MITSUBISHI FORKLIFT TRUCKS

SERVICE MANUAL

FG10	FD10
FG14	FD14
FG15	FD15
FG18	FD18
FG20	FD20
FG25	FD25
FG30	FD30
FG35A	FD35A

NOTE

For use with the 4G15, 4G63/4G64
Engine Service Manual

For use with the S4Q2, 4DQ7/S4S
Engine Service Manual

MC
CHASSIS
MAST

Quality Makes the Difference

99719-10100

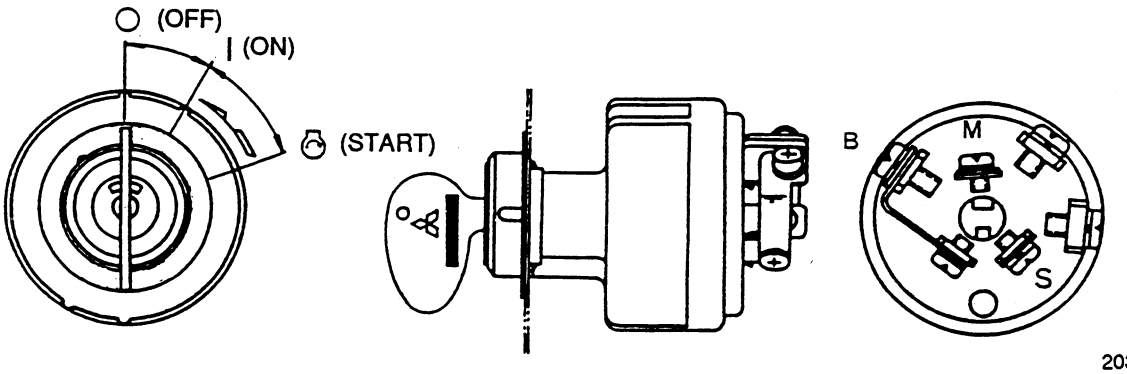
FG18	FD18	FG20	FD20	FG25	FD25	FG30	FD30	FG35A	FD35A
Down-draft type	—	Down-draft type	—	Down-draft type	—	Down-draft type	—	Down-draft type	—
Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—
Pneumatic type	—	Pneumatic type	—	Pneumatic type	—	Pneumatic type	—	Pneumatic type	—
Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—	Mikuni Kogyo	—
Diaphragm type	—	Diaphragm type	—	Diaphragm type	—	Diaphragm type	—	Diaphragm type	—
Kyosan Electric	—	Kyosan Electric	—	Kyosan Electric	—	Kyosan Electric	—	Kyosan Electric	—
Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—
Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki	—
—	Distributor type (DPK)	—	Distributor type (DPK)	—	Distributor type (DPK)	—	Distributor type (DPK)	—	Distributor type (DPK)
—	Mikuni Precision	—	Mikuni Precision	—	Mikuni Precision	—	Mikuni Precision	—	Mikuni Precision
—	6.5 [0.256]	—	7.0 [0.275]	—	7.0 [0.275]	—	7.0 [0.275]	—	7.0 [0.275]
—	1.5 [0.059]	—	1.5 [0.059]	—	1.5 [0.059]	—	1.5 [0.059]	—	1.5 [0.059]
—	Throttle type	—	Throttle type	—	Throttle type	—	Throttle type	—	Throttle type
—	1.00 [0.0394] × 1	—	1.00 [0.0394] × 1	—	1.00 [0.0394] × 1	—	1.00 [0.0394] × 1	—	1.00 [0.0394] × 1
—	$11\,768^{+981}_{0}$ (120^{+10}_{0}) [1706^{+142}_{0}]	—	$13\,729^{+1\,079}_{+490}$ (140^{+11}_{+5}) [1990^{+156}_{+71}]	—	$13\,729^{+1\,079}_{+490}$ (140^{+11}_{+5}) [1990^{+156}_{+71}]	—	$13\,729^{+1\,079}_{+490}$ (140^{+11}_{+5}) [1990^{+156}_{+71}]	—	$13\,729^{+1\,079}_{+490}$ (140^{+11}_{+5}) [1990^{+156}_{+71}]
—	Sheathed type	—	Sheathed type	—	Sheathed type	—	Sheathed type	—	Sheathed type
—	22 – 5.4	—	22 – 5.4	—	22 – 5.4	—	22 – 5.4	—	22 – 5.4
—	Vane type	—	Vane type	—	Vane type	—	Vane type	—	Vane type
—	Lucus CAV	—	Lucus CAV	—	Lucus CAV	—	Lucus CAV	—	Lucus CAV
—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1	—	Cyclone-paper element × 1
—	Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki	—	Nippon Rokaki
Pressure feed type		Pressure feed type		Pressure feed type		Pressure feed type		Pressure feed type	
Trochoid type		Trochoid type		Trochoid type		Trochoid type		Trochoid type	
Paper-element		Paper-element		Paper-element		Paper-element		Paper-element	
3.5 [0.9]	6.0 [2.4]	4.5 [1.2]	9.0 [2.4]	4.5 [1.2]	9.0 [2.4]	4.5 [1.2]	9.0 [2.4]	4.5 [1.2]	9.0 [2.4]
0.5 [0.1]	0.7 [0.3]	0.3 [0.1]	1.0 [0.3]	0.3 [0.1]	1.0 [0.3]	0.3 [0.1]	1.0 [0.3]	0.3 [0.1]	1.0 [0.3]
4.0 [1.0]	6.7 [1.8]	4.8 [1.3]	10.0 [2.7]	4.8 [1.3]	10.0 [2.7]	4.8 [1.3]	10.0 [2.7]	4.8 [1.3]	10.0 [2.7]
Forced circulation		Forced circulation		Forced circulation		Forced circulation		Forced circulation	
Corrugated fin (pressure) type		Corrugated fin (pressure) type		Corrugated fin (pressure) type		Corrugated fin (pressure) type		Corrugated fin (pressure) type	
7.65 [2.0]	8.55 [2.3]	D8.6 T8.9 [D2.3 T2.3]	D9.3 T9.6 [D2.5 T2.5]	D8.6 T8.9 [D2.3 T2.3]	D9.3 T9.6 [D2.5 T2.5]	D8.6 T8.9 [D2.3 T2.3]	D9.3 T9.6 [D2.5 T2.5]	D8.6 T8.9 [D2.3 T2.3]	D9.3 T9.6 [D2.5 T2.5]
Centrifugal type		Centrifugal type		Centrifugal type		Centrifugal type		Centrifugal type	
Wax type		Wax type		Wax type		Wax type		Wax type	
28B19R × 1	75D26R × 1	32C24R × 1	95D31R × 1	32C24R × 1	95D31R × 1	32C24R × 1	95D31R × 1	32C24R × 1	95D31R × 1
12	12	12	12	12	12	12	12	12	12
30	65	40	80	40	80	40	80	40	80
3-phase AC		3-phase AC		3-phase AC		3-phase AC		3-phase AC	
Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric	
12 – 50	12 – 50	12 – 50	12 – 50	12 – 50	12 – 50	12 – 50	12 – 50	12 – 50	12 – 50
Built-in IC type		Built-in IC type		Built-in IC type		Built-in IC type		Built-in IC type	
Lever-shift type		Lever-shift type		Lever-shift type		Lever-shift type		Lever-shift type	
Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric		Mitsubishi Electric	
12 – 1.2	12 – 2.2	12 – 1.2	12 – 2.2	12 – 1.2	12 – 2.2	12 – 1.2	12 – 2.2	12 – 1.2	12 – 2.2

D: Manual transmission models T: Powershift transmission models

MAJOR ELECTRICAL COMPONENTS

Starter Switch (with Anti-Restart Lock)

This switch has a built-in anti-restart lock, so the key cannot be turned from I (ON) to (START) position while the engine is running. The gasoline and diesel models use the same starter switch. In the diesel models, I (ON) position of the switch is for energizing the glow plugs.



203561A

Connection for gasoline models

Terminal / Component / Key position	B	M	S
	Fuse box, battery, alternator	Fuse box, fuel-cut solenoid	Starter, neutral switch (powershift transmission models)
○ (OFF)	○		
I (ON)	○	○	
(START)	○	○	○

Connection for diesel models

Terminal / Component / Key position	B	M	S
	Fuse box, glow plug relay, battery, alternator	Fuse box, fuel-cut solenoid, glow plug timer, glow plug timer relay	Neutral switch, glow plug timer
○ (OFF)	○		
I (ON)	○	○	
(START)	○	○	○

7. Connect the battery cable to the negative (-) terminal of the battery lastly after making sure that all the harnesses and cables have been connected properly.

8. Refill the engine with oil and coolant and the transmission with oil, and check for leaks. Unless otherwise specified, use antifreeze of 35% concentration by volume.

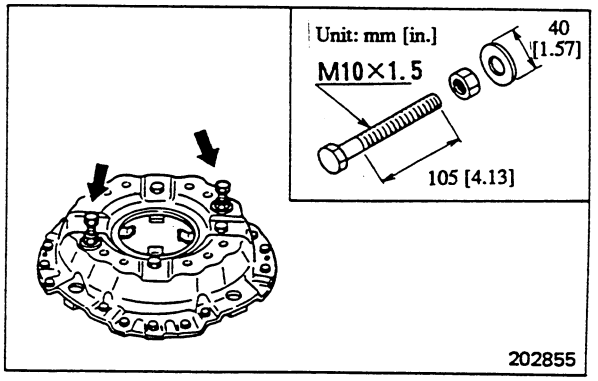
9. Prime the fuel system.

10. After completing the inspection, start the engine, and check the clutch booster for operation (wet-type clutch models). Move the mast and steering for a while, and check the oil level in the hydraulic tank. Also, check the engine oil level, coolant level and transmission oil level.

2. Using the bolts (special tool), gradually loosen the clutch springs.

Special tool needed

Bolt	91268-01900
Washer	92301-02700
Nut	F2300-10000



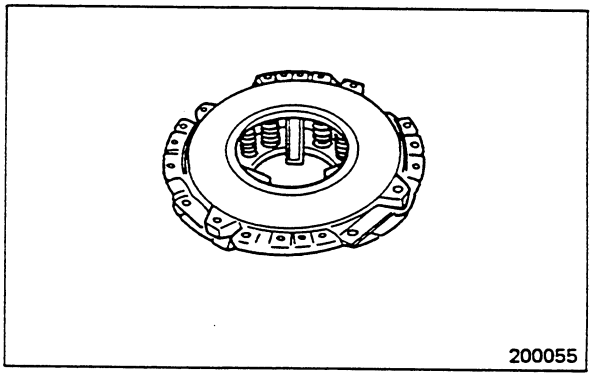
Inspection after disassembly

1. Pressure plate assembly

(1) Check the friction surface of the plate for burns and groove marks.

(2) Check the friction surface for warpage.

(3) Grind the friction surface of the plate, as necessary, and check its thickness. If the grinding operation has reduced the plate thickness to the service limit, replace it.

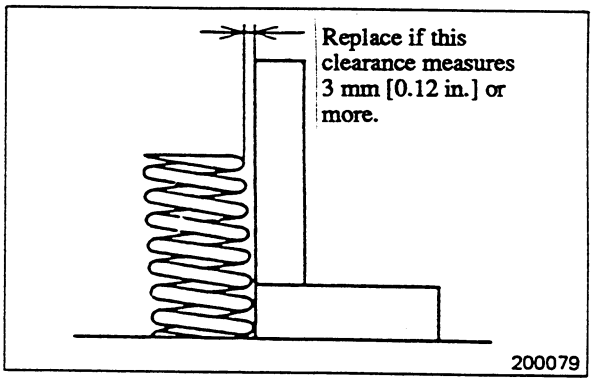


Unit: mm [in.]

		Dry-type clutch	Wet-type clutch
Pressure plate thickness	A	22.8 [0.90]	
	B	21.0 [0.83]	

2. Pressure springs

Check each pressure spring for squareness, cracks and fatigue and, if the limit is exceeded, replace the spring.



Unit: mm [in.]

		Dry-type clutch	Wet-type clutch
Free length	A	87.1 [3.43]	78.8 [3.10]
Test force, N (kgf) [lbf]	A	412 ± 49 (42 ± 5) [93 ± 11]	643 ± 49 (65.6 ± 5) [145 ± 11]
Length under test force	A	45.2 [1.77]	48.2 [1.90]

Suggestions

1. Input shaft removal

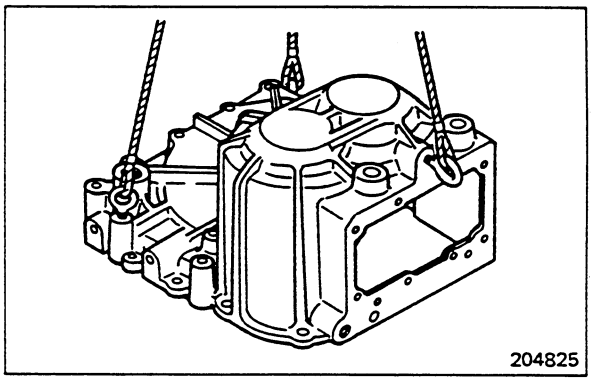
The locking ball is spring-loaded and will fly out when the input shaft is pulled out. To prevent this, cover the access hole of the shifter case when removing the shaft.

2. Transmission housing removal

(1) After removing the input shaft, unscrew the transmission housing mounting bolts on the clutch housing side.

(2) Lay the transmission housing with the clutch housing side down.

(3) Unscrew the transmission housing mounting bolts. Attach the slings and eyebolts to the housing, and fasten a hoist to the housing. Lift the housing.



(4) Take up slack in the slings, and tap the transmission and clutch housing flanges somewhere near the dowel pins with a plastic hammer to separate the housings.

3. Shifter case removal

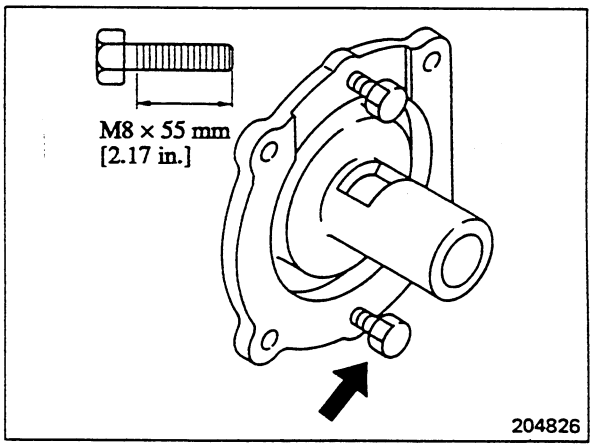
Use jacking bolts to remove the shifter case from the transmission case.

Special tool needed

Bolt	91268-05100

NOTE

Use jacking bolts having effective thread length of 25 mm [0.98 in.].



Sequence

1 Troque converter assembly, flexible plate
2 Sender unit, drain plug, gasket
3 Oil level gauge, pipe
4 Air breather
5 Oil pipe, eye joint, gasket
6 Output flange
7 Filter case, magnet strainer
8 Control valve
9 Stator shaft, relief valve, spring, washer, snap ring, O-ring, steel ball
10 Pump body, internal gear, drive gear, oil seal, O-ring
11 Transmission housing, gasket, O-ring, steel ball, plug
12 Ball bearing, idler gear
13 Input shaft assembly (consisting of 14 thru 20)
14 Seal ring, ball bearing, thrust washer
15 FORWARD gear, needle roller bearing, thrust washer
16 Seal ring, ball bearing, thrust washer
17 REVERSE gear, needle roller bearing, thrust washer
18 Snap ring, spring retainer, clutch spring
19 Snap ring, pressure plate, plates, friction plates, belleville spring
20 Clutch piston, seal ring, input shaft
21 Idler shaft, ball bearing, snap ring
22 Output gear, ball bearing
23 Baffle plate
24 Torque converter housing, O-ring, steel ball

NOTE

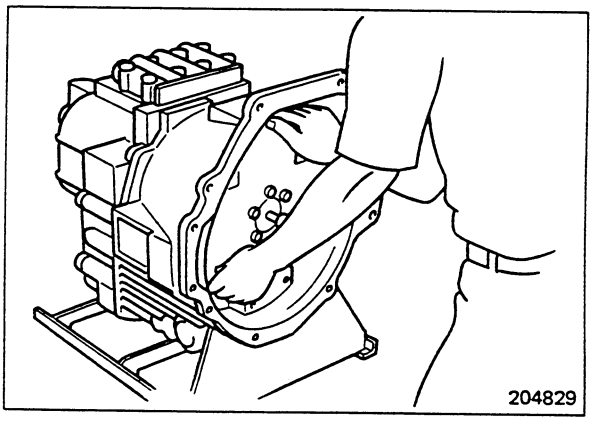
1) Remove the pump as an assembly including 9 thru 10.

2) Remove the input shaft as an assembly including 14 thru 20, and disassemble it in the order shown.

Suggestions

1. Removing torque converter assembly

Remove the torque converter assembly complete with the flexible plate. Prepare a container to catch the oil that flows out of the converter.



2. Adjusting the inching pedal

Start by:

warm up the transmission oil, raise the front wheels, and block the rear wheels

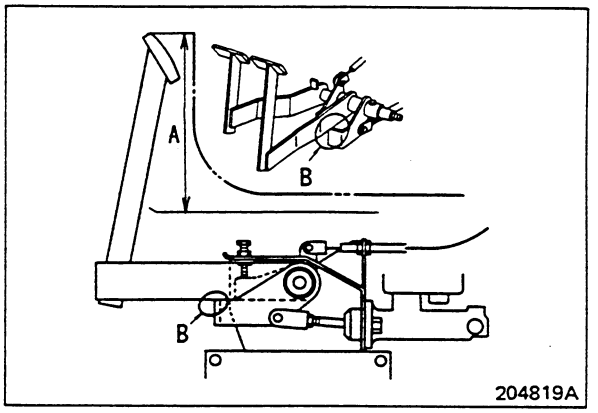
(1) Connect a pressure gauge to the clutch pressure tap.

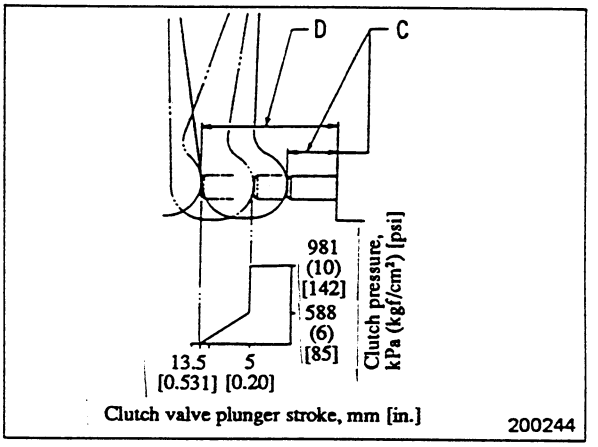
(2) Adjust the released height A of the inching pedal to 220 mm (8.7 in.) by means of the stopper bolt. Set the clearance B between the inching pedal and brake pedal connecting parts to 9 to 9.5 mm [0.354 to 0.374 in.] for the 1-ton models or 0.1 to 0.5 mm [0.004 to 0.020 in.] for the 2- to 3-ton models.

(3) Start the engine, and release the brake pedal. Depress the clutch (inching) pedal until the brake starts to be applied (the pedal encounters resistance). Under this condition, make an adjustment by means of the push rod so that the clutch valve plunger stroke (D) is 16.5 mm [0.65 in.] at 0 kgf/cm² hydraulic pressure.

(4) Release the clutch (inching) pedal, and make sure that clutch valve plunger stroke (C) is 9 to 9.5 mm [0.354 to 0.374 in.] for the 1-ton models or 6 to 9.5 mm [0.236 to 0.374 in.] for the 2- to 3-ton models at 883 to 1079 kPa (9 to 11 kgf/cm²) [128 to 156 psi] read on the pressure gauge. Make an adjustment by means of the inching cable. If the plunger stroke is out of specification, readjust the brake and brake pedal, and repeat the adjustment.

- If the plunger stroke is more than 9.6 mm [0.378 in.], the drum-to-lining clearance is too small.
- If the plunger stroke is less than 8.9 mm [0.350 in.] for the 1-ton models or 5.9 mm [0.232 in.] for the 2- to 3-ton models, the drum-to-lining clearance is too large.



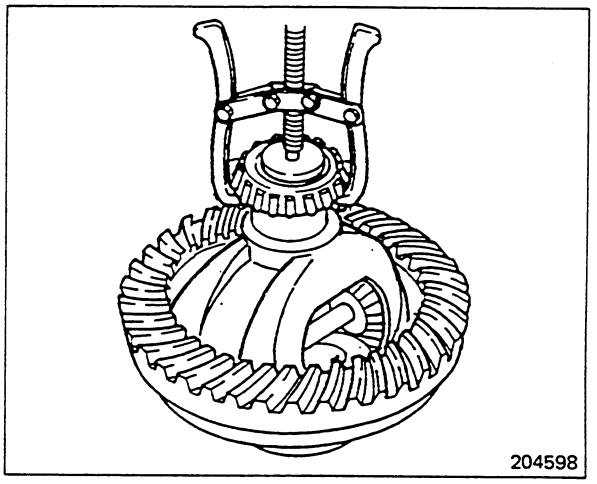


Unit: mm [in.]

A	Released height pedal		220 [8.7]
B	Clearance between clutch (inching) pedal and brake pedal connecting parts	1-ton models	9 to 9.5 [0.354 to 0.374]
		2- – 3-ton models	0.1 to 0.5 [0.004 to 0.020]
C	Clutch valve plunger stroke	1-ton models	9 to 9.5 [0.354 to 0.374]
		2- – 3-ton models	6 to 9.5 [0.236 to 0.374]
D	Clutch valve plunger stroke at start of brake application		16.5 [0.65]

1. Removing bearing

Use a bearing puller to remove the inner bearing.

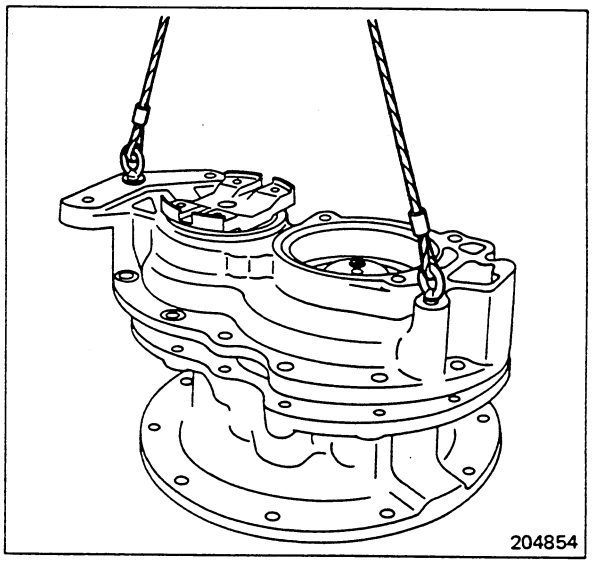


2. Removing shims

After removing plate 13 and shims, make a record of the total thickness of the shims, and tie the shims to the plate to prevent missing.

3. Removing carrier cover

To remove carrier cover 15, attach a sling to the bracket mounting holes, and lift off the cover with a hoist while hitting it with a plastic hammer at two places close to the dowel pins.



4. Checking tapered roller bearing

Do not remove the tapered roller bearing (inner) from reduction pinion 14 unless it is defective.

5. Checking oil seal

Do not remove oil seal 22 from carrier cover 15 unless it is defective.

Inspection after disassembly

1. Kingpins and bellcrank pin

Check to be sure that these pins are free of any surface flaws such as groovings and stepped wear at their surfaces in contact with bearings.

NOTE

If a pin has to be replaced, replace its needle bearings, too. This applies to both kingpin and bellcrank pin.

Unit: mm [in.]

Diameter of kingpin	A	$28^{0}_{-0.021}$ [$1.10^{0}_{-0.00083}$]
	B	27.8 [1.094]
Diameter of bellcrank pin	A	$28^{0}_{-0.021}$ [$1.10^{0}_{-0.00083}$]
	B	27.8 [1.094]

2. Knuckles

Inspect the kingpin hole of each knuckle for wear and damage. Similarly inspect the tapered hole for admitting the ball stud; be sure to examine this hole for signs of cracking.

3. Bellcrank

With respect to cracks, wear and other types of flaw or damage, inspect the needle bearing hole of the bellcrank, and also the tie-rod ball stud hole and the ball stud (for connection with the drag link).

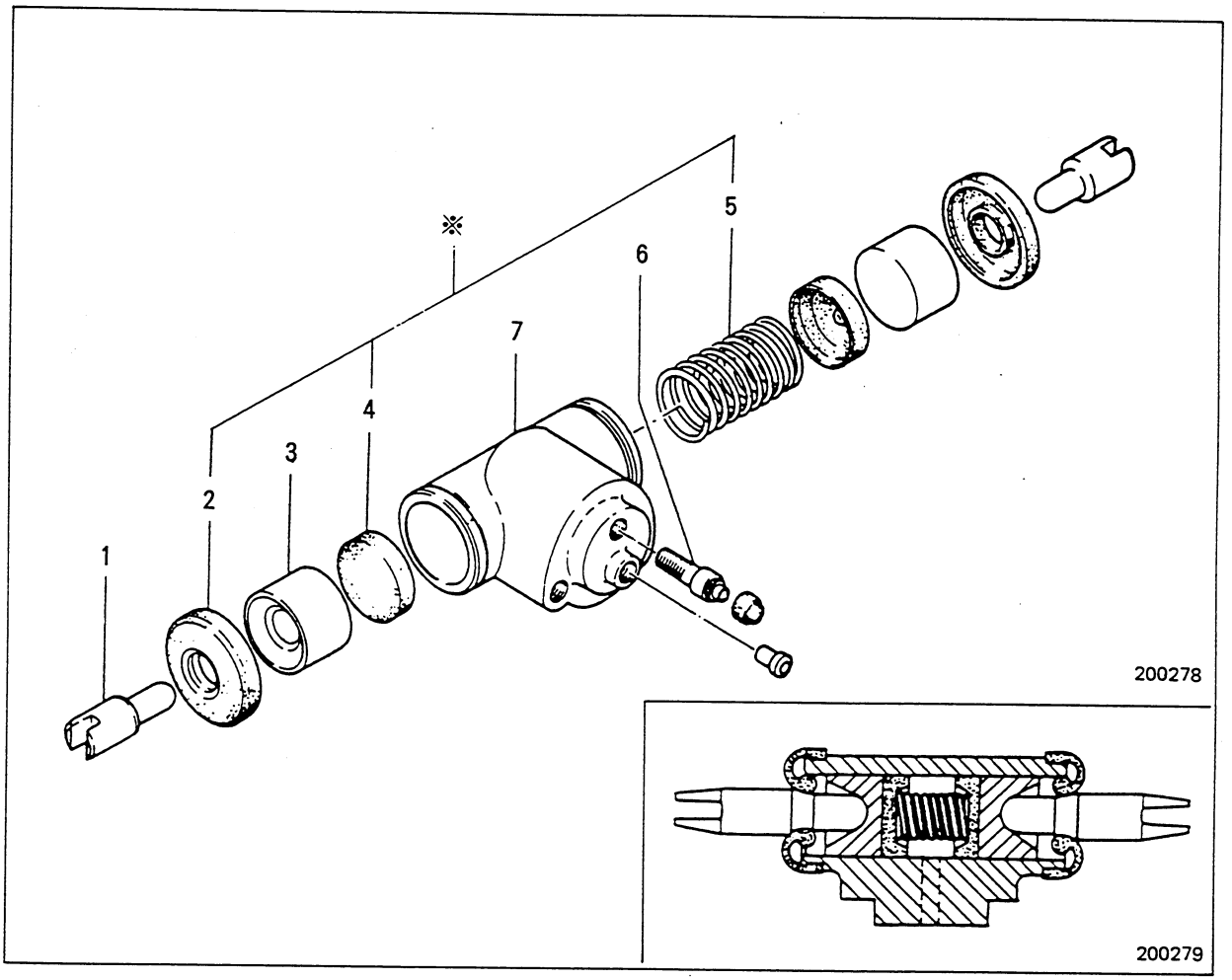
4. Tie-rod assembly

(1) Inspect each tie rod for wear and damage, and check it for alignment. A bent or bowed tie rod must be replaced. Minor damage can be corrected by repair.

(2) Inspect the threaded part of each ball stud for damage. Examine each stud for cracks.

Wheel Cylinders

Disassembly



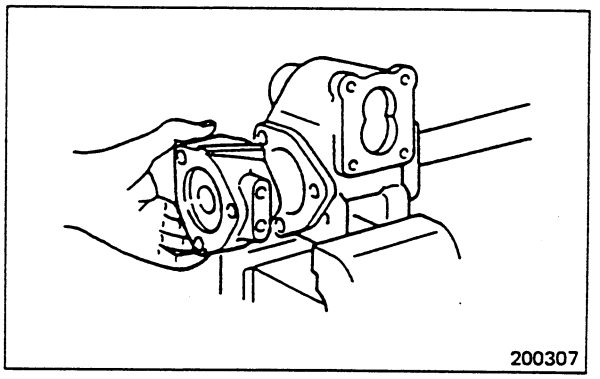
Sequence

1 Connector link
2 Boot
3 Piston
4 Piston cup
5 Return spring
6 Bleeder screw, cap
7 Cylinder body

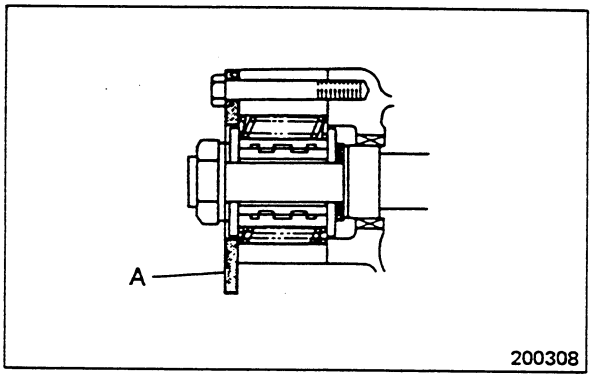
NOTE

The parts (*) to be changed periodically are involved in the Repair Kit.

(2) Install the needle roller bearing and plate. Then, install the valve with "P" mark of the sleeve on the front cover side.



(3) After installing the plate and needle roller bearing, attach set plate A (special tool) on the control valve. Tighten the lock nut to 39 to 49 N·m (4 to 5 kgf·m) [29 to 36 lbf·ft] and stake it at two places. Then, make sure that the starting torque of the shaft is less than 0.8 N·m (8.2 kgf·cm) [0.6 lbf·ft]. After staking the lock nut, make sure that the valve does not rattle.



Special tool needed

Set plate	91268-03300

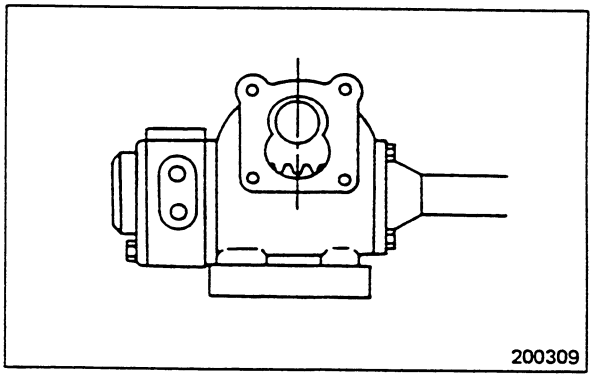
5. End cover installation

Tightening torque for end cover bolts	34 to 44 N·m (3.5 to 4.5 kgf·m) [25 to 33 lbf·ft]

6. Sector shaft installation

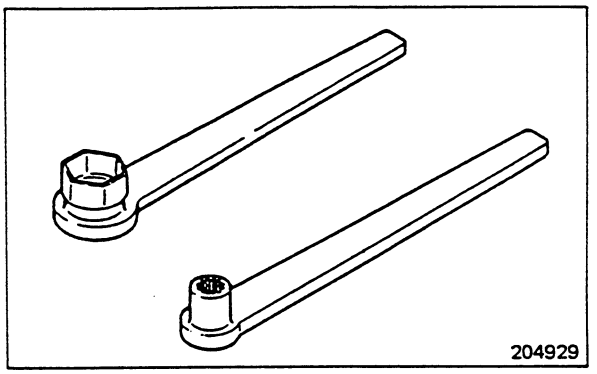
Center the ball nut as seen in the opening, and insert the sector shaft, positioning the two as in straightahead driving. Secure the side cover by tightening its securing bolts to the specified torque.

Tightening torque for side cover bolts	34 to 53 N·m (3.5 to 5.4 kgf·m) [25 to 39 lbf·ft]



Suggestions

1. Remove the drive pulley lock nut 2 with a special tool.



Special tool needed

	FG10 thru 35A FD10 thru 18	FD20 thru 35A
Wrench	91268-00100 91268-00200 (to be used in combination)	91268-00100 91868-00100 (to be used in conbination)

NOTE

The drive pulley lock nut has left-hand threads.

2. To reassemble, follow the reverse of disassembly sequence. Tighten the counterweight bolts, pump outlet joint and main delivery hose to the specified torque.

Tightening torque

Unit: N·m (kgf·m) [lbf·ft]

Counterweight bolts	412 to 490 (42 to 50) [304 to 362]
Pump outlet joint	167 (17) [123]
Main delivery hose	118 (12) [87]

3. Suction strainer

Check the suction strainer for clogging or damage.

4. Return filter

Check the return filter for clogging or damage.

Hydraulic Pump

The purpose of test run is to break-in the overhauled pump and verify its performance. The use of a pump testing equipment, specially designed as such and commonly used in the service shop, is recommended but is not mandatory. The following procedure, however, assumes that the pump is installed on the truck:

1. Install a pressure gauge capable of measuring up to 25000 kPa (250 kgf/cm²) [3555 psi]. To install the pressure gauge, remove the plug from the delivery hose joint and attach the following tools:

Special tools needed

Connector	64309-17733 (R(PT) 1/8 thread)
Hose	64309-17722
Connector	64309-17731 (for gauge)
Gauge	64309-17712 25000 kPa (250 kgf/cm²) [3555 psi]

NOTE

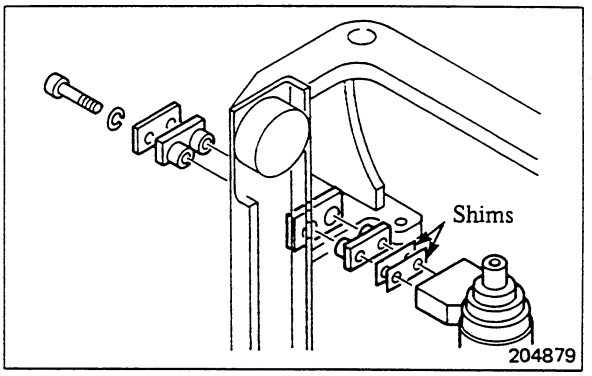
These tools are involved in the gauge kit 64309-17701.

