to 22)
Air pump securing bolts	kg-m (ft-lb)	
Adjusting bar		1.8 to 2.4 (13 to 17)
Mounting bracket		4.5 to 5.5 (33 to 40)

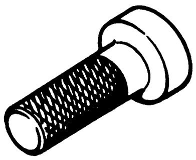
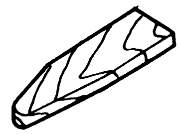
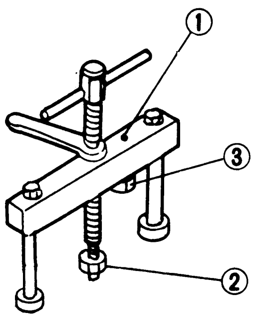
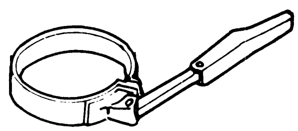
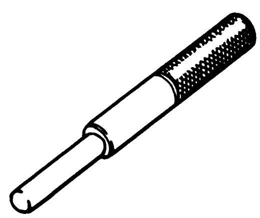
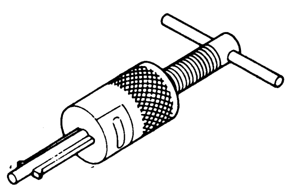
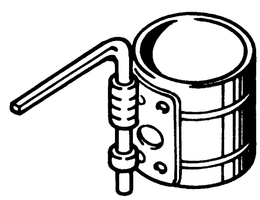
TROUBLE DIAGNOSES AND CORRECTIONS

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

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

SPECIAL SERVICE TOOL

Tool number & tool name	Kent-Moore No.	Reference page or Fig. No.
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base 	J 26023 ① J 26023-2 ② J 26023-1	Fig. EM-12
ST05260001 Engine attachment 	J 26029	Fig. EM-12
ST10120000 Cylinder head bolt wrench 	J 25613	Fig. EM-19 Fig. EM-102
ST10640001 Pivot adjuster 	J 25615-01	Fig. EM-105
KV101039S0 Valve guide reamer set ①ST11081000 Reamer [12.2 mm (0.480 in)] dia. ②ST11032000 Reamer [8.0 mm (0.315 in)] dia. ③ST11320000 Drift 	J 25618 ① J 25618-3 ② J 24618-2 ③ J 25618-1	Fig. EM-45
ST11650001 Valve seat cutter set 	———	Fig. EM-46
ST12070000 Valve lifter set 	J 25631	Fig. EM-33 Fig. EM-82
ST13030001 Piston pin press stand 	J 25634	Fig. EM-28 Fig. EM-81

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST15310000 Crankshaft rear oil seal drift 	J 25640-01 Fig. EM-91	ST17420001 Chain stopper 	J 25660-01 Fig. EM-20
KV101041S0 Crankshaft main bearing cap puller ① ST16511000 Crankshaft main bearing cap puller ② ST16512001 Adapter ③ ST16701001 Adapter  	J 25647 Fig. EM-26	ST19320000 Oil filter wrench 	J 25664 Page EM-5
		KV30100100 Clutch aligning bar 	—— Fig. EM-108
ST16610001 Pilot bushing puller 	J 23907 Fig. EM-67	EM03470000 Piston ring compressor 	—— Fig. EM-92

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

SECTION EL

ENGINE LUBRICATION SYSTEM

EL

ENGINE LUBRICATION SYSTEM .... EL- 2
SERVICE DATA AND SPECIFICATIONS .... EL- 5
TROUBLE DIAGNOSES AND CORRECTIONS .... EL- 5
SPECIAL SERVICE TOOLS .... EL- 6

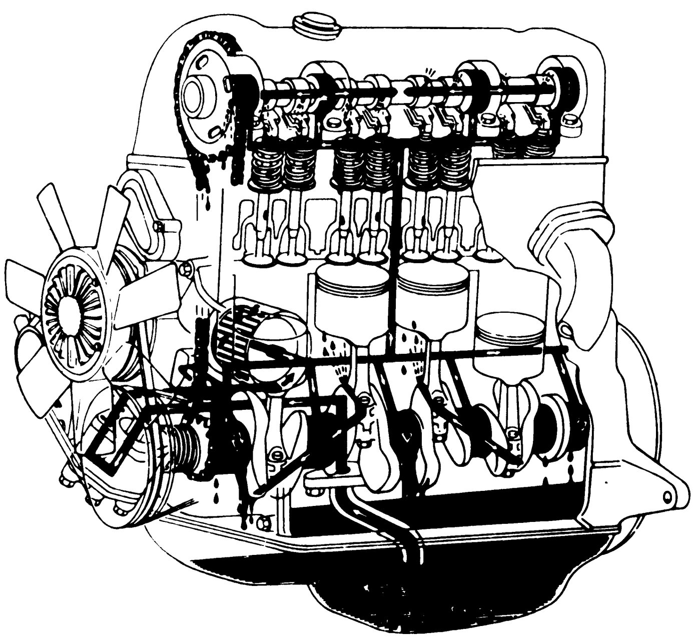
NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

ENGINE LUBRICATION SYSTEM

CONTENTS

LUBRICATION CIRCUIT EL-2
OIL PUMP EL-2
REMOVAL EL-2
INSTALLATION EL-2
DISASSEMBLY AND ASSEMBLY EL-3
INSPECTION EL-3
OIL PRESSURE REGULATOR VALVE EL-4
OIL FILTER EL-4
RELIEF VALVE EL-4

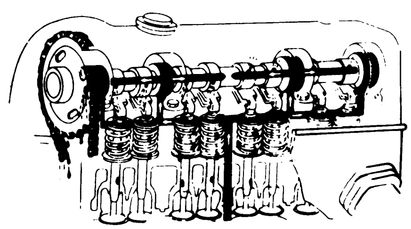


EL049

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 Figs. EL-1 and EL-2.



EL050

Fig. EL-2 Lubricating Valve Mechanism

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 secured on the bottom of the front cover with 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/cm^2 (80 psi).

REMOVAL

1. Remove distributor.
2. Remove splash shield board.
3. Remove oil pump body with drive spindle assembly.

INSTALLATION

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

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

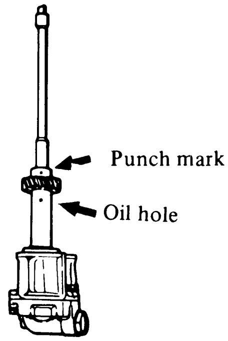


Fig. EL-3 Aligning Punch Mark and Oil Hole

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 Fig. EL-4.

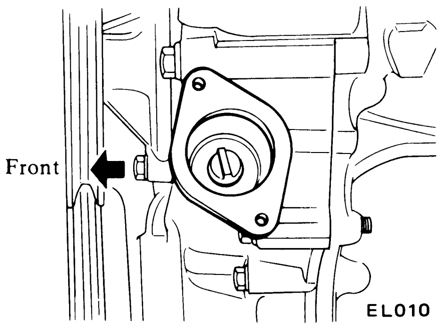


Fig. EL-4 Setting Drive Spindle

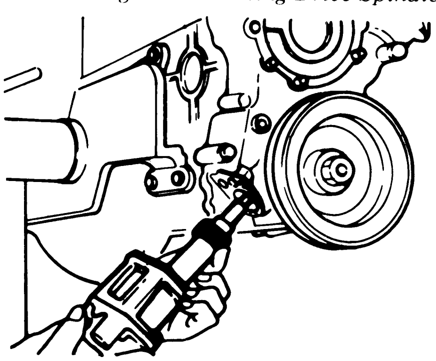


Fig. EL-5 Installing Oil Pump

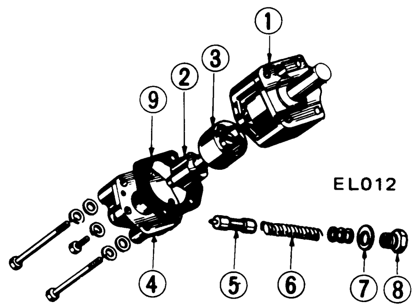
Ascertain whether or not the engagement is in order by checking the top of spindle through distributor fitting hole.

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.

Note:
The marks dotted on outer and inner rotors should face to oil pump body.



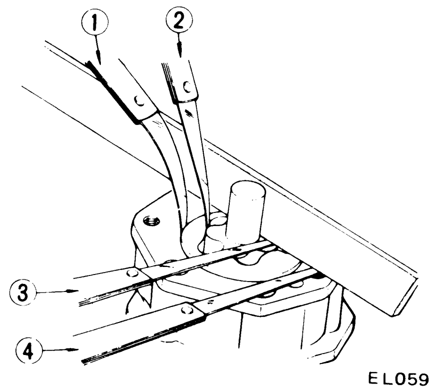
1 Oil pump body
2 Inner rotor and shaft
3 Outer rotor
4 Oil pump cover
5 Regulator valve
6 Regulator spring
7 Washer
8 Regulator cap
9 Cover gasket

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 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 (2) and outer rotor-to-body clearance (1) shown in Fig. EL-7.



1 Outer rotor to body clearance
2 Tip clearance
3 Gap between rotor and straight edge
4 Gap between body and straight edge

Fig. EL-7 Checking Rotor Clearances

7. Place a straight edge across the face of pump and depress it slightly as shown in Fig. EL-7. Check gap (4) between body and straight edge or gap (3) between rotor and straight edge.

Gap:

−0.03 to 0.06 mm
(−0.0012 to 0.0024 in)

Rotor side clearance (rotor to bottom cover clearance) with gasket should satisfy the specifications.

		Standard	Wear limit
Rotor side clearance (rotor to bottom cover)	mm (in)	0.04 to 0.08 (0.0016 to 0.0032)	0.20 (0.0079)
Rotor tip clearance (2)	mm (in)	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance (1)	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0197)

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.

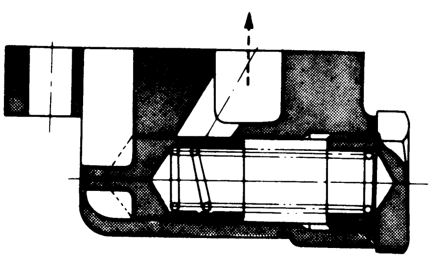

EL014

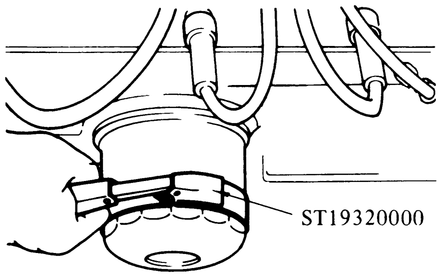
Fig. EL-8 Regulator Valve

OIL FILTER

The oil filter is 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 to cylinder block by hand.

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



EL015

Fig. EL-9 Removing Oil Filter

RELIEF VALVE

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

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.

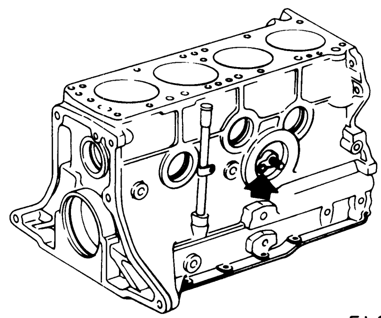

EL016

Fig. EL-10 Relief Valve

SERVICE DATA AND SPECIFICATIONS

Oil pump

		Standard	Wear limit
Rotor side clearance (rotor to bottom cover)	mm (in)	0.04 to 0.08 (0.0016 to 0.0032)	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)

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)

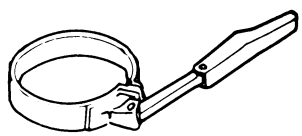
Tightening torque

Oil pump bolt	kg-m (ft-lb)	1.1 to 1.5 (8 to 11)
Oil pump cover bolt	kg-m (ft-lb)	0.7 to 1.0 (5.1 to 7.2)
Regulator valve cap nut	kg-m (ft-lb)	4 to 5 (29 to 36)

TROUBLE DIAGNOSES AND CORRECTIONS

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

SPECIAL SERVICE TOOL

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST19320000 Oil filter wrench 	J 25664 Fig. EL-9		

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CO

COOLING SYSTEM

CO

COOLING SYSTEM .... CO- 2

SERVICE DATA AND SPECIFICATIONS .... CO- 6

TROUBLE DIAGNOSES AND CORRECTIONS .... CO- 7

COOLING SYSTEM

CONTENTS

DESCRIPTION CO-2
COOLANT LEVEL CO-2
DRAINING AND FLUSHING THE COOLING SYSTEM CO-2
WATER PUMP CO-2
REMOVAL AND INSTALLATION CO-3
DISASSEMBLY CO-3
INSPECTION AND ADJUSTMENT CO-3
TORQUE COUPLING CO-3
REMOVAL AND INSTALLATION CO-4
DISASSEMBLY CO-4
INSPECTION CO-4
TEM-COUPLING CO-4
INSPECTION CO-5
THERMOSTAT CO-5
REMOVAL AND INSTALLATION CO-5
INSPECTION CO-5
RADIATOR CO-5
REMOVAL AND INSTALLATION CO-5
INSPECTION CO-6
RADIATOR RESERVOIR TANK CO-6
OPERATION CO-6
INSPECTION CO-6
REMOVAL AND INSTALLATION CO-6

DESCRIPTION

The cooling system is of the conventional pressure type. A centrifugal pump installed on the timing chain 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 it reaches normal operating temperature, the coolant circulates through the radiator.

The cooling fan drive is of a coupling type. See Fig. CO-1.

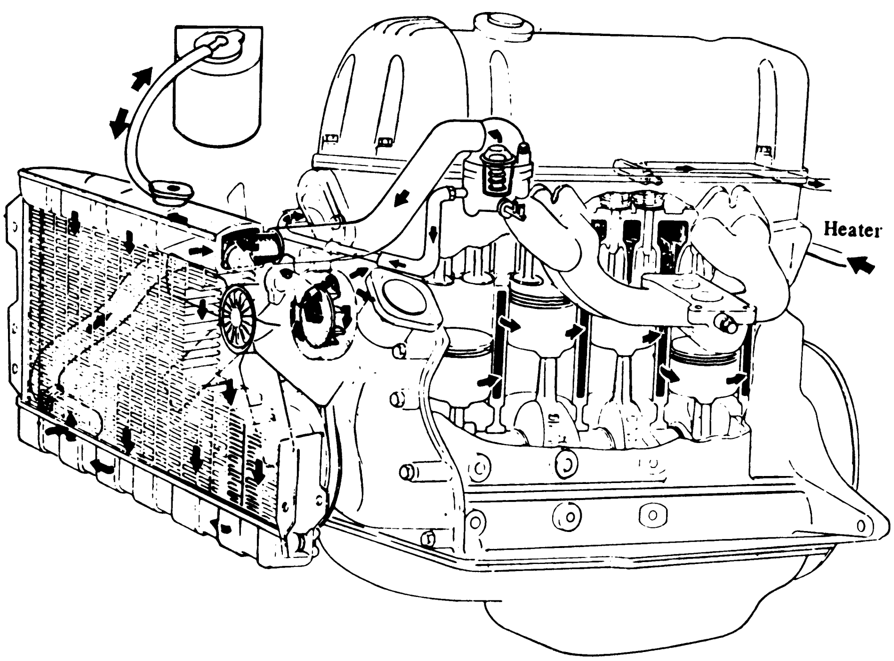


Fig. CO-1 Cooling System

COOLANT LEVEL

The coolant level should be checked and maintained at 50 mm (1.97 in) below the upper face of filler neck, when the engine is cold.

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

DRAINING AND FLUSHING THE COOLING SYSTEM

To drain the cooling system, remove radiator cap, release drain cock at the bottom of radiator and drain plug on the right side of cylinder block. If the heater system is installed, set heater temperature control valve to open position. After the coolant is drained completely, close drain cock and plug and refill the system with clean soft water.

WATER PUMP

The water pump, cooling fan pulley and torque coupling are a unitized construction.

The water pump is of a centrifugal type, which is mounted on the engine front cover.

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

The pump is provided with an impeller which turns on a steel shaft. The steel shaft rotates together with the torque coupling wheel. The volute chamber is built in the engine front cover assembly.

The inlet of the pump is connected to the radiator's lower tank by a hose.

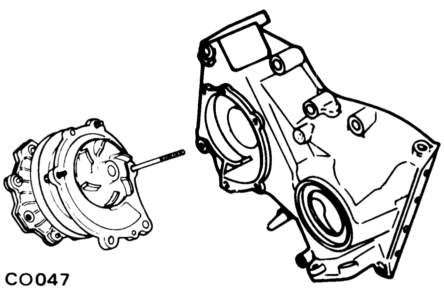


Fig. CO-2 Water Pump and Engine Front Cover

REMOVAL AND INSTALLATION

Removal

1. Drain coolant into a clean container.
2. Remove upper and lower radiator shrouds.
3. Remove fan blade.
4. Loosen fan belt.
5. Remove water pump assembly and gasket from front cover.

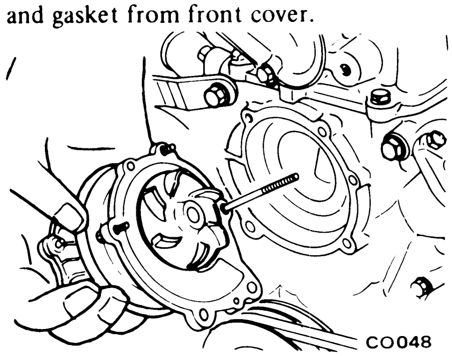


Fig. CO-3 Removing Water Pump

Installation

1. Be sure to clean the gasket surfaces in contact with pump and front cover. Always use new gaskets when installing pump assembly. Be sure to tighten bolts.

(T) Tightening torque:
Water pump securing bolts
0.4 to 0.5 kg-m
(2.9 to 3.6 ft-lb)

2. Fill cooling system and check for leaks at pump.
3. Install fan blade, and tighten attaching bolts securely. Install belt and adjust for specified tension.
4. Operate the engine at fast idling and recheck for leaks.
5. Install fan shrouds.

Note:
Ensure that clearance between shroud and fan is even at any place.

DISASSEMBLY

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

INSPECTION AND ADJUSTMENT

Inspection

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

1. Badly rusted or corroded body assembly and vane
2. Excessive end play or roughness of bearings in operation
3. Reduced cooling efficiency due to deteriorated silicone oil
4. Oil leakage in torque coupling

Adjustment

Fan belt should be properly adjusted at all times. A tight belt causes wear of alternator and water pump bearings. A loose belt brings about improper cooling fan, water pump, and alternator operation.

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

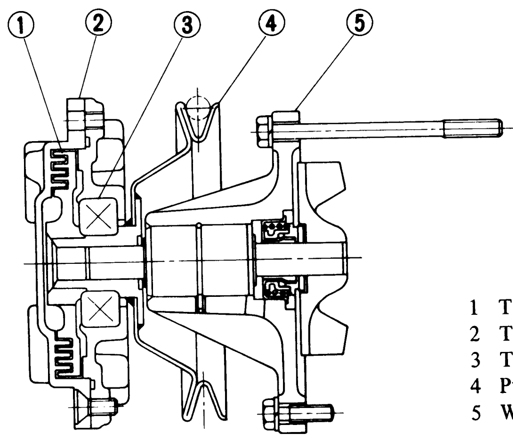
Fan belt deflection:
8 to 12 mm
(0.31 to 0.47 in)

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.

TORQUE COUPLING (Except air conditioner equipped models)

The torque coupling keeps the fan speed at 2,500 rpm (rated) or below to conserve horsepower at high engine speed. It also helps reduce fan noise to a minimum during high speed operation.

This unit is filled with a special silicone oil used as a fluid coupling which controls the fan speed. (Silicone oil can not be replenished.) See Fig. CO-4.



1 Torque coupling wheel
2 Torque coupling cover
3 Torque coupling bearing
4 Pulley
5 Water pump

CO060

Fig. CO-4 Torque Coupling and Water Pump

REMOVAL AND INSTALLATION

To replace the torque coupling, follow the same procedure as in the water pump. The torque coupling can not be separated from the water pump.

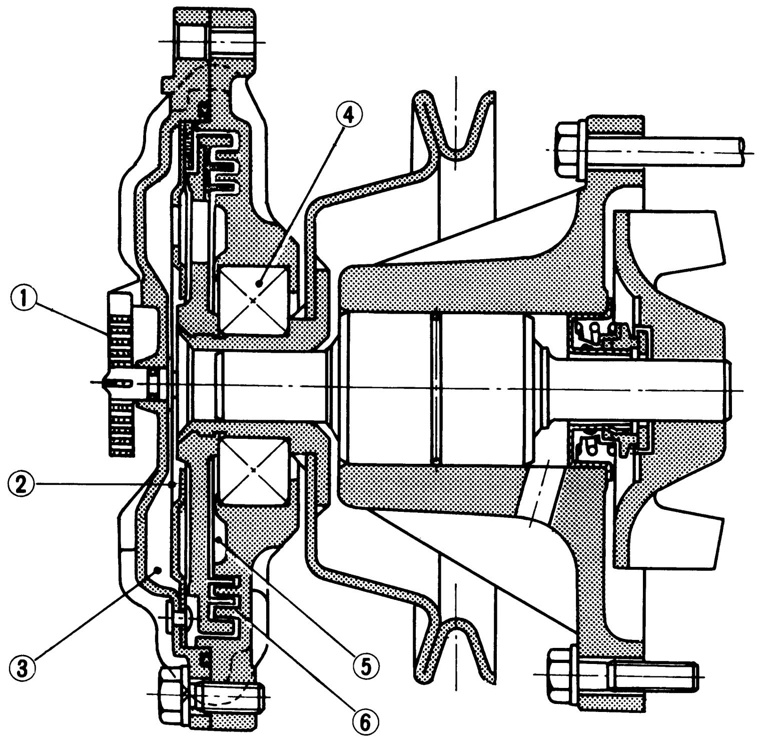
DISASSEMBLY

The torque coupling is so designed that it can not be disassembled.

INSPECTION

Inspect torque coupling for oil leakage. If necessary, replace.

TEM-COUPLING (For air conditioner equipped models)



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

CO077

Fig. CO-5 Tem-Coupling

Tem-coupling is a type of fan coupling which is provided with a temperature control system.

The conventional coupling always slips the fan at a high speed under a constant ratio regardless of the engine cooling requirement.

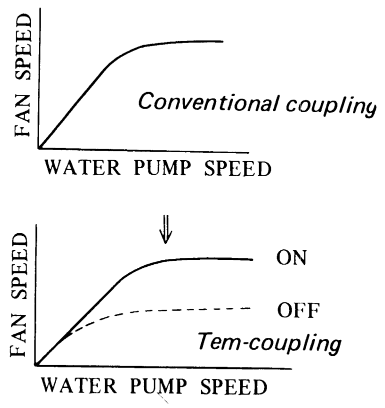
The slipping ratio of the Tem-coupling, however, is properly changed with the cooling requirement.

"ON" denotes that cooling is required and the fan operates up to about 2,150 rpm. When high cooling is not required (during cold season, with the engine warmed up, etc.), the operation is placed under "OFF" condition and the fan slips at about 1,650 rpm.

The coiled bimetal thermostat installed on the front center portion of the Tem-coupling detects temperature of air passing through the radiator (The air temperature is directly relative to the engine coolant temperature.) and the inside slide valve is opened or closed as required, and thus, the ON-OFF control is performed. When the air temperature rises, the bimetal is expanded, and the valve is opened, silicon oil is forwarded to the groove that transmits torque, and the system is placed under "ON" condition.

When the valve closes, silicone oil is not supplied to the driving chamber, oil in the driving chamber is accumulated on periphery due to the centrifugal force, and led into the reserve chamber. Now, oil is eliminated from the driving chamber, and the system is placed under "OFF" condition.

With this system, when fan cooling is not required, the output loss is minimized and noise can be far reduced. See Fig. CO-5.



CO029

Fig. CO-6 Characteristic of Tem-Coupling

INSPECTION

Check Tem-coupling for oil leakage or bend of bimetal.

If the above symptoms are found, replace it with a new one as an assembly.

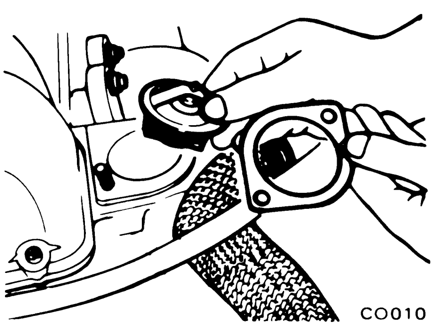
THERMOSTAT

A wax pellet type thermostat is mounted in the thermostat housing at the cylinder head water outlet.

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

REMOVAL AND INSTALLATION

1. Drain coolant partially.
2. Disconnect upper radiator hose at water outlet.
3. Remove bolts and remove water outlet, gasket, and thermostat from thermostat housing.



CO010

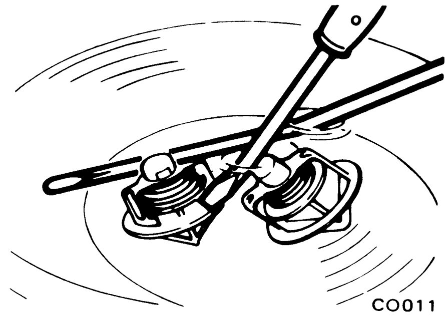
Fig. CO-7 Removing Thermostat

4. After checking thermostat, reinstall with a new gasket in place.
5. Reinstall water outlet.
6. Replenish coolant and check for leaks.

INSPECTION

A sticking thermostat will prevent the cooling system from functioning properly. If the thermostat sticks in the open position, the engine warms up very slowly. If the thermostat sticks in the closed position, overheating will result. Therefore, the thermostat should be inspected 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.
2. After preparing for the marked screwdriver at about 8 mm (0.31 in) from the tip, inspect the lift height of valve by inserting it.
3. Now, place thermostat in water 5°C (9°F) below the specified temperature.



CO011

Fig. CO-8 Inspecting Thermostat

If thermostat does not operate at the above specified temperature, it must be replaced because it cannot be repaired.

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

RADIATOR

The radiator is a conventional down flow type having top and bottom tanks to distribute the coolant flow uniformly through the vertical tube of 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 consisting of a blow-off valve and a vacuum valve, helps to prevent the coolant from boiling by giving pressure to it. However, when the pressure is reduced below atmospheric pressure, the vacuum valve allows air to re-enter the radiator preventing the formation of a vacuum in the cooling system.

On models equipped with automatic transmission, the oil cooler is combined with the radiator to cool transmission fluid.

REMOVAL AND INSTALLATION

1. Drain coolant into a clean container.
2. Disconnect radiator upper and lower hoses. On models with automatic transmissions, disconnect cooler inlet and outlet lines from radiator.
3. Remove fan shroud retaining bolts and remove fan shroud.
4. Remove front grille.
5. Remove radiator retaining bolts and then remove radiator upward.
6. Install radiator in the reverse sequence of removal. Note the following:

(1) Insert hoses in their positions until they bottom.

(2) Ensure that arrow marks on hoses are clearly visible from upper

direction when hoses are assembled.
(3) Ensure that clearance between radiator hose and any adjacent parts is 30 mm (1.18 in) minimum. On models equipped with air conditions, a minimum clearance of 18 mm (0.71 in) should exist between compressor and hose.
(4) Ensure that clearance between shroud and fan is even at any place.

Note:
Be careful not to damage radiator fins and core tube when installing.

INSPECTION

Radiator cap should be checked for working 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 or will not release at the specified pressure, replace cap.

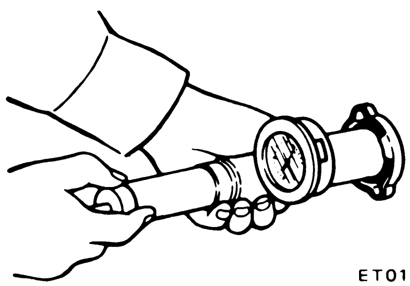

ET012

Fig. CO-9 Testing Radiator Cap

Also, inspect radiator for leakage using cap tester and applying a pressure of 1.6 kg/cm² (23 psi).

If a leakage is detected, repair or replace radiator.

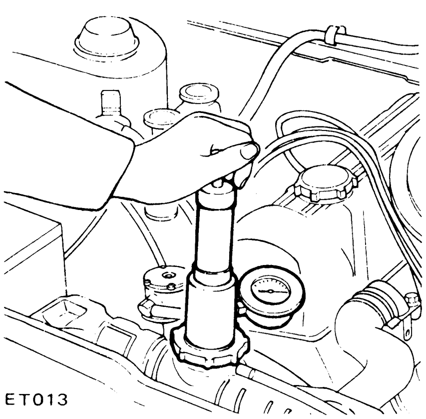
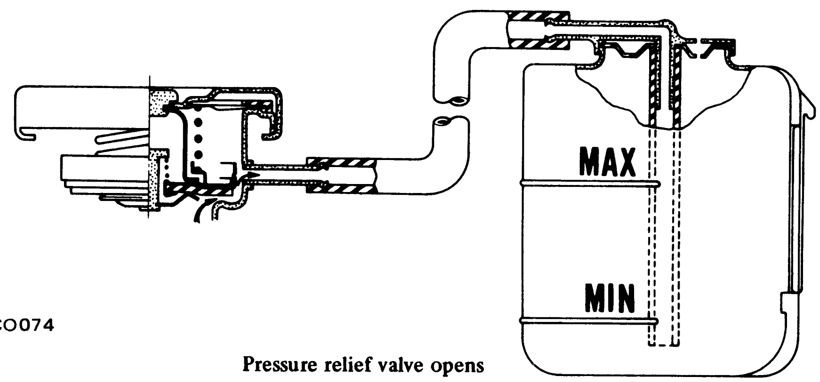

ET013

Fig. CO-10 Testing Cooling System Pressure

RADIATOR RESERVOIR TANK

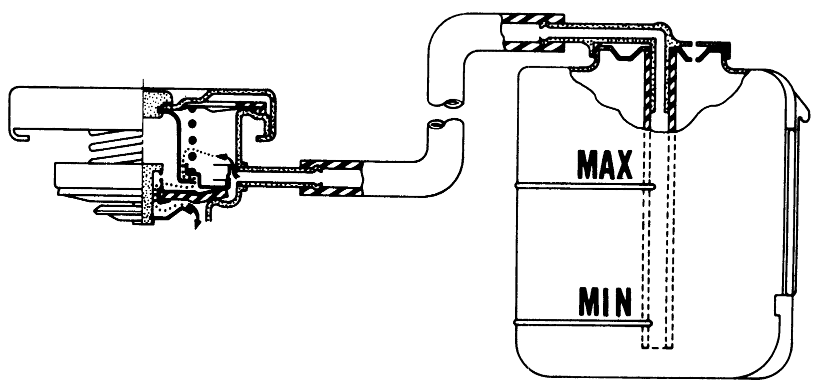
OPERATION

The radiator reservoir tank is mounted to the right hand side core support through the bracket. When the coolant temperature in the radiator rises and pressure builds up to an extent, the pressure relief valve provided in the radiator cap opens to release excess coolant into the reservoir tank. When the coolant temperature lowers and pressure decreases in the radiator, the vacuum valve provided in the radiator cap opens to allow the coolant to re-enter the radiator.



CO074

Pressure relief valve opens



CO075

Vacuum valve opens

Fig. CO-11 Operation of Reservoir Tank

INSPECTION

Check the amount of coolant in the reservoir tank. If the coolant level is below the MIN. level, remove the reservoir tank filler cap and add enough coolant to reach MAX. level.

If the reservoir tank is empty, check the coolant level in the radiator. If the coolant in the radiator is insufficient, pour it into radiator up to the radiator cap and also pour it into the reservoir tank until MAX. level.

If the coolant in the reservoir tank decreases abnormally rapid, check for a leak in the cooling system.

REMOVAL AND INSTALLATION

Reservoir tank is only inserted to reservoir tank bracket and can be easily removed.

To install reservoir tank, reverse the order of removal.

SERVICE DATA AND SPECIFICATIONS

Thermostat

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

Radiator

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

Cooling system

Leakage testing pressure	kg/cm^2 (psi)	1.6 (23)	
Capacity (including engine and reservoir tank)		with heater	without heater
Manual transmission	liters (US qt, Imp qt)	8.9 (9 3/8, 7 7/8)	8.3 (8 3/4, 7 1/4)
Automatic transmission	liters (US qt, Imp qt)	8.7 (9 1/4, 7 5/8)	8.1 (8 5/8, 7 1/8)

Fan

Number of blades x outer diameter		
Without air conditioner	mm (in)	7 x 380 (14.96)
With air conditioner	mm (in)	8 x 380 (14.96)
Fan belt deflection	mm (in)	8 to 12 (0.31 to 0.47)

Tightening torque

Water pump securing bolts	kg-m (ft-lb)	0.4 to 0.5 (2.9 to 3.6)

TROUBLE DIAGNOSES AND CORRECTIONS

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

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EF

ENGINE FUEL

EF

AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER ..... EF- 2
IDLE COMPENSATOR ..... EF- 6
FUEL FILTER ..... EF- 8
MECHANICAL FUEL PUMP ..... EF- 8
ELECTRIC FUEL PUMP EF-10
CARBURETOR EF-13
SERVICE DATA AND SPECIFICATIONS EF-40

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

CONTENTS

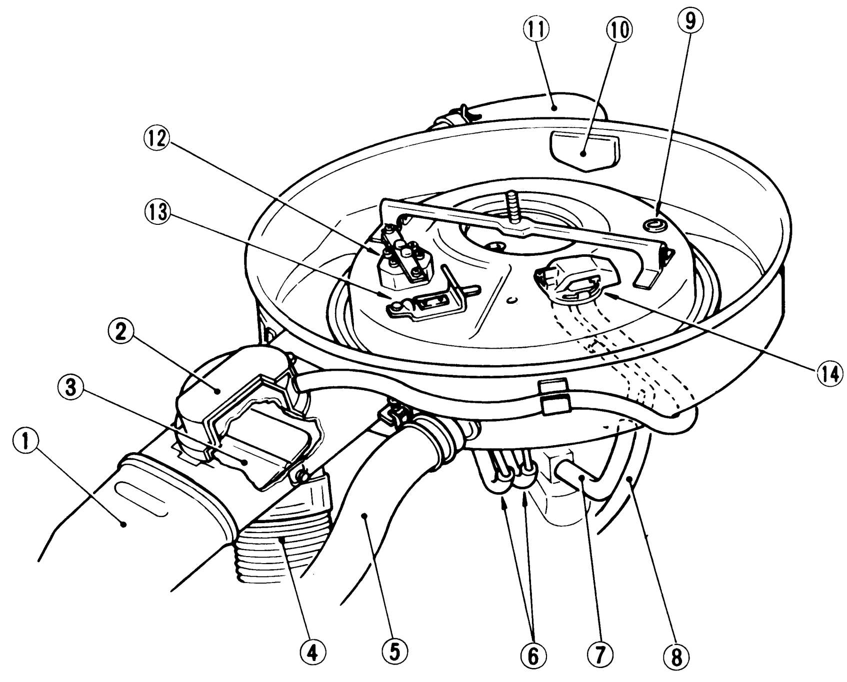
DESCRIPTION EF-2
OPERATION EF-3
HOT AIR OPERATION EF-3
COLD AIR OPERATION EF-4
TEMPERATURE SENSOR EF-4
VACUUM MOTOR AND AIR CONTROL VALVE EF-4
REMOVAL AND INSTALLATION EF-4
AIR CLEANER EF-4
TEMPERATURE SENSOR EF-5
VACUUM MOTOR EF-5
INSPECTION EF-5
AIR CLEANER FILTER EF-5
AUTOMATIC TEMPERATURE CONTROL SYSTEM EF-5
VACUUM MOTOR EF-5
TEMPERATURE SENSOR EF-6

DESCRIPTION

The automatic temperature control system maintains the temperature of air to be sucked in the carburetor within the constant range, thereby enabling lean setting for carburetor calibration. In addition to this, the automatic temperature control system is effective to improve warm-up characteristics of the engine and to remove carburetor icing.

In addition, idle compensator, altitude compensator, vacuum hose for B.C.D.D. and some hoses for A.I.S. system are connected to the air cleaner. As for these devices, refer to Section EC or related parts of this section. See Figs. EF-1 and EF-2.

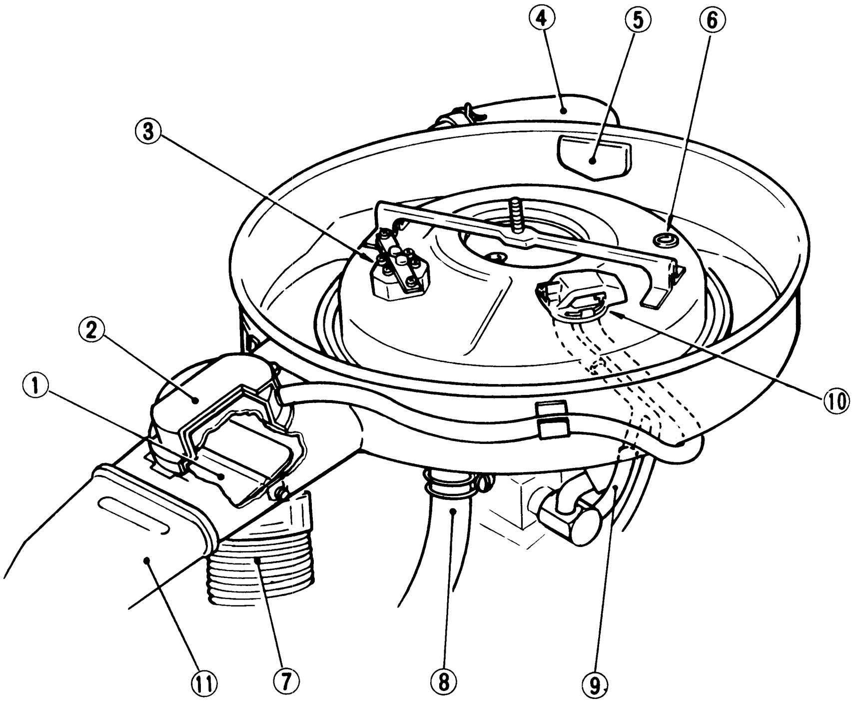
California models



1 Fresh air duct
2 Vacuum motor
3 Air control valve
4 Hot air duct
5 Air hose for A.I.S. (From C.A.C. valve)
6 Air tubes for altitude compensator
7 Vacuum tube from intake manifold
8 Vacuum tube from carbon canister
9 Air inlet for A.B. valve
10 Blow-by gas filter
11 Blow-by hose
12 Idle compensator
13 Altitude compensator
14 Temperature sensor assembly

Fig. EF-1 A.T.C. Air Cleaner (California models)

Non-California models



1 Air control valve
2 Vacuum motor
3 Idle compensator
4 Blow-by hose
5 Blow-by gas filter
6 Air inlet for A.B. valve
7 Hot air duct
8 Air relief valve for air pump
9 Vacuum tube from intake manifold
10 Temperature sensor assembly
11 Fresh air duct (Except Canada)

EF026A

Fig. EF-2 A.T.C. Air Cleaner (Non-California models)

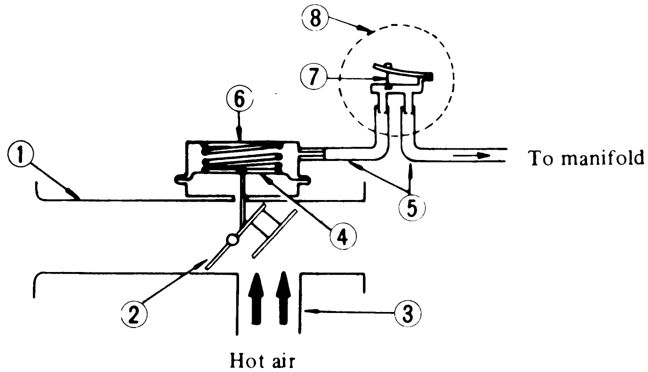
OPERATION

The automatic temperature control system of the air cleaner is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, and the vacuum motor is actuated by the engine intake vacuum.

Engine intake air temperature	Sensor vacuum at vacuum motor side	Air control valve operation	Sensor operation
Below 30°C (86°F)	Below 60 mmHg (2.36 inHg)	Open (cold air)	Closed
	Above 190 mmHg (7.48 inHg)	Closed (hot air)	
30 to 54 °C (86 to 129°F)	———	Partially open (cold air + hot air)	Partially open
Above 55 °C (131°F)	———	Open (cold air)	Open

HOT AIR OPERATION

When the engine intake air temperature is low, the sensor air bleed valve remains in the closed position, and establishes vacuum passage between the intake manifold and vacuum motor. With this condition, the vacuum at the intake manifold side actuates the air control valve attached to the vacuum motor diaphragm to introduce hot air into the air cleaner through the hot air duct on the exhaust manifold. See Fig. EF-3.



1 Air inlet pipe
2 Air control valve
3 Hot air pipe
4 Diaphragm
5 Vacuum hose
6 Diaphragm spring
7 Air bleed valve (closed)
8 Temperature sensor assembly

EC007

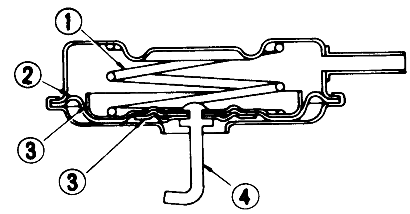
Fig. EF-3 Hot Air Delivery Mode (During cold engine operation)

COLD AIR OPERATION

1. When the vacuum is small, or when the engine is operating under heavy load, the air control valve opens widely, irrespective of the temperature around the sensor, to introduce the cold air for increased power of the engine.
2. When the engine intake air temperature is high:
   The sensor air bleed valve opens fully to break the vacuum passage between the intake manifold and the vacuum motor. Due to the force of the vacuum motor diaphragm spring, the air control valve closes the hot air pipe of the air cleaner, and introduces the cold air. See Fig. EF-4.

VACUUM MOTOR AND AIR CONTROL VALVE

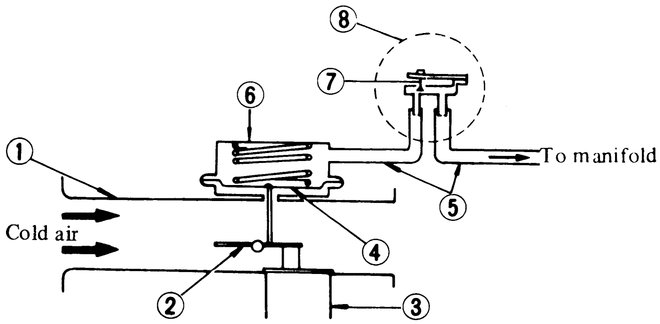
The vacuum signal from the temperature sensor acts upon the vacuum motor diaphragm. The valve shaft attached to the diaphragm is then moved up or down in response to the vacuum on the diaphragm. This movement of the valve shaft actuates the air control valve to control the temperature of the air to be introduced into the air cleaner.



1 Diaphragm spring
2 Diaphragm
3 Retainer
4 Valve shaft

EF207

Fig. EF-6 Vacuum Motor



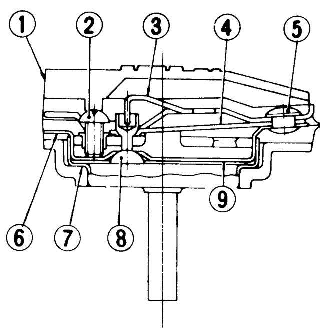
1 Air inlet pipe
2 Air control valve
3 Hot air pipe
4 Diaphragm
5 Vacuum hose
6 Diaphragm spring
7 Air bleed valve (fully open)
8 Temperature sensor assembly

EF715

Fig. EF-4 Cold Air Delivery Mode (During hot engine operation)

TEMPERATURE SENSOR

The temperature sensor is attached to the inside of the air cleaner. The bi-metal built in the sensor detects the engine intake air temperature and opens or closes the vacuum passage in the sensor.



1 Protector cover
2 Screw
3 Adjusting frame
4 Air temperature bi-metal
5 Rivet
6 Valve seat frame
7 Lower frame
8 Air bleed valve
9 Gasket

EF206

Fig. EF-5 Temperature Sensor

REMOVAL AND INSTALLATION

AIR CLEANER

1. Loosen bolts securing air cleaner to air cleaner bracket.
2. Loosen air cleaner lock bolt and remove air cleaner from carburetor. Disconnect the following hoses when dismounting air cleaner.

1) Fresh air duct
2) Hot air duct
3) Vacuum hose (Sensor and idle compensator to intake manifold)
4) Hose (Intake manifold to carbon canister)
5) Hose (C.A.C. valve to air cleaner) . . . California models
6) Hose (Air relief valve to air cleaner) . . . Non-California models
7) Hose (A.B. valve to air cleaner)
8) Blow-by hose (Air cleaner to rocker cover)
9) Hoses (Altitude compensator to carburetor) . . . California models

3. To install, reverse the removal procedure.

TEMPERATURE SENSOR

Removal

1. Using pliers, flatten clip connecting vacuum hose to sensor vacuum tube.

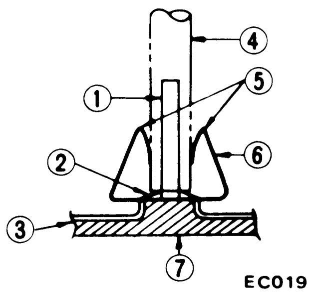


Fig. EF-7 Removal of Sensor

2. Disconnect hose from sensor.
3. Take off clip from sensor vacuum tube, and dismount sensor body from air cleaner.

Note: **The gasket between sensor and air cleaner is bonded to the air cleaner side, and should not be removed.**

Installation

1. Mount sensor on the specified position.
2. Insert clip into vacuum tube of sensor. After installing each vacuum hose, secure hose with the clip.

Note: **Be sure to install vacuum hose correctly. Correct position is: R.H. side to "Nissan" mark at the top face of sensor for intake manifold; L.H. side for vacuum motor.**

VACUUM MOTOR

1. Remove screws securing vacuum motor to air cleaner.
2. Disconnect valve shaft attached to vacuum motor diaphragm from air control valve, and remove vacuum motor assembly from air cleaner.
3. To install, reverse the removal procedures.

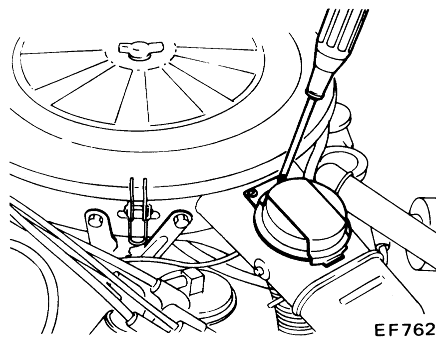


Fig. EF-8 Removing Vacuum Motor

INSPECTION

AIR CLEANER FILTER

Viscous paper type air cleaner filter does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted. For replacement interval of air cleaner filter, refer to "Maintenance Schedule".

AUTOMATIC TEMPERATURE CONTROL SYSTEM

Engine failures resulting from a malfunctioning A.T.C. system are manifest during cold weather operation. Such failures include:

- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena should occur, check A.T.C. system as described in the following before carrying out inspection of carburetor.

1. Check that vacuum hoses are securely connected in correct position.
2. Check each hose for cracks or distortion.
3. Check A.T.C. system for proper function, as follows. Confirm that engine is cold before starting test:

With engine stopped, disconnect fresh air duct if so equipped.

Place a mirror at the end of air cleaner inlet pipe as shown, and check to see if air control valve is in correct position.

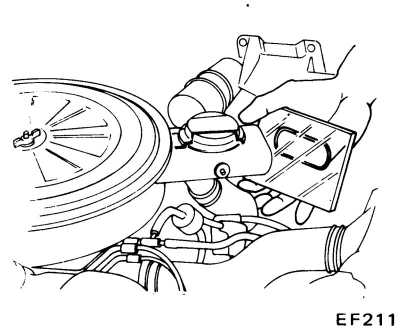


Fig. EF-9 Inspecting Valve Position

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

4. Start engine and keep idling.

Immediately after engine starting, check air control valve for correct position as described above. In this case, correct position of air control valve is the reverse of step 3, underhood air inlet is closed, and hot air inlet is open.

5. Check that air control valve gradually opens to cold air inlet side as engine warms up. When environmental temperature around temperature sensor is low, spend more time for engine warming up operation to facilitate smooth operation of air control valve.

If the above test reveals any problem in the operation of air control valve, carry out the following test:

VACUUM MOTOR

1. With engine stopped, confirm that cold air inlet is open and hot air inlet is closed.

If not, check air control valve linkage for proper operation.

2. Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Vacuum can be applied by breathing in the hose end as shown. Then, confirm that the air control valve moves.
3. With hot air inlet in open position, as described in step 2 above, pinch vacuum hose with fingers and cut off air from vacuum hose. In this condition, check that air control valve maintains the condition described in step 2 for more than 30 seconds, and that hot air inlet is open. If diaphragm spring actuates the air control valve by

its spring force to close within 30 seconds, replace vacuum motor as an assembly since this may be resulted from air leak at vacuum motor diaphragm.

TEMPERATURE SENSOR

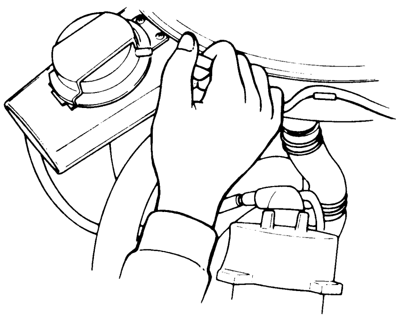
If tests indicate that A.T.C. system is malfunctioning and motor is functioning properly, check temperature sensor for proper operation.

Confirm that engine is cold before starting tests.

1. Start engine and keep idling.

Immediately after starting engine, disconnect vacuum motor inlet vacuum hose and make sure that intake vacuum is present at end of vacuum hose.

If vacuum is weak or is not present at all, check vacuum hoses for leakage. Replace temperature sensor if vacuum hoses are in good order.



EF978

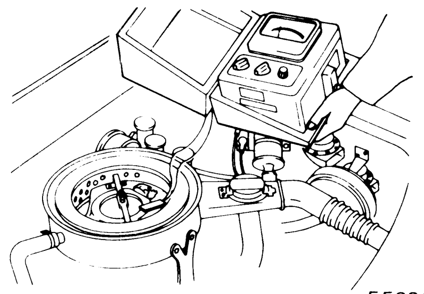
Fig. EF-10 Checking for Presense of Intake Vacuum

2. Reconnect vacuum hose to vacuum motor, and warm up engine.
3. Check that air control valve gradually opens to cold air inlet side as engine warms up. When environmental temperature around temperature sensor is low, spend more time for engine warming up operation to facilitate smooth operation of air control valve.

If air control valve does not open, check air control valve linkage for binding. Replace temperature sensor if air control valve linkage is functioning properly.

If above test results are satisfactory but A.T.C. air cleaner control temperature is questionable, conduct further tests as follows:

4. Remove air cleaner cover. Set temperature sensing element of thermistor or thermometer to a position where temperature around sensor can be measured. In this case, fix wiring of thermistor or thermometer on the bottom surface of air cleaner with adhesive tape in such a manner that the set position of temperature sensing element will not be affected by air flow. Then install air cleaner cover.



EF221

Fig. EF-11 Checking Temperature Sensor

5. Carry out test as described in steps 1, 2 and 3 above. When air control valve begins to open to underhood air inlet side several minutes after engine starting, read the indication of thermistor or thermometer. If reading falls within the working temperature range of temperature sensor, the sensor is normal. If reading exceeds the range, replace the sensor with new one.

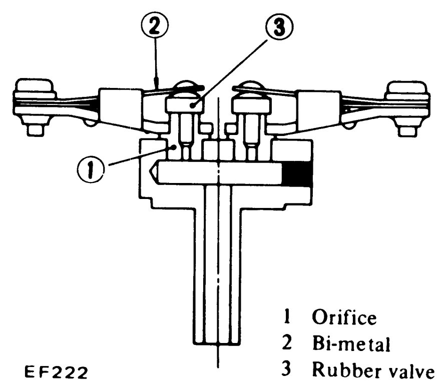
Note: Before replacing temperature sensor, check idle compensator as described in "Idle Compensator".

IDLE COMPENSATOR

DESCRIPTION

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

The bi-metal attached to the idle compensator detects the temperature of intake air, and opens or closes the valve. Two idle compensators having different temperature characteristics are installed; one opens at an intake air temperature of 60 to 70°C (140 to 158°F), and the other at 70 to 90°C (158 to 194°F).



EF222

Fig. EF-12 Structure of Idle Compensator

Bi-metal	Identification number	Intake air temperature	Idle compensator operation
No. 1	9	Below 60°C (140°F)	Fully closed
		60 to 70°C (140 to 158°F)	Close to open
		Above 70°C (158°F)	Fully open
No. 2	10	Below 70°C (158°F)	Fully closed
		70 to 90°C (158 to 194°F)	Close to open
		Above 90°C (194°F)	Fully open

REMOVAL AND INSTALLATION

1. Remove air cleaner cover.
2. Remove hose connecting idle compensator and 4-way connector.
3. Loosen screws securing idle compensator to air cleaner, then remove idle compensator.

Note:
a. **When removing idle compensator, remove gasket and plate.**
b. **When removing screw securing idle compensator to air cleaner, be careful not to miss the screw.**

4. To install, reverse the removal procedure.

Note: **Identification number is stamped on side face of idle compensator.**

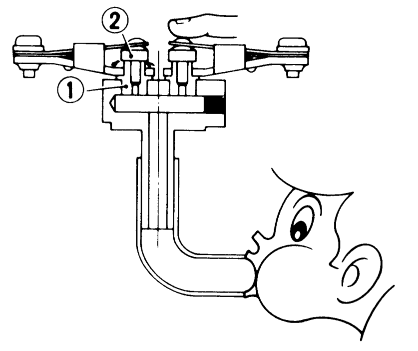


Fig. EF-13 Checking Idle Compensator

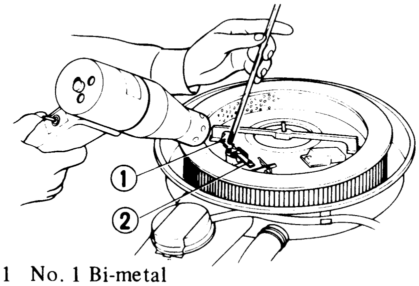
Note: **When checking idle compensator on vehicle, disconnect hose leading to idle compensator, and connect other hose, then carry out check as described above.**

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

And measure operating temperature of idle compensator.

INSPECTION

1. Check that valve is in closed position when bi-metal temperature is lower than operating temperature. To check, breathe air into tube or suck air. If excessive air leakage is found at the valve, replace idle compensator as an assembly. Note that two idle compensators are mounted to air cleaner, and that it is necessary to plug the valve of one of these idle compensators so as to prevent air leak while checking the other one.



1 No. 1 Bi-metal
2 No. 2 Bi-metal

EF979

Fig. EF-14 Checking Idle Compensator for Operation

Note: **Locate stick temperature gauge as close to sensor as possible so that warm air from dryer is directed to these parts evenly.**

5. Idle compensator is in good order if a "hissing" sound is heard when its temperature reaches operating temperature.

If not, replace idle compensator.

Idle compensator opening temperature

No. 1	60 to 70°C (140 to 158°F)
No. 2	70 to 90°C (158 to 194°F)

6. If the result of above inspection is questionable, remove idle compensator from air cleaner, and put it into hot water for inspection of opening temperature.

When bi-metal temperature is above the specified operating temperature, visually check to see if the valve is in open position. If valve is not open, replace idle compensator as an assembly.

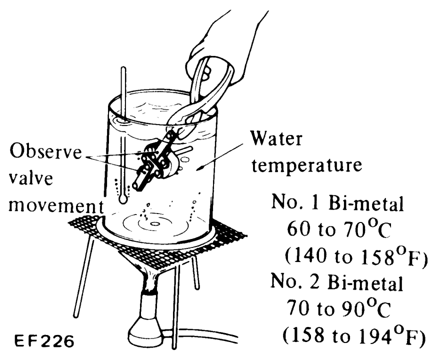


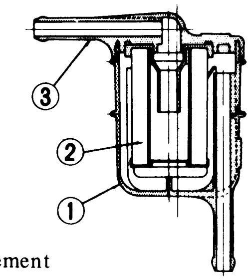
Fig. EF-15 Checking Operating Temperature

7. Others
1) Check hoses for correct installation, distortion, or cracks.
2) Check rubber valve seat of idle compensator for sticking or any other faulty conditions.

FUEL FILTER

DESCRIPTION

The fuel filter is a cartridge type. It uses a paper element which can be checked for condition from the outside.



1 Body
2 Paper element
3 Cover

EF005

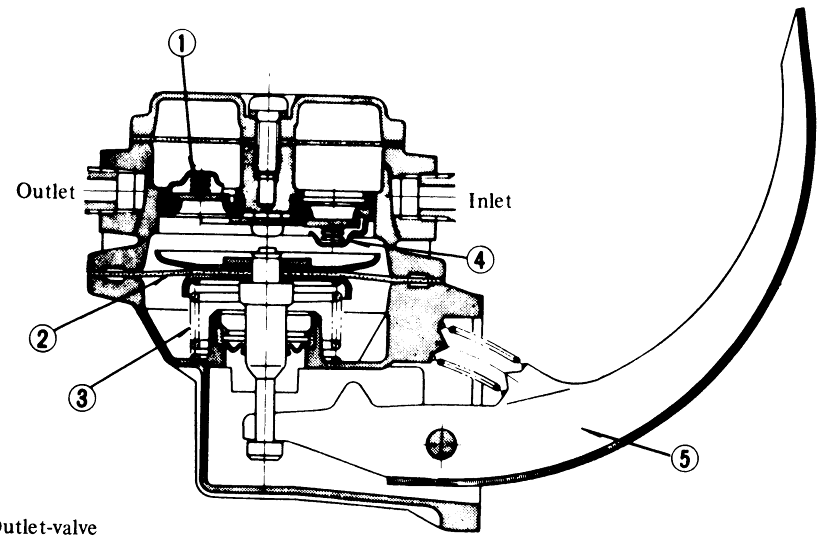
Fig. EF-16 Fuel Filter

REMOVAL

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

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

MECHANICAL FUEL PUMP



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

EF006

Fig. EF-17 Fuel Pump

FUEL PUMP TESTING

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

STATIC PRESSURE TEST

The static pressure test should be made 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 hose between carburetor and T-connector with a clip securely.
4. Run the engine at varying speeds.
5. The pressure gauge indicates static fuel pressure in the line. The gauge reading should be within the specified range.

Fuel pressure:

0.21 to 0.27 kg/cm^2
(3.0 to 3.9 psi)

Note: If the fuel in 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 made only when static pressure is within the specifications. To make 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. Run engine at 1,000 rpm.
3. The pump should deliver specified amount 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.

Pump capacity:
1,000 cc (61.02 cu in)

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 retainer screws and remove two valves.
5. To remove diaphragm, press down its center against spring force. With diaphragm pressed down, rotate it about 90°. Then, release diaphragm to unhook push rod. Be careful during this operation not to damage diaphragm or oil seal.
6. Drive rocker arm pin out with 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 mating portion 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 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 filter and connect a pipe from filter to fuel pump.

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

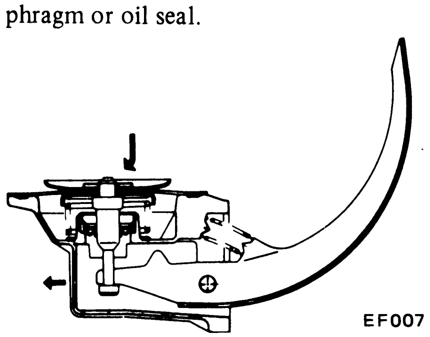
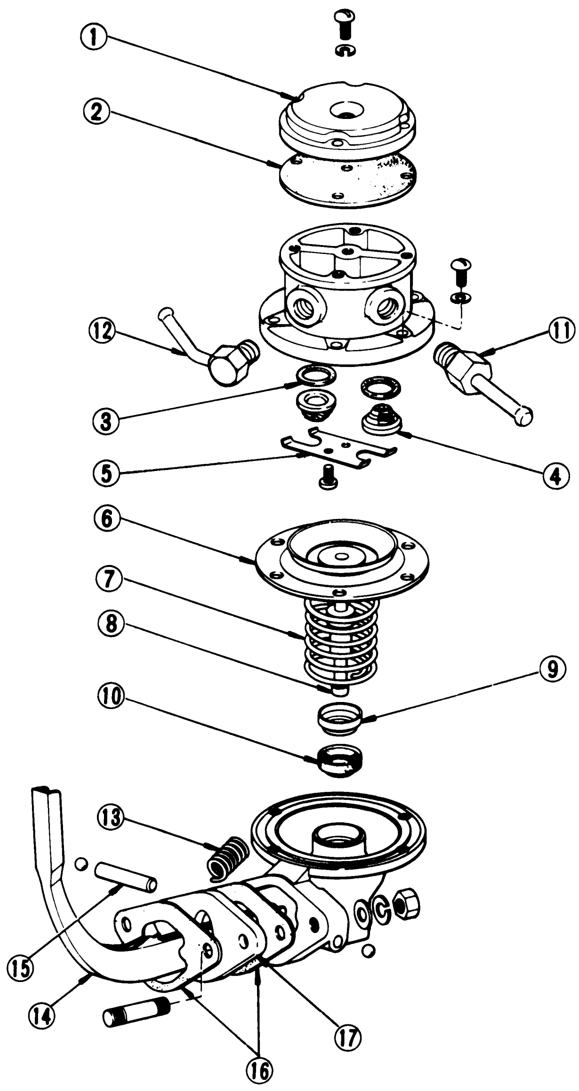


Fig. EF-18 Removing Pull Rod



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

Fig. EF-19 Fuel Pump

ELECTRIC FUEL PUMP

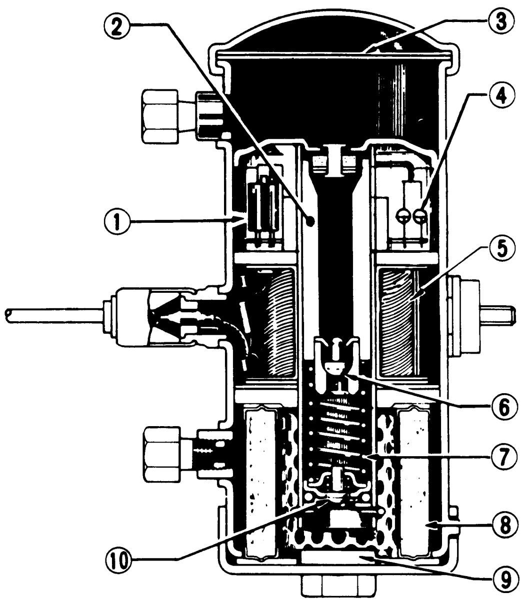
CONTENTS

DESCRIPTION EF-10
INSPECTION EF-10
REMOVAL AND INSTALLATION EF-11
DISASSEMBLY EF-11
ASSEMBLY EF-11
TROUBLE DIAGNOSES AND CORRECTIONS EF-12

DESCRIPTION

The electric fuel pump is adopted on air conditioner equipped models.

The silicon transistor type fuel pump consists of a transistor, diodes, a solenoid, a pump mechanism and filter parts.



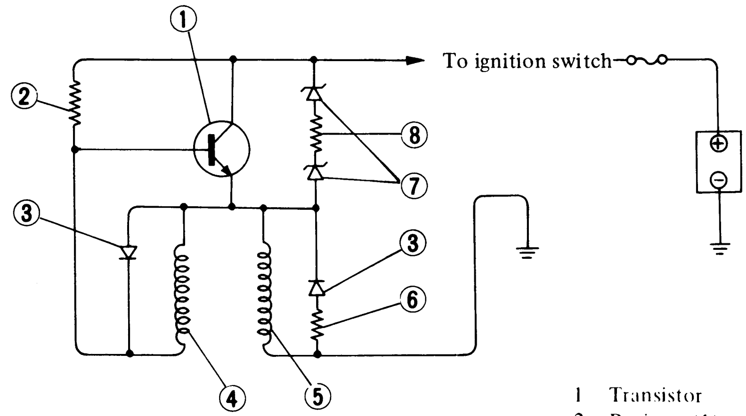


Fig. EF-20 Construction of Electric Fuel Pump

INSPECTION

1. Disconnect fuel hose at pump outlet.
2. Connect a suitable hose [approximately 6 mm (0.24 in) inner diameter] to pump outlet.

Note: If diameter is too small, the following proper delivery capacity cannot be obtained even if pump functions properly.

3. With hose outlet in a higher position than pump, operate pump and check delivery capacity for more than 15 seconds.
4. The capacity should be 1,400 cc (85.4 cu in) in one minute or less.

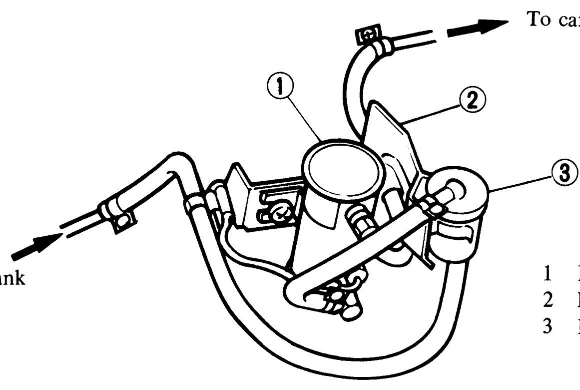
If no gasoline, or only a little flows from open end of pipe with pump operated, or if pump does not work, perform the following diagnosis.

Note:

a. **Do not connect battery in reverse polarity which, if left for a long time, would damage transitor circuit and disable pump.**
b. **Do not let fall pump, as it may damage electronic components.**
c. **Do not apply overvoltage (max. 18V). Overvoltage starting by quick charge or overvoltage running would deteriorate or damage electronic components.**

Fuel pressure (maximum): 0.32 kg/cm² (4.6 psi)

REMOVAL AND INSTALLATION



1 Electric fuel pump
2 Mounting bracket
3 Fuel filter

EF720

Fig. EF-21 Electric Fuel Pump

Electric fuel pump is installed on bracket with two bolts. This bracket is located on R.H. side member adjacent to fuel tank.

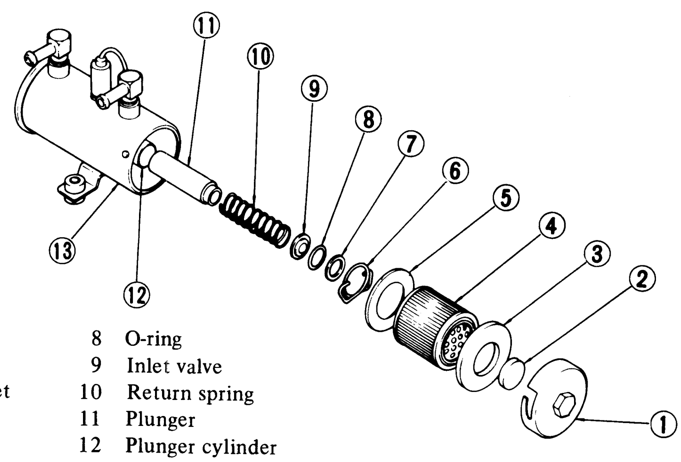
1. Remove inlet hose from fuel pump. Also remove outlet hose running to engine. Receive fuel remaining in fuel hose in a suitable container.
2. Disconnect harness at connector.
3. Remove bolts securing fuel pump to bracket, and detach fuel pump.
4. Installation is the reverse order of removal.

DISASSEMBLY

Do not disassemble unless pump is faulty.

1. Remove cover with wrench and take out cover gasket, magnet, and filter from pump body.
2. When removing plunger, take out spring retainer from plunger tube.
3. Then, take out washer, O-ring, inlet valve, return spring and plunger from tube.

Note: Do not disassemble electronic components. If necessary, replace with new ones.



1	Cover	8	O-ring
2	Magnet	9	Inlet valve
3	Cover gasket	10	Return spring
4	Filter	11	Plunger
5	Gasket	12	Plunger cylinder
6	Spring retainer	13	Body
7	Washer		

EF721

Fig. EF-22 Electric Fuel Pump

ASSEMBLY

1. Before assembly, clean all parts with gasoline and compressed air completely.

Note:

a. **If gasket and filter are faulty, replace.**
b. **Clean magnet and cover for fault.**
c. **Take care not to deform thin tube.**
d. **Assemble plunger, return spring, inlet valve, O-ring, washer and set spring retainer in that order.**
e. **Assemble filter, gasket and cover with magnet.**
f. **Tighten cover with wrench to the stopper.**

If component parts are dirty after disassembly, clean as follows:

- Wash filter and strainer with clean gasoline and blow with compressed air. When cleaning parts, check filter for fault. If faulty, replace.
- Wash plunger, plunger cylinder and inlet valve with clean gasoline, and blow dust off with compressed air.

2. Check component parts for wear or damage.

If they are found faulty, replace them.

3. Insert plunger assembly into plunger cylinder of body and apply electric current to it.

Move the assembly up and down.

If the assembly does not move, it shows that the electric unit is faulty, and it must be replaced.

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Fuel pump fails to operate.	Terminals or connections loose. Rust on terminals or grounding metal. Frozen liquid in plunger or pump.	Retighten. Clean. Clean plunger assembly. Replace pump if plunger is stuck or seized.
Fuel pump fails to discharge sufficient flow.	Clogged filter. Insufficient fuel.	Clean pump interior. Clean and, if necessary, replace filter. Replenish.
Insufficient fuel discharge during high speed travelling.	Air in fuel hose through connections.	Apply a coating of end sealing compound to connections, and retighten.
Low float level at idling.	Hose necked down or bent. Fuel tank breather tube bent or necked down. Weakened return spring.	Check and correct. Check and correct. Replace.
Fuel pump is actuated more frequently than under normal condition.	Air sucked through connection (fuel hose and fuel pump joint). Fuel hose (on suction side) bent. Clogged filter.	Apply a coating of end sealing compound to connection, and retighten. Check and correct. Clean or replace filter.
Rattling noise	Mounting bolts loose.	Retighten.

CARBURETOR

CONTENTS

DESCRIPTION EF-13
STRUCTURE AND OPERATION EF-13
PRIMARY SYSTEM EF-15
SECONDARY SYSTEM EF-16
FLOAT SYSTEM EF-17
ANTI-DIESELING SYSTEM (Non-California models) EF-17
BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.) (Non-California models) EF-18
FUEL SHUT-OFF SYSTEM (California models) EF-19
ELECTRIC AUTOMATIC CHOKE EF-21
DASH POT SYSTEM EF-21
ALTITUDE COMPENSATOR (California models) EF-22
ADJUSTMENT AND INSPECTION EF-22
CARBURETOR IDLE-RPM AND MIXTURE RATIO EF-22
FUEL LEVEL EF-24
AUTOMATIC CHOKE MECHANISM EF-24
AUTOMATIC CHOKE HEATER CIRCUIT EF-24
AUTOMATIC CHOKE HEATER EF-25
AUTOMATIC CHOKE RELAY EF-25
FAST IDLE EF-25
VACUUM BREAK EF-26
CHOKE UNLOADER EF-26
INTERLOCK OPENING OF PRIMARY AND SECONDARY THROTTLE VALVE EF-26
DASH POT EF-26
ACCELERATING PUMP EF-27
ANTI-DIESELING SOLENOID VALVE EF-27
B.C.D.D. OPERATING PRESSURE EF-27
B.C.D.D. MIXTURE EF-28
FUEL SHUT-OFF SYSTEM (California models) EF-29
ALTITUDE COMPENSATOR (California models) EF-32
MAJOR SERVICE OPERATION EF-32
REMOVAL AND INSTALLATION EF-33
DISASSEMBLY AND ASSEMBLY EF-33
TROUBLE DIAGNOSES AND CORRECTIONS EF-38

DESCRIPTION

The carburetors are of down-draft two-barrel types which produce the optimum air-fuel mixture under all operating conditions.

They present several distinct features of importance to the vehicle owners.

A summary of the features is as follows:

1. A slow economizer to make a smooth connection with acceleration or deceleration during light load running.
   It also assures stable low speed performance.
2. An idle limiter to reduce harmful exhaust emissions to a minimum.
3. A B.C.D.D. device for reducing hydrocarbon (HC) emissions.
4. An electric automatic choke to facilitate cold starting and to reduce exhaust emissions.
5. An anti-dieseling solenoid to eliminate dieseling (run-on).
   On California models, the solenoid valve also serves as an actuator of the fuel shut-off system, thereby reducing fuel consumption.
6. A power valve, or vacuum actuated booster, to ensure smooth high-speed operation.
7. The carburetor comes equipped with dash pot, which ensures smooth deceleration, without engine stall under all operating conditions.
8. The hand operated altitude compensator is installed in the California models.

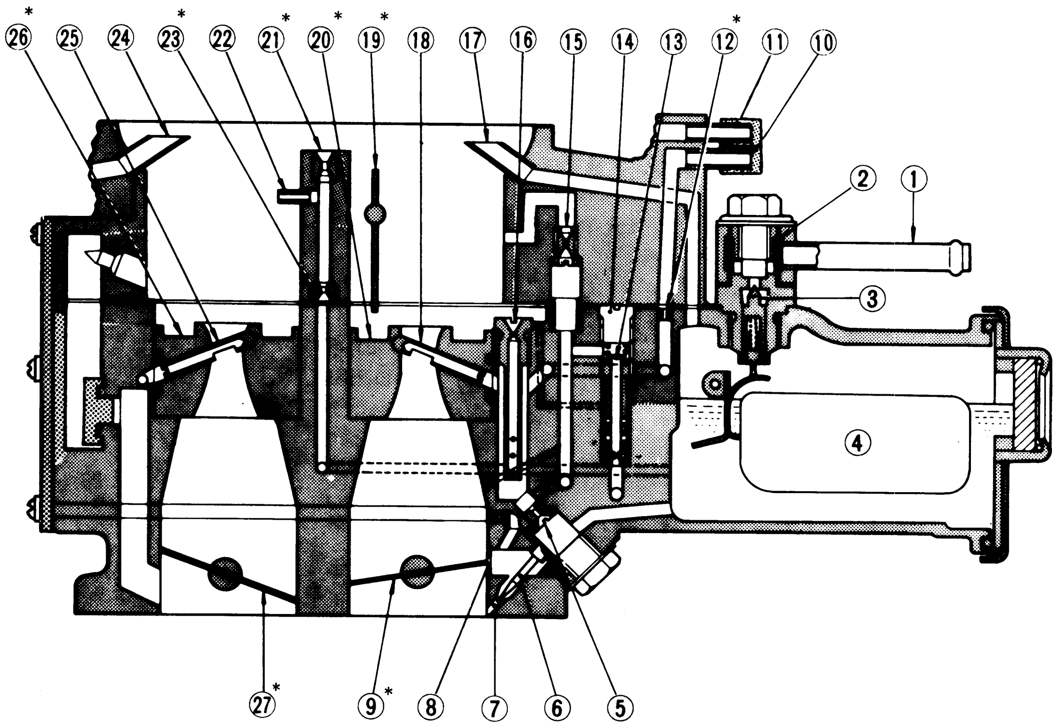
Model	Transmission	Model
California models	M/T	DCH340-95
	A/T	DCH340-96
Non-California models	M/T	DCH340-97
	A/T	DCH340-98

STRUCTURE AND OPERATION

These carburetors consist of a main system for normal running, a slow system for idling, and an accelerating and power mechanism.

Some emission control devices are added.

California models



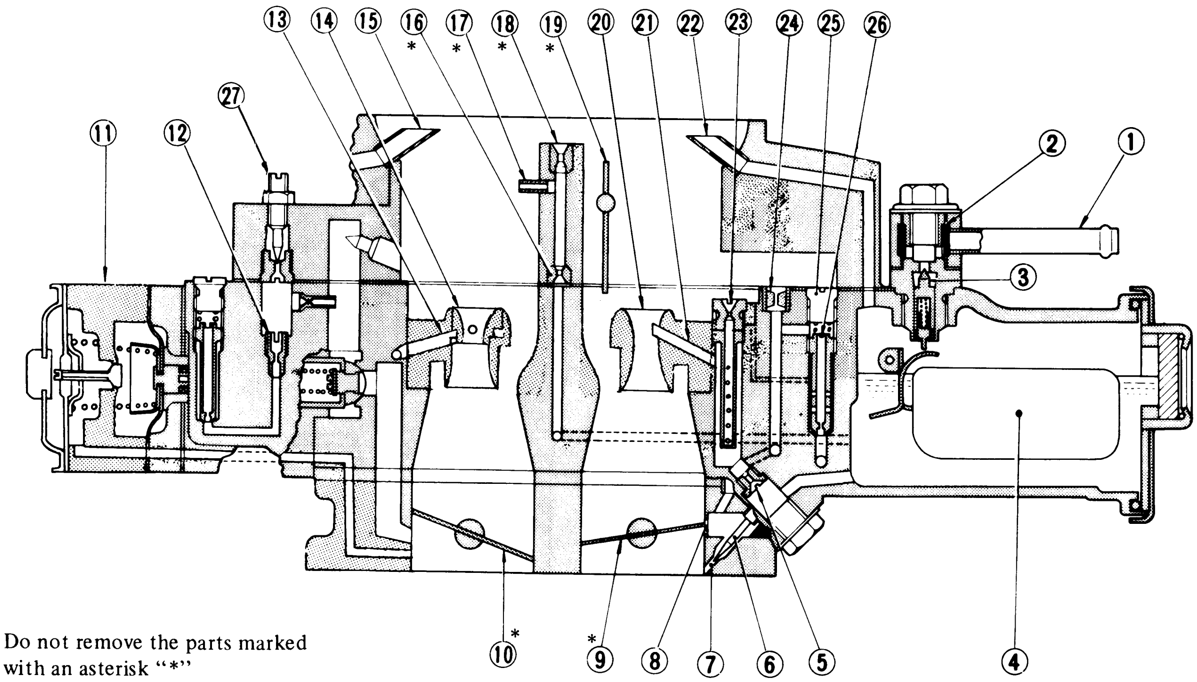
1 Fuel nipple
2 Fuel filter
3 Needle
4 Float
5 Primary main jet
6 Idle adjusting screw
7 Idle hole
8 Primary by-pass hole
9* Primary throttle valve
10 Primary altitude compensator pipe
11 Secondary altitude compensator pipe
12* Altitude compensator orifice
13 Primary slow jet
14 Plug
15 Primary slow air bleed
16 Primary main air bleed
17 Primary air vent pipe
18 Primary main nozzle
19* Choke valve
20* Primary small venturi
21* High speed enricher air bleed
22* High speed enricher nozzle
23* High speed enricher jet
24 Secondary air vent pipe
25 Secondary main nozzle
26* Secondary small venturi
27* Secondary throttle valve

Note: Do not remove the parts marked with an asterisk "*."

EF027A

Fig. EF-23 Carburetor (California models)

Non-California models



Note: Do not remove the parts marked with an asterisk "*"

1 Fuel nipple
2 Fuel filter
3 Needle
4 Float
5 Primary main jet
6 Idle adjusting screw
7 Idle hole
8 Primary by-pass hole
9* Primary throttle valve
10* Secondary throttle valve
11 B.C.D.D.
12 Coasting jet (for B.C.D.D.)
13 Secondary main nozzle
14 Secondary small venturi
15 Secondary air vent pipe
16* High speed enricher jet
17* High speed enricher nozzle
18* High speed enricher air bleed
19* Choke valve
20 Primary small venturi
21 Primary main nozzle
22 Air vent pipe
23 Primary main air bleed
24 Primary slow air bleed
25 Plug
26 Primary slow jet
27 B.C.D.D. mixture adjusting screw

EF983

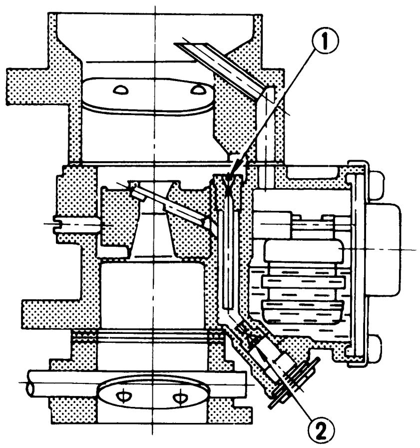
Fig. EF-24 Carburetor (Non-California models)

PRIMARY SYSTEM

Primary main system

Fuel flows as shown below 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.

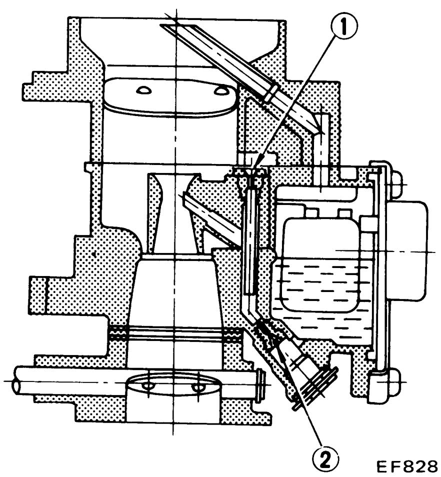
California models



1 Main air bleed
2 Main jet

EF890

Non-California models



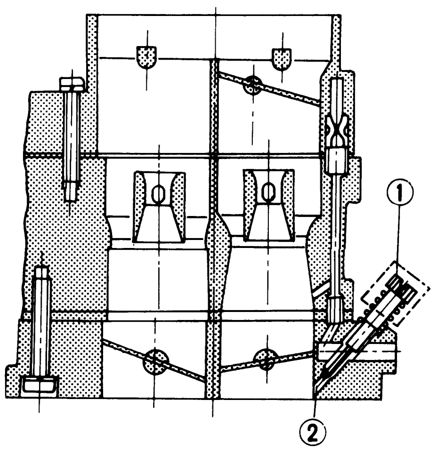
EF828

Fig. EF-25 Primary Main System

Idling and slow system

During low engine speed, as shown below, fuel flows through the slow jet located on rear right side of main nozzle, mixing with air coming from the slow economizer bleed, again mixing with air coming from the slow air bleed and then is pulled out into the engine through the idle hole and by-pass hole.

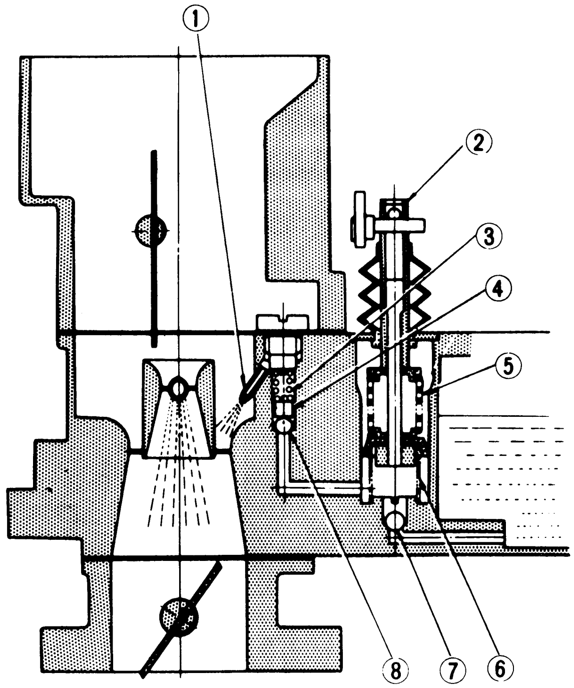
Slow economizer system obtains smooth deceleration at high speeds.



1 Idle adjusting screw
2 Idle hole

EF769

Fig. EF-26 Slow System



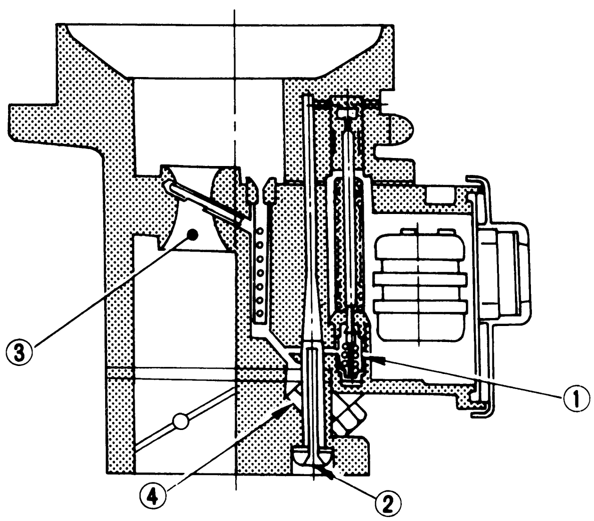
1 Pump injector
2 Piston
3 Spring
4 Weight
5 Damper spring
6 Piston return spring
7 Inlet valve
8 Outlet valve

ET023

Fig. EF-27 Accelerating Mechanism

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 Fig. EF-27.



1 Power valve
2 Vacuum take out port
3 Primary main nozzle
4 Main jet

Fig. EF-28 Power Valve Mechanism

Power valve mechanism

The power valve mechanism supplies additional fuel to primary main system during heavy load driving.

When the throttle valve is slightly opened during light load running, 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. See Fig. EF-28.

SECONDARY SYSTEM

Secondary main system

When the primary throttle valve is wide open and engine produces high power, the secondary throttle valve begins to open by the diaphragm.

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

The structure is almost the same as the primary main system.

Secondary switchover mechanism

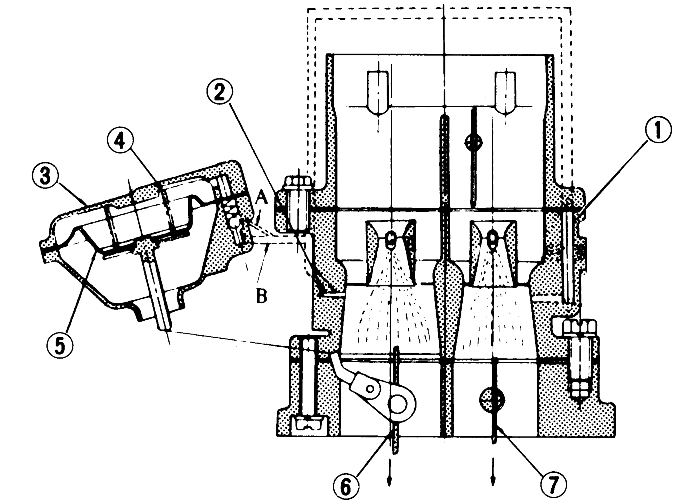
The secondary throttle valve is linked to the diaphragm which is actuated by the vacuum created in the venturi. A vacuum port is provided at each of the primary and secondary venturis, and the composite vacuum of these ports actuates the diaphragm.

As the linkage causes the secondary throttle valve to close until the primary throttle valve opening reaches approximately 50°, fuel consumption during normal operation is not excessive.

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

The other side, during low speed running (as the primary throttle valve opening does not reach 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. See Fig. EF-29.



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

EF512

Fig. EF-29 Full Throttle at High Speed

Secondary slow system (Step system)

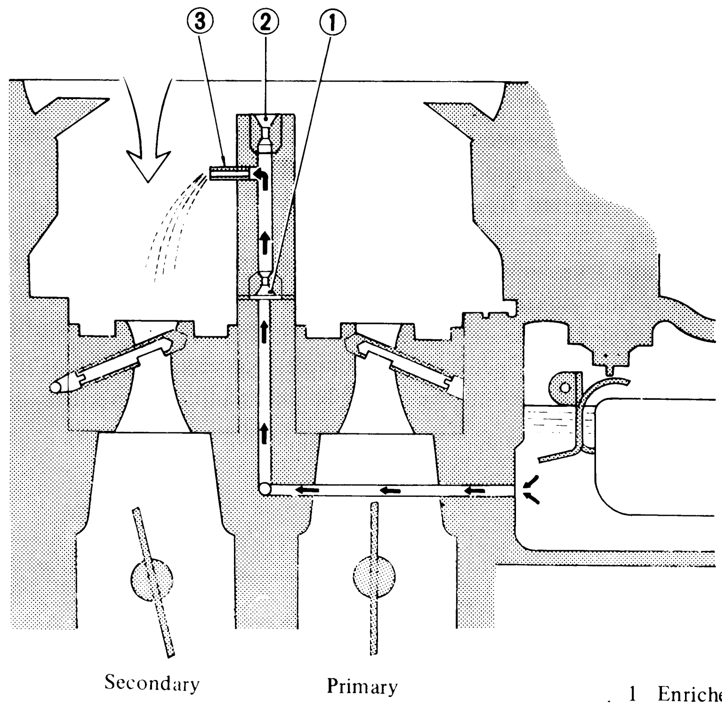
The construction of this system may correspond to the idling and slow system of the primary system.

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

Hight speed enricher

The high speed enricher improves high engine output performance during high speed driving.

This enricher operates only when driving at high speed. It consists of an enricher jet, high speed enricher air bleed, and enricher nozzle. When the velocity of suction air flowing through the carburetor secondary bore increases, additional fuel is drawn out of the enricher nozzle. See Fig. EF-30.



EF234

1 Enricher jet
2 Enricher air bleed
3 Enricher nozzle

Fig. EF-30 High Speed Enricher

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.

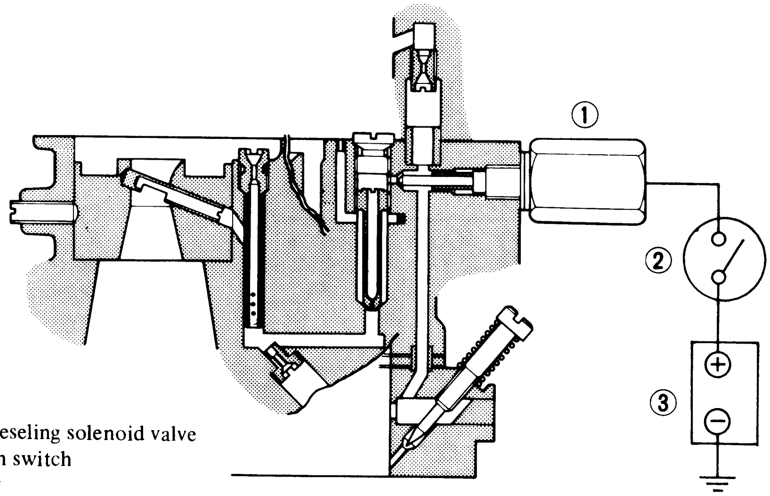
Because of the inner air vent type of the float chamber ventilation, the fuel consumption will not be influenced by some dirt accumulated in the air cleaner.

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

ANTI-DIESELING SYSTEM

The carburetor is equipped with an anti-dieseling solenoid valve. As the ignition switch is turned off, the valve is brought into operation, shutting off the supply of fuel to the slow circuit.

The following figure shows a sectional view of this control. See Fig. EF-31.



1 Anti-dieseling solenoid valve
2 Ignition switch
3 Battery

EF836

Fig. EF-31 Anti-Dieseling System

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

(Non-California models)

A Boost Controlled Deceleration Device (B.C.D.D.) serves to reduce the hydrocarbons (HC) emitted from engine during coasting.

The high manifold vacuum during coasting prevents the mixture from complete combustion because of the reduced amount of mixture per cylinder per rotation of engine, with the result that a large amount of hydrocarbons is emitted into the atmosphere.

The B.C.D.D. has been designed to correct this problem.

It operates as follows: when the manifold vacuum exceeds a predetermined value, the B.C.D.D. introduces an additional mixture of optimum mixture ratio and quantity into the manifold by opening a separate mixture passage in the carburetor. Complete combustion of fuel is assisted by this additional mixture, and the amount of HC contained in exhaust gases is substantially reduced.

The B.C.D.D. is installed on the side face of the carburetor body.

B.C.D.D. operation

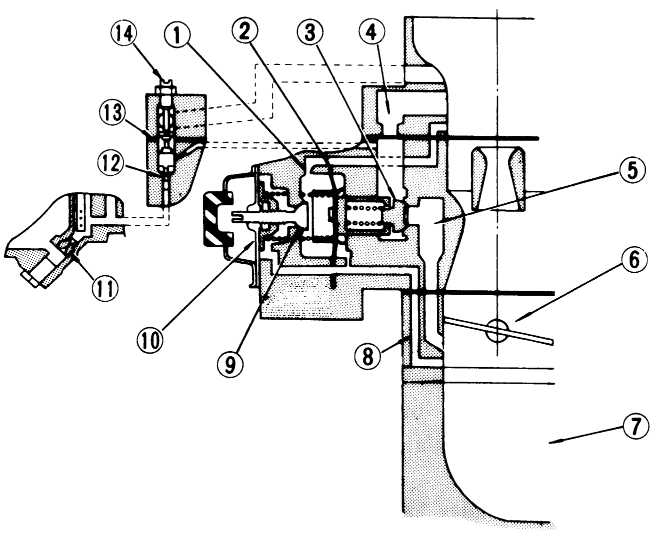
Diaphragm I ⑩ monitors the manifold vacuum and, when the vacuum exceeds a pre-determined value, acts so as to open the vacuum control valve ⑨. This causes the manifold vacuum to be introduced into the second vacuum chamber and actuates diaphragm II②.

When diaphragm II operates, the mixture control valve ③ opens the passage and introduces the additional mixture into the manifold.

The amount of the mixture is controlled by the servo-action of the mixture control valve ③ and vacuum control valve ⑨ so that the manifold vacuum may be kept at the predetermined value.

The amount of mixture depends mainly upon the coasting air bleed II④, while the mixture ratio is determined by the coasting jet ⑫ and coasting air bleed I ⑬. See the following Figure.

Non-California models



1 Air jet
2 Diaphragm II
3 Mixture control valve
4 Coasting air bleed II
5 Mixture air passage
6 Secondary barrel
7 Intake manifold
8 Vacuum passage
9 Vacuum control valve
10 Diaphragm I
11 Secondary main jet
12 Coasting jet
13 Coasting air bleed I
14 B.C.D.D. mixture adjusting screw

EF039A

Fig. EF-32 B.C.D.D. (Non-California models)

FUEL SHUT-OFF SYSTEM (California models)

The fuel shut-off system is to shut off the fuel during deceleration, thereby reducing fuel consumption. This system also helps prevent a temperature rise in the catalytic converter during long periods of deceleration.

The major parts of the system are an anti-dieseling solenoid, a neutral detecting switch, a clutch pedal switch and a vacuum switch. A schematic drawing is given in Fig. EF-33.

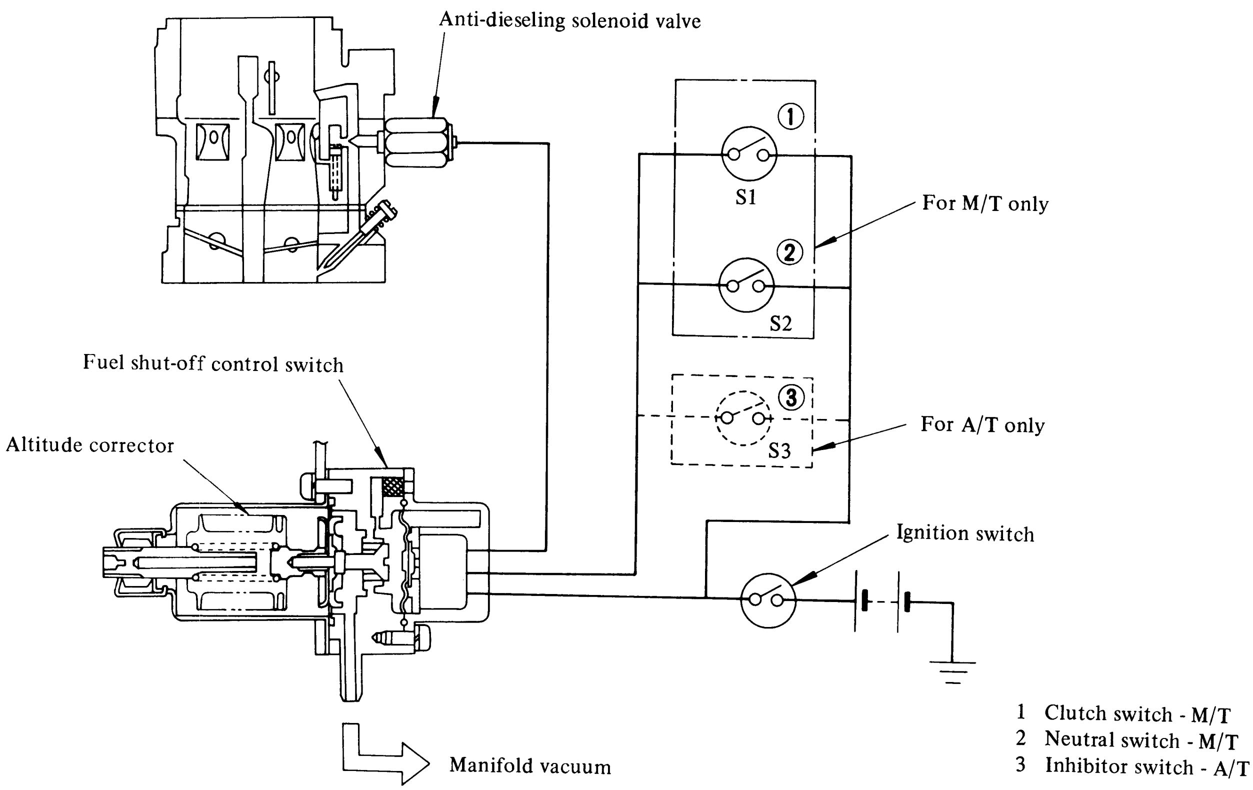


Fig. EF-33 Schematic Drawing of Anti-Dieseling Solenoid Valve

Fuel shut-off system operation

During deceleration when the manifold vacuum increases to the high level above a predetermined value, the fuel shut-off vacuum switch which monitors the manifold vacuum sends a signal to the anti-dieseling solenoid valve so as to shut off fuel. When the manifold vacuum goes down below the predetermined value, the fuel shut-off system is released.

The fuel shut-off system is further controlled by the clutch switch and gear position switches such as the neutral switch and the inhibitor switch so that fuel may not be shut off even if the manifold vacuum is high enough to operate the fuel shut-off system.

The functions of each part of this system are as follows:

1. Neutral detecting switch

The neutral detecting switch turns on in neutral, and turns off in other shift lever positions.

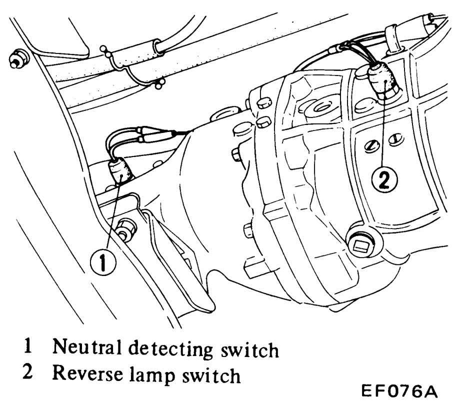


Fig. EF-34 Location of Neutral Detecting Switch

2. Clutch pedal switch

This switch is located on the clutch pedal bracket. It turns on when the clutch pedal is depressed (OFF) and turns off when the pedal is released (ON).

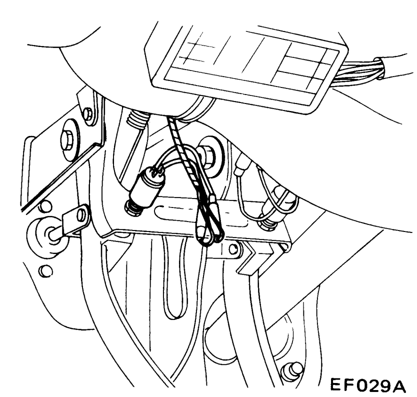
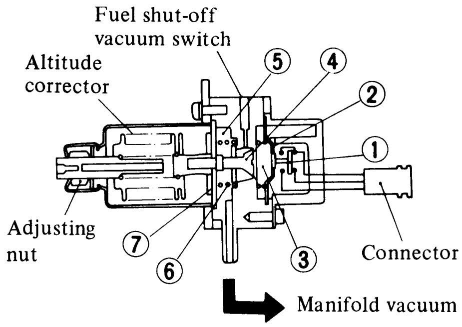


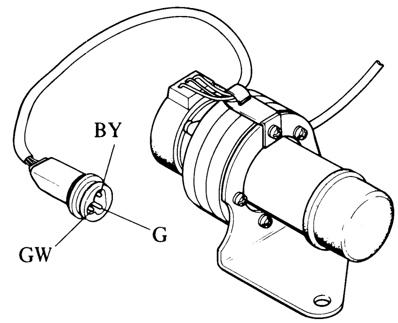
Fig. EF-35 Location of Clutch Pedal Switch

3. Vacuum switch with control valve

This switch is a combined unit of two diaphragms, a microswitch and an altitude compensation bellows. When manifold vacuum pressure rises above the specified preset value, it overcomes tension of the spring ⑥ and actuates the diaphragm II ⑦. This, in turn, actuates the control valve ④, and transmits vacuum pressure to the vacuum chamber ③. As vacuum pressure reaches the chamber, the diaphragm I ② activates to operate the microswitch ①, thereby operating the anti-dieseling valve.



EF030A



EF077A

Fig. EF-36 Fuel Shut-Off Vacuum Switch and Connector

Note: Three lead wires are connected to the microswitch. Current flows through these lead wires as shown in the chart, according to operation of the vacuum switch.

Operating pressure \ Wire color	G/W – B/Y	G/W – G
Above operating pressure	ON	OFF
Below operating pressure	OFF	ON

G/W: Green with white stripe
B/Y: Black with yellow stripe

FUEL SHUT-OFF SYSTEM

Manual transmission

Intake vacuum	Neutral switch	Clutch pedal switch	Anti-dieseling solenoid	Fuel shut-off system
High	"N" (ON)	Disengage (ON)	ON	Inactivated
		Engage (OFF)		
	Except "N" (OFF)	Disengage (ON)		
		Engage (OFF)	OFF	Activated
Low	———	———	ON	Inactivated

Automatic transmission

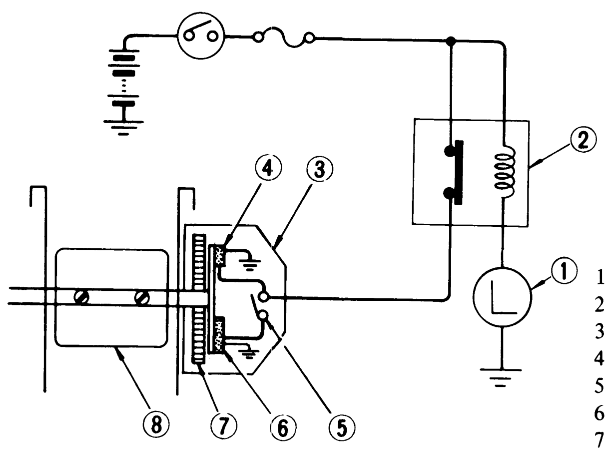
Intake vacuum	Inhibitor switch	Anti-dieseling solenoid	Fuel shut-off system
High	"N", "P" (ON)	ON	Inactivated
	Except "N", "P" (OFF)	OFF	Activated
Low	———	ON	Inactivated

( ): Continuity of switch

ELECTRIC AUTOMATIC CHOKE

An electric heater warms a bi-metal interconnected to the choke valve, and controls the position of the choke valve and throttle valve in accordance with the time elapsed, the warm-up condition of the engine, and the outside ambient temperature.

The construction and function of each part of this carburetor are as follows (See Fig. EF-37):



1 Alternator "L" terminal
2 Automatic-choke relay
3 Automatic-choke cover
4 P.T.C. heater (A)
5 Bi-metal switch
6 P.T.C. heater (B)
7 Bi-metal
8 Choke valve

Fig. EF-37 Schematic Drawing of Electric Automatic Choke Heater

1. Electric heater.

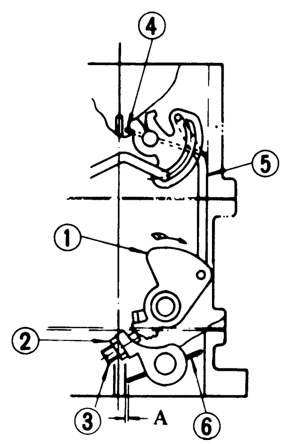
The double stage heating system is provided to obtain an optimum heating capacity. This system consists of a first and second stage heater. The first stage heater (A) always operates to heat the bi-metal during the time when electric current flows through the auto-choke circuit, and in addition to the first stage operation, the second stage heater (B) begins to operate when the bi-metal temperature reaches to the level of about 10°C (50°F) so that the choke valve opens more early. This operation of the second stage heater is controlled by a thermo switch attached to the bi-metal.

2. Bi-metal

Electric current flows through the heater as the engine starts, and warms the bi-metal. The deflection of the bi-metal is transmitted to the choke valve through the choke valve lever.

3. Fast idle cam

The fast idle cam determines the opening of the throttle valve so that the proper amount of mixture corresponding to the opening of the choke valve will be obtained. The opening of the choke valve is dependent upon the warm-up condition of the engine.



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

Fig. EF-38 Fast Idle System

4. Choke unloader

When accelerating the engine during the warm-up period, that is, before the choke valve opens sufficiently, this unloader forces the choke valve open a little so as to obtain an adequate air-fuel mixture.

5. Vacuum break diaphragm

After the engine has been started by cranking, this diaphragm forces the choke valve open to the predetermined extent so as to provide the proper air-fuel ratio.

6. Bi-metal case index mark

The bi-metal case index mark is used for setting the moment of the bi-metal which controls the air-fuel mixture ratio required for starting.

DASH POT SYSTEM

These carburetors are equipped with a dash pot interlocked with the primary throttle valve through a link mechanism.

The dash pot prevents the throttle valve from closing abruptly, thereby reducing HC emissions during deceleration or gear shifting.

In automatic transmission models, it also prevents engine stall resulting from quick application of the brake or from quick release of the accelerator pedal after it has been tread upon slightly.

On models equipped with an air conditioning system, the dash pot is a combination type which also serves as an F.I.C.D. actuator. See Fig. EF-39.

When the accelerator pedal is released during deceleration, the throttle valve lever taps on the dash pot stem.

With the air conditioning system in "OFF", diaphragm "I" gradually actuates as air leaks. This in turn causes the dash pot stem to retract, returning the engine to idling speed.

With the air conditioning system in "ON", vacuum is introduced, moving diaphragm "II" to the left. Engine speed gradually decreases as air leaks, and is held at a certain rpm (F.I.C.D. set revolution).

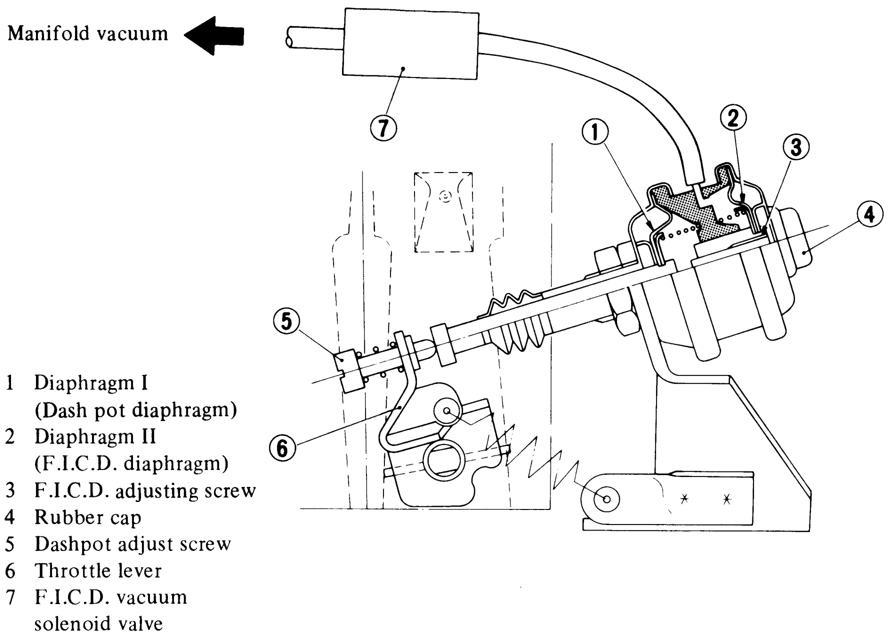


Fig. EF-39 Dash Pot (for air conditioner equipped models)

ALTITUDE COMPENSATOR (California models)

The higher the altitude, the richer the air-fuel mixture ratio and therefore, the higher exhaust gas emissions, even though the engine is properly adjusted for low altitude driving.

The altitude compensator is designed to meet Emission Standards for driving in both low and high altitudes. At high altitudes, additional air is supplied to the carburetor by the altitude compensator. When the altitude compensator lever is set at "H", air is conducted through an air passage to the carburetor. The air passage is closed when the lever is set at "L". See Fig. EF-40.

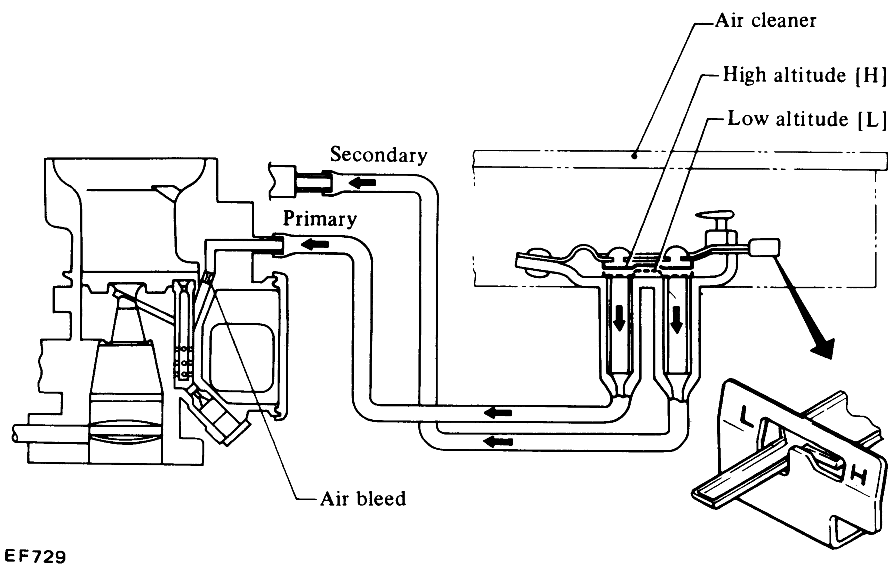


Fig. EF-40 Altitude Compensator

H-L lever

When operating the H-L lever, follow these instructions:

"H" position:

Should be used for general driving in those areas designated by law as High Altitude Counties.

"L" position:

For use outside those areas designated as High Altitude Counties.

Note:

a. **The idle rpm and CO% vary according to the altitude. Therefore, they should be properly adjusted when the position of the H-L lever is changed.**
b. **Counties 1,219 m (4,000 ft) or more above sea level have been designated by law as High Altitude Counties.**

INSPECTION AND ADJUSTMENT

CARBURETOR IDLE-RPM AND MIXTURE RATIO

WARNING:

a. **On automatic transmission models, checks should be performed with the lever shifted to the "D" position. Be sure to engage parking brake and to lock both front and rear wheels with wheel chocks.**
b. **Depress brake pedal while accelerating the engine to prevent forward surge of car.**
c. **After idle adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.**

CAUTION:

Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

Note:

a. **When measuring CO percentage, insert probe into tail pipe more than 40 cm (15.7 in).**

b. **In the case of air conditioner equipped models, the idle adjustment should carried out while the air conditioner is "OFF".**

"CO" idle adjustment with CO-meter

Idle mixture adjustment requires the use of a CO-meter (especially for California models). When preparing to adjust idle mixture, it is essential to have the meter thoroughly warmed up and calibrated.

1. Check carburetor pipes for proper connection.
2. Warm up engine until water temperature indicator points to the middle of gauge. The procedure to warm up engine is not specifically recommended. Either driving vehicle or operating engine at no load will be good.
3. Make sure that water temperature indicator points to the middle. Further keep engine running at about 2,000 rpm for about 5 minutes without applying load to engine in order to stabilize engine condition. Engine hood should be open.
4. Run engine for about 10 minutes at idling speed. During this 10 minutes, proceed as described in steps 5 to 9 below.
5. Remove air hose between 3-way connector and air check valve as shown in Figure below. Plug the disconnected hose at air check valve side.

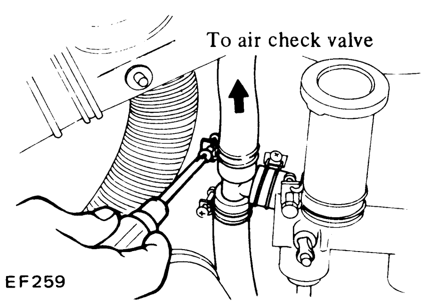


Fig. EF-41 Disconnecting Air Hose

6. Race engine (1,500 to 2,000 rpm) two or three times under no load, then run engine for one minute at idling speed.
7. Adjust throttle adjusting screw until engine is at specified speed.

Engine speed:
Manual transmission
600 rpm
Automatic transmission
(in "D" position)
600 rpm

8. Check ignition timing. If necessary, adjust it to specifications.

This operation need not be carried out at 1,600 km (1,000 miles) service.

Ignition timing:
Manual transmission
12° B.T.D.C./600 rpm
Automatic transmission
(in "D" position)
12° B.T.D.C./600 rpm

9. At about 10 minutes after engine is run at idling speed, adjust idle adjusting screw so that CO percentage is at specified level.

CO percentage:
Manual transmission
$1\%\ ^{+1}_{-0.7}$ at 600 rpm
Automatic transmission
(in "D" position)
$1\%\ ^{+1}_{-0.7}$ at 600 rpm

10. Repeat procedures as described in steps 6, 7 and 9 above so that CO percentage is at specified level. Checking idle CO in step 9 can be carried out right after step 7.
11. Race engine (1,500 to 2,000 rpm) two or three times under no load and make sure that specified CO percentage is obtained.
12. Remove plug, and connect air hose to connector.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

"CO" idle adjustment without CO-meter (Non-California models)

If CO-meter is not available, the following procedures may be used.

1. Check carburetor pipes for proper connection.
2. Warm up engine until water temperature indicator points to the middle of gauge. The procedure to warm up engine is not specifically recommended. Either driving vehicle or operating engine at no load will be good.
3. Make sure that water temperature indicator points to the middle. Further keep engine running at about 2,000 rpm for about 5 minutes without applying load to engine in order to stabilize engine condition. Engine hood should be open.
4. Run engine for about 10 minutes at idling speed. During this 10 minutes, proceed as described in steps 5 to 9 below.
5. Remove air hose between 3-way connector and air check valve shown in Fig. EF-41. Plug the disconnected hose at air check valve side.
6. Race engine (1,500 to 2,000 rpm) two or three times under no load, then run engine for one minute at idling speed.
7. Adjust throttle adjusting screw so that engine speeds are as indicated below.

Engine speed:
Manual transmission
650 rpm
Automatic transmission
(in "D" position)
650 rpm

8. Check ignition timing, if necessary adjust it to the value required by specifications. This operation need not be carried out at 1,600 km (1,000 miles) service.
9. At about 10 minutes after engine is run at idling speed, adjust idle adjusting screw until maximum rpm is obtained.
10. Repeat procedures as described in steps 6, 7 and 9 above until engine speed, at best idle mixture, is as specified in step 7. Adjustment in step 9 can be carried out right after step 7.
11. Turn the idle adjusting screw clockwise until engine speed drops by value shown below.

Engine speed drops:
45 to 55 rpm
(M/T, A/T – "D" position)

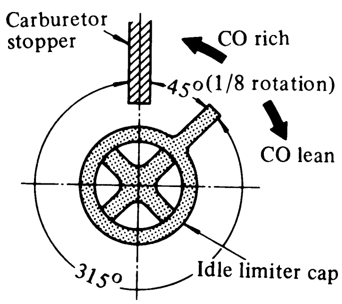
12. Remove plug, and connect air hose to connector.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

Idle limiter cap

Do not remove this idle limiter cap unless necessary. If this unit is removed, it must be readjusted at time of installation. To adjust, proceed as follows:

1. After adjusting throttle or idle speed adjusting screw, check to be sure that the amount of "CO" contained in exhaust gases meets the established standard.
2. Install idle limiter cap in position, making sure that the adjusting screw can rotate another 1/8 turn in the "CO-RICH" direction.



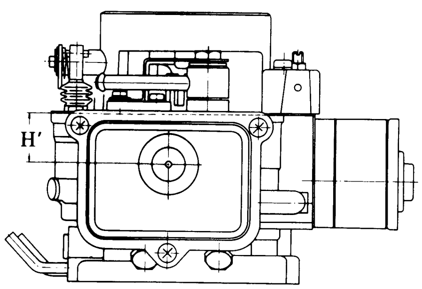
ET031

Fig. EF-42 Setting Idle Limiter Cap

FUEL LEVEL

1. With engine idling, visually check fuel level through sight window of float chamber. Fuel level is correct if it is at the indicator point.

Note: **Fuel level indicator point is located 23 mm (0.91 in) below top of carburetor body (H' as shown in Figure below).**



EF260

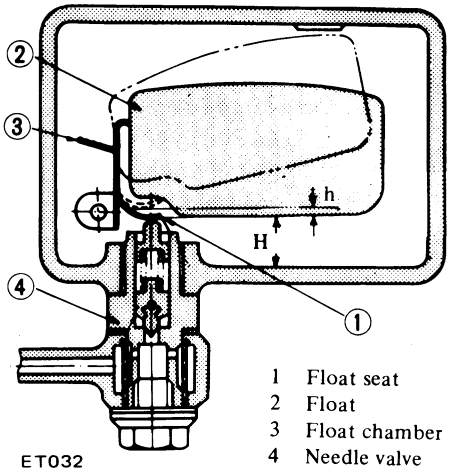
Fig. EF-43 Checking Fuel Level

To adjust fuel level, proceed as follows:

2. Remove level gauge cover.
3. Turn down float chamber to allow float to come into contact with needle valve, and measure "H" shown below.

When "H" is approximately 7.2 mm (0.283 in), top float position is correct.

The top float position can be adjusted by bending float seat.



1 Float seat
2 Float
3 Float chamber
4 Needle valve

ET032

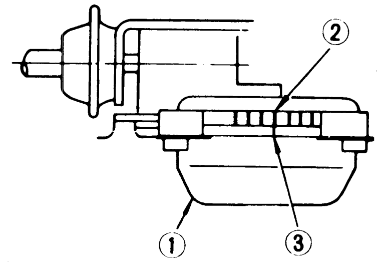
Fig. EF-44 Adjusting Float Level

4. Adjust bottom float position so that clearance "h" between float seat and needle valve stem is 1.3 to 1.7 mm (0.051 to 0.067 in) when float is fully raised. Bend float stopper as required.
5. Install level gauge cover.
6. After adjustments in steps 3 and 4 above have been made, make sure that when fuel is delivered to the float chamber, the fuel level is maintained within the specified value H'.

AUTOMATIC CHOKE MECHANISM

1. Before starting engine, fully depress accelerator pedal to ensure that choke valve closes properly.
2. Push choke valve with a finger, and check for binding.
3. Check to be sure that bi-metal cover index mark is set at the center of choke housing index mark as shown below.

Note: **Do not set bi-metal cover index mark at any position except the center of choke housing index mark.**



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

ET034

Fig. EF-45 Bi-Metal Setting

4. Check automatic choke heater source wiring for proper connection, then start engine.
5. After warming up the engine, see that choke valve is fully open.
6. If automatic choke heater source wiring is normal and choke valve does not operate after warm-up, replace bi-metal cover.

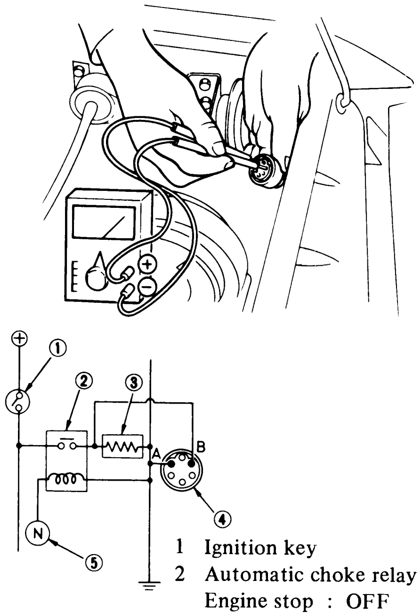
AUTOMATIC CHOKE HEATER CIRCUIT

Checking heater circuit with function connector

CAUTION:
Do not attach test leads of a circuit tester to those other than designated.

---

1. With engine not running, check for continuity between A and B as shown in Fig. EF-46.
   - If continuity exists, heater is functioning properly.
   - If continuity does not exist, check for disconnected connector or open P.T.C. heater circuit.
2. With engine running at idle, check for presence of voltage across A and B as shown in Fig. EF-46.
   - If voltmeter reading is 12 volts (d-c), heater circuit is functioning properly.
   - If voltmeter reading is zero, check for disconnected connector, open circuit, or faulty automatic choke relay.
3. Replace faulty parts.



1 Ignition key
2 Automatic choke relay
Engine stop : OFF
Engine start : ON
3 Automatic choke heater
4 Function test connector
5 Alternator

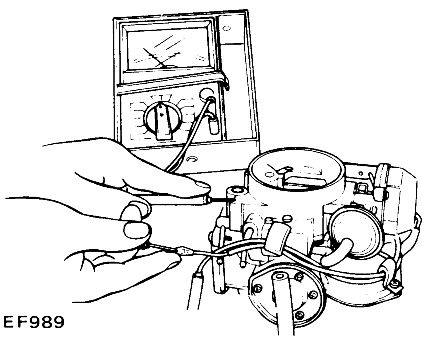
EF710

Fig. EF-46 Checking Automatic Choke Heater Circuit

AUTOMATIC CHOKE HEATER

1. Measure resistance of choke heater as shown in Fig. EF-47.

Resistance of choke heater:
3.7 to 8.9 ohms



EF989

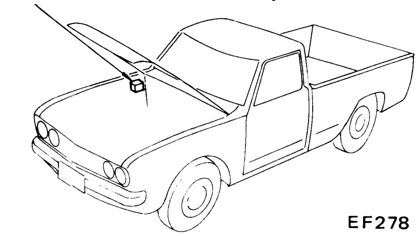
Fig. EF-47 Automatic Choke Heater Check

2. If measured value is not within the specification, replace bi-metal cover with auto-choke heater.

AUTOMATIC CHOKE RELAY

1. Remove automatic choke relay. The relay is located in the relay bracket.

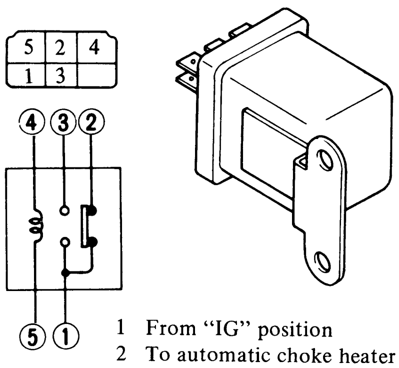
Automatic choke heater relay



EF278

Fig. EF-48 Automatic Choke Relay

2. Check for continuity between ④ and ⑤. Continuity should exist.
Check for continuity between ① and ②. Continuity should exist.
Check for continuity between ① and ③. Continuity should not exist.
3. Apply a 12-volt d-c across ④ and ⑤ to ensure that continuity exists between ① and ③ and that continuity does not between ① and ②. If test results do not satisfy the above, replace the automatic choke relay.



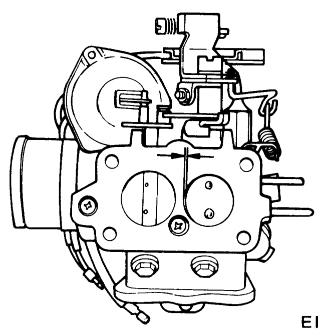
1 From "IG" position
2 To automatic choke heater
3 Useless
4 From alternator
5 From ignition switch

EC344

Fig. EF-49 Checking Automatic Choke Relay

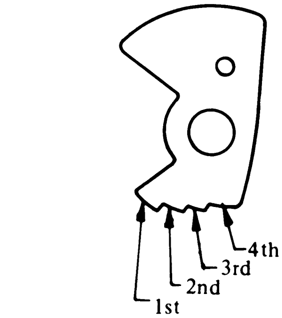
FAST IDLE

1. With carburetor assembly removed from engine, measure throttle valve clearance "A" with a wire gauge, placing the upper side of fast idling screw on the first step on the fast idling cam.



EF109A

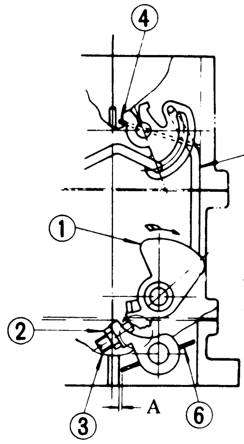
Fast idling cam steps



EC528

Fig. EF-50 Measuring Throttle Valve Clearance

2. The clearance should be specified value in the following table. If not, adjust the clearance by turning fast idling screw.



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

ET033

Fig. EF-51 Adjusting Clearance of Throttle Valve

T/M	A mm (in)
M/T	1.33 to 1.47 (0.0524 to 0.0579)
A/T	1.58 to 1.72 (0.0622 to 0.0677)

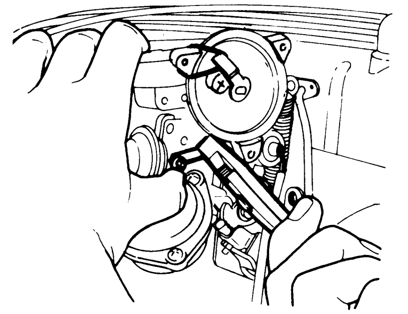
(Fast idling cam 1st step)

3. To check fast idling cam setting by engine speed, proceed as follows:
Warm up engine sufficiently. Set fast idling cam at 2nd step and read engine speed. Fast idling cam is properly set, if engine speed is within specifications below.
Clearance A in second step is reference value.

Cam step		Clearance "A" mm (in)	Engine speed rpm
M/T	1st	1.33 to 1.47 (0.0524 to 0.0579)	–
	2nd	0.94 to 1.18 (0.0370 to 0.0465)	1,900 to 2,800
A/T	1st	1.58 to 1.72 (0.0622 to 0.0677)	–
	2nd	1.16 to 1.40 (0.0457 to 0.0551)	2,200 to 3,200 ("N" position)

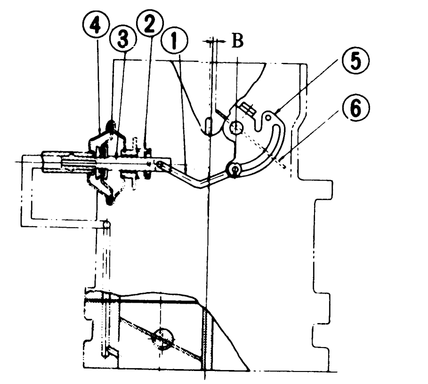
VACUUM BREAK

1. Close choke valve completely.
2. Hold choke valve by stretching a rubber band between vacuum break lever and stationary part of carburetor.
3. Grip vacuum break rod with pliers, and pull straight out.
4. Under this condition, adjust the clearance between choke valve and carburetor body ("B" in Figure below) to specified value by bending vacuum break rod.



EF110A

Fig. EF-53 Adjusting Vacuum Break Rod



EF516

1 Vacuum break rod
2 Choke spring
3 Vacuum break piston
4 Diaphragm cover
5 Vacuum break lever
6 Choke valve

Fig. EF-52 Adjusting Vacuum Break

Choke valve to carburetor body clearance (Vacuum break) B:
California models
B = 1.50 mm (0.0591 in)
Non-California models
B = 1.75 mm (0.0689 in)

CHOKE UNLOADER

1. Close choke valve completely.
2. Hold choke valve by stretching a rubber band between vacuum break lever and stationary part of carburetor.
3. Pull throttle lever until full open.

Under this condition, adjust clearance between choke valve and carburetor body to the specification by bending unloader tongue.

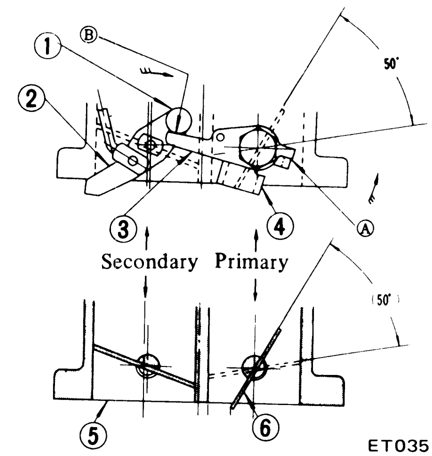
Choke valve to carburetor body clearance (Choke unloader):
B = 2.05 to 2.85 mm (0.0807 to 0.1122 in)

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

INTERLOCK OPENING OF PRIMARY AND SECONDARY THROTTLE VALVE

Fig. EF-54 shows primary throttle valve opened 50°. When primary throttle valve is opened 50° the adjust plate integrated with throttle valve is in contact with return plate at Ⓐ.

When throttle valve is opened further, locking arm Ⓑ is detached from secondary throttle arm, permitting secondary system to start operation.



ET035

1 Roller
2 Connecting lever
3 Return plate
4 Adjust plate
5 Throttle chamber
6 Throttle valve

Fig. EF-54 Adjusting Interlock Opening

Linkage between primary and secondary throttles will function properly if distance between throttle valve and inner wall of throttle chamber is 7.38 mm (0.2906 in).

Adjustment is made by bending connecting link.

DASH POT

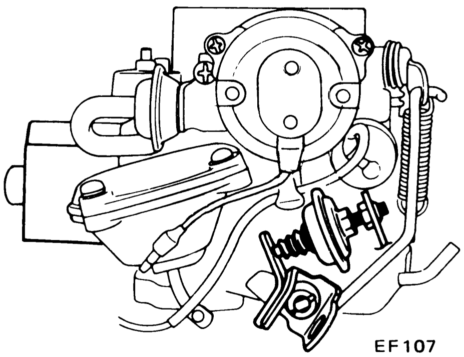
Note: **Check dash pot with air conditioning system (if equipped) "OFF".**

1. Idling speed of engine and mixture must be well tuned up and engine sufficiently warm.
2. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.
3. Adjust position of dash pot by adjusting screw until engine speed is in the specified range.

Specified engine speed:
Manual transmission
1,900 to 2,100 rpm
Automatic transmission
1,650 to 1,850 rpm

Note: Location of adjusting screws differs between models equipped with air conditioning system and those without it. Refer to Fig. EF-55 and adjust adjusting screw.

Models not equipped with air conditioner



Air conditioner equipped models

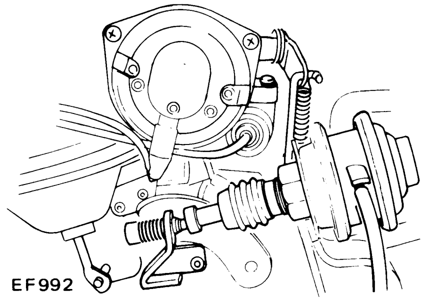
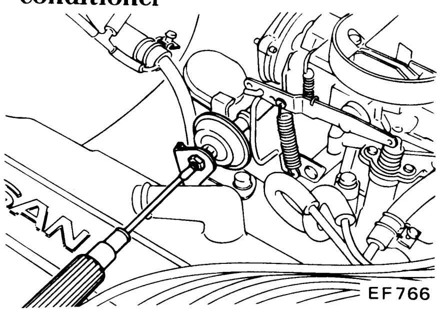


Fig. EF-55 Adjusting Dash Pot

4. Tighten lock nuts.
(Models not equipped with air conditioner)
5. Make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in about three seconds.

Note: For adjustment of F.I.C.D., refer to Section AC.

Models not equipped with air conditioner



Air conditioner equipped models

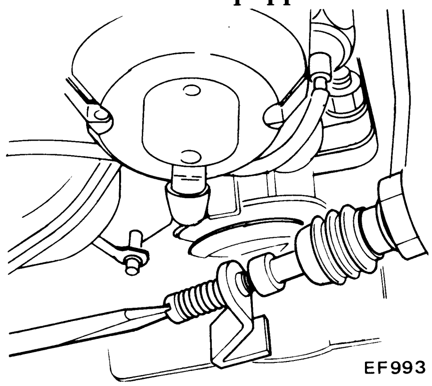


Fig. EF-56 Adjusting Dash Pot

ACCELERATING PUMP

1. Visually inspect accelerating pump cover for any sign of fuel leaks.
2. If fuel leaks are found, check gasket, and replace if necessary.
3. Turn throttle valve by hand; make sure fuel is injected through injector nozzle.

Note: To check for fuel injection, peep into nozzle from upper side while directing flashlight beam toward primary barrel.

ANTI-DIESELING SOLENOID VALVE

Check this valve if engine continues to turn over after ignition switch has been turned off or if engine does not continue to run at idle.

1. Disconnect anti-dieseling solenoid connector to see if engine stops. If it does not, replace anti-dieseling solenoid valve assembly.
2. Make sure 12-volt d-c power is applied at harness side when ignition switch is turned on. If it is not, check harness.

If harness is in good condition, replace solenoid valve as a unit.

Ⓣ **Tightening torque:**
Anti-dieseling solenoid valve
1.8 to 3.5 kg-m
(13 to 25 ft-lb)

Note: After replacement, start engine and check to be sure that fuel is not leaking, and that anti-dieseling solenoid is in good condition.

B. C. D. D. OPERATING PRESSURE

Generally, it is unnecessary to adjust the B.C.D.D., however, if it should become necessary to adjust it, the procedure is as follows:

Note: This adjustment should be carried out with the automatic transmission lever in the "N" position.

Prepare the following tools

- Tachometer to measure the engine speed while idling.
- A vacuum gauge and connecting pipe.

Note: A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.

1. Disconnect harness of B.C.D.D. solenoid valve (Non-California models).

Note: Be sure to reconnect harness of solenoid after inspection or adjustment is completed.

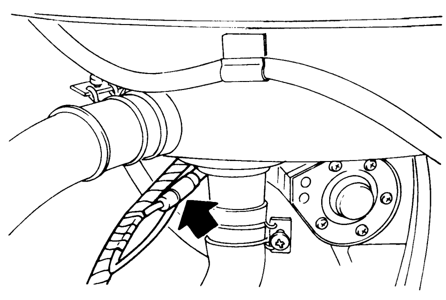


Fig. EF-57 Disconnecting Harness of B.C.D.D. Solenoid Valve (Non-California models)

2. Connect rubber hose between vacuum gauge and intake manifold as shown.

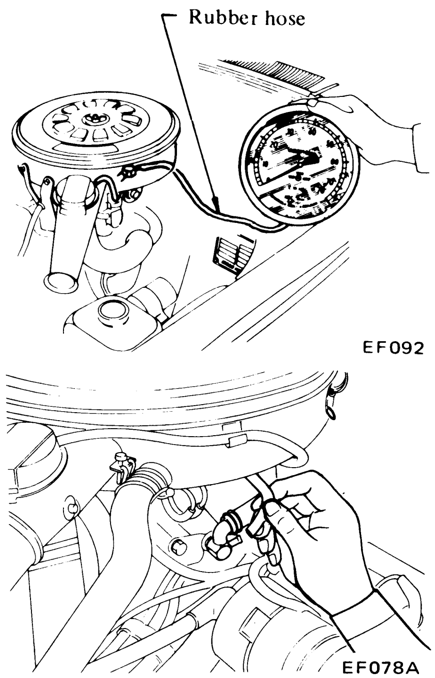


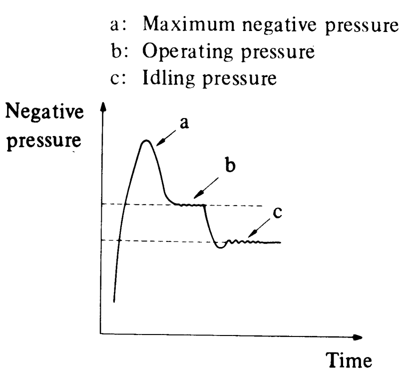
Fig. EF-58 Connecting Vacuum Gauge

3. Warm up the engine until it is heated to operating temperature.
Then adjust the engine at normal idling setting. (Refer to the item "Idling Adjustment".)

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

5. At that time, the manifold vacuum pressure will change as follows:

1) It will abruptly rise up to −600 mmHg (−23.62 inHg) or above.
2) It will decrease gradually to a certain level and stay there for a while. This is so called operating pressure.
3) In most cases, it will drop to idling pressure.



Characteristic curve of B.C.D.D.

EC502

Fig. EF-59 Characteristic Curve of B.C.D.D.

6. Check that the B.C.D.D. operating pressure is within the specified range.

B.C.D.D. operating pressure [0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure] :

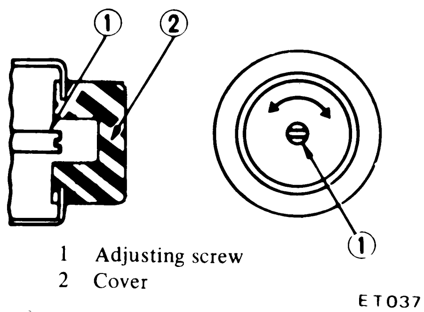
−560 ±20 mmHg (−22.05 ±0.79 inHg)

7.
(1) If it is lower than the specified level, turn the adjusting screw in the following direction until correct adjustment is made.

Adjusting screw: Counterclockwise

(2) If it is higher than the specified level, turn the adjusting screw in the following direction until correct adjustment is made.

Adjusting screw: Clockwise



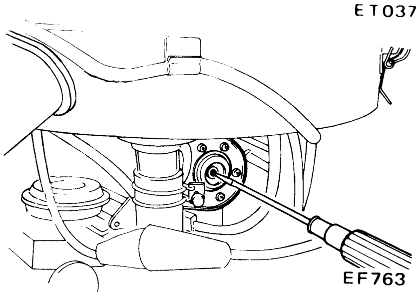


Fig. EF-60 Adjusting Operating Pressure

8. Race the engine and check for adjustment.

9. If it is lower than the set level, turn the adjusting screw until correct adjustment is made.

10. Race the engine and check for adjustment.

If engine speed cannot be decreased to idling when checking B.C.D.D. operating pressure, proceed as follows.

11.
(1) Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on high vacuum side, 25 mmHg (0.98 inHg) away from the specified value.
(2) Turn adjusting screw ¼ of a turn clockwise so that B.C.D.D. operating pressure drops by 25 mmHg (0.98 inHg).

If B.C.D.D. operating pressure cannot be observed clearly even in step 10 (1), proceed as follows.

12.
(1) Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on the high vacuum side, 50 mmHg (1.97 inHg) away from the specified value.
(2) Turn the adjusting screw ½ of a turn clockwise.

Note: The B.C.D.D. operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.

B.C.D.D. MIXTURE

As a general rule, it is not necessary to adjust the B.C.D.D. mixture. However, if it should become necessary to adjust it, the proceed as follows:

1. Shift gears into "N" position.
2. Warm up engine, and make sure engine idling speed and CO percentage are correct, referring to "Adjusting Carburetor Idle RPM and Mixture Ratio".
3. With A.I.S. air hose opening plugged at air check valve side, forcibly actuate B.C.D.D.
4. Remove rubber cap from B.C.D.D. adjusting screw and directly depress diaphragm with a screw driver.

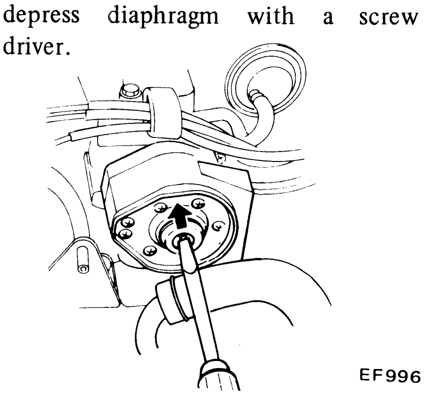


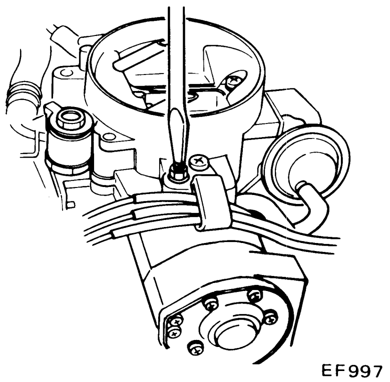
Fig. EF-61 Pushing B.C.D.D. Adjusting Screw

5. Measure CO percentage to see if it is within specified range.

B.C.D.D. mixture
CO percentage: 2.0 ±1%

6. If CO percentage is not within specifications, remove air cleaner.

Loosen B.C.D.D. mixture adjusting screw lock nut and turn adjusting screw located on upper side of carburetor to adjust it.



EF997

Fig. EF-62 Adjusting B.C.D.D. Mixture

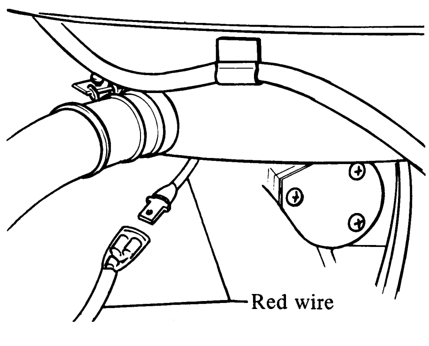
(1) Turn adjusting screw counterclockwise to reduce CO percentage.
(2) Turn adjusting screw clockwise to increase CO percentage.

7. Temporarily install air cleaner and repeat steps 3 through 5 until correct CO percentage is obtained.
8. Tighten B.C.D.D. mixture adjusting screw lock nut.
9. Securely install air cleaner. Remove A.I.S. air hose plug and connect air hose to connector. Connect vacuum hoses to proper position.

FUEL SHUT-OFF SYSTEM (California models)

Manual transmission models

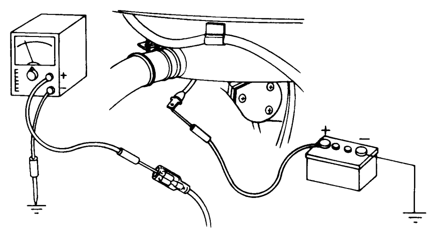
1. Run engine at idling speed.
2. Disconnect anti-dieseling solenoid valve connector. Engine should stop. If it does not, replace anti-dieseling solenoid valve assembly.



EF031A

Fig. EF-63 Checking Function of Anti-Dieseling Soleniod Valve

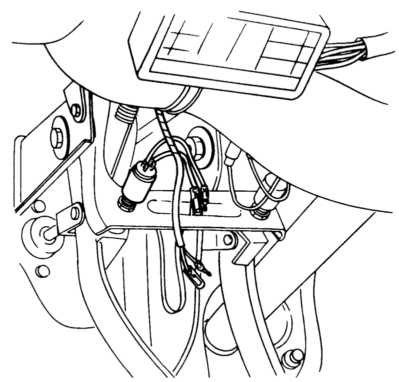
3. Connect voltmeter to harness side and ground.
4. Reconnect anti-dieseling solenoid valve wire connector directly to battery (+) terminal.



EF032A

Fig. EF-64 Connecting Voltmeter

5. Run engine.
6. Disconnect clutch pedal switch.



EF033A

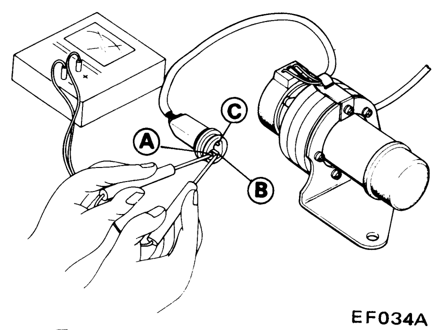
Fig. EF-65 Disconnecting Clutch Pedal Switch

CAUTION:
Apply hand brake during test.

7. Depress clutch pedal, shift into 4th gear and race engine under no load. Increase engine speed to 2,500 to 3,000 rpm, then quickly close throttle valve. At that time, if voltmeter pointer deflects from 12 to 0 volt instantly, electrical wiring is in good order. If voltmeter pointer does not deflect from 12 to 0 volt, either fuel shut-off vacuum switch or neutral switch is out of order.
8. Reconnect clutch pedal switch and disconnect fuel shut-off vacuum switch connector.
9. Connect ohmmeter as shown in Fig. EF-66. Race engine under no load. Increase engine speed to 2,500 to 3,000 rpm, then quickly close throttle valve. At this time, check continuity between terminals Ⓐ and Ⓑ and between terminals Ⓐ and Ⓒ.

If "ON-OFF" operation is normal, fuel shut-off vacuum switch is in good order.

Note: Polarity should be reversed between Ⓐ and Ⓑ and between Ⓐ and Ⓒ.



EF034A

Fig. EF-66 Checking Fuel Shut-Off Connector

10. Reconnect fuel shut-off vacuum switch connector and conduct final check.

Repeat step 7. If voltmeter pointer does not deflect from 12 to 0 volt instantly, replace neutral switch.

Automatic transmission models

1. Run engine at idling speed.
2. Disconnect anti-dieseling solenoid valve connector. Engine should stop. If it does not, replace anti-dieseling solenoid valve.

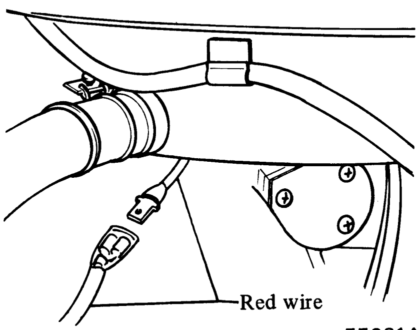


Fig. EF-67 Checking Function of Anti-Dieseling Solenoid Valve

3. Connect voltmeter to harness side and ground.
4. Reconnect anti-dieseling solenoid valve wire connector directly to battery (+) terminal.

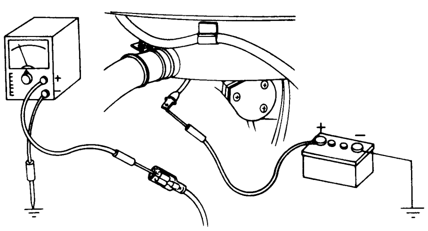


Fig. EF-68 Connecting Voltmeter

5. Set shift lever at "N" or "P" position.

CAUTION:
Apply hand brake during test.

---

6. Race engine under no load. Increase engine speed to 2,500 to 3,000 rpm, then quickly close throttle valve. At this time, if voltmeter pointer deflects from 12 to 0 volt instantly, fuel shut-off is functioning properly.

   If voltmeter pointer does not deflect from 12 to 0 volt, either fuel shut-off vacuum switch or inhibitor switch is out of order.
7. Disconnect voltmeter and reconnect harness to anti-dieseling solenoid valve.
8. Disconnect fuel shut-off vacuum switch connector.
9. Connect ohmmeter as shown in Fig. EF-69.

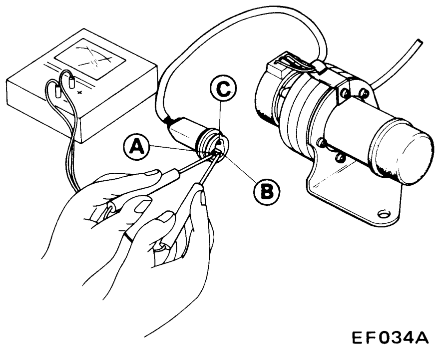


Fig. EF-69 Checking Fuel Shut-Off Connector

10. Again set shift lever at "N" or "P" position.
11. Race engine under no load. Increase engine speed to 2,500 to 3,000 rpm, then quickly close throttle valve. At this time, check continuity between terminals Ⓐ and Ⓑ and between terminals Ⓐ and Ⓒ. If "ON-OFF" operation is normal, fuel shut-off vacuum switch is in good order.

Note: **Polarity should be reversed between Ⓐ and Ⓑ and between Ⓐ and Ⓒ.**

12. Reconnect fuel shut-off vacuum switch connector and conduct final check.

    Repeat step 6. If voltmeter pointer does not deflect from 12 to 0 volt instantly, replace inhibitor switch.

Inhibitor switch (Automatic transmission models)

Refer to the AT section.

Inhibitor relay (Automatic transmission models)

1. Remove inhibitor relay under the relay cover.

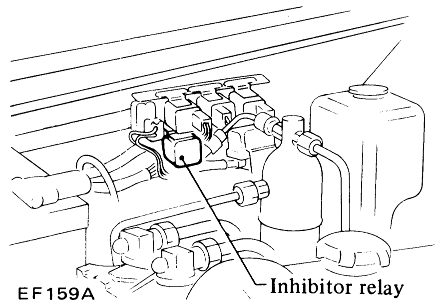


Fig. EF-70 Location of Inhibitor Relay

2. Make an inhibitor relay check as shown in Fig. EF-71.

   Apply 12 volts (d-c) across terminals 1 and 4 to ensure that continuity exists between terminals 2 and 3.

   Check that continuity does not exist between terminals 2 and 3 when no voltage is applied across them.

   If results satisfy the above, inhibitor relay is functioning properly; if not, replace inhibitor relay.

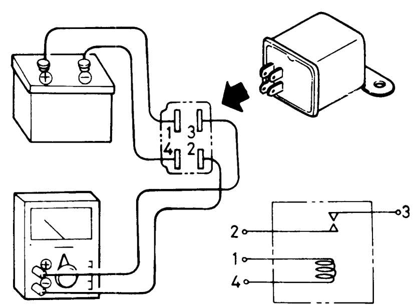


Fig. EF-71 Checking Inhibitor Relay

Fuel shut-off vacuum switch operating pressure

Generally, it is unnecessary to adjust the fuel shut-off vacuum switch operating pressure. However, if it should become necessary to adjust the pressure, follow the procedures described below:

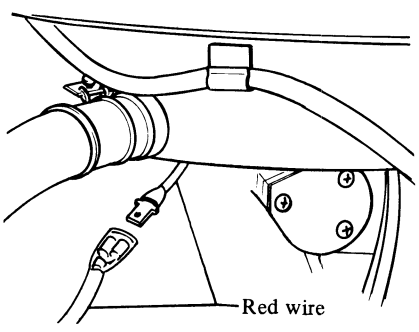
Prepare the following tools

1. Tachometer, to measure the engine speed while idling
2. Vacuum gauge and connecting pipe
3. Voltmeter and connecting lead wire

Note:
a. **A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.**

b. Apply parking brake and place wheel chocks.

1. Warm up engine to normal operating temperature.
2. Stop engine and disconnect neutral switch (inhibitor switch on automatic transmission) lead wires. Set gears to "neutral" ("N" range on automatic transmission).
3. Disconnect anti-dieseling solenoid valve harness.

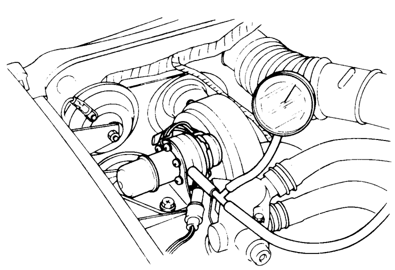


EF031A

Fig. EF-72 Removing Anti-Dieseling Solenoid Valve Harness

Note: Be sure to reconnect solenoid harness after inspection or adjustment is completed.

4. Connect rubber hose between vacuum gauge and intake manifold as shown.

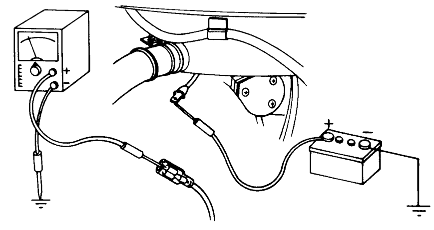


EF078A

Fig. EF-73 Connecting Vacuum Gauge

5. Connect voltmeter across harness and ground.
6. Reconnect anti-dieseling solenoid valve wire connector directly to battery (+) terminal.

Note: Be sure to connect (+) and (–) terminals correctly.



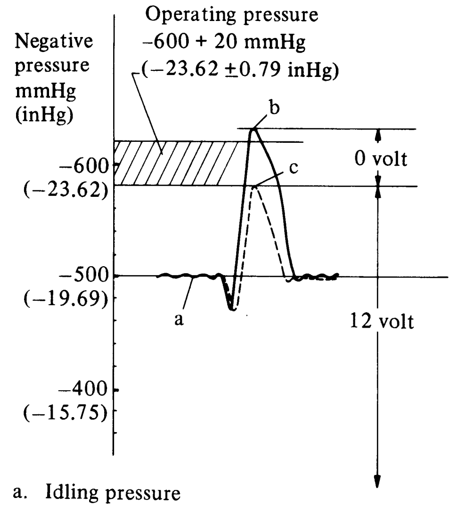
EF032A

Fig. EF-74 Connecting Voltmeter

7. Restart engine, and run it under no load. Increase engine speed to 2,500 to 3,000 rpm, then quickly close throttle valve.
8. At that time, vacuum pressure will abruptly rise up to –600 mmHg (–23.62 inHg) or above.
9. Electrical wiring circuit is normal if voltmeter readings are as shown in chart below.

Operating pressure	Voltmeter indication
–580 to –620 mmHg (–22.83 to –24.41 inHg)	0V
Others	12V

Note: This test is conducted to reproduce the coasting state of vehicle. Because operating pressure varies with time instantaneously as shown in Fig. EF-75, repeat steps 7 and 8 for a true set pressure.



a. Idling pressure
b. Maximum negative pressure (High engine racing)
c. Maximum negative pressure (Low engine racing)

EF079A

Fig. EF-75 Characteristic Curve of Fuel Shut-Off Operating Pressure

10. Check that fuel shut-off vacuum switch operating pressure is within specified range.

Fuel shut-off operating pressure [0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure]:
–600 ±20 mmHg
(–23.62 ±0.79 inHg)

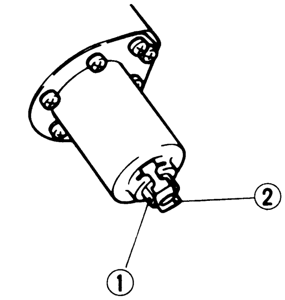
11.
(1) If pressure is lower than specified level, remove rubber cap from fuel shut-off vacuum switch and turn adjusting nut in the following direction until correct adjustment is obtained.

Adjusting nut: Clockwise

(2) If pressure is higher than specified level, turn adjusting nut in the following direction until correct adjustment is made.

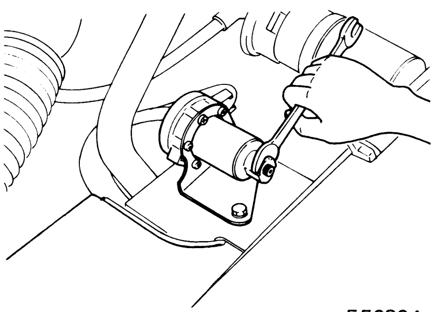
Adjusting nut: Counterclockwise

Note: When adjusting fuel shut-off vacuum switch, turn adjusting nut in or out with lock spring in place. Always set lock spring properly to prevent changes in operating pressure.



1 Adjusting nut
2 Lock spring

EC692



EF080A

Fig. EF-76 Adjusting Operating Pressure

12. Race engine and check for adjustment.
13. If pressure is lower than set level, turn adjusting nut until correct adjustment is made.
14. Race engine and check for adjustment.

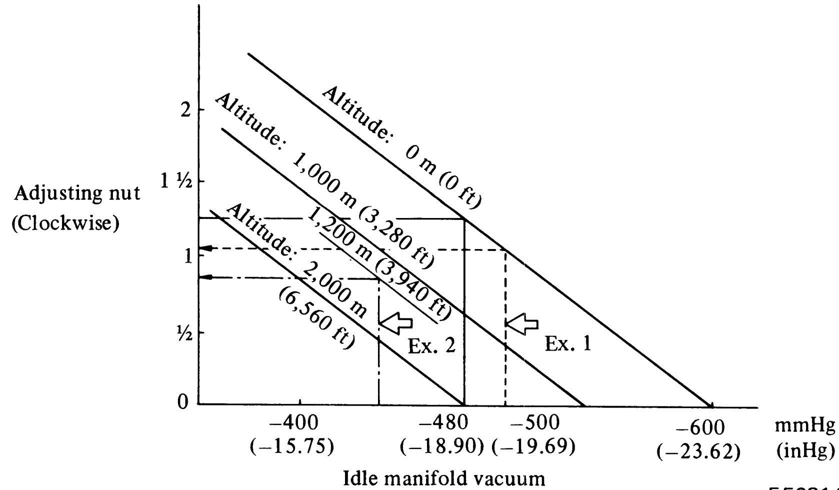
If specified fuel shut-off vacuum switch setting is not obtained in steps 1 through 14, proceed to steps 15 to 17.

15. Measure idling manifold vacuum pressure and record it as "A" mmHg.
16. Slowly turn adjusting nut for fuel shut-off vacuum switch counterclockwise until engine stops.* Record number of turns of adjusting nut.

* Turning adjusting nut in this manner will actuate fuel shut-off switch, shutting off fuel supply to engine.

Note: Do not attempt to turn adjusting nut further.

17. From graph in Fig. EF-77, read number of turns of adjusting nut corresponding to "A" measured in step 15. Then turn adjusting nut clockwise by the same number of turns.



EF081A

Fig. EF-77 Relationship between Adjusting Nut and Idle Manifold Vacuum Pressure

(Example):

If vacuum pressure measured in step 15 is −480 mmHg (−18.90 inHg), turn adjusting nut clockwise 1 ¼ turns as shown by arrow in graph.

Note: Idle manifold vacuum pressure differs with altitude where adjustment is to be made. Accordingly, note that number of turns for adjusting nut also differs.

Example 1:

When vacuum pressure is −500 mmHg (−19.69 inHg) at an altitude of zero meters (0 ft), determine number of turns of adjusting nut required by dash-and-dot line in graph.

Example 2:

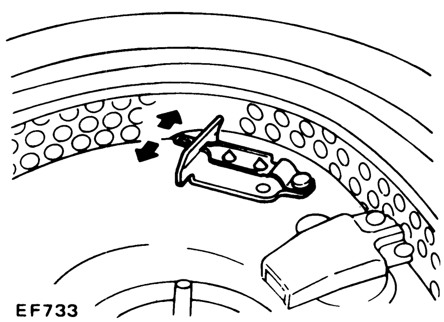
When vacuum pressure is −440 mmHg (−17.32 inHg) at an altitude of 1,200 meters (3,940 ft), determine number of turns of adjusting nut required by dotted line in graph.

18. Above steps 15 to 17 will set fuel shut-off vacuum switch operating pressure in specified range.

ALTITUDE COMPENSATOR (California models)

1. Make sure that altitude compensator to carburetor hoses are connected properly, and that they are not cracked and obstructed.
2. Check that altitude compensator is properly set.

- At low altitudes . . . Closed
- At high altitudes . . . Open



EF733

Fig. EF-78 Checking Altitude Compensator

Note: The idle rpm and CO% vary according to altitude. Therefore, they should be properly adjusted when the H–L lever is changed.

MAJOR SERVICE OPERATION

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed. By completely disassembling which will allow cleaning of all parts and passages, the carburetor can be maintained its original condition and will continue to deliver the proper ratios.

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

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

REMOVAL AND INSTALLATION

Remove carburetor from engine, taking sufficient care to the following:

CAUTION:
a. When disconnecting fuel lines, do not spill fuel from fuel pipe.
b. When removing carburetor, do not drop any nut or bolt into intake manifold.
c. Be careful not to bend or scratch any part.

1. Remove air cleaner housing.
2. Disconnect fuel lines and vacuum lines.
3. Disconnect lead wires for auto-choke heater and anti-dieseling solenoid valve.
4. Disconnect torsion shaft from throttle lever.
5. Remove four screws securing carburetor body to intake manifold.
   Carburetor assembly can then be taken out.
6. Installation is in the reverse sequence of removal.

DISASSEMBLY AND ASSEMBLY

Following instructions should be observed.

Disassembly

1. Properly fitting wrenches and screwdrivers must be used on the nozzles and jets as well as on the screws and nuts, and care must be exercised not to damage any parts.
2. Clean the carburetor thoroughly before disassembly.
3. Do not attempt to remove any parts marked with an asterisk (*) in the following illustrations.

Assembly

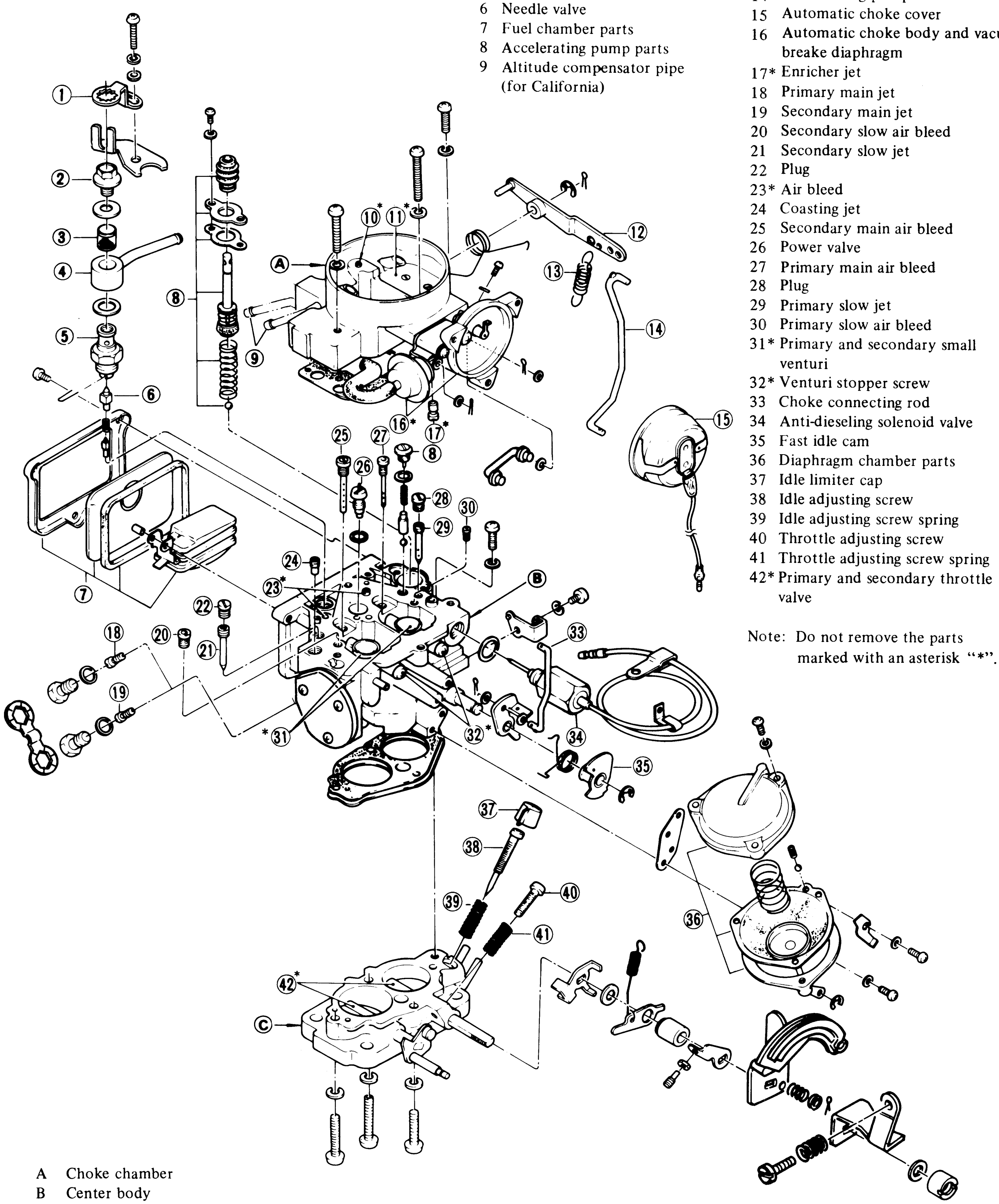
To assemble, reverse the disassembly procedure, noting the following:

1. Thoroughly wash all the parts before assembling.
2. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted.
   If any of such undesirable conditions is noted, they must be replaced.
3. Install jet and air bleed having the same size number as that of original one.
4. After reassembling carburetor, check each rotating portion or sliding portion for smooth operation.

California models

1 Lock lever
2 Filter set screw
3 Fuel filter
4 Fuel nipple
5 Needle valve body
6 Needle valve
7 Fuel chamber parts
8 Accelerating pump parts
9 Altitude compensator pipe (for California)
10* High speed enricher air bleed
11* Choke valve
12 Accelerating pump lever
13 Throttle return spring
14 Accelerating pump rod
15 Automatic choke cover
16 Automatic choke body and vacuum breake diaphragm
17* Enricher jet
18 Primary main jet
19 Secondary main jet
20 Secondary slow air bleed
21 Secondary slow jet
22 Plug
23* Air bleed
24 Coasting jet
25 Secondary main air bleed
26 Power valve
27 Primary main air bleed
28 Plug
29 Primary slow jet
30 Primary slow air bleed
31* Primary and secondary small venturi
32* Venturi stopper screw
33 Choke connecting rod
34 Anti-dieseling solenoid valve
35 Fast idle cam
36 Diaphragm chamber parts
37 Idle limiter cap
38 Idle adjusting screw
39 Idle adjusting screw spring
40 Throttle adjusting screw
41 Throttle adjusting screw spring
42* Primary and secondary throttle valve

Note: Do not remove the parts marked with an asterisk "*".



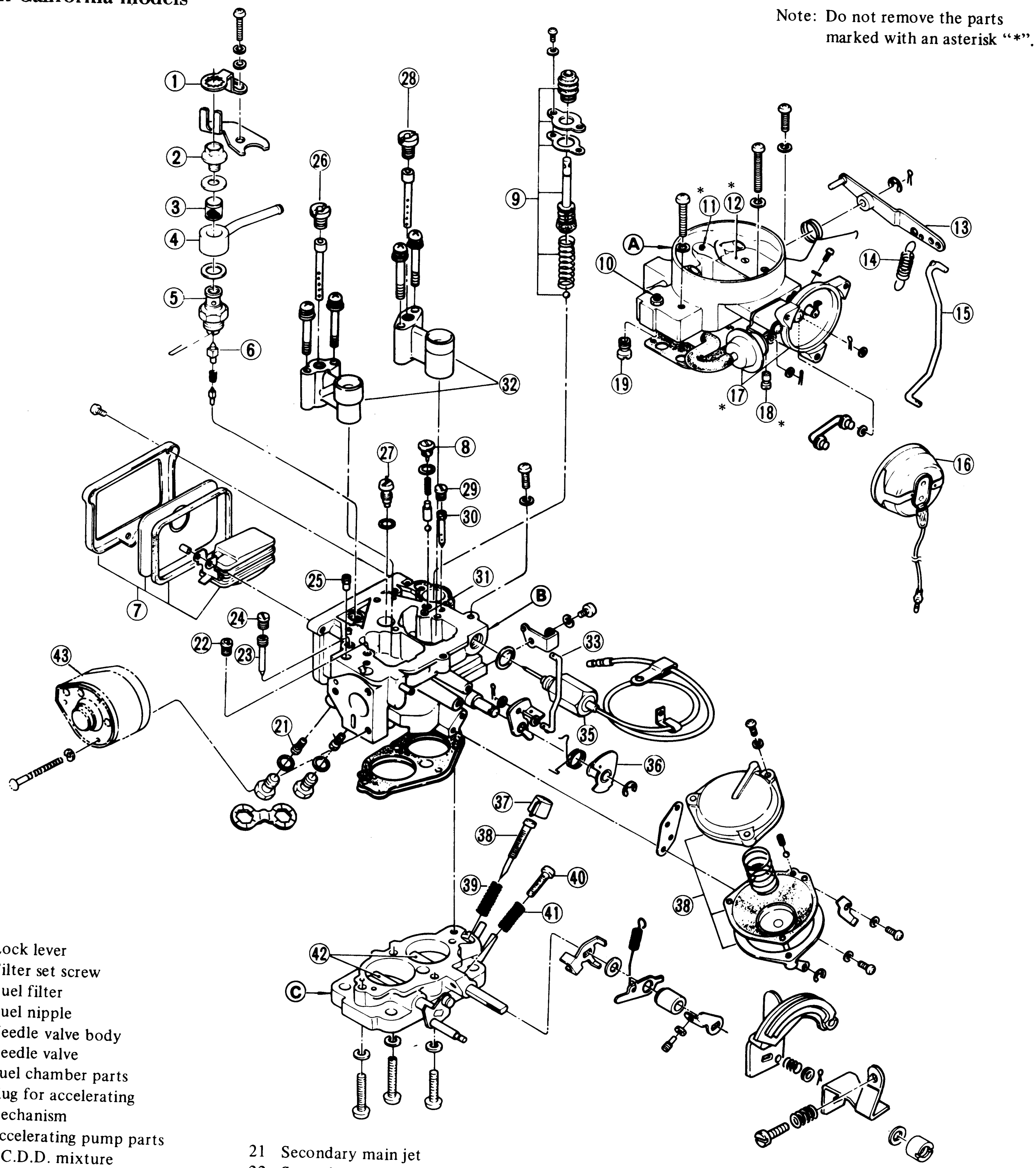
A Choke chamber
B Center body
C Throttle chamber

EF160A

Fig. EF-79 Carburetor Parts (California models)

Non-California models

Note: Do not remove the parts marked with an asterisk "*".



1 Lock lever
2 Filter set screw
3 Fuel filter
4 Fuel nipple
5 Needle valve body
6 Needle valve
7 Fuel chamber parts
8 Plug for accelerating mechanism
9 Accelerating pump parts
10 B.C.D.D. mixture adjusting screw
11* High speed enricher air bleed
12* Choke valve
13 Accelerating pump lever
14 Throttle return spring
15 Accelerating pump rod
16 Automatic choke cover
17 Automatic choke body and vacuum break diaphragm
18* Enricher jet
19* Coasting air bleed I
20 Primary main jet
21 Secondary main jet
22 Secondary slow air bleed
23 Secondary slow jet
24 Plug
25 Coasting jet
26 Secondary main air bleed
27 Power valve
28 Primary main air bleed
29 Plug
30 Primary slow jet
31 Primary slow air bleed
32 Primary and secondary small venturi
33 Choke connecting rod
34 Anti-dieseling solenoid valve
35 Fast idle cam
36 Diaphragm chamber parts
37 Idle limiter cap
38 Idle adjusting screw
39 Idle adjusting screw spring
40 Throttle adjusting screw
41 Throttle adjusting screw spring
42 Primary and secondary throttle valve
43 B.C.D.D. (for Canada)

A Choke chamber
B Center body
C Throttle chamber

EF161A

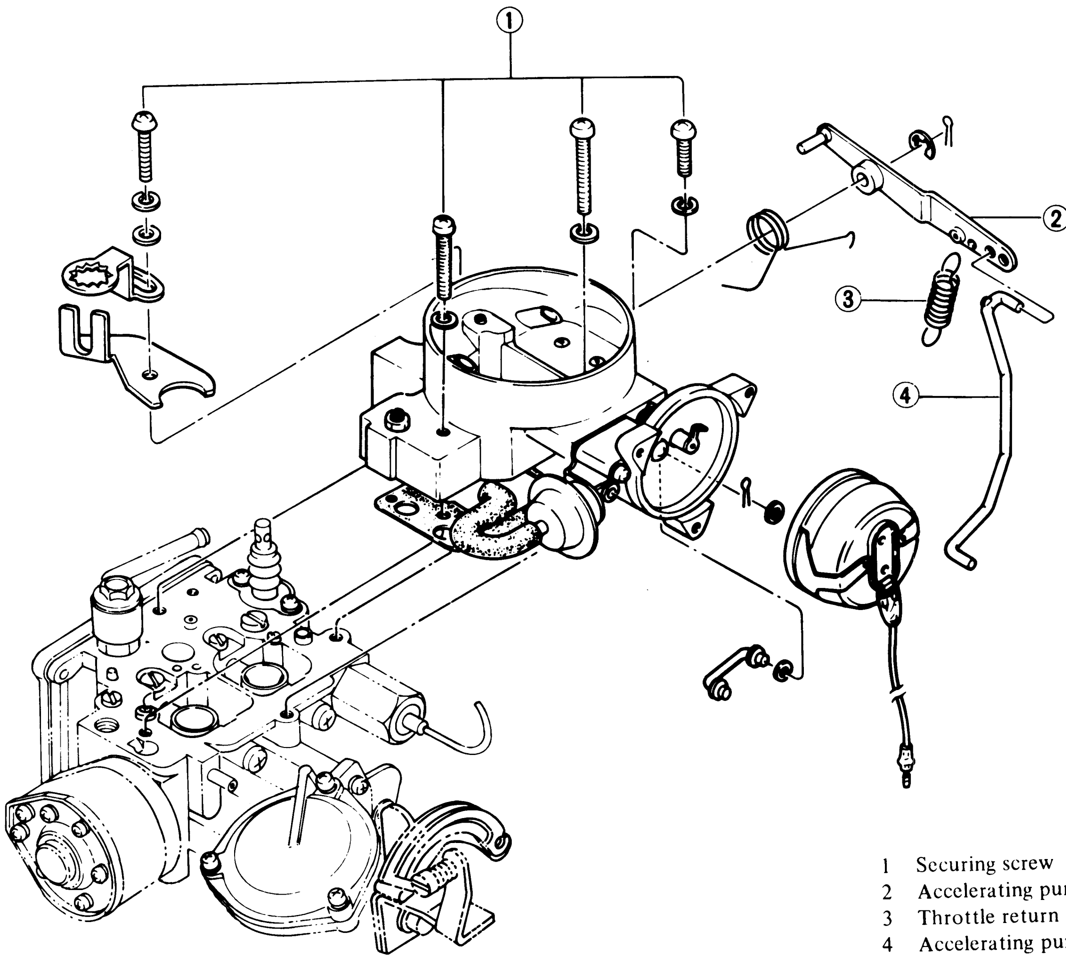
Fig. EF-80 Carburetor Parts (Non-California models)

Choke chamber parts

1. Disconnect accelerating pump rod and choke connecting rod.
2. Remove throttle return spring and vacuum hose for vacuum break diaphragm.
3. Remove four screws securing choke chamber to center body.

Choke chamber parts can then be taken out.

4. Installation is in the reverse sequence of removal.



1 Securing screw
2 Accelerating pump lever
3 Throttle return spring
4 Accelerating pump rod

EF162A

Fig. EF-81 Choke Chamber Parts

Throttle chamber parts

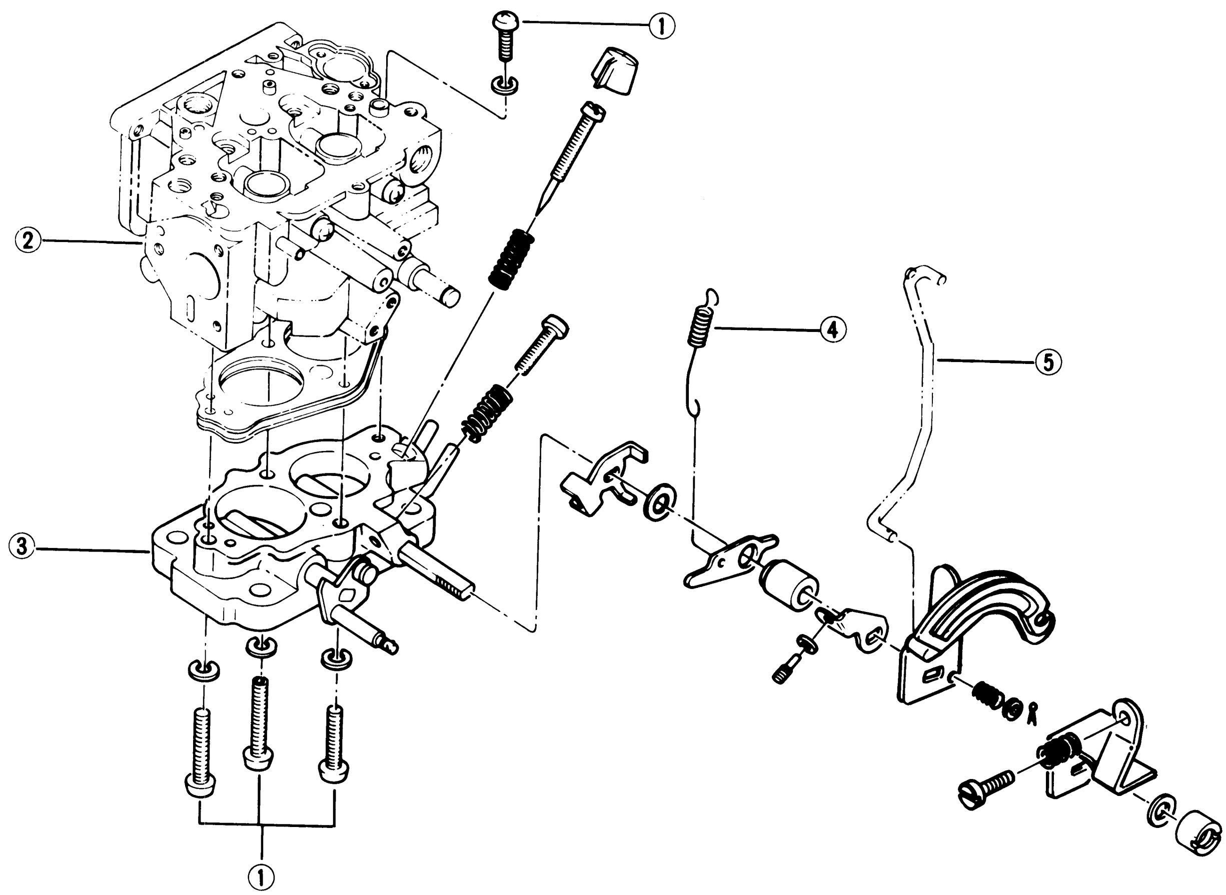
1. Remove three screws securing diaphragm chamber for secondary throttle valve.

