FK.FM

Service Manual

FOREWORD

This service manual contains the instructions for the servicing of the Mitsubishi Fuso FK, FM series trucks. Please make the most of this service manual to perform correct servicing and wasteless operations. Note that some of the contents of this service manual are subject to change owing to improvements, etc. that may be introduced after publication of the service manual.
For more details, consult your local Mitsubishi Fuso Dealers and Distributors.

March 1991

GROUP INDEX

Group 35A Brake
(Air Over Hydraulic Brake)

This section describes only the modified wheel brake.
For other information, refer to Group 35A Brake (Air Over Hydraulic Brake), 1992 FK.FM Service Manual (Pub. No. TWME9107-35A).

CONTENTS

Group 35B Brake (Full Air Brake)

This section describes only the modified wheel brake.
For other information, refer to Group 35B Brake (Full Air Brake), 1992 FK.FM Service Manual (Pub. No. TWME9107-35B).

CONTENTS

OUTLINE OF THE '95 MODEL CHANGES

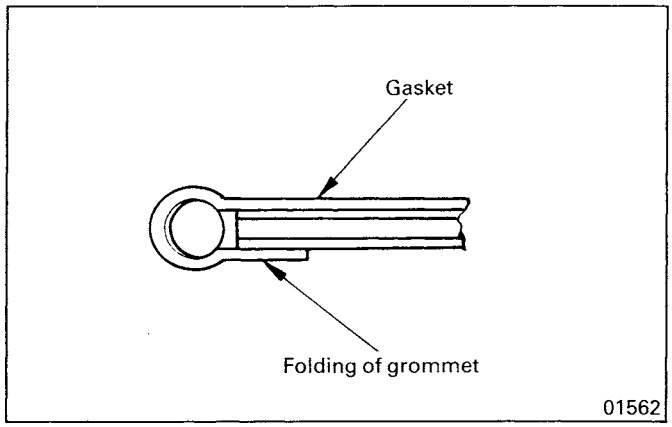
FK457L

Item \ Model	FK457LSLSUB	FK457LSLSUD	FK457LSLSUE	FK457LSLSUF
Transmission	M4A4 (AT545)		M6S6	
Tire	11R22.5-14PR	10R22.5-12PR	11R22.5-14PR	10R22.5-12PR
Type	Forward control type			
Drive system	4 x 2			
Dimensions mm {in.}				
Wheel base	5200 {204.7}	5200 {204.7}	5200 {204.7}	5200 {204.7}
Overall length	8705 {342.7}	8705 {342.7}	8705 {342.7}	8705 {342.7}
Overall width	2370 {93.3}	2370 {93.3}	2370 {93.3}	2370 {93.3}
Overall height, approx.	2690 {105.9}	2650 {104.3}	2690 {105.9}	2650 {104.3}
Tread, front	1880 {74.0}	1900 {74.8}	1880 {74.0}	1900 {74.8}
rear	1755 {69.1}	1725 {67.9}	1755 {69.1}	1725 {67.9}
Mass kg {lb}				
Vehicle kerb mass	4160 {9170}	4065 {8960}	4145 {9160}	4065 {8960}
Gross vehicle mass Max. GVM	13155 {29000}	11790 {25995}	13155 {29000}	11790 {25995}
Seating capacity	2	2	2	2
Performance (Computed)				
Max. speed km/h {mph}	105 {65}	114 {70}	119 {74}	115 {71}
Climbing ability (tan θ) with Max. GVM %	26.5	27.5	29.0	34.0
Min. turning radius m {ft.}	9.4 {30.8}	8.5 {27.5}	9.4 {30.8}	8.5 {27.5}

FK457M

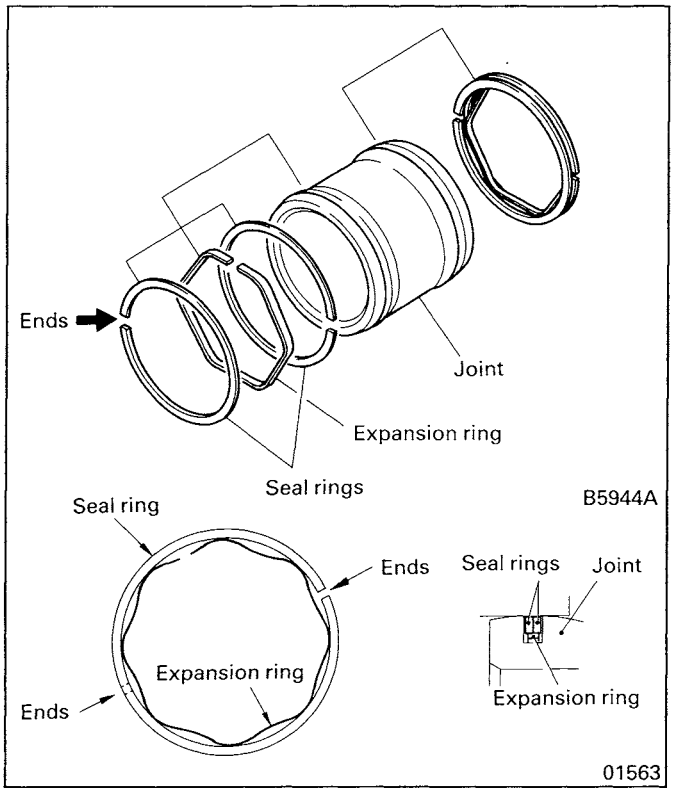
Item \ Model	FK457MSLSUB	FK457MSLSUD	FK457MSLSUE	FK457MSLSUF
Transmission	M4A4 (AT545)		M6S6	
Tire	11R22.5-14PR	10R22.5-12PR	11R22.5-14PR	10R22.5-12PR
Type	Forward control type			
Drive system	4 x 2			
Dimensions mm {in.}				
Wheel base	5550 {218.5}	5550 {218.5}	5550 {218.5}	5550 {218.5}
Overall length	9325 {367.1}	9325 {367.1}	9325 {367.1}	9325 {367.1}
Overall width	2370 {93.3}	2370 {93.3}	2370 {93.3}	2370 {93.3}
Overall height, approx.	2690 {105.9}	2650 {104.3}	2690 {105.9}	2650 {104.3}
Tread, front	1880 {74.0}	1900 {74.8}	1880 {74.0}	1900 {74.8}
rear	1755 {69.1}	1725 {67.9}	1755 {69.1}	1725 {67.9}
Mass kg {lb}				
Vehicle kerb mass	4215 {9290}	4210 {9080}	4210 {9280}	4120 {9080}
Gross vehicle mass Max. GVM	13155 {29000}	11790 {25995}	13155 {29000}	11790 {25995}
Seating capacity	2	2	2	2
Performance (Computed)				
Max. speed km/h {mph}	105 {65}	114 {70}	119 {74}	115 {71}
Climbing ability (tan θ) with Max. GVM %	26.5	27.5	29.0	34.0
Min. turning radius m {ft.}	10.0 {32.8}	9.0 {29.5}	10.0 {32.8}	9.0 {29.5}

(1) Installation of gasket



Install the gasket with its folding toward the cylinder head.

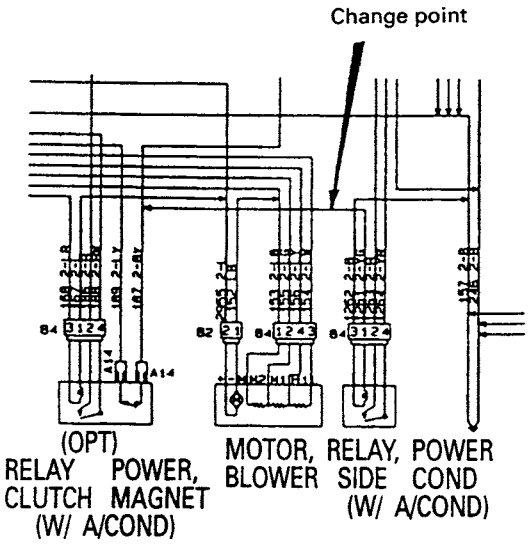
(2) Installation of seal rings and expansion ring



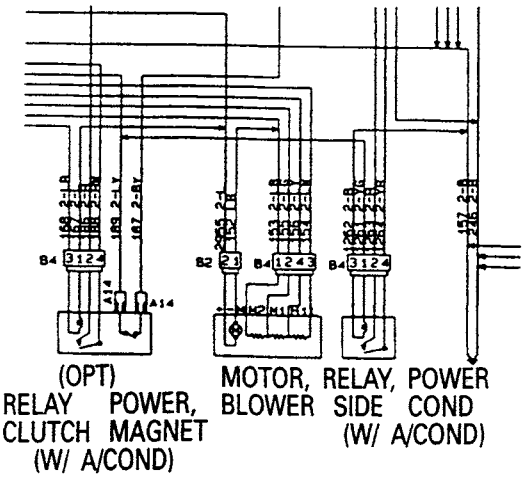
Install two seal rings each in the grooves at both ends of the joint connector. Locate the ends of the rings 180° apart with each other.
Install the expansion ring inside two seal rings. Be sure not to mate the corners of the expansion ring with the ends of the seal rings.

Item	Difference	Remarks
Group 54 Chassis Electrical	A/C side condenser fan circuit is changed.	Service procedure remains unchanged.

1994 Model



1993 Model



MITSUBISHI
FUSO

FK.FM

Service Manual

Group 00
General

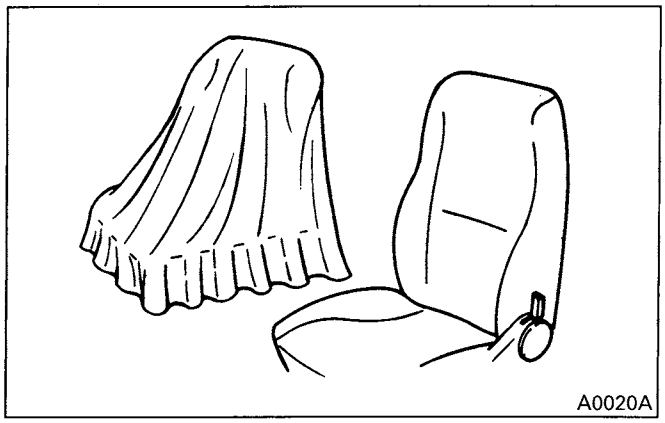
MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub. No. TWME9107-00

4. EQUIPMENT MODEL NOTATION

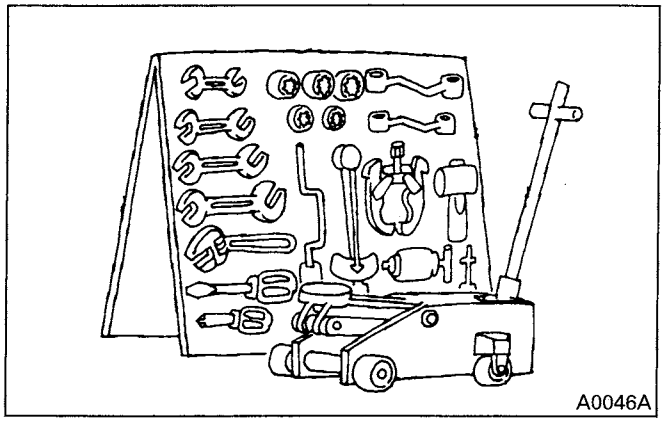
Equipment name	Model notation	Explanation
Engine	6 D 16 T	With turbocharger Version number Diesel engine No. of cylinders (6: Six cylinders)
Clutch	C 6 M 35	Disc O.D. (in cm) Facing material (M: Ceramic metal) Typical tonnage of model in which the clutch is installed Stands for clutch
Transmission	M 6 S 5	No. of forward speeds (2 x 5 for one with splitter) Meshing (S: Synchromesh, A: Automatic) Typical tonnage of model in which the transmission is installed Stands for transmission
Propeller shaft	P 4	Typical tonnage of model in which the transmission is installed Stands for propeller shaft
Front axle	F 4 T	Identification of type of vehicle (T: Truck) Typical tonnage of model in which it is installed Stands for front axle
Rear axle	R 4 T	Identification of type of vehicle (T: Truck) Typical tonnage of model in which it is installed Stands for rear axle
Reduction and differential	D 4 H	Tooth shape (H: Hypoid gear) Typical tonnage of model in which it is installed Stands for reduction and differential

(b) Protective covers



Use protective covers to prevent soiling or damaging the seats, interior, floors and body paint, etc.

(c) Tool preparation

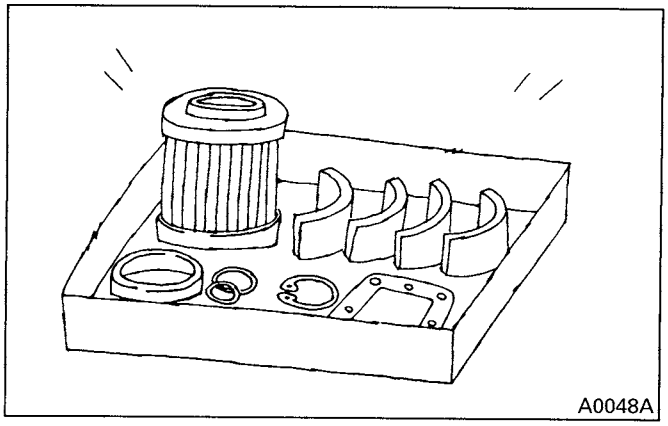


Prepare all normal and special tools required for the maintenance work.

WARNING

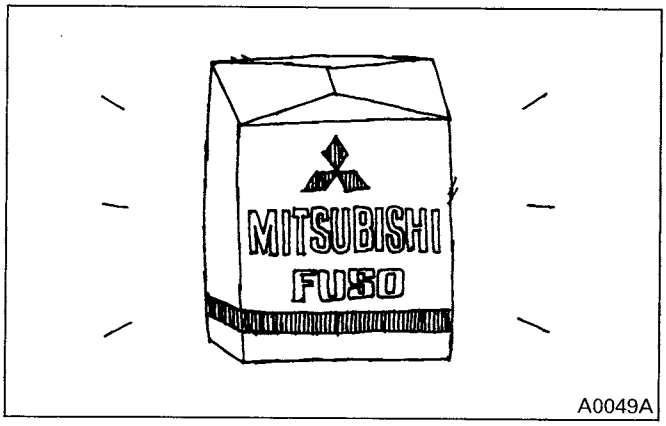
When special tools are specified in this manual, the use of other tools can damage the parts or result in injury.

(d) Prepare replacement parts



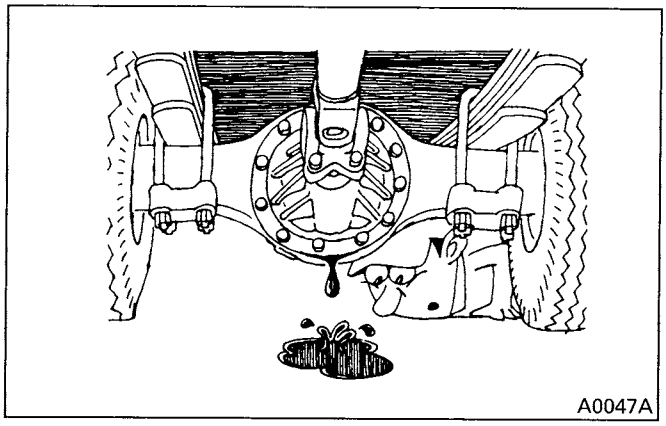
Prepare any replacement parts that may be required.

(e) Genuine parts



Replace rubber parts, such as oil seals, packing or O-rings, gaskets and split pins with new ones at every disassembly. As replacement parts, be sure to use genuine MITSUBISHI parts.

(3) Oil leak inspection



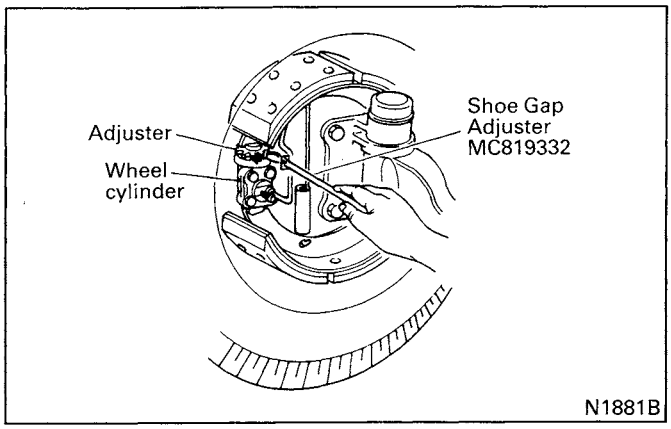
Before cleaning, check for oil leaks.
After cleaning, it is possible to overlook leaks.

Place of inspection and maintenance		Time of inspection and maintenance					Working procedures	Remarks
			Inspection interval					
		Pre-operation checks	Every 10000 km {6000 miles}	Every 30000 km {18000 miles} *1	Every 60000 km {36000 miles} *2	New vehicle at 4000 km {2500 miles}		
17	Coolant level and leaks from cooling system	X					Check coolant level and if level is low, check for coolant leaks.	
18	Coolant replacement			Every 24 months			Replace with new coolant.	
19	Radiator cap condition		X				Check radiator cap for sealing and mounting condition.	
20	Ⓔ Cooling system hose clamp position and clamping condition		X				Check clamp position and clamping condition of cooling system hose.	
21	Ⓔ Turbocharger rotor play		Every 250000 km {150000 miles}				Check whether rotor has excessive end play by dial indicator.	
22	ⒺⓃ Cleaning of air cleaner element	X					Check air cleaner dust indicator. If red signal appears, clean the element.	
23	ⒺⓃ Air cleaner element replacement		Every 50000 km {30000 miles}				Replace element.	
24	ⒺⓃ Damage of inlet system, looseness of clamp and loss of parts		X				Check inlet system for damage and inspect all parts for installation.	
25	Ⓝ Looseness and damage of exhaust pipe and muffler		X				Check installation and connection for looseness and damage and exhaust gas leaks.	
26	Starter function				X		Operate starter switch and check the switch for proper function.	
27	Alternator function				X		Check for function with a tester.	
POWER TRAIN								
28	Air or oil leaks from power train		X				Check power train for air and oil leaks.	
29	Clutch pedal play and clearance to floorboard when clutch released		X				(1) Press clutch lightly and check that play is adequate. (2) Press pedal further for complete clutch disengagement and in this condition, check that there is proper clearance from the floor.	
30	Clutch function		X				(1) Press the clutch pedal to check for unusual noise or stiffness. Also check if gear shift engages quietly. (2) Check that clutch does not slip and engages smoothly.	
31	Manual Transmission gearshift control looseness			X			In NEUTRAL position, check shift lever for looseness. With shift lever in each gear position, check engagement condition and degree of looseness. Also check for control rod is bent or damaged.	
	Automatic transmission range selector linkage and throttle (modulator) linkage condition			X			Shifting to each shift range must be done firmly and securely.	
32	Propeller shaft couplings and bearings looseness		X			X	(1) Check flange yoke bolt and center bearing attaching bolt for looseness. (2) Turn propeller shaft manually to check for spline looseness. (3) Check for looseness between spider and needle roller bearing.	On new vehicle inspection at 4000 km {2500 miles}, check only the looseness of bolts.

2.10 Adjustment of Wheel Brake Shoe Clearance

2.10.1 Air over hydraulic brake <FK series>

(1) Chock the tires and jack up the wheel to be adjusted.



(2) Using the special tool, Shoe Gap Adjuster, turn the adjuster in the direction of arrow stamped on the backing plate, until the tire drags lightly when turned by hand.

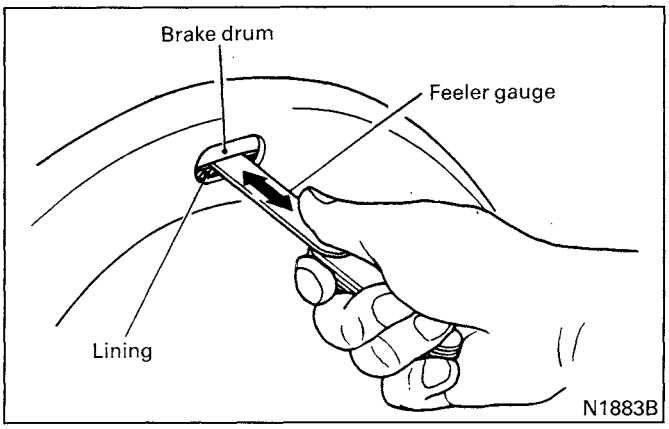
CAUTION

Make adjustment at two places on each wheel.

(3) After depressing the brake pedal several times, make sure that the tire drags lightly when turned by hand.
If the tire turns lightly, repeat the above procedures beginning with step (2).

(4) Back off the adjuster 8 to 9 notches in the direction opposite to that of the arrow.

(5) Turn the tire by hand and make sure that the tire does not drag. If the tire drags, repeat the above procedures beginning with step (2).



(6) Remove the check hole plug from the backing plate. Insert a feeler gauge between the brake drum and the lining. Make sure that slight resistance is felt when 0.2 mm {0.0079 in.} feeler gauge is withdrawn.

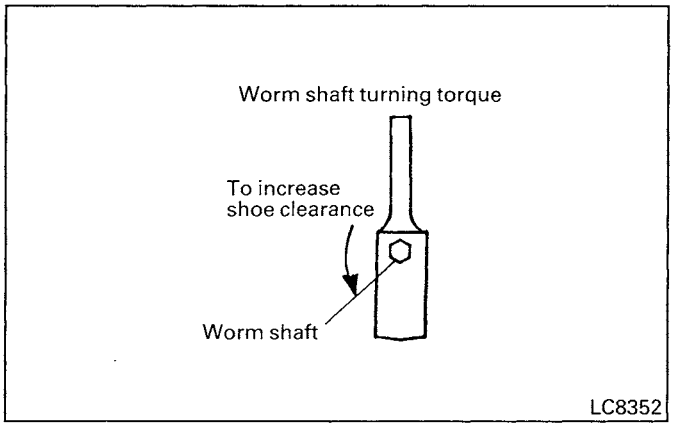
CAUTION

Make the check at two places on each wheel.

(7) When the adjustment of one wheel is completed, adjust the other wheel. After adjustment, be sure to reinstall the plugs in the backing plate.

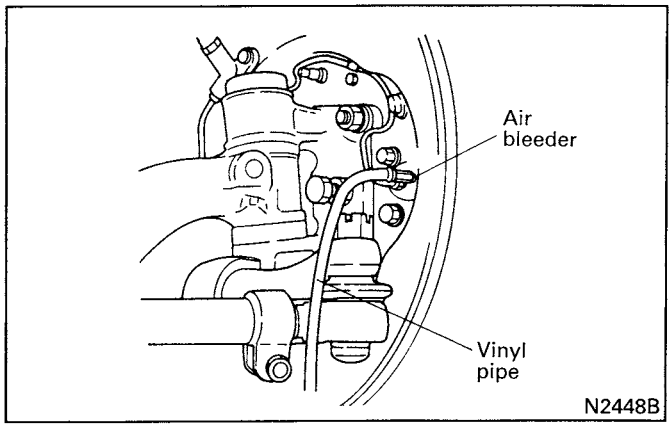
2.10.2 Full air brake <FM series>

(1) Inspection before Adjustment



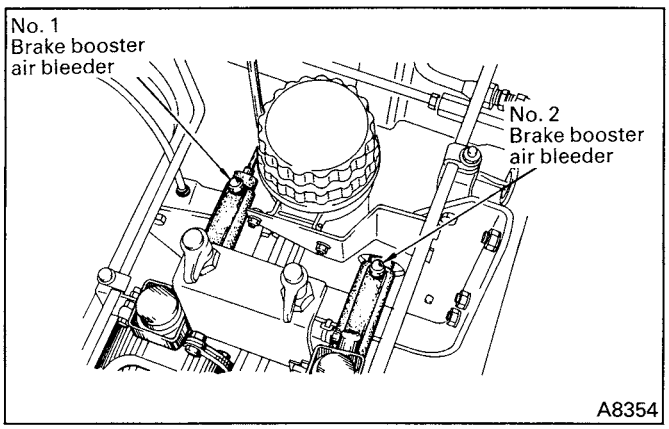
a. With the clevis pin removed from the brake chamber push rod, make the following checks.

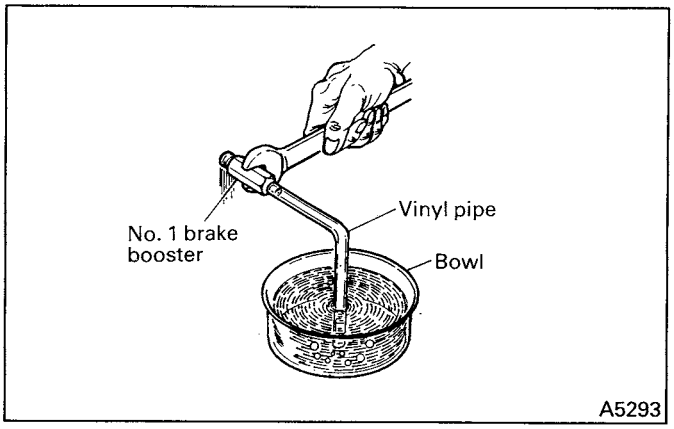
- Turn the worm shaft in the direction of arrow and check that the rotation torque is 4.9 N·m {3.62 lbf.ft, 50 kgf·cm} or more.



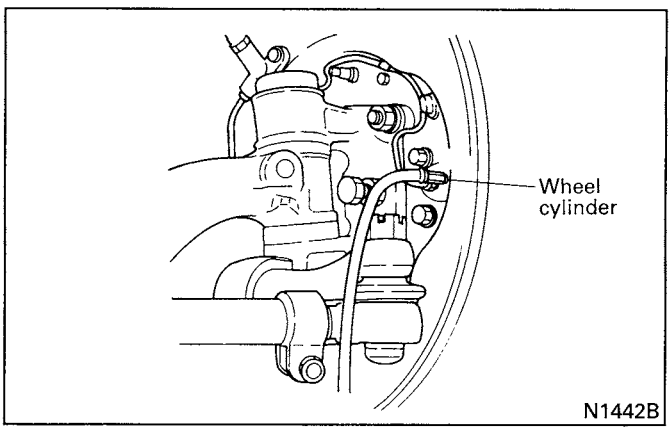
(2) Remove the cap from the wheel cylinder air bleeder and install a vinyl pipe, instead. With the air bleeder loosened, continue to depress the brake pedal until the reservoir tank is emptied and brake fluid no longer flows out from the air bleeder. Perform this step on all four wheels.
(3) Make sure that the reservoir tank has been emptied. While filling the reservoir tank with fresh brake fluid, continue to depress the brake pedal until the fluid in the brake system is completely replaced by fresh fluid (replacement with fresh fluid is indicated by change in color of fluid that flows out).
(4) Tighten the air bleeder and fill the reservoir tank with the brake fluid to the "H" line. Then, bleed the system.

3.5.3 Bleeding of brake system





(1) The brake fluid level falls as the system is bled of air. Add brake fluid as necessary during bleeding.
(2) Remove the cap from the air bleeder of No. 1 brake booster and install a vinyl pipe, instead. Put the other end of the pipe in a bowl containing brake fluid.
(3) Bleeding operation must be performed by two men.
(4) Depress the brake pedal and keep the pedal depressed. Then, loosen the air bleeder to discharge the brake fluid as well as air.
   ☆ Keep the pedal depressed as there is no change in brake pedal stroke.
(5) Tighten the air bleeder and release the pedal. Repeat these steps until there are no more air bubbles in the brake fluid that runs out from the air bleeder. Then, tighten the air bleeder securely and install the cap in position.



(6) After No. 1 brake booster has been bled of air, similarly bleed from the air bleeder of the wheel cylinder piped to this brake booster.

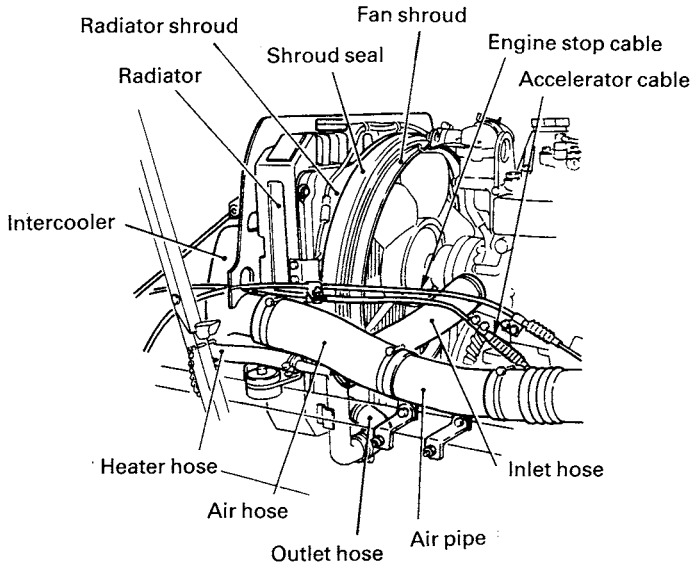
Unit: mm {in.}

Maintenance item		Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Main bearing	Oil clearance	[80] 0.05 to 0.10 {[3.15] 0.002 to 0.0039}	0.15 {0.0059}	Replace
	Span when free	–	Less than 85.5 {3.37}	
Connecting rod bearing	Oil clearance	[65] 0.06 to 0.11 {[2.56] 0.0024 to 0.0043}	0.2 {0.0079}	Replace
	Span when free	–	Less than 69.5 {2.74}	

3.2 Tightening Torque Table

Location tightened		Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}	Remarks
Crankcase water drain plug		M20 x 1.5	115 {87, 12}	
Injection nozzle mounting bolt		M8 x 1.25	15 {11, 1.5}	
Rocker cover mounting bolt		M8 x 1.25	9.8 {7.2, 1.0}	
Cylinder head bolt		M14 x 2.0	195 {145, 20}	Wet
		M10 x 1.5	34 {25, 3.5}	
Glow plug		M10 x 1.25	15 to 20 {11 to 14, 1.5 to 2}	
Exhaust manifold mounting stud		M10 x 1.5	29 {22, 3}	
Camshaft gear mounting bolt		M20 x 1.5	175 {130, 18}	
Idler gear No. 1 shaft mounting bolt		M12 x 1.75	88 {65, 9}	
Idler gear No. 2 mounting bolt		M12 x 1.25	95 {70, 9.7}	
Flywheel housing mounting bolt		M10 x 1.5	44 {33, 4.5}	
Oil seal mounting bolt		M8 x 1.25	15 {11, 1.5}	
Flywheel mounting bolt		M16 x 1.5	255 {185, 26}	Wet
Pulse rotor (for engine speed defection)		M20 x 1.5	98 {72, 10}	
Tachometer sensor		M16 x 1.5	24 to 35 {17 to 26, 2.4 to 3.6}	
Stiffener mounting bolt	6D16-T4 (Combined with M6 transmission)	M12 x 1.75	78 {58, 8}	
Oil jet check valve		M12 x 1.75	34 {25, 3.5}	
Main bearing cap mounting bolt		M14 x 2.0	175 {130, 18}	Wet
Connecting rod mounting nut		M13 x 1.25	125 {94, 13}	Wet
Torsional damper mounting bolt		M10 x 1.5	78 {58, 8}	
Crankshaft pulley mounting bolt		M14 x 1.5	185 {135, 19}	
Rocker arm adjust bolt lock nut		M10 x 1.25	34 {25, 3.5}	

(4) Removal and installation of parts around radiator



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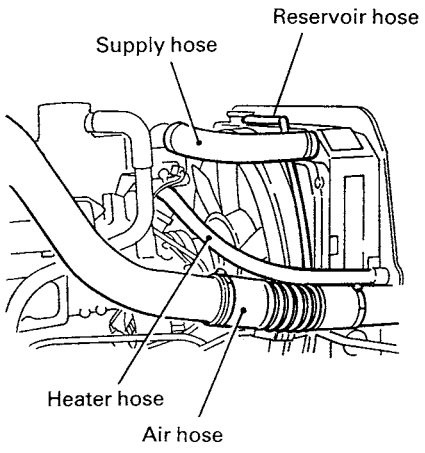

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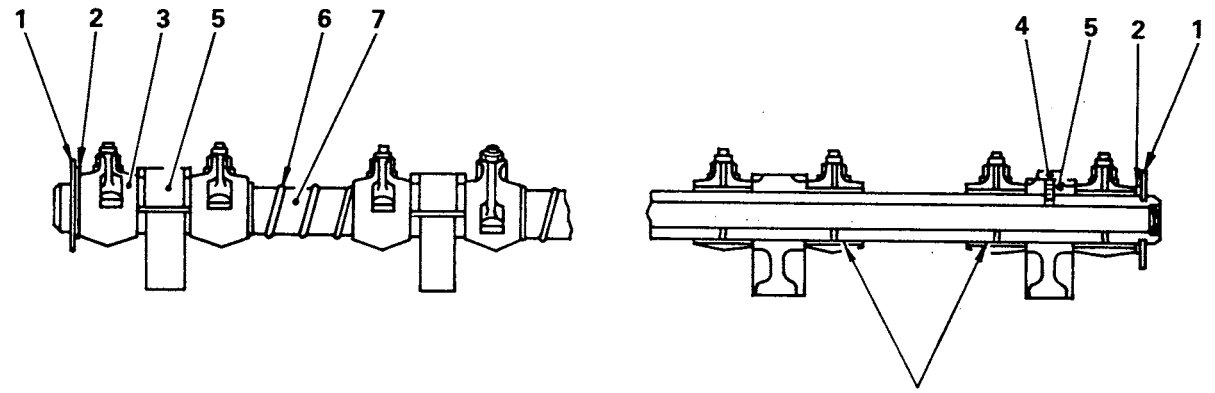
(4) Reassembly

(a) Rocker and bracket assembly



Assembly sequence
7→⑤→4→3→6→2→1

For parts with an encircled number, refer to Reassembly Procedure that follows.

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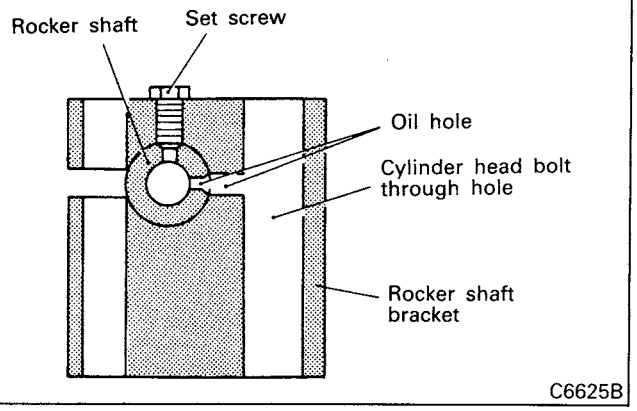
Reassembly Procedure



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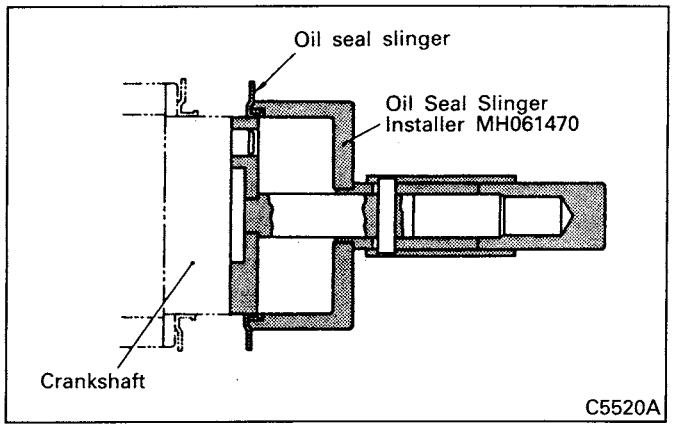
There is an oil hole in the rocker shaft bracket in the rear. Align the oil hole in rocker shaft with that in rocker shaft bracket and secure the parts with the set screw.

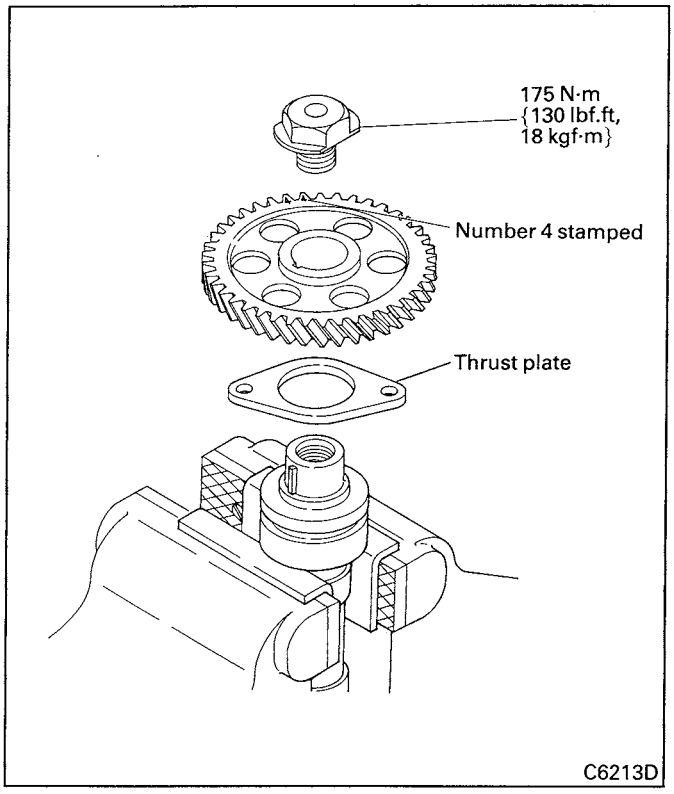
Reassembly Procedure

(a) Installation of oil seal slinger



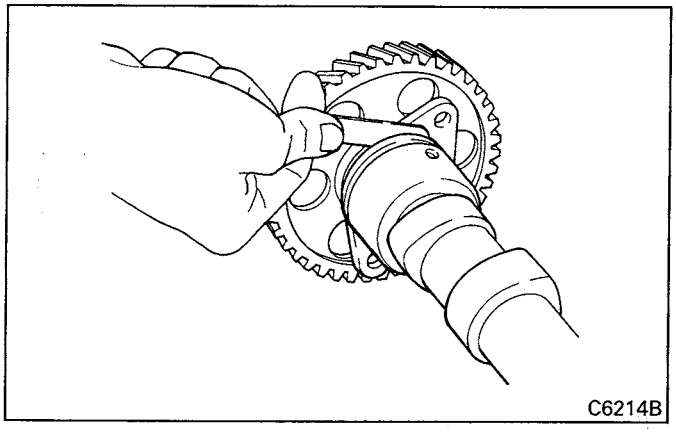
Install the oil seal slinger into position using the special tool, Oil Seal Slinger Installer.

(b) Installation of camshaft gear



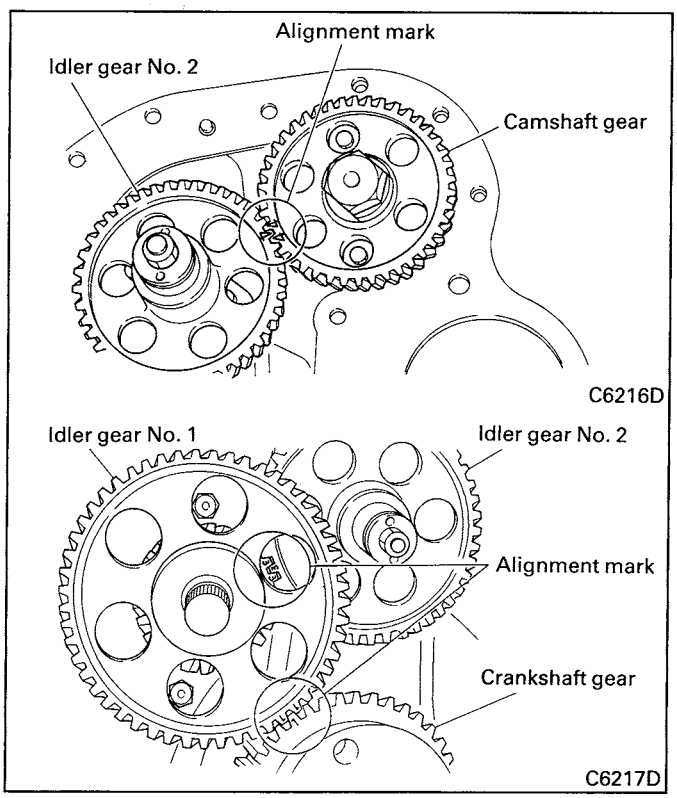
After mounting the thrust plate, install the camshaft gear so that the side on which number 4 is stamped faces upward.

(c) Camshaft gear end play



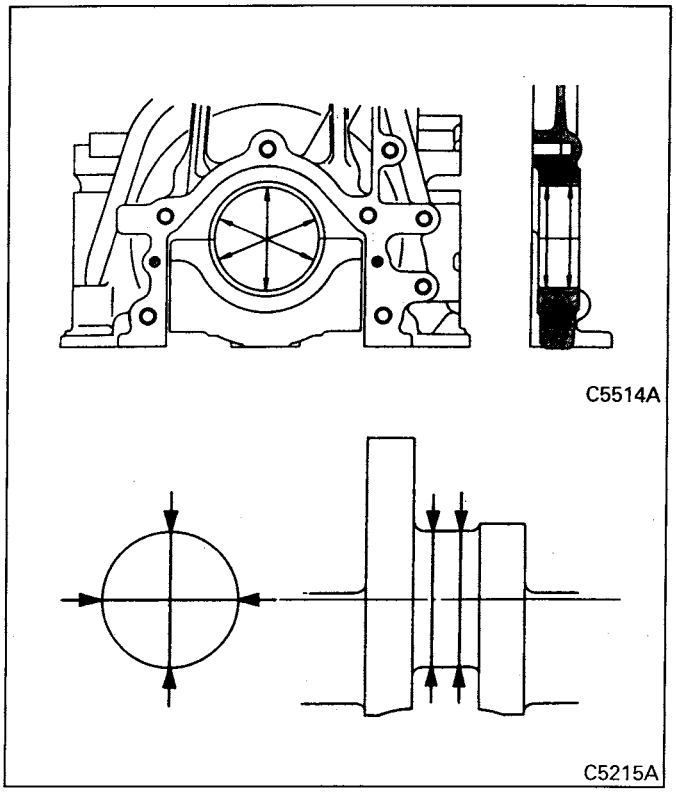
Check the camshaft gear for correct end play and then insert it into the crankcase.