2. With the control levers in neutral, run the engine at 500 to 1000 rpm, holding the discharge pressure at a level not higher than 981 kPa (10 kgf/cm²) [142 psi]. Run the pump under this condition for 10 minutes for break-in, listening for noise.

3. Raise the engine speed to 1500 to 2000 rpm, and run the engine for another 10 minutes in the no-load condition.

2. Cylinder clamps

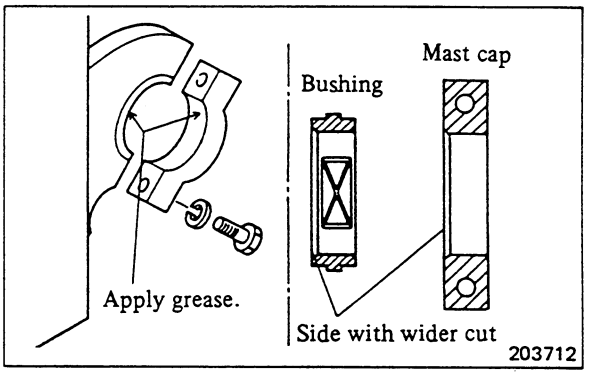
Install each lift cylinder in place (in vertical position) by fitting to the support, and see if there is any clearance between the outer mast and cylinder. Reduce the clearance, if any, to zero by shimming.



3. Mast supports

(1) Apply a grease to the inside surfaces and grooves of the caps.

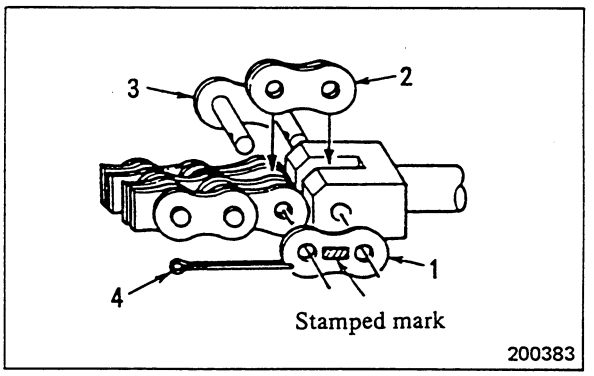
(2) Install mast support bushings and caps so that their sides with wider cut face toward the center of truck respectively. Greasing will be facilitated if masts are lifted by placing wooden blocks under them.



4. Precautins for installing chain anchor kit

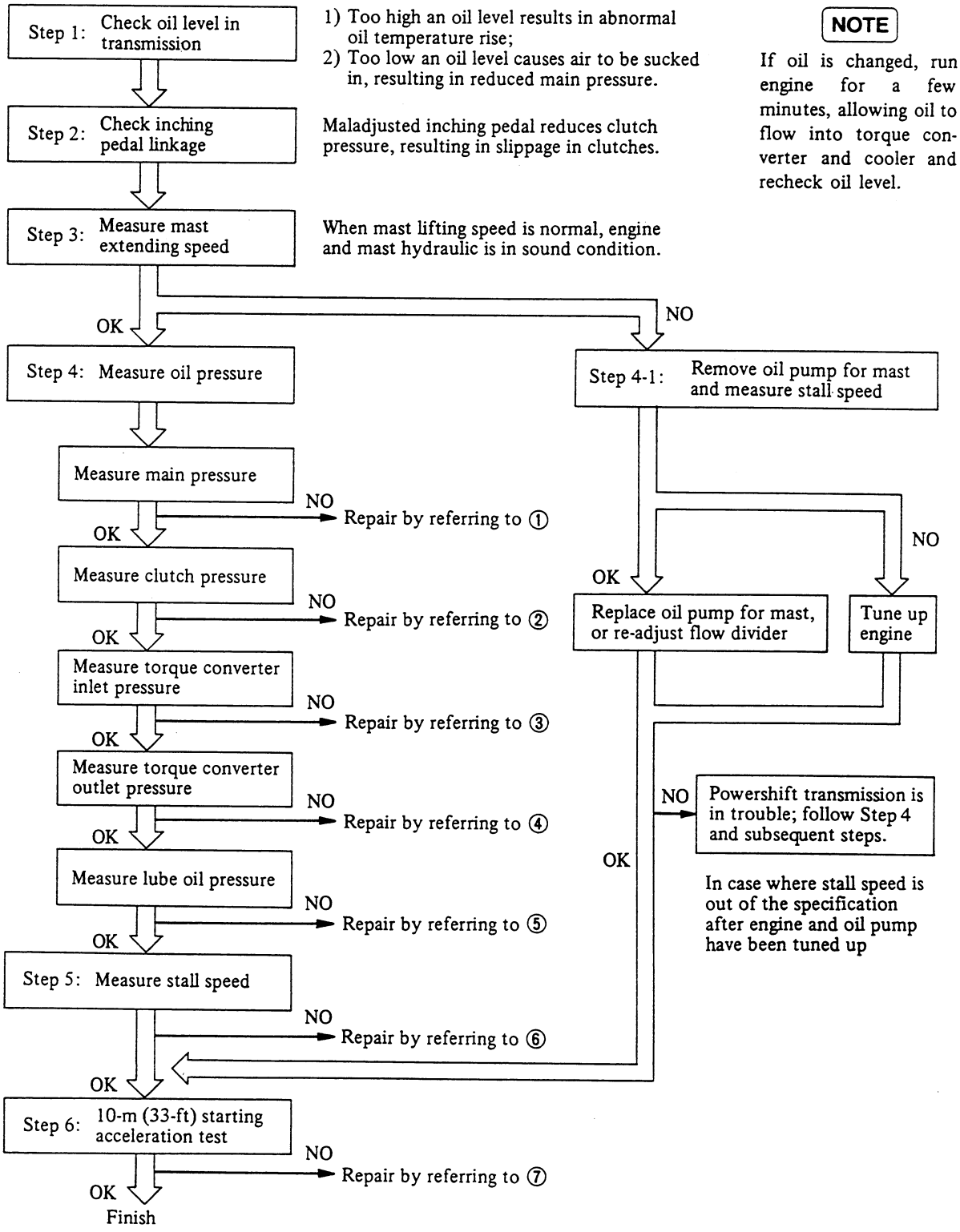
Be careful not to install the center plate in the position for link plate.

1 Link plate (mark is stamped)
2 Center plate (no mark)
3 Link
4 Split pin



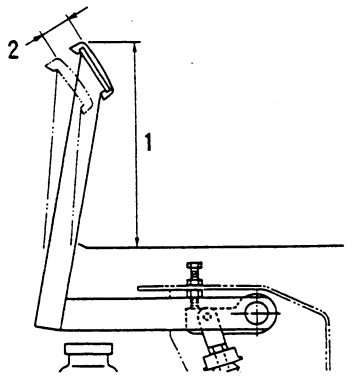
POWERSHIFT TRANSMISSION

Following is a planned method of procedure for investigation and correction of the difficulties of the powershift transmission. The chart includes some of the most common complaints that may be encountered during the service life of the powershift transmission.



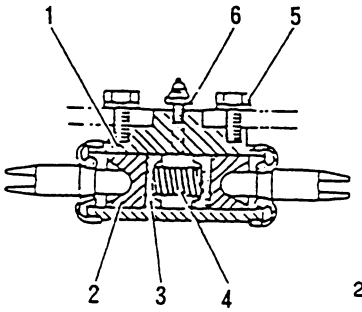
Clutches – continued
Wet-type clutch

A-Assembly standard B-Repair or service limit
Unit: mm [in.]

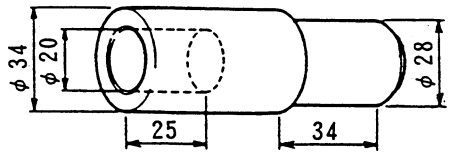
Item		Truck model	FG(D)10	FG(D)14 FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Clutch pedal	Height above floor olate with pedal released (at top of pedal pad) 1	A	233 [9.2]			
	Free play 2	A	5 to 15 [0.2 to 0.6]			
	 205013					
Input shaft	Splined shaft diameter 1	A	24.669 × 21.0 [0.97122 × 0.827]			
	Looseness of mating splines (at rim of disc)	B	6 [0.24]			
	 200396					
Clutch disc	Thickness of facing 1	A	6.0 [0.24]			
		B	0.4 [0.02], each side 0.8 [0.03], both sides			
	Face runout (at rim)	A	0.7 (0.028), max			
	 200397					

Brake system — continued

A-Assembly standard B-Repair or service limit
Unit: mm [in.]

Item			Truck model	FG(D)10	FG(D)14 FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Wheel cylinder	Inside diameter of cylinder body 1		A	$22.22^{+0.052}_{0}$ [$0.8748^{+0.00205}_{0}$]		$28.58^{+0.052}_{0}$ [$1.1252^{+0.00205}_{0}$]	
	Diameter of piston 2		A	$22.22^{-0.040}_{-0.078}$ [$0.8748^{-0.00157}_{-0.00307}$]		$28.58^{-0.020}_{-0.058}$ [$1.1252^{-0.00079}_{-0.00228}$]	
	Clearance between cylinder and piston		A	0.040 to 0.125 [0.00157 to 0.00492]		0.020 to 0.105 [0.00079 to 0.00413]	
			B	0.15 [0.0059]			
	Diameter of piston cup 3		A	23.7 ± 0.2 [0.933 ± 0.0079]		30.5 ± 0.25 [1.201 ± 0.0098]	
			B	(Replace every year)			
	Return spring 4	Free length	A	49.5 [1.95]		58 [2.28]	
		Length under test force	A	20 [0.79]		23 [0.91]	
		Test force, N (kgf) [lbf]	A	12 ± 1 (1.2 ± 0.1) [2.6 ± 0.2]		13 ± 1 (1.3 ± 0.1) [2.9 ± 0.2]	
			B	(Replace every year)			
	Tightening torque, N·m (kgf·m) [lbf·ft]	Wheel cylinder bolts 5	A	8 to 12 (0.8 to 1.2) [6 to 9]		18 to 26 (1.8 to 2.7) [13 to 20]	
		Bleeder screw 6	A	6 to 9 (0.6 to 0.9) [4 to 7]			
	 200426						
Wheel brakes	Inside diameter of brake drum 1		A	$254^{+0.13}_{0}$ [$10.00^{+0.0051}_{0}$]		$310^{+0.15}_{0}$ [$12.20^{+0.0059}_{0}$]	
			B	256 [10.08]		312 [12.28]	
	Thickness of lining 2		A	4.87 [0.19]		6 [0.24]	
			B	2.5 [0.098]		3 [0.118]	
	Clearance between drum and lining 3 (one side)		A	0.5 to 1.0 [0.02 to 0.04]		0.2 to 0.7 [0.01 to 0.03]	
	Return spring 4	Free length	A	102 [4.02]		Primary: 120 [4.72] Secondary: 139.3 [5.48]	
		Length under test force	A	111 [4.37]		Primary: 134 [5.28] Secondary: 145.4 [5.72]	
		Test force, N (kgf) [lbf]	A	157 ± 16 (16 ± 1.6) [35 ± 3.5]		226 ± 23 (23 ± 2.3) [51 ± 5.1]	
	Adjusting spring 5	Free length	A	79 [3.11]		104.5 [4.11]	
		Length under test force	A	98.5 [3.88]		122 [4.80]	
		Test force, N (kgf) [lbf]	A	137 ± 14 (14 ± 1.4) [31 ± 3]		78 ± 8 (8 ± 0.8) [18 ± 2]	
	Tightening torque for backing plate 6, N·m (kgf·m) [lbf·ft]		A	215 (21.9) [158]			

<table>
<tr><th colspan="3" rowspan="2">Inspection point</th><th rowspan="2">How to check</th><th rowspan="2">Pre-start</th><th colspan="2">Intervals</th><th rowspan="2">Service data</th></tr>
<tr><th>1 moth</th><th>12 month</th></tr>
<tr><td rowspan="2">Front and rear axle</td><td rowspan="2">Tire pressure</td><td>Front</td><td rowspan="2">Tire gauge</td><td rowspan="2">○</td><td rowspan="2">○</td><td rowspan="2">○</td><td>686 kPa (7 kgf/cm²) [100 psi]
FG(D)35A single: 834 kPa (8.5 kgf/cm²) [121 psi]</td></tr>
<tr><td>Rear</td><td>686 kPa (7 kgf/cm²) [100 psi]
FG(D)35A: 883 kPa (9 kgf/cm²) [128 psi]</td></tr>
<tr><td rowspan="6">Wheels</td><td colspan="2">Tires — cuts or gouges</td><td>Visual</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td colspan="2">Tires — wear</td><td>Depth gauge</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td colspan="2">Tires — imbedded objects</td><td>Visual</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td colspan="2">Rim bolts and wheel nuts — tightness</td><td>Torque wrench</td><td></td><td>○</td><td>○</td><td></td></tr>
<tr><td colspan="8">Unit: N·m (kgf·cm) [lbf·ft]<table>
<tr><th colspan="2"></th><th>1-ton models</th><th>2-thru 3.5A-ton models</th></tr>
<tr><td rowspan="2">Rim bolts</td><td>Front wheel</td><td>86 (8.8) [64]</td><td>FG(D)20 thru 25: 202 (20.6) [149]</td></tr>
<tr><td>Rear wheel</td><td>46 to 51 (4.7 to 5.2) [34 to 38]</td><td>82 to 90 (8.4 to 9.2) [61 to 67]</td></tr>
<tr><td rowspan="2">Wheel nuts</td><td>Front wheel</td><td rowspan="2">157 (16) [116]</td><td>378 (38.5) [278]</td></tr>
<tr><td>Rear wheel</td><td>157 (16) [116]
FG(D)35A: 233 (23.8) [172]</td></tr>
</table></td></tr>
<tr><td colspan="2">Rims, side rings and wheel discs — damage</td><td>Visual</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td rowspan="3">Hydraulic tank</td><td colspan="2">Oil level and contamination</td><td>Visual</td><td>○</td><td>○</td><td>⊗</td><td></td></tr>
<tr><td colspan="2">Strainer — clogging</td><td>Visual</td><td></td><td></td><td>⊗</td><td></td></tr>
<tr><td colspan="2">Return filter — clogging</td><td>Visual</td><td></td><td></td><td>⊗</td><td></td></tr>
<tr><td>Hydraulic pump</td><td colspan="2">Oil leaks or abnormal noise</td><td>Visual/listen</td><td></td><td>○</td><td>○</td><td></td></tr>
<tr><td rowspan="2">Flow divider valve</td><td colspan="2">Oil leaks</td><td>Visual</td><td>○</td><td>○</td><td>○</td><td></td></tr>
<tr><td colspan="2">Relief valve setting (power steering)</td><td>Pressure gauge</td><td></td><td></td><td></td><td>7845 kPa (80 kgf/cm²) [1138 psi]
FD35A: 9807 kPa (100 kgf/cm²) [1422 psi]</td></tr>
</table>



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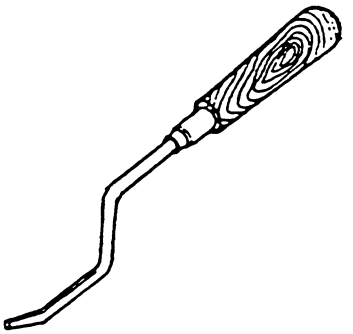

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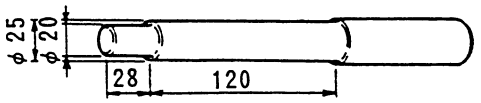

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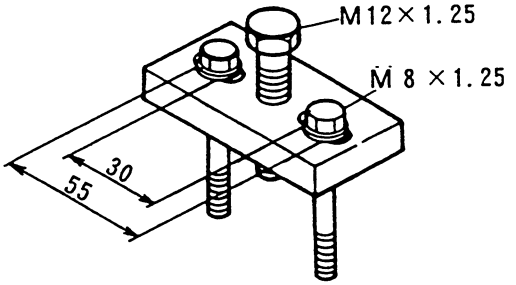

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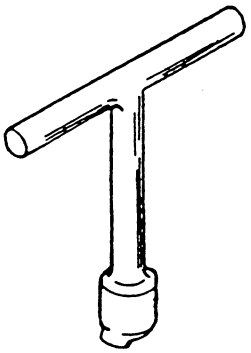

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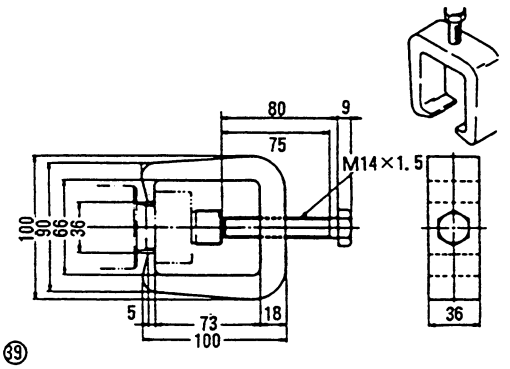

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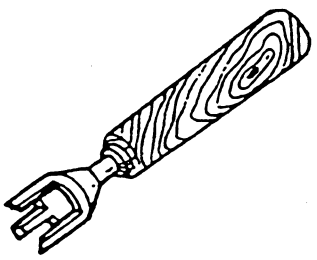

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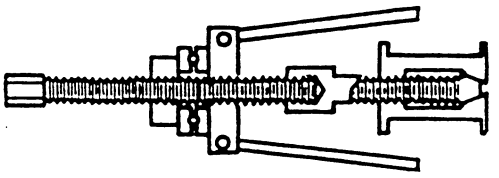

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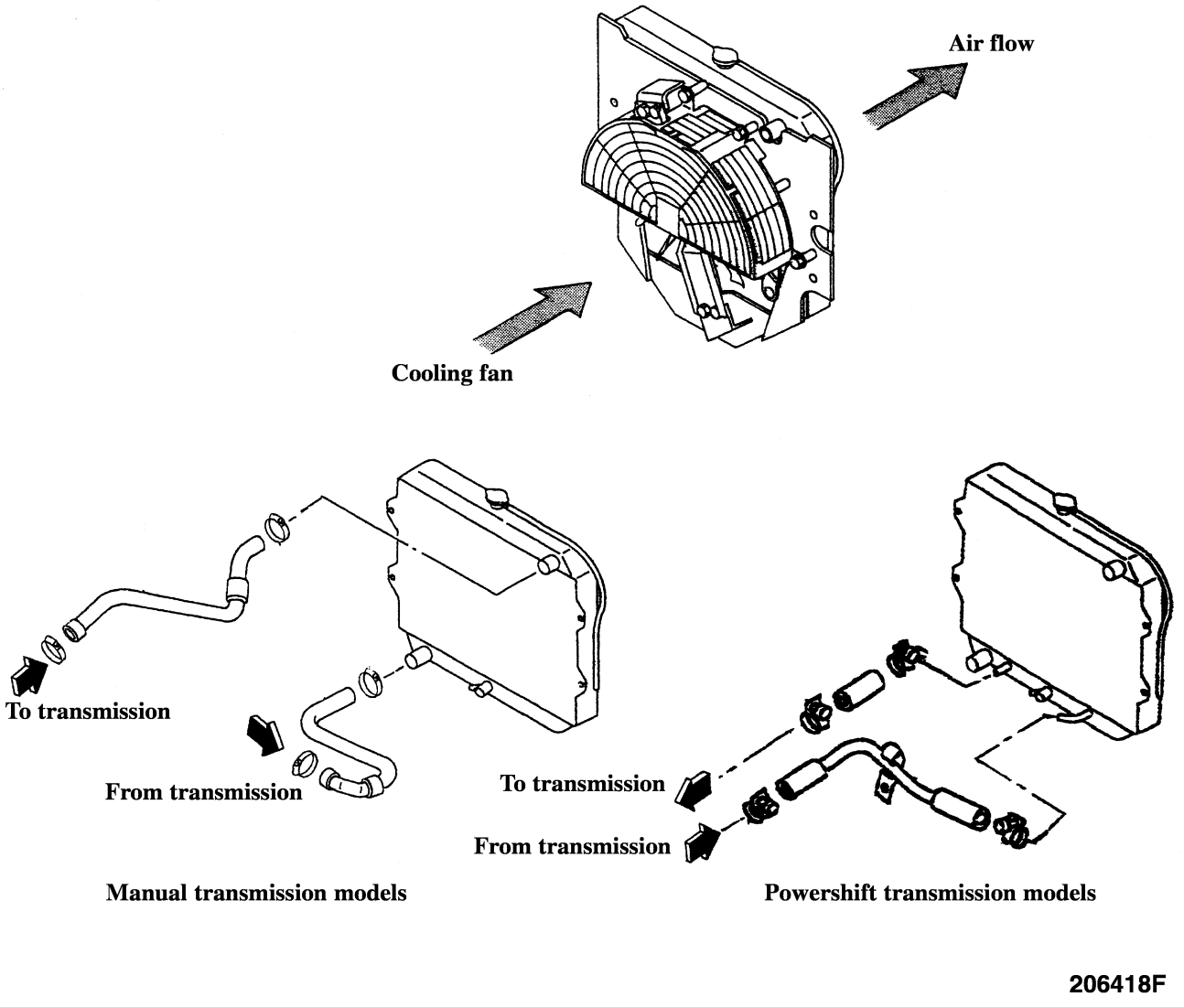
MEMO

Description



The cooling fan is installed inside with the radiator (in the engine compartment). This helps minimize radiator core clogging and retain high cooling efficiency even in continuous operation for hours. In the powershift transmission models, the radiator lower tank has a built-in transmission oil cooler.

MEMO

3. After connecting the cable between the inching pedal and transmission, make sure that the plunger projection is correct or readjust if necessary (powershift transmission models).

4. Connect the accelerator pedal to the throttle cable, and make sure that the injection pump lever is in the full throttle position when the accelerator pedal is depressed all the way (diesel models). On the gasoline models, connect the accelerator pedal to the throttle cable, and make sure that the throttle lever is in the full throttle position when the accelerator pedal is depressed all the way.

5. After connecting the brake pipes, bleed air out of the fluid lines.

6. When installing the exhaust pipe to the engine, use a new gasket.

7. Connect the battery cable to the negative (-) terminal of the battery lastly after making sure that all the harnesses and cables have been connected properly.

8. Refill the engine with oil and coolant and the transmission with oil, and check for leaks. Unless otherwise specified, use antifreeze of 35% concentration by volume.

9. Prime the fuel system.

10. After completing the inspection, start the engine, and check the clutch booster for operation (wet-type clutch models). Move the mast and steering for a while, and check the oil level in the hydraulic tank. Also, check the engine oil level, coolant level and transmission oil level.

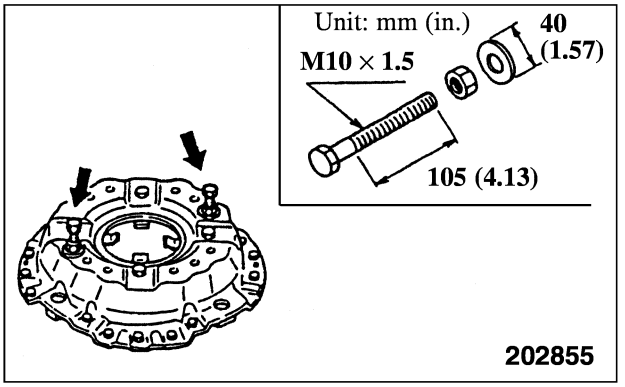
Unit: mm (in.)

Plunger projection	1 ton models	9 to 9.5 (0.35 to 0.37)
	2, 3 ton models	6 to 9.5 (0.24 to 0.37)

2. Using the bolts (special tool), gradually loosen the clutch springs.

The special tool needed

Bolt	91268-01900
Washer	92301-02700
Nut	F2300-10000



Inspection after disassembly

1. Pressure plate assembly

(1) Check the friction surface of the plate for burns and groove marks.

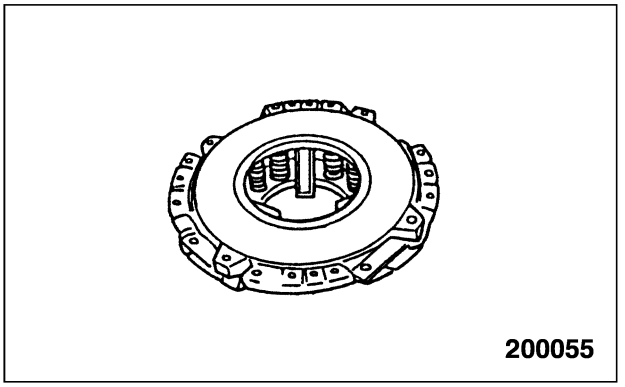
(2) Check the friction surface for warpage.

(3) Grind the friction surface of the plate, as necessary, and check its thickness. If the grinding operation has reduced the plate thickness to the service limit, replace it.

A-Assembly standard

B-Repair or service limit Unit: mm (in.)

		Dry-type clutch	Wet-type clutch
Pressure plate thickness	A	22.8 (0.90)	
	B	21.0 (0.83)	

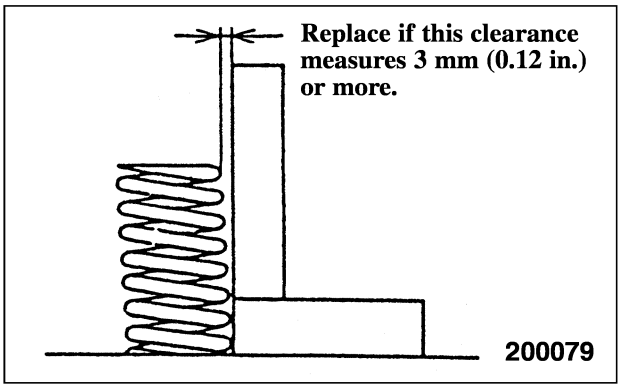


2. Pressure springs

Check each pressure spring for squareness, cracks and fatigue and, if the limit is exceeded, replace the spring.

A-Assembly standard Unit: mm (in.)

		Dry-type clutch	Wet-type clutch
Free length	A	87.1 (3.43)	78.8 (3.10)
Test force, N (kgf) [lbf]	A	412 ± 49 (42 ± 5) [93 ± 11]	643 ± 49 (65.6 ± 5) [145 ± 11]
Length under test force	A	45.2 (1.77)	48.2 (1.90)



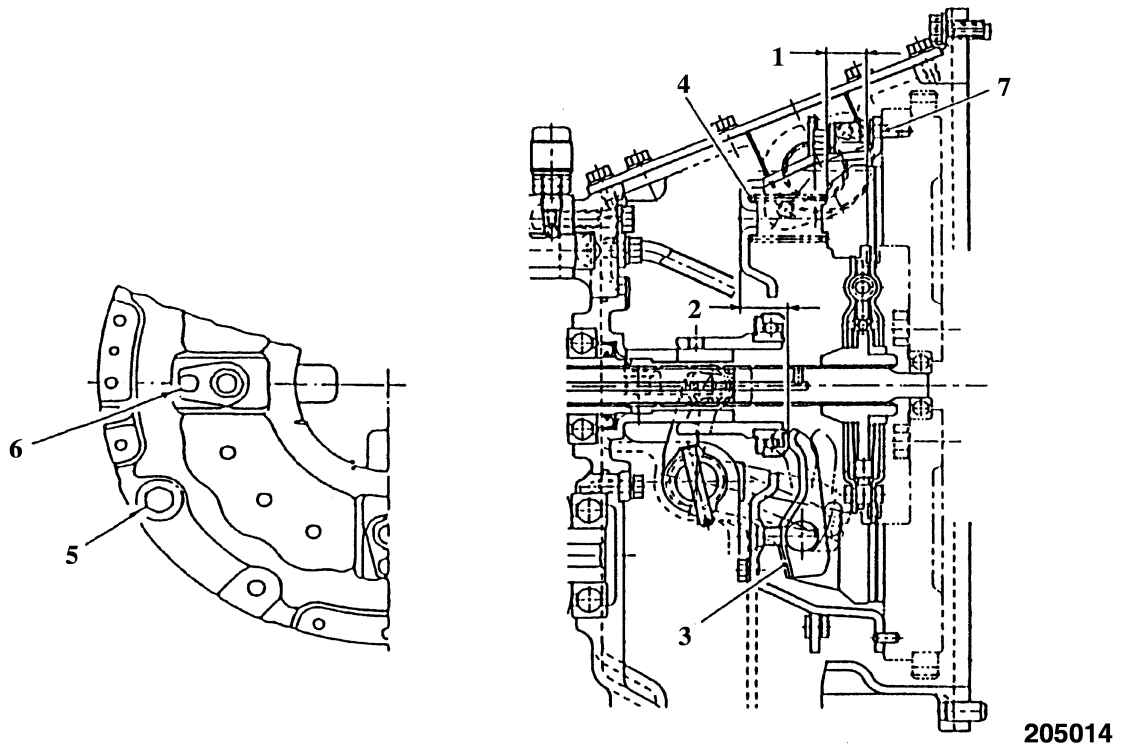
Clutches – continued

A-Assembly standard B-Repair or service limit

Wet-type Clutch

Unit: mm (in.)

Items			Truck Models	FG/FD10 thru 18	FG/FD20 FG/FD25	FG/FD30 FG/FD35A
Pressure plate	Bend or warpage		A	0.05 (0.0020), max		
			B	0.2 (0.008)		
	Thickness 1 (From spring seat to friction surface)		A	22.8 (0.898)		
			B	21.0 (0.827)		
	Height of release levers 2		A	26.5 (1.043)		
	Difference in height between adjacent release levers 3		A	0.7 (0.03)		
	Pressure springs 4	Quantity per clutch	A	FG: 10, FD: 12		
		Free length	A	78.8 (3.102)		
		Length under test force	A	48.2 (1.898)		
		Test force, N (kgf) [lbf]	A	643 ± 29 (65.6 ± 3) [145 ± 6.6]		
	Tightening torque, N·m (kgf·m) [lbf·ft]	Strap bolts 5	A	39 to 59 (4 to 6) [29 to 43]		
		Lock plate bolts 6	A	6 to 8 (0.6 to 0.8) [4.3 to 5.8]		
		Pressure plate bolts 7	A	17 (1.7) [12.3]		



Inspection and Adjustment

Shim Adjustment

1. Determine the thickness of shims to be used as follows:

   Measure distance "L" (between the outside faces of the bearing outer races), with the races evenly pushed inward.

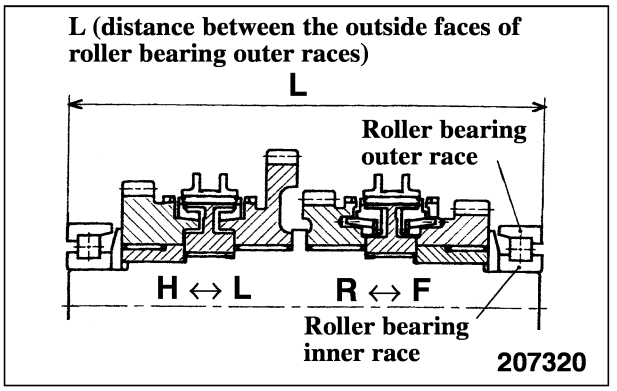
   Total shim thickness "A" = 227.6 mm (8.9606 in.) – "L"

   For "A," round the measurement to one decimal and, for "A/2," omit the figure below the second place of decimals.

   (Example)
   "L" = 226.67 mm (8.9240 in.) →
   "A" = 227.6 mm (8.9606 in.) – 226.67 mm (8.9240 in.) = 0.93 mm (0.0366 in.) → 0.9 mm (0.0354 in.)

   "A/2" = 0.9 mm (0.0354 in.)/2 = 0.45 mm (0.0177 in.) → 0.4 mm (0.0157 in.) (thickness of shims to be used on each side)

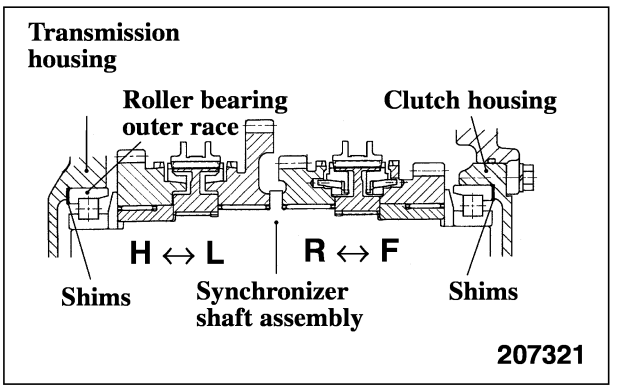
   Put shims "A/2" between the roller bearing outer race and the shoulder of the housing on each side.



