MITSUBISHI LIFT TRUCKS

Move up with MLift

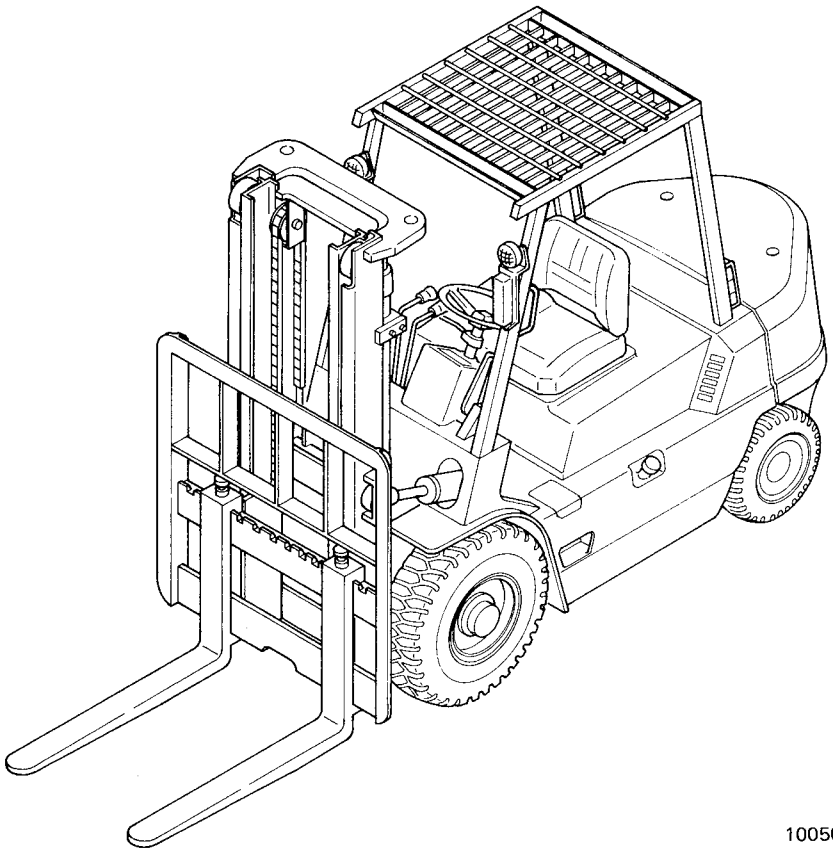
# SERVICE MANUAL

# FG35 FD35
# FG40 FD40
# FD45
# FD50C
# FD50

Mar.'90

Quality makes the Difference

## MODEL VIEW



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## TRUCK MODELS COVERED

This Service Manual furnishes servicing and maintenance information for the following trucks:

| Truck model | Transmission | Designation–Serial number | Engine mounted |
|---|---|---|---|
| FG35 | Powershift | F29 –00011-up | Mitsubishi 6G72 gasoline engine |
| FG40 | Powershift | F29 –50001-up | Mitsubishi 6G72 gasoline engine |
| FD35 | Manual | F19A–00011-up | Mitsubishi S6E diesel engine |
| | Powershift | | |
| FD40 | Manual | F19A–50001-up | Mitsubishi S6E diesel engine |
| | Powershift | | |
| FD45 | Manual | F28 –00011-up | Mitsubishi S6E2 diesel engine |
| | Powershift | | |
| FD50C<br>FD50 | Powershift | F28 –50001-up | Mitsubishi S6E2 diesel engine |

| Item \ Truck model | | | | FG35 [FD35] | FG40 [FD40] | FD45 | FD50C | FD50 |
|---|---|---|---|---|---|---|---|---|
| Hydraulic system | Flow regulator valve | Type | | Variable (adjustable) | | | | |
| | | Regulated flow rate, liter (U.S. gal)/min | | 100 (26.4) | | | 115 (30.4) | |
| | Lift cylinders | ID, mm (in.) | | $65\,^{+0.1}_{0}$ ($2.56\,^{+0.004}_{0}$) | | | $70\,^{+0.1}_{0}$ ($2.76\,^{+0.004}_{0}$) | |
| | | Stroke, mm (in.) | | 1500 (59.06) | | | | |
| | Tilt cylinders | ID, mm (in.) | | $80\,^{+0.1}_{0}$ ($3.15\,^{+0.004}_{0}$) | | $90\,^{+0.1}_{0}$ ($3.54\,^{+0.004}_{0}$) | | |
| | | Stroke, mm (in.) | | 185 (7.28) | | | | |
| | Hydraulic tank capacity, liter (U.S. gal) | | | 58.5 (15.4) | | 69.3 (18.3) | | |
| Mast and forks | Mast | | | Roller type CL | | | | |
| | Mast dimensions (flange ID x thick x web thick), mm (in.) | | Outer | 118 x 23 x 14 (4.65 x 0.91 x 0.55) | | 130 x 25 x 16 (5.12 x 0.98 x 0.63) | | |
| | | | Inner | 118 x 25 x 14 (4.65 x 0.98 x 0.55) | | | | |
| | Main rollers | Bearing | | #6309 ball bearing | | #6310 ball bearing | | |
| | | Diam x width, mm (in.) | | 118 x 40 (4.65 x 1.57) | | 130 x 40 (5.12 x 1.57) | | |
| | Side rollers | Bearing | | Lubricated type needle roller bearing | | | | |
| | | Diam x width, mm (in.) | | 52 x 36 (2.05 x 1.42) | | | | |
| | Lift chaines | | | BL834 | | BL1023 | | |
| | Fork (length x width x thick), mm (in.) | | | 1070 x 150 x 50 (42 x 5.9 x 2.0) | | 1070x150x55 (42x5.9x2.2) | 1220 x 150 x 60 (48 x 5.9 x 2.4) | |
| | Fork spread (outer width), mm (in.) | | | 300 to 1190 (12 to 47) | | | | 300 to 1500 (12 to 59) |

(3) The belt will be automatically tightened. Tighten the pulley bolt.

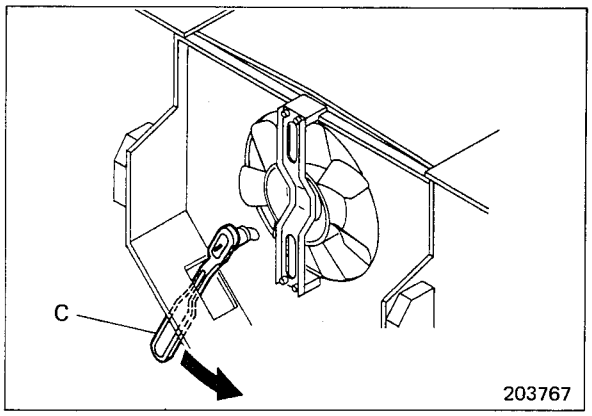
(4) Install the radiator cover.

3. Trucks having an access hole on left rear side

(1) Remove the cover from the access hole.

(2) Using ratchet wrench C through the access hole, loosen the tension pulley bolt 3 to 4 turns.

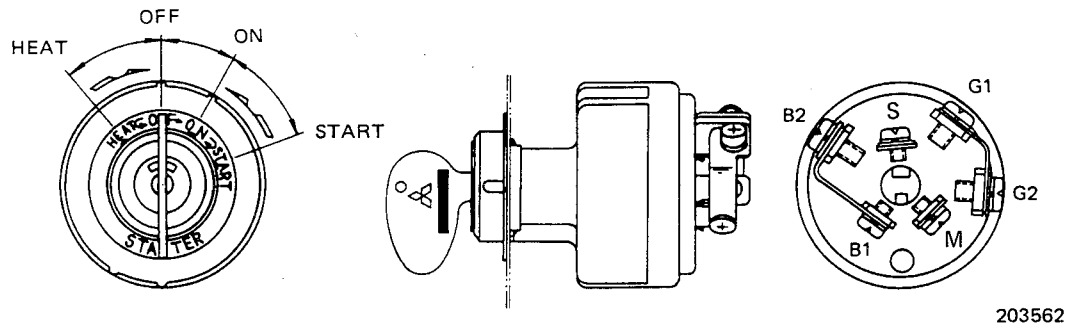
(3) The belt will be properly tightened by the tension spring. Tighten the tension pulley bolt.




The following trucks have the access hole:

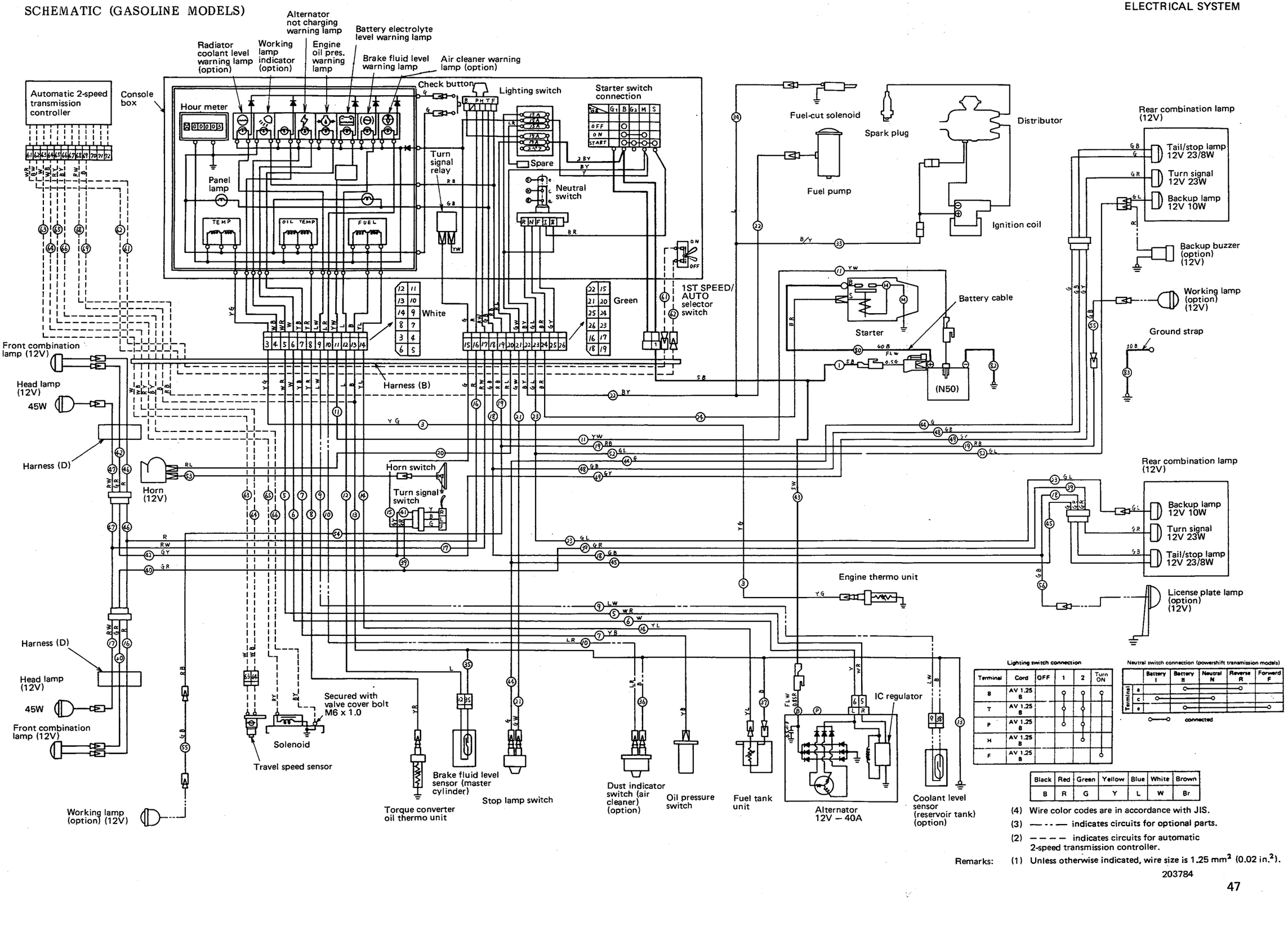
| Truck model | Serial number | Remarks |
|---|---|---|
| FG35 | F29 -00011-up | Initial serial numbers-up |
| FG40 | F29 -50001-up | |
| FD35 | F19A-00364-up | |
| FD40 | F19A-50356-up | |
| FD45 | F28-00071-up | |
| FD50C | F28-50115-up | |
| FD50 | | |

Anti-restart starter switch for diesel models (24 volts)




Connection chart

| Terminal / Device / Key position | G1, G2 | B1, B2 | M | S |
|---|---|---|---|---|
| | Time delay relay, Heater plugs | Fuse box, Battery, Alternator | Fuse box, Fuel cut solenoid | Starter neutral switch |
| HEAT | ○—— | ——○ | | |
| OFF | | ○ | | |
| ON (run) | | ○—— | ——○ | |
| START | | ○—— | ——○—— | ——○ |




Lighting switch connection

| Terminal | Cord | OFF | 1 | 2 | Turn ON |
|---|---|---|---|---|---|
| B | AV 1.25 B | | ○ | ○ | ○ |
| T | AV 1.25 B | | ○ | ○ | |
| P | AV 1.25 B | | ○ | | |
| H | AV 1.25 B | | | ○ | |
| F | AV 1.25 B | | | | ○ |

Neutral switch connection (powershift transmission models)

| Terminal | Battery I | Battery II | Neutral N | Reverse R | Forward F |
|---|---|---|---|---|---|
| a | | ○ | | ○ | |
| c | ○ | | ○ | | |
| e | | ○ | | | ○ |

○—○ connected

| Black | Red | Green | Yellow | Blue | White | Brown |
|---|---|---|---|---|---|---|
| B | R | G | Y | L | W | Br |

(4) Wire color codes are in accordance with JIS.

(3) —·—·— indicates circuits for optional parts.

(2) – – – – indicates circuits for automatic 2-speed transmission controller.

Remarks: (1) Unless otherwise indicated, wire size is 1.25 mm² (0.02 in.²).

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Start by:

(1) drain coolant from the radiator.

(2) disconnect the ground cable from the battery.

(3) drain oil from the clutch housing by removing the drain plug (manual transmission model equipped with wet type clutch).

Suggestions for removal

(1) For the removal of the following parts, refer to "Removal of engine and power train as an assembled unit."

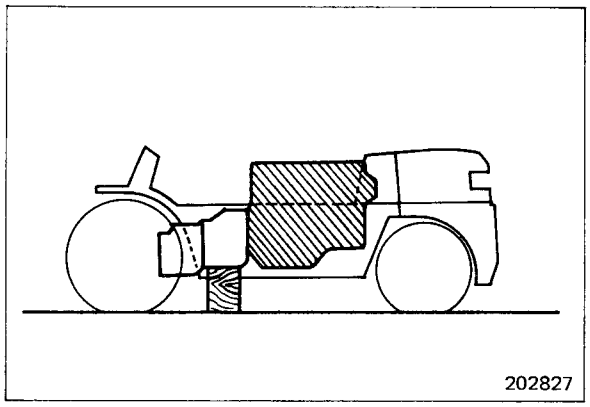
(a) Harnesses

(b) Clutch reserve tank (manual transmission models)

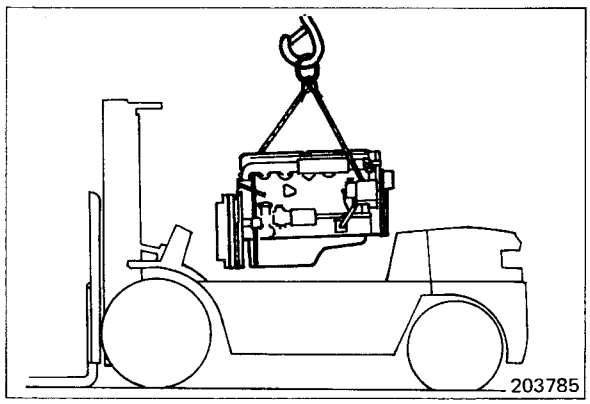
(c) Universal joint

(2) Engine removal

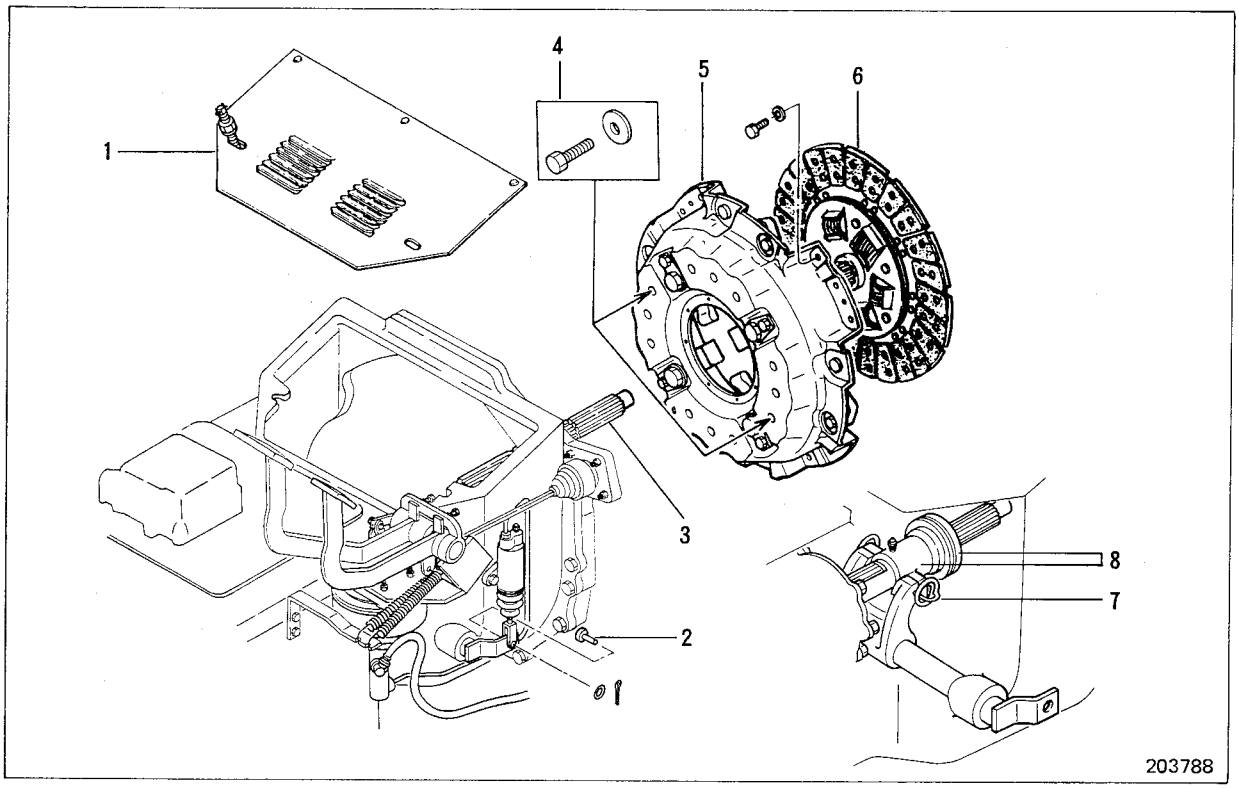
(a) Place a wood block beneath the transmission case. This step is necessary because the transmission rear supports (legs) are removed.




(b) Carefully lift the engine off the frame, taking care not to hit the engine against any other part.



Disassembly




Disassembly sequence

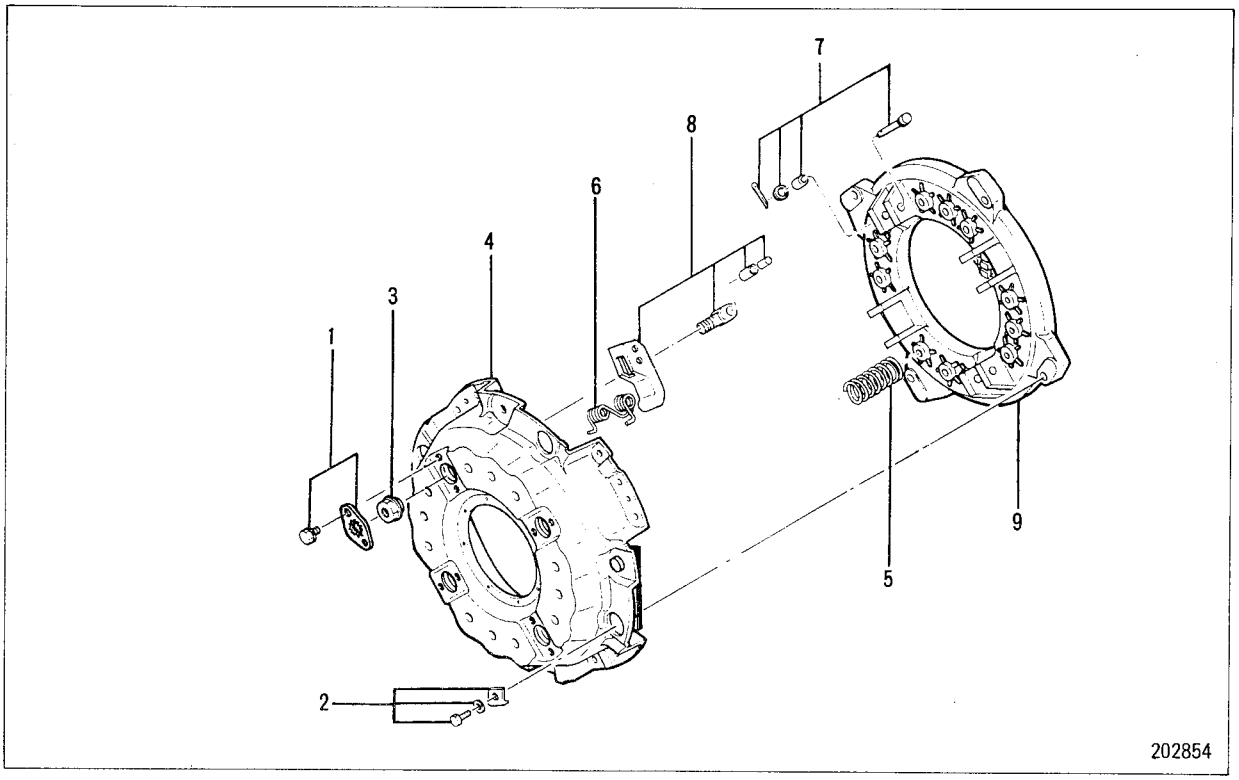
1 Clutch cover
2 Pin
3 Input shaft, stopper ring
4 Bolts, washers (special tool)
5 Pressure plate assembly
6 Clutch disc assembly
7 Spring
8 Shifter and release bearing

**NOTE**

It is not necessary to dismount the power train from the truck for replacement of the pressure plate, clutch disc and shifter of the dry type clutch.

## PRESSURE PLATE ASSEMBLY

Disassembly

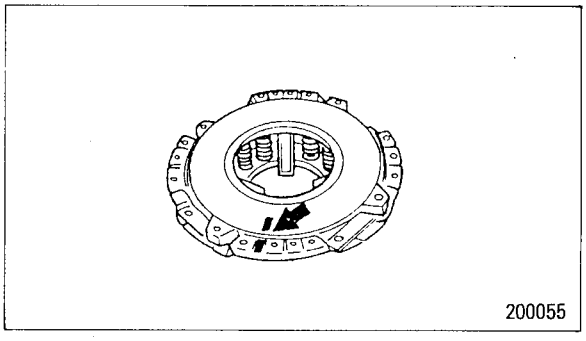



Disassembly sequence

1 Lock plate
2 Washer
3 Support nut
4 Clutch cover
5 Pressure spring
6 Return spring
7 Split pin, washer, pin
8 Release lever
[lever support assembly, pin]
9 Pressure plate

Suggestions for disassembly

(1) Make a mark across the clutch cover and pressure plate in advance.



Bleeding clutch hydraulic system

Use two men - one at the clutch pedal and the other at the master cylinder reservoir - to bleed the hydraulic system of the clutch. Keep the engine idling during bleeding operation.

(1) Fill the reservoir with fluid (Fuso Brake Fluid). Always keep the reservoir more than half full of the fluid during bleeding operation.

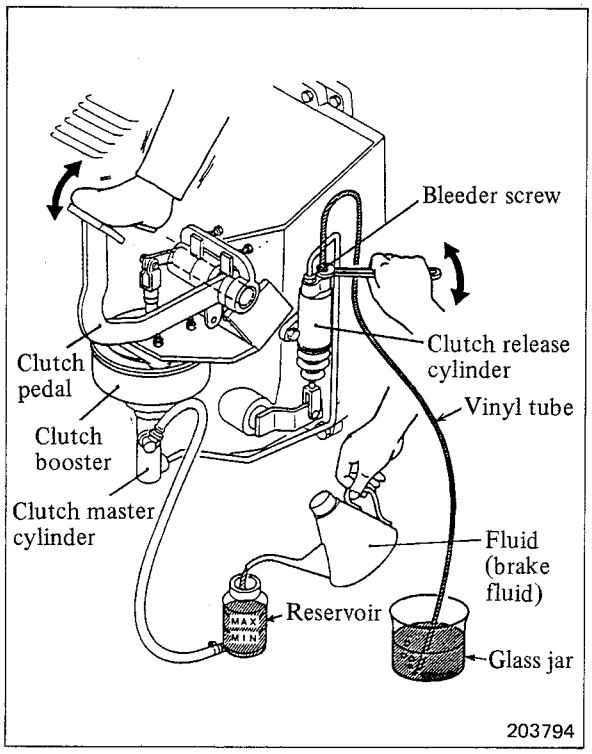
(2) Remove the bleeder cap. Connect a transparent vinyl tube (whose inside diameter is 6 mm (0.24 in.)) to the bleeder screw with the other end of the tube put in a glass jar filled with the fluid. (Make sure the end of the tube is below the fluid level in the jar.)

(3) Have someone get into the truck and pump the clutch pedal full stroke several times, allowing it to return slowly, then keep the pedal depressed. Loosen the bleeder screw (whose size is 10 mm (0.39 in.)) to allow the fluid to flow into the jar.

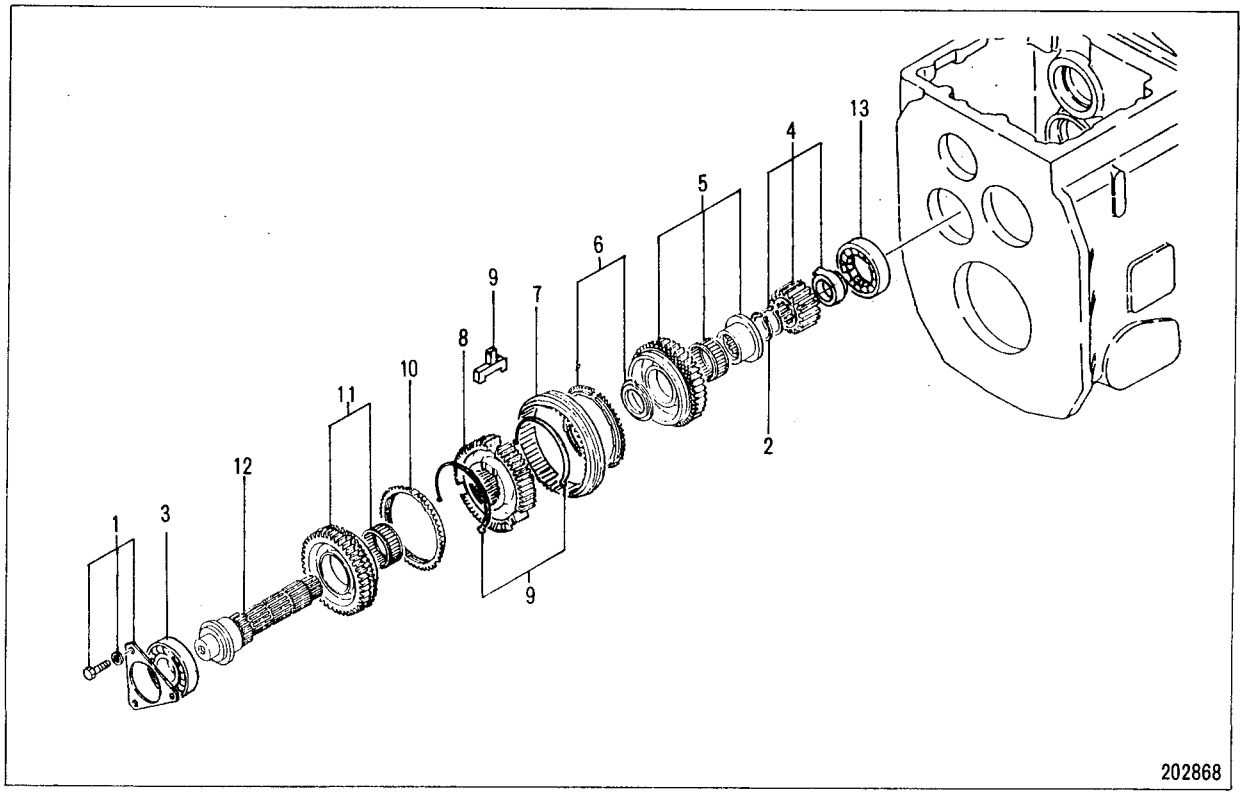
(4) Tighten the bleeder screw and release the pedal slowly.

(5) Repeat Steps (3) and (4) above until the fluid flows from the vinyl tube into the jar in a solid stream that is free of air bubbles.

(6) Replace the bleeder cap and fill the reservoir with the fluid up to the specified level.



Countershaft (3rd Shaft)




Disassembly sequence

1 Cover [bolts, washers]
2 Snap ring
3 Ball bearing
4 Countergear, roller bearing (inner), snap ring
5 Sleeve, needle roller bearing, forward gear
6 Spacer, ring
7 Sleeve
8 Hub
9 Spring, key
10 Ring
11 Reverse gear, needle roller bearing
12 Shaft
13 Roller bearing (outer)

**NOTE**

The outer race of roller bearing 13 will be left in the transmission case.

# POWERSHIFT TRANSMISSIONS

Turbine runner

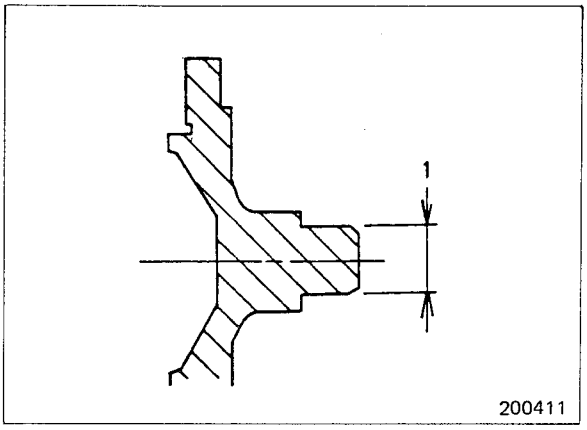
(1) Check the blades for cracks.