(d) Installation of idler gears



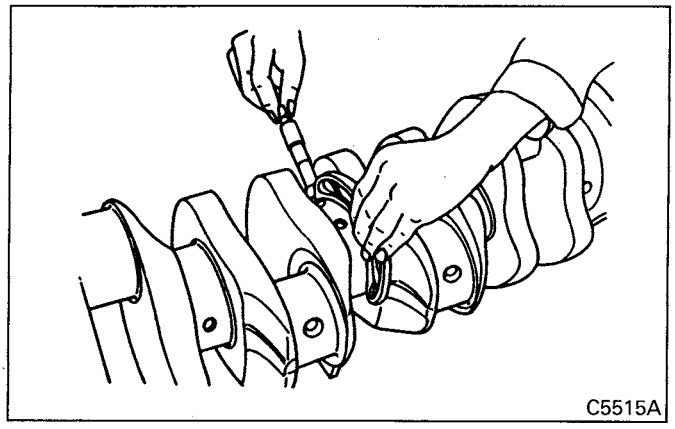
Face the side outside on which a number is stamped and align the alignment marks.

(o) Main bearing to crankshaft clearance



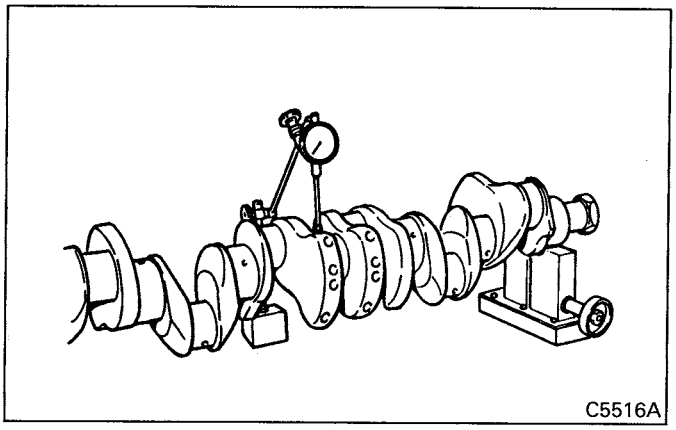
If the limit is exceeded, replace the upper and lower main bearings as a set.

(p) Crankshaft roundness and cylindricity



Measure O.D.s of journals and pins and, if the limit is exceeded, grind to undersize.

(q) Crankshaft bend

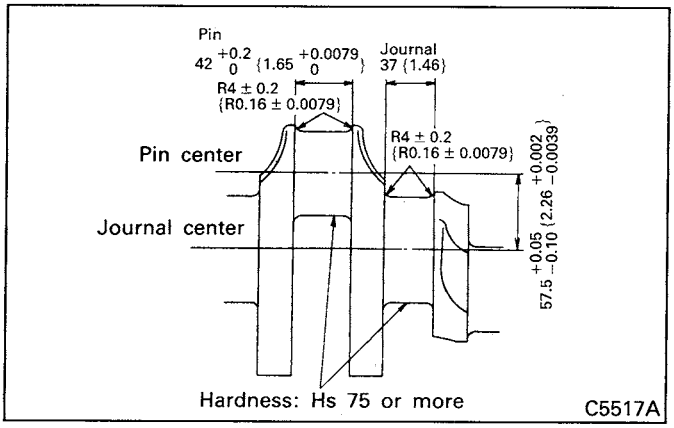


Check for bend by measuring the runout at the center journal. If the measurement exceeds the limit, grind to undersize or replace.

CAUTION

Read the runout of crankshaft center journal with a dial indicator. A half of the reading is the runout.

(r) Correcting the crankshaft to undersize

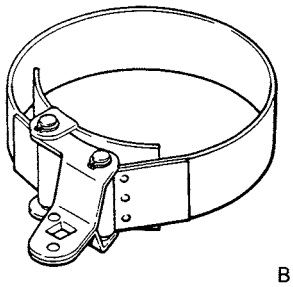


If the journal or pin is damaged or seized, grind the crankshaft to an undersize, observing the following precautions. Replace the bearings to an undersize.

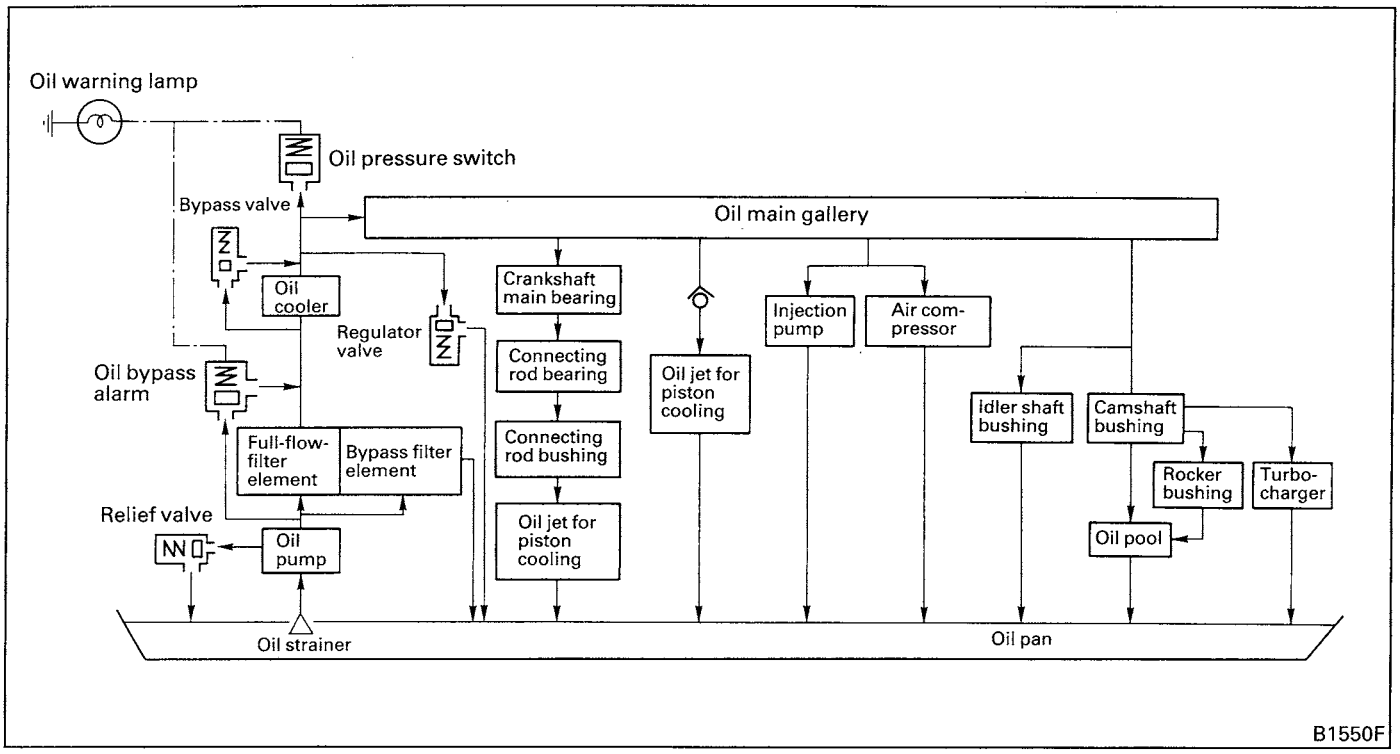
1) Do not change the center to center distance between the journal and pin.
2) Do not change the width of journal and pin.
3) Finish the fillet smooth to the specified radius.
4) Check for ground cracks by the magnetic-particle inspection. Make also sure that the surface hardness (Shore hardness Hs 75 or more) is not reduced.

4. SPECIAL TOOLS

Unit: mm {in.}

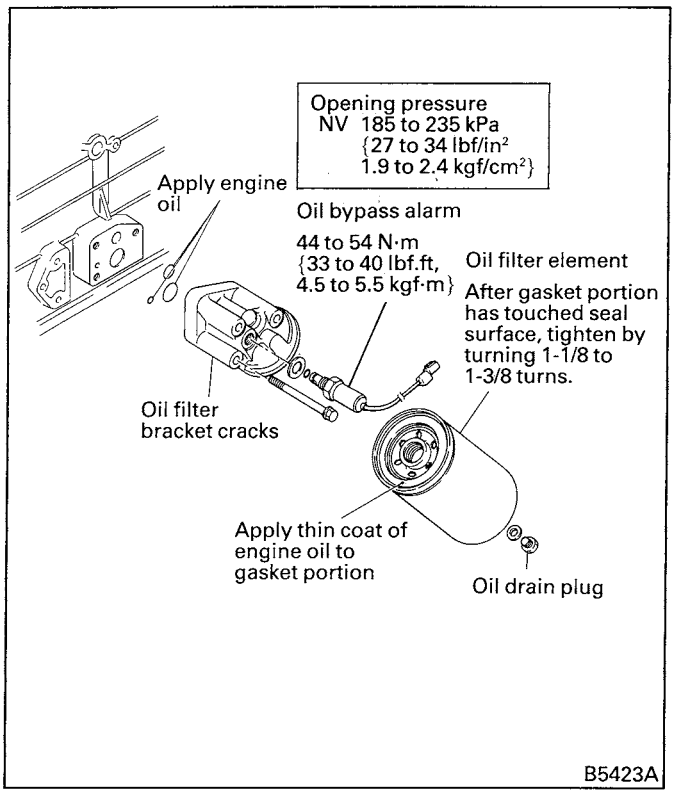
Tool name	Part No.	Shape	Application
Filter Wrench	MH061537	 B1589A	Removal of oil filter element

5. GENERAL

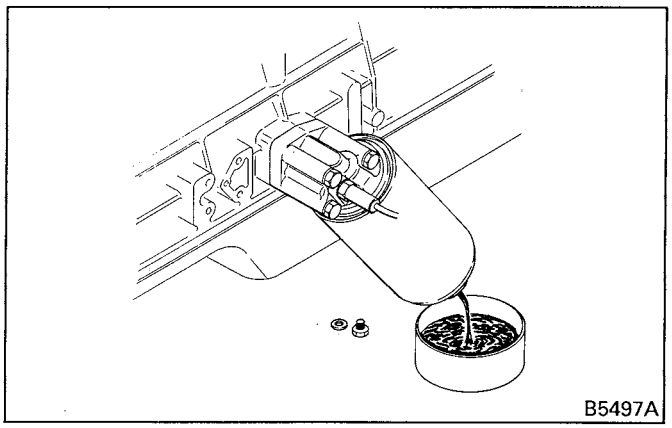


The gear pump forced feed system is employed for engine lubrication. The engine oil in the oil pan is pumped up through the oil strainer to the oil pump and forced to the oil filter and oil cooler for lubrication of various parts before it returns to the oil pan.

6.3 Oil Filter

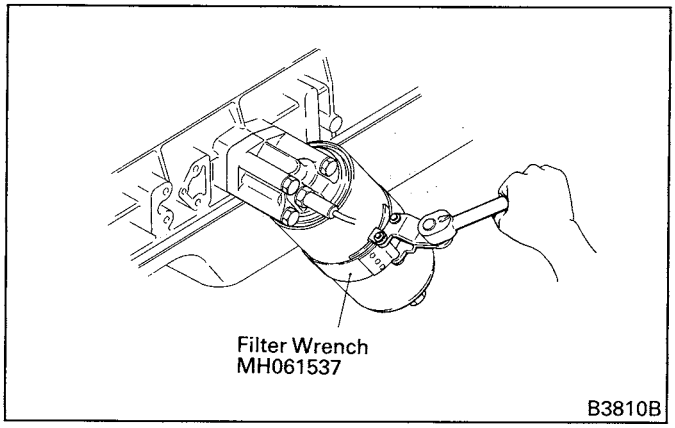


(1) Removal of engine oil



Remove the drain plug and remove the engine oil.

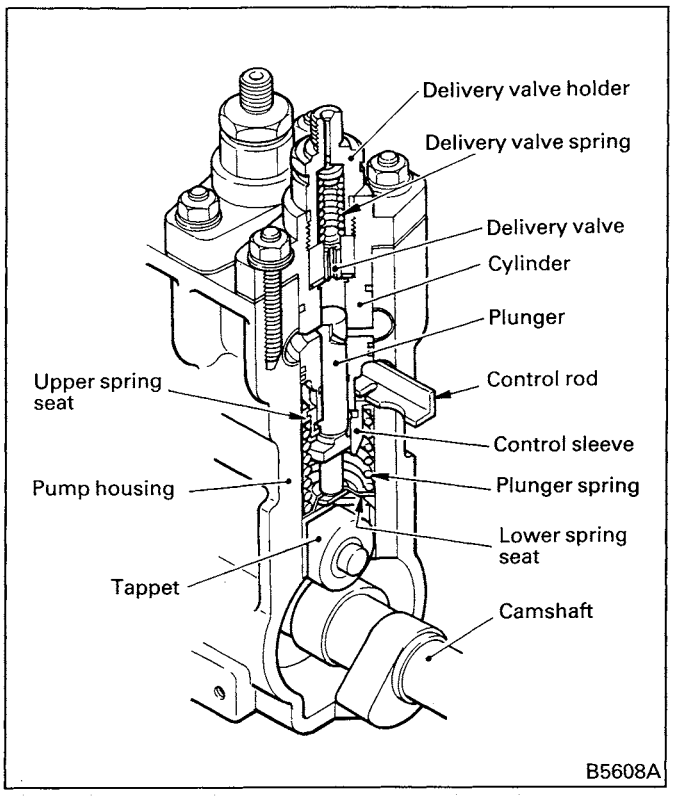
(2) Removal of oil filter element



To remove the oil filter element, use the Filter Wrench (special tool).

(3) Inspection of oil bypass alarm
[Refer to Section 5.9.2, GROUP 54 CHASSIS ELECTRICAL.]

Injection Pump



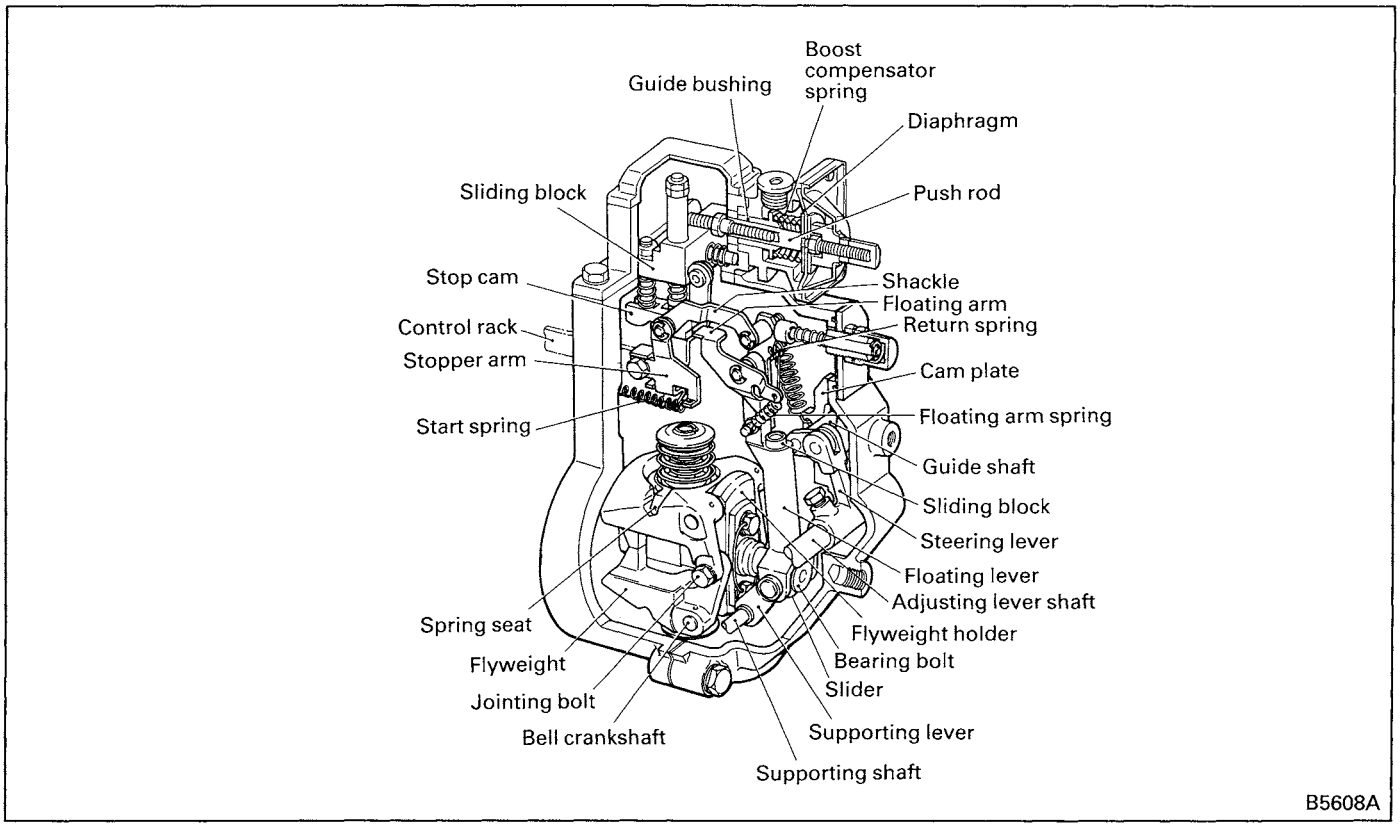
The injection pump, that forces fuel into the injection nozzle at pressure, is provided with a mechanism to increase or decrease the amount of fuel delivery according to the engine load and speed.

The injection pump is constructed as illustrated at left. It has one plunger and delivery valve for each cylinder.

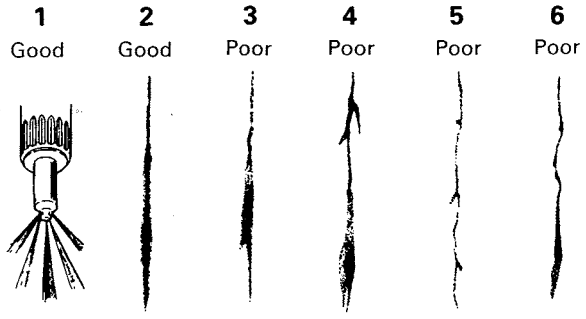
The plunger, which is pushed up by the camshaft and pushed back by the plunger spring, moves up and down in the plunger barrel on a predetermined stroke to feed fuel under pressure.

The camshaft is supported by two taper roller bearings and center bearing and is driven from the air compressor at half the engine speed.

Governor



(2) Spray condition

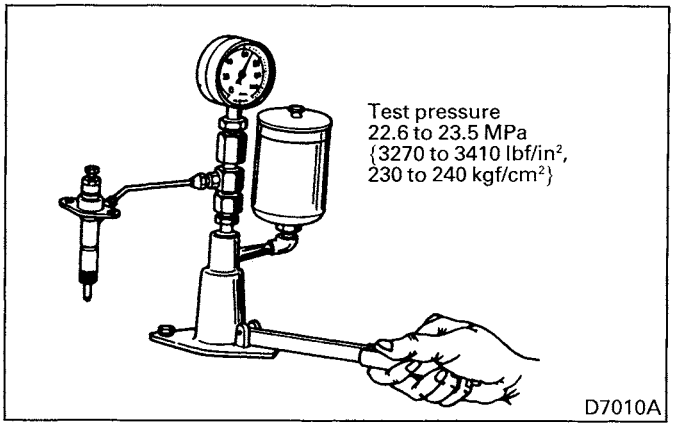


1. Evenly sprayed from five injection orifices
2. Even and symmetrical
3. Asymmetrical
4. Branched
5. Thin
6. Irregular

D7009A

When adjusting the pressure with a nozzle tester, check also for clogged injection orifices, spray condition, fuel leaks from the orifices. Replace the nozzle if defective.

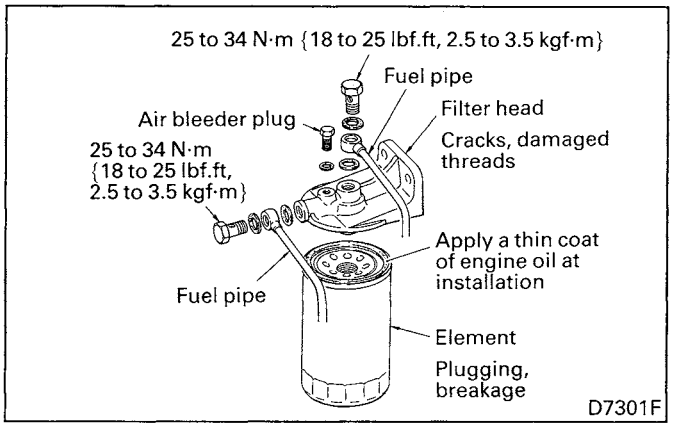
(3) Oil tightness test



Mount a nozzle, that has been adjusted to start injection at 22.6 to 23.5 MPa {3270 to 3410 lbf/in², 230 to 240 kgf/cm²}, to the nozzle tester and slowly increase the pressure to the test pressure. Keeping this condition, check for fuel leaks from the bottom of the nozzle. The nozzle is OK if there is no leak.

6.3 Fuel Filter

Disassembly and Reassembly

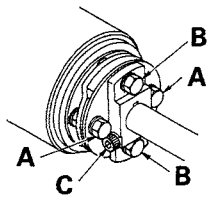


For installation, use your hand to tighten securely. After installation, run the engine to check for fuel leaks.

Unit: mm {in.}

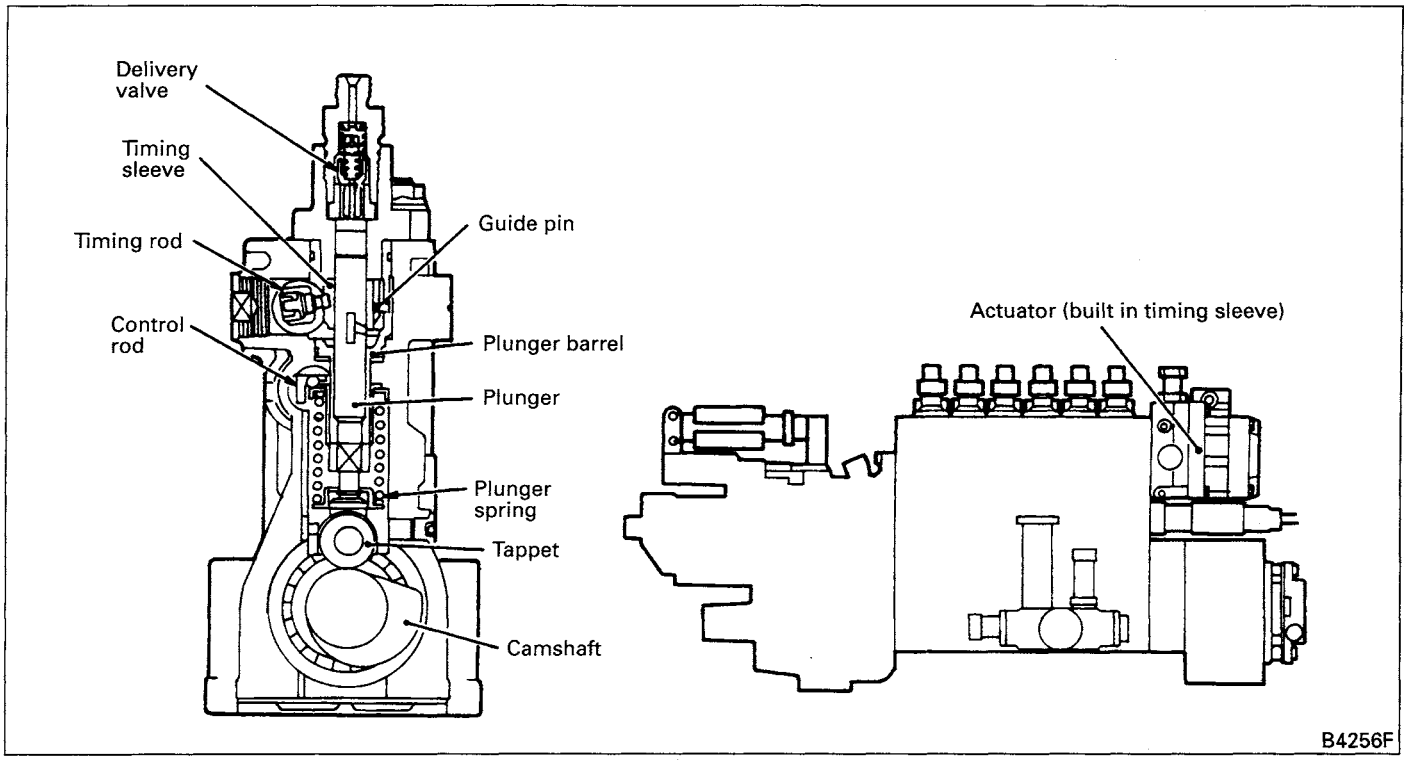
Maintenance item			Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Injection nozzle opening pressure			21.6 MPa {3130 lbf/in², 220 kgf/cm²}	–	Adjust
Accelerator pedal to stopper bolt clearance (with the accelerator pedal depressed)			5 ± 2 {0.20 ± 0.079}	–	Adjust
Fuel gauge unit resistance	Float position	E	150 ± 10 Ω	–	Replace
		1/2	50 ± 3 Ω	–	
		F	0 + 2 Ω	–	

3.2 Tightening Torque Table

Location tightened			Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Injection pump	Fuel pipe mounting eyebolt			20 to 29 {14 to 22, 2 to 3}
	Lubricating oil pipe mounting eyebolt	Oil feed		12 to 15 {8.7 to 11, 1.2 to 1.5}
		Oil return		20 to 29 {14 to 22, 2 to 3}
	Fuel leak-off pipe mounting cap nut			20 to 29 {14 to 22, 2 to 3}
	Boost hose mounting eyebolt			12 to 15 {8.7 to 11, 1.2 to 1.5}
Injection pipe flare nut			M14 x 1.5	29 to 49 {22 to 36, 3 to 5}
Injection pump bracket mounting bolt			M10 x 1.5	33 to 55 {25 to 41, 3.4 to 5.6}
Coupling	 B3401C	Bolt A		59 to 64 {43 to 47, 6 to 6.5}
		Bolt B		
		Bolt C		83 to 93 {61 to 69, 8.5 to 9.5}
Ne sensor lock nut				24 to 35 {17 to 26, 2.4 to 3.6}
Injection nozzle	Mounting bolt		M8 x 1.25	15 {11, 1.5}
	Leak-off pipe mounting bolt			9.8 to 15 {7.2 to 11, 1 to 1.5}
	Cap nut			39 to 49 {29 to 36, 4 to 5}
	Connector			69 to 78 {51 to 58, 7 to 8}
	Retaining nut			59 to 78 {43 to 58, 6 to 8}
Fuel filter	Fuel pipe mounting eyebolt		M14 x 1.5	25 to 34 {18 to 25, 2.5 to 3.5}
	Air bleeder plug		M8 x 1.25	7.8 to 12 {5.8 to 8.7, 0.8 to 1.2}
Water separator	Air vent plug		M8 x 1.25	7.8 to 12 {5.8 to 8.7, 0.8 to 1.2}
	Ring nut			5.9 to 7.8 {4.3 to 5.8, 0.6 to 0.8}
	Drain plug			2.9 to 3.9 {2.2 to 2.9, 0.3 to 0.4}
Fuel tank	Drain plug			59 to 98 {43 to 72, 6 to 10}
	Fuel tank strap mounting nut			12 to 15 {8.7 to 11, 1.2 to 1.5}

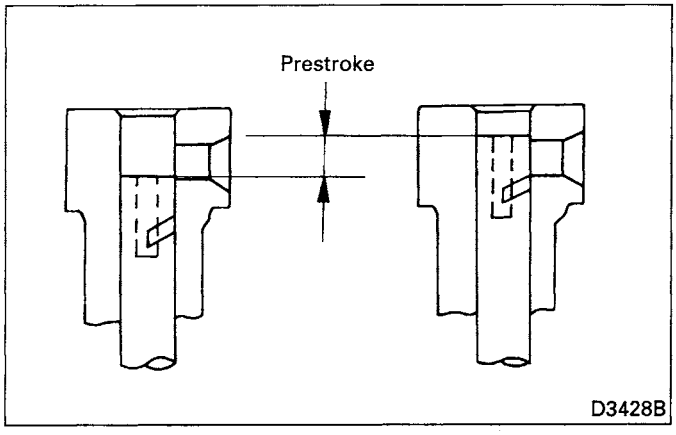
Injection Pump Proper

This injection pump controls the fuel injection timing by varying the plunger prestroke.



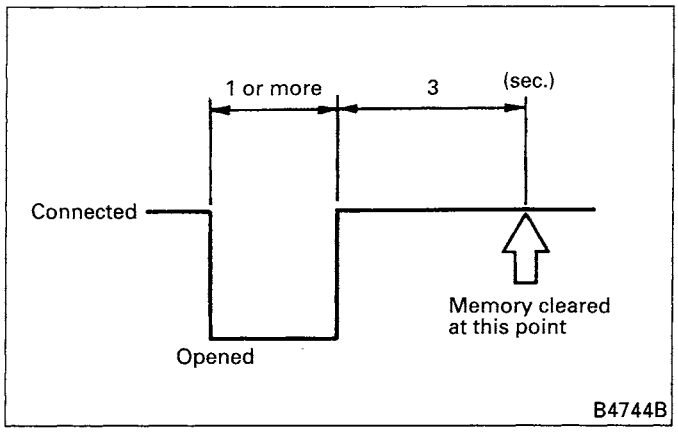
The injection pump is constructed as shown. The injection pump, unlike the conventional one, has prestroke varying mechanisms such as a timing sleeve, timing rod, actuator, etc. Inside the actuator, a timing sleeve position sensor is provided to detect the position of the timing sleeve. When the injection pump needs servicing, call your nearest Zexel service station.

(1) Prestroke



The prestroke refers to the stroke from the bottom dead center of the plunger to the point where the fuel begins to be fed under pressure. In the conventional injection pump, the prestroke is constant.

(c) Clearing DIAG codes



Disconnect and reconnect the memory clear switch. Then all the DIAG codes stored in the control unit will be cleared.

CAUTION

Be sure to use the memory clear switch in clearing the DIAG codes.

(4) DIAG code list

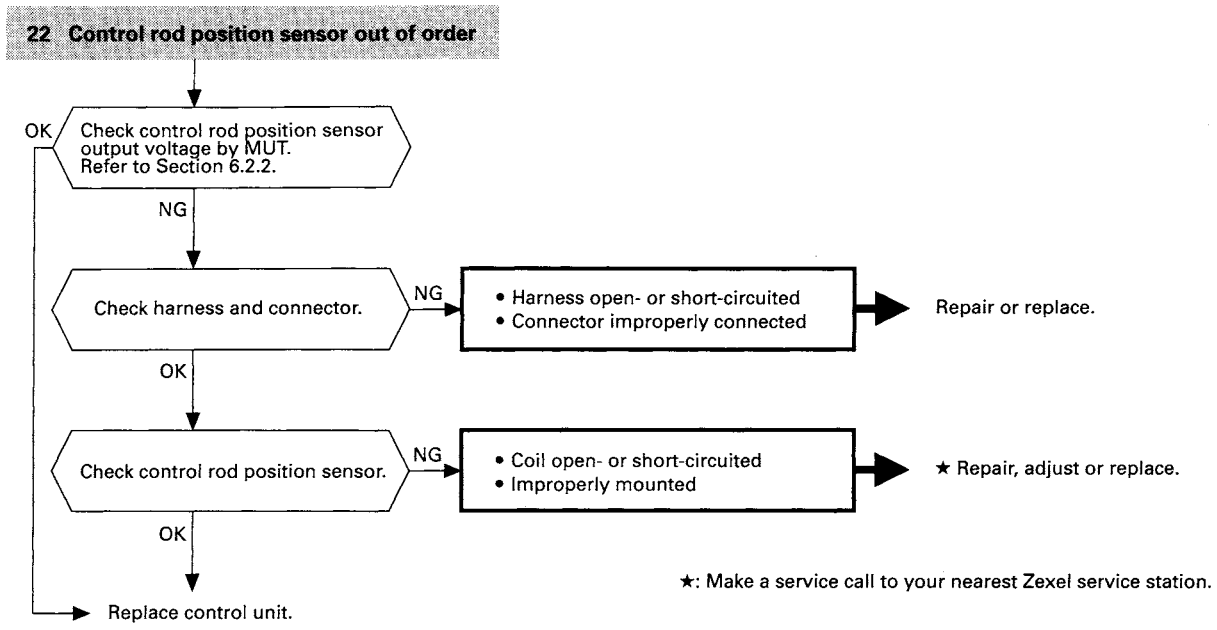
DIAG code	Where trouble is	Treatments by control unit in the event of trouble (Backup mode)	Sustained operation
01	Everything in order	—	○
03	Prestroke actuator	Provides control with compensation value as 0.	○
04	Prestroke power supply	Stops prestroke control.	×
05	Ne sensor (no pulse)	Provides control with engine speed as 0.	○
12	Prestroke actuator	Stops prestroke control.	×
13	Prestroke actuator (Timing sleeve position sensor)	Stops prestroke control.	×
15	Ne sensor (open-circuited)	Provides control with engine speed as 0.	○
21	Coolant temperature sensor	Fixes coolant temperature at 80°C {176°F}.	○
22	Control rod position sensor	Fixes control rod at full load position.	○
41	Boost temperature sensor	Fixes intake air temperature at 80°C {176°F}.	○

○: Allowed
x: Not allowed (However, a short period of operation is allowed for making repairs.)

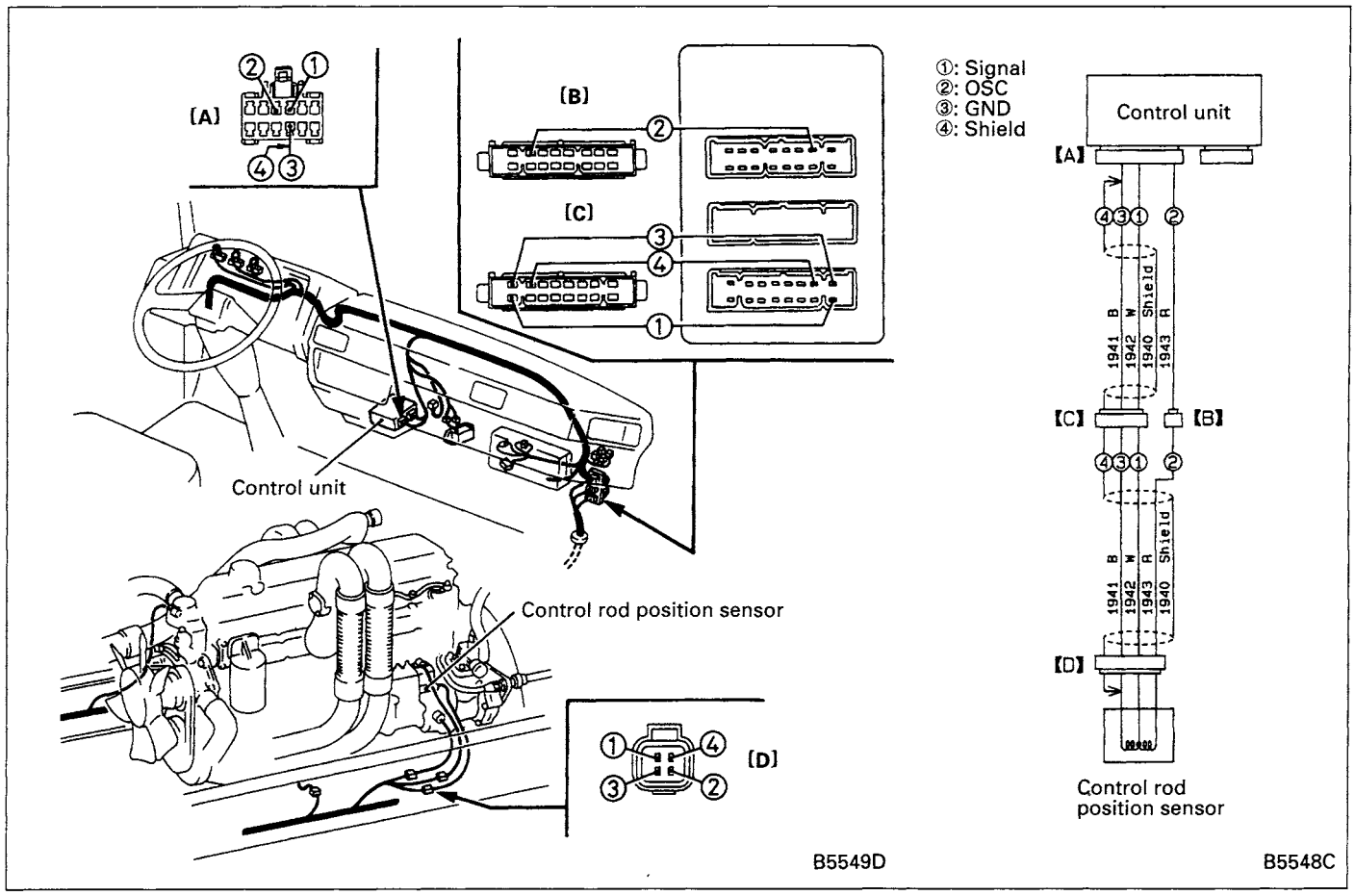
CAUTION

1. **Inspection operations are performed with the starter switch at the LOCK position as a rule, but some operations are performed with the starter switch at the ON position. In this case, use special care to prevent short circuits that may occur between pins of each connector and between the pins and body.**
2. **The resistance values of the individual components may not always fall within the nominal ranges, as they are affected by temperature and tester accuracy. The values shown in the text are those measured at room temperature (10 to 35°C {50 to 95°F}.)**

(8) Inspections to perform when code 22 is indicated

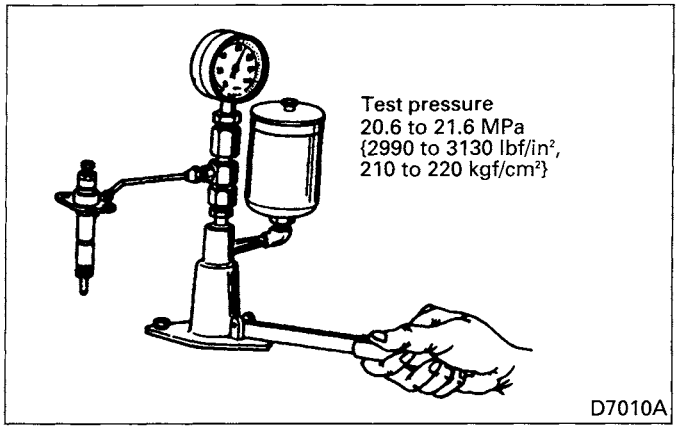


(a) Checking harness and connector



On the connectors shown, check pins ① through ④ for continuity between each of them and its counterpart at the other end of its harness. If there is anything wrong, repair or replace the harness or connector.

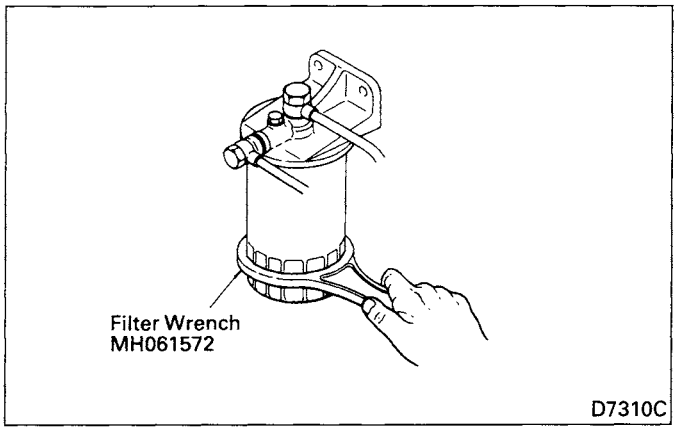
(3) Oil tightness test



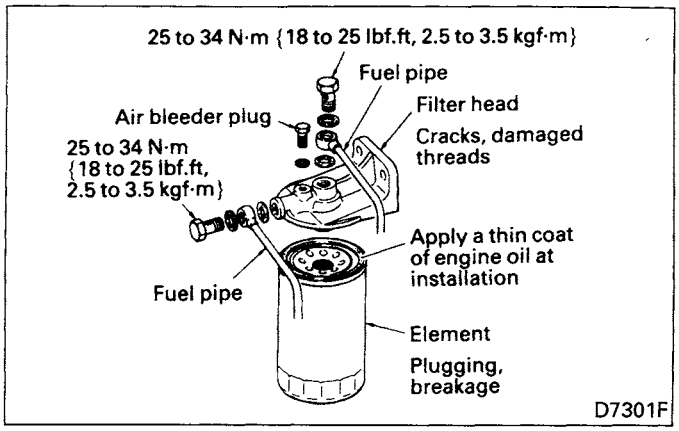
Mount a nozzle, that has been adjusted to start injection at 20.6 to 21.6 MPa {2990 to 3130 lbf/in², 210 to 220 kgf/cm²}, to the nozzle tester and slowly increase the pressure to the test pressure. Keeping this condition, check for fuel leaks from the bottom of the nozzle. The nozzle is OK if there is no leak.

6.4 Fuel Filter

Disassembly and Reassembly



For removal of the element, use the special tools, Filter Wrench.



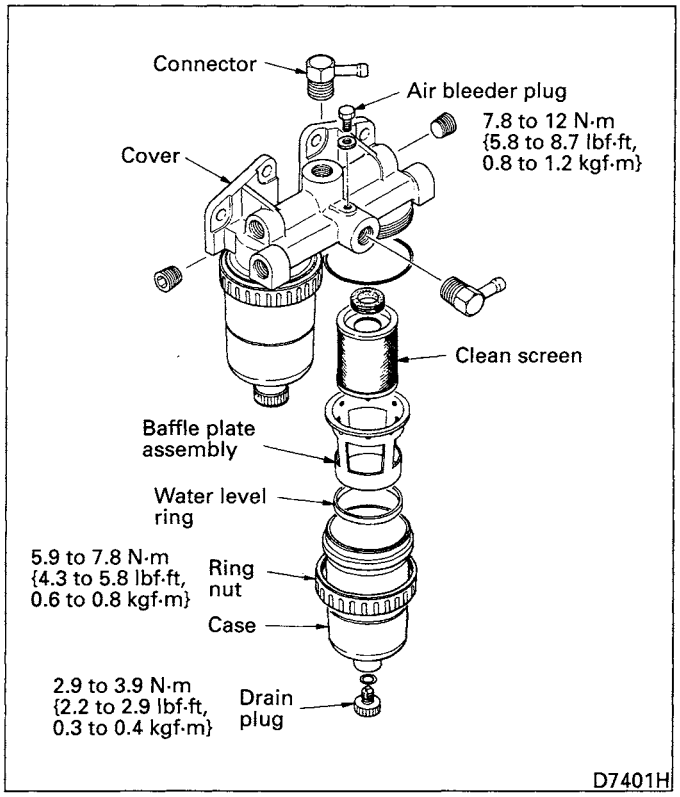
CAUTION

After installation, run the engine to check for fuel leaks.