2. Install the roller bearing outer races as follows:

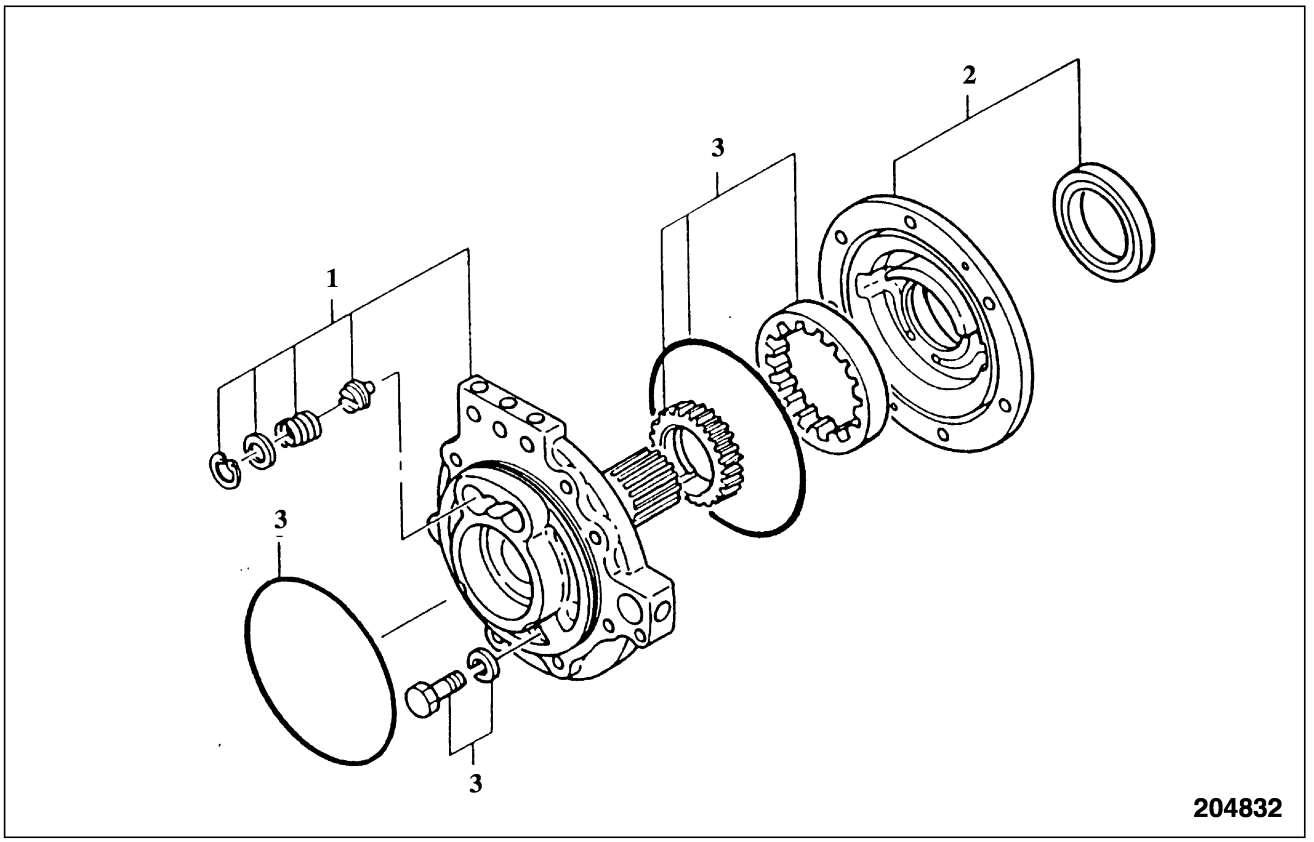
(1) Put shims in place in the clutch housing and transmission housing and drive the outer races in place.

(2) Tighten the housing bolts. With the top cover removed, make sure the synchronizer shaft assembly has a slight axial play, which is 0.4 to 0.6 mm (0.016 to 0.024 in.) in design value.



Reassembly

Pump Assembly



Sequence

1 Stator shaft, Relief valve, Spring, Washer, Snap ring
2 Pump body, Oil seal
3 Internal gear, Drive gear, O-ring, Bolt, Washer

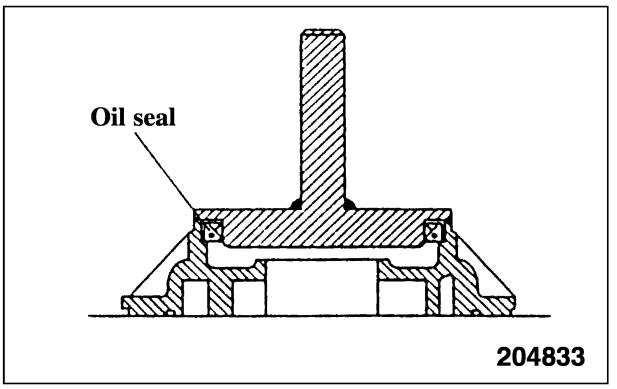
Suggestions

1. Installing oil seal

Using installer (special tool), install the oil seal to the pump body.

The special tool needed

Installer	91268-05300

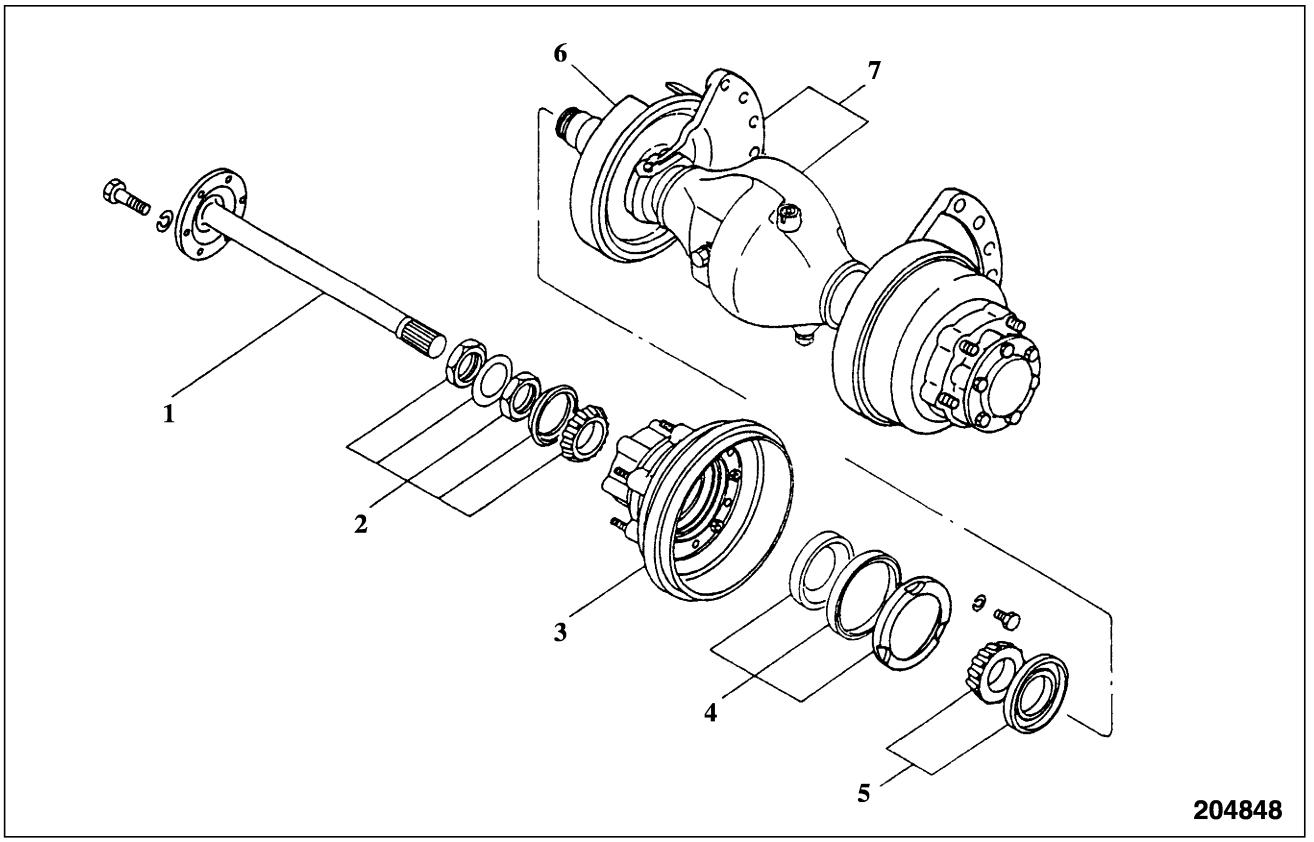


Complaints	Possible causes		Remedies
Not enough output power	Engine	a) Not enough power from engine b) Poor performance of engine	Tune-up engine. Tune-up engine.
	Torque converter	a) Oil lever too low b) Air being sucked in on suction side c) Faulty action of spool in main regulator valve d) Fatigued spring in main regulator valve e) Worn gears in oil pump, resulting in reduced capacity f) Magnet strainer clogged g) Seal rings or O-rings worn h) Stator freewheel seized i) Blades of rotating members damaged or rubbing	Refill. Replace gasket and retighten. Repair or replace. Replace. Overhaul and check or replace defective parts. Replace. Replace. Replace assembly. Replace as an assembly.
	Transmission	a) Air being sucked in on suction side b) Outlet pressure too low to suppress internal foaming c) Water in oil d) Oil level too low e) Pedal linkage maladjusted (brake shift) f) Main pressure too low, resulting in a slipping clutches g) Seal rings or O-rings worn h) Clutch piston damaged i) Friction plate seized or dragging	Retighten or replace. Readjust. 147 to 294 kPa (1.5 to 3 kgf/cm^2) [21 to 43 psi] Replace oil. Refill. Readjust, see page 7-21 Readjust 883 to 1079 kPa (9 to 11 kgf/cm^2) [128 to 156 psi] Replace. Replace. Replace.
	Wheels	High mechanical resistance in road wheels	Check and adjust brake system, see page 10-12
No power flow	Torque converter	a) Flexible plate broken b) Not enough oil c) Oil pump drive defective d) Turbine shaft broken e) Main pressure too low	Replace. Refill. Replace. Replace as an assembly. Check pump gears for wear or replace.
	Transmission	a) Not enough oil b) Inching pedal link maladjusted c) Both clutches on main shaft remain disengaged	Refill. Readjust, see page 7-21 Readjust inching pedal linkage or replace clutches, see page 7-21

Disassembly and Reassembly

Front Axle

Disassembly



Sequence

1 Axle shaft
2 Lock nut, Lock washer, Oil seal, Tapered roller bearing (inner)
3 Hub & Drum assembly [Front wheel hub, Brake drum, Wheel bolts, Drum nuts, Tapered roller bearing (outer)]
4 Tapered roller bearing (outer), Oil seal, Oil deflector
5 Tapered roller bearing (inner), Seal retainer
6 Brake assembly
7 Frame support, Axle housing

Start by:

1. Remove the mast. For replacement of the front axle housing and disassembly of the differential, refer to MAST AND FORKS.
2. Jack up the truck.
3. Support the front end of the truck at both sides with blocks or stands to keep the truck in horizontal position.
4. Remove the front wheels.

NOTE

It is not necessary to remove the axle housing nor to drain the oil for removing the axle shaft only.

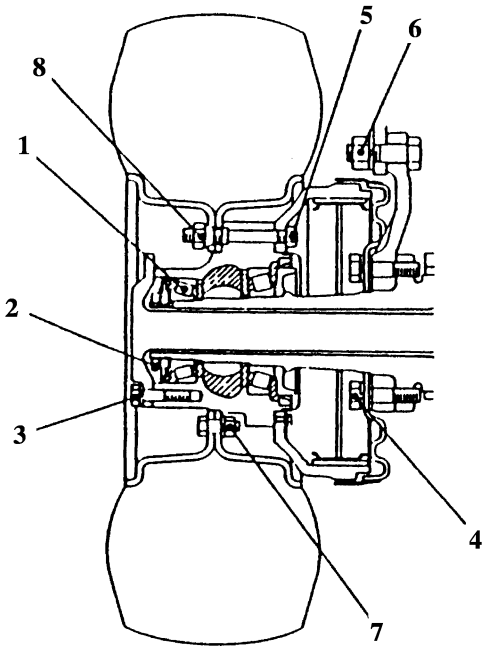
Service Data

A = Assembly standard B = Repair or service limit

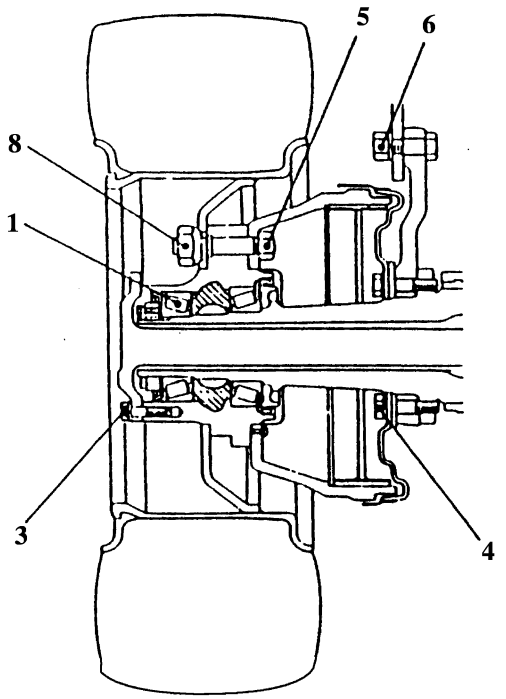
Unit: mm (in.)

Items				Truck Models: FG/FD10 thru 18	FG/FD20 FG/FD25	FG/FD30 FG/FD35A
Hubs and wheels	Face runout of axle shaft flange		A	0.05 (0.0020)		
			B	0.5 (0.020)		
	Runout of axle shaft (1/2 of dial indicator reading)		A	0.5 (0.020)		
			B	1.0 (0.039)		
	Preload for hub bearing 1 N·m (kgf·cm)[lbf·ft]		A	0.5 to 4.9 (5 to 50) [0.4 to 3.6]		
	Tightening torque N·m (kgf·m) [lbf·ft]	Hub bearing lock nuts (outer) 2	A	196 (20) [145]	—	
		Axle shaft bolts 3	A	86 (8.8) [64]		
		Nuts 4	A	215 (21.9) [158]		
		Hub blot lock nuts 5	A	59 (6) [43]	181 (18.5) [134]	
		Axle support bolts 6	A	378 (38.5) [278]		
		Rim bolts 7	A	86 (8.8) [64]	202 (20.6) [149]	—
		Wheel nuts 8	A	157 (16) [116]	378 (38.5) [278]	

FG/FD10 thru 25



FG/FD30, 35A



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Troubleshooting

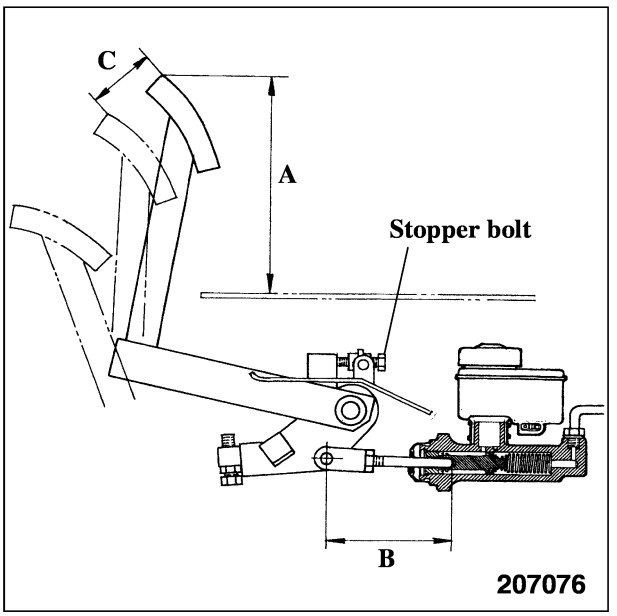
Complaints	Possible causes
Heavy steering	a) Toe-in not set to the specification b) Lack of lubrication in rear and steering linkage c) Tire inflation pressure too low
Poor steering reaction	Joint and connections in steering and rear axle linkage too tight
Truck pulls to one side	a) Tire diameter differs between right and left b) Tires inflated unequally
Shimmy	a) Excessive clearance between kingpin and its bearings b) Tapered roller bearings badly worn or damaged in hub c) Excessive rattle of ball stud in socket in tie rod d) Steering system defective
Rear wheel tires wear prematurely or unevenly	a) Wheel alignment out of adjustment b) Tires on one side differ in kind from those on the other side, or tires inflated unequally
Abnormal noise in starting and stopping	Improper shim adjustment of rear axle support

Brake Pedal Adjustment

1. Set the height A (from the frame to the top of pad) of the pedal to the specified value.
2. Set the length B of push rod to the specified value, and push in the rod into the master cylinder.
3. Make sure that the pedal stroke C (to a point where the brakes are applied) is correct.

Unit: mm (in.)

	1.0 to 1.8 ton models	2 to 3.5 ton models
Pedal height A	220 (8.7)	
Push rod length B	103.2 (4.06)	
Pedal stroke C	35 to 61 (1.4 to 2.4)	53 to 89 (2.1 to 3.5)

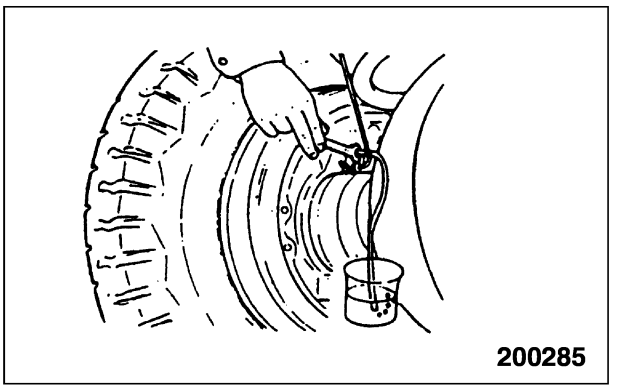


Bleeding Air Out of the Brake Fluid Line

Whenever any part of the brake fluid line was disconnected in servicing work, an air bleeding operation must be carried out to complete the work. With air trapped in any part of the fluid line, the pedal will "feel" spongy.

The procedure for air bleeding operation is as follows:

1. Connect a flexible tube, such as a clear plastic pipe, to the bleeder screw on wheel cylinder. Pour enough clean brake fluid in to the jar, and immerse the end of pipe.
2. Pump the brake pedal and depress the pedal all the way. While keeping the pedal depressed, loosen the bleeder screw and, when air bubbles cease to come out (as seen in the jar), tighten the screw. Repeat this process until nothing but brake fluid flows into the vessel.
3. Carry out the foregoing steps at each wheel brake, and fill up the brake fluid reservoir to level.



NOTE

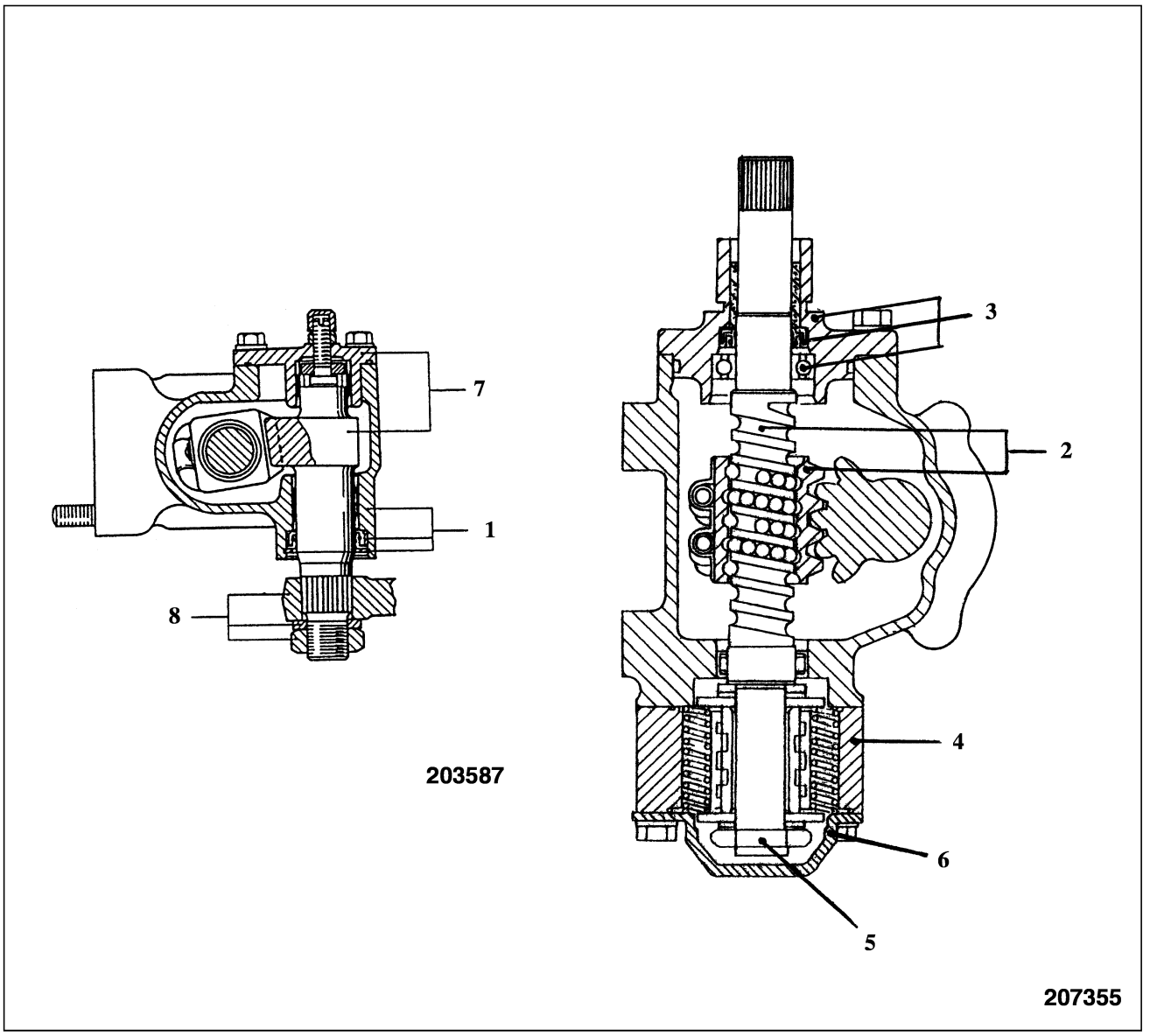
1) Be sure that, at no time during the bleeding operation, the reservoir becomes empty of fluid.
2) Use the specified brake fluid, and avoid different brands of brake fluid getting mixed before and after filling up the reservoir.

Brake Test

After completion of necessary adjustments, test the brake force by traveling the truck at a speed of 10 km/h [6.2 mph].

Refer to Manual Adjustment for necessary readjustment.

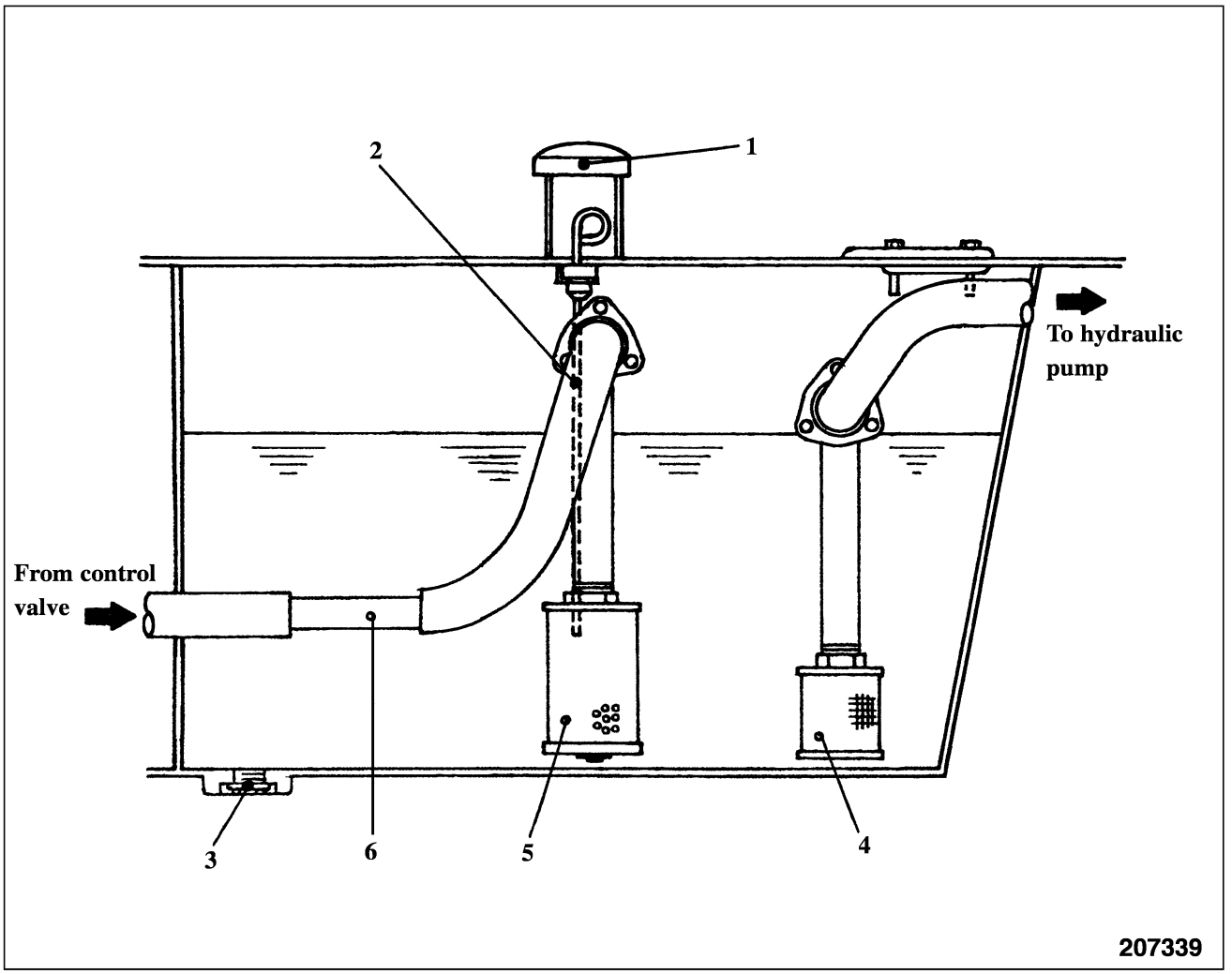
Reassembly



Sequence

1 Gear box, Bushing, Oil seal, Snap ring
2 Ball screw assembly
3 Upper cover assembly
[Oil seal, Ball bearing, O-ring]
4 Valve assembly
[Valve housing, Pipe seat, Spring, Reaction piston, Valve spool]
5 Ring plate, Needle roller bearing, Lock nut
6 End cover, O-ring
7 Sector shaft, Side cover, Bushing, O-ring, Shims, Adjusting screw, Nut, Gasket, Cap nut
8 Pitman arm, Spring washer, Nut

Hydraulic Tank



1 Air breather, cap
2 Oil level gauge
3 Drain plug
4 Suction strainer
5 Return filter
6 Return pipe

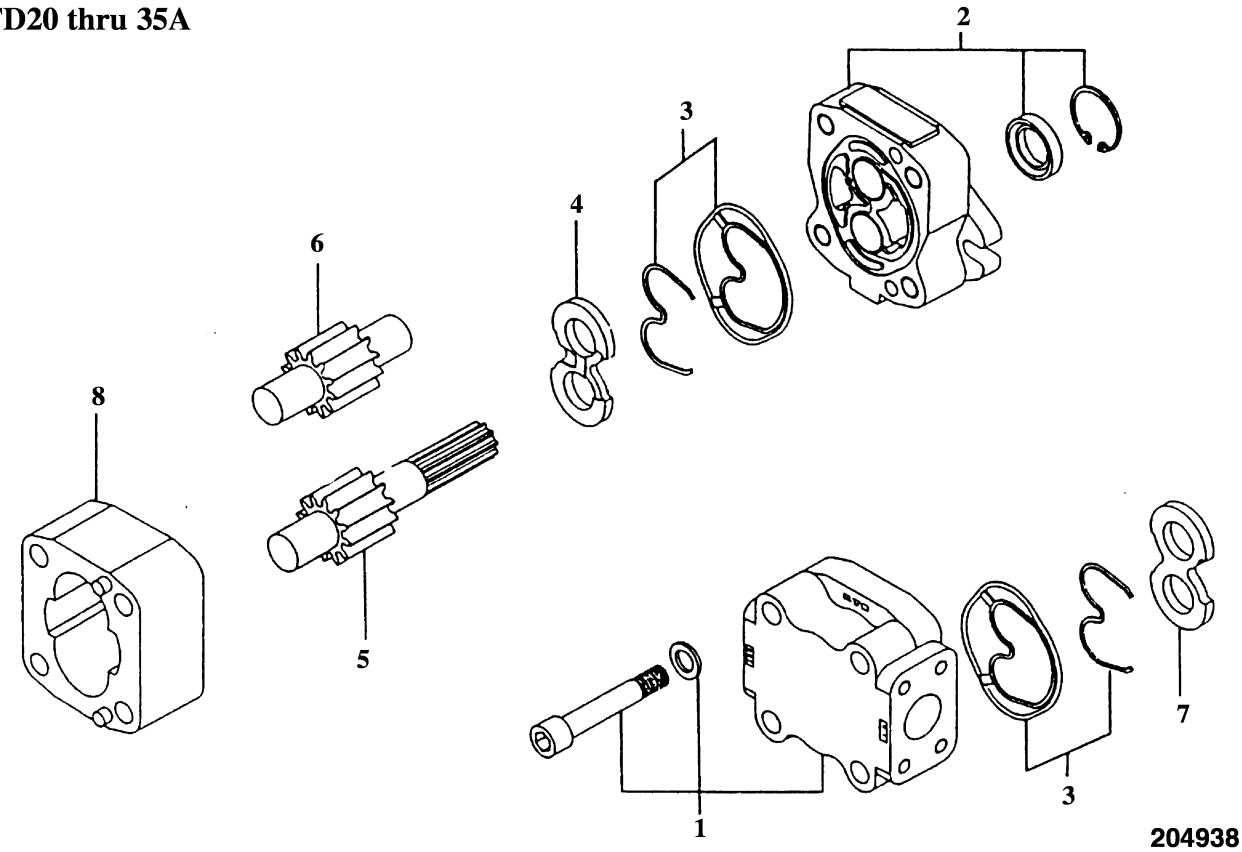
The tank is internally provided with two filtering means, suction strainer 4 with a 150-mesh screen for catching gritty particles in the oil, and return filter with the relief valve and capable of catching 15-micron and larger particles in the oil returning from the control valve.

(7) Each bushing has a flat. Be sure to locate the flat correctly in the pump body.

(8) Tighten the cover those bolts to the specification.

(9) The fit of the pump gears in the reassembled pump may be deemed satisfactory if the pump shaft rotates smoothly and lightly when turned over by hand with an adjustable wrench.

FD20 thru 35A



Sequence

1 Cover, Bolt
2 Mounting flange, Snap ring, Oil seal
3 Backup ring, Plate seal
4 Pressure plate
5 Drive gear
6 Driven gear
7 Pressure plate
8 Gear plate

General working tips

(1) Do not use a hammer or similar hard tool in an attempt to loosen or force out cover 1 and mounting flange 2. Use a plastic hammer.

(2) Prepare suitable containers to place parts in the disassembled order. This applies in particular to the pump gears and their bushings to ensure the correct reassembly.

(3) Before starting reassembly, visually inspect all parts to be sure they are perfectly clean, and apply hydraulic oil to the sliding surfaces of the gear plate.

(4) Replace oil seals; backup rings and plate seals once disturbed.

2. Internal leakage

It is not practical to check the control valve alone for internal leakage. The leakage to be checked includes leakages occurring at the lift spool, tilt spool, tilt lock valve and check valves.

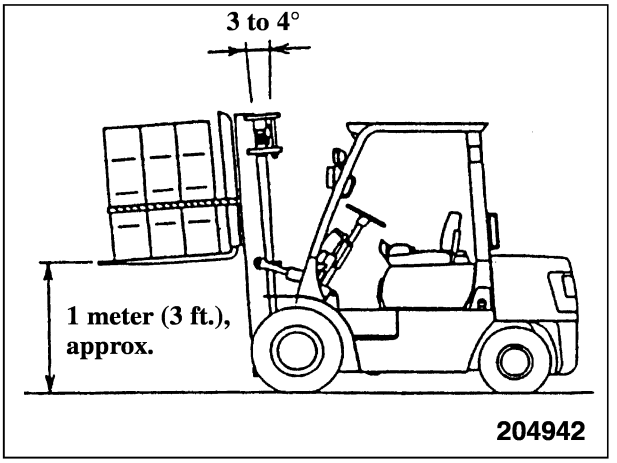
[Test oil temperature: 50 °C (122 °F), approx.]

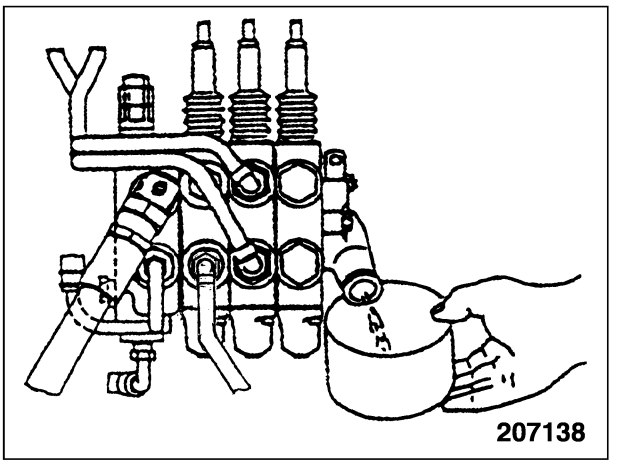
(1) Pick up a load equal to the rated capacity, and lift it approximately 1 meter (3 feet) high. Tilt the mast about 3° to 4° forward, and stop the engine.

(2) Quickly disconnect the oil return hose, and start collecting the oil coming out of this hose as shown.

The amount of oil collected for 15 minutes	500 cc [30.5 cu.in.], maximum

(3) If the tilt cylinders or lift cylinders drift (the mast tilts forward or the fork lowers) excessively in spite of that the amount of oil collected for 15 minutes is less than 500 cc [30.5 cu.in.], measure the internal leakage of each cylinder. (The measurement is the assembly standard and not the service limit.)

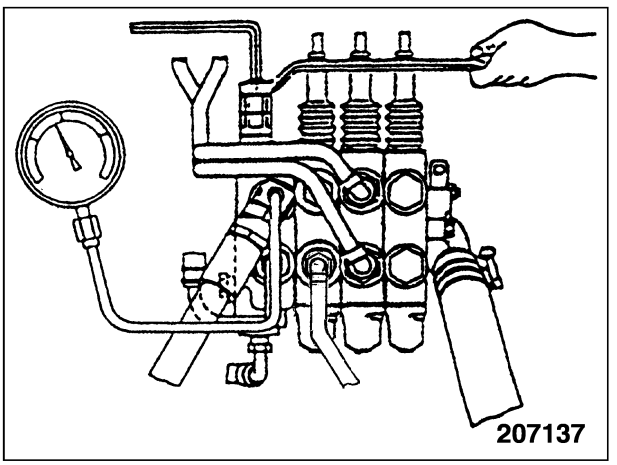




3. Main relief valve adjustment

(1) Attach a pressure gauge capable of measuring up to 25000 kPa (250 kgf/cm^2) [3555 psi] to the delivery hose connector. Use the gauge, connectors and hose used for testing the gear pump.

(2) Start the engine and run it at the maximum speed. Move the tilt control lever to the backward tilt position. If the pressure is relieved at 18142 $^{+490}_{0}$ kPa (185 $^{+5}_{0}$ kgf/cm^2) [2631$^{+71}_{0}$ psi] when the tilt cylinders reach the end of their stroke, the main relief valve setting is correct.