(2) Check the fit of turbine boss in the runner.

(3) Check the turbine boss splines for wear or other defects.

Pilot boss

Check the portion in contact with the pilot bearing for wear or other defects.




Unit: mm (in.)

| | | FG35/FG40 FD35/FD40/FD45 |
|---|---|---|
| Diameter of portion in contact with pilot bearing 1 | A | $20^{-0.007}_{-0.020}$ ($0.78^{-0.00028}_{-0.00079}$) |
| | B | 19.95 (0.7854) |

Flexible plate

(1) After installing flexible plate, measure the face runout of the plate with a dial gauge. Replace the plate if the runout exceeds the service limit.

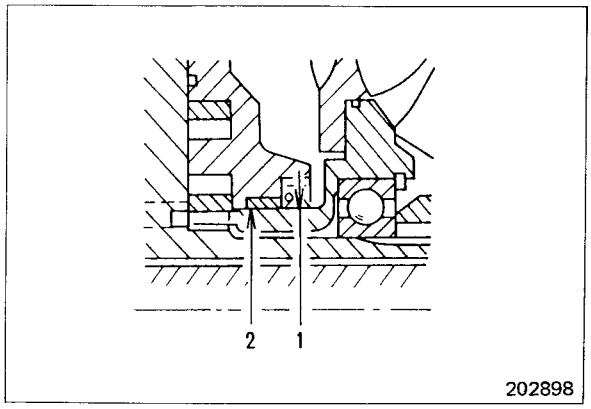
Unit: mm (in.)

| | | FG35/FG40 FD35/FD40/FD45 |
|---|---|---|
| Face runout of flexible plate | A | 0.2 (0.008) |
| | B | 0.5 (0.020) |

Pump boss

Unit: mm (in.)

| | | FG35/FG40 FD35/FD40/FD45 |
|---|---|---|
| Diameter of portion in contact with oil seal and bushing 1 | A | $70\ ^{0}_{-0.046}$ ($2.76\ ^{0}_{-0.00181}$) |
| | B | 69.90 (2.7520) |
| Inside diameter of boss bushing 2 | A | 70.06 to 70.10 (2.7583 to 2.7598) |
| | B | 70.3 (2.768) |




Stator shaft

(1) Check to make sure that bearings fit tight to the shaft.

(2) Check the splines for wear or damage.

(3) Check the oil passages for clogging.

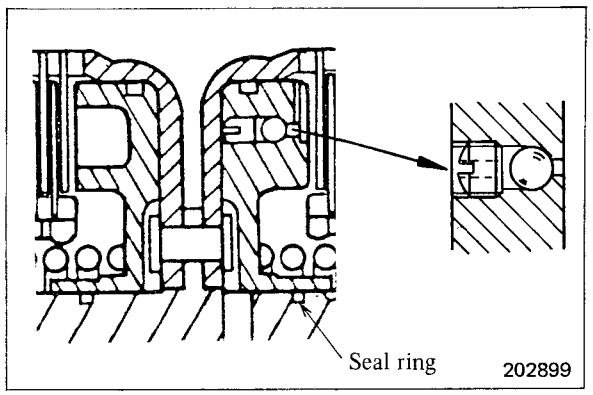
Clutch pistons

(1) Shake each piston, making sure that the balls move freely in the piston.

**NOTE**

Do not overhaul the pistons unless they are defective.

(2) Check the seal rings and their grooves for wear or damage.




Friction plates and mating plates

(1) Check for sign of seizure, uneven contact, warpage or excessive wear.

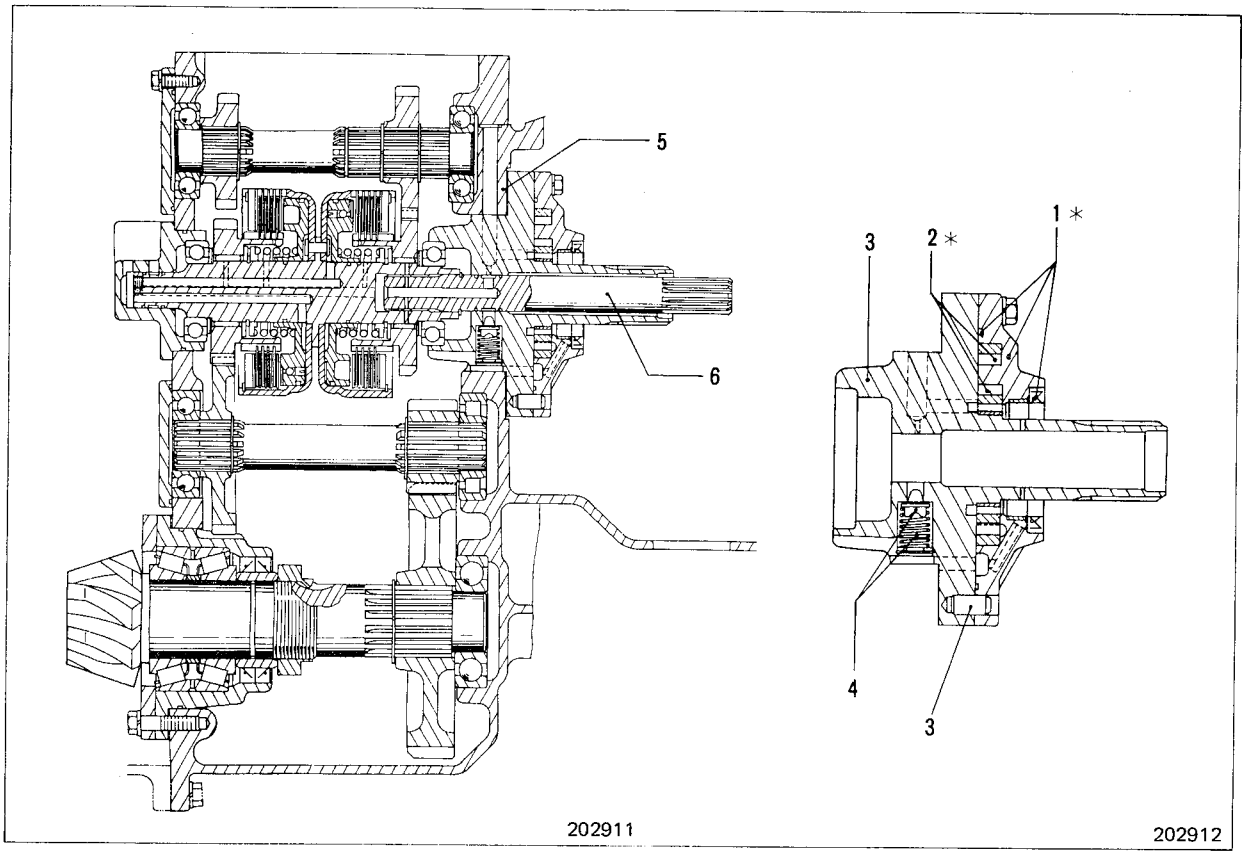
(2) Check the splines for wear or damage.

Clutch drums

(1) Check the mating plate sliding surfaces for wear or damage.

(2) Check the clutch piston sliding surfaces for wear or damage.

Pump body assembly




Reassembly sequence

6 → 5 → 3 → 4 → 2 * → 1 *

Suggestions for reassembly

(1) Install the pump body to the transmission case in assembled state.

(2) Put engine oil on the internal gear and drive gear 2 when installing them to pump body 1.

(3) Put LG2 grease on the oil seal and bushing of pump body 1.

(4) Upon reassembling, measure each gear backlash with a dial gauge.

Unit: mm (in.)

| | |
|---|---|
| Backlash of countergear with output gear | 0.14 to 0.27 (0.0055 to 0.0106) |
| Backlash of other gears | 0.14 to 0.26 (0.0055 to 0.0102) |

Control valve and strainer

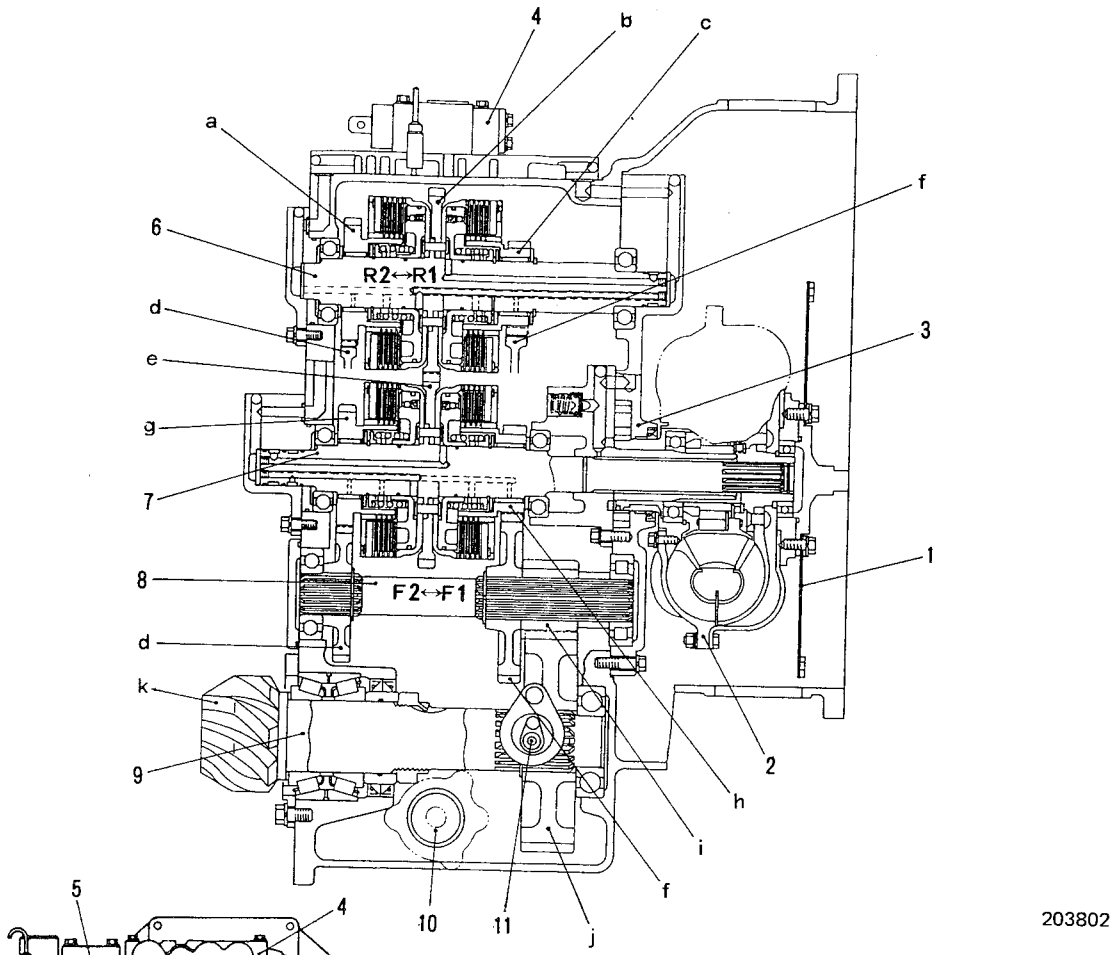
To reassemble, follow the reverse of disassembly sequence. Replace the gaskets.

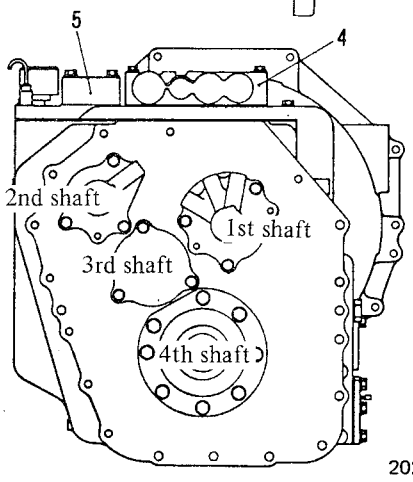
# AUTOMATIC 2-SPEED TRANSMISSION (FD50C/FD50)

*Optional for FG35/FG40 and FD35/FD40/FD45

## DESCRIPTION

### Transmission




Power flow

| Range | Path |
|---|---|
| Forward 1st | h f i j k |
| Forward 2nd | g d i j k |
| Reverse 1st | e b c f i j k |
| Reverse 2nd | e b a d i j k |

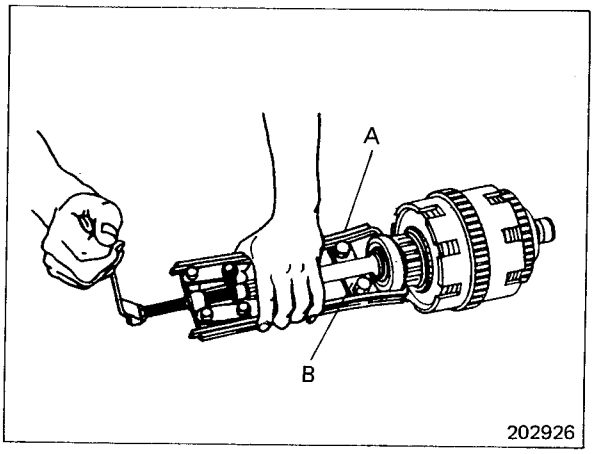
1 Flexible plate
2 Torque converter assembly
3 Pump body assembly
4 Control valve
5 Solenoid valve
6 Countershaft (2nd shaft)
7 Input shaft (1st shaft)
8 Countershaft (3rd shaft)
9 Output shaft (4th shaft)
10 Magnet strainer
11 Pulse generator

Suggestions for disassembly

(1) Removing input shaft ball bearing

Use the special tools to remove ball bearing 3 from the input shaft.

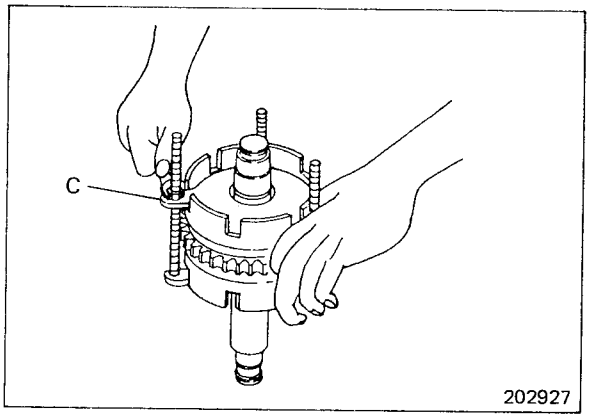
Special tools needed:
Puller A 91268-13810
Plate B 91268-13820




(2) Disassembling input shaft

Using the special tool or an arbor press, compress clutch spring 14, and remove snap ring 13.

Special tool needed:
Piston tool 91868-00200




(3) Clutch piston

Shake each piston 15, making sure that the balls move freely in the piston.

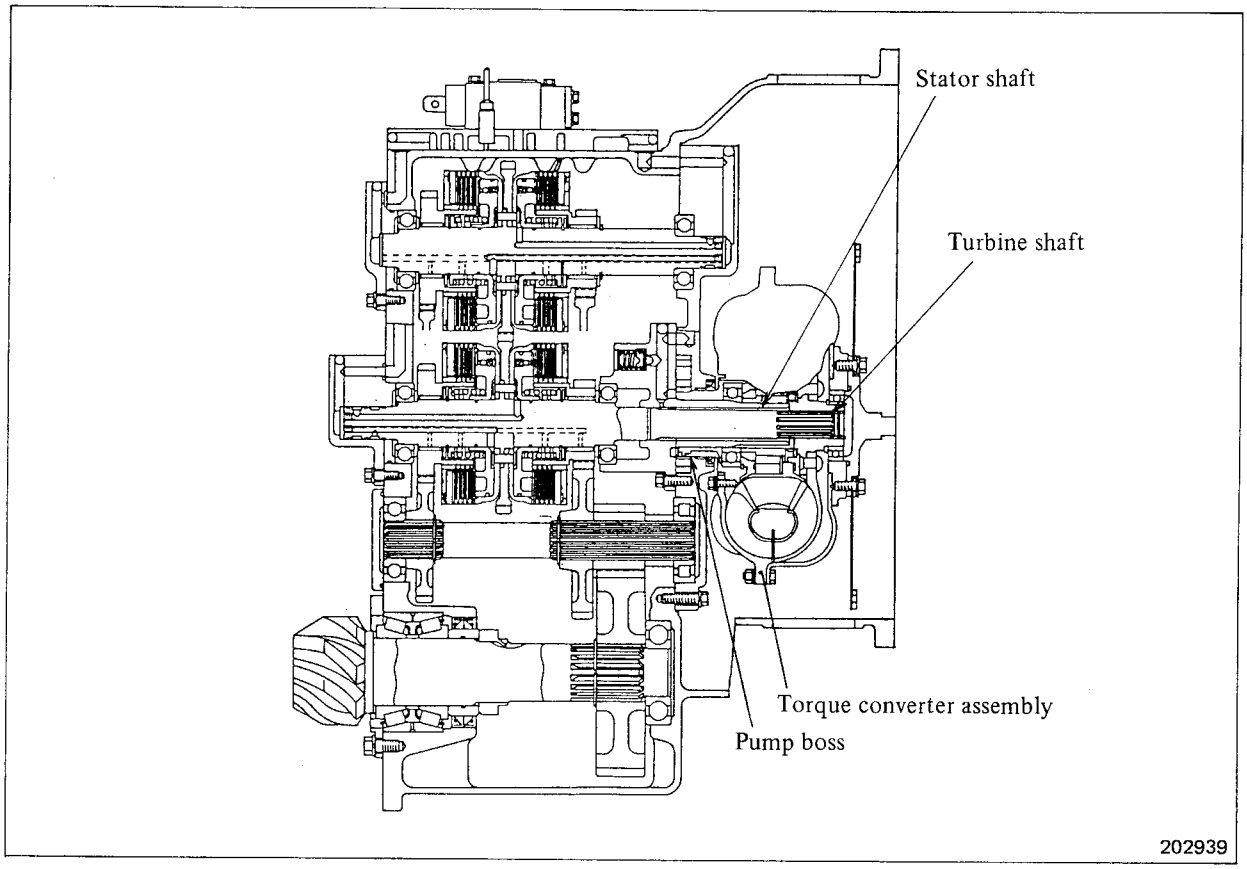
(3) Put LG2 grease on the oil seals fitted to the transmission case.

(4) Upon reassembling, measure each gear backlash with a dial gauge.

Unit: mm (in.)

| | |
|---|---|
| Backlash of forward 1st speed gear with forward 2nd speed gear | 0.14 to 0.23 (0.0055 to 0.0091) |
| Backlash of forward gear with reverse gear | 0.14 to 0.24 (0.0055 to 0.0094) |
| Backlash of countergear with output gear | 0.14 to 0.25 (0.0055 to 0.0098) |

Torque converter




Reassembly

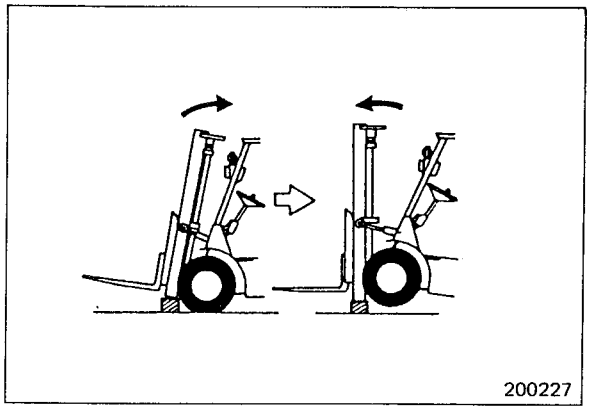
Install the torque converter assembly to the transmission.

(b) Method using hydraulic system

Tilt the mast all the way backward, place wood blocks under the mast, and tilt it forward.

WARNING

**After raising the front end of the truck in any method, securely support the truck by placing wood blocks under the frame to prevent an accident.**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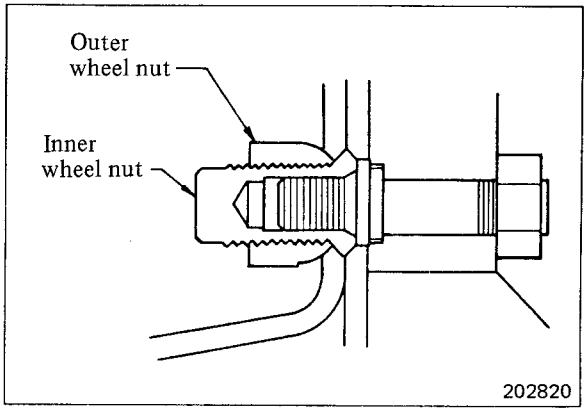
Suggestion for removal

In case of the dual tire, unscrew the outer wheel nuts and inner wheel nuts in that order.



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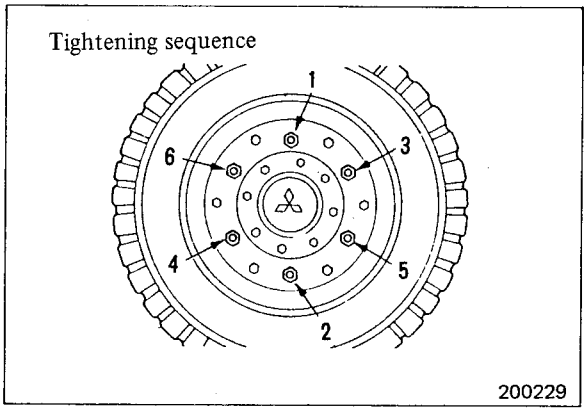
Installation

To install, follow the reverse of removing procedure, and observe the following precautions:

(1) Tighten the wheel nuts to the specified torque in the sequence shown to prevent the wheels from wobbling.

| | |
|---|---|
| Tightening torque for wheel nuts | 41.1 kgf·m<br>(297 lbf·ft)<br>[403 N·m] |

The tightening torques for single-tire and dual-tire wheel nuts are the same.



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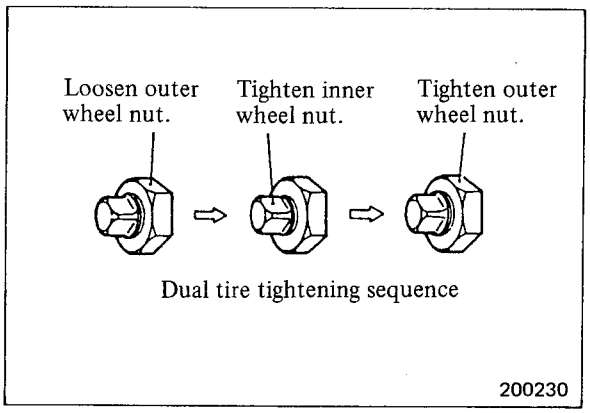
(2) When retightening the wheel nuts of dual tires, be careful not to forget tightening the inner wheel nuts.



Dual tire tightening sequence
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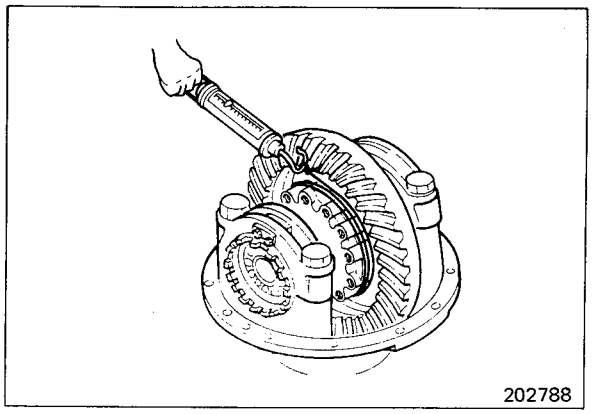
## Adjustment

### Preload of differential case side bearing

Tie a wire on the differential case, and hook a spring balancer to the wire. Tighten the side bearing nuts while reading the balancer until the specified preload is obtained.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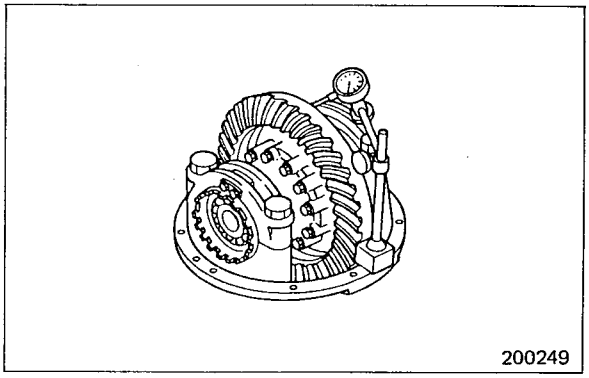
**NOTE**

Before measuring the preload, tap the back of reduction gear with a copper-faced hammer while rotating the gear by hand for running-in.

| | |
|---|---|
| Preload for differential case side bearing | 25 to 35 kgf·cm (2 to 3 lbf·ft) [2.5 to 3.4 N·m]<br>{ 2.3 to 3.3 kgf (5 to 7 lbf) [23 to 32 N] As force applied to differential case rim [$\phi$213 mm (8.4 in.)] in tangential direction } |

### Face runout of reduction gear

Using a dial gauge, measure the face runout of the gear at the maximum radius position in back of the gear while rotating the gear. If the runout exceeds the limit, check the reduction gear bolts for tightness, retightening them if necessary. Also, check the tapered roller bearings for condition, replacing them if necessary. Replace the reduction gear and pinion as a set if retightening of the bolts or replacement of the bearings is not effective.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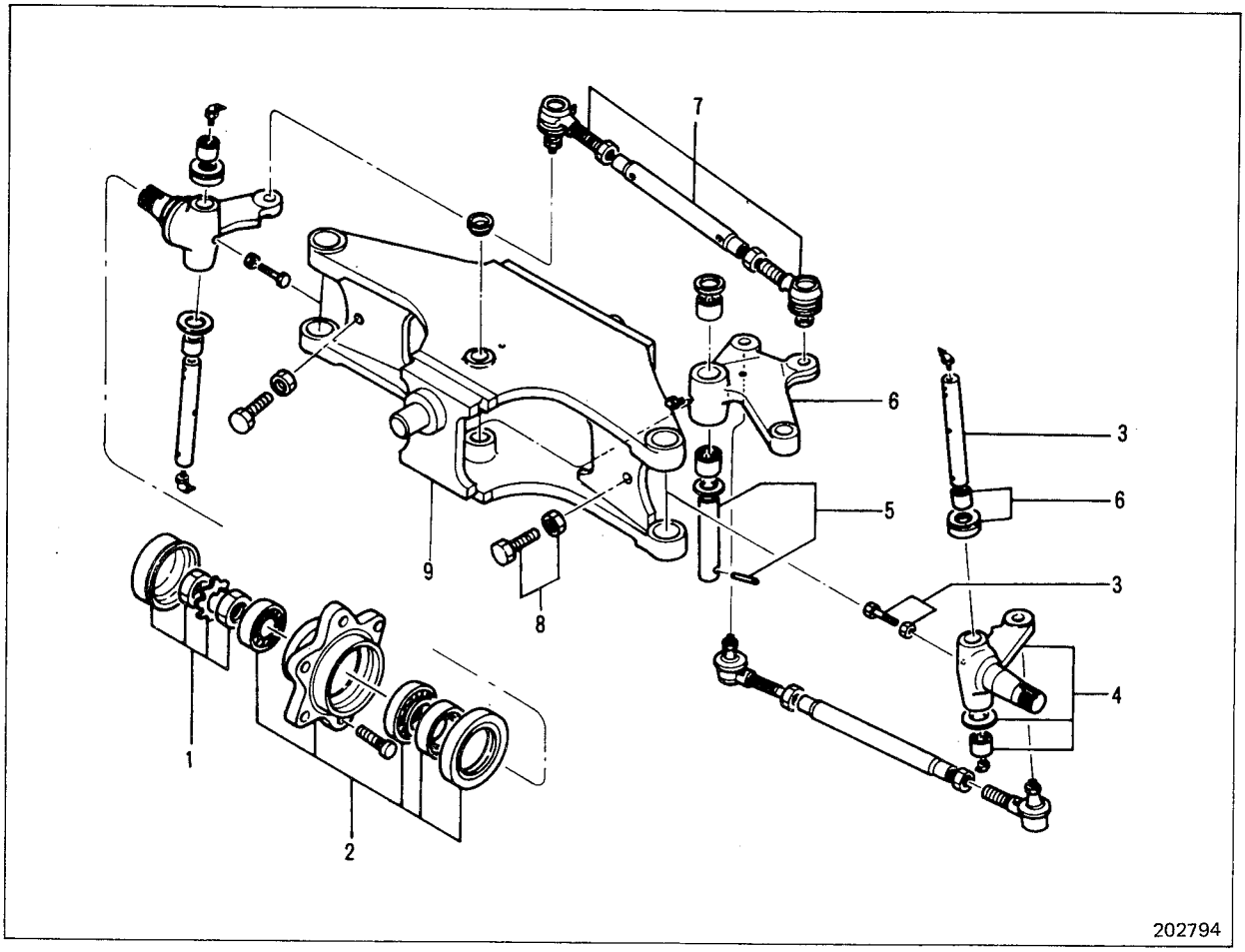
Unit: mm (in.)

| | | |
|---|---|---|
| Face runout of reduction gear | A | 0.15 (0.0059), maximum |
| | B | 0.20 (0.0079) |

# REAR AXLE ASSEMBLY

Disassembly




Disassembly sequence

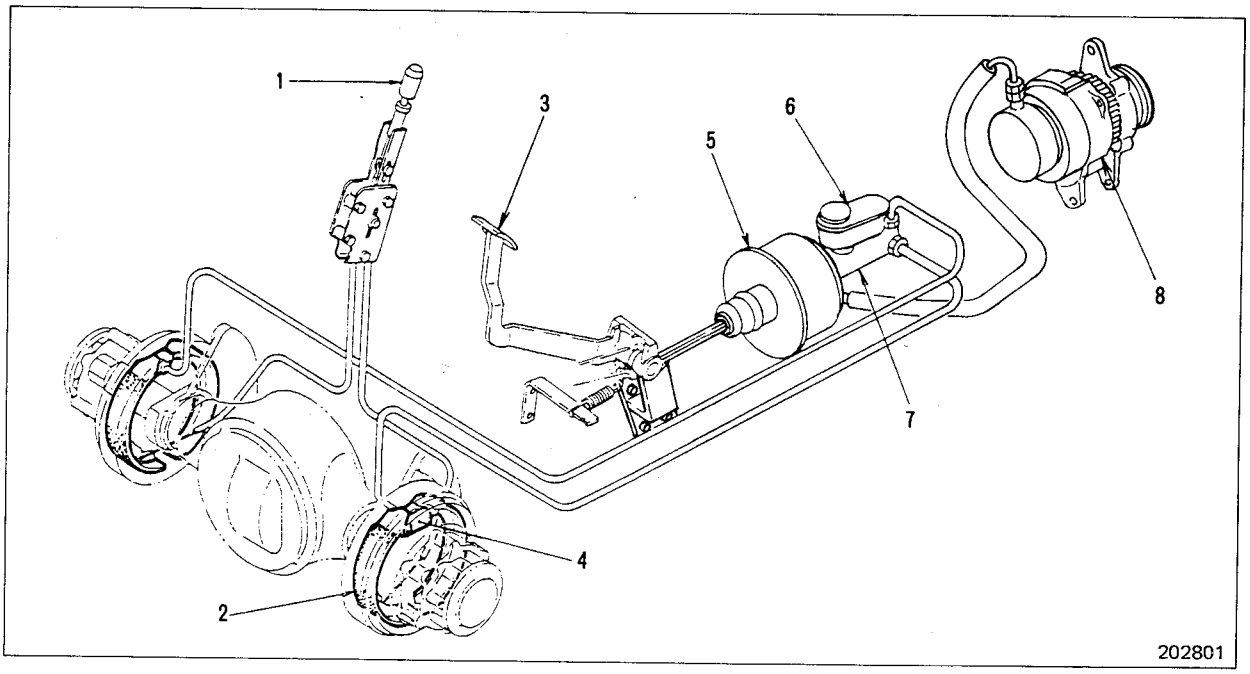
1 Hub cap [nut, lock washer]
2 Rear axle hub [bearing, retainer, oil seal]
3 Kingpin [stopper bolt]
4 Knuckle [needle roller bearing, thrust bearing, washer]
5 Bellcrank pin [spring pin]
6 Bellcrank [needle roller bearing, washer]
7 Tie rod assembly [tie rod ends, lock nuts]
8 Stopper bolt
9 Rear axle

**NOTE**

Do not remove the needle roller bearing from the knuckle or the bellcrank unless it is defective.

