SUZUKI

SJ410/410V/410K

SERVICE MANUAL

SUZUKI
Caring for Customers

99500-80002-01E
(英)

FOREWORD

This SERVICE MANUAL provides information on functional and construction details and sets forth the methods of inspecting, checking and servicing for Models SJ410, SJ410V and SJ410K. The MANUAL is intended for use by technical personnel engaged in or related to the servicing work on these SUZUKI four-wheel vehicles.

These models are practically identical as far as the major features of construction and performance as well as the methods of inspection are concerned. Those items not common to them are identified as such in the respective sections.

So that the users of these SUZUKI machines will gain maximum benefits the machines are capable of giving and that each machine will serve best with the high performance built into it, it is hoped that this MANUAL will be looked up to as the source of necessary information by each SUZUKI serviceman.

The vehicle manufactured to standard specifications is the main subject matter of this Manual. However, the vehicle distributed in your country might differ in minor respects from the standard-specification and, if they do, it is because some minor modifications (which are of no consequence in most cases as far as servicing is concerned) had to be made to comply with the statutory requirements of your country.

This MANUAL came out of the first printing for these vehicles and does not cover modifications yet to be made, but we assure you that each future printing will turn out an updated manual.

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

NOTE:
This manual is revised edition of 99500-80000-01E issued Mar. 1981. It contains, from Group 23 on details of addition and modifications, which have been carried out since the above date of the first issue up to June 1985. (In this Service Manual, Supplementary Service Manuals 99501-80013-01E and 99501-80014-01E are combined.) Be sure to read it thoroughly before your inspection and maintenance work and make effective use of it.

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SJ410

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SJ410V

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SJ410K

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1-2. Chassis View

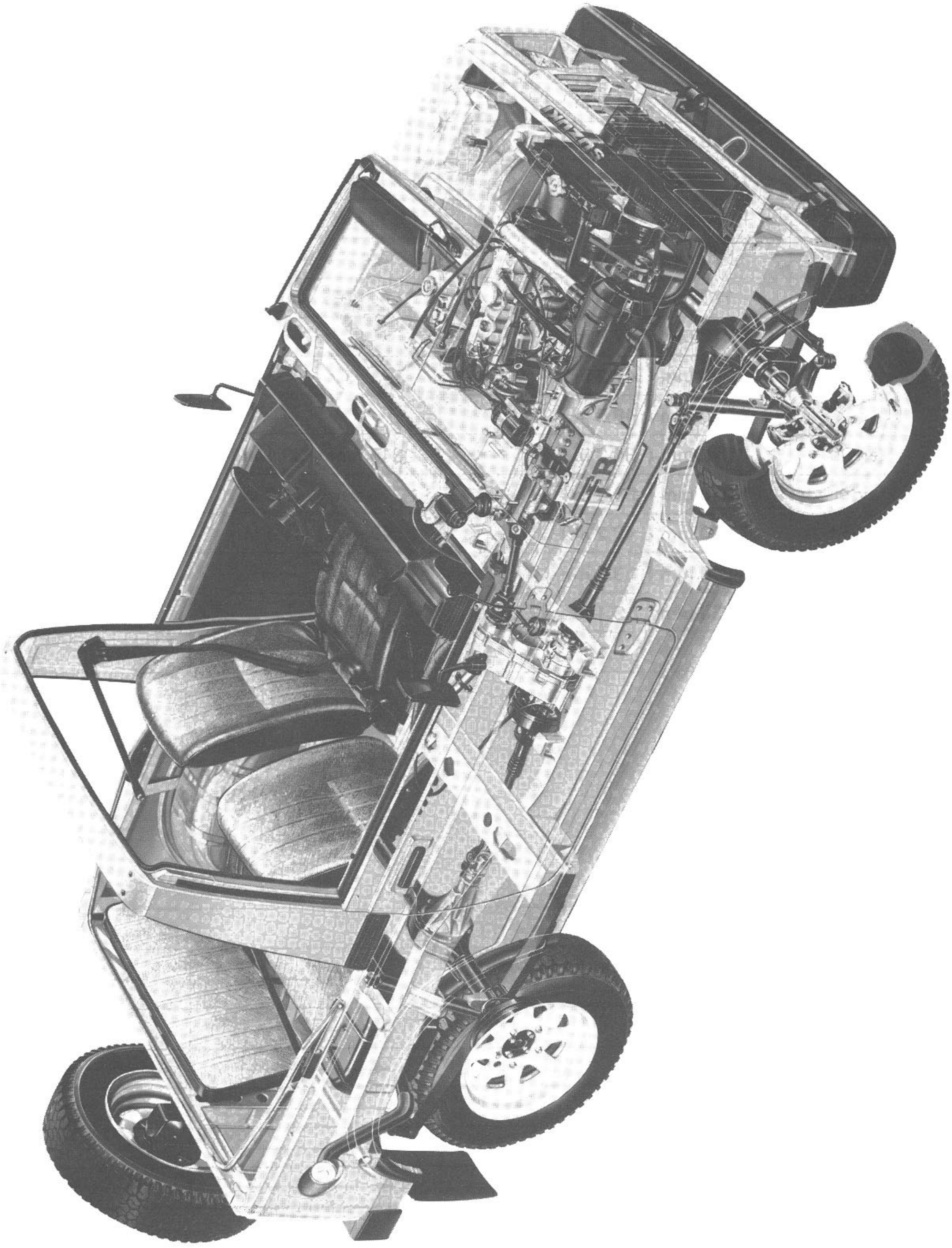


Fig. 1-4

1-3. Specifications

Item \ Models		SJ410	SJ410V	SJ410K
DIMENSIONS				
Overall length		3,410 mm (134.3 in.) 1 3,430 mm (135.0 in.) 2	3,420 mm (134.6 in.) 1 3,440 mm (135.4 in.) 2	3,890 mm (153.1 in.)
Overall width		1,395 mm (54.9 in.) 1 1,460 mm (57.5 in.) 2	←	←
Overall height		1,690 mm (66.5 in.) 1 1,680 mm (66.1 in.) 2	1,700 mm (66.9 in.) 1 1,690 mm (66.5 in.) 2	1,690 mm (66.5 in.) 1 1,680 mm (66.1 in.) 2
Wheelbase		2,030 mm (79.9 in.)	←	2,375 mm (93.5 in.)
Tread	front	1,190 mm (46.9 in.) 1 1,210 mm (47.6 in.) 2	←	←
	rear	1,200 mm (47.2 in.) 1 1,220 mm (48.0 in.) 2	←	←
Load deck size.	length	870 mm (34.3 in.)	840 mm (33.1 in.)	1,550 mm (61.0 in.)
	width	1,270 mm (50.0 in.)	1,215 mm (47.8 in.)	1,320 mm (52.0 in.)
	height	1,020 mm (40.2 in.)	1,045 mm (41.1 in.)	280 mm (11.0 in.)
Ground clearance		240 mm (9.4 in.) 1 230 mm (9.1 in.) 2	←	←

ENGINE			
Type	Four-stroke cycle, water-cooled, OHC	←	←
Number of cylinders	4	←	←
Lubrication system	Wet sump	←	←
Bore	65.5 mm (2.58 in.)	←	←
Stroke	72.0 mm (2.83 in.)	←	←
Piston displacement	970 cm^3 (970 cc, 59.2 cu.in.)	←	←

1 .... For 6.00-16-4PR tire
2.... For FR78-15 or F78-15 tire

Item		SJ410	SJ410V	SJ410K
Compression ratio		8.8 : 1	←	←
Carburetor		AISAN 80000	←	←
Air cleaner		Polyurethane foam element (Dry type)	←	←
ELECTRICAL				
Ignition timing		10° B.T.D.C. below 850 r/min (rpm)	←	←
Standard spark plug		NGK BP-5ES or NIPPON DENSO W16EX-U [※1 BPR-5ES or W16EXR-U]	←	←
Starter		Magnetic shift type	←	←
Generator		Alternator	←	←
Battery		12V, 108 kC (30 Ah)/20HR [※3 12V, 47Ah/20 HR]	←	←
Headlight		12V, 60/50W [※2 12V, 45/40W]	←	←
Turn signal light		12V, 21W [※3 32 cp]	←	←
Clearance light		12V, 5W [※3 4 cp]	←	←
Tail/Brake light		12V, 5/21W [※3 3/32 cp]	←	←
Side turn signal light		12V, 5W [※3 8w]	←	←
License plate light		12V, 10W [※3 4 cp]	←	←
Back-up light		12V, 21W [※3 32 cp]	←	←
Interior light		12V, 5W	←	←
Meter pilot light		12V, 3.4W	←	←
Main fuse		0.5 mm^2 (fusible link)	←	←
Fuse box		15/15/15/20A	←	←
POWER TRANSMISSION				
Clutch type		Dry, single disc	←	←
Transmission type		4-forward all synchromesh, 1 reverse	←	←
Transfer gear box type		2-speed constant mesh	←	←
Final reduction ratio		4.111	←	←
Gear ratios	low	3.163	←	←
	2nd	1.945	←	←
	3rd	1.421	←	←
	top	1.000	←	←
	reverse	3.321	←	←
Transfer gear ratios	low range	2.558	←	←
	high range	1.590	←	←

[※1] For Canadian and European markets　[※3] For Canadian market
[※2] For European market

Item		Models: SJ410	SJ410V	SJ410K
Overall reduction ratios:				
Low range	low	33.249	←	←
	2nd	20.446	←	←
	3rd	14.937	←	←
	top	10.512	←	←
	reverse	34.910	←	←
High range	low	20.676	←	←
	2nd	12.717	←	←
	3rd	9.290	←	←
	top	6.535	←	←
	reverse	21.707	←	←
WHEEL AND SUSPENSION				
Tire size: front and rear		6.00-16-4PR or (FR78-15, F78-15)	←	←
Tire pressure	front	140 kPa (1.40 kg/cm^2, 20 psi)	←	←
	rear	140 kPa (1.40 kg/cm^2, 20 psi)-unladen	←	210 kPa (2.10 kg/cm^2, 30 psi)
		180 kPa (1.80 kg/cm^2, 26 psi)-laden	←	
Suspension type	front	Leaf spring	←	←
	rear	Leaf spring	←	←
STEERING				
Turning radius		4.9 m (16.1 ft)	←	5.7 m (18.7 ft)
Steering gear box		Ball nut type	←	←
Toe-in		2 - 6 mm (0.08 - 0.24 in.)	←	←
Camber angle		1° 00′	←	←
Caster angle		2° 30′	←	←
Trail		14.5 mm (0.57 in.)	←	←
King pin angle		9° 00′	←	←
BRAKE SYSTEM				
Type		4-wheel, hydraulic	←	←
Wheel brake	front	Two-leading	←	←
	rear	Leading and trailing	←	←
Parking brake		Internal expanding, on propeller shaft	←	←
CAPACITIES				
Cooling solution		3.8 ℓ (8.0/6.7 US/Imp pt)	←	←
Fuel tank		40 ℓ (10.6/8.8 US/Imp gal)	←	←
Engine oil		3.2 ℓ (6.8/5.7 US/Imp pt)	←	←
Transmission oil		1.0 ℓ (2.1/1.8 US/Imp pt)	←	←
Differential gear box oil		1.3 ℓ (2.7/2.3 US/Imp pt)	←	←
Transfer gear box oil		0.7 ℓ (1.5/1.2 US/Imp pt)	←	←

1-4. Locations of Body Number and Engine Number

The chassis number is punched on the chassis inside the tire housing on the right front side.

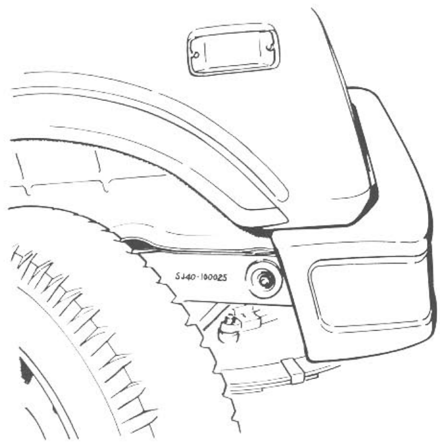


Fig. 1-5 Location of Body No.

The engine number is punched on the rear portion of the right-hand skirt part of cylinder block.

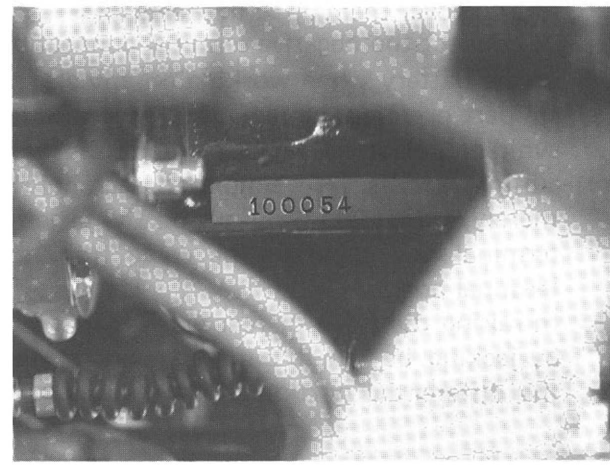


Fig. 1-6. Location of Engine No.

1-5. Standard Shop Practices

1. Protect the painted surfaces of the body, and avoid staining or tearing the seats. When working on the fenders and seats, be sure to cover them up with sheets.
2. Disconnect the negative terminal connection of the battery when working on any electrical part or component. This is necessary for avoiding electrical shocks and short-circuiting, and is very simple to accomplish: merely loosen the wing nut on the negative terminal and separate the cable from the terminal post.
3. In raising the front or rear end off the floor by jacking, be sure to put the jack up against the differential portion of the axle housing.

Fig. 1-7 Front side

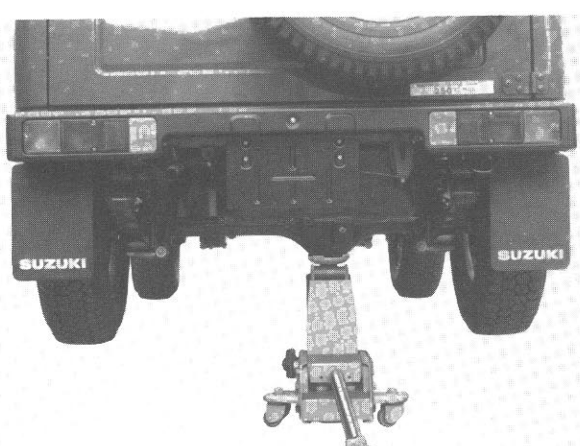


Fig. 1-8 Rear side

4. To work on the front or rear end raised by jacking, be sure to place the safety stand under the axle or reef spring seat to support it in stable condition.

Fig. 1-9 Front side

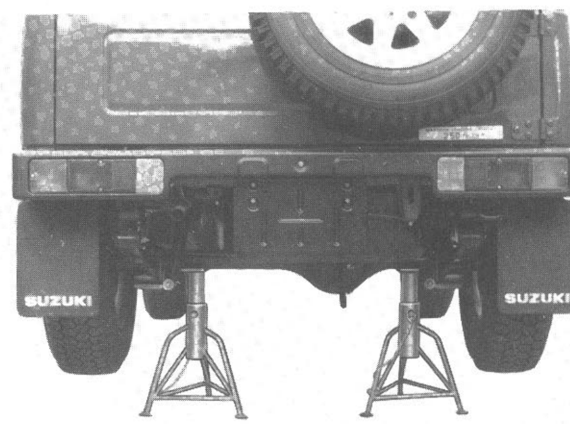


Fig. 1-10 Rear side

5. Have wheel chocks for ready use in the shop. Chock the wheels securely when raising one end of the machine.

6. Orderliness is a key to successful overhauling. Trays, pans and shelves are needed to set aside the disassembled parts in groups or sets in order to avoid confusion and misplacement. This is particularly important for engine over-hauling.
7. Have on hand the liquid packing–SUZUKI BOND No. 4 (99000-31030) – for ready use. This packing dope is an essential item assures leak-free (water and oil) workmanship.
8. Each bolt must be put back to where it was taken from or for which it is intended. Do not depend on your hunch in tightening the bolts for which tightening torque values are specified: be sure to use torque wrenches on those bolts.
9. It is advisable to discard and scrap gaskets and "O" rings removed in disassembly. Use new ones in reassembly, and try not to economize gaskets and "O" rings.
10. Use of Genuine SUZUKI parts is imperative. Use of imitation parts is a big gamble on safety and performance. Use Genuine SUZUKI parts and live up to the trust your customer places on you.
11. Special tools save time and ensure good workmanship: They are available from SUZUKI. Use them where their use is specified. Moreover, your own safety is assured by the use of special tools in many of the disassembly and reassembly steps.
12. Refer to the contents of this MANUAL as often as practical, and do each job right as prescribed.

NOTE:
The engine cylinders are identified by numbers. See Fig. 1-11. Counting from the front end, the cylinders are referred to as No. 1, No. 2, No. 3 and No. 4 cylinders.

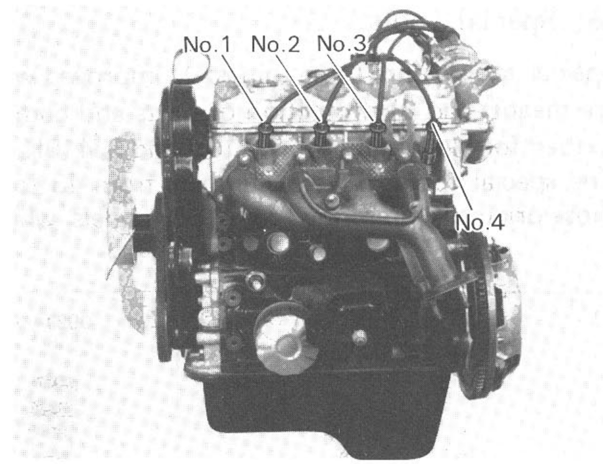
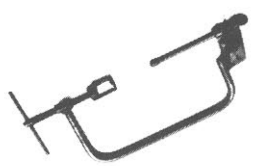
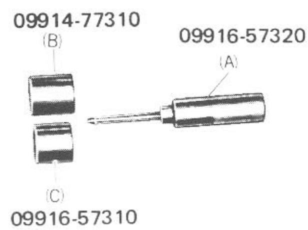
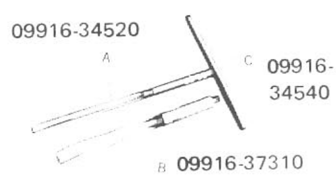
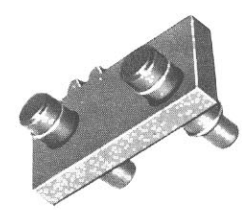
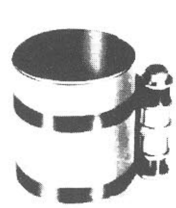
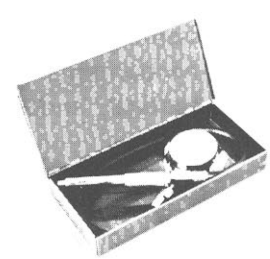
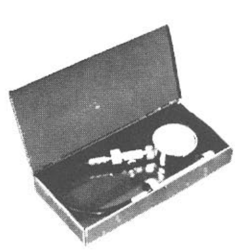
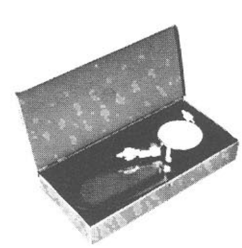
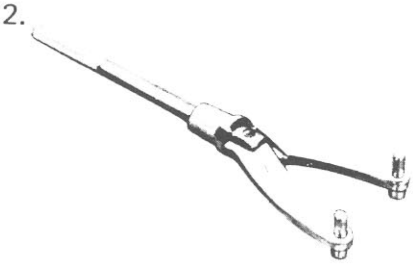


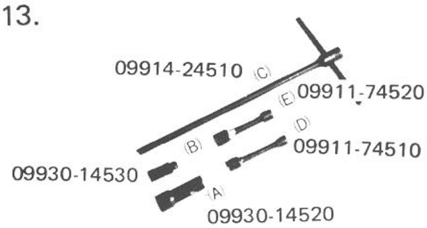
Fig. 1-11 *Engine cylinder numbers*

1-6. Special Tools

Special tools assure three things: 1) improved workmanship; 2) speedy execution of jobs for which they are meant; and 3) protection of parts and components against damage. Here are the special tools prescribed for Models SJ410, SJ410V and SJ410K:
The special tools of item numbers from 43 to 51 are those prescribed for SJ410 models in addition to those originally prescribed for LJ80 models, which remain the same for SJ410 models.

1.  09916-14510 Valve lifter	2.  (A) Valve guide & valve stem seal handle (B) Valve stem seal installer attachment (C) Valve guide installer attachment	3.  09916-44510 Valve guide remover
4.  Valve guide reamer (A) 7 mm dia. (B) 12.0 mm dia. (C) Handle	5.  09916-84510 Forceps	6.  09916-97310 Flywheel stopper
7.  09915-47310 Oil filter wrench	8.  09916-77310 Piston ring compressor	9.  09915-77310 Oil pressure gauge
10.  09915-64510 Compression gauge	11.  09915-67310 Vacuum gauge	12.  09930-40113 Camshaft lock holder

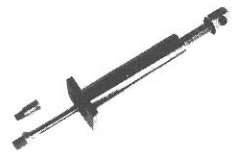
13.



09930-14511 Cylinder head bolt & Spark plug wrench set

(A) Plug wrench (B) Universal joint
(C) "T" handle
(D) 14 mm socket wrench
(E) 12 mm socket wrench

14.

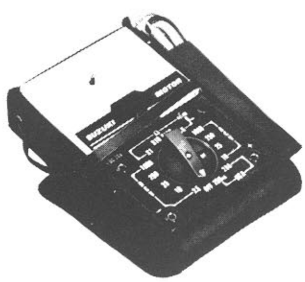


09910-34510
Piston pin puller

15.

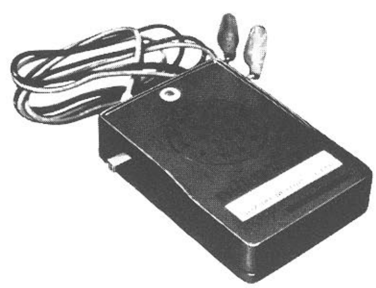
09900-09002
Shock driver set

16.



09900-25002
Pocket tester

17.

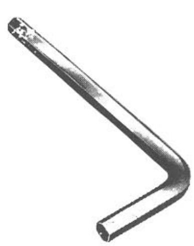


09900-27003
Ignition timing tester

18.

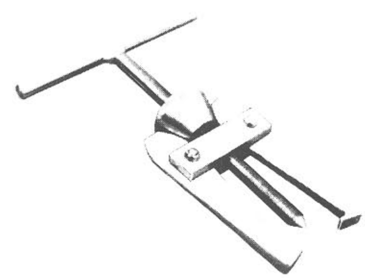
09900-28106
Electro tester

19.



09911-70120
Hexagon wrench 6 mm

20.



09913-60910
Bearing puller

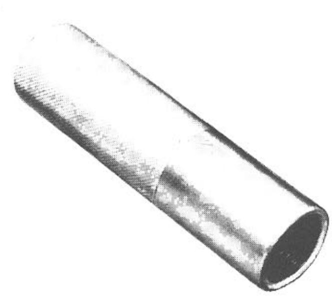
21.

09913-75510
Differential rear outer race installer

22.

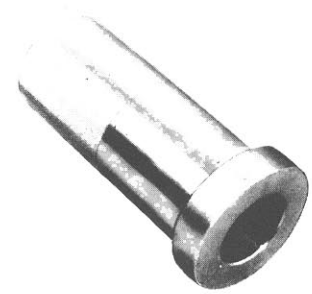
09913-75520
Differential front outer race installer

23.

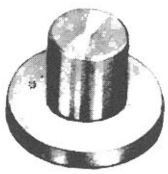
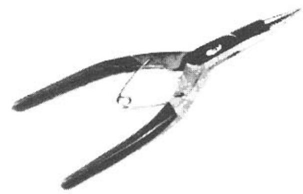
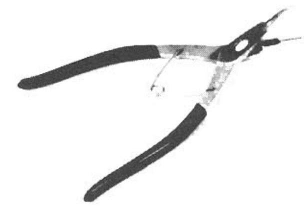
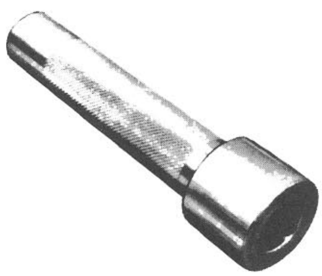
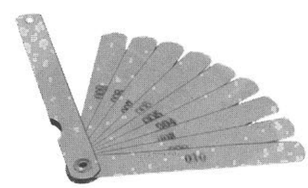
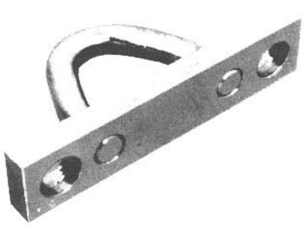
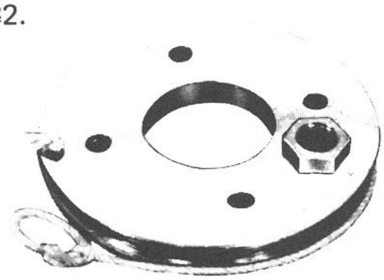
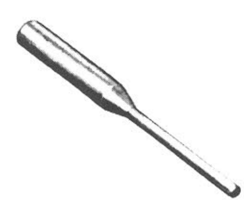
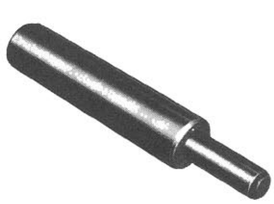
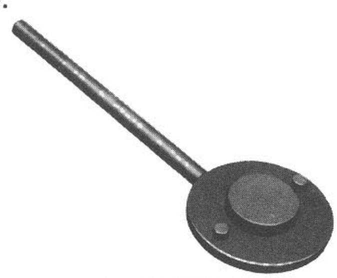


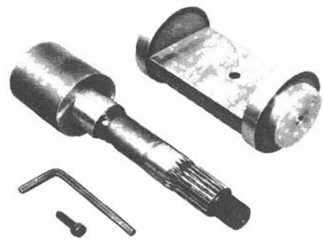
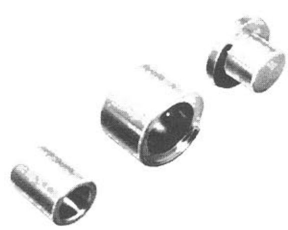
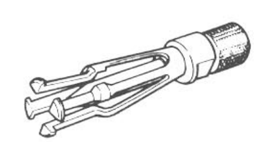
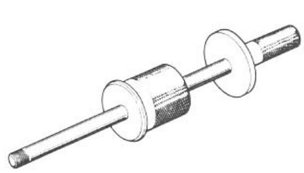
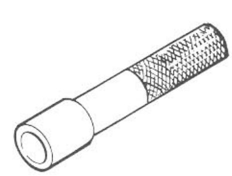
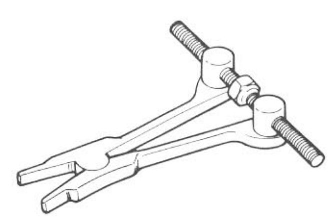
09913-80112
Bearing installer

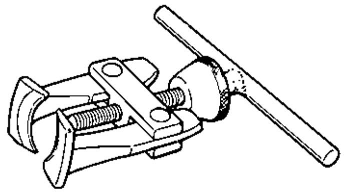
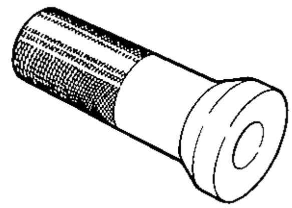
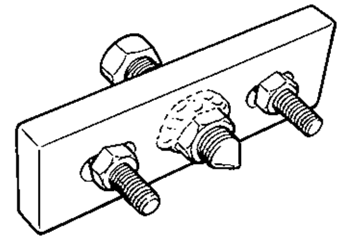
24.



09913-85210
Bearing installer

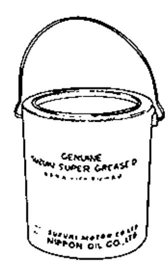
25.  09913-85230 Differential side bearing remover jig	26.  09900-06107 Snap ring pliers (opening type)	27.  09900-06108 Snap ring pliers (closing type)
28.  09922-55131 Bearing installer	29.  09915-27810 Hexagon socket (10 mm)	30.  09900-20803 Thickness gauge
31.  09922-66010 Rear axle shaft remover	32.  09922-75220 Differential pre-road checking tool	33.  09922-85811 Spring pin remover
34.  09923-36310 Clutch center guide	35.  09923-57910 Differential side bearing adjuster turner	36.  09940-53111 Differential side bearing installer

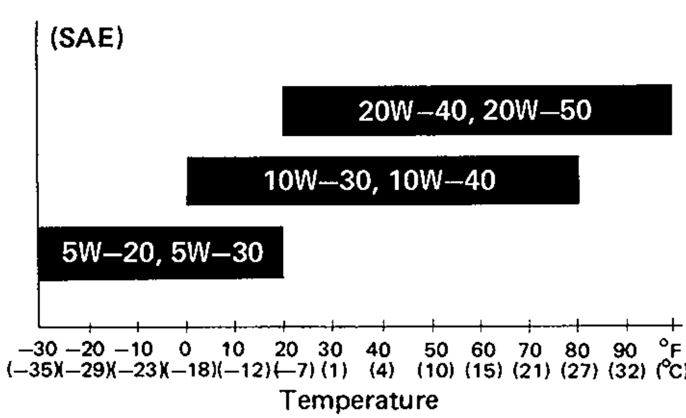
37.  09924-36320 Bevel pinion mounting dummy	38.  09942-15510 Sliding hammer	39.  09943-35511 Front drum remover
40.  09922-95210 Universal joint disassembling tool set	41.  09900-27301 Timing-light (D.C. 12V)	42.  09900-27311 Timing light (Dry cell type)
43.  09922-48010 Clutch release shaft bush remover	44.  09941-58010 50 mm socket wrench	45.  09923-74510 Bearing remover
46.  09930-30102 Sliding shaft	47.  09913-18010 Carburetor adjuster	48.  09912-34510 Cylinder disassembling tool

49.	50.	51.
		
09913-61110 Bearing puller	09913-76010 Bearing installer	09923-05110 Flywheel remover (Steering hand wheel remover)

1-7. Required Materials

The materials listed below are needed for maintenance work on these vehicles, and should be kept on hand for ready use. In addition, such standard materials as cleaning fluids, lubricants, etc., should also be available. Methods and time of use are discussed in the text of this manual on later pages.

Ref. No.	Material	Use
1.	GOLDEN CRUISER 1200 (99000-24120) 	Additive to engine cooling for improving cooling efficiency and for protection of wet walls against rusting.
2.	SUZUKI SUPER GREASE A (99000-25010) 	• For locations indicated in the section dealing with the starter motor. • Clutch release bearing retainer. • Clutch release shaft bushing. • Transmission oil seal. • Differential oil seal. • Steering column. • Gear shifting control lever bushing & seat. • Door window regulator. • For other locations specifically indicated in the text of this manual.
3.	SUZUKI GREASE SUPER H (99000-25120) 	Special grease intended for use on constant velocity joint.
4.	SUZUKI BOND (No. 4) (99000-31030) 	• For top and bottom mating faces of transmission case. • For other locations specifically indicated in the text of this manual.

5.	CHASSIS GREASE	• For grease nipples on propeller shafts. • For propeller shaft splines.
6.	GEAR OIL SAE #90	• Transmission case 1.0 ltr. (2.12/1.76 US/Imp. pt.) • Transmission gear and bearing • Transfer case 0.7 ltr. (1.50/1.20 US/Imp. pt.) • Steering gear box • Differential gear box (Hypoid gear oil) 1.3 ltr. (2.75/2.31 US/Imp. pt.)
7.	WHEEL BEARING GREASE	• Front wheel bearing • Rear wheel bearing
8.	4-STROKE ENGINE OIL **Proper oil viscosity chart** 	• For engine oil pan: 3.0 litres (6.34/5.28 US/Imp. pt.) for periodical oil change but 3.5 litres (7.39/6.16 US/Imp. pt.) for refilling at the time of engine overhauling. • Crank journal bearings and thrust plate. • Connecting-rod big-end and small-end bearings. • Camshaft journals and thrust plate. • Rocker shafts. • Oil pump gears. • Pistons and piston rings. • Engine oil seals. • Valve stems. • Accelerator, choke and clutch cables. • Parking brake cable. • Accelerator, brake and clutch pedals. • Door locks and hinges • Distributor gear.

9.	THREAD-LOCK CEMENT (99000-32040) 	• Timing belt inside cover bolt
10.	SUZUKI SUPER GREASE C (99000-25030)	• Propeller shaft universal joint spider bearings.
11.	THREAD LOCK CEMENT SUPER 1342 (99000-32050)	• Timing belt tensioner bolt
12.	SEALING COMPOUND "CEMEDINE" 366E (99000-31090) 180 mℓ 	• King pin shim face • For steering knuckle (rear axle housing) and brake backing plate matting surface.
13.	THREAD LOCK CEMENT SUPER 1333B (99000-32020) 	• Differential drive bevel gear bolt
14.	BRAKE FLUID "DOT 3, DOT 4" or SAE J1703	• Brake fluid reservoir tank

2. TROUBLE SHOOTING

2

2-1. Engine

Complaint	Possible causes	Remedy	Page
Poor starting	**Starter will not run**		
	1. Main fuse is blown off.	Replace.	
	2. Contact is not closing in main switch, or this switch is open-circuited.	Repair or replace.	
	3. Run-down battery.	Recharge.	10–12
	4. Defective starting relay.	Repair or replace.	
	5. Loose terminal connection on the battery.	Clean and retighten.	10–14
	6. Defective brushes in starter.	Replace.	9–7
	7. Loose battery cord connection.	Retighten.	
	8. Open in field or armature circuit of starter.	Repair or replace.	9–6
	No sparking		
	1. Defective spark plug.	Adjust the gap, or replace.	8–5/ 8–6
	2. Short-circuit (grounded) fault in high-tension cords.	Repair or replace defective cords.	
	3. Cracked rotor or cap in distributor.	Replace.	8–6
	4. Burnt breaker contact points.	Replace.	8–7/ 8–10
	5. Breaker contact gap out of adjustment.	Adjust as prescribed.	8–10
	6. Defective condenser.	Replace.	8–7
	7. Contact is not closing positively in main switch, or this switch is open-circuited.	Replace.	
	8. Loose or blown fuse.	Set right, or replace.	
	9. Ignition timing out of adjustment.	Adjust as prescribed.	8–10
	10. Defective ignition coil.	Replace.	8–8
	Faulty intake and exhaust systems		
	1. Carburetor needs readjustment.	Adjust as prescribed.	
	2. Fuel pump is not discharging adequately.	Replace.	
	3. Clogged fuel filter.	Clean, or replace.	5–7
	4. Defective choke mechanism.	Repair or replace.	4–6
	5. Loose intake manifold.	Retighten.	
	6. Caburetor is dirty and clogged.	Disassemble and clean.	4–6
	7. Float level out of adjustment.	Adjust as prescribed.	4–7
	8. Clogged fuel hose.	Clean or replace.	
	9. Not enough fuel in the tank.	Refill.	
	10. Clogged exhaust ports.	Clean.	
	Abnormal internal condition in engine		
	1. Ruptured cylinder head gasket.	Replace.	
	2. Valve clearance out of adjustment.	Adjust as prescribed.	3–46
	3. Weakened or broken valve spring.	Replace.	3–23
	4. Loose manifold, permitting air to be drawn in.	Retighten and, as necessary, replace the gasket.	
	5. Worn pistons, rings or cylinders.	Replace worn rings and pistons and, as necessary, rebore.	3–26

Complaint	Possible causes	Remedy	Page
	6. Broken valve timing belt.	Replace.	3–32/ 3–42
	7. Poor valve seating.	Repair or replace.	3–21
	8. Wrong kind of engine oil.	Replace.	3–54
	9. Burnt valves.	Replace.	
Not enough power	**Inadequate compression**		
	1. Valve clearance out of adjustment.	Adjust as prescribed.	3–46
	2. Valves not seating tight.	Repair;	3–21
	3. Valve stems tending to seize.	Replace.	
	4. Broken or weakened valve spring.	Replace.	3–23
	5. Piston rings seized in grooves, or broken.	Replace.	
	6. Worn pistons, rings or cylinders.	Replace worn parts and, as necessary, rebore.	3–26
	7. Leaky cylinder head gasket.	Replace.	
	Improperly timed ignition		
	1. Ignition timing out of adjustment.	Adjust as prescribed.	8–10
	2. Defective spark plug.	Adjust the gap, or replace.	8–5/ 8–6
	3. Breaker point gap out of adjustment.	Adjust or replace.	8–10
	4. Leaky high-tension cords for some cylinders.	Replace.	
	5. Distributor governor is not working correctly.	Repair.	
	Fuel system out of order		
	1. Clogged carburetor.	Disassemble and clean.	4–6
	2. Defective fuel pump.	Repair or replace.	5–4
	3. Clogged fuel filter.	Replace.	
	4. Choke wire working erratically.	Adjust.	4–6
	5. Float level out of adjustment.	Adjust.	4–7
	6. Clogged fuel pipe.	Clean or replace.	
	7. Clogged fuel tank outlet.	Clean.	
	8. Loose joint in fuel system.	Retighten.	
	Abnormal condition in air intake system		
	1. Air cleaner dirty and clogged.	Clean or replace.	5–3
	2. Poor returning motion of choke valve.	Repair, adjust or replace.	4–6
	Clogged exhaust system		
	1. Muffler is clogged with carbon.	Clean.	
	Overheating tendency of engine		
	1. (Refer to the section entitled "over-heating.")		
	Others		
	1. Dragging brakes.	Adjust as prescribed.	19–10
	2. Slipping clutch.	Adjust or replace.	11–5

Complaint	Possible causes	Remedy	Page
Sudden drop of speed in high-speed cruise	**Abnormal condition in electrical systems**		
	1. Breaker contact point gap too large.	Adjust as prescribed.	8 – 10
	2. Spark plug gap too large.	Adjust as prescribed.	8 – 6
	3. Cracked rotor or cap in distributor, resulting in leakage.	Replace.	
	4. Defective condenser.	Replace.	8 – 7
	5. Deteriorated ignition coil, or crack resulting in leakage.	Replace.	8 – 8
	6. Leaky high-tension cords.	Replace.	
	7. Ignition timing out of adjustment.	Adjust as prescribed.	8 – 10
	Abnormal condition in fuel system		
	1. Float level set too low.	Adjust as prescribed.	4 – 7
	2. Clogged condition of main jet circuit in carburetor.	Clean.	4 – 6
	3. Inadequately discharging fuel pump.	Replace.	
	Abnormal condition in engine		
	1. Loss of compression pressure due to leaky cylinder head gasket.	Replace.	
	2. Compression pressure too low because of worn pistons, rings, cylinders or burnt valves.	Replace and, as necessary, rebore.	
Engine not responding quickly to pedal control in picking up speed	**Abnormal condition in electrical system**		
	1. Ignition timing out of adjustment.	Adjust as prescribed.	8 – 10
	2. Defective spark plug, or plug gap out of adjustment.	Replace, or adjust as prescribed.	8 – 6
	3. Leaky high-tension cords for some cylinders.	Replace.	
	4. Breaker contact points out of adjustment or defective.	Adjust or replace.	8 – 6/ 8 – 10
	5. Defective condenser.	Replace.	8 – 7
	Abnormal condition in fuel system		
	1. Float level too low or too high.	Adjust as prescribed.	4 – 7
	2. Clogged jets in carburetor.	Clean.	4 – 6
	3. Air cleaner is dirty and clogged.	Clean or replace.	5 – 3
	Abnormal condition in engine		
	1. Exhaust ports dirty with carbon.	Clean.	
	2. Muffler clogged with carbon.	Clean.	
	3. Compression pressure too low.	Replace worn running parts, or rebore.	2 – 3
	4. Poorly seating valves.	Repair.	3 – 21
	5. Valve clearance out of adjustment.	Adjust as prescribed.	3 – 46
	6. Pistons tending to seize.	Replace and, as necessary, rebore.	3 – 26
	7. Bearings tending to seize.	Replace.	

Complaint	Possible causes	Remedy	Page
Erratic idling	**Abnormal condition in ignition system**		
	1. Ignition timing out of adjustment.	Adjust as prescribed.	8-10
	2. Defective spark plug, or plug gap too large.	Replace, or adjust.	8-6
	3. Cracked cap in distributor, there being leakage inside.	Replace.	8-6
	4. Leaky high-tension cords.	Replace.	
	5. Cracked rotor in distributor, there being leakage inside.	Replace.	
	Abnormal condition in fuel system		
	1. Carburetor idling adjustment is disturbed.	Adjust as prescribed.	4-8
	2. Clogged pilot jet in carburetor.	Clean.	4-6
	3. Float level out of adjustment.	Adjust as prescribed.	4-7
	4. Air cleaner is dirty and clogged.	Clean or replace.	5-3
	5. Air is being sucked in due to loose joints or broken parts.	Retighten, or replace.	
	6. Broken carburetor packings.	Replace.	
	Abnormal condition in engine.		
	1. Exhaust ports clogged with carbon.	Clean.	
	2. Valve clearance out of adjustment.	Adjust as prescribed.	3-46
	3. Poorly seating valves.	Repair.	3-21
	4. Blown cylinder head gasket.	Replace.	
Abnormal detonation	**Abnormal condition in ignition system**		
	1. Spark plugs are tending to overheat.	Change plug heat value.	8-5
	2. Ignition timing out of adjustment.	Adjust as prescribed.	8-10
	3. Defective breaker contact point.	Replace.	8-6/ 8-10
	4. Loose connection in high-tension or low-tension circuit.	Ritighten.	8-10
	Abnormal condition in fuel system		
	1. Air-fuel mixture too lean.	Clean and adjust.	4-8
	2. Carburetor is dirty inside.	Clean.	
	3. Float level out of adjustment.	Adjust as prescribed.	4-7
	4. Water inside carburetor.	Clean.	
	5. Air is leaking in through inlet manifold joint.	Retighten.	
	Abnormal condition in engine		
	1. Excessive carbon deposit on piston crowns or cylinder head.	Clean.	3-17
	2. Blown cylinder head gasket, resulting in low compression pressure.	Replace.	
	3. Valve clearance out of adjustment.	Adjust as prescribed.	3-46
	4. Valves tending to seize.	Replace.	
	5. Weakened valve springs.	Replace.	3-23

Complaint	Possible causes	Remedy	Page
Overheating	**Abnormal condition in ignition system**		
	1. Ignition timing out of adjustment.	Adjust as prescribed.	8 – 10
	2. Wrong heat value of spark plugs.	Change heat value.	8 – 5
	3. Breaker point gap out of adjustment in distributor.	Adjust as prescribed.	8 – 10
	Abnormal condition in fuel and exhaust systems		
	1. Float level set too low.	Adjust as prescribed.	4 – 7
	2. Clogged jets in carburetor.	Clean.	4 – 6
	3. Loose inlet manifold.	Retighten.	
	4. Clogged exhaust ports.	Clean.	
	Abnormal condition in cooling system		
	1. Not enough coolant.	Refill.	6 – 9
	2. Loose or broken fan belt.	Adjust or replace.	6 – 8
	3. Erratically working thermostat.	Replace.	6 – 8
	4. Poor water pump performance.	Replace.	
	5. Leaky radiator cores.	Repair or replace.	
	Abnormal condition in lubrication system		
	1. Clogged oil filter.	Replace.	3 – 53
	2. Clogged oil strainer.	Clean.	
	3. Deteriorated oil pump performance.	Replace.	3 – 51
	4. Oil leakage from oil pan or pump.	Repair.	
	5. Wrong kind of lubrication oil.	Change.	3 – 54
	6. Not enough oil in oil pan.	Replenish.	3 – 54
	Others		
	1. Dragging brakes.	Adjust.	19 – 10
	2. Slipping clutch.	Adjust or replace.	11 – 5
	3. Blown cylinder head gasket.	Replace.	
Abnormal engine noise	**Crankshaft noise**		
	1. Worn-down bearings, resulting in excessively large running clearances.	Replace.	3 – 31
	2. Worn connecting-rod bearings.	Replace.	3 – 29
	3. Distorted connecting rods.	Repair or replace.	3 – 28
	4. Worn crankshaft journals.	Repair by grinding, or replace crankshaft.	3 – 30
	5. Worn crankpins.	Repair by grinding, or replace crankshaft.	3 – 29
	Noise due to pistons, rings, pins or cylinders		
	1. Abnormally worn bores of cylinders.	Rebore to next oversize or replace.	3 – 25
	2. worn pistons, rings or pins.	Replace and, as necessary, rebore to next oversize.	3 – 26
	3. Pistons tending to seize.	Replace.	
	4. Broken piston rings.	Replace.	

Complaint	Possible causes	Remedy	Page
	Others		
	1. Excessively large camshaft thrust play.	Replace.	3–24
	2. Excessively large crankshaft thrust clearance.	Adjust as prescribed.	3–30
	3. Valve clearance too large.	Adjust as prescribed.	3–46
	4. Not enough engine oil.	Replenish.	3–54
High fuel consumption	**Abnormal condition in ignition system**		
	1. Ignition timing out of adjustment.	Adjust as prescribed.	8–10
	2. Leaky high-tension cords.	Replace.	
	3. Breaker point gap maladjusted.	Adjust or replace.	8–10
	4. Wrong heat value of spark plugs.	Change heat value.	8–5
	5. Cracked distributor cap or rotor.	Replace.	8–6
	Abnormal condition in fuel system		
	1. Float level set too high.	Adjust as prescribed.	4–7
	2. Fuel leakage from tank, pipe or carburetor.	Repair or replace.	
	3. Erratic returning action of choke valve.	Repair and adjust.	4–6
	4. Pilot screw set incorrectly.	Adjust as prescribed.	4–8
	5. Clogged breather in carburetor.	Clean.	
	6. Air cleaner is dirty and clogged.	Clean or replace.	5–3
	Abnormal condition in engine		
	1. Leakage of combustion gases from cylinder head.	Retighten, or replace head gasket.	
	2. Valve seating poorly.	Repair.	3–21
	3. Valve clearance out of adjustment.	Adjust as prescribed.	3–46
	Others		
	1. Dragging brakes.	Adjust as prescribed.	19–10
	2. Slipping clutch.	Adjust or replace.	11–5
Excessive engine oil consumption	**Oil leakage**		
	1. Oil drain plugs loose.	Retighten.	
	2. Loose oil pan securing bolts.	Retighten.	
	3. Broken oil pan gasket.	Replace.	
	4. Leaky oil seals.	Replace.	
	5. Blown cylinder head gasket.	Replace.	
	6. Oil filter malpositioned or loose.	Set the pump right, or retighten mounting bolts.	
	"Oil pumping" (Oil finding its way into combustion chambers.)		
	1. Oil rings are worn or broken.	Replace.	3–27
	2. Piston ring end gaps are not staggered as prescribed.	Reposition rings.	3–35
	3. Badly worn ring grooves.	Replace pistons.	3–27
	4. Worn pistons or cylinders.	Replace pistons and, as necessary, rebore.	3–26

Complaint	Possible causes	Remedy	Page
	Oil leakage along valve stems		
	1. Defective valve stem oil seals.	Replace.	
	2. Badly worn valves or valve guide bushes.	Replace.	3 – 19

2-2. Carburetor

Complaint	Possible causes	Remedy	Page
Fuel overflow from carburetor	1. Float valve is worn or dirty with foreign matter.	Clean or replace.	4 – 6
	2. Float level is set too high.	Adjust as prescribed.	4 – 7
	3. Float is ruptured and contains some fuel.	Replace.	
	4. Broken or otherwise defective gasket.	Replace.	
	5. Loose float chamber securing screws.	Retighten.	
	6. Fuel pump discharge pressure too high.	Adjust.	

2-3. Exhaust and Muffler

Complaint	Possible causes	Remedy	Page
Poor muffling performance	1. Loose exhaust pipe connection.	Retighten.	
	2. Broken muffler gasket.	Replace.	
	3. Broken manifold, pipe or muffler.	Repair or replace.	
	4. Exhaust manifold loose in place.	Retighten.	
	5. Interference between body and muffler.	Repair, eliminating any contact.	

2-4. Clutch

Complaint	Possible causes	Remedy	Page
Slipping clutch	1. Loss of clearance at the tip of release fork.	Adjust as prescribed.	11 – 5
	2. Clutch facings dirty with oil.	Replace.	
	3. Clutch facings excessively worn.	Replace.	11 – 3
	4. Weakened diaphragm spring.	Replace.	
	5. Distorted pressure plate or flywheel surface.	Replace.	3 – 19
	6. Not enough play of clutch pedal.	Adjust and, as necessary, replace clutch facings.	11 – 5/ 11 – 3

Complaint	Possible causes	Remedy	Page
Dragging clutch	1. Excessive clutch pedal play. 2. Weakened diaphragm spring, or worn spring tip. 3. Damaged or worn splines of transmission input shaft. 4. Front input shaft bearing worn or broken. 5. Excessively wobbly clutch disc. 6. Clutch facings broken or dirty with oil.	Adjust as prescribed. Replace. Replace. Replace. Replace. Replace.	11–5 11–4 11–4
Clutch vibration	1. Glazed (glass-like) clutch facings. 2. Clutch facings dirty with oil. 3. Wobbly clutch disc, or poor facing contact. 4. Weakened torsion springs (in clutch disc). 5. Clutch disc rivets loose. 6. Distorted pressure plate or flywheel surface. 7. Weakened engine mounts (cushion pads).	Repair or replace. Replace. Replace. Replace. Replace the disc. Replace. Retighten or replace.	 3–32
Noisy clutch	1. Worn or broken release (throw-out) bearing. 2. Front input shaft bearing worn down. 3. Excessive rattle of clutch disc hub. 4. Cracked clutch disc. 5. Pressure plate and diaphragm spring are rattling.	Replace. Replace. Replace the disc. Replace. Replace.	11–4 11–4 11–4
Grabbing clutch	1. Clutch facings are soaked with oil. 2. Clutch facings are excessively worn. 3. Rivet heads are showing out of the facing. 4. Torsion springs are weakened.	Replace. Replace. Replace. Replace.	 11–3 11–3

2-5. Transmission

Complaint	Possible causes	Remedy	Page
Gears slipping out of mesh	1. Distorted shift rod. 2. Worn shift fork shaft. 3. Worn locating steel balls. 4. Weakened springs for locating steel balls. 5. Worn shift fork. 6. Excessive rattle in thrust direction of gears. 7. Worn ring or hub in synchronizers. 8. Worn bearings of input shaft, main shaft or countershaft.	Repair or replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace.	 13–14 13–12 13–12
Gears refusing to disengage	1. Weakened or broken synchronizer springs. 2. Worn inner groove of synchronizer ring. 3. Synchronizer ring is seized on the cone. 4. Distorted shift fork shaft or shift fork. 5. Worn shift fork.	Replace. Replace. Replace the ring. Replace. Replace.	 13–12

Complaint	Possible causes	Remedy	Page
Excessive gear noise	1. Not enough oil in transmission. 2. Defective synchronizer. 3. Gears rattling in thrust direction. 4. Broken or worn bearings.	Replenish. Replace. Replace. Replace.	13–18 13–12
Hard shifting	1. Clutch pedal play too large, resulting in a "dragging clutch." 2. Clutch disc facings are worn. 3. Clutch disc facings are dirty with oil. 4. Distorted or unevenly worn shift fork shaft. 5. Broken locating balls. 6. Worn synchronizer sleeve. 7. Worn synchronizer hub.	Adjust as prescribed. Replace. Replace. Replace. Replace. Replace. Replace.	11–5 11–3 13–12

2-6. Differentials

Complaint	Possible causes	Remedy	Page
Breakage (case, gears, bearings, etc.)	1. Insufficient or wrong kind of gear oil. 2. Improperly shimmed side bearings or pinion bearings. 3. Improper mesh of drive pinion with ring gear. 4. Excessive backlash due to worn side gear thrust washer and pinion thrust washer. 5. Distorted rear axle housing. 6. Loose bolts securing ring gear.	Replenish or change. Adjust as prescribed. Adjust or replace. Adjust or replace. Replace. Replace.	16–14 16–7 16–9 16–9
Gear noise	1. Maladjusted backlash between drive pinion and ring gear. 2. Damaged gear teeth or improper mesh of drive pinion and ring gear. 3. Improper tooth contact in the mesh between drive pinion and ring gear. 4. Insufficient or wrong kind of gear oil. 5. Ring gear wobbles when turning, or ring gear securing bolts are loose. 6. Broken or otherwise damaged teeth of side gears or differential pinion gears.	Adjust as prescribed. Replace or adjust. Adjust as prescribed. Replenish or replace. Replace, or retighten. Replace.	16–9 16–11 16–14
Bearing noise	1. (Constant noise) Insufficient or wrong kind of gear oil. 2. (Constant noise) Damaged or worn bearings or borne parts. 3. (Noise during coasting) Damaged bearings of rear drive pinion. 4. (Noise during turning) Broken bearings on axle shafts.	Replenish or change. Replace. Replace. Replace.	16–14

2-7. Propeller Shafts

Complaint	Possible causes	Remedy	Page
Vibration and noise	1. Broken or worn bearings of universal joint spider. 2. Distorted propeller shaft. 3. Unbalanced propeller shaft. 4. Loose propeller shaft.	Replace. Replace. Replace. Retighten.	15 – 3
Noise occurring at standing start or during coasting	1. Worn or damaged universal joint. 2. Worn propeller shaft splines, due to lack of lubrication. 3. Loose propeller shaft. 4. Loose flanged yoke of universal joint.	Replace. Replace. Retighten. Retighten,	15 – 3 15 – 3

2-8. Brakes

Complaint	Possible causes	Remedy	Page
Not enough braking force	1. Brake oil leakage from brake lines. 2. Drum-to-shoe clearance out of adjustment. 3. Overheated brakes. 4. Poor contact of shoes on brake drum. 5. Brake shoes stained with oil or wet with water. 6. Badly worn brake shoe linings.	Locate the leaking point and repair. Adjust as prescribed. Determine the cause or overheating, and repair. Adjust for proper contact. Replace. Replace.	 19 – 10 19 – 10 19 – 9
Uneven braking (Brakes not working in unison.)	1. Shoe linings are wet with water or stained with oil in some brakes. 2. Drum-to-shoe clearance out of adjustment in some brakes. 3. Drum is out of round in some brakes. 4. Wheel tires are inflated unequally. 5. Defective wheel cylinders 6. Disturbed front wheel alignment	Clean or replace. Adjust as prescribed. Replace. Inflate equally. Repair or replace. Adjust as prescribed.	19 – 9 19 – 10 19 – 8 18 – 12 18 – 16
Pedal stroke too large	1. Drum-to-shoe clearance out of adjustment. 2. Air trapped in the brake oil circuit. 3. Brake pedal improperly adjusted. 4. Brake oil leakage. 5. Not enough oil in the brake fluid reservoir. 6. Excessively worn brake drums. 7. Distorted or poorly contacting brake shoes. 8. Defective cup in master cylinder. 9. Worn brake shoes.	Adjust as prescribed. Bleed air out as prescribed. Adjust as prescribed. Locate the leaking point and repair. Replenish. Replace. Repair or replace. Replace. Replace.	19 – 10 19 – 9 19 – 10 19 – 10 19 – 8 19 – 11

Complaint	Possible causes	Remedy	Page
Dragging brake	1. Clogged return port in master cylinder. 2. Brake shoes improperly mounted on backing plate. 3. Weakened or broken return springs in the brake. 4. Defective wheel cylinders. 5. Sluggish parking-brake cables or linkage. 6. Brake shoes improperly adjusted.	Clean. Repair. Replace. Repair or replace. Repair or replaces. Adjust as prescribed.	19 – 10
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or out-of-round brake drums. 2. Damaged wheel bearings. 3. Distorted steering knuckle or rear axle shafts.	Replace. Replace. Replace.	19 – 8
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings. 2. Worn or loose shoe linings. 3. Broken front wheel bearings. 4. Distorted or loose backing plates.	Repair or replace. Replace. Replace. Replace, or retighten securing bolts.	19 – 9 19 – 9

2-9. Front Suspension and Steering System

Complaint	Possible causes	Remedy	Page
Hard steering	1. Wheel tires not adequately inflated. 2. Tie rod ends tending to seize. 3. Linkage connections tending to seize. 4. Steering gearbox out of adjustment. 5. Unevenly worn steering shaft bush. 6. Poorly lubricated or worn joints in linkage. 7. Disturbed front wheel alignment.	Adjust the pressure. Replace. Repair or replace. Adjust as prescribed. Replace. Lubricate or replace. Adjust as prescribed.	18 – 12 18 – 9 18 – 16
Wobbly steering wheel	1. Wheel tires inflated unequally. 2. Wobbly wheels. 3. Large difference in tire diameter between right and left wheels. 4. Loose hub nuts. 5. Damaged or worn wheel bearings. 6. Worn or loose tie rod ends. 7. Steering gearbox out of adjustment. 8. Steering gearbox mounted loose. 9. Worn steering center lever. 10. Worn steering knuckle oil seal.	Adjust the pressure. Repair or replace. Replace. Retighten. Replace. Replace or retighten. Adjust as prescribed. Retighten. Replace. Replace.	17 – 21 18 – 9 17 – 14

Complaint	Possible causes	Remedy	Page
Steering wheel pulling to one side	1. Unevenly worn wheel tires. 2. Brake dragging in one road wheel. 3. Wheel tires unequally inflated. 4. Worn or distorted link rods. 5. Disturbed front wheel alignment.	Replace. Repair. Adjust the pressure. Replace. Adjust as prescribed.	 19 – 10 18 – 12 18 – 16
Shocks coming to steering wheel	1. Tire inflating pressure too high. 2. Poor shock absorber performance. 3. Differences in tire diameter amount the four road wheels. 4. Worn steering linkage connections. 5. Worn or broken front wheel bearings. 6. Loose front wheel. 7. Steering wheel loose in place.	Reduce to the specification. Replace. Adjust. Replace. Replace. Retighten. Retighten the nut.	18 – 12 17 – 21
Rapid wear or uneven wear of wheel tires	1. Wheel tires improperly inflated. 2. Differences in diameter among the four tires. 3. Worn or loose road wheel bearings. 4. Wobbly wheel tires. 5. Wheel tires improperly "rotated" to result in unbalance. 6. Disturbed front wheel alignment.	Adjust the pressure. Adjust or replace. Replace. Repair or replace. Adjust. Adjust as prescribed.	18 – 12 18 – 12 18 – 16
Steering noise	1. Loose bolts and nuts. 2. Loose leaf spring seats. 3. Broken or otherwise damaged wheel bearings. 4. Worn or sticky tie rod ends. 5. Linkage joints needing grease.	Retighten. Retighten. Replace. Replace. Lubricate or replace.	

2-10. Starting Motor

Complaint	Possible causes	Remedy	Page
Starter runs but pinion will not mesh into ring gear.	1. Worn pinion of starter clutch. 2. Defective splines, resulting in sticky pinion plunging motion. 3. Worn bush. 4. Wrong pinion plunging position. 5. Worn teeth of ring gear.	Replace. Repair or replace. Replace. Adjust. Replace.	

Complaint	Possible causes	Remedy	Page
Starter will not run at all, or runs but runs too slow to crank with full force.	**Battery trouble**		
	1. Poor contact in battery terminal connection.	Repair or retighten.	10 – 14
	2. Loose grounding cable connection.	Retighten.	
	3. Battery run down.	Recharge.	10 – 14
	4. Battery voltage too low due to battery deterioration.	Replace.	
	Ignition switch trouble		
	1. Poor contacting action.	Replace.	
	2. Lead wire socket loose in place.	Retighten.	
	3. Open-circuit between ignition switch and magnet switch.	Repair.	
	Magnet switch trouble		
	1. Lead wire socket loose in place.	Retighten.	
	2. Burnt contact plate, or poor contacting action.	Replace, or repair.	
	3. Open-circuit in pull-in coil.	Replace.	
	4. Open-circuit in holding coil.	Replace.	
	Starter proper trouble		
	1. Brushes are seating poorly or worn down.	Repair or replace.	9 – 7
	2. Burnt commutator.	Repair or replace.	9 – 6
	3. Open-circuit in armature winding.	Replace.	9 – 6
	4. Worn-down starter.	Replace.	
Starter does not stop running.	1. Fused contact points of magnet-switch contact plate.	Repair or replace.	
	2. Short-circuit between turns of magnet-switch coil (layer short-circuit).	Replace.	
	3. Failure of returning action in ignition switch.	Replace.	

2-11. Alternator

Complaint	Possible causes	Remedy	Page
Battery quickly becomes over-discharged.	1. Loose or broken "V" belt.	Adjust or replace.	6 – 8
	2. Open-circuit in stator winding.	Repair or replace.	10 – 8
	3. Open-circuit in rotor winding.	Repair or replace.	10 – 7
	4. Excessively worn slip ring brushes.	Replace.	10 – 8
	5. Weakened brush springs.	Replace.	
	6. Regulator setting too low. (Regulated voltage too low.)	Adjust as prescribed.	10 – 9
	7. Poor contacting action of low-speed point in regulator.	Repair.	10 – 9
	8. Fused high-speed contact point in regulator.	Repair, or replace.	

Complaint	Possible causes	Remedy	Page
	9. Improper acid concentration in or low level of battery electrolyte. 10. Defective battery cell plates. 11. Insufficient contact in battery terminal connection. 12. Open-circuit between two "F" terminals (one on regulator and the other on alternator), or high resistance. 13. Excessive electrical load.	Replace, or replenish. Replace the battery. Clean and retighten. Repair. Advise the user to economize.	10 –12 10 –14 10 –4
Battery tends to become overcharged.	1. Regulated voltage set too high. 2. Poorly grounded "E" terminal of regulator. 3. Open-circuit in voltage-regulator pressure coil. 4. Fused low-speed point of regulator. 5. Poor contacting action of high-speed point of regulator. 6. Open-circuit or high resistance between two "N" terminals (one on alternator and the other on regulator).	Adjust as prescribed. Repair. Replace. Repair or replace. Repair or replace. Repair.	10 –9 10 –4 10 –4
Alternator noise	1. Worn, loose or otherwise defective bearings.	Replace.	

2-12. Wiper Motor

Complaint	Possible causes	Remedy	Page
Wiper will not run.	1. Fuse is set loose or blown off. 2. Incomplete metal-to-metal contact in connector. 3. Worn or floating brushes. 4. Dirty or burnt commutator. 5. Short-circuited or fused field coil. 6. Loose terminal connention on wiper switch.	Tighten or replaces. Repair. Replace or repair. Repair or replace. Replace. Repair.	
Wiper will not stop running.	1. Defective wiper switch.	Repair or replace.	
Wiper stops at wrong position.	1. Improper wiper arm setting. 2. Cover plate incorrectly positioned in place.	Repair. Repair.	
Poor wiping action.	1. Insufficient pressure of wiper arm. 2. Deteriorated or hardened blade. 3. Blade improperly set. 4. Windshield dirty with oil.	Replace. Replace. Repair or replace. Clean.	

2-13. Fuel Meter

Complaint	Possible causes	Remedy	Page
Faulty meter indication	1. Incomplete metal-to-metal contact in terminal connections. 2. Defective receiver gauge due to burnt point or deformed bimetal element. 3. Erratic float movement. 4. Defective grounding (for float and gauge).	Retighten. Replace. Repair or replace. Repair.	
No indication	1. Open-circuit. 2. Open-circuited heat wire. 3. Burnt point. 4. Deformed bimetal element. 5. Open-circuited resistor.	Repair. Replace. Replace. Replace. Replace.	21 – 17

2-14. Turn Signal Lamps

Complaint	Possible causes	Remedy	Page
Flashing frequency is higher on one side, or flashing occurs only on one side, right or left.	1. Lamps are imperfectly grounded. 2. Lamps of wrong watt ratings are used. 3. One of the lamp bulbs is blown on right or left side or on front or rear side. 4. Defective turn signal relay. 5. Open-circuit or high resistance between switch and lamps.	Repair. Replace. Replace. Replace. Repair.	
No flashing on occurs on both sides, right and left.	1. Blown fuse in turn signal circuit. 2. Open-circuit or high resistance between battery and switch. 3. Defective turn signal relay.	Replace. Repair. Replace.	
Flashing frequency is too low, or no flashing occurs on both sides.	1. Lamps of a smaller watt rating than the specification rating are used. 2. One of the lamps on right or left side or on front or rear side is poorly grounded. 3. Supply voltage is too low. 4. Fuse set loose in place, resulting in poor contact. 5. Incomplete metal-to-metal contact in connector. 6. Defective turn signal relay.	Replace. Repair. Recharge the battery. Repair or replace. Repair. Replace.	10 – 14
Flashing frequency is too high.	1. Lamps of a larger wattage than the specification are used. 2. Defective flasher.	Replace. Replace.	

2-15. Speedometer

Complaint	Possible causes	Remedy	Page
Faulty indication	1. Damaged speedometer drive or driven gear. 2. Defective drive cable. 3. Drive cable incompletely or improperly tied into the meter. 4. Defective speedometer.	Replace. Replace. Set right. Replace.	
Speedometer noise	1. Inadequately lubricated or defective cable. 2. Not enough oil in transfer.	Lubricate or replace. Replenish.	14–20

2-16. Water Temperature Meter

Complaint	Possible causes	Remedy	Page
Faulty indication	1. Incomplete metal-to-metal contact in terminal connections. 2. Receiver gauge defective (due to burnt point or deformed bimetal element). 3. Defective temperature gauge.	Repair and tighten. Replace. Replace.	
No indication	1. Open-circuit. 2. Defective receiver gauge (open-circuited heat wire, deformed bimetal element or pointer). 3. Defective temperature gauge.	Repair Replace. Replace.	6–7

2-17. Oil Pressure Warning Lamp

Complaint	Possible causes	Remedy	Page
Turning ignition switch on (for engine starting) does not light this lamp.	1. Lamp bulb is blown. 2. Blown-off fuse. 3. Defective oil pressure switch. 4. Open-circuit between lamp and ignition switch. 5. Open-circuit between lamp and pressure switch.	Replace. Replace. Replace. Repair. Repair.	
Lamp remains burning even after engine starts up.	1. Not enough oil in engine oil pan. 2. Oil pressure too low. 3. Defective oil pressure switch.	Replenish. Repair or replace the pump. Replace.	3–54 3–53

2-18. Charge Warning Lamp

Complaint	Possible causes	Remedy	Page
Turning ignition switch on (for engine starting) does not light this lamp.	1. Lamp bulb is blown. 2. Blown-off fuse. 3. Open-circuit. 4. High resistance in circuit wire due to loose connection.	Replace. Replace. Replace. Retighten.	
Lamp remains burning even after engine starts up.	1. Alternator is not producing full output. 2. Defective voltage regulator. 3. Ground-circuit formed between lamp and the battery.	Repair. Repair or replace. Repair.	2 – 14 10 – 12

2-19. Horn

Complaint	Possible causes	Remedy	Page
Horn will not sound off.	1. Blown-off fuse. 2. Broken circuit wire. 3. Defective horn.	Replace. Repair. Replace.	
Poor sound quality	1. Incomplete contacting action inside horn switch. 2. Improper point gap or burnt point inside the horn. 3. Cracked diaphragm.	Repair. Repair or replace. Replace.	

3. ENGINE

3

3-1. Description

1) The engine is a water-cooled, in-line 4 cylinders, 4-stroke cycle gasoline unit with its S.O.H.C. (single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.

The single overhead camshaft (S.O.H.C.) is mounted over the cylinder head; it is driven from crankshaft through timing belt. Unlike conventional overhead valve (O.H.V.) engines, this engine has no pushrods. Thus, drive for valves is more direct and enables the valves to follow the crankshaft without any delay.

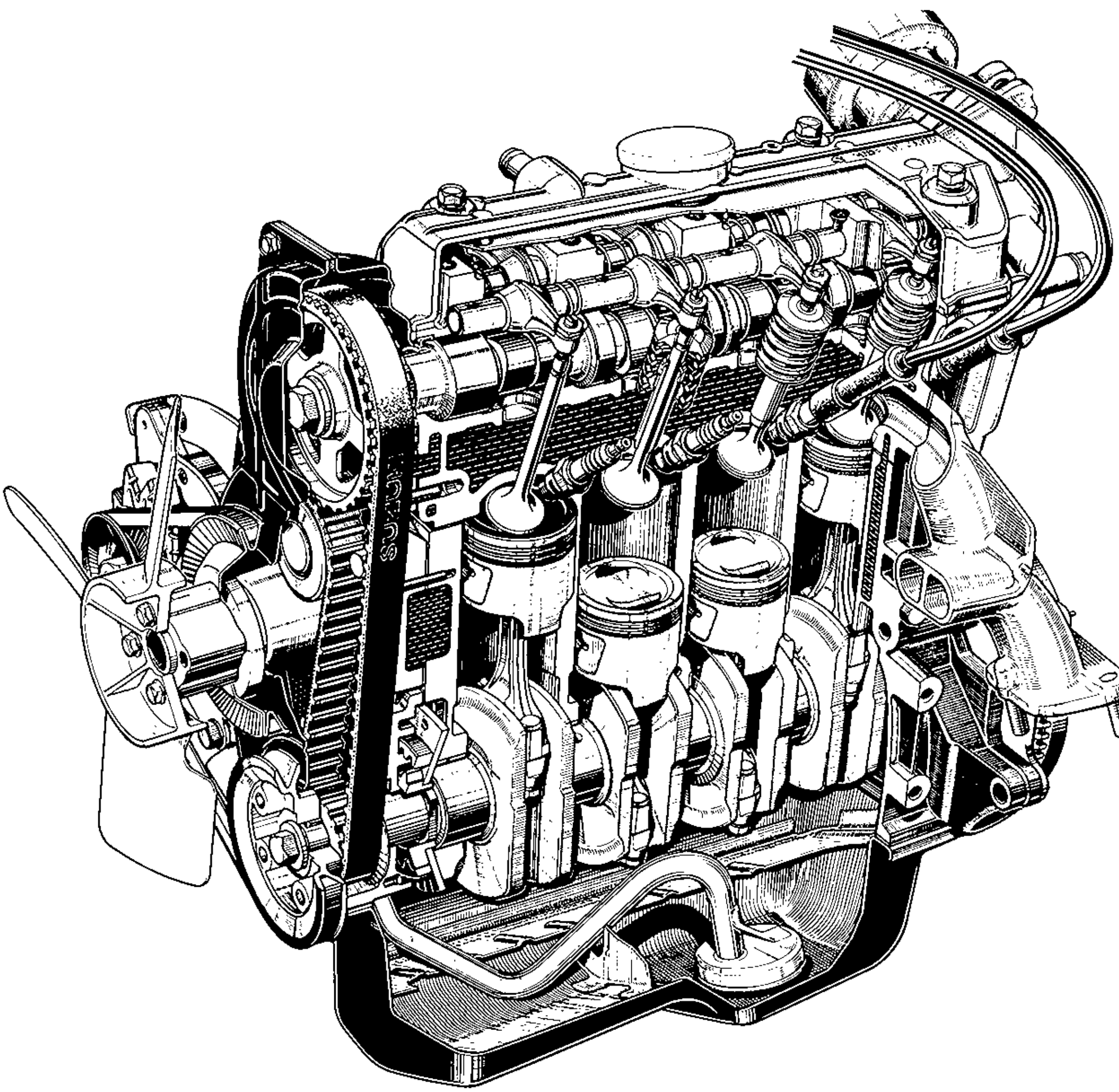


Fig. 3-1

2) The distinctive features of this engine may be summarized as follows:

1. Because of inlet and exhaust ports arranged for cross-flow pattern, with valves located in "V"-type configuration, both volumetric and scavenging efficiencies are very high.

2. The combustion chamber formed between piston crown and cylinder head is of a multi-spherical type shaped to provide squish. This feature is calculated to make available greater horsepower from a lesser amount of fuel.

3. The supports for camshaft and rocker shafts are integral with the cylinder head, so that the valve mechanism noise is markedly reduced by the structural rigidity and, moreover, that the number of valve mechanism parts is reduced, let alone a more compact size of the engine.

4. The timing belt for driving the camshaft runs quiet and is light in weight.

5. A high-grade cast iron is used for the material of the cylinder block. The block is shaped to present deep skirts and retain greater rigidity.

6. The crankshaft is a one-piece forging, and is supported by five bearings for vibration-free running.

7. Heating by hot water is employed for the inlet manifold in order to facilitate fuel carburetion and ensure the uniform distribution of the mixture. The higher combustion efficiency of this engine is largely explained by this inlet manifold feature.

8. The exhaust manifold and exhaust pipe used in this exhaust system are of dual port type. With such dual port type manifold and pipe, exhaust efficiency is improved and high horse power and high torque are obtained.
   (There are two independent ports in both the exhaust manifold and exhaust pipe. One is for passing exhaust gas which comes from No. 1 and No. 4 cylinders and the other is for exhaust gas from No. 2 and No. 3 cylinders.)

3) Blowby gas recycling system

Blowby gas passage is provided in the cylinder block to pass the blowby gases from crankcase to cylinder head. In the head cover, an oil separator removes oil particles from the gases before the gases are drawn into the air cleaner.

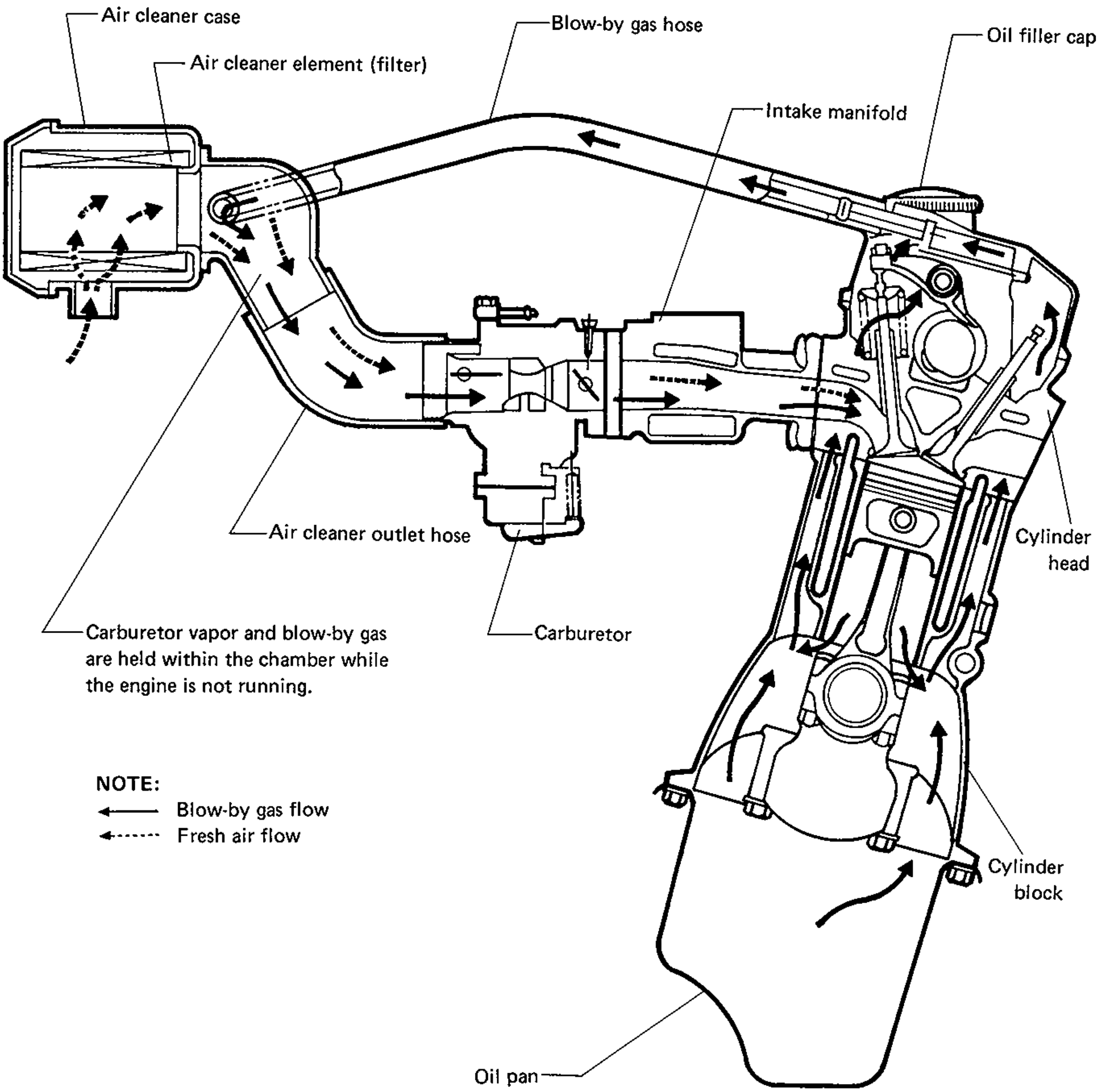


Fig. 3-2

3-2. Engine Services Not Requiring Engine Removal

The following parts or components do not require engine removal to receive services (replacement, inspection or adjustment):

Part or Component	Nature of Service
1. Spark plug	Replacement or inspection
2. Distributor	Replacement, inspection or adjustment
3. Exhaust manifold	Replacement or inspection
4. Oil filter	Replacement
5. Oil pressure unit	Replacement
6. Cylinder head cover	Replacement
7. Rocker shaft	Replacement or inspection
8. Rocker-arm	Replacement or inspection
9. Rocker-arm spring	Replacement or inspection
10. Cam shaft	Replacement or inspection
11. Cylinder head	Replacement or inspection
12. Radiator	Replacement or inspection
13. Cooling fan	Replacement
14. Camshaft timing belt pulley	Replacement or inspection
15. Crankshaft timing belt pulley	Replacement or inspection
16. Timing belt	Replacement or inspection
17. Fuel pump	Replacement
18. Carburetor	Replacement, inspection or adjustment
19. Intake manifold	Replacement
20. Alternator	Replacement or inspection
21. Starter motor	Replacement or inspection
22. Fan belt	Replacement, inspection or tension adjustment
23. Water pump	Replacement
24. Pulleys (crank, generator, fan)	Replacement
25. Timing belt cover	Replacement
26. Water hose	Replacement or inspection
27. Oil pan and oil strainer	Replacement or inspection
28. Oil pump	Replacement or inspection

3-3. Dismounting the Engine

1. Disconnect negative (–) and positive (+) cords from the battery terminals.

2. From the starter motor terminals, disconnect black/yellow lead wire and positive (+) battery cord.

3. Disconnect the coupler and white lead wire from the alternator terminals.

4. Disconnect the lead wire from water temperature gauge. This gauge is on the inlet manifold.

5. Disconnect the coupler of carburetor solenoid coil lead wire.

6. Remove the warm air hose.

7. Disconnect breather hose from cylinder head.

8. Disconnect the air inlet hose from carburetor body.

9. Disconnect the accelerator wire from carburetor body.

10. Disconnect the choke wire from carburetor body.

11. From the fuel pump, disconnect two pipes leading to fuel tank.

12. Disconnect the lead wire from oil pressure unit terminal.

13. Disconnect the lead wire from back-up light switch.

14. Disconnect the lead wire (brown) from distributor.

15. Pull off high-tension cord from the ignition coil.

16. Loosen radiator drain plug to drain the cooling water.

17. Take down the radiator, after disconnecting the water hoses from thermostat and water inlet pipe.

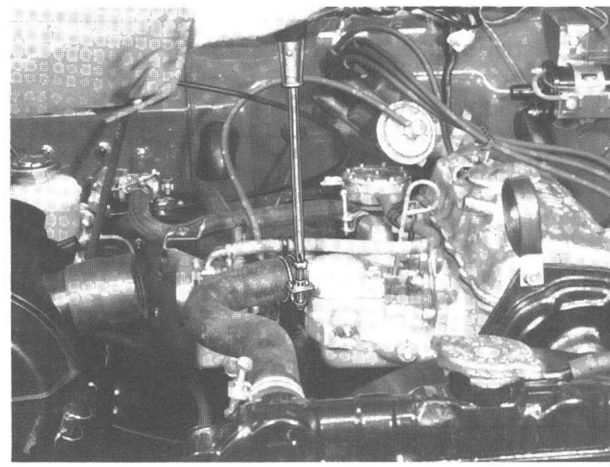


Fig. 3-3

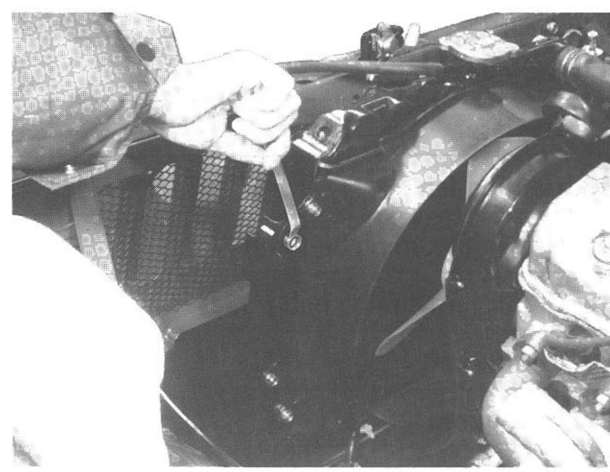


Fig. 3-3-1

18. Disconnect the heater hoses (leading to the car heater) from water inlet pipe and intake manifold.

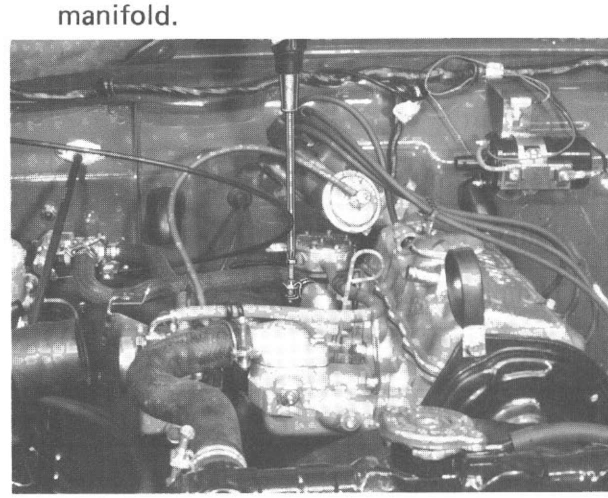


Fig. 3-3-2

19. Remove 4 bolts fastening the gear shift lever boot No. 2.

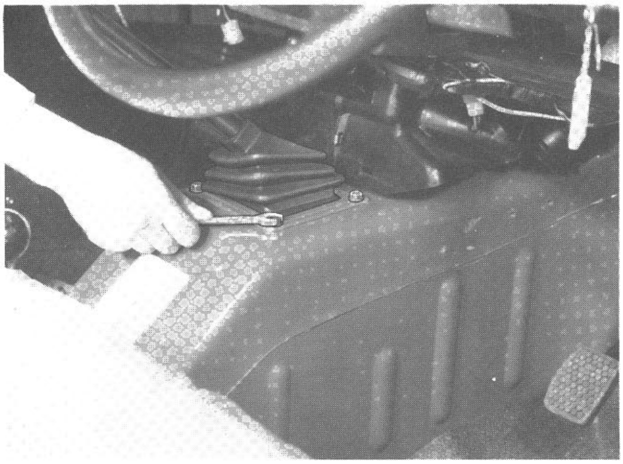


Fig. 3-3-3

20. Move by sliding the gear shift lever boot No. 1 to the upper side of the shift lever.

21. Loosen 3 bolts tightening the gear shift lever case cover and take the shift lever out of the lever case.

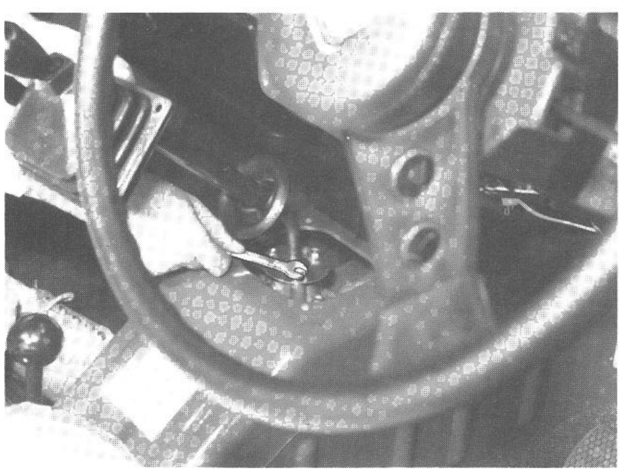


Fig. 3-3-4

22. Jack up or lift up the machine.
    Rest the machine steady on safety stands.

23. Sever exhaust manifold from muffler by undoing the joint.

24. Disconnect clutch cable from engine mounting bracket and clutch release lever.

25. Loosen drain plug to drain the transmission oil.

26. Remove the propeller shaft interconnecting the transmission case and transfer case.

27. Remove the plate provided with chassis under the transmission case.

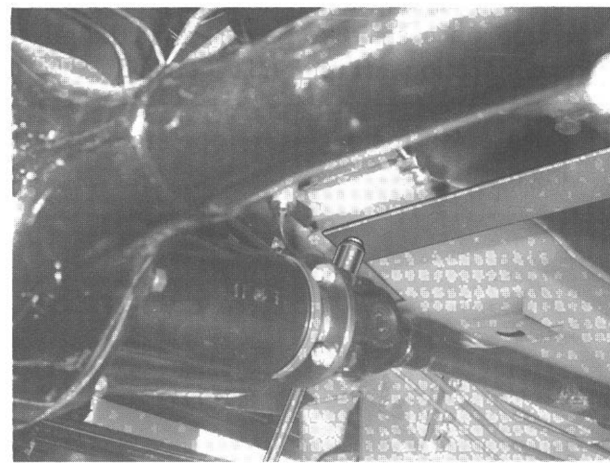


Fig. 3-3-5

28. Remove 2 transmission mounting bracket bolts.

Fig. 3-3-6

29. By using a chain block, hoist the engine to the extent that the engine is kept from falling.

NOTE:
To use a chain block for the hoist, take hitch on the engine at the two hooks provided, one on inlet-manifold side and one on exhaust-manifold side.

30. Remove 4 bolts securing the right and left engine mounting brackets (body side).

CAUTION:
Before starting to lift the engine check around once again to be sure that there is no connection left undone.

31. Take down the engine by operating a hoisting means.

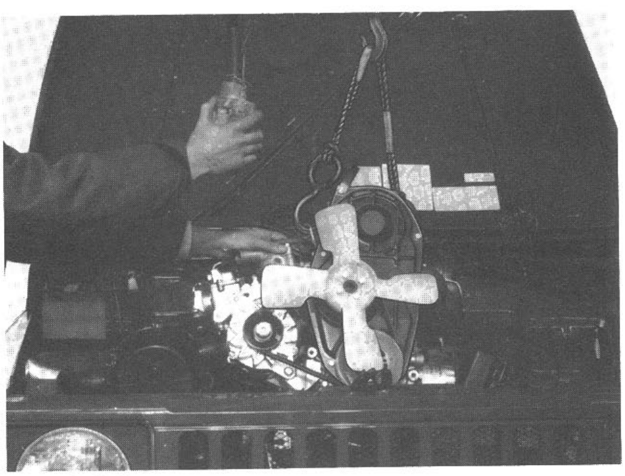


Fig. 3-3-7

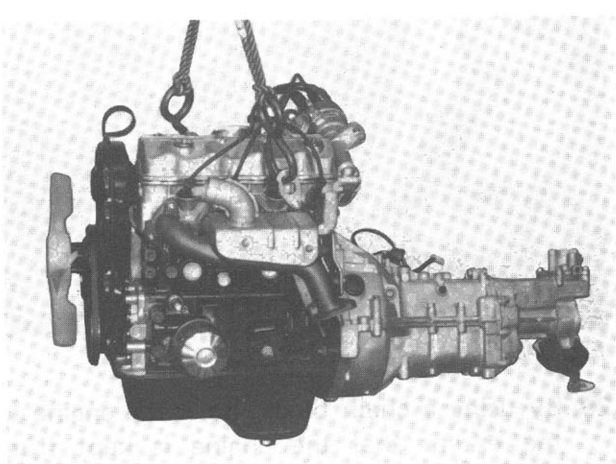


Fig. 3-3-8

Throughout this MANUAL, the four cylinders of the engine are identified by numbers: No. 1, No. 2, No. 3 and No. 4 as counted from front end.

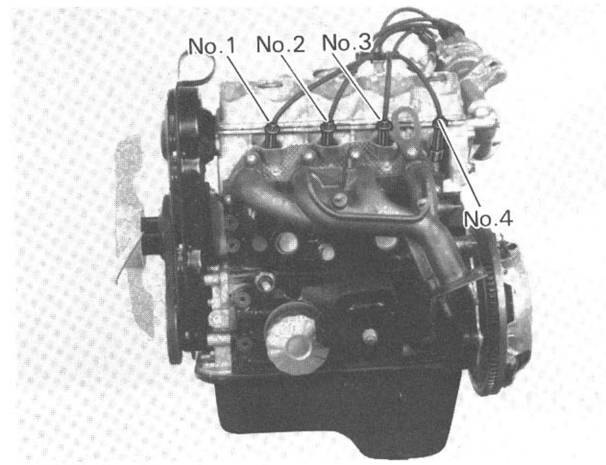


Fig. 3-3-9

3-4. Engine Disassembly

> NOTES:
> - Observe critically before starting to remove a component or part by loosening bolts, nuts and the like. What you may find before and during disassembly is valuable information necessary for successful reassembly.
> - Be careful in handling aluminium-alloy parts. They are softer than steel or cast-iron parts and their finished surfaces more easily take scratch marks.
> - Have trays and pans ready for setting aside the disassembled parts in an orderly manner. Place the parts in the trays and pans in such a way that they can be readily identified. Put match marks or tags on them, as necessary, so that they will go back to where they came from.

Carry out engine disassembly in the following sequence:

Loosen drain plug and drain out engine oil.

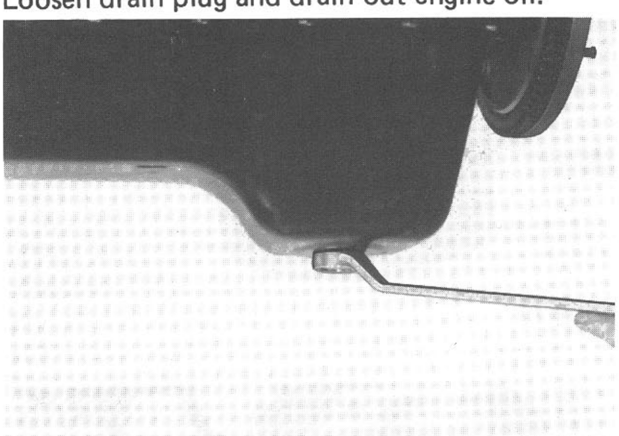


Fig. 3-4

Remove clutch cover.

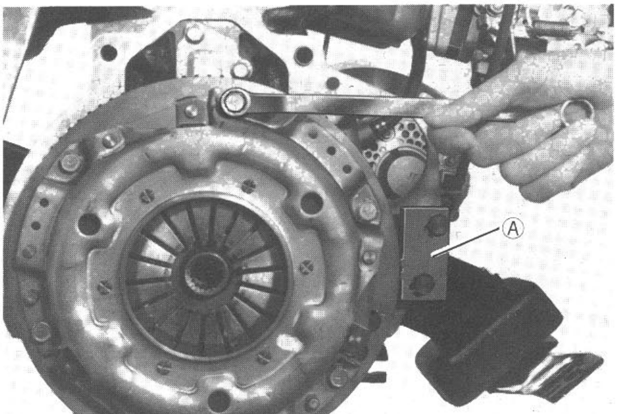


Fig. 3-5 Ⓐ *Special tool (09916-97310)*

Remove distributor assembly.

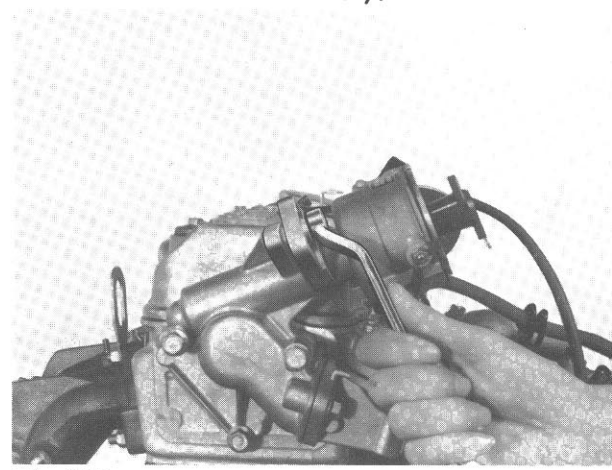


Fig. 3-6

Remove fuel pump.

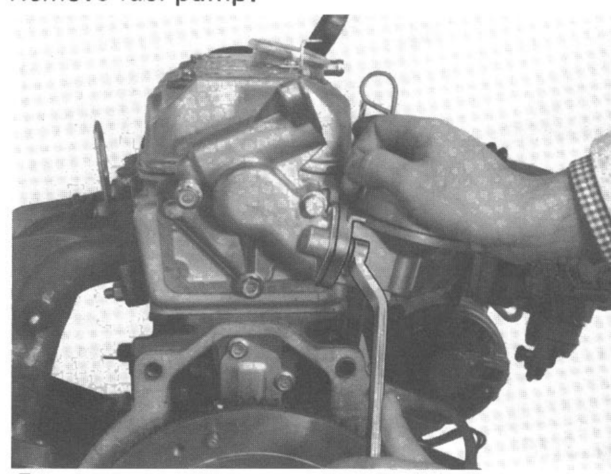


Fig. 3-7

Take down distributor case.

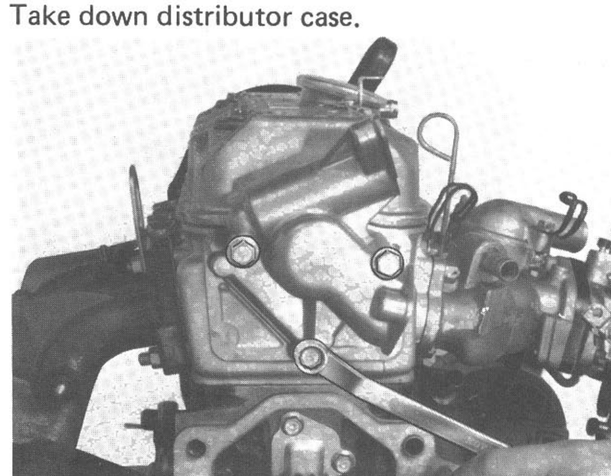


Fig. 3-8

Remove cooling fan.

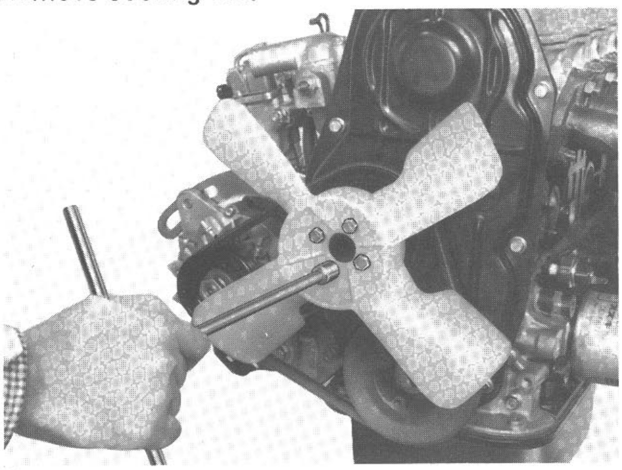


Fig. 3-9

Take down alternator.

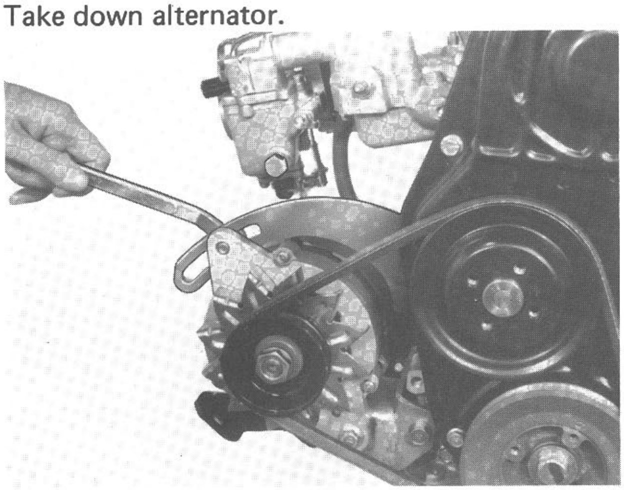


Fig. 3-10

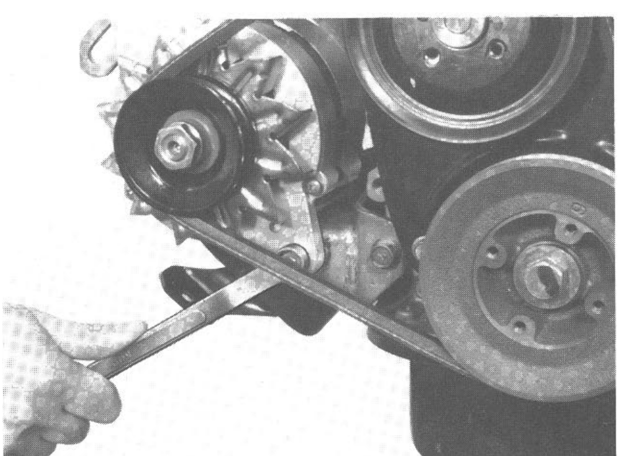


Fig. 3-11

Remove alternator mounting stay.

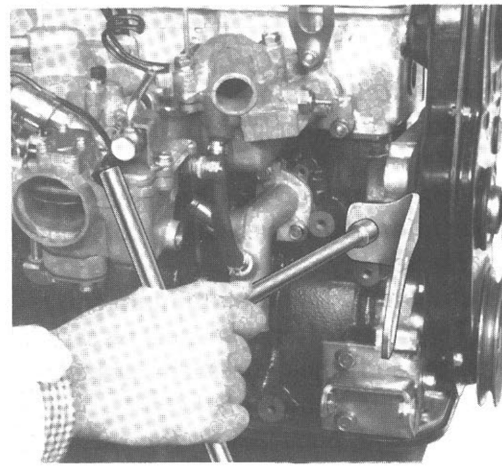


Fig. 3-12

Remove crank pulley similarly, with special tool Ⓐ (09916-97310) hitched to flywheel so that crankshaft will not turn.

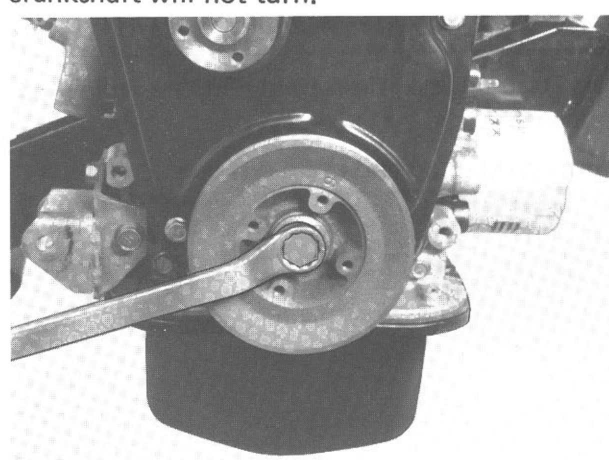


Fig. 3-13

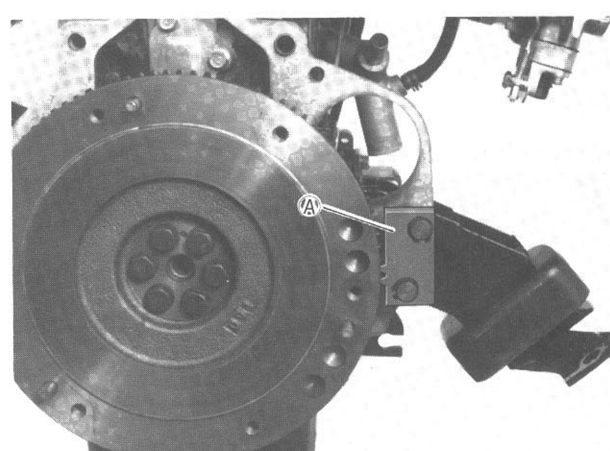


Fig. 3-14

Remove outside cover on timing belt.

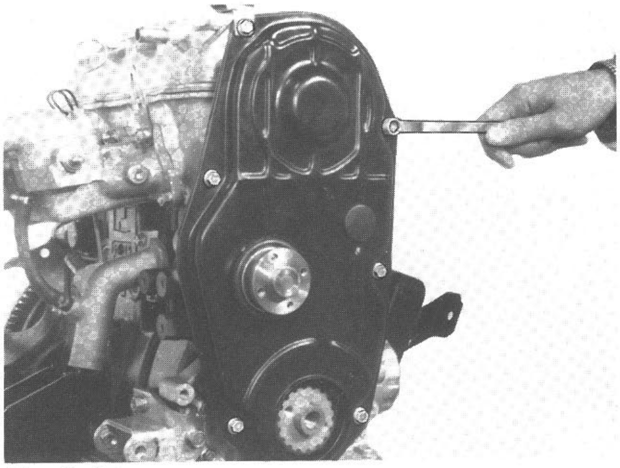


Fig. 3-15

Remove a part of the tensioner spring from tensioner bracket as shown Fig. 3-16.

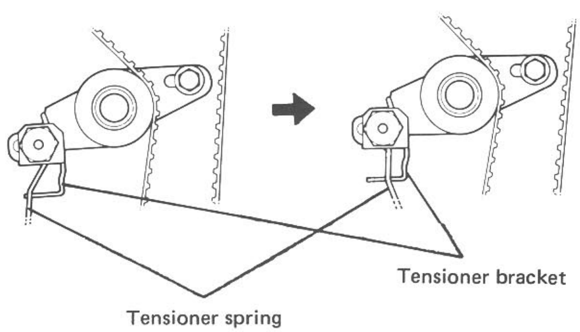


Fig. 3-16

Remove timing belt tensioner.

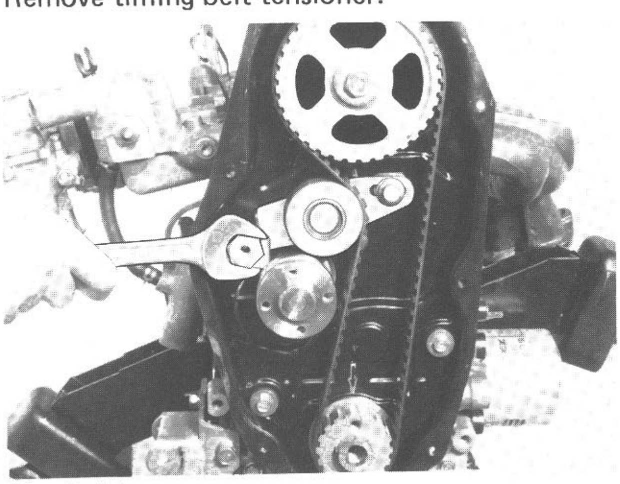


Fig. 3-17

Remove timing belt.

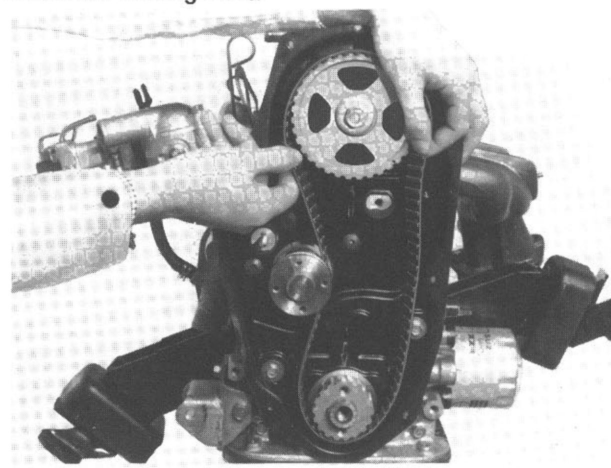


Fig. 3-18

Remove the camshaft timing belt pulley, with special tool Ⓐ (09930-40113) attached, as shown, to lock the camshaft.

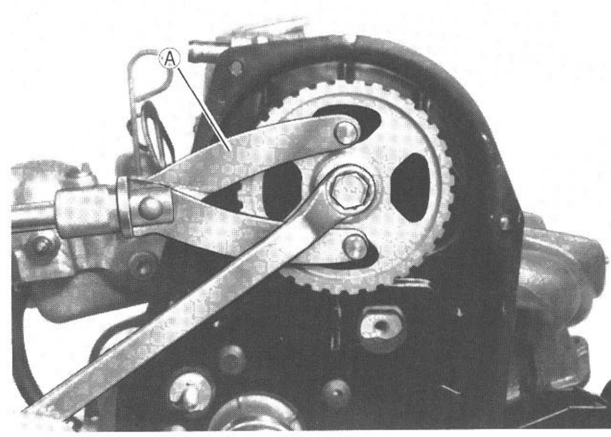


Fig. 3-19

Similarly remove the crankshaft timing belt pulley.

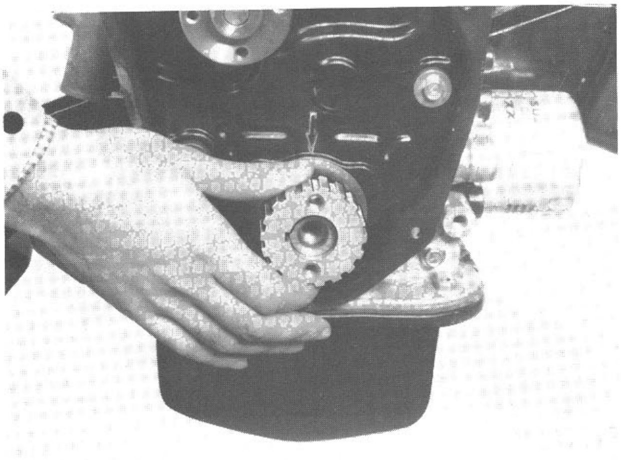


Fig. 3-20

After removing the pulley key, take out timing belt guide.

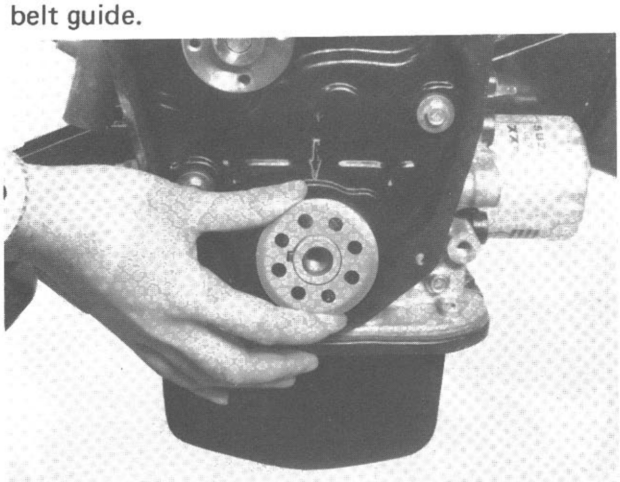


Fig. 3-21

Take down timing belt inside cover.

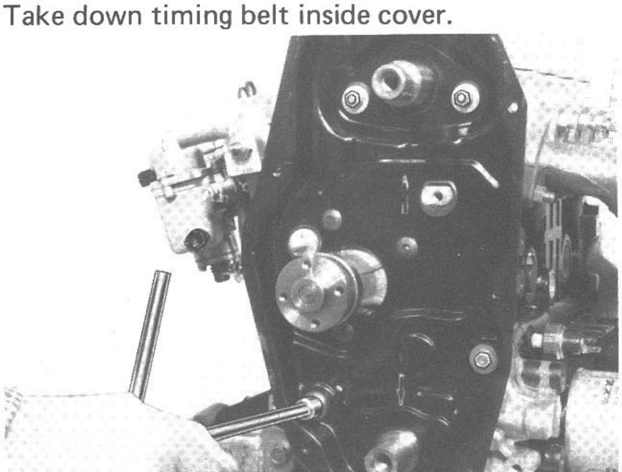


Fig. 3-22

Remove timing belt inside case spacers from cylinder head front side, and be careful not to lose them.

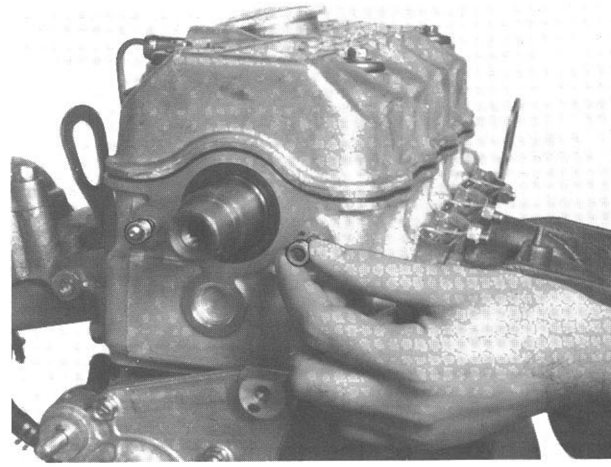


Fig. 3-23

Remove water pump case.

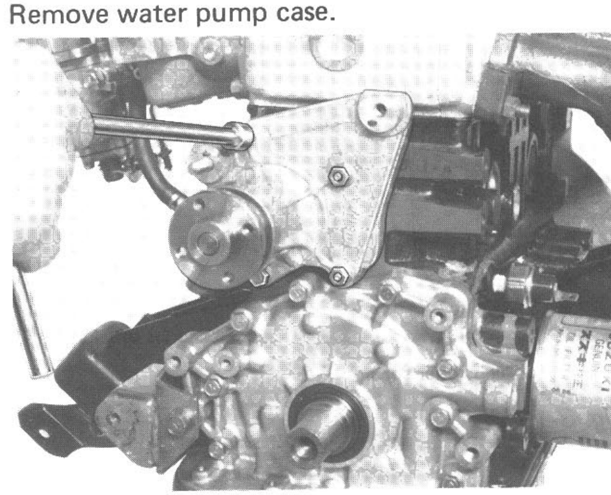


Fig. 3-24

Remove exhaust manifold cover.

Take off exhaust manifold and its gasket.

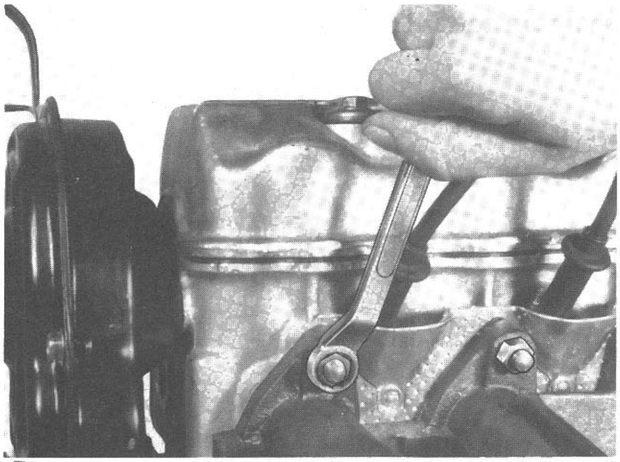


Fig. 3-25

Using special tool Ⓐ (09915-47310), remove oil filter.

> NOTE:
> Be careful not to spill the oil when removing the filter.

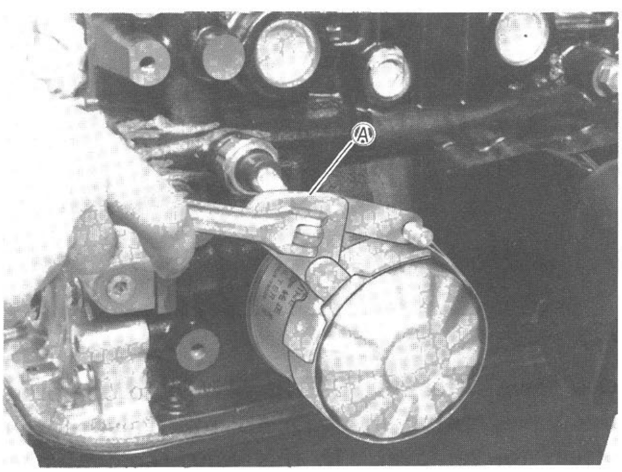


Fig. 3-26

Draw bypass hose off inlet pipe.

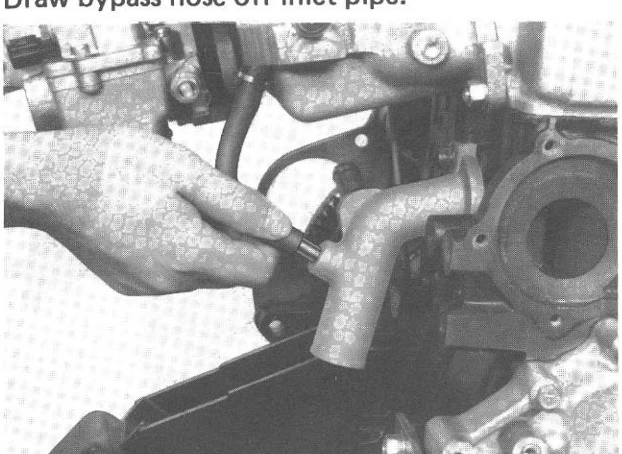


Fig. 3-27

Take down inlet manifold.

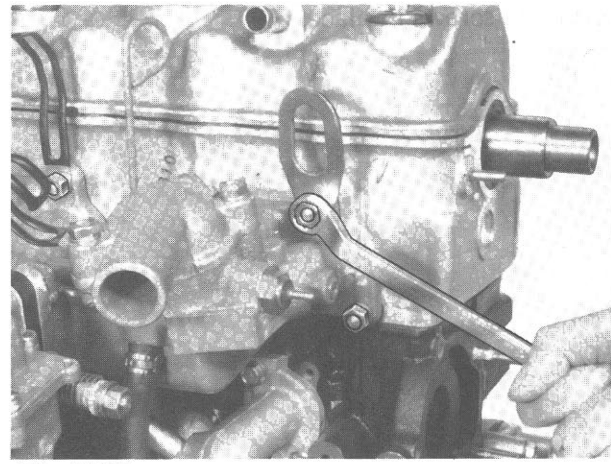


Fig. 3-28

Sever and remove water inlet pipe.

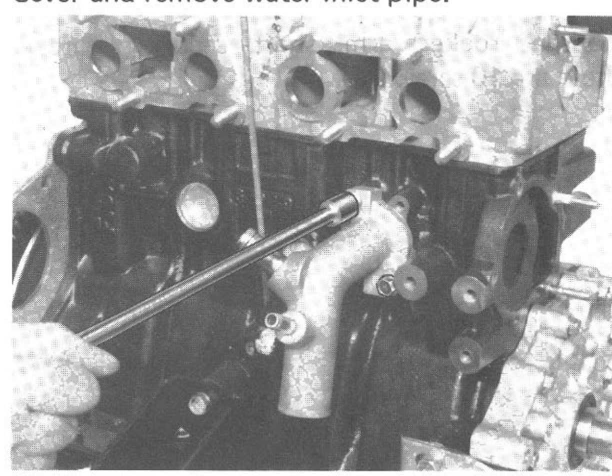


Fig. 3-29

Take off cylinder head cover.

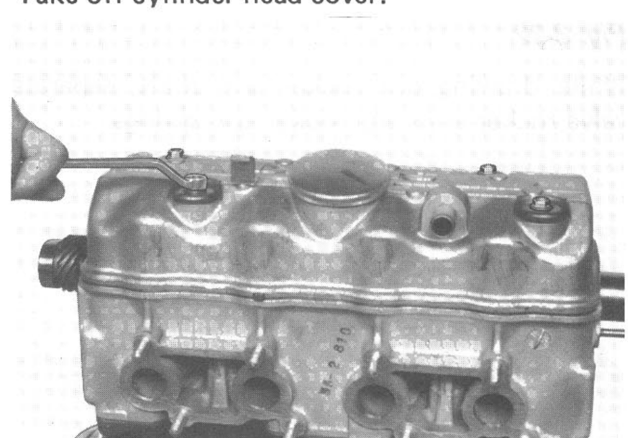


Fig. 3-30

Loosen the 8 valve adjusting screws fully. Leave the screws in place.

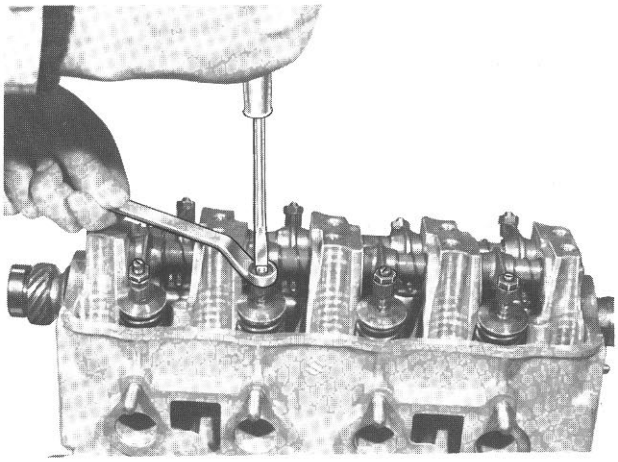


Fig. 3-31

Loosen rocker arm shaft securing screws: there are 10 screws.

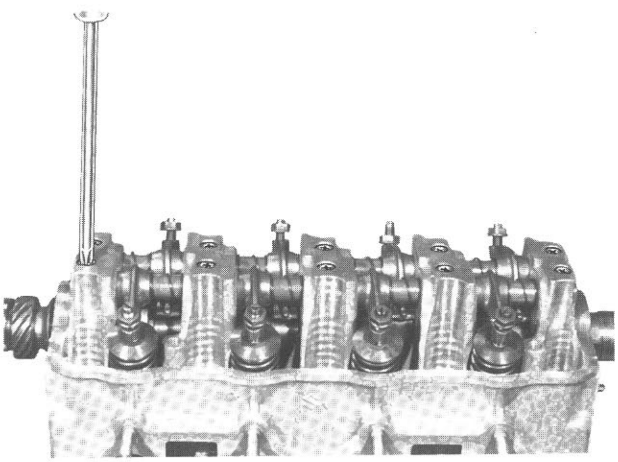


Fig. 3-32

While drawing out rocker arm shaft, separate valve rocker arms and rocker arm springs.

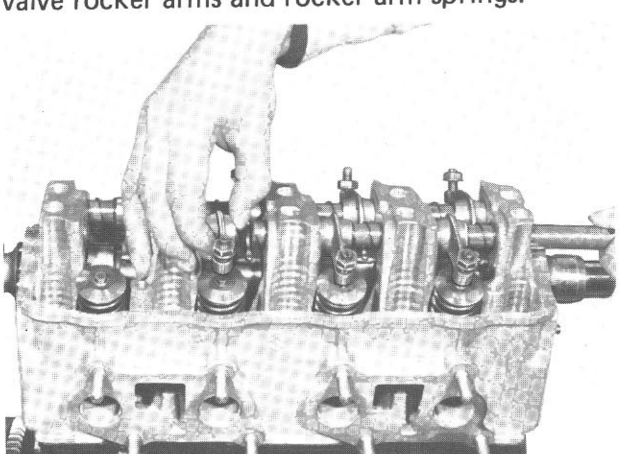


Fig. 3-33

Remove camshaft thrust plate, and draw camshaft out toward rear end.

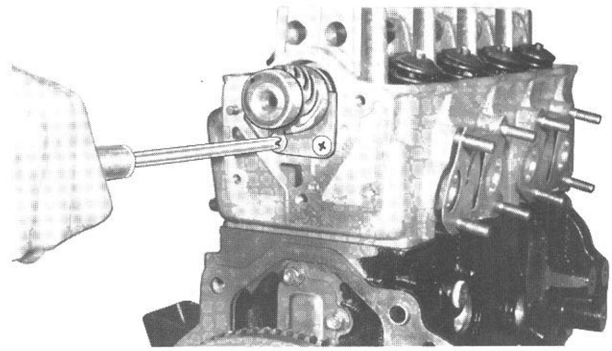


Fig. 3-34

Remove cylinder head.

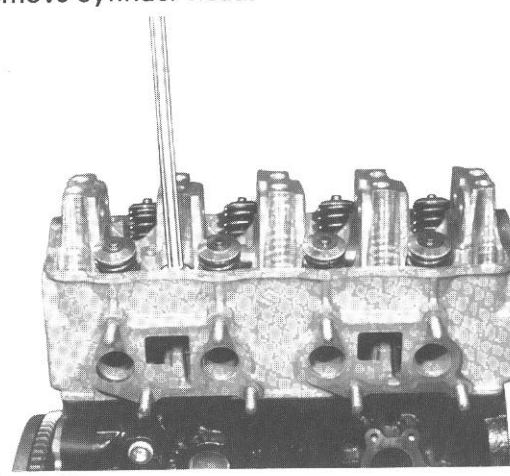


Fig. 3-35

Use valve lifter Ⓐ (09916-14510) to compress the valve spring in order to free valve cotter pieces for removal. In this way, remove valve spring and valves.

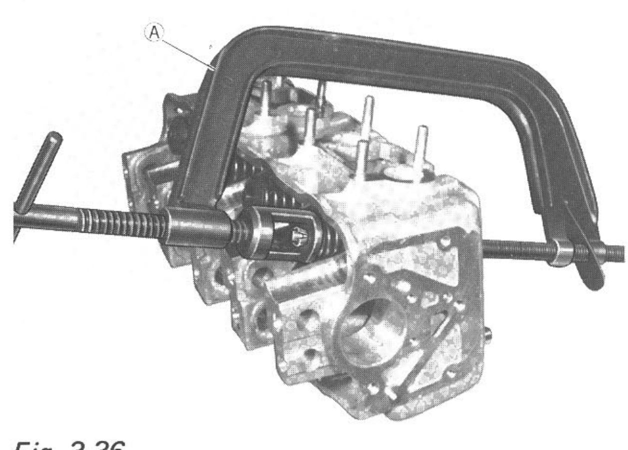


Fig. 3-36

Remove flywheel, using special tool Ⓐ (09916-97310) as shown.

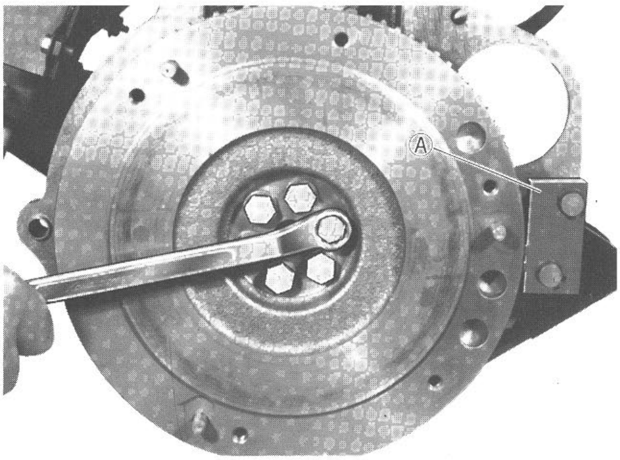


Fig. 3-37

Take down oil pan.

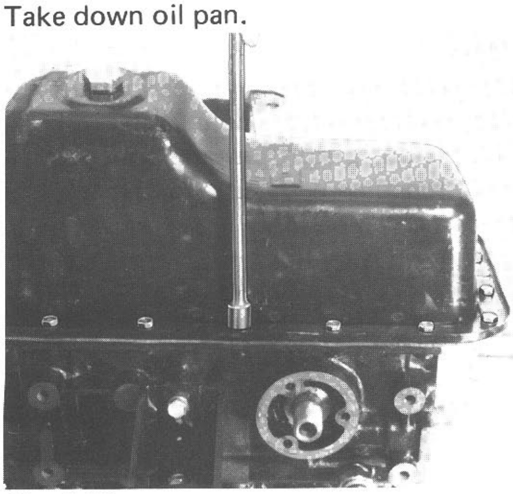


Fig. 3-38

Remove oil pump strainer.

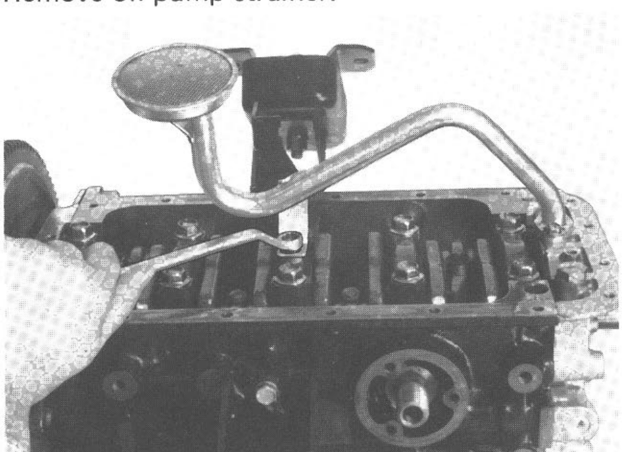


Fig. 3-39

As the first step of crankshaft removal, remove the connecting rod caps for No. 2 and No. 3 cylinders, and take out pistons, each complete with its connecting rod, from cylinder head side.

CAUTIONS:

- Before pulling the piston out, scribe the cylinder number on its crown.
- Never drive on the big end in an attempt to force the piston out. If driving is necessary to each the big end off crank-pin, run stud bolts into the big end and drive on the bolts with a mallet handle.
- Be sure to identify each bearing cap for its connecting rod by using the cylinder number. Set the cap and rod aside in combination.

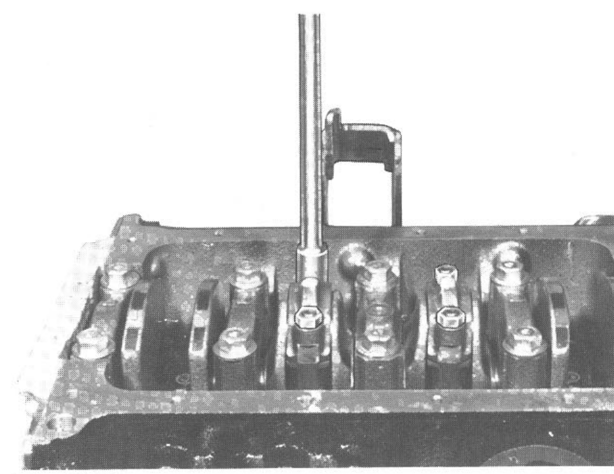


Fig. 3-40

Remove the connecting rod caps for No. 1 and No. 4 cylinders and, as mentioned above, take out the pistons and connecting rods.

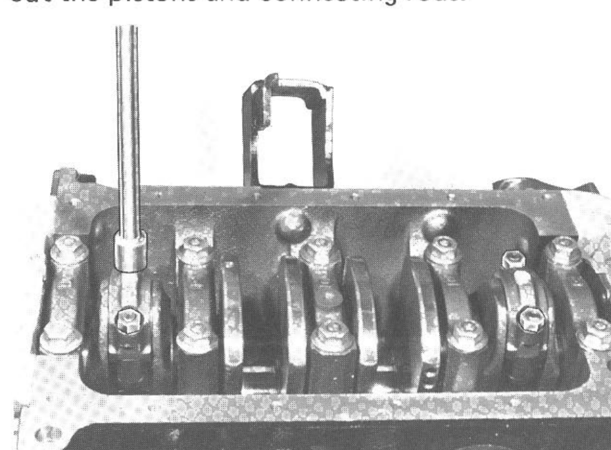


Fig. 3-41

Remove oil pump case.

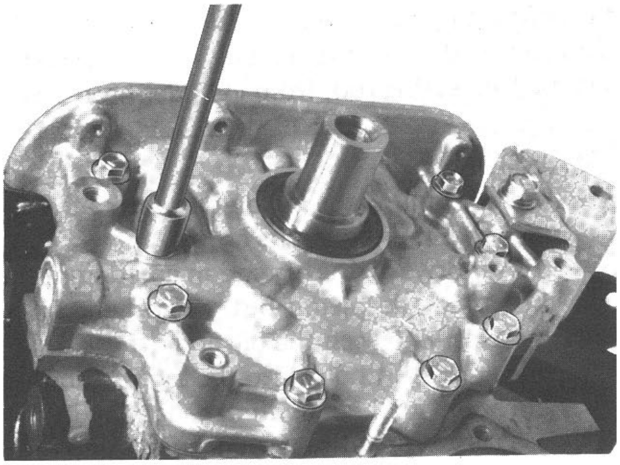


Fig. 3-42

Remove oil seal housing.

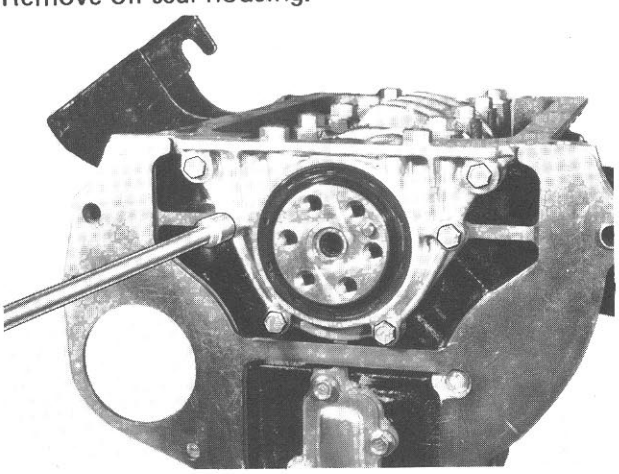


Fig. 3-43

Remove crankshaft bearing caps, and take out crankshaft.

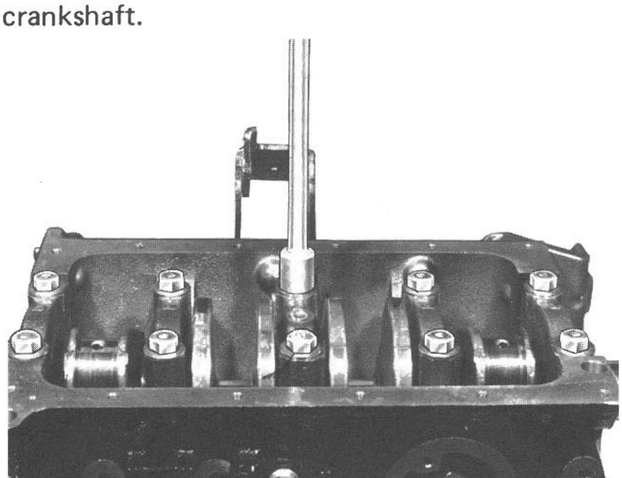


Fig. 3-44

From each piston, ease out piston pin circlips, as shown.

Fig. 3-45

Force piston pin out.

CAUTIONS:
• Before removing the pin, scribe the cylinder number on the connecting rod. • Set the piston, piston pin and connecting rod, together with cap, in the tray or pan as a combination.

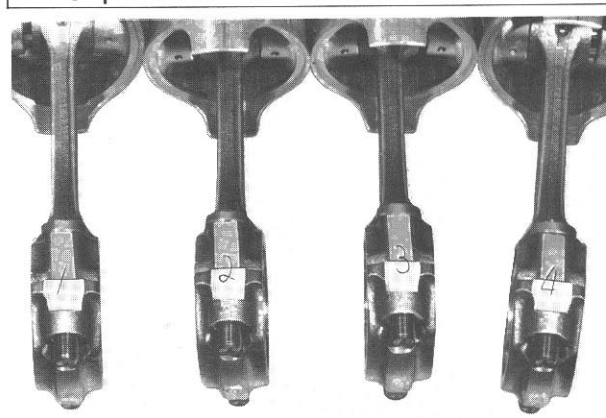


Fig. 3-46

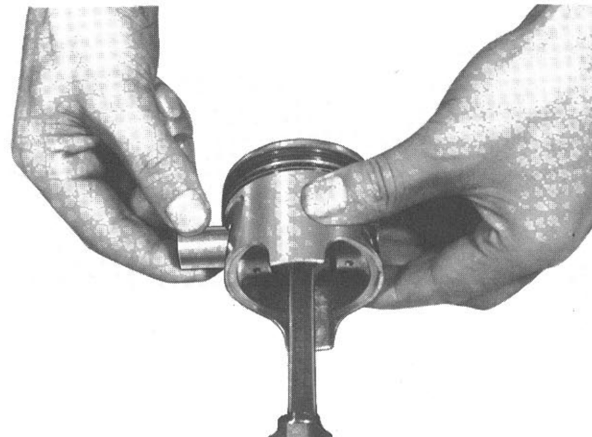


Fig. 3-47

3-5. Engine Maintenance Service

NOTES:
- During and immediately after disassembly, inspect the cylinder block and head for evidence of water leakage or damage and, after washing them clean, inspect more closely.
- Wash all disassembled parts clean, removing grease, slime, carbon and scales, before inspecting them to determine whether repair is necessary or not. Be sure to de-scale the water jackets.
- Use compressed air to clear internal oil holes and passages.
- Do not disturb the set combinations of valves, bearings and bearing caps, etc. Have the sets segregated and identified.

Cylinder head

- De-carbon the cylinder head:
  Deposits of carbon will be found on its combustion chamber surfaces and exhaust ports. Remember, overheating tendency and loss of output are often due to excessive carbon accumulation. De-carbon the valves, too.

NOTE:
Do not use any sharp-edged tool to scrape off the carbon. Be careful not to scuff or nick the metal surfaces when de-carboning. This applies to valves and valve seats, too.

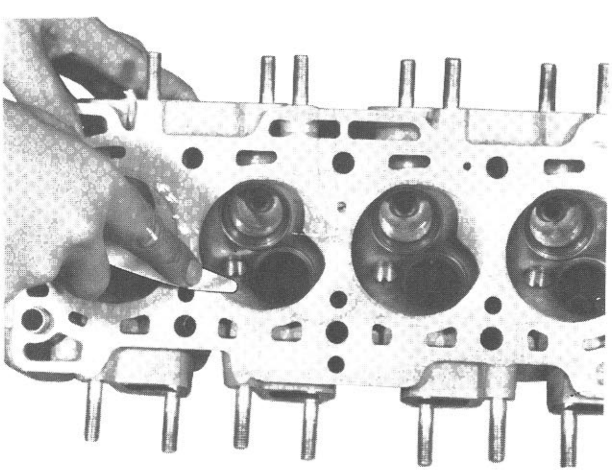


Fig. 3-48

- Flatness of gasketed surface:
  Using a straightedge and thickness gauge, check the flatness at a total of 7 locations. If the limit, stated below, is exceeded, correct the gasketed surface with a surface plate and sandpaper of about #400: place the sandpaper on and over the surface plate, and rub the gasketed surface against the sandpaper to grind off high spots. Should this fail to reduce the thickness gauge readings to within the limit, replace the cylinder head.

Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface; such leakage results in reduced power output and hence a higher cost of fuel per kilometer.

Limit on flatness	0.05 mm (0.002 in.)

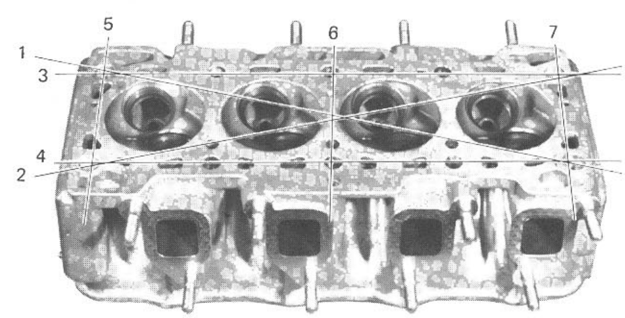


Fig. 3-49

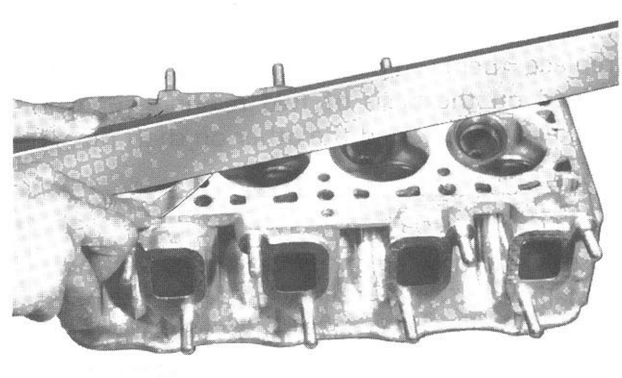


Fig. 3-50

- Flatness of manifold seating faces:
  Check the seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or the cylinder head replaced.

Limit on flatness	0.10 mm (0.004 in.)

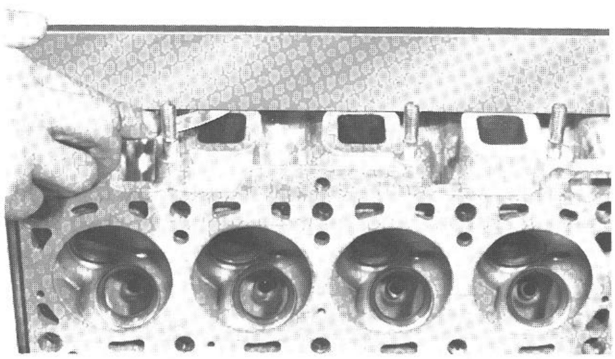


Fig. 3-51 *Checking exhaust manifold seating face for flatness*

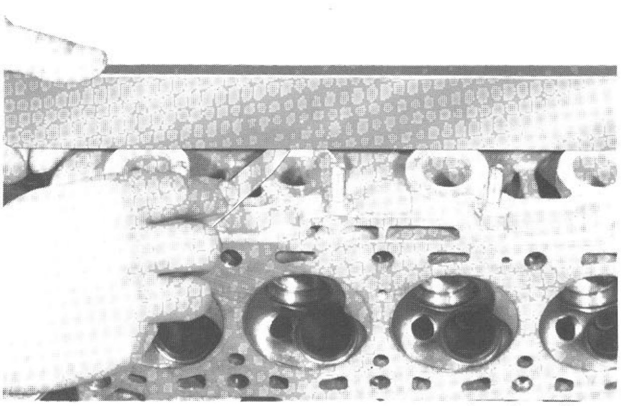


Fig. 3-52 *Checking inlet manifold seating face for flatness*

Rocker-arm shaft and rocker arms

- Wear:
  Check these parts for wear and, as necessary, replace them. The extent of wear is determined on the basis of two readings, one on rocker arm I.D. and the other on shaft diameter.

> NOTE:
> Use a micrometer on rocker-arm shaft and a caliper on rocker arm. The difference between the two readings is the arm-to-shaft clearance on which a limit is specified. If the limit is exceeded, replace shaft or arm, or both.

Item		Standard	Limit
Rocker arm I.D.		14.985 - 15.005 mm (0.590 - 0.591 in.)	------
Rocker-arm shaft dia.		14.965 - 14.980 mm (0.589 - 0.590 in.)	------
Arm-to-shaft clearance	Inlet	0.005 - 0.040 mm (0.0002 - 0.0016 in.)	0.07 mm (0.0027 in.)
	Exhaust	0.005 - 0.040 mm (0.0002 - 0.0016 in.)	0.07 mm (0.0027 in.)

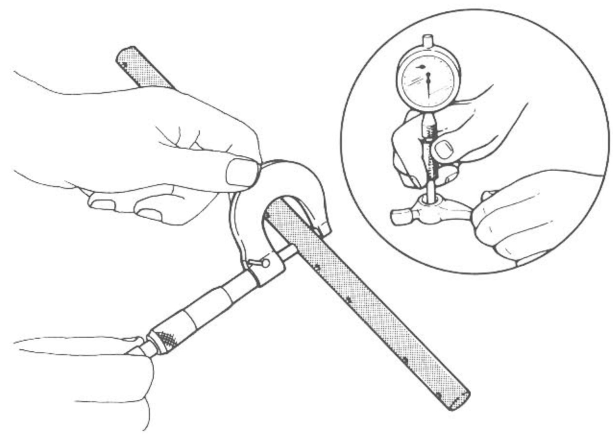


Fig. 3-53

- Rocker-arm shaft deflection:
  Using "V" blocks and a dial gauge as shown in Fig. 3-54, check the shaft for straightness in terms of deflection. If the limit is exceeded, correct it by cold-working with a wooden mallet or replace it.

Deflection limit	0.06 mm (0.0023 in.)

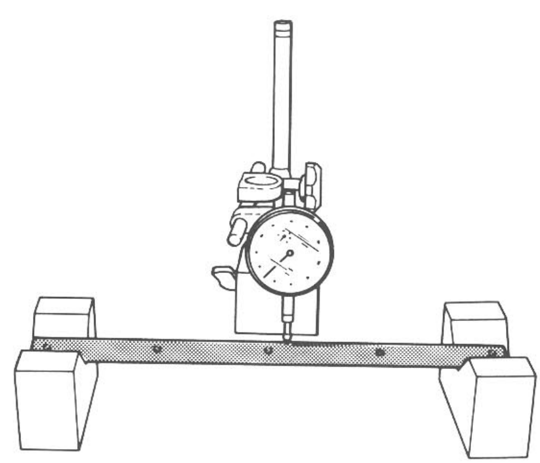


Fig. 3-54

- If the tip ① of adjusting screw ② is badly worn, replace the screw. The arm must be replaced if its cam-riding face ③ is badly worn.

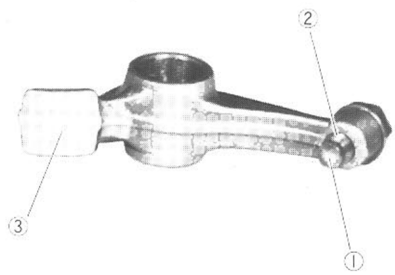


Fig. 3-55

- Visually examine each rocker-arm spring for evidence of breakage or weakening. Be sure to replace springs found in bad condition.

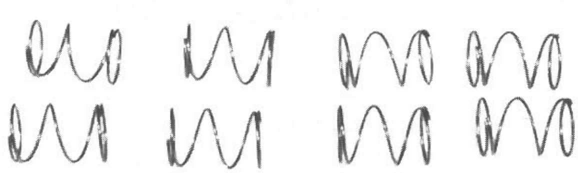


Fig. 3-56

Valve guides

- Using a micrometer and caliper, take diameter readings on valve stems and guides to determine the stem clearance in the guide. Be sure to take a reading at more than one place along the length of each stem and guide, as shown in Fig. 3-57.

Item		Standard	Limit
Valve stem diameter	Inlet	6.965 - 6.980 mm (0.2742 - 0.2748 in.)	------
	Exhaust	6.955 - 6.970 mm (0.2738 - 0.2744 in.)	------
Valve guide I.D.	Inlet	7.000 - 7.015 mm (0.2755 - 0.2761 in.)	------
	Exhaust	7.000 - 7.015 mm (0.2755 - 0.2761 in.)	------
Stem-to-guide clearance	Inlet	0.020 - 0.050 mm (0.0008 - 0.0019 in.)	0.07 mm (0.0027 in.)
	Exhaust	0.030 - 0.060 mm (0.0012 - 0.0023 in.)	0.09 mm (0.0035 in.)

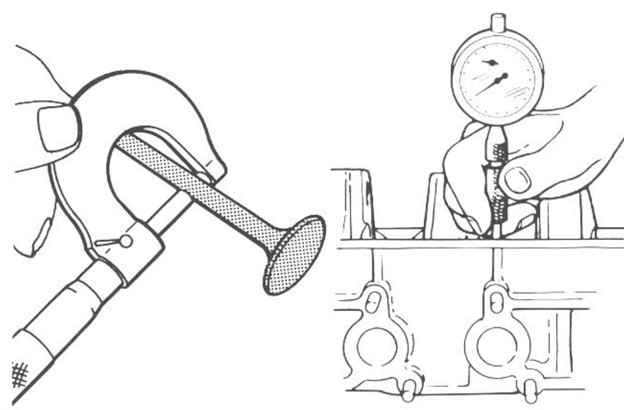


Fig. 3-57

If the caliper like the one shown in Fig. 3-57 is not available, check the end deflection of the valve stem in place with a dial gauge rigged as shown in Fig. 3-58. Move the stem end in the directions ④ ⑤ and determine whether replacement is necessary or not, by referring to these limiting values:

Valve stem end deflection	Inlet	0.12 mm (0.0047 in.)
	Exhaust	0.16 mm (0.0063 in.)

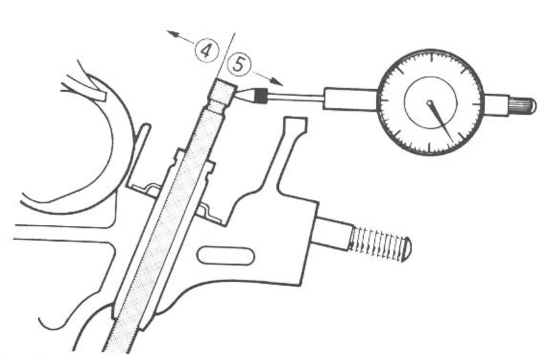


Fig. 3-58

- Valve guide replacement:
Valve guides are shrink-fitted. The method of removal and installation is as follows:

1) Using the guide remover Ⓐ (09916-44510), drive the valve guide out to remove it from the top side of cylinder head. After driving the guide out, ream the guide hole with a 12 mm (0.472 in.) reamer (Special tool 09916-37310) to remove burrs, making sure that the hole diameter after reaming comes within this range:

Valve guide hole diameter	Inlet	12.030 - 12.048 mm (0.4736 - 0.4743 in.)
	Exhaust	

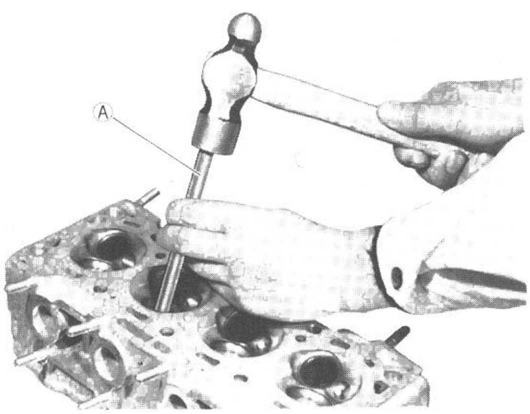


Fig. 3-59

2) Heat the cylinder head uniformly to anywhere between 80°C and 100°C (176°F-212°F) so that the head will not distort, and drive the oversize guide into the hole with the valve guide installer set Ⓑ (09916-57310 and 09916-57320). See Fig. 3-60. Be sure to carry out this step speedily so that all guides will go into the cylinder head in steady temperature state.

Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion ①	16.5 mm (0.649 in.)

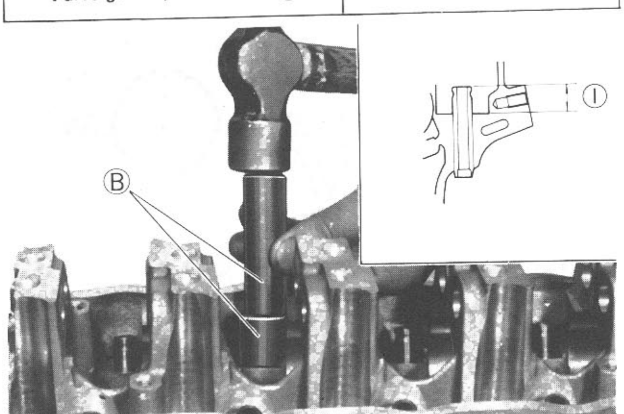


Fig. 3-60

NOTE:
Valve guide length differs between INLET and EXHAUST. It is 52.5 mm (2.067 in.) for INLET but 54.5 mm (2.145 in.) for EXHAUST.

3) Check all valve guides in place for I.D. and, if the I.D. reading compared with the stem diameter reading indicates too small a radial clearance, ream the guide I.D. with the reamer Ⓒ (09916-34520), as shown in Fig. 3-61.

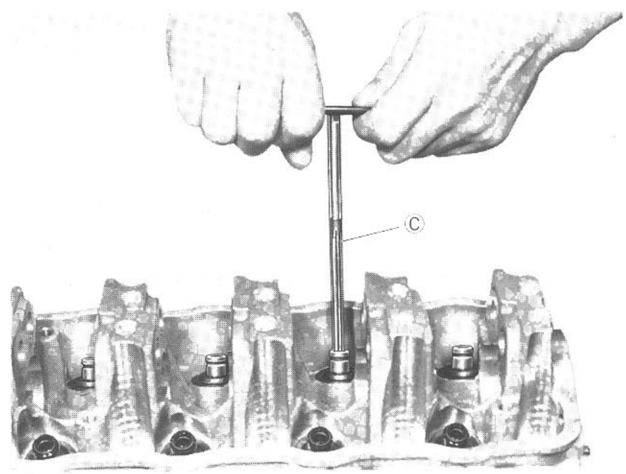


Fig. 3-61

Valves

- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure the thickness ② of valve head. If the limit given to this thickness is exceeded, the valve must be replaced.

Valve head thickness ②

Standard	Limit	
0.8 - 1.2 mm (0.031 - 0.047 in.)	Inlet	0.6 mm (0.0236 in.)
	Exhaust	0.7 mm (0.0275 in.)

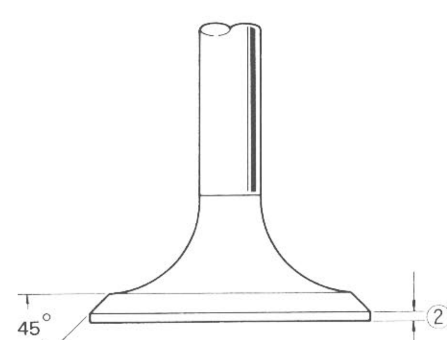


Fig. 3-62

- Check the end face of each valve stem for wear. This face meets the rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen the end face with an oil stone and, if this grinding removes the end stock by as much as 0.5 mm (0.0196 in.) (as measured from the original face), replace the valve.

Limit on stock allowance of valve stem end face	0.5 mm (0.0196 in.)

Replacement valves have their stems machined to the following diameter ranges.

Standard valve stem diameter	Inlet	6.965 - 6.980 mm (0.2742 - 0.2748 in.)
	Exhaust	6.955 - 6.970 mm (0.2738 - 0.2744 in.)

- Check each valve for radial runout with a dial gauge and "V" block, as shown in Fig. 3-63. The object of this check is to determine whether the valve stem is true and square relative to the head.

Limit on valve head radial runout	0.03 mm (0.0012 in.)

If the limit is exceeded, do not attempt to correct the stem; replace the valve, instead.

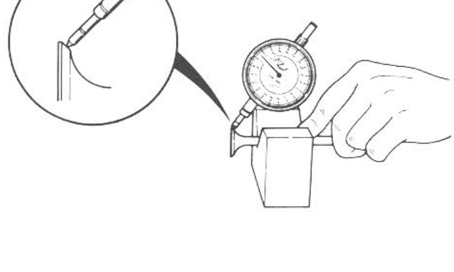


Fig. 3-63

Valve seats

> CAUTION:
> The valves to be checked and serviced for seating width and contact pattern must be those found satisfactory in regard to stem clearance in the guide and also the requirements stated in the preceding part titled VALVES.

- Seating contact width:
  Produce a contact pattern on each valve in the usual manner, namely, by giving a uniform coat of red-lead paste to the valve seat and by rotatingly tapping the seat with the valve head. The valve lapper (the tool used in valve lapping) must be used.

  The pattern produced on the seating face of the valve must be a continuous ring without any break, and the width Ⓦ of the pattern must be within the stated range.

Standard seating width Ⓦ revealed by contact pattern on valve face	Intake	1.3 - 1.5 mm (0.0512 - 0.0590 in.)
	Exhaust	

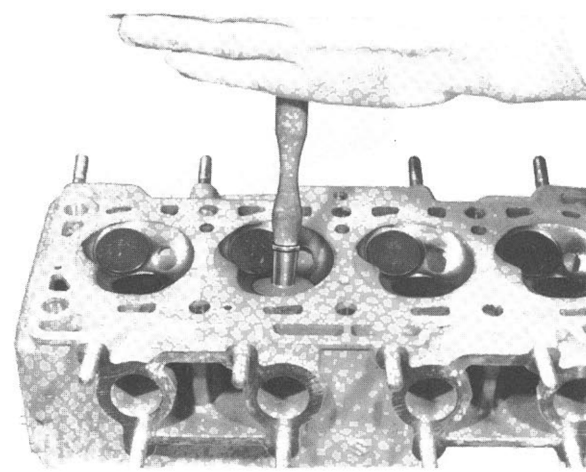


Fig. 3-64

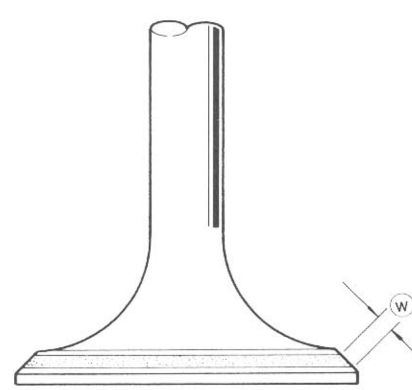


Fig. 3-65

- Valve seat repair:

  A valve seat not producing a uniform contact with its valve or showing a width Ⓦ of the seating contact that is off the specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

  1) EXHAUST VALVE SEAT: Use a valve seat cutter to make three cuts in the order illustrated in Fig. 3-67. Three cutters must be used: the first for making the 15° angle, the second for making the 75° angle and the last for making the 45° seat angle. The third cut ③ must be made to produce the desired seat width Ⓦ

Seat width Ⓦ for exhaust valve seat	1.3 - 1.5 mm (0.0512 - 0.0590 in.)

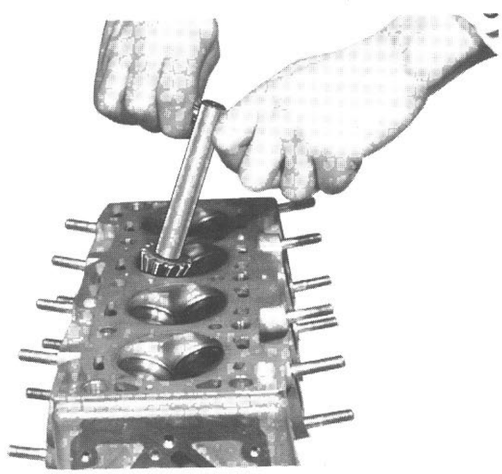


Fig. 3-66 Valve seat cutting

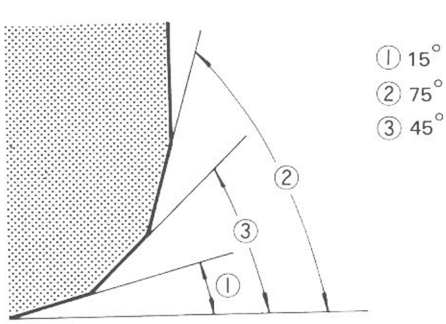


Fig. 3-67 Valve seat angles for exhaust valve seat

2) INLET VALVE SEAT: The cutting sequence is the same as for exhaust valve seats but the second angle differs, as will be noted in Fig. 3-68.

Seat width Ⓦ for inlet valve seat	1.3 - 1.5 mm (0.0512 - 0.0590 in.)

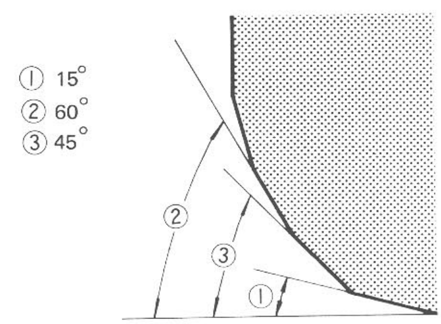


Fig. 3-68 Valve seat angles for inlet valve seat

3) VALVE LAPPING: Lap the valve on the seat in two steps, first with a coarsesize lapping compound applied to the face and the second with a fine-size compound, each time using a valve lapper according to the usual lapping method.

Fig. 3-69 Applying lapping compound to valve face

NOTES:
- After lapping, wipe the compound off the valve face and seat, and produce a contact pattern with a red-lead paste. Check to be sure that the contact is centered widthwise on the valve seat and that there is no break in the contact pattern ring.
- Be sure to check and, as necessary, adjust the valve clearance after re-installing the cylinder head and valve mechanism.

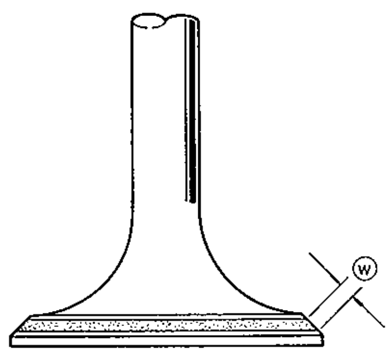


Fig. 3-70 Contact pattern ⓦ uniform in width

Valve springs

- Referring to the criterion data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can be the cause of chatter, not to mention the possibility of reducing the power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	48.9 mm (1.9252 in.)	47.6 mm (1.8740 in.)
Valve spring preload	23.6 - 27.6 kg for 40 mm (52.0 - 60.8 lb/ 1.57 in.)	22 kg for 40 mm (48.5lb/ 1.57 in.)

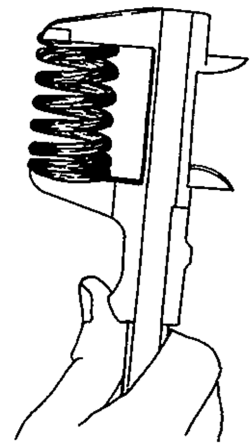


Fig. 3-71 Measuring free length of spring

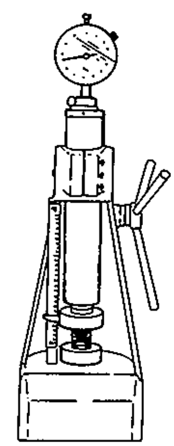


Fig. 3-72 Checking the spring for preload

- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of the clearance ⓛ, Fig. 3-73, between the end of valve spring and the square. Valve springs found to exhibit a larger clearance than the limit must be replaced.

Valve spring squareness ⓛ	2.0 mm (0.079 in.)

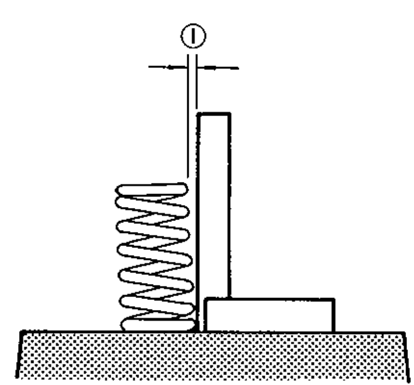


Fig. 3-73

Camshaft

A noisy engine or an engine producing not enough power is frequently due to its camshaft excessively worn or bent or bowed. The wear could occur on its cams and journals.

- Camshaft deflection:
  Hold the camshaft between two center points, as shown in Fig. 3-74, with a dial gauge rigged up to measure its deflection. Replace the camshaft if the amount of deflection so measured exceeds the limit.

Camshaft deflection limit	0.10 mm (0.0039 in.)

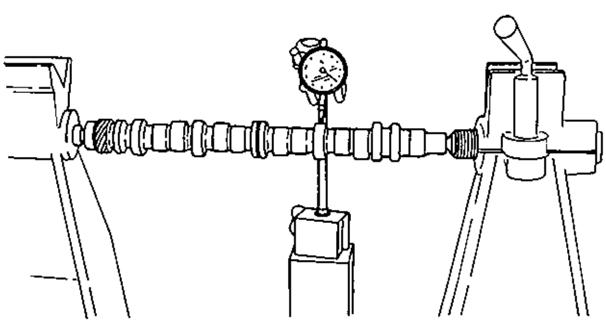


Fig. 3-74

- Cam wear:
  Measure the height Ⓗ of each cam. If any of the micrometer readings taken is down to or less than the limit, replace the camshaft.

Cam height Ⓗ	Standard	Limit
Inlet cam	36.152 mm (1.4233 in.)	36.100 mm (1.4212 in.)
Exhaust cam	36.152 mm (1.4233 in.)	36.100 mm (1.4212 in.)
Pump drive cam	33.300 mm (1.3110 in.)	33.000 mm (1.2992 in.)

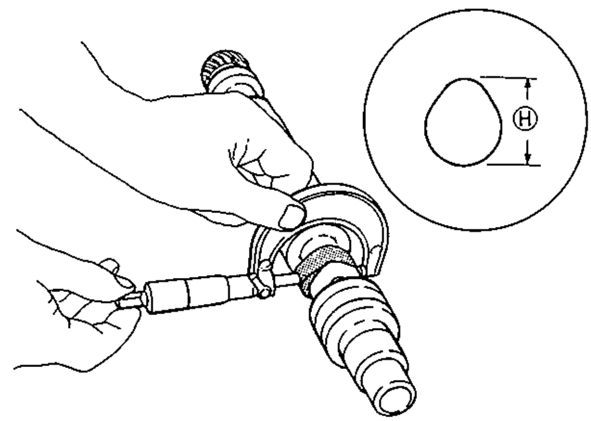


Fig. 3-75

- Thrust clearance:
  Using a thickness gauge, measure this clearance as shown in Fig. 3-76, at the thrust plate. If the limit is exceeded, replace thrust plate or camshaft.

Item	Standard	Limit
Thrust clearance	0.050 - 0.150 mm (0.0019 - 0.0059 in.)	0.300 mm (0.0118 in.)

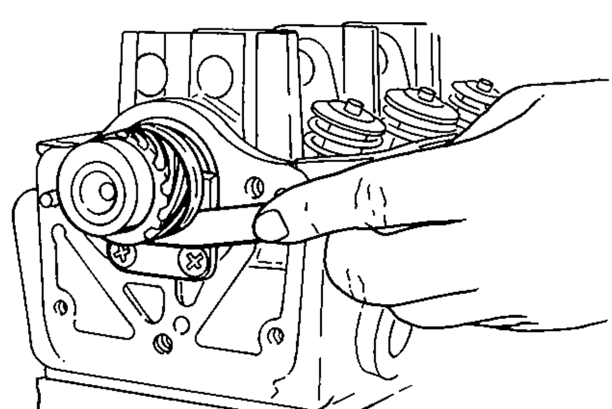
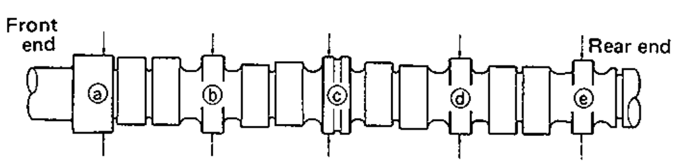


Fig. 3-76

- Journal wear:
  Measure the journal diameter in two directions at four places to obtain four readings on each journal; and check the journal bores with a cylinder gauge, as shown in Fig. 3-77, producing four readings on each. From these readings, compute the radial clearance (camshaft journal clearance). If the service limit is exceeded by any of the computed radial clearances, replace the camshaft and, as necessary, cylinder head, too.

Item	Standard	Limit
Journal clearance	0.050 - 0.091 mm (0.0020 - 0.0036 in.)	0.15 mm (0.0059 in.)



	Camshaft journal dia.	Journal bore dia.
ⓔ	44.225~44.250 mm (1.7411~1.7421 in.)	44.300~44.316 mm (1.7441~1.7447 in.)
ⓓ	44.025~44.050 mm (1.7332~1.7342 in.)	44.100~44.116 mm (1.7362~1.7368 in.)
ⓒ	43.825~43.850 mm (1.7254~1.7264 in)	43.900~43.916 mm (1.7283~1.7289 in)
ⓑ	43.625~43.650 mm (1.7175~1.7185 in.)	43.700~43.716 mm (1.7205~1.7210 in.)
ⓐ	43.425~43.450 mm (1.7096~1.7106 in.)	43.500~43.516 mm (1.7126~1.7132 in.)

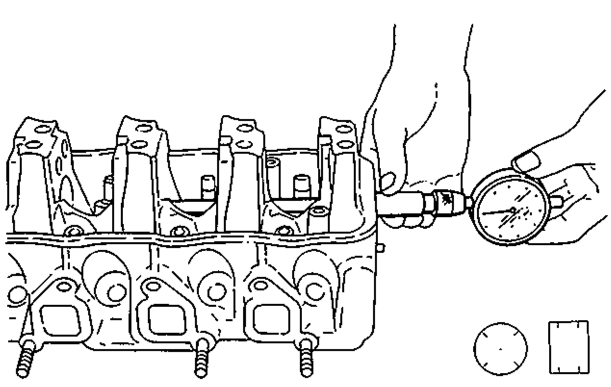


Fig. 3-77

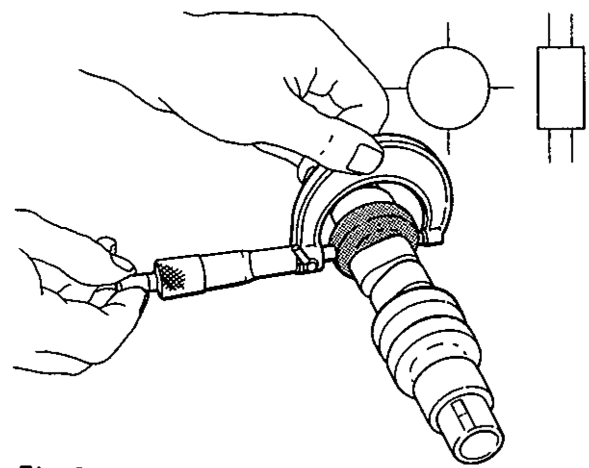


Fig. 3-78

Cylinder block

- Flatness of gasketed surface:
  By the same method that is prescribed for checking the flatness of the gasketed surface of the cylinder head, check the top face of the cylinder block for flatness and, if the flatness is found to exceed the limit, machine the face with a surface grinder.

Limit on flatness	0.05 mm (0.0020 in.)

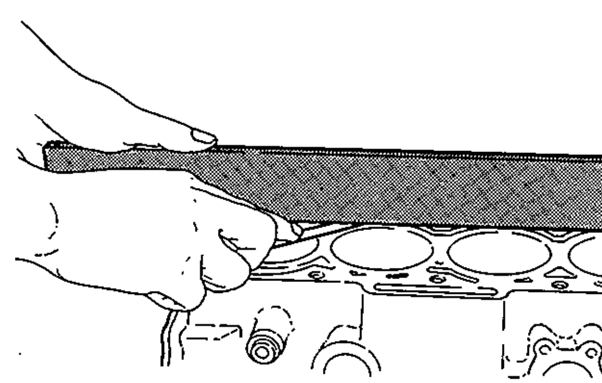


Fig. 3-79

- Cylinder bore:
  Using a cylinder bore gauge, measure the diameter of each bore in two directions, longitudinal and transverse, at three places, top, middle and bottom, as indicated in Fig. 3-80, to obtain a total of 6 readings. On the basis of these readings taken on each bore, determine whether the maximum difference in diameter between any two bores exceeds the limit. If the limit, stated below, is exceeded

or if the bore wall is badly scored or burned, re-bore all cylinders to the next oversize and use oversize pistons in engine reassembly.

Piston oversize	0.25 mm (0.0098 in.) 0.50 mm (0.0196 in.)

> CAUTION:
> If any one of the four cylinders has to be re-bored, re-bore the four to the same next oversize. This is necessary for the sake of uniformity.

When replacing the pistons or installing oversize pistons, be sure that the piston-to-cylinder clearance comes within the stated range:

Wear limit on bore	0.05 mm (0.0020 in.)

Piston-to-cylinder clearance	0.040 - 0.050 mm (0.0016 - 0.0020 in.)

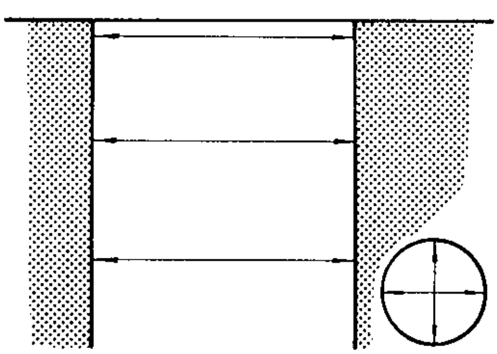


Fig. 3-80

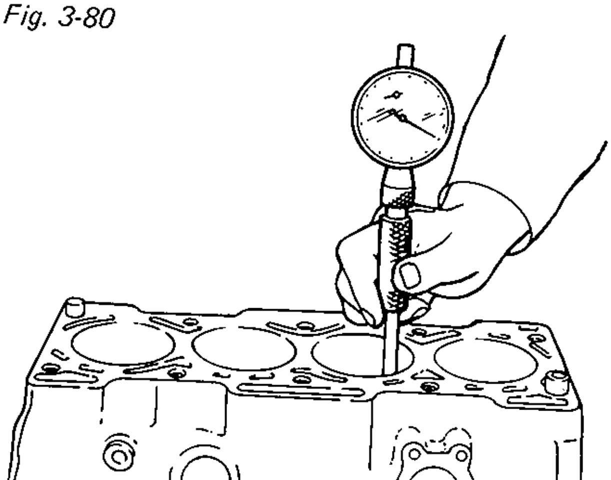


Fig. 3-81

Piston and piston rings

- Piston diameter:
  Piston-to-cylinder clearance, mentioned above, is equal to the bore diameter minus the piston diameter, which is to be measured by measuring at the level of the piston in the direction transverse to piston pin axis, as shown in Fig. 3-82. This level Ⓗ from the skirt end is 30 mm (1.18 in.) high.

Piston diameter	Standard	65.460 - 65.475 mm (2.5771 - 2.5777 in.)
	Oversize 0.25 mm (0.0098 in.)	65.710 - 65.725 mm (2.5870 - 2.5875 in.)
	Oversize 0.50 mm (0.0196 in.)	65.960 - 65.975 mm (2.5968 - 2.5974 in.)

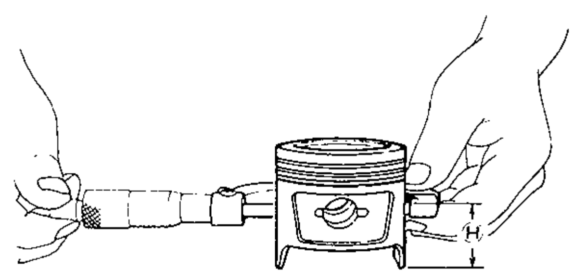


Fig. 3-82

- Inspect the outer surface of each cylinder for evidence of burn and for scratch or groove marks. Minor flaws can be removed by grinding with fine-grain sandpaper.
- De-carbon the piston crown and ring grooves, using a soft-metal scraping tool.

Fig. 3-83

- Ring clearance in the groove:
  Using a thickness gauge, check each piston ring in its groove for side clearance and, if the limit stated below is exceeded, measure the groove width and ring width to determine whether the piston or the ring or both have to be replaced.

Item		Standard	Limit
Ring clearance in the groove	Top ring	0.03 - 0.07 mm (0.0012 - 0.0027 in.)	0.12 mm (0.0047 in.)
	2nd ring	0.02 - 0.06 mm (0.0008 - 0.0023 in.)	0.10 mm (0.0039 in.)

Piston ring thickness	Top ring	1.47 - 1.49 mm (0.0578 - 0.0586 in.)
	2nd ring	1.47 - 1.49 mm (0.0578 - 0.0586 in.)
	Oil ring	0.45 mm (0.0177 in.)
Ring groove width	Top ring	1.52 - 1.54 mm (0.0598 - 0.0606 in.)
	2nd ring	1.51 - 1.53 mm (0.0594 - 0.0602 in.)
	Oil ring	2.81 - 2.83 mm (0.1106 - 0.1114 in.)

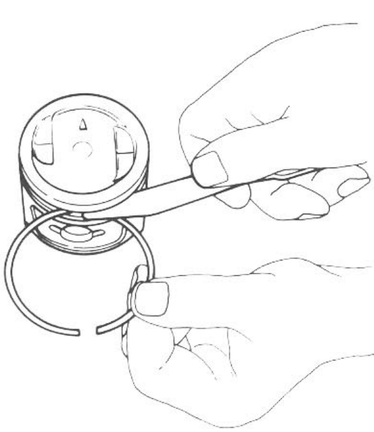


Fig. 3-84

- Piston ring end gap:
  To measure the end gap, insert the piston ring into the cylinder bore, locating it at the lowest part of the bore and holding it true and square; then use a thickness gauge to measure the gap. If the gap measured exceeds the limit, replace the ring.

Item		Standard	Limit
Piston ring end gap	Top & 2nd rings	0.15 - 0.35 mm (0.0059 - 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.30 - 0.90 mm (0.0118 - 0.0354 in.)	1.8 mm (0.0708 in.)

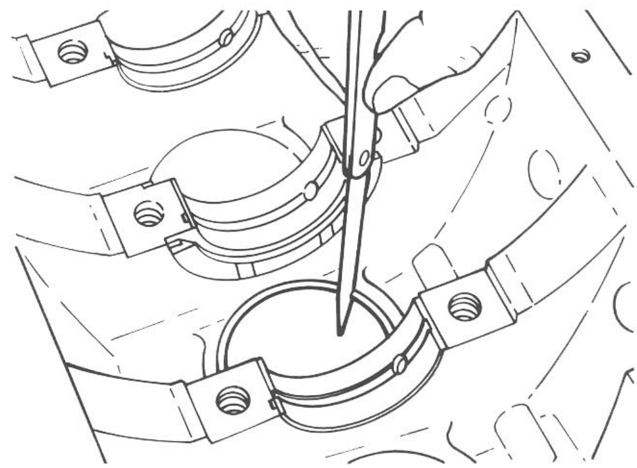


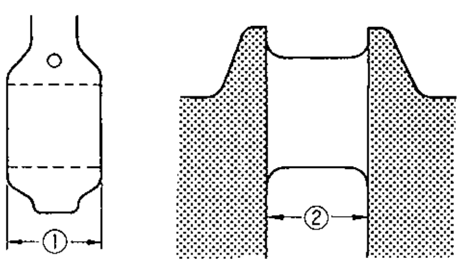
Fig. 3-85

Conecting rods

- Big-end thrust clearance:
  Check the big end of each connecting rod for thrust clearance, with the rod fitted and connected to its crank pin in the normal manner. If the clearance measured is found to exceed the limit, the connecting rod or the crankshaft, whichever is responsible for the excessive clearance, must be replaced.

Item	Standard	Limit
Big-end thrust clearance	0.10 - 0.20 mm (0.0039 - 0.0078 in.)	0.30 mm (0.0118 in.)

① Width of big end	21.95 - 22.00 mm (0.864 - 0.866 in.)
② Width of crank pin	22.10 - 22.15 mm (0.870 - 0.872 in.)



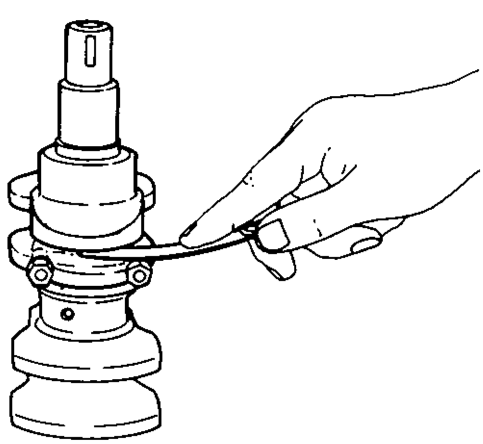


Fig. 3-86

- Connecting rod alignment:
  Mount the connecting rod on the aligner to check it for bow and twist and, if the limit is exceeded, replace it.

Limit on bow	0.05 mm (0.0020 in.)
Limit on twist	0.10 mm (0.0039 in.)

- Inspect the small end of each connecting rod for wear and evidence of crack or any other damage, paying particular attention to the condition of its bush. Check the piston pin clearance in the small end. Replace the connecting rod if its small end is badly worn or damaged or if the clearance checked exceeds the limit.

Item	Standard	Limit
Pin clearance in small end	0.003 - 0.016 mm (0.0001 - 0.0006 in.)	0.05 mm (0.0020 in.)

Small-end I.D.	16.003 - 16.011 mm (0.6300 - 0.6303 in.)
Piston pin dia.	15.995 - 16.000 mm (0.6297 - 0.6299 in.)

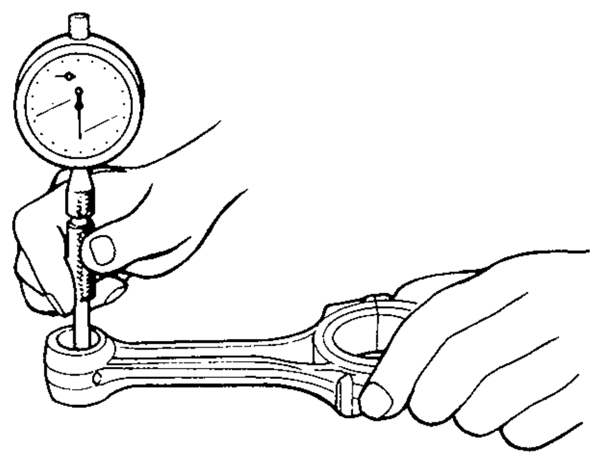


Fig. 3-87

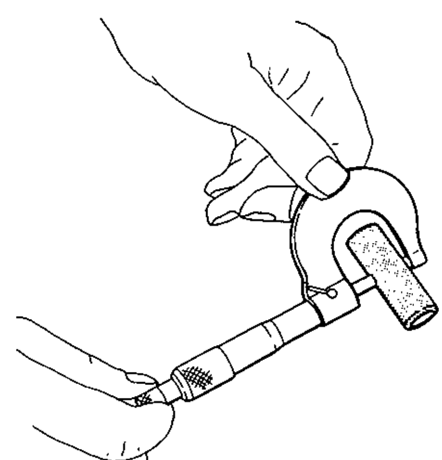


Fig. 3-88

Connecting-rod big end bearings

- Inspect the bearing shells for signs of fusion, pitting, burn or flaking and observe the contact pattern. Bearings found in defective condition through this inspection must be replaced.

> CAUTION:
> Bearing shells are not meant to be repaired by scraping or grinding with sandpaper or by any machining. The remedy is to replace them.

- Crankpin-to-bearing clearance:
  Check this clearance by using fuse stock or, preferably, PLASTIGAGE. Here's how to use PLASTIGAGE:
  1) Prepare, by cutting, a length of PLASTIGAGE roughly equal to bearing width and place it axially on crankpin, avoiding the oil hole.
  2) Make up the big end in the normal manner, with bearing shells in place and by tightening the cap to the specification.

> NOTE:
> Never rotate crankshaft or turn connecting rod when a piece of PLASTIGAGE is in the radial clearance.

Bearing cap tightening torque	2.80 - 3.20 kg-m (20.5 - 23.0 lb-ft)

> NOTE:
> When fitting bearing cap to crankpin, be sure to discriminate between its two ends, front and rear.

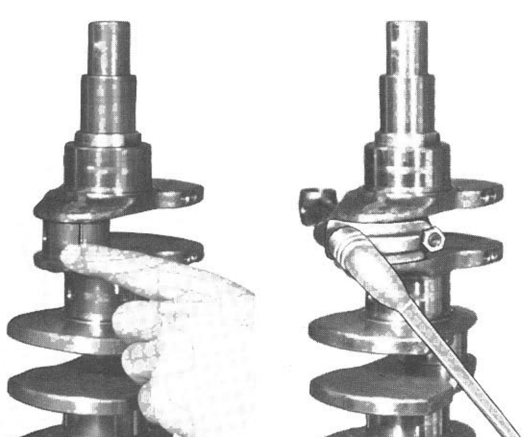


Fig. 3-89

3) Remove the cap, and measure the width of flattened PLASTIGAGE piece with the PLASTIGAGE envelope scale. This measurement must be taken at the widest part.

Item	Standard	Limit
Crankpin-to-bearing clearance	0.020 - 0.040 mm (0.0008 - 0.0016 in.)	0.080 mm (0.0031 in.)

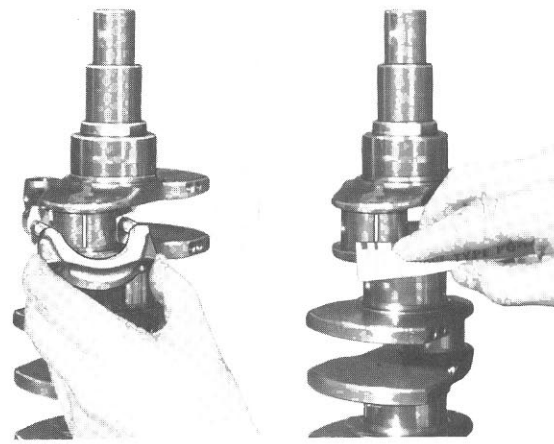


Fig. 3-90

4) If the limit, indicated above, is exceeded, re-grind the crankpin to the undersize and use the undersize bearing, both of which are stated below:

Bearing size	Crankpin diameter
Standard	37.985 - 38.000 mm (1.4954 - 1.4960 in.)
0.25-mm (0.0098 in.) undersize	37.735 - 37.750 mm (1.4856 - 1.4862 in.)
0.50-mm (0.0196 in.) undersize	37.485 - 37.500 mm (1.4760 - 1.4763 in.)

Where undersize bearings are used, the clearance specification is slightly lenient:

Radial clearance for undersize bearing	0.020 - 0.070 mm (0.0008 - 0.0027 in.)

Crankshaft

- Deflection:
  Check the crankshaft for deflection, as shown in Fig. 3-91, and if the dial gauge reading exceeds the limit, repair or replace the crankshaft.

Limit on crankshaft deflection	0.06 mm (0.0023 in.)

NOTE:
Measure the deflection at the center journal.
Rotate the crankshaft slowly.

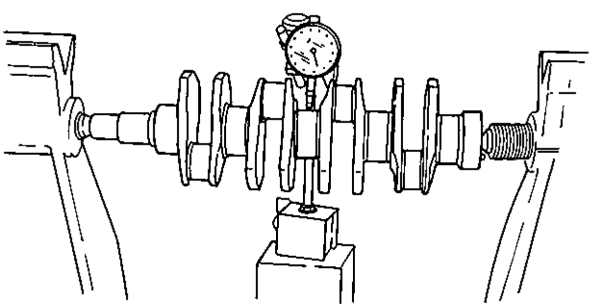


Fig. 3-91

- Crankshaft thrust play:
  Measure this play with crankshaft set in the cylinder block in the normal manner, that is, with the thrust bearing fitted and the bearing caps installed. Use a dial gauge to read the displacement in axial (thrust) direction of the crankshaft. If the limit is exceeded, replace the existing thrust bearing by the oversize one.

Item	Standard	Limit
Crankshaft thrust play	0.13 - 0.28 mm (0.0051 - 0.0110 in.)	0.35 mm (0.0138 in.)

Thickness of crankshaft thrust bearing	Standard	2.500 mm (0.0984 in.)
	Oversize 0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)
	Oversize 0.250 mm (0.0098 in.)	2.625 mm (0.1033 in.)

Tightening torque for cap bolts	4.30 - 4.80 kg-m (31.5 - 34.5 lb-ft)

Tightening torque for the bolts securing the bearing caps is specified.

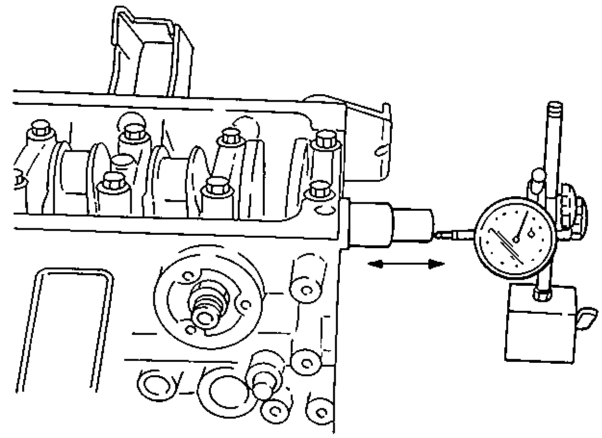


Fig. 3-92

- Out-of-round and taper (uneven wear):
  An unevenly worn crankshaft journal or crankpin shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is to be determined from micrometer readings taken as shown in Fig. 3-93.
  If any of the journals or crankpins is badly damaged or if the amount of uneven wear in the sense explained above exceeds the limit, repair (by re-grinding) or replace the crankshaft.

Limit on uneven wear	0.01 mm (0.0004 in.)

NOTE:
Where journal or crankpin re-grinding is necessary, finish the diameter to the size necessary for the undersize bearing. (Refer to page 3-31.)

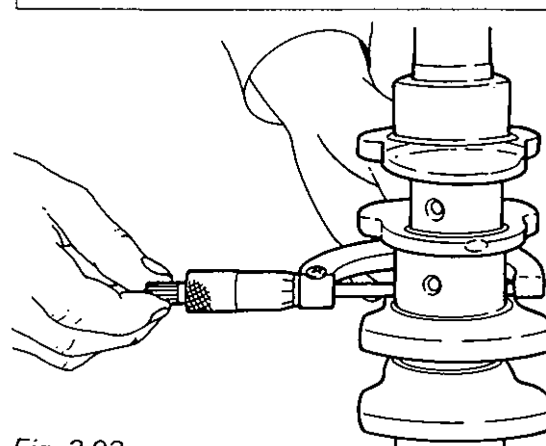


Fig. 3-93

Crankshaft journal bearings

- Inspect the bearing shells for signs of fusion, pitting, burn or flaking and observe the contact pattern. Defective shells must be replaced.

> CAUTION:
> As in the case of connecting-rod bearings, the journal bearing shells are not meant to be repaired by scraping or grinding with sandpaper or by any machining.

- Journal-to-bearing clearance:
  Check this clearance by using fuse stock or, preferably, PLASTIGAGE. The following method is based on the use of PLASTIGAGE:
  1) Cut the PLASTIGAGE stock to the required length (equal to the width of the bearing), and place it axially on the journal, avoiding the oil hole.
  2) Mount the crankshaft in the usual manner, tightening the bearing caps to the specified torque value. (It is assumed that a PLASTIGAGE piece is pinched at each journal.) Do not rotate the crankshaft when PLASTIGAGE is in.

Tightening torque for cap bolts	4.30 - 4.80 kg-m (31.5 - 34.5 lb-ft)

> CAUTION:
> Each of the five bearing caps has an arrow marked on it. Be sure to position each cap with its arrow pointing to front end and to match it (by the cylinder number) to its journal. Remember, the four cylinders are numbered, 1, 2, 3 and 4, as counted from front end. See Fig. 3-94.

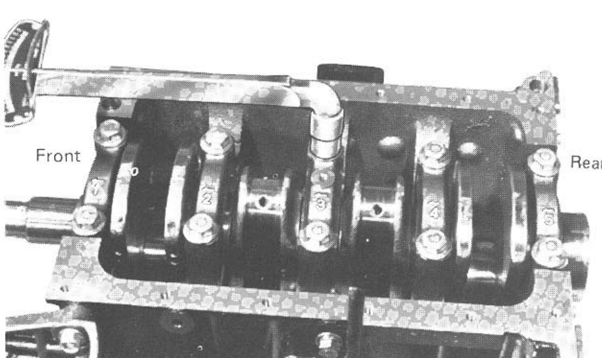


Fig. 3-94

3) Remove the caps and take out the PLASTIGAGE pieces, which are now flattened. By referring to the envelop scale, measure the width of the widest part of the piece, and determine whether the radial clearance checked (obtained from the PLASTIGAGE piece) is within the limit.

Item	Standard	Limit
Journal-to-bearing clearance	0.020 - 0.040 mm (0.0008 - 0.0016 in.)	0.08 mm (0.0032 in.)

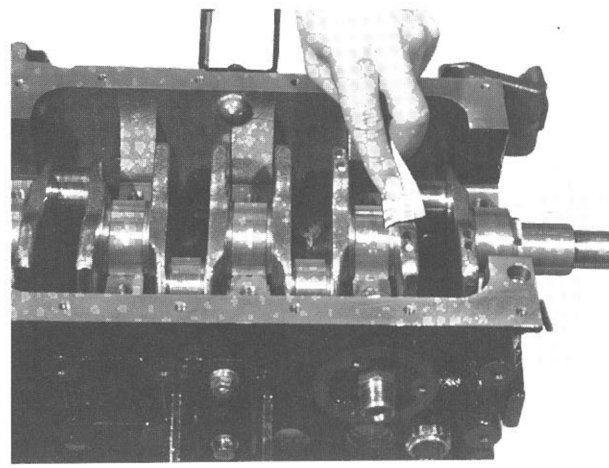


Fig. 3-95

4) If the limit is exceeded, re-grind the journals to the undersize and use the undersize bearing.

Bearing size	Journal diameter
Standard	49.985 - 50.000 mm (1.9679 - 1.9685 in.)
0.25-mm undersize (0.0098 in.)	49.735 - 49.750 mm (1.9580 - 1.9586 in.)
0.50-mm undersize (0.0196 in.)	49.485 - 49.500 mm (1.9482 - 1.9488 in.)

Radial clearance for undersize bearing	0.020 - 0.070 mm (0.0008 - 0.0027 in.)

Flywheel

- Inspect the friction surface—the surface in contact with clutch disc—for wear and damage. Most of surface flaws, if any, can be removed by simple machining. A badly damaged flywheel must be replaced.
- Face runout:
  Check the flywheel for face runout with a dial gauge, as shown in Fig. 3-96. Be sure that the runout is within the limit.

Limit on runout	0.2 mm (0.0078 in.)

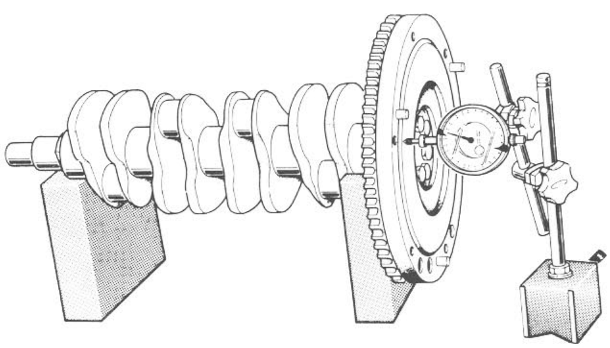


Fig. 3-96

- Ring gear tooth wear:
  Inspect the teeth for wear and for evidence of crack, chipping or any other damage. Replace the ring gear if its teeth are found in bad condition.

Oil seals

Carefully inspect the oil seals removed in disassembly, examining the lip portion ① of each oil seal for wear and damage. Use of new oil seals in reassembly is recommended.

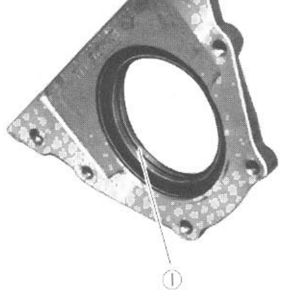


Fig. 3-97

Timing belt and timing pulleys

Inspect the belt and pulleys for wear, cracks and signs of failure. Replace them as necessary.

> CAUTION:
> - Do not bend the belt. Keep away oil and water from the belt. The belt must be kept clean.
> - The pulleys and belt tensioner, too, must be kept clean and free of oil and water.

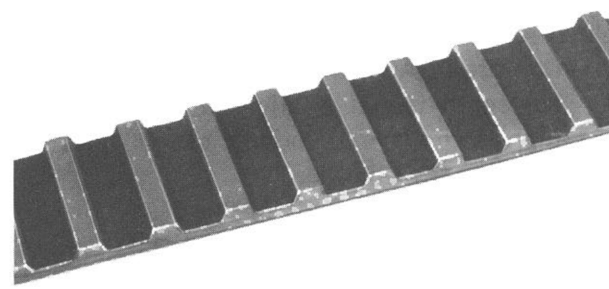


Fig. 3-98

3-6. Engine Reassembly

NOTE:
- All parts to be used in reassembly must be perfectly clean.
- Oil the sliding and rubbing surfaces of engine parts just before using them in reassembly. Use engine oil (Refer to page 1-18).
- Have the liquid packing ready for use. SUZUKI BOND No. 4 is specified for the liquid. Use it wherever its use is specified in order to ensure leak-free (oil and water) workmanship of reassembly.
- There are many running clearances. During the course of engine reassembly, be sure to check these clearances, one after another, as they form.
- Gaskets, "O" rings and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.
- Tightening torque is specified for important fasteners—bolts and nuts in the main—of the engine and other components. Use torque wrenches and constantly refer to the specified values given in the text of this manual. The list immediately following is such specifications.
- Do not disregard the match marks provided on parts. Some of them are those given at the time of disassembly.
- There are many sets of parts. Crankshaft bearings, connecting rods, pistons, etc., are in combination sets. Do not disturb the combinations and try to see that each part goes back to where it came from.

Tightening torque data
This is a list-up of important tightening jobs identified by parts to be secured:

What to tighten	kg-m	lb-ft
Crankshaft bearing cap bolt	4.3 - 4.8	31.5 - 34.5
Connecting-rod bearing nut	2.8 - 3.2	20.5 - 23.0
Crankshaft pulley bolt	5.0 - 6.0	36.5 - 43.0
Flywheel bolt	4.0 - 4.5	29.0 - 32.5
Cylinder head bolt	5.5 - 6.0	40.0 - 43.0
Spark plug	2.0 - 3.0	14.5 - 21.5
Camshaft pulley bolt	5.0 - 6.0	36.5 - 43.0
Valve adjusting nut	1.5 - 2.0	11.0 - 14.0
Oil drain plug	2.0 - 2.5	14.5 - 18.0
Oil pan securing bolt	0.4 - 0.5	3.0 - 3.5
Oil filter	1.0 - 1.5	7.5 - 10.5
Oil filter stand	2.0 - 2.5	14.5 - 18.0
Oil pressure unit	1.2 - 1.5	9.0 - 10.5
Timing belt cover bolt	0.3 - 0.4	2.5

Engine reassembly is the reverse of engine disassembly as far as sequence is concerned, but there are many reassembling steps that involve measures necessary for restoring the engine as close to the factory-assembled condition as possible. Only those steps will be dealt with.

Crankshaft
Be sure to oil crankshaft journal bearings as shown.

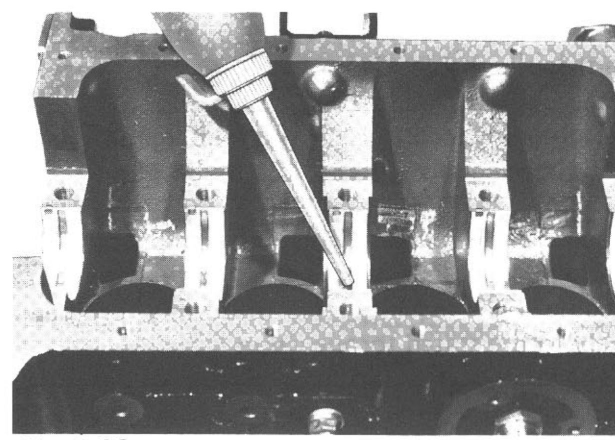


Fig. 3-99

Thrust bearings for the crankshaft are an item prone to escape the serviceman's attention: be careful not to leave them out. These bearings go into place with their oil groove side facing the crank web.

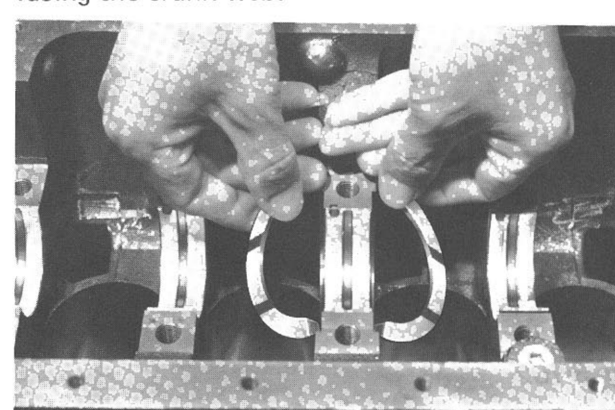


Fig. 3-100

Be sure to oil crankshaft journals as shown.

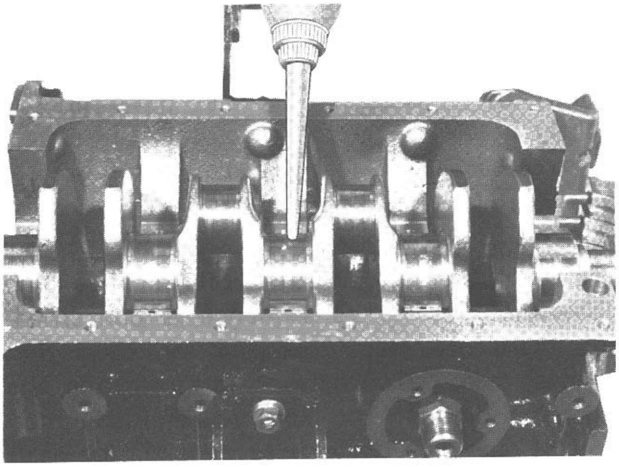


Fig. 3-101

When fitting crankshaft bearing caps to journals after setting the crankshaft in place, be sure to point the arrow mark (on each cap) to front side. Fit them sequentially in the ascending order, 1, 2, 3, 4 and 5, starting from front (pulley) side.

Tightening torque for bearing cap bolts	4.3 - 4.8 kg-m (31.5 - 34.5 lb-ft)

Gradual and uniform tightening is important for bearing cap bolts. Make sure that the five caps become tight equally and uniformly progressively to the stated torque value.

> NOTE:
> After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned over by hand.

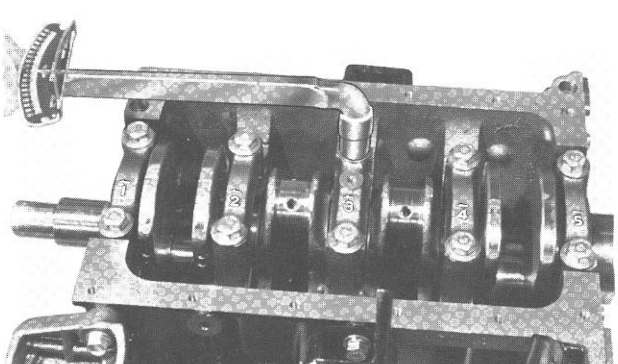


Fig. 3-102

Oil seal housing

This housing demands a new gasket: do not reuse the gasket removed in disassembly. After bolting the housing to the block, the gasket edges might bulge out; if so, cut off the edges to make the joint seam flat and smooth: use a sharp knife. After cutting, apply SUZUKI BOND No. 4, as shown.

> NOTE:
> Just before mounting the housing, oil the lip portion of the oil seal.

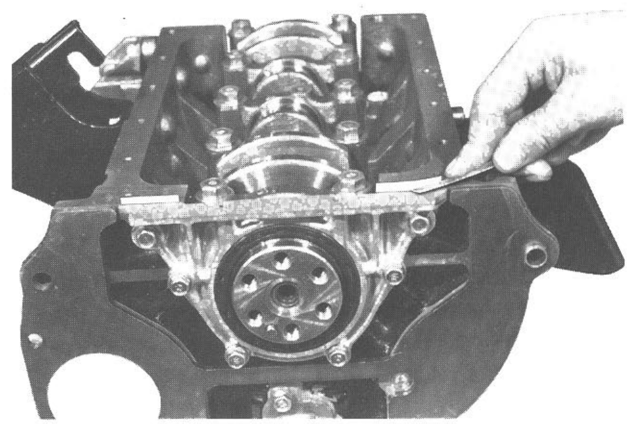


Fig. 3-103

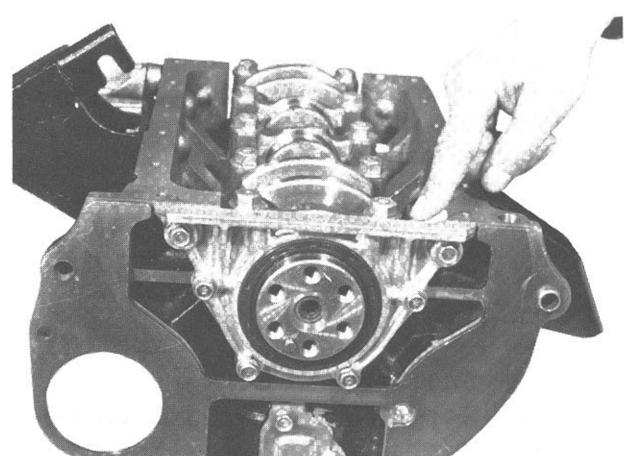


Fig. 3-104

Oil pump
The gasket for oil pump case must be new. As in the case of oil seal housing, cut off the gasket edges with a knife to smoothen the joint seam.

> NOTE:
> Before fitting the pump case, oil the oil seal lip.

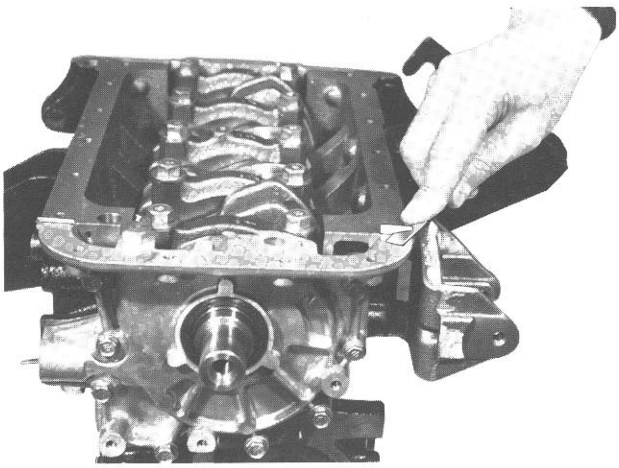


Fig. 3-105

After cutting the gasket edges, apply SUZUKI BOND No. 4.

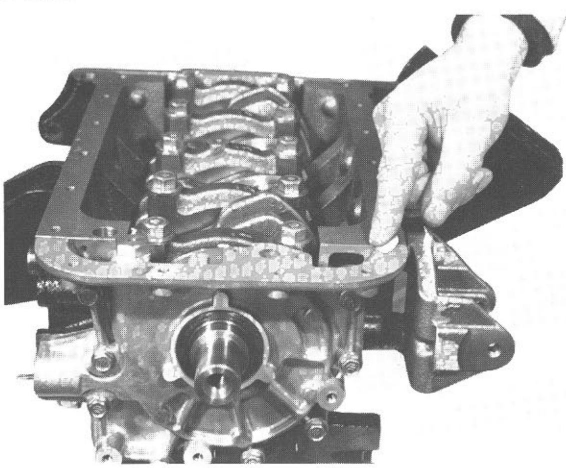


Fig. 3-106

Piston and piston rings
POSITION OF PISTON RELATIVE TO CONNECTING ROD: The arrow ① on the crown points to front (pulley) side, and the oil hole ② comes on inlet port side. See Fig. 3-107.

> NOTE:
> Before pinning piston to connecting rod, oil the small end and pin holes.

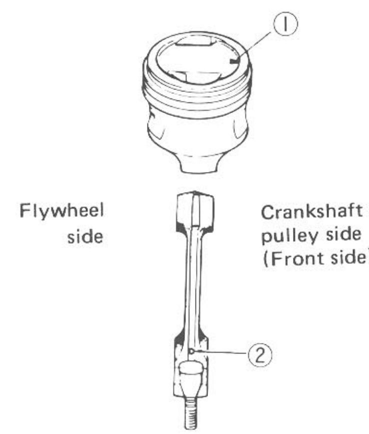


Fig. 3-107

Before fitting rings to piston, check to be sure that first ring has RN mark and second ring R mark. After mounting the three rings, distribute their end gaps as illustrated in Fig. 3-108. Remember, the marked side of each ring (1st and 2nd) comes on top side.

> NOTE:
> After fitting the rings, oil them in the grooves.

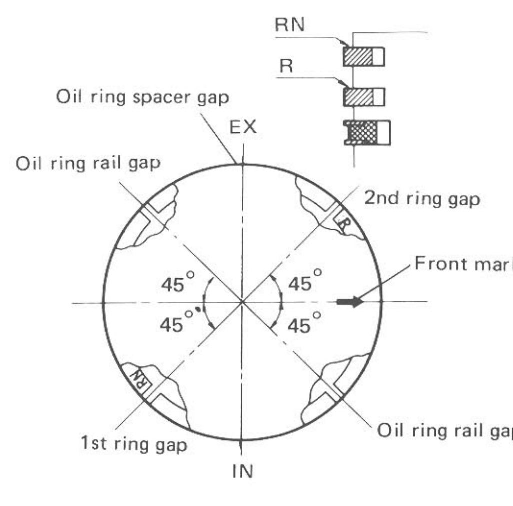


Fig. 3-108

Use of the piston ring compressor Ⓐ (09916-77310), Fig. 3-109, is mandatory in inserting pistons into cylinder block. Using this compressor Ⓐ, feed the piston and connecting rod combination into the bore from the gasketed surface side of block, starting with No. 1 and No. 4 cylinders, while the crankshaft in place is so turned as to hold No. 1 and No. 4 crankpins at bottom dead center. Install No. 2 and No. 3 combinations similarly.

Pay attention to these reminders:

- Point the piston crown arrow to front side.
- Be sure that the number (marked on the crown at the time of disassembly) tallies with the cylinder number.
- Liberally oil the big-end bearings before fitting them to crankpins.
- Oil the bore just before feeding in the piston.

> CAUTION:
> When inserting the piston and connecting rod combination into the cylinder bore, care must be taken to ensure the big end section of the connecting rod and the connecting rod bolts do not contact the cylinder wall nor the crankshaft journal, otherwise damage can occur.

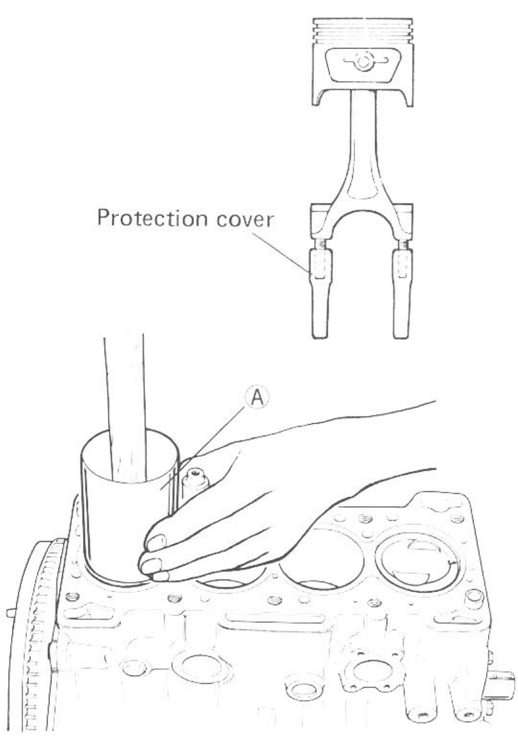


Fig. 3-109

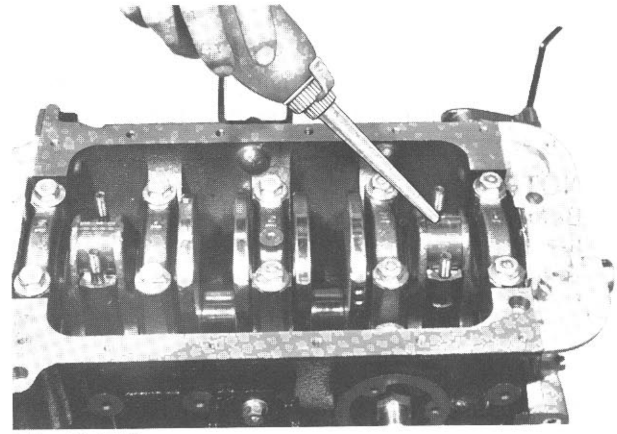


Fig. 3-110

Connecting rods

Two stoppers ① ②, Fig. 3-112, determine the position of each big-end bearing cap relative to the big end. At the time of installing these caps, be sure to locate stopper ① of cap in the direction of stopper ②.