For installation, turn the filter until its gasket comes in contact with the sealing surface, then give it additional 3/4 to 1 turn for tightening.

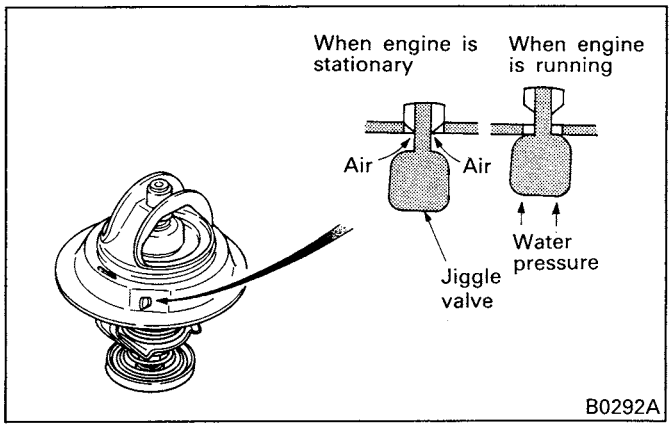
6.5 Water Separator

Disassembly and Reassembly



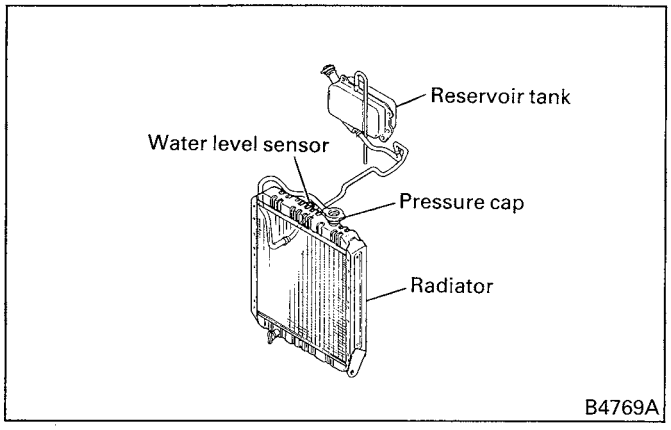
CAUTION

Since the connector must be oriented toward a predetermined direction when mounted, do not remove it unless it is defective.

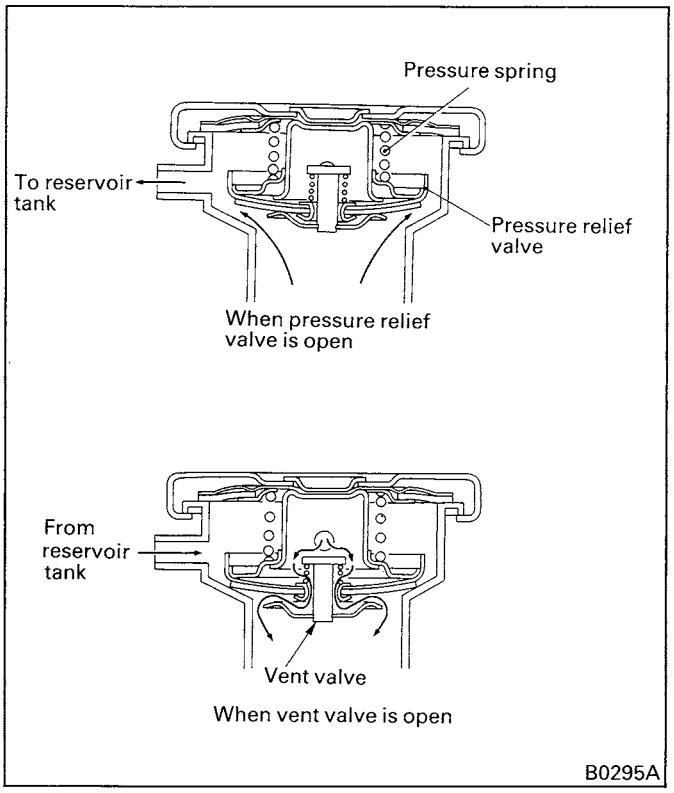


In the air purge hole of the thermostat, a jiggle valve is provided to raise the temperature of coolant earlier so that the car heater will provide earlier heating. The jiggle valve is in the lowered position under its own weight. When coolant is poured in, the air flows out through the clearance between the air purge hole and jiggle valve toward the radiator.
If the engine starts running, the coolant is caused to flow, and the jiggle valve forced up by the water pressure. The jiggle valve forced up stops up the air purge hole completely, thereby preventing outflow of coolant through the air purge hole.

(3) Radiator



The radiator is of the tube and corrugated fin type and equipped with a reservoir tank. The reservoir tank accommodates coolant overflow and prevents the introduction of air into the cooling system caused by coolant pressure fluctuations.
The upper part of the radiator is provided with a water level sensor which turns on the warning lamp on the instrument cluster when the coolant level drops below a certain limit.



The pressure cap is equipped with two types of pressure control valves; a pressure relief valve and a vent valve. The former opens when the pressure in the system rises above a predetermined level, overcoming the pressure spring tension and allowing the coolant to flow into the reservoir tank through the pipe and hose.
On the other hand, the latter opens when a drop in coolant temperature produces a negative pressure in the system, allowing the coolant to flow from the reservoir tank back into the radiator. Thus, the radiator is protected from deformation and the coolant level is kept constant.

Place the room heater temperature control knob in the maximum temperature position so that the room heater system can be cleaned at the same time.
The city water to be used should have the following properties.

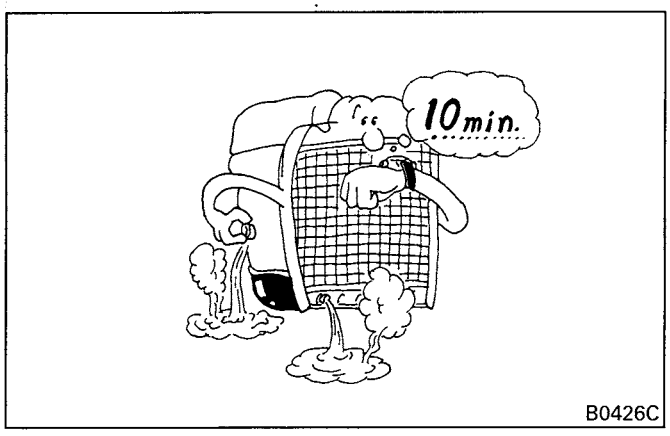
Required properties of city water

Total hardness	300 ppm or less
Sulfate SO_4^-	100 ppm or less
Chloride Cl^-	100 ppm or less
Total dissolved solids	500 ppm or less
PH	6 to 8

CAUTION

1. **Use a cleaning solution if the radiator is seriously obstructed or coolant is seriously contaminated.**
2. **When the cooling system is cleaned or washed with water, make sure that the coolant temperature is maintained at 90°C {194°F}; the coolant temperature below the valve opening temperature closes the thermostat, resulting in poor coolant circulation.**
3. **If a large amount of rust has already gathered, water leak tends to occur after cleaning and therefore every part should be checked very closely.**
4. **If the coolant temperature is still very high, never attempt to remove the pressure cap.**

(1) Washing with water



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(a) Remove the pressure cap, radiator drain plug, oil cooler drain plug and crankcase drain plug, reservoir tank, and drain out the coolant.

WARNING

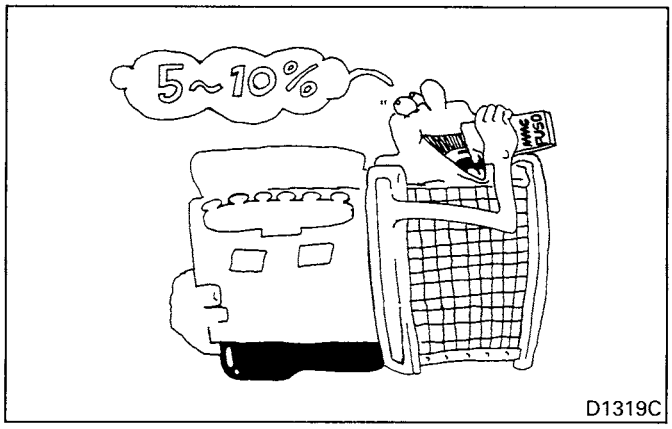
Never drain coolant unless it is cool. When hot, never loosen or remove the pressure cap.

(b) After draining the system, fill it with tap water (preferably hot water) and, with the water temperature kept at around 90°C {194°F}, run the engine at idel for about 10 minutes. Then, discharge water. Continue flushing until the drained water runs clear.

WARNING

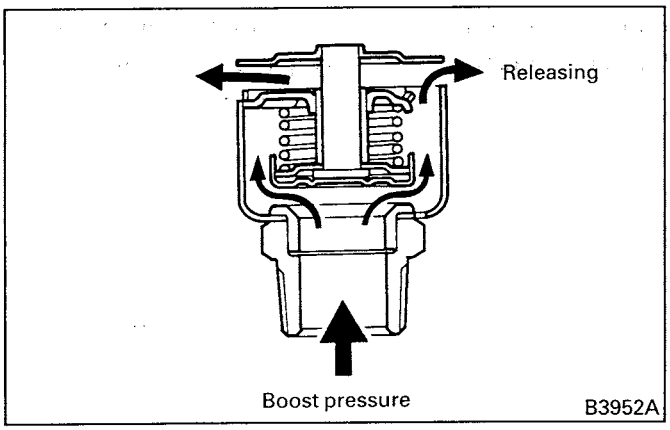
Radiator water will be extremely hot when being drained, so take care to avoid burns.

(2) Washing with cleaning solution (when radiator clogging or coolant contamination are serious)

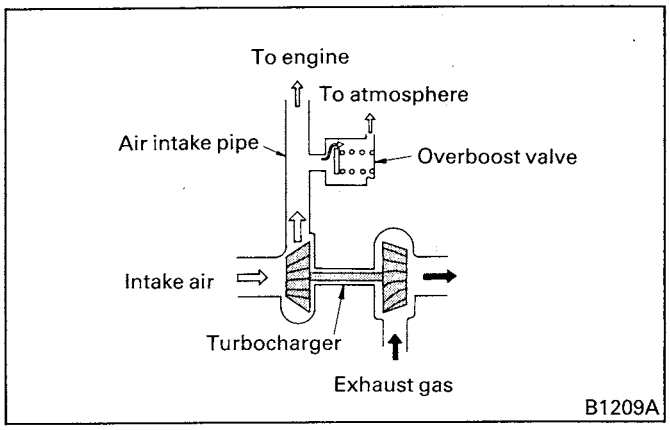


D1319C

(b) Overboost valve

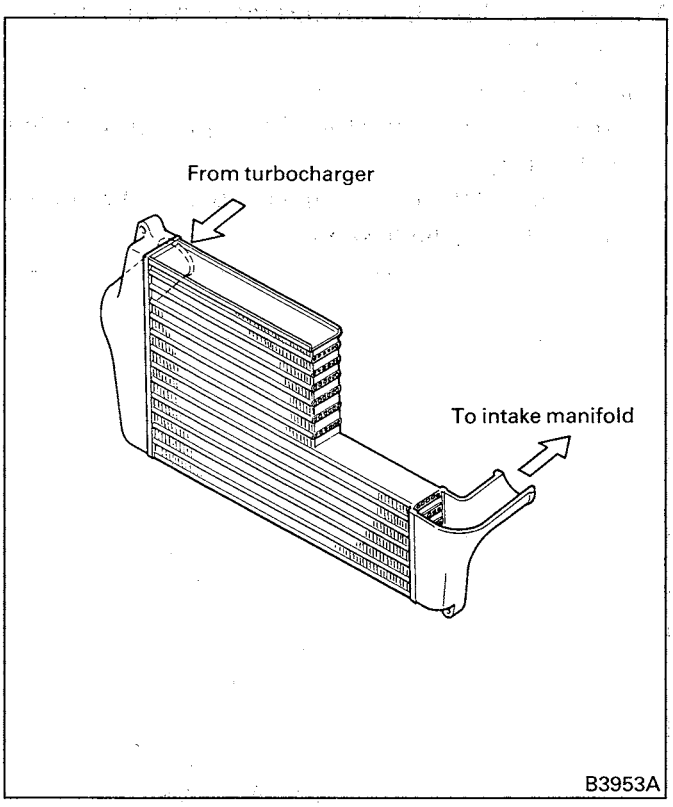


The overboost valve is installed to the air intake pipe. It is activated when the boost pressure builds up excessively; i.e., when the waste gate mechanism fails.



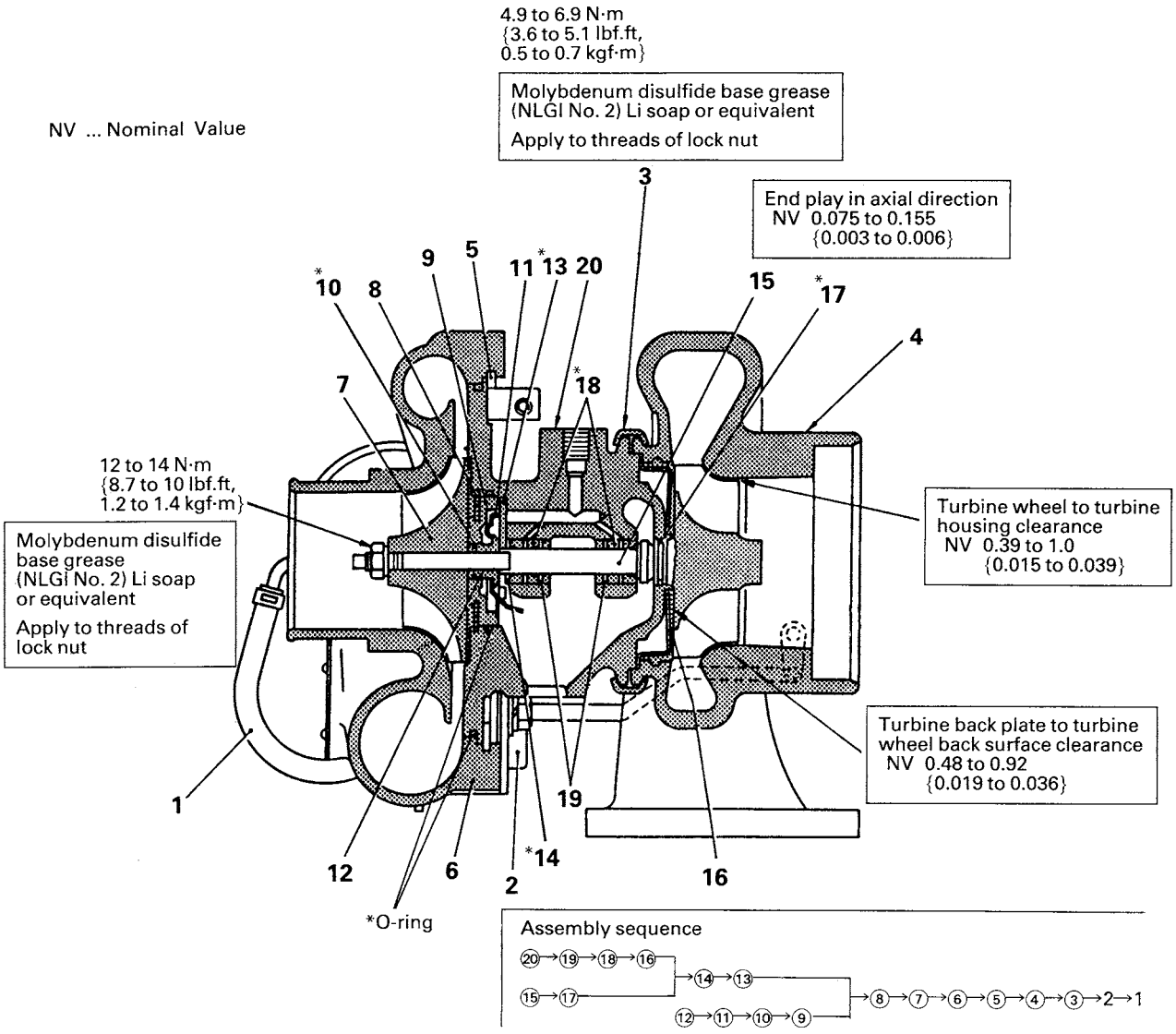
When the boost pressure in the air intake pipe exceeds the preset value, it pushes open the overboost valve, releasing the boost pressure to atmosphere. This effectively prevents excessive boost pressure from being applied to the engine.
While the overboost valve remains in the actuated state, a whistle can be heard. If it is heard, check and repair the turbocharger immediately.

(c) Intercooler



The intercooler is an air-to-air heat exchange system using a corrugated-fin heat exchanger installed in front of the radiator.
The system transfers heat from the intake air with temperature running high due to compression by the turbocharger to the atmosphere. The intake air is thus cooled down, which in turn increases its density. This allows more air to be drawn and more fuel to be injected, thereby improving combustion efficiency. It also results in greater fuel economy and power output, and reduced exhaust gases.

6.4.4 Reassembly



For parts with an encircled number, refer to Reassembly Procedure that follows.

*: Apply engine oil.

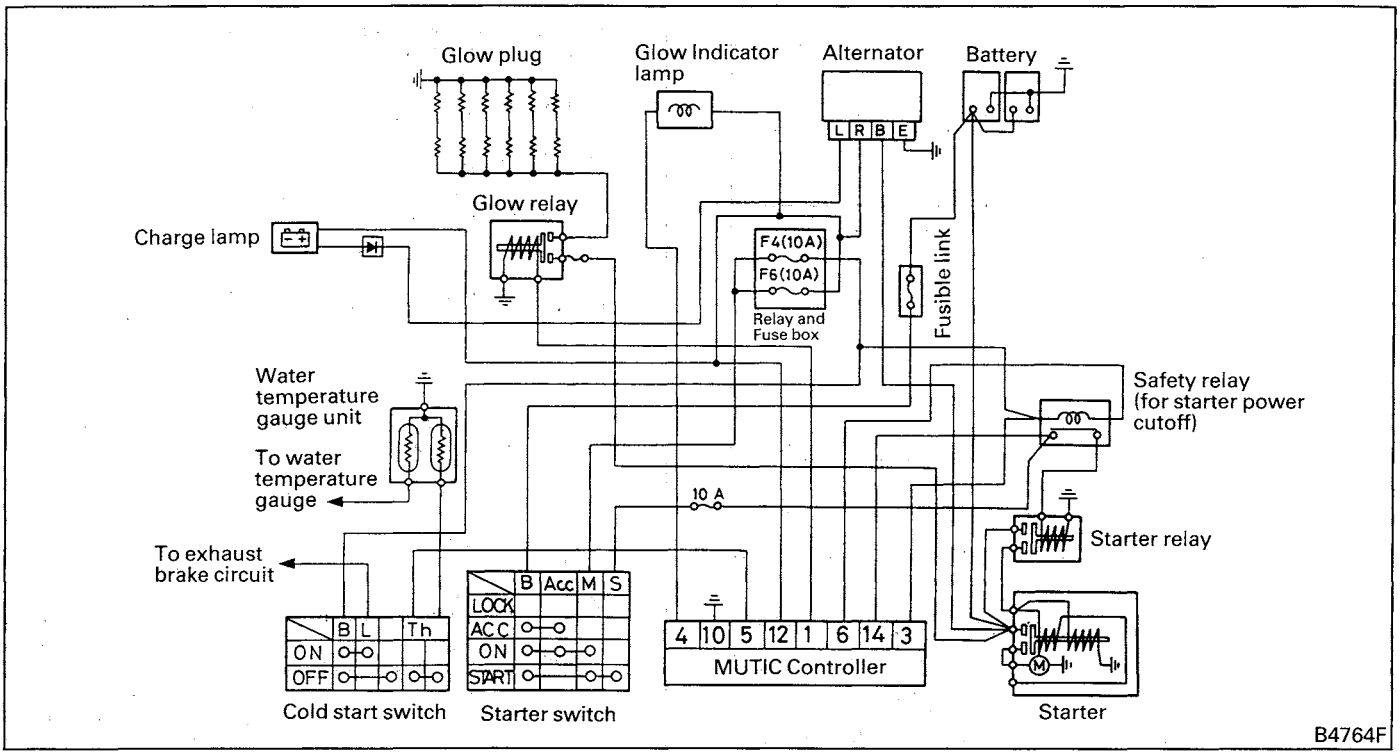
C9013C

Symptom	Probable cause	Remedy	Ref. group
Charge lamp does not come on when engine is stopped (starter switch ON)	Defective regulator	Replace	
Poor engine start	Improperly connected connector, open-circuited harness	Repair	
	Blown fuse, fusible link	Replace	
	Improperly connected connecting plate	Repair	
	Defective glow plug	Replace	
	Defective water temperature gauge unit	Replace	
	Defective MUTIC controller	Replace	

2. SPECIFICATIONS

Item		Specification
Voltage – Polarity		12V – Negative ground (Mitsubishi Electric product)
Starter	Type	Electromagnetic push-in type reduction drive starter
	Model	M5T65071
	Output	12V – 5.5 kW
	Reduction gears	Single reduction internal teeth spur gear
Alternator	Type	Brushless alternator with built-in IC regulator
	Model	A4T25688
	Output	12V – 80A
Glow plug	Type	Sheathed type
	Voltage – Current	11V – 5.5A
Glow relay	Fuse capacity	127A

4.3 Glow System



The glow system consists of the water temperature gauge unit, MUTIC controller, glow indicator lamp, starter switch, cold start switch, glow plug, glow relay, and other components.

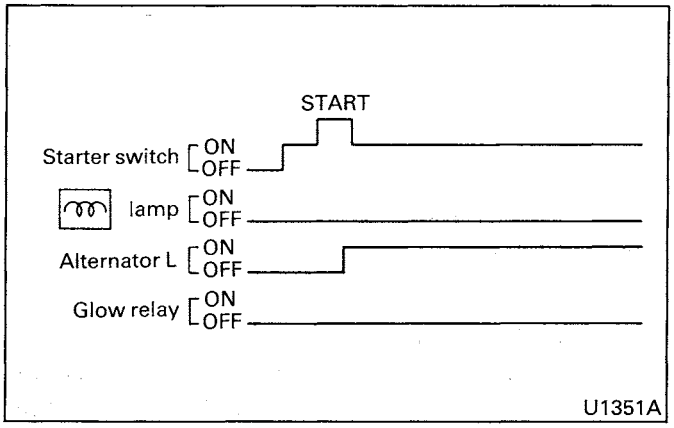
(1) MUTIC controller

The following paragraphs describe the glow plug control function of the MUTIC controller.

<Operating mode>
The basic operation.

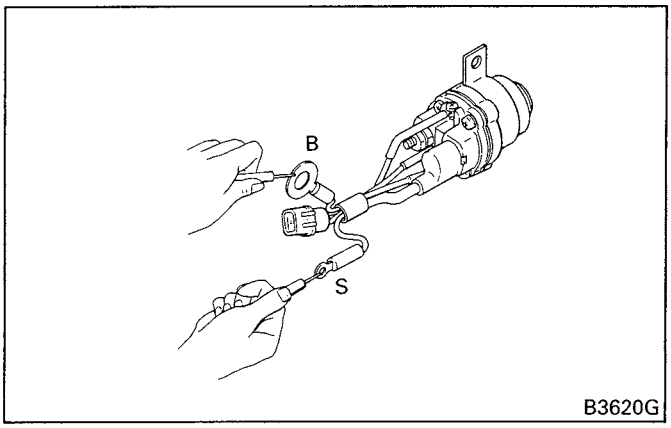
(a) The normal start is with a water temperature of about 60°C {140°F} or higher.

When the starter switch is turned ON, the MUTIC controller regulates the preheat time according to the engine coolant temperature which is detected by the water temperature gauge unit.

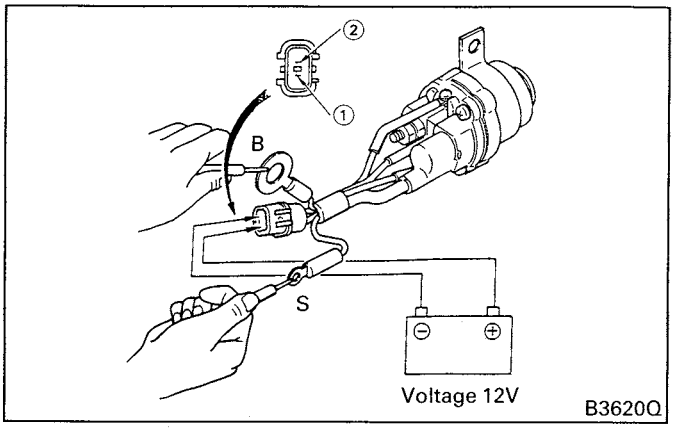


When the water temperature exceeds about 60°C {140°F}, the glow relay does not energize even when the starter switch is turned ON.

(10)Inspection of starter relay



(a) Check to see if there is no continuity between B and S terminals. If there is, replace the starter relay.

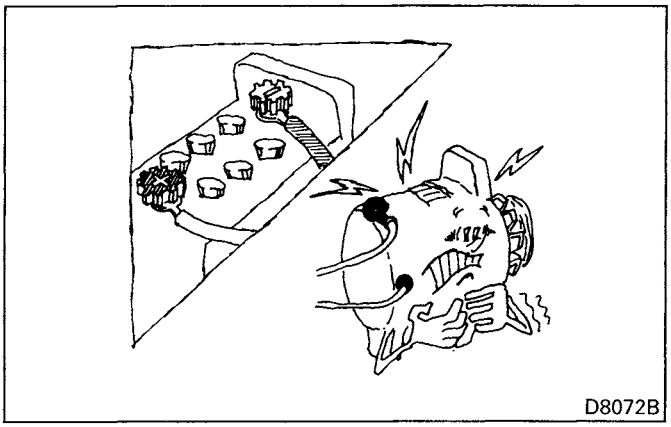


(b) Apply battery voltage to terminals ① and ② of the connector and check for continuity across terminals B and S. If there is no continuity, replace the starter relay.

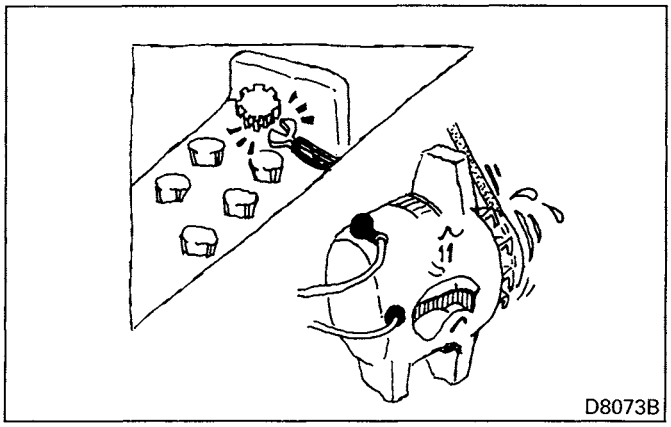
5.2.5 Inspection and adjustment after installation

(1) Handling precautions

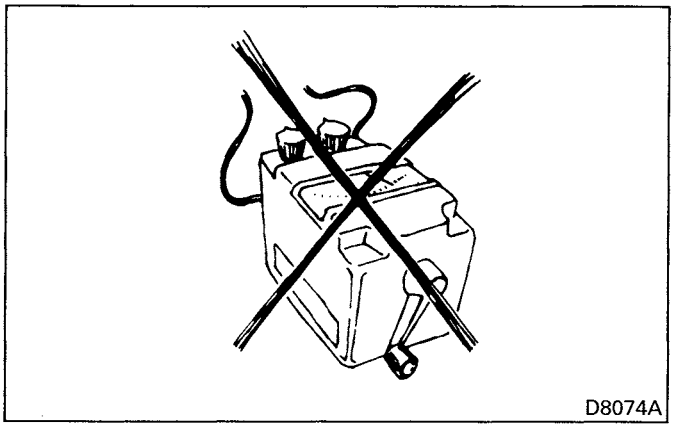
When servicing the alternator, observe the following precautions.


D8072B

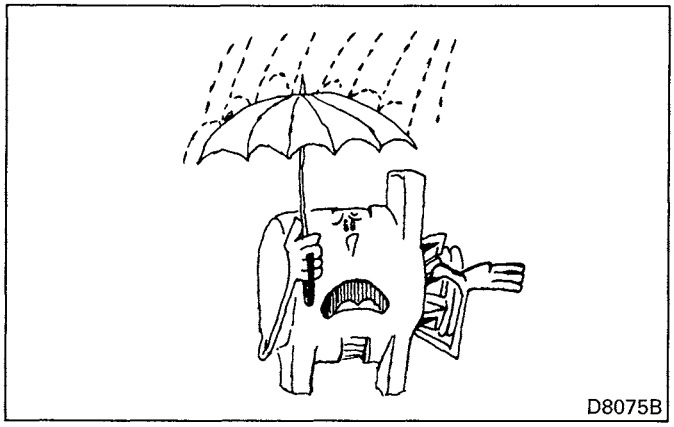
(a) Never connect the battery reversely.
If the polarity of the battery is reversed when connections are made, a large current flows from the battery to alternator, damaging the diode and IC regulator.


D8073B

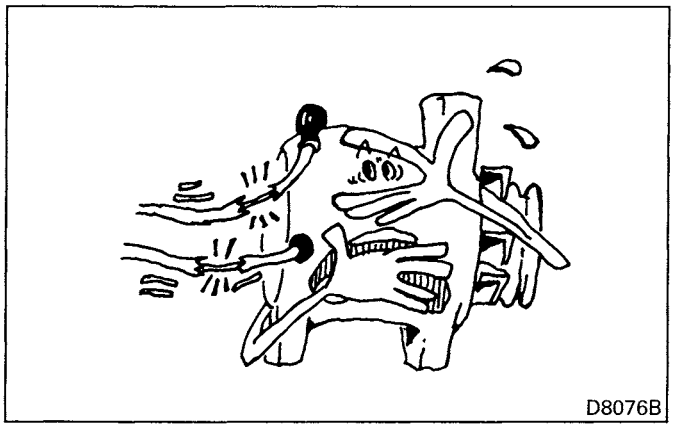
(b) Do not disconnect the battery terminal connections while the engine is running, or a surge voltage develops deteriorating the diode and regulator.


D8074A

(c) Do not use a megger or other high-voltage multi-meter, or damaged diode and regulator will result.


D8075B

(d) Do not expose the alternator to the water. If the alternator is exposed to water, short-circuit may result, causing damaged alternator.


D8076B

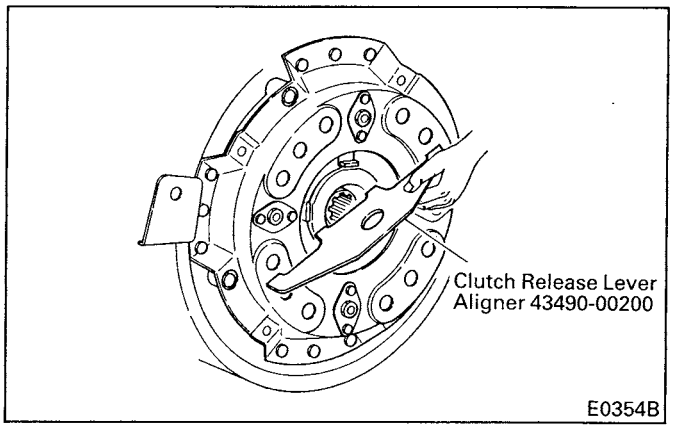
(e) Operating the alternator with its "B" and "L" terminals shorted results in the damaged diode trio.

2. SPECIFICATIONS

Unit: mm {in.}

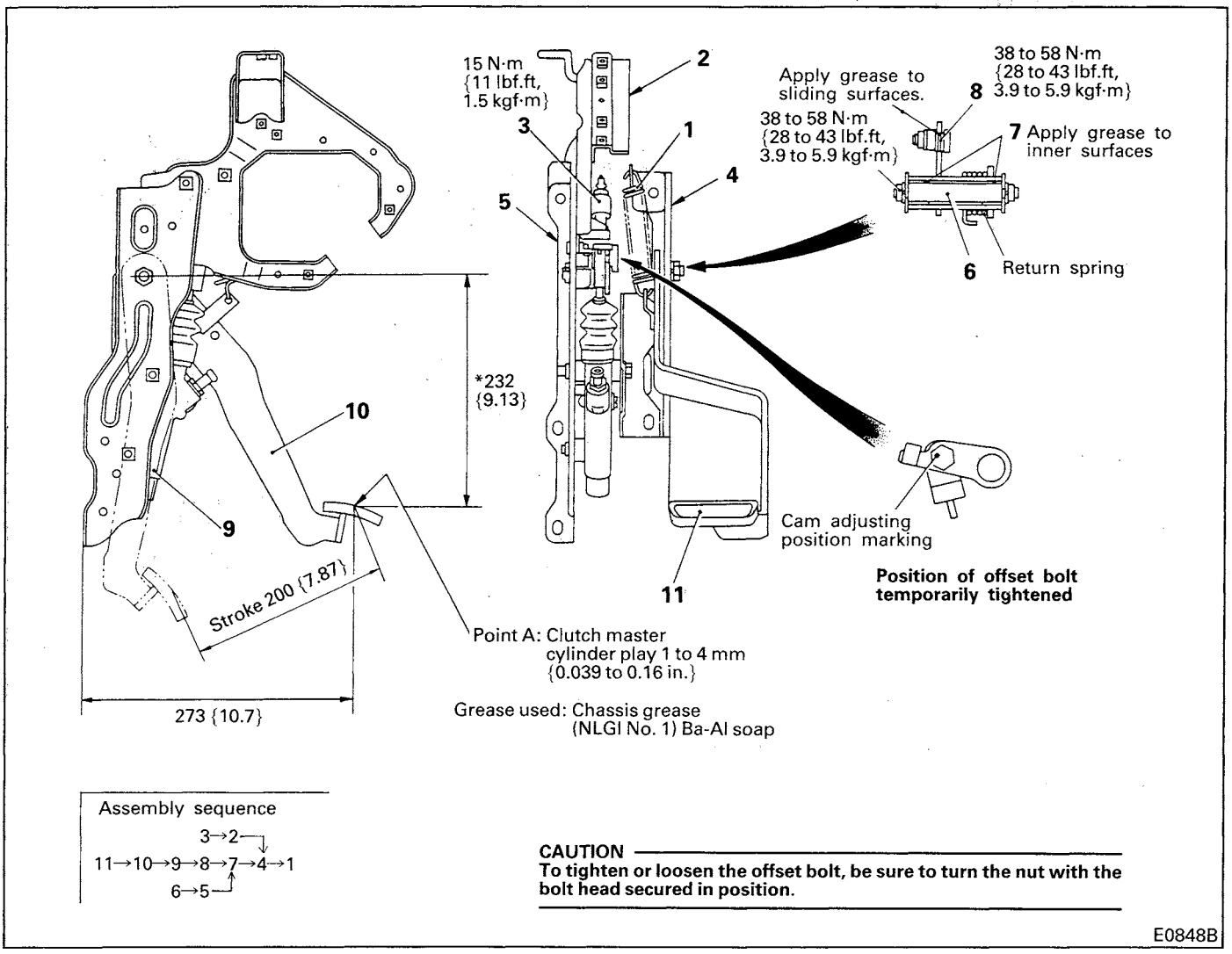
Item \ Vehicle model		FK417, FK457 FM557 <6D16-T4>	FM557 <6D16-T2>
Model		C6M35	C7M38
Drive system		Strap drive	
Clutch disc type		Single dry plate	
Facing material O.D. x I.D.		Cerametallix	
		350 x 240 {13.8 x 9.45}	375 x 228 {14.8 x 8.98}
Pressure plate		Coil spring type	
Control system		Hydraulic control with optional booster	
Clutch pedal maximum stroke		200 {7.87}	
Master cylinder	Manufacturer	Nippon Air Brake	
	Diameter x stroke	15.87 x 35 {0.62 x 1.38}	
Clutch power cylinder (except vehicles with M8S2X5 transmission)	Manufacturer	Nippon Air Brake	
	Diameter x stroke	19.05 x 35 {0.75 x 1.38}	
Clutch booster (vehicles with M8S2x5 transmission) Manufacturer		JIDOSHA KIKI CO. LTD	
Power cylinder diameter		70 {2.76}	
Power piston stroke		35 {1.38}	
Hydraulic cylinder diameter		19.05 {0.75}	
Hydraulic piston stroke		35 {1.38}	
Efective diaphragm diameter		27 {1.06}	
Relay valve piston	Diameter x stroke	14.3 x 3.5 {0.56 x 0.14}	

(c) Inspection of release lever plate height (only when the clutch disc is replaced)



To check the height of clutch cover and release lever plate, use the special tool, Clutch Release Lever Aligner.
For adjustment, refer to Item (3), Section 6.1.3.

<Vehicles with clutch booster>



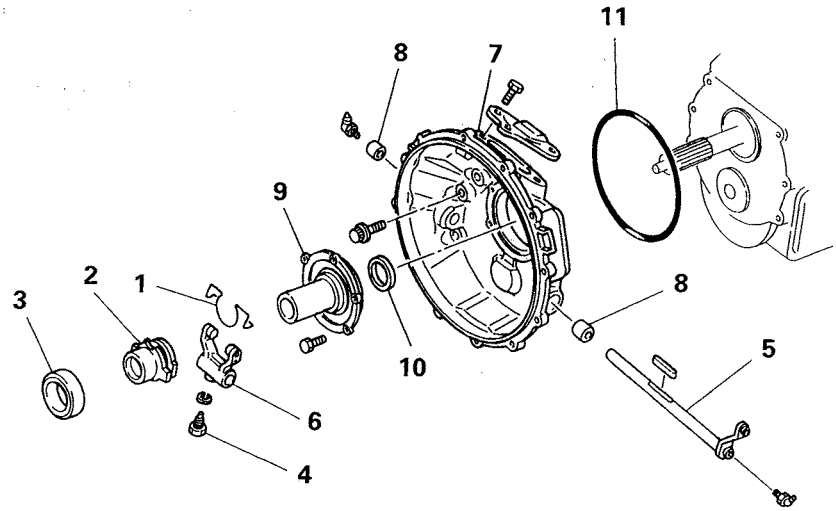
Reassembly and Adjustment Procedure

(1) Adjust with the clutch switch to obtain the dimension marked with *. At this time, temporarily tighten the offset bolt to the position shown.

(2) Turn the offset bolt so that the play in the end of clutch pedal (at point A) is 1 to 4 mm {0.039 to 0.16 in.}. This adjusting procedure will provide a clearance of 0.1 to 0.8 mm {0.0039 to 0.031 in.} between the piston and push rod of the clutch master cylinder.

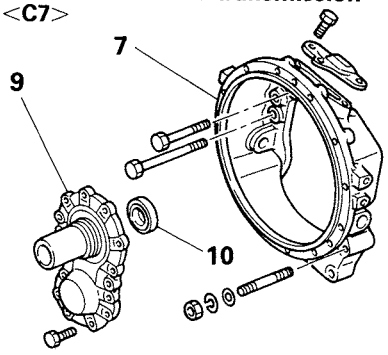
6.6 Clutch Housing

6.6.1 Disassembly



E0710D

Vehicles with M8S transmission <C7>



E0850B

Disassembly sequence

1 Return spring
2 Clutch shifter
3 Clutch release bearing
4 Release fork set screw
5 Release for shaft
6 Clutch release fork
7 Clutch housing
8 Needle roller bearing
9 Bearing retainer
10 Oil seal
11 O-ring <C6 only>

CAUTION
Do not remove the clutch release bearing, needle roller bearing, and oil seal unless defects are evident.