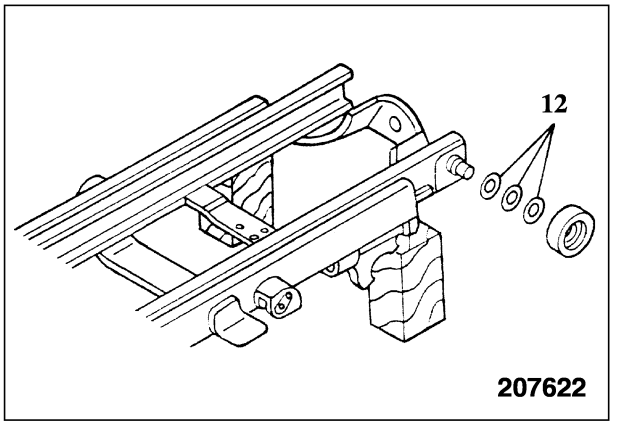


Reassembly

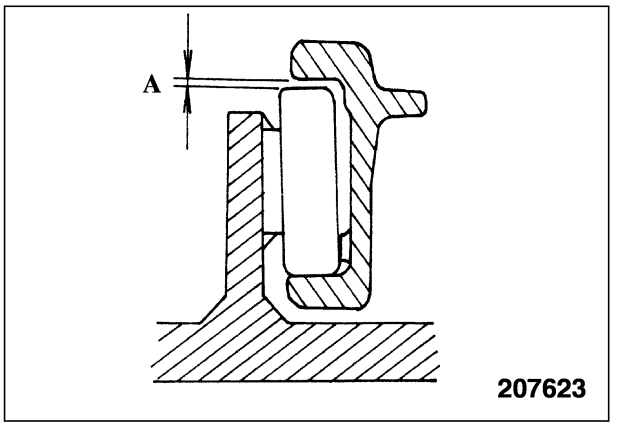
To reinstall, follow the removal sequence in reverse, and service as follows.

1. Main rollers

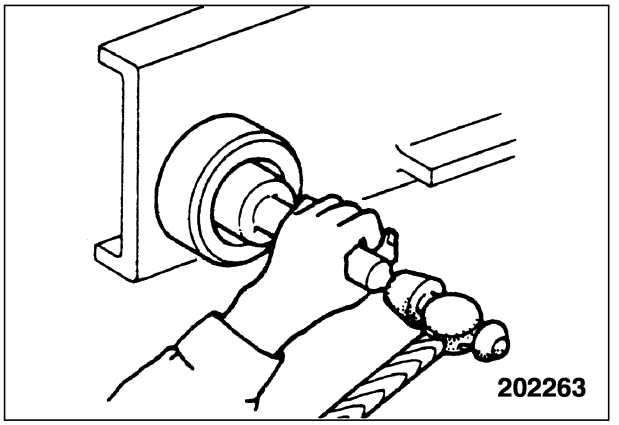
(1) Adjust the right and left clearances by increasing or decreasing the thickness of shims 12.



(2) When replacing lift bracket main rollers, make sure clearance A between each roller and mast surface is 1 mm or less.

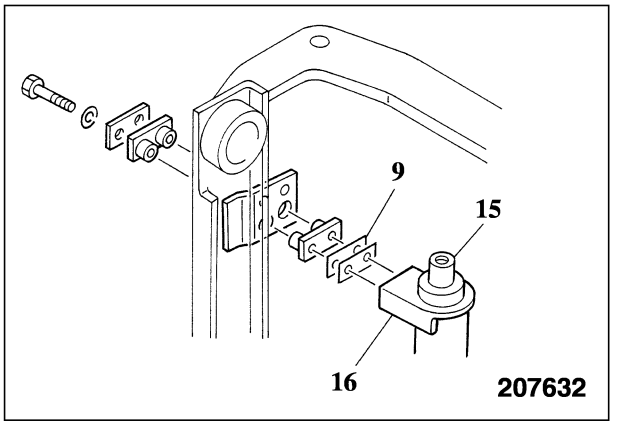


(3) To install main rollers on shafts, use a driving tool. Be careful not to accidentally strike the outer roller surface with the driving tool.
The side of the roller with larger chamfered area must face toward the outside.

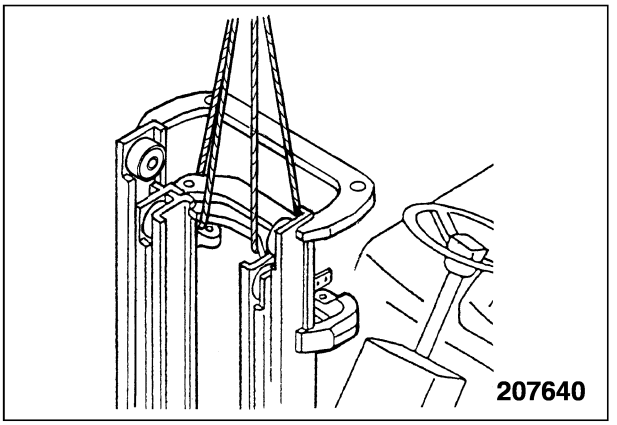


2. Installing second lift cylinders

When installing second lift cylinders 15, make sure the cylinders are parallel to the mast to prevent torsional stress on the lift cylinders when the mast is positioned at the bottom. Adjust the installation positions of lift cylinder brackets 16 with shims 9.



4. Position the middle mast lower than the outer mast by following operations.
(1) Lift the inner mast to the height of the middle mast, then place wood blocks for support.
(2) Tie wire ropes to both middle mast and inner mast, and suspend with a crane.
(3) Remove set bolts from the upper sections of the middle mast lift cylinders, then lift the middle mast and inner mast.
(4) Remove two lift cylinder clamps, dismount the cylinders from the mounting sections at the lower outer mast section. Tilt the cylinders by moving the top sections towards the center of the vehicle, then secure the cylinders to the cross-member of the outer mast with a rope.
(5) Lower the middle mast and inner mast until main rollers can be removed.
(6) Place wood blocks under the middle mast and inner mast for support.
(7) In this condition, main rollers can be removed from the inner mast and outer mast. Since the mast strips and shims can fall off, remove these parts first.



Inspection point		How to check	Intervals			Service data
			Pre-start	1 month	12 month	
Mast and lift bracket	Cracks, distortion or other defects	Visual/dye check	○	○	○	
	Mast supports — rattle or damage			○	○	
	Main rollers — clearance, damage	Feeler gauge/ dial gauge		○	○	Each roller to mast clearance (at max. height): 0.1 to 0.5 mm (0.004 to 0.020 in.)
Lift chains and chain wheels	Length of lift chains (20 links)	Scale			○	Service limit FG/FD10 thru 18: 327 mm (12.87 in.) FG/FD20/25: 392 mm (15.43 in.) FG/FD30/35A: 523 mm (20.59 in.)
	Tension deflection of lift chains	Scale	○	○	○	Both chains to be equal in tension
	Chain wheels — damage or rusting	Visual	○	○	○	
	Chain wheels — wear, distortion or other defects	Visual		○	○	
	Chain wheel bearings — rattle	Feel		○	○	
	Chain anchor bolts — distortion or damage	Visual		○	○	
Forks and backrest	Forks — wear and distortion	Visual/scale	○	○	○	Fork thickness Refer to Service Data.
	Fork stopper pins — damage or distortion	Visual	○	○	○	
	Backrest mounting bolts — tightness	Torque wrench	○	○	○	171.6 N·m (17.5 kgf/m)
	Backrest — distortion or damage	Visual	○	○	○	
Lights	Operation	Test/visual	○	○	○	
Turn signals	Operation	Test	○	○	○	
Rear view mirrors	Rear vision	Visual	○	○	○	
Overhead guard	Installation and damage	Visual/wrench	○	○	○	
Chassis	Loosen bolts or nuts	Wrench			○	
	Operator's seat — damage and installation	Visual		○	○	
	Lubrication points	Lubricate		○	○	Lubricate mast supports every week.
	Oil change	Inspect		○	○	

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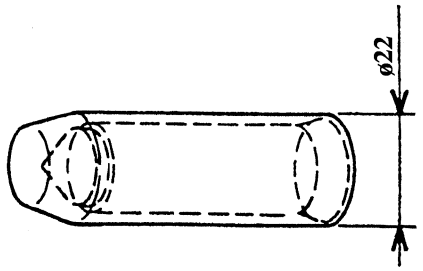

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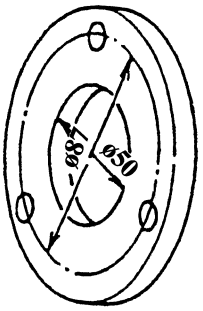

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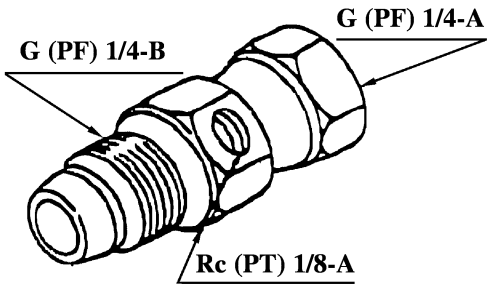

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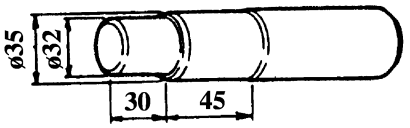

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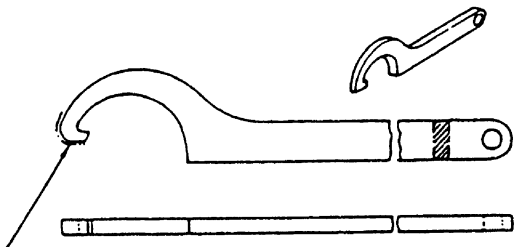

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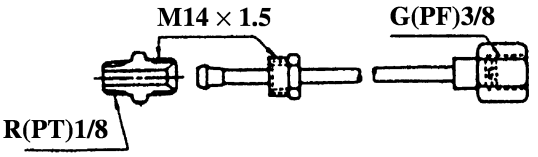

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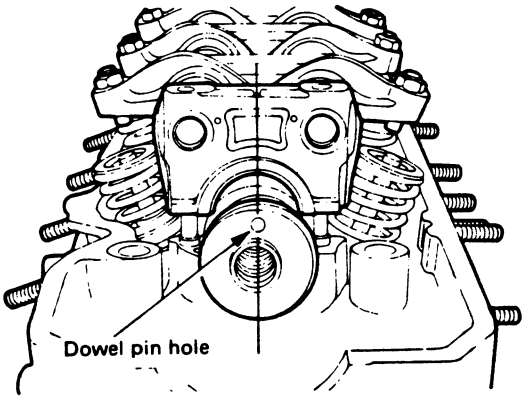
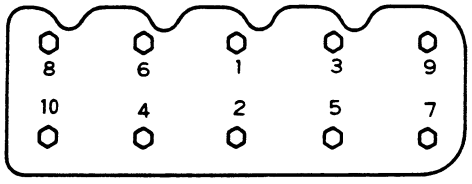


Position of camshaft just installed

Installation (4G33)

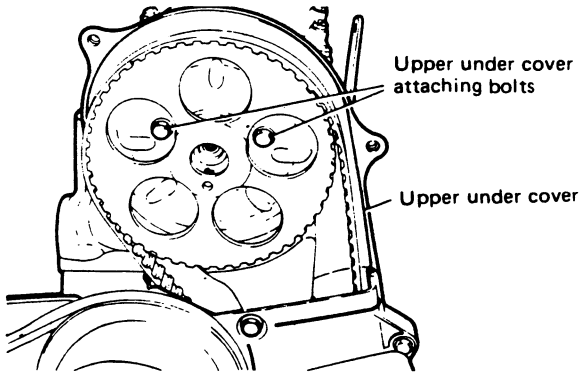
(1) Make sure that the gasket mating surfaces of the cylinder head and the block are clean and free of the old gasket debris and oil. Position the cylinder block as guided by the dowels. Gaskets are identified by markings on the upper front. A gasket stamped "33" is the one for 4G33.

(2) Mount the cylinder head assembly on the block. Do not slide the assembly over the gasket at this time. Secure the cylinder head assembly by tightening the bolts uniformly and sequentially, moving the wrench (special tool no. MD998001) from one bolt to another in the ascending order of numbers as shown. Be sure to tighten each bolt in three or four steps, completing each tightening by torquing the bolt to the specification.



Cylinder head bolt tightening sequence

(3) Tighten the timing belt upper under cover attaching bolts.

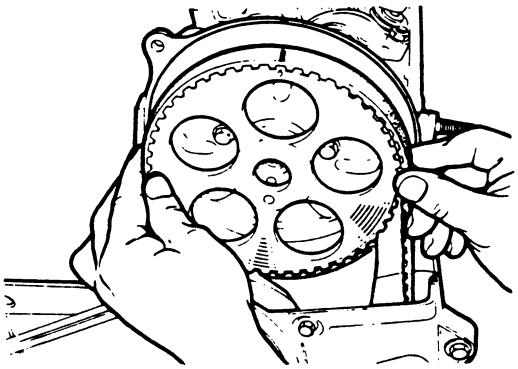


Installing upper under cover (4G33)

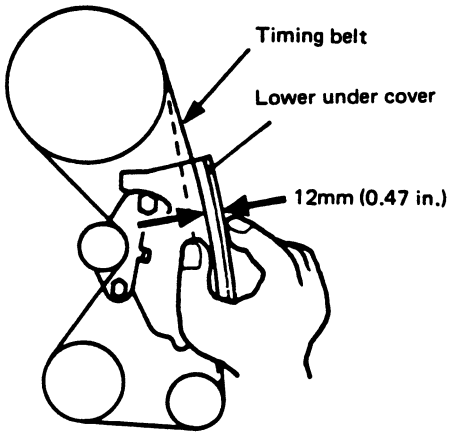
(4) Lift the camshaft sprocket upward and install the sprocket to the camshaft. If the sprocket is tight and hard to be lifted for fitting it in the spacer, insert a screwdriver into the hole in the top of the camshaft sprocket and pry up the sprocket with the screwdriver tip at the stepped upper under cover. If the dowel pin hole in camshaft sprocket is not aligned with the dowel pin on the tip of the spacer, tap the two lugs provided on the rear of No. 2 cylinder exhaust cam with a screwdriver. This will make it easy to rotate the camshaft. However, do not attempt to turn the crankshaft. Tighten the camshaft sprocket attaching bolt to the torque specification.

NOTE

Check to make sure the timing mark put on the timing belt during removal is in alignment with the mark on the camshaft sprocket.



Installing camshaft sprocket (4G33)



Timing belt tension

(31) Install the timing belt cover, lower front.

(32) Install the timing belt cover, upper front.

(33) Install the crankshaft pulley.

Reassembly (4G52, 4G54)

NOTE

a) Make sure that each part to be used in assembling work is clean. Oil holes, bearings, seats and holes for holding the bearings and cylinder bore walls must be particularly clean.

b) Apply a coat of engine oil to the bore walls and the sliding surfaces of the pistons, bearings and gears just before assembling or mounting them.

c) Do not re-use the gaskets, oil seals and packings that were removed in disassembly. Be sure to use new ones in assembling work.

d) Be sure to use the prescribed sealing compound on gaskets, packings and other designated parts.

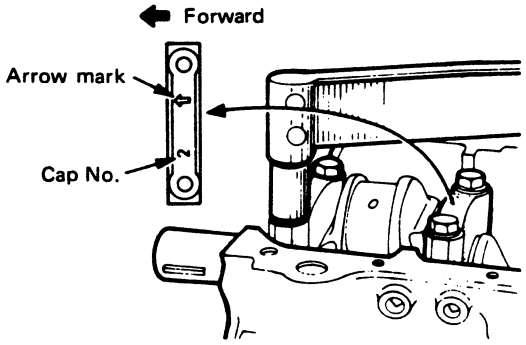
e) Be sure to adhere to the prescribed sequence of tightening and to observe the prescribed tightening torque values. Check each clearance, radial, axial or otherwise, against the specification value.

(1) Install the crankshaft. Apply a coat of engine oil to the journals and crankpins.

(2) Put on the bearing caps, and secure the caps by tightening their nuts to the specified torque. Secure the center cap, No. 2 cap, No. 4 cap, front and rear cap in that order, tightening each nut just a little at a time.

Each bearing cap has an arrow mark on its underside: be sure to point the arrow to the front side. Right beside the arrow mark is the cap number marking, No. 1, No. 2, No. 3, No. 4 or No. 5: be sure to locate each bearing cap in the right position.

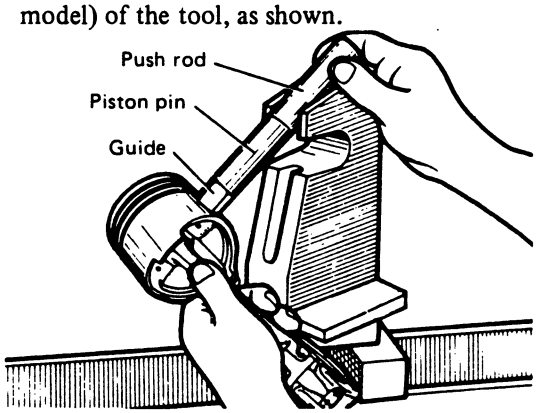
After securing the caps, check to be sure that the crankshaft is capable of turning smoothly and that it has the specified end play.



Securing main bearing caps

(3) Assemble each piston, piston pin, connecting rod and piston rings, as follows:

(a) Set the piston pin on the piston pin setting tool (special tool No. MD998184), truing it up between the push rod and the guide (specified for each model) of the tool, as shown.

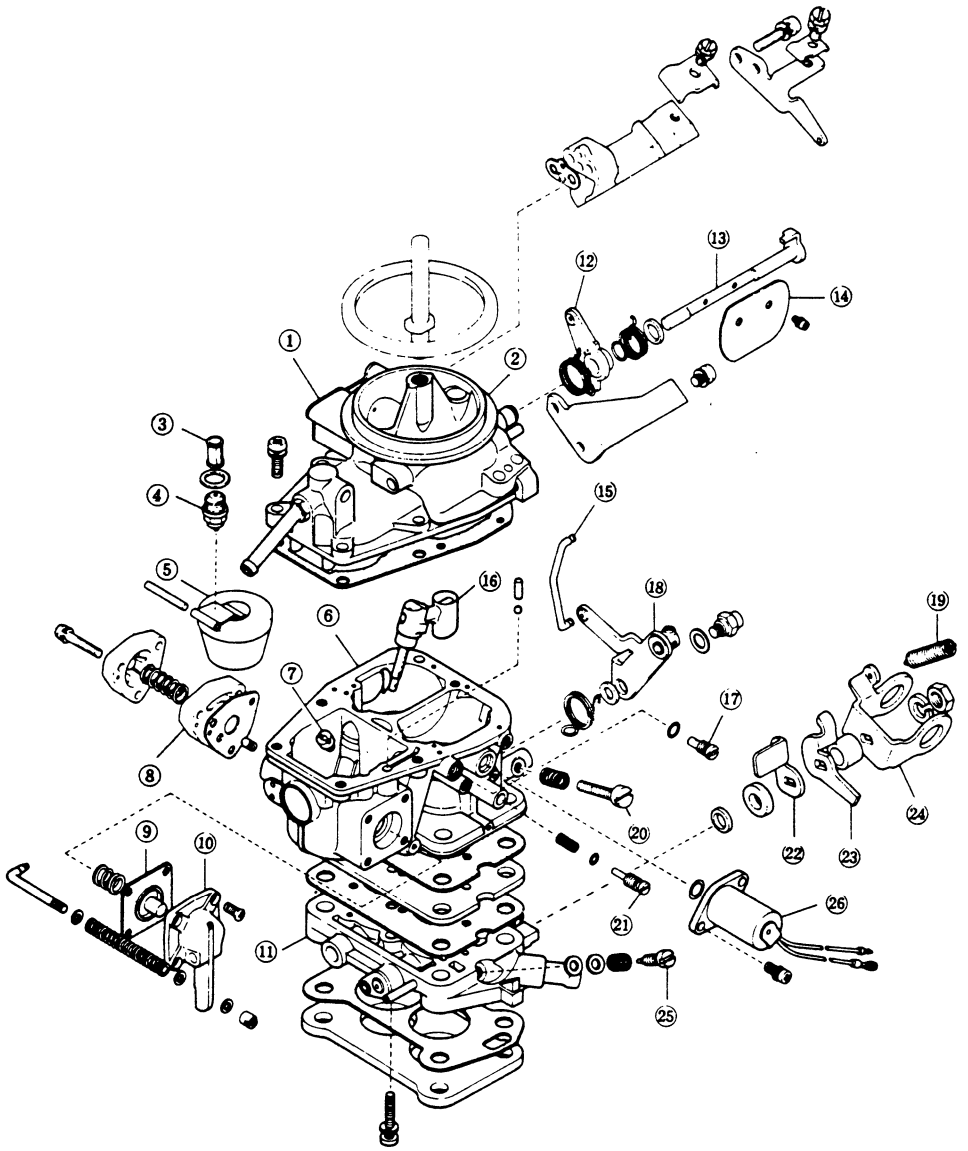


Fitting pin into piston (1)

NOTE

a) Be sure to use the guide punch-marked "4G52" for 4G52 and punch-marked "4G54" for 4G54.

b) Liberally oil the pin surface and the pin hole of the connecting rod small end: use engine oil.



1-Bimetal
2-Float chamber cover
3-Screen
4-Needle valve
5-Float
6-Main body
7-Main jet
8-Enrichment body assembly
9-Membrane
10-Pump cover
11-Throttle body
12-Choke lever assembly
13-Choke shaft
14-Choke valve
15-Choke connecting rod
16-Inner venturi
17-Pilot jet
18-Choke operating lever
19-Return spring
20-Speed adjusting screw
21-Bypass screw
22-Throttle stop lever
23-Abutment plate
24-Throttle lever
25-Mixture adjusting screw
26-Solenoid

Carburetor

Disassembly

This paragraph describes the fundamental rules or precautions to be followed in servicing the carburetor.

NOTE

a) Use wrenches and screwdrivers of the right size and type.

b) The parts removed should be set aside in group, each marked or tagged for its system or location so that the same combination or set as before can be reproduced at the time of reassembling.

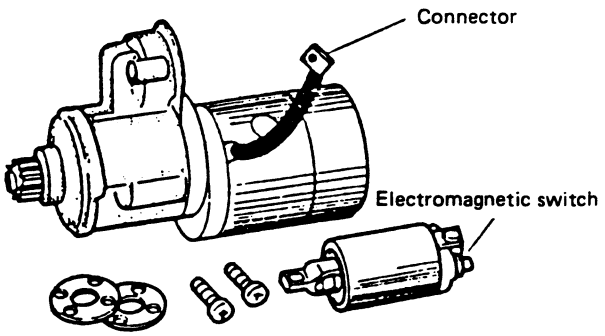
c) Do not remove the inner venturi without valid reason.

d) Do not remove the bypass screw without valid reason because it is sealed.

e) Do not remove the throttle shaft and throttle valve.

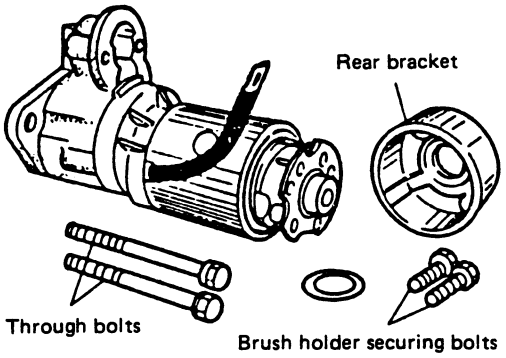
Disassembly

(1) Remove the connector from "M" terminal of the electromagnetic switch. Unscrew two screws securing the switch, and remove the switch.



Removing electromagnetic switch

(2) Remove two through bolts and two brush holder securing bolts. Then, remove the rear bracket.

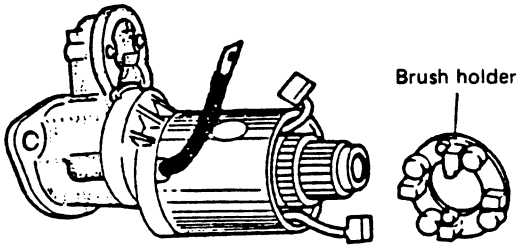


Removing rear bracket

CAUTION

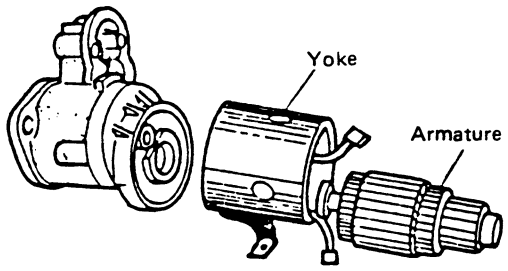
Be careful not to lose adjusting washer in the rear bracket.

(3) Take off two positive side brushes, and remove the brush holder.



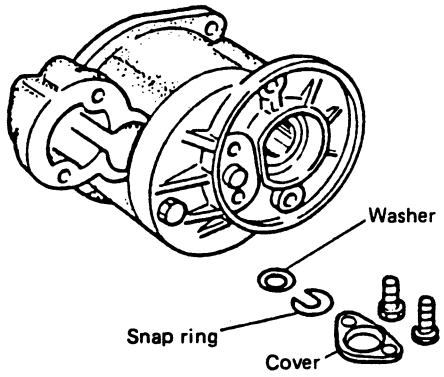
Removing brush holder

(4) Remove the yoke. Pull the armature from the yoke.



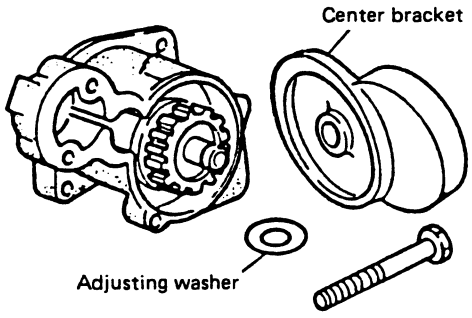
Removing yoke and armature

(5) Remove cover, and take off washer and snap ring.



Removing cover

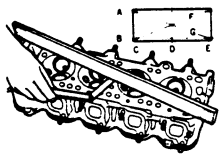
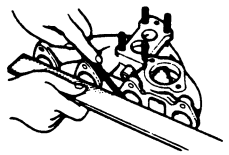
(6) Remove center bracket by pulling off one bolt. Several washers for adjusting pinion shaft axial play will come off.



Removing center bracket

MAINTENANCE STANDARDS

A: assembly standard B: repair and service limit Unit: mm (In.)

Group	Item				4G33	4G52	4G54
Engine	General	Compression pressure kg/cm² (psi) (at 250 rpm)		A	10.5 (149.3)		
				B	8.4 (119.4)		
		Difference in compression pressure among cylinders		A	10%, max		
		Ignition timing (BTDC) degree/rpm		A	5/600 ~ 700	6/600 ~ 700	
		Oil capacity liters (U.S. gal.) [including oil filter]		A	4.0 (1.06)	4.5 (1.19)	
		Oil pressure kg/cm² (psi) [At idling oil temperature 75 ~ 80°C (167 ~ 176°F)]			0.5 (7.1)		
	Cylinder head	Gasketed surface warpage 		A	0.05 (0.0020), max		
		Manifold attaching surface warpage 		B	0.3(0.012)		
		Valve seat bore oversizes	Intake	0.3 (0.012)	A	39.3 ~ 39.325 (1.547 ~ 1.54823)	44.3 ~ 44.33 (1.744 ~ 1.7453)	44.3 ~ 44.325 (1.744 ~ 1.74508)
				0.6 (0.024)	A	39.6 ~ 39.625 (1.559 ~ 1.56004)	44.6 ~ 44.63 (1.756 ~ 1.7571)	44.6 ~ 44.625 (1.756 ~ 1.75689)
			Exhaust	0.3 (0.012)	A	34.3 ~ 34.325 (1.350 ~ 1.35138)	38.3 ~ 38.33 (1.508 ~ 1.5091)	38.3 ~ 38.325 (1.508 ~ 1.50886)
				0.6 (0.024)	A	34.6 ~ 34.625 (1.362 ~ 1.36319)	38.6 ~ 38.63 (1.520 ~ 1.5209)	38.6 ~ 38.625 (1.520 ~ 1.52067)
		Camshaft bearing-to-camshaft clearance			A	0.05 ~ 0.09 (0.0020 ~ 0.0035)		
					B	0.15 (0.0059)		
		Valve guide bore oversizes (intake and exhaust)		0.05 (0.0020)	A	13.05 ~ 13.068 (0.5138 ~ 0.51449)	13.05 ~ 13.07 (0.5138 ~ 0.5146)	13.05 ~ 13.068 (0.5138 ~ 0.51449)
				0.25 (0.0098)	A	13.25 ~ 13.268 (0.5217 ~ 0.52236)	13.25 ~ 13.27 (0.5217 ~ 0.5224)	13.25 ~ 13.268 (0.5217 ~ 0.52236)
				0.50 (0.0197)	A	13.50 ~ 13.518 (0.5315 ~ 0.53220)	13.50 ~ 13.52 (0.5315 ~ 0.5323)	13.50 ~ 13.518 (0.5315 ~ 0.53220)

Symtom or suggestion	Cause	Remedy
Air-fuel mixture not proper	Carburetor out of adjustment	Refer to 3. CARBURETOR TROUBLE-SHOOTING.
	Fuel filter element or pipe dirty	Clean. Replace fuel filter element if necessary.
	Air leak in past carburetor or intake manifold	Retighten carburetor mounting nuts, intake manifold nuts. Replace gaskets and other parts if necessary.
Valves or valve seats are suspected of having worn and leaking		Refer to 2. ENGINE PROPER TROUBLESHOOTING.
Cylinder head or its related parts are responsible for	Carbon deposits in combustion chamber	Clean.
	Water jacket clogged	Clean.
	Cylinder head gasket leaking	Retighten cylinder head bolts to specified torque. Replace gasket if necessary.

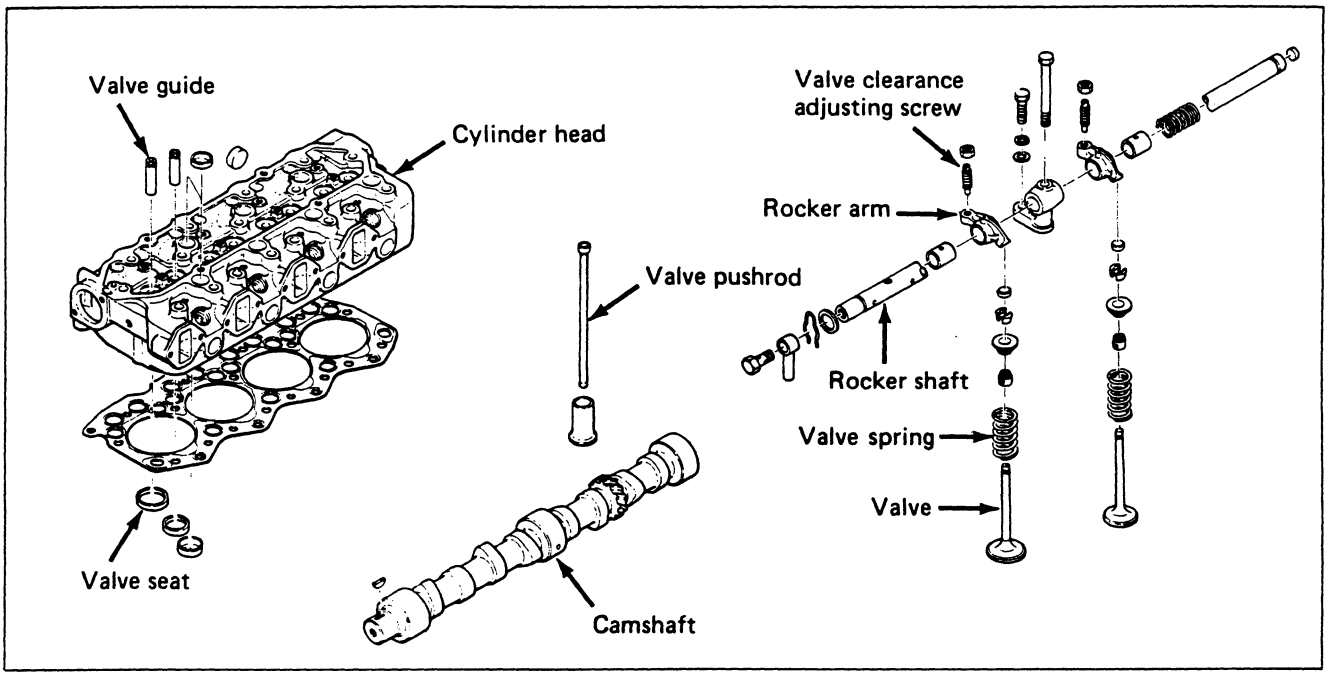
COMPLAINT 5: Loss of power

Symptom or suggestion	Cause	Remedy
Ignition system is responsible for	Ignition timing incorrect	Retime.
	Spark plugs defective	Refer to 4. ELECTRICAL EQUIPMENT TROUBLESHOOTING.
"Out of fuel" is responsible for	Carburetor defective	Refer to 3. CARBURETOR TROUBLE-SHOOTING.
	Cylinder head gasket damaged	Replace gasket.
	Fuel pipe clogged or damaged	Clean or replace.
	Fuel filter element dirty	Clean. Replace element if necessary.
	Air in fuel system	Bleed system. If system becomes arrested again, check for air leaks past joints and retighten.
	Fuel pump defective because of –	
	• Damaged diaphragm	Replace diaphragm.
	• Damaged valve	Replace valve.
Carburetor is suspected of choking	Air cleaner element dirty	Clean or replace element.
	Carburetor choke valve partly closed	Refer to 3. CARBURETOR TROUBLE-SHOOTING.
Overheating is responsible for	Lack of coolant because of –	
	• Radiator leaking	Repair radiator.
	• Coolant hose connections loose or hoses damaged	Retighten or replace.
	• Water pump leaking	Repair or replace pump.
	• Cylinder head gasket leaking	Retighten cylinder head bolts to specified torque. Replace gasket if necessary.

