Service Manuals

Manuals Available For A967 (GLC050LX)

Note: Service manuals do not contain serial number specific data.

Manual	Manual Title	Release Date
MAZDA POWERTRAIN		
0100YRM1423	FRAME	07-2011
0600YRM1122	MAZDA FE AND F2 ENGINES	07-2011
0700YRM1123	COOLING SYSTEM	08-2011
0900YRM1326	LPG FUEL SYSTEM MAZDA 2.0L AND 2.2L 2007 EMISSION COMPLIANT ENGINES	07-2011
DRIVETRAIN		
1300YRM1421	SINGLE SPEED POWERSHIFT ALUMINUM TRANSMISSION REPAIR	12-2010
1300YRM1447	SINGLE SPEED POWERSHIFT ALUMINUM CHAIN DRIVE TRANSMISSION	07-2011
1400YRM1426	DRIVE AXLE AND DIFFERENTIAL ASSEMBLY REPAIR	07-2011
HYDRAULICS		
1600YRM1425	STEERING AXLE	07-2011
1800YRM1135	BRAKE SYSTEM	07-2011
1900YRM1136	HYDRAULIC GEAR PUMP	07-2011
2000YRM1137	MAIN CONTROL VALVE	08-2011
2100YRM1139	CYLINDERS REPAIR	08-2011
4000YRM1431	MAST REPAIR	07-2011
ELECTRICAL		
2200YRM1128	WIRE HARNESS REPAIR	07-2011
2200YRM1327	ELECTRICAL SYSTEM MAZDA 2.0L AND 2.2L 2007 EMISSION COMPLIANT ENGINES	07-2011

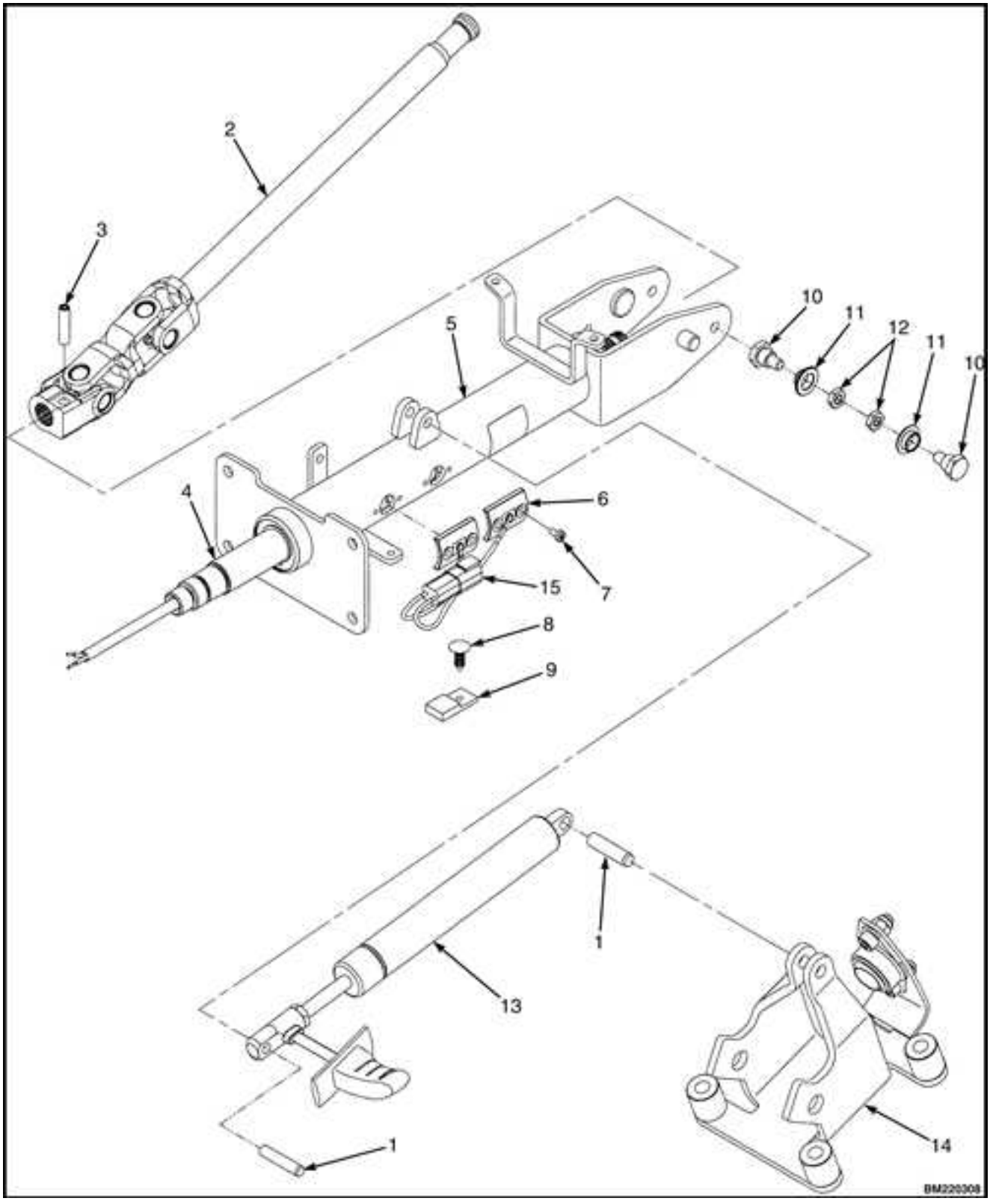
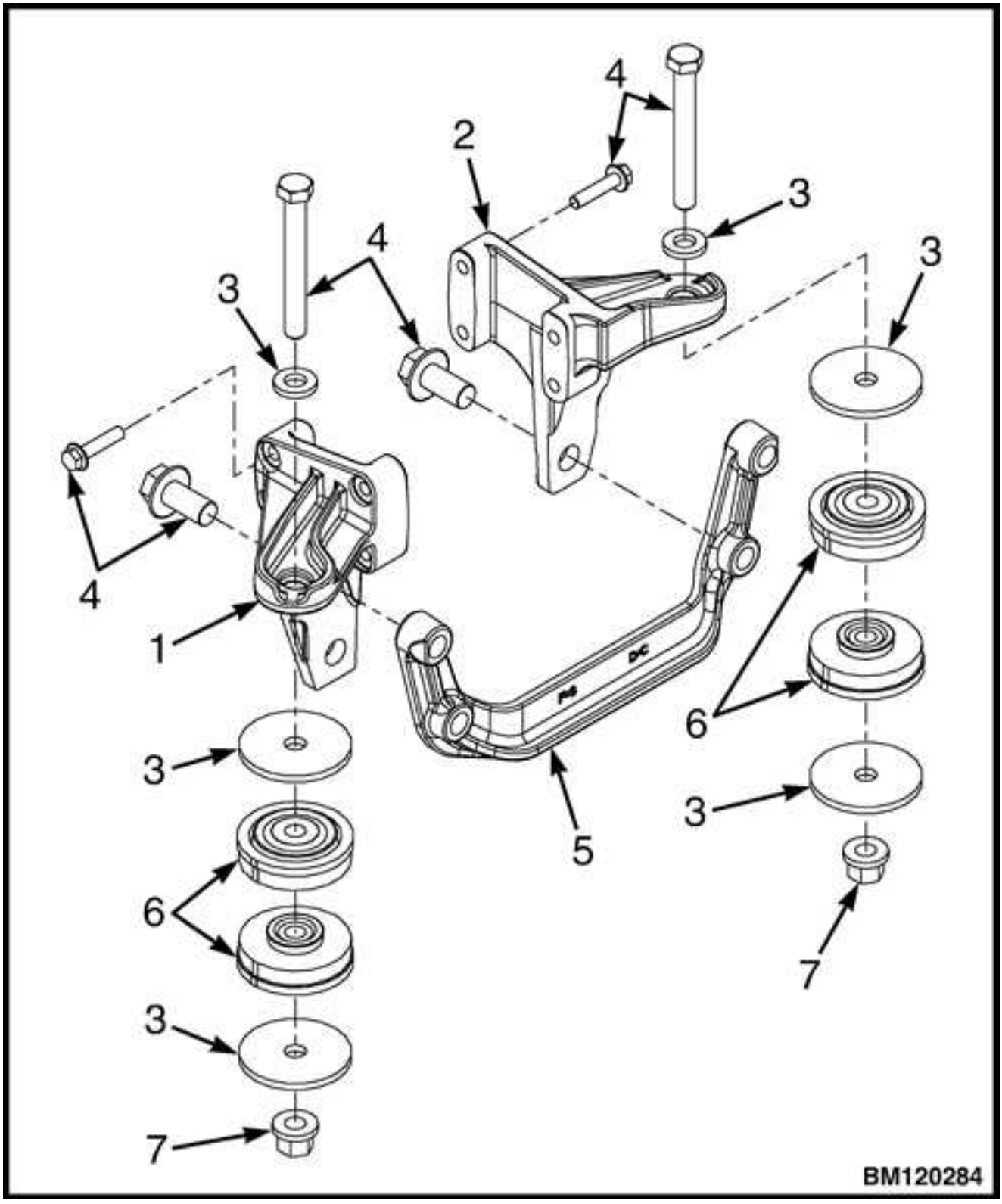


Figure 14. Steering Column Assembly

Legend for Figure 14

1. PIN
2. LOWER SHAFT
3. Split Pin
4. UPPER SHAFT



1. left engine mount
2. right engine mount
3. washer
4. capscrew
5. crossmember (Optional)
6. isolator
7. flange nut

Yanmar Diesel Engine

1. Remove floor plate and disconnect throttle cable from bellcrank and engine.

2. Fully depress throttle pedal and verify that the dimension between the bellcrank and cowl plate is 5 ±1 mm (0.20 ±0.04 in.). See Figure 39.

3. If dimension is not correct, adjust ball ends on push rod so that a minimum of 6 mm (0.24 in.) of threaded rod screws into each ball end. After adjusting push rod, tighten jam nuts to 8 to 15 N•m (71 to 133 lbf in).

4. Connect throttle cable to bellcrank and engine. See Figure 39.

5. With throttle pedal in full up position, adjust throttle cable, using jam nuts (10,) to remove all slack from cable. Cable should be adjusted to the point where additional adjustment will pull control lever off idle stop. Tighten jam nuts 8 to 15 N•m (71 to 133 lbf in).

6. Install floor plate. Fully depress throttle pedal and adjust pedal stop so that it touches floor plate. Tighten jam nuts (6,) to 8 to 15 N•m (71 to 133 lbf in).

Yanmar Diesel Engine With Electronic Throttle

If lift truck is equipped with an electronic throttle, see section **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205 for adjustment procedures.

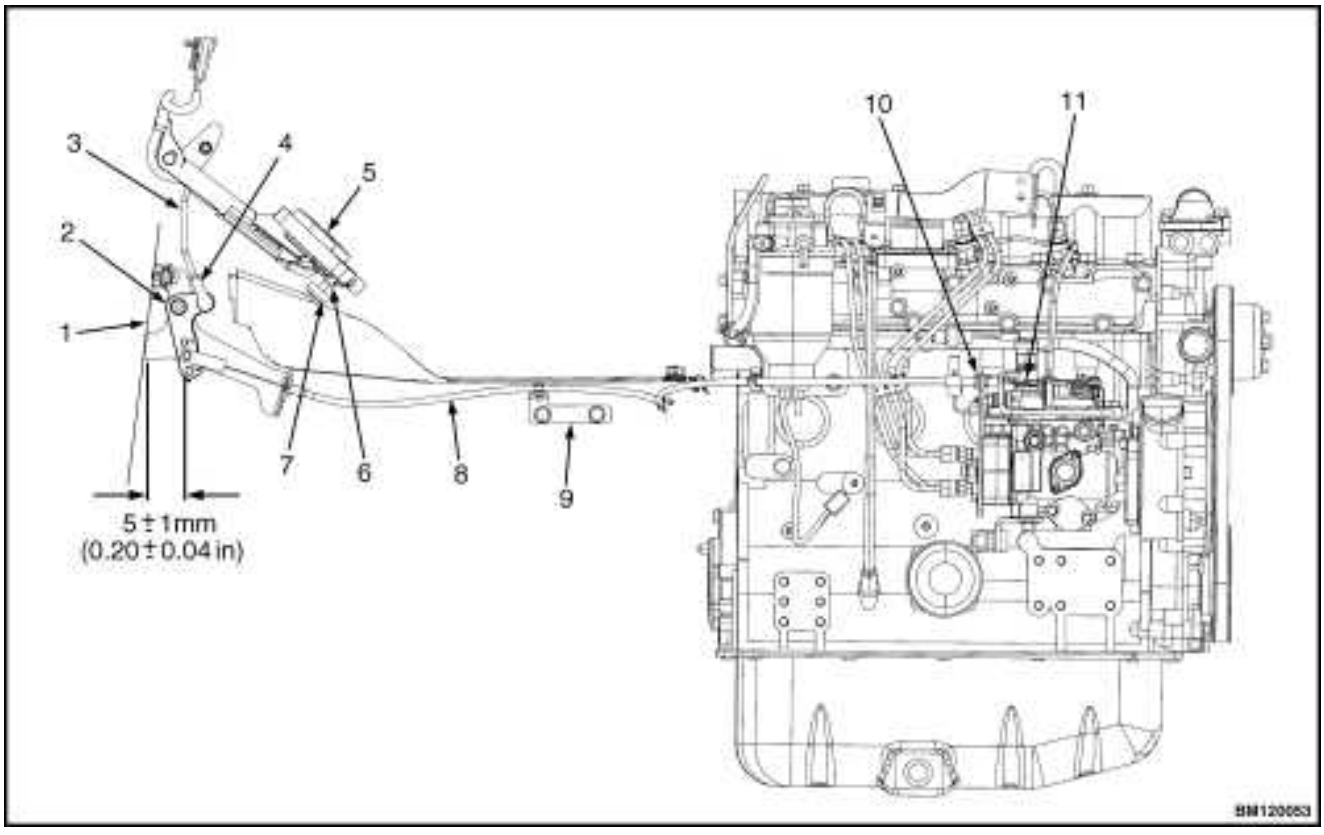


Figure 3. Timing Belt

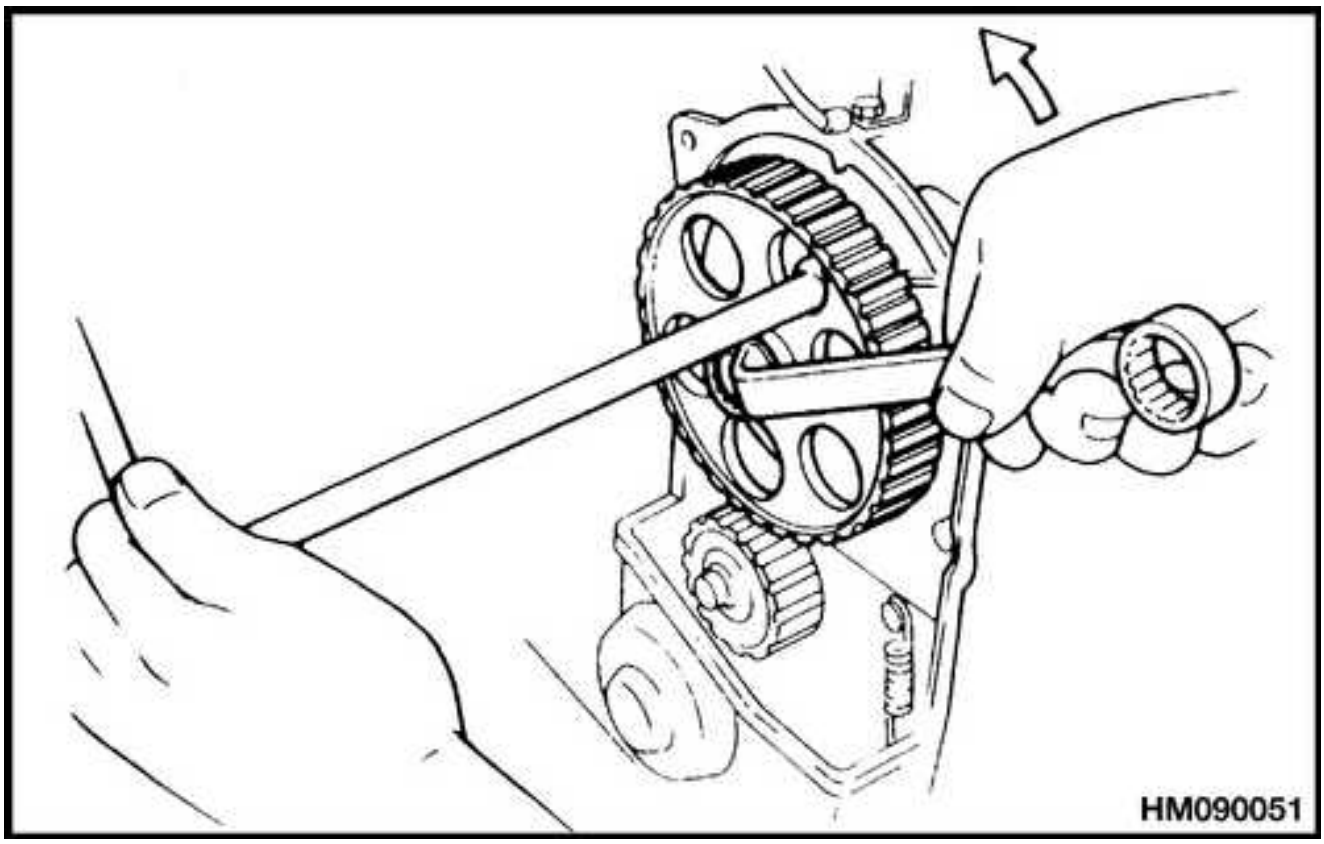
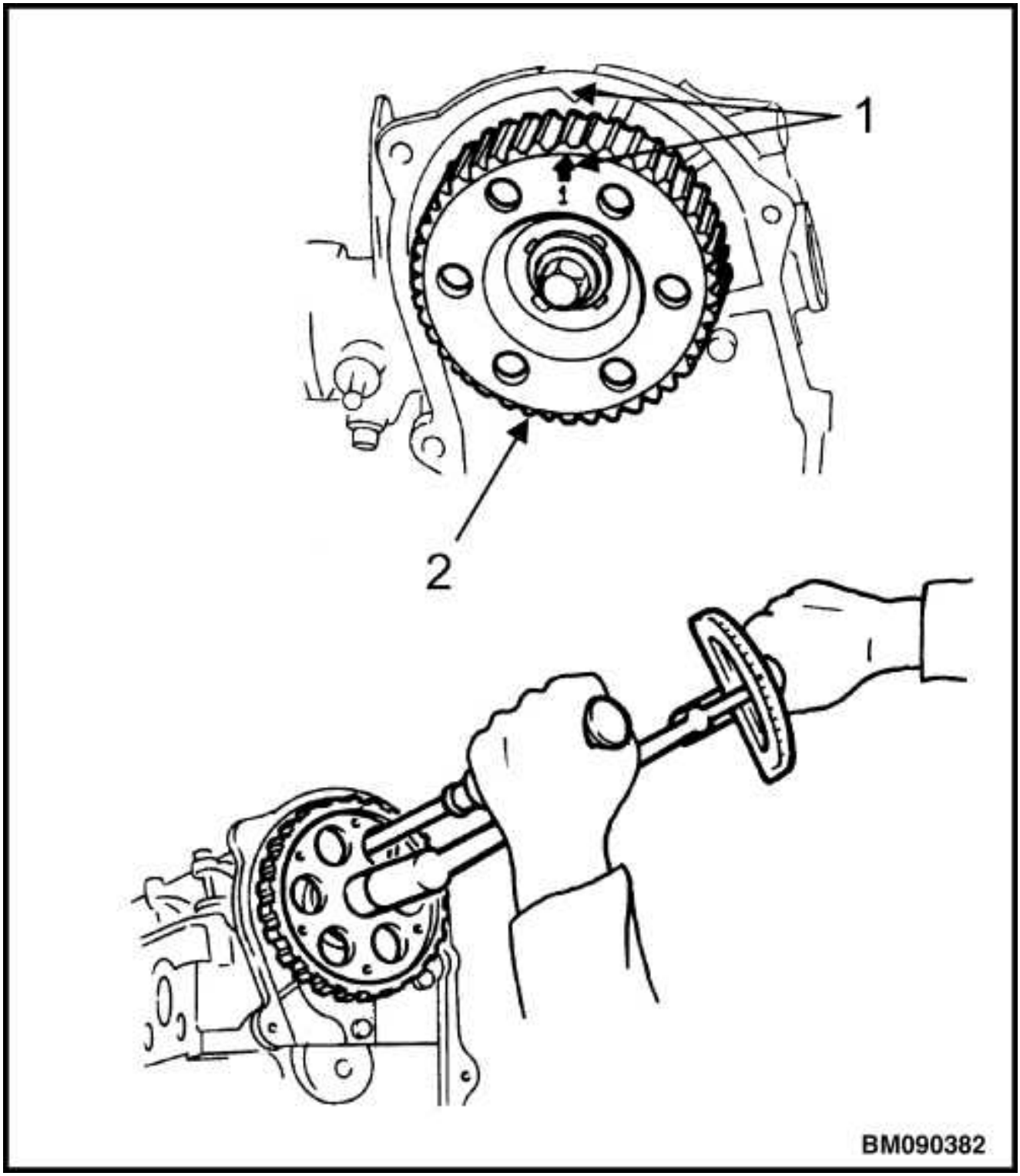