E0710D

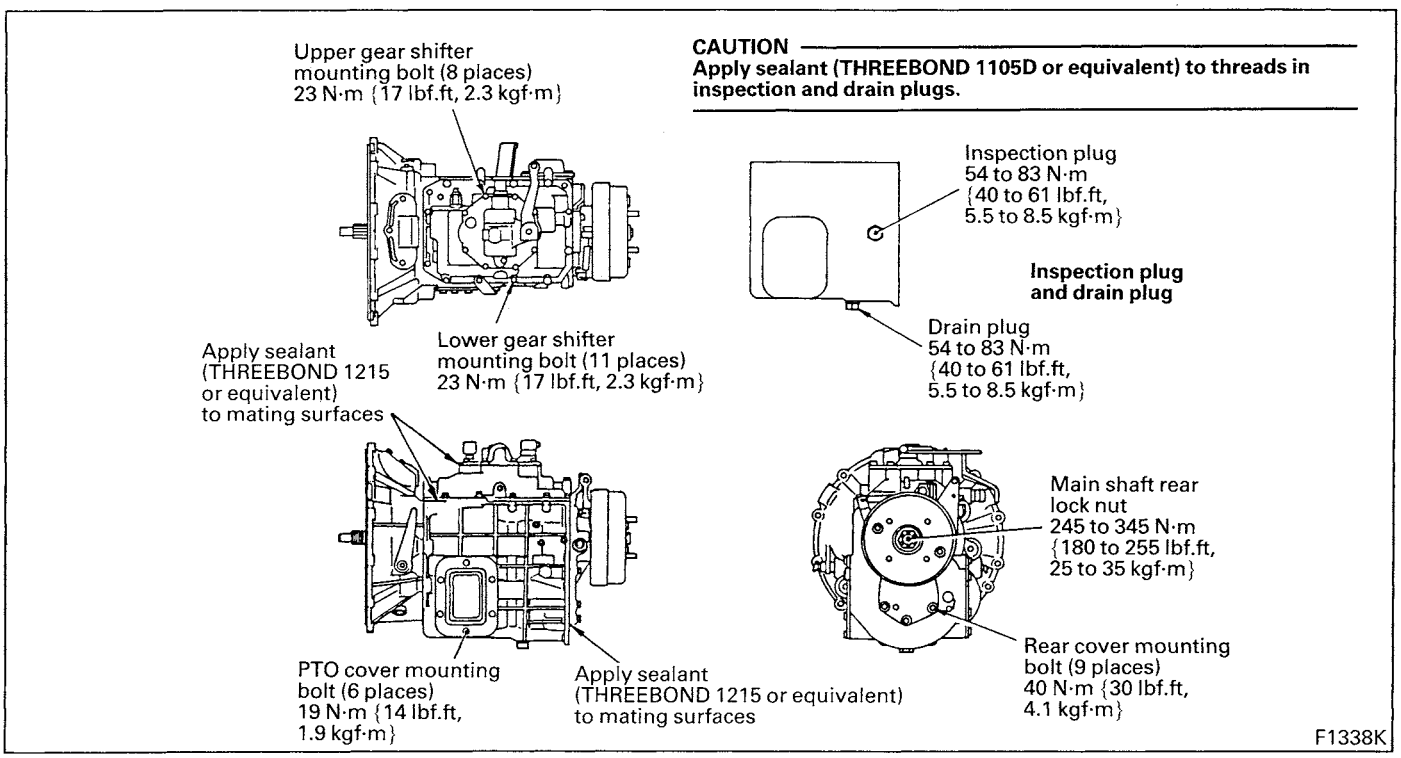
3. SERVICE STANDARDS

3.1 Service Standards Table

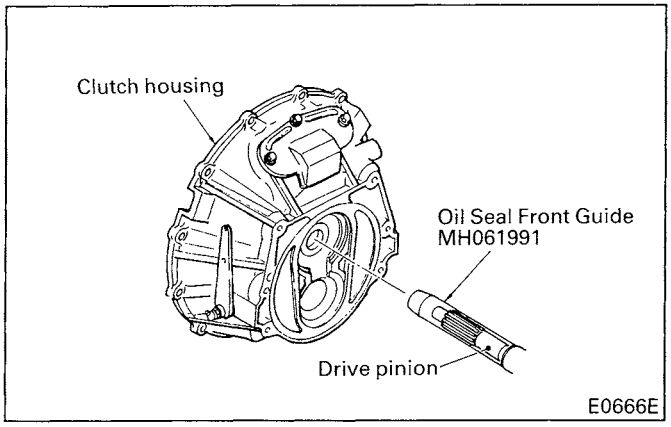
Unit: mm {in.}

Maintenance item			Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Backlash	1st gear		0.08 to 0.20 {0.0031 to 0.0079}	0.5 {0.02}	Replace Check for damaged tooth surface
	2nd gear		0.08 to 0.20 {0.0031 to 0.0079}		
	3rd gear		0.09 to 0.21 {0.0035 to 0.0083}		
	4th gear		0.09 to 0.21 {0.0035 to 0.0083}		
	5th gear (drive pinion and constant-mesh gear)		0.04 to 0.17 {0.0016 to 0.0067}		
	Reverse gear	Counter shaft	0.08 to 0.20 {0.0031 to 0.0079}		
		Main shaft	0.09 to 0.21 {0.0035 to 0.0083}		
End play	1st gear (main shaft)		0.15 to 0.35 {0.0059 to 0.014}	0.5 {0.02}	Replace gear or washer
	2nd gear (main shaft)				
	3rd gear (main shaft)				
	4th gear (main shaft)		0.25 to 0.40 {0.0098 to 0.016}		
	Reverse gear (main shaft)		0.15 to 0.35 {0.0059 to 0.014}		
	Reverse gear (reverse gear shaft)		0.2 to 0.9 {0.0079 to 0.035}	1.2 {0.047}	
Play in diametric direction after assembly of reverse gear needle bearing			–	0.12 {0.0047}	Replace defective parts
Main shaft	Play in diametric direction after assembly of pilot bearing		–	0.12 {0.0047}	Replace defective parts
	Synchromesh key type	Synchronizer ring keyway to shifting key clearance	4.75 to 4.95 {0.187 to 0.195}	5.8 {0.23}	Replace (–mark indicates interference)
		Synchronizer hub keyway to shifting key clearance	0.05 to 0.20 {0.002 to 0.0079}	0.5 {0.02}	
		Play between synchronizer hub and main shaft in diametric direction	–0.006 to 0.088 {–0.00024 to 0.0035}	0.2 {0.0079}	
		Play between synchronizer hub and synchronizer sleeve in diametric direction	0.052 to 0.148 {0.002 to 0.0058}	0.3 {0.012}	
		Synchronizer ring to main shaft 4th gear assembly gear cone clearance	1.45 to 1.85 {0.057 to 0.073}	0.2 {0.0079}	
	Synchromesh pin type	2nd and 3rd synchronizer assembly synchronizer ring to main shaft 3rd/2nd gear assembly synchronizer cone clearance	0	1.5 {0.059}	Replace (–mark indicates interference)
		Play between 2nd and 3rd synchronizer assembly and 2nd and 3rd synchronizer hub in diametric direction	0.052 to 0.148 {0.002 to 0.0058}	0.3 {0.012}	
		Play between 2nd and 3rd synchronizer hub and main shaft in diametric direction	–0.005 to 0.107 {–0.0002 to 0.0042}	0.2 {0.0079}	

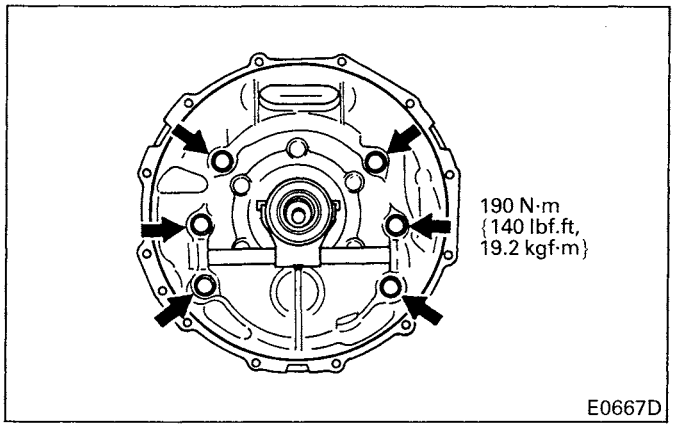
6.2.2 Reassembly



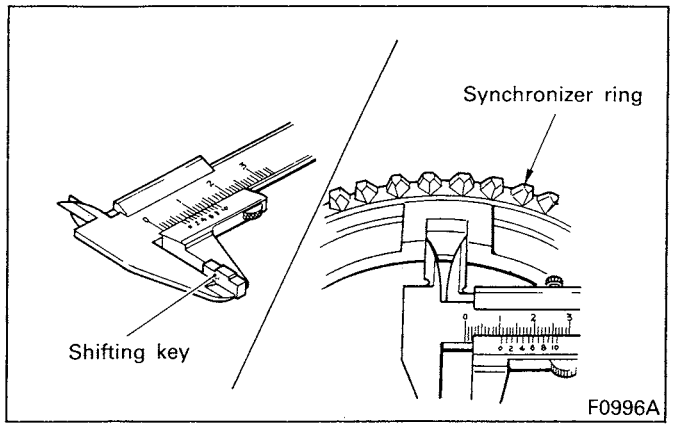
Reassembly Procedure



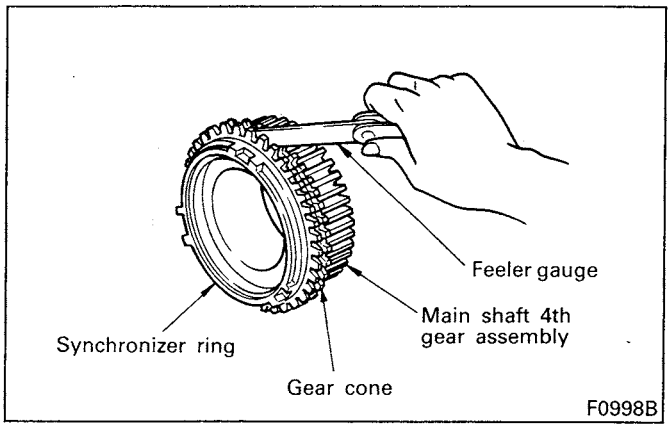
(1) To mount the clutch housing to the transmission case, install the special tool, Oil Seal Front Guide, to the drive pinion.



(2) Tighten the clutch housing mounting bolts in diagonal order and uniformly, and finally tighten to specified torque.



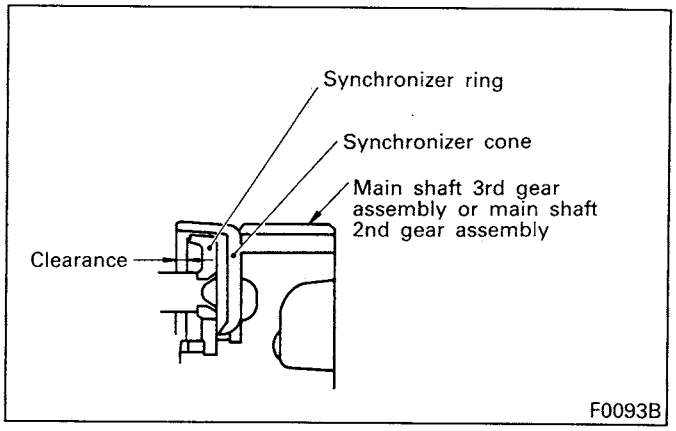
(3) Measure the synchronizer ring keyway width and shifting key width to calculate the clearance between the two. If the limit is exceeded, replace parts.



(4) Measure the clearance between the synchronizer ring and the gear cone of main shaft 4th gear assembly. If the clearance exceeds the limit, replace parts.

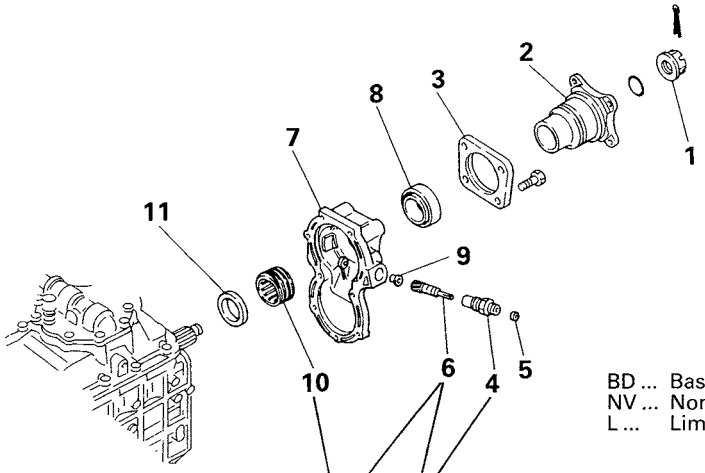
CAUTION

Press synchronizer ring evenly and take measurement throughout the entire circumference.



(5) Measure the clearance between the synchronizer ring of 2nd and 3rd synchronizer assembly and the synchronizer cone of main shaft 3rd/2nd gear assembly.
Replace parts if the clearance exceeds the limit.

<FM series>



Disassembly sequence

1. ① Lock nut
2. Companion flange
3. Dust cover
4. Speedometer gear bushing
5. Oil seal
6. ⑥ Speedometer gear
7. Rear cover
8. Oil seal
9. Speedometer gear bushing A
10. Speedometer worm
11. Washer

BD ... Basic Diameter
NV ... Nominal Value
L ... Limit

Backlash
NV 0.13 to 0.29 {0.0051 to 0.011}
L 0.36 {0.014}

Clearance
BD 12 {0.47}
NV 0.02 to 0.07 {0.00079 to 0.0028}
L 0.15 {0.0059}

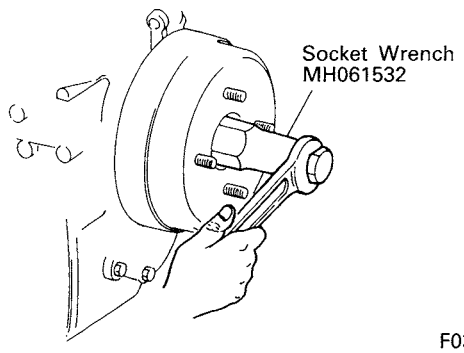
For parts with an encircled number, refer to Disassembly and Inspection Procedure that follows.

CAUTION
Do not remove the oil seal and speedometer gear bushing A unless for replacement.

F0467C

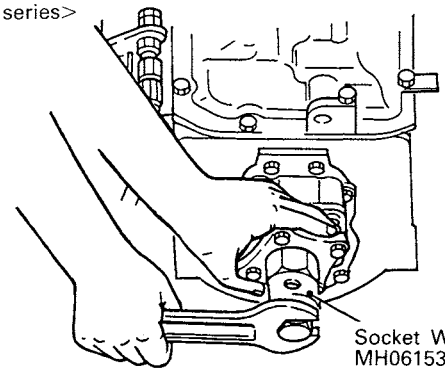
Disassembly Procedure

<FK series>



F0310A

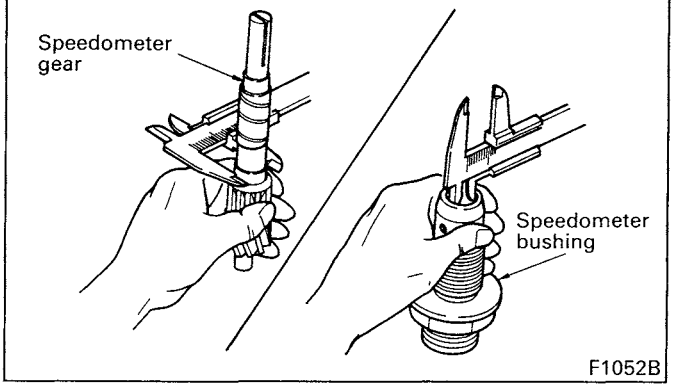
<FM series>



F0427A

Using the special tool, Socket Wrench, remove the lock nut.

Inspection Procedure



F1052B

Measure the speedometer gear shaft O.D. and speedometer gear bushing I.D. to calculate the clearance between the two. Replace parts if the clearance exceeds the limit.

2.2 Transmission Control

Unit: mm {in.}

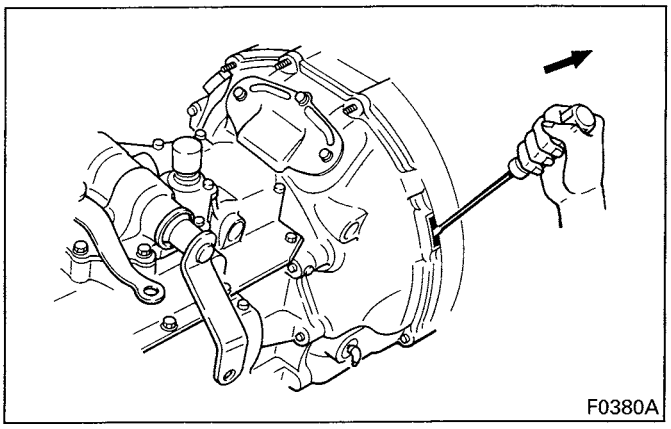
Item \ Type			M8S6	M8S2x5
Power shift	Manufacturer		JIDOSHA KI KI CO.,LTD 654-01009	JIDOSHA KI KI CO.,LTD 654-01006
	Power cylinder	Diameter	50 {1.97}	
		Stroke	±18 {±0.71}	
	Shifter rod	Diameter	34 {1.34}	
	Reaction chamber	Stroke	24 {0.94}	
Control system			Floor change, remote control type	

3. SERVICE STANDARDS

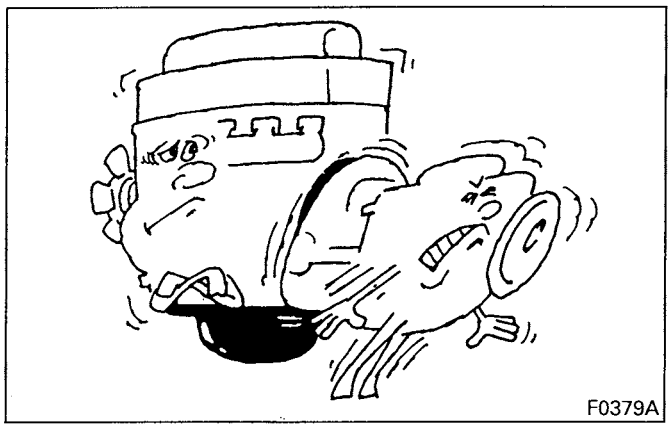
3.1 Service Standards Table

Unit: mm {in.}

Maintenance item			Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Gear backlash (main shaft, counter shaft, and reverse gears)	1st gear		0.08 to 0.27 {0.0031 to 0.011}	0.5 {0.02}	Check for damaged tooth surface Replace, if any
	2nd gear		0.08 to 0.25 {0.0031 to 0.0098}		
	3rd gear		0.08 to 0.27 {0.0031 to 0.011}		
	4th gear				
	5th gear (drive pinion and constant-mesh gear), 6th gear <M8S6>				
	Rev. gear	Main shaft	0.09 to 0.28 {0.0035 to 0.011}		
		Counter shaft	0.08 to 0.25 {0.0031 to 0.0098}		
Main shaft gear end play	1st gear		0.15 to 0.55 {0.0059 to 0.022}	0.75 {0.030}	Replace gear or washer
	2nd gear		0.15 to 0.60 {0.0059 to 0.024}	0.80 {0.031}	
	3rd gear		0.25 to 0.55 {0.0098 to 0.022}	0.75 {0.030}	
	4th gear		0.25 to 0.40 {0.0098 to 0.016}	0.60 {0.024}	
	Rev. gear		0.15 to 0.65 {0.0059 to 0.026}	0.85 {0.033}	
Counter shaft gear end play	6th gear <M8S6>		0.25 to 0.40 {0.0098 to 0.016}	0.60 {0.024}	Replace gear
6th gear portion <M8S6>	6th shift rail B bend		0.025 {0.00098} or less	0.05 {0.002}	Replace
	6th gear shift rail C bend		0.015 {0.00059} or less	0.03 {0.0012}	Replace
	6th gear shift to synchronizer sleeve side clearance		0.25 to 0.45 {0.0098 to 0.018}	1.0 {0.039}	Replace
	Synchronizer hub key groove to shifting key clearance		0.05 to 0.35 {0.002 to 0.014}	0.5 {0.02}	Replace
	Synchronizer hub groove to synchronizer ring clearance		4.7 to 5.3 {0.19 to 0.21}	6.5 {0.26}	Replace

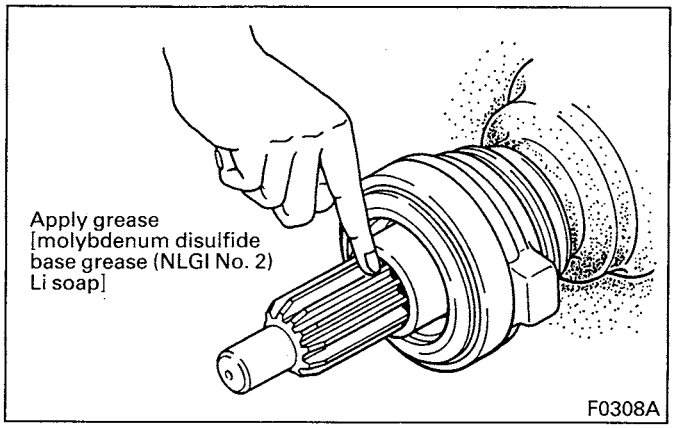

F0380A

(6) Support the transmission proper with a jack. Then, loosen the clutch housing attaching bolts to separate the transmission from the engine. There are grooves at three locations in the clutch housing provided for easy removal of the transmission. To remove, insert a screwdriver into the grooves.


F0379A

(7) Move the transmission rearward until the drive pinion splines (the input shaft on the M8S2x5 transmission) come out of position. Never jerk the transmission.

6.1.2 Key points for installation

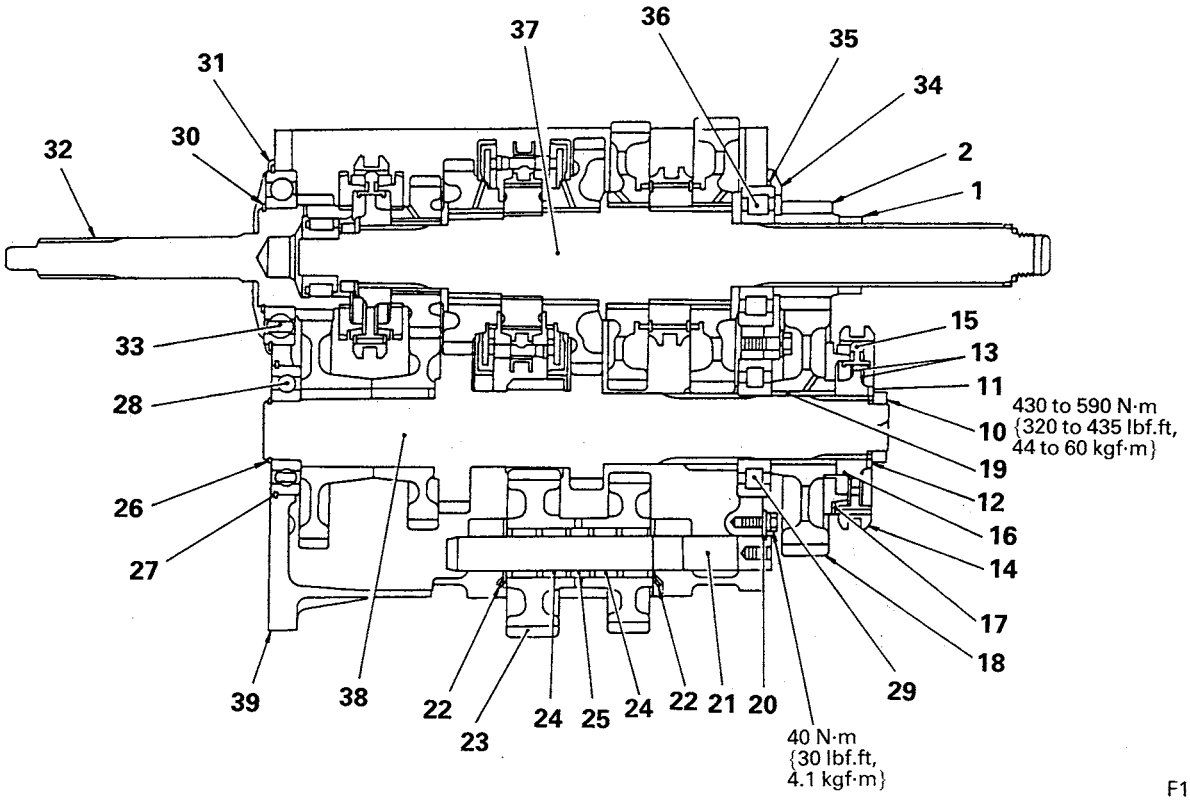


F0308A

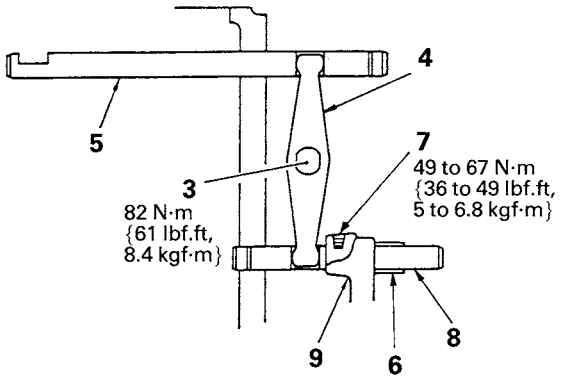
(1) Check the drive pinion splines for rust. If rust gathers, use a wire brush to clean of rust. Then, apply grease by hand to the surfaces of the drive pinion over which the clutch slides.
(2) Check the clutch release lever for proper height. (Refer to Group 21 Clutch.)
(3) Using a jack or crane, carefully insert the transmission assembly into the pilot bearing of the engine flywheel, with care not to damage the spline shaft.
Then, secure the clutch housing by tightening mounting bolts on its periphery. [32 N·m {24 lbf.ft, 3.3 kgf·m}]

6.3.3 Reassembly

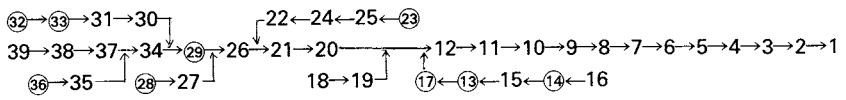
<M8S6>



F1657B



Assembly sequence

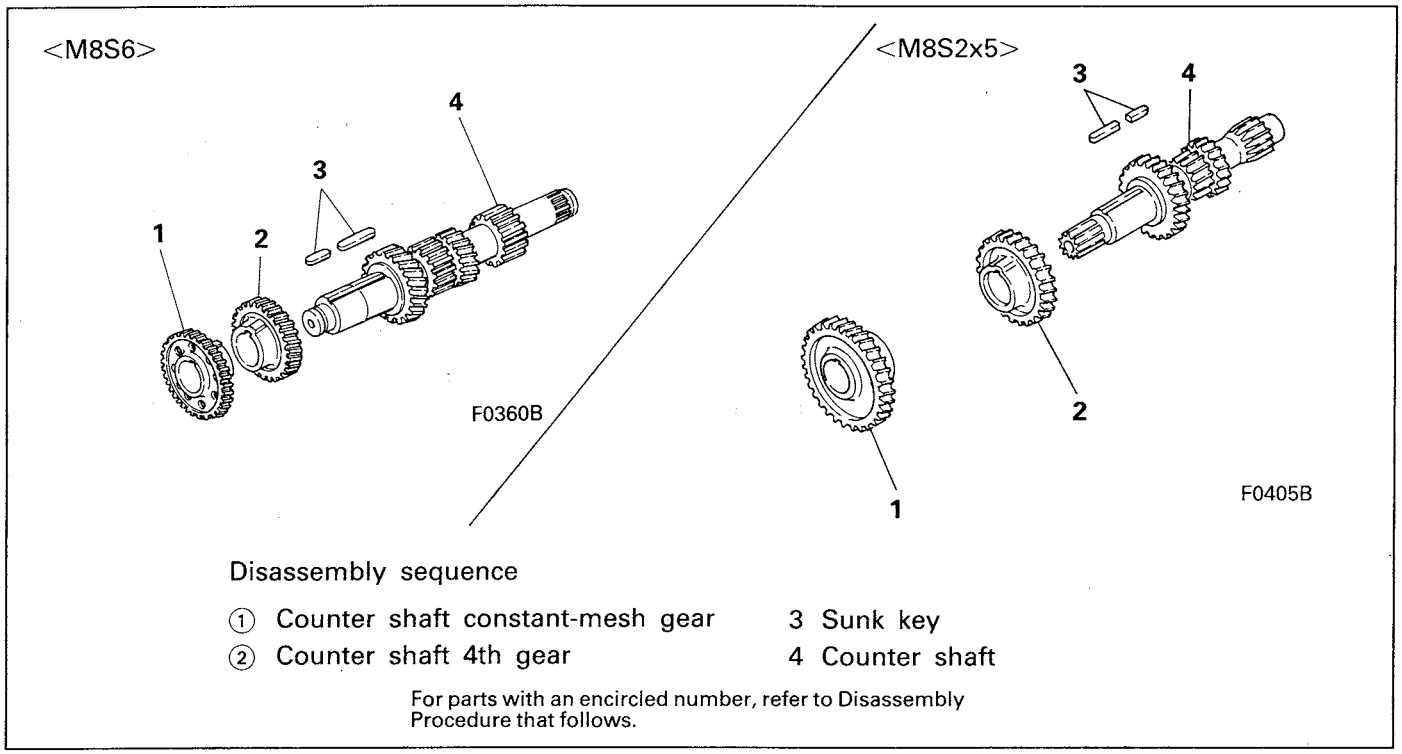


For parts with an encircled number, refer to Reassembly Procedure that follows.

F1658B

6.5 Counter Shaft

6.5.1 Disassembly

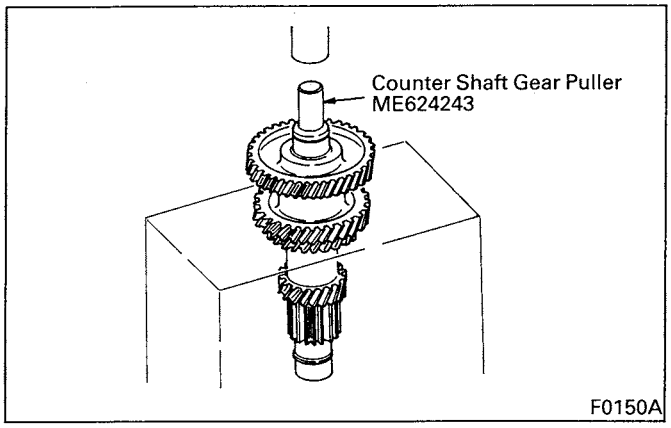


Disassembly sequence

① Counter shaft constant-mesh gear
② Counter shaft 4th gear
3 Sunk key
4 Counter shaft

For parts with an encircled number, refer to Disassembly Procedure that follows.

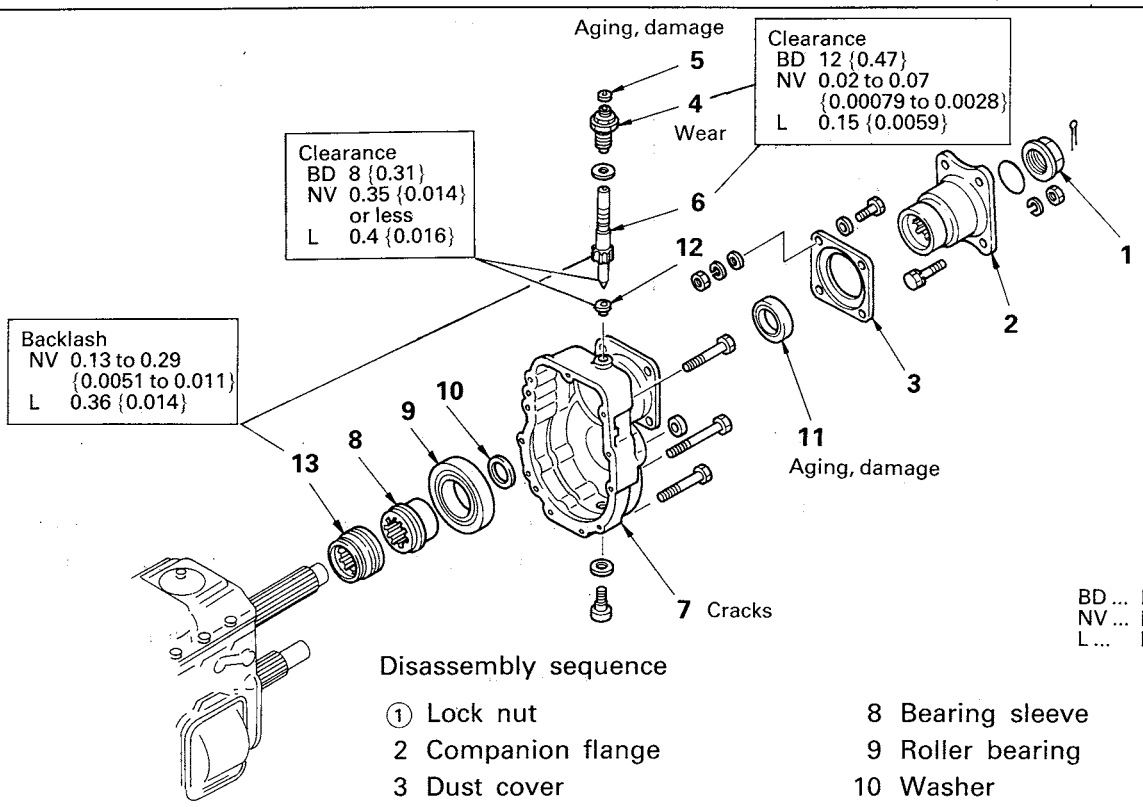
Disassembly Procedure



Use the special tool, Counter Shaft Gear Puller, to remove the counter shaft gear.

6.10 Extension Housing <M8S6 only>

6.10.1 Disassembly and inspection



BD ... Basic Diameter
NV ... Nominal Value
L ... Limit

Disassembly sequence

① Lock nut	8 Bearing sleeve
2 Companion flange	9 Roller bearing
3 Dust cover	10 Washer
4 Speedometer gear bushing	11 Oil seal
5 Oil seal	12 Speedometer gear bushing A
⑥ Speedometer gear	13 Speedometer worm
7 Extension housing	

CAUTION
Do not remove the oil seal and speedometer gear bushing A unless for replacement.

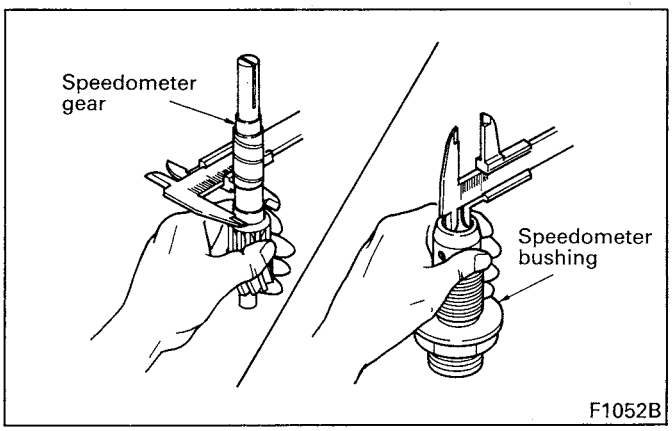
For parts with an encircled number, refer to Disassembly Procedure that follows.

F1673B

Disassembly Procedure

Referring to Section 6.2.1, remove the lock nut and propeller shaft flange.

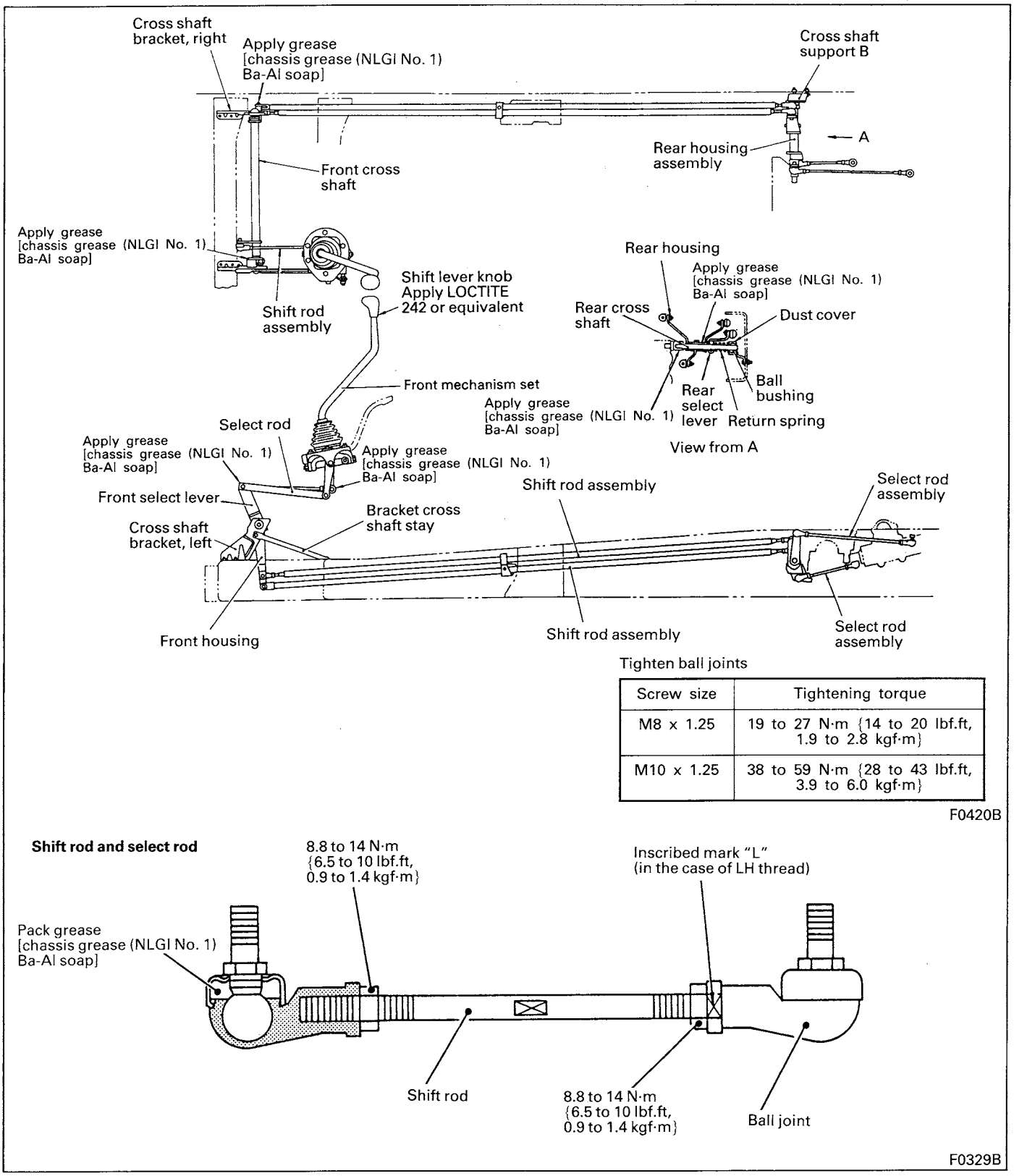
Inspection Procedure



F1052B

Measure the speedometer gear shaft O.D. and speedometer gear bushing I.D. to calculate the clearance between the two. Replace parts if the clearance exceeds the limit.

6.14.2 Reassembly



Tighten ball joints

Screw size	Tightening torque
M8 x 1.25	19 to 27 N·m {14 to 20 lbf.ft, 1.9 to 2.8 kgf·m}
M10 x 1.25	38 to 59 N·m {28 to 43 lbf.ft, 3.9 to 6.0 kgf·m}

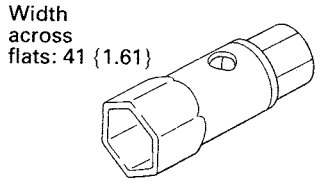
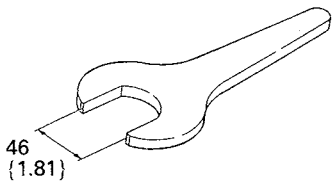
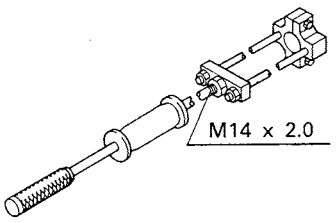
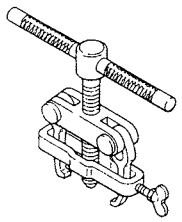
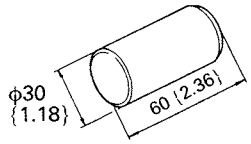
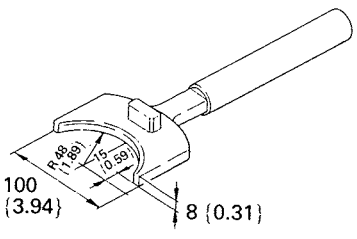
F0420B

Shift rod and select rod

F0329B

4. SPECIAL TOOLS

Unit: mm {in.}

Tool name	Part No.	Shape	Application
Socket Wrench	MH061532	 F0027A	Removal and installation of main shaft rear lock nut
Single Spanner	MH061555	 F0021B	Removal and installation of main shaft front lock nut and counter shaft rear lock nut
Drive Pinion and Reverse Shaft Puller	MH062009	 F0028A	Removal of drive pinion and reverse shaft
Pilot Bearing Puller	MH061043	 F0029A	Removal of main shaft pilot bearing
Counter Shaft Gear Puller	ME624243	 F0019A	Removal of counter shaft gear
Dummy Bearing Retainer	ME624245	 F0030A	Installation of main shaft bearing

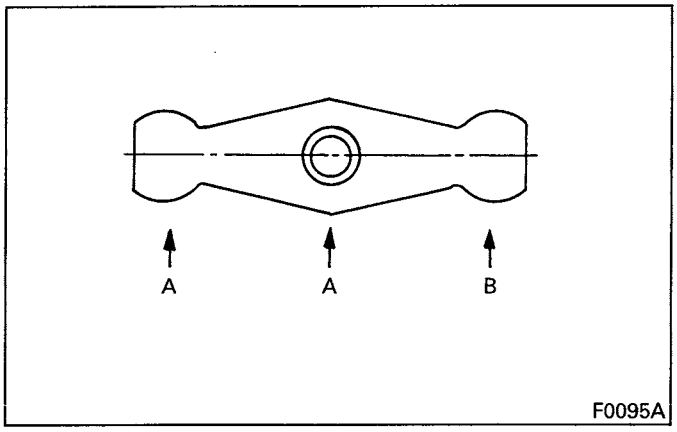
Disassembly sequence

1 Main shaft O.D. gear
2 O.D. shift shaft
③ O.D. shift lever
④ O.D. shift rail B
5 Set bolt
⑥ O.D. gearshift rail C
⑦ O.D. gearshift fork
⑧ Lock nut
9 Shifting key retainer
10 Shifting key spring
⑪ Synchronizer sleeve
⑫ Shifting key
⑬ Synchronizer hub
⑭ Synchronizer ring
⑮ Counter shaft O.D. gear assembly
16 O.D. gear sleeve
17 Thrust washer
18 Reverse shaft lock piece
⑲ Reverse gear shaft
20 Reverse gear side washer
㉑ Reverse gear
㉒ Needle bearing
㉓ Snap ring
㉔ Snap ring
㉕ Roller bearing
㉖ Roller bearing
㉗ Snap ring
㉘ Snap ring
㉙ Drive pinion assembly
㉚ Roller bearing
31 Rear bearing retainer
㉜ Snap ring
㉝ Roller bearing
34 Main shaft assembly
35 Counter shaft assembly
36 Transmission case

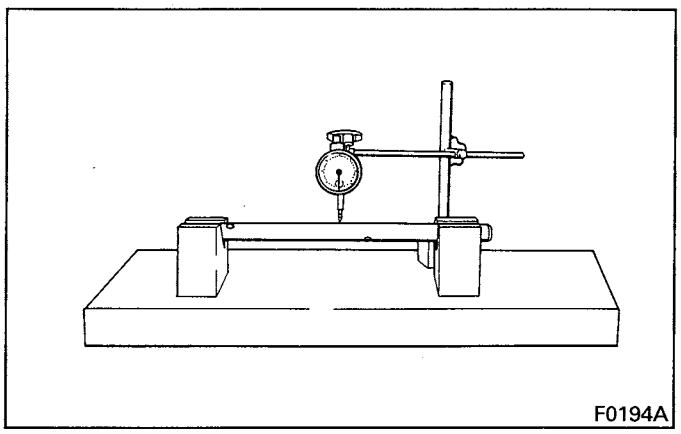
For parts with an encircled number, refer to Disassembly and Inspection Procedure that follows.