> NOTE:
> The two stoppers do not coincide in longitudinal direction: the coincidence is meant in the direction shown in Figs. 3-111 and Fig. 3-112.

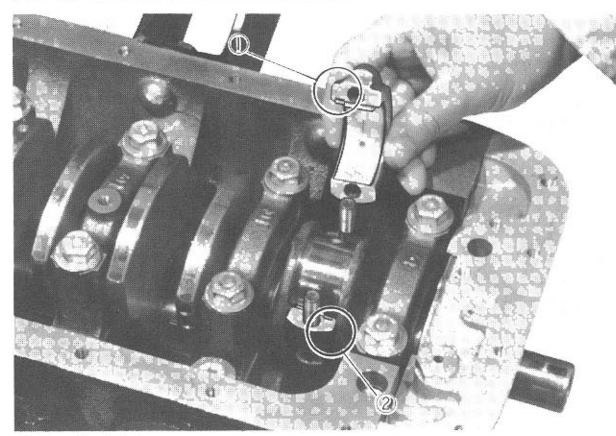


Fig. 3-111

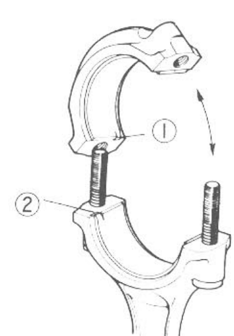


Fig. 3-112

After fitting all four big-end bearing caps, start tightening them uniformly, being sure to equalize tightness between right and left on each cap. The sequence here is similar to that for crankshaft bearing caps.

Tightening torque for big-end caps	2.8 - 3.2 kg-m (20.5 - 23.0 lb-ft)

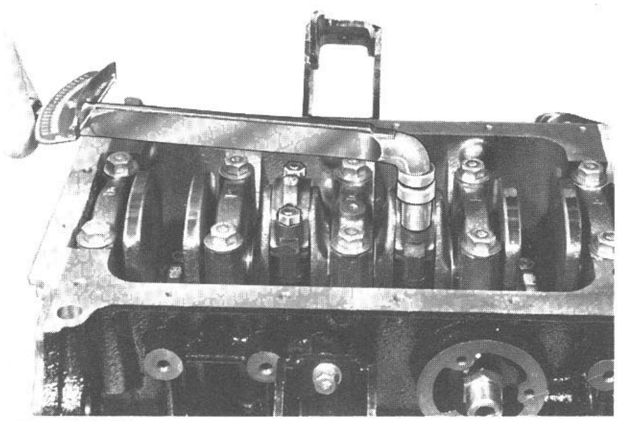


Fig. 3-113

> NOTE:
> After installing crankshaft and pistons, as above, double-check to be sure that the arrows on piston crowns are all pointing to pulley (front) side.

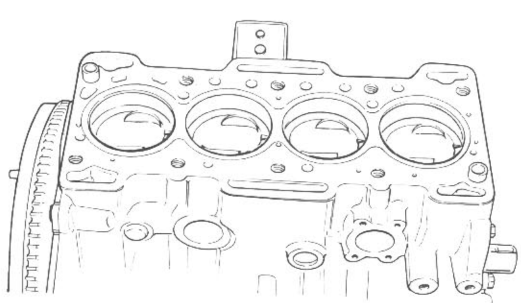


Fig. 3-114

Oil pump strainer

Bear in mind that "O" ring ① is often forgotten and left out in reassembly. Absence of this ring defeats the purpose served by the strainer.

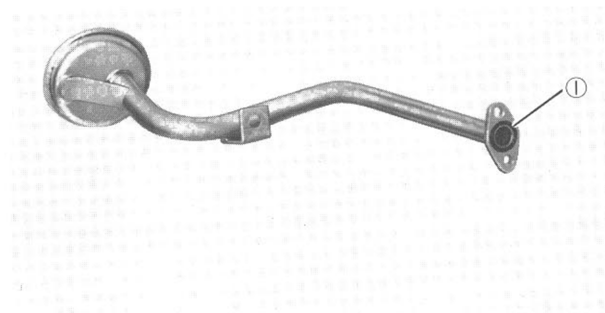


Fig. 3-115

When installing the strainer, be sure to tighten bolts ② first.

Fig. 3-116

Oil pan

After fitting the oil pan to the block, run in the securing bolts and start tightening at the center: move the wrench outward, tightening one bolt at a time.

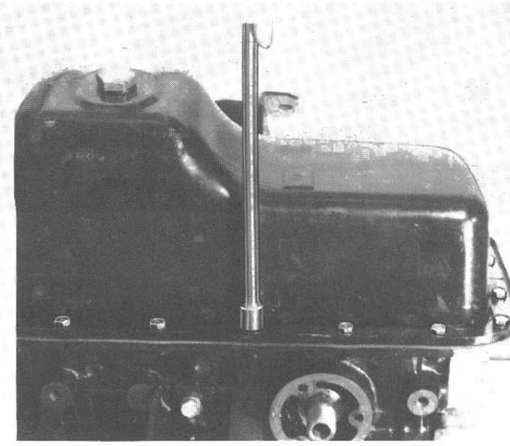


Fig. 3-117

Flywheel

The first step of flywheel installation is to check to be sure that locating pin ① is studded in the crankshaft. The next step is to fill up the pocket between input shaft bearing and oil seal ② with grease (SUZUKI SUPER GREASE A). Make this pocket 60% full.

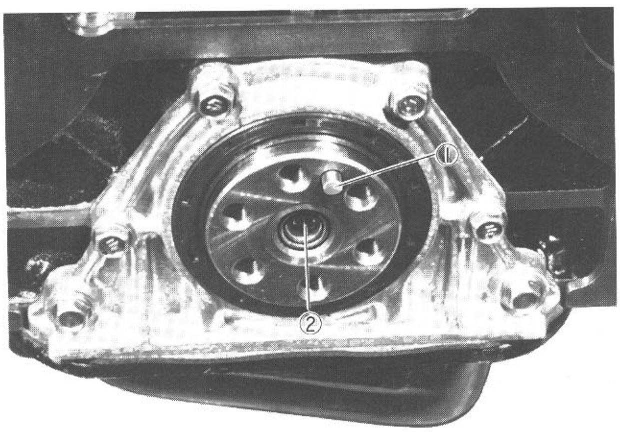


Fig. 3-118

Cylinder head

Oil valve stems before inserting them into guides.

> CAUTION:
> Be sure to distinguish between inlet valves and exhaust valves. The difference is in diameter and marking. Refer to the embossed marks, shown in Fig. 3-119.

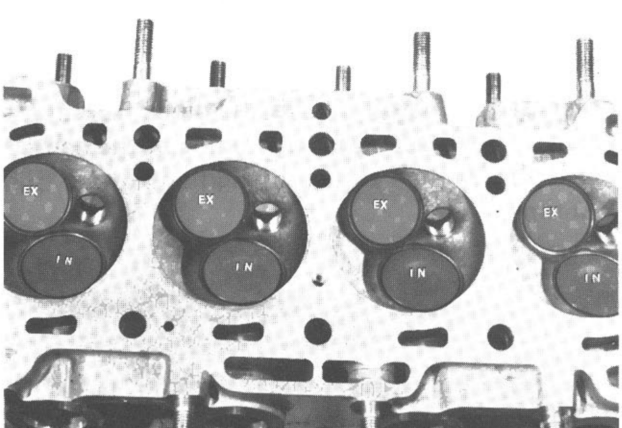


Fig. 3-119

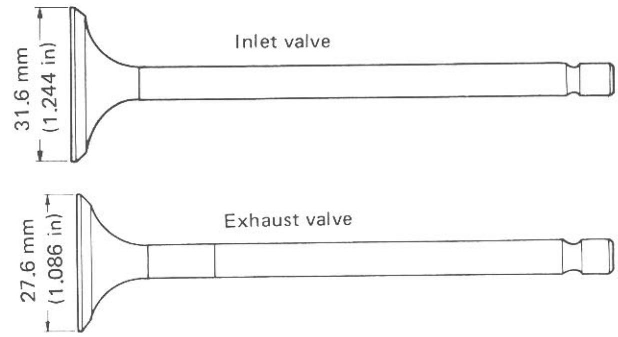


Fig. 3-120

Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position the springs in place so that their bottom ends come on bottom side.

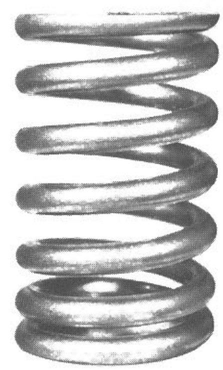


Fig. 3-121

To fit valve cotters to the groove provided on the end portion of each valve stem, be sure to use the valve lifter Ⓐ (09916-14510): compress the valve spring with this lifter and mount the cotter pieces, as shown in Fig. 3-122.

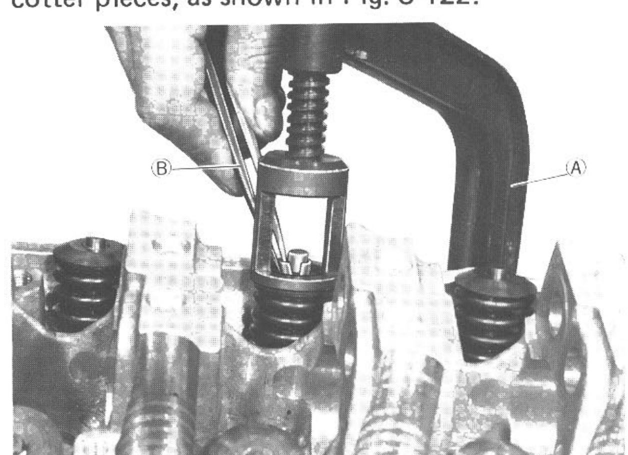


Fig. 3-122 Ⓑ *Forceps (09916-84510)*

At the time of installing the cylinder head, be sure to position the head gasket correctly on the cylinder block. "TOP" mark ①, provided on the gasket, comes on top side; "IN" mark ② comes on inlet manifold side and "EX" mark comes on exhaust side. Be sure, too, that locating pins ④ are in place.

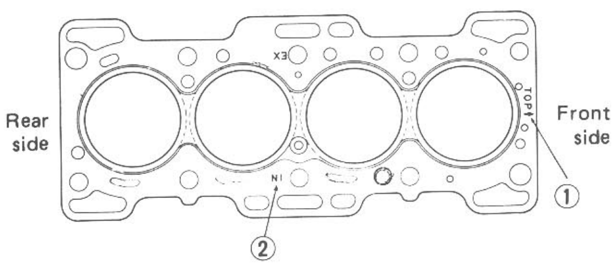


Fig. 3-123

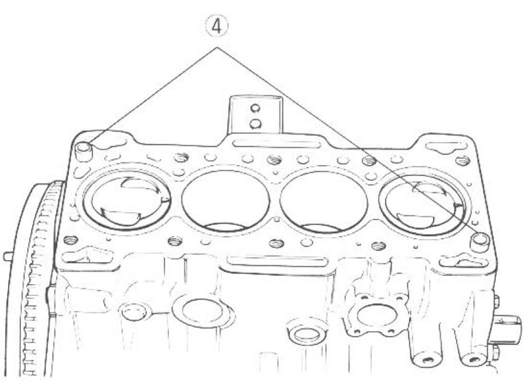


Fig. 3-124

The position the cylinder head takes on the block is but one, which is shown in Fig. 3-125. When placing the head on the block, be sure that it is correctly oriented: the clue is the inlet ports ⑤.

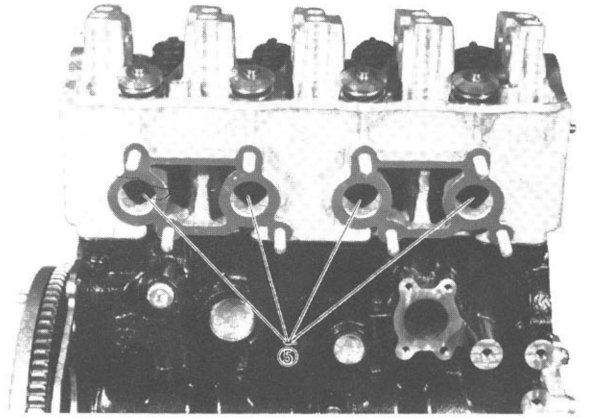


Fig. 3-125

The tightening sequence for cylinder head bolts is indicated in the photo. Tighten the bolts in that sequence to the specified torque value:

Tightening torque for cylinder head bolts	5.5 - 6.0 kg-m (40.0 - 43.0 lb-ft)

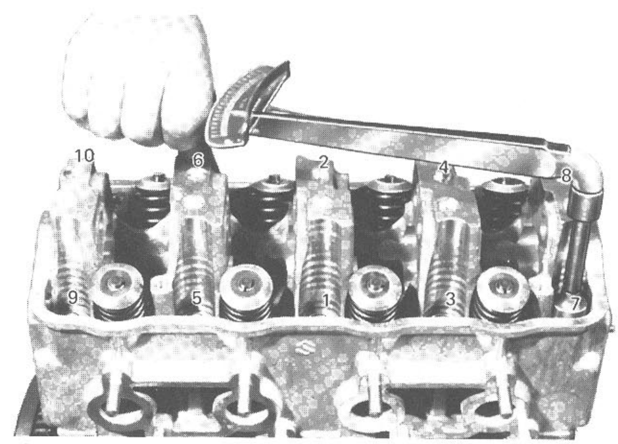


Fig. 3-126

Camshaft

The camshaft goes into cylinder head from rear side (clutch side). Before inserting it, be sure to oil its journals.

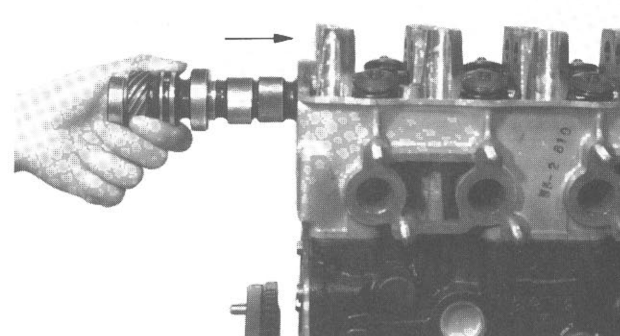


Fig. 3-127

Be careful not to leave out the thrust plate ① when installing the camshaft. After setting this shaft in place, with its thrust plate properly fitted, turn the shaft by hand to be sure it rotates smoothly.

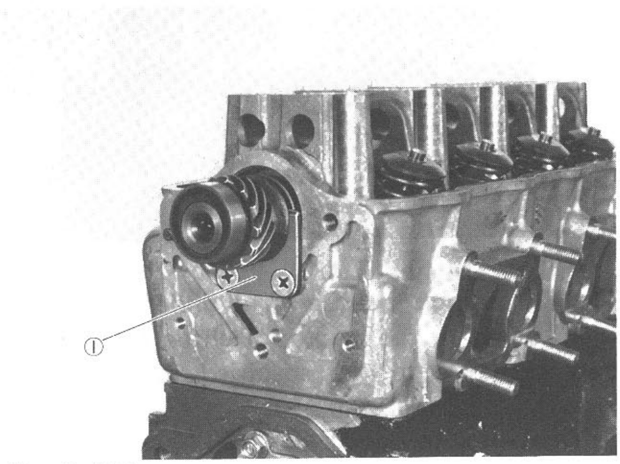


Fig. 3-128

Rocker-arm shafts

The two rocker-arm shafts are identical, there being no need to distinguish between the two. However, each shaft takes but one position in place. See Fig. 3-130.

- On the inlet side, the stepped end ③ comes on front side.
- On the exhaust side, the stepped end ④ comes on rear side.

> NOTE:
> Oil rocker-arm shafts just before installing them.

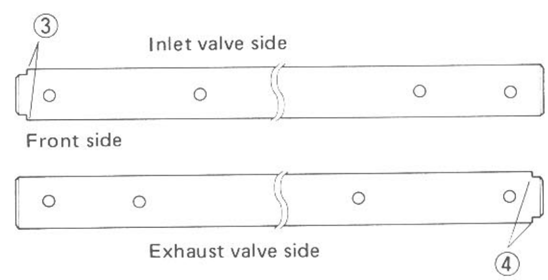


Fig. 3-130

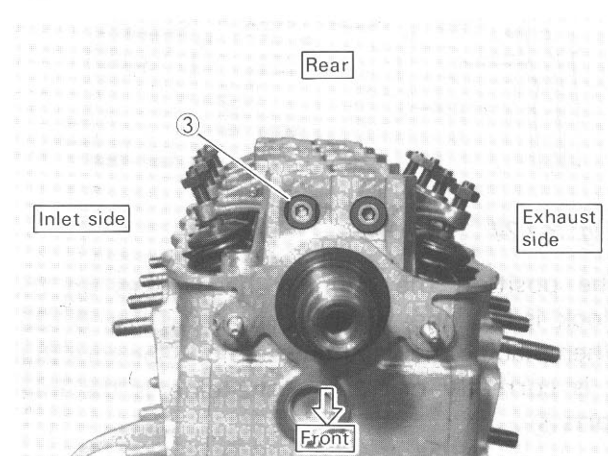


Fig. 3-131

As to the positions of rocker arms and springs on each rocker-arm shaft, refer to Fig. 3-132. "Front side" is meant by "1"; "rear side" by "2".

> NOTE:
> When installing rocker-arm shafts, be sure to have valve adjusting screws loosened fully but do not remove them.

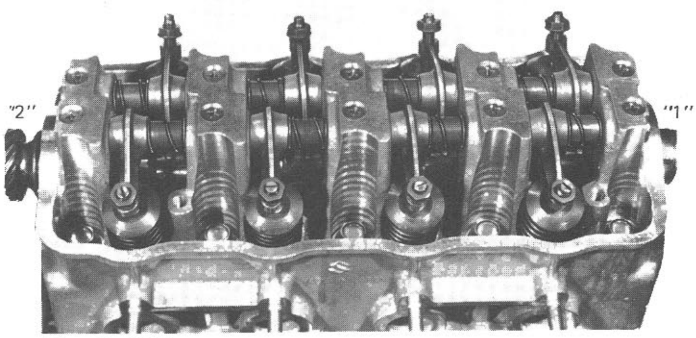


Fig. 3-132

Water inlet pipe

The angle that this pipe takes in place is important. When installing it, be sure to angle it as shown in Fig. 3-133.

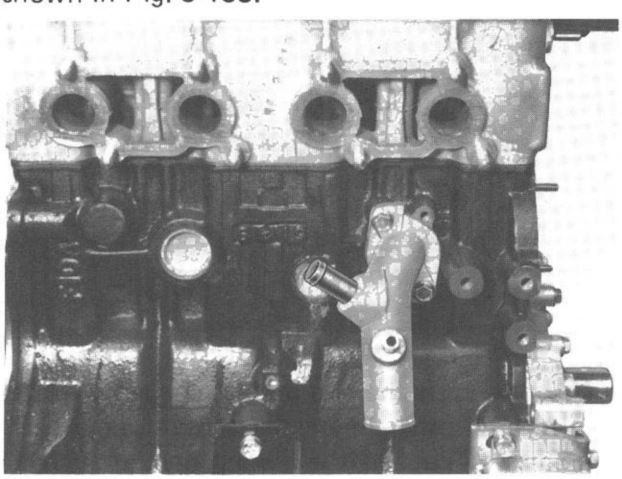


Fig. 3-133

Timing belt inside cover spacer

Before installing the timing belt inside cover, check to ensure that a spacer is fitted on each of the 2 bolts as shown in Fig. 3-134. Also before remounting these bolts which have once been removed, be sure to apply SUZUKI BOND No. 4 to their thread.

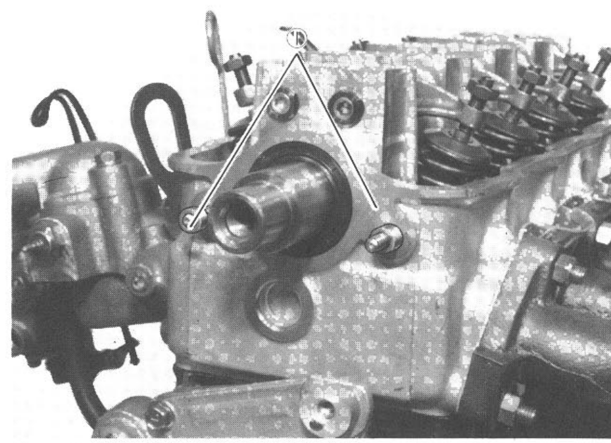


Fig. 3-134

Crankshaft timing belt guide

This guide takes its position on crankshaft as shown in Fig. 3-135. Remember, one side of this guide faces the cylinder block and the other side faces the timing belt pulley: the former side being distinct from the latter.

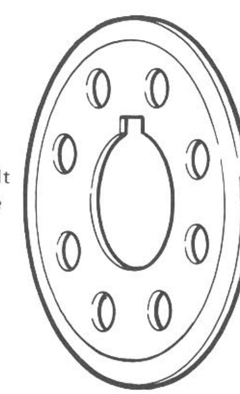


Fig. 3-135

Camshaft timing belt pulley

One side of this pulley has a punch mark ①—it is a point mark—as the reference for correctly positioning it on the camshaft. Fit the pulley to camshaft, bringing the punch-marked side to fan side and locating the mark ① at the keyway ② provided in camshaft.

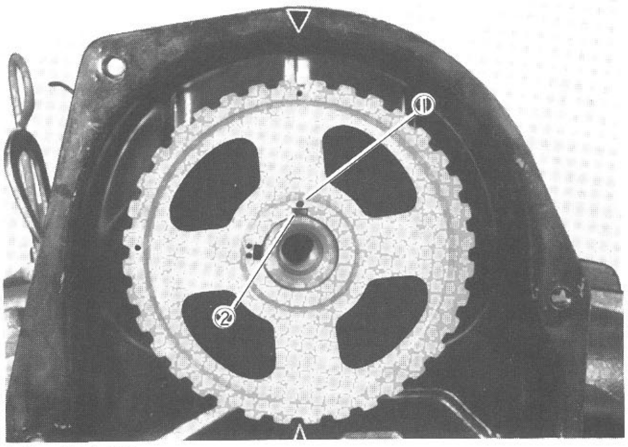


Fig. 3-136

Timing belt (valve timing adjustment)

A certain sequence must be followed in installing the timing belt. Here's the sequence:

1) Loosen all the valve clearance adjusting screws after loosening each lock nut, so that the camshaft and the pulley can rotate freely.
2) Have the timing belt tensioner slackened so that it will move freely.

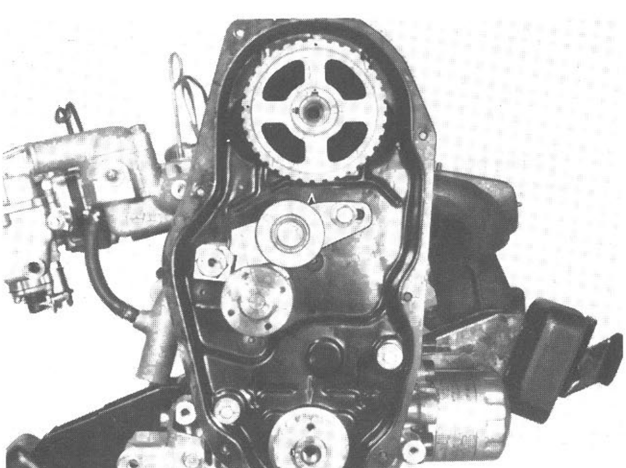


Fig. 3-137

3) Camshaft timing belt pulley has another punch-mark ④, which is located on the radial line passing through the punch-mark ① mentioned above. Now, timing belt inside cover has an embossed mark ⑤. Turn camshaft timing belt pulley to the position where mark ④ meets mark ⑤.
4) The inside cover has another embossed mark ⑥. Turn crankshaft to match keyway ③ of crankshaft timing belt pulley to mark ⑥.

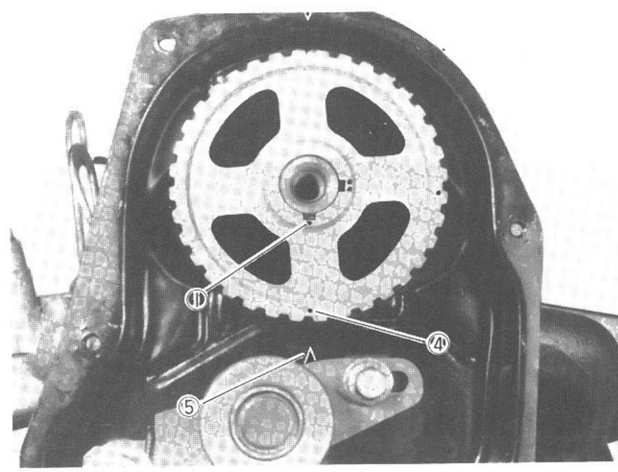


Fig. 3-138

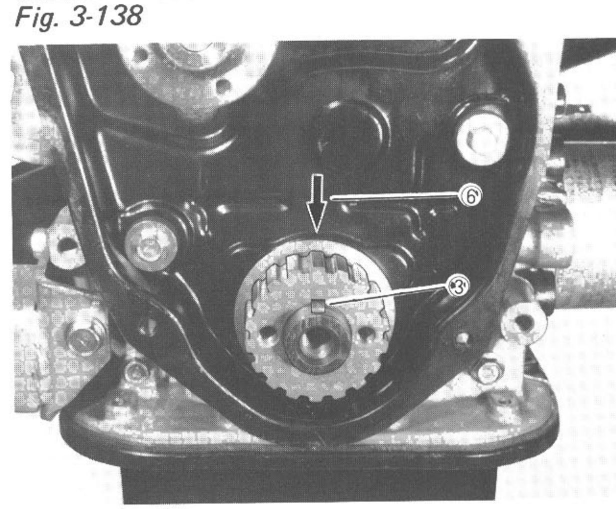


Fig. 3-139

5) You now have the two pulleys correctly related to each other in angular sense. Under this condition, put on the timing belt in such a way that portion of belt indicated as ⑦ is free of any slack.

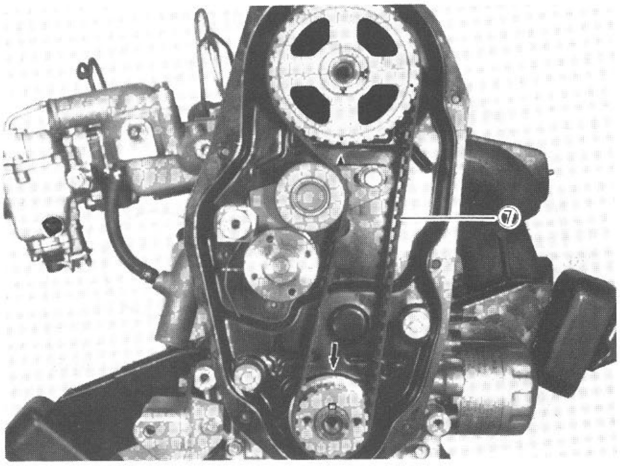


Fig. 3-140

6) After putting the belt, hook the spring on the bracket as shown in Fig. 3-141 so that the timing belt can be tensed to specified range by the tensioner spring force.

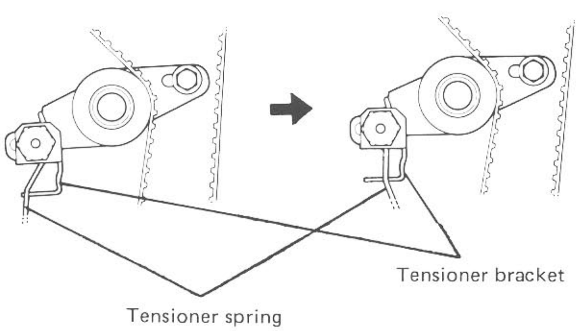


Fig. 3-141

Rotate the crankshaft clockwise fully twice and tighten the bolt and the nut to the specified torque.

NOTE:
- Apply THREAD LOCKCEMENT SUPER 1342 (99000-32050) to the screw part of the tensioner bolt.
- Make sure to tighten the bolt first and then the nut.

Tightening torque for tensioner bolt and nut	N.m	kg-m	lb-ft
	15 - 23	1.5 - 2.3	11.0 - 16.5

CAUTION:
After setting the belt tensioner, turn crankshaft 2 rotations in clockwise direction to see if marks ① ④ ⑤ ⑥ and crankshaft keyway ③ locate themselves on the same straight line. If they do not line up straight, the foregoing procedure must be repeated to satisfy this requirement.

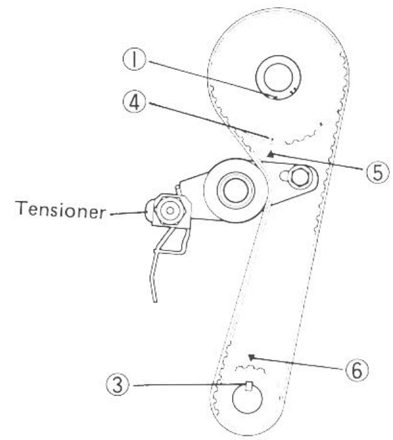


Fig. 3-141-1

7) Check to be sure that the tension is within the specified range when pushing the belt at the mid point between camshaft and crankshaft.

Timing belt tension "L"	5.5 - 6.5 mm (0.22 - 0.26 in.)

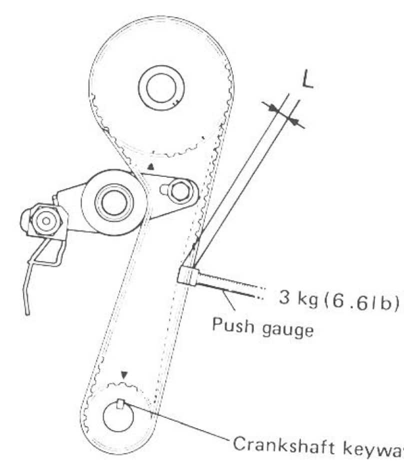


Fig. 3-141-2

After adjusting the belt tension within specified range, adjust each valve clearance to specified value.

Valve clearance adjustment

The method of valve clearance adjustment is conventional. It is accomplished by means of adjusting screw ⑧ . Nut ⑨ is for locking the screw. Use a feeler (thickness) gauge to measure the clearance between screw ⑧ and stem ⑩ when the rocker arm is turned up all the way.

Valve clearance specification (when cold)	Intake	0.13 - 0.18 mm (0.005 - 0.007 in.)
	Exhaust	

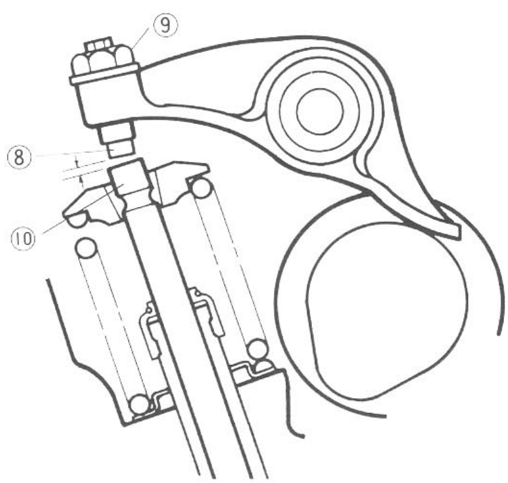


Fig. 3-142

Of the total of 8 valves, the question is how to bring the rocker arm to the position indicated in Fig. 3-143. There are two reference marks by which you can tell which valves are in the condition of Fig. 3-143. One is the key on camshaft, and the other is the "T" mark provided on flywheel.

Referring to Fig. 3-143, showing the end view of camshaft and pulley, turn crankshaft until the key comes to top position: at this position, check "valve clearance" on the inlet and exhaust valves of No. 4 cylinder. Rotate crankshaft further to relocate the key to the side position on the right; now the valves of No. 2 cylinder are ready for checking, and so on.

The method of positioning the valve mechanism by referring to the "T" mark on flywheel is similar; it will be set forth in the section for engine tune-up.

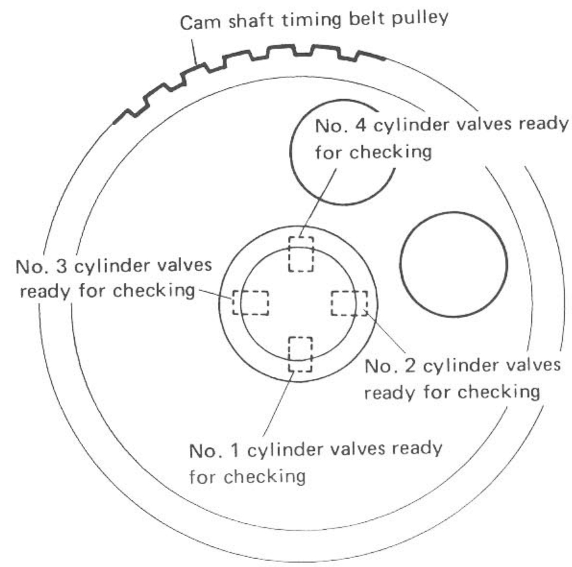


Fig. 3-143

Distributor gear case

Bolts ① are for securing this gear case to the cylinder block. When installing the case, be sure to apply SUZUKI BOND No. 4 (99000-31030) to the threads of these bolts.

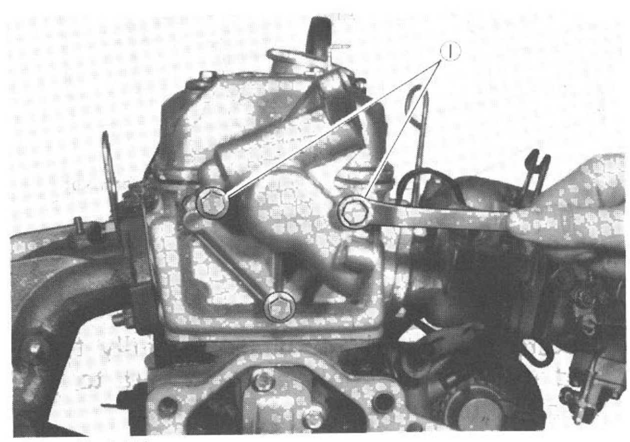


Fig. 3-144

Distributor

The distributor takes its mounted position correctly only when it is inserted into the gear case under a specific condition. The condition is this: Turn over crankshaft to locate the piston at B.T.D.C. 10°(No. 1 Piston being compression stroke), and insert the distributor into the case, with end face ② of distributor rotor lined up with edge face ③ of distributor housing, as shown in Fig. 3-145.

With the distributor correctly installed, as above, "ignition" must be timed to the specification. This timing is to be effected later at the time of making adjustments on the ignition system (Page 8-10).

CAUTION:
About 60 cc (2.03/2.11 US/Imp oz) of engine oil must be fed into the distributor gear case after servicing this case, that is, removing and putting it back. Be sure to add this much oil before starting the engine for the first time after servicing.

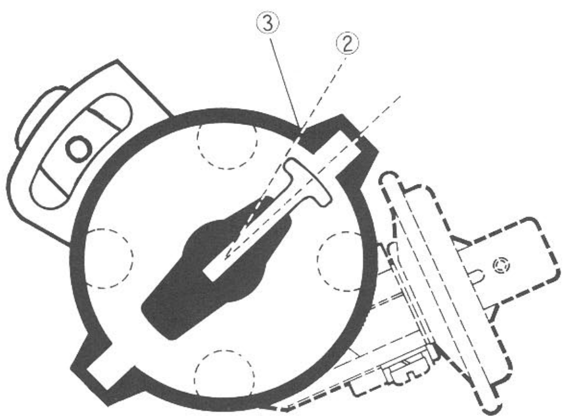


Fig. 3-145

Alternator
The water pump drive belt, by which the alternator too is driven, must be tensioned to the specification after the alternator is installed. Check the tension at the middle point of the belt between water pump pulley and alternator pulley. To vary the tention for adiustment, displace the alternator in place.

Drive belt tension (in terms of belt deflection as shown)	10 - 15 mm (0.4 - 0.6 in.) under 10 kg (22.0 lb) thumb pressure

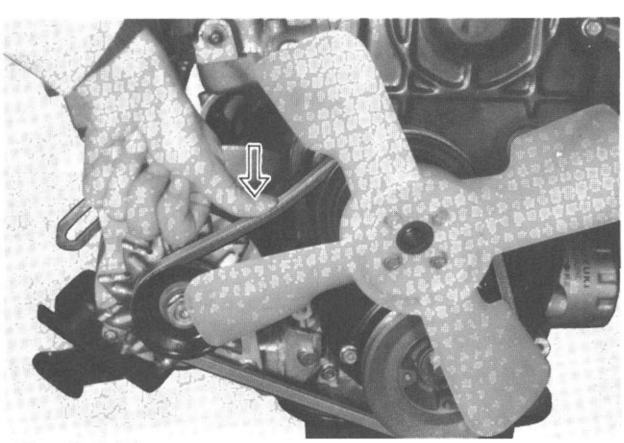


Fig. 3-146

Clutch
At the time of bolting the clutch cover after mounting the clutch disc, the disc must be trued up and centered. Carry out this centering job with the use of the special tool Ⓐ (09923-36310).

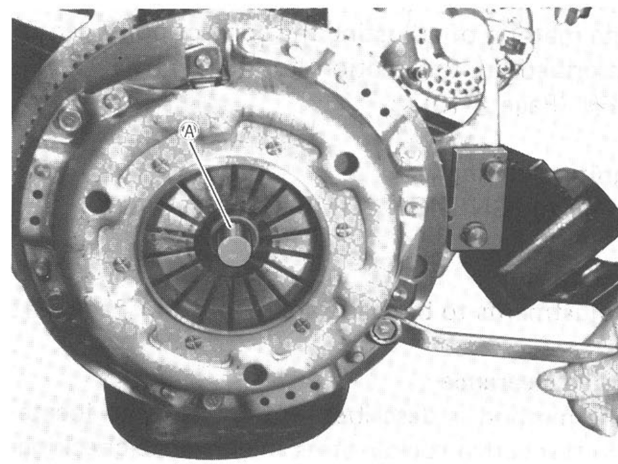


Fig. 3-147

3-7. Engine Inspection and Adjustments

Fan belt

Adjust the belt tension as outlined in the section for ENGINE COOLING SYSTEM (Page 6-8).

Distributor point gap

The method of adjusting the contact point gap is described in the section for IGNITION SYSTEM (Page 8-10).

Ignition timing

Refer to IGNITION TIMING, Page 8-10.

Carburetor

Adjustments to be made are detailed in Page 4-1.

Valve clearance

The method is described in 3-6. How to locate the respective rocker arms in clearance-checking position by turning the crankshaft in reference to the "T" mark provided on flywheel will be explained.

Valve clearance specification (COLD)	Intake	0.13 - 0.18 mm (0.005 - 0.007 in.)
	Exhaust	

Remove the plug—ignition timing check hole plug—provided at the joint between engine and transmission to gain visual access to the "T" mark. Turn over crankshaft to index mark Ⓘ to stationary mark ⅡⅠ, and see if the rocker arms of No. 1 cylinder are off the respective cam lobes (of camshaft); if so, valves ①, ②, ⑤ and ⑦, Fig. 3-149, are ready for clearance checking and adjustment: if not, turn over crankshaft further by 360° to index mark Ⓘ to mark ⅡⅠ again. This 360° turning should bring about the desired state (in which the four valves are ready for checking and adjustment).

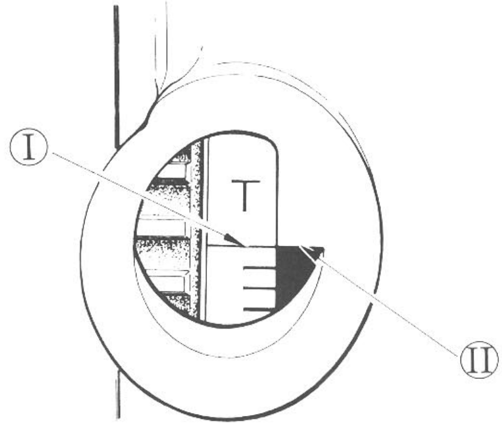


Fig. 3-148

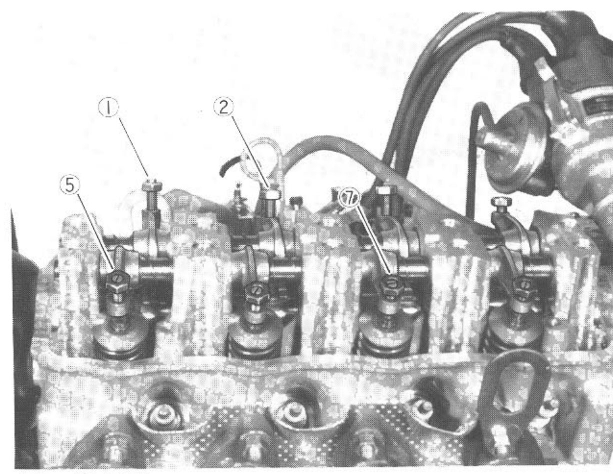


Fig. 3-149

After checking valves ①, ②, ⑤ and ⑦, turn over crankshaft by 360° to make valves ③, ④, ⑥ and ⑧ ready for checking and adjustment.

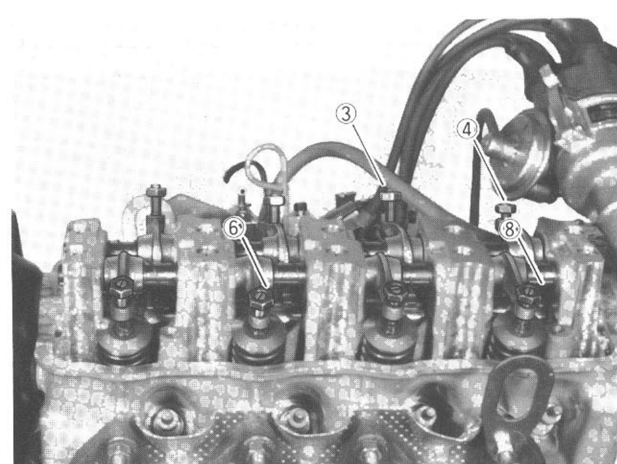


Fig. 3-150

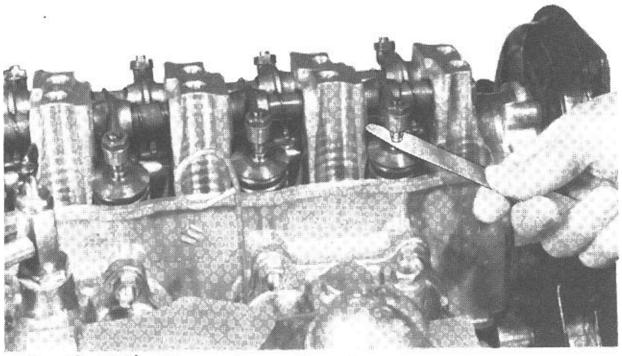


Fig. 3-151 Measuring valve clearance·

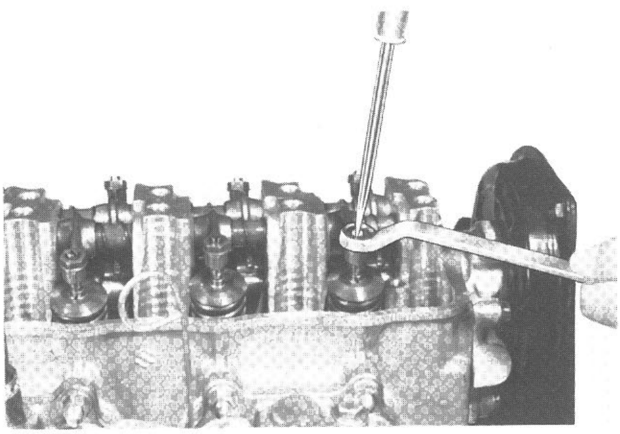


Fig. 3-152 Adjusting valve clearance

Timing belt

The timing belt is visible through the inspection window. Through this window, inspect the belt for any damage or wear while moving it by turning the crankshaft clockwise. When any damage or wear is found on the belt, replace it. To gain visual access proceed as follows:

1) Remove the 4 bolts securing the radiator shroud panel.
2) Raise the panel out of the way, and look into the window.

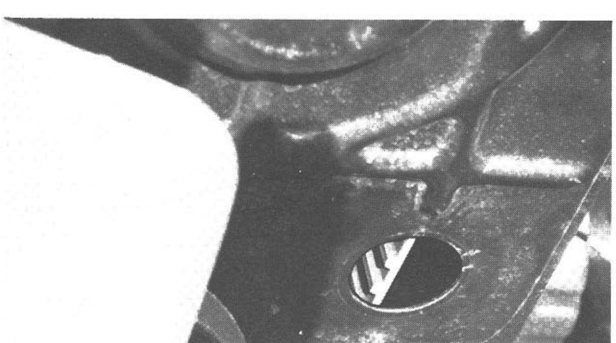


Fig. 3-153

Oil pump discharge pressure measurement

The method of pressure measurement is outlined in the section for ENGINE LUBRICATION (Page 3-53).

Compression pressure measurement

Check the compression pressure on all four cylinders, as follows:

1) Remove all spark plugs.
2) Install the compression gauge Ⓐ (09915-64510) on one of the cylinders, making the connection perfectly air-tight.
3) Disengage the clutch (to lighten starting load on engine), and depress the accelerator all the way to make the throttle full-open.
4) Crank the engine with the starter motor, and read the highest pressure on the compression gauge.
5) Carry out the steps 2) through 4) on each cylinder to obtain four readings.

Compression pressure

Standard	Limit	Difference
13.5 kg/cm^2 (192.0 psi)/ 300 r/min (rpm)	12.0 kg/cm^2 (170.0 psi)/ 300 r/min (rpm)	1.0 kg/cm^2 (14.2 psi)/ 300 r/min (rpm) between any two cylinders

NOTE:
There is some trouble in the engine when the compression pressure is not higher than the limit. Refer to TROUBLE-SHOOTING GUIDE (Page 2-3) for possible causes.

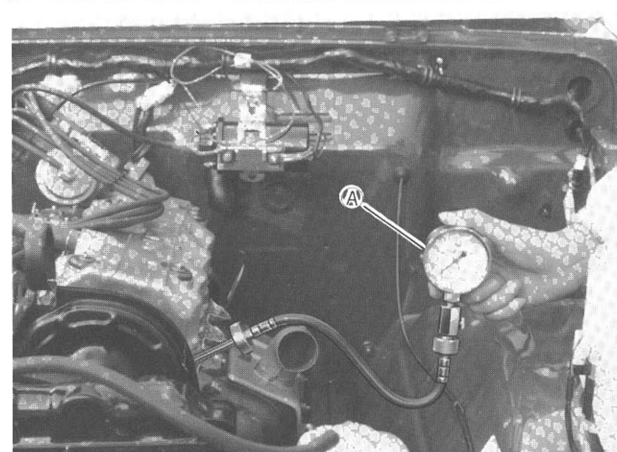


Fig. 3-154

NOTE:
The compression pressure value is measured by using the special tool (compression gauge 09915-64510).

Vacuum measurement

The vacuum that develops in the intake line is a good indicator of the condition of the engine. It is for this reason that the vacuum is measured. The measuring procedure is as follows:

1) Run the engine until its coolant temperature rises to a level between 75°C and 85°C (167°F - 185°F).
2) Install the vacuum gauge Ⓐ (09915-67310), as shown in Fig. 3-155. Install an engine tachometer.
3) Run the engine at the specified idling speed and, under this running condition, read the vacuum gauge. The vacuum should be not lower than **42** cm Hg (15.7 in. Hg).

A low vacuum reading means that any combination of the following malconditions is the cause, which must be corrected before releasing the machine to the customer:

(a) Leaky cylinder head gasket
(b) Leaky inlet manifold gasket
(c) Leaky valves
(d) Weakened valve springs
(e) Maladjusted valve clearance
(f) Valve timing out of adjustment
(g) Ignition mistimed
(h) Carburetor improperly adjusted

> NOTE:
> **Should the indicating hand of the vacuum gauge oscillate violently, turn the adjusting nut Ⓑ to steady it.**

Standard vacuum	**42~ 52 cm Hg (16.5~ 20.5 in. Hg)**
Idling speed specification	**850 r/min (rpm) (Take vacuum reading at this speed.)**

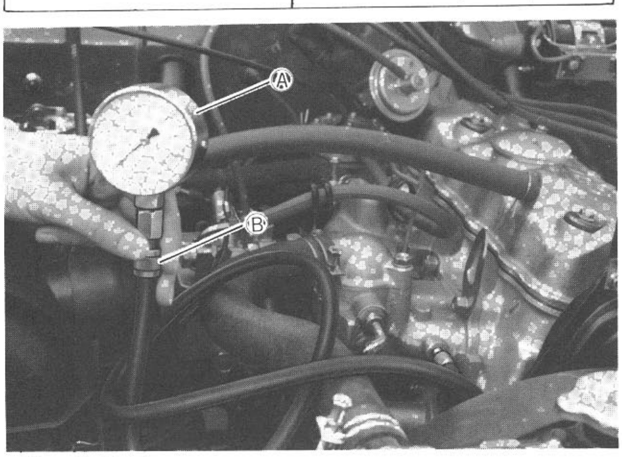


Fig. 3-155

Engine oil

Refer to the section for ENGINE LUBRICATION, Page **3-54**.

Engine oil filter

The methods of checking and servicing the oil filter are outlined under ENGINE LUBRICATION, Page **3-53**.

Engine coolant

This subject is covered in the section for ENGINE COOLING SYSTEM, Page **6-7**.

Exhaust line and muffler

Inspect each exhaust line connection for tightness, and examine the muffler and other parts for evidence of breakage and leakage of gases. Repair or replace defective parts, if any.

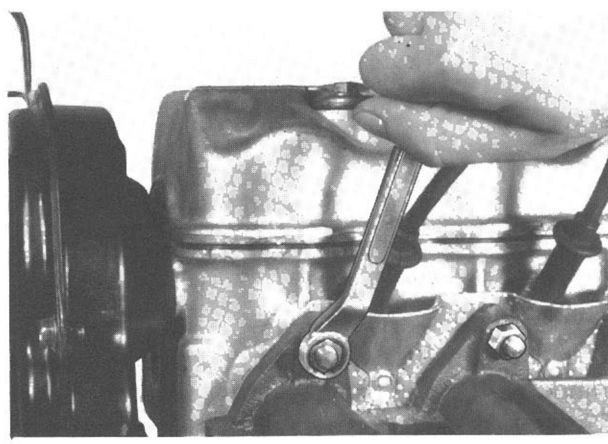


Fig. 3-156

Crankcase ventilation hose

Inspect this hose for cracks and evidence of breakage and, as necessary, replace it. Check to be sure that the hose connection is tight.

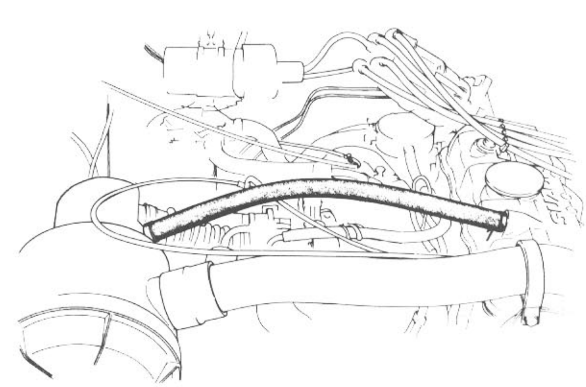


Fig. 3-157

Oil filler cap

The cap has a packing. Be sure that the packing is in good condition, free of any damage and signs of deterioration, and is tight in place: it is replaceable.

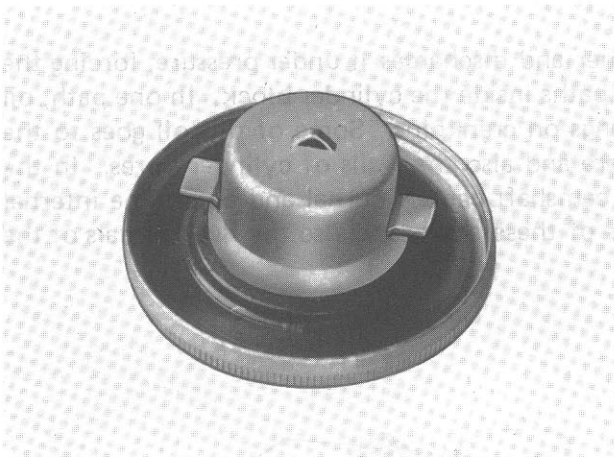


Fig. 3-158

3-8. Engine Lubrication

Description

The oil pump for pressure-feeding lubrication oil to the running parts of the engine is of an internal gear type, in which an outer ring-like gear is internally meshed with an inner gear, there being a separating srescent-like stator between the two. The pump is mounted on the front end of the engine, and is driven by the crankshaft.

OIL CIRCUIT: The oil pump lifts oil through the strainer and discharges it under pressure, forcing the oil through the oil filter. The filtered oil flows into two paths inside the cylinder block. In one path, oil reaches the crankshaft journal bearings and big-end bearings on crankpins. Some of this oil goes to the connecting-rod small ends and lubricates piston pins there and also the walls of cylinder bores. In the other path, oil goes up to the cylinder head through the camshaft center journal and enters the internal oilways of rocker arm shafts to lubricate the sliding parts of these shafts and also the five journals of the camshaft.

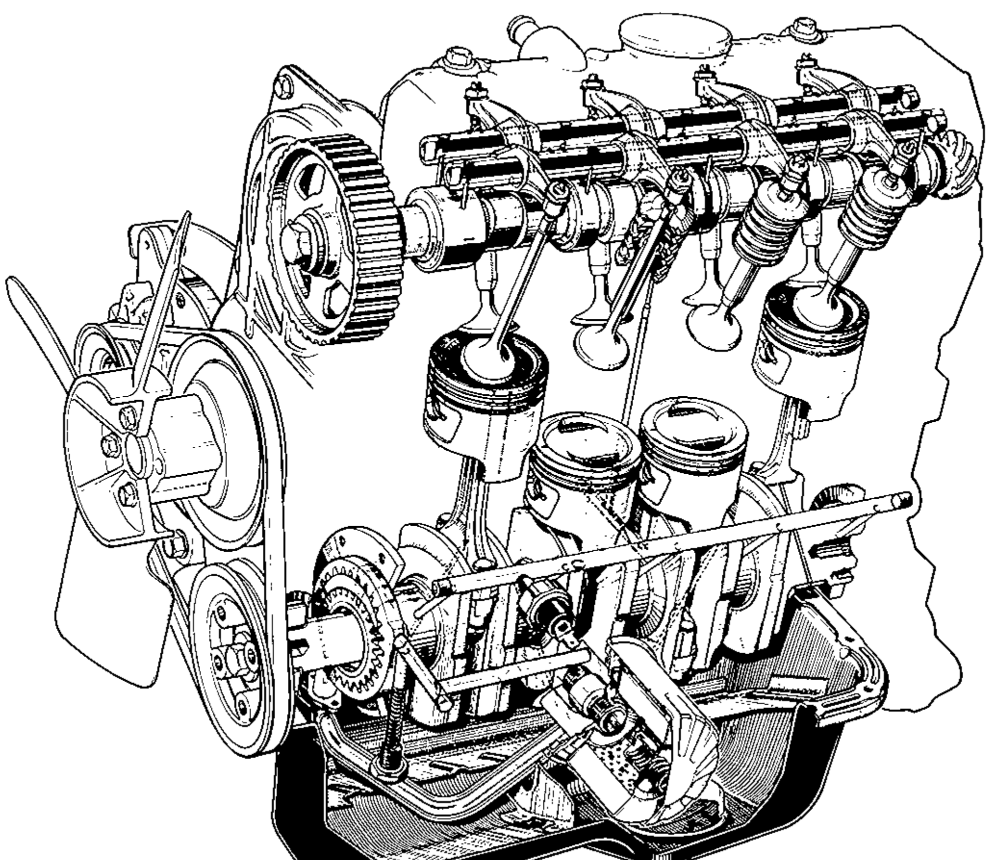


Fig. 3-159

An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.5 kg/cm^2 (64.0 psi). Relieved oil flows back to the oil pan.

Oil pump disassembly

Remove oil pump gear plate.

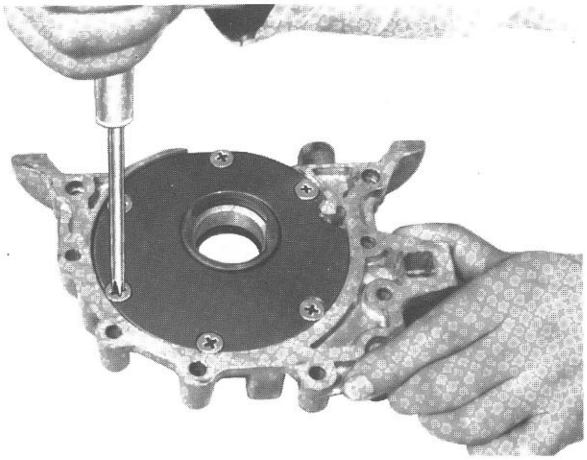


Fig. 3-160

Take out inner gear.

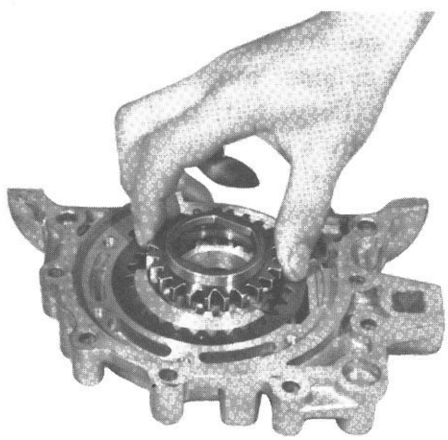


Fig. 3-161

Take out outer gear.

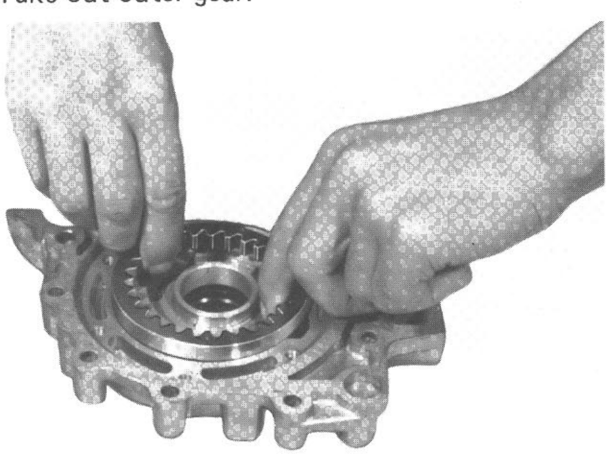


Fig. 3-162

Oil pump inspection

Radial clearance between inner gear and crescent

Standard	0.60 - 0.80 mm (0.0236 - 0.0315 in.)

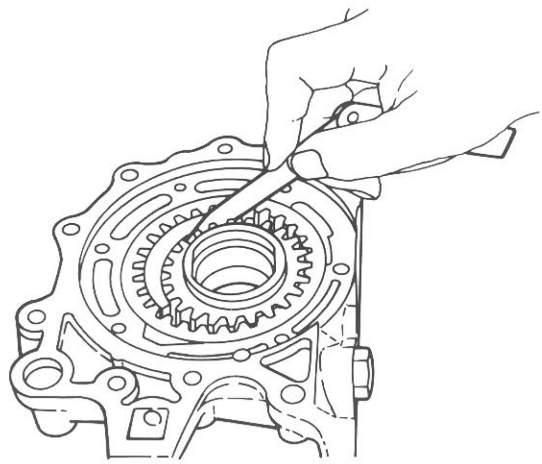


Fig. 3-163

Radial clearance between outer gear and crescent

Standard	0.25 - 0.40 mm (0.0098 - 0.0157 in.)

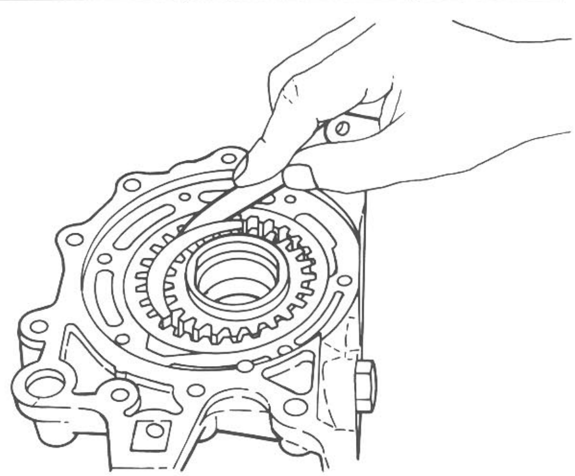


Fig. 3-164

Radial clearance between outer gear and pump case

Limit	0.3 mm (0.0118 in.)

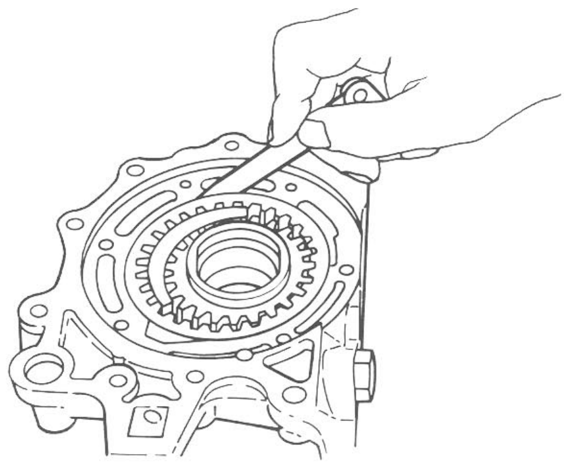


Fig. 3-165

Side clearance:
Using a straightedge, determine the side clearance in terms of the thickness gauge reading taken between straight edge and gear, as shown in Fig. 3-166.

Limit on side clearance	0.17 mm (0.0067 in.)

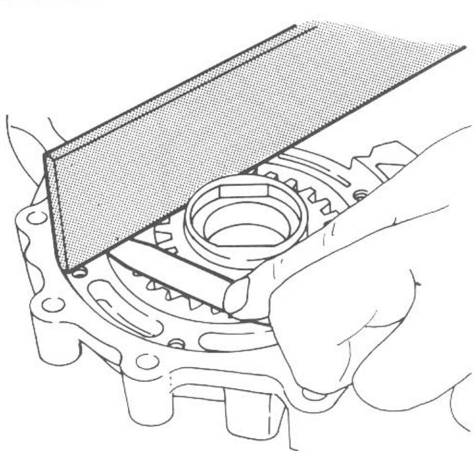


Fig. 3-166

Oil pump reassembly
Have all disassembled parts washed clean, and rebuild the pump to meet each of the following requirements:

- Outer gear has a punch mark ① . Fit outer gear into the pump case, with this punch-marked side coming on plate side.

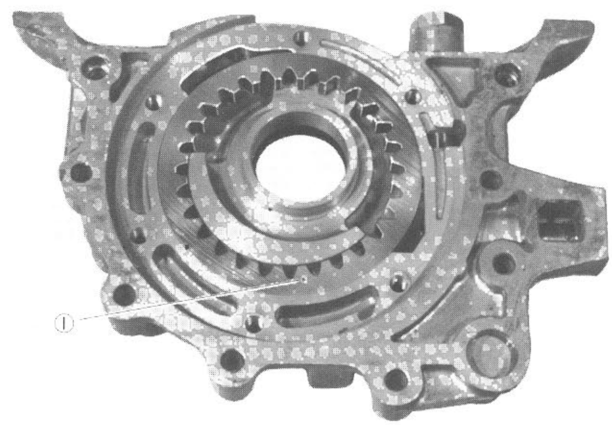


Fig. 3-167

- Use a new gasket when fitting the oil pump case to the cylinder block. The edge of the gasket might bulge out; if it does, cut the bulge off with a sharp knife, making the edge smooth and flush with the end face of the pump case, and apply SUZUKI BOND No. 4 to the cut edge.

> NOTE:
> Before fitting the pump case, oil the oil seal lip.

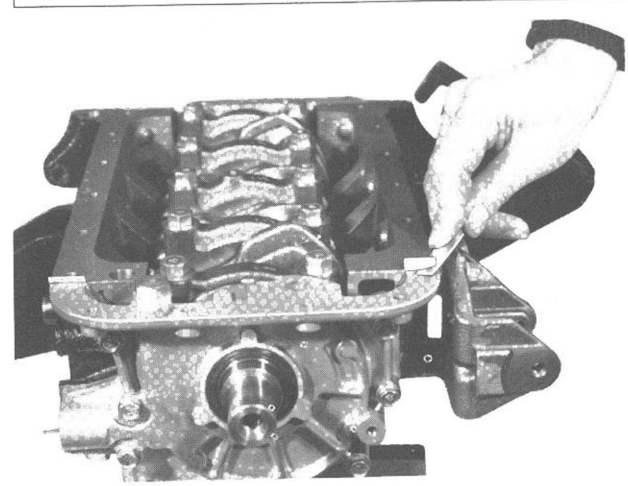


Fig. 3-168

- Installation of crankshaft timing belt pulley and timing belt must be carried out in strict conformity to the special instructions given in Page 3-42 for engine reassembly.

CAUTION: Strict adherence to the special instructions is essential, for an improperly installed pulley and timing belt prevents the engine from operating as designed.

Oil filter servicing

At intervals stated below, replace the oil filter element. The element must be replaced not only periodically but also whenever it is found dirty.

Initial replacement to be made:	After 1,000 km (1,000 miles)
Replace at intervals of:	Every 10,000 km (6,000 miles)

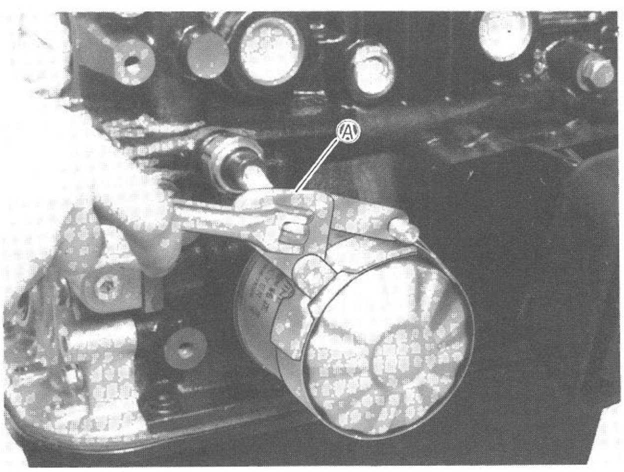


Fig. 3-169 Oil filter wrench Ⓐ (09915-47310)

Oil pump strainer servicing

- Inspect the strainer periodically and, as necessary, clean it by washing to remove dirty matters clogging its screen.

- When securing the strainer, be sure to tighten up two bolts on pump side before tightening the others.

Checking the oil pressure

When the engine is idling, not to mention fast running, the oil pressure lamp should remain completely off; if not, it is a cause for checking the oil pressure in the following manner:

1) Be sure that engine oil is up to level in the oil pan. Refill the oil pan, as necessary, to raise the oil to and above "LOW" line on the level gauge. Be sure, too, that the oil filter is clean and that the oil pump strainer is not clogged. Check to be sure that there is no oil leakage from any part of the engine.
2) Remove the oil pressure unit, which is mounted on that side of the cylinder block where the oil filter is located. Into the vacated threaded hole, screw the pressure gauge connection to install the **gauge Ⓑ (09915-77310).**

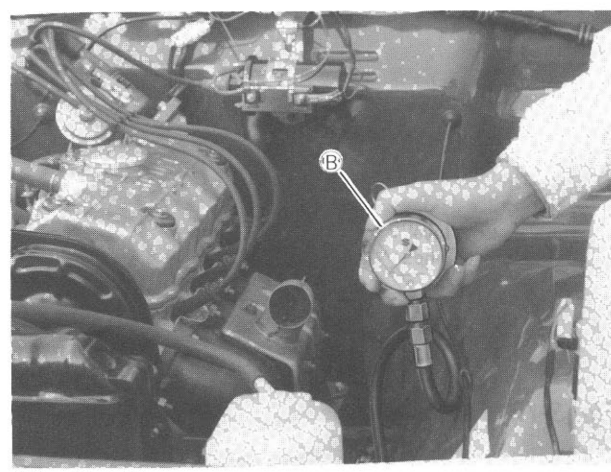


Fig. 3-170

3) Start up the engine and idle it until the coolant temperature rises to a level between 75° and 85°C (167° - 185°F). At this temperature, raise engine speed to 3,000 rpm and read the pressure gauge indication.

Oil pressure specification	3.0 - 4.5 kg/cm^2 (42.66 - 63.99 psi) At 3,000 r/min (rpm)

If the pressure read is not up to the specification, the oil pump must be checked.

CAUTION: When re-installing the oil pressure unit, be sure to wrap its screw threads with a sealing tape. Tighten the unit to a torque value of 1.2 to 1.5 kg-m (9.0 - 10.5 lb-ft).

Engine oil servicing

For the engine oil, use a 4-stroke engine oil (Refer to page 1-18). Each oil change requires this much oil:

Periodical oil change	3,000 cc (6.34/5.28 US/Imp pt)
Filling up after engine overhauling	3,500 cc (7.39/6.16 US/Imp pt)

Oil level:

Refill the engine oil whenever necessary, in order to maintain the oil surface between "LOW" and "FULL" lines on the oil level gauge.

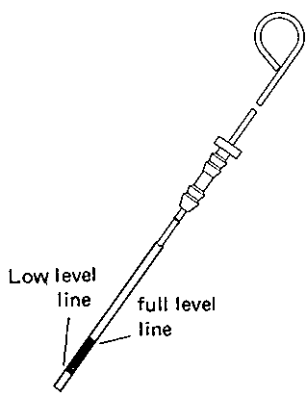


Fig. 3-171 Oil level gauge

4. CARBURETOR

4

4–1. Description

The carburetor, serving all four cylinders, is of a horizontal-draft type, composed of the following component parts:

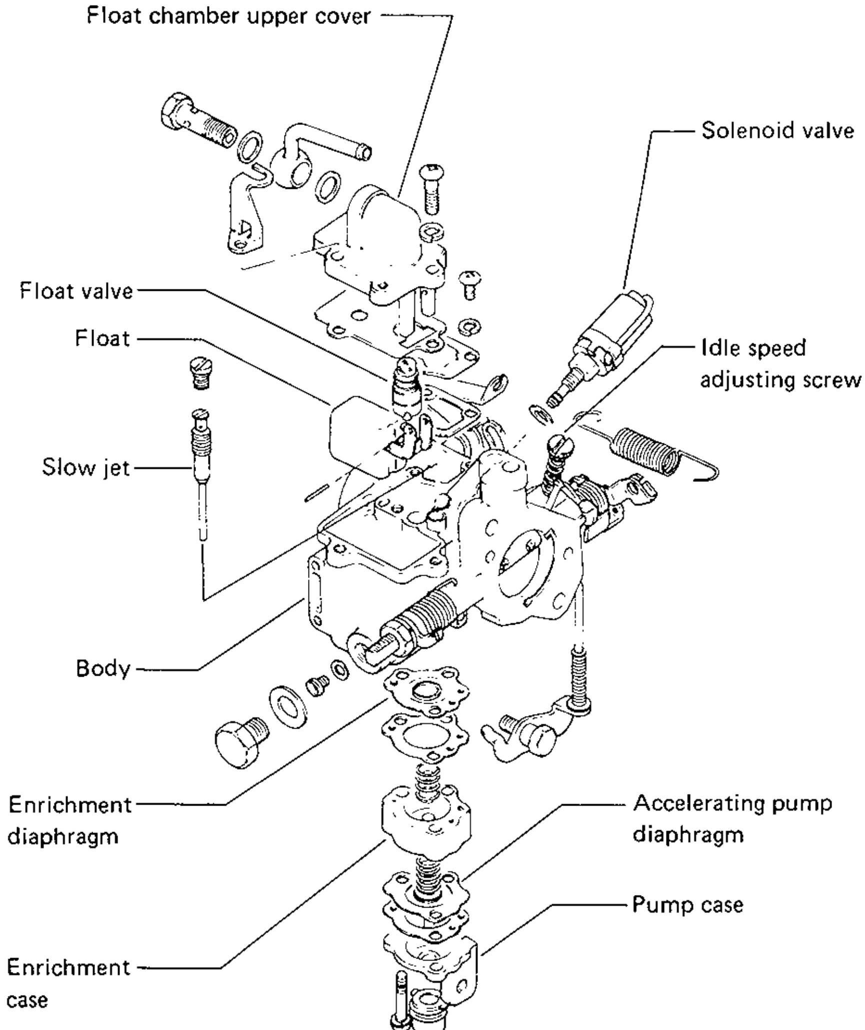


Fig. 4-1

4–2. Carburetor Specifications

Item	Specification
Venturi diameter	25 mm (0.984 in.)
Main jet	ϕ1.08 mm (0.0425 in.)
Main air jet	ϕ0.55 mm (0.0216 in.)
Slow jet	ϕ0.46 mm (0.0181 in.)
Slow air jet No. 1	ϕ1.10 mm (0.0433 in.)
Slow air jet No. 2	ϕ1.35 mm (0.0531 in.)
Enrichment jet	ϕ0.65 mm (0.0256 in.)

4–3. Carburetor Operation

Float chamber

The float chamber with its needle valve is a vessel receiving the fuel from the fuel pump and holding it up to a certain constant level. The float responds to the up-and-down movement of fuel surface and actuates the needle valve.

Slow speed mixture

When the engine is started, fuel flows out of the float chamber through the main jet as shown in Fig. 4-2. It is then metered at the slow jet and mixed with incoming air metered at slow air jet No. 1. This air-fuel mixture passes through the opened solenoid valve and is mixed again with incoming air metered at slow air jet No. 2, and the mixture is sprayed out of the bypass port and idle port provided near the throttle valve. During idling, the slow speed mixture (coming from slow jet) is sprayed out mainly from idle port and becomes mixed with the air flowing into the main bore. Thus, the air-fuel mixture can be made richer or leaner by re-setting idle mixture adjusting screw in loosening or tightening direction, respectively, in that order.

High speed mixture

Two circuits come into operation for producing the high speed mixture. One circuit begins with main jet, which meters out fuel from the float chamber, This fuel is mixed with the air meteringly admitted by main air jet; this mixing is effected in emulsion tube. The emulsified mixture is then sprayed out into the venturi from main nozzle.

The other circuit goes into service when the manifold vacuum falls to move the diaphragm in the enrichment device on the carburetor body. As the diaphragm so moves, the valve above it opens to let out fuel through the hole provided in the chamber. Enrichment jet meters out this fuel and sends it to emulsion tube, from which it flows into main nozzle and is sprayed into the venturi.

Acceleration power system

The main device of this system is an accelerating pump for making the carburetor respond without delay to the accelerator pedal depressed abruptly while the engine is running in its low speed range or is idling.

The actuating lever of this pump is linked to the throttle shaft so that, as throttle valve opens quickly, the pump lever pushes up the diaphragm, thereby closing suction ball valve and opening discharge ball valve. Consequently, the fuel in the pump is forced out of pump nozzle into the venturi.

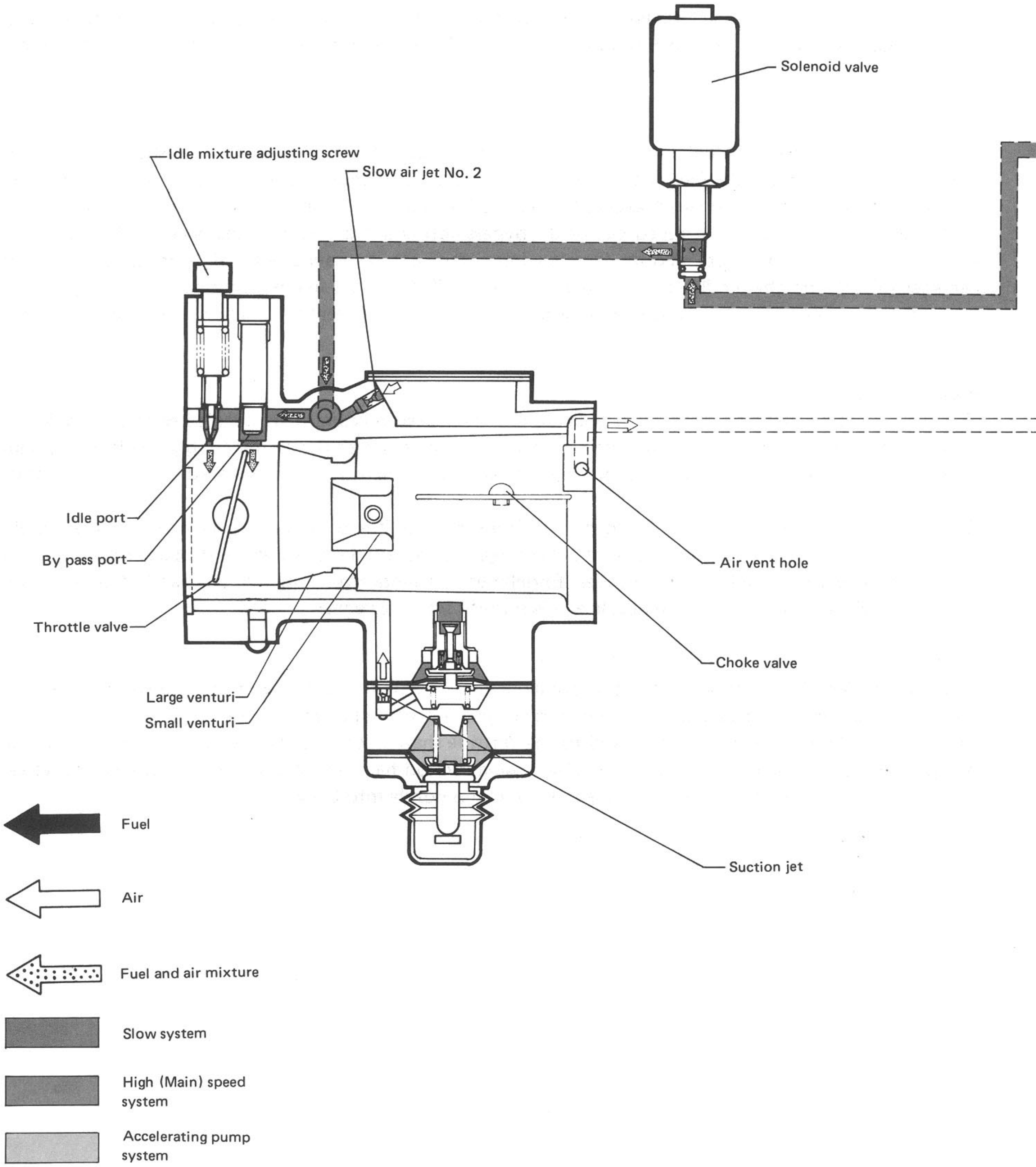
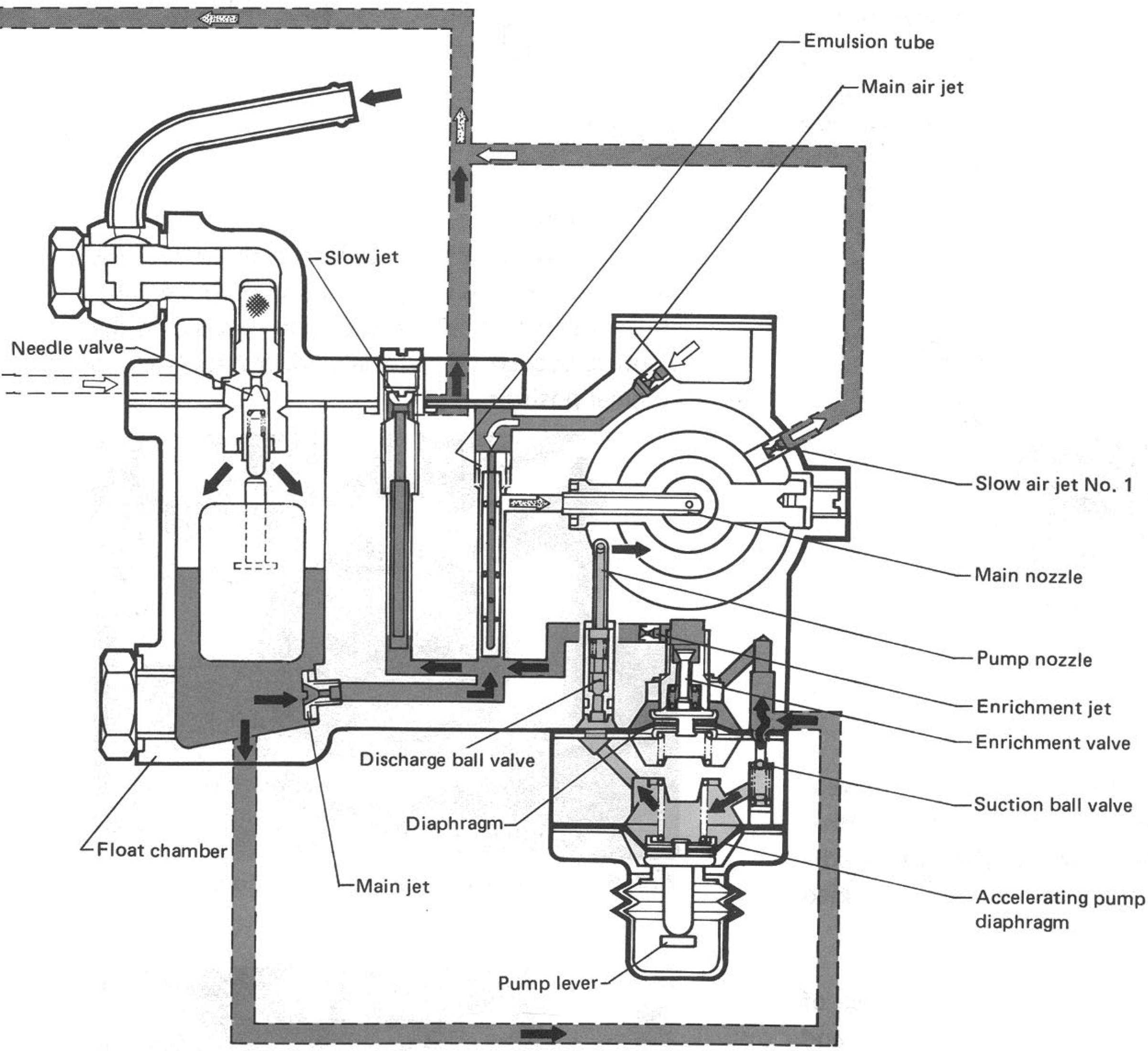


Fig. 4-2 Carburetor circuit diagram


Emulsion tube
Main air jet
Slow jet
Needle valve
Slow air jet No. 1
Main nozzle
Pump nozzle
Enrichment jet
Enrichment valve
Discharge ball valve
Suction ball valve
Diaphragm
Float chamber
Main jet
Accelerating pump diaphragm
Pump lever

4–4. Inspecting and Adjusting

Jets

Wash the jets clean. Wash the holes in which jets are located, and clear each hole by directing compressed air to it, thereby removing foreign matter, if any.

A clogged slow jet is usually responsible for erratic engine idling. Erratic engine operation in the medium and high-speed ranges and during acceleration is often accounted for by a clogged condition of main jet, main air hole or hole constrictions in the carburetor body.

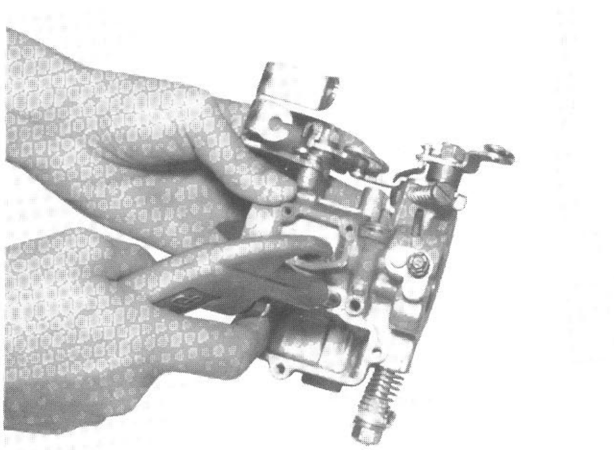


Fig. 4-3

Needle valve

The conical tip of needle valve is subject to wear as this tip seats and unseats in the normal operation of the needle valve. When the needle valve is in closed condition, this tip is pushed against the seat by the float.

Inspect the conical tip and seat for evidence of clogging. As necessary, remove the seat and wash it clean. A worn needle, illustrated in Fig.-4-4, must be replaced. Remember, a clogged or poorly seating needle valve is usually accountable for "overflow".

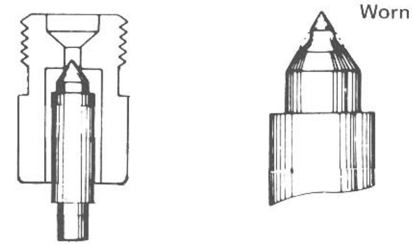


Fig. 4-4

Choke valve

Check to be sure that, when the choke knob is pulled out all the way, the shaft of choke valve in the carburetor will rotate, and that, when the knob is pushed in, the shaft will rotate back to original position.

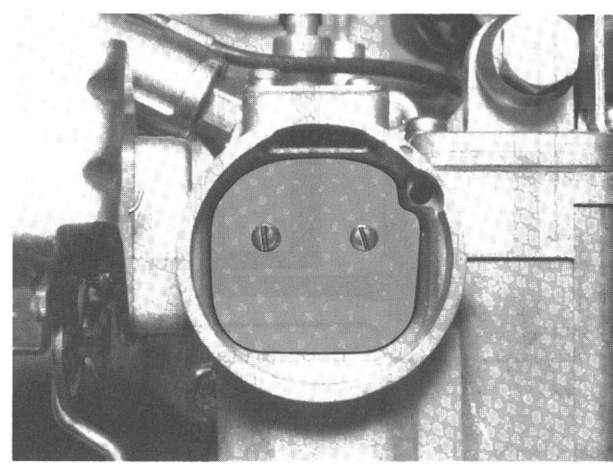


Fig. 4-5 Choke valve (with knob pulled out fully)

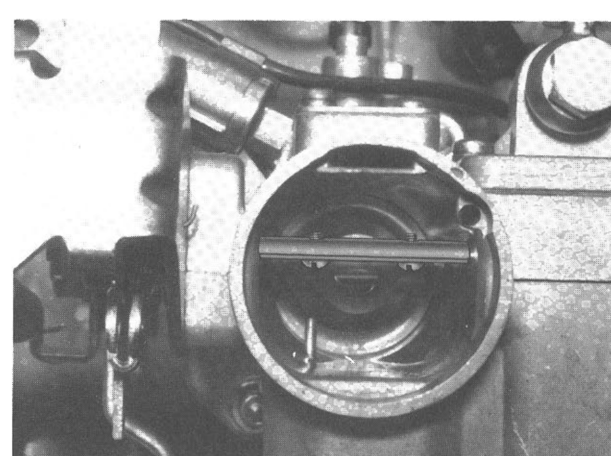


Fig. 4-6 Choke valve (with knob pushed in fully)

Accelerator and choke cables

Inspect these cables for wear and tear, and check to be sure that each cable connection is in sound condition. Do not hesitate to replace a defective cable or other part; when installing a replacement cable, tighten the connections good and hard.

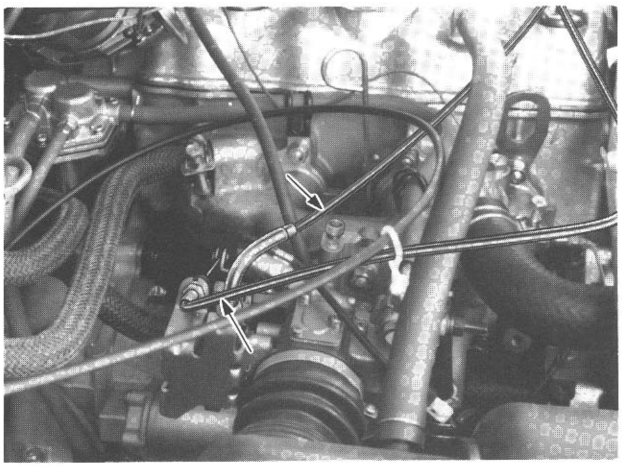


Fig. 4-7

Fuel hose

Inspect the hose for cracks and signs of breakage, and replace it as necessary. Examine it for signs of leakage, too. Be sure that the hose is free of any leak and that its connections are tight.

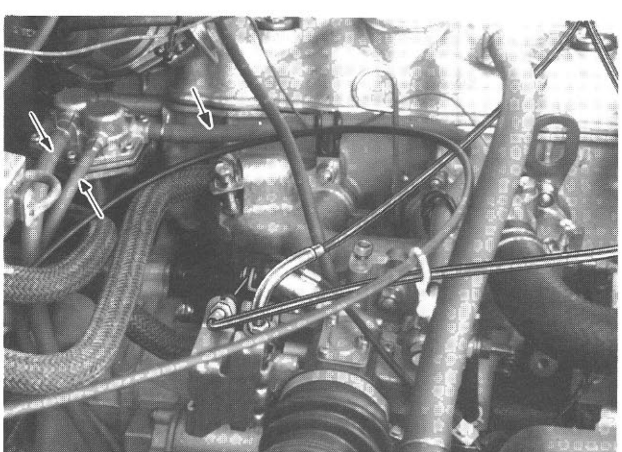


Fig. 4-8

Fuel tank cap

This cap is fitted with a rubber packing. Be sure that the packing is in good condition and that the cap in place is tight and leak-free.

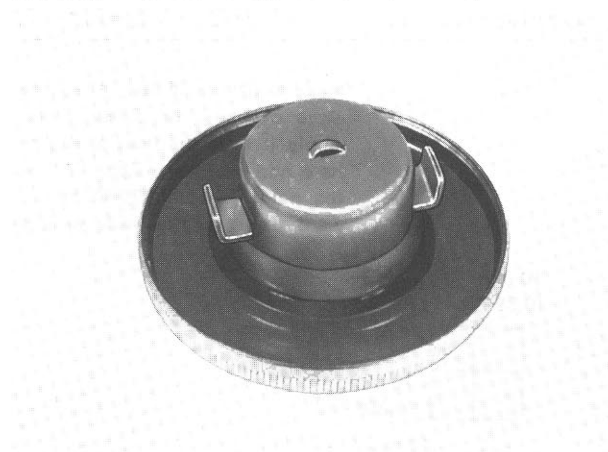


Fig. 4-9

Fuel level adjustment

To see if fuel level is properly maintained, float height should be measured according to the following procedure.

1) Remove the float chamber upper cover from the carburetor body.
2) Invert the cover.
3) Remove the gasket from the upper cover.
4) As shown in Fig. 4-10, with the weight of float ② itself applied to needle valve ①, measure the float height "H".

"H" is height between the bottom of the float (which is upside in this state) and the mating surface line of the upper cover and the carburetor body.

NOTE:
For the actual method of measurement, refer to Fig. 4-10. Given in it is one of the easy and accurate methods.

If the measurement is within the below specification, the fuel level is satisfactory.

Float height specification "H"	44.5 – 46.5 mm (1.752 – 1.830 in.)

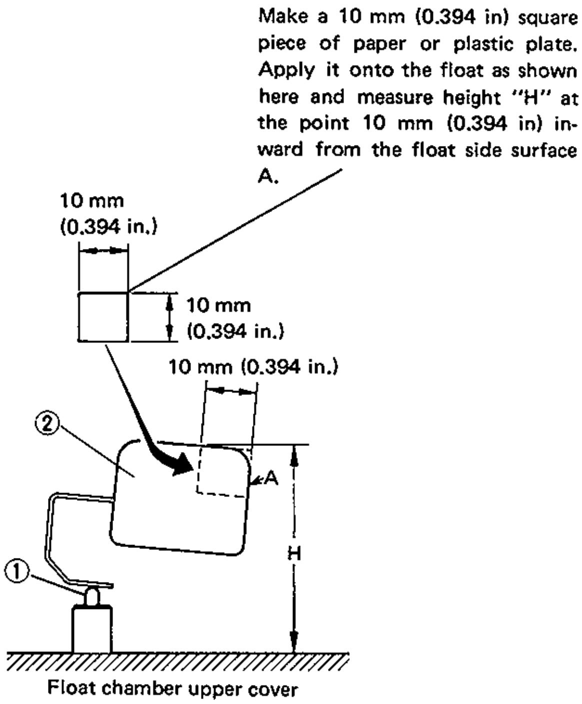


Fig. 4-10

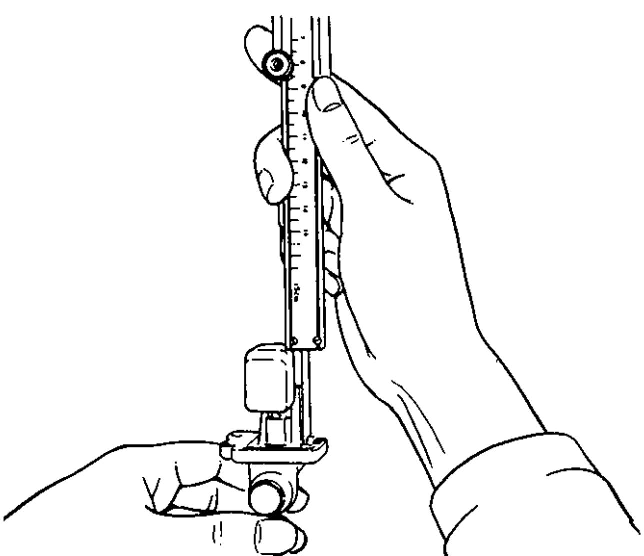


Fig. 4-10-1

Fuel level adjustment must be made if the surface is too high or too low. The method of adjustment is as follows: Remove the float from float chamber cover. Bend the tongue ① upward or downward. Tongue ① is the part in contact with needle valve.

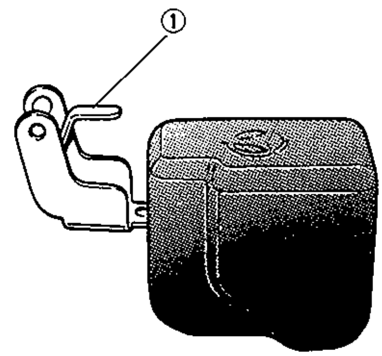


Fig. 4-11

Idle speed and idle mixture adjustment.

NOTE: **Requires external tachometer.**

1) As preliminary steps, check to be sure that:
- Coolant temperature is approximately 82°C (180°F).

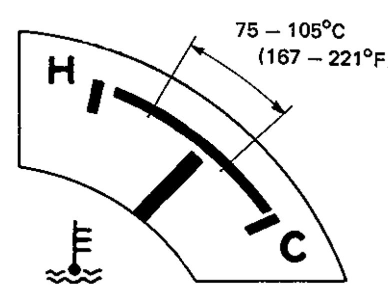


Fig. 4-12

- Choke valve is in the full-open position.
- All accessories (wipers, heater, lights, etc.) are out of service.
- The ignition timing is within specification.
- The air cleaner has been properly installed and is in good condition.

[Idle speed and idle mixture adjustment]

Adjust idle speed and idle mixture according to the following procedure.

1) Adjust idle speed to 880 r/min (rpm) by repositioning (turning) idle speed adjusting screw ①.
2) With the engine idling at 880 r/min (rpm), turn idle mixture adjusting screw ② to the right or left and set it where the highest engine speed is obtained. (This is the best idle position.)
3) Perform above 1) and 2) once again, and then readjust the idle speed to 880 r/min (rpm) with idle speed adjusting screw ①.
4) Upon completion of the work so far, readjust engine idle speed to the below specification by turning idle mixture adjusting screw ② slowly to the right (close).

All the cars of this model now manufactured are delivered from the factory after their CO% is preadjusted to the following values.

Engine idle mixture CO%	1.5 ± 0.5
Engine idle speed r/min (rpm)	840 – 850

In the country with the statutory requirements for the exhaust gas (CO%), be sure to adjust the idle mixture adjusting screw so that the CO% indicated on the exhaust gas tester will be the specified value in the above table.

Adjust the screw with special tool ③ (09913-18010).

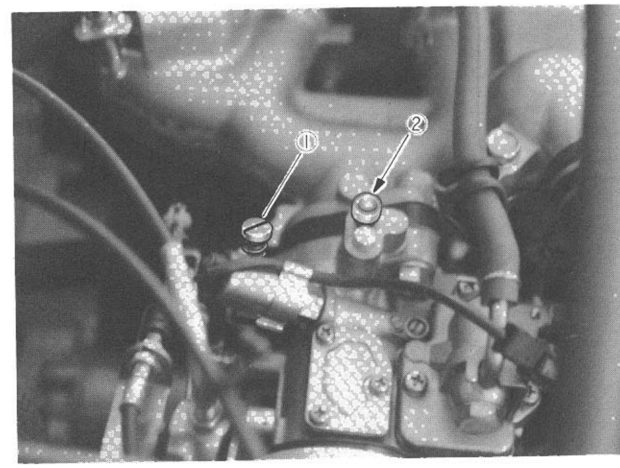


Fig. 4-13

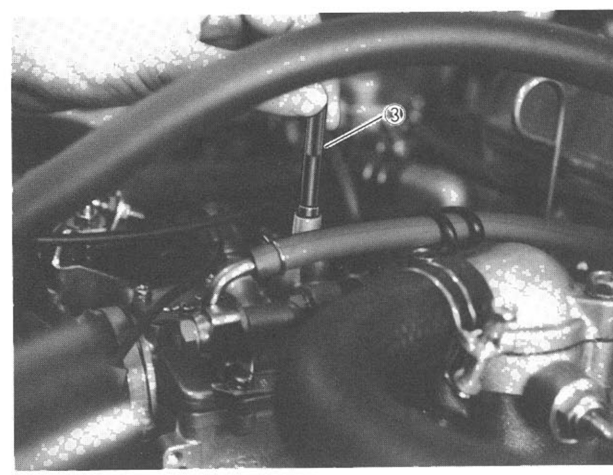


Fig. 4-14

5. AIR CLEANER, FUEL PUMP AND FUEL FILTER

5

5-1. Air Cleaner

Description

In the air cleaner case, a dry-type air cleaner element is provided for filtering out dirt and dust from air being drawn into the engine for combustion.

A damaged element must be replaced with a new one, since it allows dust particles to enter the engine if used as it is. Such dust particles could cause wear to the engine inner parts and this further results in decreased output.

Also, the element must be cleaned periodically. Dusty and dirty element cause decrease in output and increase in fuel consumption. The dusty element even after cleaning should be replaced with a new one.

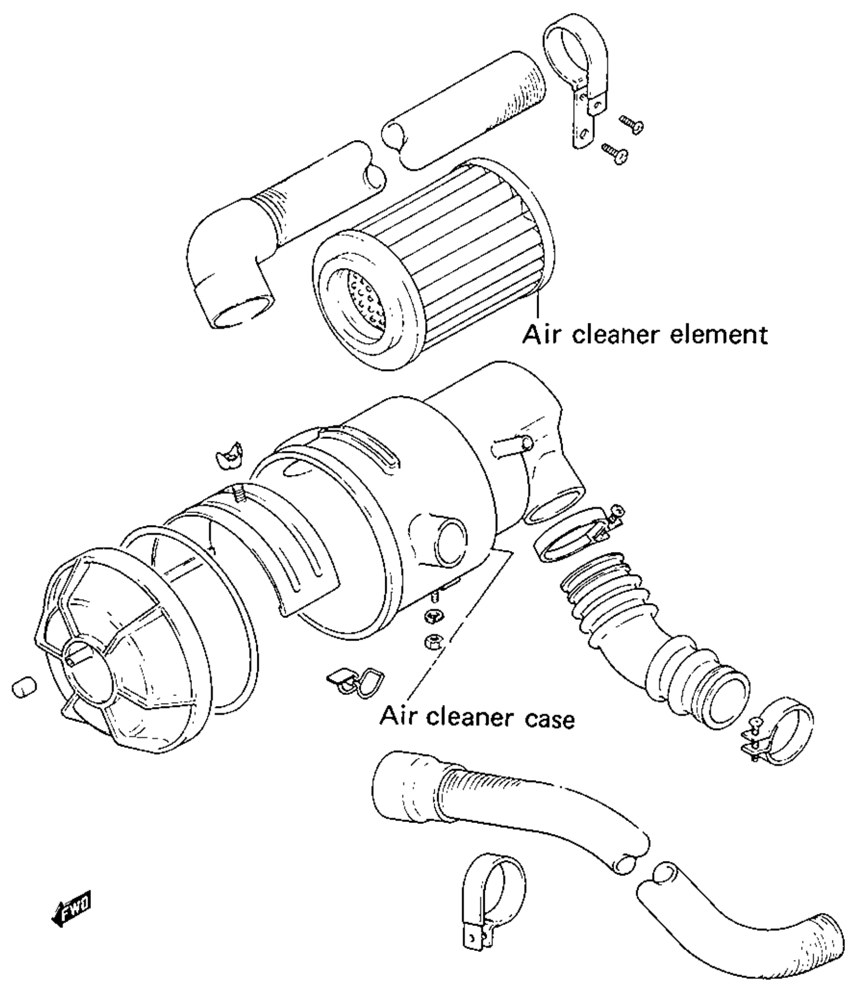


Fig. 5-1

5-2. Air Cleaner Element Maintenance Service

Remember that it needs cleaning according to the following method and interval:

1) Remove the air cleaner cap.

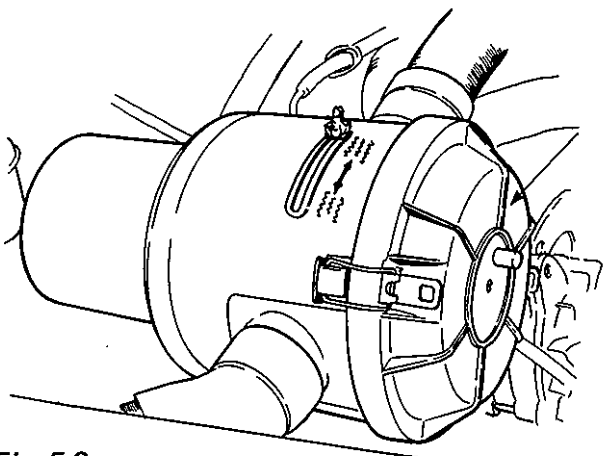


Fig. 5-2

2) Take out the cleaner element ① off the air cleaner case.

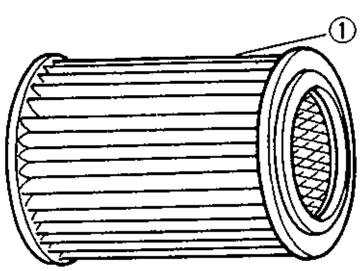


Fig. 5-3

3) Blow off dust by compressed air from inside of element.

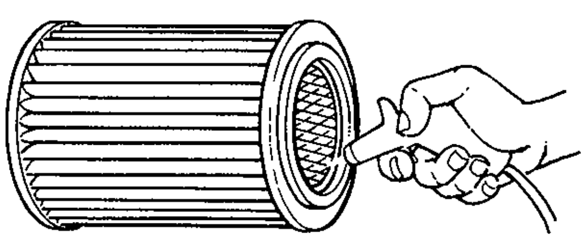


Fig. 5-4

Clean	Paved-road: Every 10,000 km (6,000 miles)
	Dusty condition: Every 2,500 km (1,500 miles) or as required
Replace	Every 40,000 km (24,000 miles) NOTE: More frequent replacement if under dusty driving conditions.

Use of the selector lever

A mispositioned selector lever can cause the carburetor to get "iced" in freezing weather or the engine to overheat in hot weather. Position this lever according to the atmospheric temperature, i.e., in WINTER position when outside temperature is 15° C (60° F) or below, or in SUMMER position when the temperature is above that level.

Warm-air selector lever position	
Atmospheric temperature	Lever position
15° C (60° F) or below	WINTER
Above 15° C (60° F)	SUMMER

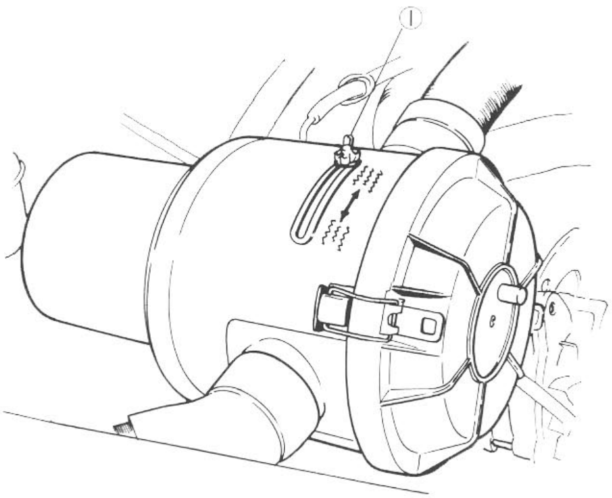


Fig. 5-5 ① *Warm air selector lever*

5-3. Fuel Pump

Description

A pneumatic diaphragm pump is used to deliver gasoline to the float chamber in the carburetor. Its diaphragm is actuated from one of the cams formed of engine camshaft. A rocker arm rides on this cam and moves the pump diaphragm up and down. A fuel return circuit is provided in this pump in order to avoid "vapor lock." When the float chamber refuses to admit fuel, a slight pressure buildup occurs on the discharge side of the pump and this buildup causes the fuel to flow through the return circuit to the fuel tank. In other words, the fuel pump is kept in action as long as the engine is running, so that the constant flow of fuel through the pump keeps it cooled.

Fuel pump specifications	
Discharge pressure	0.25 - 0.35 kg/cm^2 (3.55 - 4.97 psi)
Pump capacity	1.3 litres/minute or better at2,000r/min(rpm)

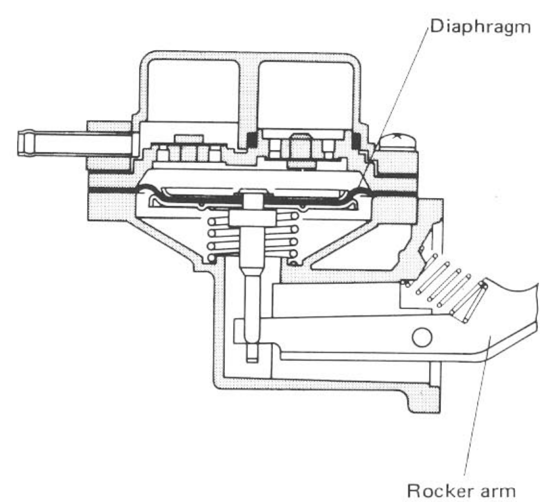


Fig. 5-6

Inspection
- Inspect the fuel pump in place for leakage.
- Be sure that the fuel hose is free of any sign of cracking.
- Be sure that the nuts securing the pump in place are tight.

Disassembly
Scribe match marks ① across the joint seams to establish and identify the angular positions of upper half ② and lower half ③ , as shown in Fig. 5-7. This provision is necessary because the screw holes are so located as to permit the two halves to be angularly positioned in more than one way, whereas the pump can be piped only when the pump is assembled as shown.

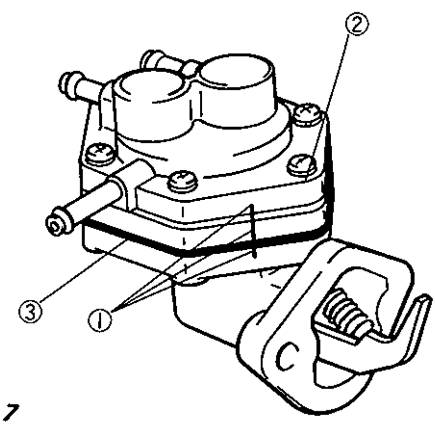


Fig. 5-7

1) Loosen the 6 screws and them remove the upper half and lower half.
2) Remove the diaphragm from the pump lever.

NOTE: Turn the diaphragm 90° to the right or left while pushing it, and it can be removed from the pump lever.

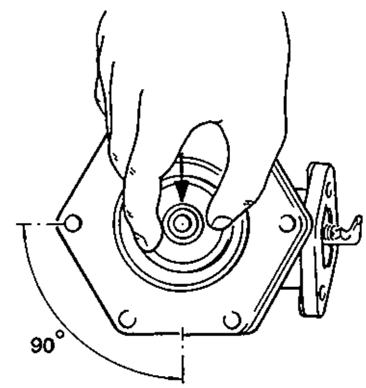


Fig. 5-8

3) After disassembling the pump, examine the diaphragm to be sure it is in good condition, free of any evidence or rupture or breakage.

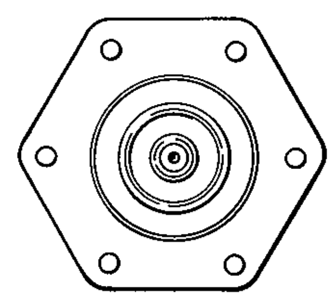


Fig. 5-9

Reassembly

1) To attach the diaphragm onto the fuel pump lever ①, insert the diaphragm stay to the pump lever ① and turn the diaphragm 90° while pushing it.

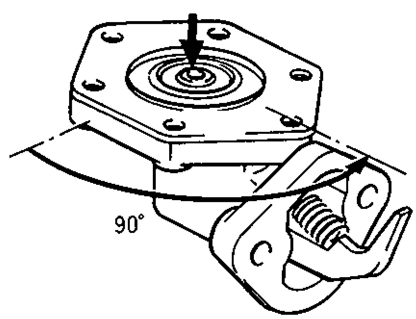


Fig. 5-10

2) Position the upper half and lower half correctly according to the match marks given at the time of disassembly, run in 6 screws and tighten them only to the extent where they can be turned by hand.

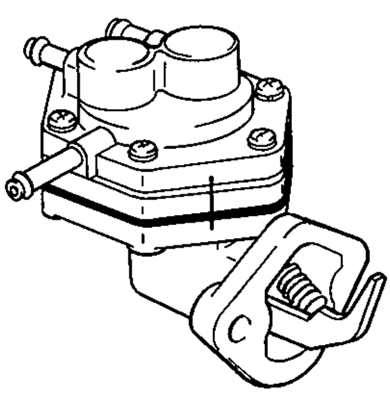


Fig. 5-11

3) Move the pump lever ① all the way up and down four or five times. This is an important step as the diaphragm center and the pump center are thus matched.

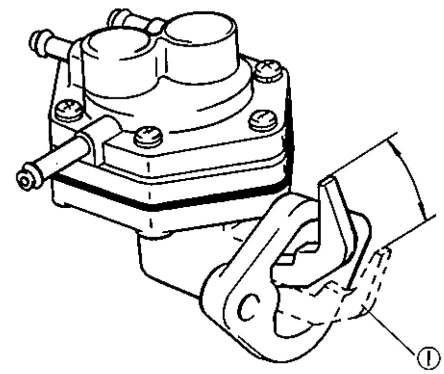


Fig. 5-12

4) While leaving the pump lever as it is (i.e. without applying any force to it), tighten 6 screws securely.
5) Install the completed fuel pump in the distributor gear case.

5-4. Fuel Filter

Description

Fuel enters the filter through its inlet hole and, after passing through the filtering element, comes out of its outlet hole communicated to the fuel pump. This filter is not meant to be disassembled. It is of cartridge type, consisting of a filtering element in a plastic case.

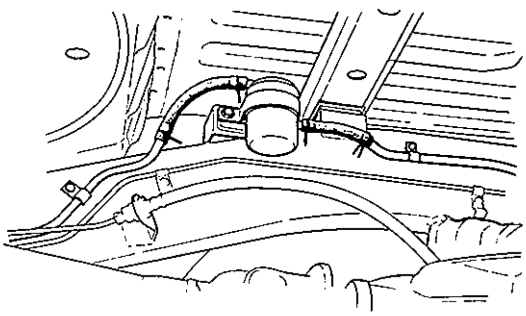


Fig. 5-13

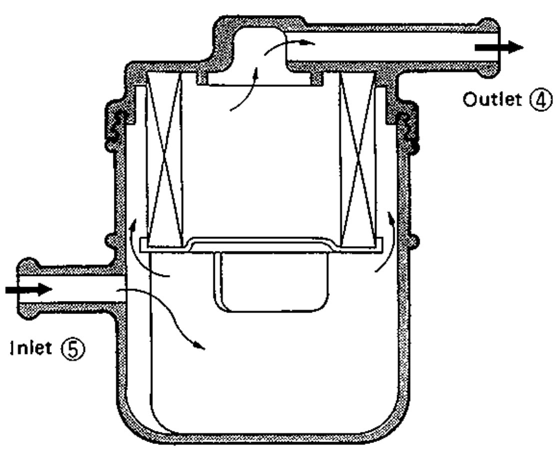


Fig. 5-14

Servicing and installation

As said before, this filter does not permit disassembly: it is to be replaced by a new one periodically. It is one of the expendable items.

Interval of fuel filter replacement	Every 40,000 km (25,000 miles)

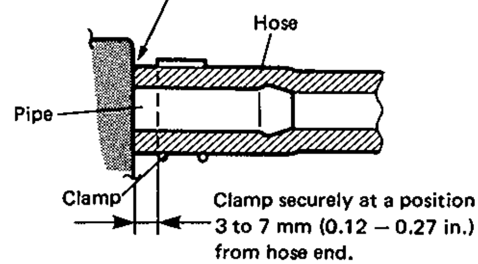
CAUTION:
Fig. 5-14, above, shows the fuel filter in its correct posture, with outlet ④ coming on top side and inlet ⑤ on bottom side. Remember the relative positions of inlet and outlet when piping the filter.

Fuel Hose Connection

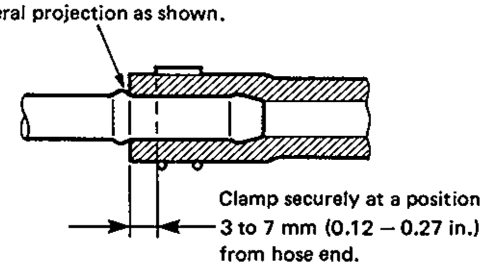
IMPORTANT:

- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the following.**

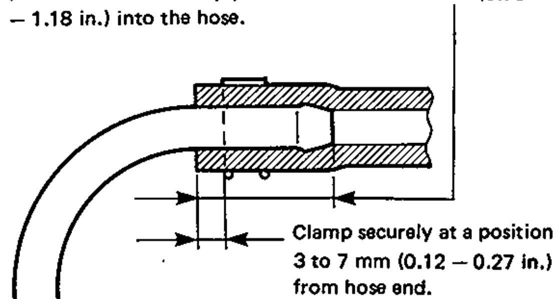
With following type pipe, fit hose as far as it reaches pipe joint as shown.



With following type pipe, fit hose as far as its peripheral projection as shown.



With following type pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose.



5–5. Charcoal Canister (For Australian market)

Canister inspection

1) Disconnect the rubber hoses (A & B) from the charcoal canister, which is located in the engine compartment.

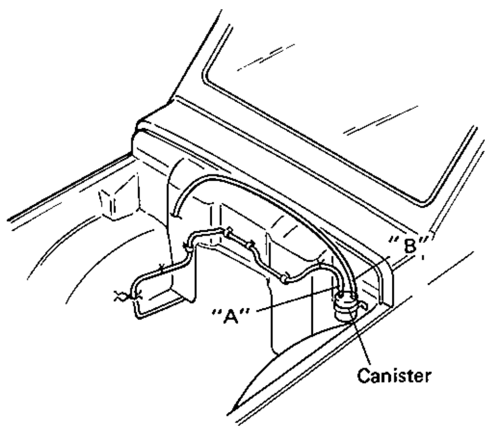


Fig. 5-15

2) When air is blown into pipe A, there should be no restriction of current through pipes B and C.
3) When air is blown into pipe B, air should not pass through either pipe A or C.
4) If operation differs from above procedure, the charcoal canister must be replaced.
5) The canister is cleaned by blowing 40 psi of ($3\ kg/cm^2$) air into pipe A while sealing pipe B with a finger.

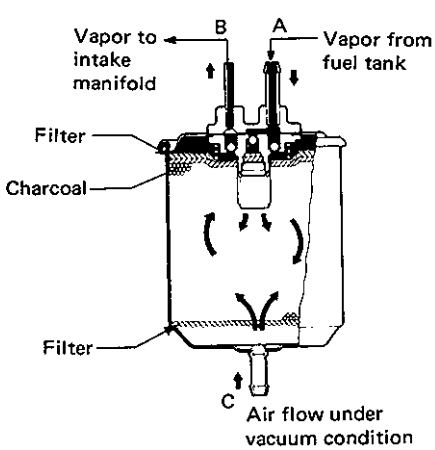


Fig. 5-16

Fuel vapor storage system hoses inspection

1) Visually inspect the hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) Inspect the fuel tank cap sealing gasket.
3) If a defect is noted, repair or replace the above as necessary.

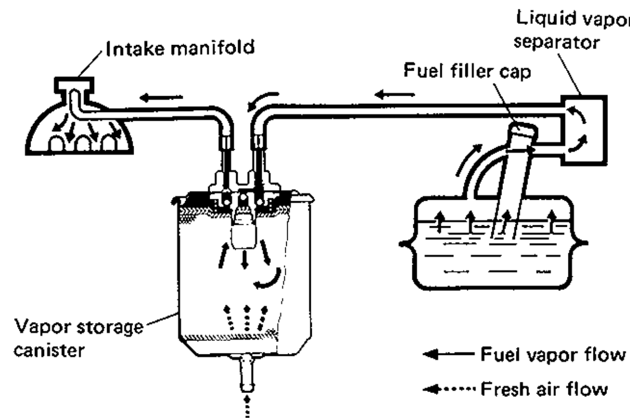


Fig. 5-17

6. ENGINE COOLING SYSTEM

6-1. Description

The engine is cooled by coolant set in forced recirculation through jackets formed in the engine body and through the radiator. For the water pump, a high-capacity centrifugal pump is used. For the radiator, a tube-and-fin type, large in heat dissipating capacity, is used.

The thermostat is of wax pellet type, accurately responsive to temperature changes and durable in construction. It maintains the coolant temperature within a narrow range during operation.

6-2. Cooling Water Circuit

The thermostat remains in closed condition—its valve is closed—when the coolant is cold. Under this condition, the coolant being pumped flows through the circuit comprising cylinder block, cylinder head, inlet mamifold, bypass hose and water pump, in that order.

As the temperature rises to 82°C (179°F) or thereabout, the thermostat begins to open, thereby allowing some of the coolant in recirculation to flow through the radiator. At about 95°C (203°F) of rising coolant temperature, the thermostat becomes completely open so that little or no flow occurs through the bypass hose: the coolant now flows through the radiator and back to the pump, releasing the most of heat to the atmosphere through the radiator core.

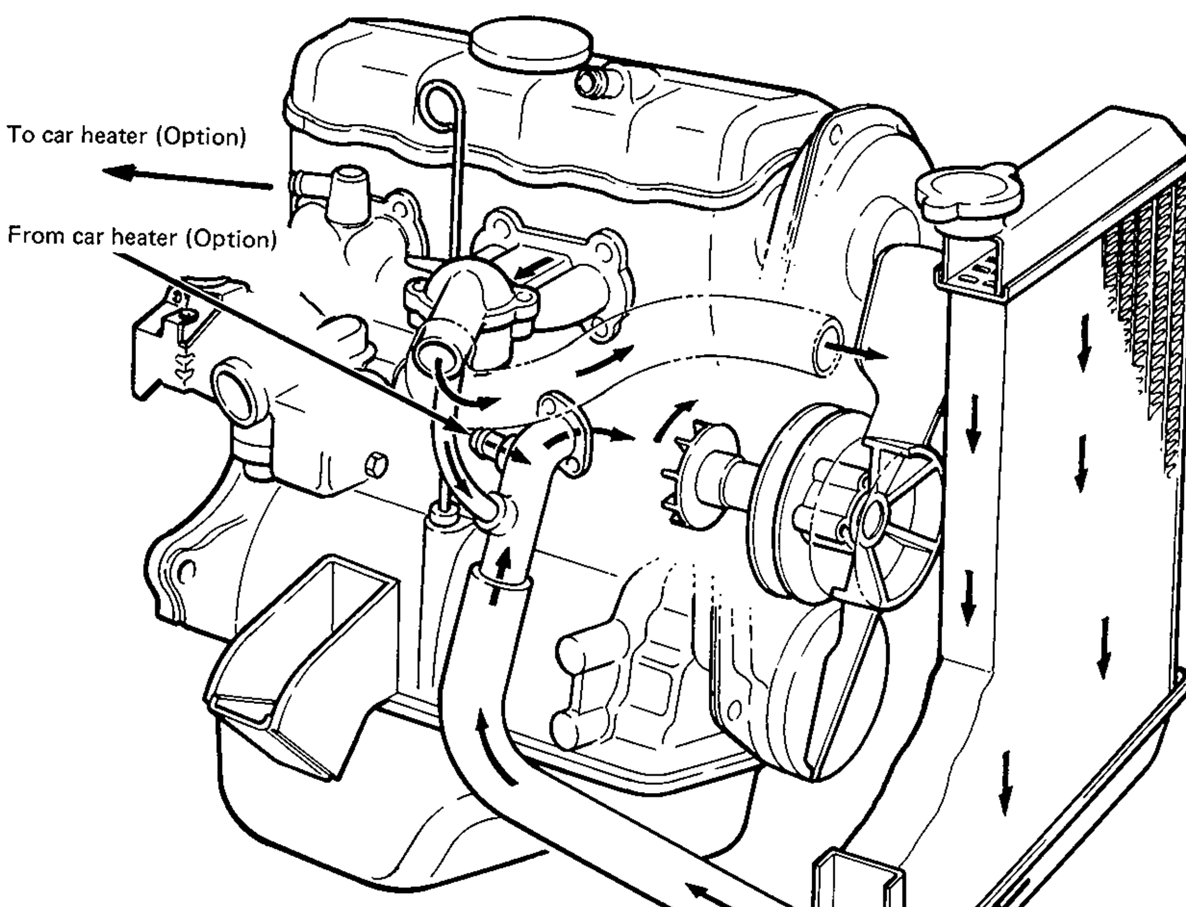


Fig. 6-1

6-3. Removal

1. Coolant draining

Loosen the drain plug ① on the radiator to empty its water side.

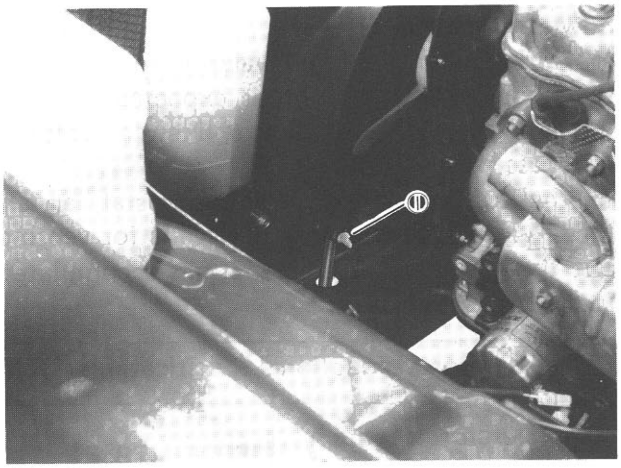


Fig. 6-2

2. Removal of cooling water pipes

To remove these pipes, loosen the screw on each pipe clip and pull the pipe end off.

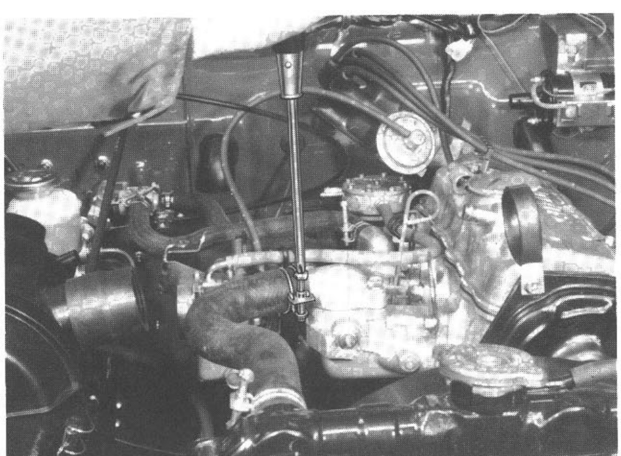


Fig. 6-3

3. Radiator removal

Remove the shroud panel, and loosen the bolts securing the radiator in place. Take out the radiator by lifting.

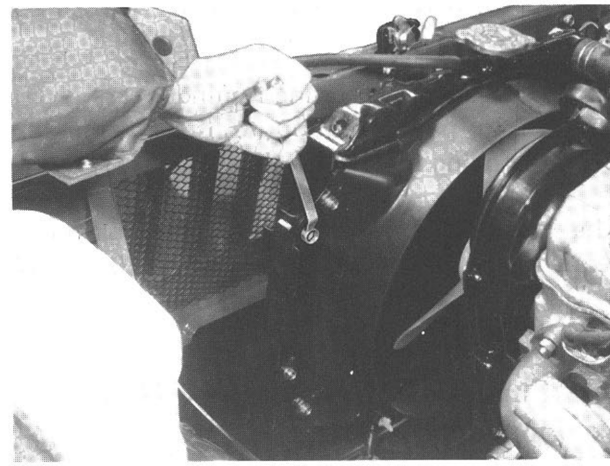


Fig. 6-4

4. Cooling fan removal

Removing the bolts securing the fan to the hub allows the fan to be detached.

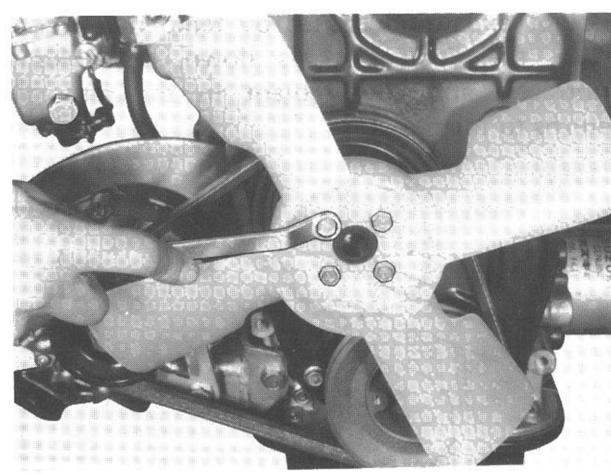


Fig. 6-5

5. Water pump removal

In order to remove the water pump, it is not necessary to take down the engine. The method of removal is sequentially illustrated in Figs. 3-9, 3-13, 3-15, 3-16, 3-17, 3-18, 3-19, 3-20, 3-21, 3-22 and 3-24.

In these figures, cautioning reminders are given. Be sure to pay attention to those reminders when removing the pump.

The method of re-installing the pump is sequentially illustrated in Figs. 3-136, 3-137, 3-138, 3-139, 3-140, 3-141, and 3-142.

6-4. Functional Description of Major Components

Water reservoir tank

This reservoir, a small tank, is so located relative to, and so associated with the radiator that it receives the excess coolant that would otherwise spill out by overflowing. The excess is due to coolant expansion caused by temperature rise. When the coolant cools down, its volume contracts, and the coolant in the reservoir returns to the radiator.

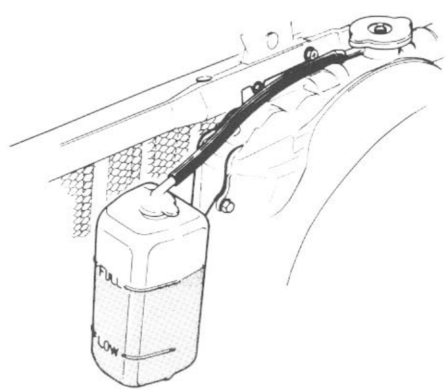


Fig. 6-6

Thermostat

The temperature-sensitive material in the thermostat is a wax pellet. It is hermetically contained in a metal case, and expands and contracts according as the coolant temperature rises and falls. When it expands, the case pushes down the valve to open it.

If, during operation, the valve is suspected of remaining closed while it is expected to open increasingly, the cause is most likely a ruptured wax case.

In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that has accumulated in the coolant circuit.

Thermostat functional specifications	
Temperature at which valve begins to open	82° C (179° F)
Temperature at which valve becomes full open	95° C (203° F)
Valve lift	8 mm (0.31 in.)

Thermostat

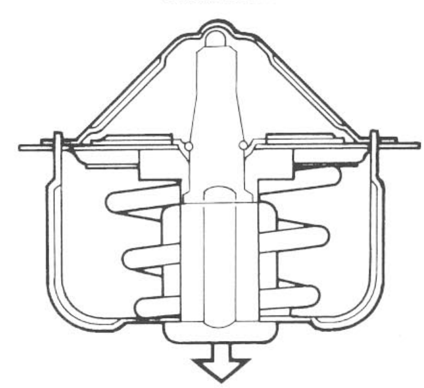


Fig. 6-7

Radiator filler cap

This cap has two built-in valves and, by these valves, allows the internal pressure of coolant circuit to rise to a certain level slightly above that of the atmosphere.

Of the two built-in valves, one is an adjusting valve and the other is a negative-pressure valve. The former opens only when the internal pressure rises by 0.9 kg/cm^2. This means that the coolant's boiling temperature is substantially above 100°C (212° F)—if the coolant

is straight water—and that, under normal running condition, no boiling occurs to reduce the coolant's heat capacity.
Following a shutting down of the engine, the coolant will cool off and the internal pressure will drop. If the pressure should be allowed to keep on falling, there happens the danger of coolant pipes and radiator cores becoming subjected to a large collapsing pressure: the pipes or radiator cores or any weakest point might give in. The negative-pressure valve opens in such a case to admit atmospheric pressure into the coolant circuit, thereby avoiding a build-up of negative pressure.
The cap has its face marked "0.9, which means that its pressure adjusting valve opens at 0.9 kg/cm^2.

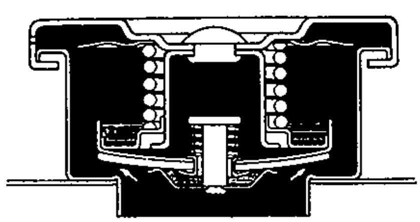


Fig. 6-8

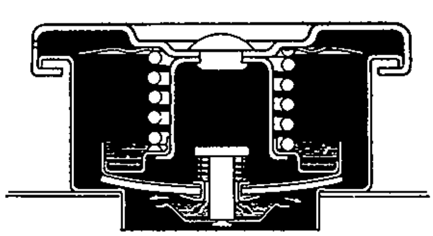


Fig. 6-9

Water pump
The pump rotor is supported by a totally sealed bearing. The seals are of high-durability type and do not permit disassembly. For this reason, the pump must be replaced by a new one when any part of it has developed a malcondition of a kind that can be corrected in an ordinary water pump by disassembly and servicing.

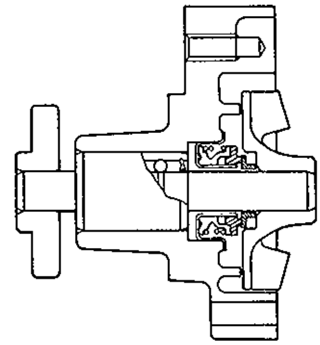


Fig. 6-10

Requirements on coolant
The long-term reliability and cooling capacity of the engine cooling system depends much on the quality of cooling water used. "Hard water," if used, will foul up the cooling circuit by scale formation, for such water is usually high in silicate and mineral contents. Scales are poor heat conductors.

Use of water high in acid concentration is just as bad; such water promotes rusting. For similar reasons, river water, well water, not to mention sea water, are not fit as engine cooling water.

Tap water available from city water supply is the best available water, in a practical sense, for the cooling system. Distilled water is ideal but is a luxury in most cases.

For protection of the cooling circuit, it is recommended that GOLDEN CRUISER 1200 (which is included as a regular item in the supply of materials from SUZUKI) be added to the cooling water in a proportion determined by the lowest atmospheric temperature expected.

Each vehicle is shipped from the factory with its cooling circuit filled with a 30% solution of GOLDEN CRUISER 1200; this solution does not freeze down to −16°C (3°F).

> NOTE:
> For the vehicles to be shipped to Canadian and European market, a 50% solution of GOLDEN CRUISER is poured in the cooling circuit.

Many brands of ANTI-FREEZE compounds are sold in the market. In no case, allow two or more different brands to be mixed in the cooling circuit of the engine.

GOLDEN CRUISER 1200 "Anti-freeze and Summer Coolant"—its effects and use

(1) Effects of GOLDEN CRUISER 1200 coolant

(a) Its freezing temperature is much lower and depends on the concentration of GOLDEN CRUISER 1200. It is an anti-freeze coolant.

(b) It does not corrode the metal surfaces of the cooling circuit. It is an anti-corrosion coolant.

(c) It does not develop foam or bubbles. It is a foam-inhibited coolant.

(d) It stands long usage. The renewal intervals is much longer.

Fig. 6-11

(2) How to proportion GOLDEN CRUISER 1200 to cooling water

GOLDEN CRUISER 1200 is a multi-purpose anti-freeze compound. Its aqueous solution as engine coolant can be kept in service as long as two years in a single stretch, regardless of changes of season. A 30% solution is recommended for regions free from freeze-up.

To prepare an anti-freeze coolant with GOLDEN CRUISER 1200, proportion this compound to water according to the following chart, in which the proportions are indicated for seven levels of temperature as the lowest expected levels:

ANTI-FREEZE PROPORTIONING CHART

Freezing temperature	°C	–9	–12	–16	–20	–25	–30	–36
	°F	16	10	3	–4	–13	–22	–33
GOLDEN CRUISER concentration	%	20	25	30	35	40	45	50
Ratio of compound to cooling water	ltr.	0.76/ 3.04	0.95/ 2.85	1.14/ 2.66	1.33/ 2.47	1.52/ 2.28	1.71/ 2.09	1.90/ 1.90
	US pt.	1.60/ 6.42	2.00/ 6.02	2.40/ 5.62	2.81/ 5.21	3.21/ 4.81	3.61/ 4.41	4.01/ 4.01
	Imp.pt.	1.33/ 5.35	1.67/ 5.01	2.00/ 4.68	2.34/ 4.34	2.67/ 4.01	3.01/ 3.67	3.34/ 3.34

NOTE:
Remember, the radiator capacity is 3.8 litres (8.02/6.68 US/Imp.pt.) which includes the reservoir tank capacity of 0.6 litre (1.27/1.07 US/Imp.pt.),

Water temperature gauge

This gauge constitues a system of its own, with an indicator mounted in the instrument panel, an engine unit or sensor of thermistor type and a regulator for passing a constant current. These three—engine unit, indicator and regulator—are connected as shown in the diagram below:

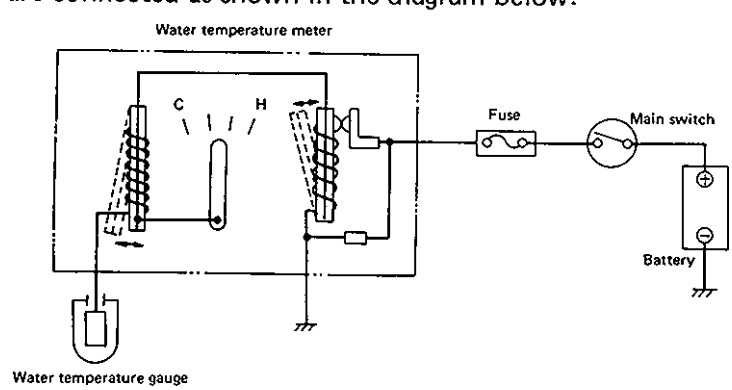


Fig. 6-12

The indicator is of bimetal type; its bimetal element is wrapped with a heater coil and becomes heated by the current flowing in the coil. By deflecting, the element actuates the indicating hand, making the hand move along the temperature scale.

The magnitude of the current is determined by the state of the thermistor in the engine unit. This unit is installed on the intake manifold. Speaking generally, a thermistor is a semiconductor resistive element. whose ohmic resistance decreases as its temperature rises; its resistance has a negative temperature coefficient. When the coolant temperature rises, the thermistor offers a decreasing resistance, so that the current increases, thereby deflecting the indicating hand wider.

The regulator is a means of maintaining a constant current in the circuit for each ohmic resistance state of the thermistor, and does so function under the varying voltage condition of the battery.

6-5. Cooling System Services

Thermostat

If the thermostat valve is suspected of malfunctioning, check first the possibility of some foreign matters being stuck on the valve seat to prevent the valve from seating tight. Next, check the thermostatic movement of the wax element in the following manner:

Heat water in a pan by placing the pan on a stove, as shown in Fig. 6-14. Grip the end of a thread or small string by pinching it in the valve and suspend the thermostat unit by holding the other end of the thread or string. Immerse it in the water, holding it about 20 mm (0.78 in.) above the bottom, and read the water temperature on the column thermometer.

If the suspended unit falls to the bottom (by releasing the gripped end of the thread or string) just when the temperature rises to 82°C (179°F) or thereabout (which is the temperature at which the valve should begin to open), the thermostat unit may be deemed to be in sound condition.

If the valve begins to open at a temperature substantially below or above, the thermostat unit should be replaced by a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.

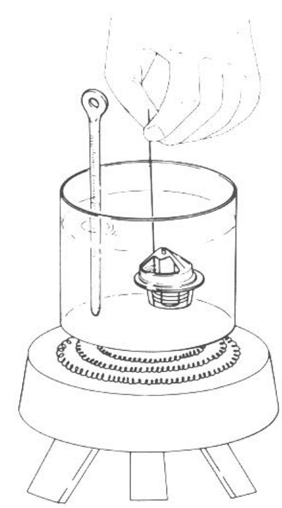


Fig. 6-13

Make sure that the air bleed valve of the thermostat is clear. Should this valve be clogged, the engine would tend to overheat.

Fig. 6-14

Fan belt

This belt drives both cooling fan and water pump. Check the belt for tension. The belt is in proper tension when a thumb pressure applied to the middle point of its span deflects it about 10 - 15 mm (0.4 - 0.6 in.). Inspect the belt for signs of deterioration and replace it as necessary.

Belt tension specification	10 - 15 mm (0.4 - 0.6 in.) as deflection

> NOTE:
> When replacing the belt with a new one, adjust belt tension to 8 - 10 mm, (0.3 - 0.4 in.).

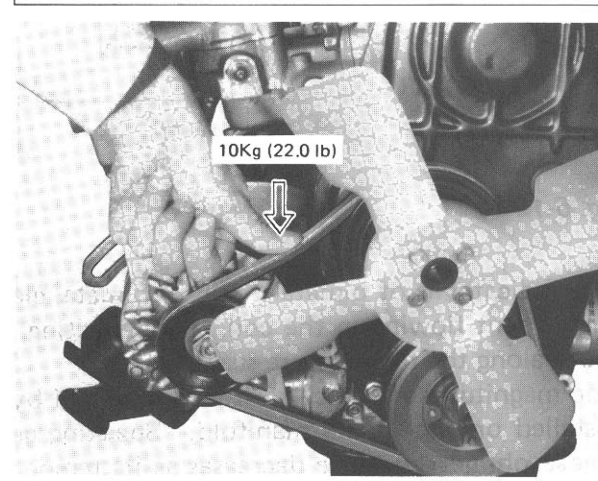


Fig. 6-15

To adjust the belt for proper tension, loosen the 3 bolts securing the generator in place, and displace it to slacken or tighten the belt.
A loose belt, or a belt tending to break off or otherwise defective, is often the cause of engine overheating. Because of the importance of this belt, it is strongly recommended that the belt be replaced at regular intervals even when the belt looks satisfactory in appearance.

Belt replacement interval	Two years (recommended)

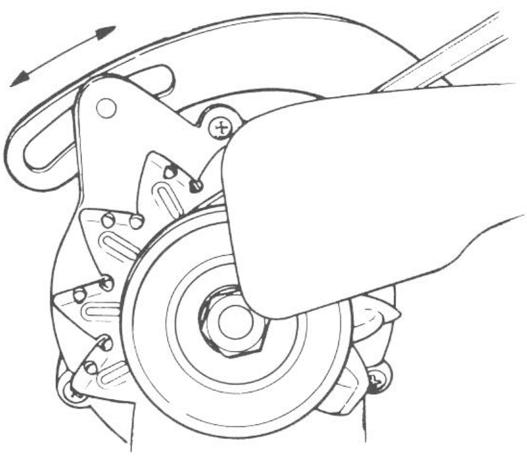


Fig. 6-16

Radiator

If the water side of the radiator is found excessively rusted or covered with scales, clean it by flushing with the radiator cleaner compound. This flushing should be carried out at regular intervals for scale or rust formation advances with time even where a recommended type of coolant is used. Periodical flushing will prove more economical.
Inspect the radiator cores and straighten the flattened or bent fins, if any. Clean the cores, removing road grimes and trashes.

Excessive rust or scale formation on the wet side of the radiator lowers the cooling efficiency. Flattened or bent fins obstruct the flow of air through the core to impede heat dissipation.

Radiator flushing interval	Two years (recommended)

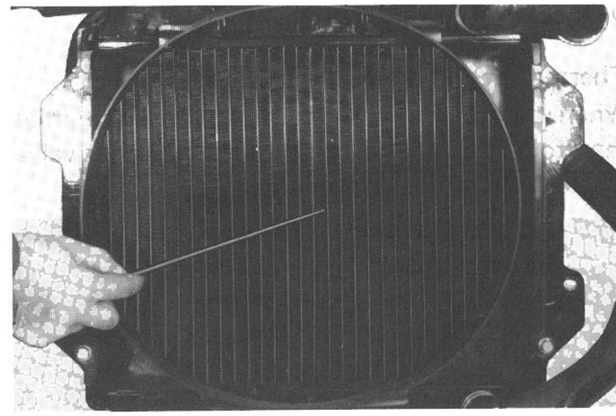


Fig. 6-17

Coolant level

Cooling water in service decreases its volume gradually on account of progressive loss due to water evaporation. Check to be sure that the water surface is up to anywhere between FULL and LOW marks on the reservoir tank. The user should be reminded of the need to daily check the water level.

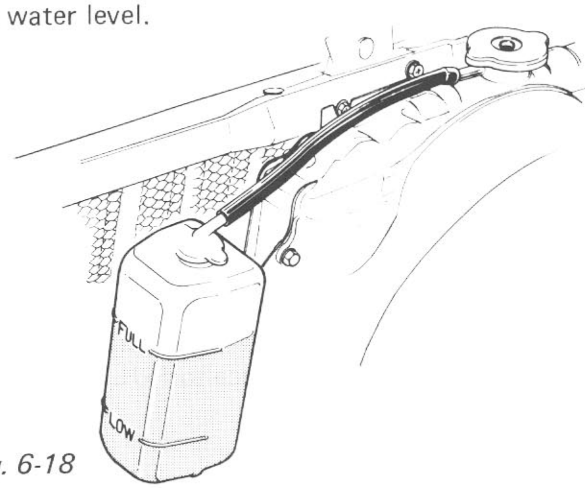


Fig. 6-18

Water hoses

Inspect each water hose for evidence of cracking or breakage, and be sure that its connection is tight. A defective hose or a hose showing signs of malcondition must be replaced. Tighten the hose connections as necessary.

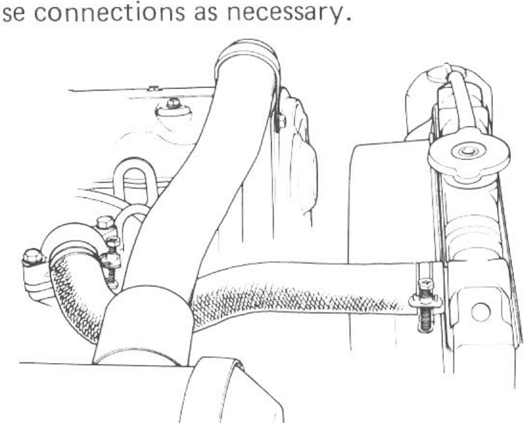


Fig. 6-19

6-6. Important Re-installing Steps

Thermostat

When positioning the thermostat on the inlet manifold, be sure to bring its air breather valve ① to front side of the engine.

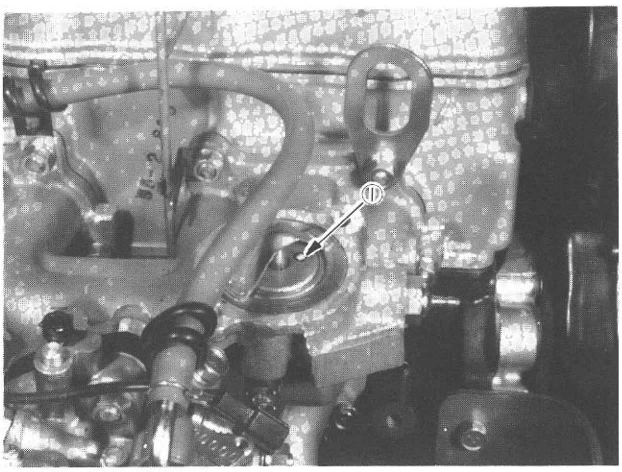


Fig. 6-20

Filling up the cooling system

Park the machine on a flat level floor, and fill in until you see the coolant come up to the well part of the radiator filler. Then, run the engine two or three minutes to recirculate the coolant. This recirculation will drive out air, if any, trapped inside, and will lower the coolant surface at the filler. Add coolant unitl its surface shows up again in the filler, and fill up the reservoir tank, raising the surface to FULL mark.

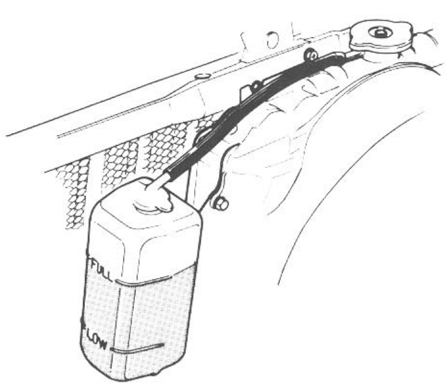


Fig. 6-21

7. CAR HEATER

7

7-1. Description

The optional car heater is of hot water type. Its operation is quiet. It takes engine heat through the medium of water and sends warm air into the room by means of a blower.
Since the blower drive is electrical, independent of engine speed, the heater is just as effective even when the engine is running slowly. In summer, the blower doubles as a fan for room ventilation, with the heater valve kept closed.

7-2. Electrical Circuit

The circuit diagram shown in Fig. 7-1 illustrates how the blower motor is controlled. With the main switch closed, turning the button of the three-position fan switch to the first position passes a current through the motor. This current is small because the circuit has a resistor (indicated as "fan resistance" in the diagram); and the blower runs slow under this condition.
Turning the switch button all the way throws the full battery voltage across the blower motor. A large current flows, and the blower runs with full speed.

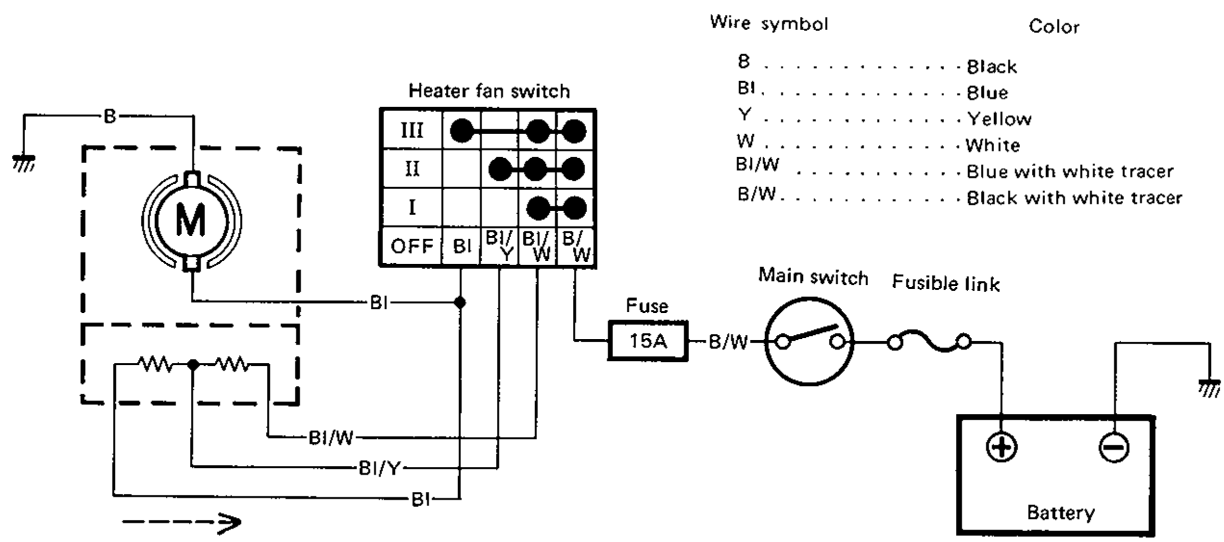


Fig. 7-1

7-3. Heater Services

Fan resistor

This resistor is in the heater case. Inspect it for signs of cracking or breakage and replace it if necessary. If the blower motor will not run or when you replace the existing resistor, check continuity between black and blue/white terminals using a circuit tester.

Fan resistor specification	Several ohms

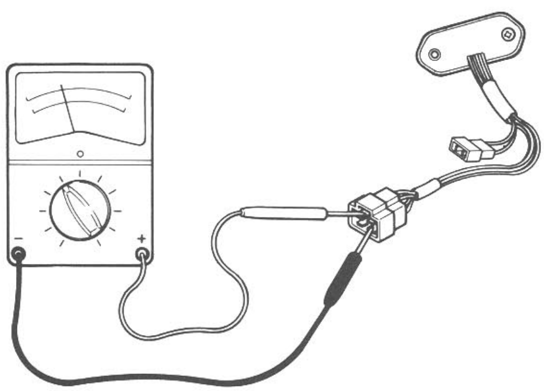


Fig. 7-2

Fan switch

Using a circuit tester, check this switch for circuit continuity:

III	○——	○——	——	○
II	○——	○——	○	
I	○——	○		
OFF				
	E terminal	L terminal	M terminal	H terminal

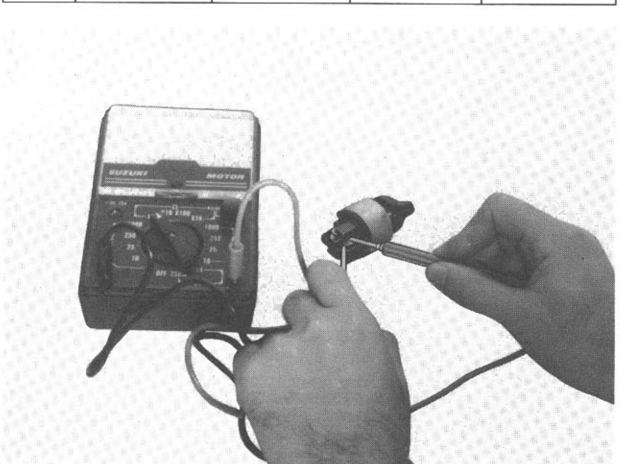


Fig. 7-3

Heater valve

Check the heater valve lever for smooth operation. If it doesn't work smoothly, repair or replace the lever linkage system and the valve.

Fig. 7-4

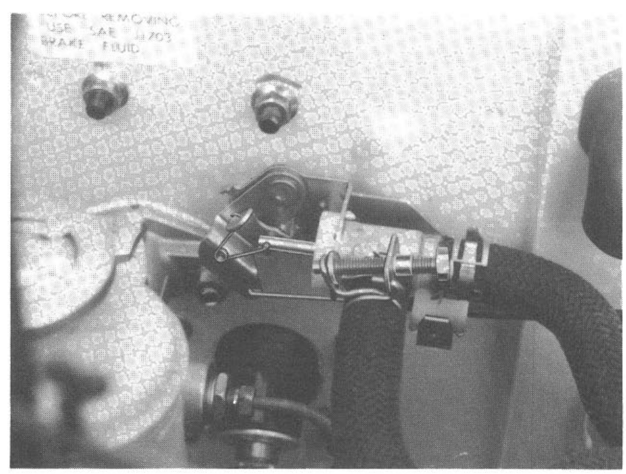


Fig. 7-5

Heater hoses

Check the heater hoses for the connection condition, cracks and other damage and replace if necessary.

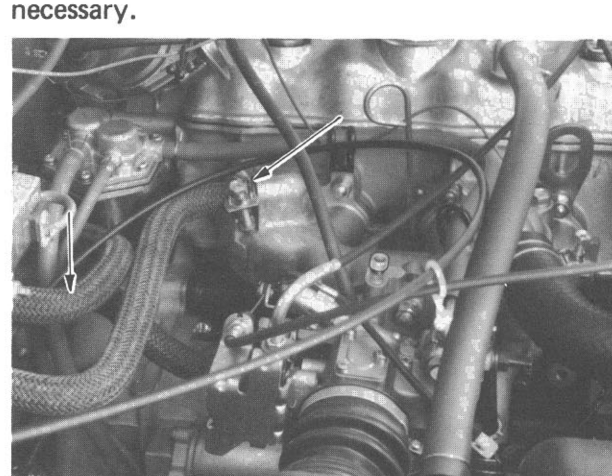


Fig. 7-6

8. IGNITION SYSTEM

8

8–1. Description

The principal components of the ignition system are, as shown in the circuit diagram of Fig. 8-1, the spark plugs, distributor, contact-breaker, ignition coil and, as the source of igniting energy, the battery. Note that the ignition coil has two windings, primary and secondary.

Current from the battery flows through the primary winding and then the contact-breaker; the contact point in the breaker opens and closes to interrupt this current intermittently.
Each time the primary current is interrupted, a very high voltage develops in secondary winding. It is this intermittent high voltage that the distributor passes sequentially to the four spark plugs to fly a spark across the gap in each, one plug a time.

The distributor is a sort of rotary switch, whose rotor connects the four plugs, one at a time, to secondary winding of the ignition coil through the wires called "high-tension" cords. Note that there are one high-tension cord, from secondary winding to the center of the distributor cap, and four more high-tension cords between the spark plugs and the four terminals on the cap.

The resistor, connected in series to primary winding, serves to reduce the inductance of primary winding so that the high voltage generation in secondary winding will be stabilized.

> **NOTE:**
> **Whereabouts of terminal connections are clearly indicated in the diagram below. When inspecting the electrical wiring, refer to this diagram and check to be sure that each connection is tight. Examine the cords for torn insulation and for evidence of grounding.**

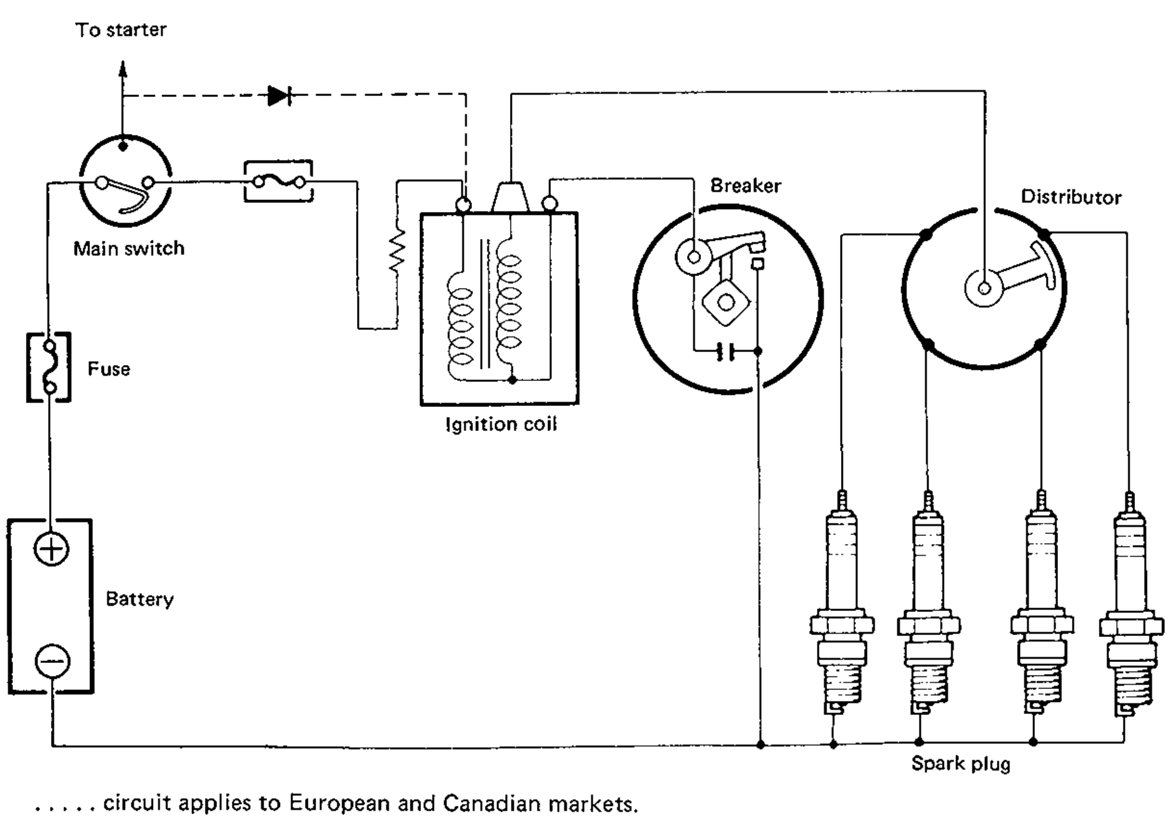


Fig. 8-1

8–2. Description of Components

Distributor

Fig. 8-2 shows the distributor unit in section to expose its internal mechanisms to easy viewing. The shaft is driven from camshaft through worm gearing, and rotates once for every two revolutions of the crankshaft.

Inside the cap are four side electrodes (for spark plugs) and one center electrode (to which the secondary side of the ignition coil is connected). The arm of the rotor, mounted on the shaft, touches the side electrodes one by one "distribute" the high voltage to the spark plugs.

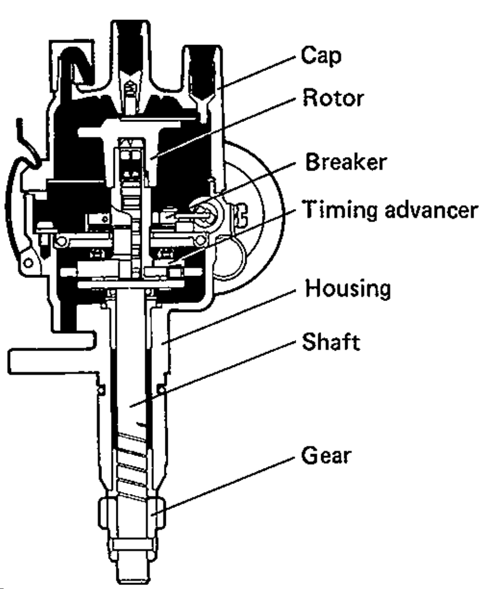
Immediately below the distributing mechanism is the contact-breaker, whose cam, mounted on the shaft, actuates the breaker arm to make and break the primary current circuit for the purpose already mentioned. The condenser (capacitor) secured to the distributor body is for absorbing the current surge, which would otherwise result in a sparking across the contact point gap. The surge occurs every time the contact point is opened, and is due to, so to say, the inertia of electric current. The object served by the condenser is obvious; it is to prevent the point faces from getting burnt by sparking.

The ignition timing advancer used in machines for every market except Australian and European markets is operated by both centrifugal advance mechanism (advance due to centrifugal governor action) and vacuum advance mechanism (advance due to vacuum control).

The advancer used in machines for Australian and European markets is operated by centrifugal advance mechanism.

Distributor data	
Cam dwell angle	52°
Condenser capacitance	0.25 microfarad
Ignition timing	10° B.T.D.C. below 850 r/min(rpm)
Number of gear teeth	13
Direction of rotation	Clockwise, as viewed from top

Distributor used in machines for every market except Australian and European markets.



Distributor used in machines for Australian and European markets.

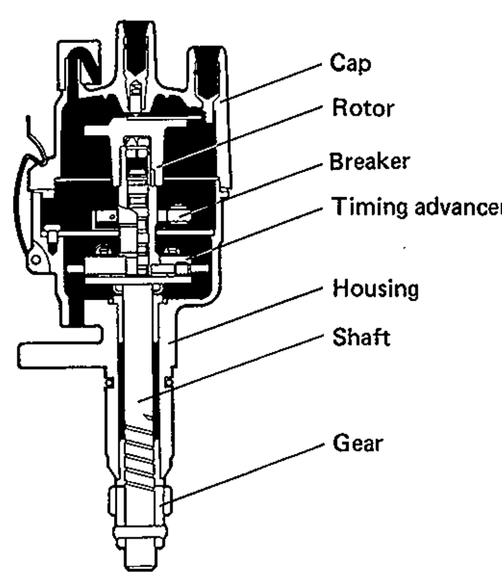


Fig. 8-2

Ignition coil

The ignition coil is a sort of miniature transformer and, as such, has an iron core around which two coils are wound – primary and secondary windings mentioned above. The two are so close to each other that a sudden change in the magnetic flux produced by "primary current" flowing in primary winding (in a less number of coil turns) induces a very large electromotive force (voltage) in secondary winding (in a greater number of coil turns). These live parts are housed in a tight, insulator case topped by the cap mentioned above. Note that the cap has three terminals: one high-tension terminal and two low-tension terminals.

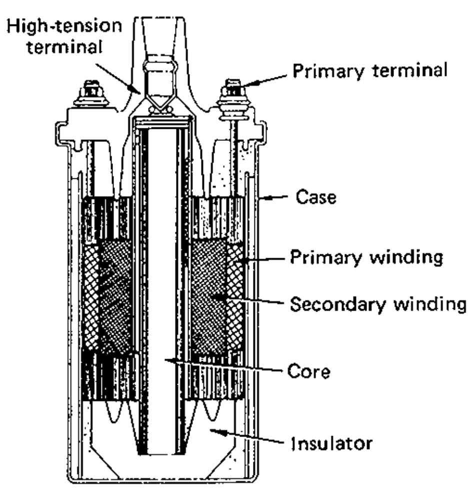


Fig. 8-3

Timing advancer

The distributor shaft, from its driven-gear end to the rotor-carrying end, is not a single solid piece; actually this shaft is in two pieces connected together through the timing advancer. The advancer is essentially a flyweight mechanism. Timing advancing action is accomplished by twisting the top shaft piece relative to the bottom one in the direction of shaft rotation.

The contact-breaker cam, mentioned above, for actuating the breaker arm is mounted on the top piece. The twisting movement is produced by the speed-dependent radial (or spreading) movements of the two flyweights.

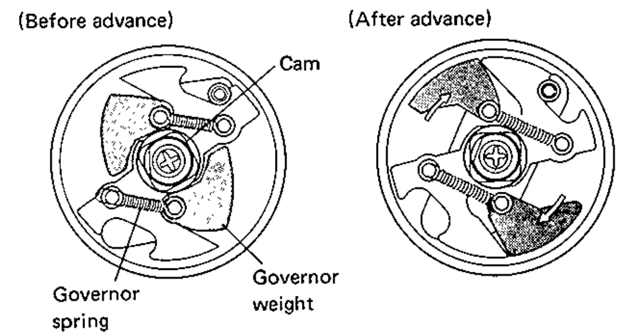


Fig. 8-4

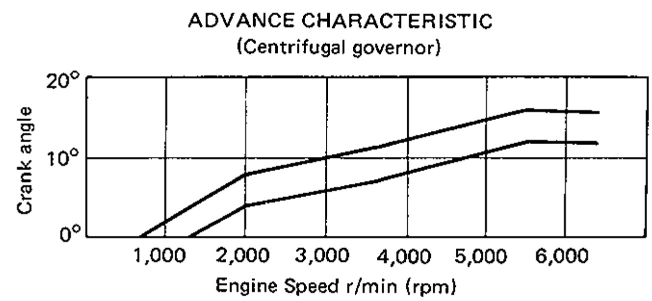


Fig. 8-5

Vacuum advancer (applicable to every market except Australian and European markets)

The vacuum advancer provided in the distributor starts working when the acceleration pedal is depressed to cause the throttle valve of the carburetor to open 4° to 5° as measured from its fully closed position. In this vacuum-advance mechanism, when the vacuum in the carburetor gets high, the pressure acting on the diaphragm overcomes the spring force in it and the advancer rod attached to the diaphragm is pulled. And the rod so pulled turns the breaker plate counter to the direction of the distributor shaft rotation (counterclockwise) to advance (quicken) the ignition.

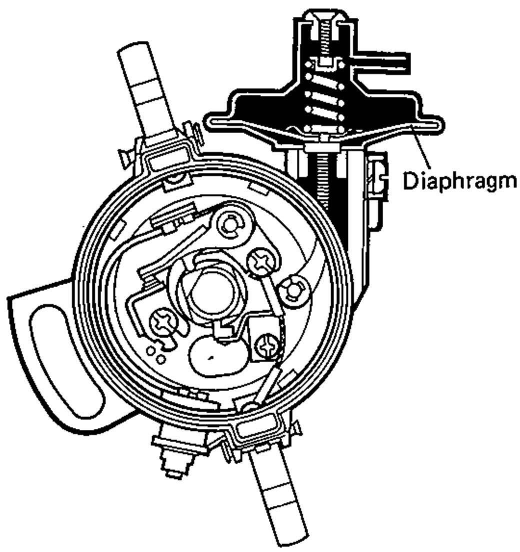


Fig. 8-6

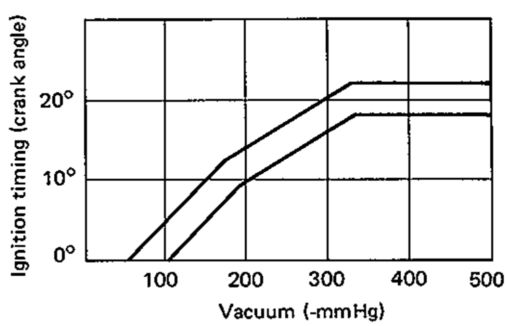


Fig. 8-7

Spark plugs

Each new machine shipped from the factory is fitted with standard plugs.

	Standard type	Cold type
NGK	BP-5ES (BPR-5ES)	BP-6ES (BPR-6ES)
Nippon Denso	W16EX-U (W16EXR-U)	W20EX-U (W20EXR-U)

(   ) : For EUROPEAN AND CANADIAN MARKETS.

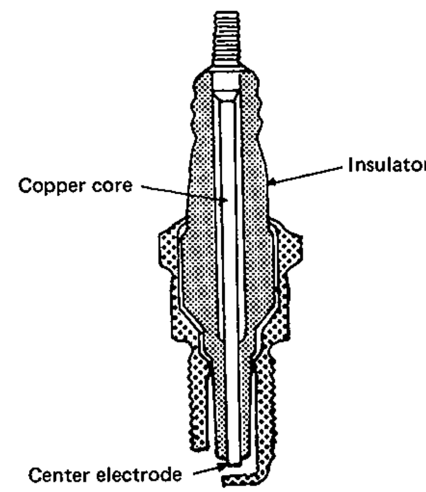


Fig. 8-8

8–3. Maintenance Services

Distributor cap

Leadage of high-tension energy for ignition shows up as misfiring in the engine. It occurs at any part of the high-tension line where insulation has failed or in a dirty distributor cap, that is, an internally dirty cap.

A wider spark gap in the plug, a condition often found in poorly cared spark plugs, promotes the tendency of high-tension energy to find a short-cut to ground.

Cleanliness is very important for the distributor cap. With a clean dry cloth, wipe off dust or grime, if any, and inspect for any damaged (scarred, scratched or cracked) part or any part evidencing high-tension leakage inside the cap. Be sure to replace such parts.

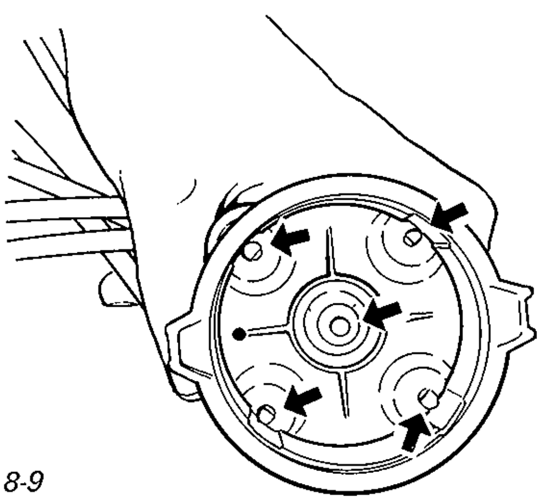


Fig. 8-9

Distributor driven gear

Inspect the gear teeth for wear, and see if the backlash is normal or not. Excessive backlash can be told by turning the shaft back and forth, with its driven gear in mesh with driving gear. Maladjusted ignition timing is often due to excessive tooth wear in this gearing and, in such a case, can be corrected by replacing the driven gear.

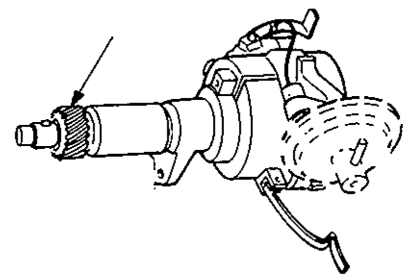


Fig. 8-10

To replace the driven gear, grind off both caulked ends of the driven gear set pin with a grinder and drive it off. After fitting the new gear, make sure to use a new pin and caulk its both ends.

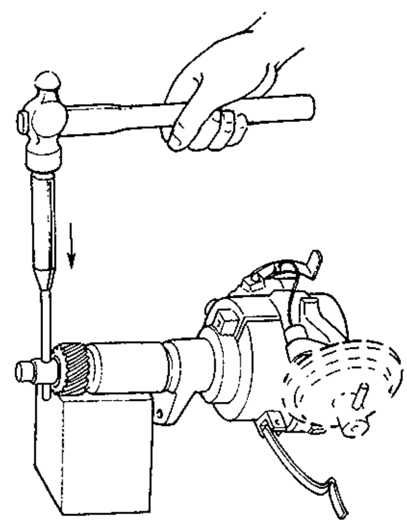


Fig. 8-10-1

Spark plugs

The spark gap specification is 0.7 – 0.8 mm (0.027 – 0.031 in). Be sure to use a thickness gauge in checking the gap. A wide gap is just as bad as a narrow gap. The 0.7 – 0.8 mm (0.027 – 0.031 in) gap will produce the right kind of sparks needed by the air-fuel mixture in this engine.

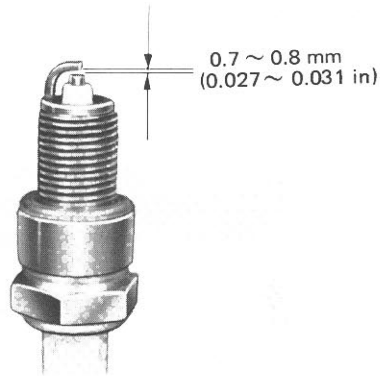


Fig. 8-11

Contact point faces

In the contact breaker, push the breaker arm with your fingertip just a little so that you can see the point faces. If the faces are oily, clean; if roughened, smoothen by grinding. In most cases, the point faces can be reconditioned by grinding with a file or oil stone. Points worn beyond repair must be replaced.

The illustration, below, tells what must be done in each case but the last one showing a pair of properly aligned, smooth faces. Wear or burning is hard to occur in the contact point whose point faces are in the condition labeled "good".

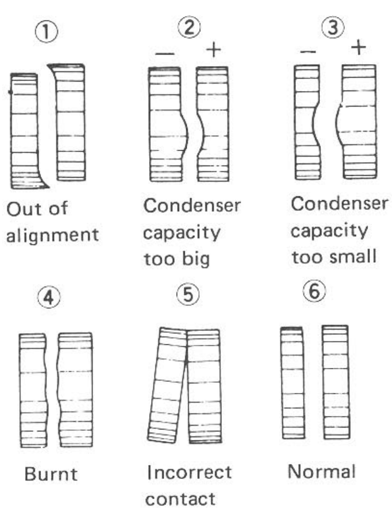


Fig. 8-12

Checking the primary circuit for fault

If the engine misfires or does not fire up at all where its spark plugs have just been checked to be in good condition, the first step of locating the cause is to check the primary circuit (between distributor and ground) for continuity by using a circuit tester as shown. Since the contact point is open, the tester should indicate discontinuity (infinitely large resistance); if continuity is noted, it means that there is a fault somewhere along the primary circuit, which could be in the ignition coil, condenser or elsewhere.

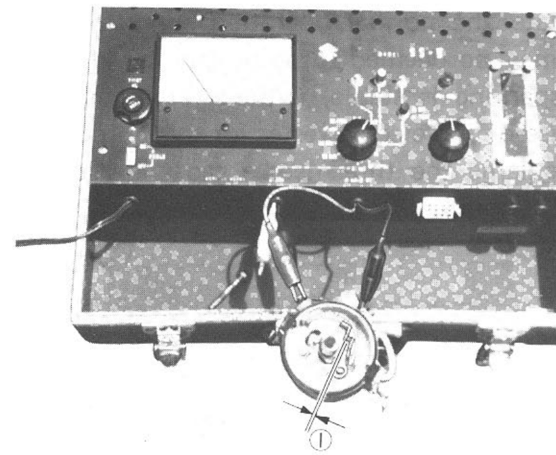


Fig. 8-13 ① *Open*

Condenser

Check the condenser for capacitance by using the electro-tester. You may do so with the condenser in place or removed. When checking it in place, that is, as mounted on the distributor, be sure to have the contact point opened. A condenser not meeting the following capacitance specification must be replaced:

Condenser capacitance specification	0.25 microfarad

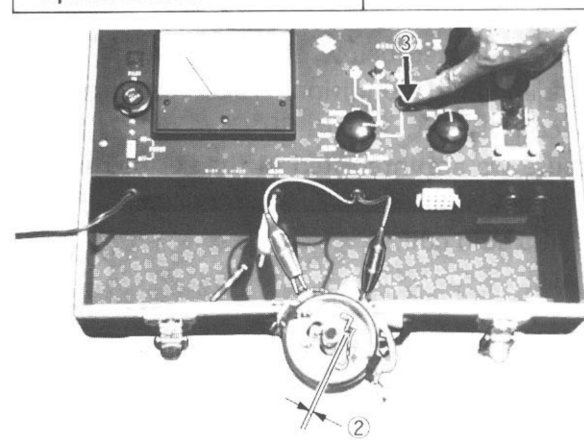


Fig. 8-14 ② *Open* ③ *Push*

Ignition coil

(1) Sparking performance test

The purpose of this test is to see if the ignition coil is capable of producing high voltage surges forceful enough to fly good sparks at the ignition coils at all times, particularly when its temperature has risen to the normal operating level. Use of the electro tester is assumed for this test. With the ignition coil connected to the tester, as shown, let the spark fly across the three-needle gap. Continue this testing for about three minutes so that the coil will get warm to simulate the normal operating condition. The coil may be deemed to be in good condition if the sparking is stable, without any misses. In the use of the electro tester for this purpose, do not enlarge the three-needle gap wider than 7 mm (0.27 in.).

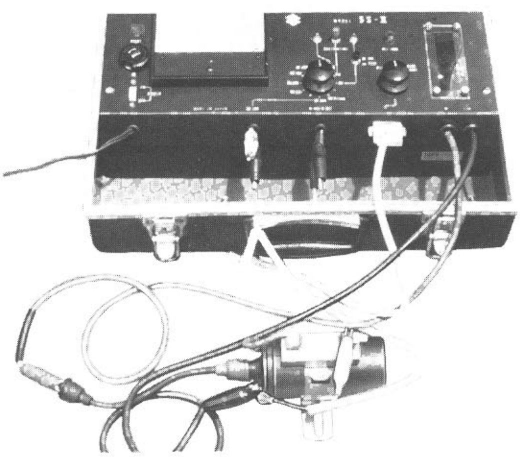


Fig. 8-15

(2) Resistance measurement

Measure the ohmic resistances of primary and secondary windings in the ignition coil. If the readings are in agreement with the prescribed values, indicated below, the coil may be judged to be in good condition. Take readings when the coil is hot, about 80°C (176°F); this is because we are interested in the performance of the coil at the normal operating temperature, not of a cold coil.

Primary winding resistance	About 3 ohms (inclusive of the 1.5-ohm resistor)
Secondary winding resistance	About 10 kilohms

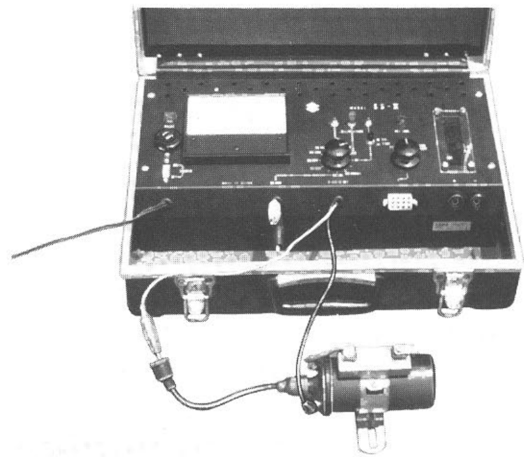


Fig. 8-16

8–4. Important Reminders for Reassembly and Installation

Distributor

When re-installing the distributor, be sure to insert it into the distributor gear case in the following sequence:

(1) Turn over crankshaft in normal direction (clockwise as viewed from front side) to bring timing mark "10°" ① (on flywheel) to the mark ② provided on transmission case, making the two marks line up. See Fig. 8-17,

> **CAUTION:**
> **After aligning marks ① and ② , remove cylinder head cover to visually confirm that the rocker arms are not riding on the camshaft cams at No. 1 cylinder. If the arms are found to be riding on the cams, turn over crankshaft 360° to align the two marks anew.**

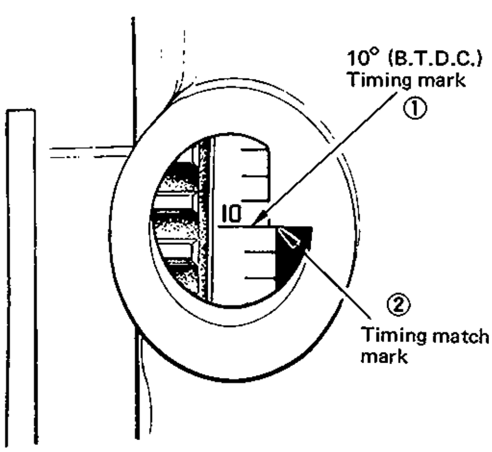


Fig. 8-17

(2) Remove the distributor cap, and check to be sure that edge face ③ of the rotor is in the position indicated in Fig. 8-18; if not, reposition the distributor housing to create the indicated positional relationship.

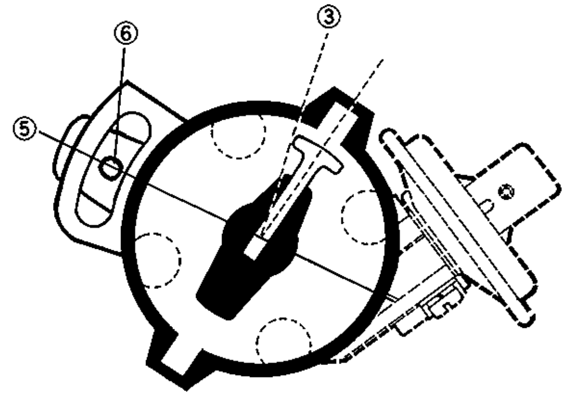


Fig. 8-18

(3) Insert the distributor into the gear case in such a way that the center ⑤ of distributor flange will coincide with the distributor mounting screw hole ⑥ provided in the distributor gear case. When inserting the distributor completely, position of distributor rotor becomes as shown in Fig. 8-18-1. Secure the distributor in place tentatively by making the mounting screw finger-tight, and adjust the ignition timing.

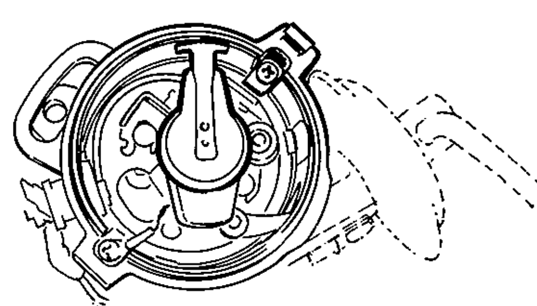


Fig. 8-18-1

High-tension cords
Install the four high-tension cords by referring to Fig. 8-19, making sure to identify the four cap terminals of the distributor for the four cylinders.

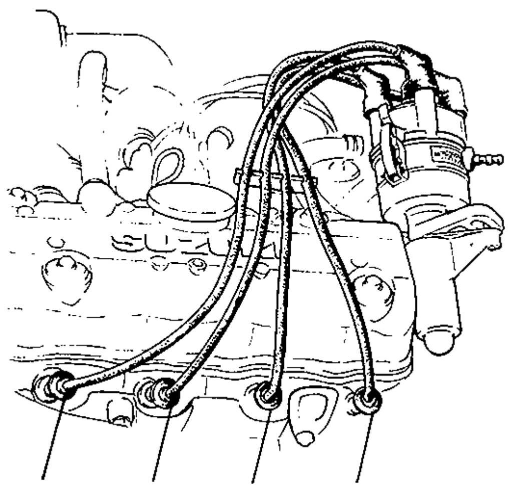


Fig. 8-19

8–5. Ignition Timing

Specifications

Ignition timing	10° B.T.D.C. below 850 r/min (rpm)
Ignition order	1 – 3 – 4 – 2
Breaker point gap ③	0.4 – 0.5 mm (0.016 – 0.019 in.)

Checking methods
Check to be sure that the point gap is within the specified range, from 0.40 to 0.50 mm (0.016 – 0.019 in.) and then check the ignition timing on No. 1 cylinder. To adjust the point gap, loosen screws ① and move the stationary point with plain screwdriver inserted into slit ② .

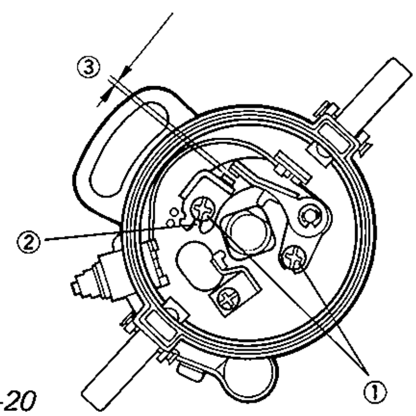


Fig. 8-20

(1) Checking and adjusting with timing light
CHECKING:
Connect the timing light to the high-tension cord of No. 1 cylinder spark plug. Start up the engine and hold it at a speed not higher than 850 r/min (rpm). Under this condition, observe the timing marks by using the light. (The 10° timing mark ④ on flywheel will appear stationary.)
If mark ④ is in register with the mark ⑤ on transmission case, the ignition is timed correctly. See Fig. 8-22.

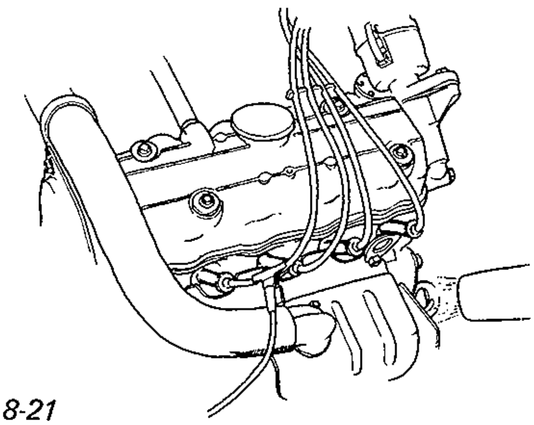


Fig. 8-21

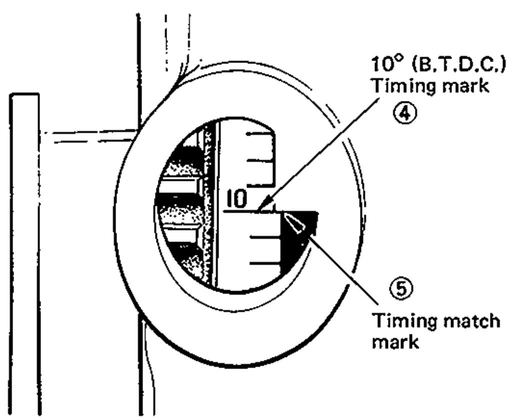


Fig. 8-22

ADJUSTING:

If the mark ④ is off the mark ⑤ , adjust the timing as follows:

1) Check to be sure that breaker point gap is between 0.4 and 0.5 mm (0.016 and 0.019 in.).
2) Loosen the distributor clamp bolt and turn the distributor housing in place to advance or retard the timing.

> NOTE:
> - **Turning the housing counterclockwise advances the timing, and vice versa.**
> - **After repositioning the housing, check the timing with the timing light and, as necessary, repeat step 2).**

Checking the timing advancer action

① CENTRIFUGAL ADVANCE:

(In every market except Australian and European markets, the check should be carried out as follows.)

Hook up the timing light. Disconnect the vacuum pipe to cut out the vacuum advancer. Start up the engine and pick up speed gradually to see if the ignition advances with rising speed in the manner represented by the curve in Fig. 8-5; if not, the cause is most likely a malcondition in the centrifugal advancer, due to broken or weakened governor-weight return springs or bound or sticky weights.

> NOTE:
> **When reading the ignition timing by referring to the Fig. 8-5, add 10 degrees (Static ignition timing) to the value represented by the graph.**

(In Australian and European markets, the check should be carried out as follows.)

Hook up the timing light. Start up the engine and pick up speed gradually to see if the ignition advances with rising speed in the manner represented by the curve in Fig. 8-5; if not, the cause is most likely a malcondition in the centrifugal advancer, due to broken or weakened governor-weight return springs or bound or sticky weights.

> NOTE:
> **When reading the ignition timing by referring to the Fig. 8-5, add 10 degrees (Static ignition timing) to the value represented by the graph.**

② VACUUM ADVANCE:

In every market except Australian and European markets, the check should be carried out as follows.

CAUTION:
Before checking vacuum advance, be sure to inspect the vacuum pipe for pinhole, crack or break.

There are two ways of vacuum advance check. One is with the engine at a stop and the other with the engine running.

- In the former case (engine at a stop), disconnect the vacuum hose from the carburetor body and check the breaker plate for smooth movement by sucking out the air in the vacuum hose as illustrated below. If it moves smoothly, vacuum advance is normal.
- In the latter case, run the engine at about 2,000 r/min (rpm) and disconnect the vacuum hose from the distributor body. If the engine speed becomes less than 2,000 r/min (rpm) when the hose is disconnected, vacuum advance is normal.

If anything is wrong in either case, correct or replace it as necessary.

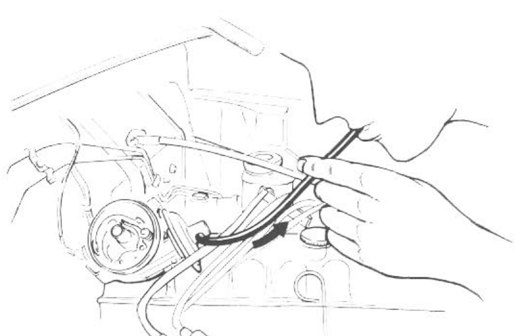


Fig. 8-22-1

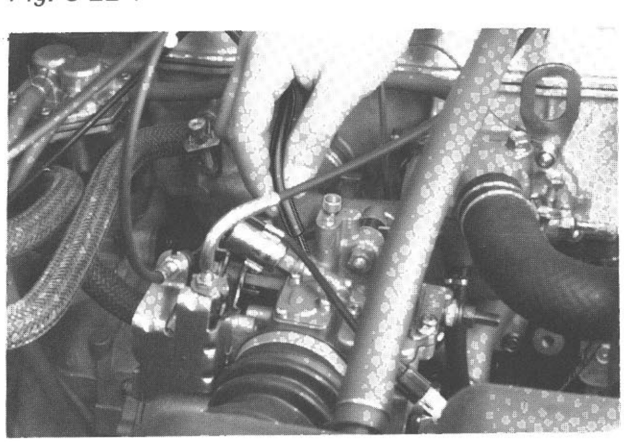


Fig. 8-22-2

(2) Checking and adjustment with the timing tester

The timing tester has a built-in buzzer.
Connect one of its leads to the primary-circuit terminal of the distributor and the other lead to the distributor body. Slowly turn the crankshaft by rotating the cooling fan clockwise with the hand while watching the timing marks. (Have the ignition switch turned off.)
The buzzer should start sounding off just when the marks come into resister, indicating that the engine is set for the specified timing.

CAUTION:
With timing marks ① ② lined up as shown in Fig. 8-23, remove the cylinder head cover and check to be sure that No. 1 cylinder rocker arms are not riding on cam lobes. If the arms are up, turn over crankshaft by one rotation (360°) clockwise (as viewed from front side). This turning should cause the buzzer to sound off just when the marks come into alignment.

NOTE:
The two tester leads are given polarity signs, (+) to one and (−) to the other lead: connect the red lead to (+) cord, and the black lead to (−) cord, of the distributor.

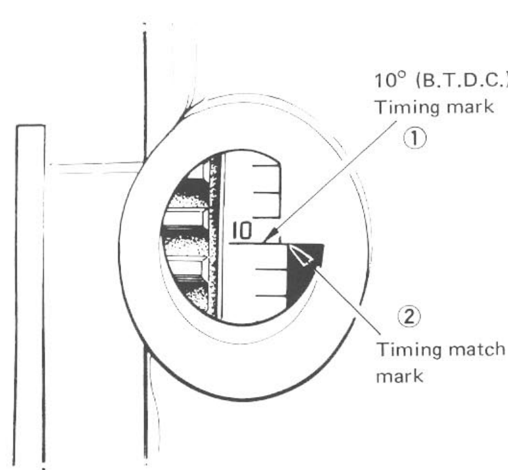


Fig. 8-23

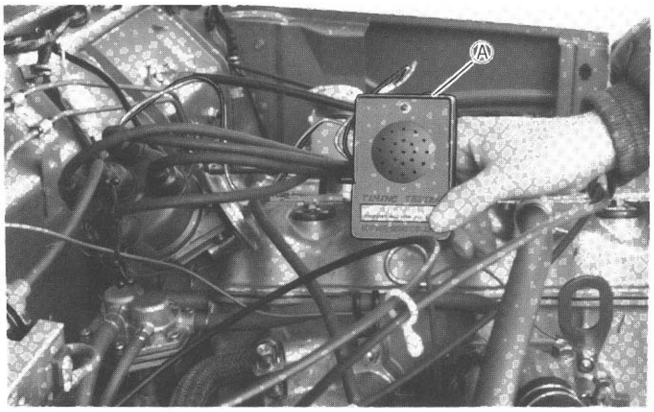


Fig. 8-24 Ⓐ *Timing tester (09900-27003)*

ADJUSTING:

Upon noting that the ignition is not timed to the specification, proceed as follows:

1) Make sure that the breaker point gap is set right, that is, between 0.4 and 0.5 mm (0.016 – 0.019 in.).
2) Bring timing mark ① into alignment with mark ②, as shown in Fig. 8-23. Mark ① represents the 10° crank angle.
3) Loosen the distributor clamp bolt, and slowly rotate the distributor housing until the buzzer starts sounding off. Hold the distributor right there and tighten the clamp bolt.

NOTES:
1. Turning the housing counterclockwise advances the timing and vice versa.
2. After tightening the clamp bolt, check the timing once again.

8–6. Replacement of Distributor Driven Gear

Replacing a worn-down driven gear (a part of the distributor assembly) is not enough. Inspect the drive gear, too, and replace it if it is badly worn down. The drive gear can be removed from the camshaft.

Worn gears in the distributor drive are likely to disturb the ignition timing and must be replaced.

When pressing the replacement drive gear onto camshaft, be sure to position the gear angularly as shown in Fig. 8-25. Note that the tooth root is radially centered on the center line through the keyway provided in camshaft.

NOTES:
1. Before removing the drive gear from the camshaft, scribe a match mark on this shaft and, when mounting the replacement drive gear, refer to this mark.
2. There is no need to discriminate between the two end faces of the drive gear: the gear may be fitted with either end held foremost.

CAUTION:
Distributor gear case
About 60 cc (2.03/2.11 US/Imp oz) of engine oil must be fed into the distributor gear case after servicing this case that is, removing and putting it back. Be sure to add this much oil before starting the engine for the first time after servicing.

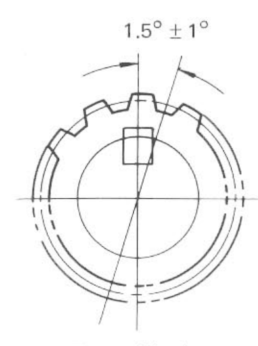


Fig. 8-25

9. STARTER MOTOR

9

9-1. Description

A shift-lever type starter motor is used for cranking the engine. The motor is mounted on the transmission case, with its drive pinion meshed with the ring gear of the flywheel. In the following illustration, note that the whole motor assembly inclusive of the magnetic switch and lever mechanism is enclosed.

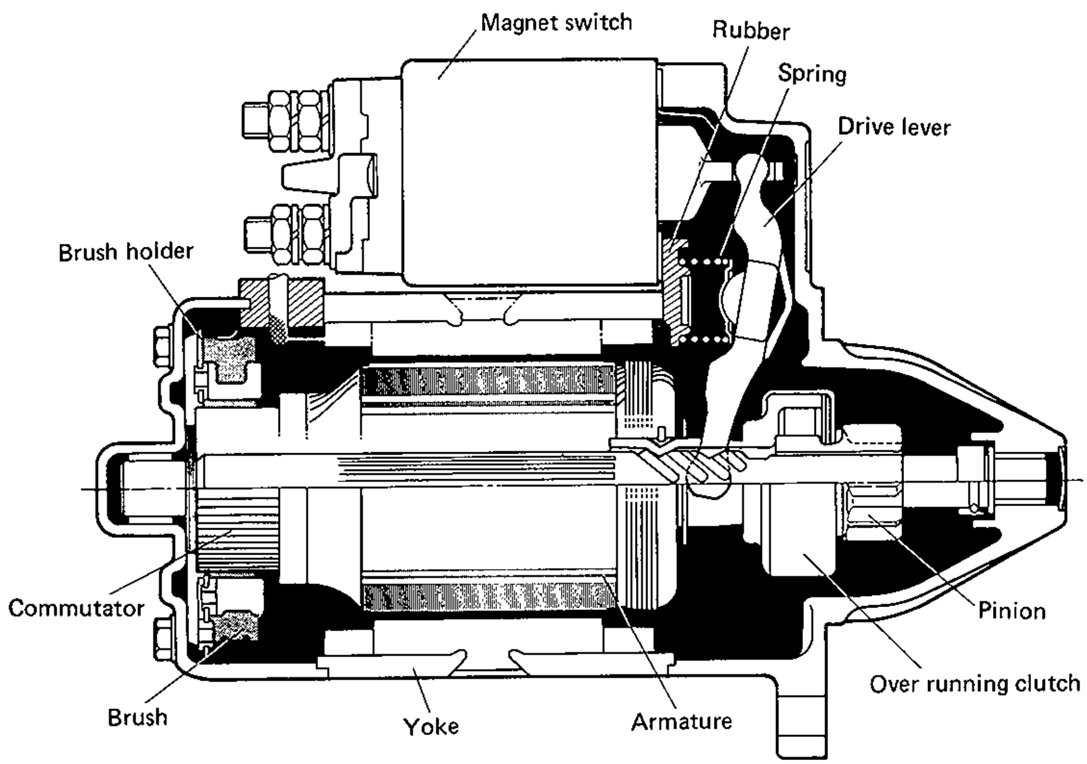


Fig. 9-1

9-2. Specifications

Voltage	12 volts
Output	0.7 kW [0.8 KW]
Rating	30 seconds
Direction of rotation	Clockwise as viewed from pinion side
Brush length	17 mm (0.67 in.)
Number of pinion teeth	8
No-load characteristic	53 A [60A] maximum at 11.5 volts, 6,800 rpm [6,500 rpm] minimum
Load characteristic	150 A maximum at 9 volts and 0.28 kg-m torque, 1,850 rpm [2,000 rpm] minimum
Locked rotor current	340 A [380A] maximum at 5 volts, 0.72 kg-m [0.88 kg-m] minimum
Magnetic switch operating voltage	8 volts maximum

[ ] For Canadian market

9-3. Cranking Action

Starting up the motor

Turning on the starting switch results in a small current flowing through the holding coil and another through the pull-in coil, both in the magnetic switch. The former current flows direct into ground, but the latter flows through motor armature and field. In other words, motor begins to run. In the magnetic switch, the two coils energized—pull-in coil and holding coil—develop a combined magnetic pull, by which the moving core is pulled against the force of the spring and moves toward the right (in the illustration). At this time, the motor armature is running but slowly because of the small initial current. As the moving core is forced toward the right, its left end turns the shift lever around its pivot, so that the bottom end of the lever pushes the clutch toward the left. Since the clutch is splined to the motor shaft and because the motor shaft is rotating, the clutch advances toward the left as assisted by the helical splines.

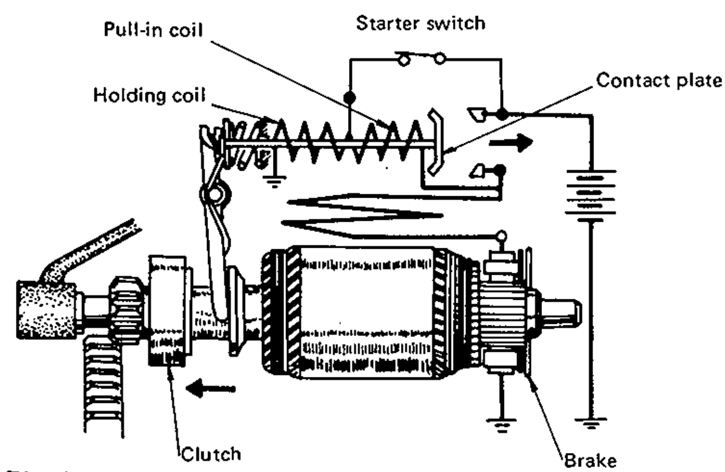


Fig. 9-2

Pinion meshing with the ring gear

The pinion may mesh into the ring gear smoothly or may bounce on the ring gear, depending on the relative positions of their teeth. In the latter event, the springs mounted on the clutch absorb the shock and, since the pinion is rotating and being pushed, its teeth will eventually mesh into those of the ring gear. In either case, the shift lever is allowed to turn fully and permit the moving core to be kept pulled all the way toward the right. When this happens, the main contactor of the magnetic switch closes to connect the starter motor direct to the battery. Consequently, a very large current—load current—flows through the motor to develop a high cranking torque for driving the engine crankshaft through the drive pinion and ring gear.

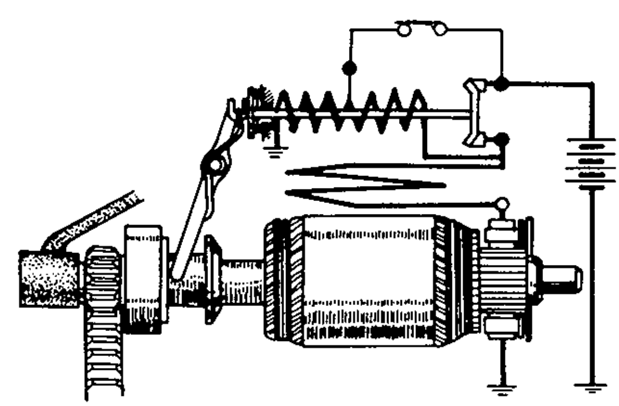


Fig. 9-3

Engine cranking

When the motor is cranking the engine with full force, the pull-in coil is bypassed or shunted but the holding coil remains energized to hold the moving core in its shifted position. Under this condition, the shift lever is pushing the pinion by overcoming the force of springs.

As the engine fires up and begins to run steadily and if the starting switch is kept closed, the ring gear starts driving the pinion. When this occurs, the pinion merely spins on the motor shaft without transmitting this reverse drive to the motor. This is because the clutch is of overrunning type.

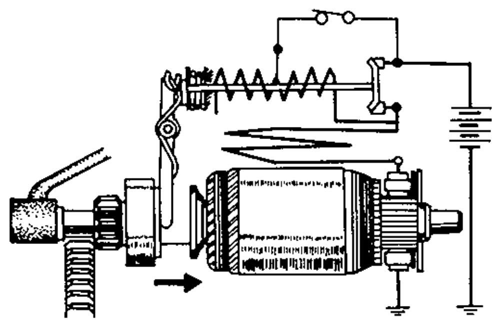


Fig. 9-4

Terminating cranking operation

Turning off the starting switch de-energizes (shutting off the current) the holding coil so that the pull hitherto acting on the moving core disappears. By the force of the spring, then, the shift lever is turned back and the moving core is forced toward the left to open the main contactor. This shuts off the load current, and the drive pinion, shift lever and moving core go back to their original positions.

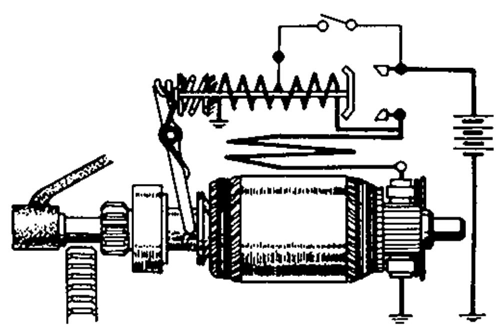


Fig. 9-5

9-4. Removal

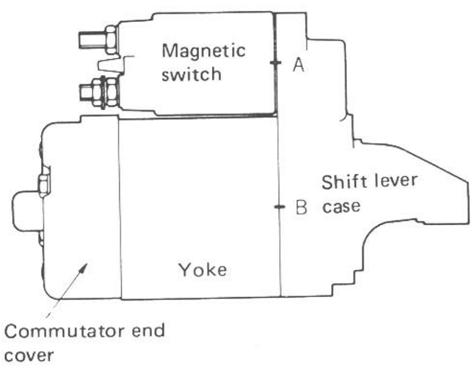
1) Disconnect battery cable from the negative terminal (–) and positive terminal (+) of the battery.

2) Disconnect BLACK/YELLOW lead wire and power circuit wire (leading to the plus side of the battery) from the starter motor.

3) Remove the two bolts securing the starter motor assembly to the transmission case, and take off the starter motor.

9-5. Disassembly

> NOTE:
> Before disassembling the starter motor, be sure to put match marks on the mating surfaces of the following parts (A and B) as shown in the figure below so that any possible mistakes can be avoided.



1) Remove the nut securing the end of the field coil lead to the terminal on the head of magnetic switch.
2) Take off the magnetic switch (1) from the starter motor body by removing the two mounting screws.

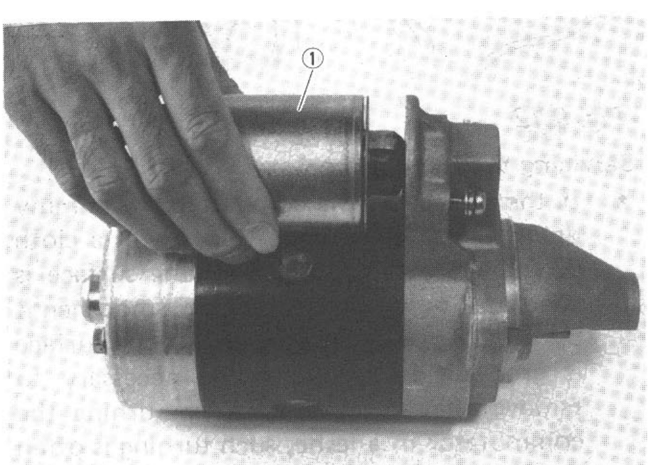


Fig. 9-6

3) Loosen 2 bolts and 2 screws to remove the commutator end cover.

4) From the yoke, separate the shift lever case and armature.

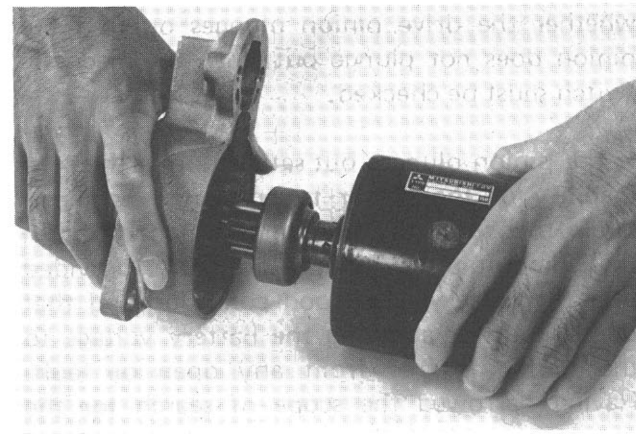


Fig. 9-7

5) Draw brushes out of the holder.

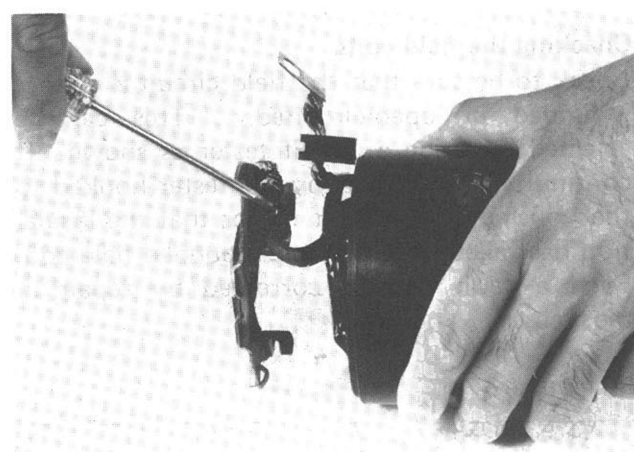


Fig. 9-8

6) Draw off the over running clutch, as follows:
   (1) Draw stop ring (1) toward the clutch side.
   (2) Remove snap ring (2) and slide off clutch.

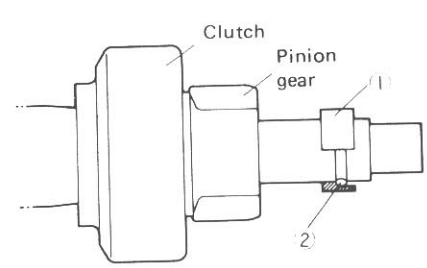


Fig. 9-9

9-6. Maintenance Services

In the event the starter motor is found unable to crank the engine, the first thing to be checked is whether the drive pinion plunges out. If the pinion does not plunge out, then the magnetic switch must be checked.

If the pinion plunges out satisfactorily, then the inability of the motor to crank the engine is likely to be due to some defective condition in the commutator or in the armature, provided that the battery is in good condition and that the circuit for applying the battery voltage to the motor is free from any open or fault. Having narrowed the scope of search for the cause of trouble to the motor proper, proceed as follows:

Checking the field coils

Check to be sure that the field circuit is neither grounded or open-circuited. This can be effected by using a circuit tester as shown. If continuity is indicated by the tester hooked to the housing or frame, it means that the insulation has failed, resulting in a grounded field coil. Such a fault can be corrected by repair in most cases.

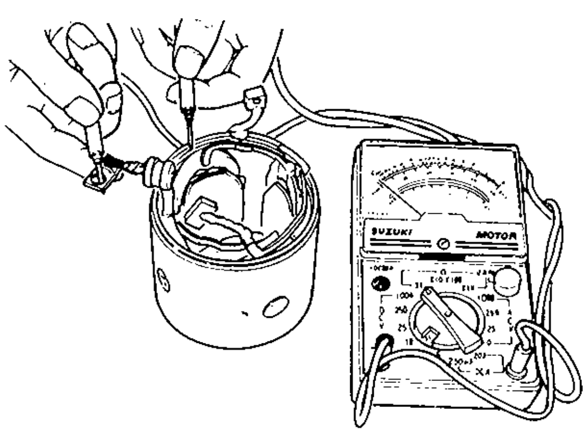


Fig. 9-10

Checking the armature

- Using the circuit tester, see if there is any continuity between commutator and armature core. The tester will indicate infinite resistance if the insulation is in sound condition.