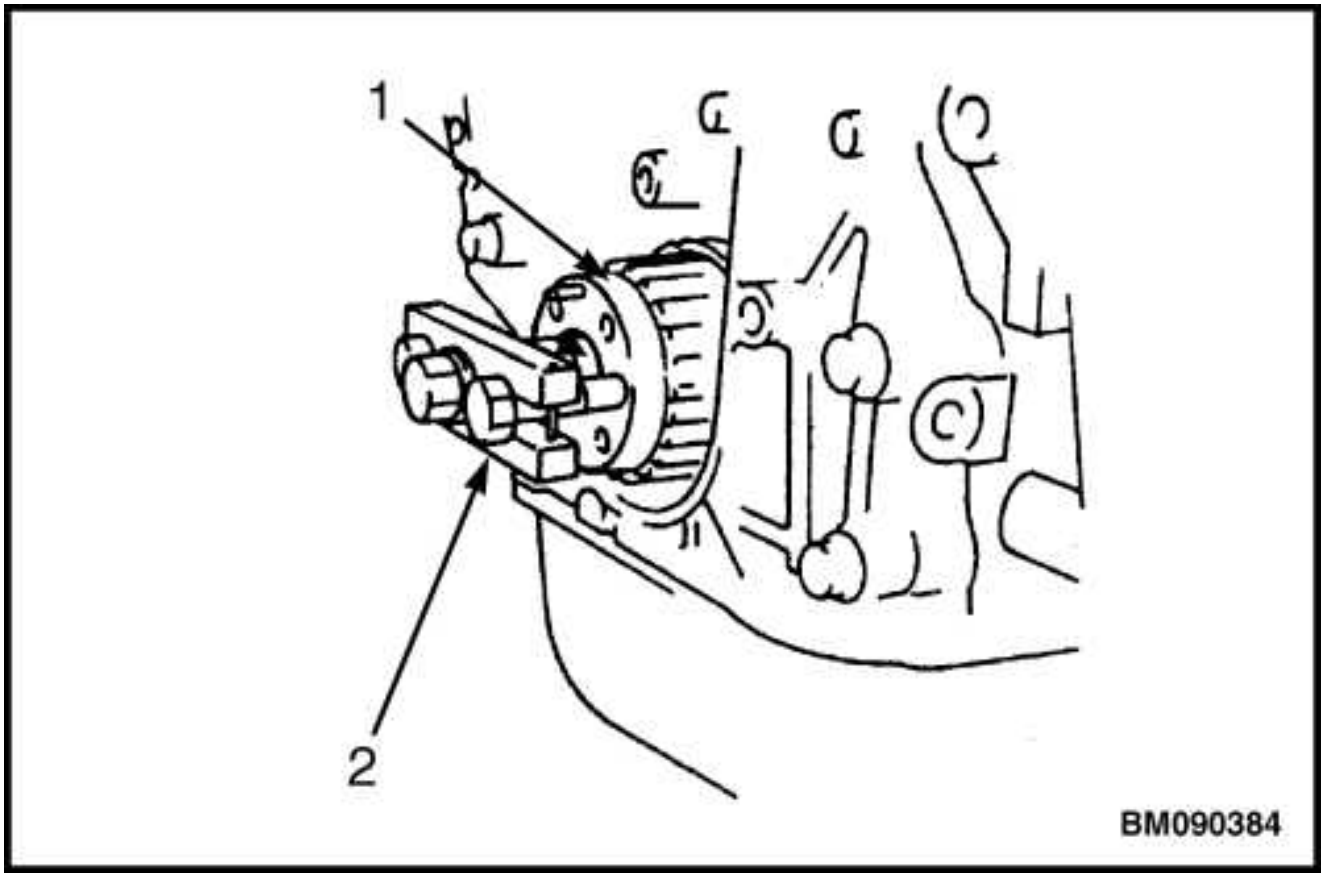
Figure 4. Camshaft Gear Removal



1. Timing Marks
2. Camshaft Pulley

Figure 25. Camshaft Pulley Installation

12. Align timing marks for crankshaft timing pulley. See Figure 26.



1. spacer 2. tool

Figure 44. Crankshaft Timing Pulley Removal

Disassemble

1. Remove screws and pump cover. See Figure 45.

2. Remove outer gear and inner gear from pump body.

3. Remove snap ring and plunger assembly from housing.

Small End Bore	21.943 to 21.961 mm (0.8639 to 0.8646 in.)
Interference Between Piston Pin and Bore	0.037 to 0.013 mm (0.0014 to 0.0006 in.)
Clearance Between Crankshaft Journals and Rod Bearings	0.027 to 0.067 mm (0.0011 to 0.0026 in.)
– Service Limit	0.10 mm (0.004 in.)

Cylinder Block

Distortion at Top Surface	0.15 mm (0.0059 in.)
Grinding Limit	0.20 mm (0.008 in.)
Bore Diameter	86.00 to 86.019 mm (3.3858 to 3.3866 in.)
– Wear Limit	0.15 mm (0.0059 in.)

Pistons

Diameter, Standard	85.945 to 85.965 mm (3.3836 to 3.3844 in.)
0.25 mm (0.01 in.) Oversize	86.193 to 86.215 mm (3.394 to 3.3943 in.)
0.50 mm (0.02 in.) Oversize	86.443 to 86.465 mm (3.4033 to 3.4041 in.)
Clearance Between Piston and Bore	0.035 to 0.076 mm (0.0014 to 0.0030 in.)
– Service Limit	0.15 mm (0.0059 in.)
Piston Pin Diameter	21.988 to 21.998 mm (0.8657 to 0.8660 in.)
Groove Width for Piston Rings Nos. 1 and 2	1.520 to 1.540 mm (0.0598 to 0.0606 in.)
Groove Width for Oil Ring	4.020 to 4.040 mm (0.1583 to 0.1591 in.)
Piston Ring Clearance in Groove (Nos. 1 and 2)	0.03 to 0.07 mm (0.0012 to 0.0028 in.)
– Service Limit	0.15 mm (0.0059 in.)
Piston Ring End Clearance:	
– Top Ring	0.20 to 0.35 mm (0.008 to 0.014 in.)
– Second Ring	0.15 to 0.30 mm (0.006 to 0.012 in.)

1. CAPSCREW
2. INSERT
3. upper RADIATOR BRACKET
4. RADIATOR CAP
5. ISOLATOR
6. CLIP NUT
7. COOLANT LEVEL SENSOR
8. RADIATOR
9. CLIP
10. RADIATOR SHROUD
11. CLAMP
12. lower HOSE
13. SCREW
14. WASHER
15. SCREEN
16. RESERVOIR
17. OUTLET ASSEMBLY
18. OUTLET
19. CAP
20. BUSHING
21. TUBE
22. upper hose
23. drain plug
24. oil cooler

20. Connect positive battery cable.

21. Connect negative battery cable.

WARNING

DO NOT use an alcohol or methanol base antifreeze. They are flammable and could cause personal injury or damage to the lift truck.

CAUTION

Additives may damage the cooling system. Before using additives, contact you local Yale dealer.

22. Fill cooling system with ethylene glycol boron-free antifreeze. Purchase a pre-diluted 50/50 solution; or mix 50% concentrate with 50% distilled or deionized water. The 50/50 mixture will protect cooling system to –37°C (–35°F).

23. Install radiator cap.

24. Use the same coolant mixture and fill the auxiliary coolant reservoir between the **ADD** and **FULL** marks. See Figure 12.

WARNING

During engine operation, be careful not to touch the fan, pulleys, or drive belts. contact with these parts can cause serious injury.

WARNING

The radiator or other parts of the cooling system may be hot or under pressure and cause serious injury.

25. Start and run the engine until thermostat opens (The upper radiator hose will be warm).

CAUTION

Additives may damage the cooling system. Before using additives, contact you local Yale dealer.

26. Check coolant level at the auxiliary coolant reservoir. Add coolant as necessary to keep level between the ADD and FULL marks on the reservoir.

27. Shut down the engine for one minute or longer prior to checking the transmission oil level. If the transmission oil is low, add transmission oil at the dipstick tube at the correct level indicated on the dipstick. See one of the following sections

Periodic Maintenance 8000 YRM 1322 for lift truck models:

- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878/D878)

Periodic Maintenance 8000 YRM 1407 for lift truck model:

- GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GDP170VX, GDP175VX36, GDP190VX)

6. Install the spacer, washers, and capscrews to the fan. Tighten the capscrews to 27 N•m (20 lbf ft).

See Figure 21 for lift truck models below equipped with GM 4.3L engine
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813)

See Figure 23 for lift truck models below equipped with GM 4.3L or Cummins 4.5L engines
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879)

See Figure 24 for lift truck models below equipped with GM 4.3L or Cummins 4.5L engines
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878)

7. Lean the radiator shroud back toward the radiator. Install the screws and washers and install the radiator shroud cover.

See Figure 18 for lift truck models below equipped with GM 2.4L, Yanmar 2.6L, or Yanmar 3.3L engine
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)

See Figure 19 for lift truck models below equipped with Yanmar 2.6L engine.
- GDP20-25LX (GDP050LX) (A974)

See Figure 20 for lift truck models below equipped with Mazda FE or F2 engines
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLC050LX (A967)
- GLP20-25LX (GLP050LX) (A974)
- GLP20-35VX (GP/GLP040-070VX) (B875)
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP16VX, GLP18VX, GLP20SVX (GP/GLP030VX, GP/GLP035VX, GP/GLP040SVX) (C810)

See Figure 21 for lift truck models below equipped with GM 4.3L engine
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813)

See Figure 22 for lift truck models below equipped with Cummins 4.5L engine
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813)

See Figure 23. for lift truck models below equipped with GM 4.3L or Cummins 4.5L engines
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879)

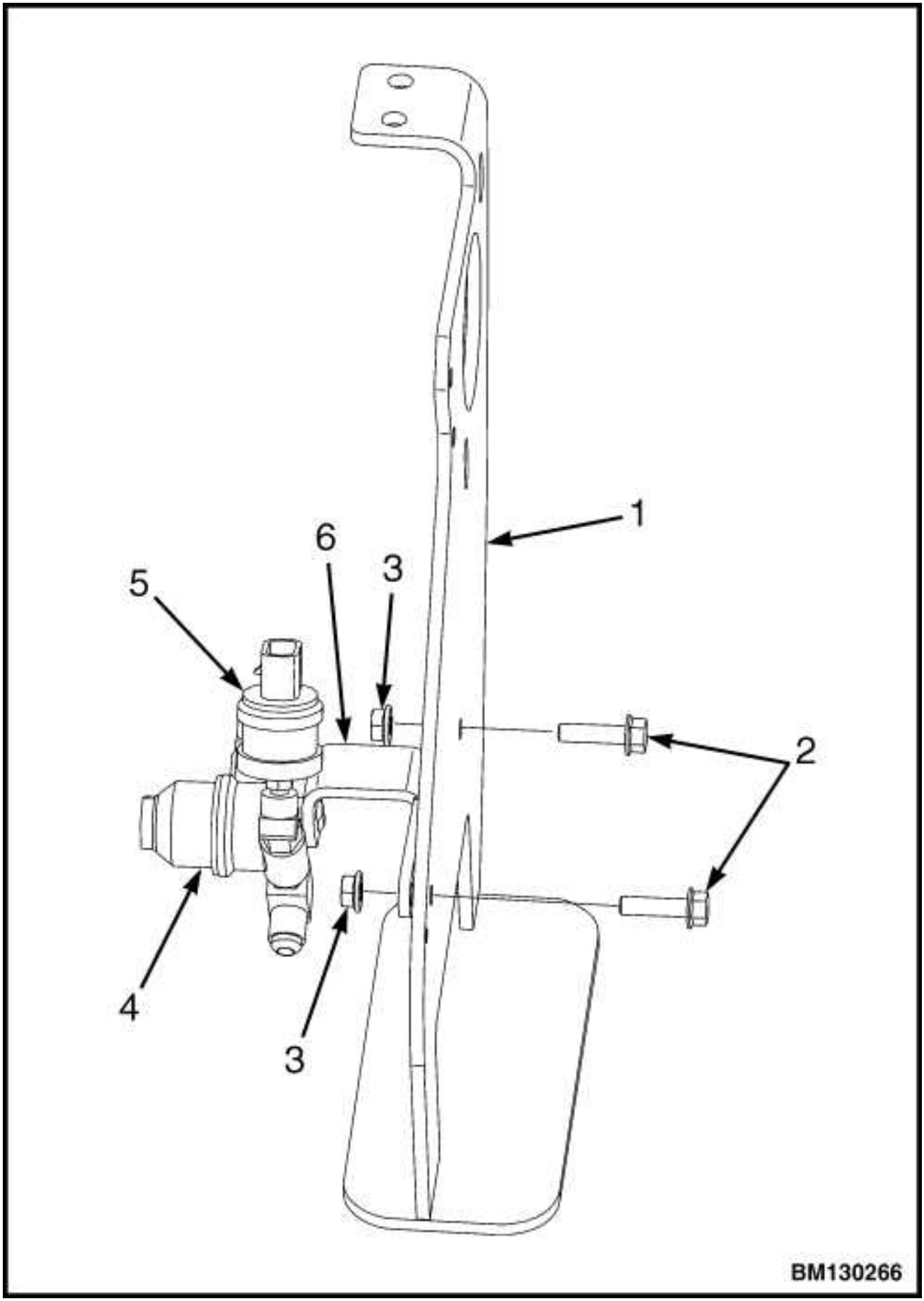

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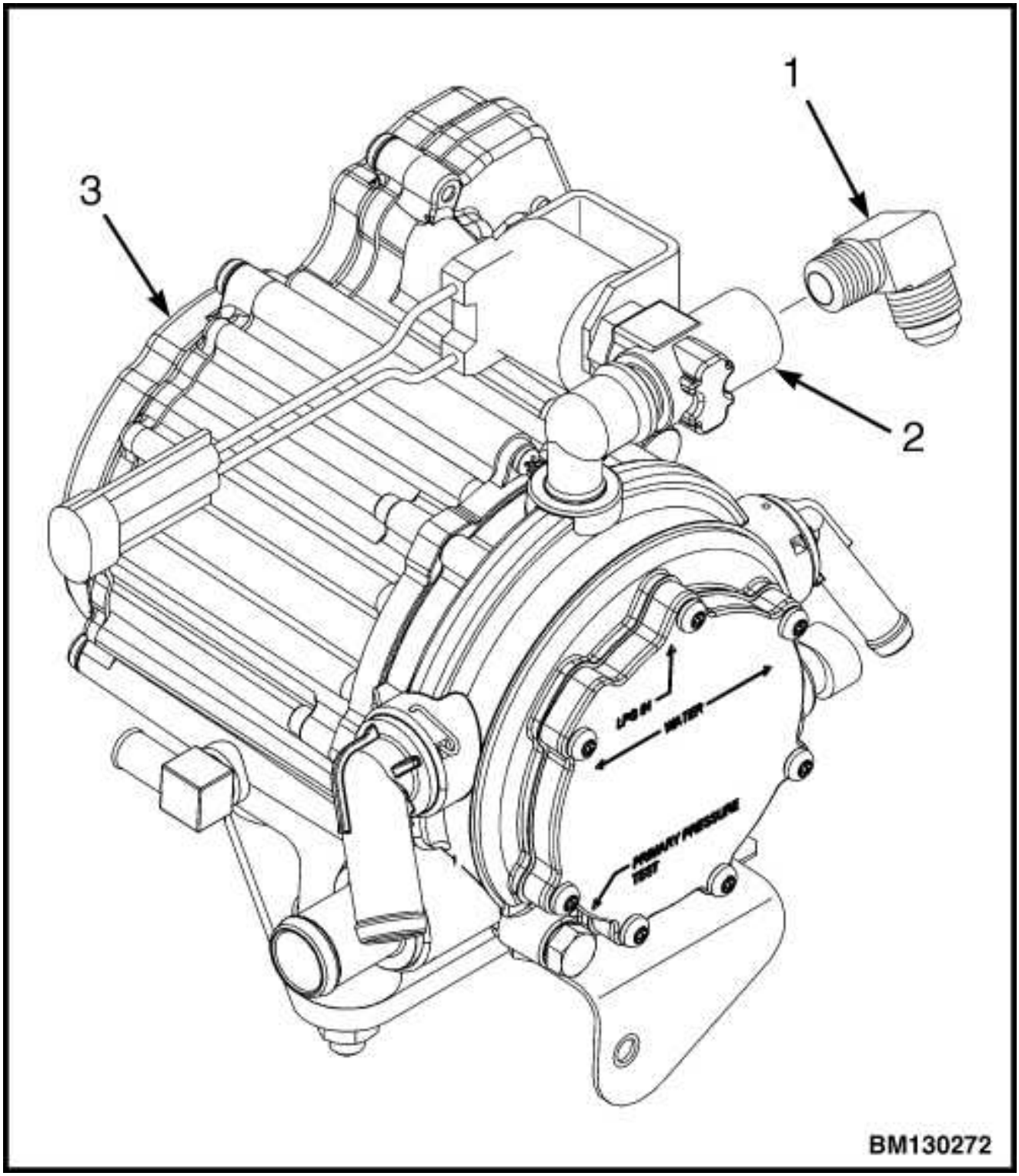
Figure 20.

7. Remove the LPG shutoff valve and the 90 degree fitting connecting it to the EPR as an assembly. See Figure 21 and Figure 22.



1. 90 Degree Fuel Inlet Fitting
2. LPG shutoff valve assembly

2. inlet fitting
3. lpg low level sensor
4. lpg low level sensor adapter fitting
5. lpg low level sensor connector
6. outlet fitting
7. mounting bracket

Figure 36. LPG Low Level Sensor, Replace for Lift Trucks Built After January, 2010

Install

CAUTION

DO NOT use Teflon tape on any fuel fittings. Use a liquid pipe thread sealant when installing fittings.

NOTE: Install the LPG low level sensor with UP arrow pointing upwards. See Figure 35 and Figure 36.

1. Apply pipe thread sealant, Yale Part No. 505970592, onto LPG low level sensor adapter fitting. Install LPG low level sensor onto LPG low level sensor adapter fitting See Figure 36.

2. Apply pipe thread sealant, Yale Part No. 505970592, onto threads of outlet fitting. Install outlet fitting into LPG low level sensor. Connect outlet hose to outlet fitting.

3. Connect engine wire harness to LPG low level sensor connector. See Figure 35 and Figure 36.

NOTE: Opening the fuel valve too quickly can cause the internal excess flow valve to close, restricting the flow of fuel. If this happens, close the fuel valve, wait a few seconds, and then slowly open the fuel valve again. This will reset the excess flow valve.

4. Slowly open the fuel valve on tank.

5. Connect the battery.

6. Close hood.

7. Turn the key to the **ON** position and back to the **OFF** position to pressurize the fuel system. Check for leaks.

8. Check for leaks at connections by using soap and water solution or electron leak detector. If leaks are detected, make proper repairs.

Exhaust System

NOTE: Always use new O-rings, seals, and gaskets when servicing the fuel and exhaust systems.

Counterweight Exhaust System

NOTE: Remove the counterweight before removing the muffler and other parts of the exhaust system.