CAUTION
1. **Before disassembly the key type synchronizer, put matching mark at one location each in the synchronizer hub and synchronizer sleeve where a key is inserted.**
2. **Before removing the main shaft assembly, extract the roller bearings at front and rear of the counter shaft and let it fall down into the transmission case.**

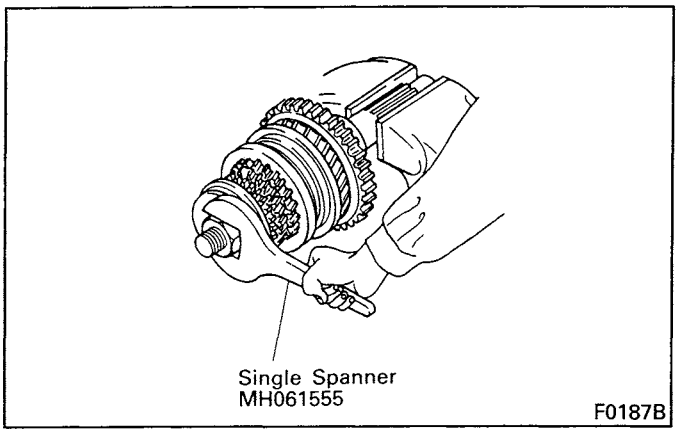
Disassembly and Inspection Procedure



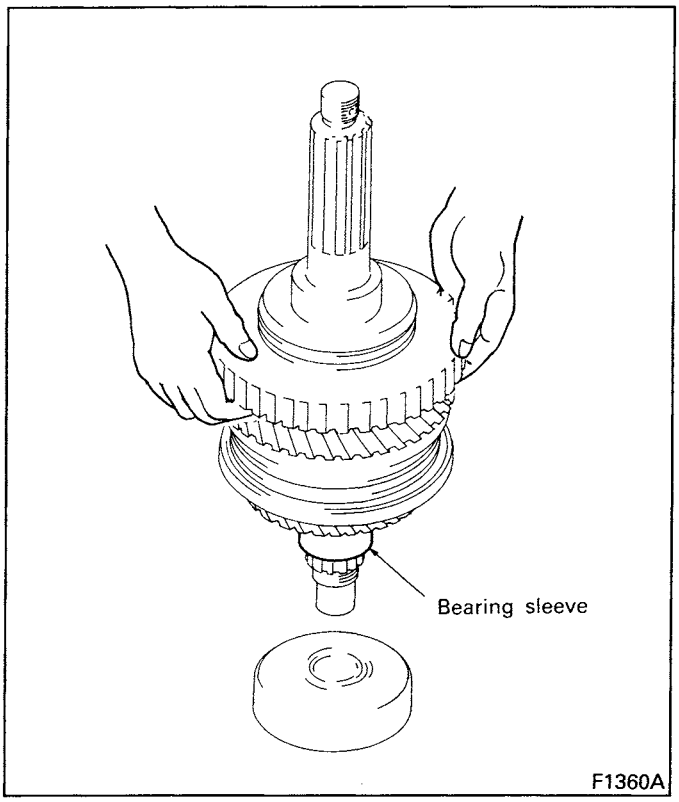
(1) Check the O.D. shift lever for alignment or bend. If B is misaligned or bent exceeding the limit with reference to A-A, replace the lever.



(2) Check O.D. shift rail B and O.D. gearshift rail C for alignment or bend. (Half of the dial indicator reading is the bend.)
If the limit is exceeded, correct or replace the part.



(3) Using the special tool, Single Spanner, loosen and remove the lock nut.

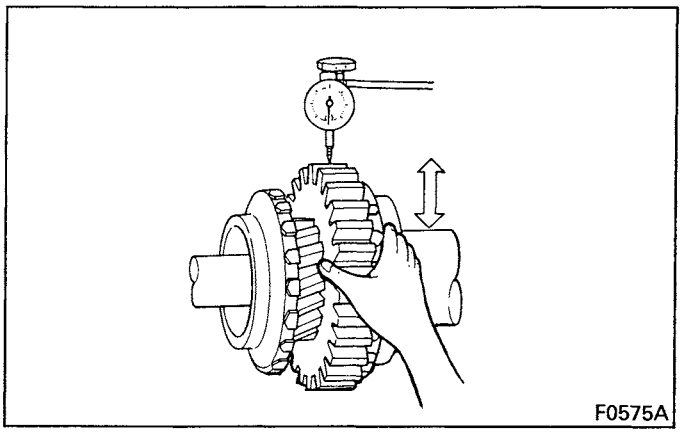


(4) To remove each bearing sleeve, make use of the weight of gear; i.e., lightly hit the main shaft against a lead plate.

CAUTION

Be sure to use a lead plate to prevent main shaft end from being damaged.

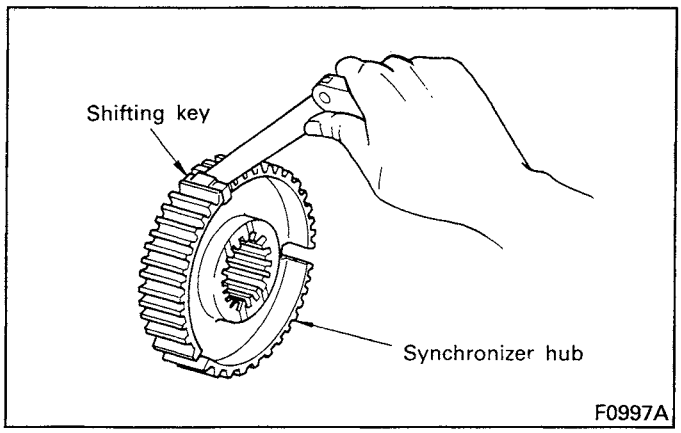
Inspection Procedure



(1) Measure the play in diametric direction in each main shaft gear and needle bearing.
If the play exceeds the limit, replace the needle bearing.

CAUTION

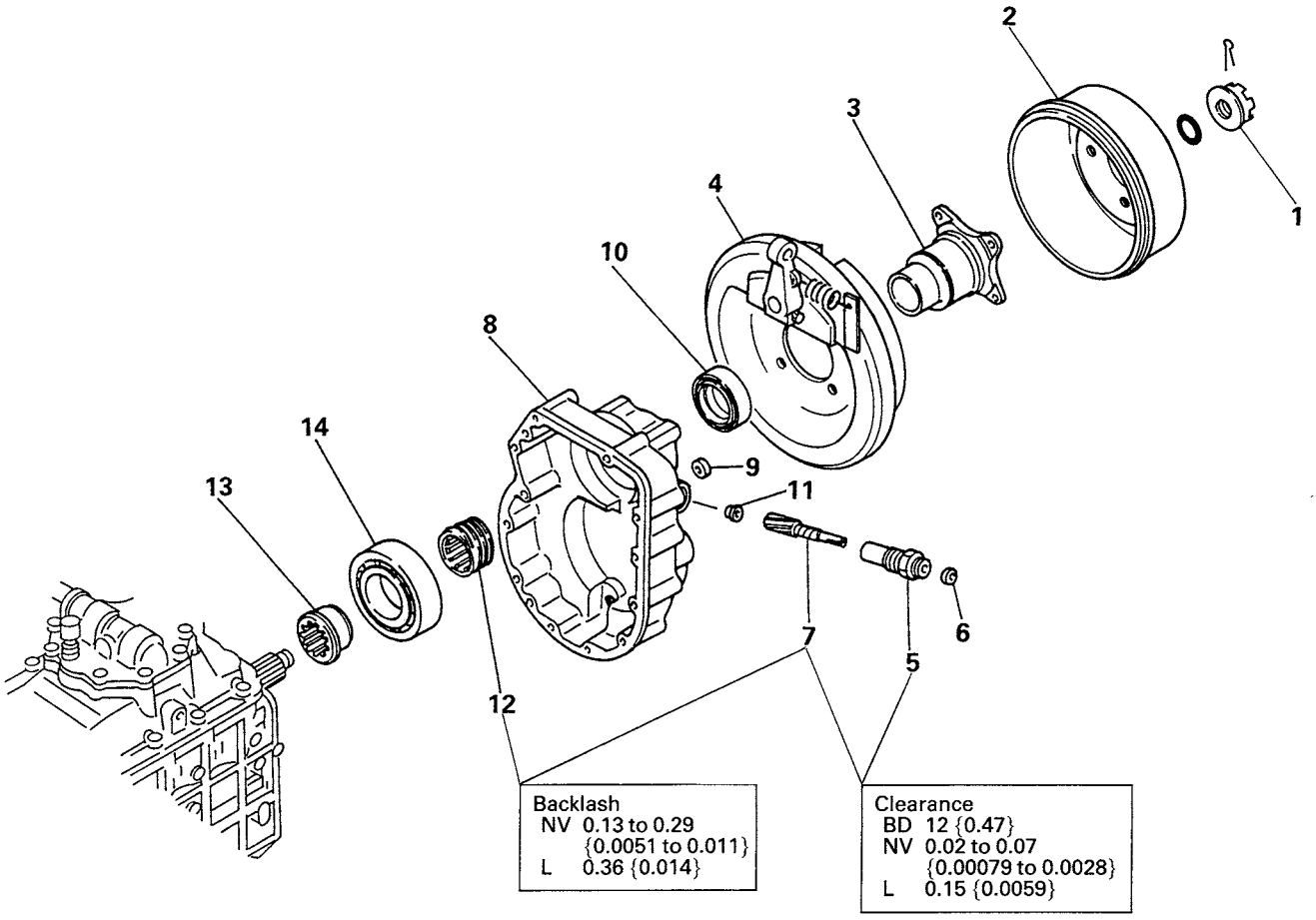
1. **If two needle bearings are used for one gear, use ones of the same package color for replacement.**
2. **If replacement of the needle bearing does not correct the excessive diametric play, check each bearing sleeve (except those in 1st and reverse gear) and main shaft gear and replace any defective parts.**



(2) Measure the clearance between the synchronizer hub keyway and shifting key. Replace parts if the clearance exceeds the limit.

6.8 Extension Housing

6.8.1 Disassembly and inspection



BD ... Basic Diameter
NV ... Nominal Value
L ... Limit

Disassembly sequence

① Lock nut
② Parking brake drum
③ Companion flange
4 Support plate and shoe assembly
5 Speedometer gear bushing
6 Oil seal
⑦ Speedometer gear
8 Extension housing
9 Dust plug
10 Oil seal
⑪ Speedometer gear bushing A
12 Speedometer worm
13 Rear bearing retainer
14 Ball bearing

For parts with an encircled number, refer to Disassembly and Inspection Procedure that follows.

CAUTION
Do not remove the oil seal and speedometer gear bushing A unless for replacement.

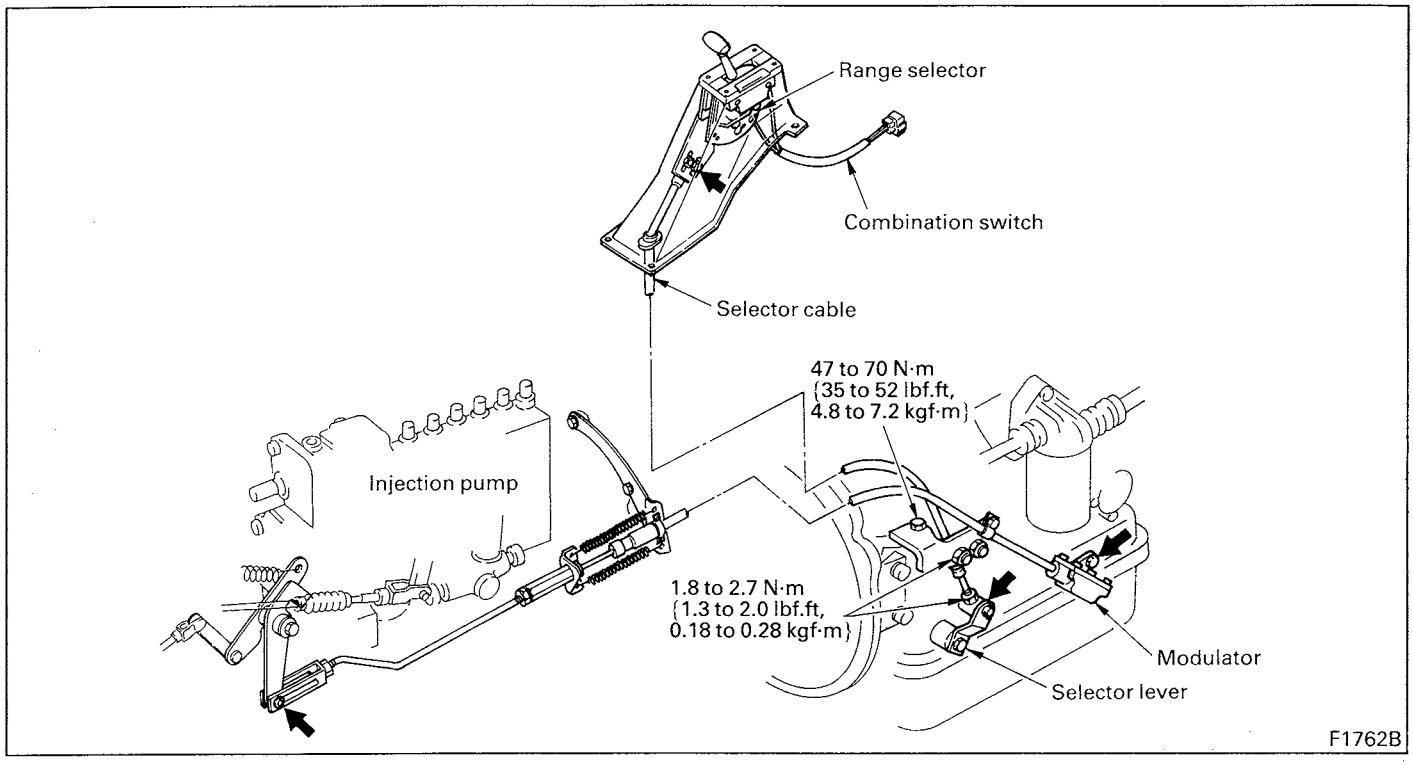
F1372G

3.2 Tightening Torque Table

Location tightened	Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Torque converter bolt	M10 x 1.5	51 to 61 {38 to 45, 5.20 to 6.22}
Oil cooler return oil port flare nut	M22 x 1.5	69 to 93 {51 to 69, 7 to 9.5}
Propeller shaft mounting nut	M12 x 1.25	69 to 98 {51 to 72, 7 to 10}
Selector lever mounting nut	M10 x 1.5	20 to 27 {15 to 20, 2.04 to 2.76}
Modulator stay mounting bolt	5/16-18UNC	18 to 22 {13 to 16, 1.80 to 2.21}
Support plate and shoe assembly	1/2-13UNF	110 to 130 {81 to 97, 11.22 to 13.46}
Flange set bolt	1/2-20UNF	140 to 160 {100 to 120, 14.10 to 16.72}
PTO cover mounting bolt	3/8-16UNC	35 to 43 {26 to 32, 3.59 to 4.42}
Speedometer gear adapter mounting	7/8-18UNS-2B	55 to 82 {41 to 61, 5.6 to 8.4}
Speedometer gear mounting	13/16-20UNEF-2B	61 to 68 {45 to 50, 6.22 to 6.93}
Selector cable bracket mounting bolt	M14 x 1.5	47 to 70 {35 to 52, 4.8 to 7.2}
Selector cable mounting U bolt	NO.10-32UNF	1.8 to 2.7 {1.3 to 2.0, 0.18 to 0.28}
Selector cable trunnion	M6 x 1.0	1.8 to 2.7 {1.3 to 2.0, 0.18 to 0.28}
Oil pan mounting bolt	5/16-18UNC	14 to 18 {10 to 13, 1.4 to 1.8}
Drain plug	1/2-20UNF	20 to 27 {15 to 20, 2.05 to 2.75}
Oil level gauge guide connector	1-1/16-16UNF	125 to 135 {91 to 100, 12.55 to 13.76}
Oil cooler pipe tightening	M24 x 1.5	69 to 93 {51 to 69, 7.0 to 9.5}
Oil cooler rubber hose connector	M24 x 1.5	69 to 93 {51 to 69, 7.0 to 9.5}
Screw plug	M12 x 1.0	26 to 42 {20 to 31, 2.7 to 4.3}
Oil filter mounting bolt	M8 x 1.25	21 {15, 2.13}
Oil filter bracket mounting bolt	M14 x 1.5	135 {98, 13.6}
Oil filter cartridge	–	10 to 20 {7 to 14, 1 to 2}

6.3 Automatic Transmission Control System

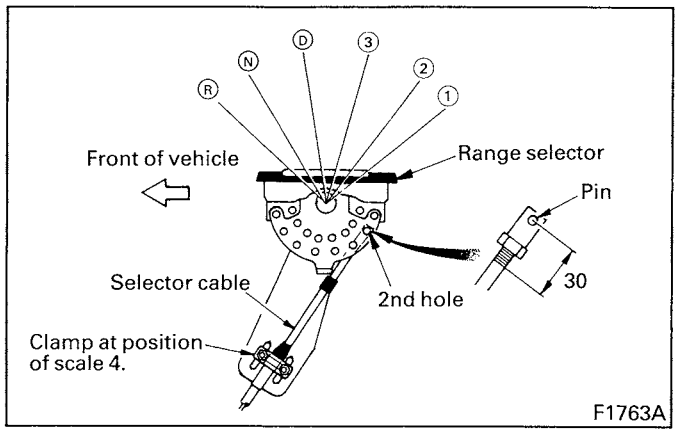
6.3.1 Removal and installation



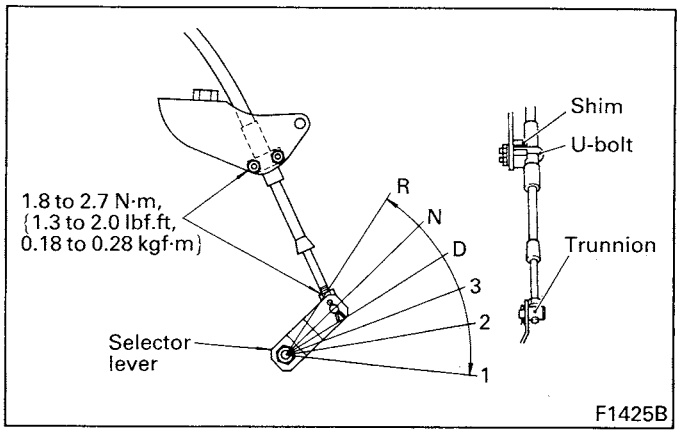
For removal, refer to 6.1 Removal and Installation of Automatic Transmission.

Installation Procedure

(1) Selector cable



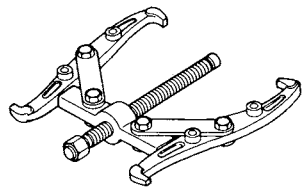
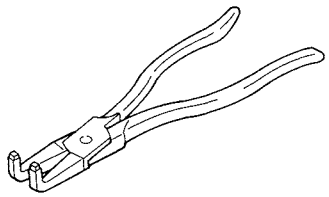
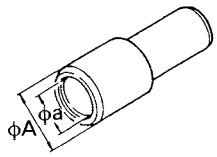
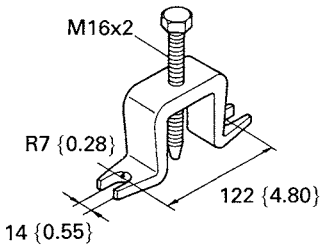
1) Place the selector lever at an intermediate position between positions ② and ③ and insert the pin at the end of the selector cable in the 3rd cable mounting hole.



2) Place the selector lever at an intermediate position between positions 2 and 3, connect the trunnion mounted at the end of the selector cable to the lever, and temporarily tighten the U bolt. In this case, the cotter pin should be replaced with a new one.

4. SPECIAL TOOLS

Unit: mm {in.}

Tool Name	Part No.	Shape	Application
Gear Puller	MH061102	Max. spread: 330  H0082A	Removal of center bearing
Snap Ring Repressor	MH061001	 H0086A	Removal and installation of needle roller bearing snap ring
Dust Seal Installer <P8>	03724-04000	A = 42 {1.65} a = 30 {1.18}  H0083B	Press fitting of spider dust seal
Flange Puller	MC881524	P4  H0088C	Removal of companion flange

Disassembly and Inspection Procedure

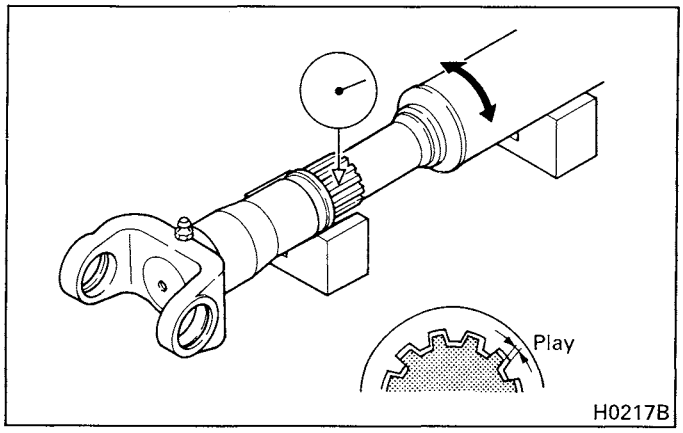
(1) Measurement of axial play
[Refer to Item (1), Section 6.2.1.]

(2) Removal of snap ring
[Refer to Item (2), Section 6.2.1.]

(3) Removal of needle roller bearing
[Refer to Item (3), Section 6.2.1.]

(4) Measurement of clearance between spider and needle roller bearing
[Refer to Item (6), Section 6.2.1]

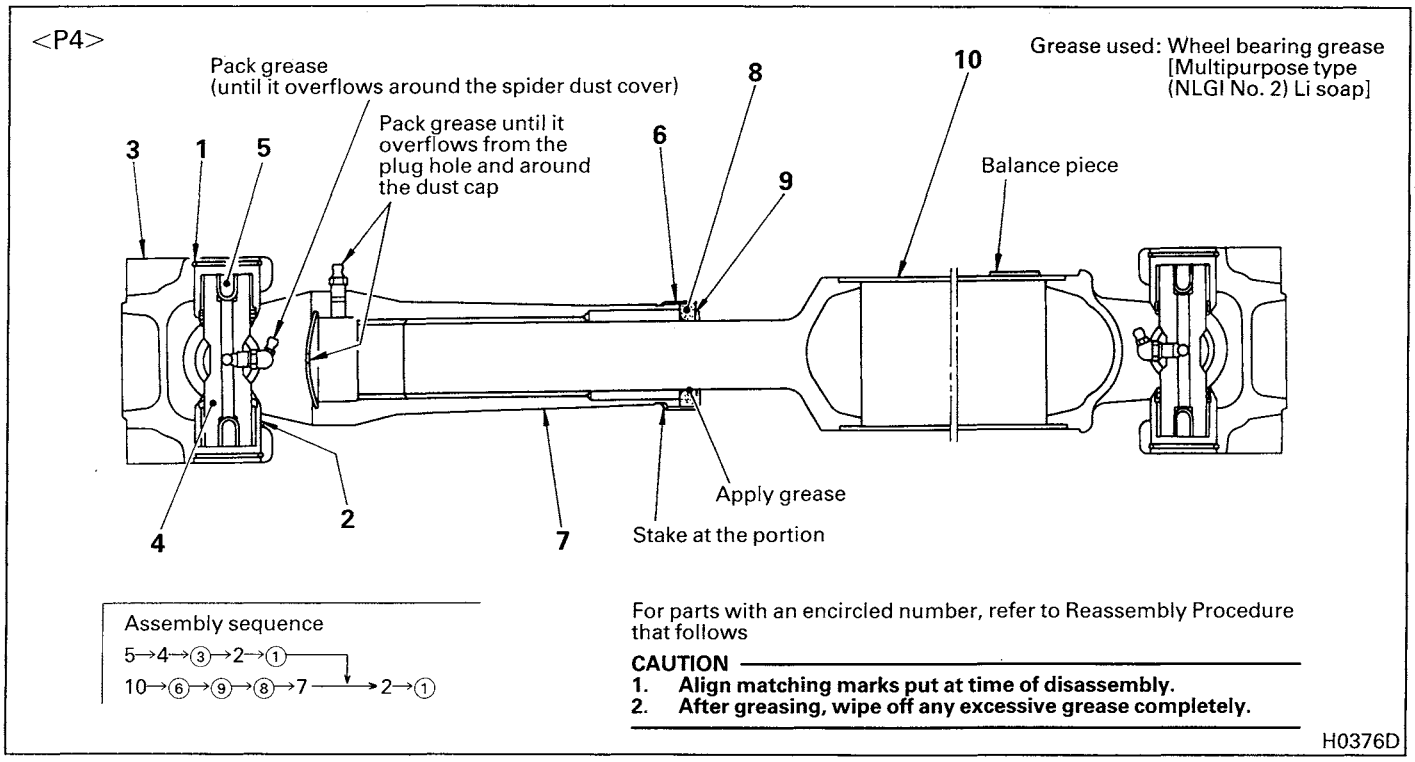
(5) Measurement of spline play in rotating direction play



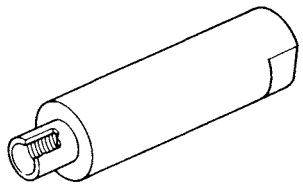
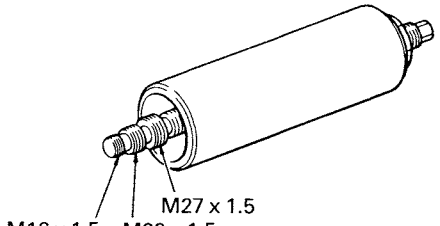
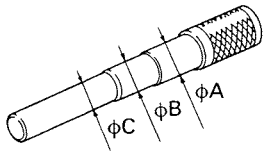
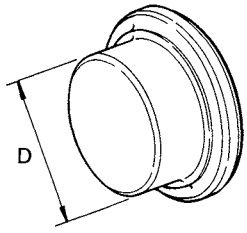
Measure the spline play in rotating direction. If it exceeds the limit, replace.

(6) Deflection of propeller shaft
[Refer to Item (7), Section 6.2.1.]

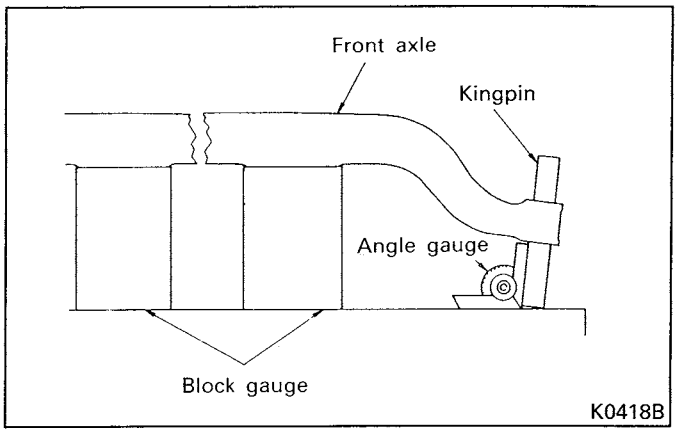
6.3.2 Reassembly



Unit: mm {in.}

<table>
<tr><th>Tool name</th><th>Part No.</th><th>Shape</th><th>Application</th></tr>
<tr><td>Kingpin Set Bolt Remover</td><td>MH061688</td><td> 
K0064A</td><td>Removal of kingpin set bolt</td></tr>
<tr><td>Kingpin Puller</td><td>MH061684</td><td> 
K0065B</td><td>Removal of kingpin</td></tr>
<tr><td>Kingpin Bushing Remover</td><td>MH061037
MH061792</td><td> 
K0083D
<table><tr><th>Part No.</th><th>Dimension A</th><th>Dimension B</th><th>Dimension C</th><th>Applicable model</th></tr><tr><td>MH061037</td><td>38.5 {1.52}</td><td>35 {1.38}</td><td>33 {1.30}</td><td>FK417</td></tr><tr><td>MH061792</td><td>54.5 {2.15}</td><td>50 {1.97}</td><td>45 {1.77}</td><td>FK457
FM557</td></tr></table></td><td>Removal of kingpin bushing</td></tr>
<tr><td>Oil Seal Installer</td><td>MH062201
MH062202
MH062203</td><td> 
K0755A
<table><tr><th>Part No.</th><th>Dimension D</th><th>Applicable model</th></tr><tr><td>MH062201</td><td>ϕ35 {1.38}</td><td>FK417</td></tr><tr><td>MH062202</td><td>ϕ45 {1.77}</td><td>FK457</td></tr><tr><td>MH062203</td><td>ϕ50 {1.97}</td><td>FM557</td></tr></table></td><td>Installation of oil seal
Used with the Kingpin Bushing Remover (shown above)
MH061037 for oil seal installation.</td></tr>
</table>

(5) Measurement of kingpin angle

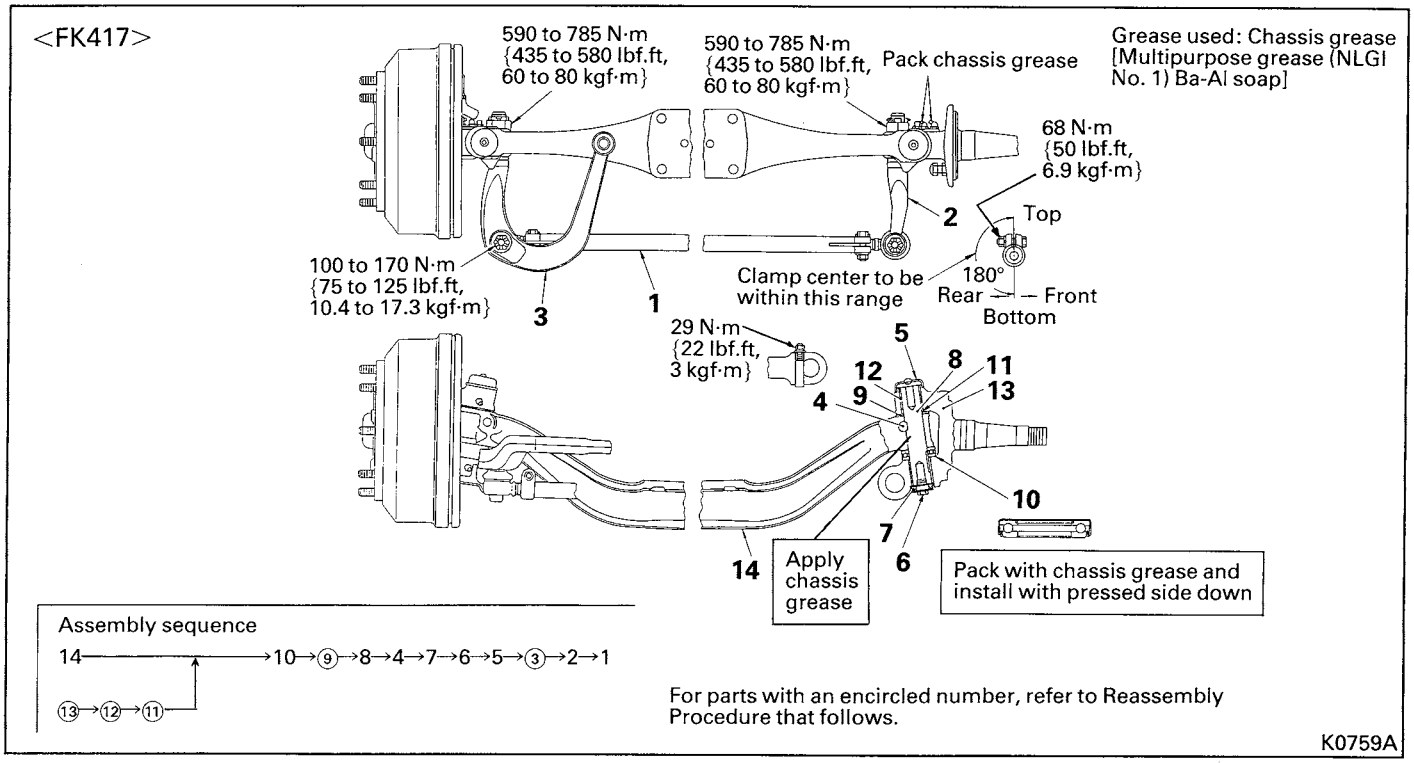


Install the kingpin to the front axle and place the front axle upside down on the block gauge. Measure the kingpin angle using the angle gauge.

Nominal value	7°
Limit	7° ± 30′

(6) For the tie rod assembly, refer to Group 37 Steering.

6.3.2 Reassembly



3. SERVICE STANDARDS

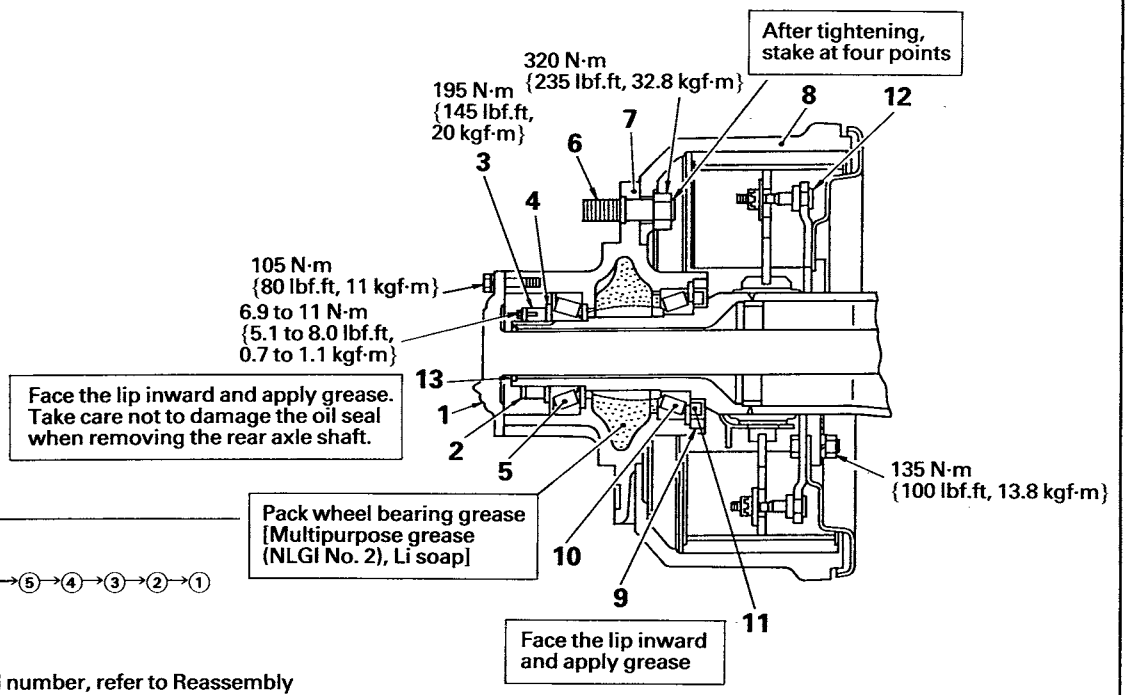
3.1 Service Standards Table

Unit: mm {in.}

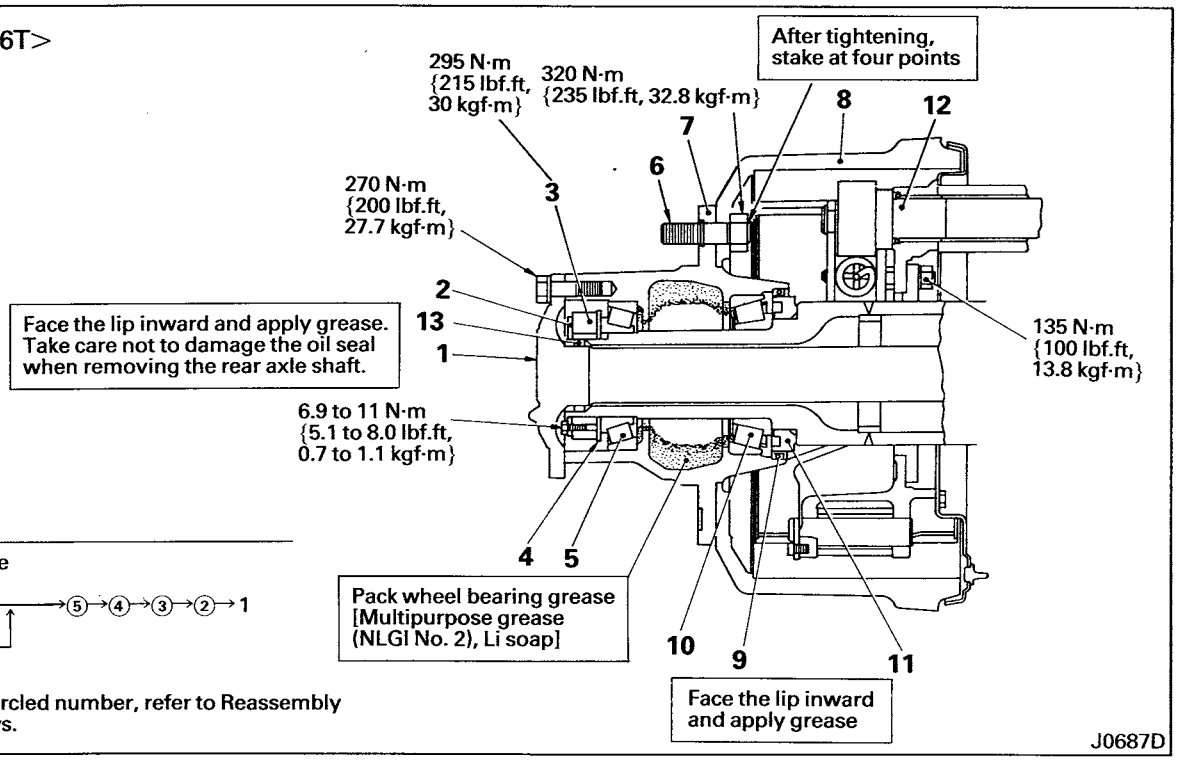
Maintenance item				Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Reduction	Gear backlash			0.25 to 0.33 {0.0098 to 0.013}	0.6 {0.024}	Adjust by shim and adjusting screw
	Gear back surface runout			0.15 {0.0059} or less	0.2 {0.0079}	Check side bearing and tightening
	Pinion bearing starting torque	When new parts are used	D4H D050H	195 to 295 N·cm {1.45 to 2.17 lbf.ft, 20 to 30 kgf·cm}	–	• Adjust by collar • Tangential force at bearing retainer outside circumference D4H 29 to 44 N {6.6 to 9.9 lbf, 3 to 4.5 kgf} D050H 24 to 34 N {5.3 to 7.7 lbf, 2.4 to 3.5 kgf} D8H 30 to 43 N {6.8 to 9.7 lbf, 3.1 to 4.4 kgf}
			D8H	245 to 345 N·cm {1.81 to 2.53 lbf.ft, 25 to 35 kgf·cm}		
		When old parts are reused	D4H D050H	155 to 235 N·cm {1.16 to 1.74 lbf.ft, 16 to 24 kgf·cm}	–	• Adjust by collar • Tangential force at bearing retainer outside circumference D4H 24 to 35 N {5.3 to 7.9 lbf, 2.4 to 3.6 kgf} D050H 19 to 27 N {4.2 to 6.2 lbf, 1.9 to 2.8 kgf} D8H 25 to 34 N {5.5 to 7.7 lbf, 2.5 to 3.5 kgf}
			D8H	195 to 275 N·cm {1.45 to 2.03 lbf.ft, 20 to 28 kgf·cm}		
Differential	Gear backlash		D4H D050H	0.19 to 0.25 {0.0075 to 0.0098}	0.5 {0.02}	Replace thrust washer
			D8H	0.20 to 0.28 {0.0079 to 0.011}	0.8 {0.031}	
	Pinion to spider clearance		D4H D050H	[26] 0.17 to 0.27 {[1.02] 0.0067 to 0.011}	0.5 {0.02}	
			D8H	[35] 0.17 to 0.28 {[1.38] 0.0067 to 0.011}		
	Side bearing starting torque		D4H D050H	195 to 295 N·cm {1.45 to 2.17 lbf.ft, 20 to 30 kgf·cm}	–	• Adjust by adjusting screw • Tangential force at differential case outside D4H, D050H 24 to 34 N {5.3 to 7.7 lbf, 2.4 to 3.5 kgf} D8H 23 to 32 N {5.1 to 7.3 lbf, 2.3 to 3.3 kgf}
			D8H	245 to 345 N·cm {1.81 to 2.53 lbf.ft, 25 to 35 kgf·cm}		
Rear axle housing	Runout	When not installed on vehicle		0	4 {0.16}	Replace
	Bend	When installed on vehicle		$L_2-L_1=0.2$ {0.0079}	$L_2-L_1 \geqq 2.5$ {0.098}	Replace

6.2.2 Reassembly

<FK series: R4T>



<FM series: R6T>



Reassemble with mating marks aligned.