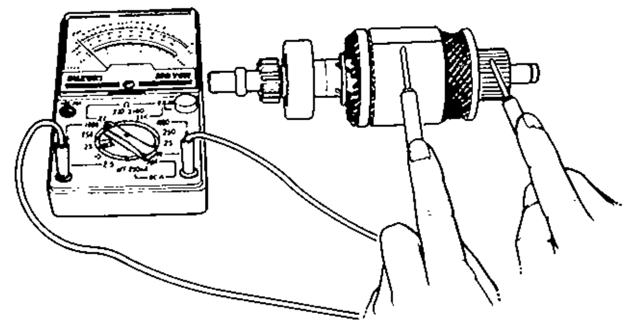


Fig. 9-11

- Again using the tester, check for continuity between each pair of adjacent commutator segments. If discontinuity is noted at any part of the commutator, replace the whole sub-assembly of the armature.

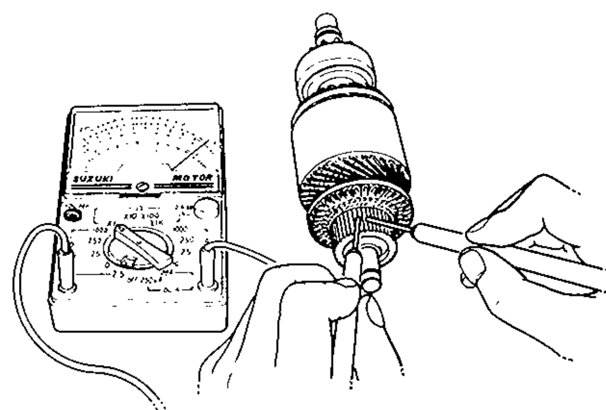


Fig. 9-12

Servicing the commutator

- If the surface of the commutator is gummy or otherwise dirty, wipe it off with a cloth dampened with gasoline. If the surface is coarsened or in burnt condition, smoothen it by grinding with sandpaper. If the surface is grooved deep, it may be necessary to remove the groove marks by turning the commutator in a lathe; such turning is often successful in reconditioning the commutator if the extra stock necessary for removal by cutting is available without reducing its diameter to the limit.

Commutator diameter	Standard
	38.7 mm (1.52 in.)

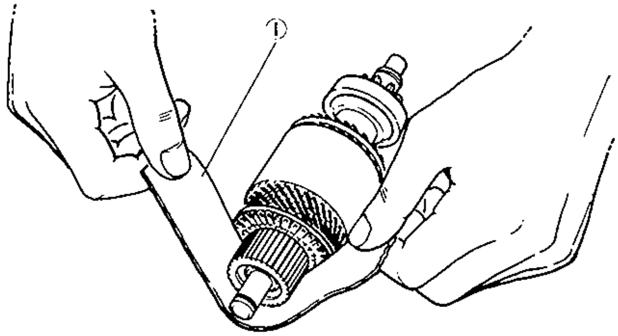


Fig. 9-13 ① *Sandpaper*

- Make sure that the mica between each pair of adjacent segments is undercut to the prescribed depth. The conventional undercutting technique is to be used in repairing the commutator.

	Standard	Service limit
Mica undercut	0.4 ~ 0.6 mm (0.015 ~ 0.023 in.)	0.2 mm (0.007 in.)

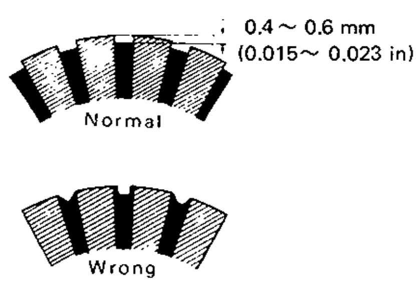


Fig. 9-14

Testing the magnetic switch

Before separating the magnetic switch from the motor proper just removed from the crankcase, test the switch by connecting the battery to the switch, as shown, to see if the drive pinion jumps out when the battery voltage is applied. (With the positive terminal of the battery cable end.) With the switch coils in sound condition, the drive pinion will jump out and, even when the main circuit is opened at "A", will remain in "jumped out" position. If undoing the connection at "A" causes the drive pinion to retract, it means that the holding coil is defective.

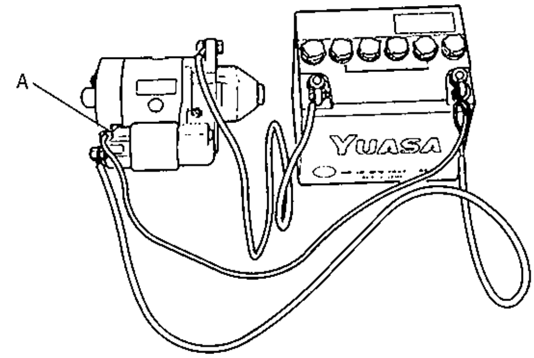


Fig. 9-15

Servicing the brushes

Check the length of each brush. If brushes are worn down to the service limit, replace them.

	Standard	Service limit
Brush length	17 mm (0.67 in.)	11.5 mm (0.45 in.)

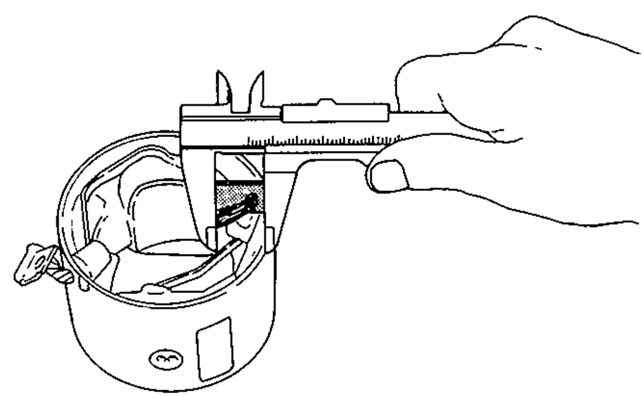


Fig. 9-16

Servicing the brush holders

Make sure that the insulation between the two brush holders, positive and negative, is in good condition. This should be verified with the use of the circuit tester. If any continuity is noted, repair the insulation.

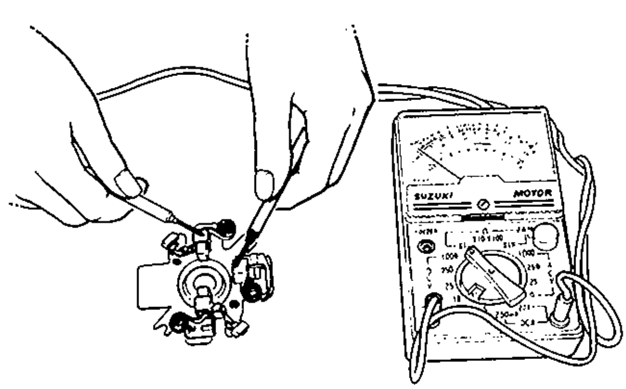


Fig. 9-17

9-7. Important Reminders for Starter Motor Reassembly

Various parts of the starter motor assembly need lubrication at each overhaul. The lubrication points are illustrated below:

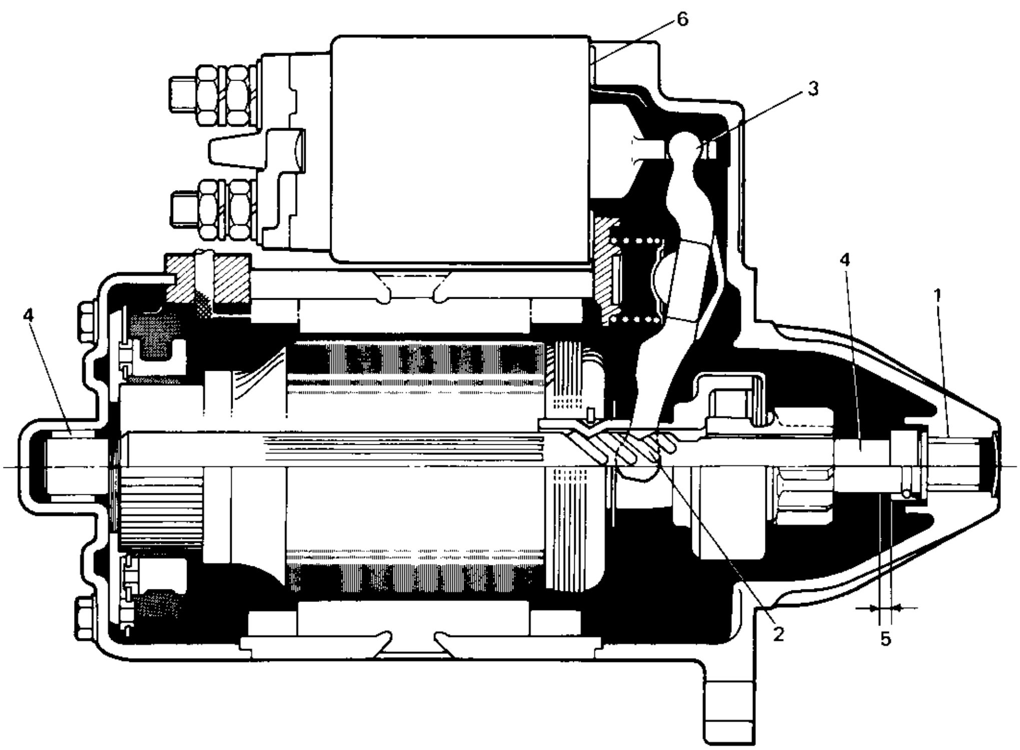


Fig. 9-18

1) Give grease to the bush in the drive housing.

2) Grease the helical splines before mounting the clutch sub-assembly.

3) Grease the sliding or contacting surfaces associated with shift lever.

4) Grease the bush fitted into the end frame and also the armature shaft end inserted into this bush.

5) The pinion gap "5" can be adjusted by means of the magnetic switch packing.
Adjust the gap with in 0.2 ~ 0.5 mm(0.008 ~ 0.020 in) by means of increasing or decreasing the switch packing "6".

Armature

When installing the armature in the shift lever case, align shift lever ① with shift lever groove ③ on the clutch side.

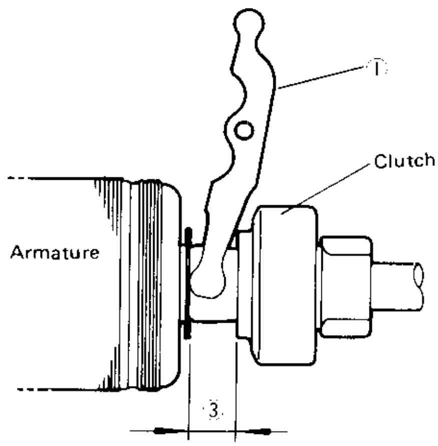


Fig. 9-19

Yoke

When installing the yoke on the shift lever case, be sure to match their match marks Ⓑ marked when disassembling.

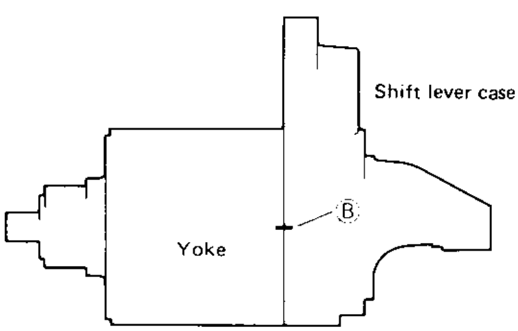


Fig. 9-20

Starter magnetic switch

When installing the magnetic switch on the lever case, be sure to match their match marks Ⓐ marked when disassembling.

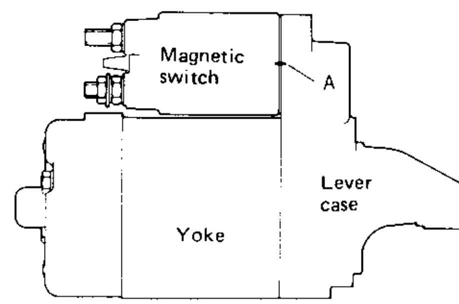


Fig. 9-21

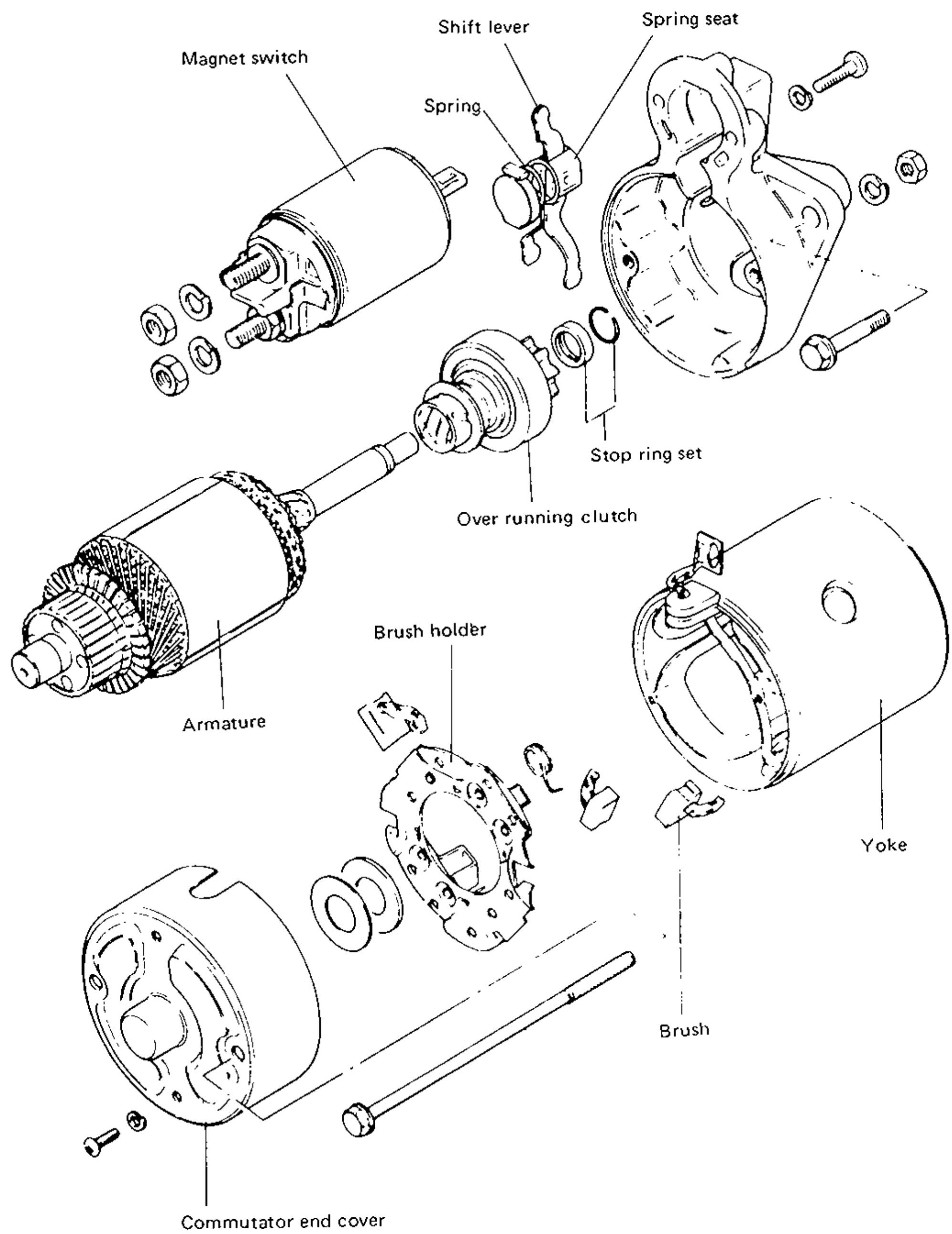

Shift lever
Spring seat
Magnet switch
Spring
Stop ring set
Over running clutch
Brush holder
Armature
Yoke
Brush
Commutator end cover

Fig. 9-22

10. CHARGING SYSTEM

10

10-1. Description

The charging system consists of the alternator complete with a means of rectification for producing DC output power, and the two-element regulator unit for controlling the voltage.

In the alternator, the armature is stationary; it consists of three coils mounted-on the stator in such a way as to produce three-phase alternating voltage. This voltage applies to the rectifier for full-wave rectification. The rectifier delivers power in the form of direct current.

Against the stationary armature, revolving magnetic fields are produced by the field winding carried in the rotor. This feature of construction of the alternator strikes a distinct contrast to the dynamo (DC generator), in which the field is in the stator while the armature is in the rotor.

The magnitude of three-phase AC power available from the alternator to its rectifier is directly proportional to rotor speed and field (excitation) current. It is the function of the regulator unit to control the field current automatically in such a way that the output voltage unit to control the field current automatically in such a way that the output voltage remains constant; another function is to control the circuit of the charge warning light. Thus, the regulator unit has two element; one is voltage regulator for performing the first function and the other is voltage relay for the second function.

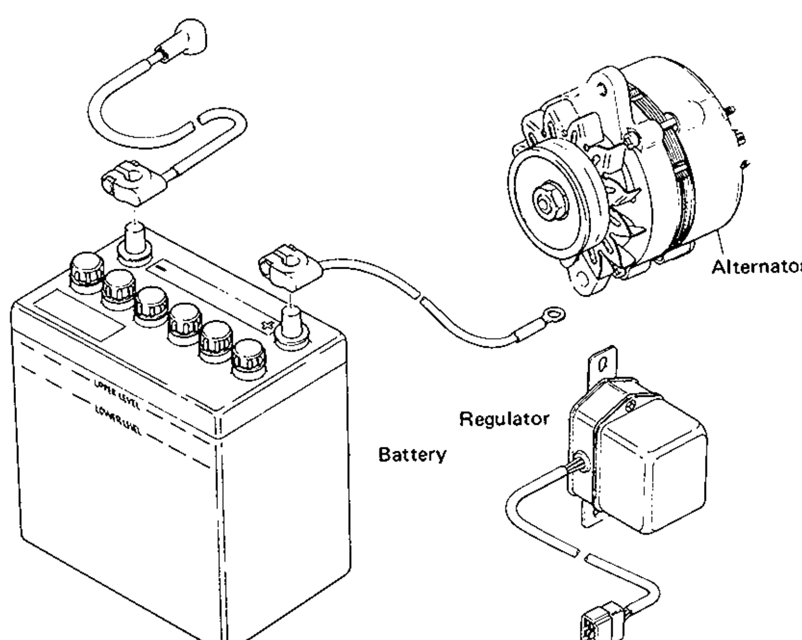


Fig. 10-1

10-2. Charging Operation

The following description of the system operation is referenced to the circuit diagram indicated in Fig. 10-2. Closing the ignition switch connects the charge warning light to the battery; a small current flows through the light, lighting this light to signify that the alternator is not charging the battery, and through the contact point of voltage relay to ground. Another current flows from the battery through the contact point of voltage regulator into the field winding in the alternator rotor, thereby producing magnetic fields around the rotor. These fields, which are stationary at this time because the rotor is not running, link the armature coils and the rotor poles through the air gap between stator and rotor.

Under these conditions, suppose the engine is started up. The rotor begins to run, and its magnetic fields revolve to "cut" the three armature coils in succession. In each armature coil, an electromotive force is generated by electromagnetic induction. This force changes its direction alternately. Consequently, the three armature coils apply three alternating voltages to the rectifier. Viewed collectively, these voltages constitute the three-phase output voltage of the alternator.

The rectifier consists of three pairs of rectifying diodes, forming three one-way paths of current for full-wave rectification to convert the alternator output power into a direct current power, which is available from the "B" terminal of the alternator-rectifier unit, relative to "E" (ground) terminal.

As the engine picks up speed, the electromotive force induced in each armature coil increases, so that the output voltage appearing at terminal "B" (relative to terminal "E") becomes high enough to "push" electricity into the battery through its positive terminal. In other words, the battery begins to draw a charging current.

Let's take a look at the pressure coil of the voltage relay. One end of this coil is connected to terminal "E" and the other end to the neutral point "N" of the three armature coils. Potential level of "E" (ground) is now so much lower than that of "N" that a current flows in the pressure coil to develop a magnetic pull on its armature carrying point "P5". Consequently, point "P5" separates from point "P4" and touches point "P6"; the charge warning light thus becomes shunted and stops burning to signify that the battery is getting charged.

During the early stage of engine starting, the alternator output voltage may be lower than the battery voltage; even in such a case, no current flows from the battery into the alternator because of the rectifier diodes. The reason why a cutout relay is not used here is explained by the presence of the diode rectifier.

The function of the voltage regulator with its voltage coil is to alter the path of field (excitation) current for the field coil, in order to maintain the alternator output voltage at a relatively constant level. When this voltage rises owing to a rise in engine speed, the voltage coil pulls point "P2" away from point "P1", thereby introducing the control resistor "R1" into the field circuit. Field current falls slightly because of this resistance and, consequently, the output voltage falls to the normal level. If the engine picks up speed further, the magnetic pull developed by the voltage coil increases to bring point "P2" into contact with "P3", thereby shunting the field coil to reduce the field current to zero. Under this condition, voltage generation in the alternator is dependent on the residual magnetization of the rotor, which is small enough to keep down the output voltage to the normal level.

The foregoing description of the voltage regulator operation may be summarized as follows: the regulator controls the alternator output voltage by controlling the field current in three steps; first allowing a full field current to flow; secondly, by inserting a resistor into the circuit to reduce the field current; and thirdly, by shunting the field coil to reduce the current to zero, all for maintaining the output voltage at a relatively constant level.

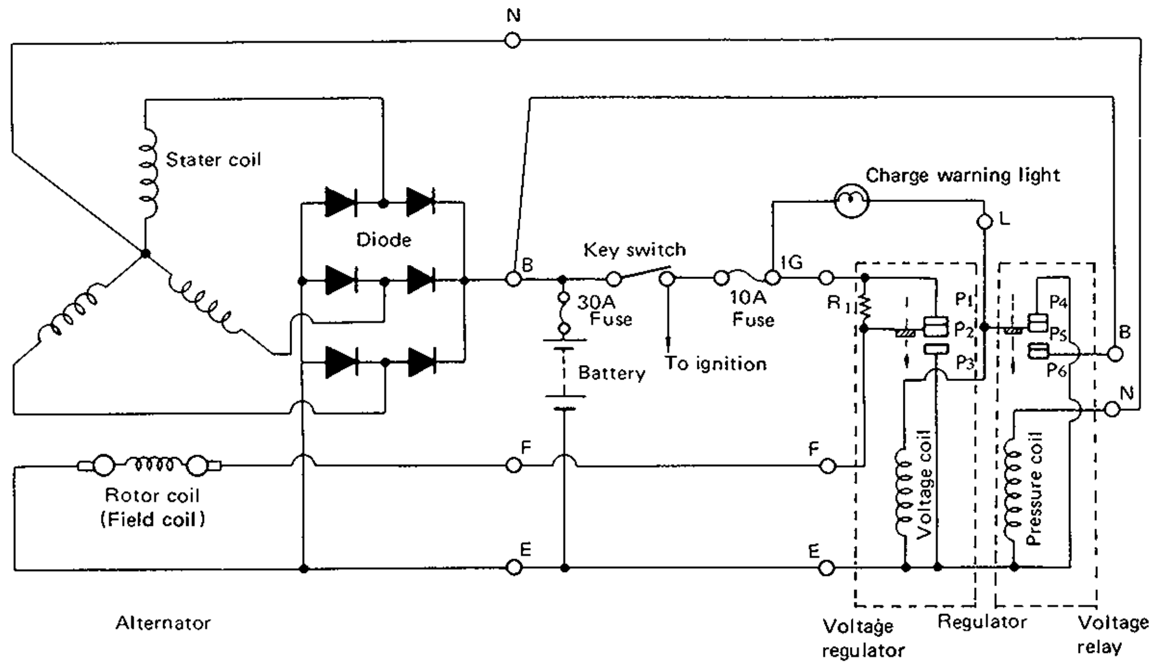

N
Stater coil
Diode
Charge warning light
L
B
Key switch
1G
30A
Fuse
10A
Fuse
R_1
P1
P2
P3
P4
P5
P6
B
N
To ignition
Battery
F
F
Rotor coil
(Field coil)
E
E
Voltage coil
Pressure coil
Alternator
Voltage
regulator
Regulator
Voltage
relay

Fig. 10-2

10-3. Alternator

Description

In order to distinguish it from conventional automotive dynamos, the AC generating device is called an alternator for it produces a DC output from three alternating currents generated in its winding.

The alternator consists of: the rotor (which produces revolving magnetic fields), stator (which is a series of coils disposed and arranged to form three coil groups), two slip rings and two brushes (through which DC excitation current is fed into the field winding of the rotor), and the rectifier (which consists of 6 semiconductor diodes, and is built in the alternator).

In operation, the revolving magnetic fields "cut" the stator coils. In other words, the three groups of coils experience changes in magnetic flux. By the flux changes, an alternating electromotive force (emf) is induced in each coil group. Thus, three alternating voltages are available from the stator.

The six diodes are arranged so that they "rectify" or convert the three alternating outputs into a DC output. Three-phase full-wave rectification is effected by the built-in rectifier.

In terms of electric current, a diode is a circuit element that passes the current only in one direction. Of the six diodes, three are arranged to pass currents in the same direction, and the remaining three in the opposite direction. Since three alternating currents undergo full-wave rectification and are combined into one by superposition, the DC output of this alternator is much steadier and carries much less pulsating or ripple components than a DC output made available by full-wave rectification of a single-phase alternating current.

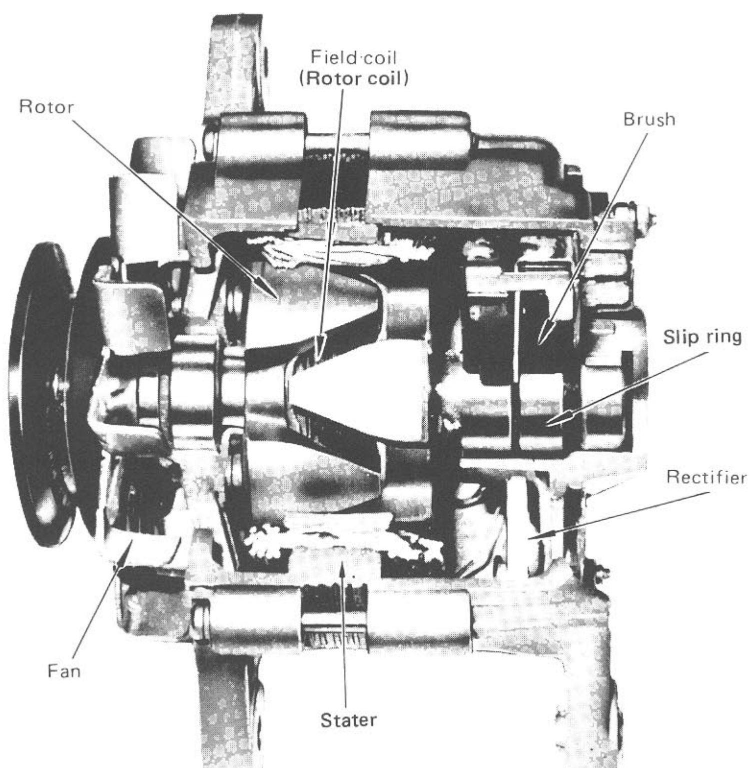


Fig. 10-3

Data and Specification

Nominal operating Voltage	12 Volts
Maximum alternator output	35A
Polarity	Negative ground
Effective pulley diameter	65 mm (2.56 in.)
No-load alternator speed	1,050 ~ 1,250 r/min, 14 Volts at normal temperature
Full-load alternator speed	4,000 r/min. maximum, 35A, 14 Volts at normal temperature
Direction of rotation	Clockwise as viewed from pulley side
Maximum permissible alternator speed	13,000 r/min. (rpm)
Working temperature range	–40°C ~ 80°C (– 40°F ~ 176°F)
Rectification	Full-wave rectification

Removal

(1) Disconnect the negative (–) and positive (+) battery cables from the battery.
(2) Disconnect from the alternator the white/-blue cord and circuit coupler.
(3) Remove the bolts securing "V" belt adjuting arm and alternator and take down the alternator.

Alternator Disassembly

Remove the nut securing the fan to the rotor shaft. To do so, the shaft must be held rigid and steady by using a special tool Ⓐ.

Hexagon wrench. 6 mm (09911-70120)

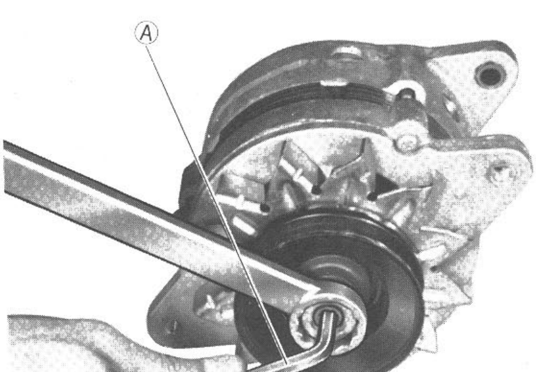


Fig. 10-4

Remove the 3 bolts fastening the end frame to the rotor housing; tap on the edges of the end frame with a wooden mallet to separate it from the housing, thereby severing the rotor from the stator.

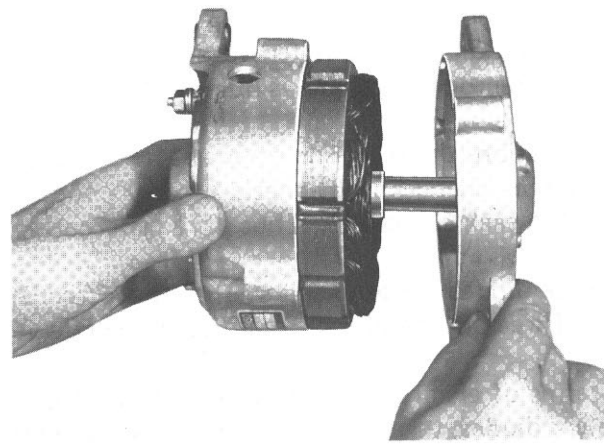


Fig. 10-5

Draw out the rotor. It may be necessary to lightly tap on the core and housing.

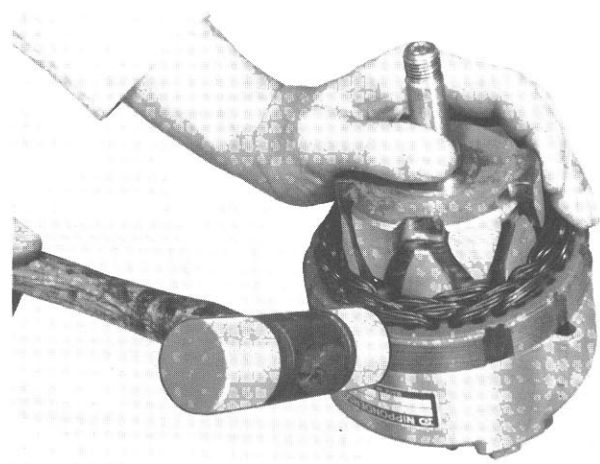


Fig. 10-6

Remove the 3 nuts securing the rectifier holder in place, and one other nut holding down the terminal insulator. Remove the rear end cover.

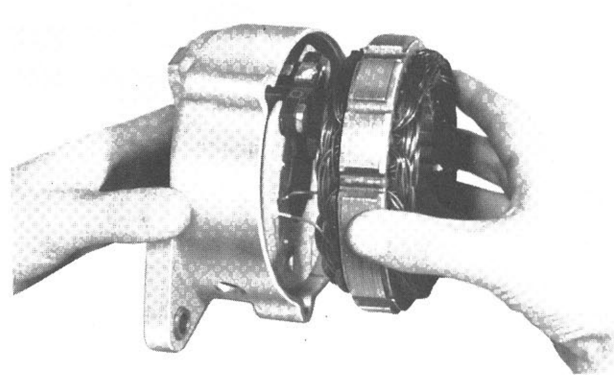


Fig. 10-7

Remove the brush holder from the stator.

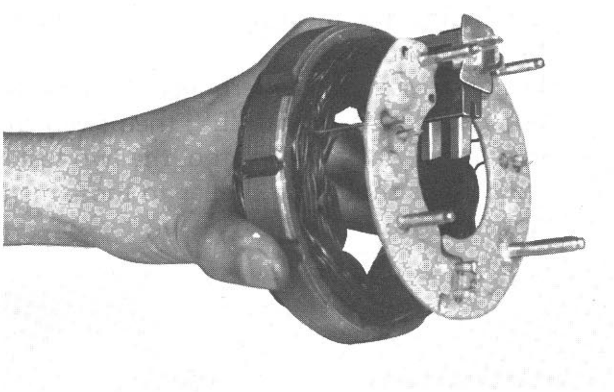


Fig. 10-8

> NOTE:
> The alternator is to be reassembled by reversing the foregoing sequence of steps. Before inserting the rotor into the housing, be sure to have the brushes installed in the holder. (Use a propersize rod Ⓐ , manipulating it from the rectifier side, to set the brush in the holder.)

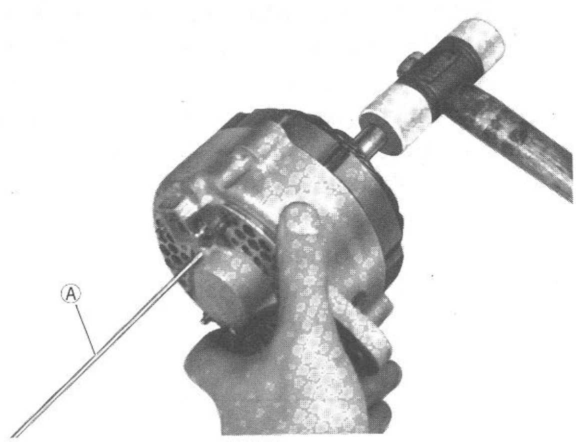


Fig. 10-9

Maintenance Services

(1) Rotor

- Testing the rotor for open-circuit
  Check to be sure there is continuity between the two slip rings when tested as shown. Absence of continuity means that the field coil is open-circuited and must be replaced.

Ring-to-ring circuit resistance	4 ~ 5 ohms

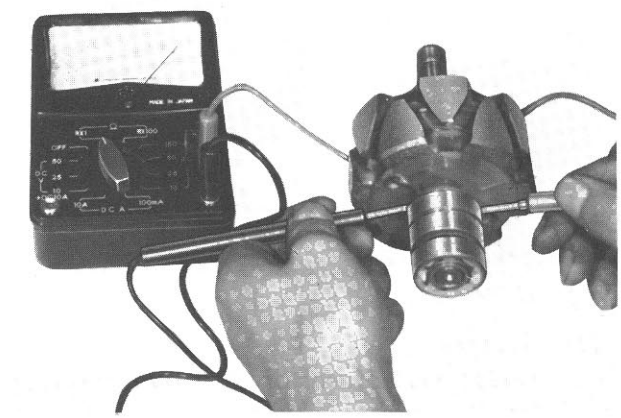


Fig. 10-10

- Testing the rotor for grounding
  Check to be sure there is no continuity between the slip ring and the rotor shaft when tested as shown. Presence of any continuity means that the insulation on the field coil has failed, making it necessary for the rotor to be replaced.

Fig. 10-11

(2) Stator

Check to be sure there is no continuity between the stator core and each armature coil; any continuity noted means that the coil is grounded. A grounded armature coil can be corrected by locating the faulted point and repairing the fault.

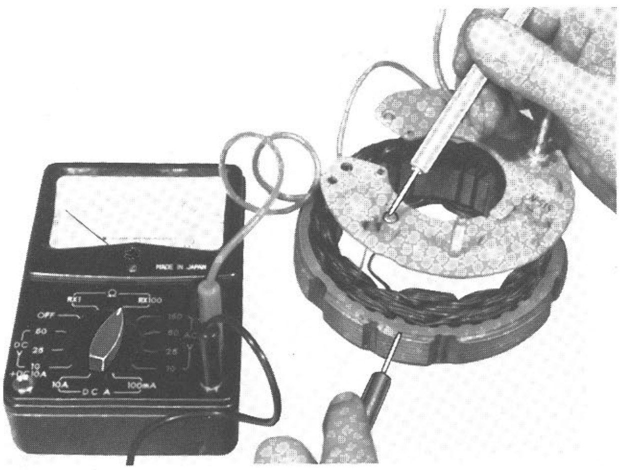


Fig. 10-12

(3) Brushes

Check each brush for wear by measuring it length, as shown. If the brush is found worn down to the service limit, replace the brush and holder altogether.

	Standard	Service limit
Brush length	16.5 mm (0.65 in.)	11.0 mm (0.45 in.)

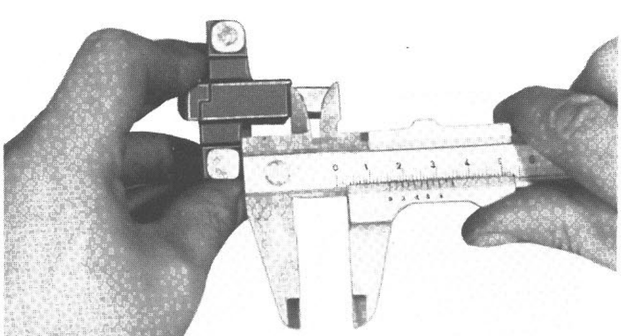


Fig. 10-13

(4) Rectifier

The rectifier is to be checked with the circuit tester for continuity in one direction and non-continuity in the other direction.

Put one tester lead to terminal "B" and the other lead to terminal "N"; then swap the two leads. Of the two tester indications, one should be about 20 ohms, meaning continuity, and the other should be infinity (non continuity.).

Put one tester lead to terminal "N" and the other lead to terminal "E"; then swap the two leads. In this case, too, the two tester indications should be similar to those mentioned above.

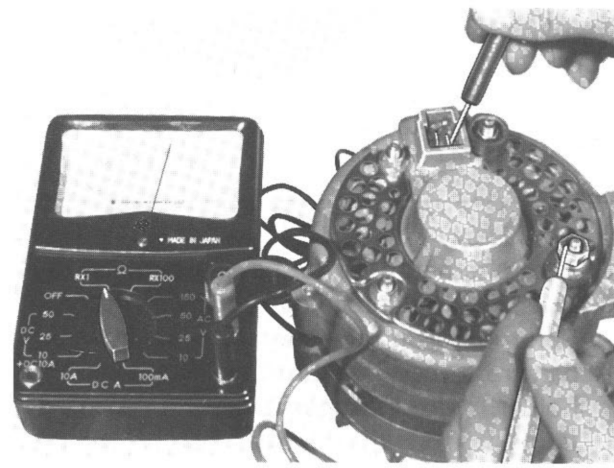


Fig. 10-14

(5) Alternator load performance

With the alternator-rectifier unit in place, run the engine in a speed range of 3,000 to 4,000 r/min., and check the alternator output voltage and current. Compare the readings against the prescribed values, indicated below. An output current which is small means the possibility of the rectifier being defective, any of the stator (armature, coil open-circuited, or an insulation failure resulting in a grounding fault.

Standard output voltage and current	13.8 ~ 14.8 volts, 20A minimum

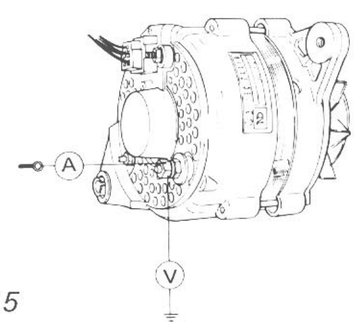


Fig. 10-15

10-4. Alternator Regulator

In the two-element regulator, one coil acts as voltage limiter or regulator and the other coil as relay for controlling the charge warning lamp. It should be noted in the circuit diagram that the magnetic pull developed by the voltage coil to move its moving point "P2" is roughly proportional to the alternator output voltage, whereas the magnetic pull developed by the pressure coil of the relay is dependent on the potential level of neutral point "N" of the armature with respect to the ground. A clear understanding of these relations is essential in checking, testing and servicing the regulator unit.

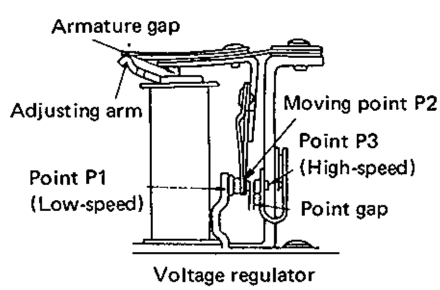


Fig. 10-16

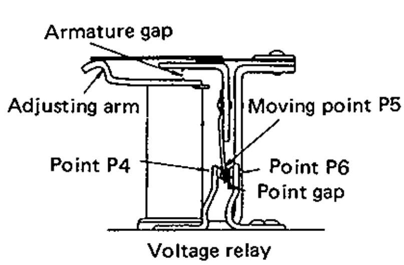


Fig. 10-17

Specifications

Regulated voltage	13.8 ~ 14.8 volts
Voltage-relay cut in voltage	4 ~ 5.8 volts

Maintenance services

(1) Voltage-regulator limiting action test
Hook up a voltmeter, inserting it between the alternator "B" terminal and ground, and run the engine within a range of 2,000 to 3,000 r/min., while reading the voltmeter indication. The voltage read is the charging voltage as limited by the action of the voltage regulator; the reading should be within the prescribed range, which is indicated below. If the charging voltage is found too high or too low, adjust it by bending the adjusting arm of the voltage regulator.

Prescribed range of charging voltage	13.8 ~ 14.8 volts for 2,000 ~ 3,000 engine r/min.

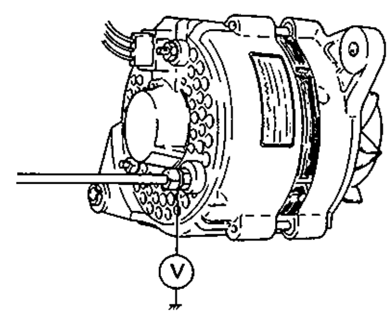


Fig. 10-18

ⓐ If the charging voltage is noted to oscillate or otherwise be unstable, it is most likely that the contact point faces in the voltage regulator are dirty or roughened. Cleaning and smoothening the faces will remedy this malcondition.

ⓑ If the charging voltage is too high, the possible causes are as follows:

- Armature gap is too wide on low-speed side or high-speed side in the voltage regulator.
- Contact resistance at high-speed side point is too large.
- The coil of voltage regulator or relay is open-circuited.
- Open circuit in the line to "N" or "B" terminal of the regulator unit. (Refer to Fig. 10-20)
- Contact pressure is too high on low-speed side point.
- Imperfect grounding of the regulator unit.

(2) Continuity test on field coil
Using the circuit tester, check for continuity between the "E" and "F" terminals of the alternator, as shown. The tester should indicate continuity with a resistance value meeting the following specification:

Standard field circuit resistance	6 ~ 9 ohms

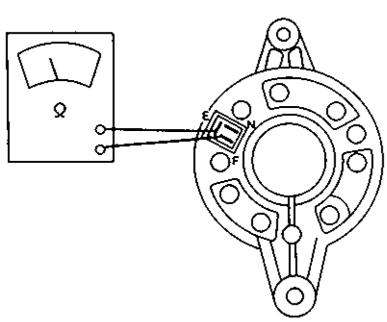


Fig. 10-19

ⓐ If the resistance value noted is too small, it is likely that there is a short-circuit through insulation layers in the coil.

ⓑ If the resistance value noted is too large, the following possibilities must be considered:

- An open-circuit is developing in the field coil.
- The brushes are not seated properly on the slip rings.
- Brushes or slip rings are burnt.

(3) Checking terminal-to-terminal resistances
Pull off the connector from the regulator unit, remove the cover, and check the resistance between terminals. Refer the resistance readings to the following chart to diagnose the internal condition of the regulator unit:

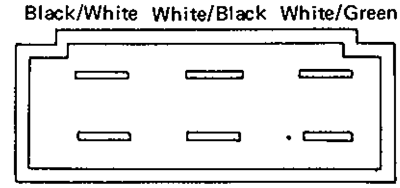


Fig. 10-20

Guide on regulator diagnosis				
Terminal checked	State of vol. relay	State of vol. regulator	Normal resistance value (ohms)	Diagnosis
IG-F		Standstill	Zero	If not zero, point contact is defective on low-speed side.
		Operated	Approx. 11	If infinity is noted, control resistor is open-circuited.
L-E	Standstill		Zero	If not zero, relay contact point is not closing fully.
	Operated		Approx. 100	If zero, relay point faces are fused together. If infinity is noted, voltage coil is open-circuited.
N-E			Approx. 24	If zero, pressure coil is shorted. If infinity, voltage coil is open-circuited.
B-E	Standstill		Infinity	If not infinity, relay point faces are fused together.
	Operated		Approx. 100	If zero, voltage coil is shorted. If infinity, voltage coil is open-circuited or contact action of the point is defective.
B-L	Standstill		Infinity	If not infinity, relay point faces are fused together.
	Operated		Zero	If not zero, contact action of the point is defective.

NOTE:
In the above chart, "standstill" means that the regulator unit is in de-energized state; "operated" means that the armature is manually (with a fingertip) actuated as if it were pulled in by the coil.

(4) Gap adjustment

ⓐ Voltage relay

Using a thickness gauge, check the two gaps, point gap and armature gap. Refer the gauge readings to the specification value, below, and adjust the gaps as necessary.

Gap specifications	
Armature gap	Approx. 0.6 mm (0.023 in.)
Point gap	Approx. 0.4 mm (0.015 in.)

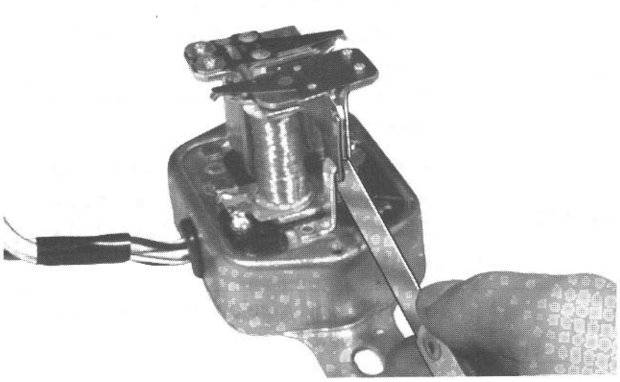


Fig. 10-21

ⓑ Voltage regulator

Two gaps are to be checked: point gap, and armature gap. Use a thickness gauge, and compare the readings taken against the following specifications. Adjust the gaps as necessary.

Gap specifications	
Aumature gap	Approx. 1.1 mm (0.043 in.)
Point gap	Approx. 0.5 mm (0.019 in.)

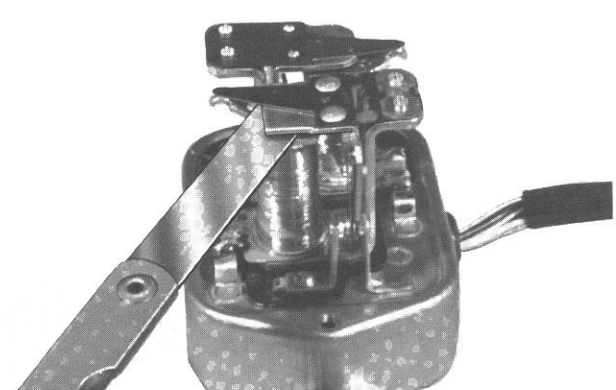


Fig. 10-22

10-5. Main Fuse

The main fuse, located in the path of current to and from the battery, is of fusible link type, whose conductor wires are copper-nickel alloy in material and are sheathed in double layer of insulation. It interrupts overcurrent by the melting action of its conductor.

Interrupting capacity of main fuse	0.5 mm^2 (fusible link)

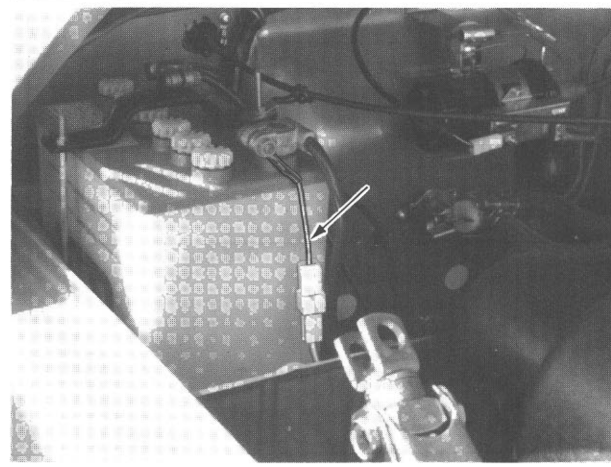


Fig. 10-23

10-6. Battery

1) Battery specifications

Model	NS40S [NX100-S6G]
Rated capacity	30AH [47AH], 12 Volts
Electrolyte	2.2 liters [3.3 liters] (4.65/3.87 US/Imp. pt.) [6.97/5.80 US/Imp. pt.]
Electrolyte S.G.	1.280 when fully charged at 20°C (68°F)

[ ] For Canadian market

2) Care of the battery

The following information is basic in nature and is nothing new; it is merely a reiteration of what every Service shop personnel knows about the automotive storage battery. The information is intended to serve as a reminder to the reader, with a hope that he will, in turn, remind each final user of the important basic facts about the battery whenever opportunity permits him to engage in a conversation with the final user in the shop or out of the shop.

(1) The battery is a very reliable component, but needs periodical attentions.
Keep the battery container clean; prevent rust formation on the terminal posts; keep the electrolyte up to the upper level uniformly in all cells; and try to keep the battery fully charged at all times.

(2) Preserve the capacity of the battery.
There is a limit to the ability of the bättery to hold electricity in store. This limit is called "capacity."

There are several ways for the battery to lower its capacity:

ⓐ Loss of electrolyte, or fall in electrolyte level.
When this happens, the battery cannot hold so much electricity as it originally could. Handle the battery with care when you take it down. Barring the loss of electrolyte by careless spilling or otherwise, the electrolyte level goes down gradually in the battery at work because the water content of it evaporates. Periodically refill distilled water to each cell, as necessary, so that the electrolyte is always up to the specified level. Never allow its surface to fall so much as to expose the cell plates.

ⓑ Overcharging the battery in place or off the machine.
In recharging the battery off the machine, caution must be exercised so as not to overcharge it. Overcharging gives rise to several complexities. For one thing, it heats up the battery to deform the battery container to result in a destroyed battery. Overcharging could occur in a battery in place if the voltage regulator is maladjusted to allow the alternator (or the dynamo in other machines) to develop too high an output voltage. For another thing, "gassing" occurs in a battery being overcharged to result in a loss of water content. One of the most serious consequences of overcharging is the swelling of positive-plate grids, causing the grids to crumble and the plates to buckle.

ⓒ Undercharging the battery in place.
Regulator malfunctioning is usually the cause of the battery remaining in a state of charge far below its capacity. This condition is very undesirable in freezing weather, for the electrolyte in such a battery can easily freeze up to result in a destroyed battery. Moreover, an undercharged battery is an easy prey to a greater evil-sulfation.

ⓓ Sulfation.
Let us recall the electrochemical reactions that take place in the battery during charging and discharging. As the battery gives out its energy (discharging), the active materials in its cell plates are converted into lead sulfate. During recharging, this lead sulfate is reconverted into activ material. If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. "Sulfation" means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but it is a damaged battery and its capacity is lower than before.

(3) Keep the battery cable connections clean.
The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current. The inability of the starter motor to crank the engine is often due to the rust formation in the battery cable connection. Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

(4) Be always in the know as to the state of charge of the battery.
The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an inexpensive instrument for measuring the specific gravity (S.G.) of the battery electrolyte. Why measure the S.G.? Because the S.G. of the electrolyte is indicative of the state of charge.

The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter, an expensive instrument used generally in the service shops but no recommendable to the user of the machine.
At 20°C of battery temperature (electrolyte temperature):
The battery is in FULLY CHARGED STATE if the electrolyte S.G. is 1.280.
The battery is in HALF CHARGED STATE if the S.G. is 1.220.
The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.
What if the battery temperatures not 20°C (68°F)? Since the S.G. varies with temparature, you have to correct your S.G. reading (taken with your hydrometer) to the value at 20°C, and apply the corrected S.G. value to the three-point guide stated above. This manner of correction needs a chart showing the relation between S.G. and temperature. There is a simpler way: refer to the graph given below, which tells you the state of charge for a range of S.G. value and a range of temperature.
How to use the temperature-corrected state-of-charge graph.
Suppose your S.G. reading is 1.28 and the battery temperature is −5°C (23°F). Locate the intersection of the −5°C line and the 1.28 S.G. line. The intersection is "A". It is in the zone for CHARGED STATE. How much is the battery charged? To find out the answer, draw a line parallel to the zone demarcation line, extending it to the right, and see where this line crosses the percentage scale. In the present example, the line crosses at, say, 85% point. The battery is 85% fully charged.

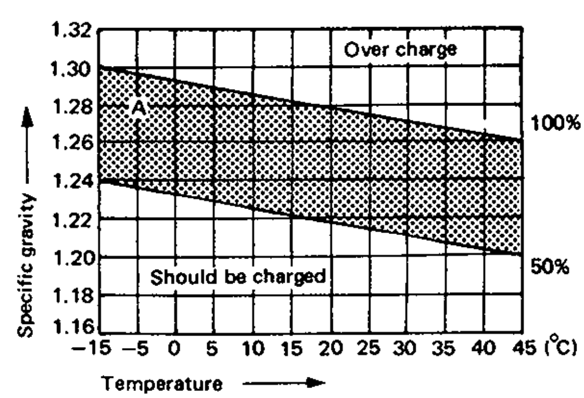


Fig. 10-24

11. CLUTCH

11

11-1. Description

The clutch is a diaphragm-spring clutch of dry single disc type, as shown in the cross sectional view of Fig. 11-1. The diaphragm spring is of tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapering fingers pointing inward. The disc, carrying four torsional damper rubbers, is slidably mounted on the transmission input shaft with a serration fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between). When the clutch release bearing (throwout bearing) is held back: This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and push on the tips of the tapering fingers of diaphragm spring. When this happens, the diaphragm spring acts like the release levers of a conventional clutch, pulling the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.

The clutch construction is simple, well balanced relative to rotating speed, durable and capable of withstanding high torsional load and, what is particularly noteworthy, does not require the adjustment of the kind involved in the conventional coil-pressure-spring release-lever type of clutch.

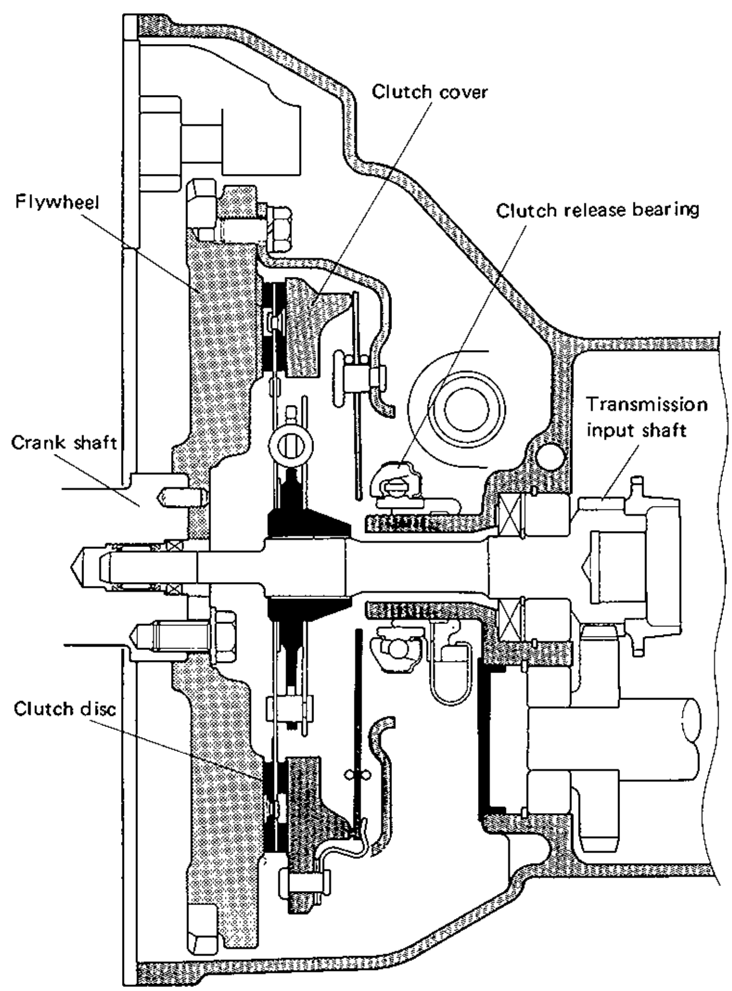


Fig. 11-1

11-2. Removal

Removal of the clutch presupposes that the transmission has been dismounted according to the method outlined in the section for the transmission.

Clutch disc

Remove the 6 bolts securing the clutch vover to the flywheel, and take off the cover and clutch disc.

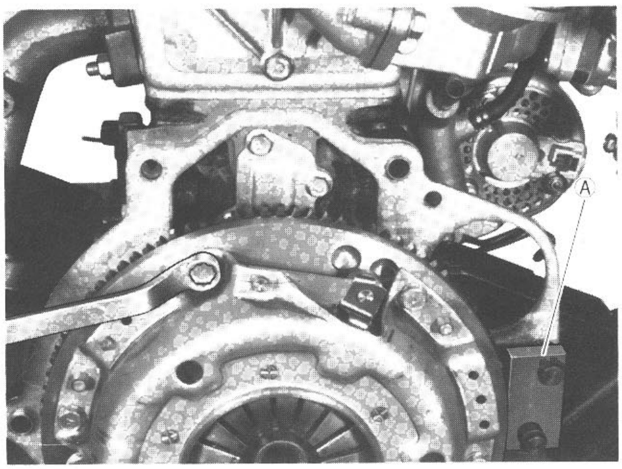


Fig. 11-2 Ⓐ *Flywheel stopper (09916-97310)*

Clutch release bearing

With the clutch release bearing attached to the retainer, remove the retainer spring from the release shaft. The release bearing will come off as the spring is being removed.

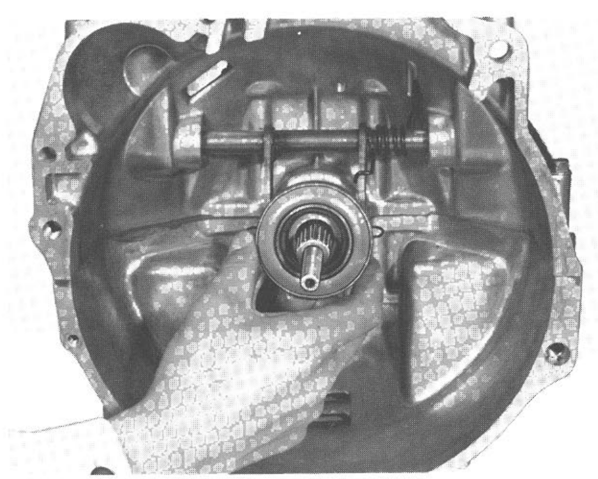


Fig. 11-3

11-3. Maintenance Services

Clutch disc facing surface condition

A burnt or glazed (glass-like surface) facing can be reconditioned by grinding it with No. 120 ~ 200 sandpaper. If the surface is in bad condition beyond repair, replace the whole clutch disc assembly.

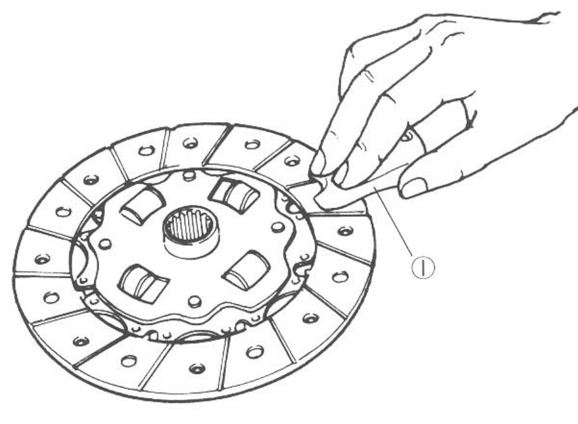


Fig. 11-4 ① *Sandpaper*

Clutch facing wear

Check the wear of the facing by measuring the depth of each rivet head depression, which is the distance between rivet head and facing surface. If the depressing is found to have reached the service limit at any of the holes, replace the clutch disc assembly.

	Standard	Service limit
Rivet head depression	1.2 mm (0.05 in.)	0.5 mm (0.02 in.)

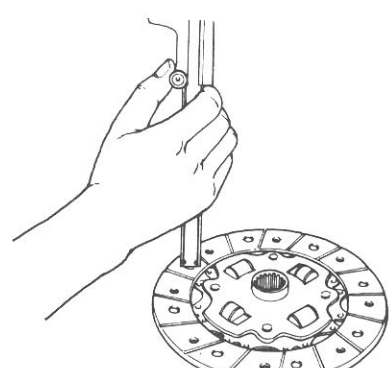


Fig. 11-5

Backlash in disc serration fit

Check the backlash by turning the disc back and forth as mounted on the transmission input shaft. Replace the disc assembly if the backlash is noted to exceed the limit. Backlash here is a circular displacement as measured with a dial indicator.

A clutch disc exhibiting a large backlash will make an impact noise each time the clutch is engaged, and will prevent the clutch to engage smoothly.

Backlash in serration fit	Service limit
	0.5 mm (0.02 in.)

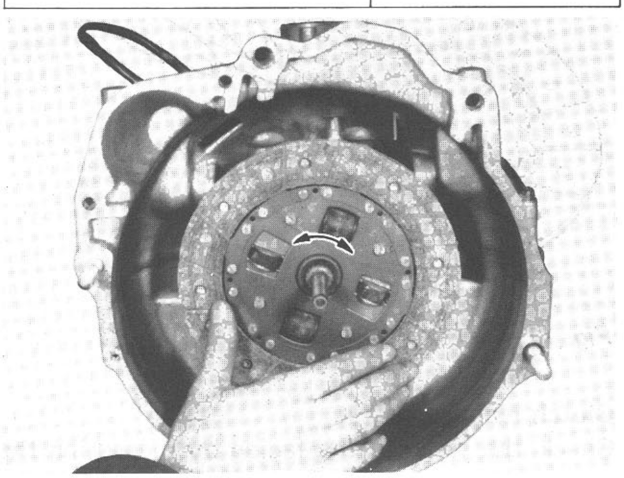


Fig. 11-6

Clutch cover

Inspect the clutch cover for evidence of the diaphragm spring rivets getting loose. If the rivets are loose or are tending to become loose, replace the cover assembly; such a cover makes a rattling noise when the clutch pedal is depressed.

Inspect the tips of the tapering fingers (to which the release bearing exerts a push to disengage the clutch) for wear. If the tips are worn excessively, replace the cover assembly.

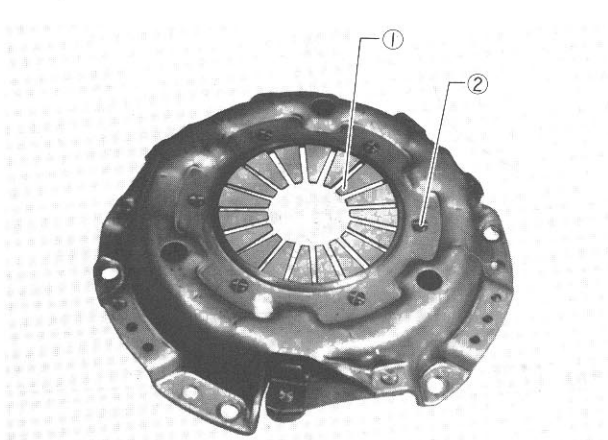


Fig. 11-7 ① Spring wear; ② Rivet

Release bearing

Replace the release bearing if it sticks, rattles or makes abnormal noise when spun and turned by hand.

Fig. 11-8

Input shaft bearing and oil seal

Inspect the pilot bearing (by which the forward end of the input shaft is piloted in the crankshaft) and oil seal for evidence of malcondition at all times.

Abnormal noise coming from the clutch, when the clutch pedal is depressed to disengage the clutch, is often due to a defective pilot bearing.

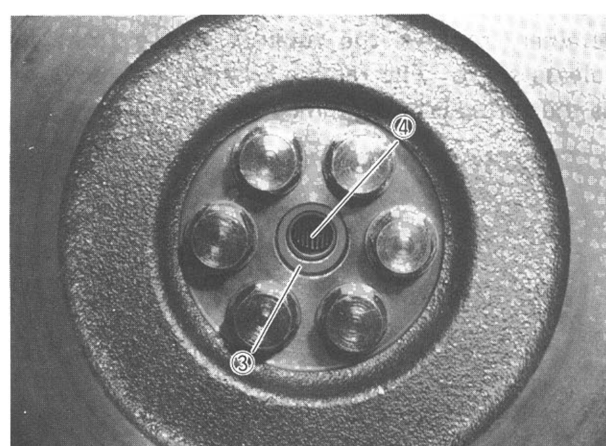


Fig. 11-9 ③ Oil seal, ④ Bearing

Clutch pedal height (For left-hand steering vehicle)
Bring the clutch pedal height to the same height as that of the brake pedal. This is to be accomplished by screwing in or out the adjusting bolt located near the pivoting point of the pedal arm.

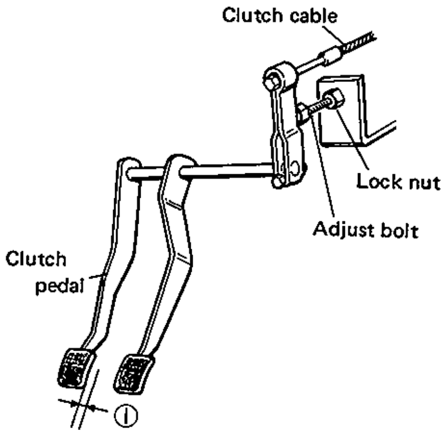


Fig. 11-10

Clutch pedal play
There are two places where adjustment is to be made for giving a proper amount of play to the clutch pedal. One is the clutch cable adjuster ②, above the engine mounting member; and the other is the inner cable adjusting nut at the distal end of the clutch release lever. The play is prescribed to be within the following range:

Clutch pedal play ①	15 ~ 25 mm (0.6 ~ 1.0 in.)
Clutch release arm play	2 ~ 4 mm (0.08 ~ 0.16 in.)

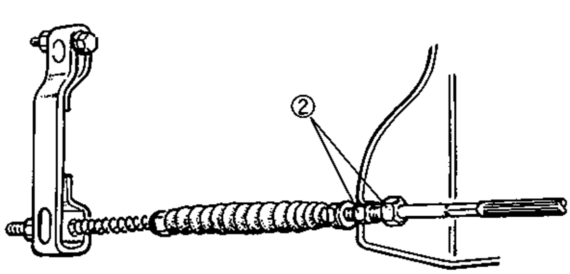


Fig. 11-11

Clutch cable lubrication
Apply grease to the hook part ③ of clutch cable.

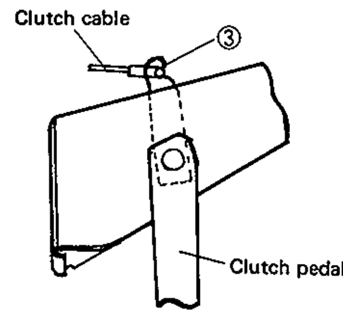


Fig. 11-12

11-4. Installation

The clutch is to be installed by reversing the removal procedure. Some important steps will be explained in detail.

Clutch disc and clutch cover

A special tool must be used to install the disc and cover, in order to align the two to the transmission input shaft. The tool is a sort of dummy; insert it into the bearing (pilot bearing) (as if it were the transmission input shaft). Then mount the disc and cover and, after bolting up the cover to the flywheel, draw off the mounting tool Ⓐ.

Clutch disc center guide (09923-36310)

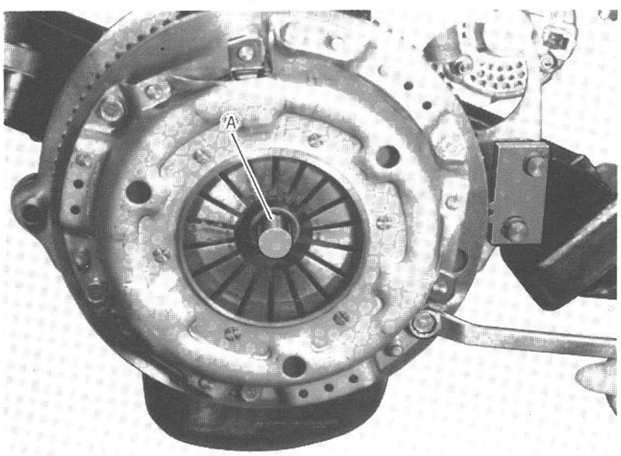


Fig. 11-13

Input shaft bearing

There is a void between input shaft bearing and oil seal. Make this void 60% full with SUZUKI SUPER GREASE "A".

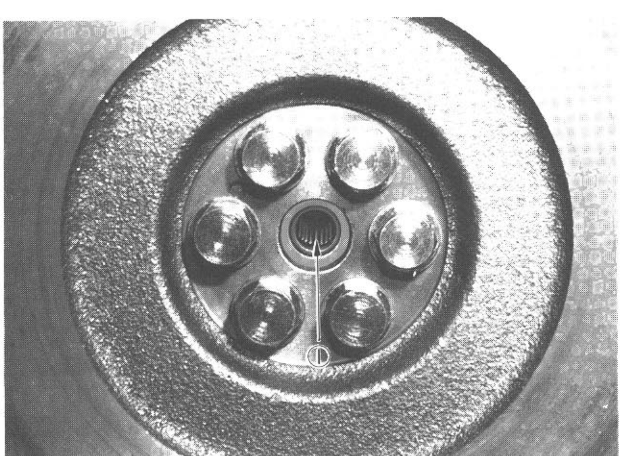


Fig. 11-14 ① *Grease*

Clutch release bearing retainer

Before installing the retainer, apply SUZUKI SUPER GREASE "A" to its inner surface.

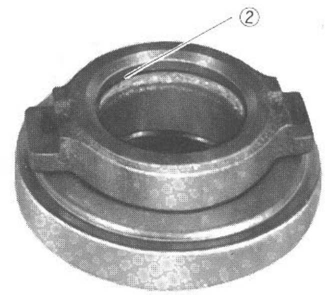


Fig. 11-15 ② *Grease*

Clutch release arm

Align the two punch marks when installing the clutch release arm on the clutch release shaft.

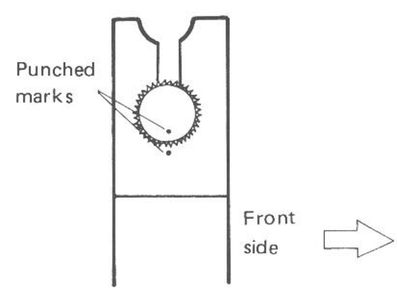


Fig. 11-16

12. GEARSHIFTING CONTROL

12

12-1. Description

In this gear shifting control system, by its mechanical structure, the movement of the gear shift lever, which is located beside the driver's seat, directly actuates the gear shift fork shaft to shift the gear into the selected position. This system consists of the following parts.

1. Gear shift lever knob
2. Gear shift lever
3. Gear shift lever boot No. 2
4. Gear shift lever boot No. 1
5. Gear shift lever case cover
6. Gear shift lever locating bolt
7. Gear shift lever case
8. Reverse select guide pin screw
9. Reverse select locating springs
10. Reverse select locating ball
11. Reverse select guide pin
12. Reverse gear shift fork shaft
13. High speed gear shift fork shaft
14. Select return springs
15. Low speed select guide pin bolt
16. Low speed select guide pin
17. Low speed gear shift fork shaft
18. Gear shift lever wave washer
19. Gear shift lever seat

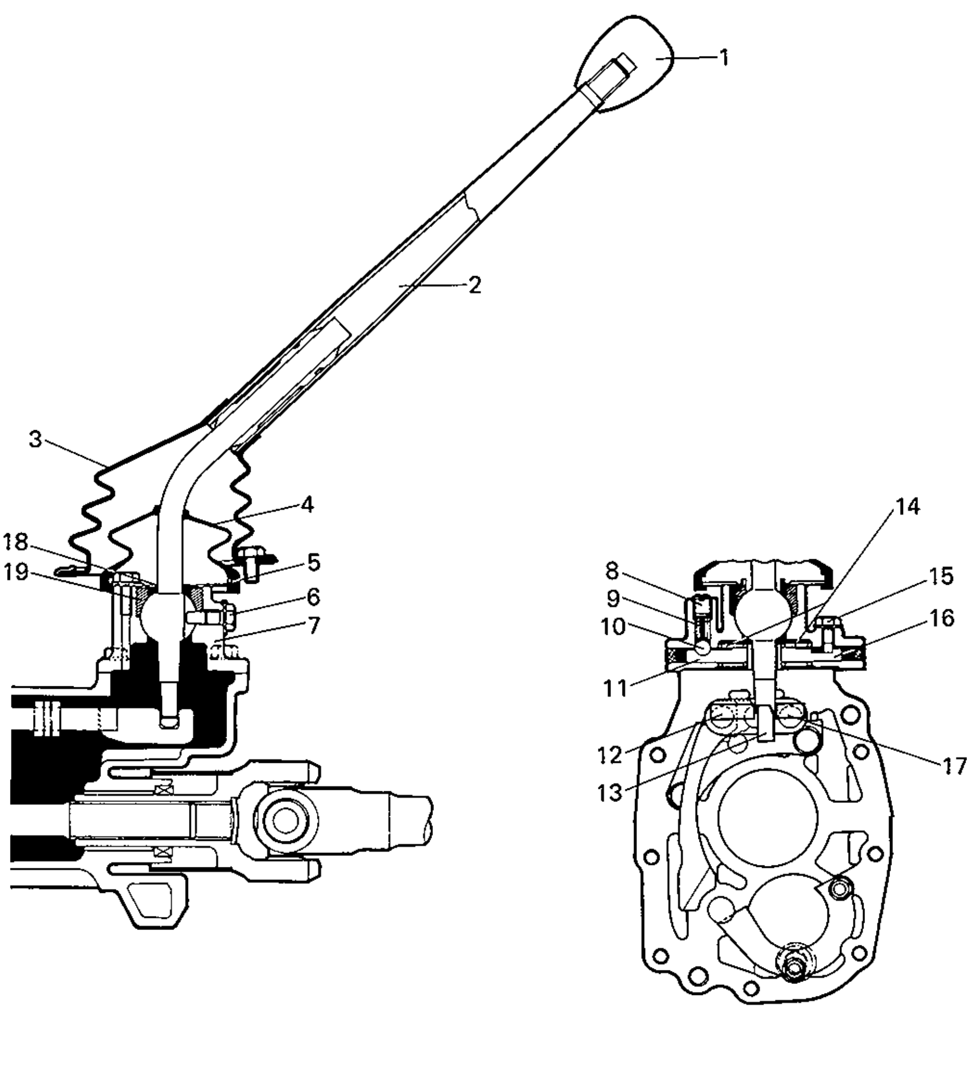


Fig. 12-1

12-2. Removal

Gear shift lever

1) Remove the bolts tightening the gear shift lever boot No. 2 and take the boot off the floor center tunnel.

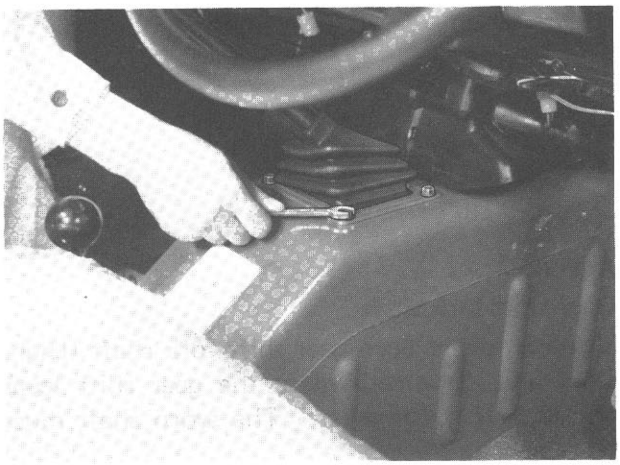


Fig. 12-2

2) Take the boot No. 1 off the gear shift lever case and move it up (toward the knob).
3) Remove 3 bolts tightening the gear shift lever case cover.

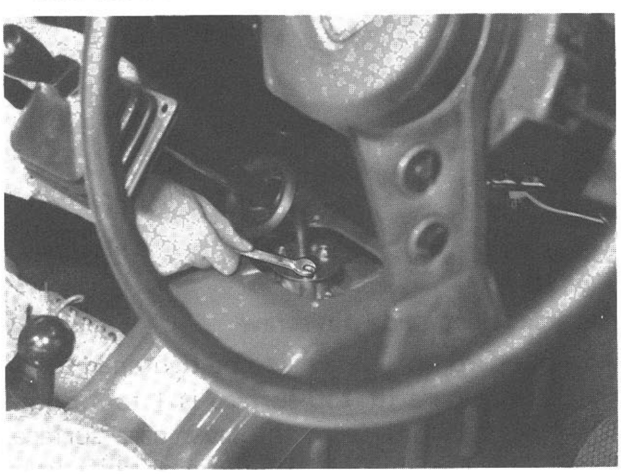


Fig. 12-3

4) Pull the gear shift lever out of the gear shift lever case.

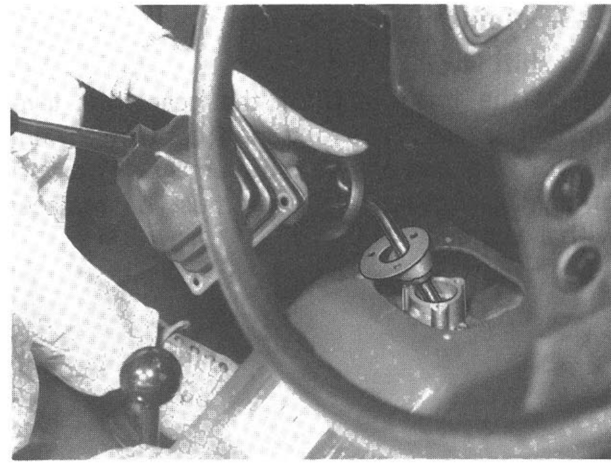


Fig. 12-4

Gear shift lever select guide pins

1) After the gear shift lever is removed according to the foregoing steps 1) through 4), remove the gear shift lever case by loosening its tightening bolts.

Fig. 12-5

2) Loosen the reverse select guide pin screw and take out the spring and ball from the case.
3) Loosen the low speed select guide pin bolt.
4) Compress the reverse select guide pin ② against the low speed select guide pin ① and take it out of the gear shift lever case.

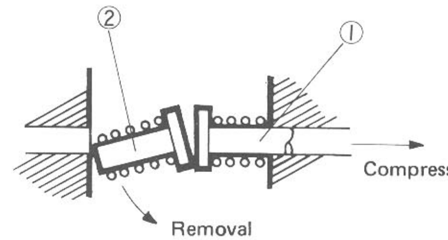


Fig. 12-6

12-3. Maintenance Services

Gear shift lever

Check the lower end of the gear shift lever where the gear shift fork shaft contact, ① and ②, for wear and any kind of damage. The worn or damaged gear shift lever must be replaced with a new one.

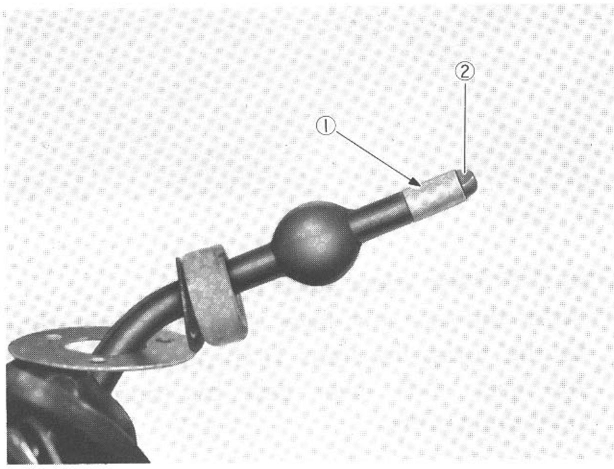


Fig. 12-7

Reverse & Low speed select guide pins

Check both select guide pins where the gear shift lever contacts, ③, if a stepped wear is found. If found, replace the worn select guide pin.

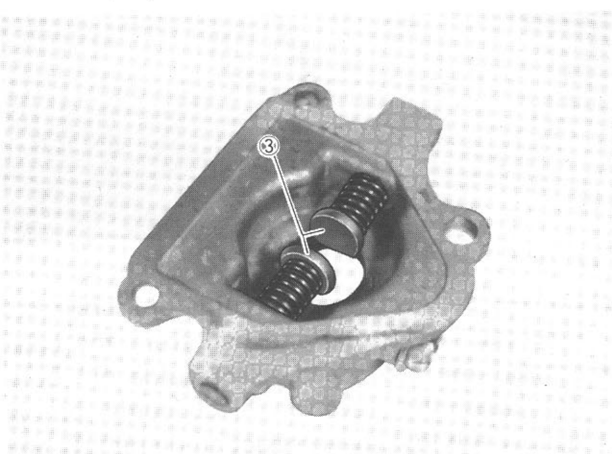


Fig. 12-8

Move the shaft and check the low speed select guide pin for smooth movement without rattle. If found defective, replace it and apply grease to the pin.

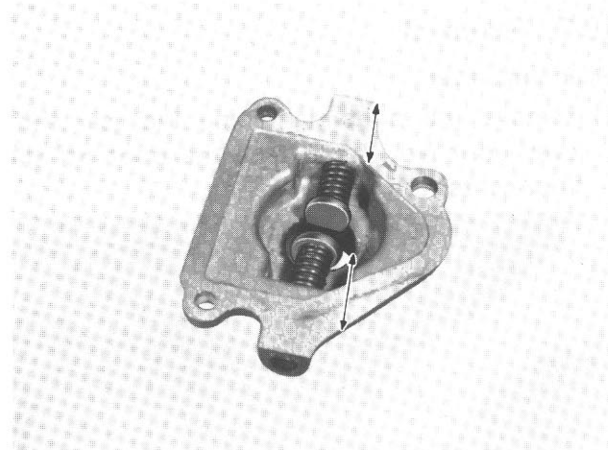


Fig. 12-9

Gear shift fork shaft

Visually check each gear shift fork shaft (High, Low and Reverse) where the gear shift lever contacts, ④, for wear. The worn shaft must be replaced.

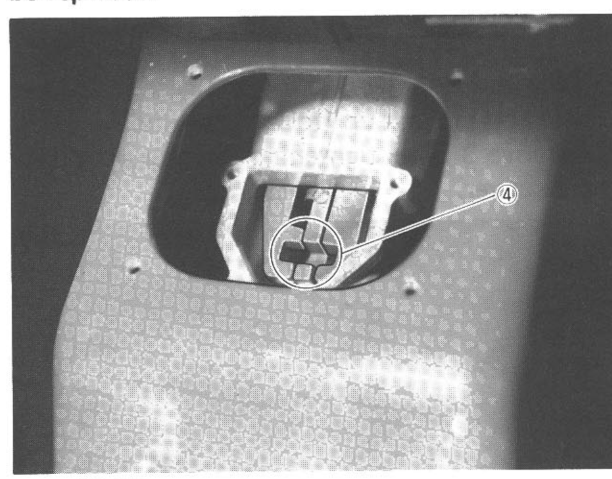


Fig. 12-10

Reverse select guide pin screw

As a standard, this screw is to be tightened to the point where its top surface is 1 to 1.5 mm (0.04 to 0.06 in) from the lever case surface. When "reverse shifting" of the gear shift lever becomes less articulate, tighten the screw as necessary.

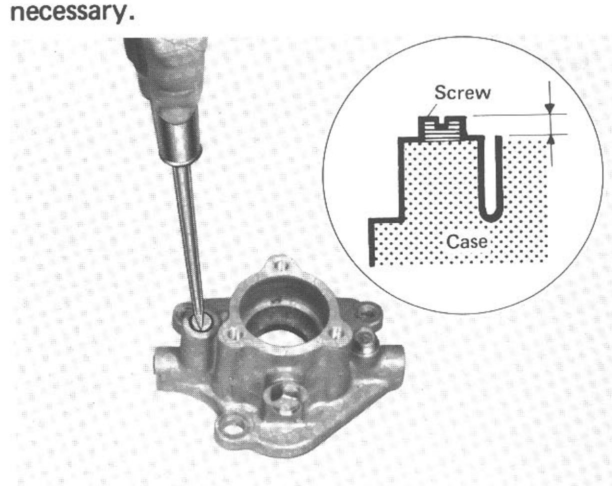


Fig. 12-11

12-4. Installation

The gear shift lever is to be installed by reversing the removal procedure. Some important steps will be explained in detail.

Reverse & Low speed guide pins

Be sure to apply grease to the select guide pins before installing them into the gear shift lever case.

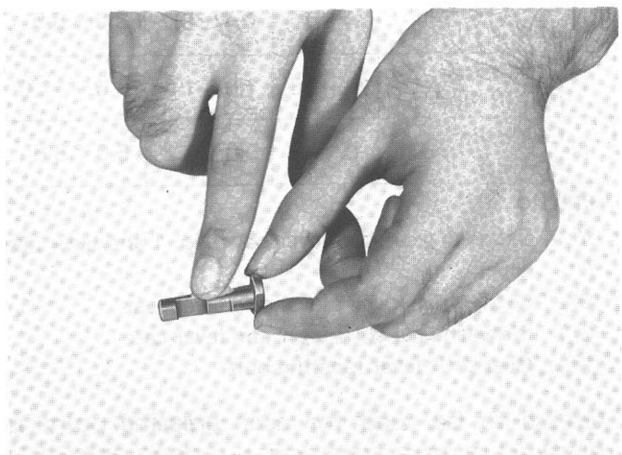


Fig. 12-12

When fitting the low speed select guide pin into the gear shift lever case, tighten the locating bolt while pushing the pin so that the bolt goes in the groove provided in the pin. Then install the reverse select guide pin in the case and securely fit the locating ball in the groove provided in the pin.

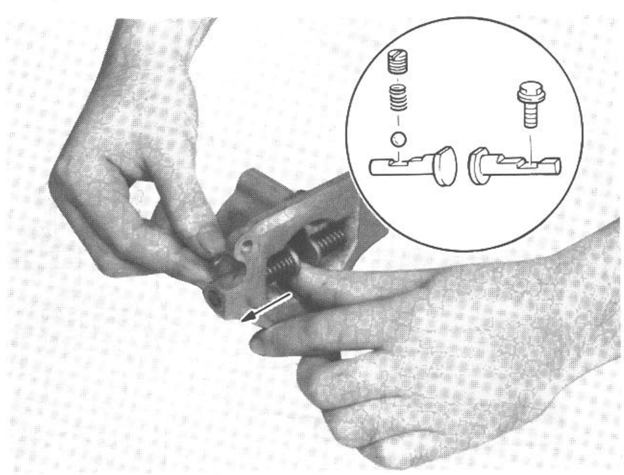


Fig. 12-13

NOTE:
After each guide pin is installed, make sure that the flat surface ⑤ at the tip of the pin faces upward (toward the gear shift lever).

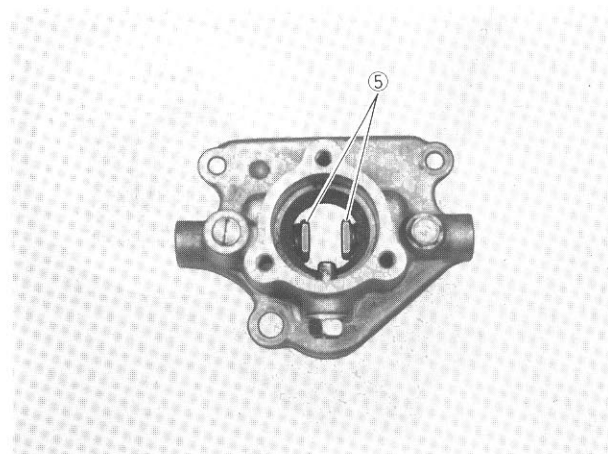


Fig. 12-14

Gear shift lever case

When installing the lever case to transmission extension case, clean the joint faces, and then apply the liquid sealing compound (SUZUKI BOND NO. 4, 99000-31030) to the joint faces.

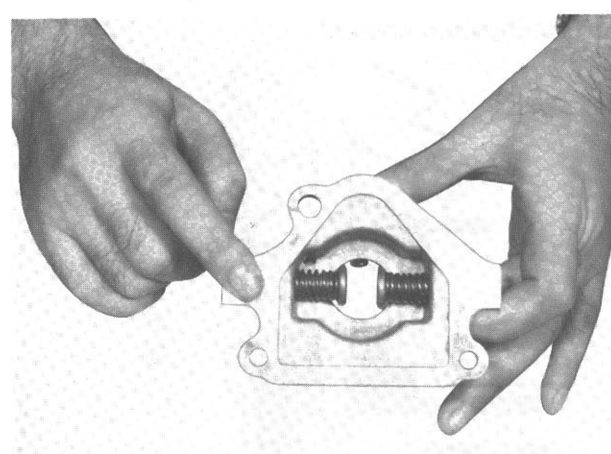


Fig. 12-15

Reverse select guide pin screw

Tighten the screw to the point where its top surface is 1 to 1.5 mm (0.04 to 0.06 in) from the lever case surface. For the details, refer to Fig. 12-11.

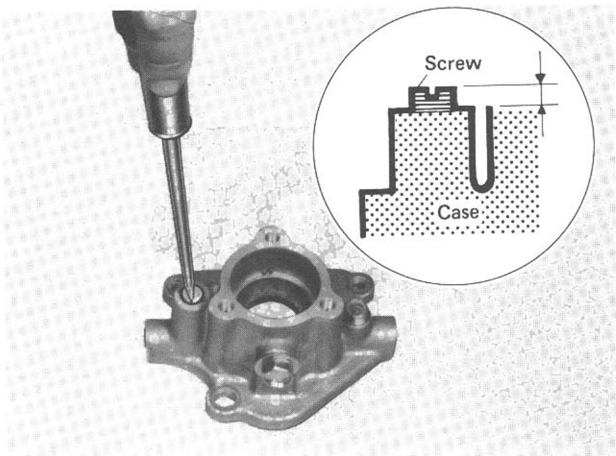


Fig. 12-16

Gear shift control lever seat

Make sure to fit the control lever seat ⑥ into the gear shift lever case so that the locating bolt ⑦ goes in the groove of control lever seat. And fit the wave washer ⑧ with its projection surface directed upward.

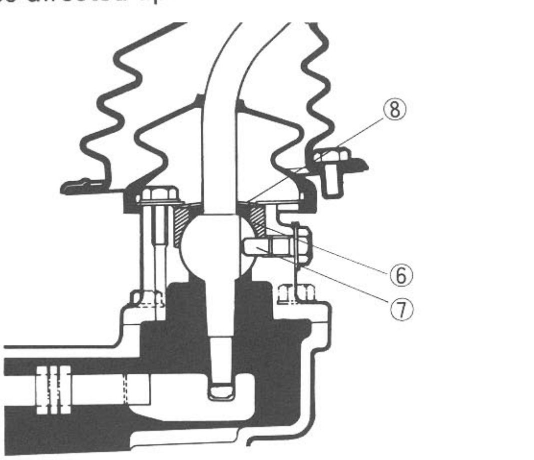


Fig. 12-17

Tightening torque & Greasing point

To be tightened to:	N-m	kg-m	lb-ft
① Lever case cover bolt	4 ~ 7	0.4 ~ 0.7	3.0 ~ 5.0
② Lever case bolt (6 mm)	4 ~ 7	0.4 ~ 0.7	3.0 ~ 5.0
③ Lever boot bolt	4 ~ 7	0.4 ~ 0.7	3.0 ~ 5.0
④ Lever locating bolt	4 ~ 7	0.4 ~ 0.7	3.0 ~ 5.0
⑤ Lever case bolt (8 mm)	10 ~ 16	1.0 ~ 1.6	7.5 ~ 11.0
⑥ Guide pin bolt	8 ~ 12	0.8 ~ 1.2	6.0 ~ 8.5

Apply to

Ⓐ : Between gear shift lever boot No. 1 and lever case cover
Ⓑ : Between gear shift lever and lever seat
Ⓒ : Between gear shift lever and lever case
Ⓓ : Gear shift lever locating bolt

*Grease to be used for each greasing point is SUZUKI SUPER GREASE A (99000-25010).

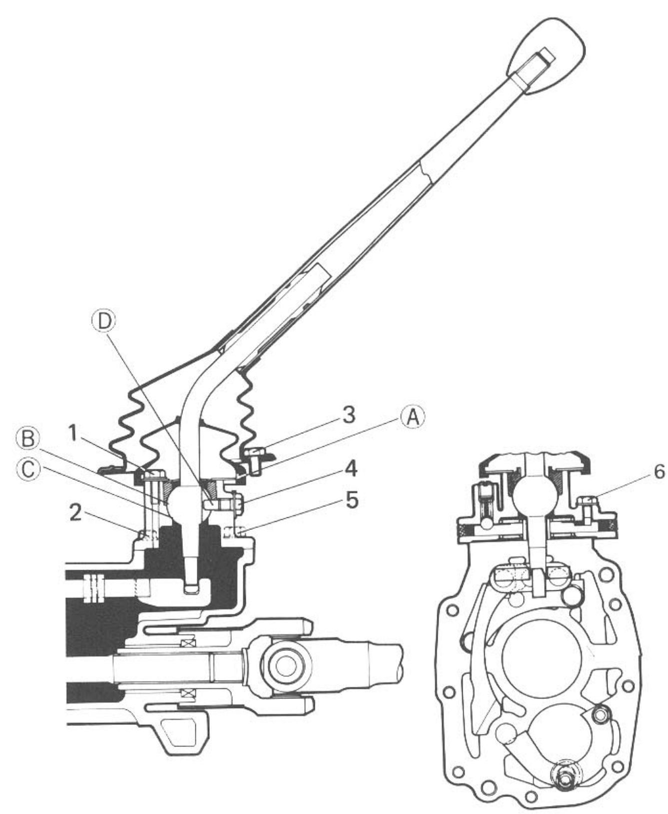


Fig. 12-18

13. TRANSMISSION

13-1. Description

The transmission is full synchronized and provides four forward speeds and one reverse speed by means of two synchronizers and three shafts—input shaft, main shaft and countershaft. Inputshaft and main shaft are in line, connected rotatably with a needle roller bearing in between. Gears on these shafts are in constant mesh with those of countershaft.

On the main shaft, low-speed synchronizer couples "low" driven gear or "second" driven gear to the main shaft. High-speed synchronizer coupls "third" driven gear or input shaft to the main shaft. Reverse idler gear is for clash meshing, and meshes with the reverse idler mounted on the extended portion of the main shaft.

The transmission case is in two-piece construction, consisting of upper case and lower case. The upper case has the three-fork-shaft shifting mechanism built in it. The lower case supports the countershaft. Fitted to the case is an extension case, in which the gears for reverse drive are housed.
The forward section of the transmission case constitutes the housing for the clutch. As viewed from the clutch side, the clutch shaft and transmission input shaft are a single integral shafting extending into the transmission case. As mentioned above, this shaft is followed by the main shaft, which extends out from the other end of the case and is splined to the universal joint yoke.

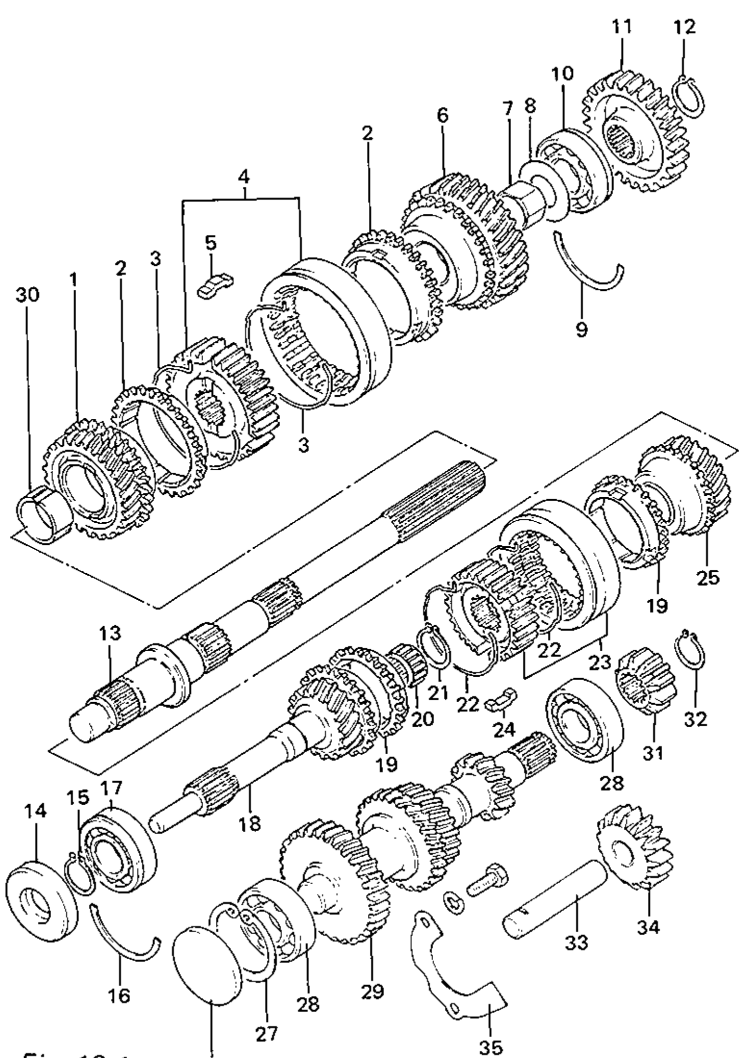


Fig. 13-1

1. Second gear
2. Low speed synchronizer ring
3. Synchronizer spring
4. Low speed hub set
5. Synchronizer key
6. Low gear
7. Bush
8. Thrust washer
9. C ring
10. Bearing
11. Reverse driven gear
12. Circlip
13. Main shaft
14. Oil seal
15. Circlip
16. C ring
17. Bearing
18. Input shaft
19. High speed synchronizer ring
20. Needle bearing
21. Circlip
22. Synchronizer spring
23. High speed hub set
24. Synchronizer key
25. Third gear
26. Plug
27. Circlip
28. Bearing
29. Counter shaft
30. Bush
31. Reverse drive gear
32. Circlip
33. Reverse shaft
34. Reverse idle gear
35. Shaft stopper plate

13-2. Flow of Drive Through Transmission

How drive flows will be explained for each shift position:

Low speed drive

Low driven gear on the main shaft is free from this shaft and merely rotates around it, as driven from the low drive gear of the countershaft. Shifting the lever into "low" causes low-speed gear shifter fork to push low-speed synchronizer toward low driven gear and, through the dog teeth, mesh it with the gear, thus coupling the gear to the main shaft.

Under this condition, drive flows from input shaft to countershaft through one stage of speed reduction, and then from countershaft to main shaft, through another stage of speed reduction.

Second speed drive

Shifting the lever into "second" causes the same low-speed gear shifter fork to push low-speed synchronizer to the other direction, that is, toward second driven gear and mesh it with this gear, thereby coupling the gear to the main shaft. Under this condition, speed reduction takes place twice, as in the low speed drive described above, first between the gear of input shaft and that of countershaft and secondly between second drive gear (of countershaft) and second driven gear (on the main shaft).

Third speed drive

Shifting the lever into "third" actuates high-speed shifter fork to engage high-speed synchronizer with third driven gear on the main shaft. This gear, like low and second driven gears, is free on the shaft and merely spins as driven by third drive gear of countershaft when the gearshift lever is any other position. Just as in the case of low and second speed drives, drive flows from countershaft to main shaft through third drive and driven gears and high-speed synchronizer.

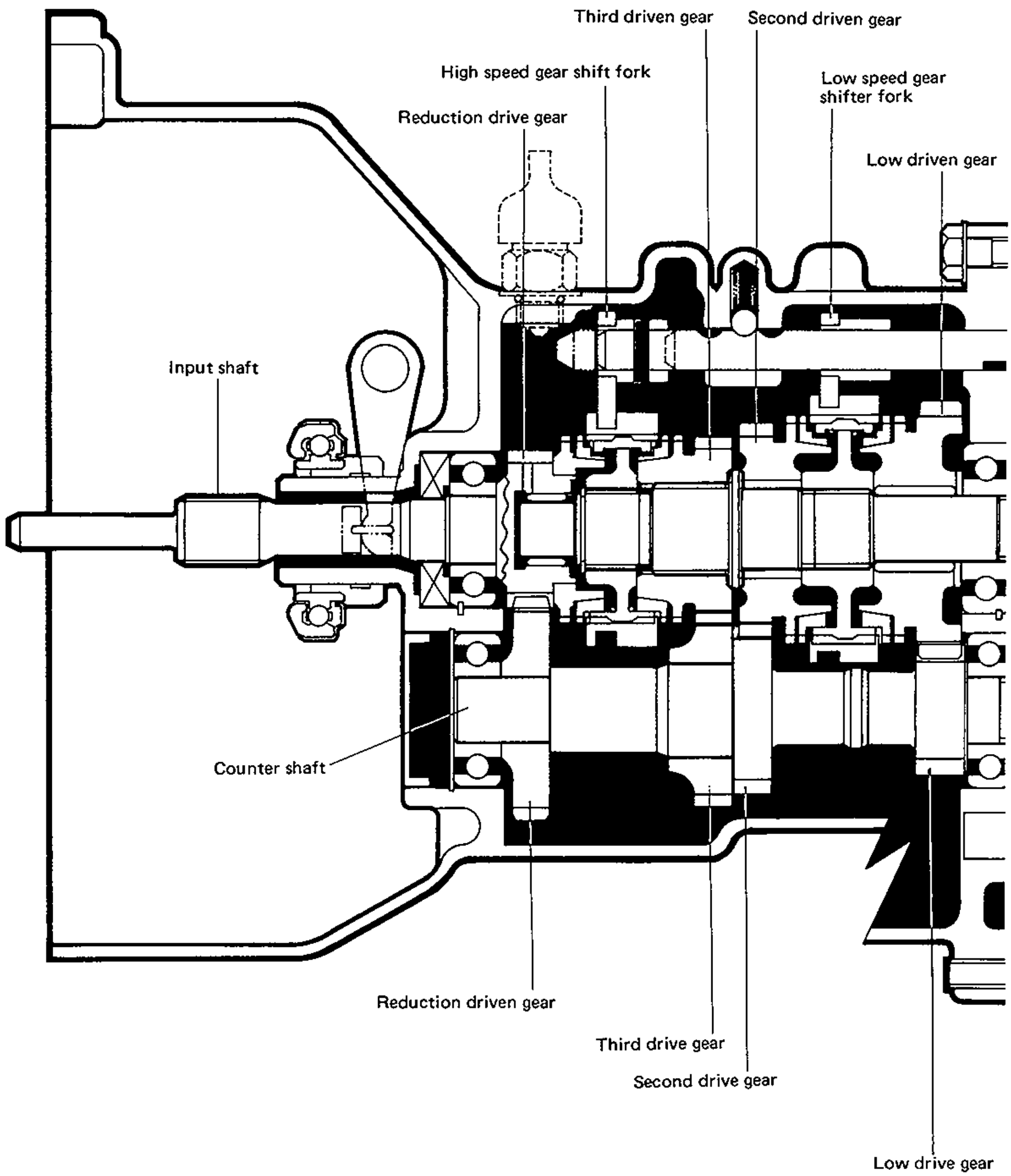
Top speed drive

Shifting the lever into "top" actuates the same high-speed shifter fork to engage high-speed synchronizer with the input shaft gear through dog teeth, thereby coupling input shaft direct with mainshaft. No speed reduction is involved in this flow of drive: engine crankshaft drives main shaft through input shaft.

Reverse drive

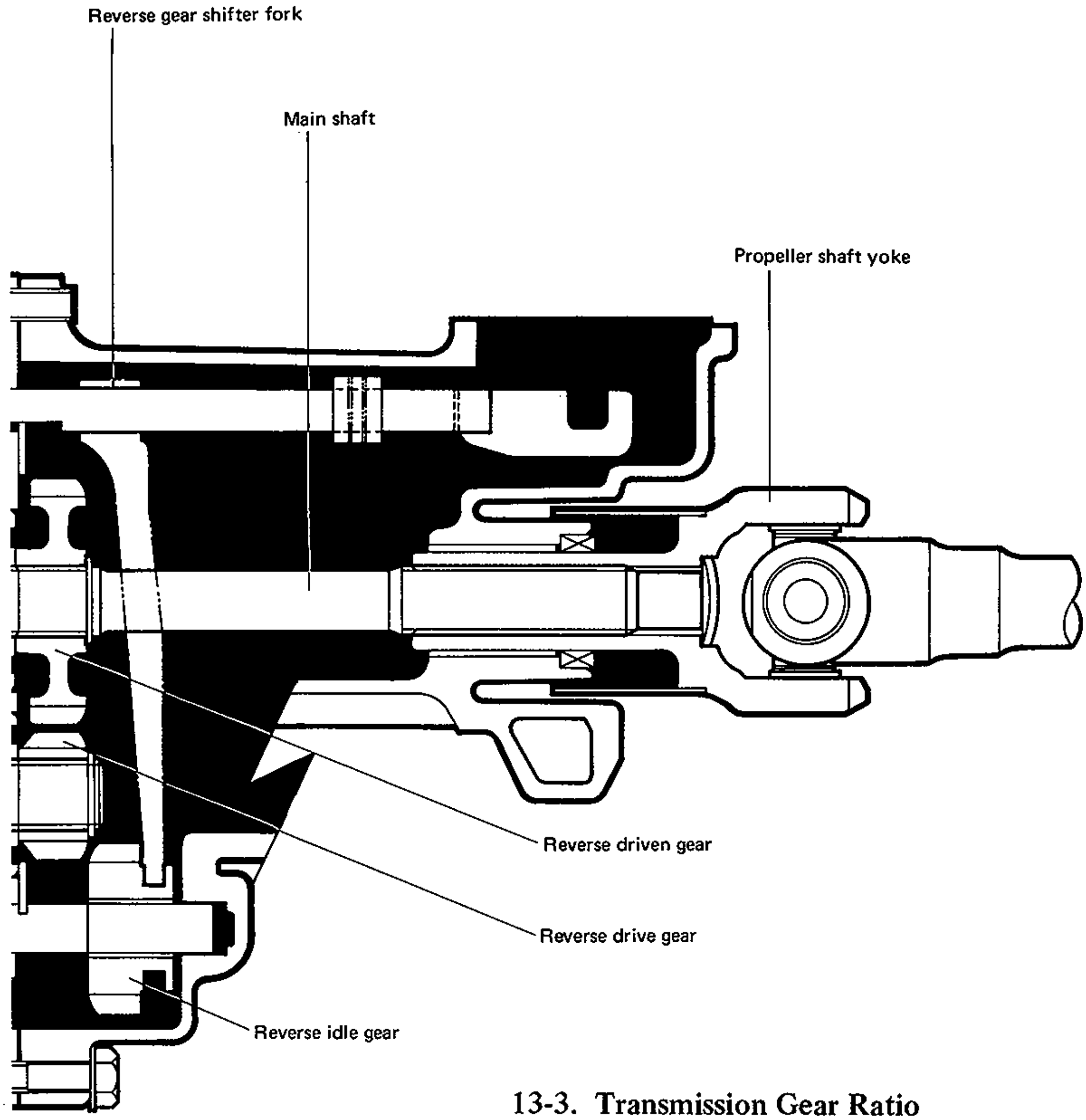
Shifting the lever into "reverse" actuates reverse gear shifter fork to mesh the reverse idle gear into the reverse gear on the main shaft. This is a "clash" meshing action, by which the idler gear comes into between the reverse drive gear of countershaft and the gear on the main shaft.

Drive is from input shaft to countershaft and then to main shaft through reverse idler gear. Two stages of speed reduction and reversal of rotary direction are involved in this drive.



Third driven gear
Second driven gear
High speed gear shift fork
Low speed gear shifter fork
Reduction drive gear
Low driven gear
Input shaft
Counter shaft
Reduction driven gear
Third drive gear
Second drive gear
Low drive gear

Fig. 13-2



13-3. Transmission Gear Ratio

Primary gear ratio		31/21				
Primary speed ratio		1.476				
	Shift position	Low	Second	Third	Top	Reverse
Secondary ratios	Gear ratio	30/14	29/22	26/27	–	27/12
	Speed ratio	2.143	1.318	0.963	–	2.250
Overall speed reduction ratio		3.163	1.945	1.421	1.000	3.321

13-4. Dismounting

Work to be done in the room

1) Loosen 4 bolts fastening the gear shift lever boot No. 2 and move the boot upward.

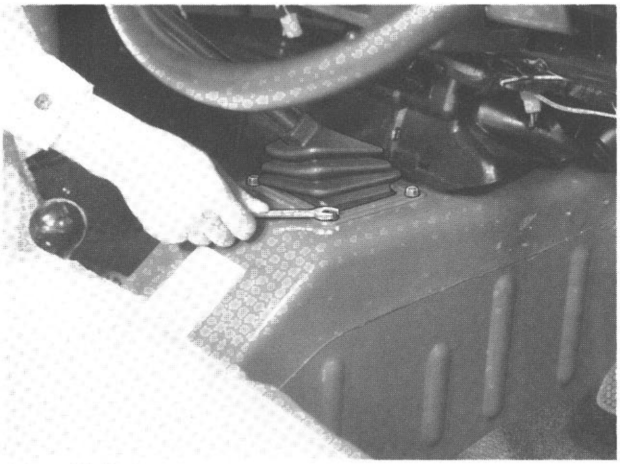


Fig. 13-2-1

2) Move the gear shift boot No. 1 upward. Loosen gear shift lever case cover bolts (3 pcs) and draw the gear shift lever out of the extension case.

Work to be done in the engine room

3) Disconnect negative (−) and positive (+) cords from battery terminals.
4) Disconnect back light switch lead wire at the coupler.
5) Disconnect Black/Yellow lead wire and positive (+) cord from the starter motor.
6) Remove starter motor from transmission case.

Work to be done under the engine

7) Remove drain plug to drain out the oil in the transmission.
8) Disconnect clutch wire from clutch release lever.
9) Remove clutch lever from clutch release shaft.
10) Remove propeller shaft No. 1.
11) Remove clutch housing lower plate from transmission case.

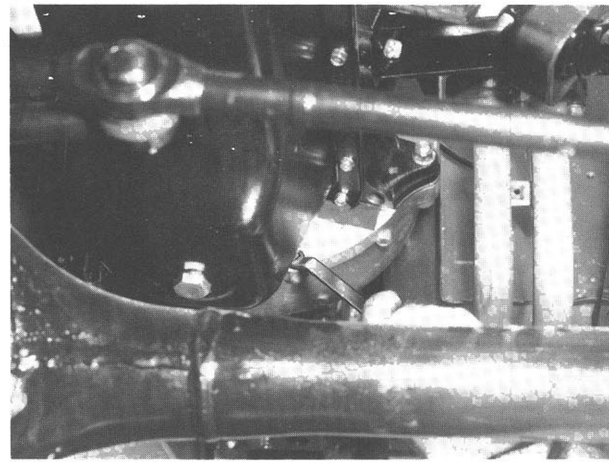


Fig. 13-2-2

12) Remove the bolts and nuts fastening the engine cylinder block and transmission case.
13) Remove the plate ① as shown in Fig. 13-2-3.

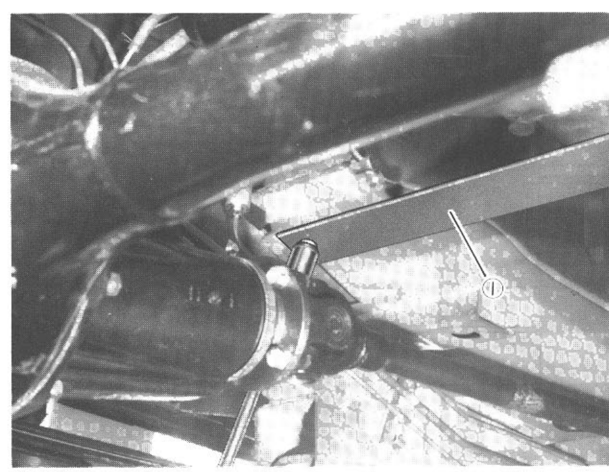


Fig. 13-2-3

14) Remove transmission rear mounting bracket from transmission rear mounting and chassis.

> NOTE:
> Before starting to remove the transmission, check around once again to be sure that there is no connection left undone.

15) Take down transmission.

13-5. Disassembly

Replacing the clutch release shaft bush

Remove clutch release bearing from transmission input shaft.

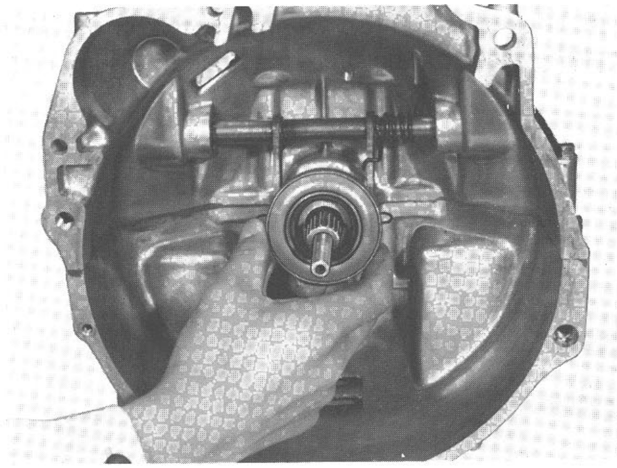


Fig. 13-3

Remove a part of the spring from the clutch release shaft lever.

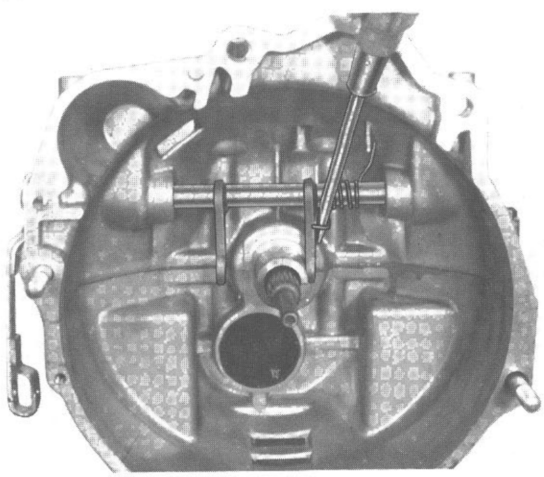


Fig. 13-3-1

With special tool Ⓐ applied in such a position as shown in Fig. 13-3-2, tap the end of the release shaft in its center so as to take out the bush.

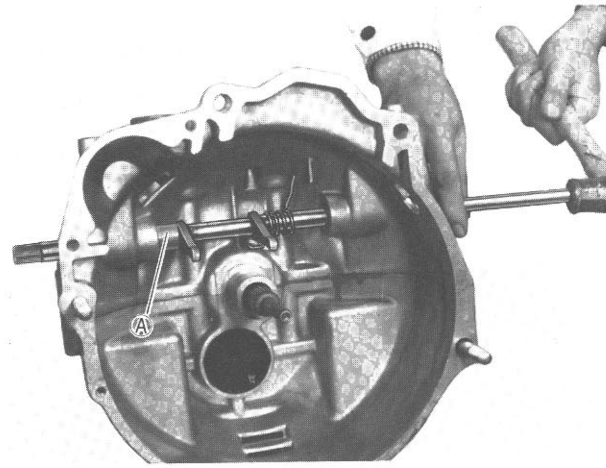


Fig. 13-3-2

Remove the clutch release shaft by letting its one end in the timing check hole as shown in Fig. 13-3-3. And then take out the other bush, too.

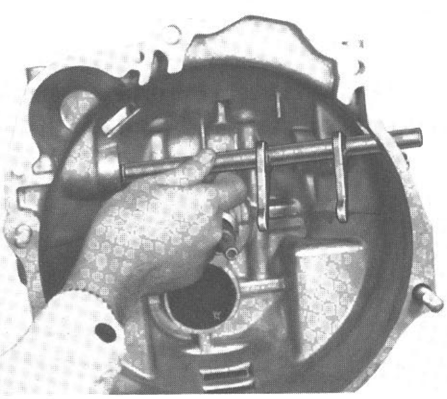


Fig. 13-3-3

Precautions in reinstalling the bush:

- Make sure to apply grease to the inside of the bush.
- Drive in the bush to the same level as the transmission case and secure it there by punching at two places as shown in Fig. 13-3-4 so that it will not come off.

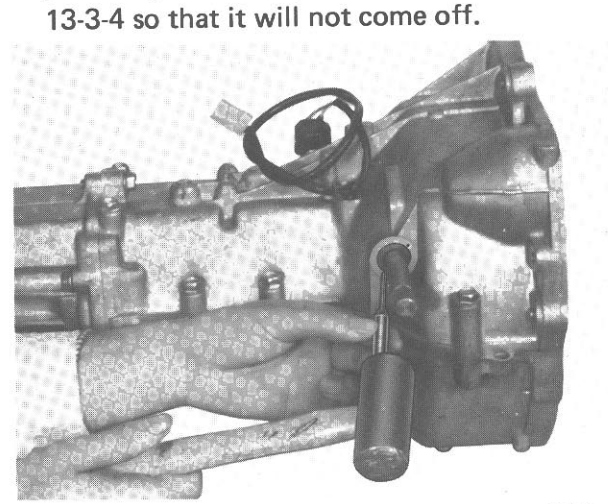


Fig. 13-3-4

Separating the upper case from the lower case

Remove clutch release bearing from transmission input shaft.

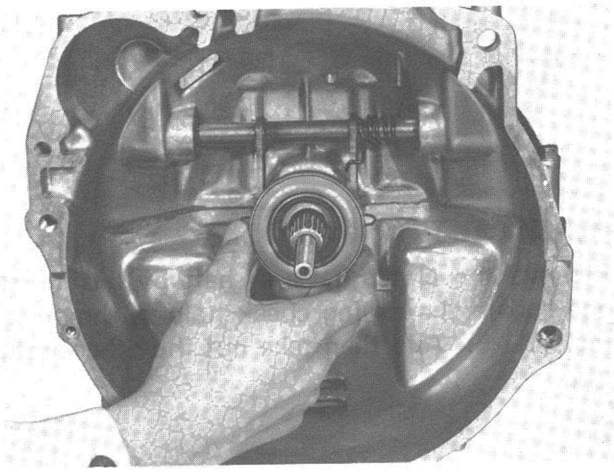


Fig. 13-4

Remove the bolts securing the extension case to the transmission case, and take off the extension case.

Fig. 13-4-1

Remove the bolts fastening the upper and lower cases together, separate the two, and take out the main shaft assembly. A steel bar, similar in shape to screwdriver, may have to be used to pry the two cases apart, as shown. In such a case, do not stick the bar too far into between the two mating faces or the faces may become damaged.

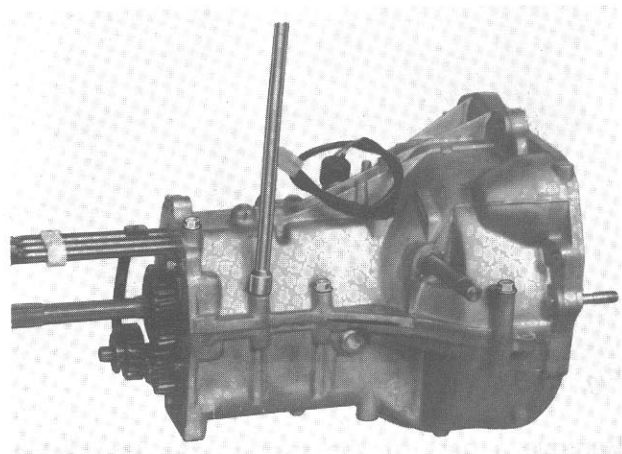


Fig. 13-5

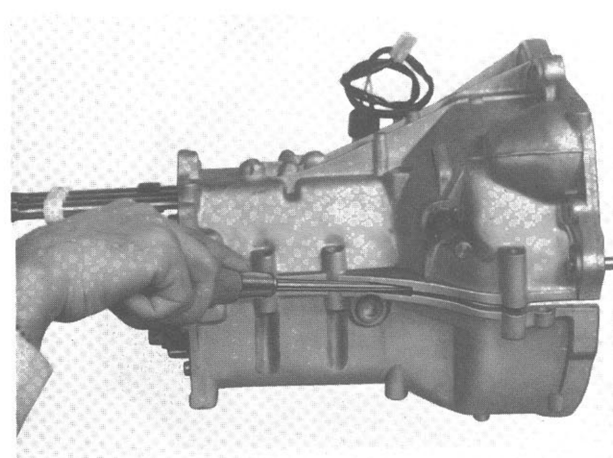


Fig. 13-5-1

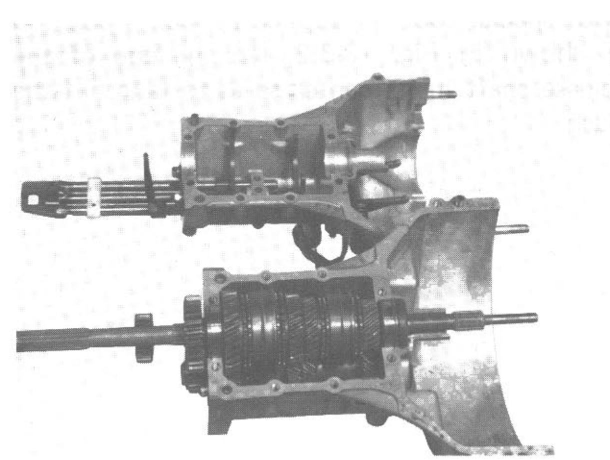


Fig. 13-5-2

Removing the countershaft

Remove the 2 bolts securing reverse gear shaft stopper plate, and take off the stopper plate and reverse gear shaft.

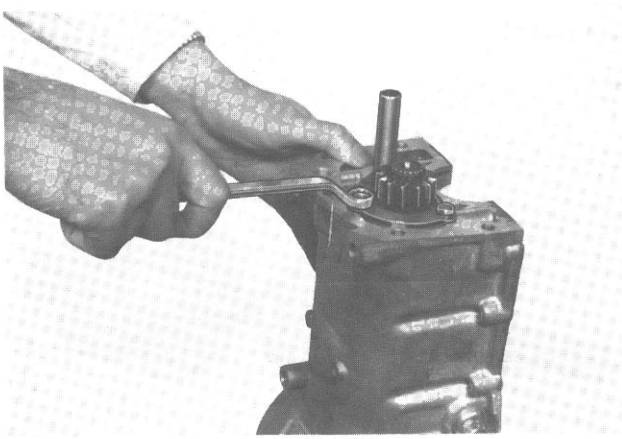


Fig. 13-6

Remove the circlip retaining the reverse gear on countershaft, using the circlip remover Ⓐ, and slide the reverse gear off countershaft.

Circlip remover (09900-06107)

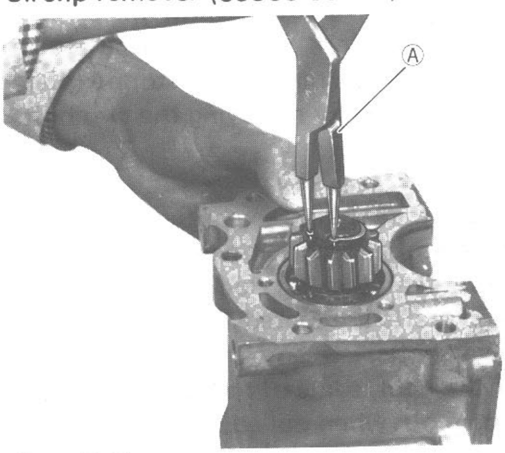


Fig. 13-7

Remove the rubber plug on countershaft. Remove the circlip retaining the countershaft bearing, as shown.

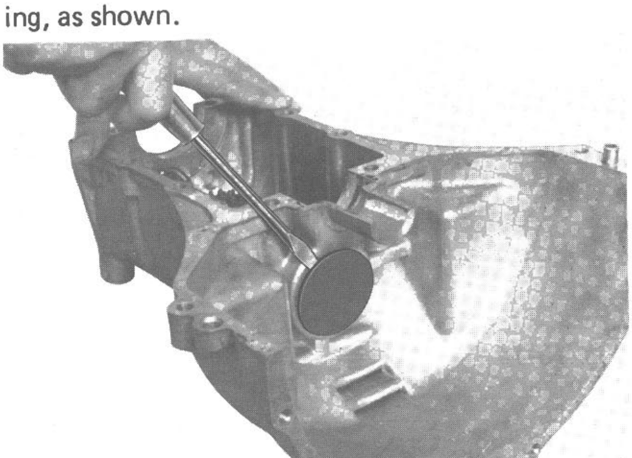


Fig. 13-8

Pull off countershaft to the low gear side, remove the bearing, and take the countershaft assembly out of the case. Two special tools must be used for this removal:

Bearing installer Ⓑ (09922-55130)
Bearing puller Ⓒ (09913-60910)

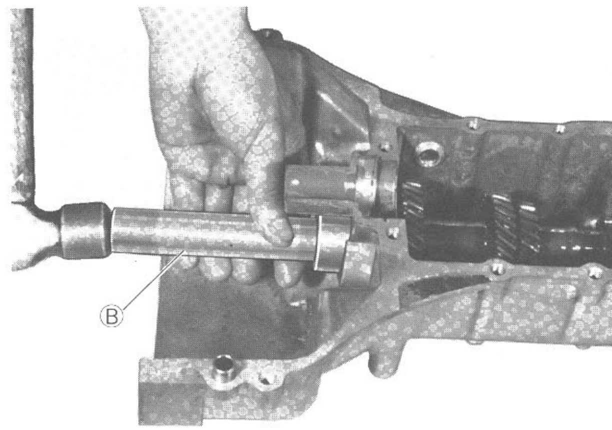


Fig. 13-9

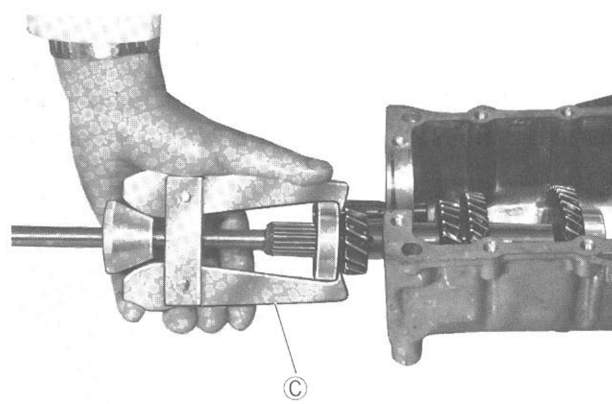


Fig. 13-9-1

Removing the main shaft and input shaft

Take out the input shaft by hand, taking care not to let the high-speed synchronizer rings drop.

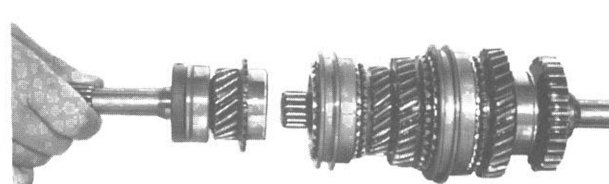


Fig. 13-10

Remove the circlip retaining the hub of high-speed synchronizer sleeve, and slide off the sleeve hub and third driven gear from main shaft. A special tool Ⓐ must be used in removing the circlip:

Circlip remover Ⓐ (09900-06107)

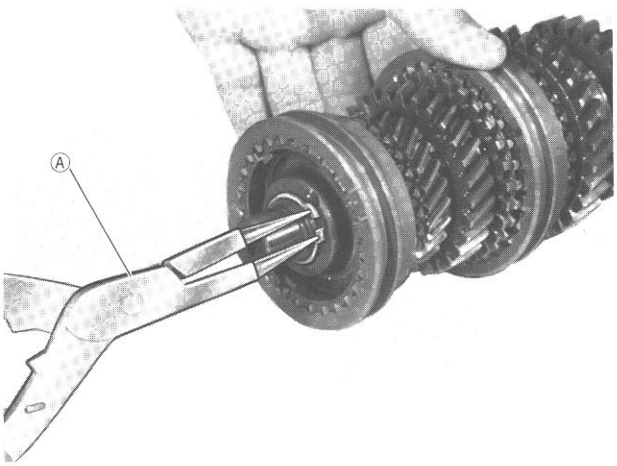


Fig. 13-11

Remove the circlip retaining the reverse gear on main shaft. Remove this gear and main shaft bearing. Be sure to use the circlip remover.

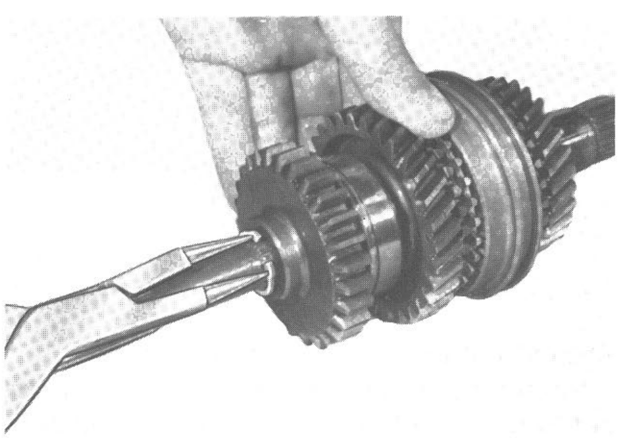


Fig. 13-12

From main shaft, take off the low driven gear, low-speed synchronizer sleeve hub and second driven gear. Be sure not to allow the synchronizer rings to drop down when the sleeve hub is coming off.

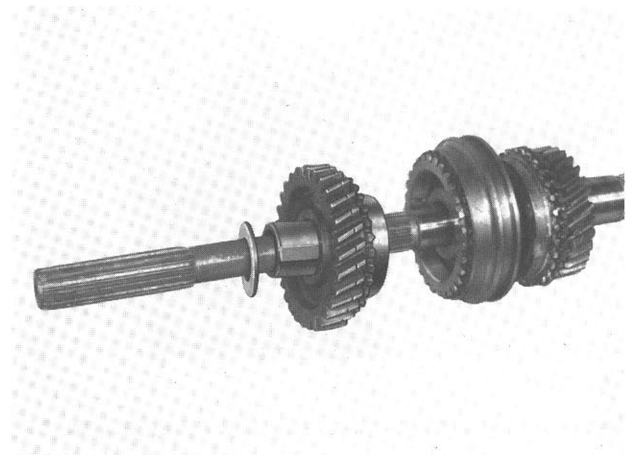


Fig. 13-13

Removing the shifter fork shafts and forks
Before starting the removal work, make sure that all the shifter fork shafts in place are in neutral position. First, remove the stopper plate for shifter fork shafts by removing the two bolts securing this plate.

It is important that the three shifter fork shafts be kept in neutral position at this time in order to make sure that the interlock balls between two adjacent shafts are seated fully in the dents of respective shafts. If any of these interlock balls is off the dent, some of the fork shafts will refuse to come out when pulled.

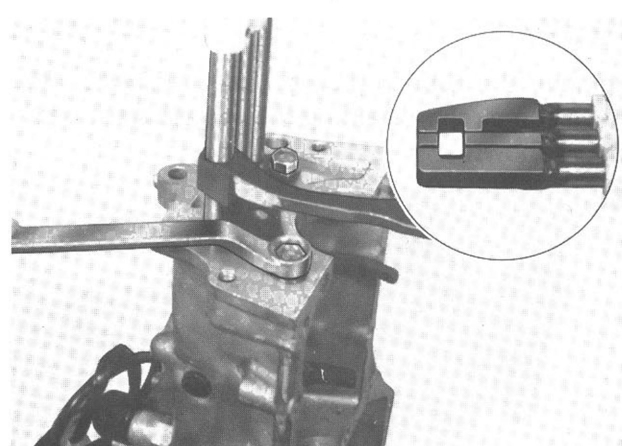


Fig. 13-14

Using the spring pin remover (special tool), draw out the spring pins on reverse gear shifter fork, and pull out the shifter fork shaft. As this shaft comes out, the locating ball and spring will jump out of the hole; do not let them fly away.

Spring pin remover Ⓐ (09922-85811)

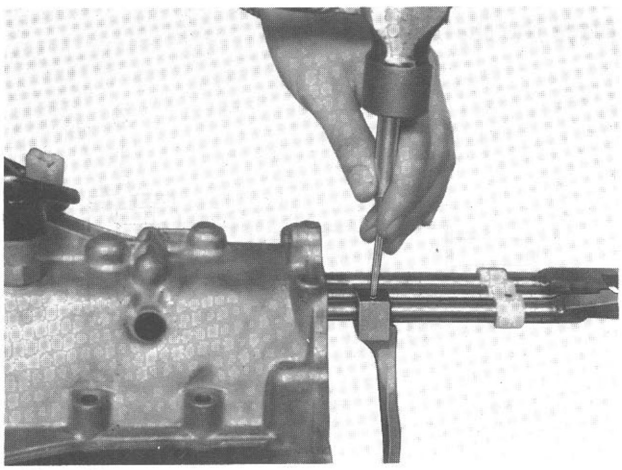


Fig. 13-15

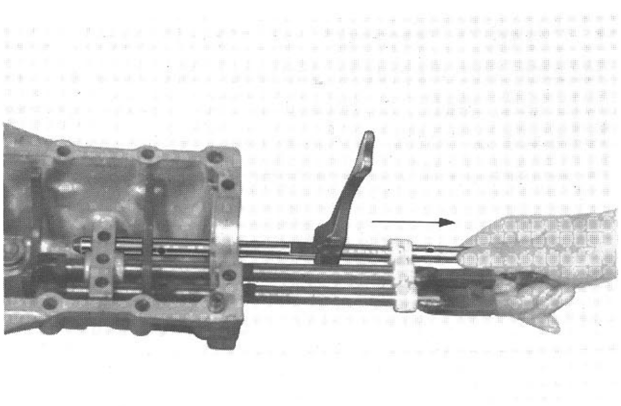


Fig. 13-15-1

Move the high-speed shifter fork shaft into the position for "third." This will allow the spring pin to shift into the dent provided in the case. Using the same special tool, mentioned above, draw out the spring pin and pull out the fork shaft. As in the case of above, be careful not to let the steel ball and spring fly away.

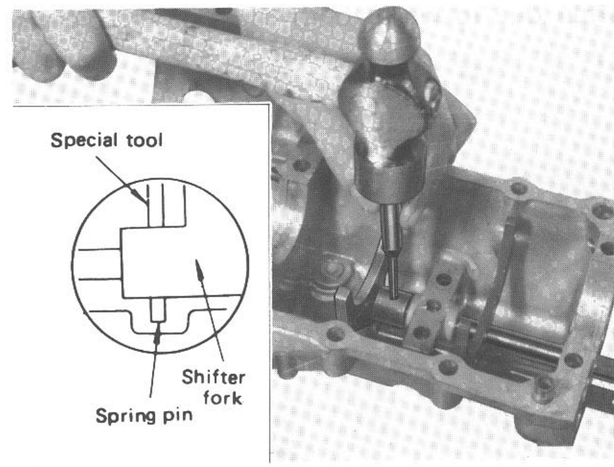


Fig. 13-16

Having thus far removed the reverse gear shifter fork shaft and high-speed shifter fork shaft, you are now to remove the low-speed shifter fork shaft, as follows: Move this fork shaft into the position for "second," so that the spring pin will shift into the dent provided in the case; draw out the spring pin by using the spring pin remover, mentioned above; and remove the shaft by pulling it out.

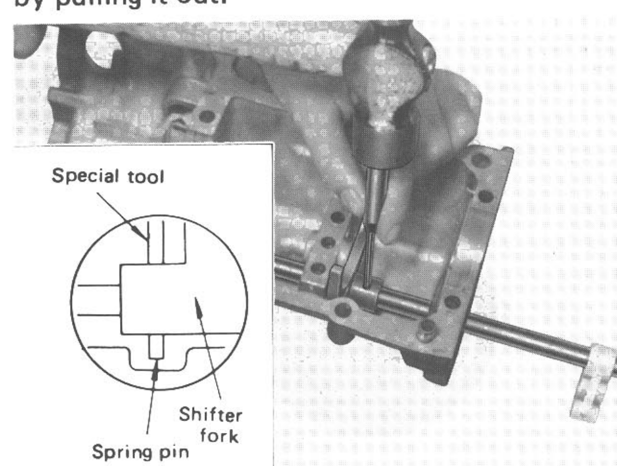


Fig. 13-16-1

13-6. Maintenance Services

Reverse gears and idle gear

Inspect the chamfered edges of gear teeth of the three gears—driving and driven gears (of main shaft and countershaft) and idle gear. If the edges are worn badly, replace the gears. Abnormal noise or gear slipping in reverse drive is often due to worn tooth edges of these gears.

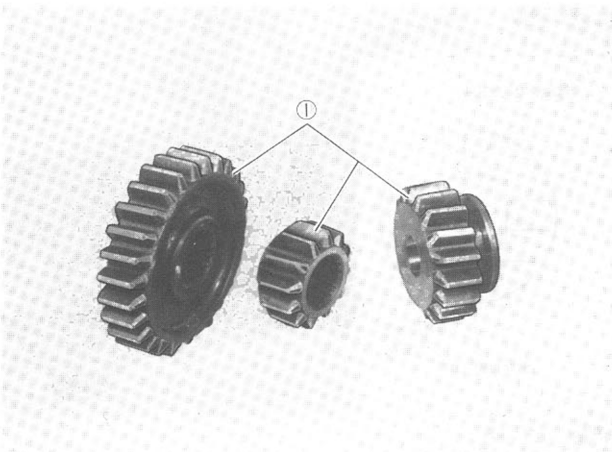


Fig. 13-17 ① *Chamfered*

Countershaft and its bearings

If any of the countershaft gears is found with chipped or broken teeth, replace the countershaft. Check each bearing by spinning its outer race by hand to "feel" the smoothness of rotation. Replace the bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

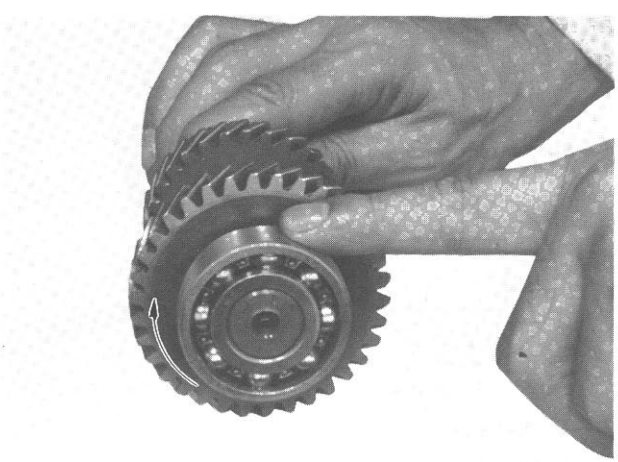


Fig. 13-18

Input shaft

Referring to Fig. 13-19, inspect the cone ①.and toothed ring ② for wear and damage.

Inspect the gear teeth ③ and splines ④ for wear and damage.

If any part of the input shaft inspected as above is found excessively worn or badly damaged, replace the shaft.

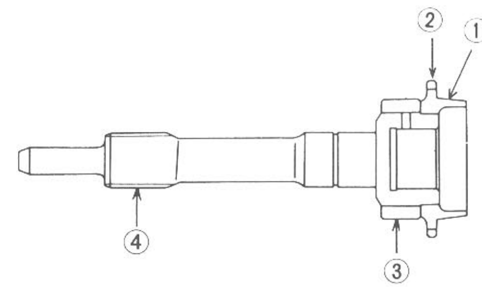


Fig. 13-19

Combination of gear and synchronizer ring

Fit the ring to the cone of the gear (input gear, or "third," "second" or "low" gear), and measure the clearance between the two at the peripheral teeth, as shown if Fig. 13-20. If the clearance is noted to have reached or exceeded the service limit, replacement is necessary.

	Standard	Service limit
Clearance between gear and ring	0.8 ~ 1.2 mm (0.03 ~ 0.05 in.)	0.5 mm (0.02 in.)

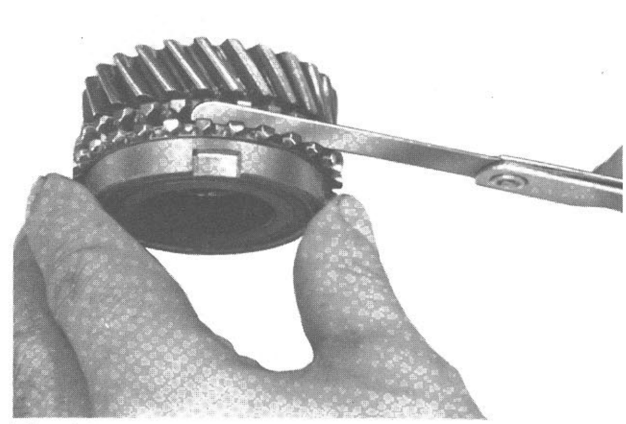


Fig. 13-20

Inspect the external cone (of the gear) and internal cone (of the ring) for abnormal wear. Be sure that the contact patterns on these surfaces indicate uniform full-face contact, and that the surfaces are from any wavy wear. A badly worn member must be replaced.
Proper synchronizing action on gear shifting can be expected when the ring-to-gear clearance (Fig. 13-20) and the condition of cone surfaces, **among other things, are satisfactory.**

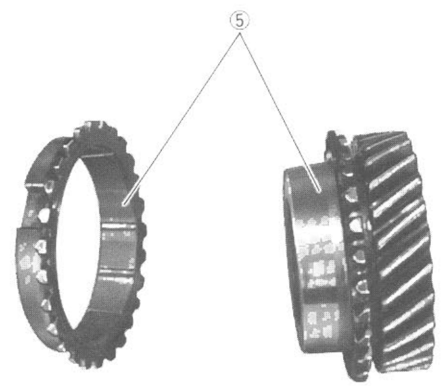


Fig. 13-21 ⑤ *Checking contacting surface*

Chamfered tooth ends of ring (external teeth) and sleeve (internal teeth)
Synchronizer ring and hub have three slots each, in which the keys are carried as backed by expanding springs, so that the hub and its two rings, one on each end, are capable of running together. Since the sleeve is engaged by its internal teeth with the hub, as if the two were splined together, the sleeve too runs with the hub and rings.

In meshing action, the sleeve is pushed (by the shifter fork) to one side, so that is slides axially on the hub, pushing the ring toward the cone surface of the gear. This push is transmitted by the three keys, which are lightly gripped by the sleeve.

By the friction between the gear cone and the ring cone (internal), the ring begins to rotate but is opposed by the hub because of the keys. In other words, the ring is at this time twisted, while the sleeve is advancing further to push the ring fully against the gear cone. Since the ring is unable to slide along any further, the sleeve lets go of the keys and rides over to the ring. At this moment, the initial contact between the chamfered ends of teeth of the ring and those of internal teeth of the sleeve occurs. This contact is such that the internal teeth of the sleeve align themselves to those of the ring. When the sleeve advances and slides into the ring, the ring will be rotating nearly with the speed of the gear, so that the sleeve is enabled smoothly to slide over into the clutch teeth of the gear.

The initial contactor mesh between sleeve and ring is determined by the widths of key and slot or, to say the same thing, the key clearance in the slot, and is prescribed to extend at least a third (1/3) of the chamfer.

With the synchronizer properly assembled on the shaft, push in and twist each synchronizer to see if the one-third mesh occurs or not; if not, it means that the overall wear (which is the sum of the wears of slots, keys and chamfered tooth ends) is excessive and, in such a case, the entire synchronizer assembly must be replaced.

Mesh of chamfered tooth ends of synchronizer ring and hub	Contact extending about 1/3 of chamfered face from apex

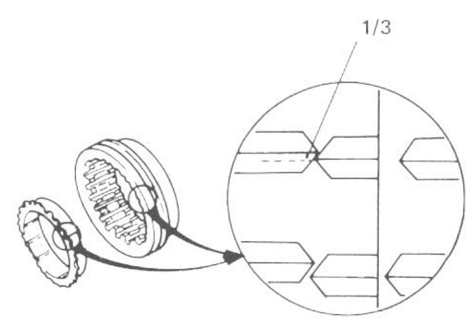


Fig. 13-22

Synchronizer rings

Inspect each synchronizer ring for wear of its key slots by measuring the width of each slot. If the width reading exceeds the limit, replace the ring.

	Standard	Service limit
Key slot width of synchro-nizer ring	9.6 mm (0.38 in.)	9.9 mm (0.39 in.)

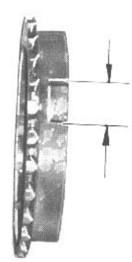


Fig. 13-23

Fork shaft locating springs

Two kinds of locating spring are used to arrest the three shifter fork shafts. If "gears slipping out of mesh" has been complained, check these springs for strength by measuring their free lengths, and replace them if their free lengths are less than the service limits.

Spring No.	Standard	Service limit
Free length of No. 1	19.5 mm (0.767 in.)	17.0 mm (0.669 in.)
Free length of No. 2	17.5 mm (0.689 in.)	16.0 mm (0.630 in.)

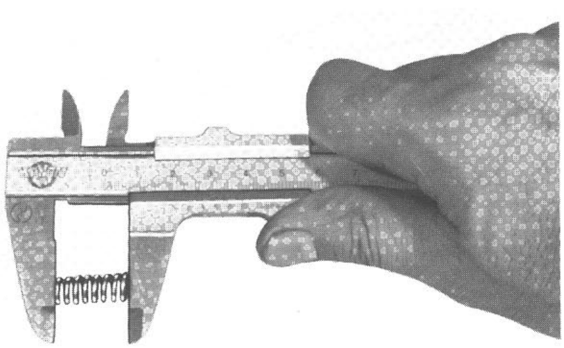


Fig. 13-24

Extension case bush

Check the bush press-fitted into the extension case for wear by measuring the redial clearance between bush bore and sliding yoke. If the sliding yoke is capable of rattling in the bush because of advanced wear it will cause the propeller shaft to rattle. For this reason, an extension case found to allow its sliding yoke to rattle in excess of the service limit must be replaced; replacement of the bush alone is not permissible.

	Standard	Service limit
Rattle of sliding yoke in extension case bush	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)	0.1 mm (0.004 in.)

13-7. Important Steps in Installation

Tightening torque

To be tightened to:	N.m	kg-m (lb-ft)
Transmission case bolt	15 ~ 20	1.5 ~ 2.0 (11.0 ~ 14.5)
Oil drain plug and lever plug	25	2.5 (18.5)
Extension case bolt	15 ~ 20	1.5 ~ 2.0 (11.0 ~ 14.5)
Rear mounting bolt	15 ~ 20	1.5 ~ 2.0 (11.0 ~ 14.5)
Gearshift lever case bolt (8 mm)	10 ~ 16	1.0 ~ 1.6 (7.0 ~ 11.0)
Gearshift lever case bolt (6 mm)	4 ~ 7	0.4 ~ 0.7 (3.0 ~ 5.0)
Bolt on stopper plate for shifter fork shafts	15 ~ 20	1.5 ~ 2.0 (11.0 ~ 14.5)

Input shaft and main shaft

When assembling the two synchronizers on main shaft, be sure to position the hub of each correctly. As shown in Fig. 13-25.

This assembling method (Fig. 13-25) is applicable up to the body No. SJ410-100155 (Engine No. F10A-500273).

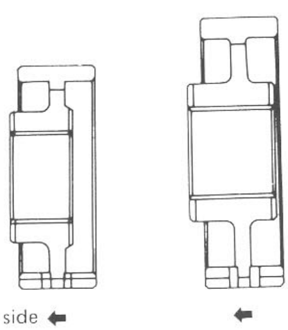


Fig. 13-25

This assembling method (Fig. 13-25-1) is applicable from body No. SJ410-100156 (Engine No. F10A-500274). (Used for CANADIAN and EUROPEAN MARKETS from initial production.)

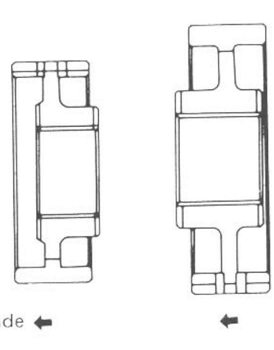


Fig. 13-25-1

Care must be exercised in positioning the sleeve of each synchronizer. Be sure to bring the groove for admitting the fork to the clutch side.

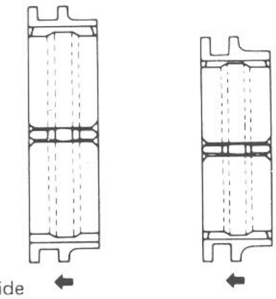


Fig. 13-26

After putting on each synchronizer, be sure that the three keys mounted on the hub fit snugly into the slots provided in the ring.

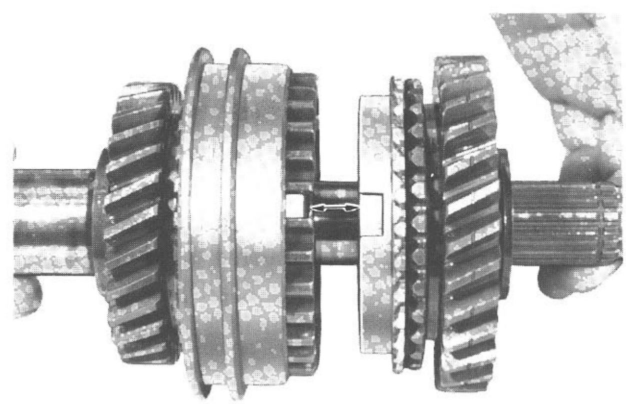


Fig. 13-27

Shifter forks and shafts

When feeding each shifter fork onto its shaft, be sure to bring the boss (in which the hole for admitting the spring pin is provided) to the extension case side.

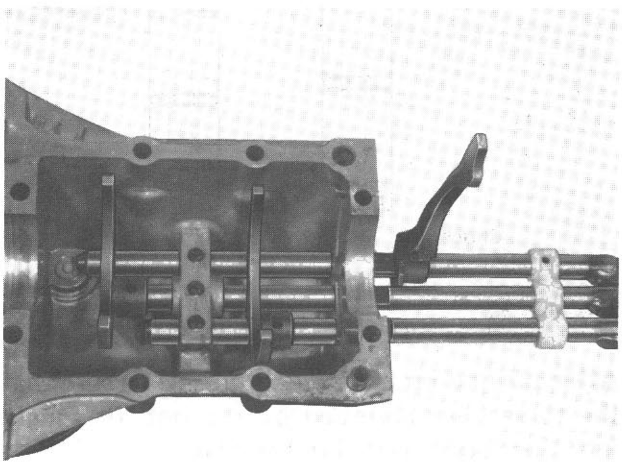


Fig. 13-28

Two kinds of coil spring are used to push down on the locating steel balls. One is larger in coil diameter, and is designated as No. 1 spring; the smaller one is designated as No. 2 spring. Each locating steel ball is backed by two springs, No. 1 and No. 2. Thus, there are a total of six springs, that is, three No. 1's and three No. 2's, for the three fork shafts, reverse, high-speed and low-speed, as shown in Fjg. 13-29. At the time of installing the balls and springs, be sure to discriminate the two kinds.

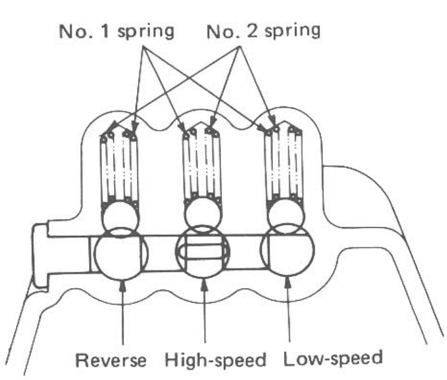


Fig. 13-29

The shifter fork shafts are to be installed sequentially. First to be put in place is low-speed shaft, followed by high-speed shaft and then reverse shaft. The sequence is indicated in the ascending order of numbers in Fig. 13-30.

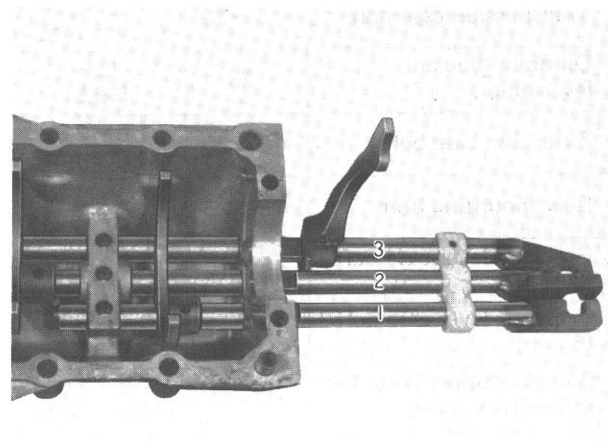


Fig. 13-30

The hole for installing the interlock steel balls is provided in the side wall, next to the reverse shifter fork shaft, of the transmission case. Be sure to feed in one ball after another, positioning each ball between two adjacent shafts, as shown in Fig. 13-31.

> NOTE:
> **Be sure to put in the pin for preventing two shafts from getting shifted at the same time. This pin goes into the hole provided in the high-speed shaft.**

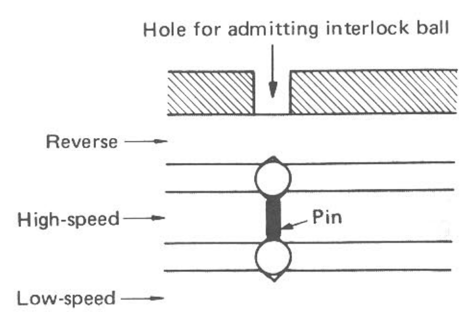


Fig. 13-31

Input shaft and main shaft installation

Before installing the input and main shaft assembly on the lower case, be sure fit the "C" rings ① and dowel pins ② into the case.

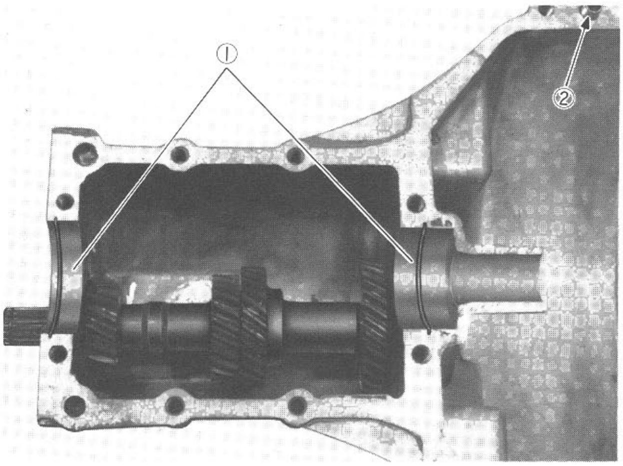


Fig 13-32

Reverse gears and idle gear

The two reverse gears have their teeth chamfered on one end, and the reverse idle gear is similarly chamfered. When mounting the reverse gears on main shaft and countershaft, respectively, be sure to bring the chamfered end to the outboard side. The chamfered end of the idle gear, however, must face inwardly, as shown in Fig. 13-33.

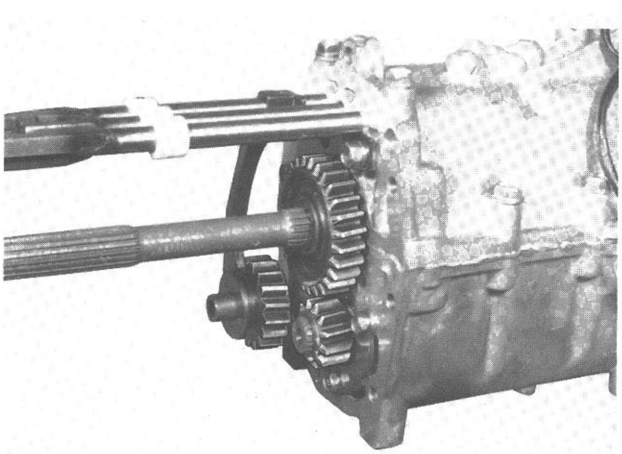


Fig. 13-33

Putting together upper and lower cases

Clean the joint faces, removing any foreign matters adhering to these faces, and then apply the liquid sealing compound (SUZUKI Bond No. 4, 99000-31030) to the point faces, coating each face uniformly with the compound and, a few minutes after this application, match the two cases together.

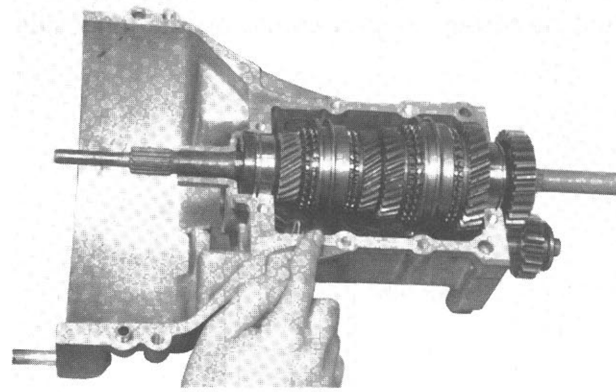


Fig. 13-34

When bringing the two cases into match as shown in Fig. 13-35, be sure to guide each shifter fork into the groove of its synchronizer sleeve. After putting the upper case on the lower case, tighten the joint bolts uniformly and sequentially so as to equalize the joint pressure all around.

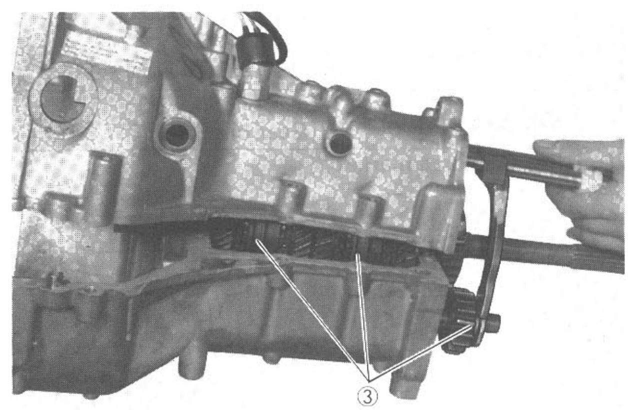


Fig. 13-35 ③ Shifting forks

Extension case oil seal

When installing this seal, be sure to position it so that its spring ① part comes on the inner side.

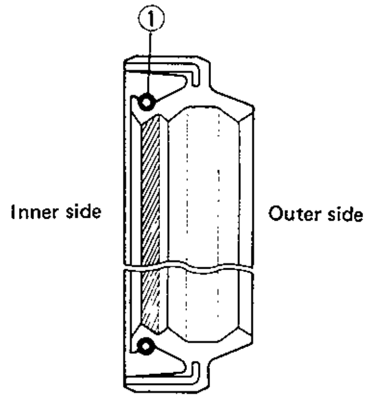


Fig. 13-36

Transmission oil

The oil capacity of the transmission and the oil specification are as follows:

Oil capacity	1.0 litres (2.12/1.76 US/Imp.pt.)
Oil specitication	Gear oil, SAE 90 [Gear oil, SAE 75W 80~85]

[ ] For Canadian market

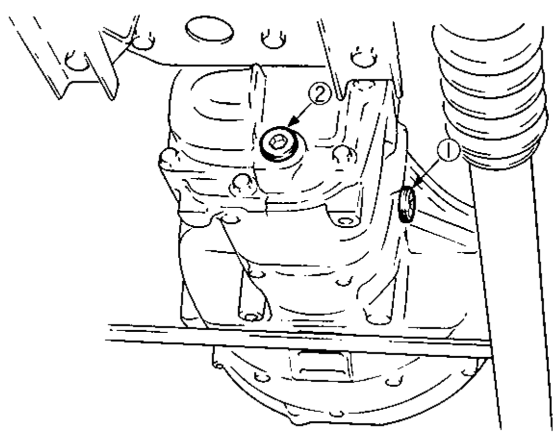


Fig. 13-37 ① Oil filler plug ② Oil drain plug

14. TRANSFER GEAR BOX

14-1. Description

The transfer gear box is an auxiliary transmission for on-off control of two-speed drive transmitted to both front and rear axles concurrently and provides additional speed reductions, HIGH and LOW, for any selection of main transmission gears.

The functions of this auxiliary transmission are mainly two—selection between four-wheel drive (front and rear axles) and two-wheel drive (rear axle) and between HIGH and LOW for four-wheel drive. Three propeller shafts are associated with the gear box.

These functions are accomplished by means of four shafts arranged in three-axis configuration and two sliding clutches. The selection is effected by actuating these clutches from a single control lever located beside the driver's seat. The gear box is mounted on a chassis frame.

1. Flange
2. Oil seal
3. Circlip
4. Bearing
5. Transfer input shaft
6. Bearing
7. Bearing
8. Transfer counter gear
9. Bearing
10. Flange
11. Oil seal
12. Circlip
13. Bearing
14. Transfer output front shaft
15. Bearing
16. Circlip
17. Hub set
18. Bearing
19. Thrust washer
20. Bush
21. Output shaft high gear
22. Sleeve
23. Transfer output rear shaft
24. Output shaft low gear
25. Bush
26. Thrust washer
27. Bearing
28. Speedometer drive gear
29. O ring
30. Spacer
31. Oil seal
32. Speedometer driven gear
33. Oil seal
34. Speedometer gear case

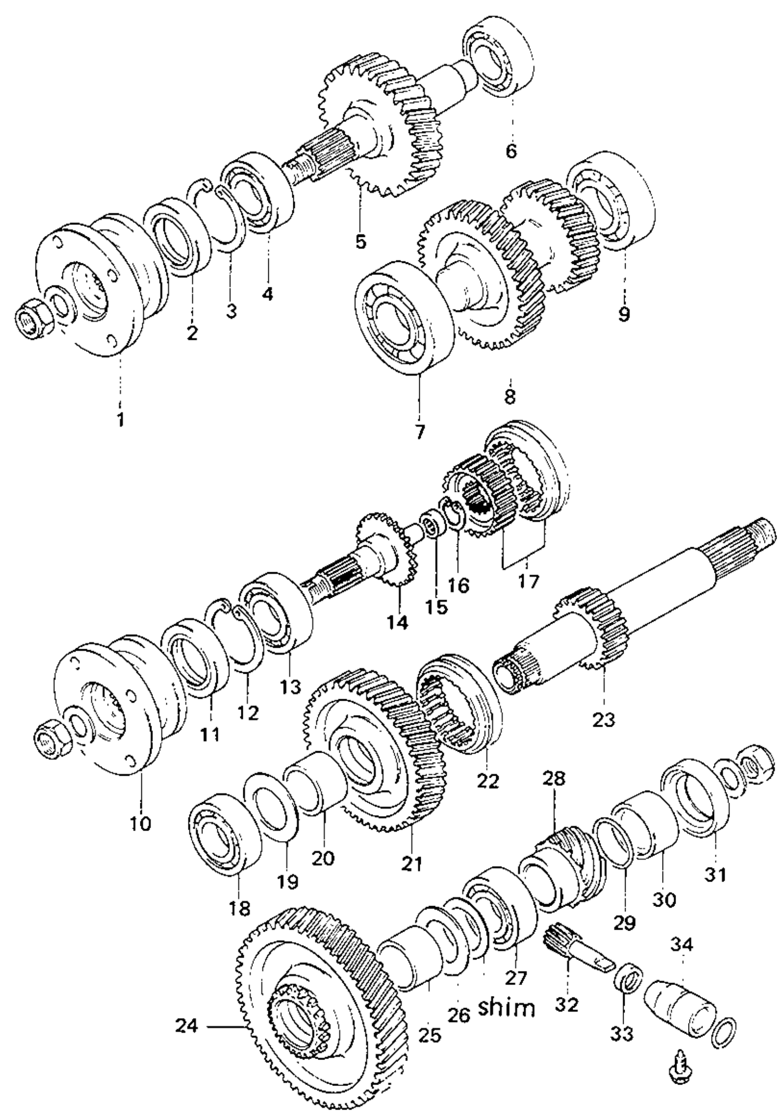


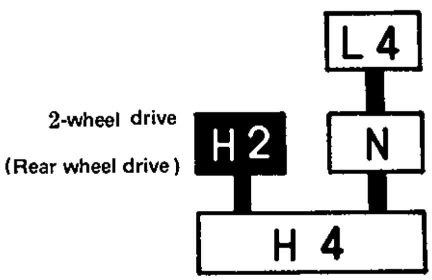
Fig. 14-1

14-2. Selective Flows of Transfer Drive

2-wheel drive (Rear-wheel drive)

Rear shifter fork pushes rear clutch sleeve into "high" gear, thus coupling the gear to output rear shaft.
Drive flows from input shaft to output rear shaft through big gear, "high" gear and rear clutch.

Gear shift control lever position



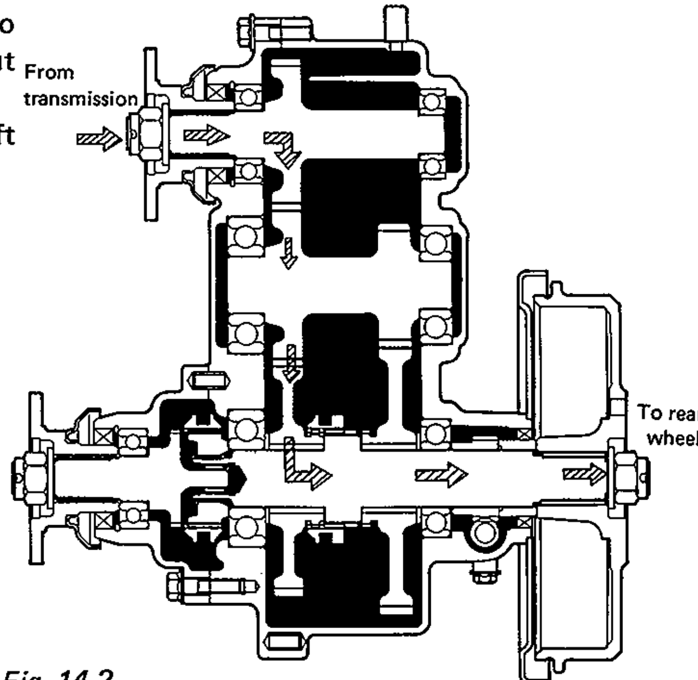
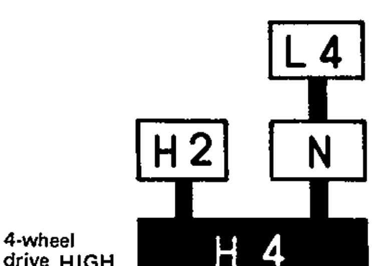


Fig. 14-2

4-wheel drive HIGH (All-wheel drive on HIGH)

Under the conditions of rear-wheel drive, described above, front shifter fork pushes the sleeve of front clutch onto the toothed clutch ring, thus coupling output rear shaft to output front shaft. Front shaft and rear shaft run together on HIGH.

Gear shift control lever position



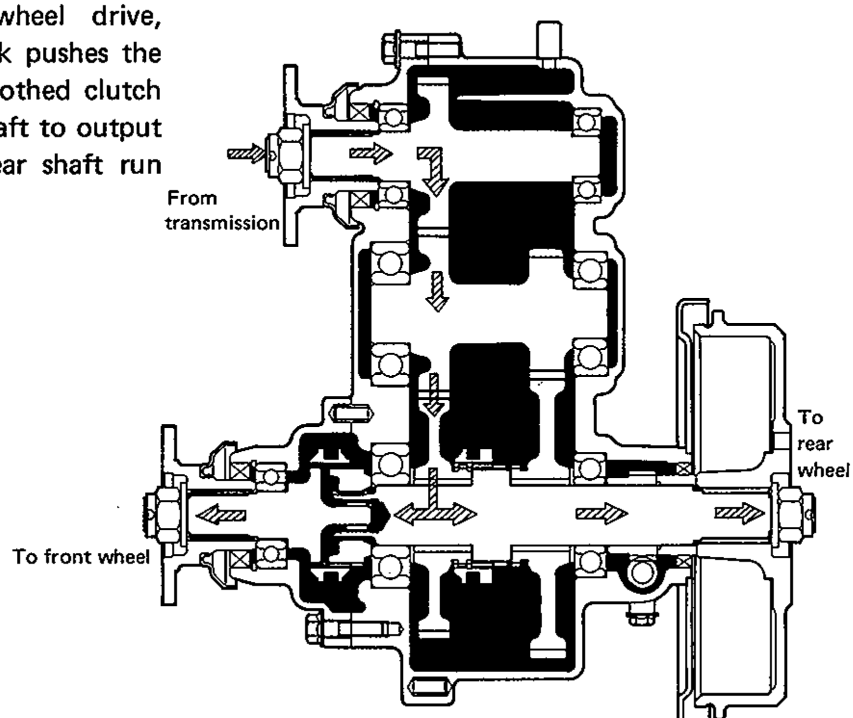
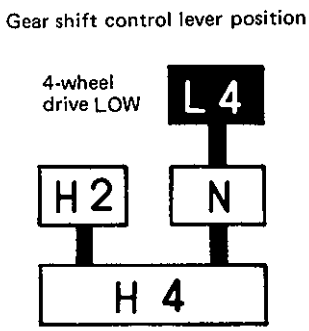


Fig. 14-3

4-wheel drive LOW (All-wheel drive on LOW)
Front shifter fork actuates front clutch to couple rear shaft to front shaft; and rear shifter fork actuates rear clutch to couple "low" gear to rear shaft. Front shaft and rear shaft run together on LOW.



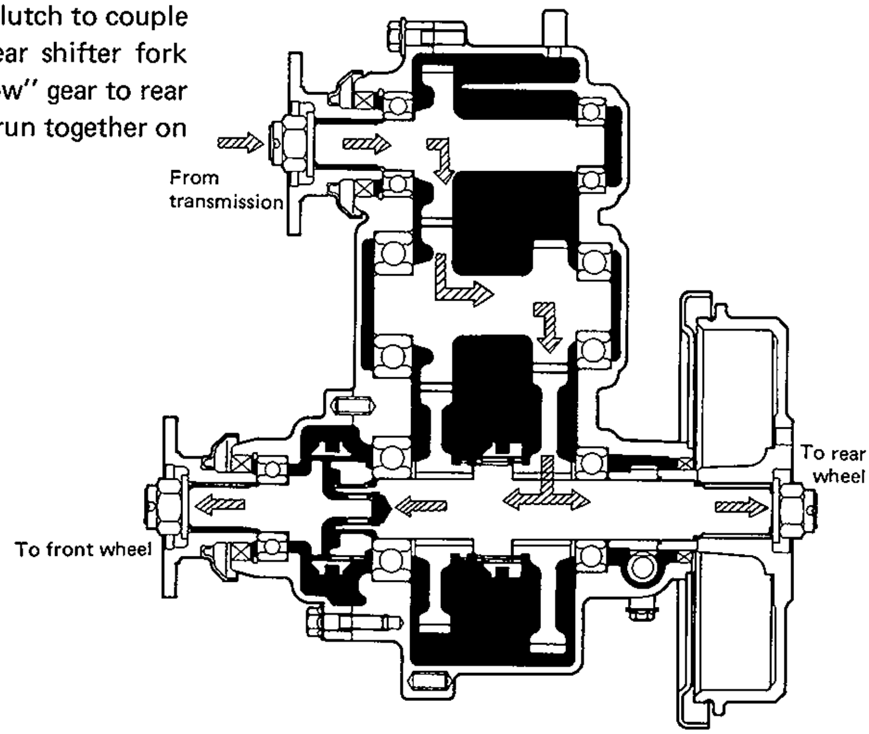


Fig. 14-4

14-3. Gear Ratio Data

Shift position		Rear-wheel drive	All-wheel drive high	All-wheel drive low
Primary gear ratio (Reduction ratio)		42/39 (1.077) [50/31 (1.613)]		
Secondary ratios	Gear	62/42 [54/50]	62/42 [54/50]	57/24 [53/28]
	Reduction	1.476 [1.080]	1.476 [1.080]	2.375 [1.893]
Overall transfer reduction ratio		1.590 [1.742]	1.590 [1.742]	2.558 [3.053]

[ ] For colombian & peruvian markets

14-4. Transfer Services Not Requiring Transfer Removal

The following parts or components do not require transfer removal to receive services (replacement, inspection):

Part or Component	Nature of Service
1. Universal-joint yoke flanges	Replacement or inspection
2. Front drive shift shaft fork	Replacement or inspection
3. Transfer output front shaft oil seal	Replacement or inspection
4. Transfer output front shaft bearing	Replacement
5. Transfer output front shaft	Replacement
6. Transfer front case	Replacement
7. Front drive clutch hub	Replacement or inspection
8. Front drive clutch sleeve	Replacement or inspection
9. Transfer input shaft oil seal	Replacement
10. Center brake drum	Replacement or inspection
11. Center brake shoe	Replacement or inspection
12. Output rear shaft oil seal	Replacement
13. Output rear shaft retainer	Replacement
14. Speed meter drive gear	Replacement or inspection
15. Speed meter driven gear	Replacement or inspection
16. Gear shift control lever	Replacement or inspection
17. Gear shift control boot No. 1, No. 2	Replacement
18. Gear shift control lever spring seat	Replacement or inspection

14-5. Removal

1) Loosen the screws securing the transfer gear shift control lever boot and remove the boot cover ①.

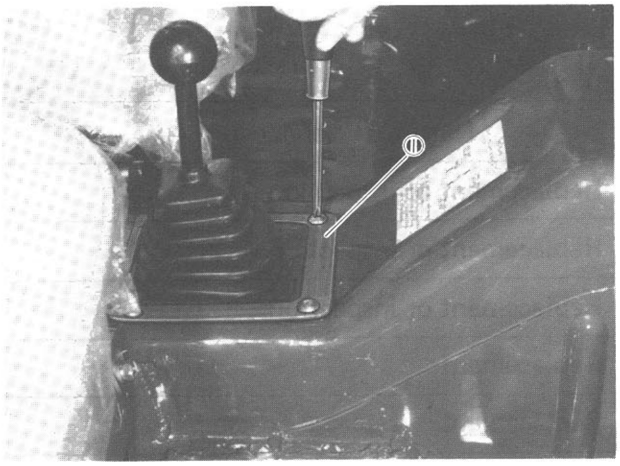


Fig. 14-5

> NOTE:
> When only the shift control lever needs to be removed, lift up the body after the above step 1), remove clamp ② and boot ③ from the case and carry out the work as shown in Fig. 14-12. In this way, only the control lever can be removed without the transfer case being removed.

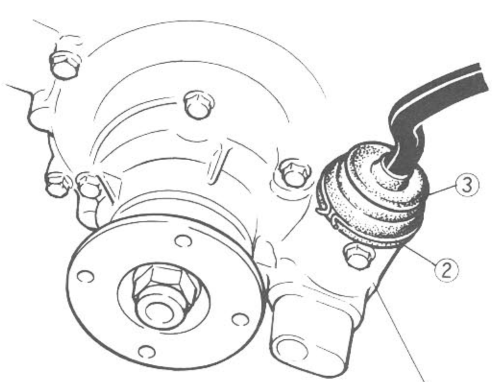


Fig. 14-6

2) Lift up the car and remove the securing bolts from each universal-joint flange connection to sever the three propeller shafts from the transfer gear box.

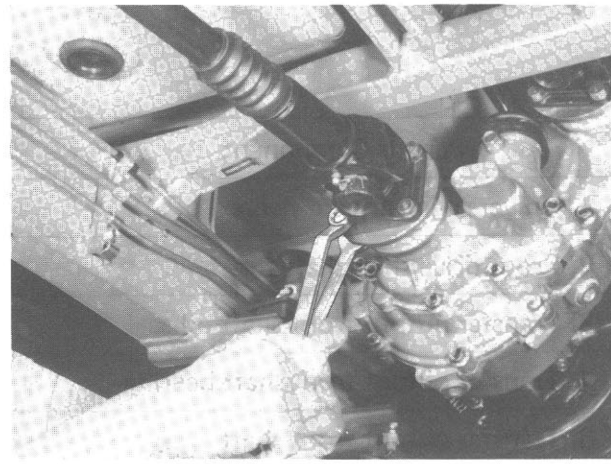


Fig. 14-7

3) Drain out oil from the gear box by loosening its drain plug.

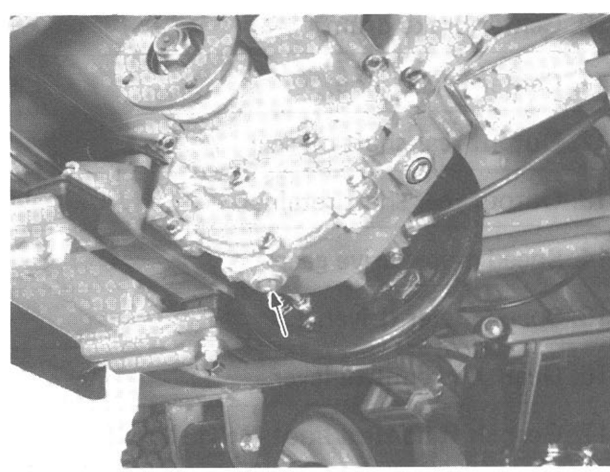


Fig. 14-8

4) Disconnect speedometer drive cable from the transfer gear box.

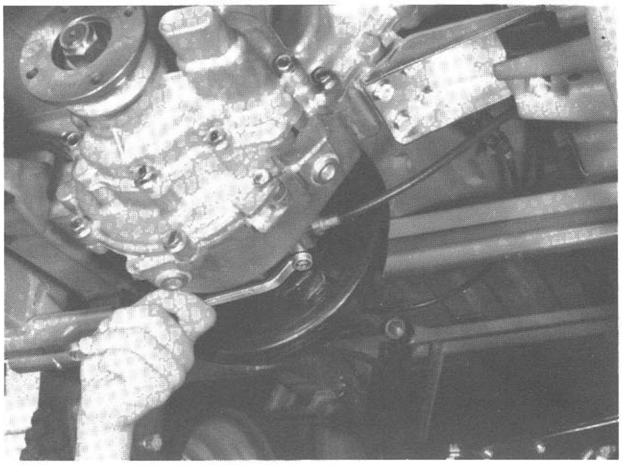


Fig. 14-9

5) Disconnect the parking brake wire from parking brake lever and body.

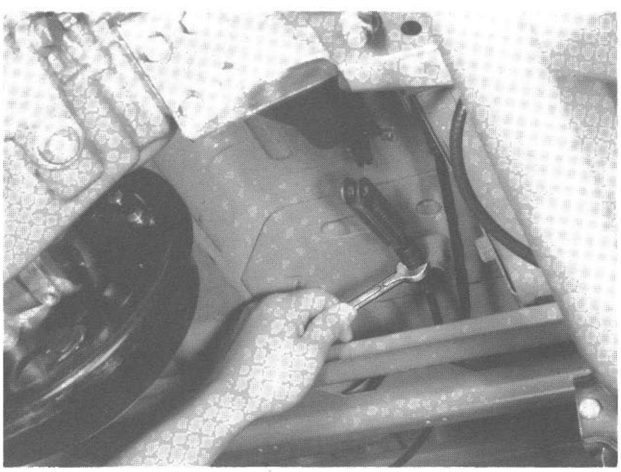


Fig. 14-10

6) Remove the four mounting bolts securing the gear box to the chassis, and take down the gear box.

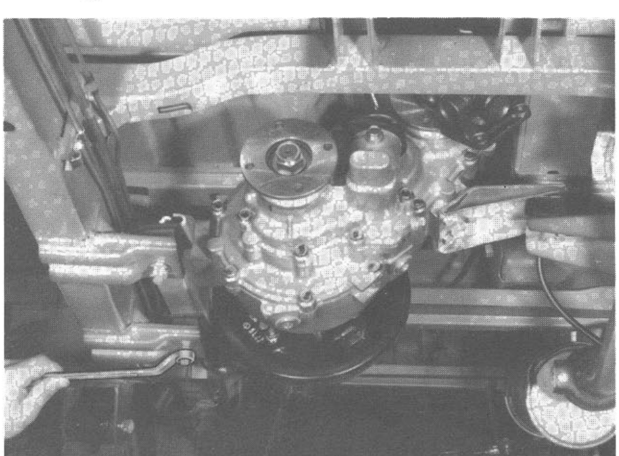


Fig. 14-11

14-6. Disassembly

Transfer gear control lever

Twist the control lever guide counterclockwise while pushing it down; this will permit the lever to be removed from the gear box.

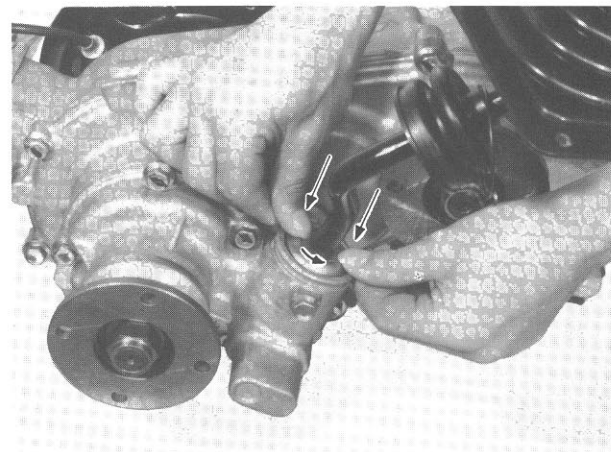


Fig. 14-12

Universal-joint yoke flanges

There are two flanges to be removed: one from the input shaft and one from the output front shaft. Lock the flange so that it will not turn, and loosen and remove the nut holding the flange to the shaft. Draw off the flange.

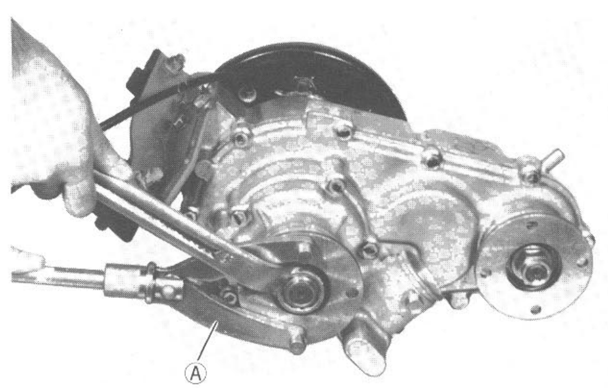


Fig. 14-13 Ⓐ Special tool (09930-40113)

Center brake

Utilize the differential preload checking tool on the center brake drum so that the drum will not turn. Loosen and remove the nut securing the drum.
Differential preload checking tool Ⓑ (09922-75220)

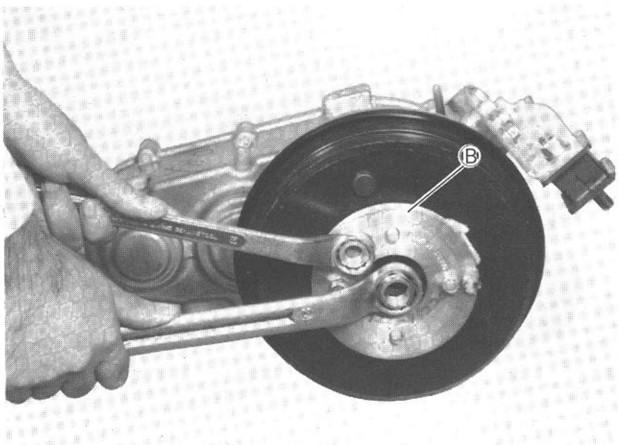


Fig. 14-14

Remove the brake shoes. Remove the 4 bolts securing the backing plate, and take out the backing plate assembly.

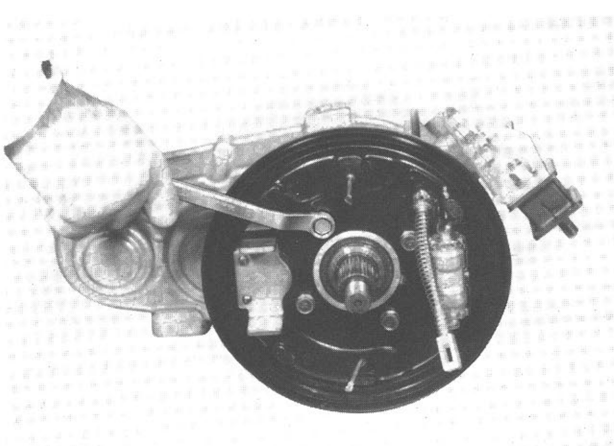


Fig. 14-15

Speedometer driven gear

Remove the speedometer driven gear, as shown in Fig. 14-16.

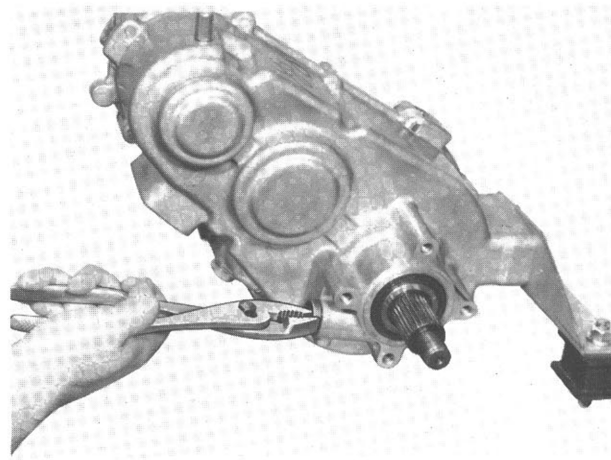


Fig. 14-16

Transfer front case

Remove the bolts securing the transfer front case, and take off the case.

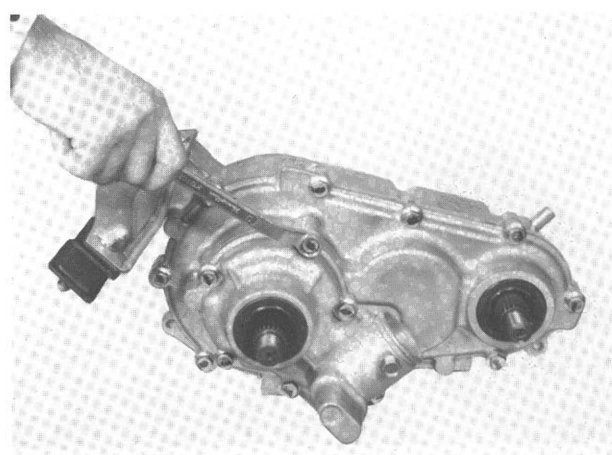


Fig. 14-17

Transfer output front shaft

Draw out the output front shaft from output rear shaft.

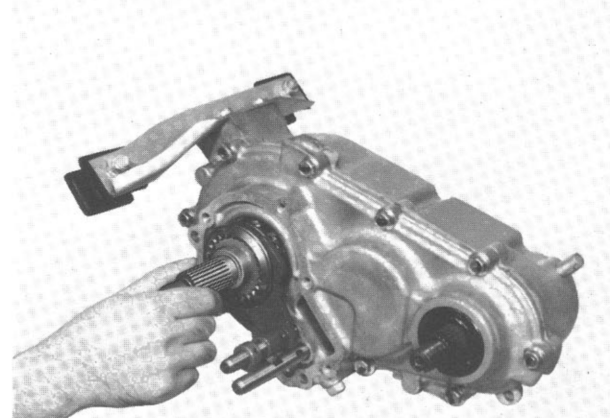


Fig. 14-18

Transfer center case

Remove the bolts fastening the center case and rear case together.

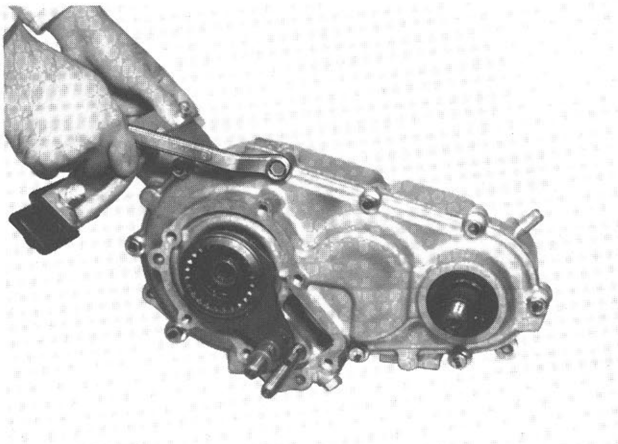


Fig. 14-19

Separate the center and rear cases. By using special tool Ⓐ (09912-34510) at each of the three ribs provided the cases in turn, they should be separated evenly and gradually.
It is also possible to facilitate the work by applying the special tool as in Fig. 14-21 and tapping the output rear shaft with a plastic hammer.

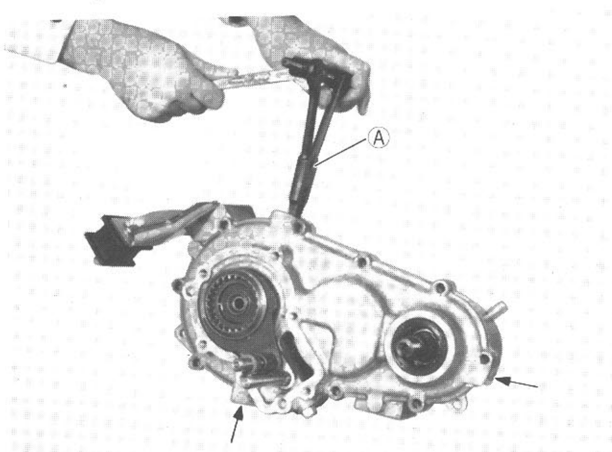


Fig. 14-20

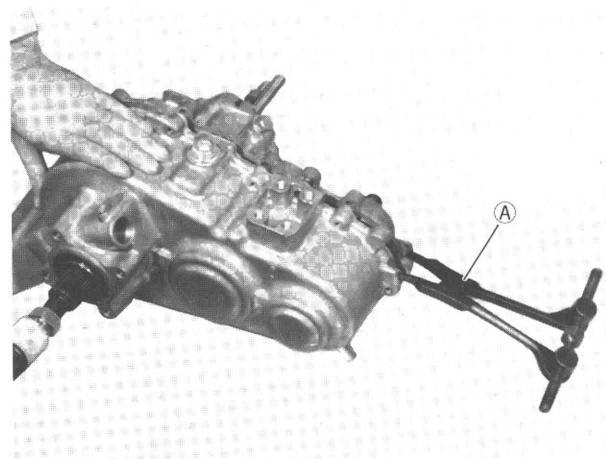


Fig. 14-21

Separated center case and rear case

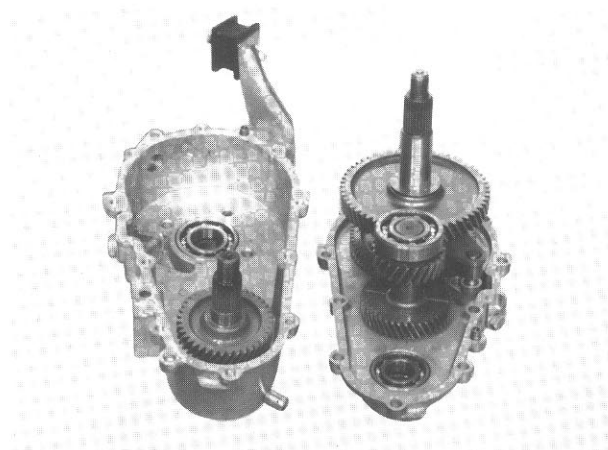


Fig. 14-22

Given below are the procedures for disassembling the component parts of the center case separated from the rear case.

1) Loosen the gear shift locating spring plug and take out the springs and locating ball.

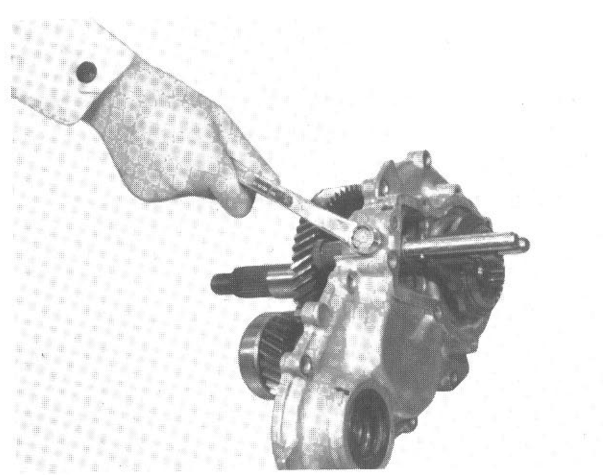


Fig. 14-23

2) Using the spring pin remover (special tool), drive three spring pins out of the front drive shift shaft ① and reduction shift shaft ② .
Spring pin remover Ⓐ (09922-85811)

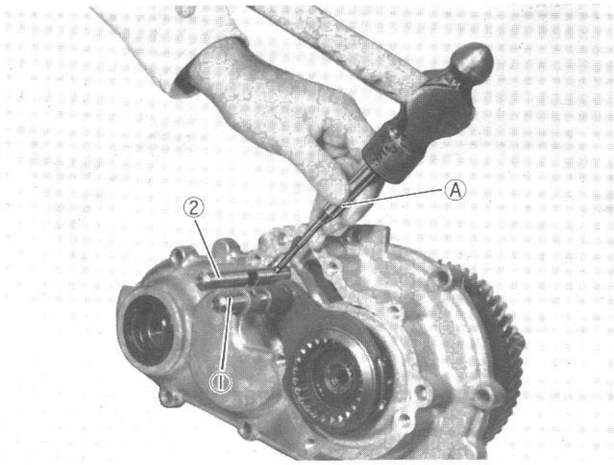


Fig. 14-24

And then remove the stop pipe and fork from the shift shaft ①.

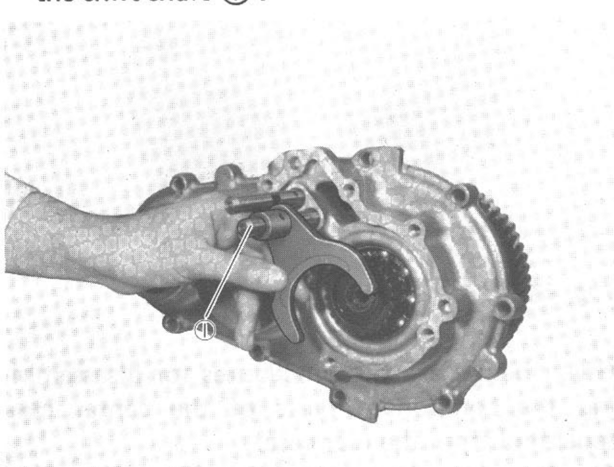


Fig. 14-25

3) Using the special tool Ⓑ , remove the front drive clutch hub circlip and pull the clutch hub off the shaft.
Circlip remover Ⓑ (09900-06107)

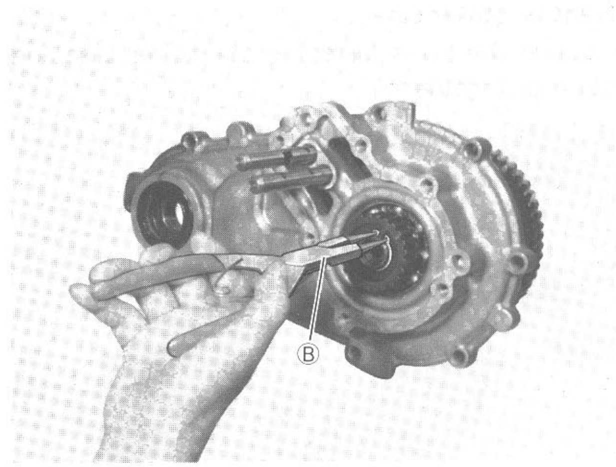


Fig. 14-26

4) Remove the washer from the output rear shaft.

5) Slide off the output low gear bush ③ from the output rear shaft.

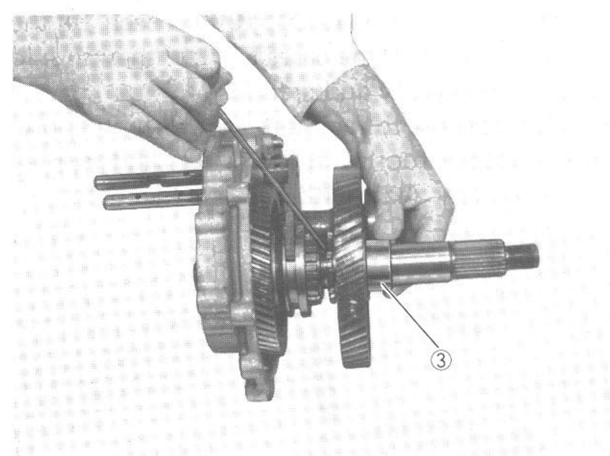


Fig. 14-27

6) Remove the output low gear.

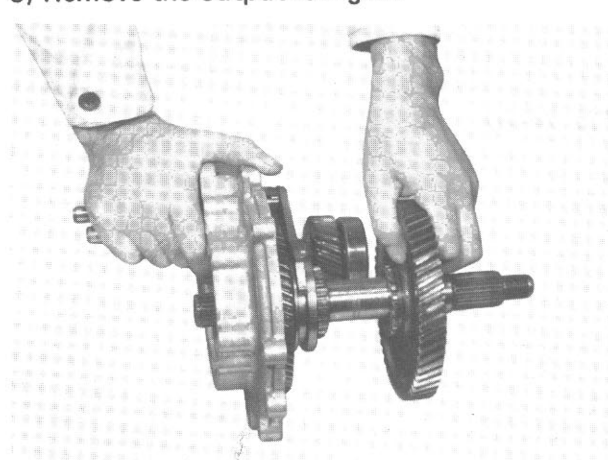


Fig. 14-27-1

7) Remove the reduction shift shaft together with the clutch sleeve.
At this time, watch out for the locating ball jumping out of the case, lest it should get lost.

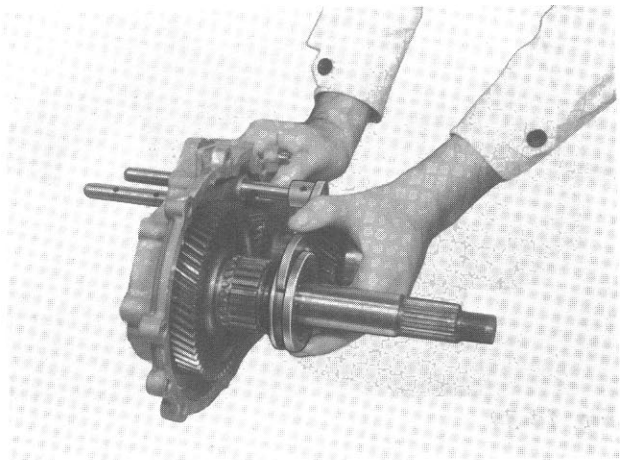


Fig. 14-28

8) Remove the front drive shift shaft from the case. In this case, too, watch out for the locating ball jumping out of the case, lest it should get lost.

9) Hammer the output rear shaft with a plastic hammer to drive it out of the center case. Be careful not to allow dust to enter the shaft in which a needle roller bearing is inserted.

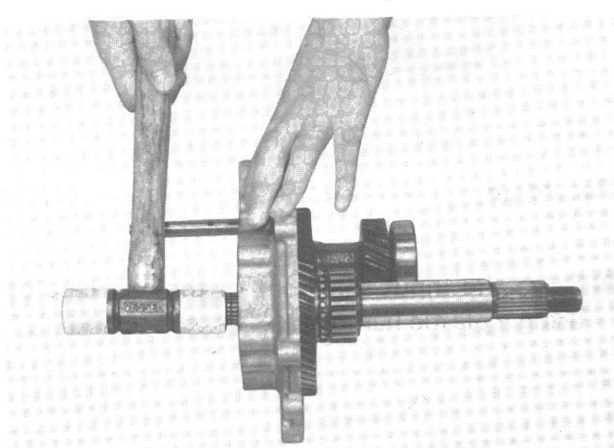


Fig. 14-29

10) Remove the counter shaft from the center case by hammering thick part of the case around the counter shaft bearing with a plastic hammer.

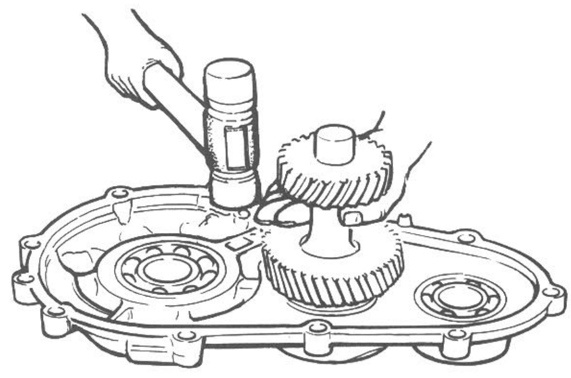


Fig. 14-30

11) When the counter shaft is removed, the front or rear bearing may come off with it. In such a case, the bearing can be removed from the shaft by using special tool Ⓐ or Ⓑ.

Special tool Ⓐ (09913-61110)

(This is used for removing the counter shaft rear bearing.)

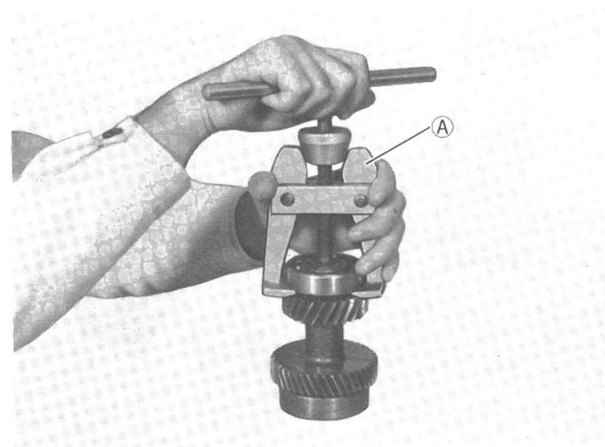


Fig. 14-31

Special tool Ⓑ (09913-60910)

(This is used for removing the counter shaft front bearing.)

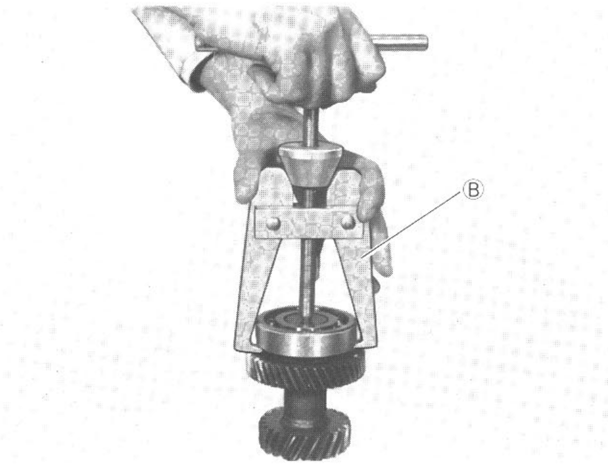


Fig. 14-32

12) When the counter shaft is removed, the counter shaft front bearing may be left in the case. In this case, the bearing can be taken out of the case by using special tools Ⓒ and Ⓓ.

Bearing remover Ⓒ (09923-74510)
Sliding hammer Ⓓ (09930-30102)

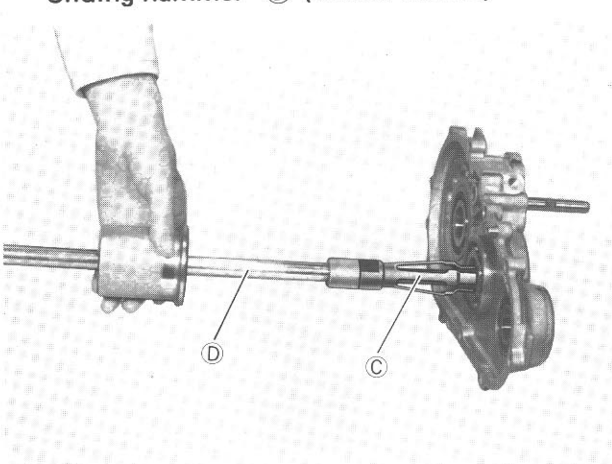


Fig. 14-33

Transfer rear case

1) Remove the retainer and oil seal from the rear case.

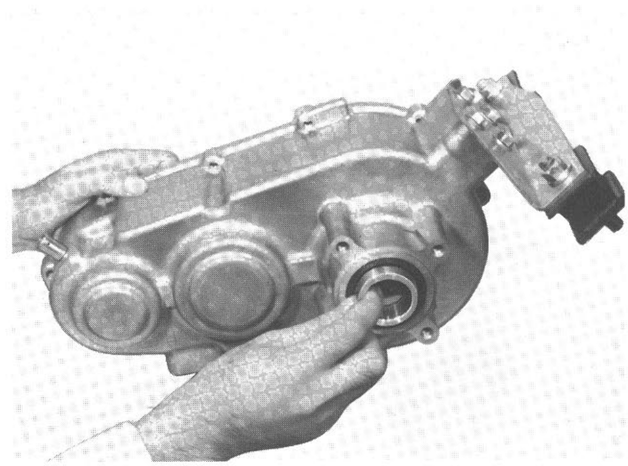


Fig. 14-34

2) Remove the speedometer drive gear from the rear case.

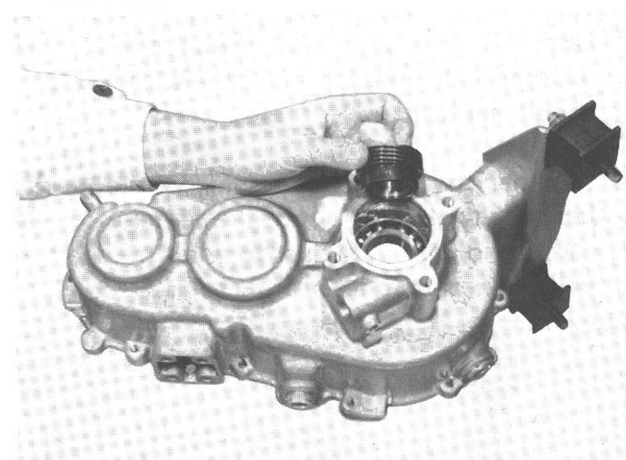


Fig. 14-35

3) Drive the input shaft out of the rear case by using a plastic hammer.

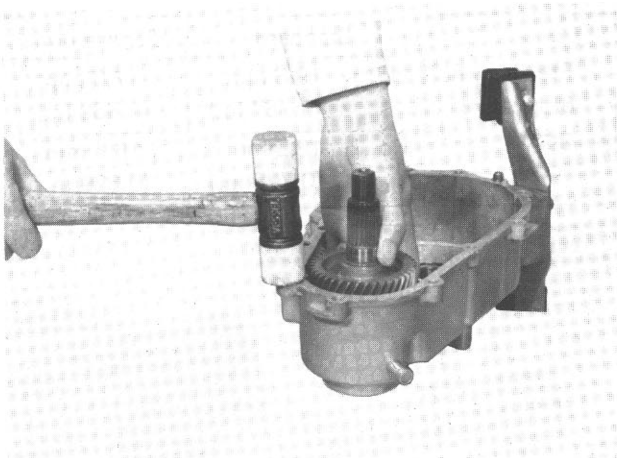


Fig. 14-36

4) The input shaft bearing can be taken out of the rear case by using special tools Ⓒ and Ⓓ.