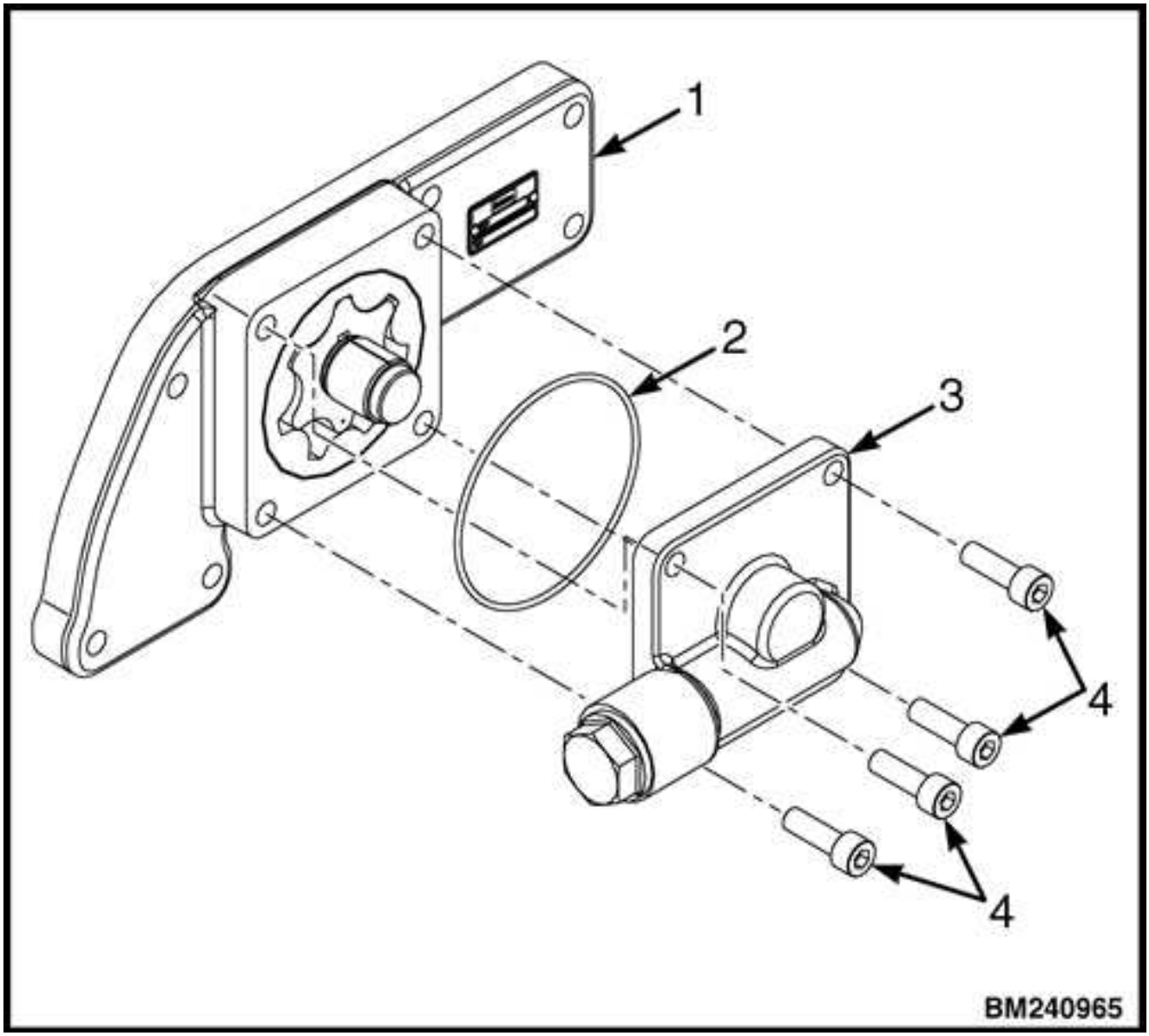
See section **Frame** 100 YRM 1120 for lift truck models

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)

5. Remove suction screen spring and suction screen from transmission housing. See Figure 3.

Disassemble

1. Remove capscrews, charge pump cover, and O-ring from charge pump body. Discard O-ring. See Figure 4.



1. charge pump body
2. O-ring
3. charge pump cover
4. Socket head screw

Figure 4. Charge Pump Assembly

Clean

1. If damaged, remove capscrews, washers, and bottom cover plate from torque converter housing. See Figure 17.

NOTE: Perform Step 2 through Step 6 as needed.

See section **Electrical System** 2200 YRM 1142 for repair procedures for lift truck models:

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)

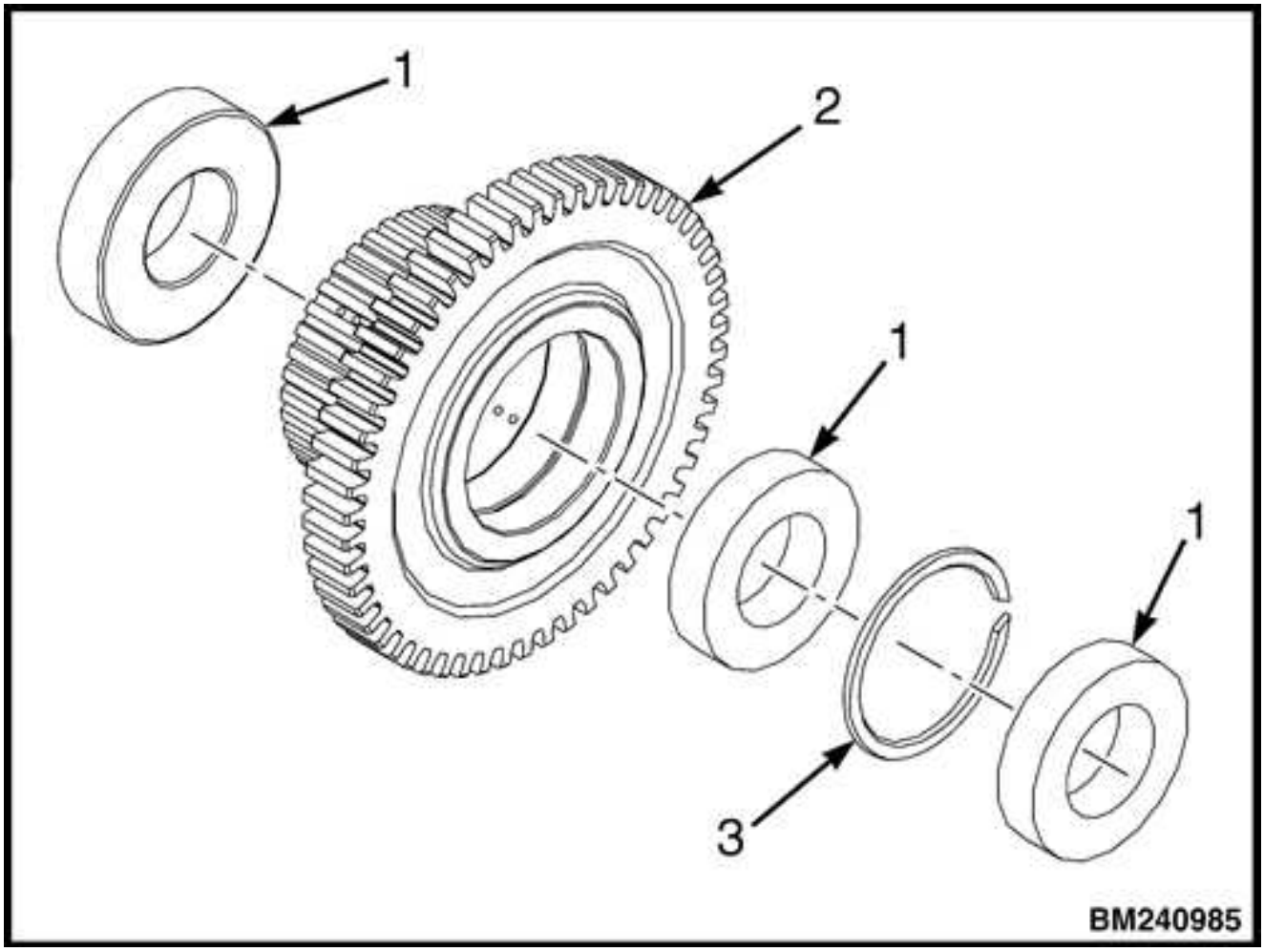
See section **Electrical System** 2200 YRM 1427 for repair procedures for lift truck models

- GLC050LX (A967)
- GLP050LX (A974)

2. Remove temp sensor from torque converter housing. See Figure 17.

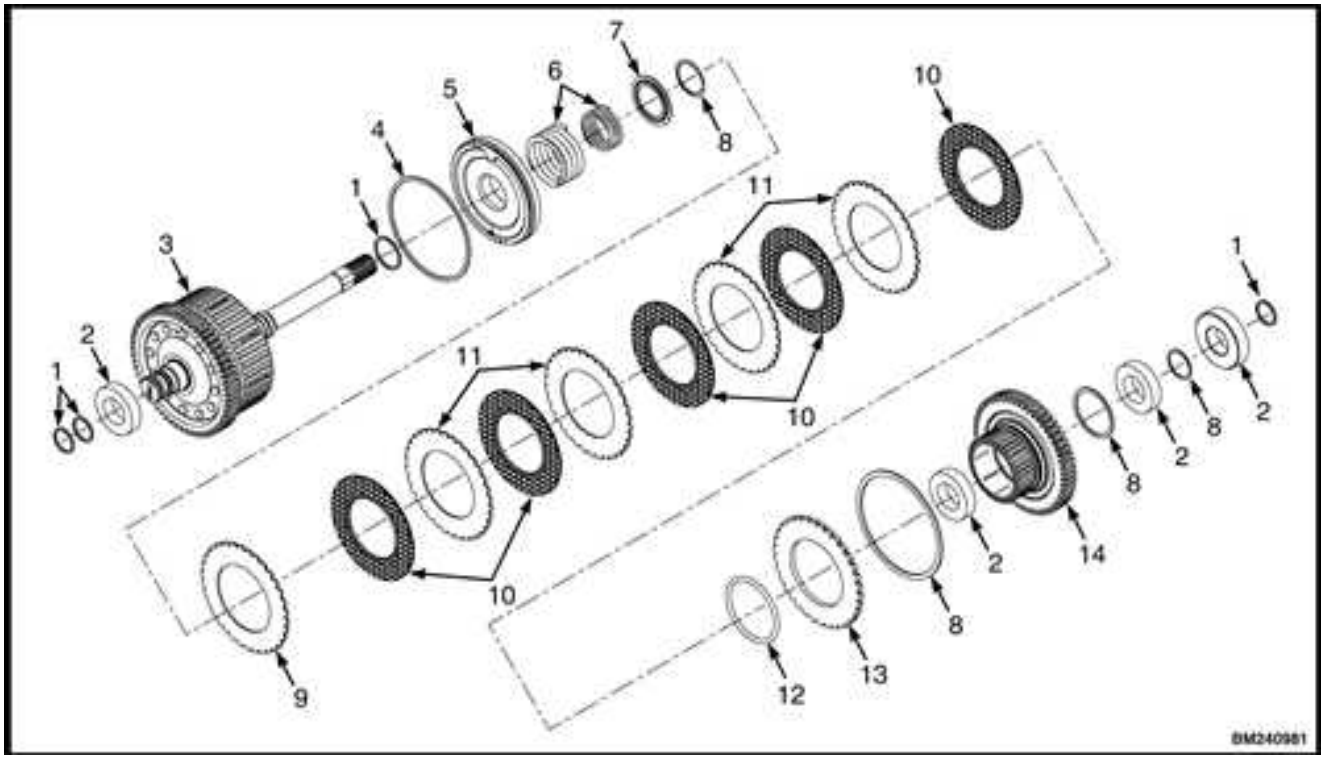
3. Remove capscrews, washers, and speed sensors from transmission housing. See Figure 17

4. Remove capscrews and solenoid valve from transmission housing. See Figure 17.



1. bearing
2. output gear
3. snap ring

STEP 5.
Remove snap ring and pressure plate from gear assembly drum. Remove and discard O-ring from pressure plate.

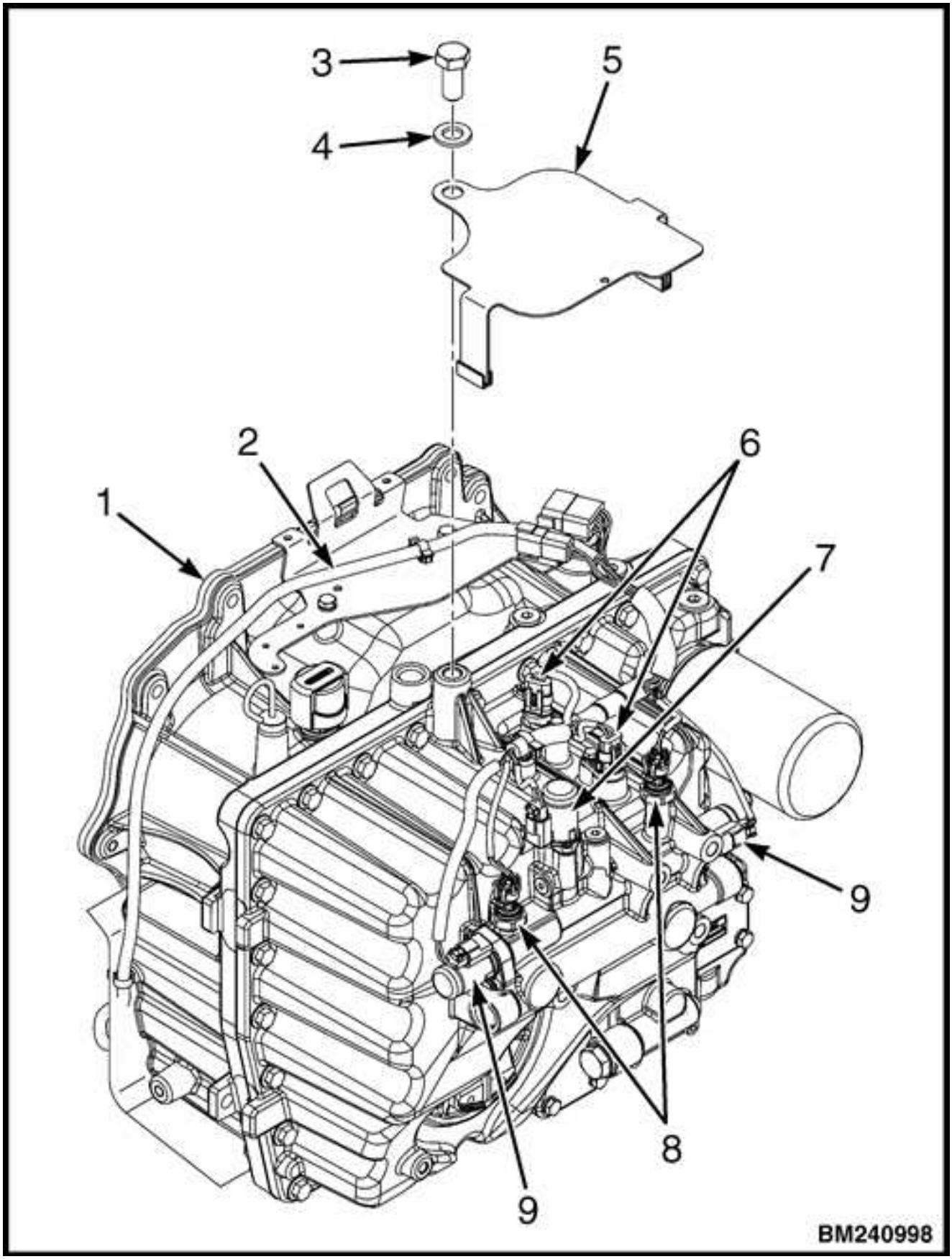


1. seal
2. bearing
3. gear assembly drum
4. piston seal
5. piston
6. spring
7. spring guide
8. snap ring
9. conical plate
10. friction disk
11. separator plate
12. pressure plate O-ring
13. pressure plate
14. output gear

Figure 25. Forward Clutch Pack Assembly

STEP 1.

Lubricate shaft seals with clean transmission oil. Install bearing and shaft seals onto input shaft.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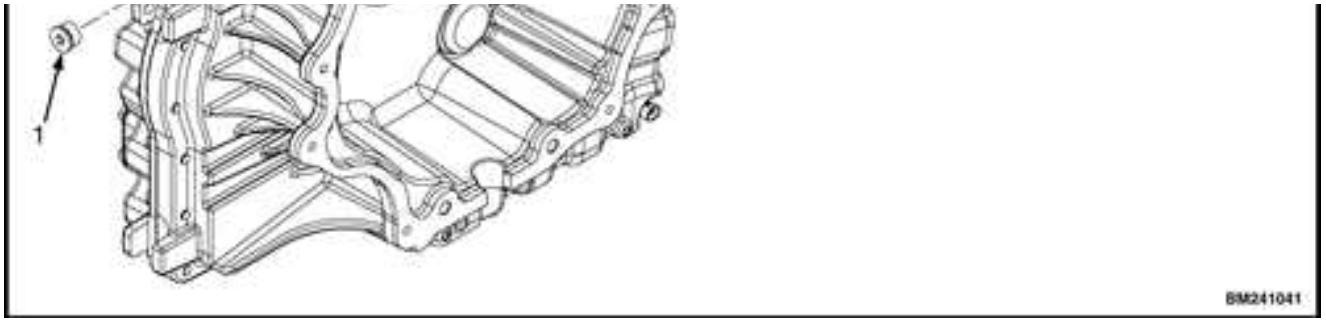


A. transmission housing
B. converter housing
1. fitting
2. hole plug

Figure 3. Housing Fittings and Hole Plug

Charge Pump Repair

Remove

WARNING
Make sure engine and transmission are held in position so that they will not fall and cause an injury and damage to equipment.

WARNING
The engine and transmission are heavy. Make sure that any lifting device has enough capacity to lift the engine and transmission.

The engine can weigh approximately 194 kg (428 lb).

The transmission can weigh approximately 84 kg (185 lb).

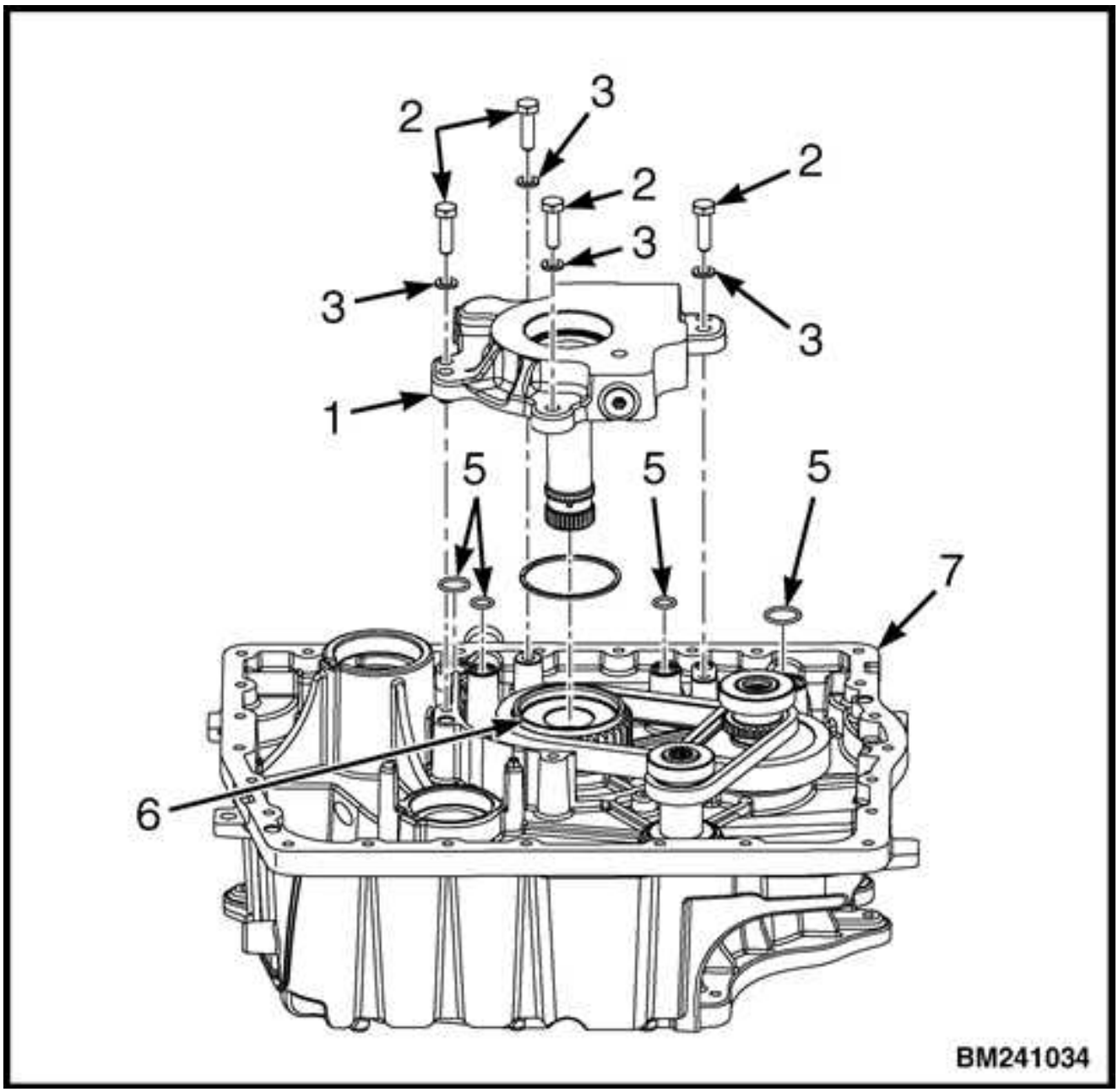
NOTE: Charge pump can be removed from transmission while it is still in lift truck. However, for the sake of clarity, illustrations in following steps are shown with transmission removed from lift truck.