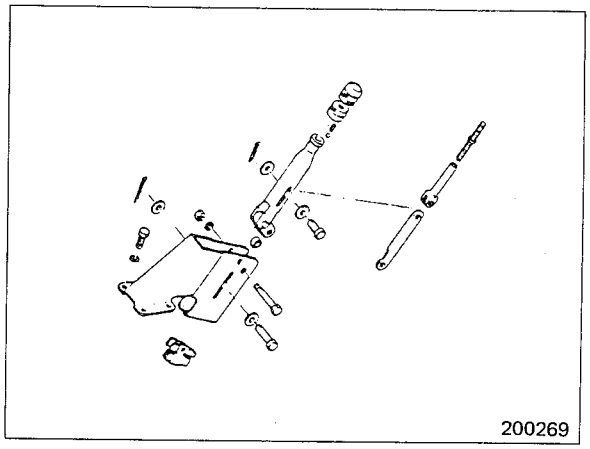
## DESCRIPTION

### Brake System

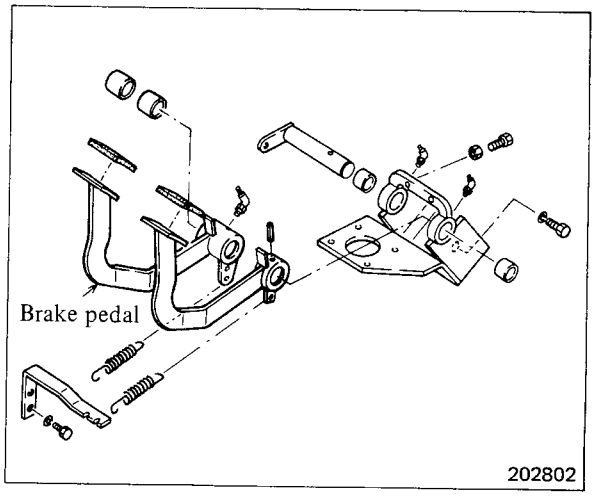



1 Parking brake lever
2 Wheel brake
3 Brake pedal
4 Wheel cylinder
5 Brake booster
6 Brake fluid reservoir
7 Master cylinder
8 Alternator and vacuum pump

### Parking brake lever



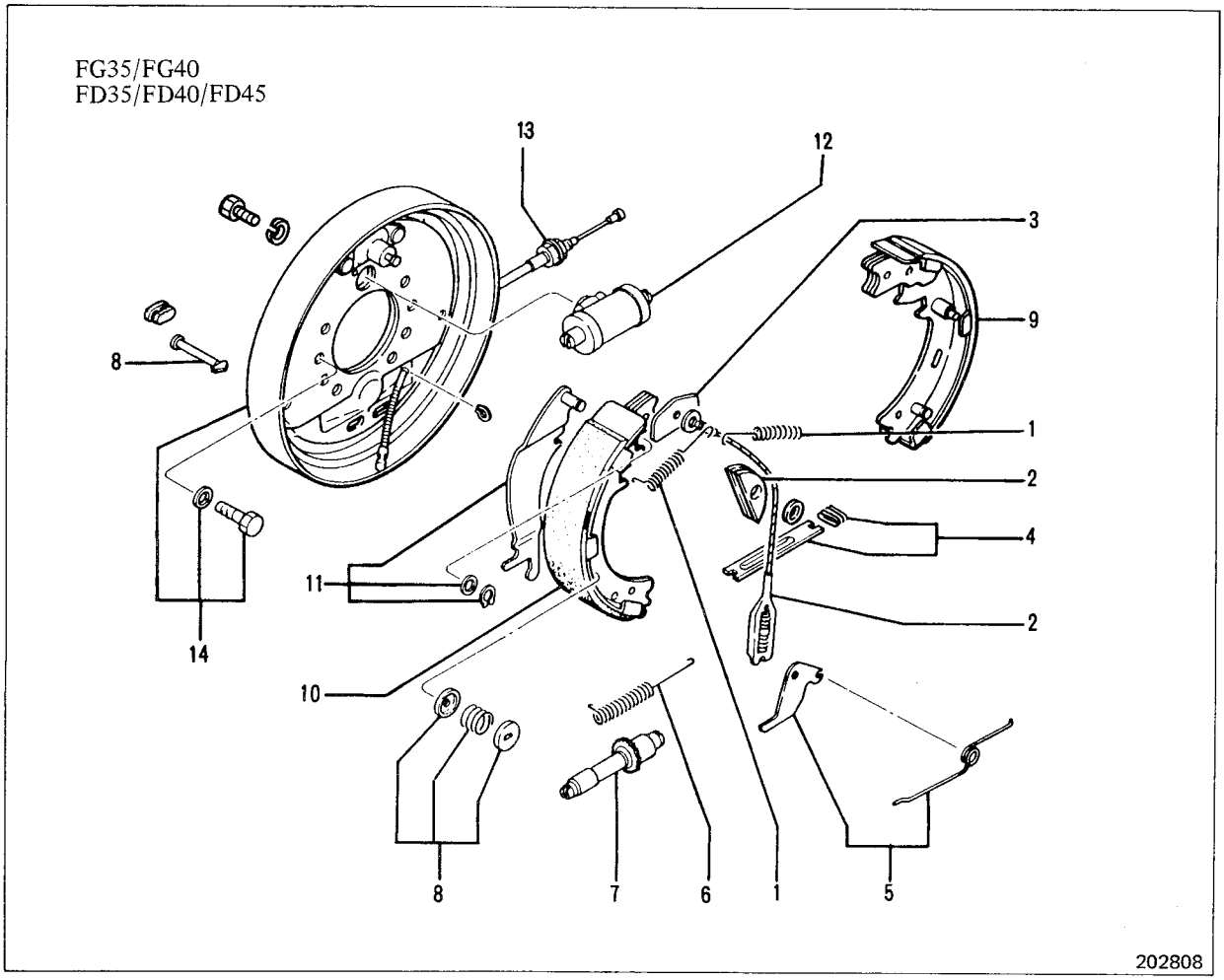

### Brake pedal



# WHEEL BRAKES

## Disassembly

FG35/FG40
FD35/FD40/FD45




Disassembly sequence

1 Return springs
2 Fitting cable [sheave]
3 Shoe guide plate
4 Strap [anti-rattle spring]
5 Adjusting lever [adjusting spring]
6 Return spring
7 Adjusting screw
8 Hold-down spring [cup, pin]
9 Shoe and lining (secondary)
10 Shoe and lining (primary)
11 Parking brake lever [retainer, washer]
12 Wheel cylinder
13 Parking brake cable
14 Backing plate

**NOTE**

Use the repair kit for periodic replacement of part 2.

Precautions for bleeding operation

(1) Maintain proper fluid level in the reservoir.

(2) Be careful not to spill the fluid on the painted surface.

(3) Avoid mixing different types of fluids.

(4) Connect the vinyl tube to the bleeder screw in such a manner as to prevent fluid leaks.

(5) 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.

(6) Do not release the pedal before tightening the bleeder screw.

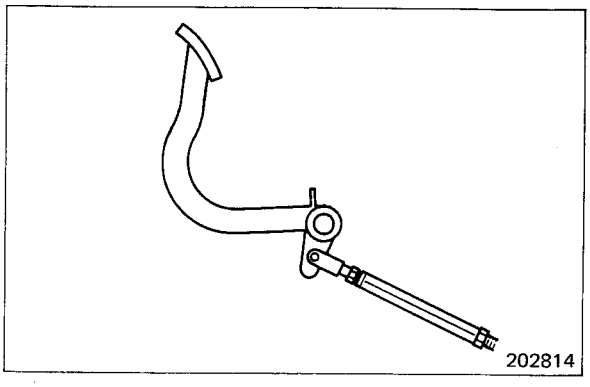
(7) When the bleeding operation is completed, make sure the fluid level in the reservoir is correct. Add fluid if necessary.

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

Brake Pedal

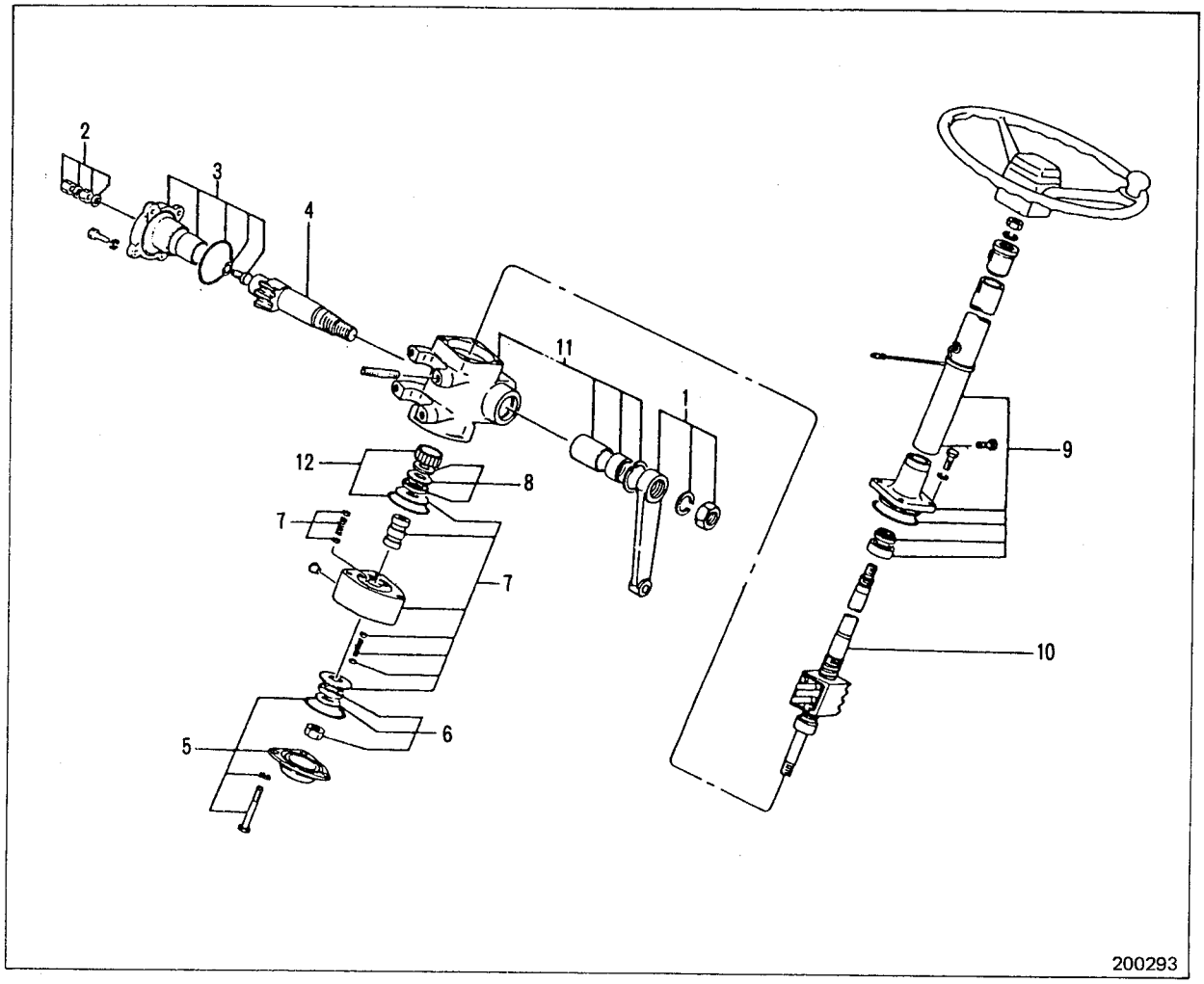
(1) Installing pedal and rod

Screw the pushrod into the clevis on the pedal side.



## STEERING GEAR

Disassembly



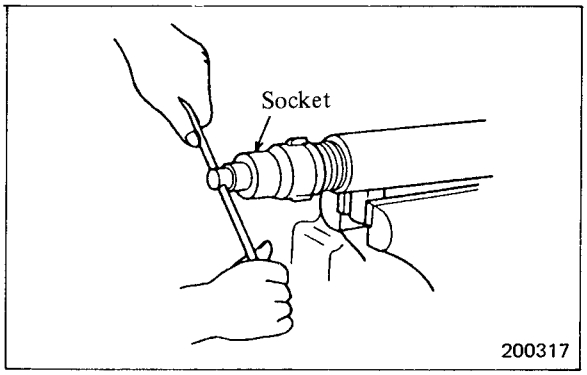

Disassembly sequence

1 Pitman arm [nut, spring washer]
2 Cap nut [gasket, nut]
3 Side cover [O-ring, shims, adjusting screw]
4 Sector shaft
5 End cover [O-ring]
6 Lock nut, ring plate, needle roller bearing
7 Valve assembly [ring plate, valve spool, reaction piston spring, pipe seat, valve housing]
8 Ring plate, needle roller bearing
9 Column assembly [O-ring, needle roller bearing, oil seal, bushing]
10 Ball-and-screw assembly
11 Gear box [snap ring, oil seal]
12 Needle roller bearing, O-ring

Start by:

measure the starting torque of the worm with a torque wrench or spring balancer.

(b) Put a socket and handle, hitching it to the notches provided in the guide, and turn the guide counterclockwise to loosen it.




Inspection and Repair (after disassembly)

(1) Cylinder tube

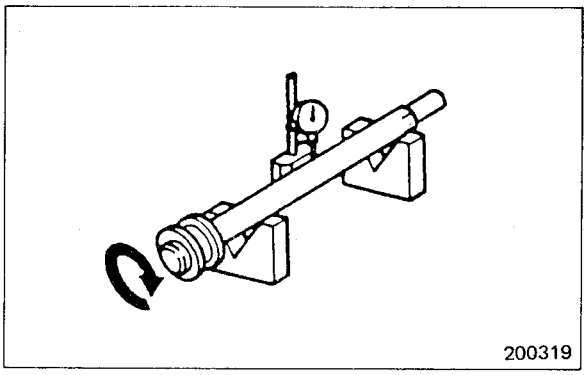
Check for wear, scuffing, scratching or rusting on its bore surface.

(2) Piston rod

Check for dents, scoring or wear. Also check for deflection.

Unit: mm (in.)

| | |
|---|---|
| Deflection of piston rod | 1 (0.04), maximum |




(3) Seals

Replace the dust seals, packing, O-ring and piston seal after disassembly, or every 1 year.

Reassembly

To reassemble, follow the reverse of disassembling sequence, and observe the following precautions:

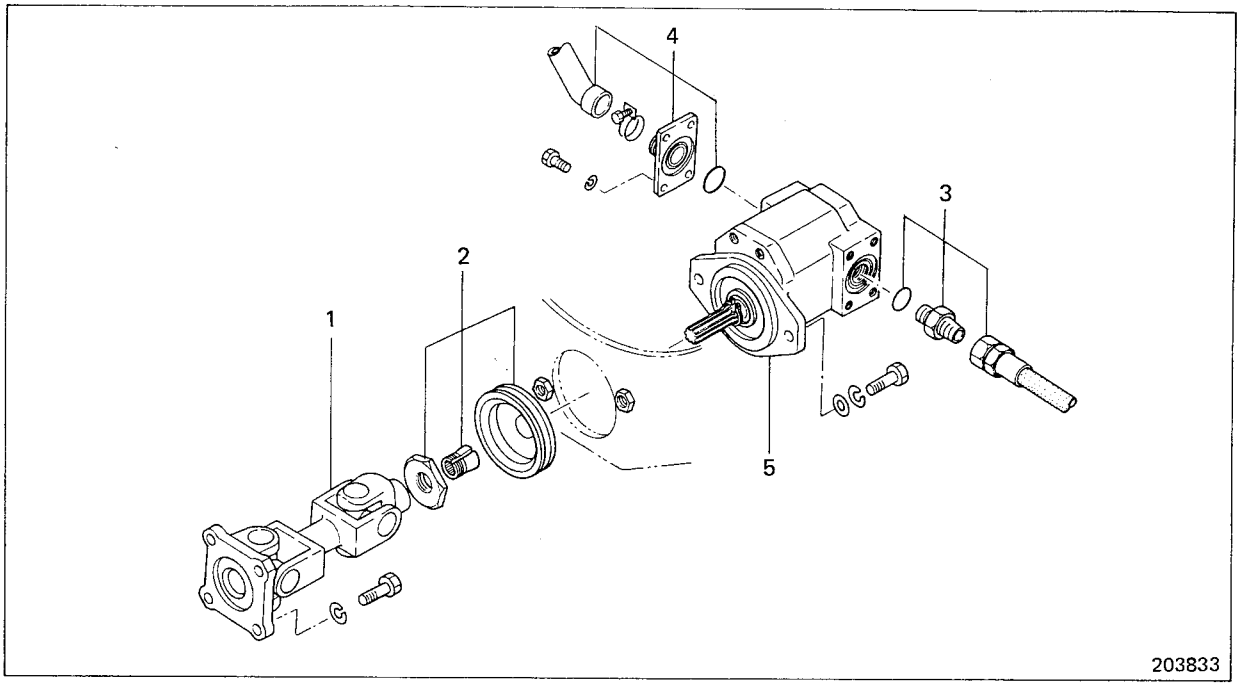
(1) Installing piston to piston rod

Place the piston on the piston rod and secure it by tightening the self-lock nut to the specified torque.

| | |
|---|---|
| Tightening torque for self-lock nut | 20 kgf·m<br>(145 lbf·ft)<br>[196 N·m] |

## REMOVAL AND INSTALLATION

Gear Pump




Removal sequence

1 Universal joint
2 Drive pulley [lock nut, boss]
3 Main hose [connector, O-ring]
4 Suction hose [elbow, O-ring]
5 Gear pump

Start by:

(1) remove the counterweight.

(2) loosen the fan belt.

(3) using the special tool, unscrew lock nut 2 of the drive pulley.

Special tools needed:
Wrench 91268-00100
Wrench 91868-00100

**NOTE**

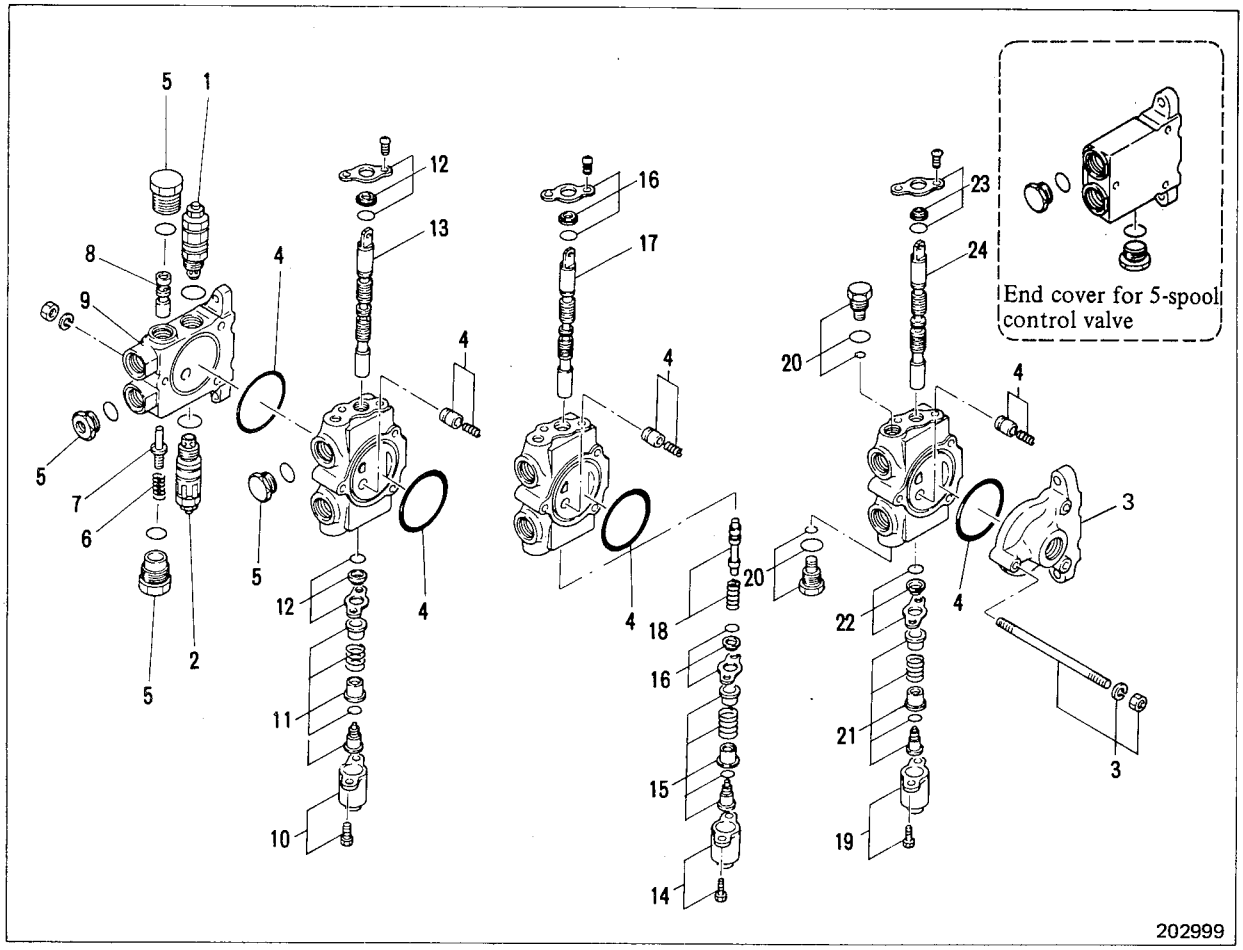
The drive pulley lock nut has left-hand threads.

To install, follow the reverse of removal sequence. Tighten the counterweight mounting bolts, pump outlet connector and main hose to the specified torques.

| | | |
|---|---|---|
| Tightening torque | Counter-weight bolts | 42 to 50 kgf·m (304 to 362 lbf·ft) [412 to 490 N·m] |
| | Pump outlet connector | 17 kgf·m (123 lbf·ft) [167 N·m] |
| | Main hose | 12 kgf·m (87 lbf·ft) [118 N·m] |

## CONTROL VALVE

Disassembly

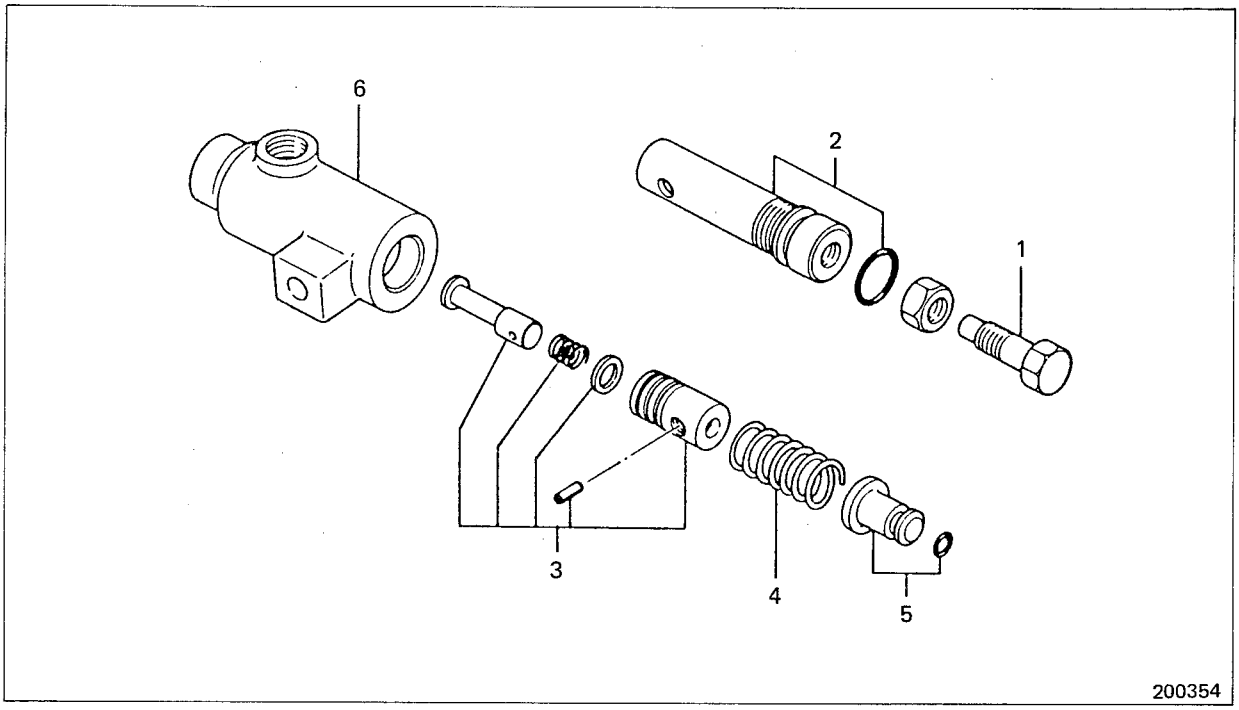



Disassembly sequence

1 Main relief valve
2 Flow divider relief valve
3 Bolt, nut, end cover
4 Load check valve, spring, O-ring
5 Plug
6 Spring
7 Orifice plug
8 Spool
9 Housing (inlet)
10 Bolt, cap
11 Cap screw, spring seat, spring
12 Plate, wiper, O-ring
13 Lift valve spool
14 Bolt, cap
15 Cap screw, spring seat, spring
16 Plate, wiper, O-ring
17 Tilt valve spool
18 Poppet (tilt lock valve), spring
19 Bolt, cap
20 Plug, O-ring
21 Cap screw, spring seat, spring
22 Plate, wiper, O-ring
23 Plate, wiper, O-ring
24 Attachment valve spool

## FLOW REGULATOR VALVE

Disassembly




Disassembly sequence

1 Set bolt
2 Sleeve [O-ring]
3 Piston [spring pin, washer, spring, valve]
4 Spring
5 Spring guide [O-ring]
6 Valve body

Inspection

(1) Check the spring for fatigue.

(2) Check the sliding and contact surfaces of valve and piston for damage.

(3) Check the sliding surfaces of piston and valve body for damage.

**NOTE**

Replace the flow regulator valve as an assembly if any part is defective.

Reassembly

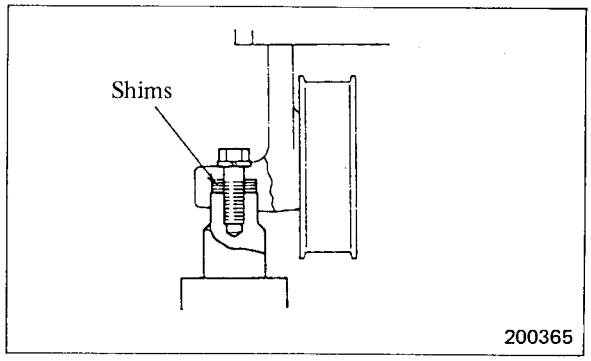
To reassemble, follow the reverse of disassembly sequence.

(2) Remove the stopper bolt at the top of lift cylinder which stopped first. Retract the piston rod by operating the lift control lever and insert shims at the top of piston rod end.

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

(4) Raise the inner mast again to make sure there is no time lag in stopping between the piston rods, right and left.

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




## TESTING

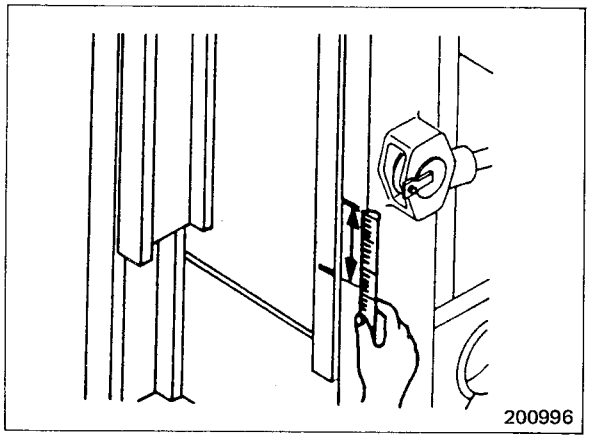
(1) Drop test

(a) Pick up a load equal to the rated capacity, tilt the mast to a vertical position, lift the fork 1 to 1.5 meters (3.3 to 4.9 ft), and stop the engine.

(b) Scribe a reference line on the mast, and measure the amount of drop (retraction of the piston rods) for 15 minutes.