Bearing remover Ⓒ (09923-74510)
Sliding hammer Ⓓ (09930-30102)

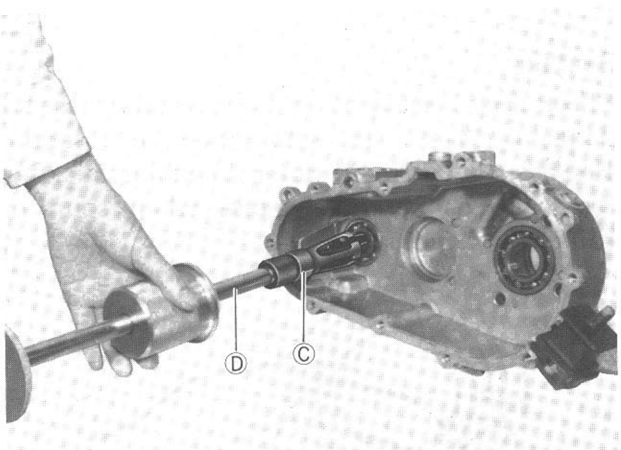


Fig. 14-37

5) The counter shaft rear bearing left on the rear case side can be taken off by using special tools Ⓒ and Ⓓ.

Bearing remover Ⓒ (09923-74510)
Sliding hammer Ⓓ (09930-30102)

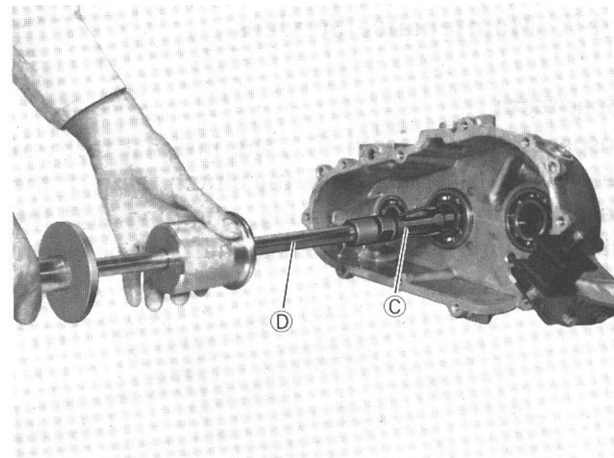


Fig. 14-38

14-7. Maintenance Services

Gear teeth

Inspect the gear teeth ①, the internal teeth of rear clutch sleeve ② and the clutch teeth of the gear ③ for wear, cracking, chipping and the like malcondition. Replace the gear or sleeve as necessary.

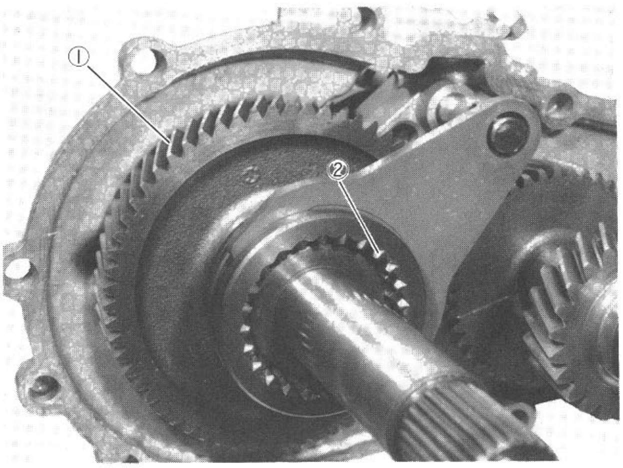


Fig. 14-39

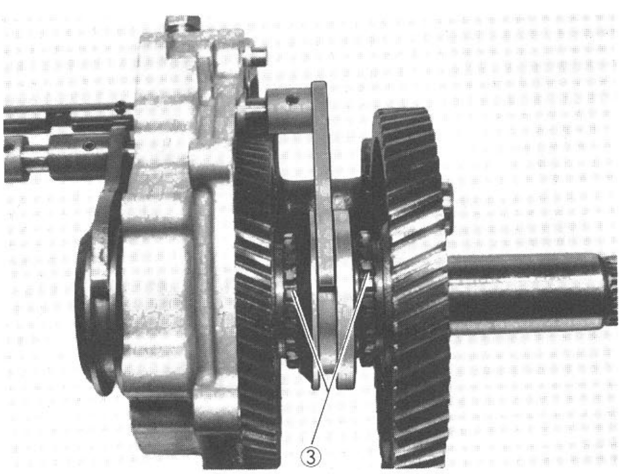


Fig. 14-40

Locating spring

Check each shifter fork shaft locating spring for strength by measuring its free length. If the length is noted to be less than the service limit, replace it.

		Standard	Service limit
Free length of locating spring	No. 1	19.5 mm (0.767 in.)	17.0 mm (0.669 in.)
	No. 2	18.5 mm (0.728 in.)	16.0 mm (0.629 in.)

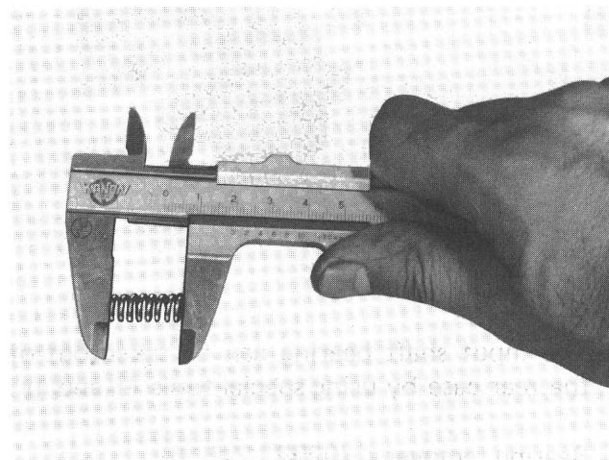


Fig. 14-41

Bearings

Check each bearing by spinning its outer race by hand to "feel" the smoothness of rotation. Replace the bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

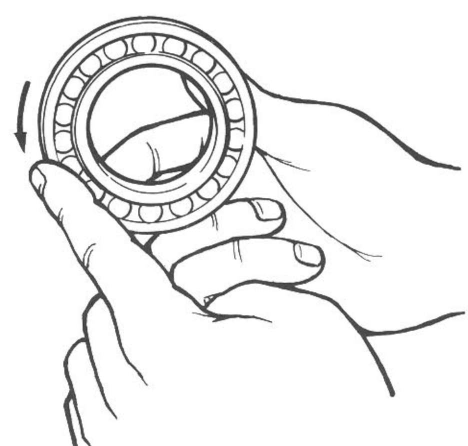


Fig. 14-42

14-8. Transfer Reassembly

NOTE:
- All parts to be used in reassembly must be perfectly clean.
- Oil the sliding and rubbing surfaces of transfer parts just before using them in reassembly. For the oil, use gear oil.
- To prevent oil leak, apply SUZUKI BOND No. 4 (liquid packing) to mating surfaces of the cases and wherever necessary.
- Oil seals, "O" rings and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.
- Tightening torque is specified for important fasteners—bolts in the main—of the transfer and other components. Use torque wrenches and constantly refer to the specified values given in the text of this manual. The list immediately following is such specifications.

Tightening torque data

This is a list-up of important tightening jobs identified by parts to be secured:

What to tighten	N.m / kg-m	lb-ft
Front case bolt	18～28 1.8～2.8	13.5～20.0
Center case bolt	18～28 1.8～2.8	13.5～20.0
Universal joint flange nut	90～130 9.0～13.0	65.0～90.0
Transfer mounting bracket bolt	15～23 1.5～2.3	11.0～16.5
Transfer mounting nut	30～37 3.0～3.7	22.0～26.5
Cross joint bolt and nut	28～35 2.8～3.5	20.5～25.0
Oil filler plug and drain plug	30～50 3.0～5.0	22.0～36.0

Rear case

1) Using special tool Ⓐ, drive the counter shaft rear bearing into the rear case.

Differential front bearing outer race installer Ⓐ (09913-75520)

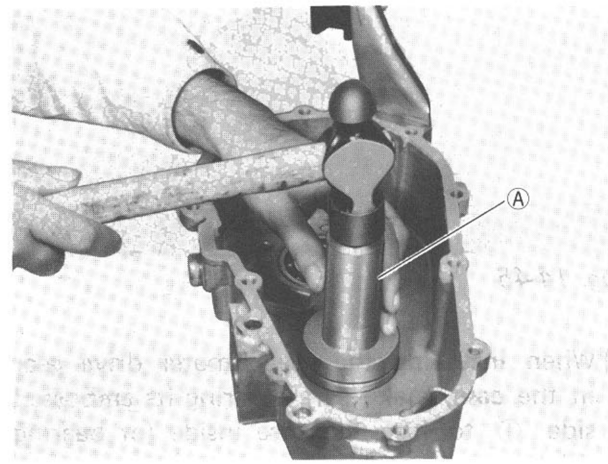


Fig. 14-43

2) Using special tool Ⓑ, drive the input shaft rear bearing into the rear case.

Bearing installer Ⓑ (09913-76010)

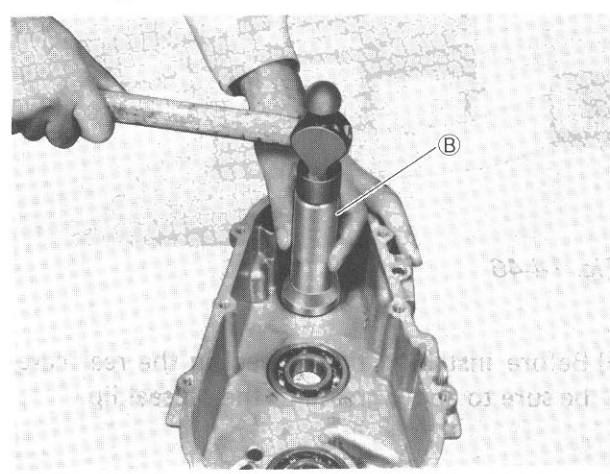


Fig. 14-44

3) Drive the input shaft into the input shaft bearing of the rear case.

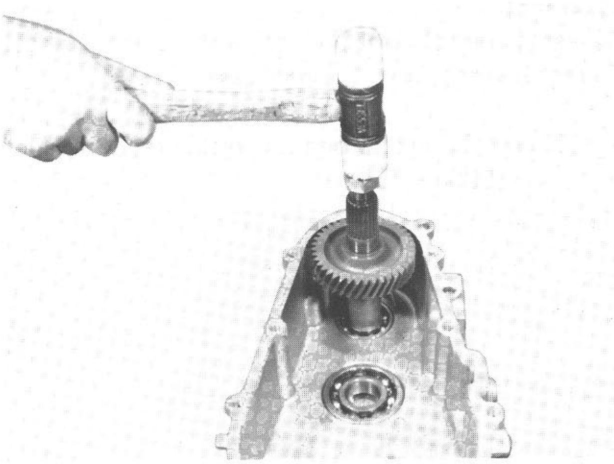


Fig. 14-45

4) When installing the speedometer drive gear in the case, make sure to bring its embossed side ① to face the case inside (or bearing side).

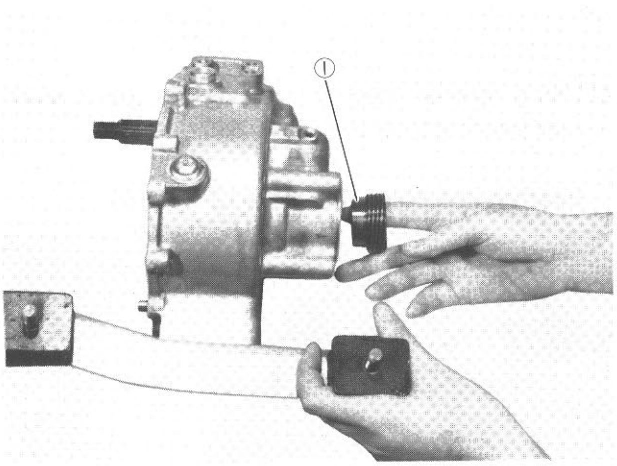
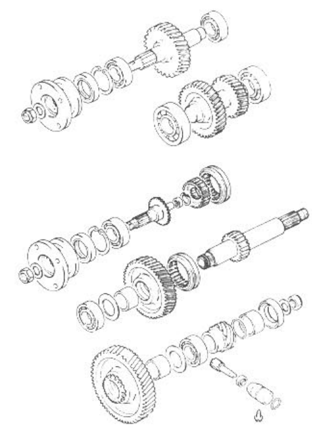


Fig. 14-46

5) Before installing the oil seal in the rear case, be sure to apply grease to the oil seal lip.

Center Case

NOTE:
Before installing the parts in the center case, look at the following figure carefully and learn where washers are fitted and in which direction the hub, sleeves and gears are installed.



1) Using special tool Ⓐ, drive the counter shaft front bearing into the center case.

Differential rear bearing outer race installer Ⓐ (09913-75510)

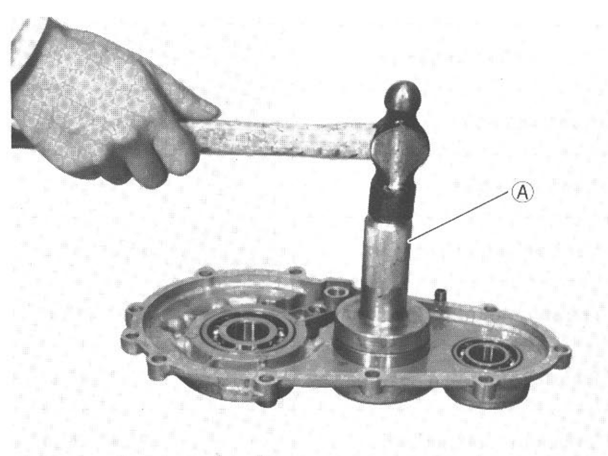


Fig. 14-47

2) Using a plastic hammer, drive the counter shaft into the counter shaft front bearing.

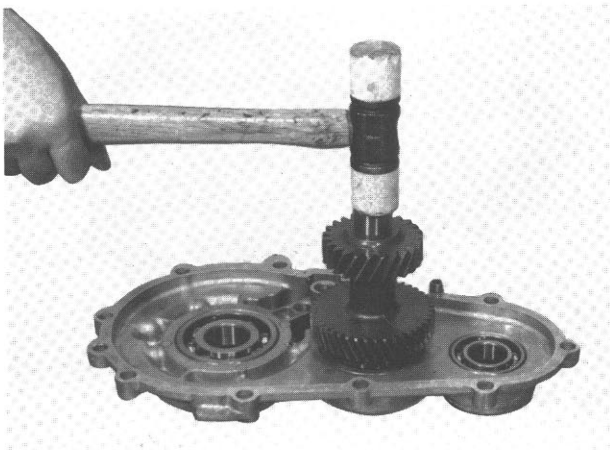


Fig. 14-48

3) Also using a plastic hammer, drive the output rear shaft in the center case as shown in Fig. 14-49.

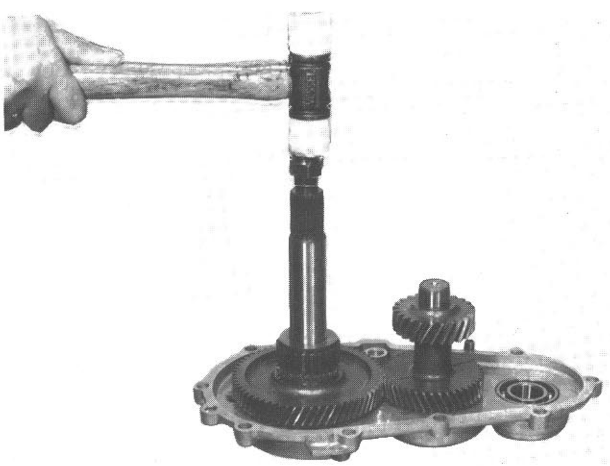


Fig. 14-49

4) When installing the front drive shift shaft in the center case, install springs ①, ball ② and the shaft ③ in that order.

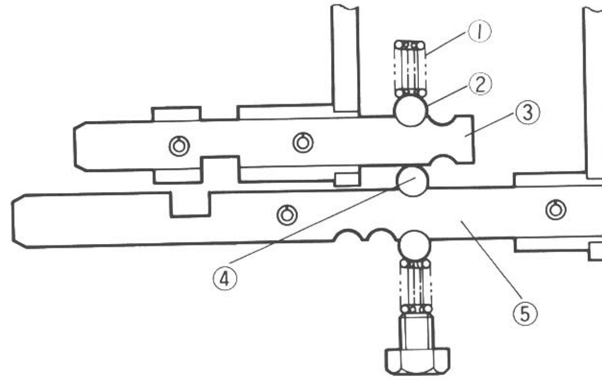


Fig. 14-50

5) Before installing the reduction shift shaft ⑤ in the center case together with the clutch sleeve, make sure to set ball ④ in place (see Fig. 14-50). The clutch sleeve should be installed in such a direction as shown in Fig. 14-52.

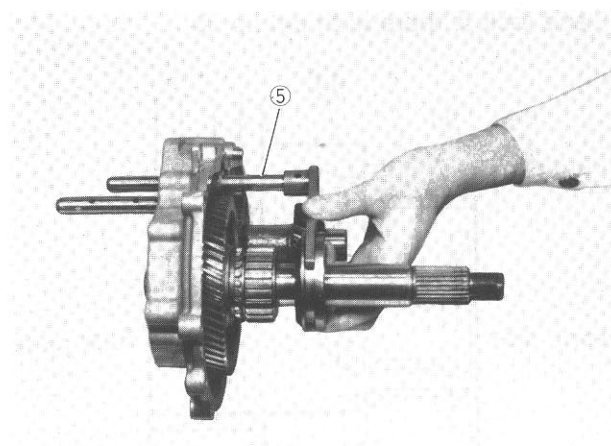


Fig. 14-51

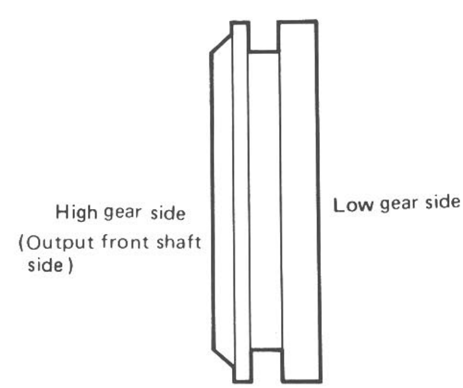


Fig. 14-52

6) After the low gear and low gear bush ⑦ are installed on the output rear shaft, make sure to fit the washer ⑧ .

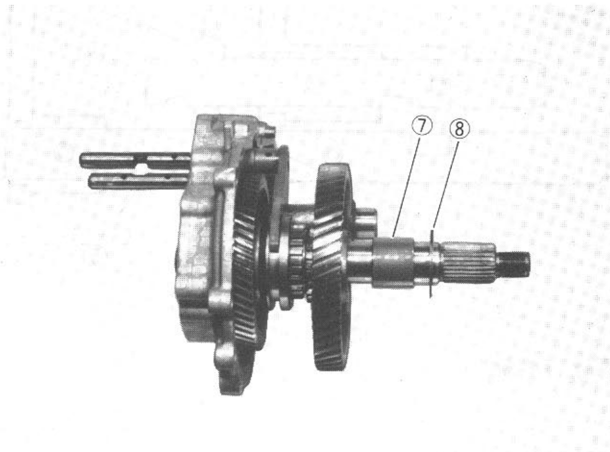


Fig. 14-53

7) Fit the front drive clutch hub ⑨ on the front side of the output rear shaft, making sure that the boss ⑪ of the hub faces the center case, and lock it there with circlip ⑩

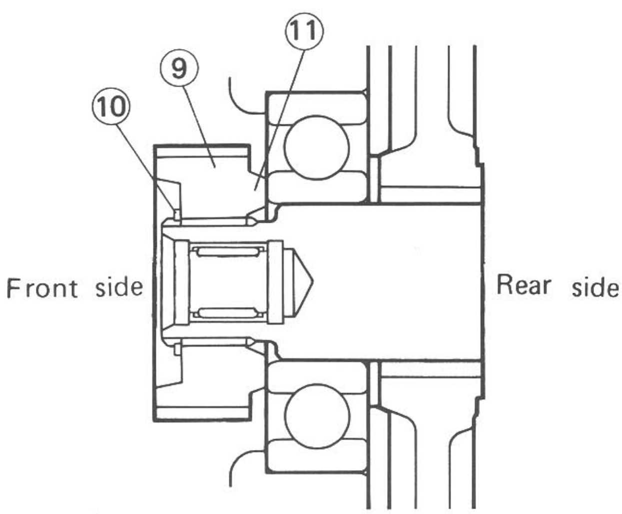


Fig. 14-54

8) Fit the fork ⑫ and stop pipe ⑬ on the front drive shift shaft and lock them with spring pins. The fork ⑫ should be fitted in the correct direction according to Fig. 14-55. Also, drive a spring pin into the other shift shaft.

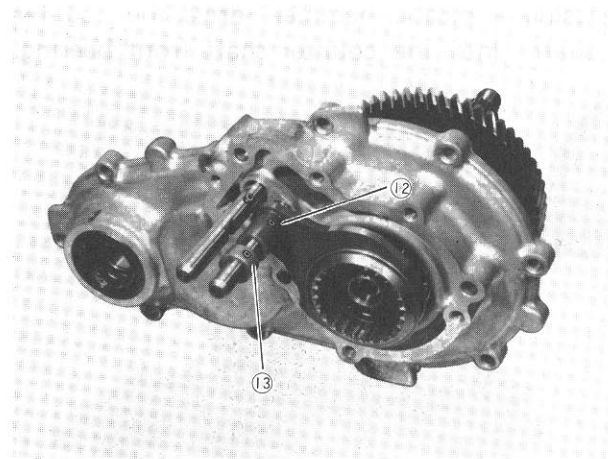


Fig. 14-55

9) Set ball ⑭ and springs ⑮ in the center case and tighten the bolt.

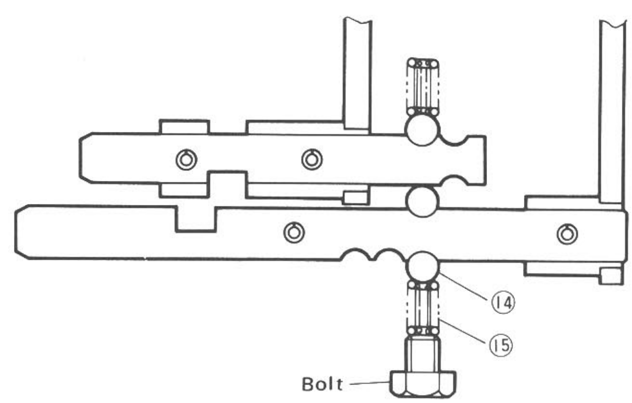


Fig. 14-56

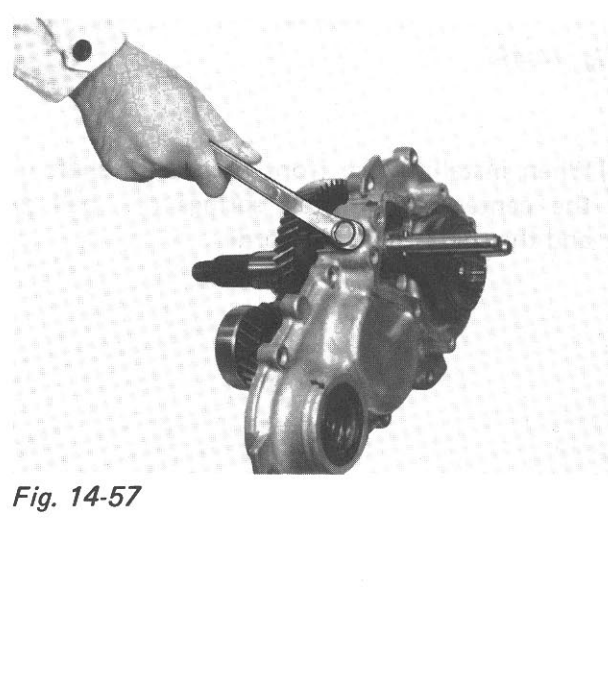


Fig. 14-57

Front, center and rear cases

1) Check the front and rear cases to ensure that they are both provided with 2 dowel pins ①.

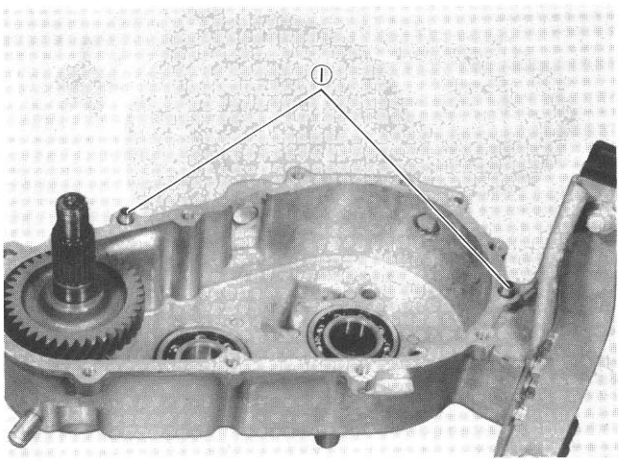


Fig. 14-58

2) Apply SUZUKI BOND No. 4 (99000-31030) to the mating surfaces of the front case and center case as well as center case and rear case.

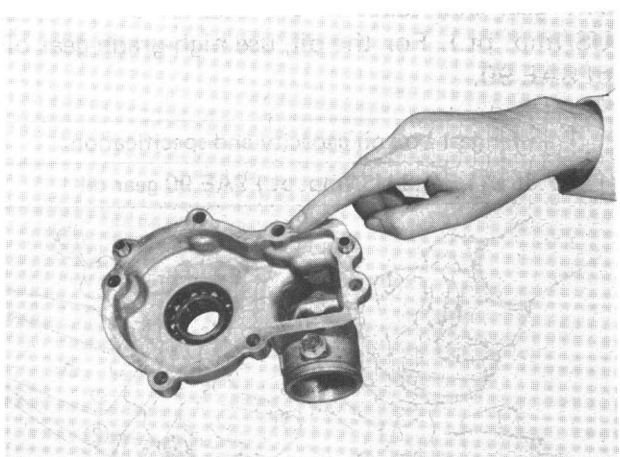


Fig. 14-59

3) Bring the rear case and the center case into match and apply uniform force gradually all around the rear case with a plastic hammer.

> NOTE:
> While rotating the input shaft or output rear shaft, tap the rear case with a plastic hammer.

When the rear case is closer to the center case to a certain extent, tighten the center case cover bolts. Thus they are fastened together securely. Be sure to apply SUZUKI BOND No. 4 to the thread of each bolt before tightening it.

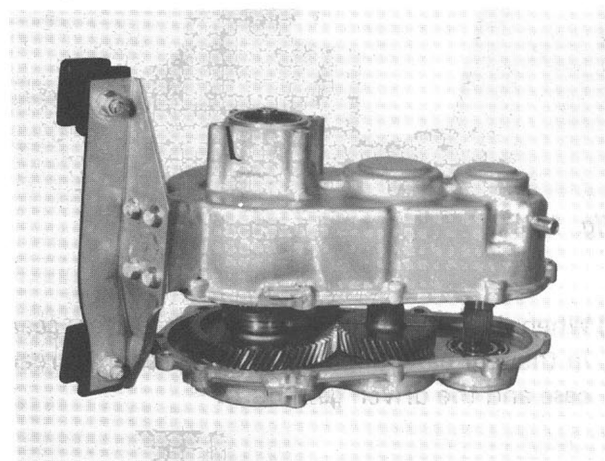


Fig. 14-60

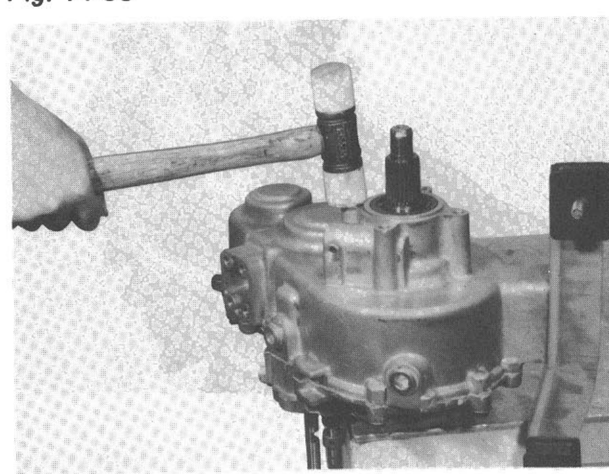


Fig. 14-61

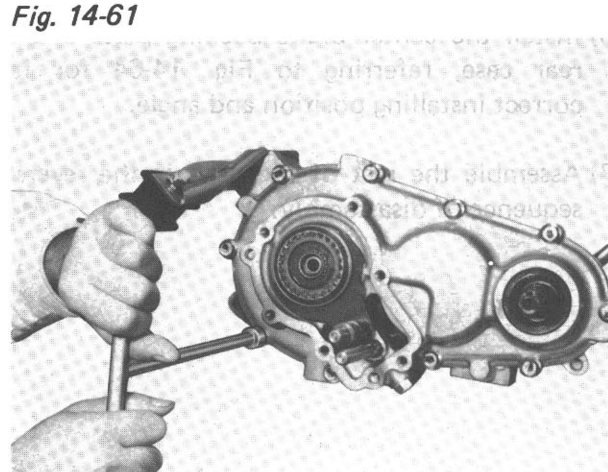


Fig. 14-61-1

4) Install the retainer with O ring ② on the output rear shaft. A this time, be sure to bring its O ring side to the bearing side.

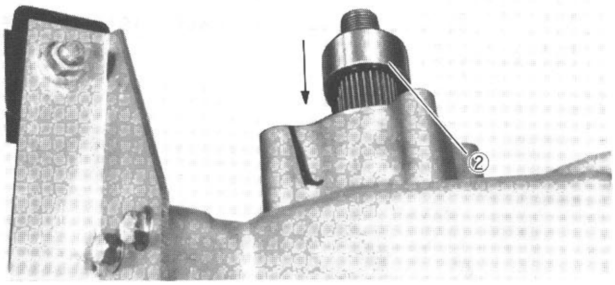


Fig. 14-62

5) When installing the speedometer driven gear in the rear case, align the bolt holes in the rear case and the driven gear bush.

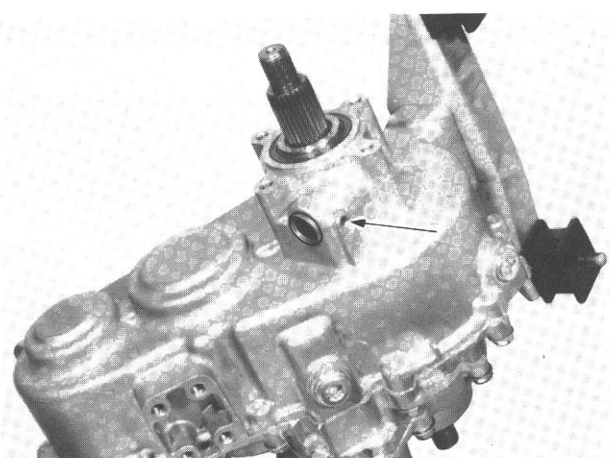


Fig. 14-63

6) Install the center brake backing plate in the rear case, referring to Fig. 14-64 for its correct installing position and angle.

7) Assemble the rest of the parts in the reverse sequence of disassembly.

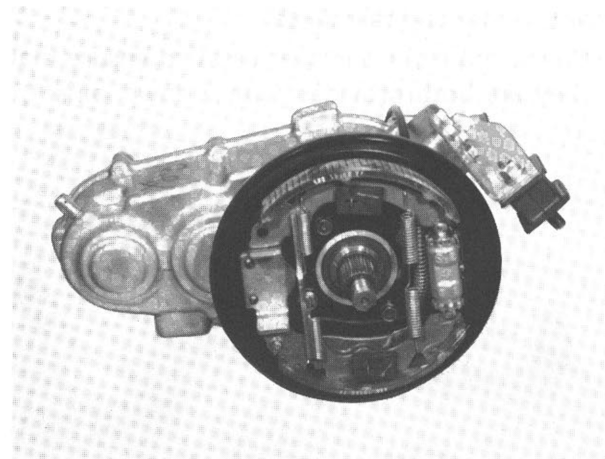


Fig. 14-64

8) Upon completion of the entire assembly work, install the transfer in the chassis body in the reverse sequence of the procedures given under 14-5 (Removal). Pour below given amount of gear oil into the transfer gear box.

Lubricating oil for transfer gear box

The gear box takes in 0.7 litre of oil (1.5/1.2 US/Imp. pt.). For the oil, use high-grade gear oil of SAE 90.

Transfer gear box oil capacity and specification
0.7 litre (1.5/1.2 US/Imp. pt.) SAE 90 gear oil

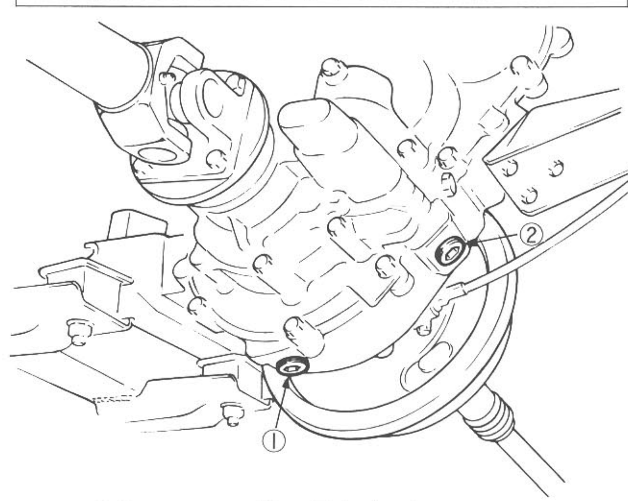


Fig. 14-65 ① *Oil drain plug*
② *Oil level plug*

15. PROPELLER SHAFTS

15

15-1. Description

These automobiles, covered in this manual are four-wheel drive machines and, as such, use three propeller shafts designated as No. 1, No. 2 and No. 3.

No. 1 propeller shaft transmits drive from the transmission to the transfer gear box. No. 2 shaft and No. 3 shaft extend from the transfer gear box, the former driving the front axle and the latter the rear axle. Each propeller shaft is terminated by universal joints to permit the shaft to accommodate the radial displacement of the driven member relative to the driving member; and each universal joint is connected to the driving or driven shaft through spline engagement, the internal splines being provided in the distal yoke of the joint, so that the propeller shaft permits the driven member to axially displace itself relative to the driving member. These two kinds of displacement are possible within certain limits, and are expected to occur between the transmission and the transfer gear box, between the transfer and the front axle and between the transfer and the rear axle.

The cross spider in each universal joint is fitted with four needle roller bearings. These bearings are press-fitted into the housing parts of the yokes and securely fixed in place by circlips.

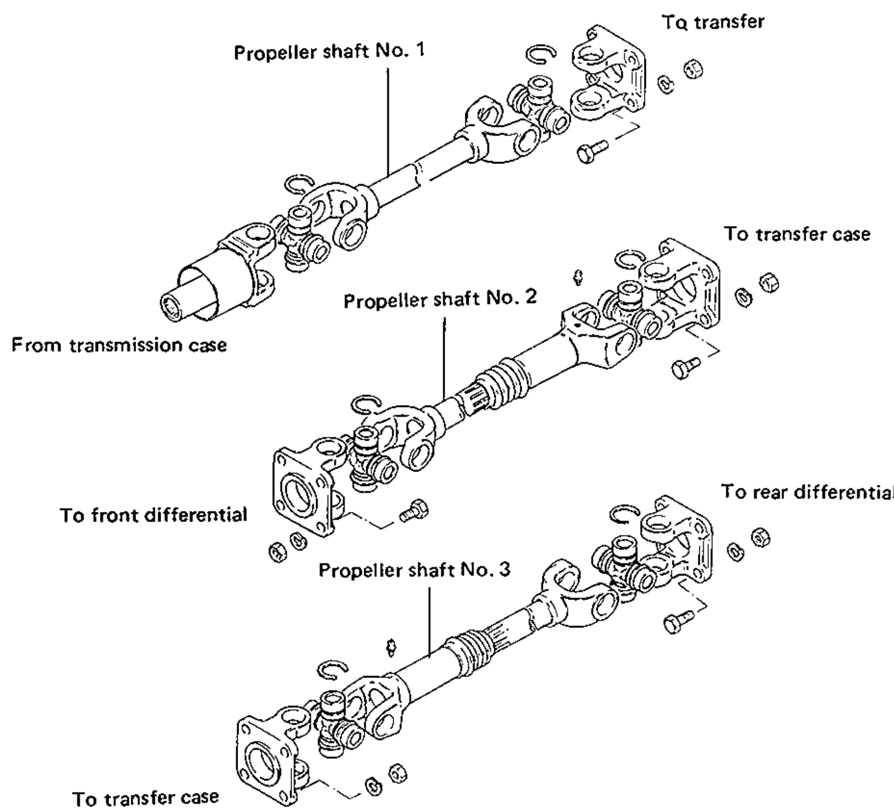


Fig. 15-1

15-2. Removal

1) Lift the machine off the floor by jacking up the axles, and rest it on safety stands.
2) At each splined connection, remove the four nuts securing the yoke to its splined companion flange piece. This disconnects the propeller shaft, leaving the flange piece behind.
   The transmission-side end of No. 1 shaft has no flange piece; this end is splined to the driving shaft inside the extension case. All you have to do there is to pull No. 1 shaft off the extension case.

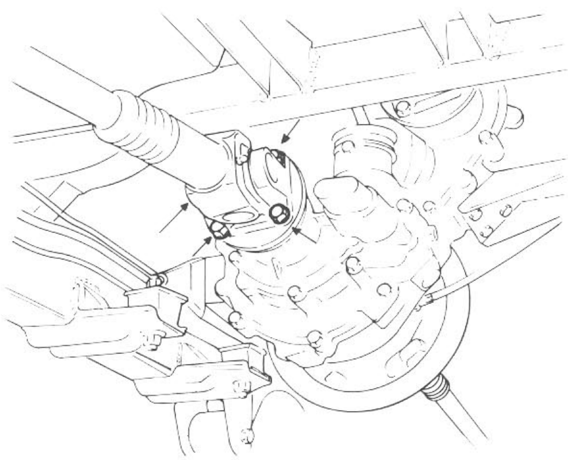


Fig. 15-2

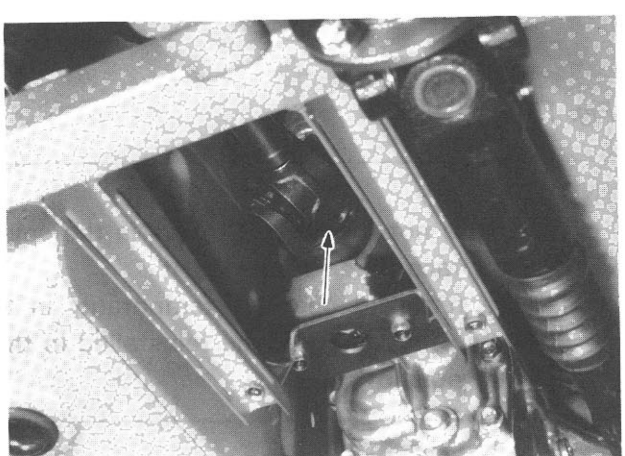


Fig. 15-3

15-3. Maintenance Services

Lubrication

The inside yoke of each universal joint has a grease nipple. At regular intervals stated in the recommended servicing schedule, pump in grease to relubricate the joint. Use chassis grease.

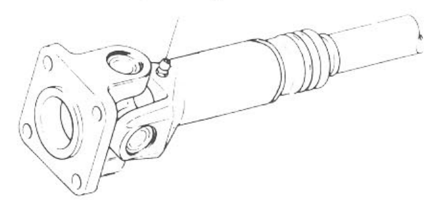


Fig. 15-4

Universal joint noise

If the universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if the cross spider rattles in the yokes or if the splines are worn down.

The noise coming from universal joint can be easily distinguished from other noises because the rhythm of chattering or rattling is in step with cruising speed. The noise is pronounced particularly on standing start or in the coasting condition (when the braking effect of the engine is showing in the drive line).

The remedy for a propeller shaft whose universal joints are making noise is either to replace the whole shaft assembly or to replace the universal joints with new ones according to the following procedure.

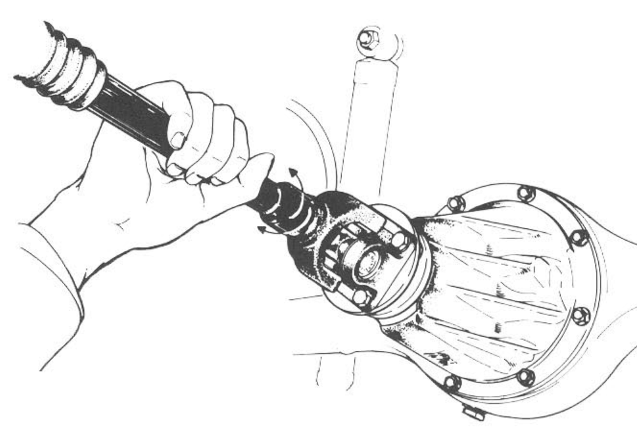


Fig. 15-5

[Disassembly of universal joint ass'y]

- Disassembling on the propeller shaft yoke side

1) Using two plain screwdriver, remove 2 circlips.

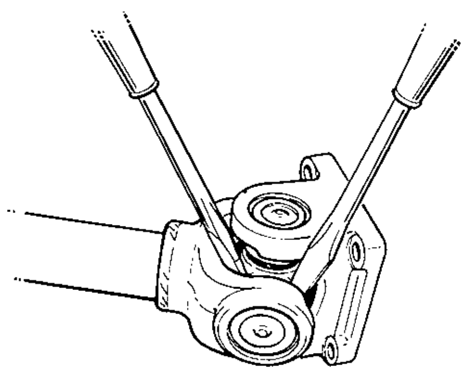
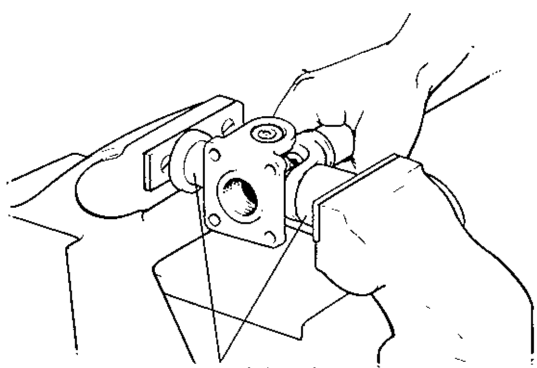


Fig. 15-6 Removing circlip

2) Using the universal joint assembler (Special tool 09922-95210), push the spider bearing race out 3 ~ 4 mm (0.12 ~ 0.16 in.) from the shaft yoke race.



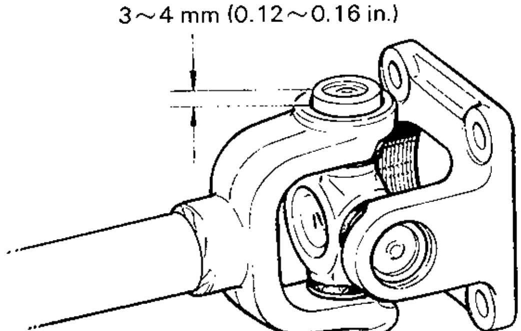


Fig. 15-7

3) Tapping the yoke with a hammer completely remove the bearing race.

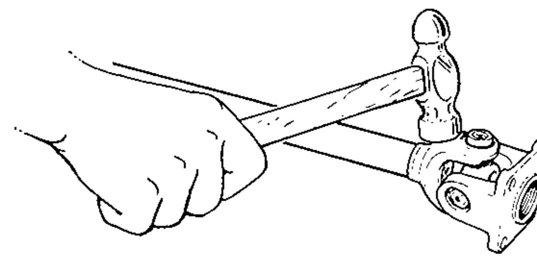


Fig. 15-8

4) Take out the bearing race on the other side in the same way as 2) and 3).

- Disassembling on the flange yoke side

Push out the bearing race on the flange yoke side as described in 1) and 2), and then, holding the bearing race in a vice, tap the flange yoke and take out the race. (Refer to the below figure.)
Remove the bearing race on the opposite side in the same way.

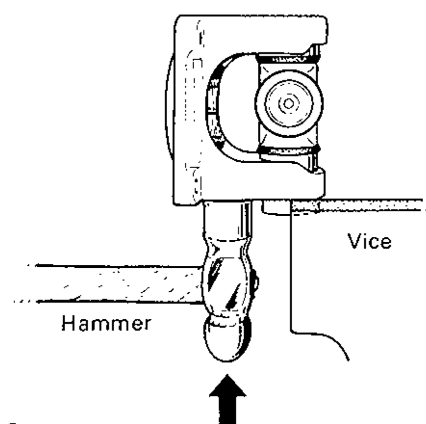


Fig. 15-9

NOTES:
- Take care not to lose the rollers in the spider bearing race when removing it.
- Fit the removed bearings temporarily in the spider so that they can be reinstalled in their original positions.

[Reassembly of universal joint ass'y]

NOTES:
- Make certain that the rollers inside the spider bearing race are all in place.
- Make certain that the charge the spider bearing race with SUZUKI SUPER GREASE C (99000-25030).

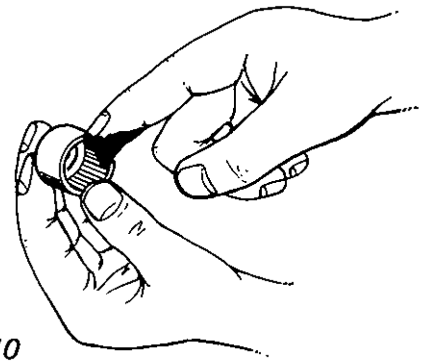


Fig. 15-10

CAUTION:
In reassembly, be sure to use new "C" rings, spider, and bearings. Reuse of "C" rings, spider, and bearings removed in disassembly is prohibited.

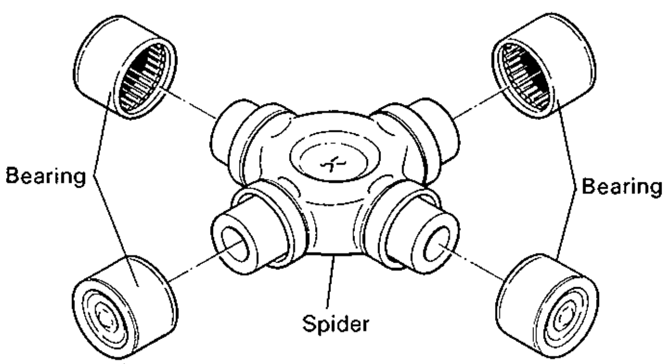


Fig. 15-11

1) Insert the bearing race into the yoke, tapping it with a hammer, until it is flush with the yoke face. When doing this, insert the spider into the bearing race to prevent the rollers in the bearing race from coming out.

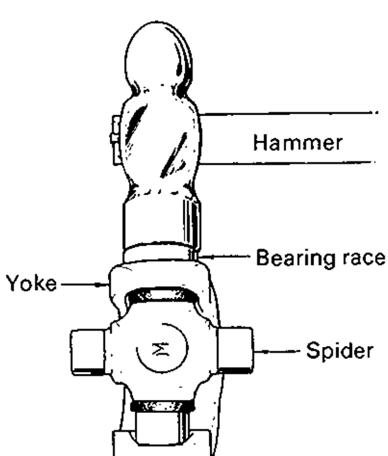


Fig. 15-12

2) Insert the other bearing race on the opposite side into the yoke, tapping with a hammer until it is flush with the yoke face.

3) Insert the bearing races on the flange yoke side in the same way as described in 1) and 2) above.

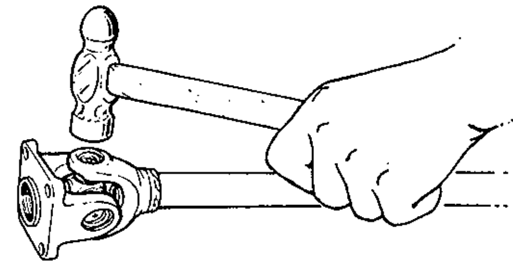


Fig. 15-13

4) Place a metal plate on the bearing races when tapping them in to avoid damaging the yoke.
5) Securely fit four C rings to the bearing races.

NOTE:
After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.

15-4. Installation

The installing procedure is reverse of the removal procedure. Be sure to adhere to the following instructions when installing the shafts:

- Flange tightening torque
  Be sure to tighten the four nuts to the following torque value when securing the companion flange to the yoke at each end of the propeller shaft:

Tightening torque for universal joint flange bolts & nuts	28～35 Nm 2.8～3.5 kg-m (20.5～25.0 lb-ft)

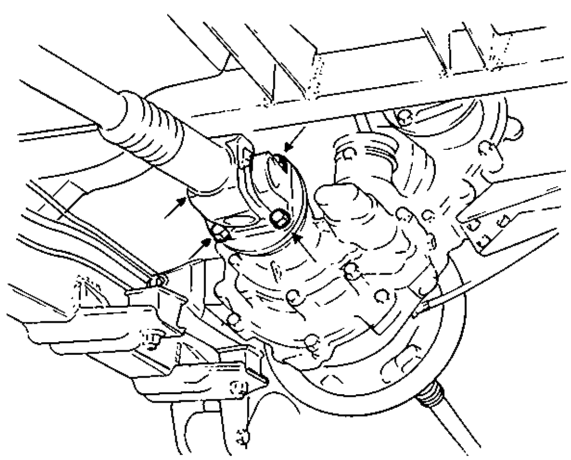


Fig. 15-14

- Grease the splines liberally, filling the grooves with grease.

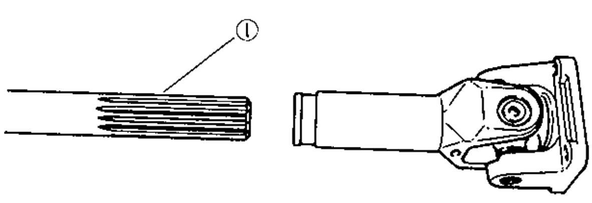


Fig. 15-15 ① *Grease (chassis grease)*

- Match marks are provided on the slip-on spline connections. Inserting the splined end into the splined bore without regard to the match marks can be a possible cause of noise or vibration of the propeller shaft. Be sure to index the marks.

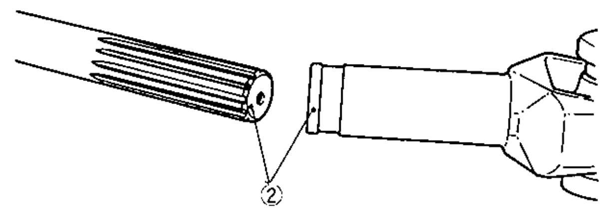


Fig. 15-16 ② *Match marks*

- The joint sheath rubber has a large diameter in one end and a small diameter in the other. Be sure to fit the sheath rubber with its large-diameter end brought to the joint yoke side.

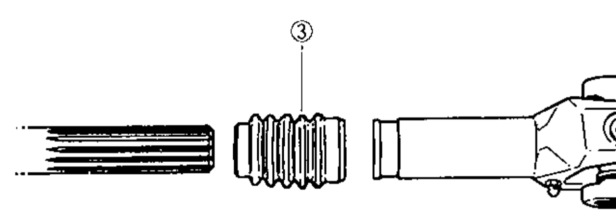


Fig. 15-17 ③ *Joint sheath rubber*

15-5. Tightening Torque

Bolts and nuts

Check the following bolts and nuts for tightness and retighten them, as necessary:

Fastening parts	Tightening torque		
	N.m	kg-m	lb-ft
(1) Propeller shaft bolt	25 ~ 30	2.5 ~ 3.0	18.5 ~ 21.5
(2) Propeller shaft nut	25 ~ 30	2.5 ~ 3.0	18.5 ~ 21.5

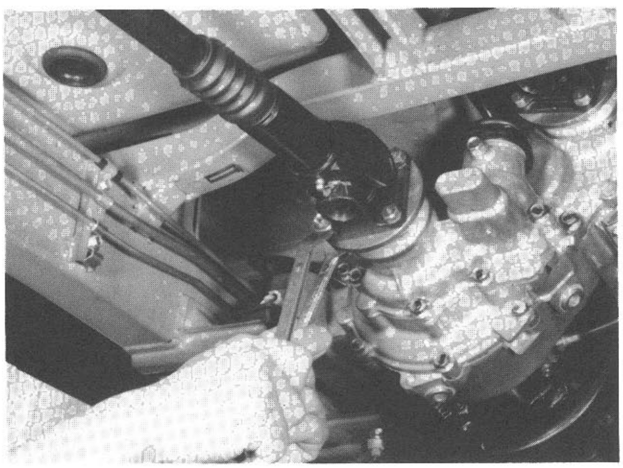


Fig. 15-18

16. DIFFERENTIAL

16

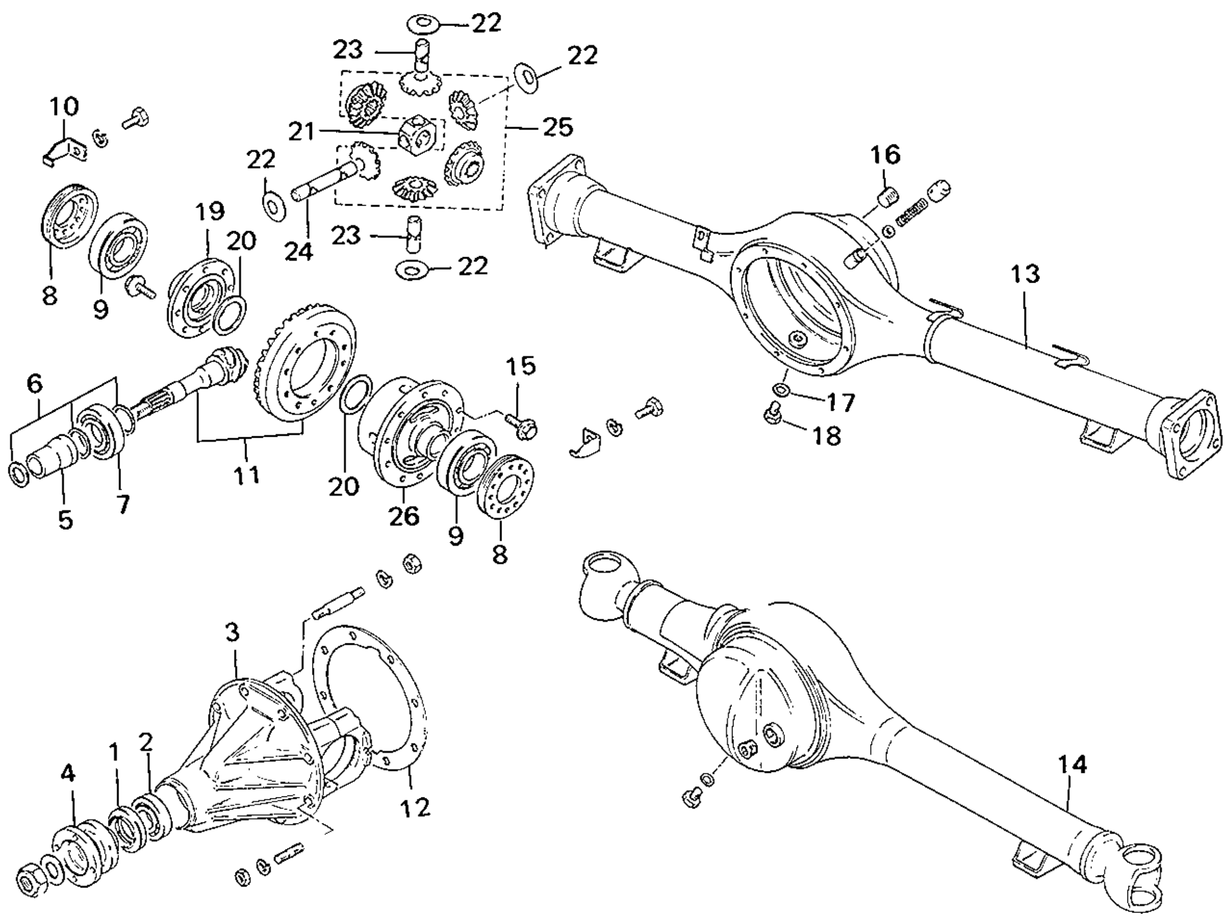
16-1. Description

The two axles, front and rear, are identical as far as the designs of pinion-and-gear drive and differential gearing are concerned. The major difference in this limited sense lies in the shape of the housing.

Each axle may be regarded as consisting, speaking roughly, of supporting parts (axle sleeves, differential housing and carrier case) and drive transmitting parts (bevel pinion and gear, differential gearing and live axle shafts). In the present section, only the bevel pinion and gear and differential gearing are taken up under the collective title of "differential."

The bevel gear drive is of hypoid design; pinion and gear have hypoid gear teeth. This means that the pinion is located slightly below the center of the bevel gear to permit the car body to be lowered in design, and that some wiping or sliding action occurs in tooth meshing between pinion and gear. Here lies the reason why use of hypoid gear oil is specified for the differential.

Four differential pinions are used in the differential case to qualify this gearing for heavy-duty "differential" drive. Thus, a total of 8 gears—a drive pinion, a crown gear, two side gears and four pinions—are inside the differential housing, all mounted on the differential carrier case bolted to the housing.



1. Oil seal
2. Bearing
3. Carrier
4. Joint flange
5. Spacer
6. Shim
7. Bearing
8. Bearing adjuster
9. Side bearing
10. Adjuster lock plate
11. Bevel gear pinion set
12. Gasket
13. Rear axle housing
14. Front axle housing
15. Bolt
16. Oil level plug
17. Gasket
18. Oil drain plug
19. Right case
20. Thrust washer
21. Joint
22. Thrust washer
23. Pinion shaft No. 2
24. Pinion shaft No. 1
25. Side gear set
26. Left case

Fig. 16-1

16-2. Removal

1. Loosen, but do not remove, hub nuts front or rear wheels, and raise the machine off the floor by jacking.
   Rest the machine steady on safety stands.
2. Drain out the oil in the differential housing by loosening the drain plug.
3. Remove the hub nuts and take the wheels, front or rear. Each wheel has five hub nuts.

For front differential

After taking down the front wheels, remove the brake drums by using two 6 mm bolts ①.

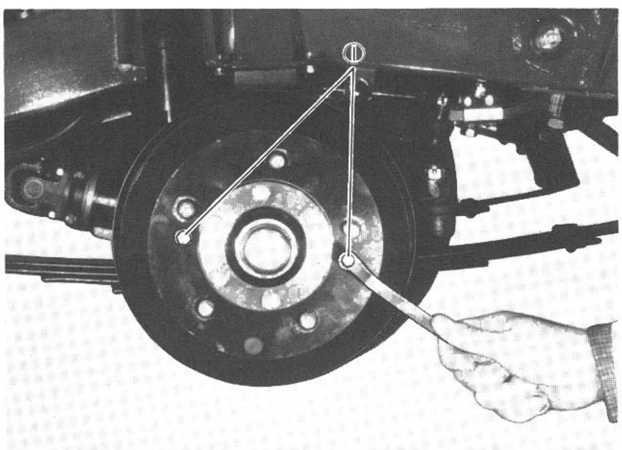


Fig. 16-2

Disconnect brake pipe from brake hose, above the kingpin. Have a small plug ready for use when disconnecting the pipe. As the pipe comes off the hose, insert the plug into the hose to prevent the brake fluid from leaking out.

Fig. 16-3

At each tie rod end, remove the nut and disconnect the end from steering knuckle. If the stud is tight in the hole of knuckle arm, lightly tap on the knuckle arm, then put a nut on the stud and again tap on the nut lightly. This will allow the stud to be removed from the knuckle arm. The nut so put on serves to protect the threads.

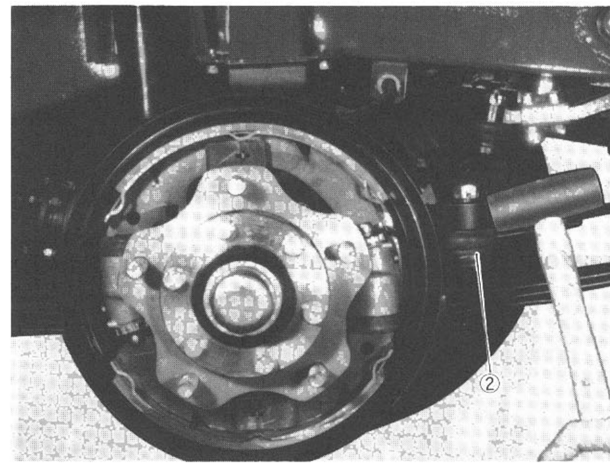


Fig. 16-4 ② Tie rod end

Remove the 8 bolts securing the oil seal cover. From the knuckle arm case, take off felt pad, oil seal and seal retainer.

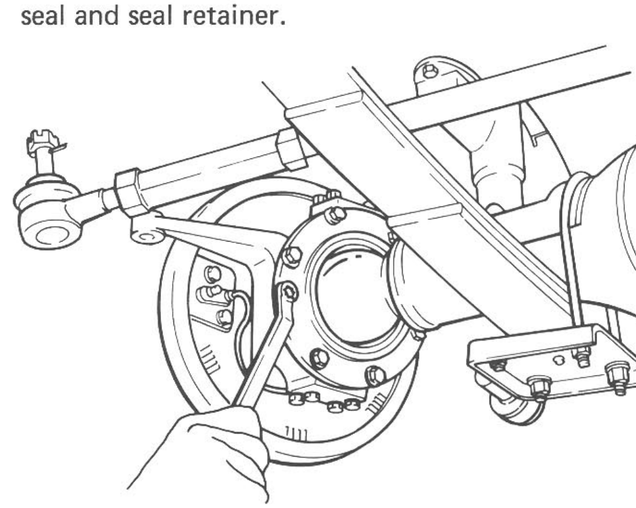


Fig. 16-5

Remove the top and bottom kingpins from the case by removing the 4 bolts securing each pin.

> NOTE:
> The removed top and bottom kingpins must be kept separated so as to prevent an error when putting them back in their place in reassembly.

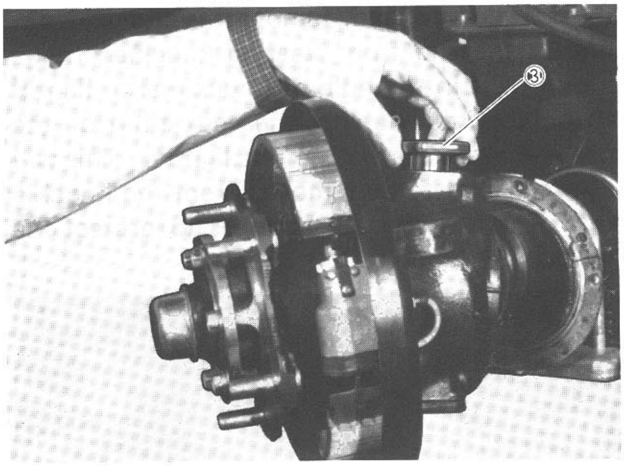


Fig. 16-6 ③ *Kingpin*

Draw out the live axle shaft from the axle sleeve.

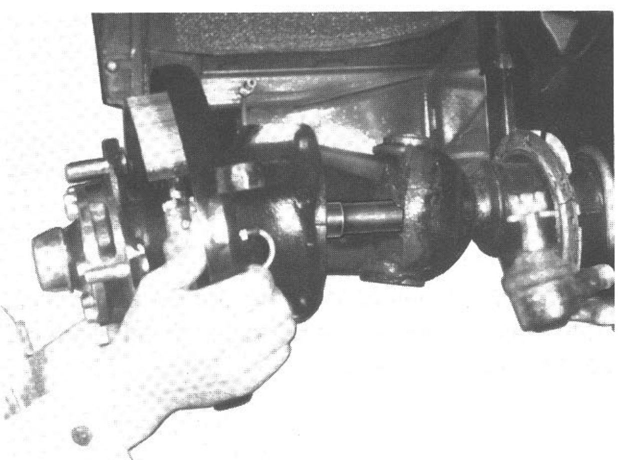


Fig. 16-7

At the differential housing, disconnect the propeller shaft by removing the bolts securing flange yoke to companion flange. Remove the 8 bolts holding fast the differential carrier case to the housing, and take down the carrier assembly.

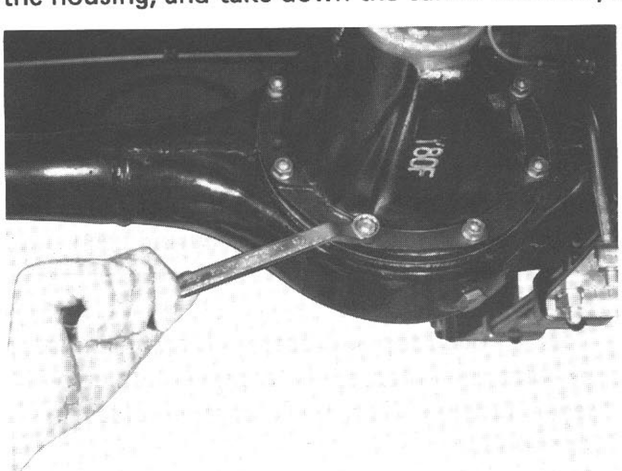


Fig. 16-8

For rear differential

After taking down the rear wheels, remove the brake drums by using the special tools.

> NOTE:
> Before removing the drums, check the parking brake lever to ensure that is not pulled up.

Front drum remover Ⓐ (09943-35511)
Sliding hammer Ⓑ (09942-15510)

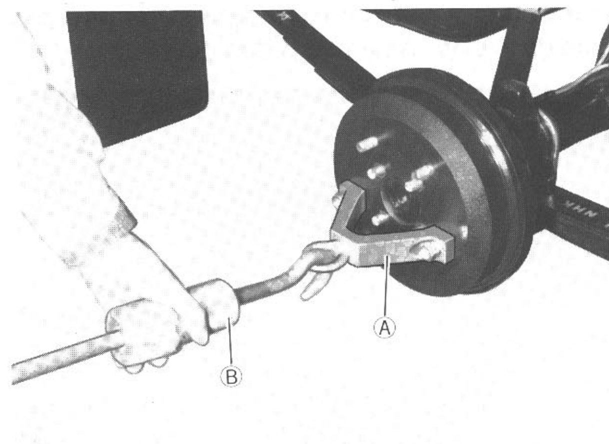


Fig. 16-9

Remove the 4 bolts securing the outer-bearing retainer, and remove the retainer from the brake backing plate.

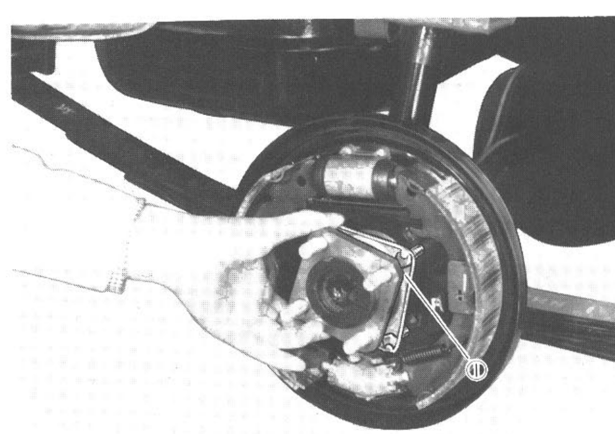


Fig. 16-9-1 Ⓘ *Retainer*

Using the special tools indicated below, draw out each live axle shaft.

> NOTE:
> When drawing out the axle shaft, use care so that the brake backing plate is not pulled along with the axle shaft.

Rear axle remover Ⓐ (09922-66010)
Sliding hammer Ⓑ (09942-15510)

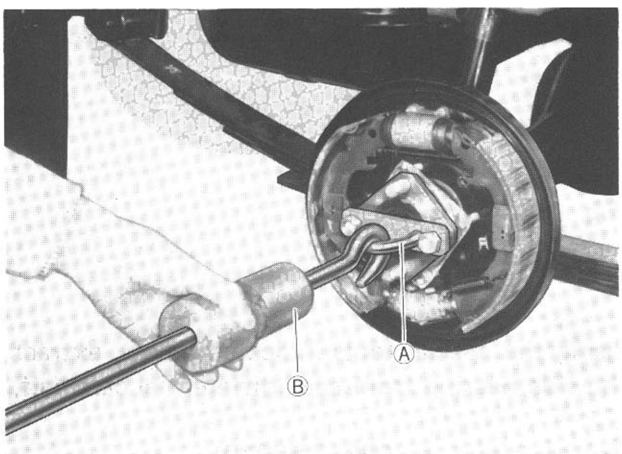


Fig. 16-10

Disconnect the propeller shaft as in the case of the front axle, and detach and take down the differential carrier case from the housing by removing the 8 bolts.

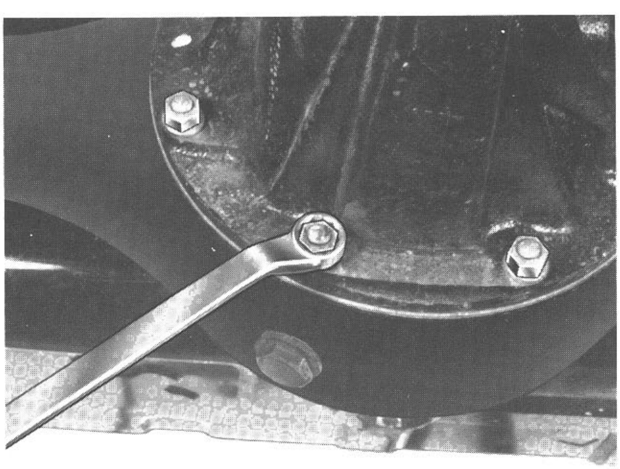


Fig. 16-11

16-3. Disassembly

Lock the flange immovable, and remove the nut from the end of the bevel pinion shank.

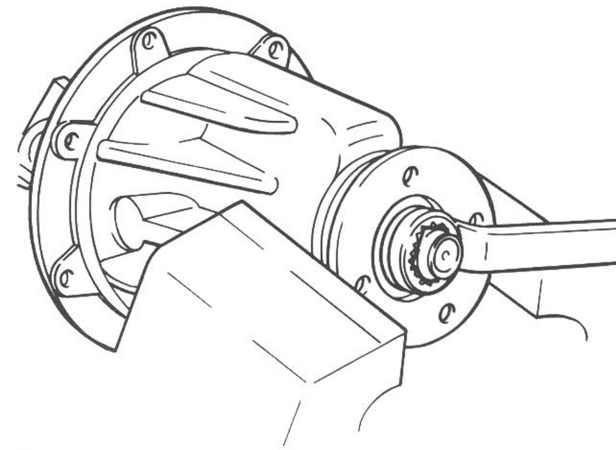


Fig. 16-12

Scribe marks on each cap bolted to the saddle portion of the carrier case and holding down the side bearing. The marks are to identify the cap. This means that there are right and left caps, so identified and so handled at the time of reassembly.

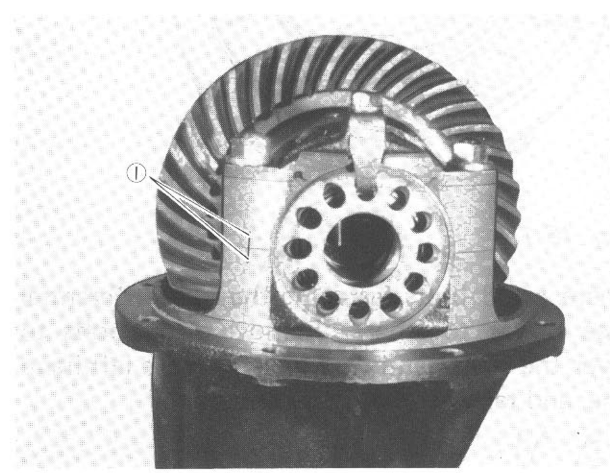


Fig. 16-13 ① *Scribed match marks*

At each side, loosen the bolts on bearing adjuster stopper, remove the nuts securing the bearing cap, and take off the cap. Lift the differential case assembly, complete with the bevel gear, off the carrier.

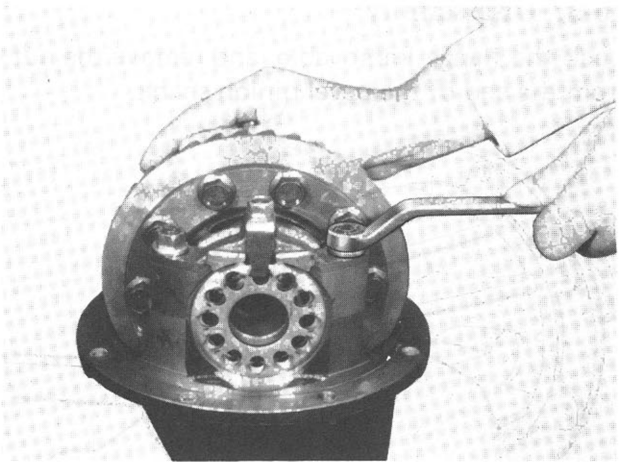


Fig. 16-14

Remove the 10 bolts securing the bevel gear to the differential case, and separate the gear from the case.

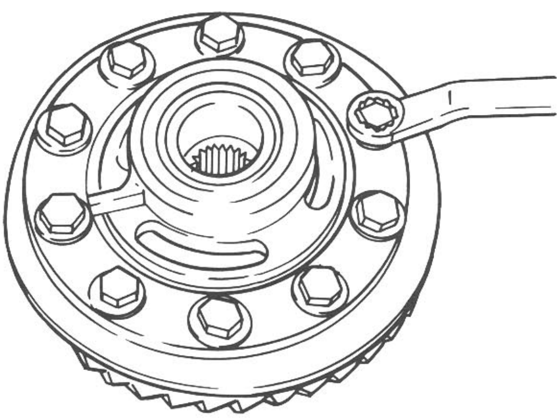


Fig. 16-15

There are 8 bolts fastening the two differential case halves together. Remove these bolts to sever the right-hand case half from the left-hand one, and take off the right-hand one.

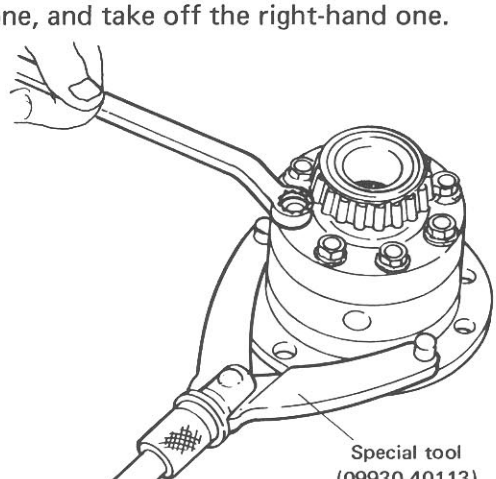


Fig. 16-16

Remove the side gears, differential pinions as mounted on the spider, and thrust washers.

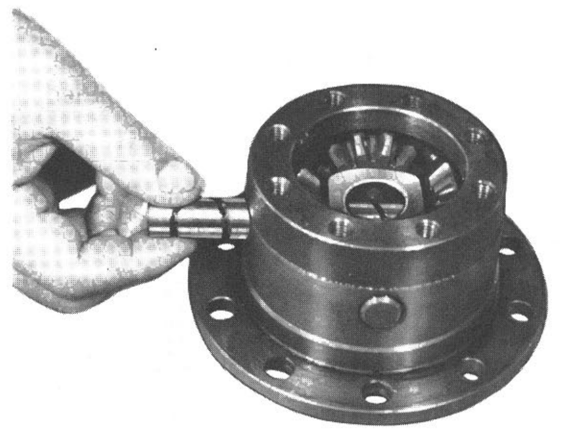


Fig. 16-17

Using the special tools indicated below, extract the side bearing from each differential case half.

Bearing puller Ⓐ (09913-60910)
Side bearing removing jig Ⓑ (09913-85230)

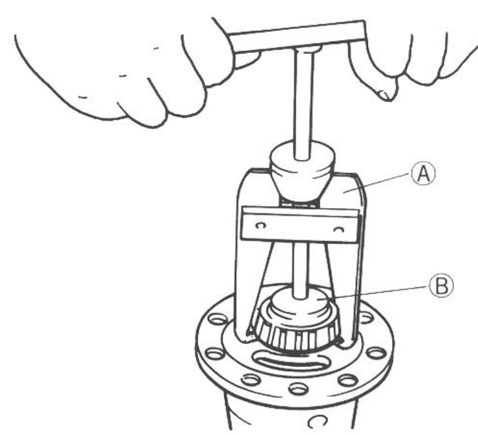


Fig. 16-18

16-4. Maintenance Services

Side gear backlash

To check this backlash, assemble the differential gearing and case, as shown in Fig. 16-19, fastening together the two case halves by tightening the securing bolts to the prescribed torque value. Use fuse stock to measure the backlash in the usual manner. By comparing the backlash reading, taken on the flattened fuse stock as shown in Fig. 16-19, or thrust play reading, taken as shown in Fig. 16-19-1, against the standard backlash or thrust play indicated below respectively, increase or decrease the total thickness of thrust washers, which are located in two places, that is, on the inner side of each case half.

Side gear backlash specification	0.05~0.10 mm (0.002~0.004 in)
or Side gear thrust play specification	0.15~0.3 mm (0.006~0.012 in)

Available thrust washer sizes (thickness)	0.8, 1.0 & 1.2 mm (0.03, 0.04 & 0.05 in)

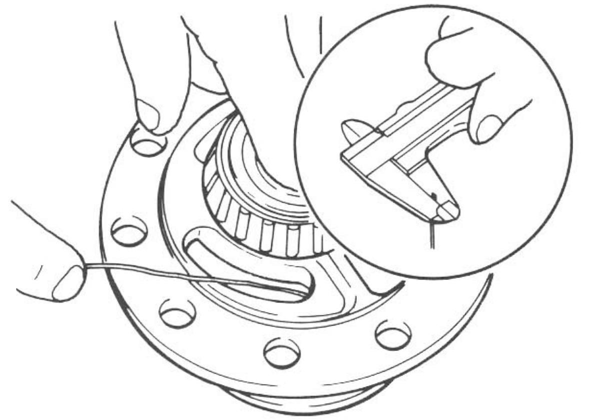


Fig. 16-19

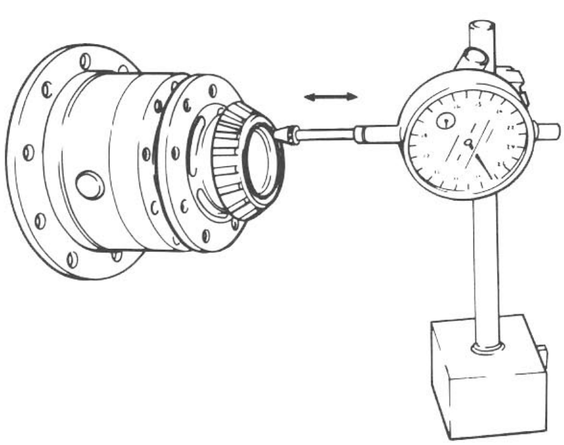


Fig. 16-19-1

Determination of shim thickness for bevel pinion

The amount of shims to be used on the bevel pinion varies from one machine to another on account of a number of factors involved in machining and assembling. Thus, for each machine, the amount of shims necessary for locating the pinion in the correct position (for producing a proper backlash in the mesh between pinion and gear) must be determined anew at the time of reassembly.

In order to facilitate this determination, a two-piece dummy tool (special tool) is made available. The following procedure is based on the use of this tool and supposes that the pinion dummy (one of the two pieces) is set in the carrier, without any shims, as shown in Fig. 16-20.

Bevel pinion mounting dummy Ⓐ (09924-36320)

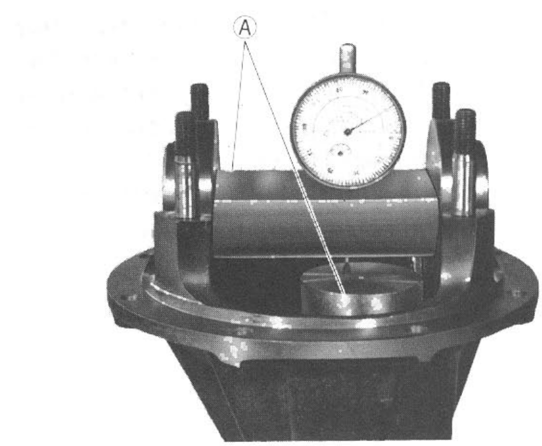


Fig. 16-20

- Set the dial indicator on the dummy, letting the indicator spindle protrude 5 to 6 mm from the bottom of the dummy as shown in Fig. 16-21-1.

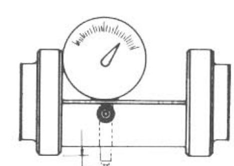


Fig. 16-21-1.

- Rest the dummy on the surface plate, and set the dial indicator to zero. See Fig. *16-21-2*. Feed the dummy pinion into the carrier, positioning it properly; and install the joint flange. Secure the joint flange in place by tightening its nut to 70 kg-cm (5.0 lb-ft) torque.

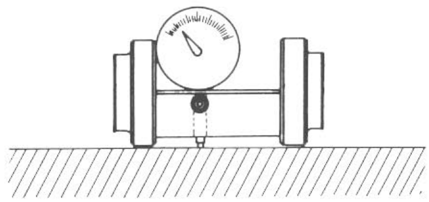


Fig. 16-21-2.

- Referring to Fig. 16-21-3, note that three dimensions are involved: "a" "b" and "c". The value of "b" is unknown, and is to be determined now for calculating the required thickness of shims. The values of "a" and "c" are given: the sum, "a" + "c", is 85 mm, which is indicated on the dummy tool (09924-36320).

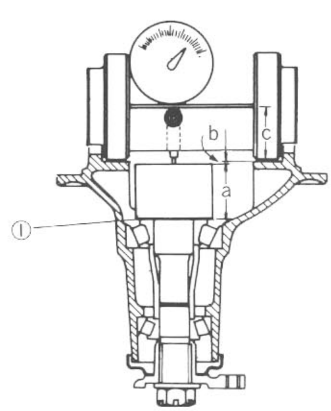


Fig. 16-21-3

With the dummy now secured, the dial indicator hand may have deflected from the "0" mark to show a certain value; read this value, which is the value of "b". Add this reading to 85 mm (= "a" + "c") and, from the sum, subtract the value marked on the bevel pinion. The remainder is the required shim thickness:

(85 + "b") − marked value = required shim thickness

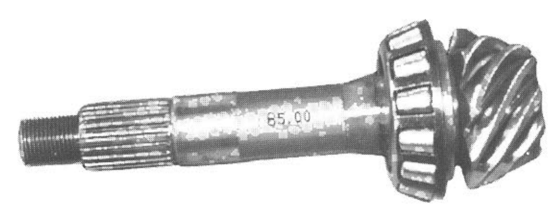


Fig. 16-22

- The shim stock is available in four selective thicknesses. Select and combine shim sizes to produce a total thickness as close to the required thickness as possible, and insert the selected shim pieces into the clearance indicated as Fig. 16-21-3 – ①

Sizes of shims for bevel pinion	0.05, 0.1, 0.3 & 0.5 mm (0.002, 0.004, 0.012 & 0.02 in.)

Bevel pinion bearing preload adjustment

The bevel pinion, as installed in the normal manner in the carrier, is required to offer a certain torque resistance when checked with the use of a prescribed torquing pulley (special tool Ⓐ) as shown in Fig. 16-23. This resistance is a "preload," which is due to the tightness of the two tapered roller bearings by which the pinion is held in the carrier. And this tightness is determined primarily by the thickness of the adjusting collar plus a shim.

Check the preload and, if the preload measurement is off the specified range indicated below, increase or decrease the thickness of the shim. The method is as follows:

Tentatively install the pinion in the carrier, using the adjusting collar and a 1-mm thick shim, and tighten the nut to secure the splined yoke. The nut is to be tightened to the specified torque:

Tightening torque on bevel pinion nut	17 ~ 23 kg-m (123 ~ 166 lb-ft)

Put on the torquing pulley (special tool) and give a pull, as shown in Fig. 16-23, and read the spring balance indication just when the pulley begins to turn. The reading is a starting torque, and is required to be within the 0.6 to 1.4 kg range (equivalent to the specified torque range of 3.0 to 7.0 kg-cm).

Pinion bearing preload	3.0 ~ 7.0 kg-cm (2.6 ~ 6.1 lb-in.)
Starting torque (with pulley)	0.6 ~ 1.4 kg (1.4 ~ 3.1 lb)

Increasing the shim thickness decreases this preload, and vice versa. Four-size shim stock available for "mounting distance" adjustment, mentioned above, is meant to be used in producing a proper shim thickness in this preload adjustment too.

Preload-check torquing pulley Ⓐ (09922-75220)

NOTES:
- When tentatively installing the pinion in the carrier, be sure to oil the bearings lightly with gear oil, and to leave out the oil seal.
- Make a note of the starting torque.

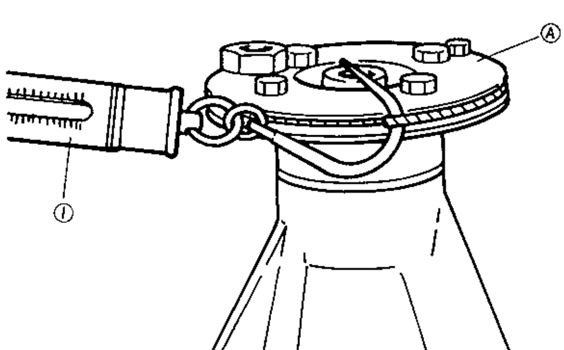


Fig. 16-23 ① *Spring measure*

Bevel gear backlash adjustment

The backlash between bevel gear and pinion is to be checked in the manner shown in Fig. 16-24. Note that the differential case assembly is mounted in the normal manner, and fastened down by tightening the side bearing cap bolts to the specification torque value. The dial indicator spindle is pointed squarely to the "heel" on the drive side (convex side) of a gear tooth. Hold the bevel pinion rigidly, and turn the gear back and forth.

The dial indicator reading, which is a backlash value, is required to be within this range:

Bevel gear backlash	0.10 ~ 0.15 mm (0.004 ~ 0.006 in.)

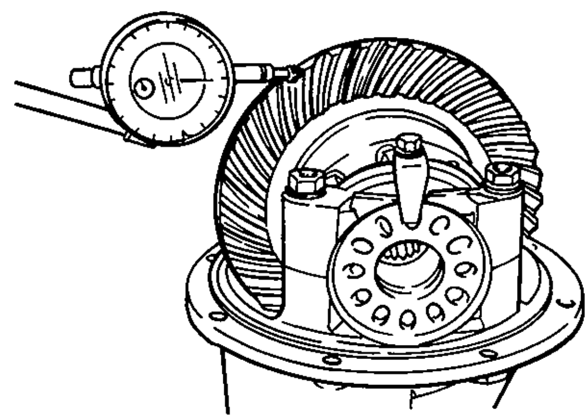


Fig. 16-24

To increase or decrease the backlash for adjustment, displace the bevel gear toward or away from the pinion by running in one adjuster and running out the other adjuster by an equal amount (with the side bearing cap bolts slightly loosened).

Turning the adjuster one notch changes the backlash by about 0.1 mm (0.004 in.).

Side bearing adjuster turner Ⓐ (09923-57910)

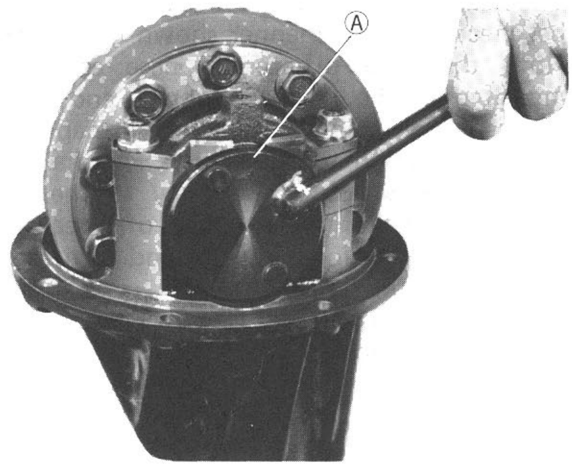
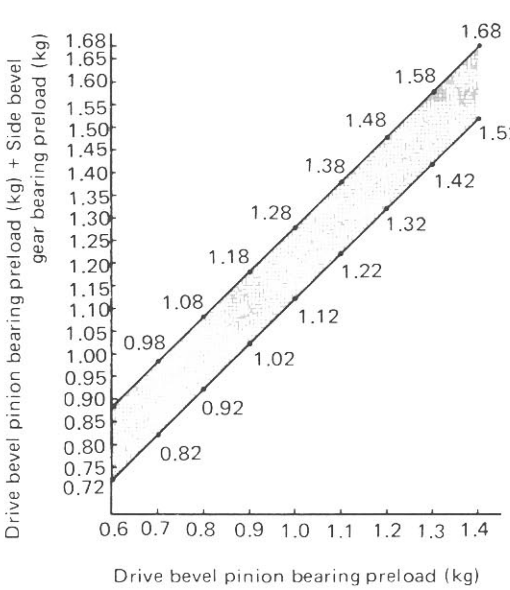


Fig. 16-25

CAUTION:
Adjust the preload on the side bearing during backlash adjustment: mount the preload check torquing pulley Ⓐ (09922-75220) on the drive bevel pinion as shown in Fig. 16-23 and measure using spring measure (1). When the reading at the instant the side bevel gear starts moving is within the range as indicated below, the side bearing preload is acceptable. Referring to the graph, for example, when the drive bevel pinion bearing preload measured as indicated in Fig. 16-23 is 1.0 kg (2.21 lb), drive bevel pinion bearing preload (kg) + side bevel gear bearing preload (kg) should be 1.12 – 1.28 kg (2.47 – 2.82 lb).



NOTE:
For the vehicle on and after the following body numbers, refer to the service bulletin attached at the end of Supplementary Service Manual 99501-80014 of section 23.

For European Market
- ⓧ JSAOSJ40000585167 ⓧ
- ⓧ JSAOSJ40V00585195 ⓧ
- ⓧ JSAOSJ40T00505001 ⓧ
- ⓧ JSAOSJ41000505001 ⓧ

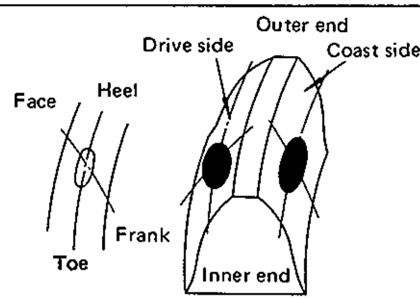
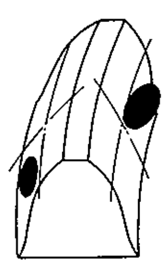
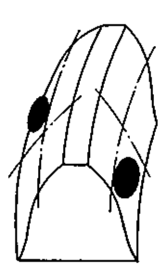
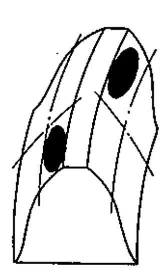
For North American Market
- JS3JA21C ☐ F4120221
- JS3JA21V ☐ F4120388
- JS4JA21T ☐ F4105001

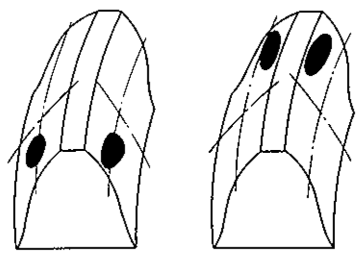
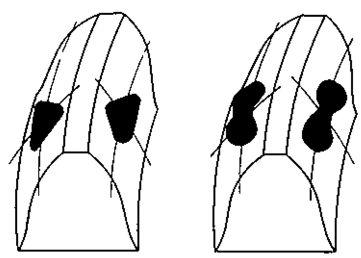
For Other Market
- SJ40-171323
- SJ40T-120510
- SJ41-110200

Pinion-to-gear tooth contact pattern check and adjustment

In addition to proper backlash, proper tooth contact must be secured in the mesh of bevel pinion and gear, so that there will be no "gear noise" coming from the axle and that the hypoid teeth will not be overstressed in transmitting drive.

After the specified amount of backlash has been secured, check the pinion and gear for tooth contact by "rolling" contact patterns in a manner consistent with the standard shop practice: use a red lead paste to paint ten teeth, both drive side and coast side, of the gear, turn the gear back and forth by hand while holding the pinion in a "braking" manner, and examine the contact patterns in reference to the following chart:

	Contact patterns	Diagnosis, and what to do
Normal contact pattern		Contact is roughly centered and somewhat more displaced toward toe than toward heel on both drive side (concave) and coast (convex) side.
Patterns due to improper shim adjustment		High contact: Contact is on heel (drive side) and on toe (coast side). This condition means that the pinion is too far back and must be brought forward by increasing its shim thickness used in "mounting distance" adjustment.
		Low contact: Contact is on toe (drive side) and on heel on (coast side). This condition means that the pinion is too far out from the carrier and must be backed away by decreasing its shim thickness.
Pattern due to defective parts	 	These contact patterns indicate that the "offset" of differential carrier is too much or too little. The remedy is to replace the carrier by a new one.

	Contact patterns	Diagnosis, and what to do
Patterns due to defective parts		These contact patterns, located on toe or heel on both drive and coast sides, mean that 1) both pinion and gear are defective, 2) carrier is not true and square, or 3) gear is not properly seated on differential case. The remedy is to replace the defective member.
		Irregular patterns: If the pattern is not oval, it means that bevel gear is defective. High or low spots on tooth surfaces or on the seat of bevel gear are the cause of irregular patterns appearing on some teeth. The remedy is to replace the pinion and-gear set and, if the seat is defective, the differential case also.

CAUTION:
When applying the red lead paste to the teeth, be sure to paint the tooth surfaces uniformly. The paste must not be too dry or too fluid.

16-5. Reassembly Instructions

Tightening torque

	kg-m (lb-ft)
Side bearing cap nut	3.0 ~ 3.7 (22.0 ~ 26.5)
Drive bevel gear bolt	8.0 ~ 9.0 (58.0 ~ 65.0)
Differential case bolt	3.7 ~ 4.5 (27.0 ~ 32.5)
Drive bevel pinion nut	17.0 ~ 23.0 (123.0~166.0)
Differential carrier nut	1.8 ~ 2.3 (13.0 ~ 16.5)
Oildrain plug	4.0 ~ 7.0 (29.0 ~ 50.5)

Drive bevel gear bolts

The bolts securing the bevel gear to the differential case are subject to shear stress since drive is transmitted by these bolts from the gear to the case. For this reason, they are special bolts made from chrome steel and must never be replaced by common bolts.

When mounting the gear on the case, be sure to apply the THREAD LOCK CEMENT SUPER 1333B (99000-32020) to these bolts before running them in.

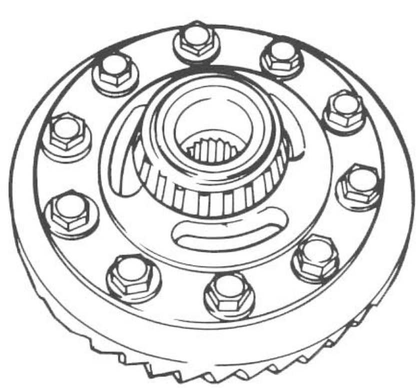


Fig. 16-26

Differential side bearings

Press-fit these bearings into the differential case by using the special tool. Driving the bearing into the case is not permitted.

Differential side bearing installer Ⓐ
(09940-53111)

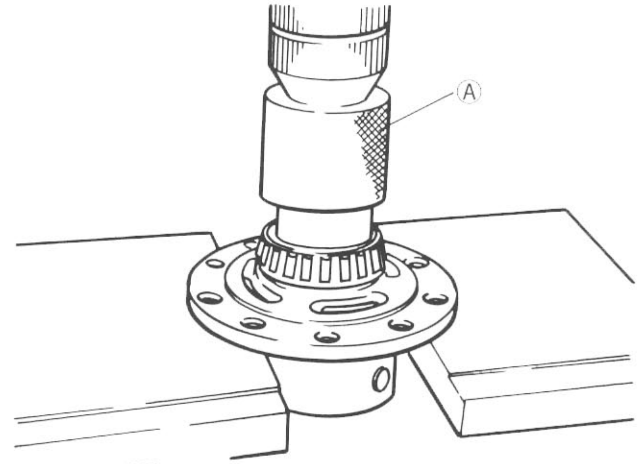


Fig. 16-27

Bevel pinion bearings

A press must be used to install the two tapered roller bearings on the bevel pinion. Outer races are to be press-fitted into the differential carrier and the inner races onto the pinion.

(1) For the outer race of front bearing (yoke side), the special tool, indicated here, must be used:

Bearing installer Ⓑ (09913-75520)

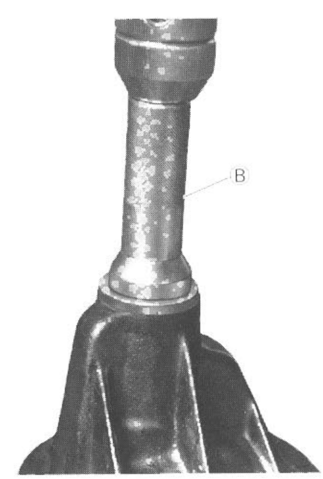


Fig. 16-28

(2) For the outer race of rear bearing (gear side):

Bearing installer Ⓐ (09913-75510)

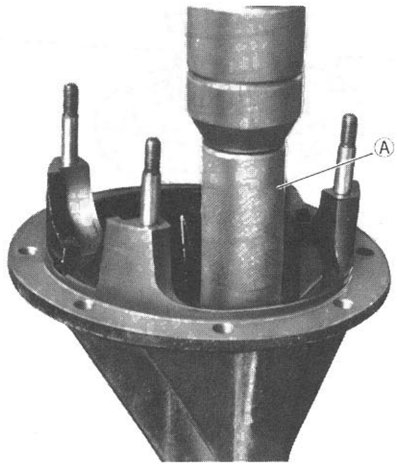


Fig. 16-29

(3) For the inner races, use this special tool:

Bearing installer Ⓑ (09913-80112)

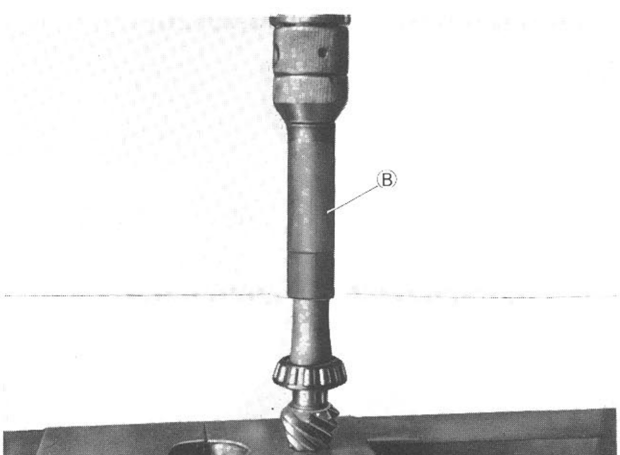


Fig. 16-30

Side bearing caps
When putting on the side bearing caps, be sure to discriminate the right-hand cap from the left-hand one by referring to the match marks scribed at the time of disassembly.

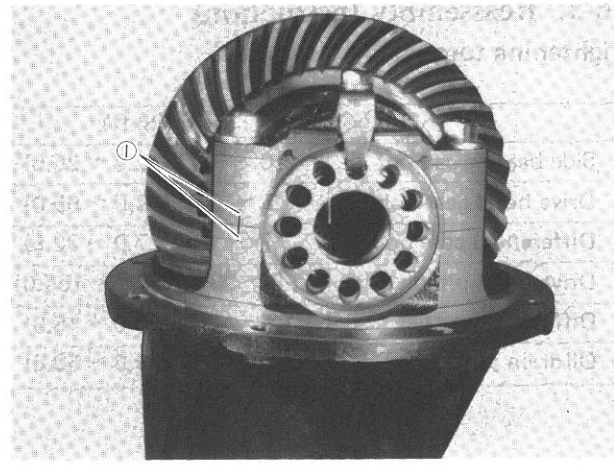


Fig. 16-31 ① *Scribed match marks*

Differential gear oil
The oil capacity of the differential housing is 1.3 litres for both rear and front axle:

Differential housing oil capacity and specification	1.3 litres (2.75/2.31 US/Imp pt) hypoid gear oil SAE #90 or SAE #90 gear oil

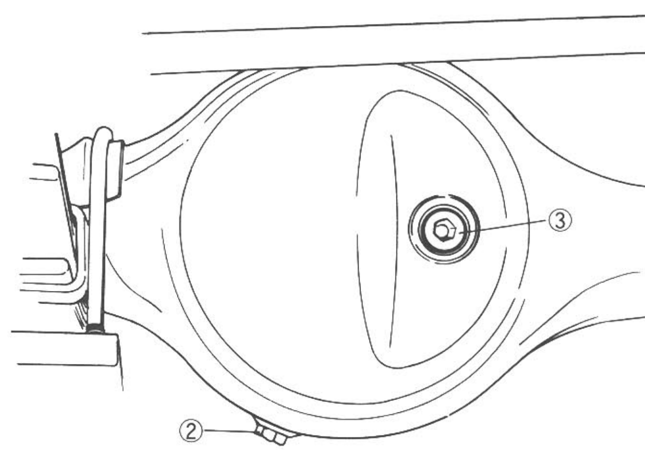


Fig. 16-32 ② *Drain plug* ③ *Oil level plug*

Brake circuit air purging
If the brake pipe (right & left) was disconnected from the brake hose as in Fig. 16-3, make sure to purge air out of the brake circuit. Refer to Group 19. BRAKES for "air purging" operation. Then check to ensure that the joint seam of the hose and pipe is free from oil leak.

17. SUSPENSION

17

17–1. Description

Suspension is by double-acting shock absorbers and semi-elliptical leaf springs for both axles, front and rear. Similar springs and shock absorbers are used.

The Barfield universal joints are used in the front axle to enable the axle shafts to drive the front wheels while allowing the wheels to be steered. This type of joint provides for a larger steering angle range and, what is more important, constant-velocity drive to the wheel.

If a single two-yoke (or Hooke's) universal joint is used to connect the live axle shaft to the wheel on each side of the front end, the wheels will run with the same speed, but not with the same constant velocity, as that of the axle shafts when the wheels are turned around their kingpins for steering action. The Barfield joint transmits drive without varying the angular velocity of drive.

The Barfield joint is enclosed by the knuckle, which is shaped integral with the knuckle arm, and has a two-piece kingpin, namely, upper and lower kingpins.

The end of the dead axle sleeve is in the shape of a dish. This dish is rotatably fitted into the knuckle structure to form a flexible connection, the sliding clearance between the two being sealed with a felt packing (against road dust and mud) and also with an oil seal (against the oil inside). The upper and lower kingpins, bolted to the knuckle extend into the knuckle and, inside, are held by the dish-like inner case through tapered roller bearings.

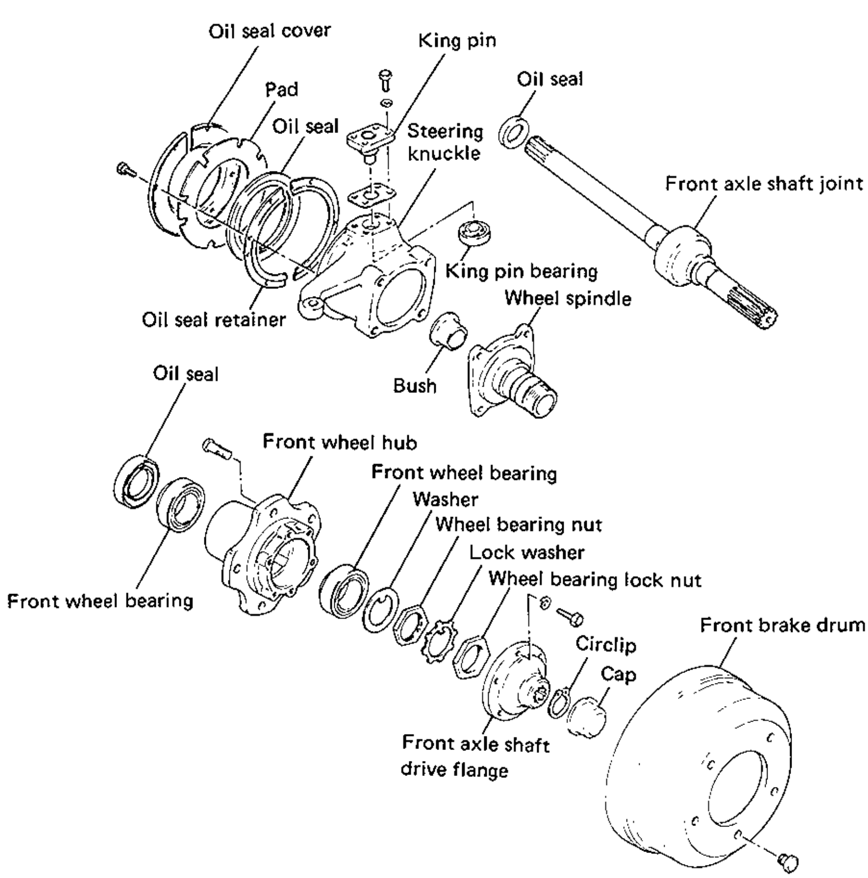


Fig. 17-1

Front Suspension

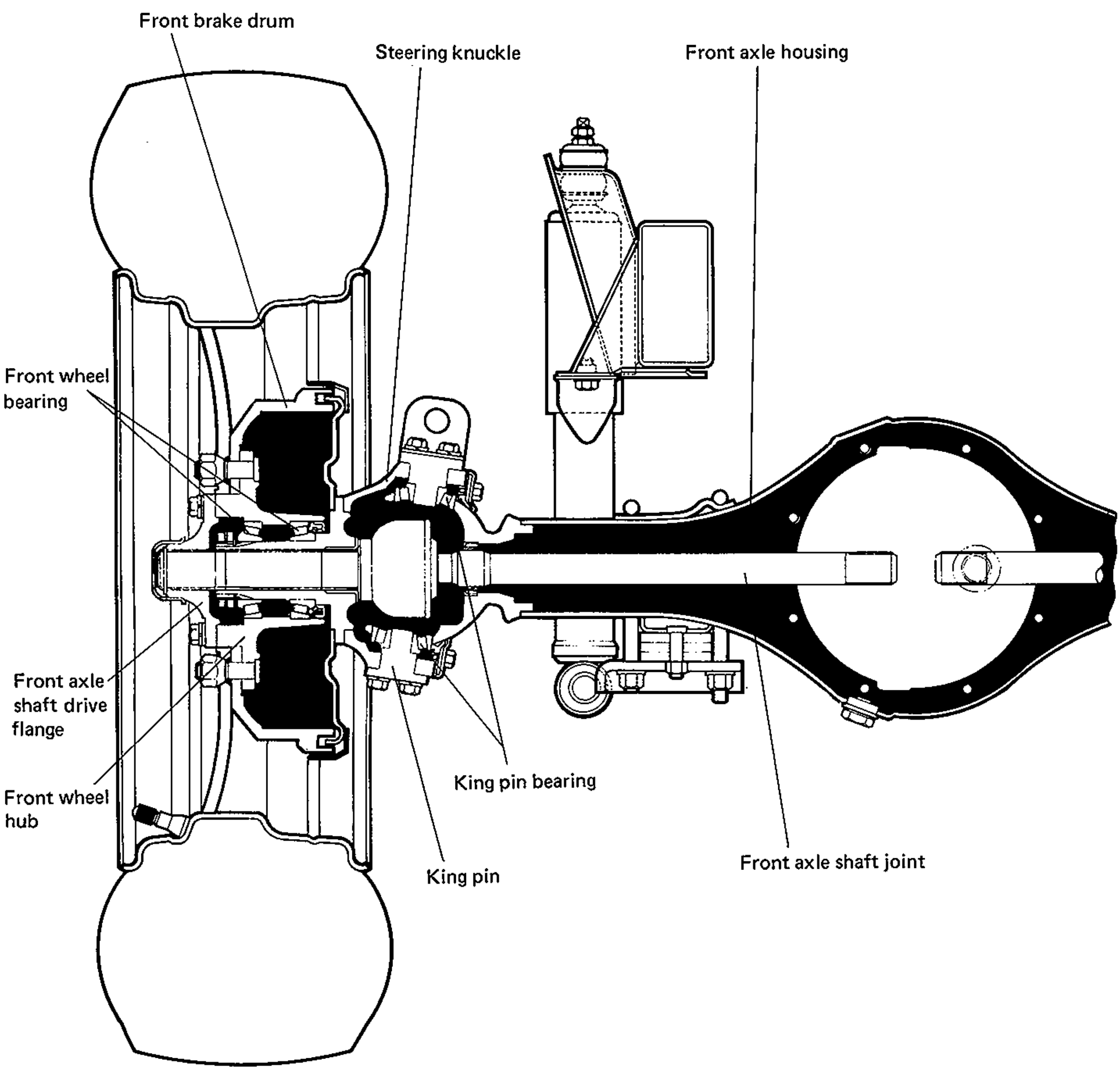


Fig. 17-1-1

17–2. Barfield Joint Construction and Operation

The major parts of the Barfield joint are the outer race (integral with wheel spindle, to which the wheel disc is splined), inner race (splined to the live axle shaft), six steel balls disposed between the two races, and cage (holding the steel balls in a single row lying in a plane).

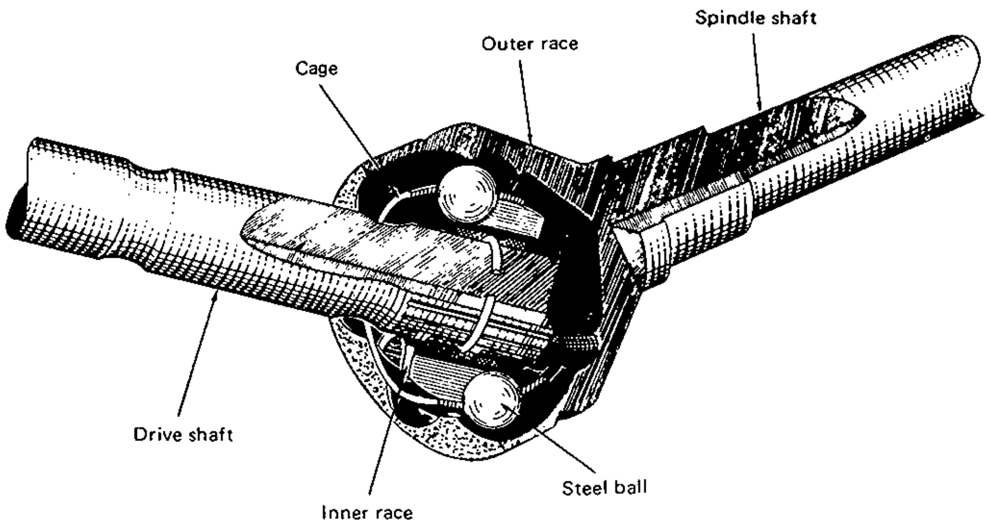


Fig. 17-2

The balls are fitted in two groups of raceways; one group is on the outer race and the other group on the inner race. Each ball is in its own raceways as if it were locked between the two races in the direction of rotation. The outer race with its wheel spindle is capable of angling and, when it so angles with respect to the axis of axle shaft, the row of steel balls angles just half as much, that is, the plane including this row tilts by an angle equal to one-half of the spindle angle. This relationship is illustrated in Figs. 17-3 and 17-4.

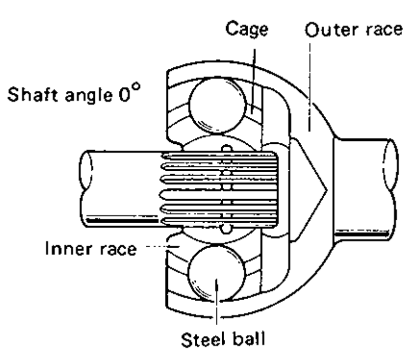


Fig. 17-3

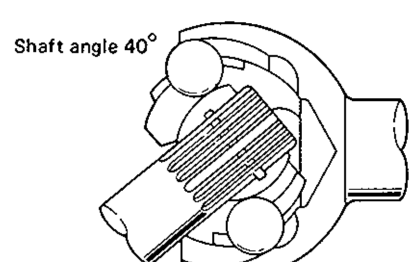


Fig. 17-4

17–3. Removal of Front Wheel and Knuckle

To remove each front wheel and its knuckle, proceed as follows:

1) Loosen the five nuts securing the wheel to the brake drum. Raise the front end by jacking.
   Rest the machine steady on safety stands.
2) Remove the five nuts and take off the wheel.

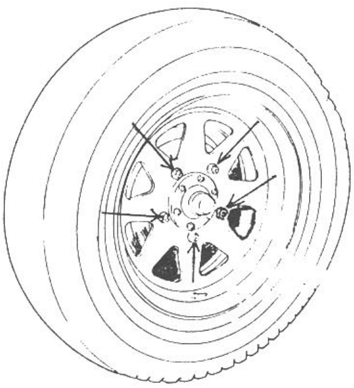


Fig. 17-5

Wheel bearing

1) Remove the brake drum by using two 6 mm bolts ①.

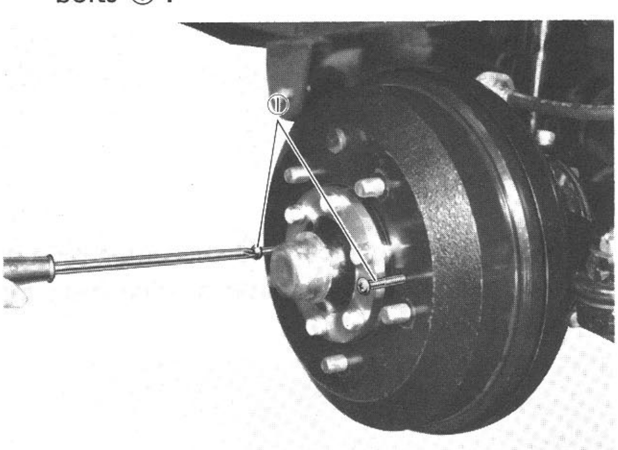


Fig. 17-6

2) Remove the front axle shaft cap.

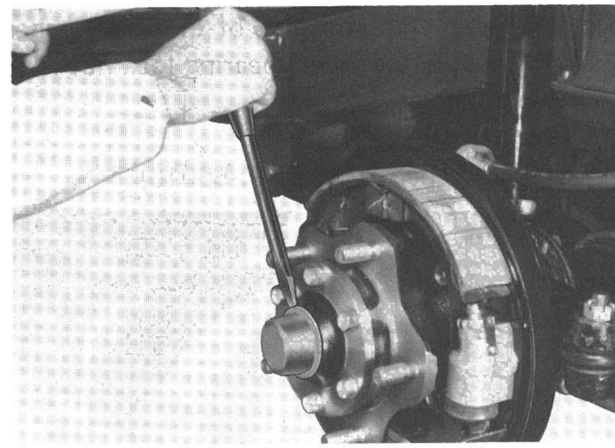


Fig. 17-7

3) Remove the circlip retaining the front axle shaft drive flange on front drive shaft, using the circlip remover Ⓐ.
   Circlip remover (09900-06107)

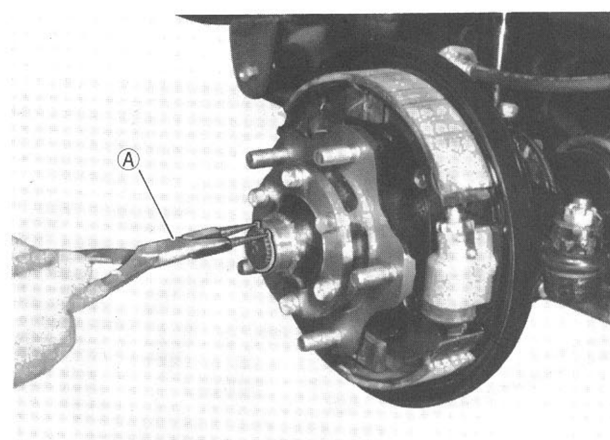


Fig. 17-8

4) Loosen the bolts tightening the front axle shaft drive flange and take off the drive flange.

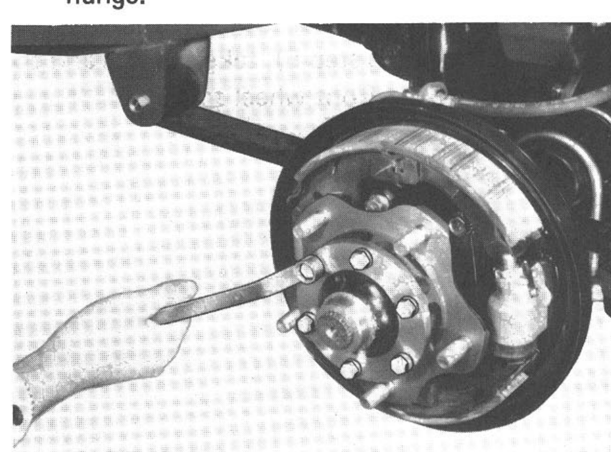


Fig. 17-9

5) Straighten the bent part of the lock washer and remove the wheel bearing lock nut with special tool Ⓑ .
Front wheel bearing nut
socket wrench Ⓑ (09941-58010)

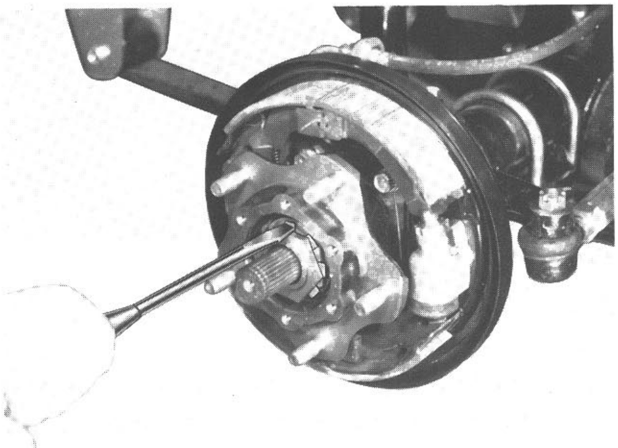


Fig. 17-10

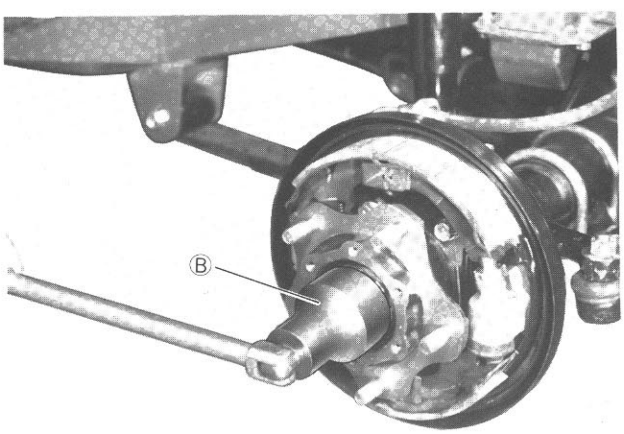


Fig. 17-11

6) After loosening the front wheel bearing nut with the same special tool Ⓑ as mentioned in the foregoing step 5), take the nut and the washer off the front wheel spindle.

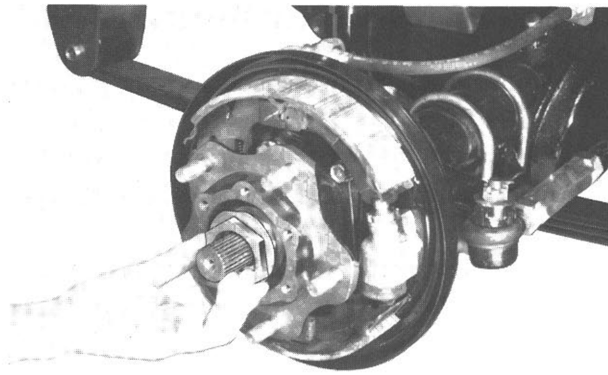


Fig. 17-12

7) Pull the front wheel hub off the front wheel spindle.

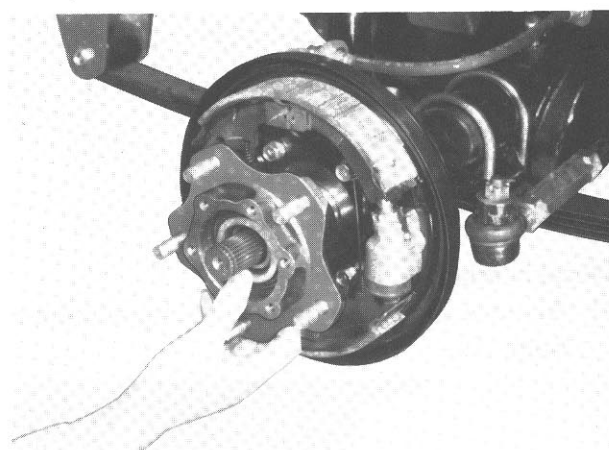


Fig. 17-13

8) Remove the oil seal and the outer race of the inner bearing or outer bearing from the wheel hub.

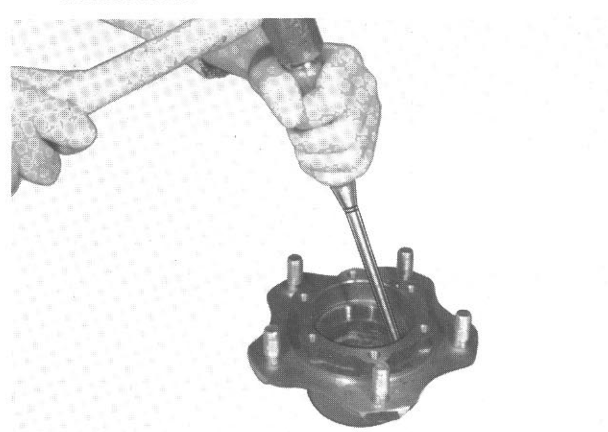


Fig. 17-14

Front axle shaft joint

For removal of the axle shaft joint, carry out the work for bearing removal from 1) up to 7) and then follow the procedure given below.

1) Drain out the oil in the differential housing by loosening the drain plug.

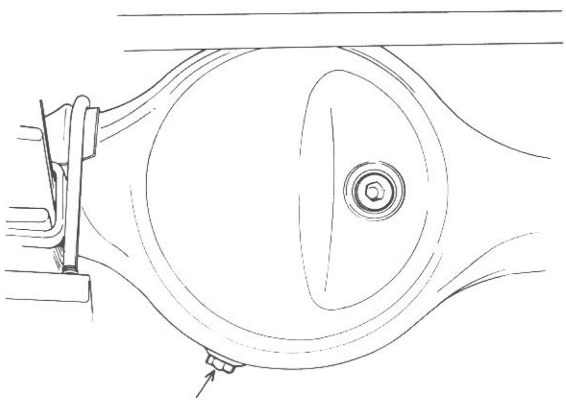


Fig. 17-15

2) Loosen the bolts securing the kingpins (upper & lower). At this point, the king pins mustn't be removed.

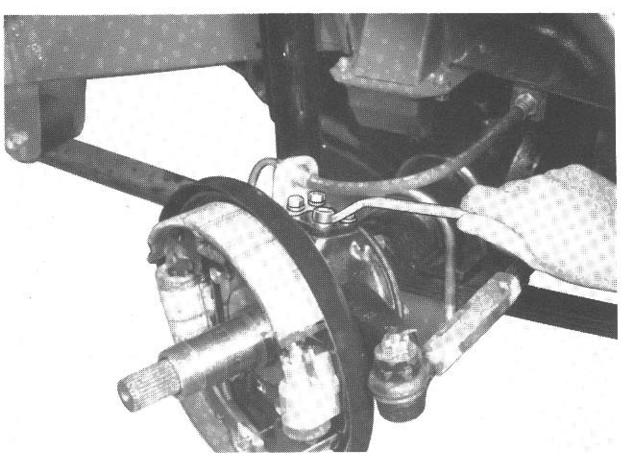


Fig. 17-16

3) Remove the four bolts securing the brake backing plate to the spindle and knuckle. The removed backing plate should be tied to the body or leaf spring with a string or something so that it will not fall off. At this time, be careful not to twist the brake hose.

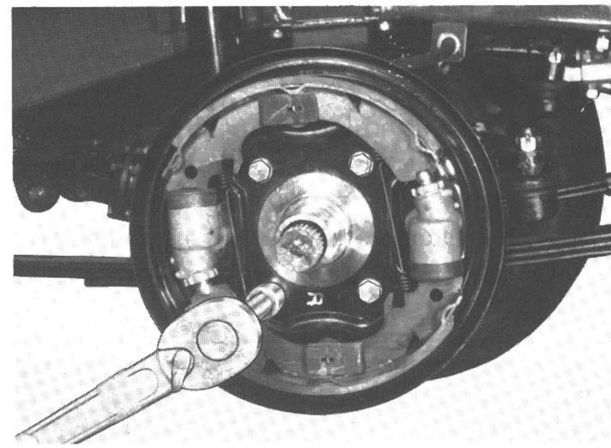


Fig. 17-17

4) Remove the tie rod end securing nut, and disconnect the tie rod from the steering knuckle arm. If the stud of tie rod end will not come off easily, tap on the part of the knuckle arm shown in Fig. 17-18 with a hammer to drive it out.

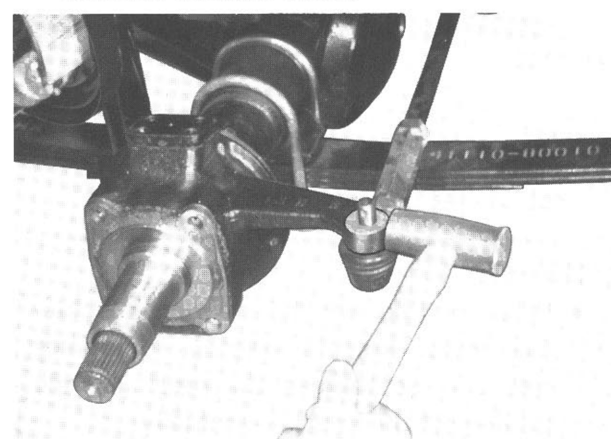


Fig. 17-18

5) Remove the joint seal bolts. And remove the oil seal cover, pad, oil seal and retainer from the knuckle.

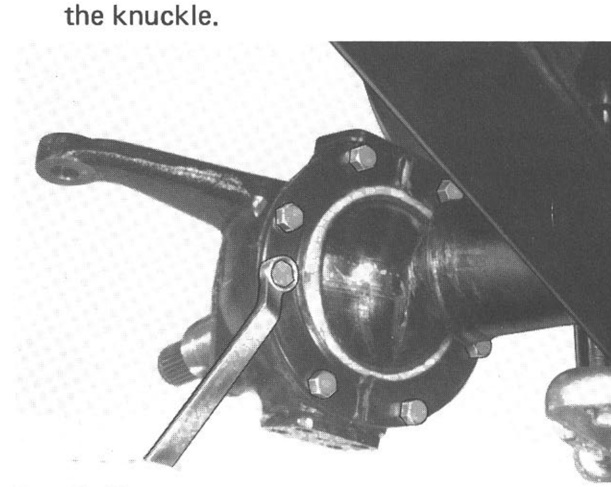


Fig. 17-19

6) Remove the lower and upper kingpins.

> **NOTES:**
> - **The upper and lower kingpins, when removed, must be marked off one from the other.**
> - **Also make sure to check the number of kingpin shims that were fitted on each side.**

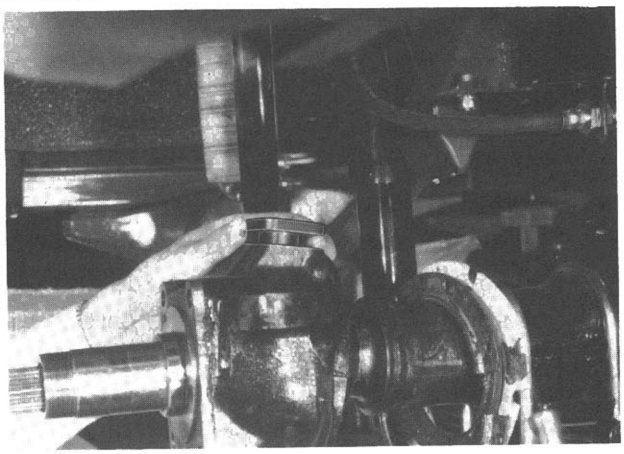


Fig. 17-20

7) Pull off the steering knuckle.

> **NOTES:**
> - **When pulling off the steering knuckle, the lower kingpin bearing sometimes falls off. So remove the bearing while pulling off the knuckle gradually.**
> - **The upper and lower kingpin bearings must be also marked off one from the other.**

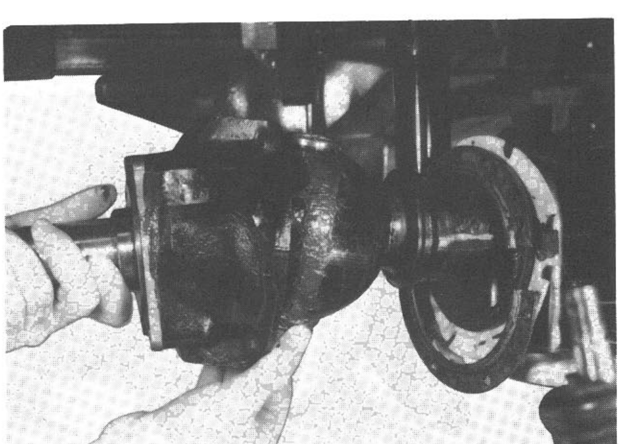


Fig. 17-21

8) Pull the axle shaft joint off the front axle housing.

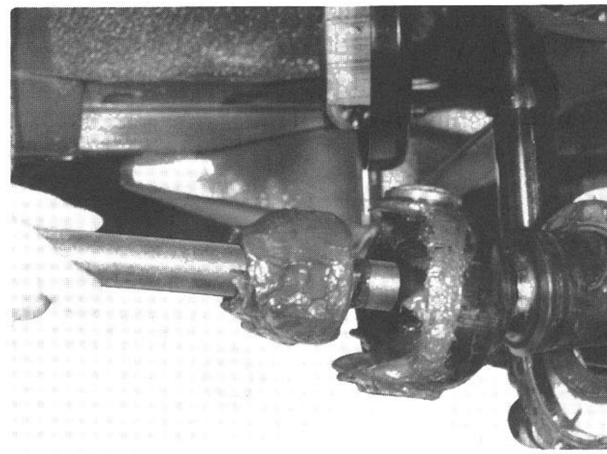


Fig. 17-22

17–4. Removal of Rear Wheel and Rear Axle shaft

To remove each rear wheel and its shaft, proceed as follows:

1) Loosen the five nuts securing the wheel to the brake drum. Raise the rear end by jacking.
   Rest the machine steady on safety stands.
2) Remove the five nuts and take off the wheel.

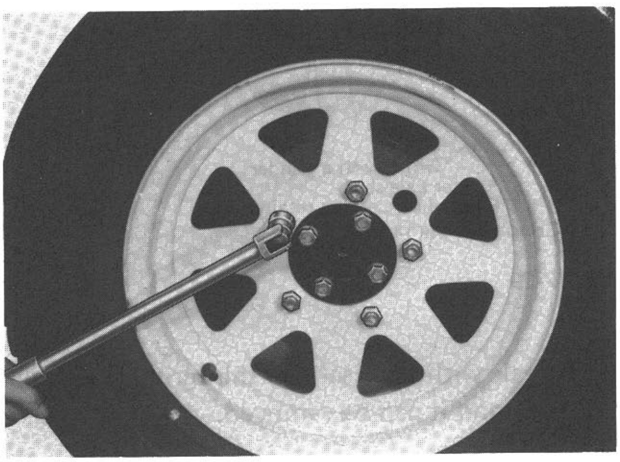


Fig. 17-23

3) Remove the nuts securing the brake drum to the rear axle shaft flange.

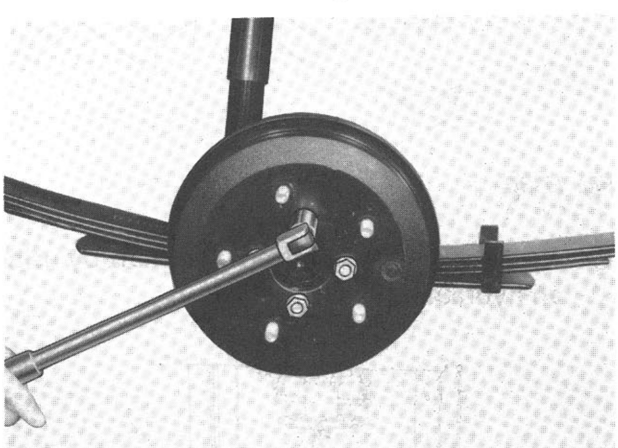


Fig. 17-24

4) Pull the drum off by using these special tools:
   Brake drum remover Ⓐ (09943-35511)
   Sliding hammer Ⓑ (09942-15510)

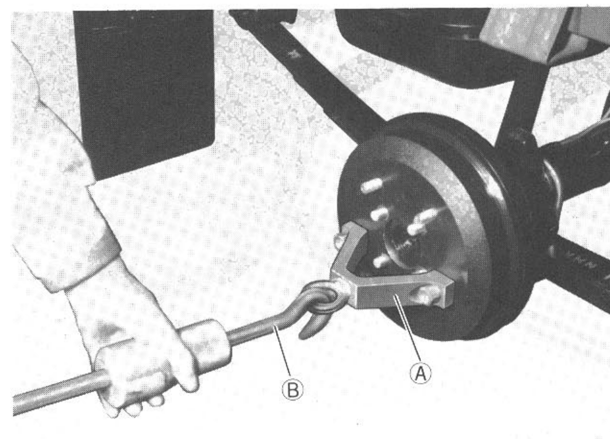


Fig. 17-25

5) Remove the 4 bolts securing the outer-bearing retainer, and separate the retainer from the brake backing plate.

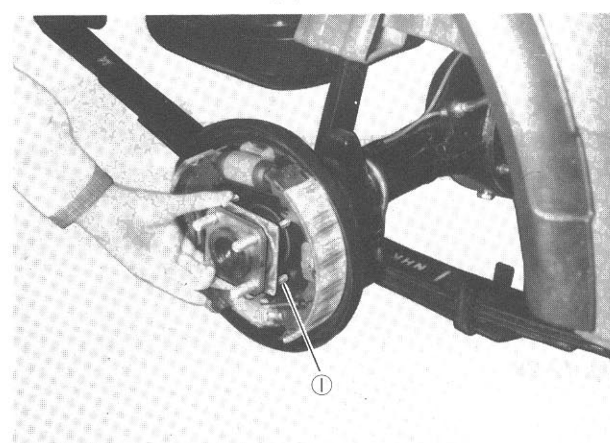


Fig. 17-26 ① *Retainer*

6) Using the special tools indicated below, draw out the axle shaft.

Rear axle remover Ⓒ (09922-66010)
Sliding hammer Ⓑ (09942-15510)

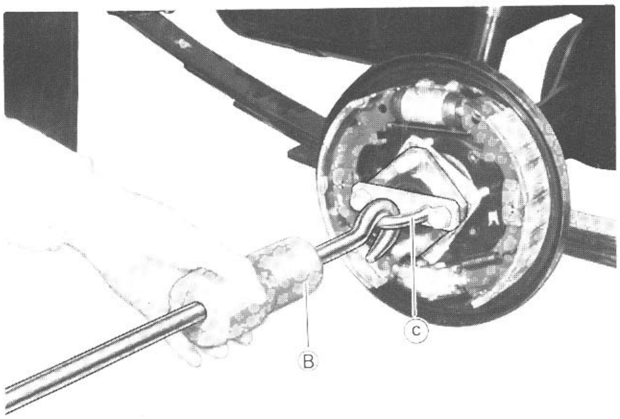


Fig. 17-27

Rear axle shaft that was drawn out.

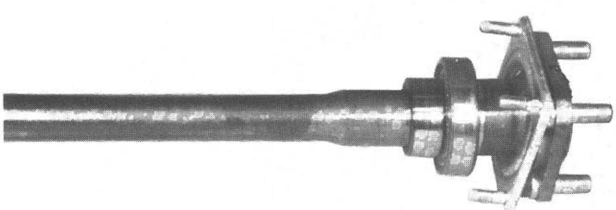


Fig. 17-28

7) Remove the bearing from the rear axle shaft according to the following procedure.

> **NOTE:**
> **The retainer ring is very tightly fitted on the axle shaft so as to prevent the rear axle shaft from coming out of the axle housing while driving. This is why a grinder is needed for its removal.**

① In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

> **CAUTION:**
> **Be careful not to go so far as to grind the shaft.**

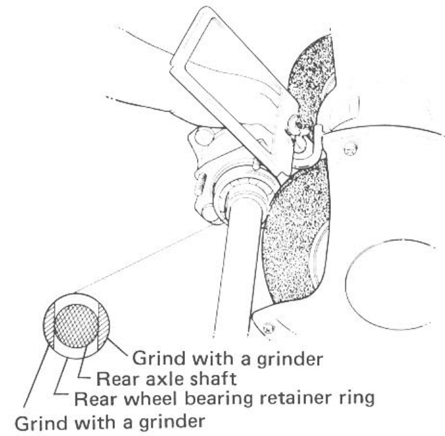


Fig. 17-29

② Break with a chisel the thin ground retainer ring, and it can be removed.

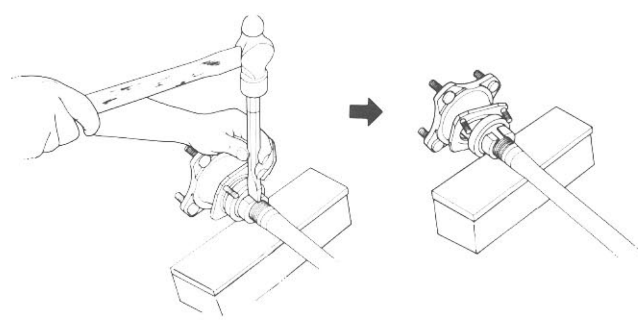


Fig. 17-30

③ Remove the bearing from the shaft by using an hydraulic press.

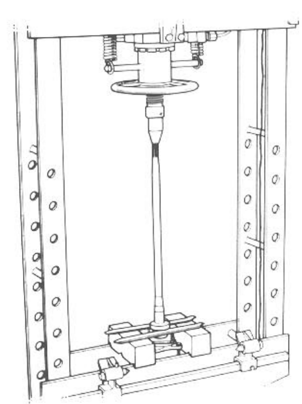


Fig. 17-31

④ Press in a new bearing and retainer ring by using an oil hydraulic press.

> **NOTE:**
> **At this time, protect the outer surface of the retainer ring from any damage.**
> **A damage on the outer surface of the retainer ring will cause an oil seal lip wear which eventually allows differential oil to leak on the brake shoe side.**

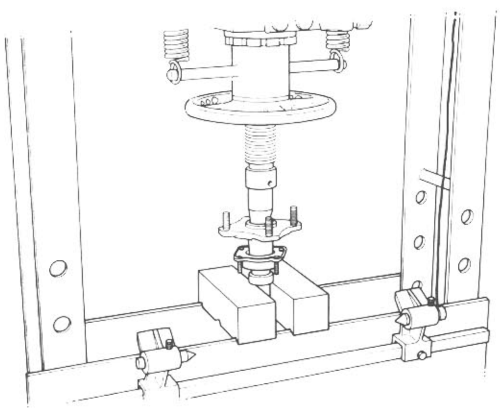


Fig. 17-32

When pressing the retainer ring, apply 4 to 8 ton pressure.
After making sure that the ring contacts the bearing, clean the ring surrounding and apply sufficient amount of wheel bearing grease to the bearing.

⑤ Fit the oil seal onto the shaft and install the shaft in the body in the reverse order of its removal.

⑥ Make absolutely sure to replenish differential oil after installation.

17–5. Maintenance Services

Barfield joint

To be checked on this joint is its axial play, which shows up when a push-and-pull motion is given to the live axle shaft and wheel spindle held in both hands, as shown in Fig. 17-33. There should be no play at all but a play of up to 1.5 mm (0.06 in.) is permissible. If the lay exceeds the limit replace it.

	Standard	Service limit
Axial play in Barfield joint	0 mm (no play)	1.5 mm (0.06 in.)

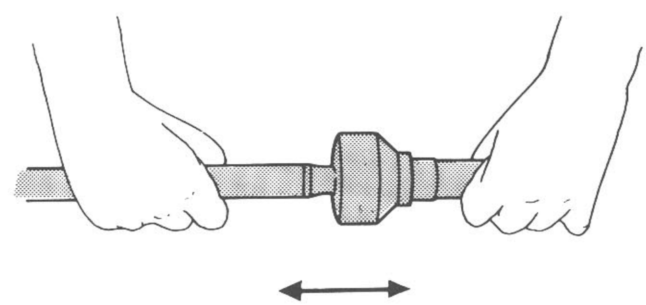


Fig. 17-33

Front wheel bearing

(1) If the front wheel hub has been removed, check the front wheel bearing rollers for damage. If anything is found wrong, replace the bearing with a new one.

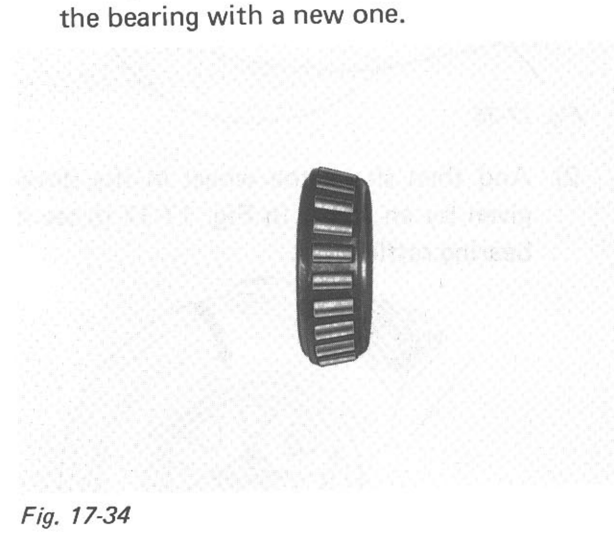


Fig. 17-34

(2) To check the wheel bearings, jack up the front end.
Spin the wheel and check if it is spun smoothly and is free from abnormal noise. If it isn't, replace the wheel bearing.

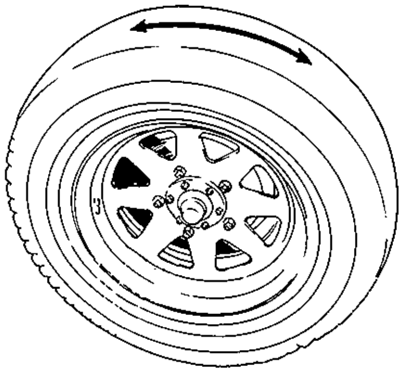


Fig. 17-35

(3) Upon completion of the check in above (2), check each joint of the steering system for tighteness, each ball stud of the steering link as well as each kingpin for rattle. Then check the bearing as described below.

1) Shake the wheel in the direction given by an arrow in Fig. 17-36 to see if the bearing rattles.

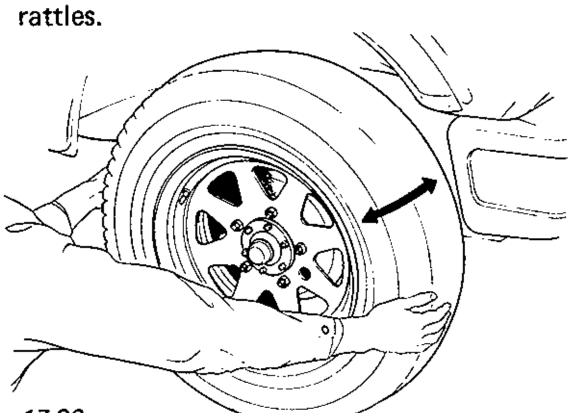


Fig. 17-36

2) And then shake the wheel in the direction given by an arrow in Fig. 17-37 to see if the bearing rattles.

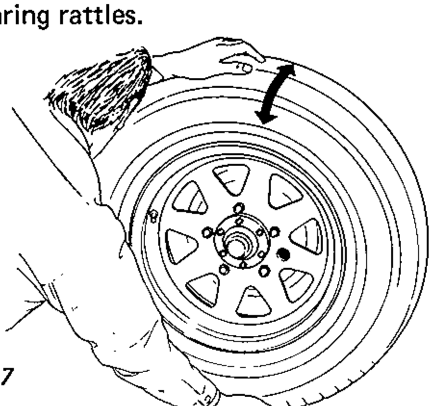


Fig. 17-37

3) If the bearing rattles, measure the bearing preload as shown in Fig. 17-38.

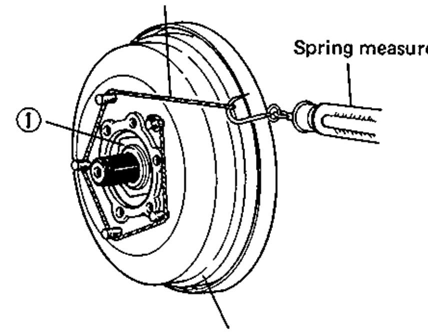


Fig. 17-38

Wheel bearing starting preload	1.0 – 3.0 kg (2.2 – 6.6 lb)

If the measurement is not within the above specified value, adjust the bearing preload by tightening or loosening nut ① while spinning the wheel until the above preload value is obtained.

4) If a bearing is replaced, tighten its nut according to the following.
First, tighten the bearing nut ① to the torque of 80N·m (8.0 kg-m, 57.5 lb-ft) while spinning the wheel by hand. Next, loosen the nut until the torque becomes 0N·m (0 kg-m, 0 lb-ft) and then tighten it again to the tightening torque specified below.
In this way, an appropriate bearing preload is obtained.

Wheel bearing nut ① tightening torque	10.0 – 15.0 N·m 1.0 – 1.5 kg-m (7.5 – 10.8 lb-ft)

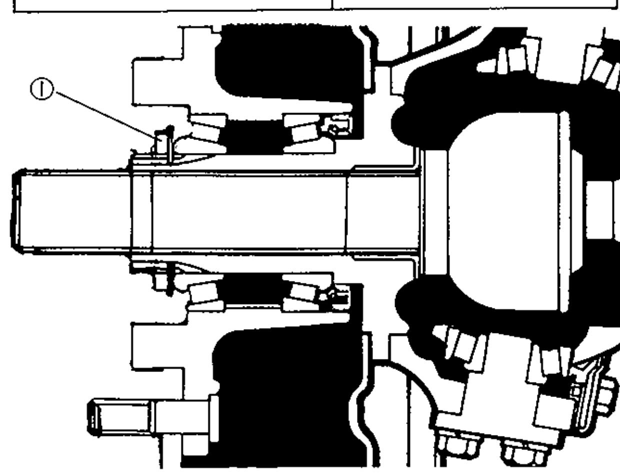


Fig. 17-38-1

5) In case that an adjustment was made as in 3) or 4), be sure to insert the lock washer after adjustment and tighten the lock nut ② to the specified torque. Then bend a part of the lock washer toward the bearing nut (body side) and another part toward the lock nut (outside) so that these two nuts are locked.

Wheel bearing lock nut tightening torque	60 – 90 N·m 6.0 – 9.0 kg-m (43.5 – 65.0 lb-ft)

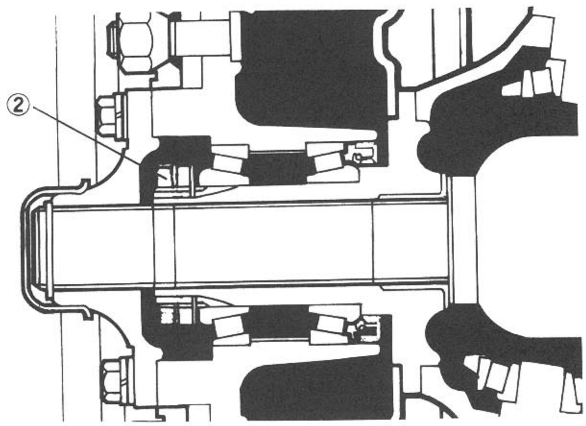


Fig. 17-39

Rear wheel bearing

Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to the drum center.

Thrust play Limit	Rear	0.8 mm (0.03 in.)

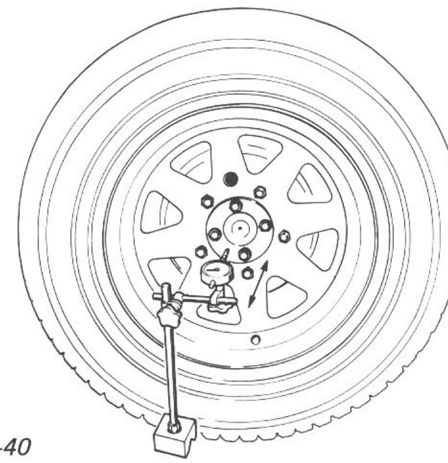


Fig. 17-40

Also, the check instructed under (2) of FRONT WHEEL BEARING must be carried out here. (Refer to Fig. 17-35)

If the check result is not satisfactory, replace the wheel bearing.

Kingpins

(1) Inspect each kingpin closely for dents, signs of cracking, distortion or any other damage. Replace the kingpins found in defective condition.

Fig. 17-41

(2) Where the tapered roller bearings holding the two kingpins at each front wheel are in good and properly preloaded (tightened) condition, there will be no appreciable rattle of the wheel. To check the kingpins and their tapered roller bearings, jack up the front end and shake the wheel to feel any rattle, as shown in Fig. 17-42. If a rattle is felt, eliminate it by properly decreasing the shim thickness. The shim is located between the flanged part of the kingpin and the knuckle.

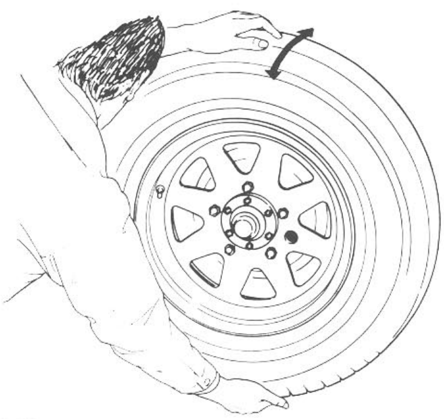


Fig. 17-42

The above-mentioned method of making a shim adjusting demands a high degree of skill on the part of the serviceman. The alternative method is to adjust the thickness of the shim by referring to the torque resistance which the knuckle arm offers when pulled in the condition shown in Fig. 17-43. For this method, the reference torque value is established, indicated below, and you are to increase or decrease the shim thickness to produce this torque value.

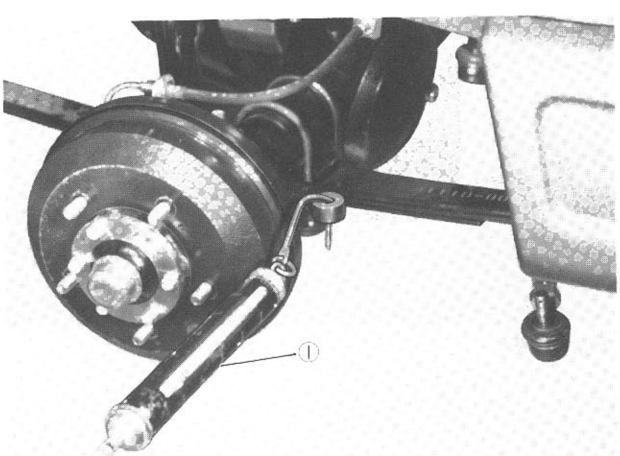


Fig. 17-43 ① *Spring measure*

Before giving a test pull to the knuckle arm with a spring balance in the alternative method, install a large amount of shims on each kingpin to lighten preload on the tapered roller bearing. Keep on reading the torque, each time decreasing the shim thickness a little, and continue this process until the specified torque value is obtained. (This process protects the kingpins because it ensures that no excessive pull will be applied to the bearings at the onset.) If the process fails to produce the specified torque, that is, if the desired torque resistance does not occur even when the shim thickness has been reduced to zero on each kingpin, it means that the bearings or kingpins are excessively worn and need replacement.

NOTE:
Read the spring balance indication when the knuckle arm begins to turn. In other words, you are to read "starting torque." When checking the knuckle arm starting torque, be sure to have the oil seal removed.

Knuckle arm starting torque (force)	1.0 - 1.8 kg (2.20 - 3.96 lb) without oil seal
Available sizes of shim for kingpins	0.1, 0.5 mm (0.004, 0.02 in.)

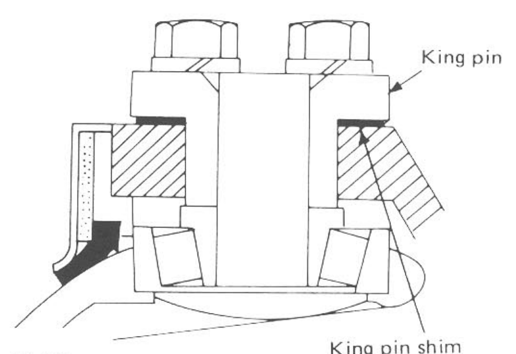


Fig. 17-44

Oil seal
The oil seal used at the spherical sliding joint between the knuckle and the inner case accomplishes the additional purposes of keeping out road dust and of acting as the damper for the steering handwheel. As the wear of this seal advances, its damping effect decreases and thus make the front wheel develop a tendency to "shimmy" not only that road dust begins to

creep into the sliding clearance to promote the wear of the spherical sliding surfaces.

The oil seal is an expendable item, and must be replaced at regular intervals.

Oil seal replacement interval	10,000 km (6,000 miles)

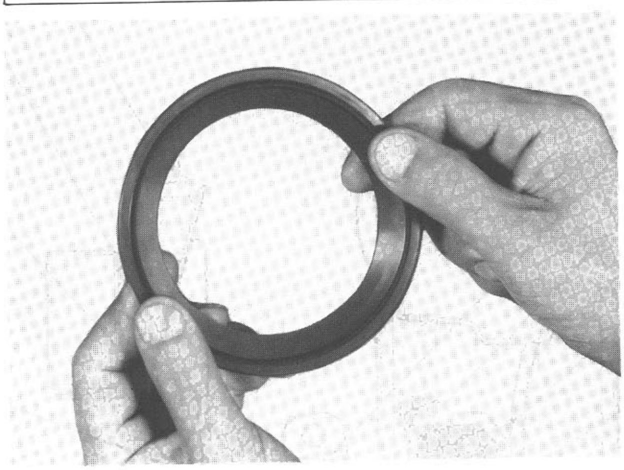


Fig. 17-45

How to replace the oil seal:

1) Remove the 8 bolts securing the joint seat, and displace the oil seal cover and felt packing inward.
2) Cut the oil seal in place with scissors or a knife, and take it off.
3) Cut the replacement oil seal at one place with scissors or a knife as shown in Fig. 17-46.
4) Install the seal in the oil seal retainer, bringing the cut portion to top side and locating it about 30 degrees off the matching face of the oil seal retainer.

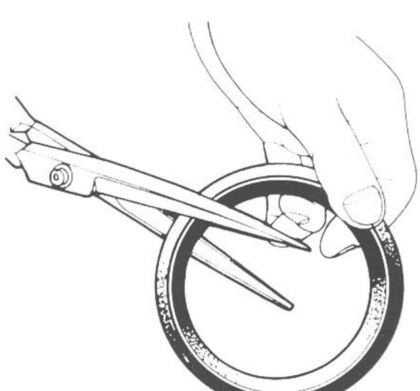


Fig. 17-46

5) Apply the sealing compound to the mating face all around: this is for preventing entry of water.

SEALING COMPOUND "CEMEDINE" 366E (99000-31090)

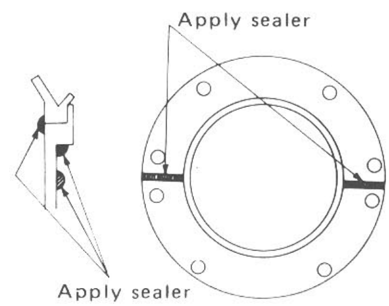


Fig. 17-47

17–6. Important Steps in Installation & Tightening Torque (Front Suspension)

Kingpin bearing

When installing the kingpin bearing, apply SUZUKI SUPER GREASE A (99000-25010) to the bearing rollers all around.

Kingpin bolt

Apply SUZUKI LOCK CEMENT "1342" (99000-32050) to the thread of the bolt before tightening it.

Kingpin

Before fitting the kingpin, apply SEALING COMPOUND 366E (99000-31090) around it as shown by the sectional view at the left.

Front wheel spindle

Apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of the brake backing plate and the steering knuckle.

Front wheel bearing oil seal

* Make sure to install the oil seal in the correct direction as illustrated.
* Apply SUZUKI SUPER GREASE A (99000-25010) to the lip of the oil seal before installation.

Front axle shaft drive flange

When installing the flange, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of the flange and the front wheel hub.

Front wheel bearing nut

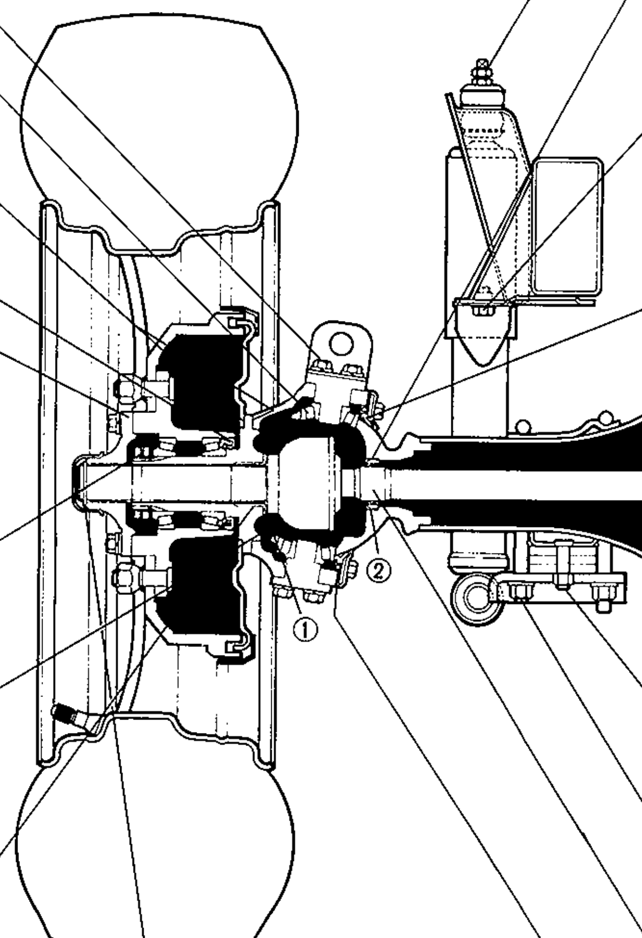
Refer to p.17 – 12 for the details on tightening it.

Steering knuckle

When installing the front axle shaft, apply SUZUKI SUPER GREASE H (99000-25120) to the axle shaft ball bearing and within the knuckle. The amount of grease to be applied within the knuckle is approximately 150g.

Front spindle bush

When fitting the bush onto the front axle shaft, apply SUZUKI SUPER GREASE A (99000-25010) to the inside of the bush and the mating surface ① of bush and barfield joint.



Front axle shaft circlip & cap

Fit the circlip in the groove of the shaft securely. And also press fit the cap onto the flange tightly.

Front wheel bearing

Before installing the outer bearing, apply about 15g of SUZUKI SUPER GREASE A (99000-25010) or wheel bearing grease between the outer bearing and the inner bearing.

Tire & wheel

When installing the wheel onto the brake drum, align the brake adjusting holes provided in both of them.

Fig. 17-48

Shock absorber lock nuts

22 – 35 N·m
2.2 – 3.5 kg-m
(16.0 – 25.0 lb-ft)

Front axle shaft oil seal

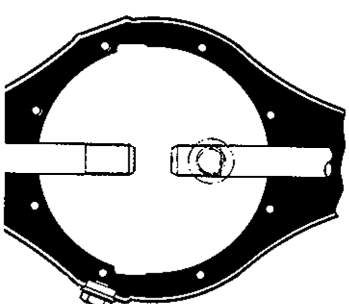
* Before installing the oil seal, apply SUZUKI SUPER GREASE A (99000-25010) to its lip.
* Use care for correct installing direction, referring to the illustration.

Spring bumper bolt

18 – 28 N·m
1.8 – 2.8 kg-m
(13.5 – 20.0 lb-ft)

Axle hub oil seal

Before installing the oil seal, apply SUZUKI SUPER GREASE A (99000-25010) to its lip.



40 – 70 N·m 4.0 – 7.0 kg-m (29.0 – 50.5 lb-ft)

Leaf spring center bolt & nut

Insert the bolt and nut securely into the holes of the axle housing seat and the spring seat.

Front spring U bolt

When securing the U bolt, tighten its front and rear nuts evenly.

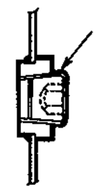
Front axle shaft joint Ass'y

When inserting the axle shaft into the front axle housing, be careful not to cause any damage or distortion to the axle shaft oil seal ②.

Oil seal retainer

When installing the retainer, apply SEALING COMPOUND 366E (99000-31090) all around it. For the details, refer to Fig. 17-47.

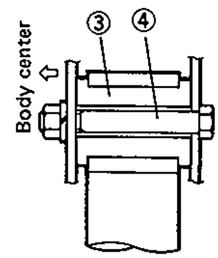
Axle housing oil level plug



Before installing the plug, apply SUZUKI BOND NO. 4 (99000-31030) to its thread.

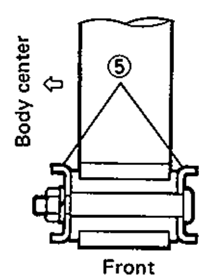
30 – 40 N·m
3.0 – 4.0 kg-m
(22.0 – 28.5 lb-ft)

Front leaf spring bush & spring bolt



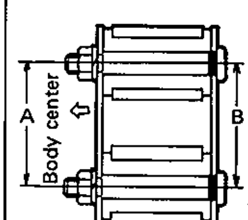
* Either water or household type detergent may be used to press-fit the bush ③ onto the spring. But oil of any kind is strictly prohibited.
* Insert both right and left bolts ④ from the outside into the inside of the body.

Front leaf spring shackle plate



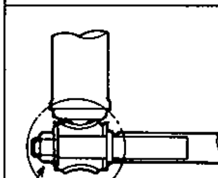
Install plates ⑤ with their backs directed to each other.

Front leaf spring shackle pins



* Insert both right and left pins from the outside into the inside of the body.
* Tighten the nuts to the specified torque in unloaded state.
* When the pins are inserted, make sure that the difference (A–B) is less than 0 – 0.6 mm (0 – 0.024 in).

Shock absorber & nut



For the correct installing direction of the absorber washer, refer to the illustration.

30 – 50 N·m
3.0 – 5.0 kg-m
(22.0 – 36.0 lb-ft)

NOTE:
Torque specifications of the other bolts and nuts are given on p-17-21.

17–7. Important Steps in Installation & Tightening Torque (Rear Suspension)

Rear shaft oil seal

* Install the oil seal so that the side with spring "A" faces the differential side. Also, before its installation, be sure to apply SUZUKI SUPER GREASE A (99000-25010) to its lip "B".

Wheel side  Differential side

* Press-fit the oil seal until it contacts the oil seal protector.

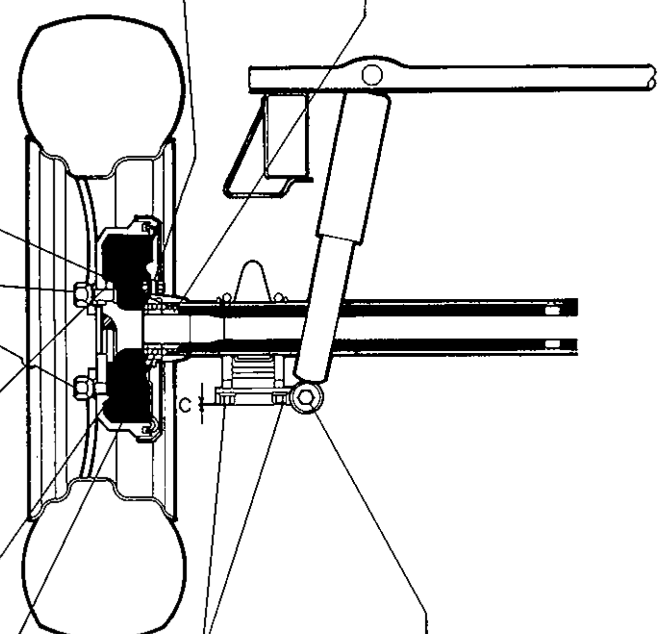
Brake backing plate

When fitting the brake backing plate onto the hub, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts. This is to make the brake drum watertight.

18 – 28 N·m
1.8 – 2.8 kg-m
(13.5 – 20.0 lb-ft)

Rear wheel bearing retainer ring

Fit the retainer ring, referring to p17-11.



Rear shaft bolt & Rear wheel bolt

When mounting the hub bolts into the rear axle shaft, make sure to fit the head securely in the stepped part of the axle shaft.

50 – 80 N·m
5.0 – 8.0 kg-m
(36.5 – 57.5 lb-ft)

Rear brake drum

When installing the drum, be careful not to let any foreign matter enter where the drum and the rear axle shaft contact.

Rear wheel bearing spacer

Install the wheel bearing spacer with the tapered side of its inner diameter directed toward the outside, or the brake drum side.

Wheel bearing

Install the wheel bearing with its sealed side directed toward the brake drum side.

Leaf spring U bolt nuts

30 – 45 N·m
3.0 – 4.5 kg-m
(22.0 – 32.5 lb-ft)

Tighten the four U bolt nuts uniformly so that the size "C" of each of the four is the same.

Shock absorber nuts

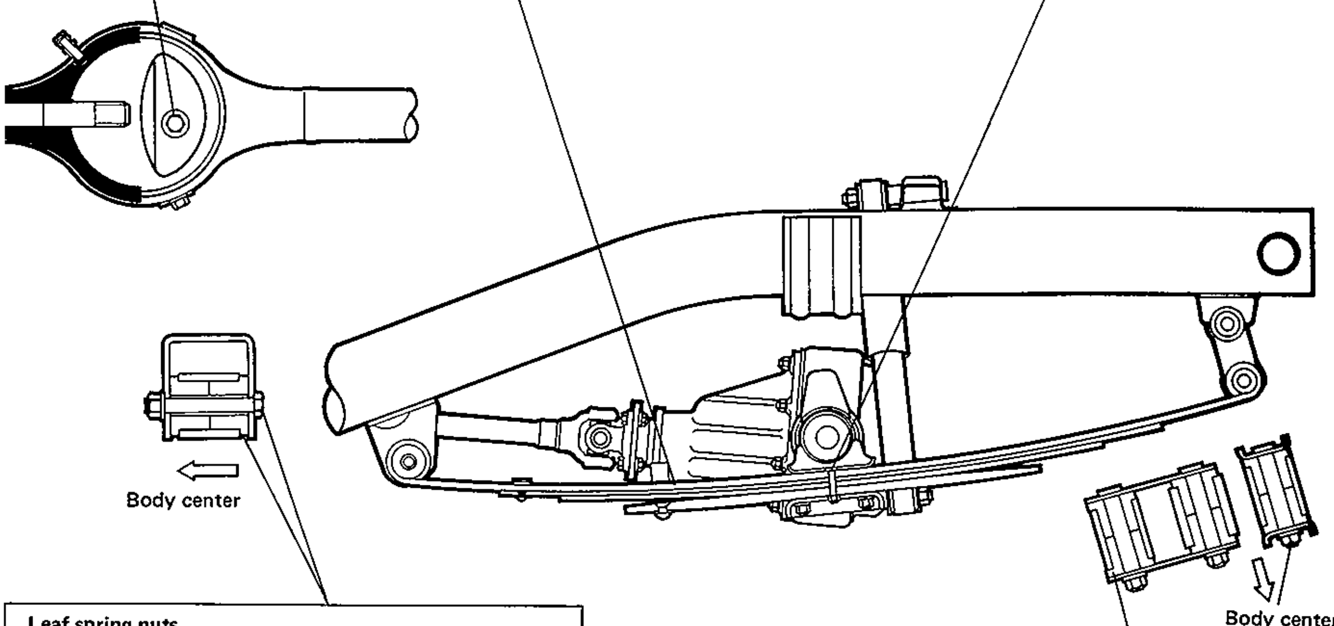
30 – 50 N·m
3.0 – 5.0 kg-m
(22.0 – 36.0 lb-ft)

Fig. 17-49

Differential oil filler & level plug
Before fitting the plug, apply SUZUKI BOND NO. 4 (99000-31030) to its thread.
30 – 40 N·m 3.0 – 4.0 kg-m (22.0 – 28.5 lb-ft)

Rear leaf spring center bolt & nut
Securely fit the bolt head and nut in the hole of the spring seats and then tighten the U bolt nuts.

Leaf spring
When installing the leaf spring, be sure that No. 1, No. 2, No. 3 and No. 4 leaves do not get out of their positions.



Leaf spring nuts	
45 – 70 N·m 4.5 – 7.0 kg-m (33.0 – 50.5 lb-ft)	●Mount the leaf spring bolts at the both ends from the outside of the car toward the inside. ●Tighten the leaf spring nut in unladen state.

Leaf spring front bush
The method of fitting the leaf spring front bushes is the same as that of fitting the shackle pin bush.

Shackle pin bushes
Press-fit the shackle pin bushes. Some water or soapy water applied to the bushes will make the work easier. Note: Never apply any kind of oil to the bushes.

Shackle pin nuts	
30 – 55 N·m 3.0 – 5.5 kg-m (22.0 – 39.5 lb-ft)	●Install the shackle pins, both right and left, from the outside of the car toward the center. ●Tighten the shackle pin nuts in unladen state.

17–8. Shock Absorbers and Leaf Spring

Specifications

SHOCK ABSORBERS

Item	Front shock absorbers	Rear shock absorbers
Damping force on rebound	100kg (220 lb)	100kg (220 lb)
Stroke	155mm (6.10in)	170mm (6.70in.)

* The force is based on piston speed of 0.3 m/second.

LEAF SPRING

Item	Front leaf springs	Rear leaf springs
Amount of bow	20.0 mm (0.78in)	60.0 mm (2.36in)
Leaf length	935 mm (36.8in)	1,000 mm (39.37in)
Spring rate	4.1 kg/mm	3.06 kg/mm

NOTE:
In the above table, "amount of bow" assumes the machine to be in non-loaded condition, and refers to right-hand traffic machines (with the steering wheel located on the left-hand side). For left-hand traffic machines, the amount of bow for rear leaf springs differs from the above specification, as follows:
Left rear leaf spring. . . . . 30.0 mm (1.18 in)
Right rear leaf spring. . . . 60.0 mm (2.36 in)

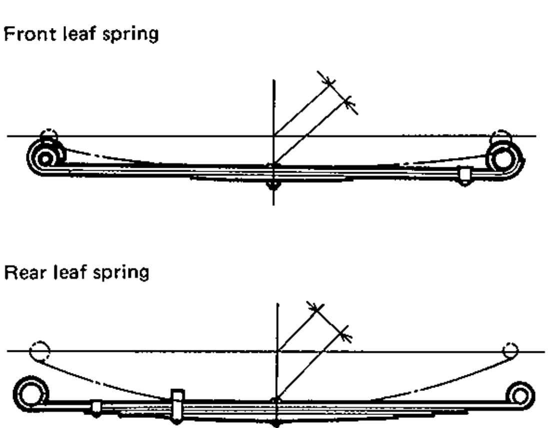


Fig. 17-50

Inspection

(1) Shock absorbers
The absorbers are of double-acting type. By trying to contract and extend each absorber by hand, the effectiveness of its damping action can be told. Absorbers found with oil leak or with inadequate damping effectiveness must be replaced.

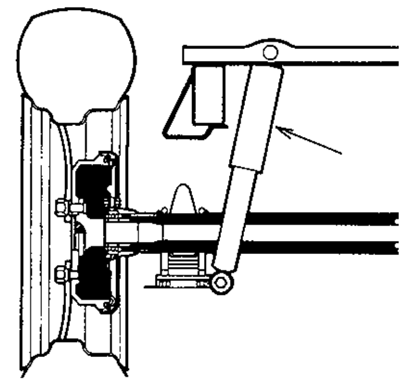


Fig. 17-51

WARNING:
When handling the rear shock absorber in which high-pressure gas is sealed, make sure to observe the following precautions.
(1) Don't disassemble it.
(2) Don't put it into the fire.
(3) Don't store it where it gets hot.
(4) Before disposing it, be sure to drill a hole in it where shown by an arrow in the illustration below and let gas and oil out. Lay it down sideways for this work.

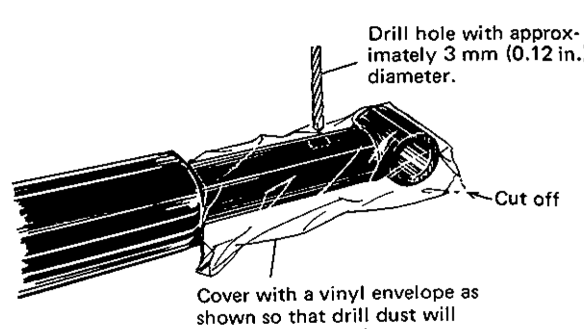


Fig. 17-51-1

17–9. Tightening Torque

BOLTS AND NUTS

Check the following bolts and nuts for tightness and retighten them, as necessary:

Fastening parts	Tightening torque		
	N·m	kg·m	lb·ft
(1) Shackle pin nut	35 – 55	3.0 – 5.5	22.0 – 39.5
(2) Leaf spring nut	45 – 70	4.5 – 7.0	32.5 – 50.5
(3) Leaf spring U bolt and nut	30 – 45	3.0 – 4.5	22.0 – 32.5
(4) Wheel nut	50 – 80	5.0 – 8.0	36.5 – 57.5
(5) Front axle shaft drive flange bolt	20 – 30	2.0 – 3.0	14.5 – 21.5
(6) Kingpin upper & lower bolts	20 – 30	2.0 – 3.0	14.5 – 21.5

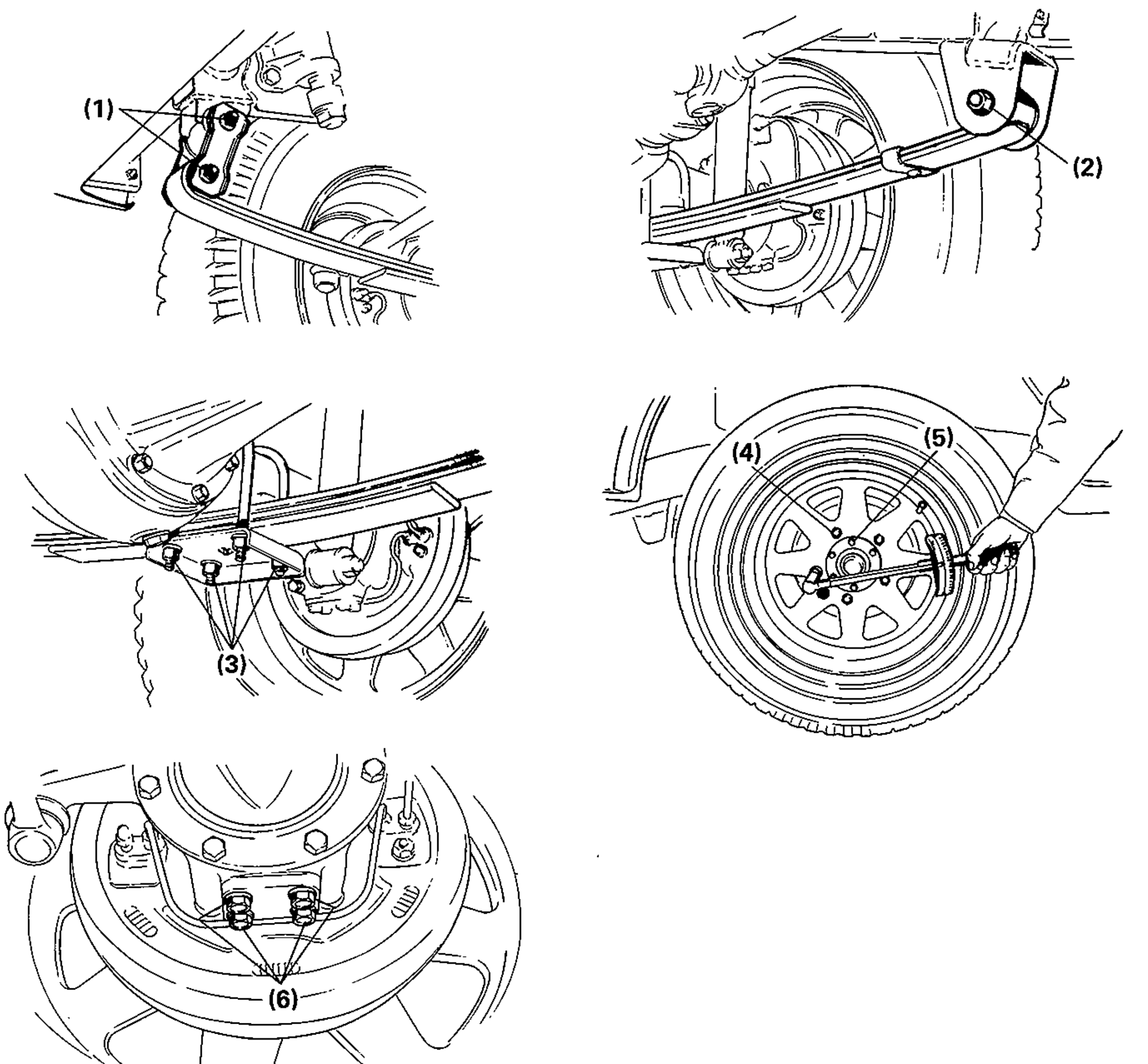


Fig. 17-52

18. STEERING SYSTEM

18–1. Description

The rotary motion of the steering handwheel is carried to the steering shaft upper, steering shaft lower, steering gear box and pitman arm. Then as the pitman arm moves, the drag rod is caused to move linearly, actuating the tie rod to turn the wheels, right and left, through their knuckle arms. The turning force exerted by the tie rod experiences a damping action due to the presence of the oil seal at the sphere-like joint between the knuckle case and the inner case (integral with the dead axle sleeve). Another damping action is available, which will be mentioned below.
The steering system formed by the components named above is designed for easy steering, high durability and excellent steering reaction as well as reliable self-restoring action. Articulated joints in the steering lever is equipped with a damping device for ensuring the greater steering stability.
Linkage are of wear-resistant ball-and-socket type. Pitman arm is equipped with a damping device for ensuring the greater steering stability.

[Right-hand steering vehicle]

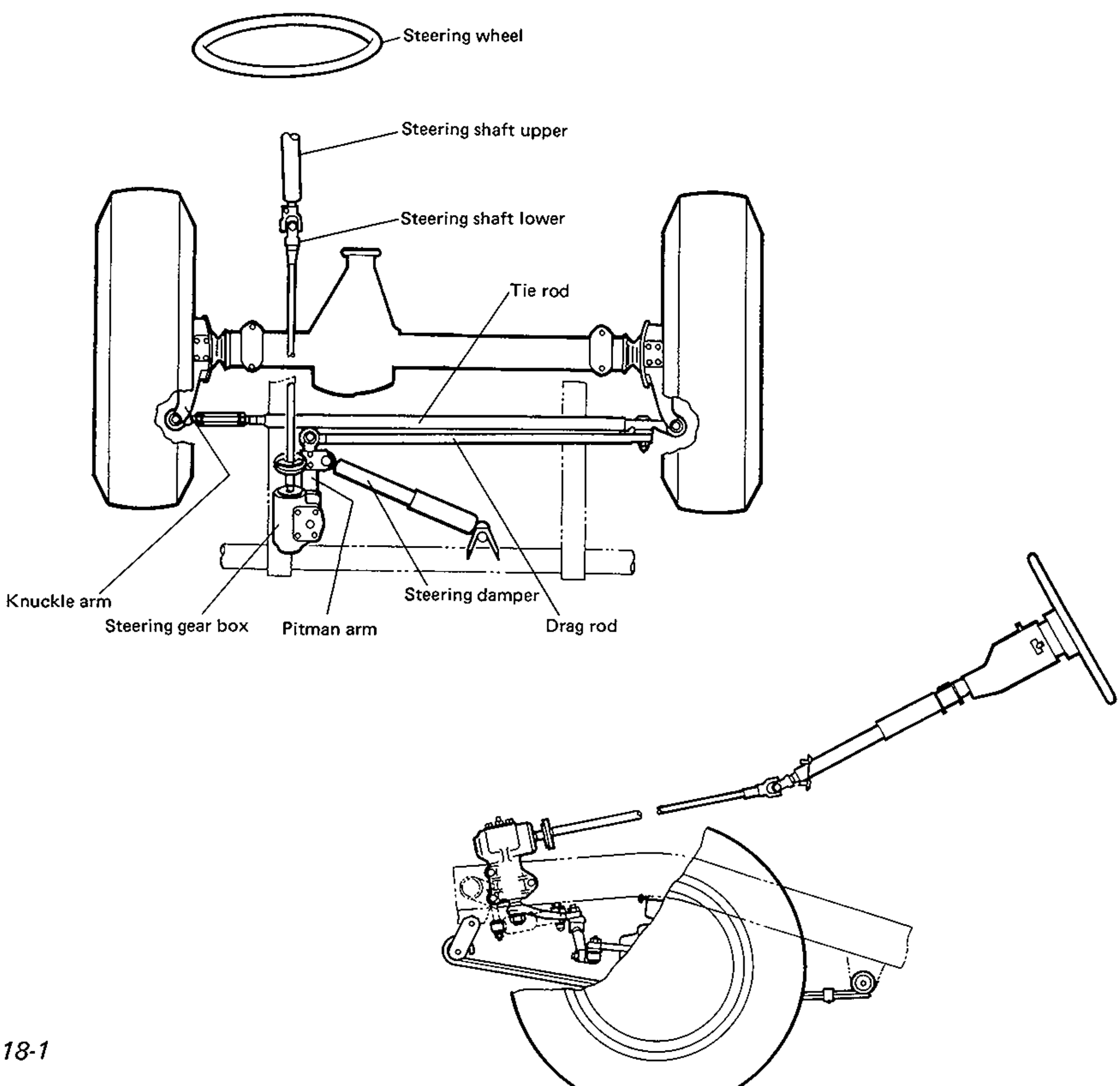
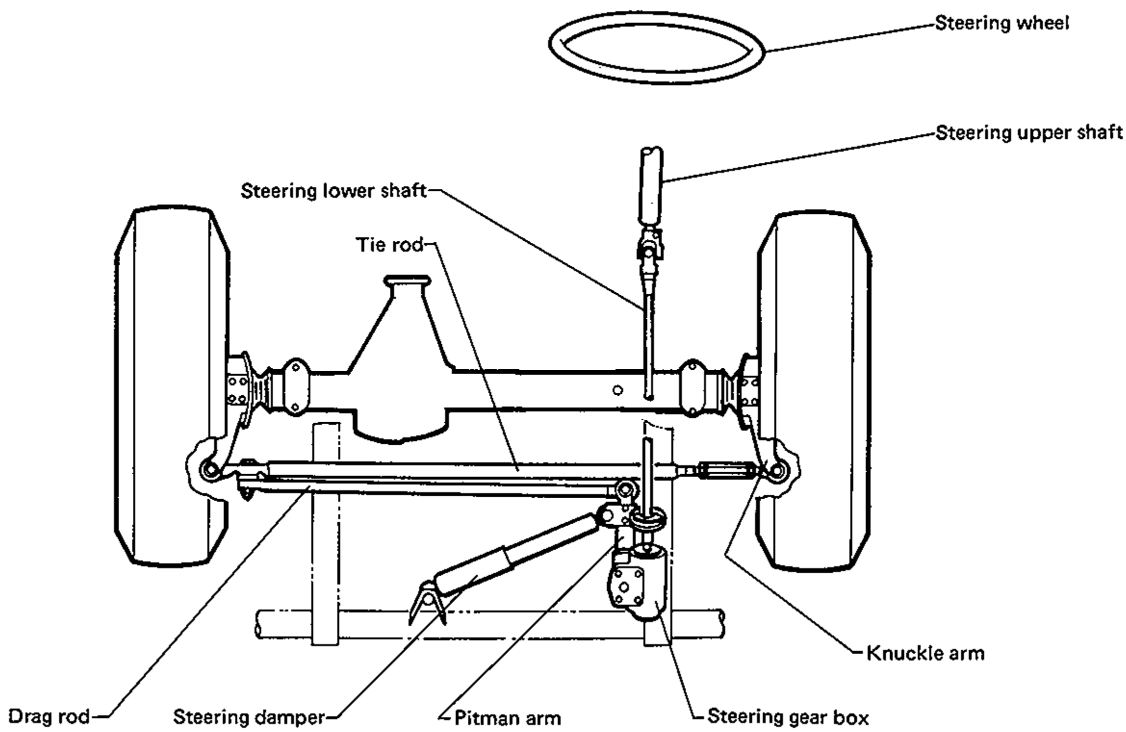


Fig. 18-1

[Left-hand steering vehicle]



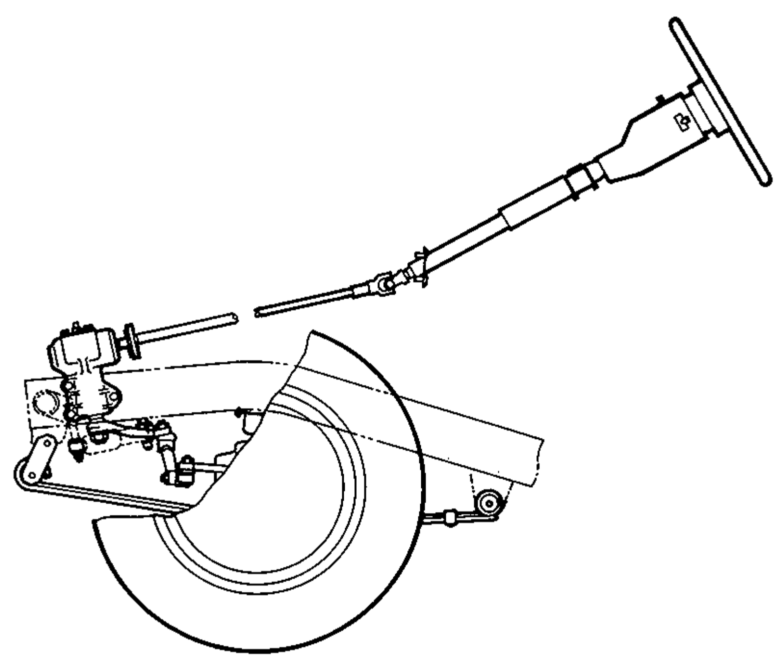


Fig. 18-1-1

18–2. Specifications and Data

	Steering gear box	Recirculating ball-and-nut type
	Gear ratio	15.6 – 18.1
	Steering angle, inside	29°
	Steering angle, outside	26°
	Steering wheel diameter	400 mm (15.74 in.)
	Minimum turning radius	4.9 m (16.07 ft.) *5.7 m (18.70 ft.)
WHEEL ALIGNMENT	Toe-in	2 – 6 mm (0.079 – 0.236 in.)
	Camber	1 degree (1°)
	Trail	14.5 mm (0.57 in.)
	Kingpin inclination	9 degree (9°)
	Caster	2 degree 30 minutes (2° 30′)
	Side slip	0 – in 3 m/km

* For SJ410K model

18–3. Steering Gear Box Construction and Operation

The pitman arm is rigidly connected to the outer end of the shaft integral with the sector gear, which is inside the gear box and meshed with the teeth of the nut capable of sliding along the worm. Between the nut and the worm is a row of steel balls, which serves two purposes: to provide rolling contact between nut and worm and to keep the nut engaged with the worm as if the two were threadedly engaged. With the nut prevented from turning, the rotation of the worm causes the nut to move up or down the worm.

The worm is an extension of the steering shaft. As the handwheel is turned, the steel balls roll along in the groove and the nut moves up or down. The steel ball that has reached the end of the groove in the nut enters the return guide. The guide sends the ball back to the other end of the same groove. In this way, the row of balls recirculates.

By so moving, the nut turns the sector gear and hence the pitman arm. It should be noted here that it is through the steel balls that a rotary motion of the worm is converted into a linear motion of the nut, which is then converted into another rotary motion of the sector gear.

The steering gear box is a precision-machined device, each part of it being machined to a closer tolerance for smooth conversion of motion, and is build sturdy for long service life. Special tools and instruments are needed in addition to specialized skill if the gear box is to be overhauled. For this reason, a gear box found to be in defective condition should be replaced by a new one; replacement is more economical and, what is perhaps more important, safer.

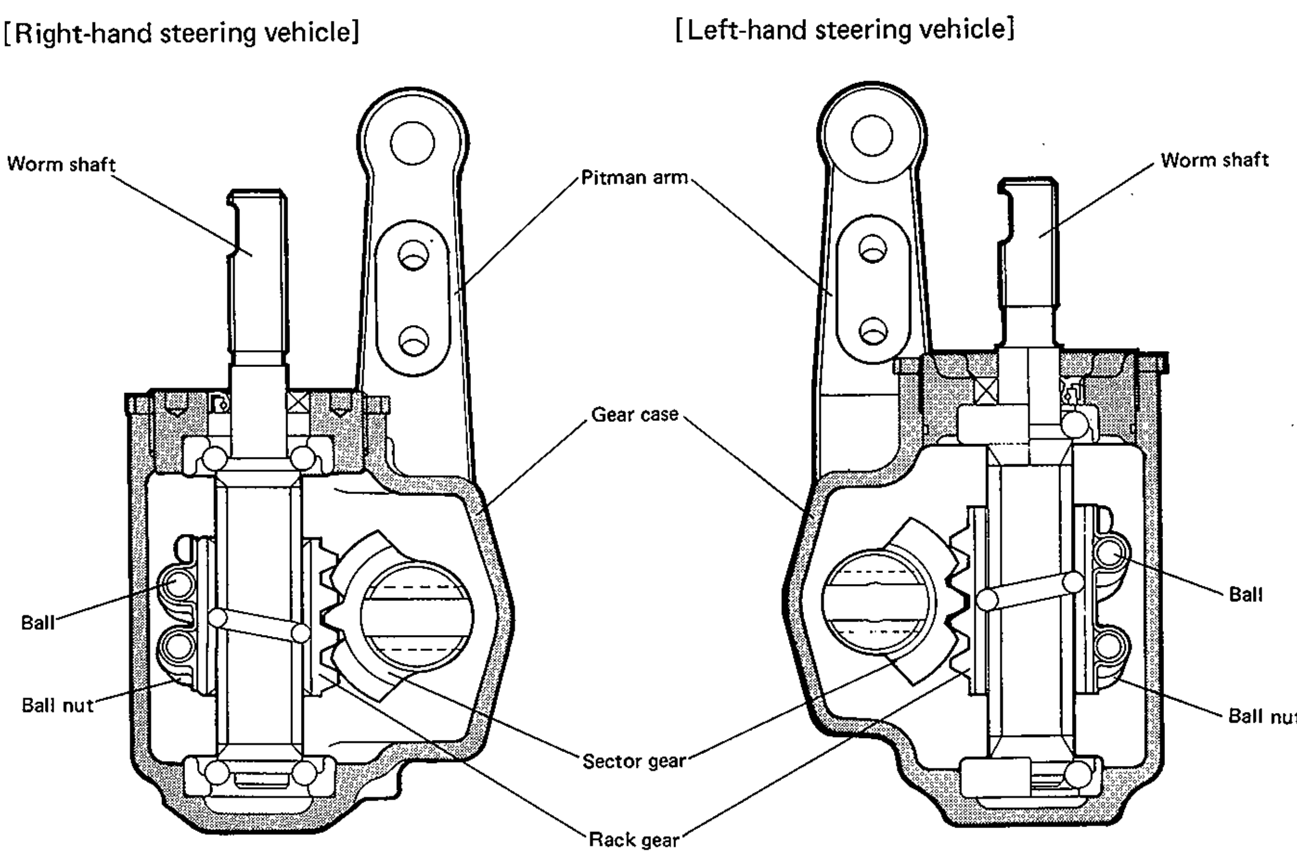


Fig. 18-2

18–4. Removal

(1) Steering handwheel

1) At the steering handwheel, depress the horn button while twisting it counter-clockwise, to remove the button. After removing the button, remove the nut securing the handwheel, and pull the handwheel off. The handwheel is splined to the shaft.

Fig. 18-3

2) If it is hard to remove the steering handwheel, take off the horn contact cap first.

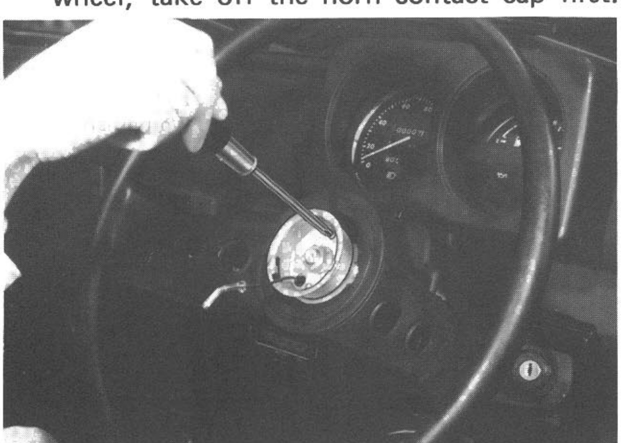


Fig. 18-4

3) And then remove the steering wheel by using special tool Ⓐ.
Steering handwheel remover Ⓐ (09923-05110).

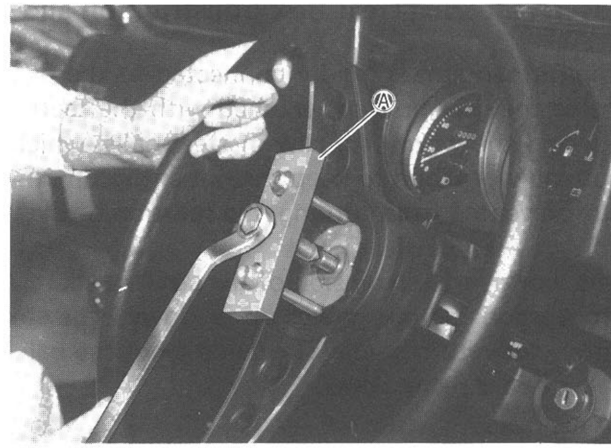


Fig. 18-5

(2) Steering shaft

> **NOTES:**
> - **This section (2) is applicable to all markets except Canadian and European ones.**
> - **The steering shaft used in the vehicle for Canada and European markets can't be disassembled. Should it be found defective, replace the column ass'y.**

1) After removing the steering handwheel according to the foregoing step (1), remove steering covers (lower & upper).

> **NOTE:**
> **Loosening slightly 2 screws securing the steering column will facilitate the upper cover removal.**

Fig. 18-6

Fig. 18-7

2) Disconnect the combination switch couplers and remove the combination switch.

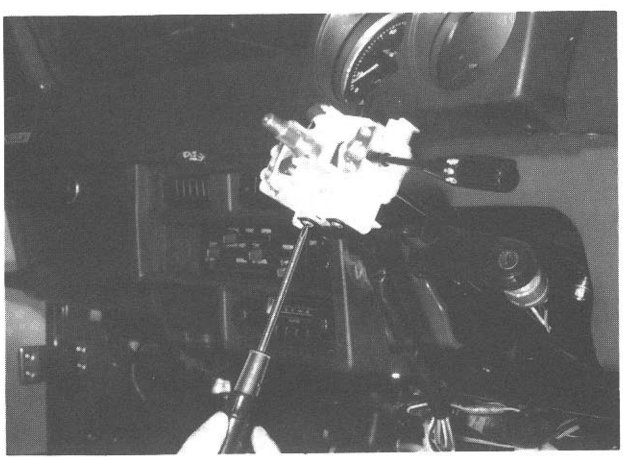


Fig. 18-8

3) Remove the bolt joining the steering shafts in the engine room.

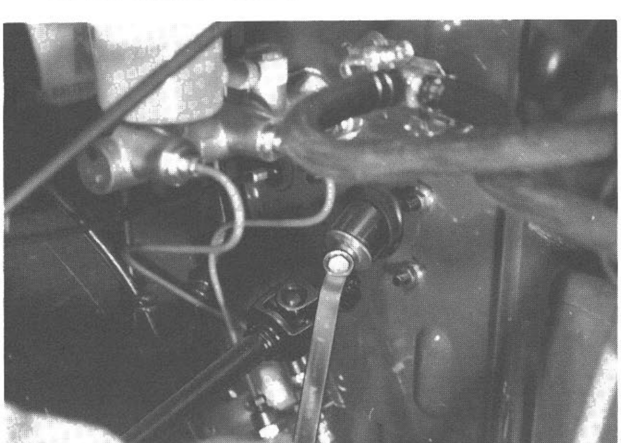


Fig. 18-9

4) Remove the circlip by using special tool Ⓑ. The washer should be also removed at this time.

Circlip pliers Ⓑ (09900-06107)

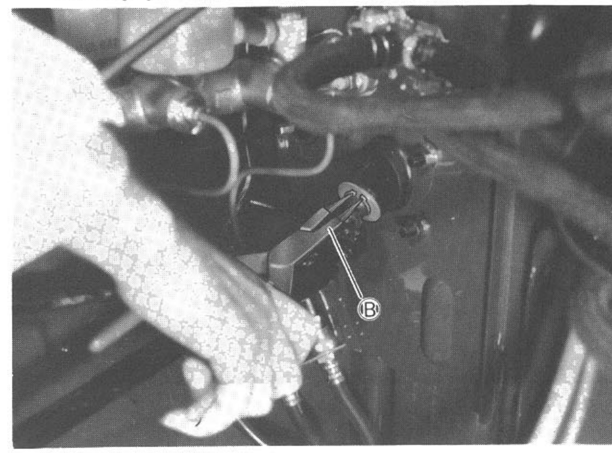


Fig. 18-10

5) Pull out the steering shaft.

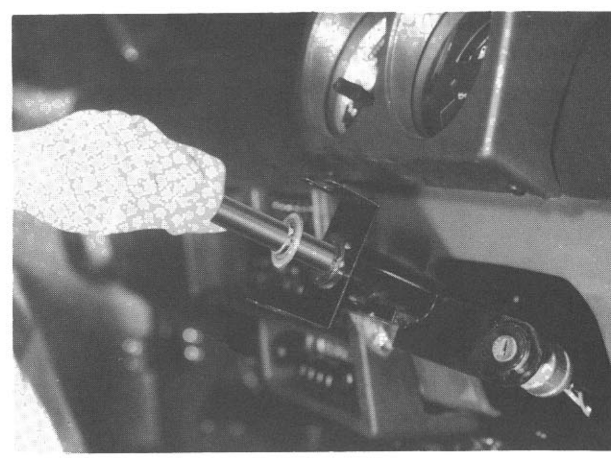


Fig. 18-11

(3) Gear box

1) Remove 4 rubber joint bolts.

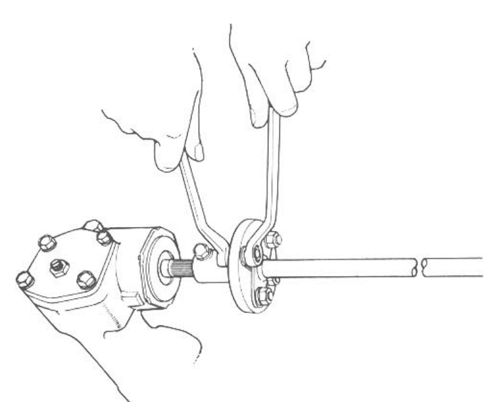


Fig. 18-12

2) Disconnect the ball stud of pitman arm and steering damper from the pitman arm.

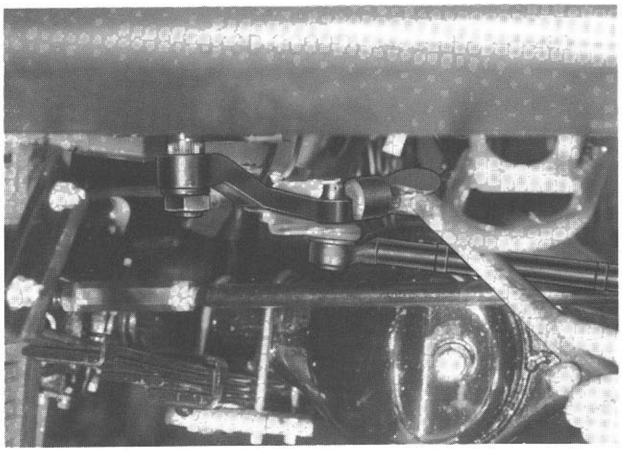


Fig. 18-13

3) The steering gear box is secured in place by three mounting bolts. Remove these bolts and take down the gear box.

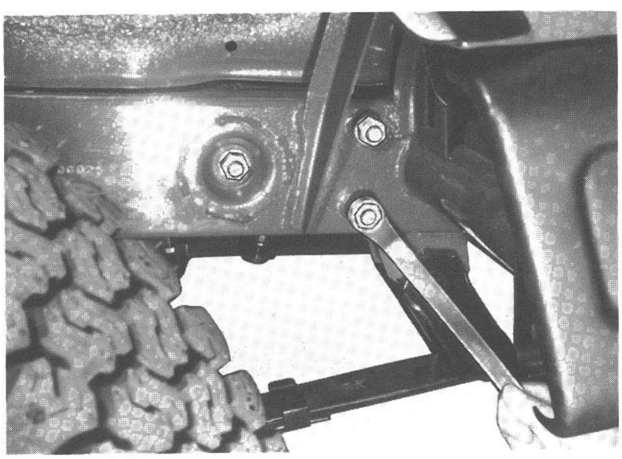


Fig. 18-14

18–5. Maintenance Services

Steering handwheel play

The wheel play is proper if it is anywhere between 10 and 30 mm (0.4 and 1.2 in.) as measured at the rim An unusually large play means that the ball-and-socket joints are loose or that the wear in the steering gear box is excessively large. Ordinarily, replacement of the worn joint will provide a proper handwheel play.

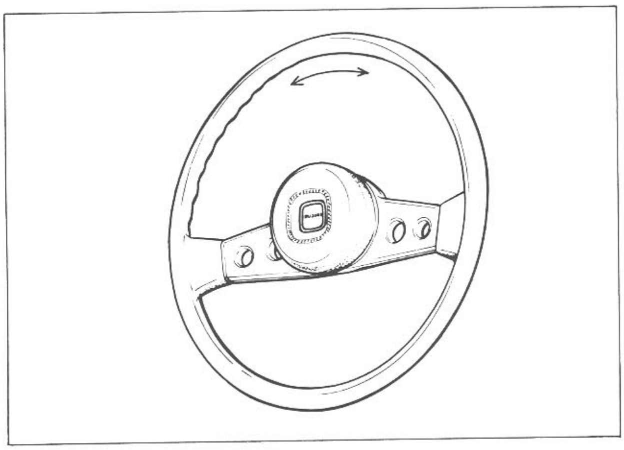


Fig. 18-15

Steering gear box

1) If any evidence of oil leakage is noted on the gear box upon inspection of the machine brought in for servicing, remove the plug and check the level of oil inside. The oil surface should be up to the level as shown in Fig. 18-16 or Fig. 18-17. If not add oil. Be sure to use the prescribed gear oil, SAE 90.

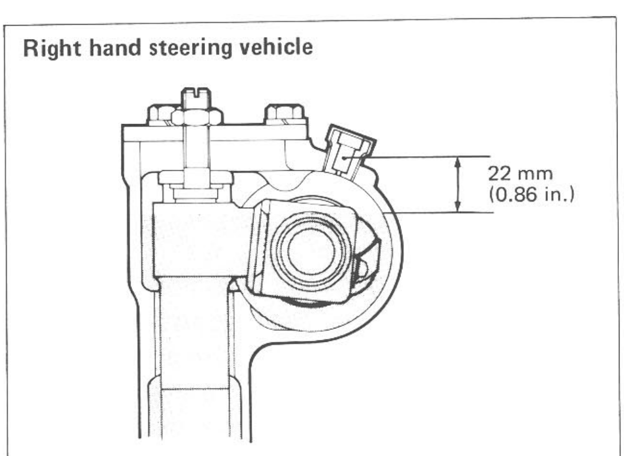


Fig. 18-16

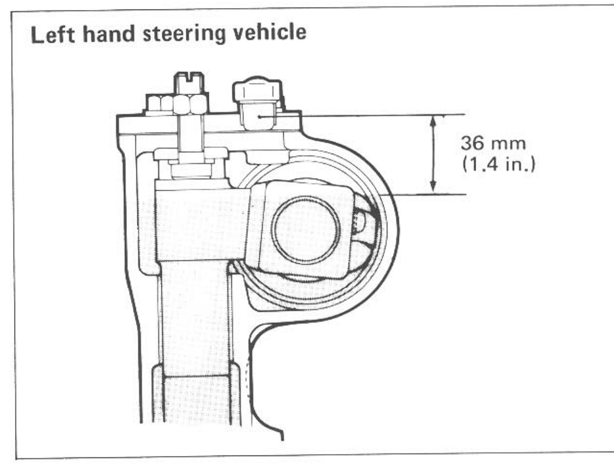


Fig. 18-17

2) The steering gear box is provided with adjusting bolt ① giving preload to the sector shaft.

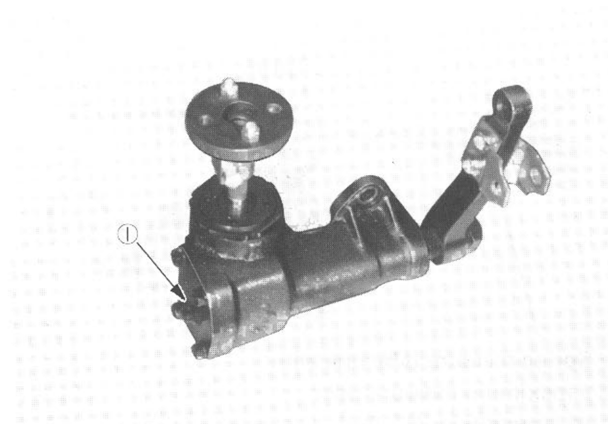


Fig. 18-18

If the steering handwheel play is excessive though no each joint of the steering system rattles, remove the steering gear box from the chassis and make an adjustment according to the following procedure.

ⓐ Check the worm shaft to ensure that it is free from thrust play.

ⓑ Position the pitman arm in parallel with the worm shaft as shown in Fig. 18-19.
(With the pitman arm in this position, the front wheel is in straightahead state.)

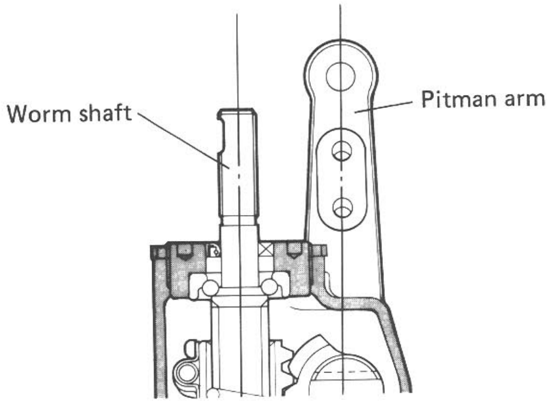


Fig. 18-19

ⓒ Measure the worm shaft starting torque from its position in the straightahead state in ⓑ, using a spring measure and string as shown in Fig. 18-20.