NOTE: Perform Step 1 through Step 4 if engine and transmission are removed from lift truck.

1. Using a lifting device, remove engine from lift truck.

See section **Frame** 100 YRM 1120 for removal procedures for lift truck models listed below:
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)

See section **Frame** 100 YRM 1423 for removal procedures for lift truck models listed below:
- GLC050LX (A967)

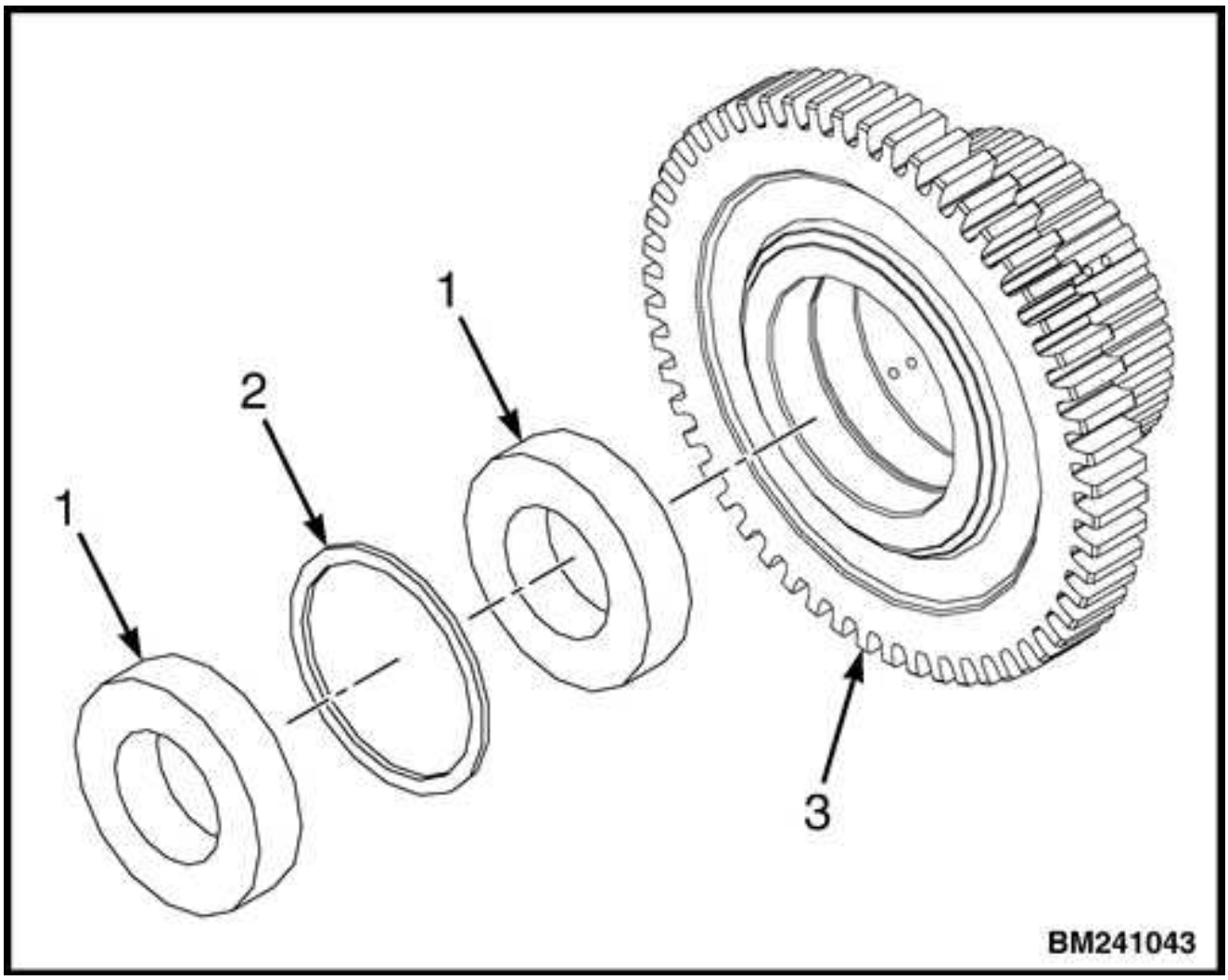


1. stator support assembly
2. capscrew
3. lockwasher
4. sealing ring
5. O-ring
6. input gear
7. converter housing

Figure 16. Stator Support

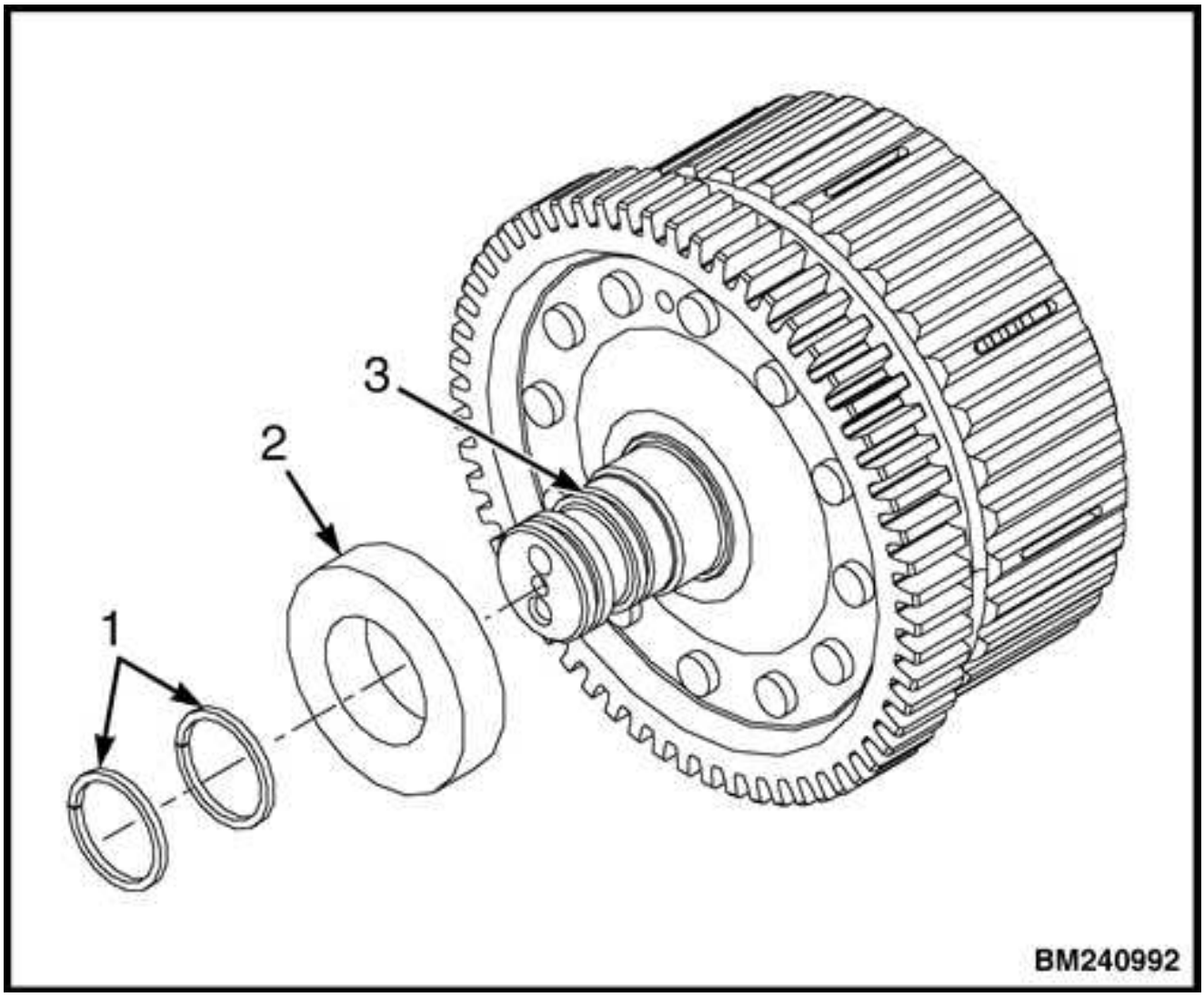
Disassemble

1. Remove fitting with O-ring, pack regulator spring, and pack regulator spool from stator support housing.



1. bearing
2. snap ring
3. output gear

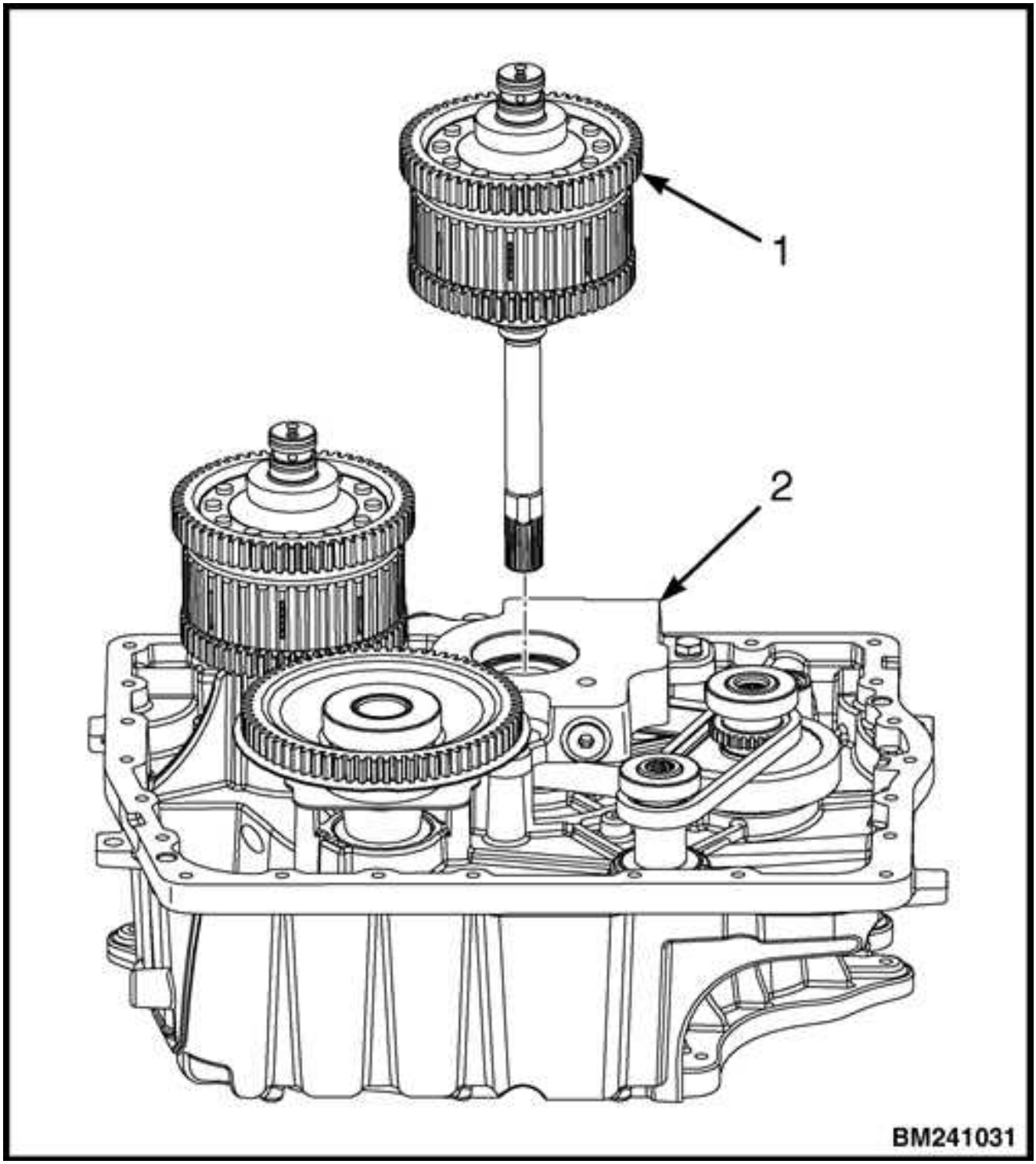
STEP 5.
Remove snap ring and pressure plate from gear assembly drum. Remove and discard O-ring from pressure plate.



1. shaft seal
2. bearing
3. center shaft

NOTE: Perform STEP 2 through STEP 4 only if piston was removed.

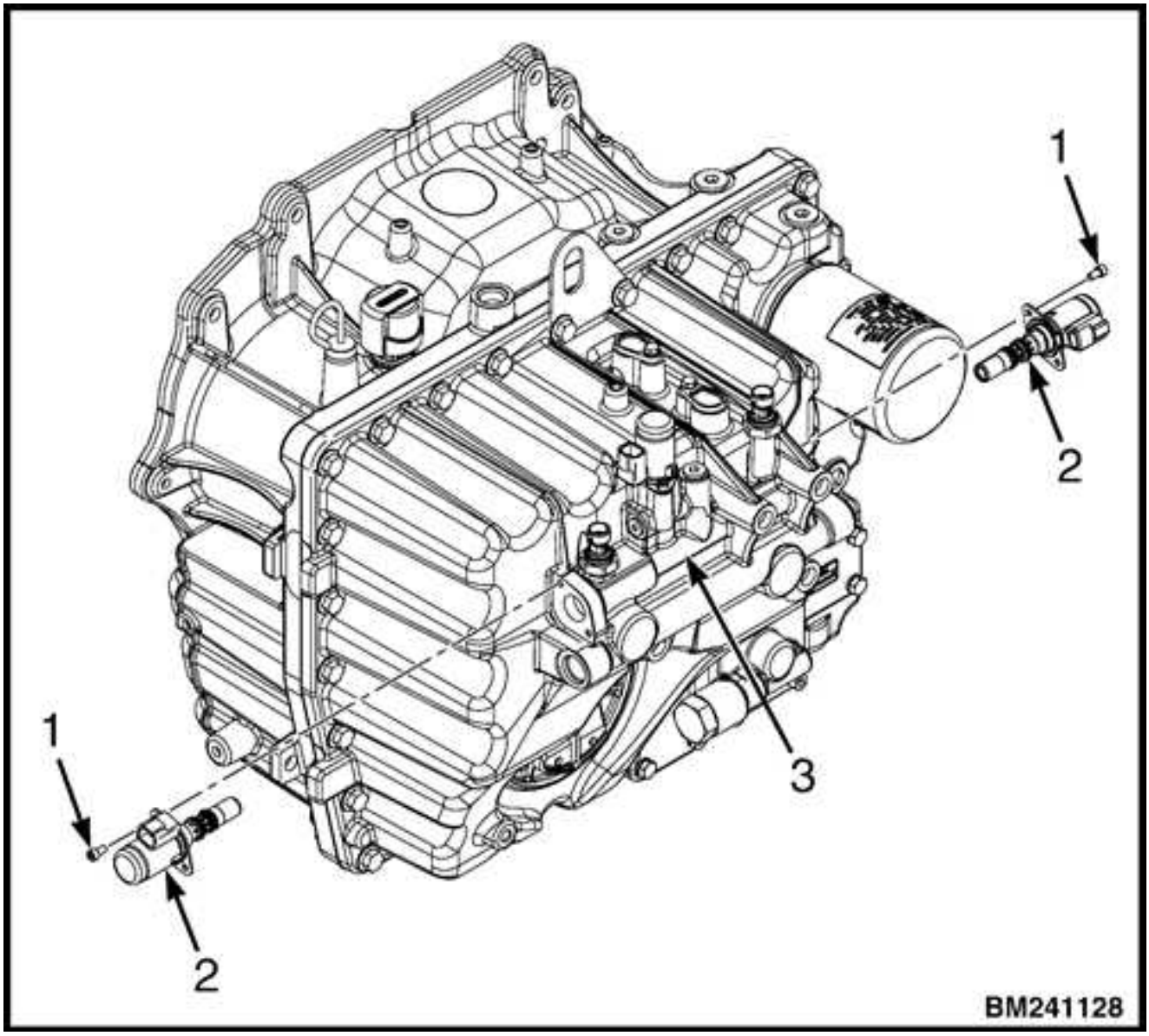
STEP 2.
Lubricate all parts with clean transmission oil. Install new shaft seal on center shaft. Install new piston seal on piston. Install piston into gear assembly drum.