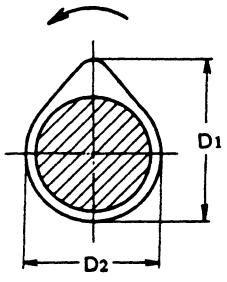
TABLE OF CONTENTS

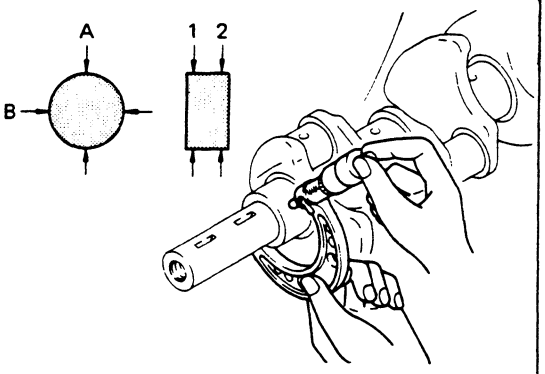
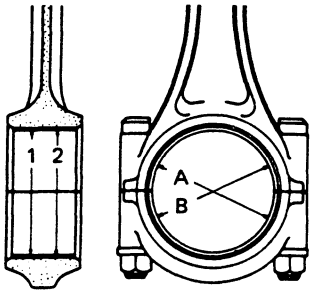
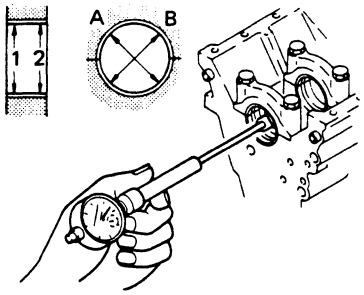
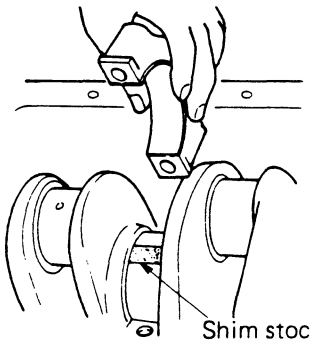
PART 2. CYLINDER HEAD AND VALVE MECHANISM

Index to inspection points

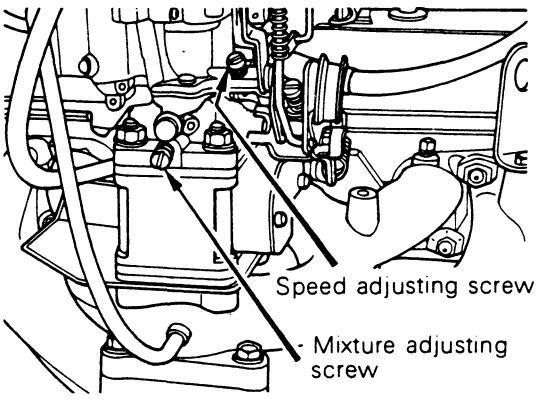
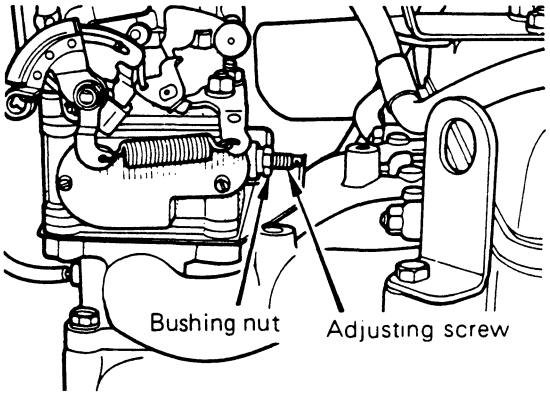


Inspection points

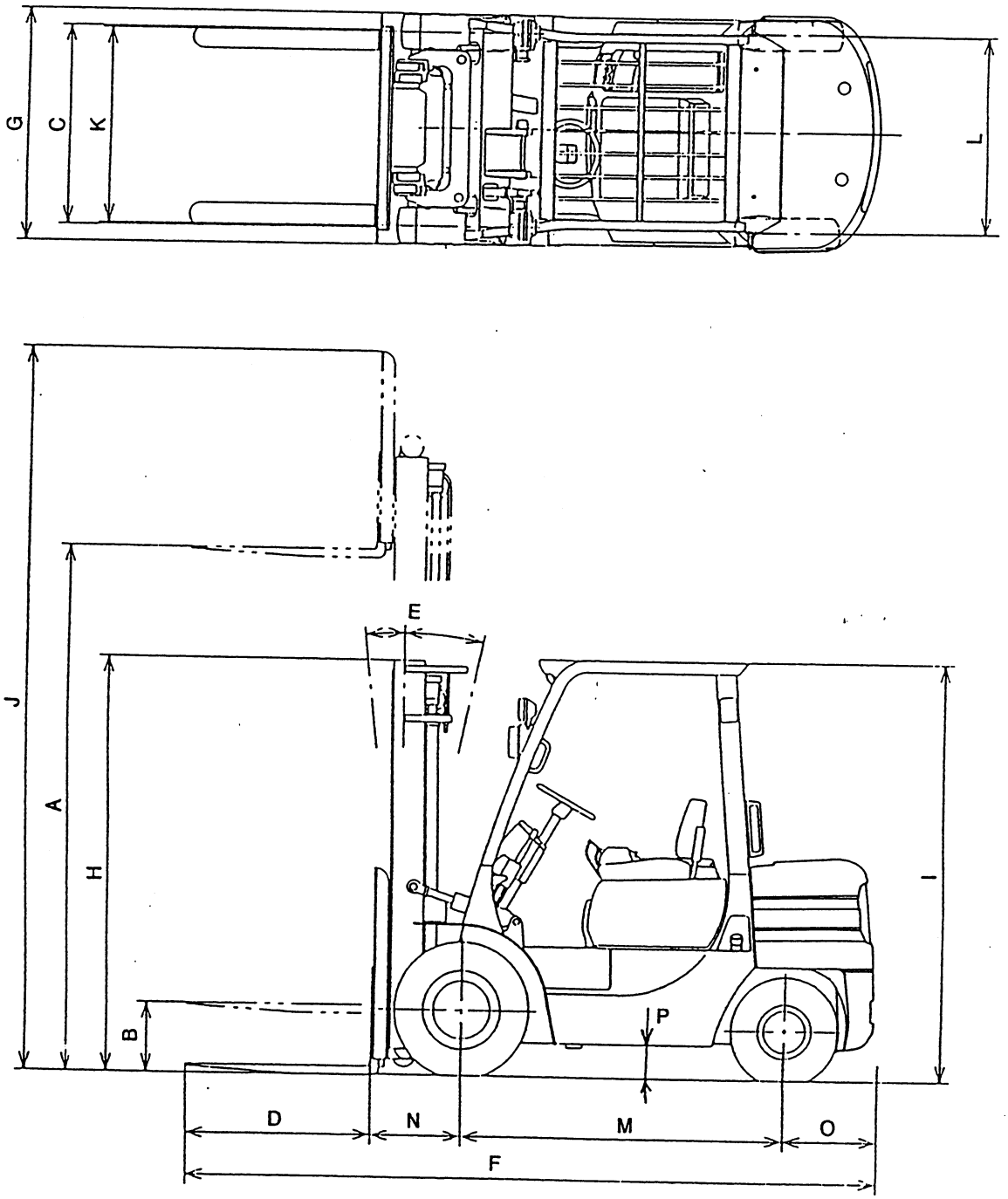
What to check		How to check or Remarks
Camshaft	**1. Visually** Cam lobe and journal surfaces (scoring, pitting, rusting, etc.)	
	2. Against specs	
	a) Cam lift ($D_1 - D_2$) 	Using a micrometer caliper, measure "D_1" (height) and "D_2" (diameter) and compute difference between the two to determine cam lift.
	b) End play	Use a feeler gauge or a dial indicator. For procedure, refer to SERVICE MANUAL for each engine.
	c) Journals (wear)	Using a micrometer caliper, measure each journal in two directions, "A" and "B," and in two positions, "1" and "2."

What to check		How to check or Remarks
Bearings (main and connecting rod) – continued		 b) Fit bearing (shells) in place by tightening cap bolts to specified torque, and measure bearing in two directions, "A" and "B," and in two positions, "1" and "2." ID is $ID = \frac{A + B}{2}$   **Method 2:** Use shim stock or Plastigage. a) With shim stock Remove bearing cap; put a piece of shim stock of the right size and thickness; coat shim stock lightly with oil; reinstall cap by tightening cap bolts to specified torque. Under this condition, note the ease with which crankshaft can be turned. 

Inspection points

What to check	How to check or Remarks
1. Adjustment of the carburetor on the engine	
Idling speed (example)	1) Run engine to warm it up throughly. 2) Turn mixture adjusting screw (on carburetor) back by specified rotations from full-close position. 3) Bring idling speed to specified rpm by means of speed adjusting screw (on carburetor). 4) Tighten mixture adjusting screw gradually and, when engine speed begins to fall, hold the screw right there. 5) Increase engine speed to specified rpm two or three times, and set idling speed to specified rpm by means of speed adjusting screw. 
2. Adjustment of the air governor on the carburetor	
a) High speed (reference)	1) Place all hydraulic control levers in neutral. 2) Depress accelerator pedal all the way, making sure that throttle valve in carburetor moves into full-open position. 3) Turn bushing nut (on air governor) in either direction to set engine speed to specified rpm. Turning the nut clockwise will increase spring load to raise engine speed. Turning the nut counterclockwise will decrease spring load to lower engine speed.  Note: Hold adjusting screw steady when turning bushing nut.
b) Hunting (example)	1) Place all hydraulic control levers in neutral. 2) Depress accelerator pedal all the way, making sure that throttle valve in carburetor moves into full-open position.

DIMENSIONS



206428

INSPECTION AND ADJUSTMENT

Fan Belt Inspection

(1) Make sure the belt is free from oil, grease or other foreign matter. Replace the belt if necessary. A slightly dirty belt can be reused by cleaning with cloth or paper. Do not clean the belt with gasoline or the like.

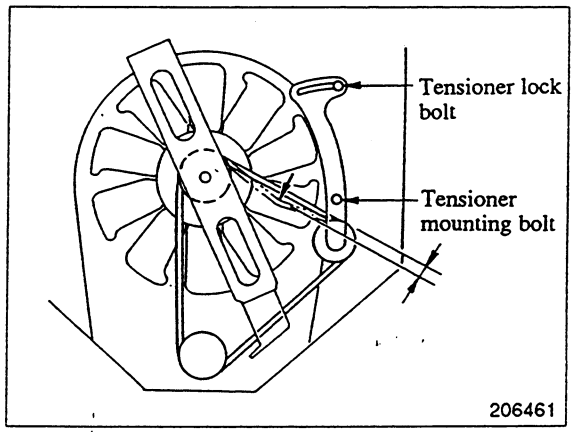
(2) At the time of overhauling the engine or adjusting the belt tension, check the belt and replace it if defective.

Fan Belt Adjustment

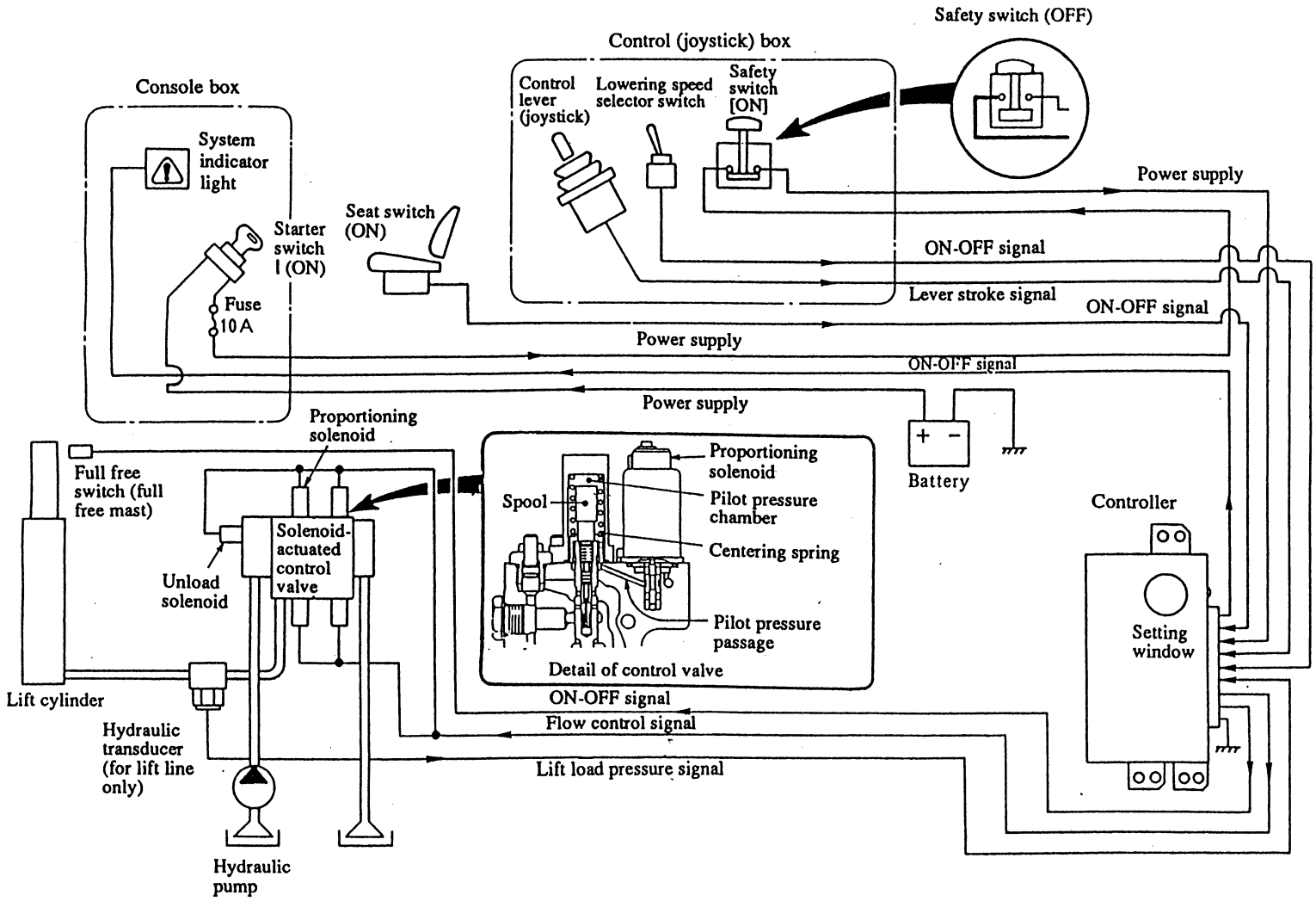
(1) Loosen the tensioner lock bolt and mounting bolt.

(2) Adjust the belt so that its deflection is 16 mm [0.6 in.] when the belt is pushed downward with 98 N (10 kgf) [22 lbf] force exerted midway between the fan pulley and tensioner pulley.

(3) Tighten the tensioner lock bolt and mounting bolt.



Finger-control system schematic

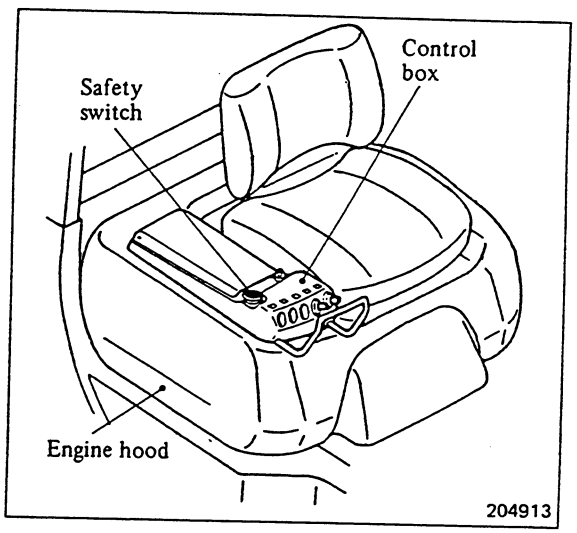


Suggestions

1. When removing battery 2, be sure to disconnect the cable from the negative (-) terminal of the battery first.

2. Engine hood and seat

Before removing the engine hood, remove the connectors (6 P) from inside the hood at two places. Be careful not to damage the control box and its component parts attached to the hood.



NOTE

On a truck with a 5-plunger control valve, one of the connectors is 12 P and a 3 P terminal (option) has been added.

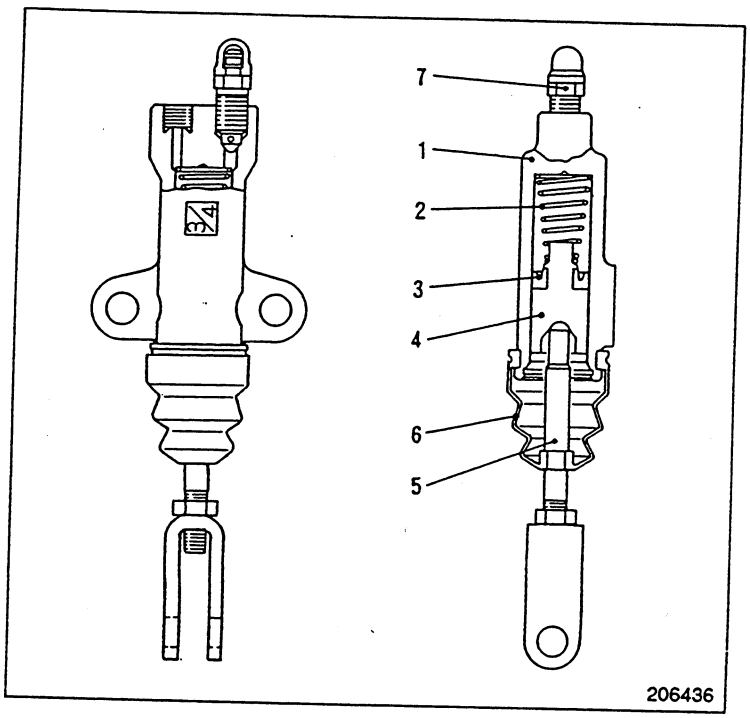
3. Remove front cover 7 together with the accelerator pedal. For this removal, disconnect the pedal from the link rod.

4. Disconnect exhaust pipe 9 at the engine side.

5. Before disconnecting fuel hose 10, close the fuel shutoff valve.

Clutch Release Cylinder

1 Body
2 Spring
3 Piston cup
4 Piston
5 Release rod
6 Boot
7 Bleeder valve



REMOVAL AND INSTALLATION

Suggestions

The input shaft of the manual transmission is 2-piece type, whether the clutch may be dry or wet type. This feature makes it possible to remove and install the clutch disc, release bearing, etc. without dismounting the engine & transmission assembly from the truck.

For removal of the fork and clutch shaft, however, it is necessary to dismount the assembly (because there is no space for removal of the clutch shaft if the assembly is on the truck).

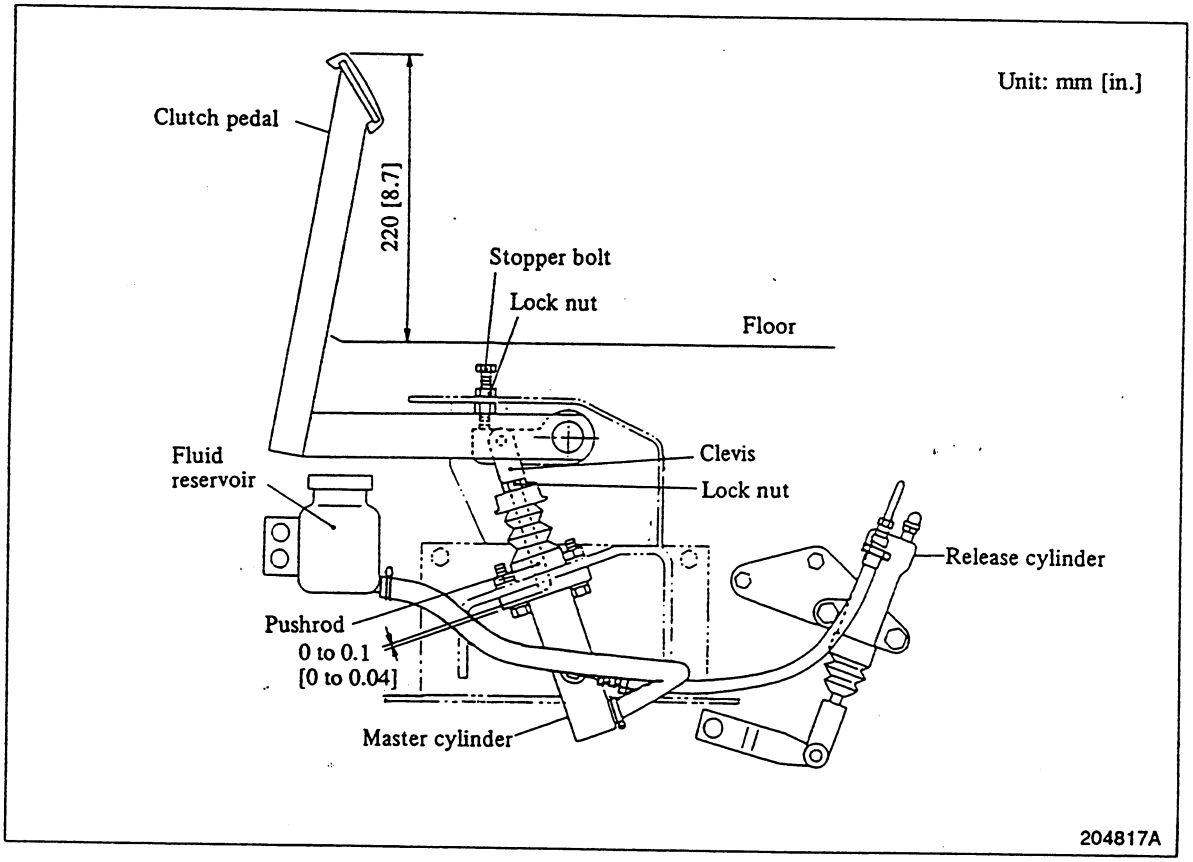
(5) When the bleeding operation is completed, make sure the fluid level in the reservoir is correct. Add fluid if necessary.

(6) Be sure to allow the pedal to return slowly when pumping it to prevent air from being sucked into the system on the pedal return strokes.

(7) Do not release the pedal before closing the bleeder valve.

(8) Do not attempt to reuse the fluid in the glass jar. It is likely to be contaminated or dirty.

Clutch Pedal Adjustment (for Dry-Type Clutch)

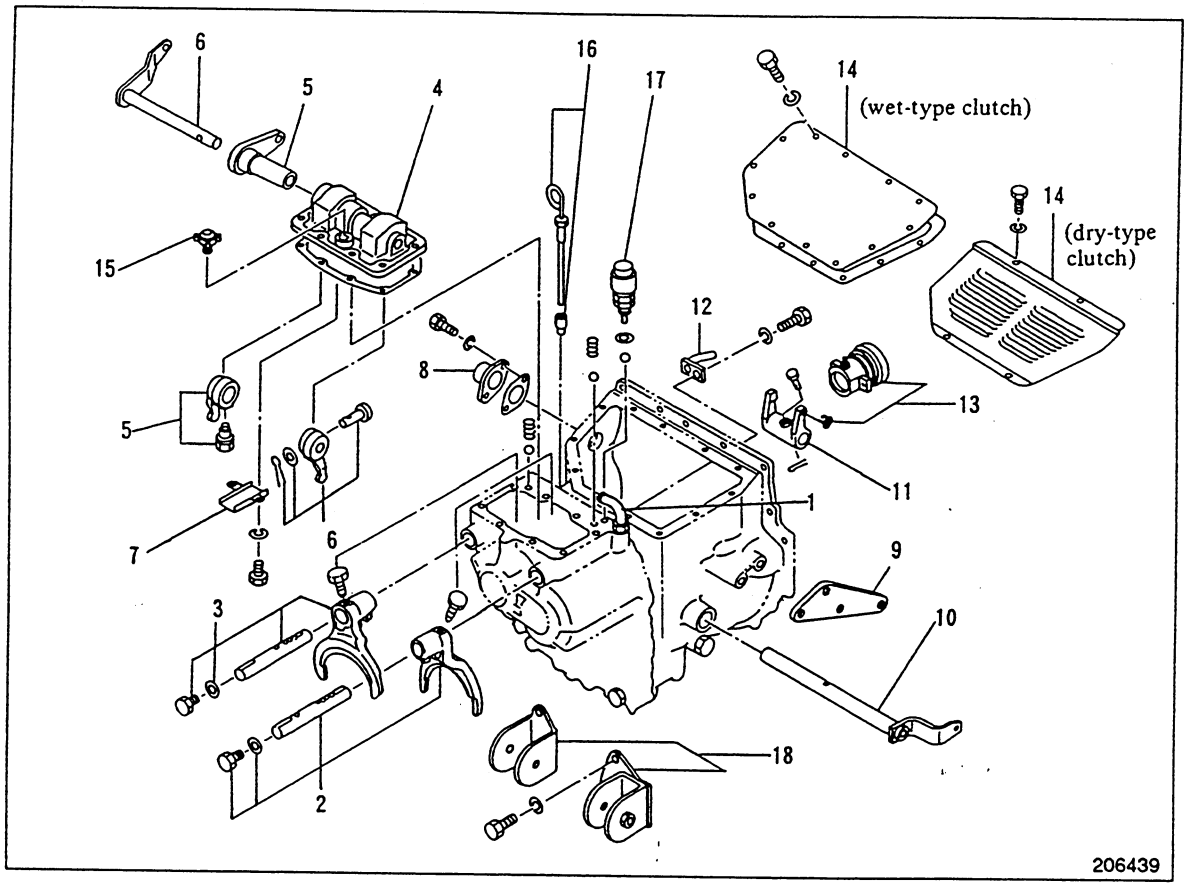


1. Bleed air out of the brake line from the reservoir through master cylinder to the release cylinder. (Bleed air at the bleeder valve on the clutch release cylinder.)
2. Screw the stopper bolt to set the clutch pedal height (from the floor to the top of pedal pad) to 220 mm [8.7 in.], and tighten the lock nut.
3. Loosen the lock nut securing the clevis at the top of pushrod.
4. Pull out the pin from the clevis of master cylinder pushrod, and loosen the lock nut. Adjust the length of the rod so that the clearance between the rod and master cylinder piston is 0 to 1 mm [0.04 in.], and tighten the lock nut.
5. Depress the clutch pedal by fingers until a resistance is encountered, and check to make sure the free play is correct.

Unit: mm (in.)

Free play of clutch pedal	A	1 to 10 [0.04 to 0.39]

Shift forks, shift rails and control cover



Sequence

1 Oil pipe (wet-type clutch only)
2 Shift fork, shift rail (F-R), set bolt, plug [steel ball, spring]
3 Shift fork, shift rail (H-L), set bolt, plug [steel ball, srping]
4 Control cover [oil seal, sealing cap, gasket]
5 Fork lever, control lever (H-L) [bushing, oil seal]
6 Fork lever, control lever (F-R), pin, washer, split pin
7 Oil stay
8 Oil pipe, gasket (wet-type clutch only)
9 Release cylinder bracket
10 Clutch shifter shaft
11 Shifter fork
12 Pipe (wet-type clutch only)
13 Shifter and thrust bearing, spring
14 Cover
15 Air breather
16 Oil level gauge, pipe
17 Backup lamp switch
18 Mount bracket

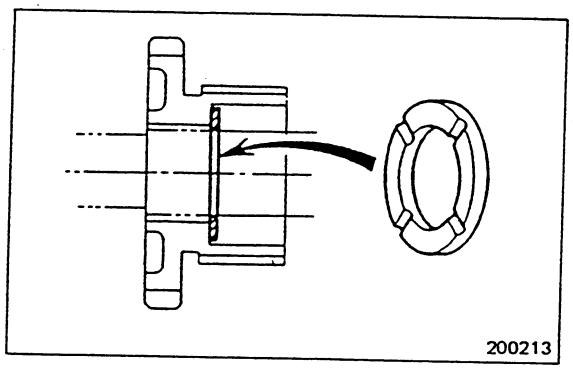
Suggestions

Control cover installation

Install parts 1 thru 7 to control cover 4, and install the cover to the transmission housing.

4. Installing FORWARD gear and REVERSE gear

Make sure that the oil groove side of thrust washer faces the gear when installed.

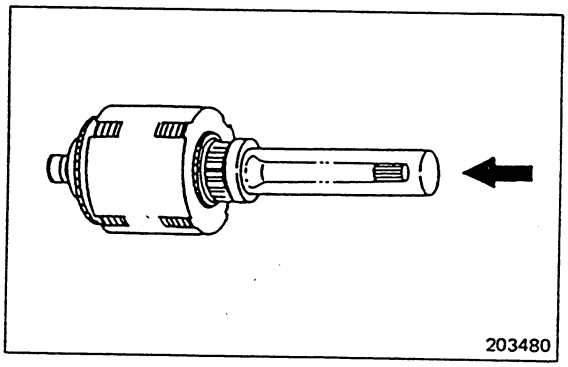


5. Installing bearing

To install the ball bearing to the input shaft, use installer (special tool).

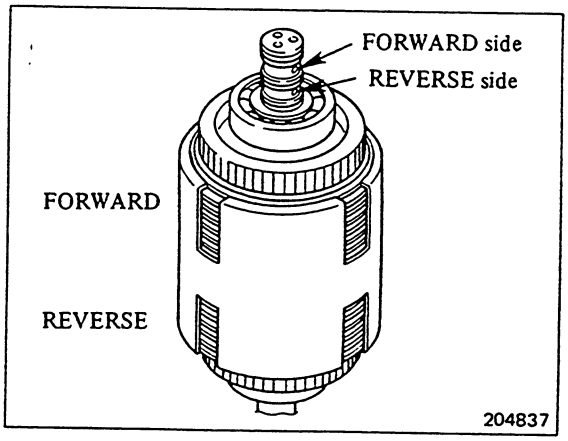
Special tool needed

Installer	91268-04100



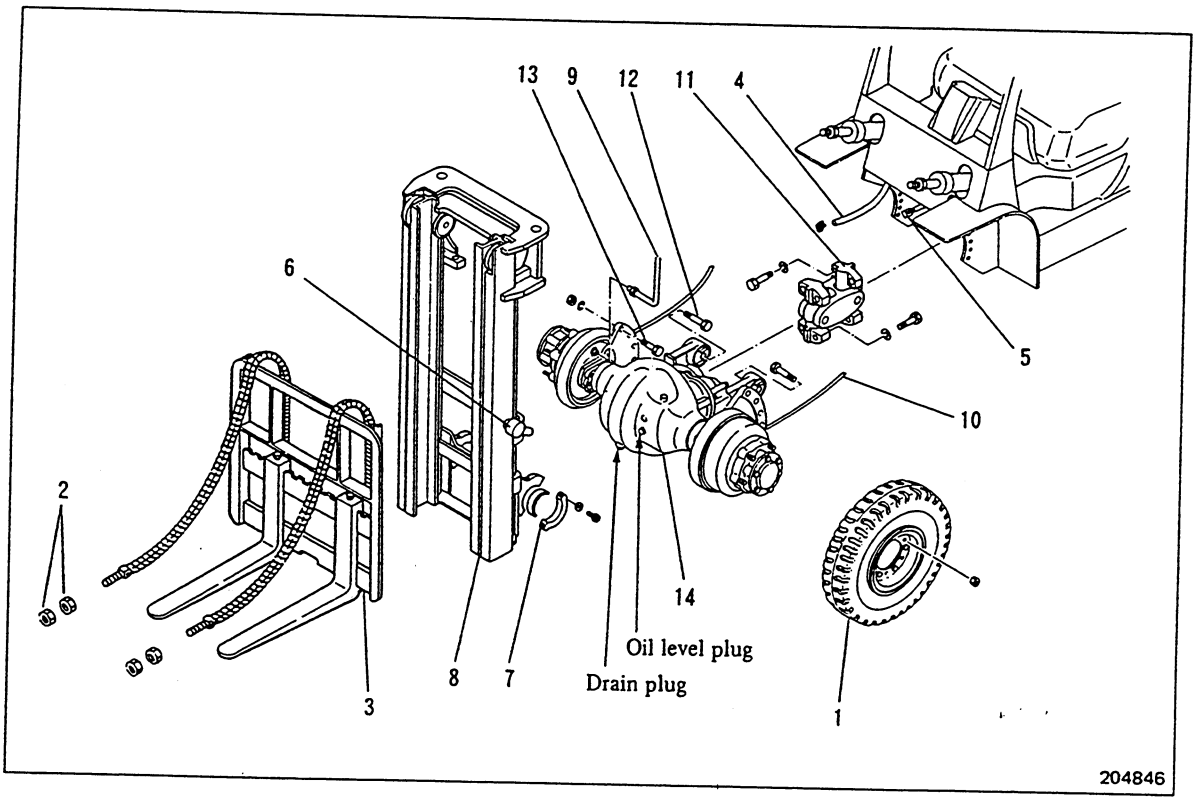
6. Testing clutch piston

After reassembling the input shaft, apply pressure air to the clutch piston through oil hole on the FORWARD gear side to make sure that the piston works properly.



Front Axle and Reduction Differential

Removal



Sequence

1 Front wheel
2 Nuts
3 Forks, lift bracket
4 Return hose for lift cylinder
5 High-pressure hose for lift cylinder
6 Tilt cylinder socket
7 Mast support bearing cap
8 Mast
9 Brake pipe
10 Parking brake cable
11 Universal joint
12 Bolt, nut
13 Bolt, nut
14 Front axle and reduction differential

NOTE

1) For removal of front wheel 1, refer to Removal, Front Wheels.

2) For removal of mast parts 2 thru 8, refer to MAST AND FORKS.

3) Before removing the front axle and reduction differential, drain differential oil by removing the front axle drain plug.