CAUTION

1. **When the following parts are to be replaced, replace always as a set.**

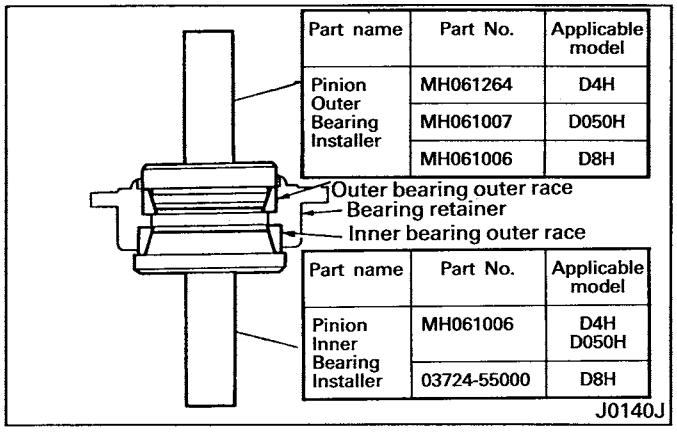
Set parts

Set name	Set composition	Remarks
Reduction gear set	Reduction pinion and reduction gear	Let serial numbers of alignment marks coincide.
Differential carrier set	Differential carrier and bearing cap	–
Differential case set	Differential case R.H. and L.H.	–

2. **When the reduction and differential assembly is installed to the housing, be sure to apply silicone liquid packing uniformly to the mounting surface of the differential carrier.**

Reassembly Procedure

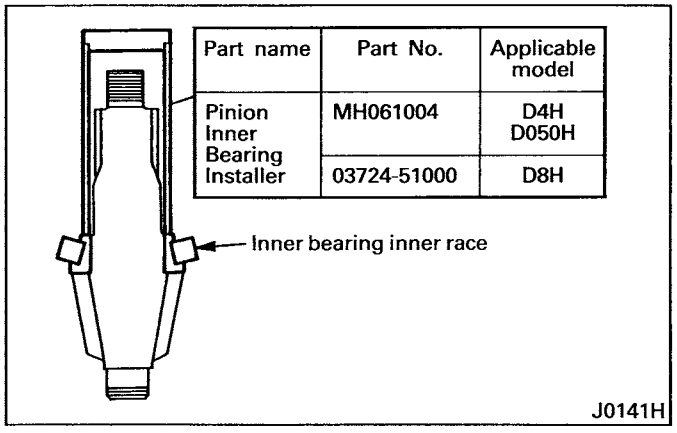
(1) Installation of inner, outer bearing outer race



Part name	Part No.	Applicable model
Pinion Outer Bearing Installer	MH061264	D4H
	MH061007	D050H
	MH061006	D8H

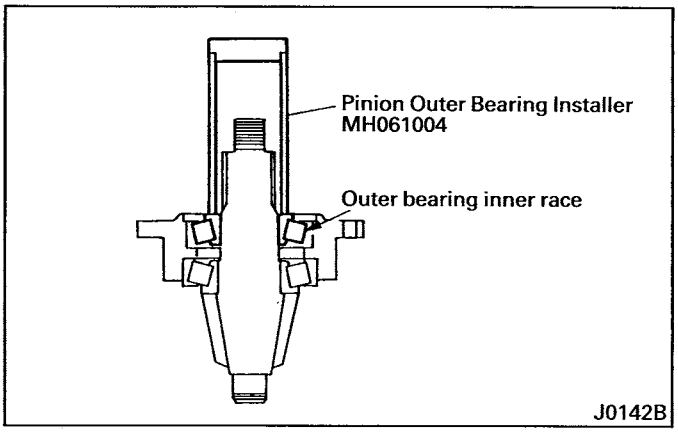
Part name	Part No.	Applicable model
Pinion Inner Bearing Installer	MH061006	D4H D050H
	03724-55000	D8H

(2) Installation of inner bearing inner race

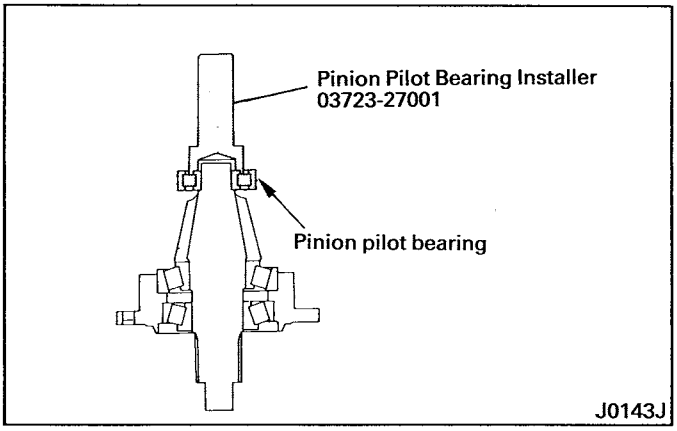


Part name	Part No.	Applicable model
Pinion Inner Bearing Installer	MH061004	D4H D050H
	03724-51000	D8H

(3) Installation of outer bearing inner race



(4) Installation of pinion pilot bearing



3. SERVICE STANDARDS

3.1 Service Standards Table

Unit: mm {in.}

Maintenance item			Nominal value (Basic diameter in [ ])	Limit	Remedy and remarks
Flatness of disc wheel (hub surface)	22.5 x 6.75 – 152 – 11 <FK417, FK457>		0.3 or less {0.012 or less}	–	Replace
	22.5 x 7.50 – 162 – 12 <FK457, FM557>		0.25 or less {0.0098 or less}		
Vertical and lateral runout of disc wheel	22.5 x 6.75 – 152 – 11 <FK417, FK457> 22.5 x 7.50 – 162 – 12 <FK457, FM557>	Lateral runout	2.0 or less {0.079 or less}	–	Replace
		Vertical runout	1.8 or less {0.071 or less}		
Tire wobble			3.5 {0.14} or less	–	Correct

*: Option

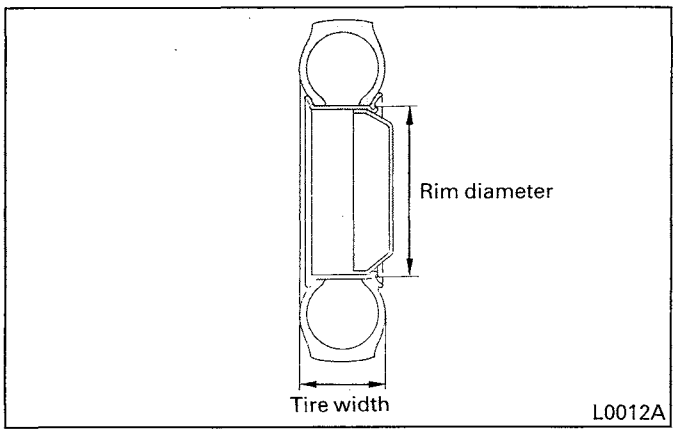
3.2 Tightening Torque Table

Location tightened			Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Wheel nut	Front		M20 x 1.5	400 to 440 {295 to 325, 41 to 45}
	Rear	Inner	M20 x 1.5	
		Outer	M30 x 1.5	

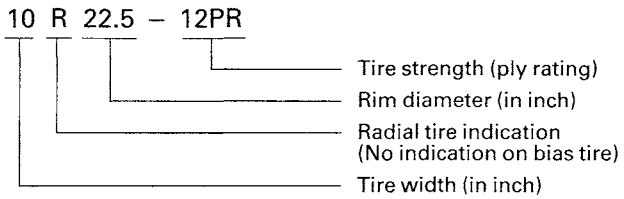
4. GENERAL

The wheel and the tire rotate integrally. The tires support the full load of the vehicle and give cushioning effect by their inflation pressure while their treads transmit power and direct the vehicle as it is steered.

(1) Tire size designation



Radial tire



FRONT SUSPENSION

CONTENTS

REAR SUSPENSION

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FK/FM
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Group 35A - Brake (Air Over Hydraulic Brake)

Group 35B - Brake (Full Air Brake)

MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub.No.TWME9107

Location tightened		Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Safety valve		PT 1/4	39 to 59 {29 to 43, 4 to 6}
Low air pressure switch		PT 1/8	29 to 39 {22 to 29, 3 to 4}
Stop lamp switch		PT 1/4	39 to 59 {29 to 43, 4 to 6}
Air dryer	Shell assembly to end cover tightening	M8 x 1.25	20 to 29 {14 to 22, 2 to 3}
	Exhaust cover assembly attaching screw	–	2.9 to 4.4 {2.2 to 3.3, 0.30 to 0.45}
	Cartridge attaching bolt	–	15 to 20 {11 to 14, 1.5 to 2.0}
	Purge valve mounting screw	–	3.9 to 5.9 {2.9 to 4.3, 0.4 to 0.6}
	Thermostat assembly	–	15 to 20 {11 to 14, 1.5 to 2.0}
	Heater assembly	–	20 to 25 {14 to 18, 2.0 to 2.5}
	Heater assembly and thermostat assembly harness attaching nut	–	1.0 to 1.5 {0.72 to 1.10, 0.10 to 0.15}
	Bracket mounting bolt, nut	–	11 to 16 {8 to 12, 1.1 to 1.6}
	Indicator assembly	–	51 to 67 {38 to 49, 5.2 to 6.8}

3.2.2 Wheel brake

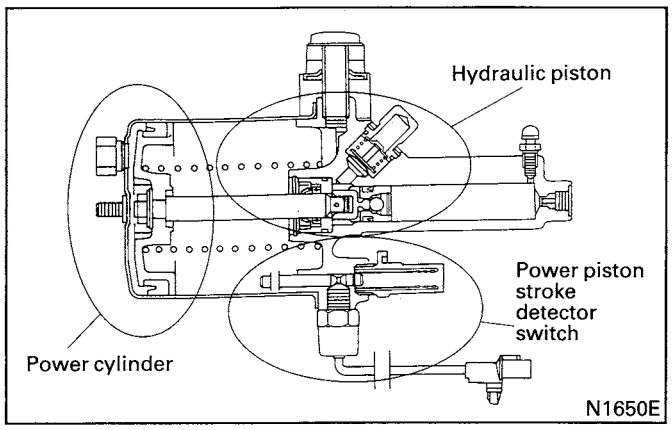
Location tightened		Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Wheel cylinder attaching bolt	Front	M10 x 1.25	37 to 49 {27 to 36, 3.8 to 5.0}
		M14 x 1.5	120 to 165 {90 to 120, 12.5 to 17.0}
	Rear	M14 x 1.5	120 to 165 {90 to 120, 12.5 to 17.0}
Pipe flare nut		M10 x 1.0	13 to 18 {9.4 to 13, 1.3 to 1.8}
Pipe connector attaching bolt	Front	M10 x 1.25	37 to 49 {27 to 36, 3.8 to 5.0}
Bleeder screw		M10 x 1.0	6.9 to 12 {5.1 to 8.7, 0.7 to 1.2}
Wheel cylinder cover attaching bolt	Rear	M6 x 1.0	7.6 to 12 {5.6 to 8.7, 0.78 to 1.2}
Wheel cylinder	Stopper spring attaching screw	M5 x 0.8	2.4 to 3.5 {1.7 to 2.6, 0.24 to 0.36}

3.2.3 Exhaust brake

Location tightened		Screw size O.D. x pitch (mm)	Tightening torque N·m {lbf.ft, kgf·m}
Exhaust brake unit	Bracket to control cylinder attaching bolt	–	21 to 25 {15 to 19, 2.1 to 2.6}
	Body to arm attaching bolt	–	9.8 to 16 {7.2 to 12, 1 to 1.6}
	Lever attaching nut	–	9.8 to 16 {7.2 to 12, 1 to 1.6}
	Body to bracket attaching nut	–	9.8 to 16 {7.2 to 12, 1 to 1.6}
	Adjusting bolt lock nut	–	4.9 to 6.9 {3.6 to 5.1, 0.5 to 0.7}
	Cover mounting screw	–	4.9 to 6.9 {3.6 to 5.1, 0.5 to 0.7}
Control cylinder	Plate mounting nut	–	9.8 to 16 {7.2 to 12, 1 to 1.6}
	Cover mounting bolt	–	9.8 to 16 {7.2 to 12, 1 to 1.6}
	Connector	–	4.9 {3.6, 5.0}

5.5 Brake Booster (Airmaster)

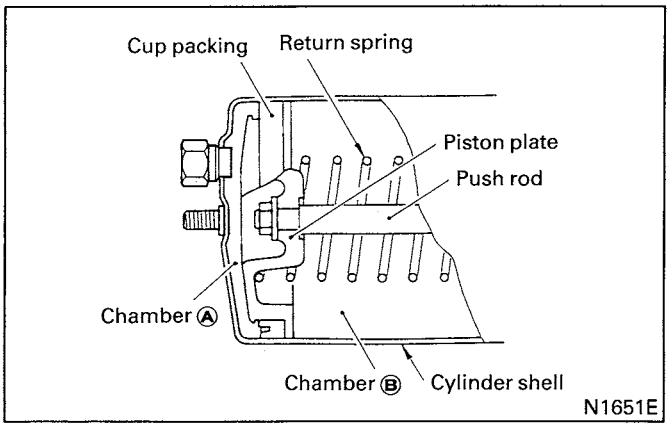
The power piston driven by the pressure difference between the compressed air of the air compressor and atmosphere supplies a fluid pressure to the wheel cylinder.



The air master is divided into three main components.

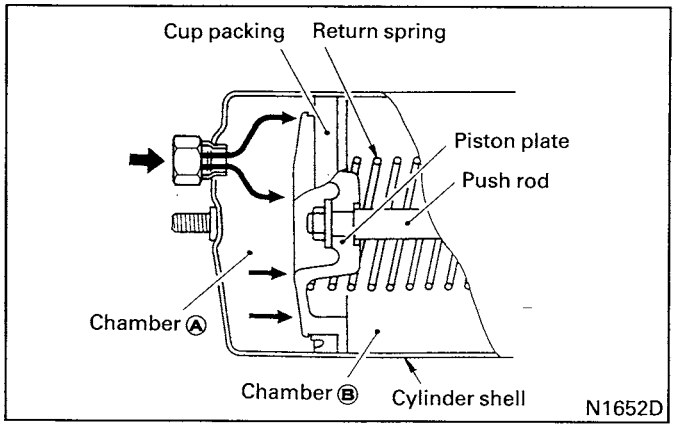
(1) Power cylinder

(a) When not operating

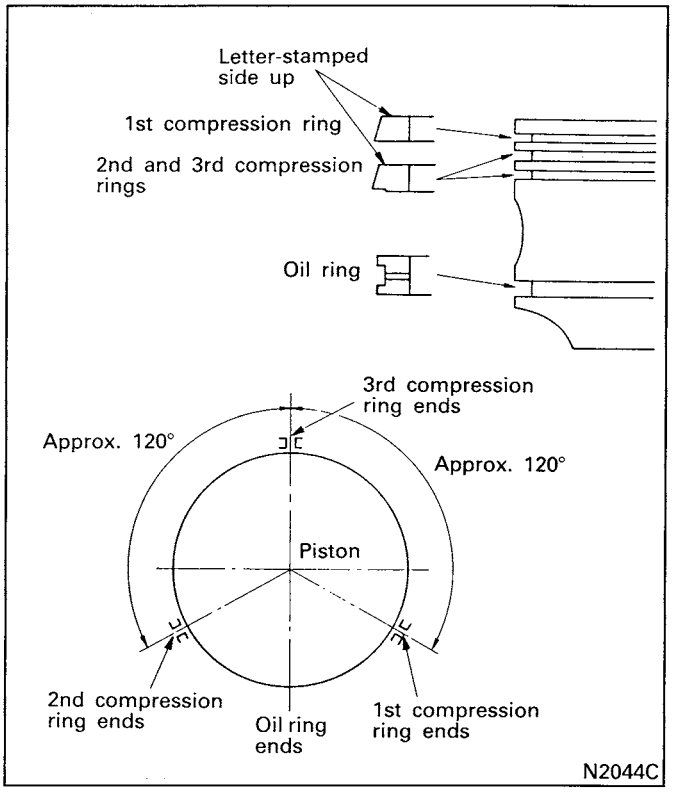


Chambers Ⓐ, and Ⓑ in the power cylinder are separated from each other by means of piston plate and cup packing. Chamber Ⓐ is open to the air through the exhaust port of dual brake valve. The piston plate is located on the left side by return spring force.

(b) When operating

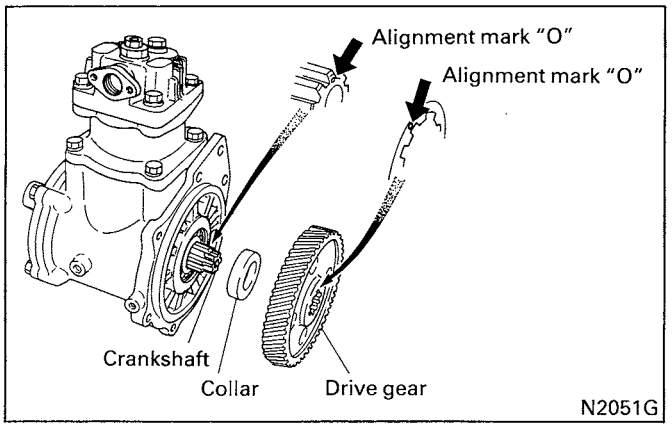


By operation of the dual brake valve, compressed air flows into chamber Ⓐ and acts on the piston plate. Chamber Ⓑ is open to the air, creating difference in pressure between chambers Ⓐ and Ⓑ. If this pressure difference becomes greater than return spring force, the piston plate moves to the right. The push rod installed to the piston plate transmits compressed air force received by the piston to the hydraulic piston.



Install the piston ring into the right position. Make sure that the letter stamp on each piston ring faces up. Position ring ends 120° apart from each other. Install the oil ring with its ends positioned midway between the compression ring ends.

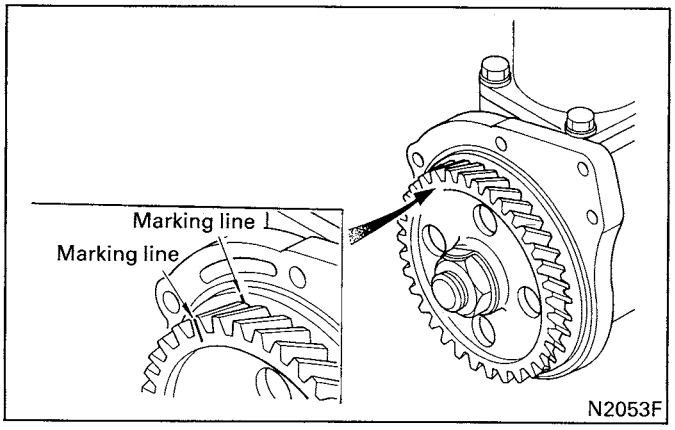
(e) Installation of drive gear



Mount the drive gear onto the crankshaft, making sure that the alignment mark "O" on the crankshaft and drive gear are lined up with each other.

(4) Installation

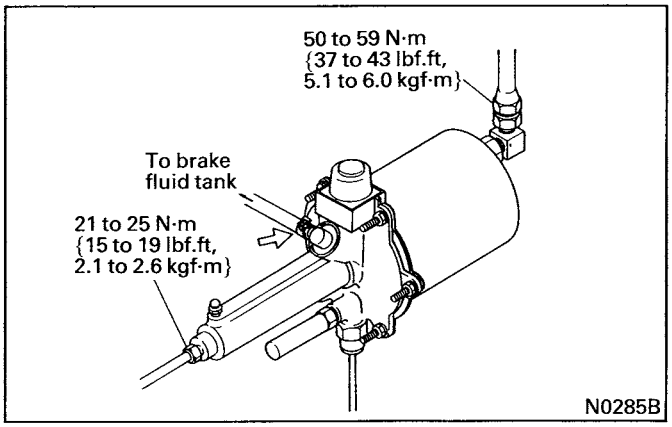
(a) Bring the piston in No. 1 cylinder to TDC on the compression stroke. (Refer to Group 11 Engine.)



(b) Align the marking line on air compressor drive gear with that on the crankcase.

6.2.4 Brake booster (airmaster)

(1) Removal and installation



CAUTION

When removing the fluid pipe, use care so that the brake fluid is not spilt on the frame or bracket.

(2) Disassembly and inspection

Use the following special tools when servicing the brake booster (air-master).

Tool name	Part No.	Application
Stand	910-00450	Work stand for disassembly and reassembly of brake booster
Needle	910-21200	Removal of cups and O-rings
Cup Insert Guide	910-23289	Installation of cup packing into hydraulic piston
Holder	910-24831	Removal and installation of power piston
Pliers	910-22570	Removal and installation of retaining ring
L-spanner	910-23370	Removal and installation of exhaust cover

Shown in the following are JIDOSHA KIKI CO.LTD part numbers.

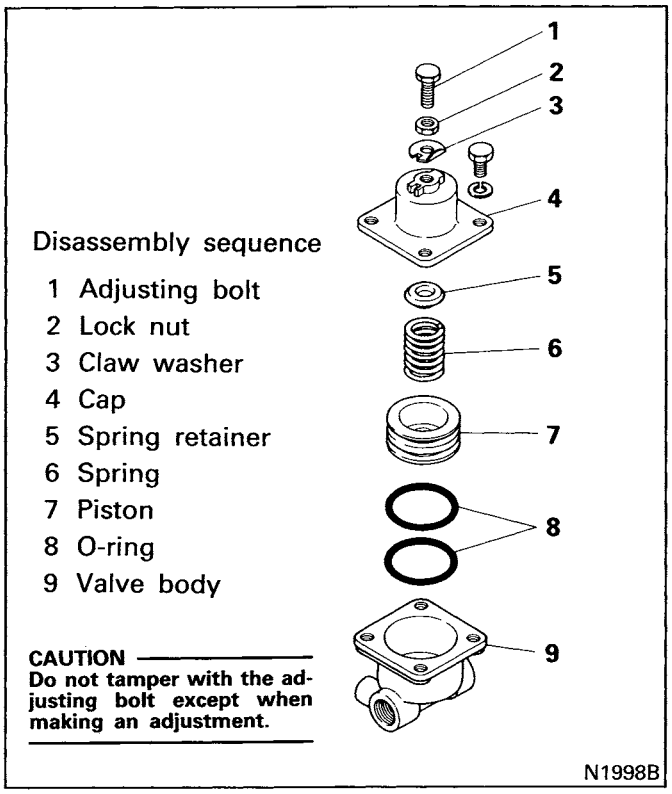
CAUTION

1. **Before disassembly, remove dirt, dust, foreign matter from the surface to prevent their entry.**
2. **Put alignment marks before disassembly.**
3. **Never immerse rubber parts in a cleaning solution.**
4. **Replace rubber parts even before scheduled period of replacement.**

Wipe or wash clean the disassembled parts by the following procedures.

- Rubber parts ..... Wipe away deposits with a cloth immersed in alcohol (when rubber parts have to be reused).
- Metallic parts ..... Wash in a cleaning solution (trichloroethylene, Metalclen) and blow air to completely remove the cleaning solution and dry the parts.

6.2.7 Supply valve



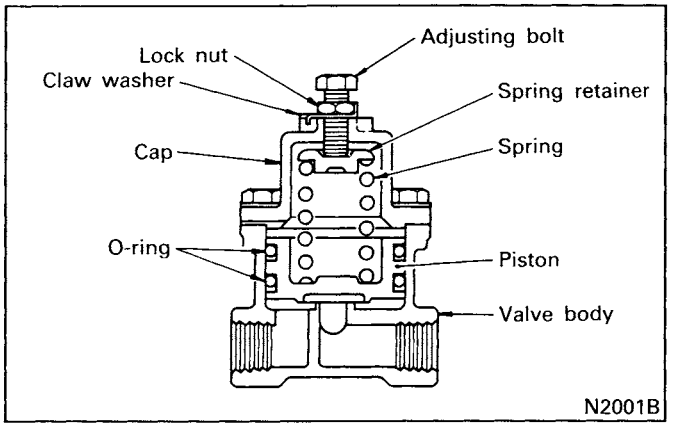
Disassembly sequence

1 Adjusting bolt
2 Lock nut
3 Claw washer
4 Cap
5 Spring retainer
6 Spring
7 Piston
8 O-ring
9 Valve body

CAUTION
Do not tamper with the adjusting bolt except when making an adjustment.

N1998B

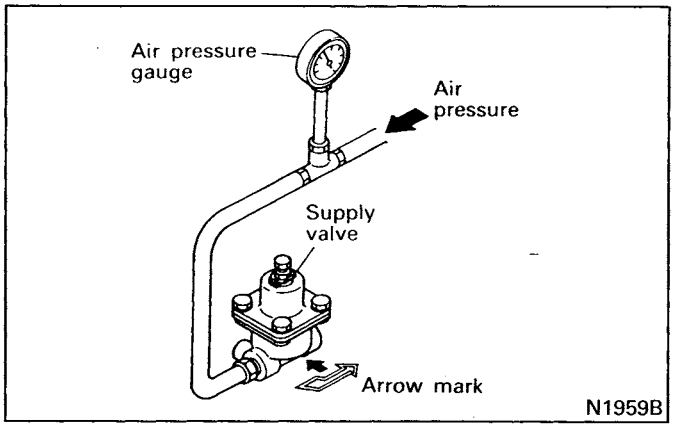
(2) Reassembly



N2001B

(3) Inspection after reassembly

(a) Operation test



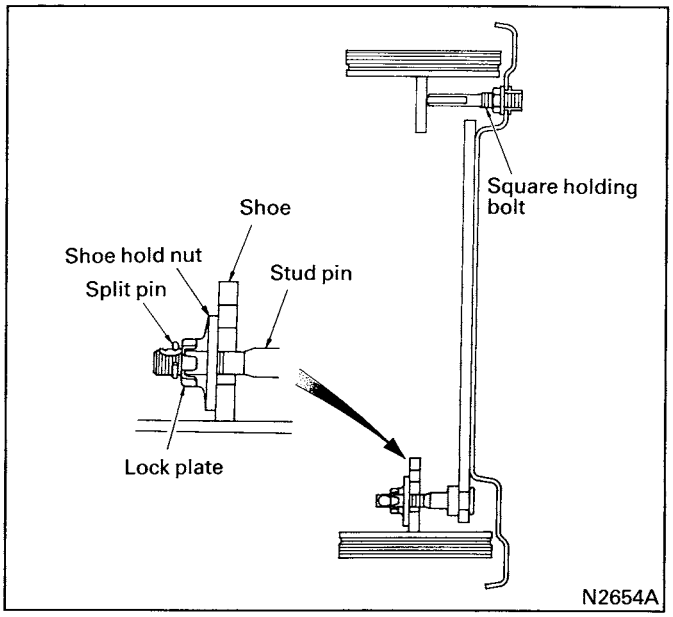
N1959B

1) Connect an air pressure gauge between air compressor and supply valve port on the side not pointed by the arrow.
2) Increase air pressure gradually and check to ensure that air blows out from the port pointed by the arrow, when the gauge reading reaches the nominal value for the valve opening pressure. Also check that air blow from the port is stopped, when air pressure is lowered to the nominal value for the valve closing pressure. If that is not the case, make an adjustment.

Nominal value	Valve opening pressure	345 ± 29 kPa {50 ± 4.3 lbf/in², 3.5 ± 0.3 kgf/cm²}
	Valve closing pressure	315 ± 20 kPa {46 ± 2.8 lbf/in², 3.2 ± 0.2 kgf/cm²}

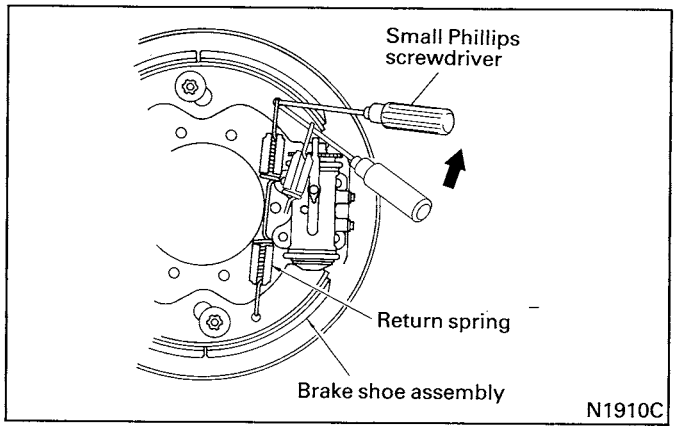
Reassembly Procedure

(a) Installation of brake shoe assembly



Place the brake shoe assembly into the wheel cylinder and fit the return spring. Then, tighten the shoe hold nut until the shoe contacts the square holding bolt on the back plate and then back it off 1/3 turn. Mount the lock plate and, from this position, back off the shoe hold nut. Do this until the stud pin hole in the back plate first meets the pin hole in the lock plate. Finally, secure with the split pin.

(b) Installation of return spring



Catch one of the hooks of the return spring at the brake shoe assembly and fit the other hook to a small Phillips screwdriver. Insert the end of the screwdriver into the brake shoe assembly return spring mounting hole and pry it into position.

CAUTION

When the return spring center faces the direction shown in Fig., it is installed in the correct direction.

BRAKE
(FULL AIR BRAKE)

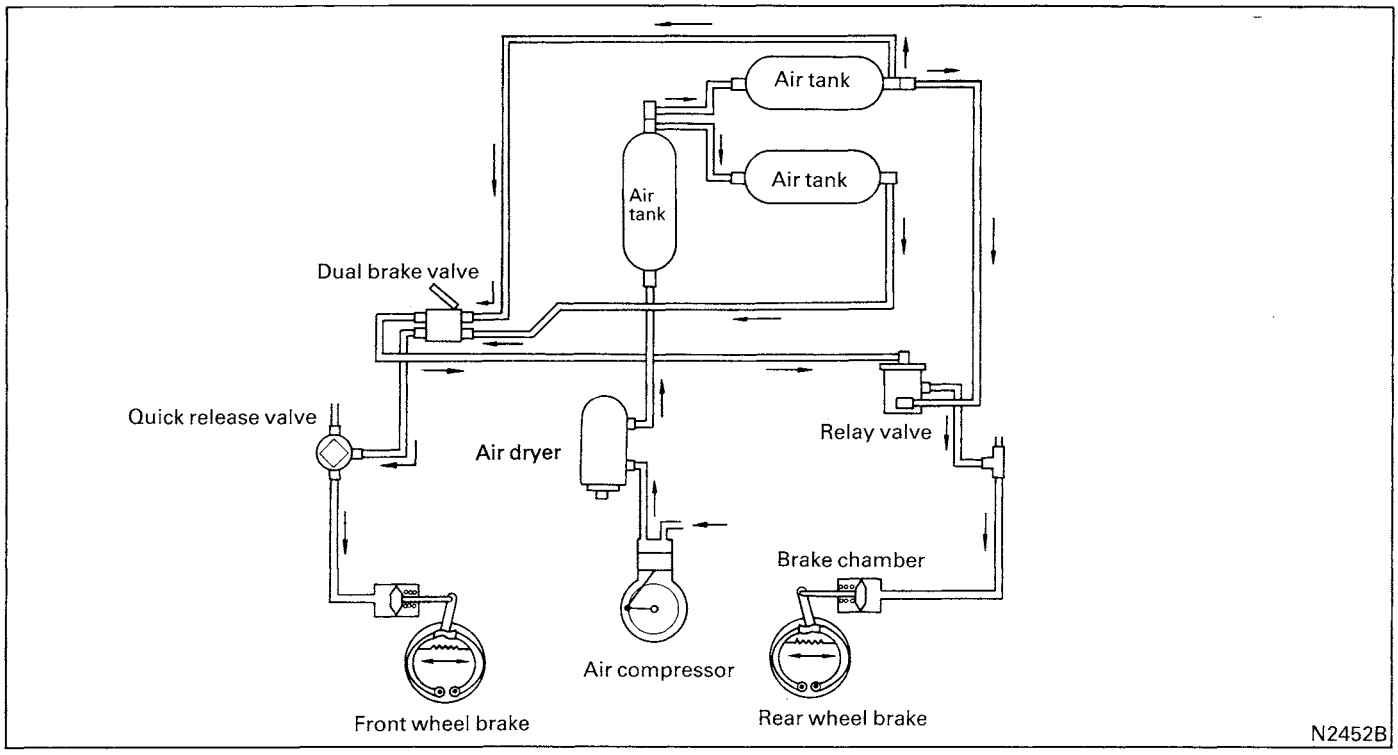
CONTENTS

5. GENERAL

5.1 Service Brake

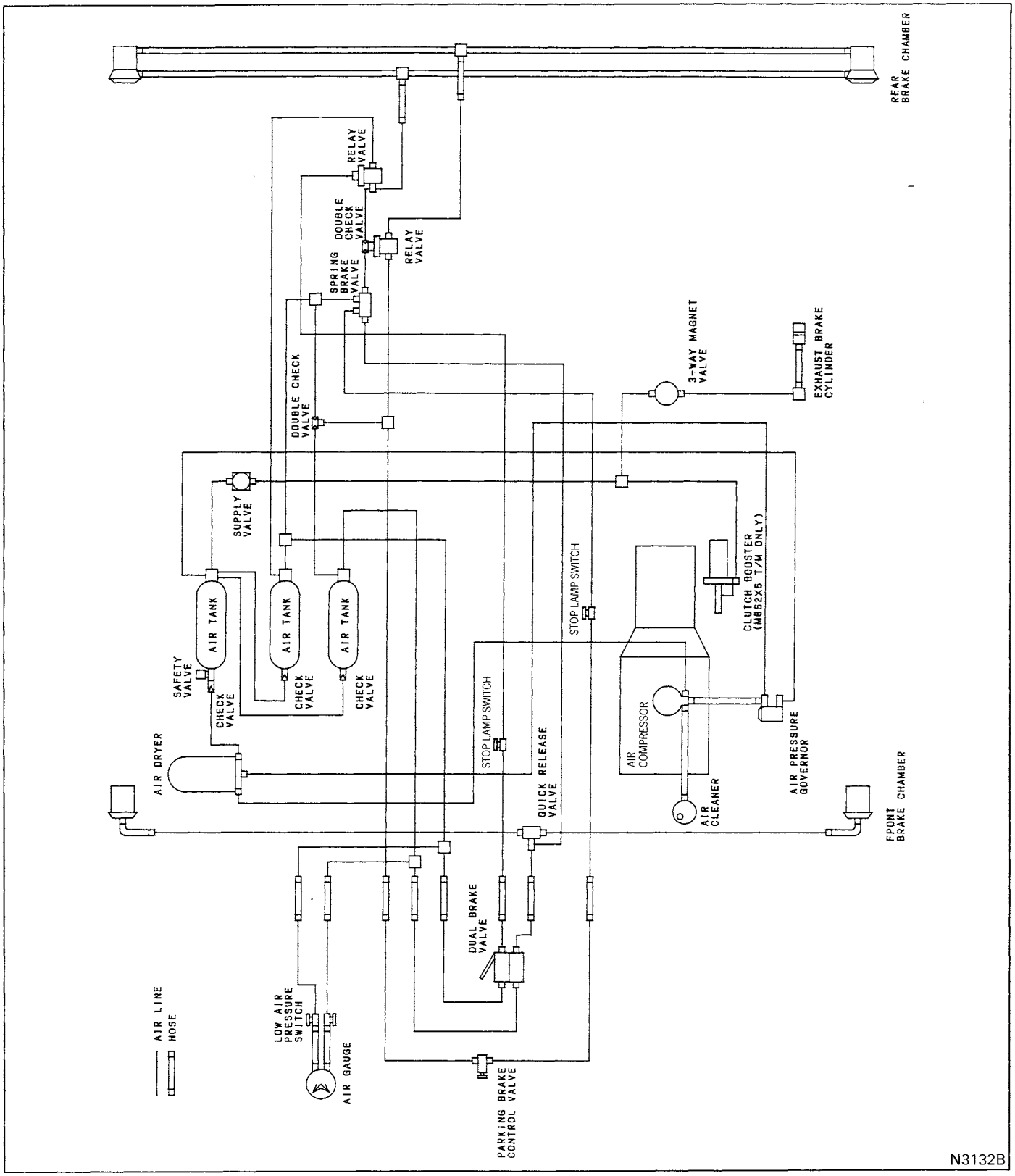
The service brakes are full air brakes completely in two circuits and are used to decelerate or stop the traveling vehicle.
The compressed air is always available in the circuit up to the supply port of the dual brake valve.

When the pedal is depressed, the compressed air is sent through the quick release valve (for front) and relay valve to the brake chamber, which drives the slack adjuster to rotate the brake cam which in turn causes the brake shoe to expand and be pressed against the brake drum to produce a frictional force.



6. SERVICE PROCEDURE

6.1 Brake System Diagram

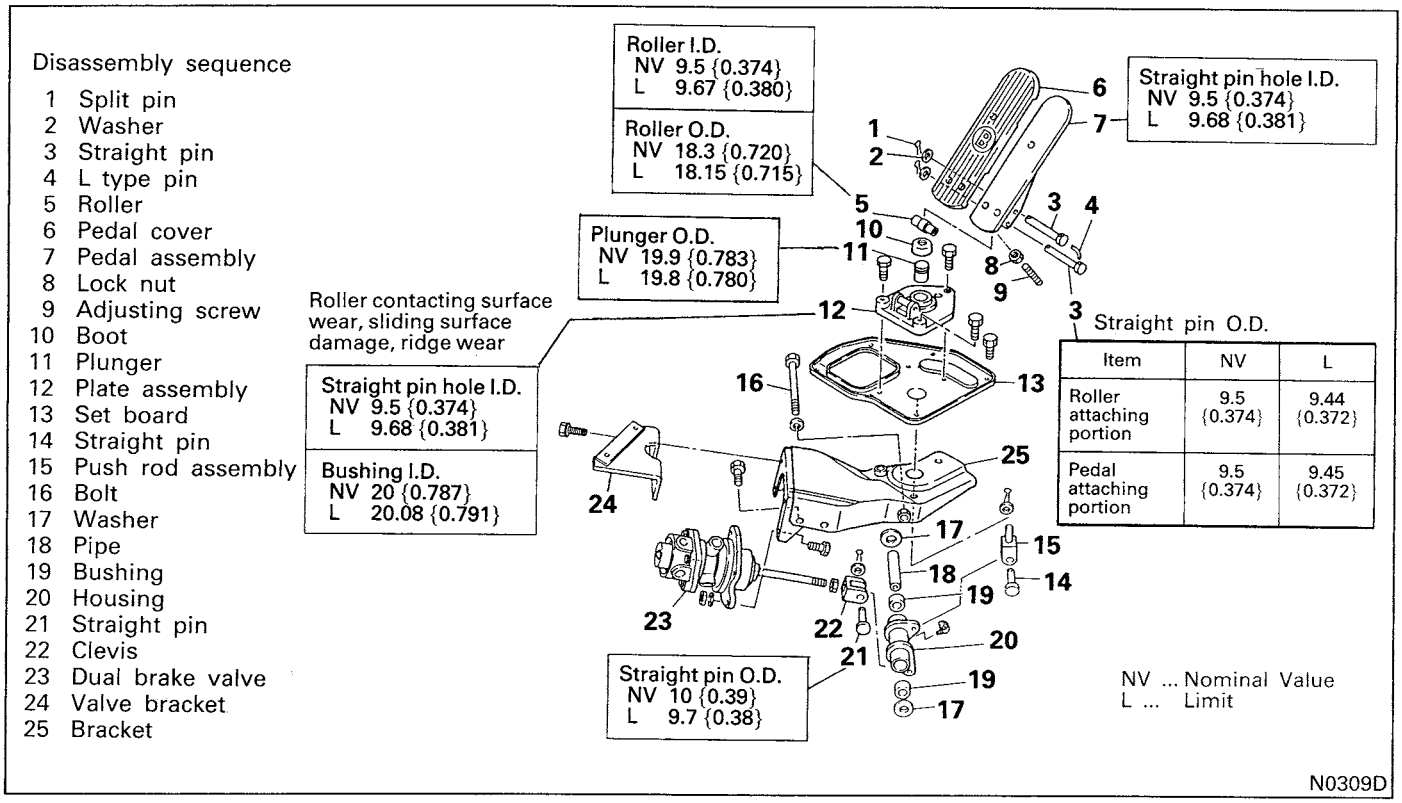


(2) Disassembly and inspection

CAUTION

1. **Before disassembly, remove dirt, dust, foreign matter from the surface to prevent their entry.**
2. **Put alignment marks before disassembly.**
3. **Never immerse rubber parts in a cleaning solution.**
4. **Replace rubber parts even before scheduled period of replacement.**

(a) Brake pedal



(b) Dual brake valve

Use the following special tools when servicing the dual brake valve.

Tool name	Part No.	Application
Needle	910-21200	Removal of O-ring
Pliers	910-22570	Removal and installation of retaining ring
Insert Tool	910-24461	Installation of relay piston O-ring (small)
Retainer	910-24590	Holding piston in position

Shown in the following are JIDOSHA KIKI CO. LTD part numbers.

1) For disassembly of the dual brake valve, disassemble the primary valve section and secondary valve section in that order.

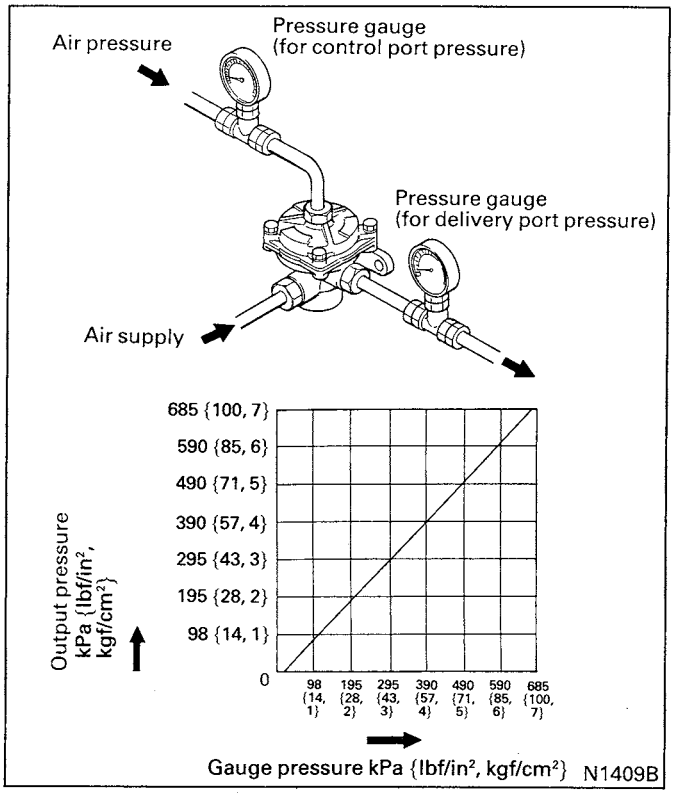
CAUTION

Put alignment marks on all joints before disassembly.

2) Wipe or wash clean the disassembled parts by the following procedures.

- Rubber parts ..... Wipe away deposits with a cloth immersed in alcohol or gas oil (when rubber parts have to be reused).
- Metallic parts (except for plate assembly and pedal) ..... Wash in a cleaning solution (trichloroethylene, Metalclen) and blow air to completely remove the cleaning solution and dry the parts.

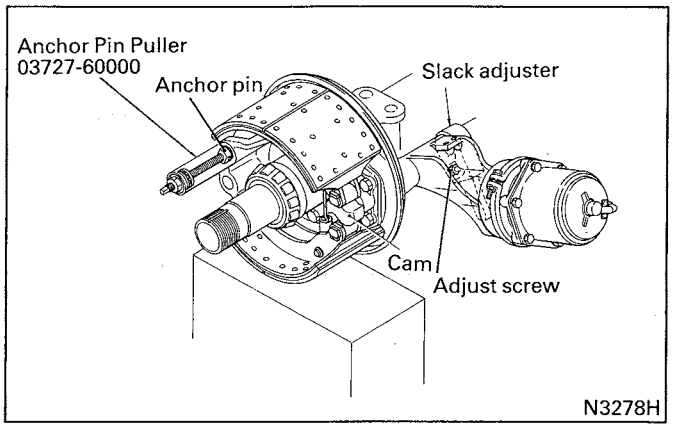
(3) Inspection after reassembly



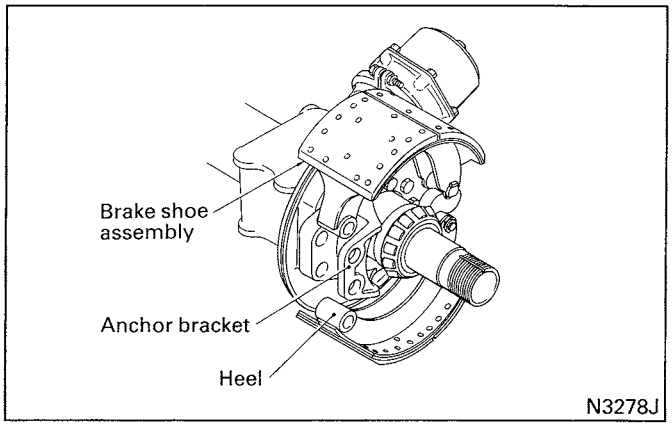
In the test setup shown at the left, the operating pressure difference between the control port and delivery port should be 25 kPa {3.6 lbf/in², 0.25 kgf/cm²} or less when air pressure is applied to the air supply port and control port. If the specification is not met, replace spring or replace as an assembly.