2. Loosen four screws securing throttle chamber parts.

Throttle chamber can then be taken out.

3. Installation is in the reverse sequence of removal.

Note: One of three screws has a hole for power valve mechanism in itself. Take care not to confuse them.



1 Throttle chamber securing screws
2 Center body
3 Throttle chamber
4 Spring
5 Accelerating pump rod

EF002A

Fig. EF-82 Throttle Chamber Parts

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 malfunctions. It sometimes happens that a carburetor which has no fault appears to have some problems, when actually the electric system is at fault. Therefore, whenever the engine is malfunctioning, the electrical system should be checked first, before adjusting carburetor.

Condition	Probable cause	Corrective action
Overflow	Dirt accumulated on needle valve.	Clean needle valve.
	Fuel pump pressure too high.	Repair pump.
	Needle valve improperly seated.	Replace.
Excessive fuel consumption	Fuel overflow.	See condition "overflow".
	Slow jet too large on each main jet.	Replace.
	Main air bleed clogged.	Clean.
	Choke valve does not open fully.	Adjust.
	Outlet valve seat of accelerator pump improper.	Lap.
	Linked opening of secondary throttle valve opens too early.	Adjust.
Power shortage	Main jets clogged.	Clean.
	Every throttle valve does not open fully.	Adjust.
	Idling adjustment incorrect.	Adjust.
	Fuel filter clogged.	Repair.
	Vacuum jet clogged.	Clean.
	Air cleaner clogged.	Clean.
	Diaphragm damaged.	Replace.
	Power valve operating improperly.	Adjust.
	Altitude compensator setting incorrect (California models).	Correct H-L lever position.
Improper idling	Slow jet clogged.	Clean.
	Every throttle valve does not close.	Adjust.
	Secondary throttle valve operating improperly.	Overhaul and clean.
	Throttle valve shafts worn.	Replace.
	Packing between manifold/carburetor faulty.	Replace packing.
	Manifold/carburetor tightening improper.	Correct tightening.
	Fuel overflow.	See condition "overflow".
	B.C.D.D. adjustment incorrect. (Non-California models)	Adjust.
	Stuck dash pot.	Replace.

Condition	Probable cause	Corrective action
Engine hesitation	Main jet or slow jet clogged.	Clean.
	By-pass hole, idle passage clogged.	Clean tube.
	Emulsion tube clogged.	Clean.
	Idling adjustment incorrect.	Adjust.
	Secondary throttle valve operating improperly.	Overhaul and clean.
	Altitude compensator setting incorrect (California models).	Correct H-L lever position.
Engine does not start.	Fuel overflows.	See condition "overflow".
	No fuel.	Check pump, fuel pipe and needle valve.
	Idling adjustment incorrect.	Adjust.
	Fast idle adjustment incorrect.	Adjust.
	Damaged anti-dieseling solenoid.	Replace.
Floor temperature warning lamp lights.		
Float level (Overflow)	Dirt accumulated on needle valve.	Clean needle valve.
	Fuel pump pressure too high.	Repair pump.
	Needle valve improperly seated.	Lap or replace.
	Float damaged.	Replace.
	Fuel return tube clogged.	Replace.
Choke	Choke valve does not open fully: Electric circuit broken. Choke mechanism stuck.	 Repair or replace. Repair.
	Vacuum break diaphragm broken.	Replace.
	Fast idle adjustment incorrect.	Adjust.
Normal fuel supply system (Primary & secondary)	Main jet or slow jet clogged or loose.	Clean or tighten.
	Main air bleed or slow air bleed emulsion tube clogged.	Clean.
	Damaged anti-dieseling solenoid.	Repair or replace.
	Idling adjustment incorrect.	Adjust.
	Secondary throttle valve operating improper: Diaphragm broken. Vacuum jet clogged. Valve mechanism broken.	 Replace. Clean. Repair or replace.
Accelerating pump	Accelerating pump mechanism operating improperly.	Repair.
Power valve	Power valve operating improperly.	Repair.
B.C.D.D.	B.C.D.D. adjustment incorrect. (Non-California models)	Adjust.

Condition	Probable cause	Corrective action
Fuel filter	Fuel filter clogged.	Replace.
Air cleaner	Air cleaner filter clogged.	Replace filter.
Fuel tank	No fuel.	Refuel.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

CARBURETOR

		California models				Non-California models			
		Manual transmission		Automatic transmission		Manual transmission		Automatic transmission	
Type		DCH340-95		DCH340-96		DCH340-97		DCH340-98	
		Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
Outer diamter	mm (in)	30 (1.18)	34 (1.34)	30 (1.18)	34 (1.34)	30 (1.18)	34 (1.34)	30 (1.18)	34 (1.34)
Venturi diameter	mm (in)	24 (0.94)	31 (1.22)	24 (0.94)	31 (1.22)	23 (0.91)	30 (1.18)	23 (0.91)	30 (1.18)
Main jet		#101	#158	#101	#158	#103	#160	#103	#160
Main air bleed		#70	#60	#70	#60	#60	#60	#60	#60
Slow jet		#48	#70	#48	#70	#48	#70	#48	#70
Power valve		#40		#40		#43		#43	

INSPECTION AND ADJUSTMENT

A.T.C. AIR CLEANER

Air control valve partially opens °C (°F) .... 30 to 54 (86 to 129)

Air control valve fully opens °C (°F) .... Above 55 (131)

IDLE COMPENSATOR

Idle compensator partially opens °C (°F)

Bi-metal No. 1 .... 60 to 70 (140 to 158)

Bi-metal No. 2 .... 70 to 90 (158 to 194)

Idle compensator fully opens °C (°F)

Bi-metal No. 1 .... Above 70 (158)

Bi-metal No. 2 .... Above 90 (194)

MECHANICAL FUEL PUMP

Fuel pressure kg/cm² (psi) .... 0.21 to 0.27 (3.0 to 3.9)

Fuel pump capacity cc (cu in)/min. at rpm .... 1,000 (61.02)/1,000

ELECTRIC FUEL PUMP (Air conditioner equipped models)

Fuel pressure kg/cm² (psi) .... 0.32 (4.6) or below

Fuel pump capacity cc (cu in)/min 1,400 (85.4)

CARBURETOR

Model	California models		Non-California models	
	Manual transmission	Automatic transmission	Manual transmission	Automatic transmission
Idle rpm and mixture ratio Ignition timing/Idle speed/CO% at air off	12° B.T.D.C./600 rpm CO 1% $^{+1}_{-0.7}$	12° B.T.D.C./600 rpm in "D" position CO 1% $^{+1}_{-0.7}$	12° B.T.D.C./ 600 rpm CO 1% $^{+1}_{-0.7}$	12° B.T.D.C./600 rpm in "D" position CO 1% $^{+1}_{-0.7}$
Fuel level adjustment Fuel level (from top of carburetor body) mm (in) H'	23 (0.91)	23 (0.91)	23 (0.91)	23 (0.91)
Gap between valve stem and float seat mm (in) H	7.2 (0.283)	7.2 (0.283)	7.2 (0.283)	7.2 (0.283)
h	1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)
Bi-metal setting Bi-metal setting	Center of the index mark		Center of the index mark	
Bi-metal resistance [at 21°C (70°F)] Ω	3.7 to 8.9	3.7 to 8.9	3.7 to 8.9	3.7 to 8.9
Fast idle adjustment (Fast idle cam, first step) Gap between throttle valve and carburetor body mm (in)	1.33 to 1.47 (0.052 to 0.058)	1.58 to 1.72 (0.062 to 0.068)	1.33 to 1.47 (0.052 to 0.058)	1.58 to 1.72 (0.062 to 0.068)
Fast idle speed (at 2nd cam step) rpm	1,900 to 2,800	2,200 to 3,200 (in "N" position)	1,900 to 2,800	2,200 to 3,200 (in "N" position)
Vacuum break adjustment Gap between choke valve and carburetor body mm (in)	1.50 (0.0591)	1.50 (0.0591)	1.75 (0.0689)	1.75 (0.0689)
Choke unloader adjustment Gap between choke valve and carburetor body mm (in)	2.45 (0.0965)	2.45 (0.0965)	2.45 (0.0965)	2.45 (0.0965)
Interlock opening of primary and secondary throttle valves mm (in)	7.38 (0.2906)	7.38 (0.2906)	7.38 (0.2906)	7.38 (0.2906)
Dash pot adjustment (without loading) rpm	1,900 to 2,100	1,650 to 1,850	1,900 to 2,100	1,650 to 1,850
B.C.D.D. operating pressure [0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure] mmHg (inHg)	–	–	−560 ±20 (−22.05 ±0.79)	−560 ±20 (−22.05 ±0.79)
B.C.D.D. mixture adjustment CO % at air off	–	–	2.0 ±1.0	2.0 ±1.0
Fuel shut-off valve operating pressure [0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure] mmHg (inHg)	−600 ±20 (−23.62 ±0.79)	−600 ±20 (−23.62 ±0.79)	–	–

TIGHTENING TORQUE

Anti-dieseling solenoid valve	kg-m (ft-lb)	1.8 to 3.5 (13 to 25)
B.C.D.D.	kg-cm (in-lb)	20 to 40 (17 to 35)

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EC

EMISSION CONTROL SYSTEM

EC

GENERAL DESCRIPTION .... EC- 2

CRANKCASE EMISSION CONTROL SYSTEM .... EC- 4

EXHAUST EMISSION CONTROL SYSTEM .... EC- 5

EVAPORATIVE EMISSION CONTROL SYSTEM EC-23

SERVICE DATA AND SPECIFICATIONS EC-26

SPECIAL SERVICE TOOLS EC-27

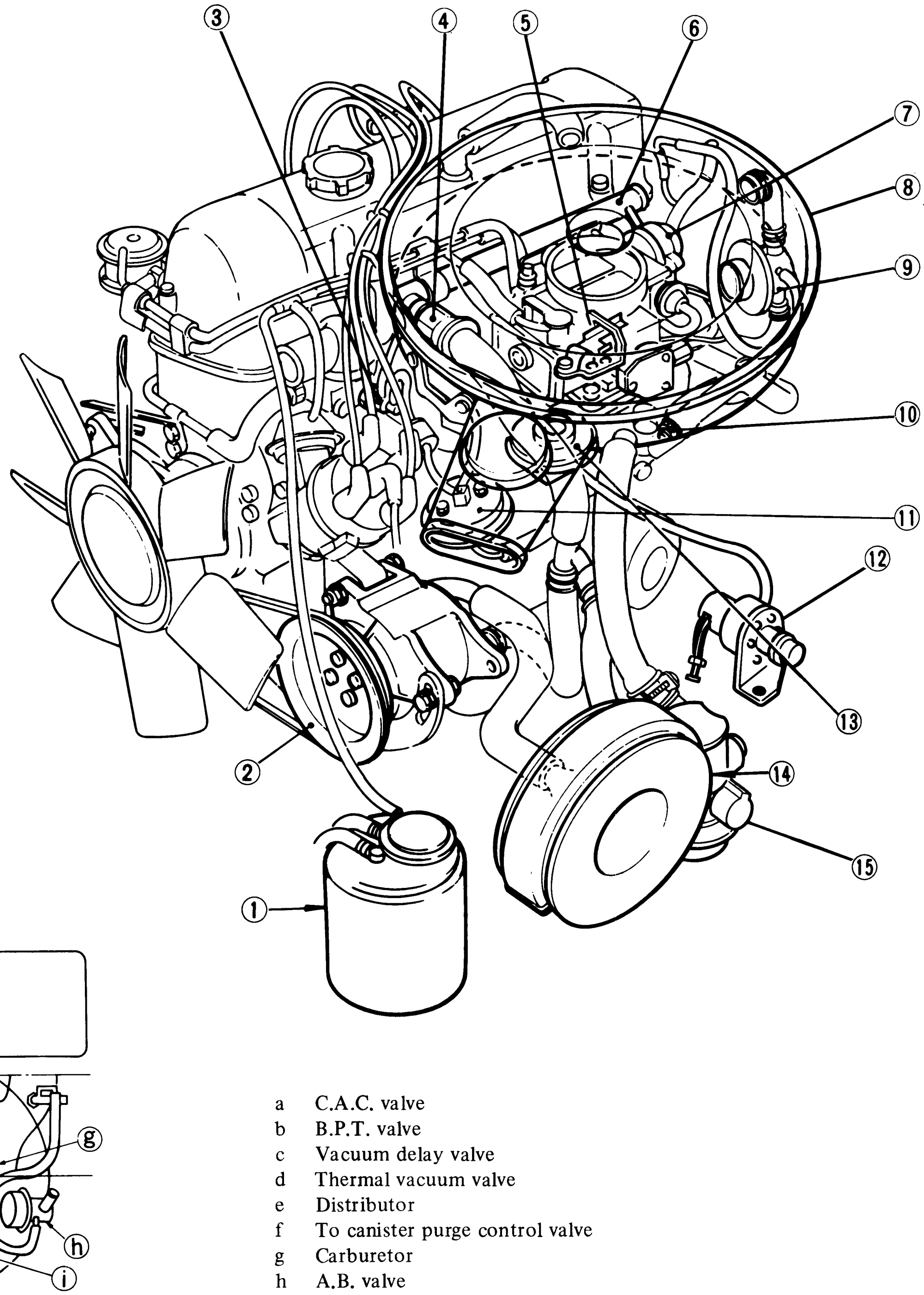
GENERAL DESCRIPTION

There are three types of control system. These are:

1. Closed type crankcase emission control system
2. Exhaust emission control system
3. Evaporative emission control system

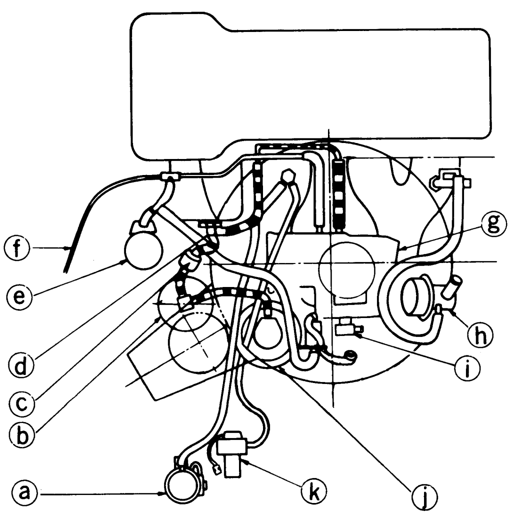
Periodic inspection and required servicing of these systems should be carried out to reduce harmful emissions to a minimum.

CALIFORNIA MODELS



1 Carbon canister
2 Air pump
3 Thermal vacuum valve
4 Check valve
5 Altitude compensator
6 Air gallery pipe
7 Automatic choke
8 A.T.C. air cleaner
9 A.B. valve
10 P.C.V. valve
11 B.P.T. valve
12 Fuel shut-off vacuum switch
13 E.G.R. control valve
14 Air pump air cleaner
15 C.A.C. valve

EC125A

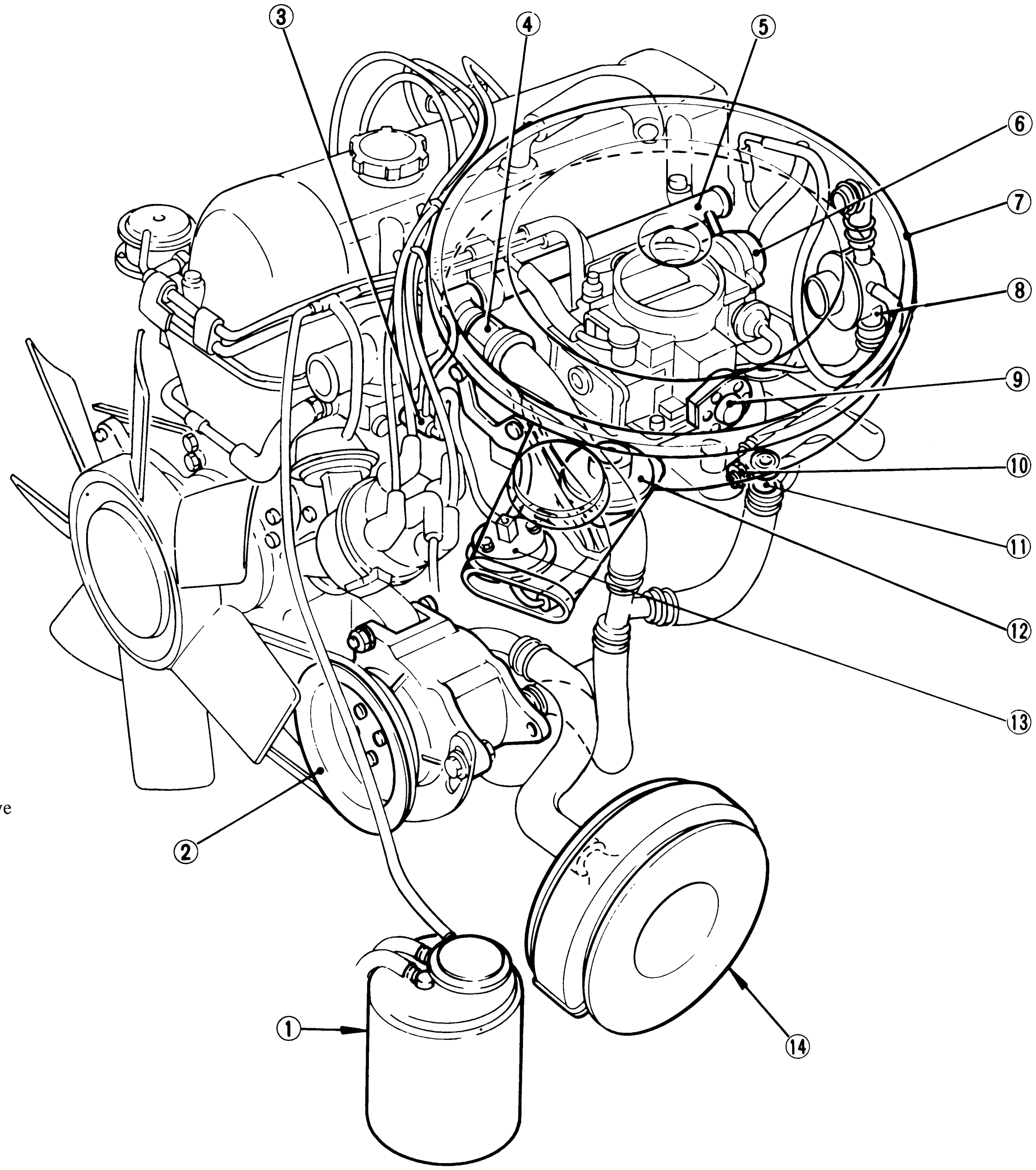


EC130A

a C.A.C. valve
b B.P.T. valve
c Vacuum delay valve
d Thermal vacuum valve
e Distributor
f To canister purge control valve
g Carburetor
h A.B. valve
i Intake manifold vacuum take-out port
j E.G.R. valve
k Fuel shut-off control valve

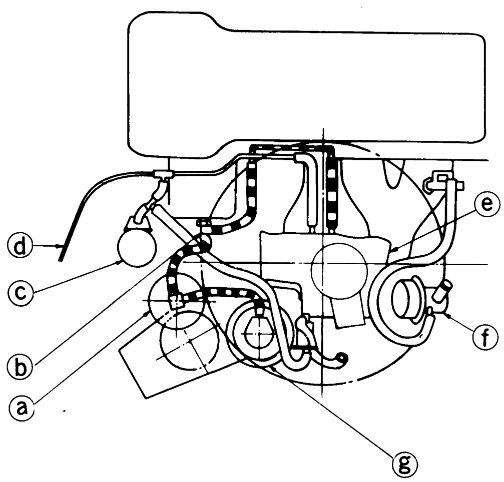
Fig. EC-1 Emission Control System (California models)

NON-CALIFORNIA MODELS



1 Carbon canister
2 Air pump
3 Thermal vacuum valve
4 Check valve
5 Air gallery pipe
6 Autmatic choke
7 A.T.C. air cleaner
8 A.B. valve
9 B.C.D.D.
10 P.C.V. valve
11 Air relief valve
12 E.G.R. control valve
13 B.P.T. valve
14 Air pump air cleaner

EC131A



a B.P.T. valve
b Thermal vacuum valve
c Distributor
d To canister purge control valve
e Carburetor
f A.B. valve
g E.G.R. valve

EC126A

Fig. EC-2 Exhaust Emission Control System (Non-California models)

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

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

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

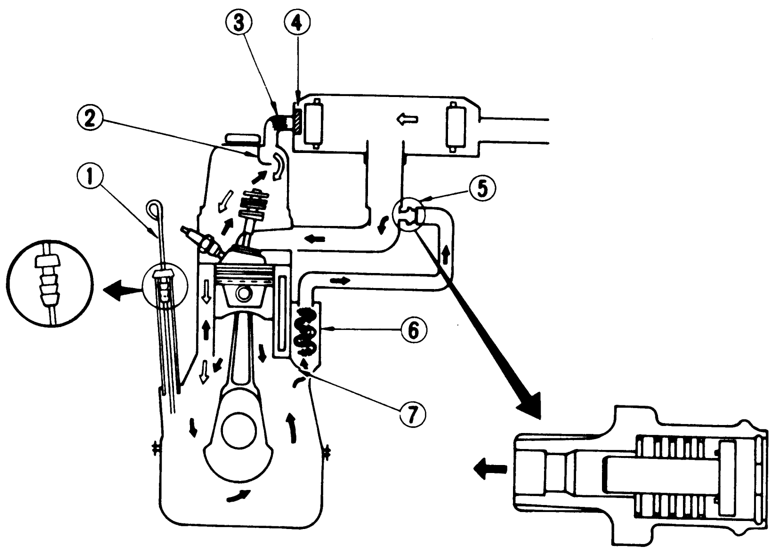
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

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

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

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the 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 carburetor air cleaner under all conditions.



⇨ Fresh air

➡ Blow-by gas

1 Seal type oil level gauge
2 Baffle plate
3 Flame arrester
4 Filter
5 P.C.V. valve
6 Steel net
7 Baffle plate

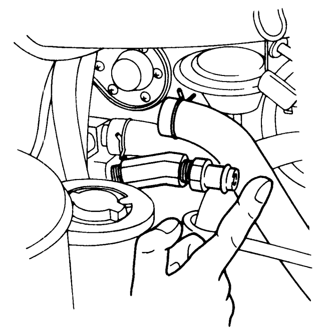
EC871

Fig. EC-3 Crankcase Emission Control System

INSPECTION

P.C.V. VALVE AND FILTER

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



EC241A

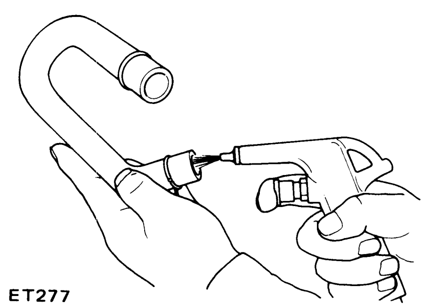
Fig. EC-4 Checking P.C.V. Valve

VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between air cleaner and rocker cover.



ET277

Fig. EC-5 Cleaning Ventilation Hose

EXHAUST EMISSION CONTROL SYSTEM

CONTENTS

DESCRIPTION .... EC- 5
AIR INJECTION SYSTEM (A.I.S.) .... EC- 5
DESCRIPTION .... EC- 5
REMOVAL AND INSTALLATION .... EC- 9
DISASSEMBLY AND ASSEMBLY OF AIR PUMP EC-11
INSPECTION EC-13
EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM EC-15
DESCRIPTION EC-15
OPERATION EC-16
REMOVAL AND INSTALLATION EC-17
INSPECTION EC-18
CATALYTIC CONVERTER (California models) EC-20
DESCRIPTION EC-20
OPERATION EC-20
REMOVAL AND INSTALLATION EC-20
INSPECTION EC-20
FLOOR TEMPERATURE WARNING SYSTEM EC-21
DESCRIPTION EC-21
OPERATION EC-21
REMOVAL AND INSTALLATION EC-21
INSPECTION EC-22

DESCRIPTION

The exhaust emission control system is made up of the following:

Emission control system \ Component	California models	Non-California models (Except Canada)	Canada models
Air injection system	Air pump Check valve A.B. valve C.A.C. valve	Air pump Check valve A.B. valve Air relief valve	Air pump Check valve A.B. valve Air relief valve
E.G.R. system	E.G.R. control valve Thermal vacuum valve B.P.T. valve Vacuum delay valve	E.G.R. control valve Thermal vacuum valve B.P.T. valve	E.G.R. control valve Thermal vacuum valve B.P.T. valve
Catalyst	Catalytic converter	–	–

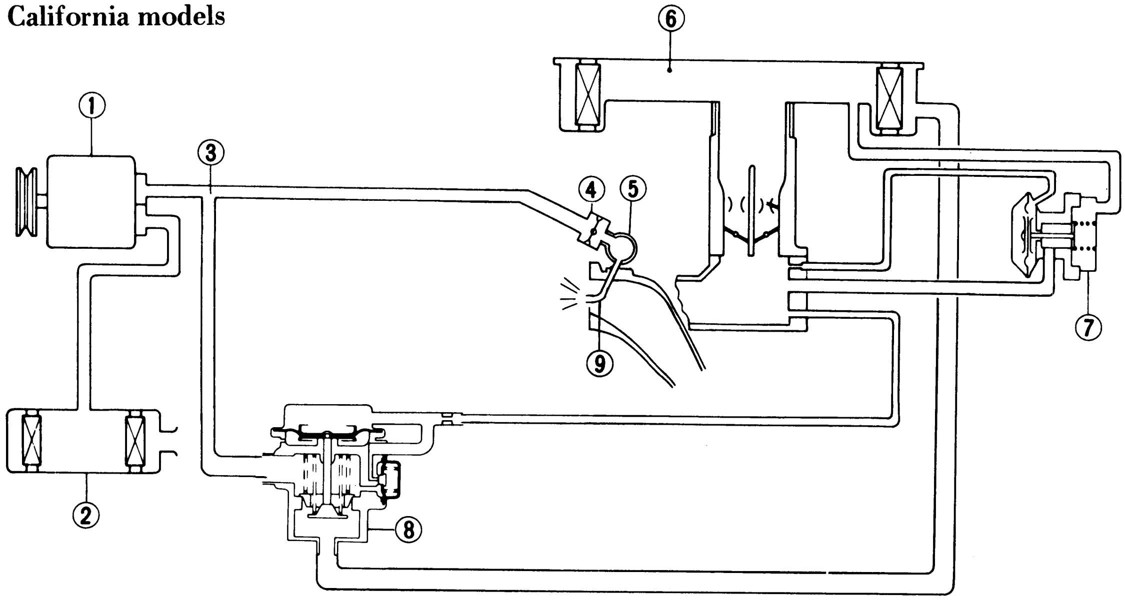
AIR INJECTION SYSTEM (A.I.S.)

DESCRIPTION

The Air Injection System (A.I.S.) is designed to inject compressed air (secondary air) coming from the air pump into the exhaust manifold to reduce hydrocarbons (HC) and carbon monoxide (CO) in exhaust gas through recombustion. There are two types of A.I.S.

Fresh outside air is drawn by the air pump through the air pump air cleaner. Compressed air is injected into the exhaust manifold through the check valve.

California models



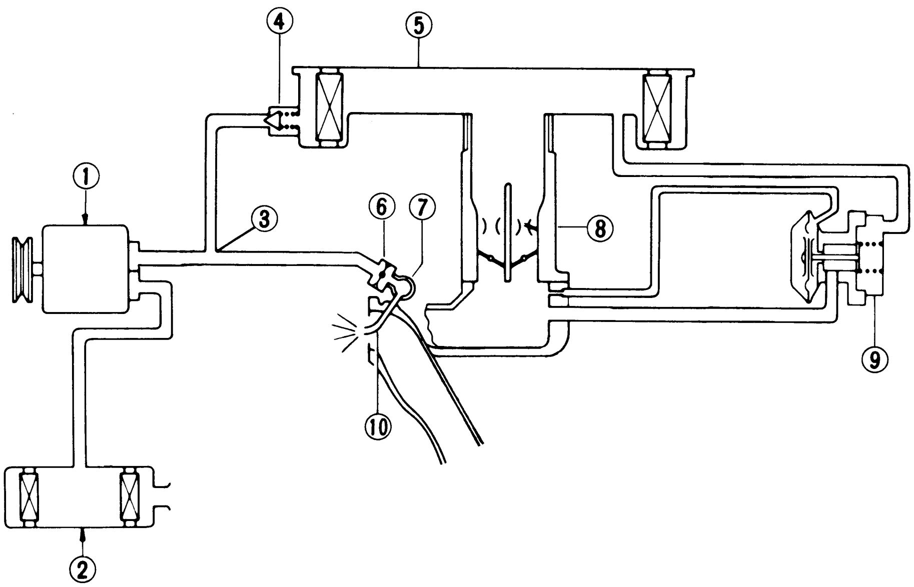
1 Air pump
2 Air pump air cleaner
3 3-way connector
4 Check valve
5 Air gallery pipe
6 Air cleaner
7 A.B. valve
8 C.A.C. valve
9 Injection nozzle

EC873

Fig. EC-6 Air Injection System (California models)

The non-California type air injection system consists of an A.B. valve, a check valve, an air relief valve and an air pump.

Non-California models



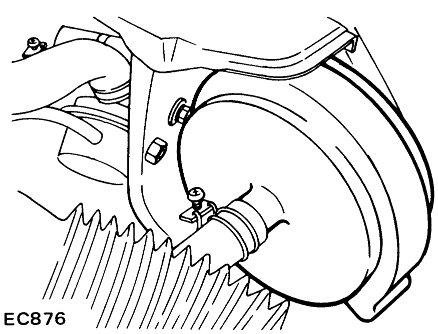
1 Air pump
2 Air pump air cleaner
3 3-way connector
4 Air relief valve
5 Air cleaner
6 Check valve
7 Air gallery pipe
8 Carburetor
9 A.B. valve
10 Injection nozzle

EC127A

Fig. EC-7 Air Injection System (Non-California models)

Air pump air cleaner

The air cleaner filter is a viscous paper type, and requires periodic replacement. The air pump air cleaner is installed on a bracket at the left front of the hoodledge.



EC876

Fig. EC-8 Air Pump Air Cleaner

Air pump

The air pump has two positive displacement vanes which requires no lubricating service.

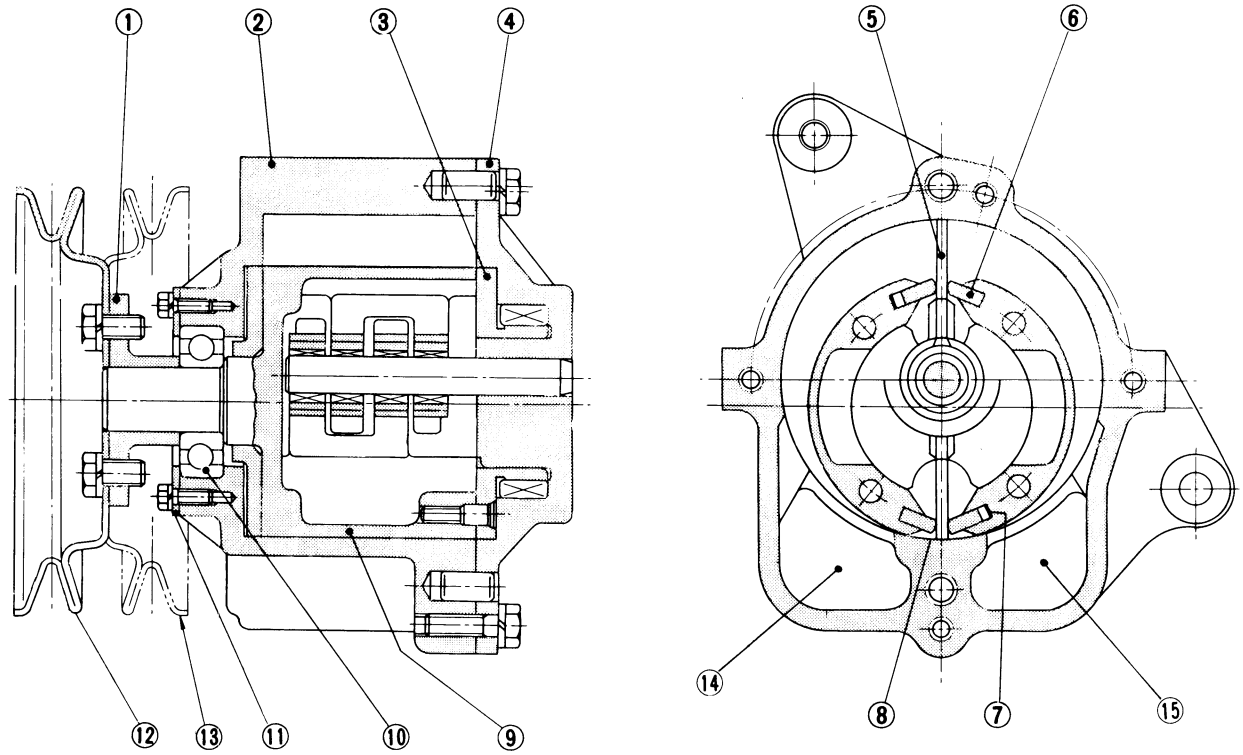
The vanes rotate freely around the off-center pivot pin, and follow the circular-shaped pump bore. The vanes form two chambers in the housing. Each vane completes a pumping cycle in every revolution of the rotor. Air is drawn into the inlet cavity through a tube connected to the air pump air cleaner. Air is sealed between the vanes and moved into a smaller cavity (the compression area).

After compression, a vane passes the outlet cavity. Subsequently it passes the stripper and a section of the housing that separates the outlet and inlet cavities and again reaches the inlet cavity to repeat the pumping cycle.

Carbon shoes (in the slots of the rotor) support the vanes. They are designed to permit sliding of the vanes and to seal the rotor interior from the air cavities. Leaf springs which are behind the leading-side of the shoes compensate for shoe abrasion.

The vane uses needle bearings. All bearings have been greased.

There are two types of bearing which support the rotor. Ball bearing is used for the front one and the needle bearing is used for the rear. See Fig. EC-9.



1 Air pump drive hub
2 Housing
3 Rotor ring
4 End cover (with needle bearing)
5 Vane
6 Carbon shoe
7 Shoe spring
8 Stripper
9 Rotor shaft
10 Ball bearing
11 Front bearing cover
12 Pulley
13 Pulley (for air conditioner)
14 Inlet cavity
15 Outlet cavity

EC066A

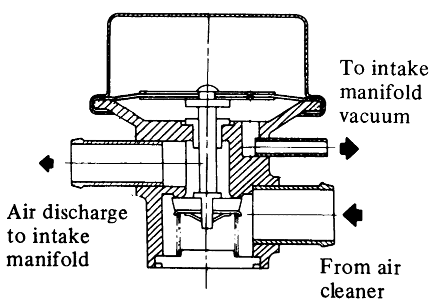
Fig. EC-9 Air Pump

Anti-backfire (A.B.) valve

This valve is controlled by intake manifold vacuum to prevent backfire in the exhaust system at the initial period of deceleration.

At this period, the mixture in the intake manifold becomes too rich to ignite and burn in the combustion chamber and burns easily in the exhaust system with injected air in the exhaust manifold.

The A.B. valve provides air to the intake manifold to make the air-fuel mixture leaner and prevents backfire.



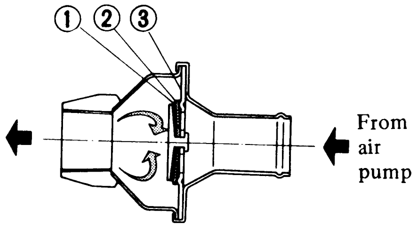
EC069

Fig. EC-10 A.B. Valve

Check valve

A check valve is located in the air pump discharge lines. The valve prevents the backflow of exhaust gas which occurs in one of the following cases.

1. When the air pump drive belt fails.
2. When relief valve spring fails.



1 Spring
2 Rubber valve
3 Seat

Secondary air
Exhaust gas

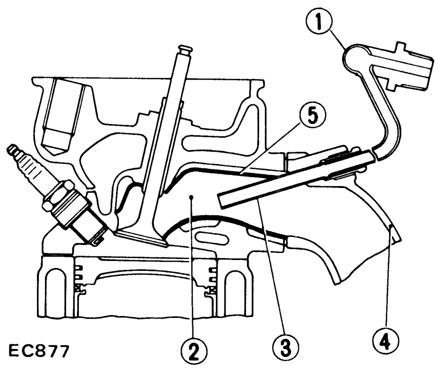
EC292

Fig. EC-11 Check Valve

Air gallery pipe, air injection nozzle and exhaust port liner

The secondary air fed from the air pump goes through the check valve to the air gallery pipe where it is distributed to each exhaust port. The secondary air is then injected from the air injection nozzle into the exhaust port near the exhaust valve.

An iron liner is cast with each exhaust port to help maintain a high exhaust gas temperature and to promote burning of remaining HC and CO with secondary air.



EC877

1 Air gallery
2 Exhaust port
3 Air injection nozzle
4 Exhaust manifold
5 Port liner

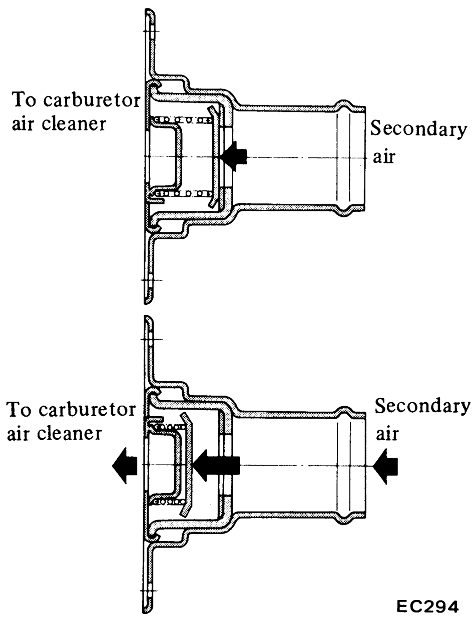
Fig. EC-12 Air Injection into Exhaust Port

Air pump relief valve (Non-California mooels)

The air pump relief valve controls the injection of the secondary air into the exhaust system when the engine is running at high speed under a heavily loaded condition. It accomplishes the following functions without affecting the effectiveness of the exhaust emission control system.

1. Minimizes horsepower losses resulting from air injection into the exhaust system.
2. Protects pump from excessive back pressure.

The air pump relief valve is installed at the bottom of the air cleaner.



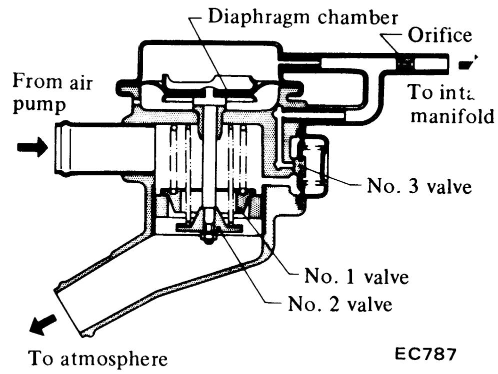
EC294

Fig. EC-13 Air Pump Relief Valve

Combined air control (C.A.C.) valve (California models)

The combined air control (C.A.C.) valve controls the amount of secondary air injected into the exhaust manifold according to engine condition and keeps the catalytic converter temperature in proper range.

This valve is operated by intake manifold vacuum and air pump discharge pressure. When intake manifold vacuum is small or in the high-load range, the No. 2 valve opens; when it is great or in the low-load range, the No. 1 valve opens. If air pump discharge pressure is large or the engine is running at a high speed, the No. 3 valve opens, admitting the air pump discharge pressure to the No. 2 diaphragm chamber of the C.A.C. valve and opening the No. 2 valve. At this point, the No. 2 valve serves as a relief valve.

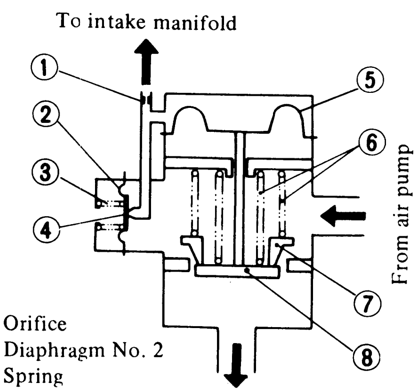


EC787

Fig. EC-14 C.A.C. Valve

(1) Engine in "low speed" and "light load"

When the engine is operating under these conditions, intake vacuum is high. The No. 2 valve (unitized with the No. 1 diaphragm) is lifted by the intake manifold vacuum, pushing up the No. 1 valve. These valves will then stop at a position where a balanced condition exists between air pump discharge pressure and spring tension acting on the No. 1 and No. 2 valves. The No. 2 diaphragm, however, does not move due to low engine speed, low air pump discharge pressure and spring tension acting on the No. 3 valve. For this reason, these valves are brought to a balanced condition.



1 Orifice
2 Diaphragm No. 2
3 Spring
4 Valve No. 3
5 Diaphragm No. 1
6 Spring
7 Valve No. 1
8 Valve No. 2

EC683

Fig. EC-15 Operation of C.A.C. Valve

(2) Engine in "low speed" and "heavy load"

When the engine is operating under these conditions, intake manifold vacuum is low, and all valves are balanced at a position shown below.

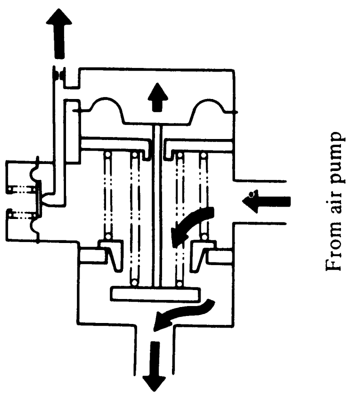


Fig. EC-16 Operation of C.A.C. Valve

(3) Engine in "high speed" and "light load"

When the engine is operating under these conditions, intake manifold vacuum is low. The No. 3 valve moves to the left because of high air pump discharge pressure. All valves are balanced at a position shown below.

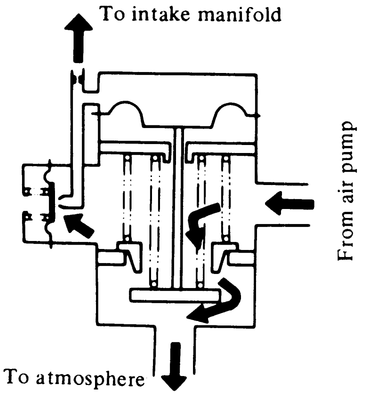


Fig. EC-17 Operation of C.A.C. Valve

REMOVAL AND INSTALLATION

Air pump air cleaner

Loosen nuts securing air pump air cleaner to bracket, then detach air cleaner from bracket. Air cleaner filter and air cleaner lower body are built into a unit construction. Replace air cleaner filter and lower body as an assembly.

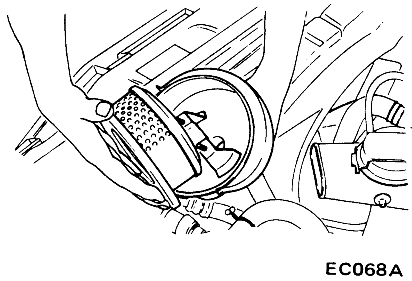


Fig. EC-18 Replacing Air Cleaner Filter

Air pump

1. Remove air hoses from air pump.
2. Remove air pump pulley.
3. Loosen air pump adjusting bar mounting bolts and air pump mounting bolts, then remove air pump drive belt.
4. Air pump assembly can be taken out from bracket.
5. Installation is in the reverse sequence of removal.

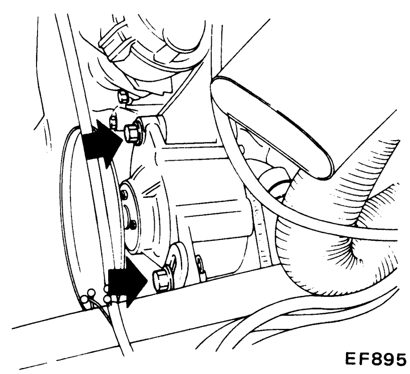


Fig. EC-19 Removing Air Pump

Ⓣ Tightening torque:
Air pump pulley bolts
0.75 to 0.90 kg-m
(5.4 to 6.5 ft-lb)

Check valve

1. Remove air cleaner assembly. Check valve can then be seen.
2. Disconnect air hose from check valve.
3. Remove check valve from air gallery pipe.

Note: Double wrench action is necessary for this stage.

4. Installation is in the reverse sequence of removal.

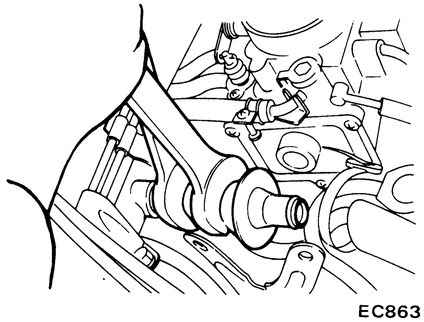


Fig. EC-20 Removing Check Valve

Air gallery pipe and injection nozzles

It is very difficult to remove the air gallery pipe from the exhaust manifold without bending the pipe, which could result in fractures or leakage. Therefore, removal of the air gallery pipe and injection nozzles should be undertaken only when they are damaged.

1. Remove air cleaner.
2. Lubricate around the connecting portion of air injection nozzle and air gallery with engine oil.
3. Remove flare nuts connecting air gallery to exhaust manifold. Air gallery with check valve can then be taken out.

Note:

a. Apply engine oil to screws several times during above work.
b. Be careful not to damage other parts.

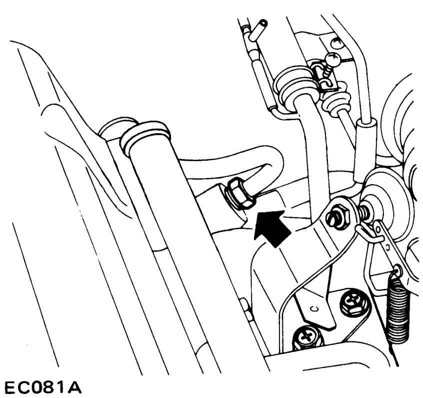


Fig. EC-21 Removing Air Gallery

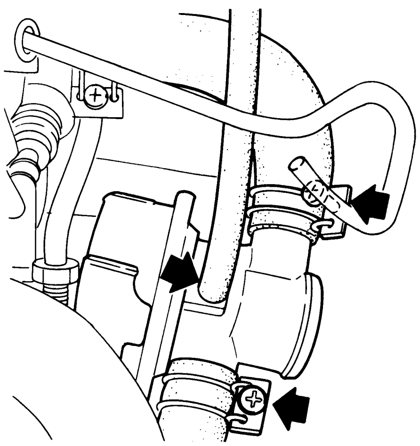
4. Injection nozzle is located in threaded hole where air gallery is fastened. Injection nozzle can be picked up from exhaust manifold.
5. Installation is in the reverse sequence of removal.

Check cylinder head, air injection nozzle and air gallery for leaks with engine running.

Ⓣ **Tightening torque:**
Air gallery flare nuts
5.0 to 5.9 kg-m
(36 to 43 ft-lb)

A.B. valve

A.B. valve is located at the rear side of air cleaner. Remove air hoses and vacuum tube. Then the A.B. valve can be taken out.

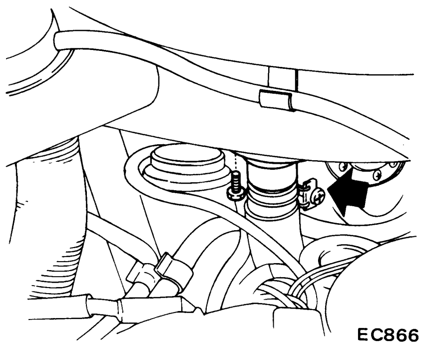


EC069A

Fig. EC-22 Removing A.B. Valve

Air pump relief valve (Non-California models)

1. Loosen clamp of air hose and disconnect air hose from relief valve.
2. Remove screws securing relief valve to air cleaner. Relief valve can then be taken out easily.
3. Installation is in the reverse sequence of removal.



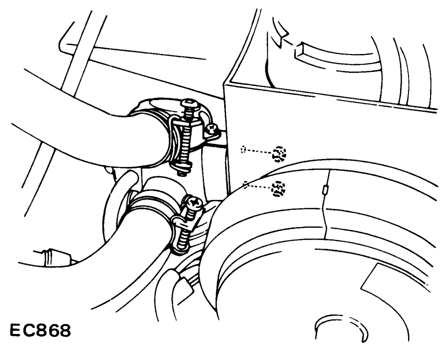
EC866

Fig. EC-23 Removing Air Pump Relief Valve

C.A.C. valve (California models)

C.A.C. valve is located beneath control device bracket.

1. Remove clamps and disconnect air hoses and vacuum tube.
2. Remove screws securing C.A.C. valve. Air control valve can then be taken out easily.
3. Installation is in the reverse sequence of removal.



EC868

Fig. EC-24 Removing C.A.C. Valve

DISASSEMBLY AND ASSEMBLY OF AIR PUMP

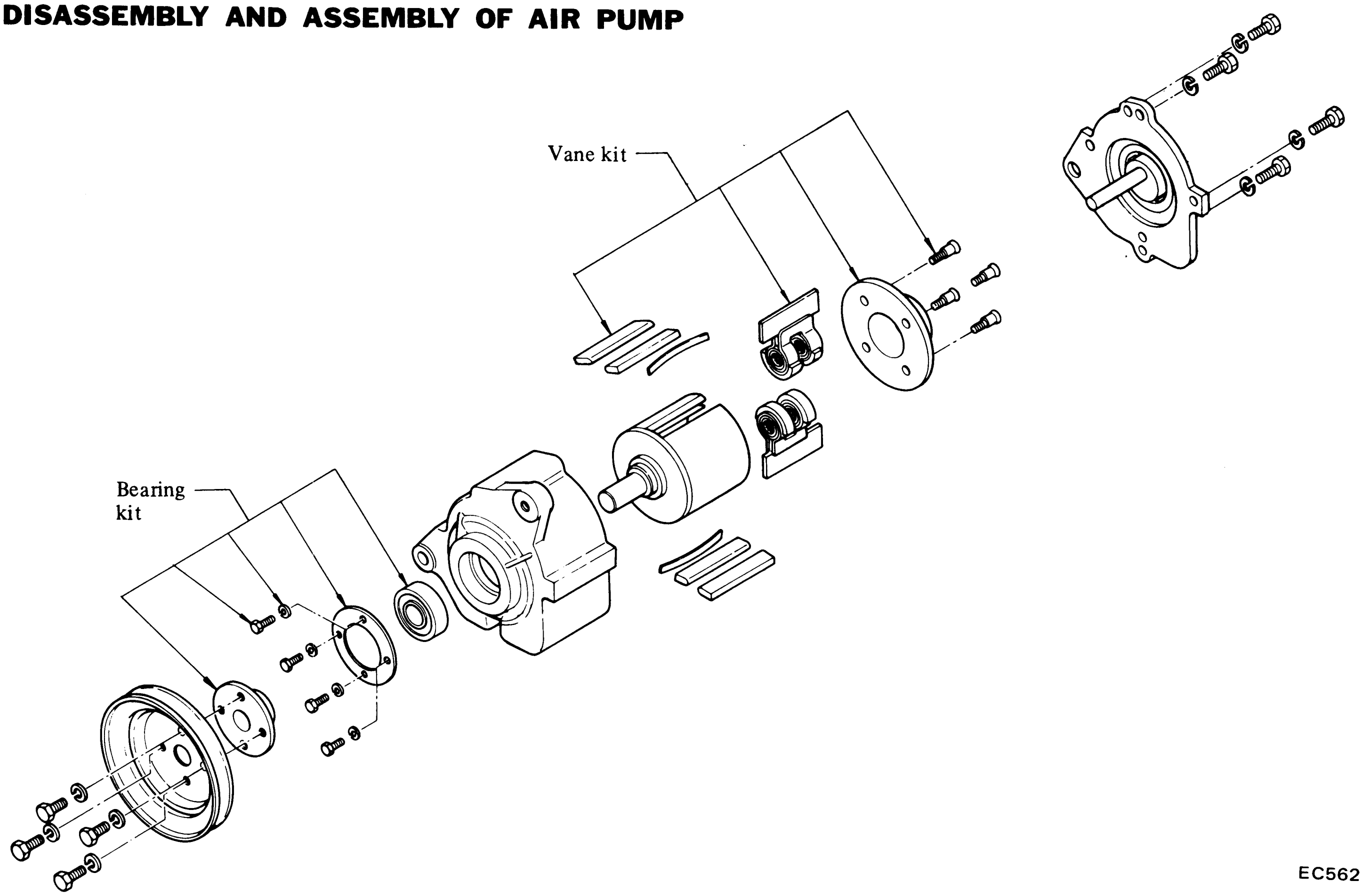


Fig. EC-25 Components of Air Pump

Disassembly

1. Remove pulley drive bolts and remove pulley from hub.
2. Secure air pump drive hub in a vise, and remove four end cover bolts.

CAUTION:
Never clamp on the aluminum housing.

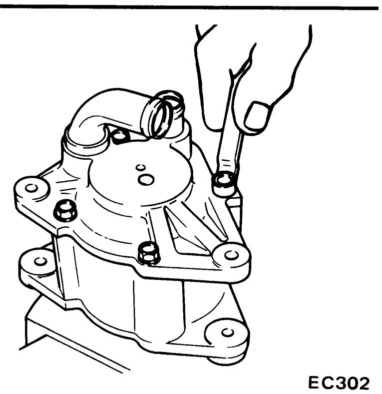


Fig. EC-26 Removing Cover

3. Remove end cover by carefully tapping around dowel pin with a plastic mallet and lift up straight.

4. Put match marks "O" on rotor ring and side of rotor to ensure correct reassembly and remove screws that retain rotor ring to rotor, using a Hexagon Wrench ST19810000.

Note:

a. **Generally, match marks are indicated on both rotor ring and rotor by the manufacturer.**

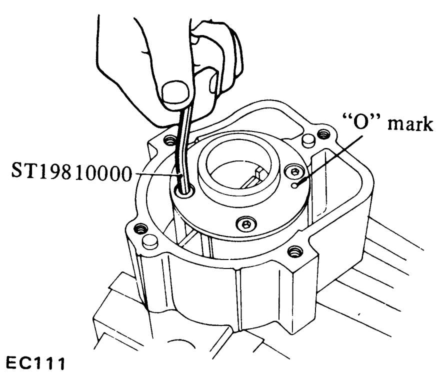


Fig. EC-27 Removing Rotor Ring

b. **Discard screws which were removed. Always use new ones when installing.**

5. Remove vane from rotor.

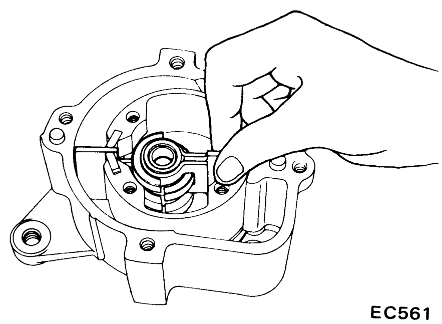


Fig. EC-28 Removing Vanes

6. Remove carbon shoes and shoe springs from rotor using needle nose pliers or tweezers.

Note: **Carbon shoe "A" is 1 mm (0.04 in) wider than "B". Do not confuse them.**

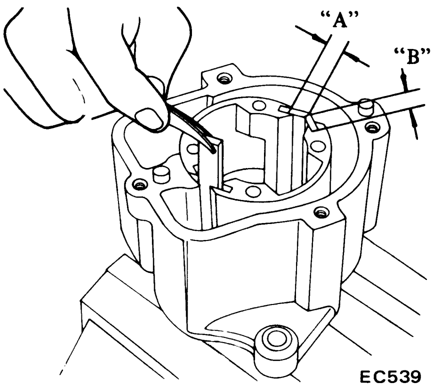


Fig. EC-29 Removing Shoe Springs

If replacement of front bearing is necessary, proceed as follows:

7. Remove air pump drive hub with standard puller.

8. Remove screws securing front bearing cover in place, and detach bearing cover.

9. Support the rear end face of air pump housing with Rotor Adapter ST19890000. Drive rotor out by pushing rotor shaft with Bearing Pressing Tool ST19940000.

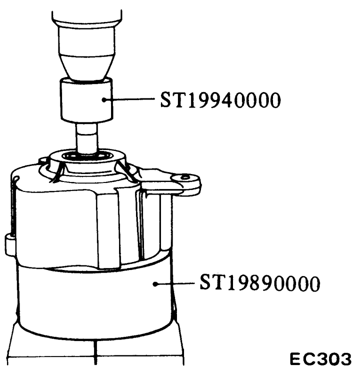


Fig. EC-30 Removing Rotor Shaft

10. Support the front end face of housing with Bearing Stand ST19930000. Attach Bearing Driver ST19910000 to front bearing on the inside of air pump housing, and press out.

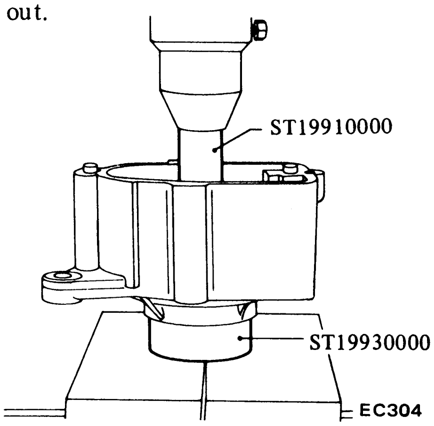


Fig. EC-31 Removing Ball Bearing

11. Keep disassembled parts in order.

Assembly

1. Front bearing

Support the rear end face of air pump housing with Rotor Adapter ST19890000. Press front bearing into place with a press and Bearing Pressing Tool ST19940000.

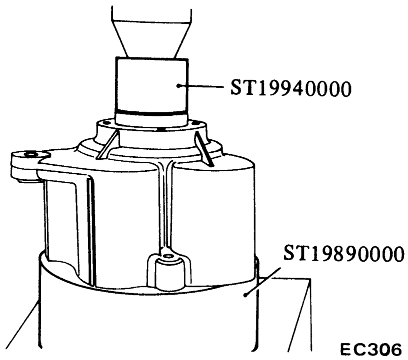


Fig. EC-32 Pressing Ball Bearing

2. Bearing cover

Tighten bearing cover securing bolts.

Ⓣ Tightening torque:
Bearing cover securing bolts
0.1 to 0.2 kg-m
(0.7 to 1.4 ft-lb)

3. Rotor shaft

Support the inward bottom of rotor with Rotor Stand ST19920000.

Press rotor into place with a press and Bearing Driver ST19910000 until the stepped portion of rotor shaft touches front bearing inner race.

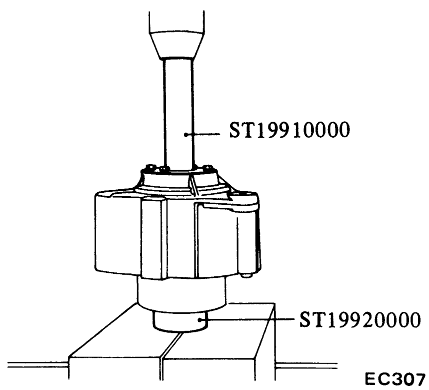


Fig. EC-33 Pressing Rotor Shaft

Note:

a. **Be sure to drive front bearing inner race in.**

b. **After rotor is installed in place, ensure that the rotor end is positioned below the end face of air pump housing.**

Position of rotor end below air pump housing:
0.050 to 0.150 mm
(0.0020 to 0.0059 in)

4. Air pump drive hub

Support the inward bottom of rotor with Rotor Stand ST19920000.

Press drive hub into place with a press and Bearing Driver ST19910000 until the end face of drive hub touches front bearing inner race.

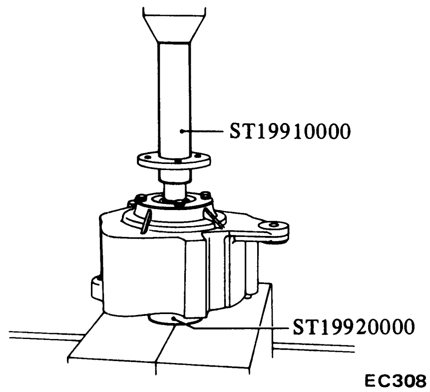


Fig. EC-34 Pressing Air Pump Drive Hub

5. Carbon shoe

(1) Place air pump drive hub in a vise.

(2) Clean carbon, dust, etc. from shoe grooves.

(3) Align rotor with housing properly. Then insert carbon shoes into place, noting their directions.

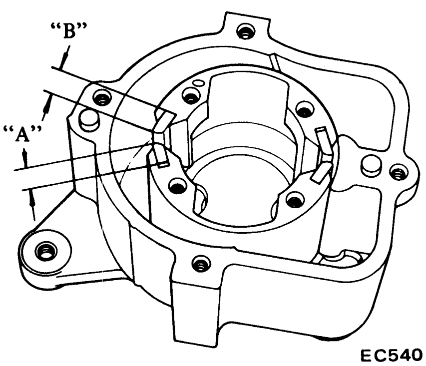


Fig. EC-35 Installing Carbon Shoe

Note:

a. **Carbon shoe "A" is 1 mm (0.04 in) wider than "B". Do not confuse them.**

b. **If carbon shoes are exposed beyond the rotor end face, remove carbon**

shoes and clean shoe grooves. Reassemble carbon shoes.

6. Vane

(1) Pack vane bearing with high melting-point grease (MIL-G-3545 A, Esso ANDOK260 or equivalent), and insert dummy shaft into the vane bearing.

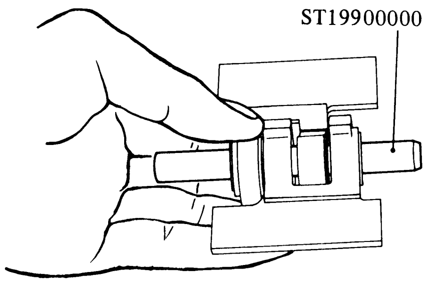


Fig. EC-36 Vane Assembly

(2) Install vane in place on rotor, using Dummy Shaft ST19900000 as a guide.

Note: **The vanes may require 6 to 16 km (4 to 10 miles) wear-in running time. In the event a slight squeaking still remains, drive the car about 64 to 80 km/h (40 to 50 MPH). In most cases 6 to 16 km (4 to 10 miles) will be sufficient for wear-in.**

7. Shoe spring

Place shoe springs in deeper groove of shoe.

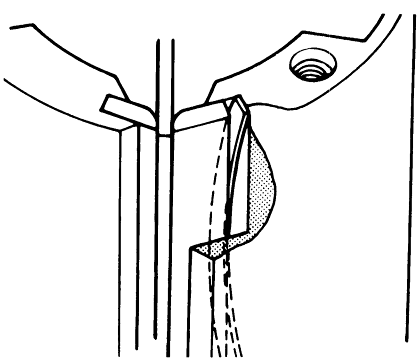


Fig. EC-37 Installing Shoe Spring

Note: **When installing a shoe spring, make sure that the outward bending side faces in shoe and that both ends of spring face in the wall of shoe groove.**
Be sure to push spring in so that spring end face is flush with rotor.

8. Rotor ring

Install rotor ring by correctly aligning the rear end face of rotor with the "O" mark in rotor ring, and tighten screws with Hexagon Wrench ST19810000.

Ⓣ Tightening torque:
Rotor ring screw
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)

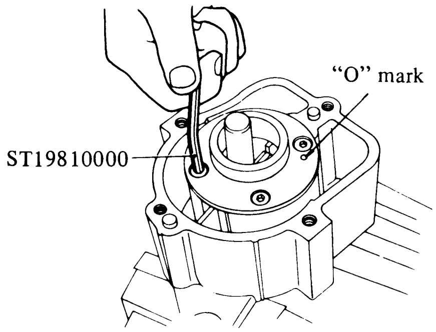


Fig. EC-38 Installing Rotor Ring

9. Removal of dummy shaft

Carefully withdraw dummy shaft from vane.

10. Vane shaft

Pack rear bearing with high melting-point grease (MIL-G-3545 A, Esso ANDOK 260 or equivalent). Apply thin coating of grease to vane shaft and rotor ring, and insert vane shaft into its bearing.

Note:

a. **Do not apply an undue stress to vane shaft when inserting.**
b. **If two vanes are dislocated when inserting vane shaft, correctly align vanes by inserting dummy shaft. Then, draw out dummy shaft and insert vane shaft.**
c. **When wear occurs on vane shaft or when replacement of rear bearing is necessary, replace rear cover assembly.**

11. End cover

Position end cover in place. Snugly tighten the bolt close to the dowel. Then tighten end cover balts.

Ⓣ Tightening torque:
End cover bolts
0.7 to 0.9 kg-m
(5.1 to 6.5 ft-lb)

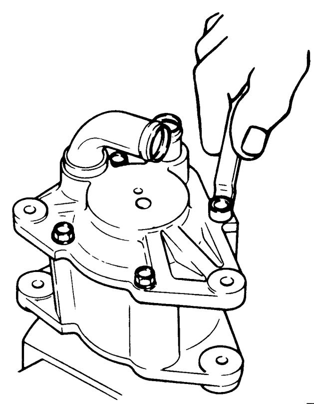


Fig. EC-39 Installing End Cover

12. Pulley

Tighten pulley securing bolts.

Ⓣ Tightening torque:
Pulley securing bolts
0.75 to 0.90 kg-m
(5.4 to 6.5 ft-lb)

INSPECTION

The following procedures are recommended for checking and/or ascertaining that the various components of the exhaust emission control system are operating properly.

The engine and all components must be at normal operating temperatures when the tests are performed. Prior to performing any extensive diagnosis of the exhaust control system, it must be determined that the engine as a unit is functioning properly.

Air injection system hoses

Check air system hoses for loose connections, cracks, or deterioration. Retighten or replace if necessary.

Air system manifold

Check air gallery pipe and injection nozzles for loose connections and cracks. Retighten or replace if necessary.

Air pump

1. Operate engine until it reaches normal operating temperature.
2. Inspect all hose, hose connections, and air gallery for leaks and correct, if necessary, before checking air injection pump.

3. Check air injection pump belt tension and adjust to specifications if necessary.
4. Plug up air discharging hose from C.A.C. valve (California models).

California models

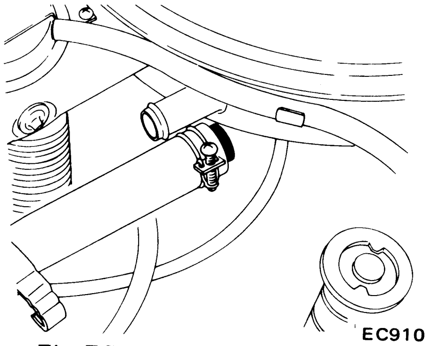


Fig. EC-40 Plugging Air Discharging Hose

5. Disconnect air supply hose at check valve.
6. Insert open pipe end of Air Pump Test Gauge Adapter ST19870000 in air supply hose. Clamp hose securely to adapter to prevent it from blowing out. Position adapter and test gauge so that air blast emitted through drilled pipe plug will be harmlessly dissipated.
7. Install a tachometer on engine. With engine speed at 2,600 rpm, observe air pressure "A" produced at test gauge.

Air pressure "A":
More than
100 mmHg (3.94 inHg)

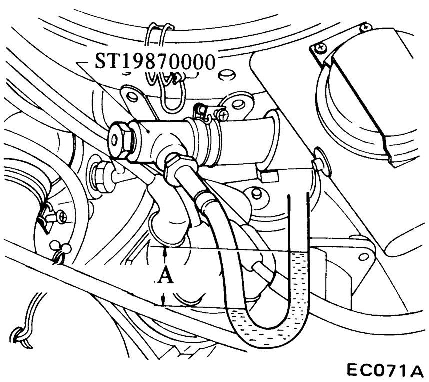


Fig. EC-41 Testing Air Pump

8. If air pressure does not meet above specifications, proceed as follows:

Non-California models

(1) Repeat 2 and 3 above.
(2) With engine speed at 1,500 rpm, disconnect tube from adapter and close hole of test gauge with finger. If a leaking sound is heard or leaking air is felt by finger at relief valve, relief valve is malfunctioning. Relief valve should be replaced or repaired.
(3) If air injection pump does not meet minimum requirement of pressure test, it should be repaired.

California models

Disassemble the air pump and repair it.

Check valve

1. Warm up engine thoroughly.
2. Disconnect hose leading to check valve from air hose connector.
3. Check hose opening for any indication of exhaust gas leaks. If leaks are detected, replace check valve.
4. Race the engine lightly (at about 2,000 rpm) and then return it to idling. Visually check the hose for any indication of exhaust gas leaks before the engine returns to idling speed. If leaks are detected, replace check valve.

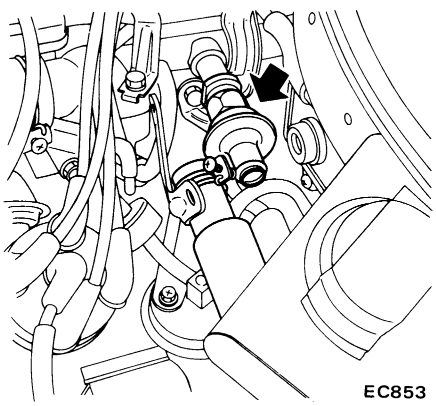


Fig. EC-42 Checking Check Valve

Air pump relief valve (Non-California models)

After completing inspection of air pump, check air pump relief valve in the following steps:

1. Disconnect hose from check valve and install blind cap to hose end.
2. With engine running at about 3,000 rpm under no load, place your hand on the air outlet of air pump relief valve to check for discharged air. If no air is felt, replace the air pump relief valve.

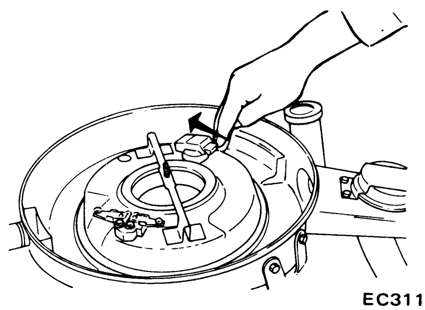


Fig. EC-43 Checking Air Pump Relief Valve

A.B. valve

1. Warm up engine thoroughly.
2. Disconnect hose from air cleaner, and place a finger near the outlet.
3. Run engine at about 3,000 rpm under no load, then quickly return it to idling. If you feel a pull or suction force on your finger, the A.B. valve is functioning normallly. If no suction is felt, replace the A.B. valve.

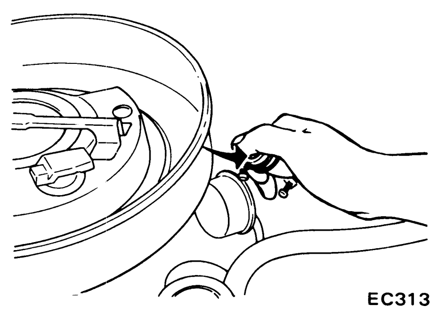


Fig. EC-44 Checking A.B. Valve

C.A.C. valve (California models)

1. Make sure that C.A.C. valve vacuum hose and air hose are not cracked.
2. Warm up engine thoroughly.
3. With engine at idle, place your finger over relief air opening in the air cleaner to check for presence of air.
4. Disconnect vacuum hoses at C.A.C. valve. Then make sure that air is discharged from C.A.C. valve at engine idling.

Note: When the vacuum hose is disconnected, plug it up or engine will stumble.

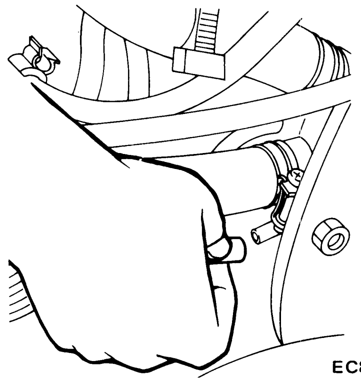


Fig. EC-45 Disconnecting Vacuum Hose

5. Connect hand-operated vacuum pump in place as shown below, and manipulate it in order to apply a pressure of −200 to −250 mmHg (−7.87 to −9.84 inHg) to C.A.C. valve. Then increase engine speed to 3,000 rpm and confirm that no air leaks from C.A.C. valve.

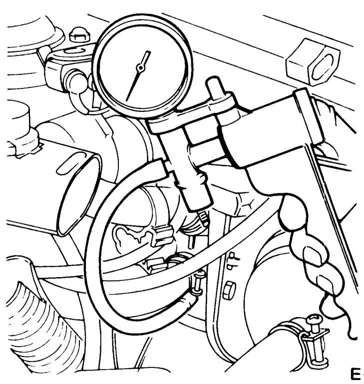


Fig. EC-46 Checking C.A.C. Valve-(1)

6. With the above condition, disconnect air hose at check valve and plug it up. At this point, confirm the air leaks from C.A.C. valve.

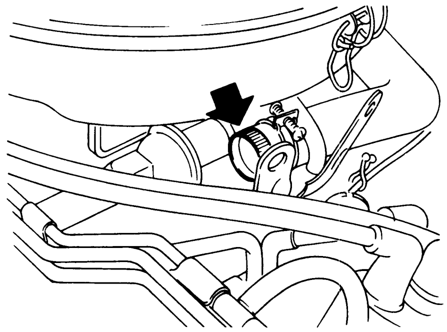


Fig. EC-47 Checking C.A.C. valve-(2)

7. If test results satisfy 3, 4, 5 and 6, the C.A.C. valve is properly functioning.

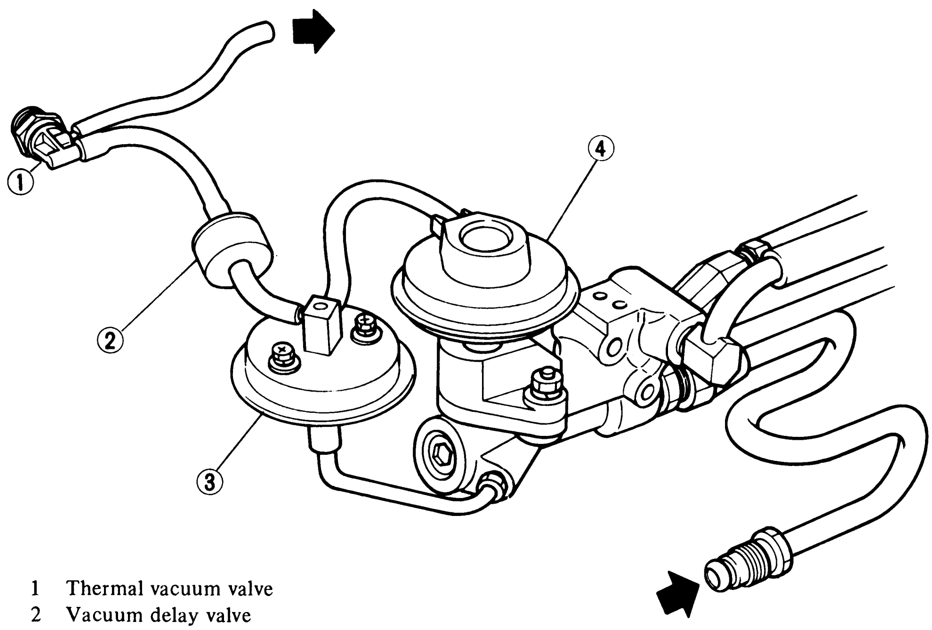
EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

DESCRIPTION

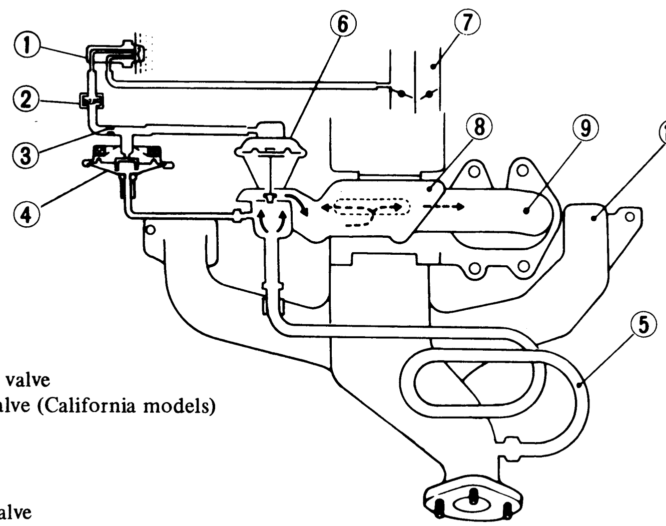
In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of the nitrogen oxide (NOx) content in the exhaust gas.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. chamber through the E.G.R. passage. The exhaust gas is then controlled in quantity by the E.G.R. valve, and is introduced into the intake manifold.

On California models, a vacuum delay valve is installed on the midway of the vacuum line between the thermal vacuum valve and B.P.T. valve.



1 Thermal vacuum valve
2 Vacuum delay valve (California models)
3 B.P.T. valve
4 E.G.R. control valve



1 Thermal vacuum valve
2 Vacuum delay valve (California models)
3 Orifice
4 B.P.T. valve
5 E.G.R. tube
6 E.G.R. control valve
7 Carburetor
8 E.G.R. passage
9 Intake manifold
10 Exhaust manifold

EC238A

Fig. EC-48 E.G.R. System

OPERATION

The operation of the system is as follows:

Water temperature °C (°F)	Thermal vacuum valve	B.P.T. valve mmH$_2$O (inH$_2$O)		E.G.R. system
Below 40 to 53 (104 to 127) max.	Closed	Exhaust pressure Below 21 to 33 (0.82 to 1.30)	Open	Not actuated
		Above 21 to 33 (0.82 to 1.30)	Closed	Not actuated
Above 40 to 53 (104 to 127) min.	Open	Exhaust pressure Below 21 to 33 (0.82 to 1.30)	Open	Not actuated
		Above 21 to 33 (0.82 to 1.30)	Closed	Actuated

Note: With the engine at idle or at full throttle, the E.G.R. control valve closes to deactivate the E.G.R. system regardless of water temperature (operation of the thermal vacuum valve) and B.P.T. valve.

E.G.R. control valve

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the carburetor throttle valve.

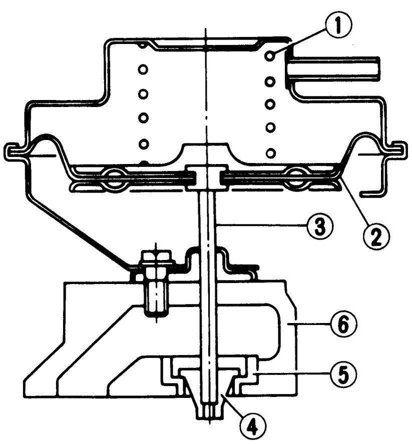


Fig. EC-49 E.G.R. Control Valve

E.G.R. control valve construction and type vary with transmission type and vehicle destination. For identification purposes, the part number is stamped on the recessed portion at the top of the valve.

Thermal vacuum valve

The thermal vacuum valve is mounted on the engine thermostat housing. It detects engine coolant temperature by means of a built-in bi-metal, and opens or closes the vacuum passage in the thermal vacuum valve.

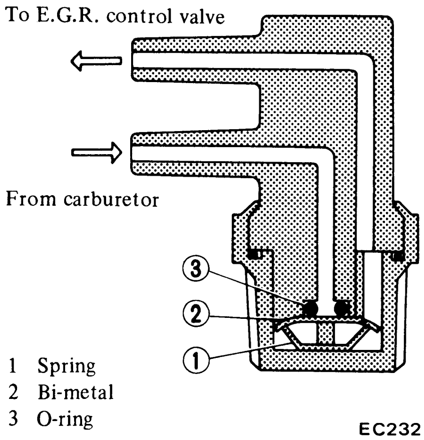


Fig. EC-50 Thermal Vacuum Valve

When the vacuum passage is open, the carburetor vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.

B.P.T. valve

The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling intake manifold vacuum applied to the E.G.R. control valve. In other words, the amount of recirculated exhaust gas varies with the position of the E.G.R. valve regulated by the operating condition of the engine.

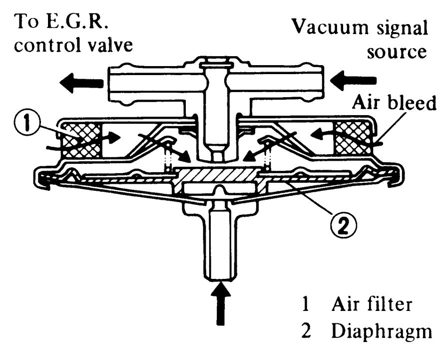
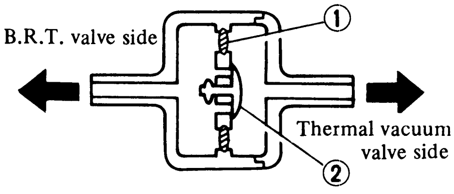


Fig. EC-51 B.P.T. Valve

Vacuum delay valve (California models)

The vacuum delay valve prevents a rapid vacuum drop of the E.G.R. control line. The valve is designed for one-way operation and consists of a one-way umbrella valve and a sintered steel fluidic restrictor.



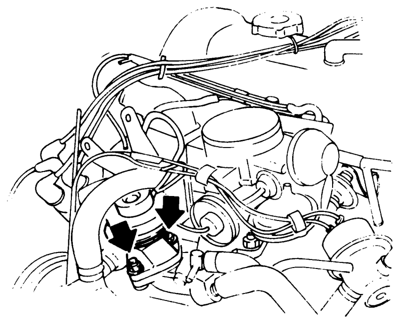
1 Sintered metric disc.
2 One-way unbrella valve

EC860
Fig. EC-52 Vacuum Delay Valve

REMOVAL AND INSTALLATION

E.G.R. control valve

1. Remove air cleaner. Refer to Removal and Installation (Section EF).
2. Disconnect vacuum hose and remove nuts securing E.G.R. control valve to E.G.R. passage. Then the E.G.R. control valve can be taken out.



EC234
Fig. EC-53 Removing E.G.R. Control Valve

CAUTION:
Pay attention not to give damage to packing of E.G.R. control valve.

3. Installation is in the reverse sequence of removal.

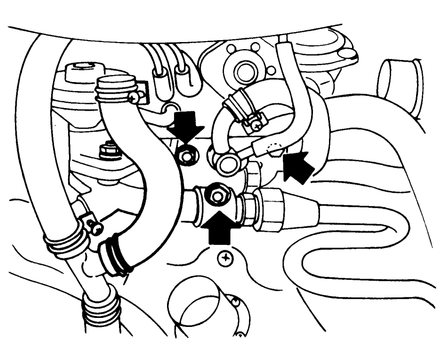
Note: **In installing new E.G.R. control valve, confirm that the model number and identification marks at the top of valve are as follows:**

Model		Type	Identification
Non-California models	M/T	AEY75-21	X
	A/T	AEY75-22	Y
California models	M/T, A/T	AEY75-22	Y

E.G.R. passage and E.G.R. tube

1. E.G.R. tube can be removed by loosening securing nuts.
2. Disconnect blow-by gas hose and remove securing bolts and nuts. E.G.R. passage can then be taken out.
3. Installation is in the reverse sequence of removal.

Note: **New gasket should be used in installing E.G.R. passage.**



EC187A
Fig. EC-54 Removing E.G.R. Passage

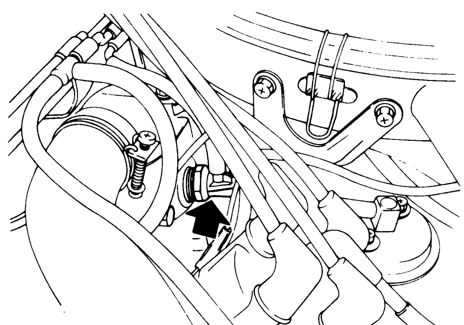
Thermal vacuum valve

The thermal vacuum valve is made of plastic. Consequently pay attention not to give damage to it.

1. Drain engine coolant about one liter.
2. Disconnect two vacuum hoses and unscrew the thermal vacuum valve. Then, the valve can be taken out.
3. Installation is in the reverse sequence of removal.

Note:
a. **Be sure to apply sealer to threads of the valve prior to installing new valve.**
b. **When installing new thermal vacuum valve, make sure it is black.**

Ⓣ **Tightening torque:**
Thermal vacuum valve
Less than 2.2 kg-m (16 ft-lb)

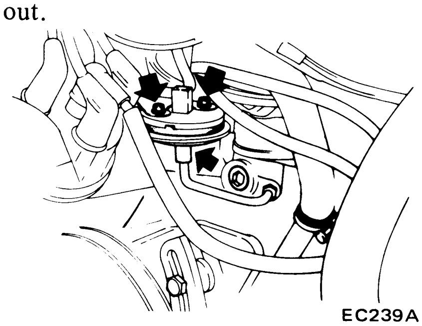


EC861
Fig. EC-55 Removing Thermal Vacuum Valve

B.P.T. valve

1. Remove two vacuum tubes on the B.P.T. valve.
2. Remove screws securing B.P.T. valve to the bracket.
3. Disconnect back pressure tube from B.P.T. valve.

The B.P.T. valve can then be taken out.



EC239A
Fig. EC-56 Removing B.P.T. Securing Screws

4. Installation is in the reverse sequence of removal.

Note: In replacing the B.P.T. valve with new one, confirm that the type number on new part is the same as that on former one.

B.P.T. valve identification number
AT175-5
(Paint mark–Blue)

Ⓣ **Tightening torque:**
B.P.T. valve mounting screw
0.38 to 0.51 kg-m
(2.7 to 3.7 ft-lb)

Vacuum delay valve (California models)

The vacuum delay valve is installed on the midway of the vacuum tube between the B.P.T. valve and thermal vacuum valve.

In installing vacuum delay valve, make sure that the brown colored face side is connected to thermal vacuum valve side.

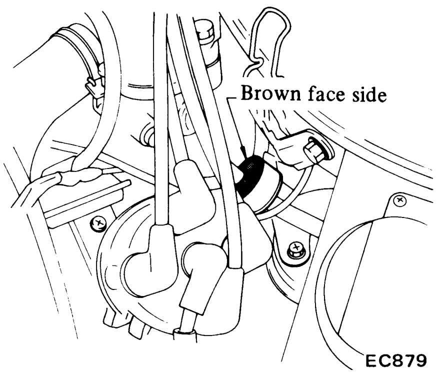


Fig. EC-57 Installing Vacuum Delay Valve

INSPECTION

Entire system

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.
3. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.

(1) When engine coolant temperature is low: [Below 40°C (104°F)]

Make sure that E.G.R. control valve does not operate when engine speed is increased from idling to 3,000 to 3,500 rpm.

Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

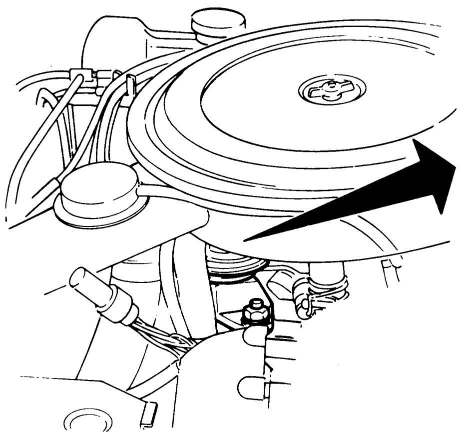
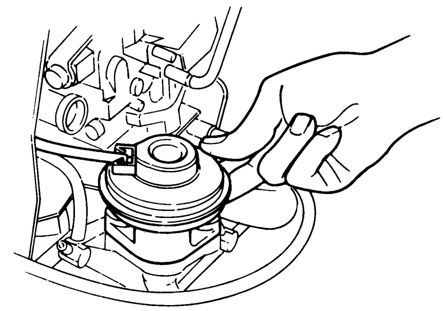



Fig. EC-58 Checking E.G.R. Control Valve

(2) When engine coolant temperature is high: [Above 53°C (127°F)]

1) Make sure that E.G.R. control valve operates when engine speed is increased from idling to 3,000 to 3,500 rpm. Place fingers on the diaphragm of E.G.R. control valve to check for valve operation.
2) If E.G.R. control valve does not operate, check as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose connecting thermal vacuum valve to E.G.R. control valve.
- Increase engine speed from idling to 3,000 to 3,500 rpm.
- Make sure that thermal vacuum valve is open, and that carburetor vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

  If vacuum is weak or not present at all, replace thermal vacuum valve. If vacuum is present, replace E.G.R. control valve.

If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

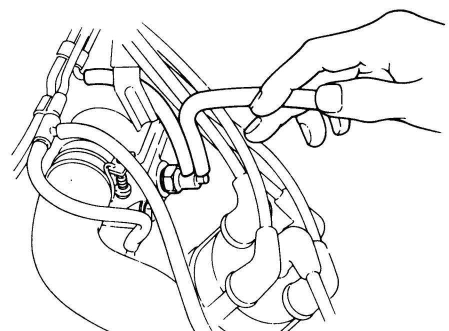


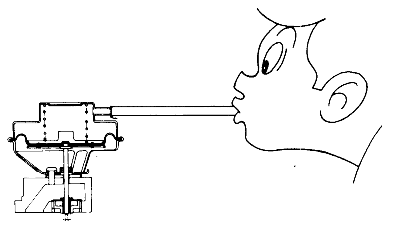
Fig. EC-59 Checking Thermal Vacuum Valve

E.G.R. control valve

Dismount E.G.R. control valve from engine.

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

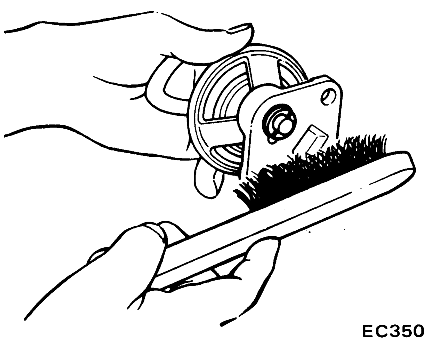
E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.



EC129A

Fig. EC-60 Checking E.G.R. Control Valve

2. Visually check E.G.R. control valve for damage, wrinkle or deformation.
3. Clean the seating surface of E.G.R. control valve with a brush and compressed air, and remove foreign matter from around the valve and port.



EC350

Fig. EC-61 Cleaning E.G.R. Control Valve

Thermal vacuum valve

Dismount thermal vacuum valve from engine.

Note: Before dismounting, drain engine coolant from engine.

Apply vacuum to thermal vacuum valve and check to be sure that thermal vacuum valve opens or closes in response to engine coolant temperature as specified.

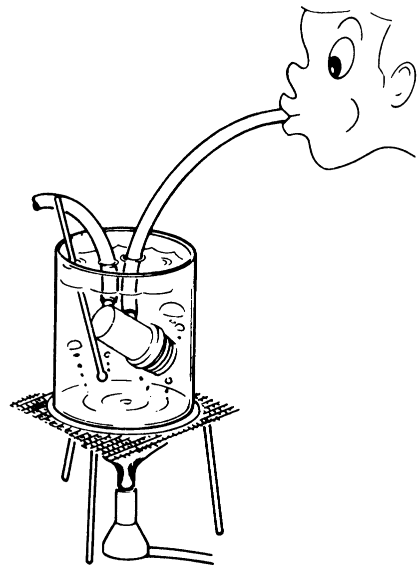
Thermal vacuum valve should open at a temperature specified below, completing the vacuum passage.

Thermal vacuum valve opening temperature:

40 to 53°C (104 to 127°F)

CAUTION:

Do not allow water to get inside the thermal vacuum valve.



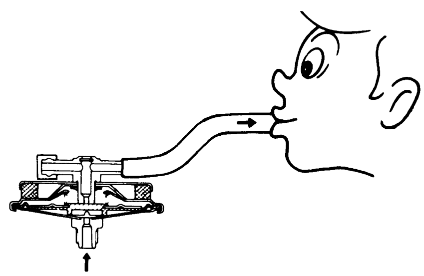
EC242

Fig. EC-62 Checking Thermal Vacuum Valve

B.P.T. valve

1. Disconnect two vacuum hoses on B.P.T. valve.
2. Plug one of two ports of B.P.T. valve.

Apply a pressure above 50 mmH_2O (1.97 inH_2O) to B.P.T. valve and orally suck back other port of B.P.T. valve as shown below to check for leakage. If a leak is noted, replace valve.

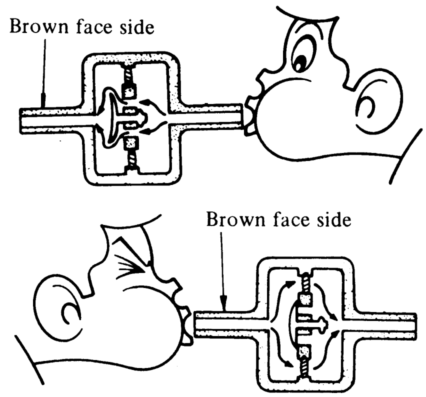


EC668

Fig. EC-63 Checking B.P.T. Valve

Vacuum delay valve (California models)

1. Remove vacuum delay valve.
2. Blow air from the port of the E.G.R. control valve side. The vacuum delay valve is in good condition if the air flows through the valve.
3. Try again from the opposite side of the valve. The valve is in good condition if the air flow resistance is greater than the step 2 above.



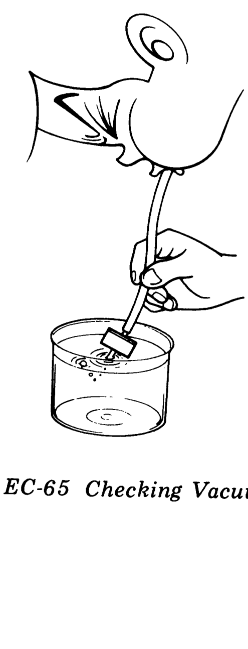
EC346

Fig. EC-64 Checking Vacuum Delay Valve

4. If the condition of spark delay valve is questionable, dip port into a cup filled with water. Blow air from brown face side. Small air bubbles should appear.

CAUTION:

Be careful to avoid entry of oil or dirt into valve.



EC279

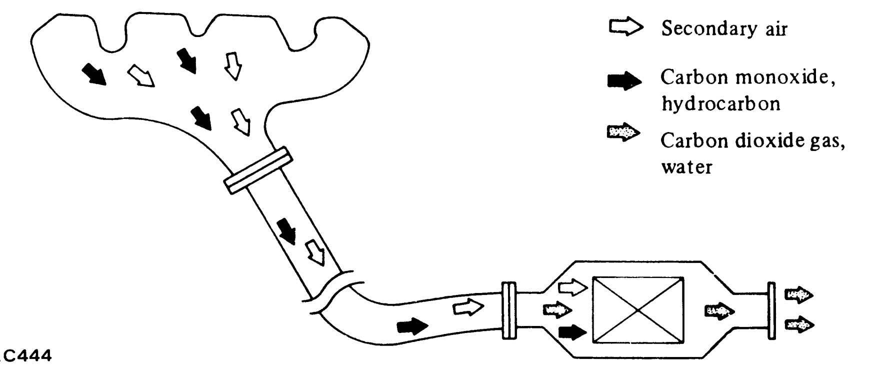
Fig. EC-65 Checking Vacuum Delay Valve

CATALYTIC CONVERTER (California models)

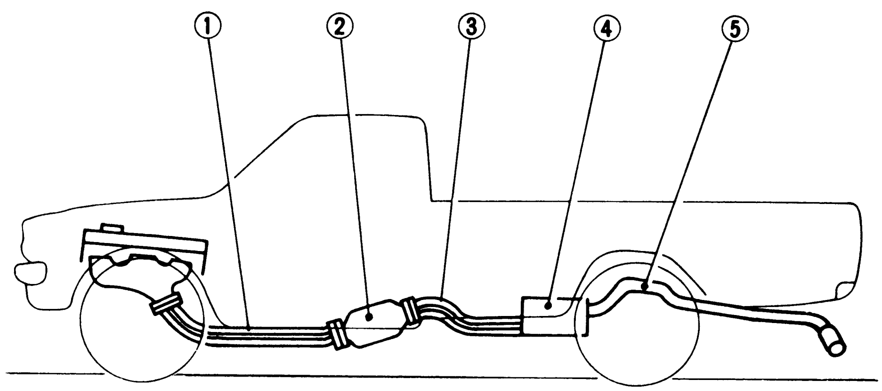
DESCRIPTION

The catalytic converter accelerates the chemical reaction of hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas, and changes them into non-harmful carbon dioxide (CO_2) and water (H_2O). This chemical reaction process requires the proper amount of air, which is supplied by the air pump (Refer to the item "A.I.S."). This air is called "secondary air".

The catalytic converter is mounted on the models destined for California.



EC444



1 Front tube
2 Catalytic converter
3 Center tube
4 Main muffler
5 Rear tube

EC782

Fig. EC-66 Function of Catalytic Converter

OPERATION

Exhaust gas emitted from the engine contains some harmful substances due to incomplete combustion in the combustion chamber. The air injection system is designed to reduce the content of such substances in the exhaust gas. In this system, the secondary air is led from the check valve and injected into the exhaust manifold. With this injection of the secondary air, hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas are gradually oxidized with oxygen (O_2) in the secondary air and converted into non-harmful carbon dioxide (CO_2) and water (H_2O).

The catalytic converter further cleans engine exhaust gas. Through catalytic action, it changes residual hydrocarbons and carbon monoxide contained in exhaust gas into carbon dioxide and water before exhaust gas is discharged to the atmosphere.

REMOVAL AND INSTALLATION

1. Jack up vehicle.

Note: Apply parking brake and place wheel chocks.

2. Remove screws securing lower shelter of catalytic converter.

Loosen flange bolts connecting catalytic converter to front and rear exhaust tubes.

Catalytic converter assembly can then be taken out.

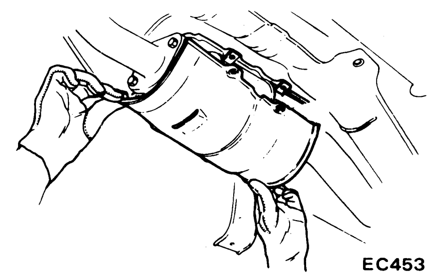
3. Installation is in the reverse sequence of removal.

CAUTION:

a. Be careful not to damage catalytic converter when handling.

b. Never wet catalyzer with water, oil, etc.

Ⓣ Tightening torque:
Catalytic converter bolt
2.6 to 3.4 kg-m
(19 to 25 ft-lb)



EC453

Fig. EC-67 Removing Catalytic Converter

INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary.

Refer to Air Injection System (A.I.S.) for inspection.

Catalytic converter

Whether catalytic converter is normal or not can be checked by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "Neutral" (for manual transmission) and "N" or "P" (for automatic transmission).

1. Visually check catalytic converter for damage or cracks.
2. Adjust engine idling speed and CO percentage. Refer to Adjusting Carburetor Idle RPM and Mixture Ratio for adjustment.

3. Race engine (1,500 to 2,000 rpm) two or three times under no load and make sure that specified CO percentage is obtained.
4. Remove cap and connect air hose to air check valve.

If idling speed increases, readjust it to specified speed with throttle adjusting screw.

5. Warm up engine for about four minutes at 2,000 rpm under no load.
6. Measure CO percentage at idling speed. After step 5 has been completed, wait for one minute before making CO percentage measurement.
7. If CO percentage measured in step 6 is less than 0.3%, the catalytic converter is normal.
8. If CO percentage measured in step 6 is over 0.3%, recheck A.I.S. and replace air check valve. Then, perform inspection steps 5 and 6.
9. If CO percentage is still over 0.3% in step 8, catalytic converter is malfunctioning. Replace catalytic converter.

FLOOR TEMPERATURE WARNING SYSTEM

DESCRIPTION

The floor temperature warning system consists of a floor temperature sensing switch installed on the vehicle's floor, floor temperature relay and a warning lamp on the instrument panel and wires that connect these parts.

When the floor temperature rises to an abnormal level, the warning lamp will light to call the attention of the driver.

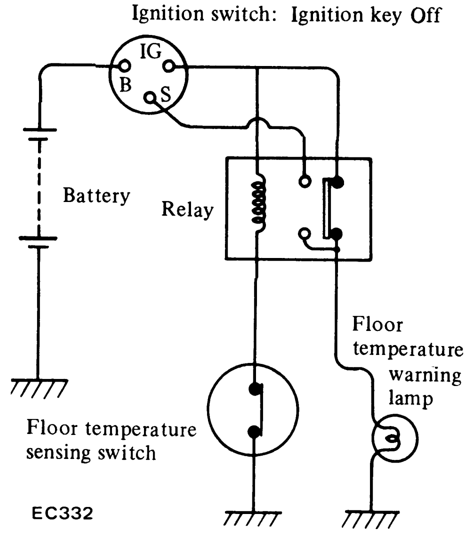


Fig. EC-68 Wiring Diagram of Floor Temperature Warning System

OPERATION

Floor temperature will exceed normal level when temperature rise in the exhaust system succeeding the catalytic converter is caused by either an engine malfunction or severe driving conditions. Under this condition the floor temperature sensing switch turns off, causing the starting switch line of the floor temperature relay to turn off and the ignition switch line to turn on. As a result, the floor temperature warning lamp comes on.

When the floor temperature is lower than the specific temperature, the floor temperature sensing switch turns on. The ignition line of the floor temperature relay turns off, while the starting switch side is in on. The floor temperature warning lamp goes out.

The lamp is functioning satisfactorily, if it remains on while the starting motor is in operation. The lamp goes out when the ignition switch is in "IG" position.

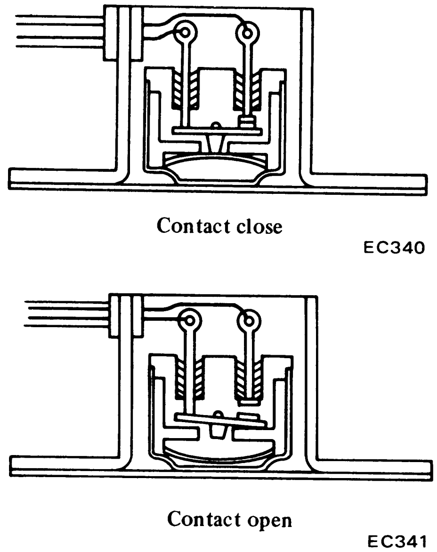


Fig. EC-69 Operation of Floor Temperature Sensing Switch

REMOVAL AND INSTALLATION

Floor temperature sensing switch

The floor temperature sensing switch is located behind the driver's seat.

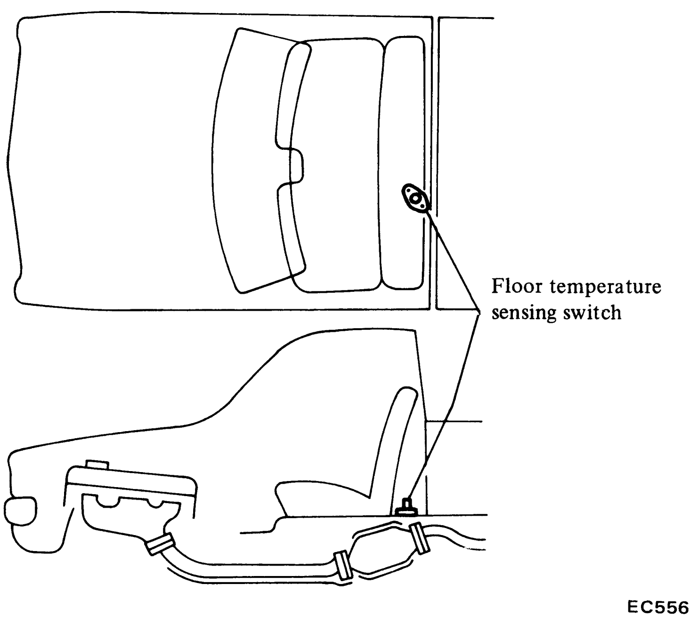


Fig. EC-70 Location of Floor Temperature Sensing Switch

1. Remove seat as outlined in "Seat" section of "Body and Frame" service manual.
2. Remove floor temperature sensing switch.
3. Installation is in the reverse sequence of removal.

Floor temperature relay

The floor temperature relay is located in the right-hand side engine compartment.

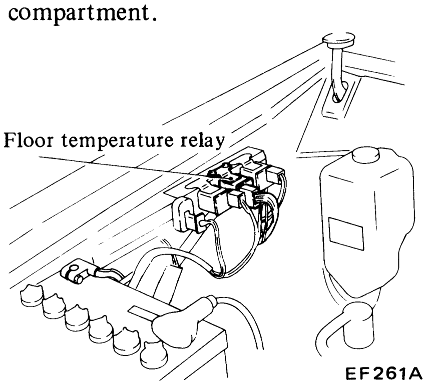


Fig. EC-71 Location of Floor Temperature Relay

1. Remove floor temperature relay from relay bracket.
2. Installation is in the reverse sequence of removal.

Floor temperature warning lamp

1. Reaching front rear of cluster lid of instrument panel, turn socket of floor temperature warning lamp. Lamp can then be removed from socket easily.

Note: **The floor temperature warning lamp is wedge base type (3.4W).**

2. Installation is in the reverse sequence of removal.

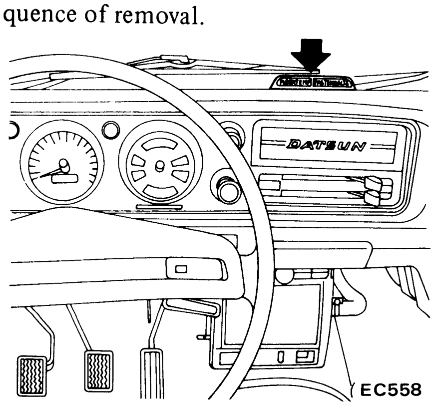


Fig. EC-72 Replacing Floor Temperature Warning Lamp

INSPECTION

Floor temperature warning system

Apply parking brake. Shift gears into Neutral (for manual transmission) and "N" or "P" (for automatic transmission) position.

1. Ensure that floor temperature warning lamp lights when ignition switch is turned to the "S" position.
   If not, check lamp for burned bulbs.
   Replace bulb if it is burned out. If it is not burned, trace wire(s) back to ignition switch. Repair or replace if necessary.
2. Be sure that floor temperature is cool [below 80°C (176°F)] before carrying out the following procedure.
   Turn the IG switch ON (IG position). At the same time, disconnect the connector for floor temperature sensor.

Note: **The connector is located behind the driver's seat.**

The warning lamp goes on when the connector is removed and goes out when the connector is connected.

Floor temperature sensing switch

Heat the surrounding areas of the floor temperature sensing switch with a proper heater to ensure that the continuity of the floor temperature sensing switch is as the specifications below.

If continuity is not as the specification, replace the switch.

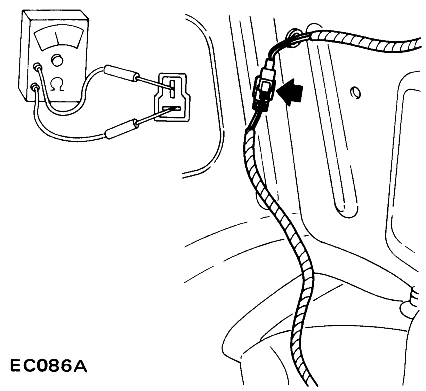


Fig. EC-73 Checking Sensor

Temperature sensing switch	Temperature warning lamp	Floor temperature °C (°F)
Contact closed	OFF	Below 82 (180)
Contact open	ON	Above 105 (221)

Floor temperature relay

When checking floor temperature relay for unit, remove it and proceed as follows:

1. Check for continuity between ④ and ⑤. Continuity should exist.
   Check for continuity between ① and ③. Continuity should exist.
   Check for continuity between ① and ②. Continuity should not exist.
2. Apply a 12-volt d-c across ④ and ⑤ to ensure that continuity exists between ① and ② and that continuity does not between ① and ③. If test results do not satisfy the above, replace the floor temperature relay.

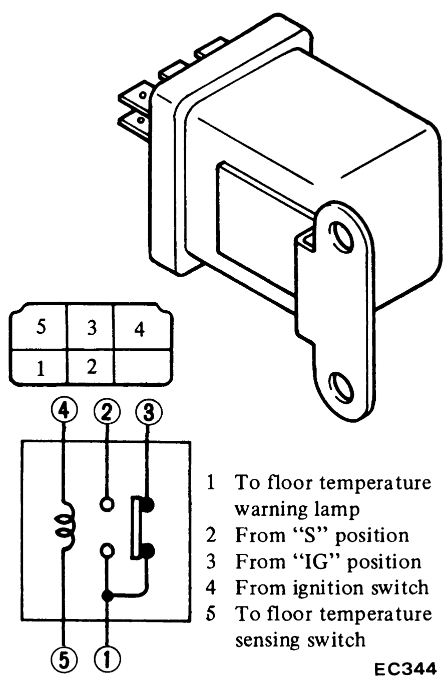


Fig. EC-74 Floor Temperature Relay

When floor temperature warning lamp lights

Check floor temperature warning lamp.

1. Open or short circuit in wiring harness.
2. Check fuel system with regard to the following items: (Refer to Inspection in Section EF.)
1) Float level
2) Choke
3) Normal fuel supply system (Primary and secondary)
4) Accelerator pump
5) Power valve
6) Fuel shut-off system
7) Fuel filter
8) Air cleaner
3. Check ignition system with regard to the following items: (Refer to Section EE.)
1) Transistor ignition unit
2) Distributor
3) Ignition coil
4) High tension cable
5) Spark plug
4. Check idle CO adjustment. (Refer Section EF.)

Note: Even if there is nothing wrong with engine, warning lamp may come on if vehicle is being driven on a steep slope continuously in lower gears at high engine speeds.

EVAPORATIVE EMISSION CONTROL SYSTEM

CONTENTS

DESCRIPTION EC-23
OPERATION EC-24
INSPECTION EC-24
FUEL TANK, VAPOR LIQUID SEPARATOR AND VAPOR VENT LINE EC-24
CARBON CANISTER PURGE CONTROL VALVE EC-25
CARBON CANISTER FILTER EC-25
FUEL TANK VACUUM RELIEF VALVE ... EC-25

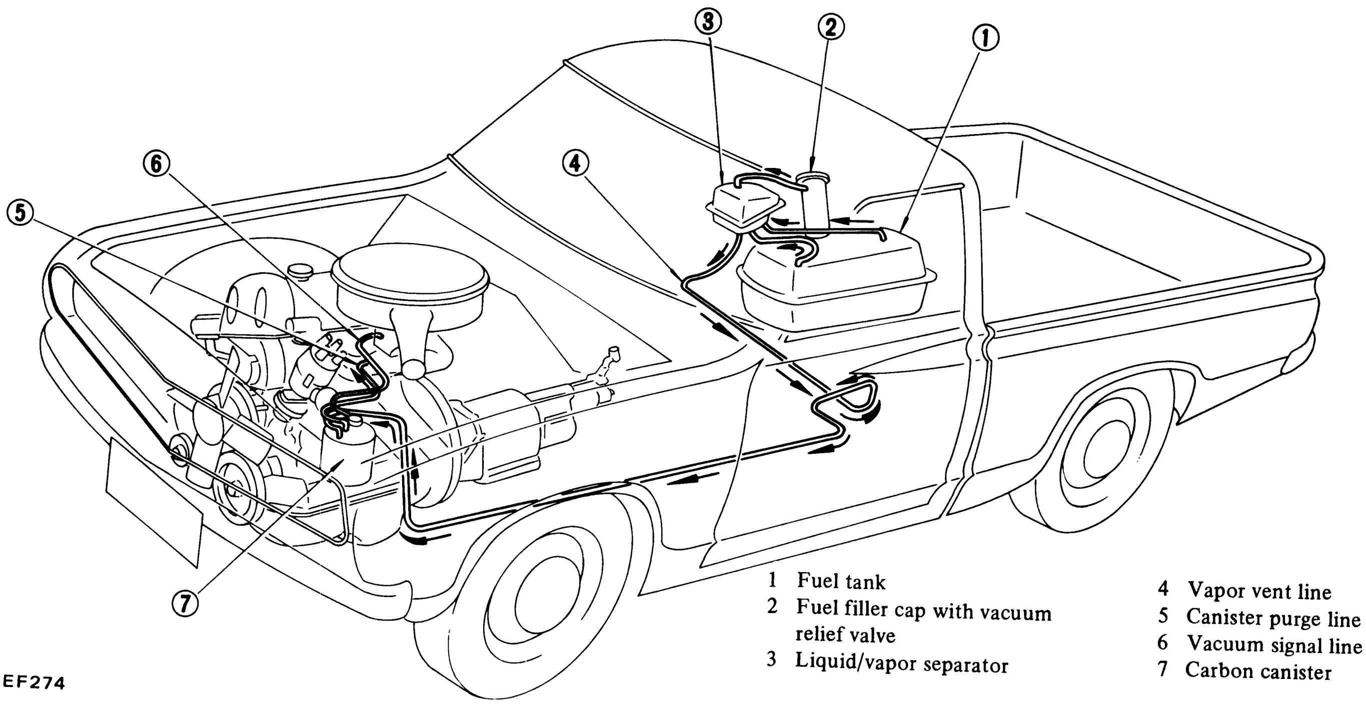
DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

This system is made up of the following:

1. Fuel tank with positive sealing filler cap
2. Liquid/vapor separator
3. Vapor vent line
4. Carbon canister
5. Vacuum signal line
6. Canister purge line

Removal and installation of above components are described in Section FE.

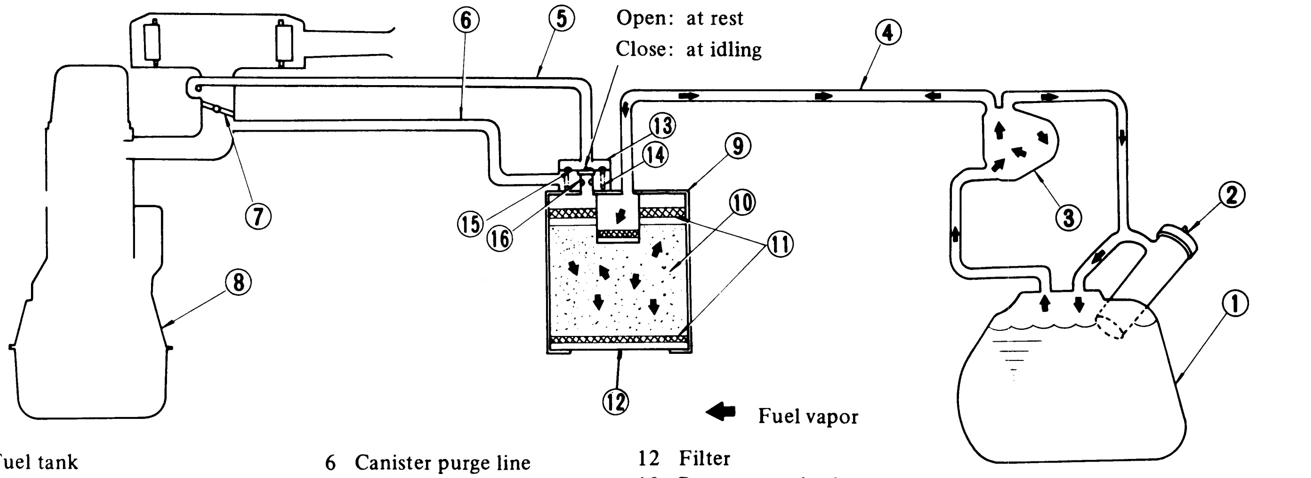


1 Fuel tank
2 Fuel filler cap with vacuum relief valve
3 Liquid/vapor separator
4 Vapor vent line
5 Canister purge line
6 Vacuum signal line
7 Carbon canister

Fig. EC-75 Evaporative Emission Control System

OPERATION

Fuel vapors from the sealed fuel tank are led into the carbon canister. The canister is filled with activated charcoals to absorb the fuel vapors when the engine is at rest or at idling.

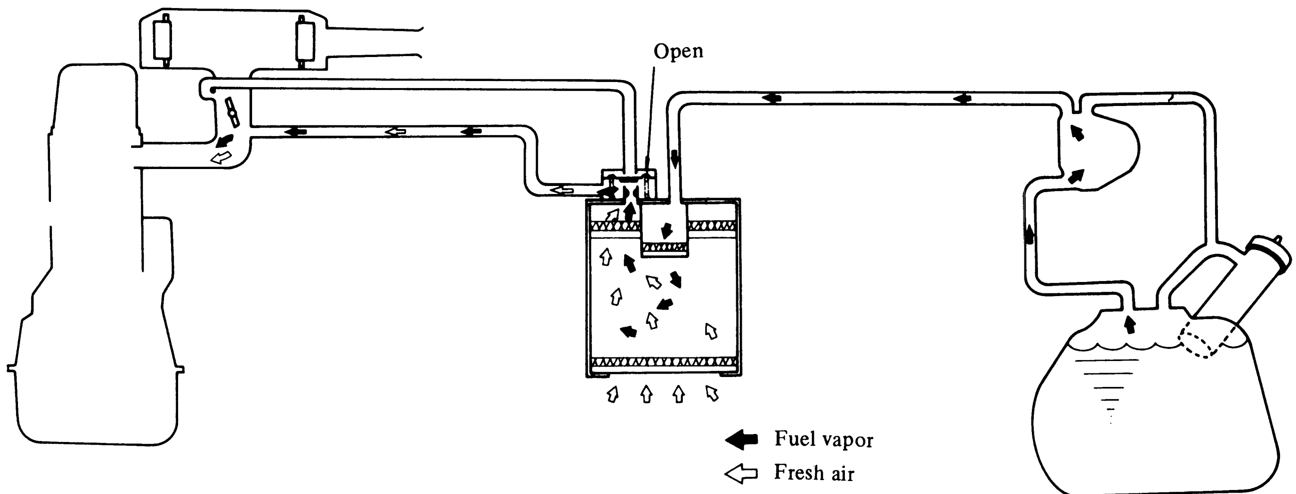


1 Fuel tank
2 Fuel filler cap with vacuum relief valve
3 Liquid/vapor separator
4 Vapor vent line
5 Vacuum signal line
6 Canister purge line
7 Throttle valve
8 Engine
9 Carbon canister
10 Activated charcoal
11 Screen
12 Filter
13 Purge control valve
14 Diaphragm spring
15 Diaphragm
16 Fixed orifice

EF552

Fig. EC-76 Evaporative Emission Control System (Fuel vapor flow when engine is at rest or idling.)

As the throttle valve opens and vehicle speed increases, vacuum pressure in the vacuum signal line forces the purge control valve to open, and admits an orifice to intake manifold and fuel vapor is then drawn into the intake manifold through the canister purge line.



EF553

Fig. EC-77 Evaporative Emission Control System (Fuel vapor flow when engine is running.)

INSPECTION

FUEL TANK, VAPOR LIQUID SEPARATOR AND VAPOR VENT LINE

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to vapor-liquid separator.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 400 mmH_2O (15.75 inH_2).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain

with 25 mmH_2O (0.98 inH_2O).

8. When filler cap does not close completely, the height should drop to zero in a short time.

9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

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.

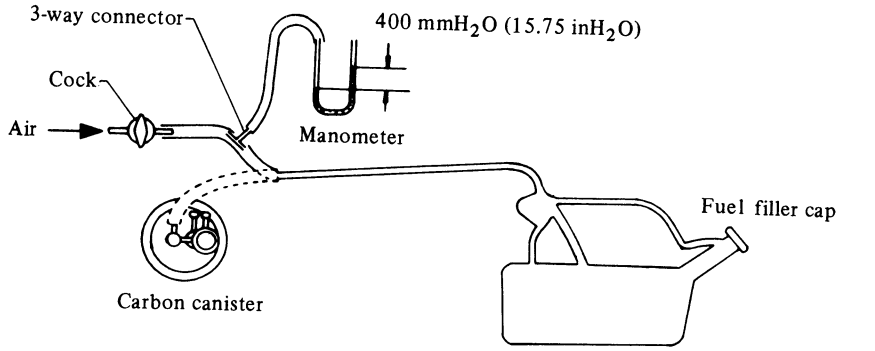


Fig. EC-78 Checking Evaporative Emission Control System

CARBON CANISTER PURGE CONTROL VALVE

Check for fuel vapor leakage, in the distributor vacuum line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

1. Disconnect rubber hose, in the line, between T-connector and carbon. canister at T-connector.
2. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.

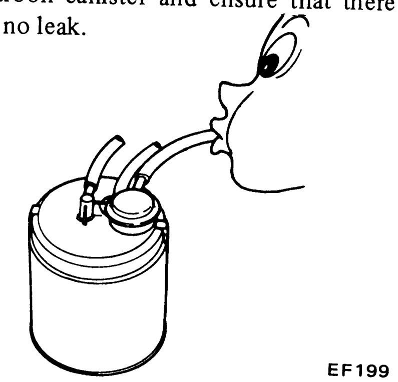


Fig. EC-79 Checking Carbon Canister Purge Control Valve

3. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).

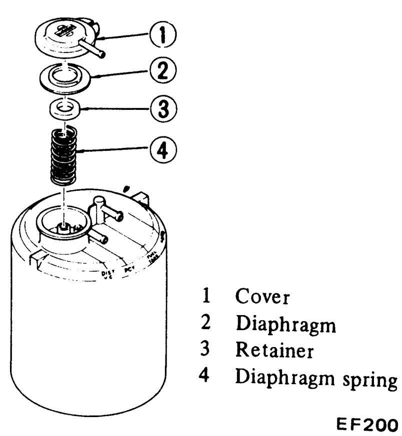


Fig. EC-80 Carbon Canister Purge Control Valve

CARBON CANISTER FILTER

Check for a contaminated filter. Filter can be removed at the bottom of canister installed on vehicle body.

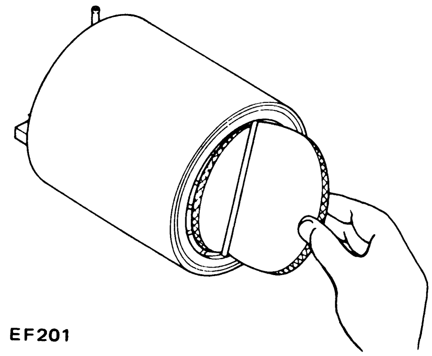


Fig. EC-81 Replacing Carbon Canister Filter

FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

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

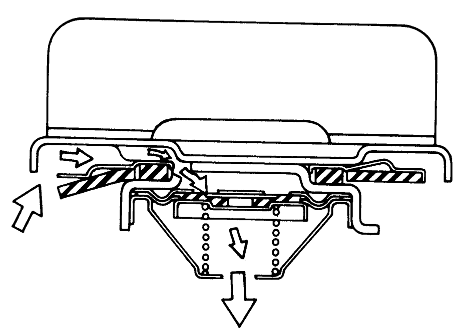


Fig. EC-82 Fuel Filler Cap

SERVICE DATA AND SPECIFICATIONS

INSPECTION AND ADJUSTMENT

Air pump

Air pressure (With engine speed at 2,600 rpm)	mmHg (inHg)	100 (3.94)

E.G.R. system

Thermal vacuum valve opening temperature	°C (°F)	40 to 53 (104 to 127)

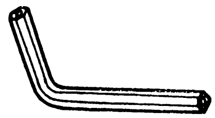
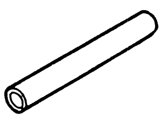
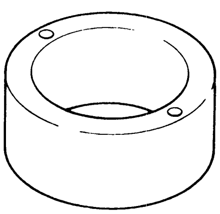
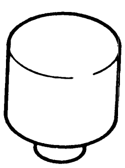
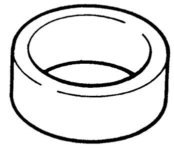
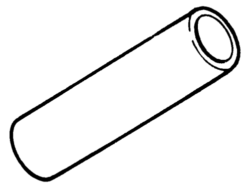
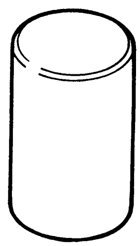
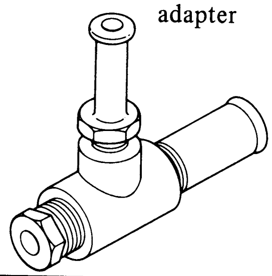
FLOOR TEMPERATURE WARNING SYSTEM

Floor temperature sensing switch contacts opening temperature	°C (°F)	Above 105 (221)

TIGHTENING TORQUE

Air gallery flare nut	kg-m (ft-lb)	5.0 to 5.9 (36 to 43)
Air pump		
Bearing cover securing bolt	kg-m (ft-lb)	0.1 to 0.2 (0.7 to 1.4)
Rotor ring screw	kg-m (ft-lb)	0.5 to 0.7 (3.6 to 5.1)
End cover bolt	kg-m (ft-lb)	0.7 to 0.9 (5.1 to 6.5)
Pulley securing bolt	kg-m (ft-lb)	0.75 to 0.90 (5.4 to 6.5)
Thermal vacuum valve	kg-m (ft-lb)	Less than 2.2 (16)
B.P.T. valve mounting screw	kg-m (ft-lb)	0.38 to 0.51 (2.7 to 3.7)
Catalytic converter bolt	kg-m (ft-lb)	2.6 to 3.4 (19 to 25)

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Reference page or Fig. No.
ST19810000 Hexagon wrench 	—	Fig. EC-27 Fig. EC-38
ST19900000 Dummy shaft 	J 26021	Fig. EC-36
ST19890000 Rotor adapter 	—	Fig. EC-30 Fig. EC-32
ST19940000 Bearing pressing tool 	—	Fig. EC-30 Fig. EC-32
ST19930000 Bearing adapter 	—	Fig. EC-31
ST19910000 Bearing driver 	—	Fig. EC-31 Fig. EC-33 Fig. EC-34
ST19920000 Rotor stand 	—	Fig. EC-33 Fig. EC-34
ST19870000 Air pump test gauge adapter 	J 25667-01	Page EC-14

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EE

ENGINE ELECTRICAL SYSTEM

EE

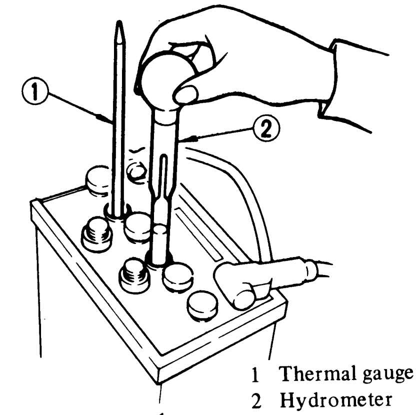
BATTERY .... EE- 2
STARTING MOTOR .... EE- 4
CHARGING CIRCUIT EE-12
ALTERNATOR EE-15
REGULATOR EE-20
IGNITION CIRCUIT EE-22
DISTRIBUTOR EE-24
TRANSISTOR IGNITION UNIT EE-27
IGNITION COIL EE-36
SPARK PLUG EE-37
SERVICE DATA AND SPECIFICATIONS EE-38
TROUBLE DIAGNOSES AND CORRECTIONS EE-41

BATTERY

CONTENTS

REMOVAL EE-2
CHECKING ELECTROLYTE LEVEL EE-2
CHECKING SPECIFIC GRAVITY EE-2
BATTERY FREEZING EE-2
CHARGING EE-3
INSTALLATION EE-3

WARNING:
Never touch positive and negative terminals at the same time with bare hands. This could result in injury.



$$S_{20} = St + 0.0007\ (t - 20)$$

Fig. EE-1 Checking Specific Gravity

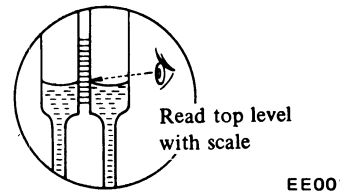


Fig. EE-2 Checking Specific Gravity

REMOVAL

1. Disconnect negative and positive cables.
2. Remove nuts from battery clamps; take off clamps.
3. Remove battery.

CHECKING ELECTROLYTE LEVEL

Remove six vent plugs and check for electrolyte level in each cell.

If necessary, pour distilled water.

CHECKING SPECIFIC GRAVITY

Specific gravity of battery electrolyte is tested by a hydrometer. If the state of charge of battery is 60% 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:

Where,

St: Specific gravity of electrolyte at t°C

S_{20}: 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, be sure that cells are filled to correct level.

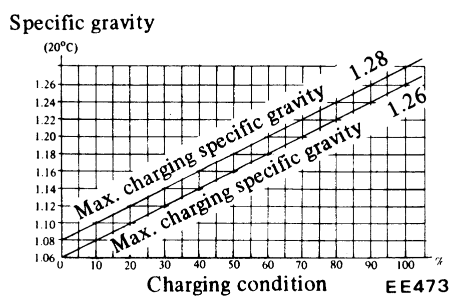


Fig. EE-3 Charging Condition

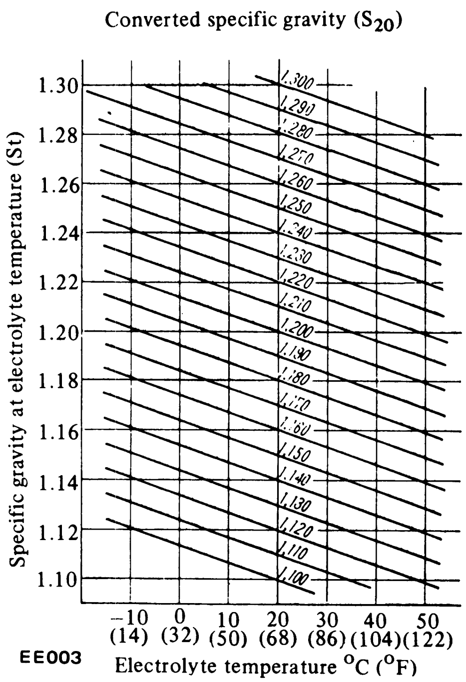


Fig. EE-4 Specific Gravity at Electrolyte Temperature

BATTERY FREEZING

Battery electrolyte freezing point varies with acid concentration or its specific gravity. A battery with an insufficient charge will freeze at lower temperatures. If specific gravity of a battery falls below 1.1, this is an indication that battery is completely discharged and will freeze readily when temperatures fall below freezing.

Note: Use extreme caution to avoid freezing battery since freezing will generally ruin the battery.

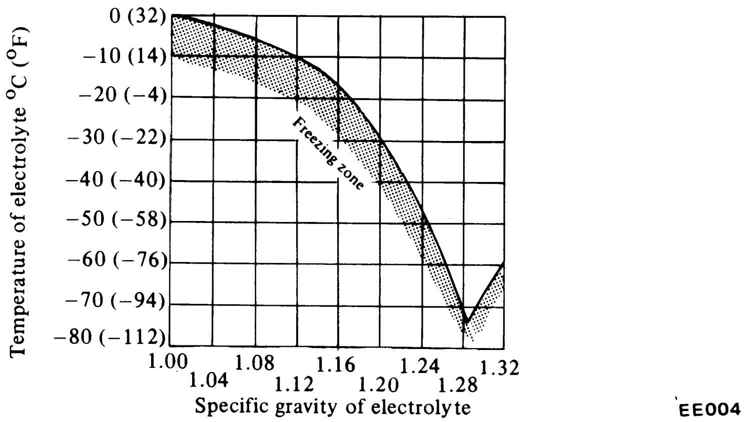


Fig. EE-5 Freezing Point of Electrolyte

CHARGING

If electrolyte level is satisfactory, battery must be charged when electrolyte-gravity reading falls below 1.20. If battery on car is quick-charged to bring it up to full charge, the operation should be carried out with negative cable removed.

Prior to charging, corroded terminals should be cleaned with a brush and common baking-soda solution. In addition, the following items should be observed while battery is being charged.

1. Be sure that electrolyte level is above top of each plate.
2. Keep removed plugs in a safe place.
3. Do not allow electrolyte temperature to go over 45°C (113°F).
4. After charging, check to be certain that specific gravity does not exceed 1.260 or 1.280 (NS70) [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 charged.
6. After all vent plugs have been tightened, clean all sprayed 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

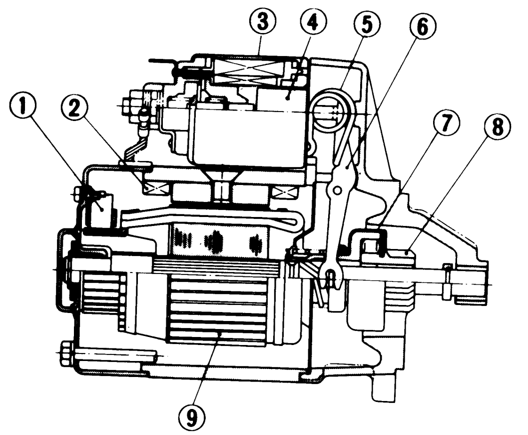
CONTENTS

DESCRIPTION .... EE- 4
NON-REDUCTION GEAR TYPE .... EE- 4
REDUCTION GEAR TYPE .... EE- 4
OPERATION .... EE- 6
CONSTRUCTION .... EE- 7
NON-REDUCTION GEAR TYPE .... EE- 7
REDUCTION GEAR TYPE .... EE- 7
REMOVAL .... EE- 8
DISASSEMBLY .... EE- 8
NON-REDUCTION GEAR TYPE .... EE- 8
REDUCTION GEAR TYPE .... EE- 8
CLEANING AND INSPECTION .... EE- 8
TERMINAL .... EE- 9
FIELD COIL .... EE- 9
BRUSHES AND BRUSH LEAD WIRE .... EE- 9
BRUSH SPRING TENSION .... EE- 9
ARMATURE ASSEMBLY .... EE- 9
OVERRUNNING CLUTCH ASSEMBLY EE-10
BRUSH HOLDER TEST FOR GROUND EE-10
BEARING METAL
(Non-reduction gear type) EE-10
BALL BEARING (Reduction gear type) EE-10
MAGNETIC SWITCH ASSEMBLY EE-10
ASSEMBLY EE-10
TEST EE-10
PERFORMANCE TEST EE-10
DIAGNOSES OF TEST EE-11
MAGNETIC SWITCH ASSEMBLY TEST EE-11

DESCRIPTION

NON-REDUCTION GEAR TYPE

S114-180F, S114-170E

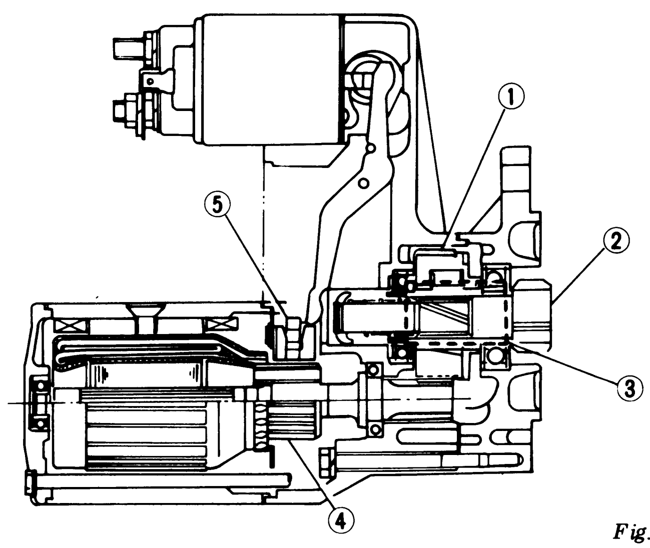


1 Brush
2 Field coil
3 Magnetic switch
4 Plunger
5 Torsion spring
6 Shift lever
7 Overrunning clutch
8 Pinion
9 Armature

EE315

Fig. EE-6 Non-Reduction Gear Type Starting Motor (S114-180F)

S114-254



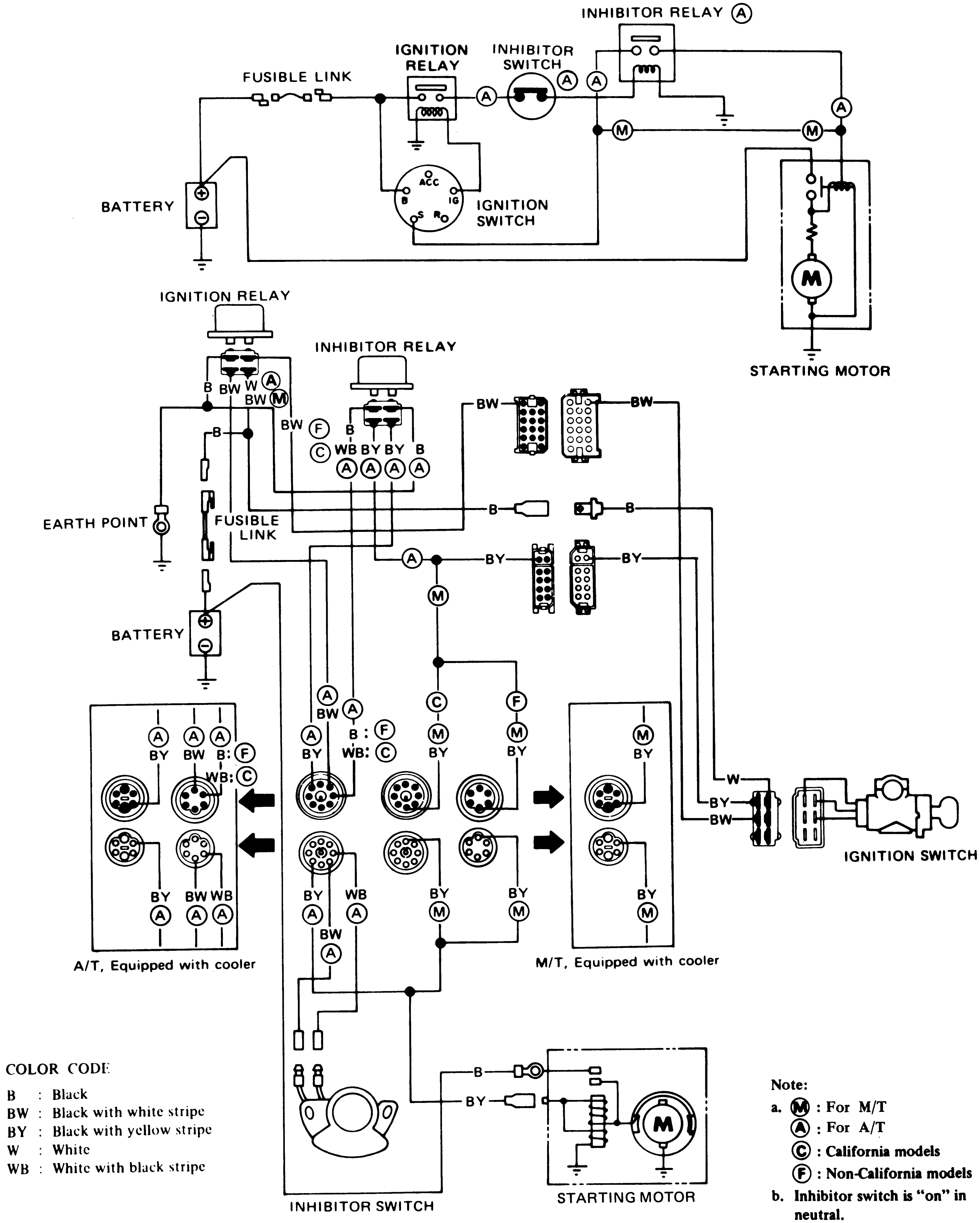
1 Reduction gear
2 Pinion gear
3 Overrunning clutch
4 Commutator
5 Brush

EE610

Fig. EE-7 Reduction Gear Type Starting Motor

REDUCTION GEAR TYPE

The reduction gear, located between the armature and pinion gear, transmits the rotation of the armature to the pinion gear, thereby reducing the speed of the armature and increasing the rotating torque. In construction, the pinion gear is located independently of the armature. The brush and commutator are positioned on the pinion and reduction gear side.



COLOR CODE

B : Black
BW : Black with white stripe
BY : Black with yellow stripe
W : White
WB : White with black stripe

Note:

a. Ⓜ : For M/T
Ⓐ : For A/T
Ⓒ : California models
Ⓕ : Non-California models

b. Inhibitor switch is "on" in neutral.

EE660

Fig. EE-8 Circuit Diagram of Starting System

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.

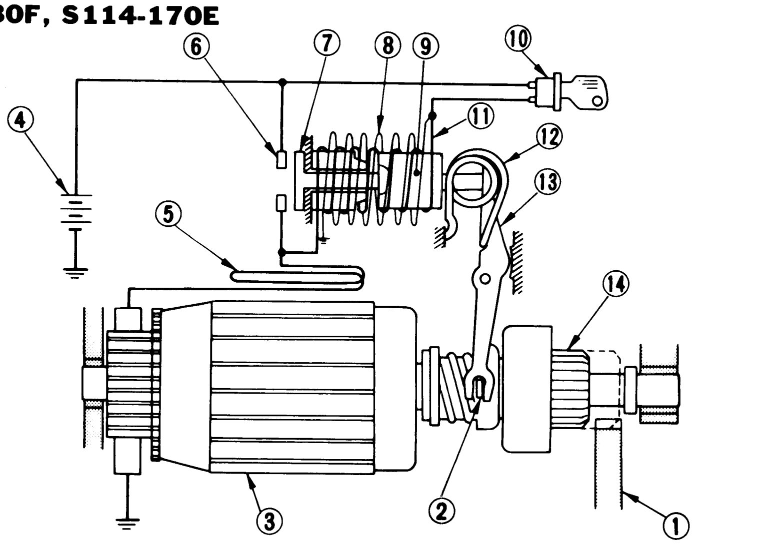
Closing of the solenoid switch contacts causes the motor to crank the engine and also cut out the "series" coil of the solenoid, the magnetic pull of the "shunt" coil being sufficient to hold the pinion in mesh after the shifting has been performed.

After the engine starts running, the driver releases the ignition key and it automatically returns to the ON position.

The torsion spring then actuates the shift lever to pull the pinion, which allows the solenoid switch contacts to open. Consequently, the starting motor stops.

More positive meshing and demeshing of the pinion and the ring gear teeth are secured by means of the overrunning clutch. The overrunning clutch employs a shift lever to slide the pinion along the armature shaft or reduction gear (reduction gear type), into or out of mesh with the ring gear teeth. The overrunning clutch is designed to transmit driving torque from the motor armature or reduction gear (reduction gear type), to the ring gear but prevent the armature from overrunning after the engine has started.

S114-180F, S114-170E

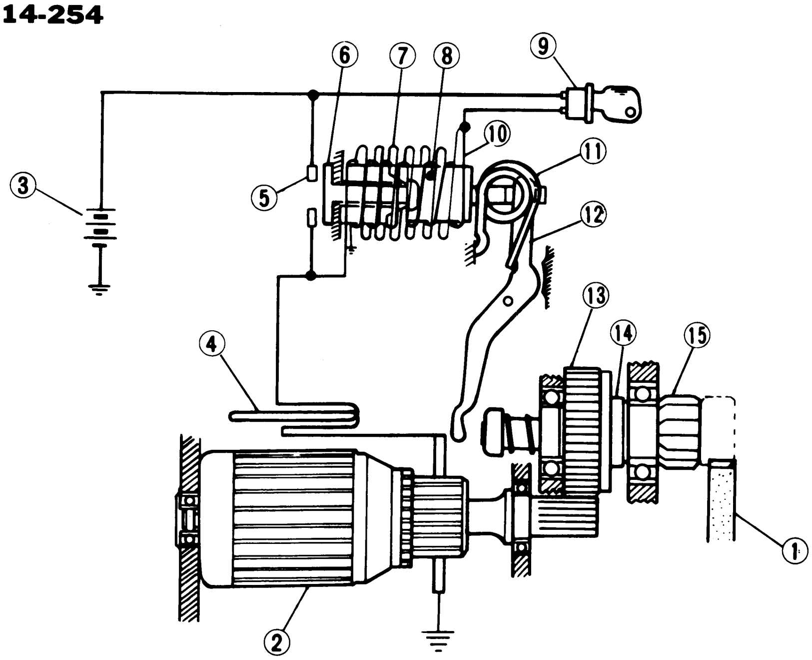


1 Ring gear
2 Shift lever guide
3 Armature
4 Battery
5 Field coil
6 Stationary contact
7 Movable contactor
8 Shunt coil
9 Plunger
10 Ignition switch
11 Series coil
12 Torsion spring
13 Shift lever
14 Pinion

EE274

Fig. EE-9 Non-Reduction Gear Type Starting Motor

S114-254



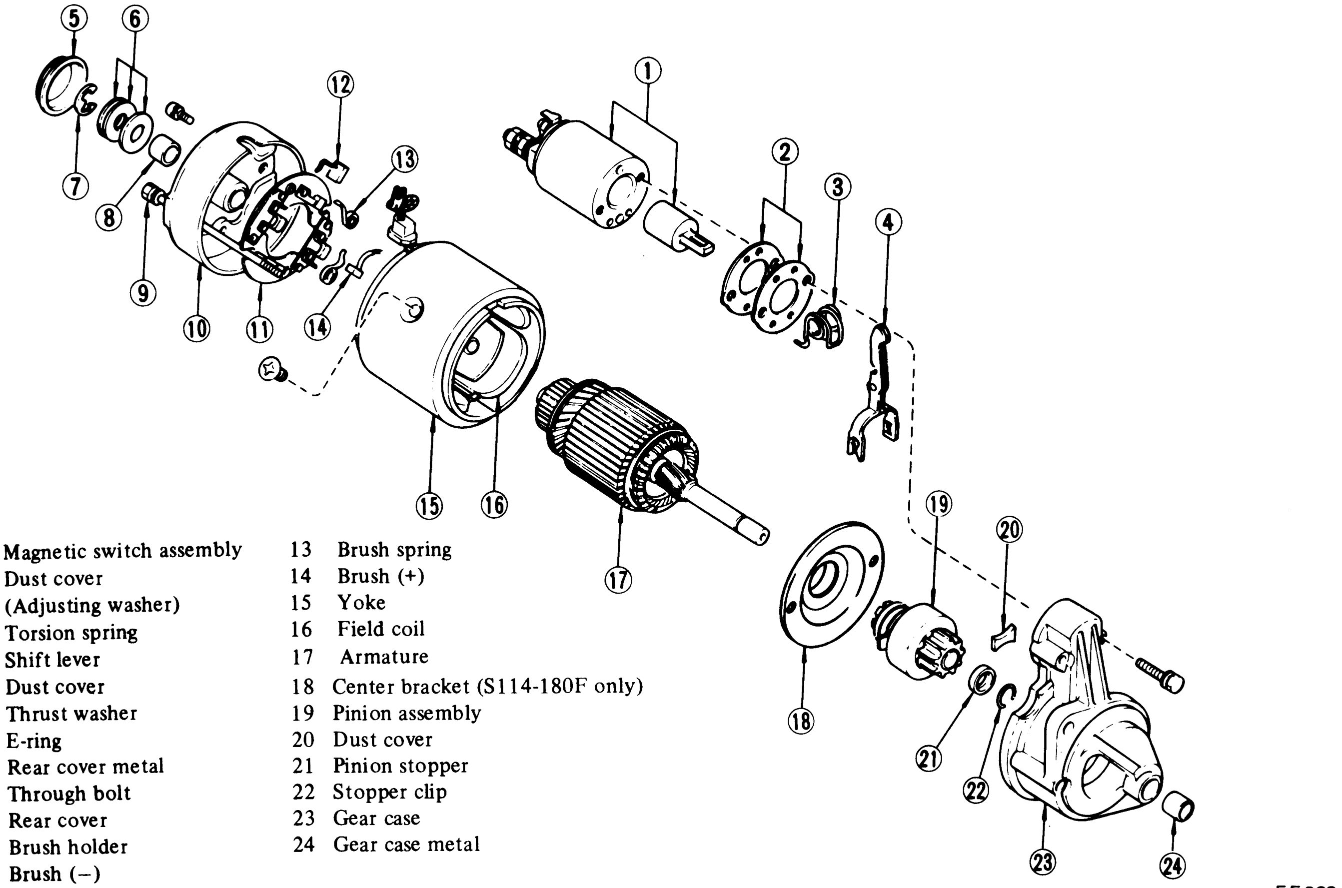
1 Ring gear
2 Armature
3 Battery
4 Field coil
5 Stationary contact
6 Movable contactor
7 Shunt coil
8 Plunger
9 Ignition switch
10 Series coil
11 Torsion spring
12 Shift lever
13 Reduction gear
14 Overrunning clutch
15 Pinion gear

EE613

Fig. EE-10 Reduction Gear Type Starting Motor

CONSTRUCTION

NON-REDUCTION GEAR TYPE

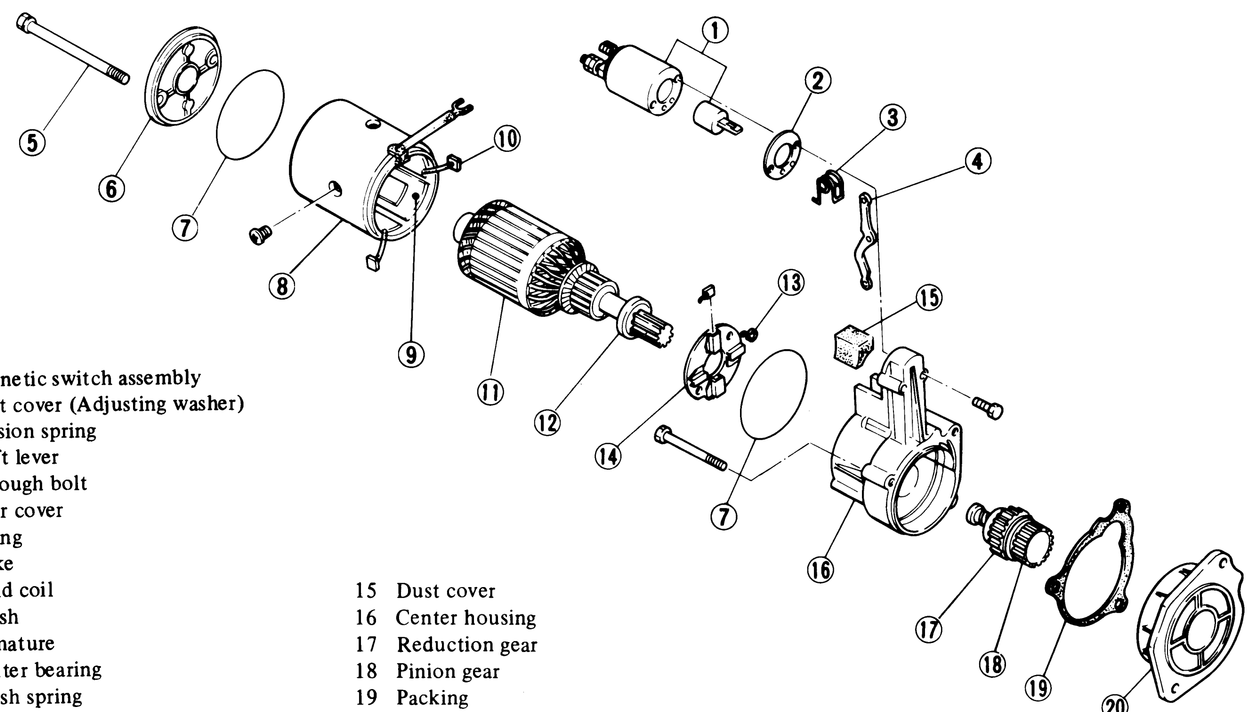


1 Magnetic switch assembly	13 Brush spring
2 Dust cover (Adjusting washer)	14 Brush (+)
3 Torsion spring	15 Yoke
4 Shift lever	16 Field coil
5 Dust cover	17 Armature
6 Thrust washer	18 Center bracket (S114-180F only)
7 E-ring	19 Pinion assembly
8 Rear cover metal	20 Dust cover
9 Through bolt	21 Pinion stopper
10 Rear cover	22 Stopper clip
11 Brush holder	23 Gear case
12 Brush (−)	24 Gear case metal

EE660

Fig. EE-11 Non-Reduction Gear Type Starting Motor (S114-180F, S114-170E)

REDUCTION GEAR TYPE



1 Magnetic switch assembly	15 Dust cover
2 Dust cover (Adjusting washer)	16 Center housing
3 Torsion spring	17 Reduction gear
4 Shift lever	18 Pinion gear
5 Through bolt	19 Packing
6 Rear cover	20 Gear case
7 O-ring	
8 Yoke	
9 Field coil	
10 Brush	
11 Armature	
12 Center bearing	
13 Brush spring	
14 Brush holder	

EE614

Fig. EE-12 Reduction Gear Type Starting Motor (S114-254)

REMOVAL

1. Disconnect battery ground cable.
   Disconnect black wire with yellow stripe from magnetic switch terminal, and black battery cable from battery terminal of magnetic switch.
2. Remove two bolts securing starting motor to transmission case. Pull starter assembly forward and remove starting motor.

DISASSEMBLY

NON-REDUCTION GEAR TYPE

1. Disconnect connecting plate from "M" terminal of magnetic switch. Remove two screws securing magnetic switch and remove magnetic switch assembly.
2. Remove dust cover, E-ring and thrust washer(s).

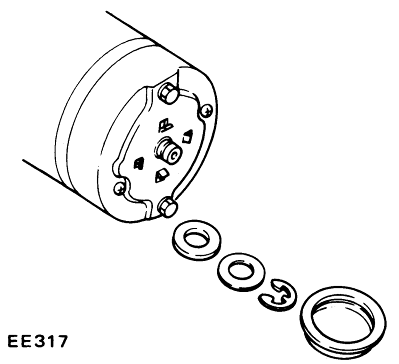


Fig. EE-13 Removing Dust Cover, E-ring and Thrust Washer(s)

3. Remove two screws securing brush holder assembly.

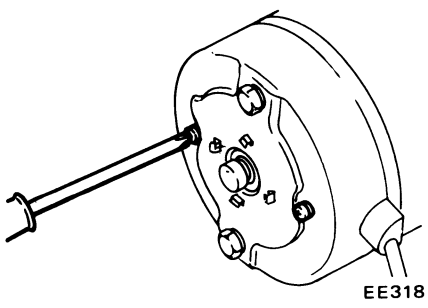


Fig. EE-14 Removing Brush Holder Setscrews

4. Remove two through bolts and rear cover.
5. Remove brushes from their holder by moving each brush spring away from brush with a hook.
   Remove brush holder.
6. Remove yoke assembly and withdraw armature assembly and shift lever.
7. Remove pinion stopper located at the end of armature shaft. To remove stopper, first move stopper toward pinion and after removing stopper clip, remove stopper with overrunning clutch assembly from armature shaft.

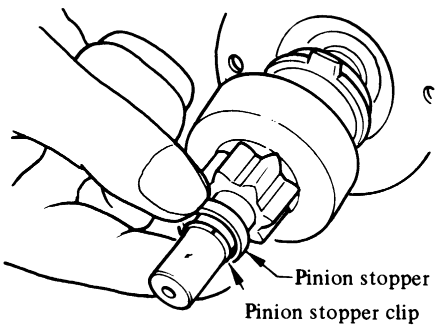


Fig. EE-15 Removing Pinion Stopper

REDUCTION GEAR TYPE

1. Disconnect connecting plate from "M" terminal of magnetic switch. Remove two screws securing magnetic switch and remove magnetic switch assembly.

Note: **Torsion spring can be pulled off magnetic switch.**

2. Remove through bolts and rear cover.

Note: **Rear cover can be pried off with a flat-blade screwdriver inserted between it and yoke. Be careful not to damage packing while removing rear cover.**

3. Remove yoke, armature and brush holder as an assembly from center housing.

CAUTION:
When removing, be careful not to knock brush, commutator or coil against any adjacent part.

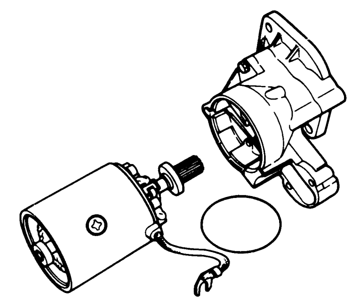


Fig. EE-16

4. To remove brush holders, proceed as follows:
(1) Remove brush (on positive side) from its holder.

Note: **Brush on positive side differs in that it is isolated from brush holder and its lead wire is connected to field coil.**

(2) Carefully lifting brush (on negative side) away from commutator surface, remove it from brush holder.

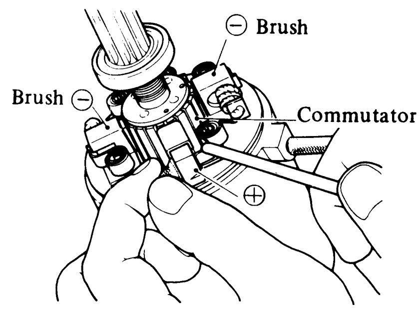


Fig. EE-17

5. Remove bolts securing center housing to gear case, and detach center housing.
6. Remove pinion gear.

CLEANING AND INSPECTION

Clean all disassembled parts, but do not use grease dissolving solvents for cleaning overrunning 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 replace if necessary.

TERMINAL

Check terminal for damage and wear, and replace magnetic switch assembly if necessary.

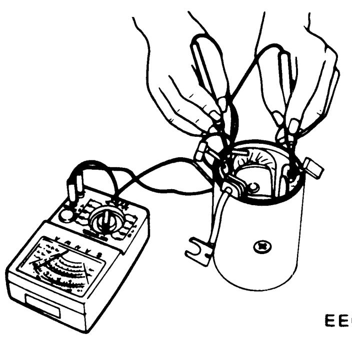
FIELD COIL

Check field coil for insulation. If the insulation of coil is damaged or worn it sould be replaced.

Testing field coil for continuity:

Connect the probe of a circuit tester or an ohmmeter to field coil two positive terminals of positive brush holder.

If tester shows no continuity, field circuit or coil is open. Replace it.



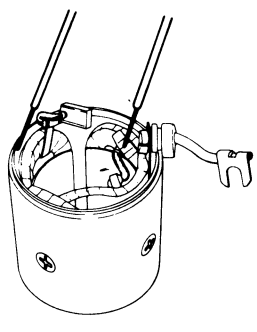
EE016

Fig. EE-18 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. Replace it.



EE017

Fig. EE-19 Testing Field Coil for Ground

BRUSHES AND BRUSH LEAD WIRE

Check the surface condition of brush contact and wear of brush. If a loose contact is found it should be replaced.

If brush is worn so that its length is less than specified value, replace.

Serviceable length limit:
Non-reduction gear type
12 mm (0.47 in)
Reduction gear type
11 mm (0.43 in)

Check the connection of lead clip and lead wire.

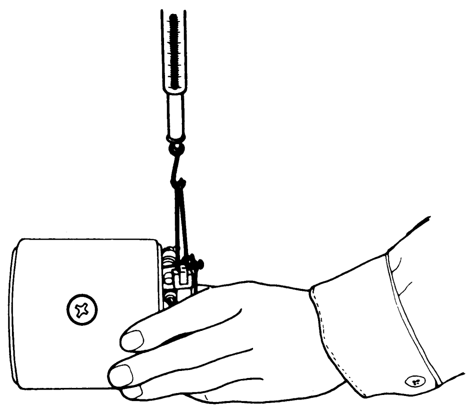
Check brush holders and spring clip to see if they are not deformed or bent, and will properly hold brushes against the commutator.

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 Fig. EE-20.

If it is faulty, replace it



EE018

Fig. EE-20 Inspecting Brush Spring Tension

Spring tension:
Non-reduction gear type
1.4 to 1.8 kg (3.1 to 4.0 lb)
Reduction gear type
1.6 to 2.0 kg (3.5 to 4.4 lb)

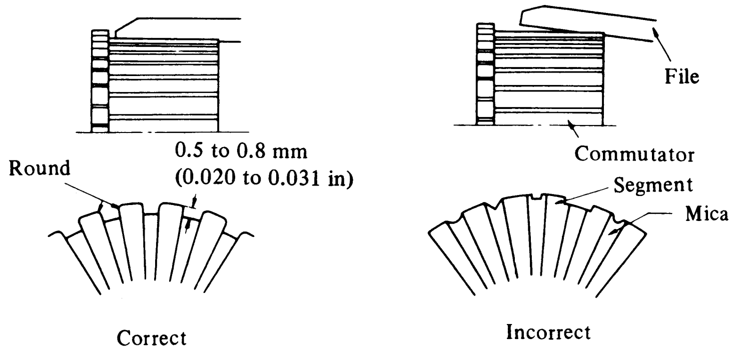
ARMATURE ASSEMBLY

Check external appearance of armature and commutator.

1. Inspect commutator. If the surface of commutator is rough, it must be sanded lightly with a No. 500 sandpaper. If the depth of insulating mica is less than 0.2 mm (0.008 in) from commutator surface, insulating mica should also be undercut so that its depth is 0.5 to 0.8 mm (0.020 to 0.031 in).

The wear limit of commutator diameter is 1 mm (0.04 in). If the diameter of commutator is less than specified value, replace armature assembly.

Diameter limit:
Non-reduction gear type
39 mm (1.54 in)
Reduction gear type
29 mm (1.14 in)



EE021

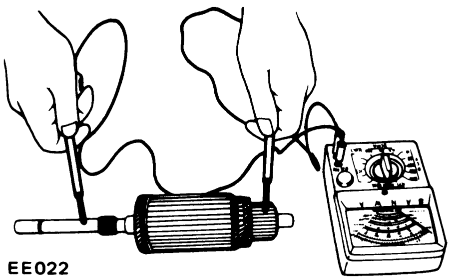
Fig. EE-21 Undercutting Insulating Mica

2. Inspect soldered connection of armature lead and commutator. If loose connection is found, solder it using resin flux.

3. Armature test for ground

Using a circuit tester, place one test probe onto armature shaft or core and other onto each commutator bar.

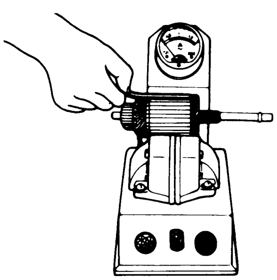
If tester shows continuity, armature is grounded and must be replaced.



EE022

Fig. EE-22 Testing Armature for Ground

4. Check armature for short by placing it on armature tester (growler) with a piece of iron over armature core, rotating armature. If the plate vibrates, armature is shorted. Replace it.



EE023

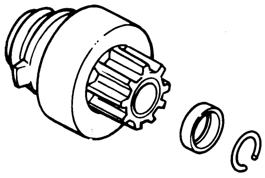
Fig. EE-23 Testing Armature for Short

5. Check armature for continuity by placing probes of tester on two segments side by side. If tester shows no continuity, the circuit is open. Replace it.

OVERRUNNING CLUTCH ASSEMBLY

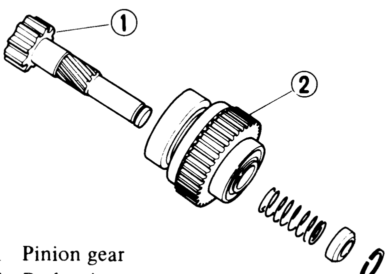
Inspect pinion assembly and screw sleeve or reduction gear. Screw sleeve must slide freely along armature shaft splines. On reduction gear type, pinion shaft must slide freely through reduction gear. If damage is found or resistance except normal resistance due to spring on reduction gear type is felt when sliding, it must be repaired.

Inspect pinion teeth. If excessive rubbing is found on teeth, replace. Flywheel ring gear also must be inspected.



EE278

Fig. EE-24 Overrunning Clutch Assembly



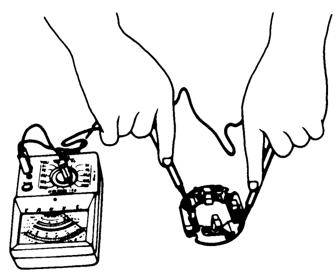
1 Pinion gear
2 Reduction gear

EE617

Fig. EE-25 Pinion and Reduction Gear Overrunning Clutch Assembly

BRUSH HOLDER TEST FOR GROUND

Using a circuit tester, place one test probe onto negative side of brush holder and another onto positive side. If tester shows continuity, brush holder is shorted to ground. Replace brush holder.



EE025

Fig. EE-26 Testing Brush for Ground

BEARING METAL (Non-reduction gear type)

Inspect bearing metal for wear or side play. If the clearance between bearing metal and armature shaft is more than 0.2 mm (0.008 in), replace metal.

BALL BEARING (Reduction gear type)

Holding outer race with finger, rotate bearing to see if there is any play or bind. If necessary, replace bearing.

MAGNETIC SWITCH ASSEMBLY

1. Using a circuit tester, check continuity between "S" terminal of magnetic switch and switch body metal. If continuity does not exist, shunt coil is opened.

Replace switch assembly.

2. In the same manner as above, check continuity between terminals "S" and "M". If continuity does not exist, series coil is opened.

Replace switch assembly.

ASSEMBLY

Reassemble starting motor in reverse sequence of disassembly.

When assembling, be sure to apply grease to gear case and rear cover bearing metal, and apply oil lightly to pinion.

TEST

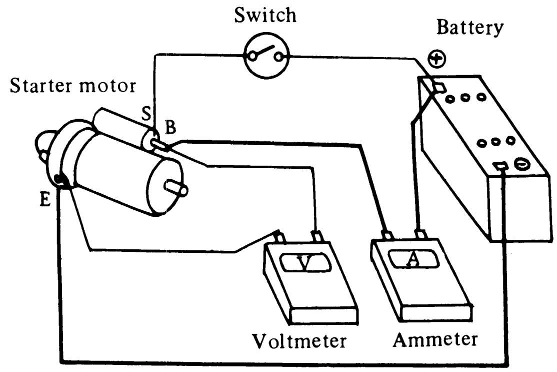
PERFORMANCE TEST

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 on engine. Starter motor 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 this test are shown in "Specifications".



EE026
Fig. EE-27 No-Load Testing

DIAGNOSES OF TEST

1. Low speed with no-load and high current draw may result from the following:

(1) Tight, dirty or worn bearings.

(2) Bent armature shaft or loosened field probe.

(3) Shorted armature;
Check armature further.

(4) A grounded 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 continuity, 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 be caused by the following:

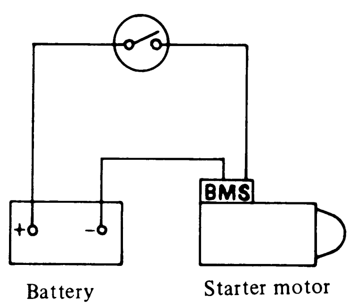
(1) A grounded or open field coil:
Inspect the connection and trace circuit with a circuit tester.

(2) Armature coil does not operate:
Inspect commutator for excessive burning. In this case, arc may occur on damaged 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 commutator bar to burn.

3. Low current draw and low no-load speed would cause high internal resistance due to loose connections, damaged leads, dirty commutator and causes listed on item 2-(3).

MAGNETIC SWITCH ASSEMBLY TEST



EE351
Fig. EE-28 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 a switch in series as shown above.

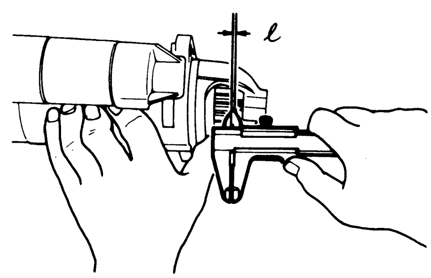
With the switch on, push pinion back to remove all slack and measure the clearance "ℓ" between pinion front edge and pinion stopper.

Reduction gear type

Compare difference in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until its stopper touches reduction gear. In this case, height difference is clearance "ℓ".

Clearance "ℓ":
0.3 to 1.5 mm
(0.012 to 0.059 in)

If necessary, adjust it by changing or adding adjusting washer(s). Adjusting washers are available into two different sizes, 0.5 mm (0.020 in) and 0.8 mm (0.031 in).



EE644
Fig. EE-29 Measuring Clearance "ℓ"

CHARGING CIRCUIT

The charging circuit consists of a battery, an alternator incorporating an IC voltage regulator and wiring that connects 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.

With the ignition switch in ON, the circuit between transistor "Tr_1" of the IC voltage regulator and ground is closed. Current from the battery then flows along the route shown by the arrow in Fig. EE-30, turning on the charge warning lamp and flowing on through terminal "L" to excite the rotor.

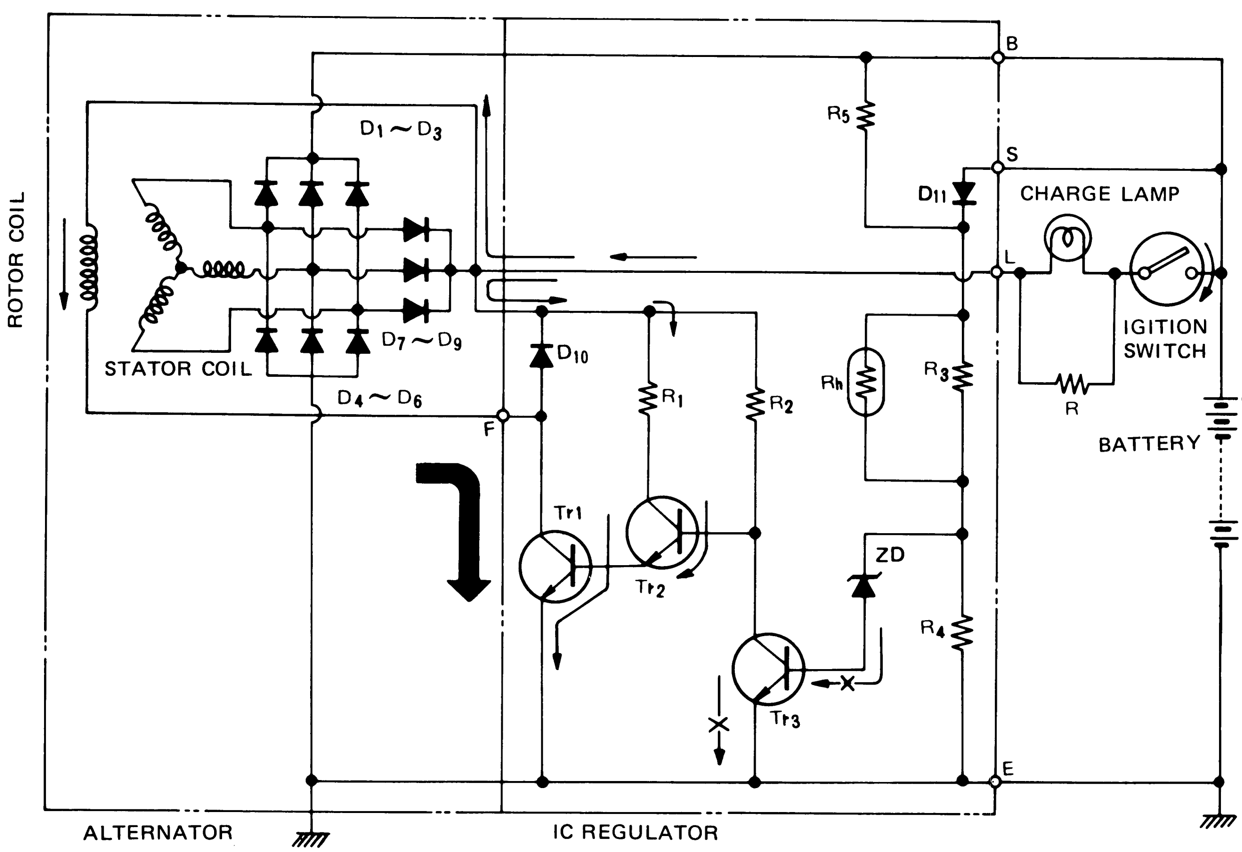
When the alternator begins to operate, three-phase alternating current is indicated in the stator coil. This alternating current is rectified by the positive and negative silicon diodes.

When the voltage at terminal "B" is higher than battery voltage, current produced at the stator flows to re-charge the battery. While the battery is being re-charged, the voltage at terminal "L" is equal to that of terminal "B". At this point, there is no voltage differential on either side of the charge warning lamp, which causes the charge warning lamp to turn off. In other words, current does not flow from the battery to terminal "L". Accordingly, current flow through the rotor as shown in Fig. EE-31, is taken over by current produced at the stator. The circuit between terminal "F" and "Tr_1" is then closed. See Fig. EE-31.

The IC voltage regulator monitors generating voltage to be applied to the battery at terminal "S". When current exceeds the specified value, it then flows through the zener diode (ZD), closing the circuit consisting of transistor "Tr_3" and resistor "R_2". At this point, current neither flows through transistor "Tr_1" to ground nor to the rotor, thereby reducing the voltage generated at the stator. See Fig. EE-32.

When voltage generated at terminal "S" is reduced to the specified value, transistor allows current to flow through the rotor, increasing the generating voltage.

In this manner, output voltage from the alternator does not rise above the specified value by the ON-OFF operation of the rotor coil through the IC voltage regulator.