ADJUSTMENT

After the reduction gear and pinion have been replaced, adjust the tooth contact as follows:

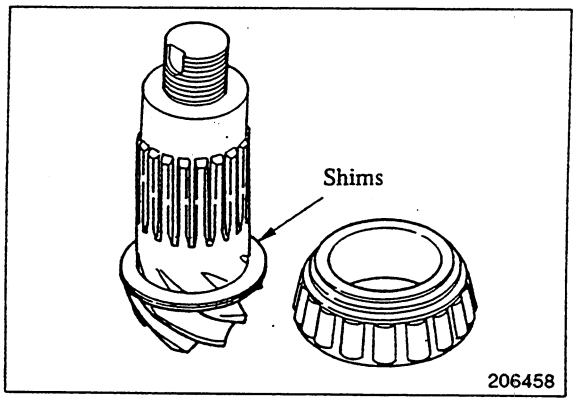
(1) Determine the required amount of shim thickness S on the basis of machining error inscribed on the end face of the pinion. It is given by this formula:

S = standard value – {machining error}

[Example]

Where the error is –0.10 mm [–0.004 in.], we find the total shim thickness to be 1.9 mm [0.075 in.]:

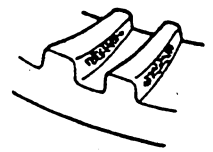
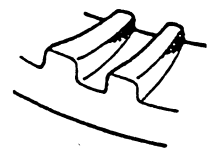
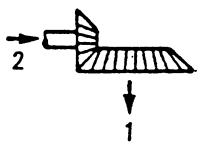
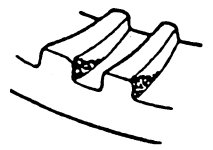
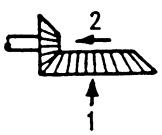
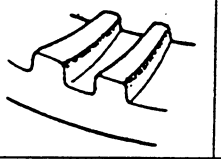
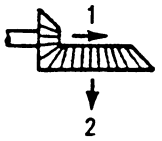
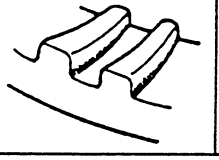
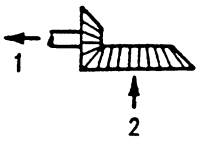
1.8 mm [0.071 in.] – {–0.1 mm [–0.004 in.]} =
1.8 mm [0.071 in.] + 0.1 mm [0.004 in.] =
1.9 mm [0.075 in.]



(2) Put the shims and install the reduction gear and pinion.

(3) Adjust the tooth contact as shown below.

Tooth Contact Patterns and Adjustment

	Tooth contact		Adjustment	
1		Extends from toe to middle portion, covering not less than 50% of tooth length.	Correct tooth contact	
2		Short contact at toe of tooth		(1) Move gear away from pinion. (2) Move pinion toward gear by increasing shim thickness to secure correct backlash.
3		Short contact at heel of tooth		(1) Move gear toward pinion. (2) Move pinion away from gear by decreasing shim thickness to secure correct backlash.
4		Heavy contact on face or upper portion of tooth		(1) Move pinion toward gear by increasing shim thickness. (2) Move gear away from pinion to secure correct backlash.
5		Heavy contact on flank or lower portion of tooth		(1) Move pinion away from gear by decreasing shim thickness. (2) Move gear toward pinion to secure correct backlash.

Remarks: Repeat the above adjustment until the correct tooth contact is obtained.

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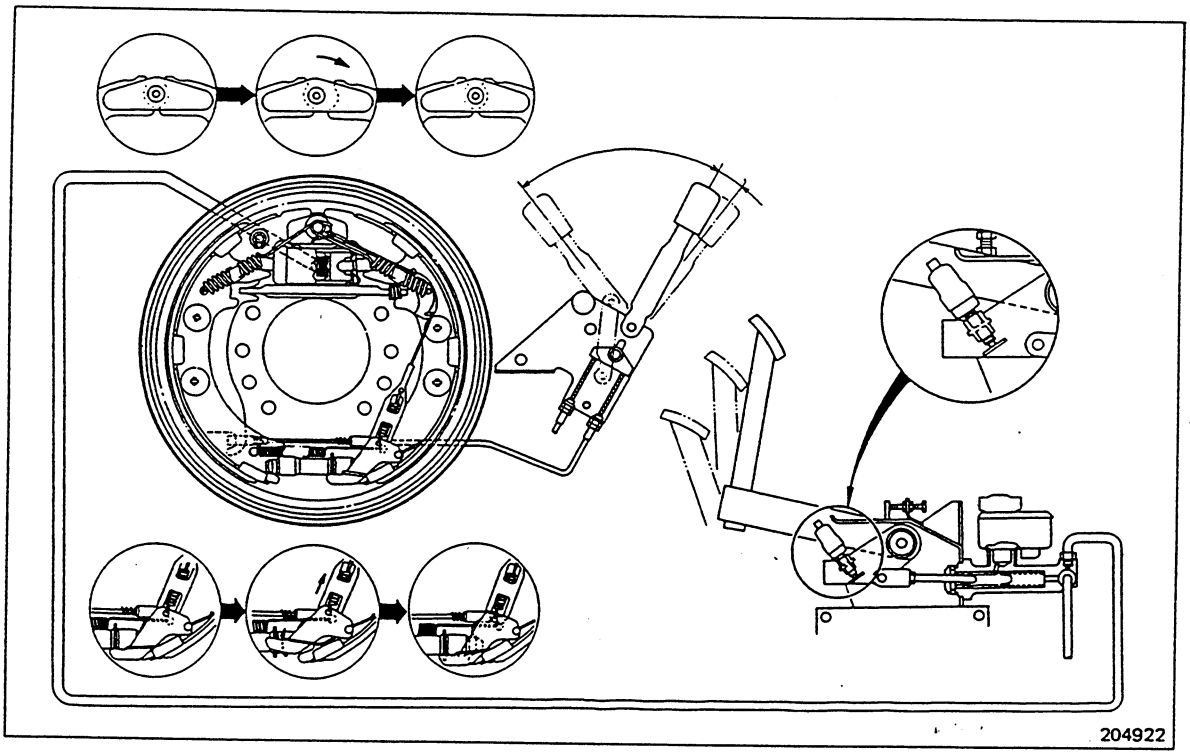
DESCRIPTION

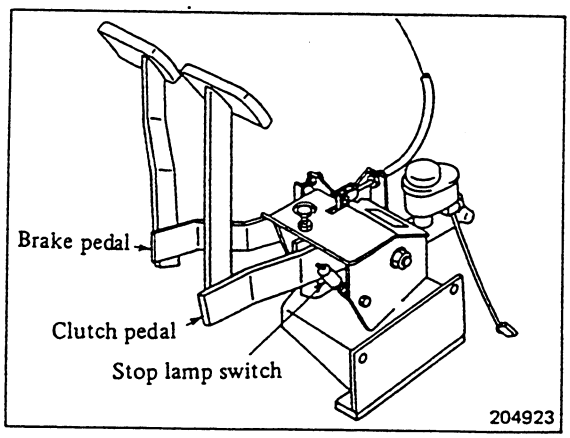
Automatic Adjusting Device

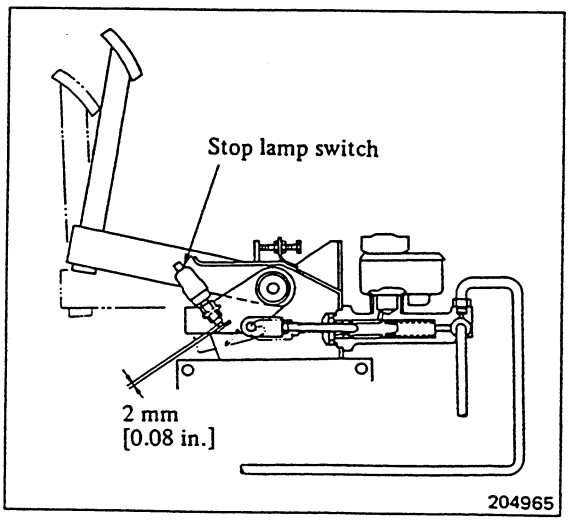


This device adjusts the drum-to-lining clearance automatically. As the clearance increases due to lining wear, the lever mechanism of this device turns the adjusting screw by one notch or tooth to reposition the shoes closer to the drum. This much turning at a time corresponds to 1/24 of one rotation or 15°. In the course of usage, the adjusting process repeats itself at long intervals.

Brake Pedal and Associated Parts

This clutch pedal is the one used in the Direct-Drive machine.





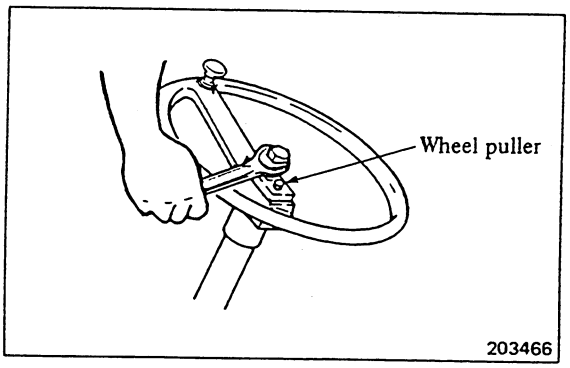
Suggestions

1. Steering wheel removal

Use a special tool.

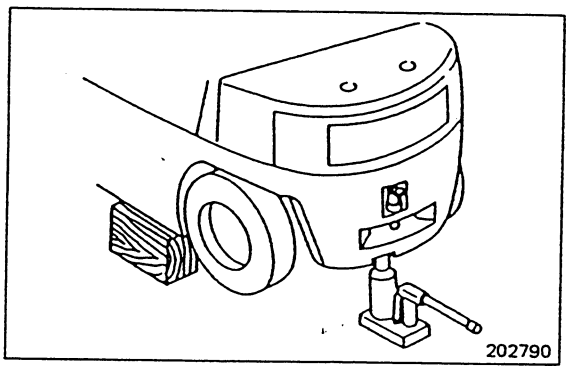
Special tool needed

Wheel puller	91268-10600



2. Power cylinder removal

Raise the rear end by jacking, and block it in raised condition. Work under the truck to disconnect the power cylinder and take it down by lowering it.



Inspection after removal

Check the drag link for distortion, cracks and damaged thread. Check the rod end for rattling. Check the dust seal for damage.

(4) Give a thin coat of grease to the lip of each oil seal and to the seals just before fitting them.

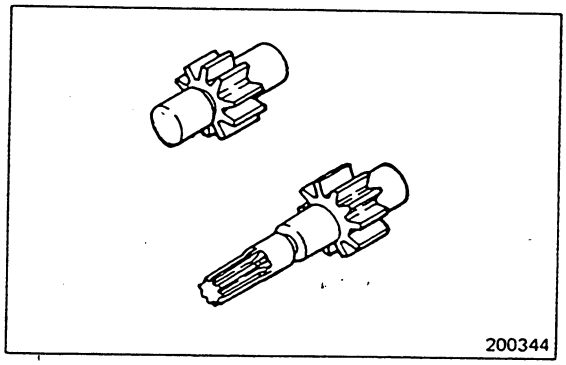
(5) Tightening torque for the cover securing bolts is specified. Tighten those bolts to the specification.

(6) The fit of the pump gears in the reassembled pump may be deemed satisfactory if the pump shaft rotates smoothly and lightly when turned over by hand with an adjustable wrench.

Inspection after disassembly

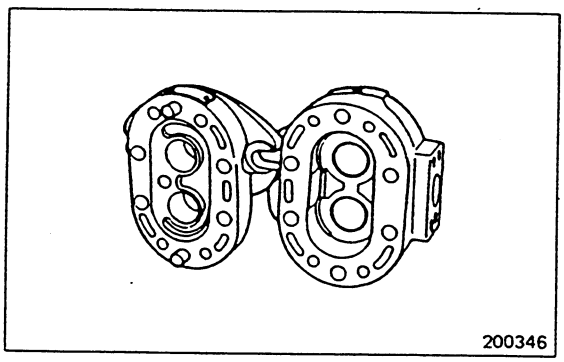
1. Drive and driven gears

Inspect the gear teeth for wear and damage. Similarly inspect the journals and splines.



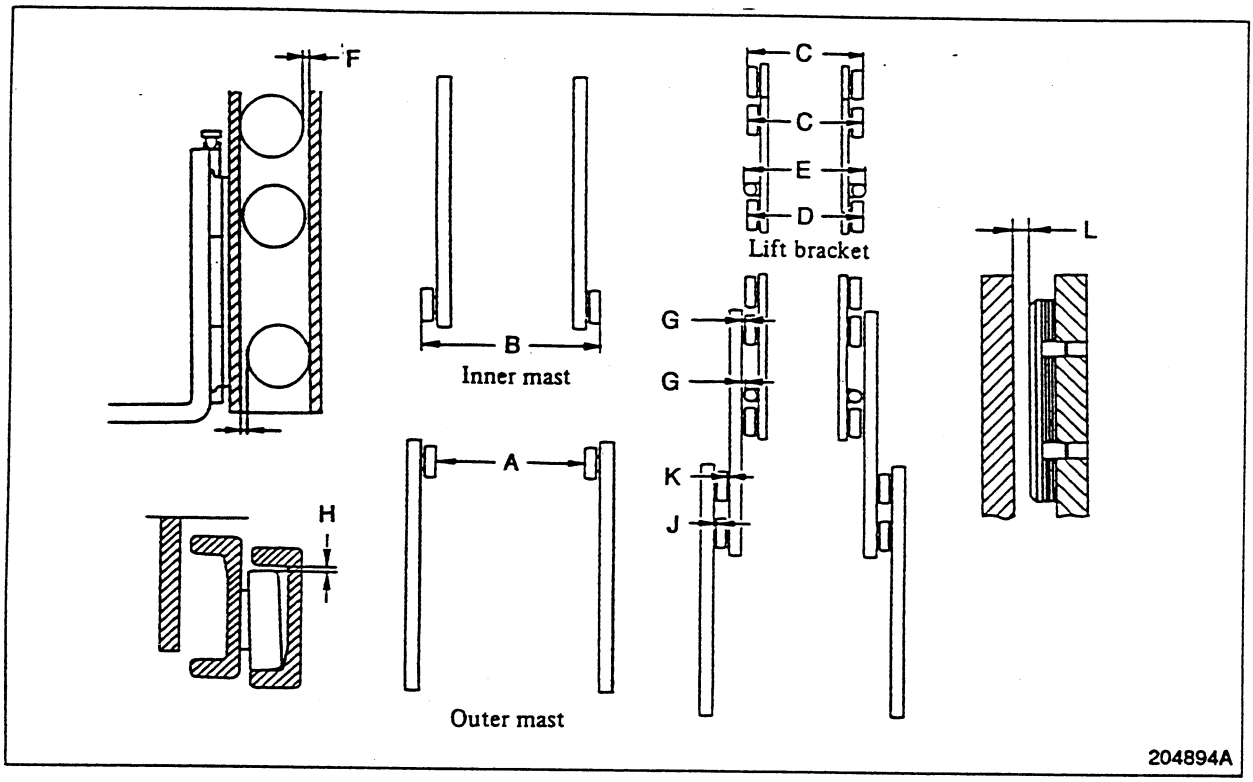
2. Pump covers, body and bushings

Inspect these parts for wear and damage.



MASTS AND FORKS

Mast Adjustment Chart



Unit: mm [in.]

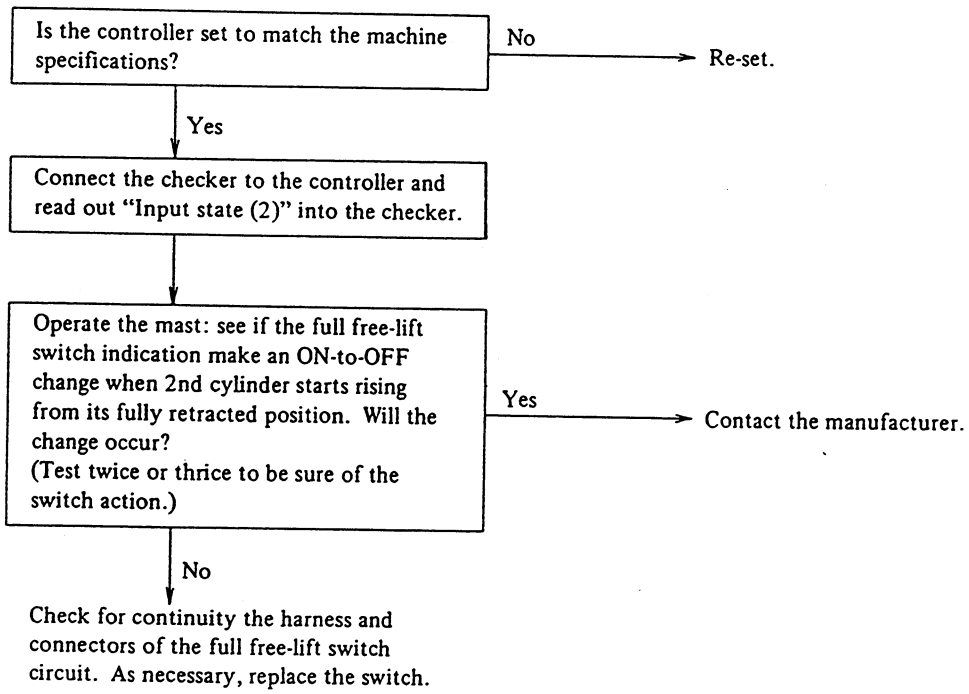
	FG(D)15 thru 18	FG(D)20 thru 35A
Distance between outer mast main rollers (inside to inside) A	511 [20.12]	559 [22.01]
Distance between inner mast main rollers (outside to outside) B	581 [22.87]	639 [25.16]
Distance between lift bracket main rollers (outside to outside) C, D	477 [18.78]	523 [20.59]
Distance between lift bracket side rollers (outside to outside) E	482 [18.98]	528 [20.79]
Longitudinal clearance of lift bracket main rollers (with forks slightly lifted) F	0.1 to 1.0 [0.004 to 0.039]	
Lateral clearance of lift bracket main rollers (fully raised) G	0.1 to 0.5 [0.004 to 0.020]	
Longitudinal clearance of mast main rollers (in the whole lift range) H	0.1 to 1.0 [0.004 to 0.039]	
Lateral clearance of inner mast main rollers (fully raised) J	0.1 to 0.5 [0.004 to 0.020]	
Lateral clearance of outer mast main rollers (fully raised) K	0.1 to 0.5 [0.004 to 0.020]	
Mast strip clearance (fully raised) L	0.1 to 0.5 [0.004 to 0.020]	

STEERING SYSTEM

Complaint	Possible cause	
Hard steering	If hydraulic pump is out of order	Hydraulic pump badly worn or seized
	If flow divider is out of order	a) No steering flow, because of: Clogged orifice in spool Weakened spool spring b) Relief valve out of order, because of: Reduced relief pressure Damaged valve seat Weakened spring c) Oil pressure leaking through relief valve due to broken O-ring on valve body
	If steering gear is defective	a) No pressure rise, because of: Loose check valve Loose lock nut b) Bearings defective c) Erratic movement of valve spool d) Spring retainer defective e) Ball screw assembly defective f) Sector shaft adjusting screw too tight g) Gears meshing improperly
	Pipe or tube flattened, or restriction in oil line	
Poor steering reaction	If steering gear is defective	a) Bearings defective b) Erratic movement of valve spool defective c) Spring retainer defective d) Ball screw assembly defective e) Gears meshing improperly
	Pipe or tube flattened, or restriction in oil line	
Truck wanders	If steering gear is defective	a) Steering lock nut loose b) Spring weakened c) Improper backlash
	Pipe or tube flattened, or restriction in oil line	
Vibration or noise	a) Steering wheel lock nut loose b) Air entrapped in oil line c) Power cylinder and socket end loose in installation	
Excessive steering wheel play	a) Backlash between ball screw and sector shaft out of adjustment b) Sector shaft loose in installation c) Drag link ball stud loose in socket d) Power cylinder securing bolts loose e) Air extrapped	

(d) Case 6 : During the lowering action of a full free-lift mast, 1st and 2nd lift cylinders differ in actuating speed.

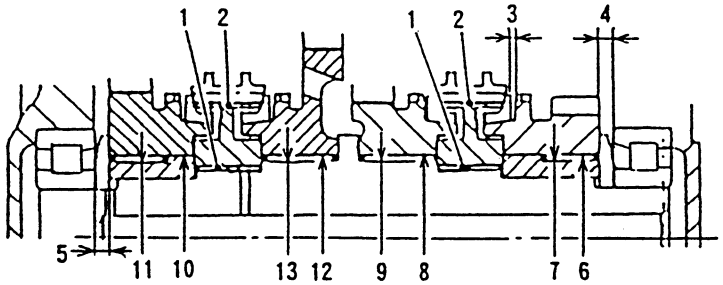
Troubleshooting procedure



Manual transmission – continued

A-Assembly standard B-Repair or service limit
Unit: mm [in.]

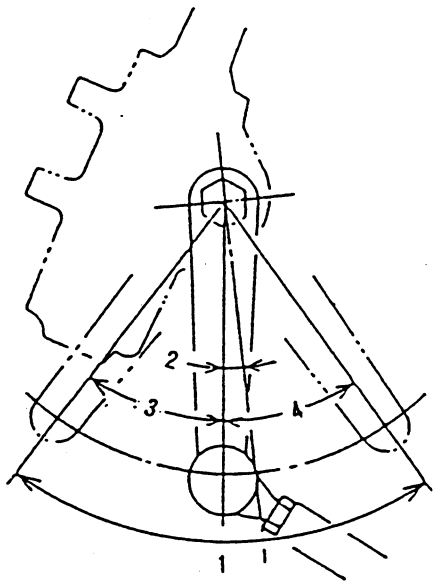
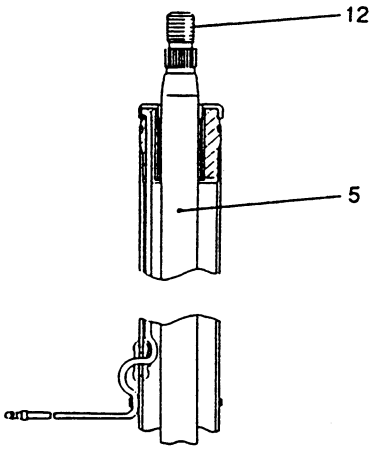
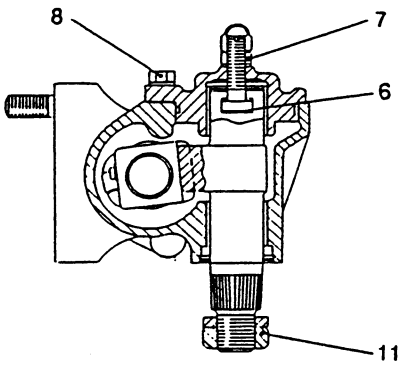
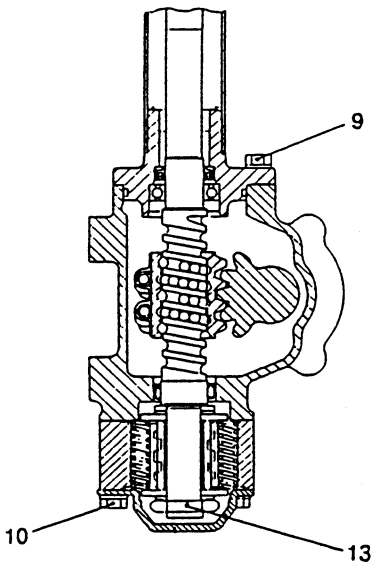
Item		Truck model	FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Main shaft	Axial clearance between synchronizer ring and gear 3	A	1.15 to 2.25 [0.045 to 0.089]		
		B	0.2 [0.008]		
	Thickness of thrust washer 4 (clutch side)	A	$5^{0}_{-0.1}$ [$0.20^{0}_{-0.0039}$]		
		B	4.8 [0.189]		
	Thickness of thrust washer 5 (clutch side)	A	$5^{0}_{-0.1}$ [$0.20^{0}_{-0.0039}$]		
		B	4.8 [0.189]		
	Inside diameter of F gear 6	A	$60^{+0.029}_{+0.010}$ [$2.36^{+0.00114}_{+0.00039}$]		
	Outside diameter of F gear sleeve 7	A	$55^{-0.010}_{-0.023}$ [$2.17^{-0.00039}_{-0.00091}$]		
	Inside diameter of R gear 8	A	$60^{+0.029}_{+0.010}$ [$2.36^{+0.00114}_{+0.00039}$]		
	Outside diameter of surface of shaft for R gear 9	A	$55^{-0.010}_{-0.023}$ [$2.17^{-0.00039}_{-0.00091}$]		
	Inside diameter of H gear 10	A	$60^{+0.029}_{+0.010}$ [$2.36^{+0.00114}_{+0.00039}$]		
	Outside diameter of H gear sleeve 11	A	$55^{-0.010}_{-0.023}$ [$2.17^{-0.00039}_{-0.00091}$]		
	Inside diameter of L gear 12	A	$60^{+0.029}_{+0.010}$ [$2.36^{+0.00114}_{+0.00039}$]		
	Outside diameter of L gear 13	A	$55^{-0.010}_{-0.023}$ [$2.17^{-0.00039}_{-0.00091}$]		



206478

A-Assembly standard B-Repair or service limit

Steering system — continued

Item \ Truck model	FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Steering gear			
			

206476

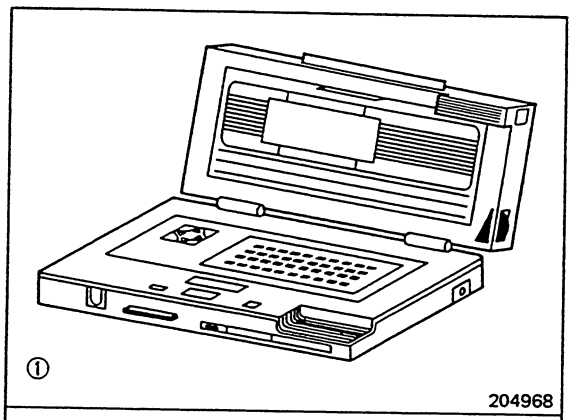
PERIODIC REPLACEMENT PARTS

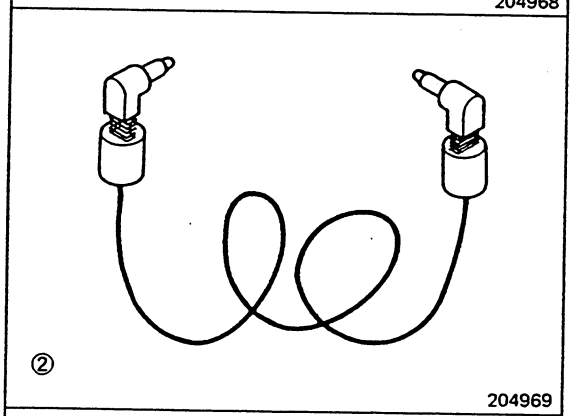
The parts listed below are important for the safe working of the truck, and are specially designated as the parts to be replaced at specified periods.

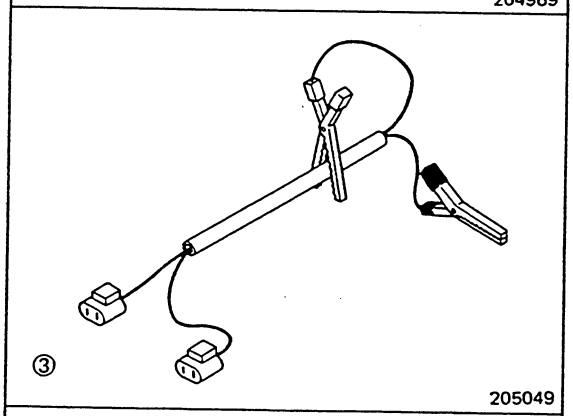
Each service shop is requested to adhere to the replacement schedule given here on all trucks brought into its care:

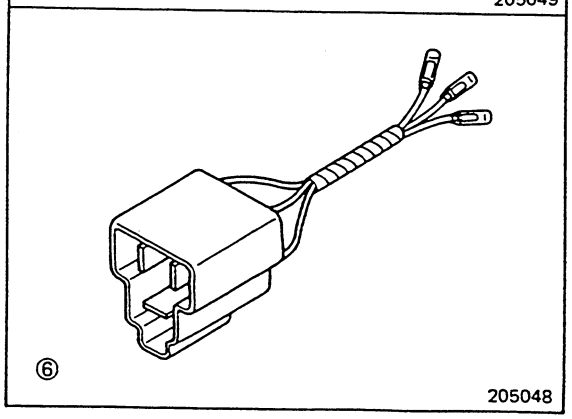
Periodic replacement parts		Service	Period				
			1 month after delivery	1 months	6 months	1 year	2 years
1	* Rubber parts for brake master cylinder	Replace				○	○
2	* Rubber parts for brake wheel cylinders	Replace				○	○
3	* Rubber parts and hoses for clutch master cylinder (manual transmission models)	Replace				○	○
4	* Rubber parts for clutch release cylinder (manual transmission models)	Replace				○	○
5	* Hydraulic hoses	Replace				○	○
6	* Hoses for power steering	Replace					○
7	* Rubber parts for power cylinder	Replace					○
8	* Fuel hoses	Replace					○
9	* Lift chains	Replace					○
10	Hydraulic tank return filter	Replace	○	○	○	○	○
11	Fuel filter element	Replace	○		○	○	○
12	Hydraulic tank return filter	Replace	○		○	○	○
13	Air cleaner element	Clean	○	○			
		Replace			○	○	○

Footnote: * indicates important safety-related parts.





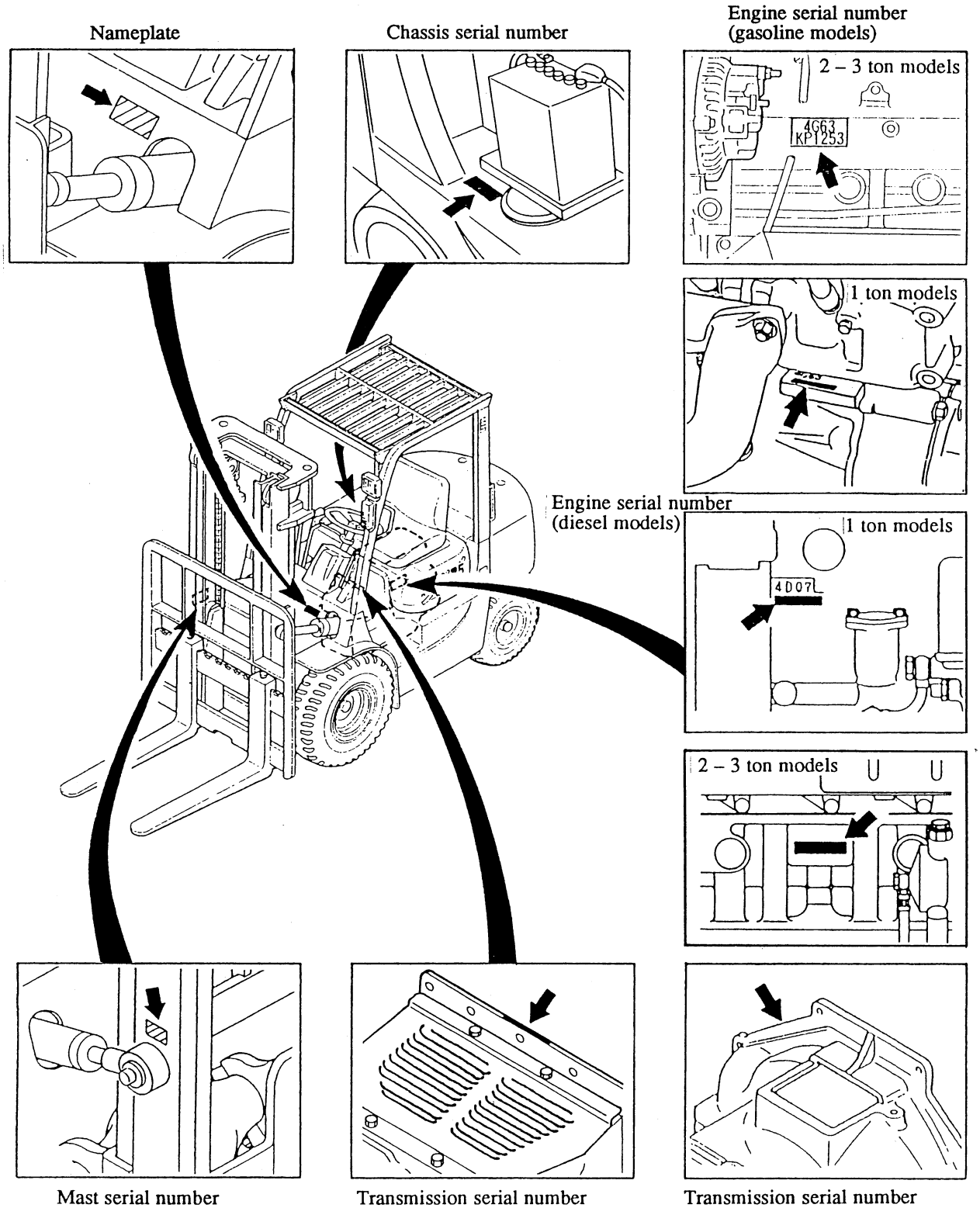




NOTE

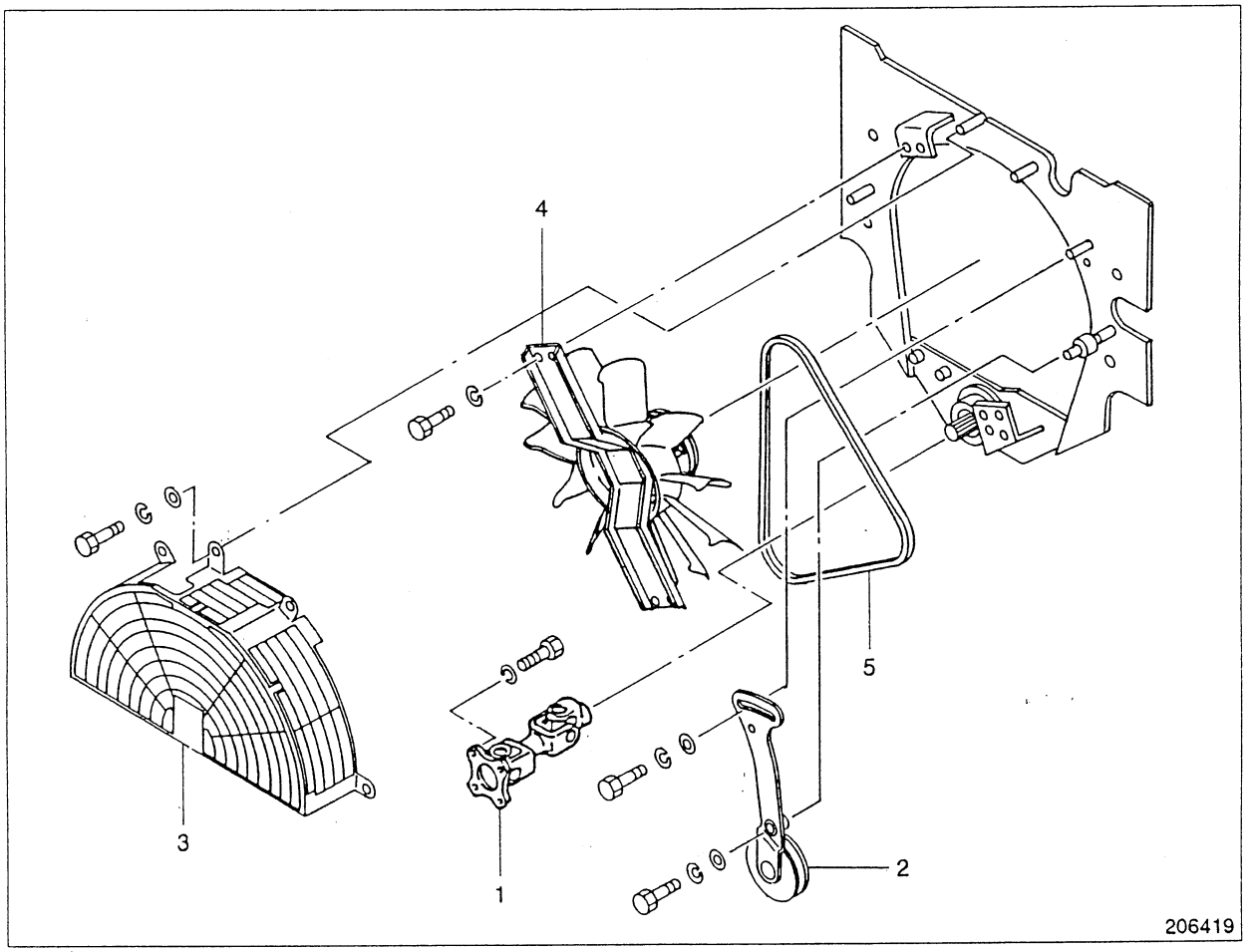
There are a total of 19 types of the test-use connectors (4) thru (22). They are supplied as a set or individually. The connector (6) is shown.