1. forward clutch assembly
2. stator support assembly

Housings

1. Install new gasket and O-rings on transmission housing. See Figure 31.

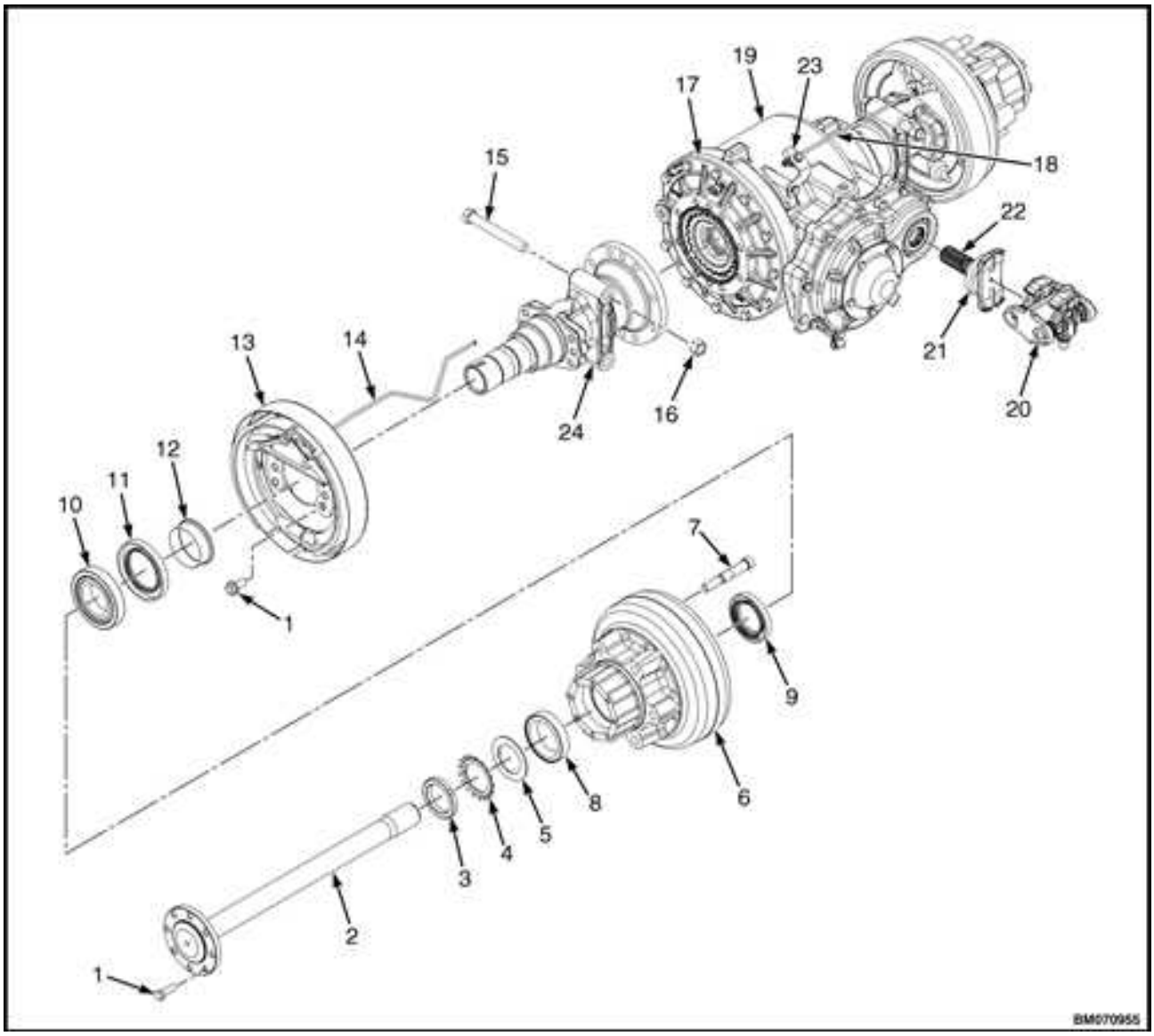


1. capscrew
2. proportional valve
3. transmission housing

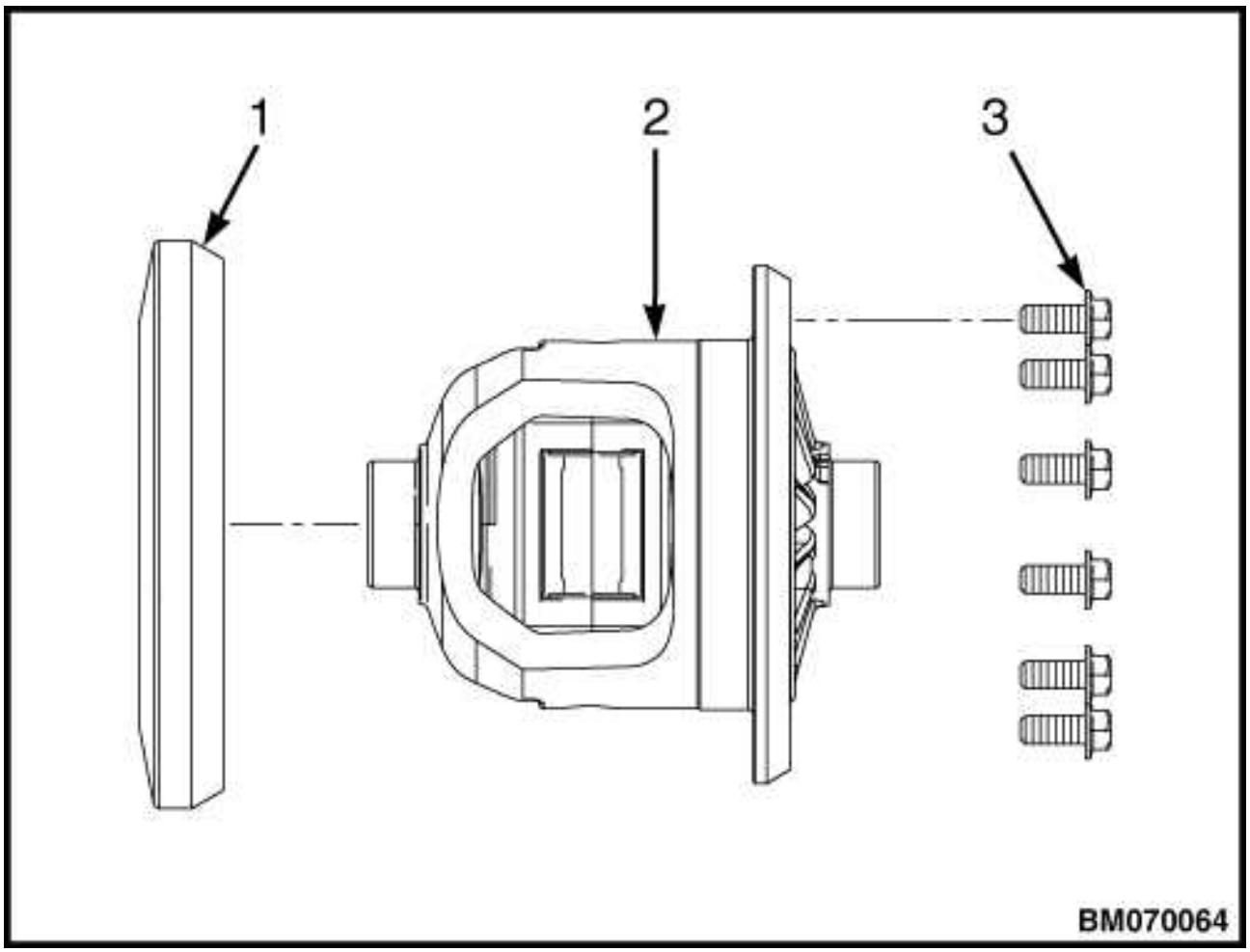
Figure 45. Proportional Valves for Lift Truck Models GLC050LX (A967) and GLP/GDP20-25LX (GLP/GDP050LX) (A974)

Disassemble

1. Remove and discard O-rings from proportional valves. See Figure 46.



1. capscrew
2. drive axle shaft
3. locknut
4. bearing lockwasher
5. washer
6. taper roller bearing
7. hub/brake assembly
8. hub bolt
9. roller bearing
10. inner seal
11. inner bearing
12. Outer seal
13. wear sleeve
14. brake assembly
15. left brake line
16. drive axle mounting capscrew
17. drive axle mounting nut
18. differential cover
19. right brake line
20. drive axle center section
21. universal joint
22. dust cover



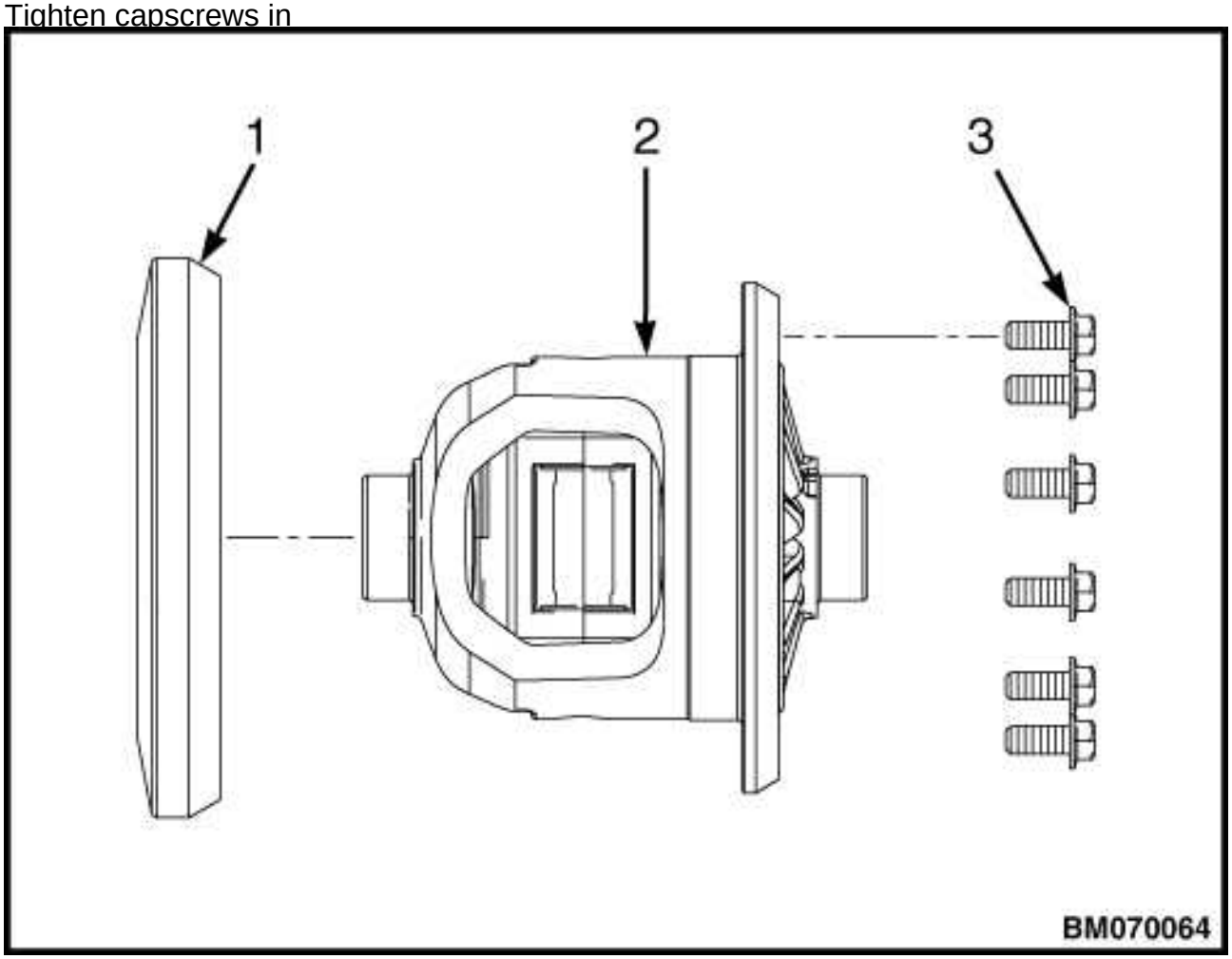
1. hypoid gear
2. differential assembly case
3. capscrew

STEP 3.
Remove pin from differential assembly case and pinion shaft. Remove pinion shaft. Inspect pinion shaft for wear. Replace as needed.

1. pin
2. differential assembly case
3. pinion shaft

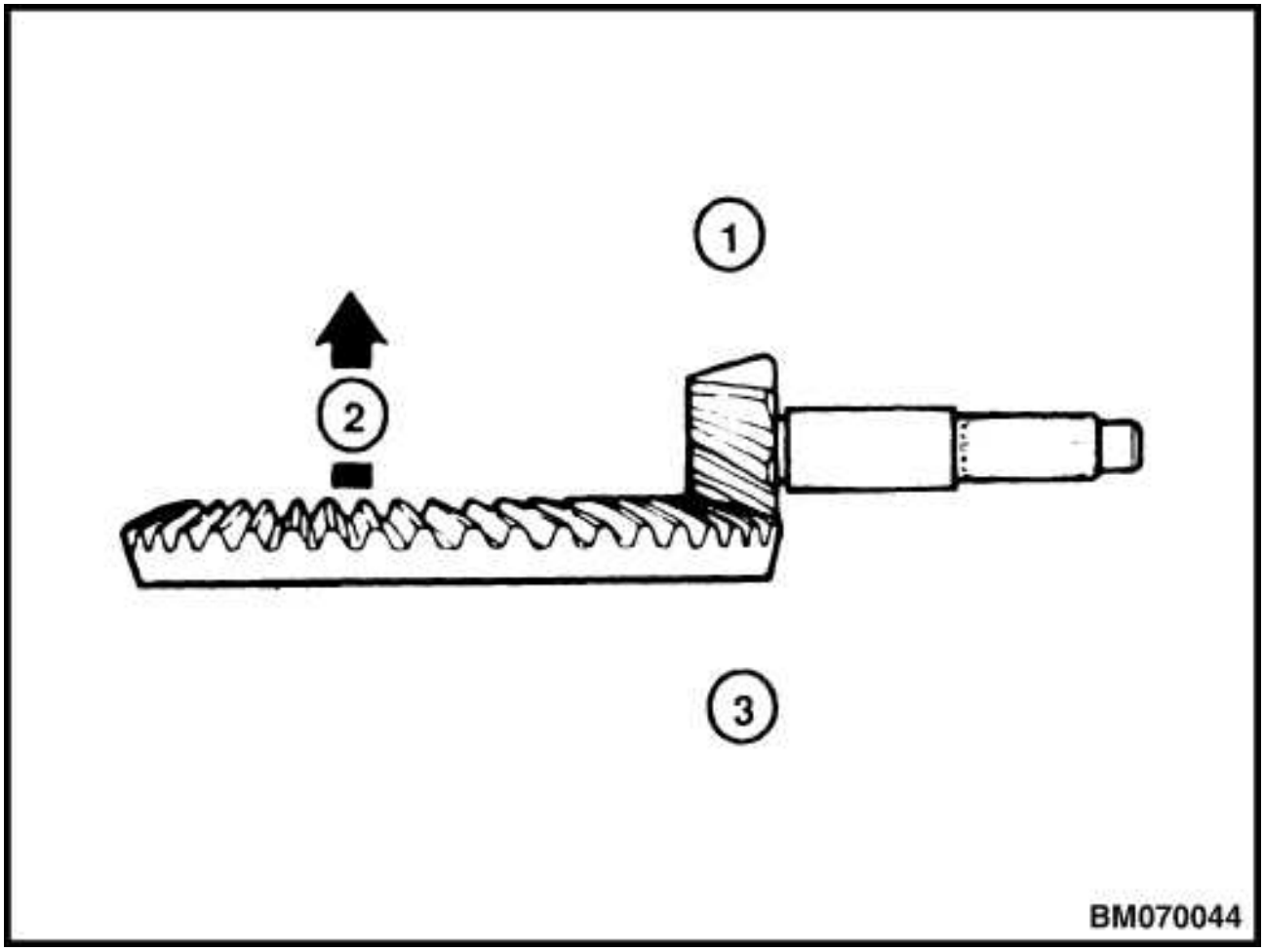
STEP 4.

Place hypoid gear in position on the differential assembly and install capscrews. Tighten capscrews in



1. hypoid gear
2. differential assembly
3. capscrew

11. Check the hypoid gear runout. See Hypoid Gear, Runout Check.



1. Loosen retainer Ring This Side
2. Decrease Backlash
3. Tighten retainer Ring This Side

Figure 13. Backlash Decrease

Hypoid Gear, Runout Check

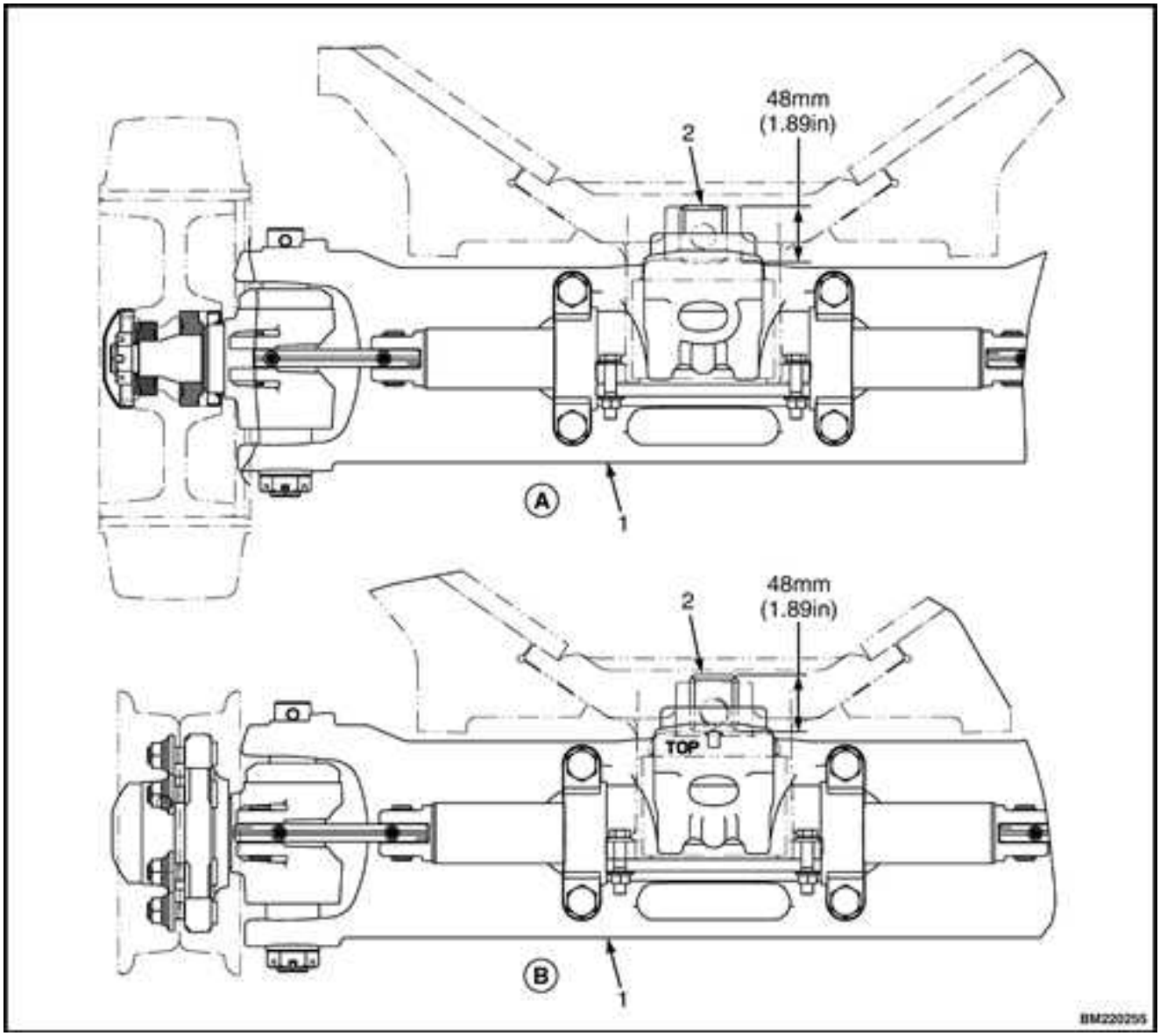
1. Attach a dial indicator to the mounting flange of the differential assembly cover as shown in Figure 14.

2. Adjust the dial indicator so that the plunger or pointer goes through oil fill hole and is against the back surface of the hypoid gear.

3. Set dial indicator to zero.

4. Rotate hypoid gear and check dial indicator for the maximum needle movement. The maximum movement permitted is 0.28 mm (0.011 in.).

5. If movement exceeds maximum limit, remove differential and hypoid gear assembly from the differential assembly and find the reason for the movement.



A. lift truck GLC050LX (A967)
B. lift truck GLP/GDP20-25LX (GLP/GDP050LX) (A974)
1. Steer Axle Assembly
2. mount

Figure 6. Steering Axle Mount Placement

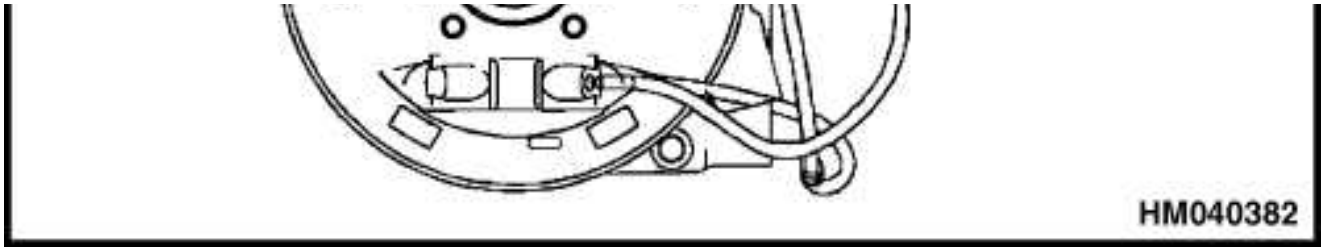
Spindles, Bearings, and Tie Rods Repair

Spindles and Bearings

Remove

WARNING

PUTTING THE LIFT TRUCK ON BLOCKS



1. park brake lever
2. adjustment knob
3. park brake cables
4. inching/brake pedal
5. master cylinder
6. brake assembly
7. Brake position sensor (Right hand side)

Figure 1. Brake System

Wet Brake System

The wet brake system in this section includes the following parts: master cylinder and parking brake system. See Figure 2.

The wet disc brakes are a component of the wet brake drive axle. The brake discs are located inside the planetary carrier housing on the left side of the drive axle. See **Drive Axle Repair**, **(Wet Brake)** 1400 YRM 1215 for Remove, Assemble and Install procedures. See Figure 2.

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC050LX (A967)
- GLP/GDP20-25LX (GLP/GDP050LX) (A974)

3. Start the engine and tilt the mast backward to remove the blocks. Push on the brake pedal. The pedal must not touch the floor plate. Move the lift truck in **REVERSE** and push on the brake pedal to permit adjusting mechanism to operate. Repeat this operation several times.

4. The service brakes must be adjusted before the parking brake can be adjusted. See Figure 18 and the following paragraphs in this section for the correct adjustment of the parking brake.