EE618

Fig. EE-30 Simplified Charging Circuit (1)

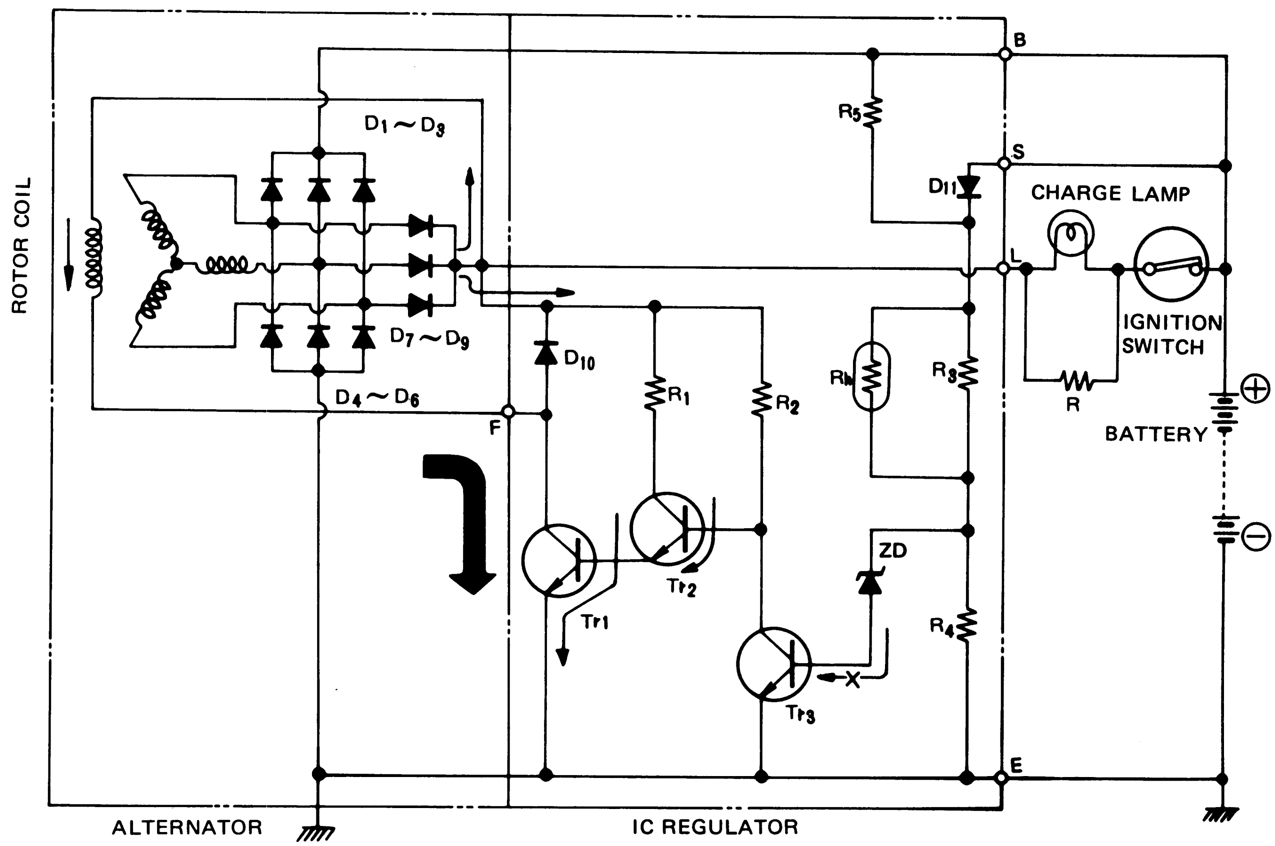


Fig. EE-31 Simplified Charging Circuit (2)

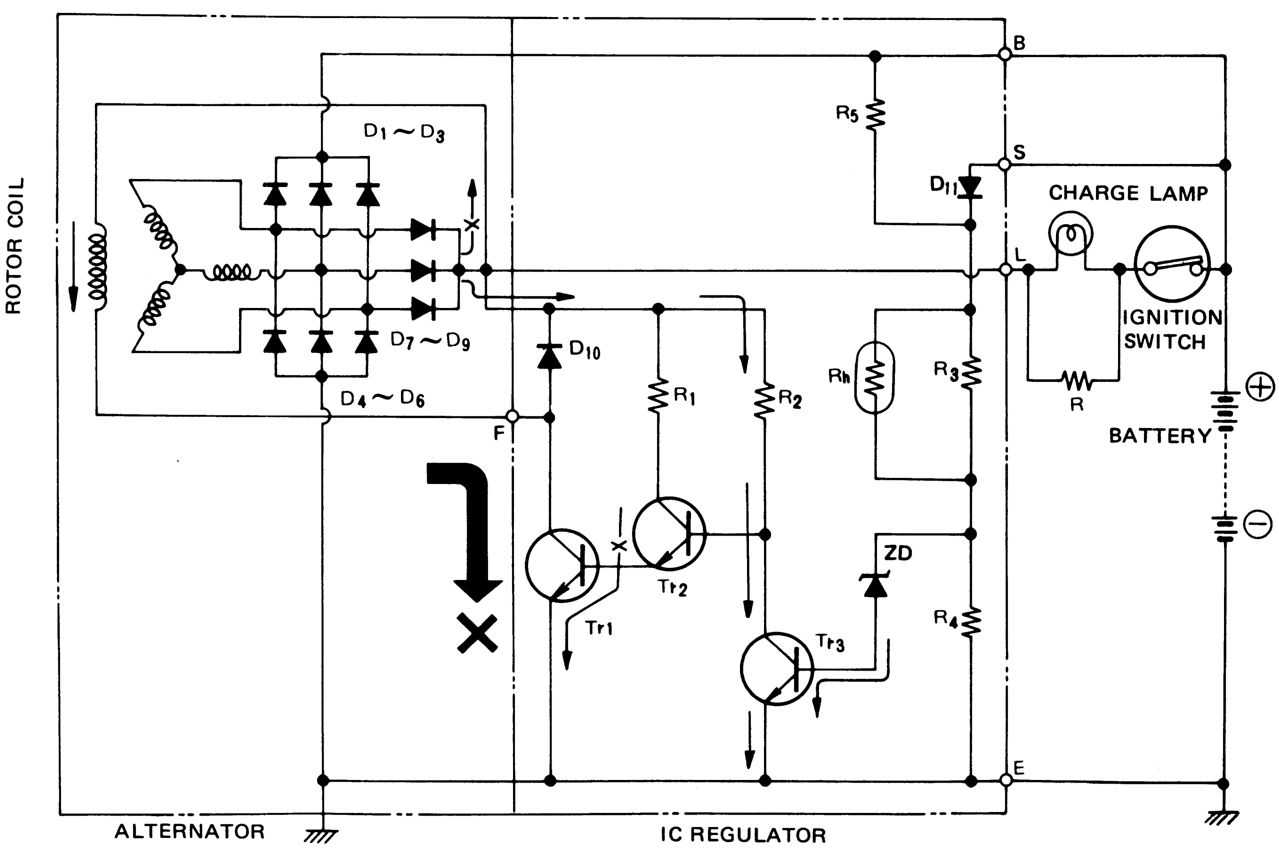
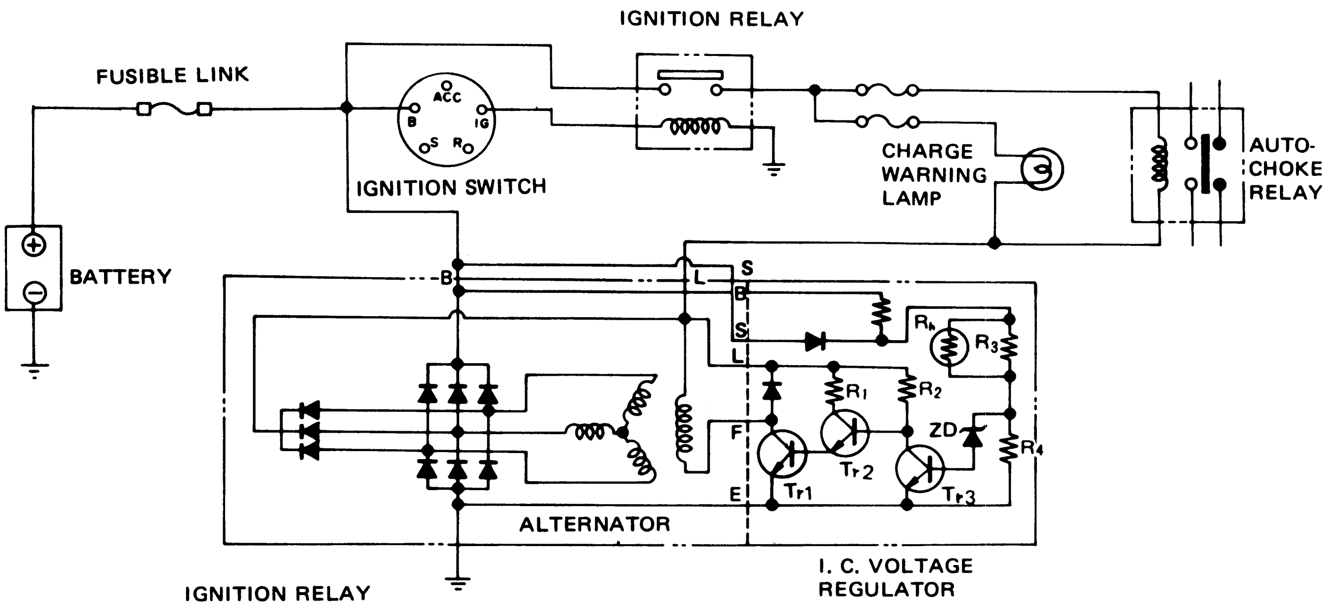
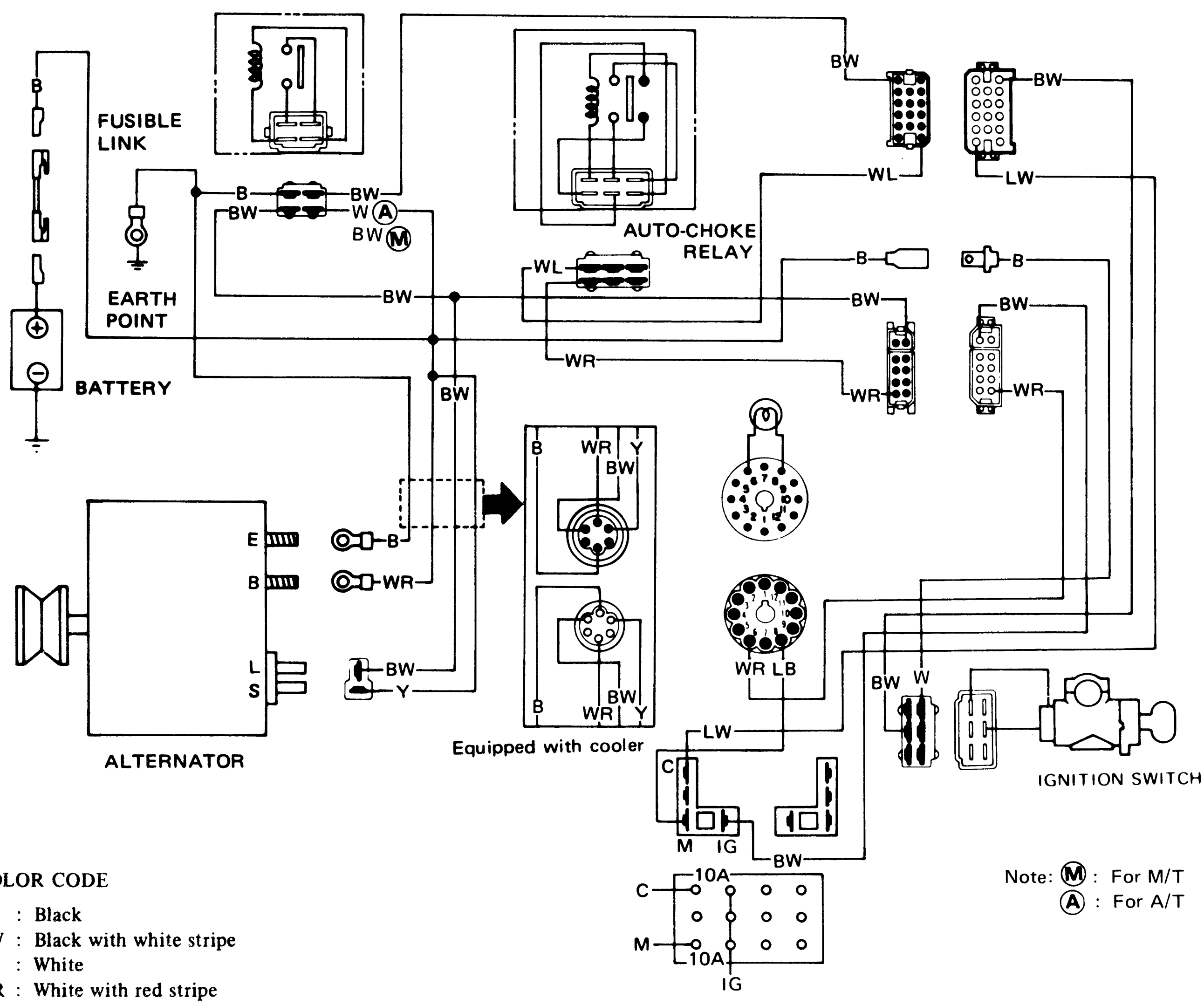


Fig. EE-32 Simplified Charging Circuit (3)





COLOR CODE

B : Black
BW : Black with white stripe
W : White
WR : White with red stripe
WL : White with blue stripe
Y : Yellow
LW : Blue with white stripe

EE667

Fig. EE-33 Circuit Diagram of Charging System

ALTERNATOR

CONTENTS

DESCRIPTION EE-15
REMOVAL EE-16
DISASSEMBLY EE-16
INSPECTION AND REPAIR EE-16
ROTOR INSPECTION EE-16
INSPECTION OF STATOR EE-16
INSPECTION OF DIODE EE-17
INSPECTION OF BRUSH EE-18
SPRING PRESSURE TEST EE-18
ASSEMBLY EE-18
ALTERNATOR TEST EE-19

DESCRIPTION

The alternator incorporates an IC voltage regulator which maintains voltage within the specified range and prevents output voltage from rising higher than the specified value. Except for the IC circuit, alternator parts are essentially the same as those of the conventional type alternator.

Service procedures outlined in this section are restricted to information on other than the voltage regulator.

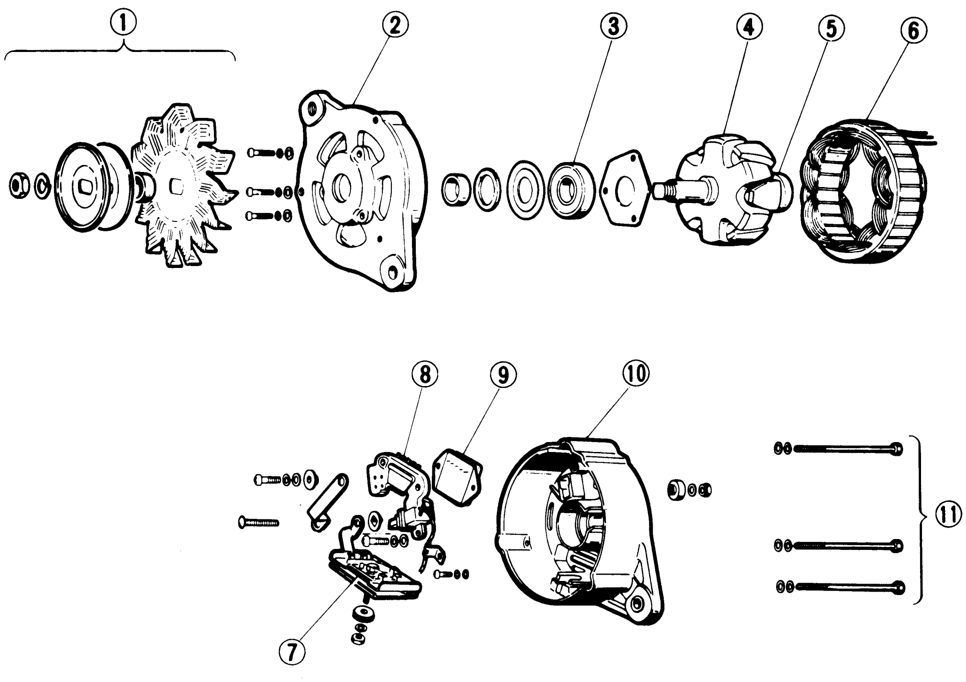
In the alternator, a magnetic field is produced by the rotor which consists of alternator shaft, field coil, pole pieces, and slip rings. The slip rings pressed in the shaft conduct only a small field current. Output current is generated in the armature coils located in the stator. The stator has three 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, pack type silicon diodes are used as main diodes.

Nine diodes (three negative, three positive and three sub-diodes), are installed in positive and negative plates as an assembly.

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.



1 Pulley assembly
2 Front cover
3 Front bearing
4 Rotor
5 Rear bearing
6 Stator
7 Diode (Set plate) assembly
8 Brush assembly
9 IC voltage regulator
10 Rear cover
11 Through bolt

EE647

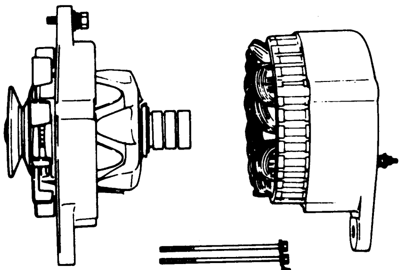
Fig. EE-34 Alternator

REMOVAL

1. Disconnect battery negative cable.
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 car.

DISASSEMBLY

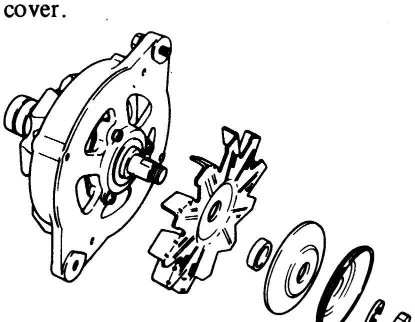
1. Remove through bolts. Separate front cover with rotor from rear cover with stator by lightly tapping front bracket with a wooden mallet.



EE525

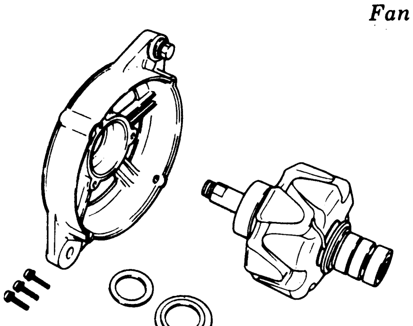
Fig. EE-35 Separating Front Cover

2. Place rear cover side of rotor in a vise with soft jaw, and remove pulley nuts. Then remove pulley and fan from rotor shaft.
3. Remove setscrews from bearing retainer, and separate rotor from front cover.



EE526

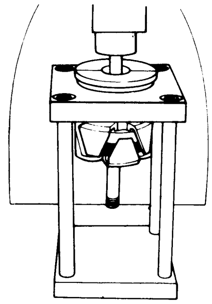
Fig. EE-36 Removing Pulley and Fan



EE527

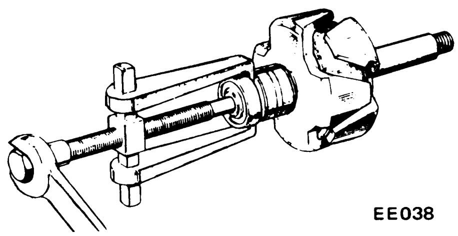
Fig. EE-37 Removing Rotor

4. Pull rear bearing off rotor assembly with a bearing puller press.



EE037

Fig. EE-38



EE038

Fig. EE-39 Pulling Out Rear Bearing

5. When removing IC regulator only, proceed as follows:

(1) Using soldering iron, disconnect wire connecting diode set plate to brush at brush terminal.

(2) Remove bolt securing diode set plate to rear cover side face.

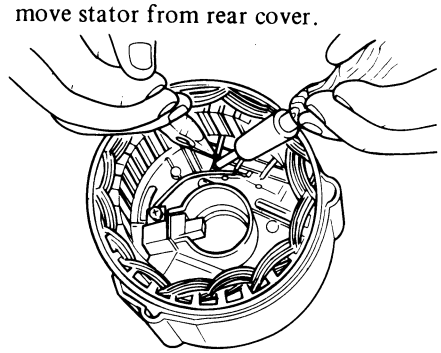
(3) Remove nut securing battery terminal bolt.

(4) To facilitate removal, slightly lift stator coil together with diode set plate from rear cover. Then remove screw connecting diode set plate with brush.

(5) Separate stator coil and diode together with rear cover, and remove brush and IC regulator.

6. Disconnect stator coil lead wires from diode terminals with a soldering iron.

Remove screws securing brush; remove stator from rear cover.



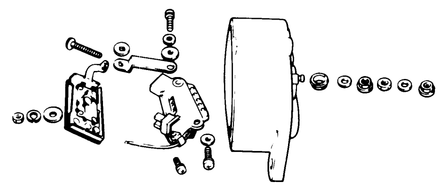
EE648

Fig. EE-40 Removing Stator Coil

7. Disconnect wires at diode terminal with soldering iron.

Remove brush assembly with IC regulator by loosening screws.

8. Remove diode holder by loosening screws.



EE649

Fig. EE-41

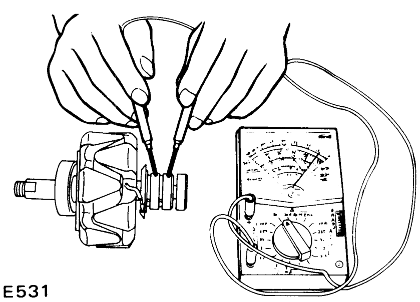
INSPECTION AND REPAIR

ROTOR INSPECTION

1. Continuity test of rotor coil

Apply tester between slip rings of rotor. If there is no continuity field coil is open.

Replace rotor assembly.

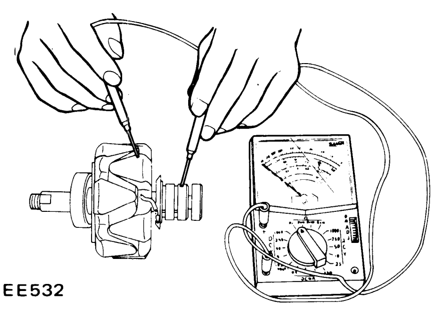


EE531

Fig. EE-42 Continuity Test of Rotor Coil

2. Ground test of rotor coil

Check continuity between slip ring and rotor core. If continuity exists, replace rotor assembly, because rotor coil or slip ring may be grounded.



EE532

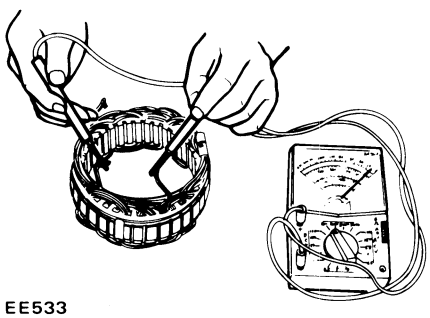
Fig. EE-43 Testing Rotor Coil for Ground

INSPECTION OF STATOR

1. Continuity test

Stator is normal when there is continuity between individual stator coil terminals. When there is no continuity between individual terminals, cable is broken.

Replace stator assembly.

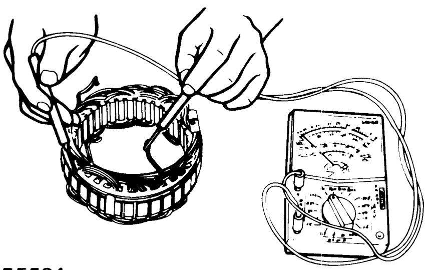


EE533

Fig. EE-44 Testing Stator for Continuity

2. Ground test

If each lead wire of stator coil (including neutral wire) is not conductive with stator core, condition is satisfactory. If there is continuity, stator coil is grounded.



EE534

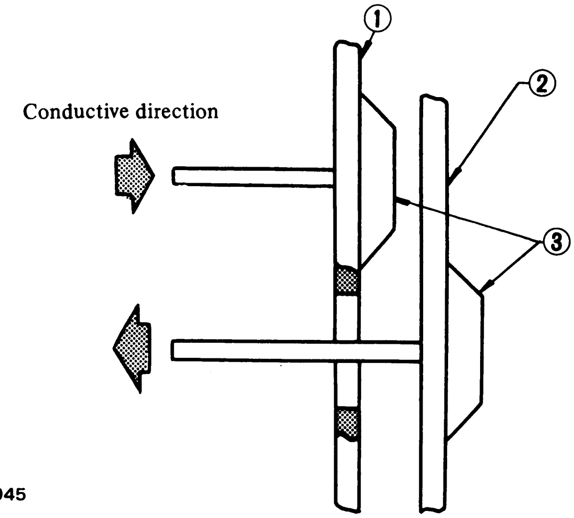
Fig. EE-45 Testing Stator for Ground

INSPECTION OF DIODE

Perform a continuity test on diodes in both directions, using an ohmmeter.

There are six main diodes and three sub-diodes attached to set plate. Three main diodes are attached to positive ⊕ plate and three others to negative ⊖ plate. Three sub-diodes are attached to terminals.

The continuity test should be performed on each diode, between the terminal and plate.

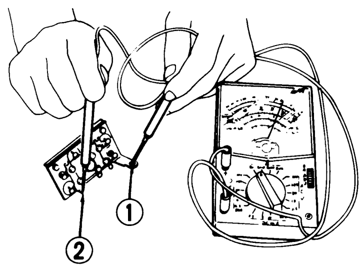


EE045

1 (+) plate
2 (−) plate
3 Diode

Fig. EE-46 Conductive Direction of Diode

1. Main diode installed on ⊕ plate is a positive diode which allows current to flow from terminal to ⊕ plate only. In other words, current does not flow from ⊕ plate to terminal.

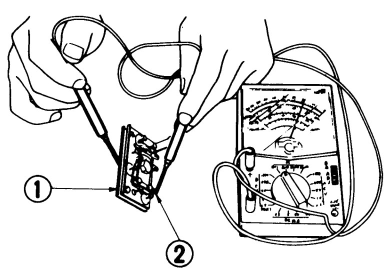


1 (+) plate
2 Terminal

EE046

Fig. EE-47 Inspecting Positive Diode

2. Main diode installed on ⊖ plate is a negative diode which allows current to flow from ⊖ plate to terminal only. In other words, current does not flow from terminal to ⊖ plate.

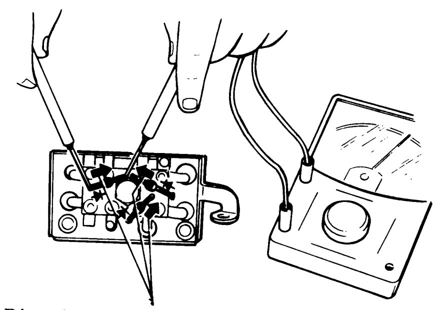


1 (−) plate
2 Terminal

EE047

Fig. EE-48 Inspecting Negative Diode

3. Correct direction of current flow for three sub-diodes is shown in Fig. EE-49.



Direction of electric current

EE650

Fig. EE-49 Sub-Diode

If current flows in both positive and negative directions, diode is short-circuited. If current flows in one direction only, diode is in good condition. If there is a faulty main diode, replace all diodes as an assembly. (See table below.) These diodes are unserviceable.

Test probe of a circuit tester		Conduction
$\ominus$	$\oplus$	
terminal	$\oplus$ plate	O
$\oplus$ plate	terminal	–
terminal	$\ominus$ plate	–
$\ominus$ plate	terminal	O
$\ominus$ plate	$\oplus$ plate	O
$\oplus$ plate	$\ominus$ plate	–

Sub-diodes can be replaced individually.

CAUTION:
If it is necessary to remove sub-diode, pinch diode lead wire with a pair of pliers to prevent heat transfer from soldering iron to diode when unsoldering connection.

INSPECTION OF BRUSH

Check movement of brush and if movement is not smooth, check brush holder and clean if necessary.

Check brush for wear. If it is worn down to less than the specified limit, replace brush assembly.

Check brush pig tail and, if damaged, replace.

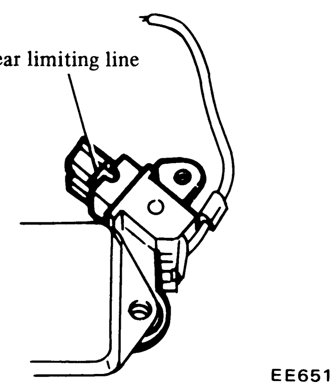


Fig. EE-50 Brush Wear Limit

SPRING PRESSURE TEST

With brush projected approximately 2 mm (0.08 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 gr (8.99 to 12.17 oz).

Moreover, when brush is worn, pressure decreases approximately 20 gr (0.71 oz) per 1 mm (0.04 in) wear.

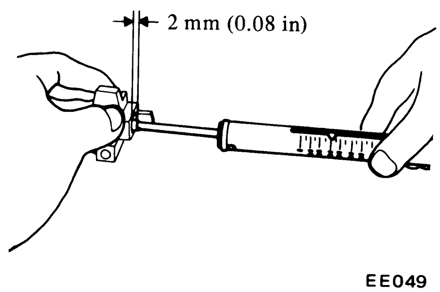


Fig. EE-51 Measuring Spring Pressure

ASSEMBLY

Assemble alternator in the reverse sequence of disassembly, noting the following:

1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When installing diode A terminal, install insulating bushing correctly.
3. Tighten pulley nut.

Ⓣ **Tightening torque:**
Pulley nut
4.5 to 6.0 kg-m
(33 to 43 ft-lb)

When pulley is tightened, make sure that deflection of V-groove.

V-groove deflection:
0.3 mm (0.012 in)

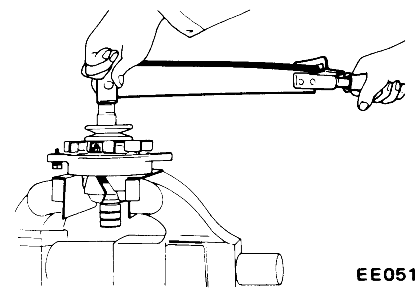


Fig. EE-52 Tightening Pulley Nut

4. Before installing front and rear sides of alternator, push rear cover brush up with fingers and retain brush, as shown in Fig. EE-53, by inserting brush lift into brush lift hole from outside.

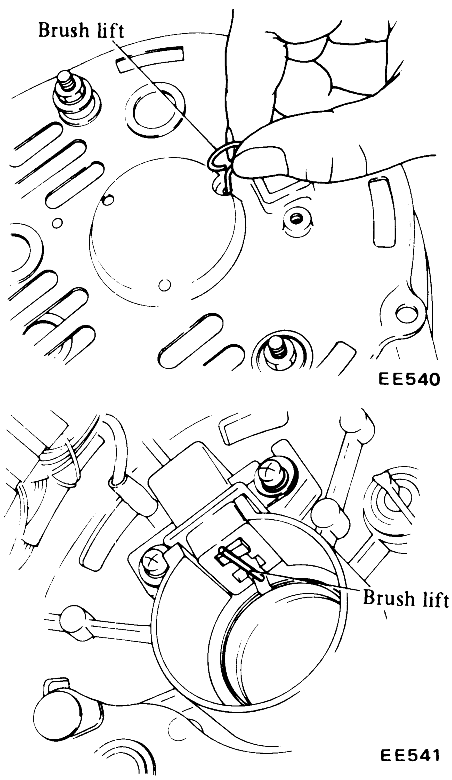


Fig. EE-53 Inserting Brush Lift

5. After installing front and rear sides of alternator, pull brush lift by pushing toward center.

Note: Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.

6. Tighten through bolts.

Ⓣ **Tightening torque:**
Through bolts
60 to 70 kg-cm
(52 to 61 in-lb)

ALTERNATOR TEST

Before conducting an alternator test, make sure that the battery is fully charged.

A 30-Volt voltmeter and suitable test probes are necessary for the test.

Set up a test circuit as shown in Fig. EE-54 and test alternator in the manner indicated in the flow chart below:

1. Connect charging circuit on car. Make sure that battery is fully charged.
2. Connect one test probe from voltmeter positive terminal to "BAT" terminal. Connect the other test probe to ground. Make sure that voltmeter registers battery voltage.
3. Turn on headlights and switch to High Beam.
4. Start engine.
5. Increase engine speed gradually.

Measured value: Below 12.5 volts Alternator is in trouble, remove and check it for condition.	Measured value: Over 12.5 volts at idling 20°C (68°F) Over 14 volts at 2,400 rpm 20°C (68°F) Alternator is in good condition.

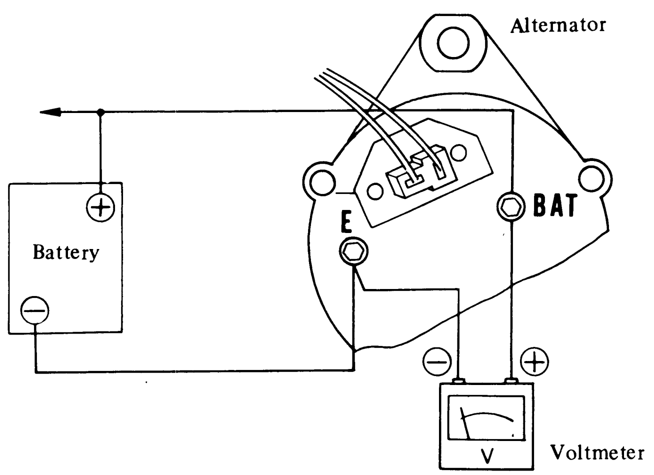


Fig. EE-54 Testing Alternator

REGULATOR

DESCRIPTION

The regulator consists essentially of integrated circuits incorporating transistors. These transistors interrupt and admit current flow to the alternator rotor coil, thus maintaining its output voltage at a constant value. Unlike in a mechanical type regulator, an electronic relay employing transistors is utilized. These transistors are enclosed in a very compact, sealed case. The electronic relay is soldered to the brush assembly inside the alternator. Should any problem with the relay arise, it should be replaced together with the brush assembly. In the charge warning lamp circuit, a diode is attached to the stator coil to monitor generating voltage at the stator so that when the monitored voltage and charging voltage are equal during re-charging, the charge warning lamp is turned off. Accordingly, a charge warning relay is not employed in this circuit.

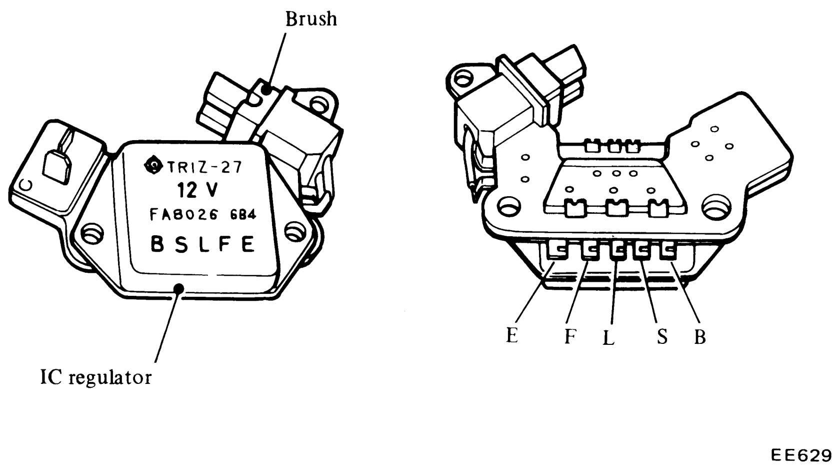


Fig. EE-55 IC Voltage Regulator

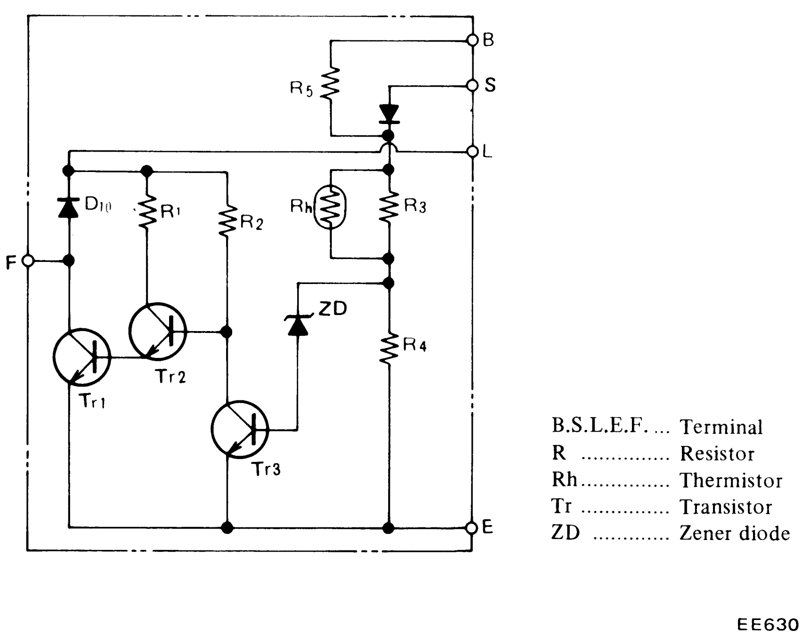


Fig. EE-56 Circuit of Regulator

INSPECTION

CAUTION:
When performing test continuously, resistor may generate heat. If it becomes high temperature, stop testing for a while to avoid burning.

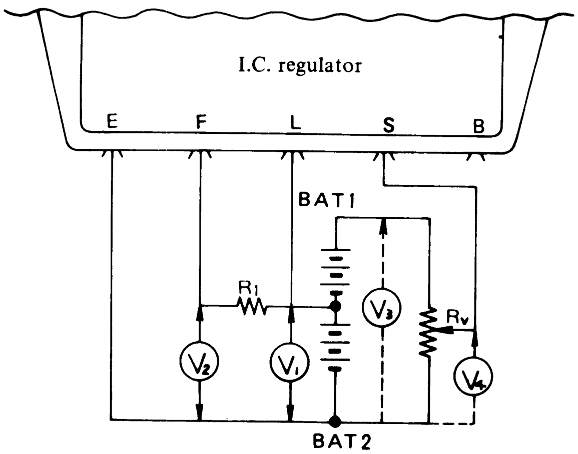
Remove IC regulator and brushes at the same time, as outlined in "Disassembly and Assembly" section under the heading "Alternator".

1. The following test equipment and accessories are required.

(1) Resistor (R_1), 10 ohms, 20 watts .... x 1
(2) Variable resistor (R_v) 0 to 300 ohms, 20 watts .... x 1
(3) Batteries (1 and 2), 12 volts .... x 2
(4) DC voltmeter, 0 to 30 volts .... x 1

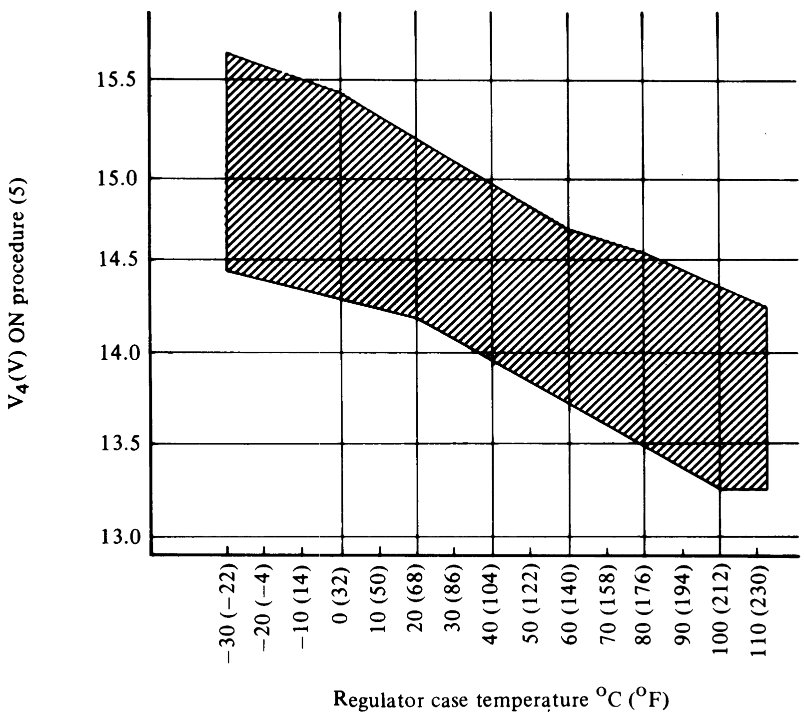
2. Connect wiring as shown in Fig. EE-57, and perform tests as follows:

(1) Measure voltage V_1 at battery. If it is not within 10 to 13 volts, re-charge or replace battery as necessary.
(2) Disconnect lead wire at terminal "S"; measure voltage V_2 between terminals "F" and "E". If it is below 2.0 volts, regulator is functioning properly. Connect lead wire to terminal S.
(3) Measure voltage V_3 (total voltage of batteries 1 and 2). If it is not within 20 to 26 volts, re-charge or replace either or both batteries.
(4) Gradually decrease resistance of variable resistor Rv from 300 ohms, and measure voltage V_2 between terminals "E" and "F". As resistance varies, voltage V_2 should at a certain point increase to as high as voltage V_1 which is measured in Step (1). If there is such a variation, the regulator is functioning properly. Hold variable resistor Rv at the same voltage as V_1. If there is no voltage variation, regulator is out of order and must be replaced.



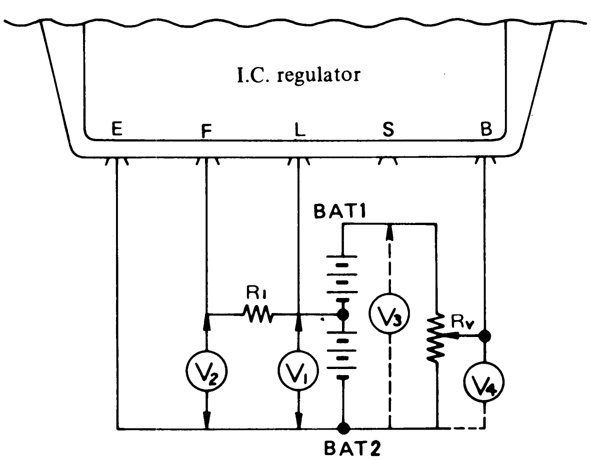
EE631

Fig. EE-57 Testing Regulator (1)



EE632

Fig. EE-58 Testing Regulator (5)



EE633

Fig. EE-59 Testing Regulator (6)

(5) Measure voltage V_4 between center tap of variable resistor Rv and terminal "E".

With Rv resistance set at a value obtained in step (4) above, measure voltage V_4 to see if it is within specified range indicated in Fig. EE-58. If it is not, regulator is not functioning properly. Replace.

(6) Reconnect wiring as shown in Fig. EE-59, and repeat steps (4) and (5). If voltage V_4 is 0.5 to 2.0 volts higher than that in step (5), regulator is functioning properly. If it is not, replace.

IGNITION CIRCUIT

DESCRIPTION

The ignition circuit consists of ignition switch, transistor ignition unit, distributor, wiring, spark plugs and battery.

The distributor is of the contactless type and is equipped with a pick-up coil which electrically detects the ignition timing signal in place of the circuit breaker of the conventional distributor. The transistor ignition unit is a new addition, which generates the signal required for the make and break of the primary electric current for the ignition coil.

The low voltage current is supplied by the battery or alternator and flows through the primary circuit.

It consists of the ignition switch, primary winding of the ignition coil, transistor ignition unit 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, distributor high tension wires to coil and spark plugs, distributor rotor and cap.

When the ignition switch is turned on and the distributor reluctor rotates, the primary current flows through the primary winding of the coil and through transistors ignition unit to ground.

When the primary circuit is opened by circuit of transistor ignition unit, the magnetic field built up in the primary winding of the coil moves through the secondary winding of the coil, inducing high voltage. This high voltage is produced every time the primary circuit opens.

The high voltage current flows through the high tension wire to the distributor cap, then the rotor distributes the current to one of the spark plug terminals in the distrubutor cap.

Then the spark occurs 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 spark plug should be inspected, cleaned and regapped at tune up. Spark plugs should also be replaced periodically as specified in the "Maintenance Schedule".

The remainder of the ignition component parts should be inspected for only their operation, air gap of distributor, tightness of electrical terminals, and wiring condition.

Apply grease (NLGI consistency No. 1 containing MoS_2 or equivalent) to distributor rotor shaft as required.

WARNING:
When current is flowing, never touch with bare hand high tension cables or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap affected parts with dry cloth before handling.

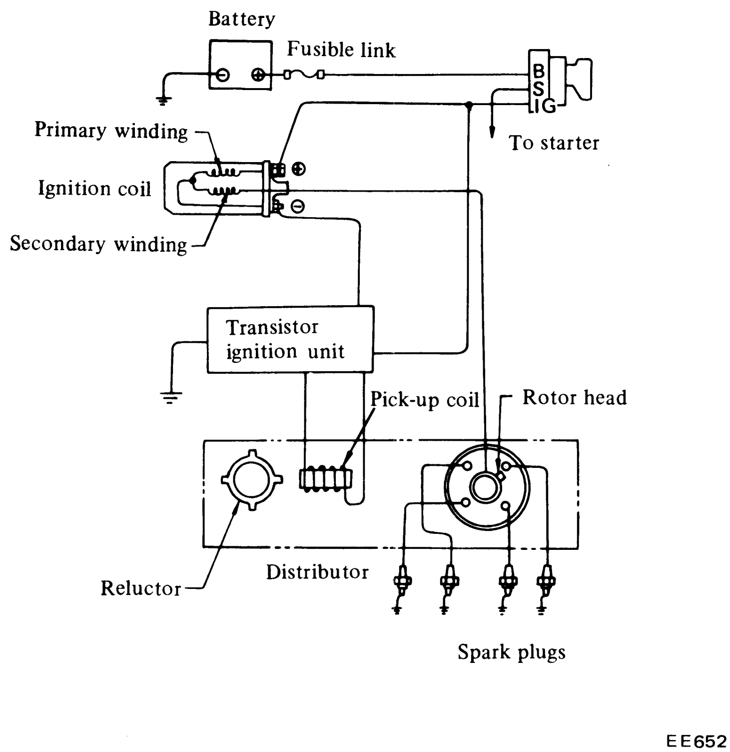
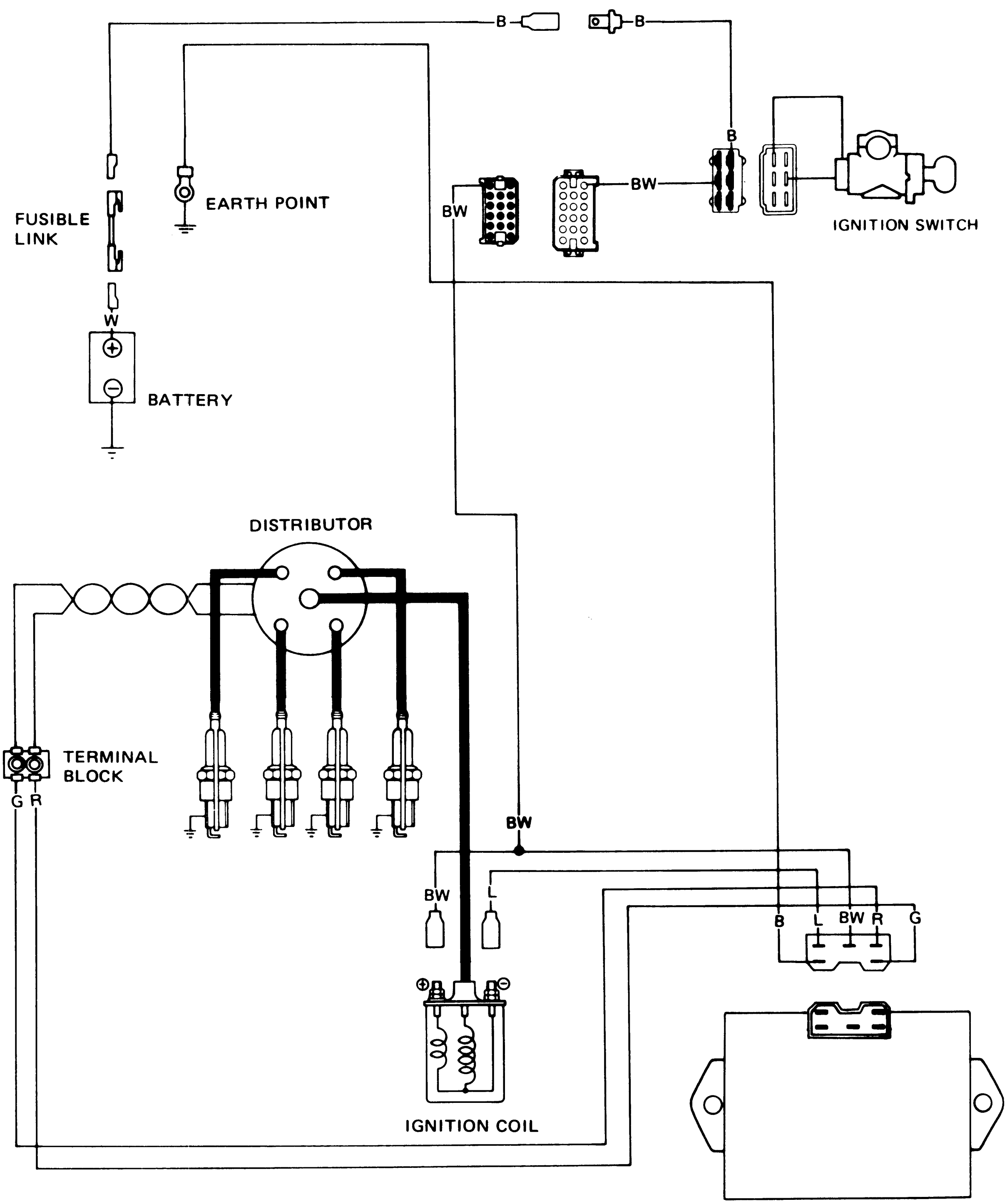


Fig. EE-60 Ignition System Circuit Diagram



COLOR CODE

B : Black
BW : Black with white stripe
R : Red
G : Green
L : Blue

EE669

Fig. EE-61 Ignition System Circuit Diagram

DISTRIBUTOR

CONTENTS

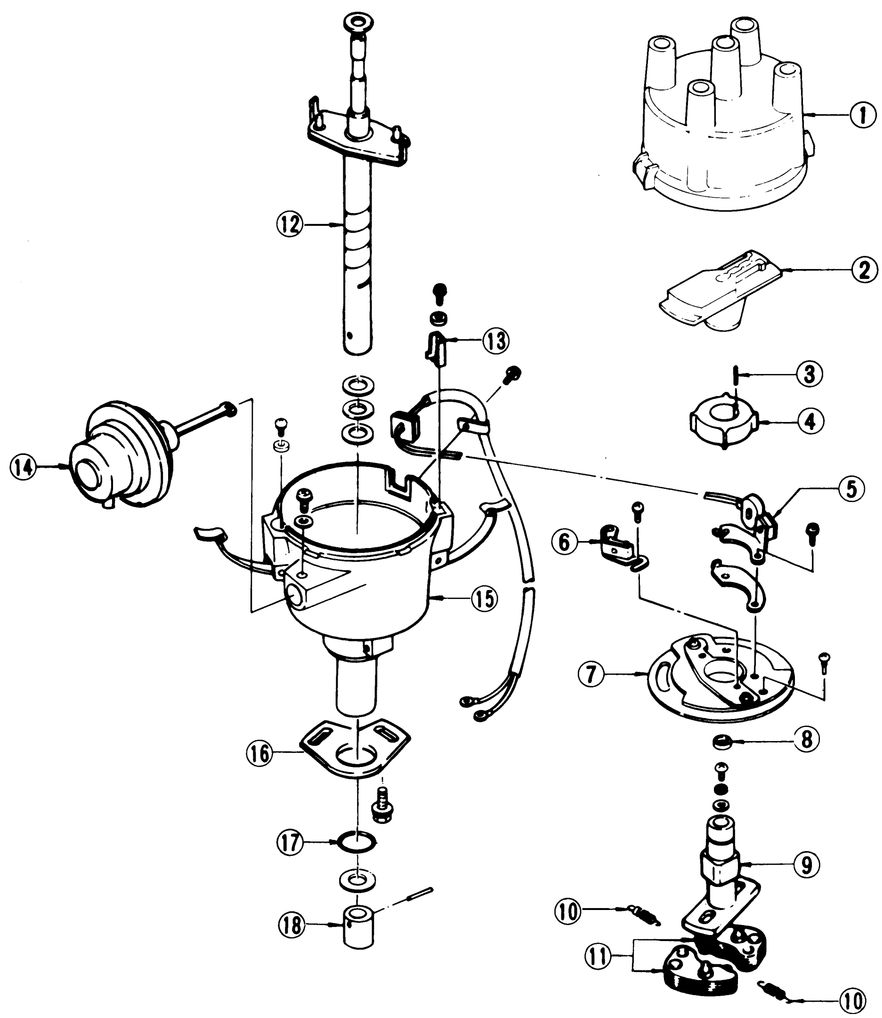
CONSTRUCTION EE-24
CHECKING AND ADJUSTMENT EE-25
CAP AND ROTOR HEAD EE-25
AIR GAP EE-25
ADVANCE MECHANISMS EE-25
DISASSEMBLY AND ASSEMBLY EE-26
DISASSEMBLY EE-26
ASSEMBLY EE-26

CONSTRUCTION

In the conventional distributor the ignition timing is detected by the cam and breaker arm, while in this transistor ignition unit it is detected by the reluctor on the shaft and the pick-up coil provided in place of the breaker. The pick-up coil consists of a magnet, coil and etc. The amount of magnetic flux passing through the pole piece in the coil is changed at the moment the pole piece faces the protrusion of the reluctor, and then the electrical signal is generated in the pick-up coil.

This electric signal is conducted into the transistor ignition unit, which in turn breaks the primary coil current running through the ignition coil and generates high voltage in the secondary winding. Also, this transistor ignition unit utilizes this electric signal to restore the primary coil to the original state after cutting off the primary current for a fixed time.

The centrifugal and vacuum advance mechanisms employ the conventional mechanical type. The contactor is used to eliminate vacuum advance hysteresis.



1 Cap assembly
2 Rotor head assembly
3 Roll pin
4 Reluctor
5 Pick-up coil
6 Contactor
7 Breaker plate assembly
8 Packing
9 Rotor shaft
10 Governor spring
11 Governor weight
12 Shaft assembly
13 Cap setter
14 Vacuum controller
15 Housing
16 Fixing plate
17 O-ring
18 Collar

EE668

Fig. EE-62 Distributor

CHECKING AND ADJUSTMENT

CAP AND ROTOR HEAD

Cap and rotor head should be inspected periodically as specified in the "Maintenance Schedule". 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.

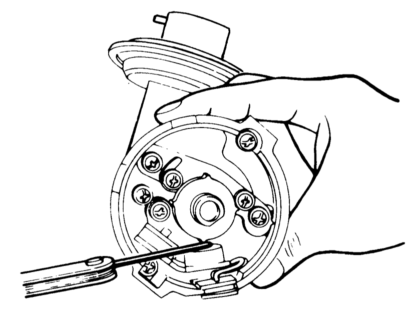
AIR GAP

Standard air gap is 0.2 to 0.4 mm (0.008 to 0.016).

If the gap is off the standard, adjustment should be made by loosening pick-up coil screws.

Gap gauge is required for adjustment. Air gaps must be checked from time to time.

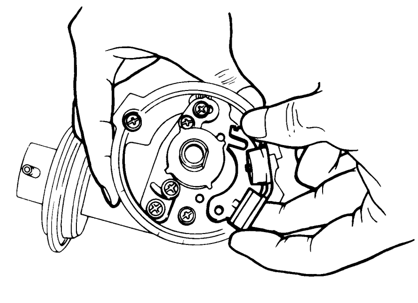
Air gap:
0.2 to 0.4 mm
(0.008 to 0.016 in)



EE657

Fig. EE-63 Checking Air Gap

To remove pick-up coil, disconnect distributor harness at terminal block and remove screws securing pick-up coil assembly and distributor harness to their positions.



EE659

Fig. EE-64 Removing Pick-Up Coil

ADVANCE MECHANISMS

	California models		Non-California models for U.S.A.		Non-California models for Canada	
Transmission	M/T	A/T	M/T	A/T	M/T	A/T
Type	D4F7-02	D4F6-07	D4F6-05	D4F6-06	D4F6-08	D4F6-09
Vacuum advance [Distributor degrees/distributor mmHg (inHg)]	0°/100 (3.94) 12.5°/300 (11.81)	0°/100 (3.94) 6.5°/250 (9.84)	0°/70 (2.76) 12.5°/250 (9.84)	0°/100 (3.94) 10°/250 (9.84)	0°/70 (2.76) 12.5°/250 (9.84)	0°/100 (3.94) 10°/250 (9.84)
Centrifugal advance [Distributor degrees/distributor rpm]	0°/600 11°/950					

≪ 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 controller assembly.

3. Inspect breaker plate for smooth moving.

If plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace distributor assembly.

≪ Centrifugal advance mechanical parts ≫

When cause of engine malfunction is traced to centrifugal advance mechanical parts, use distributor tester to check its characteristics. See the specifications above.

If nothing is wrong with its characteristics, conceivable causes are faulty or abnormal wear of driving part or others. So do not disassemble it.

In the event of improper characteristics, check closely rotor shaft assembly, governor weight and shaft.

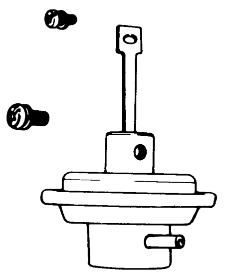
If any of above parts are malfunctioning, replace distributor assembly.

DISASSEMBLY AND ASSEMBLY

DISASSEMBLY

To disassemble, follow the below procedure.

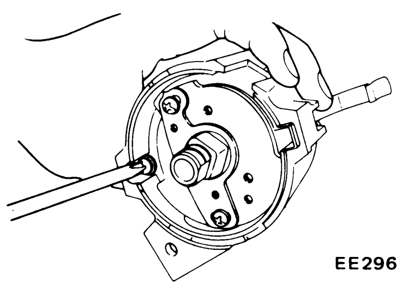
1. Take off cap and remove rotor head.
2. Remove two screws shown in Fig. EE-65 and detach vacuum controller.



EE637

Fig. EE-65 Removing Vacuum Controller

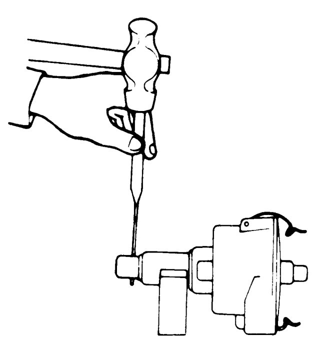
3. Remove pick-up coil assembly.
4. Using two pry bars, pry reluctor from shaft. Be careful not to distort or damage the teeth of reluctor. Remove roll pin.
5. Remove breaker plate setscrews and remove breaker plate assembly.



EE296

Fig. EE-66 Removing Breaker Plate Setscrews

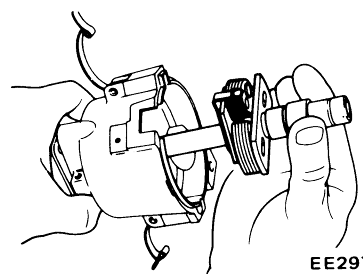
6. Punch knock pin out and remove pinion.



EE639

Fig. EE-67 Removing Knock Pin

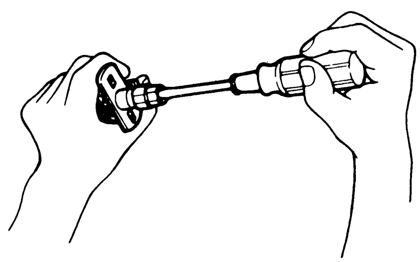
7. Remove rotor shaft and drive shaft assembly.



EE297

Fig. EE-68 Removing Rotor Shaft and Drive Shaft Assembly

8. Mark rotor shaft and drive shaft. Remove packing from the top of rotor shaft and unscrew rotor shaft setscrew. Remove rotor shaft.



EE075

Fig. EE-69 Removing Rotor Shaft

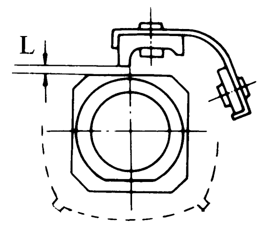
9. Mark one of the governor springs and its bracket. Also mark one of the governor weights and its pivot pins.
10. Carefully unhook and remove governor springs.
11. Remove governor weights. Apply grease to governor weights, after disassembling.

ASSEMBLY

To assemble, reverse the order of disassembly. Carefully observe the following instructions.

1. Align match marks so that parts are assembled to their original positions.
2. If, for any reason, contactor is removed from breaker plate, adjust cam-to-contactor clearance "L" shown in Fig. EE-70, after installation.

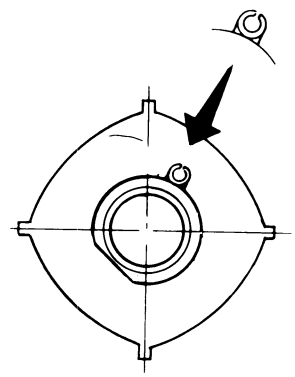
Cam-to-contactor clearance "L":
0.3 mm (0.012 in)



EE561

Fig. EE-70 Cam-to-Contactor Clearance

3. Ensure that reluctor is properly oriented when installing on shaft. Always drive in roll pin with its slit toward the outer end of shaft. See Fig. EE-71. Be sure to use a new roll pin.



EE562

Fig. EE-71 Driving in Roll Pin

4. When installing pinion on shaft, be sure to install pinion gear to position where it was installed.
5. Apply grease to the top of rotor shaft as required.
6. Check the operation of governor before installing distributor on engine.
7. Adjust ignition timing after distributor is installed on engine.

TRANSISTOR IGNITION UNIT

CONTENTS

DESCRIPTION EE-27
TRANSISTOR IGNITION UNIT EE-27
REMOVAL AND INSTALLATION EE-27
INSPECTION EE-27
1. POWER SUPPLY WIRING AND BATTERY CHECK EE-28
2. CONTINUITY CHECK OF PRIMARY CIRCUIT EE-28
3. PICK-UP COIL CONTINUITY CHECK EE-28
4. PICK-UP COIL POWER SIGNAL PULSE CHECK EE-28
5. TRANSISTOR IGNITION UNIT CHECK .. EE-29

DESCRIPTION

TRANSISTOR IGNITION UNIT

The transistor ignition unit provides the following functions:

1. It makes and breaks the electric current in the primary circuit of the ignition coil.
2. The duty control circuit sets the rate of make and break within one cycle, i.e., this maintains good ignition characteristics of engine from low speed to high speed and is equal to the dwell angle in the conventional breaker type distributor.
3. A preventive circuit against locking is provided. This cuts off the primary electric current in the ignition coil even when the ignition switch is turned on with the engine not running.
4. In addition, a current limiting circuit is provided. This controls the electric current that flows in the power switching circuit so as not to exceed a certain level.

Each component part of this unit is highly reliable, however, should any part be found faulty, the entire assembly must be replaced.

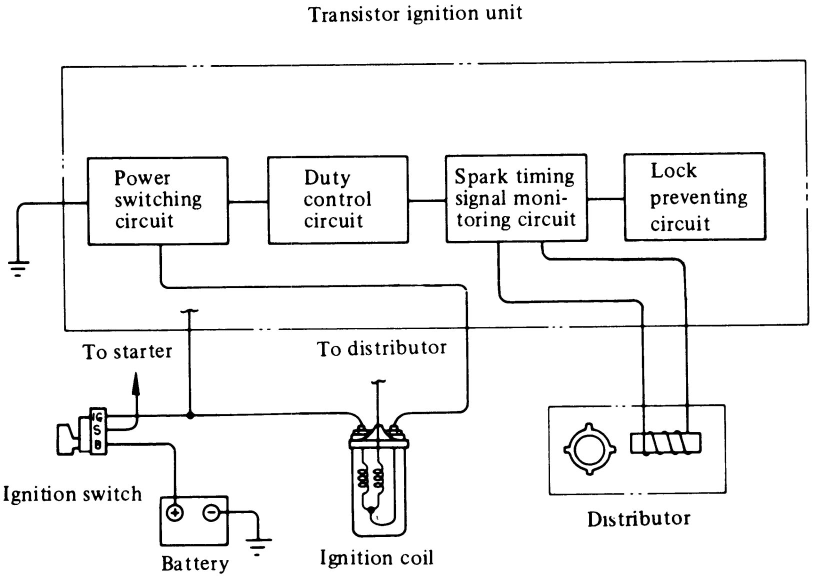


Fig. EE-72 Simplified Ignition Unit Circuit Diagram

REMOVAL AND INSTALLATION

Transistor ignition unit is located on the right-hand dash side panel in passenger compartment.

1. Disconnect battery terminals.
2. Disconnect ignition unit connector from unit.
3. Remove two setscrews and remove unit.

Note: To remove ignition unit connector, push latch of connector and pull the connector out.

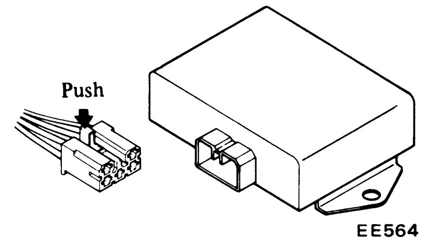


Fig. EE-73 Ignition Unit

4. To install, reverse the order of removal.

INSPECTION

If the engine does not run due to faulty ignition system, check the ignition system as follows:

Check for a cracked distributor rotor or cap and corroded terminals. Visually inspect high tension wire for condition and, if necessary, use an ignition oscilloscope or a circuit tester to make performance checks. Check spark plugs and adjust gaps as necessary.

Replace a spark plug which is not suitable for further use. If the above checks cannot correct the problem, check the entire ignition system with an oscilloscope or a circuit tester.

CHECKING WITH AN OSCILLOSCOPE

An oscilloscope can be used for checking almost all the items in a transistor ignition system.

CHECKING WITH A CIRCUIT TESTER

A circuit tester can not be used for the duty control circuit and power transistor performance tests. Both methods (use of an oscilloscope and a circuit tester) are described in this section.

The items are classified by numerals in accordance with the objective of checks to be performed. Several wiring diagrams are found on pages EE-32 to EE-36. The thick lines indicate the objective of each individual item check.

When checking a circuit with an oscilloscope or a circuit tester, be careful not to confuse the polarity of the lead wires if a potential difference exists between the check points at which the lead wires are to be contacted. Also, do not attempt to connect the lead wires to any points in the circuit other than those designated. Careless handling of the lead wires will result in damage to the transistor ignition unit as well as to the oscilloscope or circuit tester.

The connection of a tachometer or a timing light in parallel with an oscilloscope or a circuit tester is allowable, provided that such a connection is made with due consideration to wiring connections.

1. POWER SUPPLY WIRING AND BATTERY CHECK (See wiring diagram in Fig. EE-86)

Procedure:

1. Disconnect ignition unit connector from unit.
2. Turn on ignition switch.
3. Connect a circuit tester or an oscilloscope as shown in the figure below.

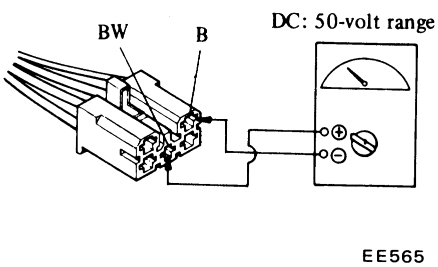


Fig. EE-74 Checking Power Supply Wiring and Battery

Criterion:

When power source (battery) voltage is indicated .... OK
Lower or no indication ..... N.G.

If the result is "N.G." – Take the following measures:

1. Check "BW" and "B" color wire harnesses respectively, for proper conductance.
2. Check battery terminals for proper connection.
3. Check charge condition of battery if an excessively low voltage is indicated.

2. CONTINUITY CHECK OF PRIMARY CIRCUIT

2-1. Checking primary circuit (See wiring diagram in Fig. EE-87)

Procedure:

1. Disconnect ignition unit connector from unit.
2. Turn on ignition switch.
3. Connect a circuit tester.

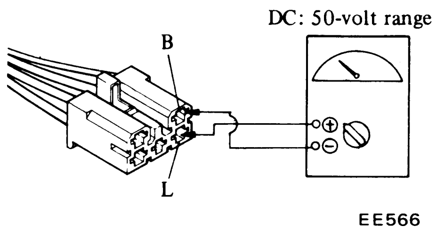


Fig. EE-75 Checking Primary Circuit

Criterion:

When normal power source (battery) voltage is indicated. . OK
Lower or no indication ..... N.G.

If the result is "N.G." – Take the following measures:

1. Check "L" color wire harness for proper conductance.
2. Check ignition coil terminals for loose contact.
3. Check ignition coil for discontinuity.

2-2. Checking ignition coil assembly (See wiring diagram in Fig. EE-88)

Procedure:

1. Disconnect engine room harness from ignition coil.
2. Connect a circuit tester as shown in the figure below.

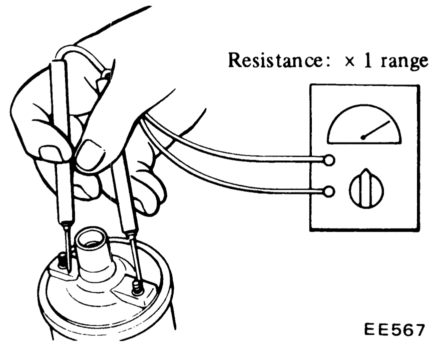


Fig. EE-76 Checking Ignition Coil Assembly

Criterion:

When approximately 0 ohm is indicated .... OK
More than 1.8 ohm .... N.G.

If the result is "N.G." – Replace ignition coil assembly.

3. PICK-UP COIL CONTINUITY CHECK (See wiring diagram in Fig. EE-89)

Procedure:

1. Disconnect ignition unit connector from unit.
2. Connect a circuit tester as shown in the figure below:

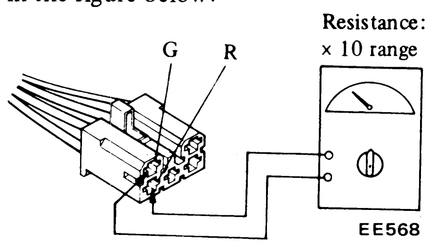


Fig. EE-77 Checking Pick-Up Coil

Criterion:

When approximately 720 ohm is indicated .... OK
Far less than, or more than, 720 ohm .... N.G.

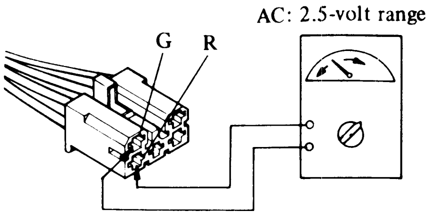
If the result is "N.G." – Replace pick-up coil assembly.

4. PICK-UP COIL POWER SIGNAL PULSE CHECK

Procedure:

1. Disconnect anti-dieseling solenoid valve connector.
2. Connect a circuit tester as shown

in the figure below.
3. Rotate starter motor.
4. Read the tester indication.



EE569
Fig. EE-78 Checking Pick-Up Coil Power Signal Pulse

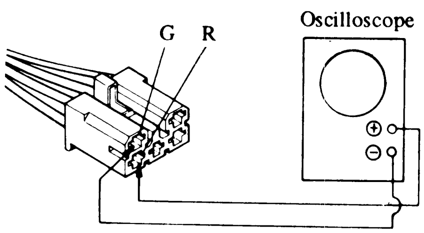
Criterion:

When pointer deflects slightly .... OK
When pointer does not deflect at all .... N.G.

If the result is "N.G." – Replace pick-up coil assembly.

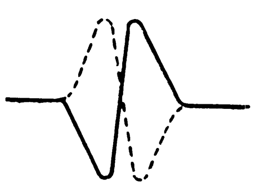
Procedure: (with an oscilloscope)

1. Disconnect anti-dieseling solenoid valve connector.
2. Connect the positive lead of an oscilloscope to "R", and the negative lead of the oscilloscope to "G" as shown in the figure below.



EE570
Fig. EE-79 Checking Pick-Up Coil Power Signal Pulse

3. Set "SLOPE" select switch of oscilloscope to positive side. (If so equipped).
4. Rotate starter motor.
5. Check the wave form as shown in the figure below.



EE268
Fig. EE-80 Wave Form of Pick-Up Coil

Criterion:

When the wave form takes the shape of a full line .... OK
When the wave form takes the shape of a dashed line or when there is no wave form ...... N.G.

If the result is "N.G." – Replace pick-up coil assembly.

5. TRANSISTOR IGNITION UNIT CHECK (See wiring diagram in Fig. EE-90)

Check items 5-1 and 5-2 with an oscilloscope.

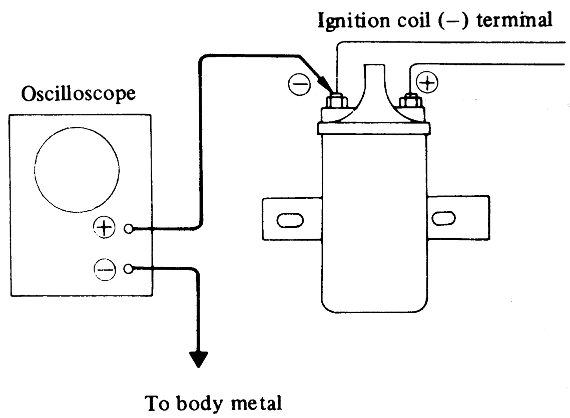
Where an oscilloscope is not available, check to make sure that all previous tests are satisfactory and that no spark is issuing from the secondary high-tension wire.

If everything else is satisfactory, then the transistor ignition unit is faulty or there is discontinuity in the secondary high-tension wire. Replace the faulty part. After replacement check the sparks from the secondary cord.

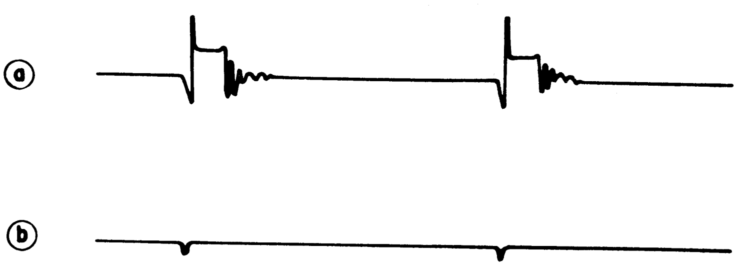
5-1. Checking operation of transistor ignition unit

Procedure:

1. Connect engine room harness to ignition coil.
2. Connect ignition unit connector to ignition unit.
3. Disconnect anti-dieseling solenoid valve connector.
4. Connect oscilloscope as shown in Fig. EE-81, rotate the starter motor and observe the wave form on the oscilloscope.



EE571
Fig. EE-81 Checking Operation of Transistor Ignition Unit



EE452
Fig. EE-82 Wave Form of Pulse

Criterion:

See Fig. EE-82.

When a wave form similar to (a) is observed .... OK
When a wave form similar to (b) is observed or when no wave form is observed .... N.G.

If the result is "N.G.", the fault lies either in the transistor unit or in the secondary high-tension wire.

Replace these parts.

– If an oscilloscope is not available –

Procedure:

1. Connect engine room harness to ignition coil.
2. Connect ignition unit connector to ignition unit.
3. Disconnect anti-dieseling solenoid valve connector.
4. Keep the secondary high-tension wire end 4 to 5 mm (0.16 to 0.20 in) away from engine block, rotate the starter motor, and check whether sparks fly across the clearance.

Criterion:

Where sparks issue . . . . OK
Where no spark issues . . . . . . N.G.

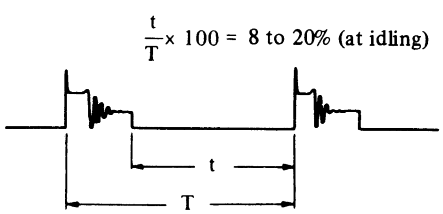
If the result is "N.G.", the fault lies either in the transistor unit or in the secondary high-tension wire.

Replace these parts.

5-2. Checking operation of duty

Procedure:

1. Connect anti-dieseling solenoid valve connector.
2. While the engine is idling, observe the wave form on the oscilloscope in the same way as stated in item 5-1, Fig. EE-81. Determine the ratio t/T as shown in Fig. EE-83.



EE257

Fig. EE-83 Wave Form of Duty Pulse

Criterion:

When a standard ratio of about 8 to 20% is obtained . . . . OK
When the ratio obtained is less than 8%, or more than 20% . . . . . N.G.

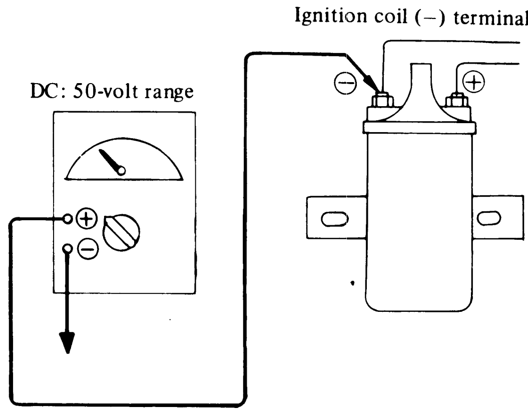
If the result is "N.G." – Replace transistor ignition unit.

5-3. Checking lock preventive circuit

– If a circuit tester is used–

Procedure:

1. Connect a circuit tester as shown in Fig. EE-84; positive terminal of tester is connected to – terminal of the ignition coil and negative terminal of tester is grounded.
2. Turn on ignition switch. Check to see whether the tester indicates the voltage of power source (battery) as soon as ignition switch is turned on.



EE572

Fig. EE-84 Checking Lock Preventive Circuit

Criterion:

When power source voltage is indicated . . . . OK
When approximately zero-voltage is indicated . . . . N.G.

If the result is "N.G." – Take the following measures:

Replace transistor ignition unit.

–If an oscilloscope is used–

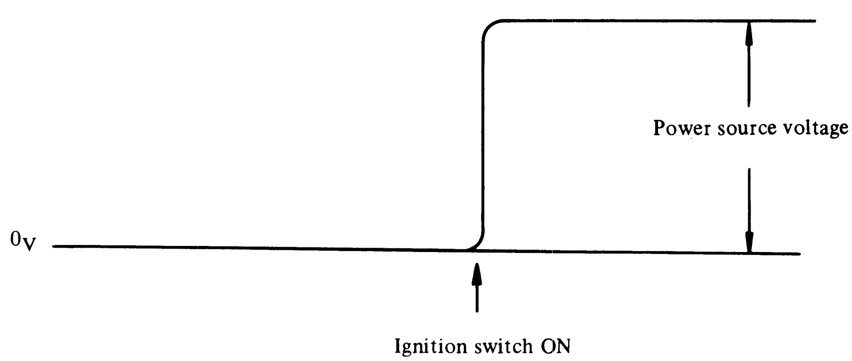
Procedure:

When using an oscilloscope instead of a tester, arrange the connection in the same way as shown in Fig. EE-81. Turn on ignition switch.

Check to see whether the wave form on the oscilloscope rises up to the power source voltage as soon as ignition switch is turned on.

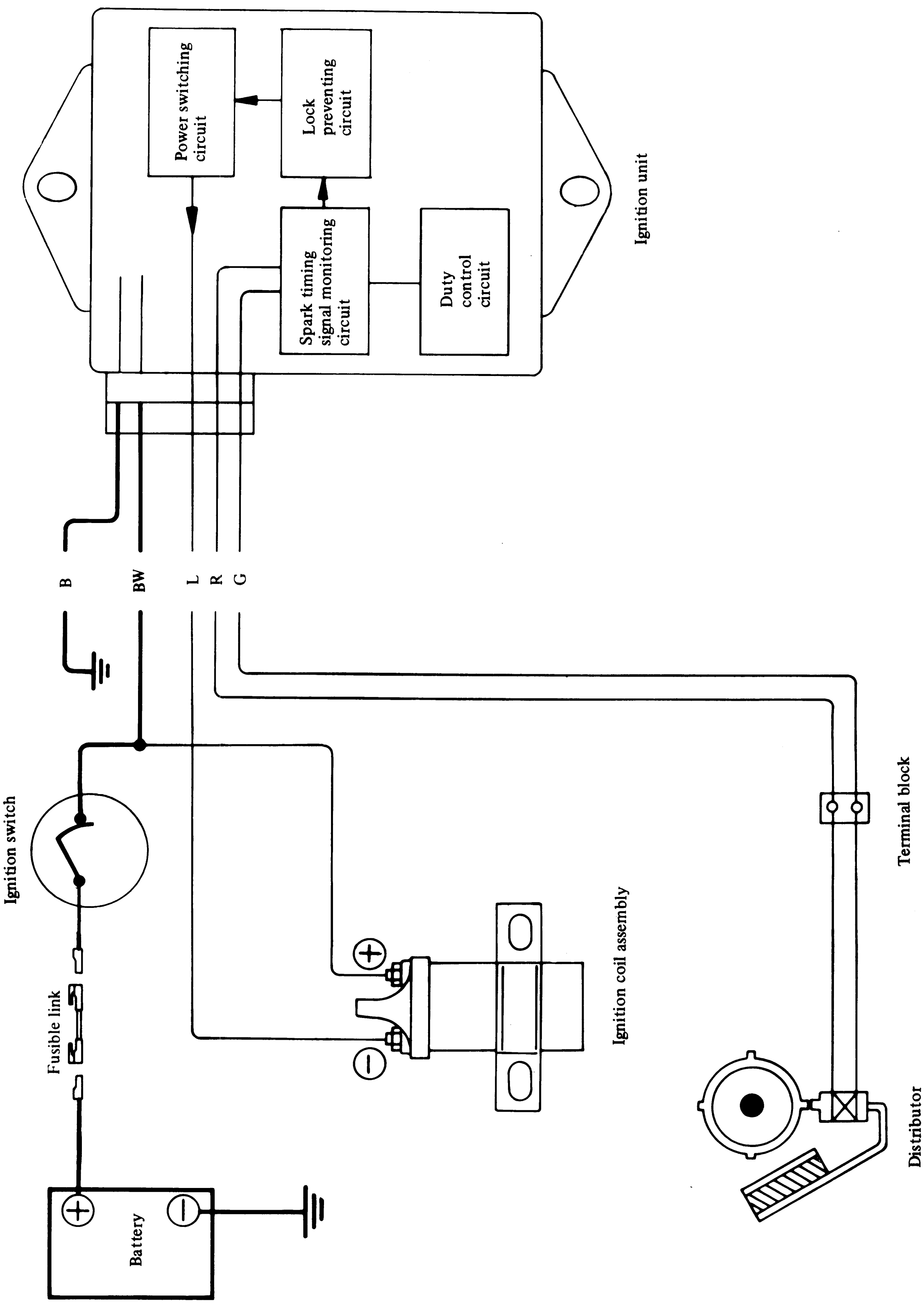
Criterion:

The same as described before for use of a tester.



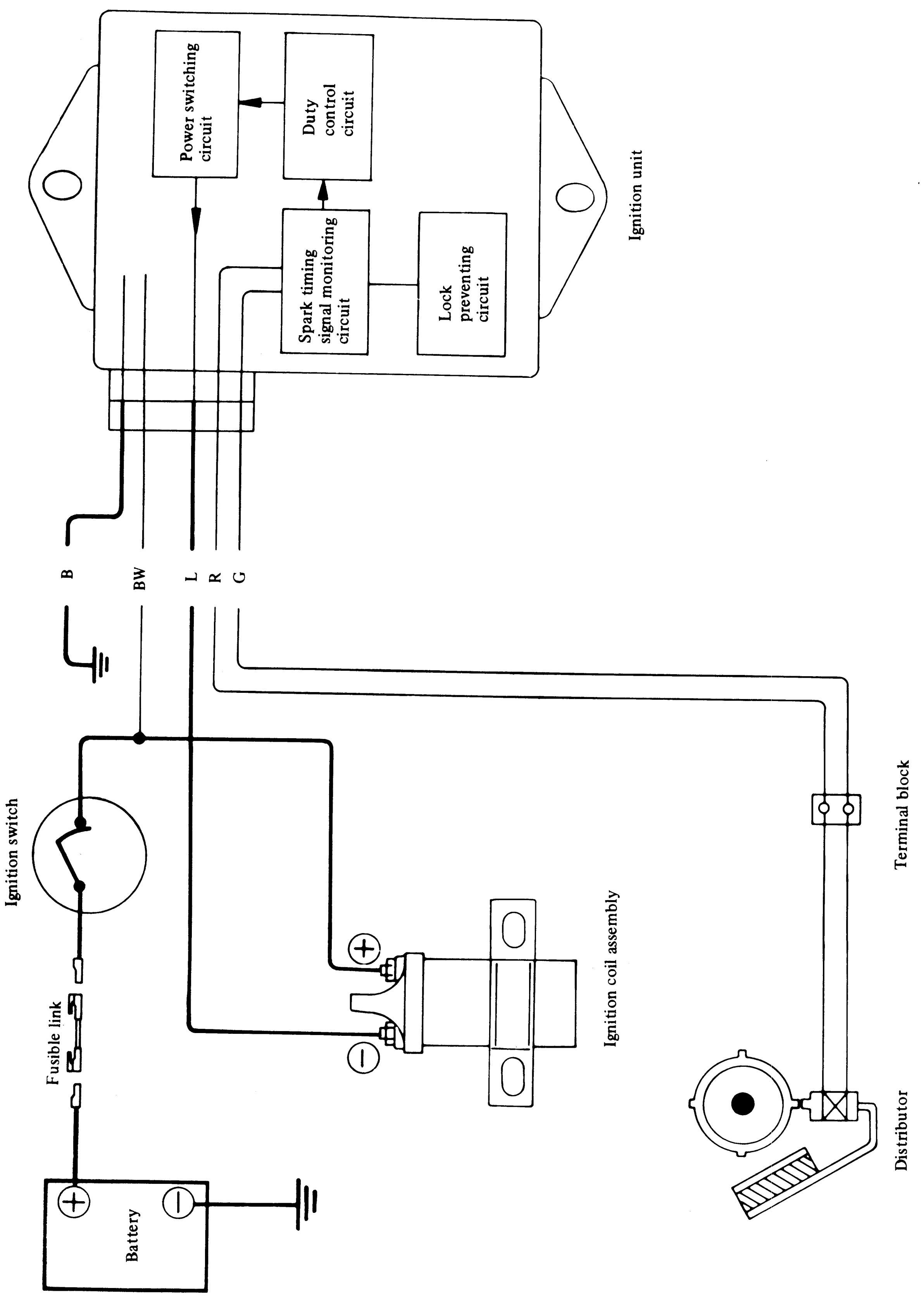
EE430

Fig. EE-85 Wave Form of Lock Preventive Circuit



EE661

Fig. EE-86 Wiring Diagram for Item (1) (Power supply wiring and battery check)



EE662

Fig. EE-87 Wiring Diagram for Item (2)-1 (Checking primary circuit)

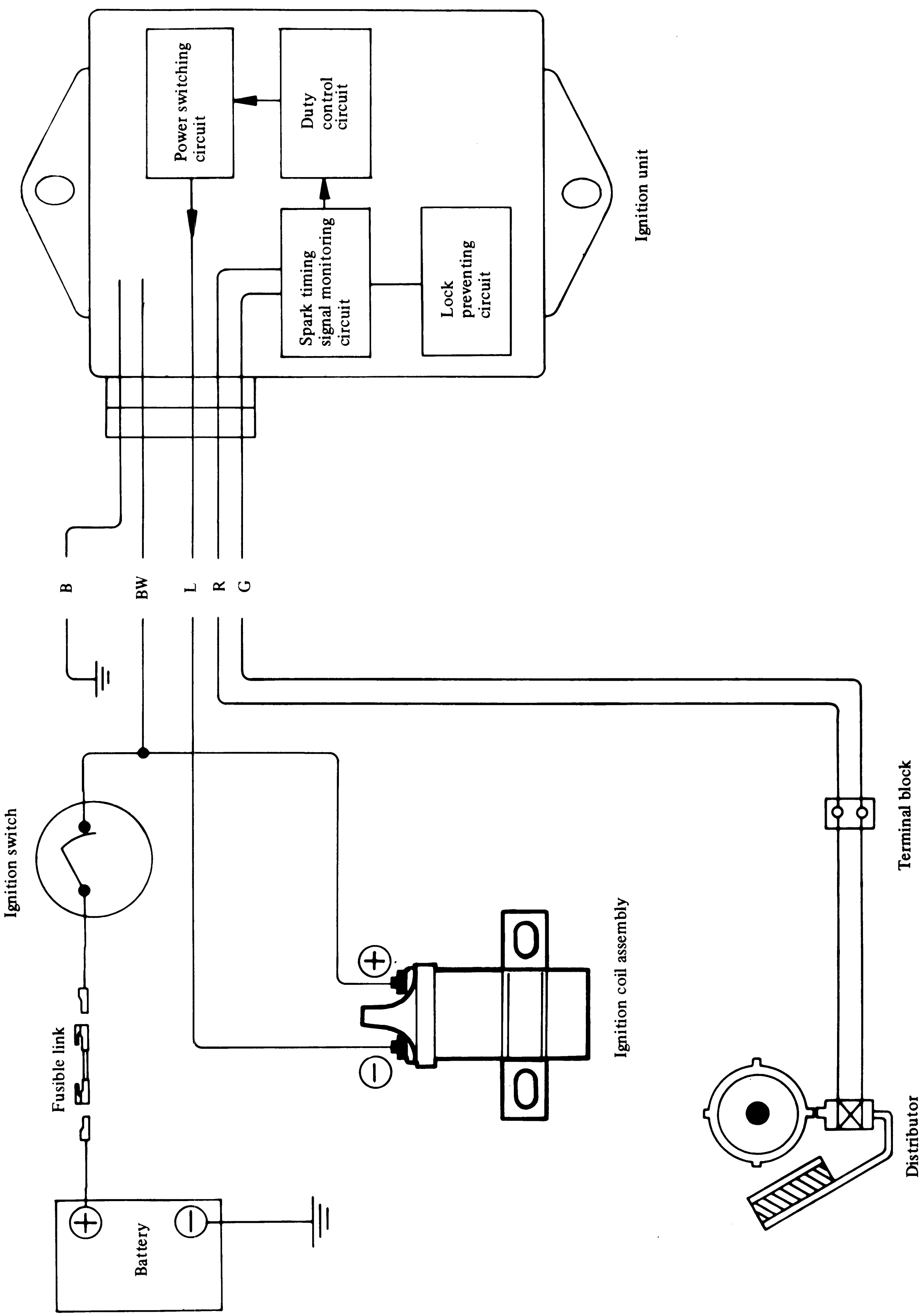
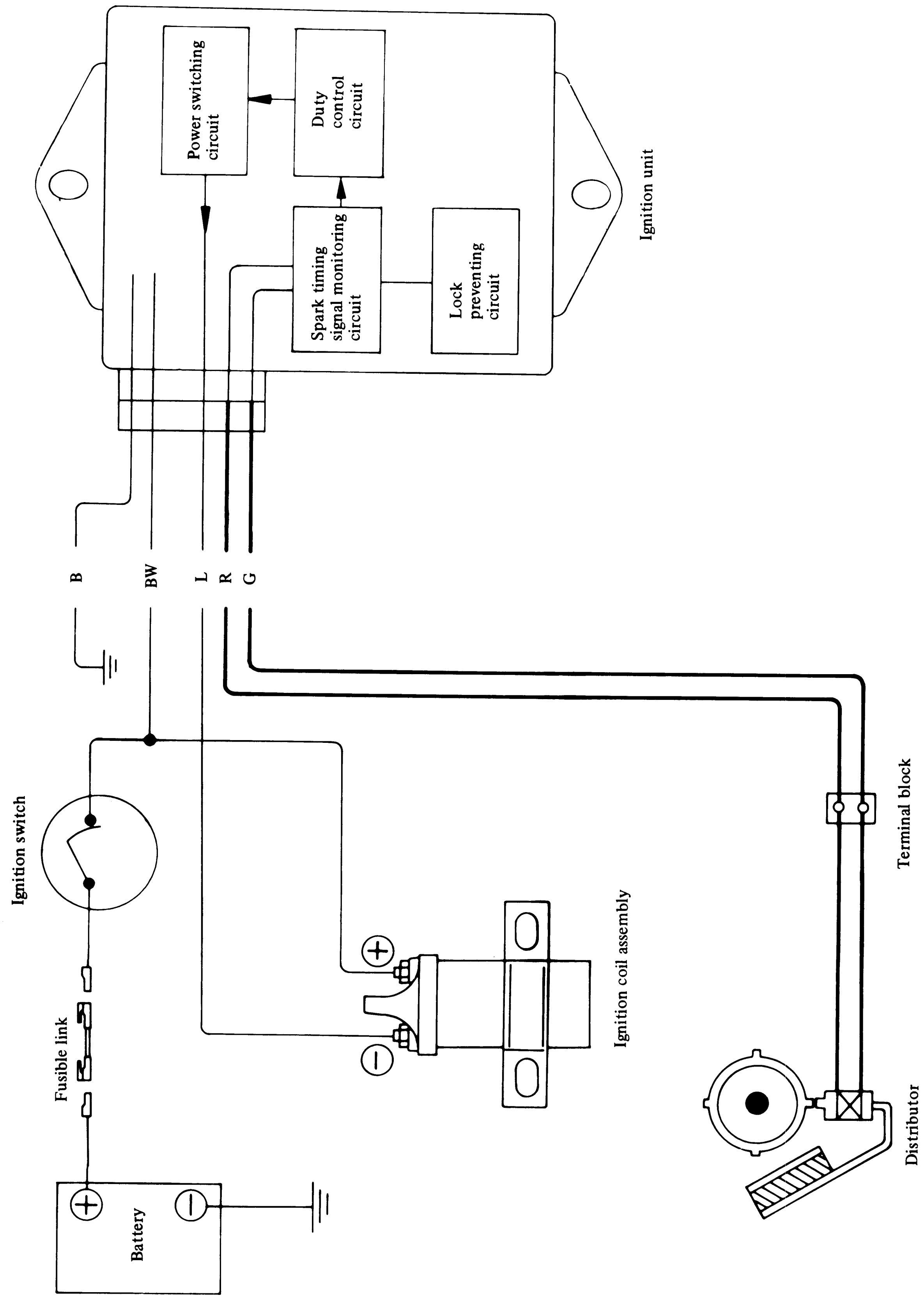
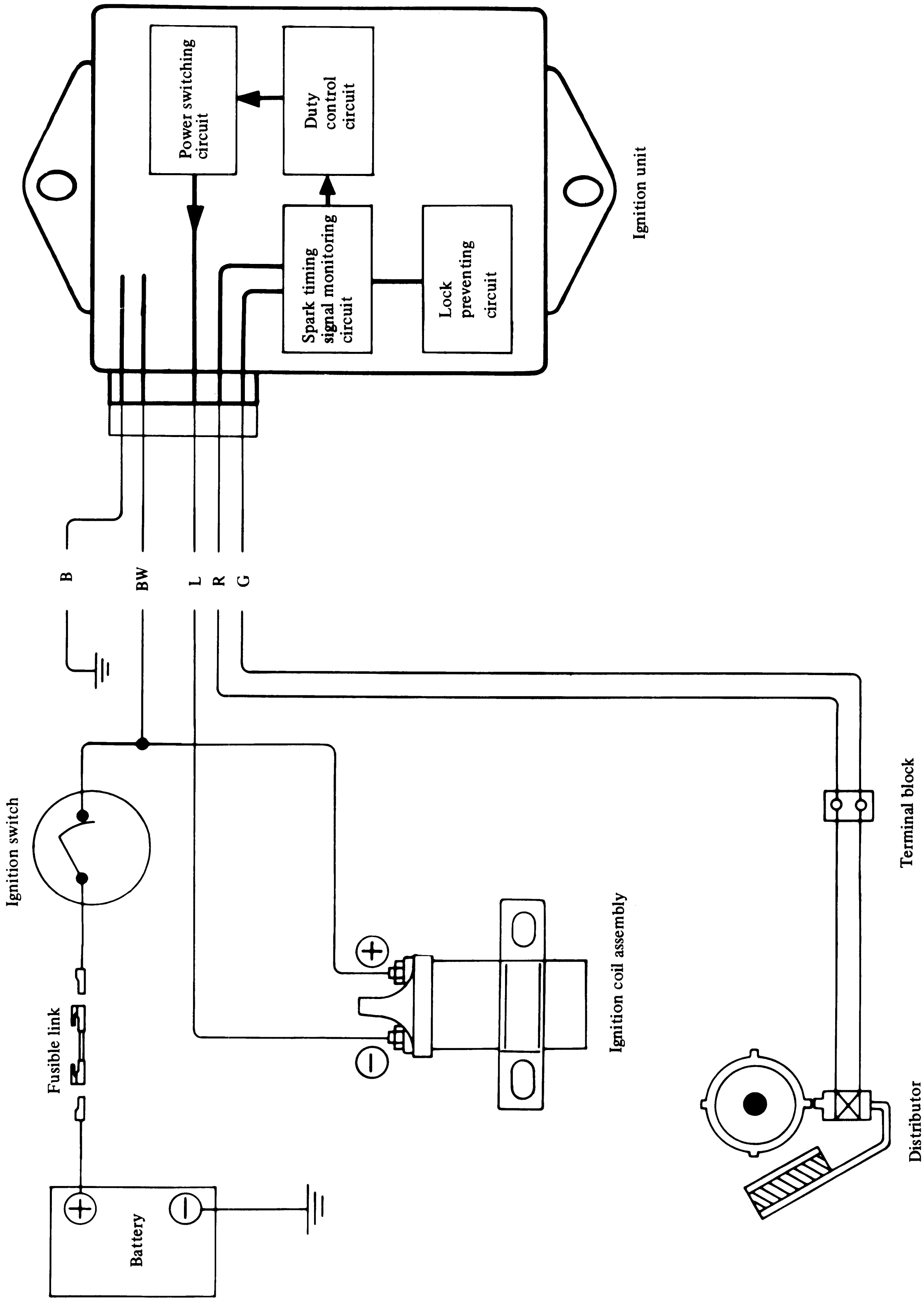


Fig. EE-88 Wiring Diagram for Item (2)-2 (Checking ignition coil assembly)



EE664

Fig. EE-89 Wiring Diagram for Item (3) (Pick-up coil continuity check)



EE665

Fig. EE-90 Wiring Diagram for Item (5) (Transistor ignition unit check)

IGNITION COIL

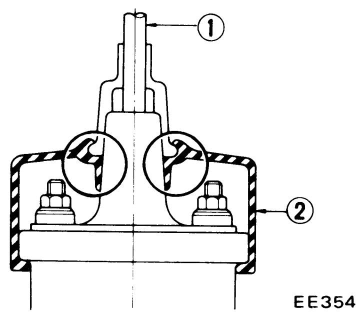
The ignition coil is an oil-filled type. The ignition coil case is filled with oil which has good insulating and heat-radiating characteristics.

The ignition coil has a greater ratio between the primary and secondary windings to step up battery voltage to high voltage. This causes stronger sparks to jump the spark plug gap.

The cap is made of alkyd resin which offers high resistance to electric arc and increased insulation.

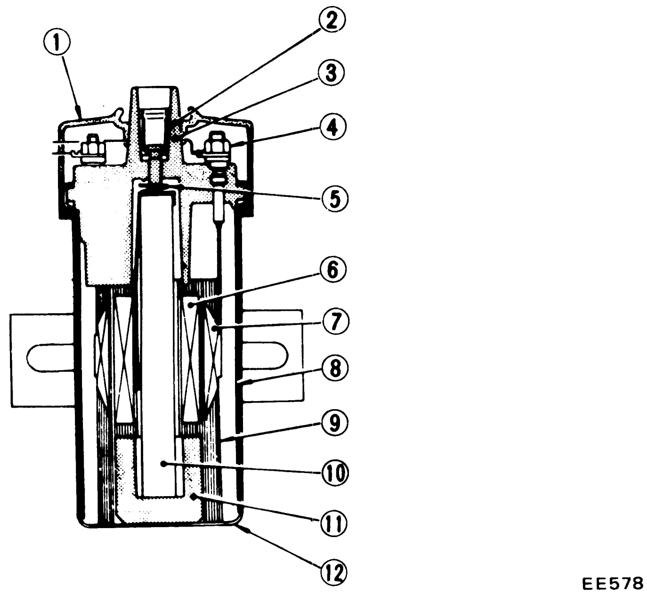
When high tension wire is installed to ignition coil, there should be no clearance between their caps.

Note: Do not disconnect high tension wires from spark plugs during engine running.



1. High tension wire
2. Rubber cap

Fig. EE-91 Correct Installation of High Tension Wire



1 Rubber cap for ignition coil
2 Secondary terminal
3 Cap
4 Primary terminal
5 Spring
6 Secondary winding
7 Primary winding
8 Side core
9 Insulator
10 Center core
11 Segment
12 Case

Fig. EE-92 Ignition Coil

SPARK PLUG

DESCRIPTION

The spark plugs are standard type, having 14 mm (0.55 in) threads and 1.0 to 1.1 mm (0.039 to 0.043 in) gap [for Canada 0.8 to 0.9 mm (0.031 to 0.035 in)].

Note: All spark plugs installed on an engine must be of the same brand and heat range.

INSPECTION

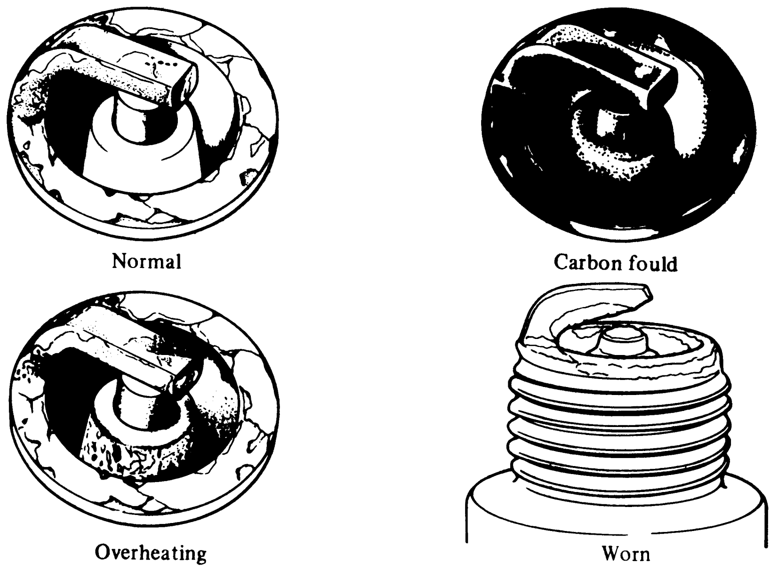
1. Remove spark plug wire by pulling on boot, not on wire itself.
2. Remove spark plugs with spark plug wrench.
3. Check electrodes and inner and outer porcelains of plugs, noting the type of deposits and the degree of electrode erosion. See Fig. EE-93.

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 are usually caused by weak ignition, too rich fuel mixture, dirty air cleaner, etc.
Check engine and repair if necessary.
When the car is used primarily for short distance travel, so that the engine does not run long enough to reach its normal operating temperature, it is advisable to use hot-type spark plugs.

Oil fouled: Wet black deposits indicate excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.
Repair engine and replace faulty parts if necessary.

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.
Check engine and repair if necessary.
When the car is frequently operated with throttle wide open for long periods of time, such as when towing another vehicle, it is advisable to use cold-type spark plugs.



EE079

Fig. EE-93 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.

Recommended spark plug

Model	Hot type	Standard	Cold type
U.S.A.	BP4E-11 BP5ES-11 L46PW-11 L47PW-11	BP6ES-11 L45PW-11	BP7ES-11 L44PW-11
Canada	BPR4ES BPR5ES	BPR6ES	BPR7ES

CLEANING AND REGAPPING

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 specified values with a round wire feeler gauge. All spark plugs new or used should have the gap checked and reset by bending ground electrode.

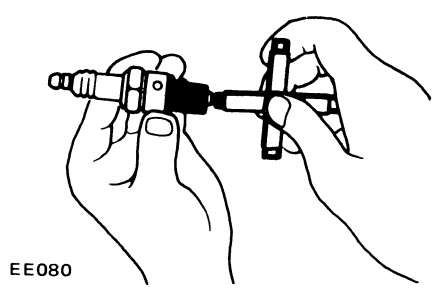


Fig. EE-94 Setting Spark Plug Gap

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

STARTING MOTOR

Type			
Non-reduction gear type	S114-180F	S114-170E	—
Reduction gear type	—	—	S114-254
Applied model	U.S.A. A/T	U.S.A. M/T	Canada

System voltage V 12

No load

Terminal voltage V 12

Current A

S114-180F, S114-170E .... Less than 60

S114-254 .... Less than 100

Revolution rpm

S114-180F .... More than 6,000

S114-170E .... More than 7,000

S114-254 .... More than 4,300

ALTERNATOR

Type		LR135-44	LR138-01 (Optional with cooler)
Nominal rating	V-A	12V-35A	12V-38A
Ground polarity		Negative	
Minimum revolution under no load (When 14 volt is applied)	rpm	Less than 1,000	Less than 1,050
Hot output current	A/rpm	More than 27.5/2,500 More than 35/5,000	More than 30/2,500 More than 38/5,000
Pulley ratio		2.25	
Regulated output voltage	V	14.4 to 15.0	

DISTRIBUTOR

Applied model	California models		Non-California models for U.S.A.		Non-California models for Canada	
Transmission	M/T	A/T	M/T	A/T	M/T	A/T
Type	D4F7-02	D4F6-07	D4F6-05	D4F6-06	D4F6-08	D4F6-09
Firing order	1-3-4-2					
Rotating direction	Counterclockwise					

IGNITION COIL

Type C1T-30, STC-30

Primary voltage V 12

Spark gap mm (in) .... More than 7 (0.28)

SPARK PLUG

Type / Item			
Type	Cold	BP7ES-11, L44PW-11	BPR7ES
	Hot	BP4E-11, BP5ES-11, L46PW-11, L47PW-11	BPR4ES, BPR5ES
	Standard	BP6ES-11, L45PW-11	BPR6ES
Item		U.S.A.	Canada
Applied engine		L20B	L20B
Size (screw dia. x reach)	mm (in)	14 x 19 (0.55 x 0.75)	14 x 19 (0.55 x 0.75)

INSPECTION AND ADJUSTMENT

BATTERY

Full charging specific gravity

For U.S.A. 1.26

For Canada 1.28

STARTING MOTOR

Outer diameter of commutator mm (in)

S114-180F, S114-170E .... More than 39 (1.54)

S114-254 .... More than 29 (1.14)

Brush length mm (in)

S114-180F, S114-170E .... More than 12 (0.47)

S114-254 .... More than 11 (0.43)

Brush spring tension kg (lb)

S114-180F, S114-170E .... 1.4 to 1.8 (3.1 to 4.0)

S114-254 .... 1.6 to 2.0 (3.5 to 4.4)

Clearance between bearing metal and armature shaft — mm (in)
- S114-180F, S114-170E .... Less than 0.2 (0.008)

Clearance " " between pinion front edge and pinion stopper — mm (in) .... 0.3 to 1.5 (0.012 to 0.059)

ALTERNATOR

Brush

Length	mm (in)	More than 7.5 (0.295)
Spring pressure	gr (oz)	255 to 345 (8.99 to 12.17)
Slip ring outer diameter	mm (in)	More than 30 (1.18)

DISTRIBUTOR

Air gap	mm (in)	0.2 to 0.4 (0.008 to 0.016)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	10 (0.39)

TRANSISTOR IGNITION UNIT

Duty .... 70% (8 to 20% at idling)

IGNITION COIL

Primary resistance at 20°C (68°F)	Ω	0.84 to 1.02
Secondary resistance at 20°C (68°F)	KΩ	8.2 to 12.4

SPARK PLUG

Item \ Type	BP7ES-11, L44PW-11, BP6ES-11, L45PW-11, BP4E-11, BP5ES-11, L46PW-11, L47PW-11	BPR7ES BPR6ES BPR4ES, BPR5ES
Plug gap mm (in)	1.0 to 1.1 (0.039 to 0.043)	0.8 to 0.9 (0.031 to 0.035)

TIGHTENING TORQUE

Magnetic switch terminal — kg-cm (in-lb)
- S114-180F, S114-170E .... 75 to 100 (65 to 87)
- S114-254 .... 115 to 160 (100 to 139)

Magnetic switch attaching bolts	kg-cm (in-lb)	38 to 51 (33 to 44)
Starting motor — Gear case attaching bolts	kg-cm (in-lb)	64 to 85 (56 to 74)
Pulley nut	kg-m (ft-lb)	4.5 to 6.0 (33 to 43)
Alternator through bolts	kg-cm (in-lb)	60 to 70 (52 to 61)
Spark plug	kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

TROUBLE DIAGNOSES AND CORRECTIONS

I. BATTERY

Battery is not charged correctly.

1. Correctly adjust belt tension of alternator.
2. Complete connections in charging system.
3. Securely connect battery terminals.

Lighting load test.

1. Make sure that electrolyte level is correct.
2. Crank engine for three seconds (with ignition system open).
3. Turn on headlight (low beam) for one minute, and then measure **specific** gravity of each cell of battery.

Specific gravity of each cell is less than 1.200.

1. When specific gravity can not be raised above 1.200 by **charging,** the battery is run-down.

Specific gravity of some cells is above 1.200 but others show lower specific gravity.

Specific gravity of each cell is above 1.200.

Unbalance is within 0.05.

1. Discharged battery. Charge it and repeat lighting load test.

Unbalance of specific gravity between cells exceeds 0.05.

1. Battery is run-down.

Unbalance is within 0.05.

1. Battery is satisfactory.

Unbalance of specific gravity between cells exceeds 0.05.

1. Battery is run-down.

II. STARTING MOTOR

Condition	Probable cause	Corrective action
Starting motor will not operate.	Discharged battery.	Charge or replace battery.
	Damaged solenoid switch.	Repair or replace solenoid switch.
	Loose connections of terminal.	Clean and tighten terminal.
	Damaged field coil.	Replace yoke.
	Damaged brushes.	Replace brushes.
	Damaged bearing.	Replace bearing.
	Starting motor inoperative	Remove starting motor and make test.
	Damaged armature.	Replace armature.
Noisy starting motor.	Loose securing bolt.	Tighten.
	Worn pinion gear.	Replace.
	Poor lubrication.	Add oil.
	Worn commutator.	Replace.
	Worn brushes.	Replace.
Starting motor cranks slowly.	Discharged battery.	Charge.
	Loose connection of terminal.	Clean and tighten.
	Worn brushes.	Replace.
	Locked brushes.	Inspect brush spring tension or repair brush holder.
	Loose connections of terminal.	Clean and tighten terminal.
	Damaged field coil.	Replace yoke.
	Damaged brushes.	Replace brushes.
	Damaged bearing.	Replace bearing.
	Starting motor inoperative.	Remove starting motor and make test.
	Damaged armature.	Replace armature.
Starting motor cranks slowly.	Dirty or worn commutator.	Clean and repair.
	Armature rubs field coil.	Repalce assembly.
	Damaged solenoid switch.	Repair or replace.
Starting motor operates but does not crank engine.	Worn pinion.	Replace.
	Locked pinion guide.	Repair.
	Worn ring gear.	Replace.
Starting motor will not disengage even if ignition switch is turned off.	Damaged solenoid switch.	Repair or replace.
	Damaged gear teeth.	Replace damaged gear.

III. ALTERNATOR (Including voltage regulator)

Condition	Probable cause	Corrective action
No output	Sticking brushes.	Correct or replace brushes and brush springs.
	Dirty brushes and slip rings.	Clean.
	Loose connections or broken leads.	Retighten or solder connections. Replace leads if necessary.
	Open stator winding.	Repair or replace stator.
	Open rotor winding.	Replace rotor.
	Open diodes.	Replace.
	Shorted rotor.	Replace rotor.
	Shorted stator.	Replace.
	Ground "A" terminal.	Replace insulator.
	Broken fan belt.	Replace.
Excessive output.	Voltage regulator breakdown.	Check regulator operation and repair or replace as required.
	Poor grounding of alternator and voltage regulator "E" terminal.	Retighten terminal connection.
	Broken ground wire (color of wire is black).	Replace.
Low output.	Loose or worn fan belt.	Retighten or replace.
	Sticking brushes.	Correct or replace brushes and springs if necessary.
	Low brush spring tension.	Replace brush springs.
	Voltage regulator breakdown.	Check regulator operation and repair or replace as required.
	Dirty slip rings.	Clean.
	Partial short, ground, or open in stator winding.	Replace stator.
	Partially shorted or grounded rotor winding.	Replace rotor.
	Open or damaged diode.	Replace diode.
Noisy alternator.	Loose mounting.	Retighten bolts.
	Loose drive pulley.	Retighten.
	Broken ball bearing.	Replace.
	Improperly seated brushes.	Seat correctly.

IV. IGNITION CIRCUIT

1. When engine does not start.

If there is no problem in fuel system, ignition system should be checked. This can be easily done by detaching a high tension wire from spark plug, starting engine and observing condition of spark that occurs between high tension wire and spark plug terminal. After checking this, repair as necessary.

Note: Turn ignition switch off and disconnect ground cable from battery and electronic fuel injection harness connector from injectors and cold start valve, to cut off supply of fuel to engine. Then, observe the condition of sparks while starter motor is in operation.

Condition	Location	Probable cause	Corrective action
No spark at all	Distributor	Breakage of lead-wire on low tension side.	Repair.
		Poor insulation of cap and rotor head.	Replace.
		Open pick-up coil.	Replace.
		Air gap wider than specification.	Adjust.
	Ignition coil	Wire breakage or short circuit of coil.	Replace with new one.
	High tension wire	Wire coming off.	Repair.
		Faulty insulation.	Replace.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.
		Breakage of circuit.	Replace.
		Detached connection.	Repair.
Spark length More than 6 mm (0.236 in)	Spark plugs	Spark plug gap too wide.	Correct or replace.
		Too much carbon.	Clean or replace.
		Broken neck of insulator.	Replace.
		Expiration of plug life.	Replace.
	Distributor	Air gap too wide.	Correct.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.
		Breakage of circuit.	Replace.
		Detached connection.	Repair.

2. Engine rotates but does not run smoothly.

This may be caused by the ignition system or other engine conditions not related to ignition. Therefore, first a complete inspection of ignition system should be carried out.

Condition	Location	Probable cause	Corrective action
Engine misses.	Distributor	Foreign matter on pick-up coil.	Clean.
		Improper air gap.	Correct.
		Leak of electricity at cap and rotor head.	Repair or replace.
		Breakage of pick-up coil lead wire.	Replace.
		Worn or shaky breaker plate.	Replace assembly.
		Worn or shaky distributor driving shaft.	Replace assembly.
	Ignition coil	Layer short circuit or inferior quality coil.	Replace with good one.
	High tension wire	Deterioration of insulation with consequent leak of electricity.	Replace.
	Spark plugs	Fouled.	Clean.
		Leak of electricity at upper porcelain insulator.	Repair or replace.
		Spark plug gap too narrow.	Correct or replace.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.
		Breakage of circuit.	Replace.
		Detached connection.	Repair.
Engine causes knocking very often.	Distributor	Improper ignition timing (too advanced).	Correct.
		Coming off or breakage of governor spring.	Correct or replace.
		Worn pin or hole of governor.	Replace.
	Spark plugs	Burnt too much.	Replace.
Engine does not deliver enough power.	Distributor	Improper ignition timing (too retarded).	Correct.
		Improper functioning governor.	Replace assembly.
		Foreign particles stuck in air gap.	Clean.
	Spark plugs	Fouled.	Clean.

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ER

ENGINE REMOVAL & INSTALLATION

ENGINE REMOVAL AND INSTALLATION .... ER- 2

ENGINE REMOVAL AND INSTALLATION

CONTENTS

REMOVAL ER-2
INSTALLATION ER-3
ENGINE MOUNTING INSULATORS ER-3
FRONT INSULATOR ER-4
REAR INSULATOR ER-4
TIGHTENING TORQUE ER-4

REMOVAL

It is much easier to remove engine and transmission as a single unit than to remove them separately. After removal, engine can be separated from transmission assembly.

WARNING:
a. Place wheel chocks in front of front wheels and in rear of rear wheels.
b. Be sure to hoist engine and jack up transmission in a safe manner.

CAUTION:
Use fender covers to protect vehicle body.

1. Remove battery.
2. Scribe hood hinge location for proper reinstallation, and remove hood.

CAUTION:
Have an assistant help you so as to prevent damage to body.

3. Drain radiator coolant.
4. Disconnect upper and lower radiator hoses from engine.
5. Remove two oil cooler hoses from lower end of radiator. (Automatic transmission models only)
6. Remove radiator shroud and terminal block.
7. Remove four bolts securing radiator and detach radiator.

Note: **Always tighten securing bolt at upper right hand side together with body harness terminal.**

8. Remove carburetor air cleaner as follows:

- Remove fresh air duct.
- Remove hot air duct.
- Loosen air cleaner band bolt and air cleaner supporting bolts.
- Disconnect air cleaner-to-rocker cover hose at rocker cover.
- Disconnect air cleaner-to-C.A.C. valve hose. (California models only)
- Disconnect air cleaner-to-air pump hose. (Non-California models only)
- Disconnect air cleaner-to-A.B. valve hose.
- Disconnect air cleaner-to-vacuum hoses.

CAUTION:
Protect carburetor from dust and foreign matter by placing cover over air inlet opening.

9. Disconnect fuel pump-to-fuel filter hose and return hose.
10. Disconnect carbon canister hose on engine side.
11. Disconnect air pump air cleaner-to-air pump hose.
12. Disconnect following cables, wires and hoses:

- Engine ground cable.
- Accelerator wire at carburetor.
- High tension cable between ignition coil and distributor.
- Wire to distributor at body terminal.
- Wire to oil pressure switch.
- Wires to thermal transmitter.
- Wires to B.C.D.D. cut solenoid (Non-California models only), auto-choke heater and anti-dieseling solenoid.
- Wires to alternator.
- Wires to starter motor.
- Heater inlet and outlet hoses, if so equipped.
- Vacuum hose of Master-Vac at intake manifold.
- Wires for neutral switch (California models only) and back-up lamp switch.
- Cable to speedometer.

13. Remove transmission control linkage from transmission.

- Manual transmission models.

(1) Detach rubber boot.
(2) Remove E-ring and control lever pin from transmission striking rod guide and remove control lever.

Fig. ER-1 Removing shift lever

- Automatic transmission models.

(1) Disconnect selector range lever from manual shaft.
(2) Disconnect wires at inhibitor switch and down shift solenoid.

14. Air conditioner equipped models need following procedures.

(1) After removing flexible hose support, remove four compressor securing bolts. Then move the compressor to battery support.
(2) Remove vacuum hoses of F.I.C.D. solenoid valve.

15. Remove two bolts securing clutch operating cylinder. Then disconnect operating cylinder and flexible tube as an assembly. (Manual transmission models only)
16. Disconnect front exhaust tube from exhaust manifold.
17. Remove propeller shaft.

(1) Disconnect propeller shaft center bearing bracket from third crossmember.
(2) Disconnect propeller shaft from companion flange of differential carrier.
(3) Remove propeller shaft from transmission, and plug up rear end of extension housing of transmission to prevent oil leakage.

18. Attach a suitable wire or chain

to lift engine.

19. Remove front engine mounting bolts at engine mounting front support.

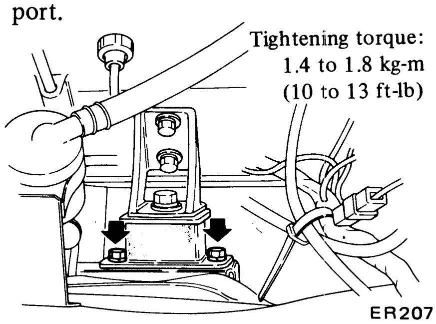


Fig. ER-2 Removing front engine mounting bolts

20. Place a jack under transmission and jack it up.

21. Loosen two rear engine mounting bolts ①.

22. Loosen two exhaust tube hanger bolts ②. (California models only)

23. Remove four bolts ③ securing engine mounting rear support to side member and detach rear support.

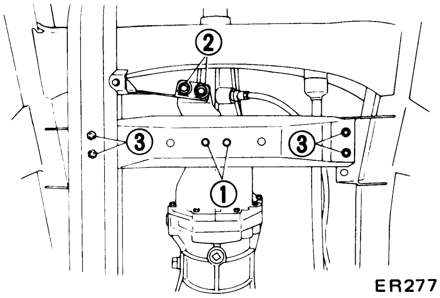


Fig. ER-3 Removing rear engine mounting support

24. Remove steering idler arm securing bolts and push down cross rod.

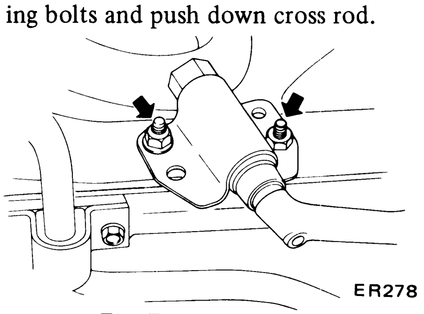


Fig. ER-4 Removing idler arm

25. Pull engine towards front as far as possible and carefully raise if and transmission with a hoist and cable.

CAUTION:

In this operation, care should always be taken not to allow the unit to hit against any adjacent parts.

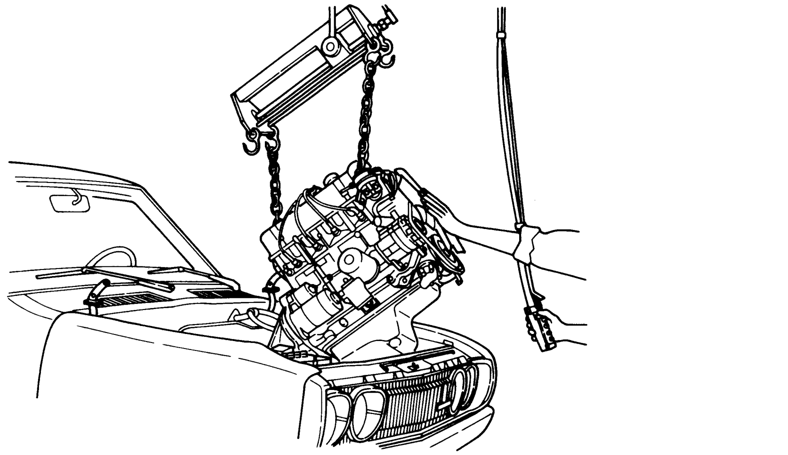
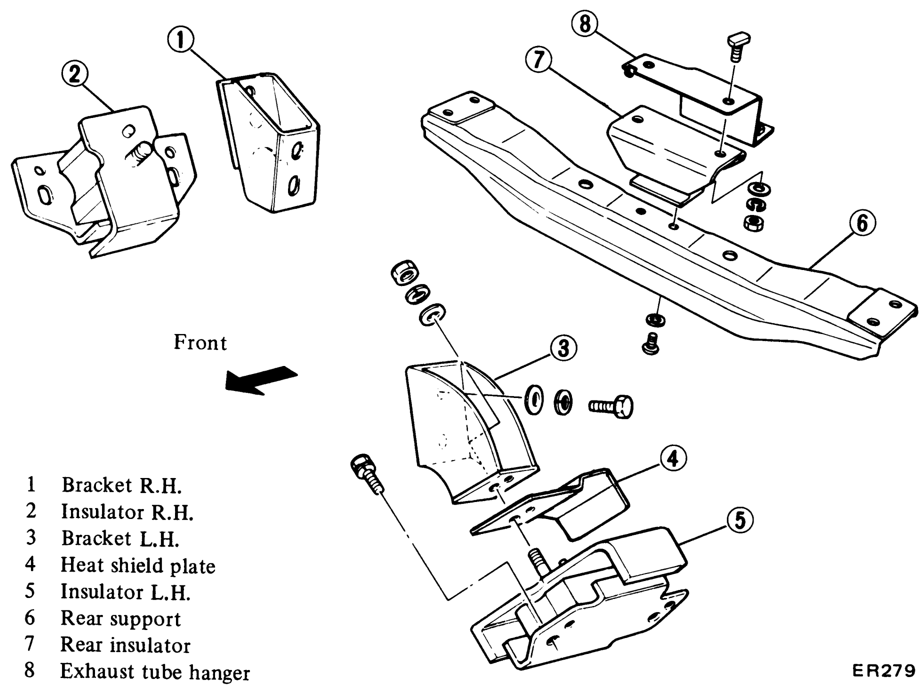


Fig. ER-5 Lifting engine

INSTALLATION

Install engine with transmission in reverse order of removal, observing the following:

1. When installing, first secure rear engine mounting support to body.
2. Refer to applicable section when installing and adjusting any parts.



1 Bracket R.H.
2 Insulator R.H.
3 Bracket L.H.
4 Heat shield plate
5 Insulator L.H.
6 Rear support
7 Rear insulator
8 Exhaust tube hanger (California models only)

Fig. ER-6 Structual view of engine mounting

ENGINE MOUNTING INSULATORS

Three insulators are used to mount the engine and transmission; two are located at the left and right of the cylinder block and one at the transmission rear extension housing.

Replace any insulator that shows signs of separation or deterioration.

Be sure to keep insulator free from oil or grease.

FRONT INSULATOR

Removal and installation

1. Disconnect battery ground cable.
2. Remove hood.
3. Suspend engine with wire or chain.
4. Loosen front engine mounting insulator upper nuts (both sides).
5. Carefully raise engine a little with a hoist and cable.
6. Remove front mounting insulators at front supports after removing front mounting bolts.
7. To install, reverse order of removal.

REAR INSULATOR

Removal and installation

1. Place a jack under transmission and jack it up slightly.
2. Loosen two rear engine mounting bolts.
3. Loosen two exhaust tube hanger bolts. (California models only)
4. Remove rear mounting insulator at transmission rear extension after removing insulator securing bolts.
5. To install, reverse order of removal.

TIGHTENING TORQUE

Fixing bolts and nuts

Front mounting bracket to cylinder block	kg-m (ft-lb)	2.6 to 3.6 (19 to 26)
Front mounting insulator to bracket	kg-m (ft-lb)	2.6 to 3.6 (19 to 26)
Front mounting insulator to front support	kg-m (ft-lb)	1.4 to 1.8 (10 to 13)
Rear mounting insulator to transmission	kg-m (ft-lb)	3.2 to 3.7 (23 to 27)
Rear mounting insulator to rear support	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Rear support to frame	kg-m (ft-lb)	3.2 to 4.3 (23 to 31)
Clutch operating cylinder to transmission	kg-m (ft-lb)	2.5 to 3.5 (18 to 25)
Exhaust front tube to exhaust manifold	kg-m (ft-lb)	1.9 to 2.5 (14 to 18)
Center bearing bracket to crossmember	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Propeller shaft to companion flange	kg-m (ft-lb)	2.4 to 3.3 (17 to 24)

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CL

CLUTCH

CLUTCH .... CL- 2
CLUTCH CONTROL .... CL- 5
SERVICE DATA AND SPECIFICATIONS .... CL- 9
TROUBLE DIAGNOSES AND CORRECTIONS CL-10
SPECIAL SERVICE TOOL CL-12

CLUTCH

CONTENTS

DESCRIPTION CL-2
REMOVAL AND INSTALLATION CL-2
Removal CL-2
Installation CL-3
DISASSEMBLY AND ASSEMBLY CL-3
Disassembly CL-3
Assembly CL-3
INSPECTION CL-4

DESCRIPTION

The clutch 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.

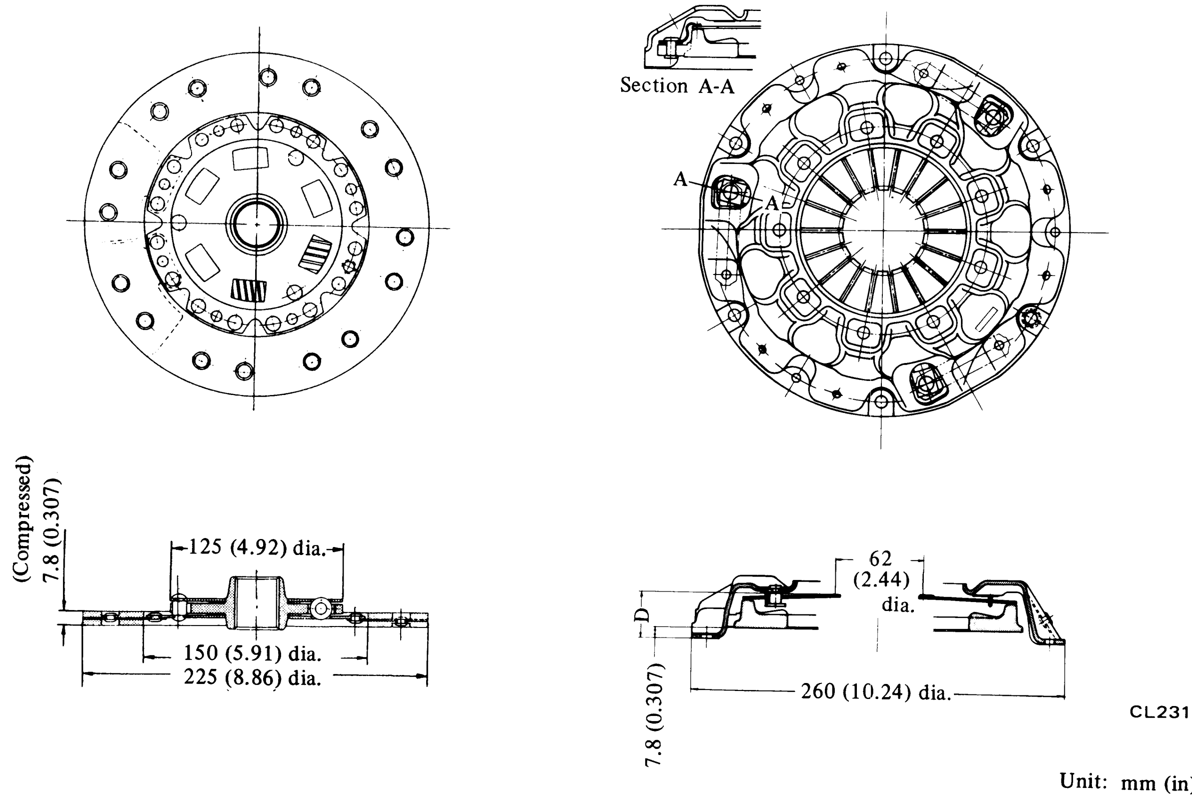


Fig. CL-1 Construction of clutch disc and cover assembly

REMOVAL AND INSTALLATION

Removal

1. Remove transmission from vehicle.

For details of transmission removal, refer to "Transmission Section."

2. Insert Clutch Aligning Bar KV30100200 into clutch disc hub until it will no longer go. It is important to support weight of clutch disc during further steps. See Figure CL-2.

3. Loosen six screws attaching clutch cover to flywheel one turn at a time each until spring pressure is released. Be sure to turn them out in a crisscross fashion.

Note: Exercise special care to avoid grease or oil getting on clutch linings.

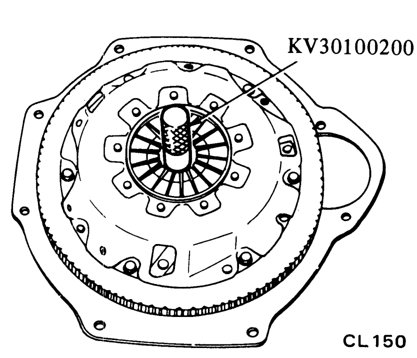


Fig. CL-2 Supporting clutch assembly

Installation

1. Apply a light coat of lithium base grease (containing molybdenum disulphide) on 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.

2. Install clutch disc and clutch cover assembly on flywheel. Support two assemblies with Clutch Aligning Bar KV30100200. See Figure CL-3.

Note: Be sure to keep disc facings, flywheel, and, pressure plate clean and dry.

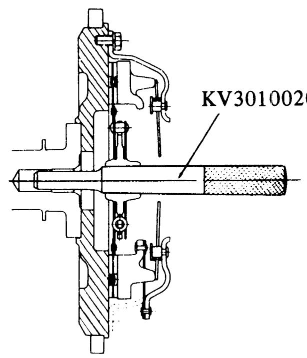


Fig. CL-3 Installing clutch cover assembly

3. Install six bolts to tighten clutch cover assembly to flywheel squarely. Each bolt should be tightened one turn at a time to the specified torque 1.5 to 2.2 kg-m (11 to 16 ft-lb).

Note: Three dowels are used to locate clutch cover on flywheel properly.

4. Remove Clutch Aligning Bar KV30100200 after tightening the bolts securely.
5. Install transmission.

Note: Make certain that withdrawal lever engages lever ball pin.

6. Connect push rod of clutch operating cylinder to withdrawal lever.

DISASSEMBLY AND ASSEMBLY

Disassembly

1. Clutch cover assembly can not be disassembled since diaphragm spring is securely reveted 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 (See Figure CL-4):

(1) Remove dust cover from clutch houisng.

(2) Remove withdrawal lever from clutch housing.

(3) Remove retainer spring from withdrawal lever.

(4) Remove release bearing, bearing sleeve and holder spring from clutch housing as an assembly.

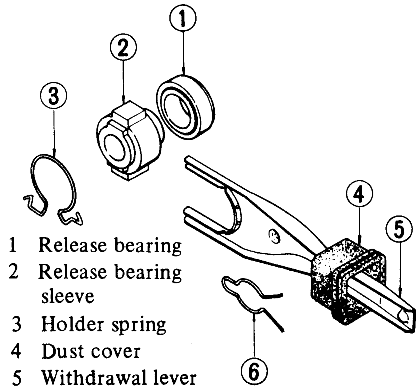


Fig. CL-4 Exploded view of clutch release mechanism

3. Take out clutch release bearing from bearing sleeve, using a universal puller. See Figure CL-5.

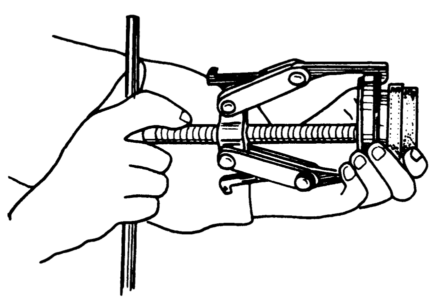


Fig. CL-5 Disassembling release bearing

4. Remove pilot bushing in crankshaft by Pilot Bushing Puller ST16610001 if necessary. See Figure CL-6.

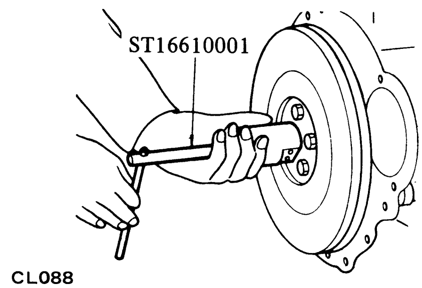


Fig. CL-6 Removing pilot bushing

Assembly

Release mechanism

1. When assembling release bearing on sleeve, use a press and seat bearing squarely on sleeve. See Figure CL-7.

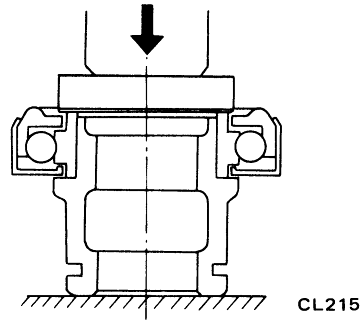


Fig. CL-7 Installing release bearing

2. Before or during assembling, lubricate the following points with a light coat of multi-purpose grease.

(1) Inner groove of release bearing sleeve. See Figure CL-8.

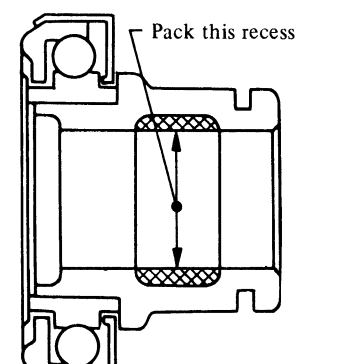


Fig. CL-8 Lubricating recess of bearing sleeve

(2) Contact surfaces of withdrawal lever, lever ball pin and bearing sleeve.
(3) Contact surfaces of transmission front cover. See Figure CL-9.

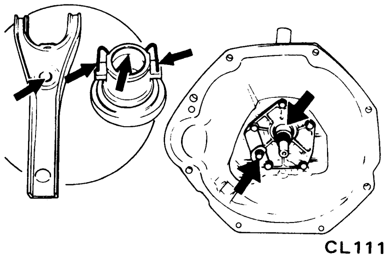


Fig. CL-9 Lubricating points of withdrawal lever and front cover

(4) Contact surfaces of transmission main drive gear splines. [lithium base grease (including molybdenum disulphide)].

Note: Very small amount of grease should be coated to the above points. If too much lubricant is applied, it will run out on the friction plates when hot, resulting in damaging clutch disc facings.

3. Install retainer spring to withdrawal lever. Fit holder spring to release bearing and sleeve assembly, then assemble withdrawal lever and bearing sleeve as a unit. Install this assembly on transmission case. Then 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.

INSPECTION

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 torsional 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 less than 0.3 mm (0.012 in) at revets. See Figure CL-10.

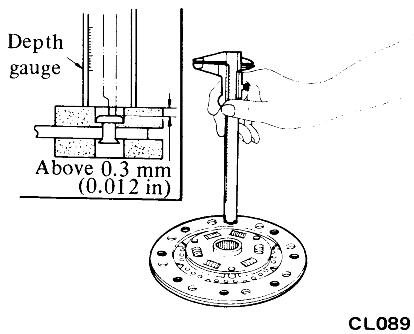


Fig. CL-10 Measuring clutch lining

3. Check disc plate for runout whenever the old disc or a new one is installed.
4. If runout exceeds the specified value at the outer circumference, replace or repair disc. See Figure CL-11.

Runout:
0.5 mm (0.020 in)
total indicator reading
R (from the hub center):
107.5 mm (4.23 in)

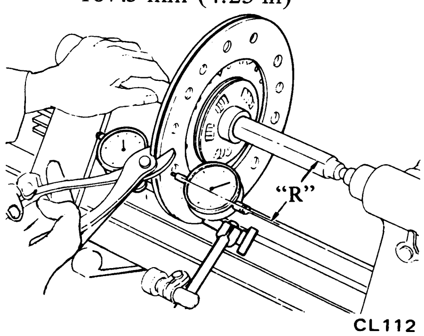


Fig. CL-11 Measuring disc runout

5. Check the fit of disc hub on transmission main drive gear for smoothly sliding. If splines are worn, clutch disc or main drive gear should be replaced; that is, backlash exceeds 0.4 mm (0.016 in) at the outer edge of clutch disc.

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. See Figure CL-12.

a. Place Distance Piece ST20050100 on Base Plate ST20050010 and then tighten clutch cover assembly on the base plate by using Set Bolts (ST20050051).
b. Measure diaphragm spring toe height "A" at several points with a vernier caliper depth gauge.

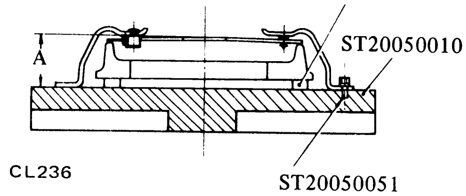


Fig. CL-12 Measuring the height of diaphragm spring

If the height "A" of spring end is beyond the specified value of 33 to 35 mm (1.30 to 1.38 in), adjust the spring height with Diaphragm Adjusting Wrench ST20050240. See Figure CL-13.

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).

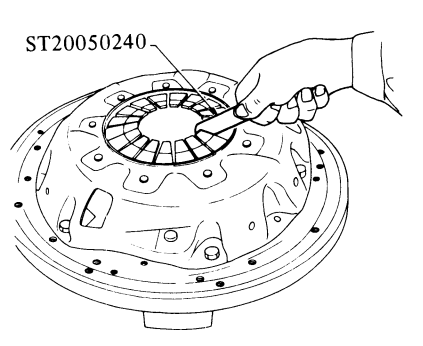


Fig. CL-13 Adjusting the spring height

3. Inspect thrust rings for wear or damage. As these parts are invisible from outside, shake cover assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises mean requirement for replacement as a complete assembly.

Release bearing and sleeve

Check for abnormal wear on contact surface of withdrawal lever, ball pin and bearing sleeve.

Pilot bushing

Check pilot bushing in crankshaft for wear or roughness. If necessary, replace it.

When bushing is faulty, be sure to check transmission main drive gear at the same time.

CLUTCH CONTROL

CONTENTS

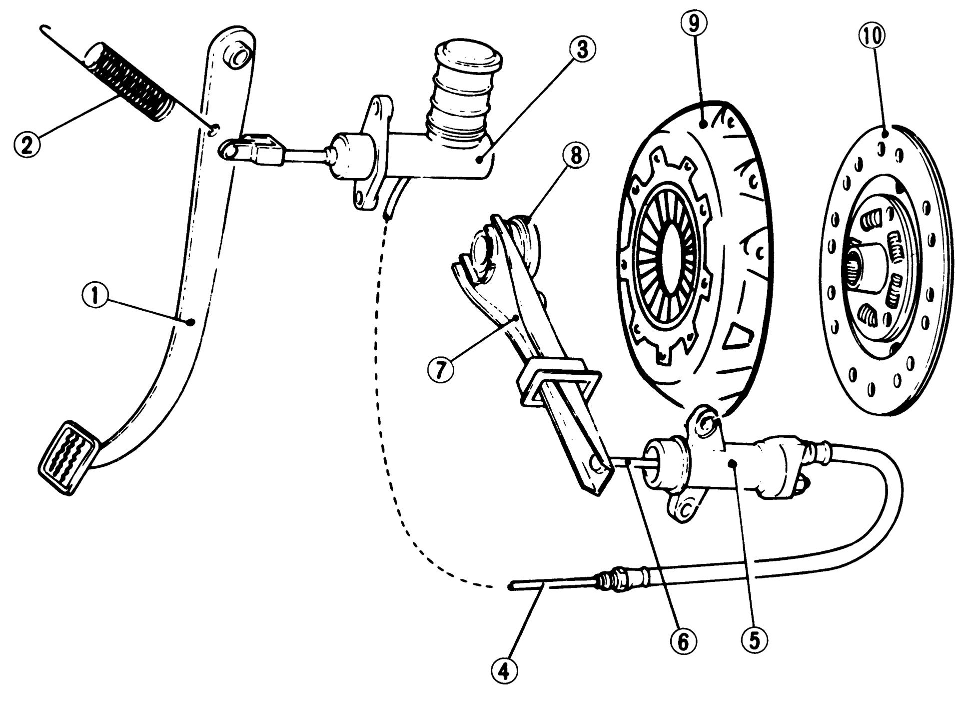
DESCRIPTION CL-5
CLUTCH PEDAL CL-6
Removal and installation CL-6
Inspection and adjustment CL-6
CLUTCH MASTER CYLINDER CL-7
Removal and installation CL-7
Disassembly and assembly CL-7
Inspection CL-8
OPERATING CYLINDER CL-8
Removal and installation CL-8
Disassembly and assembly CL-8
Inspection CL-8
BLEEDING CLUTCH SYSTEM CL-8

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 forwards 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.

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 wear on the clutch disc.



1 Clutch pedal
2 Return spring
3 Clutch master cylinder
4 Clutch piping
5 Operating cylinder
6 Push rod
7 Withdrawal lever
8 Release bearing
9 Clutch cover
10 Clutch disc

CL305

Fig. CL-14 Clutch operating system

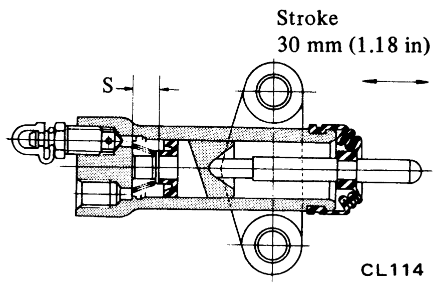


Fig. CL-15 Non-adjustable operating cylinder

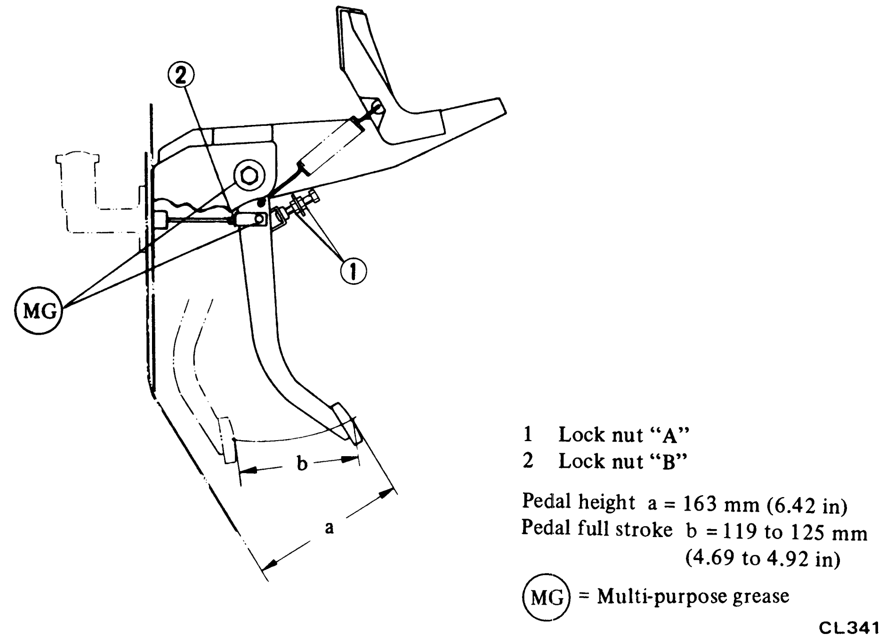


Fig. CL-17 Adjusting pedal height

CLUTCH PEDAL

Removal and installation

Removal

1. Pry off cotter pin and take out clevis pin; disconnect push rod from pedal assembly.
2. Unhook return spring. Loosen off fulcrum pin and remove pedal assembly.

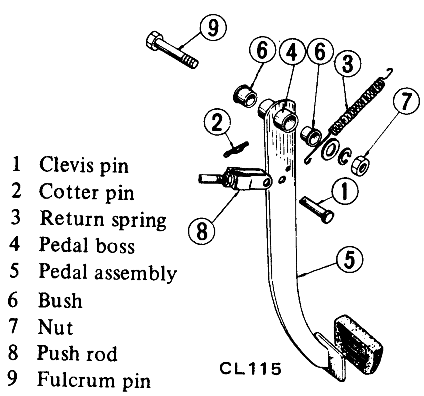


Fig. CL-16 Exploded view of clutch pedal

Note: Before removing clutch pedal, note toe board clearance at pedal pad.

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-17.

Tightening torque:
- Pedal installation bolt (Fulcrum pin):
  - 1.9 to 2.4 kg-m (14 to 17 ft-lb)
- Lock nut "A":
  - 1.2 to 1.5 kg-m (9 to 11 ft-lb)
- Lock nut "B":
  - 0.8 to 1.2 kg-m (5.8 to 8.7 ft-lb)

Note: Refer to Figure CL-18 for the correct direction of return spring.

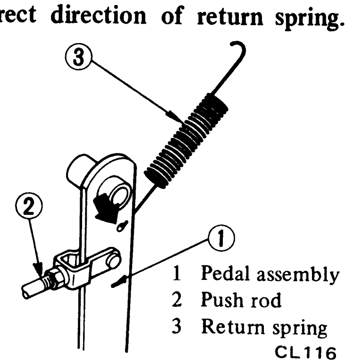


Fig. CL-18 Hooking return spring

Inspection and adjustment

Clean all the following parts in cleaning solvent and check for wear, damage or any other abnormal condition. Replace the parts which are faulty.

(1) Return spring
(2) Bush
(3) Pedal boss, etc.

1. Adjust the pedal height to 163 mm (6.42 in) by adjusting pedal stopper and tighten lock nut "A" to the specified torque 1.2 to 1.5 kg-m (9 to 11 ft-lb).
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 the specified torque 0.8 to 1.2 kg-m (5.8 to 8.7 ft-lb).

Note: Exercise care in adjusting the play not to block the port or master cylinder. A blocked port may result if too small play at clevis pin exists.

3. After adjusting, check the pedal full stroke is in 119 to 125 mm (4.69 to 4.92 in).

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

CLUTCH MASTER CYLINDER

Removal and installation

Removal

1. Remove clevis pin at push rod.
2. Disconnect clutch tube from master cylinder and drain clutch fluid.
3. Remove bolts securing master cylinder to the vehicle, and dismount master cylinder.

Note: Remove dust cover from master cylinder body, on the side of driver's seat.

Installation

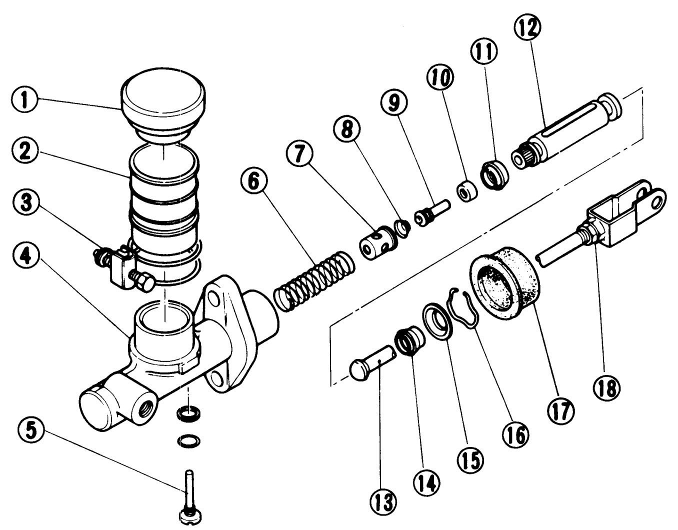
To install, reverse the order of removal. Closely observe the following instructions.

1. Adjust pedal height by changing pedal stopper length.
2. Bleed air out of hydraulic system.

Tightening torque:
Master cylinder to dash panel:
0.8 to 1.2 kg-m
(5.8 to 8.7 ft-lb)
Clutch tube connector (Flare nut):
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

3. Using Flare Nut Torque Wrench GG94310000, tighten each connector to the specified torque.

Disassembly and assembly



1 Reservoir cap
2 Reservoir
3 Reservoir band
4 Cylinder body
5 Supply valve stopper
6 Return spring
7 Spring seat
8 Valve spring
9 Supply valve rod
10 Supply valve
11 Primary cup
12 Piston
13 Push rod
14 Secondary cup
15 Stopper
16 Stopper ring
17 Dust cover
18 Lock nut

CL265

Fig. CL-19 Exploded view of master cylinder

Disassembly

1. Remove dust cover and remove stopper ring from body.
2. Remove push rod and piston assembly.
3. Take off piston cups.
4. Remove spring seat from piston and take off supply valve if necessary. See Figure CL-19.

Note: Discard piston cup, supply valve and spring seat after removal.

Assembly

To assemble, reverse the order of disassembly. Closely observe 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.
3. Press piston into spring seat when assembling.

Note: The clutch master cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.
When replacing the repair kit or component parts, ascertain the brand of the clutch master cylinder body. Be sure to use parts of the same make as the former ones.

Inspection

CAUTION:
To clean or wash all parts of master cylinder, operating cylinder and piping, 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 if necessary, replace.
2. If the clearance between cylinder and piston is more than 0.15 mm (0.0059 in), replace cylinder.
3. Renew piston cup when disassembled. It must also be replaced when wear or deformation due to fatigue or damage is found.
4. 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.

5. Replace clutch hose and tube if any abnormal sign of damage or defromation is found.

OPERATING CYLINDER

Removal and installation

Removal

1. Detach clutch hose from operating cylinder.
2. Remove two bolts securing operating cylinder to clutch housing.

Installation

Install in the reverse order of removal.

Observe the following instructions.

1 Bleed air thoroughly from clutch hydraulic system.

2 Do not install return spring, or clutch will not be disengaged properly.

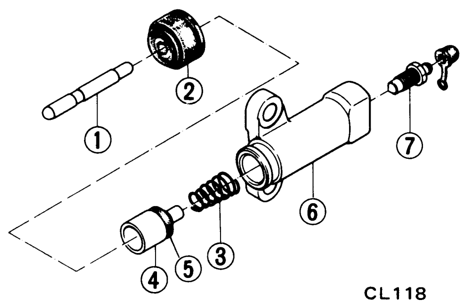
Tightening torque:

Operating cylinder securing bolt:
2.5 to 3.5 kg-m (18 to 25 ft-lb)
Bleeder screw:
0.7 to 0.9 kg-m (5.1 to 6.5 ft-lb)
Clutch hose connector:
1.7 to 2.0 kg-m (12 to 14 ft-lb)

Disassembly and assembly

Disassembly

1. Remove push rod with dust cover.
2. Remove piston assembly and piston spring.
3. Remove bleeder screw.



1 Push rod
2 Dust cover
3 Piston spring
4 Piston
5 Piston cup
6 Operating cylinder
7 Bleeder screw

Fig. CL-20 Exploded view of operating cylinder

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:

a. **Be sure to install piston assembly with piston spring in place.**
b. **The clutch operating cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.**
When replacing the repair kit or component parts, ascertain the brand of the clutch operating cylinder body. Be sure to use parts of the same make as the former ones.

Inspection

Visually inspect all disassembled parts, replacing those found worn or damaged too badly beyond specifications.

BLEEDING CLUTCH SYSTEM

The hydraulic clutch system must be bled whenever clutch line has been disconnected or air has entered it.

When pedal action has a "spongy" feeling, it is an indication that air has entered the system.

Bleeding clutch system is an essential part of regular clutch service.

1. Remove reservoir cap and top up with recommended brake fluid.
2. Thoroughly clean mud and dust from bleeder screw of operating cylinder so that outlet hole is free from any foreign material. Install bleeder hose (vinyl hose) on bleeder screw.

Place the other end of it in a clean container.

3. Have a co-worker depress clutch pedal two or three times. With clutch pedal depressed fully, loosen bleeder screw to bleed air out of clutch system.
4. Close bleeder screw quickly as clutch pedal is on down stroke.
5. Allow clutch pedal to return slowly with bleeder screw closed.
6. Repeat steps 4 and 5 until no air bubble shows in the vinyl hose.
7. Operate clutch several times; then, check connections for external hydraulic leaks.

CAUTION:
a. **Do not reuse brake fluid drained during bleeding operation.**
b. **Exercise care not to splash brake fluid on exterior finish as it will damage the paint.**

Note:

a. **Brake fluid containing air is white and has visible air bubbles.**
b. **Brake fluid containing no air runs out of bleeder screw in a solid stream without air bubbles.**
c. **Pay close attention to clutch fluid level in reservoir during bleeding operation.**
d. **Pour brake fluid into reservoir up to specified level.**

SERVICE DATA AND SPECIFICATIONS

Clutch cover		
Clutch cover type		Diaphragm (C225S)
Diaphragm spring-to-flywheel distance	mm (in)	33 to 35 (1.30 to 1.38)
Unevenness of diaphragm spring toe height	mm (in)	less than 0.5 (0.020)
Full load	kg (lb)	400 (882)
Out of flatness of pressure plate	mm (in)	0.05 (0.0020)
Allowable refacing limit of pressure plate	mm (in)	1.0 (0.040)
Clutch disc		
Facing size		
Outer dia. x inside dia. x thickness	mm (in)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
Thickness of disc assembly		
Free	mm (in)	8.3 to 8.9 (0.327 to 0.350)
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 run-out	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)	163 (6.42)
Play at clevis pin	mm (in)	1 to 5 (0.04 to 0.20)
Full stroke	mm (in)	119 to 125 (4.69 to 4.92)
Clutch master cylinder		
Dia. of master cylinder	mm (in)	15.87 (5/8)
Allowable maximum clearance between cylinder and piston	mm (in)	0.15 (0.0059)
Clutch operating cylinder		
Dia. of operating cylinder	mm (in)	19.05 (¾)
Tightening torque		
Clutch assembly to flywheel securing bolt	kg-m (ft-lb)	1.5 to 2.2 (11 to 16)
Pedal installation bolt (Fulcrum pin)	kg-m (ft-lb)	1.9 to 2.4 (14 to 17)
Pedal stopper lock nut	kg-m (ft-lb)	1.2 to 1.5 (9 to 11)
Push rod lock nut	kg-m (ft-lb)	0.8 to 1.2 (5.8 to 8.7)
Master cylinder to dash panel securing bolt	kg-m (ft-lb)	0.8 to 1.2 (5.8 to 8.7)
Clutch tube connector (Flare nut)	kg-m (ft-lb)	1.5 to 1.8 (11 to 13)
Clutch hose connector	kg-m (ft-lb)	1.7 to 2.0 (12 to 14)
Operating cylinder to clutch housing securing bolt	kg-m (ft-lb)	2.5 to 3.5 (18 to 25)
Bleeder screw	kg-m (ft-lb)	0.7 to 0.9 (5.1 to 6.5)

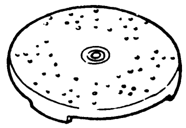
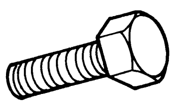
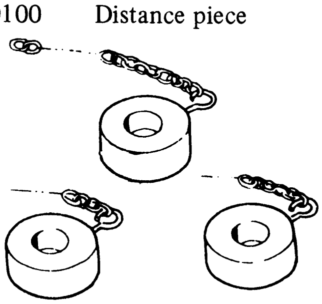
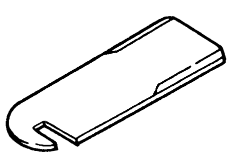
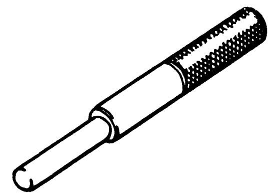
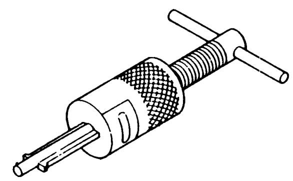
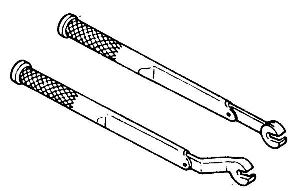
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause and testing	Corrective action
Clutch slips	Slipping of the clutch may be noticeable when any of the following symptoms is encountered during operation. (1) Vehicle will not respond to engine speed during acceleration. (2) Insufficient vehicle speed. (3) Lack of power during uphill driving. Some of the above conditions are also experienced when engine problem s occurring. First determine whether engine or clutch is causing the problem. If slipping clutch is left unheeded, wear and/or overheating will occur on clutch facing until it is no longer serviceable. TO TEST FOR SLIPPING CLUTCH, proceed as follows: During upgrade travelling, run engine at about 40 to 50 km/h (25 to 31 MPH) with gear shift lever in 3rd speed position, shift into highest gear and at the same time rev up engine. If clutch is slipping, vehicle will not readily respond to depression of accelerator pedal.	
	• Clutch facing worn excessively. • Oil or grease on clutch facing. • Warped clutch cover or pressure plate.	Replace. Replace. Repair or replace.
Clutch drags	Dragging clutch is particularly noticeable when shifting gears, especially into low gear. TO TEST FOR DRAGGING CLUTCH, proceed as follows: (1) Start engine. Disengage clutch. Shift into reverse gear, and then into Neutral. Gradually increase engine speed, and again shift into reverse gear. If clutch is dragging, gear "grating" is heard when shifting from Neutral into Reverse. (2) Stop engine and shift gear. (Conduct this test at each gear position.) (3) Gears are smoothly shifted in step (2), but drag when shifting to 1st speed position at idling. a. If dragging is encountered at the end of shifting, check condition of synchro-mechanism in transmission. 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 travel. a. If pedal can be depressed further, check clutch condition. b. If pedal cannot be depressed further, proceed to step (5) below. (5) Check clutch control (pedal height, pedal free travel, withdrawal lever play, etc.). If no abnormal condition exists and if pedal cannot be depressed further, check clutch condition.	
	• 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.	Repair or replace. Clean and lubricate with grease, or replace. Adjust or replace. Repair or replace.

Condition	Probable cause and testing	Corrective action
Clutch chatters	Clutch chattering is usually noticeable when vehicle is just rolled off with clutch partially engaged.	
	• Weak or broken clutch disc torsion spring.	Replace.
	• Oil or grease on clutch facing.	Replace.
	• Clutch facing out of proper contact or clutch disc runout.	Replace.
	• Loose rivets.	Replace.
	• Warped pressure plate or clutch cover surface.	Repair or replace.
	• Unevenness of diaphragm spring toe height.	Adjust or replace.
	• Loose engine mounting or deteriorated rubber.	Retighten or replace.
Noisy clutch	A noise is heard after clutch is disengaged.	
	• Damaged release bearing.	Replace.
	A noise is heard when clutch is disengaged.	
	• Insufficient grease on the sliding surface of bearing sleeve.	Apply grease.
	• Clutch cover and bearing are not installed correctly.	Adjust.
	A noise is heard when vehicle is suddenly started off with clutch partially engaged.	
	• Damaged pilot bushing.	Replace.
Clutch grabs	When grabbing of clutch occurs, vehicle will not start off smoothly from a standing start or clutch is engaged before clutch pedal is fully depressed.	
	• Oil or grease on clutch facing.	Replace.
	• Clutch facing worn or loose rivets.	Replace.
	• Wear or rust on splines in drive shaft and clutch disc.	Clean or replace.
	• Warped flywheel or pressure plate.	Repair or replace.
	• Loose mountings for engine or power train units.	Retighten.

CLUTCH

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Reference page or Fig. No.
ST20050010 Base plate 	—	Fig. CL-12
ST20050051 Set bolt 	—	Fig. CL-12
ST20050100 Distance piece 	—	Fig. CL-12
ST20050240 Diaphragm adjusting wrench 	—	Fig. CL-13
KV30100200 Clutch aligning bar 	—	Fig. CL-2 Fig. CL-3
ST16610001 Pilot bushing puller 	J 23907	Fig. CL-6
GG94310000 Flare nut torque wrench 	—	Fig. CL-7

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION MT

MANUAL TRANSMISSION

4-SPEED TRANSMISSION (TYPE: F4W71B) .... MT- 2

5-SPEED TRANSMISSION (TYPE : FS5W71B) MT-13

SERVICE DATA AND SPECIFICATIONS MT-18

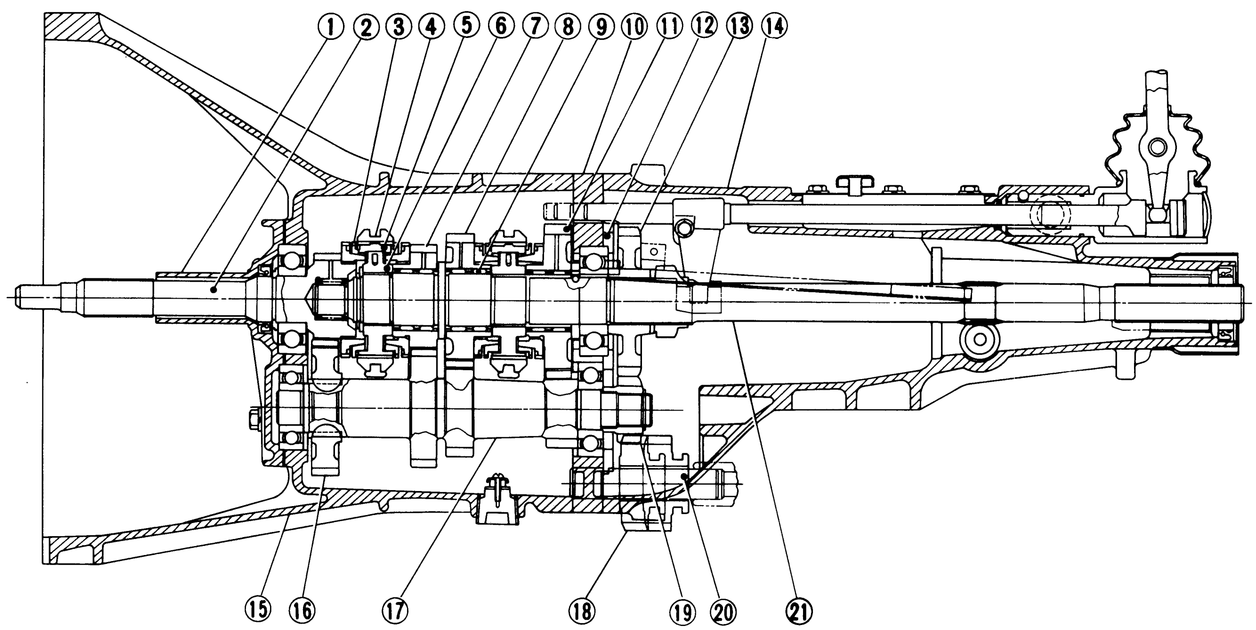
TROUBLE DIAGNOSES AND CORRECTIONS MT-21

SPECIAL SERVICE TOOLS MT-22

4-SPEED TRANSMISSION (TYPE: F4W71B)

CONTENTS

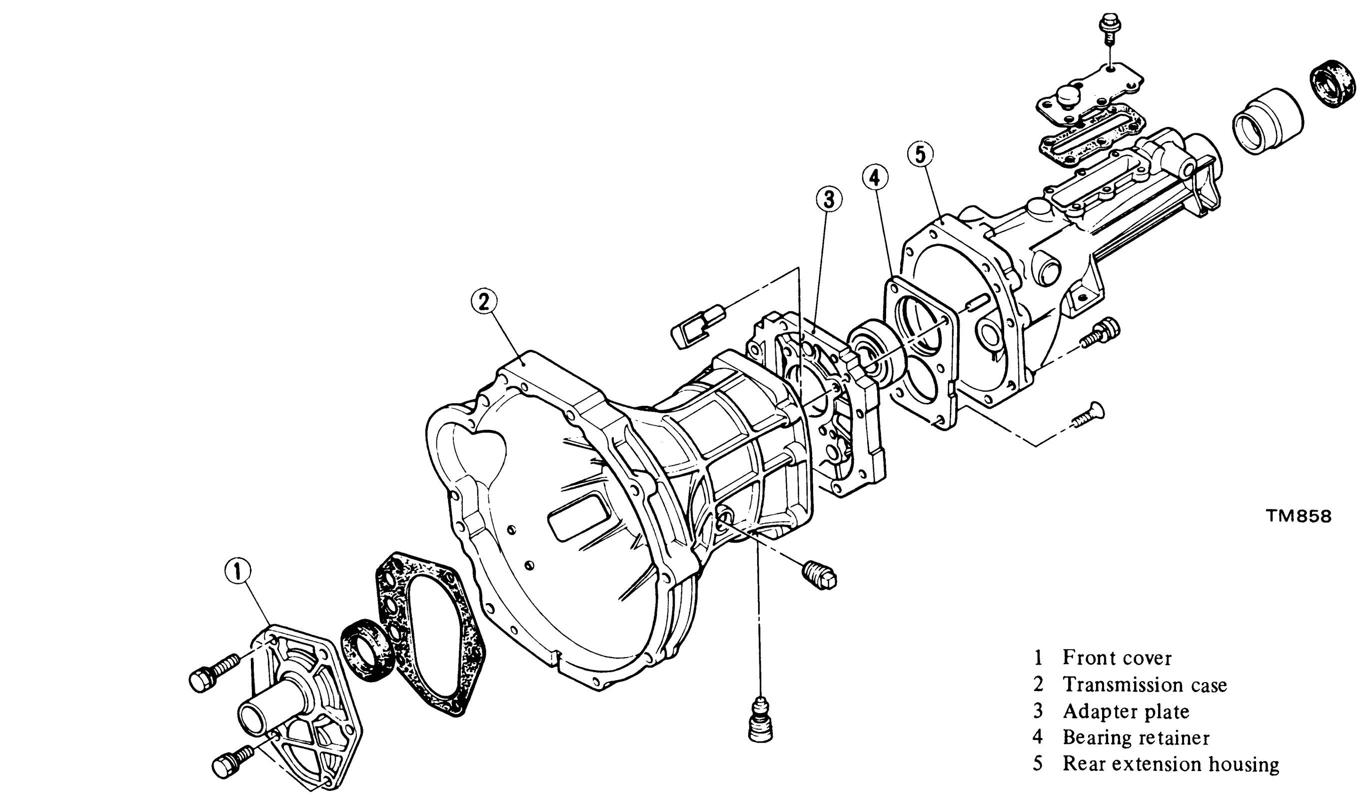
REMOVAL ..... MT- 4
INSTALLATION ..... MT- 5
DISASSEMBLY ..... MT- 5
HOUSING ..... MT- 5
FORK ROD ..... MT- 5
GEAR ..... MT- 6
REAR EXTENSION ..... MT- 7
ADAPTER PLATE ..... MT- 7
INSPECTION ..... MT- 7
TRANSMISSION CASE AND REAR EXTENSION HOUSING ..... MT- 8
BEARING ..... MT- 8
GEAR ..... MT- 8
BAULK RING ..... MT- 8
OIL SEAL ..... MT- 8
ASSEMBLY ..... MT- 8
FRONT COVER ..... MT- 8
REAR EXTENSION ..... MT- 8
ADAPTER PLATE ..... MT- 9
GEAR ..... MT- 9
HOUSING MT-12



1 Front cover
2 Main drive gear
3 Baulk ring
4 Coupling sleeve
5 Shifting insert
6 Synchronizer hub, 3rd & 4th
7 3rd main gear
8 2nd main gear
9 Needle bearing
10 Adapter plate
11 1st main gear
12 Bearing retainer
13 Reverse main gear
14 Rear extension housing
15 Transmission case
16 Counter drive gear
17 Counter gear
18 Reverse idler gear
19 Reverse counter gear
20 Reverse idler shaft
21 Mainshaft

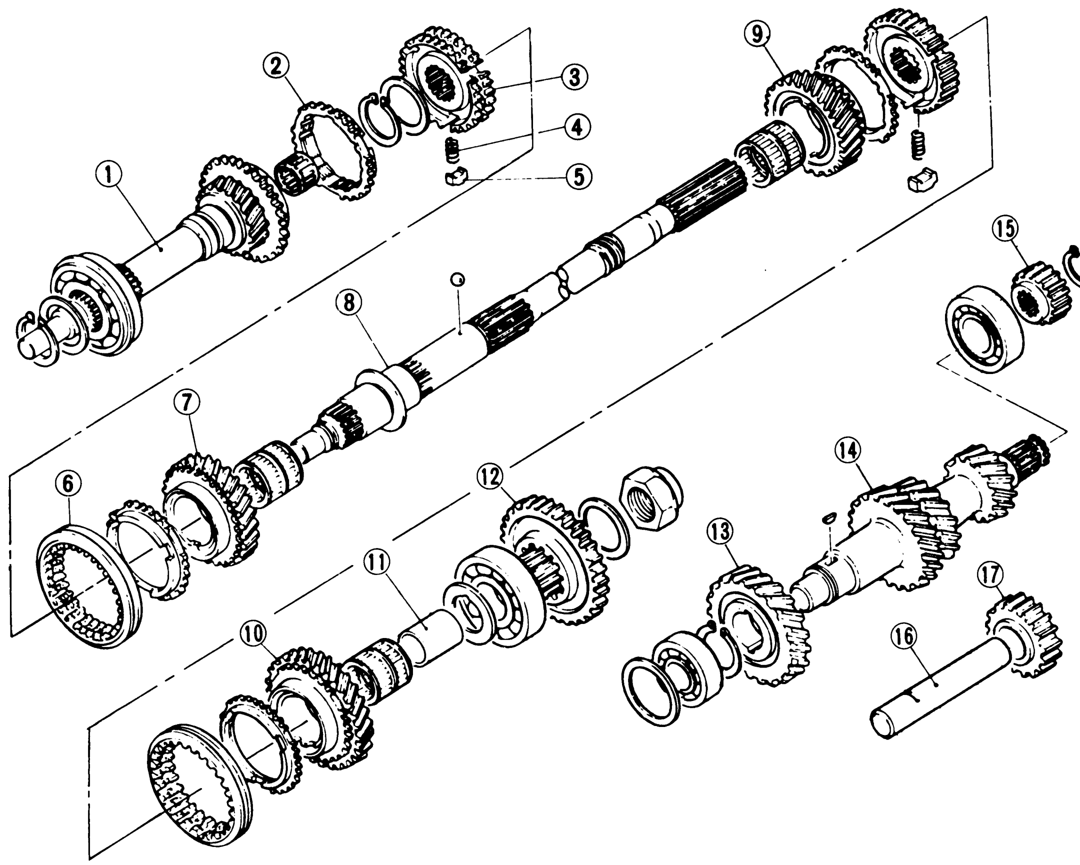
TM126A

Fig. MT-1 F4W71B transmission



1 Front cover
2 Transmission case
3 Adapter plate
4 Bearing retainer
5 Rear extension housing

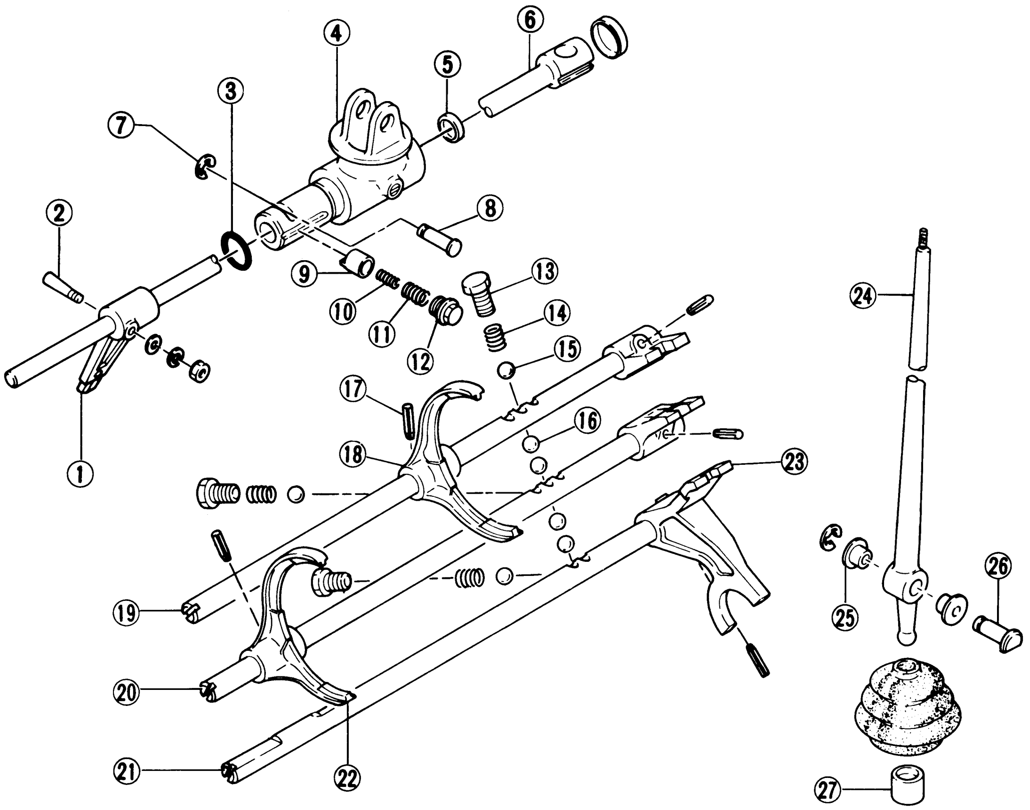
Fig. MT-2 F4W71B transmission case components



1 Main drive gear
2 Baulk ring
3 Synchronizer hub, 3rd & 4th
4 Shifting insert spring
5 Shifting insert
6 Coupling sleeve
7 3rd main gear
8 Mainshaft
9 2nd main gear
10 1st main gear
11 1st gear spacer
12 Reverse main gear
13 Counter drive gear
14 Counter gear
15 Reverse counter gear
16 Reverse idler shaft
17 Reverse idler gear

TM857

Fig. MT-3 F4W71B transmission gear components



1 Striking lever
2 Lock pin
3 O-ring
4 Striking guide
5 Oil seal
6 Striking rod
7 E-ring
8 Stopper guide pin
9 Return spring plunger
10 Return spring
11 Reverse check spring
12 Return spring plug
13 Check ball plug
14 Check spring
15 Check ball
16 Interlock ball
17 Retaining pin
18 1st & 2nd shift fork
19 1st & 2nd fork rod
20 3rd & 4th fork rod
21 Reverse fork rod
22 3rd & 4th shift fork
23 Reverse shift fork
24 Control lever
25 Control lever bushing
26 Control lever pin
27 Control lever bushing

Fig. MT-4 F4W71B transmission shift control components

REMOVAL

In dismounting transmission from the vehicle, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. Place transmission control lever in neutral position.
3. Remove E-ring and control lever pin from transmission striking rod guide, and remove control lever.

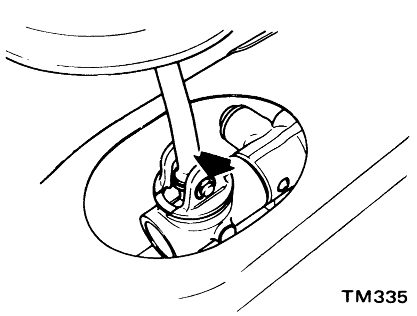


Fig. MT-5 Removing control lever

4. Jack up the vehicle and support its weight on safety stands. Use a hydraulic hoist or open pit, if available.

   Confirm that safety is insured.
5. Disconnect exhaust front tube.
6. Disconnect wires from reverse lamp switch.
7. Disconnect speedometer cable from rear extension housing.
8. Remove clutch operating cylinder from transmission case.
9. Remove bracket holding center bearing on 3rd crossmember by loosening off attaching bolts.

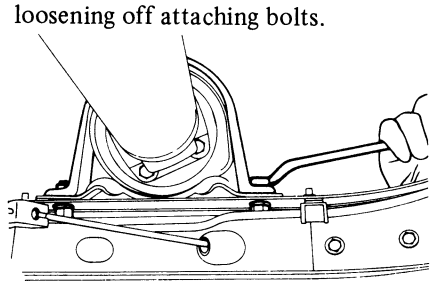


Fig. MT-6 Removing center bearing holding bracket

10. Detach propeller shaft from companion flange of differential carrier by removing bolts.

CAUTION:

Remove propeller shaft carefully so as not to damage spline, sleeve yoke and rear oil seal.

Note:

Plug up the opening in the rear of rear extension housing to prevent oil from flowing out.