SERIAL NUMBER LOCATIONS



REMOVAL AND INSTALLATION

Fan Belt Removal



Sequence

1 Universal joint
2 Tensioner, tensioner pulley
3 Fan guard
4 Support, cooling fan
5 Fan belt

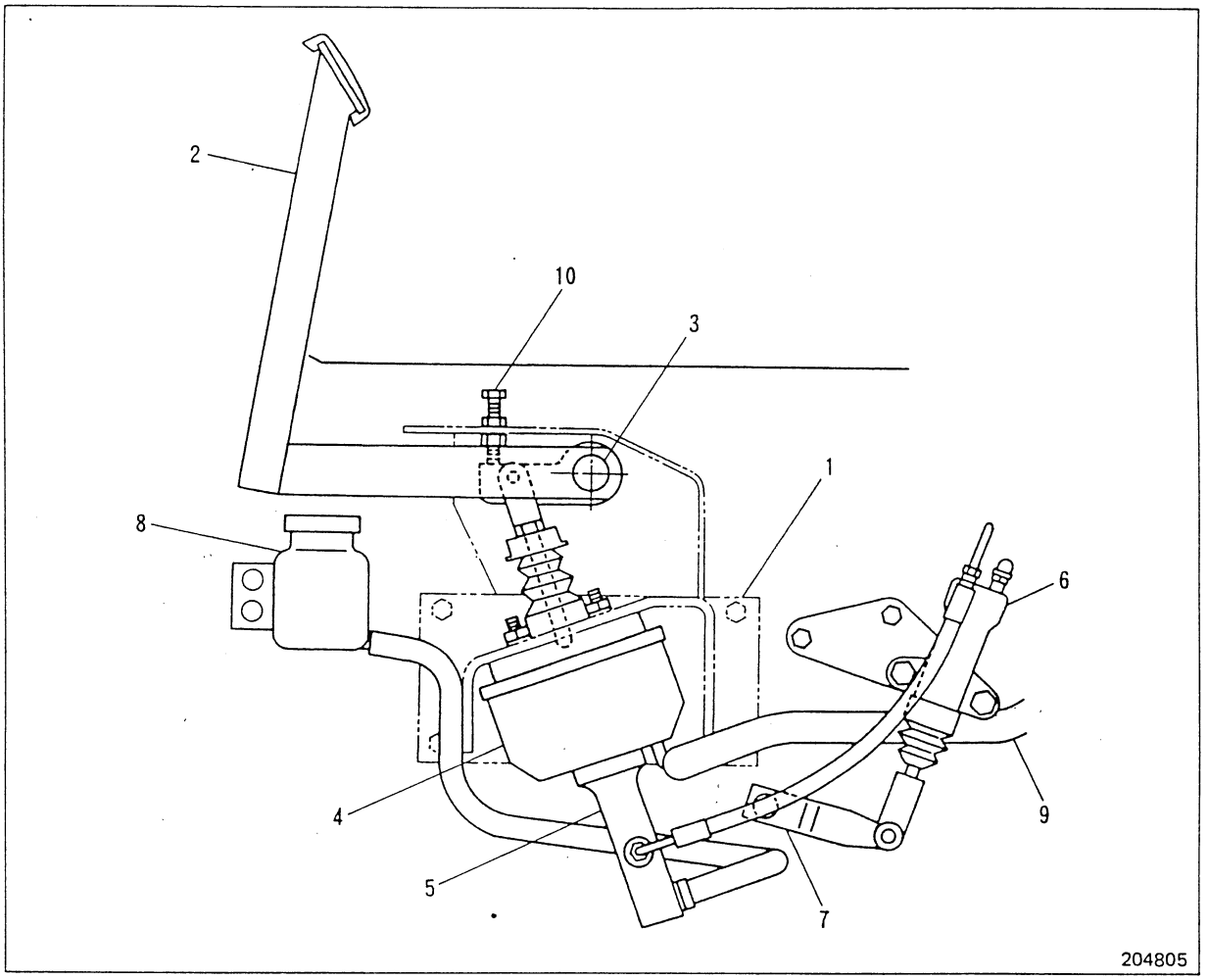
Start by:

remove the engine hood and gas-filled cylinder

Suggestions

Make sure the muffler is cool enough to touch with your hand.

Clutch Pedal (for Wet-Type Clutch)



1 Bracket
2 Clutch pedal
3 Clutch shaft
4 Clutch booster
5 Clutch master cylinder
6 Clutch release cylinder
7 Clutch shifter shaft
8 Fluid reservoir
9 To vacuum pump
10 Stopper bolt

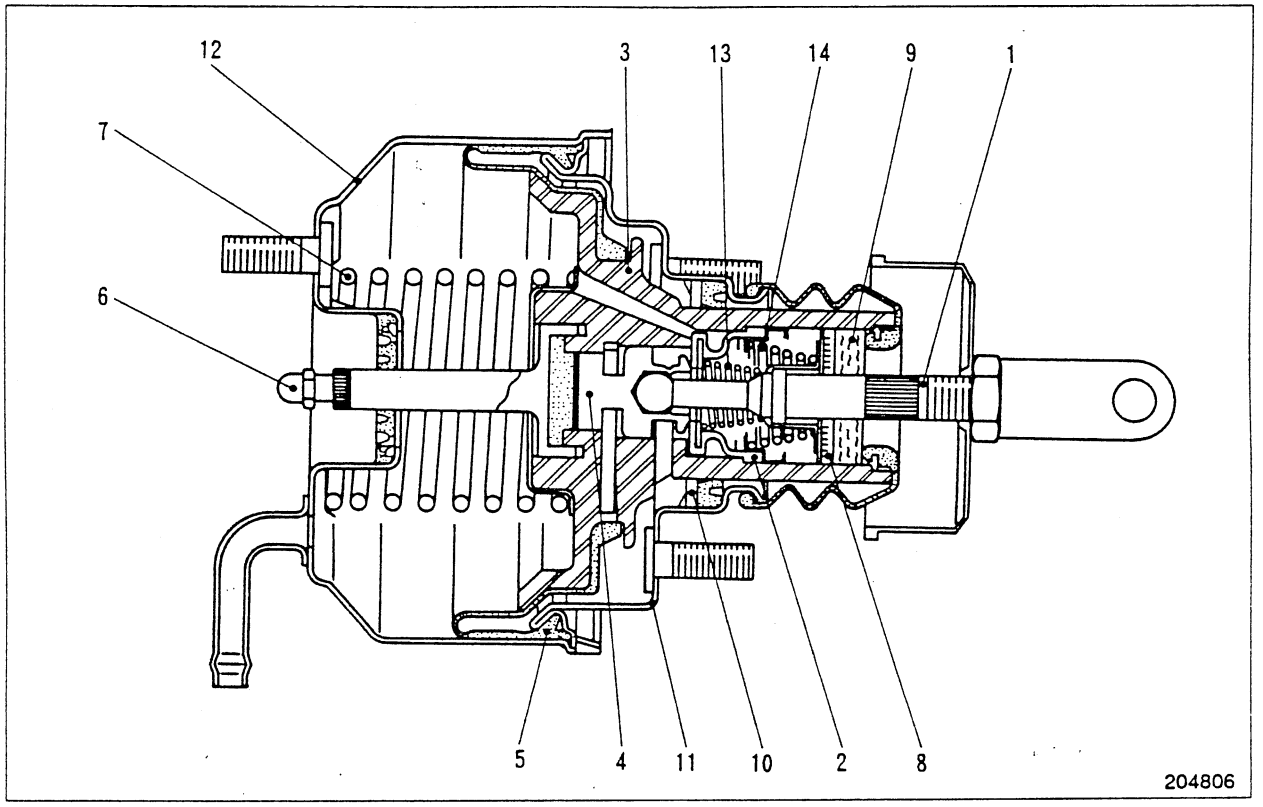
The power clutch used in the manual transmission models is a system of control linkage for the wet-type clutch.

The clutch release cylinder automatically compensates for changes in the position of the release levers due to wear of the clutch disc (fasings). Because of this feature, there is no need of adjusting the pedal if it is properly adjusted at the time of assembly.

NOTE

The dry-type clutch linkage is nearly identical with the wet-type clutch one, the only difference being the absence of clutch booster. In this linkage, the clutch pedal is directly connected to the master cylinder push rod.

Repair kit parts



1 Valve rod assembly
Consisting of (1) – (8)
(1) Poppet assembly
(2) Washer
(3) Retainer
(4) Rod
(5) Valve plunger
(6) Retainer
(7) Spring
(8) Spring
2 Diaphragm
3 Retainer
4 Filter
5 Silencer
6 Seal and retainer assembly
7 Bearing
8 Retainer
9 Plate and seal assembly
10 Retainer
11 Disc assembly
12 Guard

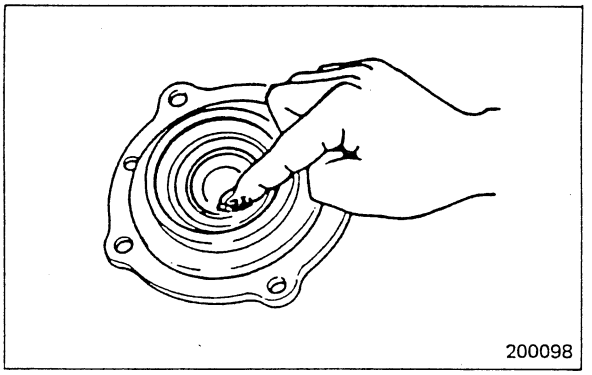
2. Shifter case oil seal installation

(1) Using an installer (special tool), install the oil seal to the shifter case.

Special tool needed

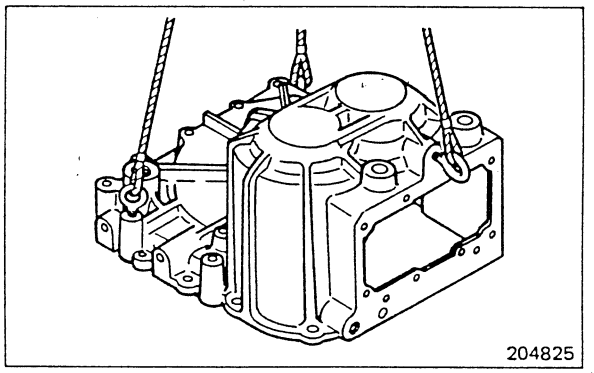
Installer	91268-05200

(2) Coat the oil seal lip with grease. Do not fill the void between the lips of the oil seal.



3. Transmission housing installation

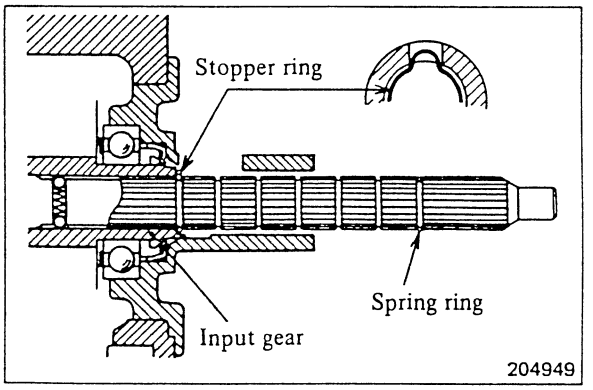
Fasten a hoist to the transmission housing. With the housing held in a horizontal position, install the housing to the clutch housing by aligning the 3rd shaft bearing with its bore in the clutch housing. Be sure to put the gasket on the mating flange.



4. Input shaft installation

(1) Coat the splines with molybdenum disulfide.

(2) Install the stopper ring to the input shaft, and insert the shaft into the housing until the stopper ring comes in contact with the input gear.

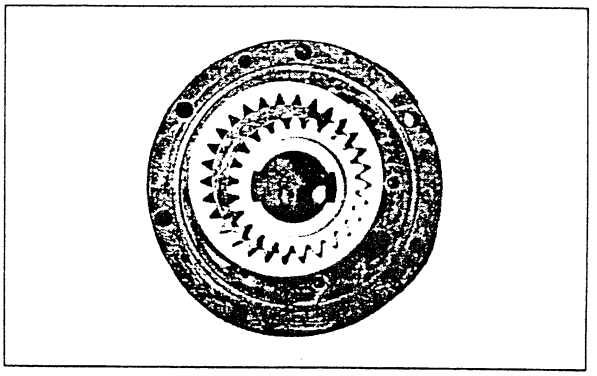


2. Installing pump

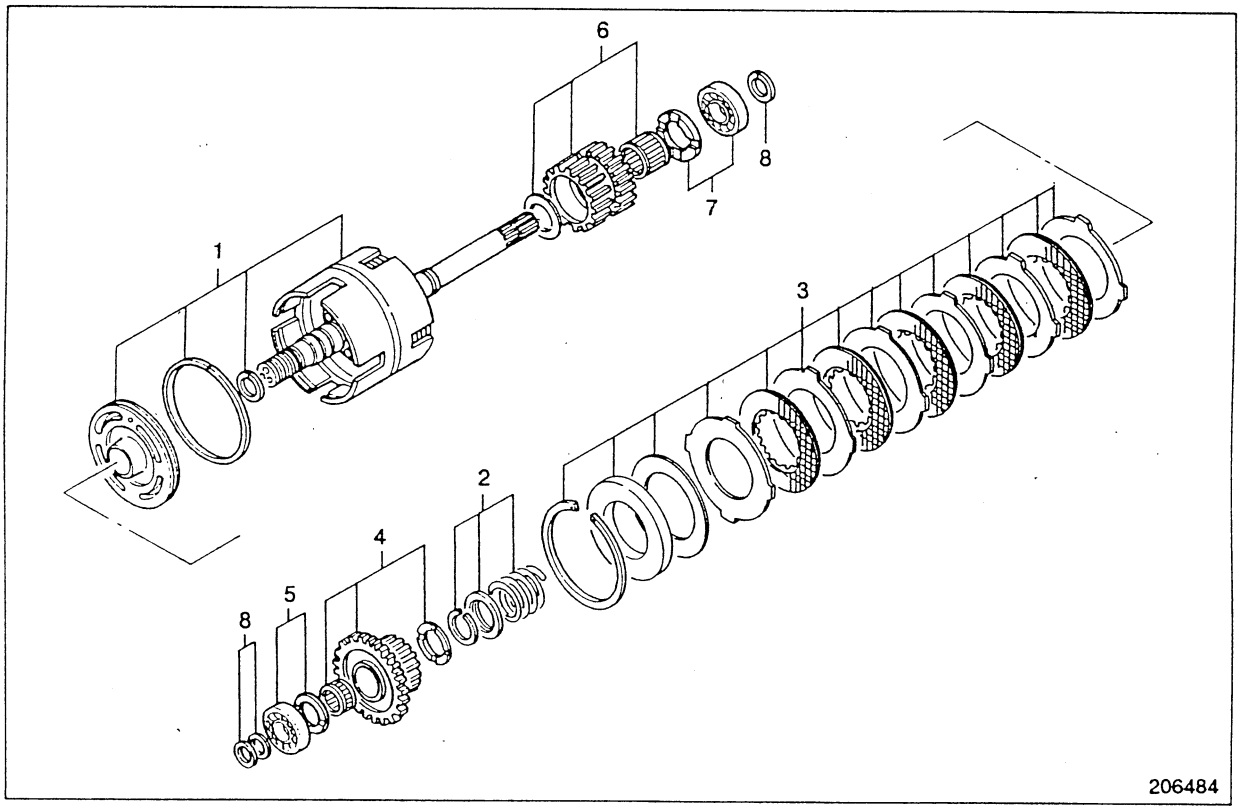
When installing the pump, coat the pump body interior, internal gear and drive gear with automatic transmission fluid.

3. Inspection after reassembly

Turn the drive gear by hand to make sure the pump gears rotate smoothly.



Input shaft assembly



Sequence

1 Input shaft, clutch piston, seal ring
2 Clutch spring, spring retainer, snap ring
3 Belleville spring, plates, friction plates, pressure plate, snap ring
4 Thrust washer, needle roller bearing, FORWARD gear
5 Thrust washer, ball bearing
6 Thrust washer, needle roller bearing, REVERSE gear
7 Thrust washer, ball bearing, seal ring
8 Seal ring

NOTE

Reassembly of the clutch spring and plates on the REVERSE gear side is the same as that on the FORWARD gear side.

REMOVAL AND INSTALLATION

Front Wheels

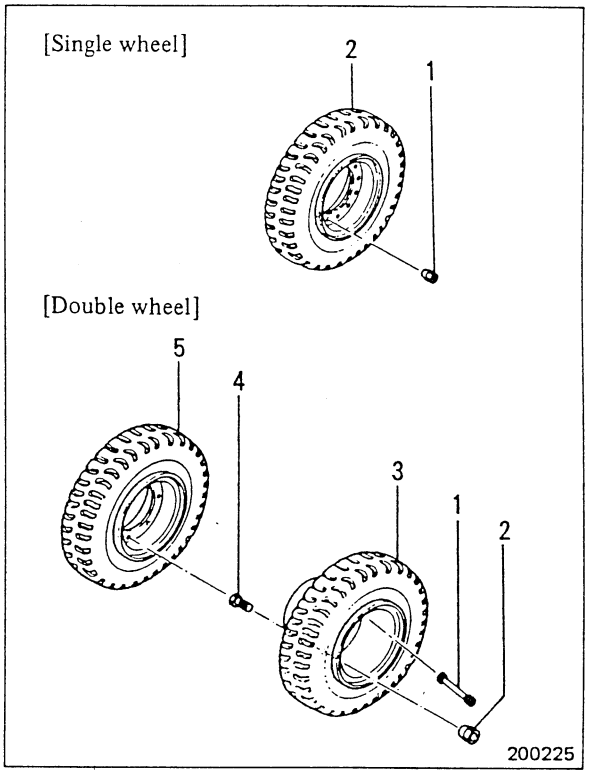
Removal

[Single wheels]

1 Wheel nuts
2 Front wheel

[Double wheels]

1 Extension valve
2 Outer wheel nuts
3 Front wheel (outer)
4 Inner wheel nuts
5 Front wheel (inner)

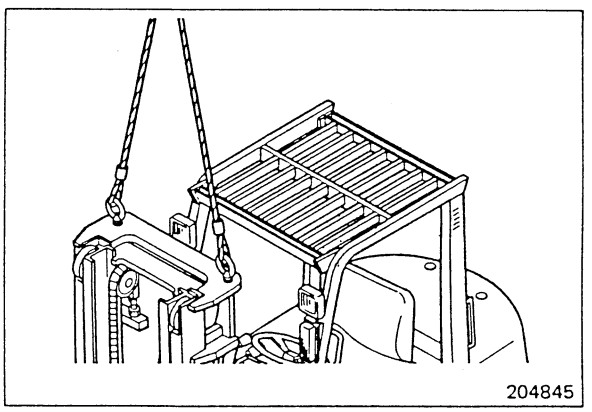


Suggestions

1. Block the rear wheels.
2. Pull the parking brake lever, and loosen the wheel nuts 1 to 2 turns.
3. Raise the front end of the truck by jacking or hoisting.

(1) Method using a hoist

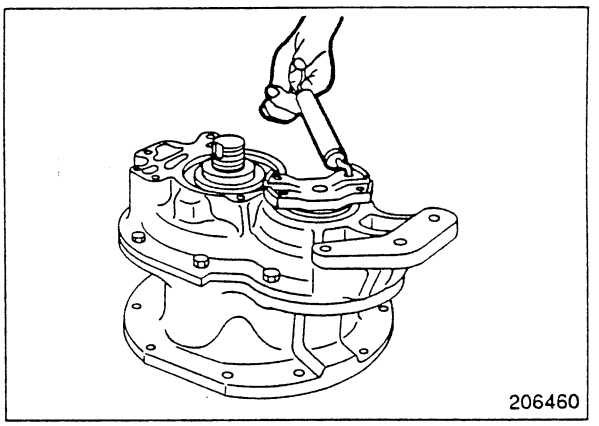
Attach a sling to the round holes in the top crossmember, and lift the front end with a hoist.



(2) Put the required amount of shims, and install plate 22.
The shims are available in five sizes, 0.05 mm [0.0020 in.], 0.1 mm [0.004 in.], 0.2 mm [0.008 in.], 0.5 mm [0.020 in.] and 1.0 mm [0.039 in.].

(3) Hook a spring balancer to the bolt hole of the input flange, and pull the balancer in the tangential direction to check the preload for the tapered roller bearing (the force when the flange starts rotating). Adjust the preload by adding or subtracting the shims.

Gear symbol	Force applied to input flange in tangential direction
A, B, C	34 to 49 N (3.5 to 5.0 kgf) [7.7 to 11 lbf]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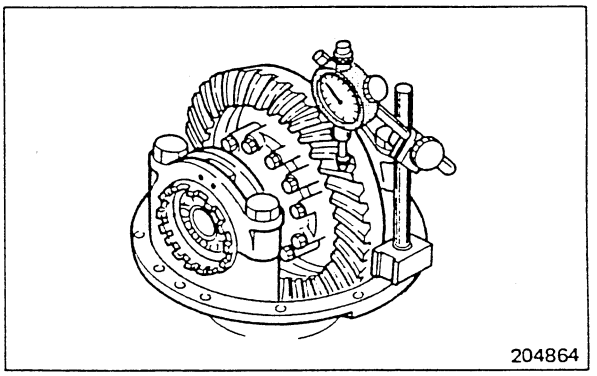
13. Adjusting reduction gear and pinion tooth contact

(1) Turn the differential carrier upside down.

(2) Install the differential cases (removed in Step 7) to the carrier. Align the marks on the bearing cap and adjusting screw on each side.

(3) Adjust the backlash between the reduction gear and pinion by turning the adjusting screws. With the contact point of the indicator squarely set at the tooth of the reduction gear, turn the gear back and forth, and read the indicator.

Backlash between reduction gear and pinion	0.15 to 0.25 [0.0059 to 0.0098]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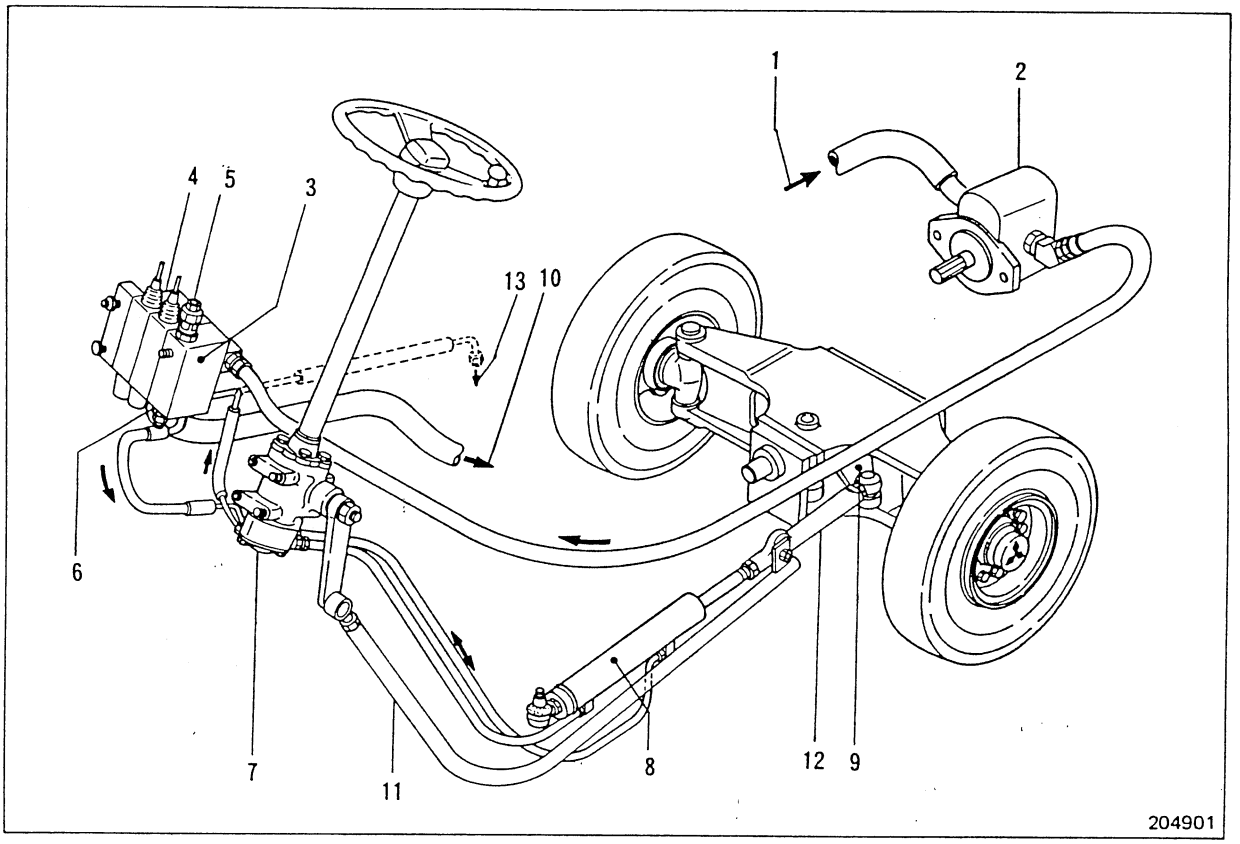
BRAKE SYSTEM

DESCRIPTION



Sequence

1 From hydraulic tank
2 Hydraulic pump
3 Flow divider valve
4 Hydraulic control valve
5 Main relief valve
6 Relief valve for flow divider valve
7 Power steering control valve
8 Power cylinder assembly
9 Bellcrank for rear axle
10 To hydraulic tank
11 Drag link assembly
12 Socket end assembly
13 To transmission (wet-type clutch)

This steering is a hydrostatic power steering with a semi-integral (follow-up mechanical) linkage which insures steering in the event of power failure.

The flow divider provides a priority flow to the steering system for smooth, responsive control under all operating conditions, even at low engine speeds.

The steering control valve features a reaction chamber which senses steering load to permit the operator to maintain full feel at all times.

The steering pressure is regulated by the relief valve built in the flow divider.

For the flow divider and relief valve, refer to HYDRAULIC SYSTEM.

6. Staking cylinder tube

Connect the steering hose to the power cylinder assembly. Apply hydraulic pressure to the cylinder to make sure that the cylinder is free from leakage. Then, stake the tube at one place.

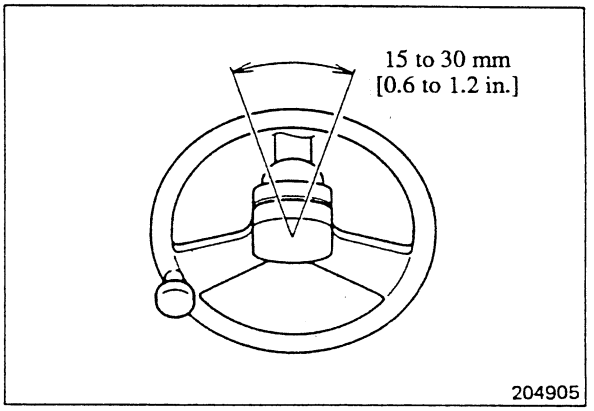
INSPECTION AND ADJUSTMENT

Steering Wheel Free Play

With the engine running at idle speed, measure the free play at the wheel rim.

NOTE

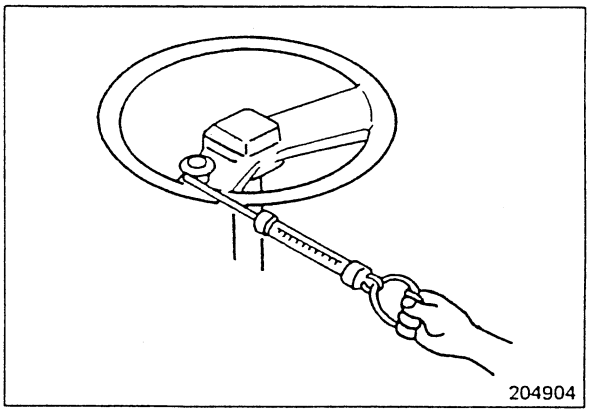
The control valve spool movement will be evidenced by a steering wheel movement of 170 to 175 mm [6.7 to 6.9 in.]. Do not confuse this movement with the free play.



If the free play is off this range, correct it by referring TROUBLESHOOTING.

Steering Effort

1. Set the parking brake. Run the engine to warm up the hydraulic oil (until the engine coolant temperature gauge needle moves into the white zone).
2. Hook a spring balancer to the rim of steering wheel and turn the wheel. Read the balancer indication when the wheel begins to turn with the engine idling. This effort should not exceed the standard value.



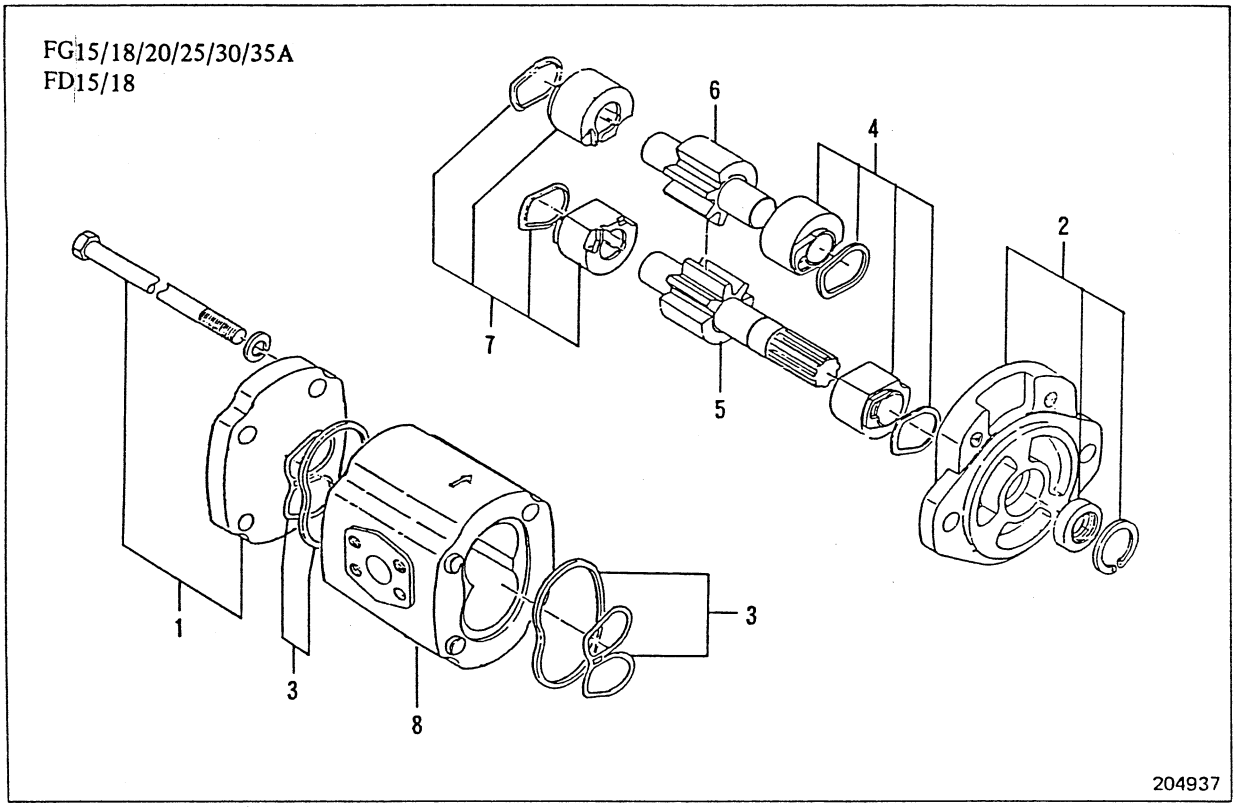
Steering effort	20 N·m (2 kgf·m) [4.4 lbf·ft]

Relieving Pressure Adjustment

Refer to HYDRAULIC SYSTEM.

DISASSEMBLY AND REASSEMBLY

Hydraulic Pump



Sequence

1 Cover, bolt
2 Mounting flange, snap ring, oil seal
3 Body seal, bushing seal
4 Backing rings, bushings
5 Drive gear
6 Driven gear
7 Backing rings, bushings
8 Body

General working tips

(1) Driving with a hammer or similar tool in an attempt to loosen or force out any part of the pump is not permissible. This applies particularly to the body, gears and bushings.

(2) Lay out each part removed in disassembly, identifying its location and position, so that it can be restored to its exact original condition in reassembly. This applies in particular to the pump gears and their bushings. Have them laid out neatly in, say, trays.

(3) Before starting reassembly, visually inspect all parts to be sure they are perfectly clean, and apply hydraulic oil to the sliding surfaces of the pump body.