Unit: mm (in.)

| | |
|---|---|
| Amount of drop (retraction of piston rods) with rated load for 15 minutes | 50 (2), maximum |



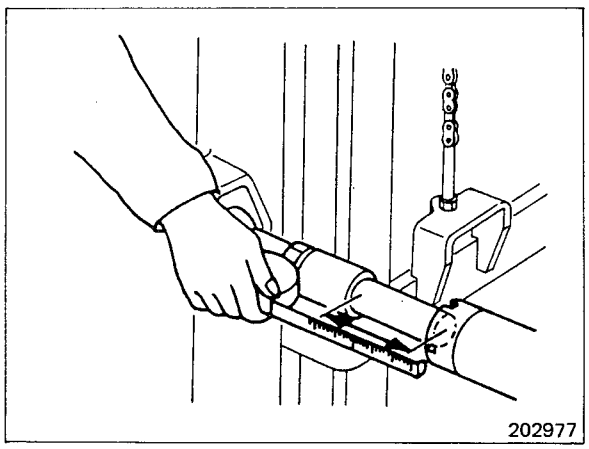

(2) Forward tilt test

(a) Pick up a load equal to the rated capacity, tilt the mast to a vertical position, lift the fork about 50 cm (20 in.), and stop the engine.

(b) Measure the extension of tilt cylinder piston rods for 15 minutes.

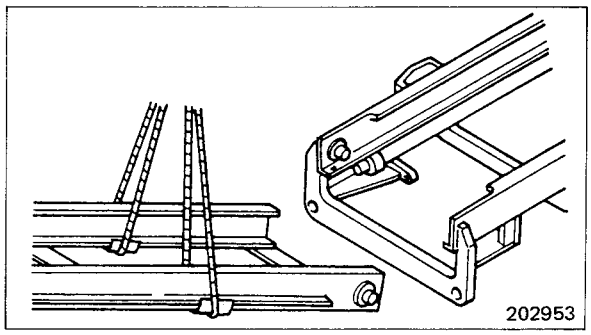
Unit: mm (in.)

| | |
|---|---|
| Amount of forward tilt (extension of piston rods) with rated load for 15 minutes | 30 (1.2), maximum |



(c) Slide the inner mast to the lower side, and remove the main rollers for outer and inner masts and the mast strips.

(d) After removing the main rollers, withdraw the inner mast from the outer mast by dodging the main roller shafts alternately.




Inspection and Repair

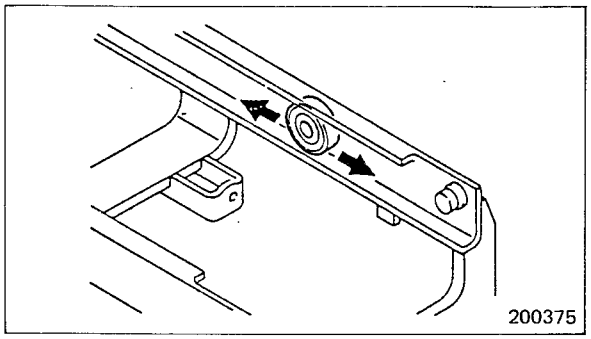
(1) Mast

(a) Check each roller for seizure, wear or cracks.

(b) Check each roller for flat spots on rolling surface.

(c) Check the mast member and the welds of crossmembers, pins and supports for cracks.

(d) Check the mast support bushings for wear or other defects.

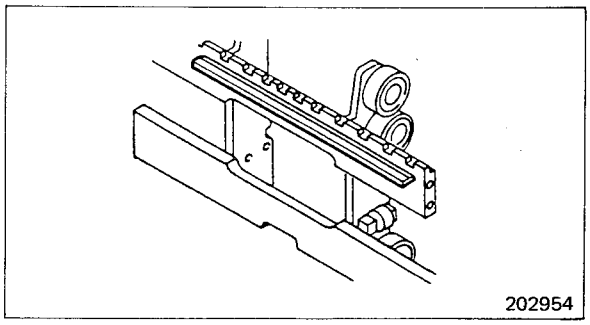



(2) Lift bracket

(a) Check the main and side rollers for seizure, wear or cracks.

(b) Check the welds for cracks.

(c) Check the finger bar for distortion.




Unit: mm (in.)

| | | |
|---|---|---|
| Distortion of finger bar | A | 5 (0.20), maximum |

(3) Chains, chain wheels and chain wheel supports

(a) Measure the length of each chain to make sure that two chains are equal in length. Also check the chains for wear, breakage, link binding or twist.

(b) Check the chain anchor bolts for cracks or damaged threads.

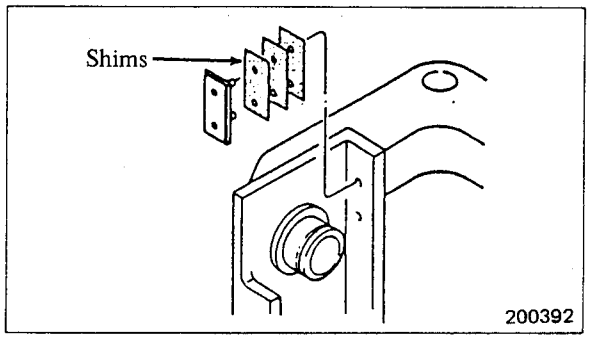
Unit: mm (in.)

| | | FG35/FG40 FD35/FD40 | FD45/FD50C/FD50 |
|---|---|---|---|
| Length of lift chain (20 links) | A | 508 (20.0) | 635 (25.0) |
| | B | 523 (20.6) | 654 (25.7) |

(v) Now, the main rollers can be removed from the inner and outer masts. Before removing the rollers, remove the mast strips and shims.

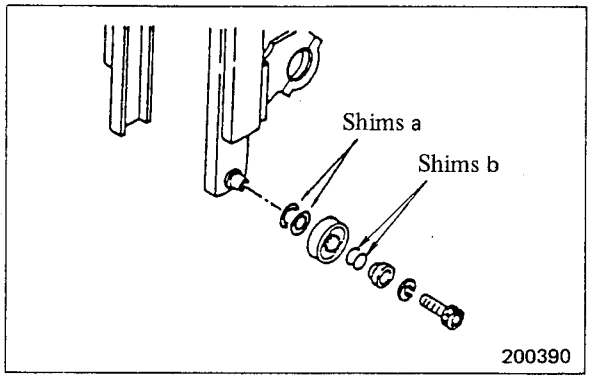
(e) If the longitudinal clearance of upper main rollers exceeds the assembly standard, increase the thickness of mast strip shims.

(f) If the longitudinal clearance of lower main rollers exceeds the assembly standard, replace the rollers with oversize rollers.




(g) If the lateral clearance exceeds the assembly standard, remove the main roller, increase the thickness of shims a and decrease the same thickness of shims b, then install the main roller.

(h) After adjusting the lift bracket and inner mast, slowly raise and lower the mast and lift bracket to make sure they move smoothly.



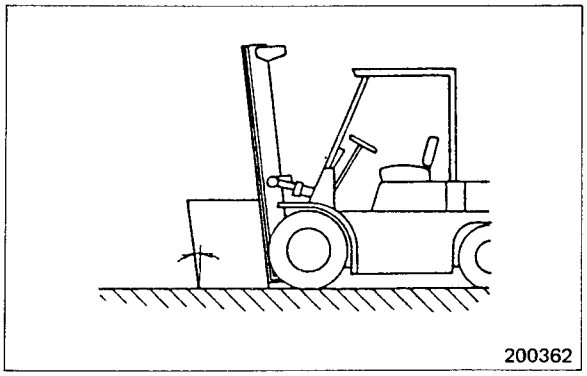

(4) Mast tilt angle adjustment

(a) Adjust the tire pressure correctly, and keep the truck level.

(b) Tilt the mast all the way backward, and stop the engine.

(c) Measure the backward tilt angle of the mast at both sides.

(d) To adjust the tilt angle, loosen the lock nut of tilt cylinder rod, and turn the rod so that there is no difference in stroke between the cylinders, right and left.




**NOTE**

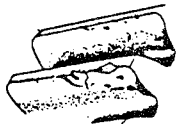
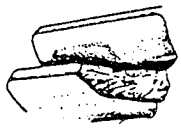
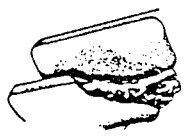
It is not necessary to adjust the forward tilt angle if the backward tilt angle is properly adjusted.

| Complaint | Possible cause | Remedy |
|---|---|---|
| Will vibrate | a) Facings glazed or hardened | Replace disc. |
| | b) Facings dirty with oil or grease | Wipe with cloth soaked with suitable cleaning solvent or alcohol. |
| | c) Torsion springs damaged | Replace disc. |
| | d) Facings not contacting uniformly or disc wobbles | Replace disc. |
| | e) Disc rivets loose | Replace. |
| | f) Pressure plate or flywheel warped | Repair or replace. |
| Will chatter | a) Facings dirty with oil or grease | Wipe with cloth soaked with suitable cleaning solvent or alcohol. |
| | b) Facings worn or rivets loose | Replace disc. |
| | c) Rivets exposed | Replace disc. |
| | d) Torsion springs damaged | Replace disc. |
| | e) Release levers abnormally worn | Replace. |
| Oil leaks | a) Engine oil leaking into clutch housing (dry-type clutch), or hydraulic oil and engine oil mixed (wet-type clutch) because | |
| | • Engine rear seal damaged | Replace. |
| | • Seal case gasket damaged | Replace. |
| | b) Oil leaking past joint between engine cylinder block and rear plate | Replace gasket. |
| Pedal will give resistance | a) Vacuum hose joint loose | Retighten. |
| | b) Vacuum hose flat or ruptured | Replace. |
| | c) Vacuum pump malfunctioning | Repair or replace. |
| | d) Alternator drive belt loose | Readjust. |
| | e) Vacuum valve or atmospheric pressure valve dirty or damaged in clutch booster | Repair or replace. |
| | f) Clutch booster element clogged | Clean or replace. |
| | g) Clutch booster diaphragm defective | Replace. |
| | h) Clutch cylinder internally dirty | Clean and lubricate. |
| Spongy pedal | a) Lack of clutch cylinder fluid | Refill. |
| | b) Clutch cylinder fluid leaks | Repair or replace. |
| | c) Air in system | Bleed. |

## STEERING SYSTEM

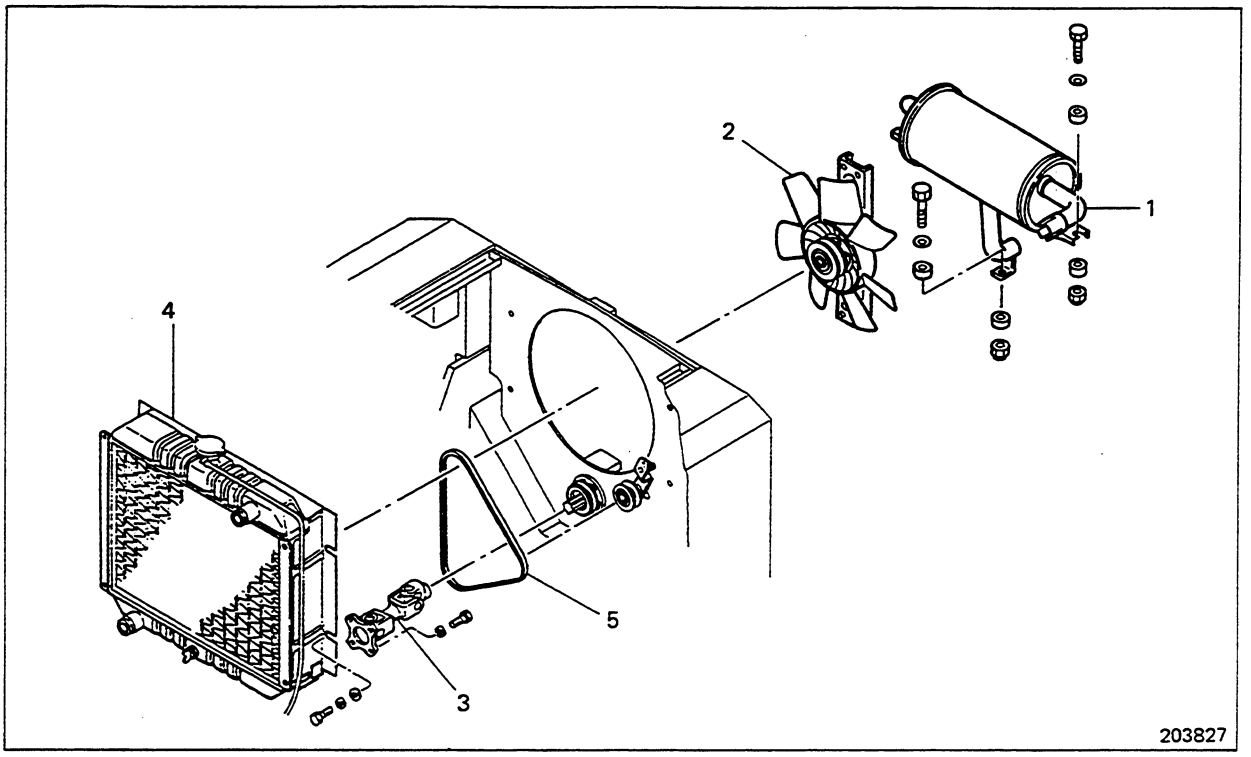
| Complaint | Possible cause | | Remedy |
|---|---|---|---|
| Hard steering | If flow divider is out of order | a) No steering flow, because of: | |
| | | • Clogged orifice in spool | Clean. |
| | | • Fatigued spool spring | Replace. |
| | | b) Relief valve out of order, because of: | |
| | | • Reduced relief pressure | Readjust. |
| | | • Damaged valve seat | Replace valve assembly. |
| | | • Fatigued spring | Replace spring and re-adjust relief setting. |
| | | c) Oil pressure leaking through relief valve due to broken O-ring on valve body | Replace O-ring. |
| | If steering gear is defective | a) No pressure rise, because of: | |
| | | • Loose check valve | Retighten. |
| | | • Loose lock nut | Check caulking and re-tighten. |
| | | b) Bearings defective | Replace. |
| | | c) Erratic movement of valve spool | Clean or replace assembly. |
| | | d) Spring retainer defective | Clean or replace. |
| | | e) Ball screw assembly defective | Clean or replace assembly. |
| | | f) Sector shaft adjusting screw too tight | Readjust. |
| | | g) Gears meshing improperly | Disassemble and readjust. |
| | Pipe or tube flattened, or restriction in oil line | | Clean or replace. |
| Poor steering reaction | If steering gear is defective | a) Bearings defective | Replace. |
| | | b) Erratic movement of valve spool | Clean or replace assembly. |
| | | c) Spring retainer defective | Clean or replace. |
| | | d) Ball screw assembly defective | Clean or replace assembly |
| | | e) Gears meshing improperly | Disassemble and readjust. |
| | Pipe or tube flattened, or restriction in oil line | | Clean or replace. |
| Truck wanders | If steering gear is defective | a) Steering lock nut loose | Retighten. |
| | | b) Spring fatigued | Replace. |
| | | c) Improper backlash | Readjust. |
| | Pipe or tube flattened, or restriction in oil line | | Clean or replace. |

| Ref. No. | Part number | Description | Applicable model / To be used for: | FG35/ FG40 | FD35 thru FD50 |
|---|---|---|---|---|---|
| 23 | 64309-15413 | Spring hook | Return spring installation | ○ | ○ |
| 24 | 91268-10600 | Puller | Steering wheel removal | ○ | ○ |
| 25 | 91268-03200 | Puller | Steering column needle roller bearing removal | ○ | ○ |
| 26 | 91868-00700 | Guide | Power cylinder piston installation | ○ | ○ |
| 27 | 91868-01100 | Rod cap | Power cylinder guide bushing installation | ○ | ○ |
| 28 | 91268-03300 | Plate | Steering gear control valve assembly | ○ | ○ |
| 29 | 91268-01700 | Connector | Power steering main pressure testing (to be used in combination with 64309-17701 gauge kit) | ○ | ○ |
| 30 | 09305-00880 | Hook wrench | Tilt cylinder bushing removal/installation | ○ | ○ |

| Check: | For (item or defect): | How |
|---|---|---|
| Gears | c) Abrasive wear (caused by fine particles carried in lubricant)  | Visually. |
| | d) Overload wear  | Visually. |
| | e) Pitting  | Visually. |
| | f) Spalling  | Visually. |
| | g) Overload breakage  | Visually. |
| | h) Fatigue breakage  | Visually. |

| Item \ Truck model | | | FG35 {FD35} | FG40 {FD40} | FD45 | FD50C | FD50 |
|---|---|---|---|---|---|---|---|
| Engine | Valve clearance | Intake valves, mm [in.] | 6G72-32FD: 0.25 [0.009 8] (hot)<br>S6S: 0.25 [0.009 8] (cold) | | | | |
| | | Exhaust valves, mm [in.] | | | | | |
| | Ignition | | 6G72-32FD: Spark<br>S6S: Compression | | | | |
| | Firing order | | 6G72-32FD: 1 – 2 – 3 – 4 – 5 – 6<br>S6S: 1 – 5 – 3 – 6 – 2 – 4 | | | | |
| | Ignition or injection timing, BTDC | | 6G72-32FD: 5°<br>S6S: 19° | | | | |
| | Fuel tank capacity, liter [U.S. gal] | | 105 [27.7] | | 125 [33] | | |
| | No-load minimum speed, rpm | | 6G72-32FD: 600 to 650<br>S6S: 650 to 700 | | | | |
| | No-load maximum speed, rpm | | 6G72-32FD: 2 650 to 2 700<br>S6S: 2 600 to 2 650 | | | | |
| Ignition system (6G72-32FD) | Ignition coil | Type | Mold | | | | |
| | | Manufacturer | Diamond Electric | | | | |
| | Distributor | Type | Pointless | | | | |
| | | Manufacturer | Mitsubishi Electric Corporation | | | | |
| | | Type of spark advance mechanism | Centrifugal-vacuum | | | | |
| | Spark plug | Model | W16EX-U/BP5ES | | | | |
| | | Manufacturer | Nippon Denso and NGK | | | | |
| | | Size, mm [in.] | 14 [0.55] | | | | |
| | | Gap, mm [in.] | 0.7 to 0.8 [0.028 to 0.031] | | | | |
| Fuel system (6G72-32FD) | Carburetor | Type | Downdraft | | | | |
| | | Manufacturer | Aisan Kogyo | | | | |
| | Governor | Type | Pneumatic | | | | |
| | | Manufacturer | Mikuni Kogyo | | | | |
| | Fuel pump | Type | Electromagnetic plunger | | | | |
| | | Manufacturer | Jidosha Kiki | | | | |
| | Air cleaner | Type × number | Cyclone with paper element × 1 | | | | |
| | | Manufacturer | Nippon Rokaki | | | | |
| Fuel system (S6S) | Fuel injection pump | Type | Bosch | | | | |
| | | Manufacturer | Nippon Denso | | | | |
| | | Plunger diam., mm [in.] | 6.5 [0.256] | | | | |
| | | Cam lift (one side), mm [in.] | 8 [0.31] | | | | |
| | Fuel injection nozzles | Type | Throttle | | | | |
| | | Spray holes, diam., mm [in.] | 1.0 [0.04] | | | | |
| | | Injection pressure, MPa (kgf/cm$^2$) [psi] | 13.7 (140) [1 991] | | | | |

2. Method by removing counterweight




Removal sequence

1 Muffler
2 Fan assembly
3 Universal joint
4 Radiator
5 Belt

Start by:

(1) remove the radiator cover.

(2) remove the counterweight mounting bolts. Attach a hoist to the counterweight and lift it off.

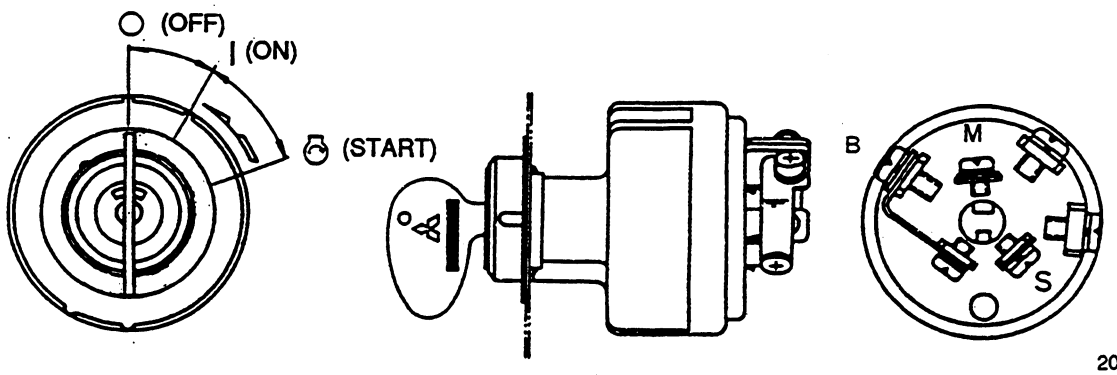
**NOTE**

Check the weight of counterweight in attaching the hoist.

## 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

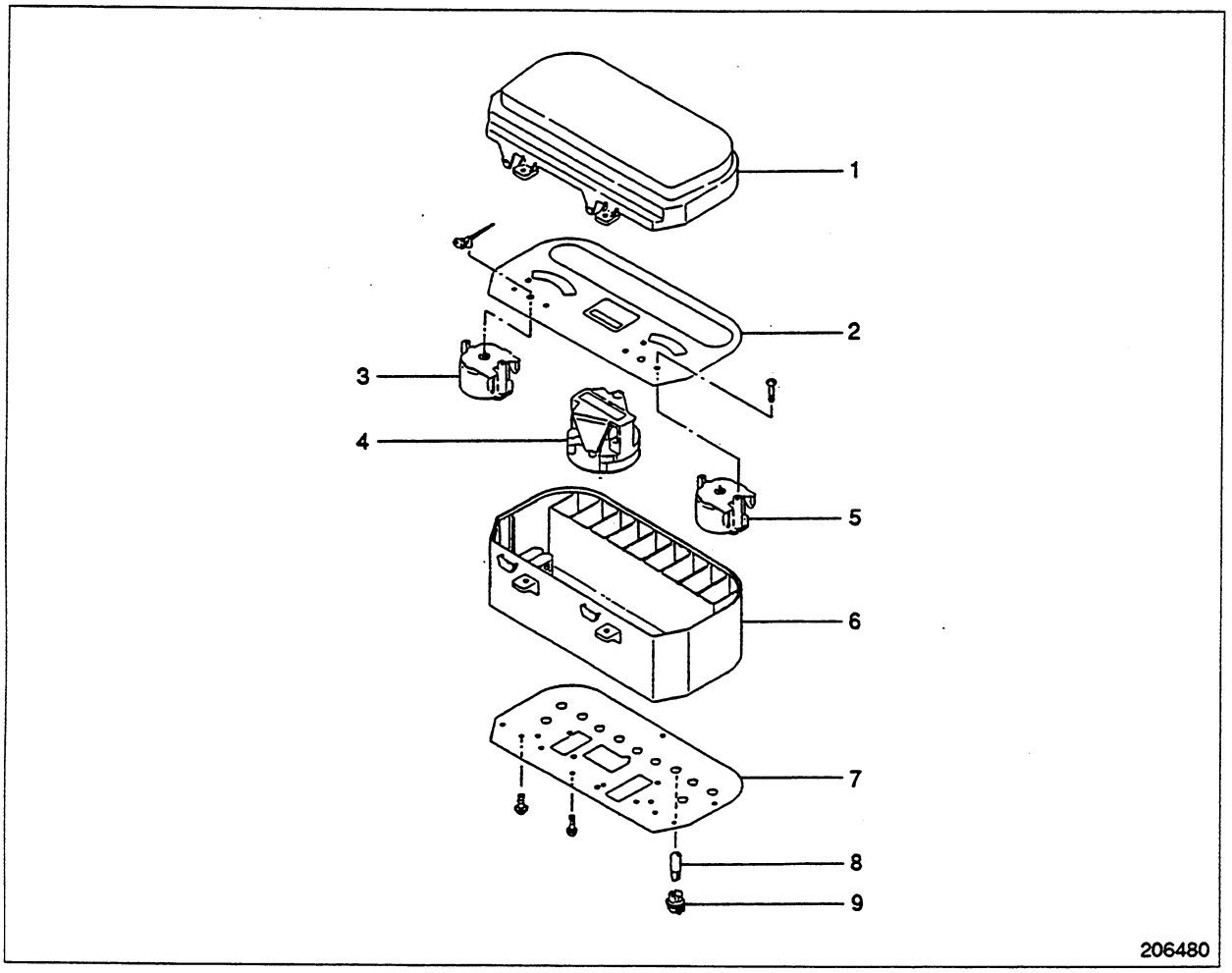
| Terminal / Component / Key position | B | M | S |
|---|---|---|---|
| | Fuse box, battery, alternator | Fuse box, fuel-cut solenoid | Starter, neutral switch (powershift transmission models) |
| (OFF) | ○ | | |
| I (ON) | ○—— | ——○ | |
| (START) | ○—— | ——○—— | ——○ |

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) | ○—— | ——○—— | ——○ |

## Combination Meter

### Disassembly




### Sequence

1 Instrument panel
2 Dial
3 Engine coolant temperature gauge
4 Service hour meter
5 Fuel gauge
6 Meter case
7 Printed circuit
8 Bulb
9 Socket

**⚠ CAUTION**

Be careful not to damage the printed circuit when disassembling the combination meter.

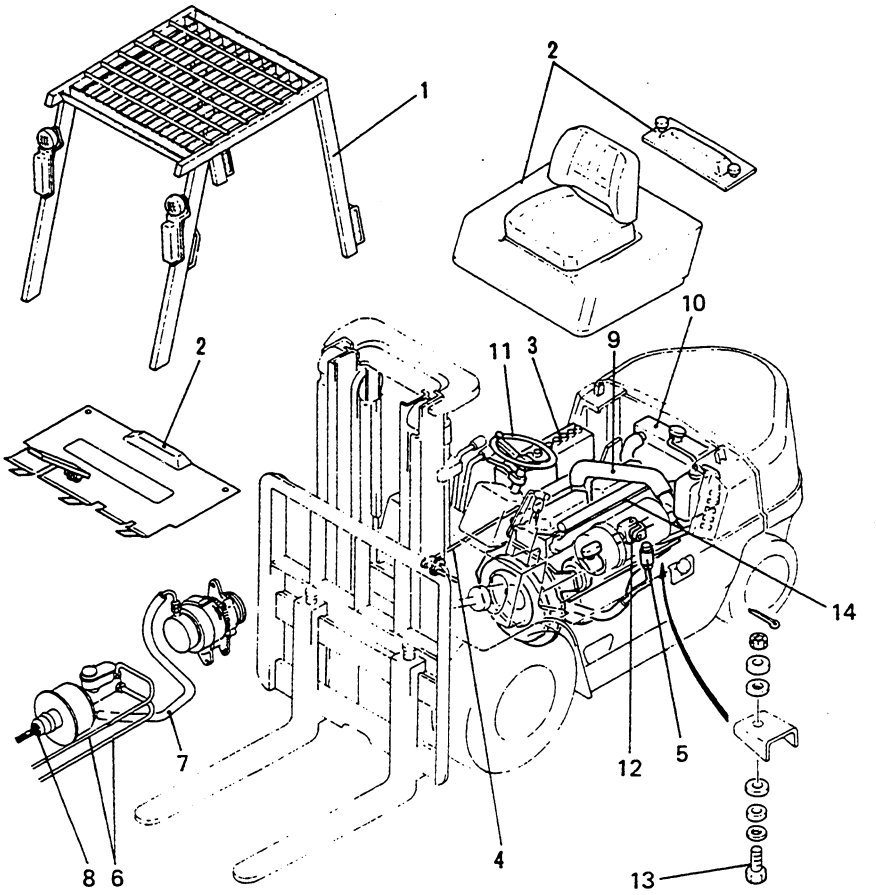
### Reassembly

To reassemble the combination meter, follow the reverse of disassembly procedure.

### Bulb replacement

For bulb replacement, remove the socket from the printed circuit by turning it to the left. For configuration of the indicator lights, refer to "OK Monitor."