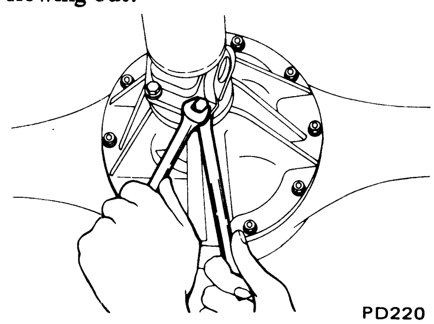
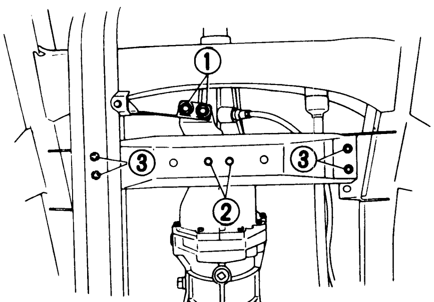


Fig. MT-7 Removing four bolts securing propeller shaft to companion flange

11. Support engine by locating a jack under oil pan with a wooden block used between oil pan and jack.
12. Support transmission with a transmission jack.
13. Remove exhaust pipe bracket by unscrewing attaching bolts ① (California models only). See Figure MT-8.
14. Remove rear engine mounting insulator securing bolts ② and rear mounting member securing bolts ③.



ER277

Fig. MT-8 Removing engine mounting rear support

15. Remove starter motor.
16. 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 vehicle.

CAUTION:
Take care in dismounting transmission not to strike any adjacent parts and main drive gear.

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 ⅝ US pt, 3 Imp pt)].

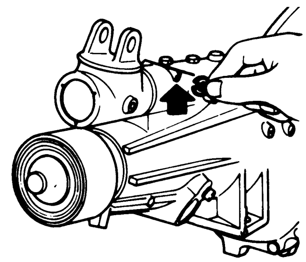
DISASSEMBLY

HOUSING

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.

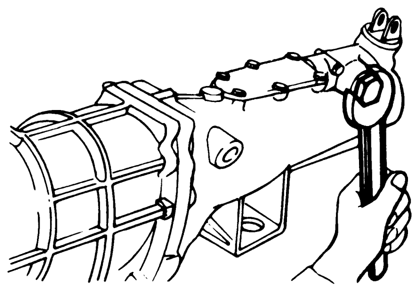
4. Remove reverse lamp switch.
5. Move gear to Neutral.
6. Remove speedometer pinion.
7. Remove E-ring and stopper guide pin from rear end of rear extension.



TM337

Fig. MT-9 Removing striking rod E-ring and stopper pin

8. Remove return spring plug, return spring, reverse check spring, and plunger from rear extension.

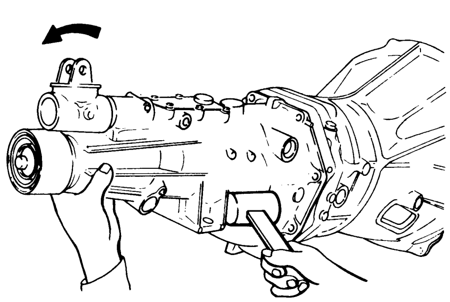


TM338

Fig. MT-10 Removing return spring plug

9. Remove rear extension securing bolts and turn the striking rod toward left.

Drive out rear extension backward by lightly tapping around it with a soft hammer.



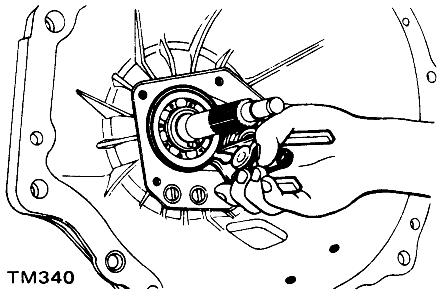
TM339

Fig. MT-11 Removing rear extension

10. Remove front cover securing bolts and remove front cover.

Detach countershaft front bearing shim.

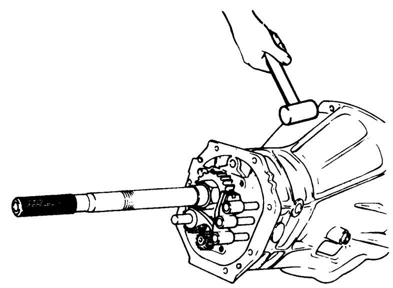
11. Remove main drive bearing snap ring with Expander.



TM340

Fig. MT-12 Removing main drive bearing snap ring

12. Separate transmission case from adapter plate with a soft hammer.

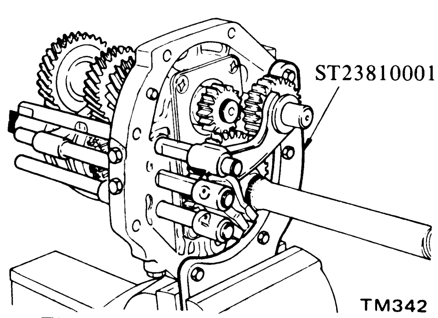


TM341

Fig. MT-13 Removing transmission case

13. Set up Setting Plate Adapter ST23810001 on adapter plate.

With countershaft side up, place the above assembly in a vise.



TM342

Fig. MT-14 Attaching gear assembly to special tool

FORK ROD

1. Drive out retaining pins from each fork rod with Fork Rod Pin Punch KV31100300.

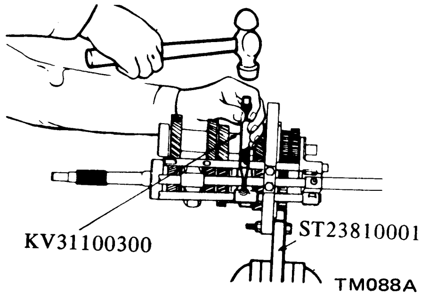


Fig. MT-15 Drive out retaining pins

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 three(3) check balls and four(4) interlock balls.

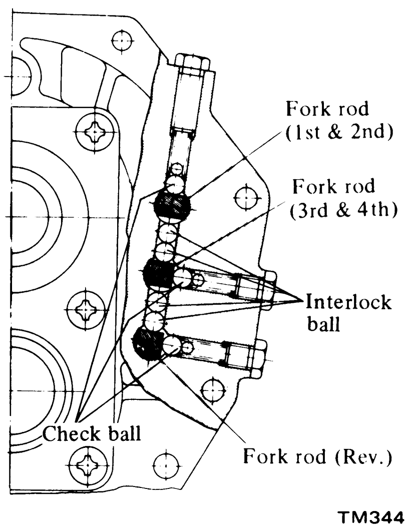


Fig. MT-16 Layout of check ball and interlock ball

GEAR

Gear assembly

1. With gears doubly engaged, draw out counter gear front bearing using a suitable gear puller.

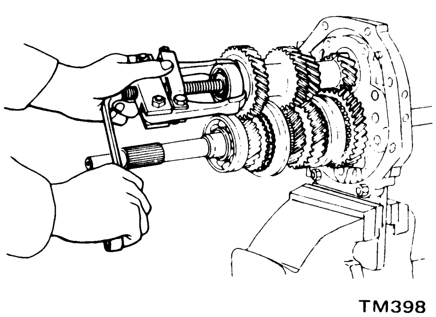


Fig. MT-17 Removing countershaft front bearing

2. Remove counter drive gear snap ring.
3. Draw out counter drive gear with main drive gear by means of a gear puller.

When drawing out main drive gear assembly, be careufl not to drop pilot needle bearing onto floor from the front end of mainshaft.

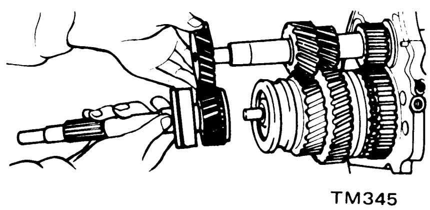


Fig. MT-18 Removing counter drive gear and main drive gear

4. Remove snap ring and then thrust washer from mainshaft front end.

Draw out 3rd & 4th synchronizer assembly and remove 3rd gear.

5. Release staking on mainshaft nut and loosen it.

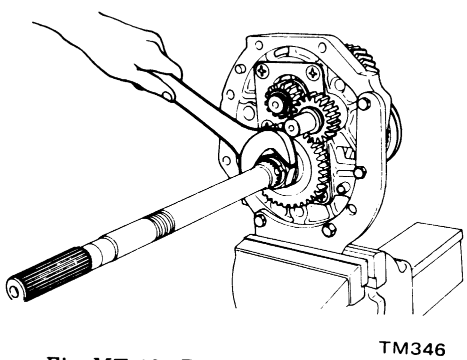


Fig. MT-19 Removing mainshaft nut

6. Remove mainshaft nut, thrust washer and reverse main gear.

Note:

Mainshaft nut should be discarded and should not be reused.

7. Remove snap ring from countershaft rear end, and remove reverse counter gear.
8. Draw out mainshaft assembly together with counter gear by lightly tapping the rear end with a soft hammer while holding the front of mainshaft assembly by hand.

Be careful not to drop off counter gear.

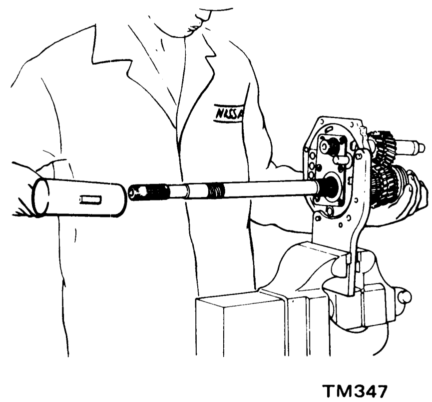


Fig. MT-20 Driving out gear assembly

Mainshaft

1. Remove thrust washer, steel ball, 1st gear and needle bearing. Be careful not to lose steel ball retaining thrust washer.
2. Press out 1st gear mainshaft bushing together with 2nd gear and 1st & 2nd synchronizer using Bearing Puller ST30031000.

Note:

When pressing out bushing, hold mainshaft by hand so as not to drop it.

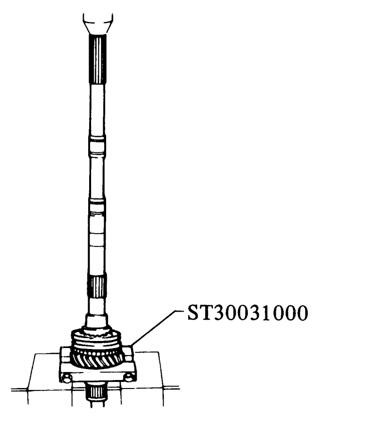
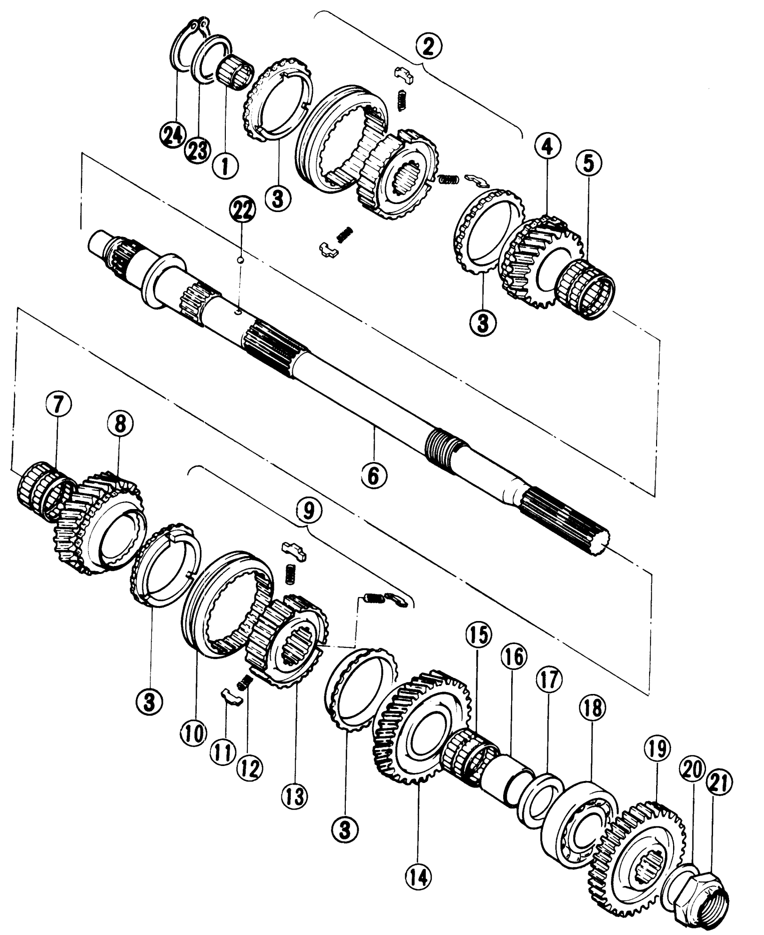


Fig. MT-21 Removing 1st gear bushing



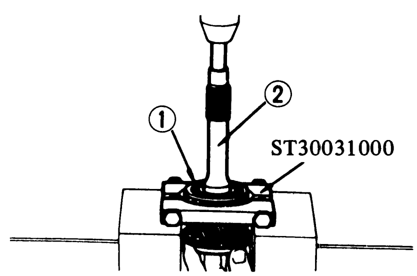
1 Pilot bearing
2 3rd & 4th synchronizer assembly
3 Baulk ring
4 3rd main gear
5 Needle bearing
6 Mainshaft
7 Needle bearing
8 2nd main gear
9 1st & 2nd synchronizer assembly
10 Coupling sleeve
11 Shifting insert
12 Shifting insert spring
13 Synchronizer hub
14 1st main gear
15 Needle bearing
16 1st gear bushing
17 Thrust washer
18 Mainshaft bearing
19 Reverse main gear
20 Thrust washer
21 Mainshaft nut
22 Steel ball
23 Thrust washer
24 Snap ring

TM127A

Fig. MT-22 Mainshaft assembly

Main drive gear

1. Remove main drive gear snap ring and spacer.
2. Remove main drive bearing with Bearing Puller ST30031000 and a suitable press.



1 Main drive bearing
2 Main drive gear

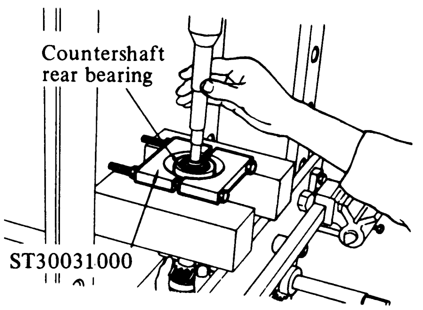
TM349

Fig. MT-23 Removing main drive bearing

Counter gear

Press out counter gear rear bearing using Bearing Puller ST30031000.

Note:
When pressing out bearing, hold shaft by hand so as not to drop shaft onto floor.



TM351

Fig. MT-24 Removing countershaft bearing

REAR EXTENSION

Remove lock pin from striking lever, and remove striking rod.

Note:
Do not disassemble rear extension bushing from rear extension.

ADAPTER PLATE

1. Remove six(6) bearing retainer attaching screws with an impact wrench and remove bearing retainer from adapter plate.
2. Remove reverse idler shaft.
3. Remove mainshaft bearing from the rear extension side.

INSPECTION

Wash all parts in a suitable cleaning solvent and check for wear, damage or other faulty conditions.

CAUTION:

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 with solvent thoroughly and check for cracks which might cause oil leak or other faulty conditions.
2. Check mating surface of the case to engine or adapter plate for small nicks, projection or sealant.

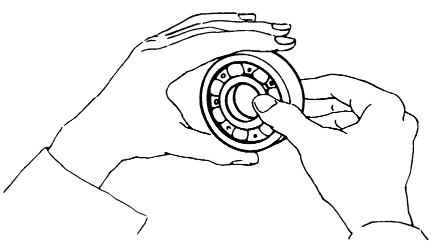
Remove all nicks, projection or sealant with a fine stone.

3. If rear extension bushing is worn or cracked, replace it as an assembly of bushing and rear extension housing.

BEARING

1. Thoroughly clean bearing and dry with a compressed air.

CAUTION:
Do not allow the bearings to spin. Because it will damage the race and balls. Turn them slowly by hand.



TM372

Fig. MT-25 Inspecting ball bearing

2. When race and ball surfaces are worn or rough, or when balls are out-of-round or rough, replace bearing with a new one.
3. Replace needle bearing if worn or damaged.

GEAR

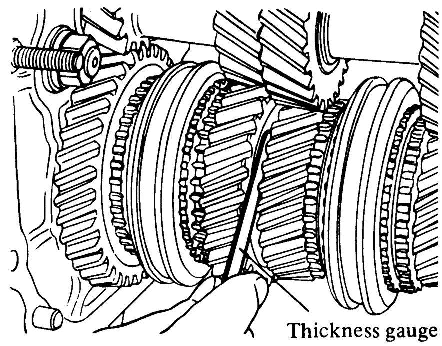
1. Check all gears for excessive wear, chips or cracks; replace as required.
2. Check shaft for bending, crack, wear, and worn spline; if necessary, replace.
3. Measure gear end play:

1st gear:
0.32 to 0.39 mm
(0.0126 to 0.0154 in)

2nd gear:
0.12 to 0.19 mm
(0.0047 to 0.0075 in)

3rd gear:
0.13 to 0.37 mm
(0.0051 to 0.0146 in)

Reverse counter gear:
0.01 to 0.20 mm
(0.0004 to 0.0079 in)



TM374

Fig. MT-26 Measuring end play

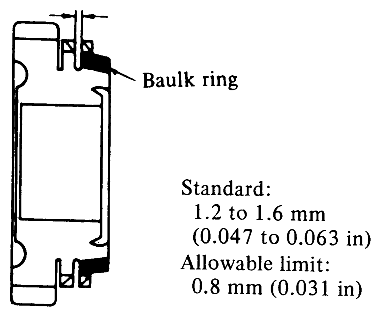
4. Check for stripped or damaged speedometer pinion gear. If necessary, replace.

BAULK RING

1. Replace baulk ring if found to be deformed, cracked or otherwise damaged excessively.
2. Place baulk ring in position on gear cone.

While holding baulk ring against gear as far as it will go, measure gap between baulk ring and outer gear.

If gap is smaller than allowable limit, discard baulk ring.



TM375

Fig. MT-27 Baulk ring-to-cone gap

OIL SEAL

Discard O-ring or oil seal which is once removed. Replace oil seal if sealing lip is deformed or cracked. Also discard oil seal if spring is out of position.

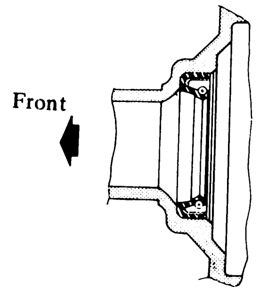
ASSEMBLY

To assemble, reverse the order of disassembly. Observe the following instructions.

FRONT COVER

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.



TM354

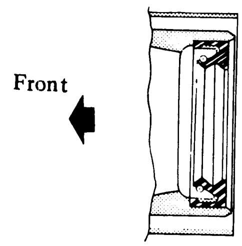
Fig. MT-28 Front cover oil seal

2. Apply sealant to withdrawal lever ball pin screw. Install withdrawal lever ball pin to front cover and tighten screw to 1.6 to 2.1 kg-m (12 to 15 ft-lb) torque.

REAR EXTENSION

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.



TM355

Fig. MT-29 Rear extension oil seal

2. Apply 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 (6.5 to 8.7 ft-lb).

ADAPTER PLATE

1. Place dowel pin, mainshaft bearing and oil gutter on adapter plate, and tap with a soft hammer until they are properly positioned in place.

Use a new dowel pin.

Bend oil gutter on front side and expand on rear side.

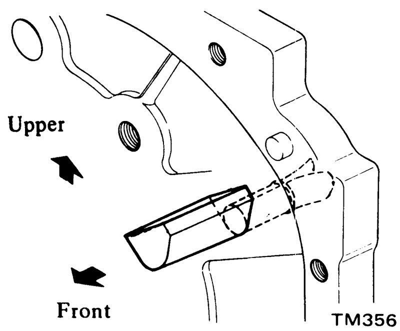


Fig. MT-30 Oil gutter

2. Insert reverse idler shaft in adapter plate.

Make sure that the cut-out portion of reverse idler shaft is lined up with inner face of adapter plate.

3. Install bearing retainer in adapter plate.

Align bearing retainer with reverse idler shaft at the cut-out portion of this shaft, torque screws to 1.9 to 2.5 kg-m (14 to 18 ft-lb) and stake each screw at two points with a punch.

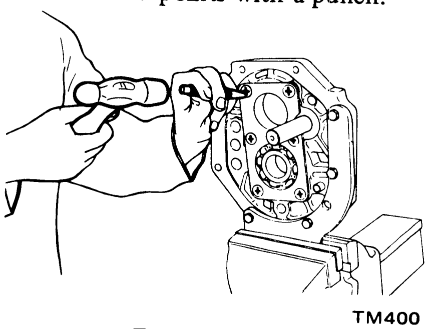


Fig. MT-31 Staking screw

4. Install countershaft rear bearing in adapter plate by lightly tapping around it with a soft hammer.

GEAR

Clean all parts in solvent and dry with compressed air. Be sure to coat all sliding surfaces with gear oil for initial lubrication.

Synchronizer

Assemble synchronizer assembly.

Position shifting insert springs and shifting inserts in three(3) slots in synchronizer hub; put coupling sleeve on synchronizer hub.

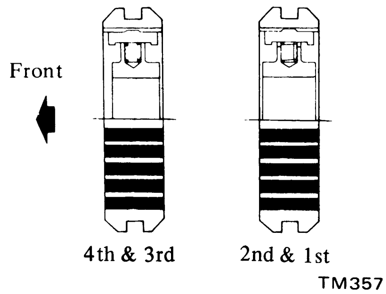


Fig. MT-32 Installing synchronizer hub

Main drive gear

1. Using Transmission Adapter ST23800000, press main drive bearing onto the shaft of main drive gear. Make sure that snap ring groove on shaft clears bearing.

2. Place main drive bearing spacer on main drive bearing and secure main drive bearing with thicker snap ring that will eliminate end play.

Available snap ring

No.	Thickness mm (in)
1	1.73 (0.0681)
2	1.80 (0.0709)
3	1.87 (0.0736)
4	1.94 (0.0764)
5	2.01 (0.0791)
6	2.08 (0.0819)

Gear assembly

1. Assemble 2nd gear needle bearing, 2nd gear, baulk ring, 1st & 2nd speed synchronizer assembly, 1st gear baulk ring, 1st gear bush, needle bearing, 1st gear, steel ball, and thrust washer on mainshaft. Before installing a steel ball, apply grease to it.

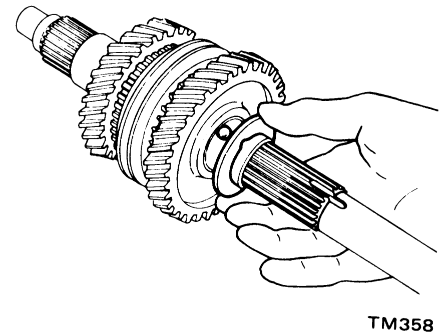


Fig. MT-33 Installing thrust washer

2. Set Transmission Press Stand KV31100400 and place adapter plate assembly on it.

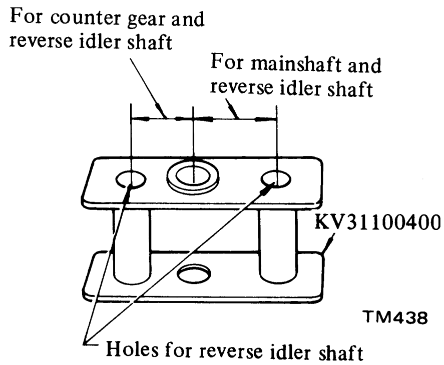


Fig. MT-34 Transmission Press Stand

3. Install mainshaft assembly to adapter plate assembly. Be sure to place bearing squarely against shaft and press it into place on shaft gradually.

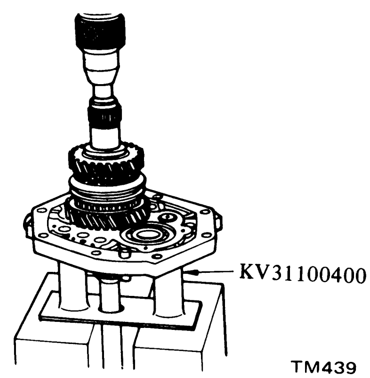


Fig. MT-35 Installing mainshaft assembly

4. Place new woodruff keys in grooves in counter gear and tap them lightly until they are seated securely.

Use a soft hammer to avoid damaging keys.
5. Place adapter plate assembly and mainshaft assembly so that counter gear rear bearing rests on Transmission Press Stand KV31100400 properly.
6. Install counter gear into adapter plate by pressing it.

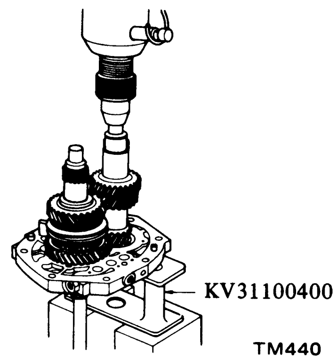


Fig. MT-36 Installing counter gear

7. Position needle bearing, 3rd main gear, baulk ring and 3rd & 4th synchronizer assembly on the front of mainshaft.
8. Install thrust washer on mainshaft and secure it with snap ring of proper thickness that will minimize clearance of groove in mainshaft.

Available snap ring

No.	Thickness mm (in)
1	1.4 (0.055)
2	1.5 (0.059)
3	1.6 (0.063)

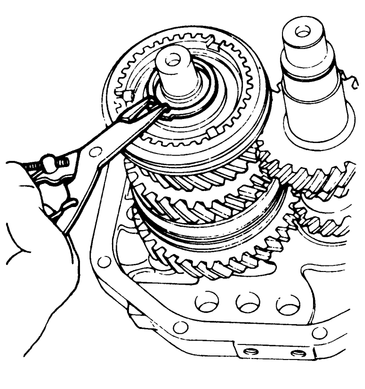


Fig. MT-37 Installing snap ring

9. 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.
10. Press counter drive gear onto counter gear with Counter Gear Drift ST23860000 by meshing gears and secure counter drive gear with thicker snap ring.

Note:
Be sure to drive in counter drive gear and main drive gear simultaneously.

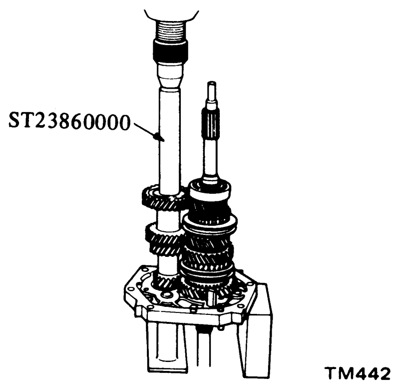


Fig. MT-38 Installing counter drive gear

Available counter drive gear snap ring

No.	Thickness mm (in)
1	1.4 (0.055)
2	1.5 (0.059)
3	1.6 (0.063)

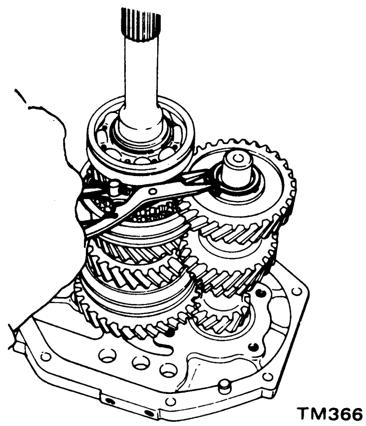


Fig. MT-39 Installing snap ring

11. Press counter gear front bearing onto counter gear with Bearing Drift ST22360002.

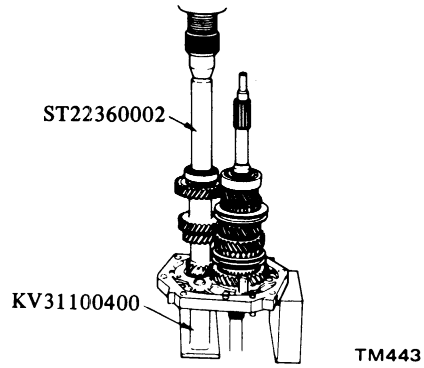


Fig. MT-40 Installing counter gear front bearing

12. Support adapter plate in a vise with Setting Plate Adapter ST23810001, with mainshaft facing down.
13. Install reverse main gear, plain washer on the rear of mainshaft and install mainshaft nut.

Tighten mainshaft nut temporarily.
14. Install counter reverse gear on the rear of counter gear and secure with snap ring.

Use snap ring to give a minimum gear end play.

No.	Thickness mm (in)
1	1.4 (0.055)
2	1.5 (0.059)
3	1.6 (0.063)

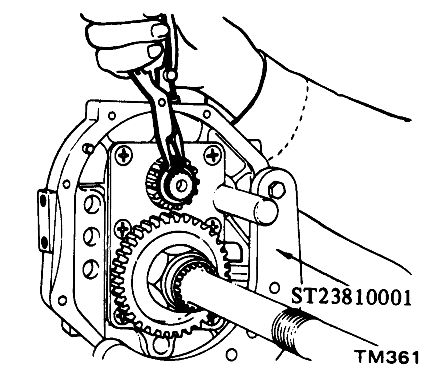


Fig. MT-41 Installing counter reverse gear snap ring

15. Install reverse idler gear on reverse idler shaft.
16. With gears doubly engaged, tighten mainshaft nut to the converted torque "C" (See Fig. MT-44.) using Wrench ST22520000.

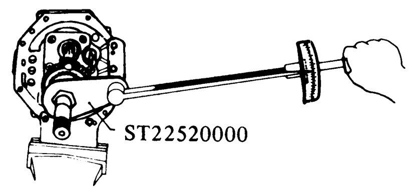


Fig. MT-42 Tightening mainshaft nut

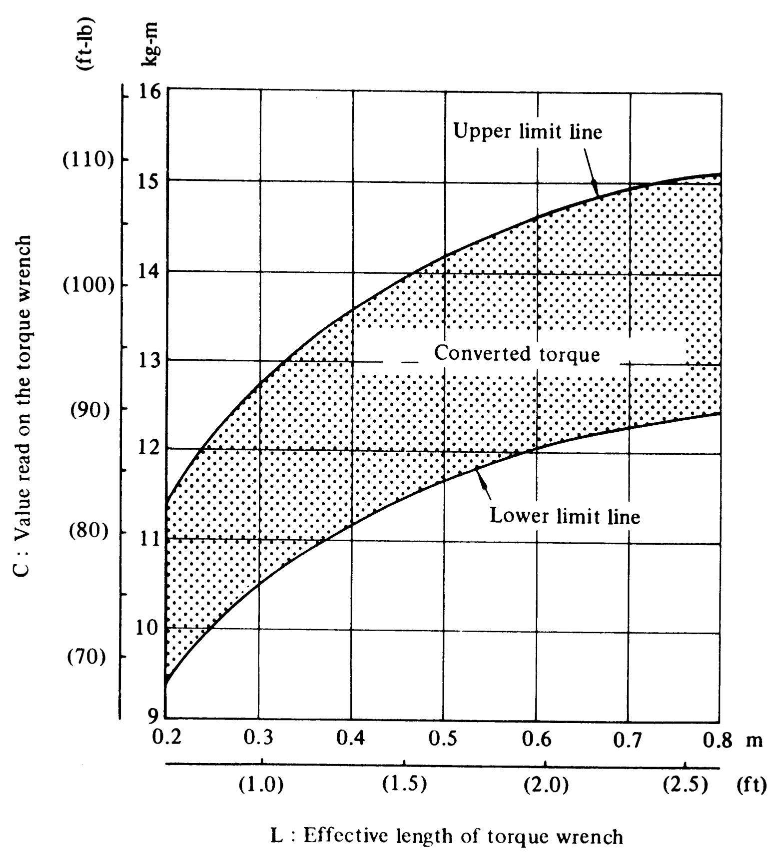


Fig. MT-44 Converted torque

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:

$$C \text{ kg-m} = 14 \times \left(\frac{L}{L + 0.10}\right) \text{ to } 17 \times \left(\frac{L}{L + 0.10}\right)$$

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)

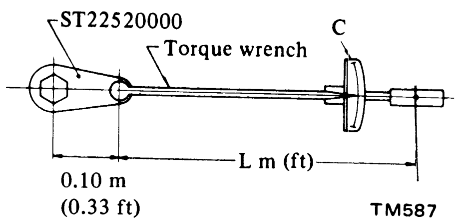


Fig. MT-43 Setting wrench

Example,

When a 0.40 m (1.31 ft)-long torque wrench is used, the "C" in Fig. MT-44 will be 11.2 to 13.6 kg-m (81 to 98 ft-lb).

17. Tighten mainshaft nut to 14.0 to 17.0 kg-m (101 to 123 ft-lb) torque, and stake mainshaft nut to groove of mainshaft with a punch.

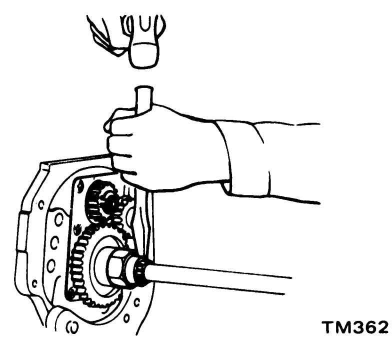


Fig. MT-45 Staking mainshaft nut

18. Measure gear end play and backlash.

Make sure that they are held within the specified values.

For details, refer to the instructions under topic "Inspection".

Note:
The main drive gear and counter drive gear should be handled as a matched set.
When you replace a main drive gear or counter drive gear, be sure to replace as a set of main drive gear and counter drive gear.

Shift forks and fork rods

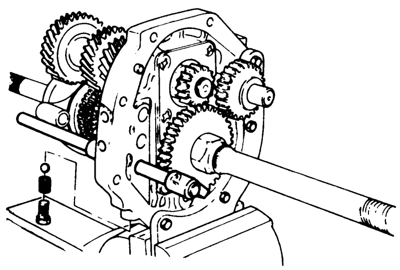
1. Place 1st & 2nd shift fork in groove in 1st & 2nd coupling sleeve, and slide 1st & 2nd fork rod through adapter plate and 1st & 2nd shift fork. Prior to installing 1st & 2nd fork rod, install 3rd & 4th shift fork in groove in 3rd & 4th coupling sleeve.

Note:
Shift forks for 1st & 2nd and 3rd & 4th are one and the same parts.
Make sure that the long end of shift fork for 1st & 2nd is placed on the counter gear side and the long end for 3rd & 4th is on the opposite side.

Secure 1st & 2nd fork rod to shift fork with a new retaining pin.

2. Install check ball, check ball spring, and check ball plug. Prior to tightening check ball plug, apply sealant to check ball plug.

Align notch in 1st & 2nd fork rod with check ball.



TM367

Fig. MT-46 Installing 1st & 2nd fork rod

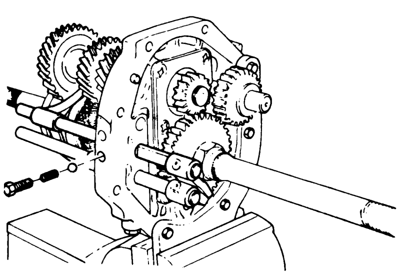
3. Slide 3rd & 4th fork rod through adapter plate and 3rd & 4th shift fork, and secure with a new retaining pin.

Note:
Prior to assembling 3rd & 4th fork rod, install two(2) interlock balls into adapter plate as shown in Fig. MT-16.

4. Install check ball and check ball spring.

Apply sealant to check ball plug and install it in place.

Align notch in 3rd & 4th fork rod with check ball by sliding 3rd & 4th fork rod as necessary.



TM368

Fig. MT-47 Installing 3rd & 4th fork rod

5. Place reverse shift fork in reverse idler gear.

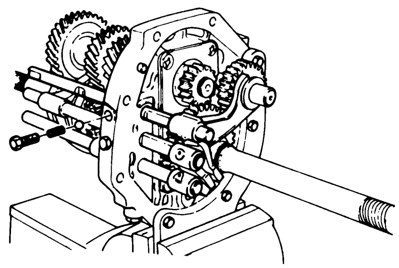
Slide reverse fork rod through reverse shift fork and adapter plate, and secure with a new retaining pin.

Note:
Prior to assembling reverse fork rod, install two(2) interlock balls into adapter plate as shown in Fig. MT-16.

6. Install check ball and check ball spring.

Apply sealant to check ball plug and install it in place.

Align notch in reverse fork rod with check ball.



TM369

Fig. MT-48 Installing reverse fork rod

7. Torque each check ball plug to 1.9 to 2.5 kg-m (14 to 18 ft-lb).

Note:
Ball plug for 1st & 2nd fork rod is longer than those for reverse shift fork rod and 3rd & 4th fork rod.

8. Apply gear oil to all sliding surfaces and check to see that shift rods operate correctly and gears are engaged smoothly.

HOUSING

Transmission case

1. Clean mating surfaces of adapter plate and transmission case.

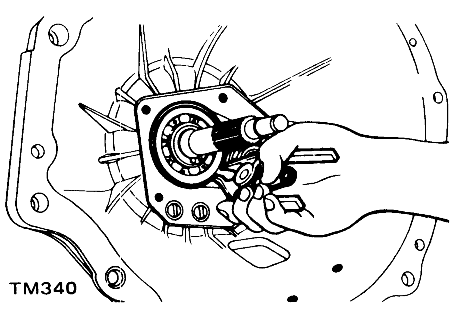
Apply sealant to mating surfaces of adapter plate and transmission case.

2. Slide transmission case onto adapter plate by lightly tapping with a soft hammer until case bears against adapter plate.

Carefully install main drive bearing and countershaft front bearing.

Make certain that mainshaft rotates freely.

3. Fit main drive bearing snap ring to groove in main drive bearing by using Expander.



TM340

Fig. MT-49 Fitting main drive bearing snap ring

Rear extension

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 neutral positions, gradually slide rear extension onto adapter plate, making sure that striking lever engages with fork rod brackets correctly.

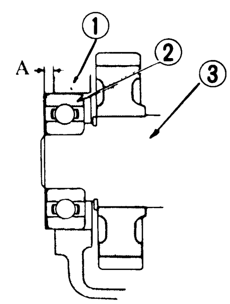
3. Install washers and through-bolts and torque to 1.6 to 2.1 kg-m (12 to 15 ft-lb).

Front cover assembly

1. Select countershaft front bearing shim as follows:

(1) Measure height "A" from front end of transmission case to countershaft front bearing.

(2) Select a shim of thickness "A" measured.



1 Transmission case
2 Counter gear front bearing
3 Counter gear

TM371

Fig. MT-50 Selecting counter gear front bearing shim

Available shim

No.	"A" mm (in)		Counter gear front bearing shim mm (in)
1	2.92 to 3.01	(0.1150 to 0.1185)	0.6 (0.024)
2	3.02 to 3.11	(0.1189 to 0.1224)	0.5 (0.020)
3	3.12 to 3.21	(0.1228 to 0.1264)	0.4 (0.016)
4	3.22 to 3.31	(0.1268 to 0.1303)	0.3 (0.012)
5	3.32 to 3.41	(0.1307 to 0.1343)	0.2 (0.008)
6	3.42 to 3.51	(0.1346 to 0.1382)	0.1 (0.004)
7	3.52 to 3.61	(0.1386 to 0.1421)	–
8	3.62 to 3.71	(0.1425 to 0.1461)	–

2. Clean mating surfaces of front cover and transmission case.

Apply grease to shim selected to retain it on front cover; install front cover to transmission case with gasket in place.

Install through-bolts with washers under them and tighten to 1.6 to 2.1 kg-m (12 to 15 ft-lb) torque.

Apply sealant to threads of through-bolts before installation.

3. Install speedometer pinion.
4. Install back-up lamp switch and torque to 2.0 to 3.0 kg-m (14 to 22 ft-lb).

Be sure to apply sealant before installation.

5. 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.

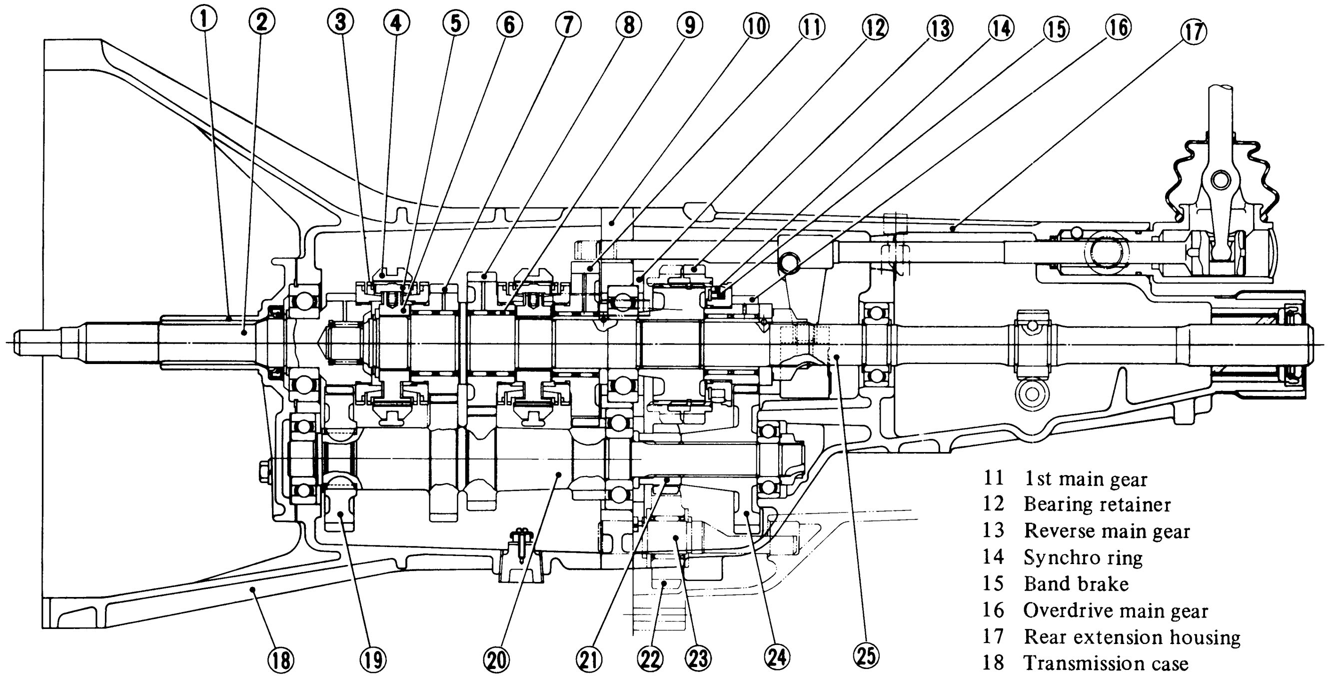
6. Install control lever temporarily, and shift control lever through all gears to make sure that gears operate smoothly.

Note:
Install drain plug and filler plug with sealant in place.

5-SPEED TRANSMISSION (TYPE : FS5W71B)

CONTENTS

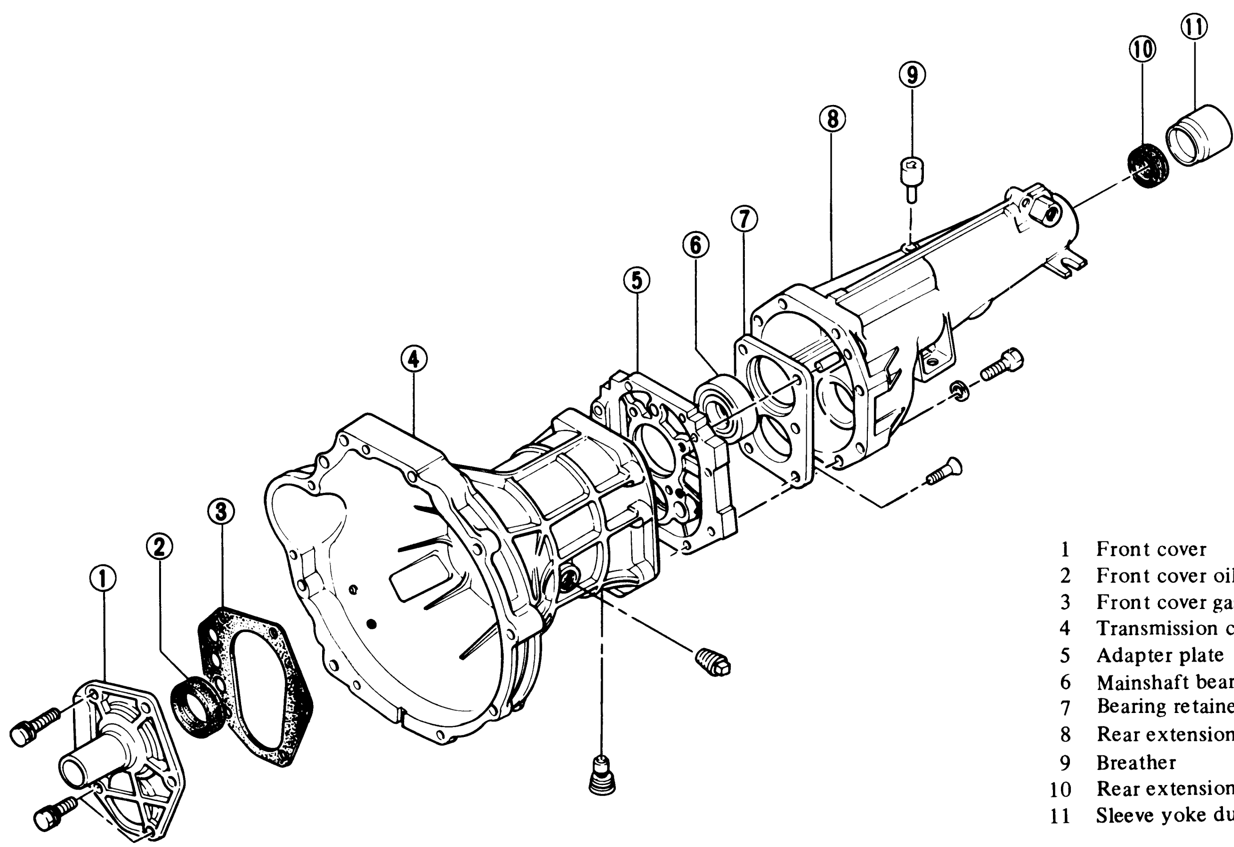
REMOVAL AND INSTALLATION MT-16
DISASSEMBLY MT-16
HOUSING MT-16
FORK ROD MT-16
GEAR MT-16
REAR EXTENSION MT-17
ADAPTER PLATE MT-17
INSPECTION MT-17
ASSEMBLY MT-17
FRONT COVER MT-17
REAR EXTENSION MT-17
ADAPTER PLATE MT-17
GEAR MT-17
HOSUING MT-18



1 Front cover
2 Main drive gear
3 Baulk ring
4 Coupling sleeve
5 Shifting insert
6 Synchronizer hub, 3rd & 4th
7 3rd main gear
8 2nd main gear
9 Needle bearing
10 Adapter plate
11 1st main gear
12 Bearing retainer
13 Reverse main gear
14 Synchro ring
15 Band brake
16 Overdrive main gear
17 Rear extension housing
18 Transmission case
19 Counter drive gear
20 Counter gear
21 Reverse counter gear
22 Reverse idler gear
23 Reverse idler shaft
24 Overdrive counter gear
25 Mainshaft

TM128A

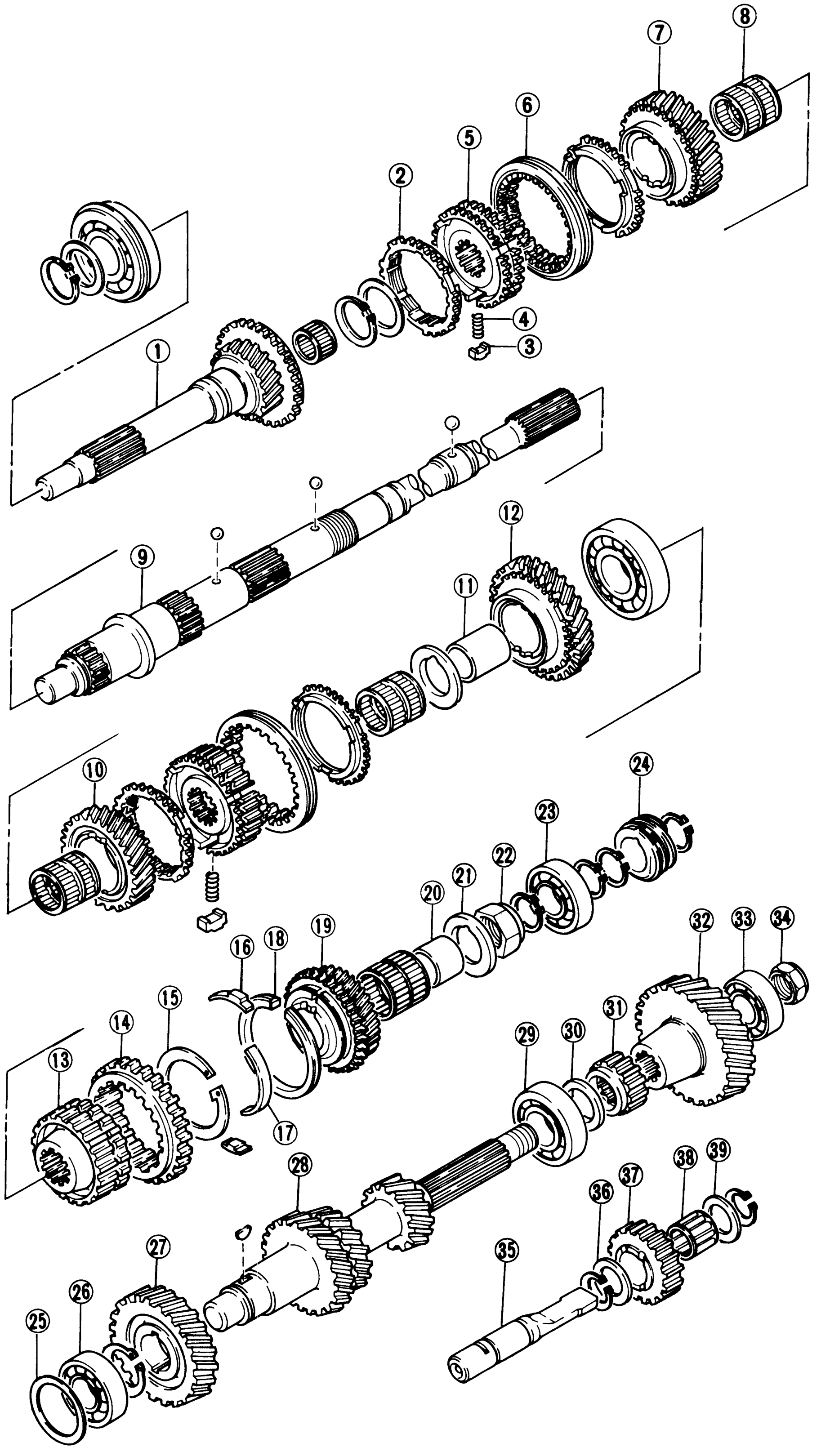
Fig. MT-51 FS5W71B transmission



1 Front cover
2 Front cover oil seal
3 Front cover gasket
4 Transmission case
5 Adapter plate
6 Mainshaft bearing
7 Bearing retainer
8 Rear extension
9 Breather
10 Rear extension oil seal
11 Sleeve yoke dust cover

TM046A

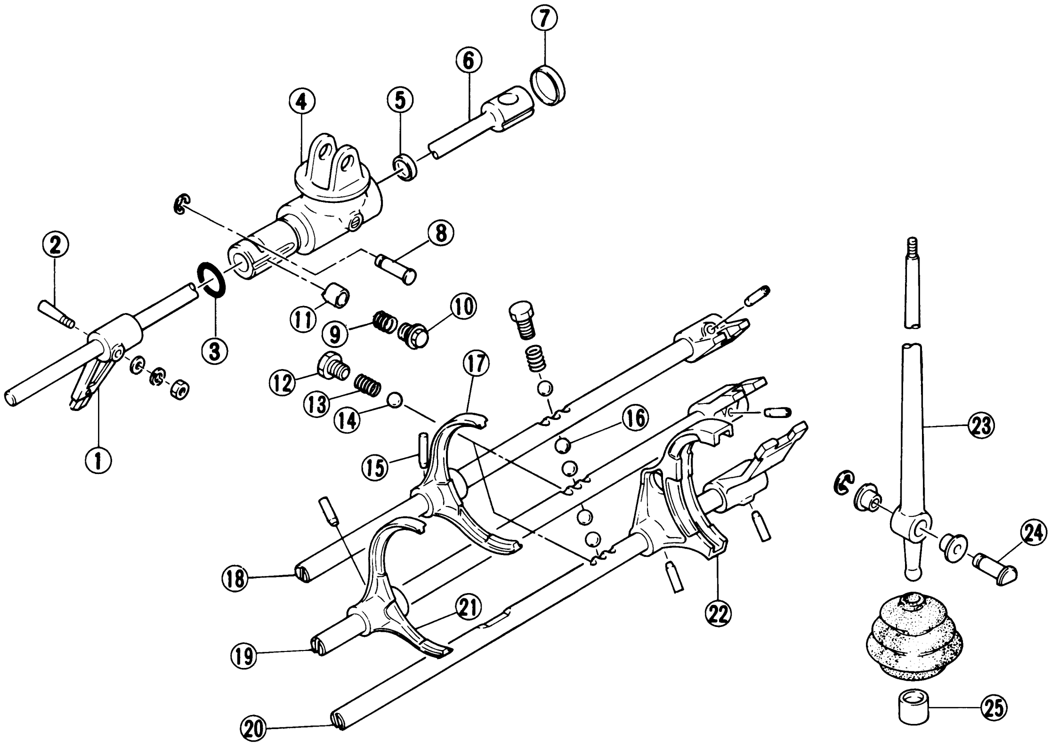
Fig. MT-52 FS5W71B transmission case components



1 Main drive gear
2 Baulk ring
3 Shifting insert
4 Shifting insert spring
5 Synchronizer hub
6 Coupling sleeve
7 3rd main gear
8 Needle bearing
9 Mainshaft
10 2nd main gear
11 Bushing
12 1st main gear
13 OD-reverse synchronizer hub
14 Reverse main gear
15 Circlip
16 Thrust block
17 Brake band
18 Synchronizer ring
19 Overdrive main gear
20 Overdrive gear bushing
21 Washer
22 Mainshaft nut
23 Mainshaft rear bearing
24 Speedometer drive gear
25 Counter gear front bearing shim
26 Counter gear front bearing
27 Counter drive gear
28 Counter gear
29 Counter gear bearing
30 Reverse counter gear spacer
31 Reverse counter gear
32 Overdrive counter gear
33 Counter gear rear bearing
34 Counter gear nut
35 Reverse idler shaft
36 Reverse idler thrust washer
37 Reverse idler gear
38 Reverse idler gear bearing
39 Reverse idler thrust washer

TM047A

Fig. MT-53 FS5W71B transmission gear components



1 Striking lever
2 Lock pin
3 O-ring
4 Striking guide
5 Oil seal
6 Striking rod
7 Expansion plug
8 Stopper guide pin
9 Return spring
10 Return spring plug
11 Return spring plunger
12 Check ball plug
13 Check spring
14 Check ball
15 Retaining pin
16 Interlock ball
17 1st & 2nd shift fork
18 1st & 2nd fork rod
19 3rd & 4th fork rod
20 Reverse & OD fork rod
21 3rd & 4th shift fork
22 Reverse & OD shift fork
23 Control lever
24 Control lever pin
25 Control lever bushing

Fig. MT-54 FS5W71B transmission shift control components

REMOVAL AND INSTALLATION

Same as for the F4W71B.

DISASSEMBLY

Disassembly and assembly procedures are almost the same as those for the F4W71B. Unless otherwise noted, refer to the F4W71B.

HOUSING

Same as for the F4W71B.

FORK ROD

Same as for the F4W71B.

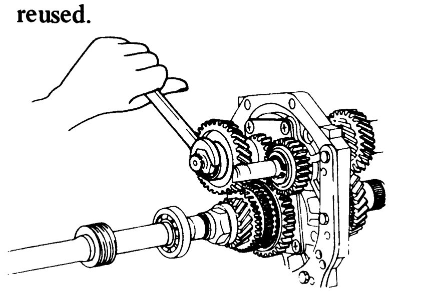
GEAR

Gear assembly

1. Remove counter gear front bearing.
2. Remove counter drive gear snap ring.
3. Draw out counter drive gear and main drive gear.
4. With gears doubly engaged, release staking on counter gear nut and mainshaft nut then loosen them.

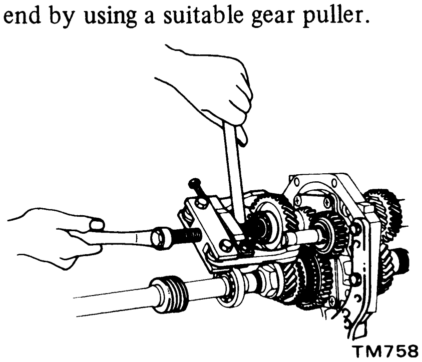
Remove counter gear nut.

Note:
Counter gear nut and mainshaft nut should be discarded and should not be reused.



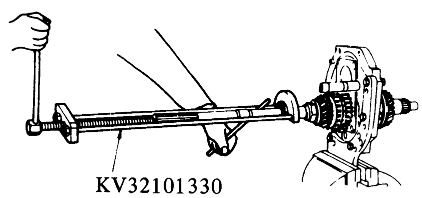
TM757
Fig. MT-55 Removing counter gear nut

5. Draw out counter overdrive gear and bearing from countershaft rear end by using a suitable gear puller.



TM758
Fig. MT-56 Removing counter overdrive gear and bearing

6. Remove reverse counter gear and spacer.
7. Remove snap ring from reverse idler shaft, and remove reverse idler gear.
8. Remove snap rings and then draw out speedometer gear and bearing from mainshaft rear side. When drawing out mainshaft rear bearing, use Mainshaft Rear Bearing Puller KV32101330.



TM760
Fig. MT-57 Removing mainshaft rear bearing

9. Remove mainshaft nut, thrust washer, reverse main gear, OD synchronizer and overdrive gear.
10. Draw out mainshaft gear assembly together with countershaft by lightly tapping the rear end with a soft hammer while holding the front of mainshaft gear assembly by hand.

Be careful not to drop off counter gear.

Mainshaft

Same as for the F4W71B.

Main drive gear

Same as for the F4W71B.

Counter gear

Same as for the F4W71B.

REAR EXTENSION

Same as for the F4W71B.

ADAPTER PLATE

Same as for the F4W71B.

INSPECTION

Same as for the F4W71B.

ASSEMBLY

FRONT COVER

Same as for the F4W71B.

REAR EXTENSION

Same as for the F4W71B.

ADAPTER PLATE

Same as for the F4W71B.

GEAR

1st & 2nd and 3rd & 4th gear synchronizer

Same as for the F4W71B.

OD gear synchronizer

Position synchronizer ring, band brake, thrust block and anchor block on overdrive clutch gear; install circlip.

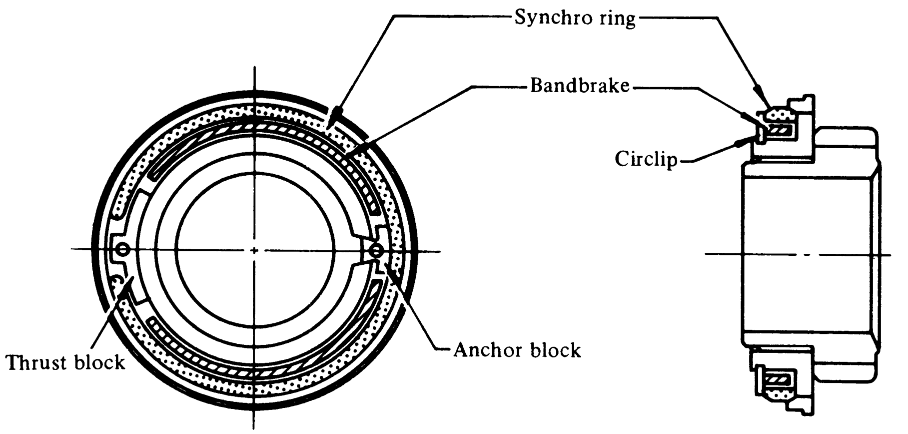


Fig. MT-58 Installing overdrive gear assembly

Main drive gear

Same as for the F4W71B.

Gear assembly

Assembly procedure for the front side is the same as that for the F4W71B. So only rear side is described here.

1. After front side is assembled, assemble snap ring, spacer, needle bearing, reverse idler gear, spacer and snap ring.

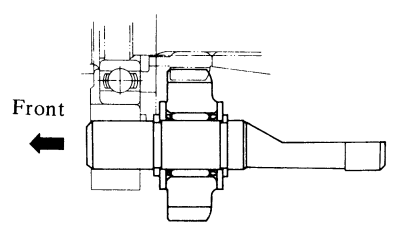


Fig. MT-59 Reverse idler gear

2. Assemble OD-reverse synchronizer hub, reverse gear, OD gear bushing, needle bearing, OD gear assembly, steel ball and thrust washer on mainshaft rear side. Before installing a steel ball, apply grease to it.
3. Assemble new mainshaft nut, and tighten it temporarily.
4. Assemble spacer, reverse counter gear, overdrive counter gear, bearing and new counter gear lock nut.

Tightening torque:
Counter gear lock nut:
10.0 to 13.0 kg-m
(72 to 94 ft-lb)

5. With gears doubly engaged, tighten mainshaft lock nut.

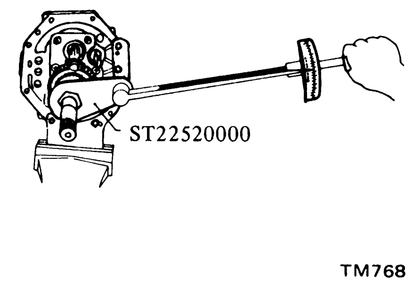


Fig. MT-60 Tightening mainshaft nut

6. Stake mainshaft and counter gear nuts to groove of mainshaft and counter gear with a punch.

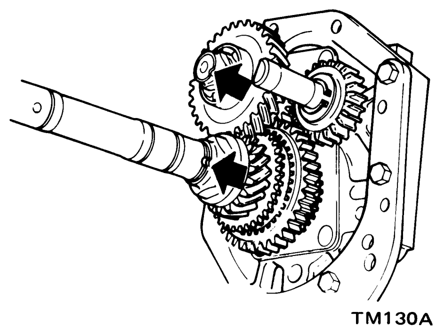
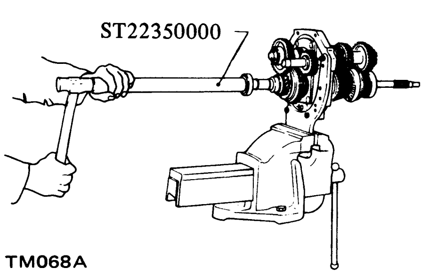


Fig. MT-61 Staking mainshaft nuts

7. Assemble mainshaft rear 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)



TM068A

Fig. MT-62 Assembling mainshaft rear bearing

8. Fit snap ring to front of speedometer drive gear.
9. Assemble steel ball, speedometer drive gear and rear snap ring.

Shift forks and fork rods

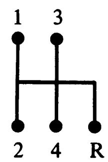
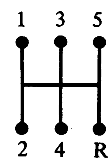
Same as for the F4W71B.

HOUSING

Same as for the F4W71B.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Transmission type		F4W71B	FS5W71B
Shift pattern			
Synchromesh type		Warner	1st to 4th Warner, 5th Servo
Gear ratio			
1st		3.592	3.321
2nd		2.246	2.077
3rd		1.415	1.308
4th		1.000	1.000
5th		–	0.864
Reverse		3.657	3.382
Number of teeth			
Main drive gear		21	22
Main gear	1st	33	33
	2nd	28	28
	3rd	26	26
	5th	–	19
	Reverse	36	36
Counter drive gear		32	31
Counter gear	1st	14	14
	2nd	19	19
	3rd	28	28
	5th	–	31
	Reverse	15	15
Reverse idler gear		23	23
Oil capacity	liter (US pt, Imp pt)	1.7 (3⅝, 3)	2.0 (4 ¼, 3 ½)
Speedometer gear ratio		20/6	20/6
Final gear ratio		4.375	4.375
Tire size		6.00-14-6PRLT	6.00-14-6PRLT

INSPECTION AND REPAIR

<table>
<tr><th>Transmission type</th><th>F4W71B</th><th>FS5W71B</th></tr>
<tr><td>Gear backlash mm (in)</td><td colspan="2"></td></tr>
<tr><td>Main drive gear</td><td colspan="2">0.05 to 0.10 (0.0020 to 0.0039)</td></tr>
<tr><td>1st gear</td><td colspan="2">0.05 to 0.20 (0.0020 to 0.0079)</td></tr>
<tr><td>2nd gear</td><td colspan="2">0.05 to 0.20 (0.0020 to 0.0079)</td></tr>
<tr><td>3rd gear</td><td colspan="2">0.05 to 0.20 (0.0020 to 0.0079)</td></tr>
<tr><td>5th gear</td><td>–</td><td>0.05 to 0.20 (0.0020 to 0.0079)</td></tr>
<tr><td>Reverse idler gear</td><td colspan="2">0.05 to 0.20 (0.0020 to 0.0079)</td></tr>
<tr><td>Gear end play mm (in)</td><td colspan="2"></td></tr>
<tr><td>1st gear</td><td colspan="2">0.32 to 0.39 (0.013 to 0.015)</td></tr>
<tr><td>2nd gear</td><td colspan="2">0.12 to 0.19 (0.005 to 0.008)</td></tr>
<tr><td>3rd gear</td><td colspan="2">0.13 to 0.37 (0.005 to 0.015)</td></tr>
<tr><td>5th gear</td><td>–</td><td>0.12 to 0.19 (0.005 to 0.008)</td></tr>
<tr><td>Reverse counter gear</td><td>Less than 0.20 (0.008)</td><td>–</td></tr>
<tr><td>Reverse idler gear</td><td>–</td><td>0.05 to 0.50 (0.002 to 0.020)</td></tr>
<tr><td>Baulk ring to cone gap mm (in)</td><td colspan="2"></td></tr>
<tr><td>Standard</td><td colspan="2">1.20 to 1.60 (0.047 to 0.063))</td></tr>
<tr><td>Allowable limit</td><td colspan="2">0.8 (0.0315)</td></tr>
<tr><td>Main drive gear snap ring mm (in)</td><td colspan="2">1.73 (0.0681)
1.80 (0.0709)
1.87 (0.0736)
1.94 (0.0764)
2.01 (0.0791)
2.08 (0.0819)</td></tr>
<tr><td>Mainshaft front snap ring mm (in)</td><td colspan="2">1.4 (0.055)
1.5 (0.059)
1.6 (0.063)</td></tr>
<tr><td>Mainshaft rear bearing snap ring mm (in)</td><td>–</td><td>1.1 (0.043)
1.2 (0.047)
1.3 (0.051)
1.4 (0.055)</td></tr>
<tr><td>Counter drive gear snap ring mm (in)</td><td colspan="2">1.4 (0.055)
1.5 (0.059)
1.6 (0.063)</td></tr>
<tr><td>Counter reverse gear snap ring mm (in)</td><td>1.4 (0.055)
1.5 (0.059)
1.6 (0.063)</td><td>–</td></tr>
<tr><td>Counter gear front bearing shim mm (in)</td><td colspan="2">0.1 (0.004)
0.2 (0.008)
0.3 (0.012)
0.4 (0.016)
0.5 (0.020)
0.6 (0.024)</td></tr>
</table>

TIGHTENING TORQUE

Transmission installation

Clutch operating cylinder installation bolt	kg-m (ft-lb)	....	2.5 to 3.0 (18 to 22)
Bolt fixing transmission to engine	kg-m (ft-lb)	....	4.4 to 5.9 (32 to 43)
Bolt fixing engine rear plate to transmission	kg-m (ft-lb)	....	0.9 to 1.2 (6.5 to 8.7)
Bolt fixing crossmember to body	kg-m (ft-lb)	....	2.7 to 3.7 (20 to 27)
Bolt fixing rear mounting insulator to crossmember	kg-m (ft-lb)	....	2.7 to 3.7 (20 to 27)
Bolt fixing rear mounting insulator to rear extension	kg-m (ft-lb)	....	3.2 to 4.3 (23 to 31)

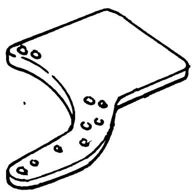
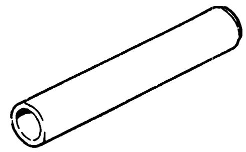
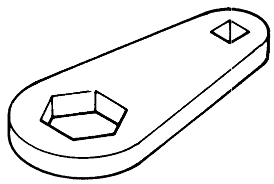
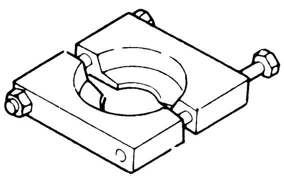
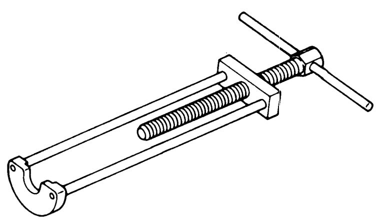
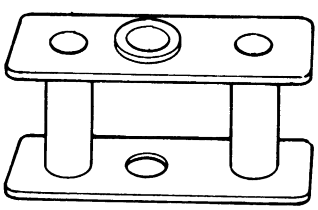
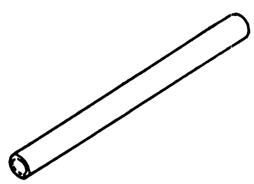
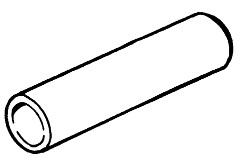
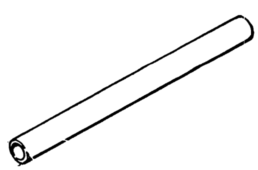
Gear assembly

Bolt fixing bearing retainer to adapter plate	kg-m (ft-lb)	....	1.9 to 2.5 (14 to 18)
Mainshaft lock nut	kg-m (ft-lb)	....	14.0 to 17.0 (101 to 123)
Counter gear lock nut (FS5W71B only)	kg-m (ft-lb)	....	10.0 to 13.0 (72 to 94)
Bolt fixing rear extension to transmission case	kg-m (ft-lb)	....	1.6 to 2.1 (12 to 15)
Bolt fixing front cover to transmission case	kg-m (ft-lb)	....	1.6 to 2.1 (12 to 15)
Filler plug	kg-m (ft-lb)	....	2.5 to 3.5 (18 to 25)
Drain plug	kg-m (ft-lb)	....	2.5 to 3.5 (18 to 25)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
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.	Worn gears, shaft, and/or bearing. Insufficient operating stroke due to worn or loose sliding part. Faulty or damaged synchronizer.	Replace. Repair or replace. Replace.
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.	Worn interlock ball. Worn check ball and/or weakened or broken spring. Worn fork rod ball groove. Worn or damaged bearing. Worn or damaged gear.	Replace. Replace. Replace. Replace. Replace.
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. (Transmission may rattle during engine idling. Check air-fuel mixture and ignition timing. After above procedure, readjust engine idling.)	Insufficient or improper lubricant. Oil leaking due to faulty 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.	Add oil or replace with designated oil. Clean or replace. Replace. Replace. Replace. Replace.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST23810001 Setting plate adapter 	J25693 Fig. MT-14 Fig. MT-15 Fig. MT-41	ST22360002 Bearing drift 	J25679 Fig. MT-40
KV31100300 Fork rod pin punch 	——— Fig. MT-15	ST22520000 Wrench 	——— Fig. MT-42 Fig. MT-43 Fig. MT-60
ST30031000 Bearing puller 	J25733 Fig. MT-21 Fig. MT-23 Fig. MT-24	KV32101330 Bearing puller 	——— Fig. MT-57
KV31100400 Transmission press stand 	——— Fig. MT-34 Fig. MT-35 Fig. MT-36 Fig. MT-40	ST22350000 Mainshaft bearing drift 	J25678 Fig. MT-62
ST23860000 Counter gear drift 	——— Fig. MT-38	ST23800000 Transmission adapter 	J25691 Page MT-9

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION AT

AUTOMATIC TRANSMISSION

DESCRIPTION .... AT- 2
HYDRAULIC CONTROL SYSTEM .... AT- 4
REMOVAL AND INSTALLATION AT-33
MAJOR REPAIR OPERATION AT-36
TROUBLE DIAGNOSES AND ADJUSTMENT AT-48
SERVICE DATA AND SPECIFICATIONS AT-59
SPECIAL SERVICE TOOLS AT-6

AT

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.

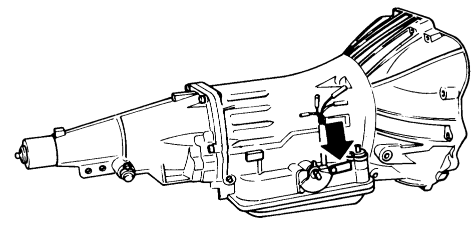
FLUID RECOMMENDATION

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.



AT344

Fig. AT-1 Identification number

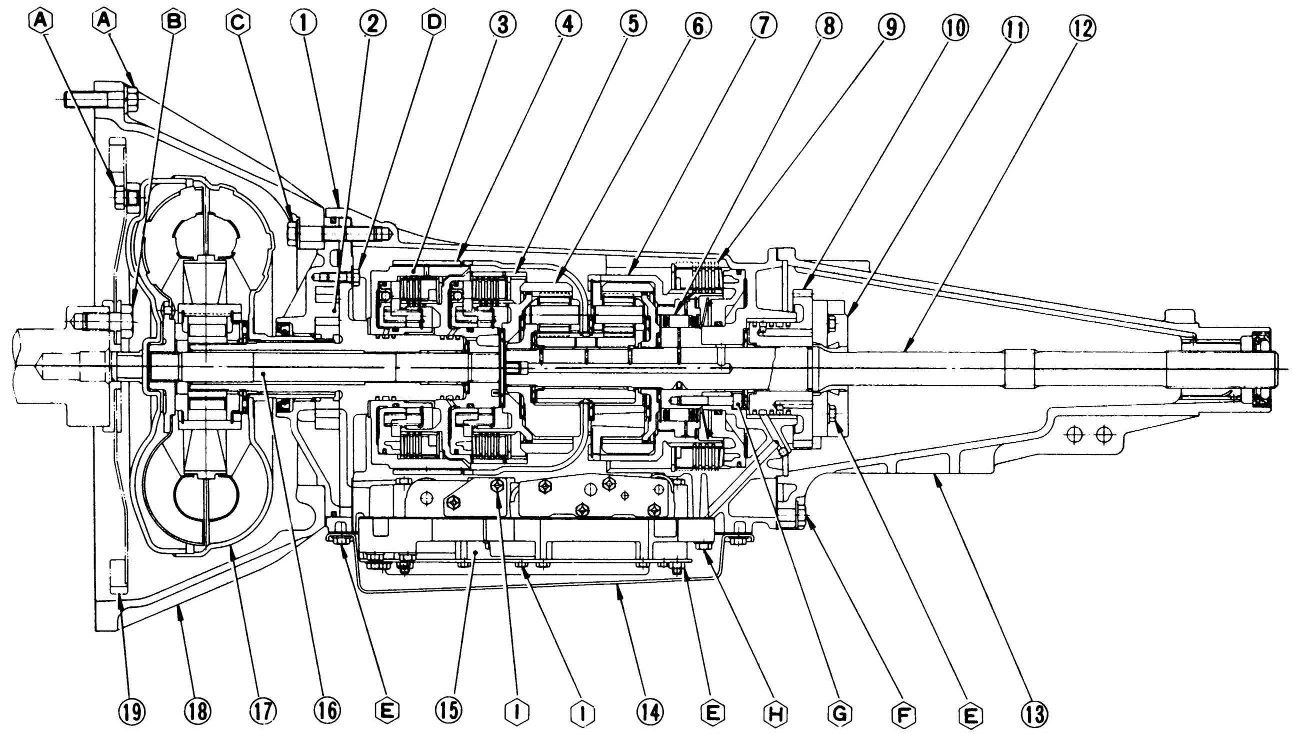
Identification of number arrangements:

JAPAN AUTOMATIC TRANSMISSION CO.,LTD
MODEL X2461
NO. 7606596

Number designation

7 9 1 2 3 4 5

- 1 2 3 4 5 — Serial production number for the month
- 9 — Month of production (X: Oct., Y: Nov., Z: Dec.)
- 7 — Last figure denoting the year (A.D.)



1 Transmission case
2 Oil pump
3 Front clutch
4 Band brake
5 Rear clutch
6 Front planetary gear
7 Rear planetary gear
8 One-way clutch
9 Low & Reverse brake
10 Oil distributor
11 Governor
12 Output shaft
13 Rear extension
14 Oil pan
15 Control valve
16 Input shaft
17 Torque converter
18 Converter housing
19 Drive plate

Tightening torque (T) of bolts and nuts kg-m (ft-lb)

Ⓐ T : 4 to 5 (29 to 36)
Ⓑ T : 14 to 16 (101 to 116)
Ⓒ 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 to 13)
Ⓗ T : 0.55 to 0.75 (4.0 to 5.4)
Ⓘ T : 0.25 to 0.35 (1.8 to 2.5)

Fig. AT-2 Cross-sectional view of 3N71B automatic transmission

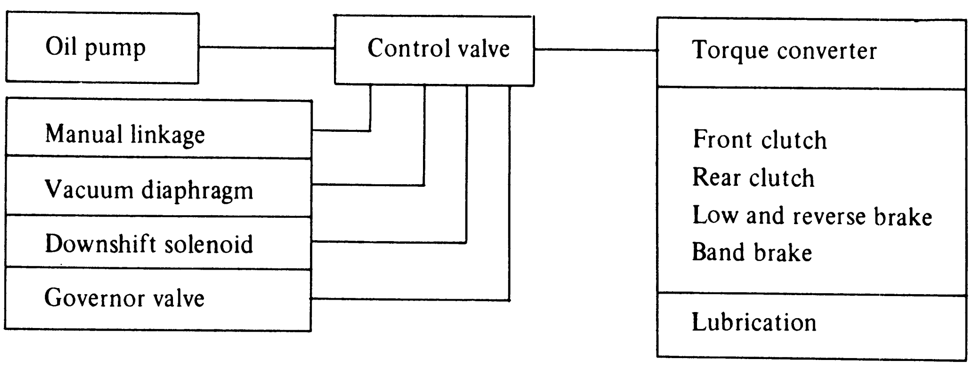
HYDRAULIC CONTROL SYSTEM

CONTENTS

FUNCTIONS OF HYDRAULIC CONTROL UNIT AND VALVES .... AT- 4
OIL PUMP .... AT- 4
MANUAL LINKAGE .... AT- 4
VACUUM DIAPHRAGM .... AT- 5
DOWNSHIFT SOLENOID .... AT- 5
GOVERNOR VALVE .... AT- 5
CONTROL VALVE ASSEMBLY .... AT- 6
HYDRAULIC SYSTEM AND MECHANICAL OPERATION AT-13
"P" RANGE (PARK) AT-14
"R" RANGE (REVERSE) AT-16
"N" RANGE (NEUTRAL) AT-18
"D_1" RANGE (LOW GEAR) AT-20
"D_2" RANGE (2ND GEAR) AT-22
"D_3" RANGE (TOP GEAR) AT-24
"D" RANGE KICK-DOWN AT-26
"2" RANGE (2ND GEAR) AT-28
"1_1" RANGE (LOW GEAR) AT-30
"1_2" RANGE (2ND GEAR) AT-32

FUNCTIONS OF HYDRAULIC CONTROL UNIT AND VALVES

The hydraulic control system contains 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 solenoid. 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.

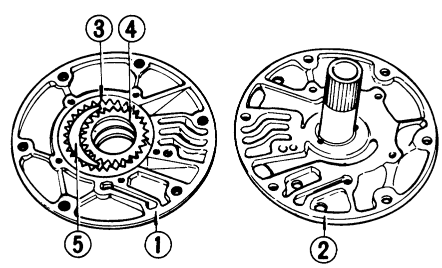


OIL PUMP

The oil pump is the source of control medium (i.e., oil) for the control system.

The oil pump is of an internal, involute gear type. The drive sleeve is a part of the torque converter pump impeller and serves to drive the pump inner gear with the drive sleeve directly coupled with the engine operation.

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.



AT071

1 Housing
2 Cover
3 Outer gear
4 Inner gear
5 Crescent

Fig. AT-3 Oil pump

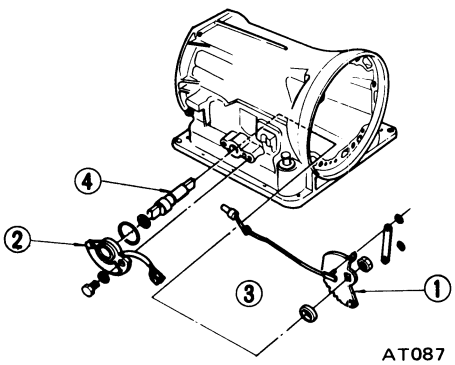
MANUAL LINKAGE

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 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
2 Inhibitor switch
3 Parking rod
4 Manual shaft

Fig. AT-4 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 timing for speed change and line pressure is obtained so that the most proper torque capacity is obtained against the transmitting torque.

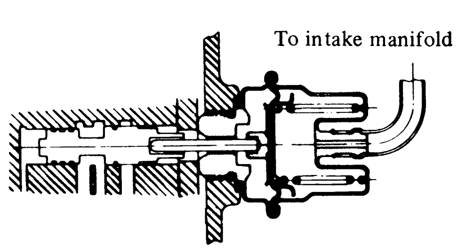


Fig. AT-5 Vacuum diaphragm

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 forcedly 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.**

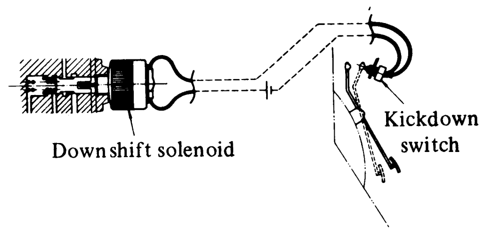


Fig. AT-6 Downshift solenoid

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.

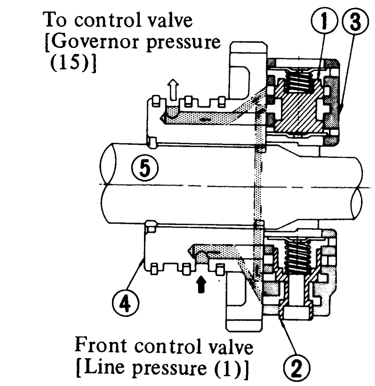
Operation of secondary governor valve

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 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).



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

Fig. AT-7 Cross-sectional view of governor

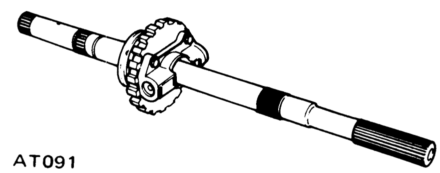
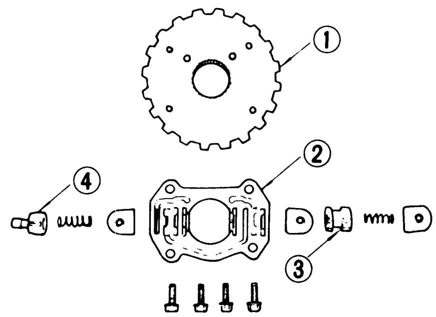


Fig. AT-8 Output shaft with oil distributor and governor



1 Oil distributor
2 Governor valve body
3 Primary governor valve
4 Secondary governor valve

Fig. AT-9 Exploded view of governor

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.

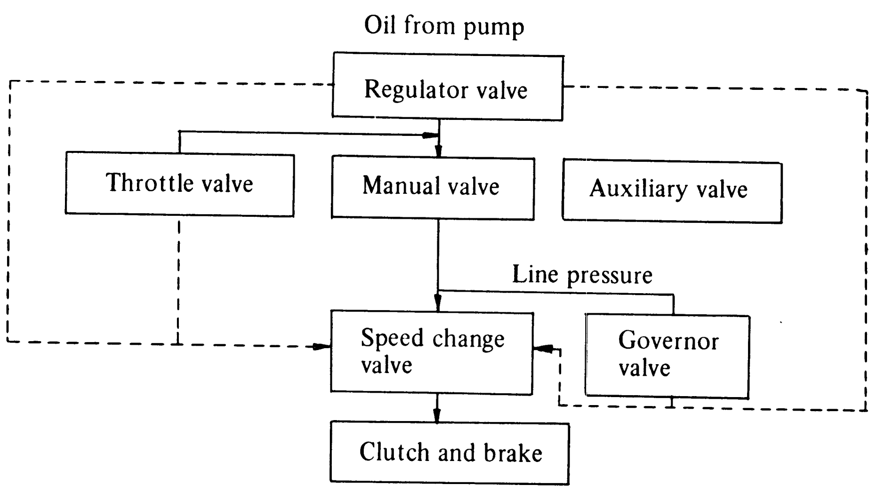
When the vehicle is stopped, the governor pressure is zero. However, when the vehicle is running slowly, this valve is depressed to the center and the groove to (15) is closed since the governor pressure applied to the ring-shaped area is higher than the centrifugal force of this valve. When the governor 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.

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-20):

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-10) 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.

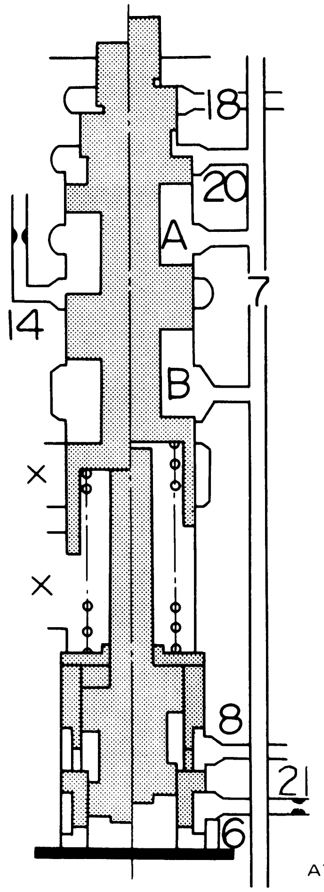


Fig. AT-10 Pressure regulator valve

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).

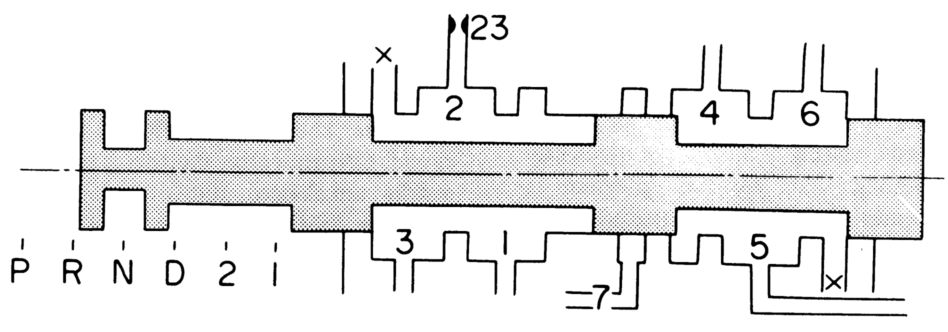


Fig. AT-11 Manual valve

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 is 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".)

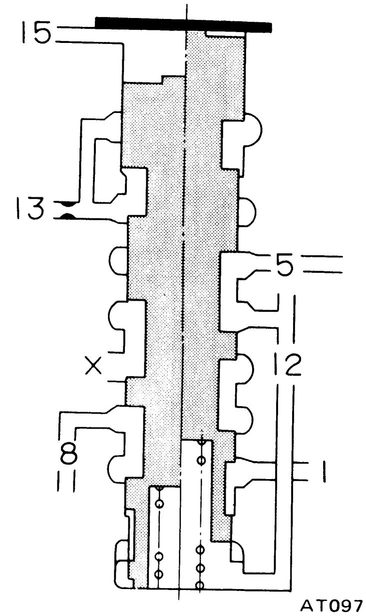


Fig. AT-12 "1st-2nd" shift valve

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 velave 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 velocity 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).

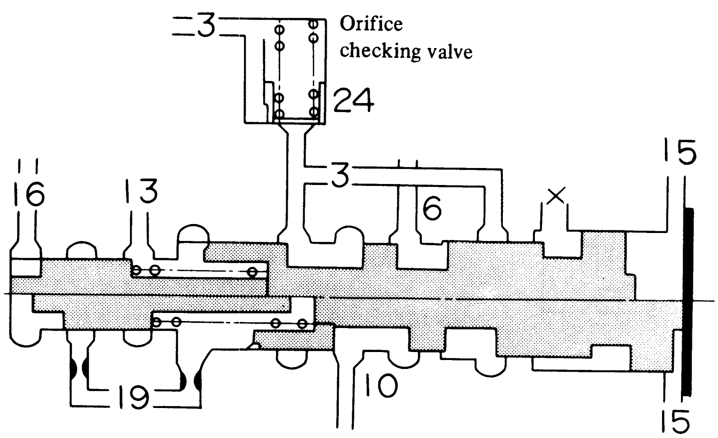


Fig. AT-13 "2nd-3rd" shift valve

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. 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.

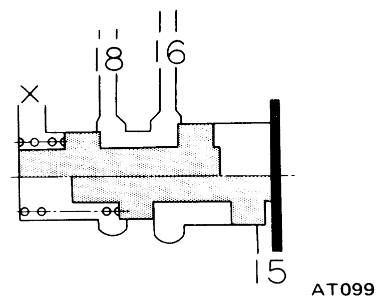


Fig. AT-14 Pressure modifier valve

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.

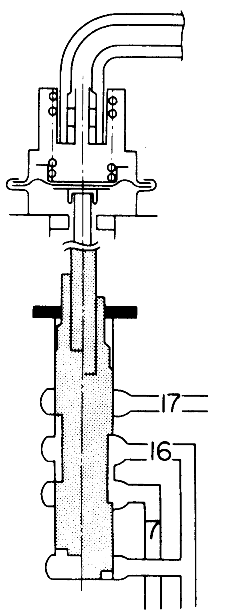


Fig. AT-15 Vacuum throttle valve

Throttle back-up valve (TBV)

Usually, this valve is depressed downward by the spring force, and circuit (17) is drained upward.

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.

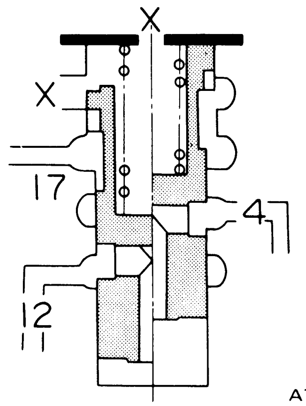


Fig. AT-16 Throttle back-up valve

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.

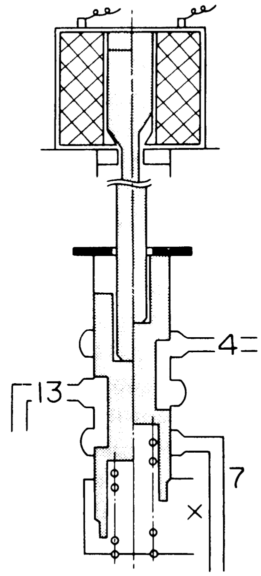


Fig. AT-17 Solenoid downshift valve

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.

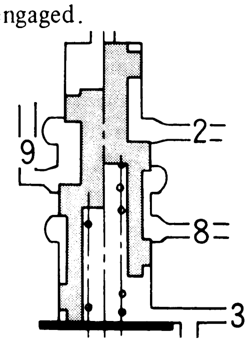


Fig. AT-18 Second lock valve

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.

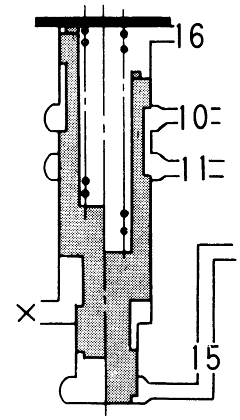
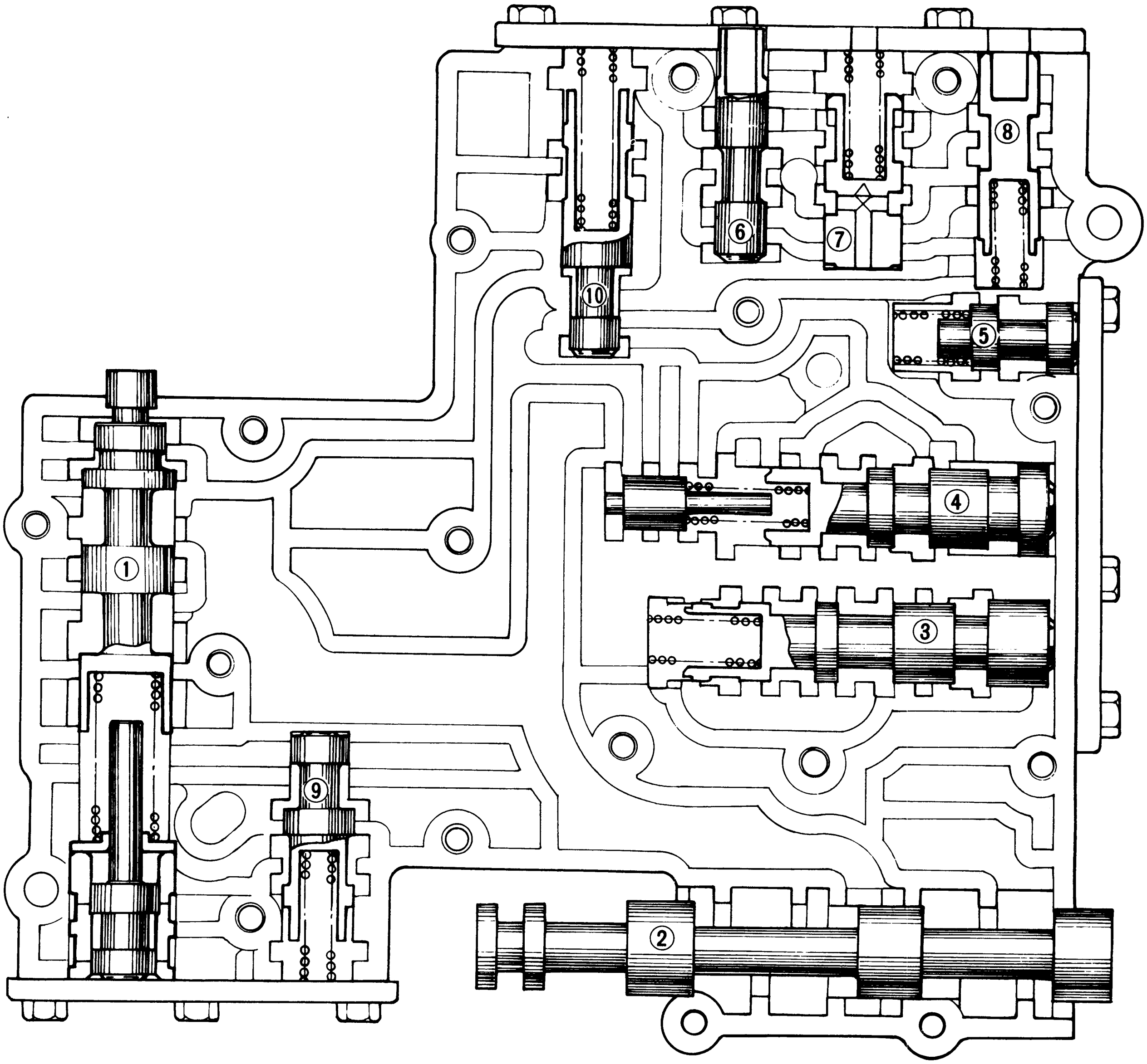


Fig. AT-19 "2nd-3rd" timing valve



1 Pressure regulating 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 down shift valve (SDV)
9 Second lock valve (SLV)
10 2 - 3 timing valve (TMV)

Fig. AT-20 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:

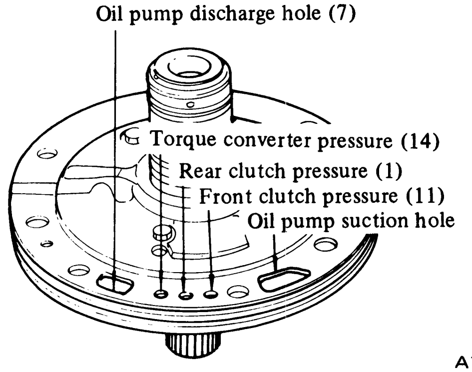
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Auxiliary line pressure: 13

Throttle system pressure:

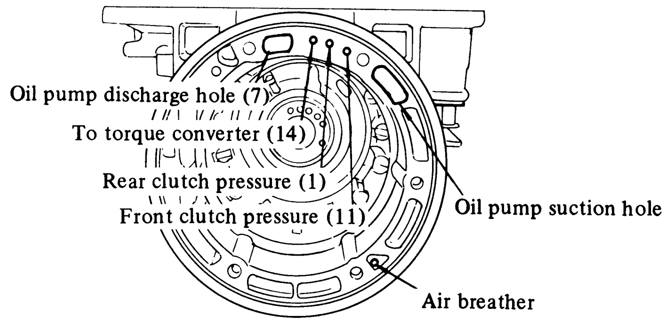
16, 17, 18, 19.

Others: 14, 15



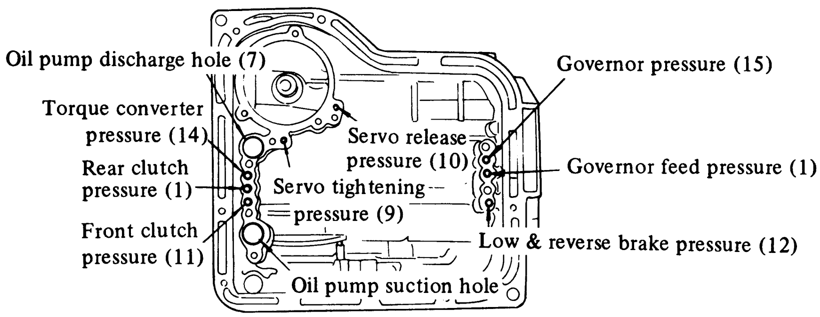
AT105

Fig. AT-21 Identification of oil channels in oil pump



AT106

Fig. AT-22 Identification of oil channels in case front face



AT107

Fig. AT-23 Identification of oil channels in case face

"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.

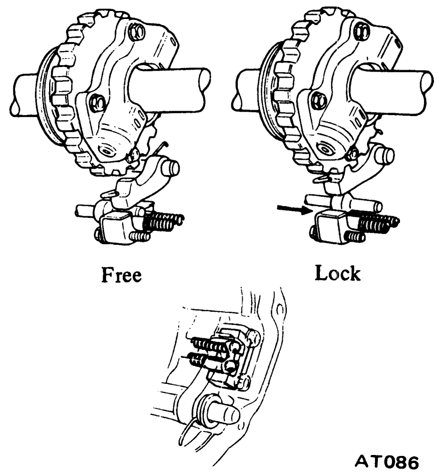


Fig. AT-24 Parking mechanism

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.

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				

"P" range (Park)

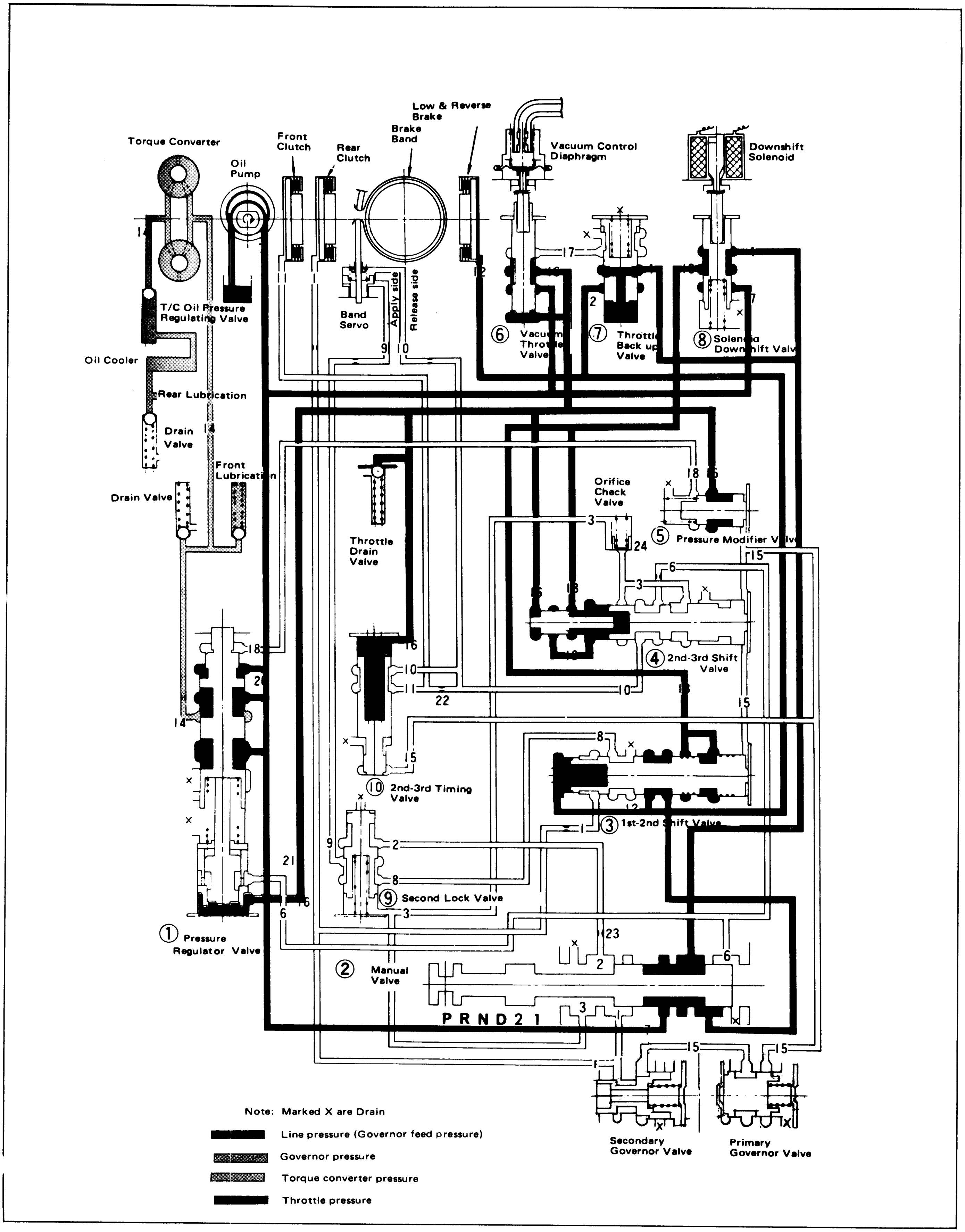
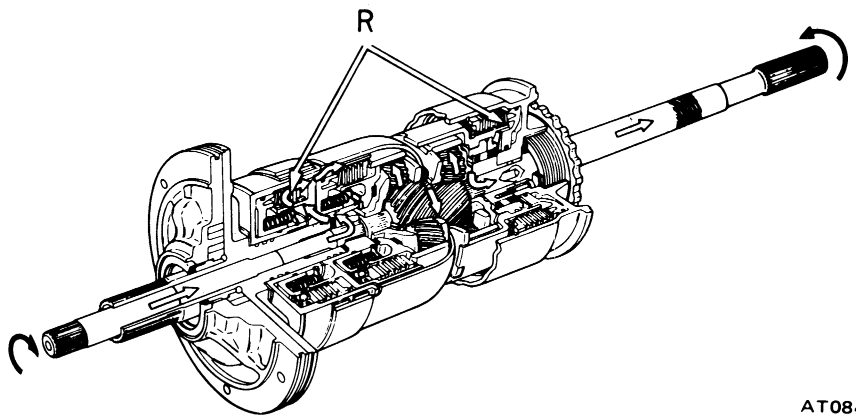


Fig. AT-25 Oil pressure circuit diagram — "P" range (Park)

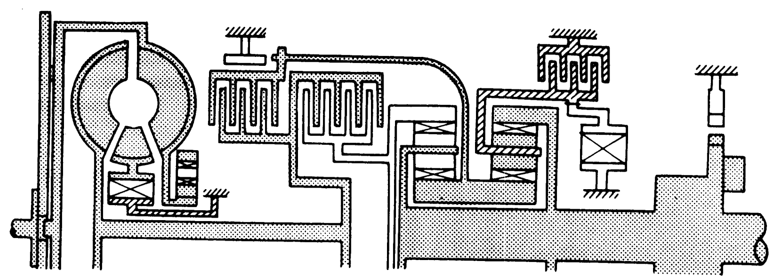
"R" RANGE (REVERSE)

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-26 Power transmission during "R" range



AT085

Fig. AT-27 Operation of each mechanism 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.

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				

"R" range (Reverse)

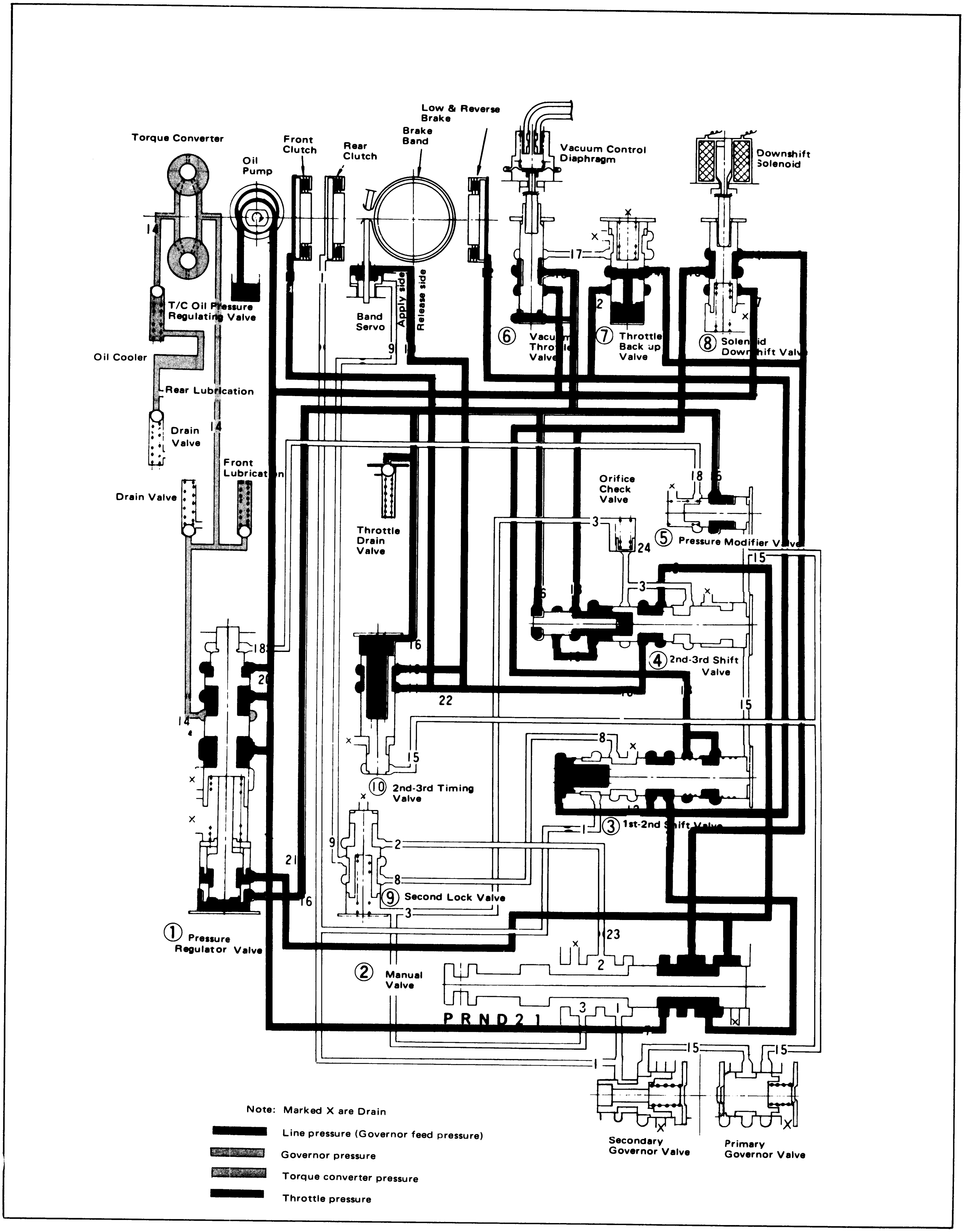


Fig. AT-28 Oil pressure circuit diagram — "R" range (Reverse)

"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 downshift 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.

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				

"N" range (Neutral)

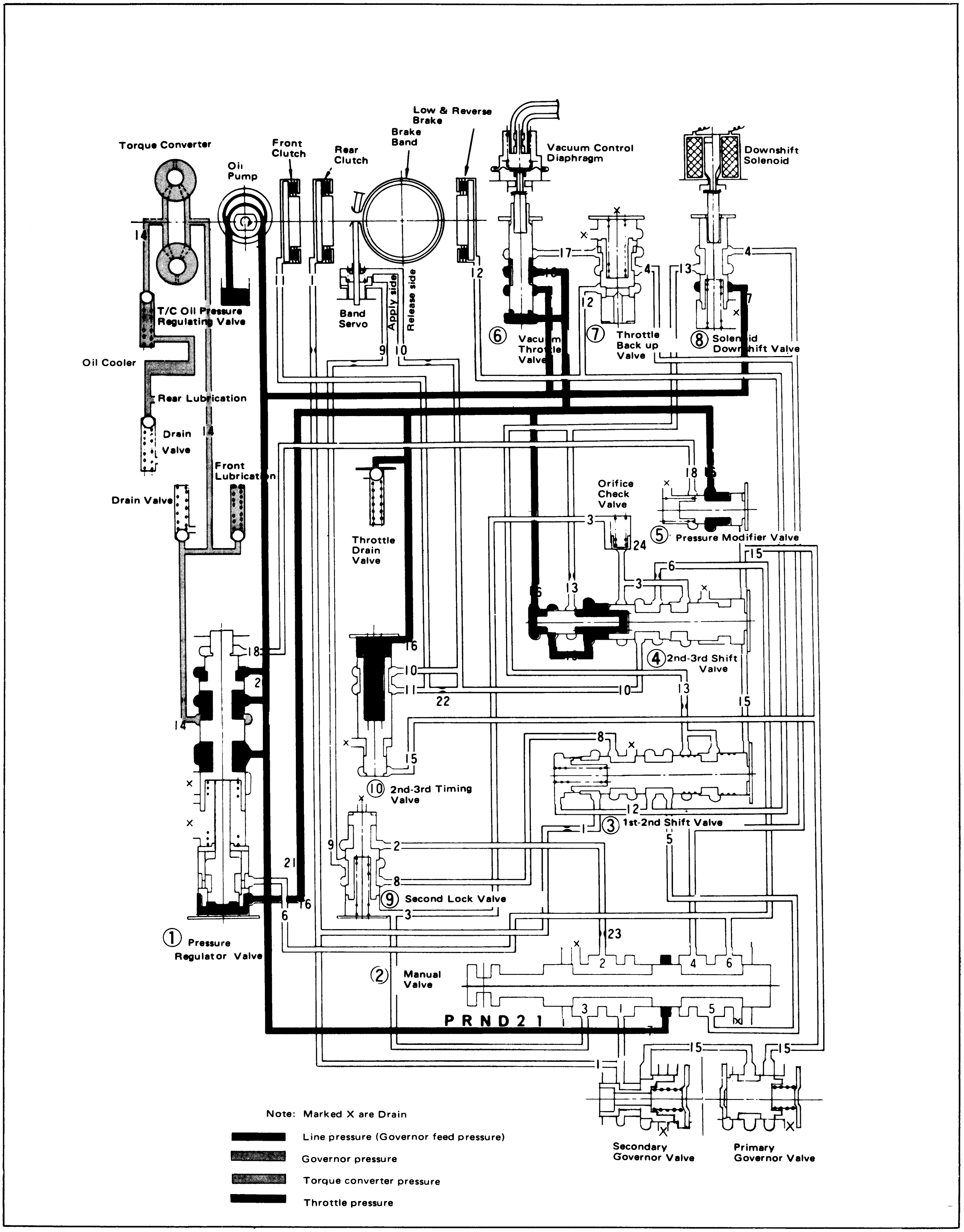


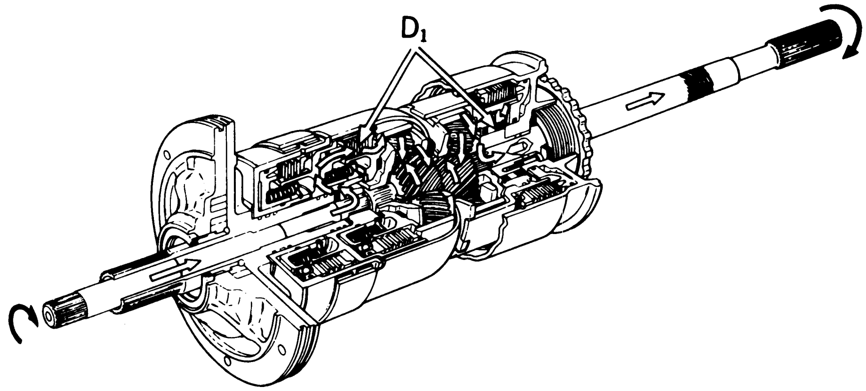
Fig. AT-29 Oil pressure circuit diagram — "N" range (Neutral)

"D_1" RANGE (LOW GEAR)

The low gear in "D" range is somewhat different from that in "1_1" range.

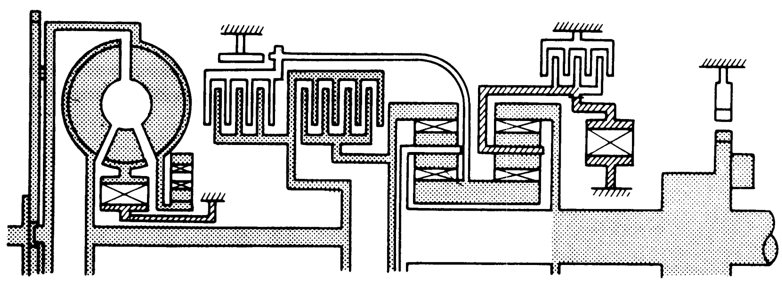
The rear clutch is applied as in "1_1" range, but the one-way clutch holds the connecting drum. The power flow is the same as in "1_1" range. That is, the power flow takes place through the input shaft and into the rear clutch. The input shaft is splined to the rear clutch drum and drives it. Rotation 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-30 Power transmission during "D_1" range



AT081

Fig. AT-31 Operation of each mechanism during "D_1" range

Range		Gear ratio	Clutch Front	Clutch Rear	Low & reverse brake	Band servo Operation	Band servo Release	One way clutch	Parking pawl
Park					on				on
Reverse		2.182	on		on		on		
Neutral									
Drive	D1 Low	2.458		on				on	
Drive	D2 Second	1.458		on		on			
Drive	D3 Top	1.000	on	on		(on)	on		
2	Second	1.458		on		on			
1	1_2 Second	1.458		on		on			
1	1_1 Low	2.458		on	on				

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.

"D_1" range (Low gear)

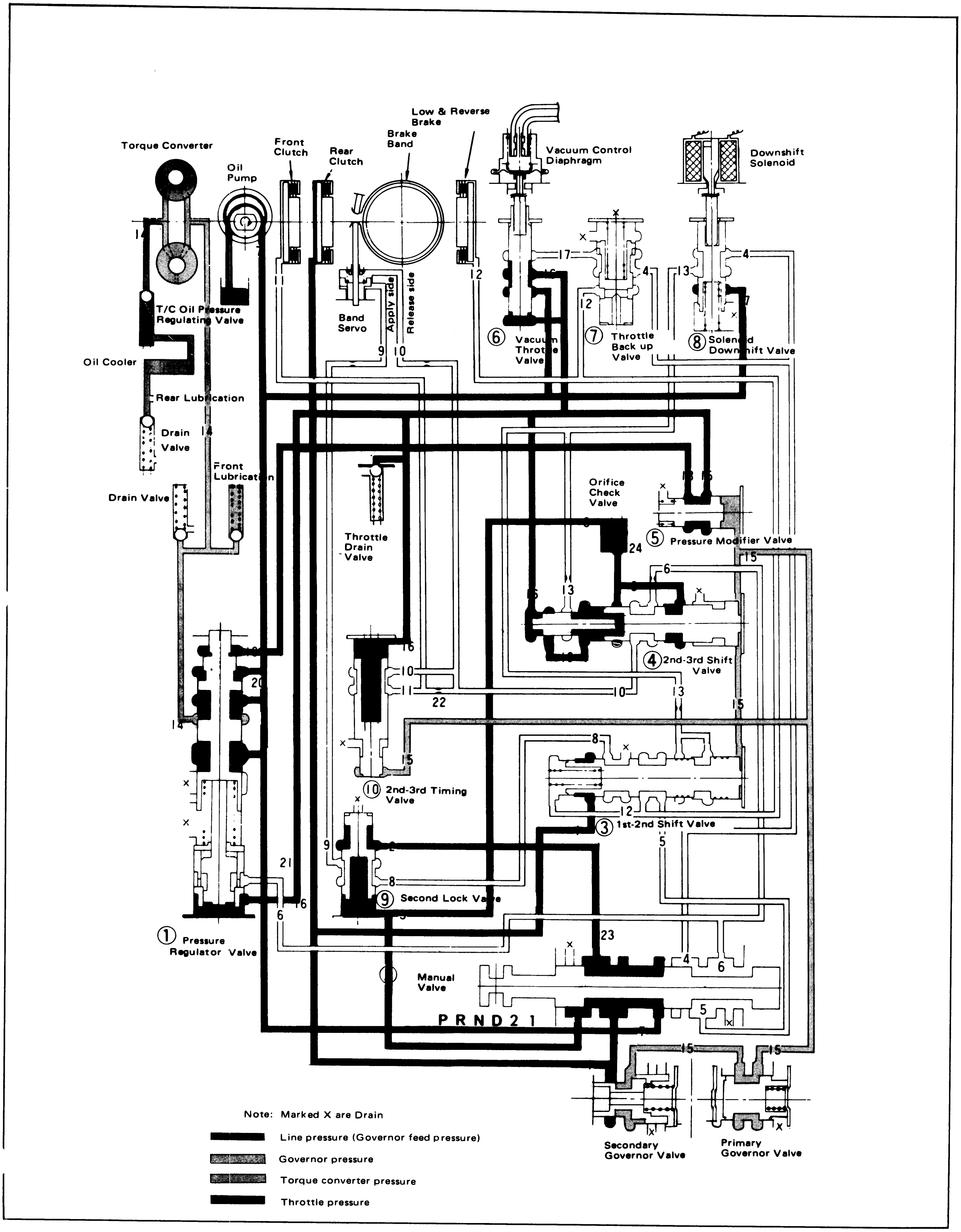
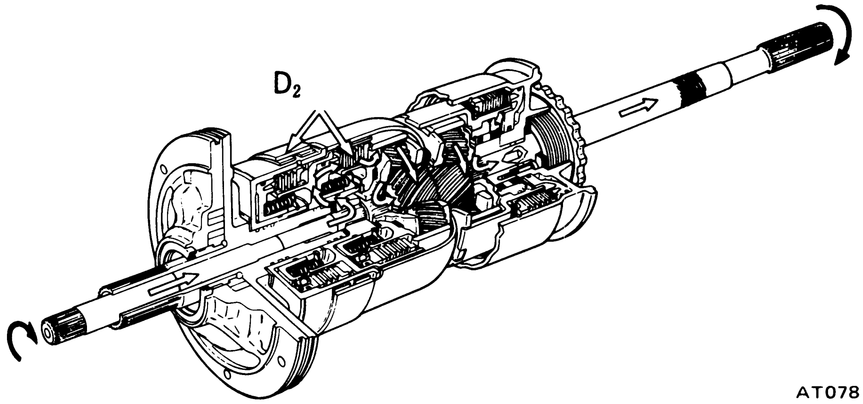


Fig. AT-32 Oil pressure circuit diagram — "D_1" range (Low gear)

"D_2" RANGE (2ND GEAR)

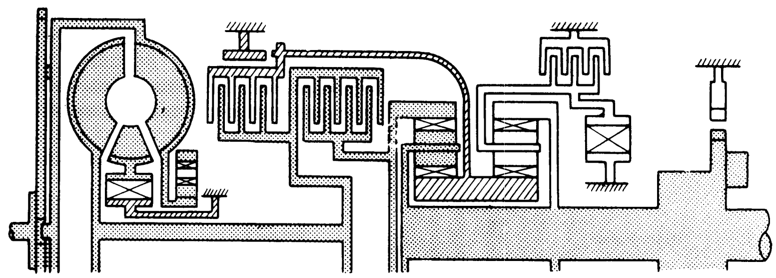
In this case, the rear clutch is applied and the band brake holds the front clutch drum, the connecting shell and the sun gear from rotating.

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-33 Power transmission during "D_2" range



AT079

Fig. AT-34 Operation of each mechanism during "D_2" range

Range		Gear ratio	Clutch Front	Clutch Rear	Low & reverse brake	Band servo Operation	Band servo Release	One way clutch	Parking pawl
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				

When the car speed increases while running at "D_1" 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.

"D₂" range (2nd gear)

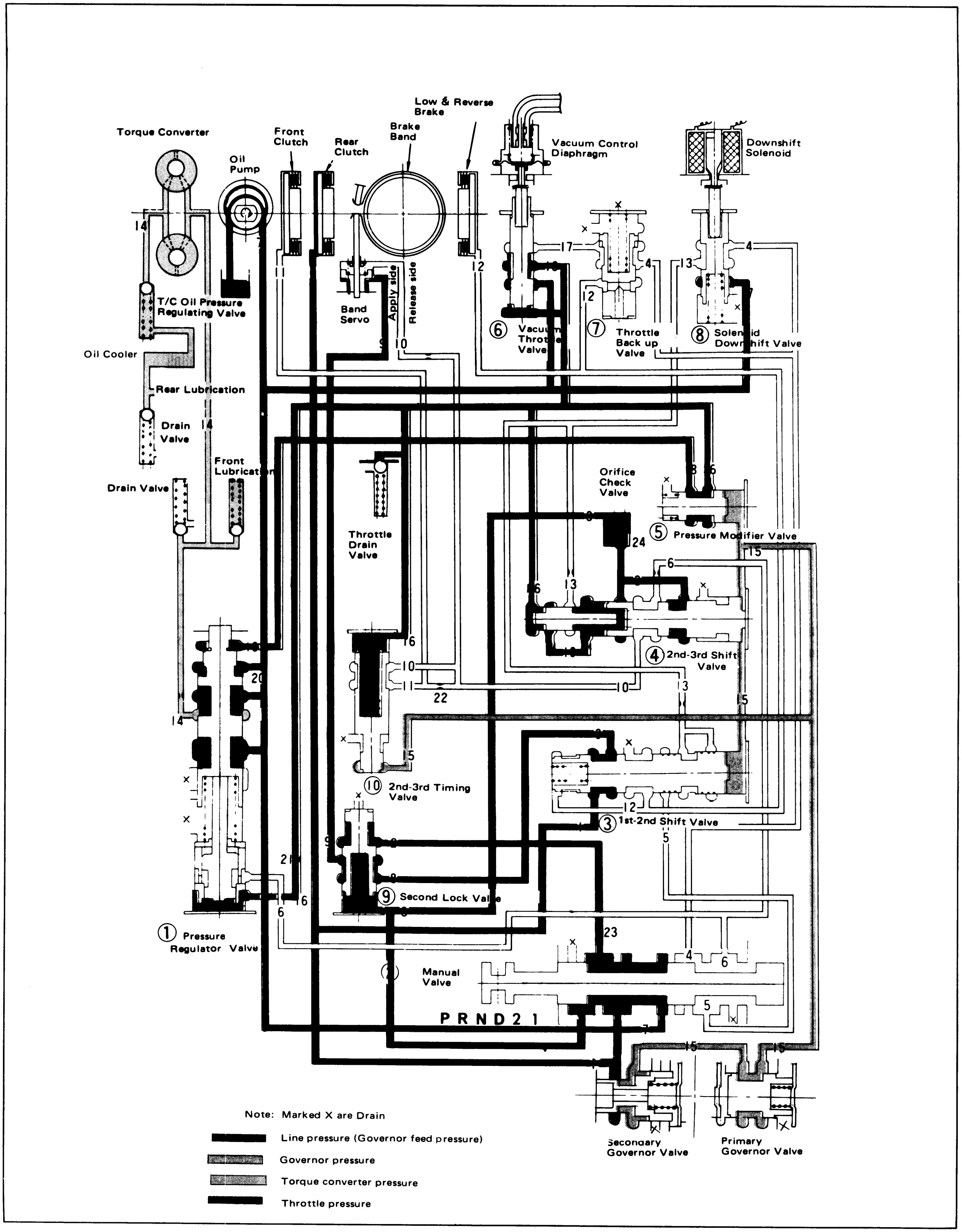
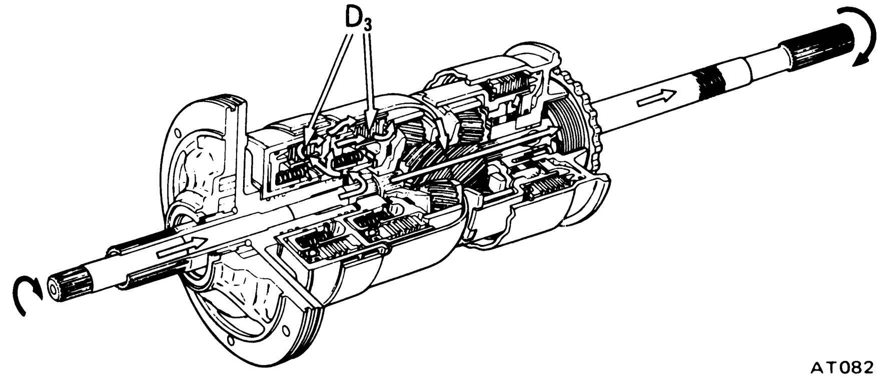


Fig. AT-35 Oil pressure circuit diagram — "D ₂" range (2nd gear)

"D₃" RANGE (TOP GEAR)

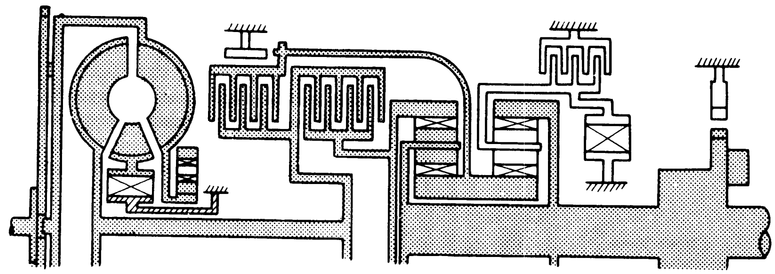
In 3rd gear position, the front and rear clutches are engaged. The power flow takes place through the input shaft into rear clutch drum. The rear clutch drum rotates the steel drive plates of the rear clutch and the lined drive plates of the rear clutch and the lined drive plates of the front clutch. 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.



AT082

Fig. AT-36 Power transmission during "D_3" range



AT083

Fig. AT-37 Operation of each mechanism "D_3" range

When the car speed further increases while running at "D_2" 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).

Range			Gear ratio	Clutch Front	Clutch Rear	Low & reverse brake	Band servo Operation	Band servo Release	One way clutch	Parking pawl
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				

"D₃" range (Top gear)

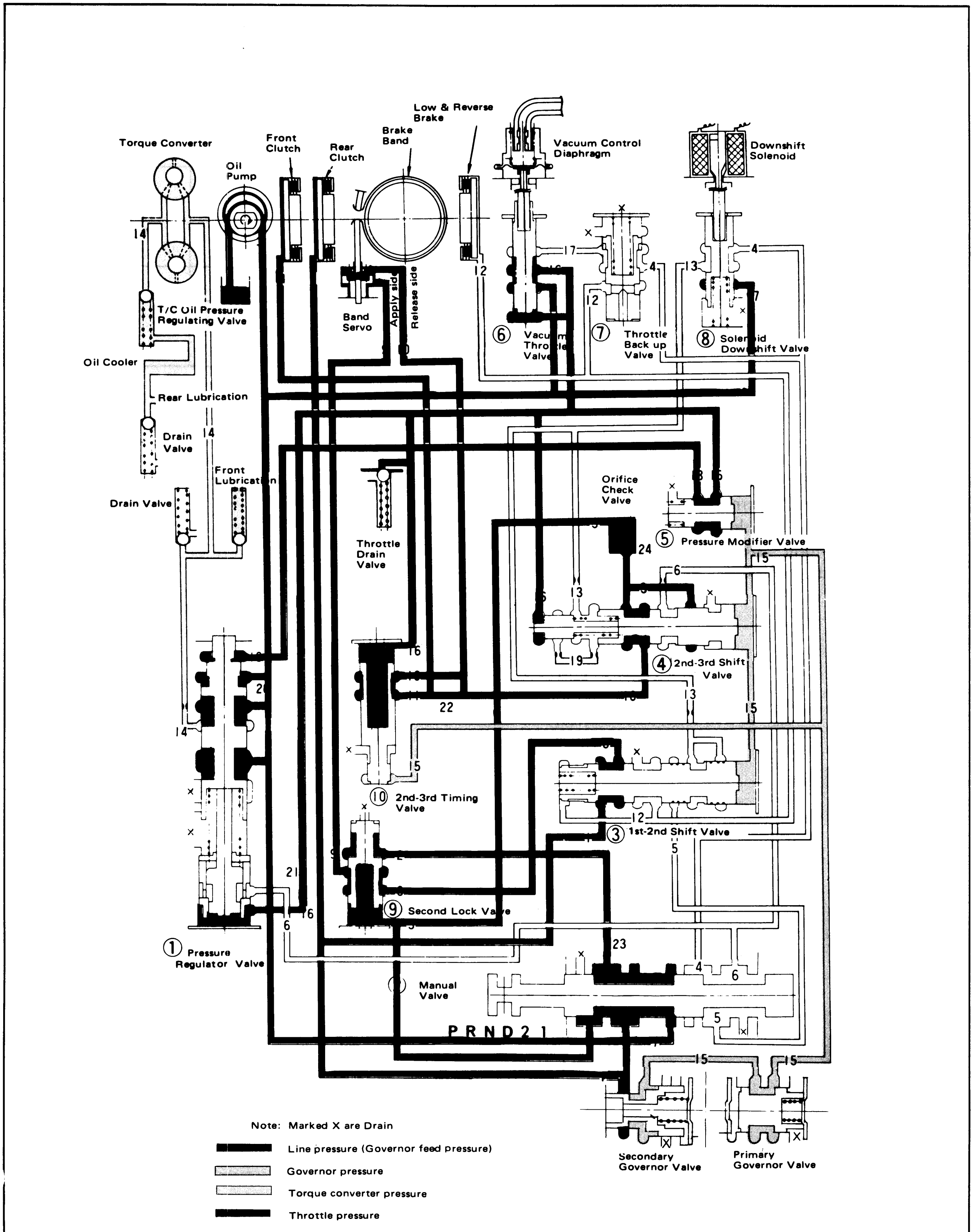


Fig. AT-38 Oil pressure circuit diagram — "D₃" range (Top gear)

"D" RANGE KICKDOWN

While operating at speeds below approximately 80 to 90 km/h (50 to 55 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 30 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.

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				

"D" range kickdown (Shift valves in 2nd gear position)

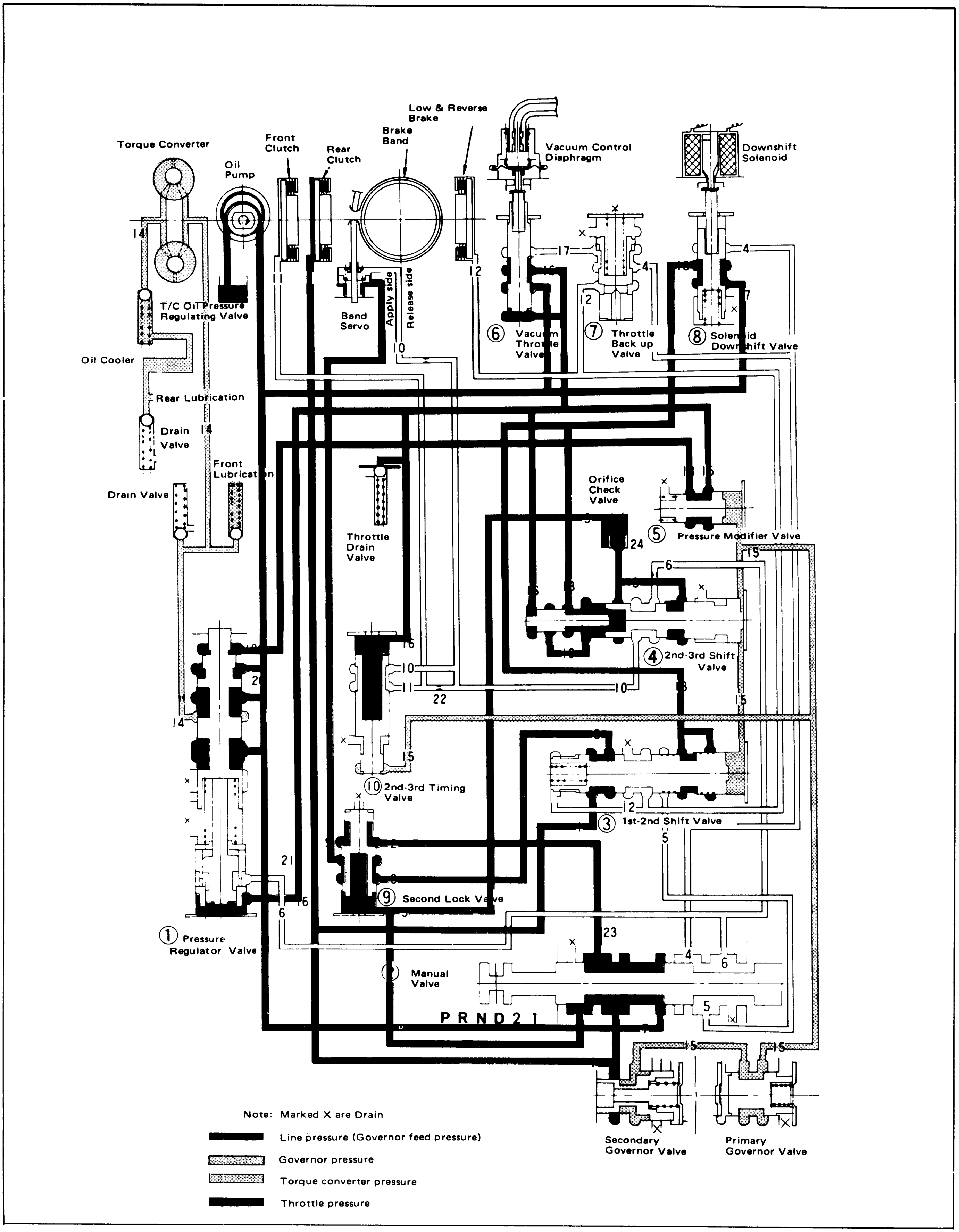


Fig. AT-39 Oil pressure circuit diagram — "D" range kickdown (shift valves in 2nd gear position)

"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.

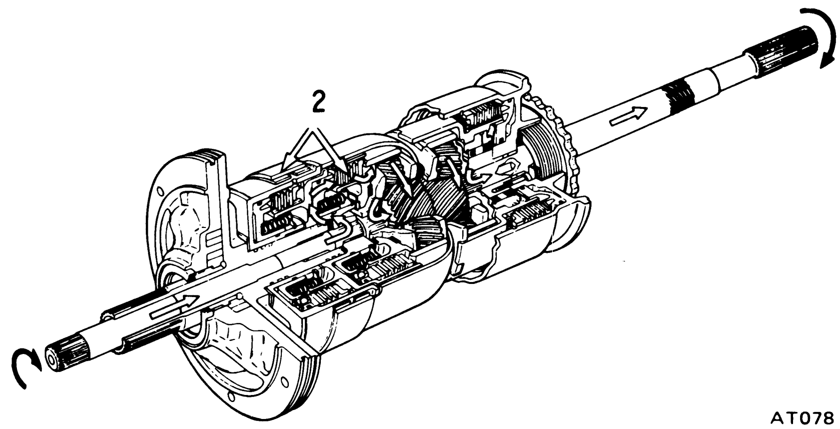


Fig. AT-40 Power transmission during "2" range

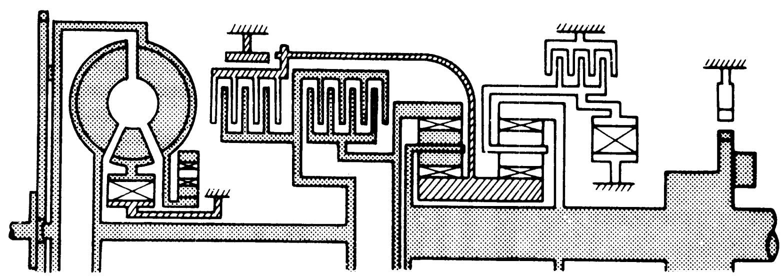


Fig. AT-41 Operation of each mechanism during "2" range

Range			Gear ratio	Clutch Front	Clutch Rear	Low & reverse brake	Band servo Operation	Band servo Release	One way clutch	Parking pawl
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				

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 "D_3" (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: "D_3" range (3rd gear) to "2" range:

If "D_3" range (3rd gear) is shifted to "2" range during operation, the manual valve ② is also shifted to "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.

"2" range (2nd gear)

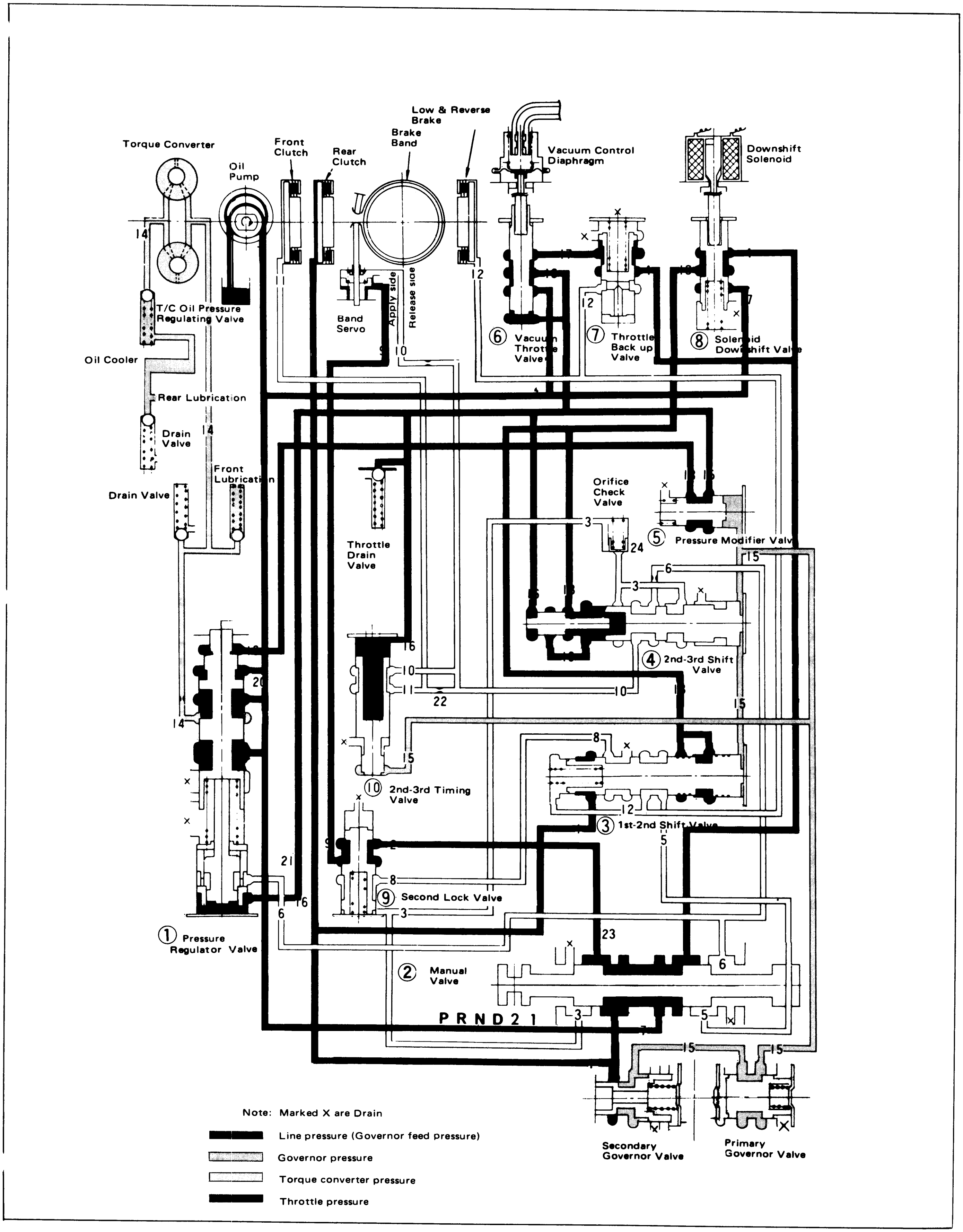


Fig. AT-42 Oil pressure circuit diagram — "2" range (2nd gear)

"1_1" RANGE (LOW GEAR)

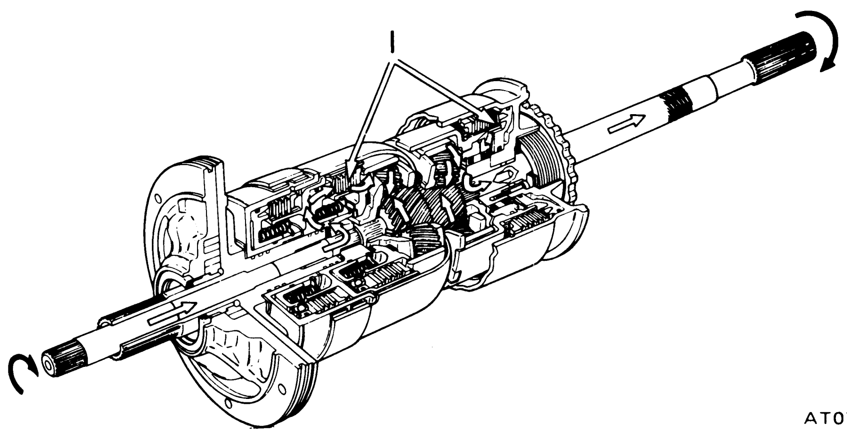
When starting in "1" range, the driving gear is locked to the low gear ratio.

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 counter-clockwise.

Counterclockwise rotation of the sun gear turns the rear planetary gear clockwise.

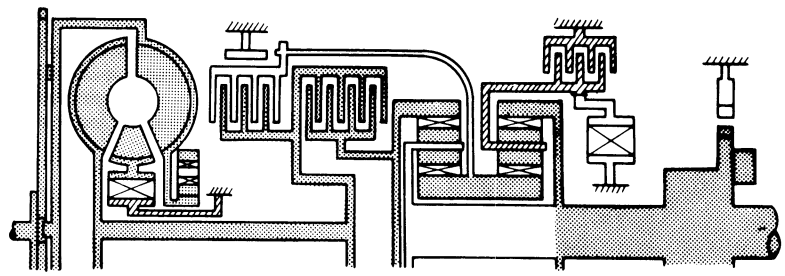
The rear planet carrier splined to the connecting drum is held from rotating by the low and reverse brake.

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-43 Power transmission during "1_1" range



AT077

Fig. AT-44 Operation of each mechanism during "1_1" range

Range			Gear ratio	Clutch Front	Clutch Rear	Low & reverse brake	Band servo Operation	Band servo Release	One way clutch	Parking pawl
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				

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.

"1_1" range (Low gear)

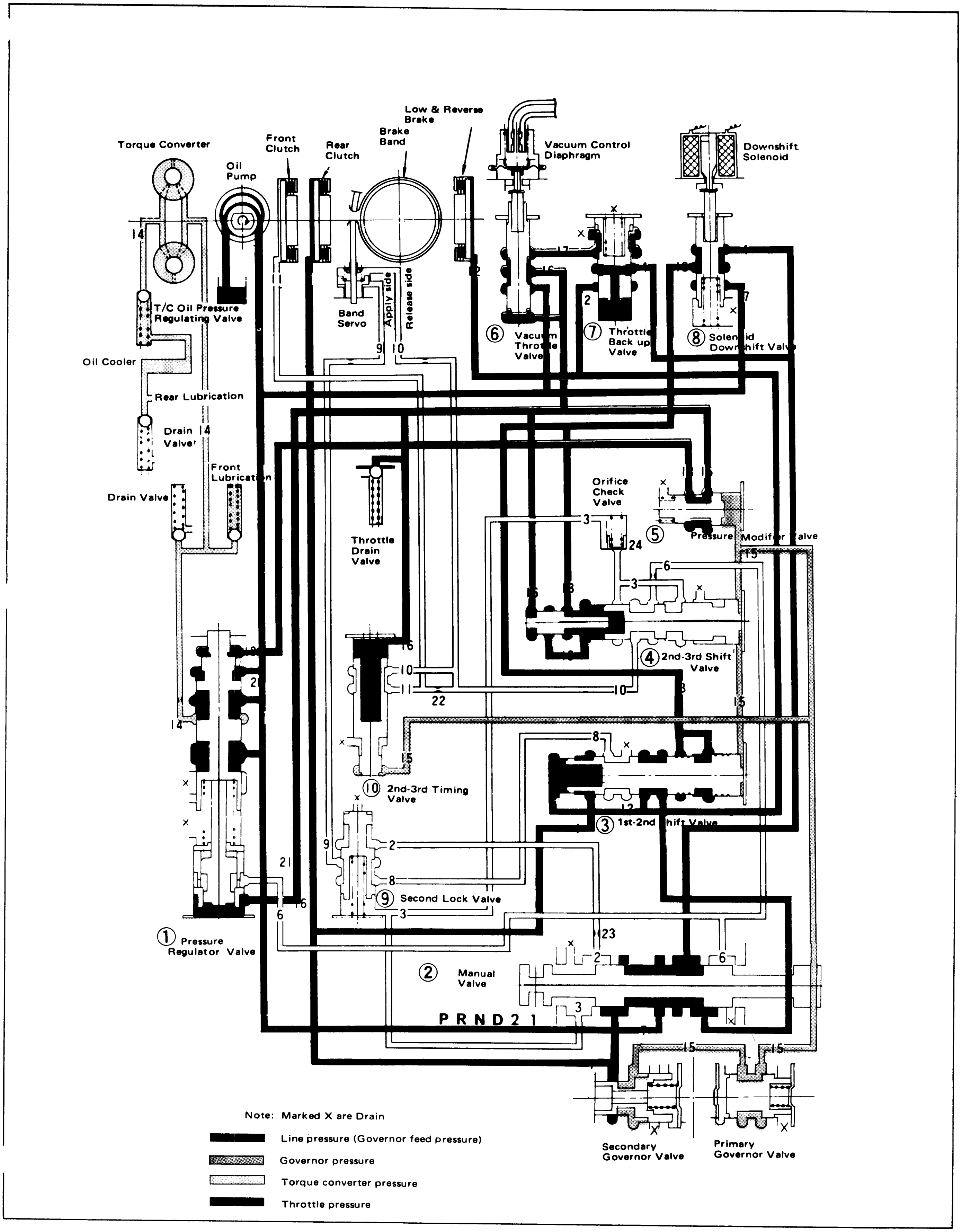


Fig. AT-45 Oil pressure circuit diagram — "1_1" range (Low gear)

"1_2" range (2nd gear)

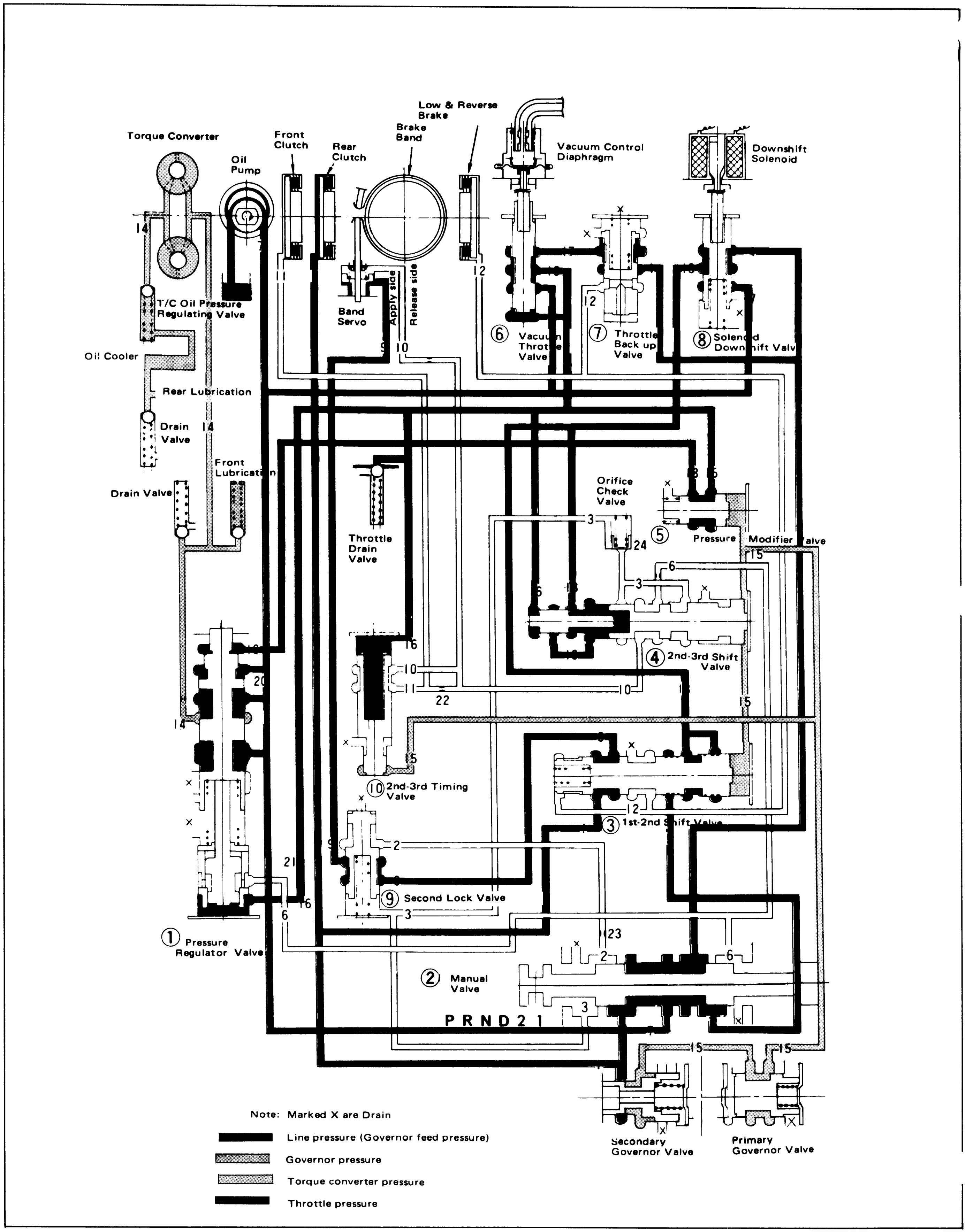


Fig. AT-46 Oil pressure circuit diagram — "1_2" range (2nd gear)

REMOVAL AND INSTALLATION

CONTENTS

TRANSMISSION ASSEMBLY AT-33
REMOVAL AT-33
INSTALLATION AT-33
TRANSMISSION CONTROL LINKAGE AT-35
REMOVAL AND INSTALLATION AT-35
ADJUSTMENT AT-35

TRANSMISSION ASSEMBLY

When dismounting the automatic transmission from a vehicle, pay attention to the following points:

1. Before dismounting the transmission, rigidly inspect it by aid of the "Troubleshooting Chart," and dismount it only when considered to be necessary.
2. Dismount the transmission with utmost care; and when mounting, observe the tightening torque indicated on another table, not to exert excessive force.

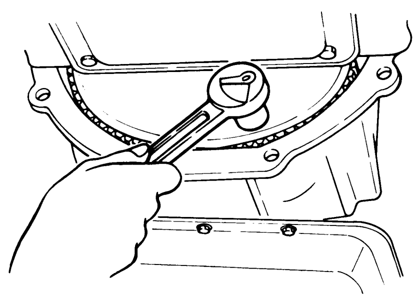
REMOVAL

In dismounting 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. Recommend a hydraulic hoist or open pit be utilized, if available.
   Make sure that safety is insured.
4. Remove propeller shaft.

Note: **Plug up the opening in the rear extension to prevent oil from flowing out.**

5. Disconnect front exhaust tube.
6. Disconnect selector range lever from manual shaft.
7. Disconnect wire connections at inhibitor switch.
8. Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid.
9. Disconnect speedometer cable from rear extension.
10. Disconnect oil charging pipe.
11. Disconnect oil cooler inlet and outlet tubes at transmission case.
12. Support engine by locating a jack under oil pan with a wooden block used between oil pan and jack. Support transmission by means of a transmission jack.
13. Detach converter housing dust cover. Remove bolts securing torque converter to drive plate. See Figure AT-47.



AT261

Fig. AT-47 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 at assembly.**

14. Remove rear engine mount securing bolts and crossmember mounting bolts.
15. Remove starter motor.
16. Remove bolts securing transmission to engine. After removing these bolts, support engine and transmission with jack, and lower the jack gradually until transmission can be removed and take out transmission under the car.

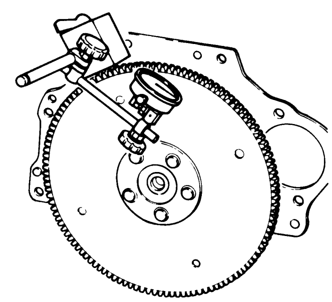
Note: **Plug up the opening such as oil charging pipe, oil cooler tubes, etc.**

INSTALLATION

Installation of automatic transmission on vehicle is reverse order of removal. However, observe the following installation notes.

1. Drive plate runout
   Turn crankshaft one full turn and measure drive plate runout with indicating finger of a dial gauge rested against plate. See Figure AT-48.
   [Replace drive plate if in excess of 0.5 mm (0.020 in).]

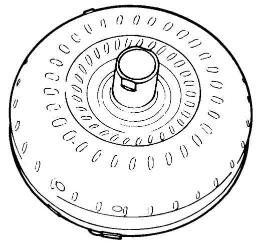
- Maximum allowable runout:
  0.3 mm (0.012 in)



AT262

Fig. AT-48 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 in installing torque converter. See Figure AT-49.



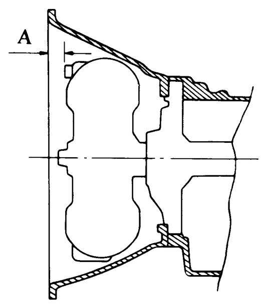
AT116

Fig. AT-49 Torque converter aligning cut

3. When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled. See Figure AT-50.

Distance "A":

More than 21.5 mm (0.846 in)



AT117

Fig. AT-50 Installing torque converter

4. Bolt converter to drive plate.

Note: Align chalk marks painted across both parts during disassembling processes.

5. After converter is installed, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.
6. Pour recommended automatic transmission fluid up to correct level through oil charge pipe.
7. Connect manual lever to shift rod. Operation should be carried out with manual and selector levers in "N."
8. Connect inhibitor switch wires.

Note:

a. Refer to covering topic under "Checking and adjusting inhibitor switch" on page AT-49.

b. Inspect and adjust switch as above whenever it has to be removed for service.

9. Check inhibitor switch for operation:

Starter should be brought into operation only when selector lever is in "P" and "N" positions (it should nc 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.

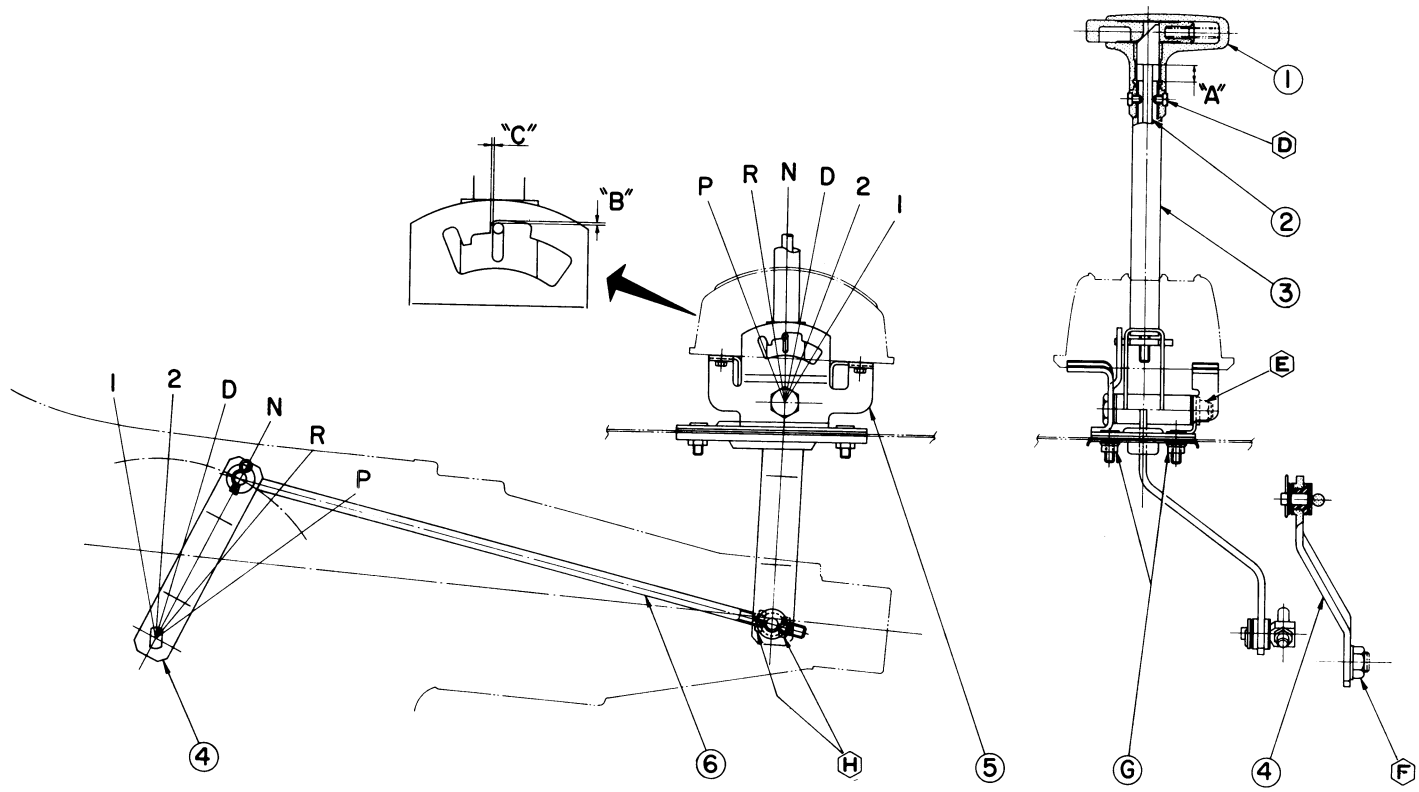
10. Check level of oil in transmission. For detailed procedure, see page AT-48.
11. Move selector lever through all positions to be sure that transmission operates correctly.

With hand brake applied, rotate engine at idling. Without disturbing the above setting, move selector lever through "N" to "D," to "2," to "1" and to "R." A slight shock should be felt by hand gripping selector each time transmission is shifted.

Note: See page AT-49 for checking engine idling.

12. Check to be sure that line pre sure is correct. To do this, refer relative topic under "Testing line pressure" on page AT-52.
13. Perform stall test as per the instructions on page AT-50.

TRANSMISSION CONTROL LINKAGE



1 Control lever knob
2 Pusher
3 Control lever assembly
4 Selector range lever
5 Control lever bracket
6 Selector rod

Tightening torque (T) of nuts and screws kg-m (ft-lb)

D T : 0.07 to 0.13 (0.5 to 0.9)
E T : 1.6 to 2.2 (12 to 16)
F T : 3 to 4 (22 to 29)
G T : 0.35 to 0.45 (2.5 to 3.3)
H T : 0.8 to 1.1 (5.8 to 8.0)

Fig. AT-51 Control linkage system

REMOVAL AND INSTALLATION

1. Disconnect control knob from control lever by removing two (2) screws.
2. Remove console box.
3. Remove selector rod, selector range lever and control lever assembly with bracket.

To install, reverse the order of removal.

ADJUSTMENT

The adjustment of linkage is as important as "Inspection of oil level" for the automatic transmission.

Therefore, great care should be exercised because faulty adjustment will result in the breakdown of the transmission.

1. Prior to installing control knob, set the dimension "A" to 11 to 12 mm (0.43 to 0.47 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 (0.004 to 0.043 in) by turning pusher 2. See Figure AT-51.
3. Loosen adjust nuts H. Set control lever 3 and selector lever 4 at "N" position, moreover, set the clearance "C" to 1 mm (0.04 in) by turning in or out adjusting nuts at trunnion which connects selector rod 6.

After adjusting, make sure that control lever can be set in any position correctly and that selector lever operates properly without any binding.

If levers do not operate satisfactorily, readjust or replace parts as necessary.

MAJOR REPAIR OPERATION

CONTENTS

SERVICE NOTICE FOR DISASSEMBLY AND ASSEMBLY AT-36
TORQUE CONVERTER AT-36
INSPECTION AT-36
TRANSMISSION AT-36
DISASSEMBLY AT-36
INSPECTION AT-38
ASSEMBLY AT-38
COMPONENT PARTS AT-40
FRONT CLUTCH AT-40
REAR CLUTCH AT-41
LOW & REVERSE BRAKE AT-42
SERVO PISTON AT-42
GOVERNOR AT-43
OIL PUMP AT-43
PLANETARY CARRIER AT-44
CONTROL VALVE AT-44

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.

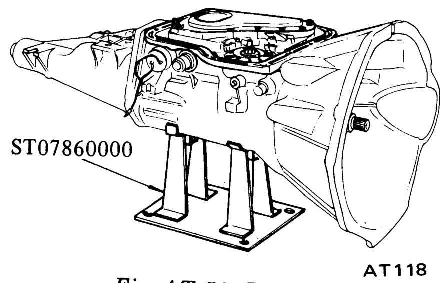
If torque converter oil is fouled or contaminated due to burnt clutch, flush the torque converter as follows:

(1) Drain oil in torque converter.
(2) Pour non lead gasoline or kerosene into torque converter [approximately 0.5 liter ($1\frac{1}{8}$ U.S.pt., $\frac{7}{8}$ 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 ($1\frac{1}{8}$ U.S.pt., $\frac{7}{8}$ Imp.pt.)].
(5) Again blow air into torque converter, and drain torque converter oil.

TRANSMISSION

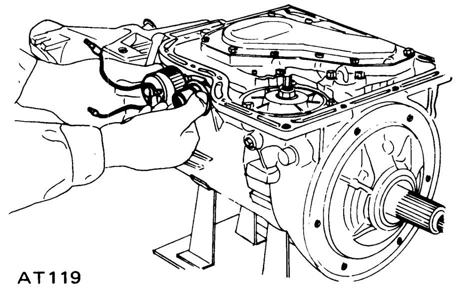
DISASSEMBLY

1. Drain oil from the end of rear extension. Mount transmission on Transmission Case Stand ST07870000 or ST07860000. Remove oil pan. See Figure AT-52.

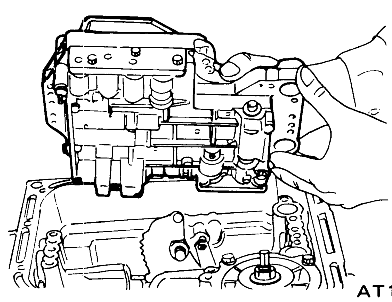


AT118
Fig. AT-52 Removing oil pan

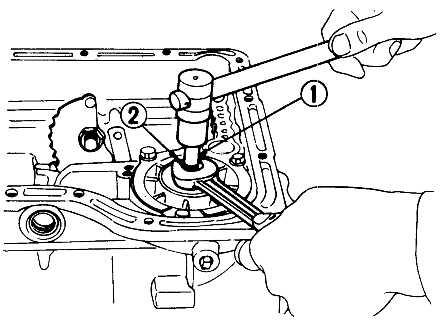
2. Remove bolts securing converter housing to transmission case. Remove torque converter.
3. Remove speedometer pinion sleeve bolt. Withdraw pinion.
4. Remove downshift solenoid and vacuum diaphragm. Do not leave diaphragm rod at this stage of disassembly. Rod is assembled in top of vacuum diaphragm. See Figure AT-53.


AT119
Fig. AT-53 Downshift solenoid and vacuum diaphragm

5. Remove bolts which hold valve body to transmission case. See Figure AT-54.


AT120
Fig. AT-54 Removing valve body

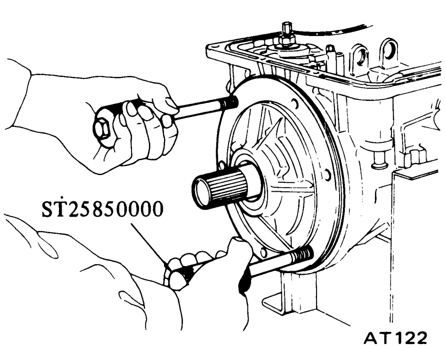
6. Loosen lock nut ② on piston stem ① as shown in Figure AT-55. Then tighten piston stem in order to prevent front clutch drum from falling when oil pump is withdrawn.



AT121

Fig. AT-55 Loosening band servo

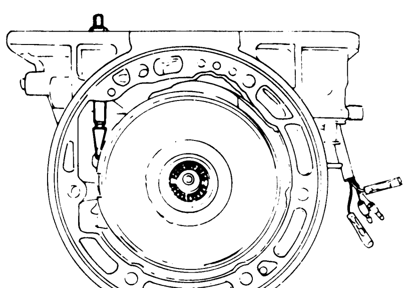
7. Pull out input shaft.
8. Withdraw oil pump using Sliding Hammer ST25850000. Do not allow front clutch to come out of position and drop onto floor. See Figure AT-56.



AT122

Fig. AT-56 Removing oil pump

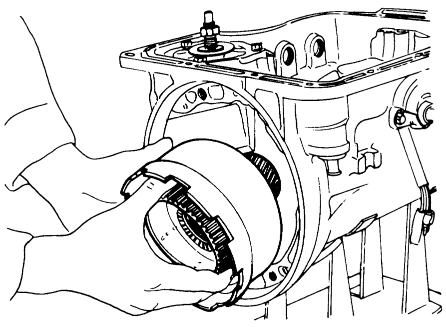
9. Remove band strut. This can be done by loosening piston stem further. See Figure AT-57.



AT123

Fig. AT-57 Removing band strut

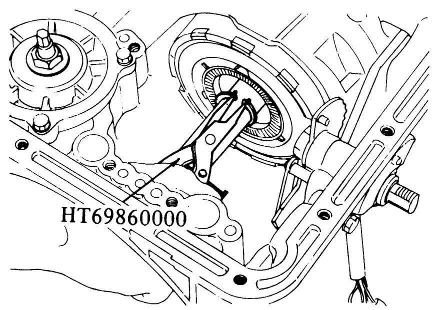
10. Remove brake band, front clutch and rear clutch as an assembled unit.
11. Remove connecting shell, rear clutch hub and front planetary carrier as a unit. See Figure AT-58.



AT124

Fig. AT-58 Removing connecting shell

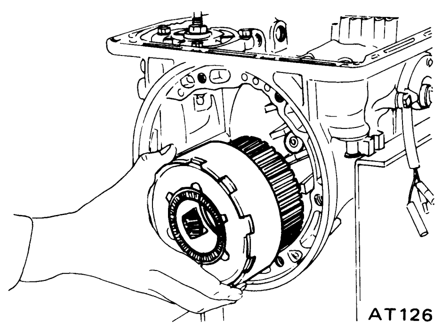
12. With the aid of Snap Ring Remover HT69860000, pry snap ring off output shaft. See Figure AT-59.



AT125

Fig. AT-59 Removing snap ring

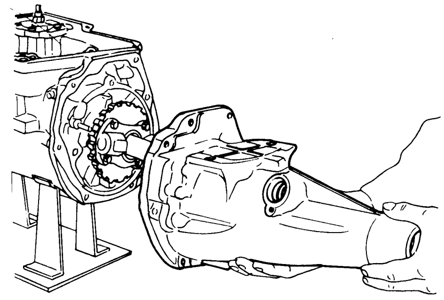
13. Remove connecting drum and inner gear of rear planetary carrier as an assembly. See Figure AT-60.



AT126

Fig. AT-60 Removing connecting drum

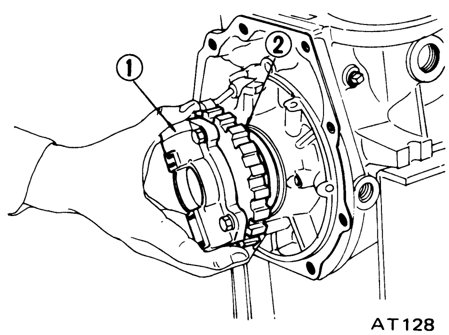
14. Remove snap rings and then remove rear planetary carrier, internal gear, connecting drum, one-way clutch outer race and one-way clutch in that order.
15. Remove rear extension by loosening securing bolts. See Figure AT-61.



AT127

Fig. AT-61 Removing rear extension

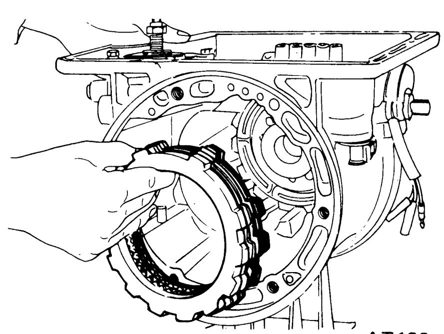
16. Pull out output shaft; remove oil distributor ② together with governor valve ①. See Figure AT-62.



AT128

Fig. AT-62 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-63.



AT129

Fig. AT-63 Removing drive and driven plates

18. Reaching through back side of transmission case, remove hex-head slotted bolts as shown in Figure AT-64. 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.

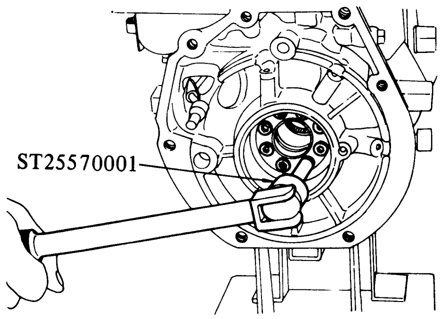


Fig. AT-64 Removing hex-head slotted bolt

19. Blow out low and reverse brake piston by directing a jet of air into hole in cylinder. See Figure AT-65.

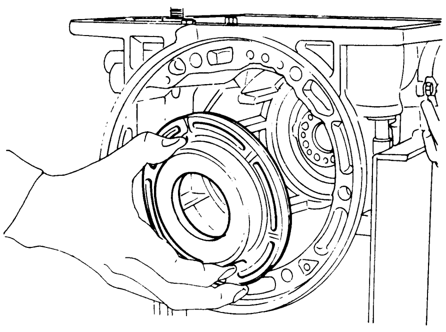


Fig. AT-65 Removing piston

20. Remove band servo loosening attaching bolts.

Note: If difficulty is encountered in removing retainer, direct a jet of air toward release side as shown in Figure AT-66.

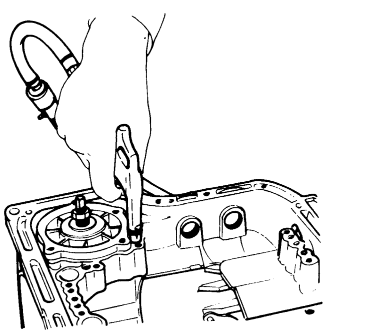


Fig. AT-66 Removing band servo

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-67.

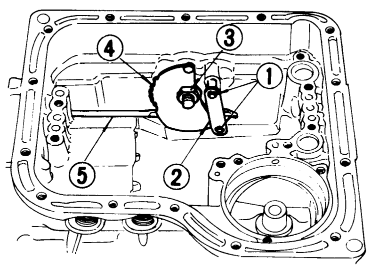


Fig. AT-67 Removing manual plate

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. If rear extension bushing is worn or cracked, replace it as an assembly of bushing and rear extension housing.

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-68.

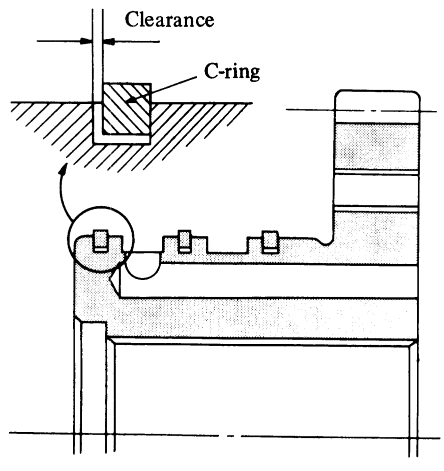


Fig. AT-68 Measuring seal ring to ring groove clearance

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 to 13 ft-lb), using Hex-head Extension ST25570001 (ST25570000), Torque Wrench GG93010000 and Socket Extension ST25490000 (ST25512001). See Figure AT-69.

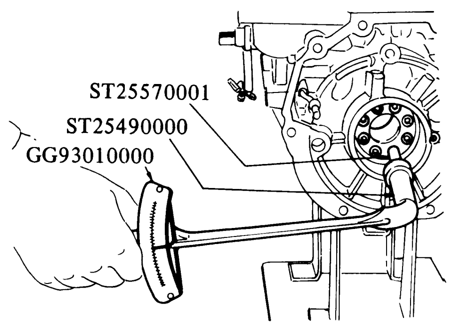


Fig. AT-69 Installing one-way clutch inner race

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-70.

- Low and reverse brake clearance:

  0.80 to 1.25 mm
  (0.031 to 0.049 in)

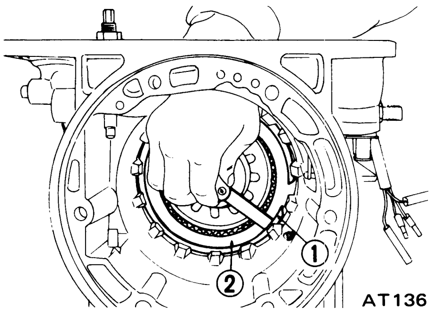


Fig. AT-70 Measuring ring to plate clearance

Available retaining plate

Thickness 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)

For inspection procedure for low and reverse brake, see page AT-42 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-71.

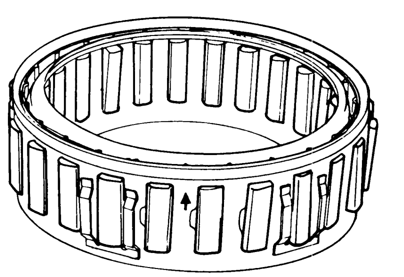


Fig. AT-71 One-way clutch

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-72.

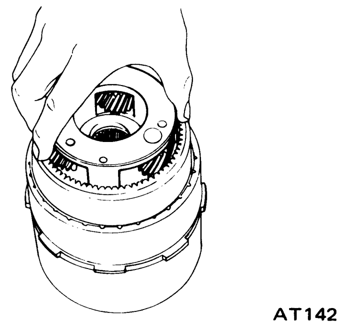


Fig. AT-72 Installing planetary carrier

8. Assemble connecting shell and other parts up to front clutch in reverse order of disassembly.

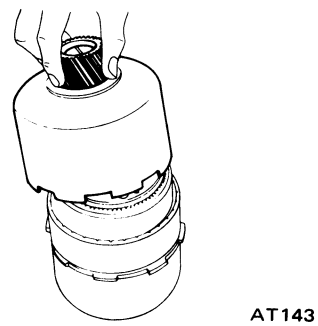
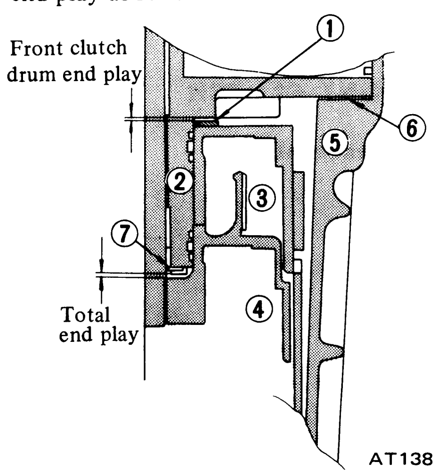


Fig. AT-73 Installing connecting shell

9. Adjust total end play and front end play as follows:



1 Front clutch thrust washer
2 Oil pump
3 Front clutch
4 Rear clutch
5 Transmission case
6 Oil pump gasket
7 Oil pump cover bearing race

Fig. AT-74 End play

(1) Measure the distances "A" and "C" by vernier calipers as shown in Figure AT-75.