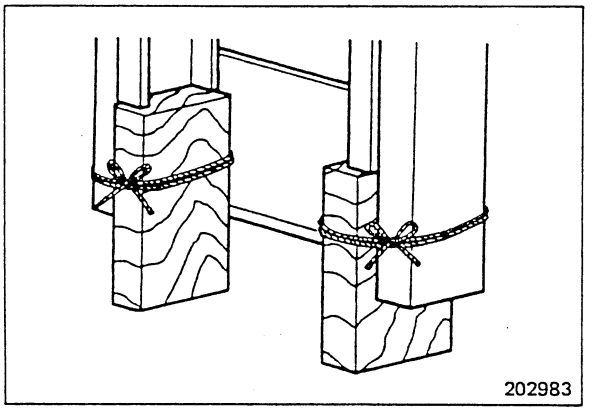
(4) Replace seals and seal rings at each disassembly.

(5) Give a thin coat of grease to the lip of each oil seal and to the seals just before fitting them.

(6) There are four bushings for the two pump gears. Be sure to combine each with the gear from which it was removed in disassembly.

[Adjusting method]

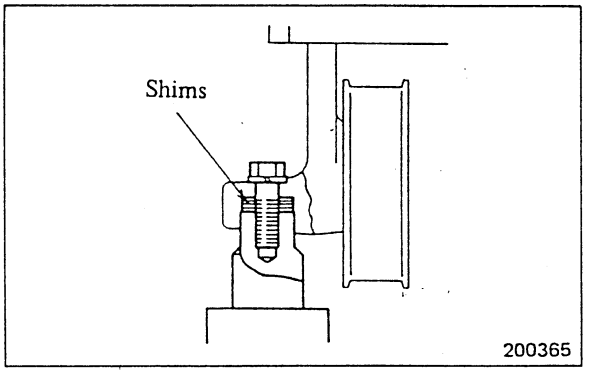
(1) Raise the inner mast, place blocks under the right and left sides of the mast, and lower the mast until it rests on the blocks.



(2) Remove the stopper bolt at the top of lift cylinder which stopped first, retract the piston rod, and insert shims at the top of piston rod end.

NOTE

To retract the piston rod, move the lift control lever to the lowering position to let the oil escape from the lift cylinder.



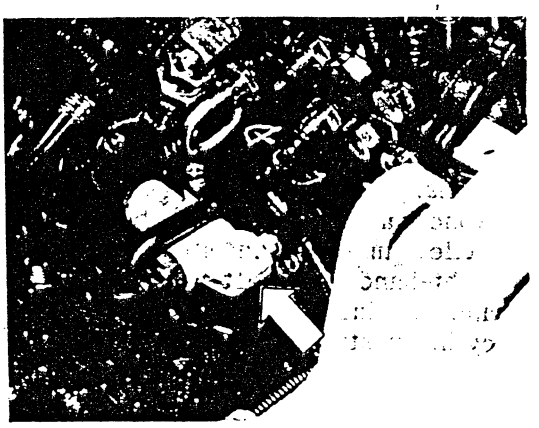
(3) Extend the piston rod, and tighten the cylinder stopper bolt. Remove the blocks from under the inner mast.

(4) Slowly lower the inner mast all the way to make sure that the piston rods move smoothly.

Flow Regulator Valve

Measure the lowering speed with rated load. If the speed is out of specification, repair or replace the flow regulator valve.

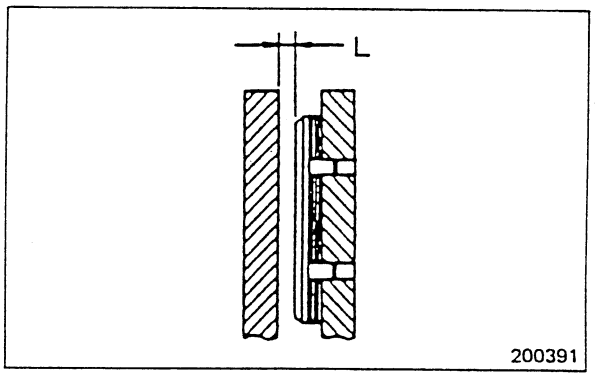
Lowering speed	FG(D)10 thru 25	500 mm/sec [99 fpm]
	FG(D)30	530 mm/sec [104 fpm]
	FG(D)35A	440 mm/sec [87 fpm]



Mast Strip Adjustment

1. Check the clearance L when the clearance between the outer mast rollers and inner mast is set to zero (0) in maximum lift position.

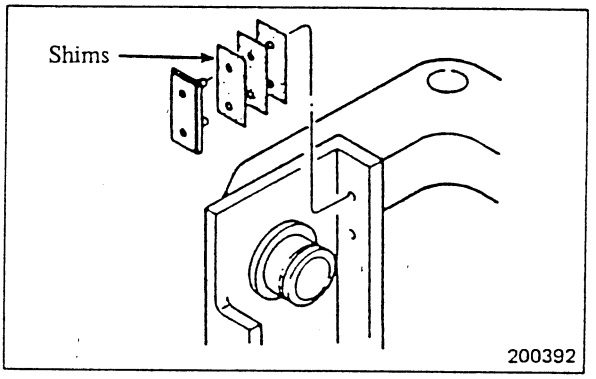
Clearance L	0.1 to 0.5 mm [0.004 to 0.020 in.]



2. If the clearance L is out of specification, adjust it by means of shims.

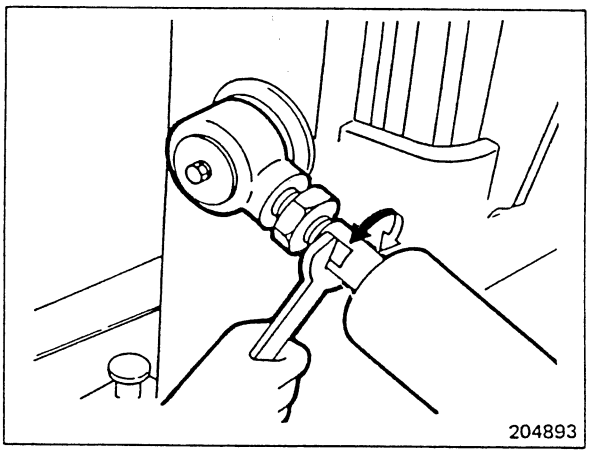
NOTE

Refer to Main Roller Shim Replacement.



Mast Tilt Angle Adjustment

1. Adjust the tire pressure correctly and keep the truck level.
2. Tilt the mast all the way backward and stop the engine.
3. Measure the backward tilt angle of the mast at both sides.
4. To adjust the tilt angle, loosen the lock nut of tilt cylinder socket, and adjust the cylinder stroke by turning the rod on either cylinder so that there is no difference in stroke between the cylinders, right and left.



NOTE

It is not necessary to adjust the forward tilt angle if the backward tilt angle is properly adjusted.

Forward – backward tilt angle	6° – 12° (standard)

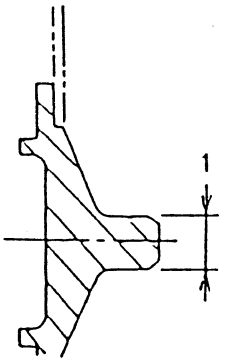
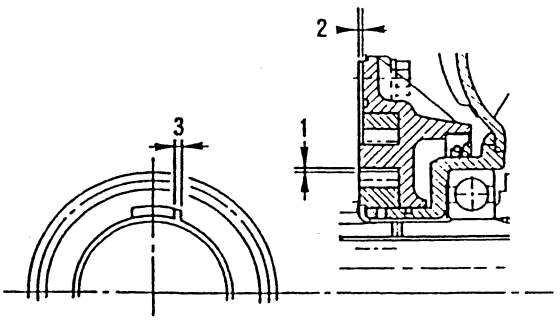
REAR AXLE

Complaint	Possible cause
Hard steering	a) Toe-in not set to the specification b) Lack of lubrication in rear axle and steering linkage c) Tire inflation pressure too low
Poor steering reaction	Joints and connections in steering and rear axle linkage too tight
Truck pulls to one side	a) Tire diameter differs between right and left b) Tires inflated unequally
Shimmy	a) Excessive clearance between kingpin and its bearings b) Tapered roller bearings badly worn or damaged in hub c) Excessive rattle of ball stud in socket in tie rod d) Steering system defective
Rear wheel tires wear prematurely or unevenly	a) Wheel alignment out of adjustment b) Tires on one side differ in kind from those on the other side, or tires inflated unequally
Abnormal noise in starting and stopping	Improper shim adjustment of rear axle support

A-Assembly standard B-Repair or service limit

Powershift transmission — continued

Unit: mm [in.]

Item			Truck model: FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Pilot boss	Diameter 1	A	$15^{-0.006}_{-0.024}$ [$0.59^{-0.00024}_{-0.00094}$]		
		B	14.95 [0.5886]		
	 200411				
Oil pump	Tip clearance 1	A	0.3 to 0.33 [0.012 to 0.0130]		
	Side clearance 2	A	0.040 to 0.083 [0.00157 to 0.00327]		
		B	0.15 [0.0059]		
	Clearance between pump boss and drive gear	A	0.1 to 0.4 [0.004 to 0.016]		
	Backlash	A	0.1 to 0.18 [0.004 to 0.0071]		
		B	0.3 [0.012]		
	Capacity, liter [cu in.]/min	A	FD: 33 [2014] at 2200 rpm FG: 36 [2197] at 2400 rpm		
		B	FD: 23 [1404] at 2200 rpm FG: 26 [1587] at 2400 rpm		
	 204831				

Hydraulic system

A-Assembly standard B-Repair or service limit
Unit: mm [in.]

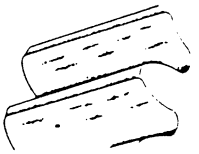
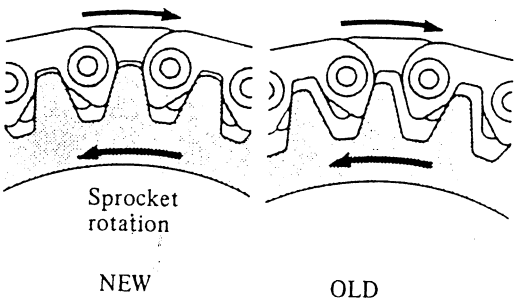
Item				Truck model: FG(D)15 FG(D)18	FG(D)20 FG(D)25	FG(D)30 FG(D)35A
Dual-stage panoramic mast	Lift speed (rated load/no load), mm/sec [fpm] [dual-stage panoramic mast]		A	FG15/18 490/520 [96/102] FD15/18 600/640 [118/126]	FG20/25: 510/550 [100/108] FD20/25: 640/660 [126/130]	FG30: 470/500 [93/98] FD30: 510/550 [100/108] FG35A: 400/430 [79/85] FD35A: 430/460 [85/91]
	Lowering speed (rated load), mm/sec [fpm] [dual-stage panoramic mast]		A	500 [98]		FG(D)30: 530 [104] FG(D)35A: 440 [87]
	Forward tilt angle		A	6°		
	Backward tilt angle		A	10°		
	Lift cylinder rod drift (rated load), mm [in.]/15 min. {Oil temperature 45°C [113°F]}		A	50 [1.97], max		FG(D)30: 40 [1.57] FG(D)35A: 35 [1.38]
	Tilt cylinder rod drift (forward) (rated load), mm [in.]/15 min. {Oil temperature 45°C [113°F]}		A	20 [0.8], max		
Main relief valve setting, kPa (kgf/cm²) [psi]			A	18142^{+490}_{0} (185^{+5}_{0}) [2631^{+71}_{0}]		
Power steering relief valve setting, kPa (kgf/cm²) [psi]			A	7845 (80) [1138]		FG(D)30: 7845 (80) [1138] FG(D)35A: 9807 (100) [1422]
Hydraulic pump	Capacity, liter [cu in.]/min.		A	FG15/18 58.8 [3588]/ 2400 rpm FD15/18 66 [4028]/ 2200 rpm	FG20/25: 72 [4394]/ 2400 rpm FD20/25: 85 [5187]/ 2200 rpm	FG30/35A: 79.9 [4876]/ 2400 rpm FD30/35A: 85 [5187]/ 2200 rpm
	Tightening torque for oil pump bolts, N·m (kgf·m) [lbf·ft]		A	47 to 49 (4.75 to 5.0) [34 to 36]	FG20/25: 47 to 49 (4.75 to 5.0) [34 to 36] FD20/25: 123 to 132 (12.5 to 13.5) [90 to 98]	FG30/35A: 47 to 49 (4.75 to 5.0) [34 to 36] FD30/35A: 123 to 132 (12.5 to 13.5) [90 to 98]
Control valve	Tightening torque, N·m (kgf·m) [lbf·ft]	Tie bolts (1/2 in.)	A	46 (4.7) [34]		
		Tie bolts (3/8 in.)	A	19 (1.9) [14]		
Lift cylinder	[Piton] Inside diameter of cylinder head 1		A	$50^{+0.2}_{0}$ [$1.97^{+0.008}_{0}$]	$55^{+0.2}_{0}$ [$2.17^{+0.008}_{0}$]	$60^{+0.2}_{0}$ [$2.36^{+0.008}_{0}$]
			B	50.25 [1.9783]	55.25 [2.1752]	60.25 [2.3720]

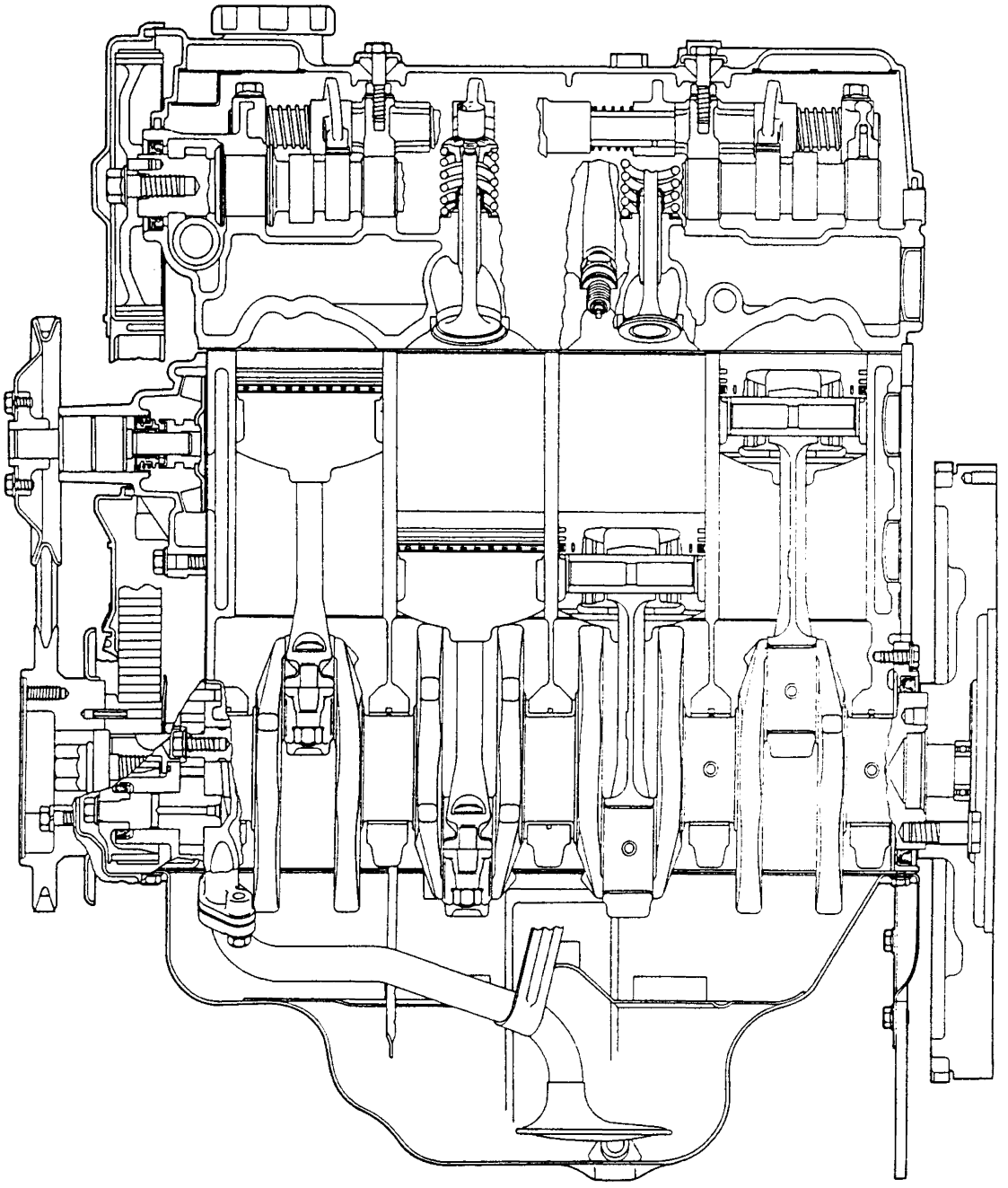
Fuel and Lubricant Specifications

Fuel or lubricant		Recommendation	Recommendation for ambient temperature, °C (°F) –30 (–22) –20 (–4) –10 (14) 0 (32) 10 (50) 20 (68) 30 (86)
Fuel	Gasoline model	Gasoline	Consult your MITSUBISHI dealer.
	Diesel model	Diesel fuel	
Engine oils	Gasoline model	API service classification SC	SAE 10W or SAE 10W-30 / SAE 20 / SAE 30
	Diesel model	API service classification CC	
Transfer and differential oil		API service classification GL-4 (multi-purpose)	SAE 80 / SAE 90
Powershift transmission oil		Dexron	See RECOMMENDED BRANDS OF LUBRICANTS.
Hydraulic oil	Powershift and dry clutch models		ISOVG32
	Wet clutch model	API service classification CD	SAE 10W
Brake fluid and clutch oil		F.M.V.S.S. No. 116 — DOT 3 or DOT 4 (SAE J1703)	
Grease	Wheel bearings	NLGI No. 2 grade multi-purpose type (lithium base) Consistency: 265 — 295	See RECOMMENDED BRANDS OF LUBRICANTS.
	Chassis	NLGI No. 1 grade multi-purpose type (lithium base) Consistency: 310 — 340	

Antifreeze solution (Long Life Coolant)	Ambient temperature, °C (°F)	–39 (–38.2)	–30 (–22)	–25 (–13)	–20 (–4)	–15 (5)	–10 (14)
	Concentration, %	55	50	45	40	35	30

Remarks: Avoid mixing lubricants. In some cases, different brands of lubricants are not compatible with each other and deteriorate when mixed. It is best to sick with one and the same brand at successive service intervals.

Check:	For (item or defect):	How
Gears	i) Corrosive wear 	Visually.
Keys and keyways	Wear on sides making parts not fit tightly	Examine by placing.
Moving parts	a) Runout exceeding limit b) Wear exceeding limit c) Seizure or sticking d) Flaws	Use a dial gauge. Examine by measuring. Visually.
Oil seals	Turned, cut or hardened lips	Visually.
Roller chains and sprockets	a) Wear on pins, bushings, rollers and plates ineach link tending to increase pitch b) Wear on sprocet teeth Chain load 	Visually.
Rubber parts	Hardening or softening, swelling, tackiness, tearing, and deterioration due to aging or attacking of mineral base solvent	Visually.



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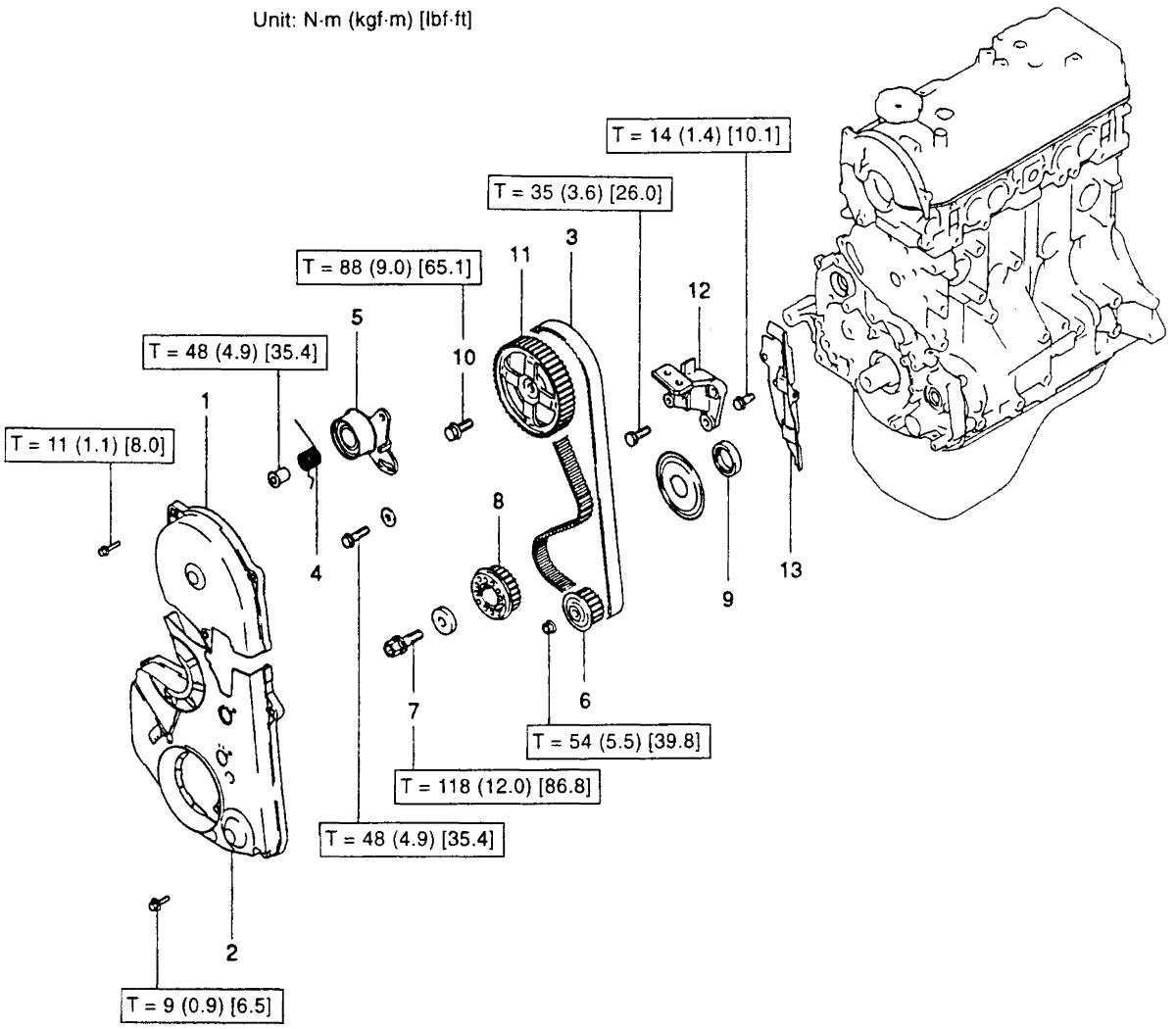
REMOVAL AND INSTALLATION



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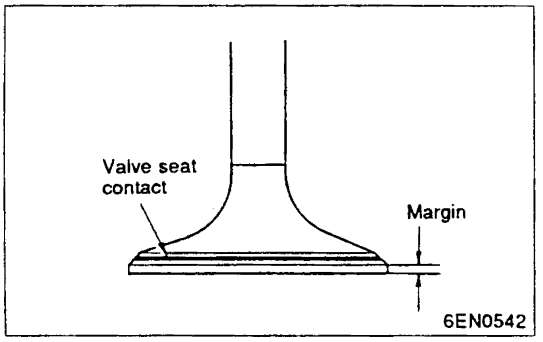
Removal steps

1. Timing belt front upper cover
2. Timing belt front lower cover
◇A◇ ◆D◆ 3. Timing belt
◆C◆ 4. Tensioner spring
◆C◆ 5. Tensioner pulley
6. Oil pump sprocket
◇B◇ ◆B◆ 7. Crankshaft bolt
◇C◇ 8. Crankshaft sprocket
9. Spacer
10. Camshaft sprocket bolt
◇D◇ ◆A◆ 11. Camshaft sprocket
12. Engine support bracket
13. Timing belt rear cover



2. Valve

(1) Check the valve face for correct contact. If incorrect, reface. Valve seat contact should be maintained uniform at the center of valve face.

(2) If the margin exceeds the service limit, replace the valve.

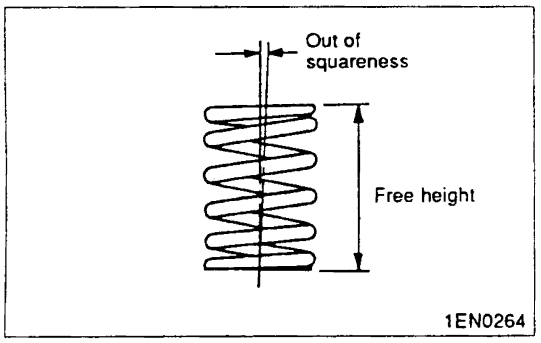
Standard value:
Intake 1.2 mm (0.047 in.)
Exhaust 2.0 mm (0.079 in.)

Limit:
Intake 0.7 mm (0.028 in.)
Exhaust 1.5 mm (0.059 in.)

(3) Measure the valve's total length. If the measurement is less than specified, replace the valve.

Standard value:
4G63 Intake 109.8 mm (4.328 in.)
Exhaust 108.7 mm (4.280 in.)
4G64 Intake 106.6 mm (4.197 in.)
Exhaust 105.2 mm (4.142 in.)

Limit:
4G63 Intake 109.3 mm (4.3031 in.)
Exhaust 108.2 mm (4.260 in.)
4G64 Intake 106.1 mm (4.177 in.)
Exhaust 104.7 mm (4.122 in.)

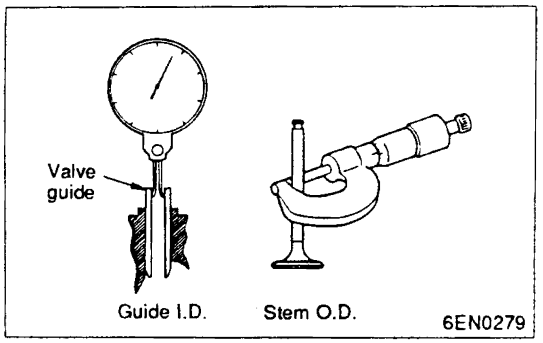


3. Valve Spring

(1) Measure the free height of spring and, if it is smaller than the limit, replace.

Standard value: 49.8 mm (1.961 in.)

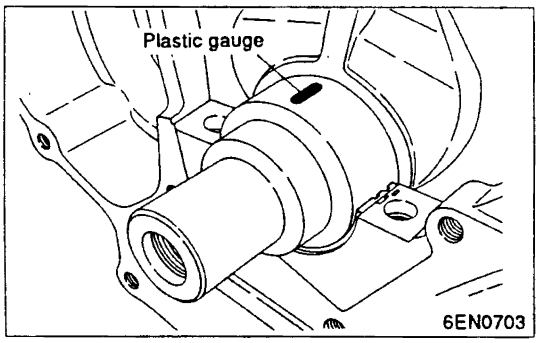
Limit: 48.8 mm (1.921 in.)

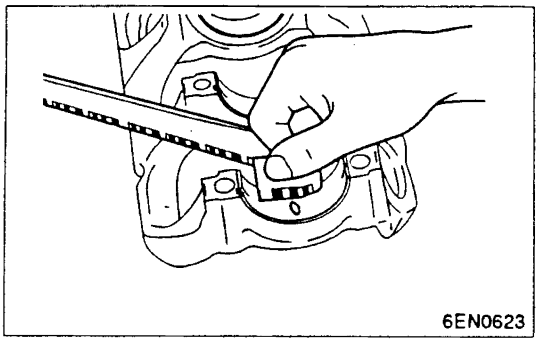


(2) Measure the squareness of the spring and, if the limit is exceeded, replace.

4. Valve Guide

Measure the clearance between the valve guide and valve stem. If the limit is exceeded, replace the valve guide or valve, or both.





INSPECTION

1. Crankshaft Oil Clearance (Plastic Gauge Method)

Use of the plastic gauge can facilitate the oil clearance measurement work.

To use the plastic gauge, proceed as follows:

(1) Remove oil from the crankshaft journal and crankshaft bearing.

(2) Install the crankshaft.

(3) Cut the plastic gauge to the same length as the width of the bearing and place it on the journal in parallel with its axis.

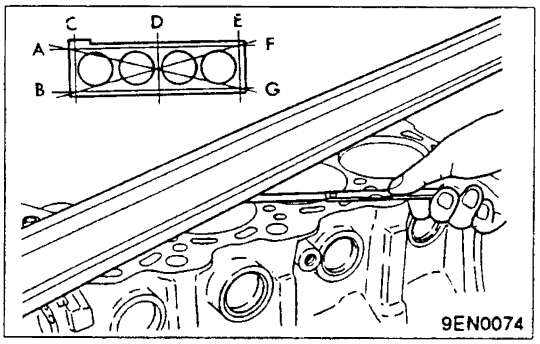
(4) Install the crankshaft bearing cap carefully and tighten the bolts to specified torque.

(5) Remove the bolt, and carefully remove the crankshaft bearing cap.

(6) Measure the width of the plastic gauge at its widest part by using a scale printed on the plastic gauge package.

Standard value: 0.02 to 0.04 mm
(0.0008 to 0.0016 in.)

Limit: 0.1 mm (0.004 in.)



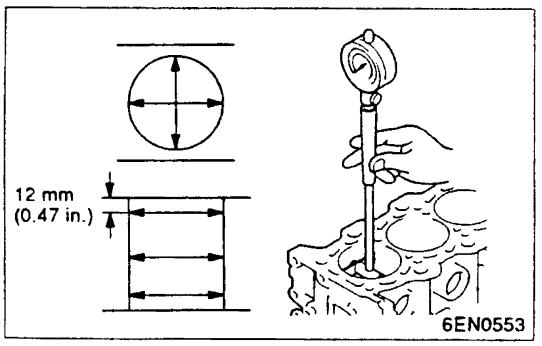
2. Cylinder Block

(1) Visually check for scratches, rust, and corrosion. Use also a flaw detecting agent for the check. If defects are evident, correct, or replace.

(2) Using a straightedge and feeler gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other foreign matter.

Standard value: 0.05 mm (0.0020 in.)

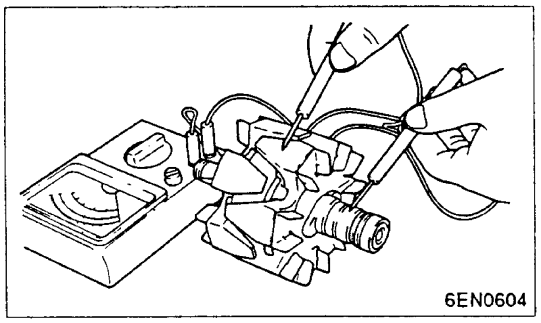
Limit: 0.1 mm (0.004 in.)



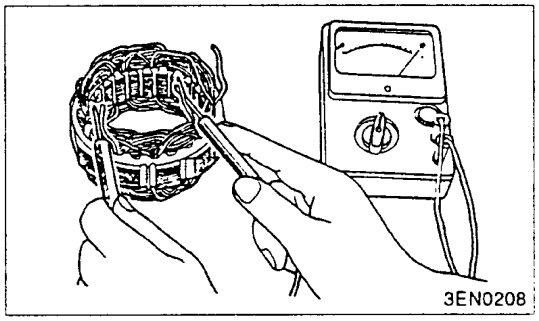
(3) Check the cylinder walls for scratches and seizure. If defects are evident, correct (bored to oversize) or replace.

(4) Using a cylinder gauge, measure the cylinder bore and cylindricity. If worn badly, rebore all cylinders to an oversize and replace piston rings. Measure at the points shown in the illustration.

Standard value:
Cylinder I.D.
4G63
85.00 to 85.03 mm (3.3465 to 3.3476 in.)
4G64
86.50 to 86.53 mm (3.4055 to 3.4067 in.)
Cylindricity 0.1 mm (0.004 in.)

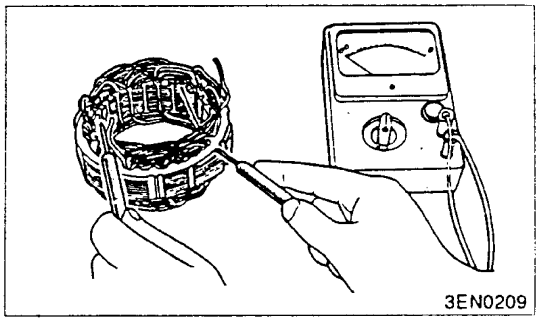


(2) Check for rotor coil grounding. Make sure that there is no continuity between the slip ring and the core. Replace the rotor assembly if there is continuity.

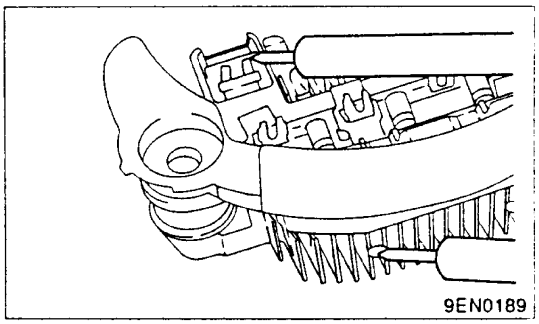


2. Stator

(1) Check the stator continuity. Make sure that there is continuity between the coil leads. Replace the stator assembly if there is no continuity.



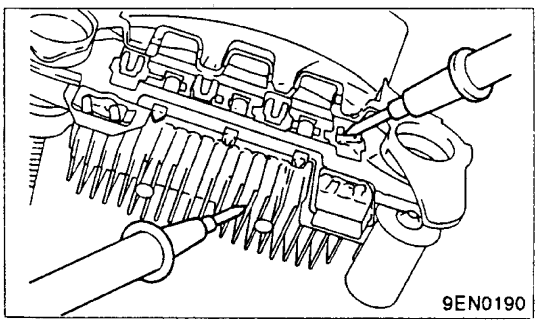
(2) Check for coil grounding. Make sure that there is no continuity between the coil and the core. Replace the stator assembly if there is continuity.



3. Rectifier

(1) Inspection of (+) heat sink assembly

Using a circuit tester, check continuity between the (+) heat sink and the stator coil lead connection terminals. If there is continuity in both directions, the diode is shorted and the rectifier assembly must be replaced.



(2) Inspection of (–) heat sink assembly

Check continuity between the (–) heat sink and the stator coil lead connection terminals. If there is continuity in both directions, the diode is shorted and the rectifier assembly must be replaced.