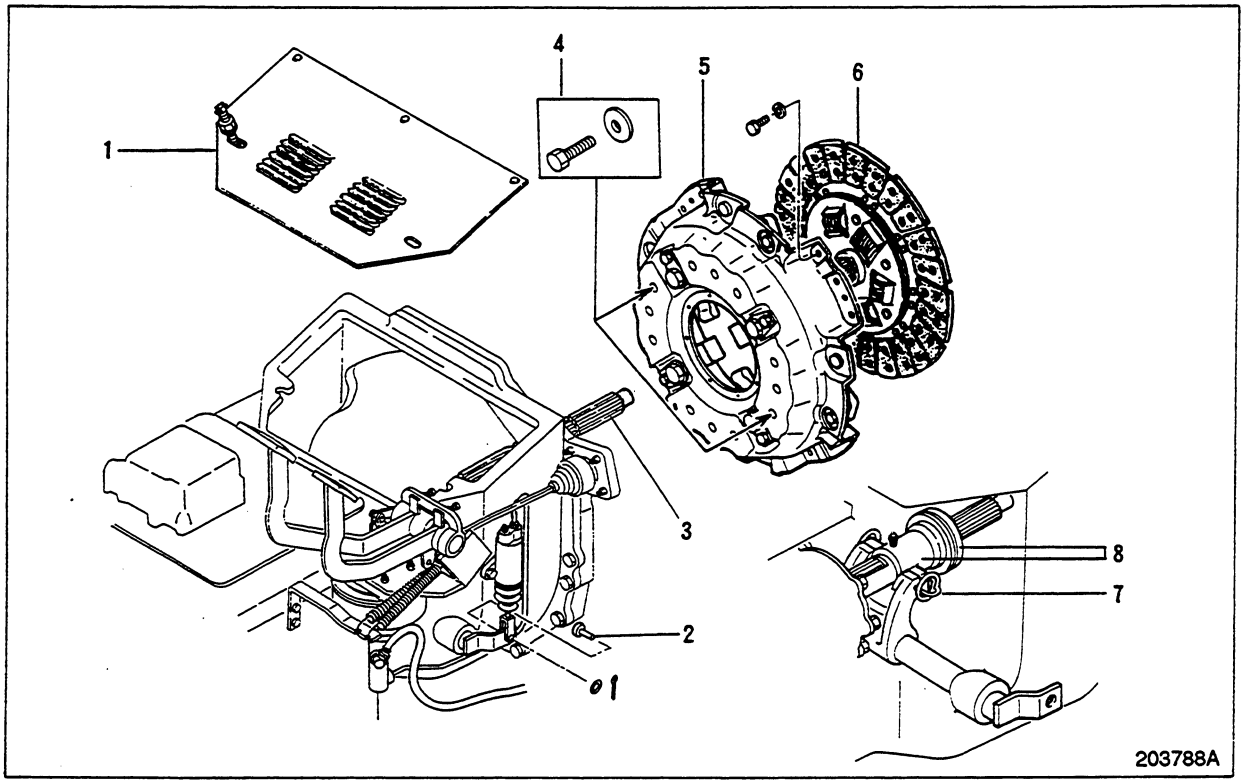
Removal of Engine as a Single Unit




Removal sequence

1 Lamp harnesses, overhead guard
2 Radiator cover, seat, engine cover, floor plate
3 Battery, harnesses connected between engine and transmission
4 Fuel hose, accelerator pedal linkage
5 Clutch reserve tank (manual transmission models)
6 Brake pipe
7 Clutch booster vacuum hose
8 Brake booster turnbuckle
9 Air cleaner rubber hose, exhaust pipe
10 Radiator hoses, reserve tank, torque converter oil hose (powershift transmission models), radiator
11 Steering wheel
12 Universal joint
13 Engine mounting bolt
14 Engine assembly

Disassembly




Disassembly sequence

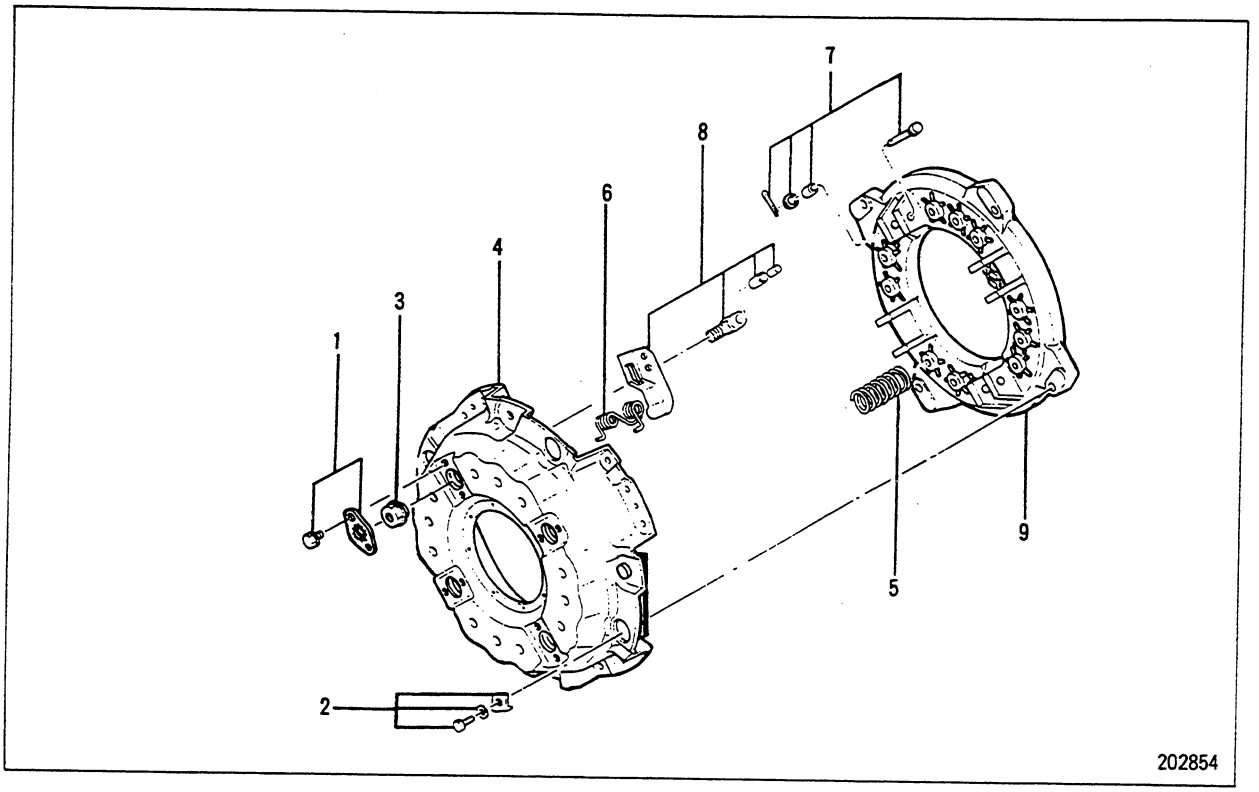
1 Clutch cover
2 Pin
3 Input shaft, stopper ring
4 Bolts, washers (special tool)
5 Pressure plate assembly
6 Clutch disc assembly
7 Spring
8 Shifter and release bearing

**NOTE**

It is not necessary to dismount the power train from the truck for replacement of the pressure plate, clutch disc and shifter of the dry type clutch.

## PRESSURE PLATE ASSEMBLY

Disassembly

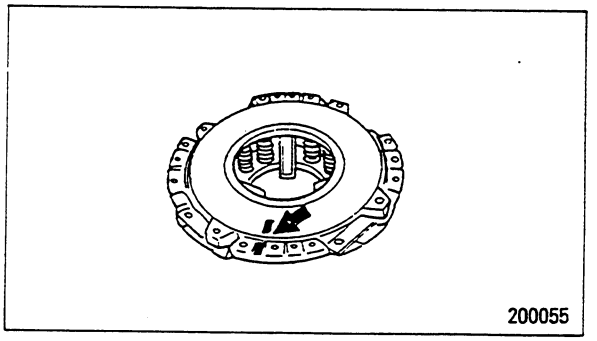



Disassembly sequence

1 Lock plate
2 Washer
3 Support nut
4 Clutch cover
5 Pressure spring
6 Return spring
7 Split pin, washer, pin
8 Release lever
[lever support assembly, pin]
9 Pressure plate

Suggestions for disassembly

(1) Make a mark across the clutch cover and pressure plate in advance.



Bleeding clutch hydraulic system

Use two men - one at the clutch pedal and the other at the master cylinder reservoir - to bleed the hydraulic system of the clutch. Keep the engine idling during bleeding operation.

(1) Fill the reservoir with fluid (Fuso Brake Fluid). Always keep the reservoir more than half full of the fluid during bleeding operation.

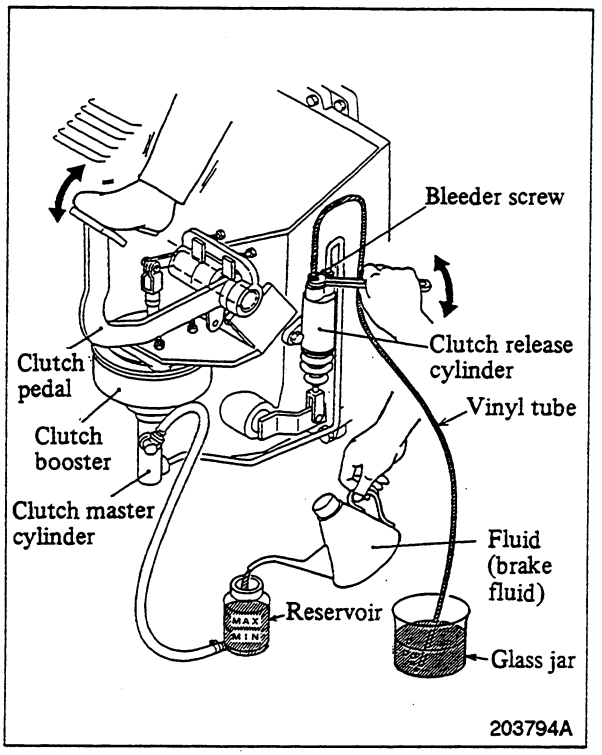
(2) Remove the bleeder cap. Connect a transparent vinyl tube (whose inside diameter is 6 mm [0.24 in.]) to the bleeder screw with the other end of the tube put in a glass jar filled with the fluid. (Make sure the end of the tube is below the fluid level in the jar.)

(3) Have someone get into the truck and pump the clutch pedal full stroke several times, allowing it to return slowly, then keep the pedal depressed. Loosen the bleeder screw (whose size is 10 mm [0.39 in.]) to allow the fluid to flow into the jar.

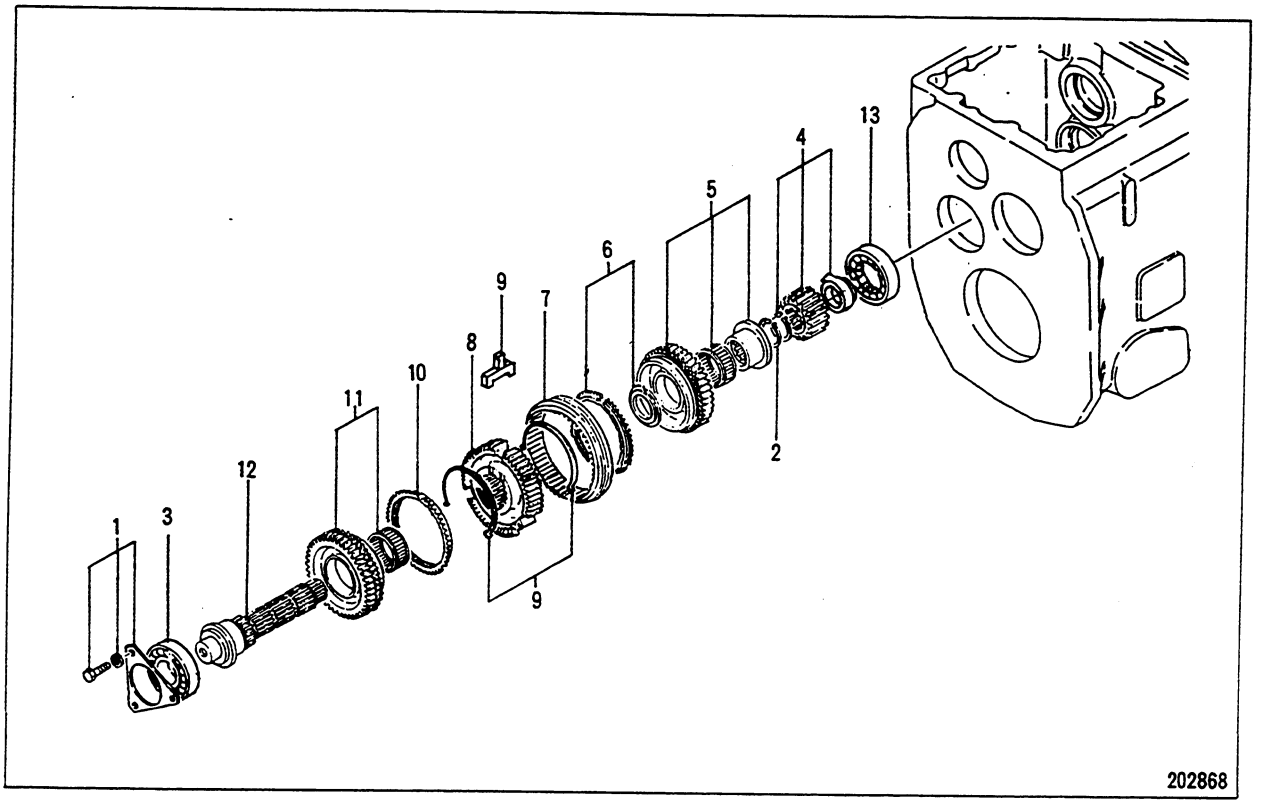
(4) Tighten the bleeder screw and release the pedal slowly.

(5) Repeat Steps (3) and (4) above until the fluid flows from the vinyl tube into the jar in a solid stream that is free of air bubbles.

(6) Replace the bleeder cap and fill the reservoir with the fluid up to the specified level.



Countershaft (3rd Shaft)




Disassembly sequence

1 Cover [bolts, washers]
2 Snap ring
3 Ball bearing
4 Countergear, roller bearing (inner), snap ring
5 Sleeve, needle roller bearing, forward gear
6 Spacer, ring
7 Sleeve
8 Hub
9 Spring, key
10 Ring
11 Reverse gear, needle roller bearing
12 Shaft
13 Roller bearing (outer)

**NOTE**

The outer race of roller bearing 13 will be left in the transmission case.

# POWERSHIFT TRANSMISSIONS

Turbine assembly

(1) Check the blades for cracks.

(2) Check the fit of turbine boss in the runner.

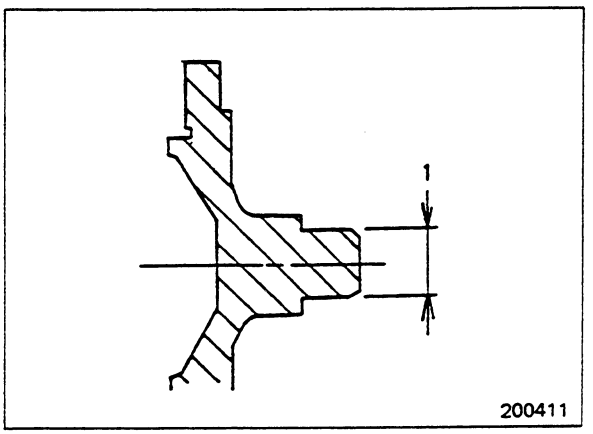
(3) Check the turbine boss splines for wear or other defects.

Pilot boss

Check the portion in contact with the pilot bearing for wear or other defects.

Unit: mm [in.]

| Item | | FG35/FG40 FD35 thru FD50 |
|---|---|---|
| Diameter of portion in contact with pilot bearing 1 | A | $20^{-0.007}_{-0.020}$ [$0.78^{-0.000\,28}_{-0.000\,79}$] |
| | B | 19.85 [0.781 5] |




Flexible plate

(1) After installing flexible plate, measure the face runout of the plate with a dial gauge. Replace the plate if the runout exceeds the service limit.

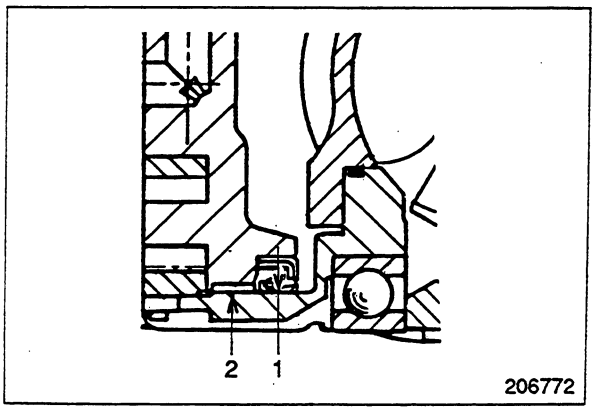
Unit: mm [in.]

| Item | | FG35/FG40 FD35 thru FD50 |
|---|---|---|
| Face runout of flexible plate | A | 0.2 [0.008] |
| | B | 0.5 [0.020] |

Pump boss

Unit: mm [in.]

| Item | | FG35/FG40 FD35 thru FD50 |
|---|---|---|
| Diameter of portion in contact with oil seal and bushing 1 | A | $70^{0}_{-0.046}$ [$2.76^{0}_{-0.001\,81}$] |
| | B | 69.90 [2.752 0] |
| Inside diameter of boss bushing 2 | A | 70.06 to 70.10 [2.758 3 to 2.759 8] |
| | B | 70.3 [2.768] |




Stator shaft

(1) Check to make sure that bearings fit tight to the shaft.

(2) Check the splines for wear or damage.

(3) Check the oil passages for clogging.

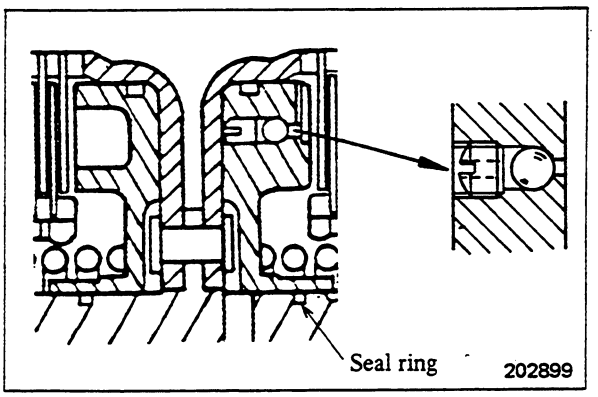
Clutch pistons

(1) Shake each piston, making sure that the balls move freely in the piston.

**NOTE**

Do not overhaul the pistons unless they are defective.

(2) Check the seal rings and their grooves for wear or damage.




Friction plates and mating plates

(1) Check for sign of seizure, uneven contact, warpage or excessive wear.

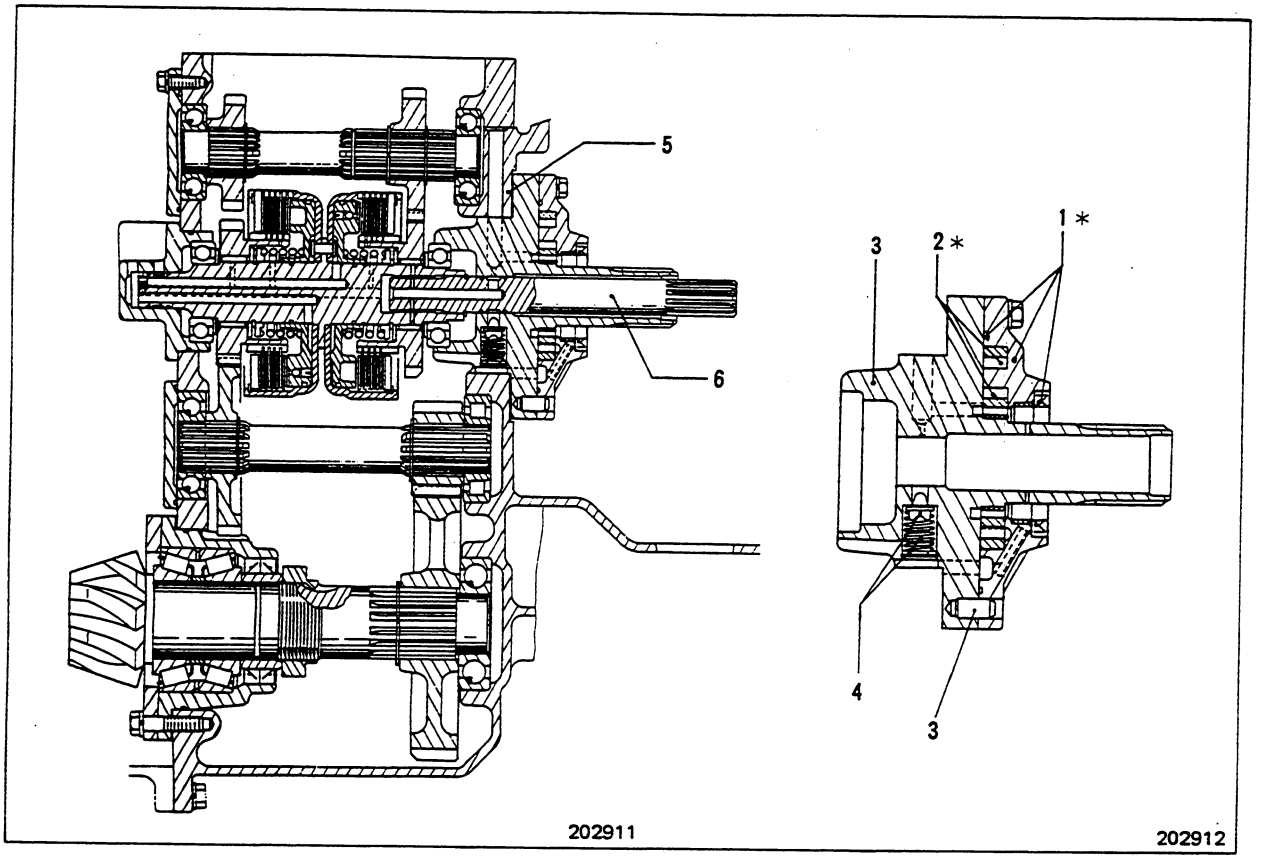
(2) Check the splines for wear or damage.

Clutch drums

(1) Check the mating plate sliding surfaces for wear or damage.

(2) Check the clutch piston sliding surfaces for wear or damage.

Pump body assembly




Reassembly sequence

6 → 5 → 3 → 4 → 2 * → 1 *

Suggestions for reassembly

(1) Install the pump body to the transmission case in assembled state.

(2) Put engine oil on the internal gear and drive gear 2 when installing them to pump body 1.

(3) Put LG2 grease on the oil seal and bushing of pump body 1.

(4) Upon reassembling, measure each gear backlash with a dial gauge.

Unit: mm [in.]

| | |
|---|---|
| Backlash of countergear and output gear | 0.14 to 0.27 [0.005 5 to 0.010 6] |
| Backlash of other gears | 0.14 to 0.26 [0.005 5 to 0.010 2] |

Control valve and strainer

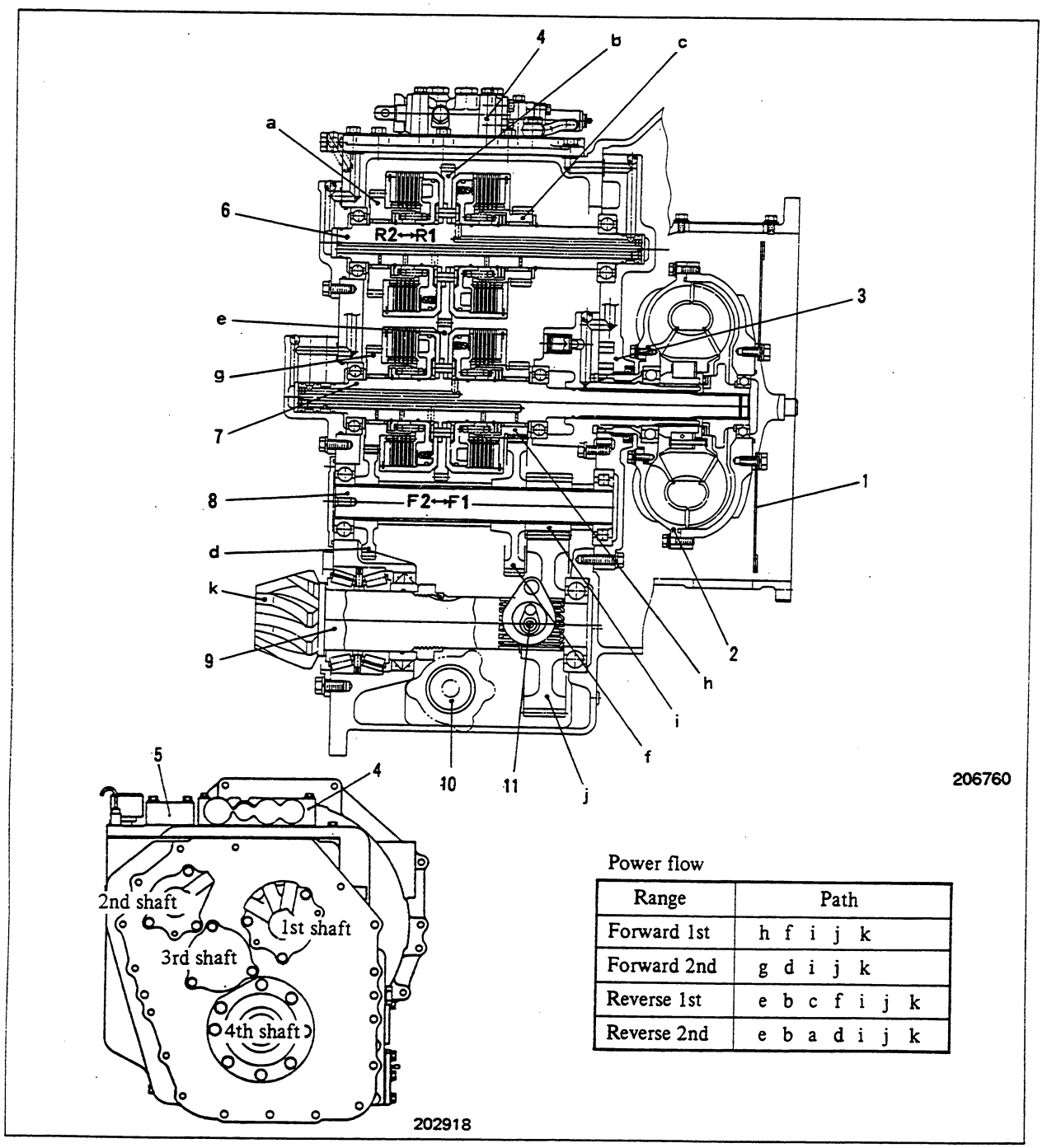
To reassemble, follow the reverse of disassembly sequence. Replace the gaskets.

# AUTOMATIC 2-SPEED TRANSMISSION (FD50C/FD50)

## (Optional for FG35/FG40 and FD35/FD40/FD45)

## DESCRIPTION

### Transmission




Power flow

| Range | Path |
|---|---|
| Forward 1st | h f i j k |
| Forward 2nd | g d i j k |
| Reverse 1st | e b c f i j k |
| Reverse 2nd | e b a d i j k |

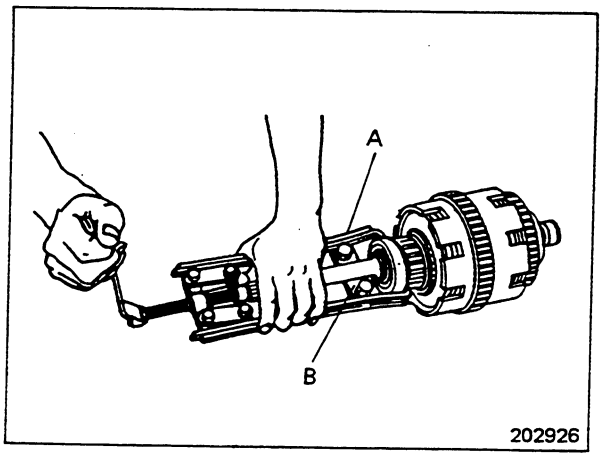
1 Flexible plate
2 Torque converter assembly
3 Pump body assembly
4 Control valve
5 Solenoid valve
6 Countershaft (2nd shaft)
7 Input shaft (1st shaft)
8 Countershaft (3rd shaft)
9 Output shaft (4th shaft)
10 Magnet strainer
11 Pulse generator

Suggestions for disassembly

(1) Removing input shaft ball bearing

Use the special tools to remove ball bearing 3 from the input shaft.

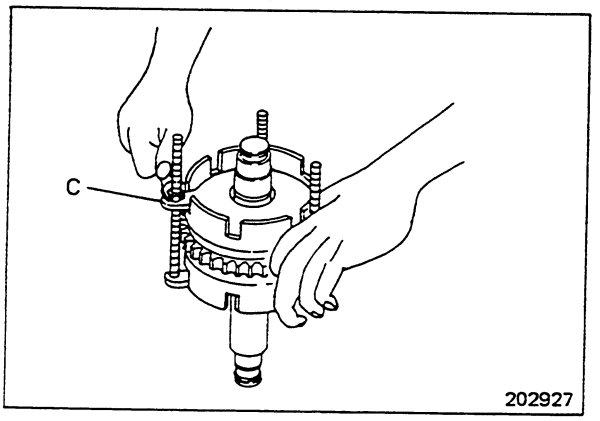
Special tools needed:
Puller A 91268-13810
Plate B 91268-13820




(2) Disassembling input shaft

Using the special tool or an arbor press, compress clutch spring 14, and remove snap ring 13.

Special tool needed:
Piston tool 91868-00200




(3) Clutch piston

Shake each piston 15, making sure that the balls move freely in the piston.

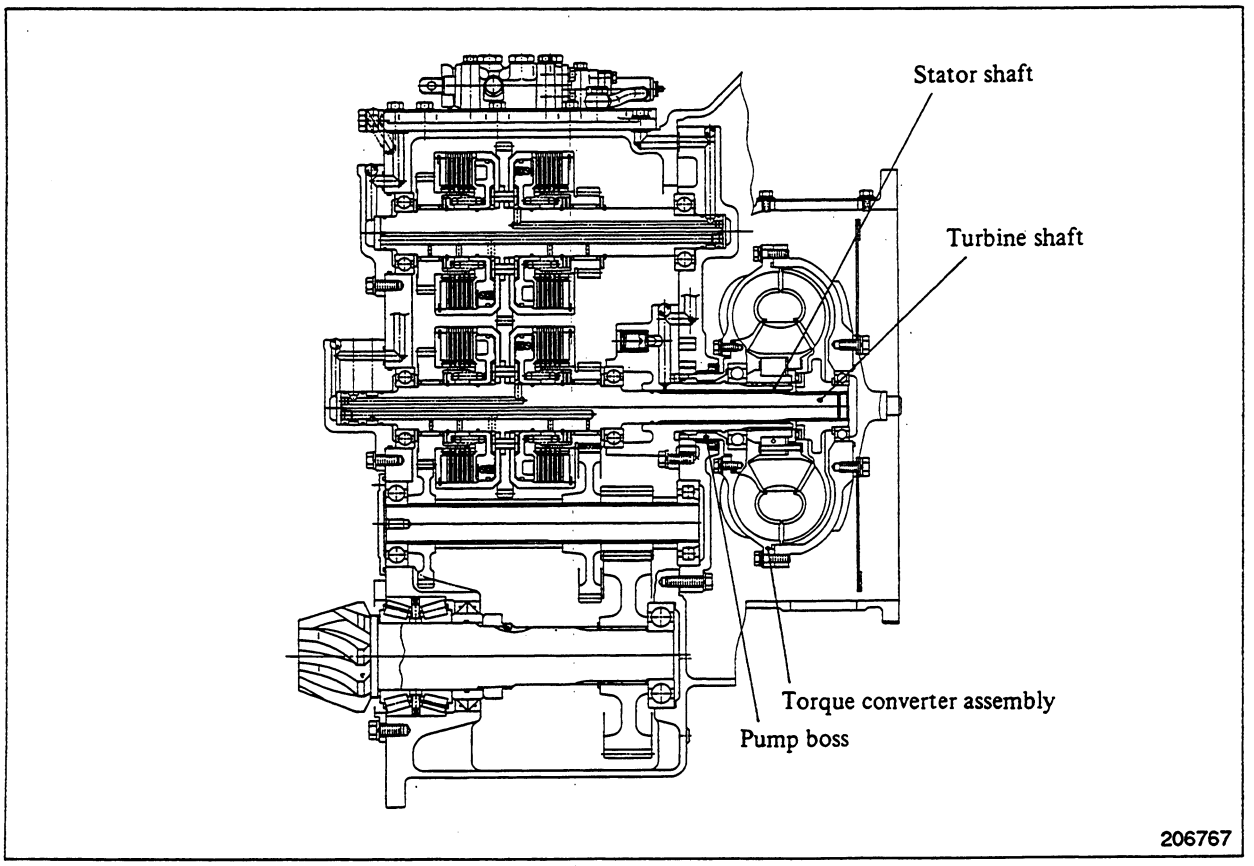
(3) Put LG2 grease on the oil seals fitted to the transmission case.