Disassembly Procedure

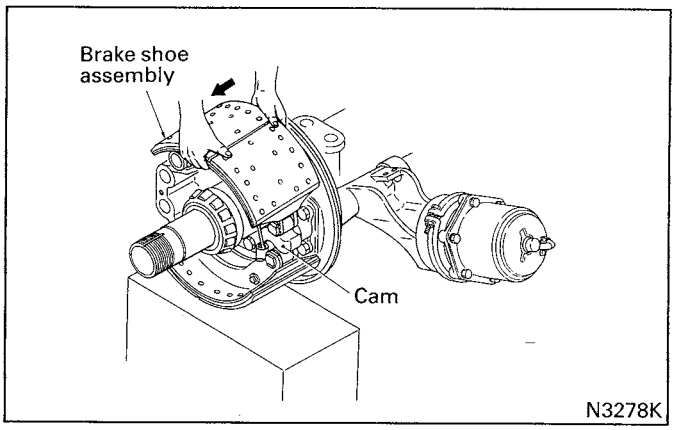
(a) Removal of brake shoe assembly



1) Turn the adjust screw on the slack adjuster so that the cam does not push the shoe outward. Using the special tool, remove the anchor pin.



2) Remove the heel of the lower brake shoe assembly from the anchor bracket. Similarly, remove the upper brake shoe assembly.



3) Hold the upper brake shoe assembly. Shifting it sideways, remove the brake shoe assembly from the cam. Then, remove the return spring.

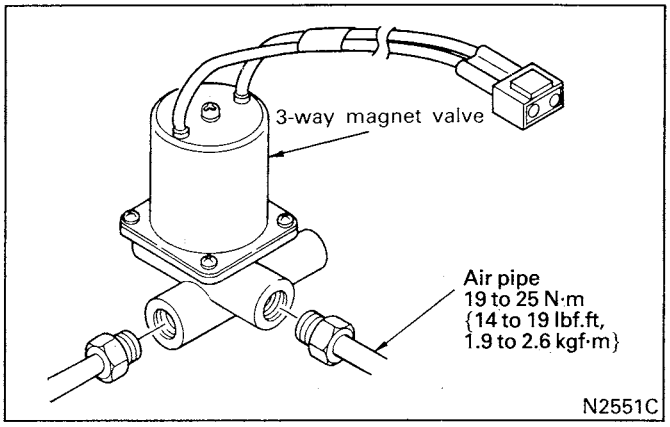
3) Inspection after reassembly

Perform the airtightness test. [Refer to Item (3), Section 6.5.1.]
If there is an air leak, replace the whole assembly.

6.5.3 Exhaust brake control

(1) Removal and installation

(a) 3-way magnet valve



CAUTION

1. **Install air pipe and hose, making sure that they do not interfere with other parts.**
2. **Do not twist or bend the hose excessively; keep them in natural position.**

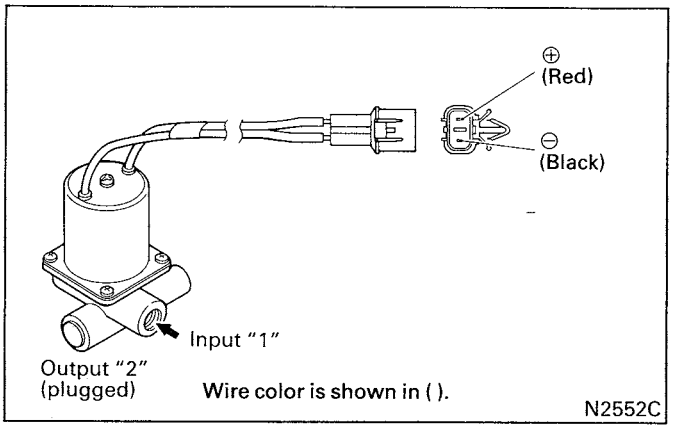
(b) Clutch switch
(Refer to Group 21 Clutch.)

(c) Combination switch (exhaust brake switch)
(Refer to Group 37 Steering.)

(2) Inspection

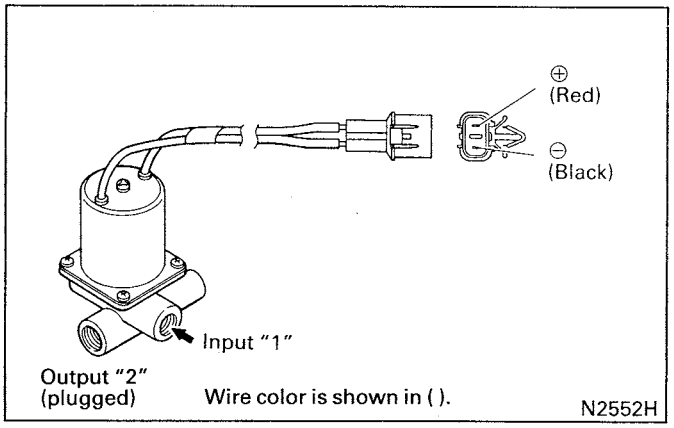
(a) 3-way magnet valve

1) Airtightness check



With outputs "2" completely plugged and with a 295 to 980 kPa {43 to 140 lbf/in², 3 to 10 kgf/cm²} air pressure applied from input "1", apply and shut down alternately a 12 V voltage to check for possible leak.

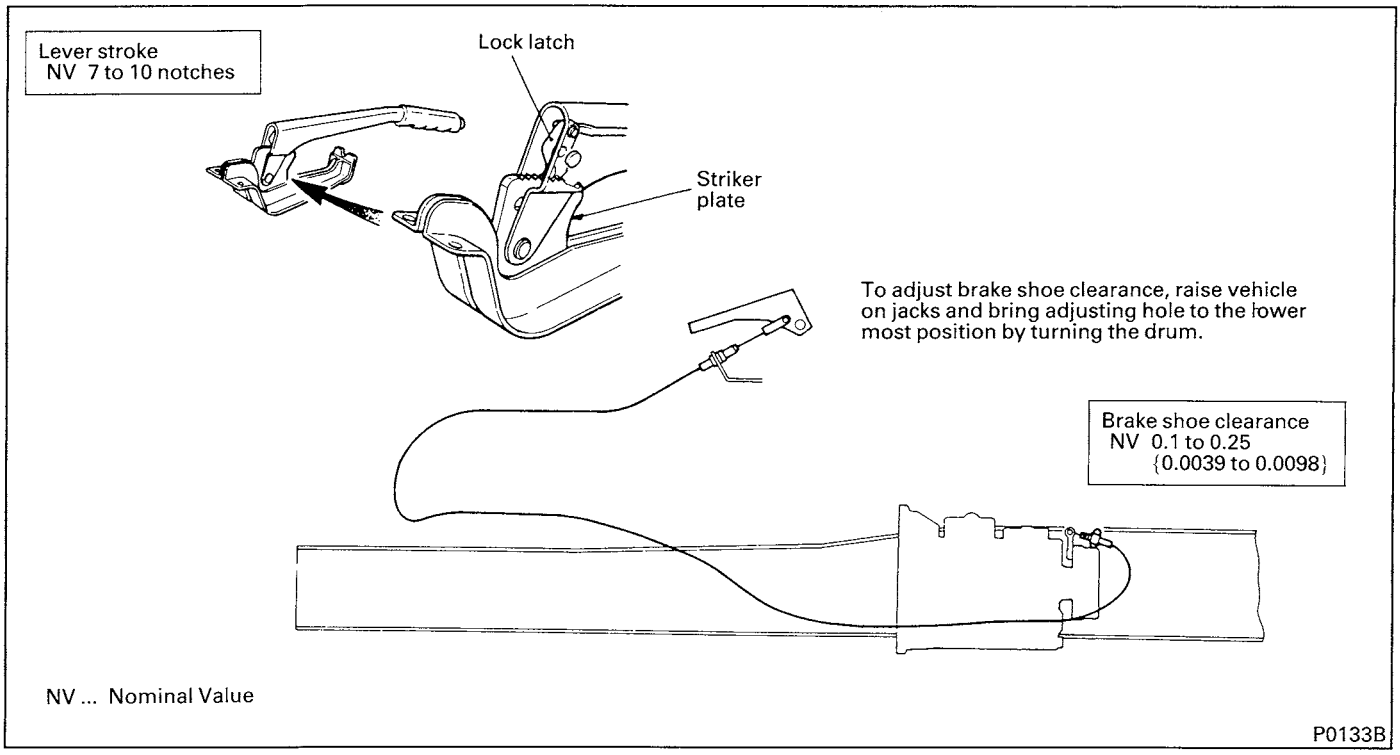
2) Operation check

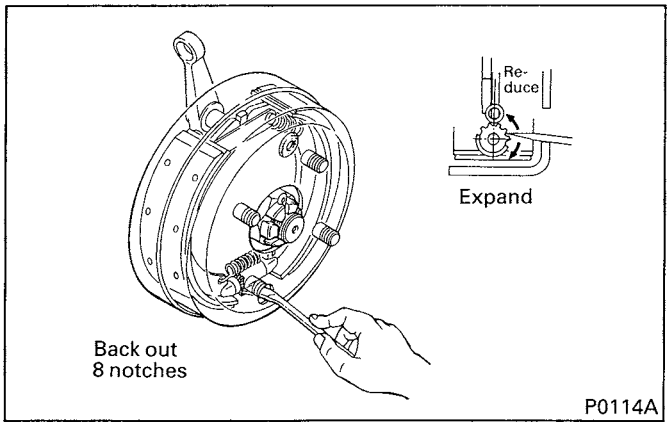


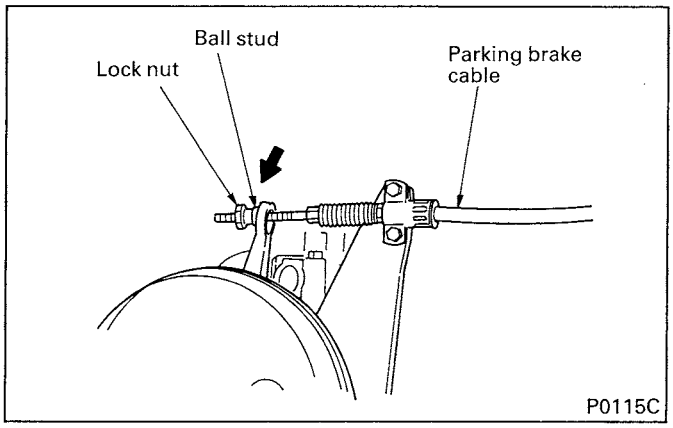
With a 980 kPa {140 lbf/in², 10 kgf/cm²} air pressure applied from input "1", apply voltage, gradually increasing from 0 V.
Then, make sure that the voltage at which the valve is actuated is up to specification.

Nominal value	10 V or less

6.3 Adjustment







Place the camshaft lever in its released position. Turn the adjusting screw by using a screwdriver through the shoe clearance adjusting hole in the drum until the shoes firmly contact the drum, and then back off the screw 8 notches. The shoe clearance then should be the nominal value of 0.1 to 0.25 mm {0.0039 to 0.0098 in.}.

Adjust the parking brake lever stroke by turning the cam shaft lever lock nut so that the number of the clicks produced when the lever is pulled up all the way from its released position corresponds to the nominal value (7 to 10 notches).

After making the adjustment, operate the parking brake lever two or three times to make sure that the stroke is correctly adjusted, the parking brake operates normally and the brake drum does not drag.

MITSUBISHI
FUSO

FK.FM

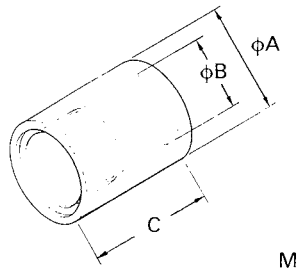
Service Manual

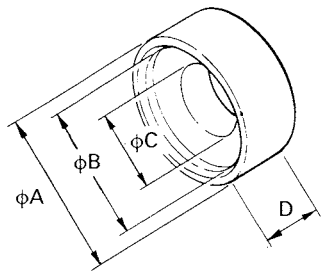
Group 37
Steering

MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub. No. TWME9107-37

Unit: mm {in.}

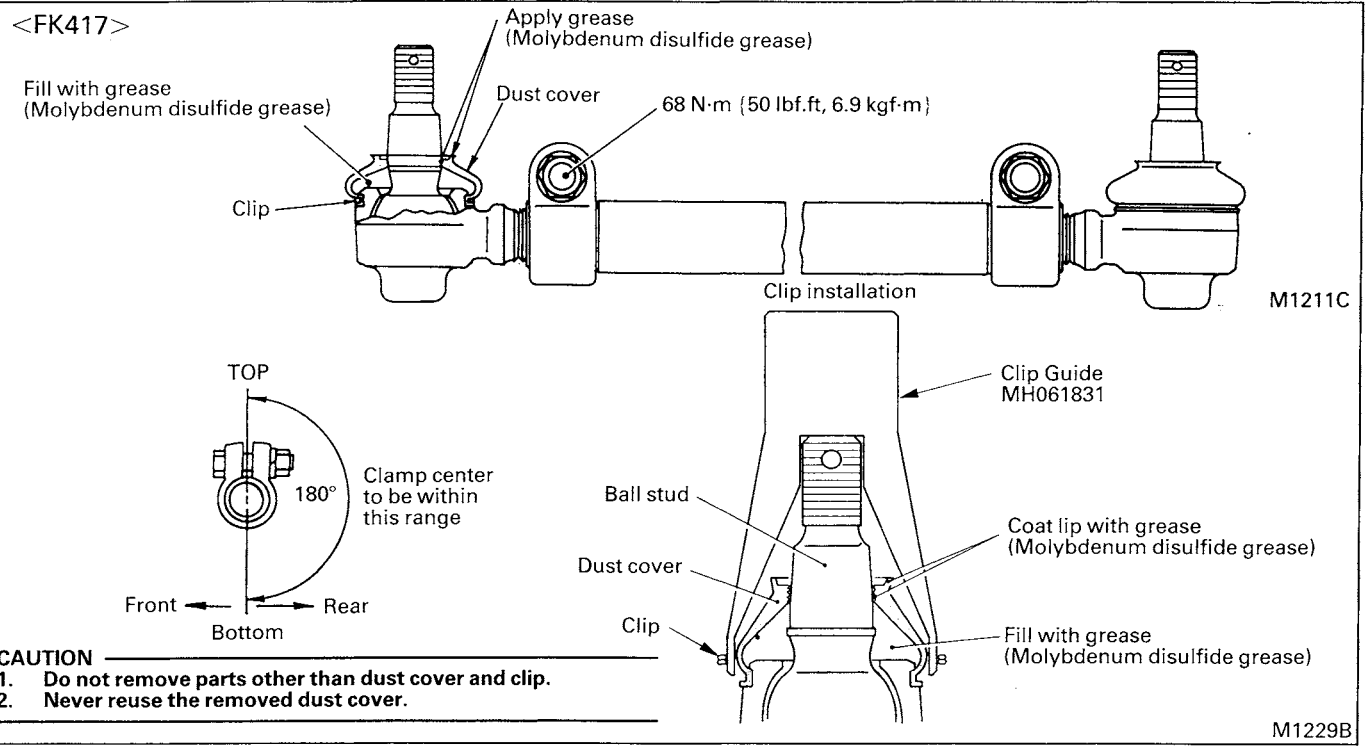
<table>
<tr><th>Tool name</th><th>Part No.</th><th>Shape</th><th>Application</th></tr>
<tr><td>Dust Cover Installer
<FK457, FM557></td><td>MH061827
MH061828</td><td> 

M1279A
<table>
<tr><th rowspan="2">Part No.</th><th colspan="3">Dimension</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>MH061827</td><td>65
{2.56}</td><td>51
{2.01}</td><td>100
{3.94}</td></tr>
<tr><td>MH061828</td><td>60.3
{2.37}</td><td>45
{1.77}</td><td>80
{3.15}</td></tr>
</table></td><td>Installation of drag link and tie rod dust covers</td></tr>
<tr><td>End Holder
<FK457, FM557></td><td>MH061829
MH061830</td><td> 

M1280A
<table>
<tr><th rowspan="2">Part No.</th><th colspan="4">Dimension</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td>MH061829</td><td>64
{2.52}</td><td>55.7
{2.19}</td><td rowspan="2">35
{1.38}</td><td rowspan="2">25
{0.98}</td></tr>
<tr><td>MH061830</td><td>60
{2.36}</td><td>50.5
{1.99}</td></tr>
</table></td><td>Installation of drag link and tie rod dust covers</td></tr>
</table>

6.5 Tie Rod

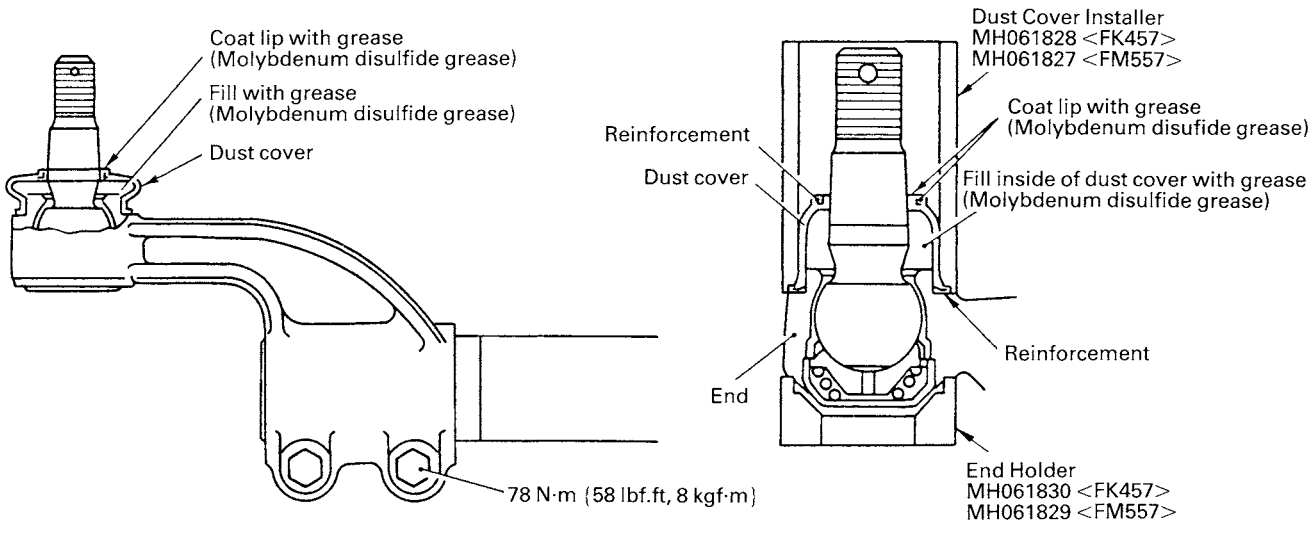
<FK417>



CAUTION
1. **Do not remove parts other than dust cover and clip.**
2. **Never reuse the removed dust cover.**

M1229B

<FK457, FM557>



Key Points for Installation of Tie Rod

With the steering in the straight ahead position, push the tie rod forward and make sure that on both sides, the tie rod end and the ball stud contact simultaneously.

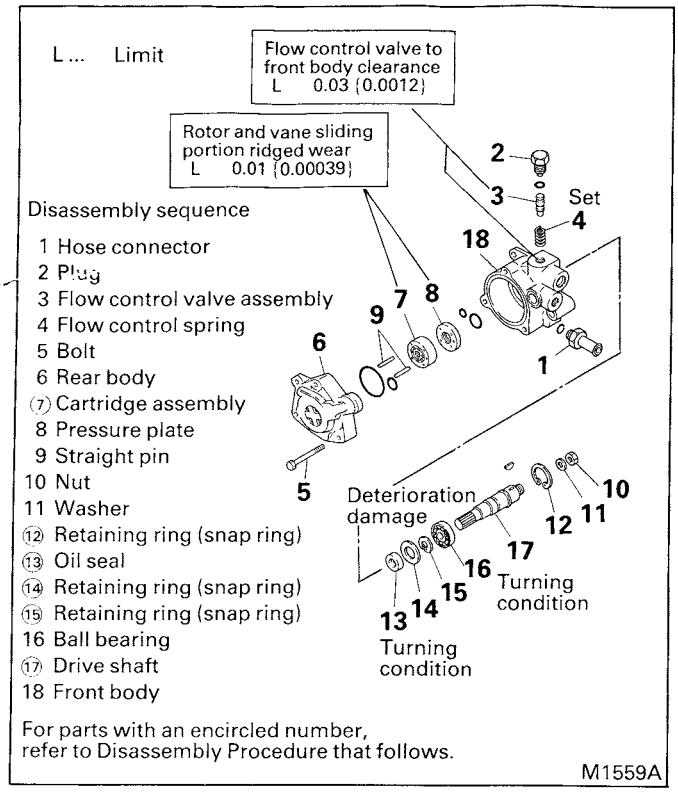
CAUTION
1. **Do not remove parts other than dust cover and clip.**
2. **Never reuse the removed dust cover.**

M1243A

6.7.2 Installation

(1) Install parts by reversing the order of removal.
(2) Fill in fresh hydraulic oil and bleed the piping. (Refer to Section 6.9.1.)
(3) Start the engine and check parts for possible oil leak.

6.7.3 Disassembly, inspection and correction

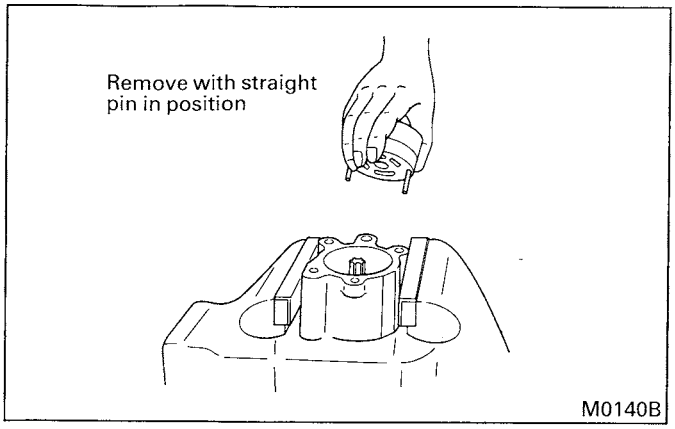


CAUTION

Do not disassemble the flow control valve but reuse unless defective.

Disassembly Procedure

(1) Removal of cartridge assembly



Remove the cartridge assembly with the straight pin in position.

Disassembly of cartridge assembly

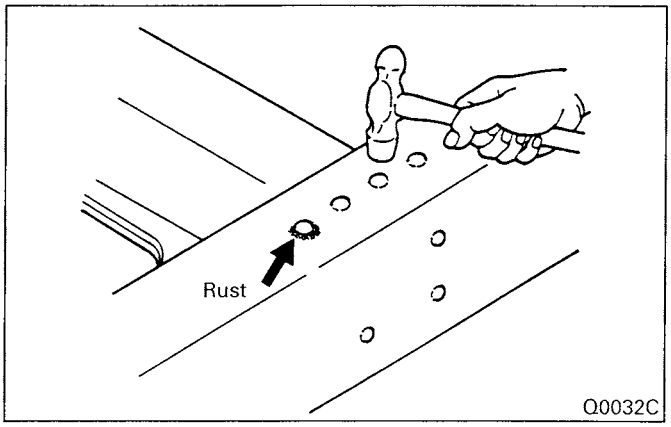
(a) Before disassembly, make an alignment mark on the outside circumference with a marker pen, etc.
(b) The cartridge can be completely disassembled into parts by removing the straight pin. Before removing the vane from the rotor section, put alignment marks on the side surface for reference at reassembly.

CAUTION

The rotor, vane and cam ring have been precision-machined to fit each other.
Handle with utmost care to prevent damage. When any of them requires replacement, replace the cartridge assembly.

2.1.2 Rivets

(1) Inspect for rivet looseness

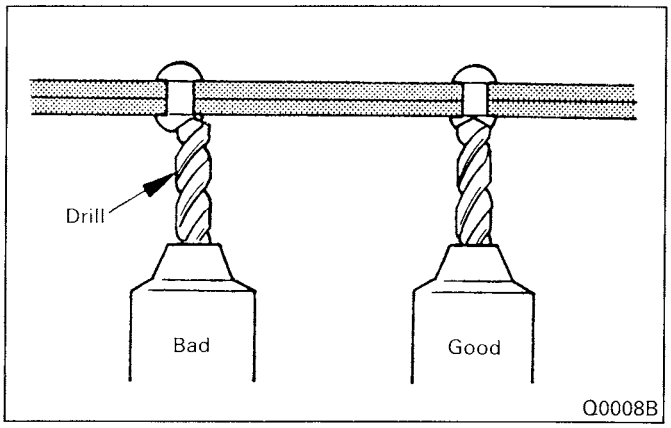


Tap the rivet heads lightly with a test hammer, and judge rivet tightness from the sound or feel. Replace loose rivets.
If rust is found between the rivet and the frame, the rivet is loose. Replace the rivet.

CAUTION

If it is not repaired, loose rivets will break or lead to cracks in the frame from the rivet holes, causing accidents. Be sure to repair using a new rivet.

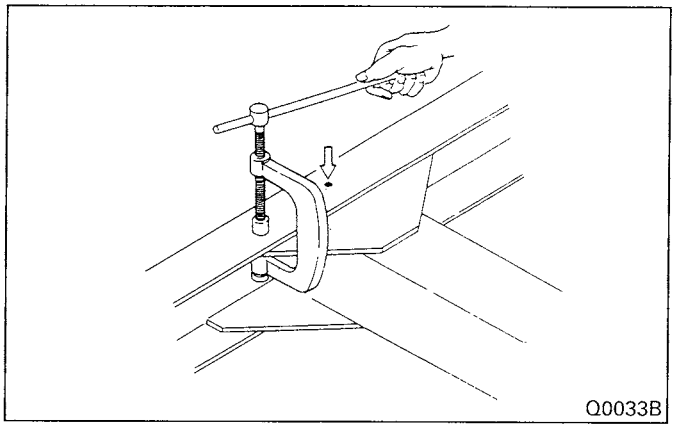
(2) Rivet repair



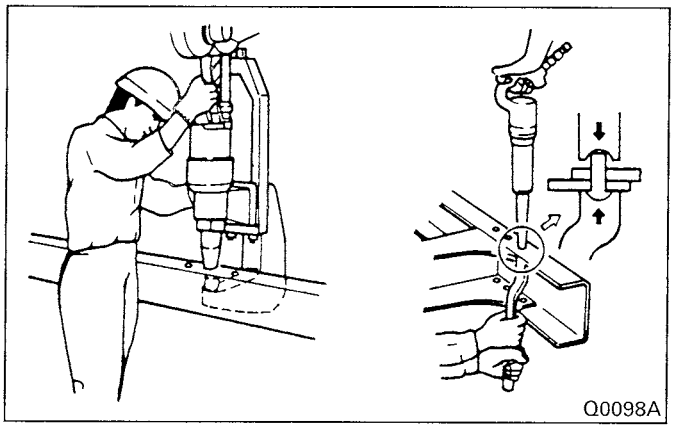
(a) To remove loose rivets, apply a punch, etc., to the center of the rivet head to make a notch and then drill out.

CAUTION

Use of a chisel may damage the rivet hole and should be avoided.



(b) When driving rivets, be sure to press the both plates near the rivet hole using a "C" clamp to ensure that no gap is left.



(c) Use a riveting machine to press the rivets.

CAUTION

Where riveting is impossible, ream out the rivet hole, insert a reamer bolt, and weld after tightening the nut thoroughly.

2.1.3 Bolts and nuts

Check the crossmember and helper stopper mounting bolts for looseness. Retighten as necessary.

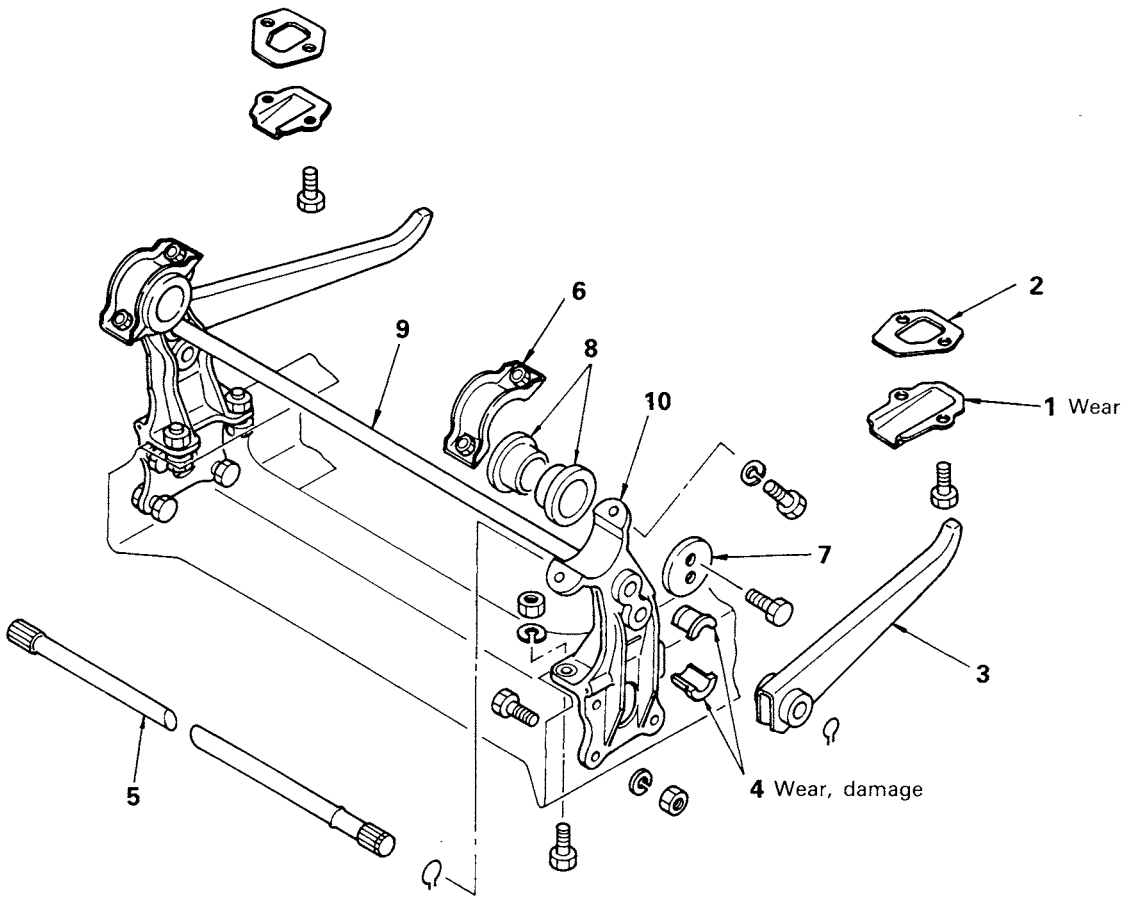
CAUTION

If the helper stopper mounting bolt is loose, retighten the nut.

5.2 Cab Mounting

5.2.1 Front cab mounting

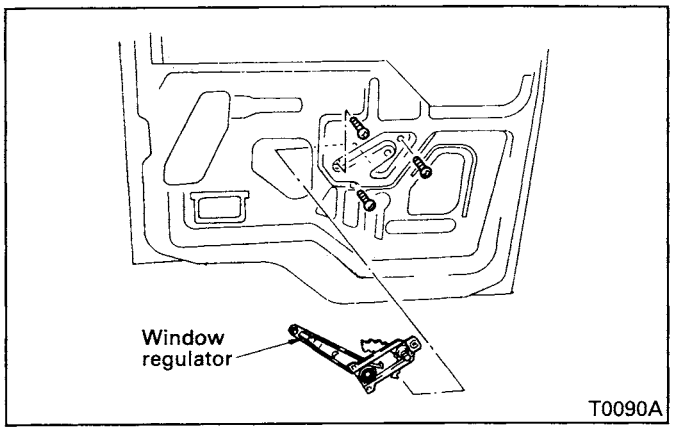
(1) Disassembly and inspection



Disassembly sequence

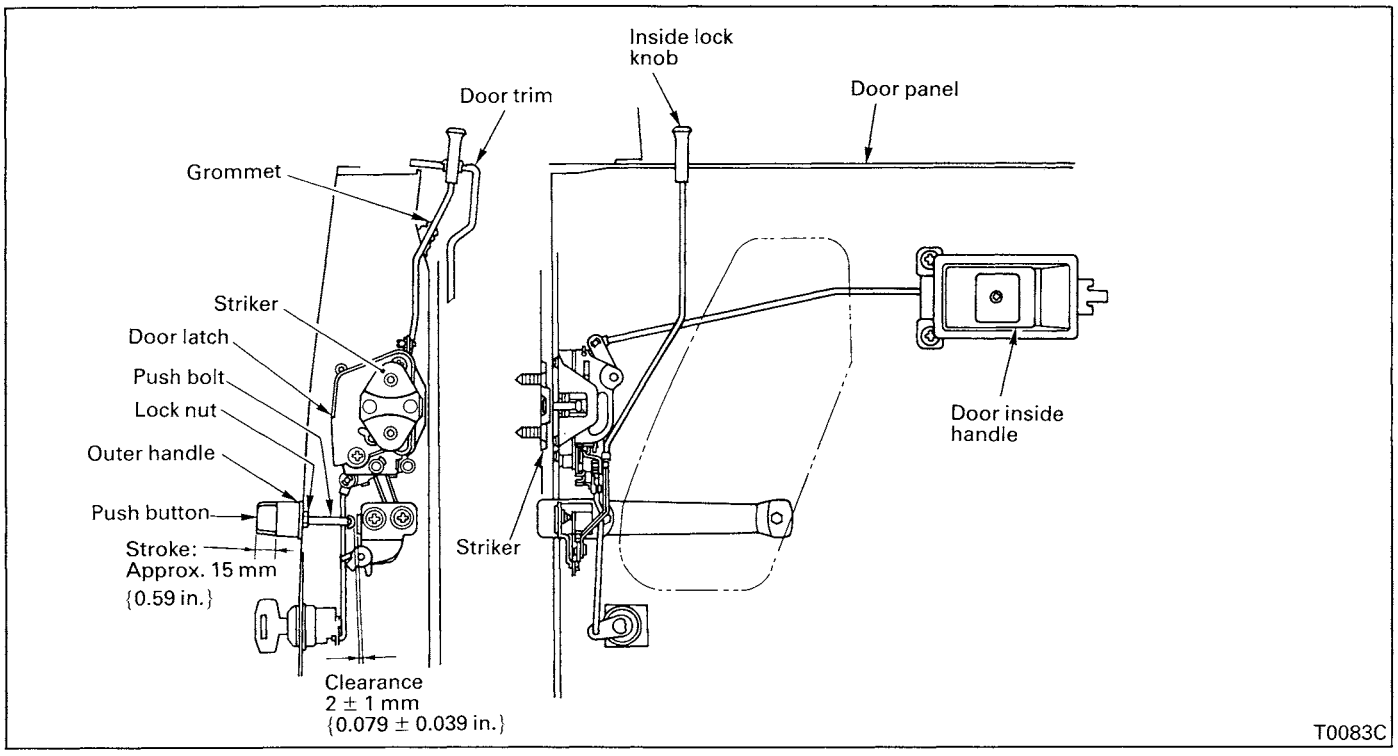
1 Support
2 Shim
3 Torsion bar arm
4 Bushing
5 Upper torsion bar
6 Cab hinge cap
7 Plate
8 Cab hinge cushion
9 Lower torsion bar
10 Cab hinge

T1153A



(12)Remove the window regulator.

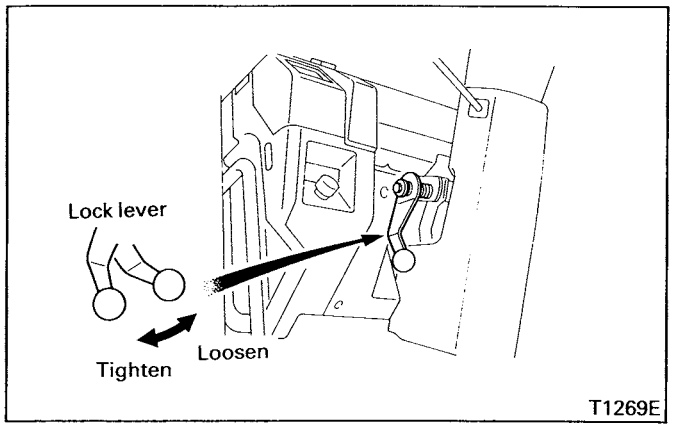
Reassembly Procedure



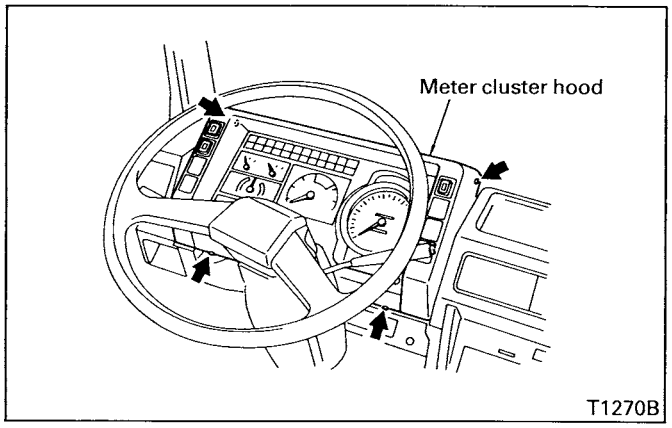
Disassembly Procedure

(1) Meter cluster

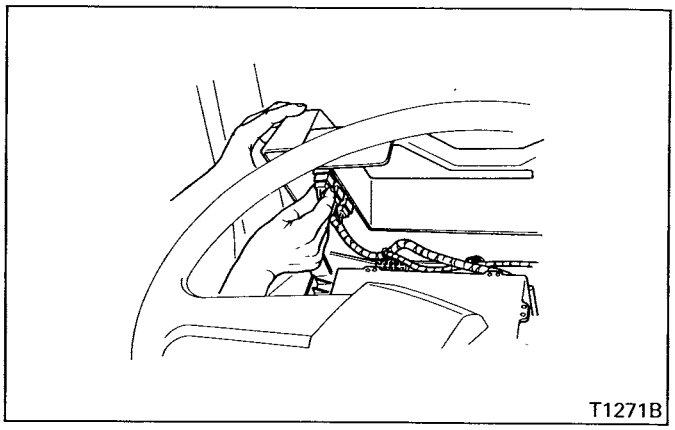
(a) Disconnect negative terminal from battery.



(b) To make removal of meter cluster easier, loosen the steering lock lever, pull the steering wheel forward and up all the way, and lock the steering lock lever.

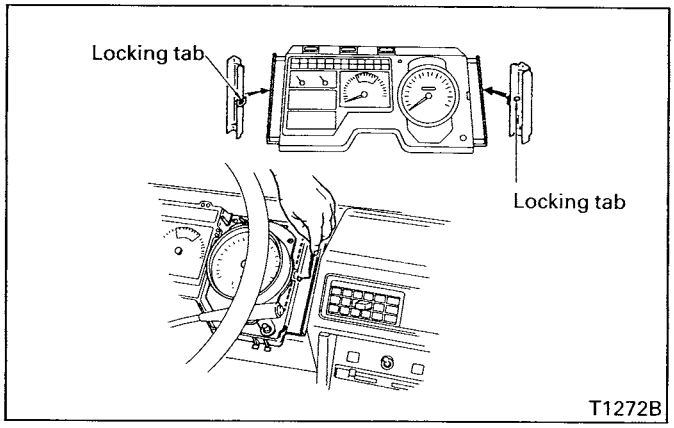


(c) Remove the meter cluster hood mounting tapping screws.



(d) Raise the front end of the meter cluster hood and, working from the back of the hood, disconnect all connectors between push lock switch and body harness.

(e) Remove the meter cluster hood toward the assistant's seat side. (It cannot be removed to the door side as the front pillar and steering wheel block.)



(f) Press the locking tab of the harness protector with a flat-blade screwdriver or Allen wrench and remove the protector straight upward.

CAUTION

Do not apply excessive force to press the locking tab, as a damaged tab could result.