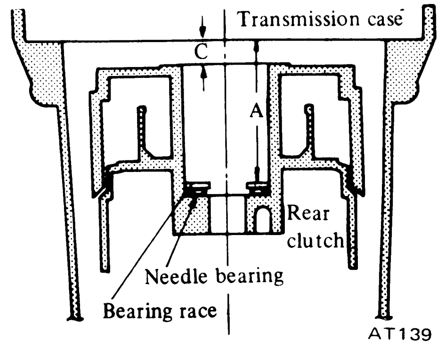


Fig. AT-75 Measuring the distance "A" and "C"

(2) Measure the distances "B" and "D" of oil pump cover as shown in Figure AT-76.

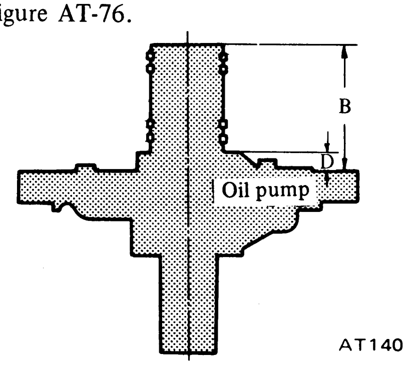


Fig. AT-76 Measuring the distance "B" and "D"

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
(0.0098 to 0.0197 in)

Adjustment of front end play

Select front clutch thrust washer by calculating the following formula:

$T_F = C - D - 0.2$ (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)

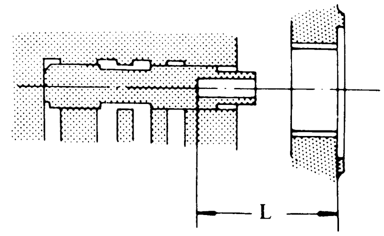
Available front clutch thrust washer

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)

Specified front end play:
0.5 to 0.8 mm
(0.020 to 0.031 in)

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 (9 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-49 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-77.



AT145

Fig. AT-77 Measuring the distance "L"

Available diaphragm rod

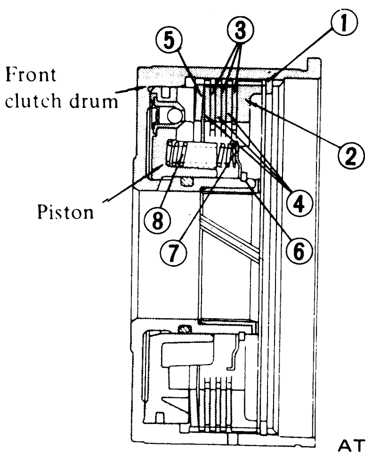
Distance measured "L" mm (in)	Diaphragm rod length mm (in)
Under 25.55 (1.0059)	29.0 (1.142)
25.65 to 26.05 (1.0098 to 1.0256)	29.5 (1.161)
26.15 to 26.55 (1.0295 to 1.0453)	30.0 (1.181)
26.65 to 27.05 (1.0492 to 1.0650)	30.5 (1.201)
Over 27.15 (1.0689)	31.0 (1.220)

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.

FRONT CLUTCH

Disassembly

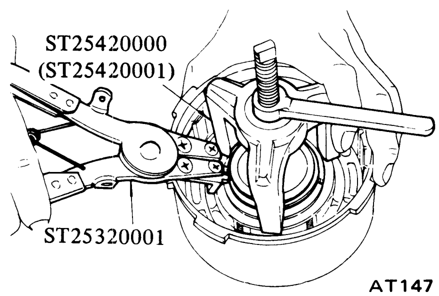


AT146

1 Snap ring
2 Retaining plate
3 Drive plate
4 Driven plate
5 Dished plate
6 Snap ring
7 Spring retainer
8 Coil spring

Fig. AT-78 Sectional view of front clutch

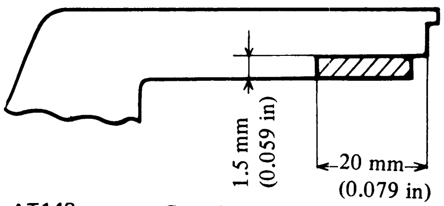
1. Pry off snap ring ① with a suitable screwdriver or a pair of pliers. Remove a retaining plate ②, drive plate ③, driven plate ④ and dished plate ⑤ in the order listed, as shown in Figure AT-78.
2. Compress clutch springs, using Clutch Spring Compressor ST25420001 (or ST25420000). Remove snap ring ⑥ from spring retainer, using Snap Ring Remover ST25320001. See Figure AT-79.



AT147

Fig. AT-79 Removing snap ring

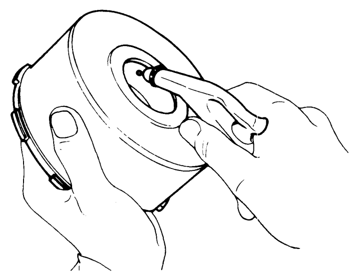
Note: **When Clutch Spring Compressor ST25420000 is to be used, cut the toe-tips of three legs by a grinding wheel. See Figure AT-80.**



AT148 Cut off hatched portion

Fig. AT-80 Modifying coil spring compressor

3. Take out spring retainer ⑦ and spring ⑧. See Figure AT-78.
4. Blow out piston by directing a jet of air into hole in clutch drum. See Figure AT-81.



AT149

Fig. AT-81 Blowing out piston

Inspection

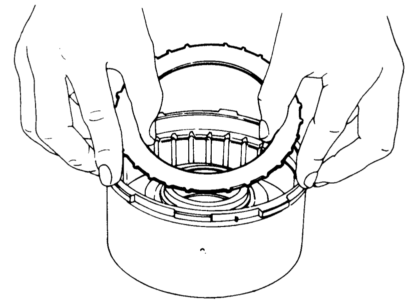
1. Check for signs of wear or damage to clutch drive plate facing. If found worn or damaged excessively, discard.

Drive plate thickness:
Standard
1.5 to 1.65 mm
(0.059 to 0.065 in)
Allowable limit
1.4 mm (0.055 in)

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.



AT150

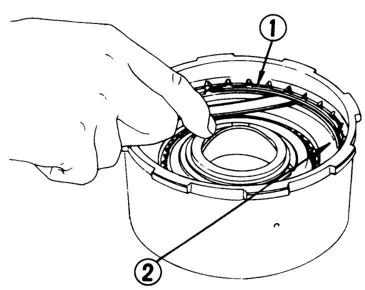
Fig. AT-82 Inserting clutch plate

2. 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 retaining plate having different thickness until correct clearance is obtained. See Figure AT-83.

Specified clearance:
1.6 to 2.0 mm
(0.063 to 0.079 in)

Available retaining plate

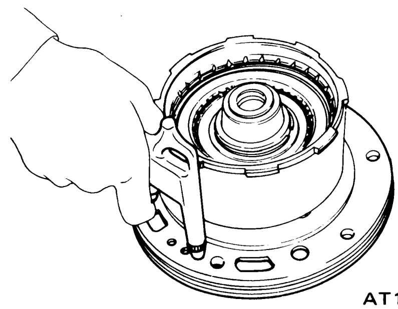
Thickness mm (in)
10.6 (0.417)
10.8 (0.425)
11.0 (0.433)
11.2 (0.441)
11.4 (0.449)
11.6 (0.457)



AT151

Fig. AT-83 Measuring ring to plate clearance

3. Testing front clutch
With front clutch assembled on oil pump cover, direct a jet of air into hole in clutch drum for definite clutch operation. See Figure AT-84.

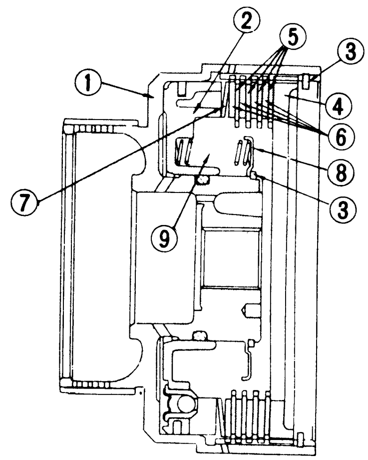


AT152

Fig. AT-84 Testing front clutch

REAR CLUTCH

Disassembly

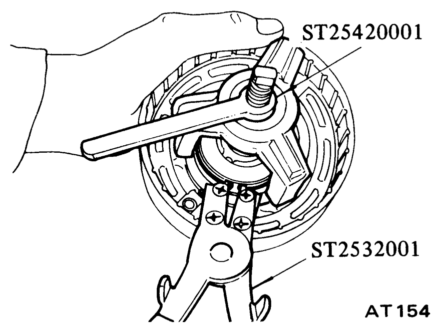


AT153

1 Rear clutch drum
2 Front clutch piston
3 Snap ring
4 Retaining plate
5 Drive plate
6 Driven plate
7 Dished plate
8 Spring retainer
9 Coil spring

Fig. AT-85 Sectional view of rear clutch

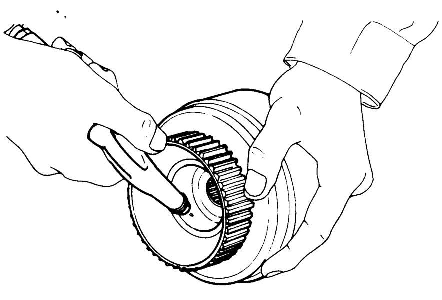
1. Take out snap ring ③, retaining plate ④, drive plate ⑤, driven plate ⑥ and dished plate ⑦. Same technique can be applied as in disassembling front clutch. See Figure AT-85.
2. Remove snap ring from coil spring retainer. See Figure AT-86.



AT154

Fig. AT-86 Removing snap ring

3. Blow out piston by directing a jet of air into hole in clutch drum. See Figure AT-87.



AT155

Fig. AT-87 Blowing out piston

Inspection

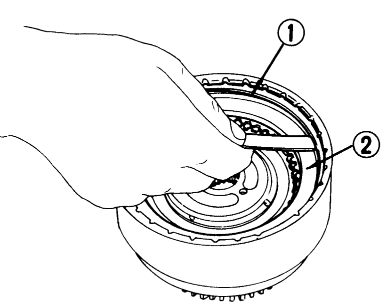
Refer to page AT-41 for Inspection of Front Clutch.

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 specified clearance. See Figure AT-88.

Specified clearance:
0.8 to 1.6 mm
(0.031 to 0.063 in)



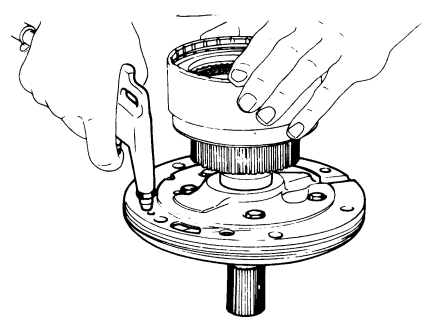
AT156

Fig. AT-88 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-89.



AT157

Fig. AT-89 Testing rear clutch

LOW & REVERSE BRAKE

Disassembly

1. Fllow steps as described in page AT-36 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.

Drive plate thickness:
Standard
1.9 to 2.05 mm
(0.075 to 0.081 in)
Allowable limit
1.8 mm (0.071 in)

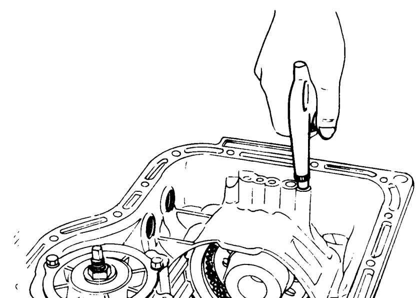
2. Test piston return spring for weakness. Discard if weakened beyond use.
3. Replace faulty parts with new ones.

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 1.3 to 1.8 kg-m (9 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.
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 1.25 mm
(0.031 to 0.049 in)

4. Blow compressed air into oil hole in low & reverse brake to test for definite brake operation as shown in Figure AT-90.



AT158

Fig. AT-90 Testing low & reverse brake

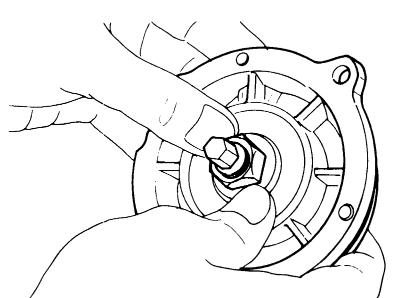
SERVO PISTON

Disassembly

1. Blow out piston by directing a jet of air into hole in release-side of piston.
2. Remove servo piston return spring.

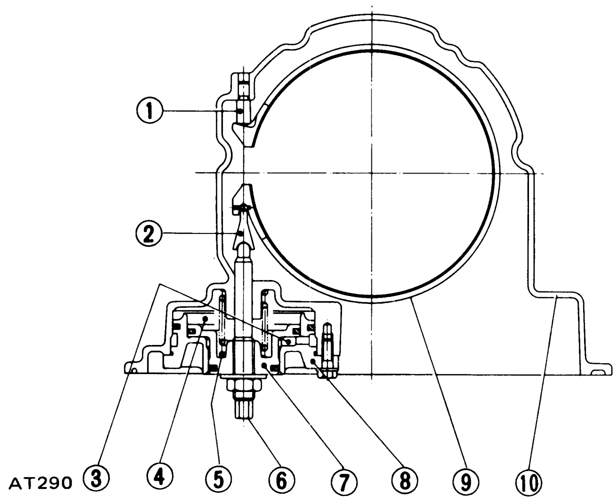
Inspection

Check piston for wear, damage or other faults which might interfere with proper brake operation.



AT159

Fig. AT-91 Removing piston



1 Anchor end pin
2 Band strut
3 Apply
4 Release
5 Return spring
6 Band servo piston stem
7 Band servo piston
8 Servo retainer
9 Brake band assembly
10 Transmission case

Fig. AT-92 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-93.

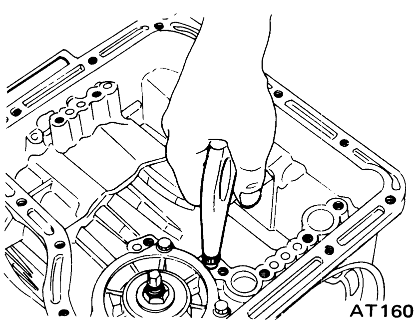


Fig. AT-93 Testing piston (Apply side)

4. With apply-side of piston plugged with thumb, blow compressed air into cylinder from release-side as shown in Figure AT-94. If retainer is raised a little, it is an indication that attaching bolts are loose, calling for retightening.

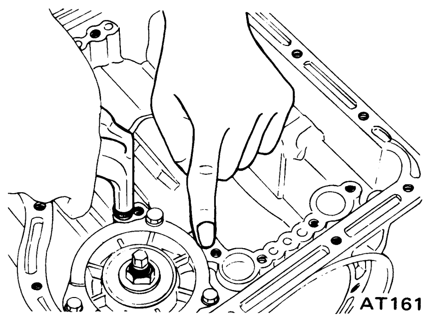
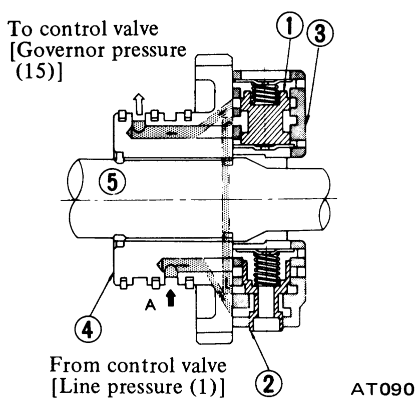


Fig. AT-94 Testing piston (Release side)

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-95.



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

Fig. AT-95 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 springs. Secondary governor spring is stronger than primary governor spring. 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.

Note: Be careful not to confuse respective sides of inner and outer gears.

Inspection

1. Inspect for wear or damage to gear teeth. Replace rubber ring if fround 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-96.

Standard clearance:
0.02 to 0.04 mm
(0.001 to 0.002 in)

[Replace if over 0.08 mm (0.003 in).]

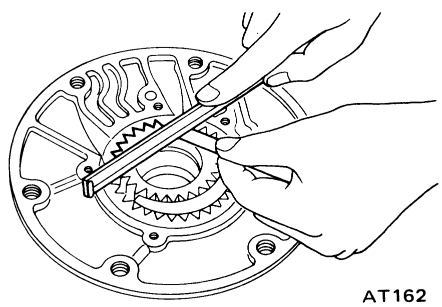


Fig. AT-96 Measuring clearance

- Clearance between seal ring and ring groove. See Figure AT-97.

Standard clearance:
0.04 to 0.16 mm
(0.002 to 0.006 in)

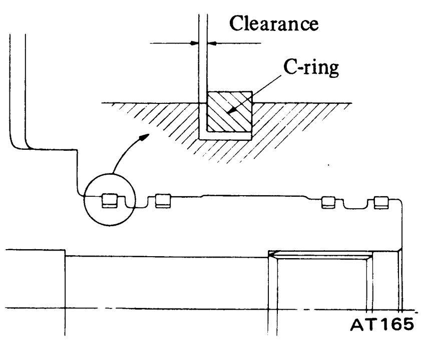


Fig. AT-97 Measuring clearance

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-98.

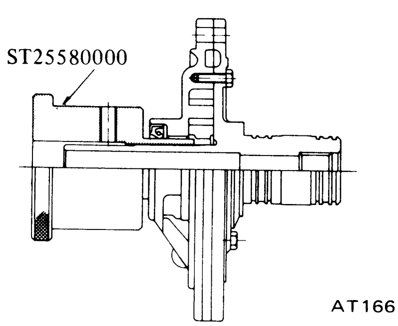


Fig. AT-98 Centering oil pump

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-99.

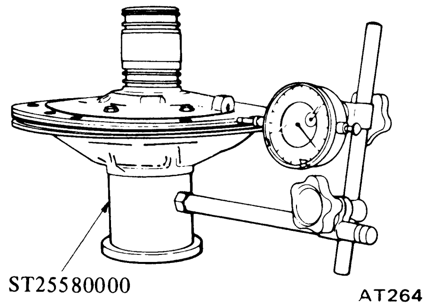


Fig. AT-99 Measuring runout

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-100.

- Standard clearance:
  0.20 to 0.70 mm
  (0.008 to 0.028 in)

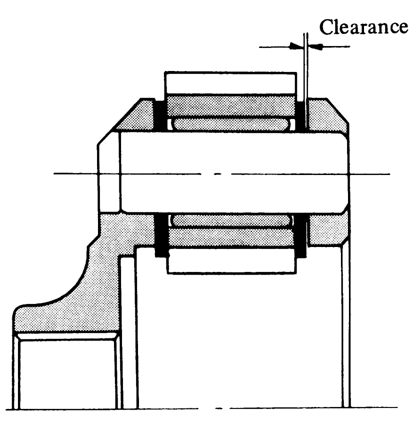


Fig. AT-100 Measuring pinion washer to carrier clearance

[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-101.

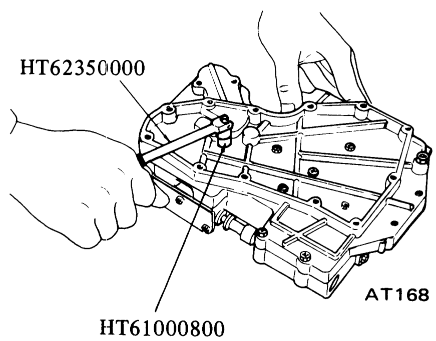


Fig. AT-101 Disassembling valve body

2. Remove attaching bolts. With bolts removed, lower valve body, separate plate, and upper valve body are free for removal. See Figure AT-102.

CAUTION:
Do not allow orifice check valve and valve spring in lower valve body to be scattered and lost when removing separate plate.

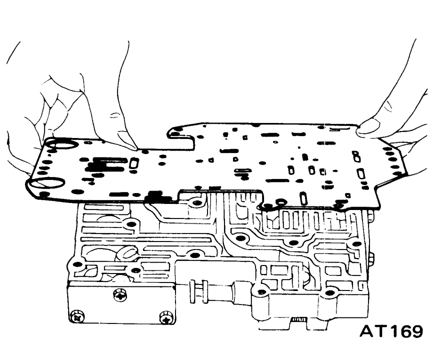


Fig. AT-102 Removing separate plate

3. Pull out manual valve as shown in Figure AT-103.
4. Remove side plate. Take out "1st-2nd" shift valve, "2nd-3rd" shift valve, pressure modifier valve and three valve springs. See Figure AT-104.

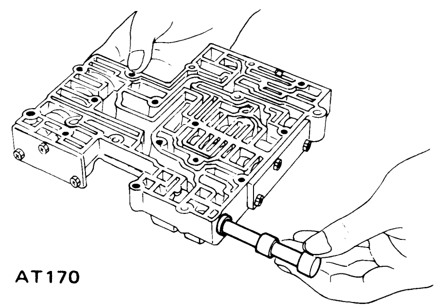


Fig. AT-103 Removing manual valve

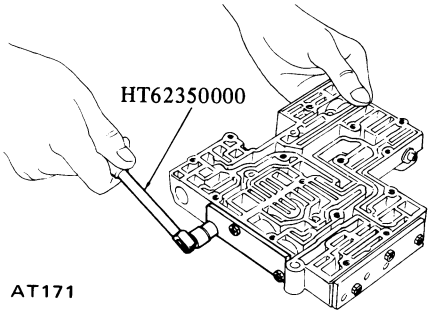


Fig. AT-104 Removing side plate

CAUTION:
Do not work it off with screwdrivers. To avoid damaging machine screws do not work it off with screwdriver.

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.

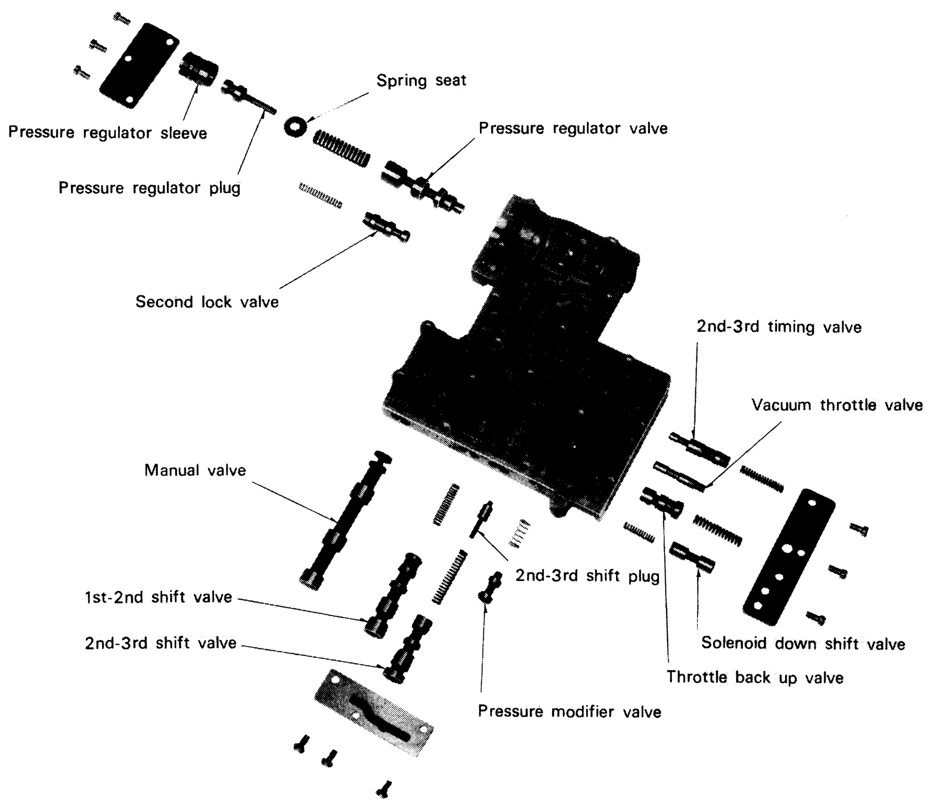


Fig. AT-105 Components parts of control valve

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 tension; if necessary replace.
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.

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)	Installed Load kg (lb)
Manual detent	1.3 (0.051)	6.0 (0.236)	15.0	32.4 (1.276)	26.5 (1.043)	5.5 (12.1)
Pressure regulator	1.2 (0.047)	10.5 (0.413)	13.0	43.0 (1.693)	23.5 (0.925)	2.8 (6.2)
Pressure modifier	0.4 (0.016)	8.0 (0.315)	5.0	18.5 (0.728)	9.0 (0.354)	0.1 (0.2)
1st - 2nd shift	0.6 (0.024)	6.0 (0.236)	16.0	32.0 (1.260)	16.0 (0.630)	0.625 (1.378)
2nd - 3rd shift	0.7 (0.028)	6.2 (0.244)	18.0	41.0 (1.614)	17.0 (0.669)	1.40 (3.09)
2nd - 3rd timing	0.7 (0.028)	5.5 (0.217)	15.0	32.5 (1.280)	27.0 (1.063)	0.55 (1.21)
Thro[illegible]ck-up	0.8 (0.031)	6.5 (0.256)	14.0	36.0 (1.417)	18.8 (0.740)	1.92 (4.23)
Solenoid downshift	0.55 (0.0217)	5.0 (0.197)	12.0	22.0 (0.866)	12.5 (0.492)	0.60 (1.32)
Second lock	0.55 (0.0217)	5.0 (0.197)	16.0	33.5 (1.319)	21.0 (0.827)	0.60 (1.32)
Throttle relief	0.9 (0.035)	5.6 (0.220)	14.0	26.8 (1.055)	19.0 (0.748)	2.19 (4.83)
Orifice check	0.23 (0.0091)	4.77 (0.1878)	12.0	15.5 (0.610)	11.5 (0.453)	0.01 (0.02)
Primary governor	0.45 (0.0177)	8.3 (0.327)	5.0	21.8 (0.858)	7.5 (0.295)	0.215 (0.474)
Secondary governor	0.7 (0.028)	8.5 (0.335)	5.5	25.1 (0.988)	10.5 (0.413)	1.10 (2.43)

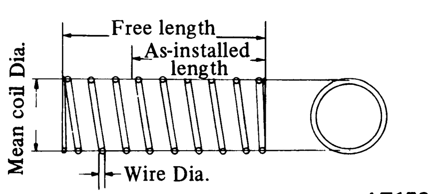


Fig. AT-106 Valve spring

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.
2. Install side plates using Torque Driver ST25160000 and Hexagon Wrench HT61000800. See Figure AT-107.

Tightening torque:
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

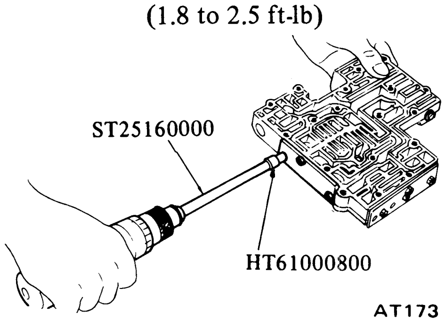


Fig. AT-107 Installing side plate

3. Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.

CAUTION:
Install check valve and relief spring so that they are properly positioned in valve body. See Figure AT-109.

4. Install upper and lower valves. See Figure AT-108.

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)

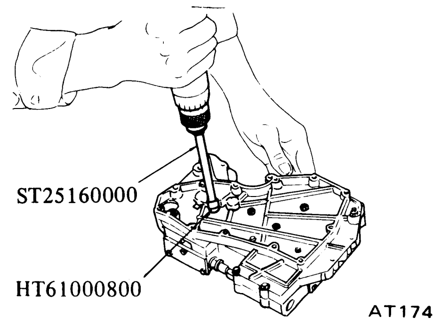


Fig. AT-108 Installing valve body

5. Install oil strainer.

Tightening torque:
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

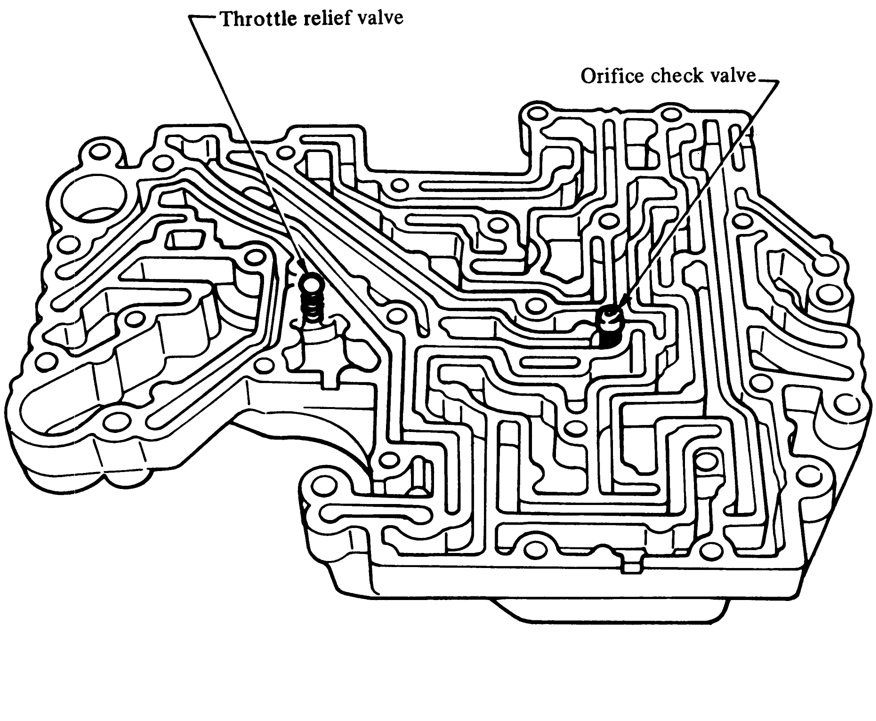


Fig. AT-109 Position of check valve and spring

TROUBLE DIAGNOSIS AND ADJUSTMENT

CONTENTS

INSPECTION AND ADJUSTMENT BEFORE TROUBLE DIAGNOSIS AT-48
TESTING INSTRUMENT FOR INSPECTION . AT-48
CHECKING OIL LEVEL AT-48
INSPECTION AND REPAIR OF OIL LEAKAGE AT-49
CHECKING ENGINE IDLING REVOLUTION AT-49
CHECKING AND ADJUSTING KICKDOWN SWITCH AND DOWNSHIFT SOLENOID AT-49
INSPECTION AND ADJUSTMENT OF MANUAL LINKAGE AT-49
CHECKING AND ADJUSTING INHIBITOR SWITCH AT-49
STALL TEST AT-50
STALL TEST PROCEDURES AT-50
JUDGEMENT AT-50
ROAD TEST AT-51
VEHICLE SPEED AND LINE PRESSUR WHEN SHIFTING GEARS AT-51
CHECKING SPEED CHANGING CONDITION . AT-52
CHECKING ITEMS DURING SPEED CHANGE AT-52
SHIFT SCHEDULE AT-52
LINE PRESSURE TEST AT-52
LINE PRESSURE (governor feed pressure) AT-53
JUDGEMENT IN MEASURING LINE PRESSURE AT-53
TROUBLE SHOOTING CHART AT-53
INSPECTING ITEMS AT-53
TROUBLE SHOOTING CHART FOR 3N71B AUTOMATIC TRANSMISSION AT-54
TROUBLE SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION AT-57

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. 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 (⅞U.S. pt., ¾Imp. 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 control valve to stick. Blackened oil indicates a burned clutch, brake band, etc.

In these cases, the transmission must be replaced.

Note: **Insert the gauge fully and take it out quickly before splashing oil adheres to the gauge. Then observe the level.**

CAUTION:

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

c. Pay attention because the oil to be used differs from that used in the Nissan Full Auotmatic 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.
- Bolts of converter housing to case.

2. Transmission and rear extension
- Junction of transmission and rear extension.
- Oil cooler tube connectors.
- Oil pan.
- Oil-pressure inspection holes (Refer to Figure AT-113).
- 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.

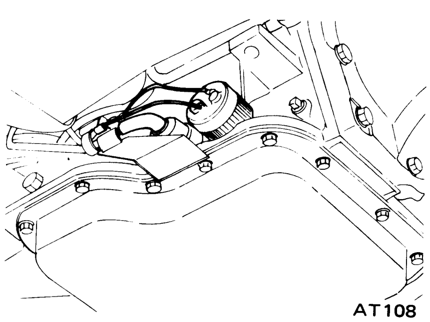


Fig. AT-110 Downshift solenoid

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.

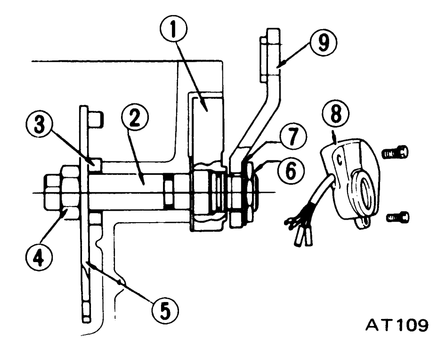
Inspect whether the pointer of selector dial corresponds to this point, and also whether the lever comes in alignment with the stepping of position plate when it is released.

Adjustment

This procedure can be accomplished by referring to page AT-35 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-111 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 (0.059 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.

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.
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".

CAUTION:

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".

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.

VEHICLE SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

Intake manifold vacuum −mmHg	Gearshift	Vehicle speed ** km/h (MPH)	Propeller shaft rpm	Line pressure kg/cm² (psi)
0 (Kickdown)	$D_1 \rightarrow D_2$	55 to 62 (34 to 39)	1,970 to 2,220	5.4 to 7.0 (77 to 100)
	$D_2 \rightarrow D_3$	96 to 103 (60 to 64)	3,480 to 3,730	
	$D_3 \rightarrow D_2$	88 to 94 (55 to 58)	3,160 to 3,410	
	$D_2 \rightarrow D_1$	41 to 48 (25 to 30)	1,470 to 1,720	
100	$D_1 \rightarrow D_2$	21 to 28 (13 to 17)	750 to 1,000	4.5 to 6.1 (64 to 87)
	$D_2 \rightarrow D_3$	62 to 68 (39 to 42)	2,210 to 2,460	
	$D_3 \rightarrow D_2$	37 to 44 (23 to 27)	1,350 to 1,600	
	$D_2 \rightarrow D_1$	10 to 17 (6 to 11)	350 to 600	
0 (Full throttle)	$1_2 \rightarrow 1_1$*	42 to 48 (26 to 30)	1,500 to 1,750	5.6 to 7.2 (80 to 102)
300	$1_2 \rightarrow 1_1$*	42 to 48 (26 to 30)	1,500 to 1,750	5.6 to 7.2 (80 to 102)

* : Reduce the speed by shifting to "1" range from "D" range (output shaft 2,000 rpm).

Note: **Vehicle 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 = Vehicle 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

**: R_F = 4.375
r = 0.321 [6.00-14]

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.

This indicates that the throttle pressure is too high or some valve connected to the throttle is faulty.

2. A gear change is made with a long and dragging feeling.

This indicates that the throttle pressure is too low or some valve connected to the throttle is faulty.

CHECKING ITEMS DURING SPEED CHANGE

1. In "D" range, gear changes, $D_1 \longrightarrow D_2 \longrightarrow D_3$ 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 $D_3 \longrightarrow 2(1_2) \longrightarrow 1_1$ are effected. In the ranges "1_2" and "1_1", 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 "D_1", directly to "D_3" or in shifting up from "D_1" to "D_2", the brake band should be adjusted. If these troubles remain after the brake band is adjusted, check the servo piston seal for oil leakage.

SHIFT SCHEDULE

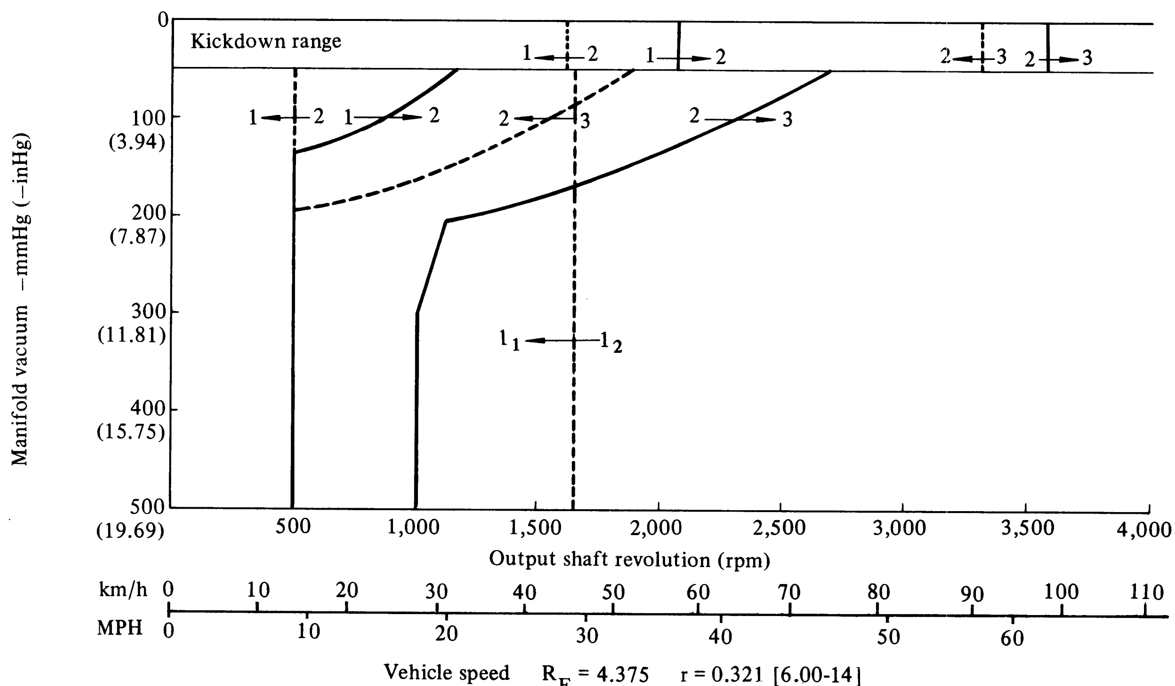


Fig. AT-112 Shift schedule

LINE PRESSURE TEST

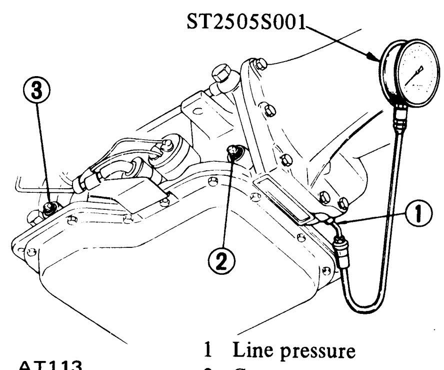
When any slipping occurs in clutch or brake, or the feeling during a speed change is not correct, the line pressure must be checked.

Measuring line pressure is done by a pressure gauge attached to pressure measuring holes after removing blind plugs located at transmission case. See Figure AT-113.

The line pressure measurement is begun at idling and taken step by step by enlarging the throttle opening.

The line pressure at gear shift is shown in Road Test.

1. A sharp shock in up-shifting 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 pressure
3 Servo release pressure

Fig. AT-113 Measuring line pressure

LINE PRESSURE

At idling

Range	Line pressure kg/cm² (psi)
R	4.2 to 5.6 (60 to 80)
D	3.2 to 3.8 (46 to 54)
2	6.0 to 11.7 (85 to 166)
1	3.2 to 3.8 (46 to 54)

At stall test

Range	Line pressure kg/cm² (psi)
R	14.3 to 16.2 (203 to 230)
D	9.9 to 11.1 (141 to 158)
2	10.2 to 11.7 (145 to 166)
1	9.9 to 11.1 (141 to 158)

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".

-. 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 300 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 troque converter
v One-way clutch of transmission
w Front clutch check ball
x Parking linkage
y Planetary gear

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	.	.	.	.	.

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	.	.	..	.	.	.	.	.	.	.	.	.	.	.	.	.	.

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

TROUBLE SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION

Order	Test item	Procedure
Checking	1. Oil level gauge	Check gauge for oil level and leakage before and after each test.
	2. Downshift solenoid	Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON".
	3. Manual linkage	Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.
	4. Inhibitor switch	Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.
	5. Engine idling rpm	Check whether idling rpm meets standard.
	6. Vacuum pressure of vacuum pipe.	Check whether vacuum pressure is more than 450 mmHg in idling and whether it decreases with increasing rpm.
	7. Operation in each range	Check whether transmission engages positively by shifting "N"→"D", "N"→"2", "N"→ "1" and "N"→"R" range while idling with brake applied.
	8. Creep of vehicle	Check whether there is any creep in "D", "2", "1" and "R" ranges.
Stall test	1. Oil pressure before testing	Measure line pressures in "D", "2", "1" and "R" range while idling.
	2. Stall test	Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation. Note: **Temperature of torque converter oil used in test should be from 60 to 100°C (140 to 212°F) i.e., sufficiently warmed up but not overheated.** **CAUTION:** **To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range. Measurement time must not be more than 5 seconds.**
	3. Oil pressure after testing	Same as item 1.
Road test	1. Slow acceleration, 1st→2nd 2nd→3rd	Check 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.
	2. Quick acceleration, 1st→2nd 2nd→3rd	Same as item 1 above except with engine vacuum pressure of 0 mmHg (i.e., in position just before kickdown).
	3. Kickdown operation, 3rd→2nd or 2nd→1st	Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 38, 44 MPH) in "D_3" range.

Order	Test item	Procedure
	4. Shift down, $D_3 \rightarrow D_2 \rightarrow D_1$	Check vehicle speeds and engine rpm in shifting down from 3rd→2nd→1st (sequentially) while coasting with accelerator pedal released in "D_3" range and engine vacuum pressure of about 450 mmHg.
	5. Shift down, $D_3 \rightarrow 1_2 \rightarrow 1_1$	Check for shifting down $D_3 \rightarrow 1_2$ and engine braking, and further for shifting down $1_2 \rightarrow 1_1$ and engine braking, after shifting the lever into "1" range with the accelerator pedal released and the engine vacuum pressure of 0 mmHg while driving at about 50 km/h (31 MPH) in "D_3" range.
	6. Shift down, $D_3 \rightarrow 2$	Check for quick shifting down $D_3 \rightarrow 2$ and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (31 MPH) in "D_3" range. Further, check for locking of the transmission in 2nd gear ratio regardless of vehicle speed.
	7. Shift up, $1_1 \rightarrow 1_2$	Check for failure of the transmission to shift up during acceleration, when starting in "1" range.
	8. Shift up or down when starting in "2" range	Check the transmission for not shifting up or down during acceleration or deceleration, when starting in "2" range.
	9. Parking	Confirm that vehicle will not move on grade when shifting to "P" range.
Others	Abnormal shock. oil leakage	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Model	3N71B
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
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. Enigne 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 pump	1
Oil	Automatic transmission fluid "DEXRON" type
Capacity	5.5 liters (5 7/8 US qt, 4 7/8 Imp qt) Approximately 2.7 liters (2 7/8 US qt, 2 3/8 Imp qt) in torque converter
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).

SPECIFICATIONS AND ADJUSTMENT

Automatic transmission assembly

Model code number		X2461

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 2.0 (0.063 to 0.079)
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)	0.8 to 1.6 (0.031 to 0.063)
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 1.25 (0.0315 to 0.0492)
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 diameter		64 (2.52)
Small diameter		40 (1.57)

Control valve assembly

Stamped mark on strainer		LEJ

Governor assembly

Stamped mark on governor body		35

Engine idling and stall revolution

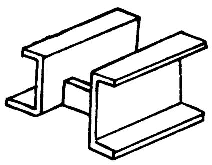
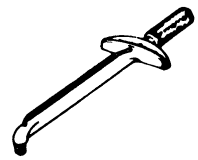
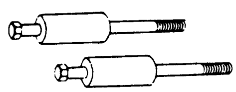
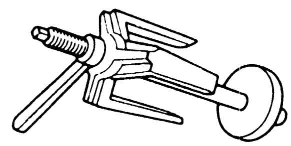
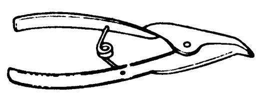
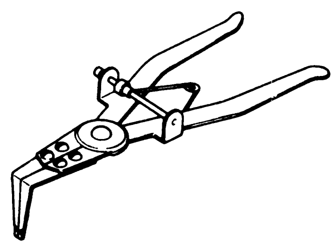
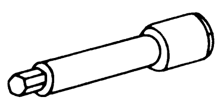
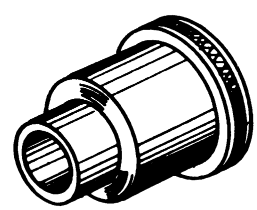
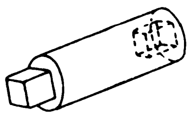
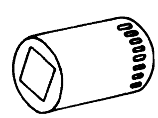
Idling revolution	rpm	600 at "D" position
Stall revolution	rpm	1,900 to 2,200

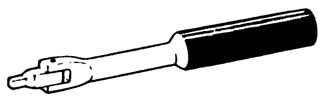
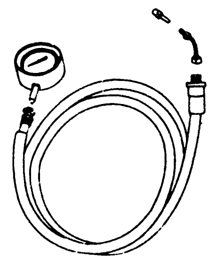
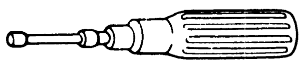
TIGHTENING TORQUE

	kg-m (ft-lb)
Drive plate to crankshaft	14.0 to 16.0 (101 to 116)
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 (9 to 11)
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 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 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

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST07870000 Transmission case stand (ST07860000) 	J 25607 Fig. AT-52	GG93010000 Torque wrench 	J 25703 Fig. AT-69
ST25850000 Sliding hammer 	J 25721 Fig. AT-56	ST25420001 Clutch spring compressor (ST25420000) 	J 26063 Fig. AT-79 Fig. AT-86
HT69860000 Snap ring remover 	—— Fig. AT-59	ST25320001 Snap ring remover 	J25710 Fig. AT-79 Fig. AT-86
ST25570001 Hex-head extension (ST25570000) 	J 25718 Fig. AT-64	ST25580000 Oil pump assembling gauge 	J 25719 Fig. AT-98
ST25490000 Socket extension (ST25512001) 	J 25713 Fig. AT-69	HT61000800 Hexagon wrench 	—— Fig. AT-101 Fig. AT-104

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
HT62350000 Spinner handle 	——— / Fig. AT-101 Fig. AT-104	ST2505S001 Oil pressure gauge set 	J 25695 / Fig. AT-113
ST25160000 Torque driver 	——— / Fig. AT-107 Fig. AT-108		

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

PD

PROPELLER SHAFT AND CENTER BEARING .... PD- 2

DIFFERENTIAL CARRIER (TYPE H190) .... PD- 5

TROUBLE DIAGNOSES AND CORRECTIONS PD-14

SERVICE DATA AND SPECIFICATIONS PD-16

SPECIAL SERVICE TOOLS PD-19

PROPELLER SHAFT AND CENTER BEARING

CONTENTS

DESCRIPTION PD-2
REMOVAL AND INSTALLATION PD-2
DISASSEMBLY AND ASSEMBLY PD-3
INSPECTION PD-3
CHECKING AND CORRECTING UNBALANCED PROPELLER SHAFT PD-3
SERVICE DATA PD-4
TROUBLE DIAGNOSES AND CORRECTIONS PD-4

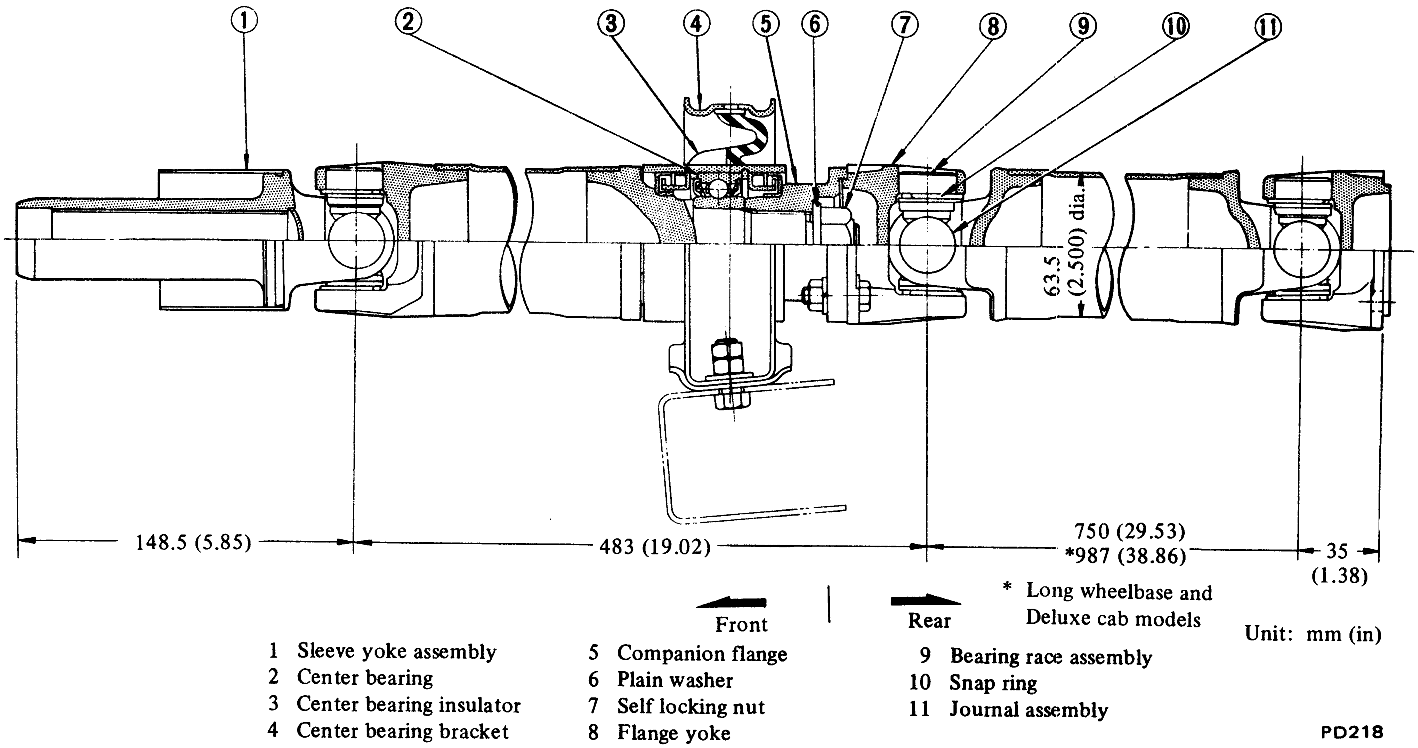


Fig. PD-1 Cross-sectional view of propeller shaft

DESCRIPTION

The propeller shaft on the 620 series is 3-joint type.

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 5,800 rpm.

If the propeller shaft has to be assembled, it must be made carefully so that the above limit is not exceeded. Therefore, when the vehicle is to be undercoated, cover the propeller shaft and universal joints to prevent application of the undercoating material.

REMOVAL AND INSTALLATION

1. Raise vehicle 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 retaining center bearing bracket. See Figure PD-2.

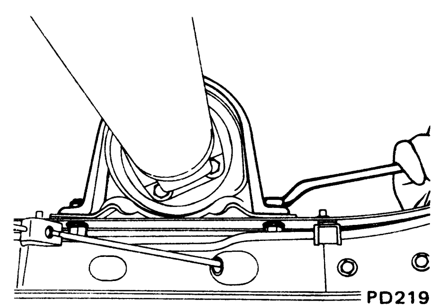


Fig. PD-2 Removing center bearing bracket

3. Remove bolts connecting shaft to companion flange of differential carrier. See Figure PD-3.

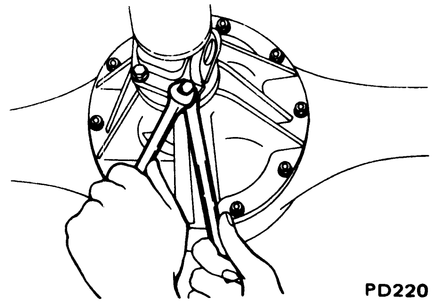


Fig. PD-3 Removing propeller shaft

4. Withdraw propeller shaft sleeve yoke from transmission by moving shaft rearward, passing it under rear axle.

Watch for oil leakage from transmission end.

Note:

a. **Remove propeller shaft carefully so as not to damage spline, sleeve yoke and rear oil seal.**
b. **Plug up the opening in the rear of rear extension housing to prevent oil from flowing out.**

To install, reverse the foregoing removal procedure.

CAUTION:
Align propeller shaft with companion flange using reference marks prescribed in removal procedure and assemble with bolts.

Tightening torque:
2.4 to 3.3 kg-m
(17 to 24 ft-lb)

Insert bolts through the holes of center bearing bracket and torque nuts to retain center bearing on crossmember.

Tightening torque:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

DISASSEMBLY AND ASSEMBLY

Primarily, do not disassemble propeller shaft because it is balanced as an assembly.

However, check propeller shaft with journal for movement. When 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.

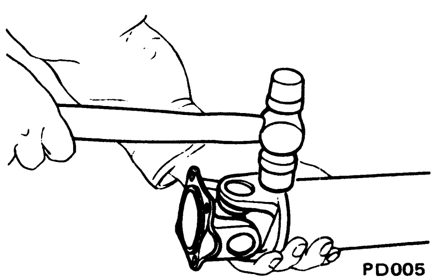


Fig. PD-4 Removing bearing

Note: When removing journal from yoke, be careful not to damage journal and yoke hole.

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. Applying Drive Pinion Flange Wrench ST31530000, loosen off locking nut and remove center bearing. See Figure PD-5.

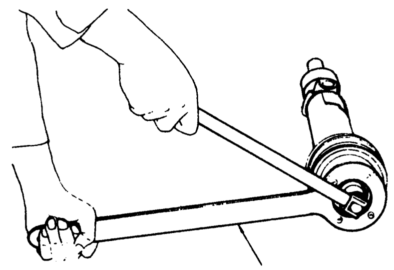


Fig. PD-5 Removing locking nut

To assemble, reverse the foregoing procedure using reference marks prescribed in disassembly procedure.

New bearing need not be lubricated since it is lubricated for life. Fill joint with recommended multi-purpose grease whenever propeller shaft is overhauled.

Use related snap rings of the same thickness and 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)	Right Brown
2.12 (0.0835)	No paint
2.14 (0.0843)	Pink

Install and assemble components correctly so that joint moves under friction resistance of less than 15.0 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 5,800 rpm.

Center bearing assembling procedures are as follows:

1. Install center bearing in center bearing insulator.
2. Install center bearing assembly and companion flange on front shaft using reference marks established in disassembly procedure.
3. Install washer and locking nut on front shaft and tighten nut using Drive Pinion Flange Wrench ST31530000 to specified torque.

Tightening torque:
20.0 to 24.0 kg-m
(145 to 174 ft-lb)

4. Join companion flange of front shaft with flange yoke of rear shaft and tighten connect bolts to specified torque.

Tightening torque:
2.4 to 3.3 kg-m
(17 to 24 ft-lb)

5. Install center bearing bracket on center bearing.

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. If it is rough, noisy or damaged, discard. Cracked bearing insulator cannot be tolerated here.
3. Check propeller shaft tube surface for dent or crack. Change if necessary.

CHECKING AND CORRECTING UNBALANCED PROPELLER SHAFT

To check and correct an unbalanced propeller shaft, proceed as follows:

1. Remove undercoating and other foreign materials which could upset shaft balance, and check shaft vibration by road test.
2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange 180 degrees and reinstall propeller shaft.
3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

SERVICE DATA

Permissible dynamic unbalance	gr-cm (in-oz)	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 15.0 (13)
Propeller shaft (front and rear) out of round	mm (in)	Less than 0.6 (0.024)
Tightening torque		
Shaft to companion flange (Gear carrier) bolt	kg-m (ft-lb)	2.4 to 3.3 (17 to 24)
Self locking nut (front shaft)	kg-m (ft-lb)	20.0 to 24.0 (145 to 174)
Flange yoke (rear shaft) to companion flange (front shaft) bolt	kg-m (ft-lb)	2.4 to 3.3 (17 to 24)
Center bearing bracket to cross member bolt	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration during at medium or high speed.	Worn or damaged universal joint needle bearing.	Replace.
	Unbalance due to bent or dented propeller shaft.	Replace.
	Loose propeller shaft installation.	Retighten.
	Worn transmission rear extension bushing.	Replace.
	Damaged center bearing or insulator.	Replace.
	Tight universal joints.	Impact yokes with hammer to free up. Replace joint if unable to free up or if joint feels rough when rotated by hand.
	Undercoating or mud on the shaft causing unbalance.	Clean up shaft.
	Tire unbalance.	Balance wheel and tire assembly or replace from known good vehicle.
	Balance weights missing.	Replace.

Condition	Probable cause	Corrective action
Knocking sound during starting or noise during coasting on propeller shaft.	Worn damaged universal joint.	Replace.
	Worn sleeve yoke and main shaft spline.	Replace.
	Loose propeller shaft installation.	Retighten.
	Loose joint installation.	Adjust snap ring.
	Damaged center bearing or insulator.	Replace.
	Loose or missing bolts at center bearing bracket to body.	Replace or tighten bolts.
Scraping noise.	Dust cover on sleeve yoke rubbing on transmission rear extension. 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 H190)

CONTENTS

DESCRIPTION .... PD- 5
REMOVAL .... PD- 7
PRE-DISASSEMBLY INSPECTION .... PD- 7
DISASSEMBLY .... PD- 7
INSPECTION .... PD- 8
ASSEMBLY AND ADJUSTMENT .... PD- 8
PRECAUTIONS IN REASSEMBLY .... PD- 8
ASSEMBLY OF DIFFERENTIAL CASE ..... PD- 8
ASSEMBLY OF DIFFERENTIAL CASE .... PD- 8
ADJUSTMENT OF DRIVE PINION HEIGHT .... PD- 9
ADJUSTMENT OF DRIVE PINION PRELOAD PD-10
ADJUSTMENT OF SIDE BEARING SHIMS PD-11
INSTALLATION PD-13
REPLACEMENT OF FRONT OIL SEAL PD-13

DESCRIPTION

The differential carrier on the 620 series has a gear ratio of 4.375.

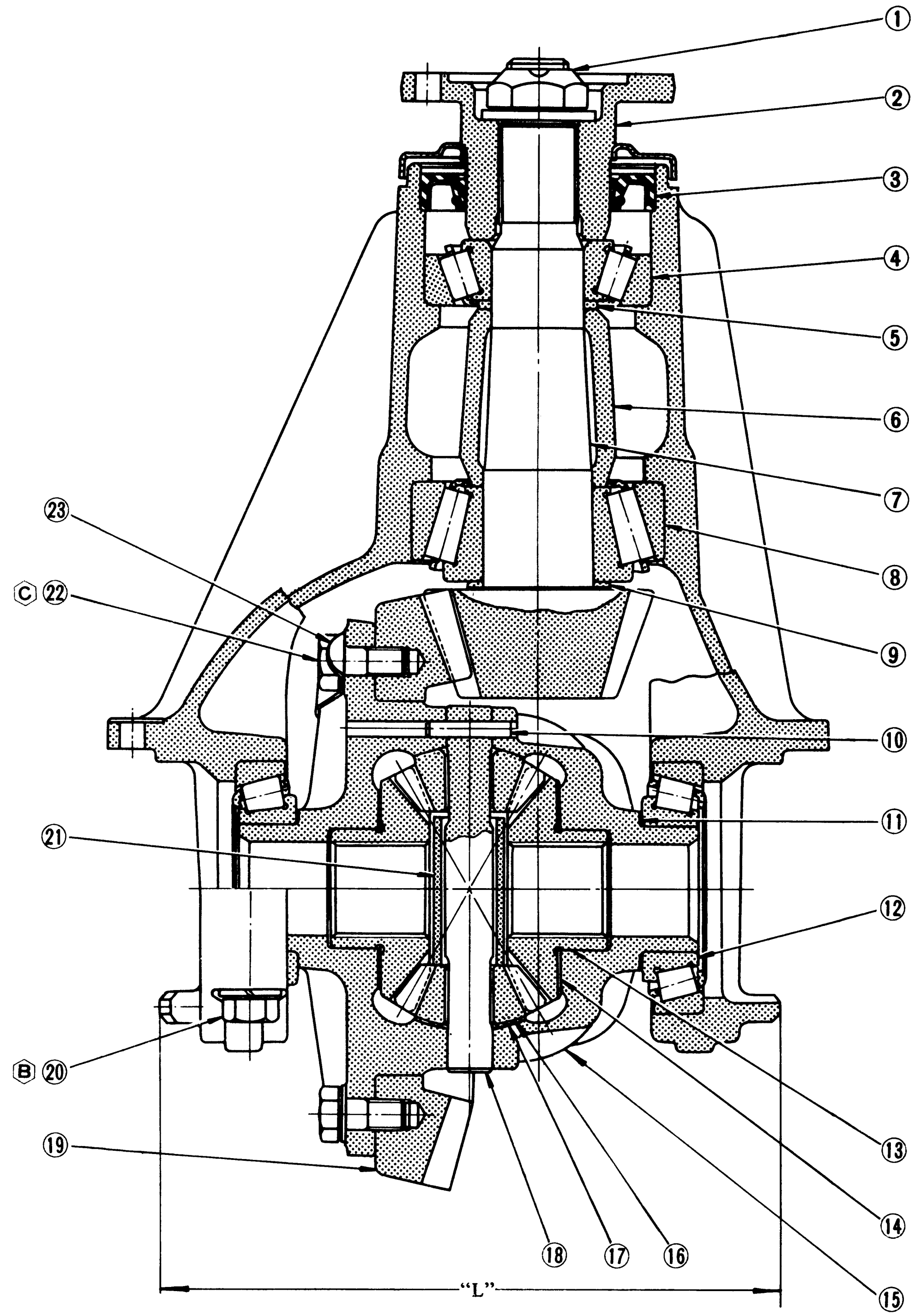
The drive pinion is mounted in two tapered roller bearings which are preloaded by pinion bearing adjusting spacer and washer during assembly.

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 bearings and the differential case. The differential case assembly is positioned for proper ring gear and 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 pinion mates mounted on a pinion shaft. The pinion shaft anchored in the case by lock pin. The pinion mates and side gears are backed by thrust washers.

The carrier is of malleable cast iron.

(TYPE H190)



1 Drive pinion nut
2 Companion flange
3 Oil seal
4 Front bearing
5 Drive pinion bearing adjusting washer
Adjust pinion bearing preload by selecting ⑤ and ⑥.
6 Drive pinion bearing spacer
7 Drive pinion
8 Rear bearing
9 Drive pinion adjusting washer
10 Lock pin
11 Side bearing adjusting shim
Adjust side bearing preload and backlash between ring gear and drive pinion by selecting ⑪.
12 Side bearing
13 Side gear
14 Thrust washer
Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to 0.02 to 0.08 mm (0.0008 to 0.0031 in) by ⑭.
15 Differential case
16 Thrust washer
17 Pinion mate
18 Pinion shaft
19 Ring gear
Backlash between ring gear and drive pinion:
0.15 to 0.20 mm
(0.0059 to 0.0079 in).
20 Bearing cap bolt
21 Thrust block
22 Ring gear bolt
23 Lock strap

Tightening torque (T) of bolts and nut kg-m (ft-lb)

Ⓐ T : 14.0 to 17.0 (101 to 123)
Ⓑ T : 4.0 to 5.0 (29 to 36)
Ⓒ T : 7.0 to 8.0 (51 to 58)

L : 198.40 to 198.55 mm
(7.8110 to 7.8169 in)

PD229

Fig. PD-6 Cross-sectional view of differential carrier

REMOVAL

1. Jack up rear of vehicle 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 by referring to "Rear Axle and Rear Suspension".
3. Loosen off bolts securing differential carrier to rear axle case, and take out differential carrier assembly.

PRE-DISASSEMBLY INSPECTION

Differential carrier should be inspected before any parts are removed from it.

These inspections are helpful to find the cause of a problem and to determine the corrections needed.

1. Mount differential carrier on Differential Attachment ST06310000.

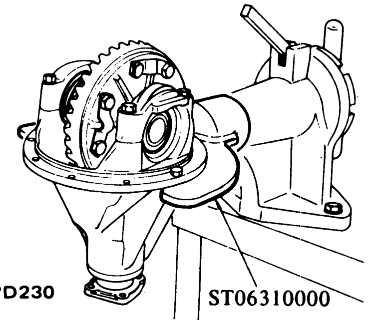


Fig. PD-7 Holding differential carrier

2. Visually inspect parts for wear or damage.
3. Rotate gears to see if 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. See Figure PD-19.
4. Set up a dial indicator and check the backlash at several points around ring gear. Backlash should be 0.15 to 0.20 mm (0.0059 to 0.0079 in).
5. Check the gear tooth contact with a mixture of ferric oxide and gear oil to all ring gear teeth.

For the tooth contact pattern, see paragraph dealing with tooth contact pattern adjustment.

DISASSEMBLY

1. Put match marks on side bearing caps and carrier, and remove side bearing caps and take out differential case assembly.

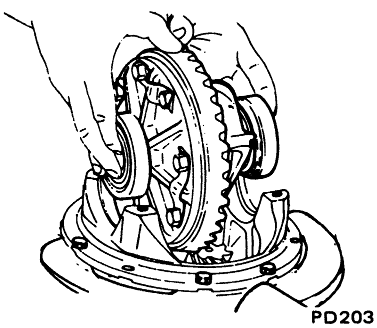


Fig. PD-8 Removing differential case assembly

Note: Care should be taken not to confuse the left and right hand bearing caps and bearing outer race 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 standard puller.

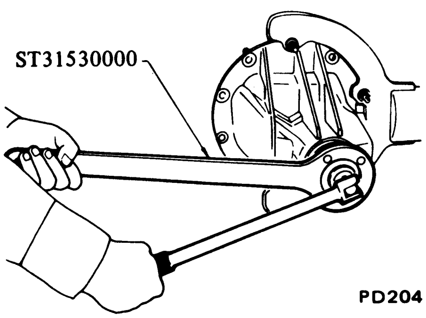


Fig. PD-9 Removing drive pinion nut

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, bearing spacer and washer.
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.

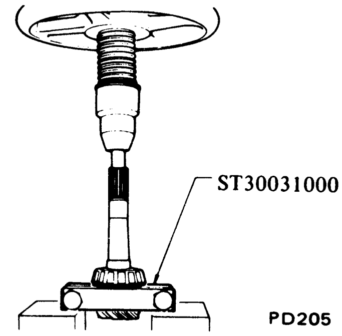


Fig. PD-10 Removing pinion rear bearing inner race

6. To remove outer races of both front and rear bearing, apply a brass drift to race side surface, and withdraw them by tapping the top of drift with a hammer.

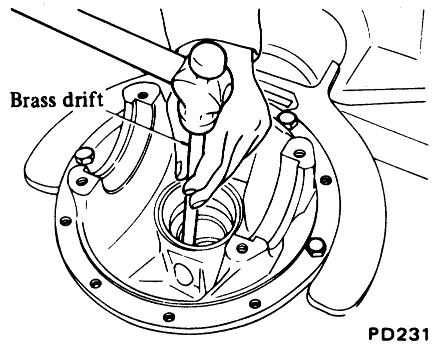


Fig. PD-11 Removing pinion front and rear bearing outer races

Disassembly of differential case

1. When replacing side bearing, use Differential Side Bearing Puller Set ST3306S001 (set of ST33051001 and ST33061000).

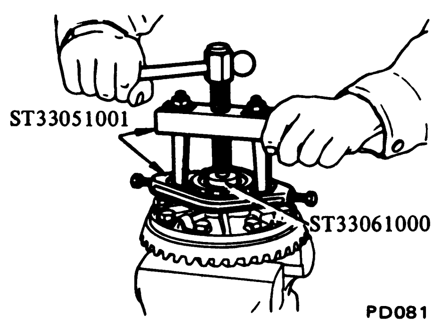


Fig. PD-12 Removing side bearing

Note:

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.

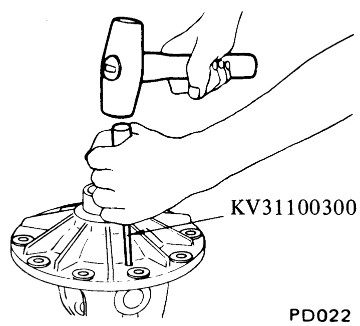


Fig. PD-13 Removing lock pin

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 shaft and remove thrust block, pinion mates, side gears and thrust washers.

Note: **Put marks on gear and thrust washer so that they can be reinstalled in their original positions from which they were removed.**

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see if 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 and 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 shaft, and pinion mate 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.
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 0.02 to 0.08 mm (0.0008 to 0.0031 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 grease cavity between lips when fitting oil seal.

ASSEMBLY OF DIFFERENTIAL CASE

1. Assemble pinion mates, side gears, thrust block 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 0.10 to 0.20 mm (0.0039 to 0.0079 in) by selecting side gear thrust washer.

Side gear thrust washer

Thickness mm (in)
Over 0.75 to 0.80 (0.0295 to 0.0315)
Over 0.80 to 0.85 (0.0315 to 0.0335)
Over 0.85 to 0.90 (0.0335 to 0.0354)
Over 0.90 to 0.95 (0.0354 to 0.0374)

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 strap.

Tightening torque:
7.0 to 8.0 kg-m
(51 to 58 ft-lb)

CAUTION:

a. Use only genuine ring gear bolts and new lock strap.
b. Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer.

7. When replacing side bearing, measure bearing width using a standard gauge [20.00 mm (0.7874 in) thickness] and a weight block 2.5 kg (5.5 lb) prior to installation. See Figure PD-14.

Standard bearing width:
20.00 mm (0.7874 in)

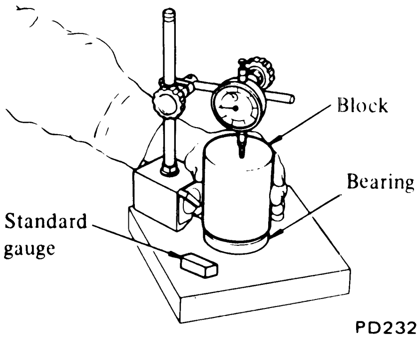


Fig. PD-14 Measuring bearing width

8. Press fit side bearing cone into differential case using Differential Side Bearing Drift ST33230000 and Adapter ST33061000.

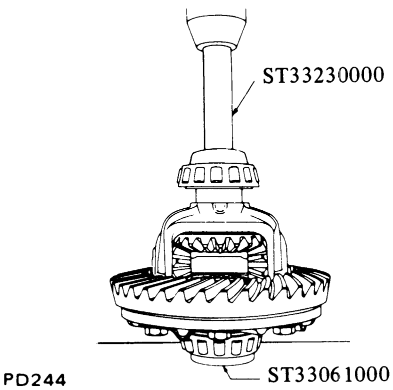


Fig. PD-15 Installing side bearing cone

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.

Front:

ST30611000 and
ST30613000

Rear:

ST30611000 and
ST30621000

2. Fit rear bearing on carrier and install Dummy Shaft ST31942000 and Collar ST31970000 on rear bearing, and place Height Gauge ST31941000 on carrier.

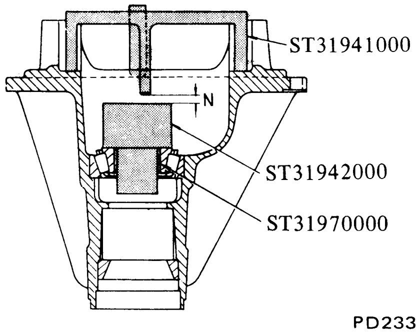


Fig. PD-16 Adjusting pinion height

3. Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge.

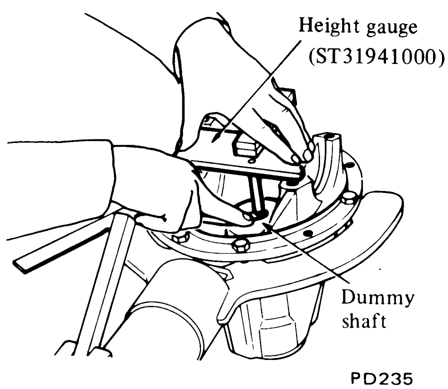


Fig. PD-17 Measuring clearance

4. The thickness of drive pinion height adjusting washers can be obtained from the following formula:

$$T = N - [(H - D' - S) \times 0.01] + 2.18$$

Where,

T : Required thickness of rear bearing adjusting washers (mm).
N : Measured value with thickness gauge (mm).
H : Figure marked on the drive pinion head. See Figure PD-18.
D' : Figure marked on the dummy shaft.
S : Figure marked on the height gauge.

Figures for H, D' and S are dimensional variations in a unit of 1/100 mm against each standard measurement.

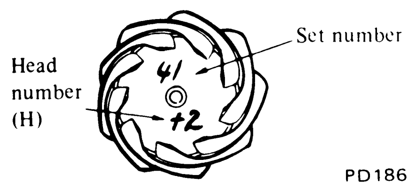


Fig. PD-18 Variation number on drive pinion

Examples of calculation

Ex. 1 ---

$N = 0.51$ mm, $H = +2$, $D' = -1$, $S = 0$

$$\begin{aligned} T &= N - [(H - D' - S) \times 0.01] + 2.18 \\ &= 0.51 - [((+2) - (-1) - (0)) \times 0.01] + 2.18 \\ &= 0.51 - [(2 + 1 - 0) \times 0.01] + 2.18 \\ &= 0.51 - [3 \times 0.01] + 2.18 \\ &= 0.51 - 0.03 + 2.18 \\ &= 2.66 \text{ mm} \end{aligned}$$

The correct washer is 2.67 mm thick. See following table for drive pinion adjusting washer.

Ex. 2 ---

N = 0.68 mm, H = −3, D′ = +1
S = −2

$$T = N - [(H - D' - S) \times 0.01] + 2.18$$
$$= 0.68 - [((-3) - (+1) - (-2)) \times 0.01] + 2.18$$
$$= 0.68 - [(-3 - 1 + 2) \times 0.01] + 2.18$$
$$= 0.68 - [-2 \times 0.01] + 2.18$$
$$= 0.68 - [-0.02] + 2.18$$
$$= 0.68 + 0.02 + 2.18$$
$$= 2.88 \text{ mm}$$

The correct washer is 2.88 mm thick.

Ex. 3 ---

N = 0.70 mm, H = 0, D′ = 0
S = 0

$$T = N - [(H - D' - S) \times 0.01] + 2.18$$
$$= 0.70 - [(0 - 0 - 0) \times 0.01] + 2.18$$
$$= 0.70 - [0 \times 0.01] + 2.18$$
$$= 0.70 - 0 + 2.18$$
$$= 0.70 + 2.18$$
$$= 2.88 \text{ mm}$$

The correct washer is 2.88 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-12 for Contact Pattern.

Drive pinion adjusting washer

Thickness mm (in)
2.58 (0.1016)
2.61 (0.1028)
2.64 (0.1039)
2.67 (0.1051)
2.70 (0.1063)
2.73 (0.1075)
2.76 (0.1087)
2.79 (0.1098)
2.82 (0.1110)
2.85 (0.1122)
2.88 (0.1134)
2.91 (0.1146)
2.94 (0.1158)
2.97 (0.1169)
3.00 (0.1181)
3.03 (0.1193)
3.06 (0.1205)
3.09 (0.1217)
3.12 (0.1228)
3.15 (0.1240)
3.18 (0.1252)

5. Fit determined drive pinion adjusting washer in drive pinion, and press fit rear bearing inner race in it, using Base ST30901000.

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the preload of drive pinion with spacer and washer between front and rear bearing inner races.

This procedure has nothing to do with thickness of drive pinion adjusting washer.

This adjustment must be carried out without oil seal inserted.

1. Lubricate pinion front and rear bearings. Install drive pinion in gear carrier. Be sure that spacer, washer, front bearing inner race, companion flange and flat washer are fitted on pinion. Tighten nut to specified torque and confirm preload.

Tightening torque:
14.0 to 17.0 kg-m
(101 to 123 ft-lb)

Note: Replace bearing washer and spacer with thicker ones if pinion cannot be turned by hand while it is being tightened.

2. Measure pinion bearing preload using Preload Gauge ST3127S000 and select washer and spacer that will provide required preload.

Preload (without oil seal):
10.0 to 13.0 kg-cm
(8.7 to 11.3 in-lb)
At companion flange bolt hole:
2.9 to 3.7 kg
(6.4 to 8.2 lb)

Note: Preload of old bearing is the same value as that of a new bearing.

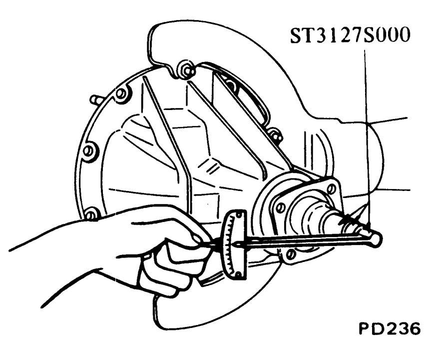


Fig. PD-19 Measuring pinion preload

Pinion bearing adjusting spacer

Length mm (in)
54.50 (2.1457)
54.80 (2.1575)
55.10 (2.1693)
55.40 (2.1811)
55.70 (2.1929)
56.00 (2.2047)

Drive pinion bearing adjusting washer

Thickness mm (in)
over 3.80 to 3.82 (0.1496 to 0.1504)
over 3.82 to 3.84 (0.1504 to 0.1512)
over 3.84 to 3.86 (0.1512 to 0.1520)
over 3.86 to 3.88 (0.1520 to 0.1528)
over 3.88 to 3.90 (0.1528 to 0.1535)
over 3.90 to 3.92 (0.1535 to 0.1543)
over 3.92 to 3.94 (0.1543 to 0.1551)
over 3.94 to 3.96 (0.1551 to 0.1559)
over 3.96 to 3.98 (0.1559 to 0.1567)
over 3.98 to 4.00 (0.1567 to 0.1575)
over 4.00 to 4.02 (0.1575 to 0.1583)
over 4.02 to 4.04 (0.1583 to 0.1591)
over 4.04 to 4.06 (0.1591 to 0.1598)
over 4.06 to 4.08 (0.1598 to 0.1606)
over 4.08 to 4.10 (0.1606 to 0.1614)

3. Check and adjust tooth contact pattern when former adjustment of bearing preload is completed. Unless anything wrong is found, remove drive pinion nut and companion flange and press new oil seal into gear carrier using Oil Seal Fitting Tool KV381025S0. Apply grease cavity between seal lips.
4. Again install companion flange and washer, and tighten nut to specified torque 14.0 to 17.0 kg-m (101 to 123 ft-lb)
5. Measure preload again.

Preload (with oil seal):
11.0 to 14.0 kg-cm
(9.5 to 12.2 in-lb)

At companion flange bolt hole:
3.1 to 4.0 kg
(6.8 to 8.8 lb)

ADJUSTMENT OF SIDE BEARING SHIMS

1. If hypoid gear set, carrier, differential case or side bearing has been replaced with new one, adjust the side bearing preload with adjusting shim.

The required thickness of adjusting shim can be calculated by the following formulas.

$$T_1 = (A - C + D - H') \times 0.01 + 0.175 + E$$
$$T_2 = (B - D + H') \times 0.01 + 0.150 + F$$

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 (20.00 mm) (mm).
If bearing width is 19.89, the difference will be as follows:

$$20.00 - 19.89 = 0.11$$

H' : Figure marked on the ring gear. See Figures PD-20 and PD-21.

Figures for A, B, C, D and H' are dimensional variations in a unit of 1/100 mm against each standard measurement.

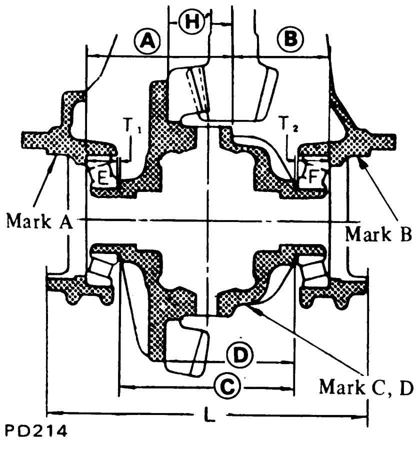


Fig. PD-20 Thickness of shim on left and right sides

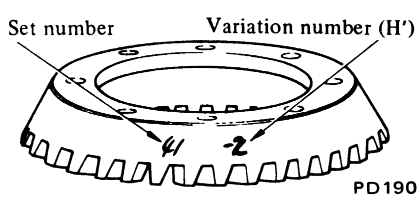


Fig. PD-21 Variation number on ring gear

Examples of calculation

Ex. 1 ---

A = 1, B = 2, C = 2, D = 3
E = 0.11 mm, F = 0.15 mm
H' = −2

Left side:

$$\begin{aligned} T_1 &= (A - C + D - H') \times 0.01 + 0.175 + E \\ &= (1 - 2 + 3 - (-2)) \times 0.01 + 0.175 + 0.11 \\ &= (1 - 2 + 3 + 2) \times 0.01 + 0.175 + 0.11 \\ &= 4 \times 0.01 + 0.175 + 0.11 \\ &= 0.04 + 0.175 + 0.11 \\ &= 0.325 \text{ mm} \end{aligned}$$

The correct shims are as follows:

Thickness		Quantity	
0.07	x	2	= 0.14
0.20	x	1	= 0.20
Total thickness			= 0.34 mm

Right side:

$$\begin{aligned} T_2 &= (B - D + H') \times 0.01 + 0.150 + F \\ &= (2 - 3 + (-2)) \times 0.01 + 0.150 + 0.15 \\ &= (2 - 3 - 2) \times 0.01 + 0.150 + 0.15 \\ &= -3 \times 0.01 + 0.150 + 0.15 \\ &= -0.03 + 0.150 + 0.15 \\ &= 0.27 \text{ mm} \end{aligned}$$

The correct shims are 0.07 plus 0.20 mm thick.

Ex. 2 ---

$A = 0,\ B = 3,\ C = 1,\ D = 0$
$E = 0.20$ mm, $F = 0.17$ mm
$H' = 2$

Left side:

$$\begin{aligned} T_1 &= (A - C + D - H') \times 0.01 + 0.175 + E \\ &= (0 - 1 + 0 - (+2)) \times 0.01 + 0.175 + 0.20 \\ &= (0 - 1 + 0 - 2) \times 0.01 + 0.175 + 0.20 \\ &= -3 \times 0.01 + 0.175 + 0.20 \\ &= -0.03 + 0.175 + 0.20 \\ &= 0.345 \text{ mm} \end{aligned}$$

The correct shims are 0.05 plus 0.10 plus 0.20 mm thick.

Right side:

$$\begin{aligned} T_2 &= (B - D + H') \times 0.01 + 0.150 + F \\ &= (3 - 0 + (+2)) \times 0.01 + 0.150 + 0.17 \\ &= (3 - 0 + 2) \times 0.01 + 0.150 + 0.17 \\ &= 5 \times 0.01 + 0.150 + 0.17 \\ &= 0.05 + 0.150 + 0.17 \\ &= 0.37 \text{ mm} \end{aligned}$$

The correct shims are 0.07 plus 0.10 plus 0.20 mm thick.

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)

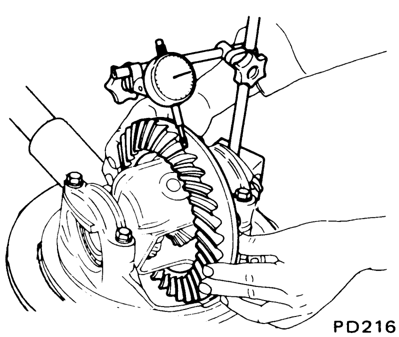
2. Fit determined side bearing adjusting shim on differential case, and press fit left and right side bearing inner races on it, using Side Bearing Drift ST33230000 and Adapter ST33061000.
3. Install differential case assembly into gear carrier, tapping with a rubber mallet.
4. Align mark on bearing cap with that on gear carrier, and install bearing cap on carrier. And tighten bolts to specified torque.

Tightening torque:
4.0 to 5.0 kg-m
(29 to 36 ft-lb)

5. Measure ring gear-to-drive pinion backlash.

If backlash is too small, remove shims from left side and add them to right side. To reduce backlash, remove shims from right side and add them to left side.

Backlash:
0.15 to 0.20 mm
(0.0059 to 0.0079 in)



PD216

Fig. PD-22 Measuring backlash

6. At the same time, check side bearing preload. Bearing preload should read 12.0 to 20.0 kg-cm (10 to 17 in-lb) of rotating torque, [3.5 to 5.8 kg (7.7 to 12.8 lb) at ring gear bolt hole].

If preload does not accord with this specification, adjust it with side bearing shims.

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 ferric oxide and gear oil to produce a contact pattern.

(3) Rotate pinion through several revolutions in the forward and reverse directions until a definite contact pattern is developed on ring gear.

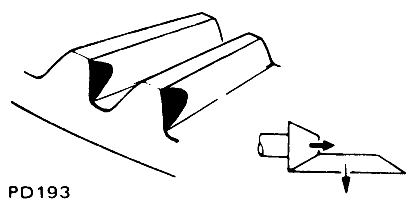
(4) When contact pattern is incorrect, readjust thickness of adjusting washer.

(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.

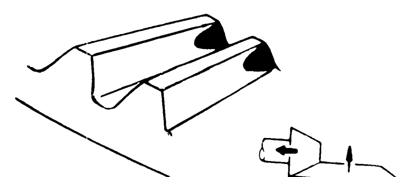


PD193

Fig. PD-23 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.

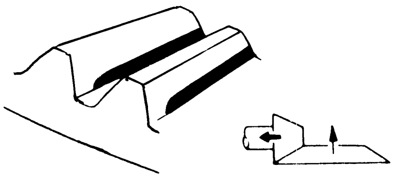


PD194

Fig. PD-24 Toe contact

c. Flank contact

Adjust in the same manner as in b.

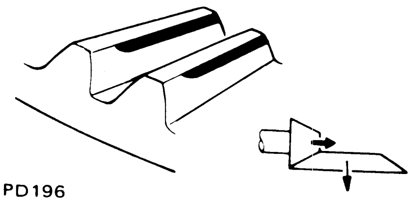


PD195

Fig. PD-25 Flank contact

d. Face contact

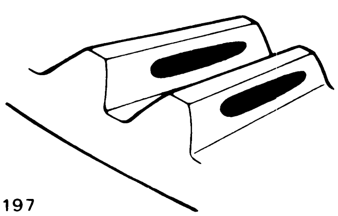
Adjust in the same manner as in a.



PD196

Fig. PD-26 Face contact

e. Correct tooth contact



PD197

Fig. PD-27 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:
  - 1.7 to 2.5 kg-m
  - (12 to 18 ft-lb)
- Drain and filler plug:
  - 6.0 to 10.0 kg-m
  - (43 to 72 ft-lb)

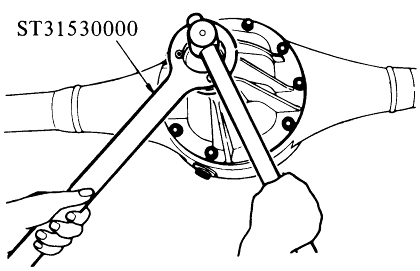
Gear oil capacity: 1.0 liter
(2 ⅛ US pt, 1 ¾ Imp pt)

REPLACEMENT OF FRONT OIL SEAL

Replacement of front oil seal with differential carrier assembly installed on the vehicle.

When replacing front oil seal, do as follows:

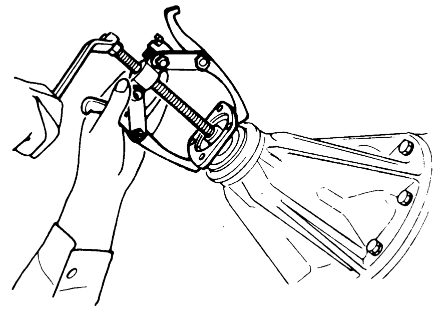
1. Drain gear oil.
2. Raise the rear end of vehicle and support it with safety stands.
3. Detach propeller shaft from companion flange of carrier.
4. Remove drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000.



PD237

Fig. PD-28 Removing drive pinion nut

5. Extract companion flange using a standard puller.



PD238

Fig. PD-29 Removing companion flange

6. Remove oil seal.
7. Set new oil seal in position using Oil Seal Fitting Tool KV381025S0. Apply grease in between seal lips.
8. Fit companion flange and flat washer on drive pinion, and secure them in position by tightening nut to the given torque confirming specified preload, using Drive Pinion Flange Wrench ST31530000.

Tightening torque:
- 14.0 to 17.0 kg-m
- (101 to 123 ft-lb)

Pinion bearing preload (with oil seal):
- 11.0 to 14.0 kg-cm
- (9.5 to 12.2 in-lb)

At companion flange bolt hole:
- 3.1 to 4.0 kg
- (6.8 to 8.8 lb)

Note:

a. Preload of old bearing is the same value as that of a new bearing.

b. If the desired nut tightening torque cannot be obtained, renew nut and readjust.

8. Reinstall propeller shaft, and fill up differential carrier with gear oil.

TROUBLE DIAGNOSES AND CORRECTIONS

When a differential carrier is suspected of being noisy, it is advisable to make a thorough test to determine whether the noise originates in the tires, road surface, exhaust, universal joint, propeller shaft, wheel bearings, engine, transmission, or differential carrier. Noise which originates in other places cannot be corrected by adjustment or replacement of parts in differential carrier.

Condition	Probable cause	Corrective action
Noise on drive, coast and float.	Shortage of oil.	Supply gear oil. Rebuild gear carrier if necessary.
	Incorrect tooth contact between ring gear and drive pinion.	Adjust tooth contact or replace the hypoid gear set.
	Incorrect backlash between ring gear and drive pinion.	Adjust backlash or replace the hypoid gear set if necessary.
	Seized up or damaged ring gear and drive pinion.	Replace the hypoid gear set.
	Seized up, damaged or broken drive pinion bearing.	Replace the pinion bearing and faulty parts.
	Seized up, damaged or broken side bearing.	Replace the side bearing and faulty parts.
	Loose bolts or nuts fixing ring gear, bearing cap, etc.	Clamp them to specified torque, and replace faulty parts.
Noise on turn.	Seized up, damaged or broken side and pinion mate.	Replace faulty parts.
	Seized up, damaged or broken side gear and pinion thrust washer.	Replace faulty parts.
	Pinion mates too tight on their shaft.	Replace faulty parts.
Knocking sound during starting or gear shifting.	Excessive backlash.	
	Incorrect backlash ring gear-to-drive pinion or side gear-to-pinion mate.	Adjust backlash.
	Worn gears or case.	Replace worn parts.
	Worn rear axle shaft and side gear spline.	Replace worn parts.
	Drive pinion bearing under preload.	Adjust preload.
	Loose drive pinion nut.	Repair or replace.
	Loose bolts or nuts fixing ring gear, bearing cap, etc.	Clamp them or replace if necessary.

Condition	Probable cause	Corrective action
Seizure of breakage.	Shortage of oil or use of unsuitable oil.	Replace faulty parts and use recommended gear oil.
	Excessively small backlash.	Adjust backlash and replace as required.
	Incorrect adjustment of bearings or gears.	Replace faulty parts.
	Severe service due to an excessive loading, improper use of clutch.	Replace faulty parts.
	Loose bolts and nuts, such as ring gear bolts.	Replace faulty parts.
Oil leakage.	Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange.	Replace faulty oil seal. Repair the affected flange with sandpaper or replace if necessary.
	Loose gear carrier bolts.	Tighten the bolts to specified torque.
	Faulty gasket.	Replace faulty gasket with new one.
	Loose filler or drain plug.	Tighten the plug.
	Clogged or damaged breather.	Repair or replace.

SERVICE DATA AND SPECIFICATIONS

Type	H190
Gear carrier material	Malleable cast-iron
Gear ratio (number of teeth)	4.375 (35/8)
Drive pinion preload adjusted by	Spacer and washer

Drive pinion

Preload	kg-cm (in-lb)	
(without oil seal)		10.0 to 13.0 (8.7 to 11.3)
(with oil seal)		11.0 to 14.0 (9.5 to 12.2)
At companion flange bolt hole	kg (lb)	
(without oil seal)		2.9 to 3.7 (6.4 to 8.2)
(with oil seal)		3.1 to 4.0 (6.8 to 8.8)
Thickness of drive pinion adjusting washer	mm (in)	2.58 (0.1016)
		2.61 (0.1028)
		2.64 (0.1039)
		2.67 (0.1051)
		2.70 (0.1063)
		2.73 (0.1075)
		2.76 (0.1087)
		2.79 (0.1098)
		2.82 (0.1110)
		2.85 (0.1122)
		2.88 (0.1134)
		2.91 (0.1146)
		2.94 (0.1158)
		2.97 (0.1169)
		3.00 (0.1181)
		3.03 (0.1193)
		3.06 (0.1205)
		3.09 (0.1217)
		3.12 (0.1228)
		3.15 (0.1240)
		3.18 (0.1252)
Length of drive pinion bearing adjusting spacer	mm (in)	54.50 (2.1457)
		54.80 (2.1575)
		55.10 (2.1693)
		55.40 (2.1811)
		55.70 (2.1929)
		56.00 (2.2047)

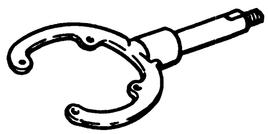
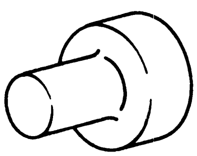
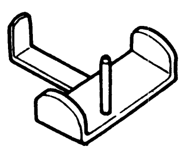
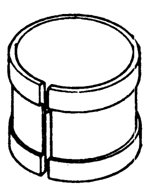
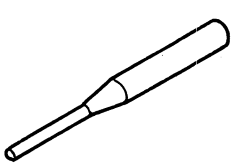
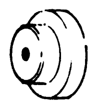
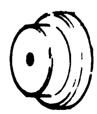
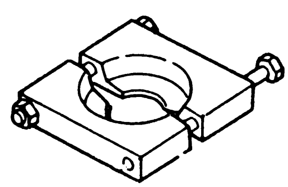
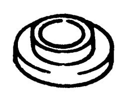
Thickness of drive pinion bearing adjusting washer	mm (in)	over 3.80 to 3.82 (0.1496 to 0.1504) over 3.82 to 3.84 (0.1504 to 0.1512) over 3.84 to 3.86 (0.1512 to 0.1520) over 3.86 to 3.88 (0.1520 to 0.1528) over 3.88 to 3.90 (0.1528 to 0.1535) over 3.90 to 3.92 (0.1535 to 0.1543) over 3.92 to 3.94 (0.1543 to 0.1551) over 3.94 to 3.96 (0.1551 to 0.1559) over 3.96 to 3.98 (0.1559 to 0.1567) over 3.98 to 4.00 (0.1567 to 0.1575) over 4.00 to 4.02 (0.1575 to 0.1583) over 4.02 to 4.04 (0.1583 to 0.1591) over 4.04 to 4.06 (0.1591 to 0.1598) over 4.06 to 4.08 (0.1598 to 0.1606) over 4.08 to 4.10 (0.1606 to 0.1614)
Side gear and pinion mate		
Thickness of side gear thrust washer	mm (in)	over 0.75 to 0.80 (0.0295 to 0.0315) over 0.80 to 0.85 (0.0315 to 0.0335) over 0.85 to 0.90 (0.0335 to 0.0354) over 0.90 to 0.95 (0.0354 to 0.0374)
Pinion mate-to-side gear backlash (or clearance between side gear and thrust washer)	mm (in)	0.10 to 0.20 (0.0039 to 0.0079)
Ring gear		
Ring gear-to-drive pinion backlash	mm (in)	0.15 to 0.20 (0.0059 to 0.0079)
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)	20.00 (0.7874)
Tightening torque	**kg-m (ft-lb)**	
Drive pinion nut		14.0 to 17.0 (101 to 123)
Ring gear bolt		7.0 to 8.0 (51 to 58)
Side bearing cap bolt		4.0 to 5.0 (29 to 36)
Differential carrier to axle case		1.7 to 2.5 (12 to 18)
Companion flange of front shaft and flange yoke connecting nut		2.4 to 3.3 (17 to 24)
Center bearing bracket nut		1.6 to 2.2 (12 to 16)
Companion flange to propeller shaft		2.4 to 3.3 (17 to 24)
Oil drain and filler plug		6.0 to 10.0 (43 to 72)

Oil capacity (about)	liter (US pt, Imp pt)	1.0 ($2\frac{1}{8}$, $1\frac{3}{4}$)

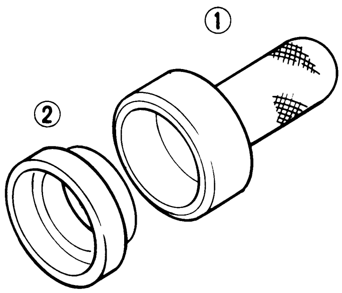
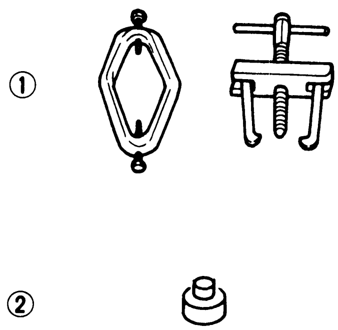
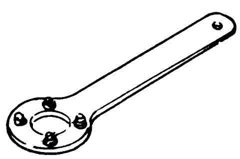
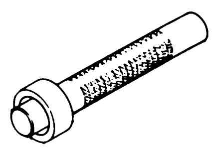
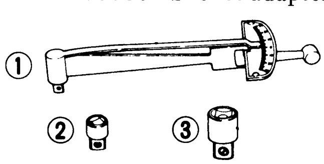
Adjusting methods

Variable numbers expressed by	1/100 mm
Dummy shaft	Use
Drive pinion adjusting formula	$T = N - [(H - D' - S) \times 0.01] + 2.18$
Side bearing adjusting formula	$T_1 = (A - C + D - H') \times 0.01 + 0.175 + E$ $T_2 = (B - D + H') \times 0.01 + 0.150 + F$

SPECIAL SERVICE TOOLS

Tool number & tool name		Kent-Moore No.	Reference page or Fig. No.
ST06310000	Differential carrier attachment 	J 25603	Fig. PD-7
ST3194S000 ① ST31942000 ② ST31941000	Drive pinion setting gauge assembly Dummy shaft Height gauge ①  ② 	① See J 25269 -01	Fig. PD-16 Fig. PD-17
ST31970000	Collar 	——	Fig. PD-16
KV31100300	Solid punch 	——	Fig. PD-13
ST30611000	Bar 	J 25742-1	Page PD-9
ST30613000	Adapter 	J 25742-3	Page PD-9
ST30621000	Adapter 	——	Page PD-9
ST3090S000 ① ST30031000 ② ST30901000	Drive pinion rear bearing inner race puller Puller Base ①  ② 	① J 25733-1	Fig. PD-10 Page PD-10

PROPELLER SHAFT & DIFFERENTIAL CARRIER

Tool number & tool name	Kent-Moore No. Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. Reference page or Fig. No.
KV381025S0 Oil seal fitting tool ① ST30720000 Drift ② KV38102510 Drift 	① J 25751 Page PD-11 Page PD-13	ST3306S001 Diff. side bearing puller set ① ST33051001 Diff. side bearing puller ② ST33061000 Adapter 	② J 25797-2 Fig. PD-12 Fig. PD-15
ST31530000 Drive pinion flange wrench 	J 25774 Fig. PD-5 Fig. PD-9 Fig. PD-28	ST33230000 Diff. side bearing drift 	J 25805-01 Fig. PD-15
ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter 	See J 25765 ① See J 25765 Fig. PD-19		

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION FA

FRONT AXLE & FRONT SUSPENSION

DESCRIPTION .... FA- 2
INSPECTION AND ADJUSTMENT .... FA- 3
FRONT AXLE .... FA- 6
FRONT SUSPENSION .... FA- 8
SERVICE DATA AND SPECIFICATIONS FA-13
TROUBLE DIAGNOSES AND CORRECTIONS FA-15
SPECIAL SERVICE TOOLS FA-18

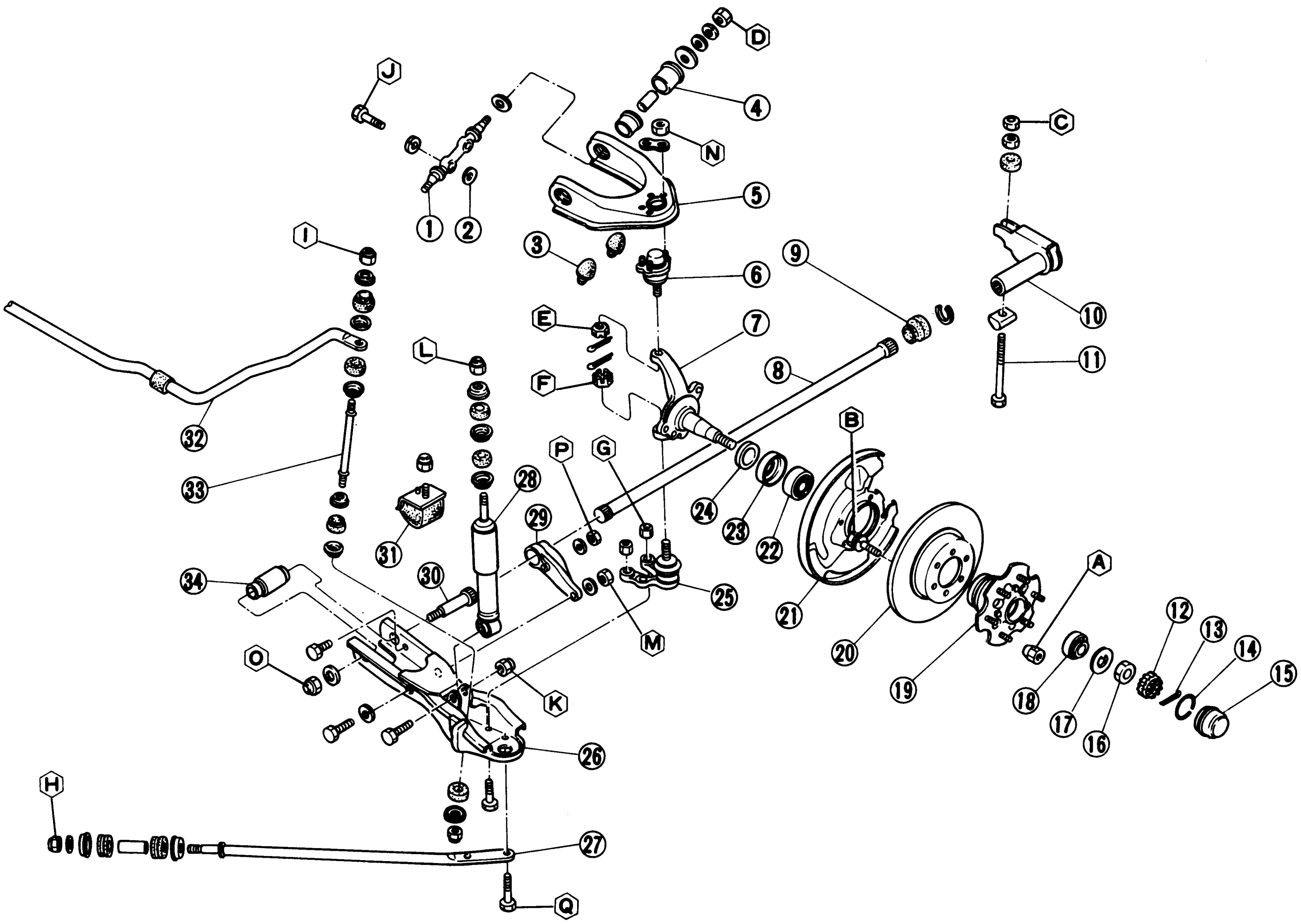
FA

DESCRIPTION

The front suspension is an independent double-wishbone type employing a torsion bar spring. It is equipped with a double acting shock absorber, a tension rod and a stabilizer (Option).

The top and bottom of the knuckle spindle are connected respectively to the upper and lower links through ball joints so that the wheel can be steered.

The upper and lower links swing vertically, being controlled by the torsion bar spring and shock absorber, and the bumper rubbers limit the vertical motion.



1 Upper link spindle
2 Camber adjusting shim
3 Rebound bumper
4 Upper link bushing
5 Upper link
6 Upper ball joint
7 Knuckle spindle
8 Torsion bar spring
9 Dust cover
10 Anchor arm
11 Anchor arm adjusting bolt
12 Adjusting cap
13 Cotter pin
14 O-ring
15 Hub cap
16 Spindle nut
17 Washer
18 Outer wheel bearing
19 Wheel hub
20 Rotor
21 Baffle plate
22 Inner wheel bearing
23 Grease seal
24 Spacer
25 Lower ball joint
26 Lower link
27 Tension rod
28 Shock absorber
29 Torque arm
30 Lower link spindle
31 Bound bumper
32 Stabilizer
33 Stabilizer connecting rod
34 Lower link bushing

Tightening torque kg-m (ft-lb)
A 8.0 to 10.0 (58 to 72)
B 3.9 to 5.3 (28 to 38)
C 3.1 to 4.1 (22 to 30)
D 7.7 to 10.5 (56 to 76)
E 8.0 to 10.0 (58 to 72)
F 17.2 to 19.5 (124 to 141)
G 3.9 to 9.9 (28 to 72)
H 3.0 to 4.2 (22 to 30)
I 1.6 to 2.2 (12 to 16)
J 11.1 to 15.0 (80 to 108)
K 3.1 to 4.1 (22 to 30)
L 1.6 to 2.2 (12 to 16)
M 2.7 to 3.7 (20 to 27)
N 1.7 to 2.2 (12 to 16)
O 11.1 to 15.0 (80 to 108)
P 3.6 to 4.6 (26 to 33)
Q 3.9 to 5.3 (28 to 38)

FA675

Fig. FA-1 Front axle and suspension

INSPECTION AND ADJUSTMENT

CONTENTS

INSPECTION FA-3
SUSPENSION PARTS FA-3
ADJUSTMENT FA-3
WHEEL BEARING FA-3
WHEEL ALIGNMENT FA-4
VEHICLE POSTURE FA-5

INSPECTION

Inspect in accordance with periodic maintenance schedule.

SUSPENSION PARTS

1. Jack up the front of vehicle until front wheels are free from the floor.
2. By shaking each front wheel 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.

ADJUSTMENT

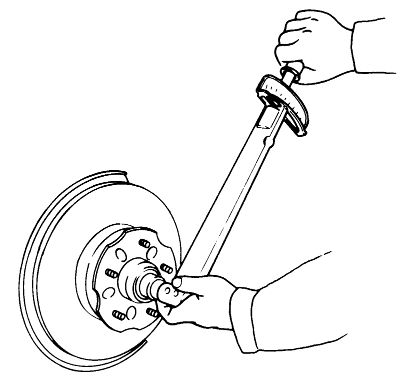
WHEEL BEARING

Wrong adjustment of wheel bearings causes abnormal wear and score on the bearing and knuckle spindle.

To attain proper preload on wheel bearings, proceed to the following operations:

CAUTION:
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 and spindle nut.

1. Jack up and support vehicle on the stand at the frame in a safe manner, and remove wheel, hub cap and cotter pin.
2. Sparingly apply grease to threaded parts of spindle shaft, wheel bearing washer and spindle nut.
3. Tighten spindle nut to 3.5 to 4.0 kg-m (25 to 29 ft-lb) torque, using suitable torque wrench.

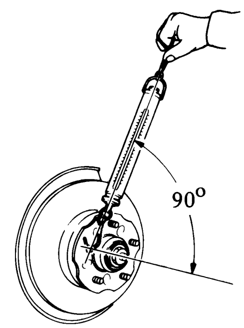


FA676

Fig. FA-2 Tightening spindle nut

4. Turn wheel hub several times in both directions to seat wheel bearing correctly; again tighten spindle nut to the above torque.
5. Turn spindle nut back 45 degrees. Install adjusting cap and tighten until any of its grooves aligns with hole in spindle. If the above procedure fails to align hole and groove, then tighten lock nut as much as 15 degrees.
6. Again turn wheel hub in several times in both directions to see if it rotates freely. Then, measure bearing preload (with oil seal) using a spring balance as follows:

New parts
  Less than 22 kg-cm (19.1 in-lb)
As measured at wheel hub bolt
  Less than 3.9 kg (8.6 lb)
Adjustment with old parts
  7 kg-cm (6.1 in-lb)
As measured at wheel hub bolt
  1.2 kg (2.6 lb)



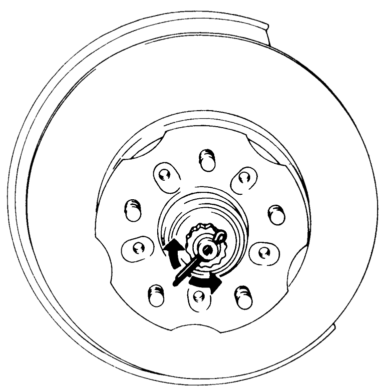
FA677

Fig. FA-3 Measuring bearing preload

Repeat above procedures until correct preload is obtained.

Note:
a. **Correctly measure rotation starting force toward tangential direction against hub bolt.**
b. **Slackness of wheel bearings in axial direction should be 0.08 mm (0.0031 in).**

7. Insert cotter pin with legs through these two parts, spread legs away from each other against sides of spindle nut to secure installation.



FA500

Fig. FA-4 Installing cotter pin

8. Install hub cap.

WHEEL ALIGNMENT

Correct front wheel alignment attains proper vehicle handling characteristics and the least steering effort with a minimum amount of tire wear.

Before adjusting front wheel alignment, be sure to carry out a preliminary inspection of the front end parts for the following conditions:

1. Tire pressure.
2. Wheel bearings and spindle nuts.
3. Steering gear loose.
4. Steering gear housing loose at frame.
5. Steering linkage and connections.
6. Shock absorber action.
7. Play or excessive wear in ball joint.

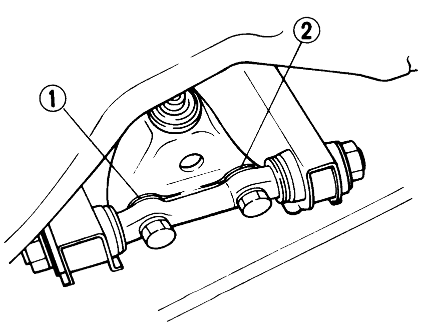
When using the equipment for front wheel alignment inspection, follow the instructions furnished with the equipment. Furthermore, the inspection should be made with the vehicle level and at curb weight.

Camber and caster

Measure camber and caster angles of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures if necessary.

Both camber and caster angles are adjusted by increasing or decreasing the number of caster shims inserted between upper link spindle and frame.

To adjust caster, make a difference in thickness between front and rear shims.



1 Rear shim
2 Front shim

FA678

Fig. FA-5 Adjusting camber and caster

Camber and caster under no load condition

Camber	−15′ to 1°15′
Caster	35′ to 2°05′

WARNING:
When adjusting camber and caster, remove either of the front and rear bolts securing upper link spindle and adjust by adding or removing camber adjusting shim(s). After installing above bolt, remove other bolt and adjust in same manner as above.

Camber adjusting shim

Thickness mm (in)
1.0 (0.039)
2.0 (0.079)
4.0 (0.157)

(1) When adding 1.0 mm (0.039 in) shim to each of the front and rear,
Camber decreases 13′
Caster decreases 3′

(2) When front shim(s) is 1.0 mm (0.039 in) thicker than rear one(s),
Caster decreases 32′
Camber decreases 3′

(3) When rear shim(s) is 1.0 mm (0.039 in) thicker than front one(s),
Caster increases 29′
Camber decreases 7′

Note:
a. Do not use more than three shims at one place.
b. Total thickness of shims must be within 6.0 mm (0.236 in).
c. Difference of total thickness of the front and rear must be within 2.0 mm (0.079 in).

Toe-in

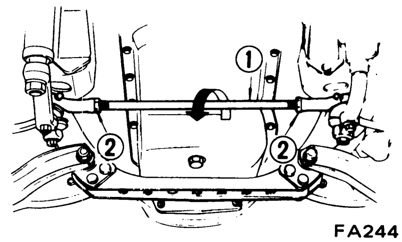
Measure toe-in and adjust if necessary. For adjustment, carry out the following procedure.

1. Turn steering wheel to straight ahead position with front wheels in the same position. Then, check steering gear for straight ahead position.
2. Loosen lock nut and turn cross rod. Turn this to forward direction as shown by arrow, and toe-in is increased. When the tube is turned to opposite side, toe-in is decreased. See Figure FA-6.

Toe-in under no load conditions

Toe-in	5 to 7 mm (0.20 to 0.28 in)

3. After correct toe-in is obtained, tighten lock nut to 8.0 to 10.0 kg-m (58 to 72 ft-lb).



FA244

1 Cross rod
2 Lock nut

Fig. FA-6 Adjusting toe-in

Steering angle

Check steering angle and use the following procedures if necessary.

1. Loosen lock nut at stopper bolt and adjust steering angle with stopper bolt.

Steering angle under no load conditions

Inner wheel	34° to 36°
Outer wheel	29°30′ to 31°30′

2. After obtaining correct steering angle, secure lock nut.

Tightening torque:
Steering stopper lock nut:
2.7 to 3.7 kg-m
(20 to 27 ft-lb)

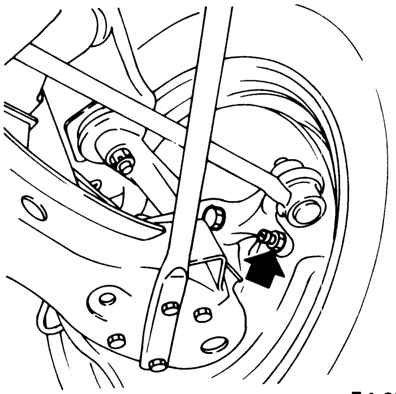


Fig. FA-7 Adjusting steering angle

VEHICLE POSTURE

Vehicle posture may be incorrect due to weakened spring or the other faulty condition. The following procedures are necessary when adjustment is required.

The vehicle posture can be adjusted by obtaining only the specified "H" dimension changing the length of anchor bolt.

1. Jack up and support vehicle on the stands at the frame in a safe manner.
2. Loosen lock nut, and turn anchor bolt adjusting nut to obtain the specified "H" dimension.

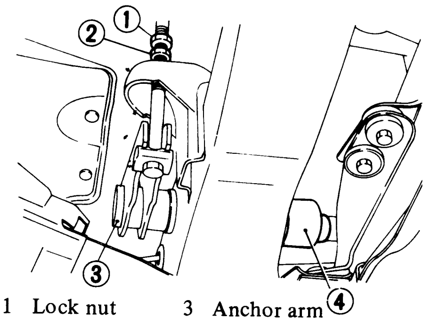


Fig. FA-8 Adjusting anchor bolt

3. Lower the vehicle. To make the best vehicle posture, "H" dimension must be as follows in the unladen case.

"H" dimension	125 mm (4.92 in)

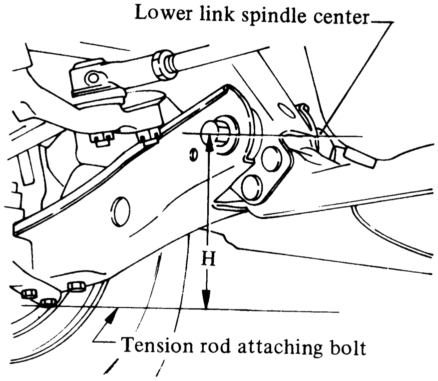


Fig. FA-9 Dimension for standard vehicle posture

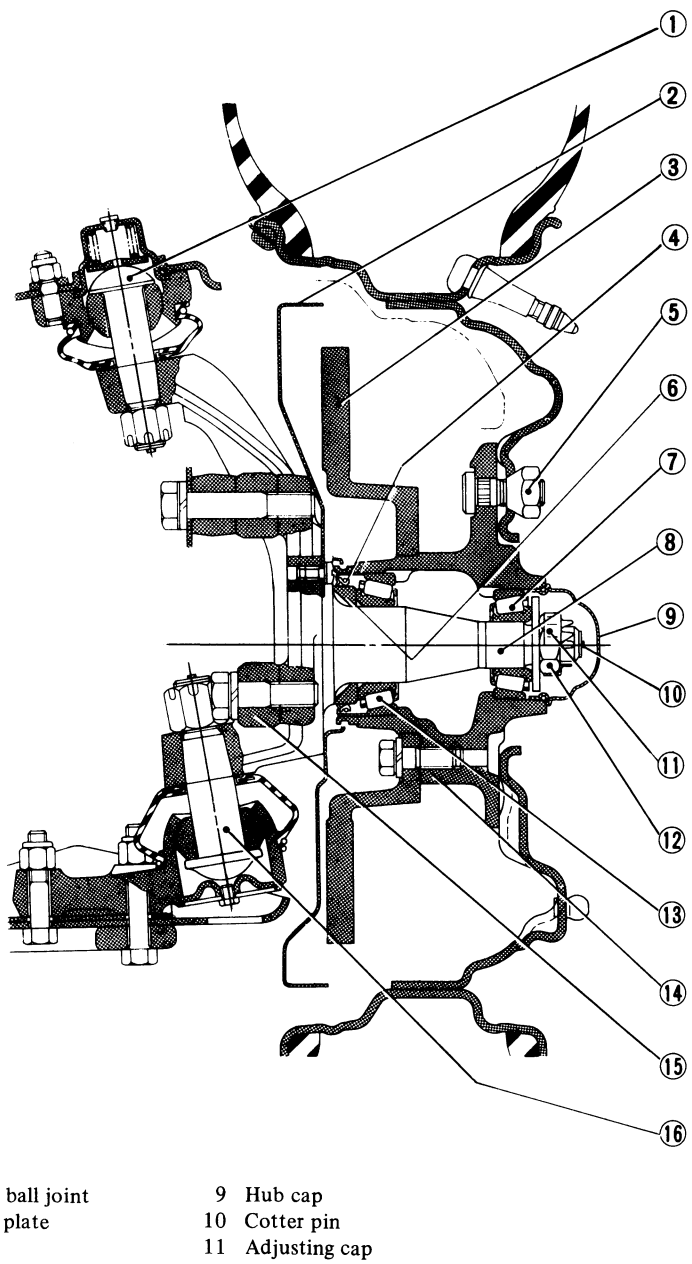
4. Tighten lock nut to 3.1 to 4.1 kg-m (22 to 30 ft-lb).

FRONT AXLE

CONTENTS

FRONT AXLE FA-5
REMOVAL FA-5
INSPECTION FA-6
INSTALLATION FA-6

FRONT AXLE



1 Upper ball joint
2 Baffle plate
3 Rotor
4 Grease seal
5 Wheel nut
6 Spacer
7 Outer bearing
8 Knuckle spindle
9 Hub cap
10 Cotter pin
11 Adjusting cap
12 Spindle nut
13 Inner bearing
14 Wheel hub
15 Knuckle arm
16 Lower ball joint

Fig. FA-10 Cross-sectional view of front axle

REMOVAL

1. Jack up and support vehicle on the stands at frame in a safe manner.
2. Remove front wheel and tire assembly.
3. Disconnect brake hose at bracket from knuckle spindle.
4. Remove caliper.

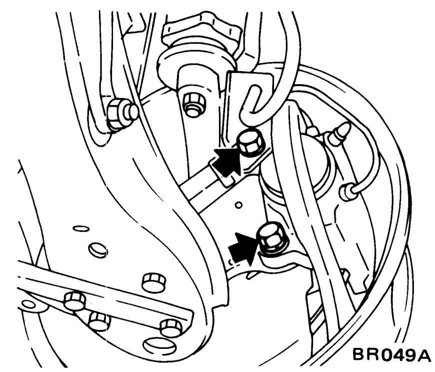
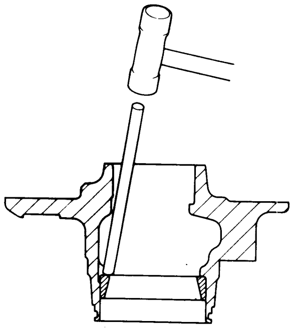


Fig. FA-11 Removing caliper

5. Remove wheel hub cap, and then remove cotter pin, adjusting cap and spindle nut from knuckle spindle.
6. Remove wheel hub and rotor assembly.

CAUTION:
Do not allow outer bearing cone to fall out of wheel hub when removing hub from knuckle spindle.

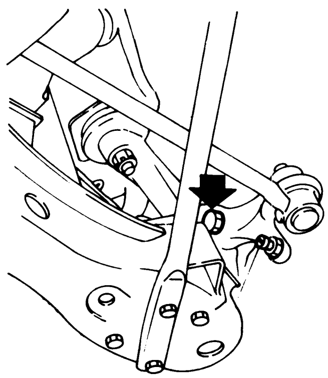
7. Remove rotor from wheel hub.
8. Remove outer bearing cone with fingers and remove inner bearing cone by prying out grease seal with a screwdriver. Discard grease seal.
9. If it is necessary to replace bearing outer race, drive it out from hub with a brass drift and mallet. Evenly tap bearing outer race through hole inside hub.



FA684

Fig. FA-12 Removing bearing outer race

10. Remove baffle plate.
11. Separate knuckle arm from knuckle spindle.



FA685

Fig. FA-13 Removing knuckle arm

12. Loosen torsion bar spring anchor lock nut and adjusting nut to cancel the torsion of torsion bar spring.
13. Remove upper and lower ball joint securing nuts and then remove knuckle spindle from ball joint using Ball Joint Remover ST29020001.

INSPECTION

Wheel hub and knuckle spindle

Check wheel hub and knuckle spindle for crack by means of a magnetic exploration or dyeing test, and replace if cracked.

Grease seal

When grease leakage is detected during disassembly, replace with a new one.

Replace grease seal with a new one 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 outer race for condition. Removal of outer race from hub is not necessary.

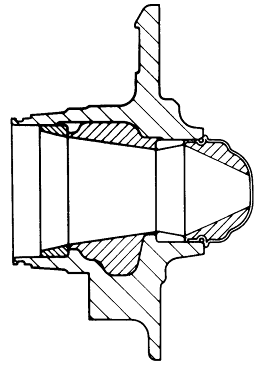
INSTALLATION

1. Install knuckle spindle to upper and lower ball joints. Make sure that oil or grease does not come into contact with tapered areas of ball joint and knuckle spindle and the threads of ball joint.

   Tighten stud nuts to specifications until the cotter pin hole is in line with nut slots.

   Tightening torque:
   - Upper ball stud nut:
     8 to 10 kg-m
     (58 to 72 ft-lb)
   - Lower ball stud nut:
     17.2 to 19.5 kg-m
     (124 to 141 ft-lb)

2. Tighten anchor arm adjusting bolt and lock nut so that "B" dimension shown in Figure FA-18 can be obtained.
3. Install baffle plate.
4. If bearing outer race has been removed from hub, drive a new one in hub by evenly tapping around circumference with a brass drift and mallet until it seats in hub.
5. Pack the inside (shaded areas in Figure FA-14) of hub and hub cap with recommended grease.



FA686

Fig. FA-14 Greasing portion

6. Pack cavity of each bearing cone with a sufficient amount of recommended grease.

FA262

Fig. FA-15 Filling bearing cone with grease

7. Place inner bearing cone in hub and install a new grease seal, coating sealing lips with recommended grease.
8. Install wheel hub and rotor assembly over spindle and then install outer bearing cone.
9. Apply a thin coat of recommended grease to washer, threaded portions of spindle and spindle nut. Then install washer and spindle nut.
10. Adjust bearing preload. Refer to Adjustment.

CAUTION:
In order to assure correct bearing preload and extend service life of wheel bearings, be sure to avoid dirt and foreign particles getting in wheel bearings, grease seal, washer and spindle nut.

---

11. Install knuckle arm and caliper.

Tightening torque:
Knuckle arm fixing bolt:
7.3 to 9.9 kg-m
(53 to 72 ft-lb)
Caliper fixing bolt:
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

12. After lowering vehicle to the ground, tighten wheel nut, bleed brakes and adjust vehicle posture. Refer to Adjustment.

FRONT SUSPENSION

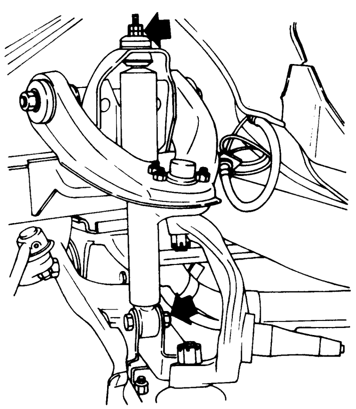
CONTENTS

SHOCK ABSORBER .... FA- 8
REMOVAL .... FA- 8
INSPECTION .... FA- 8
INSTALLATION .... FA- 8
TORSION BAR SPRING .... FA- 8
REMOVAL .... FA- 8
INSPECTION .... FA- 9
INSTALLATION .... FA- 9
UPPER LINK AND BALL JOINT .... FA- 9
REMOVAL .... FA- 9
INSPECTION .... FA- 9
INSTALLATION FA-10
LOWER LINK AND BALL JOINT FA-10
REMOVAL FA-10
INSPECTION FA-11
INSTALLATION FA-11
TENSION ROD FA-11
REMOVAL FA-11
INSPECTION FA-12
INSTALLATION FA-12
STABILIZER (Option) FA-12
REMOVAL FA-12
INSPECTION FA-12
INSTALLATION FA-12

SHOCK ABSORBER

REMOVAL

1. Jack up and support vehicle on the stands at the frame in a safe manner.
2. Remove front wheel and tire assembly.
3. While holding upper stem of shock absorber, remove lock and adjusting nuts, washer and rubber bushing at upper end.



FA687
Fig. FA-16 Removing shock absorber

4. Remove nut and bolt at lower end and remove shock absorber.

INSPECTION

1. Visually check shock absorber for faults or oil leaks. Place shock absorber right side up in a vise, and hand stroke absorber as outlined below:

Extend and compress shock absorber to the extreme ends of travel.

If smooth hydraulic resistance is not present in both directions, replace absorber.

Specifications for shock absorber
Piston stroke:
40 mm (1.57 in)
Damping force [at piston speed of 0.3 m (1.0 ft)/sec.]:
Expansion
40 to 58 kg
(88 to 128 lb)
Compression
16 to 28 kg
(35 to 62 lb)

2. Replace rubber bushing if crack or deterioration is detected.

INSTALLATION

Install shock absorber in the reverse sequence of removal, noting the following:

(1) Tighten nuts and bolts to specified torque.

Tightening torque:
Shock absorber upper end nut:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)
Shock absorber lower end nut:
3.1 to 4.1 kg-m
(22 to 30 ft-lb)

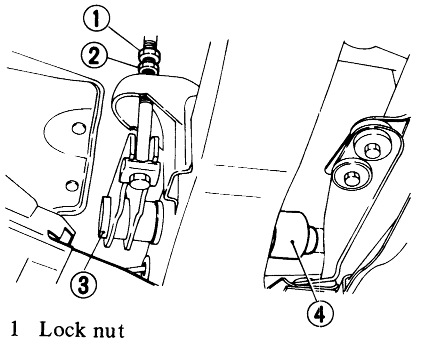
(2) Do not allow oil or grease to come into contact with rubber parts.

TORSION BAR SPRING

REMOVAL

1. Jack up and support vehicle on the stands at the frame in a safe manner.
2. Remove catalytic converter. (When removing L.H. torsion bar spring)

3. Loosen nuts at spring anchor bolt.
4. Remove dust cover at rear end of torsion bar spring and detach snap ring.



1 Lock nut
2 Adjusting nut
3 Anchor arm
4 Dust cover

FA680

Fig. FA-17 Removing torsion bar spring

5. Pull out anchor arm rearward.
6. Withdraw torsion bar spring rearward.

INSPECTION

Check torsion bar spring for wear, twist, etc. When adjusting vehicle posture, replace torsion bar spring with a new one if the specified height can not be obtained.

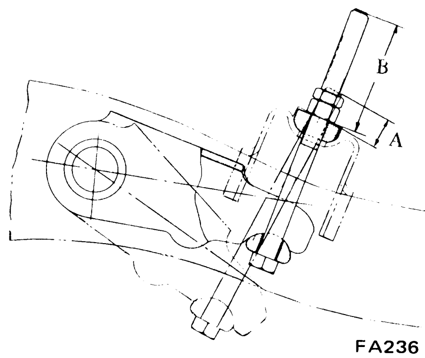
INSTALLATION

1. Coat grease on the serrations of torsion bar spring and install it to torque arm.

Note: **Be sure to install right and left torsion bar springs correctly. They can be identified with "R" (Right) and "L" (Left) marked on the end surface.**

2. Install anchor arm and tighten adjusting nut to obtain "A" dimenion, when upper link is in contact with rebound bumper.

A: 7 to 17 mm (0.28 to 0.67 in)
B: 60 to 70 mm (2.36 to 2.76 in)



FA236

Fig. FA-18 Installing anchor arm

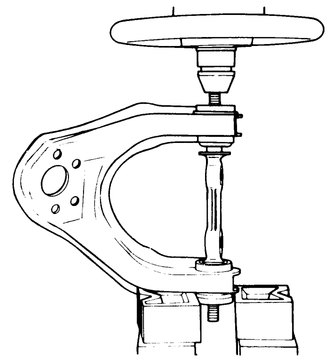
3. Install snap ring and dust cover.
4. Temporarily tighten adjusting nut until "B" dimension is reached. See Figure FA-18.
5. Install wheel and lower vehicle. Adjust vehicle posture at curb weight (full fuel tank, no passengers). Refer to Adjustment.
6. Tighten lock nut.

Tightening torque:
Anchor bolt lock nut:
3.1 to 4.1 kg-m
(22 to 30 ft-lb)

UPPER LINK AND BALL JOINT

REMOVAL

1. Jack up and support vehicle on the stands at the frame in a safe manner.
2. Remove wheel and tire assembly.
3. Loosen torsion bar spring anchor lock and adjusting nuts to cancel torsion of torsion bar spring.
4. Remove cotter pin and nut from upper ball joint stud and separate upper ball joint from knuckle spindle using Ball Joint Remover ST29020001.
5. Loosen bolts securing upper ball joint and remove upper ball joint.
6. Remove bolts retaining upper link spindle and remove upper link with camber adjusting shims from body bracket.
7. Remove nuts and washers at both ends of upper link spindle.
8. Press upper link spindle on both ends one after the other, and remove upper link spindle and rubber bushing.



FA688

Fig. FA-19 Removing upper link spindle and rubber bushing

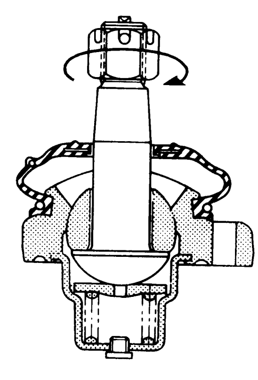
INSPECTION

Upper ball joint

Ball joint is of non-disassembly type. The following check should be made.

1. Check dust cover, dust cover retainer and clip for damage, crack, wear or distortion. Replace if necessary.
2. Measure force required to keep joint turning. If found to be more or less than specifications, discard.

Turning torque:
New parts:
10 to 50 kg-cm
(8.7 to 43.4 in-lb)
Old parts:
More than 10 kg-cm
(8.7 in-lb)



FA689

Fig. FA-20 Sectional view of upper ball joint

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.**

Upper link spindle and rubber bushing

Check upper link spindle and rubber bushing for damage. Replace if necessary.

Upper link

Check upper link for deformation or crack. Replace if necessary.

INSTALLATION

1. Apply ample amount of soapsuds to rubber bushing and force-fit it from outside of link. To do this, position guide on end surface of inside of outer collar and press inner collar of bushing until dimension "C" exceeds 4.5 mm (0.177 in).

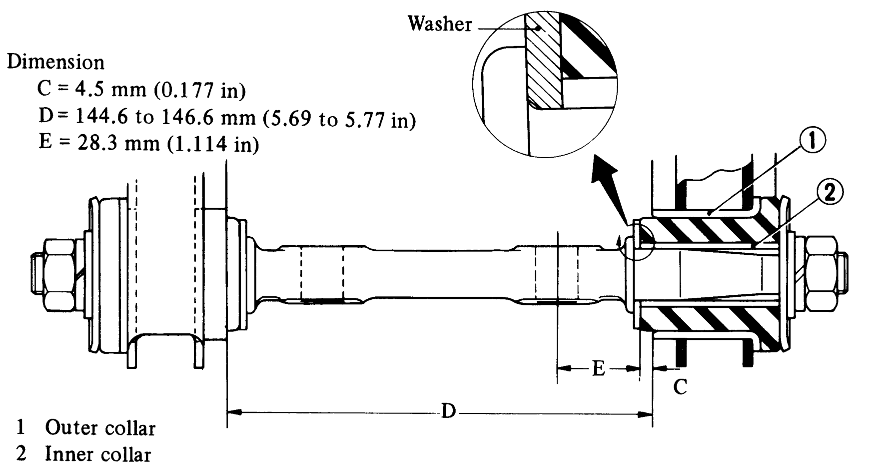


Fig. FA-21 Installing upper link bushing

2. Insert upper link spindle and upper link inner washer from position where bushing is not inserted.

Note: **Do not insert washer in a wrong manner as direction of washer is designated. See Figure FA-21.**

3. Press-fit other bushing in same manner as in step 1.
4. After fitting, check dimensions C, D and E shown in Figure FA-21 to make sure that bushing is fitted properly.
5. Set upper link spindle as shown in Figure FA-22. Then tighten bushing to specified torque.

Tightening torque:
Upper link spindle nut:
7.7 to 10.5 kg-m
(56 to 76 ft-lb)

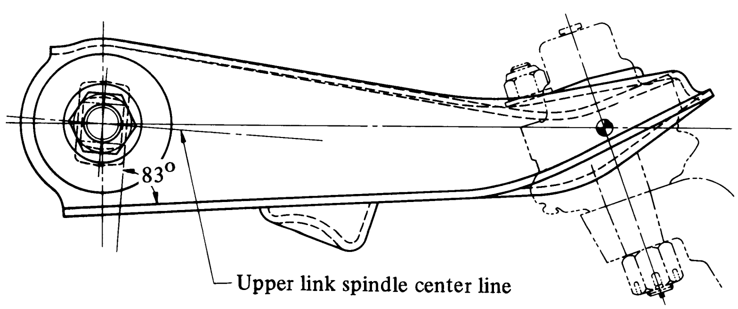


Fig. FA-22 Installing upper link spindle

6. Install upper link and upper link spindle as an assembly to frame.

Tightening torque:
Upper link spindle to frame bolt:
11.1 to 15.0 kg-m
(80 to 108 ft-lb)

Note: **Be sure to install the camber shims that were removed.**

7. Install upper ball joint to upper link.

Tightening torque:
Upper ball joint installation nut:
1.7 to 2.2 kg-m
(12 to 16 ft-lb)

8. Guide upper ball stud into knuckle spindle and install nut and cotter pin. Make sure that oil or grease does not come into contact with tapered areas of ball joint and knuckle spindle and threads of ball joint.

Tightening torque:
8 to 10 kg-m
(58 to 72 ft-lb)

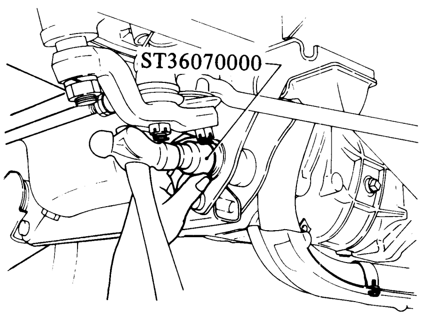
9. Install wheel and tire.
10. Adjust vehicle posture. Refer to Adjustment.
11. Check and adjust wheel alignment. Refer to Adjustment.

LOWER LINK AND BALL JOINT

REMOVAL

1. Jack up and support vehicle on the stands at the frame in a safe manner.
2. Remove wheel and tire assembly.
3. Remove shock absorber lower end bolt. Refer to Shock abosrber.
4. Loosen torsion bar spring anchor lock and adjusting nuts, and reparate anchor arm bolt from anchor arm.
5. Remove snap ring, and move anchor arm and torsion bar spring fully rearward.
6. Disconnect stabilizer connecting rod from lower link.
7. Disconnect tension rod from lower link.

8. Remove cotter pin and nut from lower ball joint stud and disconnect lower ball joint from knuckle spindle using Ball Joint Remover ST29020001.
9. Remove nut and washer at lower link spindle front end.
10. Remove lower link spindle, lightly tapping on front end of lower link spindle and pushing down torsion bar spring, and remove lower link.
11. Separate lower link ball joint from lower link by removing attaching bolts.
12. Remove lower link spindle bushing, using Lower Link Bushing Drift ST36070000.



FA692
Fig. FA-23 Removing lower link spindle bushing

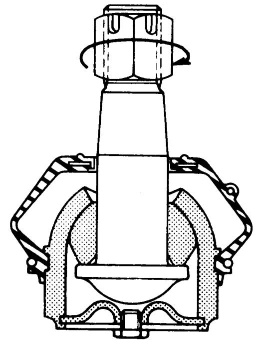
13. Separate torque arm from lower link by removing attaching bolt.

INSPECTION

Lower ball joint

Ball joints is of non-disassembly type. The following checks should be made.

1. Check dust cover, dust cover retainer and clip for damage, crack, wear or distortion, and replace if necessary.
2. Turning torque:
   New parts:
      10 to 40 kg-cm
      (8.7 to 34.7 in-lb)
   Old parts:
      More than 10 kg-cm
      (8.7 in-lb)



FA693
Fig. FA-24 Sectional view of lower ball joint

3. Lubricate ball joint with recommended mutli-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.**

Lower link and lower link spindle

Check lower link and lower link spindle for deformation or crack. Replace if necessary.

Lower link rubber bushing

Check lower link rubber bushing for damage or distortion. Replace if necessary.

Torque arm

Check torque arm for deformation or crack. Replace if necessary.

INSTALLATION

1. Assemble lower ball joint to lower link.

   Tightening torque:
      Lower ball joint installation nut:
         3.9 to 5.3 kg-m
         (28 to 38 ft-lb)

2. Assemble torque arm to lower link.

   Tightening torque:
      Torque arm installation nut outer:
         2.7 to 3.7 kg-m
         (20 to 27 ft-lb)
      Torque arm installation nut inner:
         3.6 to 4.6 kg-m
         (26 to 33 ft-lb)

3. Install rubber bushing to frame using Lower Link Bushing Drift ST36070000.
4. Install lower arm to frame by inserting lower link spindle.
5. Tighten lower link spindle nut.

   Tightening torque:
      Lower link spindle nut:
         11.1 to 15.0 kg-m
         (80 to 108 ft-lb)

6. Guide lower ball stud into knuckle spindle and install nut. Make sure that oil or grease does not come into contact with tapered areas of ball joint and knuckle spindle and threads of ball joint.

   Tightening torque:
      17.5 to 19.5 kg-m
      (127 to 141 ft-lb)

7. Install torsion bar spring to torque arm.
8. Install wheel and tire.
9. Adjust vehicle posture. Refer to Adjustment.

TENSION ROD

REMOVAL

1. Remove bolt securing tension rod to lower link, and separate these parts.
2. Remove nut securing tension rod to tension rod bracket, and then remove tension rod with tension rod bushings, collar and washers.

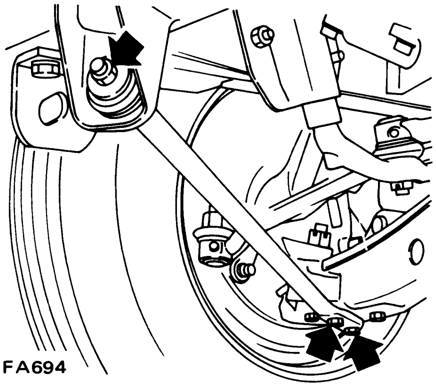


Fig. FA-25 Removing tension rod

INSPECTION

1. Check tension rod for bend and thread for faulty condition. Repair or replace if necessary.
2. Check tension rod bushings for wear or deterioration. Replace if necessary.

INSTALLATION

Install tension rod in the reverse sequence of removal, noting the following.

1) Swing tension rod a few times until rubber bushing and washers are settled down.
2) Do not allow oil or grease to come into contact with rubbers.
3) Tighten tension rod installing bolts and nut to specified torque.

Tightening torque:
Tension rod to lower link bolt:
3.9 to 5.3 kg-m
(28 to 38 ft-lb)
Tension rod to tension rod bracket nut:
3.0 to 4.2 kg-m
(22 to 30 ft-lb)

STABILIZER (Option)

REMOVAL

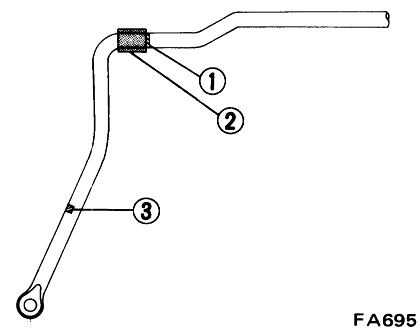
1. Remove nut securing stabilizer connecting rod to lower link.
2. Remove bolt securing stabilizer mounting bracket to frame.
3. Remove nut securing stabilizer and connecting rod, and remove stabilizer and connecting rod.

INSPECTION

Check stabilizer for deformation and rubber bushings for crack, wear and deterioration. Replace if necessary.

INSTALLATION

Install stabilizer in the reverse order of removal, noting the following.
1) Install stabilizer so that right-left distinguishing mark (white paint) is on left side.
2) Be sure that locating mark is located inside the frame mount bushing.



1 Locating mark (white)
2 Frame mounting bushing
3 Right-left distinguishing mark (white)

Fig. FA-26 Stabilizer

SERVICE DATA AND SPECIFICATIONS

Wheel alignment (When vehicle is unloaded and tire inflated to specification)

Camber		–15′ to 1°15′
Caster		35′ to 2°05′
Toe-in	mm (in)	5 to 7 (0.20 to 0.28)

Steering angle

Inner wheel		34° to 36°
Outer wheel		29°30′ to 31°30′

Shock absorber

Stroke	mm (in)	40 (1.57)
Damping force [at piston speed of 0.3 m (1.0 ft)/sec.]		
Expansion	kg (lb)	40 to 58 (88 to 128)
Compression	kg (lb)	16 to 28 (35 to 62)

Upper ball joint

Turning torque		
New parts	kg-cm (in-lb)	10 to 50 (8.7 to 43.4)
Old parts	kg-cm (in-lb)	More than 10 (8.7)

Lower ball joint

Turning torque		
New parts	kg-cm (in-lb)	10 to 40 (8.7 to 34.7)
Old parts	kg-cm (in-lb)	More than 10 (8.7)

Wheel bearing

Rotation starting torque		
New parts	kg-cm (in-lb)	Less than 22 (19.1)
At wheel hub	kg (lb)	Less than 3.9 (8.6)
Old parts	kg-cm (in-lb)	Less than 7 (6.1)
At wheel hub	kg (lb)	Less than 1.2 (2.6)

TIGHTENING TORQUE

Front axle

Wheel nut	kg-m (ft-lb)	8.0 to 10.0 (58 to 72)
Knuckle arm fixing bolt	kg-m (ft-lb)	7.3 to 9.9 (53 to 72)
Caliper fixing bolt	kg-m (ft-lb)	7.3 to 9.9 (53 to 72)
Steering stopper lock nut	kg-m (ft-lb)	2.7 to 3.7 (20 to 27)
Cross rod lock nut	kg-m (ft-lb)	8.0 to 10.0 (58 to 72)

Shock absorber

Shock absorber upper end nut	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Shock absorber lower end nut	kg-m (ft-lb)	3.1 to 4.1 (22 to 30)

Torsion bar spring

Anchor bolt lock nut	kg-m (ft-lb)	3.1 to 4.1 (22 to 30)

Upper link and ball joint

Upper ball joint to upper link nut	kg-m (ft-lb)	1.7 to 2.2 (12 to 16)
Upper ball joint stud nut	kg-m (ft-lb)	8.0 to 10.0 (58 to 72)
Upper link spindle to frame bolt	kg-m (ft-lb)	11.1 to 15.0 (80 to 108)
Upper link spindle end nut	kg-m (ft-lb)	7.7 to 10.5 (56 to 76)

Lower link and ball joint

Lower ball joint to lower link nut	kg-m (ft-lb)	3.9 to 9.9 (28 to 72)
Lower ball joint stud nut	kg-m (ft-lb)	17.2 to 19.5 (124 to 141)
Lower link spindle end nut	kg-m (ft-lb)	11.1 to 15.0 (80 to 108)
Torque arm fixing nut inner	kg-m (ft-lb)	3.6 to 4.6 (26 to 33)
Torque arm fixing nut outer	kg-m (ft-lb)	2.7 to 3.7 (20 to 27)
Bound bumper fixing nut	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)

Tension rod

Tension rod to lower link bolt	kg-m (ft-lb)	3.9 to 5.3 (28 to 38)
Tension rod end nut	kg-m (ft-lb)	3.0 to 4.2 (22 to 30)

Stabilizer (Option)

Stabilizer frame mounting bracket bolt	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Stabilizer connecting rod end nut	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)

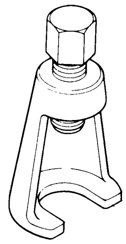
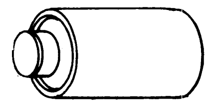
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration, shock and shimmying of steering wheel		
Vibration: Too much backlash of steering gear, abrasion of each part of linkage and vibration of front wheels are, in many cases, transmitted to the steering wheel. This is very much noticeable when travelling over bad roads and at higher speeds.	Improper air pressure of tire.	Adjust.
	Unbalance and deformation of roadwheel.	Correct unbalance or replace.
	Unevenly worn tire or insufficient tightening.	Replace or tighten.
	Improperly adjusted or worn front wheel bearing.	Adjust or replace.
	Faulty wheel alignment.	Adjust.
Shock: When the front wheels are travelling over bumpy roads, play of the steering linkage is transmitted to the steering wheel. This is especially noticeable when travelling rough road.	Worn or loose suspension link rubber bushing.	Replace.
	Damaged idler arm.	Replace.
	Loose steering gear housing.	Tighten.
	Worn steering linkage.	Replace ball joint.
	Improper steering gear adjustment (insufficient backlash).	Adjust.
Shimmying: Abnormal vibrations of the front suspension group and the whole steering linkage, which occur when a specific speed is attained.	Faulty shock absorber or loose installation.	Replace or tighten.
	Unbalanced vehicle posture.	Adjust.
Vehicle pulls to right or left		
When driving with hands off the steering wheel on a flat road, the vehicle persistently pulls to right or left.	Improper air-pressure of tire or insufficient tightening of wheel nuts.	Adjust or tighten.
	Difference in height of right and left tire treads.	Replace tires.
Note: **A faulty rear suspension may also be the cause of this trouble and, therefore, see also the chapter dealing with the rear suspension.**	Incorrect adjustment or abrasion of front wheel bearing.	Adjust or replace.
	Weak front torsion spring or deviation from standard specification.	Replace.
	Worn or loose suspension link rubber bushing.	Replace.
	Deformed steering linkage and suspension link.	Replace.
	Unbalanced vehicle level.	Correct unbalance.
Instability of vehicle	Improper air pressure of tire.	Adjust.
	Worn or loose suspension arm screw bushing.	Replace.
	Incorrect wheel alignment.	Adjust.
	Worn or deformed steering linkage and suspension link.	Replace.
	Incorrect adjustment of steering gear.	Adjust.
	Deformed or unbalanced wheel.	Correct or replace.

Condition	Probable cause	Corrective action
Stiff steering wheel. (checking up procedure) Jack up front wheels, detach the steering gear and operate the steering wheel, and if it is light, check steering linkage and suspension groups. If it is heavy, check steering gear and steering column groups.	Improper air pressure of tire.	Adjust.
	Insufficient lubricant or mixing impurities in steering linkage or excessively worn steering linkage.	Replenish grease or replace worn parts.
	Insufficient lubricant in gear box or contaminated lubricant.	Add or replace gear oil.
	Worn or incorrectly adjusted wheel bearing.	Replace or adjust.
	Worn or damaged steering gear and/or bearing.	Replace.
	Incorrectly adjusted steering gear.	Adjust.
	Deformed steering linkage.	Replace.
	Incorrect wheel alignment.	Adjust.
	Interference of steering column with turn signal switch.	Adjust.
Excessive steering wheel play	Incorrectly adjusted steering gear housing.	Adjust.
	Worn steering linkage idler arm.	Replace.
	Improperly fitted gear box.	Retighten.
	Incorrectly adjusted wheel bearing.	Adjust.
	Worn or loose suspension link rubber bushing.	Replace.
Noise	Improper pressure of tire.	Adjust.
	Insufficient lubricating oil and grease for suspension ball joint and steering linkage or their breakage.	Replenish lubricating oil and grease, or replace.
	Loose steering gear bolts, linkage and suspension groups.	Retighten.
	Damaged shock absorber.	Replace.
	Worn wheel bearing.	Replace.
	Worn steering linkage and steering gear.	Replace.
	Worn or loose suspension link rubber bushing.	Replace.
Grating tire noise	Improper air pressure of tire.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Deformed knuckle spindle and suspension linkage.	Replace.

Condition	Probable cause	Corrective action
Jumping of disc wheel		
	Improper air pressure of tire.	Adjust.
	Unbalanced wheels.	Adjust.
	Damaged shock absorber.	Replace.
	Worn tire.	Replace.
	Deformed wheel rim.	Replace.
Excessively or partially worn tire.		
	Improper air pressure of tire.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Worn wheel bearing.	Replace.
	Incorrect brake adjustment.	Adjust.
	Improper tire shifting (rotation).	Adjust.
	Rough and improper driving manner.	Drive more gently.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST29020001 Ball joint remover	J 25725	ST36070000 Lower link bushing drift	——
	Page FA-7 Page FA-9 Page FA-11		Fig. FA-23

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION RA

REAR AXLE & REAR SUSPENSION

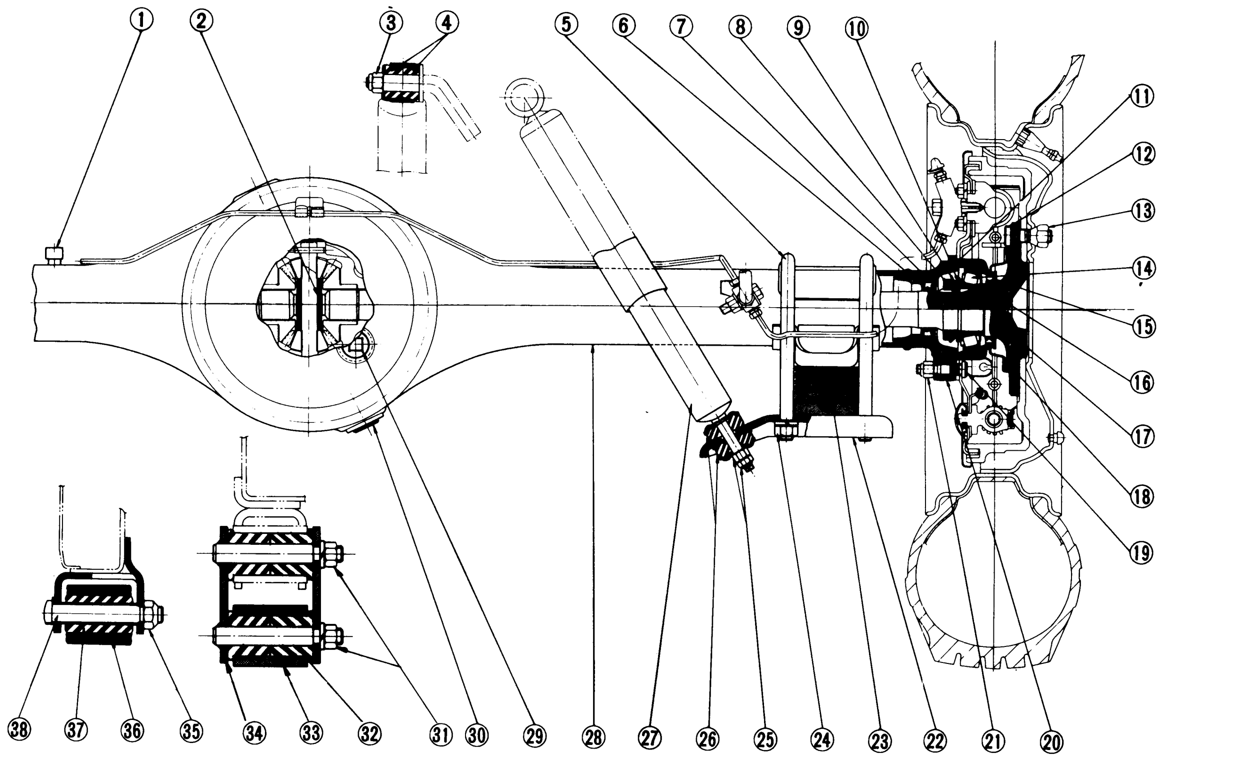
REAR AXLE AND REAR SUSPENSION ..... RA- 2
SERVICE DATA AND SPECIFICATIONS ..... RA- 7
TROUBLE DIAGNOSES AND CORRECTIONS ..... RA- 8
SPECIAL SERVICE TOOLS ..... RA- 9

RA

REAR AXLE AND REAR SUSPENSION

CONTENTS

DESCRIPTION RA-3
REMOVAL AND INSTALLATION RA-3
Rear axle assembly RA-3
Rear axle shaft and wheel bearing RA-4
Rear axle case RA-5
Rear spring RA-5
Shock absorber RA-6
INSPECTION RA-6
Rear axle shaft and wheel bearing RA-6
Rear axle case RA-6
Rear spring RA-6
Shock absorber RA-6



1 Air breather
2 Thrust block
3 Nut
T = 3.1 to 4.1 kg-m
(22 to 30 ft-lb)
4 Shock absorber mounting rubber bush
5 Rear spring clip (U-bolt)
6 Rear axle oil seal spacer
7 Rear axle shaft oil seal.
Supply wheel bearing grease to oil seal lip when assembly.
8 Rear axle bearing lock nut
T = 15 to 20 kg-m
(108 to 145 ft-lb)
9 Rear axle bearing lock washer
10 Plain washer
11 Rear axle bearing cage
12 Road wheel bolt
13 Road wheel nut
T = 8 to 10 kg-m
(58 to 72 ft-lb)
14 Wheel bearing
15 Rear axle bearing grease seal.
Supply wheel bearing grease to oil seal lip when assembly.
16 Rear axle bearing spacer
17 Rear axle shaft
18 Grease catcher
19 Bearing cage bolt
20 Rear axle case end shim
21 Nut
T = 5.4 to 6.4 kg-m
(39 to 46 ft-lb)
22 Rear spring pad
23 Rear spring
24 Nut
T = 7.3 to 9.9 kg-m
(53 to 72 ft-lb)
25 Nut
T = 1.6 to 2.2 kg-m
(12 to 16 ft-lb)
26 Shock absorber rubber bush
27 Shock absorber
28 Rear axle case
29 Filler plug
T = 6 to 10 kg-m
(43 to 72 ft-lb)
Oil capacity (about) = 1.0 liter
(1 ⅛ US qt, ⅞ Imp qt)
30 Drain plug
T = 6 to 10 kg-m
(43 to 72 ft-lb)
31 Nut
T = 5.1 to 6.9 kg-m
(37 to 50 ft-lb)
32 Rear spring rear bush
33 Rear spring
34 Rear spring shackle
35 Nut
T = 11.5 to 13.0 kg-m
(83 to 94 ft-lb)
36 Rear spring
37 Rear spring front bush
38 Rear spring front pin

T: Tightening torque

Fig. RA-1 Cross-sectional view of rear axle and suspension

DESCRIPTION

The rear axle assembly is of the semi-floating type in which the vehicle weight is carried on the axle shafts through bearings enclosed in the bearing cages on outer rear axle case. The axle case is a pressed steel "Banjo" type housing.

The rear axle assembly is attached to the frame through semi-elliptic leaf springs and telescopic hydraulic shock absorbers. Rubber bushings at either end of the leaf springs and shock absorbers are designed to absorb vibration and noise.

The rear axle shaft splines engage the differential side gears with a floating fit. The outer ends are supported in the bearing cages by tapered-roller bearings.

The bearings are lubricated by wheel bearing grease. The axle shaft oil seals are located outboard and inboard of the bearing. The bearings are secured against shoulders on the shafts by press fit, and held in place by a large nuts.

The bearing cages hold the bearings against shoulders on the axle case.

Wheel side thrust is taken at the wheel bearings through the thrust block, so an axle shaft may be removed simply by removing the bolts holding the brake disc to the bearing cage and the rear axle case.

REMOVAL AND INSTALLATION

REAR AXLE ASSEMBLY

It is not necessary to remove the rear axle assembly for any normal repairs.

However, if the axle case is damaged, the rear axle assembly may be removed and installed using the following procedures.

1. Raise rear of vehicle high enough to permit working underneath. Place a jack under center of axle case so it just starts to raise rear axle assembly.

Place stands solidly under frame members on both sides. Remove rear wheels.

2. Mark relationship across propeller shaft flange and companion flange of differential carrier so that the original combination is restored at assembly.
3. Remove bolts retaining center bearing bracket and connecting shaft to companion flange. Withdraw propeller shaft sleeve yoke from transmission by moving the shaft rearward, passing it under rear axle.
4. Disconnect rear hand brake cable ① by removing adjusting nut ②, three clamps ③ and connector ⑨. Slide front cable rearward and disconnect rear cable ④ at connector ⑤ by removing three clamps ③.
5. Disconnect rear brake hose at frame ⑥. Cover brake hose and pipe openings to prevent entrance of dirt.
6. Disconnect shock absorbers at lower end ⑦ and push shock absorbers up out of the way.
7. Lower jack under axle case. Remove U-bolts (spring clips) ⑧ to separate axle case from spring.

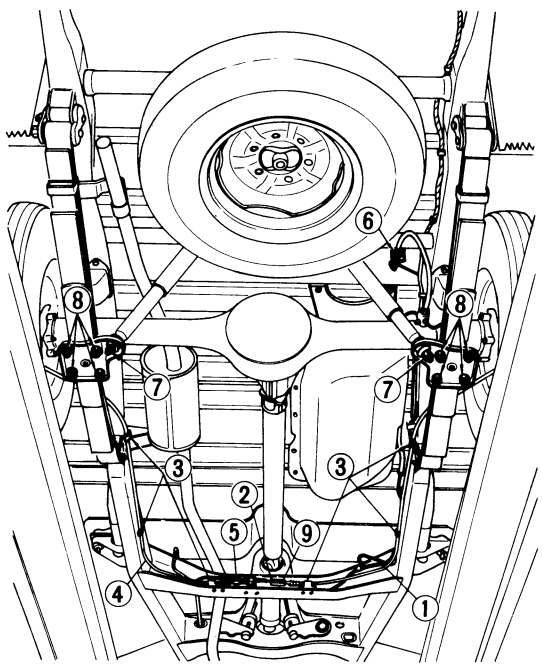


Fig. RA-2 Under view

8. Place a jack under center of axle case. Pass axle case through space above spring, and take it out to the side.

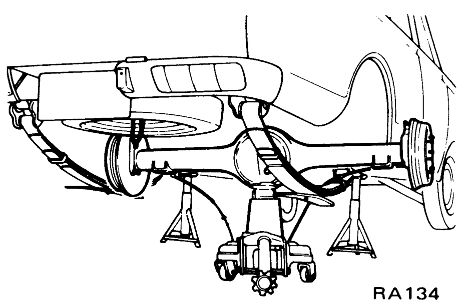


Fig. RA-3 Removing rear axle assembly

9. Install the axle case assembly in the reverse order of removal.

Tightening torque:

U-bolt (Spring clip):
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

Shock absorber lower end nut:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

Brake pipe flare nut:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Propeller shaft to companion flange connecting bolt:
2.0 to 2.7 kg-m
(14 to 20 ft-lb)

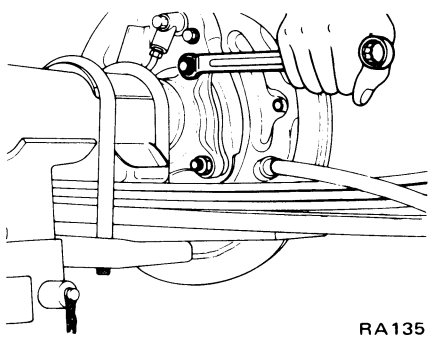
Center bearing bracket fixing bolt:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

REAR AXLE SHAFT AND WHEEL BEARING

1. Raise rear of vehicle and support under axle case on stands. Remove rear wheel.
2. Disconnect rear hand brake cable by removing adjusting nut and clamps.
3. Disconnect brake tube at rear wheel cylinder. Cover brake tube and wheel cylinder openings to prevent entrance of dirt.
4. Remove brake drum.

Note: If brake drum cannot be easily removed, return brake adjuster, install two bolts (M8 x 1.25) in holes on the flange face of brake drum, and tighten bolts evenly until brake drum is driven out.

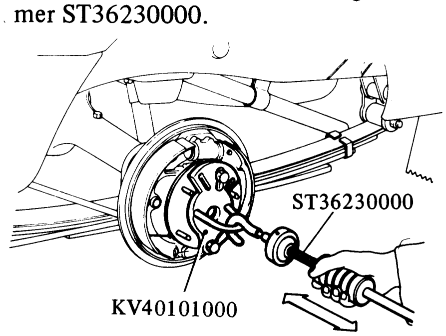
5. Remove nuts retaining wheel bearing cage to brake disc.



RA135

Fig. RA-4 Removing nuts

6. Pull out axle shaft assembly together with brake disc using Rear Axle Stand KV40101000 and Sliding Hammer ST36230000.

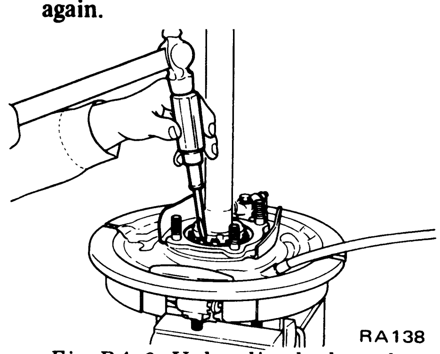


RA418

Fig. RA-5 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. Position axle shaft in vise with Rear Axle Stand ST07630000.
9. Unbend lock washer with a screwdriver.

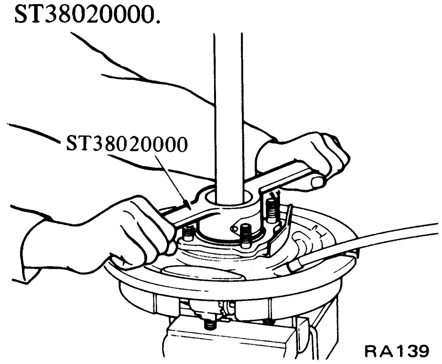
Note: Do not use used lock washer again.



RA138

Fig. RA-6 Unbending lock washer

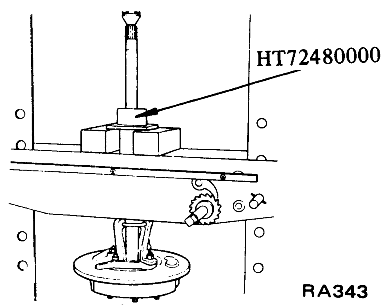
10. Remove lock nut using Rear Axle Bearing Lock Nut Wrench ST38020000.



RA139

Fig. RA-7 Removing lock nut

11. Withdraw wheel bearing together with bearing cage and brake disc using Rear Axle Shaft Bearing Puller HT72480000.



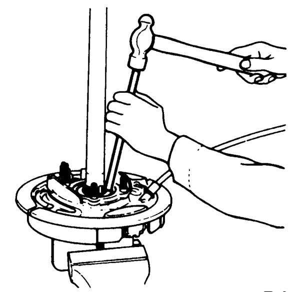
RA343

Fig. RA-8 Removing bearing

12. Remove oil seal in bearing cage if necessary.
13. To remove wheel bearing outer race after removed oil seal, apply a brass drift to race side surface, and withdraw it by tapping the top of drift with a hammer.

Installing can be proceeded in the reverse order of removal procedure as follows;

1. Fit wheel bearing outer race by tapping with a brass hammer evenly while fitting.
2. Install a new oil seal in bearing cage. Lubricate cavity between seal lips with wheel bearing grease after fitting seal.
3. Place bearing cage with brake disc and bearing spacer on axle shaft, and fit bearing cone. To install bearing cone, apply a brass drift to race side surface and tapping the top of drift with a hammer.



RA141

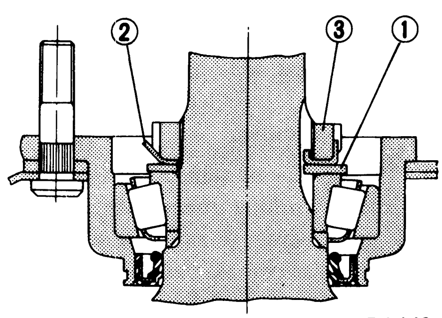
Fig. RA-9 Installing wheel bearing

4. Place bearing lock washer ① and bearing nut lock washer ② on axle shaft, and tighten lock nut ③ using Rear Axle Bearing Lock Nut Wrench ST38020000, and bend up lock washer.

Note:

a. **Be careful to place the faced side of nut to washer side so that washer is not damaged.**
b. **Coincide washer lip with nut groove correctly by tightening nut, and bend washer carefully so that lip will not be damaged.**

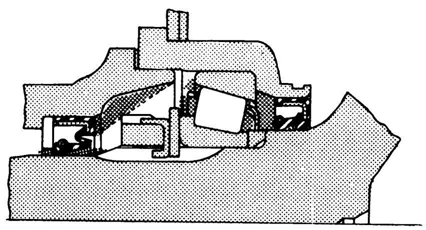
Tightening torque:
15 to 20 kg-m
(108 to 145 ft-lb)



RA142

Fig. RA-10 Layout of lock nut

5. Apply wheel bearing grease in wheel bearing and recess of axle case end.



: Lubricating portion

RA143

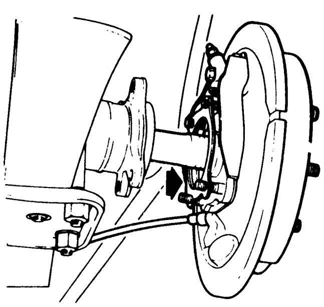
Fig. RA-11 Lubricating portion in and around wheel bearing

6. Apply gear oil to the spline at the inner end of axle shaft. Apply a coat of wheel bearing grease on the seal surface of the shaft.
7. Install left or right shaft, and adjust axial end play by applying rear axle case end shim (indicated by arrow mark).

Axial end play: 0.3 to 0.9 mm
(0.012 to 0.035 in)

Standard shim thickness:
1.5 mm (0.059 in)

Tightening torque of
bearing cage fixing nut:
5.4 to 6.4 kg-m
(39 to 46 ft-lb)



RA144

Fig. RA-12 Installing rear axle shaft

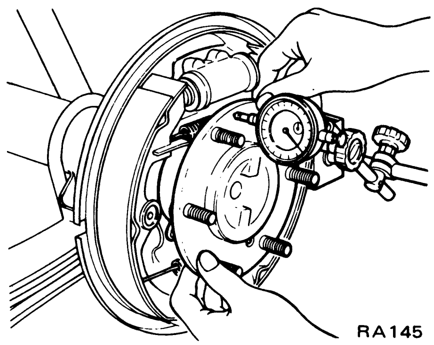
Rear axle case end shim

Thickness mm (in)
0.05 (0.0020)
0.07 (0.0028)
0.10 (0.0039)
0.20 (0.0079)
0.50 (0.0197)

8. Install shaft in opposite side, and adjust axial end play by applying shim.

Axial end play: 0.02 to 0.15 mm
(0.0008 to 0.0059 in)

Tightening torque of
bearing cage fixing nut:
5.4 to 6.4 kg-m
(39 to 46 ft-lb)



RA145

Fig. RA-13 Measuring axial end play

9. Install other parts in reverse sequence to removal.

REAR AXLE CASE

Rear axle case may be removed and installed using the following procedures:

1. Raise rear of vehicle and support securely under both frame members with stands.
2. Remove rear axle assembly (See removal of rear axle assembly.).
3. Remove rear axle shaft at both sides (See removal of rear axle shaft and wheel bearing.).
4. Remove differential carrier assembly.

Installing can be proceeded in the reverse order of removal procedure.

Another procedure is available as listed below:

1. Raise rear of vehicle and support under both frame members with stands.
2. Remove rear axle shaft at both sides.
3. Remove differential gear carrier assembly.
4. Remove rear axle case.

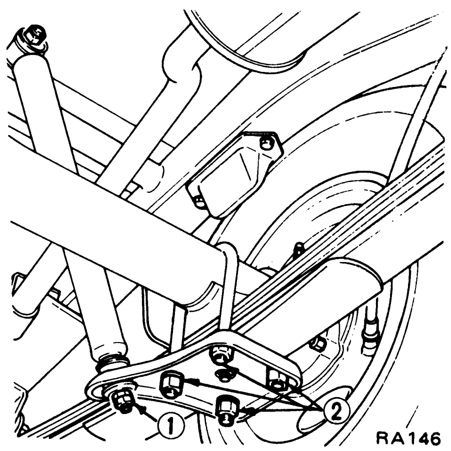
Installing can be proceeded in the reverse order of removal procedure.

Tightening torque:
Differential carrier to axle case
fixing nut: 1.7 to 2.5 kg-m
(12 to 18 ft-lb)

Oil drain and filler plug:
6 to 10 kg-m
(43 to 72 ft-lb)

REAR SPRING

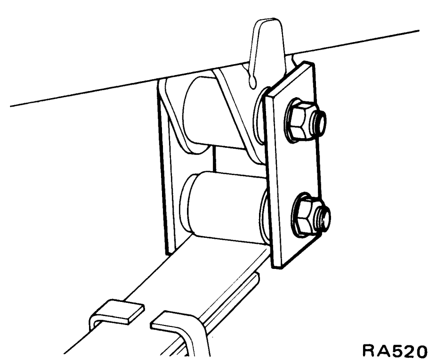
1. Raise rear of vehicle and support under both frame members with stands.
2. Disconnect shock absorber at lower end ① and remove U-bolts (Spring clips)②.



RA146

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.



RA520

Fig. RA-15 Removing spring shackle

5. Disconnect spring from body by removing spring front pin.

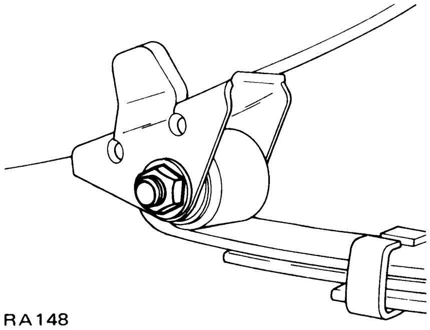


Fig. RA-16 Remvoing spring pin

6. Remove rubber bush in spring if necessary and install new bush. Coat rubber bush with a soapy solution prior to assembly.

Install rear spring in the reverse order of removal, noting the following point.

Vehicle weight must be on rear wheels when tightening front pin, shackle and shock absorber lower end nut in order to clamp rubber bush in a neutral or unloaded position.

Tightening torque:

Spring front pin nut:
11.5 to 13.0 kg-m
(83 to 94 ft-lb)

Spring shackle nut:
5.1 to 6.9 kg-m
(37 to 50 ft-lb)

U-bolt: 7.3 to 9.9 kg-m
(53 to 72 ft-lb)

Shock absorber lower end nut:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

SHOCK ABSORBER

1. Raise rear of vehicle and support under axle case on stands. It is recommended that a hydraulic hoist or open pit be utilized if available.
2. Disconnect lower end of shock absorber by removing nuts ① at spring seat.
3. Disconnect upper end of shock absorber by removing nut ② at frame.

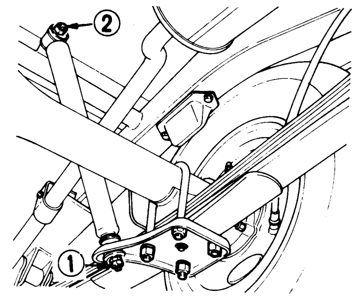


Fig. RA-17 Removing shock absorber

Installation of shock absorber in the reverse order of removal.

Note: Vehicle weight must be on rear wheels when tightening shock absorber upper and lower ends in order to clamp rubber bushings in a neutral or unloaded position.

INSPECTION

REAR AXLE SHAFT AND WHEEL BEARING

Inspect the following parts for faults and replace as required.

1. Check axle shaft for straightness, cracks, damage, wear and distortion.
2. Check the lip of oil seal fo. damage, deformation and wear.
3. Check bearing for wear and damage.

REAR AXLE CASE

Check axle case for yield, deformation, cracks or oil leakage and replace if necessary.

REAR SPRING

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, straightness and damaged threads. If faulty parts are found, replace with new ones.
3. Inspect all rubber parts for wear, damage, separation and deformation. Replace them if necessary.

SHOCK ABSORBER

1. Test shock absorber and compare with the specifications 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.

SERVICE DATA AND SPECIFICATIONS

Item \ Applied model		All models	
Rear shock absorber			
Stroke x Maximum length	mm (in)	190 x 475 (7.48 x 18.70)	
Damping force at 0.3 m (1.0 ft)/sec. Expansion	kg (lb)	36 to 52 (79 to 115)	
Compression	kg (lb)	16 to 28 (35 to 62)	
		Standard	*Option
Rear leaf spring			
Dimensions (Length x Width x Thickness-Number of leaves)	mm (in)	1,200 x 60 x 7-2 13-1 (47.24 x 2.36 x 0.28-2 0.51-1)	1,200 x 60 x 8-2 13-2 (47.24 x 2.36 x 0.31-2 0.51-2)
Free camber	mm (in)	161 (6.34)	114.5 (4.51)
Laden camber	mm/kg (in/lb)	–7/450 (–0.28/992)	–7.5/695 (–0.30/1,532)
Spring constant	kg/mm (lb/in)	1.9 to 5.5 (106 to 308)	2.9 to 9.8 (162 to 549)
Rear axle			
End play	mm (in)	0.02 to 0.15 (0.0008 to 0.0059)	
Rear axle case end shim thickness	mm (in)	0.05 (0.0020) 0.07 (0.0028) 0.10 (0.0039) 0.20 (0.0079) 0.50 (0.0197)	

*Recommended for use on heavy load under high center of gravity such as camper loading.

Tightening torque

Shock absorber upper end nut	kg-m (ft-lb)	3.1 to 4.1 (22 to 30)
Shock absorber lower end nut	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Rear spring U-bolt (Clip)	kg-m (ft-lb)	7.3 to 9.9 (53 to 72)

Spring front pin	kg-m (ft-lb)	11.5 to 13.0 (83 to 94)
Spring shackle	kg-m (ft-lb)	5.1 to 6.9 (37 to 50)
Bearing cage fixing bolt	kg-m (ft-lb)	5.4 to 6.4 (39 to 46)
Wheel bearing lock nut	kg-m (ft-lb)	15 to 20 (108 to 145)
Air breather	kg-m (ft-lb)	0.7 to 0.9 (5.1 to 6.5)
Differential gear carrier to axle case nut	kg-m (ft-lb)	1.7 to 2.5 (12 to 18)
Propeller shaft flange bolt	kg-m (ft-lb)	2.4 to 3.3 (17 to 24)
Drain and filler plug	kg-m (ft-lb)	6 to 10 (43 to 72)
Bumper rubber fixing bolt	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Wheel nut	kg-m (ft-lb)	8 to 10 (58 to 72)

TROUBLE DIAGNOSES AND CORRECTIONS

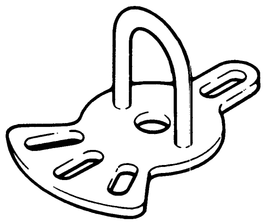
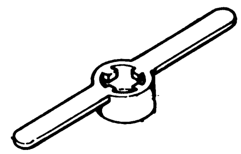
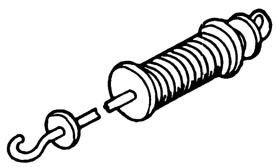
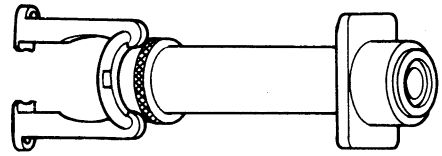
When rear axle and suspension is suspected of being noisy it is advisable to make a thorough test to determine whether the noise originates in the tires, road surface, exhaust, propeller shaft, engine, transmission, universal joint, wheel bearings or suspension.