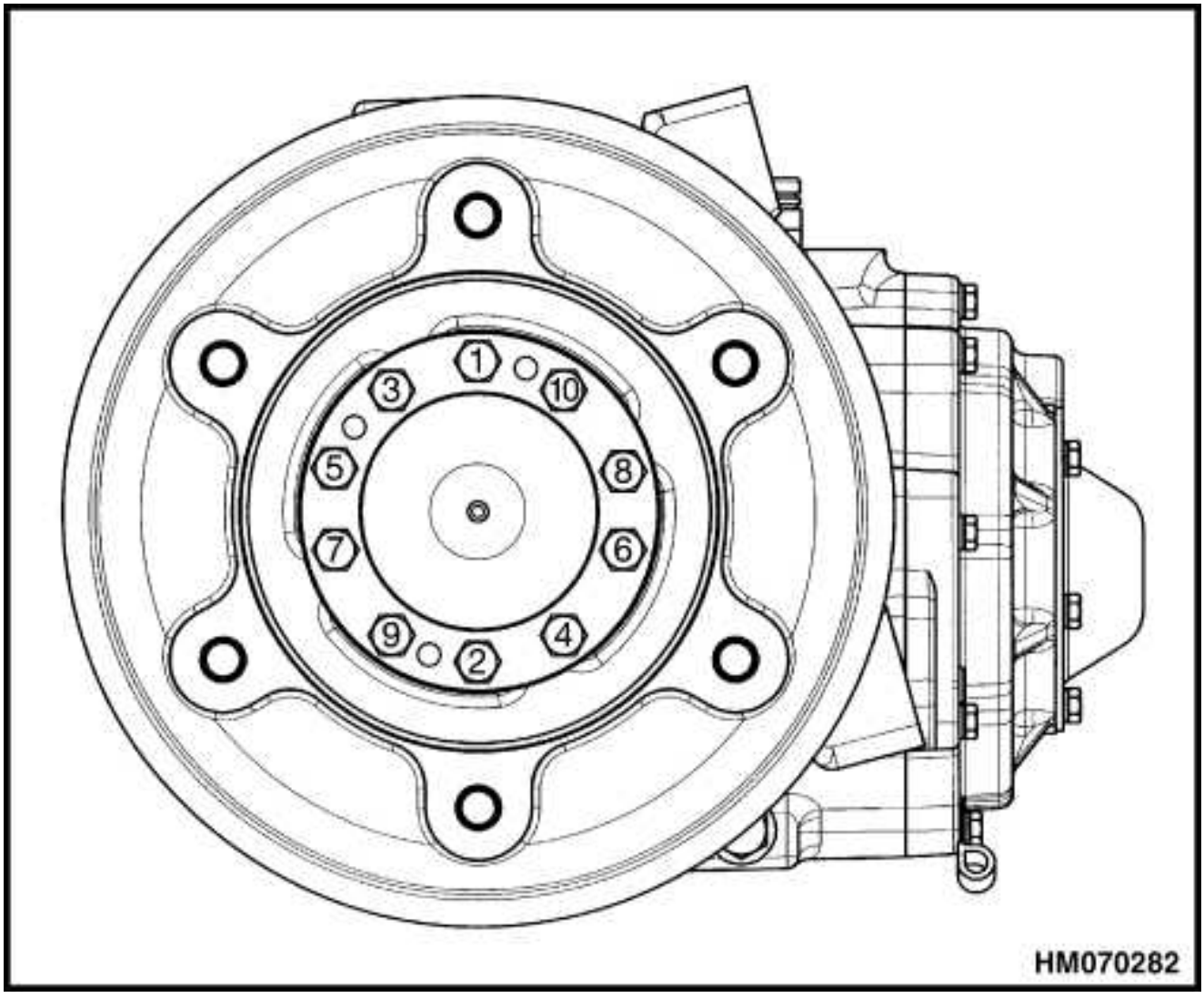


Figure 16. Axle Shaft Torque Sequence, GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875) and GLP/GDP20-25LX (GLP/GDP050LX) (A974)

Inching Overlap Adjustment

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
90 to 108 N•m (66 to 80 lbf ft)

GC/GLC030-035VX, GC/GLC040SVX [C809], GLP/GDP16-18VX, GLP/GDP20SVX (GP/GLP/GDP030-035VX, GP/GLP/GDP040SVX) [C810], GLC050LX (A967), and GLP/GDP20-25LX (GLP/GDP050LX) (A974)
52 to 62 N•m (39 to 46 lbf ft)

Wheel Nuts

GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) [A910]
340 to 380 N•m (251 to 280 lbf ft)

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
450 to 500 N•m (332 to 369 lbf ft)

GC/GLC030-035VX, GC/GLC040SVX [C809], GLP/GDP16-18VX, GLP/GDP20SVX (GP/GLP/GDP030-035VX, GP/GLP/GDP040SVX) [C810], GLC050LX (A967), and GLP/GDP20-25LX (GLP/GDP050LX) A974)
155 to 175 N•m (115 to 130 lbf ft)

Upper Parking Brake Cable Bracket Capscrews (Wet Brake)

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
38 to 42 N•m (28 to 31 lbf ft)

Upper Parking Brake Cable Bracket Capscrews (Wet Brake)

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
38 to 42 N•m (28 to 31 lbf ft)

Brake Pressure Transducer to Master Cylinder (Wet Brake)

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
23 to 28 N•m (16.9 to 20.6 lbf ft)

Master Cylinder to Booster Capscrews (Wet Brake)

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875]
49 to 59 N•m (36 to 43 lbf ft)

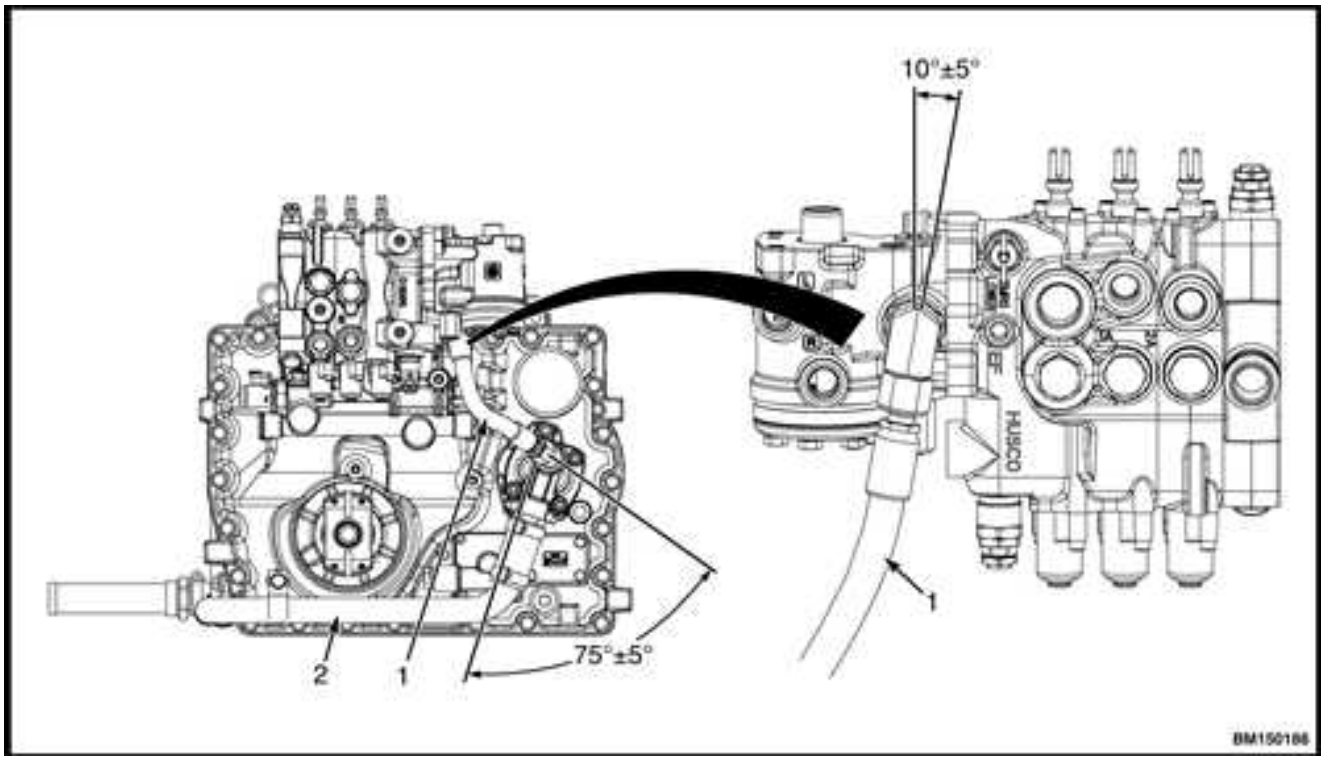
Yale Materials Handling Corp.
1400 Sullivan Dr.,
Greenville, NC 27834-2011

for procedures.

8. On lift truck models equipped with a Quick-Lok hydraulic hose and adapter, connect hydraulic lines, except for the Quick-Lok hydraulic hose, to hydraulic gear pump assembly. Install the Quick-Lok hydraulic hose and adapter into gear pump and position inlet hydraulic line as shown in Figure 10. Tighten adapter at the gear pump to 59 to 69 N•m (44 to 51 lbf ft). Tighten the adapter at the SCU port to 170 to 183 N•m (125 to 135 lbf ft).

9. Remove the lift truck from the blocks. See the **Operating Manual** or the **Periodic Maintenance Manual** for the procedures to remove lift truck from blocks.

10. Fill the tank using the hydraulic oil shown in the Maintenance Table located in the **Operating Manual** or the **Periodic Maintenance Manual** for your lift truck model. When the oil level is correct, operate the system and check for leaks. Check the hydraulic oil level and add hydraulic oil if necessary.



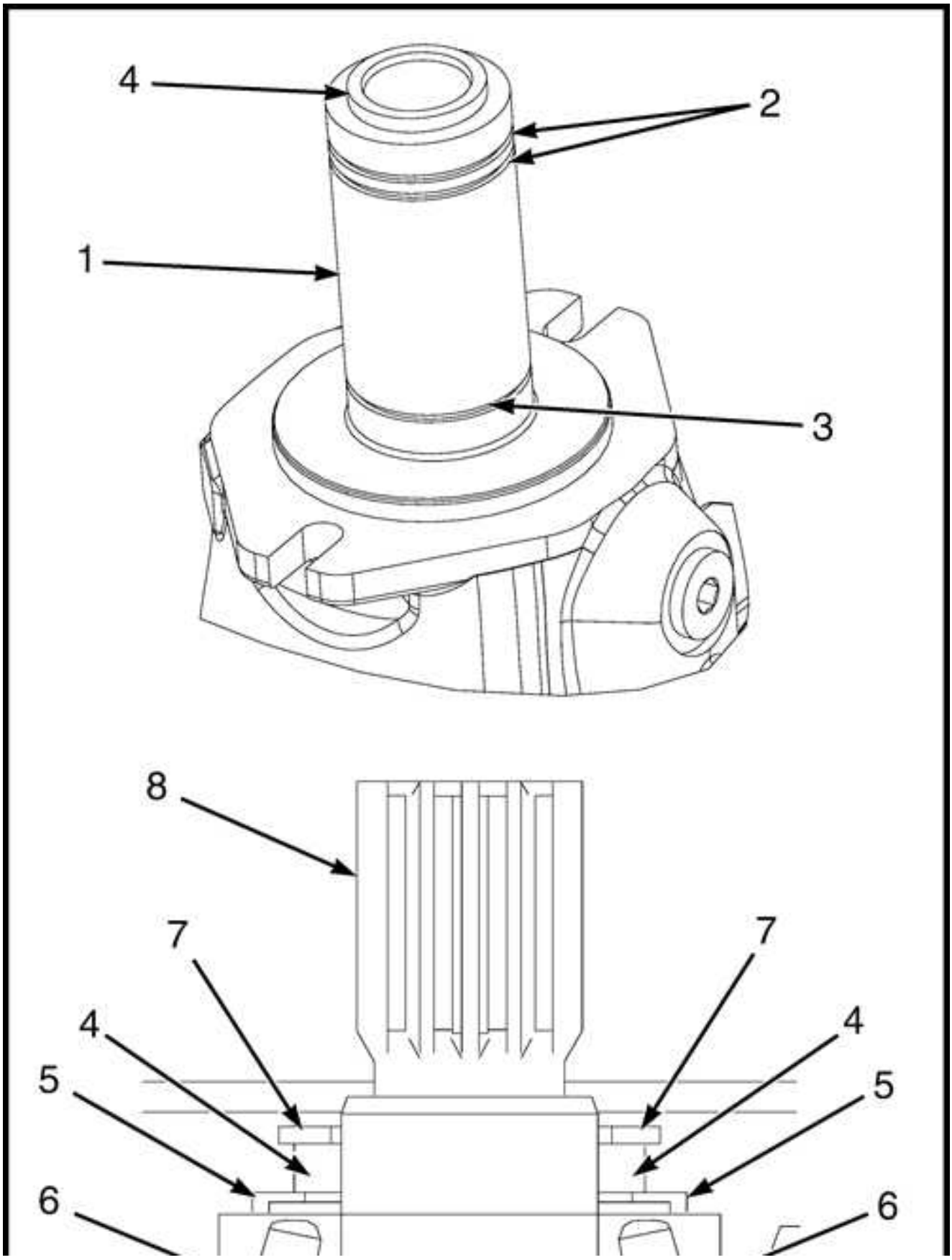
NOTE: Quick-Lok™ hydraulic hose and adapters not shown.

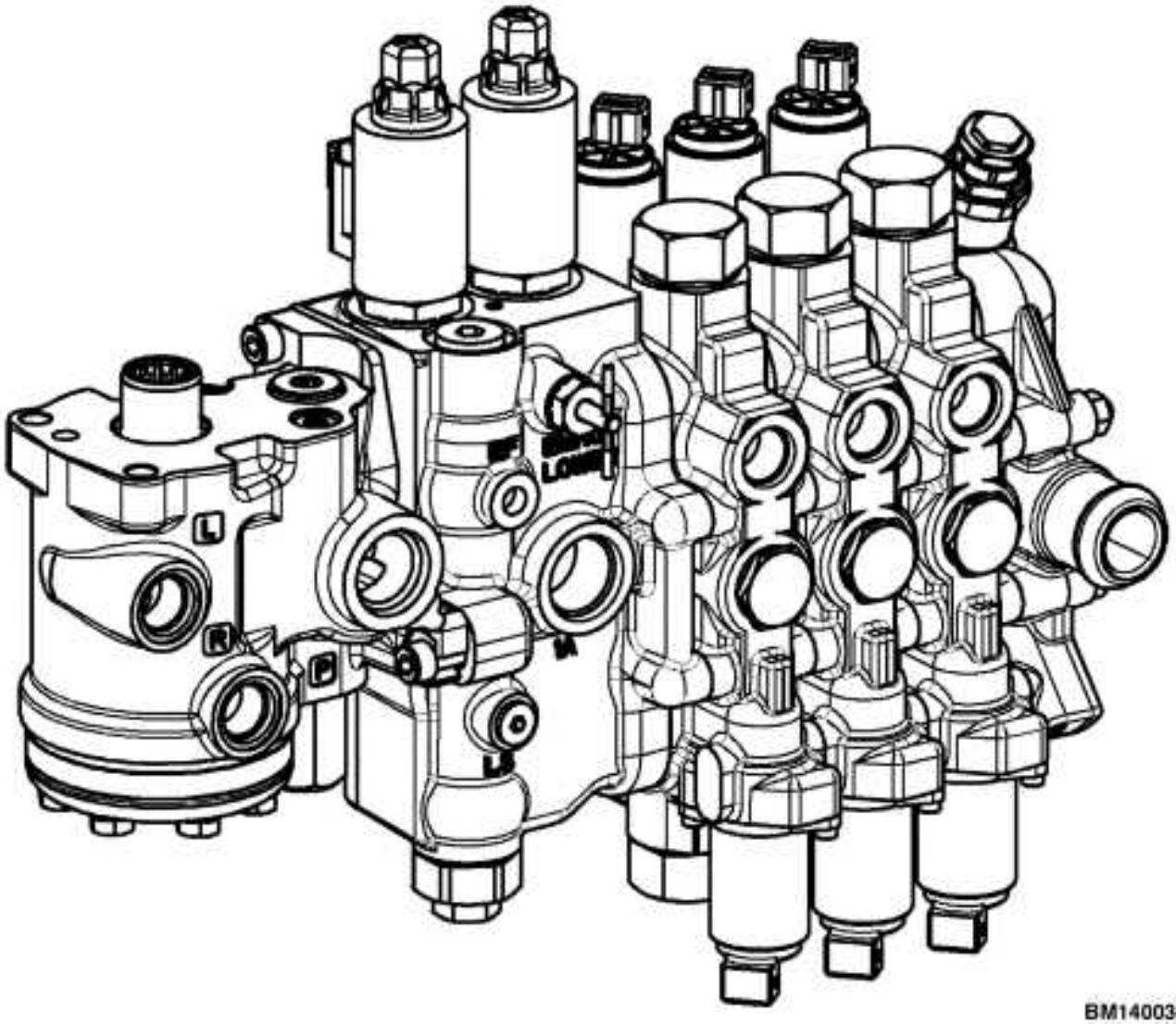
1. hydraulic inlet hose
2. suction hose

Figure 9. Inlet Hose Orientation for Lift Truck Models, GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809), GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX, (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810), GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910), GLC050LX (A967), GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875) and GLP/GDP20-25LX (GLP050LX) (A974) With Aluminum Transmission Housing Before January, 2011 and Equipped With Mazda Engine

f. Use rubber hammer and tap on VDP shaft seal tool until VDP shaft seal tool shoulder stops against the face of VDP housing. See Figure 20.

g. Install the retaining ring. Be sure retaining ring correctly rests in the groove. See Figure 18.





Safety Precautions Maintenance and Repair

• When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.

• Do not lift heavy parts by hand, use a lifting mechanism.

• Wear safety glasses.

• DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.

• Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK

Remove

1. Remove four nuts from the control valve tie rods. See Figure 13.

2. Remove the outlet control valve section from the four tie rods and discard 10 O-rings (item 13 in Figure 15) from the auxiliary control valve section.

Disassemble

NOTE: Perform Step 1 and Step 2 for lift truck models listed below, equipped with anti-stall solenoid.

- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813)
- GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (D879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (D878)

1. Remove solenoid and orifice disk from outlet control valve section. See Figure 12.

NOTE: Note placement of backup rings and O-ring prior to disassembly to aid in assembly.

2. Remove and discard two backup rings and one O-ring from solenoid.

3. Remove the plug from the outlet control valve section and discard the O-ring. See Figure 13.

4. If the secondary relief valve has been leaking, remove it from the outlet control valve section. See Step 5 through Step 9 to disassemble the secondary relief valve. See Figure 13.

5. Remove the plug from the adjusting nut. Remove and discard the O-ring from the plug. Remove and discard the backup rings and O-ring from the adjusting nut. See Figure 13.

6. While holding the adjustment nut, loosen the jam nut.

NOTE: While performing Step 7, count and note the number of turns used to remove the adjusting nut.

7. Remove the adjusting nut and jam nut assembly from the secondary relief valve plug and discard the O-ring on the adjusting nut.