(4) Upon reassembling, measure each gear backlash with a dial gauge.

Unit: mm [in.]

| | |
|---|---|
| Backlash of 1st speed gear and forward 2nd speed gear | 0.14 to 0.23 [0.005 5 to 0.009 1] |
| Backlash of forward gear and reverse gear | 0.14 to 0.24 [0.005 5 to 0.009 4] |
| Backlash of countergear and output gear | 0.14 to 0.25 [0.005 5 to 0.009 8] |

Torque converter

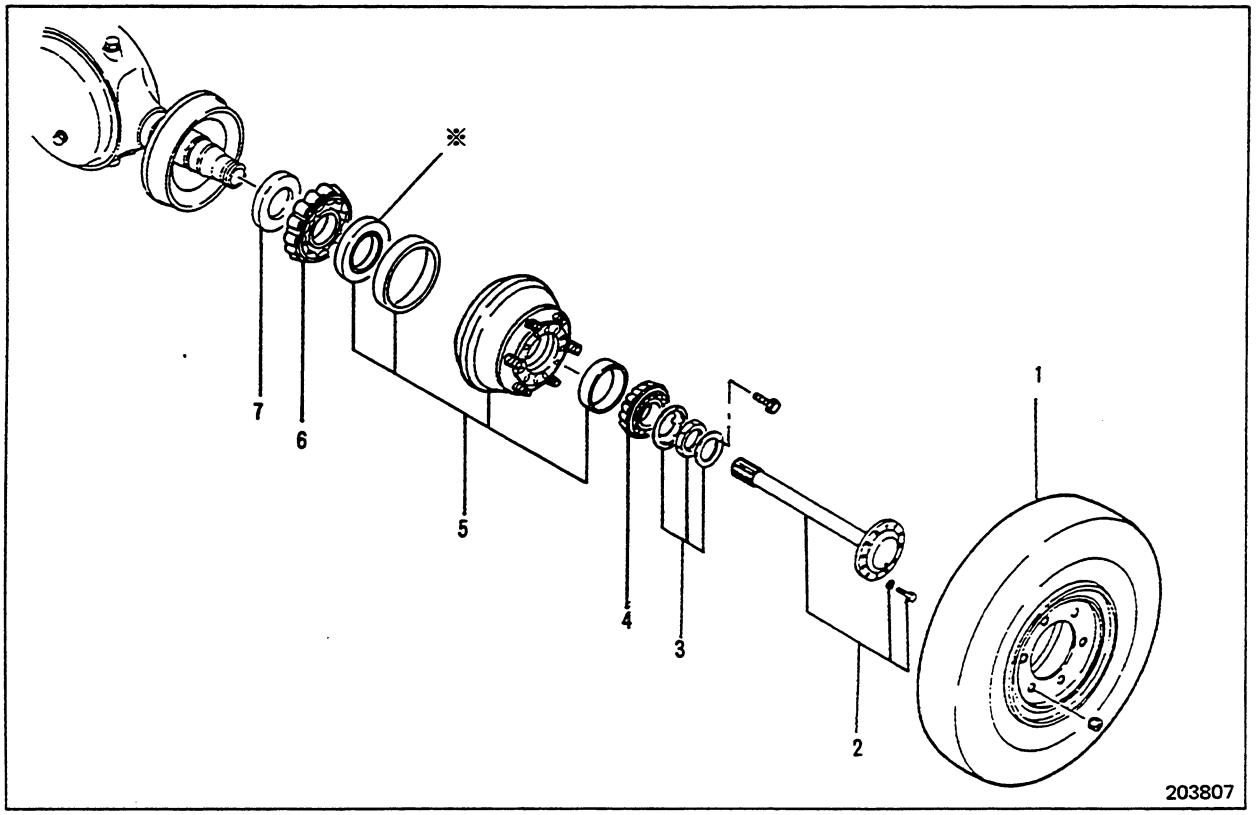



Reassembly

Install the torque converter assembly to the transmission.

## AXLE SHAFTS AND HUBS

Disassembly




Disassembly sequence

1 Front wheel
2 Axle shaft
3 Bolts, lock washers, lock nut, oil seal
4 Tapered roller bearing (inner)
5 Front hub and drum assembly [oil seal, tapered roller bearing]
6 Tapered roller bearing (inner)
7 Retainer

**NOTE**

The parts (※) to be changed periodically are involved in the repair kit.

Start by:

(1) remove the mast assembly. (For replacement of the front axle, make reference to MAST AND FORKS.)

(2) loosen the wheel nuts about two turns and jack up the truck.

(3) support the front end of the truck at both ends with stands or wood blocks to keep the truck at a level position.

(4) remove the front wheels.

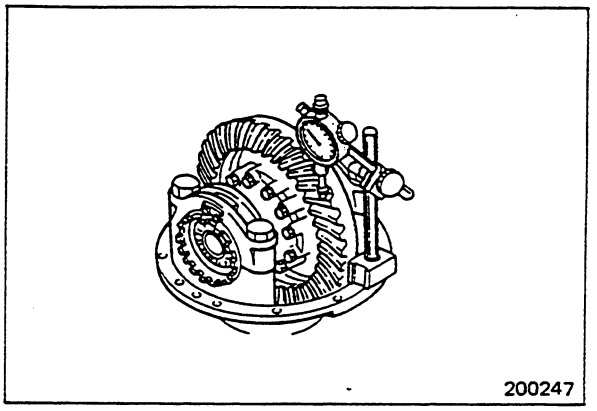
(5) drain oil from the differential.

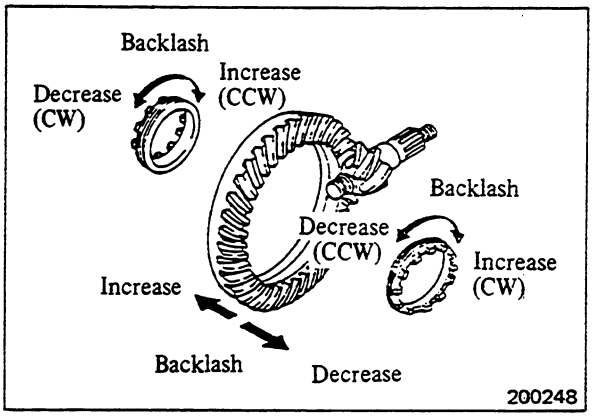
Backlash of reduction gear and pinion

The backlash is to be adjusted after the differential carrier assembly is installed to the transmission case.
Set up a dial gauge with its spindle pointing squarely to the tooth face of reduction gear. With the pinion held, move the gear back and forth to observe the gauge reading. To adjust the backlash, unscrew or screw the side bearing nuts.

Unit: mm [in.]

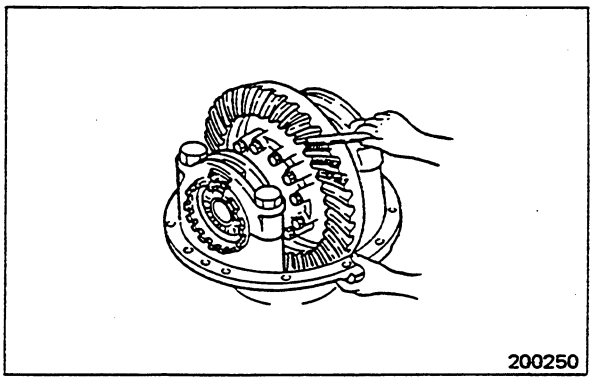
| Item | FG35/FG40<br>FD35/FD40/FD45 | FD50C<br>FD50 |
|---|---|---|
| Backlash of reduction gear with pinion | 0.25 to 0.33<br>[0.009 8 to 0.013 0] | 0.30 to 0.41<br>[0.011 8 to 0.016 1] |




Tooth contact pattern

Put a small amount of red lead on the three or four reduction gear teeth on both concave and convex faces. Press forward on the pinion, and rotate the reduction gear back and forth until a contact pattern is noted on both the concave and convex faces of the gear teeth. To adjust the tooth contact, refer to the following chart:



Inspection and Repair

(1) Kingpins and bellcrank pins

Check the pins for any surface flaws such as scratches and abnormal wear at their surfaces in contact with the bearings.

**NOTE**

If any pin has to be replaced, replace its needle roller bearing, too.

Unit: mm [in.]

| | | |
|---|---|---|
| Diameter of kingpins | A | $40^{0}_{-0.016}$ [$1.57^{0}_{-0.000\,63}$] |
| | B | 39.8 [1.57] |
| Diameter of bellcrank pin | A | $40^{0}_{-0.016}$ [$1.57^{0}_{-0.000\,63}$] |
| | B | 39.8 [1.57] |

(2) Knuckles

Check the kingpin hole for wear or damage. Also check the tapered hole for tie rod end for cracks or other defects.

(3) Bellcrank

Check the needle roller bearing hole for cracks, wear or other defects. Also check the tie rod end hole and the ball stud (for connecting with the drag link) for wear or cracks.

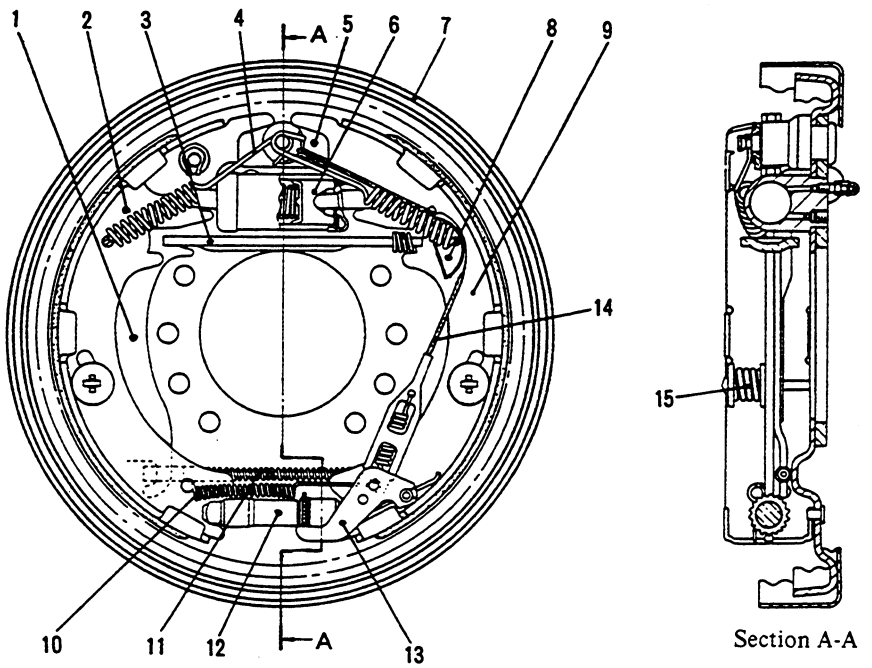
(4) Tie rod assembly

(a) Check each tie rod for wear or damage. Also check for distortion. Repair or replace a distorted tie rod.

(b) Check the threaded part of each ball stud for damage. Check each stud for cracks.

## Wheel Brakes

FG35/FG40
FD35/FD40/FD45



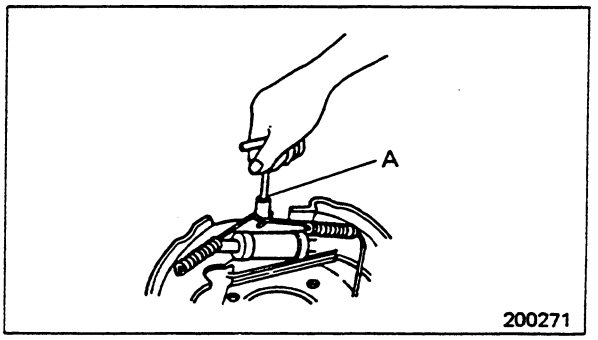

1 Parking brake lever
2 Shoe and lining (primary)
3 Strap
4 Return spring
5 Shoe guide plate
6 Wheel cylinder
7 Backing plate
8 Sheave
9 Shoe and lining (secondary)
10 Return spring
11 Parking brake cable
12 Adjusting screw
13 Adjusting lever
14 Fitting cable
15 Hold-down spring

Suggestions for disassembly

(1) Removing return springs

Using special tool A, remove the return springs from the shoe guide plate.

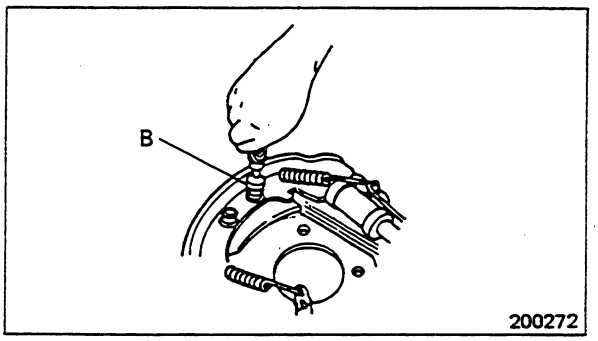
Special tool needed:
Spring remover 64309-15411




(2) Removing hold-down springs

Using special tool B, remove the hold-down springs from the backing plate.

Special tool needed:
Spring retainer 91868-00600




Inspection and Repair

(1) Backing plate

(a) Check for cracks.

(b) Check the bolts for tightening torque.

Unit: N·m (kgf·m) [lbf·ft]

| Item | FG35/FG40<br>FD35/FD40/FD45 | FD50C<br>FD50 |
|---|---|---|
| Tightening torque for backing plate bolts | 160 to 196<br>(16.3 to 20.0)<br>[118 to 145] | 238 to 284<br>(24.3 to 29.0)<br>[176 to 210] |

Brake Booster Test

1. Test method using no tester

The brake booster may be considered to be satisfactory if it meets the following three items of tests and requirements:

(1) Run the engine for 1 to 2 minutes, then stop it, and depress the brake pedal with normal operating effort several times to see how the pedal changes its stroke as you repeat depressing the pedal. If the pedal stroke decreases each time you depress the pedal, the booster is in satisfactory condition. No change in pedal stroke means that the booster is faulty.

(2) Depress the brake pedal several times with the engine stopped, then keep the pedal depressed, and start the engine. If the pedal goes down slightly when the engine is started, the booster is in good condition. The booster is faulty if the pedal fails to go down.

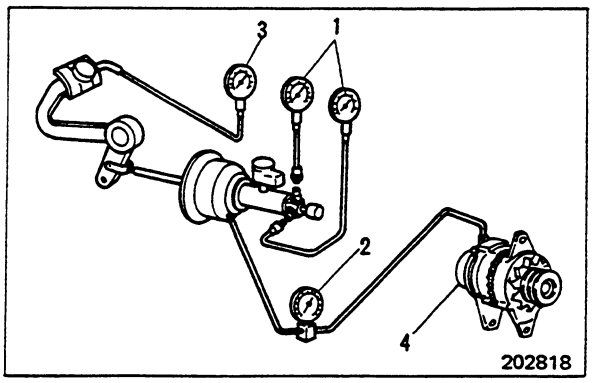
(3) Depress the brake pedal with the engine running. Under this condition, stop the engine, and keep the pedal depressed for about 30 seconds. If the pedal height will not change, the booster is in good condition.

2. Test method using a tester

Use a vacuum gauge, a pressure gauge and a force gauge. Bleed the pressure gauge, and proceed as follows:

(1) No-load air-tightness test

Start the engine, and run it until the vacuum gauge reads about 500 mmHg [20 in.Hg]. The booster is in good condition if the vacuum drop is less than 25 mmHg [1 in.Hg] for about 15 seconds after the engine has been stopped.




1 Pressure gauge
2 Vacuum gauge
3 Force gauge
4 Vacuum pump

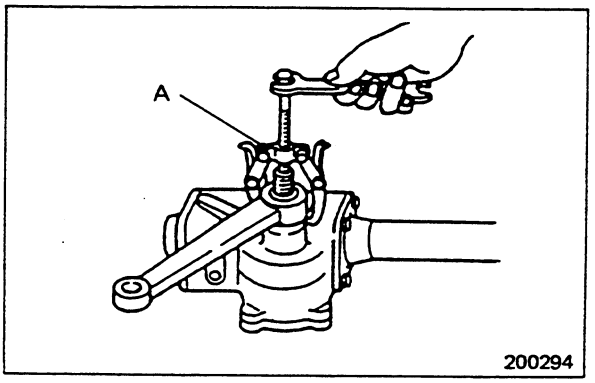
Suggestions for disassembly

(1) Removing pitman arm

Make a mark across the pitman arm and sector shaft. Using special tool A, remove the pitman arm from the sector shaft.

Special tool needed:
Pitman arm puller 91268-01800

A conventional puller may be used for removal of pitman arm.

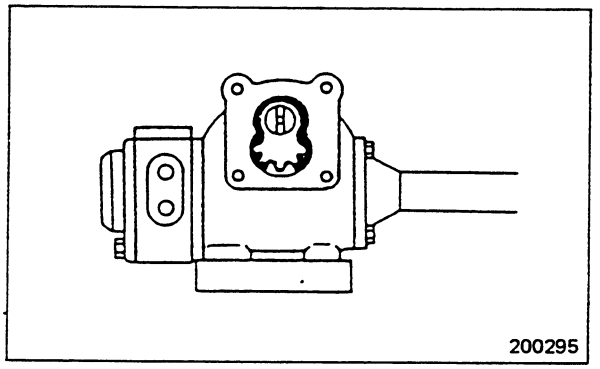



(2) Removing side cover

Turn the adjusting screw clockwise to remove the side cover.

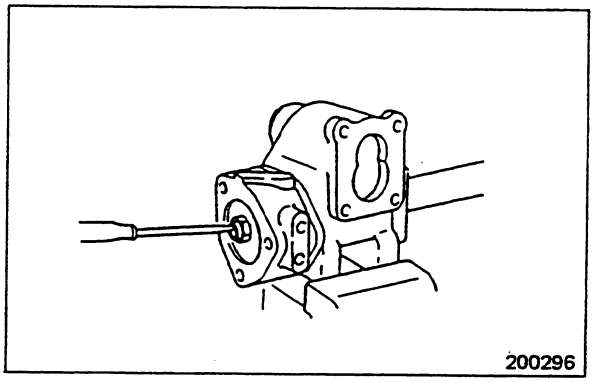
(3) Removing sector shaft

Rotate the worm to bring the sector shaft to the position shown, and lightly tap the serrated end of the shaft to force it out of the box.



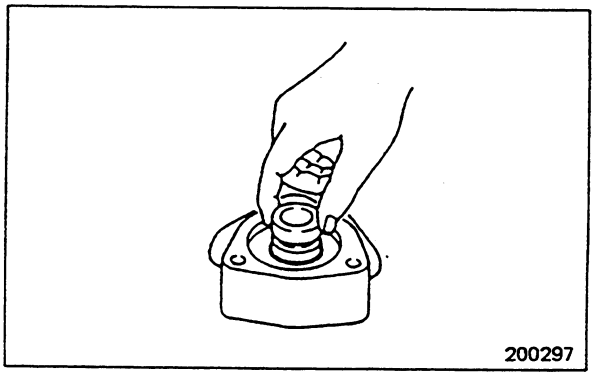

(4) Removing lock nut

Using a screwdriver, loosen the staked portion of the nut.




(5) Disassembling control valve

Separate the control valve from the gear box, and pull the spool straight out, taking a firm grip on its head. Set the valve body on the work bench as shown, and take out the inner parts by lifting them straight up.



## Inspection

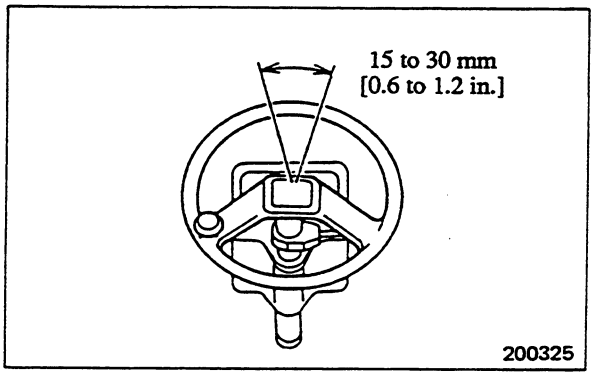
### Steering wheel free play

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

**NOTE**

Do not confuse the movement of control valve spool of 170 to 175 mm [6.7 to 6.9 in.] measured on the wheel rim with the free play.

If the free play is out of this range, correct it by remedying the causes stated in TROUBLESHOOTING.

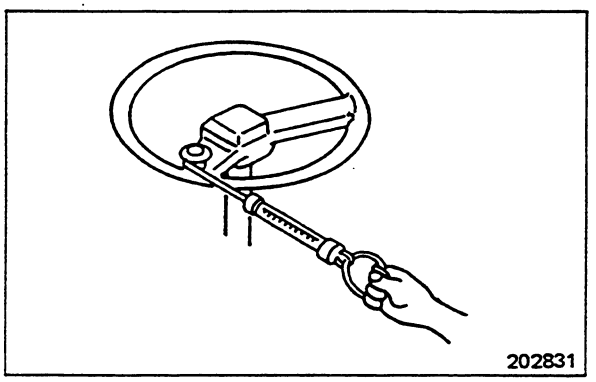



### Steering effort

(1) Set the parking brake, and run the engine until the water temperature gauge pointer moves into the green zone to warm up the hydraulic oil.

(2) Hook a spring balancer to the rim or spoke of the steering wheel, and turn the wheel. Read the balancer indication when the wheel begins to turn in both directions.

| | |
|---|---|
| Steering effort (at steering wheel rim) | 20 N·m<br>(2 kgf·m)<br>[14 lbf·ft] |



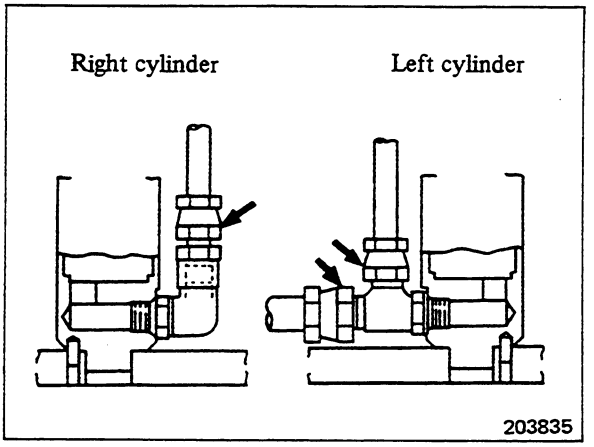
**CAUTION**

Be careful not to touch the lift control lever.

(3) Lower the lift bracket by carefully operating the lift control lever.

(4) Disconnecting high-pressure hoses

Disconnect the high-pressure hoses at the joints indicated by arrows. Use a container to catch oil flowing out of the hoses.

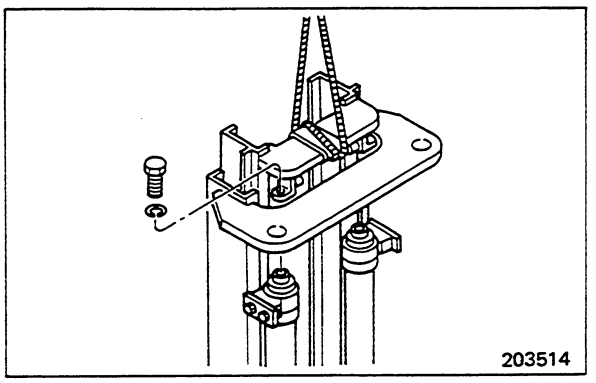



(5) Removing stopper bolts

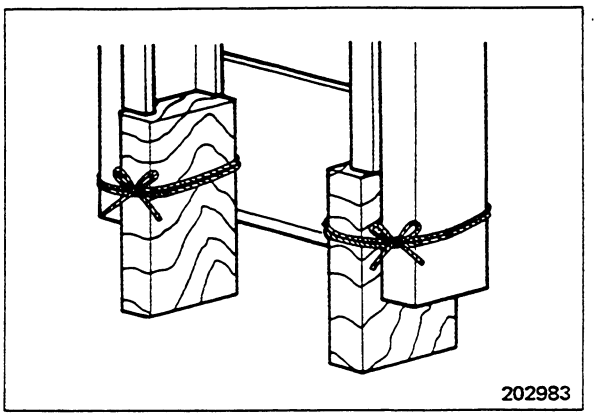
(a) Remove the stopper bolt at the top of each lift cylinder. Lift the inner mast to separate the cylinder rod ends. To lift the inner mast, clove-hitch a sling to the mast with protective wad.

**NOTE**

The rod end of either lift cylinder is shim adjusted to eliminate the difference in stroke between the cylinders. Before removing the stopper bolts, make a record of the amount of shims and a cylinder to which the shims are fitted.



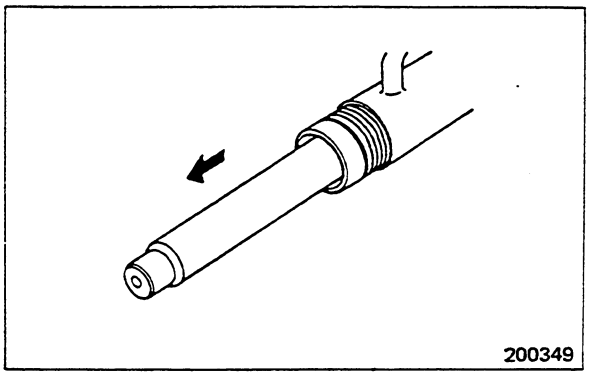

(b) Place wood blocks under the inner mast and detach the sling. Use the blocks strong enough to support the mast.



Suggestion for disassembly

Removing piston rod

When withdrawing the piston rod from the cylinder tube, take care not to damage the rings.




Inspection and Repair

(1) Cylinder tube

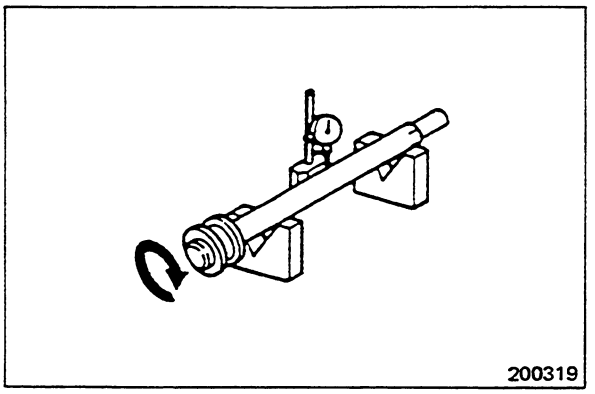
(a) Check the bore wall for wear, grooving, scratching or rusting.

(b) Check the welds for cracks or other defects.

(2) Piston rod

(a) Check the rod for deflection in V-blocks with a dial gauge as shown.

(b) Check for surface flaws such as grooving, scratching, rusting or wear. Replace the rod if its threads are badly damaged.




(3) Rings and packings

(a) Check the packings and U-rings for damage or distortion.

(b) Also check for deterioration due to aging.

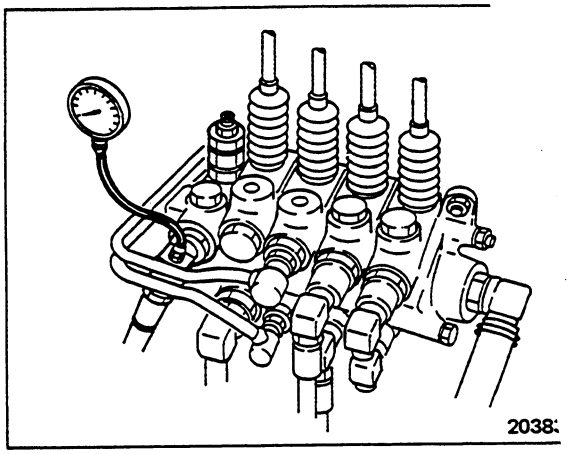
Gear Pump Test Run

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 25 000 kPa (250 kgf/cm²) [3 555 psi].

To install the pressure gauge, remove the plug from the delivery hose connector and attach the following tools:

| | |
|---|---|
| Connector: | 64309-17733 (PT 1/8 thread) |
| Hose: | 64309-17722 |
| Connector: | 64309-17731 (for gauge) |
| Gauge: | 64309-17712 (25 000 kPa (250 kgf/cm²) [3 555 psi]) |



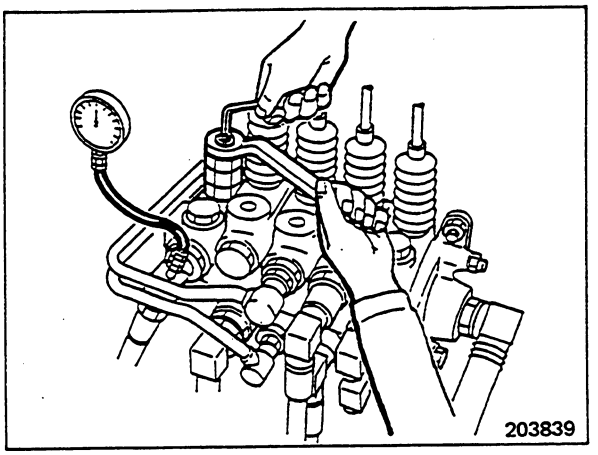

**NOTE**

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

(2) With the control levers in neutral, run the engine at 500 to 1 000 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.