Noise which originates in other places can not be corrected by adjustment or replacement of parts in the rear axle and rear suspension.

In case of oil leak, first check if there is any damage or restriction in breather.

Condition	Probable cause	Corrective action
Noise	Loose wheel nuts.	Tighten the wheel nuts.
	Loose one or more securing bolts.	Tighten the bolts to the specified torque.
	Lack of lubricating oil or grease.	Lubricate as required.
	Faulty shock absorber.	Replace the shock absorber.
	Incorrect adjustment of rear axle shaft end play.	Adjust the rear axle shaft end play.
	Damaged or worn wheel bearing.	Replace wheel bearing.
	Worn spline portion of rear axle shaft.	Replace if necessary.
	Broken leaf spring.	Replace leaf spring.
	Loose journal, connections or so no.	Tighten to the given torque.
	Wheel and tire unbalance.	Balance wheel and tire.
	Damaged rubber parts such as leaf spring bush, shock absorber mounting bush.	Replace the required parts.
	Faulty universal joints.	Adjust or replace.
Instability in driving	Loose wheel nuts.	Tighten to the given torque.
	Worn shock absorber.	Replace faulty shock absorber.
	Worn or broken leaf spring.	Replace leaf spring.
Oil leakage	Damaged or restricted air breather.	Clean or replace air breather.
	Damaged oil seal in rear axle case or differential carrier.	Replace the damaged oil seal.
	Oil leakage from between the differential carrier and axle case.	Tighten to the specified torque, or replace gasket.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
KV40101000 Rear axle stand 	J 25604-01 / Fig. RA-5	ST38020000 Bearing lock nut wrench 	J 25864-01 / Fig. RA-7
ST36230000 Sliding hammer 	J 25840 / Fig. RA-5	HT72480000 Rear exle shaft bearing puller 	—— / Fig. RA-8

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

SECTION BR

BRAKE SYSTEM

BR

GENERAL DESCRIPTION .... BR- 2

ADJUSTMENT .... BR- 2

SERVICE BRAKE .... BR- 4

HAND BRAKE BR-20

SERVICE DATA AND SPECIFICATIONS BR-22

TROUBLE DIAGNOSES AND CORRECTIONS BR-24

SPECIAL SERVICE TOOLS BR-27

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

GENERAL DESCRIPTION

The 620 series vehicles are equipped with hydraulic brakes on the four wheels, and mechanical hand brakes on the rear wheels. The front brake is a single cylinder type disc brake (N22A), and the rear the duo-servo, with the built-in hand brake. The mechancal hand brake is controlled by a hand brake lever located in the driver's compartment.

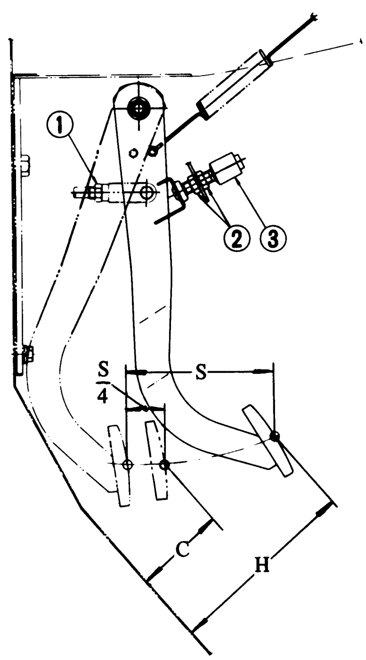
For added safety, the tandem master cylinder, Master-Vac and Nissan Load Sensing Valve (N.L.S.V.) are standard equipment on all models. The Master-Vac is installed to increase braking force. The N.L.S.V. ensures greater safety and reliability.

ADJUSTMENT

CONTENTS

BRAKE PEDAL BR-2
FRONT DISC BRAKE BR-2
REAR BRAKE BR-2
HAND BRAKE (Parking brake) BR-3
BLEEDING HYDRAULIC SYSTEM BR-3

BRAKE PEDAL



Free height: H = 154 (6.06)
Full stroke at pedal pad: S = 142 to 148 (5.59 to 5.83)
Depressed height: C = 75 (2.95)

1 Push rod adjusting nut
2 Switch adjusting nuts
3 Brake lamp switch

Unit: mm (in)

BR080A

Fig. BR-1 Adjusting brake pedal

1. Under the condition that the push rod of brake lamp switch is pushed in, position the height of brake pedal from toeboard to 154 mm (6.06 in), operating the switch adjusting nuts. Then, tighten nuts securely.

   Tightening torque:
   1.2 to 1.5 kg-m
   (9 to 11 ft-lb)

2. Adjust length of push rod until a pedal free play of 1 to 5 mm (0.04 to 0.20 in) is obtained at pedal pad. Then, tighten push rod lock nut securely.

   Tightening torque:
   1.9 to 2.4 kg-m
   (14 to 17 ft-lb)

Note: Take care not to allow the push rod to get into master cylinder in free condition.

3. After completing adjustment, operate brake pedal several times to ensure that it travels over its entire stroke of 145 mm (5.71 in) smoothly without showing squeak noise, twisting or interference.

FRONT DISC BRAKE

Front disc brake does not require adjustment under normal conditions since pad to rotor clearance is automatically compensated for by elasticity of piston seal and gripper.

REAR BRAKE

1. Raise vehicle until wheel clear floor.
2. Remove rubber boot from brake disc.
3. Lightly tap adjuster housing and move it forward. Turn down adjuster wheel with a screwdriver, and spread brake shoes. Stop turning adjuster wheel when a considerable drag is felt and lock up brake drum.

Note: For both right and left brakes, brake shoes spread when adjuster wheel is turned downward.

4. Return adjuster wheel 12 ratches to obtain correct clearance between brake drum and brake shoes. Turn brake drum, and make sure that brake drum turns without dragging when brake shoes interfere with brake drum, then readjust clearance.
5. Install rubber boot.

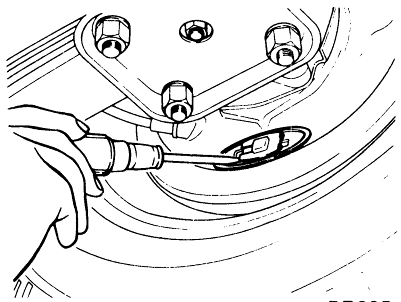


Fig. BR-2 Adjusting rear brake

HAND BRAKE (Parking brake)

1. Raise vehicle until rear wheels are clear of the floor.
2. Apply hand brake lever, operate lock nuts to be 80 to 100 mm (3.15 to 3.94 in) in hand brake lever stroke, and tighten lock nuts securely.

Applying force to hand brake lever:
20 to 30 kg (44 to 66 lb)

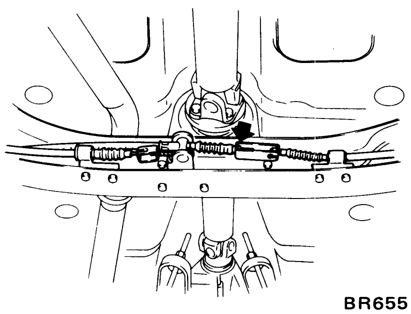


Fig. BR-3 Adjusting lock nut

3. Fully release hand brake and rotate rear wheels. No drag should be present.

Note:
a. **Before adjusting hand brake, complete the adjustment of rear brakes.**
b. **After adjusting hand brake, operate the brake lever to make cable stable.**
c. **Hand brake must be operated smoothly while being pulled and released. Make sure that no abnormal noise, dragging, twisting or other faulty condition occurs.**

BLEEDING HYDRAULIC SYSTEM

Hydraulic brake system must be bled whenever any line has been disconnected or air has entered into system.

When pedal action has a "spongy" feel, it is an indication that air has entered the system.

Bleeding the hydraulic system is an essential part of regular brake service.

1. Clean all dirt around master cylinder reservoir, remove cap and top up reservoir with recommended brake fluid.

Note: **Do not mix two different brand oils.**

2. Thoroughly clean mud and dust from bleeder valve so that outlet hole is free from any foreign material. Install a bleeder hose on bleeder valve.
Place the other end of hose in a container filled with brake fluid.
3. Depress brake pedal two or three times, then keep pedal fully depressed.
4. With brake pedal fully depressed, open bleeder valve to expel air.

Note:
a. **Pay attention to brake fluid level in master cylinder reservoir during bleeding operation.**
b. **Do not reuse brake fluid drained during bleeding operation.**
c. **Bleed air as follows:**
   (1) Master cylinder, front
   (2) Master cylinder, rear
   (3) N.L.S.V., front
   (4) Front wheels
   (5) Rear wheels (left one first)
   (6) N.L.S.V., rear
   (7) N.L.S.V., center
d. **Exercise care not to splash brake fluid on exterior finish as it will damage the paint.**

5. Close bleeder valve quickly as brake pedal is on down stroke.
6. Allow brake pedal to return slowly with bleeder screw closed.
7. Repeat bleeding operations until no air bubbles show in hose.

Note:
a. **Brake fluid containing air is white and has visible 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 lines to expel all air.

SERVICE BRAKE

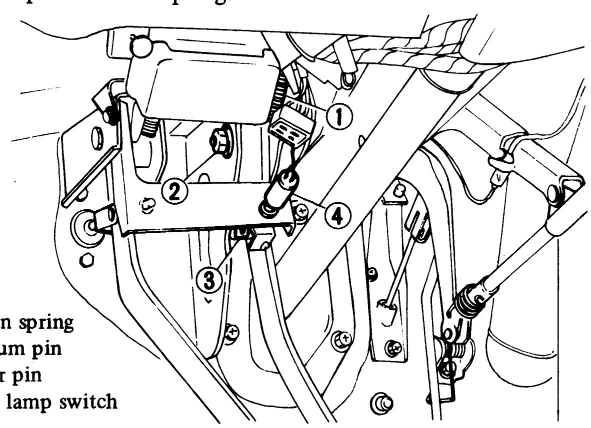
CONTENTS

BRAKE PEDAL .... BR- 4
REMOVAL .... BR- 4
INSPECTION .... BR- 4
INSTALLATION .... BR- 4
MASTER CYLINDER .... BR- 5
REMOVAL .... BR- 5
DISASSEMBLY AND ASSEMBLY .... BR- 6
INSPECTION .... BR- 6
INSTALLATION .... BR- 6
BRAKE LINE .... BR- 7
REMOVAL .... BR- 8
INSPECTION .... BR- 8
INSTALLATION .... BR- 8
N.L.S.V. .... BR- 9
DESCRIPTION .... BR- 9
N.L.S.V. TEST .... BR- 9
FRONT DISC BRAKE BR-10
DESCRIPTION BR-10
PAD REPLACEMENT BR-10
REMOVAL BR-11
DISASSEMBLY BR-11
INSPECTION BR-12
ASSEMBLY BR-12
INSTALLATION BR-13
REAR BRAKE BR-13
REMOVAL BR-14
DISASSEMBLY AND ASSEMBLY BR-14
INSPECTION BR-14
INSTALLATION BR-15
MASTER-VAC BR-15
DESCRIPTION BR-15
INSPECTION OF OPERATION BR-16
REMOVAL BR-17
DISASSEMBLY BR-17
INSPECTION BR-19
ASSEMBLY AND ADJUSTMENT BR-19
INSTALLATION BR-20

BRAKE PEDAL

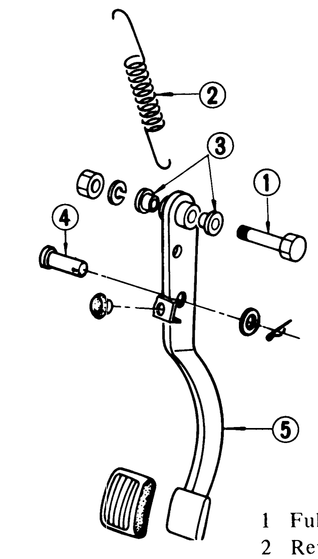
REMOVAL

1. Remove pedal return spring.



1 Return spring
2 Fulcrum pin
3 Cotter pin
4 Brake lamp switch

Fig. BR-4 Brake pedal mounting



1 Fulcrum pin
2 Return spring
3 Pedal bushings
4 Clevis pin
5 Brake pedal

Fig. BR-5 Brake pedal

2. Remove cotter pin from clevis pin, and separate pedal from (Master-Vac) push rod.
3. Remove fulcrum pin and pedal.

Note: Loosen fulcrum pin clockwise.

INSPECTION

Check brake pedal for the following items, servicing as necessary.

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. Insert fulcrum pin into hole in brake pedal and bracket from right side.
2. Install clevis pin from left-hand side.

3. Hook return spring to brake pedal assembly from accelerator pedal side.
4. Apply a coating of recommended multi-purpose grease to the inner and outer faces of pedal bushing, clevis pin, and hooks of return spring. Charge the clearances in bushings with grease.

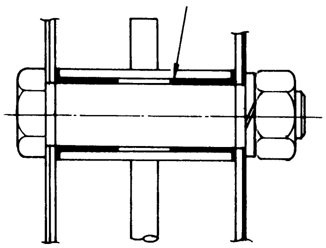


Fig. BR-6 Greasing place

5. Install brake lamp switch.
6. Adjust the brake pedal after installation. (Refer to the instructions under Adjustment.)

Tightening torque:
Fulcrum pin:
1.9 to 2.4 kg-m
(14 to 17 ft-lb)

MASTER CYLINDER

The diameter of cylinder is 20.64 mm (13/16 in) for all models. The tandem master cylinder contains two fluid reservoirs which connect 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 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 cap with the slit in the reservoir tank and push retention cap in the tank.
(3) Turn retention ring fully in the TIGHTEN direction.

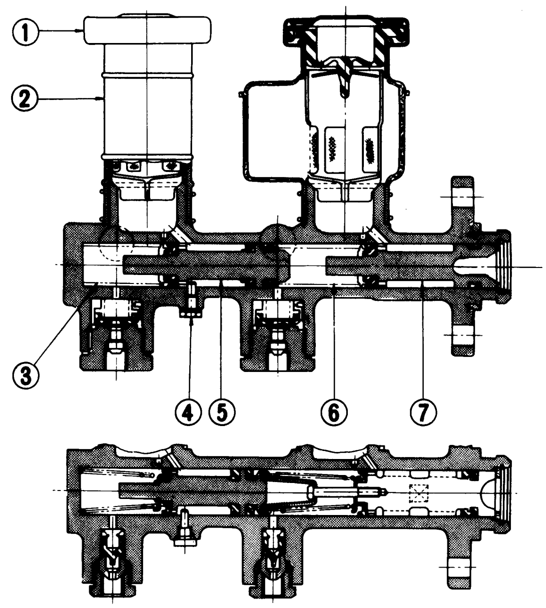


Fig. BR-7 Sectional view of tandem master cylinder

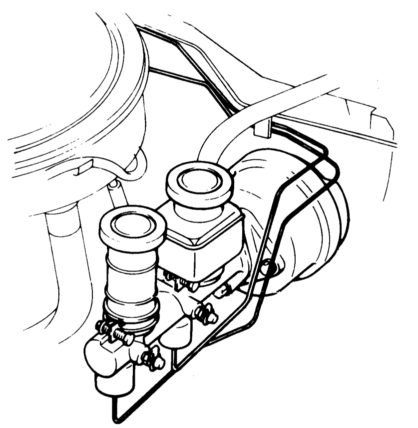


Fig. BR-8 Master cylinder

REMOVAL

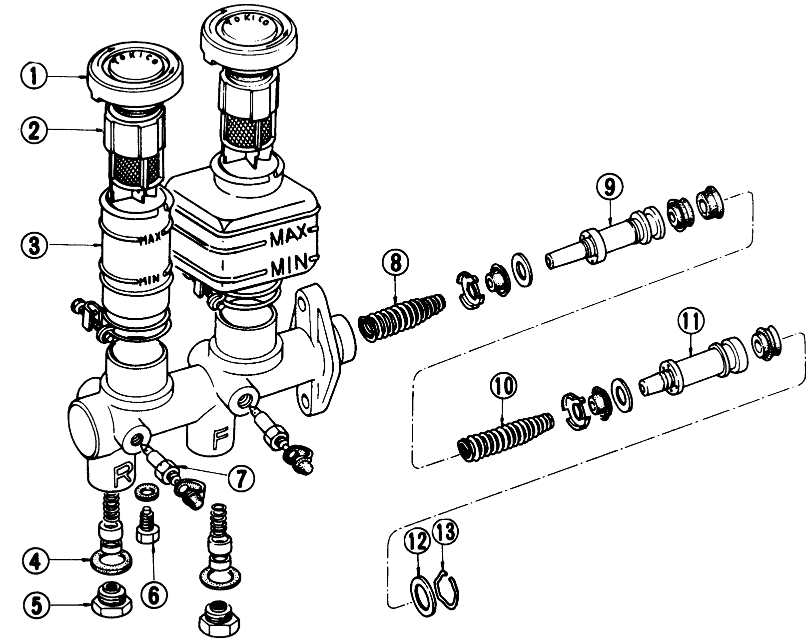
1. Disconnect front and rear brake tubes from master cylinder.

CAUTION:
When removing brake tubes, use Flare Nut Torque Wrench GG94310000. Never use open end or adjustable wrench.

Note: **When disconnecting brake tubes, be sure to use a container to receive draining brake fluid. Use of rags is also suggested to keep adjacent parts and area clean.**

2. Remove master cylinder securing nut. Then master cylinder can be taken out.

DISASSEMBLY AND ASSEMBLY



1	Reservoir cap	6	Secondary piston stopper	11	Primary piston
2	Oil filter	7	Bleeder screw	12	Piston stopper
3	Oil reservoir	8	Secondary return spring	13	Piston stopper ring
4	Packing	9	Secondary piston		
5	Valve cap	10	Primary return spring		

BR043A

Fig. BR-9 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 piston cup if it is removed from piston assembly and use a new one.

4. Unscrew plugs to gain access to check valve for disassembling.

Note: Never detach reservoir tank. If it is removed for any reason, discard it and install a new one.

5. Assemble master cylinder in the reverse sequence of disassembly, paying particular attention to the following notes:

Tightening torque:
Valve cap:
Tokico
8 to 9 kg-m
(58 to 65 ft-lb)
Nabco
2.5 to 3.5 kg-m
(18 to 25 ft-lb)
Bleeder:
0.7 to 0.9 kg-m
(5.1 to 6.5 ft-lb)

Note:

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.**
c. **The brake master cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes. When replacing the repair kit or component parts, ascertain the brand of the brake master cylinder body. Be sure to use parts of the same make as the former ones.**

INSPECTION

Thoroughly clean all parts in a suitable solvent, and check for worn or damaged parts. Replace any part that is faulty.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

1. Check cylinder and position for evidence of abnormal wear or damage.
   Replace if found faulty.
2. Check piston-to-cylinder clearance. If it is more than 0.15 mm (0.0059 in), replace either piston or cylinder.

   Master cylinder inner diameter:
   20.64 mm ($^{13}/_{16}$ in)

3. Check for weakened, fatigued or damaged springs, and replace if necessary.
4. When master cylinder is disassembled, be sure to discard cups and valves. Replace any other part which shows evidence of deformation, wear or damage.
5. Replace damaged oil reservoirs and caps.

INSTALLATION

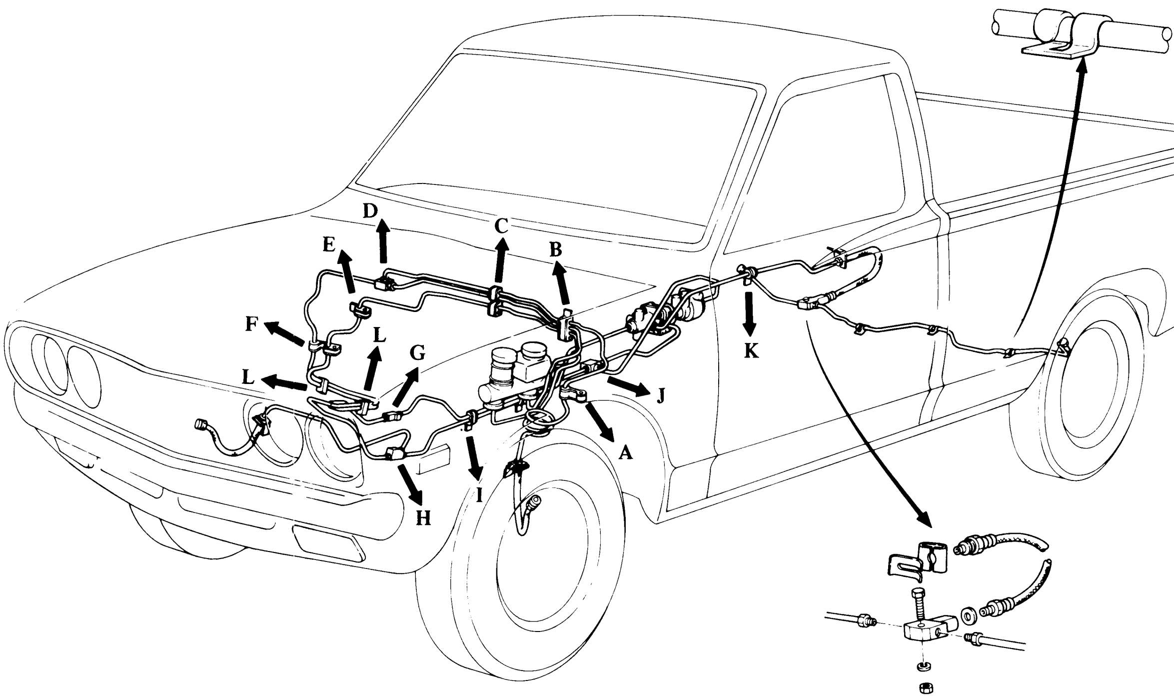
Install master cylinder in the reverse sequence of removal.

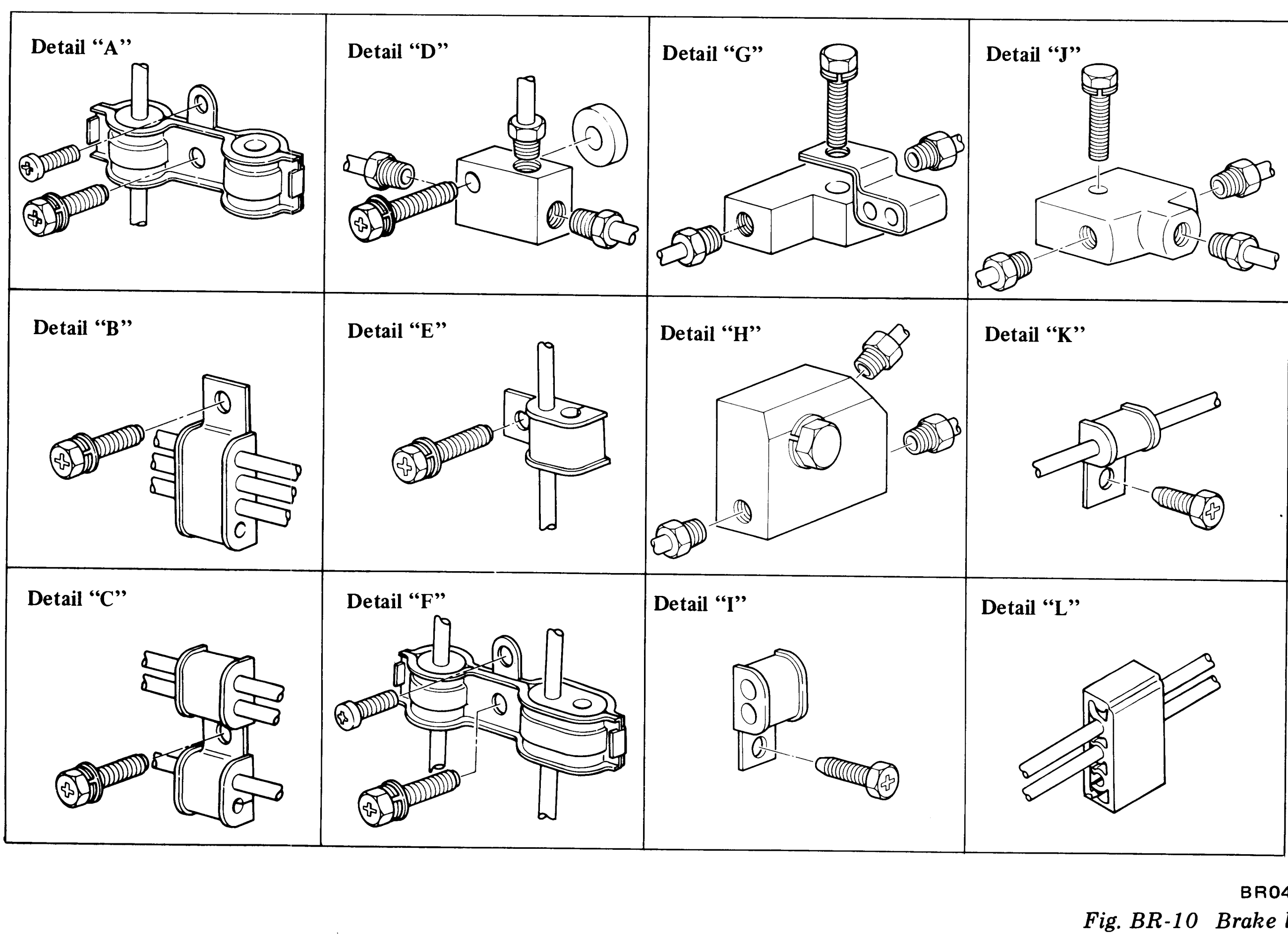
Bleed air out of master cylinder by loosening bleeder screw after it is installed in its original position.

CAUTION:
When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

Tightening torque:
Brake master cylinder attaching nut:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)
Brake tube connector:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

BRAKE LINE





BR044A

Fig. BR-10 Brake line

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.

CAUTION:
When removing brake tubes and hoses, use Flare Nut Torque Wrench GG94310000.
Never use an open end or an adjustable wrench.

INSPECTION

1. Examine all hoses for swell, rubbing marks or ozone-cracking, replacing those found with any of above badly beyond use. Also, inspect end fittings and be sure that no fluid leak through staked end has taken place; replace if necessary. Hose with badly rusted fitting should also be replaced with a new one.
2. Clean all tubes to remove dust and dirt with isopropyl alcohol, checking for collapse, wear, cracking, swell or rusting. Replace if found with any of above. Use care not to damage brake tubes while operation.

Check if tubes are clamped securely.

After all brake lines have been installed, retighten all connections, if necessary, to assist in obtaining correct torque.

Hold pedal as far downward as possible 80 kg (176 lb) or more, examining evidence as to whether fluid is leaking through brake lines or connections. Leakage in any manner cannot be permitted here. In case fluid leaks, tightening to specified torque, tighten additionally up to 2.5 kg-m (18 ft-lb). Under no circumstances should not be tightened over 2.5 kg-m (18 ft-lb) torque since this elongates end fitting, making it impossible to reuse brake tube.

Under no circumstances should rear brake hose and 3-way connector be retightened over specified torques. Instead, replace copper washer with a new one after checking for sign of damage on seating surface. Never reuse an old copper washer.

INSTALLATION

Brake hose

Front brake hose

In installing brake hose, first jack up vehicle to take off the weight of vehicle from wheels so that suspension is in rebound. Steering wheel should also be kept in straight-ahead position.

To connect brake line, first connect brake hose to the bracket at brake unit with the specified torque.

Tightening torque:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Then secure brake hose to the bracket at frame side with lock plate so as not to twist or abnormally bend the hose.

Note: After connecting brake hose at both ends, pay keen attention not to twist the hose when additional tightening is required.

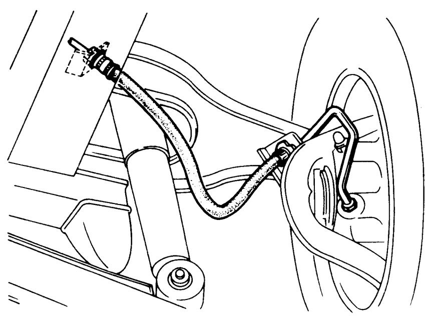


Fig. BR-11 Front brake hose

Rear brake hose

First, secure rear brake hose to 3-way connector on rear axle case to the specifications. After connecting hose to the bracket at frame side, do not tighten it at 3-way connector additionally since this operation causes hose to be twisted.

Tightening torque:
1.7 to 2.0 kg-m
(12 to 14 ft-lb)

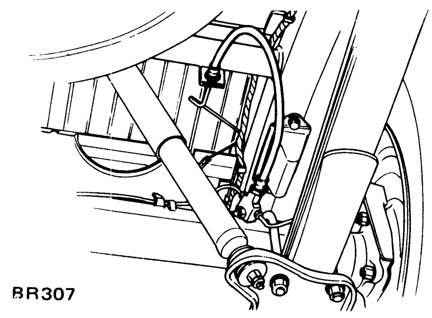


Fig. BR-12 Rear brake hose

After brake hose has been installed, check to be sure that there is enough clearance between hose and adjacent parts to avoid contact with other ones. The check should be carried out while moving wheel up and down through its full stroke and rotating steering wheel between two extreme lock positions. The above clearance must be as follows:

Hose to rotating or moving parts such as tire and rim:
40 mm (1.57 in) and more
Hose to stationary part:
25 mm (0.98 in) and more

In case that the above clearance cannot be obtained, it may be caused by the hose twisted. Accordingly, carry out the correction with hose connection again, following the above instructions.

Brake tube

In installing a brake tube, use care to locate its end squarely on mating seat, noting the fact that nut can be turned freely by a light finger twist. Then, tighten to correct torque with a Flare Nut Torque Wrench GG94310000.

Tightening torque (Flare nut):
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

In addition, care should also be exercised to avoid damaging or collapsing brake tube during operation.

Be sure to make enough clearance between all tubes and other adjacent parts to avoid contact.

In installing tube through hood ledge grommet, be sure to position it at the center of grommet.

After connecting brake tube, be sure to check the clearance to prevent from damage. The clearance at the following portions must be specified distance or more.

Tube to body panel and frame:
  Over 5 mm (0.20 in)
Tube to edge of each panel:
  Over 10 mm (0.39 in)
Tube to tube:
  Loop pitch:
    Over 5 mm (0.20 in)
  Between front tube and rear tube:
    Over 9 mm (0.35 in)
Tube to moving parts:
  Over 10 mm (0.39 in)
Loop tube to hoodledge panel:
  Over 10 mm (0.39 in)

Note:

a. **Brake tubes are shaped at factory to secure specified clearance and may not require reshaping. Discard if they call for excessive reshaping.**
b. **In reshaping a brake tube, take care to avoid damaging galvanization or collapsing section.**

After brake lines have been asssembled, check to make sure that all fittings and flare nuts are tightened to correct torques.

Tightenint torque:
  Brake tube to connector:
    1.5 to 1.8 kg-m
    (11 to 13 ft-lb)
  Brake tube to brake hose:
    1.7 to 2.0 kg-m
    (12 to 14 ft-lb)
  Clip fixing bolt:
    0.32 to 0.44 kg-m
    (2.3 to 3.2 ft-lb)
  3-way connector fixing bolt (on rear axle case):
    1.7 to 2.0 kg-m
    (12 to 14 ft-lb)

N.L.S.V.

DESCRIPTION

The Nissan Load Sensing Valve (N.L.S.V.) serves to change braking power of the rear wheels in response to changes in the load and fluid pressure, improving braking stability and shortening stopping distances.

The N.L.S.V. is installed on the frame, being inclined at 10 degrees. A summary of the N.L.S.V. operation is given in Figures BR-13 and BR-14.

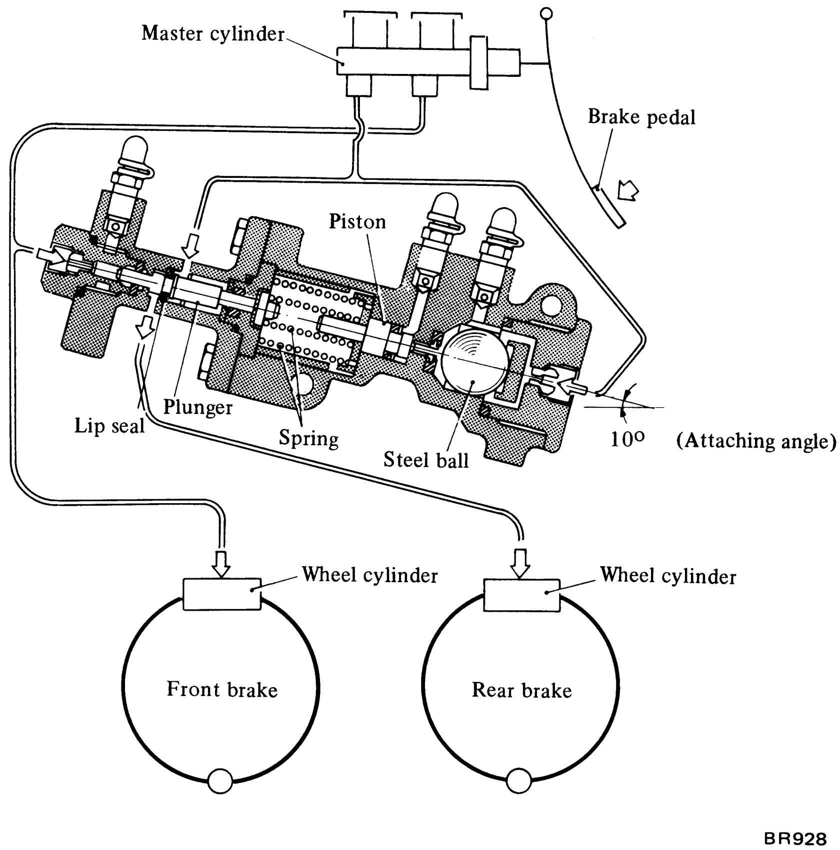


Fig. BR-13 Construction of N.L.S.V.

Performance curve of brake fluid pressure is as follows:

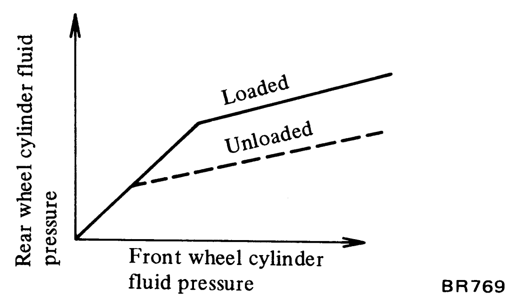


Fig. BR-14 Performance curve of fluid pressure

N.L.S.V. TEST

Operating test

Under unloaded condition, drive vehicle on dry flat concrete or asphalt roads without an occupant except driver. When driving at a speed of 40 km/h (25 MPH), suddenly fully apply brakes [with a deceleration 6.9 m/sec^2 (23 ft/sec^2)].

Under these conditions, make sure that front and rear wheels have not locked. And if rear, instead of front, wheels have locked in advance, it may be attributable to malfunction of N.L.S.V. Replace N.L.S.V. with a new one as an assembly.

Note:

a. The above mentioned operating test is available when the entire brake system except N.L.S.V. is correctly adjusted.
b. Deceleration 6.9 m/sec^2 (23 ft/sec^2) means such a condition under which vehicle stops at a distance of about 13 m (43 ft) without locking front and rear wheels when brakes are abruptly fully applied at about 40 km/h (25 MPH).

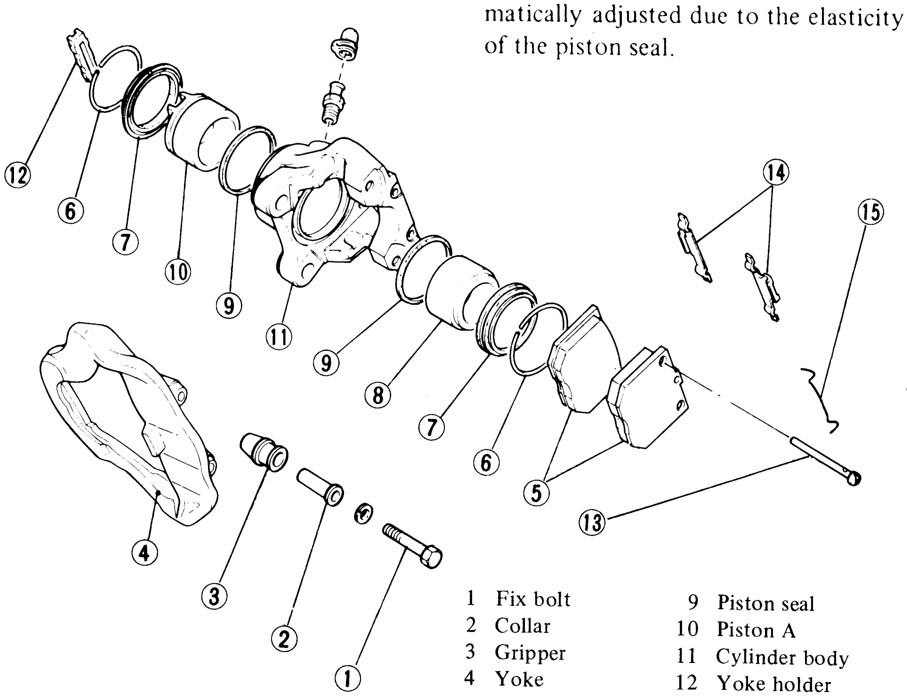
FRONT DISC BRAKE

DESCRIPTION

The N22A type disc brake has two pistons in a single cylinder.

When the brake is operated, the inner pad is directly pushed against the rotor by piston B, and the outer pad is indirectly pushed by piston A. The yoke and cylinder body slide through the grippers, and there is no metallic contact. The gripper is useful for preventing dragging and reducing the knock-back phenomenon.

The pad-to-rotor clearance is automatically adjusted due to the elasticity of the piston seal.



1 Fix bolt	9 Piston seal
2 Collar	10 Piston A
3 Gripper	11 Cylinder body
4 Yoke	12 Yoke holder
5 Pad	13 Pad pin
6 Retaining ring	14 Anti-squeal spring
7 Dust seal	15 Clip
8 Piston B	

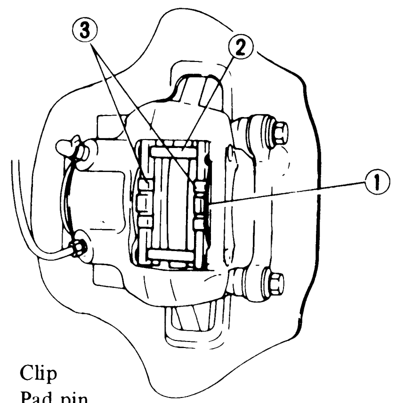
BR733

Fig. BR-15 Disc brake

PAD REPLACEMENT

Removal

1. Jack up front of vehicle, and support it on safety stands. Remove tire.
2. Remove clip.
3. Remove pad pins holding anti-squeal springs with finger.
4. Detach pads.



1 Clip
2 Pad pin
3 Anti-squeal spring

BR956

Fig. BR-16 Removing pads

CAUTION:
After removing pads, do not depress brake pedal, or pistons will jump out.

Inspection

1. Clean pads with cleaning solvent.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

2. When pads are heavily fouled with oil or grease or when pad is deteriorated or deformed, replace it.
3. When thickness of friction material is less than 2 mm (0.08 in), replace pads.

Note: **Always replace pads in pad kit [four pads, and four clips, four pad pins and four anti-squeal springs].**

4. Check rotor, referring to following page BR-12 for Inspection.

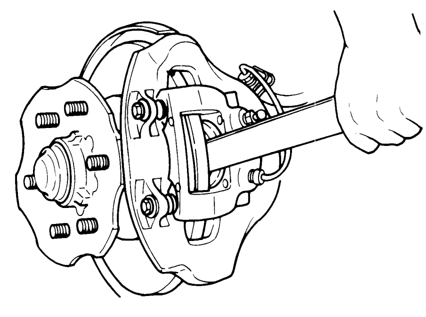
Installation

1. Clean piston end and surroundings of gripper.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

Note: **Be careful not to get oil on rotor.**

2. Loosening air bleeder, push piston B (outer piston) in cylinder until dust seal groove of piston B coincides with end surface of retaining ring on dust seal. After piston B is at the point, tighten air bleeder. Inner pad can then be installed.

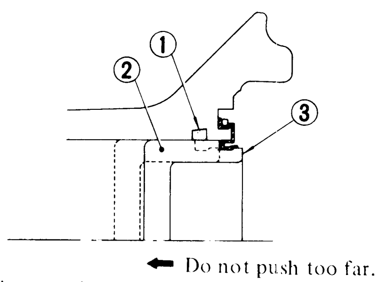


BR046A

Fig. BR-17 Pushing piston B

CAUTION:

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-18. At this point, if piston is pressured or moved, piston seal will be damaged. If piston has been pushed in too far, remove caliper assembly and disassemble it. Then, push piston out in direction shown by arrow. Assemble it again, referring to following section.

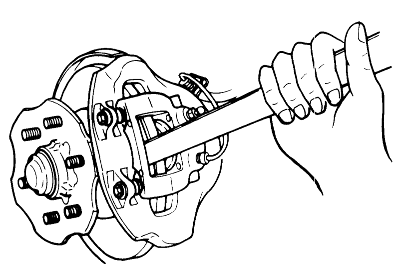


1 Piston seal
2 Piston B
3 Normal position

BR780

Fig. BR-18 Position of piston

3. Push piston A (inner piston) in cylinder by pulling yoke. Outer pad can then be installed.



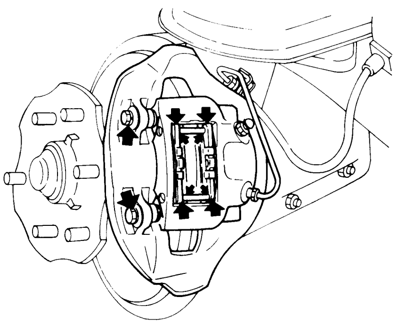
BR047A

Fig. BR-19 Pulling in piston A

4. Coat the following points with pad grease.

- Cylinder body-to-pad clearance
- Pad pin-to-pad clearance
- Pad pin-to-cylinder body clearance

Note: **Do not grease friction face of pad.**



BR048A

Fig. BR-20 Greasing points

5. After installing pads, install anti-squeal spring and pad pin, and fix with clip.
6. Depress brake pedal several times, and pads will settle into proper position.

Add brake fluid to reservoir tank of master cylinder.

7. Install wheels and lower car to ground.

Note: If necessary, bleed brake system.

REMOVAL

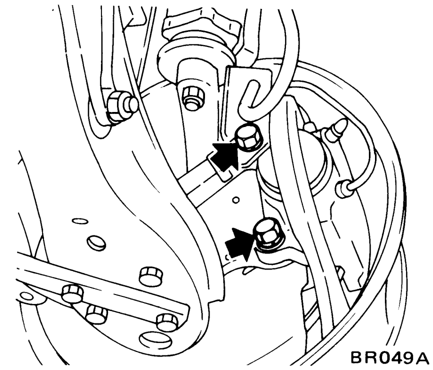
1. Remove brake tube from caliper assembly.

CAUTION:

When removing brake tube, use Flare Nut Torque Wrench GG94310000. Never use open-end or adjustable wrench.

Note: **Plug up hole in caliper and brake tube so that brake fluid does not flow out.**

2. Remove caliper assembly from knuckle spindle.



BR049A

Fig. BR-21 Removing caliper

3. If necessary, remove rotor as follows:

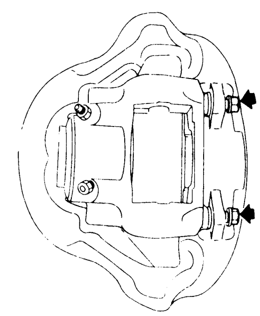
(1) Remove hub cap, cotter pin and adjusting cap.

(2) Loosen bearing lock nut and remove wheel hub with rotor.

(3) Secure wheel hub in a vice, loosen bolts and remove rotor from wheel hub.

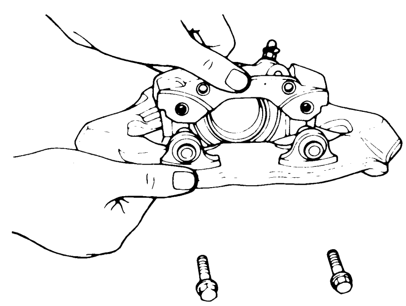
DISASSEMBLY

1. Drain brake fluid from cylinder body.
2. Wipe off dust and mud from caliper assembly.
3. Remove pads. Refer to page BR-10 for Pad Replacement.
4. Remove fixing bolts from cylinder body.



BR740

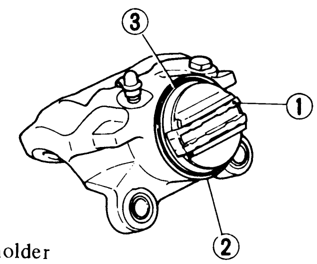
Fig. BR-22 Removing fixing bolts



BR741

Fig. BR-23 Removing yoke

5. Remove yoke holder from piston.
6. Remove retaining rings and dust seals from end of both pistons A and B.



1 Yoke holder
2 Retaining ring
3 Dust seal

BR742

Fig. BR-24 Removing piston

7. Force out pistons from cylinder by feeding compressed air gradually.

WARNING:
Gradually increase air pressure so that piston does not pop out.

8. Remove piston seals.

CAUTION:
Be careful not to damage seals and cylinder body.

9. If necessary, remove gripper.
Be careful not to damage collar.

INSPECTION

Clean all parts and check as follows:

CAUTION:
Use brake fluid to clean. Never use mineral oil.

Cylinder body

1. Check inside surface of cylinder for score, rust, wear, damage or presence of foreign substances. If any surface fault is detected, replace cylinder body.
2. Minor damage from rust of foreign substances may be eliminated by polishing surface with a fine emery cloth. If damage is major, cylinder assembly must be replaced.

Yoke

Check for wear, cracks or other damage. Replace if any fault is detected.

Piston

Check piston for score, rust, wear, damage or presence of foreign substances. Replace if any fault is detected.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck on sliding surface.

Piston seal and dust seal

Replace piston seal and dust seal at each disassembly.

Gripper and yoke holder

Check for wear, cracks or other damage. Replace if any fault is detected.

Rotor

1. Check rotor for score and damage. If excessive, machine reconditioning will be required.
2. Measure thickness of rotor with a micrometer. If thickness of rotor is beyond wear limit specified below, replace rotor.

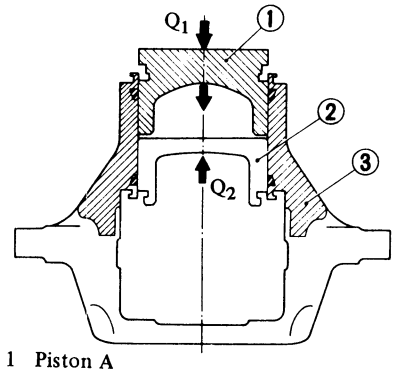
Wear limit: 10.5 mm (0.413 in)

3. Measure thickness around the entire periphery on same circumference. If parallelism is over 0.03 mm (0.0012 in), replace rotor.

ASSEMBLY

1. Install piston seals, taking care not to damage them.
2. Apply brake fluid to sliding portions of piston, inside of cylinder, and insert piston A and piston B one by one.

CAUTION:
Insert piston A in direction shown by arrow Q1 and piston B in direction shown by arrow Q2.



1 Piston A
2 Piston B
3 Cylinder body

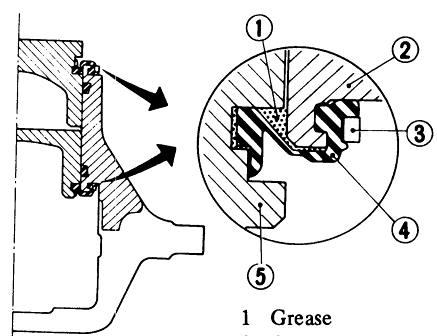
BR787

Fig. BR-25 Inserting piston

Note:
a. **When inserting pistons, be careful not to insert too far. Refer to page BR-10 for Pad Replacement.**
b. **Install piston A so that its yoke groove coincides with yoke groove of cylinder.**

3. Install dust seal and clamp securely with retainer ring.

Note:
a. **Apply N22A disc brake grease to sealing surface of dust seal.**
b. **Be careful not to deform dust seal.**
c. **Wipe off excess grease with alcohol.**

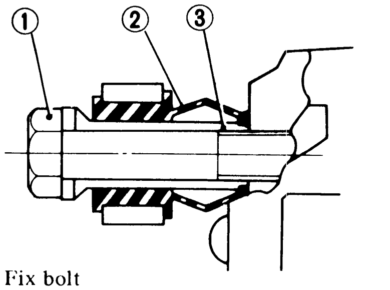


1 Grease
2 Cylinder body
3 Retaining ring
4 Dust seal
5 Piston

BR788

Fig. BR-26 Installing dust seal

4. Install yoke holder to piston A.
5. Install gripper to yoke. Apply a coating of 1% soap water to inner wall of gripper, and drive in collar.



1 Fix bolt
2 Gripper
3 Collar

Fig. BR-27 Installing gripper

Note: Use only 1% soap water on gripper.

6. Install yoke to yoke holder and, supporting end of piston B, press yoke into yoke holder by a force of 20 to 30 kg (44 to 66 lb).

CAUTION:
When pressing yoke into yoke holder, be sure to insert yoke vertically so as not to crack or chip yoke holder. If yoke holder is damaged or pressing force is out of specification, replace with a new one.

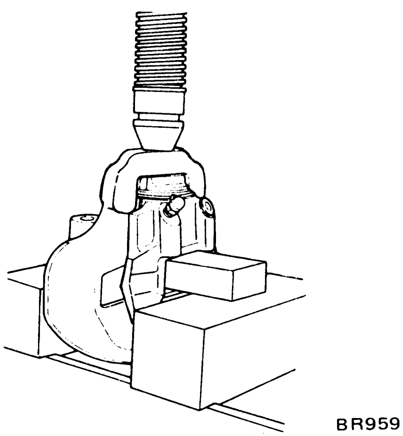


Fig. BR-28 Installing yoke

7. Coat the following points with pad grease. See Figure BR-20.

- Cylinder body-to-pad clearance
- Pad pin-to-pad clearance
- Pad pin-to-cylinder body clearance.

8. Install pads, anti-squeal springs, pad pins and fix with clip.
9. Tighten fixing bolts.

Tightening torque:
1.6 to 2.1 kg-m
(12 to 15 ft-lb)

INSTALLATION

1. Install rotor and wheel hub in reverse order of removal. Adjust wheel bearing preload correctly, referring to Section FA for Adjustment.

Tightening torque:
Rotor to wheel hub:
3.9 to 5.3 kg-m
(28 to 38 ft-lb)

2. Using a dial gauge, measure runout of rotor at circumference of 200 mm (7.87 in). If it exceeds 0.15 mm (0.0059 in), machine reconditioning or replacement is required.

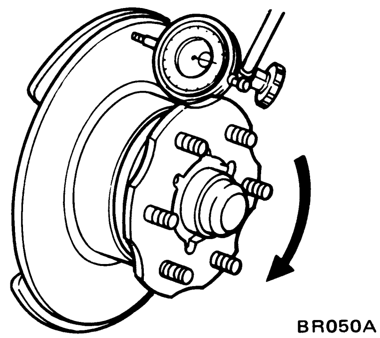


Fig. BR-29 Measuring runout of rotor

3. Install caliper assembly to knuckle spindle.

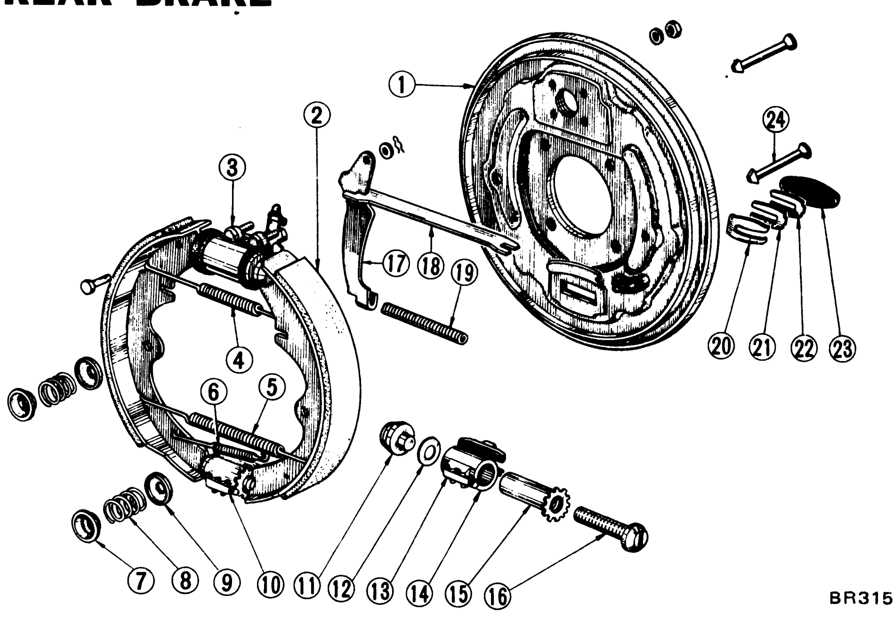
Tightening torque:
Caliper to knuckle spindle:
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

4. Install brake tube and bleed brake system.

Tightening torque:
Brake tube flare nut:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)
Air bleeder:
0.7 to 0.9 kg-m
(5.1 to 6.5 ft-lb)

CAUTION:
When installing brake tube, use Flare Nut Torque Wrench GG94310000.

REAR BRAKE



1 Brake disc
2 Brake shoe assembly
3 Wheel cylinder assembly
4 Return upper spring
5 Return lower spring
6 After shoe return spring
7 Retainer
8 Antirattle spring
9 Spring seat
10 Adjuster assembly
11 Adjuster head
12 Adjuster head shim
13 Lock spring
14 Adjuster housing
15 Adjuster wheel
16 Adjuster screw
17 Toggle lever
18 Extension link
19 Return spring
20 Adjuster spring
21 Lock plate
22 Adjuster shim
23 Rubber boot
24 Antirattle pin

Fig. BR-30 Rear brake

REMOVAL

1. Jack up rear of vehicle just high enough to remove tire and support it with safety stands.
2. Remove wheel, loosen hand brake and detach brake drum.
3. Turn pin by 90°, and remove antirattle springs.
4. Open brake shoe assemblies outward against return spring, and remove extension link.
5. Remove return springs.
6. Remove brake shoe assemblies. Note that after (secondary) brake shoe assembly must be separated from toggle lever. When separating after (secondary) brake shoe assembly from toggle lever, withdraw clevis pin.
7. Disconnect toggle lever from hand brake rear cable.

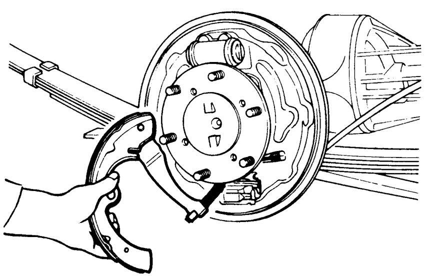


Fig. BR-31 Removing toggle lever

8. Disconnect brake tube at wheel cylinder by loosening flare nut.
9. Remove wheel cylinder from brake disc by loosening installation nuts.
10. Remove rubber boot, adjuster shim, lock plate and adjuster springs and remove adjuster assembly from brake disc.

DISASSEMBLY AND ASSEMBLY

Wheel cylinder

Wheel cylinder can be disassembled simply by the following procedures described below:

Remove dust cover, and take out piston from wheel cylinder. Be careful not to damage sliding part of piston and piston cup.

Thoroughly wash all disassembled parts in brake fluid.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

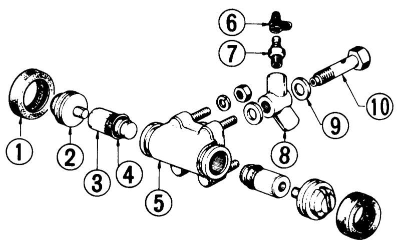
Assemble wheel cylinder in reverse sequence of disassembly.

When securing connector bolt, insert its location tip to the hole of wheel cylinder firmly and tighten it securely.

Carry out operations carefully so that component parts are not damaged or no dust and other foreign material enter cylinder.

Note:

a. **Apply a coating of brake fluid to piston cup at assembly.**
b. **The brake wheel cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.**
When replacing the repair kit or component parts, ascertain the brand of the brake wheel cylinder body. Be sure to use parts of the same make as the former ones.



1	Dust cover	6	Bleeder cap
2	Piston head	7	Bleeder screw
3	Piston	8	Connector
4	Piston cup	9	Washer
5	Wheel cylinder housing	10	Connector bolt

Fig. BR-32 Rear wheel cylinder

INSPECTION

Brake drum

1. Replace brake drum whose diameter is beyond the limit of 1.5 mm (0.059 in) with respect to the standard inner diameter of 254.0 mm (10.00 in).
2. The allowable maximum "out-of-round" of brake drum is 0.015 mm (0.0006 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 45 mm (1.77 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. When brake shoe linings are cracked, incompletely seated, unevenly worn, and/or deteriorated due to excessive heating or soiled with oil, grease and brake fluid, replace.
2. Replace linings if the thickness is worn down to less than 1.5 mm (0.059 in).

Note: **When brake shoe lining is installed, grind brake shoe lining face to diameter equal to that of brake drum.**

Lining dimension:
Width x Thickness x Length
45 x 4.5 x 244 mm
(1.77 x 0.177 x 9.61 in)

3. Check adjuster for smooth operation.
4. Replace shoe return springs which are broken or fatigued.

Standard dimensions of shoe springs

Item	Free length mm (in)	Dia. of spring mm (in)	No. of coils	Installed length/load mm/kg (in/lb)
Upper	175 (6.89)	2.0 (0.079)	32.5	184/11 to 13 (7.24/24 to 29)
Lower	158 (6.22)	2.3 (0.091)	30	176/18 to 20 (6.93/40 to 44)
After shoe	83.2 (3.276)	1.4 (0.055)	27.5	99/4 to 5 (3.90/9 to 11)
Antirattle	20.5 (0.807)	1.6 (0.063)	3.5	12/3.5 to 4.5 (0.47/8 to 9.9)

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).

   Wheel cylinder inner diameter:
   15.88 mm (5/8 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 faulty threaded parts.
6. Replace tube connector which is worn on its threaded portion.

INSTALLATION

Install rear brake in the reverse sequence of removal, paying particular attention to the following instructions.

CAUTION:
When installing brake tube, use Flare Nut Torque Wrench GG94310000.

1. When assembling adjuster assembly, apply brake grease to adjuster housing bore, adjuster wheel and adjuster screw.

   When installing adjuster assembly to brake disc, apply brake grease to disc, adjuster and retaining spring sliding surfaces to slide adjuster smoothly.

   Measure adjuster sliding resistance. Adjust with adjuster shim when sliding resistance is incorrect.

   Adjuster sliding resistance:
   5 to 12 kg (11 to 26 lb)

2. When assembling toggle lever and after brake shoe assembly, adjust clearance between toggle lever and after brake shoe assembly to 0 to 0.3 mm (0 to 0.012 in) with a properly selected toggle pin washer.

Toggle pin washer

No.	Thickness mm (in)
1	2.0 (0.079)
2	2.3 (0.091)
3	2.6 (0.102)
4	2.9 (0.114)
5	3.2 (0.126)

3. Before installing brake shoe assemblies, apply brake grease to the following places:

   (1) Brake shoe installing grooves of adjuster and wheel cylinder.
   (2) Extension link installing grooves.
   (3) Lower surface of spring seat.
   (4) Contact surfaces between brake disc and brake shoe assembly (six places).

Note: Exercise care not to allow grease to come into contact with linings or adjuster.

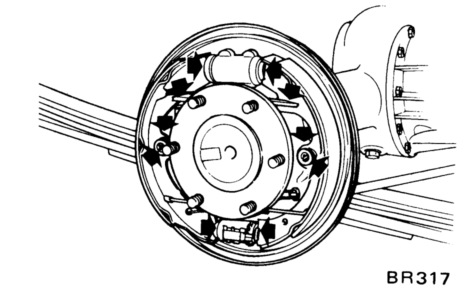


Fig. BR-33 Greasing points

4. Tightening torque:

   Wheel cylinder:
   1.5 to 1.8 kg-m
   (11 to 13 ft-lb)
   Connector bolt:
   1.9 to 2.5 kg-m
   (14 to 18 ft-lb)
   Brake tube:
   1.5 to 1.8 kg-m
   (11 to 13 ft-lb)
   Air bleeder:
   0.7 to 0.9 kg-m
   (5.1 to 6.5 ft-lb)
   Brake disc:
   5.4 to 6.4 kg-m
   (39 to 46 ft-lb)

5. Adjust brake shoe clearance and bleed brake system. Upon completion of the above adjustments, make sure that brake operates correctly and no brake fluid leaks.

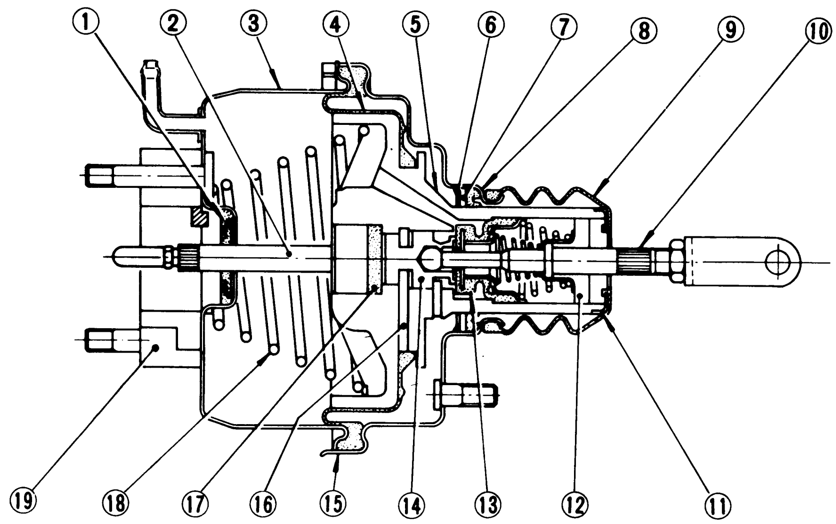
MASTER-VAC

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 vehicle.

The Master-Vac contains a spring loaded diaphragm of 152.4 mm (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.



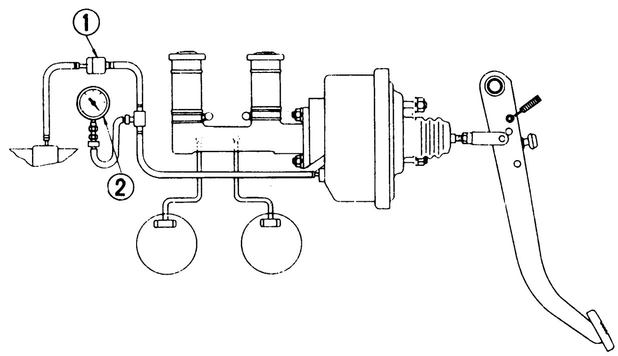
1 Plate and seal assembly
2 Push rod
3 Front shell
4 Diaphragm
5 Diaphragm plate and valve body
6 Retainer
7 Bearing
8 Valve body seal
9 Valve body guard
10 Valve operating rod
11 Silencer retainer
12 Silencer (rubber)
13 Poppet assembly
14 Plunger assembly (valve operating rod, poppet assembly)
15 Rear shell
16 Valve plunger stop key
17 Reaction disc
18 Diaphragm return spring
19 Flange

Fig. BR-34 Sectional view of Master-Vac

INSPECTION OF OPERATION

Checking vacuum pressure

1. Connect a vacuum gauge, in the line, between check valve and Master-Vac, as shown in Figure BR-35.
2. Start engine and increase engine speed. Stop engine when vacuum gauge indicates 500 mmHg (19.69 inHg).



1 Check valve
2 Vacuum gauge

Fig. BR-35 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.

2. Fifteen seconds after engine is stopped and brake fully applied, observe the rate of drop in air pressure registered by vacuum gauge.

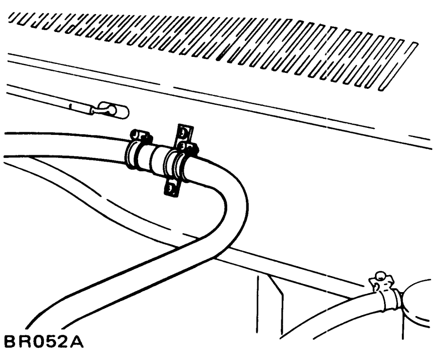
If a pressure drop of 25 mmHg (0.98 inHg) is exceeded, refer to the following chart to determine the cause of failure.

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: Whenever Master-Vac is to be disassembled, rubber part must be replaced with a new one.

Inspecting check valve

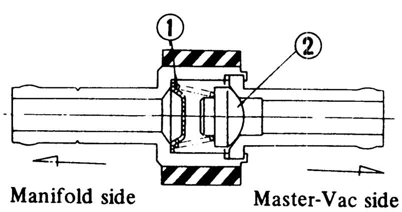
1. Remove clip and disconnect hoses at connections. The check valve can now be removed.



BR052A

Fig. BR-36 Location of check valve

2. Using a Master-Vac tester, apply a vacuum pressure of 200 mmHg (7.87 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.



1 Spring 2 Valve BR289

Fig. BR-37 Sectional view of check valve

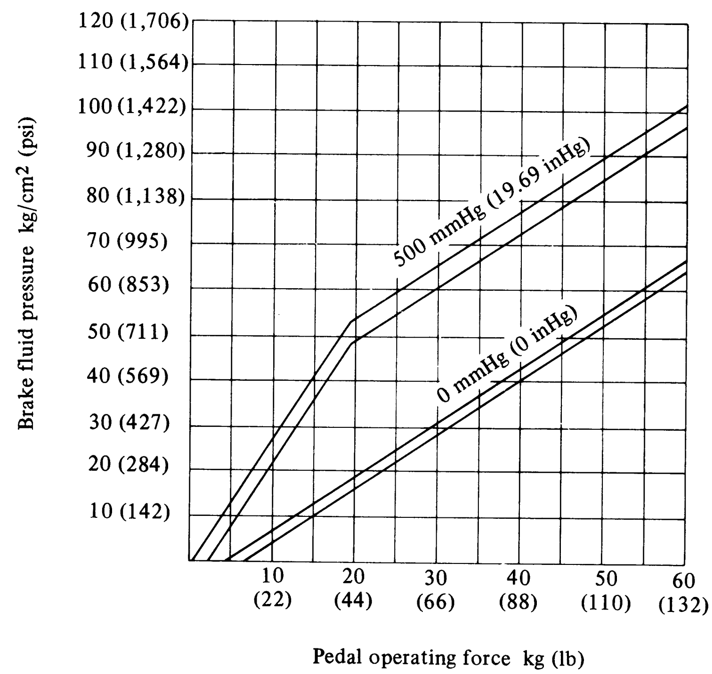
Operating test

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-38. If test results are not as specified in Figure BR-38, 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.

Note: Determine whether source of problem is in Master-Vac or check valve. Before you reach a final conclusion, always inspect check valve first.

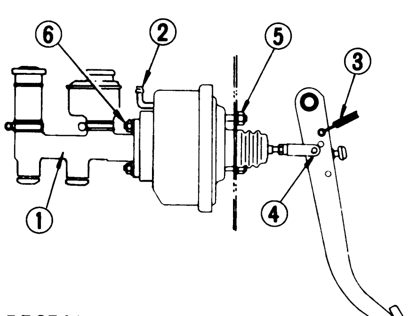


BR053A

Fig. BR-38 Performance curves of Master-Vac

REMOVAL

Referring to Figure BR-39, remove parts in numerical order enumerated.



BR054A

Fig. BR-39 Removal method of Master-Vac

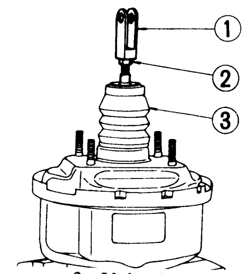
DISASSEMBLY

When disassembling Master-Vac, observe the following instructions:

a) Thoroughly clean mud or dust from Master-Vac.
b) Extreme care should be taken not to allow dirt, dust, water or any other foreign matter into any component-parts.
   Be sure to select a clean place before disassembly or assembly.
c) Mark mating joints so that they may be installed exactly in their original positions.
d) Keep all disassembled parts arranged properly so that they may readily be assembled at any time.
e) Clean rubber parts and synthetic resin parts in alcohol.
f) After all disassembled parts are cleaned in a suitable clean 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 soft jaws.
2. Remove clevis and lock nut. De-

tach valve body guard.



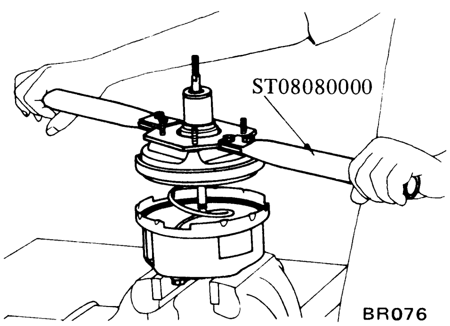
1 Clevis
2 Lock nut
3 Valve body guard

BR075

Fig. BR-40 Removing rear shell

3. Identify front shell and rear shell clearly so that they may be reassembled in their original positions from which they were withdrawn. (Bolts attached on dashboard are not the same in pitch.)

4. Using Master-Vac Wrench ST08080000, remove rear shell-seal assembly, and disassemble diaphragm plate assembly, front shell assembly, diaphragm spring and push rod assembly.



BR076

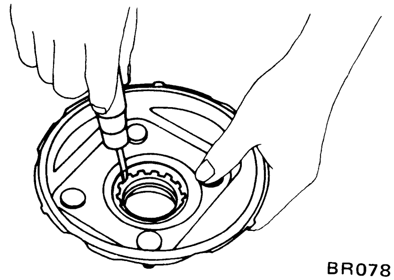
Fig. BR-41 Removing rear shell

Rear shell-seal

Pry off retainer with use of screwdriver as shown and detach bearing and seal.

Note:

a. **Do not disassemble seal assembly unless absolutely necessary.**
b. **Use care not to damage retainer.**
c. **Be sure to install new seal at each reassembly.**

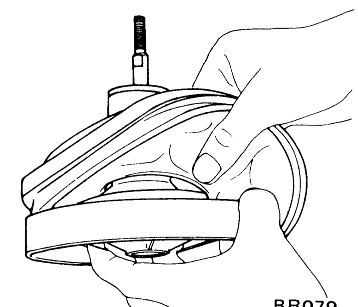


BR078

Fig. BR-42 Removing retainer

Diaphragm plate

1. Place diaphragm plate assembly on a clean work bench. Detach diaphragm from groove in plate as shown.

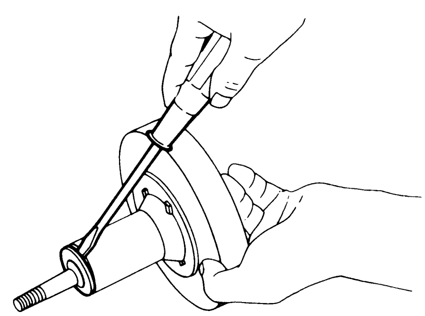


BR079

Fig. BR-43 Separating diaphragm

2. Using a screwdriver as shown, evenly pry air silencer retainer until it is detached from diaphragm plate assembly.

CAUTION:
To avoid damaging retainer, never tap screwdriver with a hammer.



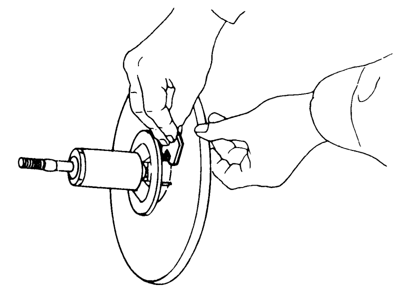
BR945

Fig. BR-44 Removing air silencer retainer

3. Pull out valve plunger stop key and withdraw silencer and plunger assembly.

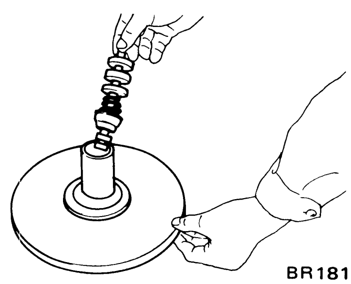
Note: **To remove valve plunger stop key properly, proceed as follows:**

With key hole facing down, lightly push valve operating rod simultaneously while applying vibration to it.



BR180

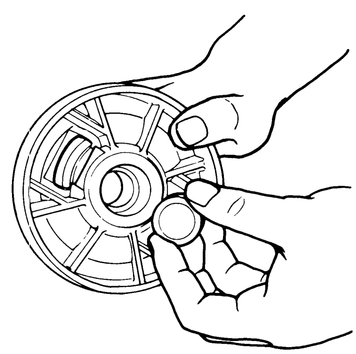
Fig. BR-45 Pulling out stop key



BR181

Fig. BR-46 Removing valve operating rod assembly

4. Withdraw reaction disc.



BR286

Fig. BR-47 Removing reaction disc

CAUTION:
Valve rod and plunger assembly cannot be disassembled, since they are staked.

Note: **Be sure to install new reaction disc at each reassembly.**

Front shell-seal

1. Detach flange from front shell assembly.

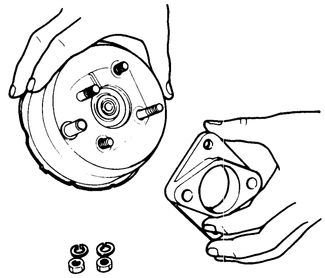


Fig. BR-48 Removing flange

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

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 Master-Vac Oil Seal Retainer Drift ST08060000.

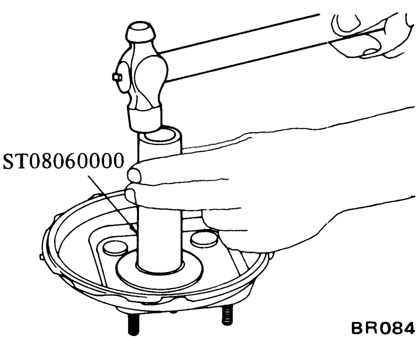


Fig. BR-49 Installing oil seal

Note: Install seal in place by properly aligning the pawl of special tool with seal hole, referring to Figure BR-50. Adjustment is correct when specified length at "A" is obtained.

Length "A"
6.7 to 7.0 mm
(0.264 to 0.276 in)

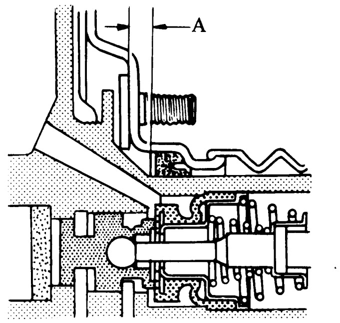


Fig. BR-50 Length at "A"

Diaphragm plate

1. Apply a thin coating of grease to the sliding contact portion on the periphery of plunger assembly.

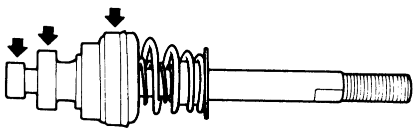


Fig. BR-51 Requiring grease place

2. Install plunger assembly and silencer in diaphragm plate, and lightly push plunger stop key in place.

CAUTION:
Diaphragm plate is made of bakelite. Exercise care in installing plunger assembly not to damage diaphragm plate.

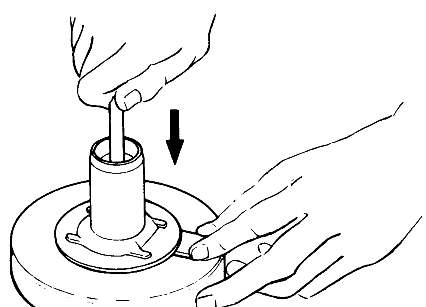


Fig. BR-52 Inserting stop key

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.

Note: A new diaphragm must be installed at each reassembly.

4. Before installing reaction disc in place on diaphragm plate, apply a thin coating of Master-Vac grease.

CAUTION:
Take care not to fall reaction disc when assembling rear shell on front shell.

Note: The reaction disc must be a new one.

Front shell-seal

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 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 Master-Vac Wrench ST08080000 clockwise until it reaches notch in shell retainer.

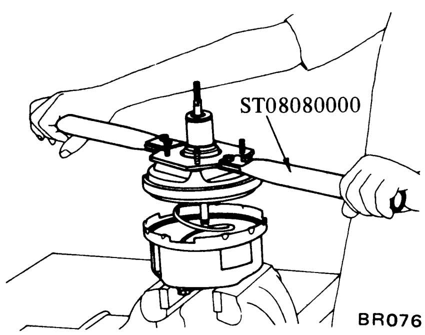


Fig. BR-53 Tightening rear shell

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)

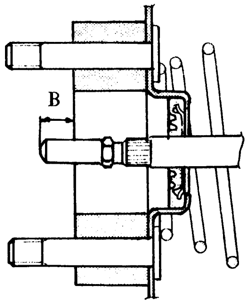


Fig. BR-54 Length at "B"

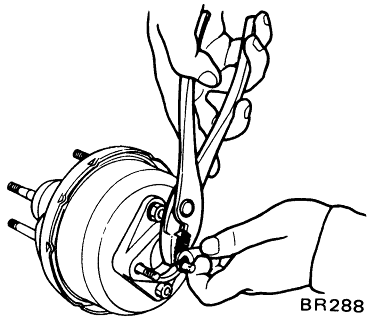


Fig. BR-55 Adjusting push rod length

INSTALLATION

Install in the reverse sequence of removal.

Tightening torque:
Master cylinder to Master-Vac:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)
Master-Vac to body:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)

Note: After Master-Vac is properly installed on vehicle, be sure to conduct an air-tight test and operation test.

HAND BRAKE

CONTENTS

HAND BRAKE (Stick lever type) BR-20
REMOVAL BR-21
INSPECTION BR-21
INSTALLATION BR-21

HAND BRAKE (Stick lever type)

The hand brake system is of a cable reaction type, which actuates rear wheel brake shoes. All the cable adjustment can be made by operating only adjusting nut at balance lever.

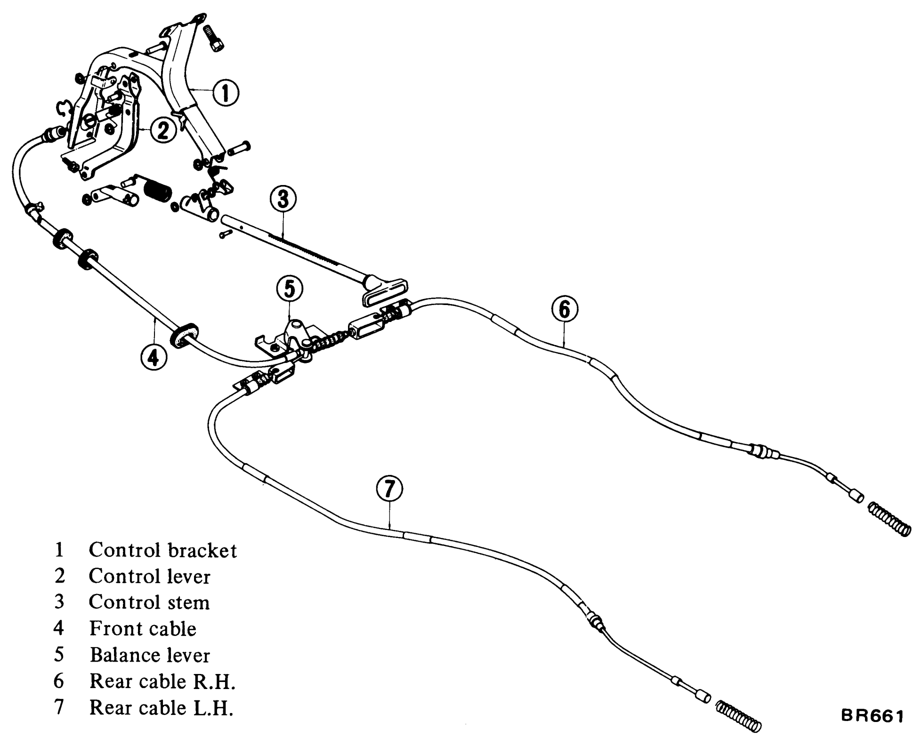


Fig. BR-56 Hand brake linkage

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.

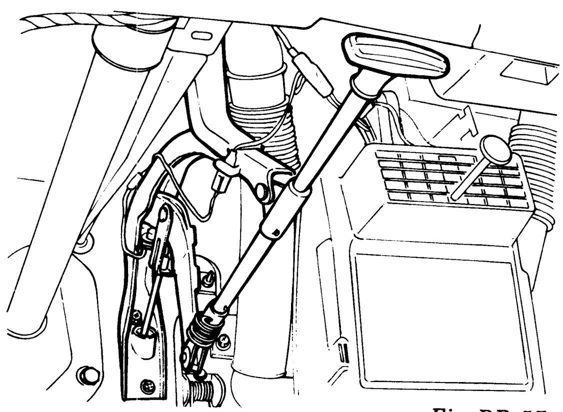


Fig. BR-57 Control stem

Front cable

1. Fully release control stem.
2. Loosen adjusting nut at balance lever.
3. Disconnect front cable from control lever.
4. Remove retainer spring at cable guide bushing.
5. Disconnect rear cables (R.H. and L.H.) from balance lever brackets. See Figure BR-58.
6. Remove balance lever brackets from crossmember.
7. Detach front cable clip and pull front cable rearward.

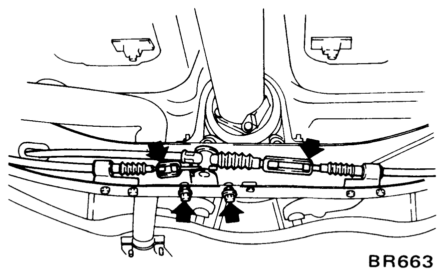


Fig. BR-58 Balance lever

Rear cable

1. Fully release control stem.
2. Remove both rear brake drums, and disconnect rear cable from toggle lever.
3. Detach spring and spring retainer.
4. Remove rear cable from brake disc.
5. Disconnect rear cable from balance lever bracket.
6. Detach cable clips and remove rear cable.

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.
2. Upon completion of installation of hand brake assembly, adjust the entire system, referring to the 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.

SERVICE DATA AND SPECIFICATIONS

Brake pedal		
Free height	mm (in)	154 (6.06)
Free play at pedal pad	mm (in)	1 to 5 (0.04 to 0.20)
Full stroke at pedal pad	mm (in)	142 to 148 (5.59 to 5.83)
Depressed height	mm (in)	More than 75 (2.95)
Brake adjustment notches		
Front		12
Rear		12
Master cylinder		
Inner diameter	mm (in)	20.64 (13/16)
Piston to cylinder clearance	mm (in)	0.15 (0.0059)
Master-Vac		
Diaphragm diameter	mm (in)	152.4 (6)
Maximum vacuum leakage (after 15 sec.)	mmHg (inHg)	25 (0.98)
Shell seal depth A	mm (in)	6.7 to 7.0 (0.264 to 0.276)
Push rod length B	mm (in)	9.75 to 10.00 (0.3839 to 0.3937)
Front disc brake		
Type		N22A
Wheel cylinder inner diameter	mm (in)	53.98 (2.1252)
Pad Width x Thickness x Length	mm (in)	52.9 x 9.2 x 76.2 (2.083 x 0.362 x 3.000)
Pad wear limit (Min. thickness)	mm (in)	2 (0.08)
Brake rotor		
Outer diameter x Thickness	mm (in)	271 x 12.5 (10.67 x 0.492)
Runout	mm (in)	0.15 (0.0059)
Repair limit of thickness (Min. thickness)	mm (in)	10.5 (0.413)
Rear drum brake		
Type		Duo-servo
Wheel cylinder inner diameter	mm (in)	15.88 (5/8)
Lining Width x Thickness x Length	mm (in)	45 x 4.5 x 244 (1.77 x 0.177 x 9.61)
Lining wear limit	mm (in)	1.5 (0.059)

Brake drum (Rear)

Inner diameter	mm (in)	254.0 (10)
Repair limit of thickness	mm (in)	255.5 (10.06)
Out-of-roundness	mm (in)	Less than 0.015 (0.0006)
Radial runout (Total indicator reading)	mm (in)	Less than 0.12 (0.0047)

Parking brake

Type		Stick type
Stroke	mm (in)	80 to 100 (3.15 to 3.94)
Adjuster sliding resistance	kg (lb)	5 to 12 (11 to 26)
Number of notches		6 to 10

Tightening torque

Master cylinder to Master-Vac	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Brake tube flare nut	kg-m (ft-lb)	1.5 to 1.8 (11 to 13)
Air bleeder valve	kg-m (ft-lb)	0.7 to 0.9 (5.1 to 6.5)
Fulcrum pin of brake pedal	kg-m (ft-lb)	1.9 to 2.4 (14 to 17)
Clip fixing bolt	kg-m (ft-lb)	0.32 to 0.44 (2.3 to 3.2)
3-way connector fixing bolt (on rear axle case)	kg-m (ft-lb)	1.7 to 2.0 (12 to 14)
Brake pedal stopper lock nut	kg-m (ft-lb)	1.2 to 1.5 (9 to 11)
N.L.S.V. to body	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Rear brake wheel cylinder mounting nut	kg-m (ft-lb)	1.5 to 1.8 (11 to 13)
Rear brake wheel cylinder connector bolt	kg-m (ft-lb)	1.9 to 2.5 (14 to 18)
Rear brake disc (Back plate) nut	kg-m (ft-lb)	5.4 to 6.4 (39 to 46)
Master-Vac		
Master-Vac to body nut	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Flange to shell cover nut	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Operating rod lock nut	kg-m (ft-lb)	1.6 to 2.2 (12 to 16)
Push rod adjusting nut	kg-m (ft-lb)	1.9 to 2.4 (14 to 17)
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)
Yoke-to-cylinder body bolt	kg-m (ft-lb)	1.6 to 2.1 (12 to 15)

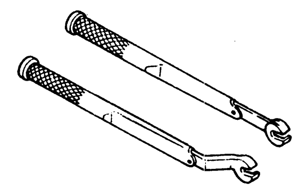
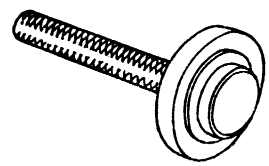
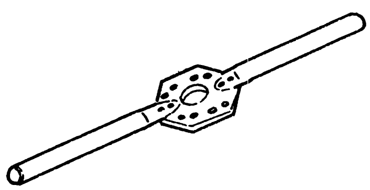
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Excessive pedal travel	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary. Test for source of leakage by examining all lines, connections and wheel cylinder.
	Leakage in master cylinder.	Overhaul master cylinder.
	Deteriorated check valve.	Replace check valve and bleed system.
	Air in system.	Bleed system.
	Faulty brake adjustment.	Adjust shoe-to-drum clearance. Inspect auto-adjuster operation.
Spongy pedal	Low fluid level in master cylinder.	Top with fluid and inspect for leakage.
	Air in system.	Correct as necessary.
	Faulty brake adjustment.	Adjust shoe-to-drum clearance. Inspect auto-adjuster operation.
	Reservoir filler cap vent hole clogged.	Clean and bleed system.
	Swollen hose due to deterioration or use of poor quality hose.	Replace hose and bleed system.
	Distorted brake shoes, or excessively worn or cracked brake drum.	Replace faulty parts.
	Soft or swollen caliper seals.	Drain hydraulic system, flush with alcohol and replace all seals.
	Use of a brake fluid with too low boiling point.	Replace with specified brake fluid and bleed system.
Poor braking effect	Fluid leakage in brake lines.	Check master cylinder, piping and wheel cylinder for leaks, and repair.
	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary.
	Air in brake lines.	Bleed system.
	Excessive shoe-to-drum clearance.	Adjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check for cause of problem. Replace linings or pads.
	Deterioration of linings or pads.	Replace.
	Local fit of linings or pads.	Shave or replace.
	Linings or pads excessively worn.	Replace.
	Master cylinder or wheel cylinders in poor condition.	Repair or replace.
	Binding mechanical linkage at brake pedal and shoes.	Free up as required.
(Brakes drag)	Clogged brake lines.	Check and clean.
	Incorrect adjustment of wheel bearings.	Adjust or repair.
	Improper shoe-to-drum clearance.	Adjust.
	Weak shoe return springs.	Replace.
	No free travel in brake shoe return.	Adjust pedal height.

Condition	Probable cause	Corrective action
Brake chatters	Groove or out-of-round brake drum.	Grind or replace as required.
	Loose or bent brake disc.	Tighten support plate bolts to specified torque, or replace plate.
	Distorted brake shoes or pads.	Replace as necessary.
	Grease or brake fluid on linings.	Replace linings.
Brake squeals	Dirty or scored brake drums.	Blow out assembly with compressed air or refinish drum.
	Distorted brake shoes or bent support plate.	Replace faulty unit.
	Weak or broken brake shoe retaining spring or return spring.	Replace if faulty.
	Glazed or contaminated brake lining.	Cam ground lining to eliminate glaze. If it doesn't, replace linings.
Pedal pulsates	Out-of-round or off-center drum.	Turn drum or replace as necessary.
Brakes fade	Brake fluid has too low boiling point.	Drain and fill system with approved fluid.
	Use of improper linings or brake linings are contaminated.	Replace linings.
	Brake drums are out-of-round.	Repair or replace as necessary.
	Hydraulic connections, master cylinder and wheel cylinders are corroded or damaged.	Repair as necessary.
	Bleed screw is open.	Close screw and bleed system.
Brakes drag	Pedal linkage is binding or push rod adjustment is too long.	Lubricate linkage, check pedal return spring for condition and adjust push rod as necessary.
	Master cylinder compensator part is obstructed.	Blow out foreign matter with compressed air.
	Seized master cylinder piston.	Disassemble master cylinder and replace piston. Bleed system.
	Poor shoe condition.	Clean and repair.
	Poor wheel cylinder condition.	Repair or replace.
	Deformation of piston cups.	Replace.
	Hand brake will not return.	Check and repair.
	Clogged master cylinder return port.	Clean.
Unbalanced brakes	Improper tire inflation.	Inflate to correct pressure.
	Improper adjustment of shoe-to-drum clearance.	Readjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check for cause of problem. Replace linings or pads.
	Mud in brake drum.	Clean.
	Deterioration of linings or pads.	Replace.
	Excessive wear of linings or pads.	Replace.

Condition	Probable cause	Corrective action
	Wheel cylinder in poor condition.	Repair or replace.
	Poor sliding condition of brake shoe.	Adjust.
	Looseness of cylinder body or back plate securing bolts.	Fasten or replace.
	Scored or out-of-round drums.	Recondition or replace brake drum as required. Check for improper lining contact with drum and grind lining if necessary.
	Sticking wheel-cylinder cups.	Recondition or replace cylinder.
	Deformation of back plate.	Replace.
	Incorrect adjustment of wheel bearings.	Adjust or replace.
	Incorrect adjustment of wheel alignment.	Adjust.
	Looseness of leaf spring securing U-bolts.	Tighten or replace.
	Faulty N.L.S.V.	Replace.
Pedal yields under slight pressure.	Deteriorated check valve.	Replace check valve and bleed system.
	External leaks.	Check master cylinder, piping and wheel cylinder for leaks and repair.
	Leakage on master cylinder.	Overhaul master cylinder.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. Reference page or Fig. No.
GG94310000 Flare nut torque wrench 	—— Page BR-5 Page BR-6 Page BR-8 Page BR-11 Page BR-13 Page BR-15 Page BR-19	ST08060000 Master-Vac oil seal retainer drift 	J 25609 Fig. BR-49
ST08080000 Master-Vac wrench 	—— Fig. BR-41 Fig. BR-53		

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION WT

WHEEL AND TIRE

WT

WHEEL AND TIRE .... WT- 2
TROUBLE DIAGNOSES AND CORRECTIONS .... WT- 5

WHEEL AND TIRE

CONTENTS

DESCRIPTION WT-2
MAINTENANCE AND SERVICE WT-2
TIRE INFLATION WT-2
TIRE REPAIR WT-2
WHEEL REPAIR WT-2
WEAR WT-2
TIRE ROTATION WT-3
CHANGING TIRE WT-3
INSPECTION WT-4
WHEEL BALANCE WT-4
WHEEL AND TIRE WT-4

DESCRIPTION

The 620 series models are equipped with 5J-14 wheels with 40 mm (1.57 in) offset. All tires are tubeless.

Tire size

Model	Tire size	Wheel size
All models	6.00-14-6PR (Tubeless)	5J-14

Tire pressure

Unit: kg/cm^2 (psi)

Model \ Vehicle speed			Under 100 km/h (60 MPH)	Over 100 km/h (60 MPH)
All models	Moderate	Front	1.5 (21)	1.8 (26)
		Rear	1.75 (25)	2.25 (32)
	Heavy	Front	1.5 (21)	1.8 (26)
		Rear	3.0 (42)	3.15 (45)

Note: Tire inflation pressures should be measured when tires are cold.

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 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

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.

WHEEL REPAIR

Inspect the wheel rim flange for bend or dents.

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.

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 vehicle 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.

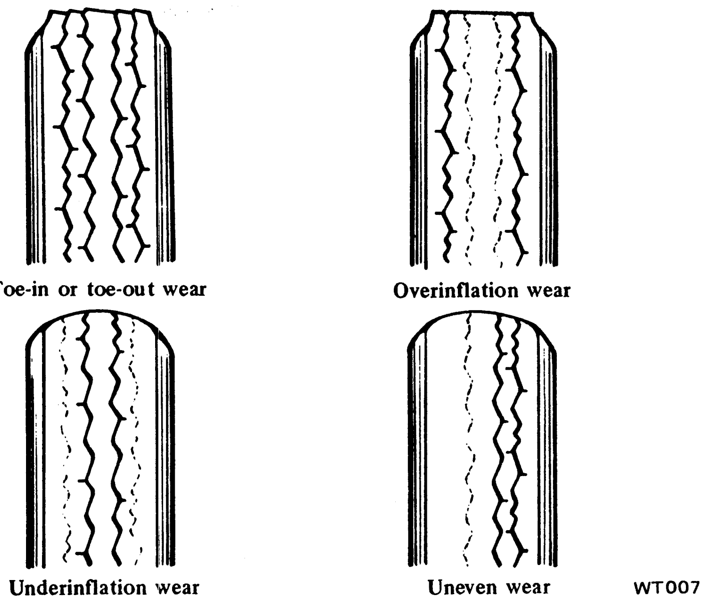


Fig. WT-1 Abnormal tire wear

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.

- All the tires including the spare tire are of the same type.

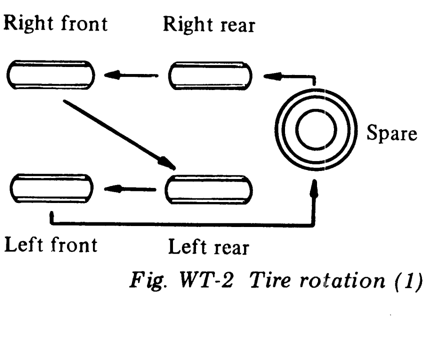
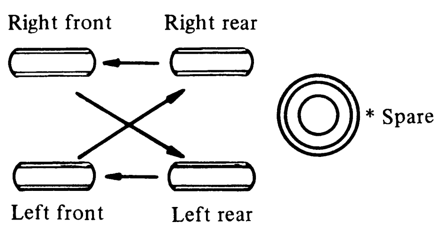


Fig. WT-2 Tire rotation (1)

- The spare tire has a different brand from 4 tires on the vehicle.



* The spare tire should be used in an emergency only.

Fig. WT-3 Tire rotation (2)

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-4.

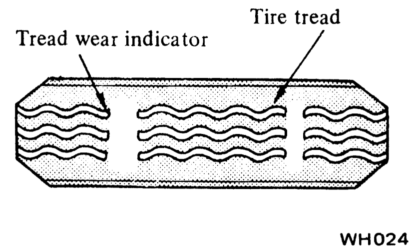


Fig. WT-4 Tread wear indicator

CHANGING TIRE

To change tire with wheel using a jack in the safe manner, observe the following procedures.

1. To remove spare tire, insert jack rod to guide and then turn it counterclockwise. When installing, tighten a little strong after lifting up and lock.

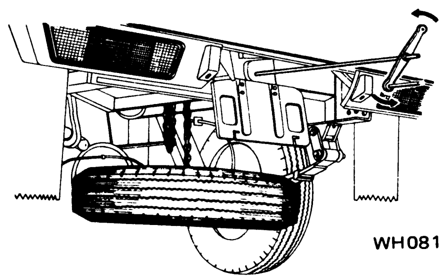


Fig. WT-5 Removing spare tire

2. It is necessary to remove wheel cap and temporarily to loosen wheel nuts before vehicle is jacked up.
3. To jack up front, place jack under side frame [about 520 mm (20.5 in) at rear of front axle center] after applying parking brake and blocking rear wheels.

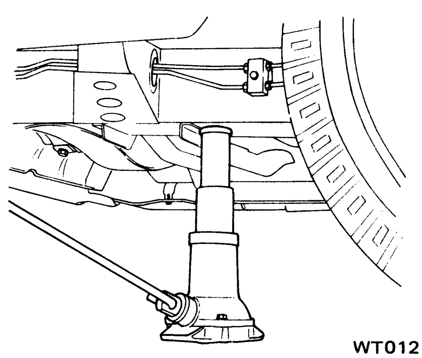


Fig. WT-6 Jacking up front side

4. To jack up rear, place jack under rear axle case close to the side of rear spring after applying parking brake and blocking front wheels.

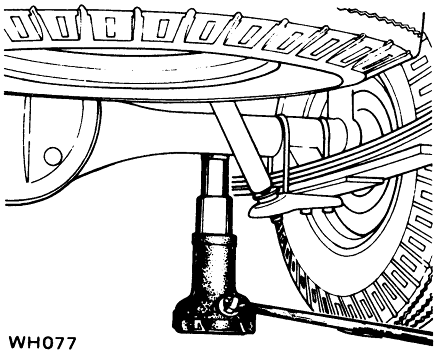


Fig. WT-7 Jacking up rear side

5. Remove wheel nuts and wheel from drum.
6. To install wheel, reverse the above steps.

Tighten wheel nuts in criss-cross fashion to 8.0 to 10.0 kg-m (58 to 72 ft-lb).

> **WARNING:**
> **Never get under the vehicle 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 vehicle.**

INSPECTION

WHEEL BALANCE

The wheel and tire assembly should be kept balanced statically and dynamically.

Proper tire balance is necessary when driving the vehicle at high speeds. Consequently, the wheel and tire assembly should be properly rebalanced whenever 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, vehicle shake and steering malfunction.

To correct unbalance, use proper wheel balancer.

Maximum allowable unbalance:
177 gr-cm (2.5 in-oz)
10 gr. (0.35 oz) at rim circumferences

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-8. 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 for rust, distortion, cracks or other faults.

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 run-out.

Lateral run-out limit:
Less than 1.5 mm (0.059 in) total indicator reading

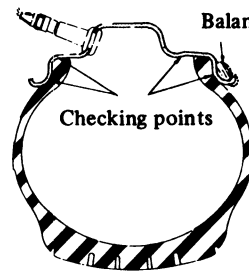


Fig. WT-8 Wheel rim run-out check points

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 problems occur:
(1) Broken or damaged bead wire.
(2) Ply or tread separation.
(3) Cracked or damaged side wall, etc.

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Wheel wobbles.	Improper tire pressure.	Measure and adjust.
	Damaged tire or distorted wheel rim.	Repair or replace.
	Unbalanced wheel.	Balance.
	Loose wheel nuts.	Tighten.
	Worn or damaged wheel bearing, or excessive play of wheel bearing.	Correct play or replace wheel bearing.
	Improper front wheel alignment.	Align.
	Worn or damaged ball joint.	Replace.
	Excessive steering linkage play or worn steering linkage.	Adjust or replace.
	Loose steering linkage connection.	Tighten nuts to rated torque, or replace worn parts if any.
	Broken suspension spring.	Replace.
	Damaged shock absorber.	Replace.
Unevenly or excessively worn tire.	Improper tire rotation.	Conduct tire rotation periodically.
	Improper tire pressure.	Measure and adjust.
	Unbalanced wheel.	Balance or replace.
	Improperly adjusted brake.	Adjust.
	Improper wheel alignment.	Align.
	Excessively distorted or improperly installed suspension link.	Repair, replace or, if necessary, reinstall.
	High speed on curves.	Reduce speed.
	Sudden start and improper speed due to rapid acceleration or improper brake application.	Follow correct and proper driving manner.
Tire squeals.	Improper tire pressure.	Measure and adjust.
	Improper front wheel alignment.	Align.
	Distorted knuckle or suspension link.	Repair or replace.

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ST

STEERING SYSTEM

ST

STEERING ..... ST- 2

SERVICE DATA AND SPECIFICATIONS ..... ST- 8

TROUBLE DIAGNOSES AND CORRECTION ..... ST- 9

SPECIAL TOOLS ST-10

STEERING

CONTENTS

DESCRIPTION ST-2
STEERING GEAR ST-3
Removal and installation ST-3
Disassembly and assembly ST-4
Inspection and repair ST-5
STEERING LINKAGE ST-6
Removal and installation ST-6
Inspection and repair ST-7

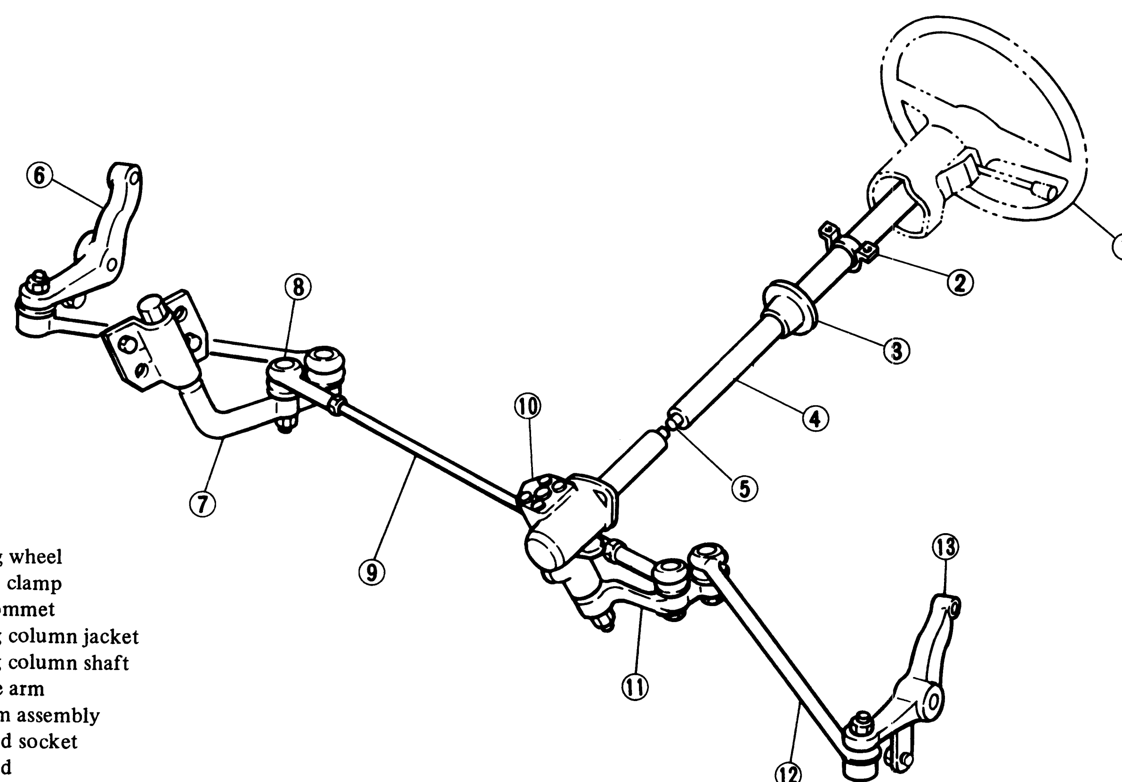
DESCRIPTION

The steering gear used on this model series vehicles is the same re-circulating type. This steering gear is designed especially for easy operation and high durability.

The steering linkage is of a relay design, of which gear arm is connected to one end of the adjustable cross rod. The other end of the cross rod is linked to the idler arm connecting with the side member located on the opposite side of the steering gear. The two side rods serve to connect the steering gear arm and idler arm to the both knuckle arms (right and left hand sides).

With this construction, even if the left and/or right wheel moves vertically and independently, steering can be safely maintained.

Steering wheel rotation is converted to gear arm motion in proportion to the gear ratio by the steering gear. The gear arm motion operates the side rod on the same side. At the same time, the idler arm is moved through the cross rod, and the opposite side rod is also moved.

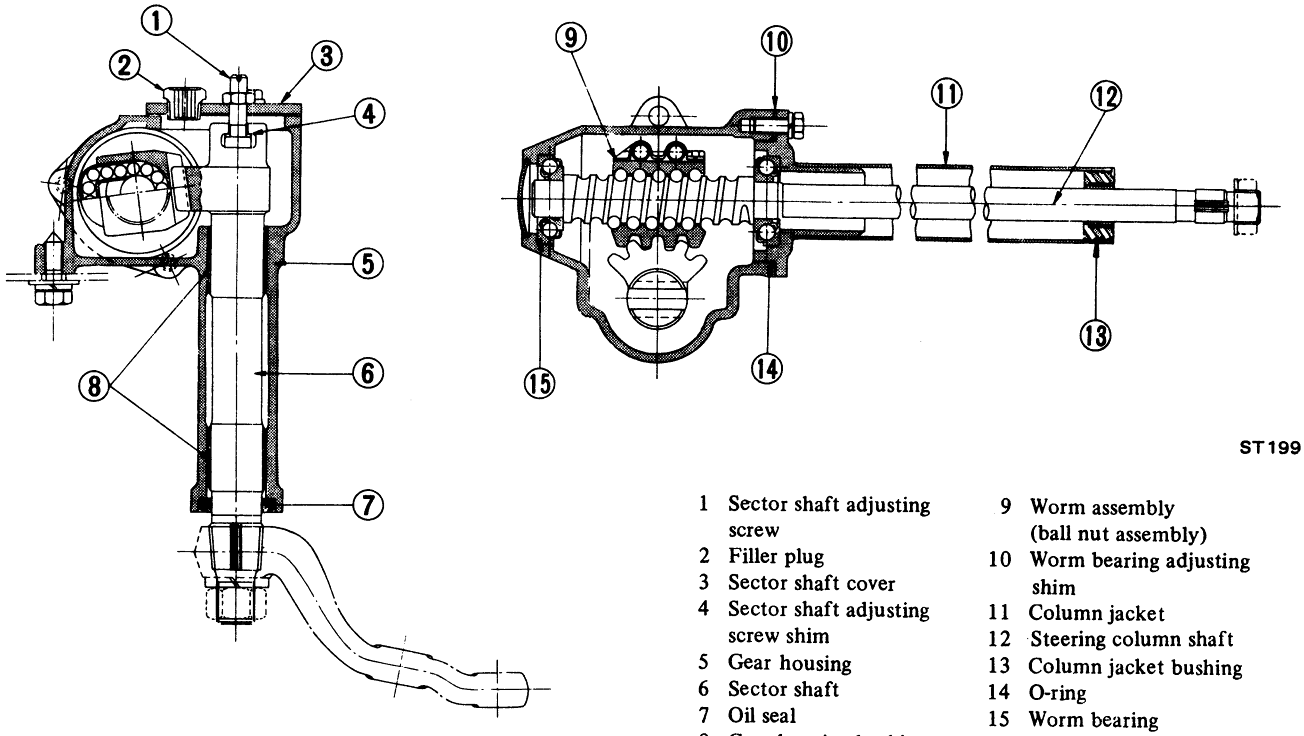


1 Steering wheel
2 Column clamp
3 Post grommet
4 Steering column jacket
5 Steering column shaft
6 Knuckle arm
7 Idler arm assembly
8 Cross rod socket
9 Cross rod
10 Steering gear assembly
11 Steering gear arm
12 Side rod
13 Knuckle arm

ST707

Fig. ST-1 Structural view of steering system

STEERING GEAR



1 Sector shaft adjusting screw
2 Filler plug
3 Sector shaft cover
4 Sector shaft adjusting screw shim
5 Gear housing
6 Sector shaft
7 Oil seal
8 Gear housing bushing
9 Worm assembly (ball nut assembly)
10 Worm bearing adjusting shim
11 Column jacket
12 Steering column shaft
13 Column jacket bushing
14 O-ring
15 Worm bearing

Fig. ST-2 Sectional view of steering gear

Removal and installation

Removal

1. Disconnect battery ground cable from the terminal.
2. Remove horn pad by unscrewing two bolts from the rear side of steering wheel bar.

Note: Be sure to punch mark with "o" on the top of steering column shaft.

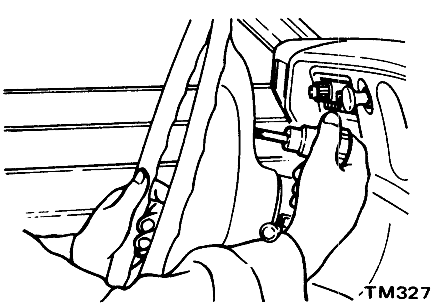


Fig. ST-3 Removing horn pad

3. Remove steering wheel with Steering Wheel Puller ST27180001 after backing off steering wheel fixing nut.

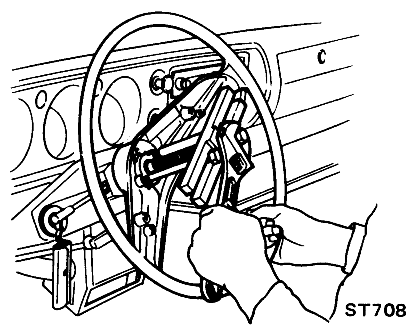


Fig. ST-4 Removing steering wheel

CAUTION:
Be sure not to hammer the special tool while removing.

4. Remove upper and lower steering column shell covers.
5. Remove turn signal switch assembly.
6. Remove column clamp fixing bolts.

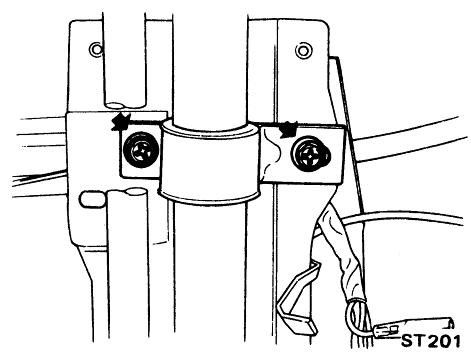
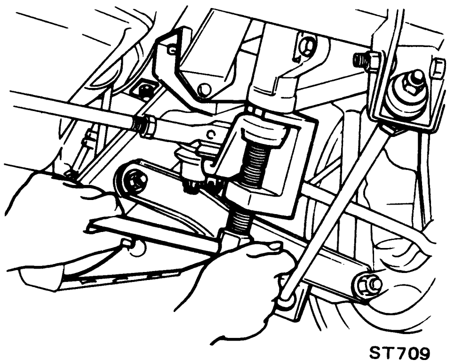


Fig. ST-5 Removing column clamp

7. Remove four bolts securing steering post grommet to dash panel.
8. Remove nut securing gear arm to sector shaft and then withdraw gear arm with the use of Pitman Arm Puller ST29020001.



ST709

Fig. ST-6 Withdrawing gear arm

Note: Before removing steering gear arm, scribe match marks on arm and housing so that they can easily be replaced in their original positions at assembly.

9. Remove bolts securing steering gear housing to frame.
10. Withdraw steering gear assembly toward engine compartment.

Installation

Install steering gear assembly in the reverse order of removal observing the following instructions.

1. When installing steering gear housing securing bolts, insert bolts through gear housing to frame.
2. When installing steering gear arm, align four grooves of gear arm serrations with four projections of sector shaft serrations.
3. Tightening torque

   Steering gear housing:
   4.6 to 5.3 kg-m (33 to 38 ft-lb)

   Gear arm:
   13 to 15 kg-m (94 to 108 ft-lb)

   Steering wheel:
   7.0 to 7.5 kg-m (51 to 54 ft-lb)

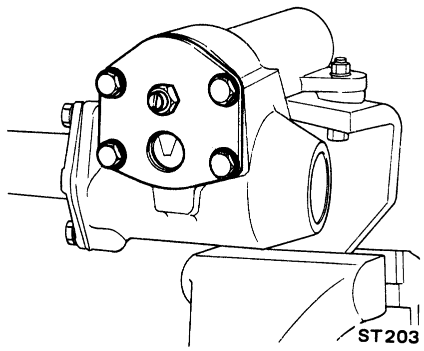
4. With front wheels set in a straight ahead position, make sure that punch mark on the upper end surface of steering column shaft is at the center of the upper side in its installing portion.
5. When installing steering wheel, apply grease to sliding parts.
6. After installing, make sure that steering wheel turns smoothly.

Disassembly and assembly

Disassembly

1. Drain oil in steering gear housing by unscrewing filler plug.
2. Place steering gear assembly in a vise securely.
3. Loosen lock nut and turn sector shaft adjusting screw a few turns counterclockwise.

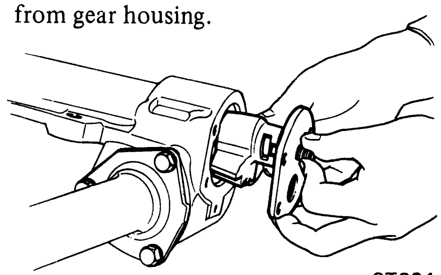
   Remove sector shaft cover by unscrewing four fixing bolts.



ST203

Fig. ST-7 Removing sector shaft cover

4. Turn sector shaft adjusting screw a few turns clockwise and pull sector shaft cover together with sector shaft from gear housing.



ST204

Fig. ST-8 Pulling out sector shaft

5. Separate sector shaft, adjusting screw and shim from cover.
6. Remove jacket tube by unscrewing three fixing bolts.
7. Remove steering worm assembly from gear housing.
8. Detach worm bearings and worm bearing adjusting shims from worm gear assembly and column jacket.

CAUTION:

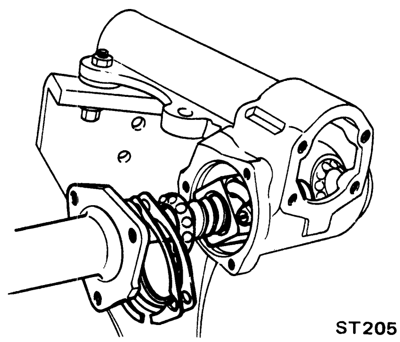
Be careful not to allow ball nut to run down to the worm end. If ball nut rotates suddenly to the worm end, the ends of ball guides may be damaged.

9. Pry out sector shaft oil seal from gear housing and discard it.
10. Remove O-ring from the rear cover of column jacket and discard it.
11. Remove column jacket bushing.

CAUTION:

a. Do not remove sector shaft bushing from housing. If necessary, replace as a gear housing assembly.

b. Do not disassemble ball nut and worm gear. If necessary, replace them with new ones as a worm gear assembly.



ST205

Fig. ST-9 Removing steering worm assembly

Assembly and adjustment

Apply recommended gear oil to all disassembled parts.

1. Fit column jacket bushing to column jacket in place.

Note: When fitting, apply adhesive to bushing exterior and grease to interior.

2. Fill the space between new sector shaft oil seal lips with grease, and fit it to gear housing.
3. Place steering worm assembly in position in gear housing together with worm bearings.
4. Install column jacket on gear housing with O-ring and worm bearing shims.

   Be sure to install thicker shims to the gear housing side.

   Standard shim thickness:
   1.5 mm (0.059 in)
   Tightening torque:
   1.5 to 2.5 kg-m (11 to 18 ft-lb)

Available worm bearing 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)

5. Adjust the worm bearing preload with Preload Gauge ST3127S000 by selecting suitable bearing shims so that the initial turning torque of steering column is the specified value.

Initial turning torque of steering column shaft.

New worm bearing:
4.0 to 6.0 kg-cm
(3.5 to 5.2 in-lb)
Used worm bearing:
2.4 to 4.4 kg-cm
(2.1 to 3.8 in-lb)

6. Insert adjusting screw into the T-shaped groove at the 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 screw shim

No.	Thickness mm (in)
1	1.575 (0.0620)
2	1.550 (0.0610)
3	1.525 (0.0600)
4	1.500 (0.0591)
5	1.475 (0.0581)
6	1.450 (0.0571)

7. Rotate ball nut by hand until it is in the center of its travel, then install sector shaft together with adjusting screw in gear housing, ensuring that the center gear of sector shaft engages with that of ball nut.

8. Install sector shaft cover to gear housing. Be sure to apply sealant to each face of sector shaft cover packing when installing cover.

9. By turning adjusting screw counterclockwise, attach sector shaft cover to gear housing and then temporarily secure it with its fixing bolts.

10. Pull sector shaft toward cover approximately 2 to 3 mm (0.08 to 0.12 in) by turning adjusting screw counterclockwise and tighten sector shaft cover fixing bolts to 1.5 to 2.5 kg-m (11 to 18 ft-lb).

11. 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.

12. Install gear arm to sector shaft and move sector shaft several times from the side of gear arm and make sure that it turns smoothly.

13. Adjust the backlash at the neutral position of gear arm by turning in or out adjusting screw so that the movement of the gear arm top end is less than 0.1 mm (0.004 in).

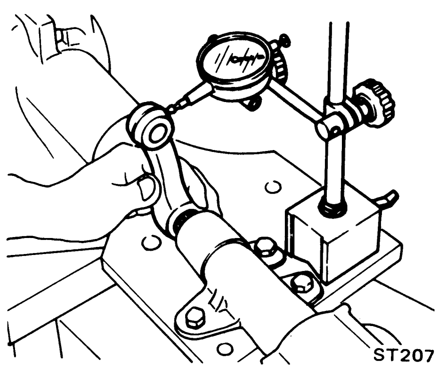


Fig. ST-10 Measuring backlash

14. Turn adjusting screw approximately 1/8 to 1/6 turn clockwise and then retighten lock nut to 3.0 to 4.0 kg-m (22 to 29 ft-lb).

15. Fill recommended gear oil approximately 0.33 liter (¾ U.S. pt., ⅝ Imper. pt.) into gear assembly through the filler hole and install filler plug.

Inspection and repair

Wash clean all the disassembled parts in solvent and check for conditions.

Sector shaft

1. Check gear tooth surface for pitting, burrs, cracks or any other damage, and replace if faulty.
2. Check sector shaft for distortion of its serration, and if necessary replace. In this case, be sure to check gear housing for deformation.

Steering column shaft assembly

1. Inspect the 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 as follows:

Move ball nut to either end of worm gear, and gradually stand steering column shaft assembly until ball nut moves downward on worm gear under its own weight. In the above test, if ball nut does not move freely over entire stroke, assembly may be damaged. Replace with a new one as an assembly.

Note: **In this inspection, be careful not to damage ball nut guide tube.**

Bearings and bushings

1. Replace worm bearings if pitting, wear or any other damage is found on them.
2. Replace column bushing which is excessive worn or deformed.
3. If sector shaft bushings in gear housing are found worn or damaged, replace as an assembly of gear housing and bushing.

Oil seal, gasket and O-ring

Do not reuse above parts which are removed once.

Be sure to use new parts at each reassembly.

STEERING LINKAGE

Removal and installation

Removal

1. Jack up the front of vehicle and support it on the safety stands.
2. Remove cotter pins and nuts fastening side rod ball stud to knuckle arms.
3. To detach side rod ball studs from knuckle arms, insert Ball Joint Remover HT72520000 between them and separate them by striking the top of this tool with a hammer. If this operation must be done without this tool, strike the knuckle arm boss with a hammer backing up the opposite side of it with a large hammer and ball stud is freed from knuckle arm. Must not strike the ball stud head, the ball socket of side rod and side rod with a hammer and so on in this operation.

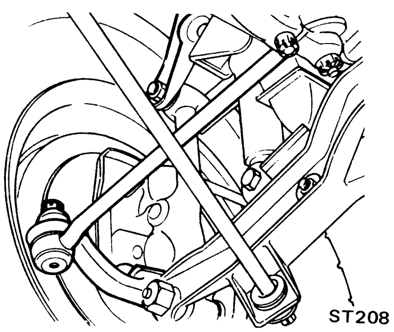


Fig. ST-11 Ball joints (gear arm side)

4. Remove nut securing gear arm on sector shaft, and remove gear arm with the use of Pitman Arm Puller ST29020001. See Figure ST-6.
5. Remove idler arm assembly from frame by backing off fixing bolt and nut.

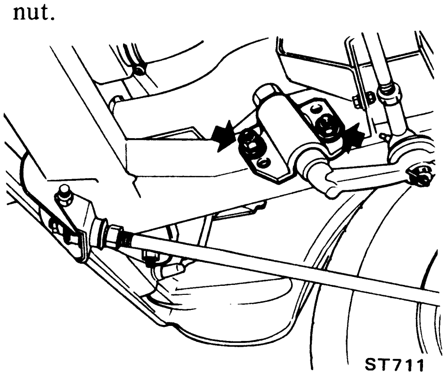


Fig. ST-12 Removing idler arm

6. Cross rod, both side rods and the adjacent parts can then be freed from the vehicle as an assembly.
7. Then separate the ball joints of steering linkage assembly following the procedure for removal of the side rods ball joints at knuckle arm sides.

Assembly

Install steering linkage in the reverse sequence of removal observing the following notes:

1. Tightening torque:

Ball stud: 5.5 to 10.0 kg-m (40 to 72 ft-lb)
Idler arm assembly: 3.2 to 3.7 kg-m (23 to 27 ft-lb)
Cross rod adjust bar lock nut: 8 to 10 kg-m (58 to 72 ft-lb)

2. When cross rod sockets and cross rod are separated, adjust cross rod length correctly.

Adjustment should be done between the centers of ball joints at the both end of cross rod assembly.

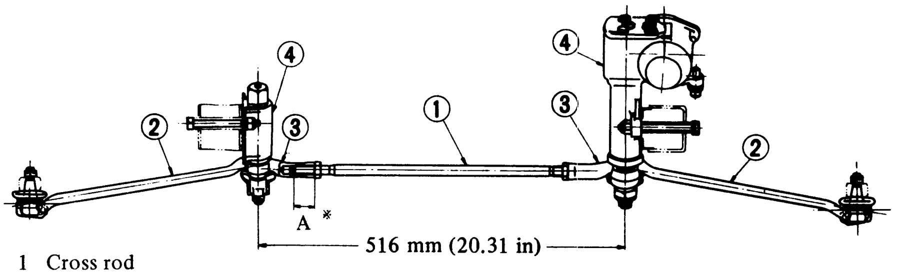
Standard cross rod length: 516 mm (20.31 in)

3. Adjust toe-in and steering angle.

The procedures of toe-in and steering angle adjustments are described in Section FA.

Toe-in:
5 to 7 mm (0.20 to 0.28 in)

Steering angle:
Inner wheel: 34° to 36°
Outer wheel: 29°30′ to 31°30′



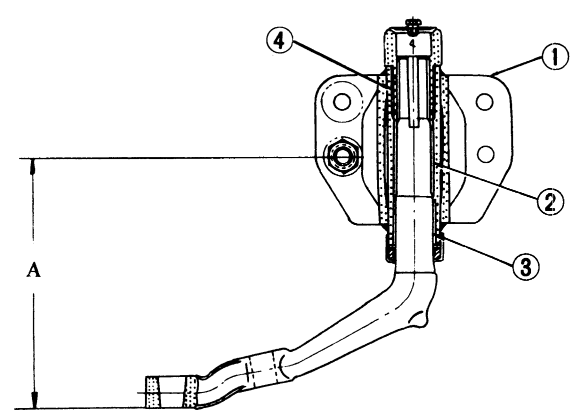
1 Cross rod
2 Side rod
3 Cross rod socket
4 Idler arm assembly
5 Gear housing assembly

*After adjustment of toe-in, be sure that dimension "A" at both ends of cross rod is not less than 20 mm (0.79 in).

ST710

Fig. ST-13 Adjusting cross rod assembly

Idler arm assembly



1 Idler body
2 Collar (welded to idler body)
3 Plain bushing
4 Screw bushing

ST529

Fig. ST-14 Sectional view of idler arm assembly

1. Apply recommended grease to screw bushing interior, plain bushing interior, dust seal inside and bushing sliding surface of idler arm.

Screw bushing tightening torque:
12 kg-m (87 ft-lb)

2. Before installing idler arm assembly, replace filler plug with grease nipple, and apply recommended grease to idler arm through this grease nipple until grease is forced out at the lower end of the dust seal lip. Remove grease nipple and reinstall filler plug.

3. In installing idler arm assembly, make sure that the standard dimension "A" is adjusted correctly.

Standard dimension "A":
133.8 to 135.8 mm
(5.27 to 5.35 in)

See Figure ST-14.

Furthermore, be sure to install washers correctly. See Figure ST-15.

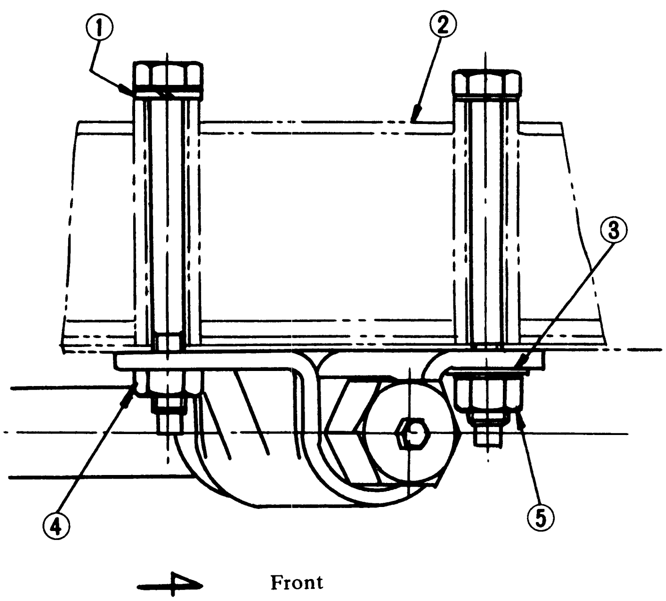


Fig. ST-15 Locations of washers

Inspection and repair

Ball joint

1. When ball stud is worn or axial play is too excessive, replace cross rod socket or side rod with a new one.
2. When dust cover is broken or deformed, be sure to replace with a new one.

Axial end play: 0.1 to 0.5 mm
(0.004 to 0.020 in)

Initial swing torque:
5 to 15 kg-cm
(4.3 to 13.0 in-lb)

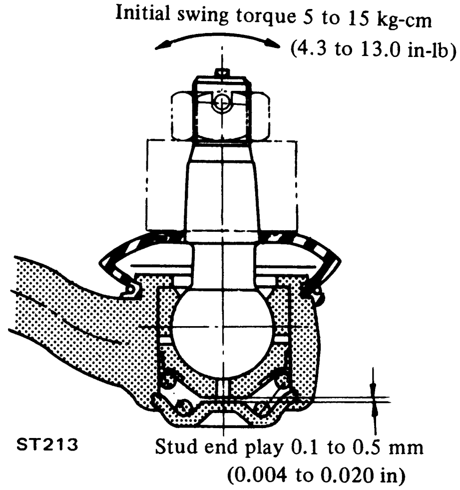


Fig. ST-16 Sectional view of ball joint

Note: At the recommended intervals, check grease and renew if necessary. To renew grease, remove grease nipple cap and apply recommended grease to ball joint through grease nipple until grease is forced out at the grease vent hole.

Idler arm assembly

Remove old grease and dirt, and check idler arm assembly for wear, deformation and damage.

Cross rod, side rod and gear arm

Check them for bending, damage and crack, and replace as necessary.

Inspecting steering system on the vehicle which comes into collision

Steering system is very important for driving a vehicle. When the vehicle comes into collision, especially the front of the vehicle is damaged, special inspection should be done for the following matters.

If any component parts of steering system is found to be damaged, replace them with new ones.

1. Steering angles correctness

Inspect side rods and cross rod for bend, and sector shaft for distortion.

2. Level of steering wheel bar (with the front wheels in a straight ahead position)

If its deflection is more than about 90 degrees, the bend or distortion of sector shaft and column shaft can be seen.

3. Noise during operation of steering wheel.

Inspect column shaft and jacket tube for bend.

4. Smooth operation of steering wheel

Inspect sector gear for breakage, ball nut screw for dint and column shaft for bend.

5. Gear arm breakage
6. Gear housing breakage

In addition, inspect gear housing fixing bolts for looseness.

7. Distortion of sector shaft serration
8. Sector gear breakage

9. Column shaft breakage (on the welded section)

In addition, inspect column shaft for scratch.

10. Deformation of body construction and frame

Inspect the installation portion of steering system on the body construction and frame for deformation or any other faulty conditions.

SERVICE DATA AND SPECIFICATIONS

SPECIFICATIONS

Gear type	Recirculating ball type
Gear ratio	19.8 : 1

SERVICE DATA

Standard thickness of worm bearing adjusting shims	mm (in)	1.5 (0.059)
Initial turning torque of steering column:		
New worm bearing	kg-cm (in-lb)	4.0 to 6.0 (3.5 to 5.2)
Used worm bearing	kg-cm (in-lb)	2.4 to 4.4 (2.1 to 3.8)
End clearance of sector shaft adjusting screw	mm (in)	0.01 to 0.03 (0.0004 to 0.0012)
Backlash at the gear arm top end	mm (in)	Less than 0.1 (0.004)
Oil capacity	ℓ (U.S. pt., Imper. pt.)	0.33 (3/4, 5/8)
Ball joint axial end play	mm (in)	0.1 to 0.5 (0.004 to 0.020)
Standard cross rod length	mm (in)	516 (20.31)
Toe-in	mm (in)	5 to 7 (0.20 to 0.28)
Steering angle:		
Inner wheel		34° to 36°
Outer wheel		29°30′ to 31°30′

Tightening torque

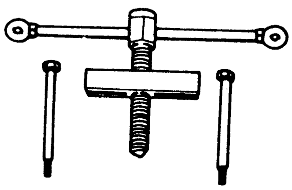
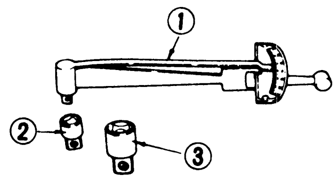
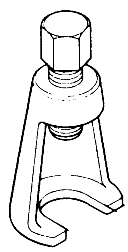
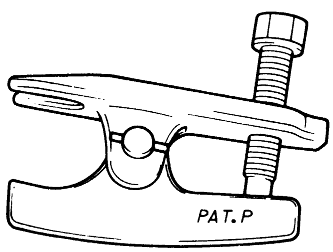
Unit: kg-m (ft-lb)

Steering column jacket to gear housing	1.5 to 2.5	(11 to 18)
Sector shaft cover	1.5 to 2.5	(11 to 18)
Sector shaft lock nut	3.0 to 4.0	(22 to 29)
Gear housing	4.6 to 5.3	(33 to 38)
Gear arm	13 to 15	(94 to 108)
Steering wheel	7 to 7.5	(51 to 54)
Ball studs of cross rod	5.5 to 10.0	(40 to 72)
Ball studs of side rod:		
Knuckle arm side	5.5 to 10.0	(40 to 72)
Gear or idler arm side	5.5 to 10.0	(40 to 72)

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.	Align or inflate tires to correct pressure.
	Steering linkage out of adjustment.	Adjust and see relative topic under Front Suspension.
	Steering column out of alignment.	Repair.
Steering wheel turns but sluggishly.	Wheels out of alignment or air pressure in tires too low.	Repair or inflate tires to correct air pressure.
	Damaged steering linkage.	Replace and see relative topic under Front Suspension.
Vehicle pulls to one side.	Wheels out of proper alignment.	Align.
	Wheel bearing out of adjustment.	Adjust.
	Damaged steering linkage.	Replace and see relative topic under Front Suspension.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST27180001 Steering wheel puller 	J 25726 / Fig. ST-4	ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter 	See J 25765 ① See J 25765 / Page ST-5
ST29020001 Pitman arm puller 	J 25725 / Fig. ST-6		
HT72520000 Ball joint remover 	—— / Page ST-6		

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION FE

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

FE

ENGINE CONTROL SYSTEM .... FE- 2
FUEL SYSTEM .... FE- 4
EXHAUST SYSTEM .... FE- 6

ENGINE CONTROL SYSTEM

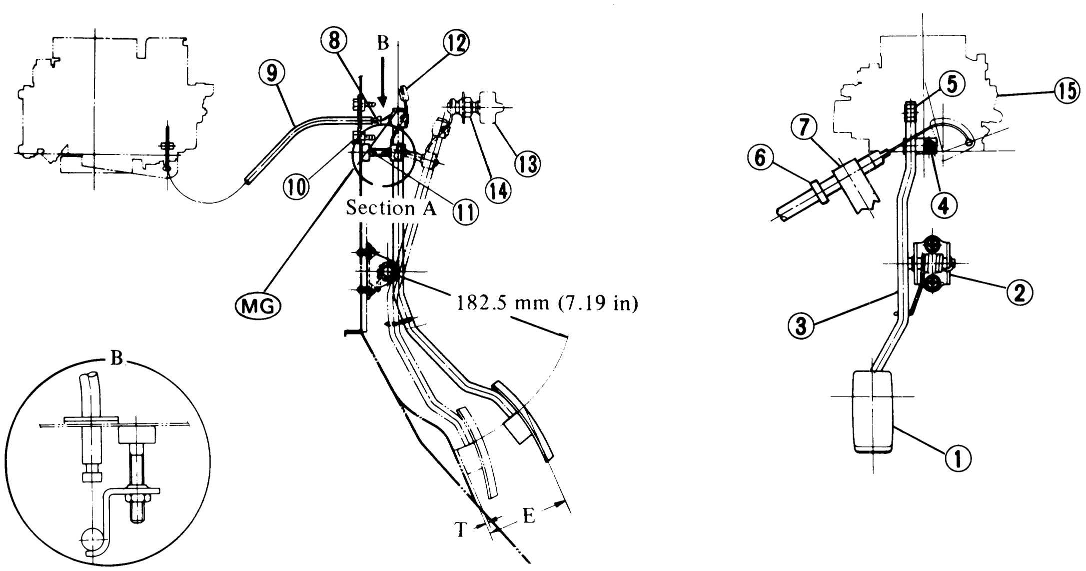
CONTENTS

DESCRIPTION FE-2
REMOVAL AND INSTALLATION FE-3
INSPECTION FE-3
ADJUSTMENT FE-3

DESCRIPTION

The accelerator control system is of flexible cable type so that the linkage operates smoothly and the system is not affected by engine vibration.

The choke system is automatically controlled.



Arrow B

E: 78 mm (3.07 in)
T: 2 to 4 mm (0.08 to 0.16 in)

MG Multi-purpose grease

1 Accelerator pedal
2 Accelerator pedal bracket and return spring
3 Accelerator pedal arm
4 Pedal stopper lock nut
5 Spring clamp
6 Accelerator wire socket
7 Accelerator wire clamp
8 Accelerator wire
9 Accelerator wire outer case
10 Screw
11 Pedal stopper bolt
12 Kickdown switch striker (Automatic transmission models only)
13 Kickdown switch (Automatic transmission models only)
14 Switch stopper nut
15 Carburetor

FE530

Fig. FE-1 Accelerator control system

REMOVAL AND INSTALLATION

Accelerator wire

1. Remove air cleaner assembly.
2. Disconnect accelerator wire from carburetor.
3. Remove screw securing accelerator wire to engine.
4. Remove spring clamp and disconnect accelerator wire from accelerator pedal arm.
5. Remove two screws securing accelerator wire outer case to body, and detach accelerator wire.
6. To install, reverse the order of removal. Apply recommended multi-purpose grease slightly to portion (MG) shown in Figure FE-1.

Accelerator pedal assembly

1. Remove spring clamp, then disconnect accelerator wire from tip of pedal arm.
2. Remove two screws securing accelerator pedal bracket to body.
3. Remove accelerator pedal from dash panel. See Figure FE-1.
4. To install, reverse the order of removal.

INSPECTION

1. Check accelerator pedal return spring for rust, fatigue or damage. Replace if necessary.
2. Check accelerator wire, cases and fastening locations for rust, damage or looseness.

Repair or replace if necessary.

ADJUSTMENT

Accelerator pedal and wire

1. Adjust pedal stopper bolt (Section A) so as to obtain specified height "E" as shown in Figure FE-1. Secure pedal stopper bolt with stopper lock nut. Refer to Figure FE-1.

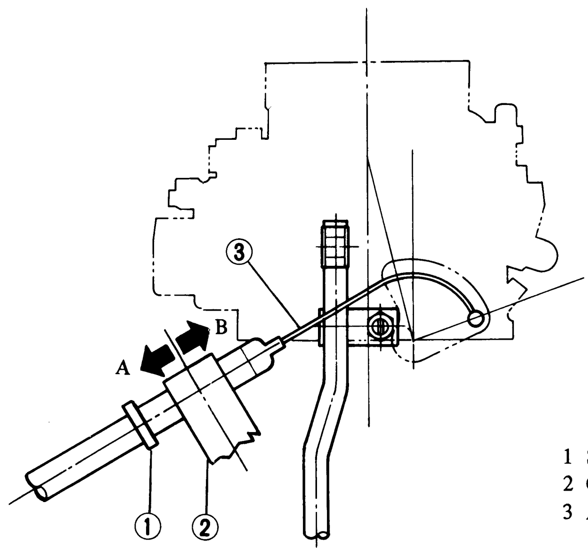
E: 78 mm (3.07 in)

Tightening torque of nut:
0.38 to 0.45 kg-m
(2.7 to 3.2 ft-lb)

2. Release auto choke effect, since throttle lever is opened by fast idle cam until engine warms up.

(1) Keep choke valve fully open with fingers.
(2) Pull throttle lever up by hand, then automatic choke effect will be released.

3. Set throttle valve to completely closed position and, with wire sufficiently slackened, pull socket down toward "A" direction until throttle lever is about to move. Accelerator pedal play is zero at this time. See Figure FE-2.
4. Then pull socket up 1.0 to 1.5 mm (0.039 to 0.059 in) from that position toward "B" direction, and fasten socket securely with clamp.



1 Socket
2 Clamp
3 Accelerator wire

FE531

Fig. FE-2 Adjusting accelerator wire play

5. After completing the adjustment as previously explained, check the following:

(1) Make sure that accelerator system functions smoothly and quietly without disturbing any adjacent parts.
(2) Depress accelerator pedal down until throttle valve fully opens. Make sure that the clearance "T" between accelerator pedal reverse side and dash floor is 2 to 4 mm (0.08 to 0.16 in) without floor mat. Adjust pedal stopper bolt and lock nut if beyond limits.
(3) Check throttle lever if it returns to the original position as soon as accelerator pedal is released.
(4) Apply recommended multi-purpose grease slightly on the portion as shown in Figure FE-1. Also refer to the periodic maintenance schedule.

Kickdown switch (Automatic transmission models only)

Kickdown switch adjustment is correct if it is actuated by kickdown switch striker when accelerator pedal is fully depressed.

Always tighten switch stopper nut securely after proper adjustment is obtained.

FUEL SYSTEM

CONTENTS

DESCRIPTION FE-4
REMOVAL FE-5
INSPECTION FE-6
INSTALLATION FE-6

DESCRIPTION

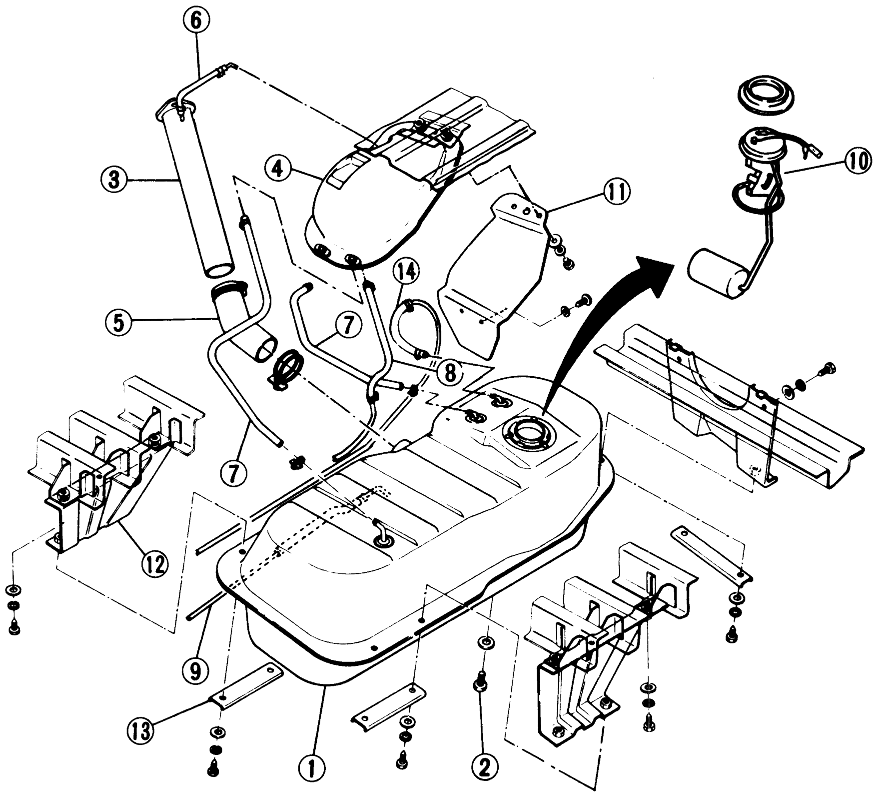
The fuel tank is 45 liters ($11\frac{7}{8}$ U.S. gal., $9\frac{7}{8}$ Imper. gal.) in capacity. The tank unit is mounted to the right side of the rear floor.

The filler shutter is installed to the filler tube on California models.

The electric fuel pump is adopted on air conditioner equipped models.

For the electric fuel pump, refer to Section EF.

1 Fuel tank
2 Drain plug
3 Filler tube
4 Reservoir tank
5 Filler hose
6 Breather hose
7 Ventilation hose
8 Evaporation hose
9 Fuel outlet hose and tube
10 Fuel tank gauge unit
11 Protector
12 Bracket
13 Retainer
14 Return tube



FE194

Fig. FE-3 Fuel tank

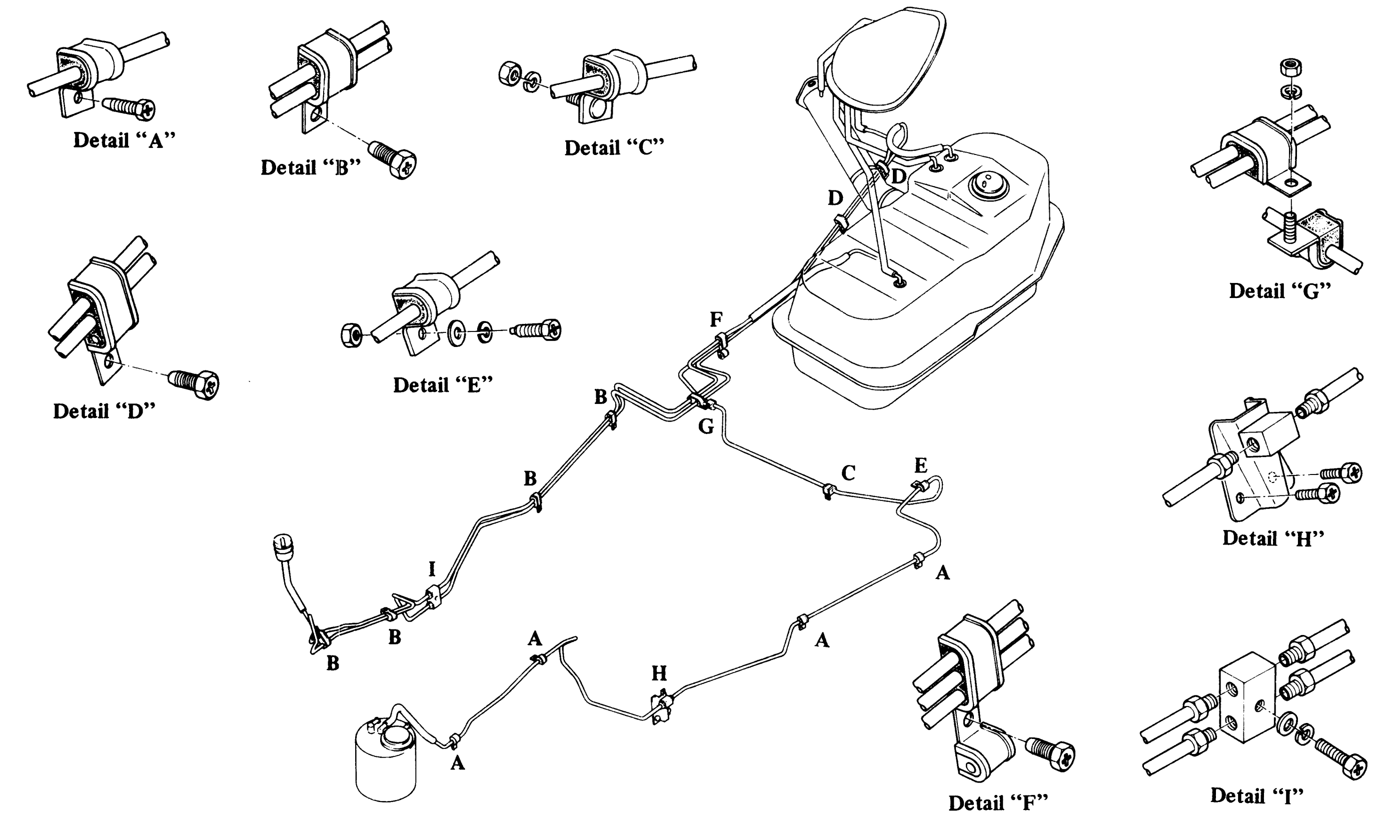


Fig. FE-4 Fuel piping

REMOVAL

Fuel tank (See Figure FE-3)

1. Disconnect battery ground cable.
2. Remove drain plug and receive the remaining fuel into a suitable container.
3. Disconnect filler tube from filler hose.
4. Remove fuel tank securing bolts.
5. Disconnect two ventilation hoses, fuel return hose and fuel outlet hose from fuel tank.
6. Disconnect fuel tank gauge unit wires at connector.
7. Remove fuel tank.

Note: **Plug hose and tube openings to prevent entry of dust or dirt while removing.**

Reservoir tank

1. Disconnect battery ground cable.
2. Disconnect two ventilation hoses, evaporation hose and breather hose.
3. Remove reservoir tank securing bolts, and remove tank with protector.

Note: **Plug hose and tube openings to prevent entry of dust or dirt while removing.**

Fuel tank gauge unit

1. Disconnect battery ground cable.
2. Disconnect wires from fuel tank gauge unit.
3. Remove fuel tank. For details, refer to fuel tank removal.
4. Unit gauge is a bayonet type and can be removed by turning it counter-clockwise with screwdriver.

Fuel piping (See Figure FE-4)

Fuel tubes are serviced as an assembly, so that replacement of fuel tube can be easily done. However, do not disconnect any fuel line unless absolutely necessary.

1. Drain fuel from fuel tank.
2. Loosen fuel hose clamps and disconnect fuel tubes on each end.

Note: **Plug hose and tube openings to prevent entry of dust or dirt while removing.**

3. Unfasten clips that hold tube on under body and remove tube from the vehicle.

Fuel filter

1. Disconnect fuel hoses from fuel filter by removing clamps. See Figure FE-5.

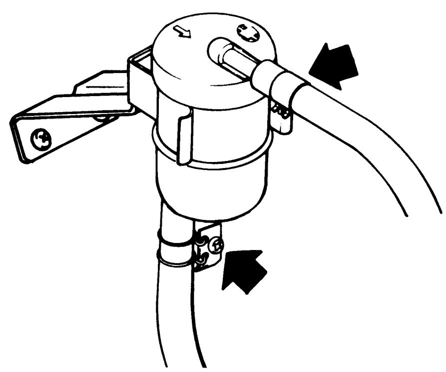


Fig. FE-5 Removing fuel filter clamps

2. Remove fuel filter.

INSPECTION

1. Fuel tank.
Check fuel tank for cracks or deformation. If necessary, replace.
2. Fuel hose
Inspect all hoses for cracks, fatigue, sweating or deterioration. Replace any hose that is damaged.
3. Fuel tube
Replace any fuel tube that is cracked, rusted, collapsed or deformed.

Note: Inspect hoses and tubes according to the periodic maintenance schedule.

4. Fuel filter
Replace fuel filter according to the periodic maintenance schedule or when it is clogged or restricted.

Fuel filter is of a cartridge type and cannot be cleaned. Always replace with a new one.

5. Fuel tank gauge unit
Check gauge unit for rust, deformation or deterioration. If necessary, replace.

INSTALLATION

To install, reverse the order of removal. Observe the following:

1. Install hose clamps securely. Do not tighten excessively to avoid damaging hoses.
2. Fasten clips holding fuel tube on under body securely. Failure to follow this caution could result in damage to the surface of fuel tube.
3. Do not kink or twist hose and tube when they are routed.
4. Install filler hose after fuel tank has been mounted in place. Failure to follow this caution could result in leakage from around hose connections.
5. When installing fuel tank gauge unit, align the projection of tank gauge unit with the notch in fuel tank and tighten it securely. Be sure to install gauge unit with O-ring in place.
6. Run engine and check for leaks at connections.

Tightening torque:
Drain plug:
5.0 to 6.0 kg-m
(36 to 43 ft-lb)
Fuel tank securing bolt:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)
Reservoir tank securing bolt:
0.32 to 0.44 kg-m
(2.3 to 3.2 ft-lb)

EXHAUST SYSTEM

CONTENTS

DESCRIPTION FE-6
REMOVAL FE-8
INSPECTION FE-8
INSTALLATION FE-8

DESCRIPTION

The exhaust systems installed on the non-California models differ in specifications from those installed on the California models.

Non-California models:

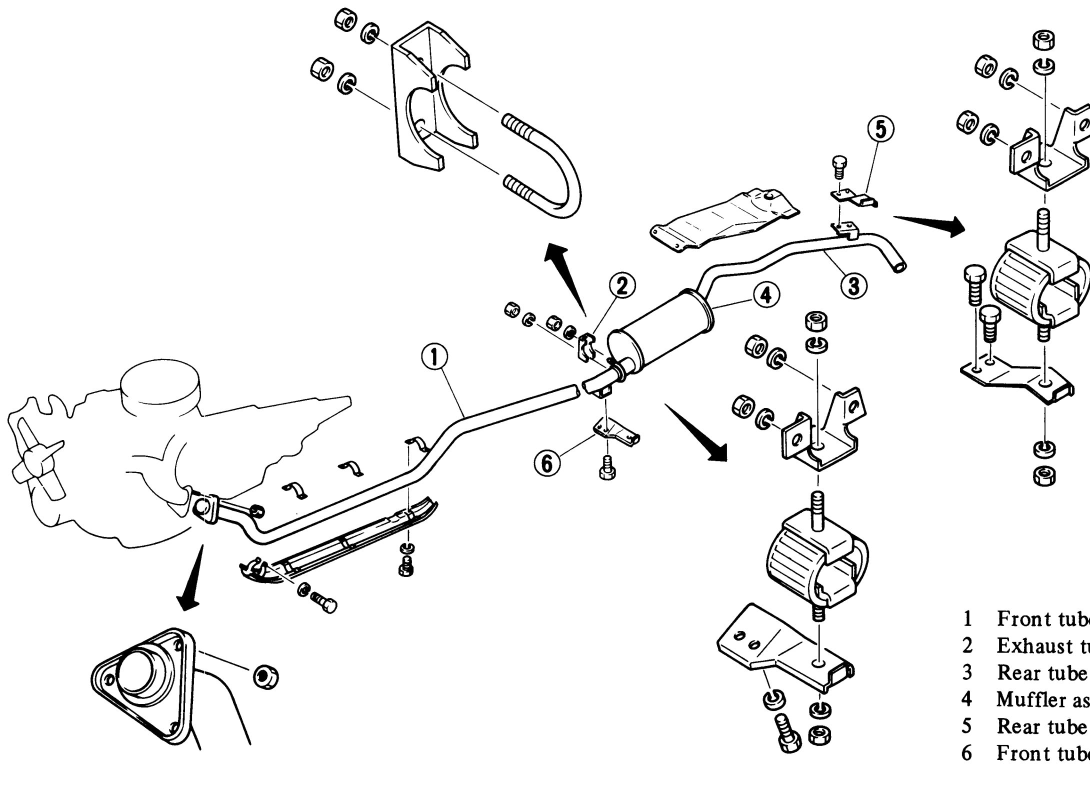
The exhaust system consists of a front exhaust tube, a main muffler assembly (with rear tube), mounting hangers, brackets and a heat insulator.

California models:

The exhaust system consists of a front exhaust tube, a catalytic converter assembly, a center tube, a main muffler assembly (with rear tube), mounting hangers, brackets and heat insulators.

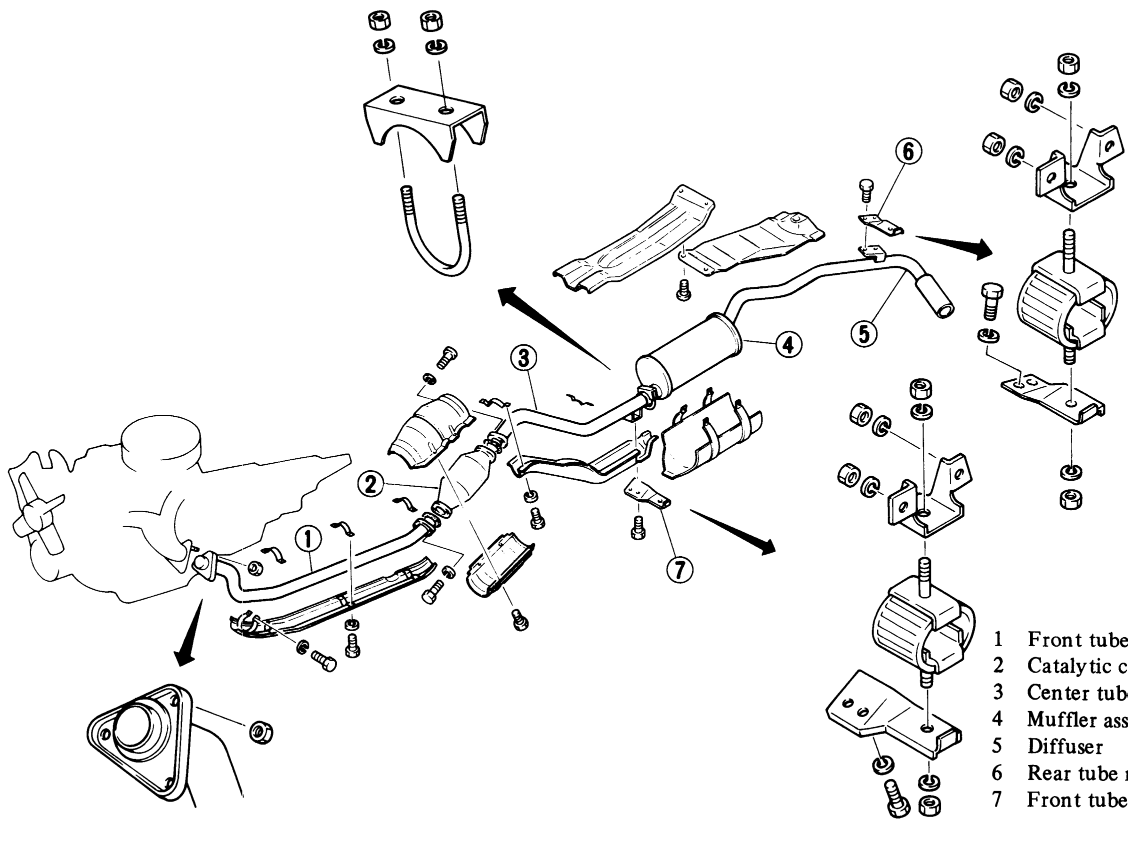
The catalytic converter is connected to the front tube and the center tube with bolts and nuts.

Non-California model



1 Front tube
2 Exhaust tube clamp
3 Rear tube assembly
4 Muffler assembly
5 Rear tube mounting
6 Front tube mounting

California model



1 Front tube
2 Catalytic converter
3 Center tube
4 Muffler assembly
5 Diffuser
6 Rear tube mounting
7 Front tube mounting

FE390

Fig. FE-6 Exhaust system

REMOVAL

Non-California models

1. Remove exhaust tube U-bolt clamp.
2. Break sealant off at front tube to main muffler connection.
3. Remove rear tube mounting bolt, and remove muffler assembly with rear tube.
4. Remove front tube heat insulator.
5. Remove nuts securing front tube to exhaust manifold, and remove front tube mounting bolts. Then detach front tube.

When disconnecting the exhaust tube connections, pay attention to the following points.

(1) Break old sealant off at the connection by lightly tapping around the tube with a hammer and twisting muffler. See Figures FE-7 and FE-8.

(2) Using a rubber hammer, tap on the front end of muffler while pushing it toward rear. The muffler assembly can then be taken out. See Figure FE-9.

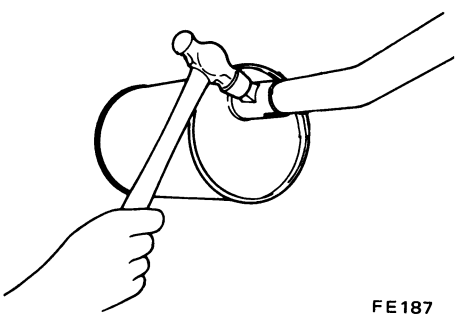

FE187

Fig. FE-7 Breaking sealant

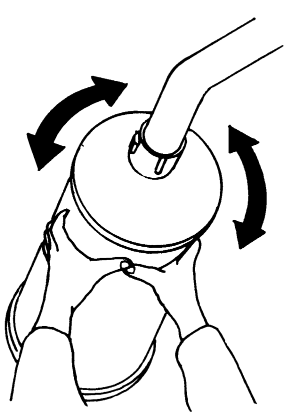

FE188

Fig. FE-8 Twisting muffler

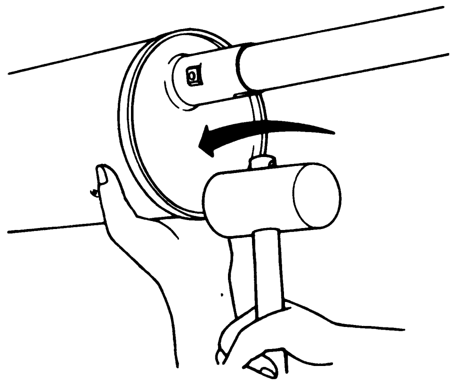

FE189

Fig. FE-9 Tapping muffler with a rubber hammer

California models

1. Remove all heat insulators.
2. Remove exhaust tube U-bolt clamp.
3. Break sealant off at center tube to main muffler connection.
4. Remove rear tube mounting bolt, and remove muffler assembly with rear tube.
5. Remove bolts securing catalytic converter to center tube and remove center tube mounting bolts.

   Then detach center tube.
6. Remove bolts and nuts securing catalytic converter to front tube, and detach catalytic converter.
7. Remove nuts securing front tube to exhaust manifold, and remove front tube mounting bolts. Then detach front tube.

INSPECTION

1. Check muffler and tubes for cracks or damage.

   Replace any part that is damaged beyond limits.
2. Replace bracket and mounting insulator that are cracked, fatigued, or sweated.

INSTALLATION

Install the exhaust system assembly in reverse order of removal. Observe the following:

Note:

a. **Insert front tube until it touches emboss.**

b. **When there is no clearance between front tube and floor or propeller shaft, turn tube along center line of tube in the manifold connecting unit, and obtain proper clearance.**

c. **Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.**

d. **After installation, check that mounting brackets and mounting rubbers are free from undue stress. If any of the above parts is not installed properly, excessive noises or vibrations may be transmitted to the vehicle body.**

e. **Tightening torque:**

- **Exhaust manifold to front tube nut:**
  1.9 to 2.5 kg-m
  (14 to 18 ft-lb)
- **U-bolt securing nut:**
  1.9 to 2.1 kg-m
  (14 to 15 ft-lb)
- **Mounting bracket bolt:**
  1.0 to 1.2 kg-m
  (7 to 9 ft-lb)
- **Front tube mounting bracket bolt: (California models)**
  1.9 to 2.1 kg-m
  (14 to 15 ft-lb)
- **Catalytic converter to front and center tube bolt: (California models)**
  3.2 to 4.3 kg-m
  (23 to 31 ft-lb)

If exhaust tubes are separated at connection to renew muffler assembly, etc., use the Genuine Nissan Sealant "Exhaust Sealant Kit 20720-N2225" or equivalent (See Figure FE-10) to eliminate gas leakage at the joint. Be sure to observe the following.

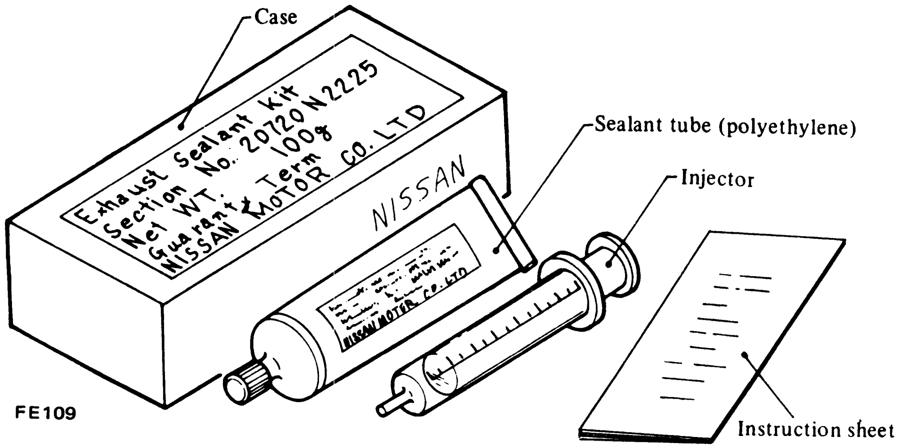


Fig. FE-10 Exhaust sealant kit

1. Wipe clean all the contact portions of tube joints; allow them to dry thoroughly.
2. Temporarily mount in place muffler assembly as an assembled unit on the vehicle.
3. Insert front tube until it touches emboss.

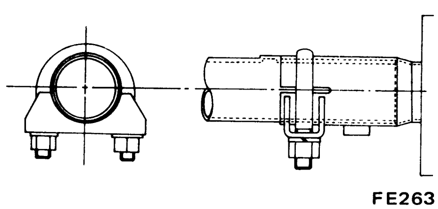


Fig. FE-11 Exhaust tube connection

4. Torque nut securing the male and female tubes at the connection. Tightening torque is 1.6 to 2.0 kg-m (12 to 14 ft-lb).
5. Squeeze approximately 5 cc (0.31 cu in) of sealant into injection from sealant tube. See Figure FE-12.

Be sure to place cap back to sealant tube since sealant will dry.

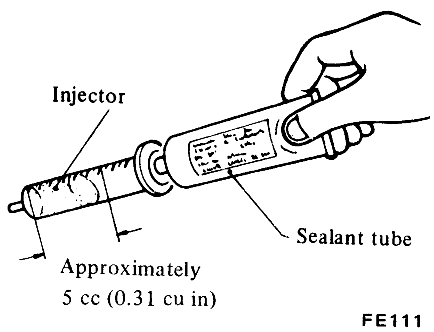


Fig. FE-12 Squeezing sealant to injector

6. Position nozzle of injector to the guide and press it there firmly. Inject sealant slowly until sealant begins to flow out of the slit of tube. This indicates that the bead requires no further sealant. Excessive sealant can cause a clogged tube. See Figure FE-13.

After injecting, wash injector thoroughly in clean water to remove all traces of sealant.

7. Start 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 vehicle. It is also essential that the vehicle should not be accelerated sharply for 20 to 30 minutes subsequent to this operation.

Note:

a. The sealant should be used within guaranty term indicated on the kit case.

b. Exposure of sealant to the skin may cause a rash. Wash sealant off the skin with water.

c. Do not keep the sealant tube in a place where the ambient temperature is above 40°C (104°F). A sealant hardened above 40°C (104°F) cannot be used. The most suitable storage temperature is from 15 to 35°C (59 to 95°F). If sealant becomes hardened because of low temperatures, warm the sealant tube with lukewarm water until the sealant is softened. Do not warm tube at a temperature over 40°C (104°F) for a long time.

d. Thoroughly read the instruction sheet furnished with the kit before using the sealant.

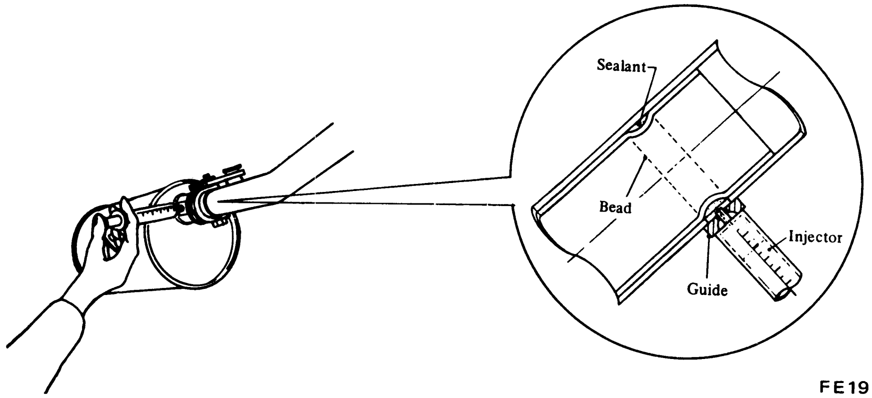


Fig. FE-13 Injecting sealant

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BF

BODY & FRAME

CAB BODY AND FRAME .... BF- 2
REAR BODY .... BF- 5
BODY FRONT END .... BF- 7
HOOD .... BF- 8
DOOR BF-11
WINDSHIELD GLASS BF-16
INSTRUMENT PANEL BF-17
INTERIOR TRIM AND CENTER CONSOLE BF-18
SEAT BF-19

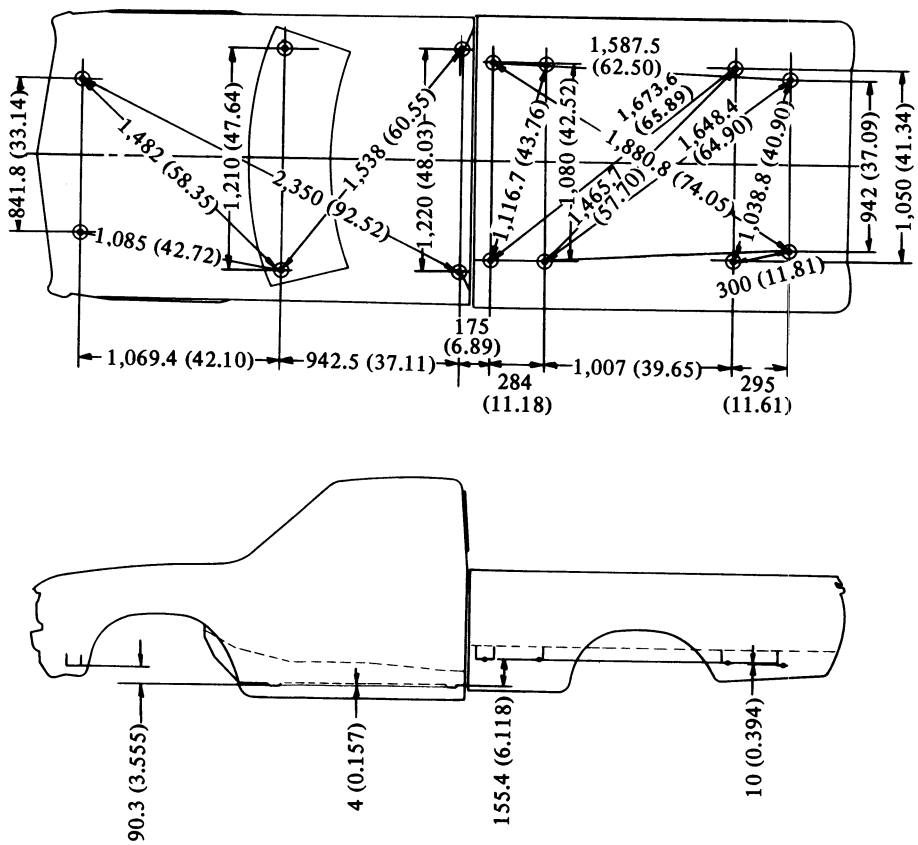
CAB BODY AND FRAME

On the 620 series models, chassis frames are classified into three types: the standard wheelbase model, long wheelbase model and Deluxe Cab.

The frame consists of right and left side members which are linked together with crossmembers to form a rigid structure that can withstand heavy loads. The second crossmember is located somewhat to the rear to permit individual replacement of the transmission.

FRAME ALIGNMENT

STANDARD WHEELBASE MODEL



BF025B

Fig. BF-1 Underbody dimensions (Standard wheelbase)

LONG WHEELBASE MODEL

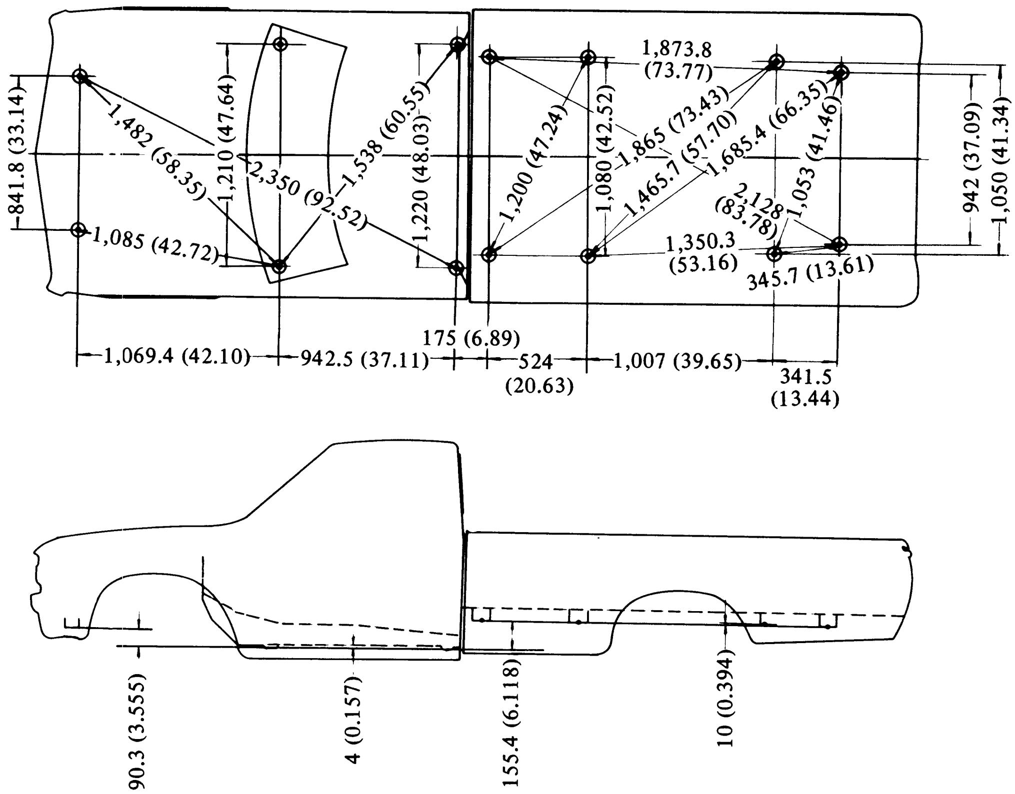


Fig. BF-2 Underbody dimensions (Long wheelbase)

DELUXE CAB

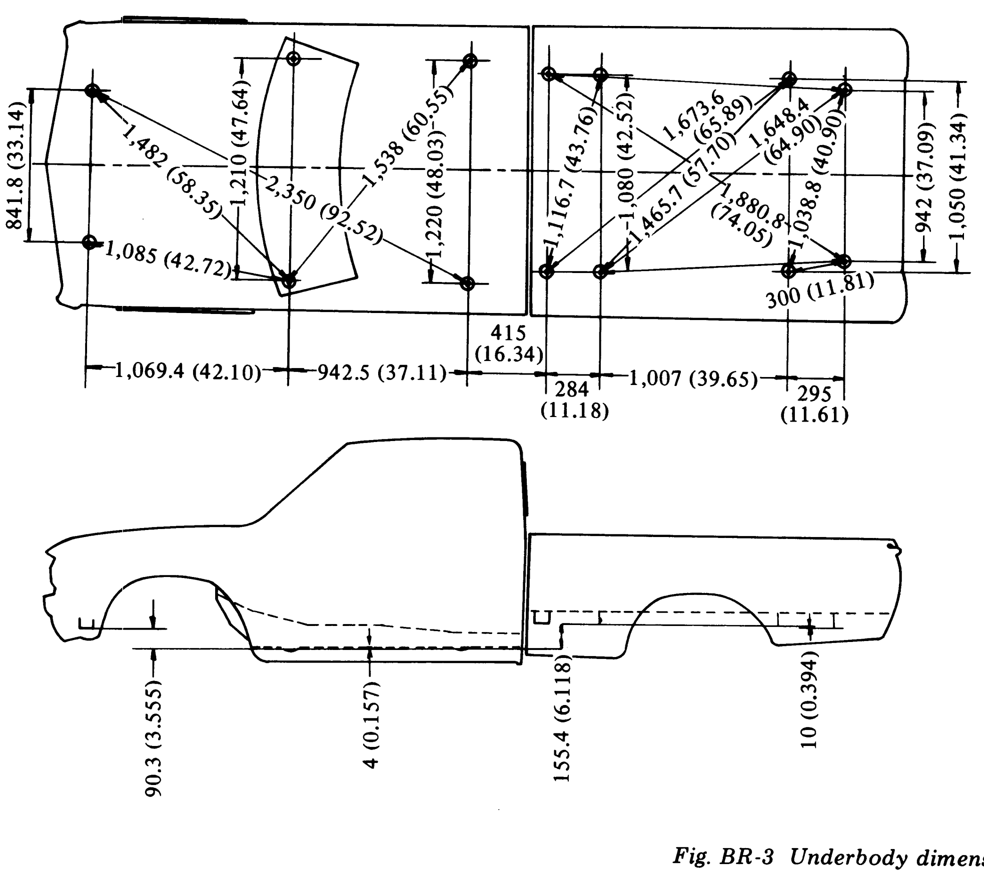
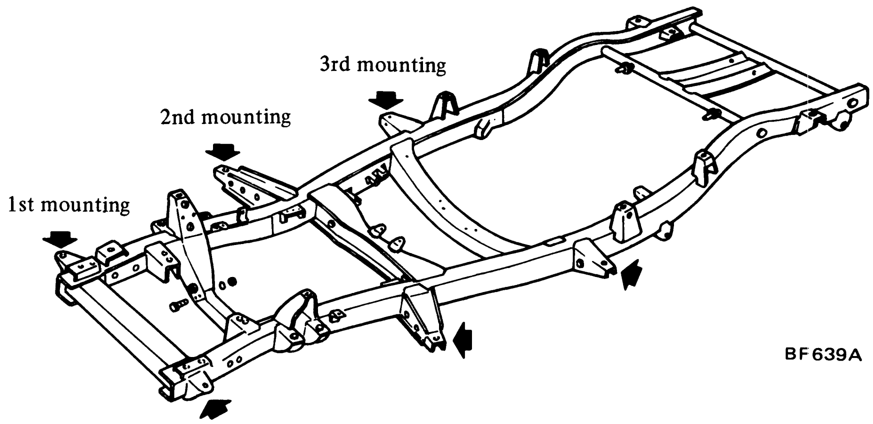


Fig. BR-3 Underbody dimensions (Delux Cab)

CAB BODY



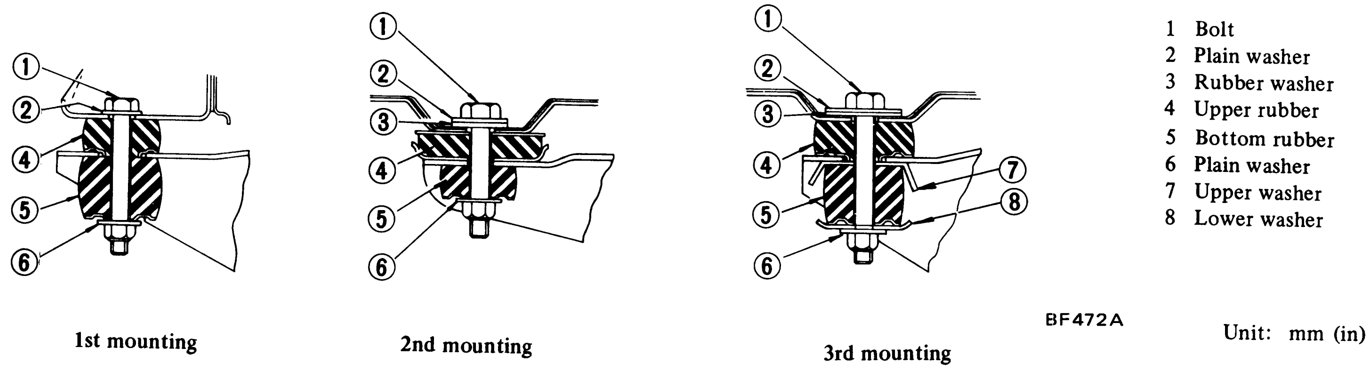


Fig. BF-4 Cab body mountings

REMOVAL AND INSTALLATION

1. Remove battery from engine compartment.
2. Disconnect oil cooler hoses from radiator. (automatic transmission model only).
3. Disconnect air conditioner tubes from condenser, if so equipped.
4. Drain water from cooling system completely and remove radiator and condenser (if so equipped).
5. Remove engine hood from hood hinges after scribing hood for reinstallation.
6. Remove bumper stay from frame and remove front bumper.
7. Remove radiator grille.
8. With the aid of Steering Wheel Puller ST27180001, remove steering wheel from steering shaft.
9. Remove steering gear arm from steering sector shaft using suitable puller.
10. Remove screws securing steering shaft dust seat and insulator in position.
11. Remove steering gear housing from frame and pull it out into engine compartment.
12. Disconnect speedometer cable at transmission.
13. Disconnect carbon canister hoses between canister to vacuum gallery and canister to intake manifold at canister.
14. Disconnect air pump to air pump air cleaner hose at air cleaner.
15. Disconnect air conditioner hoses from compressor, if so equipped.
16. Disconnect air cleaner duct from body.
17. Disconnect Master-Vac vacuum hose at intake manifold.
18. Remove snap-ring and control lever pin from transmission striking guide, and remove control lever.
19. Disconnect fuel hoses at fuel strainer.
20. Disconnect fuel return hose and evaporation hose at connectors.
21. Disconnect brake and clutch tubes from each master cylinder.
22. Remove all clips securing fuel tubes, brake tubes and clutch tube at cab body.
23. Loosen hand brake control cable at brake control lever. Then disconnect cable from dash panel.