Symptom	Probable cause	Remedy	Ref. group
Water temperature gauge pointer is unstable or its indication error is very large	Faulty water temperature gauge	Replace	
	Faulty water temperature gauge unit	Replace	
	Faulty cold start switch	Replace	
	Faulty wiring	Repair	
	Faulty thermostat	Replace	Group 14
Fuel gauge does not operate	Faulty fuel gauge	Replace	
	Faulty fuel gauge unit	Replace	
	Blown fuse or fusible link	Replace	
Air pressure gauge does not operate Air pressure gauge pointer is unstable or its indication error is very large	Air leak from air system	Repair	
	Faulty air pressure gauge	Replace	

(4) Indicator and warning lamp system

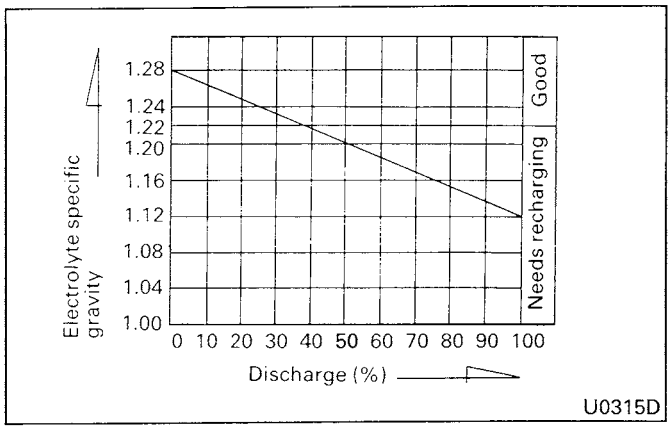
Symptom	Probable cause	Remedy	Ref. group
When switch is turned ON, each unit operates but indicator lamp does not light	Blown bulb	Replace	
	Open circuit in wiring or poor connection	Repair	
	Malfunctioning switch	Replace	
When parking brake lever is pulled (FK series) or when spring brake control valve knob is placed in "PARK" position, parking indicator lamp does not come on.	Blown bulb	Replace	
	Faulty parking brake switch	Replace	
	Blown fuse or fusible link	Replace	
	Open circuit in wiring, incorrect connection	Repair	
	Air not released from parking brake system (FM series)	Check for clogged air pipe and faulty spring brake control valve operation	Group 36B
When parking brake lever is returned (FK series) or when spring brake control valve knob is placed in "RELEASE" position, parking indicator lamp does not go out.	Faulty parking brake switch	Replace	
	Faulty wiring	Repair	
	Air not force-fed to parking brake system (FM series)	Check for clogged air pipe and faulty spring brake control valve	Group 36B
Brake warning lamp does not light when brake fluid level is lower than specified (FK series)	Blown bulb	Replace	
	Faulty brake fluid level sensor	Replace	
	Blown fuse or fusible link	Replace	
	Open circuit in wiring, incorrect connection	Repair	
Oil warning lamp lights while engine is running	Low engine oil pressure	Correct	Group 12
	Engine oil leaks, low oil level	Correct	
	Faulty oil pressure switch	Replace	
	Clogged oil filter	Replace element	Group 12
	Faulty oil bypass alarm	Replace	
Charge warning lamp lights while engine is running	Broken or loose V-belt	Correct	Group 14
	Faulty alternator	Repair	Group 16

5. SERVICE PROCEDURE

5.1 Battery

5.1.1 General description

(1) Two 12 V batteries connected in series are used.

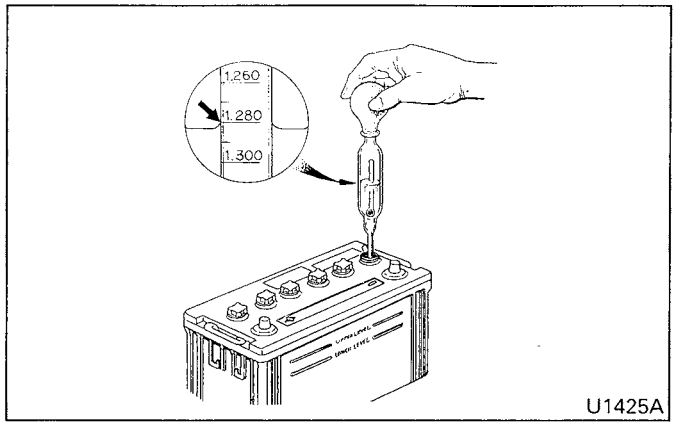


(2) The electrolyte in the battery is sulfuric acid diluted with deionized water or distilled water. The specific gravity of the electrolyte is approx. 1.280 at fluid temperature of 20°C {68°F} and when the battery is in the fully charged condition.

5.1.2 Inspection

Precautions:

1. **The battery releases hydrogen gas which is explosive.**
   Do not shortcircuit the + and – terminals. Keep the battery away from sparks, lit cigarettes, etc.
2. **The battery electrolyte is sulfuric acid which is corrosive. When handling the battery, wear safety goggles to protect your eyes and wear rubber gloves to protect your hands.**
3. **When handling the battery, do not wear a metallic article over your arms. Do not bring you face close over the battery.**
4. **When disconnecting battery cables, disconnect the negative one first.**
5. **Use care not to allow disconnected cables to touch the terminals, causing shortcircuit.**
6. **When removing the battery, do not incline it unnecessarily.**
7. **The battery is heavy [each weighing 26 kg {57 lb}]. Handle carefully.**



1) Measure the electrolyte specific gravity and recharge the battery if it is smaller than the limit given below.

Nominal value	1.280
Limit	1.220

CAUTION

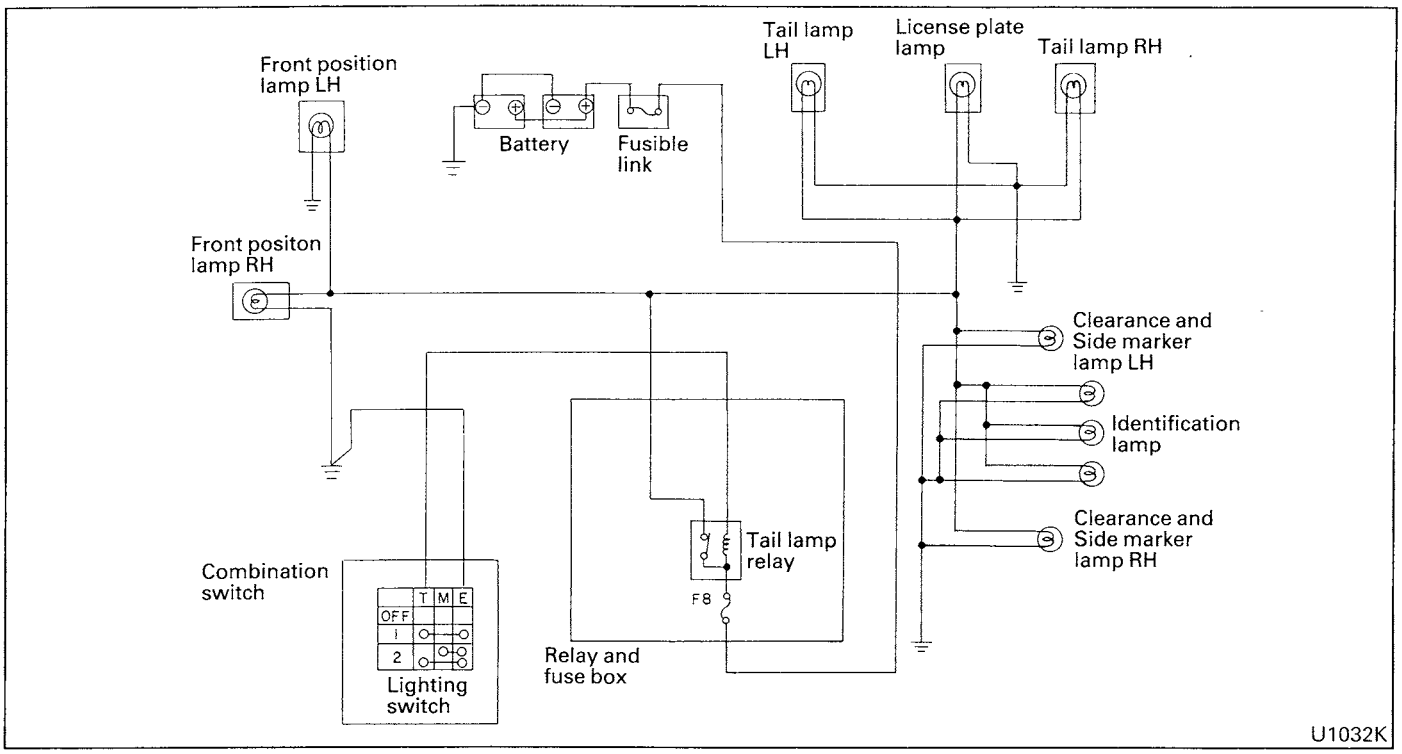
The battery electrolyte specific gravity changes with temperature. Use the equation below to convert the measured value to specific gravity at 20°C {68°F}.

$$S_{20} = St + 0.0007\ (t - 20)$$

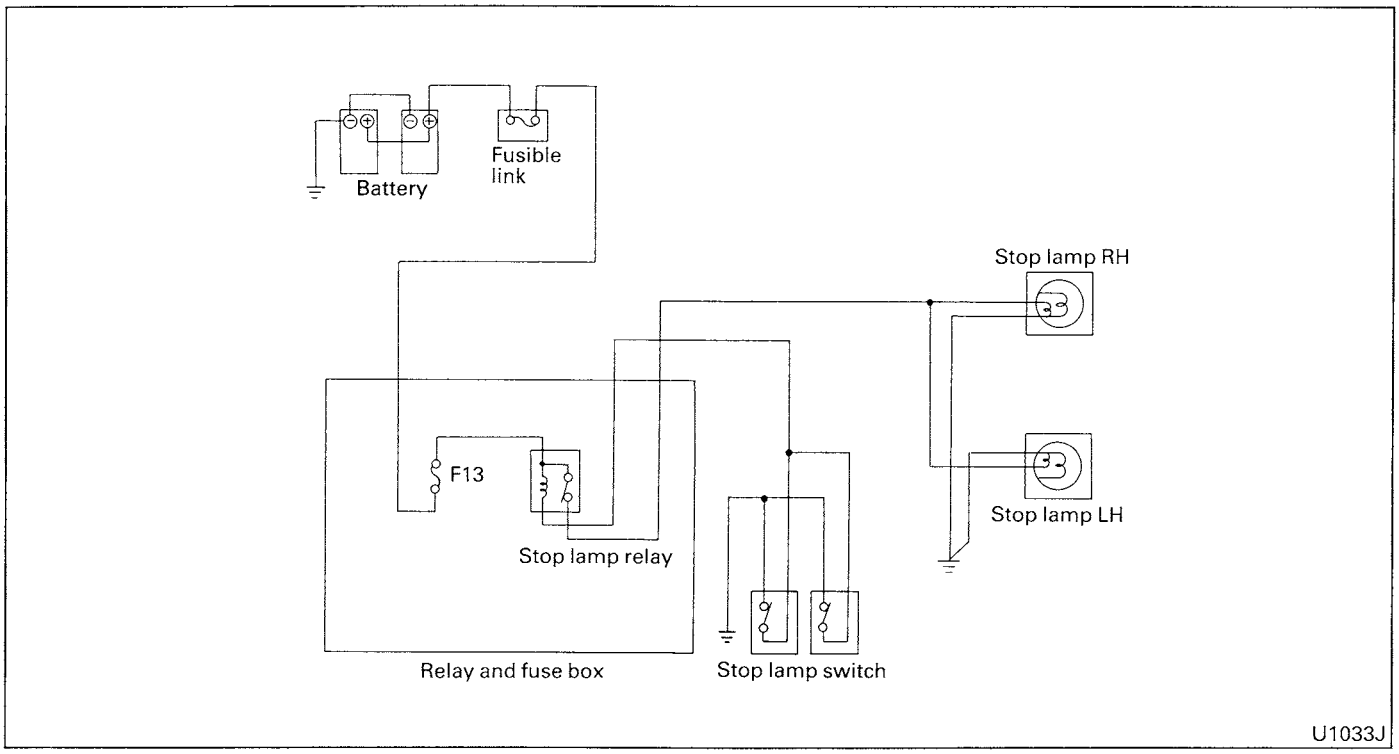
where

S_{20}: Specific gravity at standard electrolyte temperature of 20°C {68°F}
St: Specific gravity measured at t°C {t°F}
t: Electrolyte temperature

(3) Front position, tail, license plate, identification, clearance and side marker lamp circuit

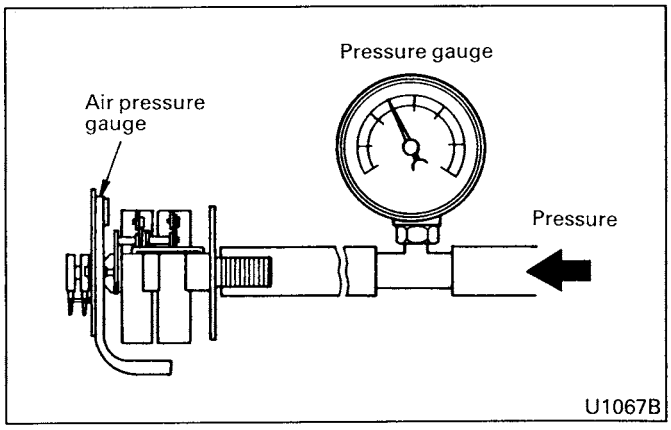


(4) Stop lamp circuit



Measure resistance at each float position. If the measurements differ greatly from the standard resistance, replace the fuel tank unit.

(10)Inspection of air pressure gauge



Apply various pressures to the air pressure gauge and check for correct registration. If the gauge does not register correctly, replace it.

(6) MUTIC controller

When the conditions given below are all satisfied, place the wiper switch in the INT position. If the interval of intermittent wiper operation is not within the nominal value range. A faulty MUTIC controller is suspected.

- The wiper switch is normal.
- The wiper motor is normal.
- There is nothing wrong with the harness.
- The wiper relay is normal.

Therefore, replace the MUTIC controller.

Nominal value

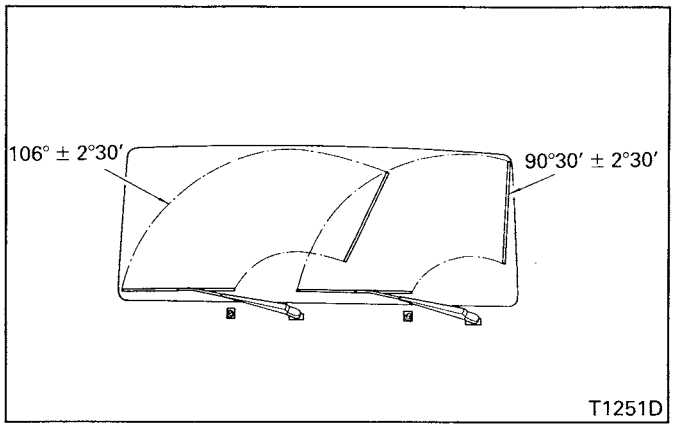
Interval times	3 to 5 sec.

CAUTION

Do not check the MUTIC controller in the field since its inspection requires the use of dedicated inspection device.

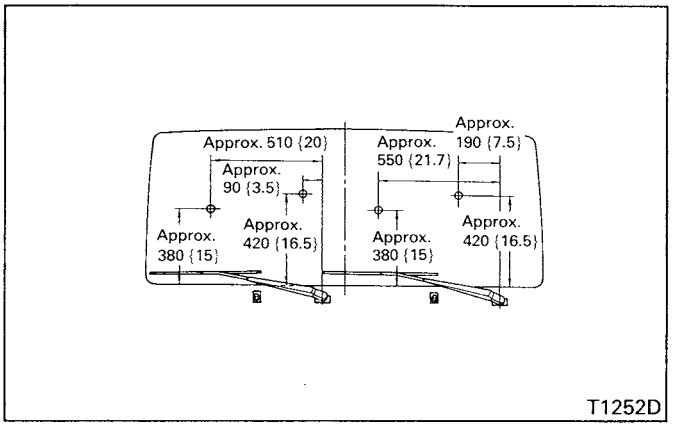
5.10.3 Inspection and adjustment after installation

(1) Wiping angles



Operate the wipers and make sure that they form the pattern as shown with wiping angles specified. To correct the angle, adjust the wiper arm installed position.

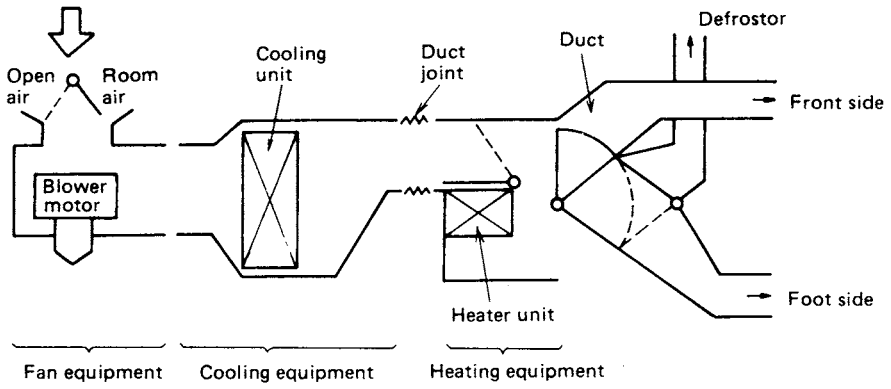
(2) Washer fluid squirt points



(a) Let the nozzles send a squirt of washing fluid to check if the washer is correctly aimed at the positions shown. If aiming is incorrect, adjust the nozzles.

2. OUTLINES OF REFRIGERATION SYSTEM

2.1 Air system



Cooling operation

Open air is induced to the cooling unit by a blower fan, where it is cooled down and dehydrated, then discharged at the front side outlet through a duct.

Heating operation

Open air is induced to the heater unit by a blower fan through the cooling unit, where it is heated, then discharged at the foot side outlet through a duct.

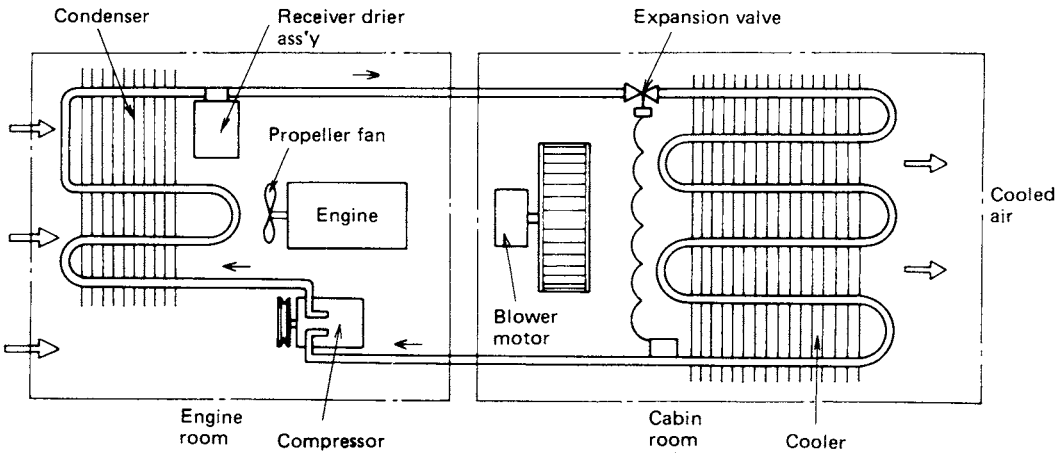
Dehumidifying operation

Open air is induced to the cooling by a blower fan, where it is cooled down and dehydrated, and succeedingly to the heater unit for warming, then discharged at the front side outlet through a duct.

Temperature control

Cooled air and warmed air are mixed for temperature control of the room inside.

2.2 Refrigerating cycle

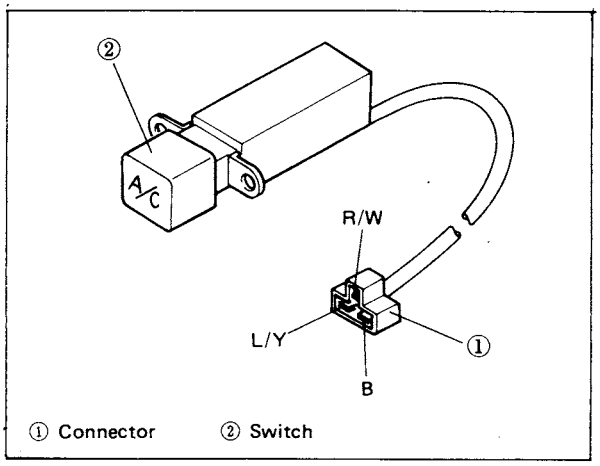


4.3 Inspection procedures

4.3.1 A/C switch

(1) Unplug the connectors of cords RW, LY, B for A/C switch.

(2) Check the continuity between terminals of the connector with a tester.



Continuity

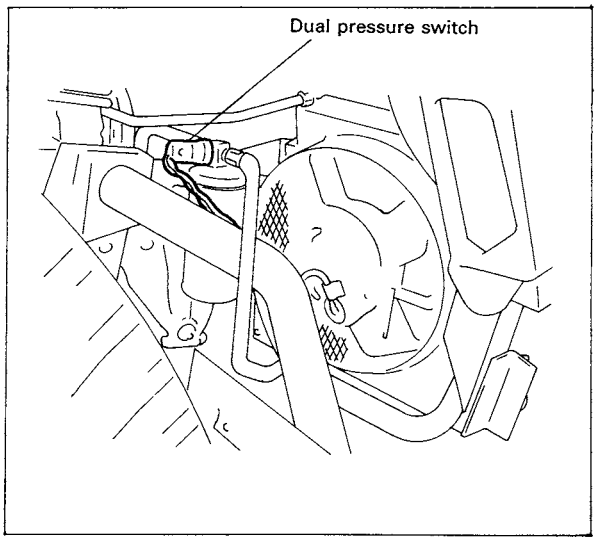
Switch position	Colored cords between	Result, in normal
OFF	RW LY	No
ON	RW LY	Yes

Switching of contactors

Switch position \ Colored cords	RW	LY	B	Lighting
OFF				OFF
ON				ON

4.3.2 Dual pressure switch

The dual pressure switch is attached to the receiver drier ass'y for controlling the operation of the air conditioner by checking the inside pressure of the receiver drier assembly.



Preset: kPaG (Lb/in^{2}G, kg/cm^2 G)

	High side	Low side
OFF	2646 (384, 27)	196 (28, 2)
ON	2058 (299, 21)	209 (29, 2.1)

(1) Unplug the connector at the receiver drier ass'y.

(2) Check the continuity between terminals of the connector with a tester.

(3) When electric continuity is found, connect the connector to the high pressure switch.

(4) Attach the high pressure gauge and low pressure gauge.

(5) Operate the air conditioner.

(6) Cover the surface of the condenser by using a piece of paper.

(7) When the high pressure exceeds 2646 kPaG (384 Lb/in^{2}G, 27 kg/cm^{2}G), if the magnetic clutch is turned off, the switch is normal.

(8) If the magnetic clutch is not turned off, replace pressure switch with new one.

(9) Check the accuracy of the preset as below.

(a) Stop the air conditioner.

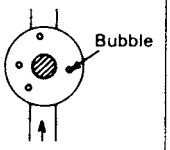
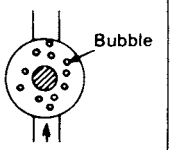
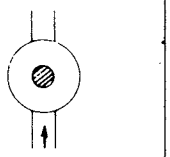
(b) Purge the air conditioner of refrigerant slowly starting at over 209 kPaG (29 Lb/in^{2}G, 2.1 kg/cm^{2}G).

(c) At reading the pressure 196 kPaG (28 Lb/in^{2}G, 2 kg/cm^{2}G), the switch opens.

(d) Here, stop the purging, then turn it to charging.

(e) At reading the pressure 209 kPaG (29 Lb/in^{2}G, 2.1 kg/cm^{2}G), the switch closes.

If the dual pressure switch does not meet specifications, replace the switch.

Sight glass		Remarks
Proper refrigerant level		1. Bubble occasionally appears. 2. Bubble disappear if speed is a little increased.
Insufficient refrigerant		Considerable bubbles appears. If the system is extremely short of refrigerant, the sight glass appear white.
Excessive refrigerant		1. No bubbles appear. 2. Slight bubbles appear if speed is decreased.

6.6 Performance test

6.6.1 Preparation

Reinstall all vehicle parts that were removed for installation of the air conditioner at their original positions, adjust the mounting, and test the following items.

1. Installation of grommets

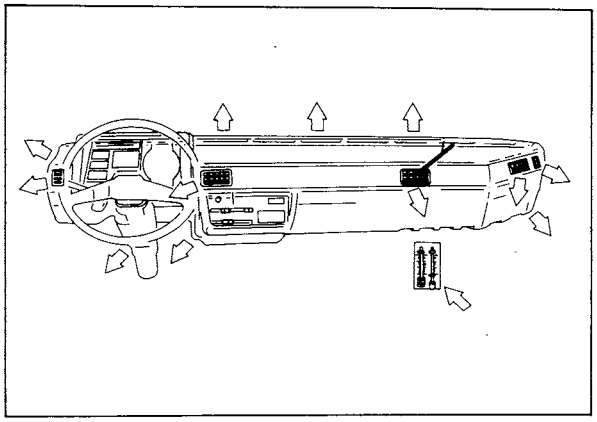
   Install the specified grommets

6.6.2 Stationary performance test

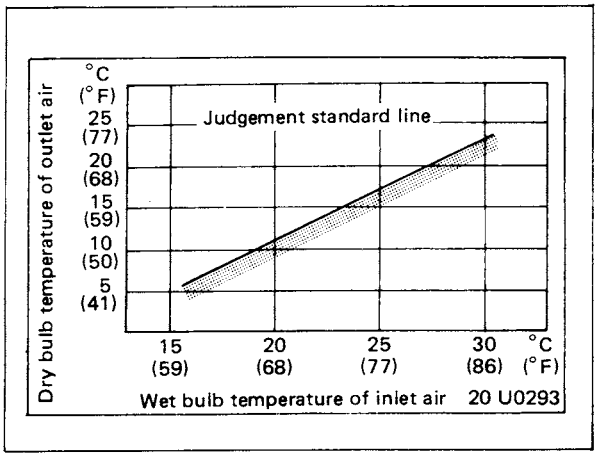
1. Operating conditions
   a. Place the vehicle in the shade with all windows and doors open.
   b. Keep the return air temperature between 25 to 30°C (77 to 86°F). (Adjust by changing the opening degree of the doors).
   c. Set the fan switch to the position.
   d. Turn the thermostat control lever to the cool position.
   e. Set the engine speed to approx. 2,000 rpm.
   f. Set the high pressure at 1,177 to 1,373 kPaG (170 to 200 psiG, 12 to 14 kg/cm² G).
   (If the high side pressured does not rise up, place paper or the like in front of the condenser.)

2. Test procedure

   Operate the air conditioner for more than 10 minutes under the above operating conditions in order to stabilize the high and low pressures. Then perform the test by the following procedure:



   a. Measure the outlet air temperature at the inside space of the outlet grille.
   b. Measure the air conditioner intake air temperature, humidity, etc., and the items shown in the Table of Measuring Items at a position free from the effects of cool outlet air.
   c. The intersecting point of the plotted line perpendicular to the point which corresponds to the air conditioner intake and outlet air temperature difference and the plotted line perpendicular to the point which corresponds to the relative humidity of intake air should be between the oblique lines in bigure.



7.4.2 Consumable parts

The following parts with identification should be replaced with new ones at each overhaul.

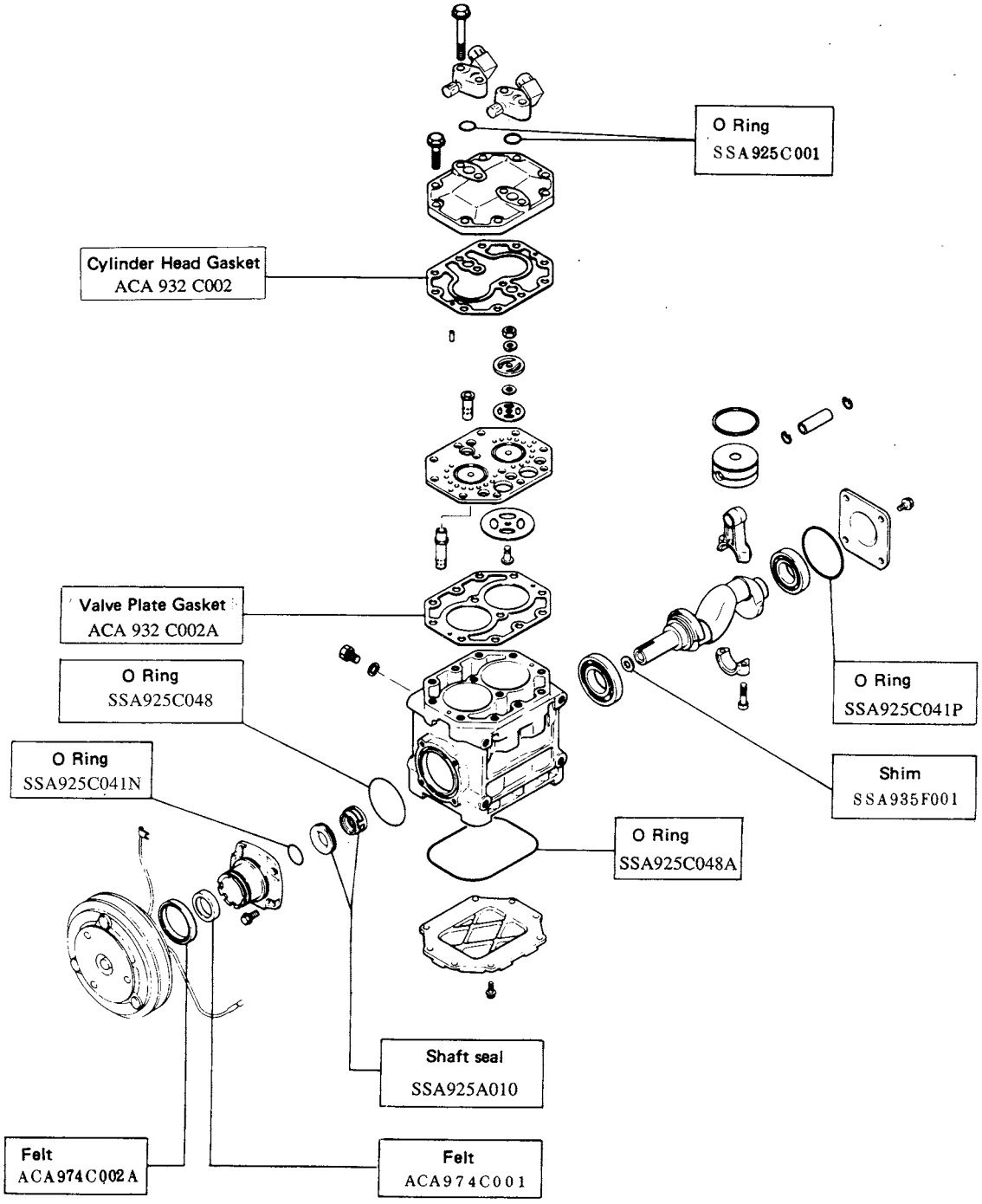
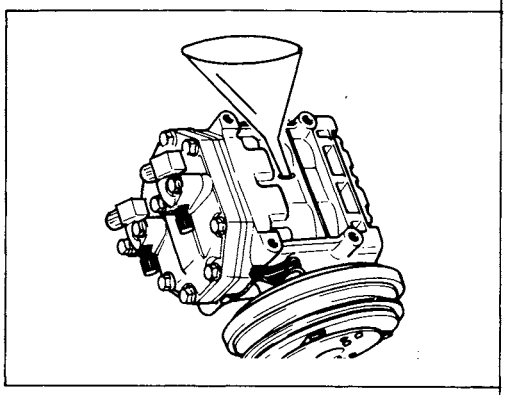


Fig. 71 Expendables

Item	Work Procedure
Rotation Check	Make sure that the crankshaft rotates smoothly and lightly.
Pouring Oil	(1) Pour the specified amount of compressor oil (SUNISO 5GS) through the supply port on the side of the crankcase; the specified amount of 200 cc (12.2 cuin). (2) After supplying, tighten the bolt to the specified torque, 1.5 kg.m (10.9 ft-Lb) with an in-between washer.
Leak Test	(1) Charge a refrigerant upto 98.07 kPaG (14.2 Lb/inG, 1 kg/cm^{2}G) as a leak test reagent, then pressurize it upto 785 kPaG (113.6 Lb/inG, 8 kg/cm^{2}G) with a dry nitrogen gas for leakage evidence. (2) Turn the crankshaft two or three times and then check the shaft seal for leakage.
Long Period of Storage	Evacuate the equipment and charge dry nitrogen to a pressure of about 98.07 kPaG (14.2 Lb/inG, 1 kg/cm^{2}G) to prevent rust formation in it.
Cleaning the Exterior	After all finished, wipe the oil off the exterior in clean.

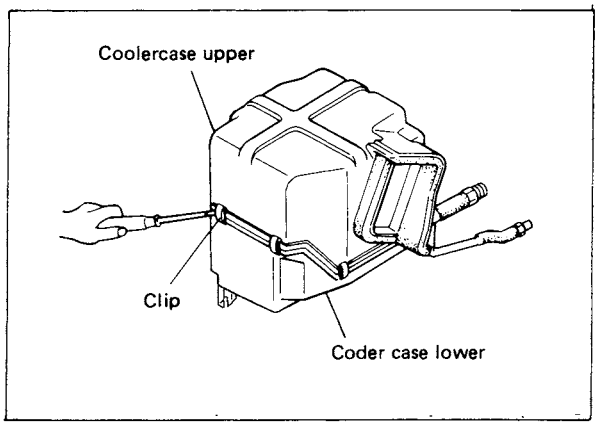


8.2 Cautions in disassembling

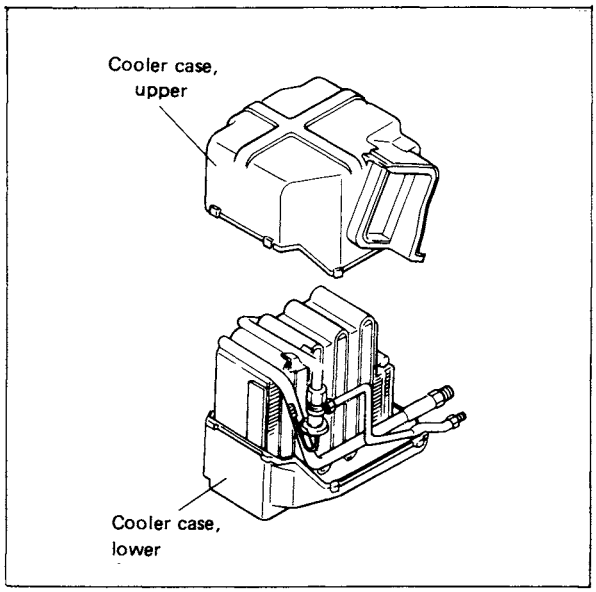
1. Direct after disconnecting the refrigerant piping, blind the opening to prevent dust and moisture etc. from entering in it.
2. When disconnecting the expansion valve, surely apply two spanners to prevent unstable twisting from applying with the one for supporting and the other for torquing at the connection.
3. Pipings in the cooling unit should be handled gently. Particularly, the ingress and egress portions should be from any bending trouble in carrying it.
4. If the cooling unit is stored, or transported on disassembled condition, be careful not to deform the fins.
5. When disconnecting the wiring, avoid pulling it with the insulation cover catched, but apply force by pinching the terminals or by catching the connectors.

8.3 Disassembling

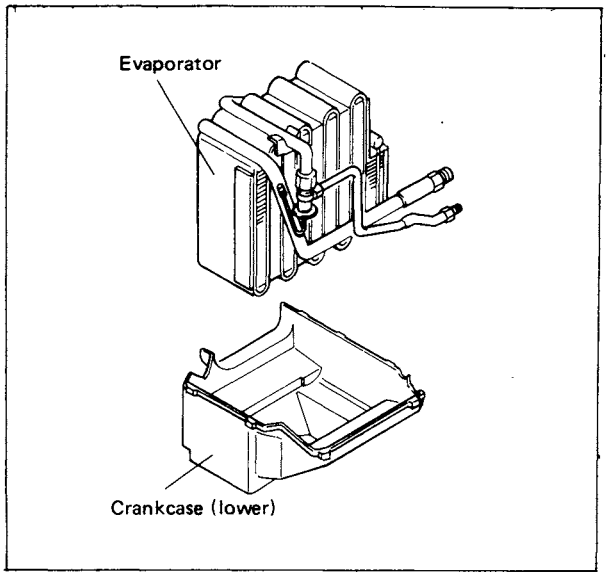
(1) Remove the clip for jointing the upper & lower side cooler case with a flat type screwdriver.



(2) Dismount the cooler case, upper.

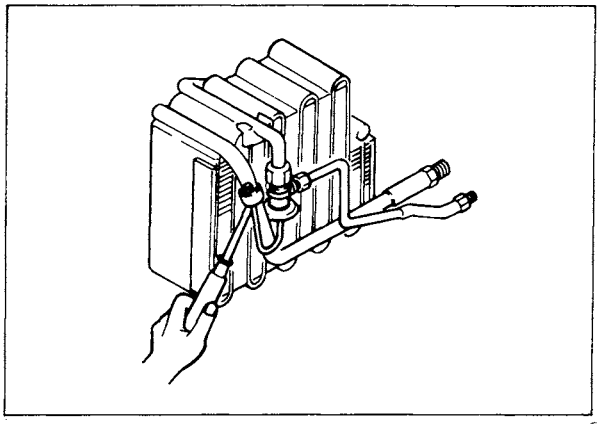


(3) Dismount the evaporator.

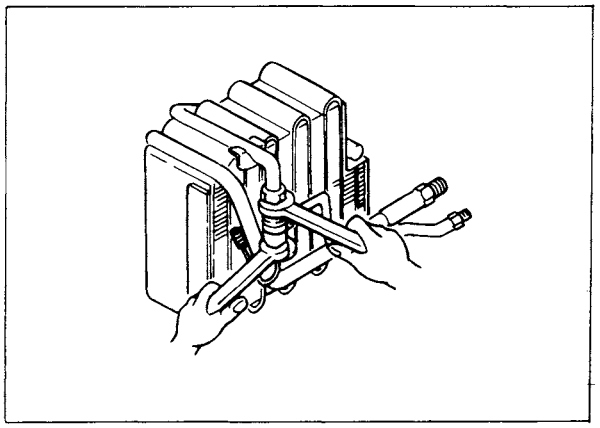


(4) Separate the expansion valve.

1) Dismount the feeler bulb at the suction side.

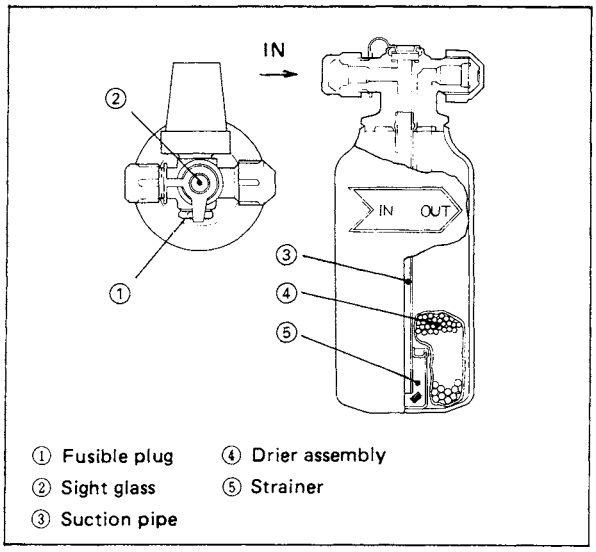


(5) Disconnect the expansion valve from the circuit.



check the refrigerant flow in the refrigerant circuit.

The sight glass appears clear when the refrigerant flow is enough, and shows bubbles flowing when the refrigerant flow is short.



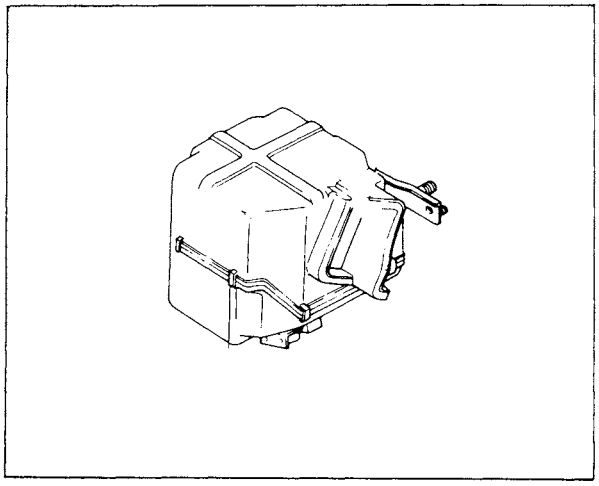
3.7 Cooling unit ass'y

Evaporator core

The evaporator core is a type of corrugate fin and tube, and direct-expansion.

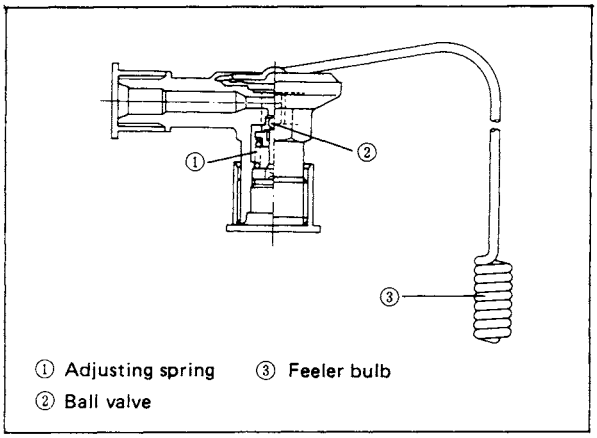
The tube is arranged in zigzag to achieve high efficiency, and it makes the core system compact.

The enclosure uses a thicker reinforced plastic plate to increase heat and shock resistance, and to protect the core from humidity. This case is a split type, and in a simple design to facilitate installation on the heater case and the dash panel of the vehicle.



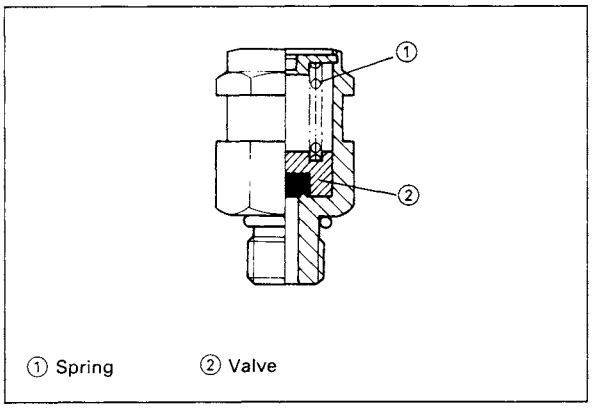
3.8 Expansion valve

The expansion valve is mounted at the inlet of the cooling unit. The liquid refrigerant from the receiver is led to it through a narrow passage (for throttle action), where-in, the liquid refrigerant is throttled with pressure dropping and at the same time the flow rate is adjusted before the refrigerant is sent to the cooling unit. The refrigeration load in the cooling unit is not constant, but usually fluctuates over a certain range. So the refrigerant flow should undergo the control in design. An automatic expansion valve performs this function automatically. The air conditioner uses a thermal type automatic expansion valve.



3.9 Relief valve

The relief valve is mounted to the compressor & clutch ass'y. The relief valve is usually closed by spring. If pressure of refrigerant in air conditioner system is higher than spring pressure, refrigerant is discharged from relief valve. The pressure drop due to discharge refrigerant, and relief valve is closed again.



Preset: MPa (Lb/in²G, kg/cm²G)

Open	3.38 ~ 4.1 (490 ~ 594, 34.5 ~ 41.8)
Close	2.94 (427, 30)