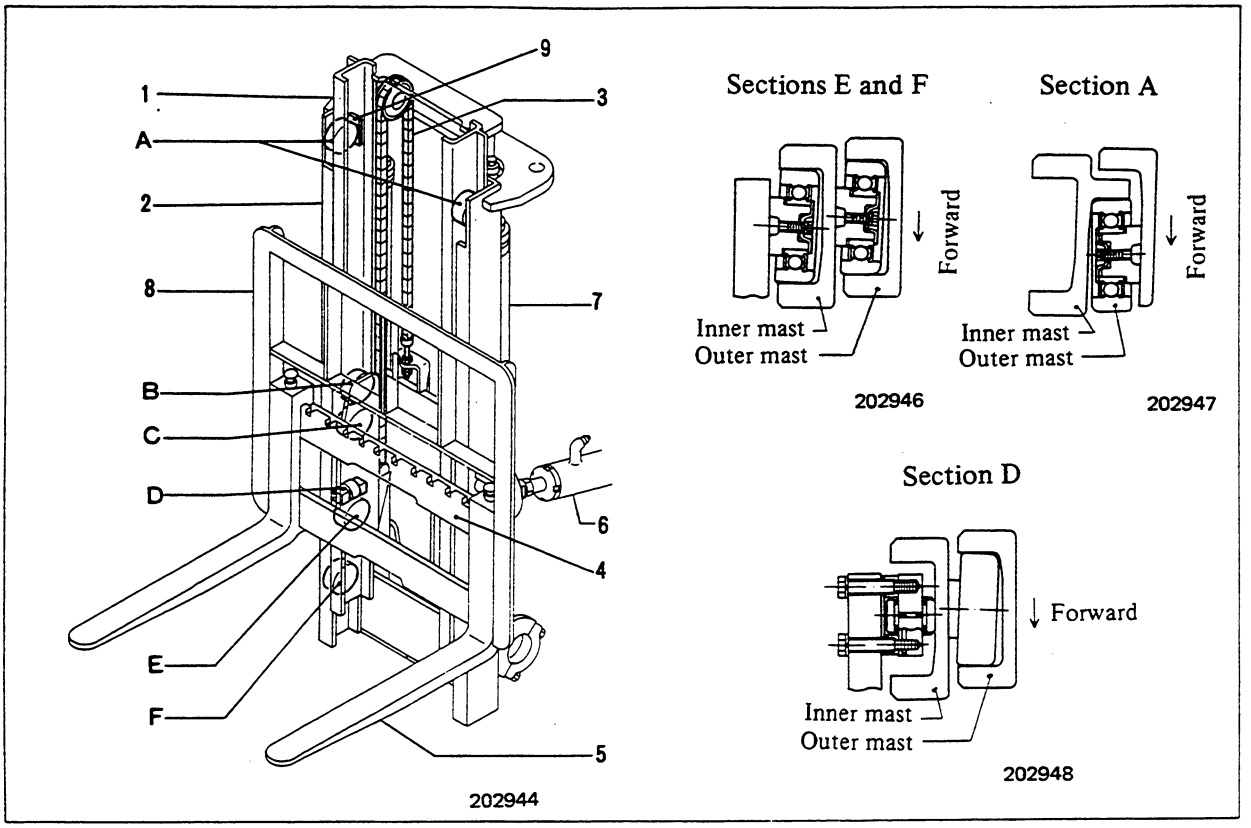
(3) Raise the engine speed to 1 500 to 2 000 rpm, and run the engine for another 10 minutes in the no-load condition.

(4) While the pump is being so run, loosen the adjusting screw, and shift the control levers into operating positions. Next set the adjusting screw, to obtain a gauge reading of 2 942 kPa (30 kgf/cm²) [427 psi], and run for 5 minutes at this pressure. Following this, raise the pressure by



## DESCRIPTION

Mast and Fork Assembly (FG35/FG40, FD35/FD40)



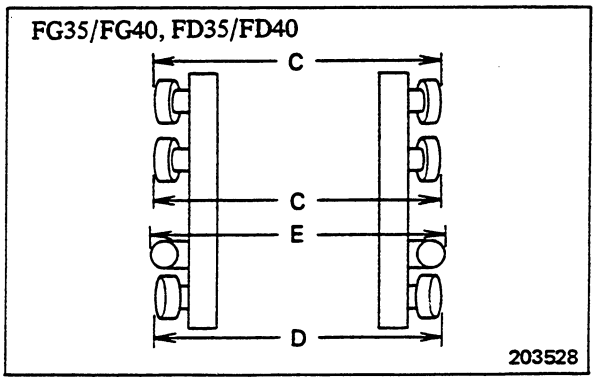

| | | |
|---|---|---|
| 1 Inner mast | 6 Tilt cylinder | B Main roller |
| 2 Outer mast | 7 Lift cylinder | C Main roller |
| 3 Lift chain | 8 Backrest | D Side roller |
| 4 Lift bracket | 9 Mast strip | E Main roller |
| 5 Fork | A Main roller | F Main roller |

(4) Lateral clearance on lift bracket

(a) Install the main rollers and side rollers to the lift bracket and measure distances C, D and E.

Unit: mm [in.]

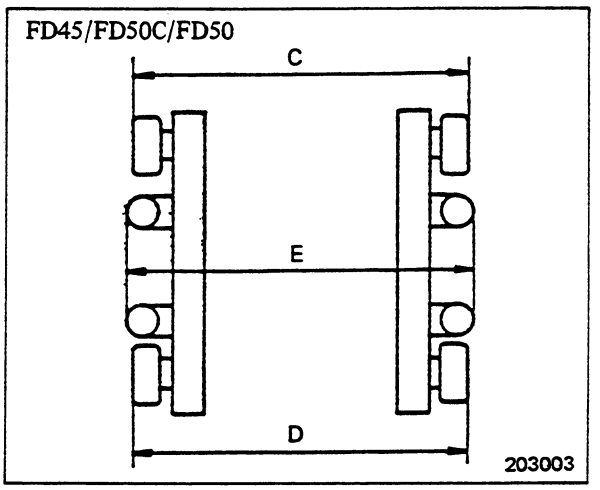
| Item | | FG35/FG40 FD35/FD40 | FD45/FD50C/ FD50 |
|---|---|---|---|
| Distances | C | 608 ± 0.5 [23.94 ± 0.020] | 593 [23.35] |
| | D | 604 [23.78] | 593 [23.35] |
| | E | 613 ± 0.5 [24.13 ± 0.020] | 609 ± 0.5 [23.98 ± 0.020] |



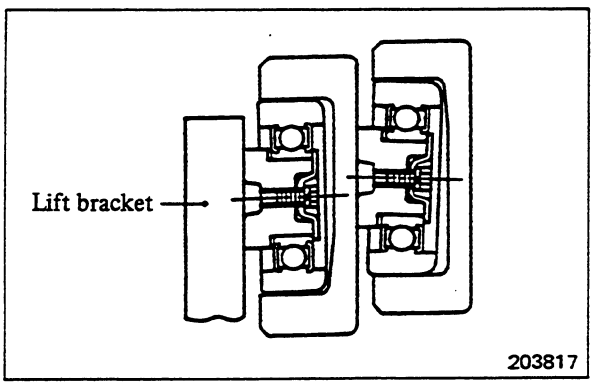

**NOTE**

In FD45/FD50C/FD50, the measurements may be taken between the front or rear end faces of the rollers.

In FD45/FD50C/FD50, the lateral clearance of the lift bracket is maintained by side rollers.




In FG35/FG40 and FD35/FD40, the lateral clearance of the top of lift bracket is maintained by the declining rollers.



# TROUBLESHOOTING

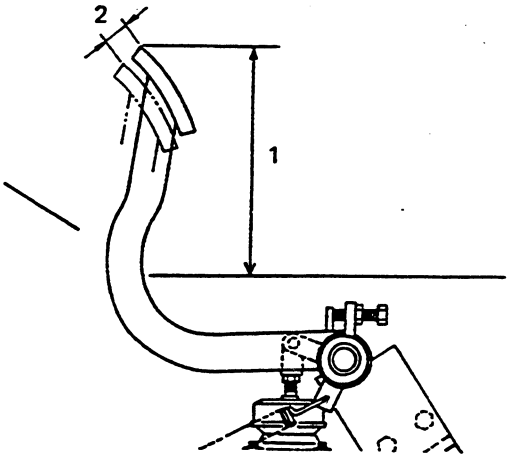
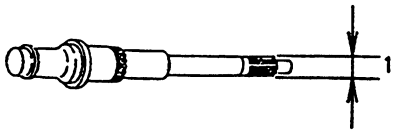
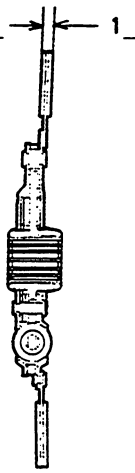
| Complaint | Possible cause | | Remedy |
|---|---|---|---|
| Oil leaks | a) Leaking oil seals | | Check lips and sliding surfaces for wear. Replace seals. |
| | b) Leaking joint of case | | Retighten or replace packing. |
| | c) Leaking pipe connection or joint | | Repair or replace pipe, gasket and O-rings. |
| | d) Leaking drain plug | | Retighten and replace gasket. |
| | e) Cracks or blowholes in case | | Replace. |
| | f) Oil blowing out of transmission case | | |
| | • Water in oil | | Replace oil. |
| | • Air being sucked in suction side | | Replace packing and retighten. |
| | • Oil leaks from air breather | | Repair. |
| | g) Oil level too high | | Lower oil level. |
| Oil temperature is too high | Torque converter | a) Oil level too high or too low | Keep correct oil level. |
| | | b) Oil strainer clogged | Clean or replace. |
| | | c) Rubbing blades of running members | Repair or replace. |
| | | d) Stator freewheel defective | Replace stator assembly. |
| | | e) Air being sucked in | Retighten or replace gasket. |
| | | f) Water in oil | Replace oil. |
| | | g) Restriction in oil pipe (resulting in reduced circulation flow) | Repair or replace. |
| | | h) Bearings worn or seized | Repair or replace. |
| | | i) Instruments out of order | Replace. |
| | Transmission | a) Clutches dragging | Replace clutch plate. |
| | | b) Bearings worn or seized | Repair or replace. |
| | | c) Control linkage defective | Repair or replace. |
| | Others | a) Truck not operated properly | Urge user to drive truck properly. |
| | | b) Others | |
| | | • Cooling fan belt damaged | Replace. |
| | | • Oil cooler clogged | Clean or replace. |
| | | • Brakes grabbing | Check and readjust. |
| Main pressure is too high | a) Main regulator valve defective | | Repair or replace valve assembly. |
| | b) Oil viscosity too high because of low temperature | | Replace oil. |
| | c) Wrong kind of oil used | | Replace oil. |

| | Complaint | Possible cause | Remedy |
|---|---|---|---|
| Lift and tilt cylinders | Will not lift rated load | a) Relief valve out of order, because of: | |
| | | • Too low a relief valve setting | Readjust. |
| | | • Defective plunger or poppet seat | Replace. |
| | | • Fatigued spring | Replace. |
| | | • Damaged O-ring in valve case | Replace O-ring. |
| | | b) Gear pump defective | Replace. |
| | | c) Piston seals worn or damaged | Replace. |
| | Lifting speed is too low | a) Engine rpm too low | Adjust. |
| | | b) Control lever installed loose, resulting in not enough spool stroke | Repair or replace. |
| | | c) Tank strainer clogged | Clean or replace. |
| | | d) Pump not delivering enough oil | Repair or replace. |
| | Lowering speed is too low | a) Sleeve seized in flow regulator valve | Repair. |
| | | b) Dirt in flow regulator valve | Clean, repair system and replace defective hose. |
| | | c) Abnormal resistance to flow due to flattened hose or local clogging | Replace hose. |
| | Cylinder vibrates when actuated | a) Piston rod distorted | Repair or replace. |
| | | b) Air in oil circuit | Bleed air by operating cylinder through full stroke. |
| | | c) Not enough oil in hydraulic tank | Refill. |
| | Load will not hold | a) Control valve spool internally leaking | Replace. |
| | | b) Sliding (inside) surface of cylinder tube slightly grooved | Repair or replace cylinder assy. |
| | | c) Sliding (inside) surface of cylinder tube badly grooved | Replace. |
| | | d) Piston seals broken or distorted | Replace seal kit. |
| | | e) Oil leakage from piping | Repair or replace. |
| | Mast tilts forward spontaneously | a) Control valve spool internally leaking | Replace. |
| | | b) Foreign particles lodged between packing and mating surface | Replace packing. |
| | | c) Piston seals damaged | Replace. |
| | | d) Cylinder distorted | Repair or replace. |
| | Lift cylinders drop or tilt cylinders tilt forward spontaneously at a certain point of stroke | a) Sliding surface of cylinder tube badly grooved or rusted at one point | Repair or replace. |
| | | b) Cylinder tube distorted | Replace. |

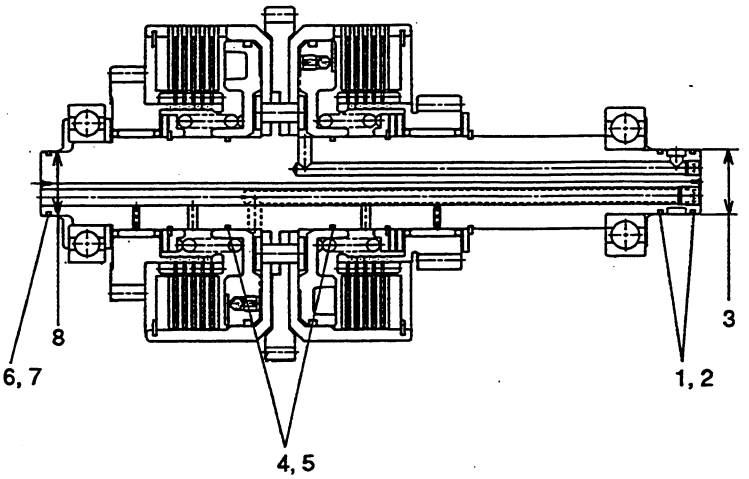
A-Assembly standard B-Repair or service limit

## Wet-type clutch

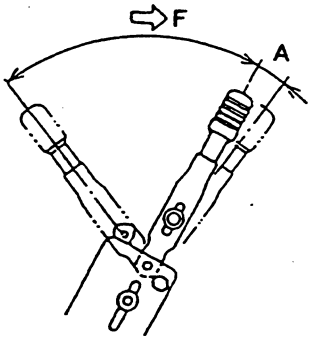
Unit: mm [in.]

| Item | | Truck model | FD35 | FD40 | FD45 | FD50C FD50 |
|---|---|---|---|---|---|---|
| Clutch pedal | Height (from frame to top of pedal) 1 | A | 220 [8.7] | | | |
| | Free play 2 | A | 11 to 17 [0.4 to 0.7] | | | |
| |  203820 | | | | | |
| Input shaft | Splined shaft diameter 1<br>Free movement of clutch disc (looseness of mating splines) at rim of disc | A | $29.667^{0}_{-0.1}$ [$1.167\,99^{0}_{-0.004}$] | | | |
| | | B | 6 [0.24] | | | |
| |  202965 | | | | | |
| Clutch disc | Facing thickness (total) 1 | A | 8.1 ± 0.3 [0.32 ± 0.012] | | | |
| | | B | 0.4 [0.02], each side<br>0.8 [0.03], both sides | | | |
| | Face runout (at rim) | A | 1.0 [0.04], maximum | | | |
| |  202966 | | | | | |

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

| Item | | Truck model | | FD50C/FD50 |
|---|---|---|---|---|
| Main shaft (turbine shaft) and servo case | Width of countershaft seal ring 1 | | A | 2.5 ± 0.05 [0.098 ± 0.002 0] |
| | | | B | 2.0 [0.079] |
| | Width of countershaft piston seal ring groove 2 | | A | $2.5^{+0.2}_{+0.1}$ [$0.098^{+0.008}_{+0.004}$] |
| | | | B | 3.0 [0.118] |
| | Inside diameter of pump body in contact with seal ring 3 | | A | $35^{+0.025}_{0}$ [$1.38^{+0.000\,98}_{0}$] |
| | | | B | 35.2 [1.386] |
| | Width of clutch piston seal ring 4 | | A | 2. 5 ± 0.05 [0.098 ± 0.002 0] |
| | | | B | 2.0 [0.079] |
| | Width of clutch piston seal ring groove 5 | | A | $2.5^{+0.2}_{+0.1}$ [$0.098^{+0.008}_{+0.004}$] |
| | | | B | 3.0 [0.118] |
| | Width of countershaft seal ring 6 | | A | 2.5 ± 0.05 [0.098 ± 0.002 0] |
| | | | B | 2.0 [0.079] |
| | Width of countershaft seal ring groove 7 | | A | $2.5^{+0.2}_{+0.1}$ [$0.098^{+0.008}_{+0.004}$] |
| | | | B | 3.0 [0.118] |
| | Inside diameter of servo case in contact with seal ring 8 | | A | $35^{+0.025}_{0}$ [$1.38^{+0.000\,98}_{0}$] |
| | | | B | 35.2 [1.386] |
| |   206773 | | | |
| Backlash | Forward 1st speed gear and forward 2nd speed gear | | A | 0.14 to 0.23 [0.005 5 to 0.009 1] |
| | Forward gear and reverse gear | | A | 0.14 to 0.24 [0.005 5 to 0.009 4] |
| | Countergear and output gear | | A | 0.14 to 0.25 [0.005 5 to 0.009 8] |
| | Looseness of mating splines | | A | 0.036 to 0.206 [0.001 42 to 0.008 11] |

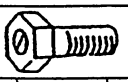
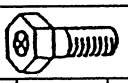
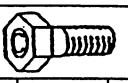
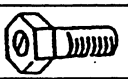
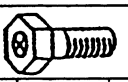
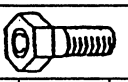
A-Assembly standard B-Repair or service limit
Unit: mm [in.]

| Item | | | Truck model | FG35 FD35 | FG40 FD40 | FD45 | FD50C FD50 |
|---|---|---|---|---|---|---|---|
| Parking brake | Locked position of lever A | | A | 4° to 5° | | | |
| | Lever operating effort F, N (kgf) [lbf] | | A | 245 to 294 (25 to 30) [55 to 66] | | | |
| |   200428 | | | | | | |

## Steering System

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

| Item | | | Truck model | FG35 FD35 | FG40 FD40 | FD45 | FD50C FD50 |
|---|---|---|---|---|---|---|---|
| Steering wheel free play (with the engine idling) | | | A | 15 to 30 [0.6 to 1.2] | | | |
| Steering effort (at steering wheel rim), N (kgf) [lbf] | | | A | 20 (2) [4.4] | | | |
| Steering gear | Pitman arm swing angle | Lock to lock 1 | A | $84°^{+6°}_{0}$ | | | |
| | | Straight-ahead 2 | A | 10° | | | |
| | | Right turn 3 | A | 38°16' | | 38°43' | |
| | | Left turn 4 | A | 34°10' | | 33°58' | |
| | Steering torque (steering wheel side), N·m (kgf·cm) [lbf·ft] | | A | 1.0 (10) [0.7], maximum | | | |
| | Deflection of steering shaft 5 | | A | 0 | | | |
| | | | B | 1 [0.04], maximum | | | |
| | Clearance between adjusting screw and sector shaft 6 | | A | 0.1 [0.004], maximum | | | |
| | Backlash of ball screw and sector shaft (Measure at a point 205 mm [8.07 in.] from sector shaft axis with a dial indicator.) | | A | 0.3 [0.01], maximum | | | |

| | Nominal size | | Pitch | | With spring washer 101656 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | |  | | |  | | |  | | |
| | mm | in. | mm | in. | N·m | kgf·m | lbf·ft | N·m | kgf·m | lbf·ft | N·m | kgf·m | lbf·ft |
| Metric coarse thread | 10 | 0.39 | 1.5 | 0.06 | 33.3 | 3.4 | 24.6 | 43.1 | 4.4 | 31.8 | 67.7 | 6.9 | 49.9 |
| | 12 | 0.47 | 1.75 | 0.07 | 58.8 | 6.0 | 43.4 | 76.5 | 7.8 | 56.4 | 115.7 | 11.8 | 85.3 |
| | 14 | 0.55 | 2 | 0.08 | 96.1 | 9.8 | 70.9 | 124.5 | 12.7 | 91.9 | 182.4 | 18.6 | 134.5 |
| | 16 | 0.63 | 2 | 0.08 | 147.1 | 15.0 | 108.5 | 191.2 | 19.5 | 141.0 | 274.6 | 28.0 | 202.5 |
| | 18 | 0.71 | 2.5 | 0.10 | 203.0 | 20.7 | 149.7 | 264.8 | 27.0 | 195.3 | 383.4 | 39.1 | 282.8 |
| | 20 | 0.79 | 2.5 | 0.10 | 286.4 | 29.2 | 211.2 | 371.7 | 37.9 | 274.1 | 536.4 | 54.7 | 395.6 |
| | 22 | 0.87 | 2.5 | 0.10 | 383.4 | 39.1 | 282.8 | 499.2 | 50.9 | 368.2 | 715.9 | 73.0 | 528.0 |
| | 24 | 0.95 | 3 | 0.12 | 492.3 | 50.2 | 363.1 | 640.4 | 65.3 | 472.3 | 924.8 | 94.3 | 682.1 |
| | 27 | 1.06 | 3 | 0.12 | 724.7 | 73.9 | 534.5 | 942.2 | 96.1 | 695.1 | 1 350.4 | 137.7 | 996.0 |
| | 30 | 1.18 | 3.5 | 0.14 | 969.9 | 98.9 | 715.3 | 1 259.2 | 128.4 | 928.7 | 1 843.7 | 188.0 | 1 359.8 |
| | 33 | 1.30 | 3.5 | 0.14 | 1 328.8 | 135.5 | 980.1 | 1 727.0 | 176.1 | 1 273.7 | 2 477.2 | 252.6 | 1 827.1 |
| | 36 | 1.42 | 4 | 0.16 | 1 676.0 | 170.9 | 1 236.1 | 2 180.0 | 222.3 | 1 607.9 | 3 199.9 | 326.3 | 2 360.1 |
| | 39 | 1.54 | 4 | 0.16 | 2 219.2 | 226.3 | 1 636.8 | 2 884.1 | 294.1 | 2 127.2 | 4 118.8 | 420.0 | 3 037.9 |
| | 42 | 1.65 | 4.5 | 0.18 | 2 754.7 | 280.9 | 2 031.8 | 3 581.4 | 365.2 | 2 641.5 | 5 137.7 | 523.9 | 3 789.4 |
| | Nominal size | | Pitch | | Without spring washer 101656 | | | | | | | | |
| | | | | |  | | |  | | |  | | |
| | 10 | 0.39 | 1.5 | 0.06 | 39.2 | 4.0 | 28.9 | 51.0 | 5.2 | 37.6 | 79.4 | 8.1 | 58.6 |
| | 12 | 0.47 | 1.75 | 0.07 | 69.6 | 7.1 | 51.4 | 90.2 | 9.2 | 66.5 | 135.3 | 13.8 | 99.8 |
| | 14 | 0.55 | 2 | 0.08 | 112.8 | 11.5 | 83.2 | 146.1 | 14.9 | 107.8 | 215.7 | 22.0 | 159.1 |
| | 16 | 0.63 | 2 | 0.08 | 172.6 | 17.6 | 127.3 | 224.6 | 22.9 | 165.6 | 323.6 | 33.0 | 238.7 |
| | 18 | 0.71 | 2.5 | 0.10 | 239.3 | 24.4 | 176.5 | 311.9 | 31.8 | 230.0 | 451.1 | 46.0 | 332.7 |
| | 20 | 0.79 | 2.5 | 0.10 | 336.4 | 34.3 | 248.1 | 437.4 | 44.6 | 322.6 | 630.6 | 64.3 | 465.1 |
| | 22 | 0.87 | 2.5 | 0.10 | 392.3 | 40.0 | 289.3 | 587.4 | 59.9 | 433.3 | 842.4 | 85.9 | 621.3 |
| | 24 | 0.95 | 3 | 0.12 | 578.6 | 59.0 | 426.7 | 753.2 | 76.8 | 555.5 | 1 088.5 | 111.0 | 802.9 |
| | 27 | 1.06 | 3 | 0.12 | 852.2 | 86.9 | 628.5 | 1 108.2 | 113.0 | 817.3 | 1 588.7 | 162.0 | 1 171.7 |
| | 30 | 1.18 | 3.5 | 0.14 | 1 140.5 | 116.3 | 841.2 | 1 481.8 | 151.1 | 1 092.9 | 2 168.3 | 221.1 | 1 599.2 |
| | 33 | 1.30 | 3.5 | 0.14 | 1 563.2 | 159.4 | 1 153.0 | 2 031.9 | 207.2 | 1 498.7 | 2 915.5 | 297.3 | 2 150.4 |
| | 36 | 1.42 | 4 | 0.16 | 1 972.1 | 201.1 | 1 454.6 | 2 564.4 | 261.5 | 1 891.4 | 3 765.8 | 384.0 | 2 777.5 |
| | 39 | 1.54 | 4 | 0.16 | 2 610.5 | 266.2 | 1 925.4 | 3 393.1 | 346.0 | 2 502.6 | 4 845.5 | 494.1 | 3 573.8 |
| | 42 | 1.65 | 4.5 | 0.18 | 3 241.1 | 330.5 | 2 390.5 | 4 212.9 | 429.6 | 3 107.3 | 6 044.8 | 616.4 | 4 458.4 |

Remarks: 1. The tolerance on these torques is ±10%.
2. These torques are for "dry" condition.

| Inspection point | | How to check | Pre-start | Intervals | | Service data |
|---|---|---|---|---|---|---|
| | | | | 1 moth | 12 month | |
| Lights | Operation | Test/visual | ○ | ○ | ○ | |
| Horn | Operation | Test/listen | ○ | ○ | ○ | |
| Turn signals | Operation | Test/visual | ○ | ○ | ○ | |
| Rear view mirrors | Rear vision | Visual | ○ | ○ | ○ | |
| Overhead guard | Installation and damage | Visual/wrench | ○ | ○ | ○ | |
| Chassis | Bolts and nuts — tightness | Wrench | | | ○ | |
| | Operator's seat — damage and installation | Visual | | ○ | ○ | |
| | Lubrication points | Lubricate | | ○ | ○ | Lubricate mast supports every 1 week. |
| | Oil change | Inspect | | ○ | ○ | |

## Refill Capacities (Approximate)

Unit: liter [U.S. gal]

| Item \ Truck model | | FG35 {FD35} | FG40 {FD40} | FD45 | FD50C FD50 |
|---|---|---|---|---|---|
| Fuel tank | | 105 [28] | | 125 [33] | |
| Engine cooling system | Engine | 8.0 [2.1] | | | |
| | Radiator | 3.2 [0.8] | | | |
| | Reserve tank | 0.65 [0.2] | | | |
| | Total | 11.85 [3.1] | | | |
| Engine lubrication system | Engine | 4.0 [1.1] {11 [2.9]} | | 11 [2.9] | |
| | Oil filter | 0.4 [0.1] {1 [0.3]} | | 1 [0.3] | |
| | Total | 4.4 [1.2] {12 [3.2]} | | 12 [3.2] | |
| Torque converter (P/T) | | 14 [3.7] | | | 15 [4.0] |
| Differential (P/T) | | 9.1 [2.4] | | | |
| Transmission and differential (M/T) | | 14.8 [3.9] | | | |
| Hydraulic tank | | 58.5 [15.4] | | 69.3 [18.3] | |
| Brake fluid reservoir | | 130 cm³ [7.9 cu in.] | | | |
| Clutch cylinder | | 120 cm³ [7.3 cu in.] | | | |

M/T: Manual transmission models, P/T: Powershift transmission models

## Weight of Major Components (Approximate)

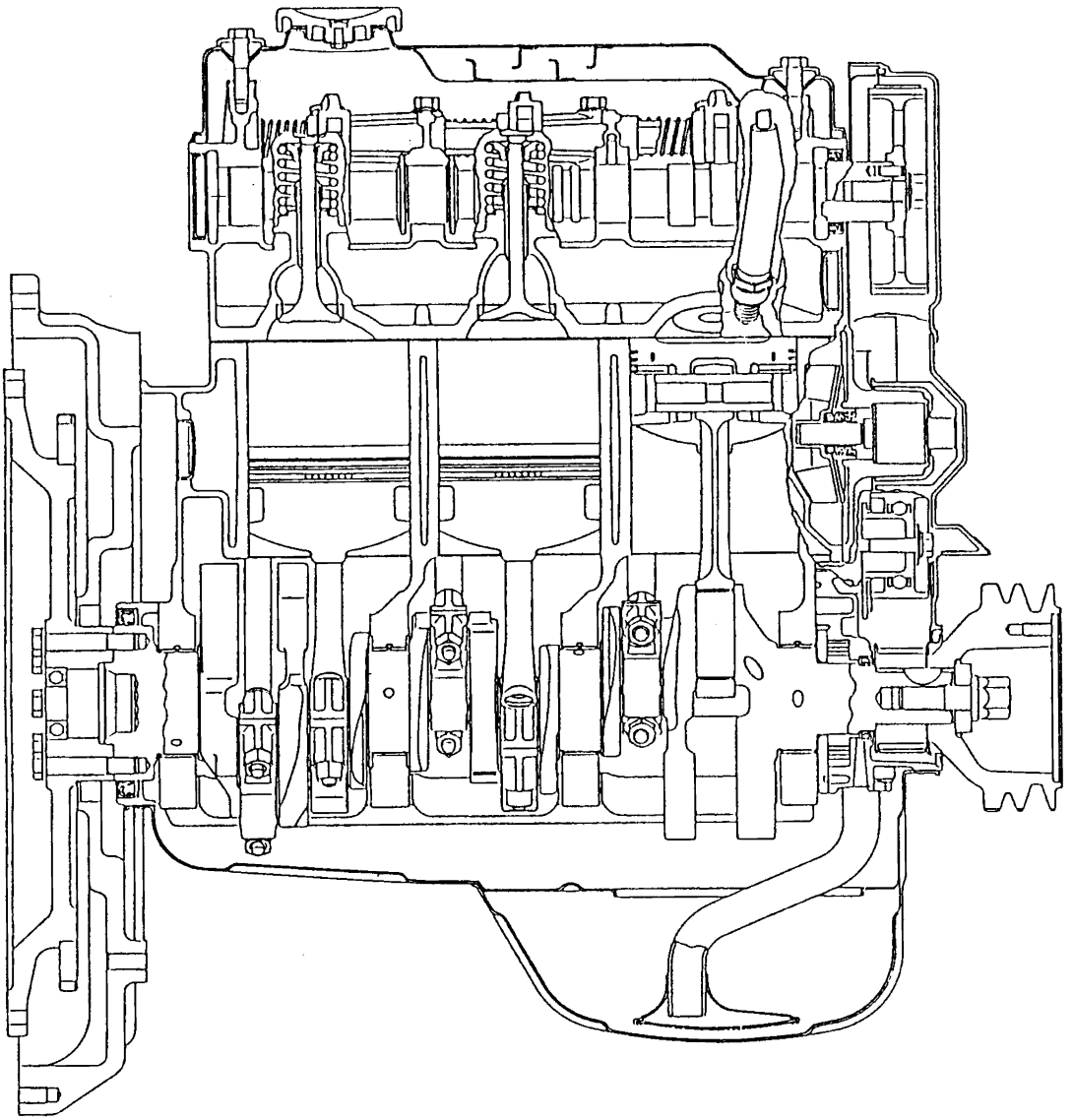
Unit: kg [lb]

| Item \ Truck model | | FG35 {FD35} | FG40 {FD40} | FD45 | FD50C FD50 |
|---|---|---|---|---|---|
| Counterweight | | 1 760 [3 880] | 2 110 [4 650] | 2 400 [5 290] | 2 750 [6 060] |
| Engine proper (service weight) | | 175 [390] {350 [770]} | | 350 [770] | |
| Power train (engine, transmission and reduction gear & differential) | | 470 [1 040] {730 [1 610]} | | | 790 [1 740] |
| Overhead guard | | 90 [200] | | | |
| Rear axle | | 225 [500] | | | |
| Dual-stage panoramic mast (3 m [118 in.]) | Outer mast | 340 [750] | | 380 [840] | |
| | Inner mast | 250 [550] | | 300 [660] | |
| | Lift bracket (with backrest) | 230 [510] | | 250 [550] | 360 [790] |
| | Forks (2 pcs) | 200 [440] | | 210 [460] | 280 [620] |
| | Lift cylinders, etc. | 120 [270] | | | 130 [290] |