Note: **Place blocks against front and rear wheels to prevent vehicle from rolling off accidentally.**

24. Free accelerator wire from carburetor.
25. Disconnect heater hoses at engine side.
26. Disconnect wire harnesses from related engine electrical parts.
27. Disconnect engine and chassis harnesses at their connection on right sidemember near rear engine mounting member.
28. Remove six bolts securing body to frame.
29. With the use of suitable ropes and an overhead hoist, lift cab body straight up slowly and place it on a level surface.

Note: **In lifting up cab body, use care not to dash it against engine or rear body. Cab body weighs approximately 220 kg (485 lb).**

30. For installation, reverse above steps. However, observe the following instructions.
(1) If the cab body is to be replaced, note position and location of insulators and washers used. See Figure BF-4.
(2) Adjust hand brake stroke properly.
(3) Air bleed brake and clutch system thoroughly.

Cab body to frame mounting bolt torque:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

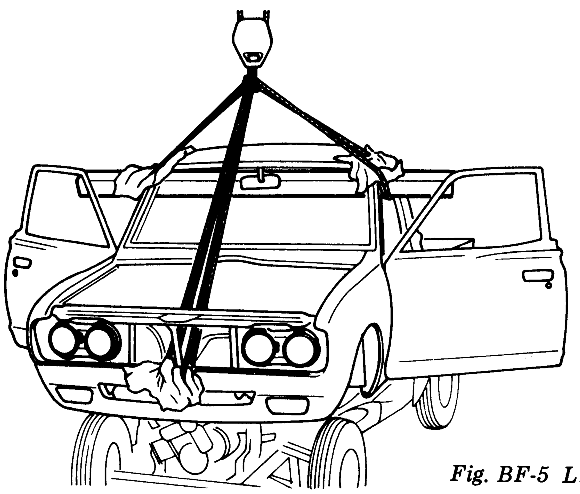
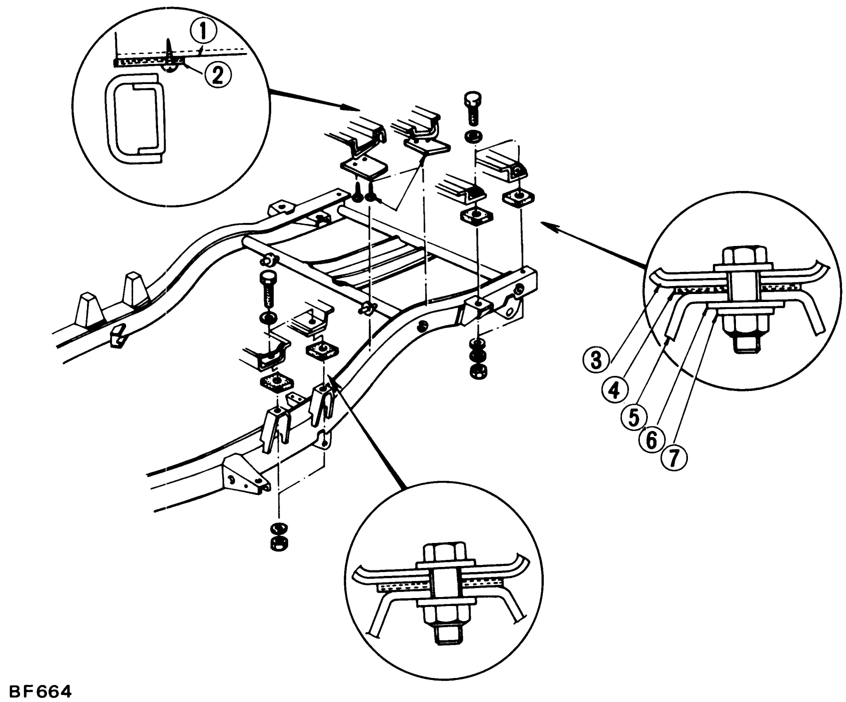


Fig. BF-5 Lifting up cab body

REAR BODY



1 Bolster
2 Shim B
3 Bolster
4 Shim A
5 Frame
6 Rubber washer
7 Plain washer

Fig. BF-6 Rear body mountings

REAR BODY

REMOVAL AND INSTALLATION

The rear body is securely fastened to the frame at eight places. It should be hoisted after the fuel tank is removed from the rear body.

Use the following procedures as a guide when removal or installation of rear body is necessary.

1. Apply parking brake.
2. Disconnect cables from battery.
3. Disconnect rear combination lamp wiring harness at connectors.
4. Disconnect fuel hoses from fuel tank. Remove fuel tank from rear body.
5. Remove eight rear body attaching bolts.

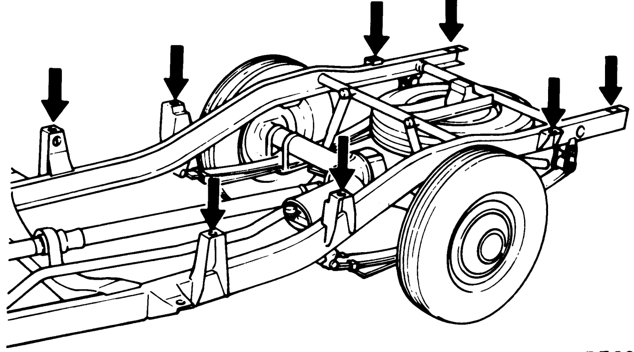
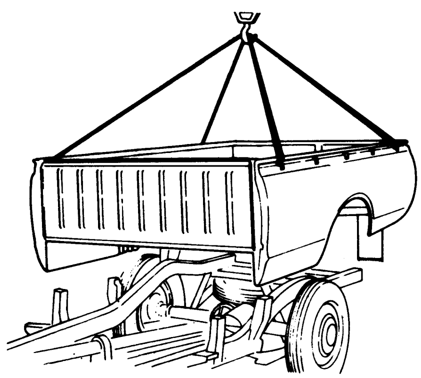


Fig. BF-7 Rear body mountings

6. Attach lifting ropes to hooks in rear body as shown in Figure BF-8, and lift up rear body slowly and carefully.

Note:

a. **When lifting rear body, make sure that it is in a good balanced condition.**
b. **While lifting, use care not to allow rear body to hit against cab body or any adjacent parts.**
c. **The rear body weighs approximately 130 kg (286 lb).**



BF028B

Fig. BF-8 Lifting up rear body

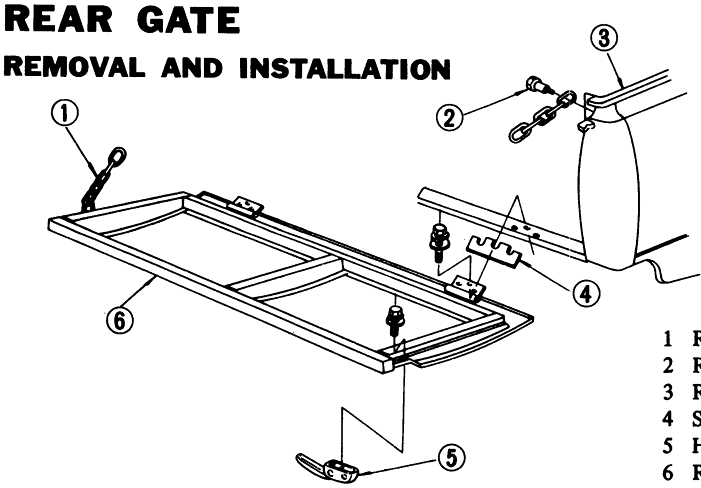
7. To install rear body, reverse the order of removal. Carefully observe the following instructions.

Make sure that spacers and shims (used with bolts) are properly placed in their original positions. Refer to Figure BF-6 for the location of these parts.

The rear body-to-frame attaching bolts should be torqued to 3.3 to 4.2 kg-m (24 to 30 ft-lb).

REAR GATE

REMOVAL AND INSTALLATION



1 Rear gate chain
2 Rear gate chain bolt
3 Rear body
4 Shim
5 Hook handle
6 Rear gate

BF667

Fig. BF-9 Rear gate

1. Open rear gate.
2. Remove rear gate chain from rear gate.
3. Remove rear gate hinge attaching bolts and take out rear gate and rear gate hinge shims.
4. To install rear gate, reverse the order of removal.

ALIGNMENT

The rear gate should be adjusted so that there exists an equal clearance between body and the periphery of rear gate. There should be no stepped portion at any points.

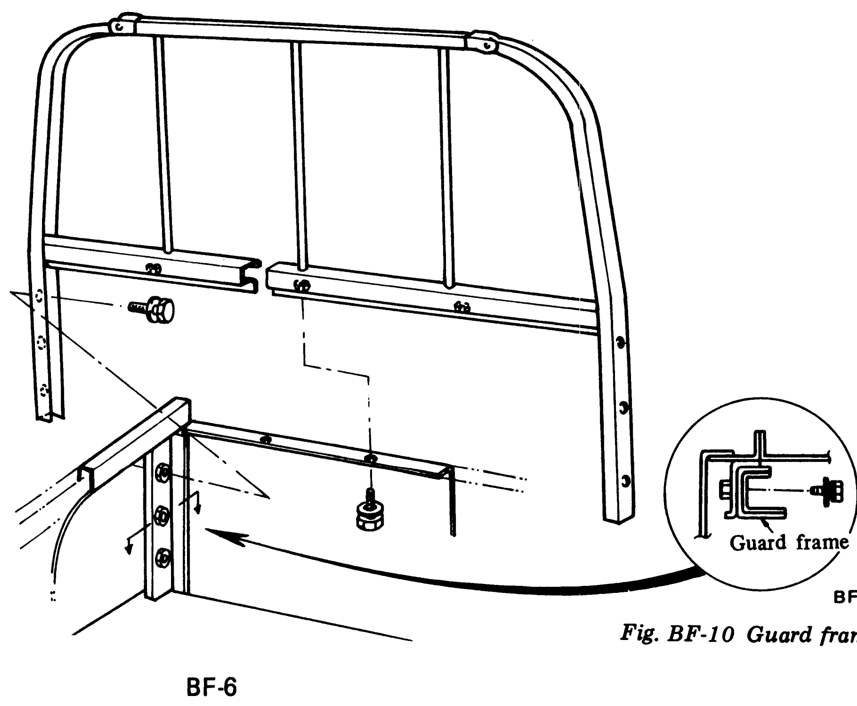
1. To adjust the height of rear gate, add or remove shims at rear gate hinge. Two sizes of shim are available in thickness; 1.6 mm (0.0630 in) and 0.8 mm (0.0315 in).
2. To adjust rear gate in the left and right directions, loosen rear gate hinge attaching bolts, and move rear gate as required.
3. To adjust rear gate hook, loosen two attaching bolts and move rear gate hook up-down or left-right in elongated holes as required.

GUARD FRAME (Optional)

REMOVAL AND INSTALLATION

The guard frame is furnished as an optional equipment.

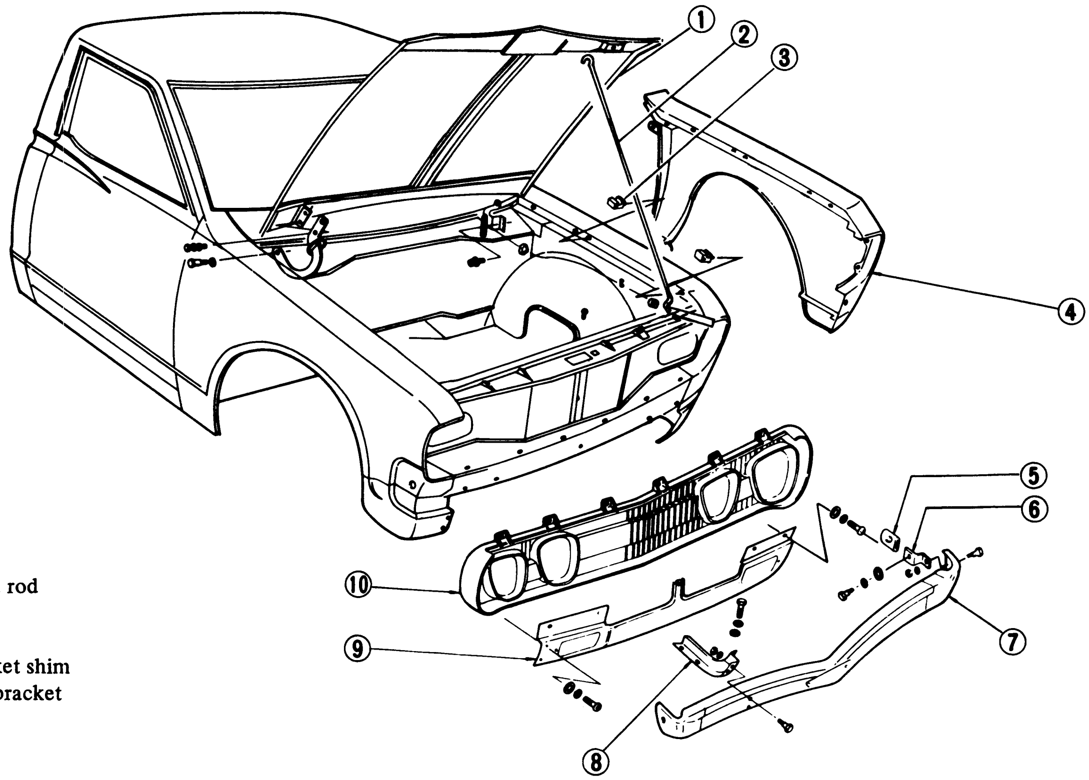
1. Remove nine guard frame attaching bolts and detach guard frame.
2. To install optional guard frame, reverse the order of removal.



BF673

Fig. BF-10 Guard frame

BODY FRONT END



1 Hood
2 Hood support rod
3 Hood bumper
4 Fender
5 Bumper bracket shim
6 Bumper side bracket
7 Bumper
8 Bumper stay
9 Front apron
10 Radiator grille

BF029B

Fig. BF-11 Body front end

FRONT BUMPER

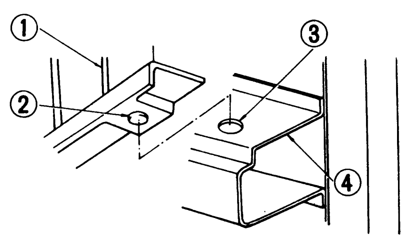
REMOVAL AND INSTALLATION

1. Remove bumper to fender attaching bolts.
2. Remove four bumper stay-to-side frame front attaching bolts. Pull bumper assembly straight forward.
3. For installation, reverse above steps. Align bumper with front fender and apron; then tighten them up.

RADIATOR GRILLE

REMOVAL AND INSTALLATION

1. Remove radiator grille by removing attaching screws, six on top and two on both ends.
2. Remove ornament on radiator grille by removing nuts from behind radiator grille.
3. For installation, reverse above steps, observing the following:
(1) Check to be certain that six guide studs enter holes in radiator support lower frame before tightening top screws.



BF632

1 Radiator grille
2 Guide stud
3 Guide stud hole
4 Radiator support lower frame

Fig. BF-12 Radiator grille guide studs

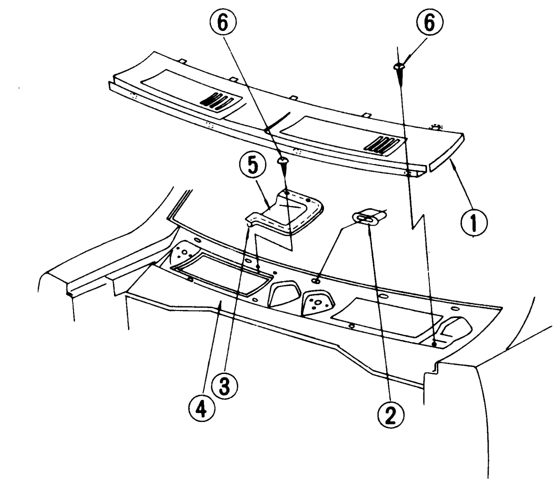
(2) Align grille with head lamps and fenders.

FRONT APRON

REMOVAL AND INSTALLATION

1. Remove front bumper.
2. Remove radiator grille.
3. Disconnect front turn signal wire harness at connector.
4. Remove front apron by removing attaching bolts.
5. For installation, reverse above steps.

COWL TOP GRILLE



1 Cowl top grille
2 Cap
3 Air box drain seal
4 Cowl top
5 Air box drain
6 Screw

BF633

Fig. BF-13 Cowl top grille

REMOVAL AND INSTALLATION

1. Open engine hood.
2. Remove two windshield wiper blades.
3. Remove cowl top grille attaching screws. Pull grille straight forward to remove.
4. Remove air box drain.
5. To install, reverse above steps.

However, observe the following items:
(1) When installing air box drain, apply adhesive to its lower end.
(2) Align cowl top grille with fenders.

FRONT FENDER

REMOVAL AND INSTALLATION

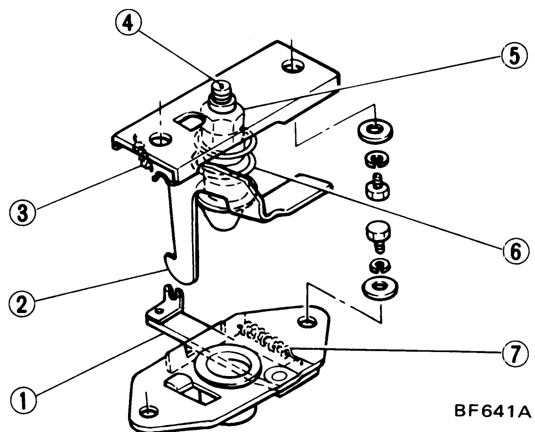
1. Remove front bumper.
2. Remove radiator grille.
3. Remove front apron.
4. Remove cowl top grille.
5. Remove hood bumpers (two on each side).
6. Remove nine screws attaching front fender to hood ledge. See Figure BF-11.
7. To install, reverse above steps.

HOOD

REMOVAL AND INSTALLATION

1. Place protective covers over front fender and cowl top grille.
2. Open engine hood. Mark hinge locations on hood and loosen off four bolts securing hood to hood hinge. Use extra caution to avoid damaging painted surfaces of fender and cowl top grille.
3. Remove engine hood.
4. To install, reverse above procedures.

HOOD



1 Female lever
2 Safety catch lever
3 Return spring
4 Dove-tail bolt
5 Lock nut
6 Hood lock spring
7 Spring

BF641A

Fig. BF-14 Hood lock male and female

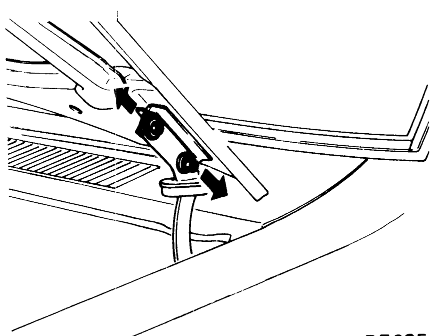
ADJUSTMENT

Four slotted holes in hood hinge provide for fore-aft and side adjustment to correct space between hood and fender, and hood and cowl top grille.

Loosen four bolts just enough to move engine hood and move hood to desired position if necessary to correct space.

To make vertical adjustment, adjust height of dove-tail bolt at hood lock male until hood is flush with fender.

1. Loosen hood to hinge bolts just far enough to permit movement of hood.
2. Shift hood in elongated hole until parallel space is reached between hood and fender or cowl top grille. Tighten bolts securely.



BF635

Fig. BF-15 Engine hood alignment

Note: Vertical adjustment should be carried out after hood lock male and female adjustment has been completed.

3. To correct hood lock alignment, loosen two hood lock male attaching bolts and move hood lock male and female in the lateral and fore-and-aft directions as required.

Tightening torque:
Male and female attaching bolts
0.45 to 0.60 kg-m
(3.3 to 4.3 ft-lb)

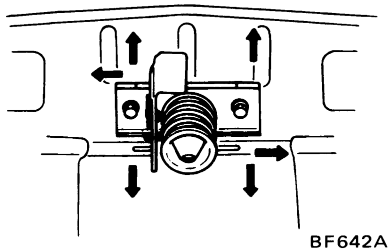
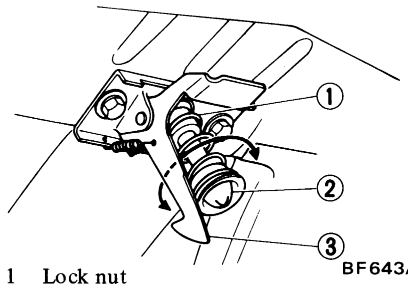

BF642A

Fig. BF-16 Adjusting hood lock male

4. Dove-tail bolt at hood lock male provides for vertical adjustment in aligning hood to make it flush with fender. To correct, loosen lock nut on dove-tail bolt and turn dove-tail bolt in or out as necessary to obtain a correct height.

5. Tighten lock nut firmly while holding dove-tail bolt with a screwdriver to secure adjustment.

Tightening torque:
Lock nut of dove-tail:
1.9 to 2.6 kg-m
(14 to 19 ft-lb)

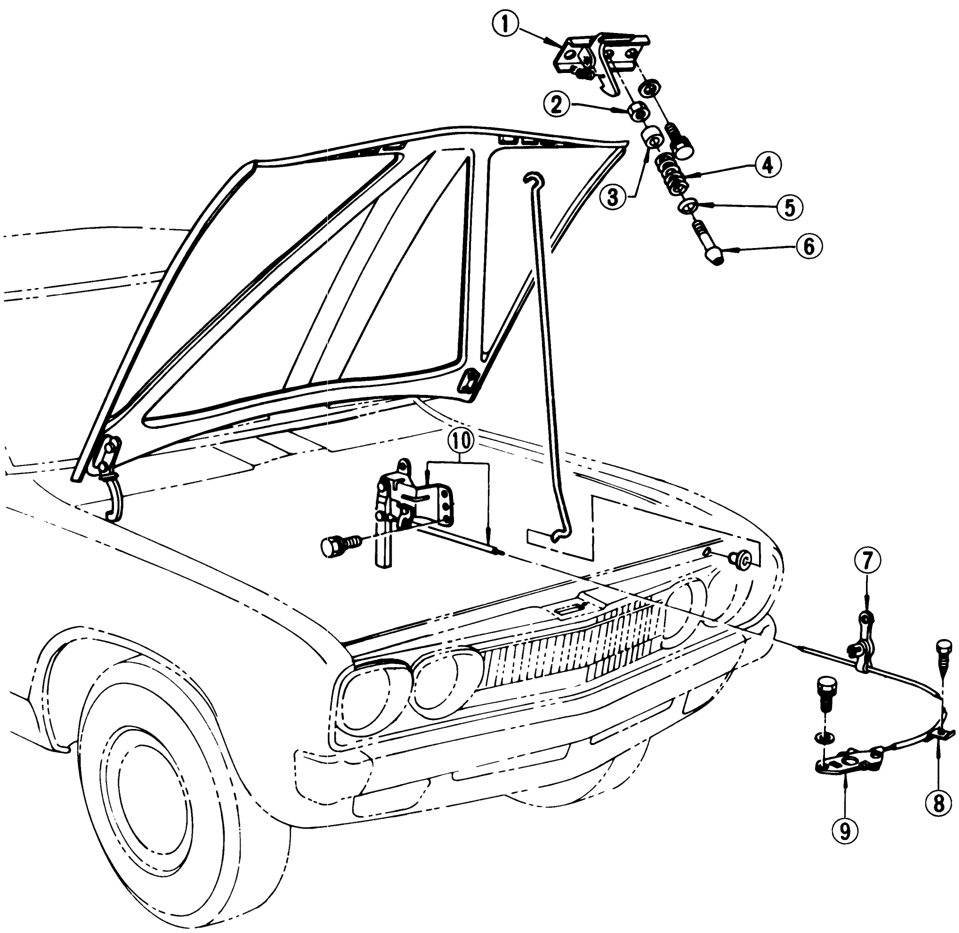


BF643A

1 Lock nut
2 Hood lock male 3 Safety catch

Fig. BF-17 Dove-tail bolt height adjustment

HOOD LOCK CONTROL



1 Dove-tail bolt seat
2 Lock nut
3 Cushion rubber
4 Spring
5 Spring retainer
6 Dove-tail bolt
7 Clamp
8 Clamp
9 Hood lock female
10 Control cable assembly

BF644A

Fig. BF-18 Hood lock and control cable

REMOVAL AND INSTALLATION

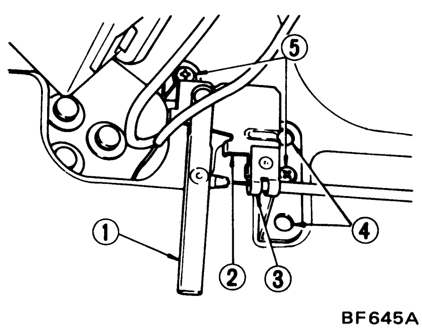
1. Remove hood lock male by removing two attaching bolts.
2. To remove hood lock female, first remove radiator grille. Back off two bolts securing hood lock female in position. Hood lock female can now be taken out.
3. Remove two bolts attaching hood lock handle assembly to dash side panel.

Disconnect cable at hood lock female and remove cable clamps. Pull cable out into cab.

4. To install hood lock male and female, reverse removal procedure. After installation, check to insure that they are properly aligned.
5. To install hood lock handle assembly, reverse steps, observing the following notes:

(1) Check to be certain that cable clamps are tight and secure.

(2) Install hood lock handle bracket in place by using two of four holes. See Figure BF-19.



1 Hood lock handle
2 Hood lock handle bracket
3 Clamp
4 Hole
5 Attaching bolt

Fig. BF-19 Installing hood lock handle bracket

ADJUSTMENT AND INSPECTION

1. If hood lock handle is heavy, turn dove-tail bolt of hood lock male counterclockwise to reduce tension of hood lock spring.

Lock nut of dove-tail bolt should first be loosened.

If looseness is noticed, hood is not tight and will vibrate. To correct this, turn bolt clockwise and recheck.

2. Check hood lock mechanism as follows:

(1) Check safety catch lever and spring for deformation, fatigue or rusting.

(2) Check female lever and return spring for deformation, fatigue or rusting. Improper operation of female lever may cause disengagement between female lever and dove-tail bolt.

(3) Make sure that safety catch hooks engine hood properly when hood latch has been disengaged.

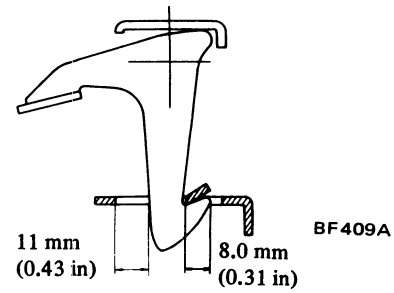


Fig. BF-20 Safety catch lever to radiator upper support adjustment

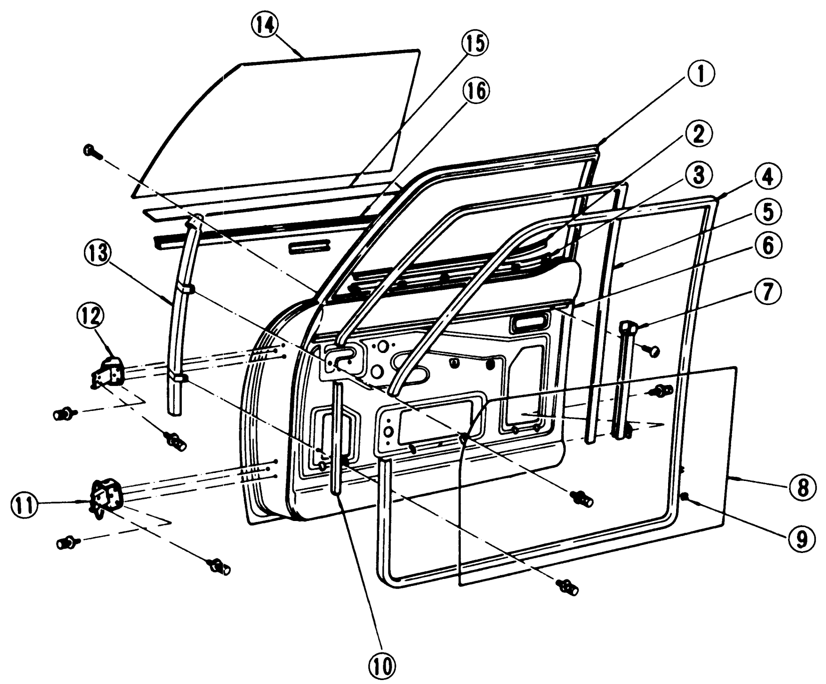
Lubrication

When checking or adjusting the hood lock, lubricate the pivot, catcher and return spring of secondary latch thoroughly. Also, lubricate the lever of the hood lock female for smooth and correct operation.

DOOR

CONTENTS

DESCRIPTION BF-12
DOOR BF-12
REMOVAL AND INSTALLATION BF-12
ALIGNMENT BF-12
DOOR TRIM AND SEAL BF-12
REMOVAL AND INSTALLATION BF-12
GLASS RUN BF-13
REMOVAL AND INSTALLATION BF-13
DOOR VENTILATOR WINDOW (Optional) BF-13
REMOVAL AND INSTALLATION BF-13
DOOR GLASS AND REGULATOR BF-14
REMOVAL AND INSTALLATION BF-14
ADJUSTMENT BF-14
DOOR LOCK BF-14
REMOVAL AND INSTALLATION BF-15
ADJUSTMENT BF-15
DOOR LOCK STRIKER BF-15
WEATHERSTRIP BF-15
DESCRIPTION BF-15
REMOVAL AND INSTALLATION BF-15



1 Door sash
2 Window outside weatherstrip
3 Window inside weatherstrip
4 Door weatherstrip
5 Rear glass run rubber
6 Door finish holder
7 Rear lower sash
8 Seal screen
9 Door weatherstrip clip
10 Front glass run rubber
11 Lower door hinge
12 Upper door hinge
13 Front lower sash
14 Door glass
15 Glazing rubber
16 Door glass bottom channel

BF030B

Fig. BF-21 Door without ventilator window

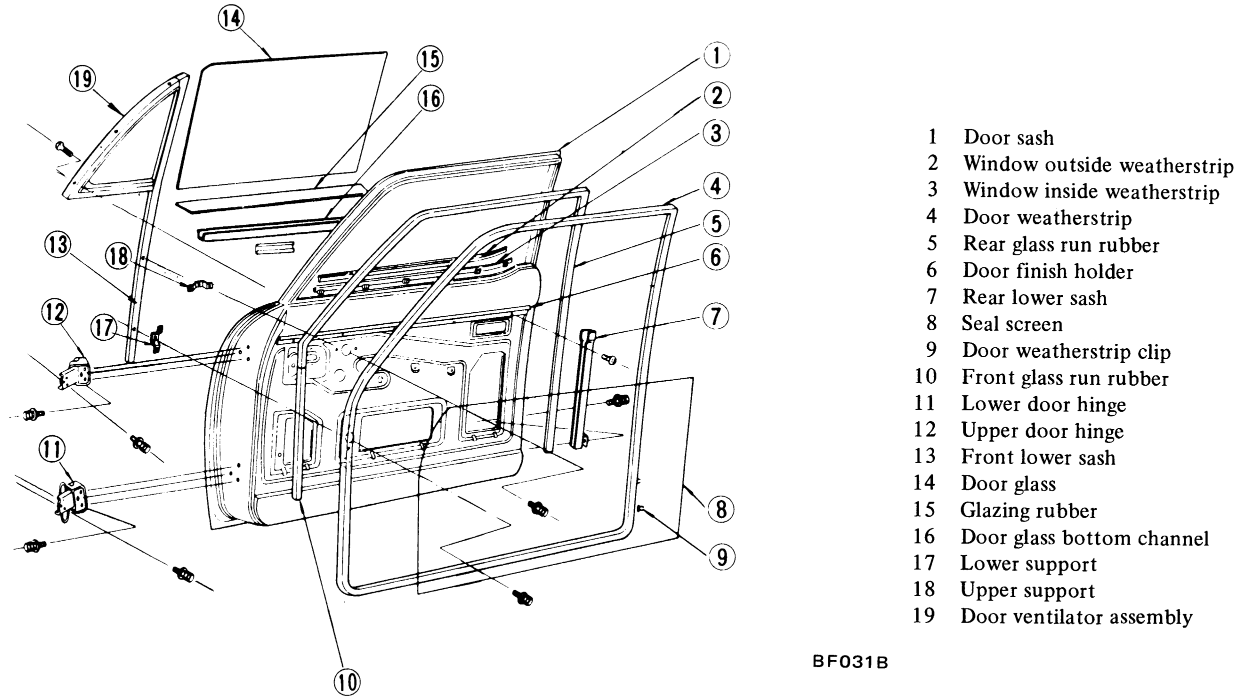


Fig. BF-22 Door with ventilator window (Optional)

DESCRIPTION

The door consists of inner and outer panels welded together to form a rigid structure.

The curved glass provides greater shoulder room.

A door that incorporates a ventilator window is also available as an option.

The weatherstrip is inserted into the groove on the door sash side and is attached by clips on the door side.

DOOR

REMOVAL AND INSTALLATION

1. With door in full open position, place a garage jack or stand beneath door to support its weight when bolts are removed. Place rag between door and jack or stand to avoid damaging painted surface.

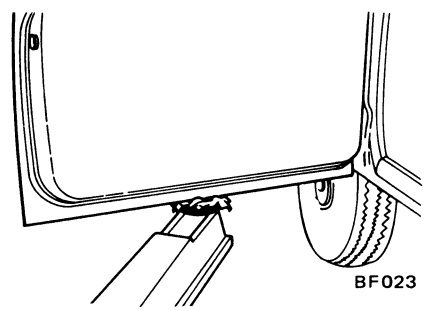


Fig. BF-23 Supporting door

2. Separate lower door hinge hole cover from dash side trim.
3. While supporting door as above, back off body to upper and lower hinge attaching bolts accessible from inside cab (three each). Door can now be taken out from cab body.

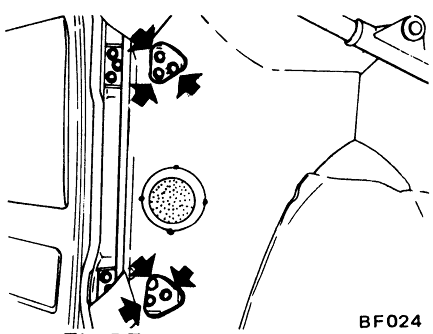


Fig. BF-24 Removing door hinge bolts

4. To install, reverse removal procedure.

ALIGNMENT

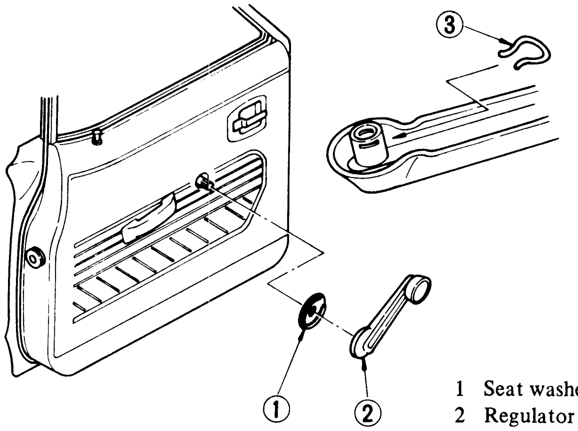
Elongated holes (three each) in door hinge and door lock striker provide for up and down, forward and backward, and/or sideways adjustment to assure proper door fit to door opening.

To adjust door alignment, loosen bolts and move door to desired position to obtain a parallel space between door sides and door opening. Also check to be certain that weatherstrip contacts body opening evenly to prevent entry of mud and water.

DOOR TRIM AND SEAL

REMOVAL AND INSTALLATION

1. Remove screw securing inside door handle escutcheon; remove escutcheon.
2. Remove screws which hold pull handle and arm rest in position. Pull handle and arm rest can then be taken out.
3. Pull retaining spring off regulator handle. Take out regulator handle and seat washer.



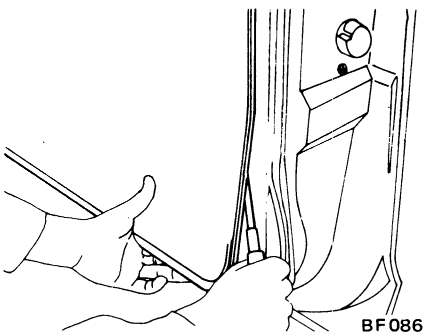
BF640

1 Seat washer
2 Regulator handle
3 Retaining spring

Fig. BF-25 Removing regulator handle

4. When removing door finish, it is important that inside door panel and door finish are not damaged.

With a screwdriver, pry off retaining clips, exercising care not to damage clips.



BF086

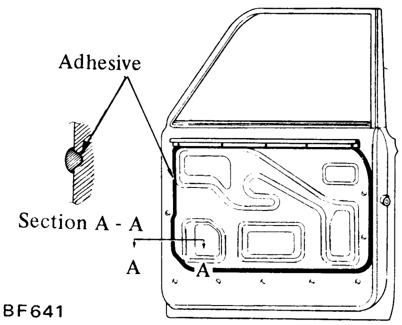
Fig. BF-26 Removing door finish

5. Separate water seal screen from inside door panel.

6. To install, reverse removal procedure. However, observe the following installation notes:

(1) When water seal screen is to be replaced, be sure to cement it back into position securely to ensure a water sealed door. This can be done by evenly applying adhesive to grooves in inside door panel.

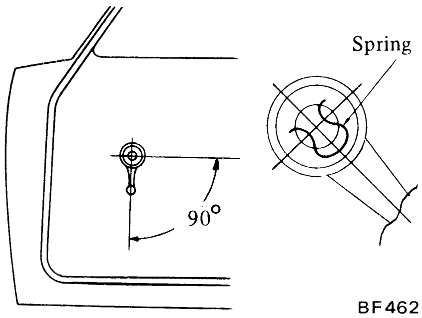
Broken screen or one suspected to be leaking must be replaced with a new one.



BF641

Fig. BF-27 Adhesive for seal screen

(2) With door glass up, set regulator handle at an angle shown in Figure BF-28.



BF462

Fig. BF-28 Installation angle of regulator handle

GLASS RUN

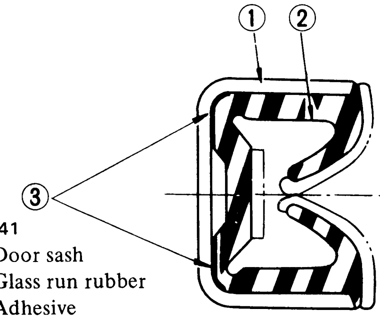
REMOVAL AND INSTALLATION

1. With door in full out position, lower glass all the way.
2. Remove pull handle, arm rest and regulator handle.
3. Remove door finish and water seal screen.
4. Remove outer and inner weather-strips from door.
5. Remove door glass.
6. Remove glass run rubbers from front and rear lower sashes, and from those of fixed door.

   Use caution to avoid damaging rubbers during removal operation.
7. Remove front and rear lower door sashes (when ventilator window is not provided).
8. On vehicles equipped with ventilator window, remove ventilator window frame and rear lower door sash.
9. To install, reverse removal procedure. However, observe the following notes:

(1) Before applying adhesive, clean the inside of door sash.

(2) Apply adhesive to glass run rubber on door sash contacting face and fit it correctly. Particularly, care should be taken at corners and contact face to assure a good fit.



BF641

1 Door sash
2 Glass run rubber
3 Adhesive

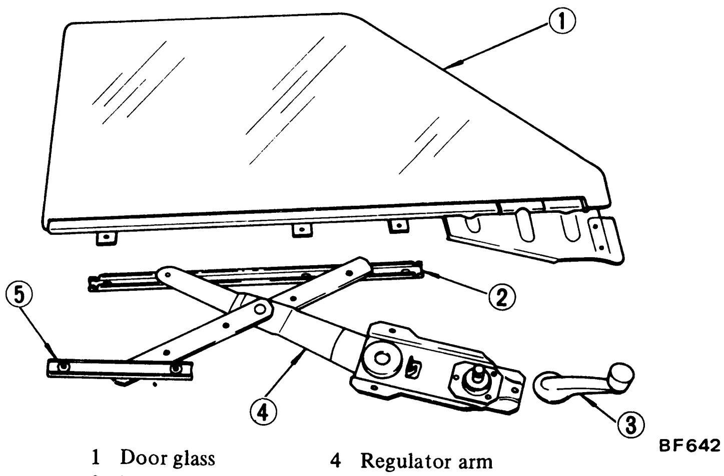
Fig. BF-29 Applying adhesive to glass run rubber

DOOR VENTILATOR WINDOW (Optional)

REMOVAL AND INSTALLATION

1. Remove five ventilator window frame attaching bolts. Lift frame out of door. For detailed procedure, refer to relative topic under "Door Glass and Regulator."
2. Remove nuts and spring securing lower end of ventilator window to frame.
3. Work off rivets which hold upper end of ventilator window to frame; take out window.
4. To install, reverse removal procedure.

DOOR GLASS AND REGULATOR

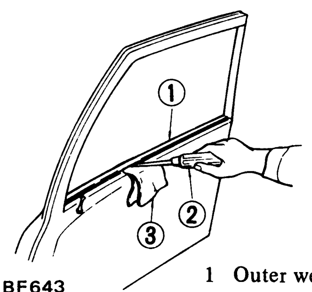


1 Door glass
2 Bottom channel
3 Regulator handle
4 Regulator arm
5 Guide channel

Fig. BF-30 Door glass and regulator

REMOVAL AND INSTALLATION

1. Open door; lower glass all the way.
2. Remove inside door handle escutcheon.
3. Remove pull handle.
4. Remove arm rest.
5. Remove regulator handle.
6. Remove door finish.
7. Peel off water seal screen.
8. Work off outer and inner weatherstrips from door, being sure not to scratch door paint during operation. Use a suitable plain screwdriver or similar flat-bladed tool to remove and place a piece of rag between screwdriver and door panel.



1 Outer weatherstrip
2 Screwdriver
3 Piece of rag

Fig. BF-31 Removing outer weatherstrip

9. Remove three door glass bottom channel attaching bolts. Remove door glass by lifting it straight-up.

10. On door equipped with ventilator, remove three bolts securing door glass bottom channel, then let glass go to the bottom of door.

Remove ventilator frame attaching bolts, and lift frame straight-up out of door. Remove door glass by lifting it straight-up.

11. Back off the five guide channel-to-regulator base attaching screws. Take out regulator assembly through large access hole in inside door panel.

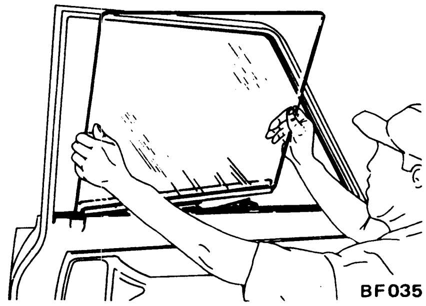


Fig. BF-32 Removing door glass

12. To install, reverse removal procedure.

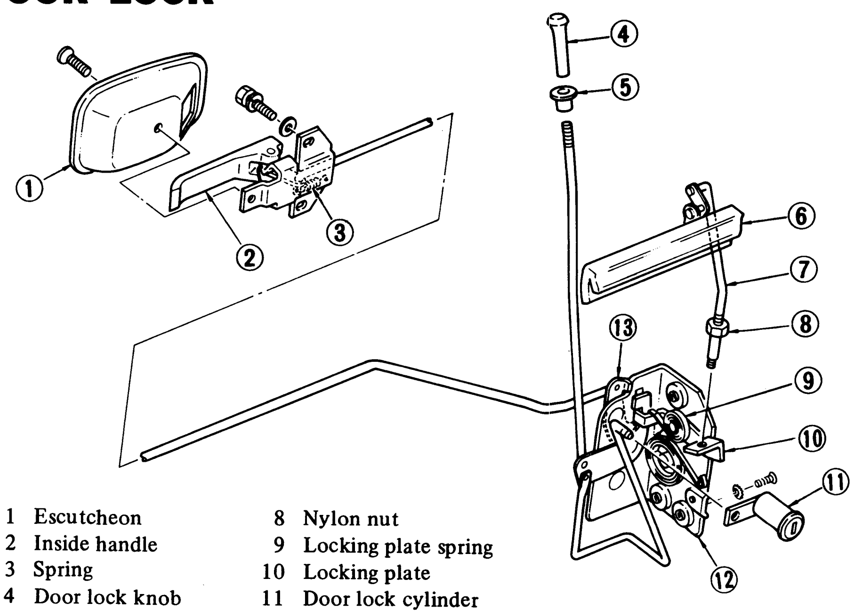
ADJUSTMENT

1. In-and-out and fore-and-aft adjustment can be made by moving front- or rear-sash and guide channel as required.

The ease with which window assembly raises and lowers depends on adjustment of rear lower sash. Rear lower sash should be parallel with front lower sash.

2. Fore-and-aft adjustment is determined by position of guide channel and front lower sash. Moving front lower sash backward reduces play in window assembly.

DOOR LOCK



1 Escutcheon
2 Inside handle
3 Spring
4 Door lock knob
5 Knob grommet
6 Outside handle
7 Outside handle rod
8 Nylon nut
9 Locking plate spring
10 Locking plate
11 Door lock cylinder
12 Door lock
13 Stopper

Fig. BF-33 Door lock mechanism

REMOVAL AND INSTALLATION

1. Open door.
2. Remove inside door handle escutcheon.
3. Remove pull handle.
4. Remove arm rest.
5. Remove regulator handle.
6. Remove door finish.
7. Peel off water seal screen.
8. Raise door glass to full-up position.
9. Remove inside door lock knob.
10. Remove rear lower sash attaching bolts.
11. Disconnect remote control rod from key cylinder and outside door handle.
12. Remove three door lock assembly attaching screws.
13. Remove two inside door handle attaching screws.
14. Together with inside door handle, take out door lock as an assembly through large access hole in door panel.
15. Remove two outside door handle attaching nuts. Outside door handle can then be taken out.
16. Remove lock plate from key cylinder and detach key cylinder.
17. To install door lock assembly, outside and inside door handles and key cylinder, reverse removal procedure.
18. Lubricate door lock with grease which meets the requirements of MIL-G-10924B or equivalent as listed below:

ALVANIA GREASE RA (SHELL)
BEACON 325 (ESSO)
MOBILE GREASE 22 (MOBIL)

ADJUSTMENT

Outside door handle

Adjustment of play in outside door handle is controlled by play adjustment of nylon nut on threaded end of outside door handle rod.

Correct play is 1.0 mm (0.039 in) or below as measured between nylon nut and locking plate.

Inside door handle

Elongated hole in inside door handle provides for play adjustment of inside door handle.

Correct play is 1.0 mm (0.039 in) or below as measured at control rod.

DOOR LOCK STRIKER

Adjustment of door lock striker should be made after door hinge has been adjusted correctly.

Elongated holes (three) provide for up-and-down or fore-and-aft adjustment to establish proper engagement between door lock striker and door lock latch.

WEATHERSTRIP

DESCRIPTION

The weatherstrip is retained by clamp to the door sash and by 19 clips to the door panel. No adhesive is used to retain the weatherstrip to door.

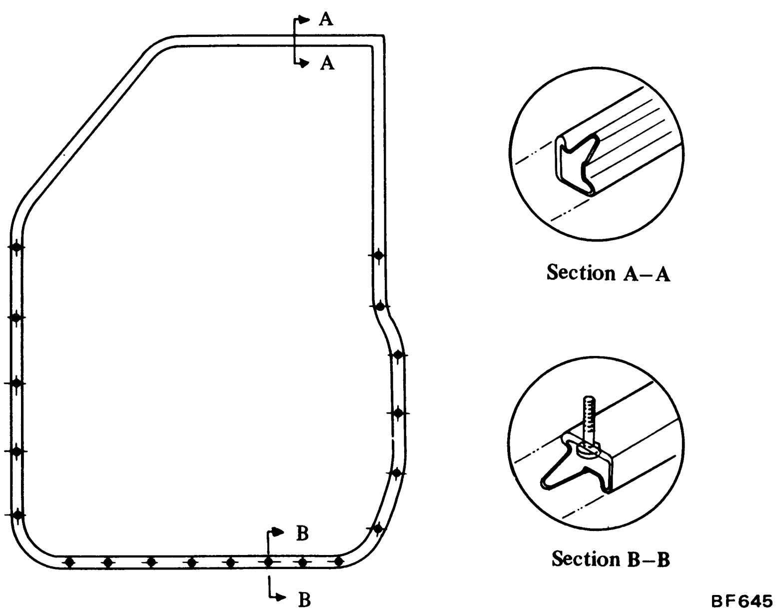


Fig. BF-34 Door weatherstrip

REMOVAL AND INSTALLATION

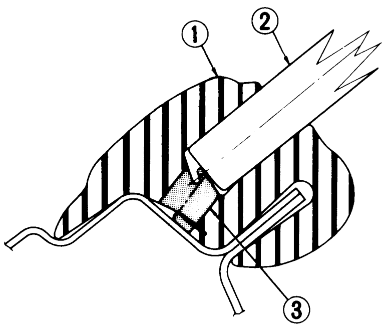
1. Open door.
2. Free weatherstrip from door sash clamp.
3. Pry off clips from door panel; remove weatherstrip.
4. To install, reverse removal procedure.

WINDSHIELD GLASS

WINDSHIELD GLASS

DESCRIPTION

The windshield glass is retained in the body glass opening through the weatherstrip. There are twelve water drain holes; one on each side of the bottom of the glass opening, and ten along the length of the weatherstrip.



1 Weatherstrip
2 Windshield glass
3 Water drain hole

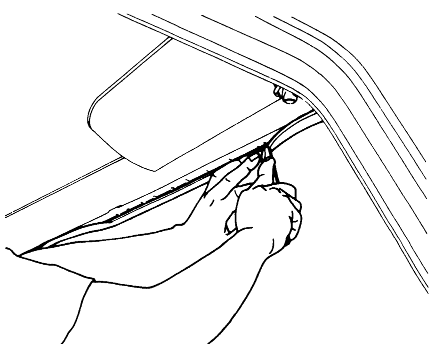
BF473A

Fig. BF-35 Windshield glass and weatherstrip

REMOVAL

1. Place protective covers over engine hood, front fender, seat and instrument panel.
2. Remove inside rearview mirror and sun visor.
3. Remove windshield mouldings if so eqquipped.
4. Using a putty knife or similar flat-bladed tool, pry lips of weatherstrip out of place from top and side flanges of body opening.

If weatherstrip is to be reused, it is important that it not be damaged during this operation.



BF041

Fig. BF-36› Removing weatherstrip

5. Working from inside vehicle, push windshield glass out of body opening by hand, starting at right and left upper corners and working out toward ends.
6. After removing weatherstrip from top and sides of body opening, lift glass up sufficiently to permit removal of weatherstrip from bottom flange; pry weatherstrip out of position.

This operation requires two men.

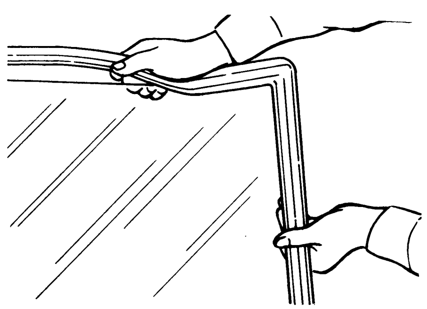
INSPECTION

Prior to installing windshield glass, make the following checks on body glass opening and weatherstrips:

1. Clean weatherstrip channels, replacing those found with cracks or signs of deterioration.
2. Clean body openings noting if these are distorted or corroded.

INSTALLATION

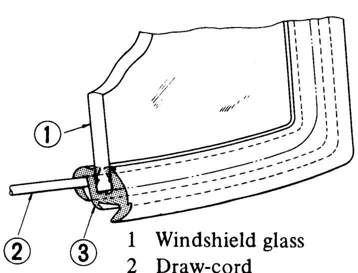
1. Fit weatherstrip on glass, making sure it is properly seated and positioned. Adhesive need not be applied.



BF647

Fig. BF-37 Fitting weatherstrip on glass

2. Insert a draw-cord completely around weatherstrip outer channel.



1 Windshield glass
2 Draw-cord
3 Weatherstrip

BF648

Fig. BF-38 Inserting draw-cord around weatherstrip outer channel

3. With aid of a helper, press windshield assembly against body opening from outside, being sure weatherstrip lip aligns with body opening flange.
4. Slowly pull cord ends from inside to overlap weatherstrip channel on body opening flange, starting at center top and working out toward ends. This operation should be done while one man pushes glass against body opening from outside.

The same technique should be applied to right, left and bottom weatherstrips.

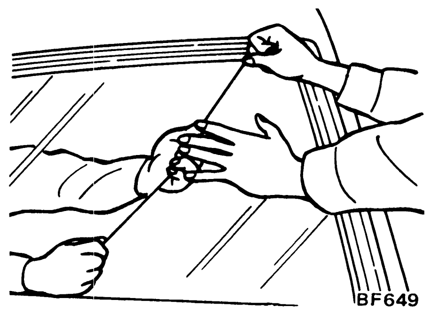
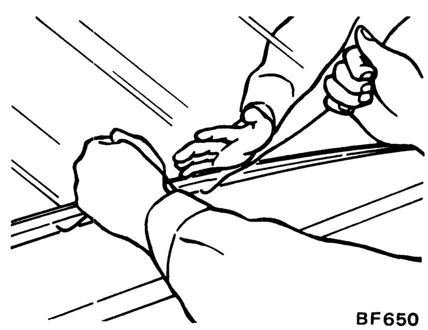


Fig. BF-39 Fitting weatherstrip (top'



BF650

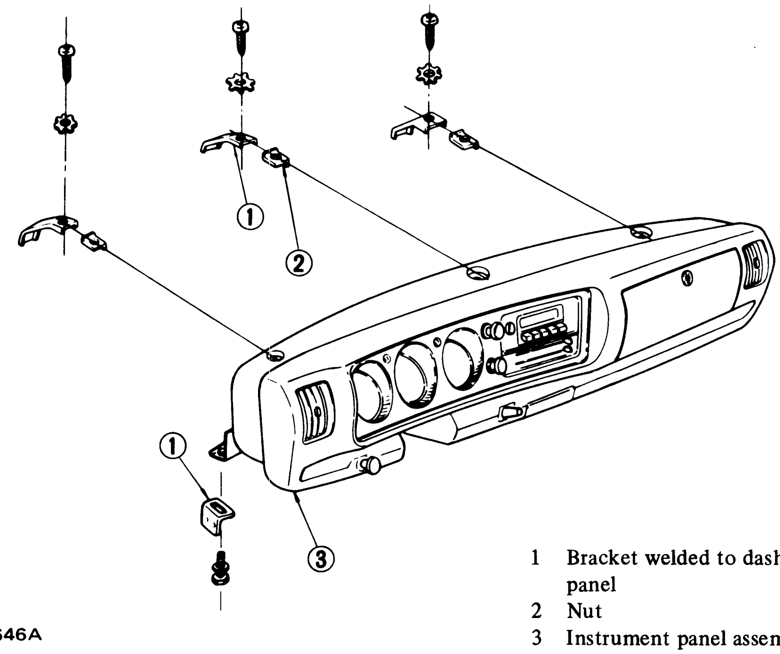
Fig. BF-40 Fitting weatherstrip (bottom)

5. Install windshield moldings on weatherstrip if so equipped.
6. Install inside rearview mirror and sun visor.

BACK WINDOW GLASS AND SIDE WINDOW GLASS

Refer to relative topics under "Removal," "Inspection" and "Installation" of windshield glass.

INSTRUMENT PANEL



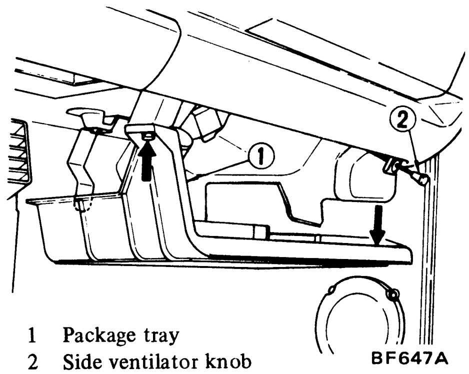
1 Bracket welded to dash panel
2 Nut
3 Instrument panel assembly

Fig. BF-41 Instrument panel assembly

INSTRUMENT PANEL

REMOVAL AND INSTALLATION

1. Disconnect battery cables.
2. Disconnect heater control cables from heater assembly.
3. Disconnect speedometer cable on the back of speedometer.
4. Disconnect antenna and speaker wiring harnesses at connectors.
5. Disconnect relative wiring harnesses from instrument panel at connectors.
6. Remove steering column shell. Removal of steering wheel at this stage facilitates further removal of instrument panel.
7. Remove two side ventilator knobs. Remove package tray attaching bolt and detach package tray.



1 Package tray
2 Side ventilator knob

Fig. BF-42 Package tray

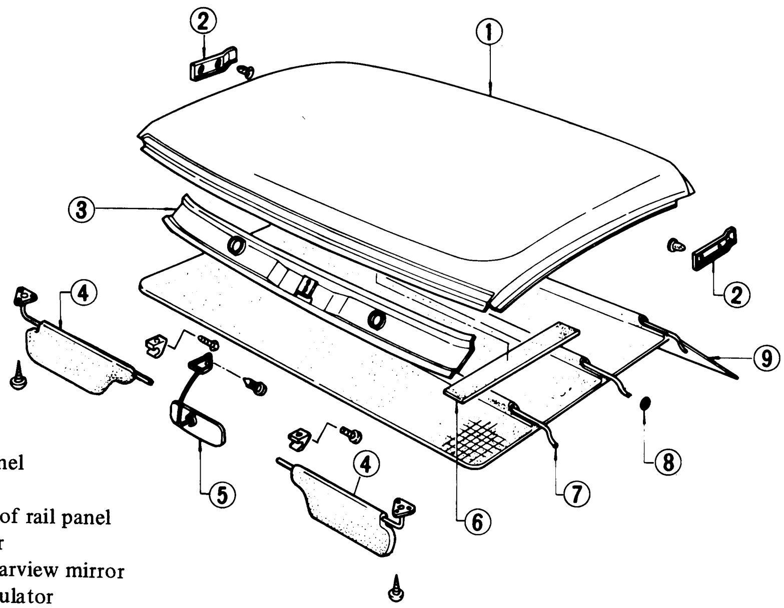
8. Support instrument panel assembly and remove five attaching bolts from it.
9. Withdraw instrument panel assembly while lifting it slightly.
10. To install, reverse the order of removal.

INTERIOR TRIM AND CENTER CONSOLE

HEADLINING

DESCRIPTION

The headlining assembly is of a suspension type, which is held in place by listing wires. The design is quite similar to that used in a passenger car.

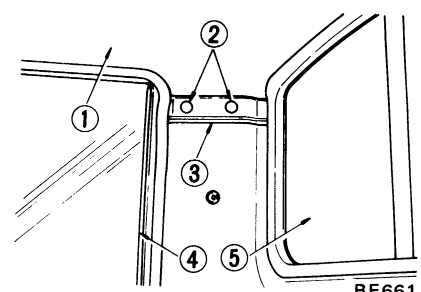


1 Roof panel
2 Retainer
3 Front roof rail panel
4 Sun visor
5 Inside rearview mirror
6 Roof insulator
7 Listing wire
8 Listing wire hook
9 Headlining cloth

Fig. BF-43 Headlining

REMOVAL

1. Remove two inside rearview mirror attaching screws and detach rearview mirror.
2. Remove three sun visor attaching screws and detach sun visor.
3. Remove two assist rail attaching screws and detach assist rail.
4. Remove room lamp.
5. Open doors and remove body side welts on each side.
6. Remove windshield glass and weatherstrip.
7. Remove back window and weatherstrip.
8. Remove garnish securing the end of headlining to rear pillar.



1 Headlining cloth
2 Clip
3 Garnish
4 Door glass
5 Back window glass

Fig. BF-44 Removing garnish

9. Detach all cemented edges of headlining from flanged portion of roof rail.
10. Disengage listing wires from roof rail, and detach headlining.

INSTALLATION

1. Apply adhesive cement to the outer surface of flange and headlining attaching surface evenly.
2. Install listing wires in place on roof rail.
3. First, attach front headlining to the flanged portion of roof rail. Secondly, attach the rear edges of headlining in place while pulling the headlining material to avoid wrinkles.
4. Attach the right and left edges of headlining material to the flanged portions, using care to avoid wrinkles.
5. Cut excess headlining material except for that (at the upper areas of front, center and rear pillars) not covered by body side welt. The edges of headlining material at these areas should be so cut that it can be folded properly in place.
6. Install garnish on the extreme end of headlining at rear pillar.
7. Drill a hole in headlining where room lamp is located. Install room lamp.
8. Install body side welts.
9. Install windshield glass.
10. Install back window glass.
11. Install assist rail, sun visor and inside rearview mirror.

BACK TRIM AND BACK INSIDE FINISHER (DELUXE CAB)

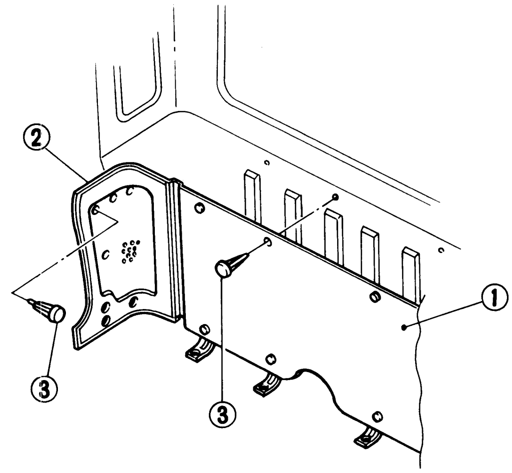
REMOVAL AND INSTALLATION

Back trim

1. Move floor carpet aside.
2. Remove four bolts attaching back trim to floor.
3. Remove five trim clips and detach back trim.
4. Installation is the reverse order of removal.

Back inside finisher

1. Remove seat belt retractor.
2. Remove five trim clips and detach back inside finisher.
3. Installation is the reverse order of removal.



1 Back trim
2 Back inside finisher
3 Clip

Fig. BF-45 Back trim and back inside finisher

CENTER CONSOLE

REMOVAL AND INSTALLATION

Except for air conditioner equipped models

1. Remove two bolts from rear of center console.
2. Remove center console by pulling it back.
3. To properly install center console, insert its front portion into bracket on the floor, and install and tighten rear attaching bolts.

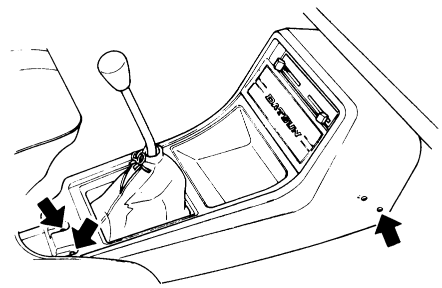


Fig. BF-46 Removing center console

Air conditioner equipped models

1. Remove two bolts from front of center console.
2. Remove two bolts from the rear, and remove center console.

CONSOLE WITH ARMREST (DELUXE CAB)

REMOVAL AND INSTALLATION

1. Remove two bolts from front of console/armrest unit.
2. Remove one bolt in the console box, and remove center console.
3. Installation is the reverse order of removal.

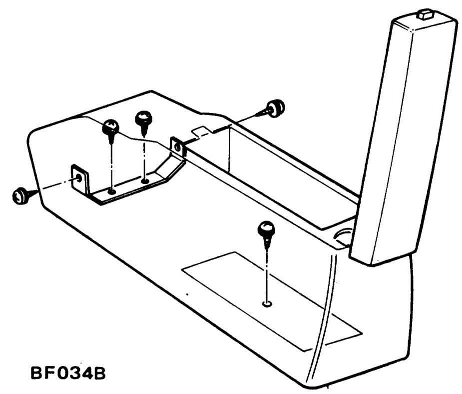


Fig. BF-47 Console with armrest

SEAT

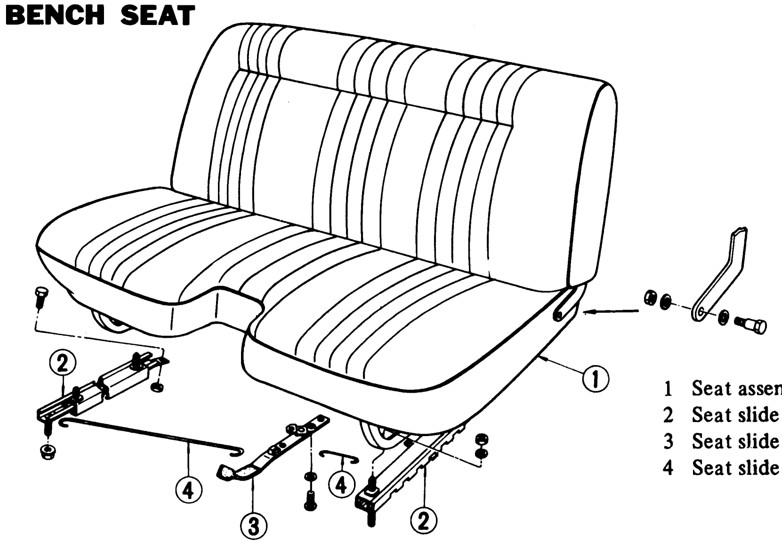
SEAT

DESCRIPTION

There are two types of seats: a semi separate bench seat for the standard wheelbase and long wheelbase models, and a separate seat for the Deluxe Cab models.

CAUTION:
In conforming with M.V.S.S. No. 302, be sure to remove the thin polyethylene covers from seat cushions, seat backs and head restraints at the time of:
a. Pre-delivery service
b. Parts replacement

BENCH SEAT



1 Seat assembly
2 Seat slide
3 Seat slide lock handle
4 Seat slide lock wire

Fig. BF-48 Bench seat

Removal and installation

1. Remove four bolts retaining seat slide assembly to floor; take out seat assembly.
2. To install seat, reverse above removal procedure.

SEPARATE SEAT

1 Head restraint
2 Seat assembly
3 Reclining device
4 Seat slide outer
5 Seat slide inner

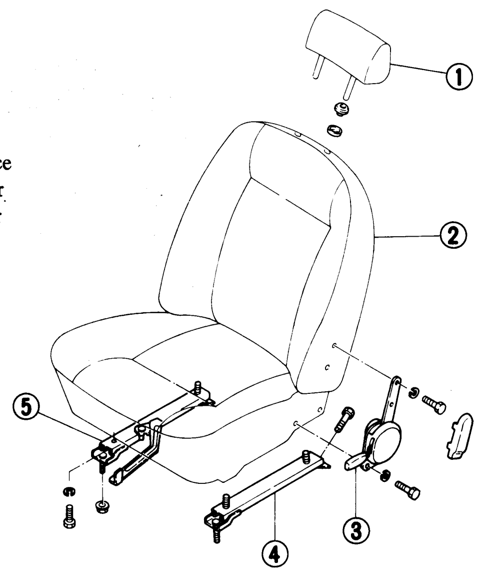
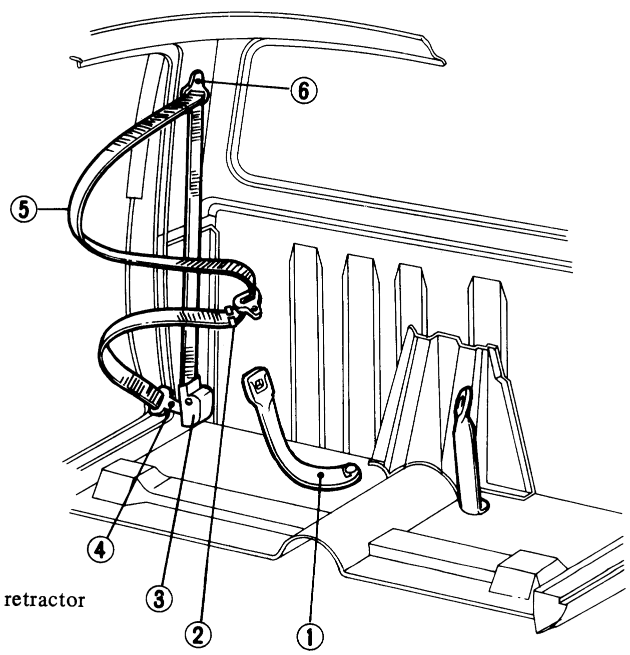


Fig. BF-49 Separate seat

Removal and installation

1. Remove two nuts attaching front of seat slide to floor.
2. Remove two bolts attaching rear of seat slide to floor.
3. Then remove seat with seat slides from the vehicle.
4. Installation is the reverse order of removal.

SEAT BELT



1 Inner belt
2 Tongue stopper
3 Emergency locking retractor
4 Outer anchor plate
5 Lap-shoulder belt
6 Shoulder through anchor

Fig. BF-50 Seat belt

DESCRIPTION

The seat belt is a three-point type, consisting essentially of a lap-shoulder belt and an inner lap belt.

The lap-shoulder belt is fitted with an emergency locking retractor which senses the speed at which the webbing is being pulled and the deceleration of the vehicle.

The inner lap belt has a buckle. The buckle of the driver's seat belt includes a switch which functions as a seat belt warning device.

CAUTION:

a. In conformity with M.V.S.S. No. 302, be sure to remove the thin polyethylene covers from seat belts at the time of:
(1) Pre-delivery service
(2) Parts replacement

b. If the vehicle has overturned or been in a collision, replace the entire belt assembly, regardless of nature of accident.

c. If the condition of any component of a seat belt is questionable, have entire belt assembly replaced rather than attempting to repair seat belt.

d. If webbing is cut, frayed, or damaged, replace belt assembly.

e. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.

f. Use only a genuine Nissan seat belt assembly.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Disconnect buckle switch harness at connector under seat.
3. Loosen bolt retaining inner lap belt and remove inner lap belt.
4. Remove bolt securing emergency locking retractor.
5. Remove shoulder anchor bolt, and remove lap-shoulder belt assembly.
6. Installation is the reverse order of removal.

Tightening torque:
Anchor bolts:
2.5 to 3.0 kg-m
(18 to 22 ft-lb)

Note: When installing emergency locking retractor, make sure that it is set vertically.

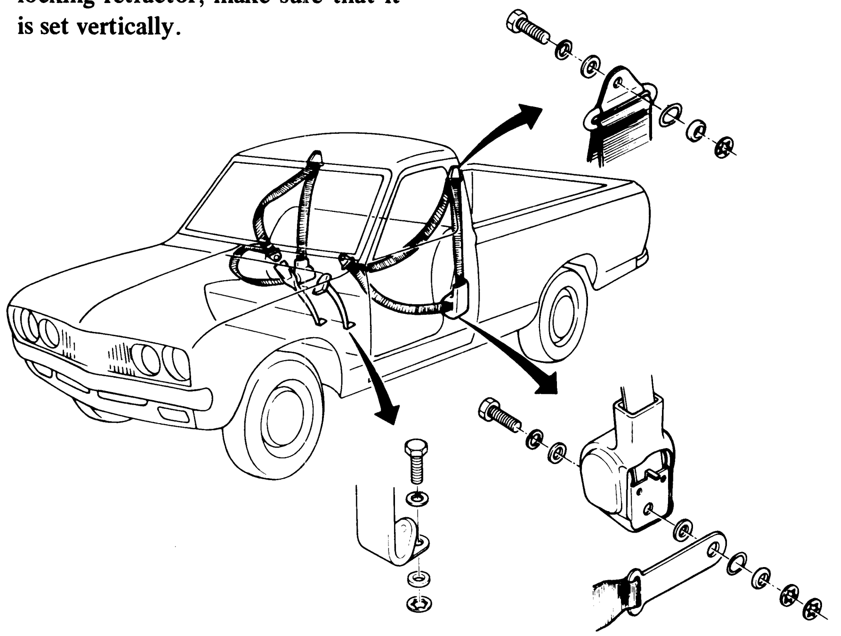


Fig. BF-51 Seat belt anchorages

INSPECTION OF BUCKLE SWITCH

The contacts of the buckle switch are normally closed. When tongue latches the buckle, tip end of the tongue pushes the push rod to open the switch contacts.

1. Disconnect battery ground cable.
2. Disconnect buckle switch wire harness.
3. Using a test light, check buckle switch for proper operation. The light should go out when tongue of outer lap belt latches buckle, and go on when it unlatches buckle. Replace belt assembly if necessary.

Note: **When checking buckle switch operation, make sure that power is held below 16 volts and 13 mA.**

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

SECTION BE

BODY ELECTRICAL SYSTEM

BODY ELECTRICAL WIRING ....BE- 2

LIGHTING AND SIGNAL LAMP SYSTEM ....BE- 3

METERS AND GAUGES BE-14

ELECTRICAL ACCESSORIES BE-20

EMISSION WARNING SYSTEM (California models) BE-41

NISSAN

NISSAN MOTOR CO., LTD.

TOKYO, JAPAN

BODY ELECTRICAL WIRING

DESCRIPTION

Cables are covered with color-coded vinyl for easy identification. In the wiring diagram, colors are indicated by one or two alphabetical letters.

It is recommended that the battery be disconnected before performing any electrical service other than bulb or fuse replacement.

In addition to fuses, a fusible link has been installed to protect wiring. The fusible link functions almost the same as a fuse, though its characteristics are slightly different than normal fuses.

CABLE COLORS

Cable colors are indicated by one or two alphabetical letters:

B: Black, Br: Brown, G: Green,
L: Blue, Lg: Light green,
R: Red, W: White, Y: Yellow

The main cable is generally coded with a single color. The others are coded with a two-tone color as follows:

BW: Black with white stripe
LgR: Light green with red stripe

INSPECTION

Inspect all electrical circuits, referring to wiring or circuit diagrams. Circuits should be tested for continuity or short circuit with a conventional test lamp or low reading voltmeter. Before inspection of circuit, ensure that:

1. Each electrical component part or cable is securely fastened to its connector or terminal.
2. Each connection is firmly in place and free from rust and dirt.
3. No cable covering shows any evidence of cracks, deterioration or other damage.
4. Each terminal is at a safe distance away from any adjacent metal parts.
5. Each cable is fastened to its proper connector or terminal.
6. Each grounding bolt is firmly planted.
7. Wiring is kept away from any adjacent parts with sharp edges or high temperature parts (such as exhaust pipe).
8. Wiring is kept away from any rotating or working parts: fan pulley, fan belt, etc.
9. Cables between fixed portions and moving parts are long enough to withstand shocks and vibratory forces.

CAUTION:

a. Never use a screwdriver or service tool to conduct a continuity test. Use test leads.

b. Never ground an open circuit or circuits under no load. Use a test lamp (12V-3W) or circuit tester as a load.

Note: **Before starting to inspect and repair any part of electrical system or other parts which may lead to a short circuit, disconnect cables at battery terminals as follows:**
Disconnect cable at negative (–) terminal, and then disconnect cable at positive (+) terminal.
Before connecting cables to battery terminal, be sure to clean terminals with a rag. Fasten cable at positive (+) terminal, and then ground cable at negative (–) terminal. Apply grease to top of these terminals to prevent rust from developing on them.

FUSE AND FUSIBLE LINK

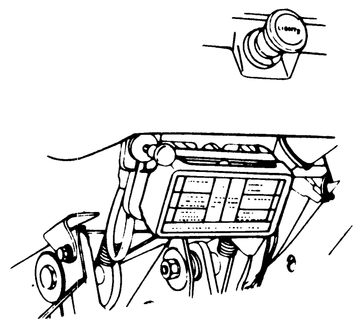
DESCRIPTION

The fuse and fusible link are protective devices used in an electrical circuit. When current increases beyond rated amperage, fusible metal melts and the circuit is broken.

MAINTENANCE INSTRUCTIONS

Fuse

The fuse block is installed under the instrument panel on the left-hand drive vehicle.



TFU001

Fig. BE-1 Fuse block

When, for one reason or another, fuse has melted, use systematic procedure to check and eliminate cause of problem before installing new fuse.

CAUTION:

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.

b. Use fuse of specified rating. Never use fuse of more than specified rating.

Note: **Check condition of fuse holders. If much rust or dirt is found thereon, clean metal parts with fine-grained sandpaper until proper metal-to-metal contact is made.**
Poor contact in any fuse holder will often lead to voltage drop or heating in the circuit and could result in improper circuit operation.

Fusible link

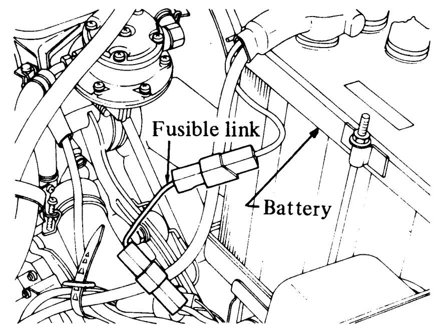
Fusible link protects lighting, starting, charging and accessory circuits.

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp, as required, to conduct continuity test. This continuity test can be performed in the same manner as for any conventional fuse.

CAUTION:

a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.

b. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.



BE849A

Fig. BE-2 Fusible link

LIGHTING AND SIGNAL LAMP SYSTEM

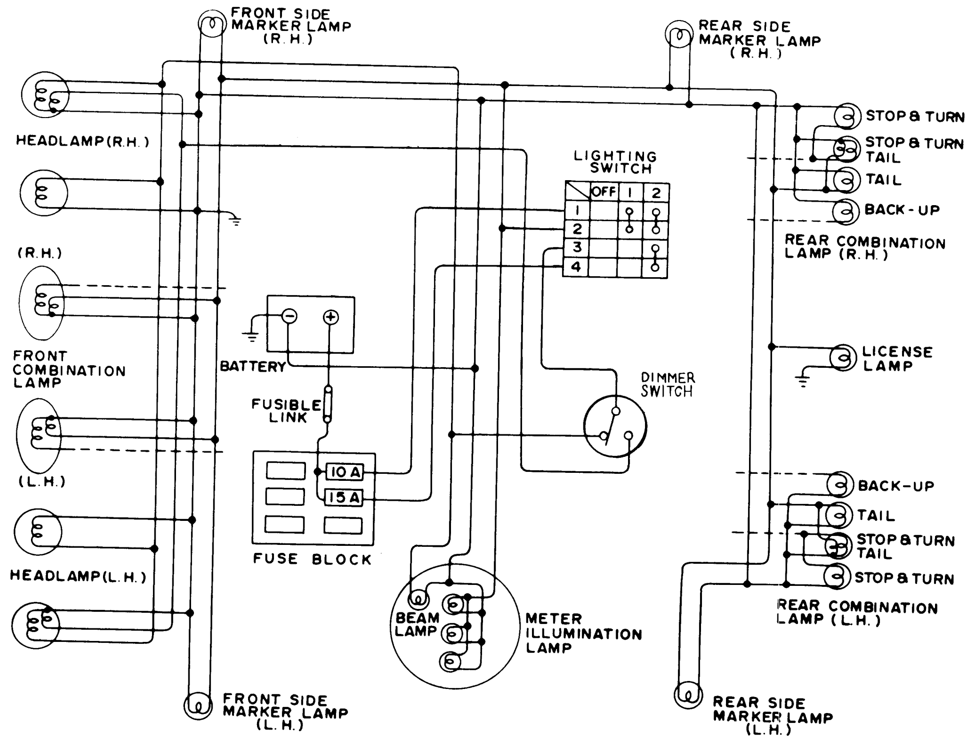
CONTENTS

DESCRIPTION ..... BE- 4
LIGHTING SYSTEM CIRCUIT DIAGRAM ..... BE- 4
HEADLAMP ..... BE- 5
HEADLAMP BEAM REPLACEMENT ..... BE- 5
AIMING ADJUSTMENT ..... BE- 5
FRONT COMBINATION LAMP ..... BE- 7
BULB REPLACEMENT ..... BE- 7
REMOVAL AND INSTALLATION ..... BE- 7
SIDE MARKER LAMP ..... BE- 7
BULB REPLACEMENT ..... BE- 7
REMOVAL AND INSTALLATION ..... BE- 7
ROOM LAMP ..... BE- 8
BULB REPLACEMENT ..... BE- 8
REMOVAL AND INSTALLATION ..... BE- 8
REAR COMBINATION LAMP ..... BE- 8
BULB REPLACEMENT ..... BE- 8
REMOVAL AND INSTALLATION ..... BE- 8
LICENSE LAMP ..... BE- 8
BULB REPLACEMENT ..... BE- 8
REMOVAL AND INSTALLATION ..... BE- 8
ENGINE COMPARTMENT LAMP ..... BE- 9
LIGHTING SWITCH ..... BE- 9
REMOVAL AND INSTALLATION ..... BE- 9
INSPECTION ..... BE- 9
ILLUMINATION CONTROL RHEOSTAT ..... BE- 9
REMOVAL AND INSTALLATION ..... BE- 9
INSPECTION ..... BE- 9
KNOB ILLUMINATION LAMP BE-10
BULB REPLACEMENT BE-10
LAMP BODY REPLACEMENT BE-10
TURN SIGNAL AND DIMMER SWITCH BE-10
REMOVAL AND INSTALLATION BE-10
INSPECTION BE-10
STOP LAMP SWITCH BE-10
REMOVAL AND INSTALLATION BE-10
INSPECTION BE-10
DOOR SWITCH BE-10
REMOVAL AND INSTALLATION BE-10
INSPECTION BE-11
HAZARD SWITCH BE-11
REMOVAL AND INSTALLATION BE-11
INSPECTION BE-11
FLASHER UNIT BE-11
REPLACEMENT BE-11
BULB SPECIFICATIONS BE-12
TROUBLE DIAGNOSES AND CORRECTIONS BE-12
HEADLAMP BE-12
TURN SIGNAL LAMP BE-13
TAIL LAMP, STOP LAMP AND BACK-UP LAMP BE-13

DESCRIPTION

LIGHTING SYSTEM CIRCUIT DIAGRAM

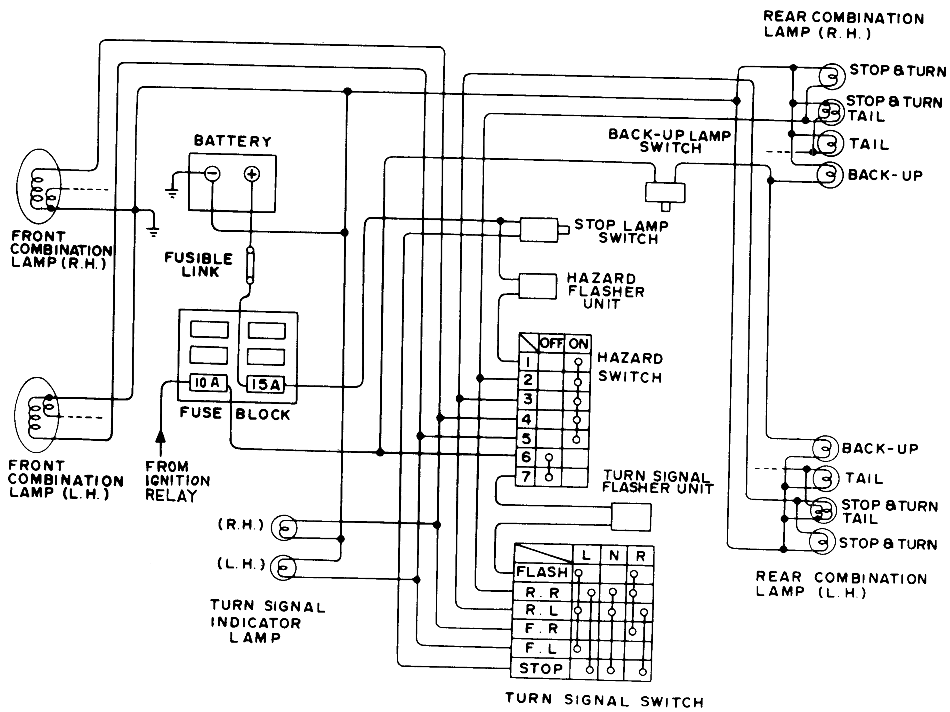
Headlamp, tail lamp and license lamp system



BE464C

Fig. BE-3 Headlamp, tail lamp and license lamp system

Turn signal, hazard warning lamp, stop lamp and back-up lamp system



BE465C

Fig. BE-4 Turn signal, hazard warning lamp, stop lamp and back-up lamp system

Room lamp and engine compartment lamp system

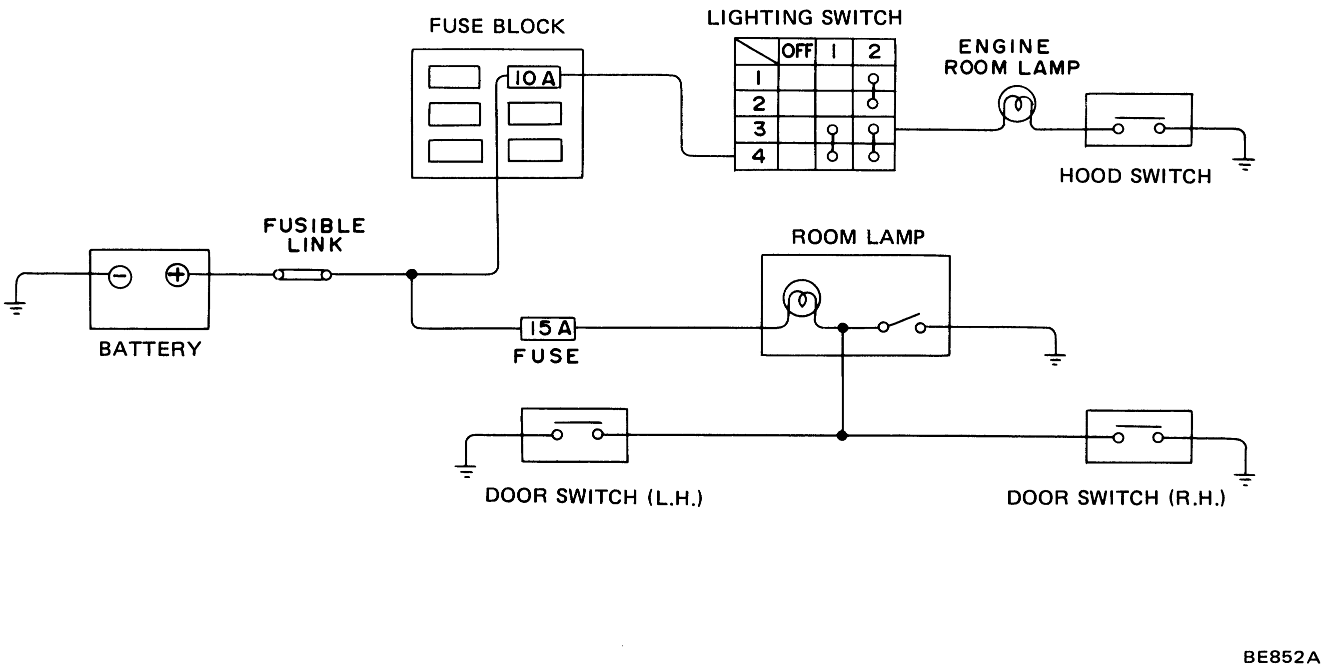


Fig. BE-5 Room lamp and engine compartment lamp system

HEADLAMP

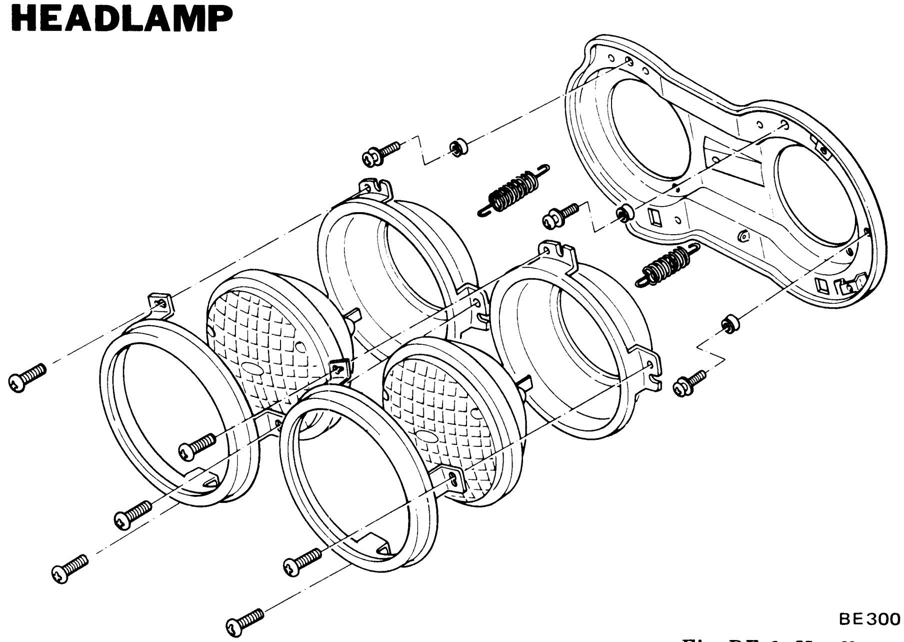


Fig. BE-6 Headlamp

HEADLAMP BEAM REPLACEMENT

1. Remove radiator grille retaining screws and remove radiator grille.
2. Loosen three screws and remove retaining ring.

Note: **Do not disturb aiming adjust screws.**

3. Remove headlamp beam from mounting ring and disconnect wiring connector from behind beam.

Note: **Rubber cover is installed at back of headlamp beam. The connector is located in the cover.**

4. Change headlamp beam and connect wiring connector to new beam.
5. Place headlamp 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.
6. Install headlamp retaining ring and tighten retaining screws.
7. Place radiator grille in position and tighten retaining screws.

AIMING ADJUSTMENT

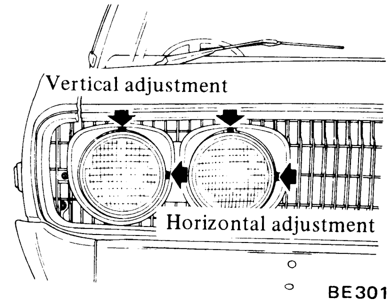


Fig. BE-7 Aiming adjustment

To adjust vertical aim, use adjusting screw on upper side of headlamp; and to adjust horizontal aim, use adjusting screw on side of headlamp.

Note:

Before making headlamp aiming adjustment, observe the following instructions.

a. Keep all tires inflated to correct pressures.

b. Place vehicle and tester on the same flat surface.

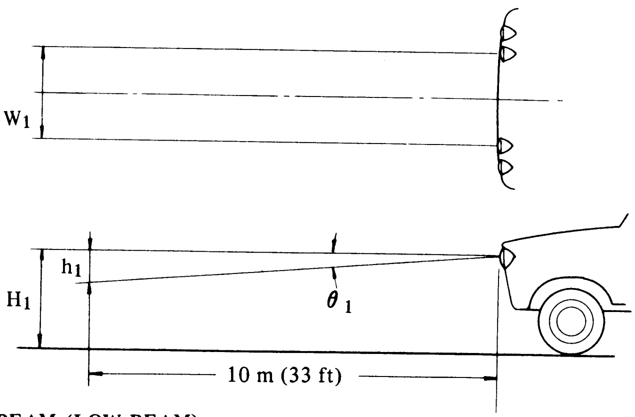
c. See that there is no load in vehicle.

1) Gasoline, radiator and engine oil pan filled up to correct levels

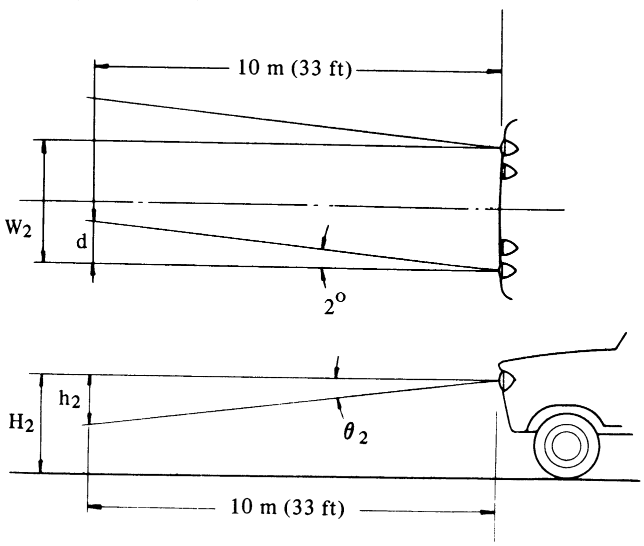
2) Without passenger

When performing headlamp aiming adjustment, use an aiming device, aiming wall screen or headlamp tester. For operating instructions of any aimer, refer to respective operation manuals supplied with the unit.

DRIVING BEAM (HIGH BEAM)



PASSING BEAM (LOW BEAM)



Item / Model	Driving beam (High beam)				Passing beam (Low beam)				
	H_1 mm (in)	W_1 mm (in)	θ_1 (°)	h_1 mm (in)	H_2 mm (in)	W_2 mm (in)	θ_2 (°)	h_2 mm (in)	d mm (in)
All models	715 (28.15)	780 (30.71)	48	140 (5.51)	715 (28.15)	1,160 (45.67)	2°18′	392 (15.43)	349 (13.74)

BE302

Fig. BE-8 Aiming adjustment

FRONT COMBINATION LAMP

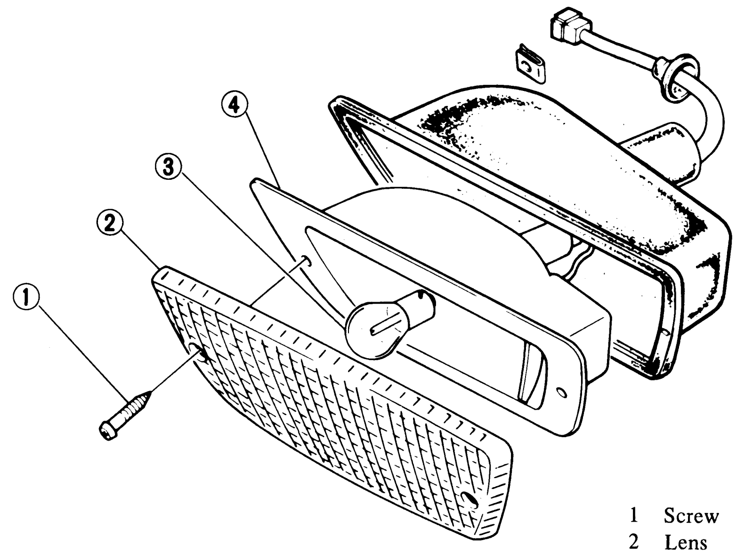
BULB REPLACEMENT

1. Remove two retaining screws and lens.
2. Push in on bulb, turn it counterclockwise and remove it from socket.
3. Insert new bulb into socket, press it inward and rotate it clockwise. Make sure that bulb is locked in its socket.
4. Place packing to lamp body in position and install lamp body (with packing), lens and two retaining screws.

REMOVAL AND INSTALLATION

To remove lamp body, disconnect wiring at connector and remove wire grommet from panel. Remove two retaining screws and lens and withdraw lamp body from vehicle.

Install new lamp assembly in the reverse sequence of removal.



1 Screw
2 Lens
3 Bulb
4 Lamp body

BE698B

Fig. BE-9 Front combination lamp

SIDE MARKER LAMP

BULB REPLACEMENT

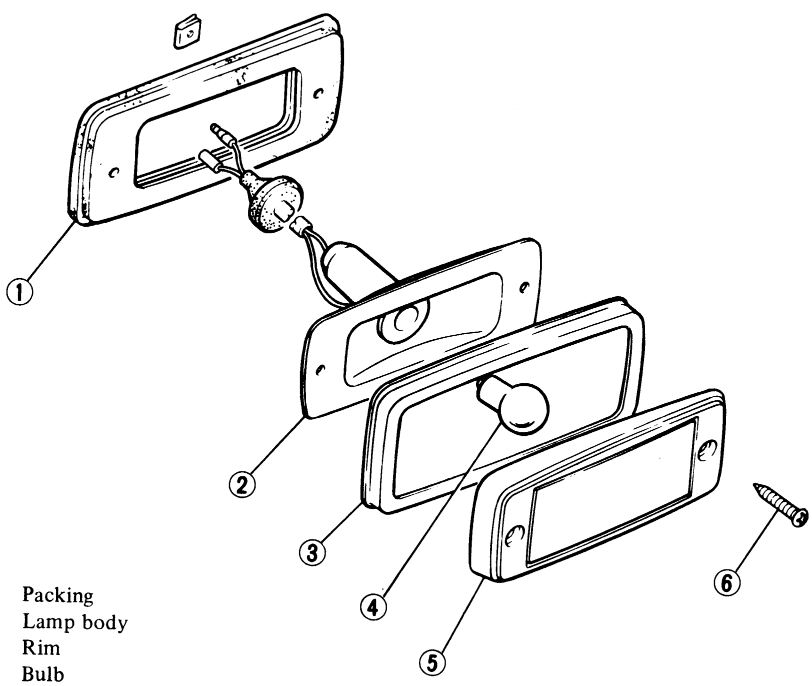
1. Remove two retaining screws, lens and rim.
2. Push in on bulb, turn it counterclockwise and remove it from socket.
3. Insert new bulb into socket, press it inward and rotate it clockwise. Make sure that bulb is locked in its socket.
4. Place packing to lamp body in position and install lamp body (with packing), lens and two retaining screws.

REMOVAL AND INSTALLATION

To remove lamp body, disconnect two lead wires at connectors and remove wire grommet (if so equipped) from panel.

Remove two retaining screws, lens and rim and withdraw lamp body from vehicle.

Install new lamp assembly in the :everse sequence of removal.



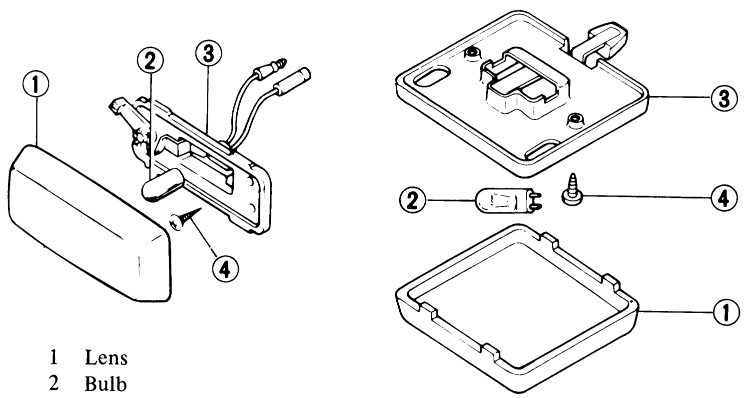
1 Packing
2 Lamp body
3 Rim
4 Bulb
5 Lens
6 Screw

BE699B

Fig. BE-10 Side marker lamp

ROOM LAMP

BULB REPLACEMENT



1 Lens
2 Bulb
3 Lamp body
4 Screw

(Delux Cab)

BE700B

Fig. BE-11 Room lamp

1. Remove lens from lamp housing.
2. Pull bulb forward and remove it from socket.
3. Push new bulb into socket.
4. Install lens.

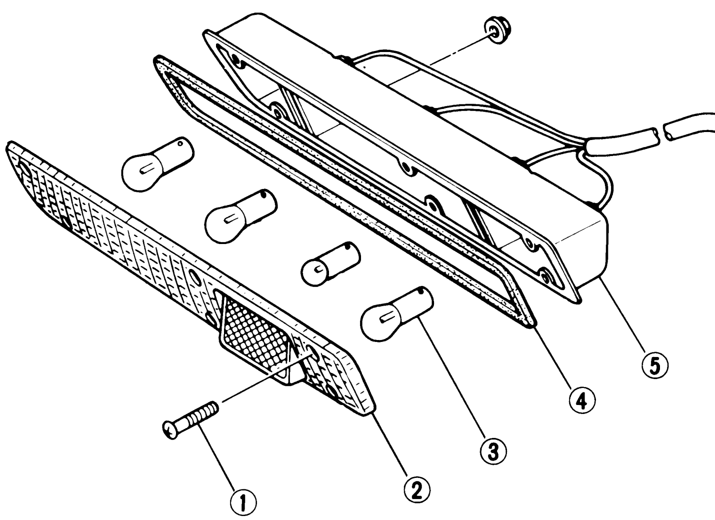
REMOVAL AND INSTALLATION

To remove lamp assembly, disconnect battery ground cable, remove two retaining screws with lens removed from lamp housing, dismount lamp housing from roof rail and disconnect two wires at connectors.

Install new lamp assembly in the reverse sequence of removal.

REAR COMBINATION LAMP

BULB REPLACEMENT



1 Screw
2 Lens
3 Bulb
4 Packing
5 Lamp body

BE701B

Fig. BE-12 Rear combination lamp

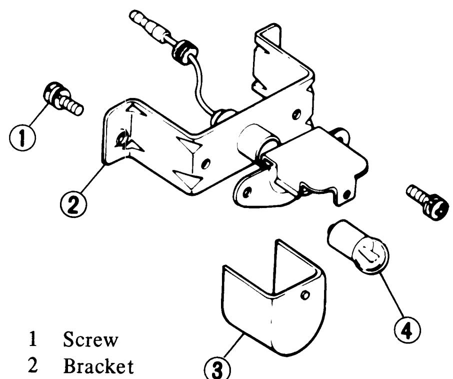
1. Remove six lens retaining screws and lens.
2. Push in on bulb and turn it counterclockwise to remove it from socket.
3. Insert new bulb into socket, press it inward, and rotate it clockwise. Make sure that bulb is locked in its socket.
4. Place lens into position and install retaining screws.

REMOVAL AND INSTALLATION

1. Disconnect wiring assembly at connector.
2. Remove two nuts from combination lamp mounting studs.
3. Dismount combination lamp assembly from vehicle.
4. Replace lamp assembly with a new one.
5. Install new lamp assembly in the reverse sequence of removal.

LICENSE LAMP

BULB REPLACEMENT



1 Screw
2 Bracket
3 Lens
4 Bulb

BE702B

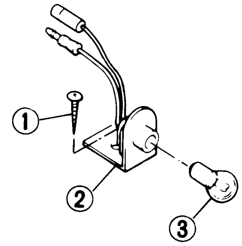
Fig. BE-13 License lamp

1. Remove lens retaining screw, if so equipped, and remove lens.
2. Pull out bulb and replace it with a new one.
3. Install lens.

REMOVAL AND INSTALLATION

1. Disconnect lead wire at connector.
2. Remove lamp bracket retaining screws and lamp assembly.
3. Install new lamp assembly in the reverse sequence of removal.

ENGINE COMPARTMENT LAMP



1 Screw
2 Bracket
3 Bulb

BE703B

Fig. BE-14 Engine compartment lamp

Bulb can be replaced by pushing in on bulb and turning it counterclockwise.

To replace engine compartment lamp assembly, remove one screw retaining lamp bracket to upper dash panel and disconnect wires at connectors.

Engine compartment lamp switch can be replaced by disconnecting lead wire at connector and pulling switch assembly out of its bracket. To install switch assembly to bracket, clean dirt, dust and rust from the opening groove of bracket and press down on switch head until it fits in with bracket.

LIGHTING SWITCH

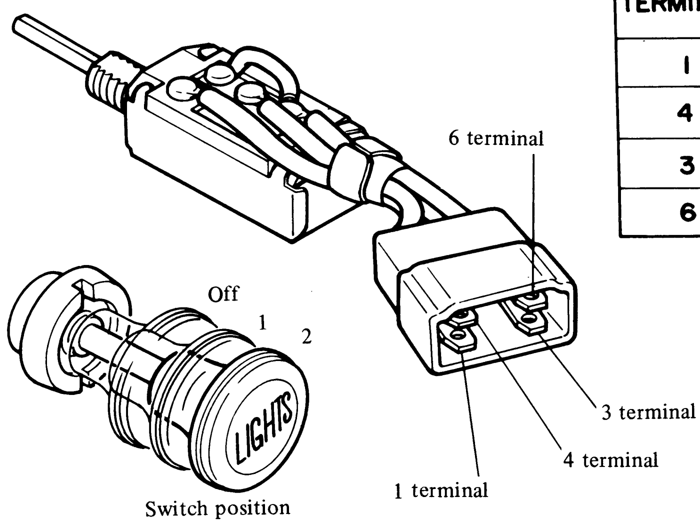
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Press in switch knob, turn it counterclockwise and pull it out of switch.
3. Unscrew escutcheon and remove escutcheon and spacer.
4. Reach up from underneath instrument panel, disconnect lighting switch multiple connector from instrument harness wiring assembly and remove spacer and lighting switch.
5. Install new switch in the reverse sequence of removal.

INSPECTION

Remove lighting switch from vehicle, following the procedures given in Removal and Installation.

Test continuity through lighting switch by using test lamp or ohmmeter.



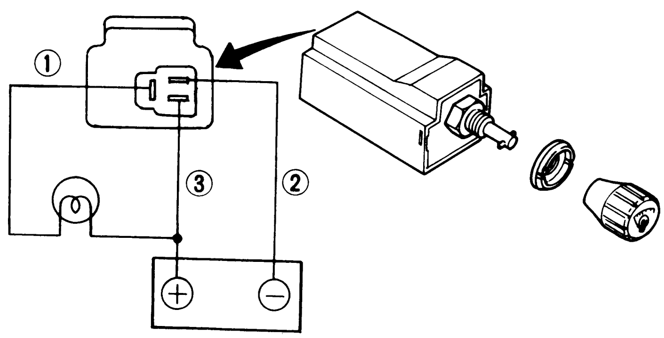
TERMINAL	SWITCH POSITION		
	OFF	1	2
1			○
4			○
3		○	○
6		○	○

BE855A

Fig. BE-15 Lighting switch

ILLUMINATION CONTROL RHEOSTAT

This illumination control rheostat is an electronic type and controls the brightness of the illumination lamps of the combination meter, heater control, wiper and lighting switch knob, clock or tachometer and radio.



BE466C

Fig. BE-16 Illumination control rheostat

REMOVAL AND INSTALLATION

1. Pull out knob of switch.
2. Remove ring nut retaining switch to instrument panel.
3. Disconnect lead wires for switch at connector.
4. Switch body can be taken out from behind instrument panel.
5. Installation is in the reverse sequence of removal.

INSPECTION

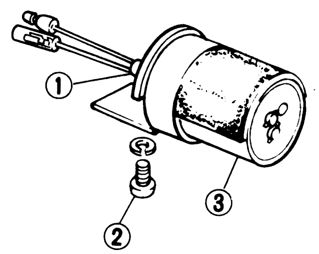
1. Connect test lamp between terminal ① and positive (+) terminal.
2. Connect terminal ③ to positive (+) terminal, and terminal ② to negative (−) terminal.
3. Turn control knob right or left, and brightness of test lamp will vary.

KNOB ILLUMINATION LAMP

The illumination lamp is located on the illumination control rheostat.

This lamp illuminates the knob of the wiper switch and lighting switch with fiberscopes.

The fiberscopes between the knobs and cap of the illumination lamp carry the light through their tubes with the inner reflective wall.



1 Bulb socket
2 Screw
3 Lamp body

BE705B

Fig. BE-17 Knob illumination lamp

BULB REPLACEMENT

1. Reach up from under the instrument panel, and pull out socket with bulb from lamp body.
2. Pick up bulb and install a new one.
3. Installation is in the reverse sequence of removal.

LAMP BODY REPLACEMENT

1. Remove illumination control rheostat. Refer to section of illumination control rheostat for removal.
2. Disconnect lead wires for illumination lamp at connector.
3. Remove screw retaining lamp body to instrument panel. Lamp body can then be taken out easily.
4. Installation is in the reverse sequence of removal.

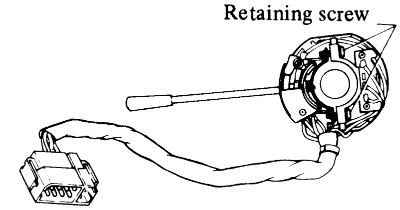
TURN SIGNAL AND DIMMER SWITCH

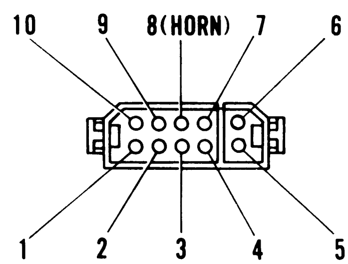
REMOVAL AND INSTALLATION

1. Remove steering wheel.
   Refer to the related section Steering.
2. Unhook wiring assembly from clip that retains wiring assembly to lower instrument panel.
3. Disconnect multiple connector and lead wire from instrument harness wiring.
4. Remove shell covers (Upper and Lower).
5. Loosen two screws attaching switch assembly to steering column jacket and remove switch assembly.
6. Position switch assembly to steering column jacket. Make sure that a location tab (or screw) fits in with hole of steering column jacket.
7. Tighten two attaching screws.
8. Install shell covers.
9. Connect multiple connector and lead wire to instrument harness wiring.
10. Clip wiring assembly at lower instrument panel.
11. Install steering wheel.

INSPECTION

Test continuity through lighting switch by using test lamp or ohmmeter.





TARMINAL	LEVER POSITION		
	R	N	L
7.RR R.H.	O	O	O
6.RR L.H.	O	O	O
5.STOP	O	O	O
4.FR L.H.			O
10.FLASH	O		O
9.FR R.H.	O		

	MAIN	DIMMER
1	O	O
2	O	
3		O

BE467C

Fig. BE-18 Turn signal and dimmer switch

STOP LAMP SWITCH

REMOVAL AND INSTALLATION

Stop lamp switch is mounted at the bottom of (pedal and steering post) bracket.

1. Disconnect battery ground cable.
2. Disconnect lead wires at connectors.
3. Loosen lock nut, unscrew switch assembly and remove switch assembly.
4. Install switch assembly as described under Brake Pedal in Section BR.

INSPECTION

When plunger is pressed into switch assembly (when brake pedal is released), stop lamp switch contacts are open. On the contrary, contacts are closed with plunger projected.

DOOR SWITCH

Door switch is installed on both L.H. and R.H. front door pillars.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. To pull switch assembly out of lower pillar, withdraw switch and wiring assembly.
3. Disconnect lead wire at connector.
4. Installation is in the reverse sequence of removal.

INSPECTION

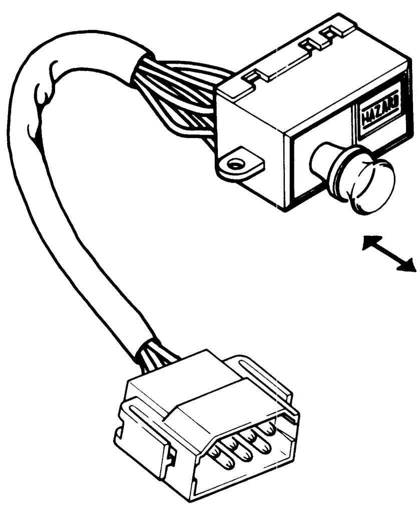
Test continuity through door switch by using test lamp or ohmmeter.

When plunger is pressed into switch assembly, door switch contacts are open. Contacts are closed when plunger is projected.

HAZARD SWITCH

REMOVAL AND INSTALLATION

1. Disconnect multiple connector and lead wire from instrument harness wiring.

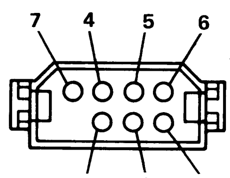


2. Remove shell covers (Upper).
3. Remove two screws attaching switch to lower shell cover and remove switch.
4. Install hazard switch in the reverse sequence of removal.

INSPECTION

Test continuity through hazard switch by using test lamp or ohmmeter.

TERMINAL	SWITCH POSITION OFF	SWITCH POSITION ON
1		O
2		O
3		O
4		O
5		O
6	O	
7	O	



BE468C

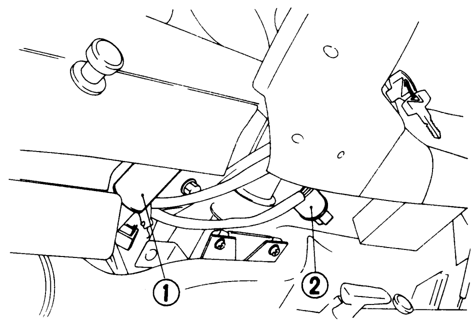
Fig. BE-19 Hazard switch

FLASHER UNIT

There are two flasher units. One is for turn signal and the other for hazard.

They are located at both sides of instrument panel near steering column. They can be distinguished from each other by their shape.

The large one is for turn signal; the smaller for hazard. See Figure BE-20.



1 Hazard flasher unit
2 Turn signal flasher unit BE707B

Fig. BE-20 Flasher unit

REPLACEMENT

1. Disconnect battery ground cable.
2. Disconnect connector fitted to bottom of unit.
3. Remove screw retaining flasher unit.
4. Installation is in the reverse sequence of removal.

BULB SPECIFICATIONS

Item		Bulb: Wattage (Candlepower)	Bulb: SAE trade number
Headlamp	Inner Outer	37.5W 37.5/50W	4001 4002
Front combination lamp Turn signal and parking lamp		23/8W (32/3C)	1034
Side marker lamp Front Rear		8W (4C) 8W (4C)	67 67
Rear combination lamp Turn signal lamp (A, B) Tail lamp (B, C) Stop lamp (A, B) Back-up lamp (D)		A: 23W (32C) B: 23/8W (32/3C) C: 8W (4C) D: 23W (32C)	1073 1034 67 1073
License plate lamp		7.5W (6C)	89
Engine compartment lamp		6W	–
Room lamp		5W	–
Combination meter illumination		1.7W (1C) x 3	161
Knob illumination lamp		3.4W (2C)	158
Heater control illumination lamp		3.4W (2C)	158

TROUBLE DIAGNOSES AND CORRECTIONS

HEADLAMP

Condition	Probable cause	Corrective action
Headlamps do not light for both high and low beams.	Burnt fuse. Loose connection or open circuit. Faulty lighting switch. Faulty dimmer switch. No ground.	Correct cause and replace fuse. Check wiring and/or repair connection. Conduct continuity test and replace if necessary. Clean and tighten ground terminal.
High beam cannot be switched to low beam or vice versa.	Faulty dimmer switch.	Conduct continuity test and replace if necessary.

Condition	Probable cause	Corrective action
Headlamps dim.	Partly discharged or faulty battery.	Measure specific gravity of electrolyte and recharge or replace battery if necessary.
	Faulty charging system.	Measure voltage at headlamp terminals. If it is less than 12.8V, check charging system for proper operation.
	Poor ground or loose connection.	Clean and/or tighten.
	Burnt sealed beams.	Replace.
Headlamp in only one side lights.	Loose headlamp connection.	Repair.
	Damaged sealed beam.	Replace.

TURN SIGNAL LAMP

Condition	Probable cause	Corrective action
Turn signals do not operate.	Burnt fuse.	Correct cause and replace.
	Loose connection or open circuit.	Check wiring and/or repair connection.
	Faulty flasher unit.	Replace.
	Faulty turn signal switch.	Conduct continuity test and replace if necessary.
Flashing cycle is too slow. (Pilot lamp does not go out.) or too fast.	Bulbs having wattage other than specified wattage are used.	Replace with specified one.
	Burnt bulbs.	Replace.
	Loose connection.	Repair.
	Inoperative flasher unit.	Replace.
Flashing cycle is irregular.	Burnt bulb.	Replace.
	Loose connection.	Repair.
	Bulb having wattage other than specified wattage is used.	Replace with specified one.

TAIL LAMP, STOP LAMP AND BACK-UP LAMP

Condition	Probable cause	Corrective action
Both right and left lamps do not light.	Burnt fuse.	Correct cause and replace.
	Inoperative stop lamp switch.	Conduct continuity test and replace if necessary.
	Faulty back-up lamp switch.	Conduct continuity test and replace if necessary.
	Loose connection or open circuit.	Check wiring and/or repair connection.
Lamp in only one side lights.	Burnt bulb.	Replace.
	Loose bulb.	Repair lamp socket.

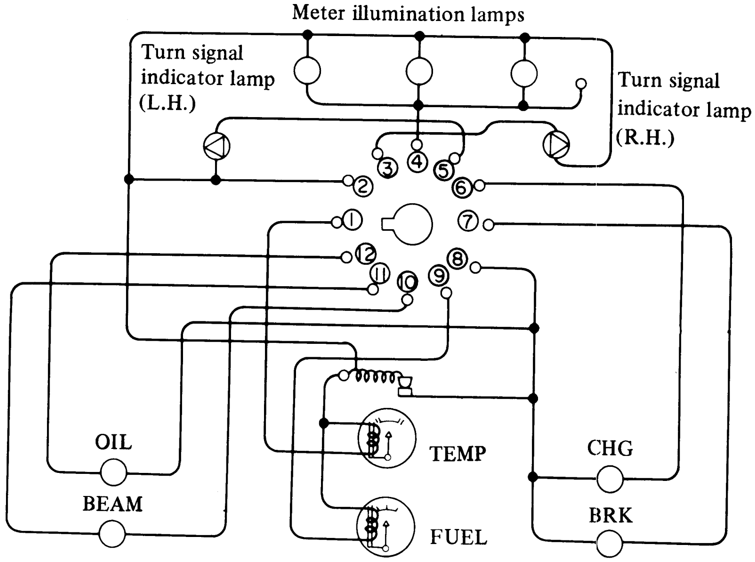
METERS AND GAUGES

CONTENTS

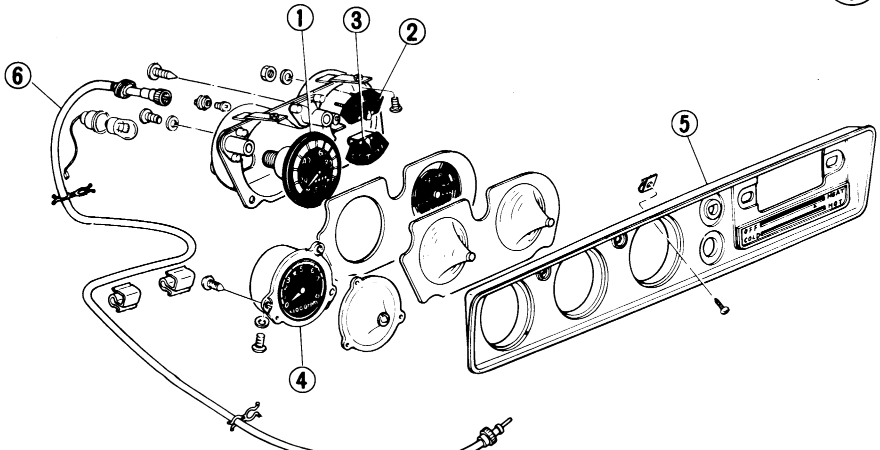
COMBINATION METER BE-14
COMBINATION METER CIRCUIT DIAGRAM BE-14
REMOVAL AND INSTALLATION BE-15
SPEEDOMETER BE-15
REMOVAL AND INSTALLATION BE-15
FUEL GAUGE AND WATER TEMPERATURE GAUGE BE-15
DESCRIPTION BE-15
REMOVAL AND INSTALLATION BE-15
OIL PRESSURE WARNING LAMP BE-16
DESCRIPTION BE-16
OIL PRESSURE SWITCH BE-16
CHARGE WARNING LAMP BE-16
HAND BRAKE WARNING LAMP BE-16
DESCRIPTION BE-16
HAND BRAKE SWITCH BE-16
METER ILLUMINATION, INDICATOR AND WARNING BULBS.................... BE-16
REMOVAL AND INSTALLATION BE-16
BULB SPECIFICATIONS.................... BE-16
TROUBLE DIAGNOSES AND CORRECTIONS BE-17
SPEEDOMETER BE-17
WATER TEMPERATURE AND FUEL GAUGES BE-18
OIL PRESSURE AND CHARGE WARNING LAMPS BE-19

COMBINATION METER

COMBINATION METER CIRCUIT DIAGRAM



BE469C



BE470C

1 Speedometer
2 Thermometer
3 Fuel meter
4 Tachometer (Option)
5 Cluster lid
6 Speedometer cable

Fig. BE-21 Circuit diagram of combination meter

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Working through meter openings of cluster lid, remove three screws retaining cluster lid to instrument panel.
3. From underneath instrument panel, remove one screw retaining meter assembly to lower panel of instrument.
4. Withdraw cluster lid slightly. For access to switches, knobs, etc., follow the procedures given in each section.
5. From behind combination meter disconnect speedometer cable at speedometer head and multiple connector (instrument wire assembly) from printed circuit.
6. On vehicle with clock, disconnect wires at each connection on meter printed circuit.
7. Remove four screws retaining meter assembly to cluster lid.
8. Remove combination meter assembly.
9. When installing combination meter assembly, follow the reverse sequence of removal.

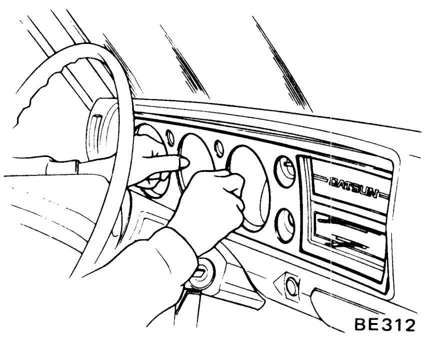


Fig. BE-22 Removing cluster lid

SPEEDOMETER

REMOVAL AND INSTALLATION

1. Remove combination meter assembly. Follow the procedures under Removal and Installation in Combination Meter.
2. Remove meter front cover and shadow plate by removing clips and screws.
3. Remove screws retaining speedometer to printed circuit housing and remove speedometer.
4. Install speedometer in the reverse sequence of removal.

FUEL GAUGE AND WATER TEMPERATURE GAUGE

DESCRIPTION

The fuel gauge consists of a tank unit located in the fuel tank and fuel gauge. 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 gauge.

The water temperature gauge consists of a gauge and thermal transmitter located in the engine block. The thermal transmitter is equipped with a thermistor element which converts cooling water temperature variation to a resistance, and thus, the thermal transmitter controls current flowing to the gauge.

The fuel gauge and water temperature gauge are provided with a bi-metal 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 bi-metal arm is bent, and thus, the pointer connected to the bi-metal arm is operated. The characteristics of both gauges are the same.

A tolerance may occur on the water temperature gauge or fuel gauge due to source voltage fluctuation. The voltage regulator is used to supply a constant voltage so that the water temperature gauge and fuel gauge operate correctly.

The operating part of the regulator consists of a bi-metal arm and a heater coil. When the ignition switch is turned on, the bi-metal arm is heated and bent by the coil, opening the contact. Consequently, current to the coil is interrupted. As the bi-metal cools, the contact closes. The repetition of this operation produces a pulsating voltage of 8 volts which is applied to the water temperature and fuel gauges.

If both the water temperature gauge and fuel gauge become faulty at the same time, this may be attributed to problem in the voltage regulator.

REMOVAL AND INSTALLATION

1. Remove combination meter assembly. Follow the procedures under Removal and Installation in Combination Meter.
2. Remove meter front cover and shadow plate by removing clips and screws.
3. Remove retaining nuts at the back side of combination meter assembly and remove meter.
4. Install meter in the reverse sequence of removal.

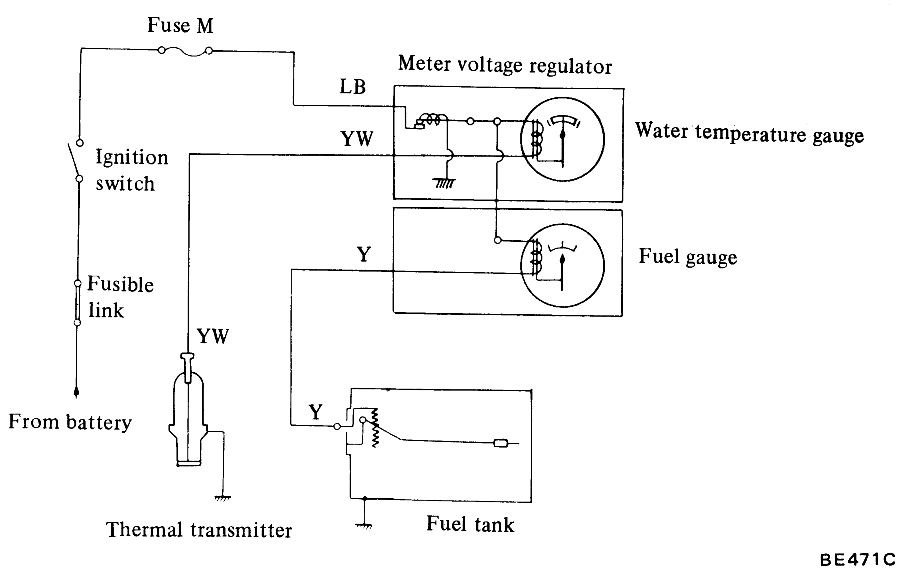


Fig. BE-23 Circuit diagram of fuel gauge and water temperature gauge

OIL PRESSURE WARNING LAMP

DESCRIPTION

The engine lubricating system incorporates an oil pressure warning lamp which glows whenever engine oil pressure falls below 0.4 to 0.6 kg/cm^2 (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.

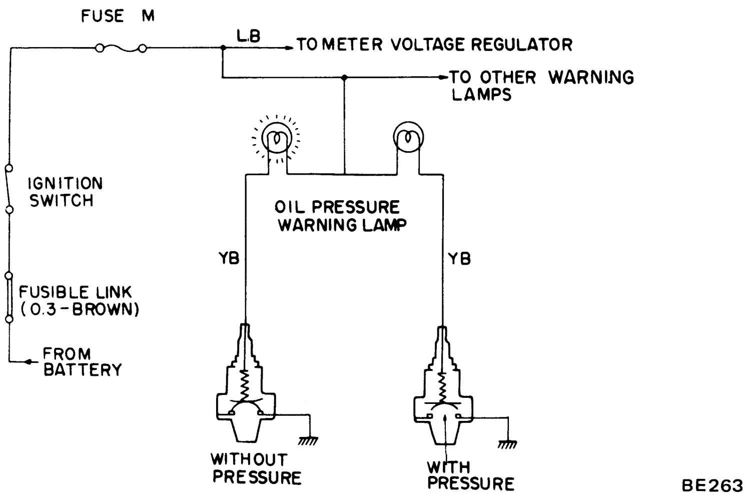


Fig. BE-24 Circuit of oil pressure warning system

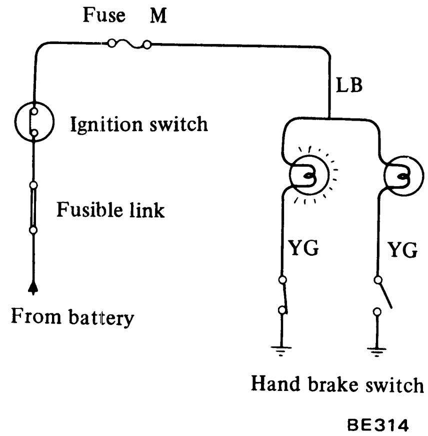


Fig. BE-25 Circuit of hand brake warning system

HAND BRAKE SWITCH

To remove hand brake switch, disconnect lead wire, pull switch out of hand brake control bracket and withdraw switch and wiring assembly.

OIL PRESSURE SWITCH

To replace oil pressure switch, disconnect lead wire from switch terminal and unscrew switch from engine cylinder block.

Prior to installing switch to cylinder block, be sure to apply conductive sealer to threads of new switch.

CHARGE WARNING LAMP

Refer to Charging Circuit (Section EE).

HAND BRAKE WARNING LAMP

DESCRIPTION

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.

METER ILLUMINATION, INDICATOR AND WARNING BULBS

REMOVAL AND INSTALLATION

To replace bulb, turn bulb socket counterclockwise to dismount it from combination meter (if necessary, disconnect lead wire connector from printed circuit) and remove bulb from socket.

BULB SPECIFICATIONS

Item	SAE trade bulb No.	Wattage (Candle power) W (C)
Meter illumination lamp	161	1.7 (1) x 3
Turn signal indicator lamp	161	1.7 (1)
High beam indicator lamp	161	1.7 (1)
Oil pressure warning lamp	161	1.7 (1)
Charge warning lamp	161	1.7 (1)
Hand brake warning lamp	158	3.4 (2)
Clock or tachometer illumination lamp	158	3.4 (2) x 2

TROUBLE DIAGNOSES AND CORRECTIONS

SPEEDOMETER

Condition	Probable cause	Corrective action
Speedometer pointer and odometer do not operate.	Loose speedometer cable union nut.	Retighten.
	Broken speedometer cable.	Replace.
	Damaged speedometer drive pinion gear (Transmission side).	Replace.
	Inoperative speedometer.	Replace.
Unstable speedometer pointer.	Improperly tightened or loose speedometer cable union nut.	Retighten.
	Faulty speedometer cable.	Replace.
	Inoperative speedometer.	Replace.
Unusual sound occurs in response to increase in driving speed.	Excessively bent or twisted speedometer cable inner wire or lack of lubrication.	Replace or lubricate.
	Inoperative speedometer.	Replace.
Inaccurate speedometer indication.	Inoperative speedometer.	Replace.
Inaccurate odometer operation.	Improperly meshed second and third gear worn gears.	Replace speedometer.
	Faulty feeding due to deformed odometer and pinion carrier.	Replace speedometer.

WATER TEMPERATURE AND FUEL GAUGES

Condition	Probable cause	Corrective action
Both water temperature gauge and fuel gauge do not operate.	Burnt fuse. Inoperative gauge voltage regulator.	Correct cause and replace fuse. Replace water temperature gauge.
Both water temperature gauge and fuel gauge indicate inaccurately.	Inoperative gauge voltage regulator. (Gauge pointer fluctuates excessively.) Loose of poor connection. (Gauge pointer fluctuates slightly.) Correct conn	Replace water temperature gauge. Correct connector contact.
Water temperature gauge		
Water temperature gauge does not operate.	Faulty thermal transmitter or loose terminal connection. (When thermal transmitter yellow/white wire is grounded, gauge pointer fluctuates.) Faulty water temperature gauge. Open circuit.	Replace thermal transmitter or correct terminal connection. Replace wtater temperature gauge.
Gauge indicates only maximum temperature.	Faulty thermal transmitter. (Gauge pointer returns to original position when ignition switch is turned off.) Faulty water temperature gauge. (Gauge pointer indicates maximum temperature even after ignition switch is turned off.)	Replace thermal transmitter. Replace water temperature gauge.
Water temperature gauge does not operate accurately.	Faulty water temperature gauge. Faulty thermal transmitter. Loose or poor connection.	[Connect a 115Ω resistance between thermal transmitter yellow/white wire and ground. When gauge indicates approximately 50°C (122°F), gauge is serviceable.] Correct gauge terminal contact.
Fuel gauge		
Fuel gauge does not operate.	Faulty tank unit or loose unit terminal connection. (Pointer indicates a half level when a 35Ω resistance is connected between tank unit yellow wire and ground.) Faulty fuel gauge. Poor or loose connection. Open circuit.	Replace tank unit or correct terminal connection. Replace fuel gauge. Correct connector terminal contact.
Pointer indicates only "F" position.	Faulty tank unit. (Pointer lowers below "E" mark when ignition switch is turned off.) Faulty fuel gauge. (Pointer still indicates "F" position when ignition switch is turned off.)	Replace tank unit. Replace fuel gauge.

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".	Inoperative oil pressure switch or loose switch terminal connection. (When switch yellow/black wire is grounded, warning lamp lights.)	Replace switch or correct terminal connection.
	Burnt bulb or loose bulb.	Replace bulb or correct bulb socket.
	Open circuit.	
Lamp does not go out while engine is being operated.	Lack of engine oil.	Check oil level and add oil as required.
	Oil pressure too low.	Inspect engine oil pressure system.
	Inoperative oil pressure switch.	Replace oil pressure switch.
Charge warning lamp Lamp does not light when ignition switch is set to "ON".	Burnt bulb or loose bulb. (Warning lamp does not light when voltage regulator white/red wire is grounded.)	Replace bulb or correct bulb socket.
	Open circuit.	
Lamp does not go out when engine is started.	Faulty charging system.	Inspect charging system.

ELECTRICAL ACCESSORIES

CONTENTS

HORN BE-20
DESCRIPTION BE-20
REMOVAL AND INSTALLATION BE-20
IGNITION SWITCH BE-21
REMOVAL AND INSTALLATION BE-21
INSPECTION BE-21
WINDSHIELD WIPER AND WASHER BE-22
REMOVAL AND INSTALLATION BE-22
INSPECTION BE-22
RADIO BE-24
REMOVAL AND INSTALLATION BE-24
ADJUSTMENT BE-24
CLOCK BE-24
REMOVAL BE-24
INSTALLATION BE-25
HEATER BE-25
DESCRIPTION BE-25
AIRFLOW BE-27
HEATER UNIT ASSEMBLY BE-28
HEATER CORE BE-28
FAN MOTOR BE-28
CONTROL ASSEMBLY BE-28
ADJUSTMENT BE-28
SPECIFICATIONS BE-29
TACHOMETER BE-29
REPLACEMENT BE-29
BULB REPLACEMENT BE-29
SEAT BELT WARNING SYSTEM BE-29
DESCRIPTION BE-29
REMOVAL AND INSTALLATION BE-29
WARNING LAMP BULB REPLACEMENT BE-30
INSPECTION BE-30
TROUBLE DIAGNOSES AND CORRECTIONS BE-31
HORN BE-31
WINDSHIELD WIPER AND WASHER BE-32
RADIO BE-33

HORN

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 ground. In the other circuit (terminal H), the current flow is supplied through the relay contacts and 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 are closed. This allows the current to flow to the horn.

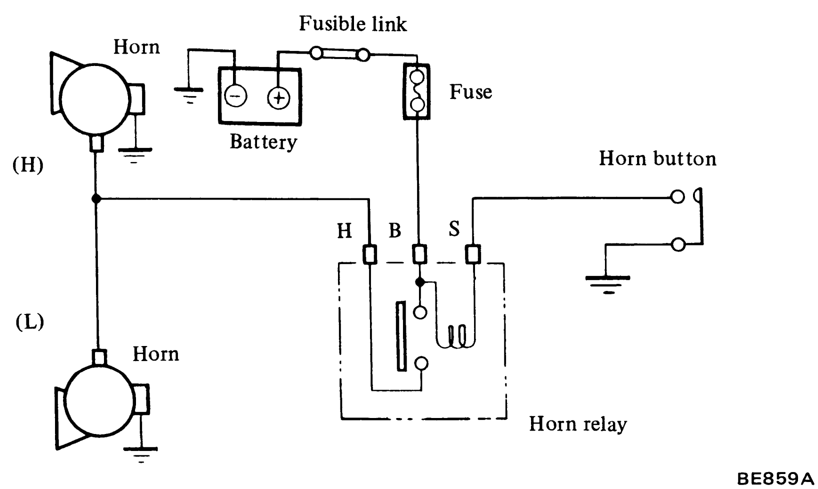


Fig. BE-26 Circuit diagram of horn system

REMOVAL AND INSTALLATION

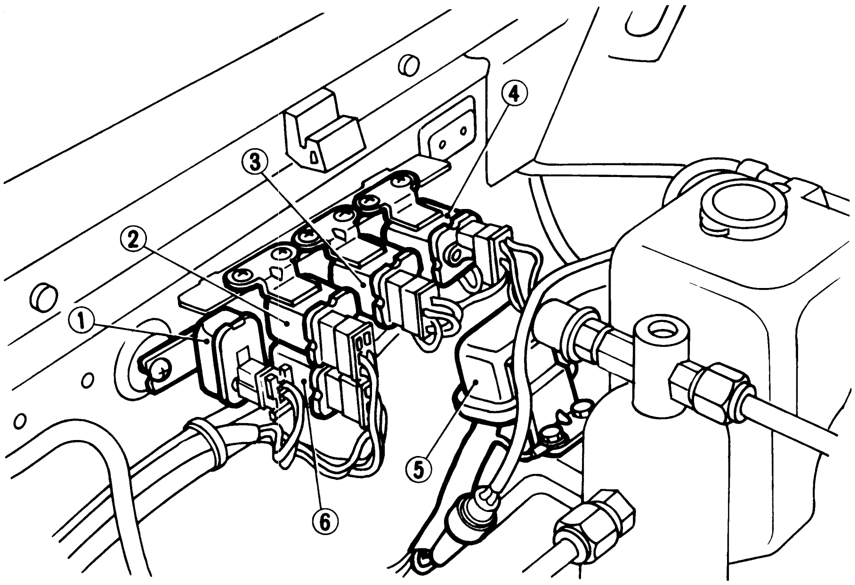
Horn

1. Disconnect battery ground cable.
2. Disconnect horn wire at terminal on horn body.
3. Remove horn retaining bolt.
4. Install horn in the reverse sequence of removal.

Horn relay

The horn relay is installed on the hoodledge on the right side of the engine compartment.

1. Disconnect battery ground cable.
2. Disconnect horn relay wire connector at terminals on horn relay.
3. Remove retaining screws.
4. Install horn relay in the reverse sequence of removal.



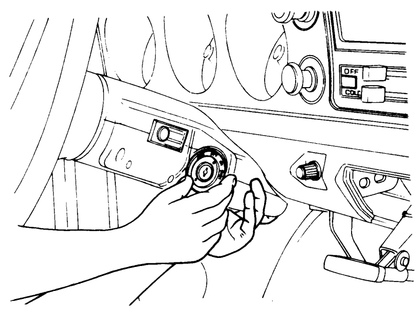
1 Horn relay
2 Auto-choke heater relay
3 Floor sensor relay
(California models only)
4 Ignition relay
5 Compressor relay
(Air conditioner only)
6 Inhibitor relay
(Automatic transmission only)

BE472C

Fig. BE-27 Location of relays

Horn switch

The horn switch is integral with the turn signal and dimmer switch assembly. Remove switch assembly as outlined in Turn Signal and Dimmer Switch.



BE861A

Fig. BE-28 Removing ignition switch

INSPECTION

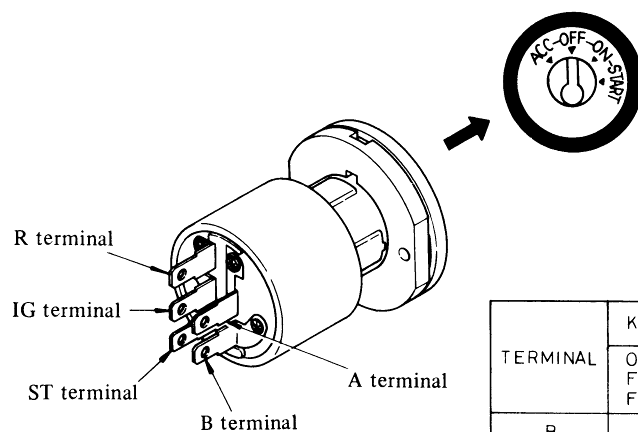
Continuity test

Test continuity through ignition switch by using test lamp or ohmmeter.

IGNITION SWITCH

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable from battery.
2. Unscrew and remove escutcheon from the front of ignition switch.
3. Withdraw ignition switch and wiring assembly (with spacer), from shell cover as shown in Figure BE-28.
4. Disconnect wiring connector from the back of ignition switch.
5. Replace ignition switch with a new one.
6. Connect ignition switch to wiring connector.
7. Position ignition switch to shell cover opening, install and tighten escutcheon and secure ignition switch to shell cover.



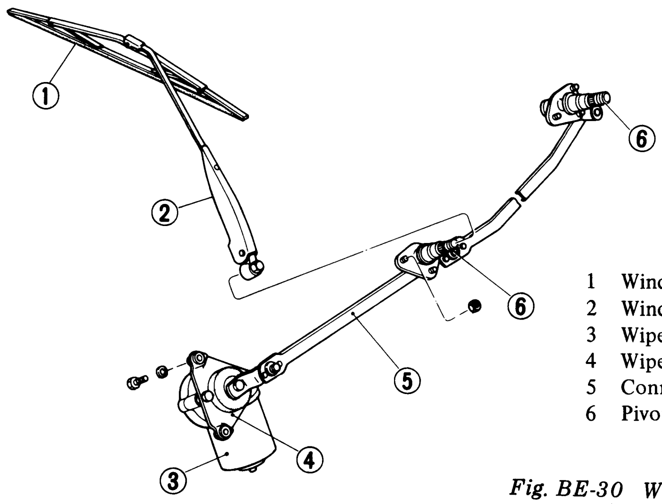
TERMINAL	KEY POSITION OFF	ACC	ON	START
B		o	o	o
IG			o	o
ST				o
A		o	o	
R				o

BE684B

Fig. BE-29 Ignition switch

WINDSHIELD WIPER AND WASHER

REMOVAL AND INSTALLATION



1 Windshield wiper blade
2 Windshield wiper arm
3 Wiper motor
4 Wiper motor bracket
5 Connecting rod
6 Pivot

BE685B

Fig. BE-30 Windshield wiper

Wiper linkage

1. Remove wiper blade and arm assembly from pivot.
2. Remove cowl top grille. See Section BF.
3. Remove two flange nuts retaining pivot (wiper linkage) to cowl top.
4. Remove stop ring that retains connecting rod to wiper motor arm.
5. Remove wiper motor linkage assembly.
6. Install wiper motor linkage in the reverse sequence of removal.

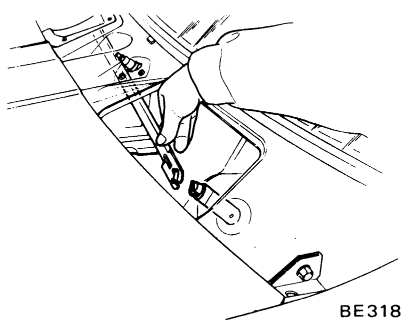


Fig. BE-31 Removing wiper linkage

7. Install wiper arm and blade assembly in correct sweeping angle. See Figure BE-32 for correct installing dimensions.

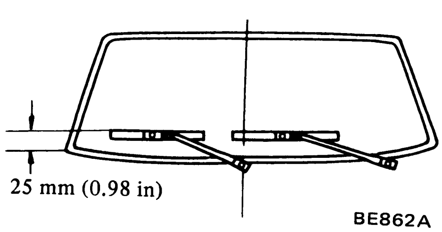


Fig. BE-32 Wiper arm installation

Wiper motor

1. Remove cowl top grille.
3. Remove stop ring that connects wiper motor arm to connecting rod.
3. From under instrument panel, disconnect wiper motor harness at connector on wiper motor body.
4. Remove three retaining screws and pull out wiper motor forward.
5. Install wiper motor in the reverse sequence of removal.

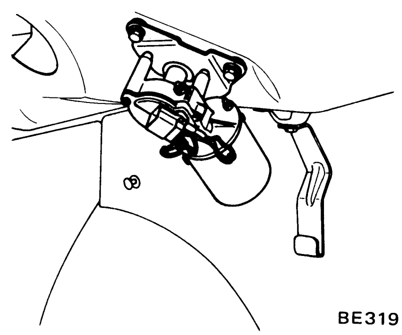


Fig. BE-33 Removing wiper motor

Wiper and washer switch

1. Press in switch knob, turn it counterclockwise and pull it out of switch.
2. Unscrew escutcheon and remove escutcheon and spacer.
3. Reach up from underneath instrument panel, disconnect wiper switch multiple connector from instrument harness wiring assembly and remove spacer and switch.
4. Install new switch in the reverse sequence of removal.

Washer pump

The washer pump and washer fluid tank are integral parts and are serviced as an assembly.

CAUTION:

a. Be sure to use only washing solution.
Never use mix powder soap or detergent with solution.

b. 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.

1. Disconnect two washer pump lead wires at connectors.
2. Remove hose from washer pump and drain washer fluid.
3. Pull out washer tank and motor assembly from tank bracket.
4. Install washer tank and motor assembly in the reverse sequence of removal.

Washer nozzele

Access for washer nozzle removal is obtained by disconnecting vinyl tube and removing washer nozzle retaining screw from cowl top.

When washer nozzle is installed or when washer fluid is not sprayed properly, adjust nozzle direction by bending nozzle tube so that washer fluid is sprayed in range indicated in Figure BE-34.

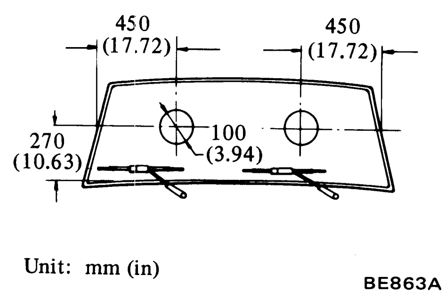


Fig. BE-34 Washer nozzle adjustment

INSPECTION

Wiper motor

1. Disconnect wiring connector from wiper motor.
2. Connect test lead between B terminal on motor side and battery posi-

tive terminal (or B terminal and blue/red wire terminal in wiring connector plug).

3. To check wiper low speed operation, connect L terminal to ground with ground cable (or connect L terminal to black wire terminal), make sure that wipers sweep at low speed.
4. To check wiper high speed operation, connect ground cable to H terminal in the same manner as in step 3; make sure that wipers sweep fast.
5. During low speed operation, connect E terminal to ground and connect P and L terminals with lead wire as shown in Figure BE-35. At this time, make sure that auto-stop mechanism actuates to stop wiper blade at the specified position.
6. Wiper is in good condition if above tests are made as indicated.

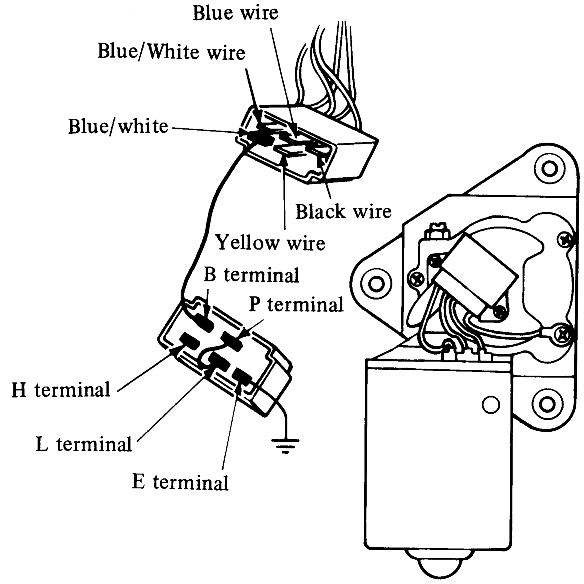


Fig. BE-35 Wiper motor

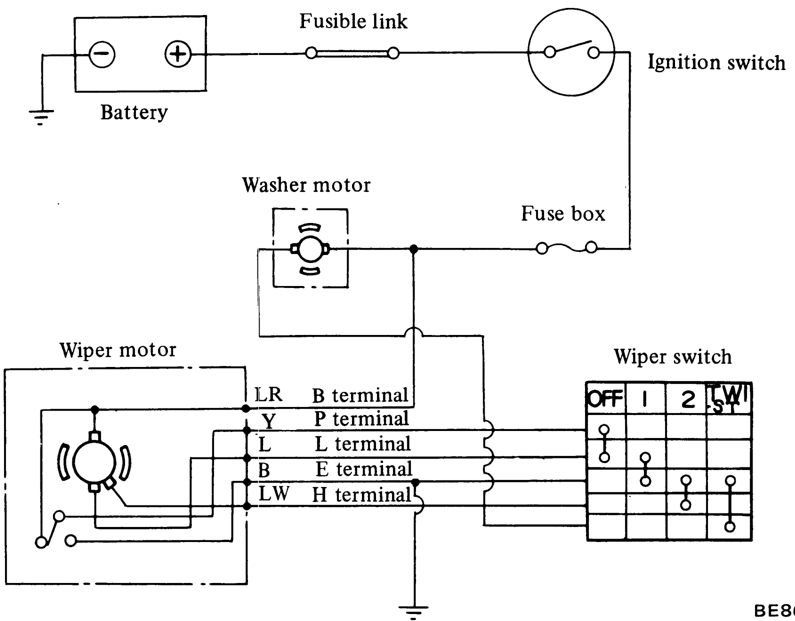


Fig. BE-36 Circuit diagram of windshield wiper—washer system

Wiper and washer switch

Continuity test

Remove wiper switch from vehicle as outlined in Wiper Switch.

Test continuity through wiper switch by using test lamp or ohmmeter.

TERMINAL	SWITCH POSITION			
	OFF	I	2	TWIST
I			O	
2		O	O	O
3	O	O		
4	O			
5				O

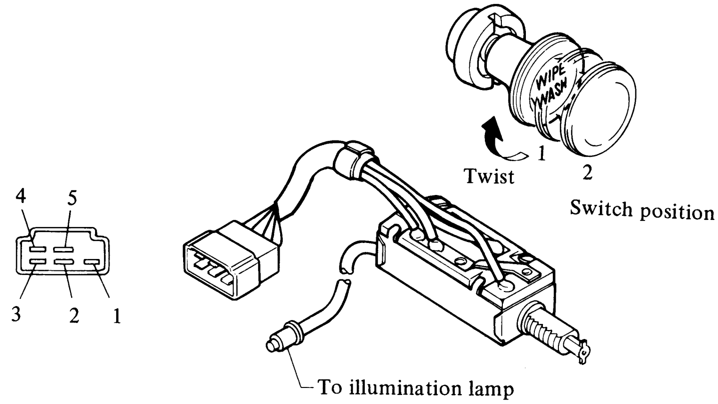


Fig. BE-37 Wiper switch

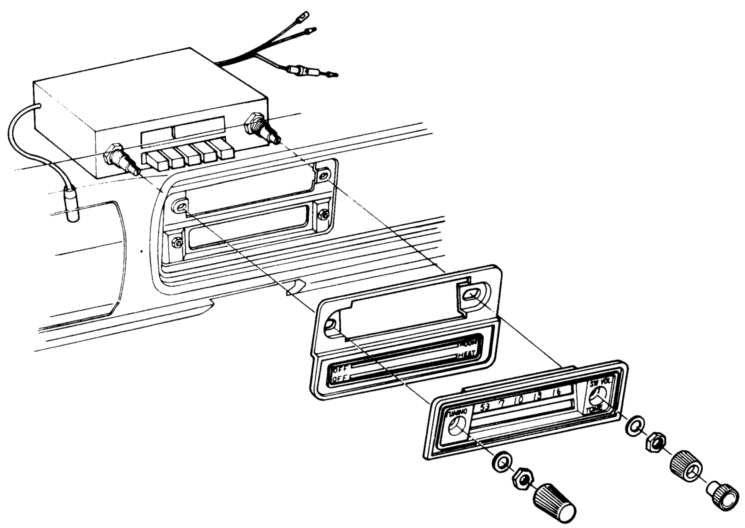
RADIO

REMOVAL AND INSTALLATION

Radio

Removal

1. Pull radio knobs off radio control shafts.
2. Remove radio holding nuts and washer from radio control shafts.
3. Remove radio bezel from the front of radio.
4. From under instrument panel, disconnect antenna cable and lead wires (power lead and speaker lead).
5. Remove radio from instrument panel.



BE323

Fig. BE-38 Radio

Installation

1. From behind instrument panel position radio to instrument panel.
2. Install radio bezel to the front of radio.
3. Install washers and nuts on radio control shafts and tighten them securely. Then install control knobs.
4. Connect antenna cable and lead wires (power lead and speaker lead).

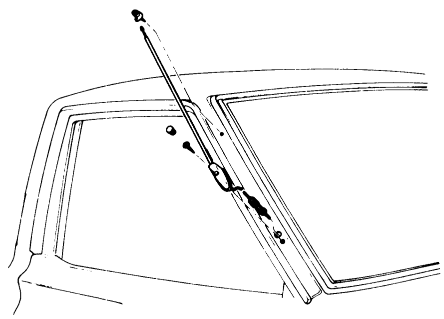
Antenna and antenna cable

Removal

1. From behind instrument panel disconnect antenna cable at connector.
2. Remove plug on antenna base and remove antenna base retaining screw.
3. Remove antenna and cable assembly from front pillar.
4. Unscrew antenna clip from front pillar if necessary.

Installation

1. Remove rubber plugs that cover antenna mounting opening in front pillar (when installing radio antenna on vehicle that is not equipped with radio).
2. Thread mounting stud of antenna clip into (upper) antenna mounting opening.
3. Insert antenna cable into (lower) antenna mounting opening and place antenna base in position.
4. Install antenna base retaining screw.
5. Route antenna cable along upper dash panel to radio.
6. Connect antenna cable at connector.



BE867A

Fig. BE-39 Radio antenna

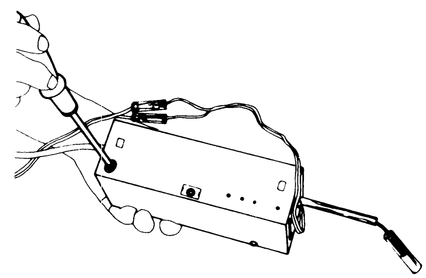
ADJUSTMENT

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 1,600KC) on dial.

   Noise may be generated but disregard it.
3. Turn antenna trimmer to right and left slowly and set it at a position where receiving sensitivity is highest.



BE133

Fig. BE-40 Adjusting antenna trimmer

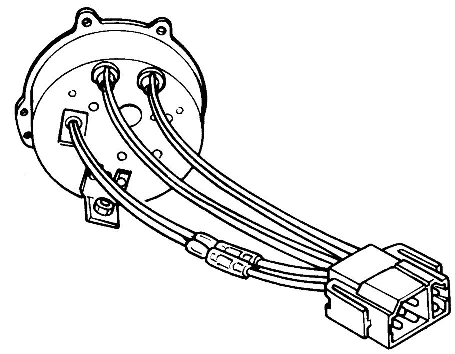
CLOCK

REMOVAL

1. Remove battery ground cable.
2. Remove cluster lid, following instructions in steps 1 to 4 of Removal in Combination Meter.
3. Disconnect wire connector of clock from instrument harness wiring.
4. Remove screws and remove clock from cluster lid.

INSTALLATION

1. Position clock to cluster lid and install screws.
2. Connect clock wire connector to instrument harness wiring.
3. Install cluster lid to instrument panel.
4. Connect battery groud cable.



BE473C

Fig. BE-41 Clock

HEATER

DESCRIPTION

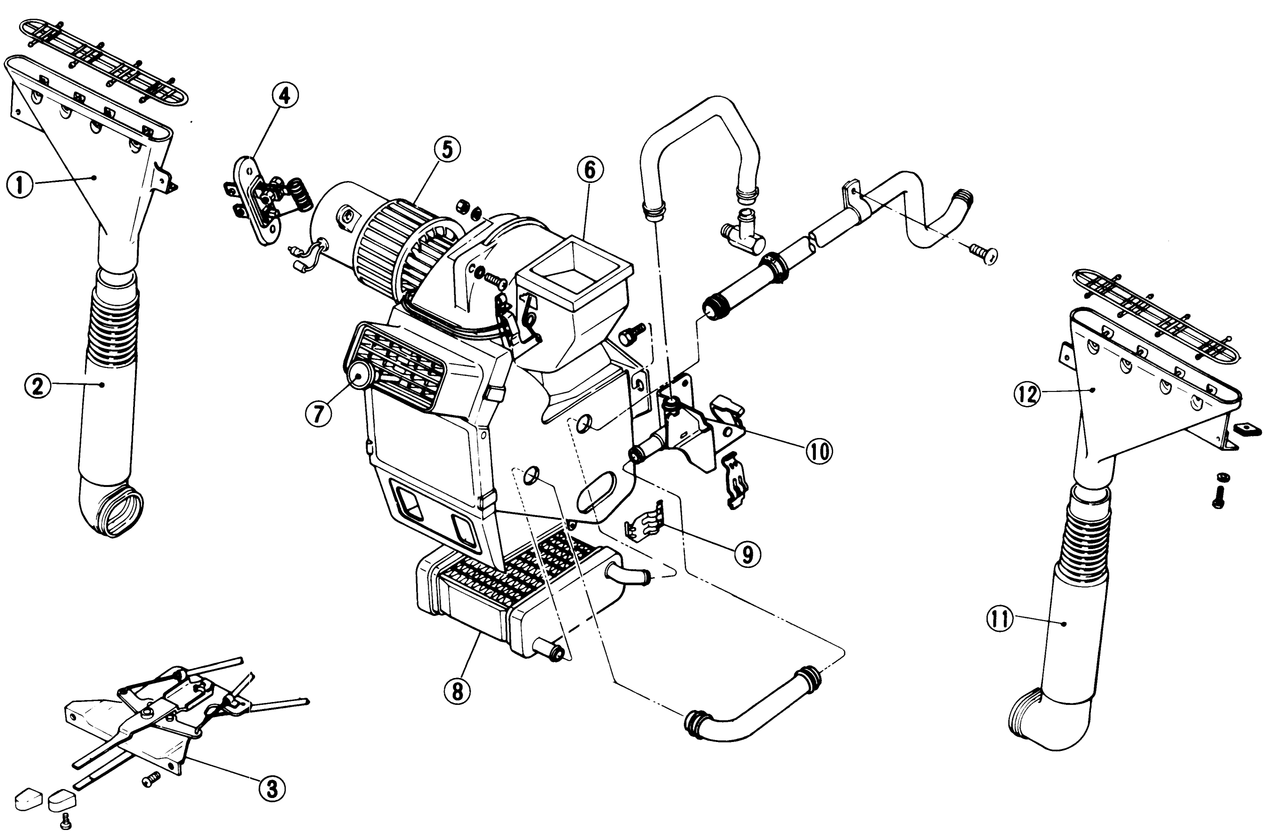


Fig. BE-42 Heater construction

Operation of the heater is controlled by two control levers located on the instrument panel and a hand operated knob on the center of the heater unit.

The AIR LEVER controls the air intake valve and/or room valve by its lever positions (OFF, DEFROST and ROOM) through the control cables. The air intake valve draws the fresh outside air from the cowl top grille and supplies the air into the heater unit. The room valve is located at the bottom of the heater unit. The air coming through the air intake valve opening is forced through the heater core to the room valve, where the air is distributed to the floor outlet and/or defroster outlets, depending on the position of the room valve.

The VENT KNOB is directly linked to the vent valve which provides fresh air for the passenger. Push the knob all the way in to open the valve. The fresh ventilating air comes out of the heater center outlet.

The TEMP lever is a dual purpose control; one is for regulating the flow of engine coolant flowing into the heater unit and the other for the operation of the fan motor. When the lever is in the OFF position, the water cock is closed and the circulation of engine coolant through the heater core stops. When the lever is slided to any other position than OFF, the water cock opens in proportion to the lever setting and allow engine coolant to flow into heater core.

To control the fan motor operation, push or pull the lever knob. Two speeds are provided for the fan motor by using a three position switch.

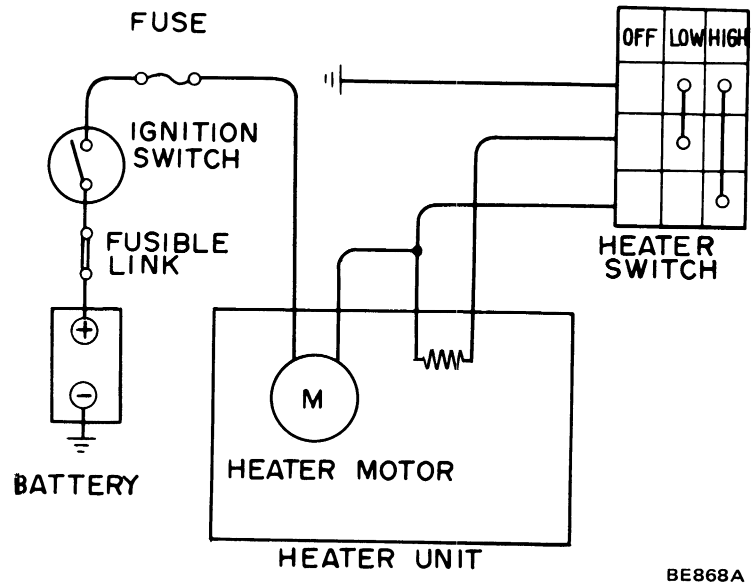


Fig. BE-43 Circuit diagram of heater

AIRFLOW

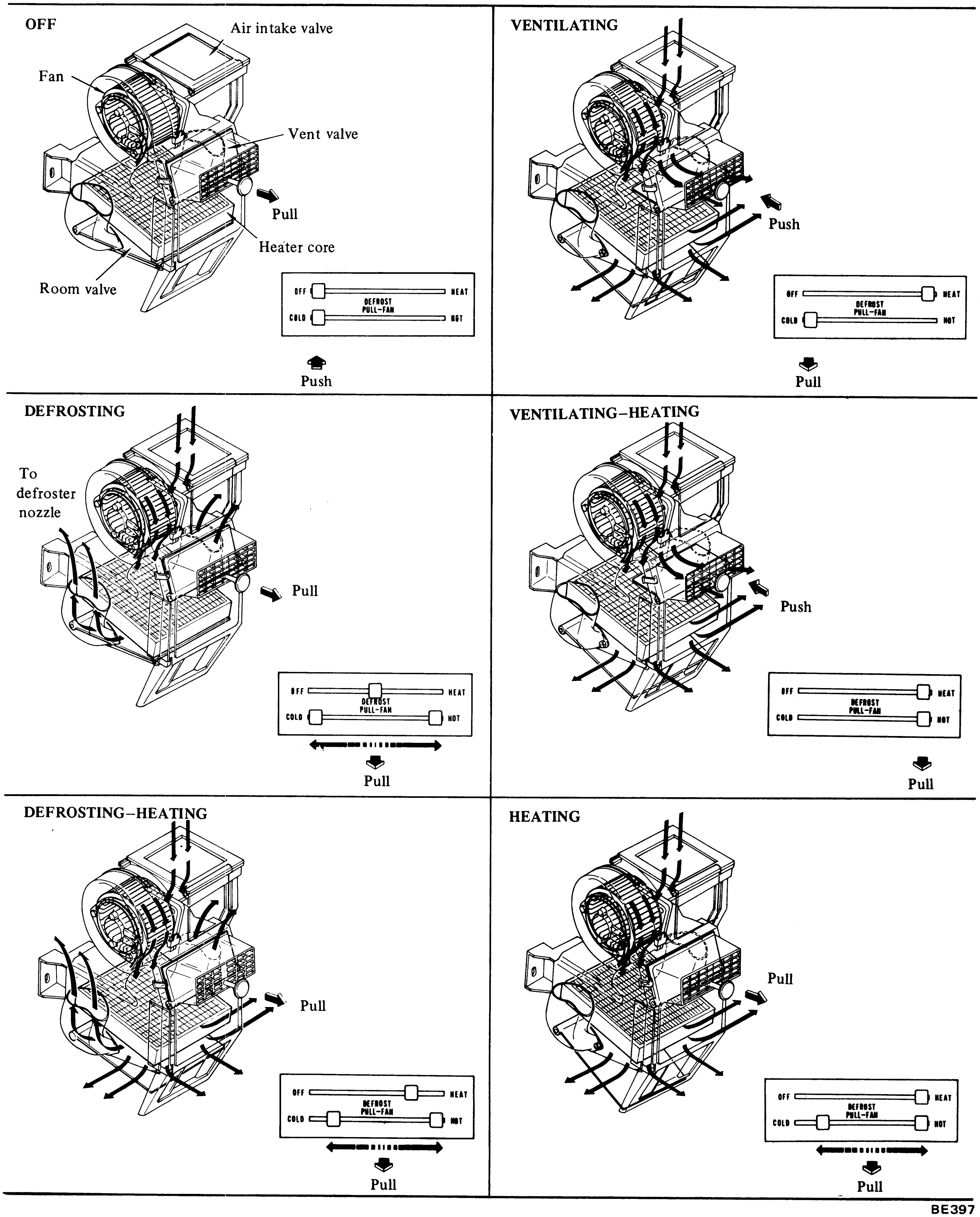


Fig. BE-44 Airflow

HEATER UNIT ASSEMBLY

Removal

1. Disconnect battery ground cable.
2. Drain engine coolant.
3. Remove defroster hoses.
4. Remove three cable retaining clips and disconnect control cables from valves and water cock.
5. Disconnect two fan motor lead wires from each connector.
6. Disconnect two resistor lead wires from each connector.
7. Disconnect water hoses from core and water cock.
8. Remove three heater housing mounting bolts and dismount heater unit from vehicle.

Installation

1. Position heater unit under instrument panel and install three heater unit securing bolts.
2. Install water hoses.
3. Position heater control cables to room valve, air intake valve and water cock.
4. Adjust control cable length for proper operation as outlined in Adjustment.
5. Connect fan motor wires and resistance wires to each connector plug.
6. Install defroster hoses.
7. Connect battery ground cable.
8. Fill cooling system.
9. Run engine at 2,000 rpm with AIR lever in the "HOT" position. Make sure that engine coolant is filled up to correct level.

HEATER CORE

Removal and installation

1. Drain engine coolant.
2. Remove defroster hoses.
3. Disconnect water hoses from inlet and outlet pipes of heater core.
4. Remove four clips and front cover.

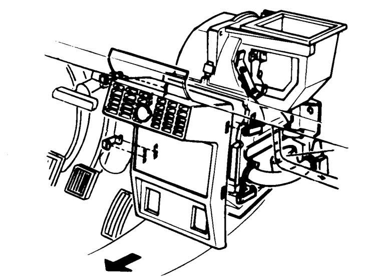


Fig. BE-45 Removing front cover

5. Withdraw heater core from heater housing.

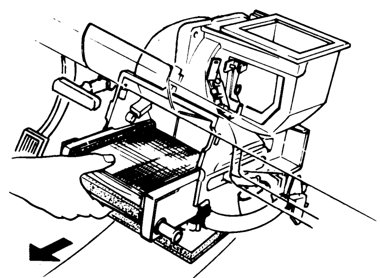


Fig. BE-46 Removing heater core

6. Install heater core in the reverse sequence of removal.

FAN MOTOR

Removal and installation

1. Dismount heater unit assembly from vehicle as outlined in Removal of Heater Unit Assembly.
2. Remove nine spring clips and disassemble heater housing.
3. Remove fan from fan motor.
4. Remove fan motor retaining screws and fan motor.
5. Assemble heater housing and install heater unit to vehicle in the reverse sequence of removal as outlined in Installation of Heater Unit Assembly.

CONTROL ASSEMBLY

Removal and installation

1. Remove three cable retaining clips and disconnect control cables from valves and cock.
2. Disconnect three lead wires from each connector plug.
3. Remove radio bezel from the front of radio, following instructions in steps 1 to 3 in Removal of Radio.
4. Remove heater control knobs and heater bezel.
5. Remove two retaining bolts and heater control assembly.
6. Install control assembly in the reverse sequence of removal. When connecting control cables to valves and cock, adjust control cable length as outlined in Adjustment.

ADJUSTMENT

AIR lever

1. Move AIR lever to the "DEF" position.
2. Open air intake valve and connect control cable to air intake valve.
3. Clip control cable with cable retaining clip.

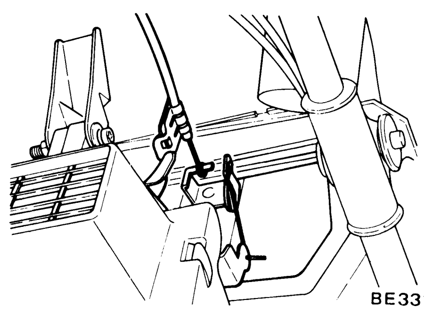


Fig. BE-47 Air intake valve

4. Pull room valve upward and connect control cable to room valve.
5. Clip control cable with cable retaining clip.

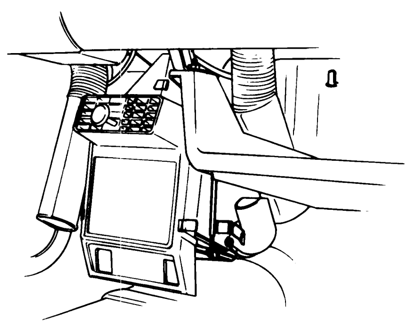


Fig. BE-48 Room valve

TEMP lever

1. Move TEMP lever to the "OFF" position.
2. Connect control cable to the lever of water cock when water cock lever is pulled forward (fully closed).
3. Install control cable on water cock bracket with cable retaining clip.

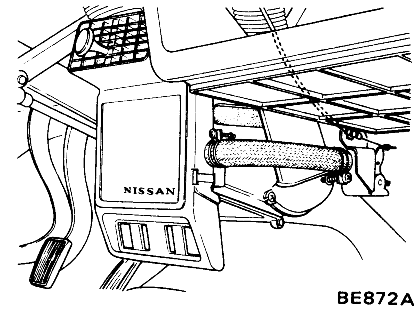


Fig. BE-49 Water cock

SPECIFICATIONS

Item		General use	Extremely cold weather use
FAN MOTOR			
Rated power consumption		12V less than 36W	12V less than 55W
Revolution	rpm	3,600	2,800
Fan dia.	mm (in)	110 (4.33)	110 (4.33)

TACHOMETER

The tachometer is an integral part of the ignition system. It counts the pulses entering the ignition coil and indicates the number of engine revolutions.

REPLACEMENT

1. Remove battery ground cable.
2. Remve cluster lid, following instructions in steps 1 to 4 of Removal in Combination Meter.
3. Disconnect wire connector of tachometer from instrument harness wiring.
4. Remove three screws and then remove tachometer from cluster lid.
5. Install in reverse sequence of removal.

BULB REPLACEMENT

1. Remove tachometer as previously described.

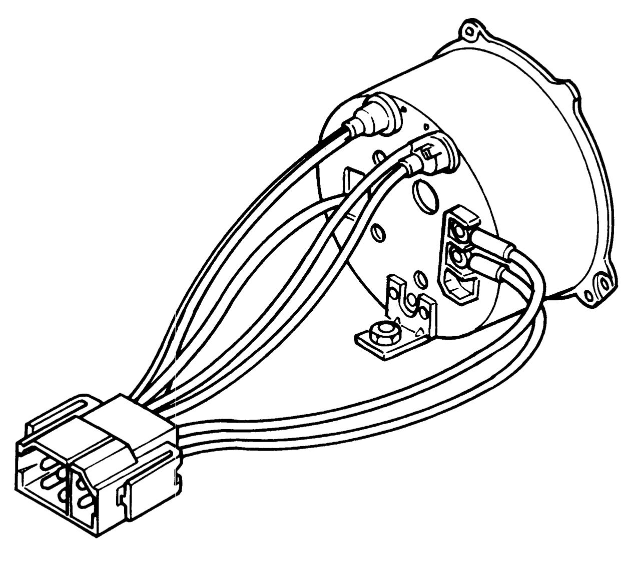


Fig. BE-50 Tachometer

2. Twist illumination bulb socket at back of tachometer. Bulb with socket can then be easily removed.
3. Remove bulb.
4. Install new bulb in reverse sequence of removal.

Bulb wattage:
Tachometer illumination lamp: 3.4W

SEAT BELT WARNING SYSTEM

DESCRIPTION

When the ignition switch is turned to the "ON" position, the warning lamp comes on and remains on for 4 to 8 seconds. The warning buzzer sounds for 4 to 8 seconds intermittently if the driver's seat belt is not fastened properly.

The seat belt warning system consists of a driver's belt switch, a warning buzzer, a warning lamp, a timer unit, and an ignition switch.

REMOVAL AND INSTALLATION

Ignition switch

Refer to page BE-21 for Removal and Installation.

Timer unit

Timer unit is fixed on a reinforcement behind glove box.

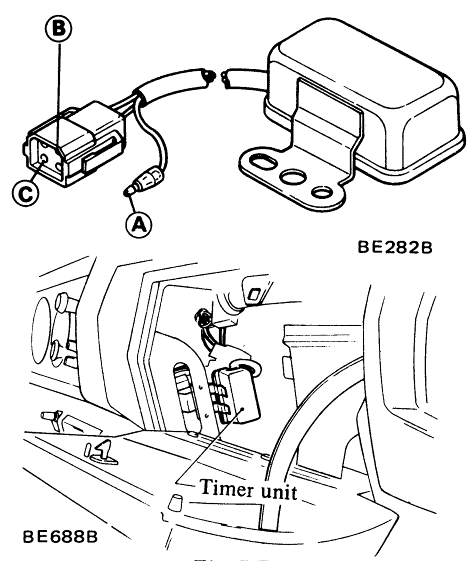


Fig. BE-51 Timer unit

1. Disconnect battery ground cable.
2. Remove glove box.
3. Disconnect timer unit connector.
4. Remove two screws retaining timer unit on reinforcement. Timer unit can then be taken out.
5. Installation is in the reverse sequence of removal.

Warning buzzer

Warning buzzer is fixed on a reinforcement behind glove box.

Refer to the preceding timer unit for Removal and Installation.

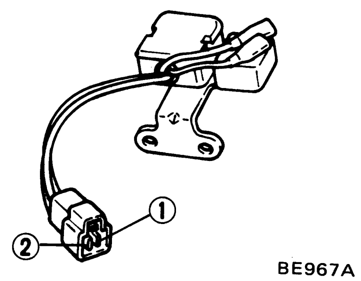


Fig. BE-52 Warning buzzer

Driver's seat belt switch

1. Remove seat belt securing bolt.
2. Disconnect belt switch lead wire at connector.
3. Seat belt can then be taken out.
4. Installation is in the reverse sequence of removal.

Warning lamp body

Warning lamp is located on instrument panel.

1. Remove cluster lid.
2. Disconnect lead wire at connector.
3. Remove two screws retaining lamp body.
4. Installation is in the reverse sequence of removal.

WARNING LAMP BULB REPLACEMENT

1. Remove cluster lid.
2. Twist warning lamp socket. Socket with bulb can then be taken out.
3. Pick up bulb from socket.
4. Install new bulb in the reverse sequence of removal.