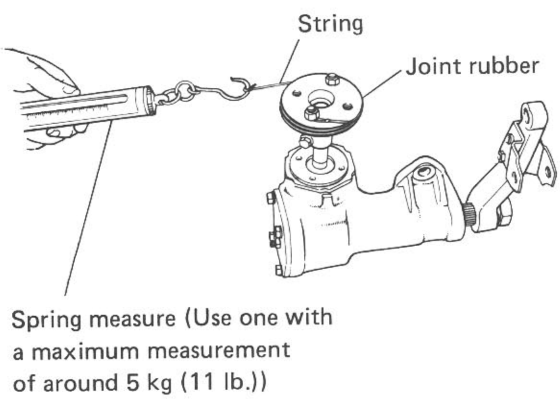


Fig. 18-20

Worm shaft (including sector shaft) starting torque (with torque wrench)	Right-hand steering vehicle 7.5 – 13.0 kg-cm (0.54 – 0.94 lb-ft)	Left-hand steering vehicle 6.0 – 10.0 kg-cm (0.43 – 0.72 lb-ft)

Worm shaft (including sector shaft) starting torque (with spring measure)	Right-hand steering vehicle 1.97 – 3.42 kg (4.34 – 7.53 lb)	Left-hand steering vehicle 1.58 – 2.63 kg (3.48 – 5.80 lb)

If the measured torque is not within the specified value, carry out an adjustment with adjusting bolt ① to meet the specification and check to confirm it again.

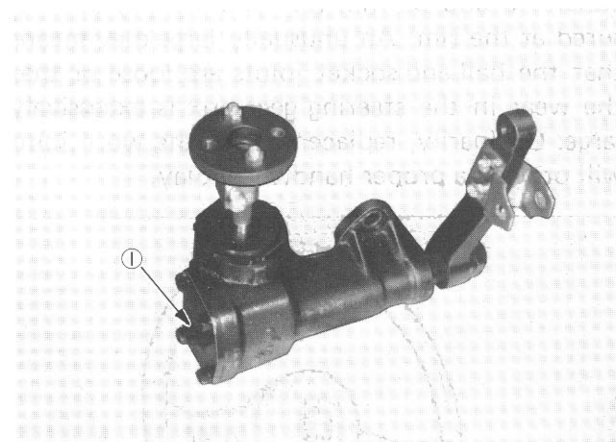


Fig. 18-21

ⓓ If the worm shaft starting torque is checked all right, another check should be carried out on the worm shaft operating torque in its entire operating range (turning the worm shaft all the way to the right and left) as shown in Fig. 18-20.

Worm shaft (including sector shaft) operating torque (with torque wrench)	Right-hand steering vehicle Under 13.0 kg-cm (Under 0.94 lb-ft)	Left hand steering vehicle Under 12.0 kg-cm (Under 0.86 lb-ft)

Worm shaft (including sector shaft) operating torque (with spring measure)	Right-hand steering vehicle Under 3.42 kg (Under 7.53 lb)	Left-hand steering vehicle Under 3.15 kg (Under 6.96 lb)

If the measured torque does not conform to the specified value, again adjust the starting torque of the worm shaft with adjusting bolt ① in the straight-ahead state and recheck the worm shaft operating torque.
If the specified value is not attained even after readjustment, it is advisable to replace the gear box with a new gear box ass'y.

Steering shaft joint

Check the universal joint and rubber joint of the steering shaft for rattle and damage. If rattle and damage is found, replace the defective part with a new one.

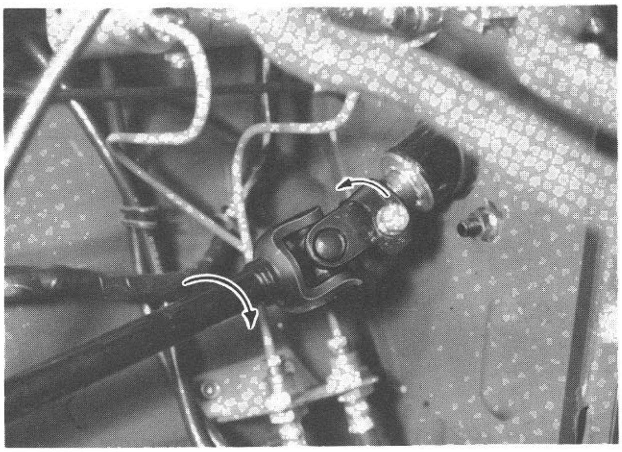


Fig. 18-22

Steering rubber joint

Inspect the rubber joint for evidence of crack or breakage, and make sure that its bolts are tight.

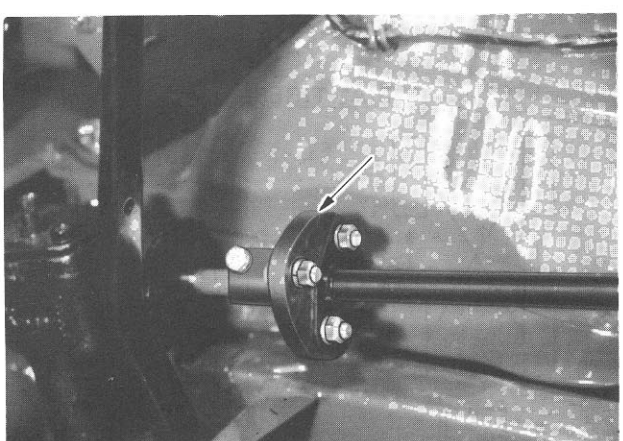


Fig. 18-23

Steering link & tie rod

Inspect the steering link and the tie rod for bend and rattle where they are joined. If one of such malconditions is found, replace the defective part with a new one.

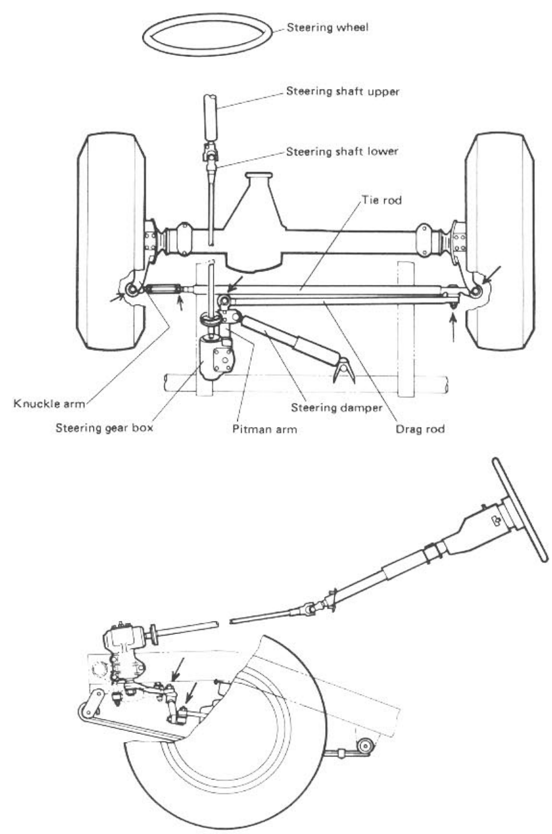


Fig. 18-24

Wheel and hub nuts

Inspect each wheel disc for cracks, dents and distortion. A disc in badly damaged condition must be replaced. Check the wheel hub nuts for tightness and, as necessary, retighten them to the specification.

Tightening torque for wheel hub nuts	50 - 80 N·m 5.0 - 8.0 kg-m (36.5 - 57.5 lb-ft)

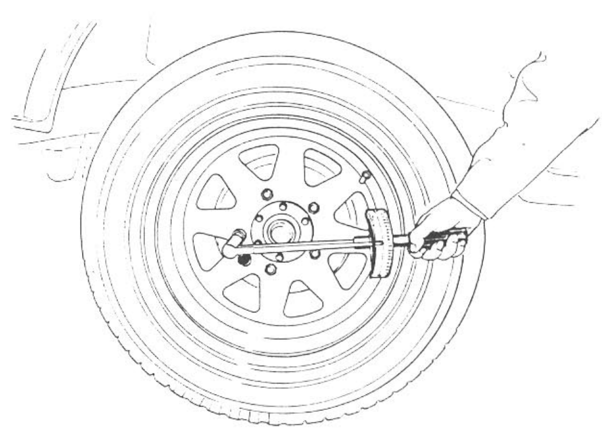


Fig. 18-25

Tires

A tire badly worn, torn or otherwise deteriorated must be replaced. Check the inflating pressure of each tire and, as necessary, adjust the pressure to the specification.

Properly inflated tires are one of the keys to satisfactory cruising performance. Be sure to advise the user about the importance of keeping the tires inflated to the pressures specified.

CAUTION:
After adjusting the tire pressure, check to be sure that the air valve is free from any signs of leakage.

Tire pressure specification (SJ410/SJ410V)

Wheel	Non-loaded condition	Loaded condition
Front wheel tires	140 kPa (1.4 kg/cm^2, 20 psi)	140 kPa (1.4 kg/cm^2, 20 psi)
Rear wheel tires	140 kPa (1.4 kg/cm^2, 20 psi)	180 kPa (1.8 kg/cm^2, 26 psi)

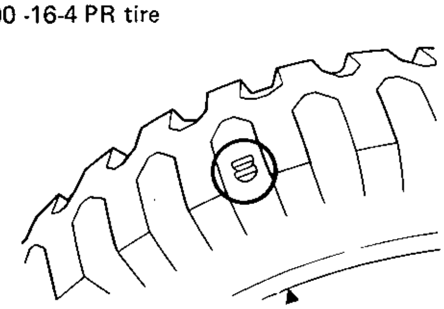
Tire pressure specification (SJ410K)

Wheel	Non-loaded condition	Loaded condition
Front wheel tires	140 kPa (1.4 kg/cm^2, 20 psi)	140 kPa (1.4 kg/cm^2, 20 psi)
Rear wheel tires	210 kPa (2.1 kg/cm^2, 30 psi)	210 kPa (2.1 kg/cm^2, 30 psi)

Check the wear indicator shown in Fig. 18-26, and replace the tire when its wear is the same level as the indicator.

Tire service limit	Less than 1.6 mm (0.063 in.) depth of tread at two places.

6.00 -16-4 PR tire



Tire tread wear indicator mark

FR 78-15, F78-15 and 195 SR15 Tire

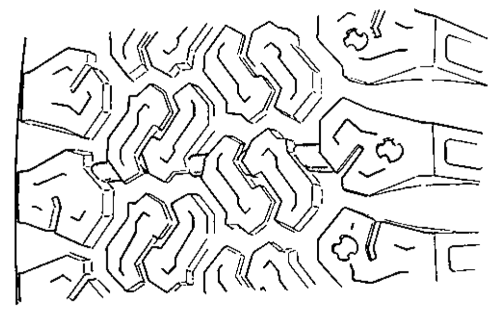


Fig. 18-26

"Rotate" the tires at the regular intervals, stated below, in order to equalize tire wear and thereby make full use of each tire. Refer to Fig. 18-27 for the scheme of rotation. Adherence to this scheme prolongs tire life.

Tire rotation interval	Every 10,000 km (6,000 miles)

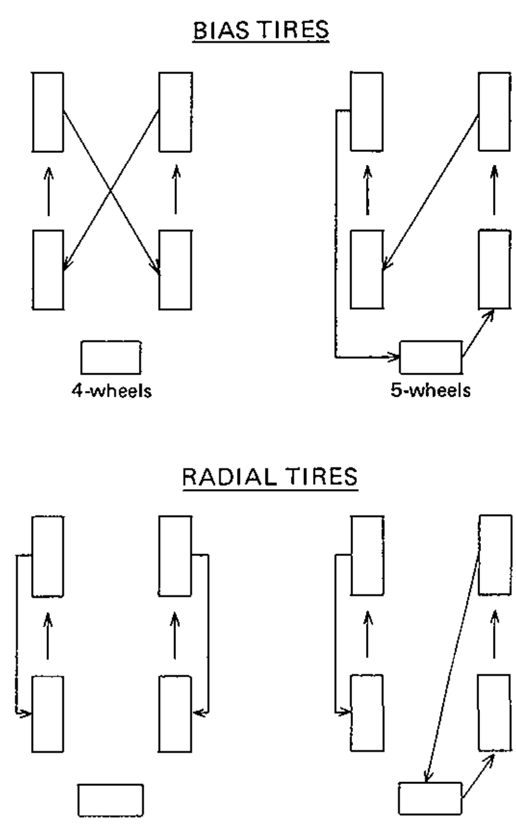


Fig. 18-27

18–6. Important Step in Reassembly (For all markets except Canadian and European markets)

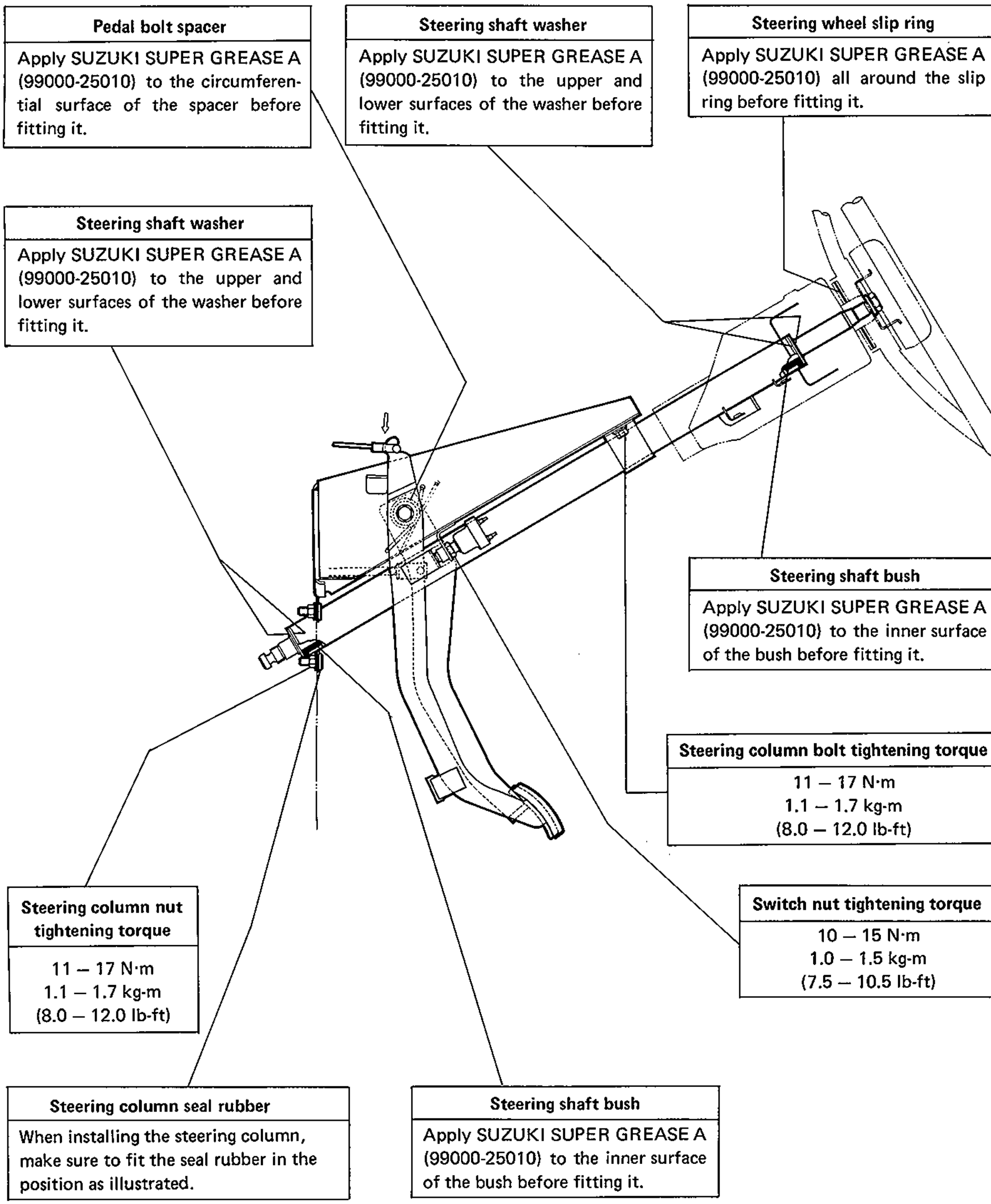


Fig. 18-28

(For Canadian and European markets)

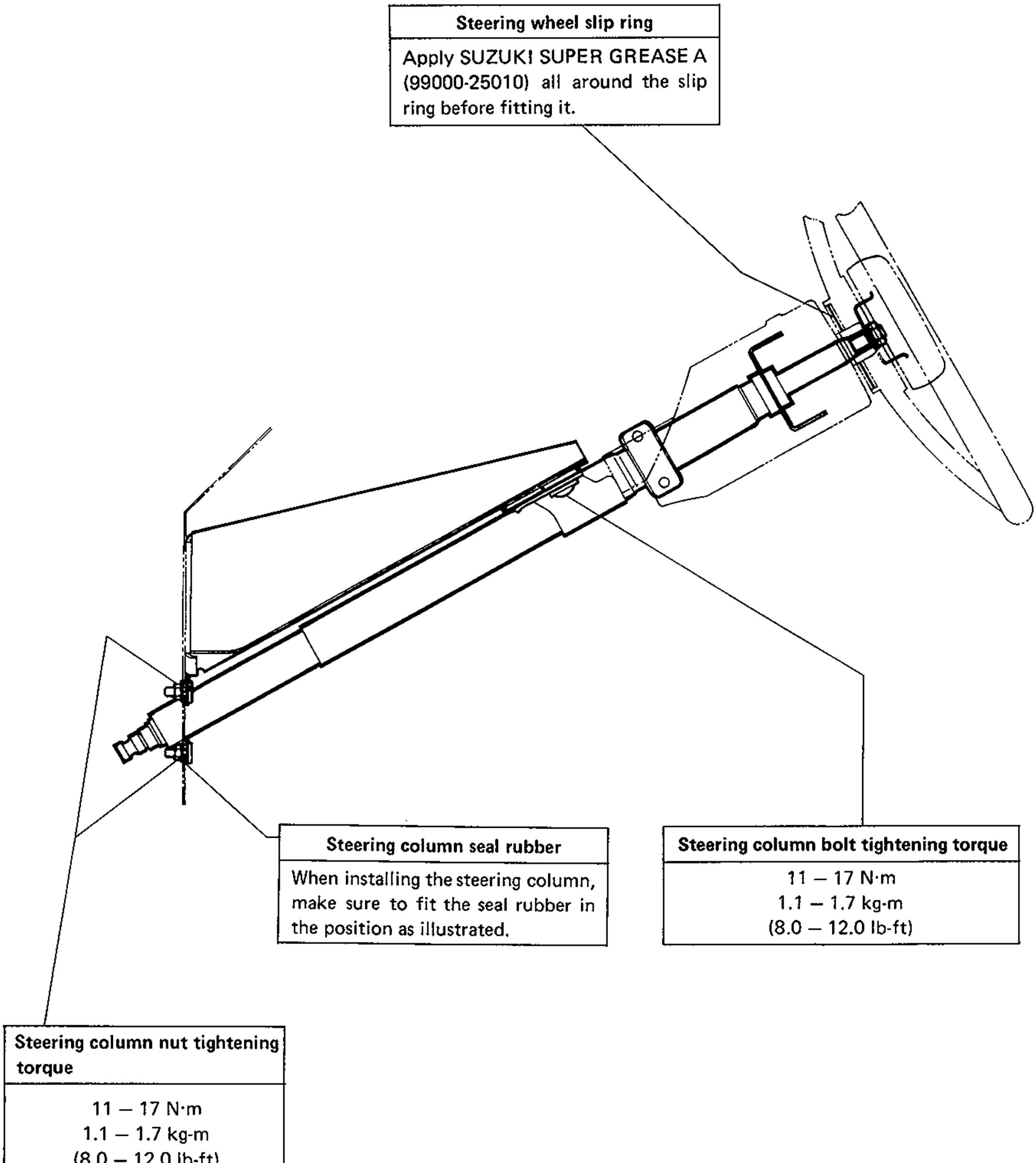
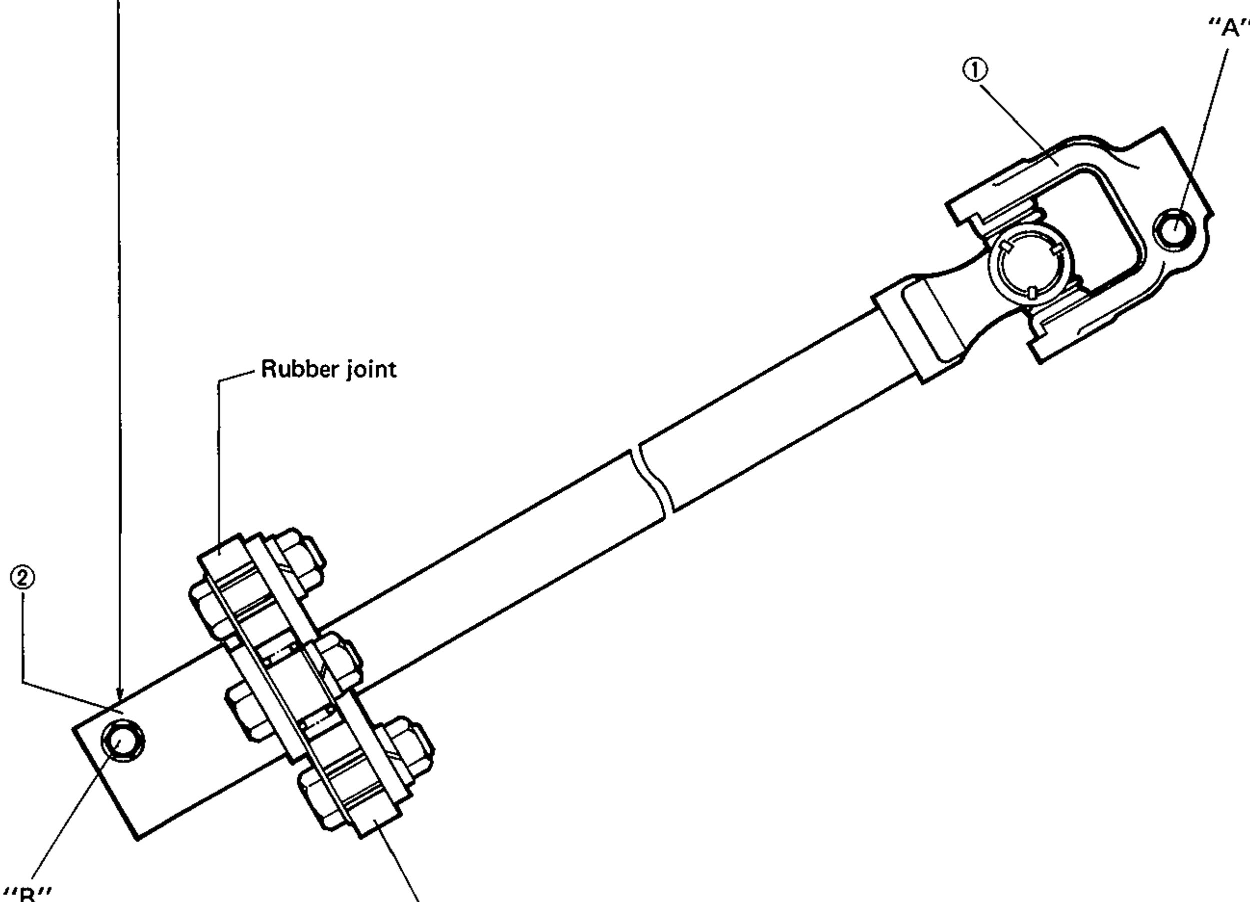


Fig. 18-29

Steering lower shaft (For all markets)

Steering rubber joint flange
Install the steering rubber joint flange ② onto the steering lower shaft ① at the angle as illustrated below (bolt "A" in ① and bolt "B" in ② must be directed to face the same direction).



Steering rubber joint
Make sure not to leave out the steering horn earth spring and steering rubber joint plat when installing the rubber joint.

Fig. 18-29-1

Tie rod turnbuckles

In case that the tie rod was once removed, make sure to check the wheel alignment (toe-in) as described in section 18-7 (p. 18-15) after its reinstallations.

Steering handwheel

Two requirements must be met, among others, in installing and setting the steering wheel: 1) check to be sure that the hand-wheel play meets the specification, and 2) set it in such a way that, with the front wheels pointing straight-ahead, its two spokes are horizontal, as shown in Fig. 18-30.

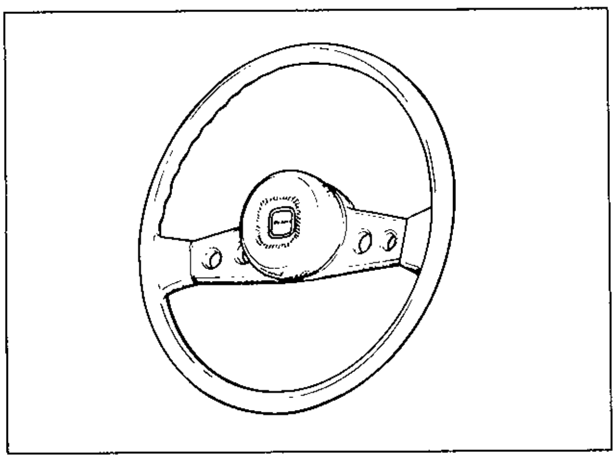


Fig. 18-30

18–7. Wheel Alignment

Alignment service data

Toe-in	2 – 6 mm (0.079 – 0.236 in.)
Camber	1 degree (1°)
Trail	14.5 mm (0.57 in.)
Kingpin inclination	9 degree (9°)
Caster	2 degree 30 minutes (2° 30')

Max. difference between right and left caster angles: 1°.

Adjustment

The only item of adjustment is toe-in. Camber and caster are given and fixed. Before checking and adjusting toe-in, let the car stand on flat level ground without any load placed aboard, and make sure that–.

(1) All tires are inflated to the following pressures:

Unloaded

Front wheel tires	1.4 kg/cm^2 (20 psi)
Rear wheel tires	1.4 kg/cm^2 (20 psi)

(2) The car is level. (Check by using a carpenter's level gauge.)

(3) The front wheels are set in straightahead driving position.

Using the toe-in gauge, read the toe-in and compare the reading against the specification (indicated above). To increase or reduce the toe-in, vary the length of each tie rod by means of its turnbuckle ①.

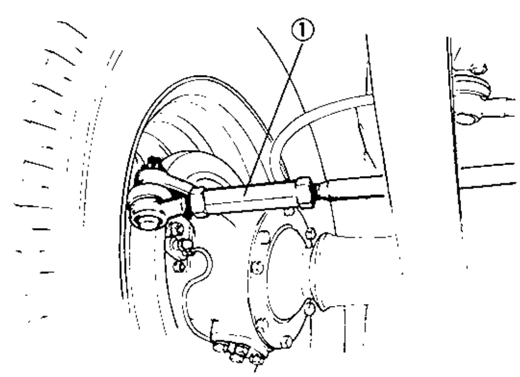


Fig. 18-31

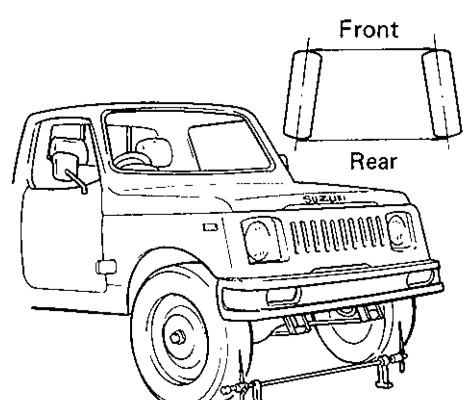


Fig. 18-32

18–8. Tightening Torque

BOLTS AND NUTS

Check the following bolts and nuts for tighteness and retighten them, as necessary:

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Front wheel bearing lock nut	60 – 90	6.0 – 9.0	43.5 – 65.0
Steering shaft nut	25 – 40	2.5 – 4.0	18.5 – 28.5
Steering shaft rubber joint bolt	15 – 25	1.5 – 2.5	11.0 – 18.0
Steering shaft joint bolt	20 – 30	2.0 – 3.0	14.5 – 21.5
Steering gear box nut	70 – 90	7.0 – 9.0	51.0 – 65.0
Drag rod castle nut	30 – 70	3.0 – 7.0	22.0 – 50.5
Tie rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.5
Tie rod end lock nut	50 – 80	5.0 – 8.0	36.5 – 57.5

19. BRAKES

19

19-1. Description

The hydraulic foot brake system of the these models has two leading shoes in the front wheel brakes, and one leading shoe and one trailing shoe in the rear wheel brakes. Hydraulic pressure is produced by a tandem master cylinder to actuate the wheel cylinders, two in each front wheel brake and one in each rear wheel brake, through two independent circuits, one for front brakes and one for rear brakes.

The parking brake system is mechanical; it consists of the brake drum mounted on a propeller shaft (at the transfer gear box) and the internally-expanding two-shoe brake assembly (whose backing plate is bolted to the gear box). Called the center brake, this brake is countrolled from the parking lever through a cable.

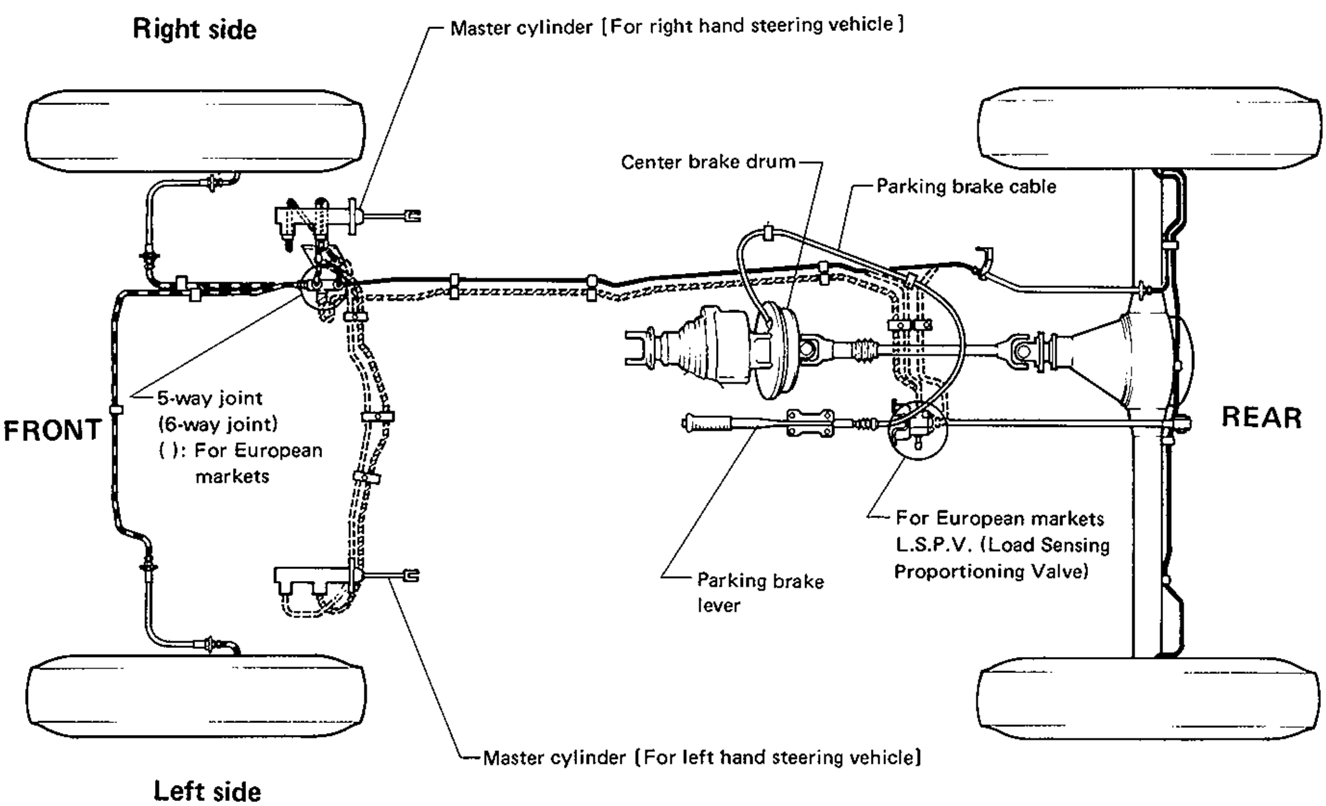


Fig. 19-1

FRONT BRAKE

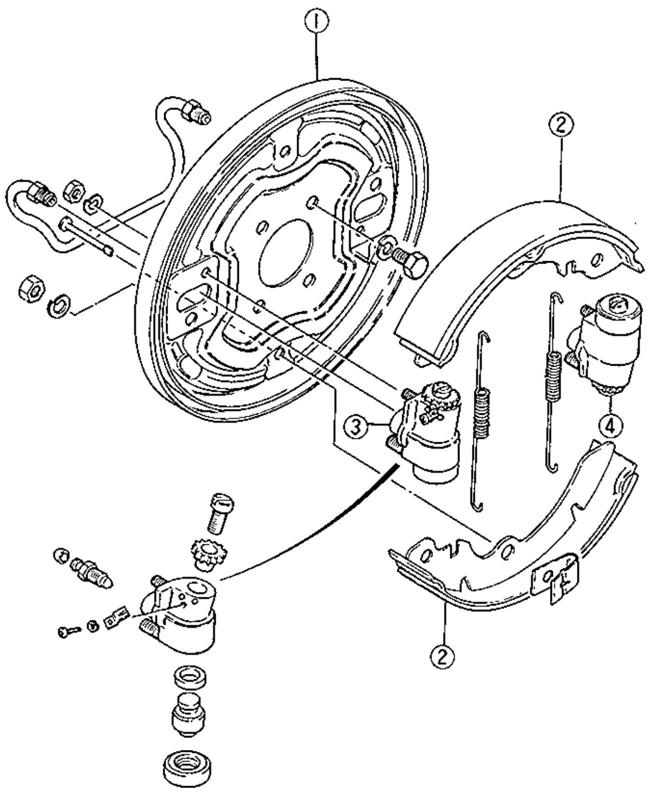


Fig. 19-1-1

1. Front brake backing plate
2. Brake shoe
3. Front wheel cylinder ass'y
4. Front wheel cylinder ass'y
5. Master cylinder ass'y

MASTER CYLINDER

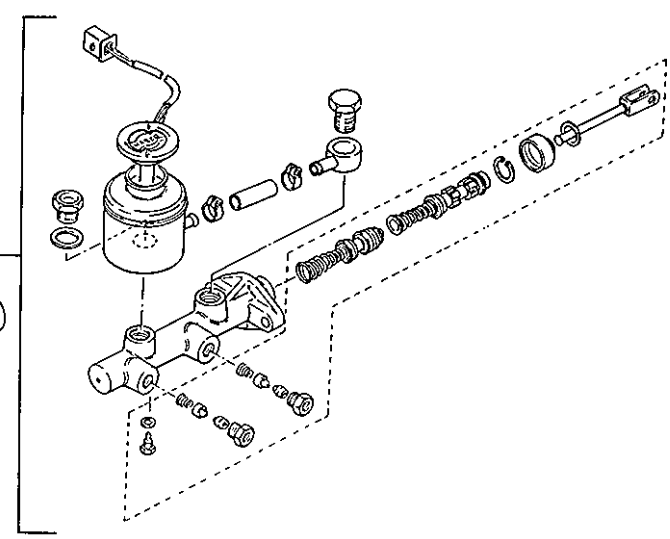


Fig. 19-1-2

REAR BRAKE

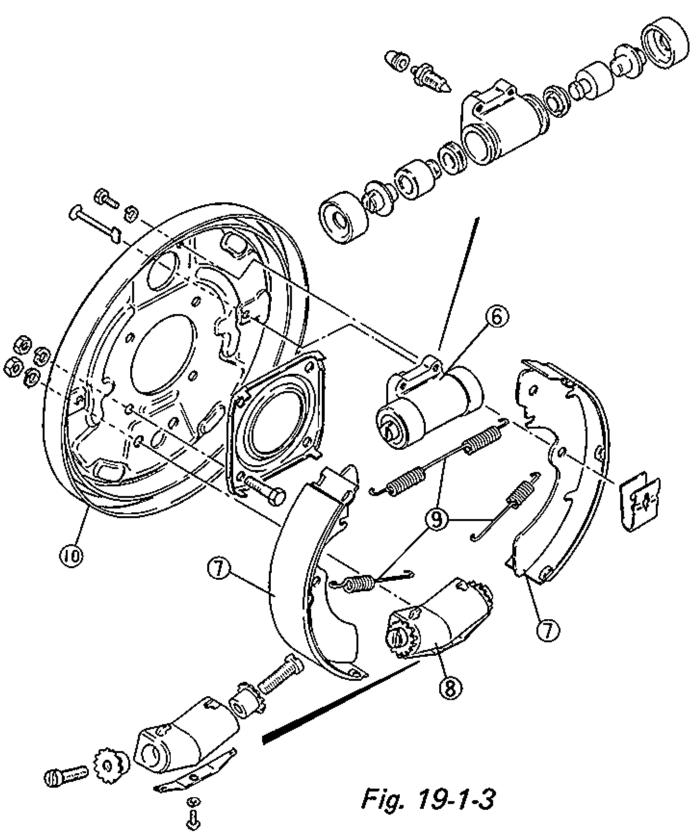
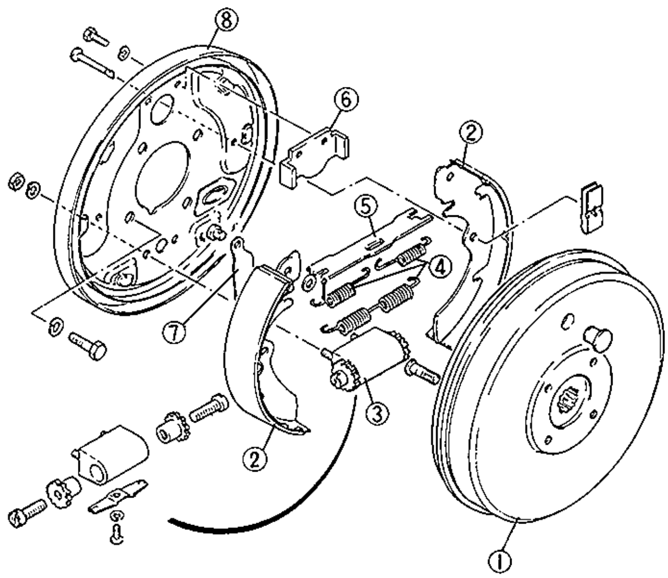


Fig. 19-1-3

6. Rear wheel cylinder ass'y
7. Brake shoe
8. Rear brake shoe anchor sub ass'y
9. Brake shoe return spring
10. Rear brake backing plate

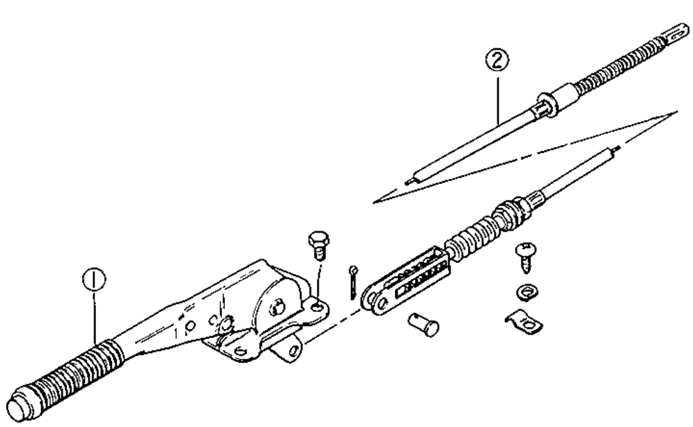
CENTER BRAKE



1. Center brake drum
2. Center brake shoe
3. Brake shoe anchor sub ass'y
4. Brake shoe return spring
5. Brake shoe strut
6. Brake shoe hole cover
7. Brake shoe lever
8. Brake backing plate

Fig. 19-1-4

CENTER (PARKING) BRAKE LEVER



1. Center (parking) brake lever
2. Center (parking) brake cable

Fig. 19-1-5

19-2. Tandem Master Cylinder

The tandem master cylinder is similar in construction to an ordinary master cylinder, the principal difdifereneces being that it has two pistons and four piston cups and that hydraulic pressure is developed in two chambers, one for front brakes and the other for rear brakes.
Obviously the two-circuit foot brake system employed in the these models assures greater safety; failure of one circuit (failure of front brakes or rear brakes) due to such as an oil line rupture does not incapacitate the machine.

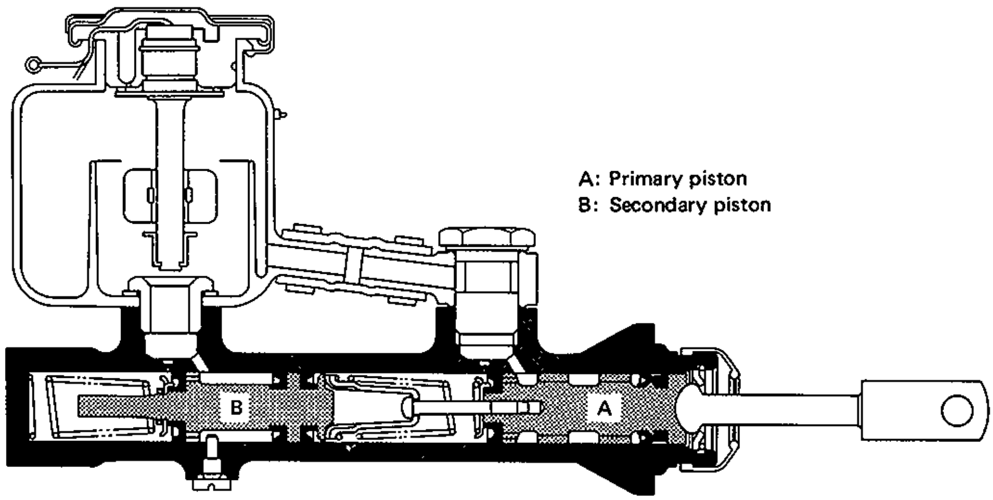


Fig. 19-2

19-3. Tandem Master Cylinder Operation

Normal operation
Depressing the brake pedal forces primary piston "A" toward the left (in Fig. 19-3) to pressurize the oil immediately ahead for front brakes. By this pressure and by the force of return spring, secondary piston "B" moves similarly to pressurize the oil for rear brakes.

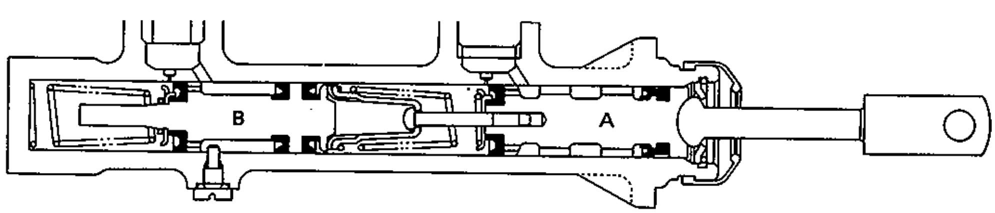


Fig. 19-3

One-circuit operation (front-brake circuit failure)
Depressing the brake pedal causes primary piston "A" to move as above but, because the front-brake circuit cannot hold pressure, the oil immediately ahead of this piston does not get pressurized. As piston "A" keeps moving, compressing the spring, it begins to push piston "B" when the spring has been compressed fully. From this point on, piston "B" moves to pressurize the oil ahead and thus actuate the rear brakes.

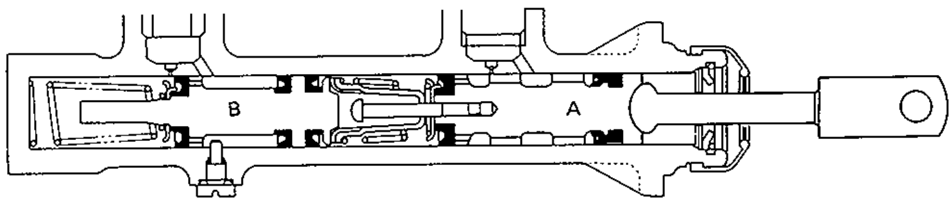


Fig. 19-4

One-circuit operation (rear-brake circuit failure)
In this case, the leftward movement of piston "A" has but little effect in pressurizing its oil (for front brakes) at first, because the initial rise in oil pressure causes piston "B" to promptly yield and move toward the left. Very soon the forward end of piston "B" comes to and bears against the head of the cylinder. From this point on, the leftward movement of piston "A" becomes effective to pressurize the oil ahead of it for the front brakes. Fig. 19-5 shows secondary piston "B" at halt.

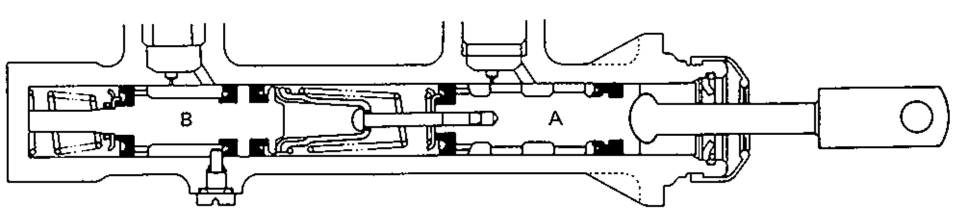


Fig. 19-5

19-4. Front Brake Construction

There are two wheel cylinders. Each cylinder has one piston, by which it pushes the leading end of its shoe. In other words, the two shoes begin to rub the drum in a "biting" manner the moment the hydraulic pressure applies to the wheel cylinders, and thus develop greater braking force more quickly as the pressure to the cylinder rises (when the machine is running forward).

The shoes are mounted on the backing plate in a floating manner, each being urged by the return spring in the contracting direction and pivoted at its trailing end.

Each wheel cylinder is complete with an adjuster consisting of a notched wheel and a bolt. Turning this wheel advances or retracts the bolt (on which the trailing end of the shoe pivots) to reduce or increase the shoe-to-drum clearance (brake adjustment). The two cylinders are bolted to the backing plate; and their adjusting wheels are accessible through holes provided in the brake drum.

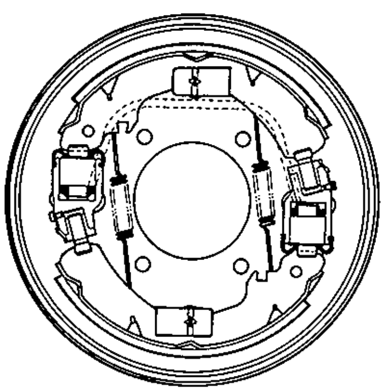


Fig. 19-6

19-5. Rear Brake construction

The rear brake has a double-piston type wheel cylinder interposed between the leading end of one shoe and the trailing end of the other. The other ends of these shoes pivot on the adjuster sleeve complete with an adjusting screw.

When hydraulic pressure applies to the wheel cylinder, which is bolted to the backing plate, the two pushrods of this cylinder move out to spread the shoes apart against the force of two return springs.

Brake adjustment is to be effected by turning the notched screw of the adjuster sleeve. This screw is accessible through a hole provided in the brake drum.

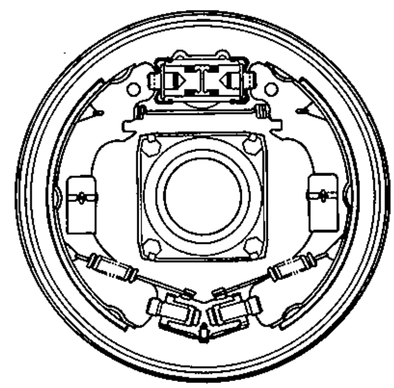


Fig. 19-7

19-6. Center Brake Construction

The major parts of this brake are the adjusting sleeve, brake shoe lever, shoe strut, shoes and return springs, all mounted on the backing plate. The drum is splined to the transfer output rear shaft. The strut, corresponding to the wheel cylinder in a wheel brake, is mechanically turned to expand the two shoes apart and thereby to develop braking force by the rubbing contact of their shoe linings against the drum.

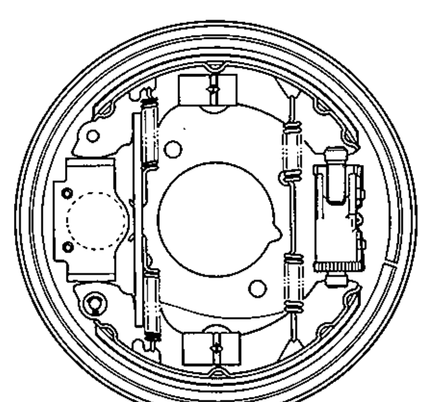


Fig. 19-8

19-7. Wheel Cylinder Construction

The double-piston cylinder used in the rear brake has two pistons, each backed by a cup and fronted by a boot. a pushrod or actuating pin bears against the piston by its inner end and is fitted to the shoe web by its outer end.

The single piston cylinder, two of which are used in the front brake, is similar to the double-piston one, except that it has one piston, with its other end being complete with the adjuster.

A bleeder screw is provided in the cylinder proper. This screw is a plug; it is to be loosened only when air trapped in the circuit has to be vented out.

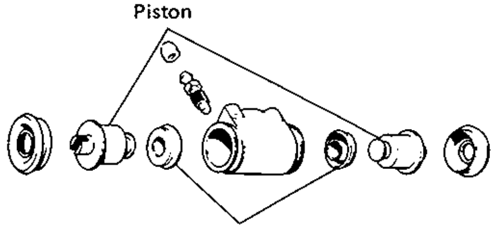


Fig. 19-9

19-8. Maintendance services

Master cylinder

Complaints on the master cylinder are in most cases traceable to excessively worn piston cups or improperly seating check valves; experience tells us that the primary cause of these malconditions is the impurities, particularly abrasive or gritty matters, that have entered the brake fluid reservoir. Check the master cylinder for the possibility of these malconditions. The internals of the master cylinder should be replaced at regular intervals, and they should be handled as a kit. The recommended interval is two years.

Master cylinder internals replacement interval	2 (two) years

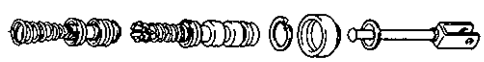


Fig. 19-10

The overall length of the primary piston sub-assembly is specified to be 93.1 mm (3.665 in.). This specification assumes great importance in the function of the master cylinder. When rebuilding this sub-assembly after its disassembly for overhaul or for replacement of piston cups, be sure to set the overall length to the specification value by means of the forming screw.

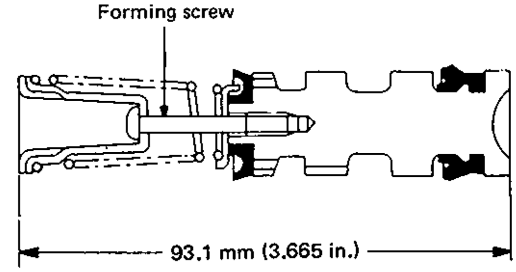


Fig. 19-11

Brake drum

Inspect the drum for cleanliness. Remove oil stains, if any. Check the wear of its braking surface by measuring its inside diameter, and determine its "out-of-round" from ID readings. The braking surface with groovy wear can be repaired by turning in a lathe if machining stock is available; a minor "out-of-round" can be corrected also by turning. A drum cracked or distorted or worn beyond repair must be replaced.

	Standard	Service limit
Brake drum inside diameter	220 mm (8.66 in.)	222 mm (8.74 in.)
Brake drum "out-of-round"	0	0.5 mm (0.02 in.)

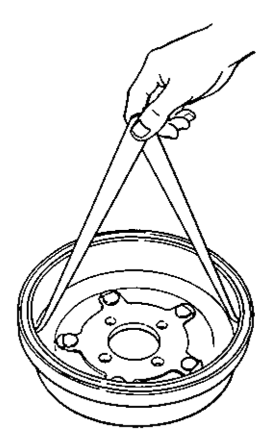


Fig. 19-12

Brake shoes

Glazed surfaces, if any, of brake shoes can and must be reconditioned by grinding with sand-paper. Oil stains too can be removed similarly. Where the lining is worn beyond the service limit, the shoe must be replaced.

	Standard	Service limit
Brake lining thickness (lining + shoe rim)	7 mm (0.28 in.)	3 mm (0.12 in.)

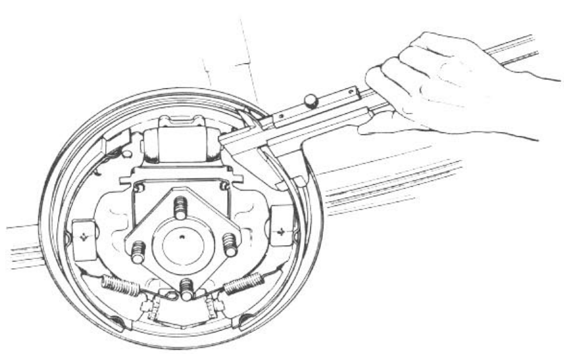


Fig. 19-13

Master cylinder and wheel cylinders

Inspect piston cups for wear and for evidence of deterioration, and replace them if found in defective condition, even when the end of the regular replacement interval is ahead.

The internals of each cylinder are to be replaced as a kit at regular intervals.

Piston cups and boots are of rubber; they must not be washed with gasoline or similar washing fluid. use the brake fluid to wash them, or they may distort or swell.

Cylinder internals replacement interval	2 (two) years

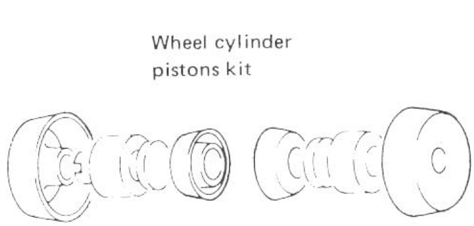


Fig. 19-14

Brake pipes

The brake pipes are double-layer wound type, made by rolling steel strip into a two-layer wall pipe, with its surfaces treated for rust prevention. After driving the machine along in sea water at the beach or in a shore area full of salt sprays, it is a good practice to wash the brake pipes with soft water.

Inspect the brake pipes in regard to the following items
(1) Cut marks or dents
(2) Leakage of brake fluid
(3) Signs of rubbing at the clamps and clips
(4) Rusting or corrosion

Air purging

Whenever any component or part of the foot brake system has been replaced, reconnected or otherwise worked on to expose the brake-fluid side of the circuit to the atmosphere, some air will get into the circuit; and the presence of such air will result in a "spongy" brake pedal. In such a case, or whenever the presence of air in the circuit is suspected, carry out an "air purging" operation at each wheel cylinder, as follows:

(1) Tie a transparent vinyl tube ① into the bleeder plug of the wheel cylinder (in order to catch the brake fluid).
(2) Pump the brake pedal several times and depress the pedal all the way.
(3) Loosen the bleeder plug by turning it a half rotation. The fluid with air bubbles will come out. Tighten up the plug when air bubbles stop coming out.

This operation requires two persons, one at the brake pedal and one at the wheel cylinder.

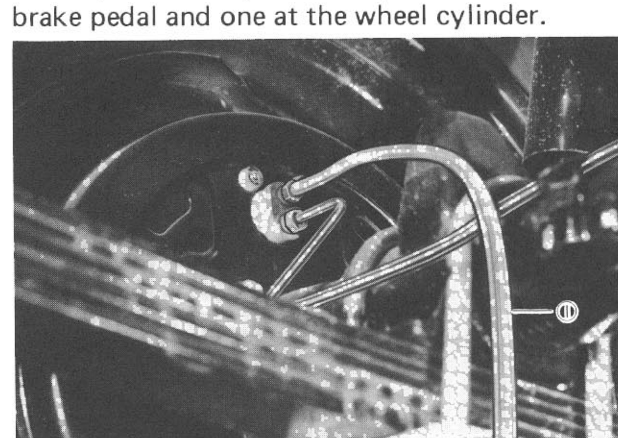


Fig. 19-15

Brake fluid

The brake system uses a glycol type brake fluid. When purchasing the replacement fluid, be sure to specify the glycol type meeting the following specifications:

Brake Fluid	Specifications
	DOT 3, DOT 4, SAE J1703

Some commercially available brake fluids are of silicone or petroleum base; do not use any of these fluid. Remember, any brake fluid which is a mixture of two or more brands is likely to effect some of the brake system components adversely, resulting in faulty braking.

The brake fluid in service is subject to gradual deterioration because the moisture content of air finds its way slowly into the brake fluid. For this reason, the brake fluid should be regarded as an expendable item and be replaced at regular intervals.

Brake fluid change interval	2 (two) years

Brake shoe clearance adjustment

The hole for gaining access to the adjusting wheel or screw is provided in the brake drum. Through this hole, insert a screwdriver to turn the adjusting wheel or screw.

Turn the wheel or screw to expand the shoe all the way, locking hard the brake drum, and then turn it back 3 to 6 notches to introduce a drum-to-shoe clearance. Leave the adjusting wheel or screw right there.

Brake shoe clearance adjustment	Back away 3 to 6 notches

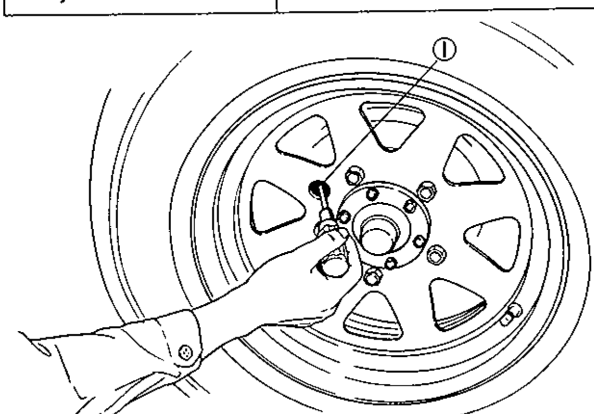


Fig. 19-16 ① Adjusting hole

Brake pedal

Confirm that clearance ② between the wall and the pedal arm is more than 50 mm (1.97 in) when the pedal is depressed by a load of approx. 30 kg (66 lb). If the clearance is less than 50 mm (1.97 in), adjust the brake shoe clearance to obtain the specified value.

> CAUTION:
> - If the specified clearance cannot be obtained, or the feel is spongy when the pedal is depressed, check the shoes for excessive wear and the brake system for air entered.
> - After reassembling the brake oil line, bleed air from the line.

> NOTE:
> Inspect pedal clearance daily, as well as at periodically scheduled inspection.

Pedal play	2 ~ 7 mm (0.08 ~ 0.28 in.)	
Pedal-to-wall clearance ② (when pedal is depressed at 30 kg (66 lb))	50 mm (1.97 in.)	minimum

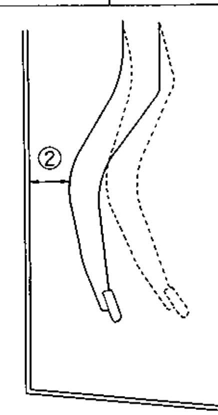


Fig. 19-17

Parking brake lever

Pull up the parking brake lever all the way with one hand to apply brake fully, and see how many notches of the ratchet the lever has traversed. If the number of traversed notches is more than 6 (six), adjustment must be made at the center brake to reduce the shoe-to-drum clearance.

Through the hole provided in the brake drum, insert a screwdriver and back away the adjusting screw 6 to 10 notches from its zero-clearance position, as in the case of the wheel brake.

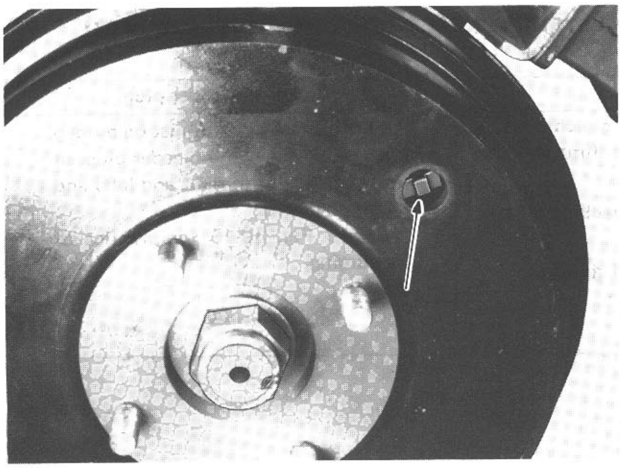


Fig. 19-18

Parking brake stroke③	6 notches maximum
Brake shoe clearance adjustment	Back away 6 to 10 notches

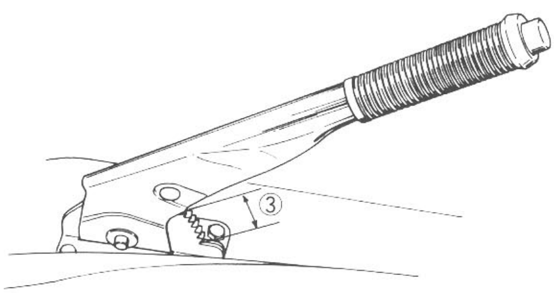


Fig. 19-18-1

Parking brake cable

Inspect the brake cable for damage, and check for smoothness of its movement. Oil the cable as necessary. A defective cable must be replaced. Advise the user to inspect and service the cable in this manner at regular intervals.

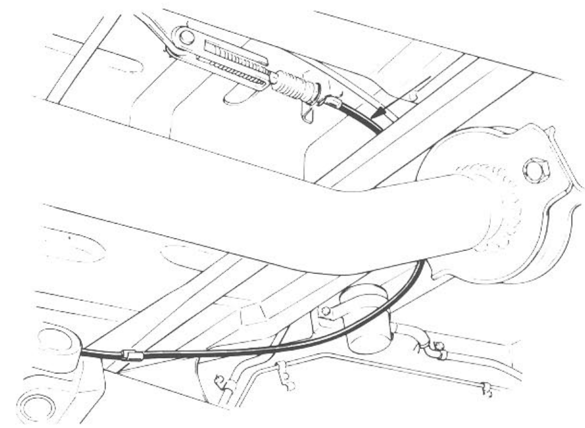


Fig. 19-19

Brake hoses and pipes

These are critical safety parts and demand greater attention. Be always sure that the hoses and pipes are in good condition, free of any evidence of crack or breadage. A damaged hose or pipe or a rusted or leaking one must be replaced.

> CAUTION:
> After replacing any of the brake pipes or hoses, be sure to carry out an air bleeding operation. You are duty-bound to do this before releasing the serviced machine to the user.

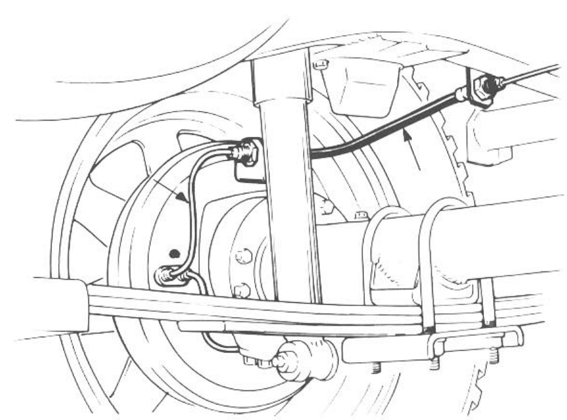
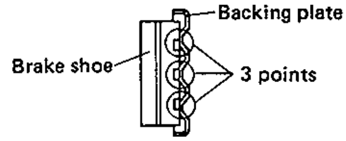


Fig. 19-20

19-9. Important Steps in Installation (applicable to general markets except European market)

Brake drum	Brake shoe	Brake air bleeder plug
Before installing the brake drum, check its inner surface which slides with the brake shoe to ensure that it is free from any foreign matters such as oil stain and rust.	Install the brake shoe in close contact with the backing plate at three positions as shown below. 	Air in the brake circuit must be purged out by loosening the bleeder plugs at front brakes (both right and left) and rear brake (left). Refer to Fig. 19-15 for practice of air purging.

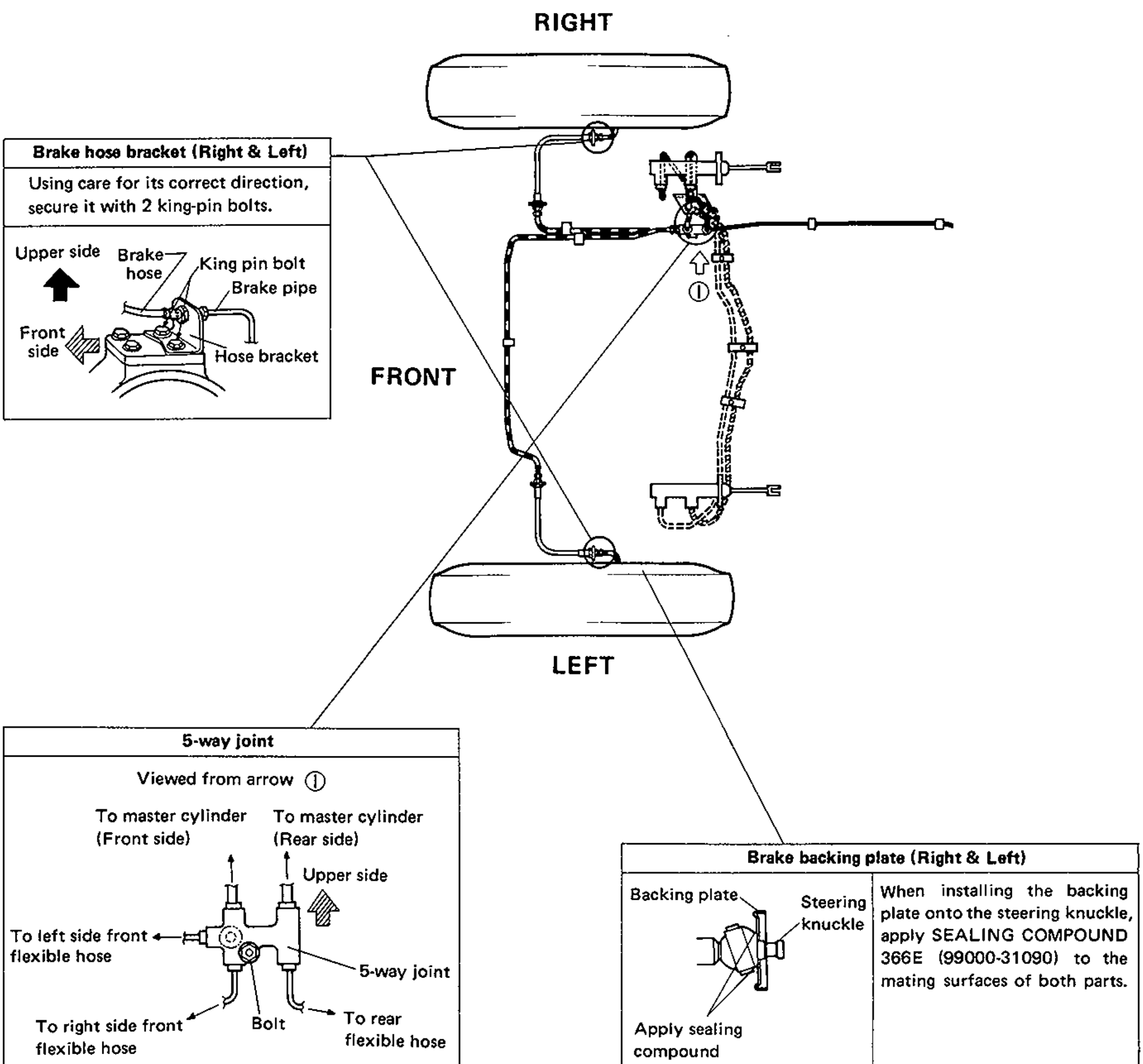
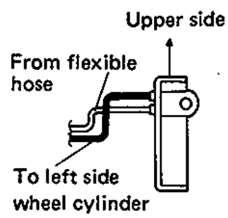


Fig. 19-21

Brake flexible hose

- Make sure that the flexible hose is not twisted when it is installed or connected with the pipe.
- The front hose and rear hose should be connected in advance to the knuckle side and housing side respectively.
- The front hose mustn't be twisted when the steering wheel is in straightahead position.

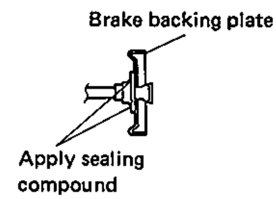
Brake pipes (Right side)

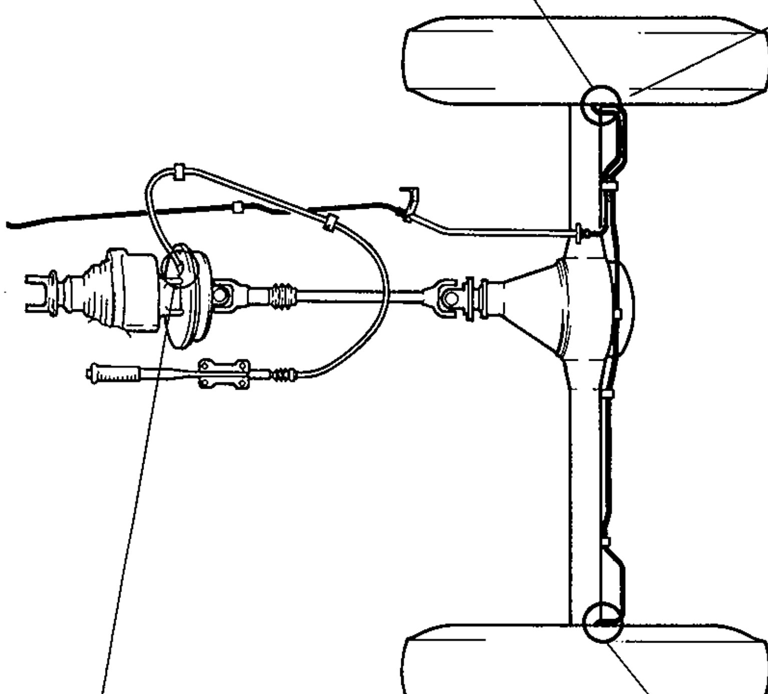


Install the brake pipe on the wheel cylinder properly using care for its installing position.

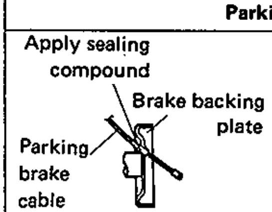
Brake backing plate (Right & Left)

When installing the backing plate onto the axle housing, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.



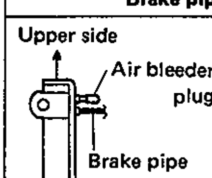


Parking brake cable



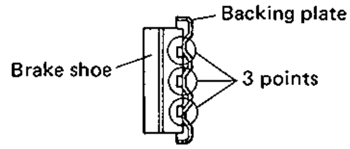
When installing the cable, apply SEALING COMPOUND 366E (99000-31090) to the illustrated position of the cable.

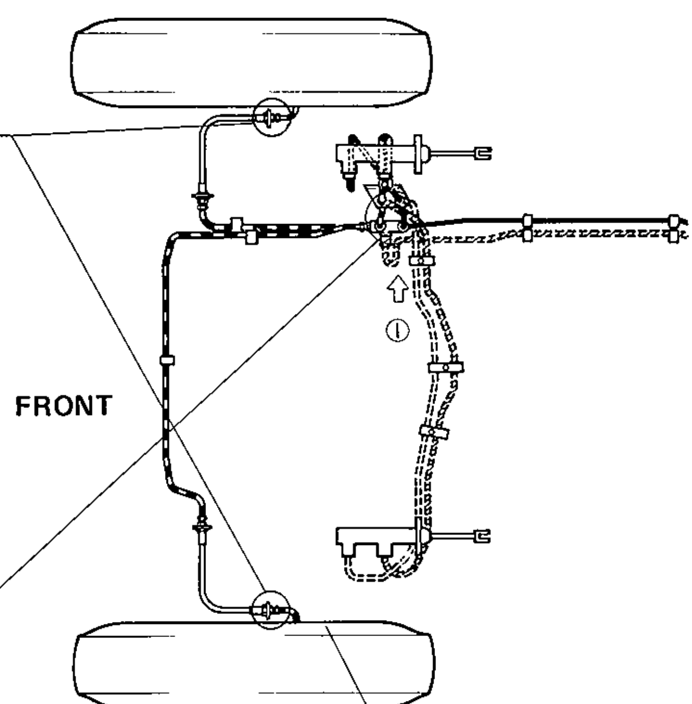
Brake pipe (Left side)



Install the brake pipe on the wheel cylinder properly using care for its installing position.

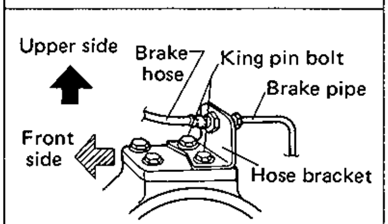
(FOR EUROPEAN MARKETS)

Brake drum	Brake shoe	Brake air bleeder plug
Before installing the brake drum, check its inner surface which slides with the brake shoe to ensure that it is free from any foreign matters such as oil stain and rust.	Install the brake shoe in close contact with the backing plate at three points as shown below. 	Air in the brake circuit must be purged out by loosening the bleeder plugs at front brakes (both right and left) and rear brake (left). Refer to Fig. 19-15 for practice of air purging. In case of the vehicle with L.S.P.V., another air bleeder plug is provided on L.S.P.V. itself in addition to the above three.



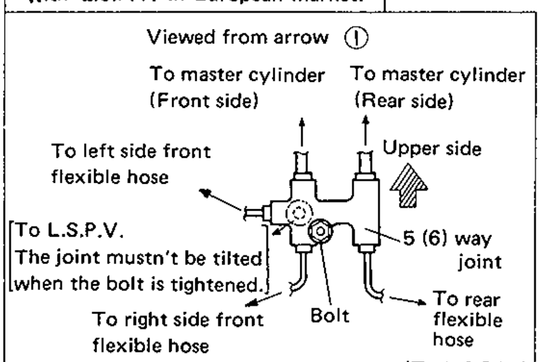
Brake hose bracket (Right & Left)

Using care for its correct direction, secure it with 2 king-pin bolts.

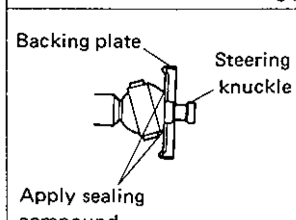


5-way joint (or 6-way joint)

NOTE:
Description or instruction in the brackets [ ] apply to the vehicle with L.S.P.V. in European market.



Brake backing plate (Right & Left)



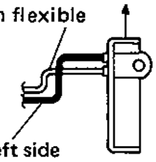
When installing the backing plate onto the steering knuckle, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.

Fig. 19-22

Brake flexible hose

- Make sure that the flexible hose is not twisted when it is installed or connected with the pipe.
- The front hose and rear hose should be connected in advance to the knuckle side and housing side respectively.
- The front hose mustn't be twisted when the steering wheel is in straightahead position.

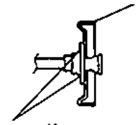
Brake pipes (Right side)

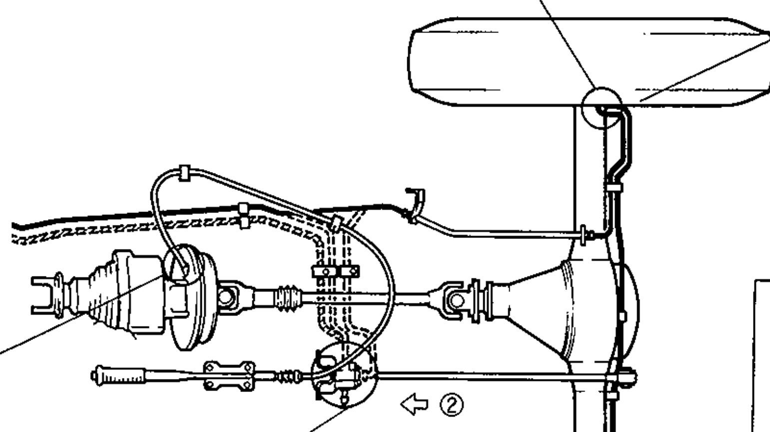


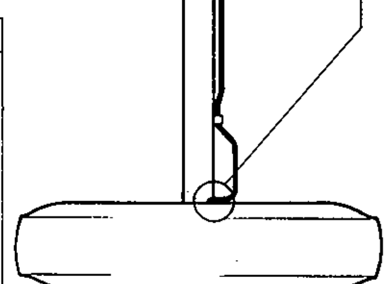
Install the brake pipe on the wheel cylinder properly using care for its installing position.

Brake backing plate (Right & Left)

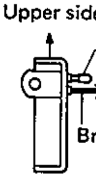
When installing the backing plate onto the axle housing, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.







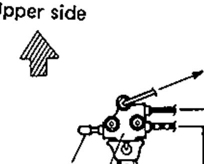
Brake pipe (Left side)



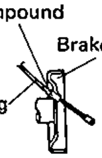
Install the brake pipe on the wheel cylinder properly using care for its installing position.

(Applicable to the vehicle with L.S.P.V.)

Connect pipes to L.S.P.V. as illustrated below.



Parking brake cable



When installing the cable, apply SEALING COMPOUND 366E (99000-31090) to the illustrated position of the cable.

Instructions on this page apply to the vehicle with L.S.P.V. in European market.

L.S.P.V. adjustment

After reinstallation of L.S.P.V. once removed, carry out the following adjustment, 1 through 6 in that order, in non-loaded condition.

1. Check to ensure that bracket "A" is installed securely on the body side and bracket "B" on the rear axle side.
2. Connect light ① or an ohmmeter between bracket "A" and spring "C".
3. By moving L.S.P.V. up and down, find a position where light ① stays off. Again move L.S.P.V. gradually from that position. When light ① turns on or the ohmmeter indicates conduction, stop L.S.P.V. and secure it there with 2 nuts "D".
4. Push down "P" point in the below figure with a finger lightly (0.5~0.8kg, 1.10~1.76 lb) and check if light ① turns off. Then take off the finger and check if it is caused to turn on again. With an ohmmeter, finger off should caûse conduction.
   If light ① stays on or the ohmmeter indicates conduction even with "P" point pushed down, the shackle length shown as "S" in the following figure should be adjusted with nut "E".
5. After the above adjustment, tighten nut "F" while holding nut "E" with a offset wrench to prevent if from turning.
6. After tightening the nut "F" securely, carry out the same check as in above 4. And if the result is unsatisfactory, adjust the shackle length "S" again.

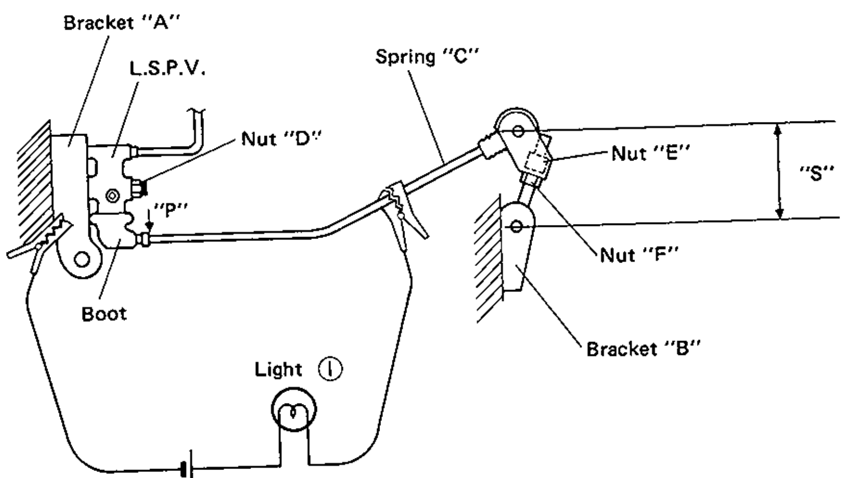


Fig. 19-23

Tightening torque	N.m	kg-m	lb-ft
L.S.P.V. Nuts "D"	10~16	1.0~1.6	7.5~11.5
Nut "F"	19~31	1.9~3.1	14.0~22.0
Air bleeder plug	9~13	0.9~1.3	6.5~ 9.0

19-10. Tightening Torque

BOLTS & NUTS

Check the following bolts and nuts for tighteness and retighten them, as necessary:

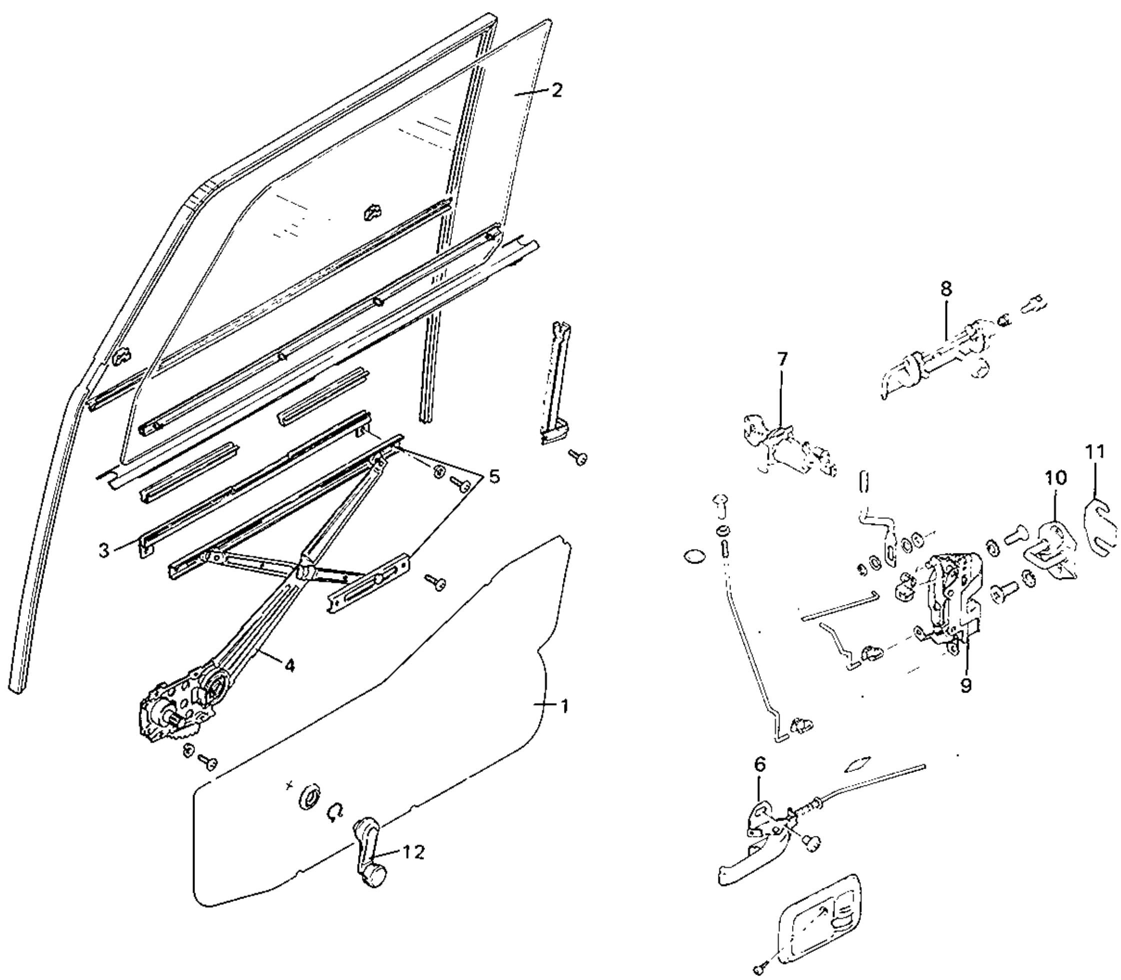
Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
(1) Front brake backing plate bolt	40 ~ 60	4.0 ~ 6.0	29.0 ~ 43.0
(2) Rear brake backing plate nut	18 ~ 28	1.8 ~ 2.8	13.5 ~ 20.0
(3) Master cylinder nut	13 ~ 23	1.3 ~ 2.3	9.5 ~ 16.5
(4) Brake hose nut	20 ~ 40	2.0 ~ 4.0	14.5 ~ 28.5
(5) 5-way or 6-way joint bolt	6 ~ 10	0.6 ~ 1.0	4.5 ~ 7.0
(6) Center brake backing plate bolt	18 ~ 28	1.8 ~ 2.8	13.5 ~ 20.0
(7) L.S.P.V. bracket bolt	18 ~ 28	1.8 ~ 2.8	13.5 ~ 20.0
(8) L.S.P.V. shackle bolt	18 ~ 28	1.8 ~ 2.8	13.5 ~ 20.0
(9) Brake pedal bolt & nut	18 ~ 28	1.8 ~ 2.8	13.5 ~ 20.0
(10) Brake pipe flare nut	14 ~ 18	1.4 ~ 1.8	10.5 ~ 13.0

20. DOOR

20

20–1. Description

There are two types of the door for this model: full metal type and half metal type. The full metal type door is provided with a door window glass which slides up and down (closes and opens) as the door window regulator handle is turned, while the half metal type door is not.



1. Door trim board	7. Door key cylinder
2. Door glass	8. Outside handle
3. Glass bottm chanel	9. Door lock ass'y
4. Regulator	10. Door lock striker
5. Regulator roller holder	11. Striker spacer
6. Remote control	12. Regulator handle

Fig. 20-1

20–2. Door Disassembly

The following procedure is applicable to the full metal type door.

1) Remove door-window regulator handle.

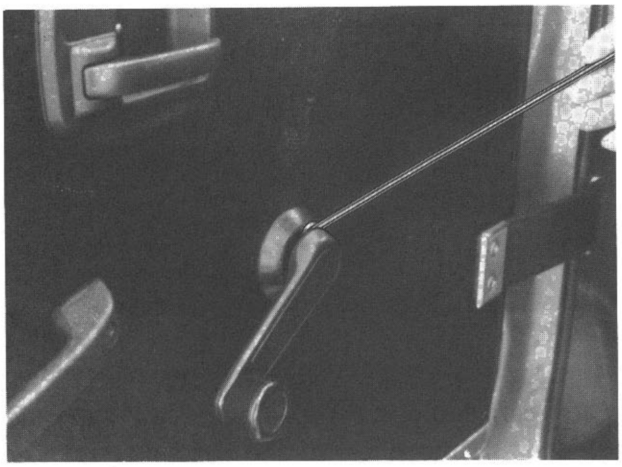


Fig. 20-2

2) Remove inside handle case.

Fig. 20-3

3) Remove inside pull handle.

Fig. 20-4

4) Loosen two screws securing the stopper band, and take off the band.

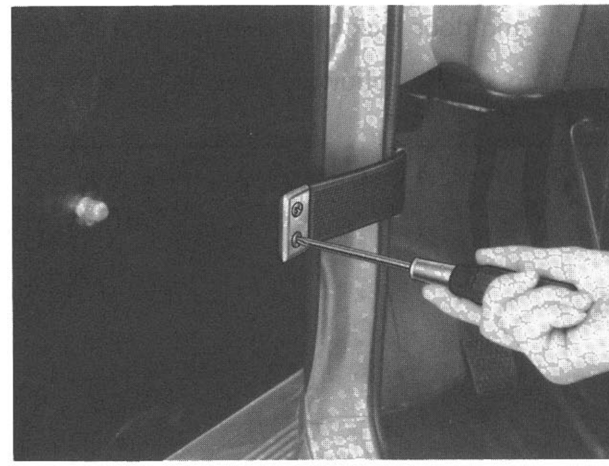


Fig. 20-5

5) Remove nine clips holding the door trim board to the door, and take the board off.

Fig. 20-6

6) Remove the door water proof film.

Fig. 20-7

With the foregoing steps completed, each of the door inside handle, door key cylinder, outside handle and door lock can be removed.

Move on to the following steps to take off the door window glass.

7) Remove the glass inside and outside scraper.

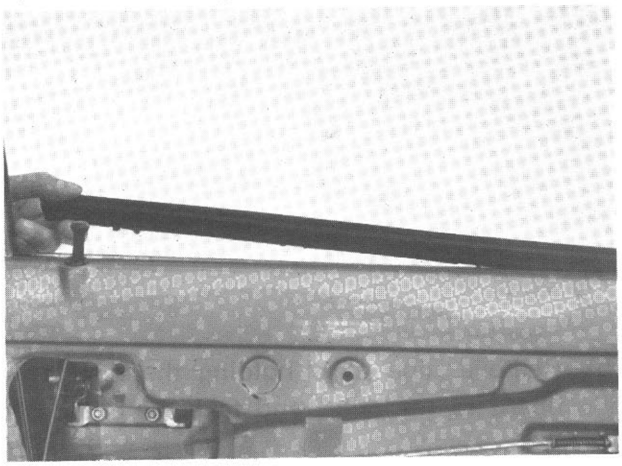


Fig. 20-8

8) Remove 2 screws securing the door window regulator roller holder (lower side).

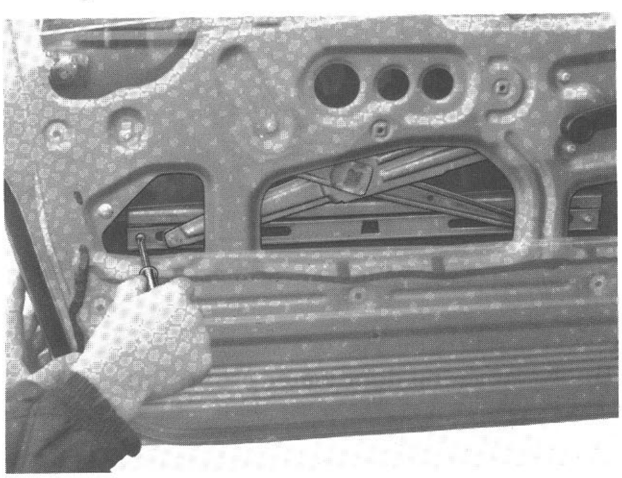


Fig. 20-9

9) Take out the glass.

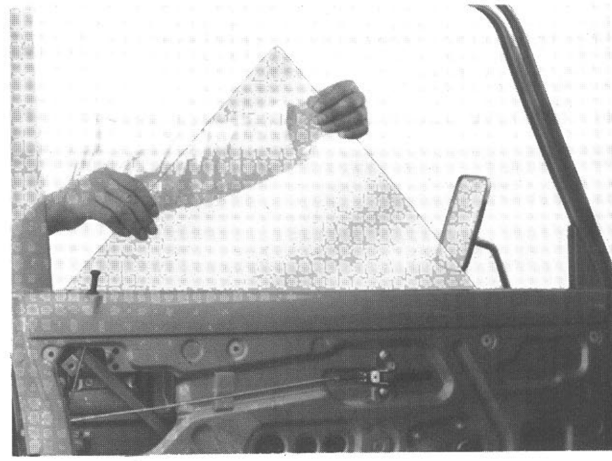


Fig. 20-10

After carrying out the previous steps 1) through 6) and 8), move on to the following steps to take off the door window regulator.

10) Remove 2 screws securing the door window regulator roller holder (upper side).

> **NOTE:**
> **Make sure to support the glass to keep it from falling while removing the screws.**

Fig. 20-11

11) Remove 4 screws securing the window regulator.

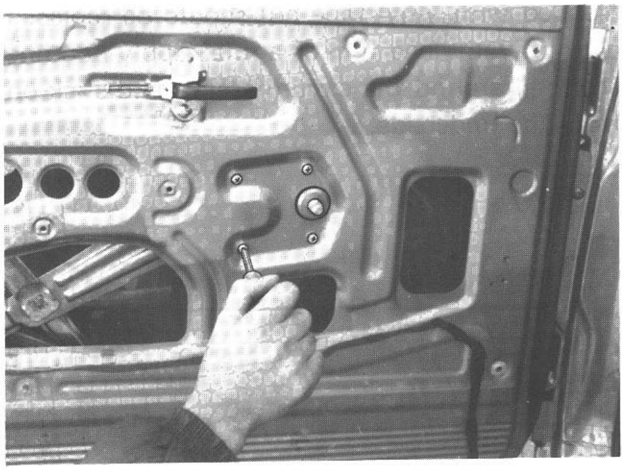


Fig. 20-12

12) Remove the window regulator.

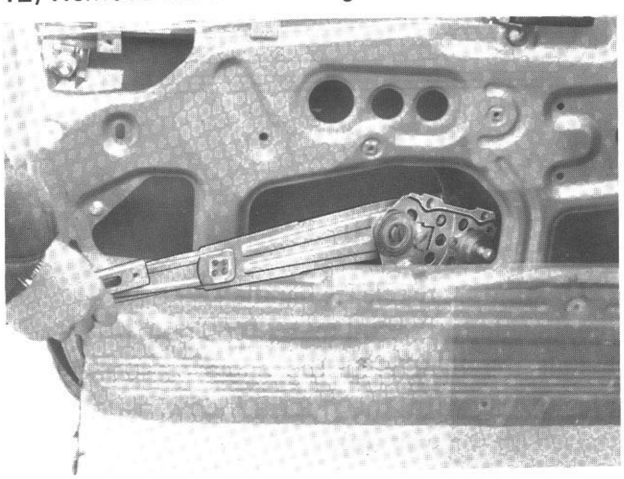


Fig. 20-13

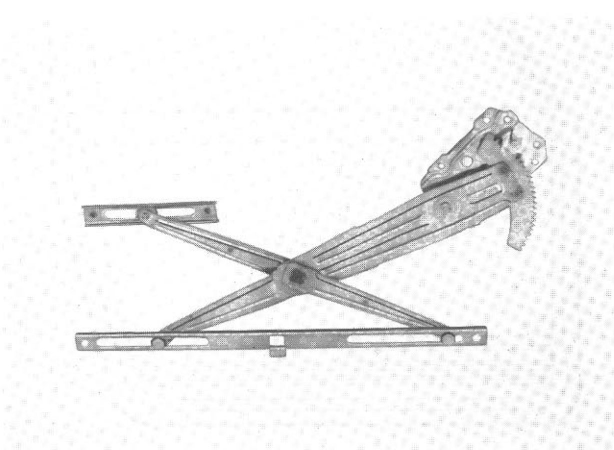


Fig. 20-14

20–3. Important Steps in Installation and Adjustments

[FRONT DOOR]

Door window glass
(applicable to the full metal type door)

When fitting the glass bottom channel on the door glass, adjust the distance between the glass end ① and channel end ② to that indicated below.

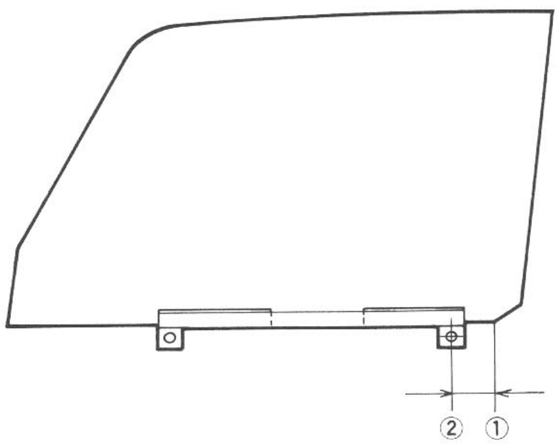


Fig. 20-15

When it is hard to raise and lower the door glass, the glass may be slanting towards the door sash. If this is the case, loosen the screws fastening the door regulator roller holder, move the holder up and down so that the glass and sash are brought in parallel.

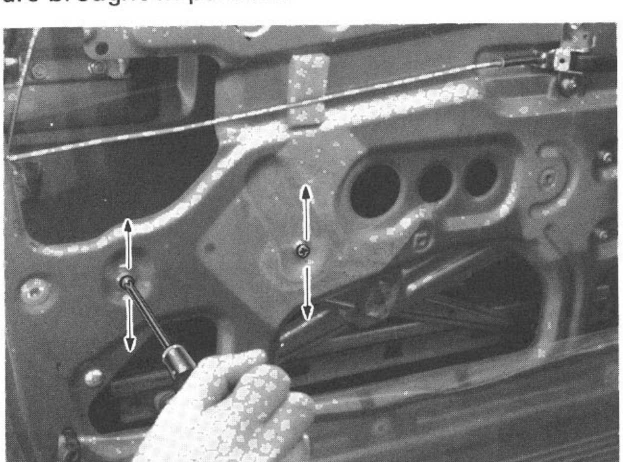


Fig. 20-15-1

Door water proof film

A proof film that is broken a little may be mended with vinyl tape but should be replaced with polyethylene film as a rule. Apply bonding agent all around the circumference and stick on from the underside.

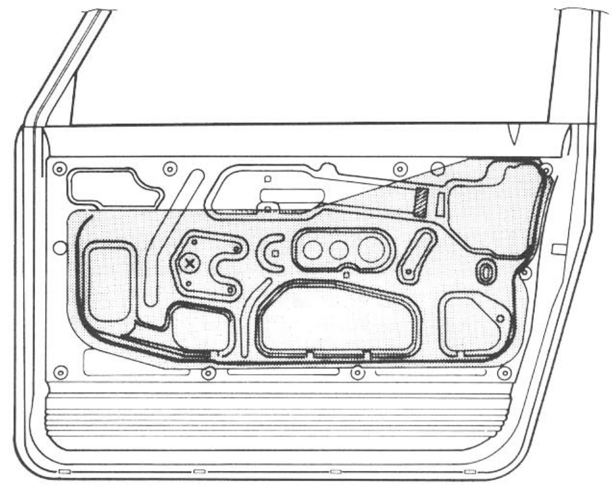


Fig. 20-16

Door window regulator handle
(applicable to the full metal type door)

Install the handle at the angle as specified in Fig. 20-17 with the door window glass closed (raised all the way up).

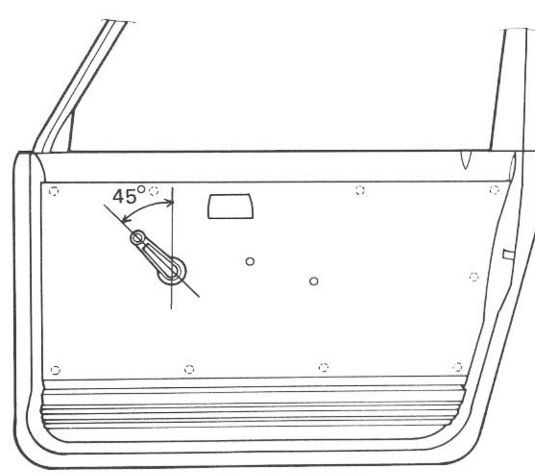


Fig. 20-17

Door outside open rod

When installing open rod ① on outside handle ② , adjust clearance "A" as in Fig. 20-18 to 0 – 2 mm (0 – 0.079 in) by turning adjusting joint ③ .

> **NOTE:**
> **Don't push down push plate ④ when installing the open rod.**

After installing the open rod, give the outside handle a trial and check if its play felt then is appropriate.

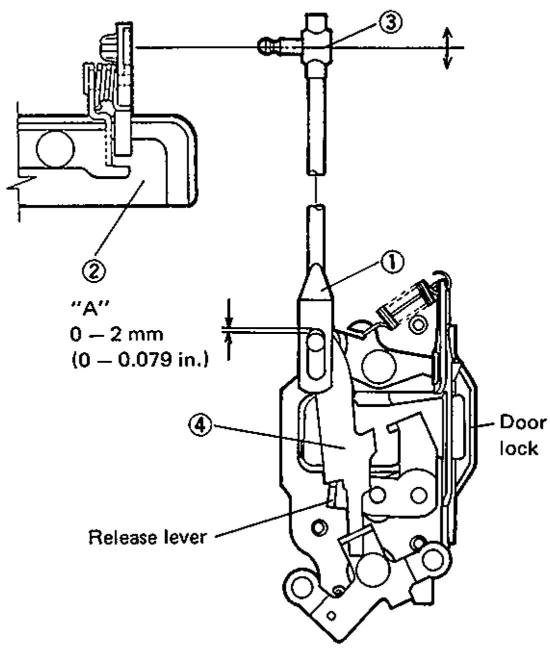


Fig. 20-18

Door lock inside handle

Fit the inside handle, adjusting the clearance between inside open lever ⑤ and outside open lever ⑥ of the door lock to 0 – 2 mm (0 – 0.079 in) by moving the inside handle remote control rod ⑦ in the arrow direction given in Fig. 20-19.

After installation, give it a trial and check if its play felt then is appropriate.

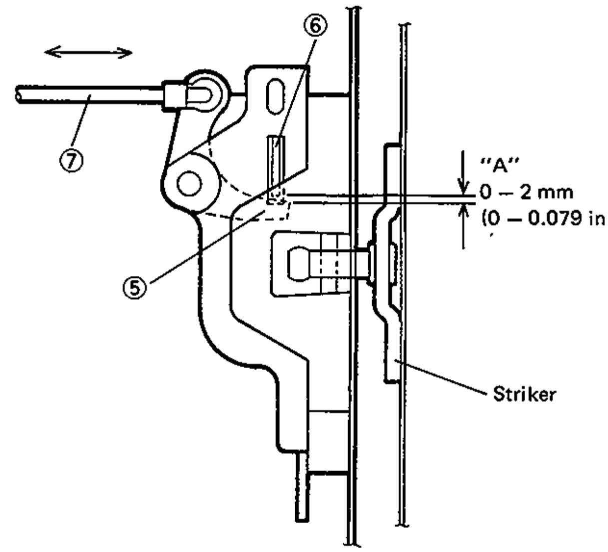


Fig. 20-19

Door lock rod pin

Fix the lock rod with rod pin securely as illustrated below.

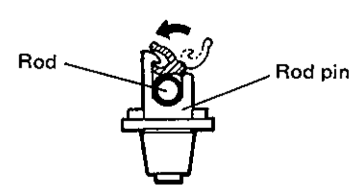


Fig. 20-20

Door lock striker

Increase or decrease striker spacers fitted in "A" position behind the striker to adjust dimensions to below values as shown in Fig. 20-21.

After adjustment, check the difference in level between the door and body and adjust when there is a difference by moving the door lock striker to right or left.

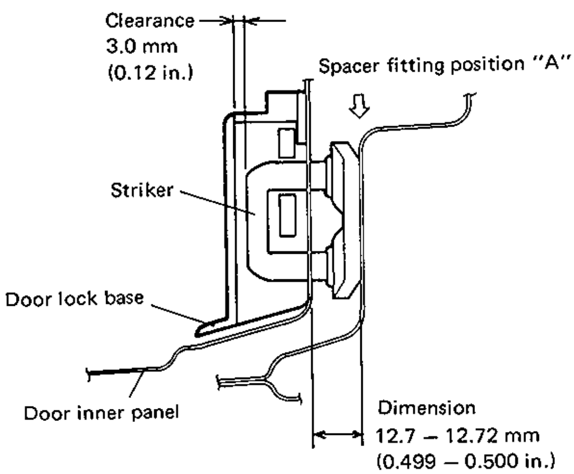


Fig. 20-21

Move the striker base up and down so that the clearance between the shaft of door lock striker ⑩ and door lock cam is 1.0 mm (0.04 in.) in the vertical direction.

> **CAUTION:**
> - **The striker should be placed vertically.**
> - **Do not adjust the door lock.**

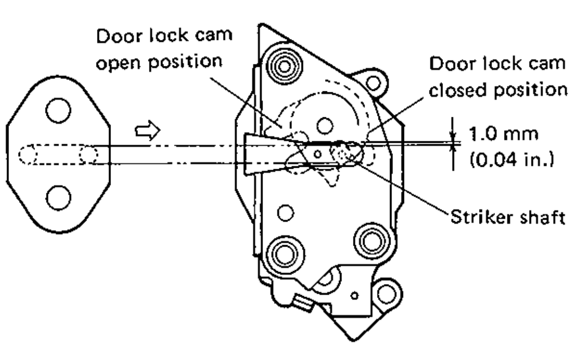


Fig. 20-22

[BACK DOOR (SJ410V)]

Door outside open rod

When installing open rod ② onto outside open handle ①, adjust clearances "A" to 0 – 2 mm (0 – 0.079 in) and "B" to 2 mm (0.079 in) as shown in Fig. 20-23 by turning adjusting joint ③ .

> **NOTE:**
> **Don't push down push plate ④ when installing the rod.**

After installing the open rod, give the outside handle a trial and check if its play felt then is appropriate.

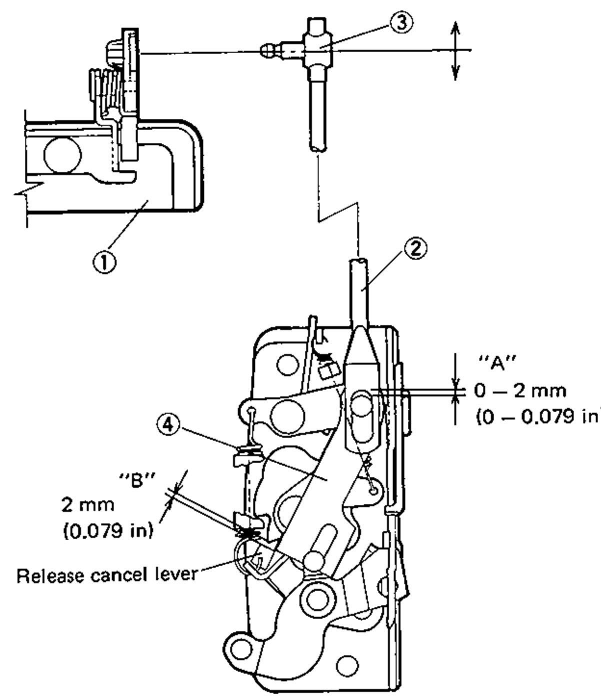


Fig. 20-23

Door lock striker

After reinstalling the door lock striker or door lock which was once removed, adjust dimension "C" in Fig. 20-24 to 1.0 mm (0.04 in) by moving the striker up and down.

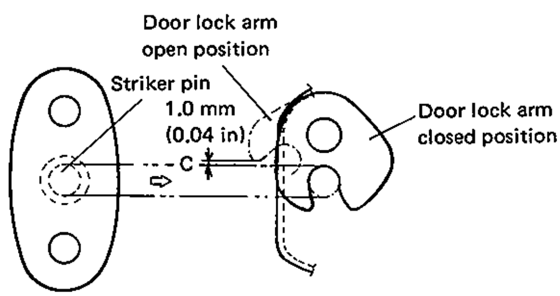


Fig. 20-24

To position the door lock striker correctly in the front and rear direction, adjust dimension "D" to 5.5 mm (0.22 in) as shown in Fig. 20-25 by increasing or decreasing spacers fitted in "E" position behind the striker.

After adjustment, check the difference in level between the door and body and adjust when there is a difference by moving the door lock striker to right or left.

CAUTION: **Do not adjust the door lock.**

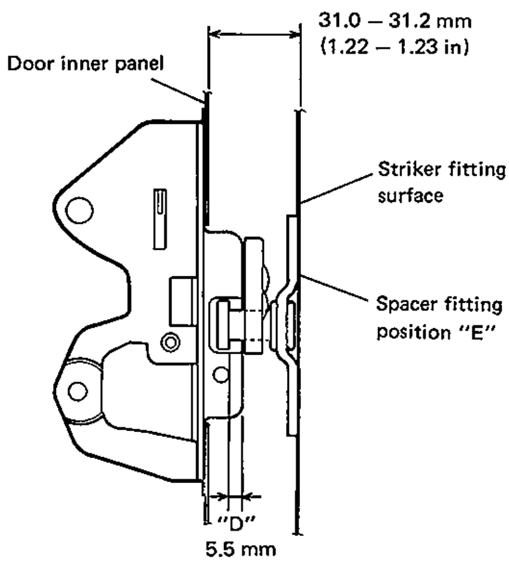


Fig. 20-25

21. BODY ELECTRICAL EQUIPMENT

21–1. Wiring Diagram (For all markets except Canadian and European markets)

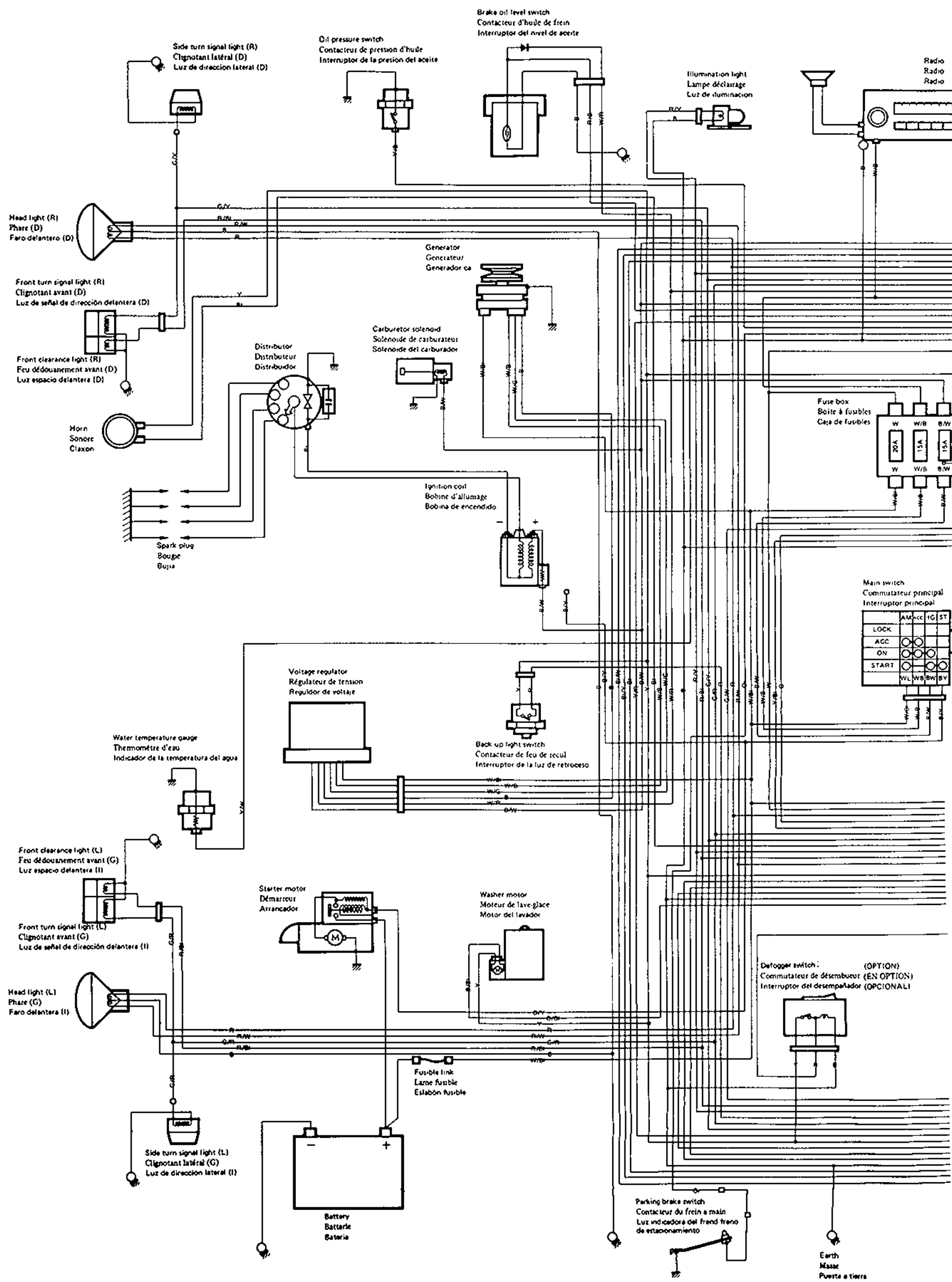
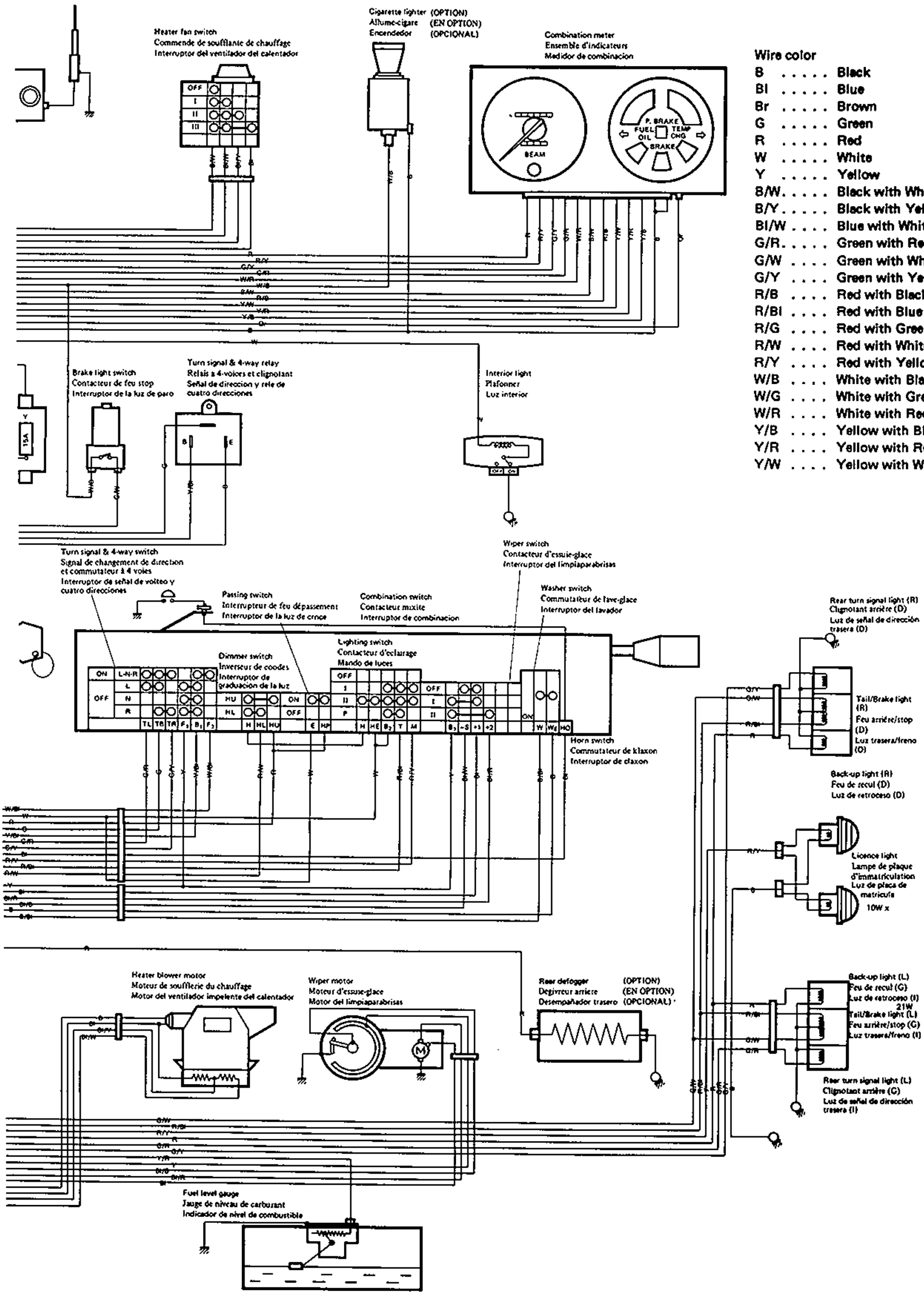


Fig. 21-1



Wire color

B	Black
Bl	Blue
Br	Brown
G	Green
R	Red
W	White
Y	Yellow
B/W.....	Black with White tracer
B/Y.....	Black with Yellow tracer
Bl/W	Blue with White tracer
G/R.....	Green with Red tracer
G/W	Green with White tracer
G/Y	Green with Yellow tracer
R/B	Red with Black tracer
R/Bl	Red with Blue tracer
R/G	Red with Green tracer
R/W	Red with White tracer
R/Y	Red with Yellow tracer
W/B	White with Black tracer
W/G	White with Green tracer
W/R	White with Red tracer
Y/B	Yellow with Black tracer
Y/R	Yellow with Red tracer
Y/W	Yellow with White tracer

For Canadian market

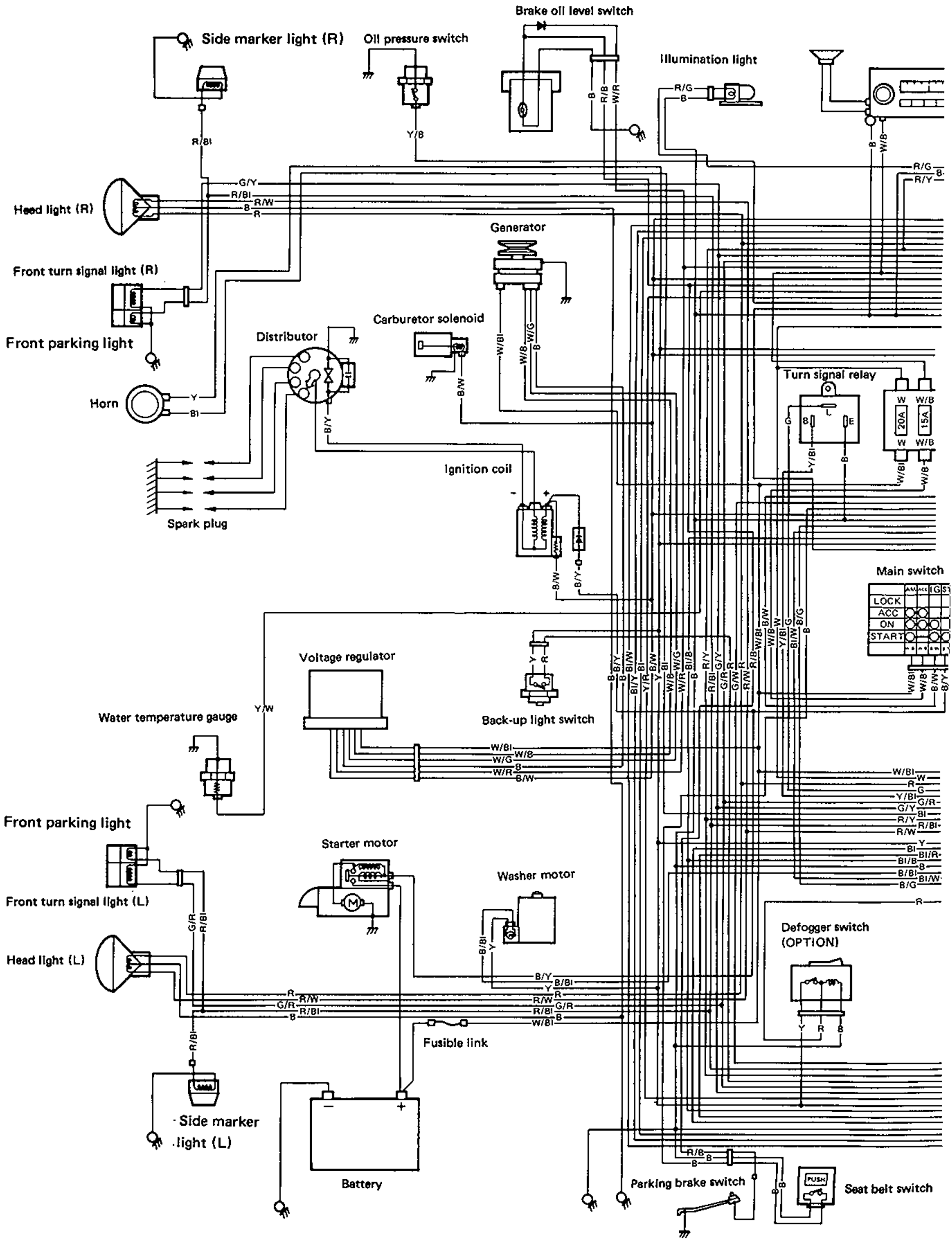
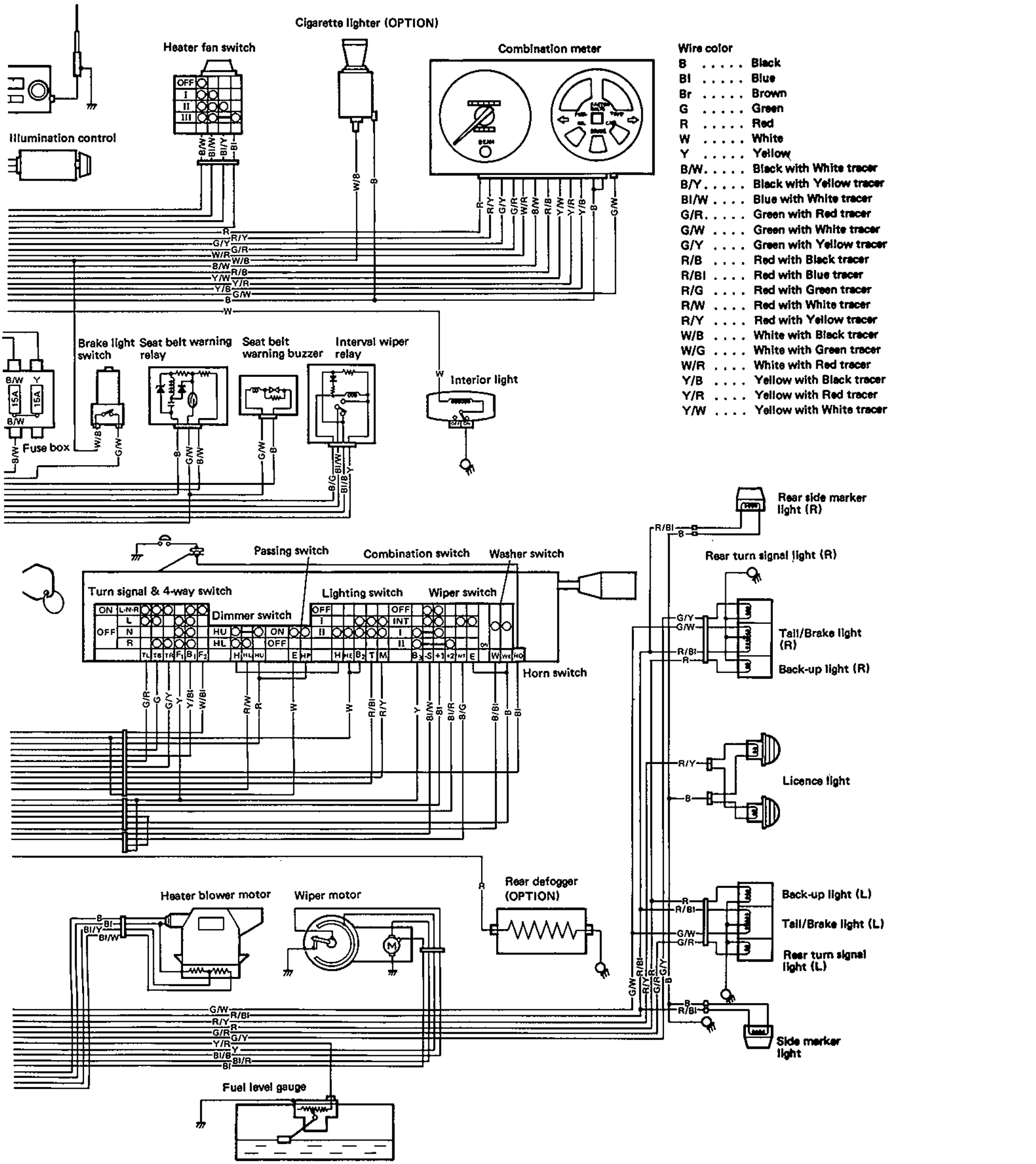


Fig. 21-1-1


Cigarette lighter (OPTION)
Heater fan switch
Combination meter
Illumination control
Wire color
B ..... Black
Bl ..... Blue
Br ..... Brown
G ..... Green
R ..... Red
W ..... White
Y ..... Yellow
B/W..... Black with White tracer
B/Y..... Black with Yellow tracer
Bl/W .... Blue with White tracer
G/R..... Green with Red tracer
G/W .... Green with White tracer
G/Y .... Green with Yellow tracer
R/B .... Red with Black tracer
R/Bl .... Red with Blue tracer
R/G .... Red with Green tracer
R/W .... Red with White tracer
R/Y .... Red with Yellow tracer
W/B .... White with Black tracer
W/G .... White with Green tracer
W/R .... White with Red tracer
Y/B .... Yellow with Black tracer
Y/R .... Yellow with Red tracer
Y/W .... Yellow with White tracer
Brake light switch
Seat belt warning relay
Seat belt warning buzzer
Interval wiper relay
Interior light
Fuse box
15A
15A
Rear side marker light (R)
Rear turn signal light (R)
Passing switch
Combination switch
Washer switch
Turn signal & 4-way switch
Lighting switch
Wiper switch
Dimmer switch
Horn switch
Tail/Brake light (R)
Back-up light (R)
Licence light
Rear defogger (OPTION)
Heater blower motor
Wiper motor
Back-up light (L)
Tail/Brake light (L)
Rear turn signal light (L)
Side marker light
Fuel level gauge

For European markets except German market

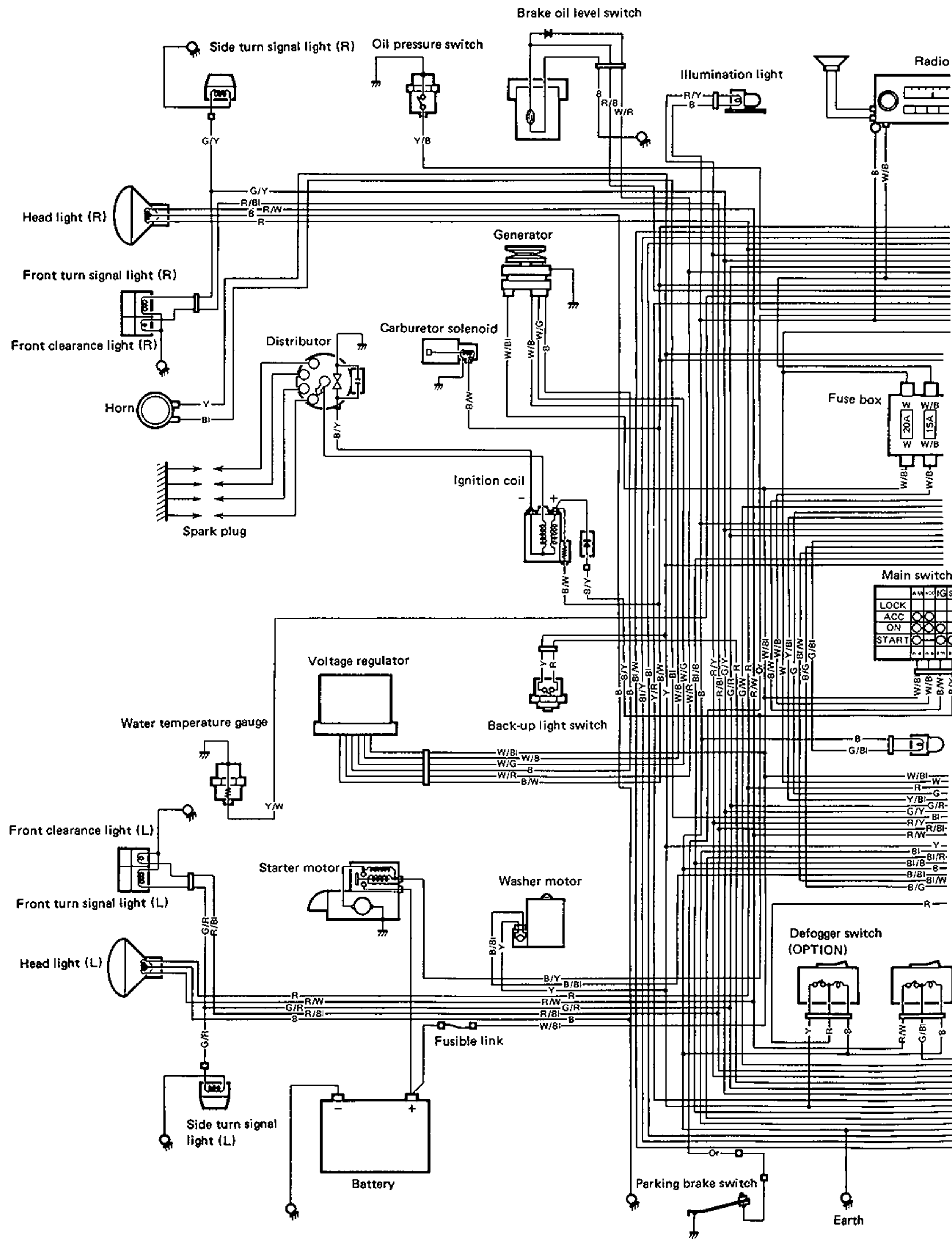
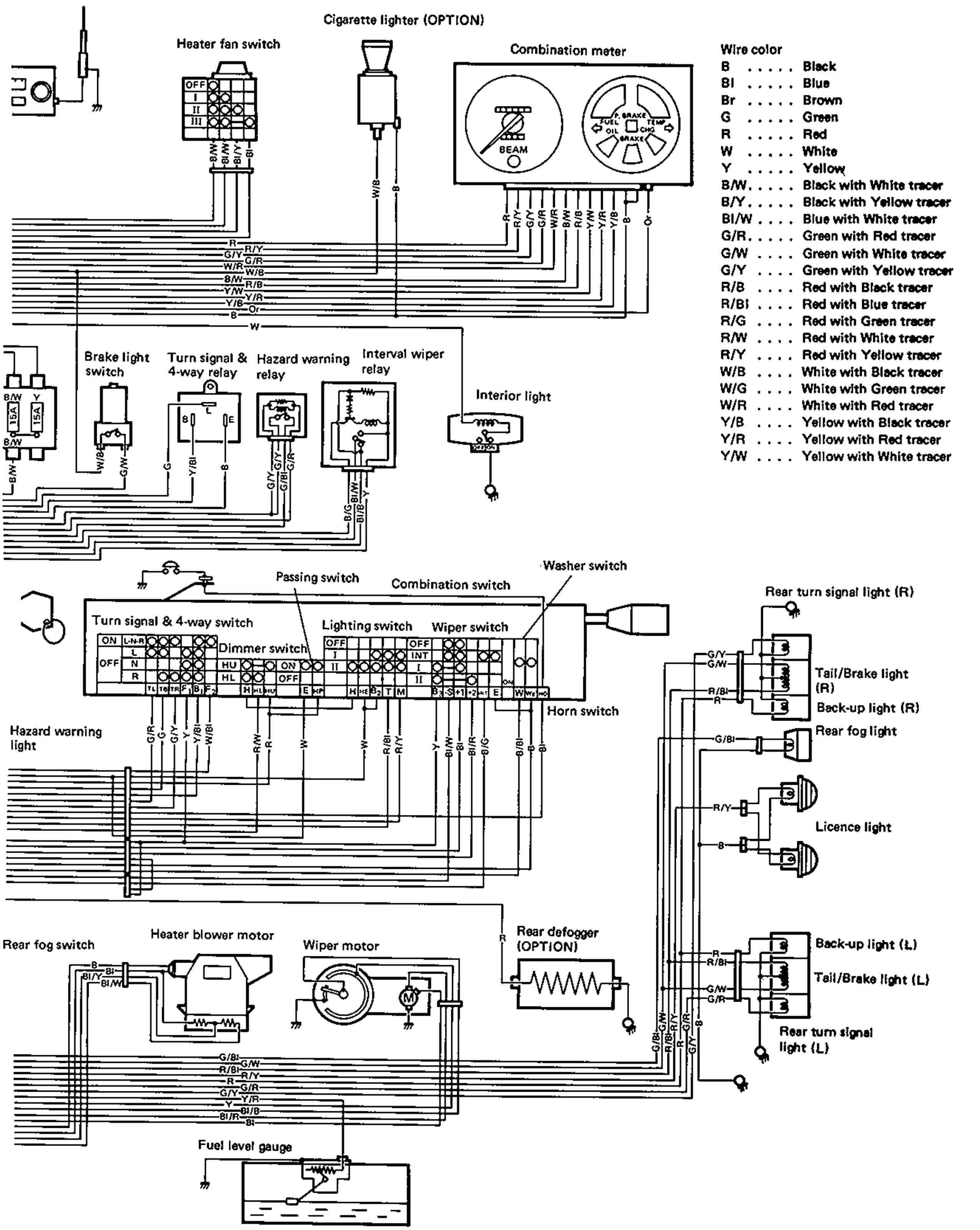
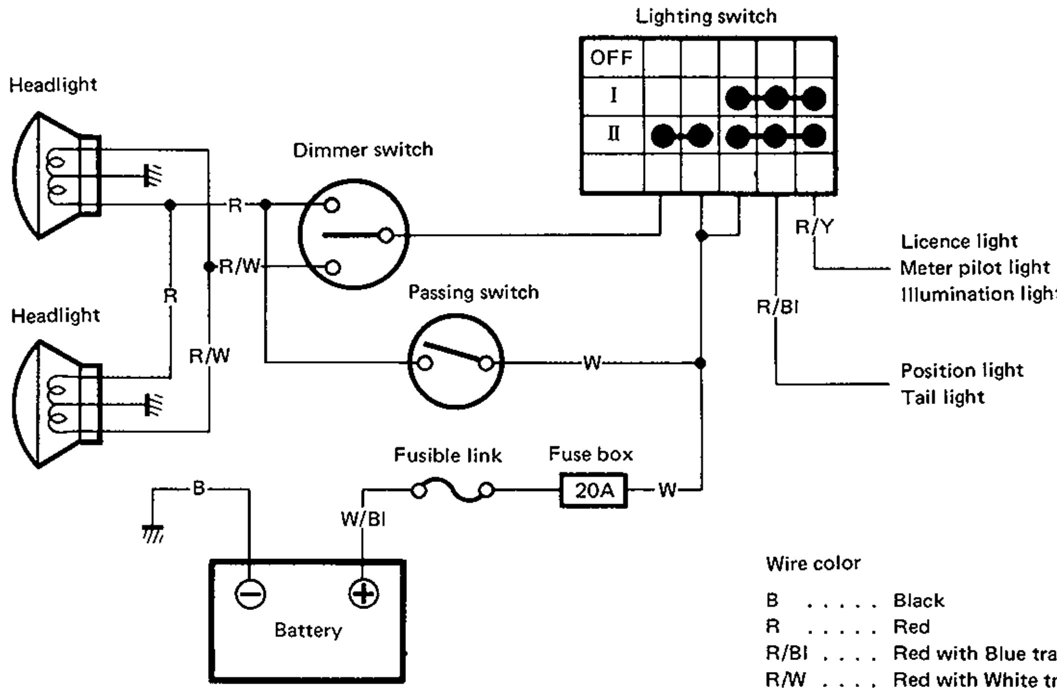


Fig. 21-1-2


Heater fan switch
Cigarette lighter (OPTION)
Combination meter
BEAM
Wire color
B ..... Black
Bl ..... Blue
Br ..... Brown
G ..... Green
R ..... Red
W ..... White
Y ..... Yellow
B/W..... Black with White tracer
B/Y..... Black with Yellow tracer
Bl/W ..... Blue with White tracer
G/R..... Green with Red tracer
G/W .... Green with White tracer
G/Y .... Green with Yellow tracer
R/B .... Red with Black tracer
R/Bl .... Red with Blue tracer
R/G .... Red with Green tracer
R/W .... Red with White tracer
R/Y .... Red with Yellow tracer
W/B .... White with Black tracer
W/G .... White with Green tracer
W/R .... White with Red tracer
Y/B .... Yellow with Black tracer
Y/R .... Yellow with Red tracer
Y/W .... Yellow with White tracer
Brake light switch
Turn signal & 4-way relay
Hazard warning relay
Interval wiper relay
Interior light
Passing switch
Combination switch
Washer switch
Turn signal & 4-way switch
Dimmer switch
Lighting switch
Wiper switch
Horn switch
Hazard warning light
Rear turn signal light (R)
Tail/Brake light (R)
Back-up light (R)
Rear fog light
Licence light
Rear fog switch
Heater blower motor
Wiper motor
Rear defogger (OPTION)
Back-up light (L)
Tail/Brake light (L)
Rear turn signal light (L)
Fuel level gauge

21–2. Head Light

Wiring circuit



Wire color

B	.....	Black
R	.....	Red
R/Bl	....	Red with Blue tracer
R/W	....	Red with White tracer
R/Y	....	Red with Yellow tracer
W	.....	White
W/Bl	....	White with Blue tracer

Fig. 21-2

Headlight inspection

1. Lighting (Low beam, High beam, Passing)
2. Mounting
3. Dirt and cracks on lenses
4. Main beam axis direction and brightness

Headlight beam setting (standard)

Before measuring or adjusting the headlight beam, adjust air pressure of the 4 tires to the specified value and settle the attitude of the vehicle by manually moving it up and down, then move the vehicle onto a flat surface. There are various measuring methods (e.g. screen method, using focusing type tester, etc.). The method described in this manual does not use a tester.

(1) Vertical beam alignment

Unless otherwise prescribed by the local statutory regulations, set the head lights in such a way that the main beam axis will fall on a spot not above the height of the head light and not below a height equal to a fifth (1/5) of the head light height. In other words, the main beam should be sloped down. The beam spot, mentioned above, refers to a blank wall standing vertical 10 meters (32.8 feet) ahead of the head lights, with the vehicle standing perfectly level.

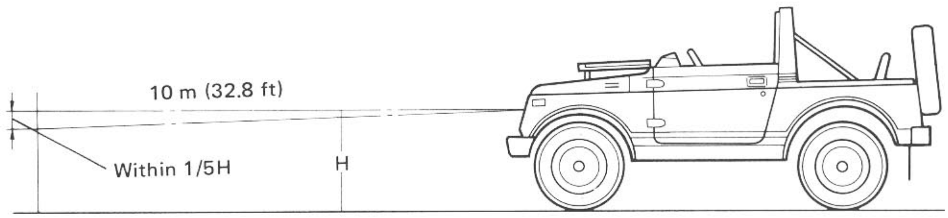


Fig. 21-3

(2) Horizontal beam alignment
Check if the hot spots of the main beam (high beam) strike within the ranges given in Fig. 21-4.

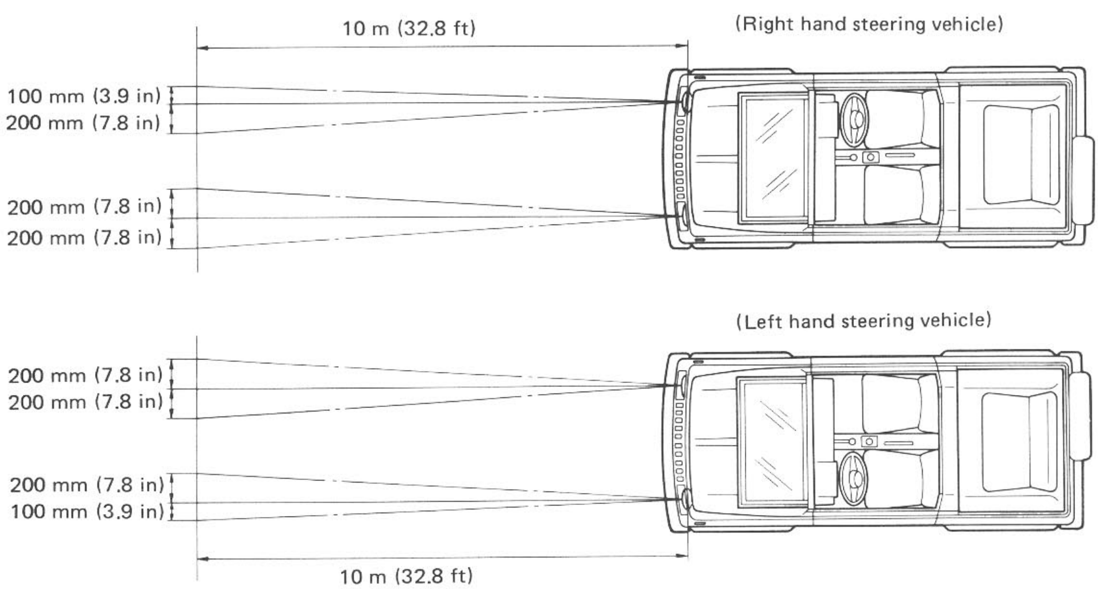


Fig. 21-4

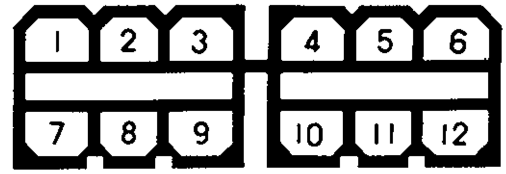
Maintenance

(1) Head light adjustment
There are three screws; 1, 2, and 3. By means of these screws, adjust the light position for beam alignment.

Fig. 21-5

(2) Head light dimmer switch

Using a circuit tester, check the respective circuits for continuity by putting the tester probe pins to the terminals shown in Fig. 21-6. With the switch kept in LOW BEAM position, the tester should indicate continuity between terminals ⑦ and ⑩ Similarly, there should be continuity between terminals ⑧ and ⑩ when the switch in HIGH BEAM position.



1. Green/red
2. Green/Yellow
3. Green
4. Yellow/blue
5. White/blue
6. Blue
7. Red/white
8. Red
9. Black
10. White
11. Red/blue
12. Red/Yellow

Fig. 21-6

Combination switch (Lighting switch circuit)

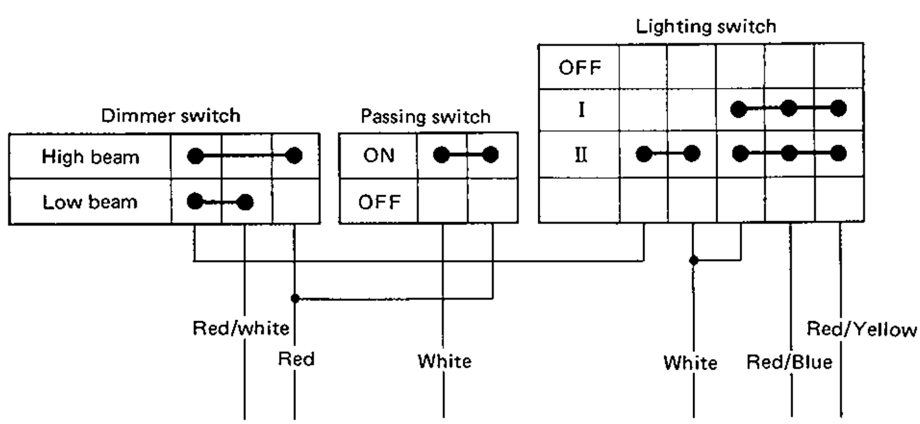
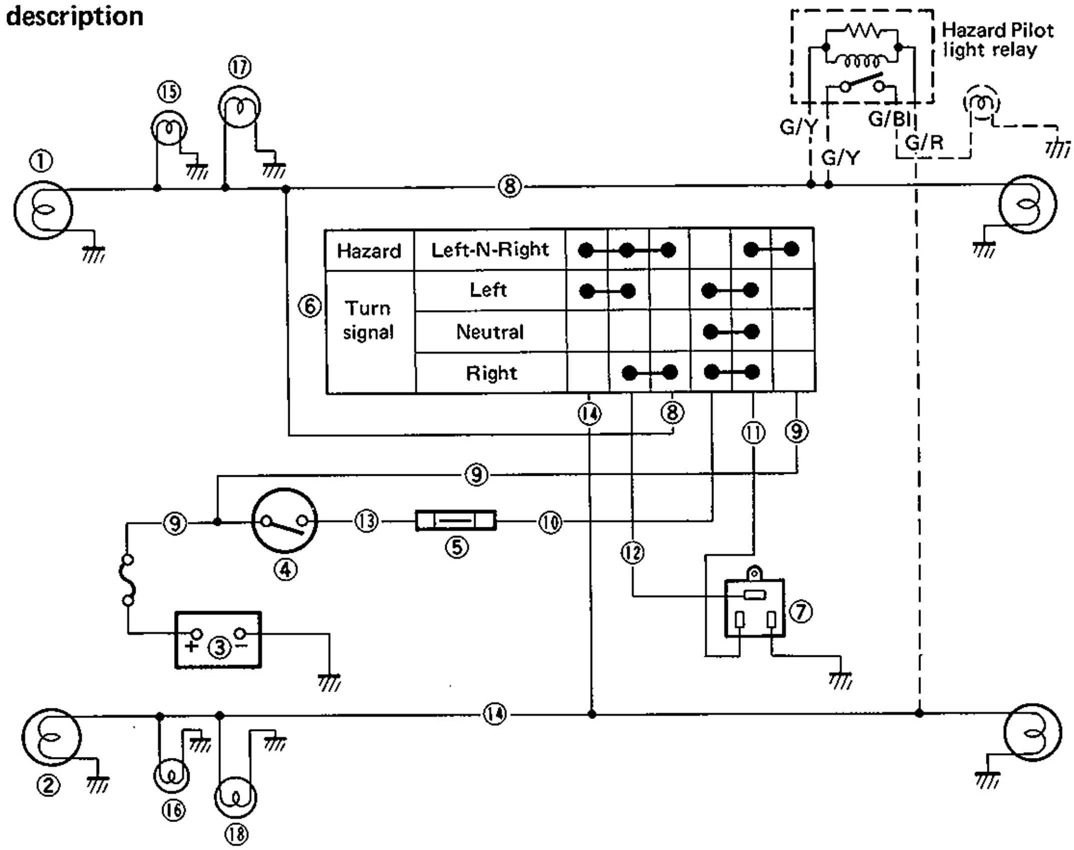


Fig. 21-6-1

21–3. Turn Signal Light and Hazard Warning Light

Circuit description



① Right turn signal
② Left turn signal
③ Battery
④ Main switch
⑤ Fuse
⑥ Turn signal and hazard warning switch
⑦ Turn signal and hazard warning relay
⑧ Green/Yellow
⑨ White/Blue
⑩ Yellow
⑪ Yellow/Blue
⑫ Green
⑬ Black/White
⑭ Green/Red
⑮ Meter pilot light (Right)
⑯ Meter pilot light (Left)
⑰ Side turn signal (Right)
⑱ Side turn signal (Left)
G/Y : Green/Yellow
G/Bl : Green/Blue
G/R : Green/Red

Fig. 21-7 ---- (Circuit) For European Markets

When the hazard warning switch is "OFF".
Yellow lead ⑩ is connected to Yellow/Blue lead ⑪.
When the hazard warning switch is "ON".
White/Blue lead ⑨ is connected to Yellow/Blue lead ⑪, and Green lead ⑫ to both Green/Yellow lead ⑧, and Green/Red lead ⑭.
When the Turn-signal switch is "ON" for a right turn, green lead ⑫ is connected to Green/Yellow lead ⑧.
When the Turn-signal switch is "ON" for a left turn, green lead ⑫ is connected to Green/Red lead ⑭.

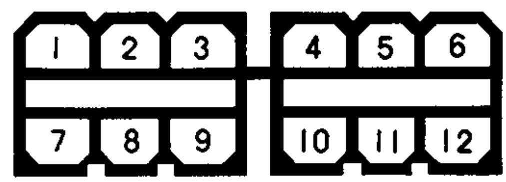
Inspection

1) Trouble diagnosis

Symptom	Possible cause
1. Lights will not come on in either group.	Fusible link is blown off.
2. Hazard light comes on but turn signal lights will not.	Open circuit (due to poor point contact) in turn signal dimmer switch.
3. No light comes on; or lights light up but do not flicker.	Defective relay unit.
4. Turn signal lights are satisfactory, but hazard light will not come on.	Open circuit in hazard warning switch.
5. Flickering frequency is erratic; or lights remain lit.	Light bulbs are defective or improperly grounded.
6. Turning on hazard warning switch lights up only one group of lights.	Defective contact in dimmer switch.

2) Turn signal switch

Using a circuit tester, check for continuity between each pair of terminals by referring to the chart given in figure on the right for each position of the turn signal switch lever. Discontinuity means that contact points are burnt or otherwise defective in the switch. The switch is in sound condition if continuity is noted between terminals 2 and 3, with the lever in right-turn position, and between terminals 1 and 3, with the lever in left-turn position.



1. Green/Red
2. Green/Yellow
3. Green
4. Yellow/Blue
5. White/Blue
6. Blue
7. Red/White
8. Red
9. Black
10. White
11. Red/Blue
12. Red/Yellow

Fig. 21-8

3) Hazard warning switch

Disconnect the lead wire of the hazard warning switch at its coupler. Set the switch to ON position and check for continuity with a circuit tester between each of the following pairs of terminals; 2 and 3, 1 and 3, 4 and 5 among those shown in Fig. 21-8. The switch is in sound condition if continuity is noted between each pair.

Turn signal & hazard warning switch

		Green/Red	Green	Green/Yellow	Yellow	Yellow/Blue	White/Blue
Hazard warning	Left-N-Right	●	●	●		●	●
Turn signal	Left	●	●		●	●	
	Neutral				●	●	
	Right		●	●	●	●	

Fig. 21-8-1

21–4. Windshield Wiper Motor

Circuit description

The circuit is designed so that, when the Wiper Switch is turned "OFF", the blade will automatically return to the horizontal position. In Fig. 21-9, when the Wiper Switch is turned "ON" while the Main Switch is "ON", current is supplied to the Wiper Motor from the Battery, the motor rotates and the blade moves. The gear mechanism which converts rotational movement of the motor into swinging movement of the blade has a cam on the final gear shaft. The cam switches the contacts of P0 and P2 every revolution. (At the blade stop position, the contact is switched from P2 to P1.)

Repeated contact making and breaking is independent of the wiper motor rotation. When the Wiper Switch is turned "OFF" while the blade is in a position other than the rest position, motor current path is changed (i.e. Bl/W → Bl → Motor). Therefore, the motor keeps rotating even though the wiper switch is turned "OFF", and the blade will return to the rest position.

When the blade returns to the rest position, the cam contact is changed from P2 to P1 and motor current is shunted. When supply to the motor is cut off, a counter electromotive force is generated in the armature. As a result of this back e.m.f., current flows through the motor and shunt circuit and the motor stops and the wiper blade stays in the specified position.

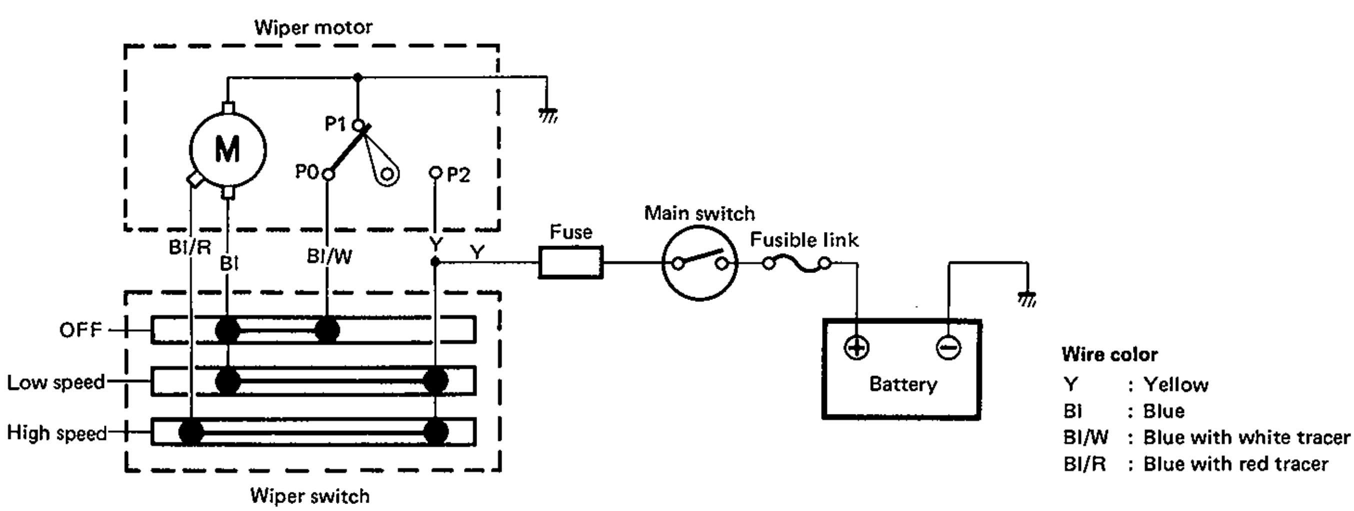


Fig. 21-9

Interval wiper relay circuit (For Canadian and European markets)

When the wiper switch is set to the interval position with the ignition switch ON (the condenser is charged at this time), current from the battery flows through the yellow wire, generates magnetic force in the coil in the relay and causes the switch in the relay to turn ON. Then current is transmitted in the sequence of yellow, blue/white, wiper switch and blue and causes the wiper motor to rotate (meanwhile, the condenser discharges). By the time the wiper motor makes one rotation and the cam in the motor comes to the automatic stop position P1, the condenser in the relay has finished discharging (no magnetic force in the coil in the relay). Then the switch in the relay turns OFF and the wiper stops. They remain that way until the condenser is fully charged. As soon as the condenser begins discharging after being fully charged, magnetic force generated in the coil in the relay causes the switch to turn ON. As described above, interval operation of the wiper motor is controlled by charging and discharging of the condenser.

> **NOTE:**
> **The same circuit description as that given for Fig. 21-9 applies to this diagram.**

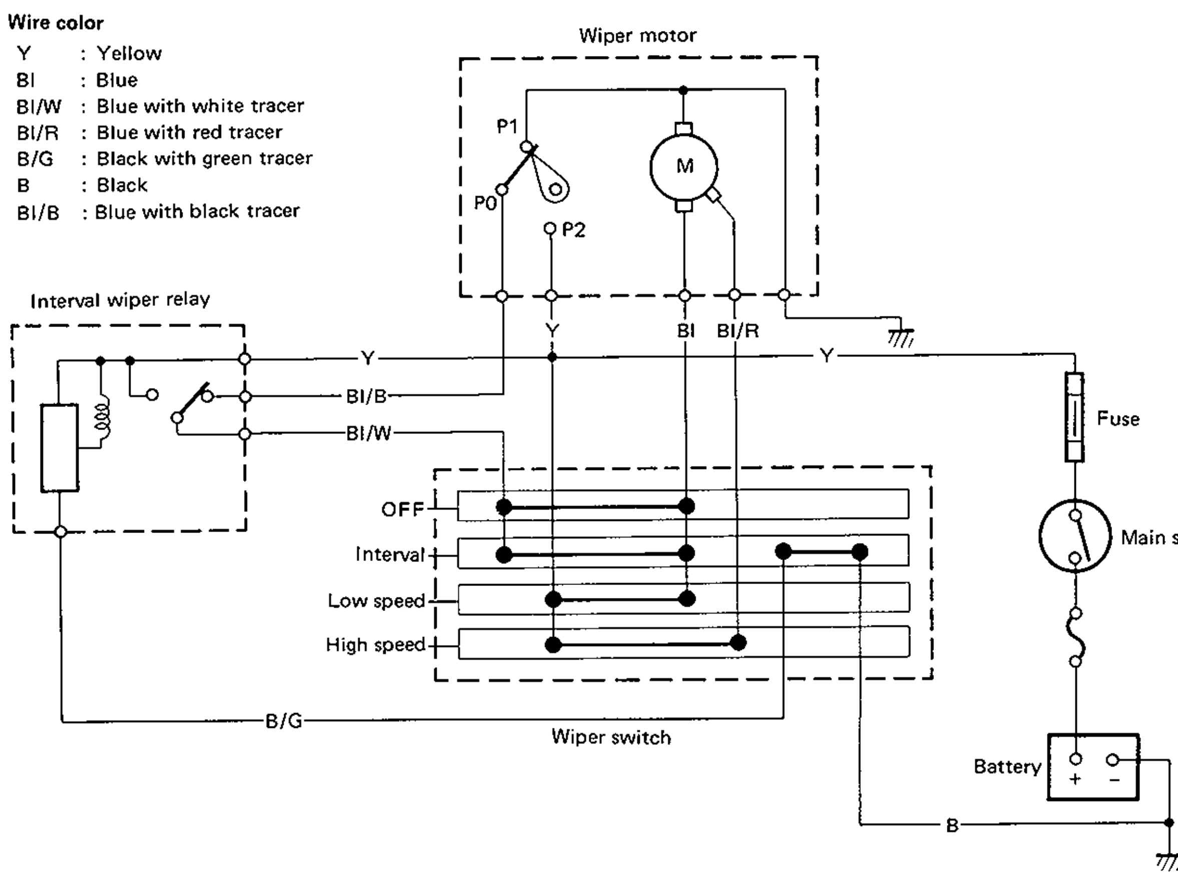


Fig. 21-10

Maintenance

(1) Wiper trouble diagnosis

When the wiper motor does not start even if the Wiper Switch is turned "ON", check lead connections and coupler connections. Then, check the following items.

a) Fuse blown or mounted incorrectly.

b) Wiper switch:

To check the wiper switch, remove the couplers and check continuity between the following terminals using a circuit tester.

2-speed type (For all markets except Canadian and European markets)

	Yellow	Blue	Blue/red	Blue/white
High speed	●	—	●	
Low speed	●	●		
OFF		●	—	●

Fig. 21-11 Wiper switch

3-speed type (For Canadian and European markets)

	Yellow	Blue/ white	Blue	Blue/ Red	Black/ Green	Black
OFF		●	●			
Interval		●	●		●	●
Low speed	●	—	●			
High speed	●	—	—	●		

Fig. 21-12 Wiper switch

c) Break in the wiper motor armature or poor commutator brush contact:

To check these, check continuity between the Blue lead and ground, and the Blue/red wire and ground.

(2) No-load run test

As shown in Fig. 21-13, using a 12V battery, connect the "+" terminal to the Blue terminal and the "–" terminal to the motor. If the motor rotates at 47 – 57 r/min, this is acceptable (for Low-speed check). For High-speed check, connect the "+" terminal of the battery to the Blue/red terminal and the "–" to the motor. If the motor rotates at 67 – 81 r/min, this is acceptable.

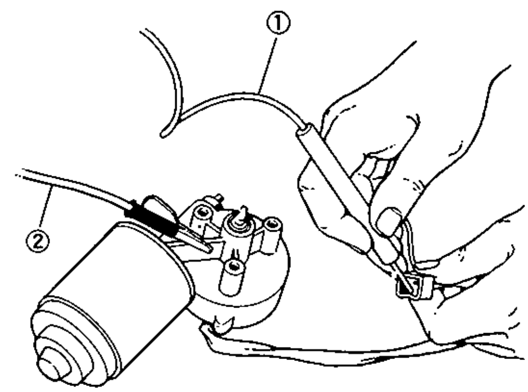


Fig. 21-13 Testing motor
1. "+" terminal
2. "–" terminal

(3) Automatic stop action test

Connect the yellow terminal of the motor to the positive "+" battery terminal, and put a jumper between the Blue/white (Blue/black) and the Blue to see if the motor output shaft comes to a halt at a certain, not just any, angular position. That position corresponds to the starting position of the blade. Using the jumper, stop the motor a number of times to make sure that the motor stops at the same position each time.

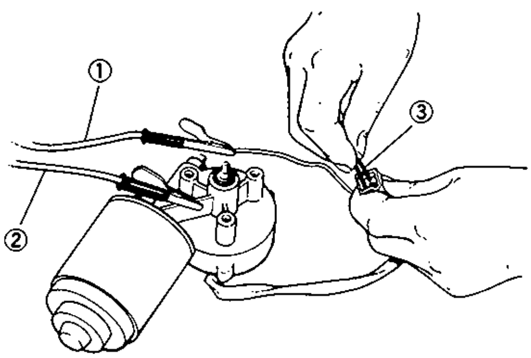


Fig. 21-14 Testing motor
1. "+" terminal 2. "–" terminal
3. Put a jumper between Blue/white (Blue/black) and Blue

(4) Interval wiper relay test (For Canadian and European markets)

Connect ⊕ cord and ⊖ cord of 12V battery to the relay terminals as shown in the illustration. If an operating sound at the contact point of the relay is heard, the relay is at work properly.

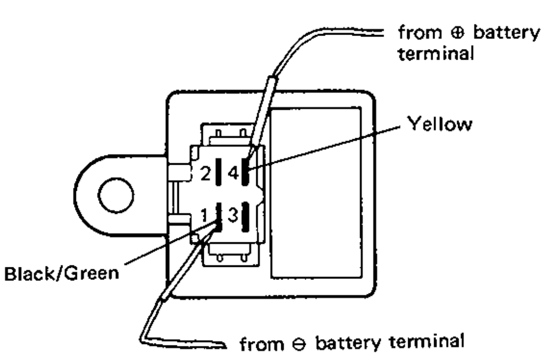


Fig. 21-15

21–5. Fuel Gauge

Circuit description

The fuel gauge for visually telling how full the fuel tank is an electrical instrument comprising a float-actuated potentiometer type of tank unit and a bimetal type indicator (meter) mounted on the instrument panel.

Two bimetal elements are used in the indicating unit, one for deflecting the lidicating hand over the "E" to "F" scale and the other (regulator) for on-off control of current.

When fuel level is low in the tank, the float is low and hence a larger ohmic resistance is introduced into the circuit by the potentiometer element in the tank unit. Consequently, a smaller current flows through the windings of the two bimetal elements, so that bimetal deflection is smaller and the indicating hand stays closer to "E" (for empty) side.

The bimetal element of the regulator bimetal draws an additional current. By the total current, the bimetal element deflects to open the circuit and, upon cooling, closes the circuit. In other words, the regulator makes and breaks the circuit intermittently. The average current is fairly constant under varying voltage condition of the battery because a higher battery voltage extends the duration of each contact point separation in the regulator.

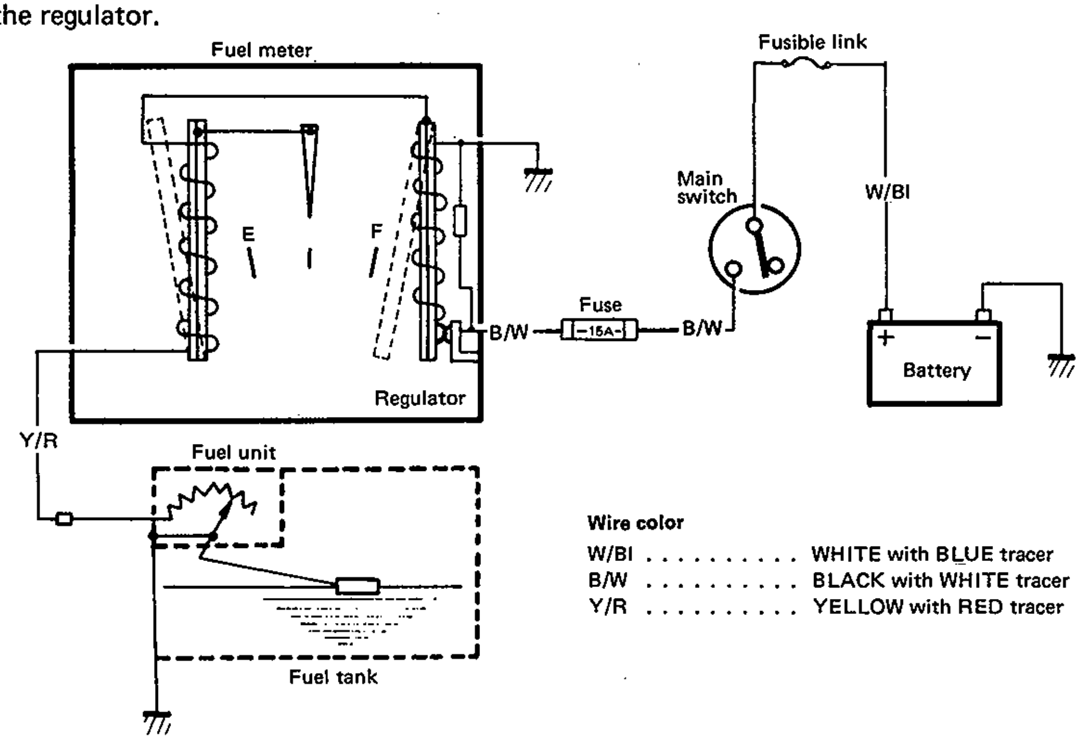


Fig. 21-16

Inspection

The following checks are necessary when the fuel meter indication is false:

① Make sure both the tank unit and fuel tank are properly and securely grounded. If ground connection is loose, current will be small and the indicating hand will be down.

② Make sure that the regulator is properly and securely grounded. If high resistance exists in this ground circuit, the regulator draws but a small current, so that the duration of contact closure is much longer and, consequently, the average current through the other winding will be larger, resulting in a hand deflected closer to "F" position.

③ Make sure that the float in the fuel tank is free from interference and without any hitch on its float arm, and that its stopper is correctly positioned.

An indicating meter checked to be internally defective must be replaced by a new one.

Water temperature gauge operation

The Water Temperature Gauge which detects the water temperature in the engine is a resistor type using a bimetal strip. The thermo-gauge, with a built-in thermistor, is mounted on the inlet manifold. Thermistor resistance decreases as the temperature increases. A heating wire is wound around the bimetal strip, so that the bimetal flexes according to the current through the heating wire. As the water temperature increases, resistance of the thermo-gauge is lowered, current increases, flexion of the bimetal strip increases, and the meter indication rises.

Inspection

FUEL GAUGE TANK UNIT

This tank unit is to be tested to see how its variable resistor changes its effective resistance value for a change in fuel level. With a resistance meter connected to the tank unit as shown, move the lever from "empty" position to "full" position. If the resistance indicated by the meter changes in a manner approximating the curve shown in the following graph, the tank unit is in sound condition:

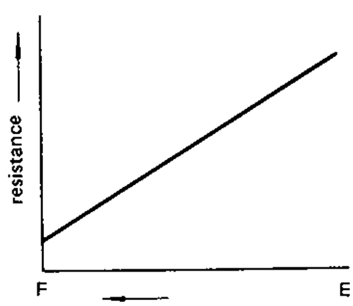


Fig. 21-17 Resistance-fuel level relationship

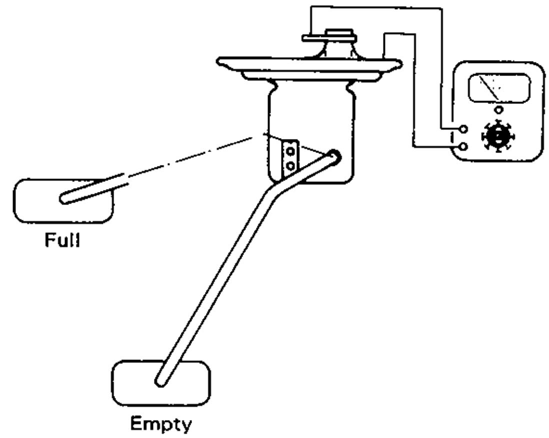


Fig. 21-18 Checking tank unit

TROUBLE SHOOTING GUIDE

A dash unit giving a false indication means that there is something wrong in the electric circuit or, less frequently, in mechanical parts. The following information will be useful in locating the cause:

FUEL GAUGE INDICATION TOO LOW

If the indicating hand tells a level much lower than the actual fuel level existing in the tank, the most likely cause is a defective ground connection, polish the mating faces with sandpaper, and tighten the connection fully to ensure the metal-to-metal contact. This will remedy the trouble; if it will not, then check the terminal connections of the circuit.

TEMPERATURE GAUGE INDICATION TOO LOW

This trouble is often due to a loose terminal connection on the inlet manifold. Check the connection, which is of slip-in type, and repair the fittings to obtain positive metal-to-metal contact.

> NOTE:
> **Bear in mind that, at the time of starting up a cold engine, the water temperature gauge could be giving a true indication while the engine itself is extremely cold.**

21–6. Defogger Circuit Diagram (SJ410V option)

The Defogger circuit for the rear window glass heating wires is as follows.

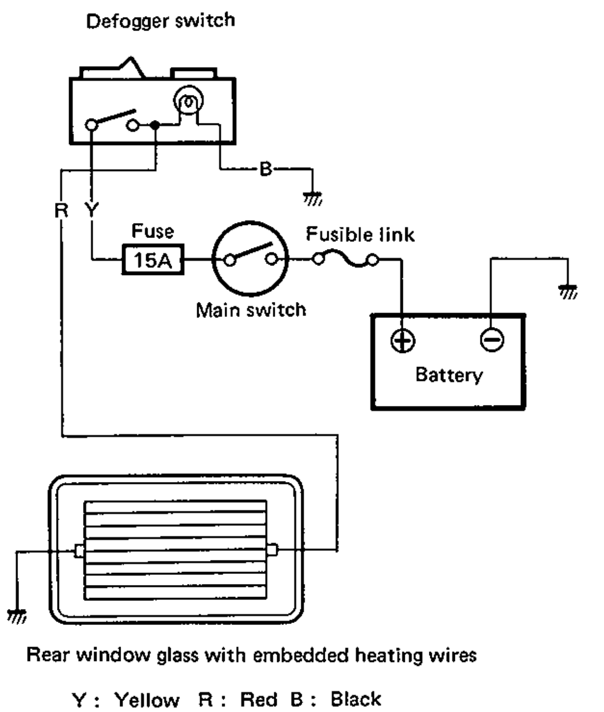


Fig. 21-19

To check function of the Defogger Switch, check continuity between the Yellow wire and the Red wire when the Defogger Switch is "ON".

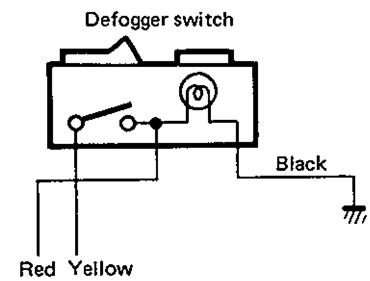


Fig. 21-20

21–7. Fuse Box

The fuse Box is wired as follows.

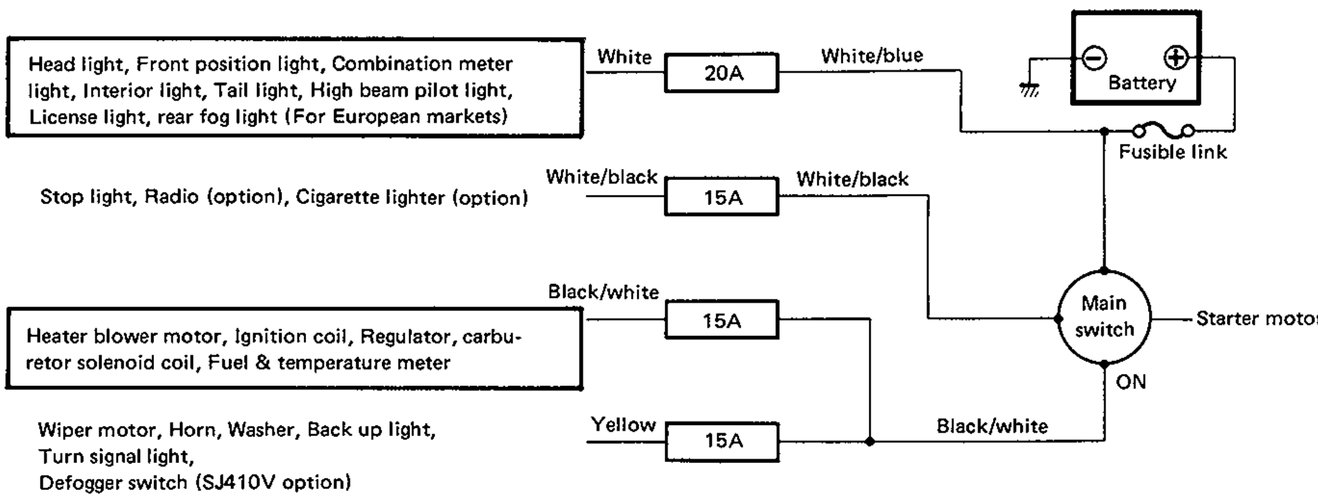


Fig. 21-21

22. MAINTENANCE SCHEDULES

22-1. Tightening Torque Schedule

In threaded fastening parts holding down a component in place, the holding force is preserved primarily in the male and female threads in contact. Screw threads are capable of withstanding this force up to a certain limit. Here occurs the need to tighten them without exceeding the limit, and this need can be met by using torque wrenches.

Fastening parts, for which the limit is specified because their fastening or holding function is critical, is listed below. Use torque wrenches and adhere to the torque specifications when tightening them at the time of periodical inspection or overhauling or servicing.

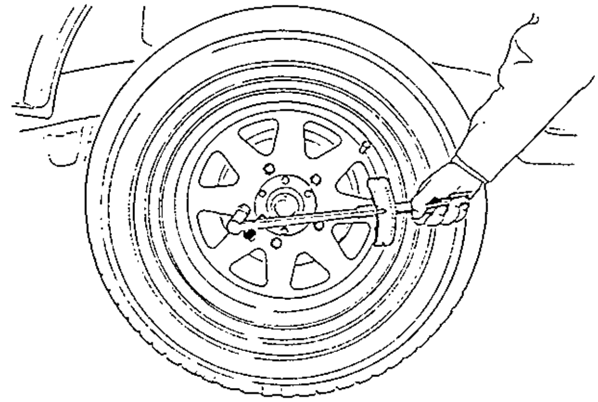


Fig. 22-1

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Cylinder head bolt	55 – 60	5.5 – 6.0	40.0 – 43.0
	Spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5
	Inlet & exhaust manifold nut	18 – 23	1.8 – 2.3	13.0 – 16.5
	Camshaft timing pulley bolt	50 – 60	5.0 – 6.0	36.5 – 43.0
	Valve adjusting nut	15 – 20	1.5 – 2.0	11.0 – 14.0
	Timing belt cover bolt	3 – 4	0.3 – 0.4	2.5
	Crankshaft pulley bolt	50 – 60	5.0 – 6.0	36.5 – 43.0
	Connecting rod bearing cap nut	28 – 32	2.8 – 3.2	20.5 – 23.0
	Crankshaft bearing cap bolt	43 – 48	4.3 – 4.8	31.5 – 34.5
	Flywheel bolt	40 – 45	4.0 – 4.5	29.0 – 32.5
	Oil pressure unit	12 – 15	1.2 – 1.5	9.0 – 10.5
	Oil filter Ass'y	10 – 15	1.0 – 1.5	7.5 – 10.5
	Oil filter stand	20 – 25	2.0 – 2.5	14.5 – 18.0
	Engine mounting bracket and frame bolt (M8 bolt) (M10 bolt)	11 – 14 40 – 60	1.1 – 1.4 4.0 – 6.0	8.0 – 10.0 29.0 – 43.5
	Relief valve spring retainer	15 – 20	1.5 – 2.0	11.0 – 14.5
	Oil pan bolt	4 – 5	0.4 – 0.5	3.0 – 3.5
	Oil drain plug	20 – 25	2.0 – 2.5	14.5 – 18.0
	Engine mount bracket bolt (bracket and cylinder)	18 – 23	1.8 – 2.3	13.0 – 16.5
	Engine front mounting nut	23 – 28	2.3 – 2.8	16.5 – 20.0
	Cylinder head cover bolt	4 – 5	0.4 – 0.5	3.0 – 3.5
	Engine rear mounting bolt (mounting and bracket)	11 – 14	1.1 – 1.4	8.0 – 10.0
	Engine rear mounting bolt (mounting and extension case)	11 – 14	1.1 – 1.4	8.0 – 10.0

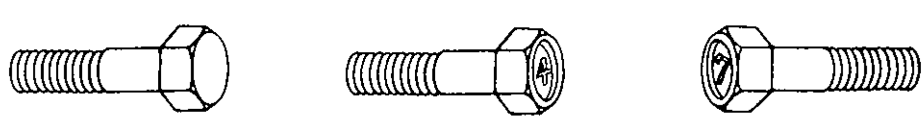
System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Gearshifting control	Gearshift lever case cover bolt (6 mm)	4 – 7	0.4 – 0.7	3.0 – 5.0
	Gearshift lever case No.1 bolt (6 mm)	4 – 7	0.4 – 0.7	3.0 – 5.0
	Gearshift lever case No.2 bolt (8 mm)	10 – 16	1.0 – 1.6	7.5 – 11.5
Transmission	Transmission case bolt (8 mm)	15 – 20	1.5 – 2.0	11.0 – 14.5
	Oil drain plug and level plug: Square type	30 – 50	3.0 – 5.0	22.0 – 36.0
	Oil drain plug and level plug: Hexagon type	25	2.5	18.5
	Extension case bolt (8 mm)	15 – 20	1.5 – 2.0	11.0 – 14.5
	Rear mounting bolt (mounting and extension case)	11 – 14	1.1 – 1.4	8.0 – 10.0
	Gearshift fork shaft stopper plate bolt	15 – 20	1.5 – 2.0	11.0 – 14.5
Transfer gear box	Transfer case bolt (8 mm)	18 – 28	1.8 – 2.8	13.5 – 20.0
	Oil filler plug and drain plug	30 – 50	3.0 – 5.0	22.0 – 36.0
	Universal joint flange nut	90 – 130	9.0 – 13.0	65.0 – 90.0
	Cross joint flange yoke nut	25 – 30	2.5 – 3.0	18.5 – 21.5
	Cross joint flange yoke bolt	25 – 30	2.5 – 3.0	18.5 – 21.5
	Transfer case mounting nut	30 – 37	3.0 – 3.7	22.0 – 26.5
	Transfer case mounting bracket bolt	15 – 23	1.5 – 2.3	11.0 – 16.5
Differential	Cross joint flange yoke bolt	28 – 35	2.8 – 3.5	20.5 – 25.0
	Side bearing cap nut	30 – 37	3.0 – 3.7	22.0 – 26.5
	Drive bevel gear bolt	80 – 90	8.0 – 9.0	58.0 – 65.0
	Differential case bolt	37 – 45	3.7 – 4.5	27.0 – 32.5
	Drive bevel pinion nut	170 – 230	17.0 – 23.0	123.0 – 166.0
	Differential carrier nut	15 – 23	1.5 – 2.3	11.0 – 16.5
	Oil filler plug (Tapered screw)	30 – 40	3.0 – 4.0	22.0 – 28.5
	Oil filler plug (Metric (parallel) screw)	35 – 50	3.5 – 5.0	25.5 – 36.5
	Oil drain plug	40 – 70	4.0 – 7.0	29.0 – 50.5
Suspension	Shackle pin nut	30 – 55	3.0 – 5.5	22.0 – 39.5
	Reef spring nut	45 – 70	4.5 – 7.0	32.5 – 50.5
	Reef spring U bolt nut	30 – 45	3.0 – 4.5	22.0 – 32.5
	Wheel nut	50 – 80	5.0 – 8.0	36.5 – 57.5
	Front wheel bearing lock nut	60 – 90	6.0 – 9.0	43.5 – 65.0
	Rear hub nut	50 – 80	5.0 – 8.0	36.5 – 57.5
	King pin upper and lower bolt	20 – 30	2.0 – 3.0	14.5 – 21.5
	Front drive flange bolt	20 – 30	2.0 – 3.0	14.5 – 21.5

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Steering	Steering shaft nut	25 – 40	2.5 – 4.0	18.0 – 28.5
	Steering rubber joint nut	15 – 25	1.5 – 2.5	11.0 – 18.0
	Steering rubber joint flange bolt	20 – 30	2.0 – 3.0	14.5 – 21.5
	Steering gear box bolt & nut	70 – 90	7.0 – 9.0	51.0 – 65.0
	Drag rod castle nut	30 – 70	3.0 – 7.0	22.0 – 50.5
	Tie rod end lock nut	50 – 80	5.0 – 8.0	36.5 – 57.5
	Tie rod end ball stud nut	30 – 55	3.0 – 5.5	22.0 – 39.5
Brake	Front brake backing plate bolt	40 – 60	4.0 – 6.0	29.0 – 43.0
	Brake master cylinder nut	13 – 23	1.3 – 2.3	9.5 – 16.5
	Brake tube union nut	15 – 18	1.5 – 1.8	11.0 – 13.0
	Brake flexible hose nut	20 – 40	2.0 – 4.0	14.5 – 28.5
	Brake pipe 5 or 6-way joint bolt	6 – 10	0.6 – 1.0	4.5 – 7.0
	Brake pedal bolt nut	18 – 28	1.8 – 2.8	13.0 – 20.0
	Rear brake backing plate bolt	18 – 28	1.8 – 2.8	13.0 – 20.0

For other bolts and nuts not listed above, refer to this chart:

Tightening torque

Bolt Diameter (mm)	Conventional or "4" Marked Bolt			"7" Marked Bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.0	40 – 60	4.0 – 6.0	29.0 – 43.5



Conventional bolt "4" Marked bolt "7" Marked bolt

22-2. Service Data

ENGINE

Item				Standard	Service Limit
Compression pressure				13.5 kg/cm² (192.0 psi) 300 r/min (rpm)	12.0 kg/cm² (170.0 psi) 300 r/min
Compression pressure	Difference between cylinders			————	1.0 kg/cm² (14.2 psi) 300 r/min (rpm)
Valve clearance (Inlet, Exhaust)	Cold			0.13 ~ 0.18 mm (0.005 ~ 0.007 in.)	————
Valve clearance (Inlet, Exhaust)	Hot			0.23 ~ 0.28 mm (0.009 ~ 0.011 in.)	————
Ignition Timing				10° B.T.D.C. below 850 r/min (rpm)	————
Cylinder head	Flatness of gasketed surface			————	0.05 mm (0.002 in.)
Cylinder head	Flatness of manifold seat		Inlet	————	0.1 mm (0.004 in.)
Cylinder head	Flatness of manifold seat		Outlet	————	0.1 mm (0.004 in.)
Cylinder head	Valve seat	Seating width	Inlet	1.3 ~ 1.5 mm (0.0512 ~ 0.0590 in.)	————
Cylinder head	Valve seat	Seating width	Exhaust	1.3 ~ 1.5 mm (0.0512 ~ 0.0590 in.)	————
Cylinder head	Valve seat	Seating angle		45°	————
Valve, Valve spring & cam shaft	Camshaft/Journal clearance			0.050 ~ 0.091 mm (0.0020 ~ 0.0036 in.)	0.15 mm (0.0059 in.)
Valve, Valve spring & cam shaft	Camshaft thrust clearance			0.050~0.150 mm (0.0019~0.0059 in.)	0.30 mm (0.0118 in.)
Valve, Valve spring & cam shaft	Cam height (Base circle + lift)		Inlet	36.152 mm (1.4233 in.)	36.100 mm (1.4212 in.)
Valve, Valve spring & cam shaft	Cam height (Base circle + lift)		Exhaust	36.152 mm (1.4233 in.)	36.100 mm (1.4212 in.)
Valve, Valve spring & cam shaft	Cam height (Base circle + lift)		Fuel pump cam	33.300 mm (1.3110 in.)	33.000 mm (1.2992 in.)
Valve, Valve spring & cam shaft	Cam shaft deflection			————	0.10 mm (0.0039 in.)
Valve, Valve spring & cam shaft	Valve stem diameter		Inlet	6.965~6.980 mm (0.2742~0.2748 in.)	————
Valve, Valve spring & cam shaft	Valve stem diameter		Exhaust	6.955 ~ 6.970 mm (0.2738 ~ 0.2744 in.)	————
Valve, Valve spring & cam shaft	Valve guide I. D.		Inlet	7.000 ~ 7.015 mm (0.2755 ~ 0.2761 in.)	————
Valve, Valve spring & cam shaft	Valve guide I. D.		Exhaust	7.000 ~ 7.015 mm (0.2755 ~ 0.2761 in.)	————
Valve, Valve spring & cam shaft	Valve guide-to-valve stem clearance		Inlet	0.020~0.050 mm (0.0008~0.0019 in.)	0.07 mm (0.0027 in.)
Valve, Valve spring & cam shaft	Valve guide-to-valve stem clearance		Exhaust	0.030 ~ 0.060 mm (0.0012 ~ 0.0023 in.)	0.09 mm (0.0035 in.)
Valve, Valve spring & cam shaft	Thickness of valve head periphery		Inlet	0.80 ~ 1.20 mm (0.0315 ~ 0.0472 in.)	0.6 mm (0.0236 in.)
Valve, Valve spring & cam shaft	Thickness of valve head periphery		Exhaust	0.80 ~ 1.20 mm (0.0315 ~ 0.0472 in.)	0.7 mm (0.0275 in.)
Valve, Valve spring & cam shaft	Contact width of valve and valve seat		Inlet	1.3 ~ 1.5 mm (0.0512 ~ 0.0590 in.)	————
Valve, Valve spring & cam shaft	Contact width of valve and valve seat		Exhaust	1.3 ~ 1.5 mm (0.0512 ~ 0.0590 in.)	————
Valve, Valve spring & cam shaft	Valve spring free length		Inlet	48.9 mm (1.9252 in.)	47.6 mm (1.8740 in.)
Valve, Valve spring & cam shaft	Valve spring free length		Exhaust	48.9 mm (1.9252 in.)	47.6 mm (1.8740 in.)
Valve, Valve spring & cam shaft	Valve spring preload		Inlet	23.6 ~ 27.6 kg (52.0 ~ 60.8 lb) for fitting length 40 mm (1.57 in.)	22 kg (48.5 lb) for fitting length 40 mm (1.57 in.)
Valve, Valve spring & cam shaft	Valve spring preload		Exhaust	23.6 ~ 27.6 kg (52.0 ~ 60.8 lb) for fitting length 40 mm (1.57 in.)	22 kg (48.5 lb) for fitting length 40 mm (1.57 in.)

Item			Standard	Service Limit
Locker arm shaft and locker arm	Rocker shaft O. D.		14.965~14.980 mm (0.589~0.590 in.)	————
	Rocker arm I. D.		14.985~15.005 mm (0.590~0.591 in.)	————
	Shaft-to-arm clearance	Inlet	0.005~ 0.040 mm (0.0002 ~ 0.0016 in.)	0.07 mm (0.0027 in.)
		Exhaust	0.005~ 0.040 mm (0.0002 ~ 0.0016 in.)	0.07 mm (0.0027 in.)
	Rocker shaft deflection		————	0.06 mm (0.0023 in.)
Cylinder	Flatness of gasketed surface		————	0.05 mm (0.0020 in.)
	Cylinder bore (S. T. D.)		65.505 ~ 65.520 mm (2.5789 ~ 2.5795 in.)	————
	Difference in bore between cylinders		————	0.05 mm (0.0020 in.)
	Wear limit on bore		————	0.05 mm (0.0020 in.)
	Cylinder-to-piston clearance		0.040 ~ 0.050 mm (0.0016 ~ 0.0020 in.)	————
Piston	Piston diameter	Standard	65.460 ~ 65.475 mm (2.5771 ~ 2.5777 in.)	————
		Oversize: 0.50 mm (0.0196 in.)	65.960 ~ 65.975 mm (2.5968 ~ 2.5974 in.)	————
	Piston ring groove width	Top ring	1.52 ~ 1.54 mm (0.0598 ~ 0.0606 in.)	————
		2nd ring	1.51 ~ 1.53 mm (0.0594 ~ 0.0602 in.)	————
		Oil ring	2.81 ~ 2.83 mm (0.1106 ~ 0.1114 in.)	————
	Piston pin diameter		15.995 ~ 16.000 mm (0.6297 ~ 0.6299 in.)	————
	Piston pin clearance in con. rod		0.003 ~ 0.016 mm (0.0001 ~ 0.0006 in.)	0.05 mm (0.0020 in.)
Piston ring	Piston ring thickness	Top ring	1.47 ~ 1.49 mm (0.0578 ~ 0.0586 in.)	————
		2nd ring	1.47 ~ 1.49 mm (0.0578 ~ 0.0586 in.)	————
		Oil ring	0.45 mm (0.0177 in.)	————
	Ring clearance in groove	Top ring	0.03 ~ 0.07 mm (0.0012 ~ 0.0027 in.)	0.12 mm (0.0047 in.)
		2nd ring	0.02 ~ 0.06 mm (0.0008 ~ 0.0023 in.)	0.10 mm (0.0039 in.)
	Piston ring end gap	Top ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0137 in.)	0.7 mm (0.0275 in.)
		2nd ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0137 in.)	0.7 mm (0.0275 in.)
		Oil ring	0.30 ~ 0.90 mm (0.0118 ~ 0.0354 in.)	1.8 mm (0.0708 in.)
	Piston ring free end gap	Top ring	9.0 mm (0.3543 in.)	————
		2nd ring	10.0 mm (0.3937 in.)	————
Crankshaft	Crankshaft deflection (middle)		————	0.06 mm (0.0023 in.)
	Crank pin diameter		37.985 ~ 38.000 mm (1.4954 ~ 1.4960 in.)	————
	Crank pin clearance in con. rod		0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)	0.08 mm (0.0031 in.)
	Connecting rod small end bore		16.003 ~ 16.011 mm (0.6300 ~ 0.6303 in.)	————
	Crank journal diameter		49.985 ~ 50.000 mm (1.9679 ~ 1.9685 in.)	————
	Bearing-to-journal clearance		0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)	0.08 mm (0.0031 in.)

Item			Standard	Service Limit
Crankshaft	Crankshaft thrust play		0.130 ~ 0.280 mm (0.0051 ~ 0.0110 in.)	0.35 mm (0.0138 in.)
	Connecting rod big end thrust clearance		0.10 ~ 0.20 mm (0.0039 ~ 0.0078 in.)	0.30 mm (0.0118 in.)
	Connecting rod	Twist	———	0.10 mm (0.0039 in.)
		Straightness	———	0.05 mm (0.0020 in.)

CLUTCH, TRANSMISSION & TRANSFER

Item			Standard	Service Limit
Clutch	Pedal play		15 ~ 25 mm (0.6 ~ 1.0 in.)	———
	Facing wear (Rived head depression)		1.2 mm (0.05 in.)	0.5 mm (0.02 in.)
	Facing-input shaft serration backlash		———	0.5 mm (0.02 in.)
	Clutch release arm play		2 ~ 4 mm (0.08 ~ 0.16 in.)	———
Transmission	Clearance between gears and rings		0.8 ~ 1.2 mm (0.03 ~ 0.05 in.)	0.5 mm (0.02 in.)
	Key slot width of synchronizer ring		9.6 mm (0.38 in.)	9.9 mm (0.39 in.)
	Fork shaft locating spring	Free length of No. 1	19.5 mm (0.767 in.)	17.0 mm (0.669 in.)
		Free length of No. 2	17.5 mm (0.689 in.)	16.0 mm (0.630 in.)
	Rattle of sliding yoke in extension case bush		0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)	0.1 mm (0.0039 in.)
	Low & second gear backlash		0.1 mm (0.0039 in.)	0.3 mm (0.0118 in.)
	Third & top gear backlash		0.1 mm (0.0039 in.)	0.3 mm (0.0118 in.)
	Reverse gear-reverse idle gear backlash		0.1 mm (0.0039 in.)	0.3 mm (0.0118 in.)
Transfer	Output shaft high gear backlash		0.1 mm (0.0039 in.)	0.3 mm (0.0118 in.)
	Output shaft low gear backlash		0.1 mm (0.0039 in.)	0.3 mm (0.0118 in.)
	Free length of locating spring	No. 1	19.5 mm (0.767 in.)	17.0 mm (0.669 in.)
		No. 2	18.5 mm (0.728 in.)	16.0 mm (0.629 in.)

LUBRICATION

Item			Standard	Service Limit
Lubrication	Outer gear periphery clearance in pump case		0.12 ~ 0.20 mm (0.0047 ~ 0.0078 in.)	0.3 mm (0.0118 in.)
	Outer gear tooth clearance in pump case		0.25 ~ 0.40 mm (0.0098 ~ 0.0157 in.)	———
	Inner gear tooth clearance in pump case		0.60 ~ 0.80 mm (0.0236 ~ 0.0315 in.)	———
	Oil pump side clearance (flatness)		0.045 ~ 0.120 mm (0.0018 ~ 0.0047 in.)	0.17 mm (0.0067 in.)
	Oil relief valve spring	Free length	60 mm (2.36 in.)	———
		10 mm (0.39 in.) Compressive force	1.488 kg (3.280 lb)	1.200 kg (2.645 lb)
	Set pressure of oil pressure switch		0.2 ~ 0.4 kg/cm^2 (2.84 ~ 5.68 psi)	

COOLING SYSTEM

Item		Standard	Service Limit
Cooling system	Fan belt tension as deflection under 10 kg (22 lb) push applied to middle point between pulleys	10 ~ 15 mm (0.4 ~ 0.6 in.)	———
	Thermostat start-to-open temperature	82°C (179°F)	———
	Thermostat full-open temperature	95°C (203°F)	———
	Valve lift	8 mm (0.31 in.)	———

DIFFERENTIAL

Item	Standard	Service Limit
Side gear backlash	0.05 ~ 0.10 mm (0.002 ~ 0.004 in.)	———
Bevel gear backlash	0.10 ~ 0.15 mm (0.004 ~ 0.006 in.)	———

SUSPENSION

Item		Standard	Service Limit
Axial play in barfield joint		0 mm (No play)	1.5 mm (0.06 in.)
Knuckle arm starting torque (force)		1.0 ~ 1.8 kg (2.20 ~ 3.96 lb) without oil seal	———
Damping force on rebound	Front shock absorbers	100 kg (220 lb)	———
	Rear shock abosrbers	110 kg (242 lb)	———
Shock absorbers stroke	Front	155 mm (6.10 in.)	———
	Rear	170 mm (6.69 in.)	———
Leaf spring length	Front	935 mm (36.8 in.)	———
	Rear	1 000 mm (39.37 in.)	———
			———
			———

STEERING SYSTEM

Item	Standard	Service Limit
Gear ratio (Gear box)	15.6 – 18.1	———
Steering angle, inside	29°	———
Steering angle, outside	26°	———
Steering wheel diameter	400 mm (15.74 in.)	———
Minimum turning radius	4.9 m (16.07 ft.) * 5.7 m (18.70 ft.)	———
Toe-in	2 ~ 6 mm (0.079 ~ 0.236 in.)	———
Camber	1 degree (1°)	———
Trail	14.5 mm (0.57 in.)	———
Kingpin inclination	9 degree (9°)	———
Caster	2 degree 30 minutes (2° 30′)	———

* For SJ410K model

BRAKE

Item	Standard	Service Limit
Brake drum inside diameter	220 mm (8.66 in.)	222 mm (8.74 in.)
Brake drum "out-of-round"	0 mm (0 in.)	0.5 mm (0.02 in.)
Brake lining thickness (lining + shoe ring)	7.0 mm (0.28 in.)	3 mm (0.12 in.)
Pedal play	2 ~ 7 mm (0.08 ~ 0.28 in.)	———
Pedal arm-to-wall clearance: When pedal is depressed at 30 kg (66 lb)	50 mm (1.97 in.) minimum	———

ELECTRICAL

	Item	Standard	Service Limit
Ignition system	Ignition timing	10° B.T.D.C. below 850 r/min (rpm)	————
	Ignition order	1 – 3 – 4 – 2	————
	Breaker point gap	0.4 ~ 0.5 mm (0.016 ~ 0.019 in.)	————
	Cam dwell angle	52°	————
	Condenser capacitance	0.25 microfarad	————
	Ignition coil; Primary winding resistance	About 3 ohms (inclusive of the 1.5-ohm resistor)	————
	Ignition coil; Secondary winding resistance	About 10 kiloohms	————
Starter motor	Voltage	12 Volts	————
	Output	0.7 kw [0.8 kw]	————
	Rating	30 seconds	————
	Brush length	17 mm (0.67 in.)	11.5 mm (0.45 in.)
	Number of pinion teeth	8	————
	Commutator diameter	38.7 mm (1.52 in.)	————
	Mica undercut	0.4 ~ 0.6 mm (0.015 ~ 0.023 in.)	0.2 mm (0.007 in.)
Charging system	Nominal operating voltage	12 Volts	————
	Maximum alternator output	35A	————
	Effective pulley diameter	65 mm (2.56 in.)	————
	Maximum permissible alternator speed	13 000 r/min (rpm)	————
	Working temperature range	–40 ~ 80°C (–104 ~ 176°F)	————
	Rotor; Ring-to-ring circuit resistance	4 ~ 5 ohms	————
	Brush length	16.5 mm (0.65 in.)	11.0 mm (0.45 in.)
	Standard output voltage and current	13.8 ~ 14.8 Volts, 20A minimum	————
	Regulated Voltage	13.8 ~ 14.8 Volts	————
	Voltage-relay cut in Voltage	4 ~ 5.8 Volts	————
	Prescribed cut in Voltage	4 ~ 4.5 Volts	————
	Field circuit resistance	Several	————

[ ] For Canadian market

PERIODIC MAINTENANCE

Periodic Maintenance Schedule

Interval: This interval should be judged by odometer reading or months, whichever comes first.		km (x 1,000)	1	10	20	30	40	50	60	70	80
		miles (x 1,000)	1	6	12	18	24	30	36	42	48
		months	1	6	12	18	24	30	36	42	48
ENGINE											
1. Water pump (fan) drive belt			A	–	I	–	R	–	I	–	R
2. Camshaft timing belt			I	–	I	–	I	–	I	–	I
3. Valve clearance			A	–	A	–	A	–	A	–	A
4. Engine bolts (All cylinder head and manifold fixings)			T	–	T	–	T	–	T	–	T
5. Engine oil filter			R	R	R	R	R	R	R	R	R
6. Engine oil	API Grade SD or SE		R	Replace every 10,000 km (6,000 miles)							
	API Grade SC		R	Replace every 5,000 km (3,000 miles)							
7. Engine coolant			–	–	–	–	R	–	–	–	R
8. Cooling system hoses and connections			–	–	I	–	I	–	I	–	I
9. Exhaust pipes and mountings			–	–	I	–	I	–	I	–	I

NOTE:

"A" : Check and/or adjust if necessary *"T" : Tighten to the specified torque*
"R" : Replace or Change *"L" : Lubricate* *"C" : Clean*
"I" : Inspect and correct or replace if necessary

Interval: This interval should be judged by odometer reading or months, whichever comes first.		km (x 1,000)	1	10	20	30	40	50	60	70	80
		miles (x 1,000)	1	6	12	18	24	30	36	42	48
		months	1	6	12	18	24	30	36	42	48
IGNITION											
10.	Ignition wiring		–	–	I	–	I	–	I	–	I
11.	Distributor cap and rotor		–	–	I	–	I	–	I	–	I
12.	Spark plugs and distributor breaker point		–	R	R	R	R	R	R	R	R
13.	Ignition timing		I	A	A	A	A	A	A	A	A
14.	Distributor advance		–	–	I	–	I	–	I	–	I
FUEL											
15.	Air cleaner	Paved-road	Clean every 10,000 km (6,000 miles)								
		Dusty condition	Clean every 2,500 km (1,500 miles) or as required Replace every 40,000 km (24,000 miles) More frequent replacement if under dusty driving conditions.								
16.	Accelerator cable & Carburetor shafts		–	I&L	I&L	I&L	I&L	I&L	I&L	I&L	I&L
17.	Fuel tank cap, gas lines and connections		I	–	–	–	I	–	–	–	I
18.	Fuel filter		–	–	–	–	R	–	–	–	R
19.	Idle speed and idle mixture		A	–	A	–	A	–	A	–	A
CRANKCASE EMISSION CONTROL											
20.	Crankcase ventilation hoses and connections		–	–	I	–	I	–	I	–	I
FUEL EVAPORATIVE EMISSION CONTROL											
21.	Fuel vapor storage system, hoses and connections		–	–	I	–	I	–	I	–	I
ELECTRICAL											
22.	Wiring harness connections and headlights		–	–	I	–	I	–	I	–	I

NOTE:

"A" : Check and/or adjust if necessary *"T" : Tighten to the specified torque*
"R" : Replace or Change *"L" : Lubricate* *"C" : Clean*
"I" : Inspect and correct or replace if necessary

Interval: This interval should be judged by odometer reading or months, whichever comes first.	km (x 1,000)	1	10	20	30	40	50	60	70	80
	miles (x 1,000)	1	6	12	18	24	30	36	42	48
	months	1	6	12	18	24	30	36	42	48
CHASSIS AND BODY										
23. Clutch play		I	I	I	I	I	I	I	I	I
24. Brake fluid		I	I	I	I	R	I	I	I	R
25. Brake pedal		I	I	I	I	I	I	I	I	I
26. Brake lever and cable		I	I	I	I	I	I	I	I	I
27. Brake drums and shoes		–	I	I	I	I	I	I	I	I
28. Brake hoses and pipes		–	I	I	I	I	I	I	I	I
29. Tires (Abnormal wear and pressure)		–	I	I	I	I	I	I	I	I
30. Wheels and hub nuts		I	I	I	I	I	I	I	I	I
31. Shock absorbers		I	I	I	I	I	I	I	I	I
32. Propeller shaft or Drive shaft		–	–	I&L	–	I&L	–	I&L	–	I&L
33. Transmission, (transfer) and differential oil		R	I	I	I	R	I	I	I	R
34. Bolts and nuts		T	–	T	–	T	–	T	–	T
35. Steering condition		I	I	I	I	I	I	I	I	I
36. Test drive		Test drive on completion of each service								

NOTE:

"A" : Check and/or adjust if necessary *"T" : Tighten to the specified torque*
"R" : Replace or Change *"L" : Lubricate* *"C" : Clean*
"I" : Inspect and correct or replace if necessary

SUZUKI

SJ410/410V/410K/410W

SUPPLEMENTARY SERVICE MANUAL

THIS SUPPLEMENT IS APPLICABLE TO GENERAL MARKET EXCEPT CANADA MARKET FOR CANADA MARKET, REFER TO SUPPLEMENTARY SERVICE MANUAL (99501-80012-E28)

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99501-80013-01E
(英)

FOREWORD

SJ410W is a new model added to SJ410 series, i.e. SJ410/410V/410K. This Supplementary Service Manual has been prepared for SJ410W and SJ410/410V/410K produced after the minor change to supplement SJ410/410V/410K SERVICE MANUAL (99500-80000) and SJ410/410V/410K PERIODIC MAINTENANCE MANUAL.

The manual, therefore, mainly contains those data and work procedures for inspecting and servicing SJ410W and SJ410/410V/410K produced after the minor change which are different from those described in the above manuals.

For any items not contained in this manual, refer to group 1~22 of this manual.

- This supplementary manual is not applicable to American and Canadian markets.
- The above minor change has been carried out since 1983 March (July for European market) production.

  Effective body No.:

For European Market	For the Other Market
X JSAOSJ40000540001 X ~	SJ 40 – 140001 ~
X JSAOSJ40V00540001 X ~	SJ40T – 105001 ~
X JSAOSJ40T00501001 X ~	SJ 41 – 102001 ~
X JSAOSJ41000501001 X ~	

- In Chile and Peru markets, vehicles with body number of and after SJ40-117346 are equipped with disc brake of front and self shoe adjusting system drum brake on rear.

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

CONTENTS

1. GENERAL

1-1. Exterior View (For SJ410W)

SJ410W

Standard canvas type

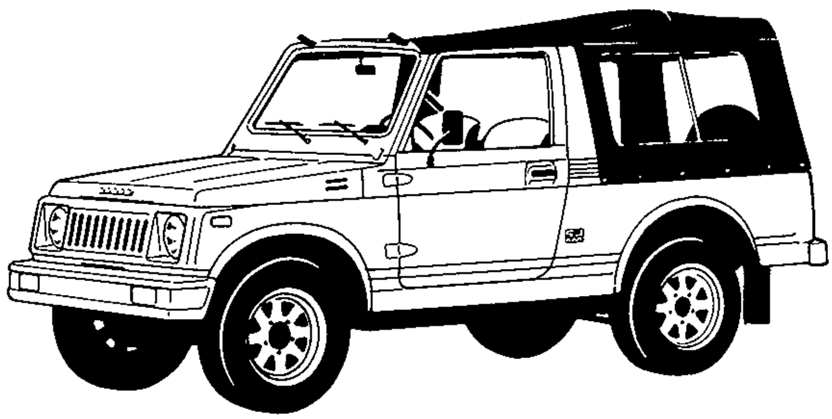


Fig. 1-1

High canvas type

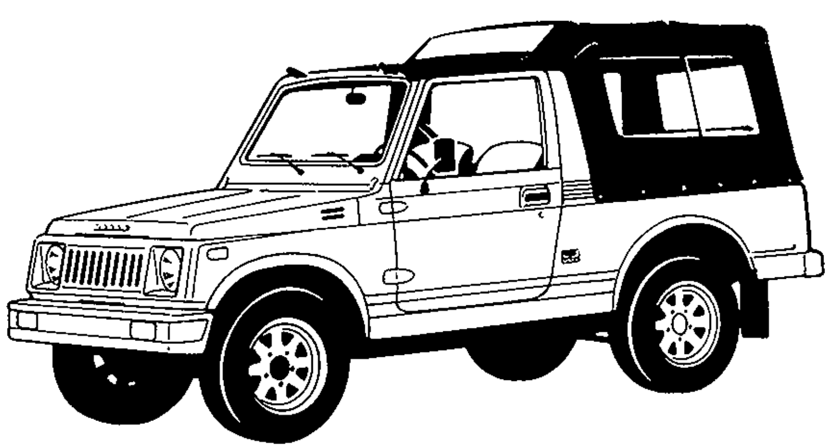


Fig. 1-2

1-2. Outline Dimensions (For SJ410W)

Standard canvas type

NOTE:
Dimensions in this figure are those with FR78-15 tires mounted. For details, refer to Specifications on p. 5.

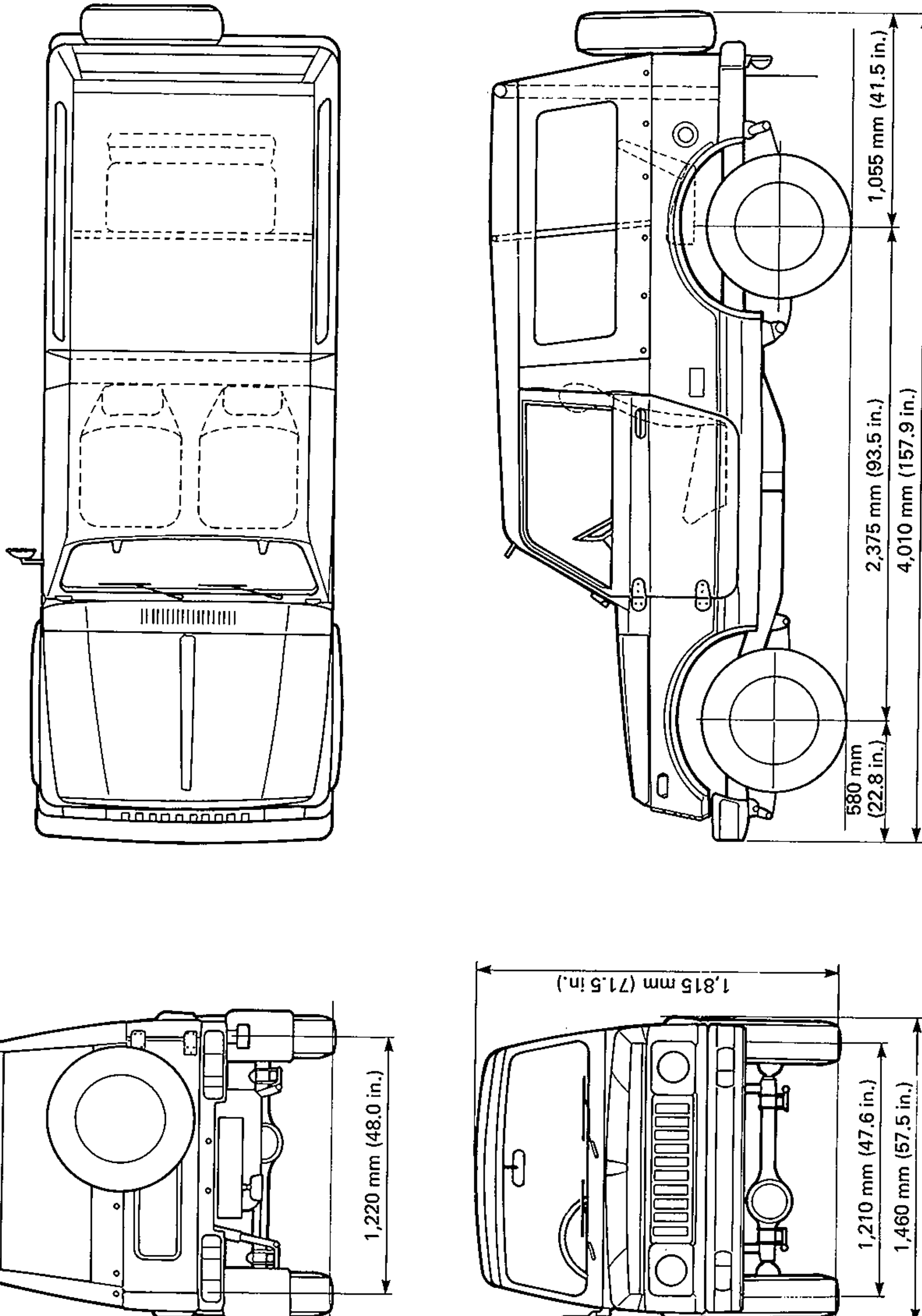


Fig. 1-3

High canvas type

> NOTE:
> Dimensions in this figure are those with FR78-15 tires mounted. For details, refer to Specifications on p. 5.