# 00 General

CONTENTS

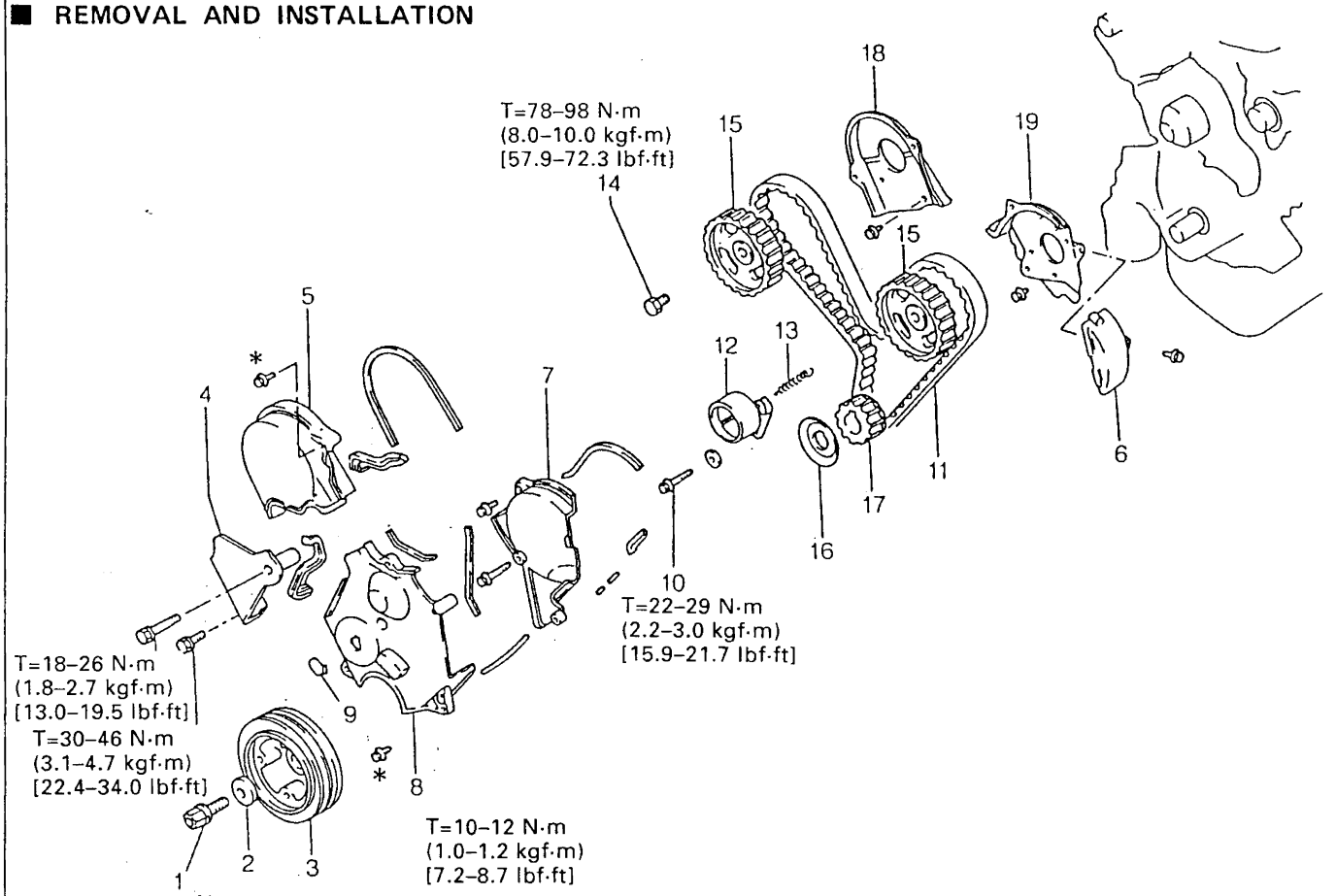
The pistons are made of die-cast aluminum. Each piston uses two compression rings and a three-piece type oil ring. The piston pin is floating in the piston and press-fitted to the forged steel connecting rod. The cylinder heads are die-cast aluminum with compact spherical combustion chambers. The left-bank cylinder head and the right-bank cylinder head are in common with each other, but they are installed in the opposite directions. In each cylinder head, intake and exhaust valves made of heat resistant steel are arranged in a "V" with a camshaft at center.



7EN0036

## TIMING BELT

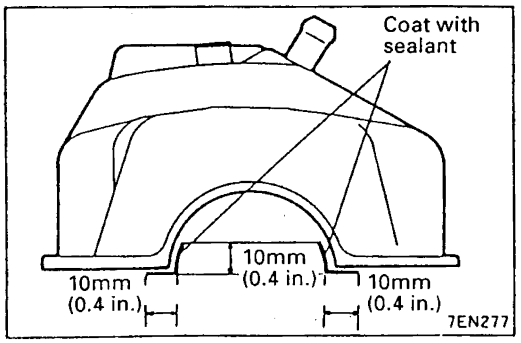
### ■ REMOVAL AND INSTALLATION




**Disassembly steps**

◆■►◆ 1. Crankshaft bolt
2. Special washer
3. Crankshaft pulley
4. Timing belt front cover
5. Timing belt outer upper cover (B)
6. Timing belt cover cap
7. Timing belt outer upper cover (A)
8. Timing belt outer lower cover
9. Access cover
10. Tensioner bolt
◆■►◆ 11. Timing belt
►◆ 12. Timing belt tensioner
►◆ 13. Tensioner spring
14. Camshaft sprocket bolt
◆■►◆ 15. Camshaft sprocket
16. Flange
17. Crankshaft sprocket
18. Timing belt inner cover (B)
19. Timing belt inner cover (A)

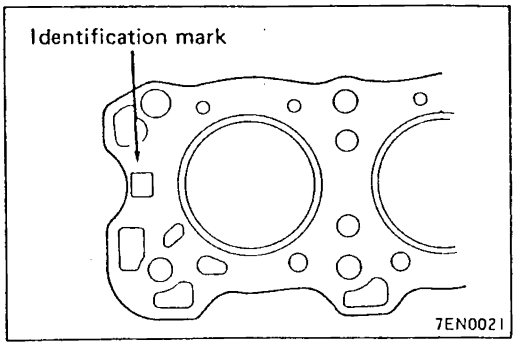
NOTES:
(1) Assembly is the reverse of the disassembly.
(2) ◆■► : Refer to "Main Points of Removal."
(3) ►◆ : Refer to "Main Points of Installation."




**6. 4. Rocker Covers**

Coat the specified places with sealant.

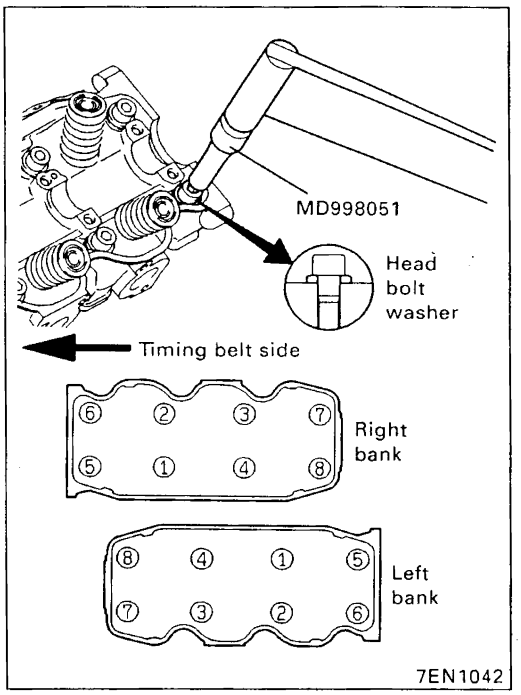
**Specified sealant: THREE-BOND No. 1212D or equivalent**




4. **Cylinder Head Gasket**
   (1) Remove gasket remains and oil from the cylinder block and cylinder head.
   (2) Install the gasket with the identification mark top.

   **Identification mark: R**

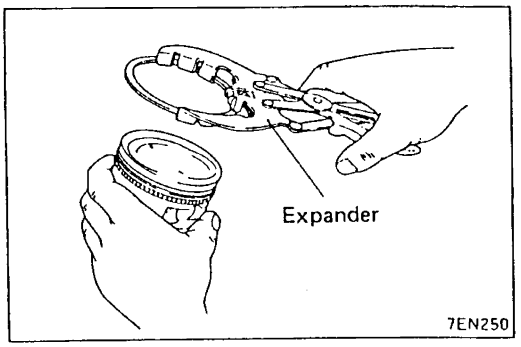
   NOTE:
   Do not coat with sealant.




1. **Cylinder Head Bolts**
   (1) Tighten the bolts in two to three stages in the illustrated sequence.
   (2) Back off the bolts once and tighten them to the specified torque in the same procedure as shown in step (1).

   **Caution**

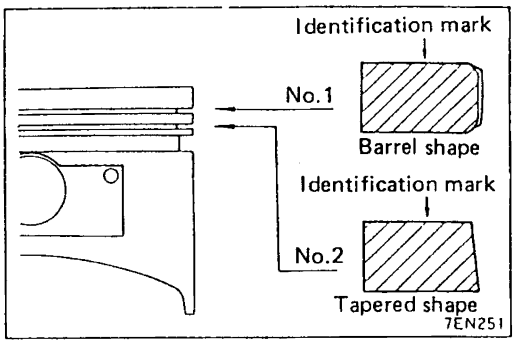
   **Attach the head bolt washer in the direction shown in the figure.**



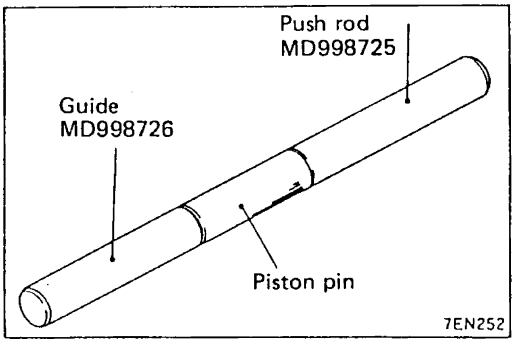

9. **Piston Ring No.2 / 8. Piston Ring No.1**

Using the piston ring expander, install piston rings No.2 and No.1 in that order.

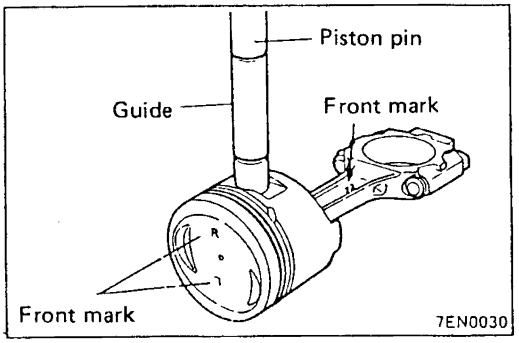
**Identification marks** **No.1: 1R or T1**
**No.2: 2R ot T2**




NOTE:
1. Nos. 1 and 2 are shaped differently. Use care not to mistake them from each other.
2. Install piston rings Nos. 1 and 2 so that the manufacture mark and size mark are at the top (piston crown side).




7. **Piston Pin**
(1) Set the piston pin on the special tool (Push rod) and screw in the special tool (Guide).
(2) Coat the area of the piston pin with engine oil.




(3) Set the connecting rod in the piston so that the front mark on the rod faces up and the piston front mark "R" or "L" is at the top (see Caution below) and that the rod small-end pin hole is concentric with the piston pin hole. Insert the guide [fitted to the pin in step (1)] into the rod small end in the piston.

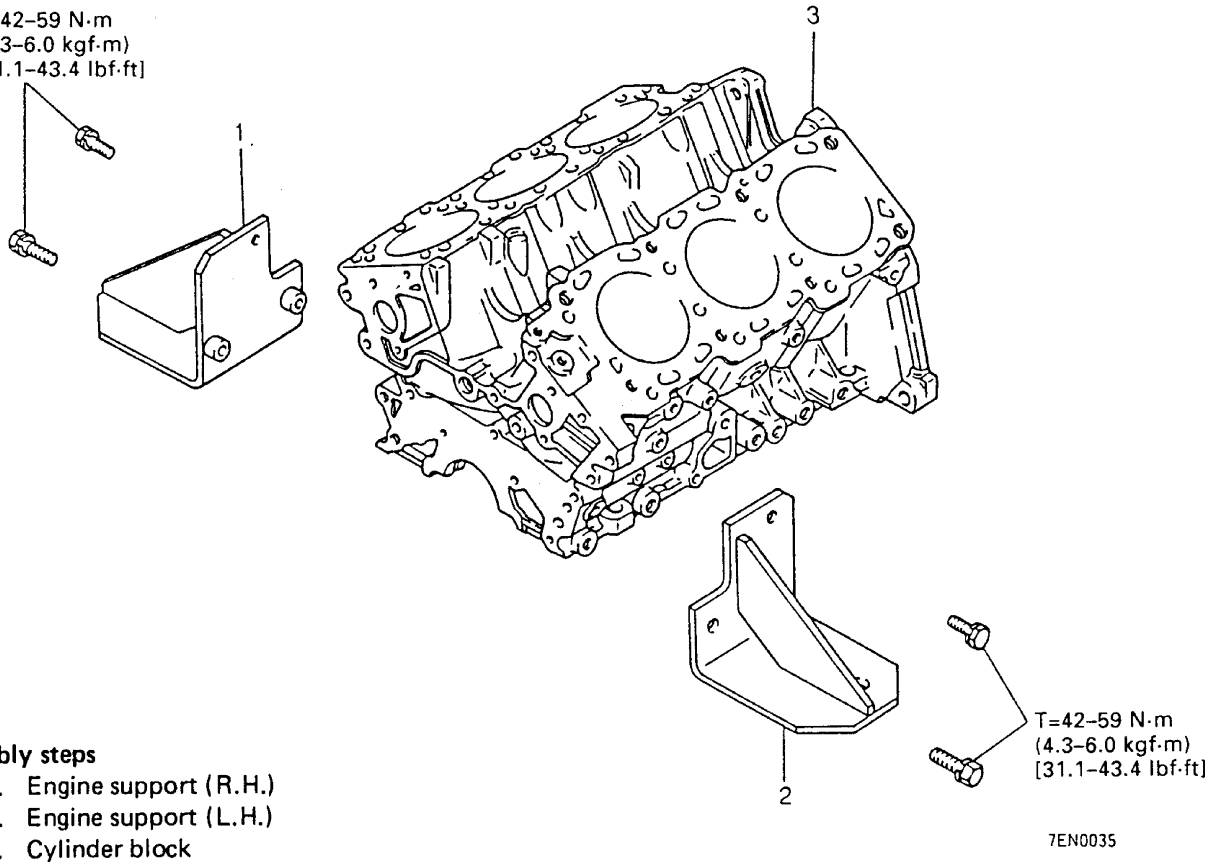
**Caution:**
**The piston is stamped with two marks "R" and "L" in the opposite directions. Use "R" as the front mark for cylinder Nos. 1, 3 and 5. Use "L" as the front mark for cylinder Nos. 2, 4 and 6.**

(4) Set the whole unit assembled in step (3) in the special tool (Base).

**Caution:**
**(1) Keep the piston pushed firmly against the base until a press-load is applied to the piston pin.**
**(2) Set the assembly in position so that the front mark on the connecting rod faces upward.**

## CYLINDER BLOCK

### ■ REMOVAL AND INSTALLATION



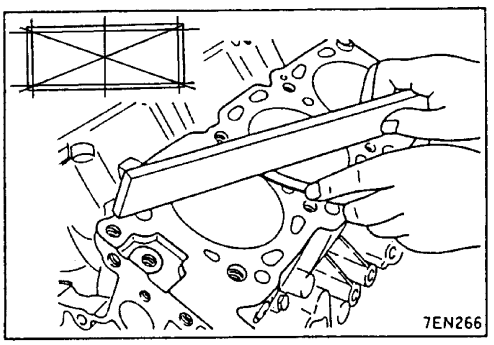

**Disassembly steps**

1. Engine support (R.H.)
2. Engine support (L.H.)
3. Cylinder block

### ■ INSPECTION

**1. Cylinder Block**

(1) Visually inspect the whole of cylinder block for scratches, corrosion, etc. Also, apply penetration inspection to portions in question. If any defect is found, repair or replace the cylinder block.



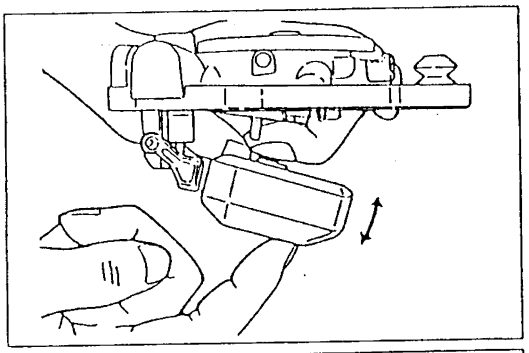

(2) Check for flatness of the gasket mounting surfaces with a straight-edge and thickness gauge. Before checking, the surfaces to be checked must be cleaned thoroughly.

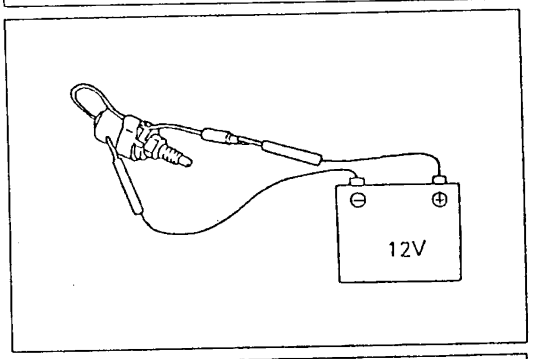
**Standard value: 0.05 mm (0.002 in.)**
**Limit: 0.1 mm (0.004 in.)**
**Grinding limit value: 0.2 mm (0.008 in.)**

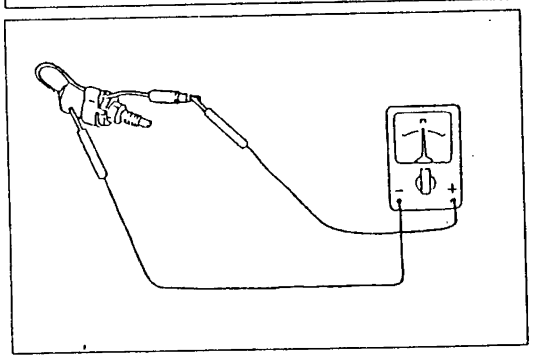
**Caution:**
**Do not grind the mating surfaces of cylinder block and cylinder head beyond 0.2 mm (0.008 in.) of total grinding limit.**

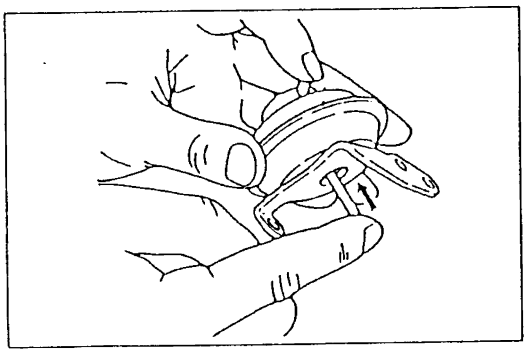
# 13 Fuel

CONTENTS







## ■ INSPECTION

1. **General Inspection**
   Check the following and repair or replace parts if faulty.
   (1) Check fuel passages (jets) and air passages (jets or orifices) for clogging. If clogged, wash thoroughly with cleaning solvent or detergent and remove dirt by compressed air. Do not use wire or other metal pieces.
   (2) Check diaphragms, O-rings and springs for damage and cracks.
   (3) Check that needle valve operates lightly. If the valve is hard to operate or is binding, repair or replace. If there is overflow, poor valve to seat contact is suspected. Check thoroughly.
   (4) Check the fuel inlet filter (located above the needle valve) for clogging and damage.
   (5) Check float operation. Check float and lever for deformation and damage and replace if necessary.
   (6) Check operation of throttle valve, choke valve and link. If they do not operate lightly, wash well and apply engine oil sparingly to their shaft.
   (7) Check the float chamber cover and main body for damage and cracks.

2. **Inspection of Fuel Cutoff Solenoid Operation**
   (1) Apply battery voltage across the fuel cut solenoid body and terminal directly.
   **Caution:**
   **Use care not to cause a short-circuit.**
   (2) Check that valve operates with a click when battery voltage is applied.

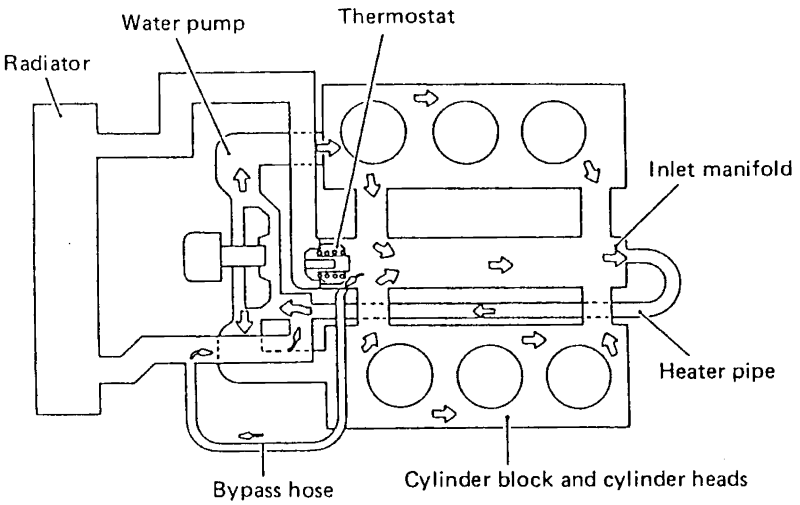
3. **Measurement of Fuel Cutoff Solenoid Resistance**
   Using a circuit tester, measure the resistance across the fuel cut solenoid body and terminal.
   **Standard value: Approx. 90 Ω [at 20°C (68°F)]**

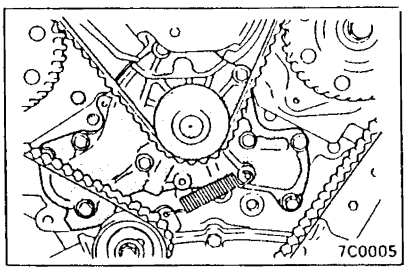
4. **Inspection of Diaphragm Chamber**
   Check the diaphragm chamber diaphragm for damage. First, push up the rod fully and while closing the nipple securely with a finger, release the rod. The diaphragm is considered normal if the rod does not return to the initial position while the nipple is closed. If the rod returns slowly or quickly, the diaphragm is damaged. Then, replace the diaphragm chamber.

## GENERAL INFORMATION

The cooling system is of the cooling water forced-circulation type. The water pump, at the center in front of the cylinder block, is driven by the camshaft driving timing belt whose reverse side is kept in contact with the water pump pulley. The thermostat which controls coolant temperature is contained in the thermostat housing which is positioned in the intake manifold.

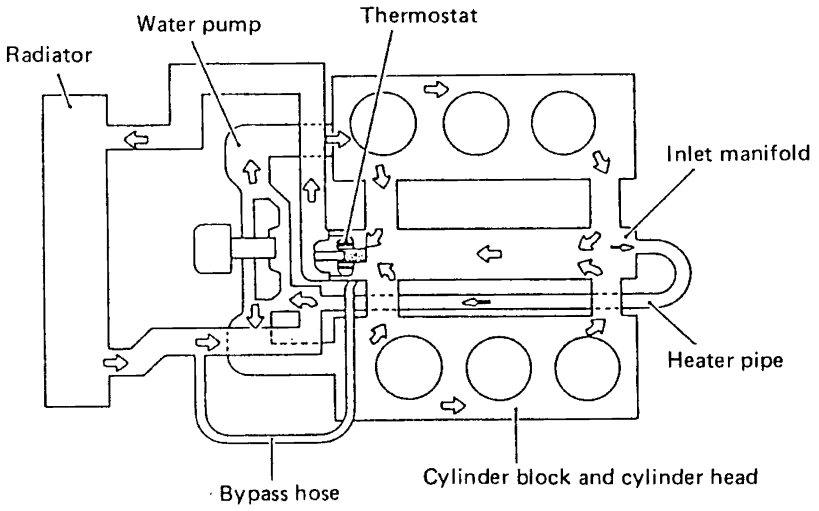
Flow of coolant during warm-up run

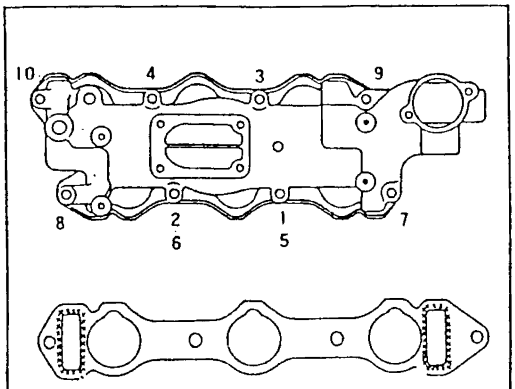


Water pump

Flow of coolant after engine warms up





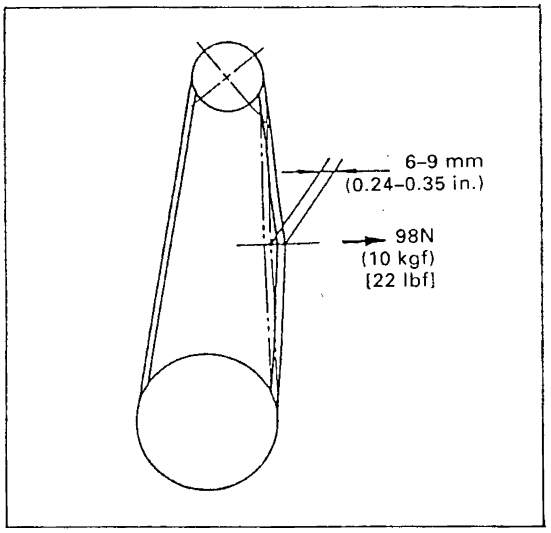

Nuts Nos. 1 and 2:
T=5–7 N·m
(0.5–0.7 kgf·m)
[3.6–5.1 lbf·ft]
(Temporary tightening)
Nuts Nos. 3 to 10:
T=20–22 N·m
(2.0–2.2 kgf·m)
[14.5–15.9 lbf·ft]
(Regular tightening)

## ■ MAIN POINT OF INSTALLATION

**11. Intake Manifold Gaskets / 10. Intake Manifold**

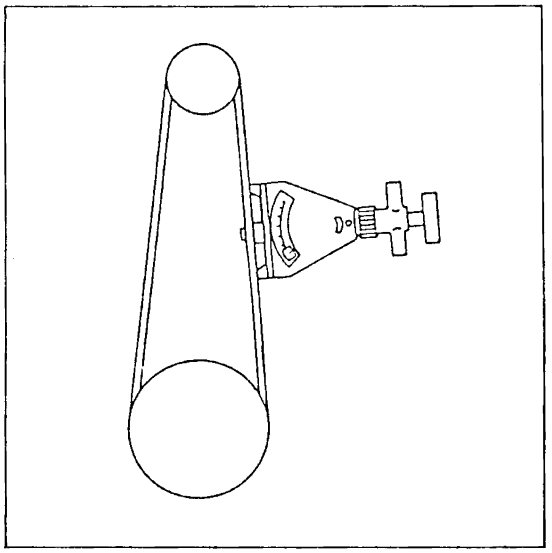
(1) Install each gasket on the cylinder head so that printed marks are visible. When installing, coat the shaded areas (shown in the figure) of the both sides of the gasket with the minimum necessary quantity of sealant. Take care not to cause excess sealant to overflow the intake ports.

(2) Install the intake manifold. First,tighten the nuts No.1 and No.2 shown in the figure temporarily to a torque of 5 to 7 N·m (0.5 to 0.7 kgf·m) [3.6 to 5.1 lbf·ft]. Then, tighten all nuts in numerical order, starting from No.3 nut, progressively in two or three steps so that every nut is fastened finally to the specified torque.




(2) Apply a 98N (10 kgf) [22 lbf] of force to the belt at the center of span between the pulleys and measure the resulting deflection.

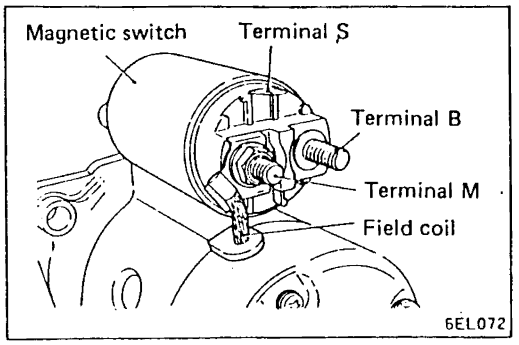
**Standard value: 6.0–0.9 mm (0.24–0.35 in.)**



Alternatively, measure belt tension with a tension gauge.

**Standard value: 343–588N (35–60 kgf) [77–132 lbf]**

(3) If the measurement of depression or tension does not fall into the range of standard value, refer to "Adjustment of V-belt Tension."



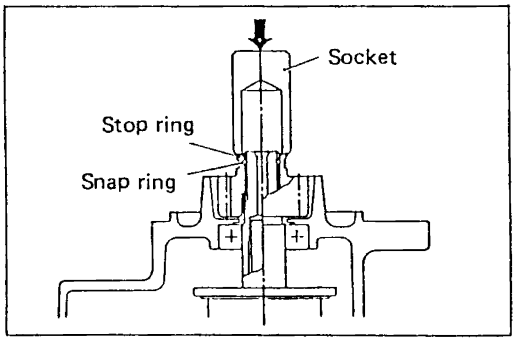

## ■ MAIN POINT OF DISASSEMBLY

**2. Magnetic Switch**

Disconnect the field coil from the magnetic switch terminal M.

**8. Armature**

Remove the rear cover and the yoke and brush holder assembly before pulling the armature out.




**19. Snap Ring / 20. Stopper Ring**

(1) Press the stopper ring with a suitable socket to expose the snap ring.

(2) Remove the snap ring with the snap ring pliers. Then, remove the stopper ring, pinion gear, and overrunning clutch from the front bracket.