Bulb wattage:
Seat belt warning lamp: 1.7W

INSPECTION

Warning buzzer

Apply 12V direct current between ① and ②, and check whether buzzer sounds or not.

The buzzer must sound when ① and ② are connected to power circuit. See Figure BE-52 for warning buzzer.

Note: **Make sure that (–) negative terminal of power circuit is always connected to ② terminal.**

Timer unit

Turn ignition key to the "ON" position. The voltage between Ⓑ and ground must be 12V for 4 to 8 seconds and then go out. See Figures BE-51 and BE-53.

Belt switch

Test continuity between two lead wires from seat belt switch with ohmmeter or test lamp.

Circuit diagram of seat belt warning system

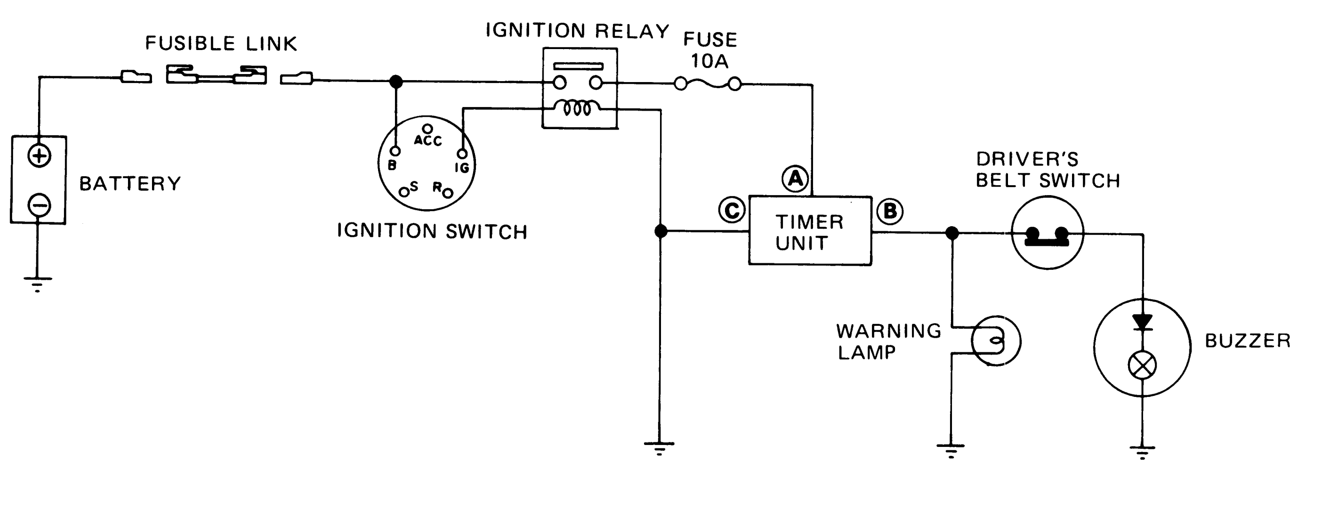


Fig. BE-53 Circuit diagram of seat belt warning system

TROUBLE DIAGNOSES AND CORRECTIONS

HORN

Condition	Probable cause	Corrective action
Horn does not operate.	Discharged battery. (Measure specific gravity of electrolyte.)	Recharge or replace battery.
	Burnt fuse.	Correct cause and replace fuse.
	Faulty horn button contact. (Horn sounds when horn relay terminal(s) is grounded.)	Repair horn button.
	Inoperative horn relay. (Horn sounds when (B) and (H) horn relay terminals are connected with a test lead).	Replace horn relay.
	Damaged horn or loose horn terminal connection.	Correct horn terminal connection or replace horn.
Horn sounds continuously.	Short-circuited horn button and/or horn button lead wire. (When light green lead wire is disconnected from horn relay terminal(s), horn stops to sound.)	Repair horn button or its wiring.
	Inoperative horn relay.	Replace horn relay.
Reduced volume and/or tone quality.	Loose or poor connector contact. (Fuse, relay, horn and/or horn button)	Repair.
	Damaged horn.	Replace.

WINDSHIELD WIPER AND WASHER

Condition	Probable cause	Corrective action
Windshield wiper motor does not operate.	Burnt fuse.	Correct cause and replace fuse.
	Damaged motor. (Check wiper motor as outlined in Inspection.)	Replace wiper motor.
	Loose connection.	Repair.
	Faulty wiper and washer switch. (Test continuity through switch as outlined in Inspection.)	Replace.
	Open power circuit or ground circuit.	Repair.
Wiper operating speed is too slow.	Damaged motor.	Replace motor.
	Loose or poor connection.	Repair.
	Seized or rusted wiper linkage. (Humming occurs on motor in wiper blade operating cycle.)	Lubricate or replace.
	Wiper blades stick on windshield glass. (Raise arm and operate wiper without load.)	Clean windshield glass and/or replace wiper blade.
Wiper speed cannot be changed correctly.	Faulty wiper switch.	Replace.
	Damaged motor.	Replace.
Wiper motor continues to run after switch is turned off or wiper blades do not return to correct position.	Faulty auto-stop operation.	Remove auto-stop device cover, and check relay contacts. Clean dirty contacts or repair relay plate bending if necessary.
	Poor connection.	Repair.
	Faulty switch.	Replace.

RADIO

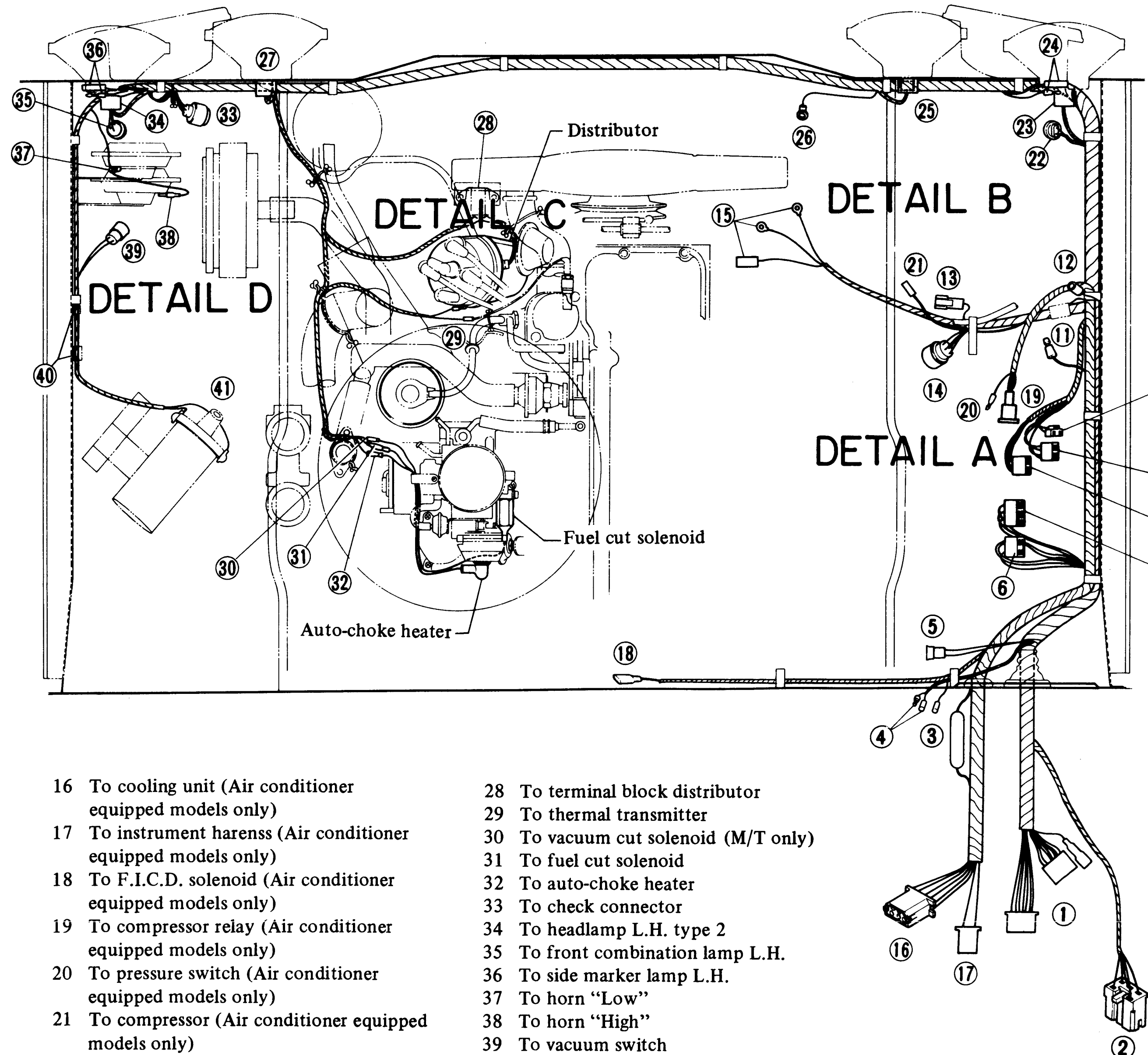
Noise prevention

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 wire.	Install new high tension wire.
	Ignition coil.	Install a 0.5μF 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.** Install bond strap.
	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.	Alternator.	Install a 0.5μF capacitor to charging terminal BAT.
Supplement equipment When engine starts, noise presents. Noise still presents even after stopping engine.	Operative noise of water temperature and fuel gauges.	Install 0.1μF capacitor between terminal and ground wire. **Note: If a capacitor having a larger capacity is used, indication of gauge will be deviated.**

Note:

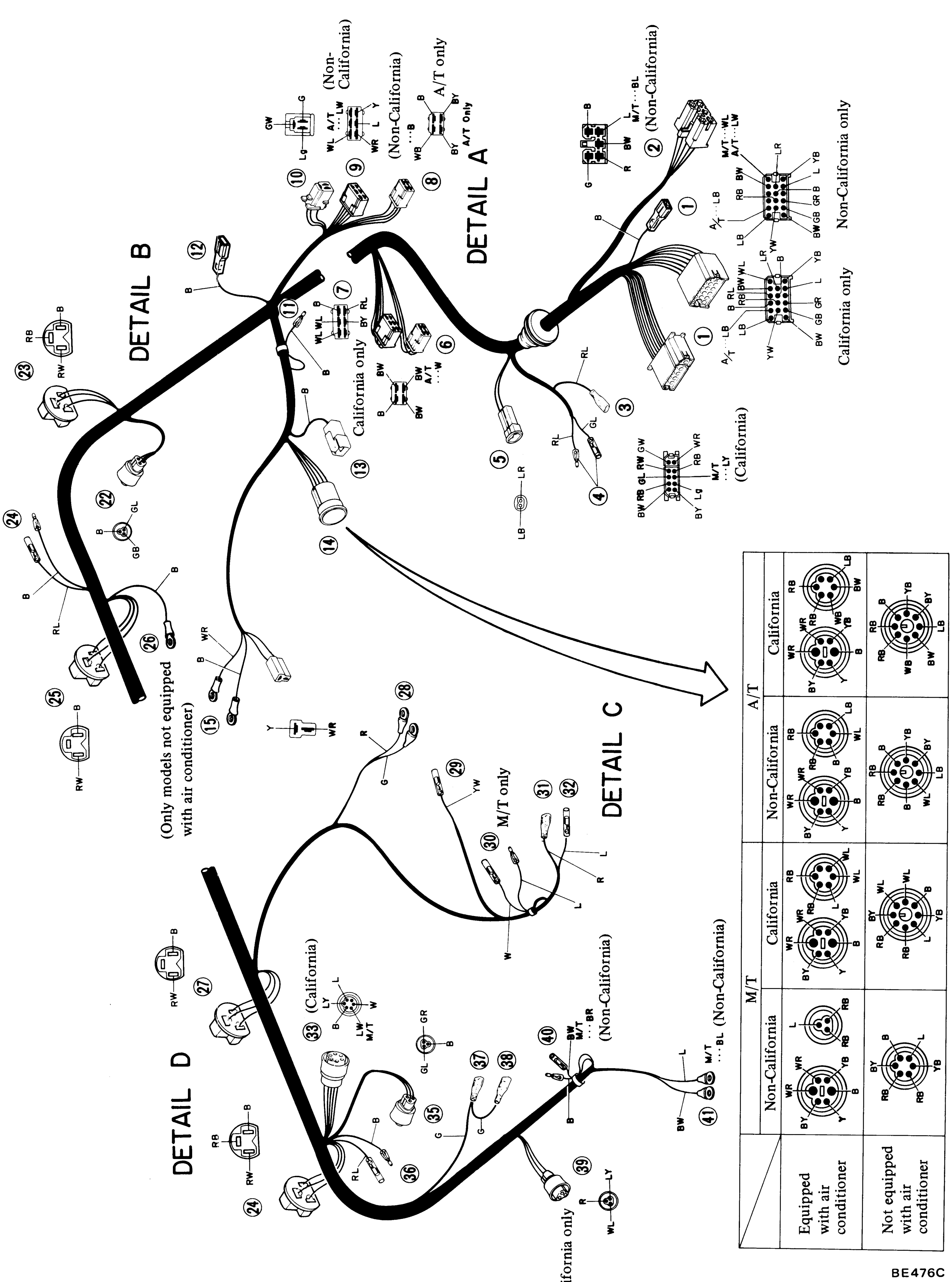
a. **Be sure to locate capacitor as close as to noise source and connect in parallel.**
b. **Cut lead wire as short as possible.**
c. **Ground wire should be attached on the body completely.**
d. **Make installation and connection securely.**
e. **Carefully identify "+," "–," "IN" or "OUT" mark.**



1 To instrument harness
2 To full transistor amplifier
3 To hood switch
4 To engine room lamp
5 To washer motor
6 To ignition relay
7 To floor sensor relay (California models only)
8 To inhibitor relay (A/T only)
9 To auto-choke heater relay
10 To horn relay
11 To cooler cable
12 To battery (–)
13 To fusible link
14 To engine harness No. 2
15 To IC alternator (models not equipped with air conditioner only)
16 To cooling unit (Air conditioner equipped models only)
17 To instrument harenss (Air conditioner equipped models only)
18 To F.I.C.D. solenoid (Air conditioner equipped models only)
19 To compressor relay (Air conditioner equipped models only)
20 To pressure switch (Air conditioner equipped models only)
21 To compressor (Air conditioner equipped models only)
22 To front combination lamp R.H.
23 To headlamp R.H. type 2
24 To side marker lamp R.H.
25 To headlamp R.H. type 1
26 To earth point
27 To headlamp L.H. type 1
28 To terminal block distributor
29 To thermal transmitter
30 To vacuum cut solenoid (M/T only)
31 To fuel cut solenoid
32 To auto-choke heater
33 To check connector
34 To headlamp L.H. type 2
35 To front combination lamp L.H.
36 To side marker lamp L.H.
37 To horn "Low"
38 To horn "High"
39 To vacuum switch (California models only)
40 To condenser
41 To ignition coil

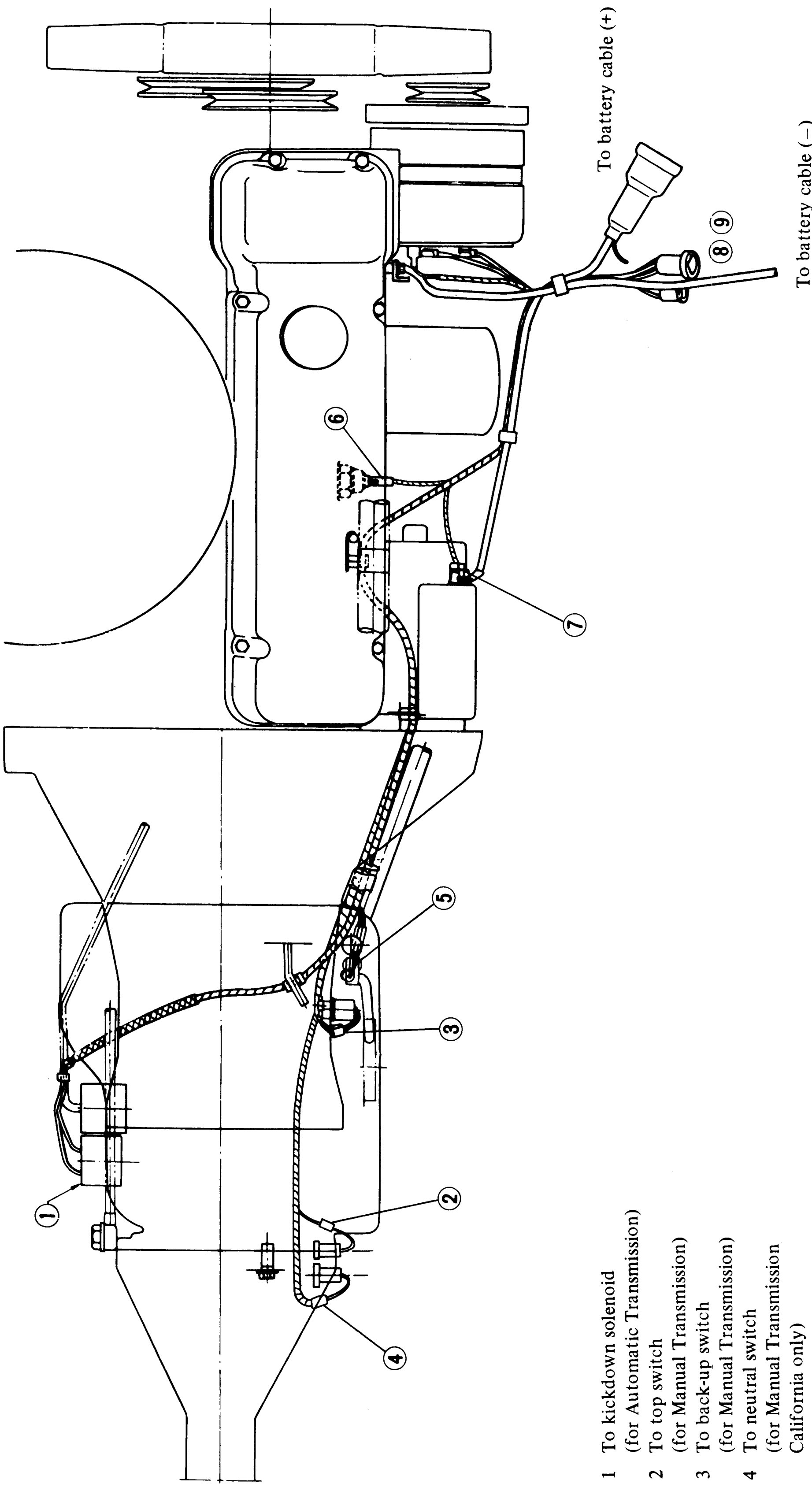
BE475C

Fig. BE-54 Engine compartment



BE476C

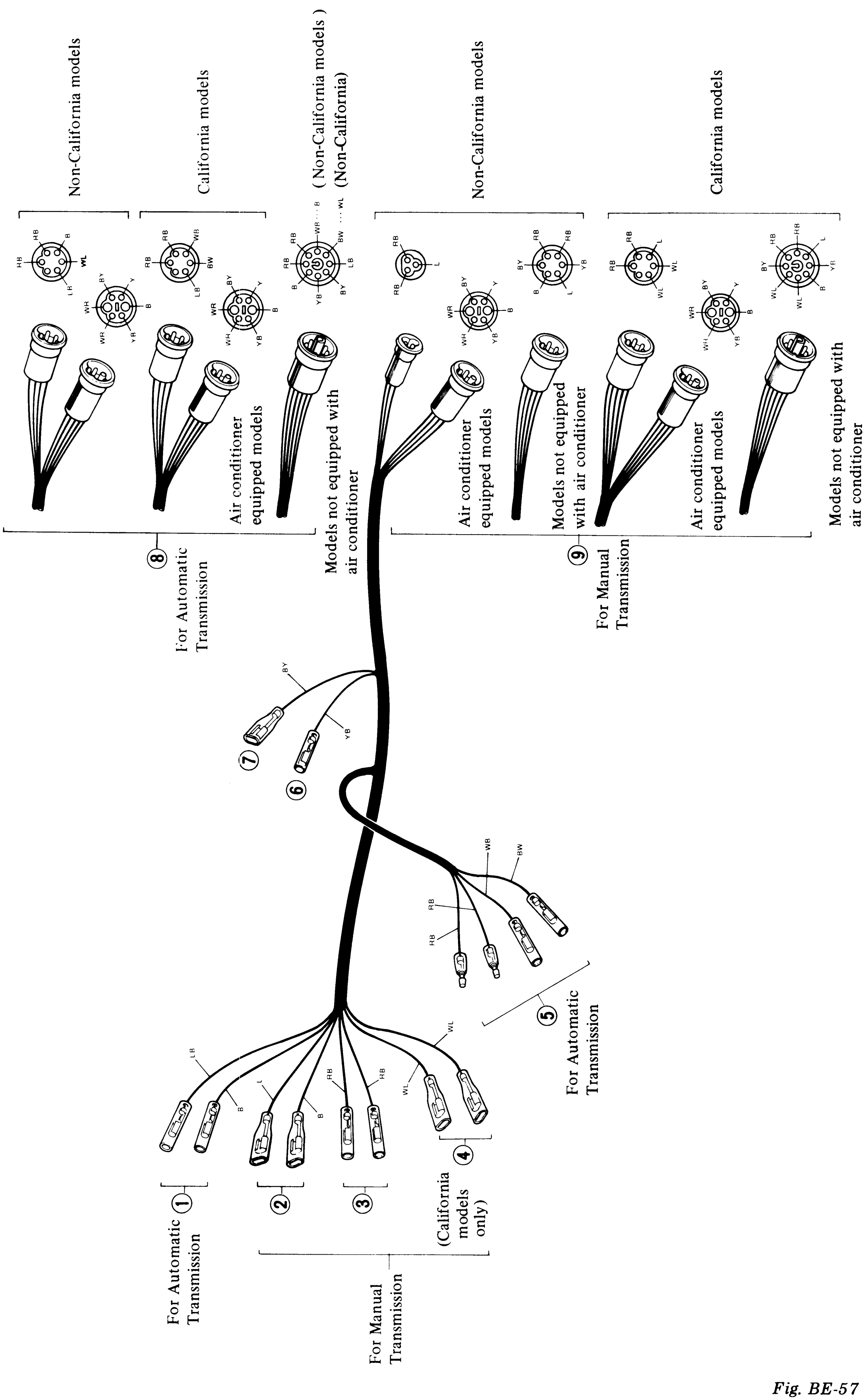
Fig. BE-55 Engine room harness



1 To kickdown solenoid (for Automatic Transmission)
2 To top switch (for Manual Transmission)
3 To back-up switch (for Manual Transmission)
4 To neutral switch (for Manual Transmission California only)
5 To inhibitor switch (for Automatic Transmisison)
6 To oil pressure switch
7 To starter motor
8 To engine room harness (for Automatic Transmission)
9 To engine room harness (for Manual Transmission)

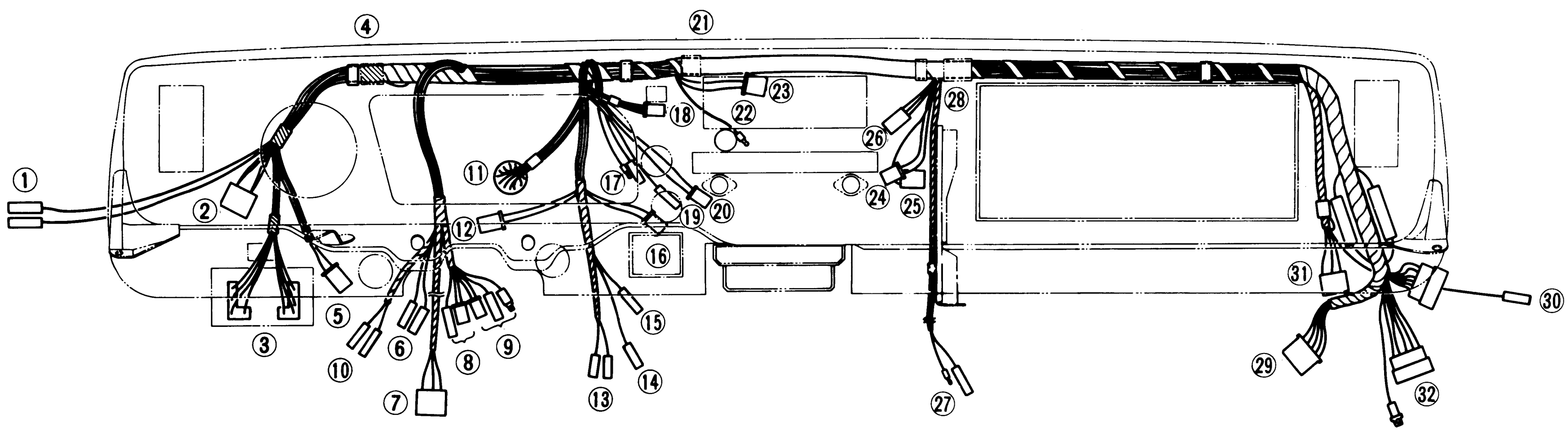
BE477C

Fig. BE-56 Engine harness No. 2



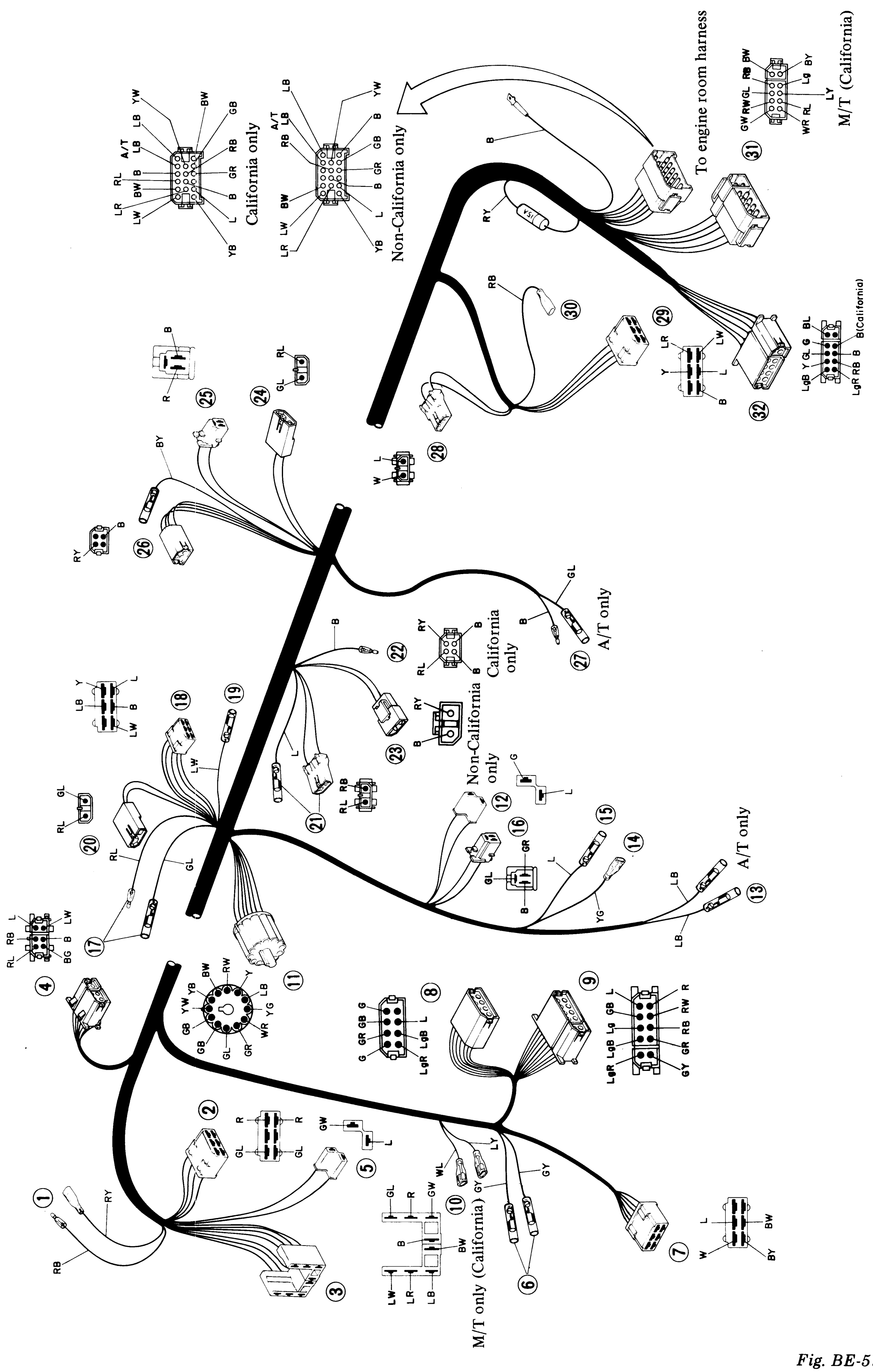
BE478C

Fig. BE-57 Engine harness No. 2



1 To room lamp cable
2 To light switch
3 To fuse
4 To tachometer or clock
5 To hazard flasher unit
6 To stop lamp switch
7 To ignition switch
8 To hazard switch
9 To turn signal lamp and dimmer switch
10 To clutch switch (California M/T models only)
11 To combination meter
12 To flasher unit
13 To kickdown switch (A/T only)
14 To hand brake switch
15 To heater motor
16 To illumination control rheostat
17 To wiper switch and light switch illumination lamp
18 To wiper switch
19 To cigarette lighter
20 To heater control illumination lamp
21 To radio
22 To heater control
23 To belt warning lamp or floor temperature (California mdels)
24 To heater control illumination lamp
25 To buzzer
26 To belt warning timer
27 To indicator lamp (A/T only)
28 To cooler harness
29 To wiper motor
30 To door switch R.H.
31 To engine compartment harness
32 To floor harness

Fig. BE-58 Instrument



BE480C

Fig. BE-59 Instrument

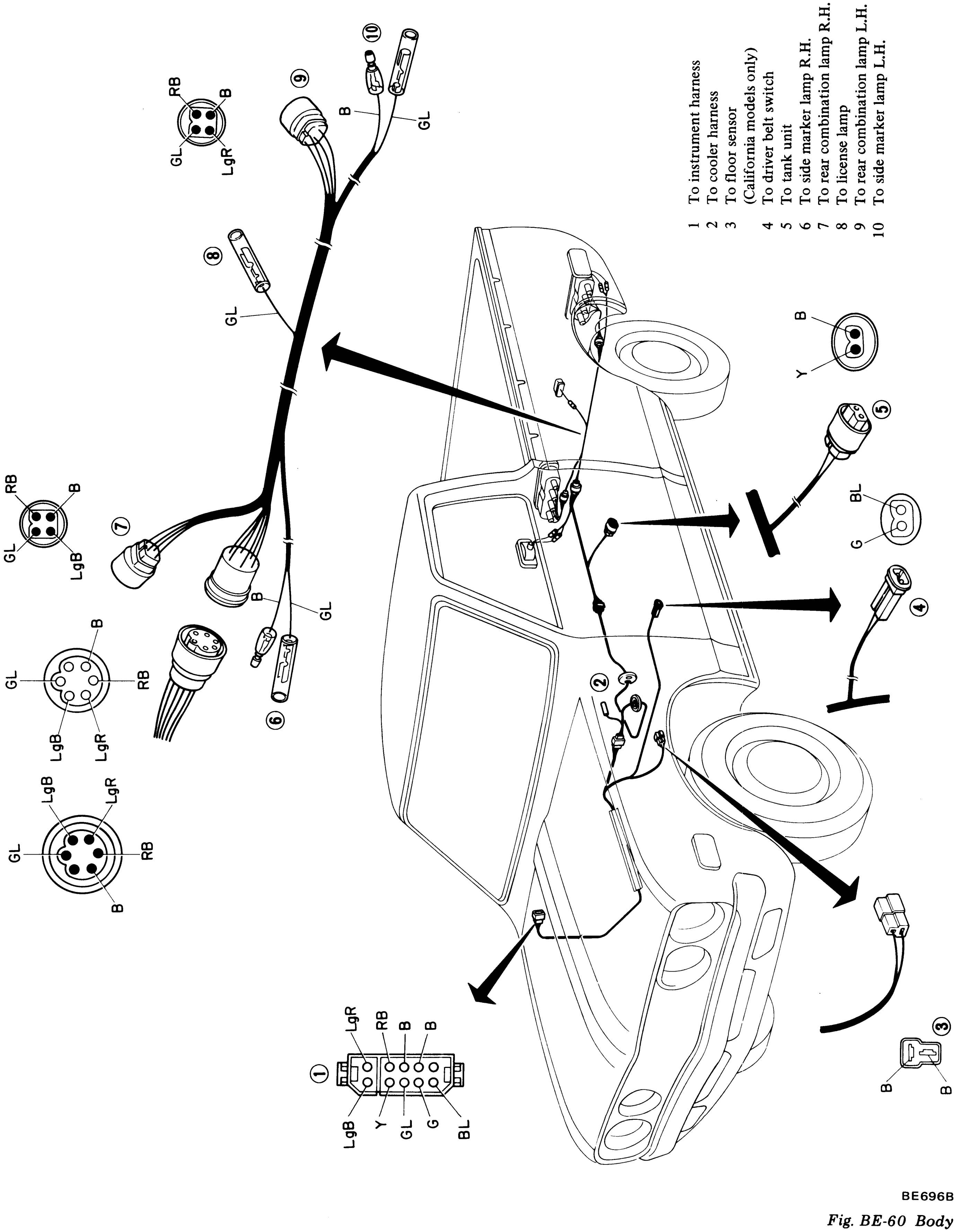


Fig. BE-60 Body

EMISSION WARNING SYSTEM (California models)

CONTENTS

FLOOR TEMPERATURE WARNING SYSTEM (California models) BE-41
DESCRIPTION BE-41
WARNING LAMP BE-41
TROUBLE SHOOTING GUIDE BE-42

FLOOR TEMPERATURE WARNING SYSTEM (California models)

DESCRIPTION

The floor temperature warning system consists of a floor temperature sensing switch installed on the vehicle floor, a floor temperature relay, a floor temperature warning lamp and harnesses.

When the floor temperature rises to an abnormal level, the warning lamp will come on to call the attention of the driver.

The warning lamp also comes on during operation of the starter motor, permitting inspection of the lamp's condition. The lamp goes out after the engine starts.

Refer to Section EC for details.

WARNING LAMP

Bulb replacement

1. Remove cluster lid.
2. Twist warning lamp socket. Socket with bulb can then be taken out.
3. Pick up bulb from socket.
4. Installation is in the reverse sequence of removal.

Bulb wattage:
Floor temperature warning lamp:
1.7W

Lamp body replacement

1. Remove cluster lid.
2. Disconnect lead wire at connector.
3. Remove two screws retaining lamp body.
4. Installation is in the reverse sequence of removal.

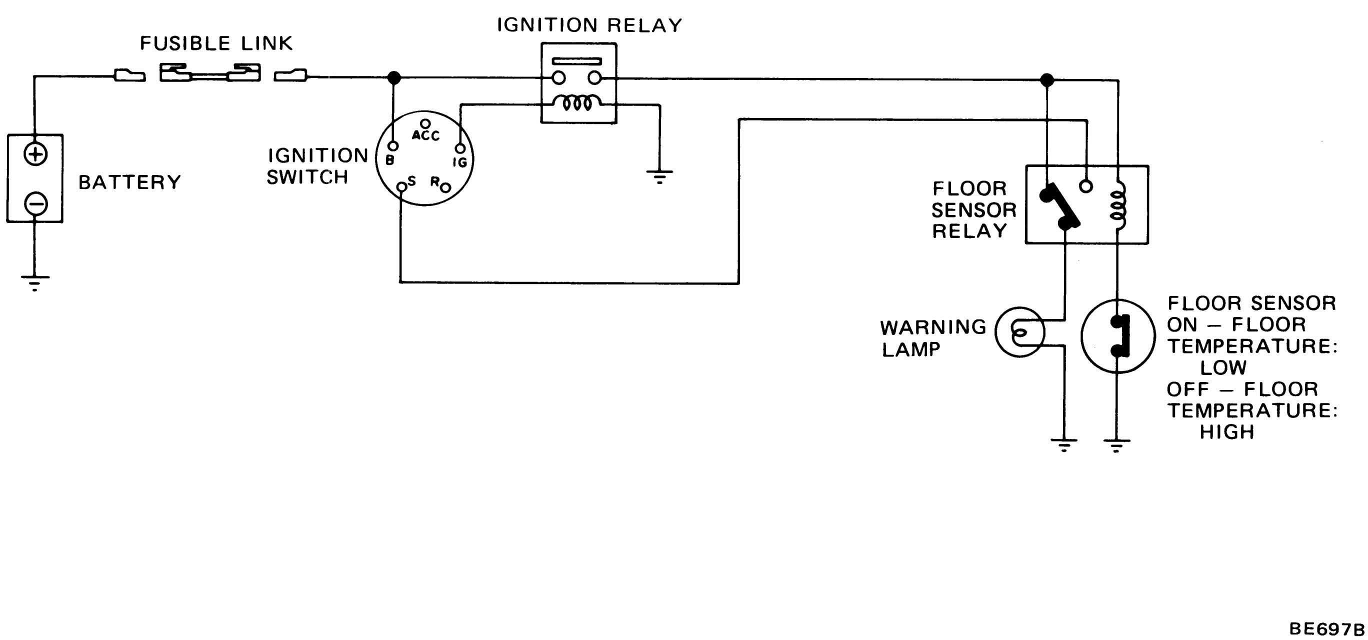


Fig. BE-61 Circuit diagram of floor temperature warning system

TROUBLE SHOOTING GUIDE

Condition	Probable cause	Corrective action
Warning lamp does not light in "START" position of ignition switch.	Burnt or loose bulb.	Replace bulb or correct bulb socket.
	Faulty floor temperature relay.	Conduct continuity test and repair or replace. Refer to Section EC.
	Loose connection or open circuit.	Check wiring and/or repair if necessary.

SERVICE MANUAL

DATSUN PICK-UP
MODEL 620 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION AC

AIR CONDITIONING

DESCRIPTION .... AC- 2
TROUBLE DIAGNOSES AND CORRECTION AC-19
REMOVAL AND INSTALLATION AC-25
COMPRESSOR AC-33
SPECIAL SERVICE TOOLS AC-39

AC

DESCRIPTION

CONTENTS

OUTLINE OF AIR CONDITIONER AC-2
REFRIGERATION SYSTEM AC-3
CONDENSER AC-3
COMPRESSOR AC-3
RECEIVER DRYER AC-4
COOLING UNIT AC-4
ELECTRICAL CIRCUIT AC-5
DESCRIPTION AC-5
MAIN RELAY AC-7
FAN SWITCH AC-7
THERMO SWITCH AC-7
PRESSURE SWITCH AC-7
COMPRESSOR RELAY AC-7
F.I.C.D. SOLENOID VALVE AC-7

OUTLINE OF AIR CONDITIONER

The air conditioner consists essentially of a cooling unit, compressor, condenser, receiver dryer and piping.

The cooling unit, secured with three brackets, is attached to the location occupied by the package tray in the dash panel.

The cooled air from the duct is directed into the passenger compartment through the three outlets at the instrument panel.

The compressor serves to compress the vaporized refrigerant and is attached, through the bracket, to the location occupied by the mechanical fuel pump on the engine.

The condenser cools the compressed refrigerant vapor sent by the compressor and is located on the front of the radiator in the engine compartment.

The receiver dryer, serving as a reservoir for storage of the liquid sent by the condenser, is located on the right in the engine compartment.

The piping consists of two flexible hoses and five copper tubes which connect various components of the air conditioning system.

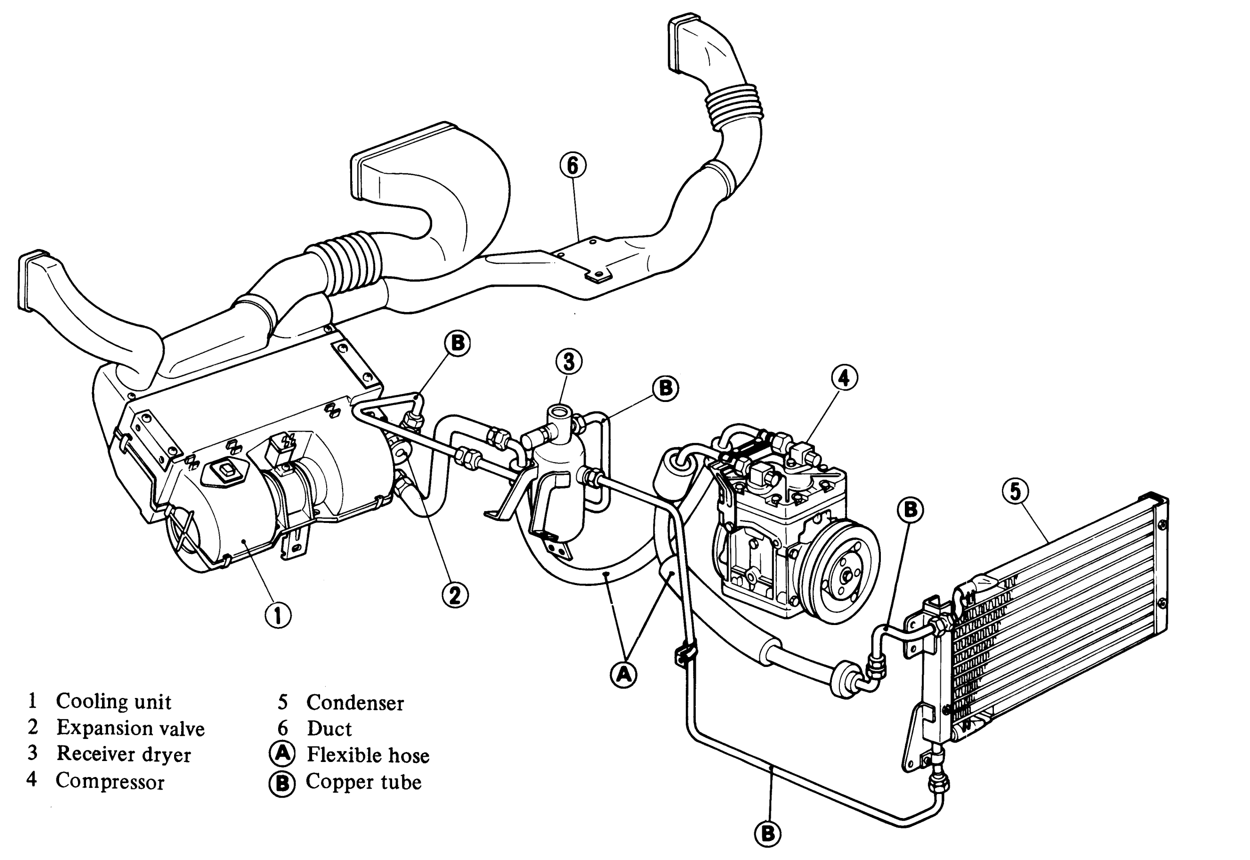


Fig. AC-1 Cooling system

REFRIGERATION SYSTEM

If you were to paint your finger with alcohol, your finger would feel cold. This is because the liquid alcohol takes heat away from your finger while it evaporates. If a quickly evaporating liquid such as alcohol is placed in a container inside a box, the temperature inside the box will drop. This is because the alcohol is evaporated absorbing the heat from the air inside the box. If the gaseous alcohol is collected and cooled with cold water, it will be changed back into a liquid by absorption of its heat by the cold water.

The cooler operates on this principle. The liquid used is the refrigerant R-12. The heat inside the passenger compartment is absorbed by changing the refrigerant from a liquid to a gas and then dissipated to the outside by changing the refrigerant from a gas back to a liquid.

The refrigeration system is shown in Figure AC-2

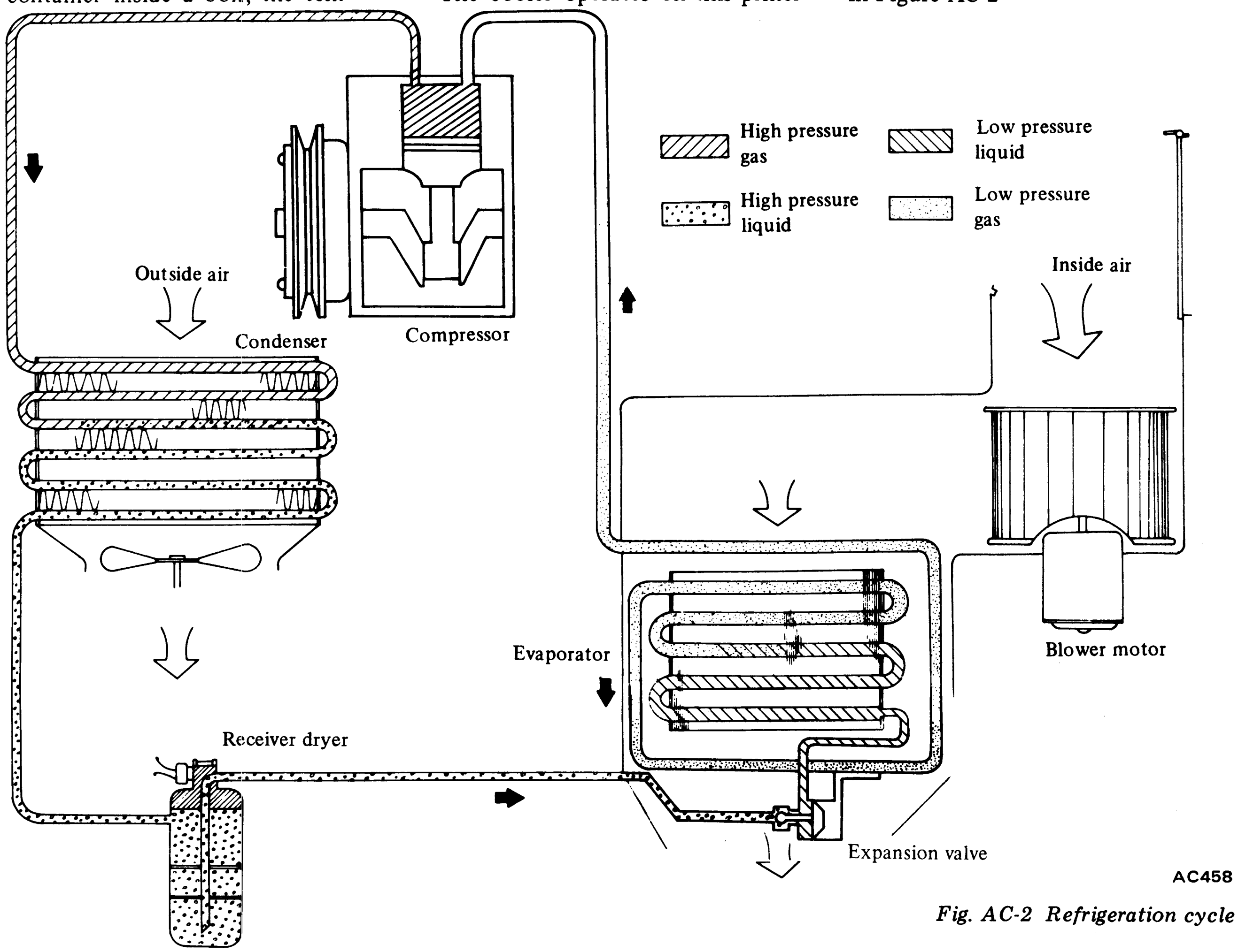


Fig. AC-2 Refrigeration cycle

CONDENSER

The condenser is installed to the front of the radiator. The heated and compressed refrigerant gas from the compressor condenses to a liquid by being cooled by air passing between the fins of the condenser.

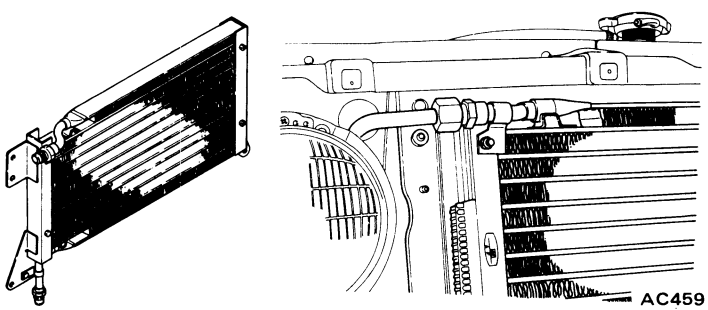


Fig. AC-3 Condenser

COMPRESSOR

The compressor is installed to the side of the engine and is driven by crank pulley through a belt. The refrigerant gas leaving the evaporator is forced out to the condenser by compressor and the low pressure refrigerant gas is compressed to a high pressure and high temperature.

The driving force is transmitted by an electrical clutch. Because engine rpm is very low during idling, the clutch will not transmit the driving force, thus ensuring smooth engine idling.

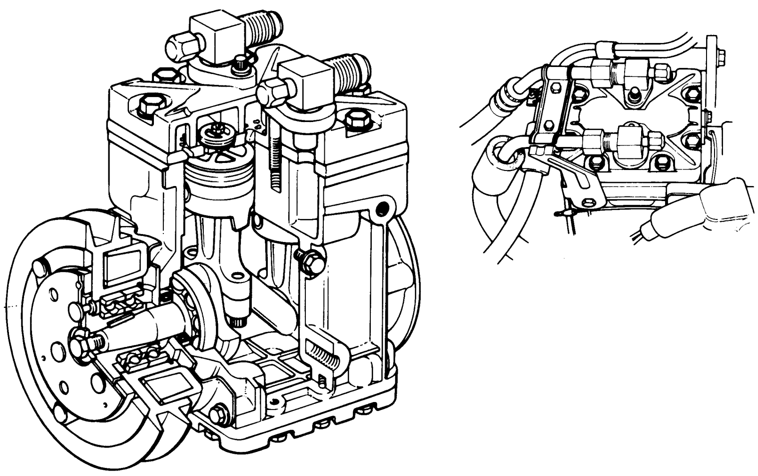


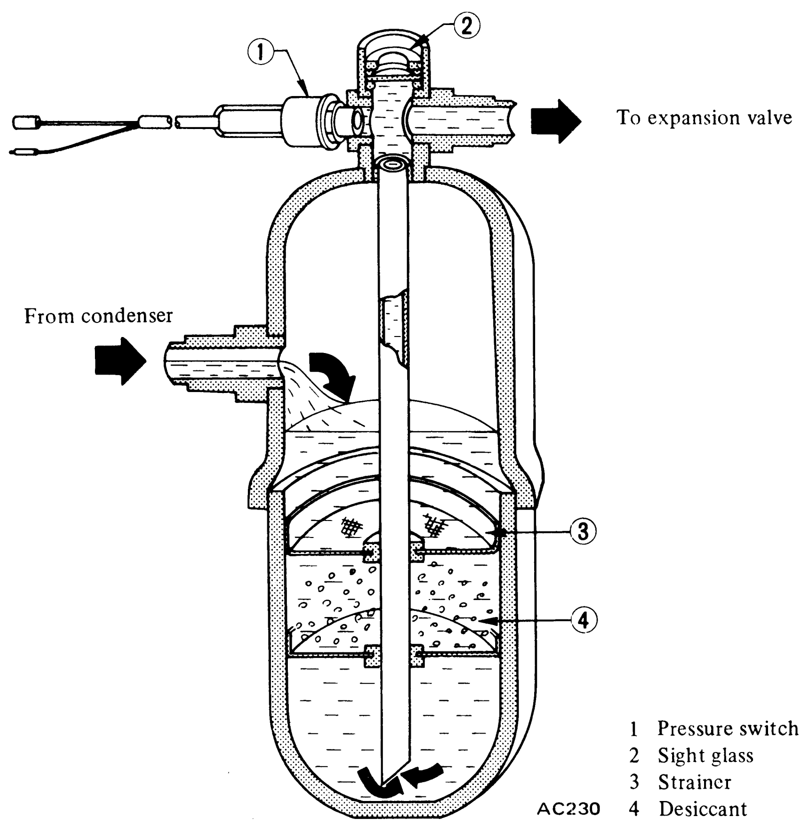
Fig. AC-4 Compressor

RECEIVER DRYER

The receiver dryer serves the purpose of storing the liquid refrigerant. The amount of the liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver dryer stores excess amount of refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus maintaining the optimum flow of refrigerant within the system.

The receiver dryer includes a strainer and desiccant. They have the job of removing moisture and foreign particles as the refrigerant circulates within the system.

The pressure switch is installed beside sight glass of receiver dryer. The purpose of the switch is to stop the compressor operation in the event an excessive system pressure builds up on the high pressure lines.



1 Pressure switch
2 Sight glass
3 Strainer
4 Desiccant

Fig. AC-5 Receiver dryer

COOLING UNIT

The cooling unit includes an evaporator and an expansion valve. From the electrical point of view, the cooling unit consists of a blower motor, a resistor for fan speed control and some switches and relays.

The liquid refrigerant evaporates in the evaporator with the aid of the expansion valve. Consequently the air drawn by the blower motor is cooled in passing through the evaporator.

The expansion valve restricts the liquid refrigerant as it passes through it and delivers sprayed refrigerant to the evaporator for facilitating refrigerant evaporation.

The refrigerant within the thermo bulb changes in pressure through the super heat condition of vaporized refrigerant gas which comes out of the evaporator, causing the deflection of the diaphragm. The lift of the ball valve attached to the diaphragm is changed by the deflection of the diaphragm, thus controlling the amount of refrigerant passing the orifice.

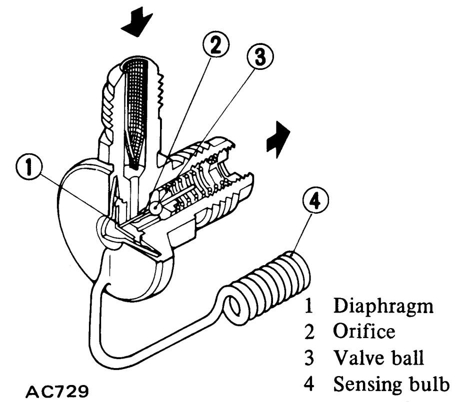


Fig. AC-6 Expansion valve

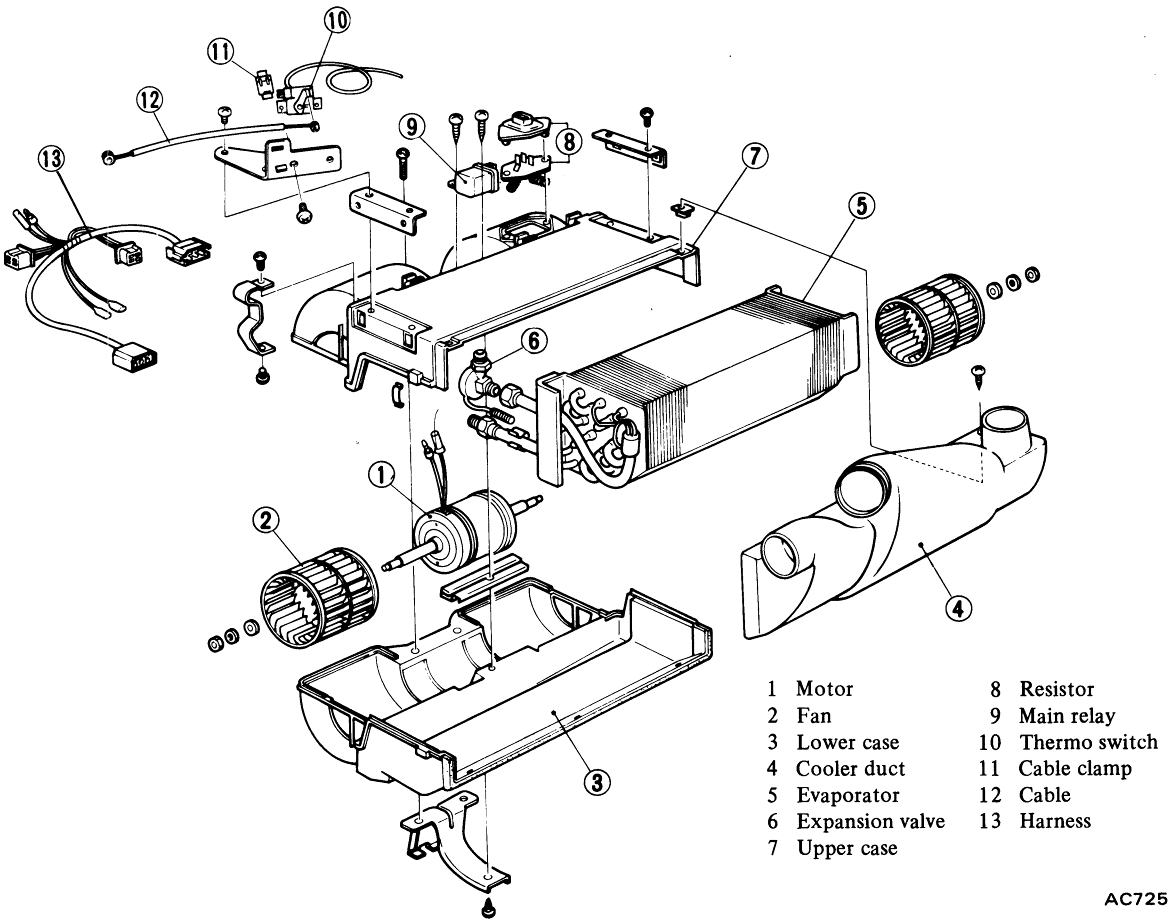


Fig. AC-7 Cooling unit

ELECTRICAL CIRCUIT

DESCRIPTION

The electrical circuit of the air conditioner consists of four switches, two relays, a solenoid valve, a fan motor and a compressor magnetic clutch.

The following wiring diagram provides a complete description of the whole circuit.

When the ignition switch and the fan switch are ON, the main relay is activated, causing battery power to flow through the fan motor and the magnetic clutch. The magnetic clutch is activated by the thermo switch, pressure switch and compressor relay. The blower motor fan speed is controlled by the fan switch and resistor. The solenoid valve is also activated. This in turn causes the fast idle control device (F.I.C.D.) to increase engine speed when the vehicle is at rest with the engine ON.

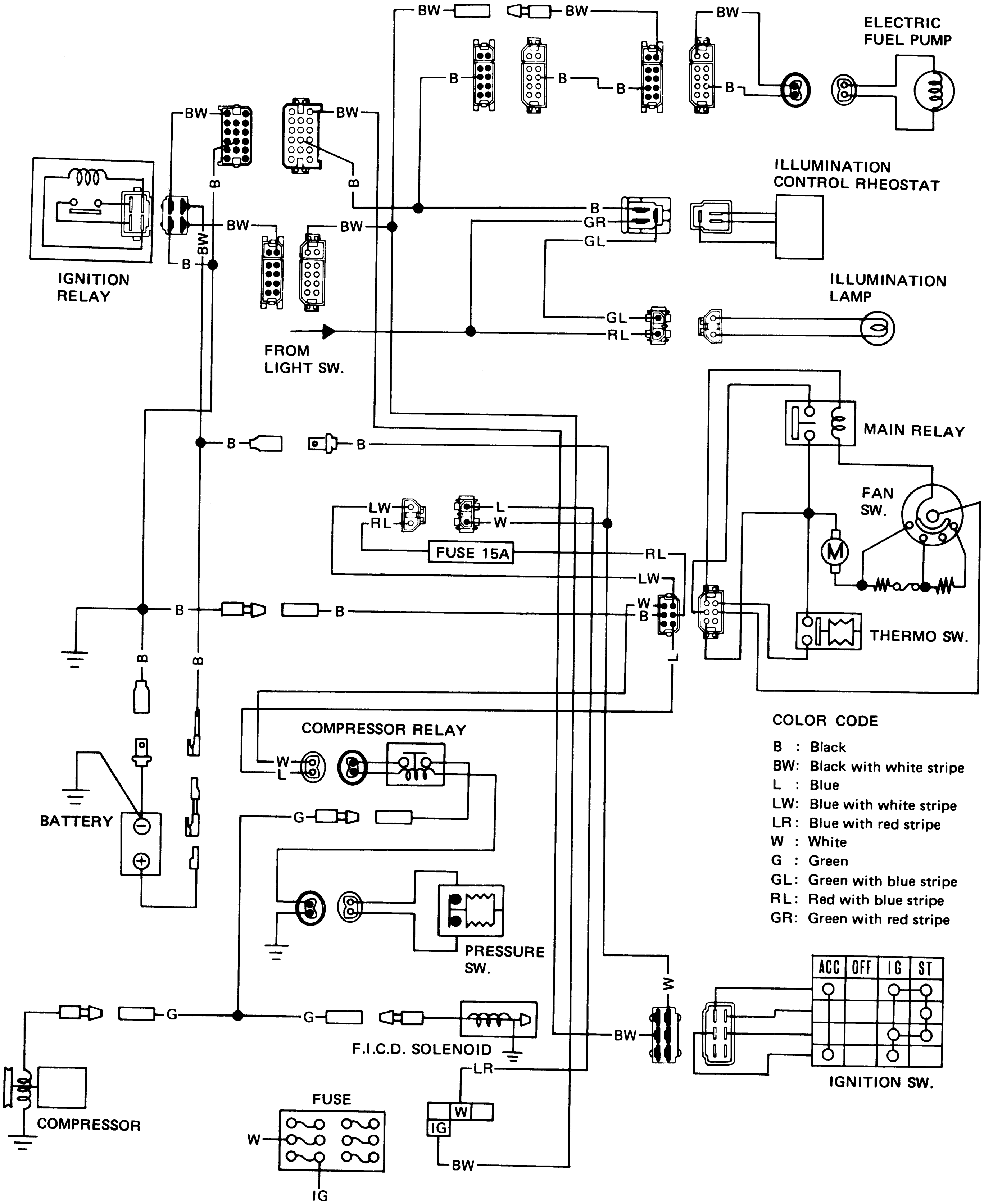


Fig. AC-8 Wiring diagram of air conditioner system

MAIN RELAY

The main relay is located on the cooling unit.

When the ignition switch and fan switch are both turned on, the contacts in the relay are closed. Then electrical power from the battery is supplied to the blower motor and the electrical clutch for the compressor.

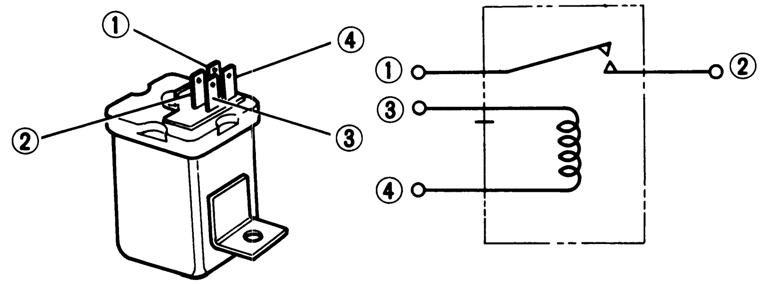


Fig. AC-9 Main relay

FAN SWITCH

The fan switch, serving as a control unit, is installed on the center console. This switch controls the blower motor speed through the resistor. It is also used as a main relay switch.

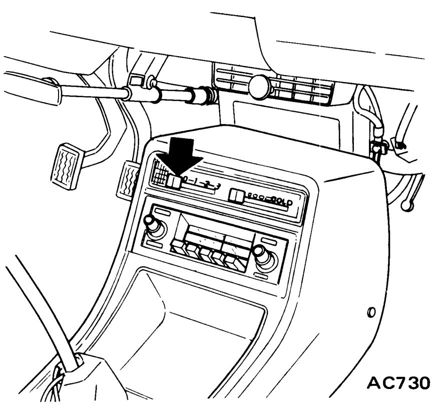


Fig. AC-10 Fan switch

THERMO SWITCH

The thermo switch is located on the upper side of the cooling unit and is controlled by the cable and the control lever attached to the console box.

It is so designed that when the air passing through the evaporator core is cooled down to the predetermined temperature (set by the control lever), it automatically turns off. When the switch is turned off, the magnetic clutch is turned off, stopping the flow of refrigerant inside the cooling system and increasing the cooling system temperature.

When the air rises to the predetermined temperature, the thermo switch automatically turns on. In this way, the temperature of the air discharged from the cooling unit is automatically controlled as desired.

PRESSURE SWITCH

The pressure switch is turned off when refrigerant pressure in the cooling system rises to an abnormally high level [28 kg/cm^2 (398 psi)]. This in turn turns off the compressor magnetic clutch, actuating the compressor relay and gradually decreasing pressure in the cooling system. When the pressure drops to or below 24 kg/cm^2 (341 psi), the pressure switch again turns on.

Thus, cooling system refrigerant pressure is automatically maintained at the proper value at all times.

COMPRESSOR RERAY

The compressor relay is attached to the receiver dryer bracket on the right side of the engine compartment. This relay is actuated by the fan switch, thermo switch and pressure switch to turn on and off the compressor magnetic clutch.

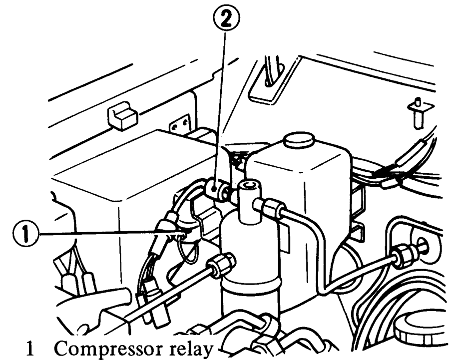


Fig. AC-11 Pressure switch and compressor relay

F.I.C.D. SOLENOID VALVE

The F.I.C.D. solenoid valve is attached to the dash panel in the engine compartment. This valve supplies vacuum to the F.I.C.D. diaphragm through the vacuum hose connected to the engine intake manifold when the engine is at idle and the cooling system is ON, thereby raising idle speed to the predetermined rpm (800).

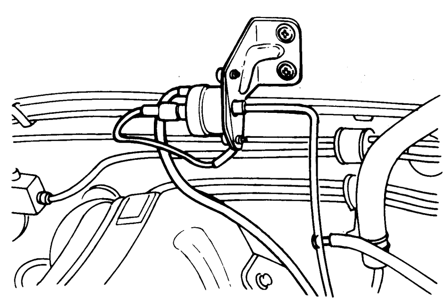


Fig. AC-12 F.I.C.D. solenoid valve

GENERAL SERVICE

CONTENTS

REFRIGERANT R-12 .... AC- 8
COMPRESSOR OIL .... AC- 8
MAINTENANCE .... AC- 8
PERIODIC MAINTENANCE AND SEASON-IN INSPECTION .... AC- 8
GENERAL SERVICE INSTRUCTION .... AC- 8
SAFETY PRECAUTIONS .... AC- 9
EVACUATING AND CHARGING SYSTEM .... AC- 9
HANDLING MANIFOLD GAUGE .... AC- 9
HANDLING SERVICE VALVE AC-10
HANDLING CAN TAP AC-11
DISCHARGING SYSTEM AC-12
EVACUATING SYSTEM AC-12
CHARGING REFRIGERANT AC-13
CHECKING FOR LEAKS AC-15
HALIDE LEAK DETECTOR AC-15
ELECTRIC LEAK DETECTOR AC-16
REFRIGERANT LEVEL CHECK AC-16
SIGHT GLASS AC-16
PERFORMANCE TEST AC-17
COMPRESSOR OIL LEVEL CHECK AC-17
PERFORMANCE TEST AC-17
REFRIGERANT LEAKS AC-18

REFRIGERANT R-12

The refrigerant used in the air conditioner is generally called "Refrigerant-12 (R-12)". No other refrigerant than the above refrigerant should be used.

This refrigerant is usually available in a small can or a cylinder. In either case, it is liquefied under high pressure in the container.

Refrigerant evaporates easily (has a low evaporation point) and, moreover, since the latent heat of the refrigerant is large, it can absorb a large amount of heat when evaporating. Extreme care must be exercised when handling the refrigerant.

COMPRESSOR OIL

The "SUNISO 5GS" or "SUNISO 351" should be used as refrigeration lubricant.

Mixing of the two is allowable.

The refrigeration lubricant should be used to assure the successful compressor operation. Use of oils other than recommended or mixing of the oil with other oils would cause chemical reaction or lead to lowered viscosity or deficient lubrication.

The oil absorbs moisture as it contacts the air. This points out the need for care not to expose it to atmosphere for an extended period of time.

MAINTENANCE

PERIODIC MAINTENANCE AND SEASON-IN INSPECTION

Both periodic maintenance and season-in inspection are most essential to enable the air conditioner to give full performance.

Perform the following checks.

1. Start engine and check refrigerant level through sight glass on receiver dryer. For details, refer to relative topics under "Refrigerant Level Check".
2. Check the entire system for sign of refrigerant leaks. Refer to relative topics under "Checking for Leaks" and "Refrigerant Leaks".

If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking. This condition can be corrected easily by retightening the joints. If any joint on line is suspected of small amount of leakage, use a leak detector to locate leaking points.

3. Check compressor drive belts for proper deflection.

Season-off

Observe the following maintenance tips to allow the air conditioner to operate normally in the next season.

1. Keep the entire system free from refrigerant leakage by periodically checking for refrigerant gas leak even out of season.
2. Turn the compressor for 10 minutes at least once a month by running the engine at 1,500 rpm.

GENERAL SERVICE INSTRUCTION

The servicing of the air conditioner should be carried out only by well-trained servicemen. This chapter describes essential points of servicing.

- If a large amount of dirt and sand enter the system, they will be carried with refrigerant and may clog the system or scratch rotating parts. This points out the need for care in servicing the system. That is, disconnecting joints should be carried out in a clean place.
- Water should not be allowed to get inside the system. The refrigerant does not readily mix with water. However, the presence of even a minute amount of water will cause a chemical reaction at high temperature which will in turn produce hydrochloric acid (HCl). Since hydrochloric acid is highly corrosive to metals, the aluminum and copper piping, etc. will become corroded and the refrigeration system will become clogged.

- Water in the system will ice the orifice when the high pressure refrigerant is changed to low pressure refrigerant by expansion valve, etc., and will obstruct the refrigerant flow.

The following items are general instructions to be closely observed in servicing the system.

1. When a system line is disconnected, plug the opening immediately. This is especially necessary to prevent moisture condensation from forming in the line and to keep out dirt and dust. It is also necessary to keep the line at and above surrounding air temperatures at all times. When connecting system lines, do not attempt to remove the plug from the opening until ready for immediate use.
2. Always keep the working place clean and dry and free from dirt and dust. Wipe water off with a clean cloth.
3. Have all necessary tools in preparation beforehand and have tools clean and dry.
4. The compressor oil will easily absorb moisture when exposed to air. Immediately close the opening of the container after use. It is also necessary to observe the following notes:

Note:

a. The oil should not be transfused from a container into another, as the failure will possibly cause moisture to mix with the oil.

b. The used oil should not be returned into a container.

c. The oil should not be used if its state of preservation is not clear enough.

5. When connecting or disconnecting pipes from the refrigeration system, use two wrenches. One wrench is used for holding the fixing nut in place while the other for turning the mating flare nut. Failure to do so may result in a twisted tube or may damage connection.
6. Also use care not to give scratches to the seating surface at connections. A small scratch on the seating surface may be the cause of gas leakage. Before connecting pipes, be sure to give coating of compressor oil to the seating surfaces.

SAFETY PRECAUTIONS

1. Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. **Wear gloves or wrap a piece of cloth around service valve to protect your fingers against frostbite by refrigerant.** If any of the refrigerant should get into your eyes when charging the refrigerant, splash your eyes with cool water to raise the temperature gradually. Apply a protective film to the eye to avoid infection. Do not rub your eyes. Consult an eye specialist. **Always wear goggles or glasses to protect your eyes when working around the system. Should refrigerant strikes your body, splash on cool water and apply a protective film.**
2. The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, **always follow the instructions on the label. In particular, never store it in a hot location [above 52°C (125°F)] or drop it from a high height.**
3. The refrigerant gas is odorless and colorless and breathing may become difficult due to the lack of oxygen. Since the refrigerant gas is heavier than air and will lay close to the floor, be especially careful when handling it in small, confined spaces.
4. The refrigerant itself is nonflammable. **However, a toxic gas (phosgene gas) is produced when it contacts fire and special care is therefore required when checking for leaks in the system with a halide torch.**
5. Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.

The above precautions are essential in handling of Refrigerant-12, and their strict observation requires sufficient training. Therefore, it is of first importance that any other personnel than a well-trained serviceman should not be allowed to handle the refrigerant.

EVACUATING AND CHARGING SYSTEM

During servicing, use caution to keep air from getting into refrigerant. When air enters the system, all refrigerant must be evacuated from system prior to charging new refrigerant. Air in refrigerant has the following deleterious effects:

1. Since the condensation temperature of the air is extremely low, the air will not be condensed when refrigerant gas is condensed in the condenser, and the air will thus remain in gaseous form. Consequently, the effective thermal transmission area of condenser for refrigerant gas will be reduced and refrigerant gas to be condensed will be reduced. The pressure rise will become proportional to the volume of the air in system.
2. When air and refrigerant are mixed in system, a chemical reaction will be produced and hydrochloric acid which will adversely affect the aluminum, copper, iron, and other materials in system may be generated.

HANDLING MANIFOLD GAUGE

The pressure at the high- and low-sides of system should be measured when evacuating and charging refrigerant and when diagnosing trouble in the system. The manifold gauge is used for these purposes. A manifold gauge has two pressure gauges; a low pressure gauge and a high pressure gauge. These gauges are connected to the high- and low-side service valves of system through flexible charging hoses. The construction of manifold gauge is shown in Figure AC-13.

When valve stem is fully screwed, the valve is front-seated and valve path and the center path are blocked. When valve stem is backed off, the paths are opened.

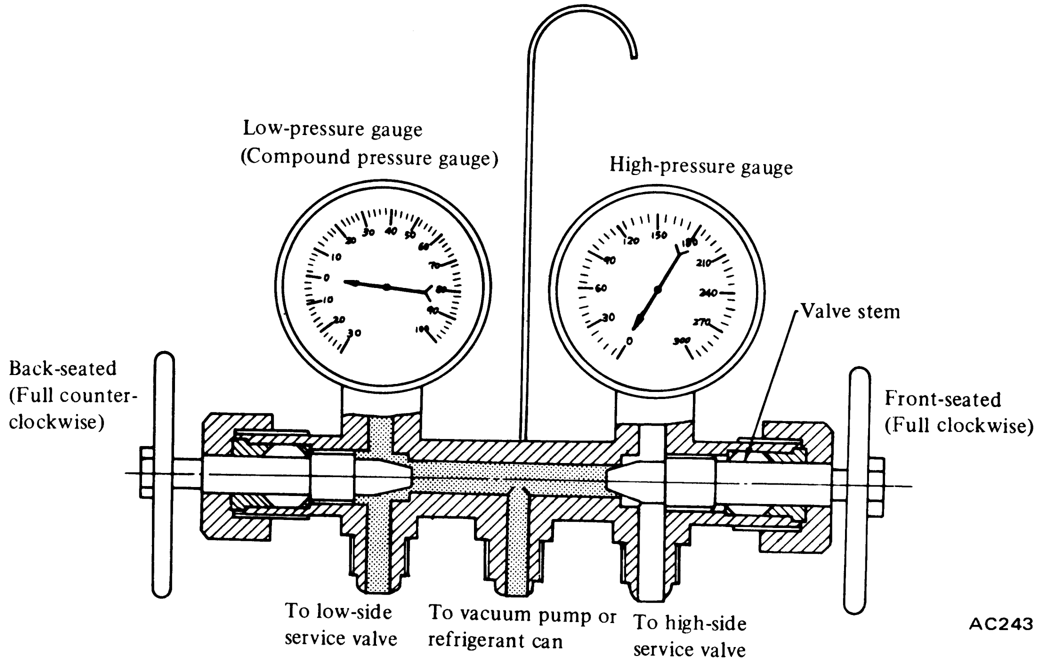


Fig. AC-13 Manifold gauge

Connection to service valve

1. Fully close both valves of manifold gauge. Connect high- and low-pressure charging hoses to manifold gauge.
2. Remove caps from service valves. Connect high- and low-pressure charging hoses to service valves in system. The refrigerant gas will be discharged since check valve is open when pressing charging hose onto service valve.
3. Next, loosen the connection fitting of charging hose at manifold gauge side for 2 to 3 seconds to purge any air inside charging hose by the pressurized gas in system.

Disconnection from service valve

1. Fully close both valves of manifold gauge.
2. Disconnect two charging hoses from service valves. At this time, the gas will be discharged until check valve is closed. Therefore, disconnect hose quickly.

WARNING:
Work with fingers protected with cloth against frostbite by refrigerant.

HANDLING SERVICE VALVE

An automatic check valve is built into service valve. When this valve presses against the connection fitting, that is, when charging hose is connected to service valve, the valve is open. When charging hose is disconnected, the valve is closed automatically. Always observe the following usage precautions:

1. Always install valve cap after using service valve.

When high speed operation is performed without valve cap, a negative pressure will gradually build up at the low pressure side of system and air may be sucked in. In addition, dirt and dust will easily enter the valve resulting in foreign matter entering the system.

2. Check valve will be half opened during connection and disconnection of charging hoses and refrigerant will be forcefully discharged. Therefore, connect and disconnect charging hoses quickly while pressing flare nut of charging hose against service valve.

WARNING:
Work with fingers protected with cloth against frostbite by refrigerant.

3. Since close contact between the thread of valve cap and the thread of service valve will prevent gas leakage, keep these sections clean and free of scratches and damage.
4. Since packing of charging hose will be lost during long use, always check packing prior to installing charging hose.

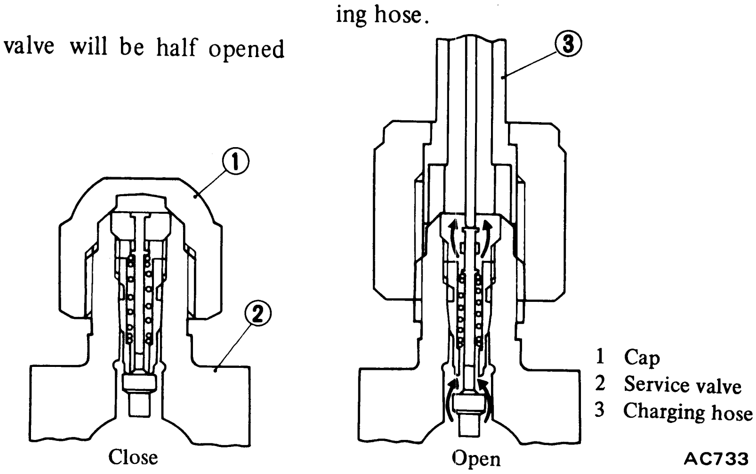


Fig. AC-14 Service valve

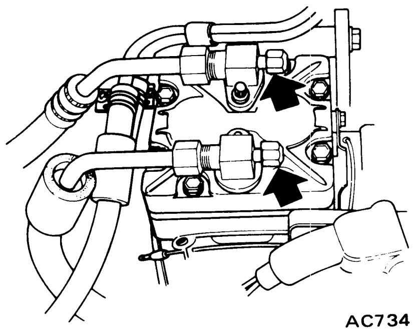


Fig. AC-15 Service valve

HANDLING CAN TAP

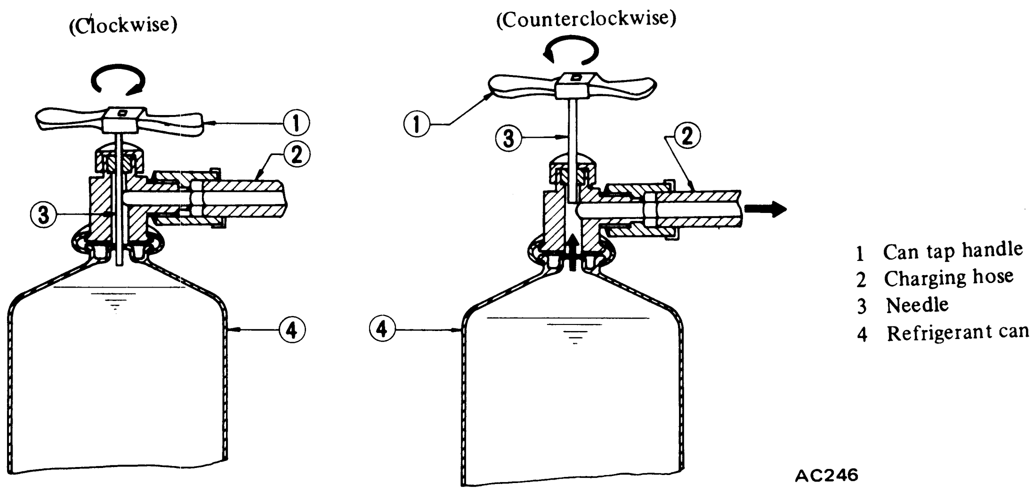
A wide variety of can taps are available. The following procedures apply to conventional can taps.

For the correct usage, refer to the manufacturer's instructions.

CAUTION:
Use can tap of good quality.

---

1. Connect charging hose to the center fitting of manifold gauge. At this time, confirm that both stems are fully turned in (front-seated).
2. Turn can tap handle fully counterclockwise so that the needle is pulled up.
3. Attach can tap to refrigerant can firmly.
4. Turn can tap handle fully clockwise to make a hole in refrigerant can.
5. Turn the handle fully counterclockwise to raise the needle. Refrigerant gas will flow up to the center fitting of manifold gauge.
6. Loosen the connection at the center fitting of manifold gauge for a few seconds to purge air inside charging hose. See Figure AC-16.



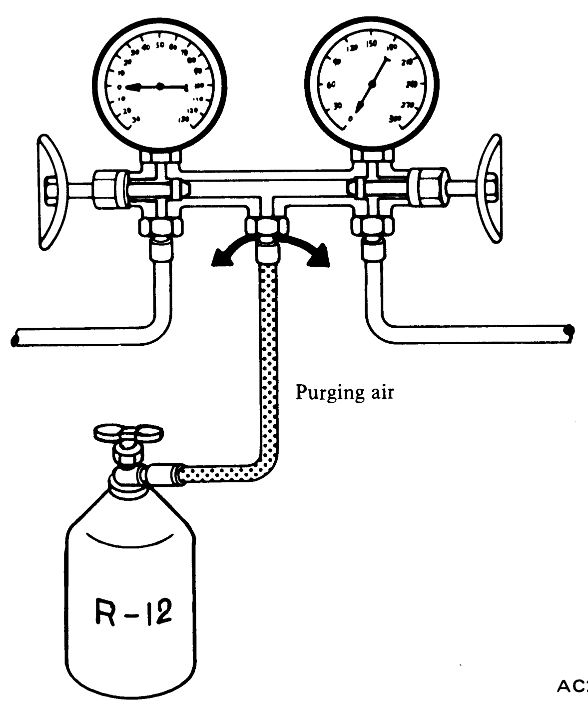


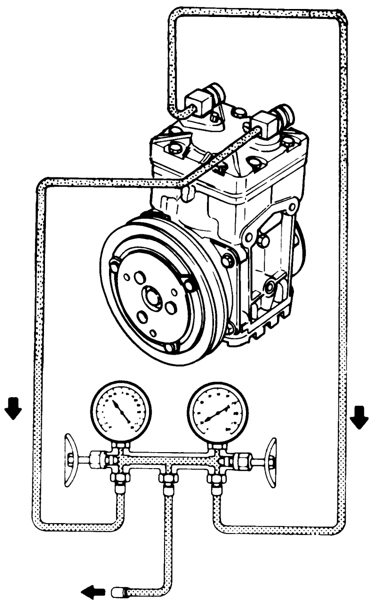
Fig. AC-16 Can tap and purging air

DISCHARGING SYSTEM

The pressurized refrigerant gas inside system must be discharged to a pressure approaching atmospheric pressure prior to evacuating refrigerant inside system. This operation should be made to permit safe removal when replacing system components.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service valves.
3. Open both manifold gauge valves slightly and slowly discharge refrigerant from system. See Figure AC-17.

CAUTION:
Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.



AC735

Fig. AC-17 Discharging system

WARNING:
Protect fingers with cloth against frostbite by refrigerant when connecting the charging hose to the service valve or disconnecting it therefrom.

EVACUATING SYSTEM

1. Connect high- and low-pressure charging hoses of manifold gauge to their respective service valves of system and discharge refrigerant from system. Refer to "Discharge System".
2. When refrigerant has been discharged to a pressure approaching atmospheric pressure, connect center charging hose to a vacuum pump.
3. Close both valves of manifold gauge fully. Then start vacuum pump.
4. Open low-pressure valve and suck old refrigerant from system. See Figure AC-18.
5. When low-pressure gauge reading has reached to approximately 500 mm Hg (20 in Hg), slowly open high-pressure valve. See Figure AC-19.
6. When pressure inside system has dropped to 710 mm Hg (28 in Hg), fully close both of valves of manifold gauge and stop vacuum pump. Let stand it for 5 to 10 minutes in this state and confirm that the reading does not rise.

Note:

a. **The low-pressure gauge reads lower by 25 mm Hg (1 in Hg) per a 300 m (1,000 ft) elevation. Perform evacuation according to the following table.**

Elevation m (ft)	Vacuum of system mm Hg (in Hg)
0 (0)	710 (28)
300 (1,000)	685 (27)
600 (2,000)	660 (26)
900 (3,000)	635 (25)

Note: **Values show readings of the low-pressure gauge.**

b. **The rate of ascension of the low-pressure gauge should be less than 25 mm Hg (1 in Hg) in five minutes.**

If the pressure rises or the specified negative pressure can not be obtained, there is a leak in the system. In this case, immediately charge system with refrigerant and repair the leak described in the following.

(1) Confirm that both valves of manifold gauge are fully closed and then disconnect center charging hose from vacuum pump.
(2) Connect center hose to can tap in place of vacuum pump. Attach refrigerant can to can tap and pass refrigerant to manifold gauge.
(3) Loosen the connection of center fitting of manifold gauge to purge air from center hose.
(4) Open low-pressure valve of manifold gauge and charge refrigerant into system. After one can [about 0.4 kg (1 lb)] of refrigerant has been charged into system, close low-pressure valve.
(5) Check for refrigerant leakage with a leak detector. Repair any leakages found. Refer to "Checking for Leaks" and "Refrigerant Leaks".
(6) Confirm that both valves of manifold gauge are fully closed and then change center charging hose from can tap to vacuum pump.
(7) Open high- and low-pressure valves and operate vacuum pump to suck refrigerant from system. When the pressure in system has dropped to 710 mm Hg (28 in Hg), fully close both valves of manifold gauge.

7. The above operation completes evacuation of system. Next, charge refrigerant. Refer to "Charging Refrigerant".

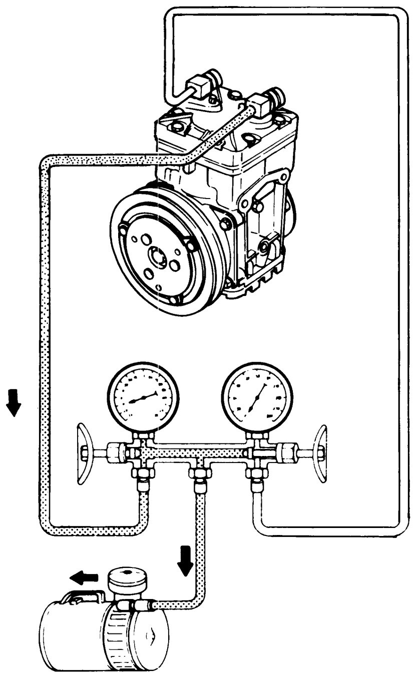


Fig. AC-18 Evacuating system - First step

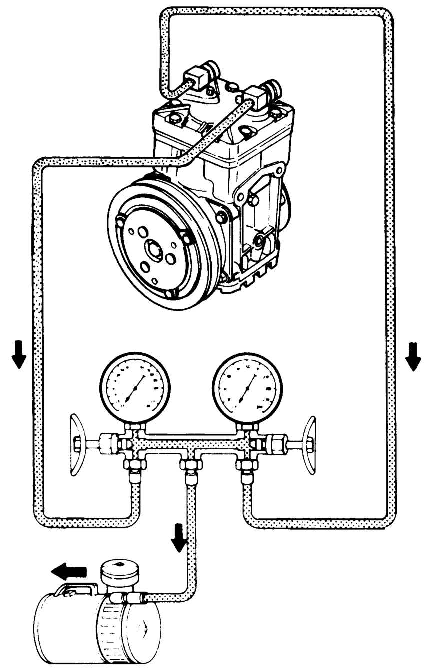


Fig. AC-19 Evacuating system - Second step

CHARGING REFRIGERANT

1. Install manifold gauge to system. Refer to "Handling Manifold Gauge".

Note:

a. Be sure to purge air from the high- and low-pressure charging hoses.

b. If air is mixed with refrigerant gas in system, evacuation of system should be performed. Refer to "Evacuating System".

2. Attach center charging hose of manifold gauge to refrigerant can through can tap. Break seal of refrigerant can to allow refrigerant to enter manifold gauge. Loosen charging hose at the center fitting of manifold gauge and purge air from inside charging hose. Refer to "Handling Can Tap".

3. Open high- and low-pressure valves of manifold gauge and charge refrigerant into system. See Figure AC-20.

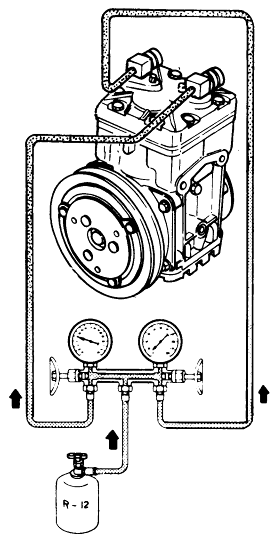


Fig. AC-20 Charging refrigerant

WARNING:
When refrigerant charging speed is slow, immerse refrigerant can in water heated to a temperature of about 40°C (104°F). However, note that this is dangerous when water is hot. See Figure AC-21.

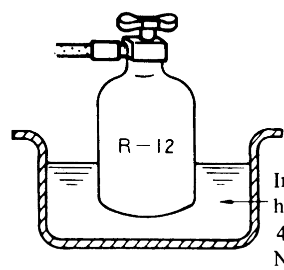


Fig. AC-21 Heating refrigerant

WARNING:
a. Under any circumstances the refrigerant can must not be warmed in water heated to a temperature of over 52°C (125°F).
b. A blow torch or stove must never be used to warm up the can.
c. When charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high pressure valve, but not through low-pressure valve. After completion of charging, the compressor should always be turned several times manually. See Figure AC-22.

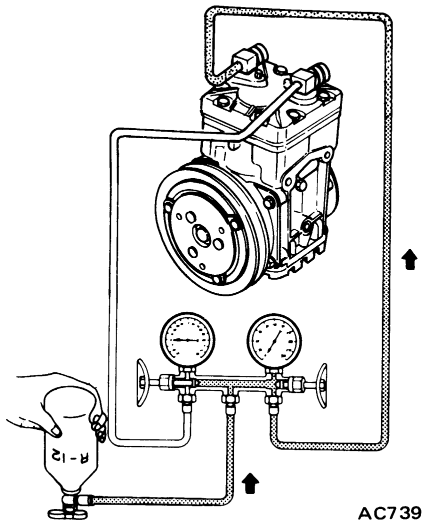


Fig. AC-22 Charging refrigerant - First step

4. If refrigerant charging speed slows down, charge it while running the compressor for ease of charging. After having taken the steps up to (3) above, proceed with charging in the following order.

(1) Shut off high pressure valve of manifold gauge.

WARNING:
Never charge refrigerant through high pressure side of system since this will force refrigerant back into refrigerant can and can may explode.

(2) Run the engine at idling speeds about 1,500 rpm.

(3) Set the temperature control lever and fan switch at maximum cool and maximum speed respectively.

(4) Charge refrigerant while controlling low-pressure gauge reading at 2.8 kg/cm² (40 psi) or less by turning in or out low-pressure valve of manifold gauge. See Figure AC-23.

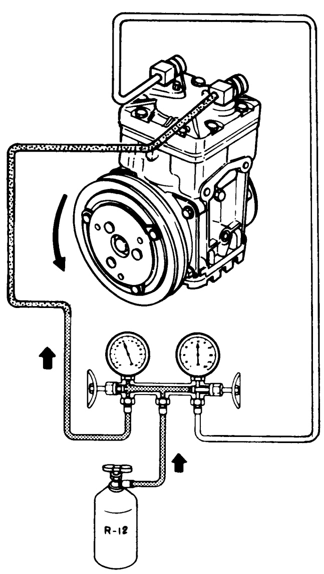
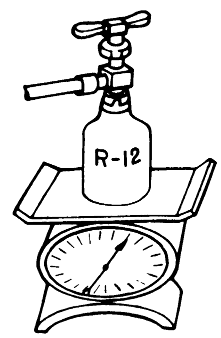


Fig. AC-23 Charging refrigerant - Second step

5. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can with a new one.

Before opening manifold gauge valve to charge refrigerant from new can, be sure to purge air from inside charging hose.

6. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.



Measure the amount of charged refrigerant with a scale.
Make a note of the amount charged from can.

Fig. AC-24 Measuring refrigerant

Refrigerant capacity

Unit: kg (lb)

Refrigerant	Minimum	Maximum
R-12	0.7 (1.5)	0.9 (2.0)

Note: The presence of bubbles in sight glass of receiver dryer is an unsuitable method of checking the amount of refrigerant charged in system. The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure. Refer to "Refrigerant Level Check".

7. After the specified amount of refrigerant has been charged into system, close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap to service valve.
8. Confirm that there are no leaks in system by checking with a leak detector.
Refer to "Checking for Leaks".

Note: **Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to "Performance Test".**

CHECKING FOR LEAKS

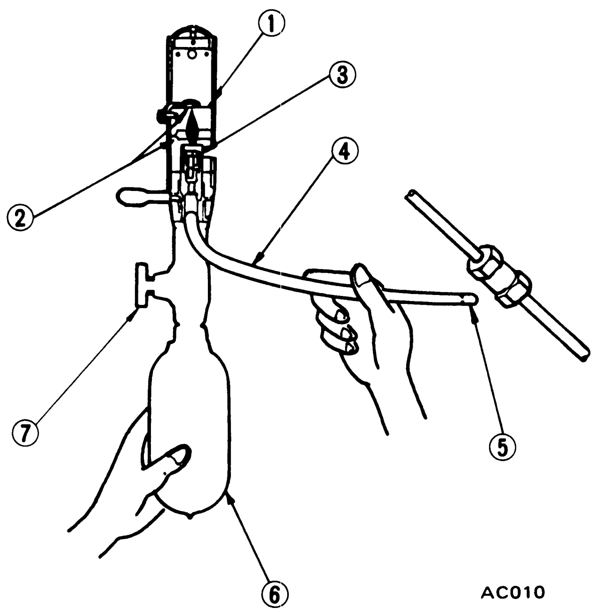
Conduct a leak test whenever leakage of refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening of connection fittings.

Refrigerant is a colorless, odorless gas and leakage from system is difficult to detect. Accordingly, the use of a leak detector facilitates check for leaks. Two methods of checking are available; one employs a halide leak detector which burns propane gas or butane gas and the other is an electric type leak detector.

HALIDE LEAK DETECTOR

Since the propane leak detector and butane leak detector are the same in respect to their operation, this section describes the operation of the propane leak detector.

The copper screen is heated by the burning of propane. Refrigerant gas decomposes to color the flame when it contacts the heated screen. The gas to be checked is drawn into the sampling tube and sent out to the burner. A refrigerant leak can clearly be detected by variations in the color of the flame.



1 Copper reaction plate
2 Flame adjusting lines
3 Burner
4 Sampling tube
5 Strainer
6 Gas bomb
7 Flame adjuster

Fig. AC-25 Checking for leaks

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

1. Discharge refrigerant in one or two seconds to ascertain that system has a sufficient pressure needed for leak detection. Charge with 0.4 kg (1 lb) of refrigerant, if necessary.
2. Light leak detector. Adjust the height of the flame between flame adjusting lines at the top and bottom of combustion tube. A reaction plate will immediately become red hot.
3. Place the end of sampling tube near the point of the suspected leak in system.

Note:
a. **Since refrigerant gas is heavier than air, small leaks can be easily detected by placing sampling tube directly below the check point.**
b. **Suitable ventilation is required. If refrigerant gas is mixed with the surrounding air, leak detector will always indicate a response and detection of the actual leak will be difficult.**
c. **Never hold leak detector at an angle.**

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

4. The flame will be almost colorless when there is no refrigerant gas being burned. When there is a small refrigerant gas leak, the flame will be green or yellowgreen. When refrigerant gas leakage is large, the flame will be brilliant blue or purple. Since the color of the flame will be yellow when dust is being burned or there is aging scale on copper reaction plate, always keep the strainer of sampling tube and reaction plate clean.
5. Major check points

(1) Compressor
- Compressor shaft seal (rotate the compressor by hand)
- Oil filler plug
- Flexible hose connections
- Rear cover and side cover gaskets.
- Service valve

(2) Condenser
- Condenser pipe fitting

- Condenser inlet and outlet pipe connections

(3) Piping
- Flared section of high pressure and low pressure flexible hose.
- Pipe connections
- Service valve

(4) Evaporator housing
- Inlet and outlet pipe connections
- Expansion valve

ELECTRIC LEAK DETECTOR

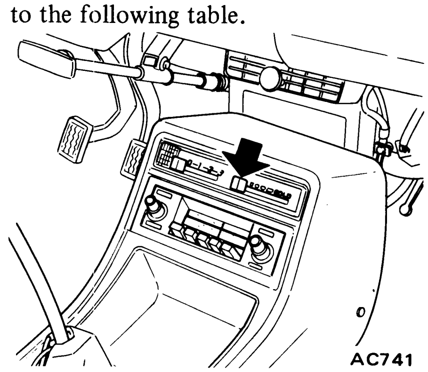
For the operational procedures, refer to the instructions furnished with each electric leak detector.

REFRIGERANT LEVEL CHECK

SIGHT GLASS

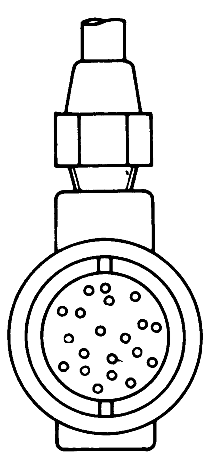
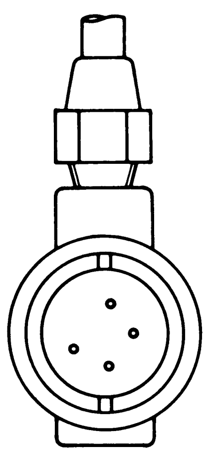
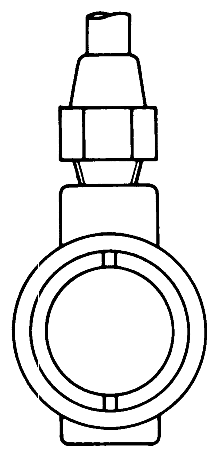
Sight glass is provided at the top of receiver dryer. One guide for whether there is enough refrigerant in system is given by observing refrigerant flow through sight glass. However, this method is unsuitable for judging the amount of refrigerant. The correct refrigerant level can be judged by measuring the system pressures in accordance with the procedures as described "Performance Test".

1. Start the engine and hold engine speed at 1,500 rpm.
2. Set temperature control lever to maximum position.
3. Set blower to maximum speed.
4. Check sight glass after the lapse of about five minutes. Judge according to the following table.



AC741

Fig. AC-26 Temperature control lever

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

Note:

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

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

PERFORMANCE TEST

Check for the amount of refrigerant in the system can be made by measuring pressure on discharge side.

The correct amount of refrigerant is in the system, if pressure on the discharge side is within the specified range. For details, refer to "Performance Test" described later.

Overcharging will show up in higher pressure on discharge side.

COMPRESSOR OIL LEVEL CHECK

The oil used to lubricate compressor circulates into system from the oil sump while compressor is operating. Therefore, to correctly measure compressor oil, the amount of oil flowing to system must be considered. If a considerable amount of leakage of refrigerant gas happens, the leakage of compressor oil is also considered. There will be no compressor oil leakage from a completely sealed system. When system operates under satisfying condition, the compressor oil level check is unnecessary.

When checking the level of compressor oil or when replacing any component part of the system, use the following service procedure. This facilitates to return oil to compressor.

1. Operate compressor at engine idling speed (1,000 rpm or below) with controls set for maximum cooling and high blower speed for 10 to 15 minutes in order to return compressor oil to compressor.
2. Stop the engine and discharge refrigerant of system and then remove compressor from the vehicle.
3. Remove compressor filler plug. Drain compressor oil from compressor oil sump and measure the amount.
4. Compressor oil is satisfactory if the following amount of oil remains in the compressor.

   Residual oil:
   85 to 128 gr (3 to 4 ½ oz)

5. Check the cleanliness of the oil. If the oil contains chips or other foreign material, clean oil sump with new oil.
6. Discard the used oil and fill with the same amount of new oil. Add oil if found less than above amount.

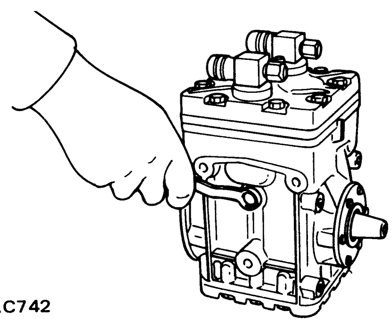

AC742

Fig. AC-27 Filler plug

If compressor is inoperative due to faulty compressor or heavy loss of refrigerant, remove compressor and repair as necessary. Then pour oil up to correct level and install on engine. After above steps have been completed, recheck oil level; drain oil to correct level if level is excessively high.

PERFORMANCE TEST

The cooling performance of the air conditioner changes considerably with changes in surrounding conditions. Testing must be performed using the correct method. This test is used to judge whether system is operating correctly and can also be used as a guide in checking for problems.

1. Park the vehicle indoors or in the shade.
2. Open all the windows of the vehicle fully. However, close the doors.
3. Open the hood.
4. Connect manifold gauge to high- and low-side service valves of the system. Refer to "Handling Manifold Gauge".
5. Set fan control lever to maximum.
6. Set temperature control lever to max. cool position.
7. Start the engine and hold engine speed at 1,500 rpm.
8. After the air conditioner has been operated for about 10 minutes, measure system pressures at high-pressure (discharge) side and low-pressure (suction) side.
9. Measure the temperature of discharge air at outlet grille.
10. Measure the temperature of cabin.
11. Measure ambient temperature and humidity one meter (3.3 ft) away from condenser front. Be careful not to expose dry bulb and wet bulb to direct sunlight.
12. Check for any abnormalities by comparing the test results with standard pressure in "Performance Chart".

Note:

a. **The pressure will change in the following manner with changes in conditions:**
   - **When blower speed is low, discharge pressure will drop.**
   - **When the relative humidity of intake air is low, discharge pressure will drop.**

b. **The temperature will change in the following manner with changes in conditions:**
   When the ambient air temperature is low, the outlet air temperature will become low.

If the test reveals that there is any abnormality in system pressure, isolate the cause and repair by reference to the "Trouble Diagnoses and Corrections".

REFRIGERANT LEAKS

If leaks are noticeable, leaky parts should be repaired. Then system should be filled with refrigerant. **Do not operate compressor with refrigerant level excessively low.**

If this caution is neglected, a burnt compressor will result since heavy loss of refrigerant usually indicates heavy loss of compressor oil.

If system has been exposed to atmosphere for an extended period of time, receiver dryer must be replaced. If leaks are slight and no air is present in system, add refrigerant as necessary.

To detect leaks, refer to relative topics under "Checking for Leaks". Here is how leaks are stopped.

1. Check torque on the connection fitting and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been retightened, discharge refrigerant from system, disconnect the fittings, and check its seating face for damage. Always replace even if damage is slight.
3. Check compressor oil and add oil if required.
4. Charge refrigerant and recheck for gas leaks. If no leaks are found, evacuate and charge system.

TROUBLE DIAGNOSES AND CORRECTION

CONTENTS

COOLING DIAGNOSES AC-19
FUNCTION TEST AC-20
STANDARD PERFORMANCE AC-20
PERFORMANCE TEST DIAGNOSES AC-21
COMPRESSOR DIAGNOSES.................. AC-22
NOISE DIAGNOSES AC-23
BLOWER MOTOR DIAGNOSES AC-24

COOLING DIAGNOSES

INSUFFICIENT COOLING

Check amount of discharged air.

If OK

Check sight glass for bubbles.

Many bubbles

Check refrigeration line for leakage.

Note: If there are too many bubbles, stop compressor and check for leaks.

Then, evacuate and recharge system.

If OK

Discharge the system. Evacuate and recharge.

If leaks

Repair leaks and recharge.

No or few bubbles

Performance test (Refer to "performance test" on the following page.)

No or insufficient discharged air

Check blower

If OK

Repair cooling unit.

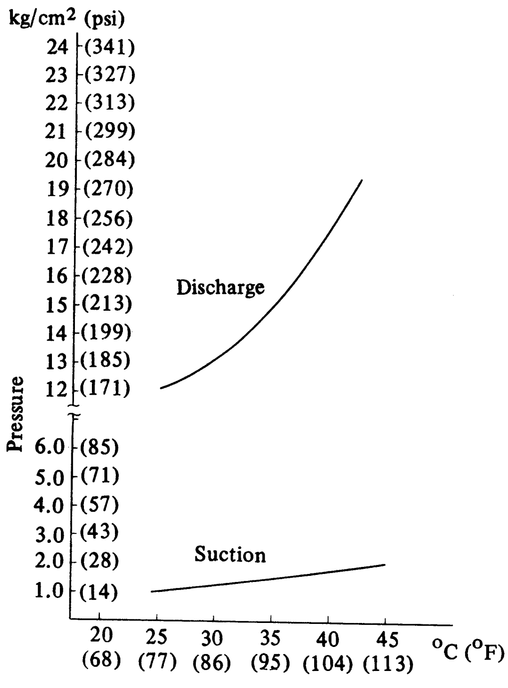
Blower stops

Refer to "Blower motor diagnoses".

FUNCTION TEST

STANDARD PERFORMANCE

The air conditioner on the model 620 has the below performance characteristics when all systems are in good condition. Compressor pressure is also indicated below.

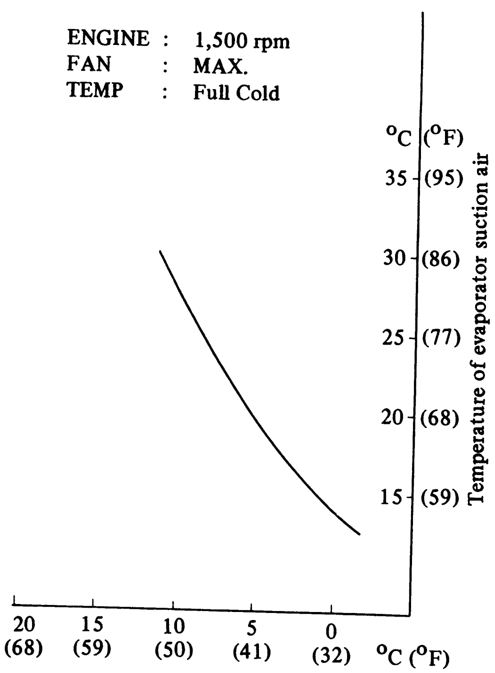


TEMPERATURE

Intake (In the cabin)	Discharged air	Pressure
16°C (61°F)	3°C (37°F)	12 kg/cm^2 (170 psi)
18°C (64°F)	5°C (41°F)	13 kg/cm^2 (185 psi)
22°C (72°F)	7°C (45°F)	15 kg/cm^2 (213 psi)
27°C (81°F)	10°C (50°F)	18 kg/cm^2 (256 psi)

Note: Engine 1,500 rpm
FAN ⟶ "3" position
TEMP ⟶ Cold (Max.)

ENGINE : 1,500 rpm
FAN : MAX.
TEMP : Full Cold



REFRIGERANT PRESSURE

Temperature (outside)	Pressure (discharge)	Pressure (suction)
25°C (77°F)	12 kg/cm^2 (171 psi)	1.0 kg/cm^2 (14 psi)
30°C (86°F)	13 kg/cm^2 (185 psi)	1.2 kg/cm^2 (17 psi)
35°C (95°F)	15 kg/cm^2 (213 psi)	1.4 kg/cm^2 (20 psi)
40°C (105°F)	18 kg/cm^2 (256 psi)	1.6 kg/cm^2 (23 psi)

PERFORMANCE TEST DIAGNOSES

Condition	Probable cause	Corrective action
Discharge air too warm		
a) Both discharge and suction pressure too high.	Air mixed with refrigerant in system.	Evacuate and charge system.
	Overcharge of refrigerant.	Discharge some of refrigerant to correct level.
	Loose fan belt or engine overheating.	Adjust fan belt or check cooling system.
	Obstructed or dirty condenser fins.	Clean exterior surface with water.
b) Both discharge and suction pressure too low	Insufficient refrigerant charge.	Add refrigerant.
c) Discharge pressure too high and suction pressure too low.	Over-filling of compressor oil.	Drain oil and correct oil level. Refer to "Compressor oil level check."
d) Suction pressure too high and discharge pressure too low.	Damaged compressor valve or packing.	Repair or replace compressor. Refer to "Compressor".
	Loose compressor drive belt.	Adjust.
	Clutch slippage.	Repair. Refer to "Compressor".
e) Discharge pressure normal and suction pressure too high.	Faulty expansion valve.	Reinstall sensing bulb correctly to keep it tight to pipe. Replace.
f) Discharge pressure normal and suction pressure too low.	Clogged expansion valve strainer.	Clean strainer.
	Water has frozen at expansion valve.	Evacuate and charge system.
	Faulty expansion valve.	Replace.
g) Suction pressure normal and discharge pressure too high.	Faults of both a) and h) exist.	
h) Both discharge and suction pressure normal. (Air conditioning is operating properly)	Air leaks from engine compartment.	Correct sealing.
Discharge air normal or too cold		
a) Discharge pressure normal and suction pressure too low.	Restricted air flow through evaporator.	Clean evaporator fins.
	Slow blower motor speed.	Check and repair blower motor and wiring.

COMPRESSOR DIAGNOSES

COMPRESSOR TROUBLE

Turn the compressor clutch wheel by hand.

If OK

Apply 12V direct current to compressor clutch.
Then, check clutch engagement.

If OK

Check voltage of lead wire for compressor on cooler cable.

If OK

Internal problem in compressor.
Repair or replace compressor.

Will not turn

Internal problem in compressor cylinder.
Repair or replace compressor.

Clutch does not engage.

Clutch is damaged.
Repair or replace clutch assembly.

No voltage

Check or repair wiring system for compressor clutch.

NOISE DIAGNOSES

NOISY

1. Set fan switch on.
2. Change the engine rpm frequently.

Detect the source of noise.

From engine compartment

Check the resonant sound when the engine rpm is changed.

No resonant sound (Compressor itself makes noise)

Repeat compressor clutch ON and OFF.
(This checking can be performed by changing engine rpm while fan switch is set at ON.)

Noisy only when clutch is engaged

- Check drive belt for slackness.
- Check for loose compressor mounting bolts.

If OK

Compressor itself makes noise.
Repair or replace compressor.

If loose

Retighten or adjust.

Noisy when clutch is not engaged

Remove compressor belt, then turn compressor pulley by hand. If noise is heard, repair compressor clutch.

Resonant sound

- Retighten compressor bracket bolt.
- If piping is resonating, add clip.

From cabin (Cooling unit)

Blower motor makes noise.
Replace or repair blower.

BLOWER MOTOR DIAGNOSES

Blower motor inoperative

Check fuse.
(In fuse block – 15A(W)
Single fuse (15A) at cooling unit)

If OK

Check the continuity and fitting of fan switch.

Blown fuse

Replace fuse.

If OK

1. Connect fan switch to wiring harness.
2. Turn the ignition switch ON(IG).
3. Set fan switch at ON (1, 2 or 3) position.

Check the voltage for blower motor.
(Blue lead wire is power source.
Blue wire with white stripe is for grounding.)

If damaged

Replace fan switch.

Voltage

Check the continuity and fitting of resistance on cooling unit

No voltage

Replace main relay

If OK

Replace blower motor.

If damaged

Replace resistance.

REMOVAL AND INSTALLATION

CONTENTS

COMPRESSOR AC-25
REMOVAL AC-25
INSTALLATION AC-26
IDLER PULLEY AC-27
FAN BELT TENSION ADJUSTMENT AC-27
REMOVAL AND INSTALLATION AC-27
INSPECTION AC-27
COOLING UNIT AC-27
REMOVAL AND INSTALLATION AC-27
DISASSEMBLY AND ASSEMBLY AC-28
INSPECTION AC-29
RECEIVER DRYER AND PIPING AC-29
REMOVAL AND INSTALLATION AC-29
INSPECTION AC-29
WIRING HARNESS AND COMPONENTS AC-30
WIRING DIAGRAM AC-30
MAINTENANCE AC-31
MAIN RELAY AC-31
COMPRESSOR RELAY AC-31
FAN SWITCH AC-31
RESISTOR FOR FAN SWITCH AC-32
THERMO SWITCH AC-32
F.I.C.D. SOLENOID VALVE AC-32

COMPRESSOR

REMOVAL

1. Remove battery.
2. Disconnect compressor lead wire at connector.
3. Loosen idler pulley lock nut, then adjusting bolt. Remove compressor drive belt from compressor pulley.

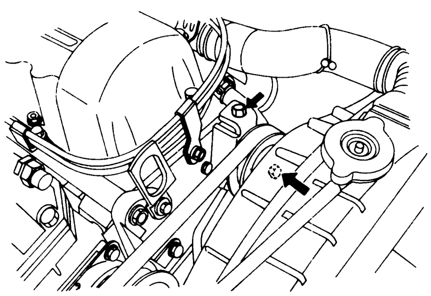


Fig. AC-28 Removing drive belt

4. Discharge system. Refer to Discharging System under General Service section.
5. Remove flexible hose fixing plate, and disconnect low and high pressure flexible hoses from compressor.

CAUTION:

a. Use two wrenches when disconnecting pipe joints.

b. Plug flexible hose and compressor joint openings immediately after disconnection to prevent entry of dust, moisture-laden air, etc.

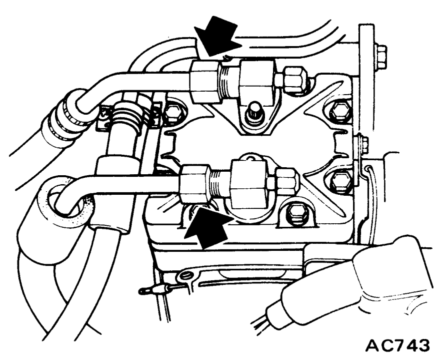


Fig. AC-29 Disconnecting flexible hoses from compressor

6. Remove bolts securing fuel tube to compressor attachment.

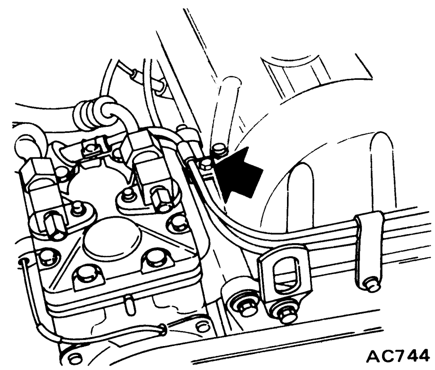


Fig. AC-30 Removing fuel tube fixing bolts

7. Remove four bolts securing compressor to its bracket. Compressor and attachment can now be detached as an assembly.

Note:

a. There are a total of four bolts, two on upper side of bracket and two on lower side of compressor. Loosen upper bolts and remove lower bolts. When removing upper bolts, securely hold compressor with one hand.

b. When installing, temporarily tighten upper bolts, then tighten lower bolts.

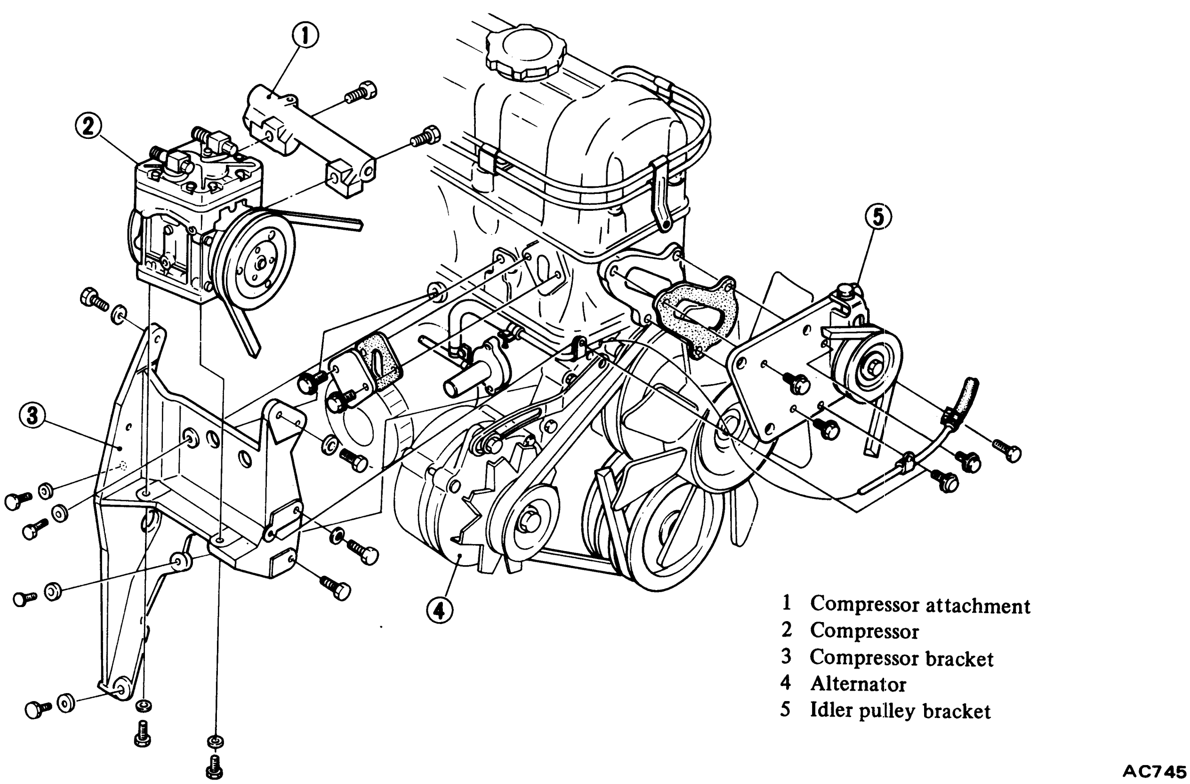


Fig. AC-31 Removing compressor

INSTALLATION

To install compressor, reverse the order of removal. Observe the following:

1. When installing, fill compressor with the same amount of oil as that used previously.

   Oil capacity (new compressor):
   100 cc (6.10 cu in)

Note: **Check quantity and quality of oil in compressor. Refer to Compressor Oil Check under General Service section.**

2. Check tightening torque of compressor bracket mounting bolts; if necessary, retighten.

   Tightening torque:
   Flexible hose-to-compressor
   6.0 kg-m (43 ft-lb)
   Compressor-to-bracket bolts
   2.2 to 3.0 kg-m
   (16 to 20 ft-lb)
   Compressor bracket-to-engine bolts
   3.7 to 5.1 kg-m
   (27 to 37 ft-lb)

3. Do not remove plugs or flexible hose before ready for immediate use.
4. When installing compressor, turn it serveral times.
5. When connecting flexible hose to compressor, apply a coat of fresh compressor oil to sealing surfaces of joints.
6. Evacuate cooling system, then recharge with refrigerant. Refer to Evacuating and Charging System under General Service section.
7. Whenever removing compressor, be sure to conduct leak test, make idle adjustment and adjust belt tension.

Note:

a. **For compressor drive belt and cooling fan belt tensions, refer to Idler Pulley.**
b. **Check refrigerant leakage; if necessary, correct.**

IDLER PULLEY

FAN BELT TENSION ADJUSTMENT

The standard compressor drive belt tension is between 8 and 12 mm (0.31 and 0.47 in) when depressed with thumb pressure midway between the crankshaft and compressor pulleys. If necessary, turn adjusting bolt to move idler pulley up or down until belt tension is correct.

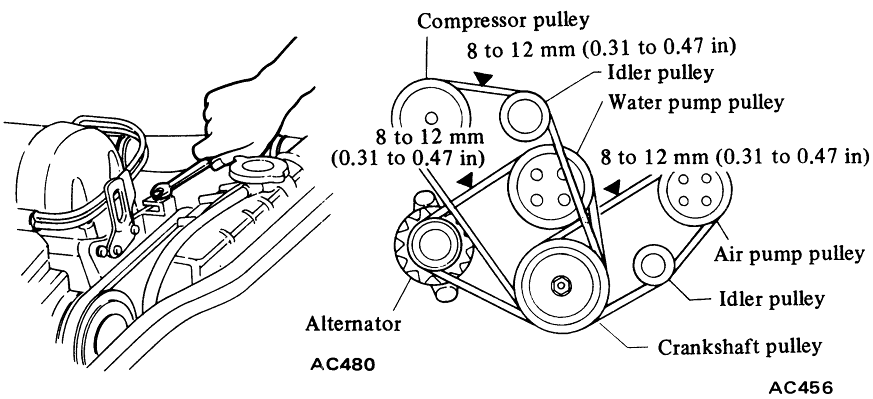


Fig. AC-32 Adjustment of bolt tension

Note: Be sure to loosen locking nut before turning adjusting bolt. Re-tighten it after adjustment.

REMOVAL AND INSTALLATION

1. Remove drive belt.
   To do this, loosen locking nut before loosening adjusting bolt. Drive belt will then be detached.
2. Remove idler pulley from bracket by removing locking nut.
3. To install, reverse the order of removal.

INSPECTION

- Check idler pulley for smooth rotation.
- Check idler pulley bracket for cracks.
- Replace parts if found damaged.

COOLING UNIT

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Discharge system. Refer to Discharging System under General Service section.
3. Connect low and high pressure pipes to their proper positions in engine compartment.

CAUTION:

a. Be sure to use two wrenches when connecting pipe joints.

b. Plug pipe opening immediately after pipe disconnection.

c. Be careful not to break expansion valve. This valve is wrapped with heat-insulating tape.

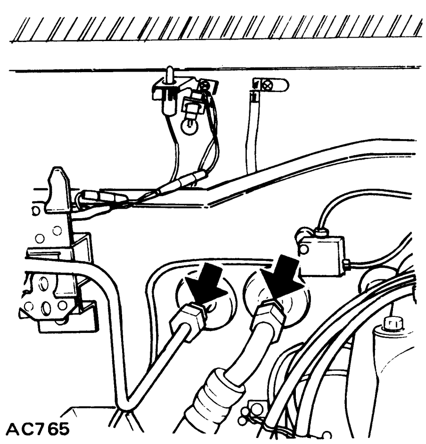


Fig. AC-33 Disconnecting pipes

4. Remove two grommets from dash panel.
5. Remove glove box.
6. Detach cooling unit cover.

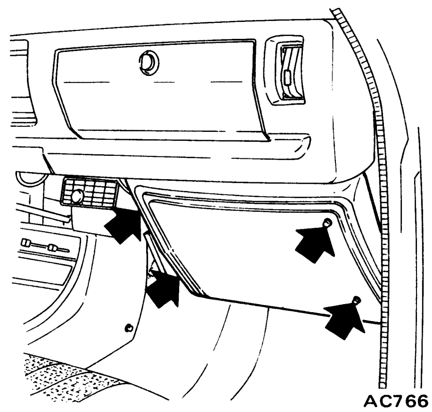


Fig. AC-34 Removing cooling unit cover

7. Remove three ducts from cooling unit.

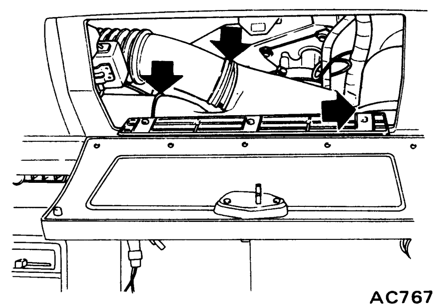


Fig. AC-35 Removing cooler ducts

8. Remove thermo switch control cable from connector.
9. Remove cooling unit and bracket as an assembly.

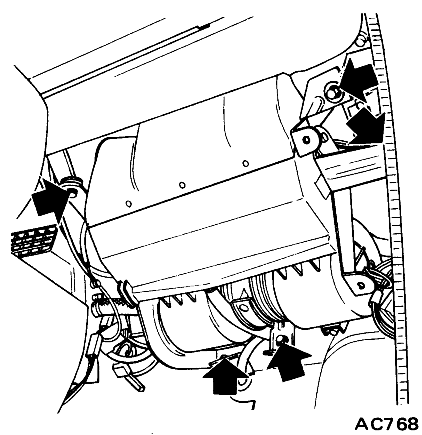


Fig. AC-36 Removing cooling unit

Note: Cooling unit is secured to vehicle body with five screws.

10. Disconnect two lead wire connectors from cooling unit.

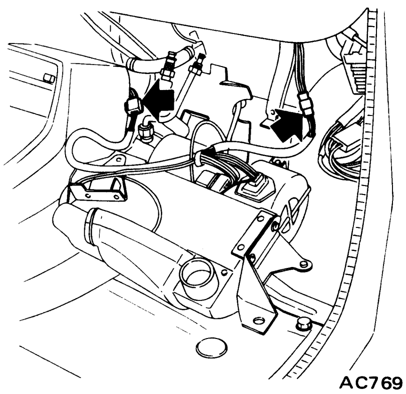


Fig. AC-37 Disconnecting connectors

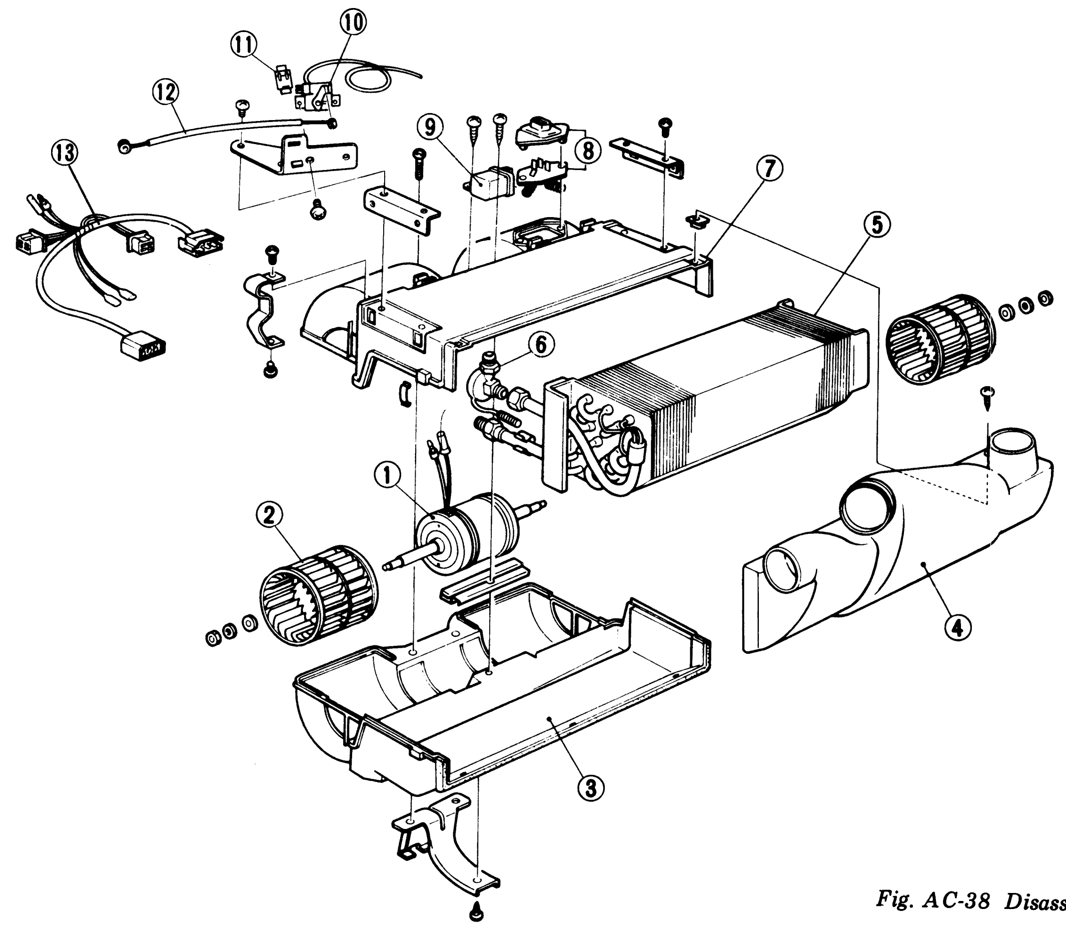
11. To install cooling unit, reverse the order of removal.

Note:

a. **Apply a coat of fresh compressor oil to sealing surfaces when connecting pipe joints.**
b. **Use two wrenches when connecting cooling pipes.**
c. **Evacuate cooling system, then recharge with refrigerant.**
   Refer fo Evacuating and Charging System under General Service section.
d. **Check refrigerant leakage; if necessary, repair. Refer to Checking for Leaks under General Service section.**

Tightening torque:
Copper tube joint nut
High pressure side (3/8 in)
3.0 to 3.5 kg-m
(22 to 25 ft-lb)
Low pressure side (1/2 in)
4.5 to 5.0 kg-m
(33 to 36 ft-lb)

DISASSEMBLY AND ASSEMBLY



1 Motor
2 Fan
3 Lower case
4 Cooler duct
5 Evaporator
6 Expansion valve
7 Upper case
8 Resistor
9 Main relay
10 Thermo switch
11 Cable clamp
12 Cable
13 Harness

AC725

Fig. AC-38 Disassembling cooling unit

1. Remove bracket and lead wire connector (main relay, thermo switch, resistor, motor, etc.) from cooling unit.
2. Remove five screws and duct.
3. Remove main relay.
4. Remove thermo switch.
5. Remove three screws and five springs securing upper case, lower case and rear bracket.
6. Unfasten fittings securing inlet and outlet pipes.
7. Upper and lower cases can now be separated.
8. Remove motor and fan as an assembly. Also remove evaporator.
9. Peel heat-insulating tape from expansion valve, and unfasten clip securing expansion valve capillary tube to pipe.
   Remove expansion valve from evaporator.
10. To install, reverse the order of removal.

Expansion valve tightening torque:
5 kg-m (36 ft-lb)

Note:

a. **When installing expansion valve on evaporator, make sure that temperature-sensing capillary tube is in its proper position on outlet side.**
b. **Apply a coat of fresh compressor oil to sealing surfaces of pipes.**

INSPECTION

Evaporator

Check evaporator for leakage or damage. If damaged, replace.

Expansion valve

Check expansion valve for leakage or clogging. If clogged, clean filter in expansion valve. If damaged, replace.

RECEIVER DRYER AND PIPING

REMOVAL AND INSTALLATION

Receiver dryer

1. Disconnect battery ground cable.
2. Discharge system. Refer to Discharging System under General Service section.
3. Disconnect compressor lead wire at connector.
4. Disconnect cooling pipes at joints.

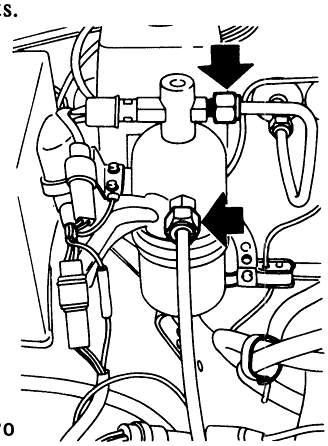


Fig. AC-39 Disconnecting cooling pipes

CAUTION:
a. Plug all piping joints immediately after pipe disconnection to prevent entry of dust or moisture-laden air into receiver dryer or air conditioning system.
b. Use two wrenches when disconnecting cooling pipes.

5. Remove four screws securing receiver dryer bracket to vehicle body, and detach compressor relay and pressure switch as an assembly.
6. To install receiver dryer and piping, reverse the order of removal.

Note:
a. Apply a coat of fresh compressor oil to sealing surfaces when connecting cooling pipes.
b. Use two wrenches when connecting cooling pipes.
c. Evacuate cooling system, then recharge with refrigerant.
Refer to Evacuating and Checking System under General Service section.
d. Check refrigerant leakage; if necessary, repair.
Refer to Evacuating and Charging System under General Service section.

Condenser

1. Disconnect battery ground cable.
2. Discharge system. Refer to Discharging System under General Service section.
3. Drain engine coolant.
4. Remove radiator grille.
5. Remove radiator shroud and radiator.

On automatic transmission models, disconnect both torque converter oil hoses.

CAUTION:
While cooling water is hot, take precautions against scalding.

6. Disconnect two pipes from condenser; remove two screws securing condenser.

Condenser can now be removed.

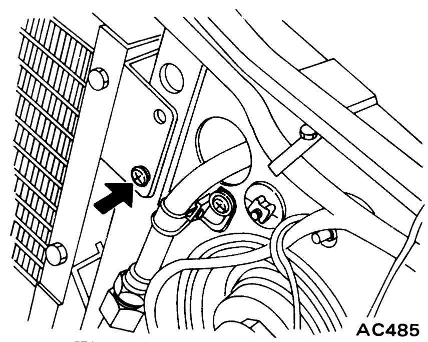


Fig. AC-40 Removing condenser

Note:
a. Use two wrenches when disconnecting pipe joints.
b. Plug openings immediately after disconnecting pipes.

7. To install, reverse the order of removal.

Tightening torque:
Flare nut for copper tube (from compressor):
2.5 to 4.0 kg-m (18 to 29 ft-lb)
Flare nut for copper tube (to receiver dryer):
2.5 to 3.5 kg-m (18 to 25 ft-lb)

WARNING:
To prevent possibility of explosion due to high pressure within cooling system, do not clean condenser with steam. Always use cold water or cold compressed air.

Note:
a. When disconnecting and connecting cooler pipes, be sure to use two wrenches.
b. Apply a coat of fresh compressor oil to sealing surfaces when connecting cooler pipes.
c. Evacuate cooling system, then recharge with refrigerant.
Refer to Evacuating and Charging System under General Service section.
d. Check refrigerant leakage; if necessary, repair. Refer to Checking for Leaks under General Service section.

INSPECTION

Receiver dryer

- Check for refrigerant leakage or damage.
- Check for proper connection of two lead wires running to pressure switch.
- If any component part is found damaged, replace receiver dryer and pressure switch as an assembly.

Condenser

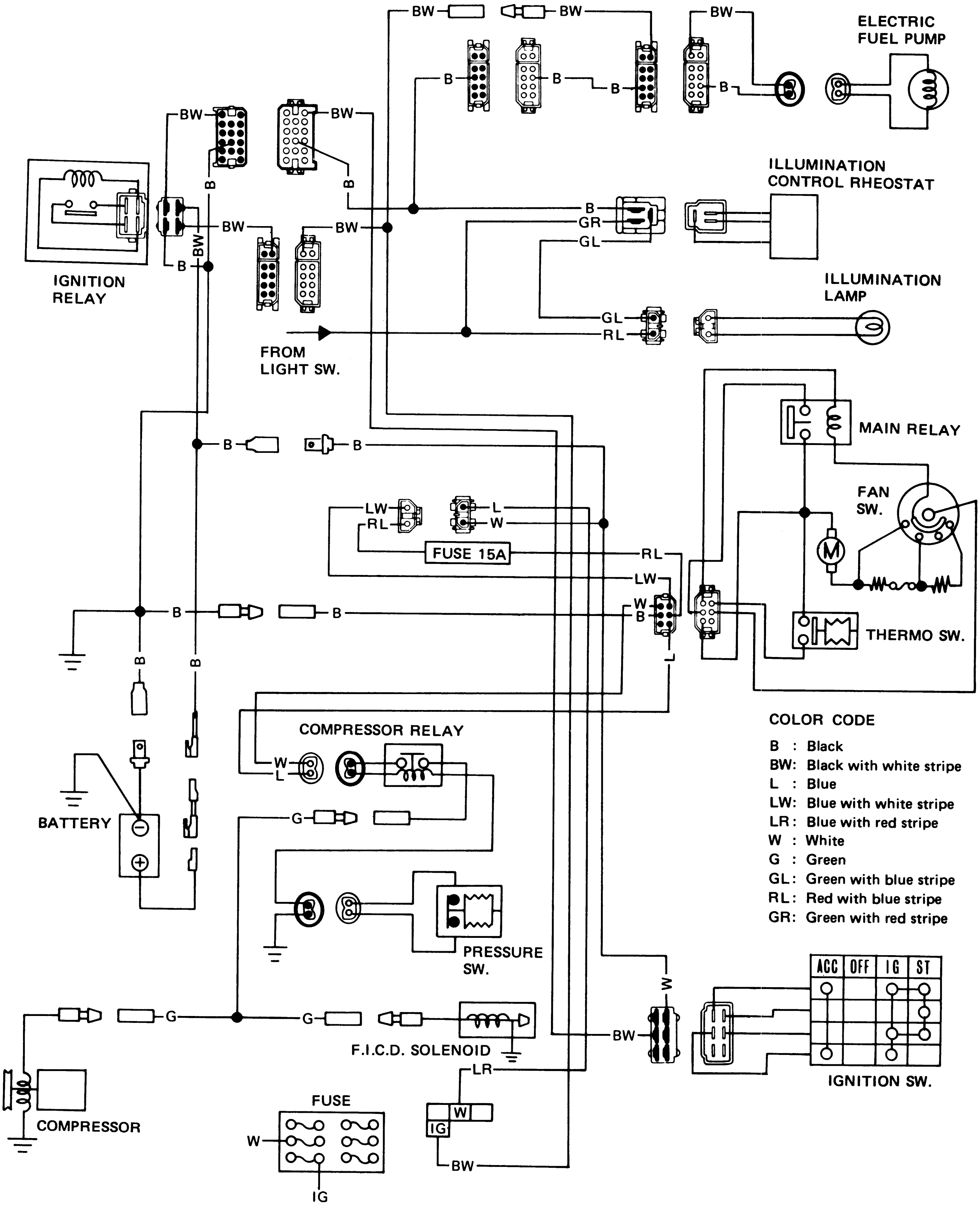
1. Check inlet and outlet pipe joints and sealing surfaces for damage. Replace parts if damaged or leaky.
2. Clogged condenser fins or air passages may reduce cooling efficiency of condenser. Clean these areas with dry compressed air.

Piping

- Check piping for leakage. If leakage occurs at connections retighten connecting nuts. Replace if leakage persists.

WIRING HARNESS AND COMPONENTS

WIRING DIAGRAM



AC229A

Fig. AC-41 Wiring diagram

MAINTENANCE

Replace any wiring harness which is cracked, deteriorated or poorly insulated.

Always replace wire with those of the same diameter. Do not use wire of smaller diameter.

Where necessary, securely retain wire harnesses with clips or tapes so that they will not be frayed or worn by vibration.

Note:

a. **Repair or replace any electrical part which is questionable or likely to cause a short-circuit.**
When disconnecting battery cables, always disconnect ground cable before positive cable. Clean battery and terminals before connecting cables, then connect positive cable and ground cable in that order. Apply a coat of grease to terminals to prevent rust formation.
b. **Do not attempt to conduct a continuity test with a screwdriver or service tools; always use test lead wires.**
c. **Do not ground terminals when circuits are open or unloaded; always use a test lamp (12V – 3W) or circuit tester as a load.**

MAIN RELAY

Removal and installation

The main relay is attached to the cooling unit.

1. Disconnect battery ground cable.
2. Disconnect main relay lead wires at connector.
3. Remove cooling unit assembly. Refer to Removal and Installation under Cooling Unit.
4. Remove the screw securing main relay to cooling unit, and detach main relay.
5. To install main relay, reverse the order of removal.

Inspection

To check continuity in relay circuit, use a test lamp or an ohmmeter. Continuity between points (3) and (4) should exist.

When a 12 volt d-c is applied across points (3) and (4), continuity between points (1) and (2) should also exist.

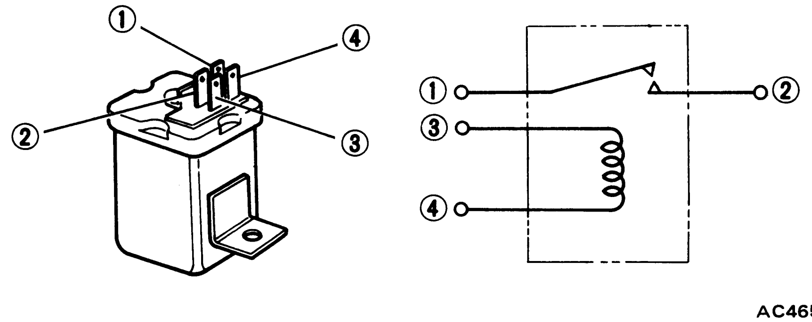


Fig. AC-42 Main relay

COMPRESSOR RELAY

Removal and installation

1. Disconnect compressor relay lead wires at connector.
2. Remove two screws securing compressor relay to receiver dryer, and detach compressor relay.
3. To install compressor relay, reverse the order of removal.

Inspection

Using a test lamp or an ohmmeter, make sure that compressor relay contacts open and close continuously. Continuity always exists between points (3) and (4). When current flows through points (3) and (4), points (1) and (2) close. This causes current to flow through (1) and (2).

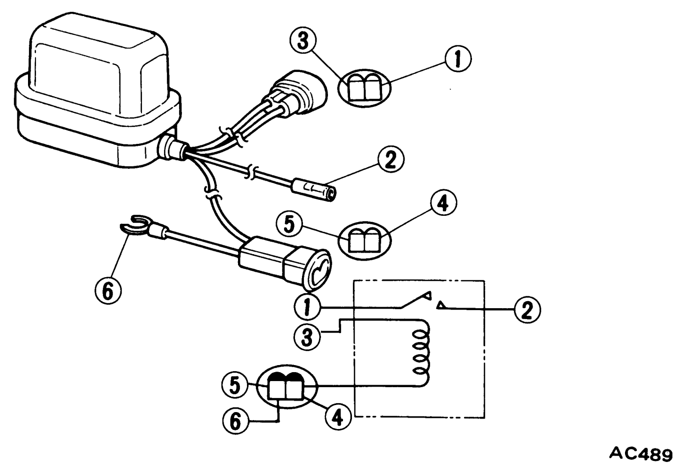


Fig. AC-43 Compressor relay

FAN SWITCH

Removal and installation

1. Disconnect battery ground cable.
2. Remove screws securing console box. Withdraw console box forward and disconnect lead wire connector.
3. Detach switch knob.
4. From rear side of console box, remove screws securing switch, and remove switch.
5. To install fan switch, reverse the order of removal.

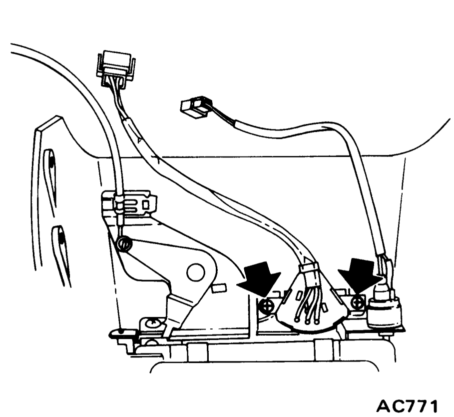


Fig. AC-44 Removing fan switch

Inspection

Check continuity in fan switch circuit with a test lamp or an ohmmeter.

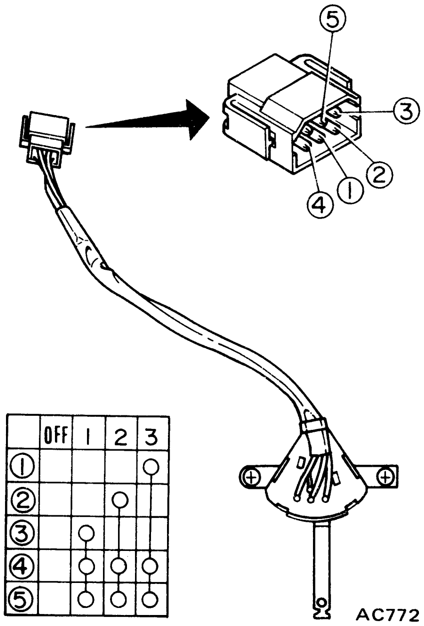


Fig. AC-45 Fan switch

RESISTOR FOR FAN SWITCH

Removal and installation

1. Disconnect battery ground cable.
2. Remove glove box.
3. Remove cooling unit. Refer to Removal and Installation under Cooling Unit.
4. Disconnect resistor lead wires at connector.

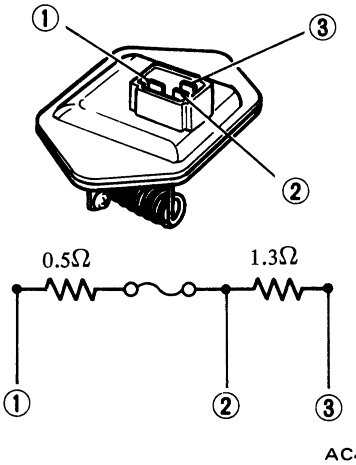


Fig. AC-46 Resistor for fan switch

5. Remove resistor assembly from upper side of cooling unit. Resistor is inserted into case.
6. To install resistor for fan switch, reverse the order of removal.

Inspection

Test continuity between resistor and fuse.

THERMO SWITCH

Removal and installation

1. Disconnect battery ground cable.
2. Remove glove box.
3. Remove duct from cooling unit.
4. Disconnect thermo switch control cable and lead wires.
5. Remove thermo switch.

Note: **Capillary tube is fitted into groove in cooler unit.**

6. To install thermo switch, reverse the order of removal.

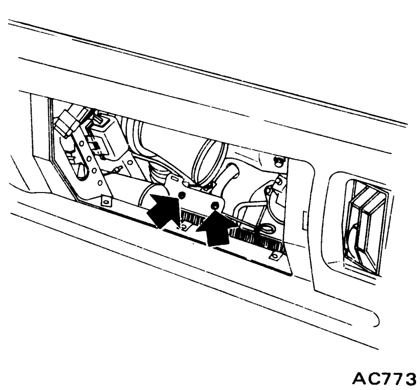


Fig. AC-47 Removing thermo switch

Inspection

1. Fully move thermo switch lever to COLD.
2. Test continuity between terminals with a test lamp or an ohmmeter. Continuity should exist.
3. Dip capillary tube end into ice water. Test continuity between terminals. Continuity should not exist.
4. Replace if switch is found damaged.

F.I.C.D. SOLENOID VALVE

Removal and installation

1. Disconnect battery ground cable.
2. Disconnect lead wires and vacuum tube.
3. Remove two screws securing solenoid valve, and remove solenoid valve.

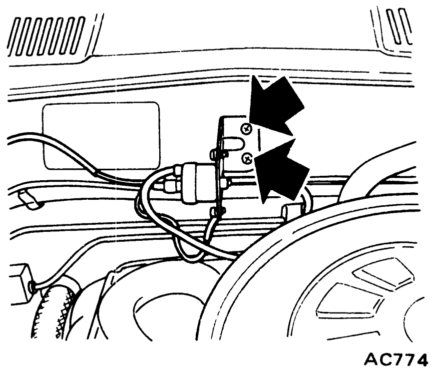


Fig. AC-48 Removing F.I.C.D. solenoid valve

4. To install solenoid valve, reverse the order of removal.

Inspection

1. Test continuity in solenoid valve circuit with a test lamp or an ohmmeter.
2. Turn both fan switch and thermo switch on.
3. Run engine at idle, and check to be sure that vacuum is present in line between solenoid valve and diaphragm.

COMPRESSOR

CONTENTS

DESCRIPTION AC-33
COMPRESSOR CLUTCH AC-34
REMOVAL AC-34
INSTALLATION AC-34
DISASSEMBLY AC-35
ASSEMBLY AC-35
INSPECTION AC-35
SHAFT SEAL ASSEMBLY AC-36
REMOVAL AC-36
INSTALLATION AC-36
INSPECTION AC-37
CYLINDER HEAD AND VALVES AC-37
REMOVAL AC-37
INSTALLATION AC-37

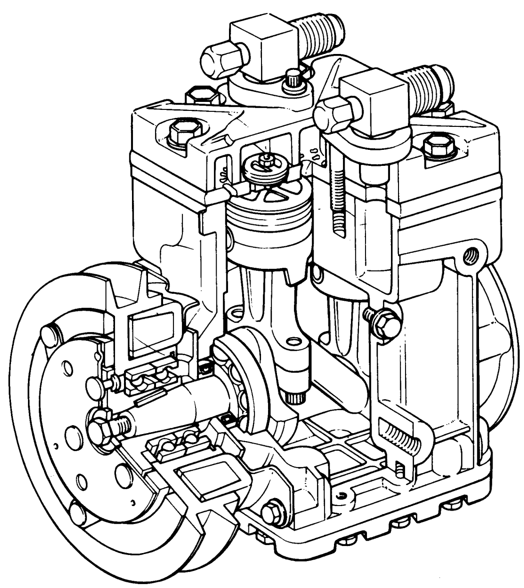
DESCRIPTION

Model CF206 is a crank type compressor specially designed, with minimum size and light weight, for use on compact vehicles.

The compressor crankshaft is driven by a belt from the crankshaft pulley through the electromagnetic clutch. Two pistons, positioned in line, are actuated by connecting rods connected to the crankshaft.

Discharge and suction valves are mounted in the valve liner between the crankcase and cylinder head.

As a lubricant, SUNISO NO. 5 is used. Simplified positive pressure lubrication utilizes existing pressure differential between suction intake and crankcase to provide a film of lubricating oil to bearings. All internal components have been designed to provide more than adequate lubrication to cylinder walls, connecting rod bearings and seal assembly. The result is improved lubrication, lower seal temperatures, reduced oil pumping and a reduction in the number of moving parts.



AC728

Fig. AC-49 Sectional view of compressor

1 Clutch wheel bearing
2 Snap ring
3 Clutch wheel assembly
4 Magnet coil
5 Shaft seal assembly
6 Service valve
7 Flange valve O-ring
8 Cylinder head
9 Cylinder head gasket
10 Cylinder gasket
11 Valve plate assembly
12 Base plate gasket
13 Base plate
14 O-ring
15 Oil filler plug
16 Clutch assembly
17 Compressor assembly

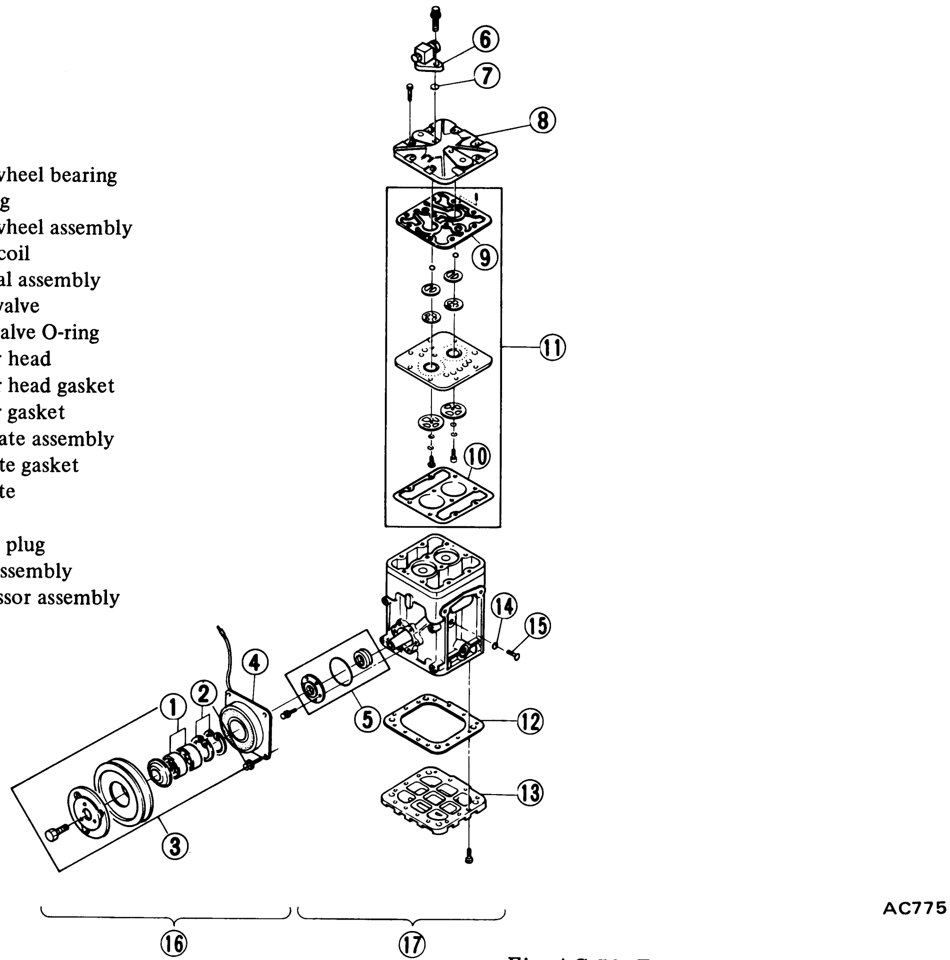


Fig. AC-50 Exploded view of compressor

COMPRESSOR CLUTCH

The most likely source of problem is clutch slippage. Factors are listed here. Exercise ample care.

1. Clearance between clutch hub and pulley should be 0.4 to 0.6 mm (0.016 to 0.024 in) at all peripheral points.
2. Make sure that there is no oil or dirt on friction surfaces of clutch disc (clutch hub) and pulley. Remove oil or dirt with clean lint-free cloth.
3. Make sure that terminal voltage at magnetic coil is above 10.5V.

REMOVAL

1. Using Clutch Spanner Wrench, hold clutch hub. With suitable socket wrench, remove bolt retaining clutch hub to crankshaft.

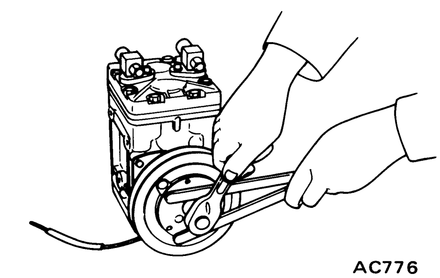


Fig. AC-51 Removing bolt

2. Then, using Clutch Removing Bolt, remove clutch assembly from crankshaft.

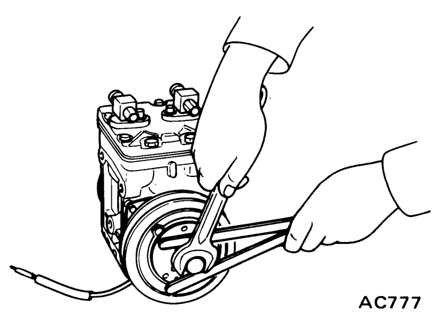


Fig. AC-52 Removing clutch

3. Loosen four electromagnetic coil mounting screws. Coil assembly can then be taken out easily.

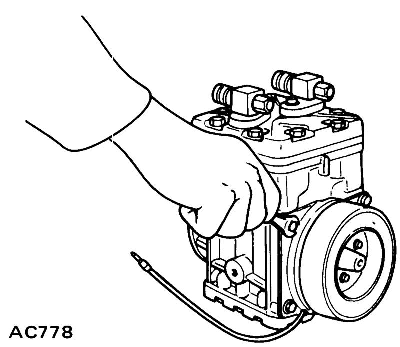


Fig. AC-53 Removing magnetic clutch

INSTALLATION

Locate the electromagnetic coil at the correct position on compressor housing. Then, secure four electromagnetic coil mounting screws.

Tightening torque:
Electromagnetic coil mounting screws:
0.7 kg-m (5.1 ft-lb)

2. Install the clutch assembly on the crankshaft.

Note: Key should be set on crankshaft before installing clutch assembly.

3. Using Clutch Spanner Wrench, hold clutch hub. With socket wrench, secure clutch hub securing bolt.

Tightening torque:
Clutch hub securing bolt:
1.5 kg-m (11 ft-lb)

DISASSEMBLY

1. Remove two snap rings retaining bearing. They are located inside of clutch wheel.

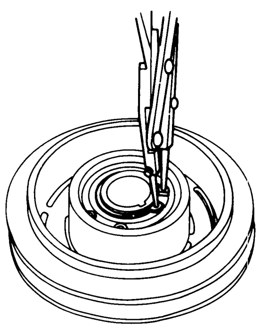


Fig. AC-54 Removing snap rings

2. Using Clutch Wheel Remover KV99100700 and conventional puller, remove V-pulley with bearings from clutch wheel.

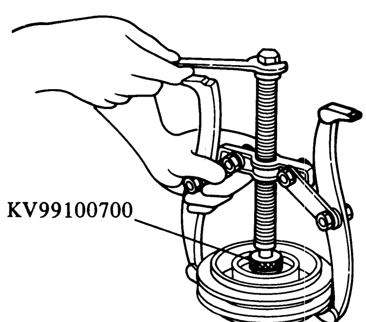


Fig. AC-55 Removing clutch wheel bearings

3. Using Bearing Remover ST33061000, press clutch wheel bearings out from clutch wheel.

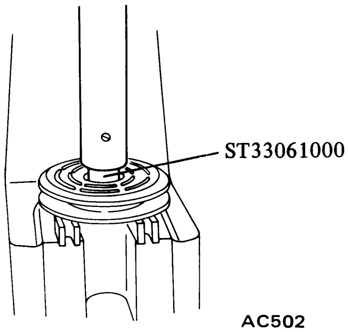


Fig. AC-56 Removing V-pulley from clutch

ASSEMBLY

1. Press bearings into V-pulley with Bearing Installer ST02371000.

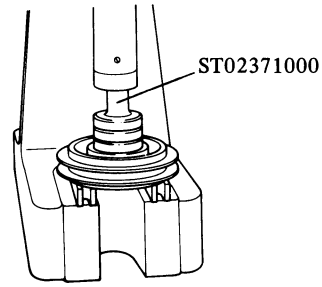
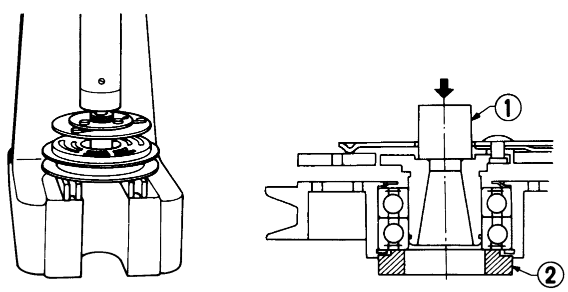


Fig. AC-57 Installing bearings

2. Install outer snap ring in groove of V-pulley.
3. Using Installer KV99100610 and Stopper ST33061000, press clutch wheel into V-pulley.
4. Install inner snap ring in groove of clutch wheel.



1 Installer (KV99100610)
2 Stopper (ST33061000)

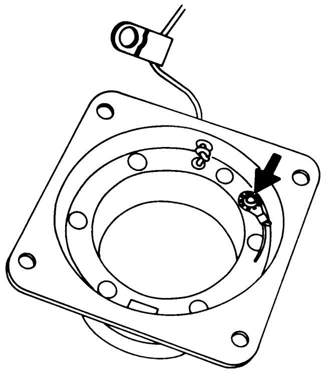
Fig. AC-58 Installing clutch wheel

INSPECTION

1. Check friction surface of clutch for damage due to excessive heat, or excessive grooving due to slippage. If necessary, replace clutch wheel and V-pulley as a set.
2. The clearance between V-pulley and clutch wheel should be 0.4 to 0.6 mm (0.016 to 0.024 in).

If not, replace clutch wheel assembly.

3. Oil or dirt on friction surfaces of clutch wheel and V-pulley should be cleaned with a clean lint-free cloth or suitable solvent.
4. Check coil for shorted or opened lead wire. Pay particular attention to grounding part of coil. If there is no continuity, replace electromagnetic coil.



AC506

Fig. AC-59 Grounding point of coil

5. If clutch assembly must be replaced, remember that break-in operation is necessary. The break-in operation consists of engaging and disengaging the clutch some tirty times.

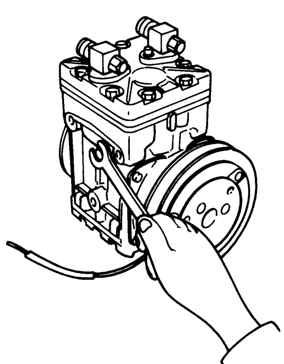
SHAFT SEAL ASSEMBLY

The shaft seal assembley of this compressor is of a simplified design, yet tight sealing and long lasting.

REMOVAL

It is recommended that the compressor be removed from the vehicle for shaft seal replacement.

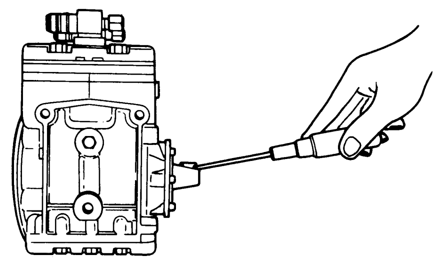
1. Remove oil filler plug with O-ring and drain the compressor oil.



AC806

Fig. AC-60 Removing filler plug

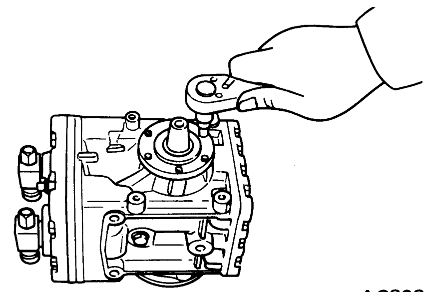
2. Remove clutch. Refer to Compressor Clutch Removal.
3. Remove shaft key.



AC807

Fig. AC-61 Removing shaft key

4. Remove seal plate.



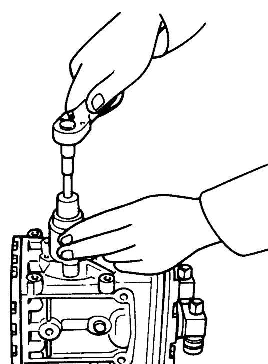
AC808

Fig. AC-62 Removing seal plate

5. With the Compressor Seal Puller, pull out seal gland and discard.

CAUTION:
Do not use a screwdriver to pry shaft seal from shaft as damage to shaft may result.

Note: **Discard all parts of the seal including the O-ring.**

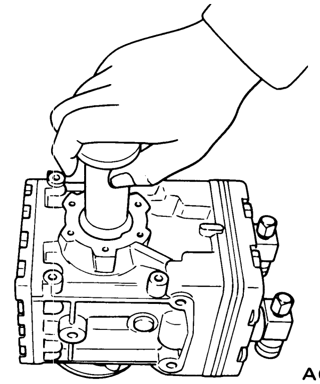


AC809

Fig. AC-63 Removing shaft seal

INSTALLATION

1. Clean shaft and seal cavity with clean lint-free cloth.
2. Dip seal gland in clean refrigerant oil.
3. Push seal assembly, except carbon ring, over end of shaft with carbon ring retainer facing out.
4. Move seal assembly into position on shaft.



AC810

Fig. AC-64 Inserting shaft seal assembly

5. Place carbon ring in ring retainer so lapped surface is facing outward.

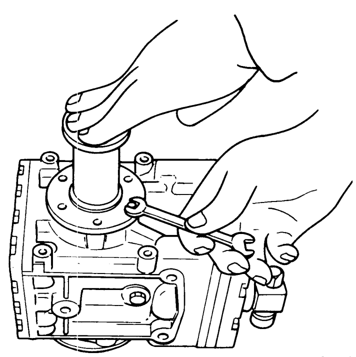
Note: **The indentions in outside edge of carbon ring must engage driving lugs and be firmly seated in retainer.**

6. Install new O-ring in groove of seal plate.

Note: **Use refrigeration oil to make it adhere to surface.**

7. Space seal plate with equal clearance around shaft and insert cap screws.
8. Tighten these screws evenly.

Tightening torque
Seal plate securing cap screws:
0.7 to 1.0 kg-m
(5.1 to 7.2 ft-lb)



AC811

Fig. AC-65 Spacing seal plate and tightening cap screws

9. Install clutch. Refer to Compressor Clutch Installation.

INSPECTION

Check for gas leakage as follows:

1. Plug high- and low-pressure joints on compressor with blind caps.
2. Connect charging hoses in lines between manifold gauge and high- and low-pressure service valves.

   Connect refrigerant can to middle hose of manifold gauge.
3. Open valve of can tap, and charge refrigerant. Loosen oil filler plug at side of compressor to purge air out of compressor.
4. Turn shaft 5 or 6 turns. Then confirm that pressure does not decrease on low pressure gauge. If gauge indicates a pressure decrease, there is a leak. Conduct a leak test. Under such a condition, remove and then install parts again.

CYLINDER HEAD AND VALVES

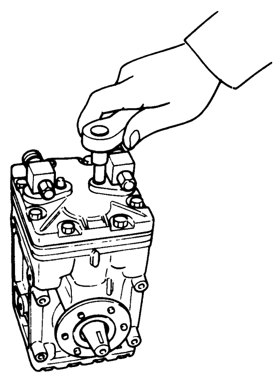
Insufficient refrigerant compression is likely to be caused by damaged head gasket or damaged valves.

Prior to servicing the head and valve plate, both service valves should be opened to free any gas pressure which may be in the compressor.

REMOVAL

1. Remove the bolts from flanged type service valves using Torx Driver Bit.

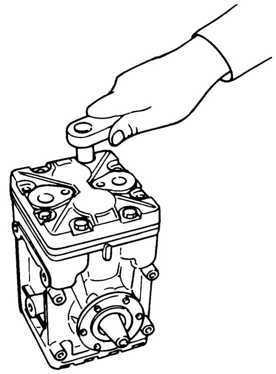
Note: The direction of flanged type service valves should be noted for reinstallation.



AC812

Fig. AC-66 Removing service valves

2. Remove the remaining bolts in the head.



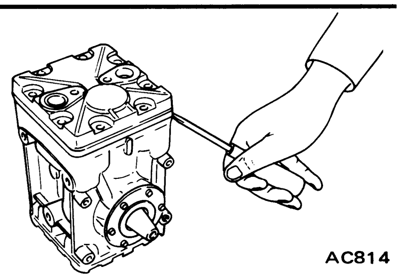
AC813

Fig. AC-67 Removing cylinder head bolts

3. Remove valve plate and head from cylinder by prying or tapping under the ears which extend from valve plate.

   If head and valve plate adhere, hold head and tap valve plate ears away from head with a soft hammer.

CAUTION:
Do not hit or tap head to separate head and valve plate because damage to head may result.

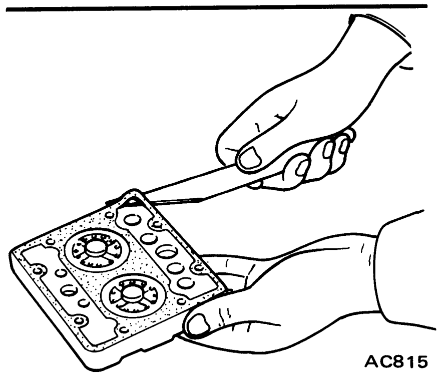


AC814

Fig. AC-68 Removing valve plate and head

4. When removing the gaskets, use a sharp-edged knife.

CAUTION:
a. In removing head gasket, be very careful not to damage machined sealing surface.
b. Do not reuse gaskets.



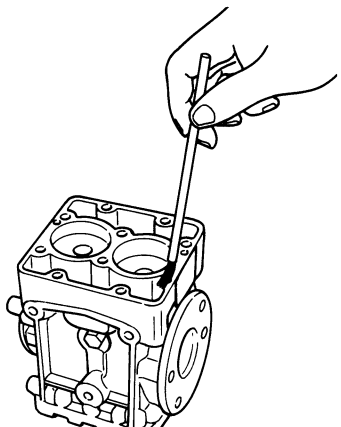
AC815

Fig. AC-69 Removing gasket

INSTALLATION

Valves and valve plates are furnished only as a complete assembly.

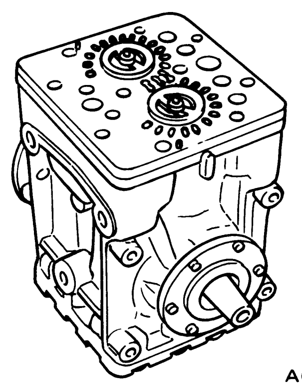
1. Apply a thin film of clean refrigeration oil on area of crankcase to be covered by cylinder gasket.
2. Place cylinder gasket in position on cylinder so dowel pins in crankcase go through dowel pin holes in cylinder gasket.
3. Apply a thin film of clean refrigeration oil to top and bottom valve plate areas to be covered by gaskets.



AC816

Fig. AC-70 Applying clean refrigeration oil

4. Place valve plate in position on cylinder gasket so discharge valve assemblies (i.e. smaller diameter assemblies with restrainer over valve reed) are facing up and locating dowel pins go through dowel pin holes in valve plate.



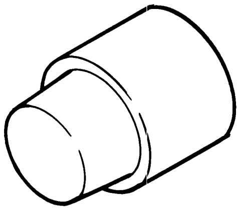
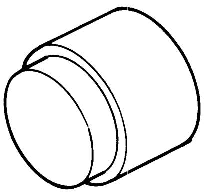
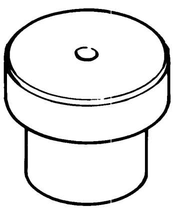
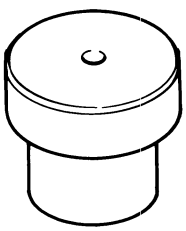
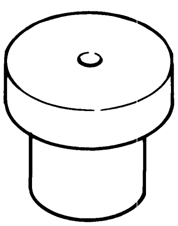
AC817

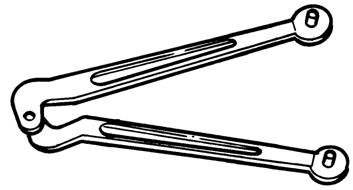
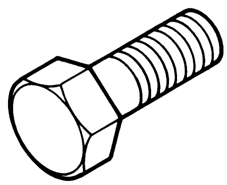
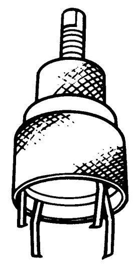
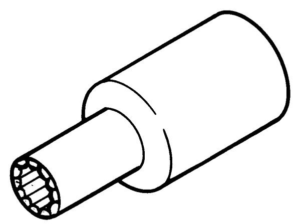
Fig. AC-71 Placing valve plate

5. Place head gasket in position on valve plate so dowel pins go through dowel pin holes in gasket.
6. Apply a thin film of clean refrigeration oil on the machined surface of cylinder head which matches head gasket.
7. Place head on cylinder head gasket so dowel pins go into dowel pin holes in head.
8. Apply a thin film of clean refrigeration oil to service valve flanges.
9. Place flange valve O-ring in position on cylinder head.
10. Place service valves in position on proper service valve ports (suction or discharge) and insert two longer screws through service valve mounting pads, head, valve plate, and into crankcase.
11. Insert remaining head screws and run in all screws until the heads make contact.

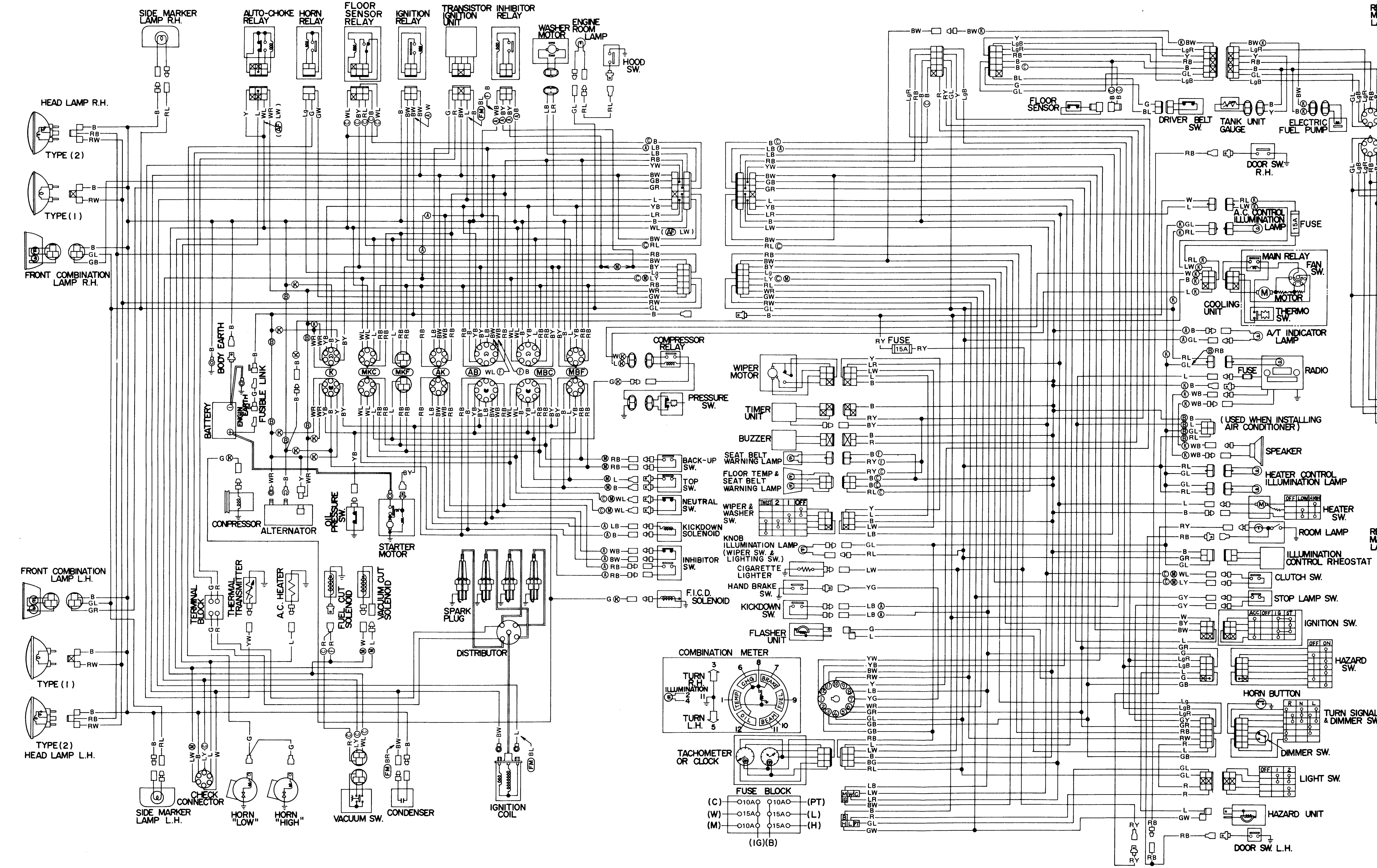
Tightening torque:
Head and service valve screws:
2.1 to 3.2 kg-m
(15 to 23 ft-lb)

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
KV99100700 Clutch wheel remover 	—— Fig. AC-55
KV991006S0 Clutch wheel installer set ① KV99100610 Installer ② ST33061000 Stopper ①  ② 	② J 25797 -2 Fig. AC-58
ST33061000 Bearing remover 	J 25797-2 Fig. AC-56
ST02371000 Bearing installer 	—— Fig. AC-57

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
KV99412302 Clutch spanner wrench 	J 24878-1 Fig. AC-51
Clutch removing bolt 	J 26344 Fig. AC-52
Compressor seal bolt 	J 10549 Fig. AC-63
Torx driver bit 	J 24392 Fig. AC-66
Oil dip stick 	J 10545

WIRING DIAGRAM



NORMAL CLOSED

NORMAL OPEN

Ⓒ CALIFORNIA MODELS
Ⓕ NON-CALIFORNIA MODELS
Ⓐ AUTOMATIC TRANSMISSION
Ⓜ MANUAL TRANSMISSON
Ⓚ AIR CONDITIONER
Ⓑ NOT EQUIPPED WITH AIR CONDITIONER

SWITCH AND RELAY POSITIONS

1 IGNITION SWITCH IN OFF
2 LIGHTING SWITCH, WIPER SWITCH IN OFF
3 SEAT UNOCCUPIED
4 DOORS AND HOOD CLOSED
5 TRANSMISSION IN NEUTRAL
6 HAND BRAKE RELEASED

NISSAN NISSAN MOTOR CO., LTD.
Tokyo, Japan

Printed in Japan

Issued: September 1977 (080550)
Publication No. SM8E-0620U0