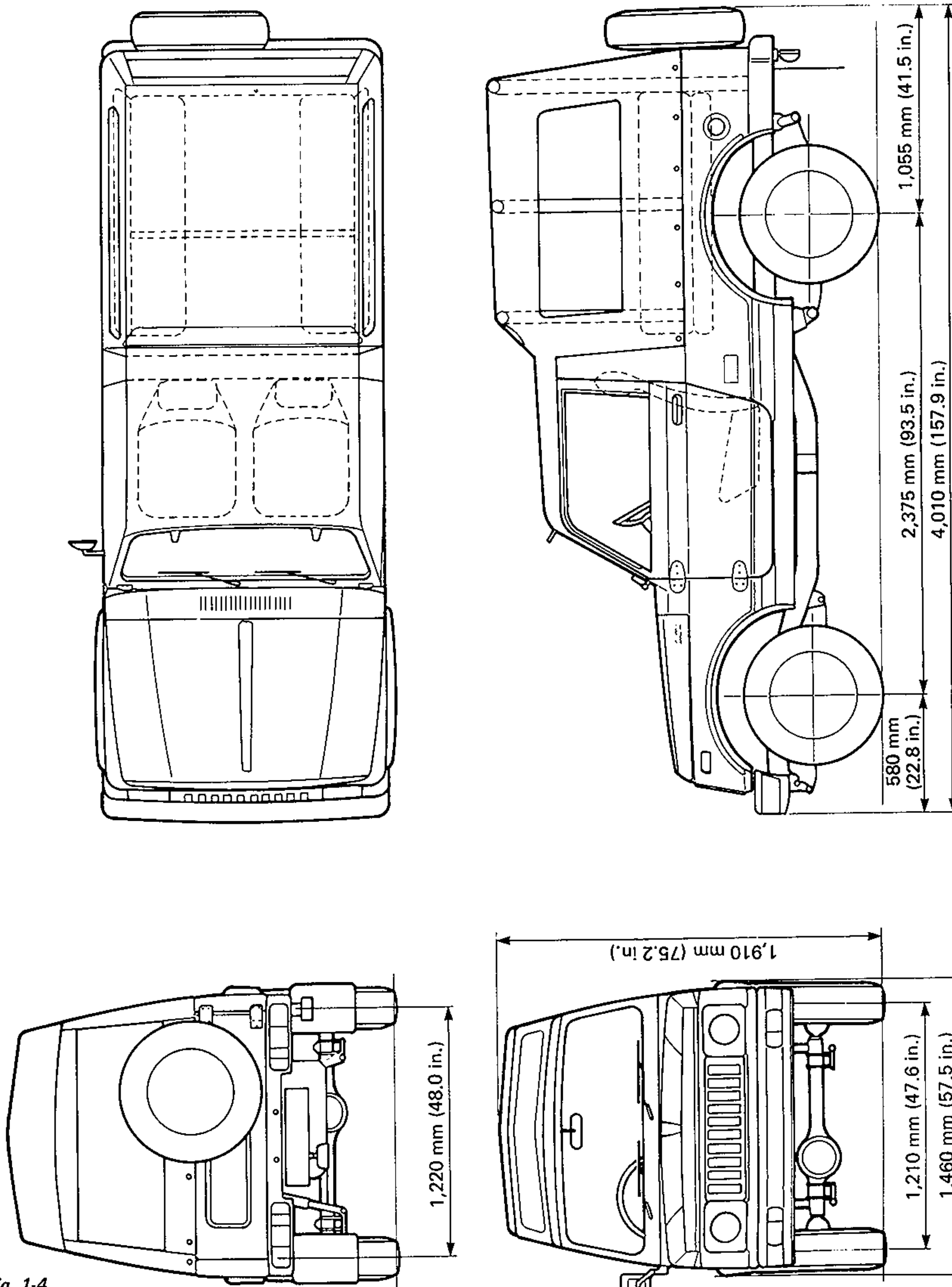


Fig. 1-4

1-3. Specifications

Item \ Model		SJ410	SJ410V	SJ410K	SJ410W
DIMENSIONS					
Overall length		3,410mm (134.3in.) 1	3,420mm (134.6in.) 1	3,890mm (153.1in.)	3,990mm (157.1in.) 1
		3,430mm (135.0in.) 2	3,440mm (135.4in.) 2		4,010mm (157,9in.) 2
Overall width		1,395mm (54.9in.) 1	←	←	←
		1,460mm (57.5in.) 2	←	←	←
Overall height		1,690mm (66.5in.) 1	1,700mm (66.9in.) 1	1,690mm (66.5in.) 1	1,830mm (72.0in.)1.3
					1,925mm (75.8in.) 1.4
		1,680mm (66.1in.) 2	1,690mm (66.5in.) 2	1,680mm (66.1in.)2	1,815mm (71.4in.) 2.3
					1,910mm (75.2in.) 2.4
Wheelbase		2,030mm (79.9in.)	←	2,375mm (93.5in.)	←
Tread	front	1,190mm (46.9in.) 1	←	←	←
		1,210mm (47.6in.) 2	←	←	←
	rear	1,200mm (47.2in.) 1	←	←	←
		1,220mm (48.0in.) 2	←	←	←
Load deck size	length	870mm (34.3in.)	840mm (33.1in.)	1,550mm (61.0in.)	1,050mm (41.3in.) 3.5
					1,450mm (57.1in.) 4
	width	1,270mm (50,0in.)	1,215mm (47.8in.)	1,320mm (52.0in.)	1,270mm (50.0in.) 3
					810mm (31.9in.) 4
	height	1,020mm (40.2in.)	1,045mm (41.1in.)	280mm (11.0in.)	1,020mm (40.2in.) 3
					1,220mm (48.0in.) 4
Ground clearance		240mm (9.4in.) 1	←	←	←
		230mm (9.1in.) 2	←	←	←
ENGINE					
Type		Four-stroke cycle, water-cooled, OHC	←	←	←
Number of cylinders		4	←	←	←
Lubrication system		Wet sump	←	←	←
Bore		65.5mm (2.58in.)	←	←	←
Stroke		72.0mm (2.83in.)	←	←	←
Piston displacement		970cm^3 (970cc, 59.2 cu.in.)	←	←	←
Compression ratio		8.8 : 1	←	←	←
Carburetor		AISAN	←	←	←
Air cleaner		Polyurethane foam element (Dry type)	←	←	←

1 ..... For 6.00-16-4PR tire
2 ..... For FR78-15 or F78-15 tire
3 ..... For standard-canvas
4 ..... For high-canvas
5 ..... For 2 passengers

NOTE:
Specifications are subject to change without notice.

Item / Model		SJ410		SJ410V	SJ410K		SJ410W	
ELECTRICAL								
Ignition timing		10° B.T.D.C. below 850 r/min (rpm)		←	←		←	
Standard spark plug		NGK BP-5ES or NIPPON DENSO W16EX-U [*1 BPR-5ES or W16EXR-U]		←	←		←	
Starter		Magnetic shift type		←	←		←	
Generator		Alternator		←	←		←	
Battery		12V, 108 kC (30 Ah)/20HR		←	←		←	
Headlight		12V, 60/50W [*1 12V, 45/40W]		←	←		←	
Turn signal light		12V, 21W		←	←		←	
Clearance light		12V, 5W		←	←		←	
Tail/Brake light		12V, 5/21W		←	←		←	
Side turn signal light		12V, 5W		←	←		←	
License plate light		12V, 5W		←	←		←	
Back-up light		12V, 21W		←	←		←	
Interior light		12V, 5W		←	←		←	
Meter pilot light		12V, 3.4W		←	←		←	
Main fuse		0.5mm² (fusible link)		←	←		←	
Fuse box		15/15/15/15/15/20A [*1 10/10/10/10 15/15/20/15/15/ 10/5/5/A]		←	←		←	
POWER TRANSMISSION								
Clutch type		Dry, single disc		←	←		←	
Transmission type		4-forward all synchro-mesh, 1 reverse		←	←		←	
Transfer gear box type		2-speed constant mesh		←	←		←	
Final reduction ratio		4.111 [*2 4.555]		←	4.111 [*2.3 4.555]		4.111	
Gear ratios	low	3.163		←	←		←	
	2nd	1.945		←	←		←	
	3rd	1.421		←	←		←	
	top	1.000		←	←		←	
	reverse	3.321		←	←		←	
Transfer gear ratios	low range	2.557	2.511	←	←		←	
	high range	1.590	1.580	←	←		←	
Overall reduction ratios:								
Low range	low	33.249 [*2 36.840]	32.652 [*2 36.177]	←	33.249 [*2.3 36.840]	32.652 [*2.3 36.177]	33.249	32.652
	2nd	20.446 [*2 22.654]	20.078 [*2 22.246]	←	20.446 [*2.3 22.654]	20.078 [*2.3 22.246]	20.446	20.078
	3rd	14.937 [*2 16.550]	14.669 [*2 16.252]	←	14.937 [*2.3 16.550]	14.669 [*2.3 16.252]	14.937	14.669
	top	10.512 [*2 11.647]	10.323 [*2 11.438]	←	10.512 [*2.3 11.647]	10.323 [*2.3 11.438]	10.512	10.323
	reverse	34.910 [*2 38.680]	34.283 [*2 37.984]	←	34.910 [*2.3 38.680]	34.283 [*2.3 37.984]	34.910	34.283

[*1] For European market
[*2] For Colombian & Peruvian markets
[*3] For New Zealand market
■ For Transfer Gear Box – 2 (Refer to page 32)

Item		SJ410	SJ410V	SJ410K	SJ410W
High range	low	20.676 [*2 22.908] / 20.545 [*2 22.764]	←	20.676 [*2.3 22.908] / 20.545 [*2.3 22.764]	20.676 / 20.545
	2nd	12.717 [*2 14.086] / 12.634 [*2 13.998]	←	12.717 [*2.3 14.086] / 12.634 [*2.3 13.998]	12.717 / 12.634
	3rd	9.290 [*2 10.291] / 9.230 [*2 10.227]	←	9.290 [*2.3 10.291] / 9.230 [*2.3 10.227]	9.290 / 9.230
	top	6.535 [*2 7.242] / 6.495 [*2 7.197]	←	6.535 [*2.3 7.242] / 6.495 [*2.3 7.197]	6.535 / 6.495
	reverse	21.707 [*2 24.052] / 21.571 [*2 23.901]	←	21.707 [*2.3 24.052] / 21.571 [*2.3 23.901]	21.707 / 21.571
WHEEL AND SUSPENSION					
Tire size: front and rear		6.00-16-4PR or FR78-15, F78-15 [*1 195 SR15]	←	←	←
Tire pressure	front	140kPa (1.40 kg/cm^2, 20 psi)	←	←	←
	rear	140kPa (1.40 kg/cm^2, 20 psi)-unladen	←	210 kPa (2.10 kg/cm^2, 30 psi)	140kPa (1.40 kg/cm^2, 20 psi)-unladen
		180 kPa (1.80 kg/cm^2, 26 psi)-laden	←		180 kPa (1.80 kg/cm^2, 26 psi)-laden
Suspension type	front	Leaf spring	←	←	←
	rear	Leaf spring	←	←	←
STEERING					
Turning radius		4.9 m (16.1 ft)	←	5.7 m (18.7 ft)	←
Steering gear box		Ball nut type	←	←	←
Toe-in		2 – 6 mm (0.08 – 0.24 in.)	←	←	←
Camber angle		1° 00′	←	←	←
Caster angle		2° 30′	←	←	←
Trail		14.5 mm (0.57 in.)	←	←	←
King pin angle		9° 00′	←	←	←
BRAKE SYSTEM					
Type		4-wheel, hydraulic	←	←	←
Wheel brake	front	Disc type	←	←	←
	rear	Drum type (Leading and trailing)	←	←	←
Parking brake		Internal expanding, on propeller shaft	←	←	←
CAPACITIES					
Cooling solution		3.8 ℓ (8.0/6.7 US/Imp. pt)	←	←	←
Fuel tank		40ℓ (10.6/8.8 US/Imp. gal)	←	←	←
Engine oil		3.0 ℓ (6.3/5.3 US/Imp. pt)	←	←	←
Transmission oil		1.0 ℓ (2.1/1.8 US/Imp. pt)	←	←	←
Differential gear box oil	front	1.5 ℓ (3.2/2.6 US/Imp. pt)	←	←	←
	rear	1.3 ℓ (2.7/2.3 US/Imp. pt)	←	←	←
Transfer gear box oil		0.7 ℓ (1.5/1.2 US/Imp pt) / 0.8 ℓ (1.7/1.4 US/Imp pt)	←	←	←

[*1] For European market [*2] For Colombian & Peruvian markets [*3] For New Zealand market

■ For Transfer Gear Box – 2 (Refer to page 32)

2. ENGINE

PCV (Positive Crankcase Ventilation) Valve

[This item is applicable to the Vehicles equipped with PCV Valve.]

This valve is mounted on the intake manifold and its other end is connected to the crankcase ventilation (blow-by gas) hose.

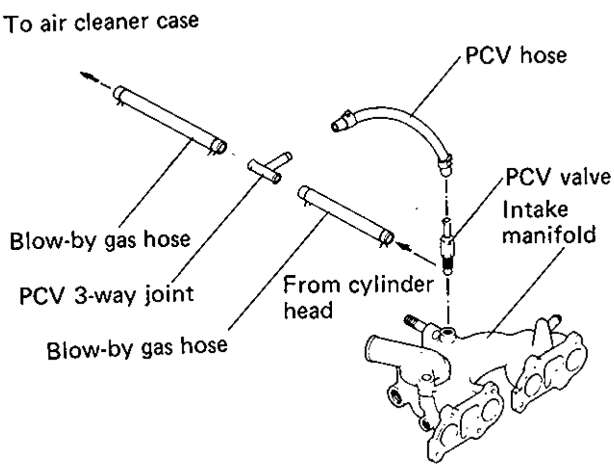


Fig. 2-1

1) Operation

A valve and two coil springs are fitted in the PCV valve. When the negative pressure in the intake manifold is small, the valve is open wide by spring force in the PCV valve and so draws a large amount of blow-by gas into the intake manifold. On the other hand, when the negative pressure is large, it causes the valve to open but only enough to draw a small amount of blow-by gas into the intake manifold.

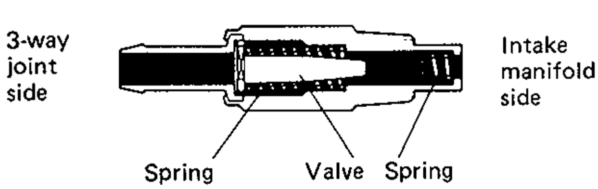


Fig. 2-2

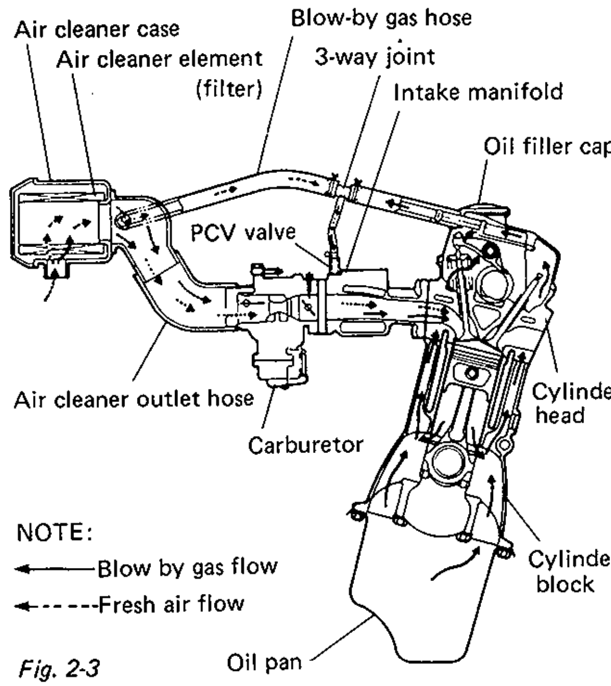


Fig. 2-3

2) Maintenance Service

[Hose]
Inspect these hoses for cracks and evidence of breakage and, as necessary, replace it. Check to be sure that the hose connection is tight.

[PCV valve]

- Remove PCV valve.
- Attach a clean hose to PCV valve.
- Blow from 3-way joint side.
  A) Check that air passes through easily.

> **CAUTION:**
> **Do not suck air through the valve. Petroleum substances inside the valve are harmful.**

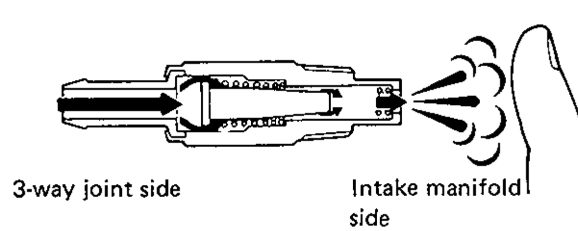


Fig. 2-4

- Blow from intake manifold side.

  B) Check that air passes through with difficulty.

  If the PCV valve fails in either of the checks, replace it.

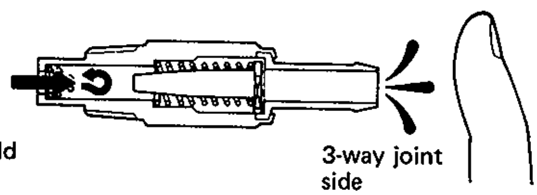


Fig. 2-5

- Reinstall PCV valve.

> **CAUTION:**
> **When re-installing the PCV valve, be sure to wrap its screw threads with a sealing tape.**

3) Periodic Maintenance Schedule (PCV valve)

Inspect at intervals of:	Every 40,000 km, 24,000 miles or 24 months

4) Trouble Shooting

	Complaint	Possible causes	Remedy
1	Engine will not start/Hard to start (cranks ok)	Leakage Vacuum of PCV line	Repair as necessary
2	Rough idle, stalls or misses	Leakage Vacuum of PCV line. Valve completely plugged or stuck.	"
3	Engine hesitates/ poor acceleration	"	"
4	Oiliness air cleaner	PCV valve stuck or system plugged	Repair or replace valve

3. CARBURETOR

3-1. Jetting

The jets of the below given sizes are used for the carburetor of the car equipped with P.C.V. valve which is described under Item 2 ENGINE.

> NOTE:
> **Although the cars for Australian market are not equipped with P.C.V. valve, their jets are of the following sizes.**

Jet	Size
Main Jet	ϕ1.13 mm (0.0445 in.)
Slow Jet	ϕ0.45 mm (0.0177 in.)

> NOTE:
> **For any information other than the above data, refer to the section 4 of the SERVICE MANUAL (99500-80000).**

3-2. Dash-pot

[This item is applicable to the vehicles equipped with Dash-Pot.]

1) Check to ensure that the coolant temperature indicated on the water temperature gauge is approximately 82°C (180°F). If it is lower than that, warm up the engine.
2) Stop the engine (ignition key at OFF position).

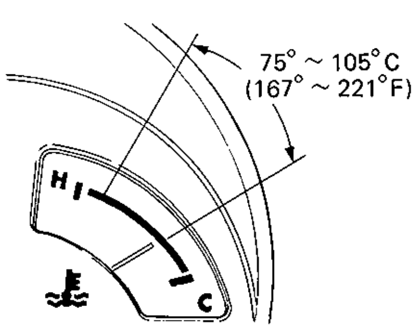


Fig. 3-1

3) Move the throttle lever to the halfway (1/2) position of its full open stroke with a finger.
4) Then let the finger off the throttle lever.
5) Observe how long it takes for the rod lever ① to return to its original position after being released.
It should be between 1 to 4 seconds.

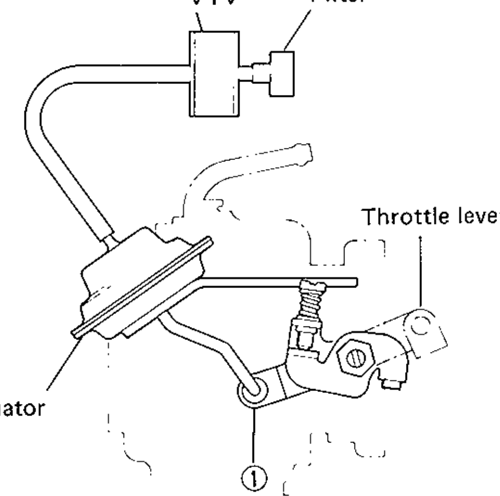


Fig. 3-2

Return time of actuator rod lever ①	1 ~ 4 Seconds

If not to the specified time, check the following parts.

[Actuator]

Stop the engine.
Disconnect the hose "A" from the actuator and move the throttle lever to the wide open throttle position. Holding the throttle lever at this position, close the actuator pipe (where the hose "A" was taken off) with a finger and then take the hand off the throttle lever.

If the rod "B" doesn't move (remains where it is) at this time and if it returns smoothly to its original position (idle position) when the finger is taken off the pipe, the actuator is in good condition.

If something is found wrong in this check, replace the actuator.

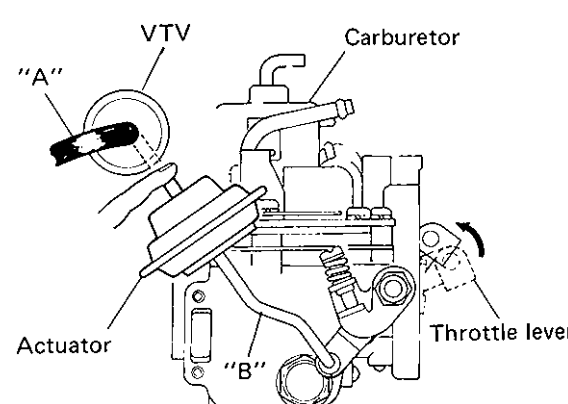


Fig. 3-3

[VTV (Vacuum Transmitting Valve)]

Use a vacuum pump gauge for the VTV check. If the pointer of the vacuum pump gauge reacts as described below in each condition, the VTV is in good condition.

With the vacuum pump gauge set at "A" (gray) side of the VTV, when the pump is operated, the pointer doesn't move (remains at zero position).

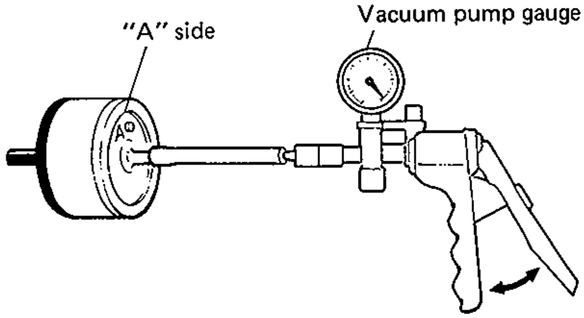


Fig. 3-4

With the vacuum pump gauge set at "B" (black) side of the VTV, when the pump is operated, the pointer moves considerably but moves back to zero position as soon as the pump is stopped.

If the check result is unsatisfactory, replace the VTV.

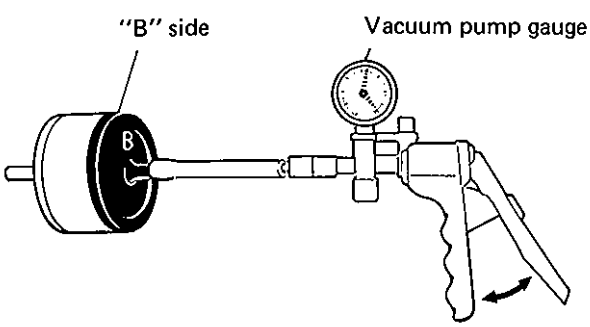


Fig. 3-5

4. ENGINE COOLING SYSTEM

Thermostat (For Finnish and Icelandic markets)

The thermostat used for the system is of the following specifications.

Thermostat functional specifications	
Temperature at which valve begins to open	88°C (190°F)
Temperature at which valve becomes full open	100°C (212°F)
Valve lift	8 mm (0.31 in.)

> NOTE:
> **For any information other than the above data, refer to the section 6 of the SERVICE MANUAL (99500-80000).**

5. IGNITION SYSTEM

Timing Advance

[This item is applicable to the Vehicles equipped with PCV valve.]

The advance characteristic of the centrifugal governor used for this system is shown in the below graph.

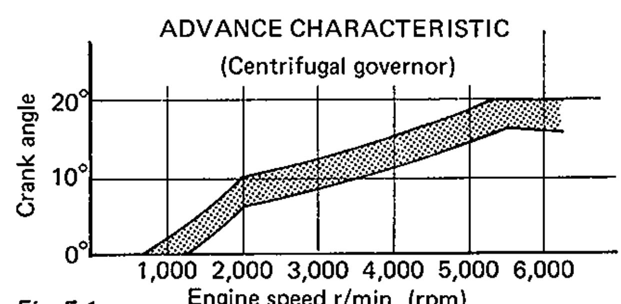


Fig. 5-1

> NOTE:
> **When reading the ignition timing by referring to the Fig. 4-1, add 10 degrees (Static ignition timing) to the value represented by the graph.**

> NOTE:
> **For any information other than the above graph, refer to the section 8 of the SERVICE MANUAL (99500-80000).**

6. SUSPENSION (For SJ410W)

Important Steps in Reassembly For Rear Stabilizer

Stabilizer Rod (upper side)

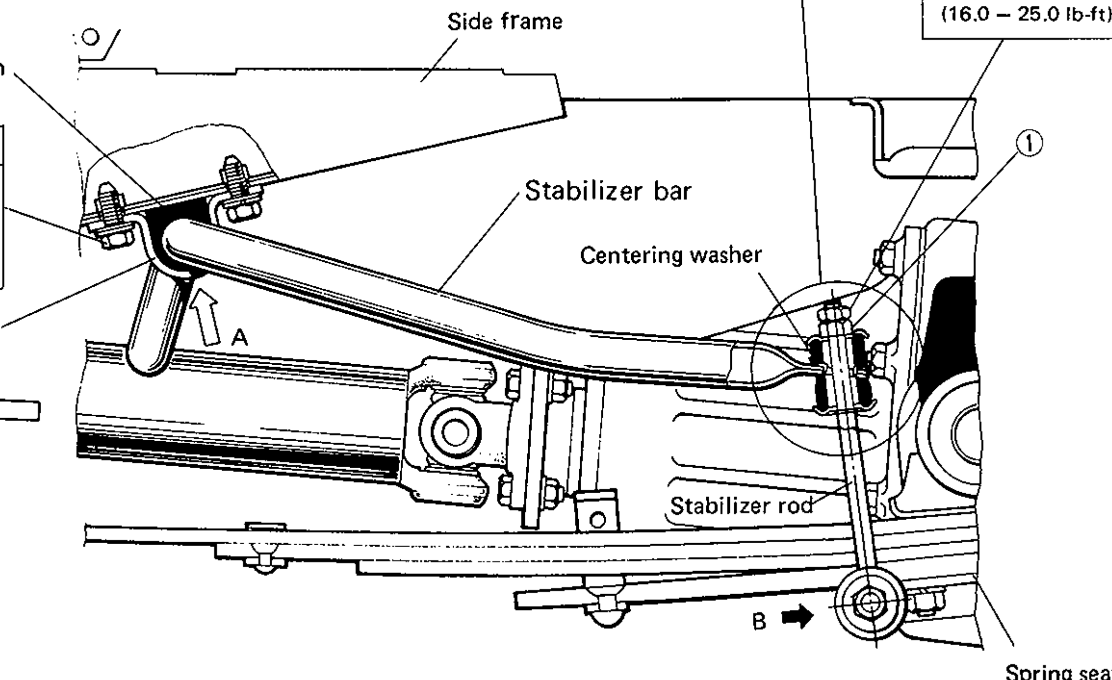
1. Make sure that the projection of the centering washer fits securely into the hole in the stabilizer bar as shown in the figure.
2. Mount the thicker nut ① first and then tighten lock nut specified torque.

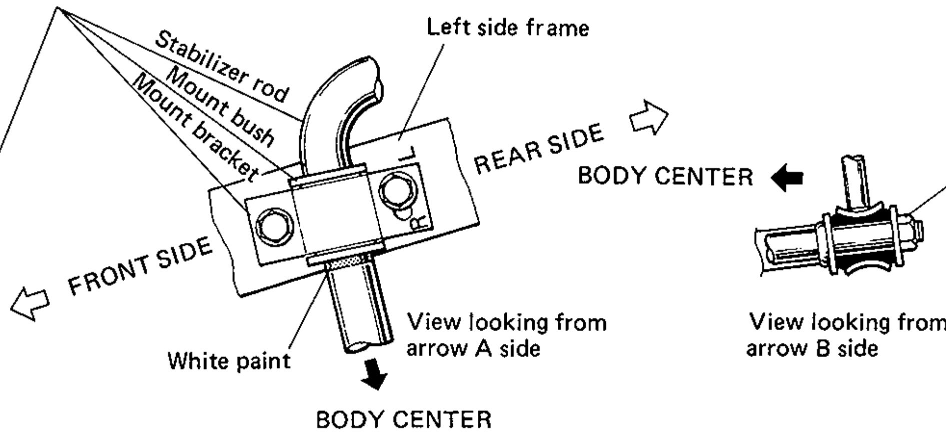
Lock nut

Tightening torque
22 – 35 N·m
2.2 – 3.5 kg-m
(16.0 – 25.0 lb-ft)

Mount bolt

Tightening torque
30 – 55 N·m
3.0 – 5.5 kg-m
(22.0 – 39.5 lb-ft)





Rod lower nut

Tightening torque
35 – 55 N·m
3.5 – 5.5 kg-m
(25.5 – 39.5 lb-ft)

Stabilizer Mount Bush

1. Install the stabilizer mount bush outside the white paint on the stabilizer bar (refer to the figure).
2. There are R and L marks on one end of the stabilizer bracket and two bolt holes on that side, too. When mounting these brackets (both right and left) to the side frames, direct the R and L marked side to the rear side of the car.
3. When mounting the bolt into the bracket hole, use the hole on the L marked side for the bracket on the left side frame and R marked side hole for the bracket on the right side frame.

Stabilizer Rod (lower side)

1. Be sure to remove the leaf spring seat from the leaf spring when removing and installing this rod.
2. Make sure to install the rod perpendicularly to the rear spring seat in its front and rear direction.

Fig. 6-1

7. BRAKES

7-1. Front Brake

1) Description

The front brake system uses disc brake of single piston floating caliper type.

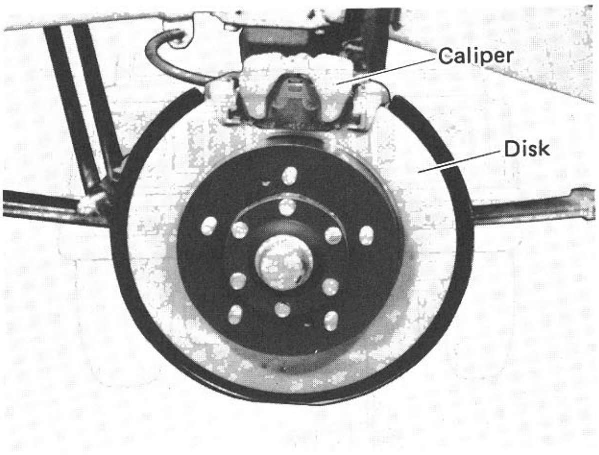
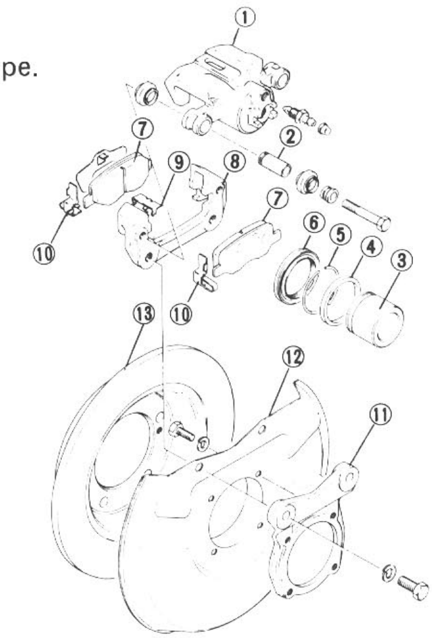


Fig. 7-1

1. Caliper
2. Cylinder guide pin
3. Piston
4. Piston seal
5. Boot ring
6. Cylinder boot
7. Pad
8. Caliper mounting
9. Dust plate
10. Pad support plate
11. Caliper holder
12. Dust cover
13. Disk



2) Operation

[Single piston floating caliper type]
The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Oil pressure generated in the cylinder causes the pad ① on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in Fig. 7-2, which pulls pad ② against the disc and so brakes the wheel.

The disc brake has no servo assistance as in drum braking, and it is necessary to increase the working pressure of the piston and pad. For this purpose, the wheel cylinder has a large bore. Only a little change in clearance between the disc and pad has therefore a large influence on the brake pedal stroke. It is necessary to have the clearance adjusted to the minimum at all times, by means of the rubber seal.

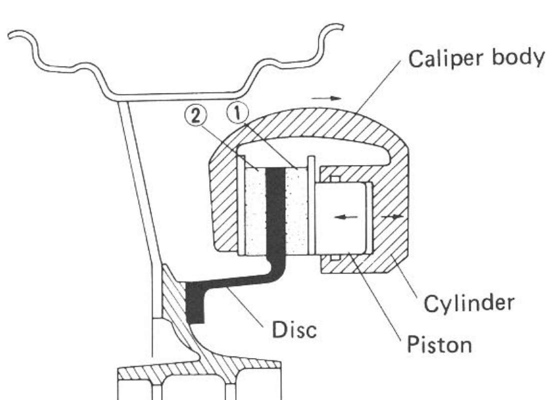


Fig. 7-2

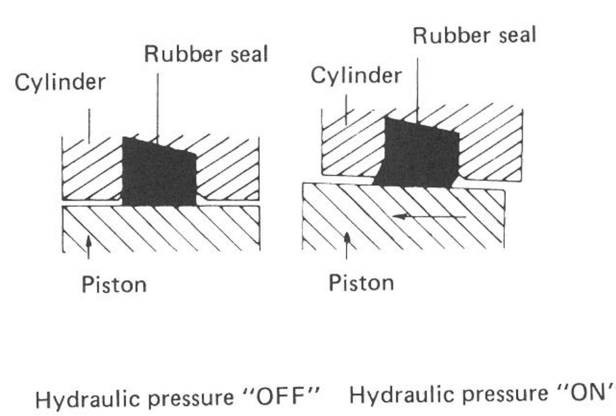


Fig. 7-3

[Clearance correction]
When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in Fig. 7-3. When pressure is taken off from the foot brake pedal and oil pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back. As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads are maintained in adjustment.

3) Removal

Brake pad

1. Loosen, but do not remove, front wheel hub nuts and raise the machine off the floor by jacking.

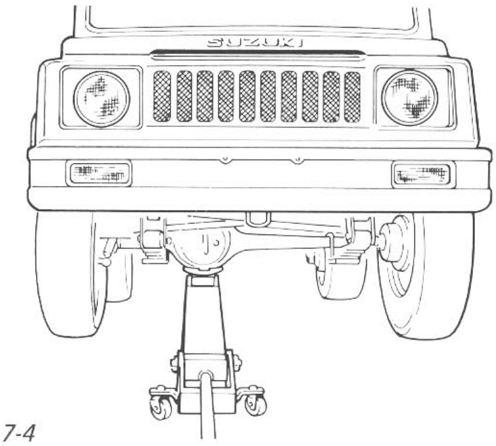


Fig. 7-4

2. Rest the machine steady on safety stands. Remove the hub nuts and take off the front wheels.

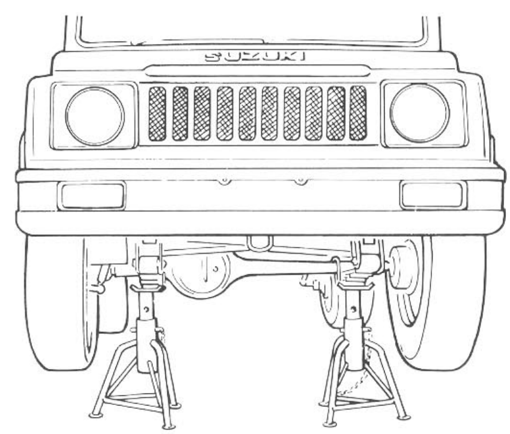


Fig. 7-5

Fig. 7-6

③ Remove the caliper pin bolts (2 pcs).

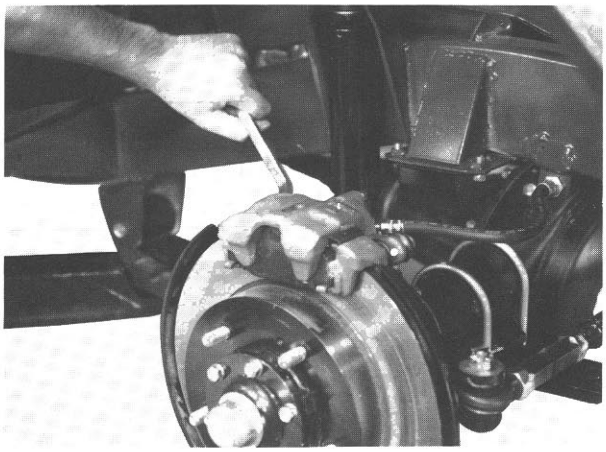


Fig. 7-7

④ Remove the caliper.

> NOTE:
> **At this time, be careful not to damage the brake flexible hose.**

⑤ Remove the pads.

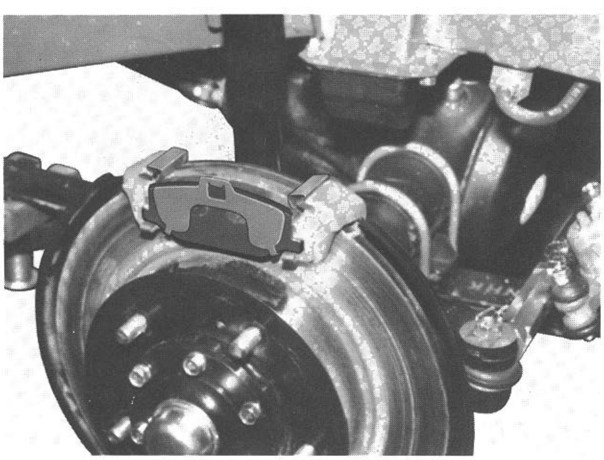


Fig. 7-8

Caliper

After taking down the wheel, remove the piston and piston seal according to the following procedure.

① Wipe the caliper clean.

② Detach the brake flexible hose from the caliper body (cylinder).

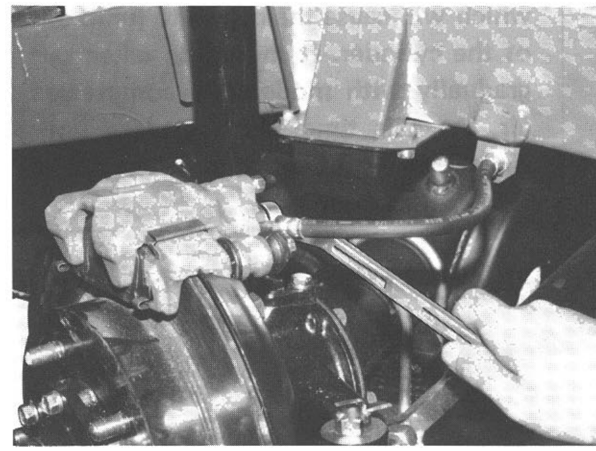


Fig. 7-9

③ Remove the caliper pin bolts (2 pcs).

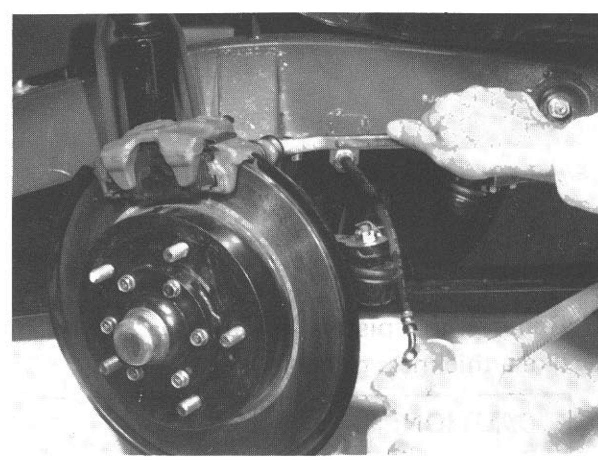


Fig. 7-10

④ Remove the cylinder boot set ring.

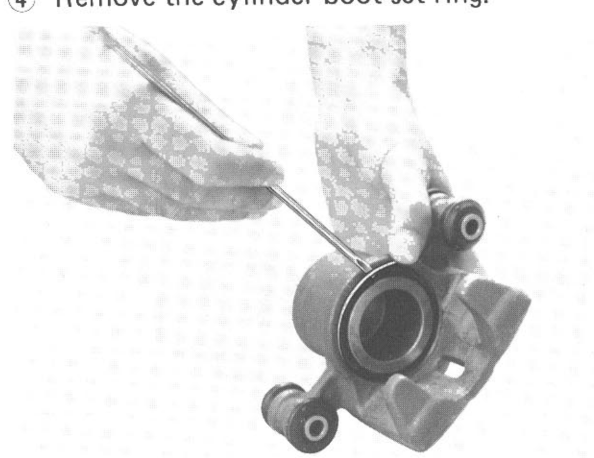


Fig. 7-11

⑤ Blow in the compressed air into the cylinder through the bolt hole where the flexible hose was fitted. With this air pressure, the piston can be pushed out of the cylinder.

> **WARNING:**
> **Do not apply too highly compressed air which will cause the piston to jump out of the cylinder. It should be taken out gradually with moderately compressed air. At this time, do not place your fingers in front of the piston when using compressed air.**

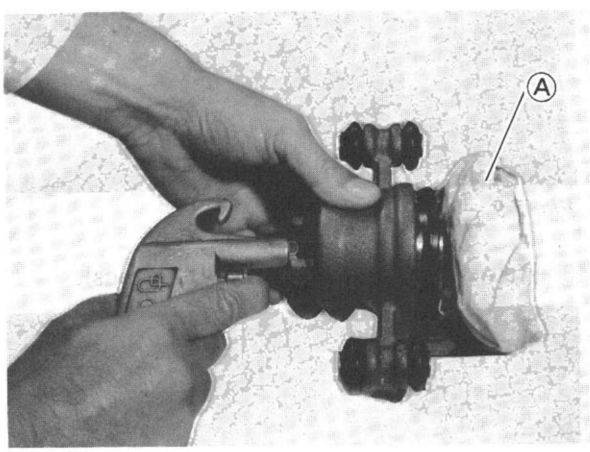


Fig. 7-12 Ⓐ Cloth

⑥ Remove the piston seal using a thin blade like a thickness gauge, etc.

> **CAUTION:**
> **Be careful not to damage the inside (bore side) of the cylinder.**

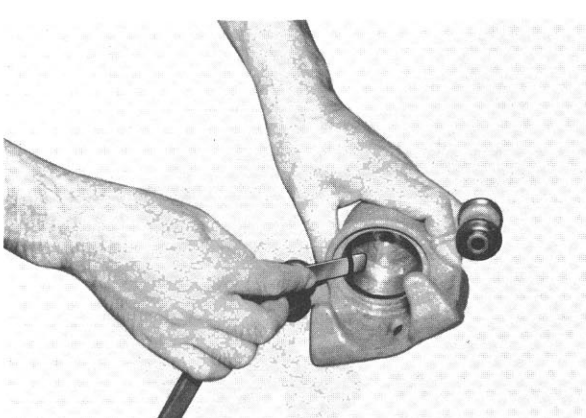


Fig. 7-13

Disc

① After taking down the wheel, Remove the caliper assembly by loosening the caliper bolts (2 pcs).

> **CAUTION:**
> **At this time, be careful not to damage the brake flexible hose.**

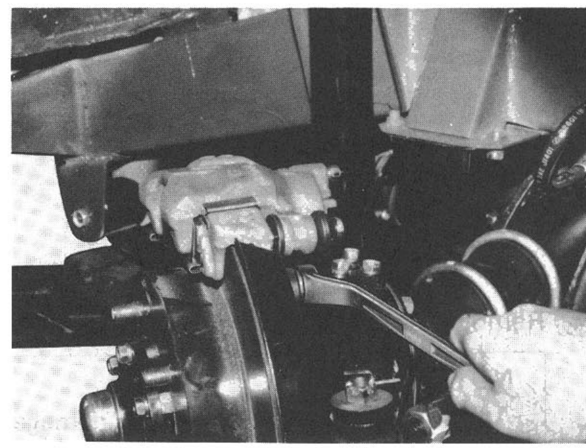


Fig. 7-14

② Remove the disc by using two 8 mm bolts Ⓑ.

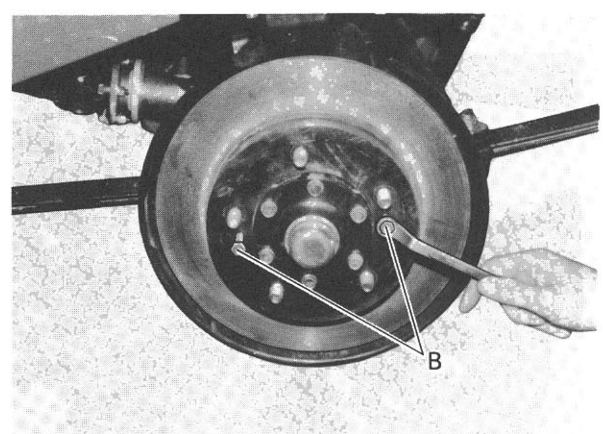


Fig. 7-15

4) Maintenance Service

Brake pad

Check the pad lining for wear. When the wear exceeds the limit, replace with a new one. Timing for the pad replacement can be determined with the line of the groove which is provided on each pad lining also. When it disappear, replace with a new one.

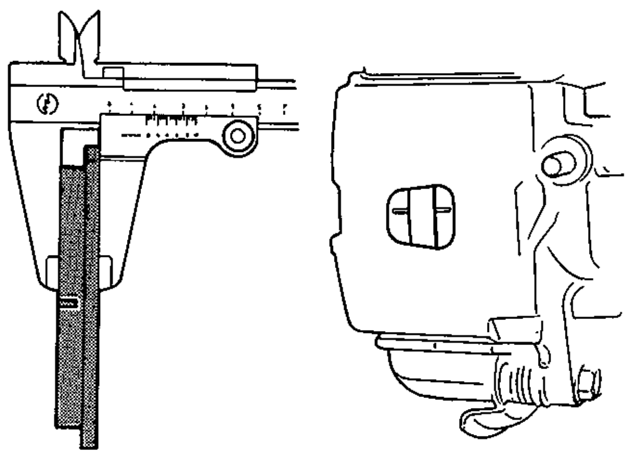


Fig. 7-16

> **CAUTION:**
> **Never polish the pad lining with sandpaper. If the lining is polished with sandpaper, hard particles of sandpaper will be deposited in the lining and may damage the disc. When it is required to correct the pad lining, replace it with a new one.**

	Standard	Limit
Pad thickness (lining + pad rim)	15.0 mm (0.590 in.)	6.0 mm (0.236 in.)

> **NOTE:**
> **When the pads are removed, visually inspect the caliper for brake fluid leak. Correct leaky point, if any.**

Brake disc

Check the disc surface for scratches in the wearing parts. Scratches on the disc surface noticed at the time of the specified inspection or replacement are normal and the disc is not defective if these are not serious. But when there are deep scratches or scratches all over the surface, replace the disc. When only one side is scratched, polish and correct that side.

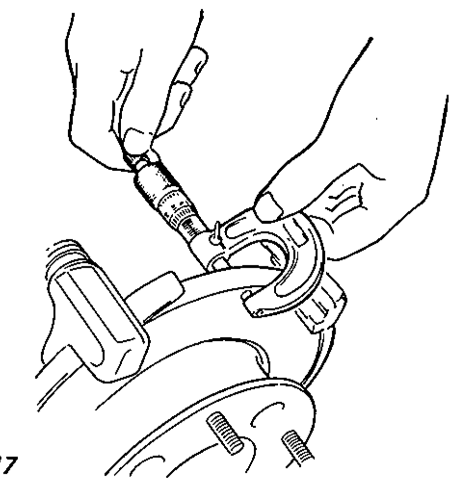


Fig. 7-17

	Standard	Limit
Disc thickness	10 mm (0.394 in.)	8.5 mm (0.334 in.)

To measure the deflection of a disc, make measurements at 2 points on the periphery and center of the disc with a dial gauge, while rotating the disc.

Limit on disc deflection	0.15 mm (0.006 in.)

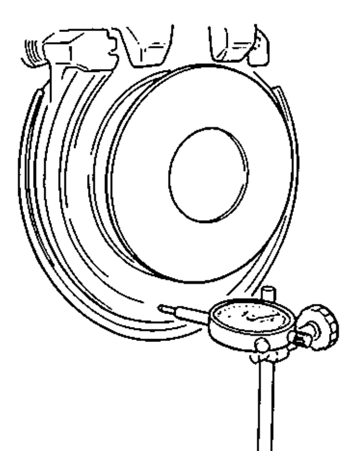


Fig. 7-18

Front brake rubber seal
(piston seal)
Excessive or uneven wear of pad lining may indicate unsmooth return of the piston. In such a case, replace the rubber seal.

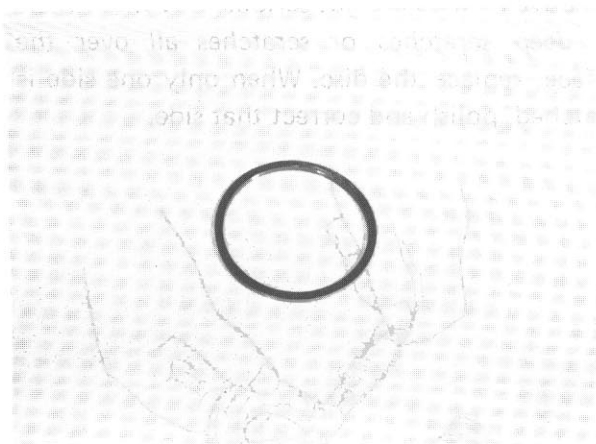


Fig. 7-19

Disc brake noise
Disc brake noises are classified into 2 kinds as follows:

(1) Noise during normal running while the brake is not in use.
There are 2 types of these noises:
One caused by the pad and disc coming in contact with each other and the other caused by vibration of the pad. These are eliminated when the brake is operated.
Check items ③, ④ and ⑤ in the list below and correct to remove the noises.
(2) Noise during operation of the brake.
Check items ①, ②, ③ and ④ in the list and correct if necessary.

Inspection	Remedy
① Wear of lining	Replace
② Deterioration of lining face	Replace
③ Foreign materials adhering	Clean
④ Scratching or deflection of the disc	Repair or re-place
⑤ Unsmooth return of the piston	Replace the seal

5) Precautions on Installation

Reassemble the front brake in the reverse order to disassembly, taking care in the following points.

> CAUTION:
> - **Wash each part cleanly before installation in the same fluid as the one used in the fluid tank.**
> - **Never use other fluid or thinner.**
> - **Before installing the piston and piston seal to the cylinder, apply the fluid to them.**
> - **After reassembling the brake oil line, bleed air from the line.**

Piston seal

The piston seal is used to seal the piston and cylinder and to adjust the clearance between the pad and disc. Replace with a new one at every overhaul. Fit the piston seal into the groove in the cylinder taking care not to twist it.

Piston and boot

Before inserting the piston into the cylinder, the boot must be fitted in the piston.

Make sure to fit the boot in proper direction as shown below.

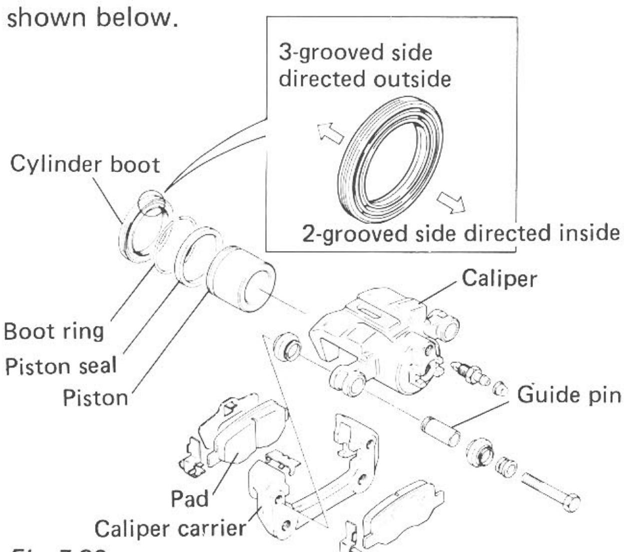


Fig. 7-20

When installing the boot to the cylinder, position the outer end of the piston so that it projects out of the end of the cylinder by about 10 mm (0.4 in.), this will facilitate the installation.

Install the boot set ring.

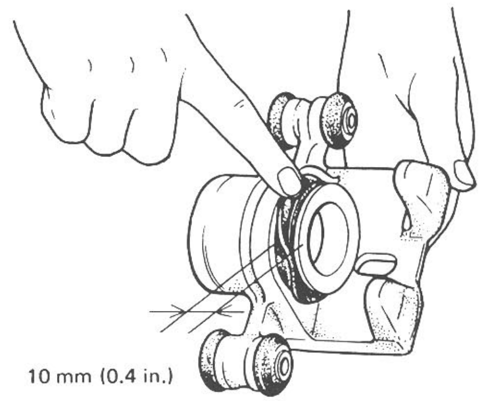


Fig. 7-21

Caliper

Before installing the caliper (cylinder body) to the carrier, check to ensure that the guide pins (2 pcs) are greased and that the guide pin inserted in each carrier hole can be moved smoothly in the thrust direction.

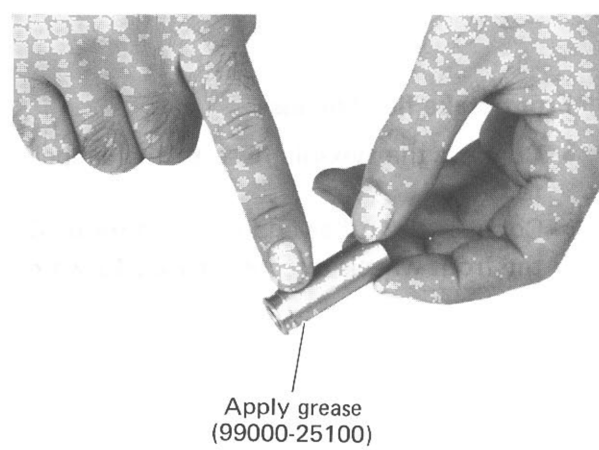


Fig. 7-22

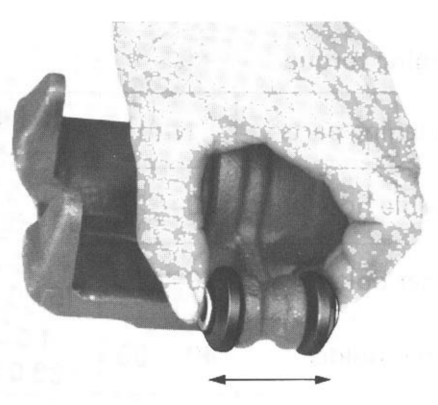


Fig. 7-23

Front brake disc and pad

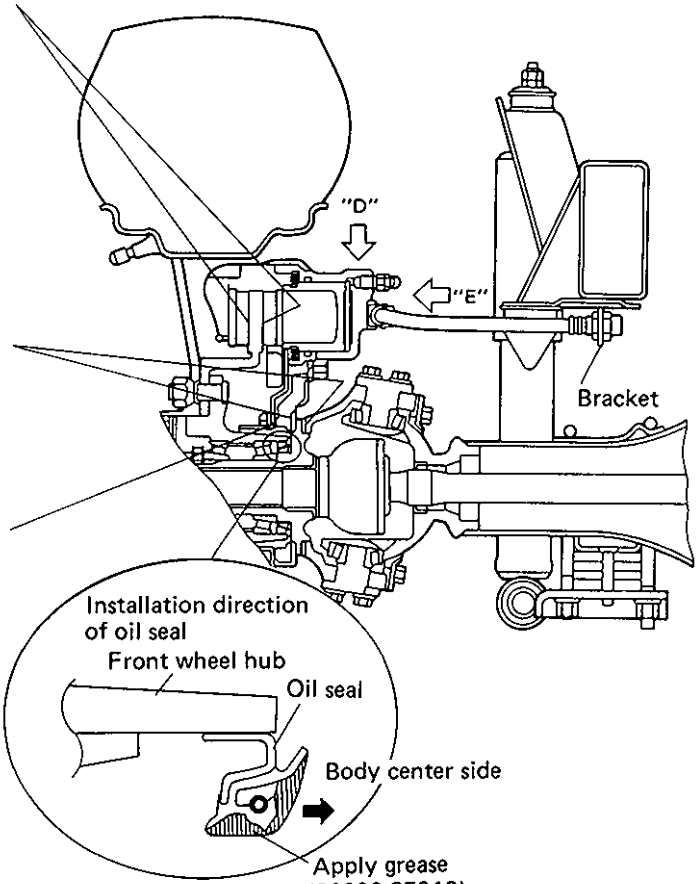
Use care not to scratch or put oil or grease on the sliding surface of the disc and pad during installation work.

Front wheel spindle

Apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of the brake caliper holder and the steering knuckle.

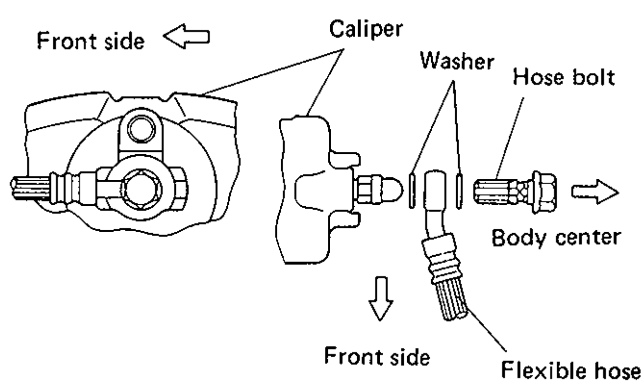
Dust cover

When fitting the dust cover onto the brake caliper holder, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.



Front brake flexible hose

- Connect the flexible hose to the caliper as shown below and tighten the hose bolt to the specified torque.
- Connect the other end of the hose to the chassis body bracket, being careful not to kink it with the front wheels directed straightforward.



Viewed from arrow "E" Viewed from arrow "D"

Tightening torque

Fastening parts	N·m	kg-m (lb-ft)
Flexible hose bolt	20– 25	2.0– 2.5 (14.5–18.0)
Carrier bolt	70–100	7.0–10.0 (51.0–72.0)
Caliper holder	40– 60	4.0– 6.0 (29.0–43.0)
Caliper pin bolt	18– 26	1.8– 2.6 (13.0–18.5)

NOTE:
For the other precautions on the brake line, refer to p. 26 of this book.

> **NOTE:**
> **After reinstalling all the parts which has been removed and disassembled, purge the air from the brake system.**

6) Inspection For Front Brake After Installing

Fit the tires and make certain that the tires rotate smoothly, with a force of less than 3.0 Kg (6.6 lb).

> **NOTES:**
> **For the above check, the following must be observed.**
> **1) Jack up the front wheels, both right and left, off the ground.**
> **2) Set the free wheeling hub of both right and left wheels to "LOCK", if so equipped.**
> **3) Shift the transfer shift lever to 2H (rear wheel) position.**
> **4) The below figure is for the outer periphery of the tires.**
> **5) Be careful not to depress the brake pedal when checking rotation of the tires.**

If rotation of the tires is heavy, check the following points:

- Breakage of wheel bearings.
- Improper adjustment of wheel bearing starting preload.
- Flatness of disc (Improper flatness brings the disc into contact with the lining during rotating and makes the rotation heavy).

To check this, measure the deflection of the disc.

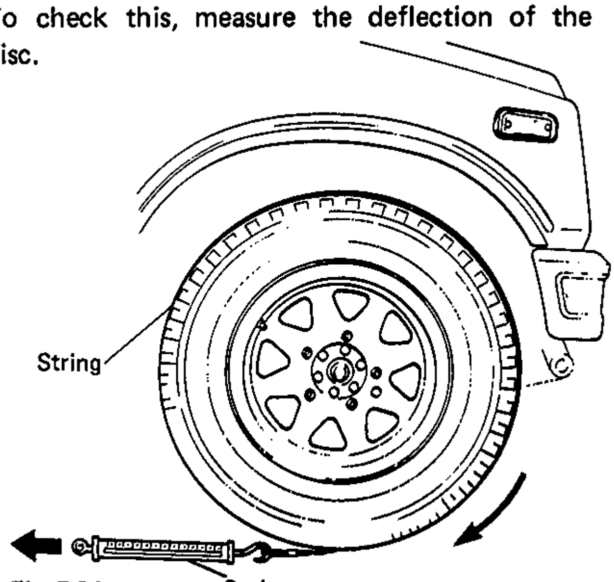


Fig. 7-24

7-2. Rear Brake

1) Description

The rear brake is drum brake type (having a leading shoe and a trailing shoe). Being provided with self shoe clearance adjusting system, the brake shoe clearance (shoe-to-drum clearance) is adjusted automatically.

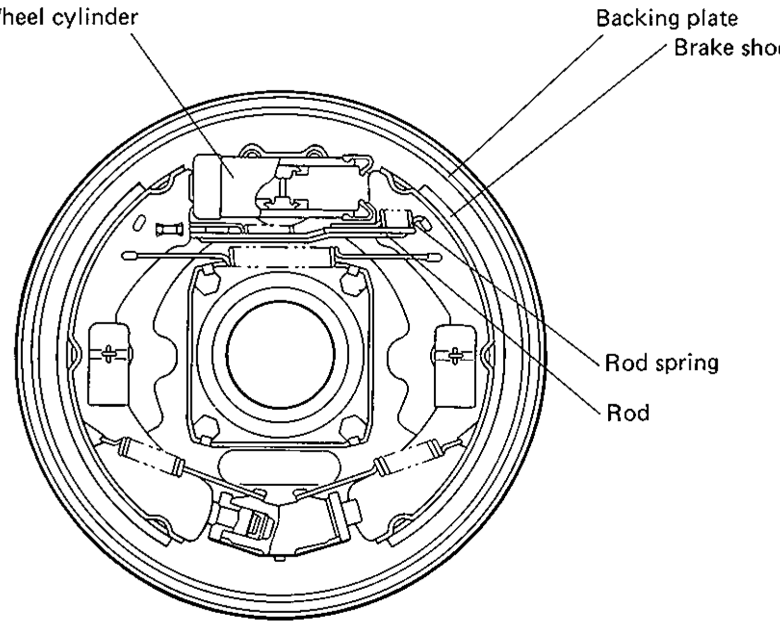


Fig. 7-25

2) Operation

With the general drum brake type, when the brake pedal is depressed, two pistons in the wheel cylinder force the brake shoes outward, restraining the turn of the drum.

The more the brake shoes get worn, the longer distance the pistons must move. As a result, the brake pedal travel (pedal-to-wall clearance) increases. Then the shoe clearance must be adjusted by the shoe adjusting screws. Thus periodical adjustment is required for the drum brake type in general.

This rear brake is provided with a self-adjusting system which automatically adjusts the shoe-to-drum clearance (pedal-to-wall clearance) caused by such brake shoe wear.

Components:

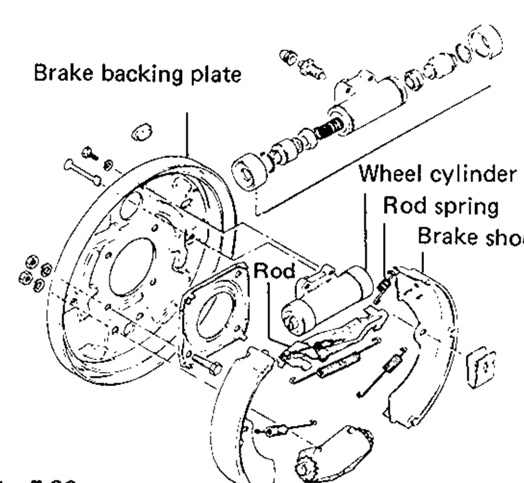


Fig. 7-26

[Clearance correction]
In each rear wheel cylinder, pistons, piston cups, spring seats and a piston spring ① are installed. When the brake pedal is depressed, oil pressure is applied to the inside of the chamber on the piston ②, ③.
Being actuated by this pressure, the piston ② moves to the left (piston ③ moves to the right) in the following figure and presses the brake shoe against the brake drum, thus producing brake power.

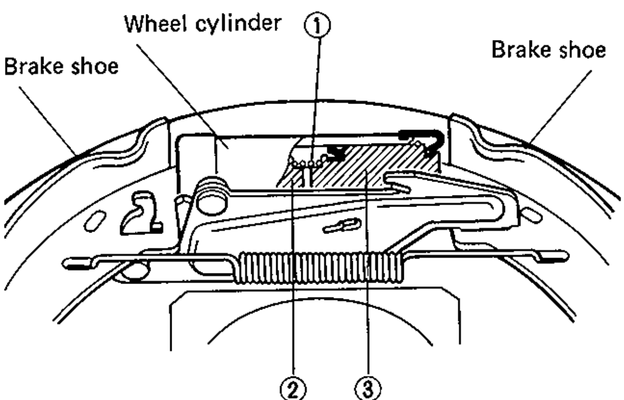


Fig. 7-27

At this time, the distance the brake shoe moves is "B", that is, the distance that "A" (the end of the long hole made in the brake shoes web) moves till it contacts the lever (1) which is fitted in the long hole.

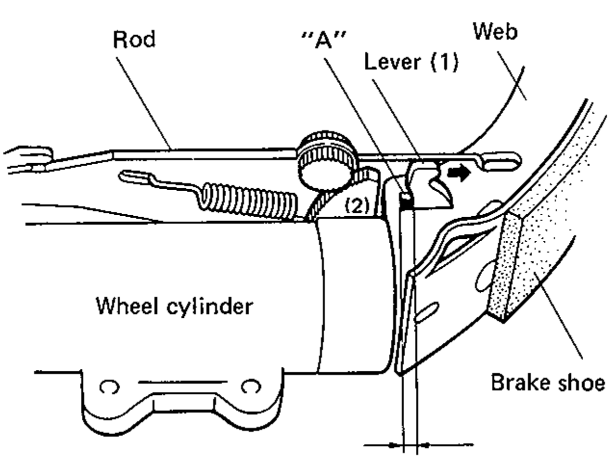


Fig. 7-28

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side by the aforementioned distance "B" and "A" of the brake shoe web contacts the lever (1). As the brake shoe gets worn and the brake shoe clearance becomes larger (longer brake pedal travel), the force applied to the lever (1) at the time of such a contact becomes larger. When it exceeds 10 ~ 12 kg, the "A" of the brake shoe web moves the lever (1) as much as the amount of the brake shoe lining wear toward the direction as shown with an arrow in the figure. Thus the shoe is forced against the drum and the brake force is produced.

The distance the lever (1) moves corresponds to the amount of wear. In accordance with the lever (1) movement, the fan-shaped ratchet (2) also moves, for they are assembled as a unit. The lever (1) and ratchet (2) remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.
When the brake pedal is released, the brake shoe is allowed to move back by the amount of clearance "B" by means of the return spring. In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

The brake shoe-to-drum clearance "B" corresponds to 0.6 ~ 0.8 mm in terms of the brake drum diameter A ⟷ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.15 mm in terms of the brake drum diameter A ⟷ A'.

The spring provided in the wheel cylinder prevents the piston from moving back more than the specified brake shoe-to-drum clearance.

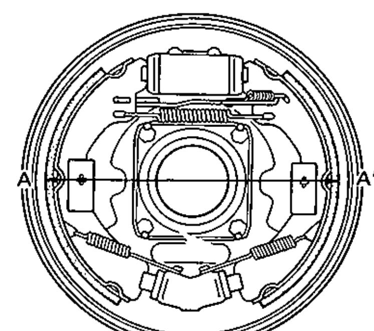


Fig. 7-29

3) Removal

Brake drums and shoes

Loosen, but do not remove, rear wheels hub nuts and raise the machine off the floor by jacking. Rest the machine steady on safety stands. Remove the hub nuts and take the rear wheels. Each wheel has five hub nuts.

After taking down the rear wheels, remove the brake drums by using the special tools.

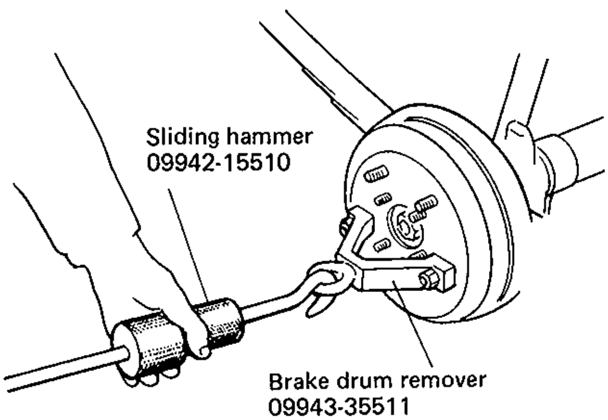


Fig. 7-30

> **NOTES:**
> - **Before removing the drums, insert a plain screw driver through the oblong hole in the brake backing plate and remove the brake shoe rod from the brake shoe rim (by pushing the V-shaped groove of the rod with the screw driver). As a result, the brake shoe returns to its original position.**
> - **Before reinstalling the brake drum, take the brake shoe spring "A" off the rod, fit the rod to the shoe rim groove and then catch the spring "A" onto the rod.**

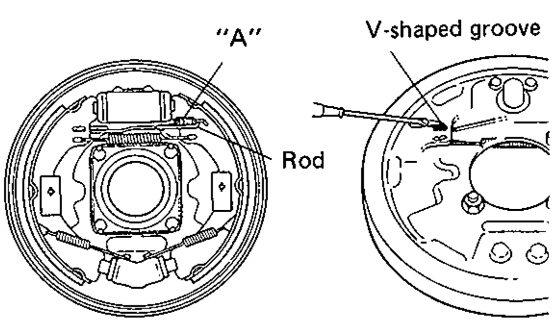


Fig. 7-31

4) Maintenance Service

Brake drum

Inspect the drum for cleanliness. Check the wear of its braking surface by measuring its inside diameter.

Item	Standard	Service Limit
Brake drum ID	220 mm (8.66 in.)	222 mm (8.74 in.)

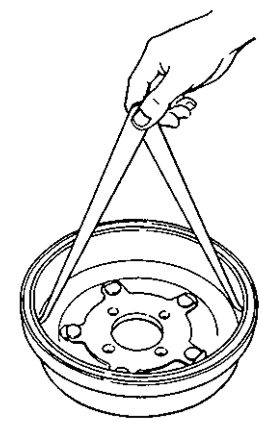


Fig. 7-32

Brake shoe

Where the lining is worn out beyond the service limit, replace the shoe.

Brake lining	Standard	Service limit
Thickness (lining + shoe rim)	7.0 mm (0.28 in.)	3.0 mm (0.12 in.)

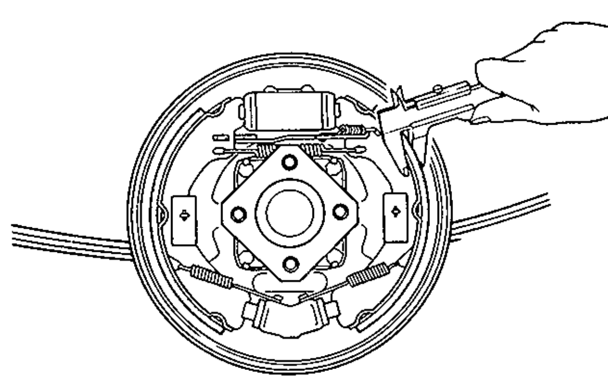


Fig. 7-33

Wheel cylinder
When removing the brake drum, check the wheel cylinder for oil leakage. If any leakage is found, replace the wheel cylinder inner parts.

Brake shoe clearance adjustment
As the rear brake shoe clearance (shoe-to-drum clearance) of this model is adjusted by the self shoe clearance adjusting system, no other adjustment is required in general. However, after such a service work including removal of the brake drum, adjust it by depressing the foot-brake pedal four or five times at 20 ~ 30 kg (44 ~ 66 lb). This must be carried out before driving the vehicle. Adequancy of the brake shoe clearance can be checked by the pedal-to-wall clearance check described in item 7-3.

Tightening torque:

Fastening parts	N·m	kg-m	lb-ft
Wheel cylinder bolt	7 ~ 11	0.7 ~ 1.1	5.5 ~ 7.9
Shoe anchor sub nut	13 ~ 23	1.3 ~ 2.3	9.5 ~ 16.5

NOTE:
Refer to the SERVICE MANUAL (99500-80000) for the other tightening torque.

7-3. Brake Pedal

Inspect the brake pedal-to-wall clearance according to the following procedure.

Inspection
With the brake pedal depressed at about 30kg (66 lb), measure the clearance (B) between the pedal arm and wall. If the measured clearance is less than 30 mm (1.18 in.), inspect the pads and shoes of the front and rear brakes for defects. Correct or replace the parts found defective.

Pedal-to-wall clearance (B) (when pedal is depressed at 30 kg (66 lb))	30 mm (1.18 in.) minimum

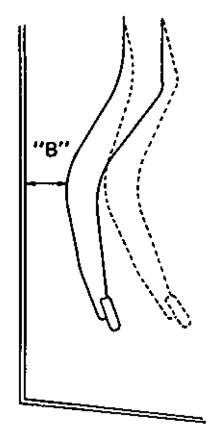


Fig. 7-34

7-4. Important Steps in Installation For Brake Line

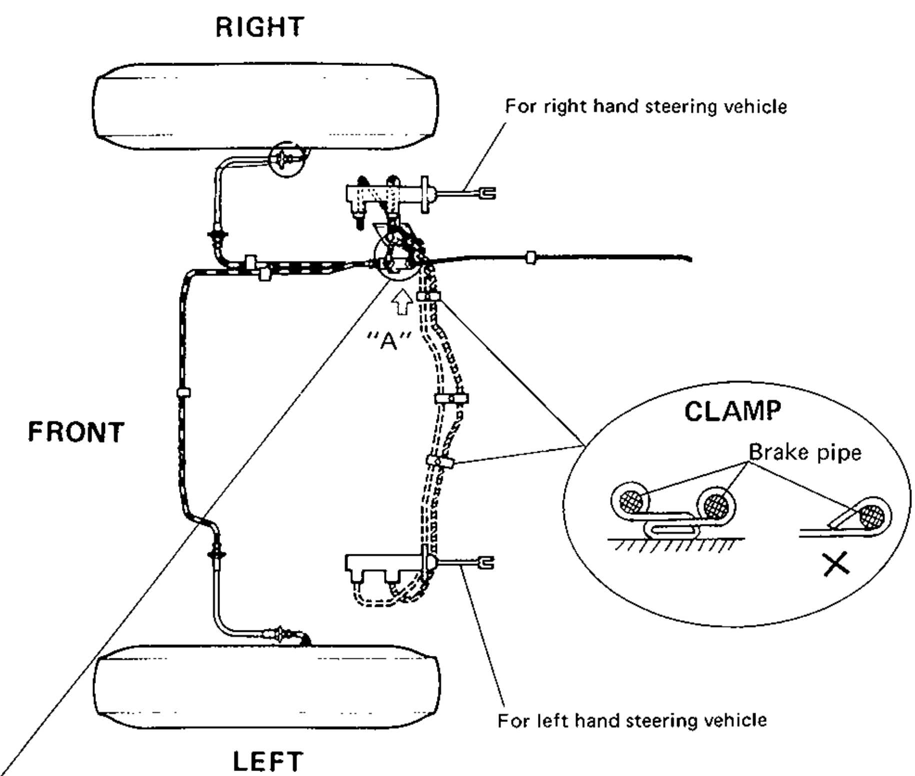
> NOTE:
> Instruction given in [ ] is applicable to those cars equipped with D.S.P. (Deceleration Sensing Proportioning) valve for European market.

Brake flexible hose

- Make sure that the flexible hose is not twisted when it is installed or connected with the pipe.
- The front hose and rear hose should be connected in advance to the caliper side and housing side respectively.
- The front hose mustn't be twisted when the steering wheel is in straightahead position.

Brake air bleeder plug

Air in the brake circuit must be purged out by loosening the bleeder plugs at front brakes (both rights and left) and rear brake (left).
[Then with D.S.P. valve equipped cars, loosen the bleeder plugs of the D.S.P. valve and perform air purging in the order of ① and ② as illustrated below.]
Refer to SERVICE MANUAL (99500-80000) for practice of air purging.



5-way joint

Viewed from arrow "A"

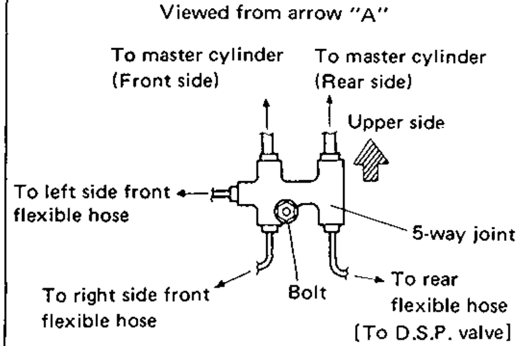
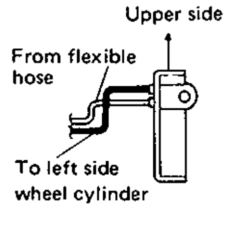


Fig. 7-35

Brake drum

Before installing the brake drum, check its inner surface which slides with the brake shoe to ensure that it is free from any foreign matters such as oil stain and rust.

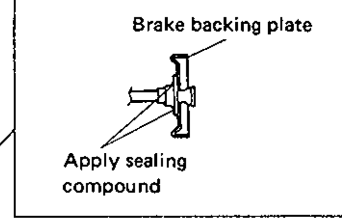
Brake pipes (Right side)



Install the brake pipe on the wheel cylinder properly using care for its installing position.

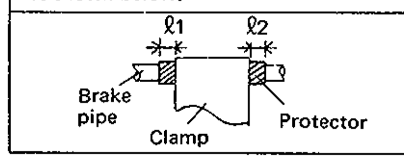
Brake backing plate (Right & Left)

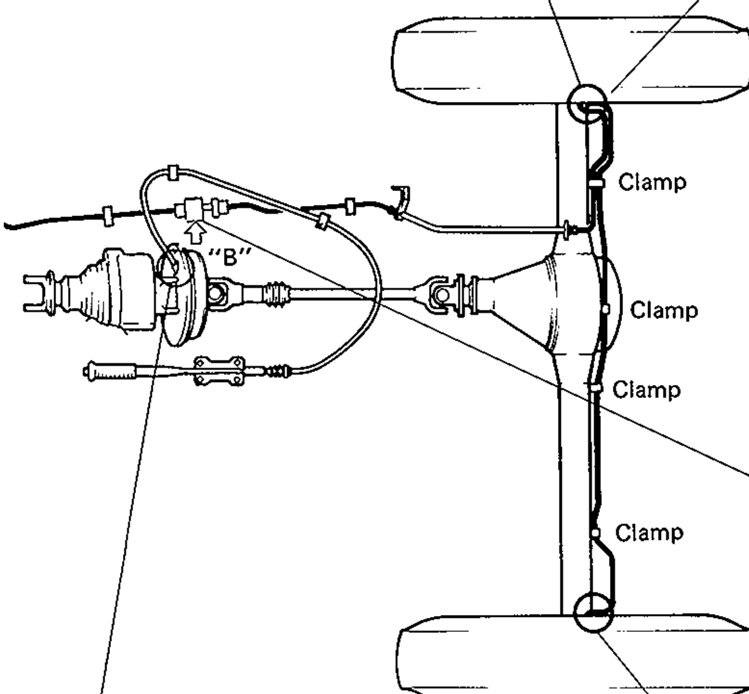
When installing the backing plate onto the axle housing, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.

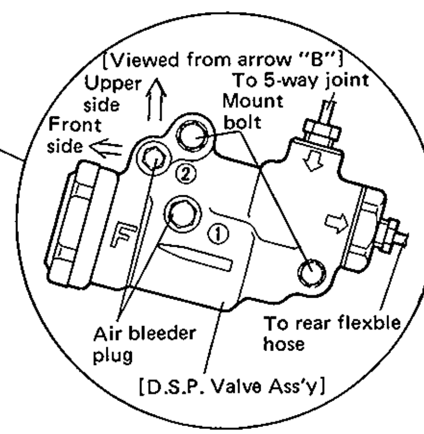


Clamps on the rear axle

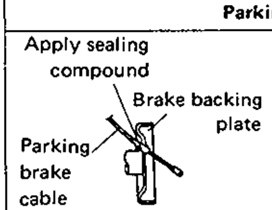
When installing the clamp, $\ell_1 = \ell_2$ as shown below is recommended as a standard. Position the clamp over the protector so that both ℓ_1 and ℓ_2 are at least 2 mm (0.08 in). Make sure to clamp the pipe and protector properly as shown below.





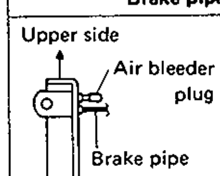


Parking brake cable



When installing the cable, apply SEALING COMPOUND 366E (99000-31090) to the illustrated position of the cable.

Brake pipe (Left side)



Install the brake pipe on the wheel cylinder properly using care for its installing position.

8. FRONT FREE WHEELING HUB (optional parts)

1) Description

The free wheeling hub is specified as one of the optional parts, but its description is missing in SERVICE MANUAL (99500-80000).
Since full description on its operation, installation and maintenance is contained in this section, make sure to perform appropriate service in accordance with it.

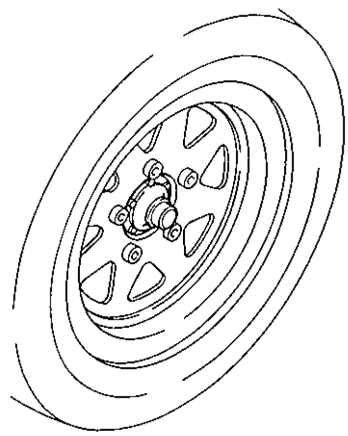


Fig. 8-1

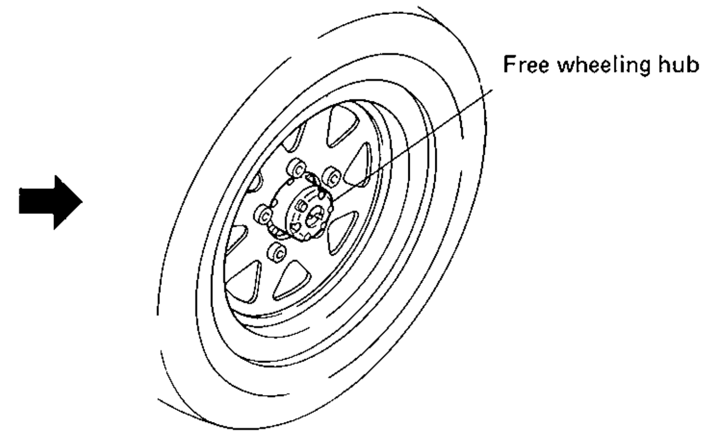


Fig. 8-2

2) Operation

A free wheeling hub should be fitted onto each of the right and left front wheel hubs. The free wheeling hub has a knob and two embossed marks, "FREE" and "LOCK". When the knob is set to the "FREE" position, the axle shaft and wheel are disconnected and the revolution of the front wheels becomes free. When it is set to the "LOCK" position, the axle shaft and wheel are connected.

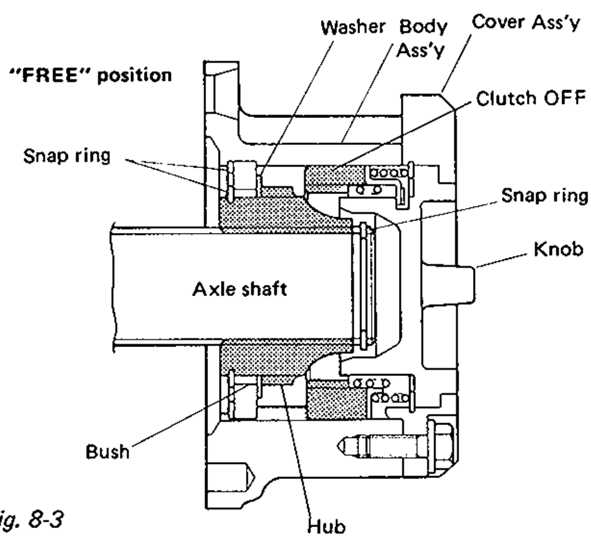


Fig. 8-3

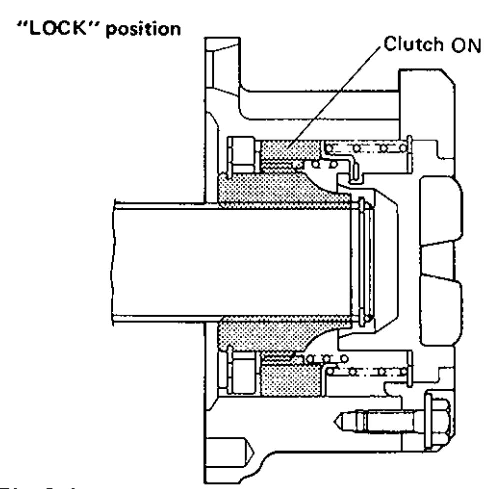


Fig. 8-4

For their usage, refer to Owner's Manual attached to the vehicle.

> **CAUTION:**
> **Both of the right and left wheeling hub knobs must be set to the same position (either FREE or LOCK). Don't set one to "FREE" and the other to "LOCK" positions.**

3) Installation Instruction

Install the parts (shown in below Fig.) in accordance with the following procedure.

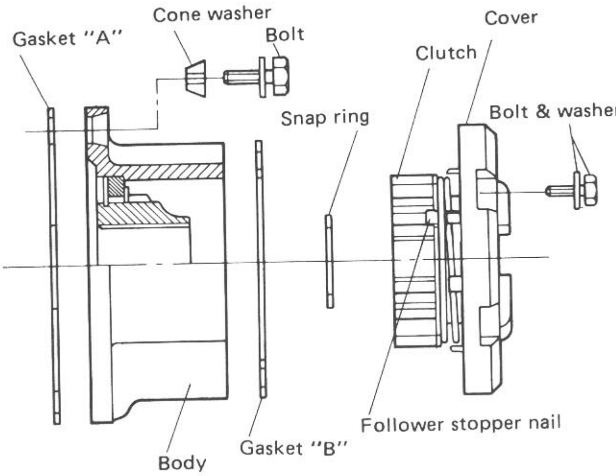


Fig. 8-5

① After aligning " ▽ " mark on the knob of Free wheeling hub cover with "FREE" position, separate free wheeling cover Ass'y from body Ass'y.

② To facilitate installation, apply the sealing compound 366E (99000-31090) thin.

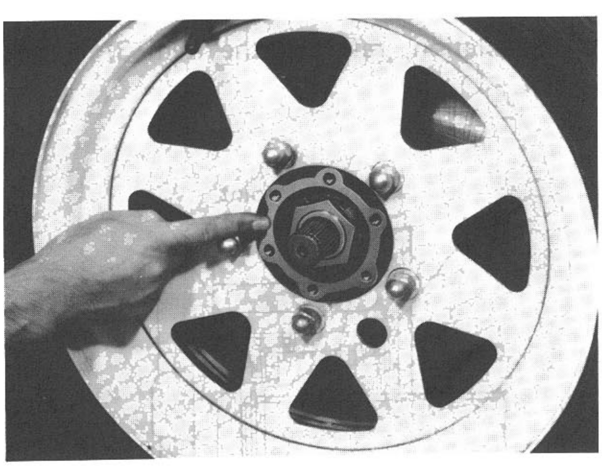


Fig. 8-6

③ Install the gasket "A" and free wheeling hub body Ass'y on the front wheel hub.

Tightening torque	N·m	kg-m	lb-ft
	20 ~ 30	2.0 ~ 3.0	14.5 ~ 21.5

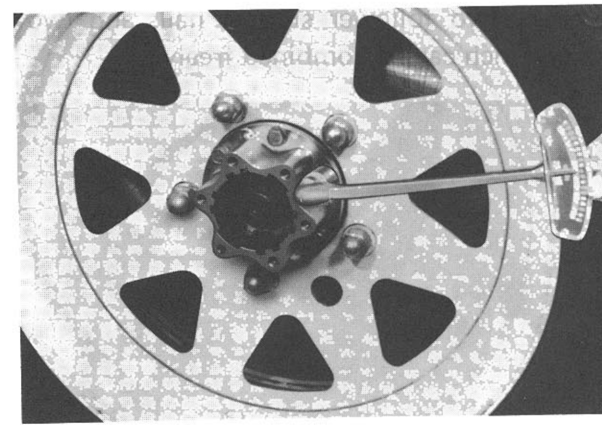


Fig. 8-7

④ Put the bolt ⓐ into the front axle shaft and pull out the shaft and fit the snap ring in the groove of axle shaft.
Remove the bolt ⓐ from axle shaft.

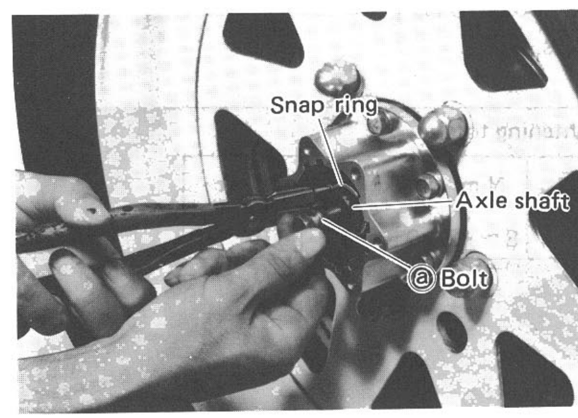


Fig. 8-8

⑤ Install the cover Ass'y to body Ass'y so as to fit follower stopper nail to groove of body Ass'y.

NOTES:
Before installing cover Ass'y, make sure the following points.
1. **" ▽ " mark on the knob is in "FREE" position.**
2. **Clutch is lifted to the cover side, if not (shown in Fig. 8-9) it may cause malfunction.**
3. **Gasket is set justly.**

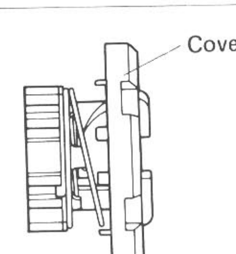


Fig. 8-9

There are two follower stopper nails and two grooves which can be combined freely.

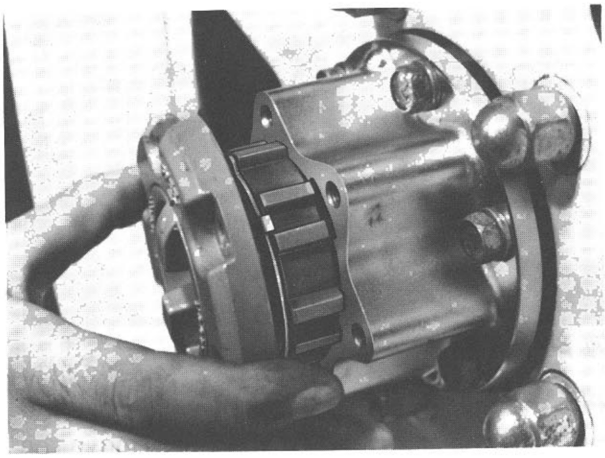


Fig. 8-10

⑥ Fix cover Ass'y to body Ass'y with cover bolts.

Tightening torque

	N·m	kg-m	lb-ft
Cover bolts	8 ~ 12	0.8 ~ 1.2	6.0 ~ 8.5

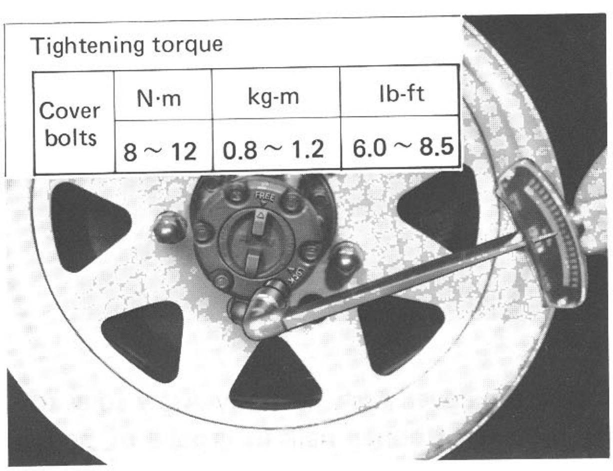


Fig. 8-11

⑦ To check the free wheeling hubs operation, jack up the front end. Move the knob of the free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if the wheel operates correctly with the knob at "FREE" and "LOCK" positions by rotating the wheel by hand.

4) Maintenance Service

The vehicle equipped with the free wheeling hubs are subject to the following periodic checks.

Free wheeling hub inspection interval	Every 10,000 km (6,000 miles) or 6 months

To check the free wheeling hubs operation, jack up the front end. Move the knob of the free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if the wheel operates correctly with the knob at "FREE" and "LOCK" positions by rotating the wheel by hand.

Should the check result is unsatisfactory, remove the free wheeling hub cover and grease each sliding surface with the SUZUKI SUPER GREASE A (99000-25010) or multipurpose grease after cleaning the each sliding part.

If faulty operation is still noted even after greasing, correct the defective part or replace it with a new one.

CAUTION:
The hubs should not be packed with grease.

For installation, refer to the item 3) in this booklet.

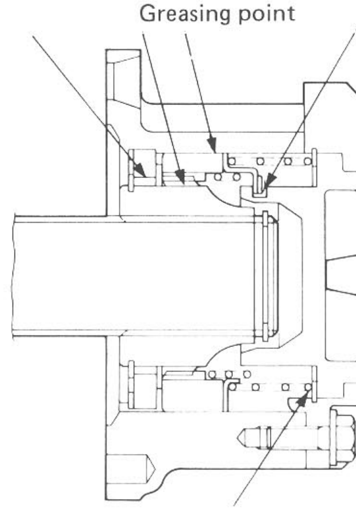


Fig. 8-12

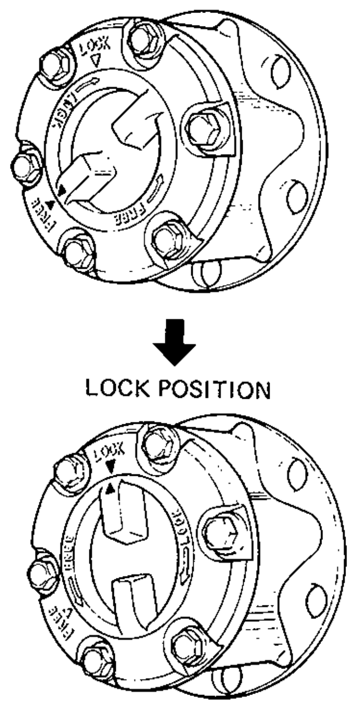


Fig. 8-13

9. TRANSFER GEAR BOX

9-1 Transfer Gear Box – 1 (For General Market Except European Market)

This section describes the transfer gear box installed in vehicles produced between March and May 1983. (Applicable body numbers: SJ40-140001 ~ SJ40-143366, SJ40T-105001 ~ SJ40T-105261, SJ41-102001 ~ SJ41-102927).

4-Wheel Drive Indicator Light Switch

4-wheel drive indicator light switch is installed on the transfer front case. This switch lights the indicator light when the gear shift lever is shifted to 4-wheel drive position (L4 or H4).

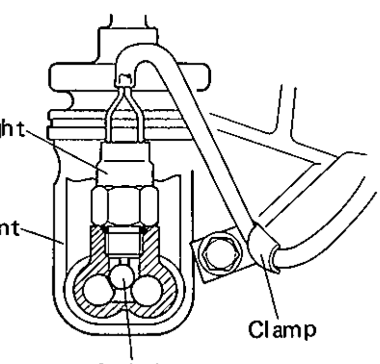


Fig. 9-1

Transfer Gear Ratio (For Peruvian, Colombian, and New Zealand Markets)

Gear ratio of transfer provided 4WD switch is as follows.

Shift position	Rear-wheel drive	All-wheel drive high	All-Wheel drive low
Primary reduction ratio	1.077 (42/39)		
Secondary reduction ratio	1.476 (62/42)	1.476 (62/42)	2.375 (57/24)
Overall reduction ratio	1.590	1.590	2.557

Vehicle with above transfer is provided with below differential.

Differential final reduction ratio	4.555 (41/9)

9-2 Transfer Gear Box – 2
(For All Market)

Described hereunder are structure, disassembly, reassembly and maintenance service on the transfer gear box installed in vehicles produced since May (July for European Market) 1983. (In this type of transfer gear box, the counter shaft is secured with a lock plate.)

EFFECTIVE BODY NO.

For European Market	For the Other Market
x JSAOSJ40000540001 x ~	SJ40 – 143367 ~
x JSAOSJ40V00540001 x ~	SJ40T – 105262 ~
x JSAOSJ40T00501001 x ~	SJ41 – 102928 ~
x JSAOSJ41000501001 x ~	

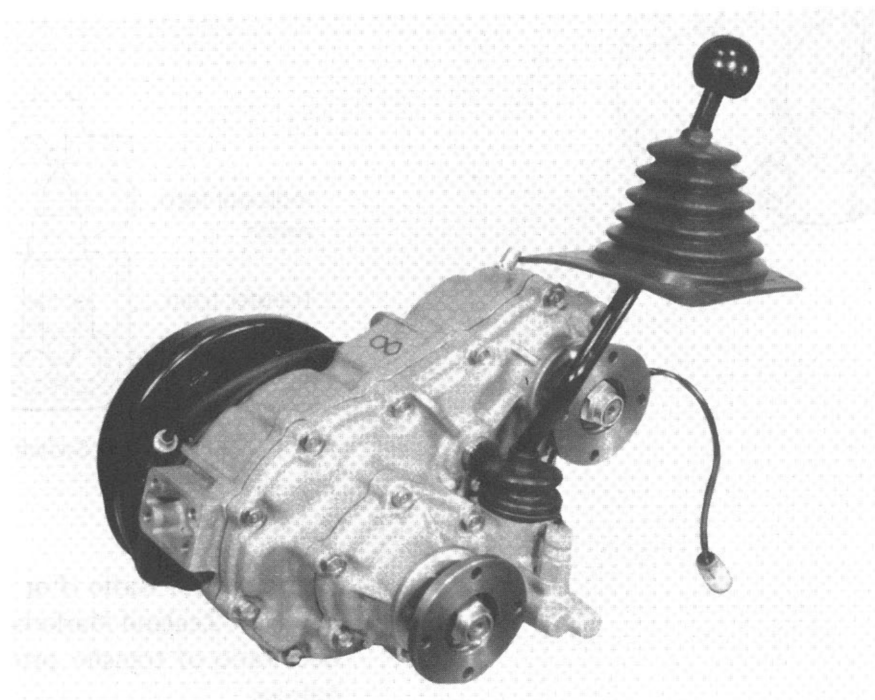


Fig. 9-2

Description

The structure and components of this transfer gear box are as shown below. Its working principle and operation are the same as described in Group 14 of SJ410/410V/410K SERVICE MANUAL.

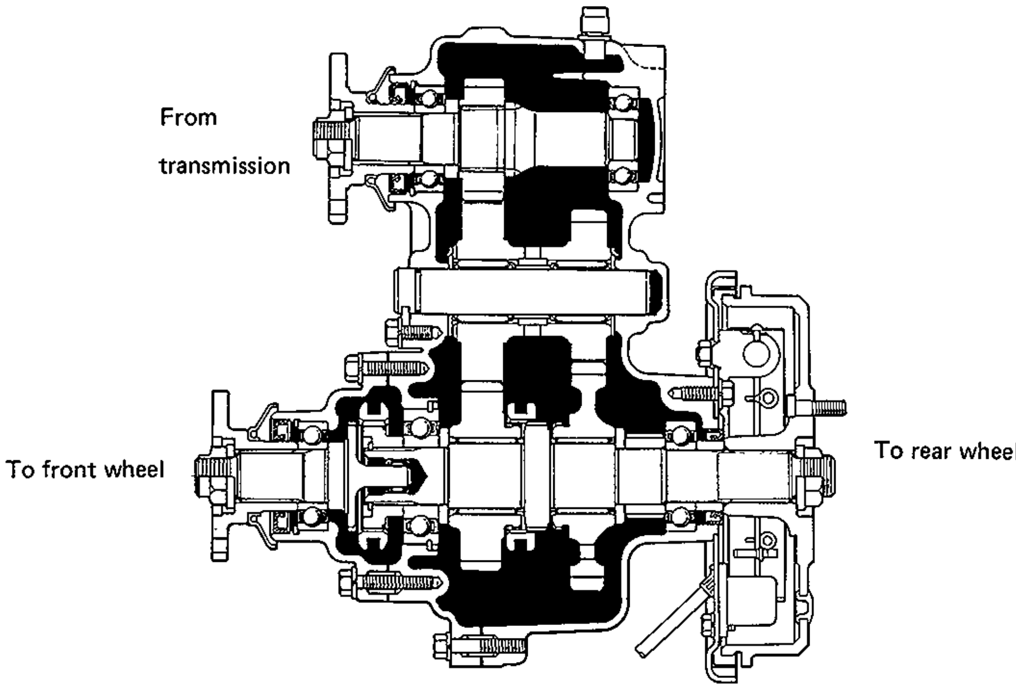
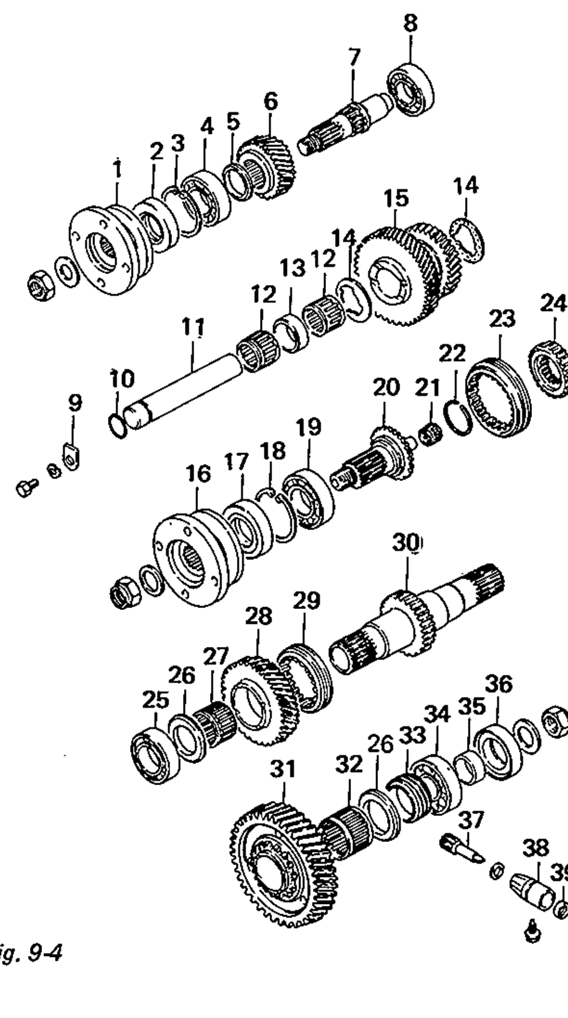


Fig. 9-3



1. Flange
2. Oil seal
3. Circlip
4. Bearing
5. Thrust washer
6. Input gear
7. Input shaft
8. Bearing
9. Counter shaft lock plate
10. O-ring
11. Counter shaft
12. Bearing
13. Spacer
14. Thrust washer
15. Counter gear
16. Flange
17. Oil seal
18. Circlip
19. Bearing
20. Output front shaft
21. Bearing
22. Circlip
23. Sleeve
24. Hub
25. Bearing
26. Thrust washer
27. Bearing
28. Output high gear
29. Sleeve
30. Output rear shaft
31. Output low gear
32. Bearing
33. Speedometer drive gear
34. Bearing
35. Retainer
36. Oil seal
37. Speedometer driven gear
38. Speedometer gear case
39. Oil seal

Fig. 9-4

Gear Ratio Data

Shift position	Rear-wheel drive	All-wheel drive High	All-wheel drive Low
Primary gear ratio (Reduction ratio)	53/31 (1.709)		
Secondary gear ratio (Reduction ratio)	49/53 (0.924)	49/53 (0.924)	47/32 (1.468)
Overall transfer reduction ratio	1.580	1.580	2.511

Transfer Services Not Requiring Transfer Removal

The following parts or components do not require transfer removal to receive services (replacement, inspection):

Part or Component	Nature of Service
1. Universal-joint yoke flanges	Replacement or inspection
2. Front drive shift shaft fork	Replacement or inspection
3. Transfer output front shaft oil seal	Replacement or inspection
4. Transfer output front shaft bearing	Replacement
5. Transfer output front shaft	Replacement
6. Transfer front case	Replacement
7. Front drive clutch hub	Replacement or inspection
8. Front drive clutch sleeve	Replacement or inspection
9. Transfer input shaft oil seal	Replacement
10. Center brake drum	Replacement or inspection
11. Center brake shoe	Replacement or inspection
12. Center brake plate	Replacement
13. 4WD indicator light switch	Replacement or inspection
14. Speedometer driven gear	Replacement or inspection
15. Gear shift control lever	Replacement or inspection
16. Gear shift control boot No. 1, No. 2	Replacement
17. Gear shift control lever spring seat	Replacement or inspection

Disassembly

Transfer gear control lever

Twist the control lever guide counterclockwise while pushing it down; this will permit the lever to be removed from the gear box.

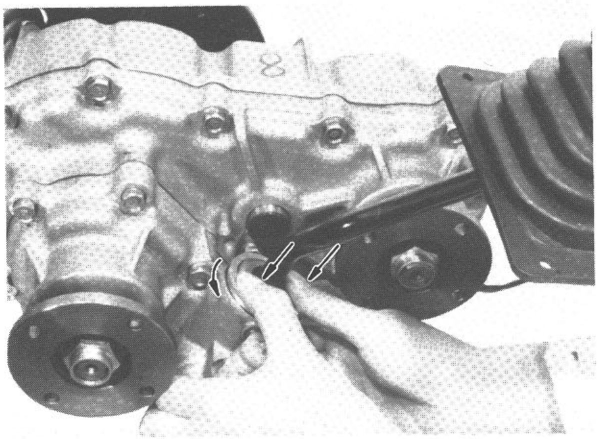


Fig. 9-5

Universal-joint yoke flanges

There are two flanges to be removed: one from the input shaft and one from the output front shaft. Lock the flange so that it will not turn, and loosen and remove the nut holding the flange to the shaft. Draw off the flange.

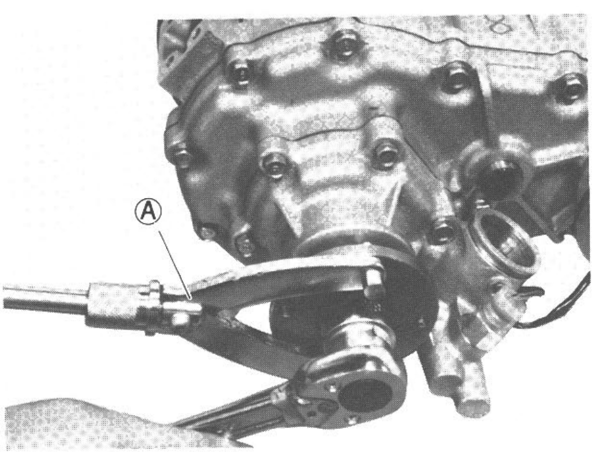


Fig. 9-6 Ⓐ: Special tool (09930-40113)

Center brake

Utilize the differential preload checking tool on the center brake drum so that the drum will not turn. Loosen and remove the nut securing the drum.

Differential preload checking tool Ⓑ:(09922-75220).

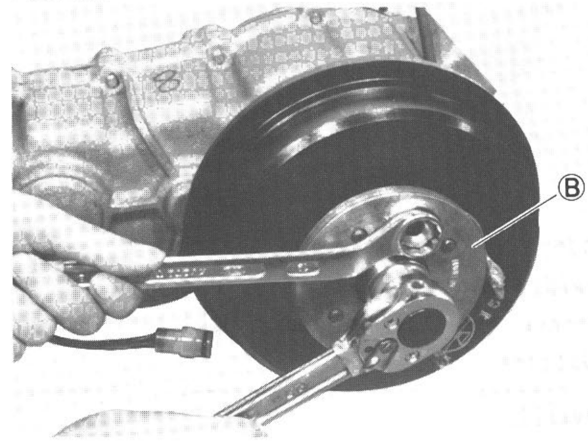


Fig. 9-7

Remove the brake shoes. Remove the 4 bolts securing the backing plate, and take out the backing plate assembly.

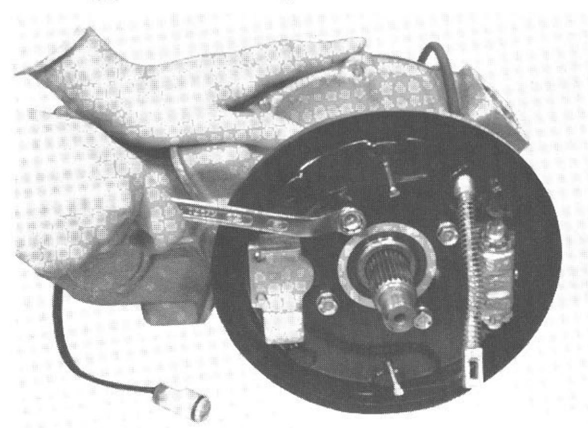


Fig. 9-8

Speedometer driven gear

Remove the speedometer driven gear case and gear, as shown in Fig. 9-9.

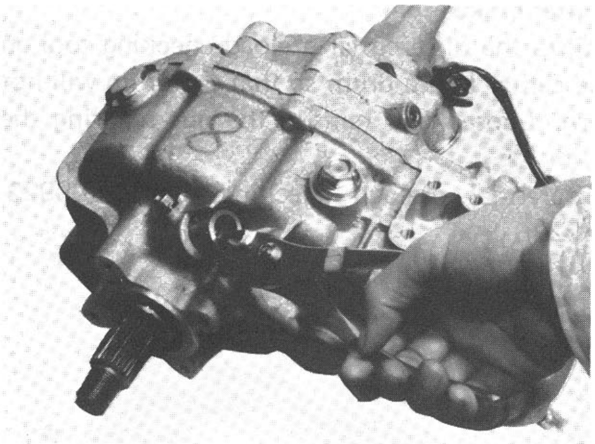


Fig. 9-9

Transfer front case

Remove the 4WD indicator light switch from front case.

> NOTE:
> **Use care not to lose the switch ball. This ball is larger than interlock ball and locating balls.**

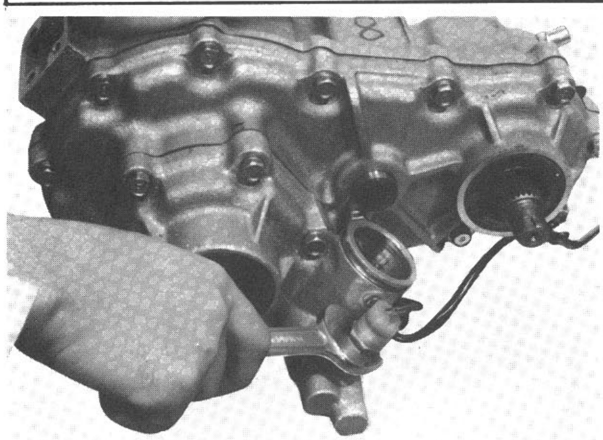


Fig. 9-10

Remove the bolts securing the transfer front case, and take off the case.

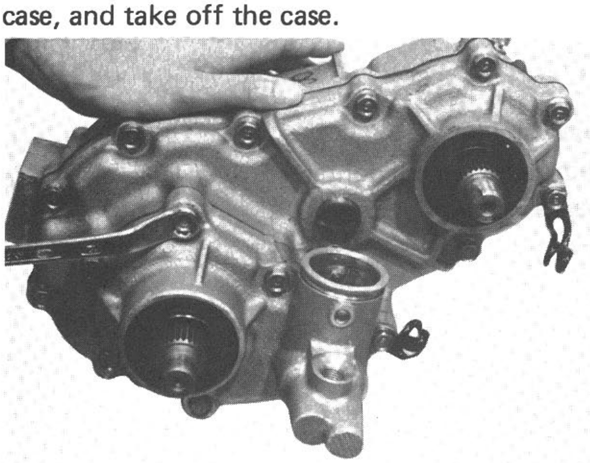


Fig. 9-11

By tapping the output front shaft with a plastic hammer, remove the output front shaft from the front case.

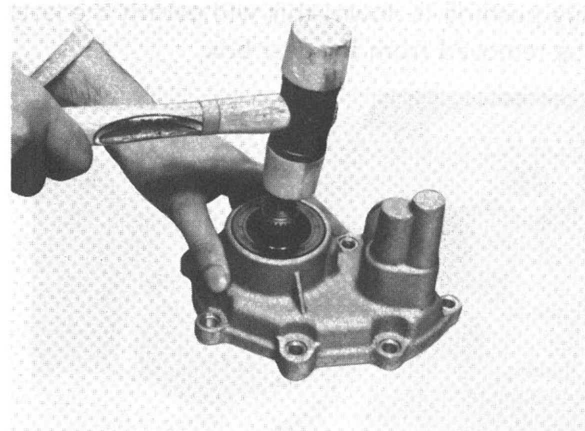


Fig. 9-12

After removing the oil seal, remove the circlip and drive the bearing out of the front case by using special tool.

Bearing installer Ⓒ : (09913-76010)

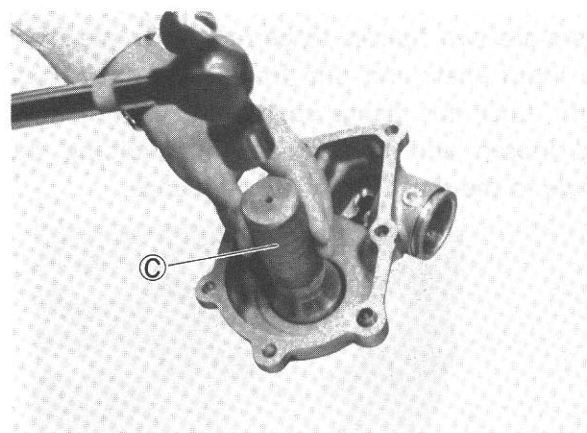


Fig. 9-13

Transfer center case

Remove the bolts fastening the center case and rear case together.

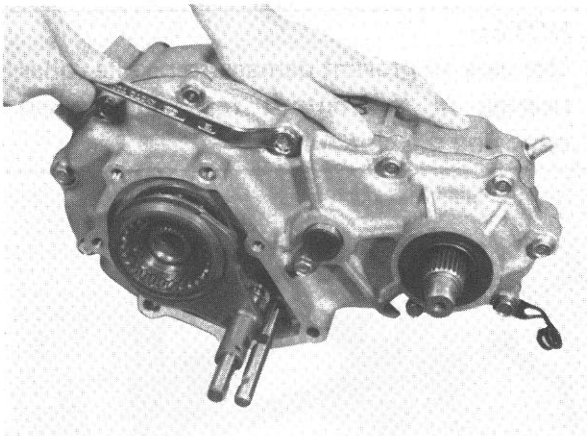


Fig. 9-14

By tapping the input shaft and output rear shaft with a plastic hammer, separate the center and rear case.

> NOTE:
> **At this time, use care to prevent damage to the shafts.**

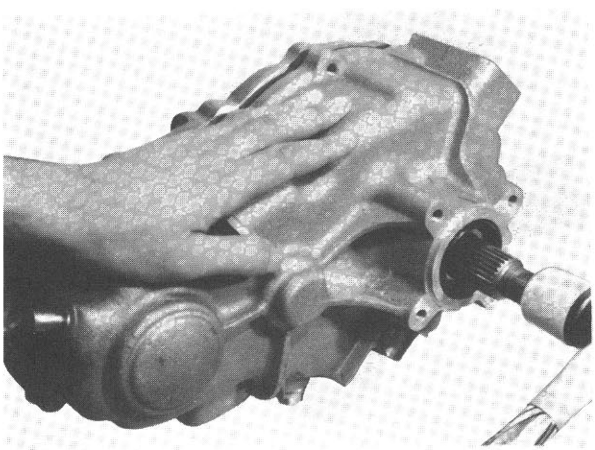


Fig. 9-15

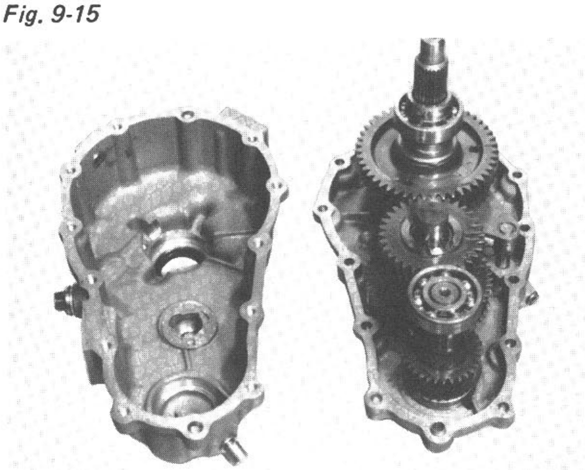


Fig. 9-16

Given below are the procedures for disassembling the component parts of the center case separated from the rear case.

1) Loosen the gear shift locating spring plug and take out the springs and locating ball.

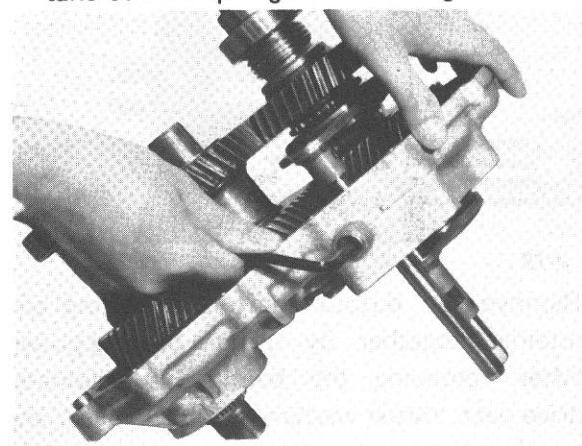


Fig. 9-17

2) Using the spring pin remover (special tool), drive two spring pins out of the front drive shift shaft ① and reduction shift shaft ②. Spring pin remover Ⓓ : (09922-85811).

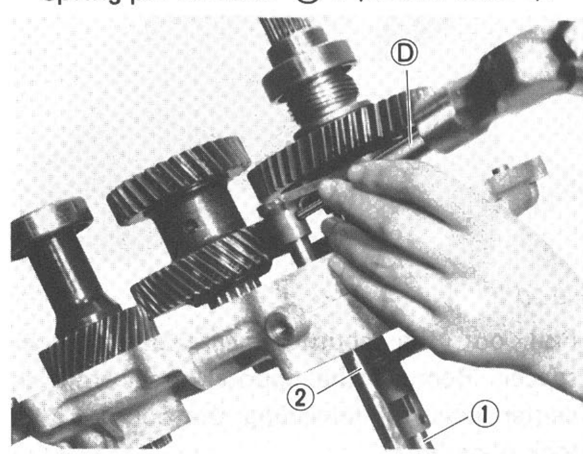


Fig. 9-18

3) Remove the forks and shift shafts.

> NOTE:
> **At this time, locating ball and spring will jump out of the hole, use care not to lose the balls and springs.**

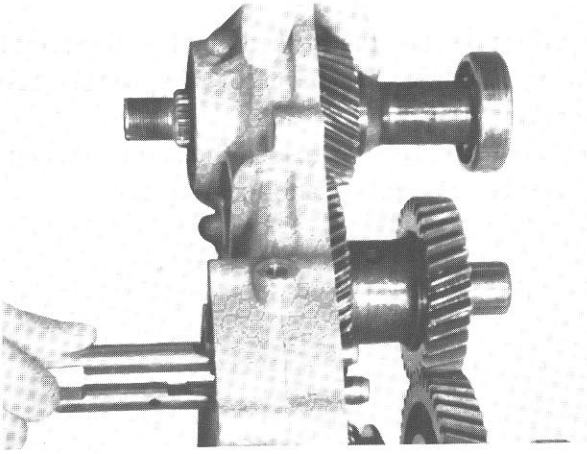


Fig. 9-19

4) Remove the output shaft rear bearing and retainer together by using a bearing puller. After removing the bearing, speedometer drive gear, thrust washer, output low gear and needle roller bearing can be removed.

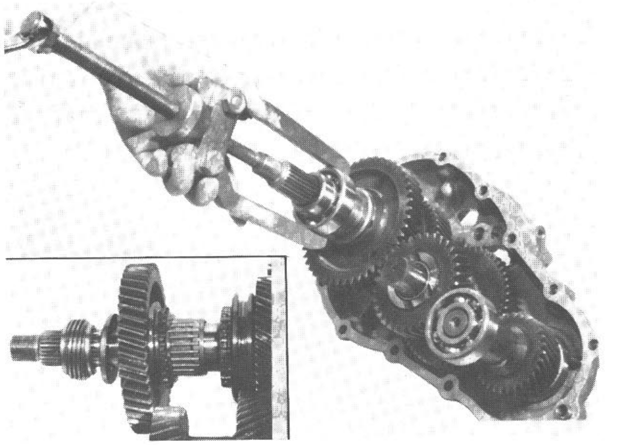


Fig. 9-20

5) Pull out the counter gear, bearings and spacer. Remove the counter shaft from the center case by loosening the counter shaft lock plate bolt.

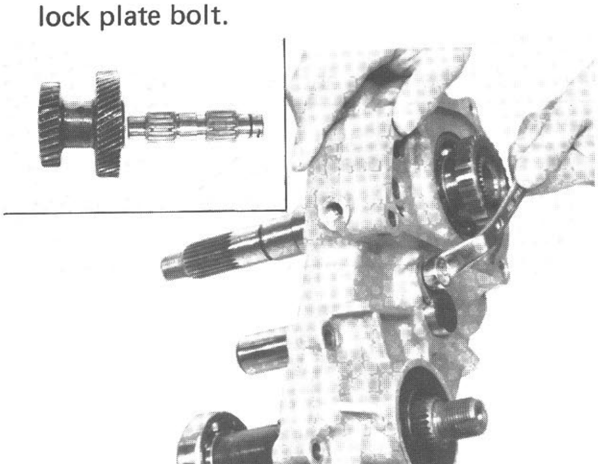


Fig. 9-21

6) Remove the front drive clutch hub circlip and pull the clutch hub off the shaft by using a bearing puller.

> NOTE:
> **Use care to prevent damage to needle roller bearing in the output rear shaft when removing the clutch hub.**

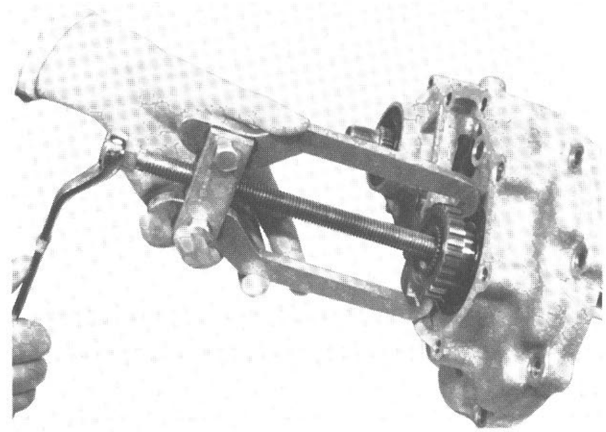


Fig. 9-22

7) Hammer the output rear shaft with a plastic hammer to drive it out of the center case.

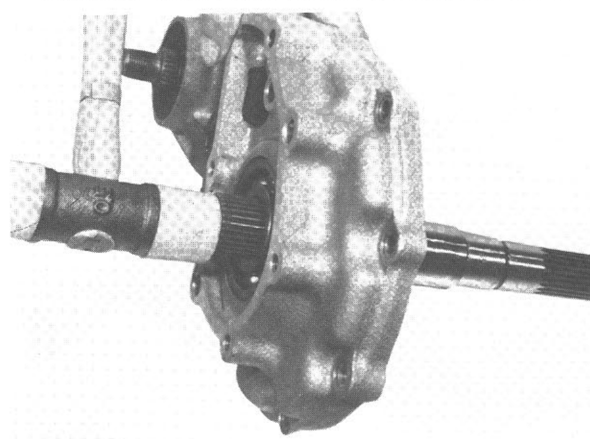


Fig. 9-23

8) Remove the input shaft from the center case by hammering thick part of the case with a plastic hammer.

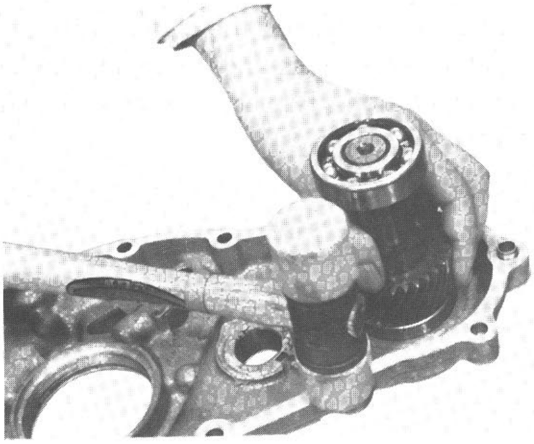


Fig. 9-24

9) When the output rear shaft is removed, the front bearing may come off with it. In such a case, the bearing can be removed from the shaft by using a bearing puller.

> **NOTE:**
> **Use care to prevent damage to needle roller bearing in the output rear shaft while the bearing is being removed.**

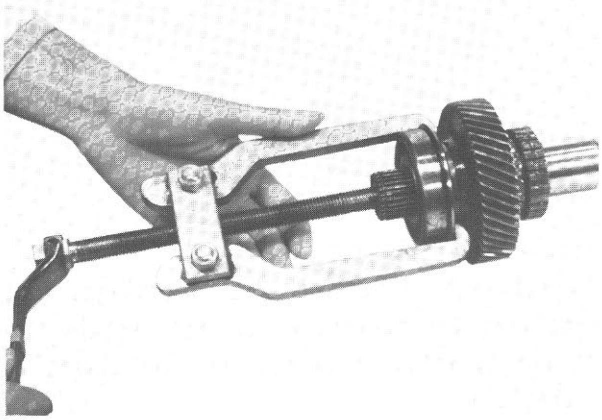


Fig. 9-25

10) When the input shaft is removed or the center case and rear case is separated, the input shaft bearings may come off with it.
In such a case, the bearings can be removed from the shaft by using a bearing puller.

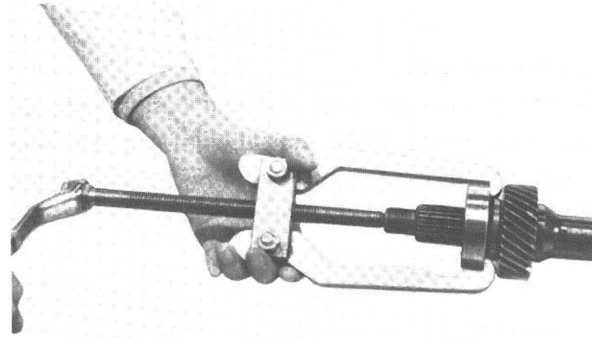


Fig. 9-26

11) When the output rear shaft is removed, the front bearing may be left in the case. In this case, the bearing can be taken out of the case by using the special tool.
Bearing installer Ⓔ : (09913-85210)

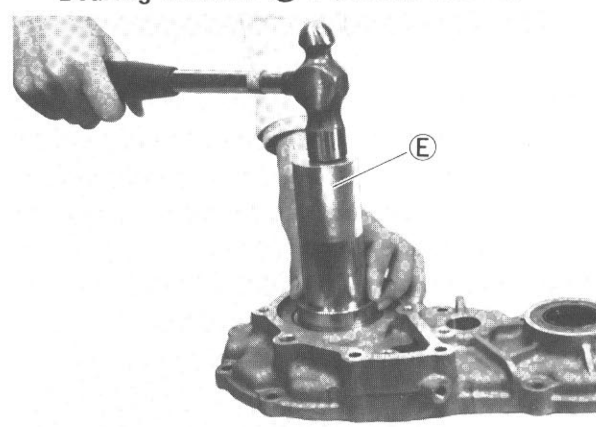


Fig. 9-27

12) When the input shaft is removed, the front bearing may be left in the case. In this case, after removing the oil seal and circlip, the bearing can be taken out of the case by using the special tool.
Bearing installer Ⓕ : (09913-75810)

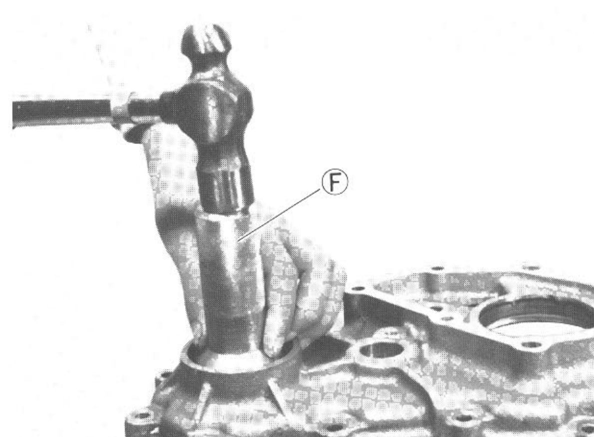


Fig. 9-28

Transfer rear case

1) When the center case and rear case is separated, the input shaft may be left in the rear case. In this case, remove the input shaft from the rear case by hammering thick part of the case with a plastic hammer.

Fig. 9-29

2) When the center case and rear case is separated or the input shaft is removed, the input shaft rear bearing may be left in the rear case. In this case, the bearing can be taken out of the case by using the special tools.
   Bearing remover Ⓖ : (09923-74510)
   Sliding hammer Ⓗ : (09930-30102)

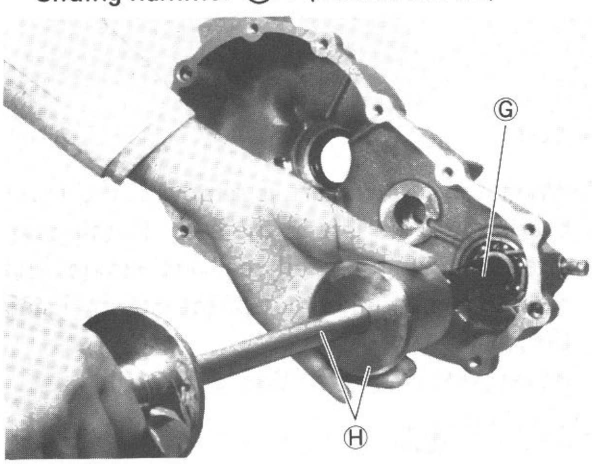


Fig. 9-30

Gear teeth

Inspect the gear teeth ①, the internal teeth of rear clutch sleeve ② and the clutch teeth of the gear ③ for wear, cracking, chipping and the like malcondition. Replace the gear or sleeve as necessary.

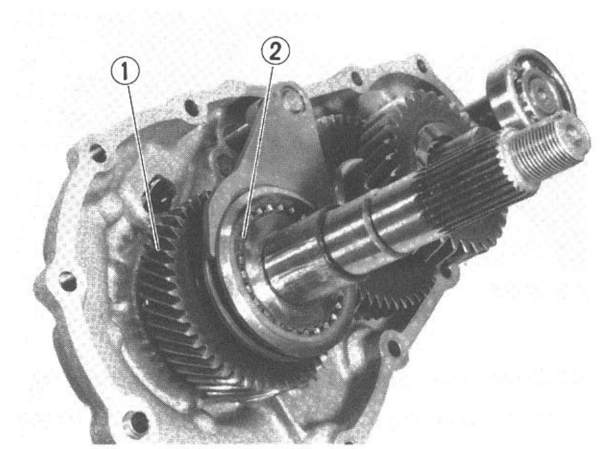


Fig. 9-31

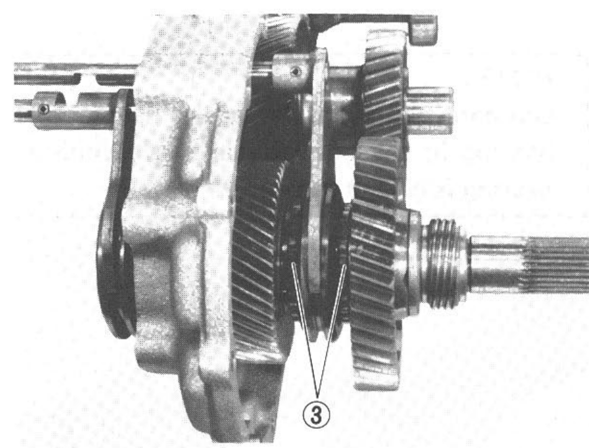


Fig. 9-32

Locating spring

Check each shifter fork shaft locating spring for strength by measuring its free length. If the length is noted to be less than the service limit, replace it.

	Standard	Service limit
Free length of locating spring	23.7 mm (0.933 in)	22.0 mm (0.866 in)

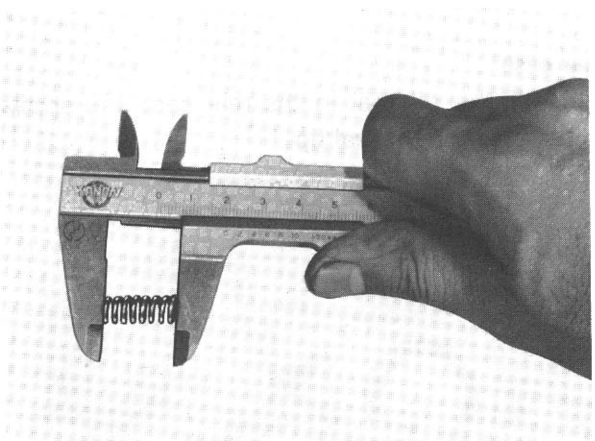


Fig. 9-33

Bearings

Check each bearing by spinning its outer race by hand to "feel" the smoothness of rotation. Replace the bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

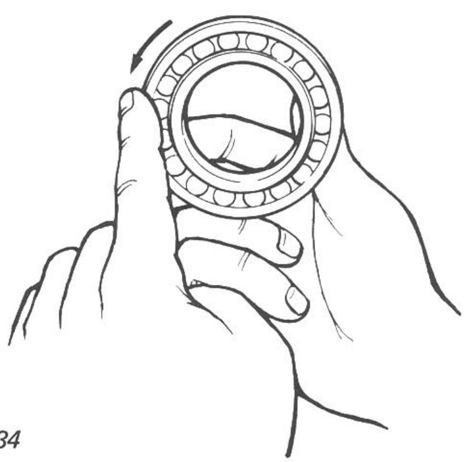


Fig. 9-34

Side clearance of gears

With the gear, bearing and thrust washer installed on the shaft, check for side clearances of gears. If the clearance exceeds the limit, replace the thrust washer.

Side clearance of gear		Standard	Service limit
Input gear		0.1 – 0.5mm (0.004 – 0.019in)	0.8mm (0.031in)
Output gears	low gear	0.175 – 0.325mm (0.007 – 0.012in)	0.7 mm (0.027in)
	high gear		

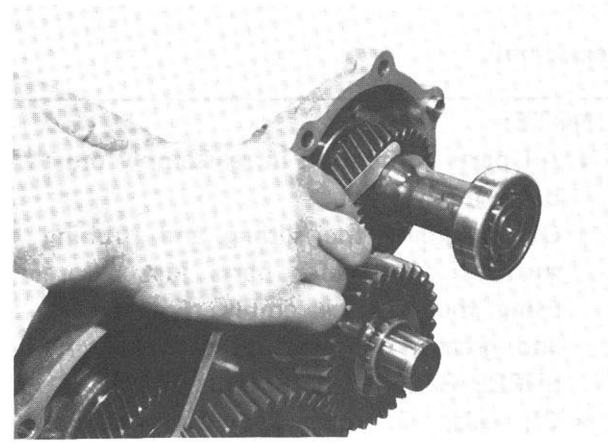


Fig. 9-35 *Input gear*

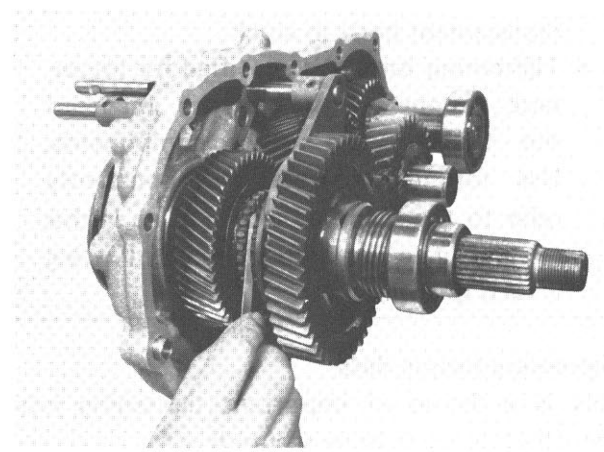


Fig. 9-36 *Output high gear*

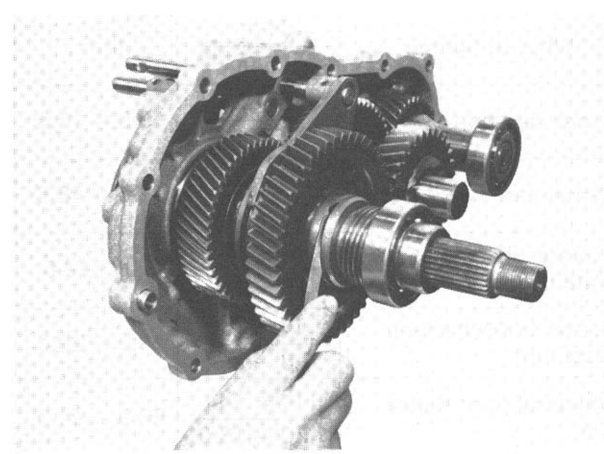


Fig. 9-37 *Output low gear*

Reassembly

NOTE:
- All parts to be used in reassembly must be perfectly clean.
- Oil or grease the sliding and rubbing surfaces of transfer parts just before using them in reassembly. For the oil and grease, use gear oil and SUZUKI SUPER GREASE A (99000-25010).
- Oil seals, "O" rings, gaskets and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.
- Tightening torque is specified for important fasteners–bolts in the main–of the transfer and other components. Use torque wrenches and constantly refer to the specified values given in this manual. The list immediately following is such specifications.

Tightening torque data

This is a list-up of important tightening jobs identified by parts to be secured:

What to tighten	N·m / kg-m	lb-ft
Front case bolt	18 – 23 / 1.8 – 2.3	13.5 – 16.5
Center case bolt	18 – 23 / 1.8 – 2.3	13.5 – 16.5
Counter shaft lock plate bolt	9 – 17 / 0.9 – 1.7	7.0 – 12.0
Center brake backing plate bolt	18 – 28 / 1.8 – 2.8	13.5 – 20.0
Universal joint flange nut	110 – 130 / 11.0 – 13.0	80.0 – 94.0
Transfer mounting bracket bolt	18 – 30 / 1.8 – 3.0	13.5 – 21.5
Transfer mounting nut	30 – 37 / 3.0 – 3.7	22.0 – 26.5
Cross joint bolt & nut	28 – 35 / 2.8 – 3.5	20.5 – 25.0
Oil filler and drain plug	36 – 54 / 3.6 – 5.4	26.5 – 39.0

Rear case

1) Install the oil seal in the rear case and apply grease to the oil seal lip.

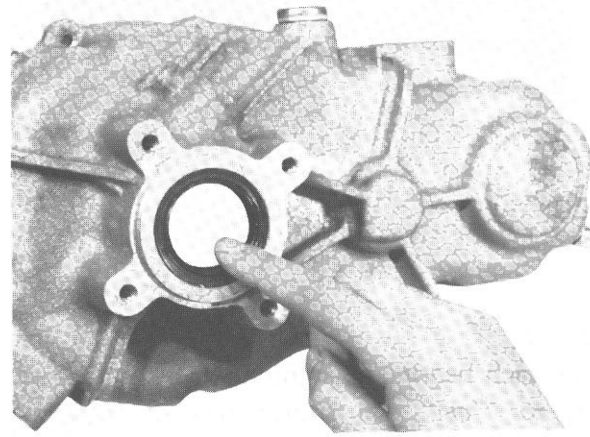


Fig. 9-38

2) Attach the counter shaft thrust washer to the rear case, bringing its face without depressions against the case and fit its bent portion securely into the groove in the case.

NOTE:
Apply ample amount of grease to both surfaces of the washer so as to lubricate the sliding surfaces and prevent the washer from moving out of place or slipping off.

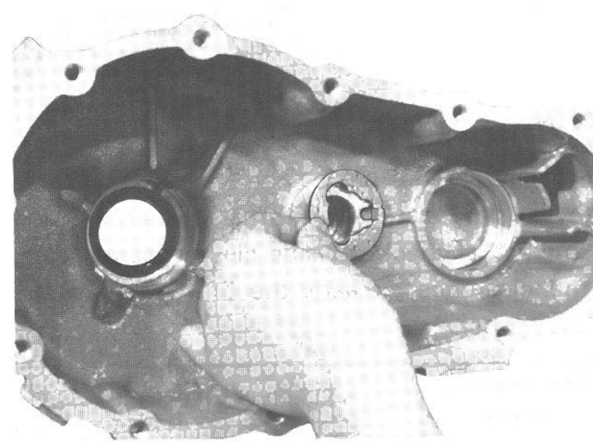


Fig. 9-39

Center case

1) Install the input shaft front bearing circlip and oil seal in the center case.
   Snap ring pliers Ⓐ : (09900-06108)

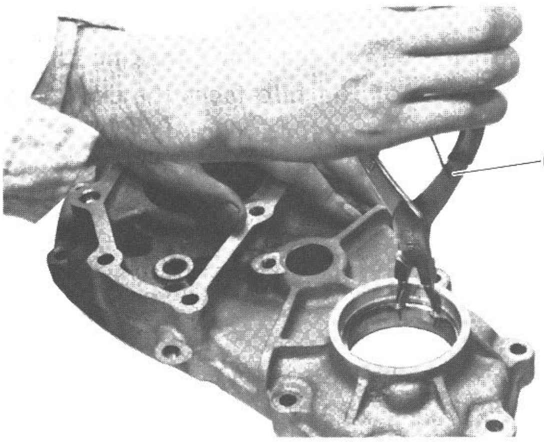


Fig. 9-40

2) Using special tool, drive the output shaft front bearing and input shaft front bearing into the center case.
Bearing installer Ⓑ : (09913-75810)
Bearing installer Ⓒ : (09913-85210)

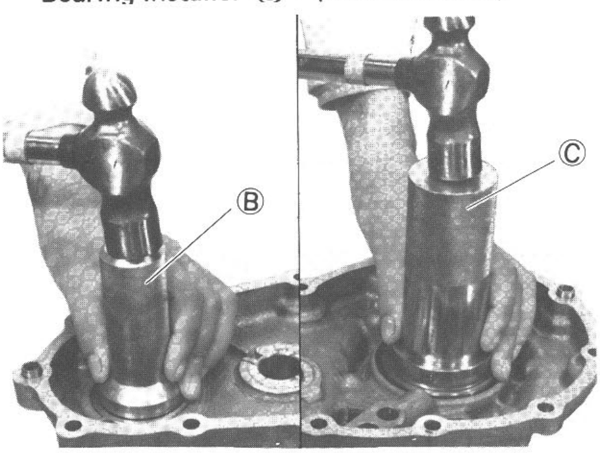


Fig. 9-41

3) Install the output high gear, needle roller bearing (the longest one) and thrust washer on the output rear shaft, with the chamfered face of the thrust washer directed to the bearing.
Drive the shaft into the output shaft bearing of the center case.

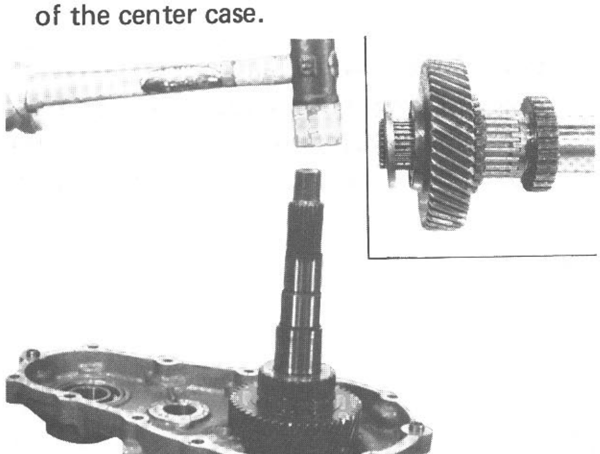


Fig. 9-42

4) Attach the counter shaft thrust washer to the center case. For this operation, apply ample amount of grease to both faces of the washer so as to lubricate the sliding surfaces and prevent it from moving out of place or slipping off and bring its face without depressions against the center case, and fit its bent portion into the groove in the case securely.

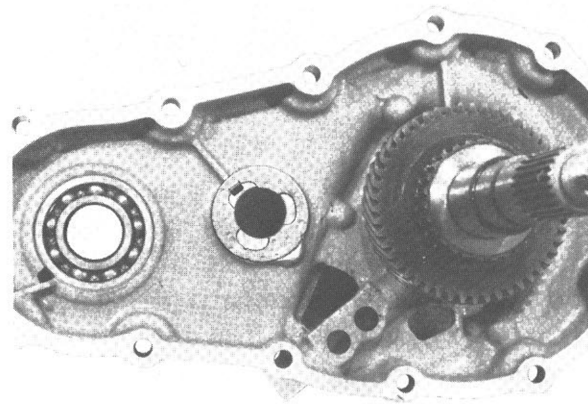


Fig. 9-43

5) After greasing the O ring on the counter shaft, insert the shaft into the center case and secure the shaft with lock plate and bolt.

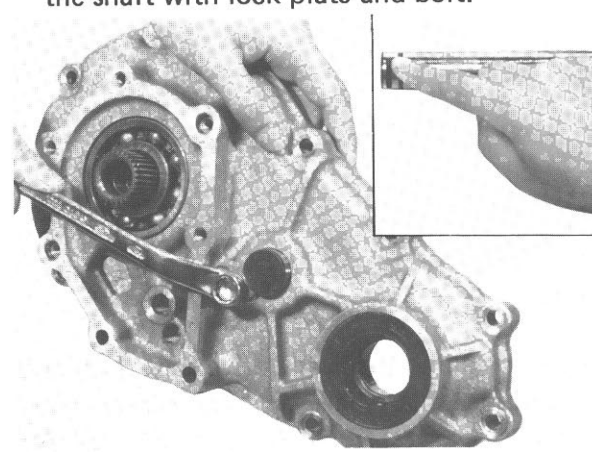


Fig. 9-44

6) Install the needle roller bearings, spacer and counter gear on the counter shaft.

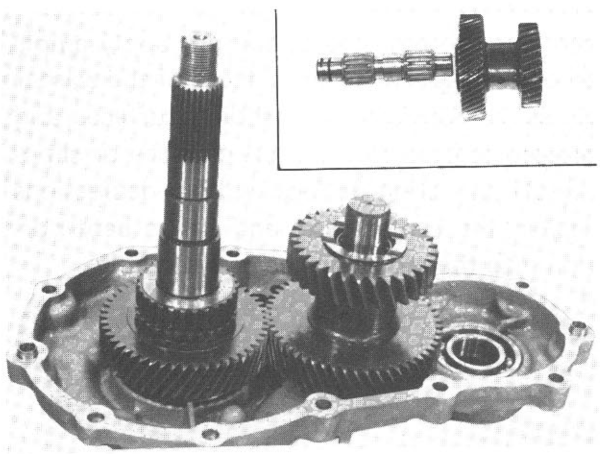


Fig. 9-45

7) Install the input shaft gear and thrust washer onto the input shaft. Be sure to install the thrust washer with its chamfered face directed to the front bearing. And then drive the shaft into the front bearing of center case.

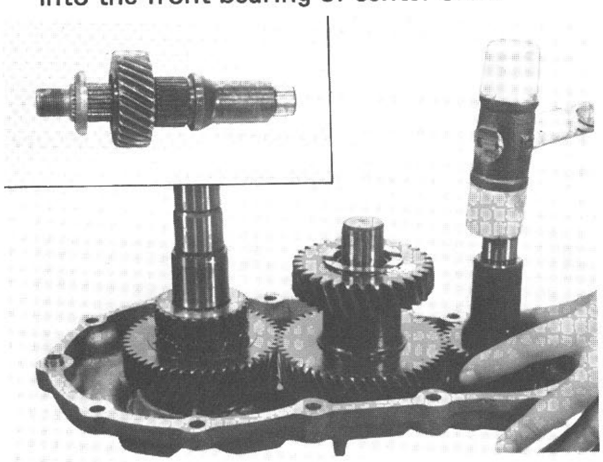


Fig. 9-46

8) When installing the front drive shift shaft and reduction shift shaft in the center case, install springs ①, ball ②, shaft ③, ball ④, shaft ⑤, ball ⑥, spring ⑦ and plug ⑧ in that order.

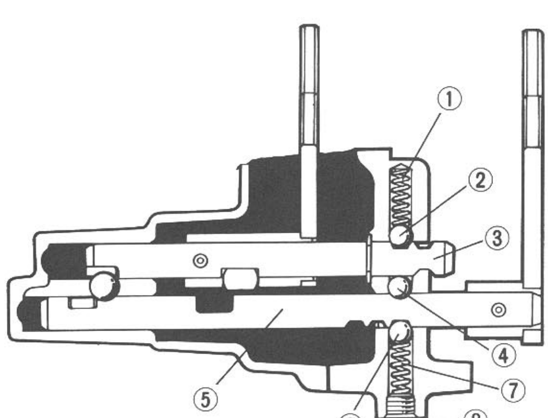


Fig. 9-47

9) Fit the front drive clutch hub ⑨ on the front side of the output rear shaft, making sure that the boss ⑪ of the hub faces the center case, and lock it there with circlip ⑩

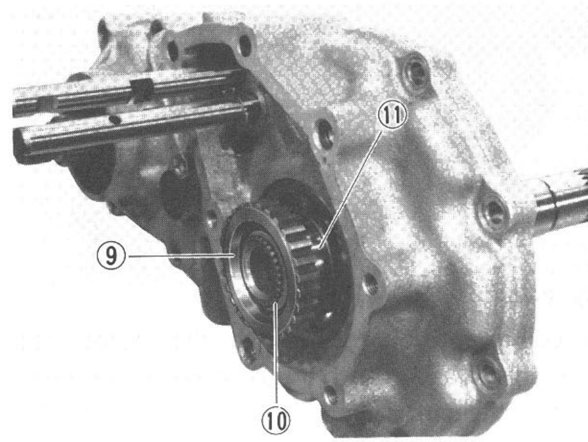


Fig. 9-48

10) Fit the forks on the shift shafts and lock them with spring pins. The forks should be fitted in the correct direction according to below figure.
Along with the above installation of forks, install sleeves to respective hubs.

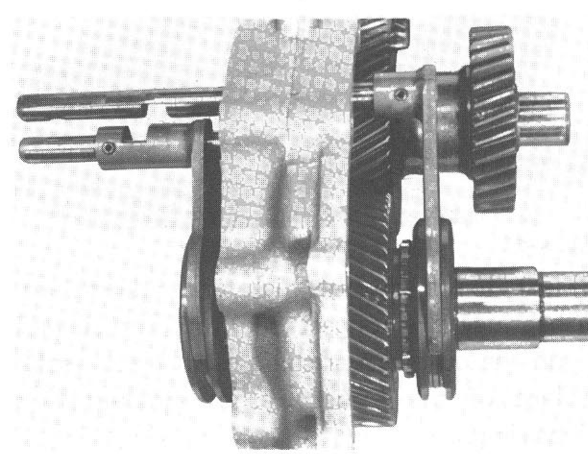


Fig. 9-49

11) Install the needle roller bearing, output low gear, thrust washer and speedometer drive gear onto the output rear shaft. Be sure to bring the chamfered face of the thrust washer against the speedometer drive gear.

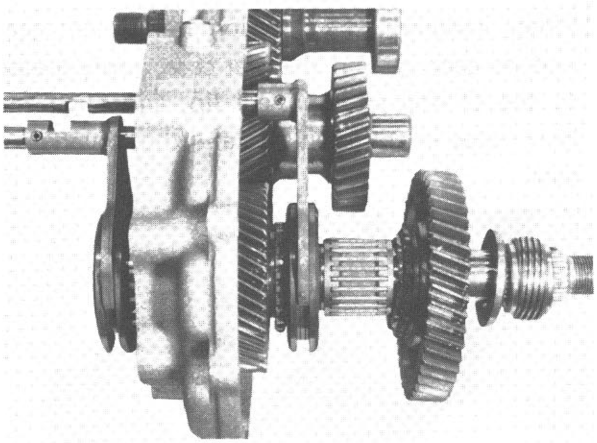


Fig. 9-50

12) Drive the output rear shaft rear bearing and retainer onto the output rear shaft by using special tool.
Bearing installer Ⓓ : (09913-84510)

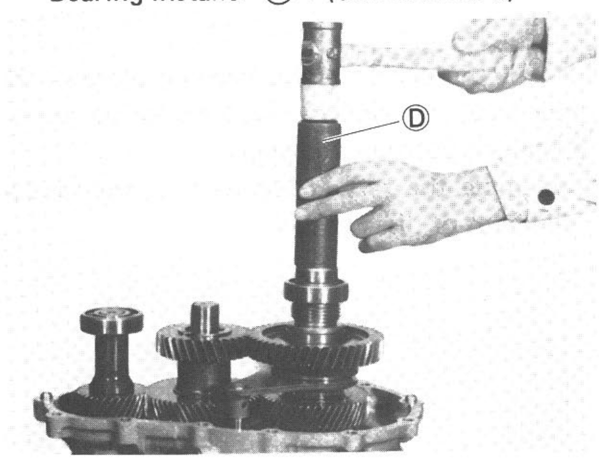


Fig. 9-51

Front, center and rear cases

1) Check the front and center cases to ensure that they are both provided with 2 dowel pins ①.

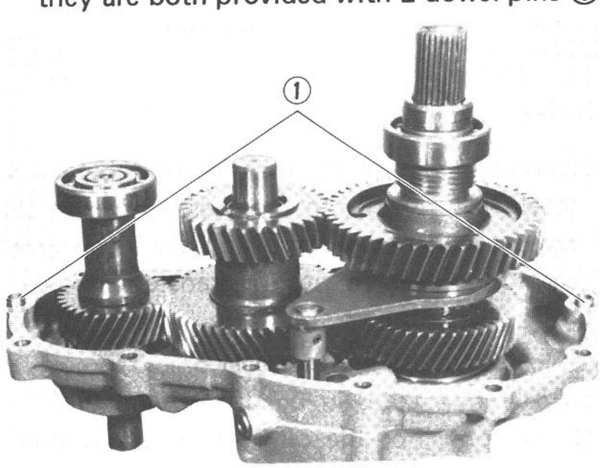


Fig. 9-52

2) Put the gasket on the center case. Bring the rear case and the center case into match and apply uniform force gradually all around the rear case with a plastic hammer. When the rear case is closer to the center case to a certain extent, tighten the center case securing bolts. Thus they are fastened together securely.

> NOTE:
> **Matching must be made carefully so as not to move the countershaft thrust washers out of place.**

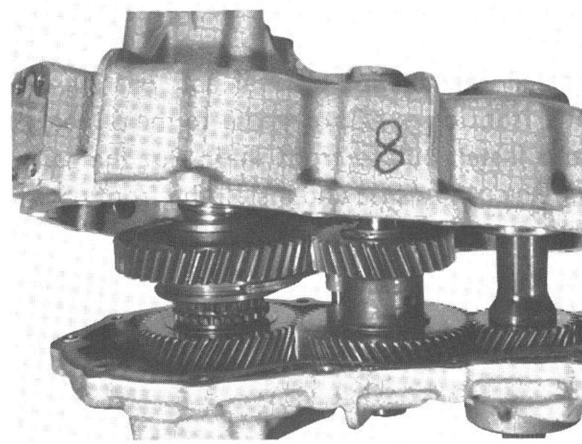


Fig. 9-53

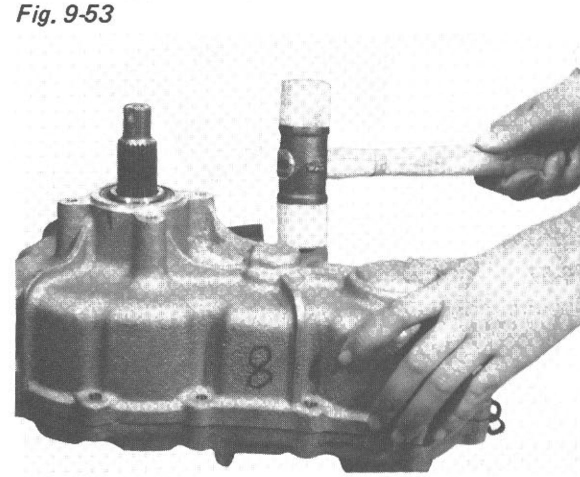


Fig. 9-54

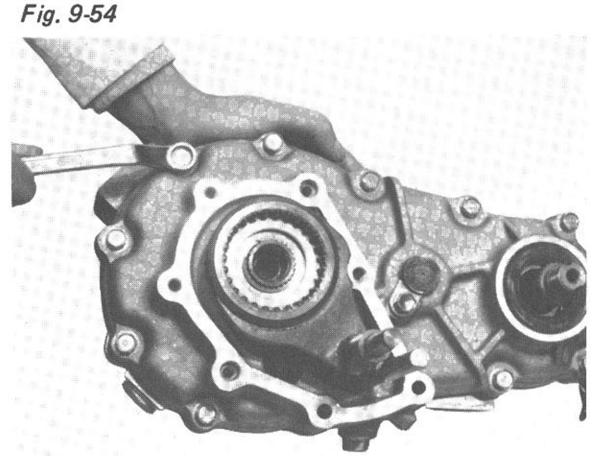


Fig. 9-55

3) Apply grease to the output front shaft rear bearing.

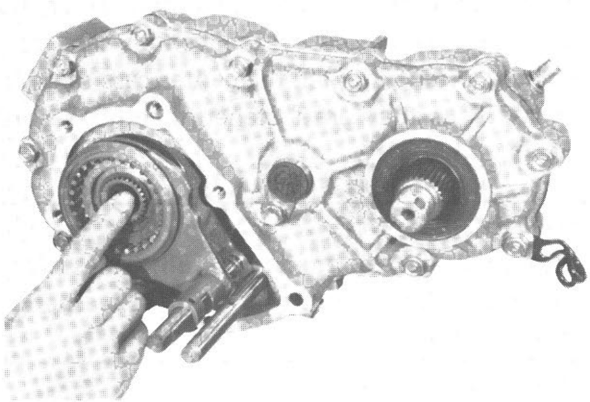


Fig. 9-56

4) Install the circlip, oil seal and bearing into the front case. Apply grease to the oil seal lip and install output front shaft. Put the gasket on the center case and install the front case to the center case.

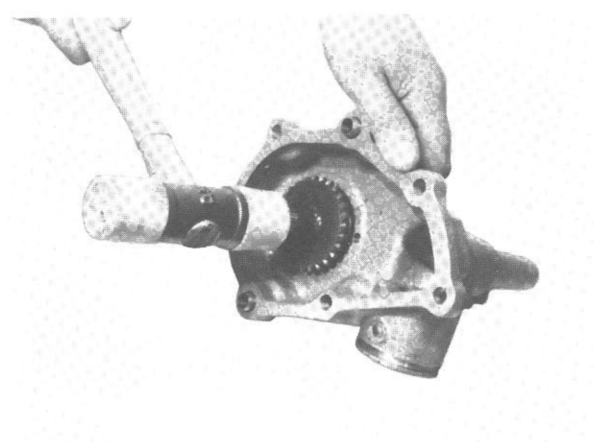


Fig. 9-57

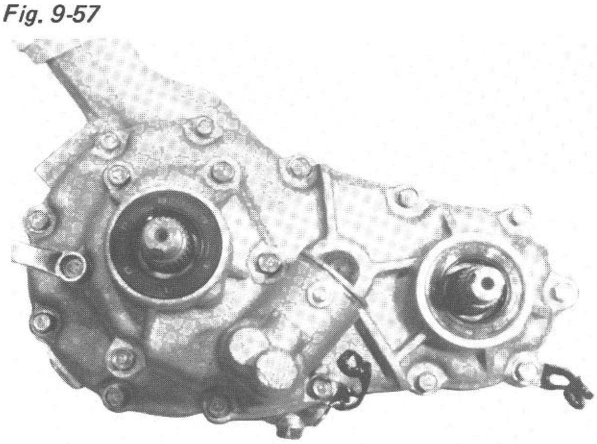


Fig. 9-58

5) When installing the speedometer driven gear and its gear case in the rear case, apply grease to the O ring and oil seal lip, and align the bolt holes in the rear case and the driven gear case.

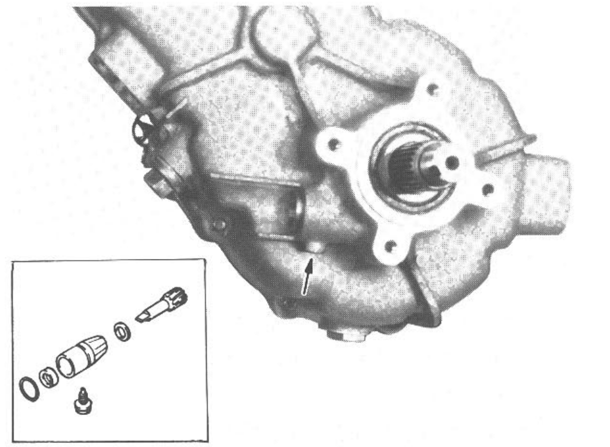


Fig. 9-59

6) Install the center brake backing plate on the rear case, referring to Fig. 9-60 for its correct installing position and angle.
7) Assemble the rest of the parts in the reverse sequence of disassembly.

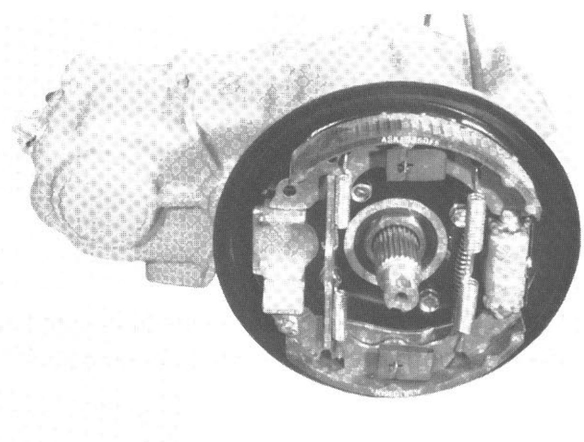


Fig. 9-60

8) Upon completion of the entire assembly work, Install the transfer in the chassis body in the reverse sequence of removal. Pour below given amount of gear oil into the transfer gear box.

Lubricating oil for transfer gear box

The gear box takes in 0.8 litre of oil (1.7/1.4 US/Imp. pt.). For the oil, use the below specified oil.

Transfer oil capacity	0.8 litre (1.7/1.4 US/Imp. pt)
Transfer oil specification	Gear oil SAE # 90 * Gear oil SAE 80W or 75W/80 – 85

*For Canadian & Finnish Markets

> **NOTE:**
> **As for the countries except Canadian and Finnish Markets, also for the vehicles used in the areas where the ambient temperature becomes lower than −15°C (5°F) during the coldest season, it is recommended with that oils be changed with SAE80W or 75W/80 ~ 85 oils during the services such as a periodic maintenance.**

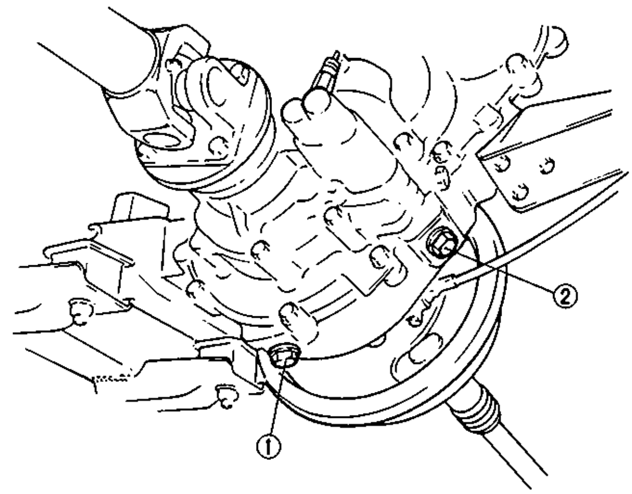


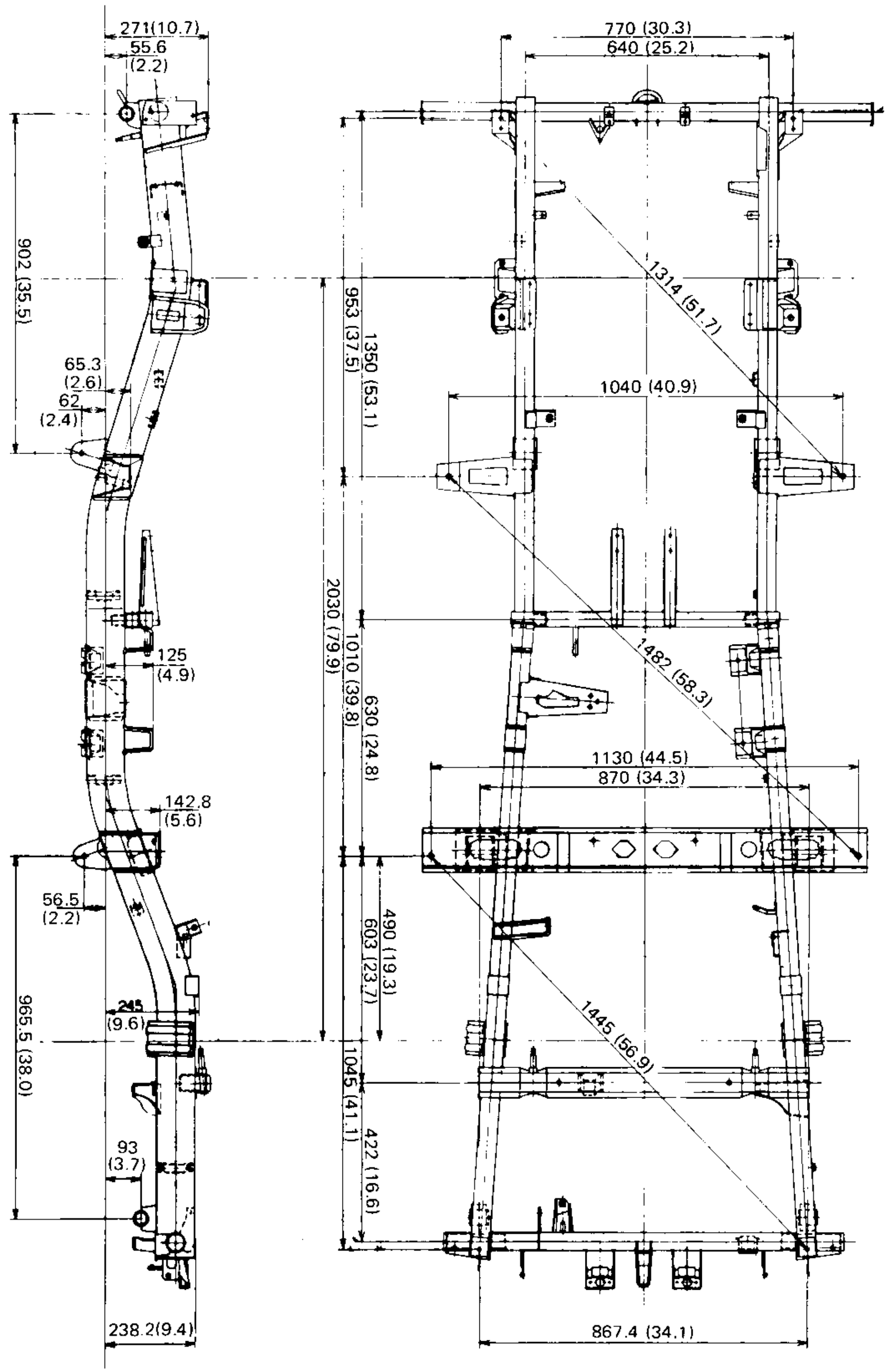
Fig. 9-61 ①: *Oil drain plug*
②: *Oil filler & level plug*

10. CHASSIS DIMENSIONS

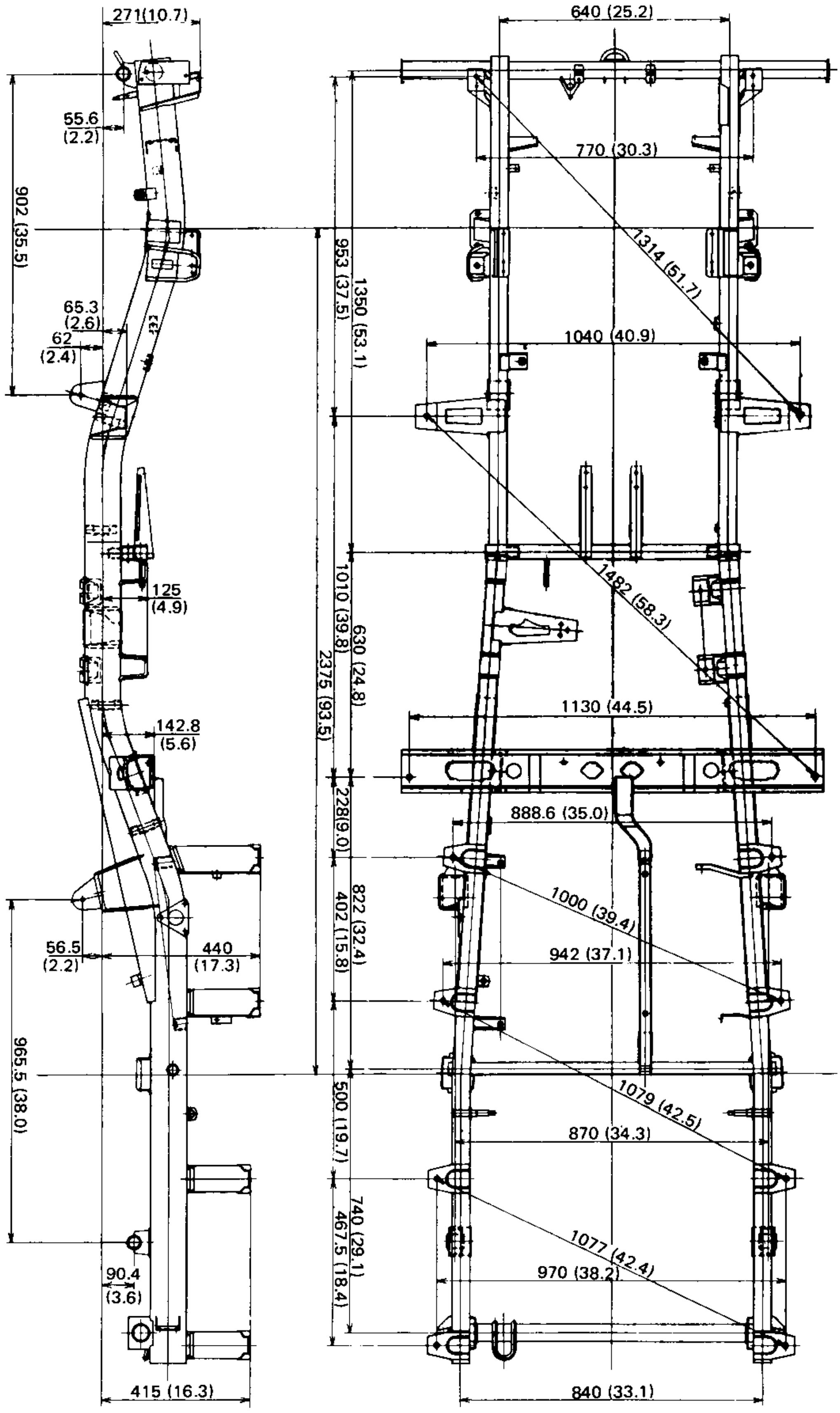
SJ410/SJ410V

Unit : mm (in.)

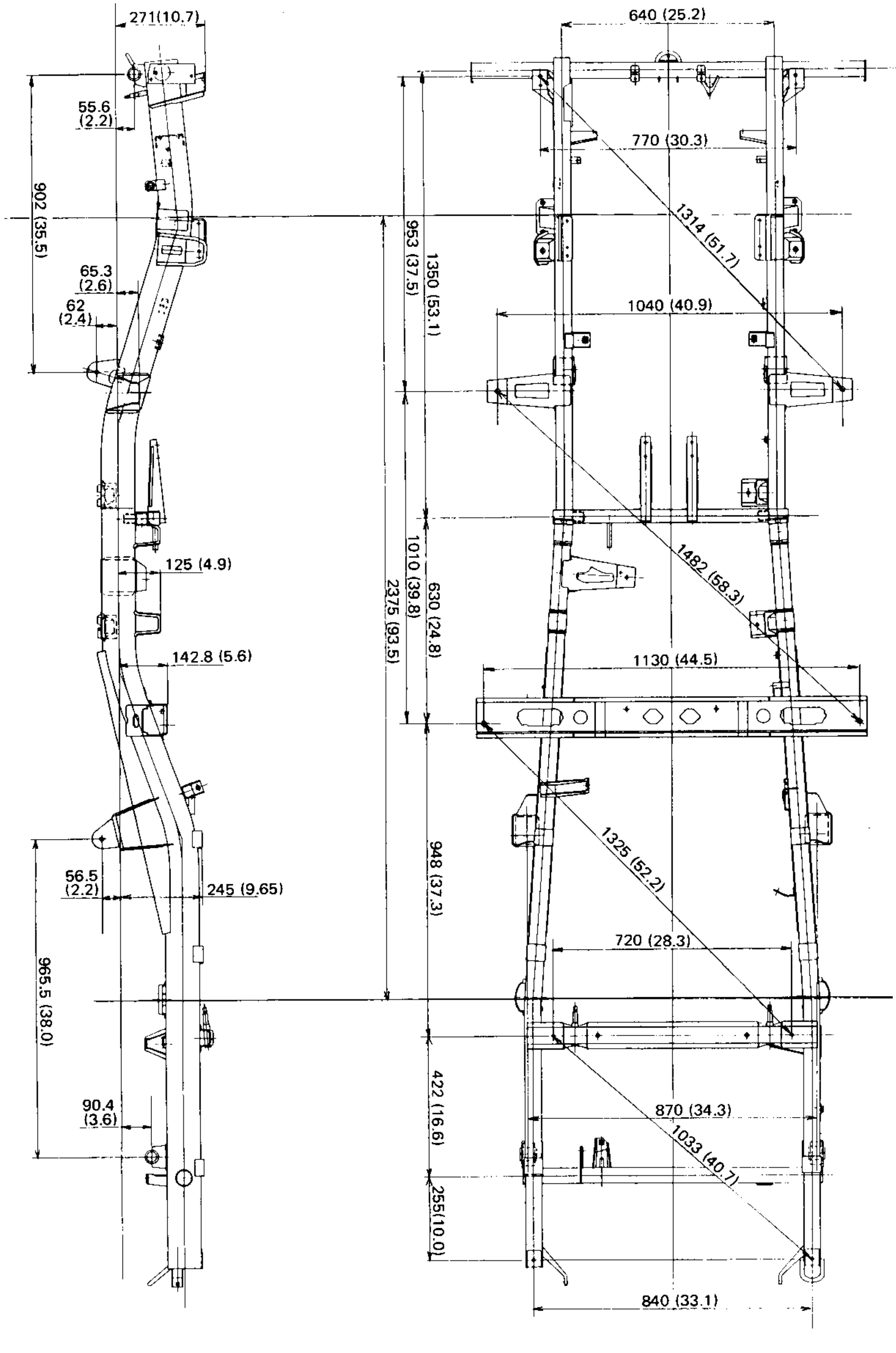
Dimention	Tolerance
L < 100 (3.94)	± 2 (0.079)
100 (3.94) ≦ L < 1 000 (39.37)	± 3 (0.118)
1 000 (39.37) ≦ L	± 4 (0.157)



SJ410K


271(10.7)
55.6
(2.2)
902 (35.5)
65.3
(2.6)
62
(2.4)
125
(4.9)
142.8
(5.6)
56.5
(2.2)
440
(17.3)
965.5 (38.0)
90.4
(3.6)
415 (16.3)
640 (25.2)
770 (30.3)
1314 (51.7)
953 (37.5)
1350 (53.1)
1040 (40.9)
1010 (39.8)
630 (24.8)
2375 (93.5)
1482 (58.3)
1130 (44.5)
228(9.0)
888.6 (35.0)
822 (32.4)
402 (15.8)
1000 (39.4)
942 (37.1)
500 (19.7)
1079 (42.5)
870 (34.3)
740 (29.1)
467.5 (18.4)
1077 (42.4)
970 (38.2)
840 (33.1)

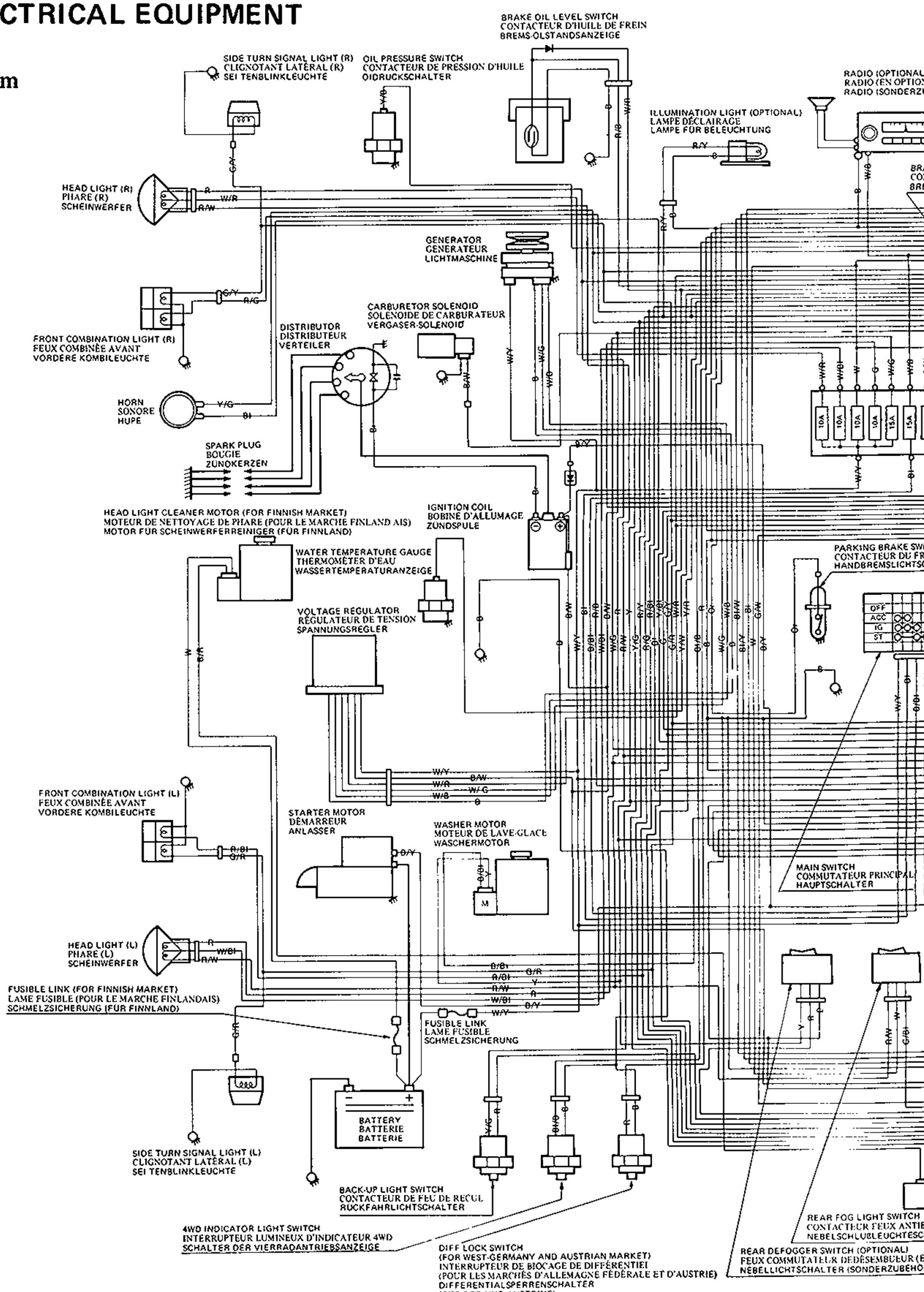
SJ410W


271(10.7)
55.6 (2.2)
902 (35.5)
65.3 (2.6)
62 (2.4)
125 (4.9)
142.8 (5.6)
56.5 (2.2)
245 (9.65)
965.5 (38.0)
90.4 (3.6)
953 (37.5)
1350 (53.1)
2375 (93.5)
1010 (39.8)
630 (24.8)
948 (37.3)
422 (16.6)
255(10.0)
640 (25.2)
770 (30.3)
1314 (51.7)
1040 (40.9)
1482 (58.3)
1130 (44.5)
1325 (52.2)
720 (28.3)
870 (34.3)
1033 (40.7)
840 (33.1)

11. BODY ELECTRICAL EQUIPMENT

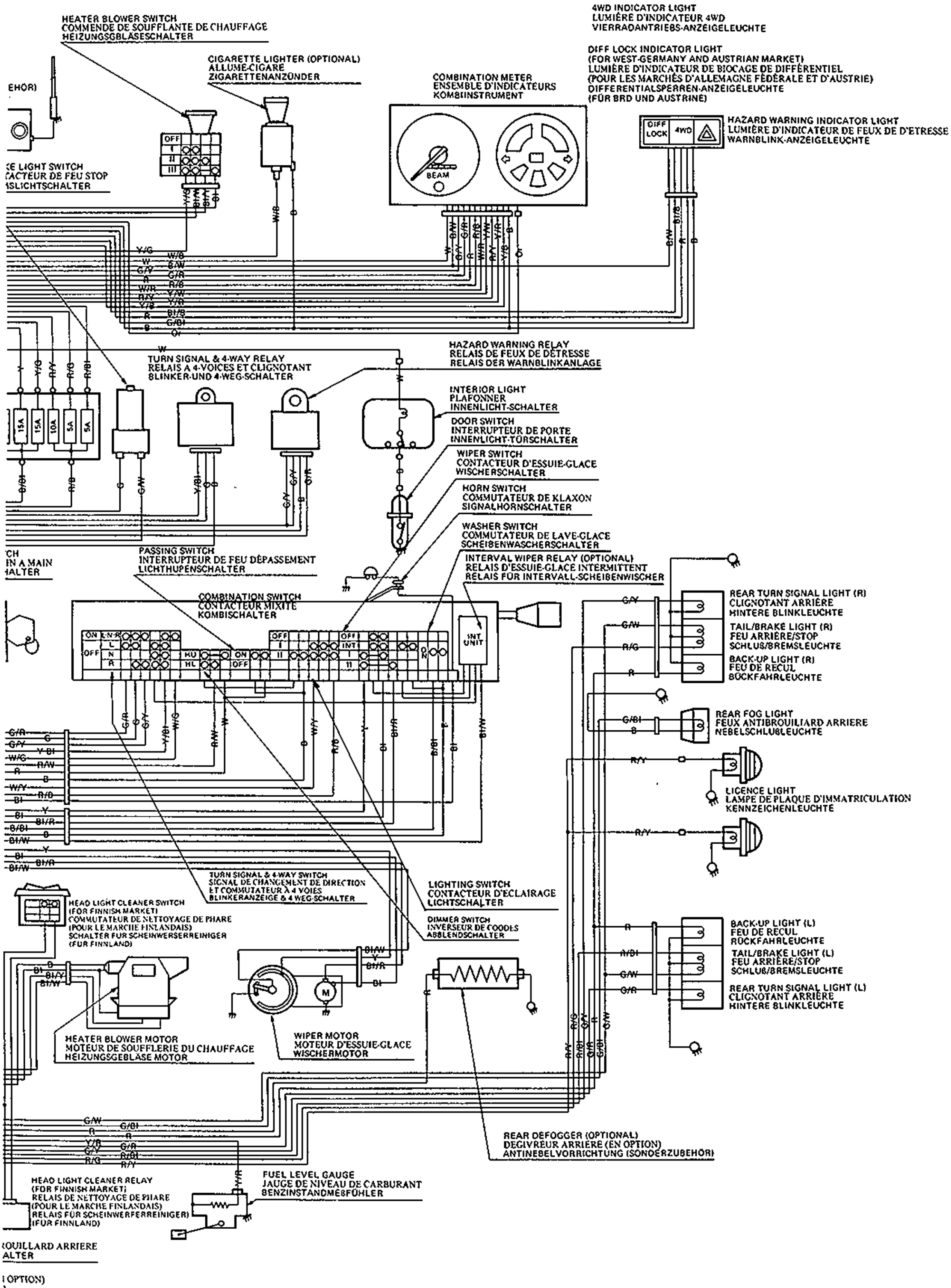
11-1. Wiring Diagram

For European Market



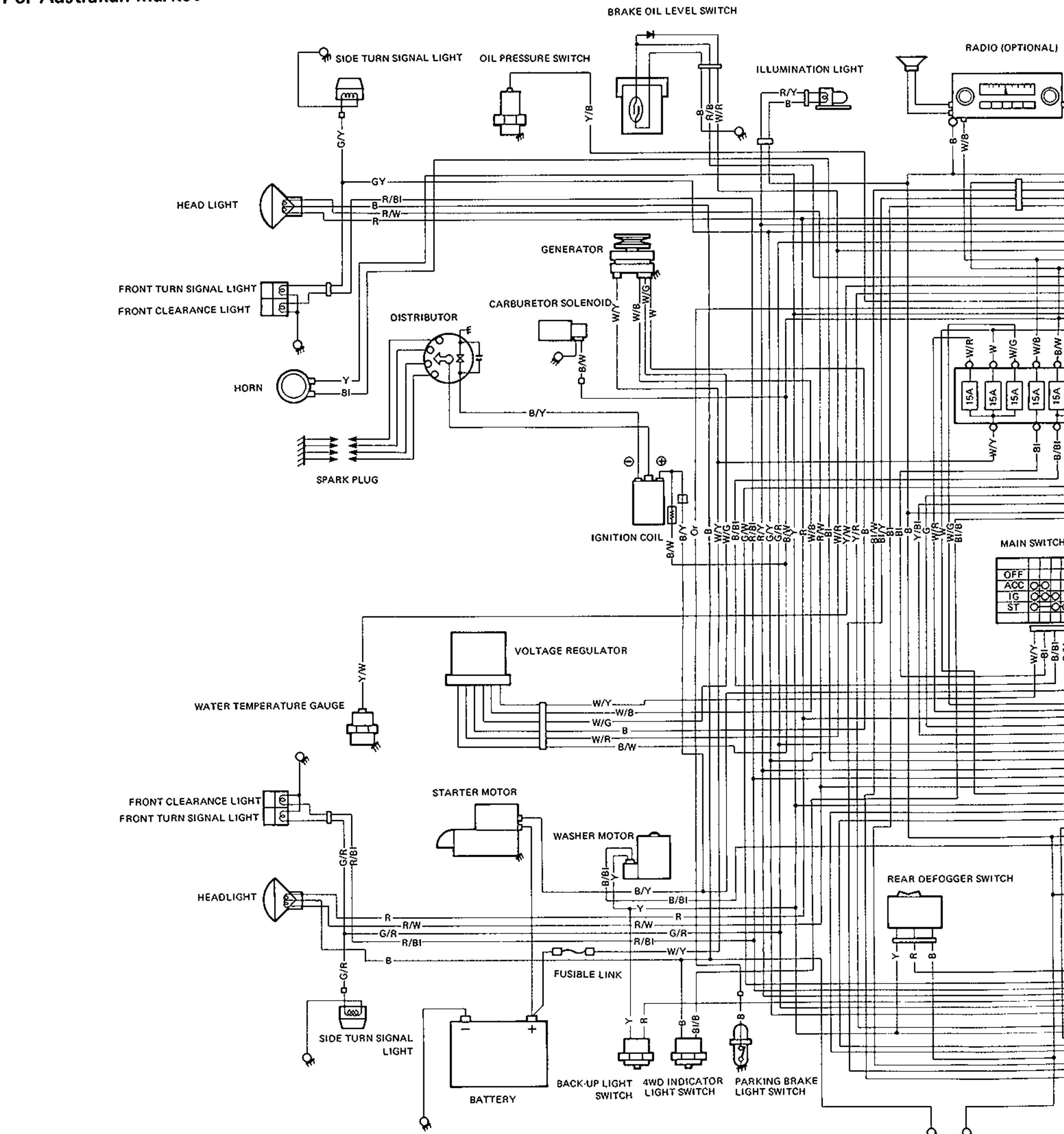
Wire color:

B . . . . Black	W . . . . White	G/R . . Green with Red tracer	R/W . . Red with White tracer
Bl . . . Blue	Y . . . . Yellow	G/W . . Green with White tracer	R/Y . . Red with Yellow tracer
Br . . . Brown	B/W . . Black with White tracer	G/Y . . Green with Yellow tracer	W/B . . White with Black tracer
G . . . . Green	Bl/R . . Blue with Red tracer	R/B . . Red with Black tracer	W/G . . White with Green tracer
R . . . . Red	Bl/W . . Blue with White tracer	R/Bl . . Red with Blue tracer	W/R . . White with Red tracer
		R/G . . Red with Green tracer	Y/B . . Yellow with Black tracer



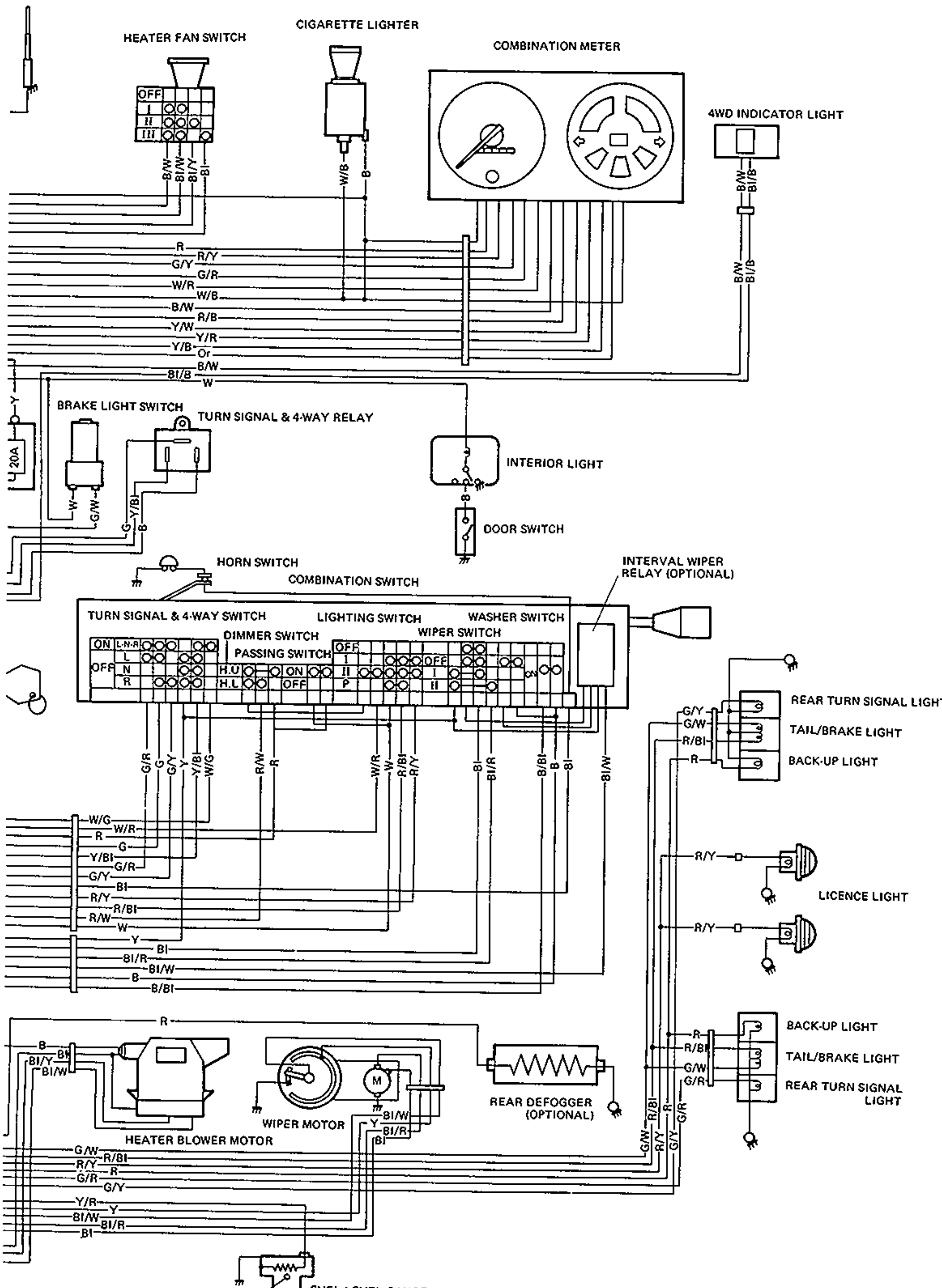
Y/Bl . . Yellow with Blue tracer
Y/G . . Yellow with Green tracer
Y/R . . Yellow with Red tracer
Y/W . . Yellow with White tracer

For Australian Market

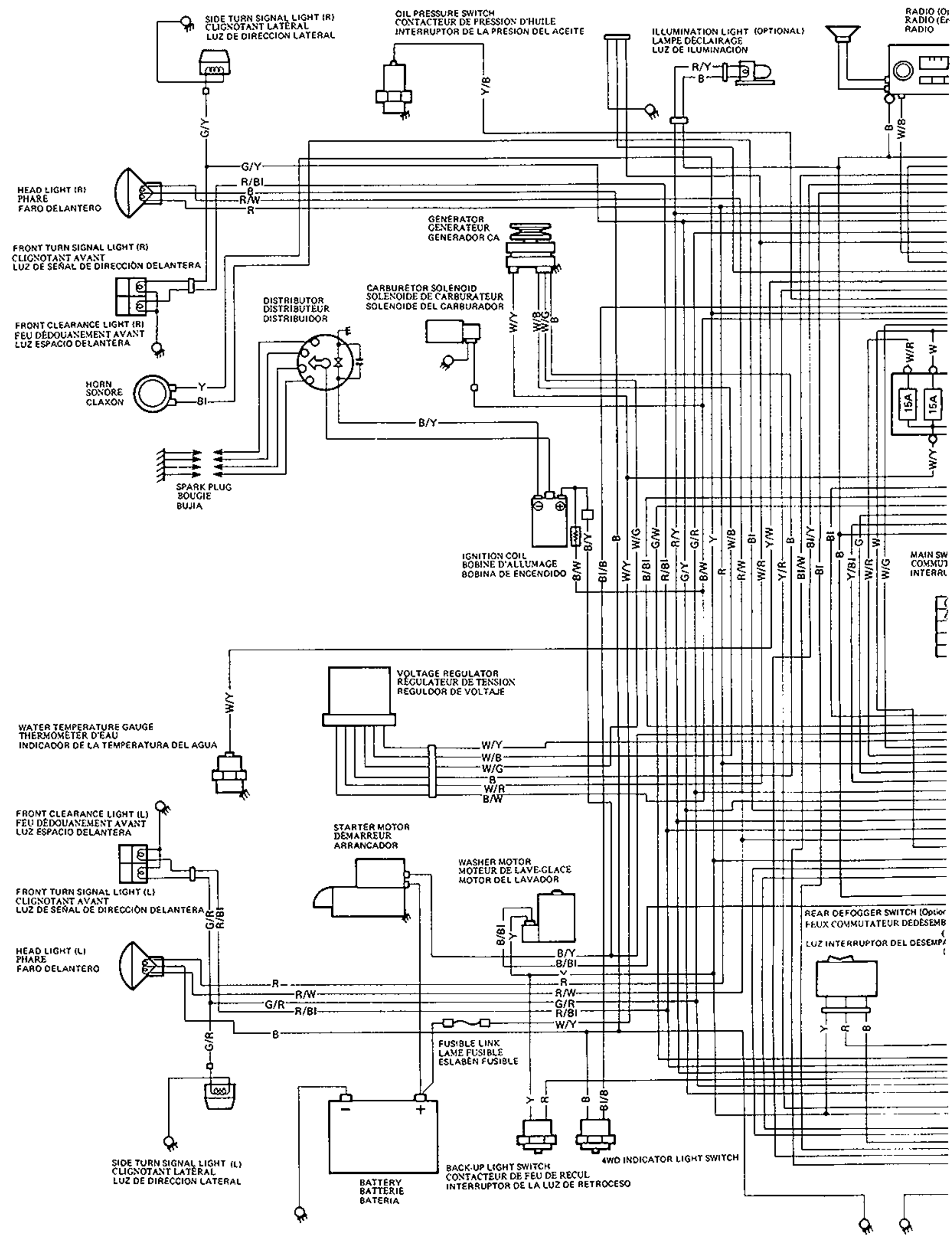


Wire color:

B	Black	Bl/W	Blue with White tracer	W/B	White with Black tracer
Bl	Blue	G/R	Green with Red tracer	W/G	White with Green tracer
Br	Brown	G/W	Green with White tracer	W/R	White with Red tracer
G	Green	G/Y	Green with Yellow tracer	Y/B	Yellow with Black tracer
R	Red	R/B	Red with Black tracer	Y/Bl	Yellow with Blue tracer
W	White	R/Bl	Red with Blue tracer	Y/G	Yellow with Green tracer
Y	Yellow	R/G	Red with Green tracer	Y/R	Yellow with Red tracer
B/W	Black with White tracer	R/W	Red with White tracer	Y/W	Yellow with White tracer
Bl/R	Blue with Red tracer	R/Y	Red with Yellow tracer		

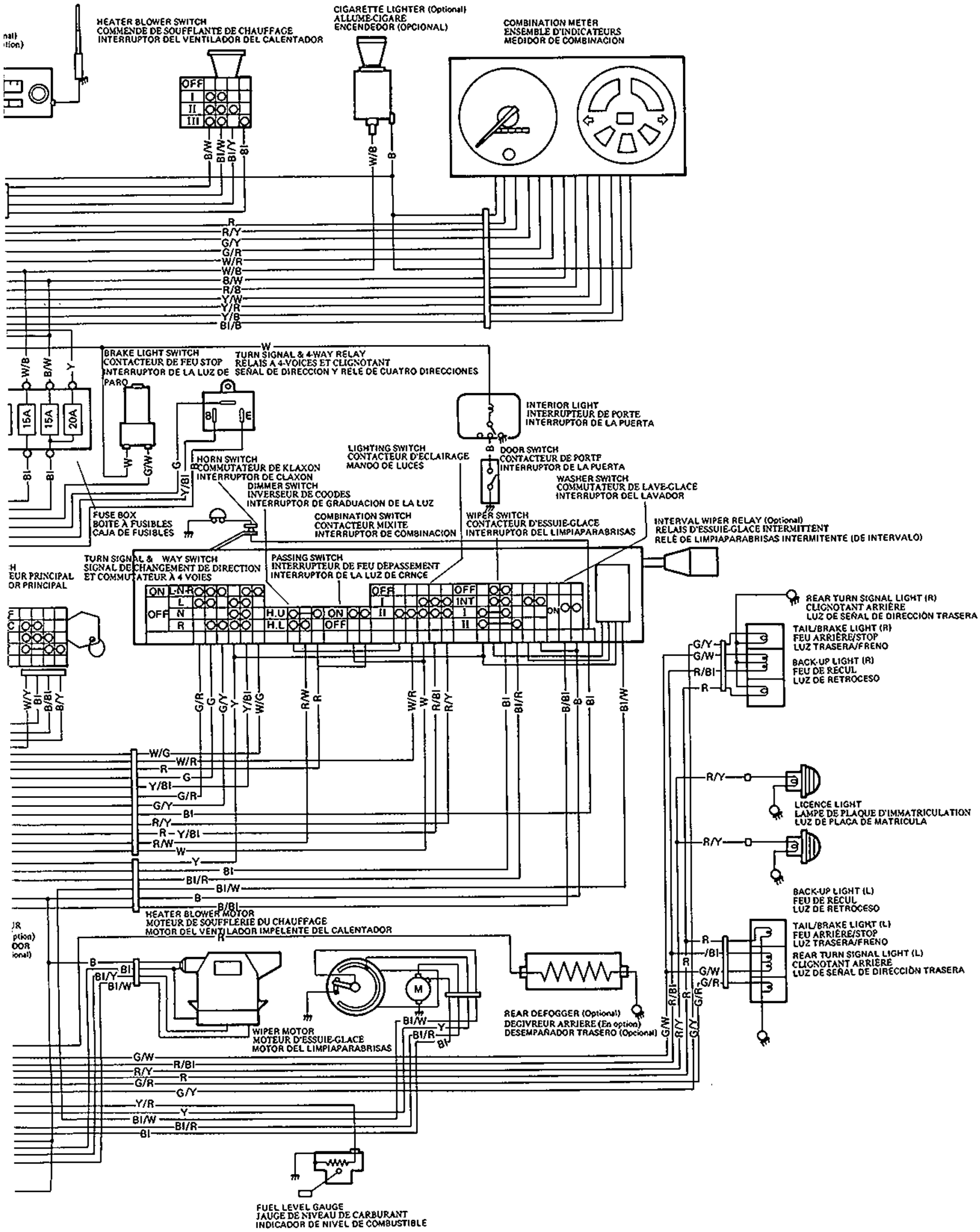

HEATER FAN SWITCH
CIGARETTE LIGHTER
COMBINATION METER
4WD INDICATOR LIGHT
BRAKE LIGHT SWITCH
TURN SIGNAL & 4-WAY RELAY
INTERIOR LIGHT
DOOR SWITCH
HORN SWITCH
COMBINATION SWITCH
INTERVAL WIPER RELAY (OPTIONAL)
TURN SIGNAL & 4-WAY SWITCH
LIGHTING SWITCH
WASHER SWITCH
DIMMER SWITCH
WIPER SWITCH
PASSING SWITCH
REAR TURN SIGNAL LIGHT
TAIL/BRAKE LIGHT
BACK-UP LIGHT
LICENCE LIGHT
BACK-UP LIGHT
TAIL/BRAKE LIGHT
REAR TURN SIGNAL LIGHT
REAR DEFOGGER (OPTIONAL)
WIPER MOTOR
HEATER BLOWER MOTOR
FUEL LEVEL GAUGE

For General Markets except European and Australian Markets



Wire color:

B . . . . Black
Bl . . . Blue
Br . . . Brown
G . . . . Green
R . . . . Red
W . . . . White
Y . . . . Yellow
B/W . . Black with White tracer
Bl/R . . Blue with Red tracer
Bl/W . . Blue with White tracer
G/R . . Green with Red tracer
G/W . . Green with White tracer
G/Y . . Green with Yellow tracer
R/B . . Red with Black tracer
R/Bl . . Red with Blue tracer
R/G . . Red with Green tracer
R/W . . Red with White tracer
R/Y . . Red with Yellow tracer
W/B . . White with Black tracer
W/G . . White with Green tracer
W/R . . White with Red tracer
Y/B . . Yellow with Black tracer
Y/Bl . . Yellow with Blue tracer
Y/G . . Yellow with Green tracer
Y/R . . Yellow with Red tracer
Y/W . . Yellow with White tracer


HEATER BLOWER SWITCH
COMMENDE DE SOUFFLANTE DE CHAUFFAGE
INTERRUPTOR DEL VENTILADOR DEL CALENTADOR
CIGARETTE LIGHTER (Optional)
ALLUME-CIGARE
ENCENDEDOR (OPCIONAL)
COMBINATION METER
ENSEMBLE D'INDICATEURS
MEDIDOR DE COMBINACION
BRAKE LIGHT SWITCH
CONTACTEUR DE FEU STOP
INTERRUPTOR DE LA LUZ DE PARO
TURN SIGNAL & 4-WAY RELAY
RELAIS À 4-VOICES ET CLIGNOTANT
SEÑAL DE DIRECCION Y RELE DE CUATRO DIRECCIONES
INTERIOR LIGHT
INTERRUPTEUR DE PORTE
INTERRUPTOR DE LA PUERTA
LIGHTING SWITCH
CONTACTEUR D'ECLAIRAGE
MANDO DE LUCES
DOOR SWITCH
CONTACTEUR DE PORTE
INTERRUPTOR DE LA PUERTA
HORN SWITCH
COMMUTATEUR DE KLAXON
INTERRUPTOR DE CLAXON
DIMMER SWITCH
INVERSEUR DE COODES
INTERRUPTOR DE GRADUACION DE LA LUZ
WASHER SWITCH
COMMUTATEUR DE LAVE-GLACE
INTERRUPTOR DEL LAVADOR
FUSE BOX
BOITE À FUSIBLES
CAJA DE FUSIBLES
COMBINATION SWITCH
CONTACTEUR MIXITE
INTERRUPTOR DE COMBINACION
WIPER SWITCH
CONTACTEUR D'ESSUIE-GLACE
INTERRUPTOR DEL LIMPIAPARABRISAS
INTERVAL WIPER RELAY (Optional)
RELAIS D'ESSUIE-GLACE INTERMITTENT
RELÉ DE LIMPIAPARABRISAS INTERMITENTE (DE INTERVALO)
TURN SIGNAL & WAY SWITCH
SIGNAL DE CHANGEMENT DE DIRECTION ET COMMUTATEUR À 4 VOIES
PASSING SWITCH
INTERRUPTEUR DE FEU DÉPASSEMENT
INTERRUPTOR DE LA LUZ DE CRNCE
REAR TURN SIGNAL LIGHT (R)
CLIGNOTANT ARRIÈRE
LUZ DE SEÑAL DE DIRECCIÓN TRASERA
TAIL/BRAKE LIGHT (R)
FEU ARRIÈRE/STOP
LUZ TRASERA/FRENO
BACK-UP LIGHT (R)
FEU DE RECUL
LUZ DE RETROCESO
LICENCE LIGHT
LAMPE DE PLAQUE D'IMMATRICULATION
LUZ DE PLACA DE MATRICULA
BACK-UP LIGHT (L)
FEU DE RECUL
LUZ DE RETROCESO
TAIL/BRAKE LIGHT (L)
FEU ARRIÈRE/STOP
LUZ TRASERA/FRENO
REAR TURN SIGNAL LIGHT (L)
CLIGNOTANT ARRIÈRE
LUZ DE SEÑAL DE DIRECCIÓN TRASERA
HEATER BLOWER MOTOR
MOTEUR DE SOUFFLERIE DU CHAUFFAGE
MOTOR DEL VENTILADOR IMPELENTE DEL CALENTADOR
REAR DEFOGGER (Optional)
DEGIVREUR ARRIERE (En option)
DESEMPAÑADOR TRASERO (Opcional)
WIPER MOTOR
MOTEUR D'ESSUIE-GLACE
MOTOR DEL LIMPIAPARABRISAS
FUEL LEVEL GAUGE
JAUGE DE NIVEAU DE CARBURANT
INDICADOR DE NIVEL DE COMBUSTIBLE

11-2. Head Light Cleaner
(For Finnish Market)

Description

This cleaner consists of washer tank, motor, switch, control relay, hose, fusible link and nozzles.