8. Remove the spring, washer, and poppet from the secondary relief valve plug.

9. Remove and discard the backup ring from the secondary relief valve plug.

Clean

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

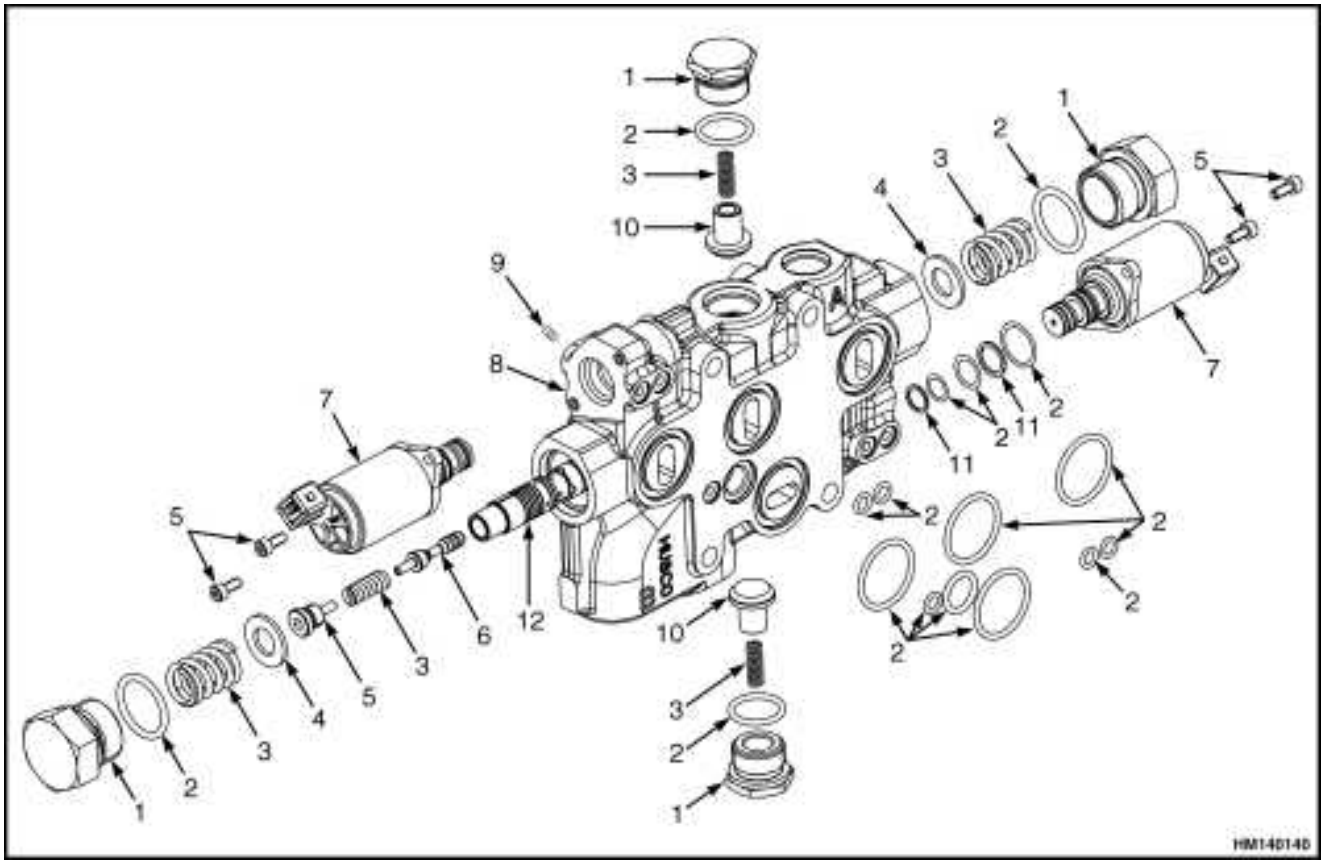


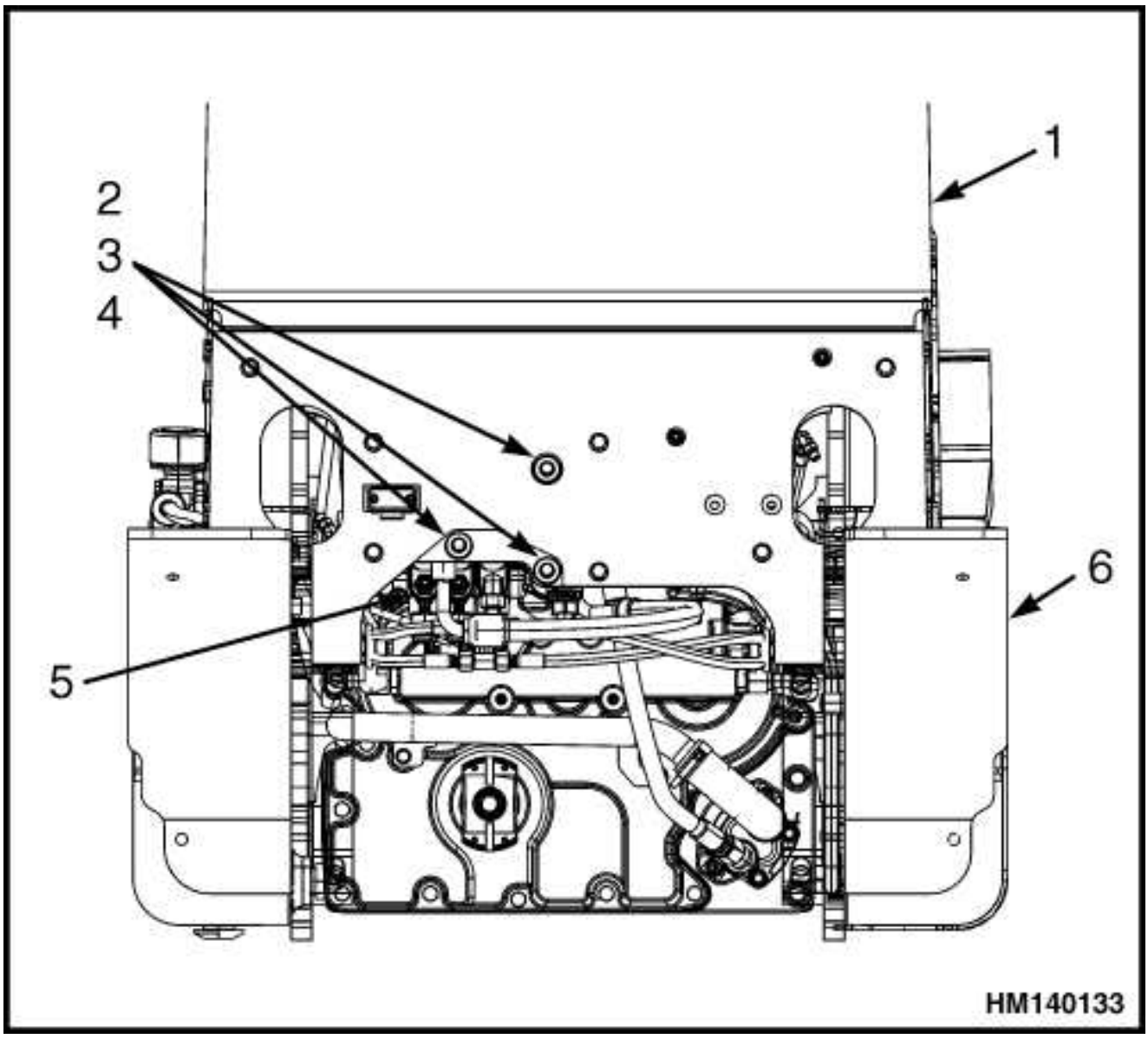
Figure 18. Tilt Control Valve Section, Lift Truck Models GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809), GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810), GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910), GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875), GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818), GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813)

Legend for Figure 18

1. PLUG
2. O-RING
3. SPRING
4. WASHER
5. SOCKET HEAD CAPSCREW
6. PISTON
7. PROPORTIONAL PRESSURE-REDUCING VALVE (PPRV)
8. TILT CONTROL VALVE BODY
9. SETSCREW
10. POPPET
11. BACKUP RING
12. SPOOL

of the cowl into the control valve. Tighten the capscrews to 19 N•m (14 lbf ft). See Figure 25.

3. Coat new O-rings with clean hydraulic oil. Install O-rings between control valve section and SCU.



1. COWL
2. INSERT
3. WASHER
4. mounting CAPSCREW
5. MAIN CONTROL VALVE
6. FRAME

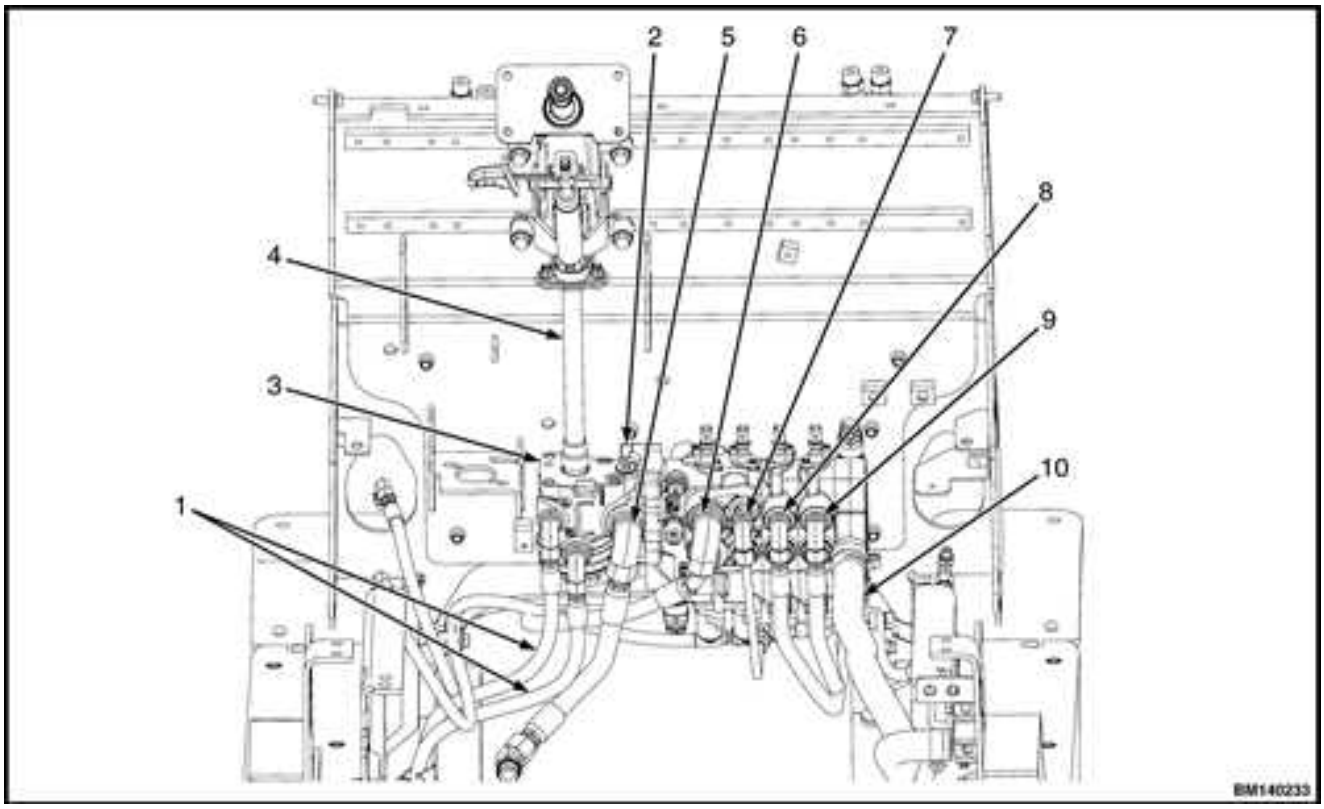
Figure 25. Main Control Valve Installation

4. Position the SCU under the steering shaft and raise the SCU to engage the steering shaft. When the steering shaft is completely engaged, position the SCU against the main control valve, and install two mounting capscrews and washers. Tighten to 45 to 55 N•m (33 to 41 lbf ft).

See Figure 26 for lift truck models:

See Figure 39

- For lift truck models equipped with manual control valve with OPS.



NOTE: Quick-Lok™ hydraulic inlet hose and adapter not shown.

1. STEERING SYSTEM HOSES
2. SCU MOUNTING CAPSCREWS
3. STEERING CONTROL UNIT (scu)
4. STEERING COLUMN
5. hydraulic inlet hose
6. lift/lower HOSE
7. TILT HOSE
8. AUXILIARY I HOSE
9. AUXILIARY II HOSE
10. RETURN HOSE

Figure 37. Hydraulic Hose Removal, Manual Control Valve Without OPS, Lift Truck Models GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809), GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810), GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910), GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875), GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818), GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813)

damage. If either the mating surfaces or the spool bore are damaged, replace the auxiliary control valve section.

If disassembled, inspect the components of the spool. If any components are damaged, replace the components. If the spool is damaged, replace the auxiliary control valve section.

NOTE: If the auxiliary control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the auxiliary control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the auxiliary control valve section.

Assemble

NOTE: Coat all backup rings and O-rings with a light coat of clean hydraulic oil to make installation easier.

1. Install two poppets, springs, and plugs, with new O-rings installed, into the auxiliary control valve section. On manual main control valves with OPS, there is only one spring and poppet. Tighten the plugs to 45 ±5 N•m (33 ±4 lbf ft).

See Figure 48
- For lift trucks without OPS.

Figure 49
- For lift trucks with OPS.

2. Install new O-ring, new wiper, seal plate, and two socket head capscrews on the auxiliary control valve section. Tighten the socket head screws to 9.5 ±1 N•m (84 ±12 lbf in).

3. Install the new O-ring, spring seat, spring, spring seat, and spool end fastener on the spool. Tighten the spool end fastener to 9.5 ±1 N•m (84 ±12 lbf in).

4. Install the new wiper and spool assembly into the auxiliary control valve section.

5. Install seal plate, end cap, and two socket head capscrews into the auxiliary control valve section. Tighten the socket head screws to 9.5 ±1 N•m (84 ±12 lbf in).

Install

NOTE: Step 1 and Step 2 are used if a four-section control valve is being installed. If a three-section control valve is being installed, use Step 1, then go to Step 3.

1. Install three new O-rings on the lift and tilt control valve section. Install the auxiliary I control valve section on the four tie rods.

2. Install three new O-rings on the auxiliary I control valve section. Install the auxiliary II control valve section on the four tie rods.

3. Install the outlet valve. See Outlet Control Valve Section, Install.

Lift/Tilt Control Valve Section

Never allow anyone under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered and the key switch is OFF.

1. Remove cap from EF port. If lift truck is equipped with a electro-hydraulic control valve.

See Figure 2 for lift truck models:
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813)

See Figure 3 for lift truck models:
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878)

If lift truck is equipped with a manual control valve,

See Figure 31 for lift truck models without OPS:
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813)

See Figure 32 for lift truck models without OPS:
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878)

See Figure 33:
- For lift truck models with OPS.

Install a 24 MPa (3500 psi) pressure gauge into the EF port.

2. Loosen lock nut. For lift truck equipped with an electro-hydraulic control valve.

See Figure 21 for lift truck models:
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/

This section is for the following models:

GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) [A910];
ERC/P16-20AAF (ERC030-040AH) [B814, C814];
GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [B875];
GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX [C809];
GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) [C810];
ERP1.60-1.80-2.00ATF (ERP030-040TH) [F807];
GLC40, 45, 55VX; GLC55SVX (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) [E818];
ERC20-32AGF (ERC040-065GH) [A908];
ERP20-32ALF (ERP040-065DH) [E216];
GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) [F813, G813];
ERC35-55HG (ERC70-120HH) [C839];
GLC050LX [A967];
GLP/GDP20-25LX (GLP/GDP050LX) [A974]

General

This section has a description and the repair procedures for several different types of cylinders. The number and the design of the parts can be different, but the operation of the cylinders is the same.

Description

This manual covers many different types of cylinders. Each cylinder will be described in detail.

Tilt cylinders are fastened between the frame of the lift truck and the outer weldment of the mast to change the angle of the mast and forks.

Two single-stage main lift cylinders and a free-lift cylinder are used to raise the carriage and extend the mast weldments.

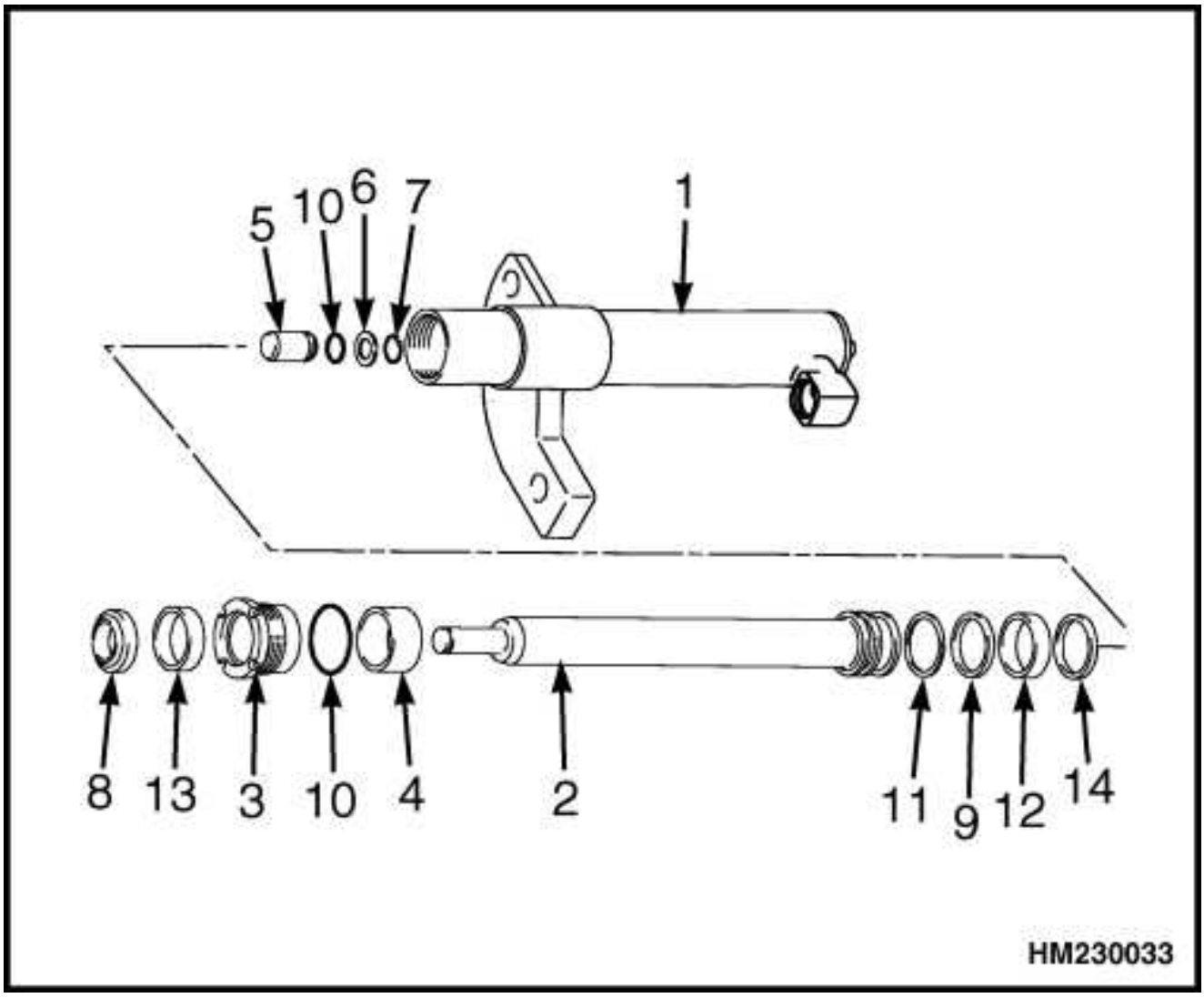
The two main lift cylinders are installed at the back of the outer mast. The base of each lift cylinder sits on a mount at the bottom crossmember of the outer mast. The top of each main lift cylinder rod fits into a guide on the top crossmember of the inner mast. The free-lift cylinder is installed in the inner mast. Each of the lift cylinders has an internal lowering control valve. A single external lowering control valve is connected by tubing and hoses to all the lift cylinders.

NOTE: On lift truck models listed below there are two free-lift chains and chain sheaves.

- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- ERC20-32AGF (ERP040-065GH) (A908)

1. shell
2. rod
3. gland
4. rod seal
5. check valve
6. washer
7. o-ring
8. snap ring
9. wiper ring
10. seal
11. backup ring
12. wear ring

Figure 8. Two-Stage LFL Main Lift Cylinder



1. Install fork positioner assembly to the integral sideshift carriage. See **Mast Repairs**, **2-, 3-, and 4-Stage Masts** 4000 YRM 1148 for procedures.

Fork Positioner Cylinder Adjustment

To adjust the flow restrictors for equal fork movement, perform the following:

NOTE: Procedures below apply to flow restrictors on both fork positioner cylinders.

1. Loosen jam nut on flow restrictor and screw flow restrictor in until it bottoms. Turn flow restrictor counterclockwise approximately three turns. See Figure 17.

2. Open forks all the way, then close the forks. Watch for unequal fork movement.

3. To increase the speed of forks opening, turn flow restrictor counterclockwise in 1/2 turn increments. To decrease the speed of forks closing, turn flow restrictor clockwise in 1/2 turn increments. See Figure 17.

4. Open and close the forks again. If fork movement is not equal, repeat Step 2 and Step 3.

5. If fork movement is equal, tighten jam nut on flow restrictor. See Figure 17.

HM170275

1. cylinder shell and rod
2. seal
3. o-ring
4. retainer
5. wiper

Figure 11. Integral Sideshift Cylinder

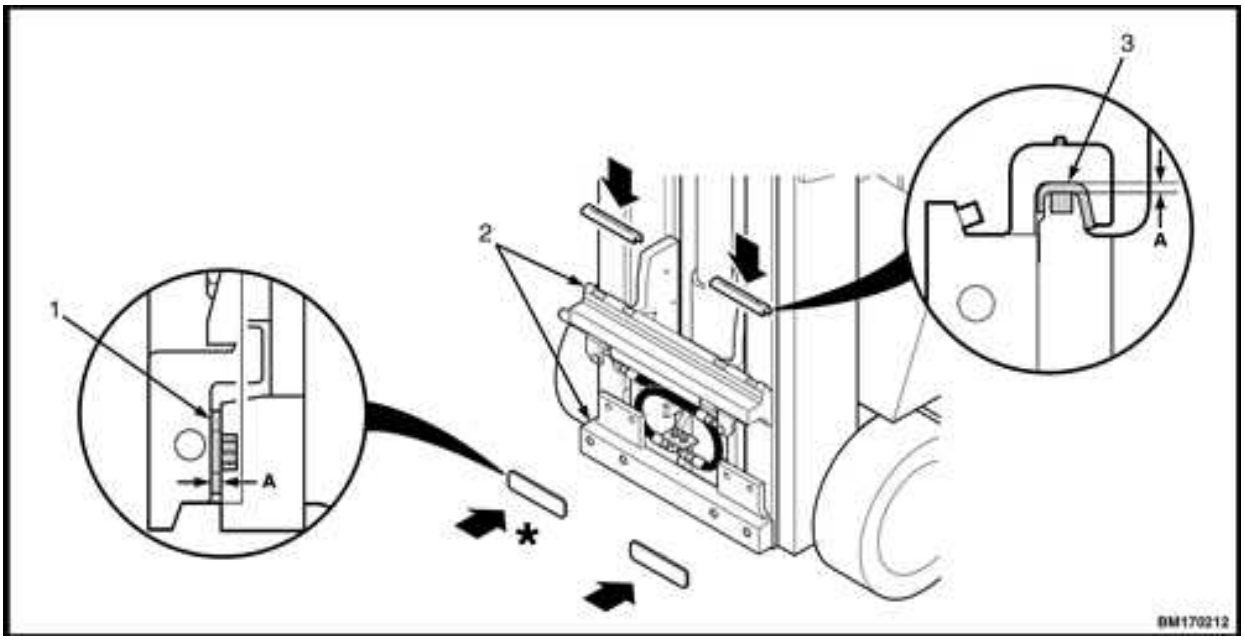
Install

1. If necessary, install new upper and lower sideshift bearings as follows:

- To install new upper bearings, align pin on the bottom side of bearing to notches on top carriage bar and slide into place on top carriage. See Figure 12.
- To install new lower bearings, align the circular pins on backside of lower bearing to holes on lower carriage bar and tap bearing into place on lower carriage bar using a rubber or brass hammer. See Figure 12.