Its system allow about 60cc (2.02/2.11 US/Imp oz) of washer fluid to be sprayed onto head lights every time the cleaner switch is turned "ON" but only when the ignition switch is also "ON".

Head light cleaner circuit

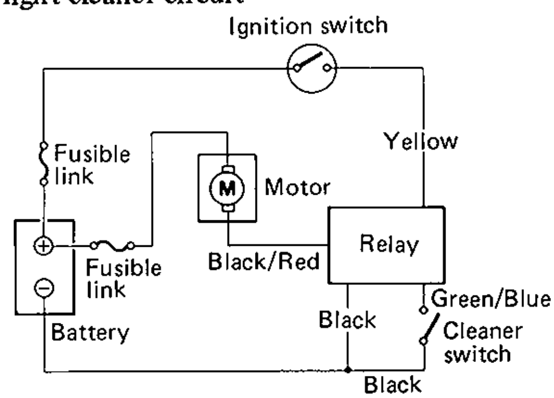


Fig. 11-1

Maintenance Service

When the cleaner motor does not start even if the cleaner switch is turned "ON", check lead connections and coupler connections.

Then, check the following items.

1) Fuse blown or mounted incorrectly
2) Cleaner switch:
   To check the cleaner switch, remove the couplers and check continuity between the Green and Black lead terminals using a ohm meter.

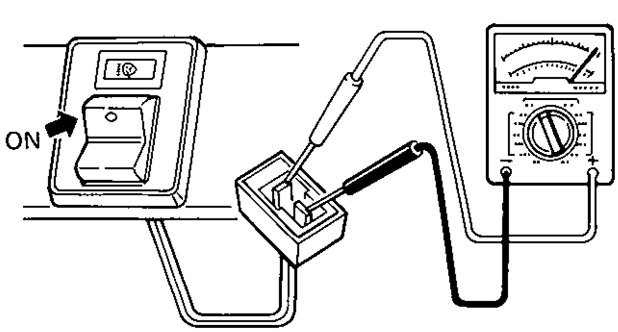


Fig. 11-2

3) Cleaner relay:
   To check the cleaner relay, turn on the ignition switch and using a volt meter, check to ensure that voltage between terminals ③ and ② is about 12V. Then connect the volt meter between coupler terminals ④ and ③ and turn on the cleaner switch. The relay is proved normal if 12V is indicated for only 0.5 second and 0V for the rest of the time while checking.

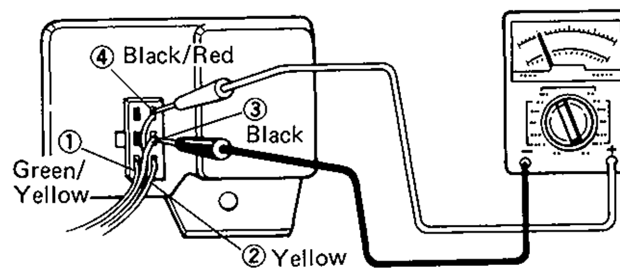


Fig. 11-3

4) Cleaner motor:
   To check the cleaner motor, remove the couplers and with the battery connected as shown in the figure, check the motor for operation.

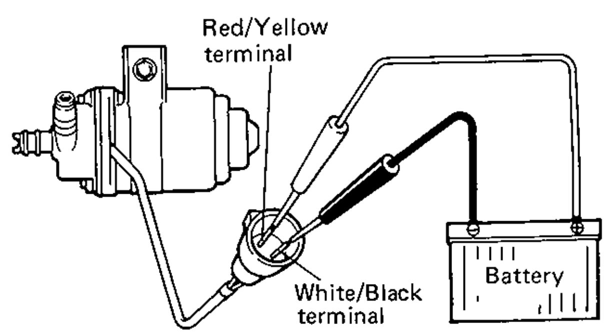


Fig. 11-4

12. PERIODIC MAINTENANCE

Periodic Maintenance Schedule

The items marked with * in this maintenance schedule are those newly added to the other manuals as mentioned in FOREWORD. Other items remain the same.

Interval: This interval should be judged by odometer reading or months, whichever comes first.										
	km (x 1,000)	1	10	20	30	40	50	60	70	80
	miles (x 1,000)	1	6	12	18	24	30	36	42	48
	months	1	6	12	18	24	30	36	42	48
ENGINE										
1. Water pump (fan) drive belt		A	–	I	–	R	–	I	–	R
*2. Camshaft timing belt		I	–	I	–	I	–	I	–	I
3. Valve clearance		A	–	A	–	A	–	A	–	A
4. Engine bolts (All cylinder head and manifold fixings)		T	–	T	–	T	–	T	–	T
5. Engine oil filter		R	R	R	R	R	R	R	R	R
6. Engine oil	API Grade SD or SE	R	Replace every 10,000 km (6,000 miles)							
	API Grade SC	R	Replace every 5,000 km (3,000 miles)							
7. Engine coolant		–	–	–	–	R	–	–	–	R
8. Cooling system hoses and connections		–	–	I	–	I	–	I	–	I
9. Exhaust pipes and mountings		–	–	I	–	I	–	I	–	I
IGNITION										
10. Ignition wiring		–	–	I	–	I	–	I	–	I
11. Distributor cap and rotor		–	–	I	–	I	–	I	–	I
12. Spark plugs and distributor breaker point		–	R	R	R	R	R	R	R	R
13. Ignition timing		I	A	A	A	A	A	A	A	A
14. Distributor advance		–	–	I	–	I	–	I	–	I
FUEL										
15. Air cleaner	Paved-road	Clean every 10,000 km (6,000 miles)								
	Dusty condition	Clean every 2,500 km (1,500 miles) or as required Replace every 40,000 km (24,000 miles) More frequent replacement if under dusty driving conditions.								
16. Accelerator cable & Carburetor shafts		–	I&L	I&L	I&L	I&L	I&L	I&L	I&L	I&L

**Item 2 is applicable to the vehicle whose owner's manual specifies to inspect about this item in its periodic maintenance schedule.*

NOTE:

"A" : Check and/or adjust if necessary
"R" : Replace or Change
"I" : Inspect and correct or replace if necessary
"T" : Tighten to the specified torque
"L" : Lubricate
"C" : Clean

Interval: This interval should be judged by odometer reading or months, whichever comes first.	km (x 1,000)	1	10	20	30	40	50	60	70	80
	miles (x 1,000)	1	6	12	18	24	30	36	42	48
	months	1	6	12	18	24	30	36	42	48
17. *Dush pot		–	–	I	–	I	–	I	–	I
18. Fuel tank cap, gas lines and connections		I	–	–	–	I	–	–	–	I
19. Fuel filter		–	–	–	–	R	–	–	–	R
20. Idle speed and idle mixture		A	–	A	–	A	–	A	–	A
CRANKCASE EMISSION CONTROL										
21. Crankcase ventilation hoses and connections		–	–	I	–	I	–	I	–	I
22. *PCV valve		–	–	–	–	I	–	–	–	I
FUEL EVAPORATIVE EMISSION CONTROL										
23. Fuel vapor storage system, hoses and connections		–	–	I	–	I	–	I	–	I
ELECTRICAL										
24. Wiring harness connections and headlights		–	–	I	–	I	–	I	–	I
CHASSIS AND BODY										
25. Clutch play		I	I	I	I	I	I	I	I	I
26. Brake fluid		I	I	I	I	R	I	I	I	R
27. Brake pedal		I	I	I	I	I	I	I	I	I
28. Brake lever and cable		I	I	I	I	I	I	I	I	I
29. *Brake discs and pads Brake drums and shoes		–	I	I	I	I	I	I	I	I
30. Brake hoses and pipes		–	I	I	I	I	I	I	I	I
31. Tires (Abnormal wear and pressure)		–	I	I	I	I	I	I	I	I
32. Wheels, hub nuts *and free wheeling hubs (Optional parts)		I	I	I	I	I	I	I	I	I
33. Shock absorbers		I	I	I	I	I	I	I	I	I
34. Propeller shaft or Drive shaft		–	–	I&L	–	I&L	–	I&L	–	I&L
35. Transmission, (transfer) and differential oil		R	I	I	I	R	I	I	I	R
36. Bolts and nuts		T	–	T	–	T	–	T	–	T
37. Steering condition		I	I	I	I	I	I	I	I	I
38. Test drive		Test drive on completion of each service								

**Item 17 is applicable to the vehicle equipped with a dush pot on the carburetor.*

**Item 22 is applicable to the vehicle equipped with a PCV valve on the intake manifold.*

SUZUKI

SJ410

SUPPLEMENTARY SERVICE MANUAL

23 -1

99501-80014-01E
(英)

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL describes the points requiring special care in the event of servicing (inspection, disassembly, assembly, etc.) of the principal parts changed starting from Body Nos. shown below.

This MANUAL includes the information, illustrations and specifications based on the most up-to-date production information available at the time of preparation of this MANUAL. However, its details may be changed without notice.

For any items not contained in this manual, refer to page 1-1 ~ 23-60.

- This supplementary manual is not applicable to American and Canadian markets.
- The minor change has been carried out since 1984, July (September for European market) production.
  Effective body No.:

For European Market	For Other Market
x JSAOSJ40000585001 x ~	SJ 40 – 170001 ~
x JSAOSJ40V00585001 x ~	SJ40T – 120001 ~
x JSAOSJ40T00505001 x ~	SJ 41 – 110001 ~
x JSAOSJ41000505001 x ~	

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

TABLE OF CONTENTS

1. GENERAL

1

NOTICE:
For the items not found in this section of this manual, refer to the section "GENERAL" on page 1-1 ~ 1-20.

1. Exterior View

SJ410 Canvas Top

Fig. 1-1

SJ410 Metal Top

Fig. 1-2

(Metal top high roof)

Fig. 1-3

SJ410 Pick-up

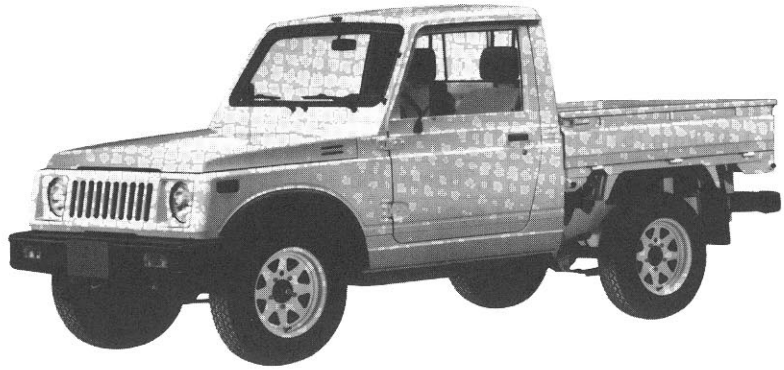


Fig. 1-4

SJ410 Long body
(4-passenger type)

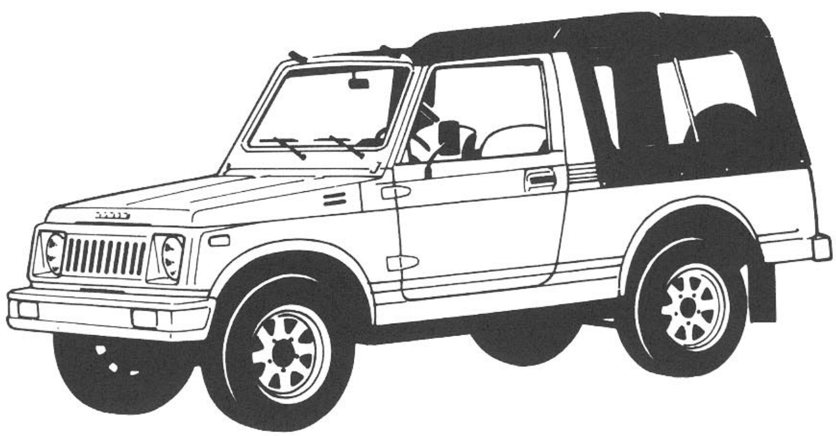


Fig. 1-5

(6-passenger type)

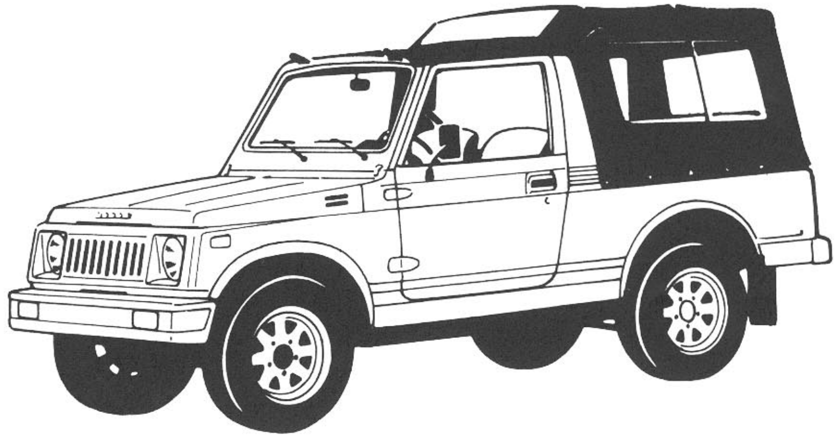


Fig. 1-6

2. Specifications

Item \ Model		SJ410 Canvas Top	SJ410 Metal Top (V-Type)	SJ410 Pick-up (K-Type)	SJ410 Long Body (W-Type)
DIMENSIONS					
Overall length		3,410mm (134.3in.) 1	3,420mm (134.6in.) 1	3,890mm (153.1in.)	3,990mm (157.1in.) 1
		3,430mm (135.0in.) 2	3,440mm (135.4in.) 2		4,010mm (157.9in.) 2
Overall width		1,395mm (54.9in.) 1	←	←	←
		1,460mm (57.5in.) 2	←	←	←
Overall height		1,690mm (66.5in.) 1	1,700mm (66.9in.) 1	1,690mm (66.5in.) 1	1,845mm (72.6in.) 1·3
			1,850mm (72.8in.) 1·6		1,940mm (76.4in.) 1·4
		1,680mm (66.1in.) 2	1,690mm (66.5in.) 2	1,680mm (66.1in.) 2	1,830mm (72.0in.) 2·3
			1,840mm (72.4in.) 2·6		1,925mm (75.8in.) 2·4
Wheelbase		2,030mm (79.9in.)	←	2,375mm (93.5in.)	←
Tread	front	1,190mm (46.9in.) 1	←	←	←
		1,210mm (47.6in.) 2	←	←	←
	rear	1,200mm (47.2in.) 1	←	←	←
		1,220mm (48.0in.) 2	←	←	←
Load deck size	length	870mm (34.3in.)	840mm (33.1in.)	1,550mm (61.0in.)	1,050mm (41.3in.) 3·5
					1,450mm (57.1in.) 4
	width	1,270mm (50.0in.)	1,215mm (47.8in.)	1,320mm (52.0in.)	1,270mm (50.0in.) 3
					810mm (31.9in.) 4
	height	1,020mm (40.2in.)	1,045mm (41.1in.)	280mm (11.0in.)	1,035mm (40.7in.) 3
			1,195mm (47.0in.) 6		1,235mm (48.6in.) 4
Ground clearance		240mm (9.4in.) 1	←	←	←
		230mm (9.1in.) 2	←	←	←
ENGINE					
Type		Four-stroke cycle water-cooled, OHC	←	←	←
Number of cylinders		4	←	←	←
Lubrication system		Wet sump	←	←	←
Bore		65.5mm (2.58in.)	←	←	←
Stroke		72.0mm (2.83in.)	←	←	←
Piston displacement		$970 cm^3$ (970cc, 59.2 cu.in.)	←	←	←
Compression ratio		8.8 : 1	←	←	←
Carburetor		AISAN	←	←	←
Air cleaner		Polyester fiber element (Dry type)	←	←	←

1 . . . For 6.00-16-4PR tire
2 . . . For FR78-15 tire
3 . . . For standard-canvas
4 . . . For high-canvas
5 . . . For 2 passengers
6 . . . For metal top high roof

NOTE:
Specifications are subject to change without notice.

Item \ Model		SJ410 Canvas Top	SJ410 Metal Top (V-Type)	SJ410 Pick-up (K-Type)	SJ410 Long Body (W-Type)
ELECTRICAL					
Ignition timing		10° B.T.D.C. at 850 r/min (rpm)	←	←	←
Standard spark plug		NGK BP-5ES, NIPPON DENSO W16EX-U or CHAMPION N9YC [*1 BPR-5ES or W16EXR-U]	←	←	←
Starter		Magnetic shift type	←	←	←
Generator		Alternator	←	←	←
Battery		12V, 108 kC (30Ah)/ 20HR [*3 12V, 162kC (45 Ah)/20HR]	←	←	←
Headlight		12V, 60/50W [*1 12V, 45/40W]	←	←	←
Turn signal light		12V, 21W	←	←	←
Clearance light		12V, 5W	←	←	←
Tail/Brake light		12V, 5/21W	←	←	←
Side turn signal light		12V, 5W	←	←	←
License plate light		12V, 5W	←	←	←
Back-up light		12V, 21W	←	←	←
Interior light		12V, 5W	←	←	←
Meter pilot light		12V, 3.4W	←	←	←
Main fuse		$0.5mm^2$ (fusible link)	←	←	←
Fuse box		15/15/15/15/15/20A [*1 10/10/10/10 15/15/20/15/15/ 10/5/5A]	←	←	←
POWER TRANSMISSION					
Clutch type		Dry, single disc	←	←	←
Transmission type		4-forward all synchro-mesh, 1 reverse	←	←	←
Transfer gear box type		2-speed constant mesh	←	←	←
Final reduction ratio		4.111 [*2 4.555]	←	←	4.111
Gear ratios	low	3.136	←	←	←
	2nd	1.946	←	←	←
	3rd	1.422	←	←	←
	top	1.000	←	←	←
	reverse	3.463	←	←	←
Transfer gear ratios	low range	2.511	←	←	←
	high range	1.580	←	←	←
Overall reduction ratios:					
Low range	low	32.372 [*2 35.868]	←	←	←
	2nd	20.088 [*2 22.257]	←	←	←
	3rd	14.678 [*2 16.264]	←	←	←
	top	10.322 [*2 11.437]	←	←	←
	reverse	35.747 [*2 39.608]	←	←	←

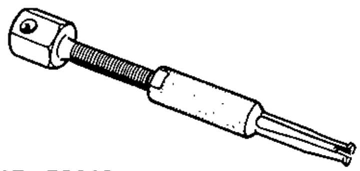
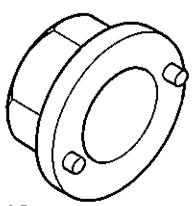
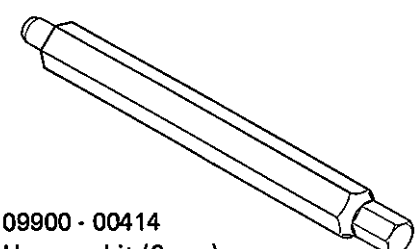
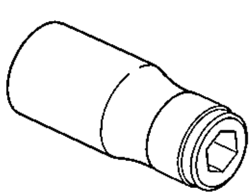
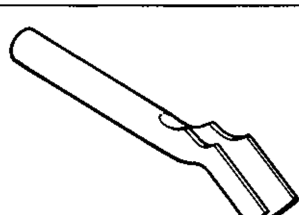
[*1] For European market
[*2] For Colombian, Peruvian and New Zealand markets
[*3] For Finnish, Norwegian and Swedish markets

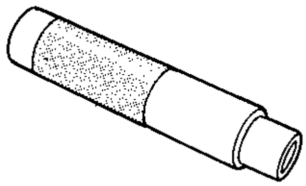
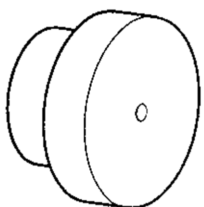
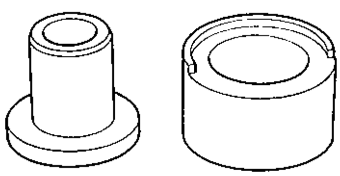
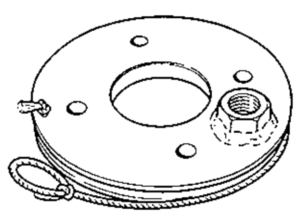
Item \ Model		SJ410 Canvas Top	SJ410 Metal Top (V-Type)	SJ410 Pick-up (K-Type)	SJ410 Long Body (W-Type)
High range	low	20.369 [*2 22.569]	←	←	←
	2nd	12.640 [*2 14.005]	←	←	←
	3rd	9.236 [*2 10.233]	←	←	←
	top	6.495 [*2 7.196]	←	←	←
	reverse	22.493 [*2 24.922]	←	←	←
WHEEL AND SUSPENSION					
Tire size: front and rear		6.00-16-4PR or FR78-15, [*1 195 SR15]	←	←	←
Tire pressure	front	140 kPa (1.40 kg/cm², 20 psi)	←	←	←
	rear	140kPa (1.40 kg/cm², 20 psi)-unladen	←	210 kPa (2.10kg/cm², 30psi)	140kPa (1.40 kg/cm², 20 psi)-unladen
		180kPa (1.80 kg/cm², 26 psi)-laden	←		180kPa (1.80 kg/cm², 26 psi)-laden
Suspension type	front	Leaf spring	←	←	←
	rear	Leaf spring	←	←	←
STEERING					
Turning radius		4.9 m (16.1 ft)	←	5.7 m (18.7 ft)	←
Steering gear box		Ball nut type	←	←	←
Toe-in		2 – 6 mm (0.08 – 0.24 in.)	←	←	←
Camber angle		1° 00′	←	←	←
Caster angle		2° 30′	←	←	←
Trail		14.5 mm (0.57 in.)	←	←	←
King pin angle		9° 00′	←	←	←
BRAKE SYSTEM					
Type		4-wheel, hydraulic	←	←	←
Wheel brake	front	Disc type	←	←	←
	rear	Drum type (Leading and trailing)	←	←	←
Parking brake		Internal expanding, on propeller shaft	←	←	←
CAPACITIES					
Cooling solution		4.0 ℓ (8.5/7.0 US/Imp. pt)	←	←	←
Fuel tank		40 ℓ (10.6/8.8 US/Imp. gal)	←	←	←
Engine oil		3.2 ℓ (6.8/5.6 US/Imp. pt)	←	←	←
Transmission oil		1.3 ℓ (2.7/2.3 US/Imp. pt)	←	←	←
Differential gear box oil	front	1.5 ℓ (3.2/2.6 US/Imp. pt)	←	←	←
	rear	1.3 ℓ (2.7/2.3 US/Imp. pt)	←	←	←
Transfer gear box oil		0.8 ℓ (1.7/1.4 US/Imp pt)	←	←	←

[*1] For European market
[*2] For Colombian, Peruvian and New Zealand markets

3. Special Tools

Special tools assure three things: 1) improved workmanship, 2) speedy execution of jobs for which they are meant; and 3) protecion of parts and components against damage.
In this section, special tools are introduced that are newly required for SJ410 series starting from Body Nos. mentioned in FORWORD of this MANUAL.

<table>
<tr><td>
09917 - 58010
Bearing remover
(for input shaft bearing)</td><td>This bearing remover, being the same as the one used for SA310 series, is employed for the removal of the transmission input shaft end bearing.</td></tr>
<tr><td>
09944 - 98010
Automatic free wheeling hub socket</td><td rowspan="3">These special tools are the ones used for the removal and installation of the automatic free wheeling hub, which is newly-provided optional part.
When removing and installing the automatic free wheeling hub, use the special tools shown here.</td></tr>
<tr><td>
09900 - 00414
Hexagon bit (6 mm)</td></tr>
<tr><td>
09900 - 00411
Hexagon socket</td></tr>
<tr><td>
09925 - 48210
Clutch release bush remover</td><td>This bush remover, being the same as the one used for SA310 series, is employed for the removal of the clutch release bush.</td></tr>
</table>

 09925 - 18010 Bearing installer	This installer is used in transmission assembling.
 09926 - 58010 Bearing remover attachment	This attachment is used in transfer gear disassembling.
 09926 - 48010 Universal joint assembler	This assembler is used in propeller shafts disassembling and assembling.
 09922-75221 Differential preload checking tool	This tool is used in center brake disassembling and assembling .

2. TROUBLE SHOOTING

Refer to the section "2. TROUBLE SHOOTING" on page 2-1 ~ 2-18 for necessary information concerning the subject of this section.

For troubles such as "battery quickly becomes overdischarged", "battery tends to become overcharged", and "charge warning lamp remains burning even after engine starts up", where the cause of trouble can be thought to be in the alternator or regulator, refer to trouble shooting concerned with the alternator with built-in IC regulator explained in section "10 Charging System" of this supplementary manual.

3. ENGINE

Refer to the section "ENGINE" on page 3-1 ~ 3-54 for necessary information concerning the subject of this section.

4. CARBURETOR

Refer to the section "CARBURETOR" on page 4-1 ~ 4-10 for necessary information concerning the subject of this section.

5. AIR CLEANER, FUEL PUMP AND FUEL FILTER

Refer to the section "5. AIR CLEANER, FUEL PUMP AND FUEL FILTER" on page 5-1 ~ 5-8 for necessary information concerning the subject of this section.

5

6

6. ENGINE COOLING SYSTEM

Refer to the section "ENGINE COOLING SYSTEM" on page 6-1 ~ 6-10 for necessary information concerning the subject of this section.

7. CAR HEATER (Optional)

NOTICE:
For the items not found in this section of this manual, refer to the section "7. CAR HEATER" on page 7-1 ~ 7-4.

7

1. Removal and Installation

Removal

1. Disconnect negative ⊖ battery lead of battery.
2. Drain cooling system when engine is cool.

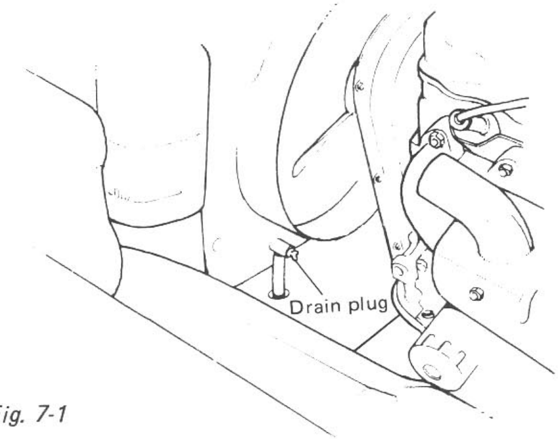


Fig. 7-1

3. Disconnect heater inlet and outlet hoses from heater unit.
4. Remove instrument panel ass'y with speedometer ass'y as follows.
   1) Take off horn pad and remove steering wheel using special tool (steering wheel remover 09944-38210 or 09923-05110)Ⓐ.

Fig. 7-2

   2) If equipped with radio,
   Disconnect radio and cigarette lighter lead wires, and pull out radio case with radio and cigarette lighter after loosening case stay screw, and remove radio case bracket.
   3) Remove ashtray and loosen ashtray plate screws.
   4) Disconnect front hood opening cable from lock ass'y.
   5) Loosen panel box stay screw and food opening cable lock nut at back side of panel box cover.
   6) Disconnect lead wires to control lever at the coupler and heater control cables.
   7) Pull out lever knobes and plate, and loosen lever case screws.
   8) Remove defroster and side ventilator hoses.
   9) Disconnect the coupler from speedometer and lead wire of switches installed to instrument panel at the coupler.
   10) Disconnect speedometer cable from speedometer.
   11) Release wire harness clamps installed to instrument panel.
   12) Loosen screws securing instrument panel.
   13) Remove instrument panel.

> **NOTICE:**
> - **Before removing, recheck to ascertain all hoses, wire harness, cables and screws are disconnected from instrument panel.**
> - **Heater lever case is fitted into steering column holder. So, use care not to damage the case when removing it from the holder.**

5. Remove steering column holder after loosening front door open stopper screws.

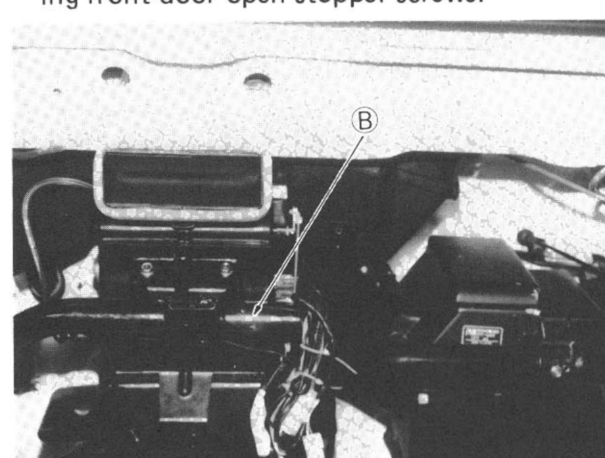


Fig. 7-3 Ⓑ Steering column holder

6. Disconnect heater blower motor and resistor lead wire at the coupler.
7. Loosen heater case securing nut at the engine room side.

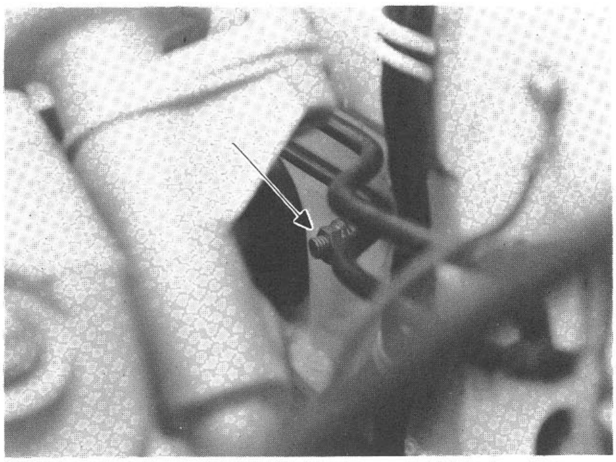


Fig. 7-4

8. Remove heater ass'y •

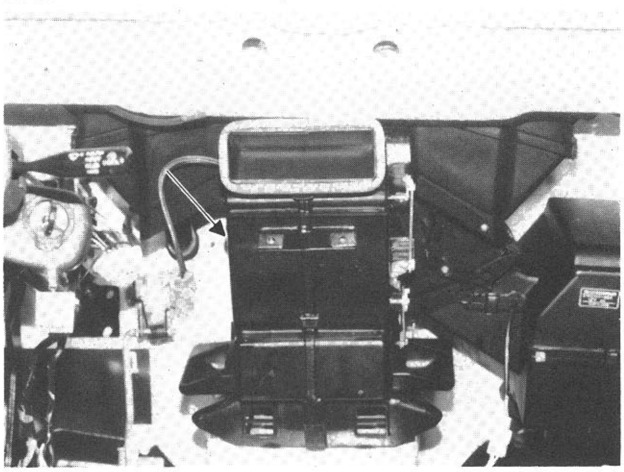


Fig. 7-5

Installation

Reverse the removal sequence to install the car heater and be careful of the following items.

1. Do not forget to insert holder plate into the right or left side of the steering column holder.
2. When assembling each part, care should be taken that no wire harness is put between each such part and the item each such part is assembled to.
3. Clamp the wire harness securely insuring no contact to the sharp edge of each part.
4. When connecting heater hoses, route them correctly with care used that they are free from kink, etc. respectively.

CAUTION:
Upon completion of all the connection and installation operations, fill coolant a specified quantity. For the filling, refer to Section 6. Cooling System.

NOTICE:
Upon completion of all the jobs, perform the following checks.

- **Check to ensure that every joint of each heater hose and pipe is free from leakage of cooling water.**
- **Check to ensure that each control lever operates smoothly and that the car heater operates correctly to each control lever position.**
  In the event of any malfunction, change the clamp position of the control cable for proper adjustment.
- **Check to ensure that the wire harness are securely clamped.**

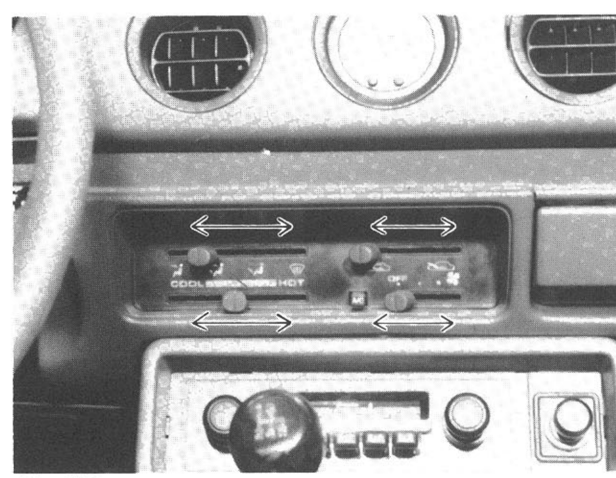


Fig. 7-6

8. IGNITION SYSTEM

Refer to the section "IGNITION SYSTEM" on page 8-1 ~ 8-14 for necessary information concerning the subject of this section.

9. STARTER MOTOR

Refer to the section "9. STARTER MOTOR" on page 9-1 ~ 9-10 for necessary information concerning the subject of this section.

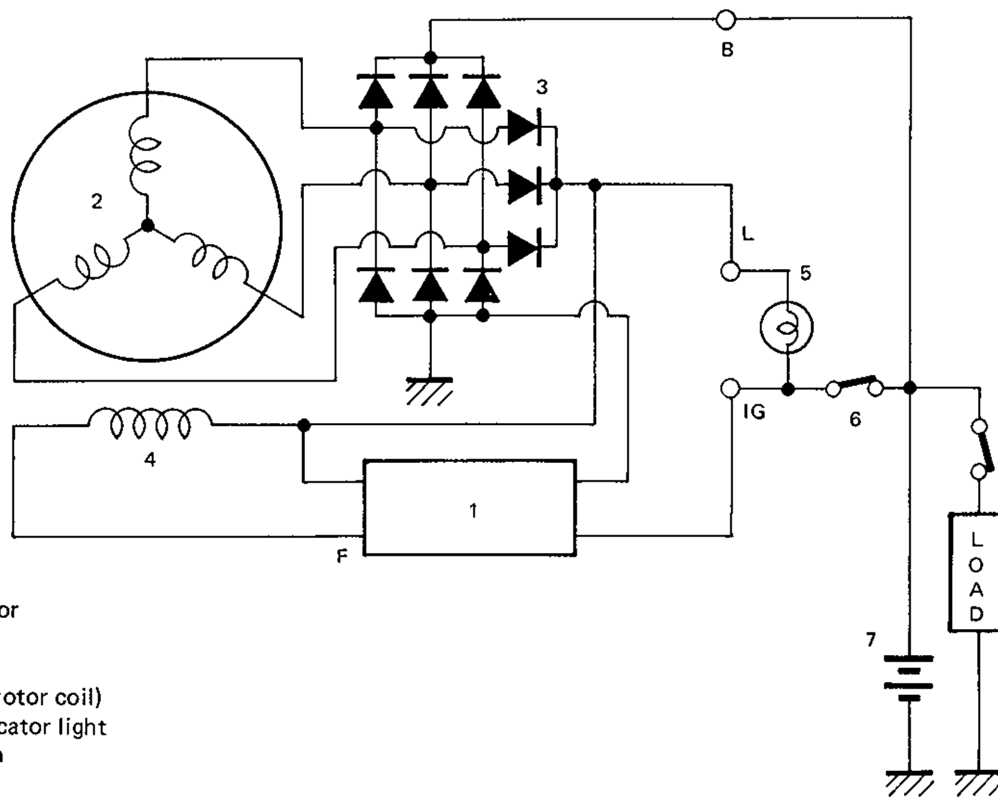
10. CHARGING SYSTEM

NOTICE:
For the items not found in this section of this manual, refer to the section "10. CHARGING SYSTEM" on page 10-1 ~ 10-14.

1. Description

The basic charging system is the IC integral regulator charging system.
The internal components are connected electrically as shown bleow.
The charging system has a basic construction consisting of the same alternator as used previously and the IC regulator contained therein (having the similar function as the conventional, mechanical regulator).

All regulator components are put together in a solid, molded unit, which is made integral with brush holders. The regulator voltage setting cannot be adjusted.



1. I.C. regulator
2. Stator coil
3. Diode
4. Field coil (rotor coil)
5. Charge indicator light
6. Main switch
7. Battery

Fig. 10-1

2. Data and Specification

Nominal operating voltage	12 Volts
Maximum alternator output	40A
Polarity	Negative ground
Effective pulley diameter	65 mm (2.56 in.)
No-load alternator speed	1,000 – 1,100 r/min. 14 volts at normal temperature
Full-load alternator speed	5,000 r/min. maximum, 40A, 13.5 Volts at normal temperature
Direction of rotation	Clockwise as viewed from pulley side
Maximum permissible alternator speed	13,500 r/min. (rpm)
Rectification	Full-wave rectification

3. Trouble Shooting

(When IC regulator-built-in alternator is troubled, i.e., when charge lamp is lighted, even though engine is turning etc.)

> **NOTE:**
> - **Previously, be sure to check the belt tension, connector contact, etc.**
> - **Equip the vehicle with a battery that is normal and charged up sufficiently.**

Check 1:
With the engine idling, measure the alternator B terminal voltage. Next, measure the B terminal voltage obtained when the engine revolution speed is raised up to a level of approx. 2,000 rpm, and compare thus measured voltage with the voltage measured with the engine idling. Does the latter voltage corresponding with an engine revolution speed of 2,000 rpm become higher than the former:
(The connector and B terminal wiring should not be disconnected.)

Does not become higher. (Does not change) ↓

Becomes higher (Normal) ⇨ Go to Check 6

Check 2:
With the engine stopped and the ignition switch ON, measure the alternator L terminal voltage.
(The connector and B terminal wiring should not be disconnected.)

0 to 1 volt ↓

Close to the battery voltage ⇩ Go to Check 5

2 to 3 volts ⇩ Go to Check 6 (Normal)

Check 3:
With the alternator B and IG terminals shorted using a lead wire, conduct Check 2 again.
(The connector and B terminal wiring should not be disconnected.)

0 to 1 volt ↓

2 to 3 volts
The body-side wiring (including ignition switch) has poor contact.

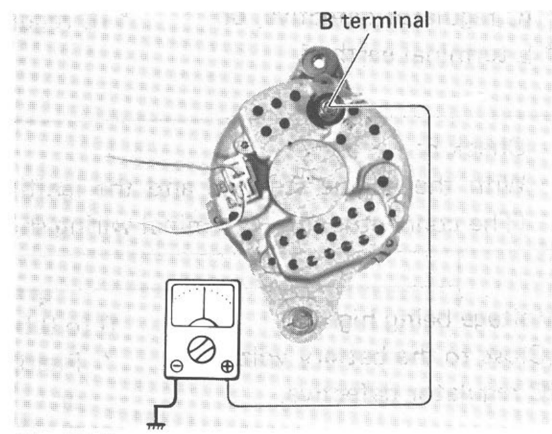


Fig. 10-2

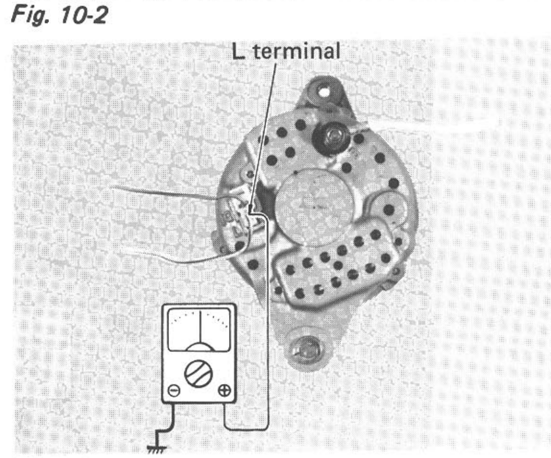


Fig. 10-3

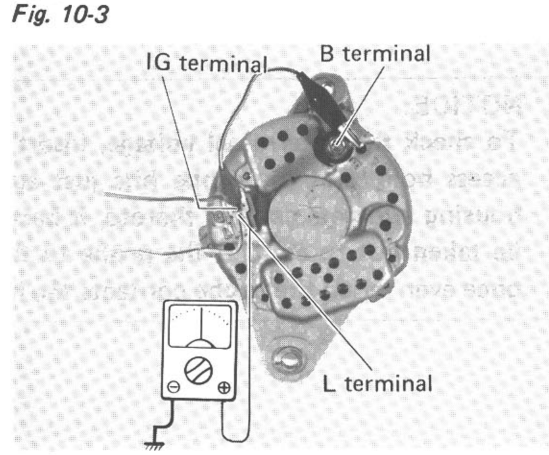


Fig. 10-4

Check 4:
With the alternator connector disconnected, check the alternator L terminal-to-IG terminal continuity.

Continuity

* IC regulator defective, or
* L terminal earthed

No continuity

* IC regulator defective

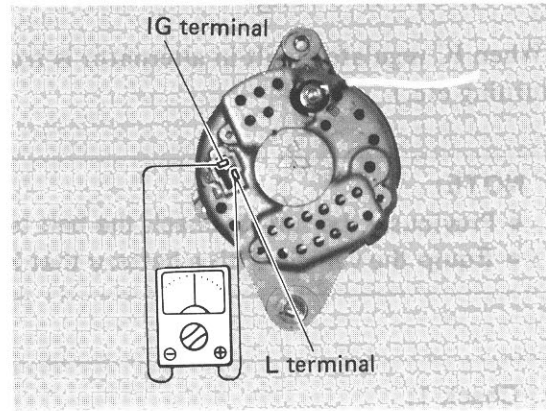


Fig. 10-5

Check 5:
With the engine stopped and the ignition switch ON, measure the IC regulator F terminal voltage. (The connector and B terminal wiring should not be disconnected.)

Voltage being high.
(Close to the battery voltage.)
IC regulator defective.

0 to 0.5 volt.
* Field coil having open circuit,
or
* Brush having poor contact.

0.5 to 2 volts.
* Positive ⊕ diode having short circuit.

⇩

Turn OFF the ignition switch, and pull out the IC generator connector. (Keep the B terminal as connected.). At this condition, measure the L terminal voltage, and consequently voltage close to the battery voltage is measured. This makes it possible to reconfirm that the positive diode is shorted.

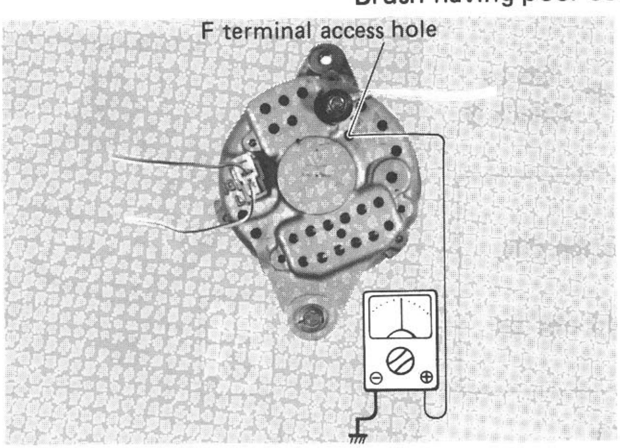


Fig. 10-6

NOTICE:
To check the F terminal voltage, insert the tester positive ⊕ probe straight through the F terminal access hole, and the probe hits just against the F terminal. At this time, if the probe touches the housing and gets earthed thereto, it becomes impossible to measure the voltage. Therefore, care must be taken not to contact the probe to the housing, and to take the probe away from the housing at once even when the probe contacts the housing.

Check 6:
Start the engine, continue the turning of engine at 1,000 to 1,500 rpm for 2 to 3 minutes to reduce the charging current, and then raise the engine revolution speed up to approx. 2,500 rpm. Measure the L terminal voltage obtained at this time. (Measurement should be conducted with the connector and B terminal wirings all connected as they are.) This voltage is called the set voltage.
Also, when this check is conducted, electric loads of lamp, etc. should all be disconnected previously.
(As for the vehicles with such specifications that the starting of engine causes the headlamps to be lighted automatically, it is necessary to pull out the headlamp coupler so that the lamps are not lighted.)

The set voltage is shown in the diagram at right. Compare this voltage with the standard value.

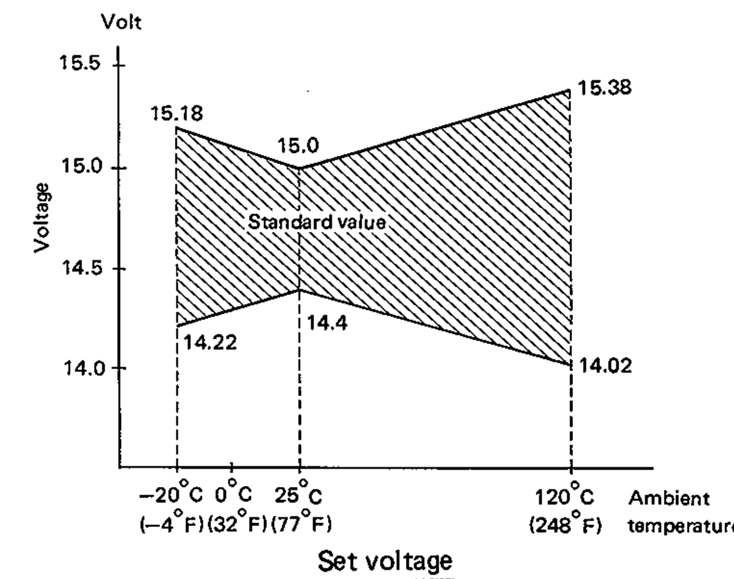


Fig. 10-7

If voltage is below the standard value, check the IC regulator or alternator.

If voltage is within the standard value, IC regulator is not defective.

If voltage is higher than the standard value, IC regulator is defective.

Alternator overhaul check
Check the rectifier and coils, etc. for continuity and short circuit.
If this check proves that the coils, etc. are free from irregularity, the IC regulator must be faulty.

4. Disassembly

1. Remove the 3 screws fastening the end frame to the rotor housing; tap on the rotor housing with a wooden mallet to separate stator and rotor housing from the end frame and motor.

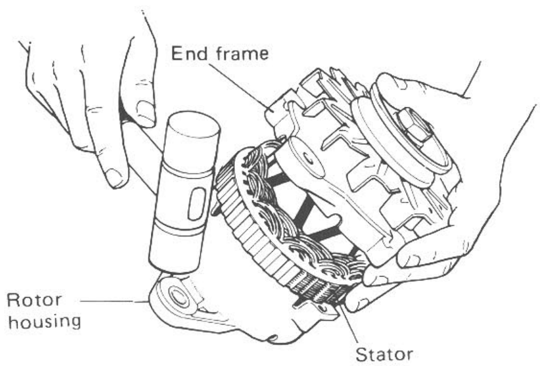


Fig. 10-8

2. Fix the rotor with vise, and loosen the nut to remove the pulley, fan and end frame.

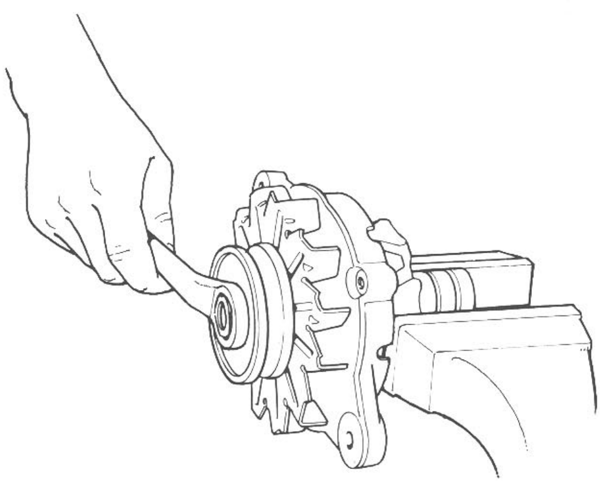


Fig. 10-9

3. Remove the 3 screws securing the rectifier holder in place, and one other nut holding down the terminal insulator. Remove the rotor housing.

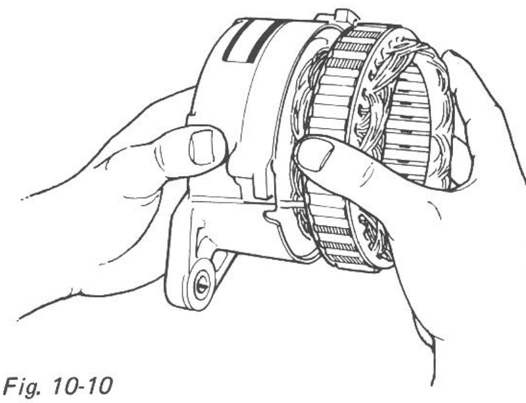


Fig. 10-10

4. Melt the stator coil terminal-to-rectifier connecting solder with a soldering iron, and separate the rectifier-IC regulator ass'y from the stator.

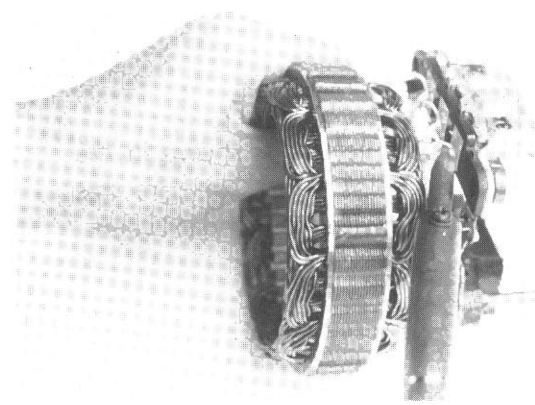


Fig. 10-11

> **NOTE:**
> **The IC regulator case serves also as the brush holder. That is, the IC regulator and the brush holder are put together as an integral unit.**

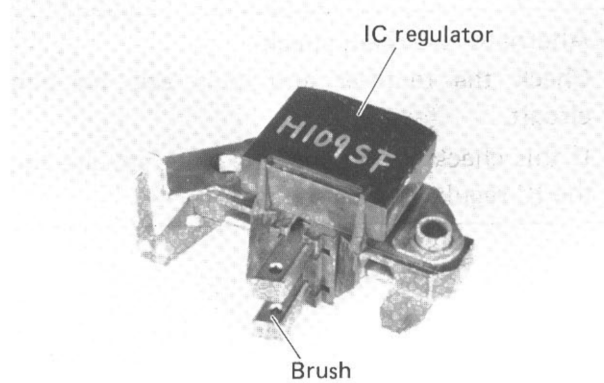


Fig. 10-12

5. Maintenance Services

1) Rotor

- Testing the rotor open-circuit

  Check to be sure there is continuity between the two slip rings when tested as shown. Absence of continuity means that the field coil is open-circuited and must be replaced.

Ring-to ring circuit resistance	3.4 – 3.7 ohms at 20°C (68° F)

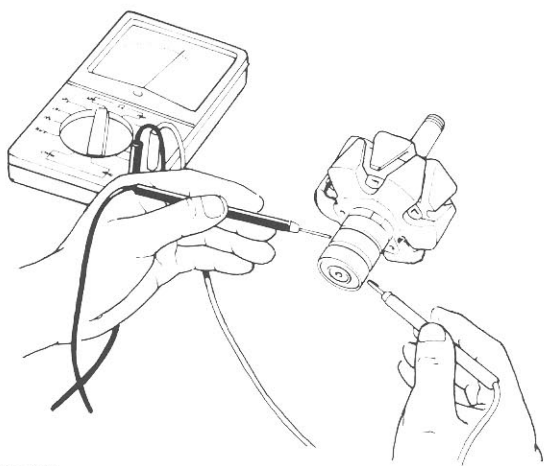


Fig. 10-13

- Testing the rotor for grounding

  Check to be sure there is no continuity between the slip ring and the rotor shaft when tested as shown. Presence of any continuity means that the insulation on the field coil has failed, making it necessary for the rotor to be replaced.

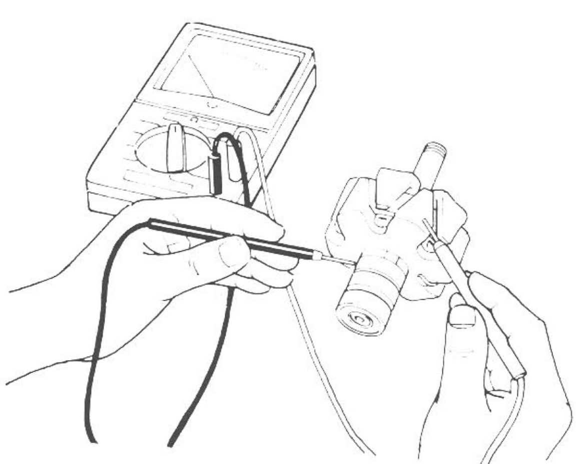


Fig. 10-14

2) Stator

Check to be sure there is no continuity between the stator core and each coil lead.

If there is continuity, replace the stator.

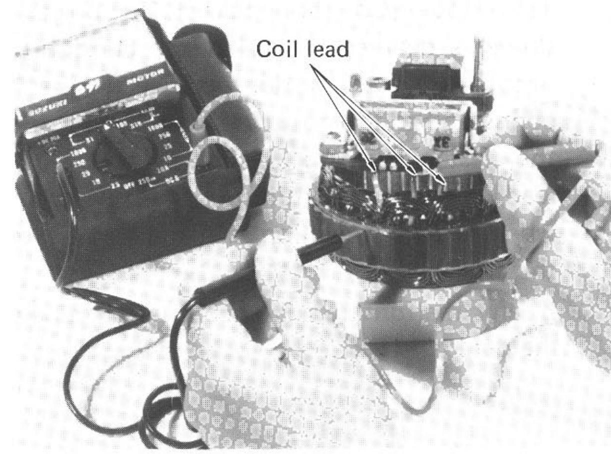


Fig. 10-15

3) Brushes

Visually check the wearing level of each brush. If the brush is worn out up to the service limit mark as shown below, replace it with a new part.

Standard length	18.5 mm (0.73 in)
Service Limit	8 mm (0.32 in)

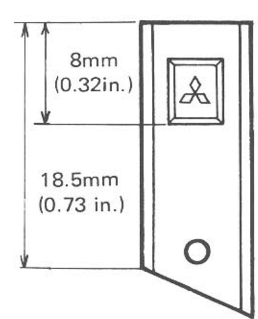


Fig. 10-16

4) Rectifier

- Inspection of positive diode

  Using a circuit tester, check the continuity between the positive-side heat sink and each diode lead (three places). The positive diode is deemed normal if the continuity occurs when the tester positive ⊕ side is connected to the positive-side heat sink and the tester negative ⊖ side to the diode lead, and if the continuity does not occur when each connection is made reverse to the above.

  If any malfunction is encountered, renew the defective part.

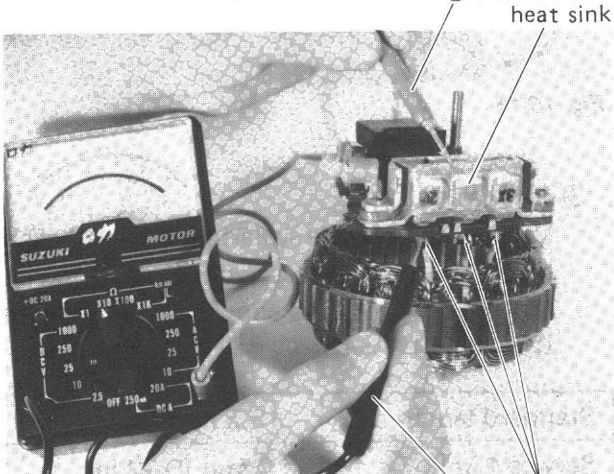


Fig. 10-17

- Inspection of negative diode

  Using a circuit tester, check the continuity between the negative-side heat sink and each diode lead (three places mentioned above).

  The negative diode is deemed normal if the continuity occurs when the tester negative ⊖ side is connected to the negative-side heat sink and the tester positive ⊕ side to the diode lead, and if the continuity does not occur when each connection is made reverse to the above.

  If any malfunction is encountered, renew the defective part.

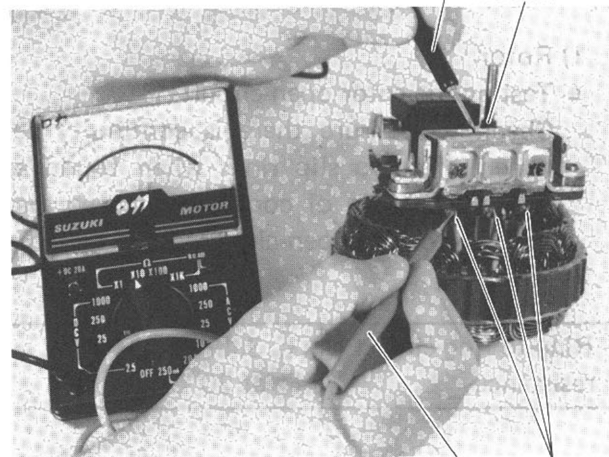


Fig. 10-18

- Inspection of Trio-Diode

  Check the continuity relative to two directions conserning each diode (three pieces) of the trio-diode. The diode in question is deemed normal if the continuity occurs only in one direction but not in the reverse direction.

  If any malfunction is encountered, renew the defective part.

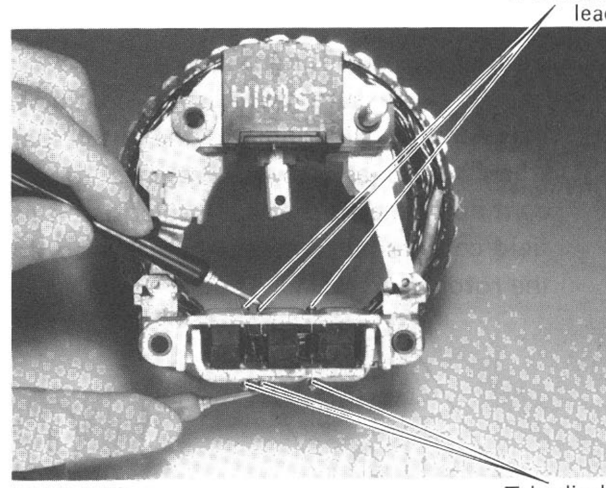


Fig. 10-19

5) IC regulator

The IC regulator can not be checked as a unit. Therefore, check it according to troubleshooting described previously. Also, if any malfunction is encountered, renew the defective part.

6. Battery Specifications

The battery has two kinds of models different in specifications. When replacing the battery, use the same model battery as was installed originally.

Model	NS40S	NX100-S6
Rated capacity	30AH, 12Volts	45AH, 12Volts
Electrolyte	2.4 liters (5.07/4.22 US/Imp. pt.)	3.1 liters (6.55/5.46 US/Imp. pt.)
Electrolyte S.G.	1.280 when fully charged at 20°C (68°F)	

11. CLUTCH

NOTICE:
For the items not found in this section of this manual, refer to the section "11. CLUTCH" on page 11-1 ~ 11-6.

1. Modified Parts

The clutch release bearing, input shaft bearing and clutch release arm shown in the figure below have been modified.

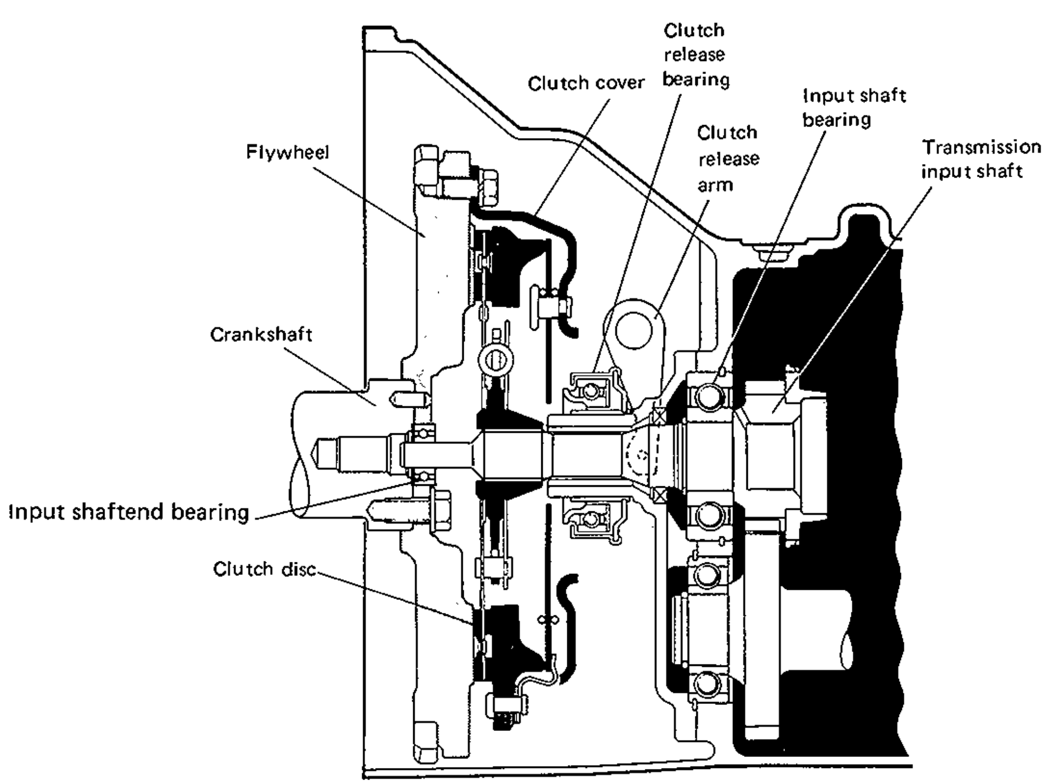
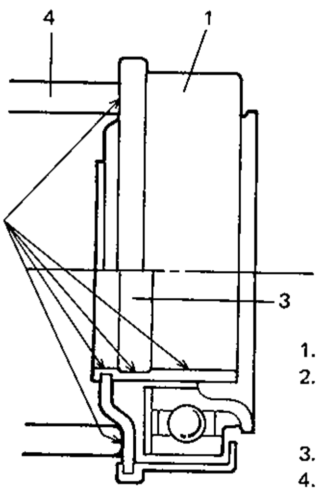


Fig. 11-1

11

2. Precautions on Disassembly and Reassembly

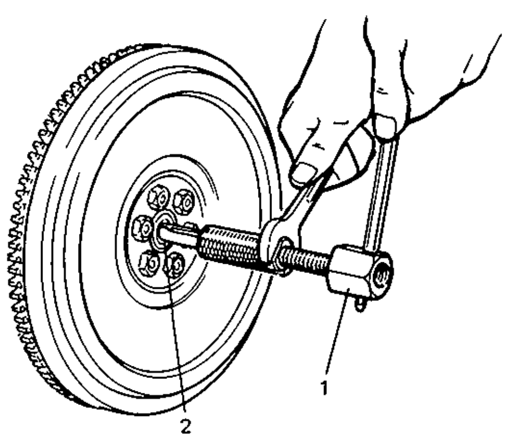
1) Clutch release bearing:
Before installing, lubricate the clutch release bearing with grease as shown in Fig. 11-2. Completely pack full the I.D. recess with grease.



1. Clutch release bearing
2. Apply grease (SUZUKI SUPER GREASE A, 99000-25010)
3. I.D. recess
4. Clutch release arm

Fig. 11-2

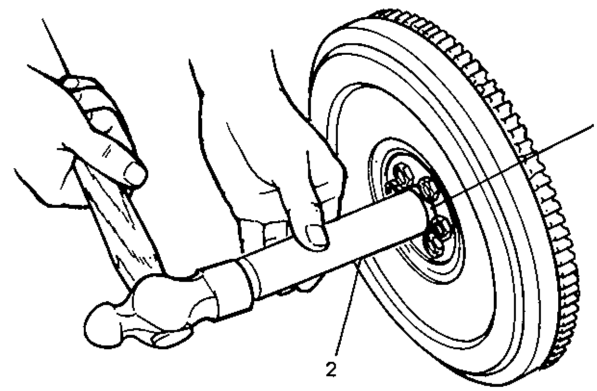
2) Input shaft bearing:
- Use special tool (Bearing remover) for removal of the bearing.



1. Special tool (Bearing remover 09917-58010)
2. Input shaft bearing

Fig. 11-3

- To install the bearing into the flywheel, use 26 mm (1.023 in.) outside diameter pipe or round bar.



1. Input shaft bearing
2. 26mm (1.023 in) outside diameter pipe or round bar

Fig. 11-4

12. GEARSHIFTING CONTROL

12

1. General Description

In this gear shifting control system, by its mechanical structure, the movement of the gear shift lever, which is located beside the driver's seat, directly actuates the gear shift fork shaft to shift the gear into the selected position. This system consists of the following parts.

1. Gear shift lever knob
2. Gear shift lever
3. Gear shift lever boot No. 2
4. Gear shift lever boot No. 1
5. Gear shift lever case cover
6. Gear shift lever locating bolt
7. Gear shift lever case
8. Reverse select pin screw
9. Reverse select locating springs
10. Reverse select locating ball
11. Reverse select guide pin
12. Reverse gear shift fork shaft
13. High speed gear shift fork shaft
14. Select return springs
15. Low speed select pin bolt
16. Low speed select guide pin
17. Low speed gear shift fork shaft
18. Gear shift lever wave washer
19. Gear shift lever seat

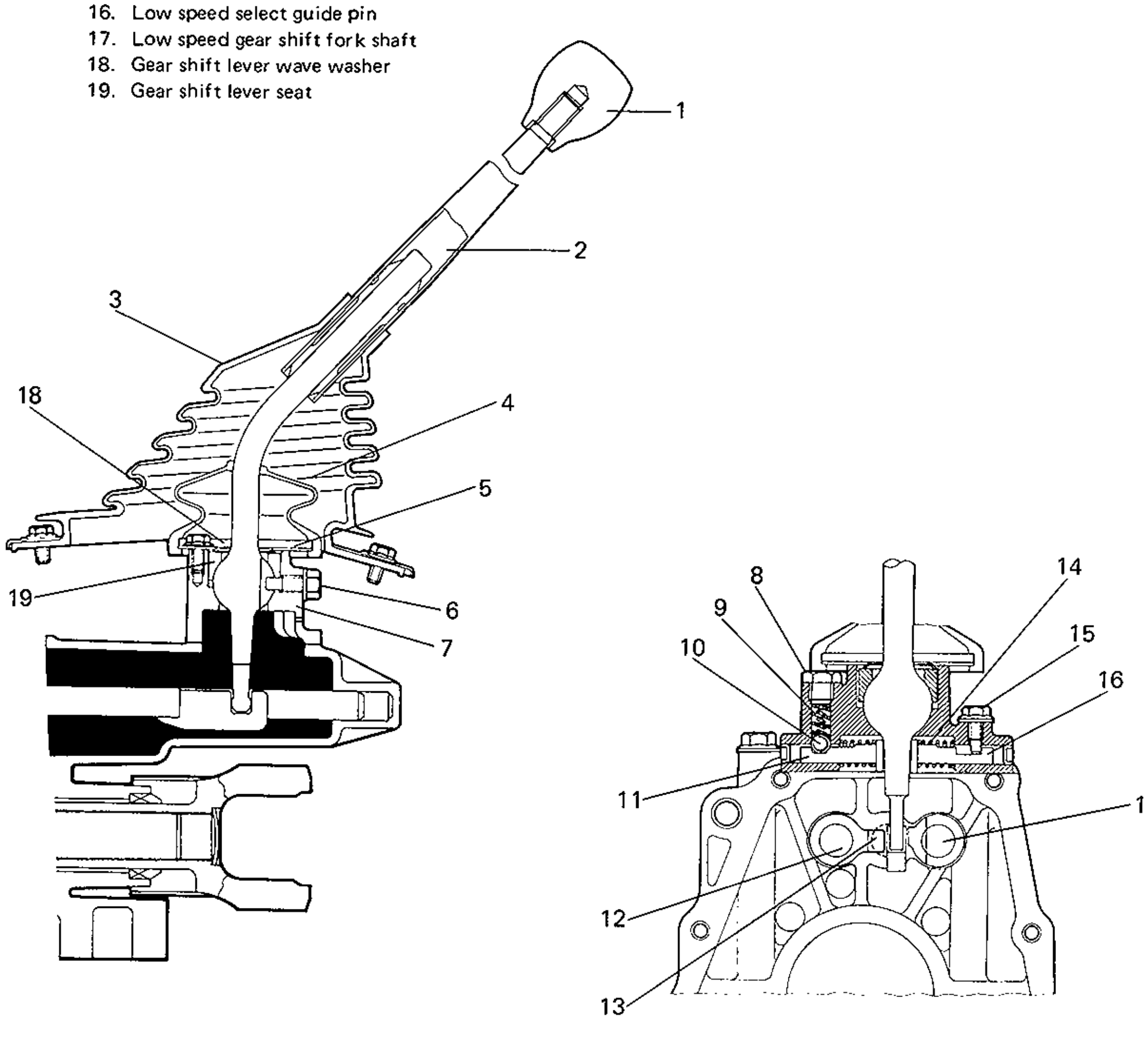


Fig. 12-1

2. Removal

Gear Shift Lever

1) Remove bolts tightening gear shift lever boot No. 2 and take boot of floor center tunnel.

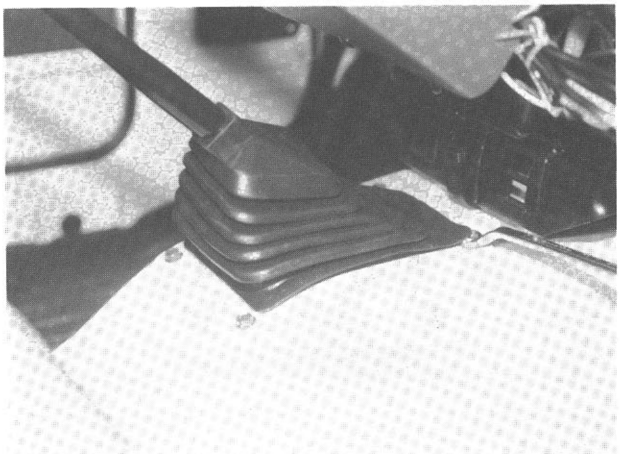


Fig. 12-2

2) Take boot No. 1 off gear shift lever case and move it up (toward knob).
3) Remove 3 bolts tightening gear shift lever case cover.

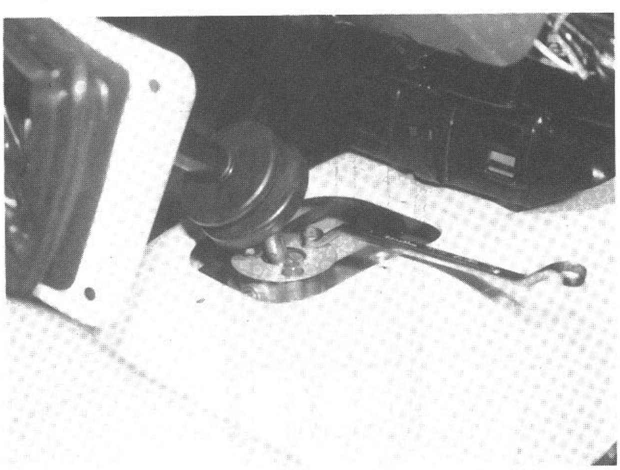


Fig. 12-3

4) Pull gear shift lever out of gear shift lever case.

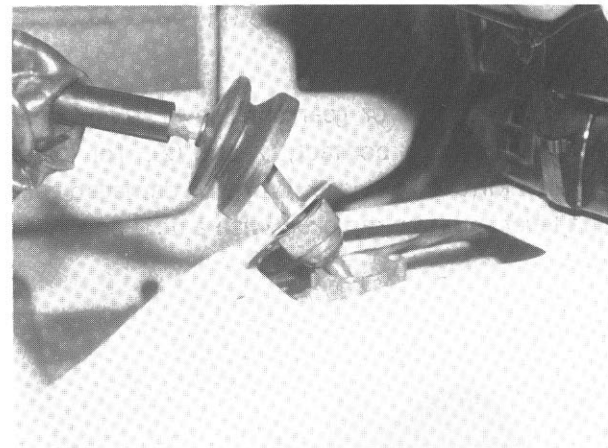


Fig. 12-4

Gear Shift Lever Select Guide Pins

1) After gear shift lever is removed according to foregoing steps 1) through 4), remove gear shift lever case by loosening its tightening bolts (4 pcs).

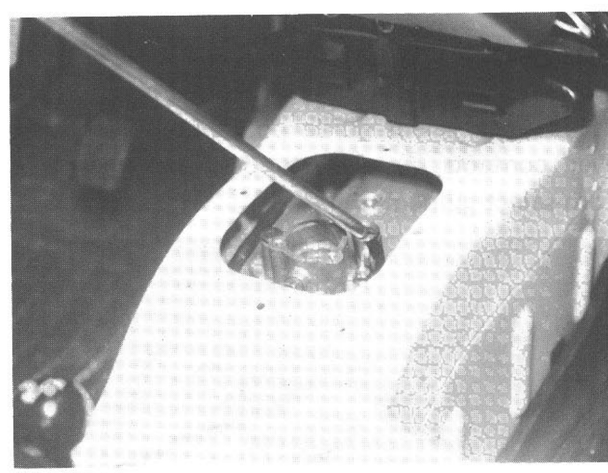


Fig. 12-5

2) Remove reverse select pin screw and take out spring and ball from case.
3) Remove low speed select pin bolt.
4) Compress reverse select guide pin ② against low speed select guide pin ① and take it out of gear shift lever case.

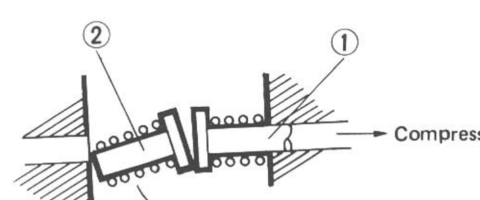


Fig. 12-6

3. Inspection of Components

Gear Shift Lever

Check lower end of gear shift lever where gear shift fork shaft contact, ① and ②, for wear and any kind of damage. Worn or damaged gear shift lever must be replaced with a new one.

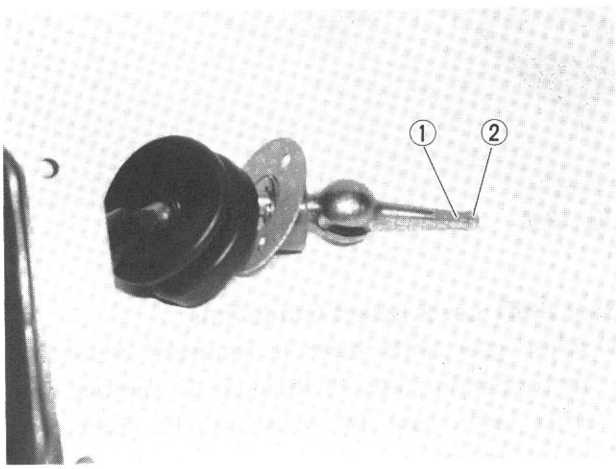


Fig. 12-7

Reverse & Low Speed Select Guide Pins

Check both select guide pins where gear shift lever contacts, ③, for stepped wear. Replace worn select guide pin.

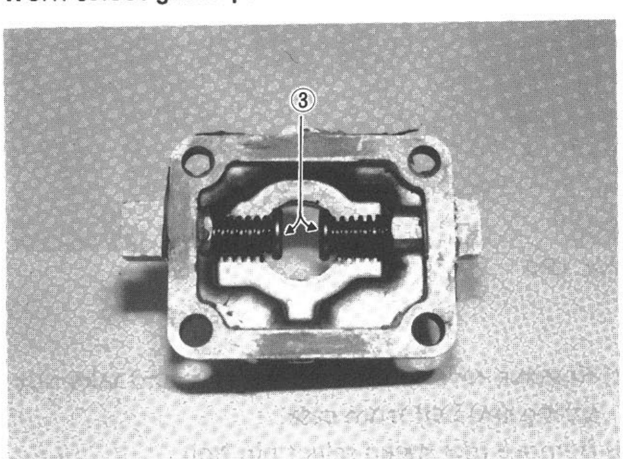


Fig. 12-8

Move shaft and check low speed select guide pin for smooth movement without rattle. If found defective, replace it and apply grease to pin.

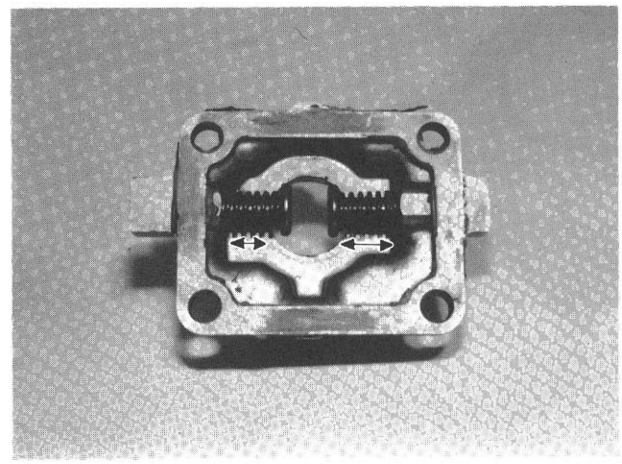


Fig. 12-9

Gear Shift Fork Shaft

Visually check each gear shift fork shaft (High, Low and Reverse) where gear shift lever contacts, ④, for wear. Worn shaft must be replaced.

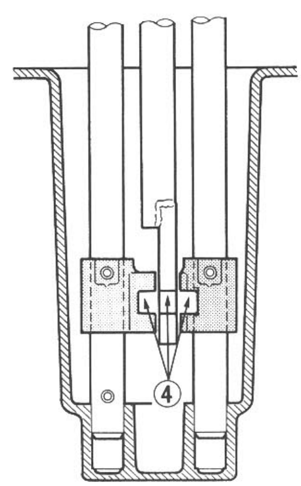


Fig. 12-10

4. Installation

Gear shift lever is installed by reversing removal procedure. Some important steps will be explained in detail.

Reverse & Low Speed Guide Pins

Be sure to apply grease to select guide pins before installing them into gear shift lever case.

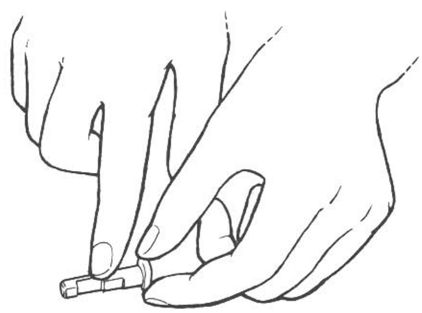


Fig. 12-11

When fitting low speed select guide pin into gear shift lever case, tighten locating bolt while pushing pin so that bolt goes in the groove provided in the pin. Then install reverse select guide pin in case and securely fit the locating ball in the groove provided in the pin.

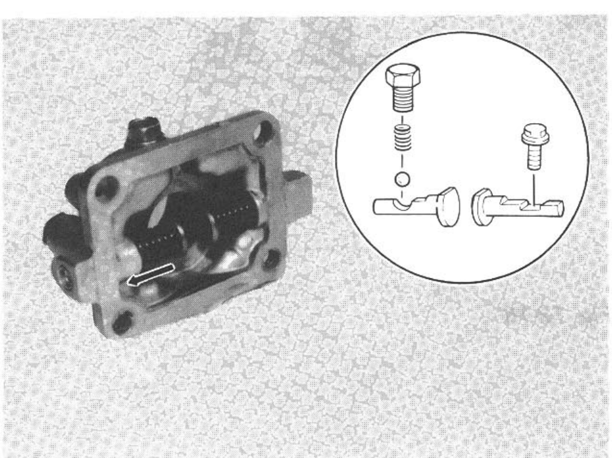


Fig. 12-12

NOTICE:

After each guide pin is installed, make sure that flat surface ⑤ at the tip of pin faces upward (toward gear shift lever).

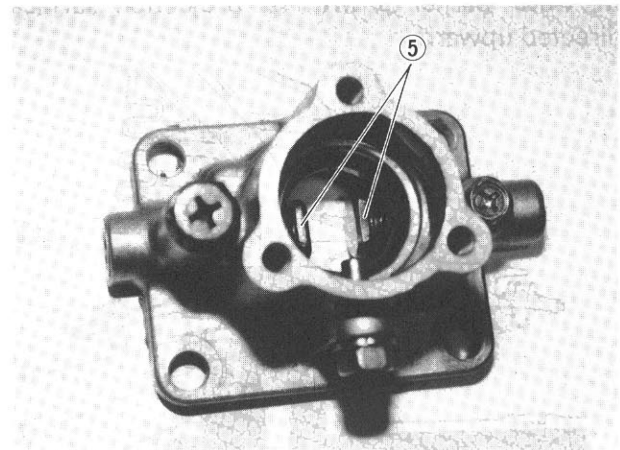


Fig. 12-13

Gear Shift Lever Case

When installing lever case to transmission extension case, clean joint faces, and then apply sealant (SUZUKI BOND NO. 1215, 99000-31110) to joint faces.

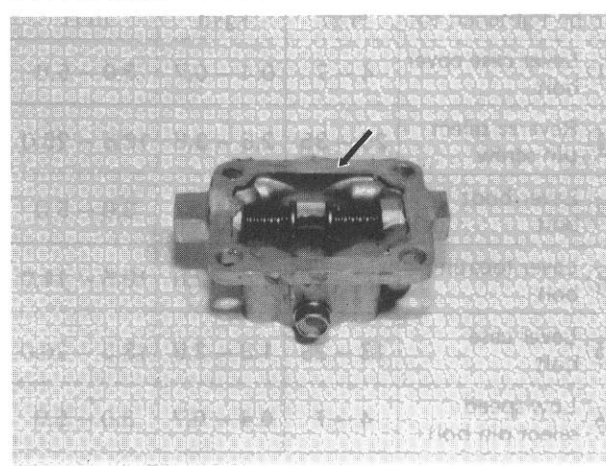


Fig. 12-14

Gear Shift Control Lever Seat

Make sure to fit control lever seat ⑥ into gear shift lever case so that locating bolt ⑦ goes in the groove of control lever seat. And fit wave washer ⑧ with its projection surface directed upward.

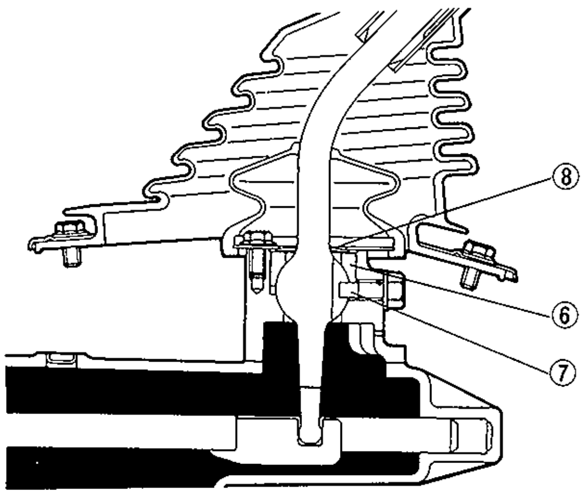


Fig. 12-15

Tightening Torque & Greasing point

To be tightened to:	N·m	kg-m	lb-ft
① Lever case cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
② Reverse select pin screw	25 – 35	2.5 – 3.5	18.5 – 25.0
③ Lever boot bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
④ Lever locating bolt	14 – 20	1.4 – 2.0	10.5 – 14.0
⑤ Lever case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
⑥ Low speed select pin bolt	4 – 7	0.4 – 0.7	3.0 – 5.0

Apply to

Ⓐ : Between gear shift lever boot No. 1 and lever case cover
Ⓑ : Between gear shift lever and lever seat
Ⓒ : Between gear shift lever and lever case
Ⓓ : Gear shift lever locating bolt

* Grease to be used for each greasing point is SUZUKI SUPER GREASE A(99000-25010).
* If gear shift lever locating bolt is removed from case, be sure to apply locking agent (THREAD LOCK CEMENT SUPER "1333B" 99000-32020) to bolt thread for reinstallation.

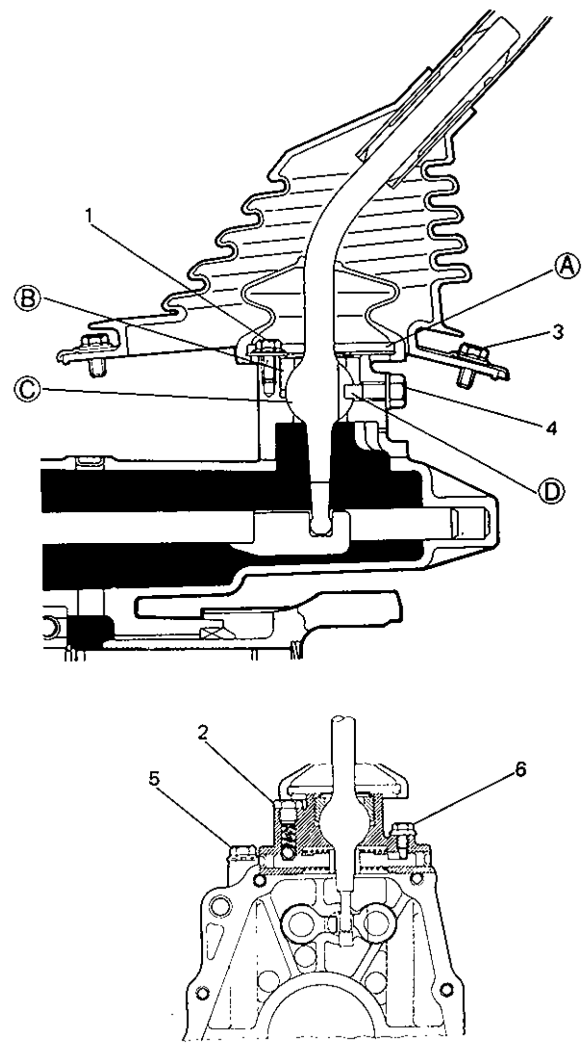
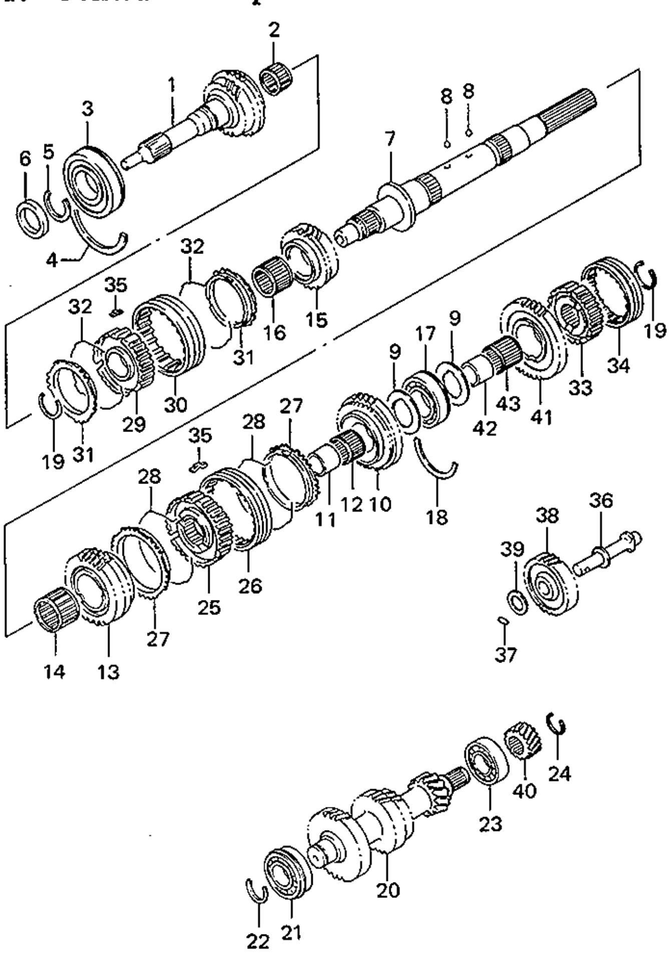


Fig. 12-16

13. TRANSMISSION

NOTICE:
For the items not found in this section of this manual, refer to the section "13. TRANSMISSION" on page 13-1 ~ 13-18.

1. General Description



1. Input shaft
2. Bearing
3. Bearing
4. C ring
5. Circlip
6. Oil seal
7. Main shaft
8. Main shaft washer ball
9. Thrust washer
10. Low gear
11. Bush
12. Bearing
13. Second gear
14. Bearing
15. Third gear
16. Bearing
17. Bearing
18. C ring
19. Circlip
20. Counter shaft
21. Bearing
22. Circlip
23. Bearing
24. Circlip
25. Low speed synchronizer hub
26. Low speed synchronizer sleeve
27. Low speed synchronizer ring
28. Synchronizer spring
29. High speed synchronizer hub
30. High speed synchronizer sleeve
31. High speed synchronizer ring
32. Synchronizer spring
33. Reverse drive hub
34. Reverse drive sleeve
35. Synchronizer key
36. Reverse gear shaft
37. Pin
38. Reverse idle gear
39. Washer
40. Reverse driven gear
41. Reverse drive gear
42. Bush
43. Bearing

Fig. 13-1

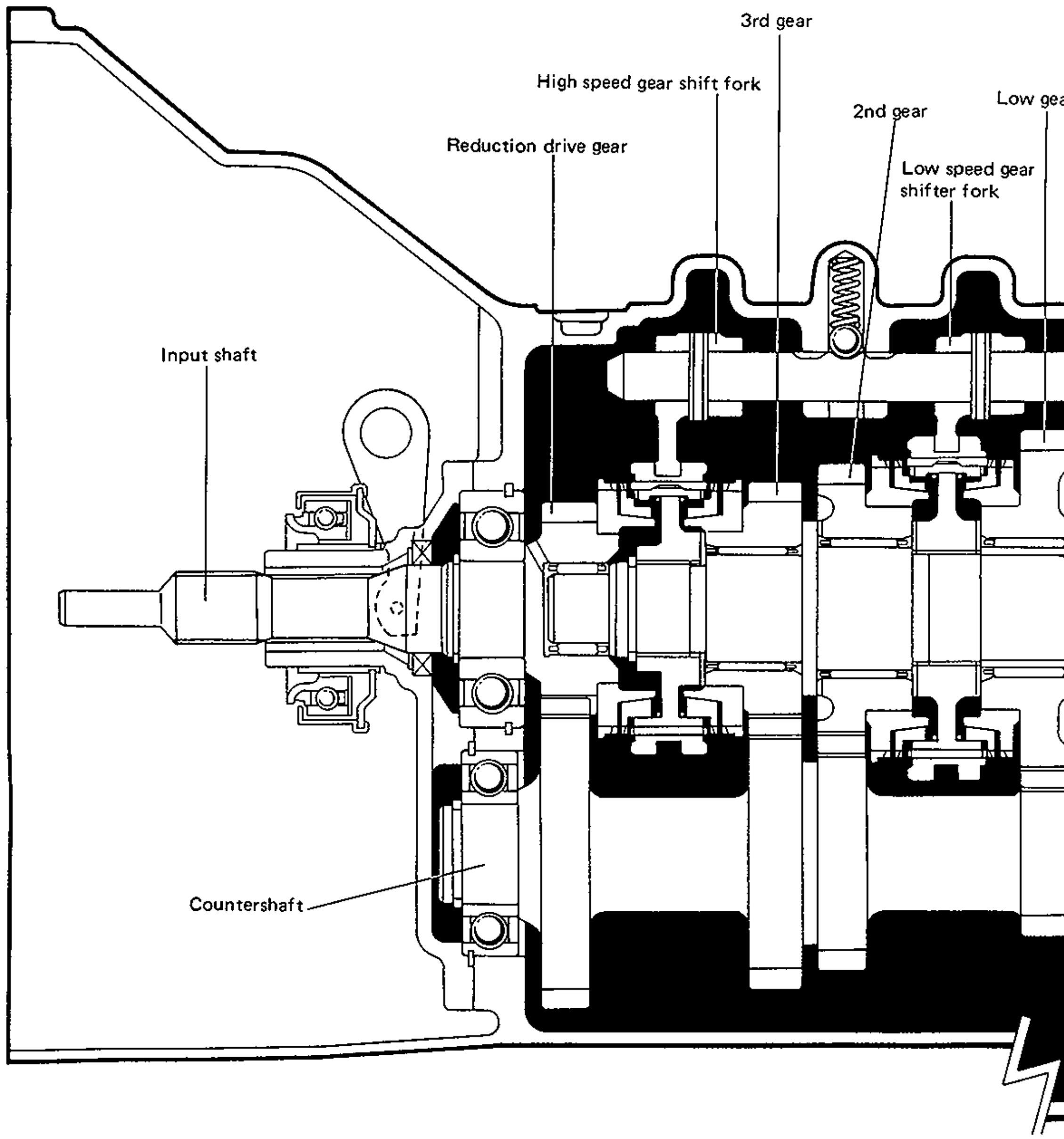
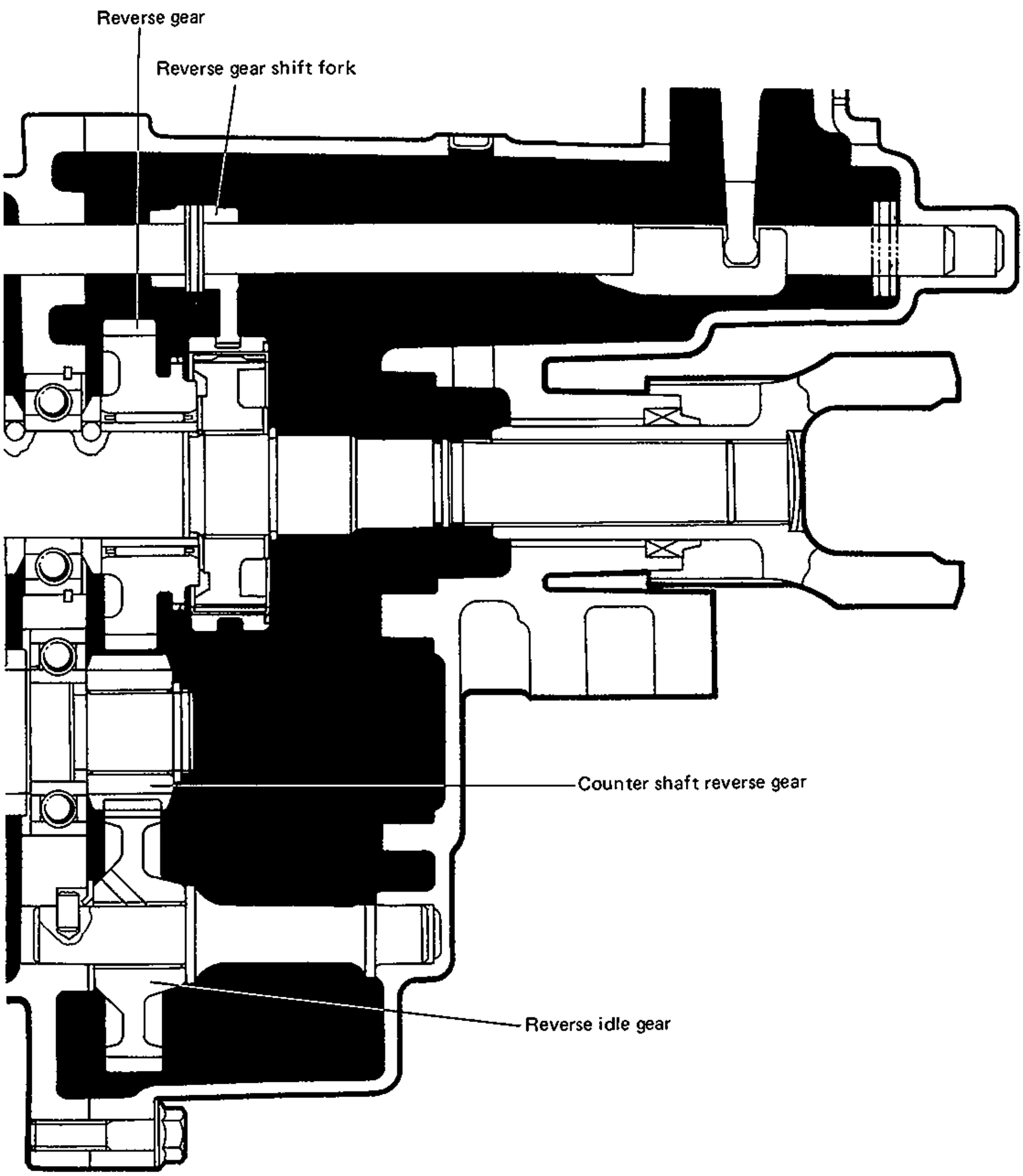

3rd gear
High speed gear shift fork
2nd gear
Low gear
Reduction drive gear
Low speed gear
shifter fork
Input shaft
Countershaft

Fig. 13-2



2. Transmission Gear Ratio

Primary gear number		35/23				
Primary ratio		1.521				
Shift position		Low	Second	Third	Top	Reverse
Secondary ratios	Gear number	33/16	32/25	29/31	–	33/18 · 41/33
	Gear ratio	2.062	1.280	0.935	–	2.277
Overall transmission gear ratio		3.136	1.946	1.422	1.000	3.463

3. Disassembly

Replacing Clutch Release Shaft Bush

1) Remove clutch release bearing from input shaft bearing retainer.

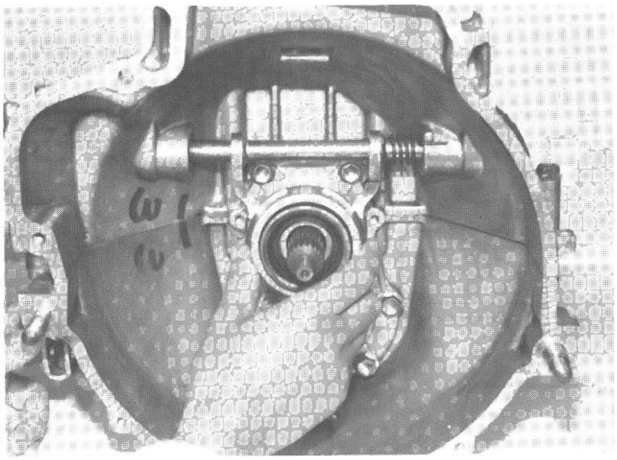


Fig. 13-3

2) Remove a part of spring from clutch release shaft lever.

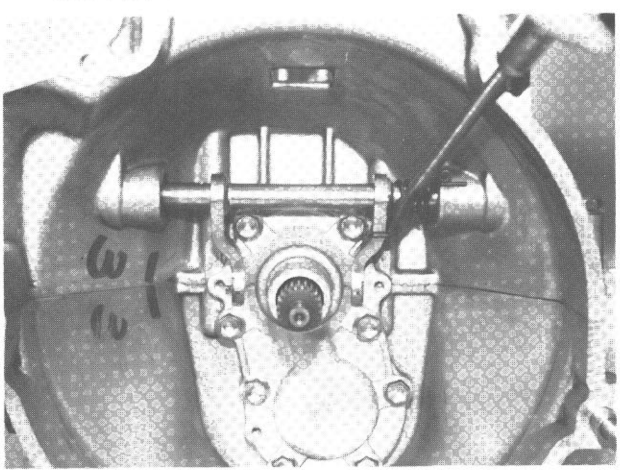


Fig. 13-3-1

3) Remove clutch release shaft spring from shaft. With special tool (A) applied in such a position as shown in Fig. 13-3-2, tap the end of special tool to take out bush and cap. Clutch release bush remover (A) (09925-48210)

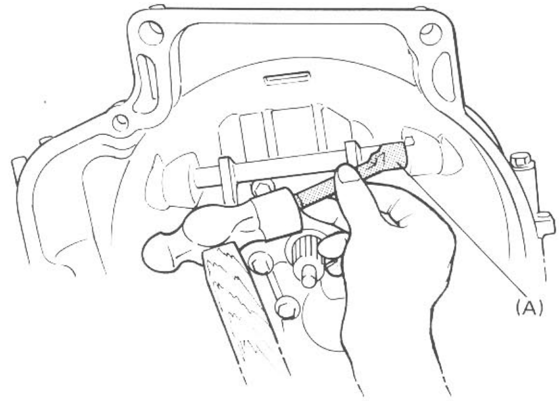


Fig. 13-3-2

4) Take out other bush, too.

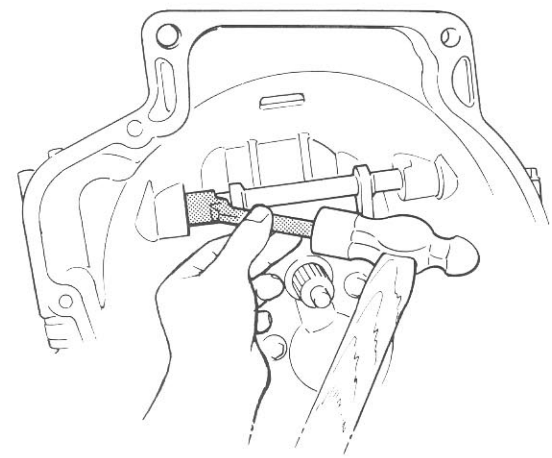


Fig. 13-3-3

5) Precautions on bush reinstallation:

- Make sure to apply grease to inside of bushes.
- Drive in bushes to the same level as inside surface of transmission case. Install cap and oil seal securely after greasing oil seal lip.

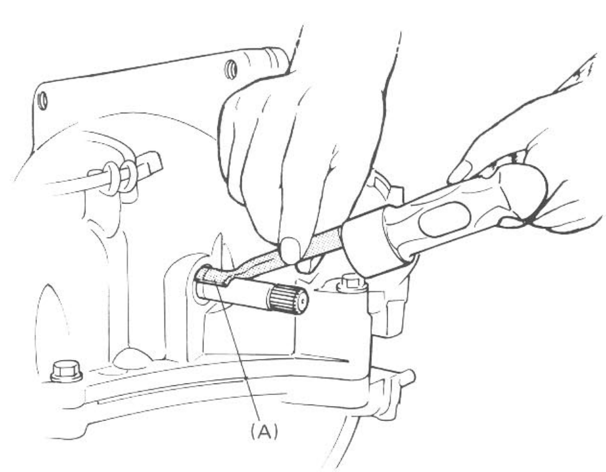


Fig. 13-3-4

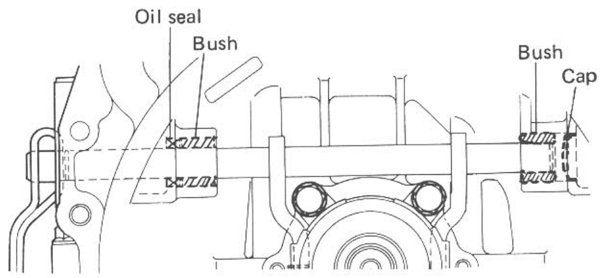


Fig. 13-3-5

- After installing seal, caulk transaxle case against seal at two points.

Separating Upper Case from Lower Case

1) Remove clutch release bearing from transmission input shaft.

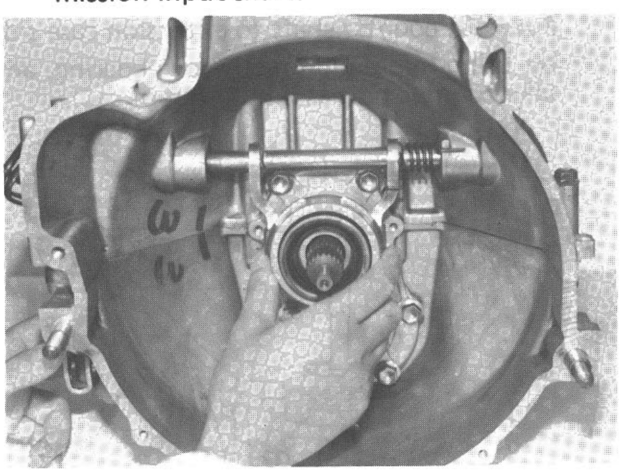


Fig. 13-4

2) Remove input shaft bearing retainer bolts and pull out retainer by using 3 conventional 6 mm bolts.

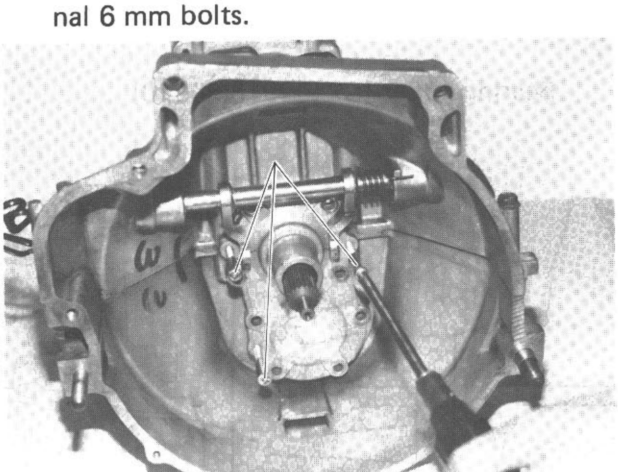


Fig. 13-4-1

3) Remove bolts securing extension case to transmission case. Then take off extension case.

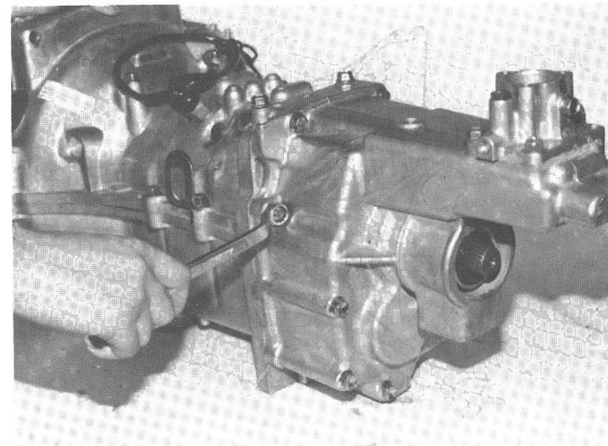


Fig. 13-4-2

4) Remove bolts fastening upper and lower cases together, separate the two, and take out main shaft assembly. A steel bar, similar in shape to screwdriver, may have to be used to pry two cases apart, as shown. In such a case, do not stick bar too far into between two mating faces, or faces may become damaged.

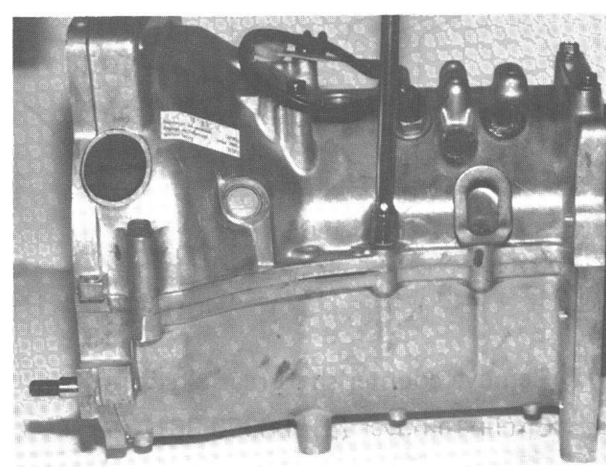


Fig. 13-5

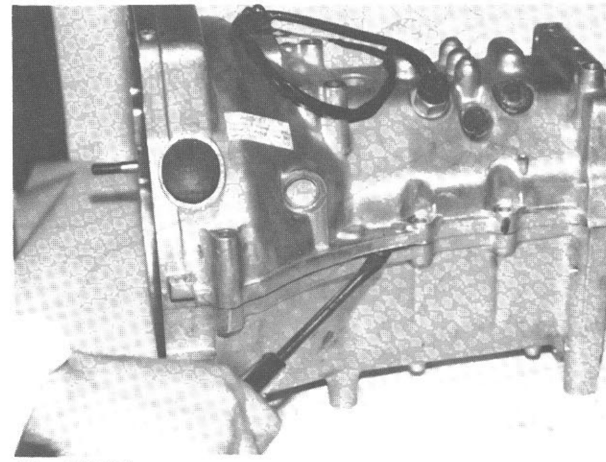


Fig. 13-5-1

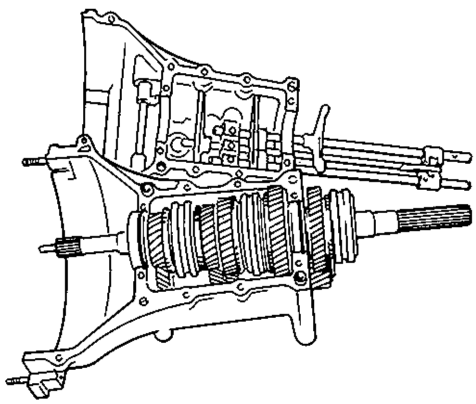


Fig. 13-5-2

Removing Countershaft

1) Remove reverse gear shaft with gear.

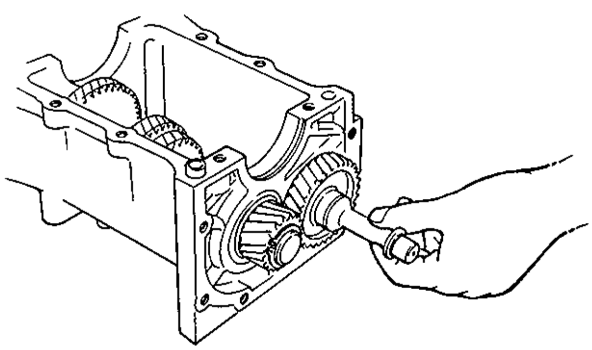


Fig. 13-6

2) Remove counter shaft rear circlip.

Circlip remover (B) (09900-06107)

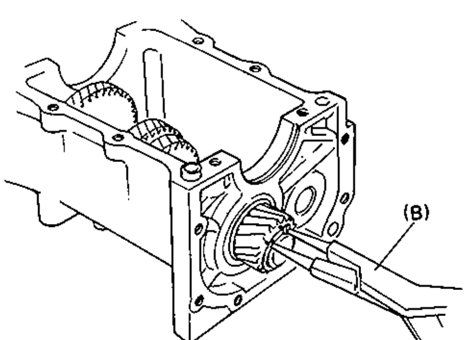


Fig. 13-7

3) Remove counter shaft reverse gear.

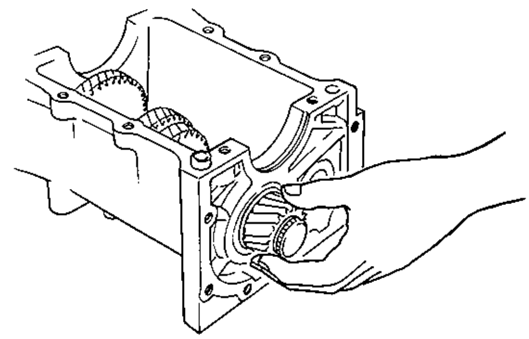


Fig. 13-8

4) Remove front circlip from counter shaft. Push out counter shaft to extension case side by using hydraulic press, move bearing, and take countershaft assembly out of case.

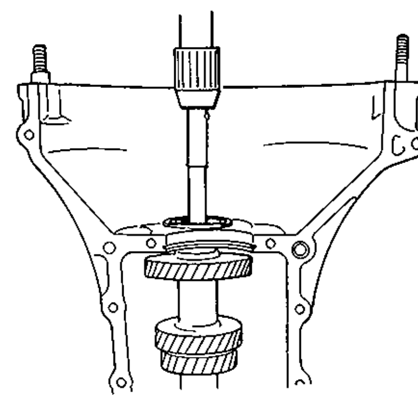


Fig. 13-9

Bearing puller (C) (09913-60910)

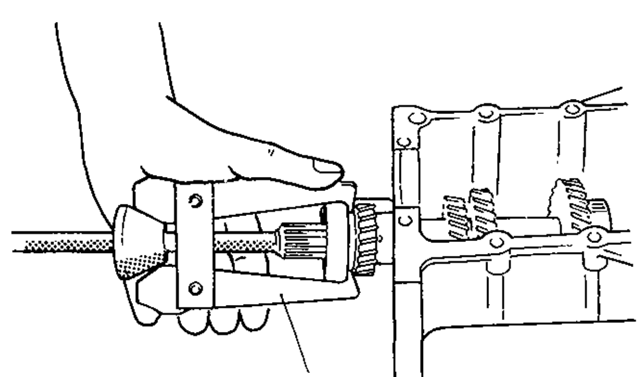


Fig. 13-9-1

Removing Main Shaft and Input Shaft

1) Take out input shaft by hand, taking care not to let high-speed synchronizer ring fall off.

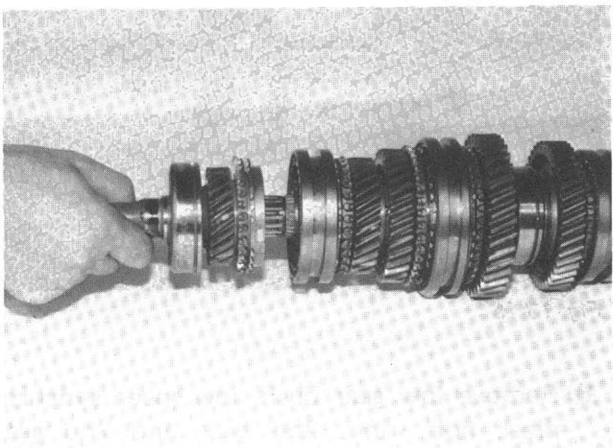


Fig. 13-10

2) Remove circlip retaining hub of high-speed synchronizer sleeve, and slide off sleeve hub, third driven gear and needle bearing from main shaft.

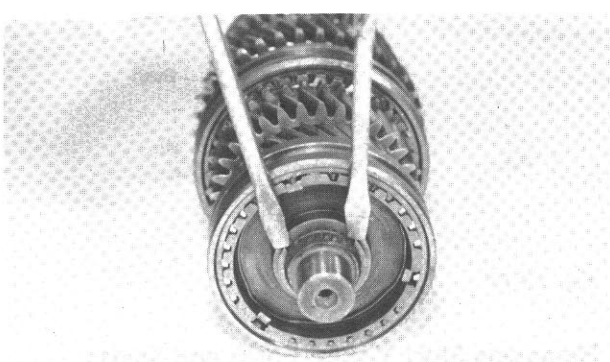


Fig. 13-11

3) Remove circlip retaining the reverse synchronizer hub on main shaft.

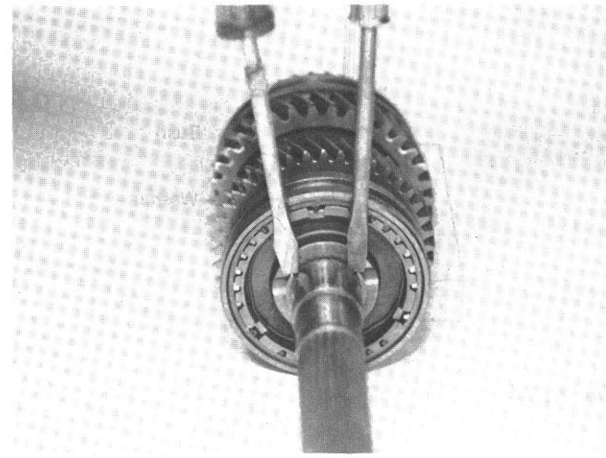


Fig. 13-12

4) Remove reverse synchronizer hub, reverse gear and reverse gear needle bearing.

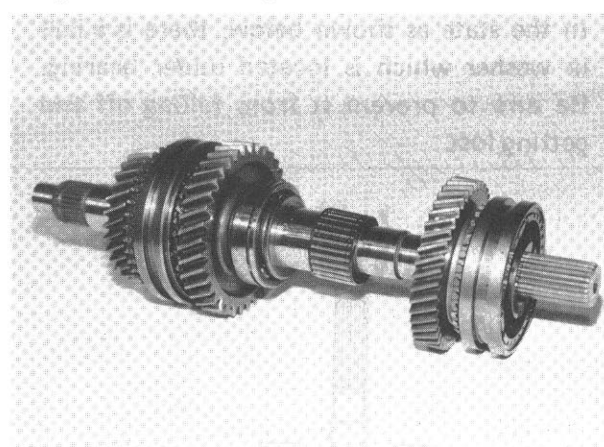


Fig. 13-13

5) Remove bearing wahser and reverse gear bush on main shaft by using hydraulic press.

NOTICE:
During this removal, watch out for a ball which may fall off. It must not be lost. Also, ball bearing should not be removed together with above washer and bush.

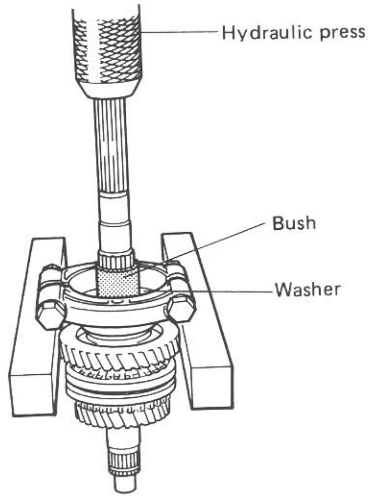


Fig. 13-14

6) Remove ball and main shaft (center) bearing by using hydraulic press.

> **NOTICE:**
> **In the state as shown below, there is a ball in washer which is located under bearing. Be sure to prevent it from falling off and getting lost.**

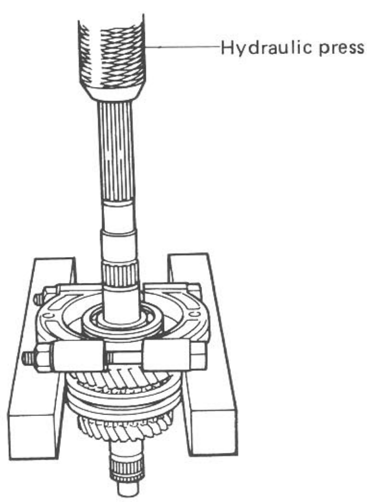


Fig. 13-15

7) Remove low gear, needle bearing and synchronizer ring on main shaft.

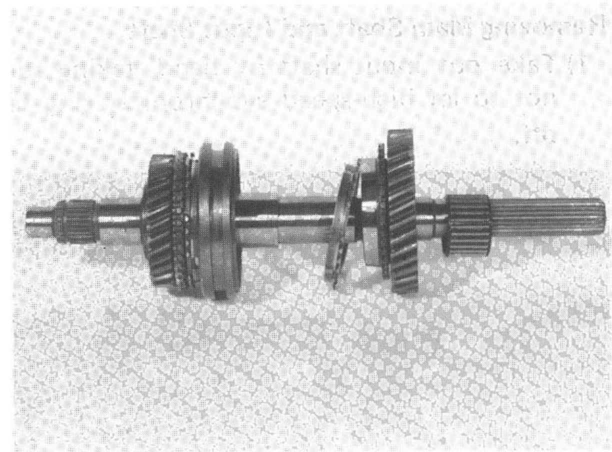


Fig. 13-16

8) Remove low gear bush, low speed synchronizer hub, ring, 2nd gear and 2nd gear bearing by using hydraulic press.

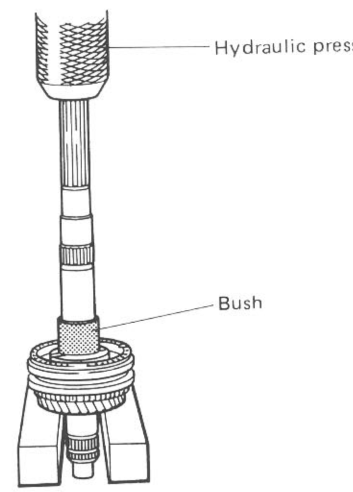
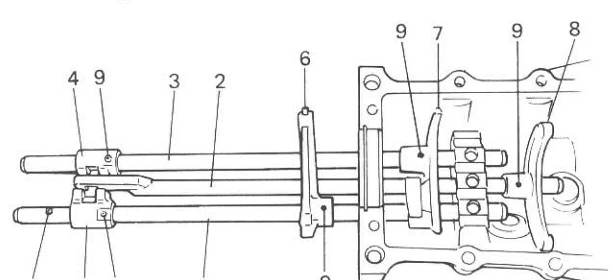


Fig. 13-17

Removing Shift Yokes, Forks and Shafts



1. Reverse gear shift shaft
2. High speed gear shift shaft
3. Low speed gear shift shaft
4. Low speed gear shift yoke
5. Reverse gear shift yoke
6. Reverse gear shift fork
7. Low speed gear shift fork
8. High speed gear shift fork
9. Shift yoke pin

Fig. 13-18

[Gear shift yoke]
For shift yoke removal, drive out yoke pins with spring pin remover (special tool) first, and then remove yoke.
Spring pin remover (D) (09922-85811)

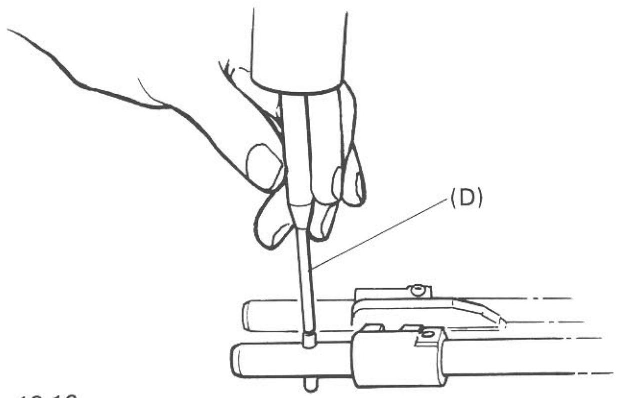


Fig. 13-19

[Gear shift fork and shaft]
Before starting removal, make sure that all shift fork shafts in place are in neutral position and remove each fork and shaft according to following 1), 2) and 3).

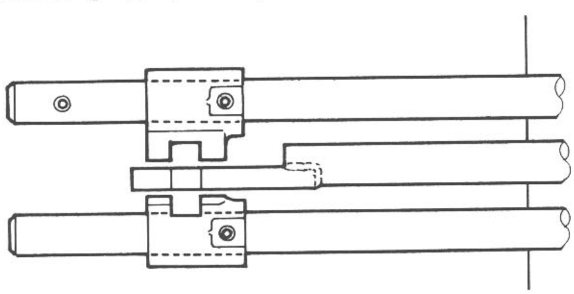


Fig. 13-20 Neutral position

1) Pull out reverse gear shift shaft. As this shaft comes out, locating ball and spring will jump out of hole; do not let them fly away.

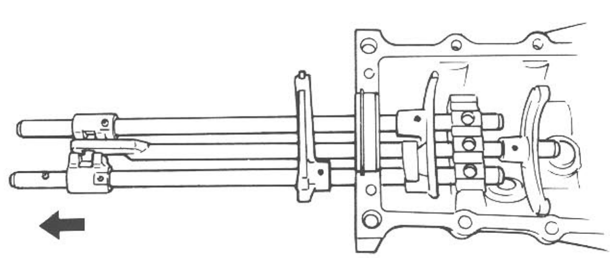


Fig. 13-21

2) Using the same special tool (D), mentioned above, drive out yoke pin on high speed gear shift fork, and pull out shift shaft. As in above case, be careful not to let locating ball, interlock ball and spring fly away.

CAUTION:
When removing yoke pin, be sure not to drive it out so far as to contact case. Or it will cause damage to case.

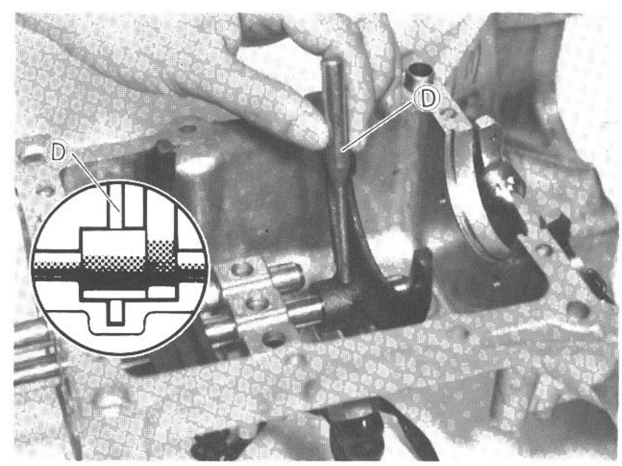


Fig. 13-22

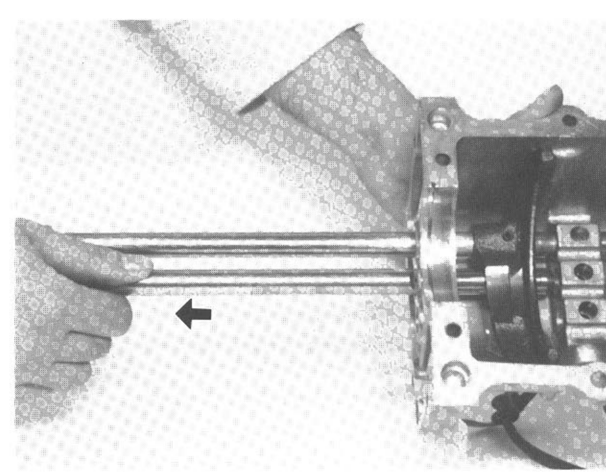


Fig. 13-23

3) Drive yoke pin out of low speed gear shift fork as in above step 2) and pull out fork shaft and fork.

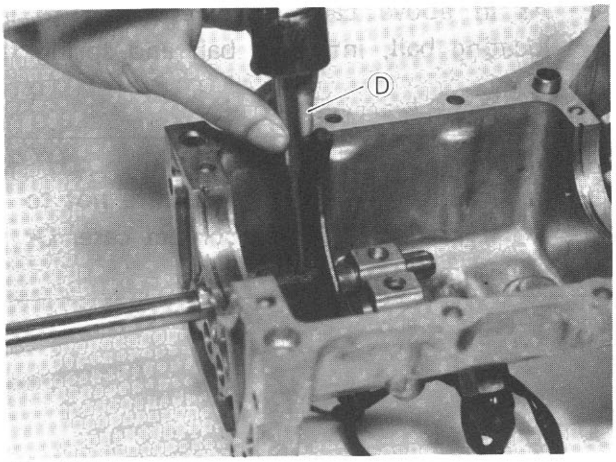


Fig. 13-24

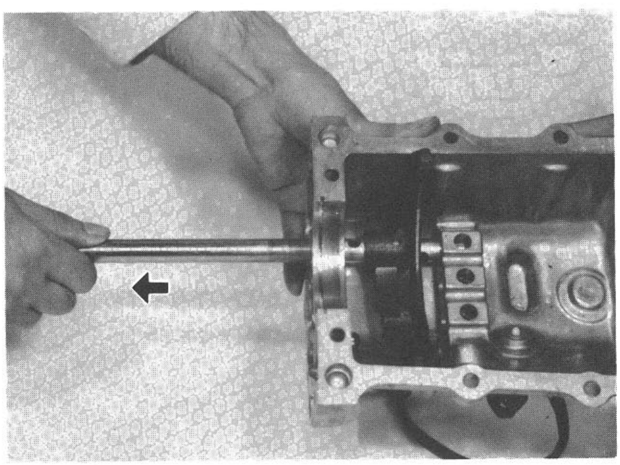


Fig. 13-25

4. Inspection of Components

Gears

Check each part for wear, damage or discoloration. Replace if found defective.

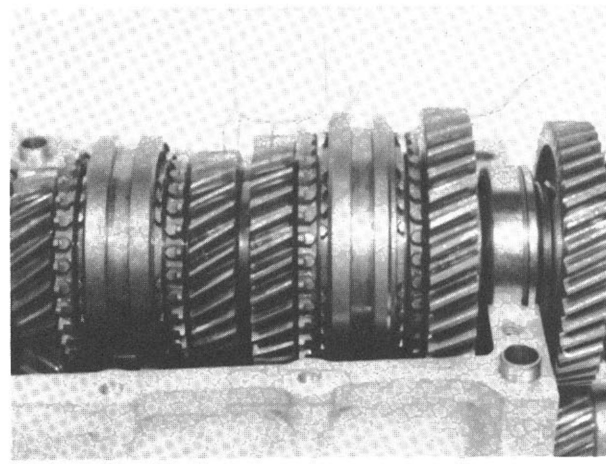


Fig. 13-26

Cynchronizer Hubs, Sleeves and Keys

Check each part for wear or damage. Replace if found defective.

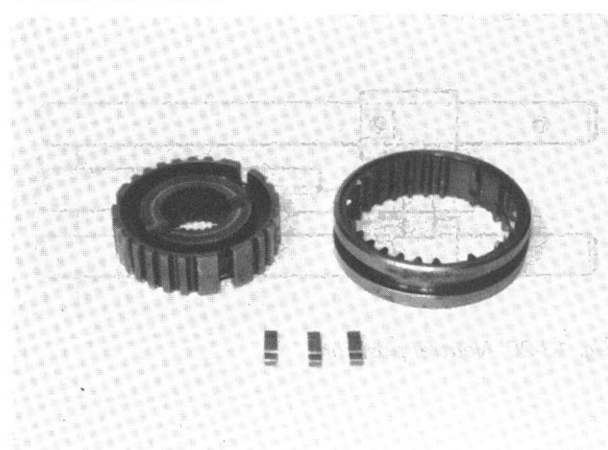


Fig. 13-27

Shift Forks and Sleeves

Check contact surfaces for wear or damage. Measure clearance between fork and sleeve.

Maximum clearance	1.0 mm (0.039 in)

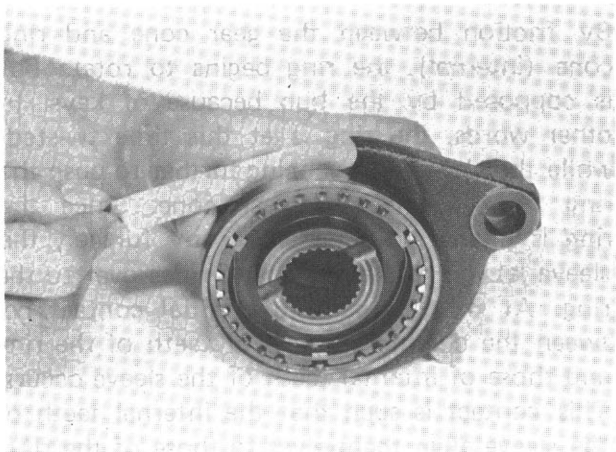


Fig. 13-28

Main Shaft

Check each part of shaft for wear, discoloration or damage. Replace shaft if any part is found defective.

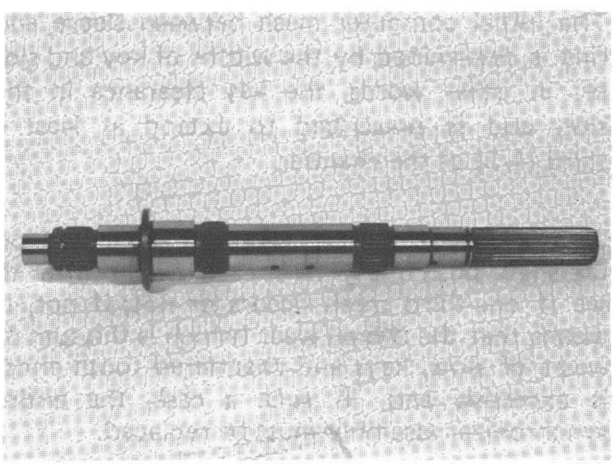


Fig. 13-29

Bearings and Bushes

Check each part for wear, damage or discoloration. With ball bearing, check to ensure that it rotates smoothly and it does not make noise. Replace if found defective.

Fig. 13-30

Input Shaft

Referring to Fig. 13-31, inspect cone ① and toothed ring ② for wear and damage.

Inspect gear teeth ③ splines ④ for wear and damage.
If any part of input shaft inspected as above is found excessively worn or badly damaged, replace shaft.

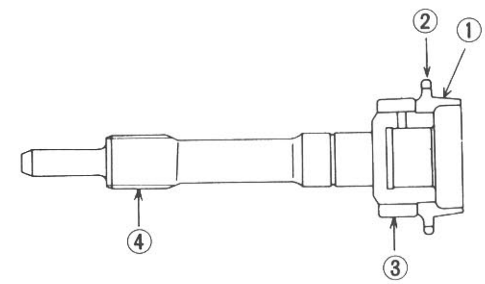


Fig. 13-31

Combination of Gear and Synchronizer Ring

Fit ring to cone of each gear, and measure clearance between the two at peripheral teeth, as shown in Fig. 13-32. If clearance exceeds service limit, replacement is necessary.

Clearance between gear and ring		
	Standard	Service limit
Low and High speed	1.0 – 1.4 mm (0.039 – 0.055 in.)	0.7 mm (0.027 in)

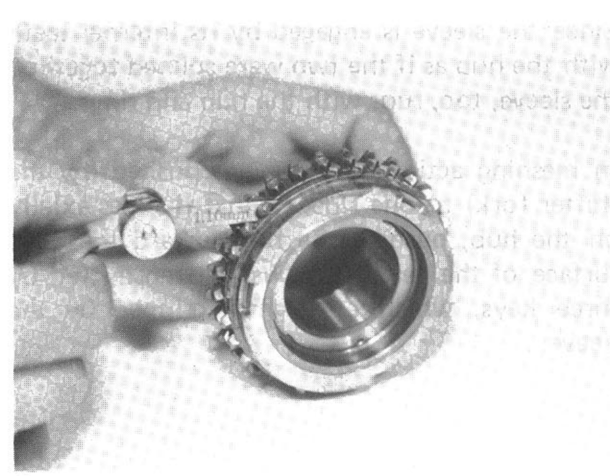


Fig. 13-32

Inspect external cone (of gear) and internal cone (of ring) for abnormal wear. Be sure that contact patterns on these surfaces indicate uniform full-face contact, and that surfaces are free from any wavy wear. A badly worn member must be replaced.
Proper synchronizing action on gear shifting can be expected only when ring-to-gear clearance (Fig. 13-32) and condition of cone surfaces, among other things, are satisfactory.

Fig. 13-33 ⑤ Checking contacting surface

Chamfered Tooth Ends of Ring (External Teeth) and Sleeve (Internal Teeth)
Synchronizer ring and hub have three slots each, in which keysare carried as backed by expanding springs, so that the hub and its two rings, one on each end, are capable of running together. Since the sleeve is engaged by its internal teeth with the hub as if the two were splined together, the sleeve, too, runs with the hub and rings.

In meshing action, the sleeve is pushed (by the shifter fork) to one side, so that if slides axially on the hub, pushing the ring toward the cone surface of the gear. This push is transmitted by three keys, which are lightly gripped by the sleeve.

By friction between the gear cone and ring cone (internal), the ring begins to rotate but is copposed by the hub because of keys. In other words, the ring is at this time twisted, while the sleeve is advancing further to push the ring fully against the gear cone. Since the ring is unable to slide along any further, the sleeve lets go off the keys and rides over to the ring. At this moment, the initial contact between the chamfered ends of teeth of the ring and those of internal teeth of the sleeve occurs. This contact is such that the internal teeth of the sleeve align themselves to those of the ring. When the sleeve advances and slides into the ring, the ring will be rotating nearly with the speed of the gear, so that the sleeve is enabled smoothly to slide over into the clutch teeth of the gear.

The initial contactor mesh between sleeve and ring is determined by the widths of key and slot or, in other words, the key clearance in the slot, and is prescribed to extend at least a third (1/3) of the chamfer.

With the synchronizer properly assembled on the shaft, push in and twist each synchronizer to see if one-third mesh occurs or not; if not, it means that the overall wear (which is the sum of wears of slots, keys and chamfered tooth ends) is excessive and, in such a case, the entire synchronizer assembly must be replaced.

Mesh of chamfered tooth ends of synchronizer ring and hub	Contact extending about 1/3 of chamfered face from apex

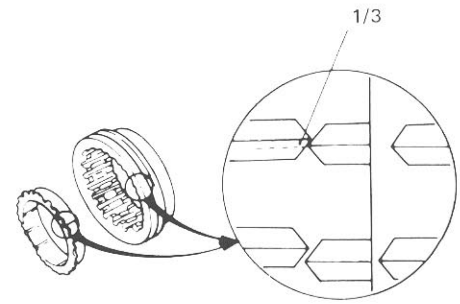


Fig. 13-34

Synchronizer Rings

Inspect each synchronizer ring for wear of its key slots by measuring width of each slot. If width reading exceeds limit, replace ring.

Key slot width of synchronizer ring	Standard	Service limit
	10.1 mm (0.397 in.)	10.4 mm (0.409 in.)

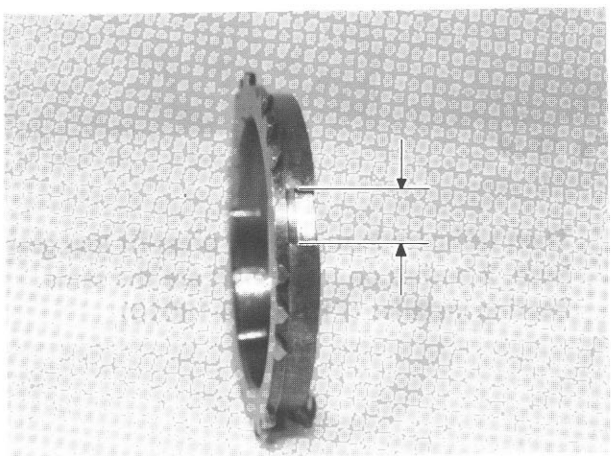


Fig. 13-35

Fork Shaft Locating Springs

If "gears slipping out of mesh" has been complained, check these springs for strength by measuring their free length, and replace them if their free lengths are less than service limit.

Spring No.	Standard	Service limit
Free length	25.5 mm (1.004 in.)	21.0 mm (0.826 in.)

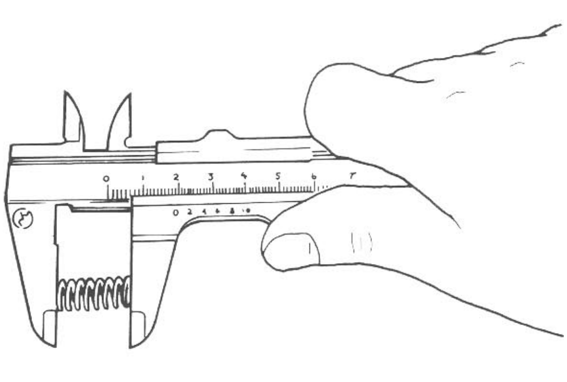


Fig. 13-36

Gear Shift Shafts

Check the part of shaft as indicated in below figure for uneven wear. Replace shaft if uneven wear is noted.

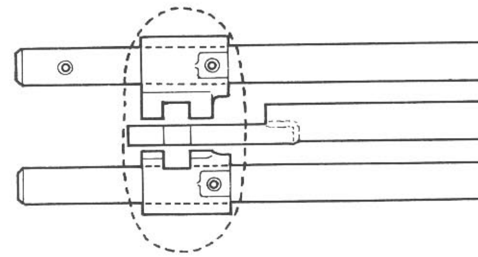


Fig. 13-37

Extension Case Bush

Check bush press-fitted in extension case for wear by measuring radial clearance between bush bore and sliding yoke. If sliding yoke rattles in bush because of advanced wear it will cause propeller shaft to rattle. For this reason, an extension case found to allow its sliding yoke to rattle in excess of service limit must be replaced; replacement of bush alone is not permissible.

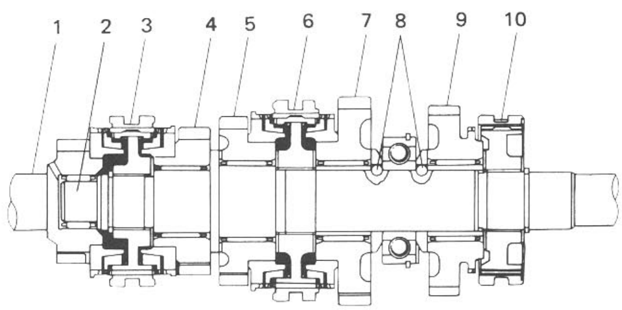
Rattle of sliding yoke in extension case bush	Standard	Service limit
	0.025 – 0.089 mm (0.0010 – 0.0035 in.)	0.119 mm (0.0046 in.)

5. Important Steps in Installation

NOTICE:
- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for reinstallation. Don't reuse used circlips.**
- **Tighten each fastening bolt and nut according to specified torque data listed on the last page of this section.**

Main Shaft and Input Shaft

Install each parts by reversing respective removal procedures. Be careful for installing direction of each washer, gear, synchronizer hub and sleeve. Refer to figure below. Make sure to install each ball on main shaft.



1. Input shaft
2. Main shaft
3. High speed synchronizer
4. Main shaft 3rd gear
5. Main shaft 2nd gear
6. Low speed synchronizer
7. Main shaft low gear
8. Main shaft washer ball
9. Main shaft reverse gear
10. Reverse drive sleeve

Fig. 13-38

1) Install 2nd gear bearing, 2nd gear, synchronizer ring and low speed synchronizer hub/sleeve onto main shaft, using care for installing direction of synchronizer sleeve.
   After putting on each synchronizer, be sure that 3 keys mounted on hub fit snugly into slots cut in ring.

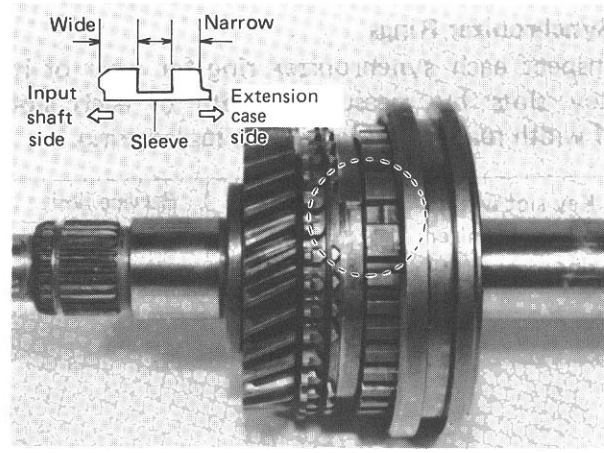


Fig. 13-39

Then using hydraulic press, press-fit low gear bush. 2 bushes on main shaft are the same.
Bearing installer (E) (09925-18010)

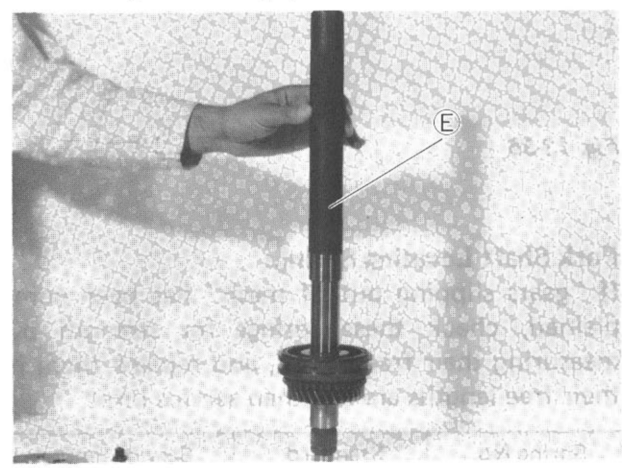


Fig. 13-40

2) Install low gear needle bearing, synchronizer ring, low gear, ball and washer onto main shaft.
   Fit ball into hole in shaft and install washer so that its slot ① comes over ball ③.
   To direct washer correctly, bring its circumpherence chamfered side ② to main shaft center bearing.

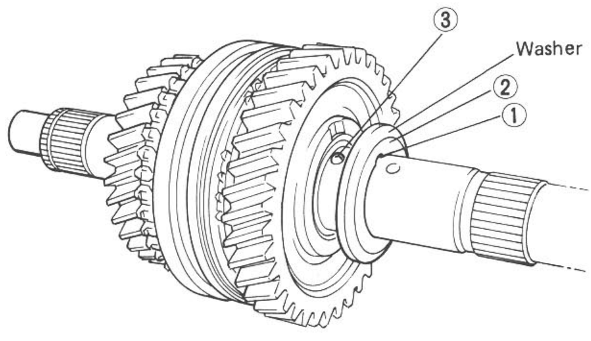


Fig. 13-41

3) Press-fit center bearing with bearing installer (special tool) using care for its installing direction.

Bearing installer (E) (09925-18010)

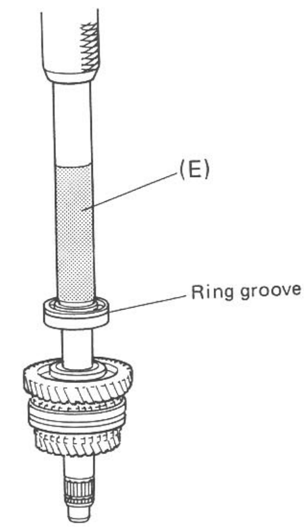


Fig. 13-42

4) Install ball and washer.

As figure shows, install washer so that its circumpherence chamfered side faces center bearing ① and its slot ② comes over ball ③.

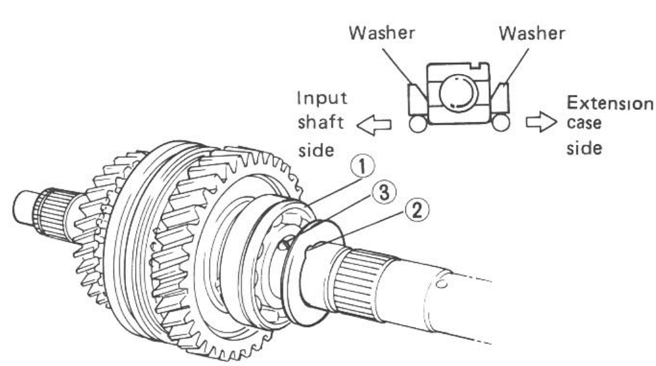


Fig. 13-43

5) Press-fit reverse gear bush, preventing ball installed in step 4) from coming off.

Bearing installer (E) (09925-18010)

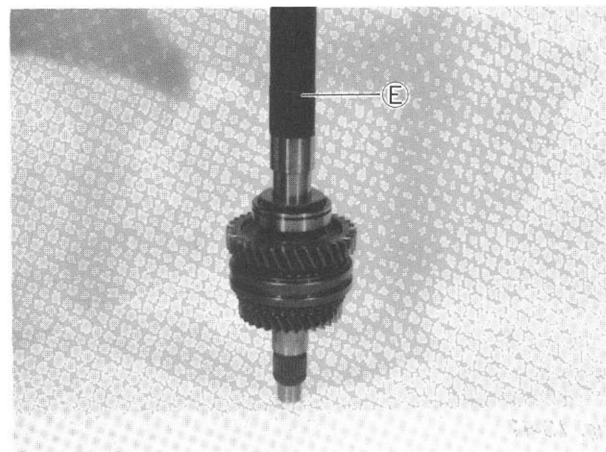


Fig. 13-44

6) Install reverse gear bearing, reverse gear and reverse synchronizer hub/sleeve. For proper direction, make sure to install hub so that the side whose inside boss ① is smaller in diameter and longer is directed to transmission case rear side, and sleeve so that the side whose inside is stepped ② is also directed to transmission case rear side.

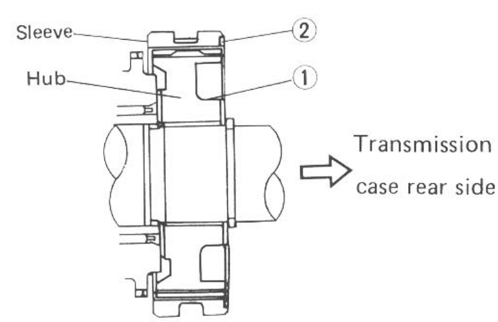


Fig. 13-45

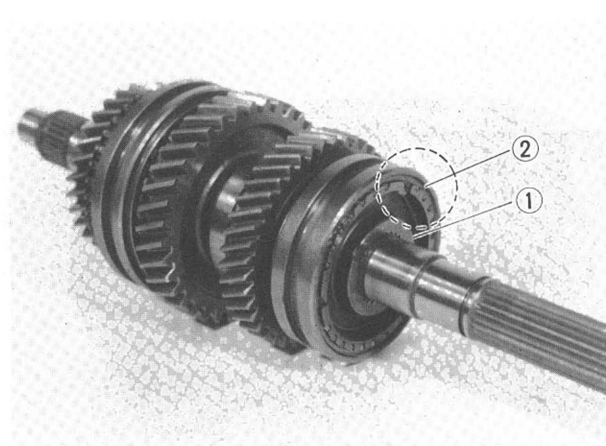


Fig. 13-46

7) Fit reverse hub circlip ③ into groove in main shaft.

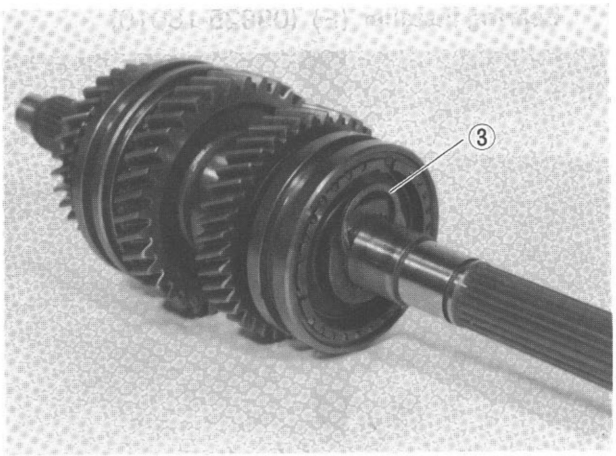


Fig. 13-47

8) Install 3rd gear bearing, 3rd gear, high speed synchronizer ring and hub/sleeve. When installing hub, direct the side with larger outer diameter boss to 3rd gear side. Then fit circlip ① into groove in main shaft.

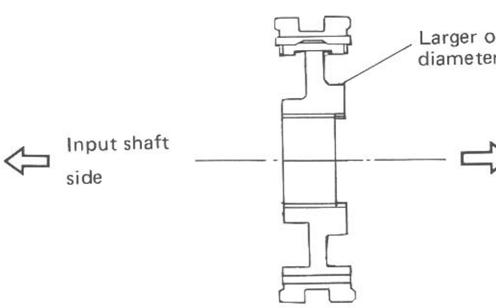


Fig. 13-48

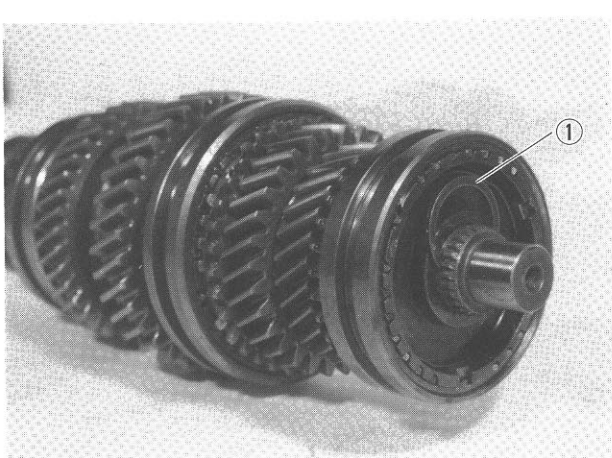


Fig. 13-49

9) Install synchronizer ring, needle bearing and input shaft.

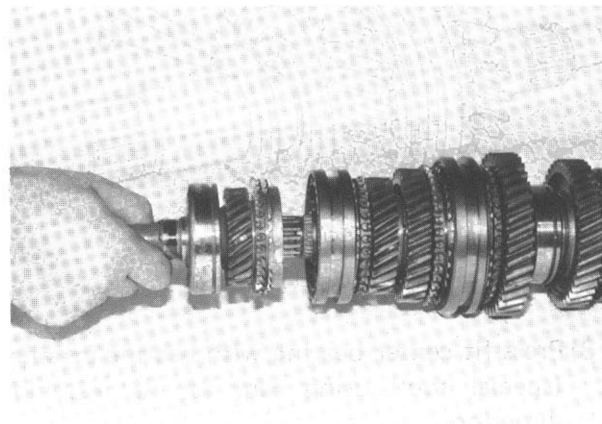
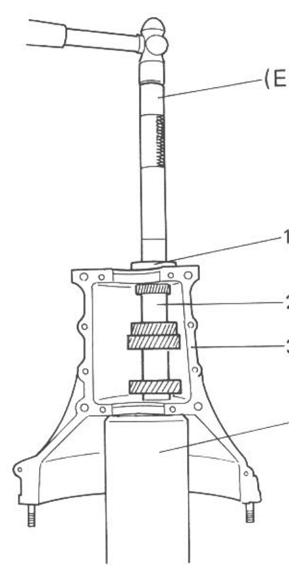


Fig. 13-50

Counter Shaft and Reverse Idle Gear

1) Drive counter shaft front bearing into lower case. Then using plastic hammer, drive counter shaft into front bearing a little.
   In the above state, using bearing installer (special tool), drive rear bearing onto counter shaft and into lower case.
   Bearing installer (E) (09925-18010)



1. Rear bearing
2. Counter shaft
3. Transmission lower case
4. Wood stand

Fig. 13-51

2) Fit counter shaft front circlip ① into groove in shaft.

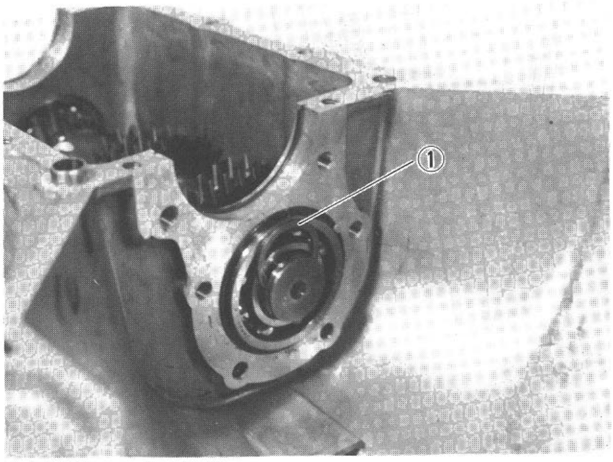


Fig. 13-52

3) Install counter shaft reverse gear onto counter shaft. And then fit counter shaft rear circlip into groove in shaft.

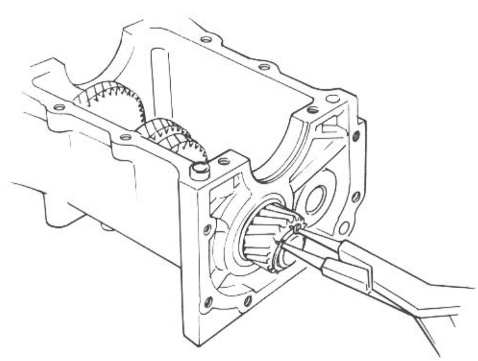


Fig. 13-53

4) Install idle gear and washer onto reverse gear shaft and pin into it.
Install above as assembled into lower case with pin ① and washer tongue ② aligned as shown below.

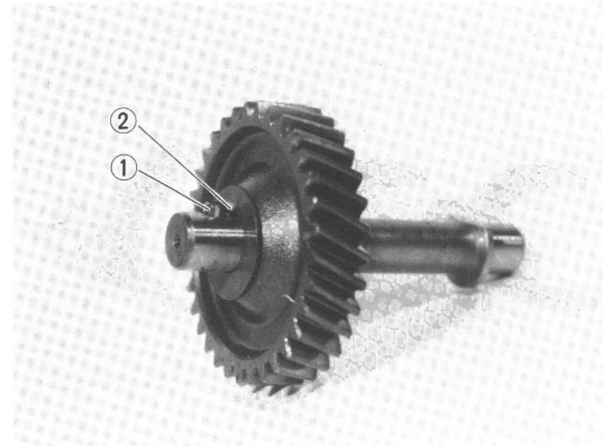


Fig. 13-54

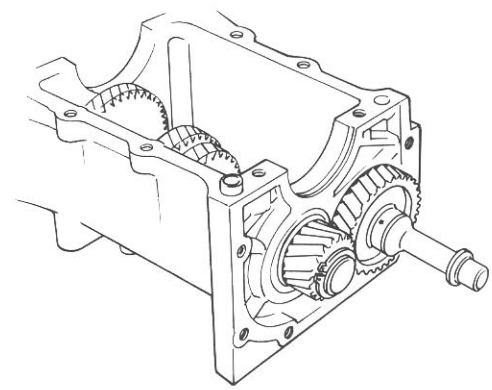


Fig. 13-55

Shifter Forks, Shafts and Yokes
[Forks and Shafts]

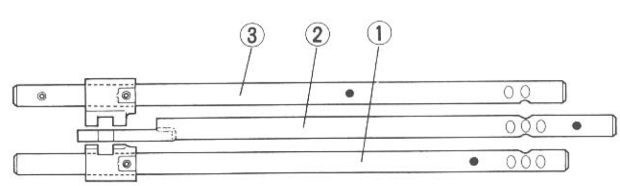


Fig. 13-56

① Low speed gear shift shaft
② High speed gear shift shaft
③ Reverse gear shift shaft

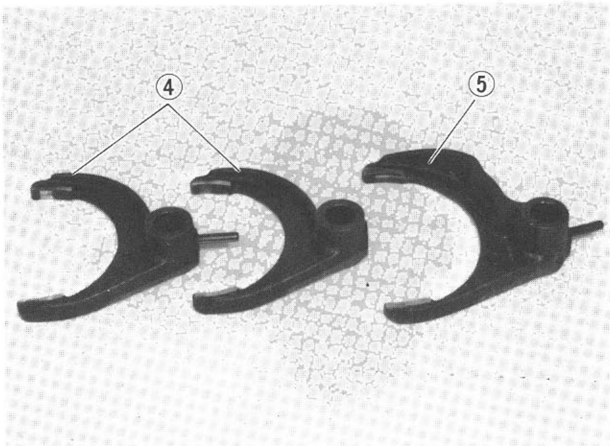


Fig. 13-57
④ High and reverse gear shift fork
⑤ Low speed gear shift fork

> **NOTICE:**
> **Gear shift forks used for high and reverse are the same.**

Note that 3 shift shafts individually have a locating ball and locating spring, and that 2 interlock balls and an interlock roller are used between shafts as shown in Fig. 13-58.

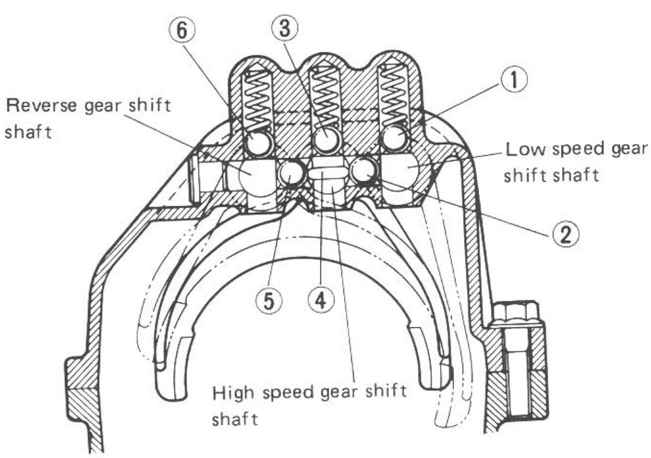


Fig. 13-58

Install low, high and reverse shafts in that order

1) Install 3 locating springs into 3 holes in upper case. Fit locating ball (① in Fig. 13-59) on top of locating spring in hole.

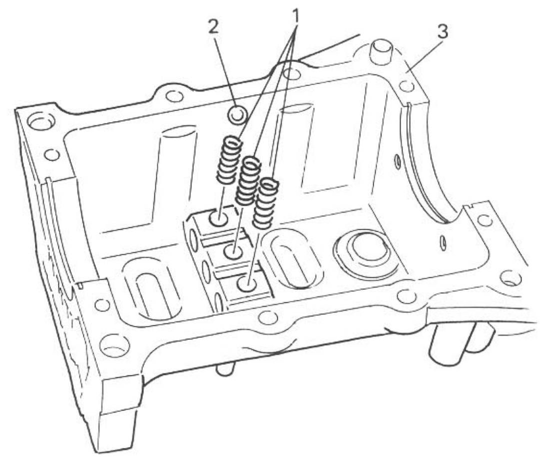


Fig. 13-59
1. Locating spring
2. Locating ball ①
3. Upper case

2) Insert low speed gear shift shaft into upper case and low speed shift fork in the direction as shown in Fig. 13-60.

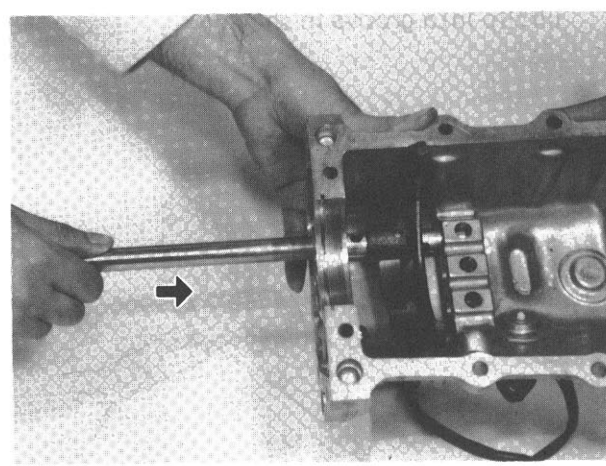


Fig. 13-60

3) As shown below, push down low speed gear shift shaft locating ball to pass shaft over it and keep inserting shaft until locating ball fits in center slot of 3 continuous slots in shaft.
Drive shift yoke pin into fork and shaft.

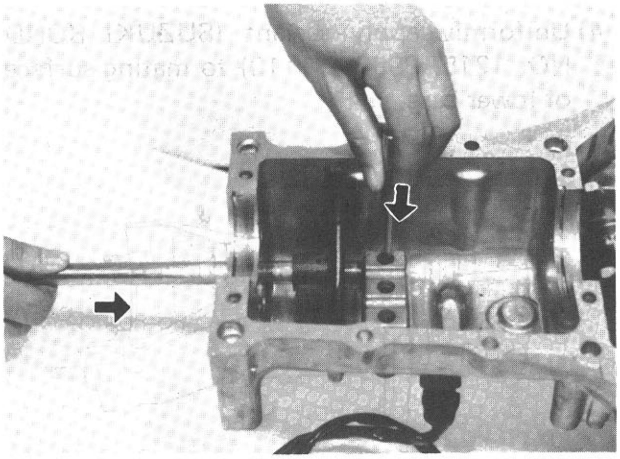


Fig. 13-61

4) Install interlock ball (② in Fig. 13-58) and locating ball (③ in Fig. 13-58) in upper case. After installing interlock roller (④ in Fig. 13-58) in high speed gear shift shaft and insert shaft into upper case as described in 2) and 3).
Fork should be installed in such direction as shown in Fig. 13-62. Then drive shift yoke pin until it becomes flush with outer surface of fork.

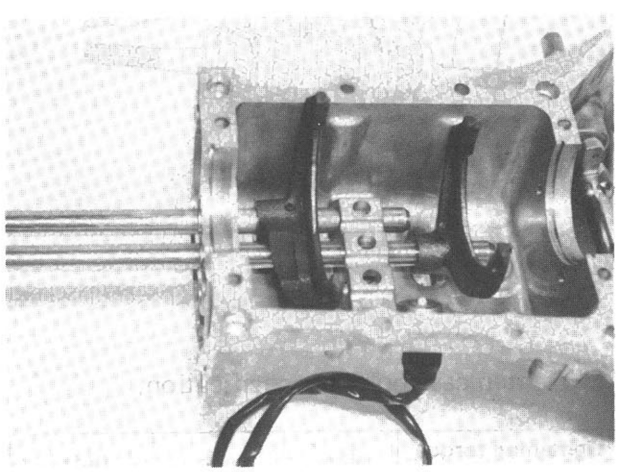


Fig. 13-62

5) Install interlock ball (⑤ in Fig. 13-58) and locating ball (⑥ in Fig. 13-58) into upper case. Then insert reverse gear shift shaft into upper case as described in 2) and 3).

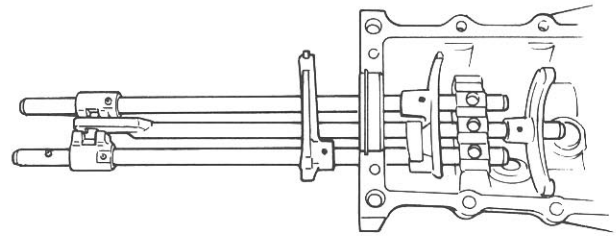


Fig. 13-63

[Yokes]

1) Install low speed gear shift yoke and reverse gear shift yoke as shown below, using care for their direction.

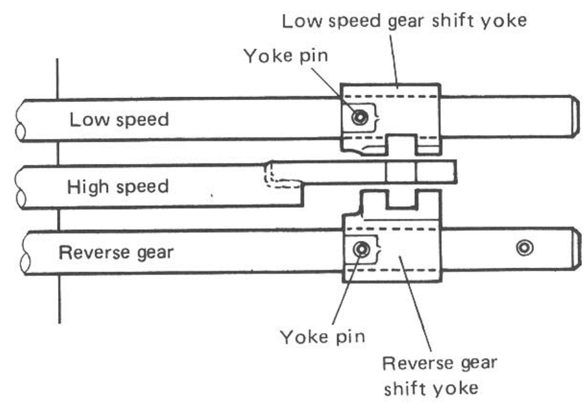


Fig. 13-64

Transmission Lower Case and Upper Case

1) With counter shaft ass'y, reverse idle gear and reverse gear shaft installed in lower case, check to ensure that bearing stopper rings ① are fitted in both sides of lower case as shown below.
Also check for 2 knock pins ②.

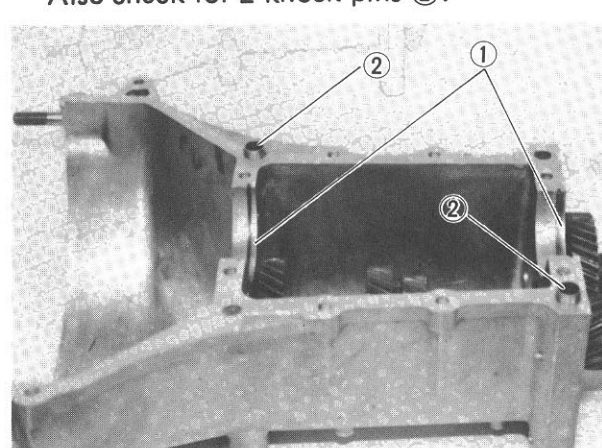


Fig. 13-65

2) Make sure that mating surfaces of both lower and upper cases are clean.

3) Install main shaft and input shaft ass'y in lower case.

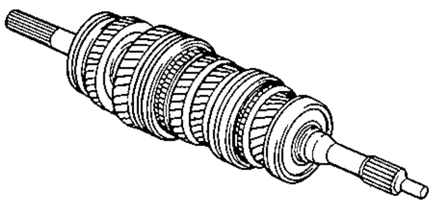


Fig. 13-66 Main shaft and input shaft assembly

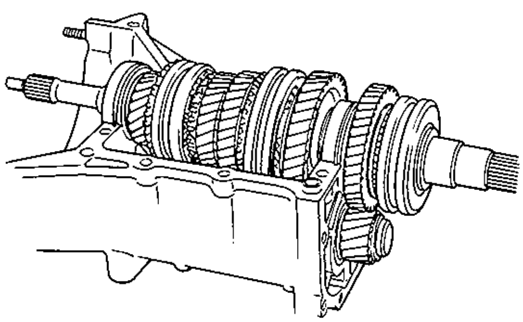


Fig. 13-67

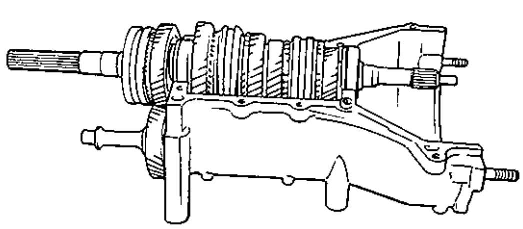


Fig. 13-68

4) Uniformly apply sealant (SUZUKI BOND NO. 1215, 99000-31110) to mating surface of lower case.

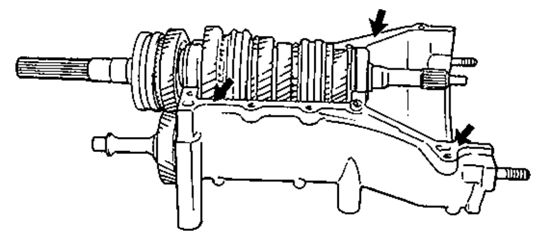


Fig. 13-69

5) Install upper case to lower case by matching 3 shift forks with 3 grooves in synchronizer sleeve on main shaft respectively.

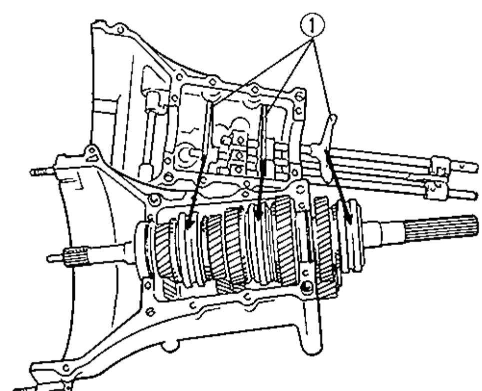


Fig. 13-70 ① Shift forks

6) Tighten case bolts to specification.

Tightening torque for transmission case bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

Extension Case

1) Check to ensure that knock pins ① are fitted.

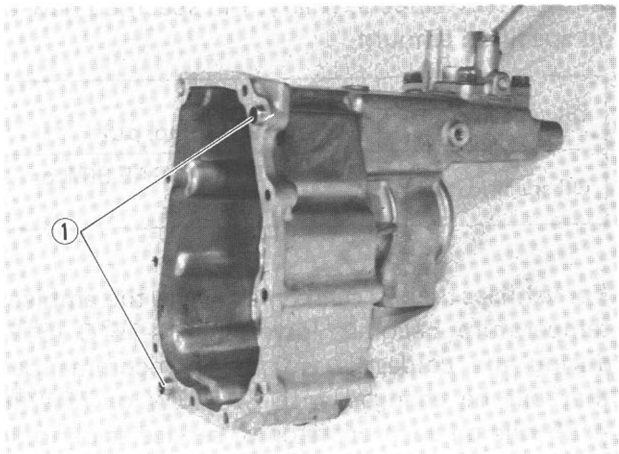


Fig. 13-71

2) Apply grease (SUZUKI SUPER GREASE A 99000-25010) to oil seal lip.
3) Clean surface of extension case to mate with transmission case and uniformly apply sealant (SUZUKI BOND No. 1215, 99000-31110).

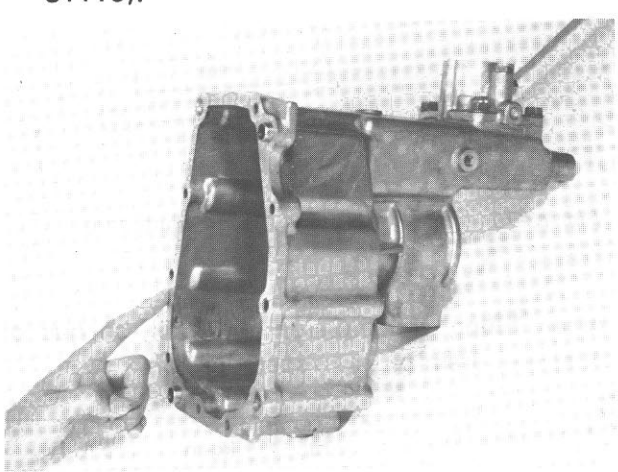


Fig. 13-72

4) Make sure that 3 shift shafts are in neutral position as shown in Fig. 13-20.
5) Install extension case to transmission case.
6) Tighten case bolts to specification.

Tightening torque for extension case bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

Input Shaft Bearing Retainer

1) Apply grease (SUZUKI SUPER GREASE A 99000-25010) to oil seal lip.
2) Clean surface of retainer to mate with transmission case and uniformly apply sealant (SUZUKI BOND No. 1215, 99000-31110).

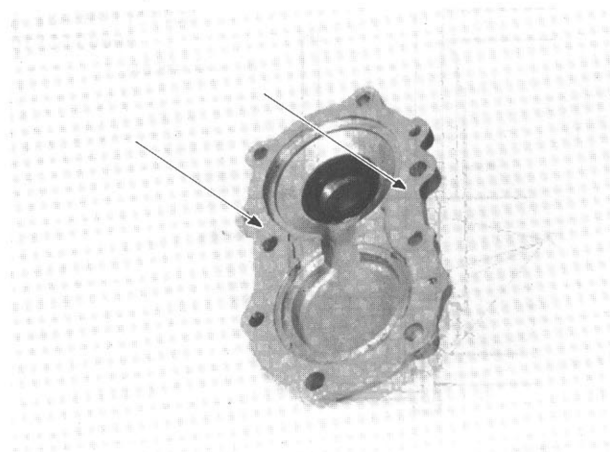


Fig. 13-73

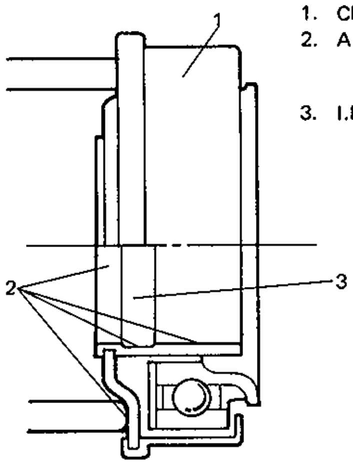
3) Tighten retainer bolts to specification.

Tightening torque for retainer bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

4) Check transmission input shaft for easy rotation by hand.
5) Check each select and shift shaft for operation.

Clutch Release Bearing

Before installing retainer, apply grease (SUZUKI SUPER GREASE A 99000-25010) to inner surface of clutch release bearing.



1. Clutch release bearing
2. Apply grease (SUZUKI SUPER GREASE A, 99000-25010)
3. I.D. recess

Fig. 13-74

Others

Upon completion or reassembly and installation of transmission ass'y in car body, pour specified amount of transmission oil into transmission, and check carefully for oil leakage.
Refer to next item "MAINTENANCE SERVICES" for oil to be used and specified amount.

6. Maintenance Services

Transmission Oil

Before changing oil, check for oil leakage first and correct defects, if any. Fill specified new oil in specified amount.

Oil capacity	1.3 litres (2.75/2.29 US/Imp. pt.)
Oil specification	Gear oil, SAE 90, SAE 80W or SAE 75W 80 – 85

For vehicles used in such areas where the ambient temperature becomes lower than –15°C (5°F) during the coldest season, it is recommended that oils be changed with SAE80W or 75W/80 – 85 oils on such occasion of service as periodic maintenance.

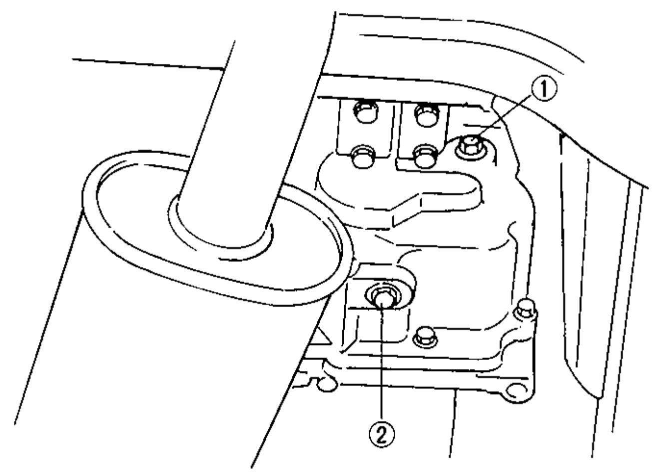


Fig. 13-75 ① oil filler plug ② oil drain plug

After filling transmission with oil, torque oil filler and drain plugs to specification.

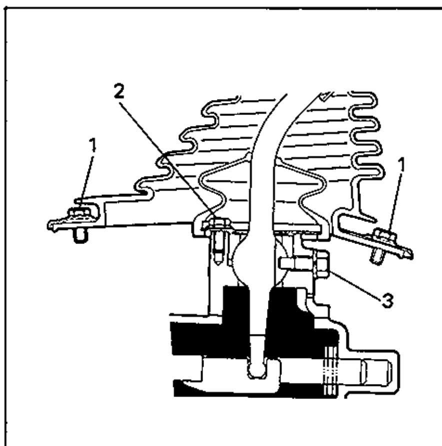
Tightening torque for oil drain and filler plug	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

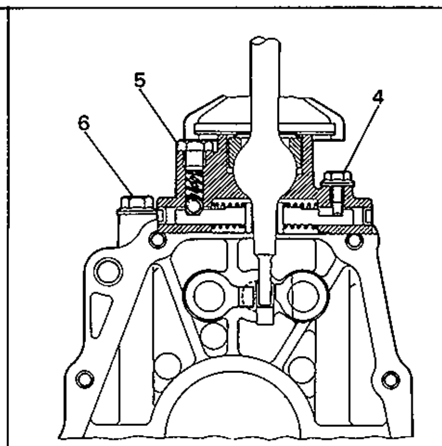
> **NOTICE:**
> **Whenever car was hoisted for any other service work than oil change, also be sure to check for oil leakage.**

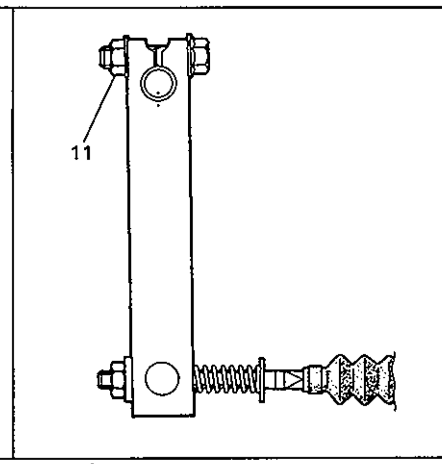
7. Recommended Torque Specification

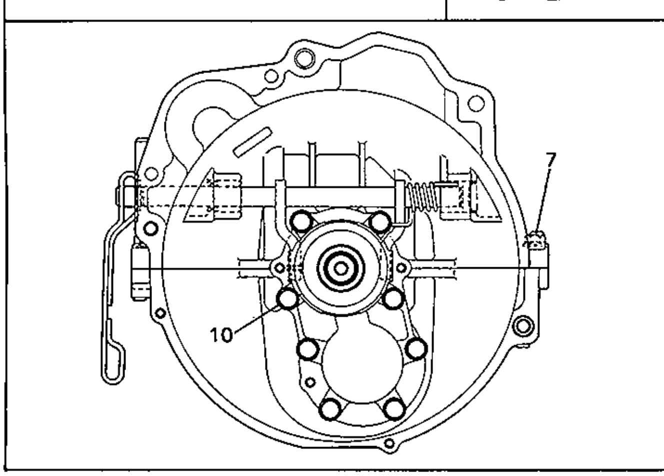
Be sure to torque each bolt and nut according to specification given below, whenever loosened.
If specified torque for particular bolt or nut is not included in the list, refer to page 130.

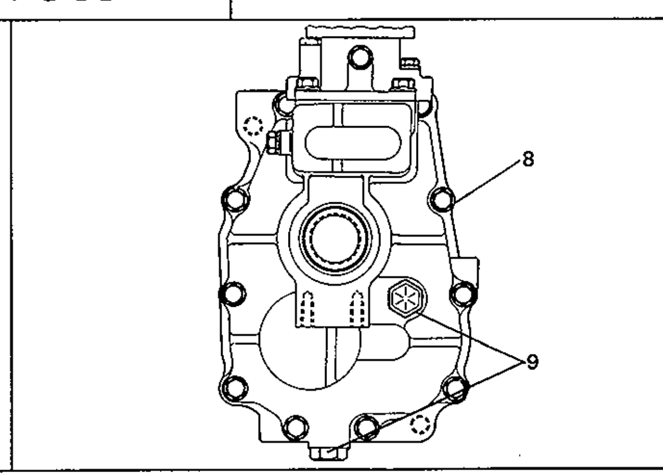
System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Gearshifitng control	1. Gear shift control boot cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	2. Gear shift lever case cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	3. Control lever locating bolt	14 – 20	1.4 – 2.0	10.5 – 14.0
	4. Low speed select pin bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	5. Reverse select pin screw	25 – 35	2.5 – 3.5	18.5 – 25.0
	6. Gear shift lever case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Transmission	7. Transmission case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	8. Extension case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	9. Transmission oil filler and drain plug	20 – 30	2.0 – 3.0	14.5 – 21.5
	10. Input shaft bearing retainer bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	11. Clutch release arm nut	10 – 16	1.0 – 1.6	7.5 – 11.5











14. TRANSFER GEAR BOX

14

1. General Description

The transfer gear box is an auxiliary transmission for on-off control of two-speed drive transmitted to both front and rear axles concurrently and provides additional speed reductions, HIGH and LOW, for any selection of main transmission gears.

The functions of this auxiliary transmission are mainly two—selection between four-wheel drive (front and rear axles) and two-wheel drive (rear axle) and between HIGH and LOW for four-wheel drive. Three propeller shafts are associated with the gear box.

These functions are accomplished by means of four shafts arranged in three-axis configuration and two sliding clutches. The selection is effected by actuating these clutches from a single control lever located beside the driver's seat. The gear box is mounted on a chassis frame.

1. Flange
2. Oil seal
3. Circlip
4. Bearing
5. Input shaft
6. Bearing
7. Counter shaft lock plate
8. O-ring
9. Counter shaft
10. Bearing
11. Spacer
12. Thrust washer
13. Counter gear
14. Flange
15. Oil seal
16. Circlip
17. Bearing
18. Output front shaft
19. Bearing
20. Circlip
21. Sleeve
22. Hub
23. Bearing
24. Thrust washer
25. Bearing
26. Output high gear
27. Sleeve
28. Output rear shaft
29. Output low gear
30. Bearing
31. Speedometer drive gear
32. Bearing
33. Retainer
34. Oil seal
35. Speedometer driven gear
36. Speedometer gear case
37. Oil seal

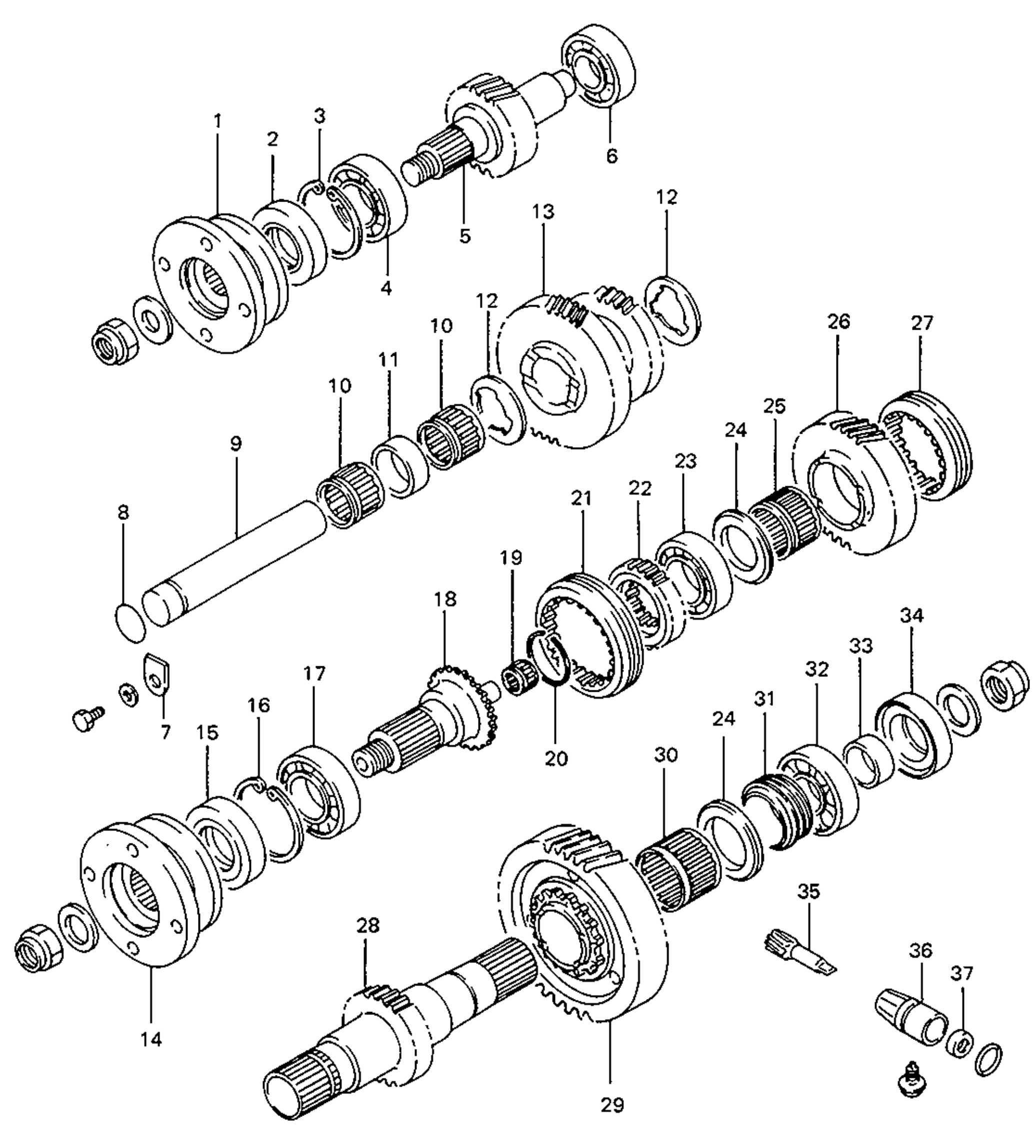
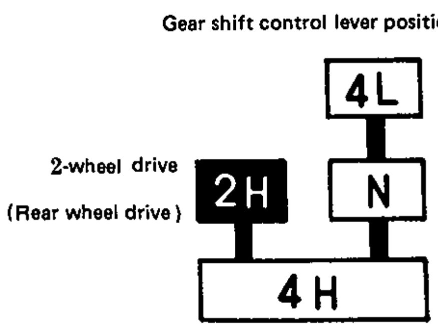


Fig. 14-1

2. Selective Flows of Transfer Drive

2-Wheel Drive (Rear-Wheel Drive)
Rear shifter fork pushes rear clutch sleeve into "high" gear, thus coupling the gear to output rear shaft.
Drive flows from input shaft to output rear shaft through big gear, "high" gear and rear clutch.



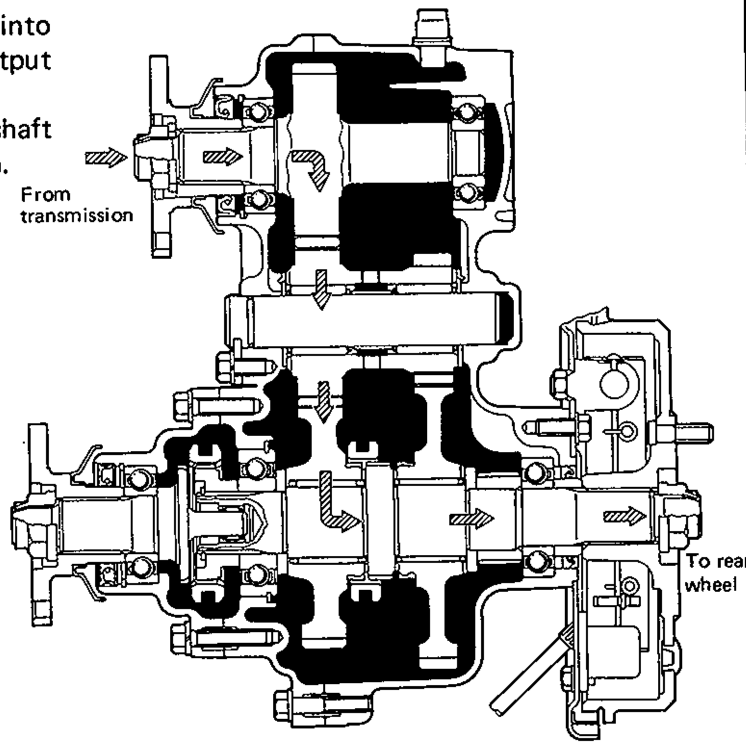
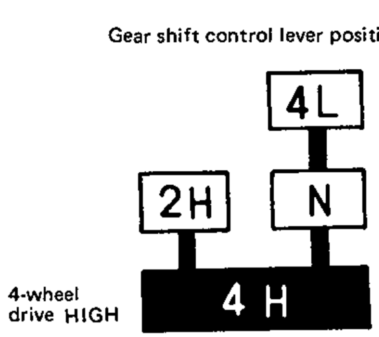


Fig. 14-2

4-Wheel Drive HIGH (All-Wheel Drive on HIGH)
Under the conditions of rear-wheel drive, described above, front shifter fork pushes the sleeve of front clutch onto the toothed clutch ring, thus coupling output rear shaft to output front shaft. Front shaft and rear shaft run together on HIGH.



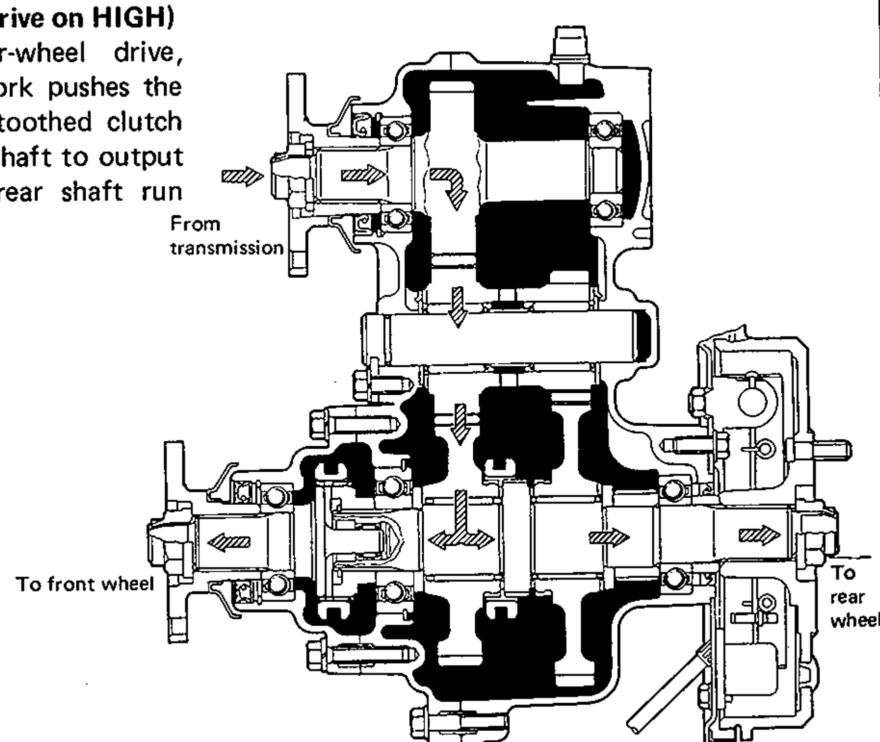
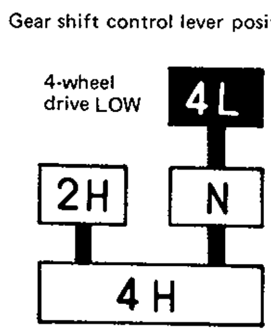


Fig. 14-3

4-Wheel Drive LOW (All-Wheel Drive on LOW)
Front shifter fork actuates front clutch to couple rear shaft to front shaft; and rear shifter fork actuates rear clutch to couple "low" gear to rear shaft. Front shaft and rear shaft run together on LOW.



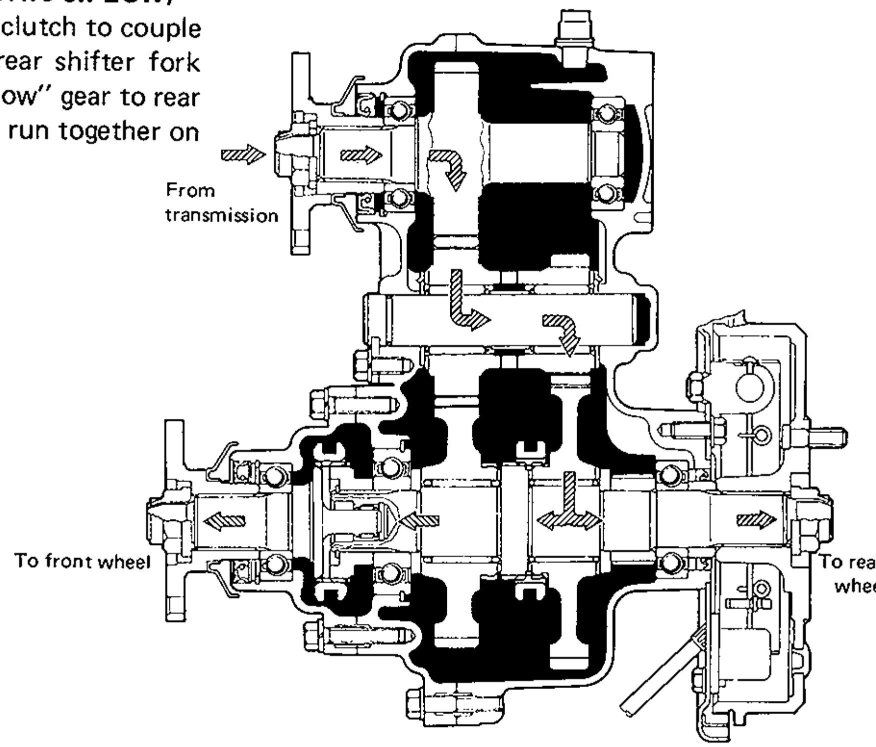


Fig. 14-4

3. Gear Ratio Data

Shift position	Rear-wheel drive	All-wheel drive high	All-wheel drive low
Gear	53/31 · 49/53	53/31 · 49/53	53/31 · 47/32
Reduction	1.580	1.580	2.511

4. Transfer Services not Requiring Transfer Removal

Following parts or components do not require transfer removal to receive services (replacement, inspection) :

Part or Component	Nature of Service
1. Universal-joint yoke flanges	Replacement or inspection
2. Front drive shift shaft fork	Replacement or inspection
3. Transfer output front shaft oil seal	Replacement or inspection
4. Transfer output front shaft bearing	Replacement
5. Transfer output front shaft	Replacement
6. Transfer front case	Replacement
7. Front drive clutch hub	Replacement or inspection
8. Front drive clutch sleeve	Replacement or inspection
9. Transfer input shaft oil seal	Replacement
10. Center brake drum	Replacement or inspection
11. Center brake shoe	Replacement or inspection
12. Center brake plate	Replacement
13. 4WD indicator light switch	Replacement or inspection
14. Speedometer driven gear	Replacement or inspection
15. Gear shift control lever	Replacement or inspection
16. Gear shift control boot No. 1, No. 2	Replacement
17. Gear shift control lever spring seat	Replacement or inspection

5. Removal

1) Lift up car and remove securing bolts from each universal-joint flange connection to sever 3 propeller shafts from transfer gear box.

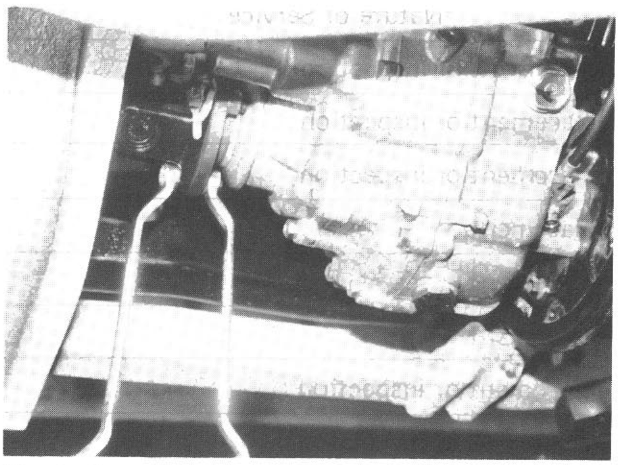


Fig. 14-5

2) Remove clamp ① and boot ② from transfer gear box.

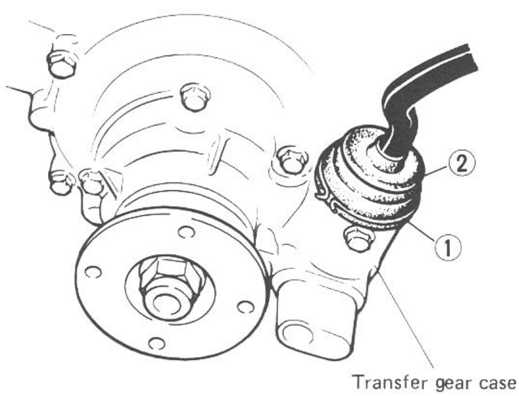


Fig. 14-6

3) Twist control lever guide counterclockwise while pushing it down; this will permit lever to be removed from gear box.

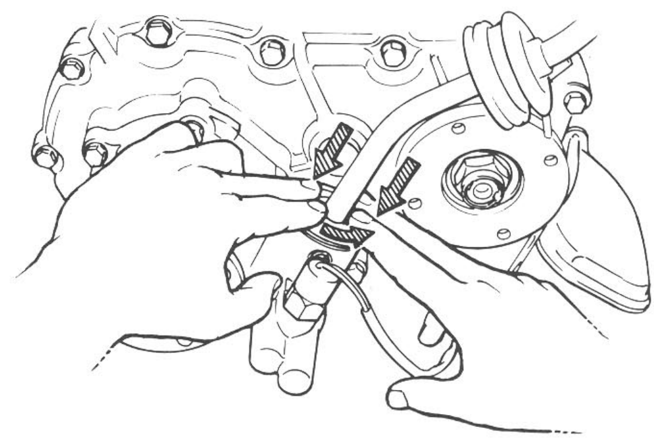


Fig. 14-7

4) Drain out oil from gear box by loosening its drain plug.

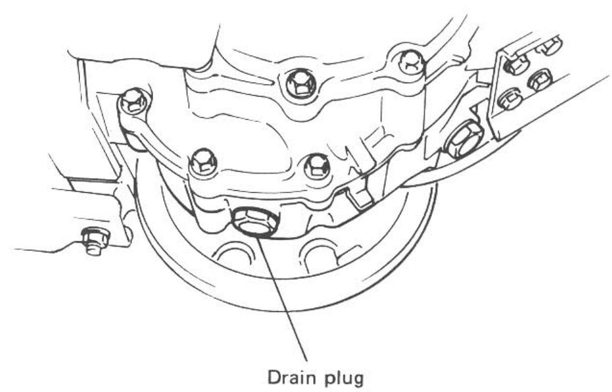


Fig. 14-8

5) Disconnect speedometer drive cable from transfer gear box.

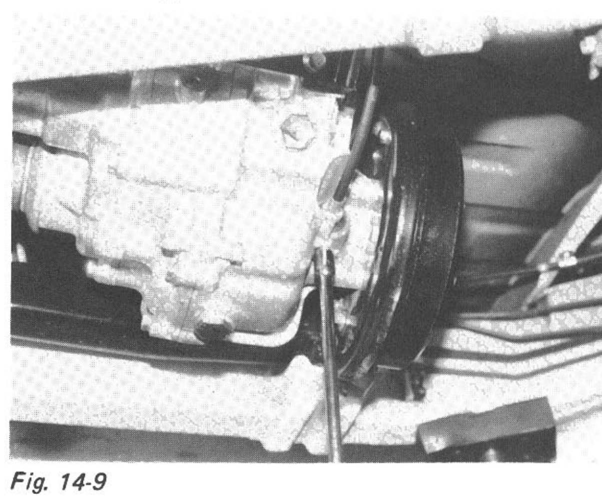


Fig. 14-9

6) Disconnect parking brake wire from parking brake lever and body.

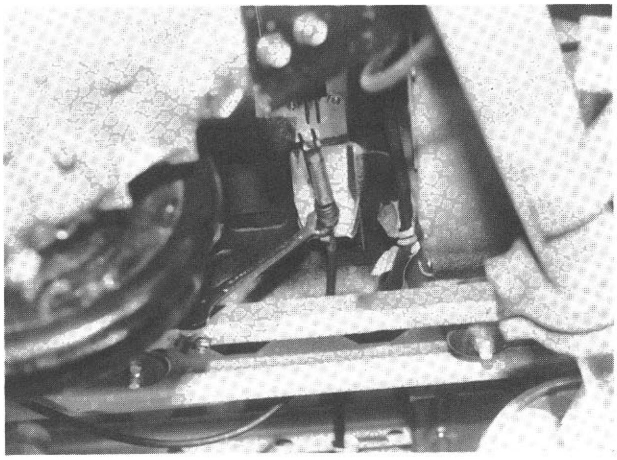


Fig. 14-10

7) Remove 3 mounting nuts securing gear box to chassis, and take down gear box.

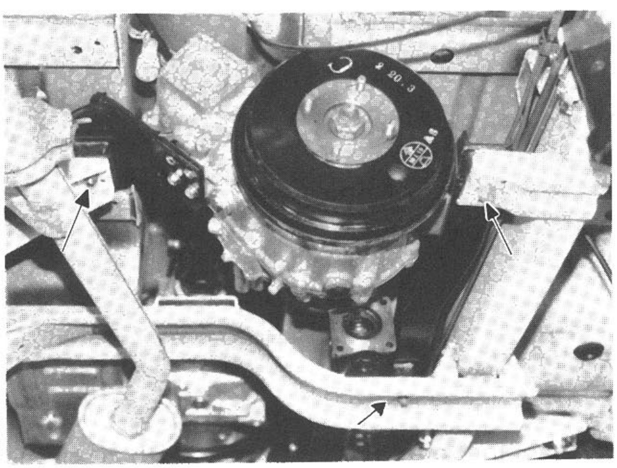


Fig. 14-11

6. Disassembly

Universal-Joint Yoke Flanges

There are 2 flanges to be removed: one from input shaft and the other from output front shaft. Lock flange so that it will not turn, and loosen and remove nut holding flange to the shaft. Draw off flange.

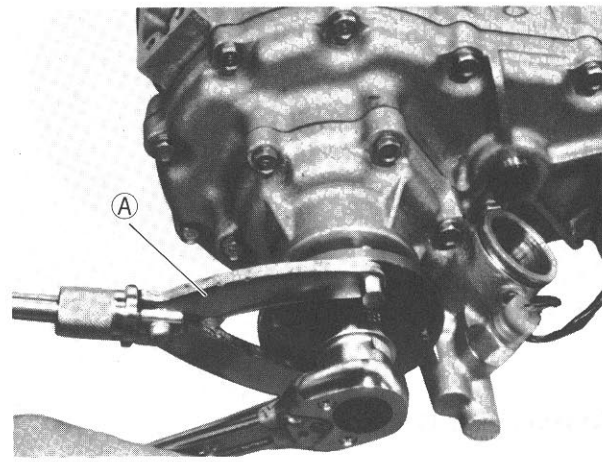


Fig. 14-12 Ⓐ Special tool (09930-40113)

Center Brake

Use differential preload checking tool on center brake drum so that drum will not turn. Loosen and remove nut securing drum.
Differential preload checking tool Ⓑ (09922-75221).

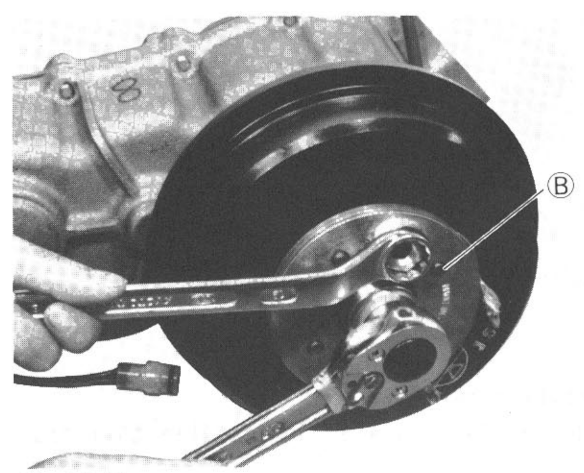


Fig. 14-13

Remove brake shoes. Remove 4 bolts securing backing plate, and take out backing plate assembly.

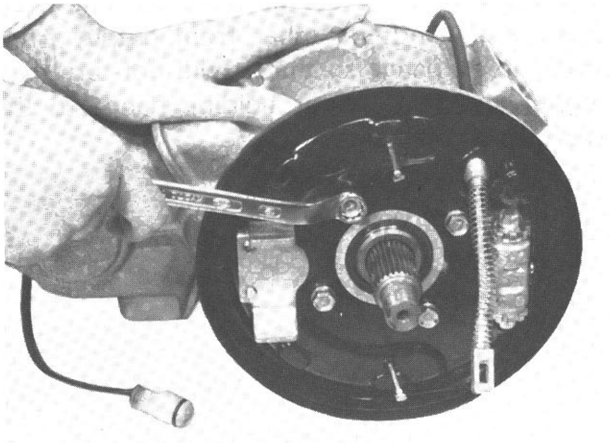


Fig. 14-14

Speedometer Driven Gear

Loosen speedometer driven gear case bolt and remove speedometer driven gear case with gear.

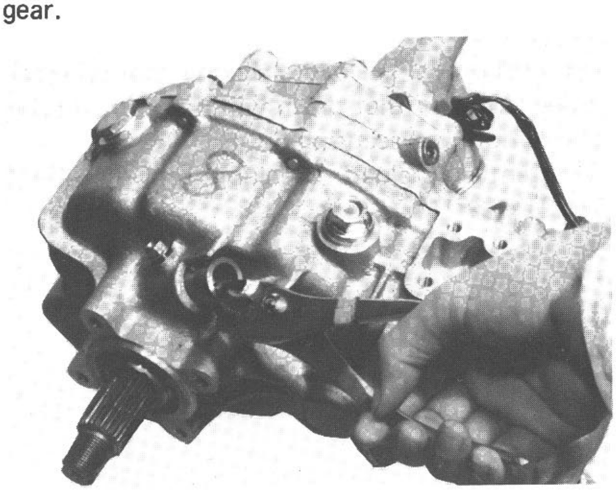


Fig. 14-15

Transfer Front Case

Remove the indicator light switch from front case.

> NOTICE:
> **Use care not to lose switch ball. This ball is larger than interlock ball and locating balls.**

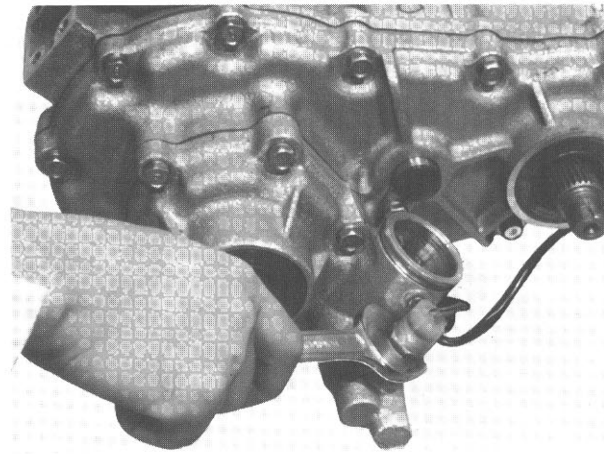


Fig. 14-16

Remove bolts securing transfer front case, and take off case.

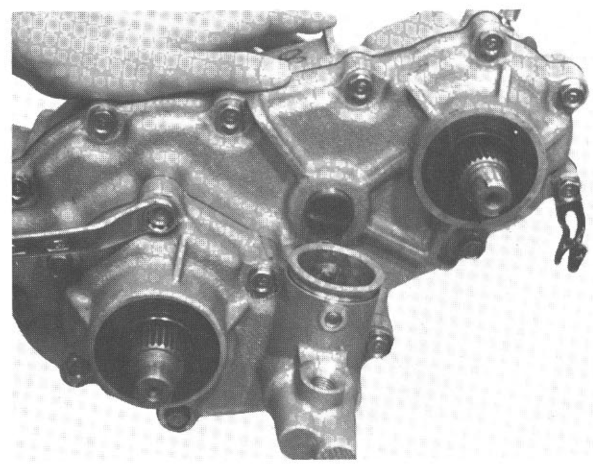


Fig. 14-17

By tapping output front shaft with a plastic hammer, remove output front shaft from front case.

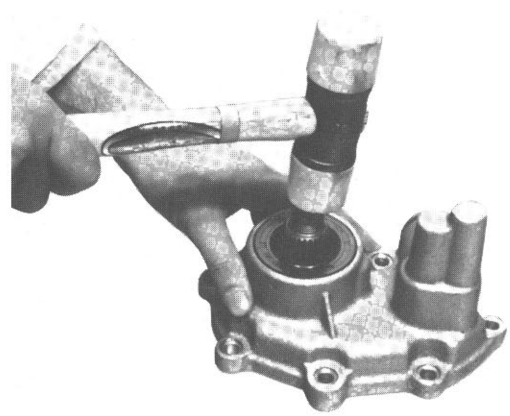


Fig. 14-18

After removing oil seal, remove circlip and drive bearing out of front case by using bearing installer (special tool).

Bearing installer Ⓒ : (09913-76010)

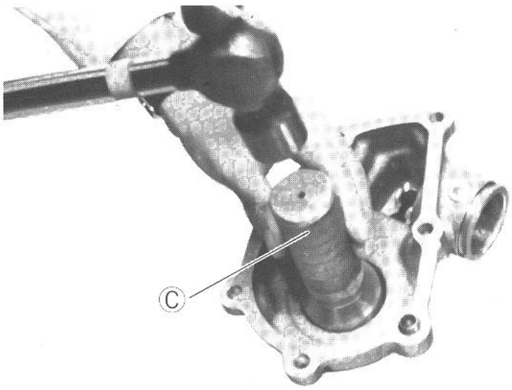


Fig. 14-19

Transfer Center Case

Remove bolts fastening center case and rear case together.
Do not loosen bolt ① at this point.

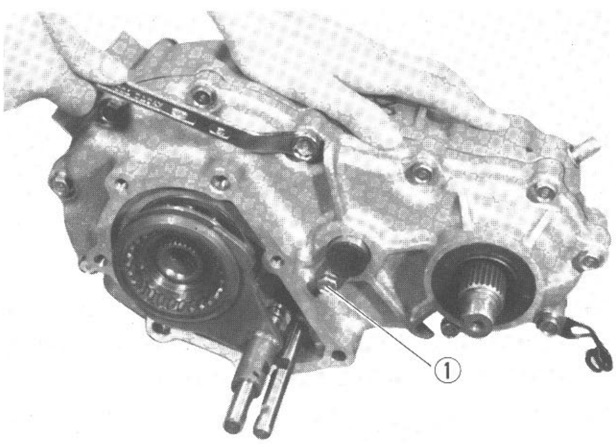


Fig. 14-20

By tapping rear case and output rear shaft with a plastic hammer, separate center and rear case.

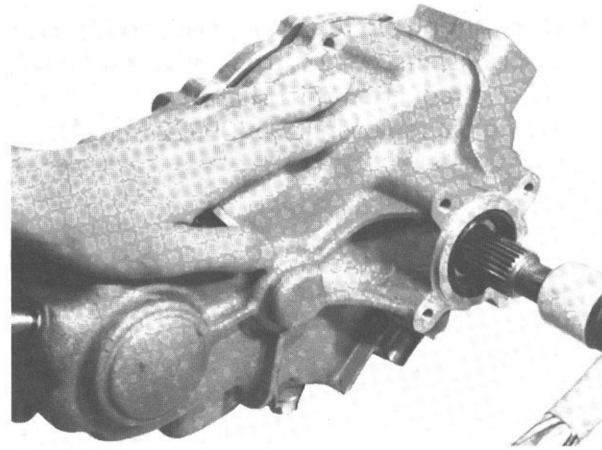


Fig. 14-21

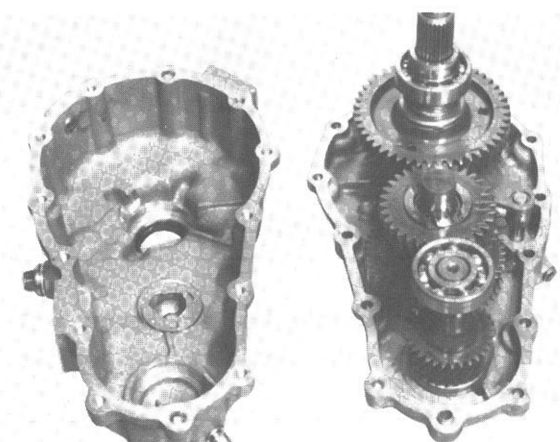


Fig. 14-22

Given below are procedures for disassembling components parts of center case as separated from rear case.

1) Loosen gear shift locating spring plug and take out spring and locating ball.

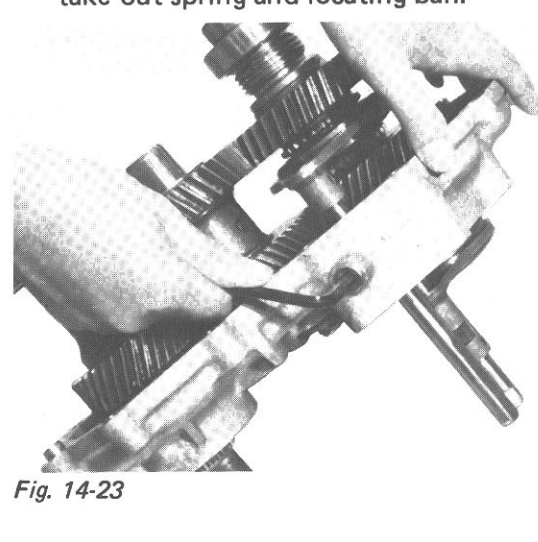


Fig. 14-23

2) Using spring pin remover (special tool), drive 2 spring pins out of front drive shift shaft ① and reduction shift shaft ②.
Spring pin remover Ⓓ : (09922-85811).

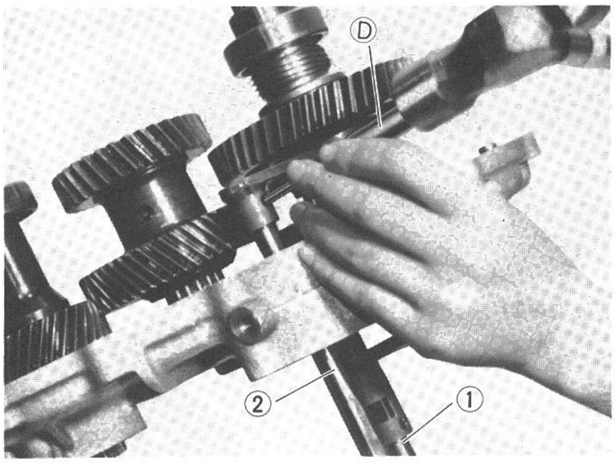


Fig. 14-24

3) Remove forks and shift shafts.

NOTICE:
At this time, locating ball and spring will jump out of hole, use care not to lose them.

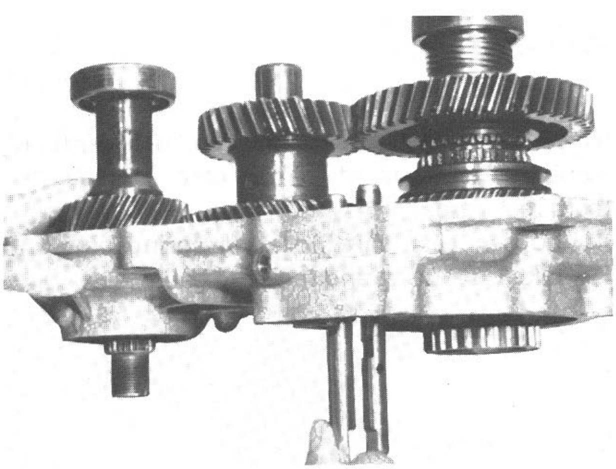


Fig. 14-25

4) Hammer output rear shaft with a plastic hammer to drive it out of center case.

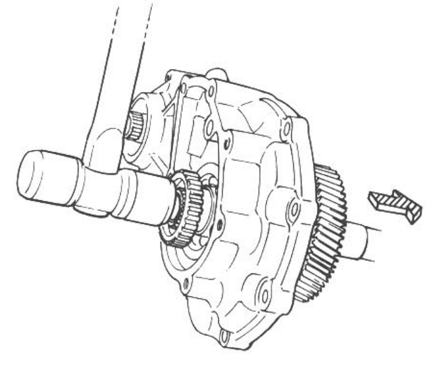


Fig. 14-26

5) Pull out counter gear, bearings and spacer. Remove counter shaft from center case by loosening counter shaft lock plate bolt.

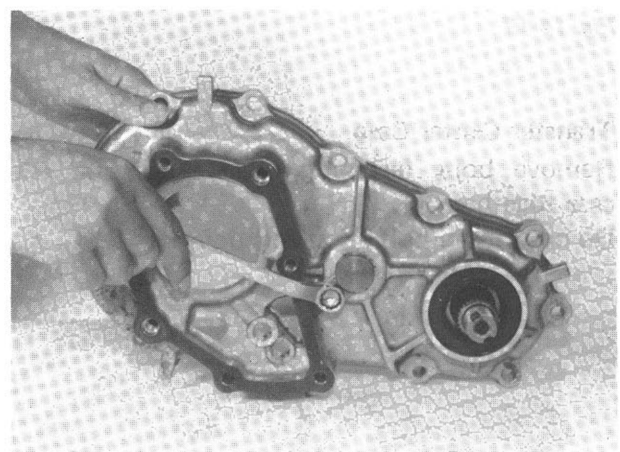


Fig. 14-27

6) Remove input shaft from center case by hammering thick part of case or input shaft center with a plastic hammer.

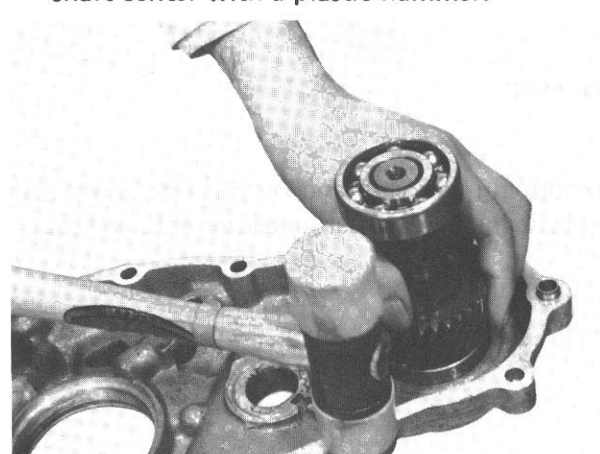


Fig. 14-28

7) Remove output shaft rear bearing and retainer together by using bearing puller. After removing bearing, speedometer drive gear, thrust washer, output low gear and needle roller bearing can be removed.

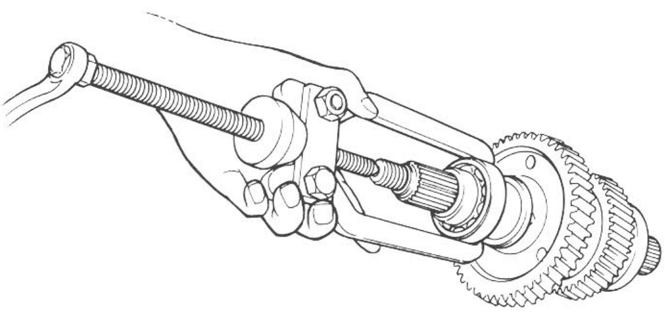


Fig. 14-29

8) Remove front drive clutch hub circlip and pull clutch hub off shaft by using bearing puller and puller attachment (special tool A).

NOTICE:
Use care to prevent damage to needle roller bearing in output rear shaft when removing clutch hub.

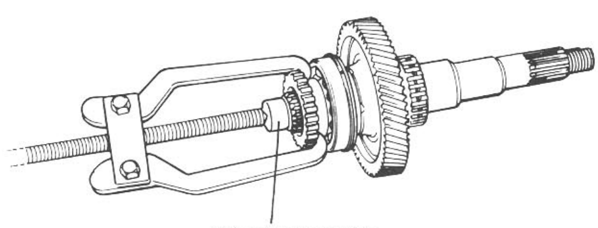


Fig. 14-30

9) Remove front bearing by using bearing puller and puller attachment (special tool A).

NOTICE:
Use care to prevent damage to needle roller bearing in output rear shaft while bearing is bearing removed.

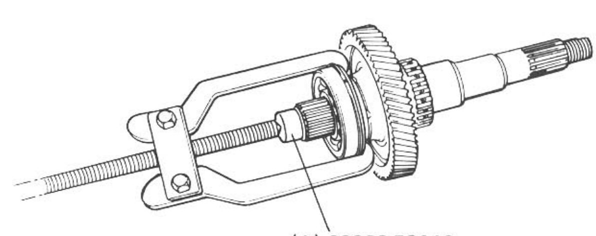


Fig. 14-31

10) When input shaft is removed or center case and rear case are separated, input shaft bearings may come off. In such a case, bearings can be removed from shaft by using bearing puller.

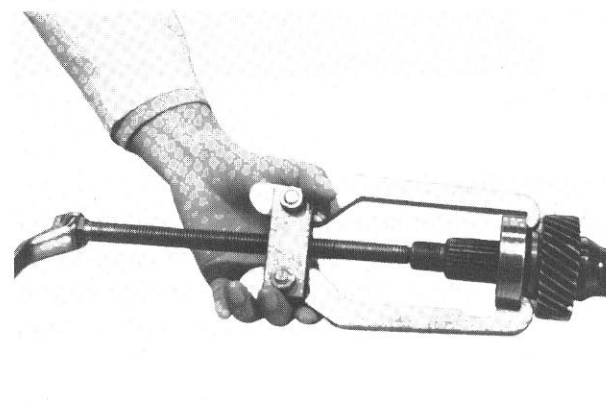


Fig. 14-32

11) When input shaft is removed, front bearing may be left in case. In this case, after removing oil seal and circlip, bearing can be taken out of case by using bearing installer (special tool).

Bearing installer Ⓕ : (09913-75810)

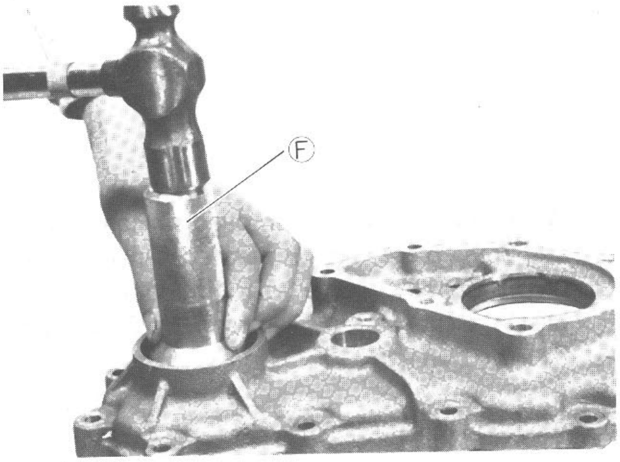


Fig. 14-33

Transfer Rear Case

1) When center case and rear case are separated, input shaft may be left in rear case. In this case, remove input shaft from rear case by hammering thick part of case with a plastic hammer.

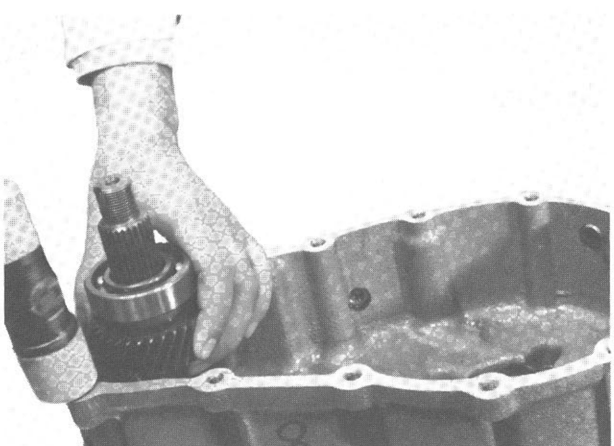


Fig. 14-34

7. Inspection of Components

Gear Teeth

Inspect gear teeth ①, internal teeth of rear clutch sleeve ② and clutch teeth of gear ③ for wear, cracking, chipping and other malcondition. Replace gear or sleeve as necessary.

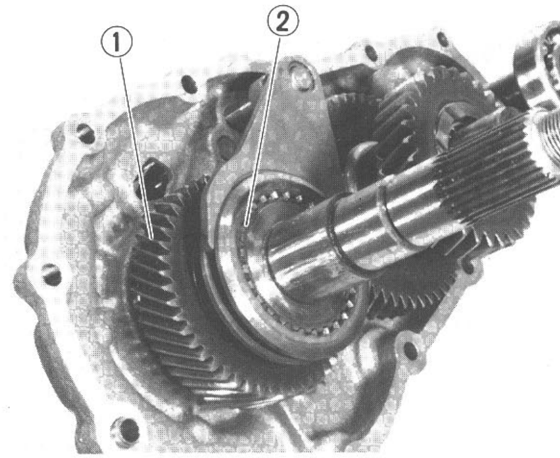


Fig. 14-35

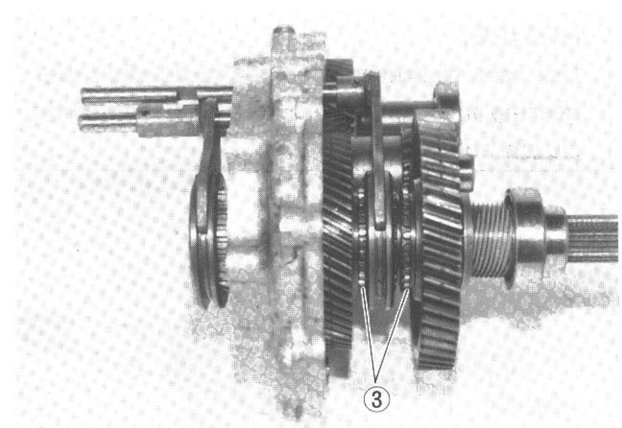


Fig. 14-36

Locating Spring

Check each shifter fork shaft locating spring for strength by measuring its free length. If length is noted to be less than service limit, replace it.

	Standard	Service limit
Free length of locating spring	23.7 mm (0.933 in)	22.0 mm (0.866 in)

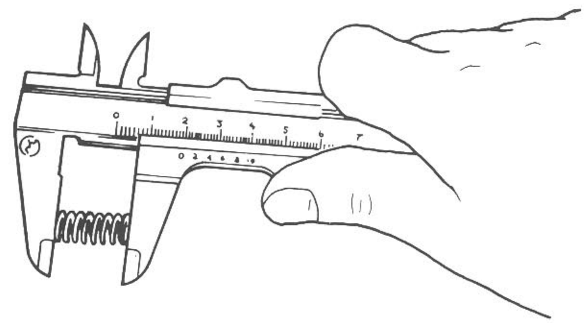


Fig. 14-37

Bearings

Check each bearing by spinning its outer race by hand to "feel" smoothness of rotation. Replace bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

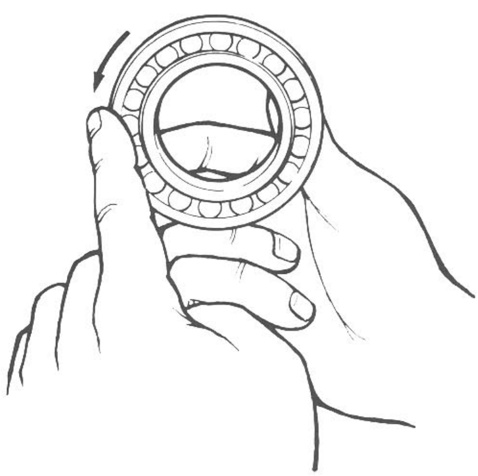


Fig. 14-38

Side Clearance of Gears

With gear, bearing and thrust washer installed on shaft, check for side clearances of gears. If clearance exceeds service limit, replace thrust washer.

Side clearance of gear		Standard	Service limit
Output gears	low gear	0.175 – 0.325mm (0.007 – 0.012in)	0.7mm (0.027in)
	high gear		

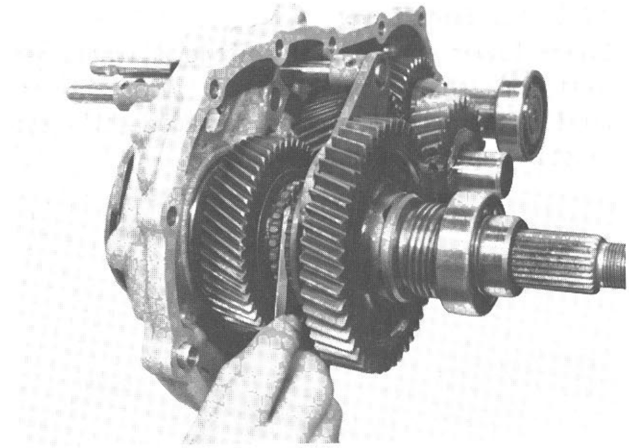


Fig. 14-39 Output high gear

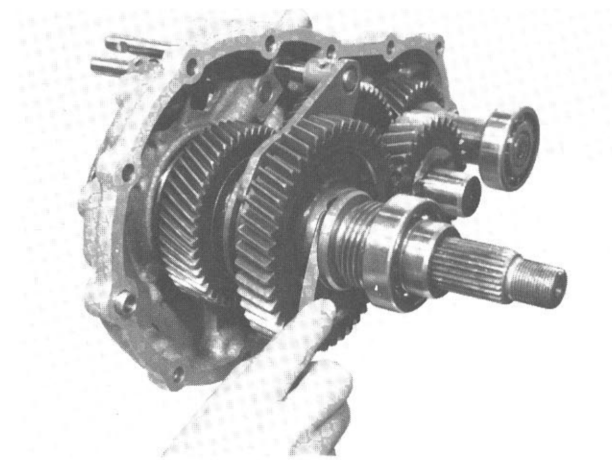


Fig. 14-40 Output low gear

Gear Shift Fork Shafts

(Front drive shift fork shaft and reduction shift fork shaft.)

Check each part as indicated in below figures for uneven wear. Replace defective parts.

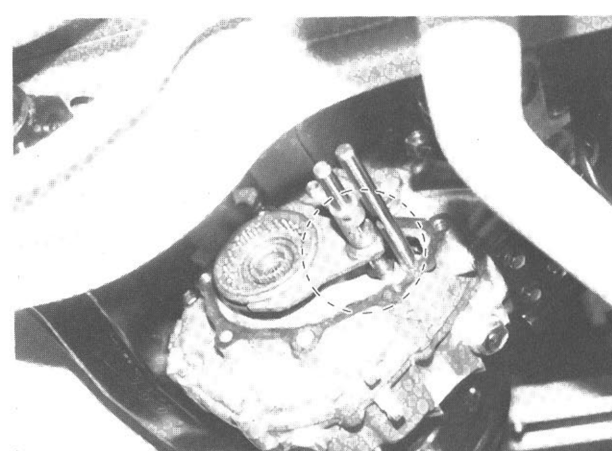


Fig. 14-41

4WD Gear Shift Lever

Check lower end of gear shift lever where gear shift fork shaft contacts ① for wear and any kind of damage. Worn or damaged shift lever must be replaced with new one.

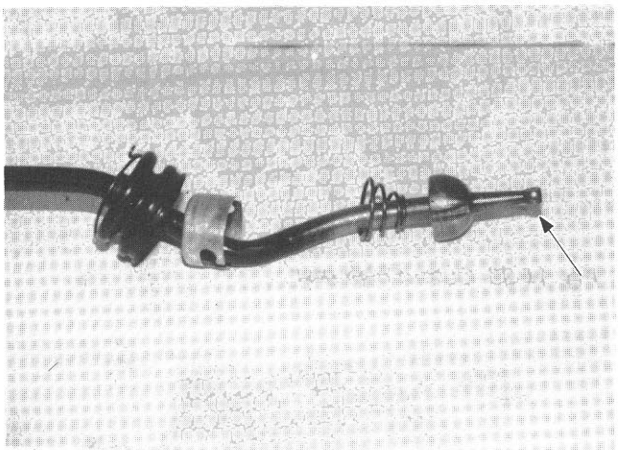


Fig. 14-42

8. Reassembly

> NOTICE:
> - All parts to be used in reassembly must be perfectly clean.
> - Oil or grease sliding and rubbing surfaces of transfer components just before using them in reassembly with gear oil and SUZUKI SUPER GREASE A (99000-25010).
> - Oil seals, "O" rings, gaskets and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.
> - Tightening torque is specified for important fasteners – mainly bolts – of transfer and other components. Use torque wrenches and constantly refer to specified data given in the last item of this section "10. Tightening Torque".

Input Shaft

Press-fit bearings onto both sides of input shaft by using bearing installer "A" (special tool 09913-84510).

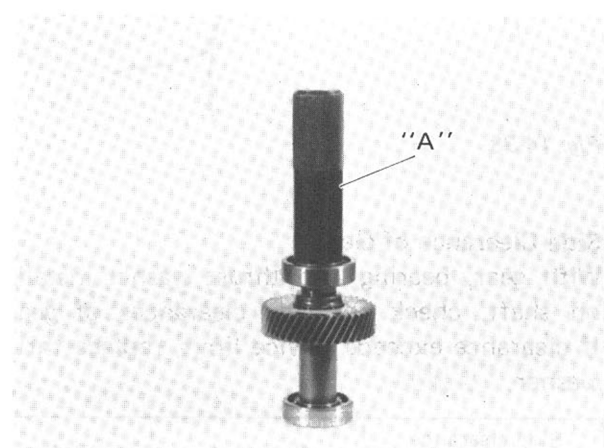
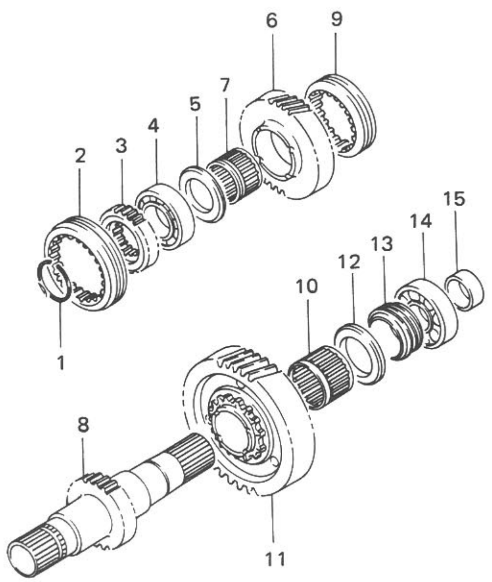


Fig. 14-43

Output Rear Shaft

Install following parts onto shaft in such order and directions as prescribed in the figure.



1. Circlip
2. Sleeve
3. Hub
4. Bearing
5. Thrust washer
6. Output high gear
7. Bearing (long)
8. Output rear shaft
9. Sleeve
10. Bearing (short)
11. Output low gear
12. Thrust washer
13. Speed meter drive gear
14. Bearing
15. Retainer

Fig. 14-44

1) After installing bearing (long), high gear and thrust washer, press-fit bearing ③ and then hub ② by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

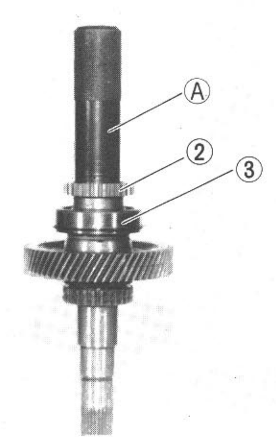


Fig. 14-45

2) Fit circlip ① securely into groove in shaft.

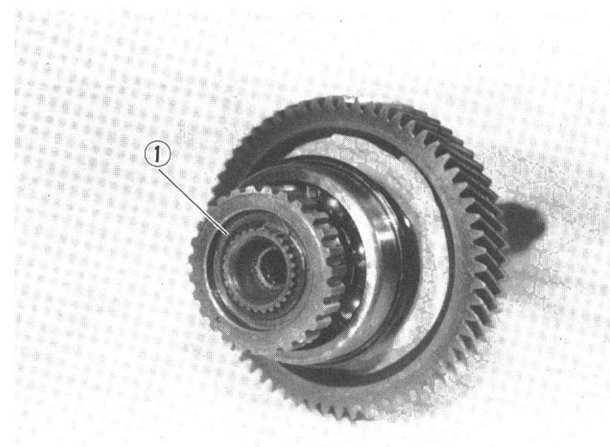


Fig. 14-46

3) After installing sleeve, bearing (short), low gear and thrust washer, press-fit speedometer drive gear by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

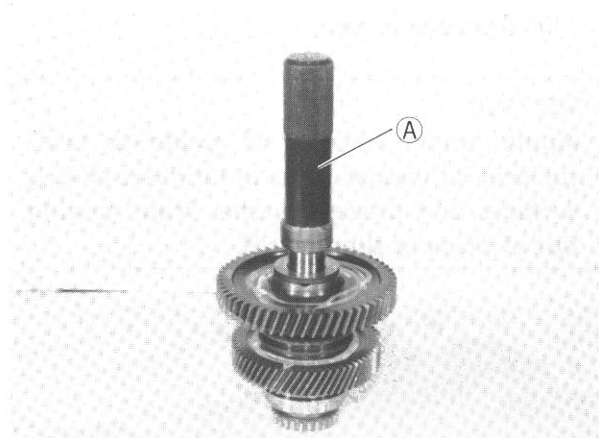


Fig. 14-47

4) Press-fit bearing ⑭ and the retainer ⑮ by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

Fig. 14-48

Rear Case

1) Install oil seal in rear case and apply grease to oil seal lip.

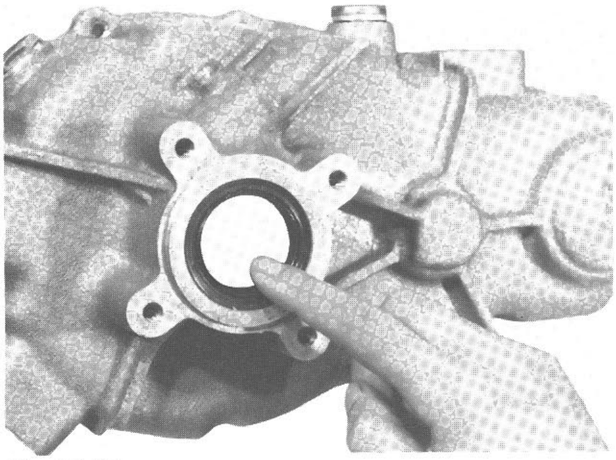


Fig. 14-49

2) Install counter shaft thrust washer to rear case, bringing its face without depressions against case and fit its bent portion securely into groove in case.

> **NOTICE:**
> **Apply ample amount of grease to both surfaces of washer so as to lubricate sliding surfaces and prevent washer from moving out of place or slipping off.**

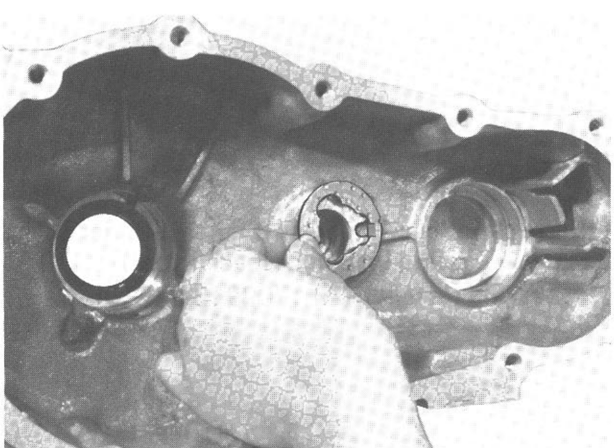


Fig. 14-50

Center Case

1) Install input shaft front bearing circlip and oil seal in center case.
   Snap ring pliers Ⓐ : (09900-06108)

Fig. 14-51

2) Install input shaft to center case.

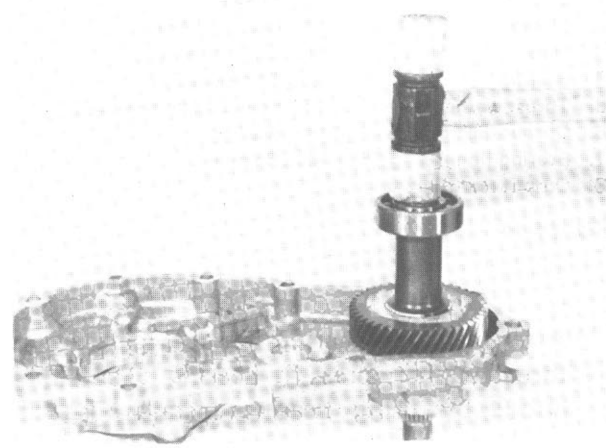


Fig. 14-52

3) After greasing O ring on counter shaft, insert shaft into center case and secure shaft with lock plate and bolt.

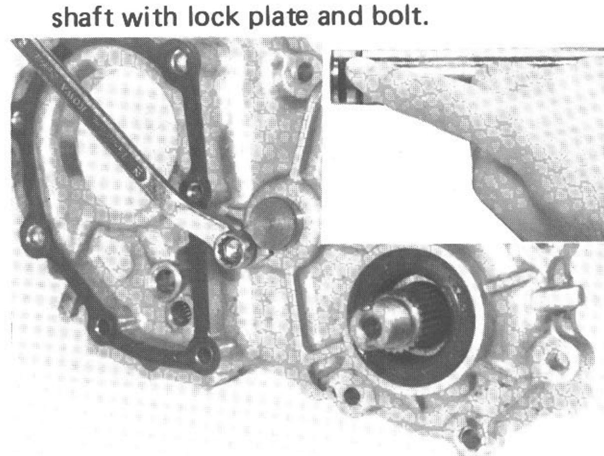


Fig. 14-53

4) Install the counter shaft thrust washer to center case. For installation, apply ample amount of grease to both faces of the washer so as to lubricate sliding surfaces and prevent it from moving out of place or slipping off and bring its face without depressions against center case, and fit its bent portion into groove in case securely.

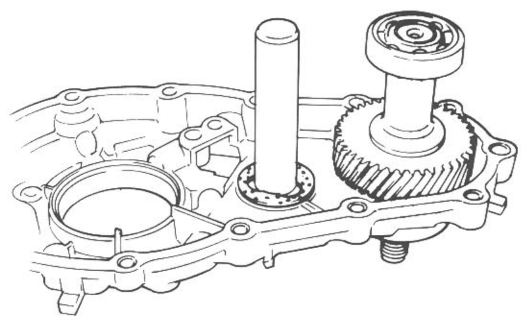


Fig. 14-54

5) Install needle roller bearings, spacer and counter gear on counter shaft.

Fig. 14-55

6) Install output shaft assembly to center case.

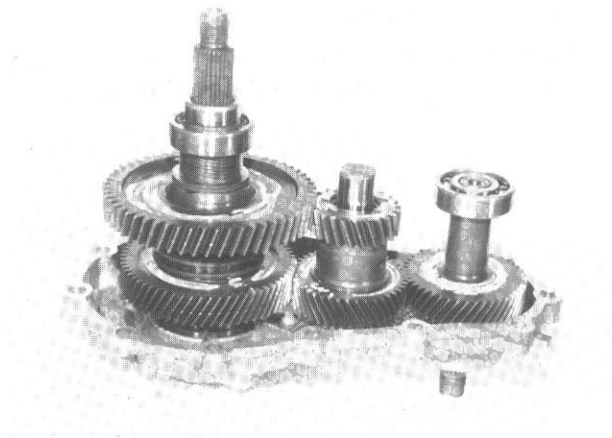


Fig. 14-56

7) When installing front drive shift shaft and reduction shift shaft in center case, install spring ①, ball ②, shaft ③, ball ④, shaft ⑤, ball ⑥, spring ⑦ and plug ⑧ in that order.

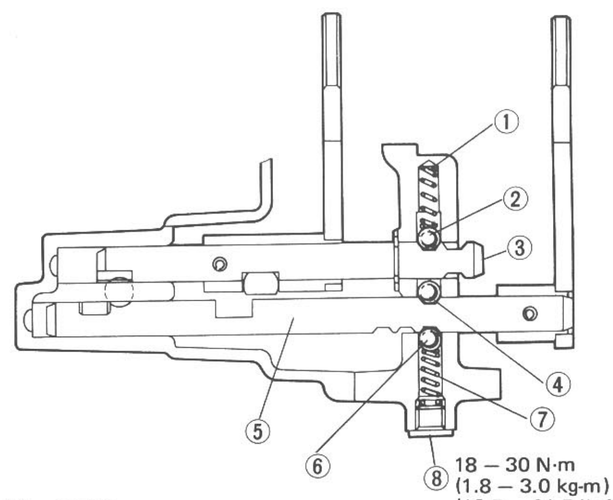


Fig. 14-57

8) Fit forks on shift shafts and lock them with spring pins. Forks should be fitted in correct direction according to below figure.

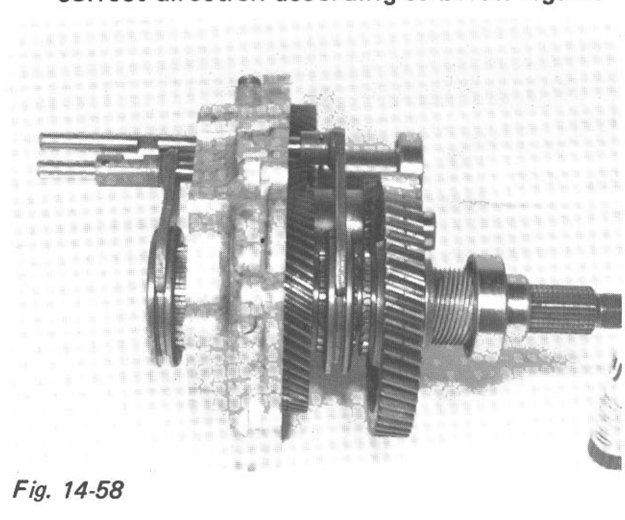


Fig. 14-58

Center and Rear Cases

1) Check center case (or rear case) to ensure that it is provided with 2 dowel pins ①.

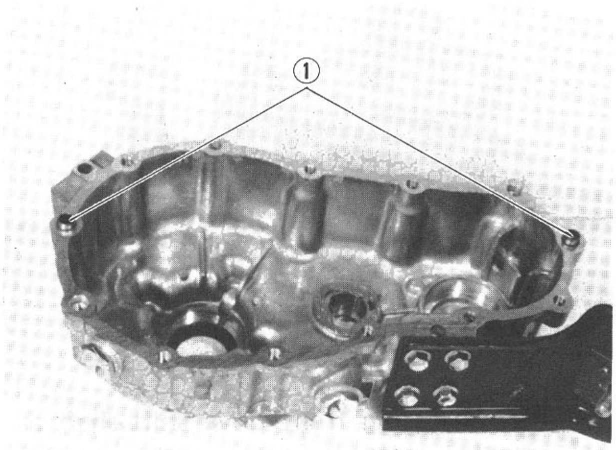


Fig. 14-59

2) Put gasket on center case. Bring rear case and center case into match and apply uniform force gradually all around rear case with a plastic hammer. Tighten center case securing bolts to specified torque.

> NOTICE:
> **Matching must be made carefully so as not to move countershaft thrust washer out of place.**

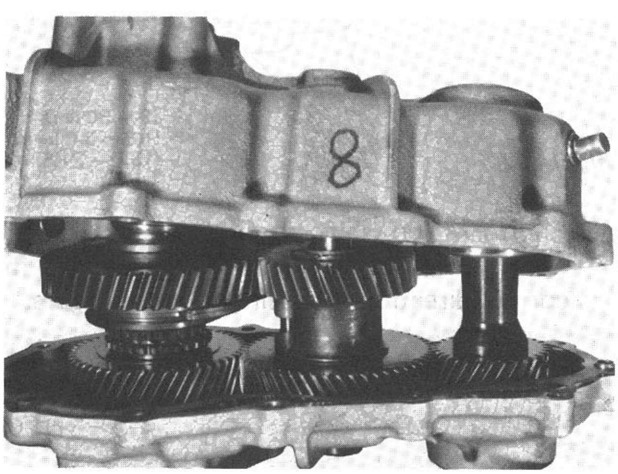


Fig. 14-60

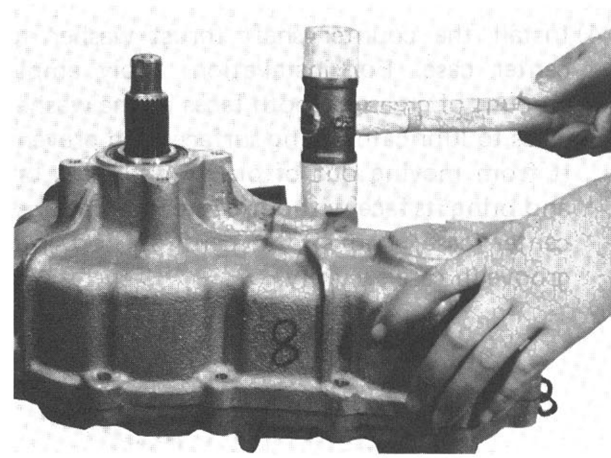


Fig. 14-61

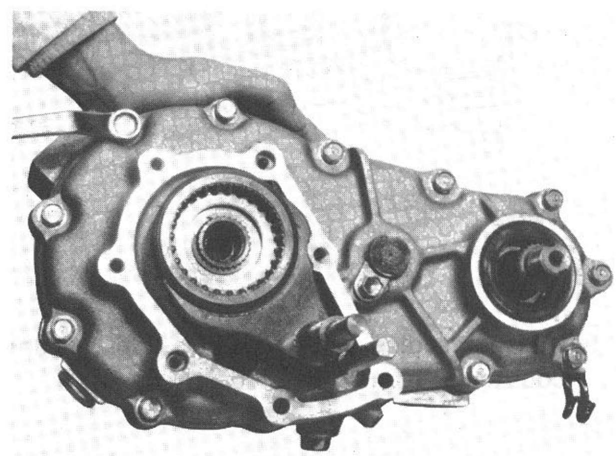


Fig. 14-62

3) Apply grease to output front shaft rear bearing.

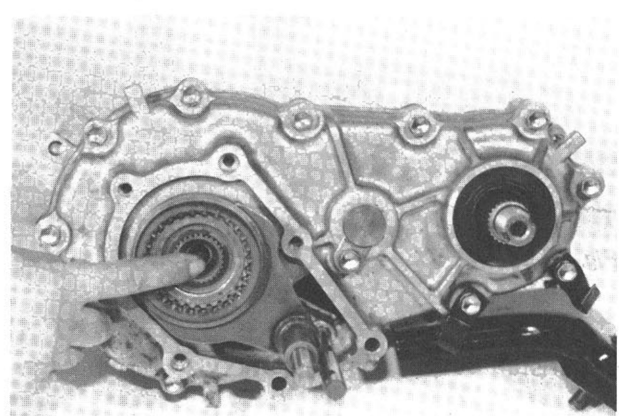


Fig. 14-63

Front Case

1) Install bearing, circlip and oil seal to front case. Apply grease to oil seal lip and install output front shaft using bearing installer (special tool).
Bearing installer (A) : (09913-76010)

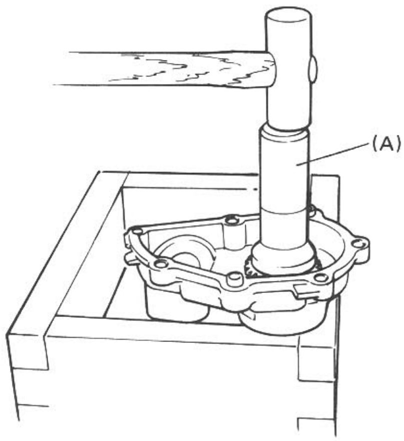


Fig. 14-64

2) Put gasket on center case.
3) Check front case to ensure that it is provided with 2 dowel pins.

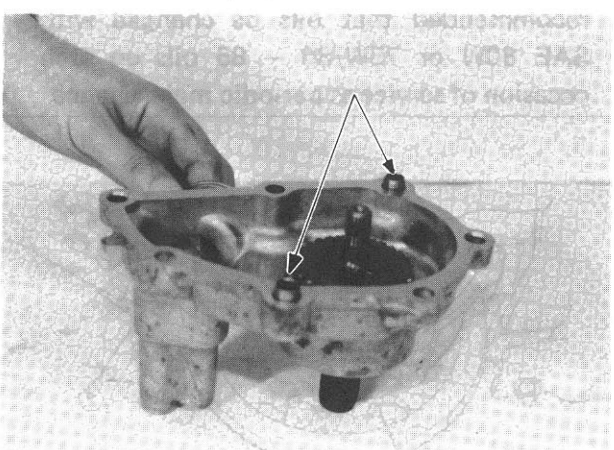


Fig. 14-65

4) Install front case to center case.

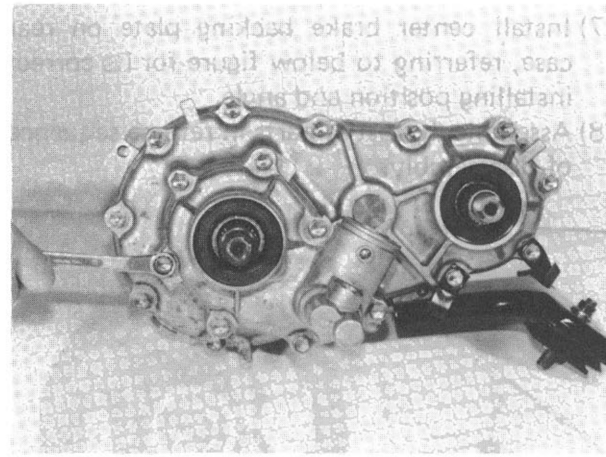


Fig. 14-66

5) When installing speedometer driven gear and its gear case in rear case, apply grease to O ring and oil seal lip, and align bolt holes in rear case and driven gear case.

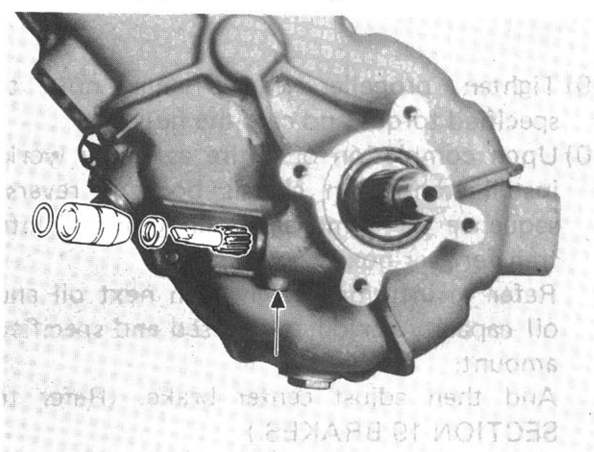


Fig. 14-67

6) Install 4WD ball and switch. Then clamp switch lead wire properly.

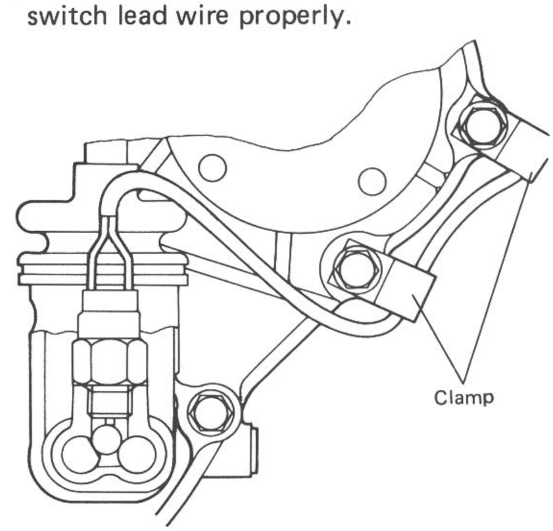


Fig. 14-68

7) Install center brake backing plate on rear case, referring to below figure for its correct installing position and angle.
8) Assemble the rest of parts in reverse sequence of disassembly.

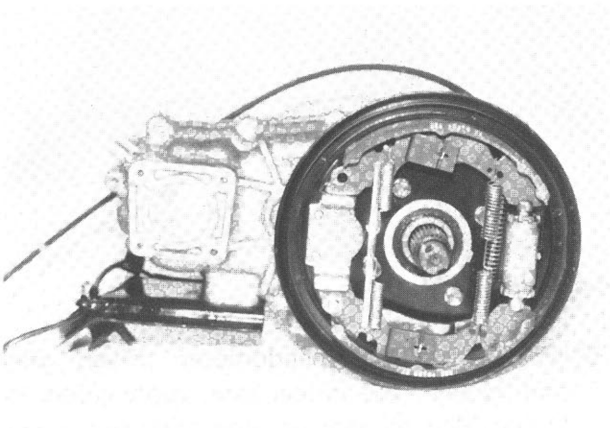


Fig. 14-69

9) Tighten propeller shaft flange nuts to specified torque and calk the nuts.
10) Upon completion of entire assembly work, install transfer in chassis body in reverse sequence of removal. Pour gear oil into transfer gear box.
    Refer to information given in next oil and oil capacity for oil to be used and specified amount.
    And then adjust center brake. (Refer to SECTION 19 BRAKES.)

9. Maintenance Services

Oil Level

Oil level must be checked with car held in horizontal position in both front to rear and side to side directions.
Oil level plug and oil filler plug are one and the same as shown in figure.
If oil flows out of level hole when level plug is removed, amount of oil is appropriate. Replenish oil if noted as insufficient.

Oil and Oil Capacity

Whenever car is lifted up for any service including oil change, make sure to check around transfer gear box for oil leakage. Correct defects, if any, and change or refill oil.

Transfer oil capacity	0.8 litre (1.7/1.4 US/Imp. pt)
Transfer oil specification	Gear oil SAE #90, 75W/80 – 85 or SAE 80W

NOTICE:
For vehicles used in such areas where the ambient temperature becomes lower than –15° C (5° F) during the coldest season, it is recommended that oils be changed with SAE 80W or 75W/80 – 85 oils on such occasion of service as periodic maintenance.

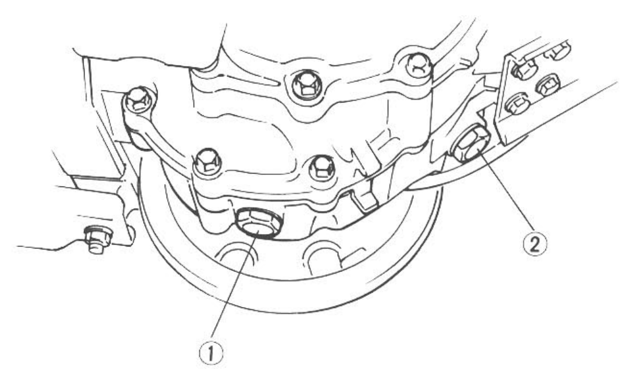


Fig. 14-70 ① : *Oil drain plug*
② : *Oil filler & level plug*

10. Tightening Torque

Fastening parts	N·m / kg·m	lb-ft
Front case bolt	13 – 23 1.3 – 2.3	9.5 – 16.5
Center case bolt	13 – 23 1.3 – 2.3	9.5 – 16.5
Counter shaft lock plate bolt	9 – 17 0.9 – 1.7	7.0 – 12.0
Center brake backing plate bolt	18 – 28 1.8 – 2.8	13.5 – 20.0
Universal joint flange nut	110 – 150 11.0 – 15.0	80.0 – 108.0
Transfer mounting bracket bolt	18 – 28 1.8 – 2.8	13.5 – 20.0
Transfer mounting nut	25 – 35 2.5 – 3.5	18.5 – 25.0
Prep eller shaft flange bolt & nut (8mm)	23 – 30 2.3 – 3.0	17.0 – 21.5
Oil filler and drain plug	36 – 54 3.6 – 5.4	26.5 – 39.0

15. PROPELLER SHAFTS

1. General Description

These automobiles, covered in this manual are four-wheel drive machines and, as such, use three propeller shafts designated as No. 1, No. 2 and No. 3.
No. 1 propeller shaft transmits drive from the transmission to the transfer gear box. No. 2 shaft and No. 3 shaft extend from the transfer gear box, the former driving the front axle and the latter the rear axle.
The cross spider in each universal joint is fitted with four needle roller bearings. These bearings are press-fitted into the housing parts of the yokes and securely fixed in place by circlips.

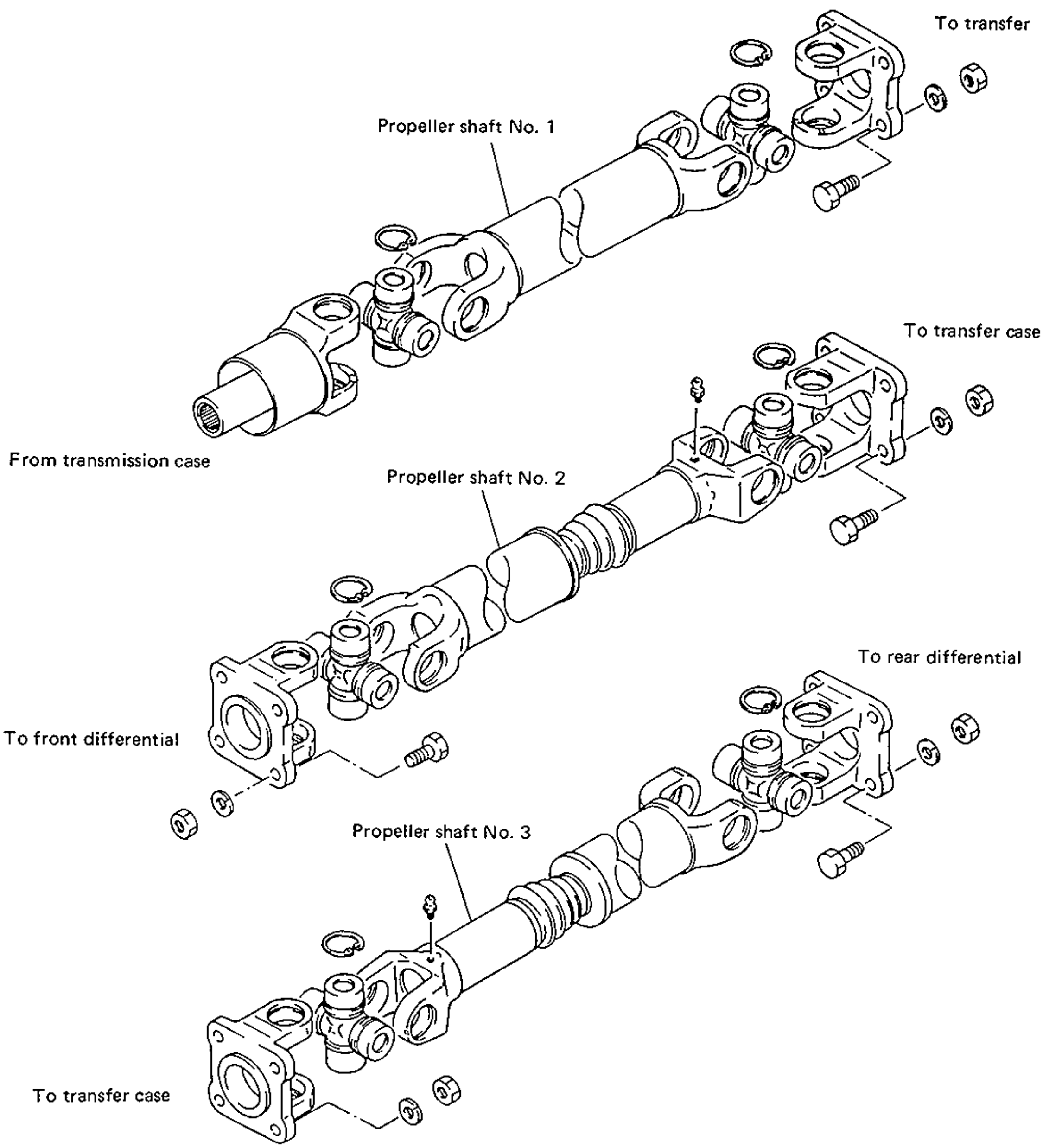


Fig. 15-1

2. Removal

1) Hoist cap.
2) Loosen propeller shaft nuts and bolts.
3) Remove propeller shaft.
   Transmission-side end of No. 1 shaft has no flange piece; this end is splined to driving shaft inside extension case. All you have to do there is to pull No. 1 shaft off extension case.

> **NOTICE:**
> **When withdrawing propeller shaft No. 1 from transmission, transmission oil will not leak, provided oil level is to specification and car is raised horizontally in its front and rear direction. However, if only car front is hoised, be sure to drain transmission oil before withdrawing propeller shaft No.1.**

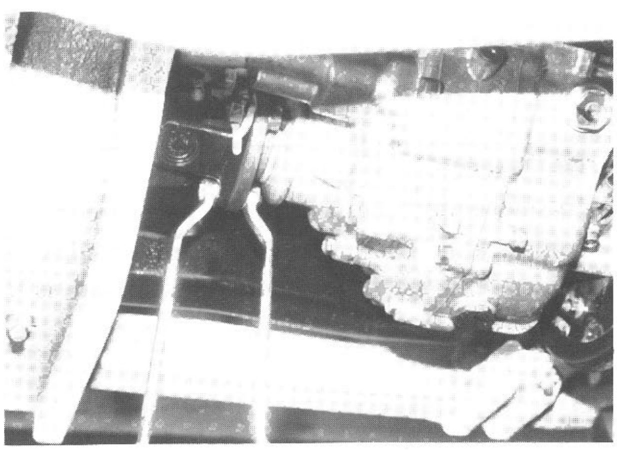


Fig. 15-2

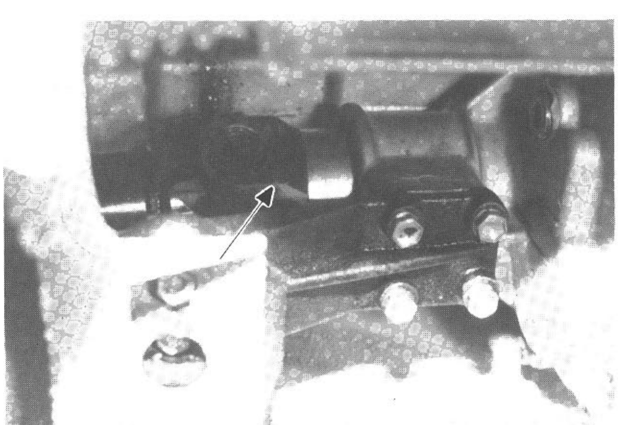


Fig. 15-3

3. Disassembly

- Disassembling on propeller shaft yoke side.

1) Using snap ring pliers (Special tool), remove 2 circlips.

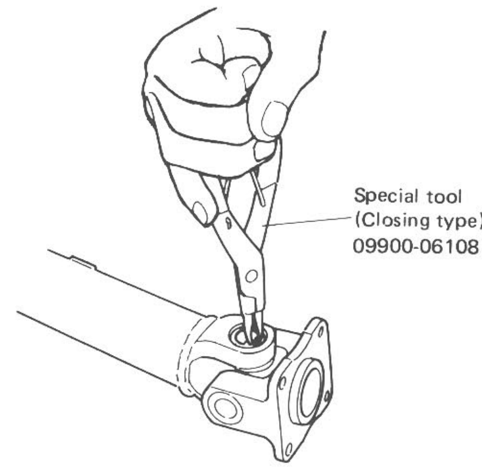


Fig. 15-4 Removing circlip

2) Using universal joint assembler (Special tool 09926-48010), push the spider bearing race out 3 – 4 mm (0.12 – 0.16 in.) from the shaft yoke race.

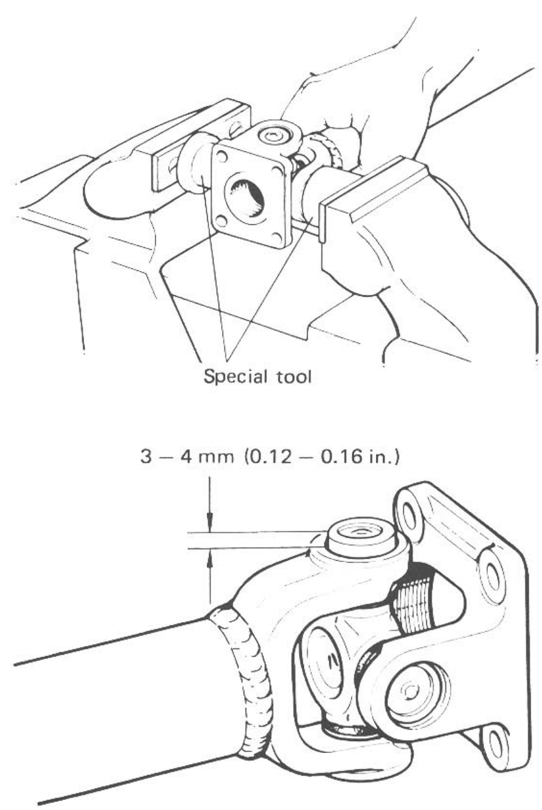


Fig. 15-5

3) Tapping yoke with a hammer, completely remove bearing race.

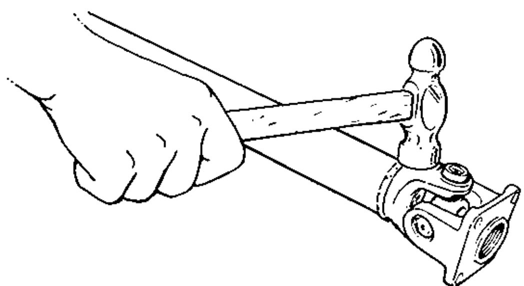


Fig. 15-6

4) Take out bearing race on the other side in the same way as in 2) and 3).

- Disassembling on flange yoke side
  Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vice, tap flange yoke and take out race. (Refer to the below figure.)
  Remove bearing race on the opposite side in the same way.

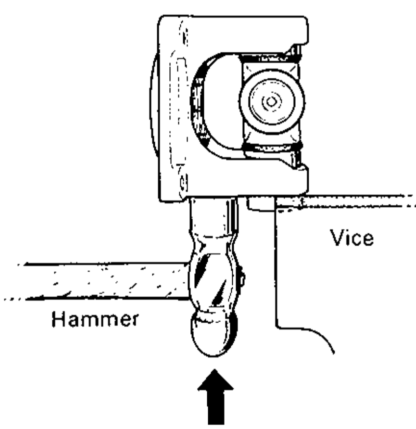


Fig. 15-7

NOTICE:
- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**

4. Reassembly

NOTICE:
- **Make certain that rollers inside spider bearing race are all in place.**
- **Make sure to apply spider bearing race with SUZUKI SUPER GREASE C (99000-25030).**

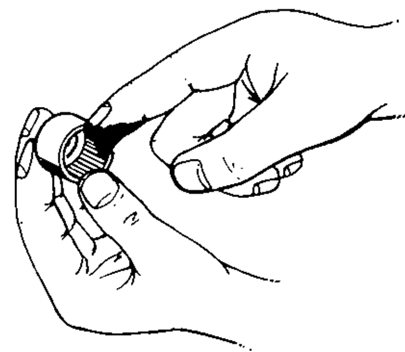


Fig. 15-8

CAUTION:
In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once reassembled is prohibited.

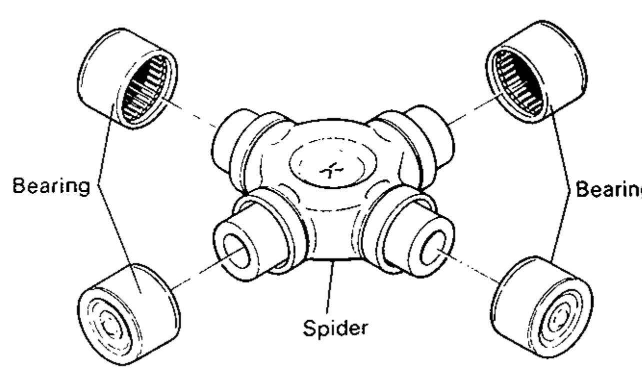


Fig. 15-9

1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.

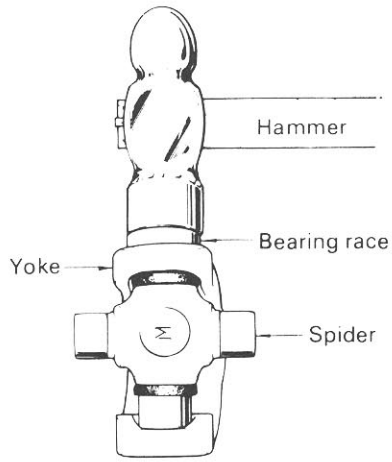


Fig. 15-10

2) Insert the other bearing race on the opposite side into yoke, tapping with a hammer until it is flush with yoke face.
3) Insert bearing races on the flange yoke side in the same way as described in 1) and 2) above.

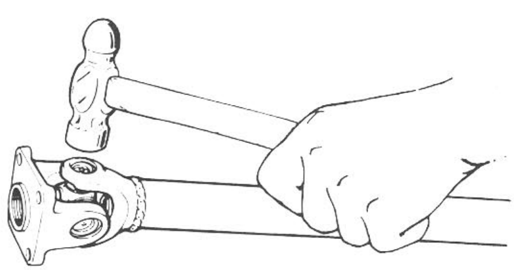


Fig. 15-11

4) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
5) Securely fit 4 circlips to shaft and flange york.

NOTICE:
After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.

5. Installation

The installing procedure is reverse of the removal procedure. Be sure to adhere to following instructions when installing shafts:

- Flange tightening torque
  Be sure to tighten 4 nuts to the following torque when securing companion flange to yoke at each end of propeller shaft:

Tightening torque for universal joint flange bolts & nuts	23 – 30 N·m (2.3 – 3.0 kg-m) (17.0 – 21.5 lb-ft)

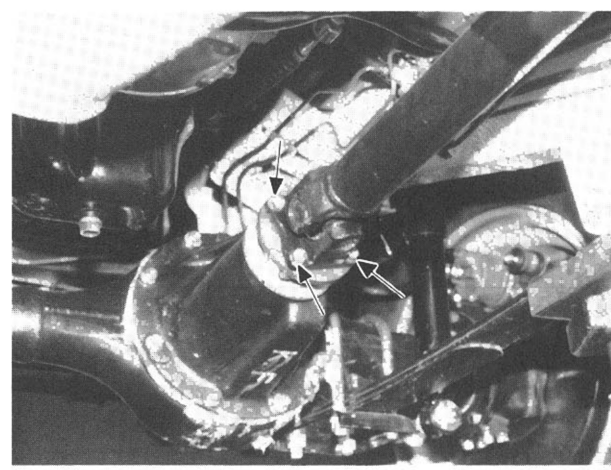


Fig. 15-12

- Grease splines liberally, filling grooves with grease.

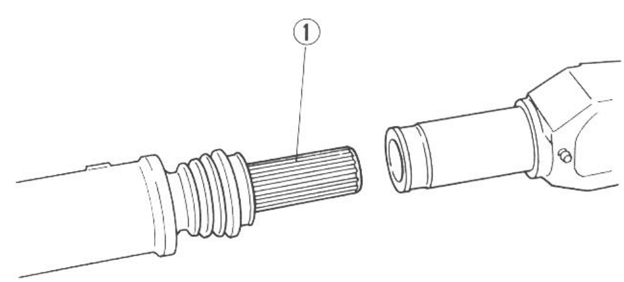


Fig. 15-13 ① *Grease (chassis grease)*

- Joint sheath rubber has a large diameter in one end and a small diameter in the other. Be sure to fit sheath rubber with its large-diameter end brought to joint yoke side.

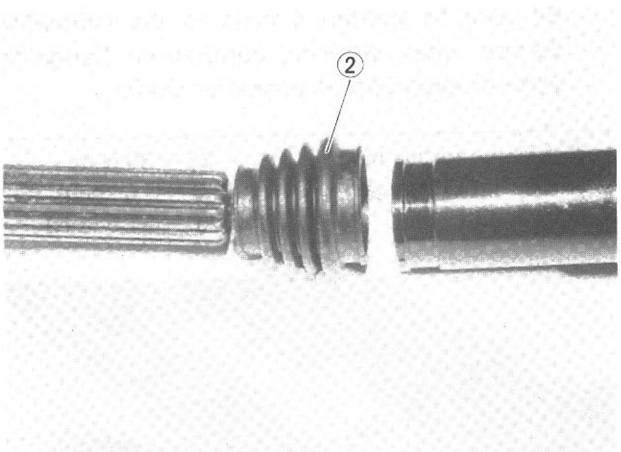


Fig. 15-14 ②Joint sheath rubber

> **NOTICE:**
> **If transmission oil was drained for propeller shaft No. 1 removal, pour specified gear oil into transmission case to specified level.**

- Match marks are provided on slip-on spline connections. Inserting splined end into splined bore without regard to match marks can be a possible cause of noise or vibration of propeller shaft. Be sure to index marks.

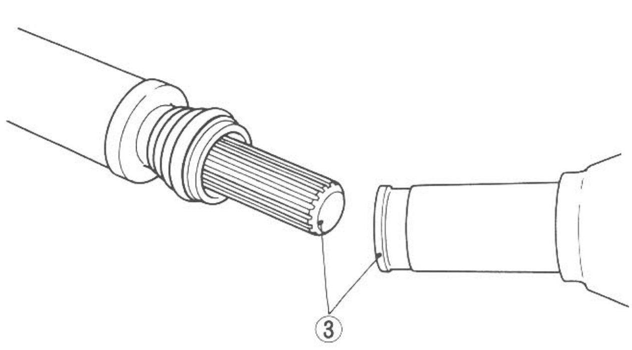


Fig. 15-15 ③Match marks

6. Maintenance Services

Lubrication

Inside yoke of each universal joint has a grease nipple. At regular intervals stated in the recommended servicing schedule, pump in grease to relubricate joint. Use chassis grease.

Fig. 15-16

Universal Joint Noise

If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider rattles in yokes or if splines are worn down.

The noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).

The remedy for a propeller shaft whose universal joints are making noise is either to replace whole shaft assembly or to replace universal joints with new ones.

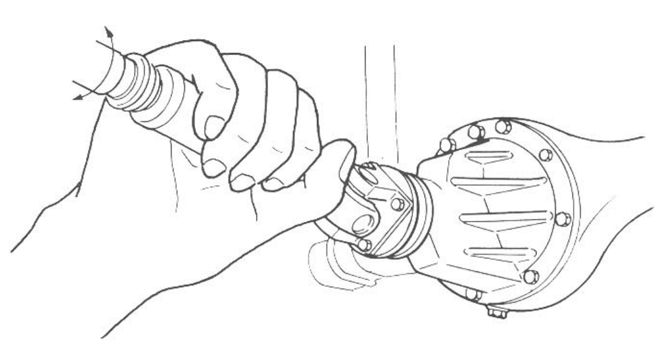


Fig. 15-17

7. Tightening Torque

Bolts & Nuts

Check following bolts and nuts for tightness and retighten them as necessary:

Fastening parts	N·m	kg-m (lb-ft)
Propeller shaft bolt & nut	23 – 30	2.3 – 3.0 (17.0 – 21.5)

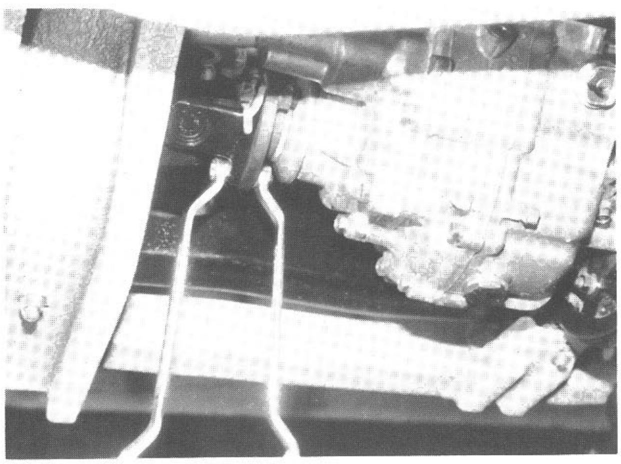


Fig. 15-18

16. DIFFERENTIAL

Refer to the section "16. DIFFERENTIAL" on page 16-1 ~ 16-14 for necessary information concerning the subject of this section.

17. SUSPENSION

NOTICE:
For the items not found in this section of this manual, refer to the sections "17. SUSPENSION" on page 17-1 ~ 17-22 and "FRONT FREE WHEELING HUB" on page 23-28 ~ 23-31.

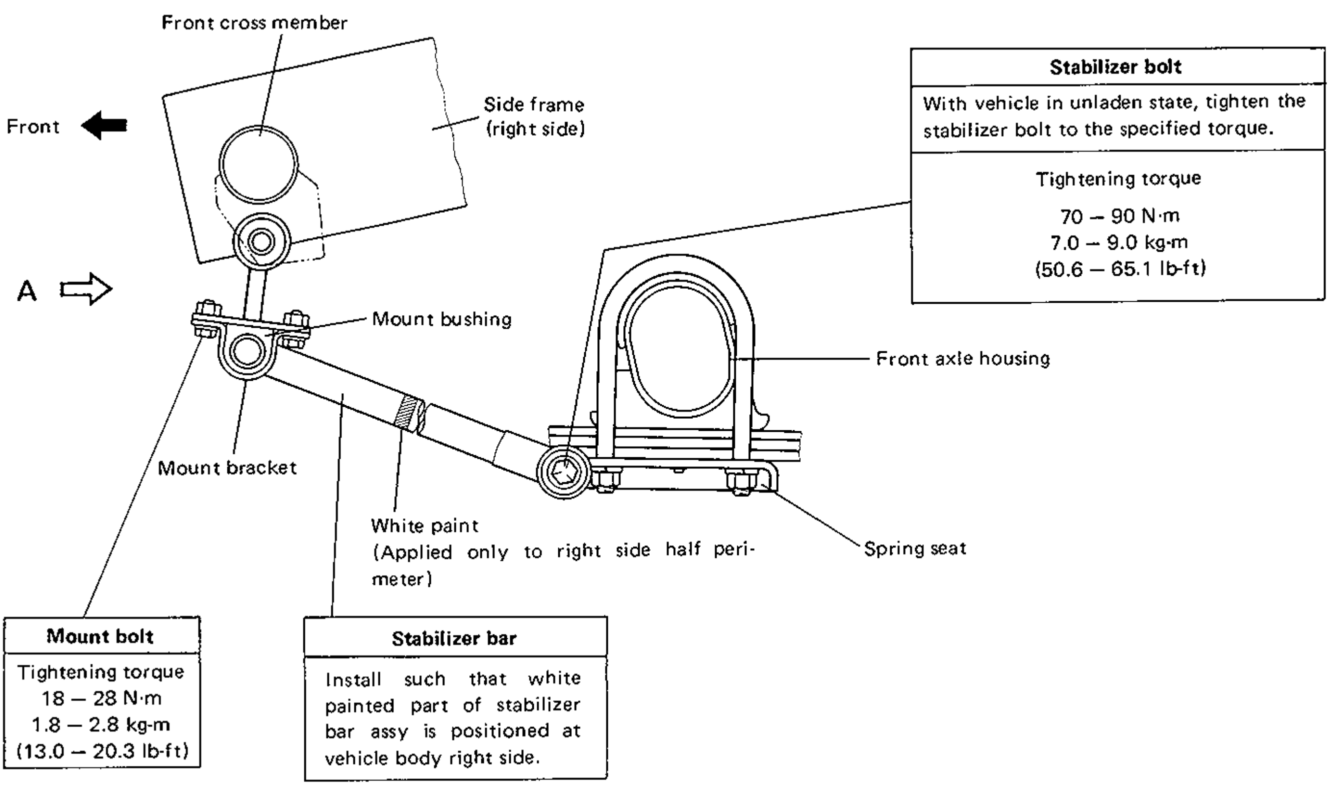
16

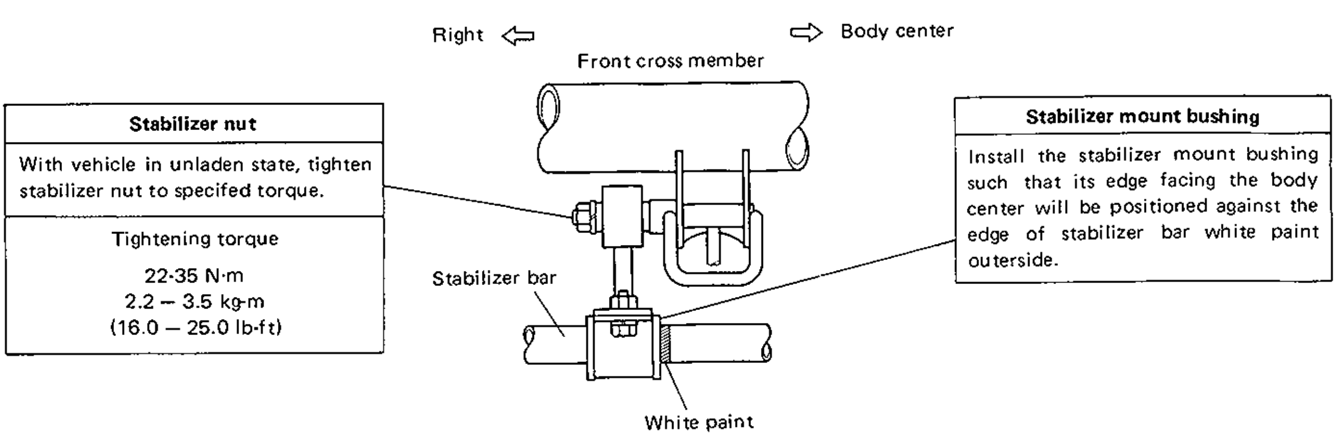
17

1. Important Steps in Installation & Tightening Torque (Front Suspension)

1) Front stabilizer (For long body type and metal top high roof type).
   In the long body type, the former rear stabilizer has been abolished and the front stabilizer equipped instead. In the metal top high roof type, the front stabilizer has also been equipped.

> **NOTE:**
> **The following diagrams cover the explanation for vehicle right side. These instructions are also applicable to the left side.**





VIEW A

Fig. 17-1

2) Front differential oil filler & level plug

Tightening torque	35 – 50 N·m 3.5 – 5.0 kg-m (25.5 – 36.0 lb-ft)

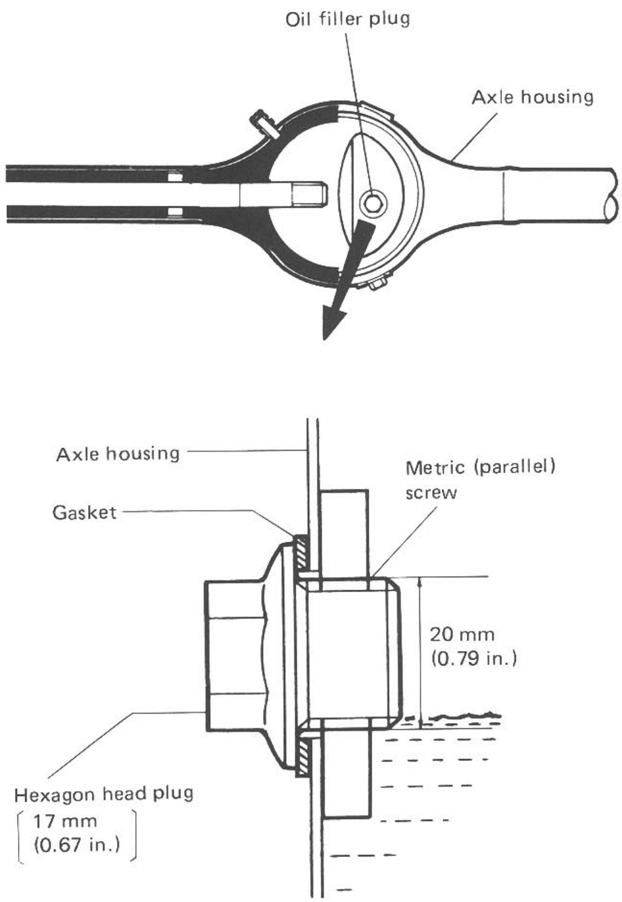


Fig. 17-2

2. Important Steps in Installation & Tightening Torque (Rear Suspension)

1) Rear differential oil filler & level plug (Refer to Fig. 17-2).

Tightening torque	35 – 50 N·m 3.5 – 5.0 kg-m (25.5 – 36.0 lb-ft)

3. Front Automatic Free Wheeling Hub (Optional Parts)

1) Description

The operation and installation of manual type free wheeling hub have already been covered in Service Manual (99500-80001-01E). The operation, installation and maintenance of the automatic free wheeling hub that has been added as optional parts are related in this manual.

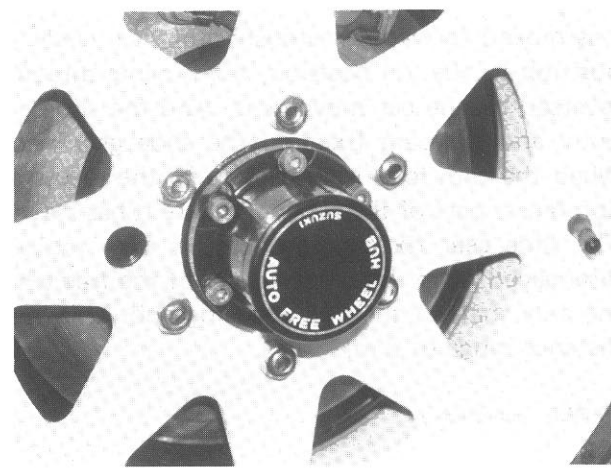


Fig. 17-3

2) Operation

The automatic free wheeling hubs, like manual free wheeling hubs, are installed onto the front wheel hubs at both sides of the car respectively.

When the car equipped with these automatic free wheeling hubs is started with the transfer gear shift lever shifted from the 2H position to the 4H or 4L position, the front axle drive power is transmitted to the hub, slide gear and finally to the cam serially as shown below.

Then, the cam lobe comes out of the recess of the retainer and gets on its non-recess part. This action causes the cam to move the slide gear to the right in the figure given below and get engaged with the internal gear of the free wheeling hub body installed to the front wheel hub. In this way, the axle shaft drive power is transmitted to the wheel hub (wheel).

As described above, automatic locking of free wheeling hub is attained.

Also, when the car is moved slowly in the reverse direction to the previous movement (i.e., backward if it was moved forward previously and vice versa) with the transfer gear shift lever shifted from the 4H or 4L position to the 2H position, the moving direction of the front wheel and front wheeling hub body is also reversed by the car movement. And the slide gear engaged with the internal gear of the free wheeling hub body and the cam fixed to the slide gear also start turning reversely to the previous moving direction. When the cam lobe is turned up to the recess of the retainer, it is returned by the spring force from the non-recess part of the retainer where it has stayed till then back to its recess.

The slide gear fixed to the cam is then moved to the left in the figure given below and consequently disengaged from the internal gear of the free wheeling hub body. Thus, the front wheel is turned free from the axle shaft at the free wheeling hub. This operation (LOCK → FREE) is completed within a car moving distance range of 2 m.

"FREE" condition

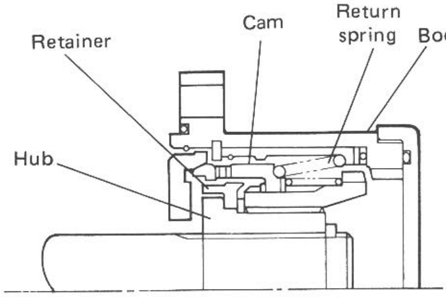


Fig. 17-4

"LOCK" condition

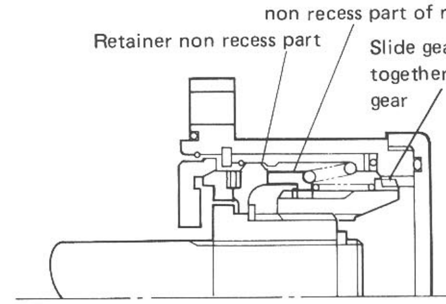


Fig. 17-5

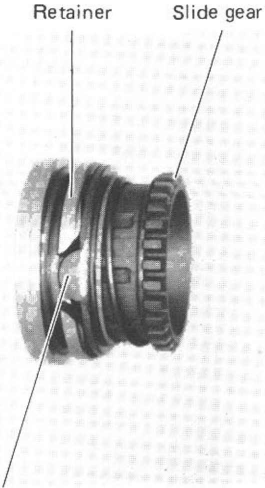


Fig. 17-6

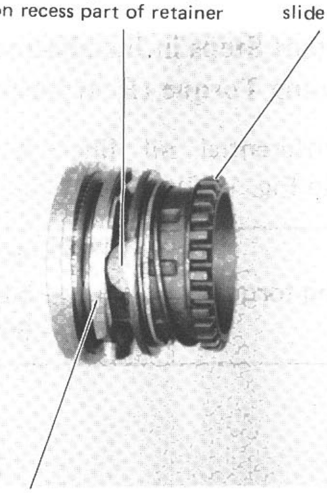


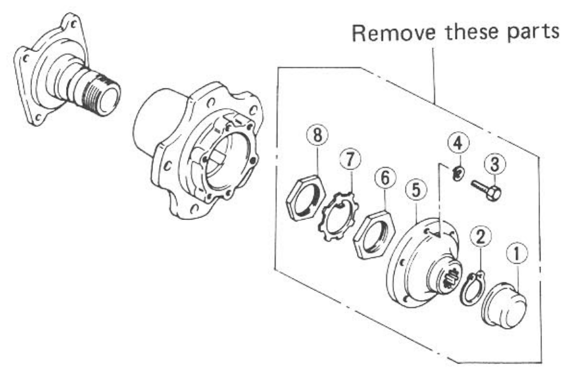
Fig. 17-7

3) Installation instruction

Removal

1. Lift up (or jack up) the front end of the vehicle, and be sure to then support the front end so that it is not dropped from its lifted-up (or jacked-up) position.
2. Remove each front tire-and-wheel.
3. Remove the parts shown below following the sequence of the number shown below.

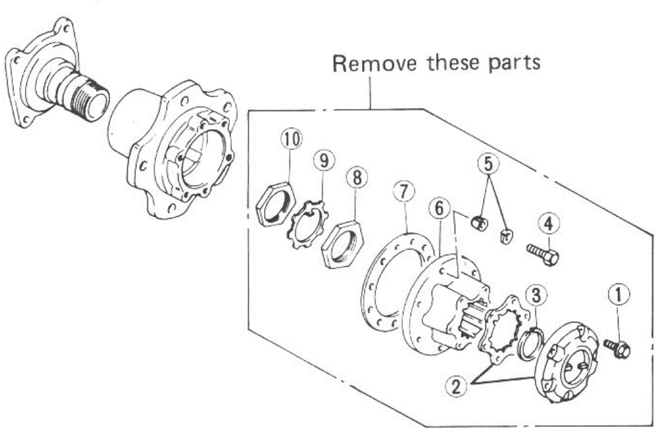
(Vehicle without free wheeling hub)



① Front axle cap
② Axle shaft circlip
③ Bolt (1-wheel 6 psc)
④ Lock washer
⑤ Drive flange
⑥ Nut
⑦ Lock washer
⑧ Nut

Fig. 17-8

(Vehicle with manual free wheeling hub)



① Hub cover bolt
② Locking hub cover and packing
③ Axle shaft circlip
④ Bolt
⑤ Lock washer and cone washer
⑥ Hub body
⑦ Packing
⑧ Nut
⑨ Lock washer
⑩ Nut

Fig. 17-9

4. Remove a pin bolt of the disc brake caliper. Thus, separate the caliper from the disc.

(When the brake is the drum brake, you can neglect this item).

NOTE:
1. **Do not disconnect the brake hose as much as practicable.**
2. **As long as the caliper is separated from the disc, use care to never depress the brake pedal.**

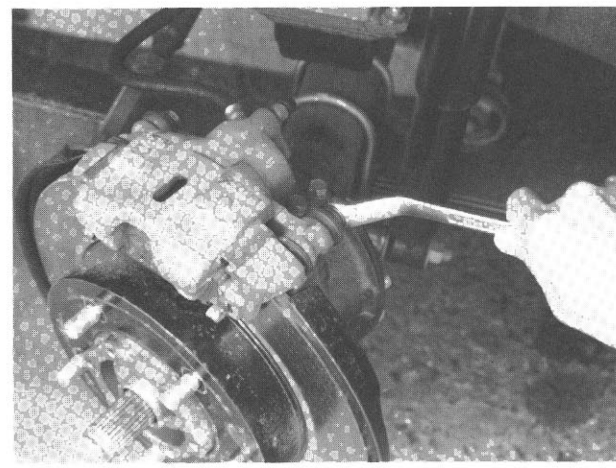


Fig. 17-10

Tighten 2 hub nuts by hand lightly so that disk will not come off.

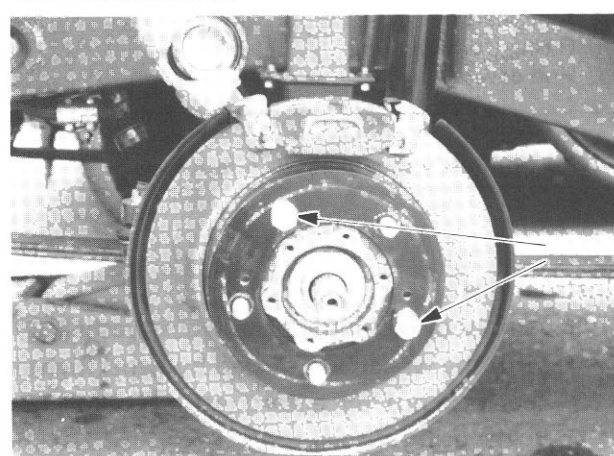
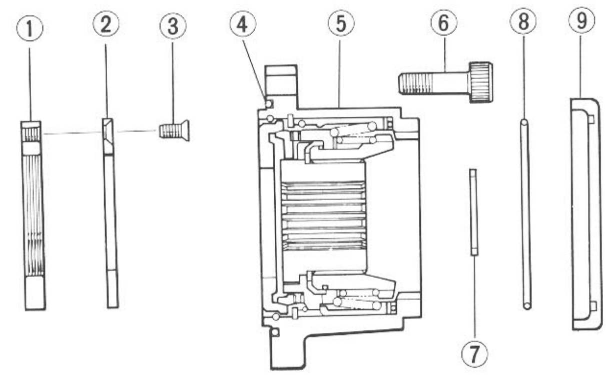


Fig. 17-11

Installation (Automatic free wheeling hub assy)

NOTES:
- **Make sure the parts shown in Fig. 17-12 below are all ready.**
- **Check that the parts shown in Fig. 17-12 below are all cleaned (not fouled).**

Assembly should be conducted according to the sequence of the number shown in Fig. 17-12 below. However, be sure to observe the instructions 1) through 3) mentioned below especially for proper assembly.



The parts ① through ⑧ shown below are the ones corresponding with one wheel.

① Lock nut
② Lock washer
③ Screw (4 pcs)
④ O ring (for body use)
⑤ Free wheeling hub body ass'y
⑥ Bolt (6 pcs)
⑦ Axle shaft circlip
⑧ O ring (for cover use)
⑨ Hub cover

CAUTION:
Hub body ass'y should not be disassembled.

Fig. 17-12

Instructions

1. Assembly of lock nut ① and lock washer ②
   1) With the wheel hub turned by hand, tighten the lock nut by a torque of 80 N·m (8.0 kg-m) using special tools (09941-58010 and 09944-98010). Next, loosen the lock nut until the above torque is reduced to 0 N·m (0 kg-m). Then, retighten the lock nut by the torque within a range of 10 to 15 N·m (1.0 to 1.5 kg-m) until the four screw holes opened on the lock nut correspond with the four screw holes opened on the lock washer assembled next to the lock nut respectively. (See Figs. 17-13 and 17-14.)
   2) Tighten the lock washer securely with the four pieces of the screws ③.

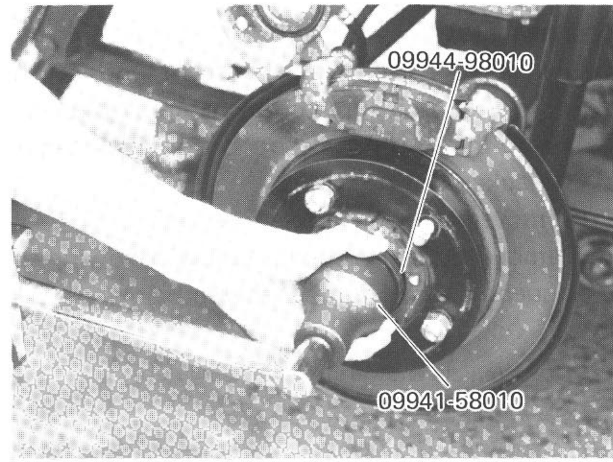


Fig. 17-13

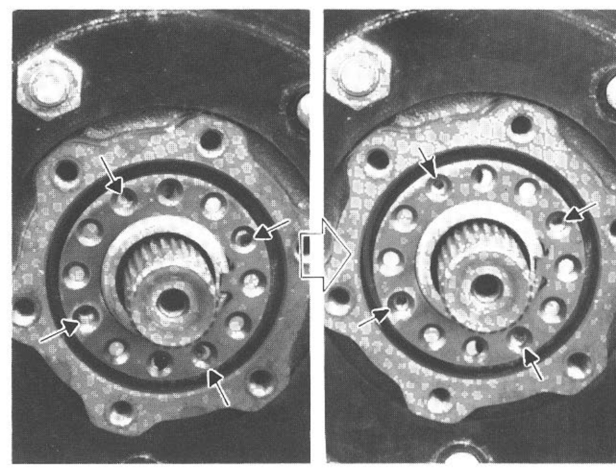


Fig. 17-14

Tightening torque	N·m	kg-m	lb-ft
For lock nut ①	10–15	1.0–1.5	7.5–10.5
For screw ③	1–1.4	0.1–0.14	0.72–1.01

   3) Set a string and a spring measure to the stud bolt of the wheel hub as shown in Fig. 17-15.
      Thus, check to see if the wheel hub starting preload is staying within a specified limit or not, and record the results.

Wheel hub starting preload	1.0 – 3.0 kg (2.2 – 6.6 lb)

      If the preload does not satisfy the specified limit, repeat the operations described in paragraph 1, item 1), and thereafter so that it is possible to obtain a correct starting preload.

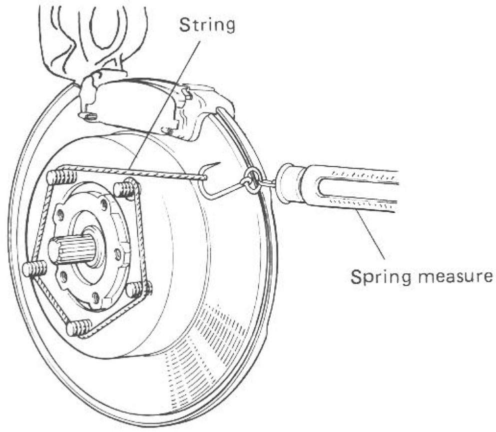


Fig. 17-15

4) In the drawing below, make sure the wheel hub Ⓐ surface-to-lock washer Ⓑ surface depth "d" is equal to 2.68 to 4.02 mm (0.106 to 0.158 in.).
If the depth does not satisfy this limit, carefully repeat the operations described in Paragraph 1, Item 1), and thereafter because it is possible to consider those items, such as poor assembly, trapped foreign matter, etc., as the causes of dissatisfaction.

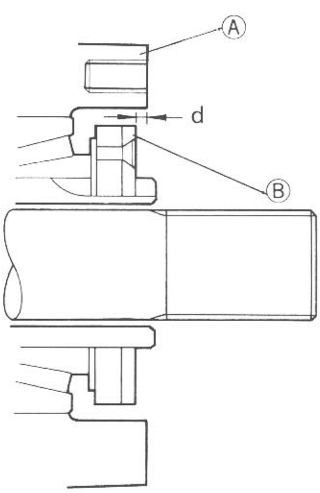


Fig. 17-16

2. Assembly of hub body ass'y ⑤
 1) Make sure the O-ring ④ is securely inserted into the hub body groove, and fit the hub body ass'y key Ⓓ to the steering knuckle spindle key groove Ⓒ. Thus, assemble the hub body ass'y onto the front axle shaft. Then, ensure that the fitting surfaces Ⓐ and Ⓑ of the hub body ass'y and wheel hub are closely fitted to each other when the body ass'y is pushed lightly to the wheel hub. In case the close fitting is not obtained, rotate the wheel hub to obtain the close fitting.

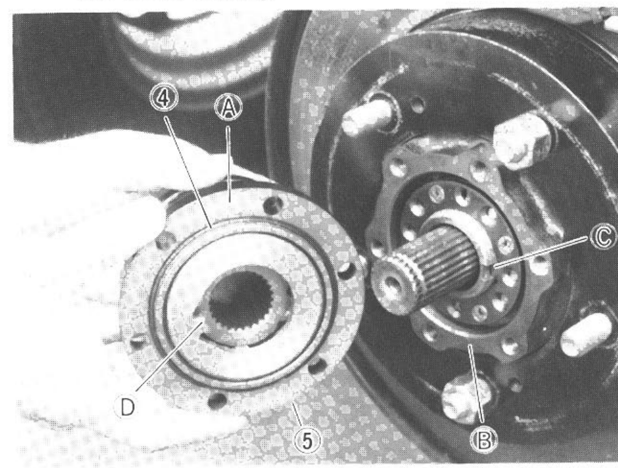


Fig. 17-17

 2) Using special tools, tighten the bolts ⑥ by a specified torque.

	N·m	kg-m	lb-ft
Tightening torque for bolts ⑥	30 – 35	3.0 – 3.5	22.0 – 25.0

Fig. 17-18

3. Assembly of Circlip ⑦, O-ring ⑧ and Cover ⑨
   1) Using new circlip ⑦, fix the hub body ass'y to the axle shaft.

CAUTION:
The circlip should be assembled securely in the groove provided on the axle shaft.

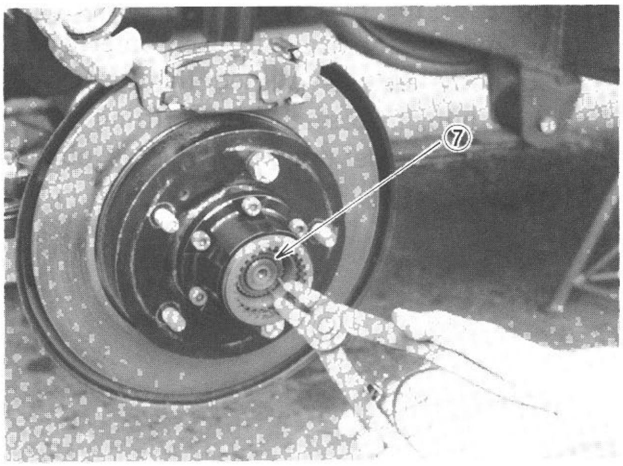


Fig. 17-19

   2) Measure the wheel hub starting preload again in the same manner as with the assembly operation described previously in paragraph 1. item 3). Compare with each other the previous measurement obtained in paragraph 1, item 3), and the present measurement.
   The difference of measurement should be 1.4 kg or under.

Difference of measurement	1.4 kg (3.1 lbs) or under

NOTE:
If the difference of measurement exceeds 1.4 kg, poor assembly of the automatic free wheeling hub can be considered as the cause of such excess.
Hence, conduct assembly and measurement once more.

   3) Assemble the O-ring ⑧ correctly in the groove provided inside the cover ⑨.
   Tighten the cover ⑨ to the hub body ass'y by hand.

NOTE:
Upon completion of the operation check mentioned in the next section "post-assembly confirmation and maintenance," be sure to firmly tighten this cover using an oil filter wrench, etc.

   4) Install the disc brake caliper.
   (Neglect this item if the brake is the drum brake.)

Caliper pin bolt tightening torque	18 – 26 N·m (1.8 – 2.6 kg-m) (13.0 – 18.5 lb-ft)

   When the above operations are finished, install the front wheels and tighten the wheel nuts by specified torque.

Tightening torque for wheel (hub) nuts	N·m	kg-m	lb-ft
	50–80	5.0–8.0	36.5–57.5

   Dismount the vehicle from the lift, and be sure to carry out the operation check of free wheeling hub mentioned in the next section "post-assembly confirmation and Maintenance."

Post-assembly confirmation and maintenance

1. Confirm the automatic free wheeling hub for proper operation in the sequence shown below.
   1) Set the transfer gear shift lever to the 4H or 4L position, and move the vehicle 2 m (6.5 ft) or more forward slowly.
   2) Remove each free wheeling hub cover at right and left, and confirm that the hub body spline is properly engaged with the slide gear spline positioned just inside the hub body (i.e., that the automatic free wheeling hub is in the locked condition).

Fig. 17-20

3) Set the transfer gear shift lever to the 2H position, and move the vehicle 2 m (6.5 ft) or more backward slowly.

4) Confirm that the slide gear of each automatic free wheeling hub at right and left is slided toward the hub body-inside so that the slide gear spline is completely disengage from the hub body spline (i.e., that each automatic free wheeling hub is in the free condition). (Fig. 17-21)

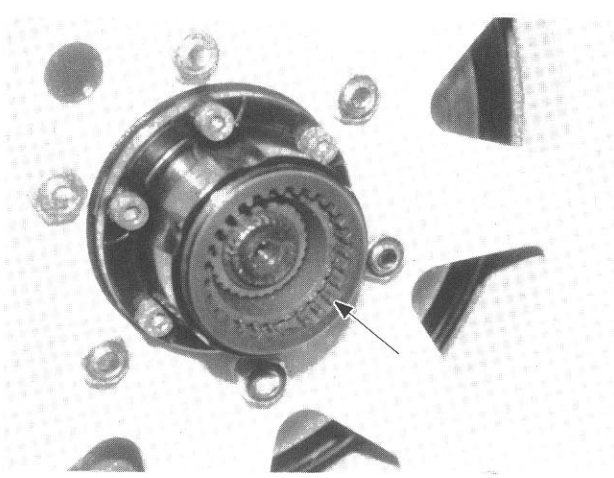


Fig. 17-21

5) Reverse the advancing direction to repeat the operations described in items 1) through 4).

6) Make sure the automatic free wheeling hub cap has an O-ring correctly installed, and assemble this cap firmly to the free wheeling hub body using an oil filter wrench, etc. (The cap should not be able to be loosened by hand.)

> NOTE:
> **While the automatic free wheeling hub cap is removed, strict care should be taken that foreign matters, such as dust, mud, etc., do not get into the free wheeling hub interior.**

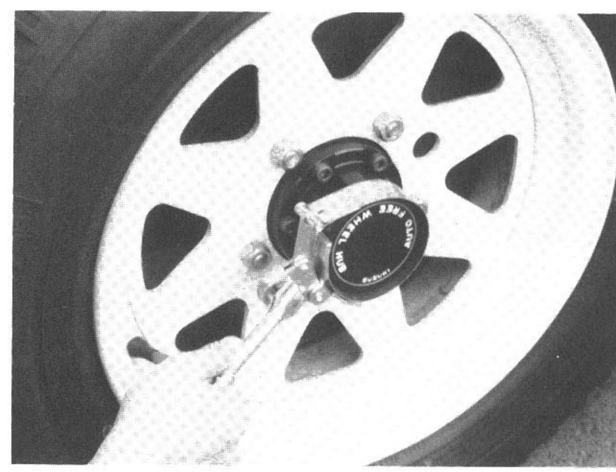


Fig. 17-22

2. If any malfunction is found as to the confirmation in the above paragraph 1, item 1) through 5), the method of assembly is responsible for the malfunction. Therefore, conduct the assembly again.
3. Maintenance
   When the automatic free wheeling hub is installed, confirm it for proper operation periodically at the intervals shown below according to the procedure mentioned previously in paragraph 1., items 1) through 6). If the automatic free wheeling hub shows any malfunction, replace it with new one.

Maintenance Interval:	10,000 km or 6 months Whichever interval reached earlier

18. STEERING SYSTEM

NOTICE:
For the items not found in this section of this manual, refer to the section "18. STEERING SYSTEM" on page 18-1 ~ 18-18.

18

1. Removal

1) Steering handwheel
At the steering handwheel, pull the horn button to remove it. After removing the button, remove the nut securing the handwheel, and pull the handwheel off. The handwheel is splined to the shaft.

Fig. 18-1

> **NOTE:**
> **If it is hard to remove the steering handwheel, use special tool Ⓐ to remove it. Steering handwheel remover Ⓐ (09944-38210 or 09923-05110).**

Fig. 18-2

2. Important Step in Reassembly

Clutch pedal stopper
When clutch pedal and brake pedal are in free state, adjust the adjust bolt such that clutch pedal and brake pedal foot pad surfaces will be at the same height. Be sure to tighten lock nut securely.

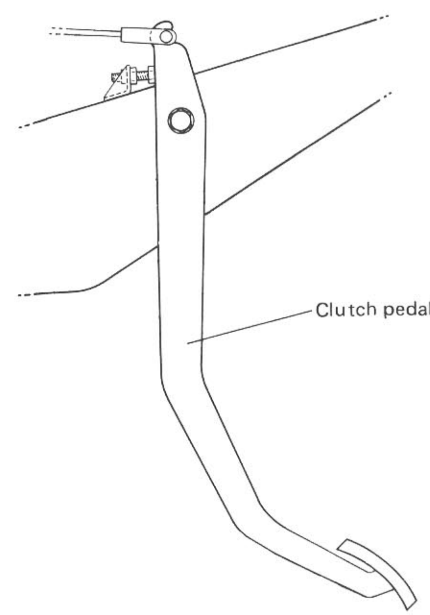
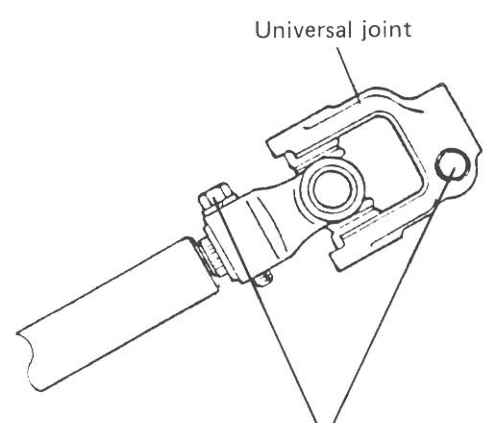


Fig. 18-3

Steering lower shaft



Tightening torque for steering shaft joint bolt
20 – 30 N·m 2.0 – 3.0 kg·m 14.5 – 21.5 lb·ft

19. BRAKES

NOTICE:
For the items not found in this section of this manual, refer to the section "BRAKES" on page 19-1 ~ 19-18.

19

1. Important Steps in Installation for Brake Line

NOTE:
Instruction given in [ ] is applicable to those cars equipped with D.S.P. (Deceleration Sensing Proportioning) valve for European market.

Brake air bleeder plug

Air in the brake circuit must be purged out by loosening the bleeder plugs at front brakes (both right and left) and rear brake (left).

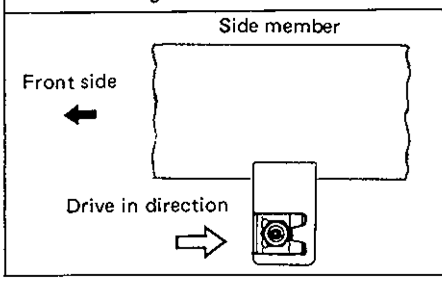
[Then with D.S.P. valve equipped cars, loosen the bleeder plug of the D.S.P. valve and perform air purging as illustrated below.]

Refer to page 19-9 of service manual (99500-80001) for air purging procedure.

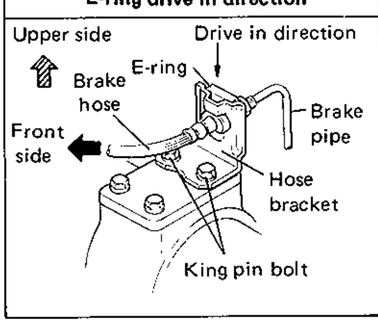
Brake drum

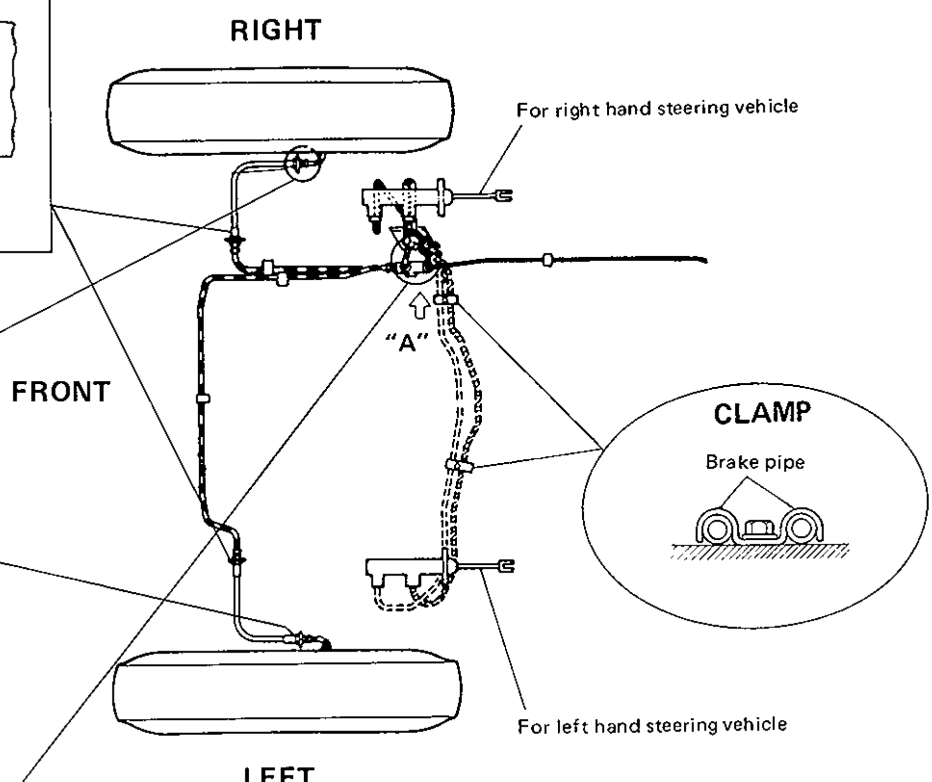
Before installing the brake drum, check its inner surface which slides with the brake shoe to ensure that it is free from any foreign matters such as oil stain and rust.

E-ring drive in direction

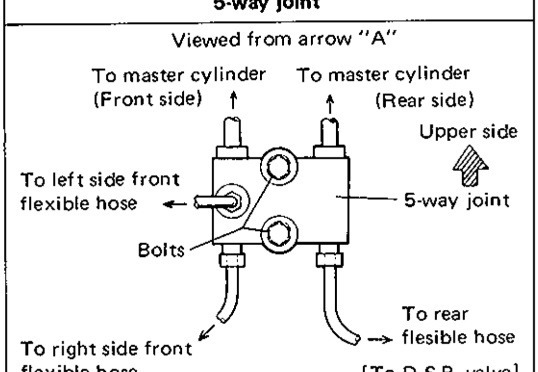


(Only the vehicle equipped front drum brakes)
E-ring drive in direction





5-way joint

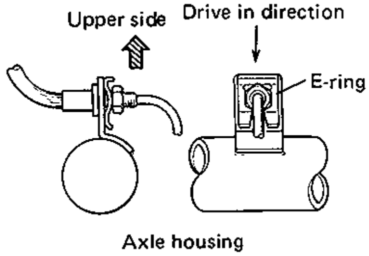


Brake flexible hose

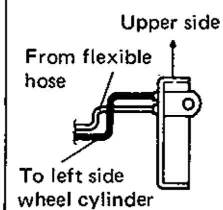
- Make sure that the flexible hose is not twisted when it is installed or connected with the pipe.
- The front hose and rear hose should be connected in advance to the caliper side and housing side respectively.
- The front hose mustn't be twisted when the steering wheel is in straightahead position.
- In case bracket is of double-hexagon drive in type, drive in hose mouthpiece hexagon part properly.
- When securing hose with E-ring, drive in E-ring straight as shown in figure, using care not to have it ride on guide. Drive in E-ring until flush with bracket edge or within bracket.

Fig. 19-1

E-ring drive in direction



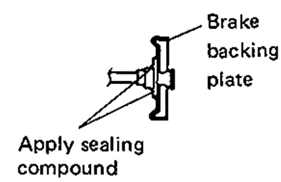
Brake pipes (Right side)



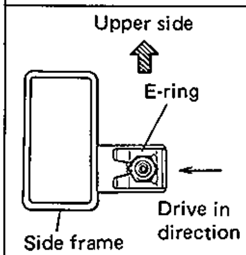
Install the brake pipe on the wheel cylinder properly using care for its installing position.

Brake backing plate (Right & Left)

When installing the backing plate onto the axle housing, apply SEALING COMPOUND 366E (99000-31090) to the mating surfaces of both parts.

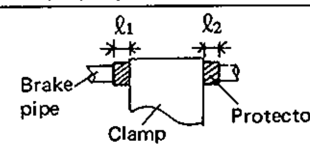


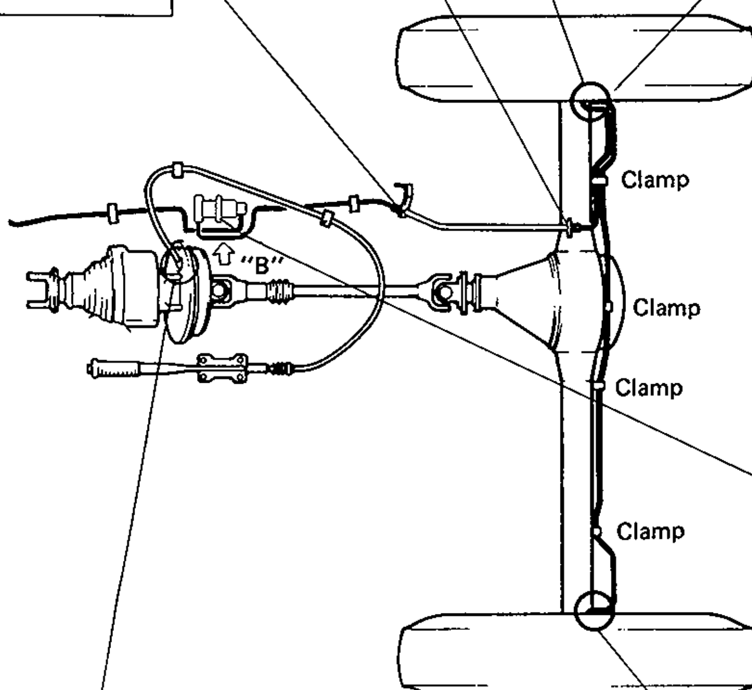
E-ring drive in direction

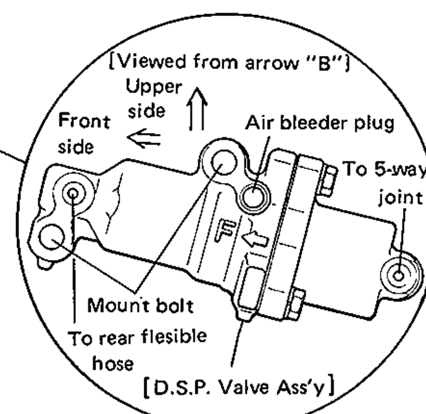


Clamps on the rear axle

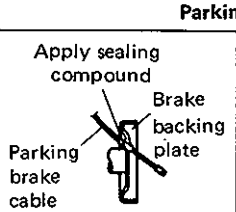
When installing the clamp, $\ell_1 = \ell_2$ as shown below is recommended as a standard. Position the clamp over the protector so that both ℓ_1 and ℓ_2 are at least 2 mm (0.08 in). Make sure to clamp the pipe and protector properly as shown below.





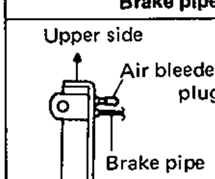


Parking brake cable



When installing the cable, apply SEALING COMPOUND 366E (99000-31090) to the illustrated position of the cable.

Brake pipe (Left side)



Install the brake pipe on the wheel cylinder properly using care for its installing position.

20. DOOR

Refer to the section "20. DOOR" on page 20-1 ~ 20-10 for necessary information concerning the subject of this section.

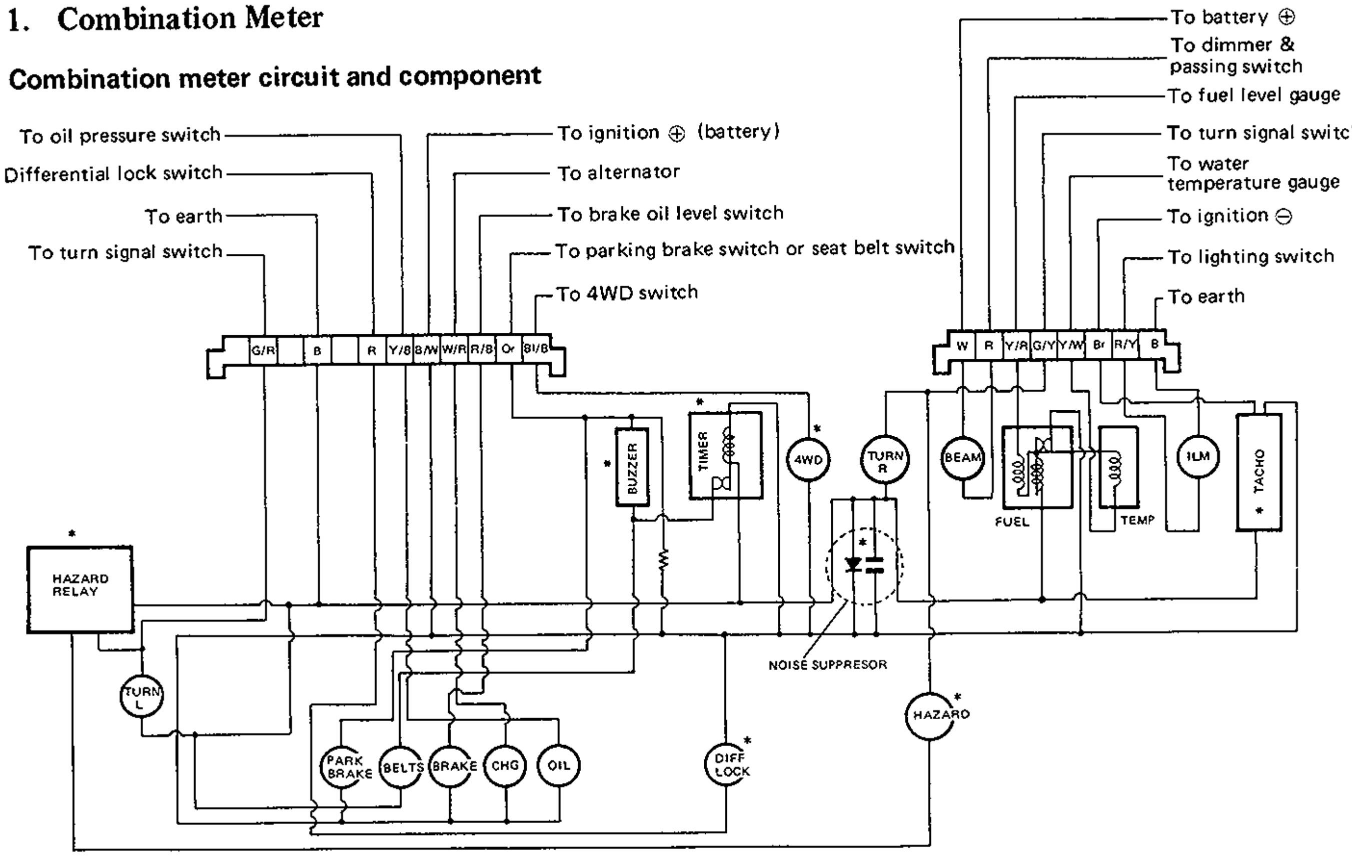
21. BODY ELECTRICAL EQUIPMENT

NOTICE:
For the items not found in this section of this manual, refer to the section "BODY ELECTRICAL EQUIPMENT" on page 21-1 ~ 21-20.

21

1. Combination Meter

Combination meter circuit and component

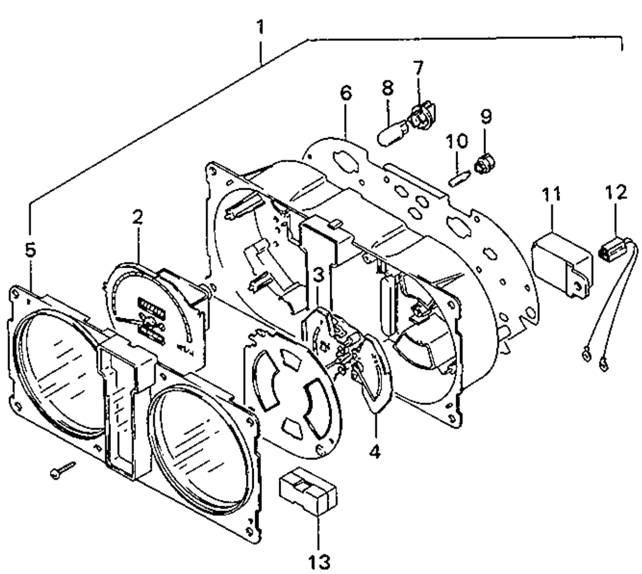


Wire color

G/R . . . Green/Red
B . . . . . Black
R . . . . . Red
Y/B . . . Yellow/Black
B/W . . . Black/White
W/R . . . White/Red
R/B . . . Red/Black
Or . . . . Orange
Bl/B . . . Blue/Black
W . . . . White
Y/R . . . Yellow/Red
G/Y . . . Green/Yellow
Y/W . . . Yellow/White
R/Y . . . Red/Yellow

NOTICE:
Whether equipped with parts of (*) mark or not depends on the vehicle specifications.

[Combination meter]



1. Speedometer assy
2. Speedometer body
3. Fuelmeter body
4. Thermometer body
5. Window visor
6. Meter print plate
7. Socket
8. Bulb
9. Socket
10. Bulb
11. Buzzer } For Saudi Arabian market only
12. Wire
13. Timer

Fig. 21-1

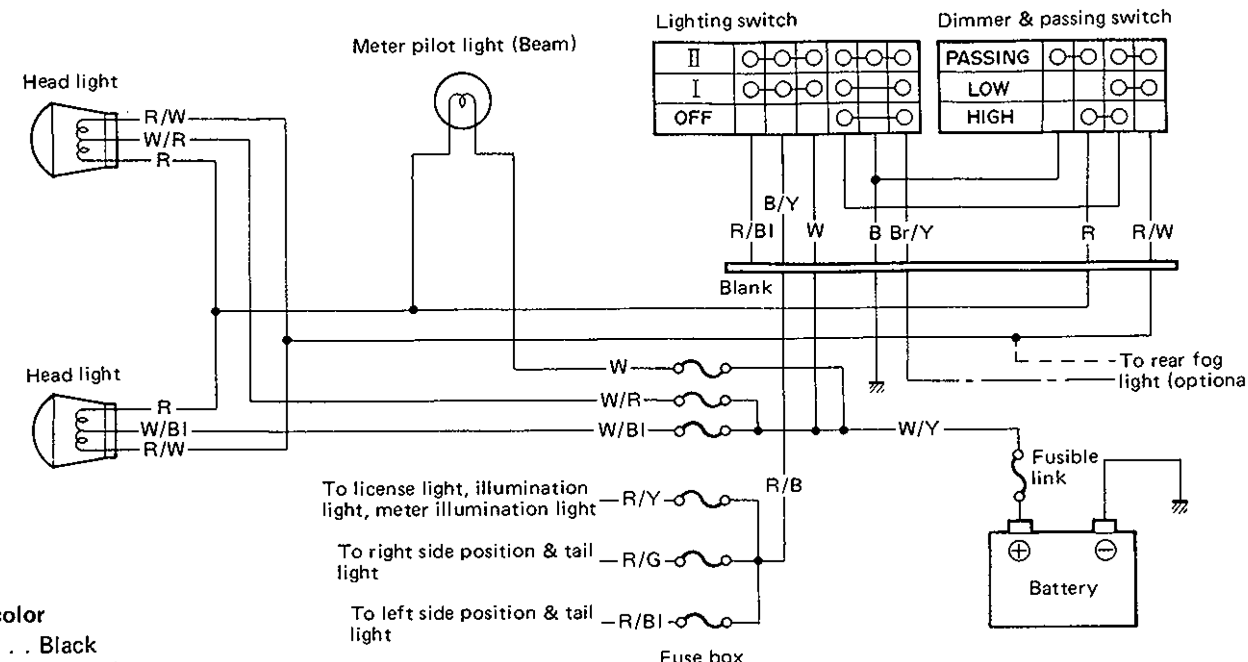
Removal and installation

1. Disconnect battery cable at the negative terminal (⊖).
2. Remove the instrument lower panel.
3. Lower the steering column.
4. Remove the combination meter cover.
5. Loosen the combination meter screws.
6. Disconnect the speedometer cable and wire harness coupler.
7. Remove the combination meter.
8. To install the combination meter, reverse the removal sequence.

2. Head Light

Wiring circuit

[This circuit is applicable to vehicle equipped with 14 fuses]



Wire color

B . . . . . Black
Br/Y . . Brown/Yellow
R . . . . . Red
R/W . . . Red/White
R/Bl . . Red/Blue
B/Y . . . Black/Yellow
W/Bl . . White/Blue
W/R . . . White/Red
W/Y . . . White/Yellow

NOTICE:
------ or —·— circuit is applicable to vehicle provided with rear fog light.

[This circuit is applicable to vehicle equipped with 10 fuses]

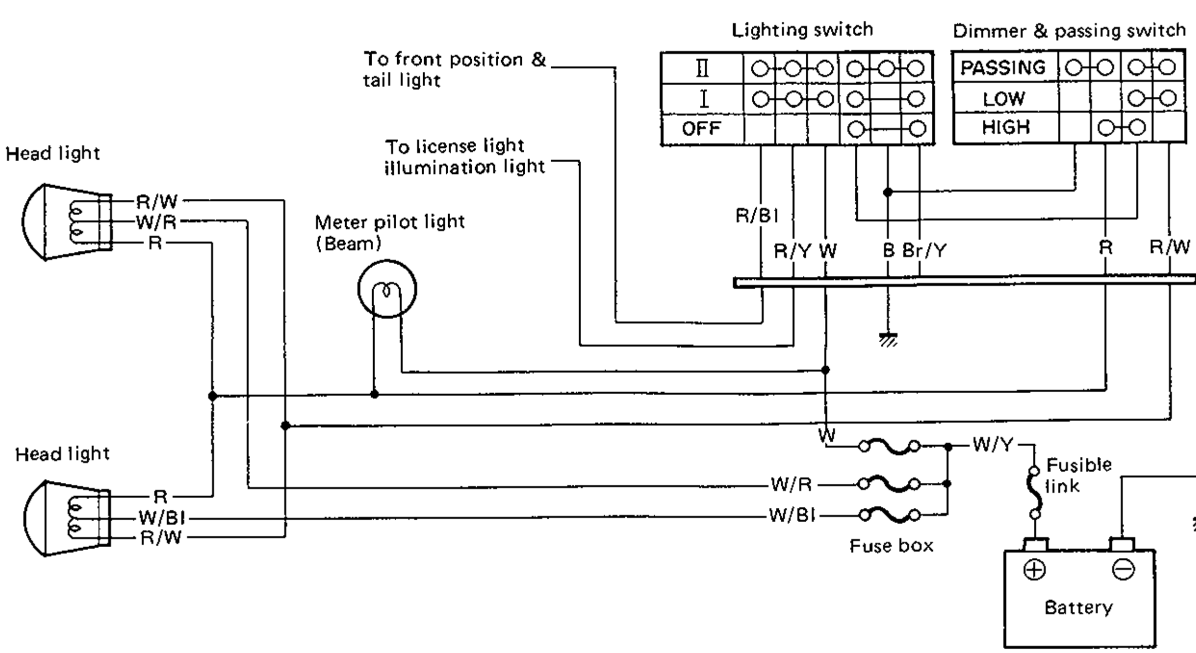
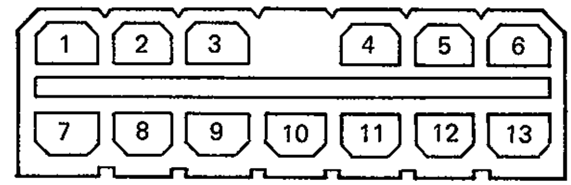


Fig. 21-2

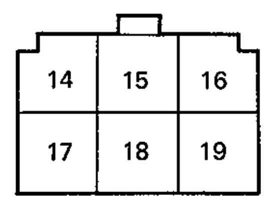
Maintenance

1) Head light dimmer switch
   Using a circuit tester, check the respective circuits for continuity by putting the tester probe pins to the terminals shown in Fig. 21-4. With the switch kept in LOW BEAM position; the tester should indicate continuity between terminals ⑦ and ⑱. Similarily, there should be continuity between terminals ⑧ and ⑱ when the switch in HIGH BEAM position.

Switch connector



1. Green/Red (Green/Black)
2. Green/Yellow
3. Green
4. Yellow
5. White/Blue
6. Yellow/Blue
7. Red/White
8. Red
9. Blue/Green
10. Brown/Yellow
11. Red/Blue
12. Red/Yellow
13. White



14. Yellow/White
15. Blue
16. Blue/Red
17. Blue/Black
18. Black
19. Blue/White

Fig. 21-3

Combination switch (Lighting switch circuit)

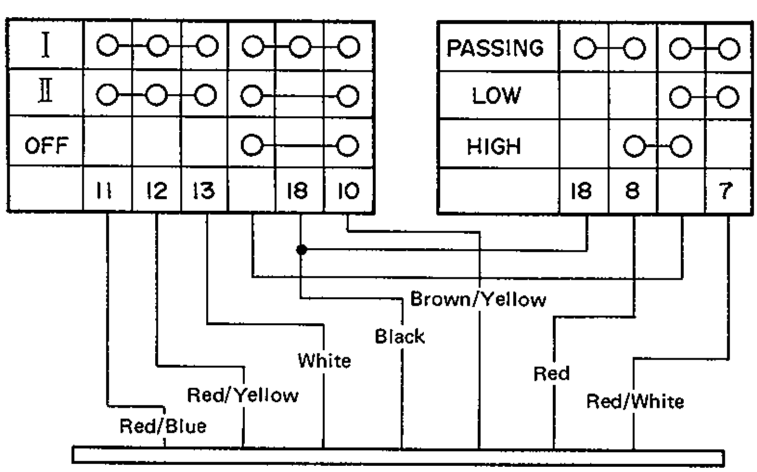
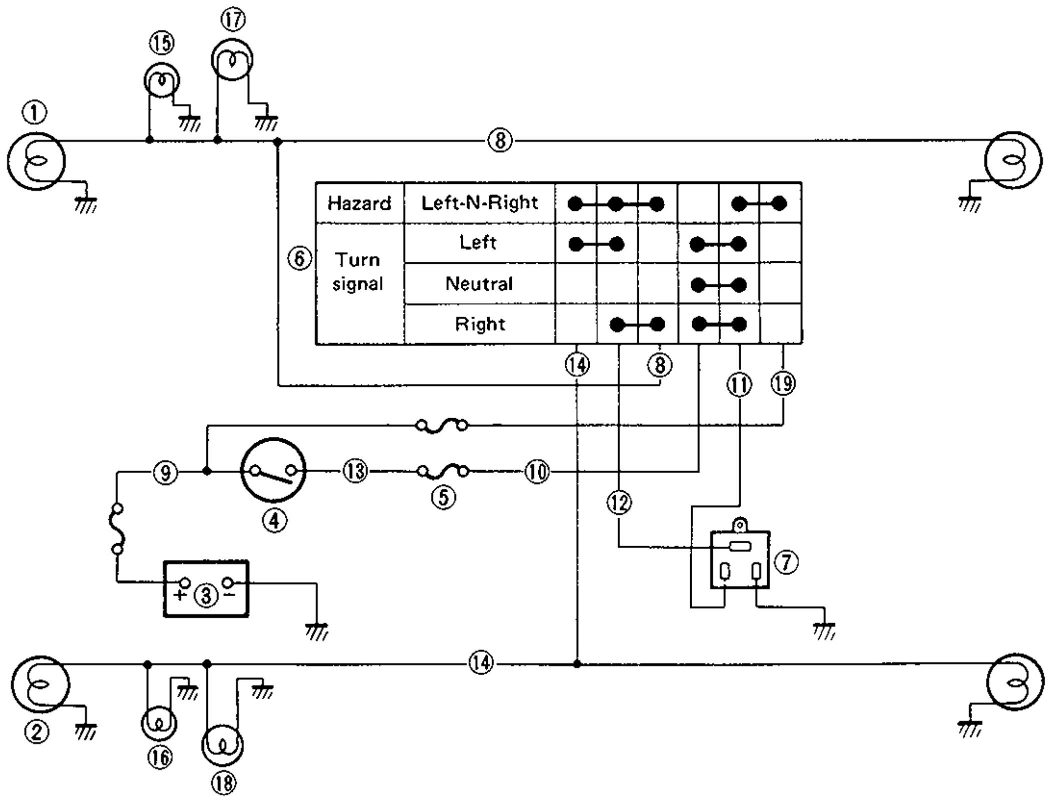


Fig. 21-4

3. Turn Signal Light and Hazard Warning Light

Circuit description



① Right turn signal
② Left turn signal
③ Battery
④ Main switch
⑤ Fuse
⑥ Turn signal and hazard warning switch
⑦ Turn signal and hazard warning relay
⑧ Green/Yellow
⑨ White/Yellow
⑩ Yellow
⑪ Yellow/Blue
⑫ Green
⑬ Black/Blue
⑭ Green/Red
⑮ Meter pilot light (Right)
⑯ Meter pilot light (Left)
⑰ Side turn signal (Right)
⑱ Side turn signal (Left)
⑲ White/Green

Fig. 21-5

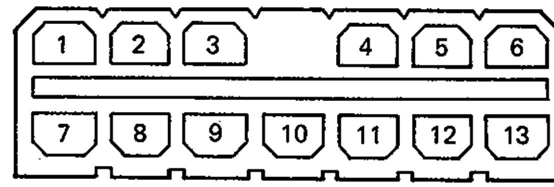
When the hazard warning switch is "OFF".
Yellow lead ⑩ is connected to Yellow/Blue lead ⑪.
When the hazard warning switch is "ON".
White/Green lead ⑲ is connected to Yellow/Blue lead ⑪, and Green lead ⑫ to both Green/Yellow lead ⑧, and Green/Red lead ⑭.
When the Turn-signal switch is "ON" for a right turn, green lead ⑫ is connected to Green/Yellow lead ⑧.
When the Turn-signal switch is "ON" for a left turn, green lead ⑫ is connected to Green/Red lead ⑭.

Inspection

1) Turn signal switch

Using a circuit tester, check for continuity between each pair of terminals by referring to the chart given in figure on the right for each position of the turn signal switch lever. Discontinuity means that contact points are burnt or otherwise defective in the switch. The switch is in sound condition if continuity is noted between terminals 2 and 3, with the lever in right-turn position, and between terminals 1 and 3, with the lever in left-turn position.

Switch connector



1. Green/Red (Green/Black)
2. Green/Yellow
3. Green
4. Yellow
5. White/Blue
6. Yellow/Blue
7. Red/White
8. Red
9. Blue/Green
10. Brown/Yellow
11. Red/Blue
12. Red/Yellow
13. White

Fig. 21-6

2) Hazard warning switch

Disconnect the lead wire of the hazard warning switch at its coupler. Set the switch to ON position and check for continuity with a circuit tester between each of the following pairs of terminals; 2 and 3, 1 and 3, 5 and 6 among those shown in Fig. 21-7. The switch is in sound condition if continuity is noted between each pair.

Turn signal & hazard warning switch

		Green/Red (Green/Black)	Green	Green/Yellow	Yellow	Yellow/Blue	White/Blue
Hazard warning	Left-N-Right	●	●	●		●	●
Turn signal	Left	●	●		●	●	
	Neutral				●	●	
	Right		●	●	●	●	

Fig. 21-7

4. Windshield Wiper Motor

Circuit

2-speed type

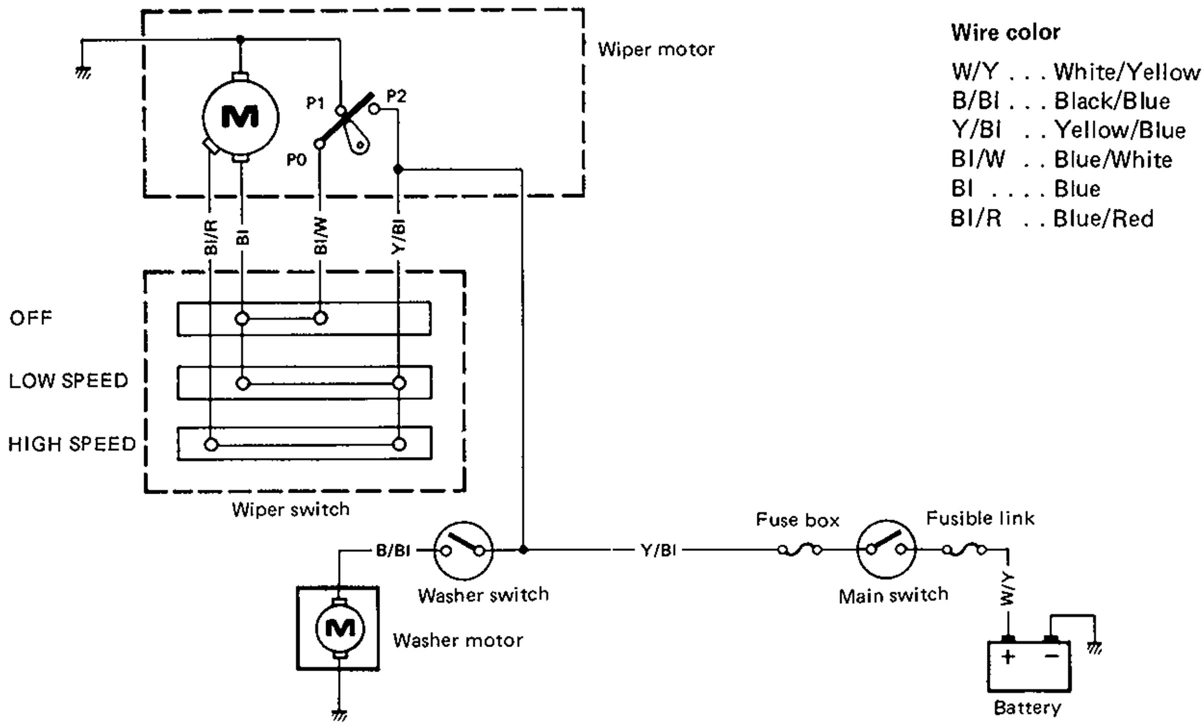


Fig. 21-8

Internal wiper relay circuit (Optional)

The internal wiper relay, having been installed as an independent part so far, is now incorporated into the combination wiper switch.

3-speed type

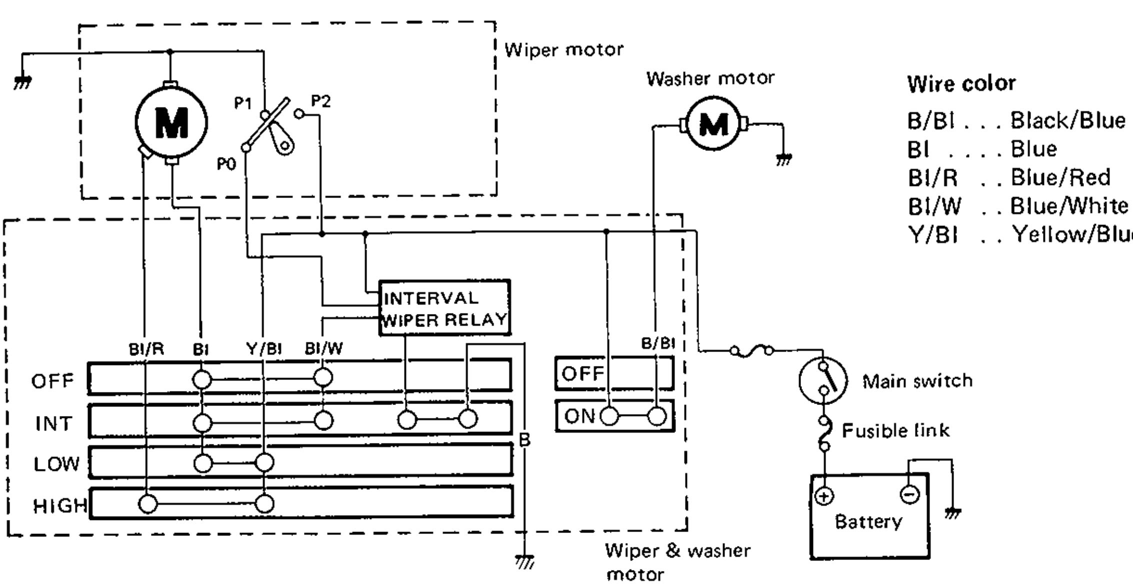
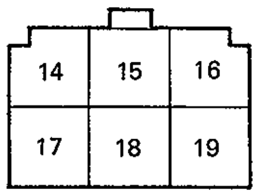


Fig. 21-9

Maintenance

1) The wiper switch continuity to be checked.

Switch connector



14. Yellow/White
15. Blue
16. Blue/Red
17. Blue/Black
18. Black
19. Blue/White

2-speed type wiper switch

	Yellow/ white	Blue	Blue/red	Blue/white
High speed	●		●	
Low speed	●	●		
OFF		●		●

3-speed type wiper switch

	Yellow	Blue/ white	Blue	Blue/ Red	To relay	Black
OFF		●	●			
Interval		●	●		●	●
Low speed	●		●			
High speed	●			●		

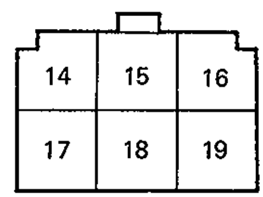
Fig. 21-10

2) Interval wiper relay test

1. Disconnect the wiper & washer switch coupler.
2. Turn the wiper switch to the "INT" position.
3. Connect the positive ⊕ battery terminal to the Yellow/White of coupler terminal and negative ⊖ battery terminal to the Black terminal.

   If an operating sound is heard, the relay is at work properly.

Switch connector



14. Yellow/White
15. Blue
16. Blue/Red
17. Blue/Black
18. Black
19. Blue/White

Fig. 21-11

5. Water Temperature Meter and Gauge

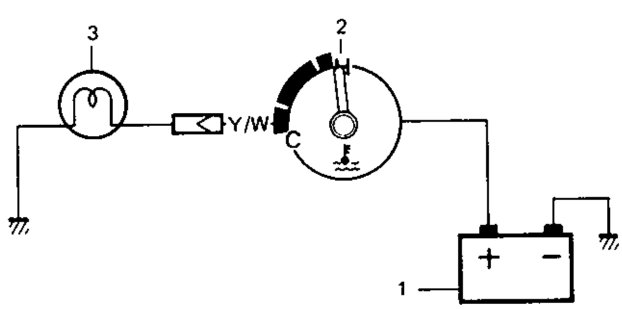
The water temperature meter is located in the combination meter and its gauge unit on the inlet manifold.

The gauge unit shows different resistance values depending on the coolant temperature. This causes a current flowing through the temperature meter coil to change, controlling the meter pointer. That is, when the coolant temperature is raised, the gauge unit resistance is decreased with more current flowing through the meter coil, raising the meter pointer upward from the "C" position.

Inspection

[Water temperature meter]

1. Disconnect the Y/W (Yellow/White) lead wire going to the gauge unit installed to the intake manifold.
2. Use a bulb (12V 3.4W) in position to ground the above wire as illustrated.
3. Turn the main switch ON. Confirm that the bulb is lighted with the meter pointer fluctuating several seconds thereafter.
   If the meter is faulty, replace it.



1. Battery
2. Water temperature meter
3. Test lamp (12V, 3.4W)

Y/W . . . Yellow/White

Fig. 21-12

[Gauge unit]

Warm up the gauge unit. Thus make sure its resistance is decreased with the increase of its temperature. The temperature and resistance relationship can be plotted in a graph as shown below.

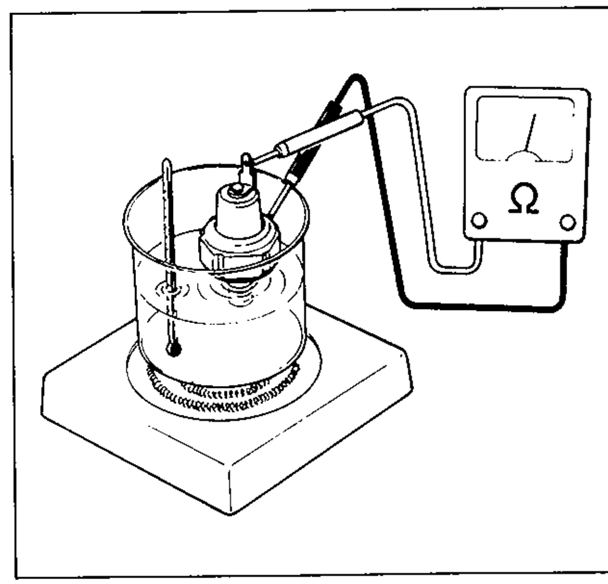


Fig. 21-13

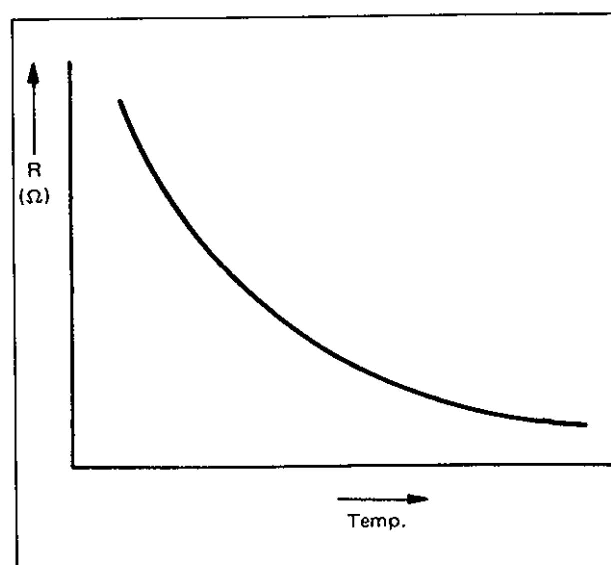


Fig. 21-14 Resistance-Temp. Relationship

Temperature	Resistance
50°C (122°F)	133.9 ~ 178.9 Ω
80°C (176°F)	47.5 ~ 56.8 Ω
100°C (212°F)	26.2 ~ 29.3 Ω

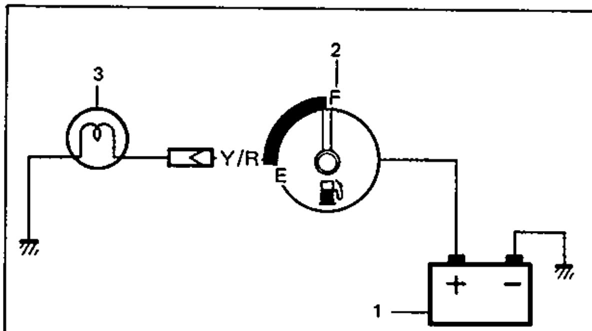
6. Fuel Level Meter and Gauge

The fuel level meter circuit consists of the fuel level meter installed inside the combination meter and the fuel level gauge installed to the fuel tank.
Current flowing through the meter coil is changed to control the meter pointer. That is, when fuel is full, the fuel level gauge unit resistance is decreased with more current flowing into the meter coil, causing the meter pointer to point at the "F" position.

Inspection

[Fuel level meter]

1. Remove the rear seat.
2. Disconnect the Y/R (Yellow/Red) lead wire going to the gauge unit.
3. Use a bulb (12V 3.4W) in position to ground the above lead wire as illustrated.
4. Turn the ignition switch ON.
   Make sure the bulb is lighted with the meter pointer fluctuating several seconds thereafter.
   If the meter is faulty, replace it.



1. Battery
2. Fuel level meter
3. Test lamp (12V, 3.4W) Y/R : Yellow/Red

Fig. 21-15

[Gauge unit]
Use a ohmmeter to confirm that the level gauge unit changes in resistance with the change of the float position. The float position-to-resistance relationship can be plotted in a graph as shown below.

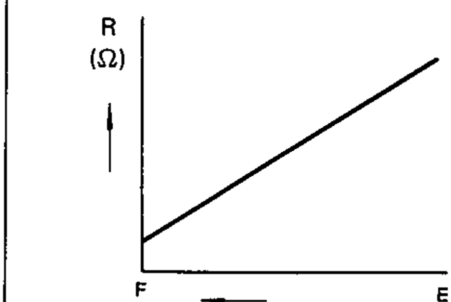
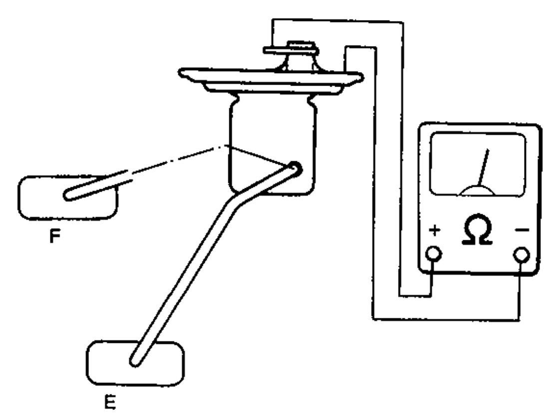


Fig. 21-16 Resistance-Fuel Level Relationship



F : Full
E : Empty

Fig. 21-17

Position	Resistance
E	110 ± 7Ω
F	3 ± 2Ω
1/2	32.5 ± 4Ω

7. Brake Fluid Level Warning Lamp System

> **NOTICE:**
> **Whether equipped with this system or not depends on the vehicle specifications.**

The brake fluid level warning lamp system consists of the brake fluid level switch installed to the master cylinder reservoir and the lamp (brake fluid level warning lamp) inside the combination meter.

Depending on specifications, this circuit may include a parking brake switch which gives a warning for unreleased parking brake.

Operation

When the engine is stopped, the warning lamp is lighted regardless of the brake fluid level position and parking brake operation, if the main switch is turned ON.

Because the point of the regulator incorporated in the alternator is closed so that the W/R lead wire is gounded. After the engine is started (meaning the charging is started), release the parking brake (When including parking brake warning circuit in this system). If the lamp goes OFF, the brake fluid level is proper.

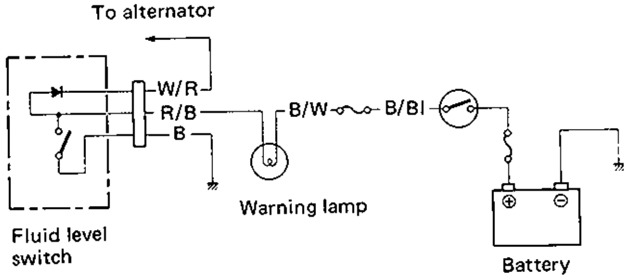


Fig. 21-18

Inspection

[Brake fluid level switch]

Use an ohmmeter to measure the switch for resistance and continuity.

If found defective, replace the switch.

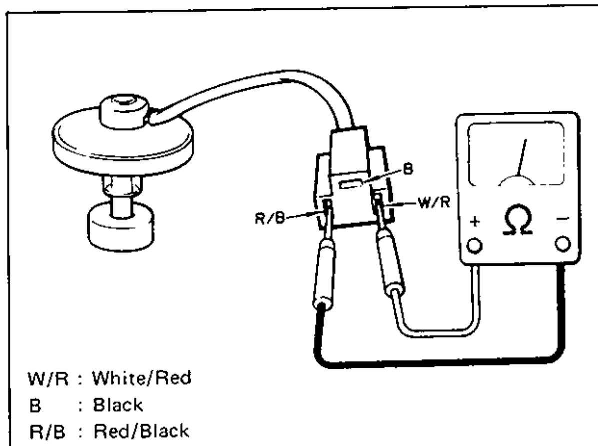


Fig. 21-19

R/B – B Resistance	
OFF position (float up)	∞
ON position (float down)	Several Ω

R/B – W/R Continuity	
R/B to W/R	Continuity obtained
W/R to R/B	No continuity obtained

8. Defogger Circuit Diagram (SJ410 Metal Roof Option)

The Defogger circuit for the rear window glass heating wires is as follows.

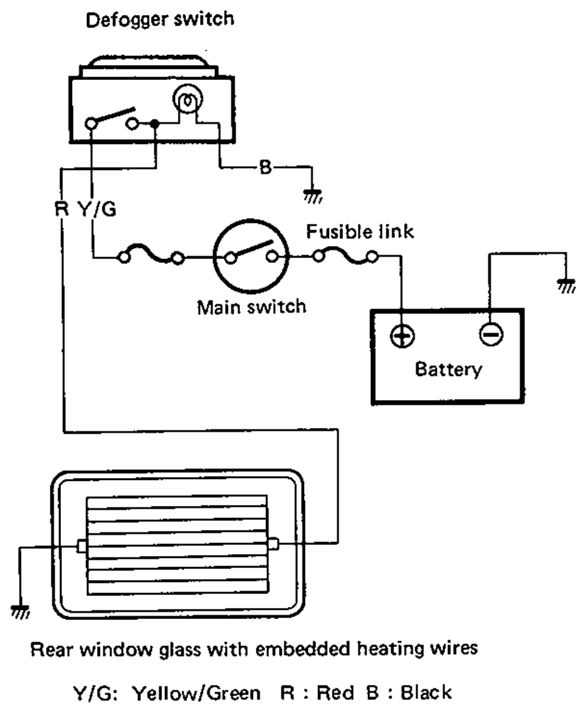


Fig. 21-20

To check function of the Defogger Switch, check continuity between the Yellow wire and the Red wire when the Defogger Switch is "ON".

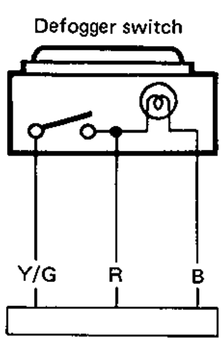


Fig. 21-21

9. Head Light Cleaner (For Finnish Market)

Head light cleaner circuit

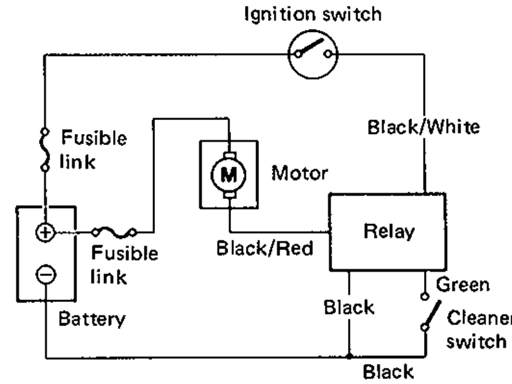
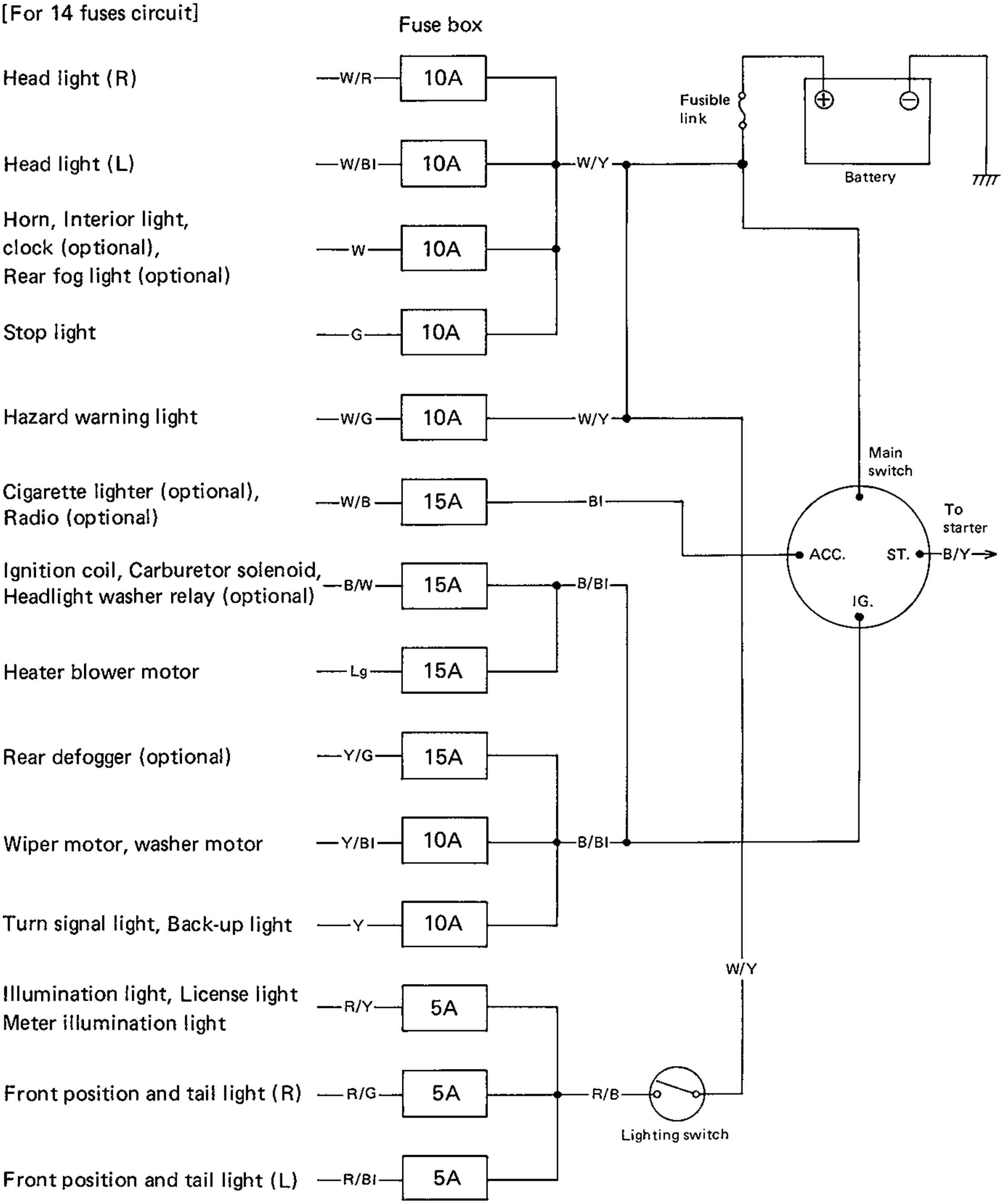


Fig. 21-22

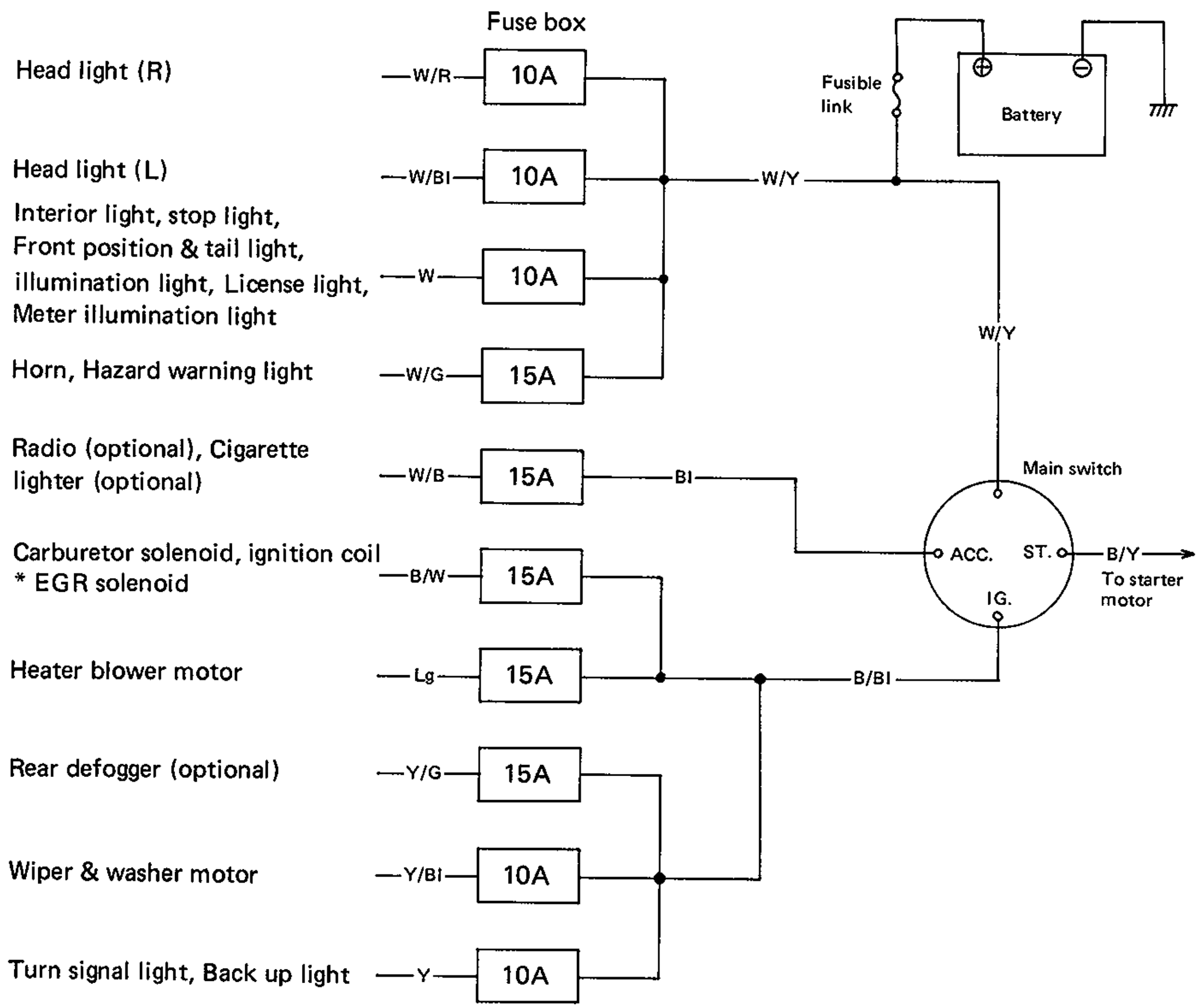
10. Fuse Box

The fuses in the fuse box are wired as follows.

[For 14 fuses circuit]



[For 10 fuses circuit]



22. MAINTENANCE SCHEDULES

NOTICE:
For the items not found in this section of this manual, refer to the sections "22. MAINTENANCE SCHEDULES" and "PERIODIC MAINTENANCE" on page 22-1 ~ 22-13.

1. Tightening Torque

In threaded fastening parts holding down a component in place, the holding force is preserved primarily in the male and female threads in contact. Screw threads are capable of withstanding this force up to a certain limit. Here occurs the need to tighten them without exceeding the limit, and this need can be met by using torque wrenches.
Fastening parts, for which the limit is specified because their fastening or holding function is critical, is listed below. Use torque wrenches and adhere to the torque specifications when tightening them at the time of periodical inspection or overhauling or servicing.

> **NOTE:**
> **The following table includes only the tightening torques newly changed starting from the vehicles carrying Body Nos. mentioned in the page of FOREWORD of this MANUAL.**

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Engine mounting bolt (bracket and cylinder)	18 – 28	1.8 – 2.8	13.0 – 20.0
	Engine front mounting nut	40 – 50	4.0 – 5.0	29.0 – 36.0
	Engine rear mounting bolt (mounting and bracket)	18 – 28	1.8 – 2.8	13.0 – 20.0
	Engine rear mounting bolt (bracket and extension case)	18 – 28	1.8 – 2.8	13.0 – 20.0
	Engine rear mounting bolt (mounting and frame)	18 – 28	1.8 – 2.8	13.0 – 20.0
Transfer gear box	Transfer case bolt (8 mm)	13 –23	1.3 – 2.3	9.5 – 6.5
	Oil filler plug and drain plug	36 – 54	3.6 – 5.4	26.0 – 39.0
	Universal joint flange nut (20mm)	110 – 150	11.0 – 15.0	80.0 – 108.0
	Propeller shaft flange bolt & nut (8mm)	23 –30	2.3 – 3.0	17.0 –21.5
	Transfer case mounting nut	25 – 35	2.5 – 3.5	18.5 – 25.0

2. Service Data

> **NOTE:**
> **This section includes only the service data newly changed starting from the vehicles carrying Body Nos. mentioned in the page of FOREWORD of this MANUAL.**

Item		Standard	Service limit
Transmission	Free length of fork shaft locating spring	25.5 mm (1.004 in.)	21.0 mm (0.826 in.)
Transfer	Free length of locating spring	23.7 mm (0.933 in.)	22.0 mm (0.866 in.)
Charging system	Nominal operating voltage	12 Volts	——
	Maximum alternator output	40A	——
	Polarity	Negative ground	——
	Effective pulley diameter	65 mm (2.56 in.)	——
	No-load alternator speed	1000 – 1100 r/min. 14 volts at normal temperature	——
	Full-load alternator speed	5,000 r/min. maximum, 40A, 13.5 volts at normal temperature	——
	Direction of rotation	Clockwise as viewed from pulley side	——
	Maximum permissible alternator speed	13,500 r/min. (rpm)	——
	Rectification	Full-wave rectification	——

23. OTHERS

23

1. Wiring Diagram

For European Market

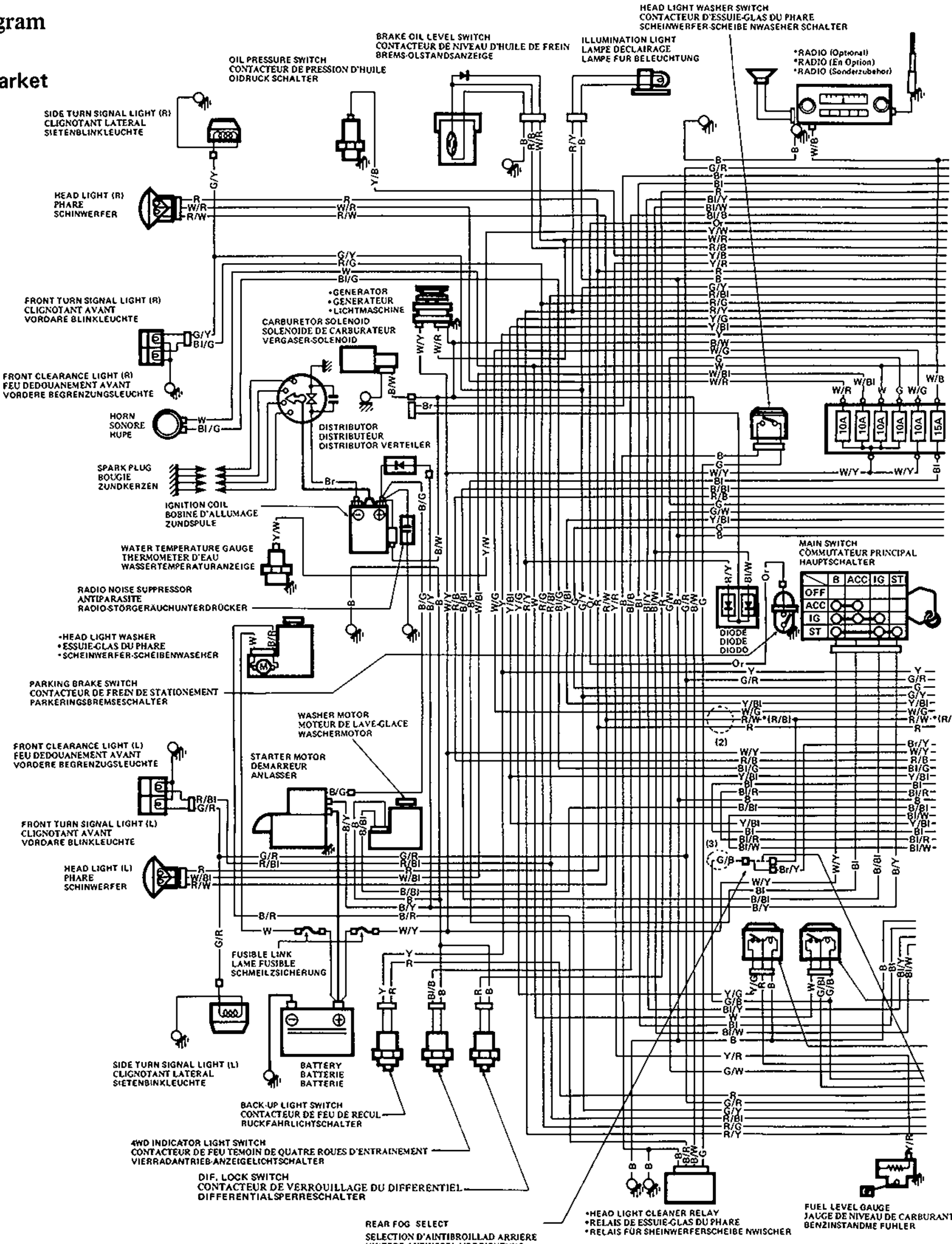
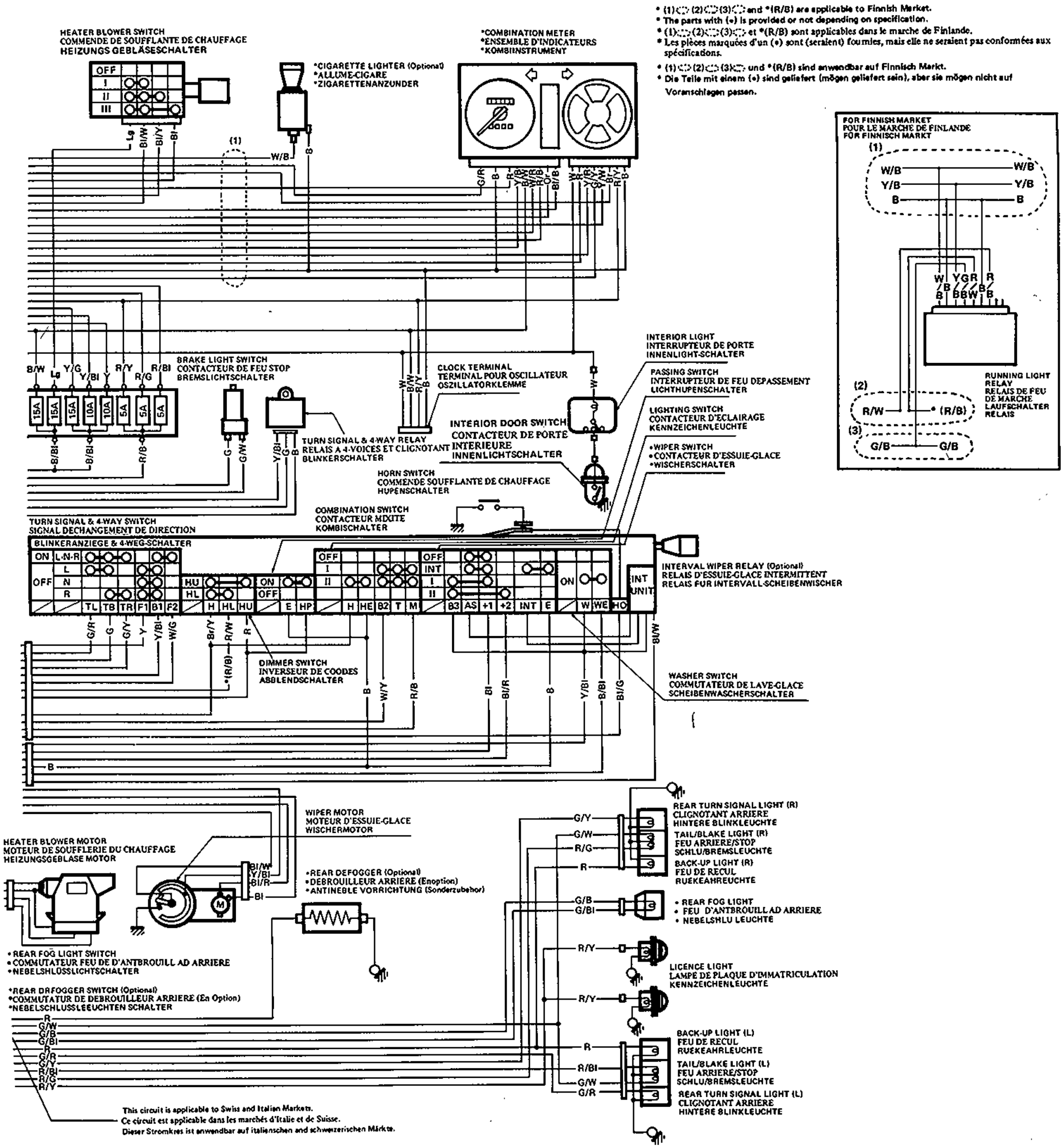


Fig. 23-1



WIRE COLOR			
B	Black	G/R	Green with Red tracer
Bl	Blue	G/W	Green with White tracer
Br	Brown	G/Y	Green with Yellow tracer
G	Green	R/B	Red with Black tracer
Or	Orange	R/Bl	Red with Blue tracer
R	Red	R/W	Red with White tracer
W	White	R/Y	Red with Yellow tracer
Y	Yellow	W/B	White with Black tracer
Lg	Light green	W/Bl	White with Blue tracer
B/Bl	Black with Blue tracer	W/G	White with Green tracer
B/W	Black with White tracer	W/R	White with Red tracer
B/Y	Black with Yellow tracer	Y/B	Yellow with Black tracer
Bl/R	Blue with Red tracer	Y/Bl	Yellow with Blue tracer
Bl/W	Blue with White tracer	Y/R	Yellow with Red tracer
		Y/W	Yellow with White tracer

CODE DES COULEURS			
B	Noir	G/R	Vert avec filet rouge
Bl	Bleu	G/W	Vert avec filet blanc
Br	Brun	G/Y	Vert avec filet jaune
G	Vert	R/B	Rouge avec filet noir
Or	Orange	R/Bl	Rouge avec filet bleu
R	Rouge	R/W	Rouge avec filet blanc
W	Blanc	R/Y	Rouge avec filet jaune
Y	Jaune	W/B	Blanc avec filet noir
Lg	Vert clair	W/Bl	Blanc avec filet bleu
B/Bl	Noir avec filet bleu	W/G	Blanc avec filet vert
B/W	Noir avec filet blanc	W/R	Blanc avec filet rouge
B/Y	Noir avec filet jaune	Y/B	Jaune avec filet noir
Bl/R	Bleu avec filet rouge	Y/Bl	Jaune avec filet bleu
Bl/W	Bleu avec filet blanc	Y/R	Jaune avec filet rouge
		Y/W	Jaune avec filet blanc

DRAHT FARBE			
B	Schwarz	G/W	Grün mit Weißem Faden
Bl	Blau	G/R	Grün mit Rotem Faden
Br	Braun	G/Y	Grün mit Gelbem Faden
G	Grün	R/W	Rot mit Weißem Faden
Or	Orange	R/B	Rot mit Schwarzem Faden
R	Rot	R/Bl	Rot mit Bleuem Faden
W	Weiß	R/Y	Rot mit Gelbem Faden
Y	Gelb	W/B	Weiß mit Schwarzem Faden
Lg	Hellgrün	W/R	Weiß mit Rotem Faden
B/W	Schwarz mit Weißen Faden	W/G	Weiß mit Grünem Faden
B/Bl	Schwarz mit Blauem Faden	W/Bl	Weiß mit Blauem Faden
B/Y	Schwarz mit Gelbem Faden	Y/W	Gelb mit Weißem Faden
Bl/W	Blau mit Weißem Faden	Y/B	Gelb mit Schwarzem Faden
Bl/R	Blau mit Rotem Faden	Y/R	Gelb mit Rotem Faden
		Y/Bl	Gelb mit Blauem Faden

For General Markets except European Markets

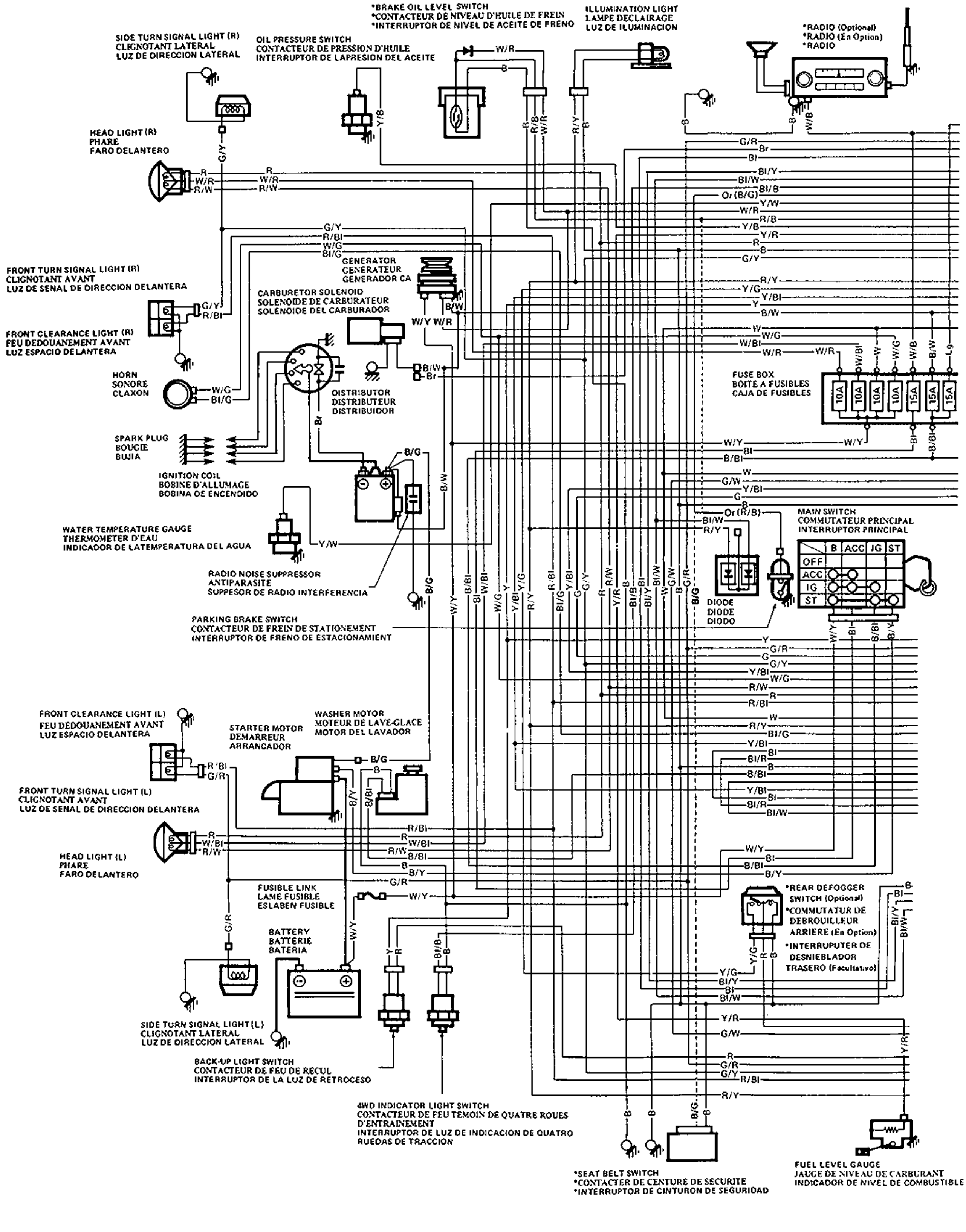
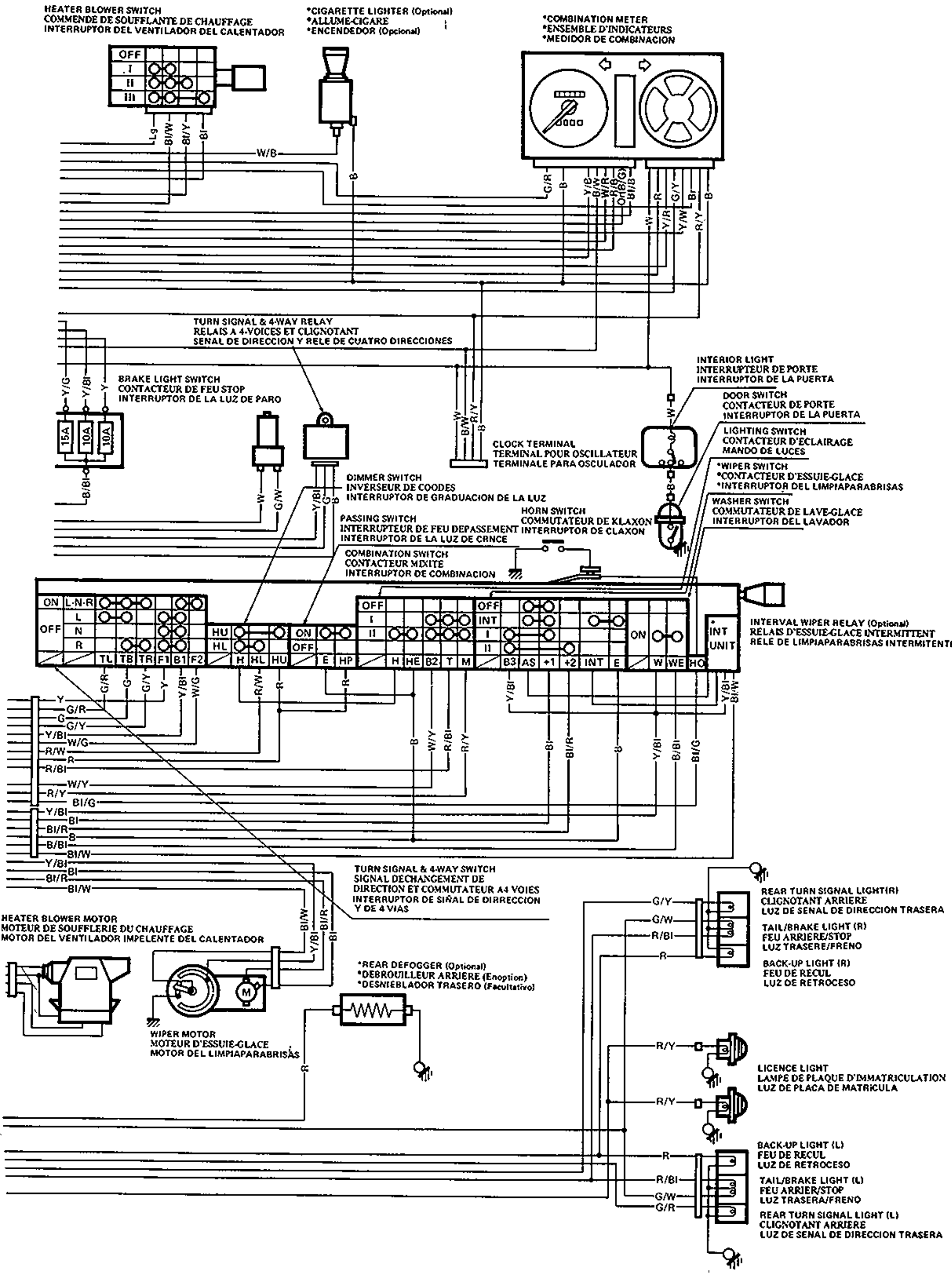


Fig. 23-2



WIRE COLOR

B . . . . Black
Bl . . . Blue
Br . . . Brown
G . . . . Green
Or . . . Orange
R . . . . Red
W . . . . White
Y . . . . Yellow
Lg . . . Light green
B/Bl . . Black with Blue tracer
B/W . . Black with White tracer
B/Y . . Black with Yellow tracer
B/G . . Black with Green tracer
Bl/R . . Blue with Red tracer
Bl/W . . Blue with White tracer
Bl/Y . . Blue with Yellow tracer
G/R . . Green with Red tracer
G/W . . Green with White tracer
G/Y . . Green with Yellow tracer
R/B . . Red with Black tracer
R/Bl . . Red with Blue tracer
R/W . . Red with White tracer
R/Y . . Red with Yellow tracer
W/B . . White with Black tracer
W/Bl . . White with Blue tracer
W/G . . White with Green tracer
W/R . . White with Red tracer
W/Y . . White with Yellow tracer
Y/B . . Yellow with Black tracer
Y/Bl . . Yellow with Blue tracer
Y/R . . Yellow with Red tracer
Y/W . . Yellow with White tracer

CODE DES COULEURS

B . . . . Noir
Bl . . . Bleu
Br . . . Brun
G . . . . Vert
Or . . . Orange
R . . . . Rouge
W . . . . Blanc
Y . . . . Jaune
Lg . . . Vert clair
B/Bl . . Noir avec filet bleu
B/W . . Noir avec filet blanc
B/Y . . Noir avec filet jaune
B/G . . Noir avec filet vert
Bl/R . . Bleu avec filet rouge
Bl/W . . Bleu avec filet blanc
Bl/Y . . Bleu avec filet jaune
G/R . . Vert avec filet rouge
G/W . . Vert avec filet blanc
G/Y . . Vert avec filet jaune
R/B . . Rouge avec filet noir
R/Bl . . Rouge avec filet bleu
R/W . . Rouge avec filet blanc
R/Y . . Rouge avec filet jaune
W/B . . Blanc avec filet noir
W/Bl . . Blanc avec filet bleu
W/G . . Blanc avec filet vert
W/R . . Blanc avec filet rouge
W/Y . . Blanc avec filet jaune
Y/B . . Jaune avec filet noir
Y/Bl . . Jaune avec filet bleu
Y/R . . Jaune avec filet rouge
Y/W . . Jaune avec filet blanc

COLOR DEL ALAMBRE

B . . . . Negro
Bl . . . Azul
Br . . . Marron
G . . . . Verde
Or . . . Naranja
R . . . . Rojo
W . . . . Blanco
Y . . . . Amarillo
Lg . . . Verde claro
B/Bl . . Negro con trazador Azul
B/W . . Negro con trazador Blanco
B/Y . . Negro con trazador Amarillo
B/G . . Negro con trazador Verde
Bl/R . . Azul con trazador Rojo
Bl/W . . Azul con trazador Blanco
Bl/Y . . Azul con trazador Amarillo
G/R . . Verde con trazador Rojo
G/W . . Verde con trazador Blanco
G/Y . . Verde con trazador Amarillo
R/B . . Rojo con trazador Negro
R/Bl . . Rojo con trazador Azul
R/W . . Rojo con trazador Blanco
R/Y . . Rojo con trazador Amarillo
W/B . . Blanco con trazador Negro
W/Bl . . Blanco con trazador Azul
W/G . . Blanco con trazador Verde
W/R . . Blanco con trazador Rojo
W/Y . . Blanco con trazador Amarillo
Y/B . . Amarillo con trazador Negro
Y/Bl . . Amarillo con trazador Azul
Y/R . . Amarillo con trazador Rojo
Y/W . . Amarillo con trazador Blanco

NOTICE:
The parts with (*) is provided or not depending on specification.
...... circuit is applicable to Saudi Arabia Market.

REMARQUE:
Les pièces marquées d'un (*) sont (seraient) fournies, mais elle ne seraient pas conformées aux spécifications.
...... circuit est applicable dans le marché d'Arabie Saoudite.

NOTA:
Las piezas con (*) son provistas o non dependiendo de las especificaciones.
...... Circuito es aplicable al mercado de Saudi-Arabia.

2. Chassis Dimensions

SJ410 Canvas top/SJ410 Metal top

Unit: mm (in.)

Dimension	Tolerance
L < 100 (3.94)	± 2 (0.079)
100 (3.94) ≦ L < 1 000 (39.37)	± 3 (0.118)
1.000 (39.37) ≦ L	± 4 (0.157)

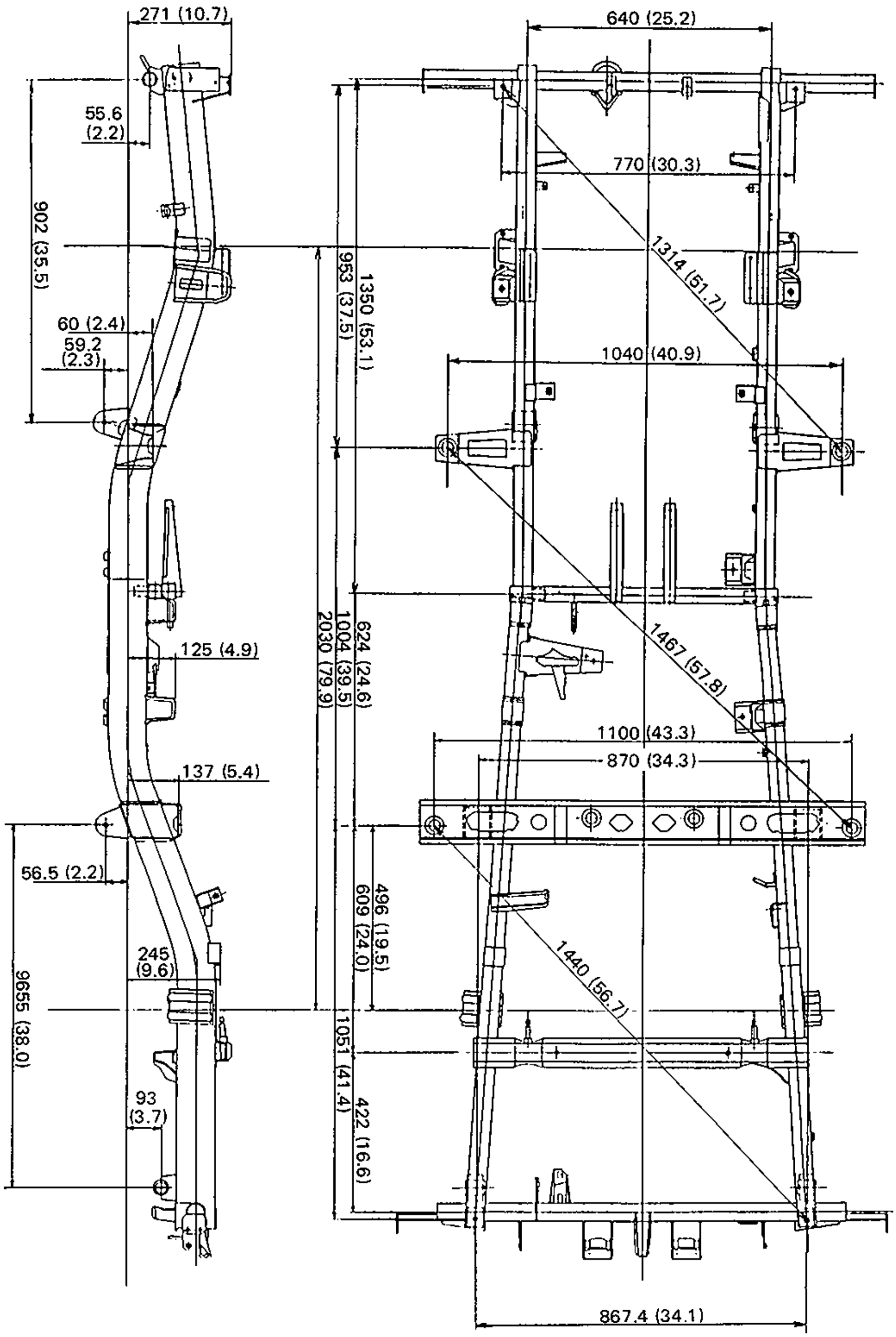


Fig. 23-3

SJ410 Pick up

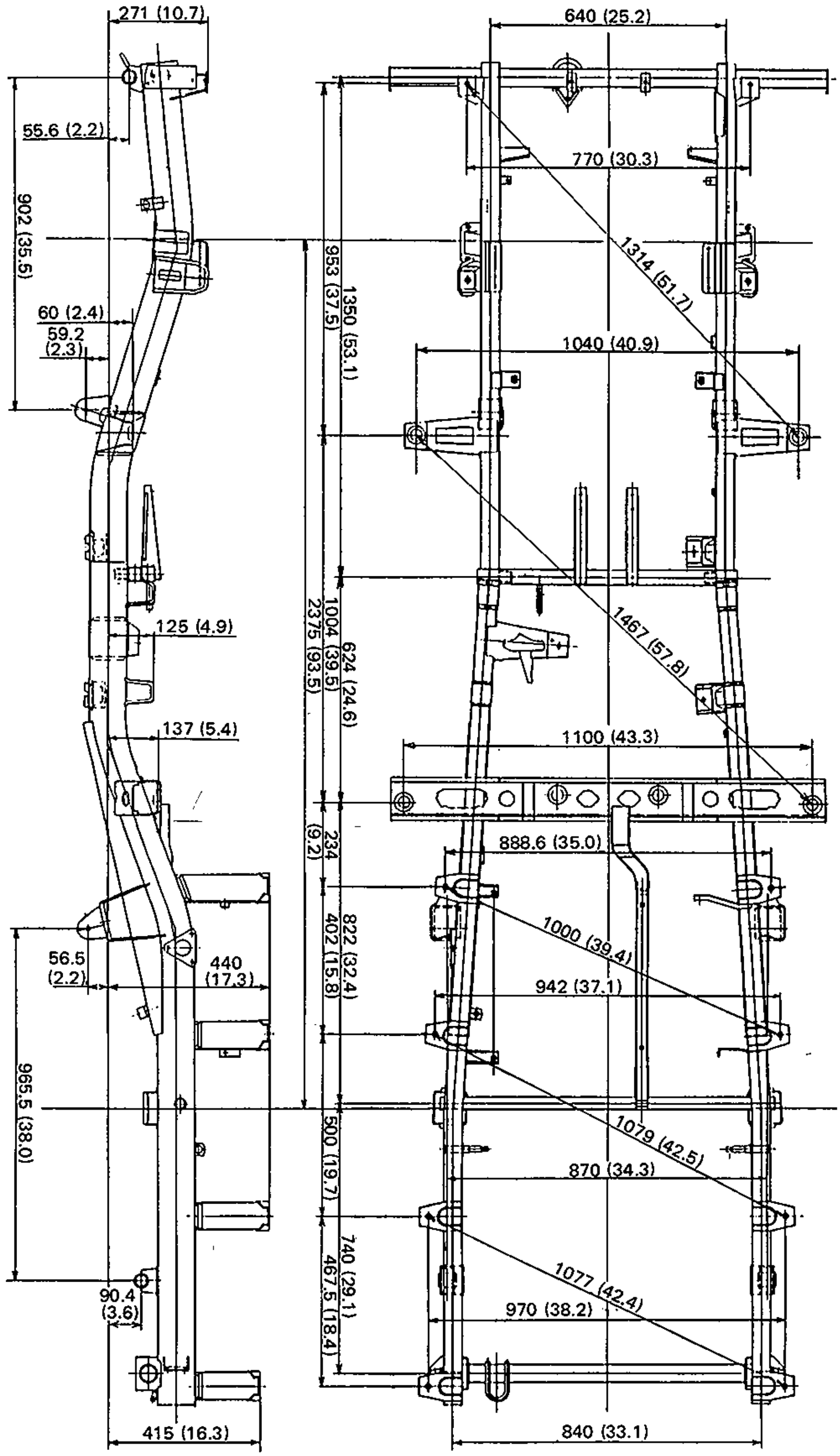


Fig. 23-4

SJ410 Long body

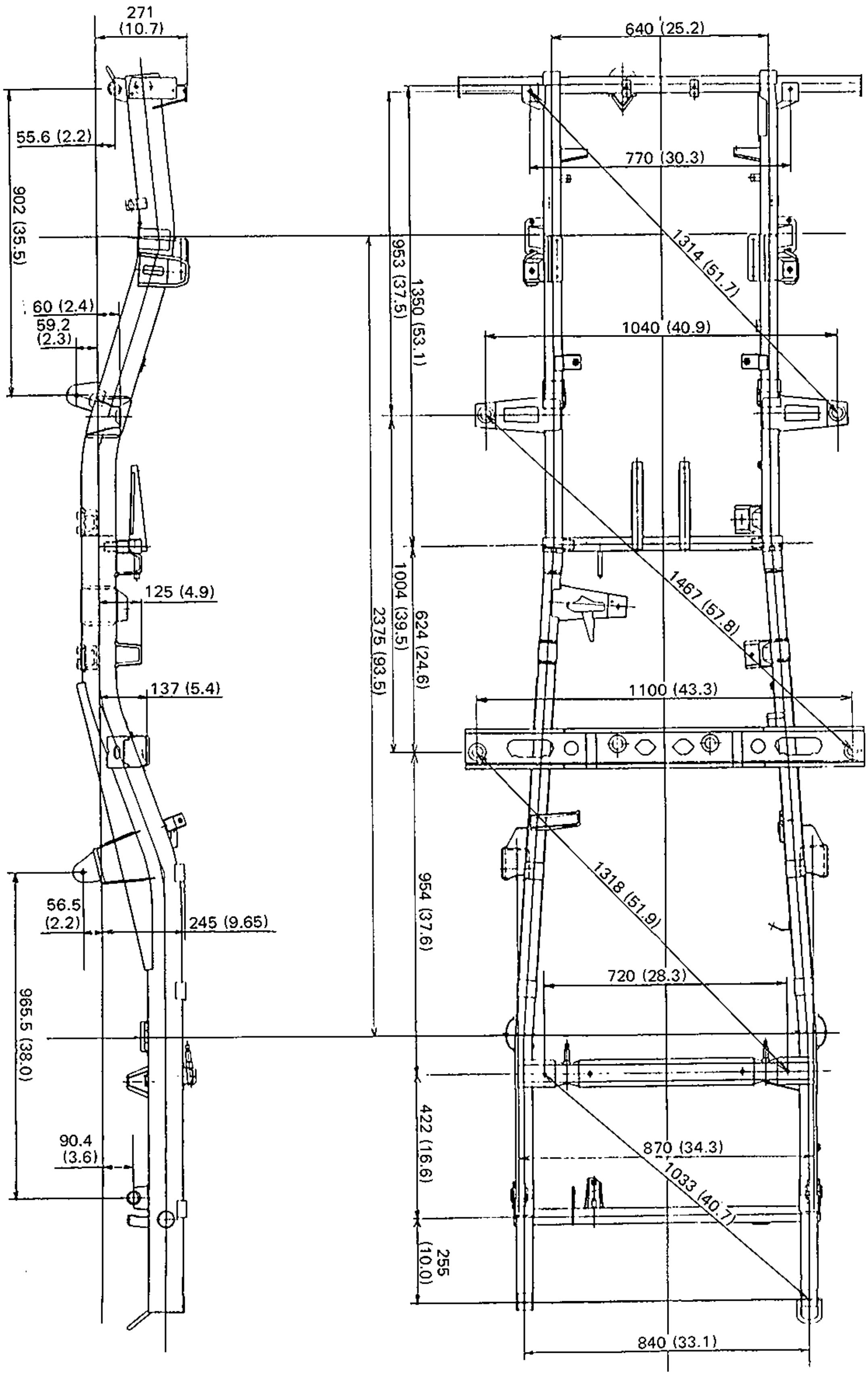


Fig. 23-5

3. Service Bulletin

SUBJECT:	MODIFICATION OF BEVEL PINION SPACER
APPLICABLE MODEL:	SJ410 SERIES
EFFECTIVE ENGINE OR FRAME NO.:	
REFERENCE:	

This bulletin is intended to inform you of the modification of the bevel pinion spacer which has been modified since September, '84 production, and to give you related instruction. You are requested to add this information to your service manuals for ready use in servicing the differential gear with the new bevel pinion spacer.

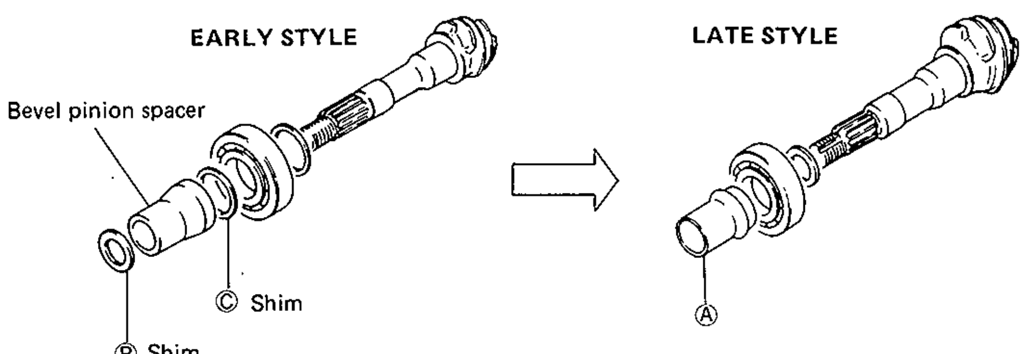


Fig. 1

Collapsible type bevel pinion spacer

NOTE:
- **The late style spacer Ⓐ is of collapsible type. By tightening bevel pinion nut, appropriate bevel pinion bearing preload is obtained instead of inserting shims Ⓑ and Ⓒ .**
- **As for preload adjustment, refere to the next page.**

PARTS SUPPLY DATA AND INTERCHANGEABILITY

PART NAME	EARLY PART NO.	LATE PART NO.	Q'TY	PARTS SUPPLY DATA	INTERCHANGEABILITY	
Bevel pinion spacer	27315-63201	27315-80000	1	Both late and early	EARLY ⇄ LATE	EARLY ⇄ LATE as a set
Shim (Ⓑ)	09181-26001 09181-25040 . . etc.	———	—	Early only	EARLY ⇄ LATE	
Shim (Ⓒ)	08221-30362 08221-30383 . . etc.					

APPLICABILITY

This modification has been carried out on and after the following body numbers.

For European Market	For North American Market	For Other Market
X JSAOSJ40000585167 X	JS3JA21C□F4120221	SJ40-171323
X JSAOSJ40V00585195 X	JS3JA21V□F4120388	SJ40T-120510
X JSAOSJ40T00505001 X	JS4JA21T□F4105001	SJ41-110200
X JSAOSJ41000505001 X		

Bevel Pinion Bearing Preload Adjustment

The bevel pinion, as installed in normal manner in carrier, is required to offer a certain torque resistance when checked by using prescribed preload adjuster (special tool Ⓓ) as shown in Fig. 2. This resistance is a "preload," which is due to the tighteness of the two tapered roller bearings by which the pinion is held in the carrier. And this tighteness is determined primarily by tightening torque of bevel pinion nut.

Adjust preload of bevel pinion bearings as follows.

1) Install pinion bearings, spacer, bevel pinion, oil seal and universal joint flange to differential carrier.
   At this time, be sure to apply gear oil to bearings lightly and grease to oil seal lip.
2) Tighten bevel pinion nut by hand, and install special tool to universal joint flange.
3) After turning pinion several times, tighten pinion nut gradually, while checking pinion starting torque with spring balance, and stop tightening when starting torque reaches specification given below.
4) Caulk bevel pinion nut to prevent it from loosening.

NOTICE:

Bevel pinion bearing preload is adjusted by tightening bevel pinion nut to compress spacer which is of collapsible type. Therefore, be sure to use a new spacer for adjustment. If exceeds specification given below during adjustment, replace spacer and repeat preload adjustment procedure. Attempt to decrease starting torque (preload) by loosening pinion nut will not do.

Pinion bearing preload	7.0 – 13.0 kg-cm (6.1 – 11.2 lb-in)
Starting torque (When using special tool)	1.4 – 2.6 kg (3.1 – 5.7 lb)

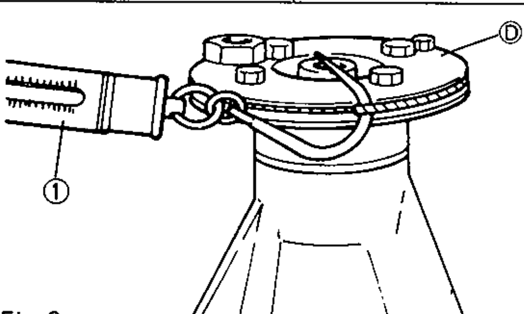


Fig. 2

① *Spring balance*
Ⓓ *Special tool (Differential gear preload adjuster 09922-75221)*

CAUTION:

Adjust preload on side bearing according to the following procedure after the bevel pinion bearing preload adjustment and side bearing backlash adjustment.

(1) Mount special tool on drive bevel pinion as shown in Fig. 2 and measure using spring balance ①. If reading at the instant bevel gear starts moving is within the range given below, side bearing preload is acceptable. Referring to the graph, for example, when the drive bevel pinion bearing preload measured as shown in Fig. 3 is 2.0 kg (4.41 lb), drive bevel pinion bearing preload (kg) + bevel gear side bearing preload (kg) should be 2.2 – 2.6 kg (4.85 – 5.73 lb).

(2) Upon completion of this adjustment, be sure to tighten bearing cap nuts to 3.0 – 3.7 kg-m (21.7 – 26.7 lb-ft.)

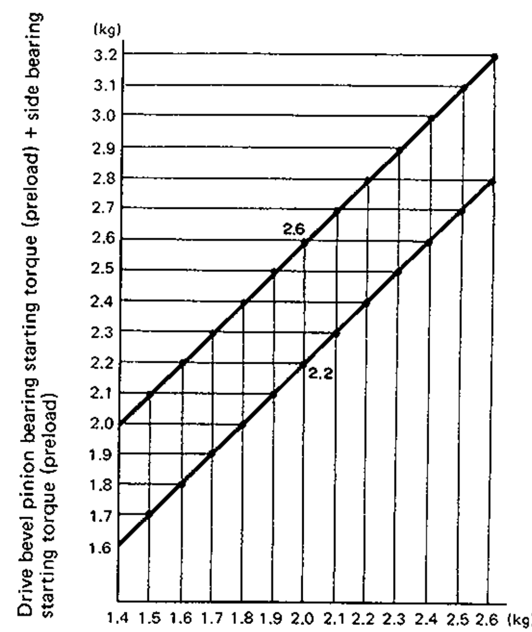


Fig. 3 Drive bevel pinion bearing starting torque (preload)

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