NOTE: The pin, located on the left top of the cylinder looking from the front of the carriage, is for alignment purposes and to prevent the cylinder from rolling to the front or to the back.

2. Install sideshift cylinder onto the carriage with the pin in the up position. Install two pins and two hairpins. See Figure 8.



A. minimum thickness 2.5 mm (0.1 in.)

1. lower bearings
2. carriage bars
3. upper bearings

*Bold arrows indicate which side to apply grease.

Figure 12. Replacing Upper and Lower Bearings

3. Use a crane with a capacity of at least 450 kg (992 lb) to install the outer frame on the inner frame.

6. capscrew
7. inner mast
8. strip bearing
9. shim(s)
10. o-ring
11. snap ring
12. load roller
13. intermediate mast
14. stubshaft
15. bar
16. hose
17. main lift chain
18. hose sheave
19. bushing
20. ball bearing
21. chain sheave
22. chain anchor
23. chain anchor pin
24. cotter pin
25. left main lift cylinder
26. lowering control valve housing
27. lowering control valve
28. clamp
29. outer mast
30. spacer
31. right main lift cylinder

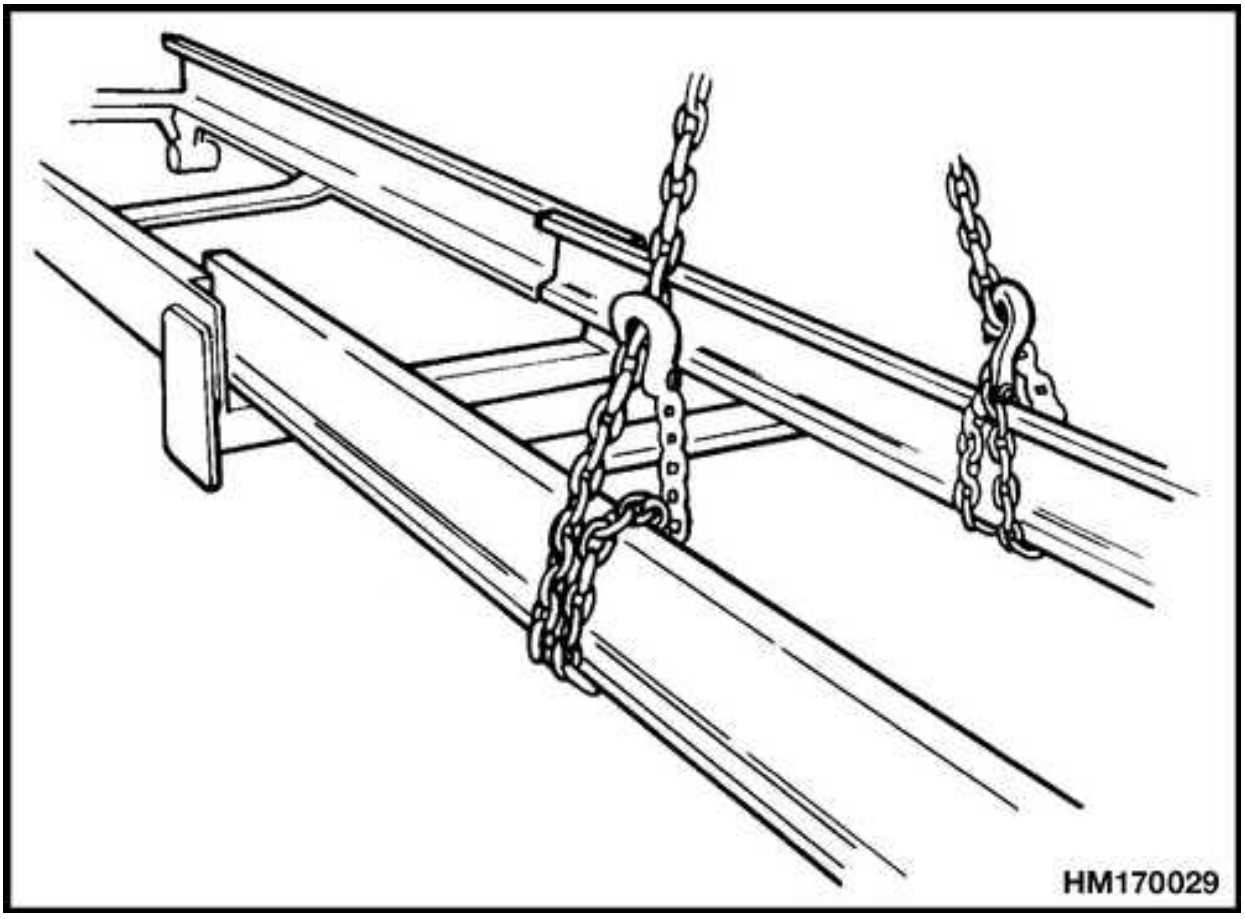
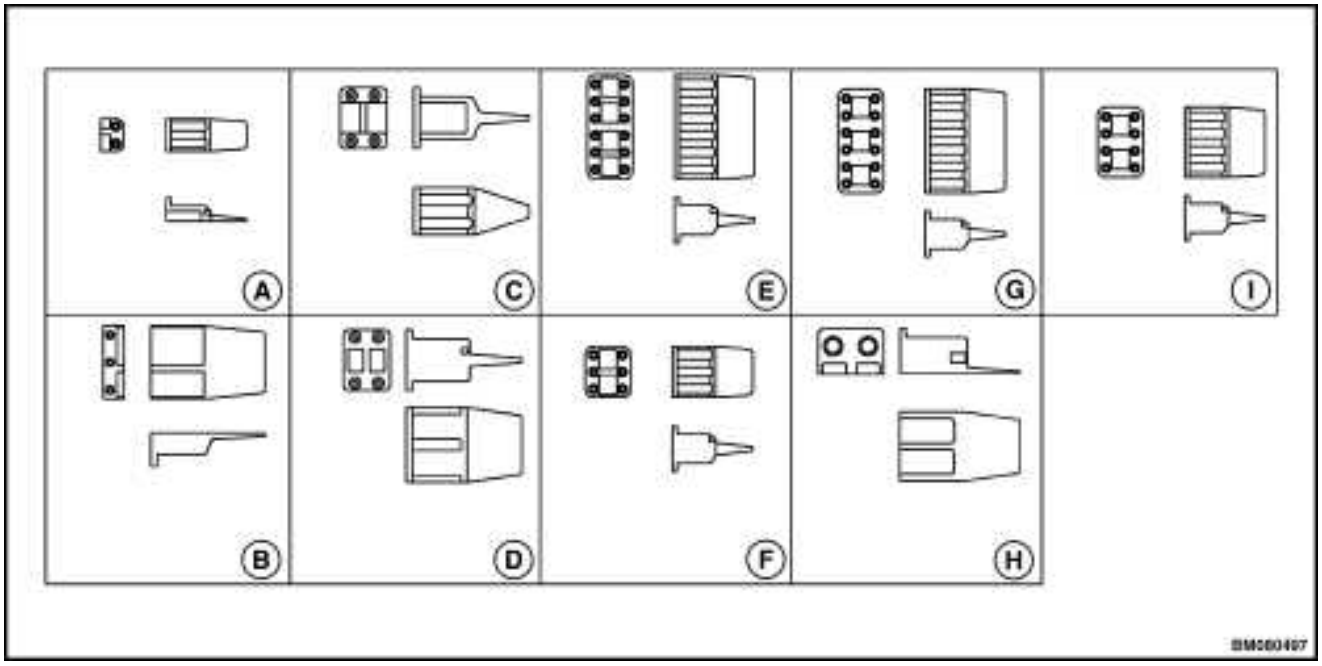


Figure 27. Mast Disassembly

9. Remove main lift cylinders. See **Cylinder Repair** 2100 YRM 1139 for procedures.

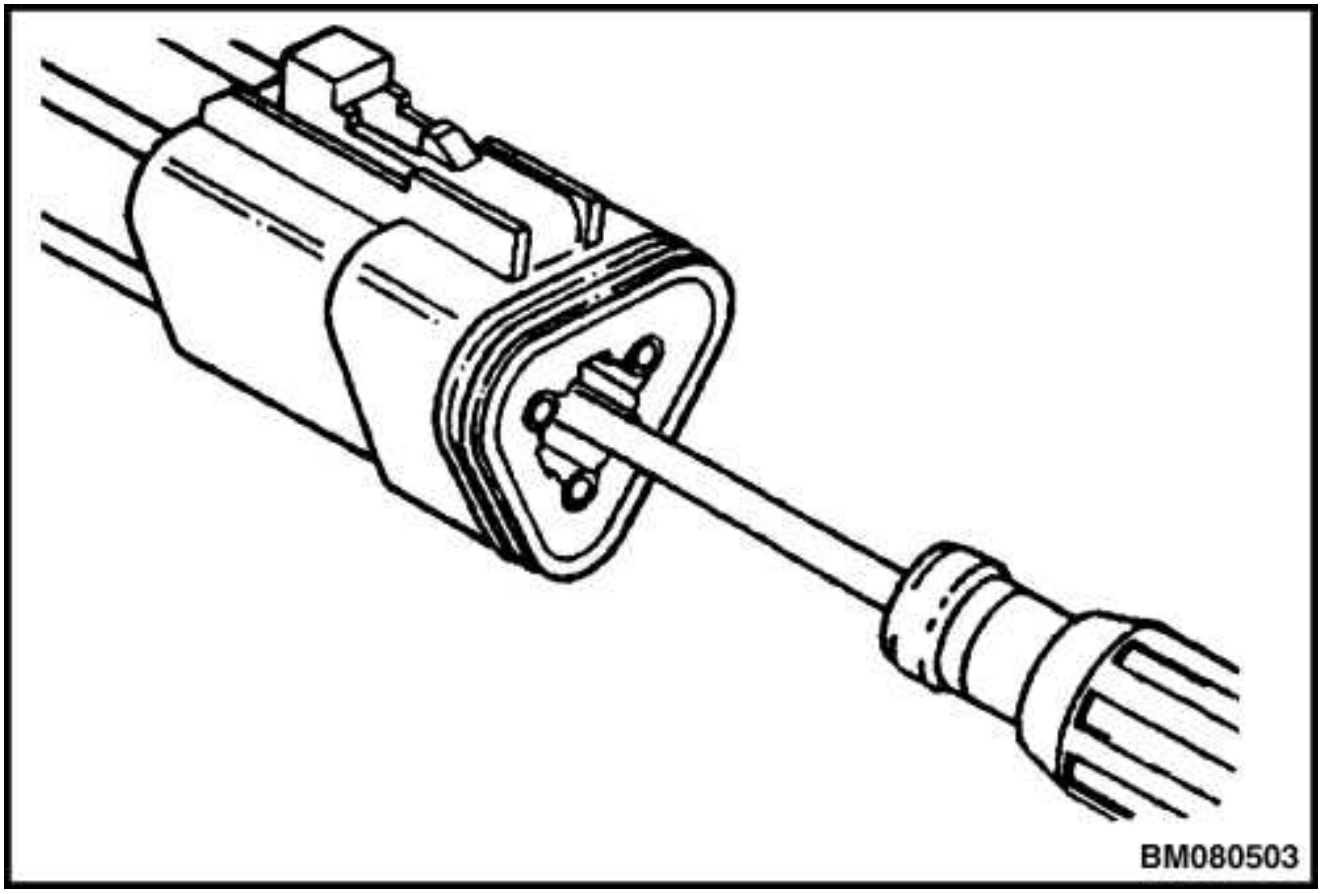


A. DTm Secondary lock type ha
B. DTm Secondary lock type hb
C. DTm Secondary lock type hc
D. DTp Secondary lock type hd
E. DTm Secondary lock type he
F. DTm Secondary lock type hf
G. DTm Secondary lock type hg
H. DTp Secondary lock type hh
I. DTm Secondary lock type hj

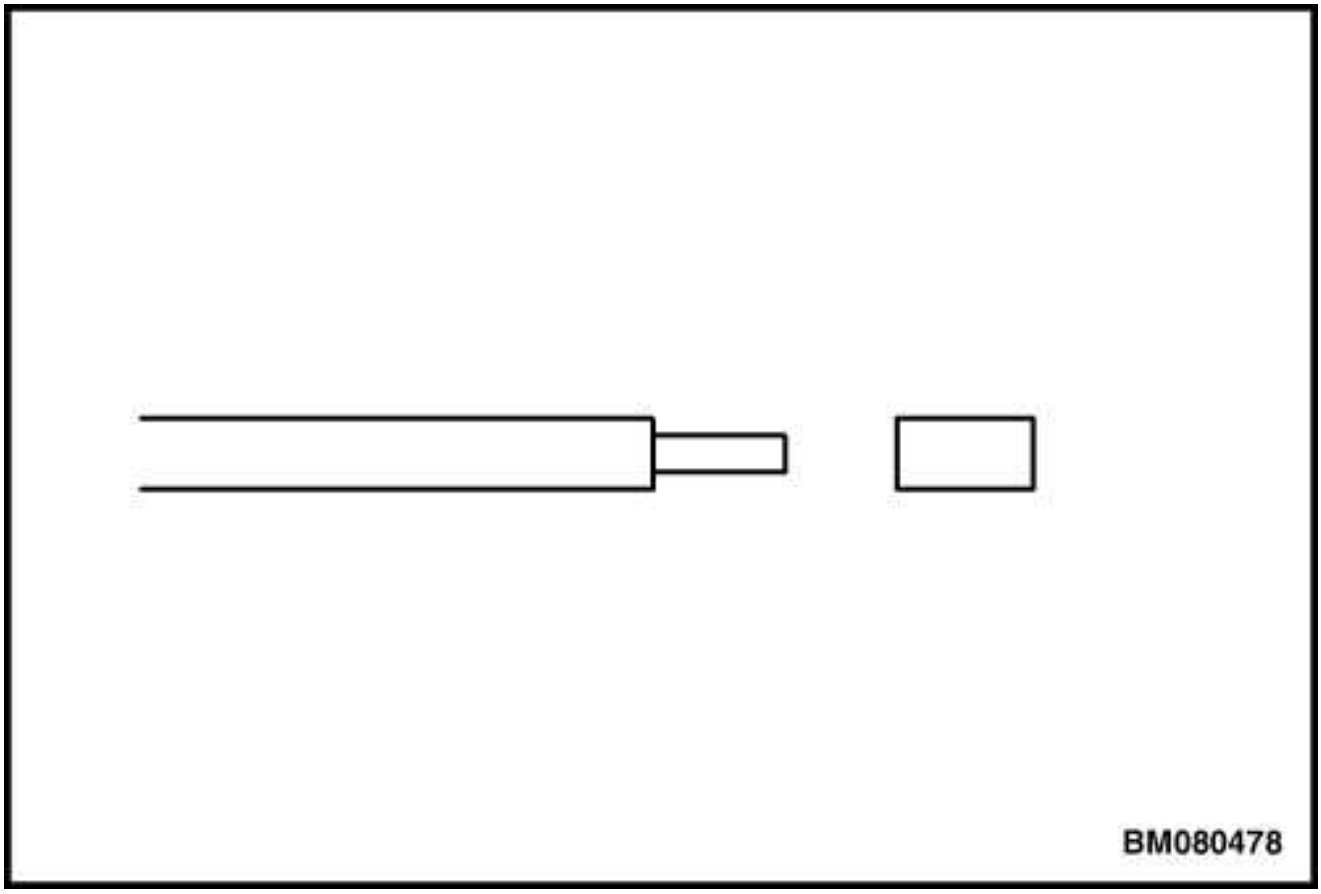
Figure 21. DTM and DTP Connector Plug Secondary Locks

Connector Receptacle Replacement

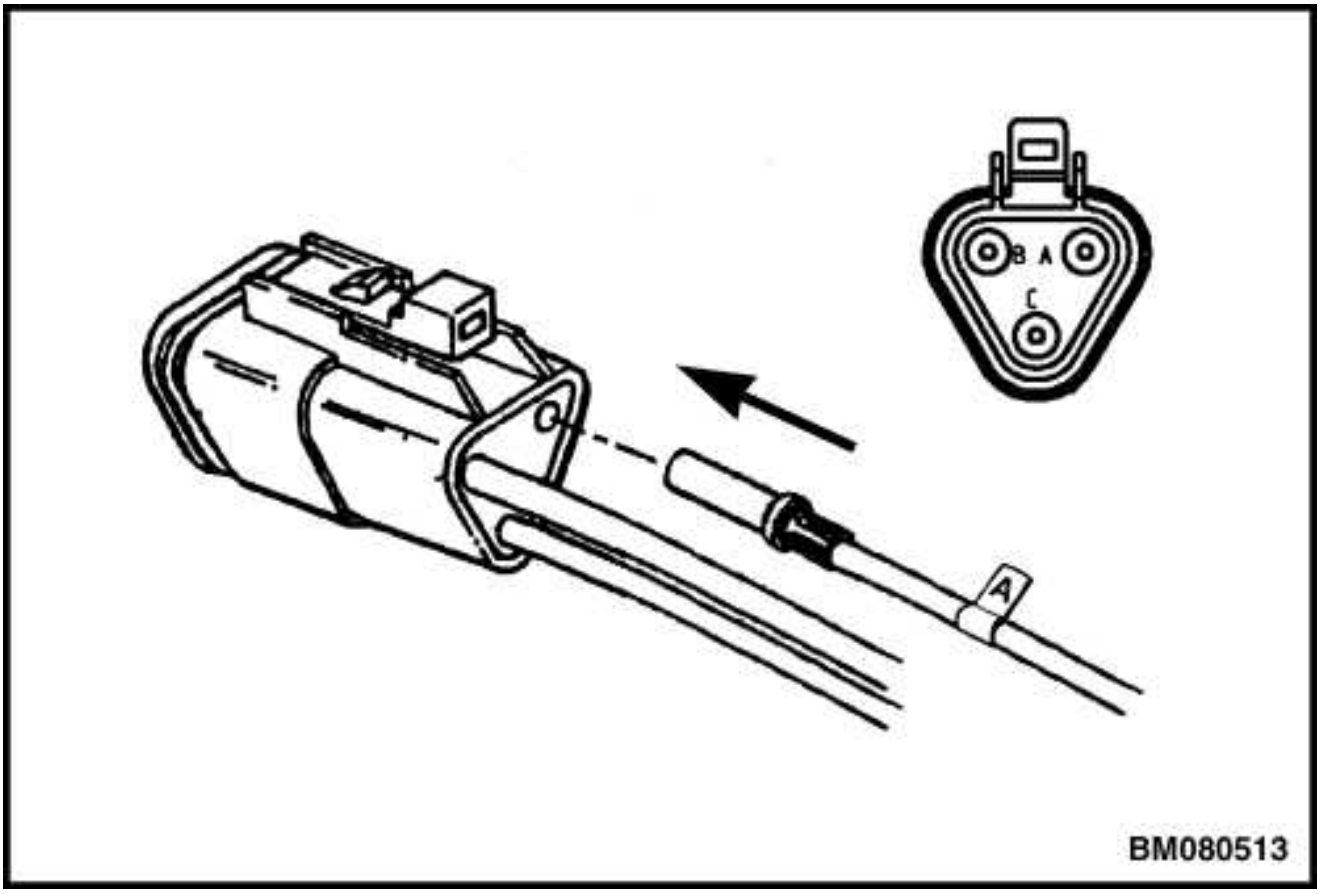
STEP 1.
Release the external locking clip(s) and separate the connector plug from the connector receptacle.



STEP 4.
Gently pull the wire backward while, at the same time, releasing the locking finger with the small, flat-blade screwdriver (Yale Part No. 150121838).

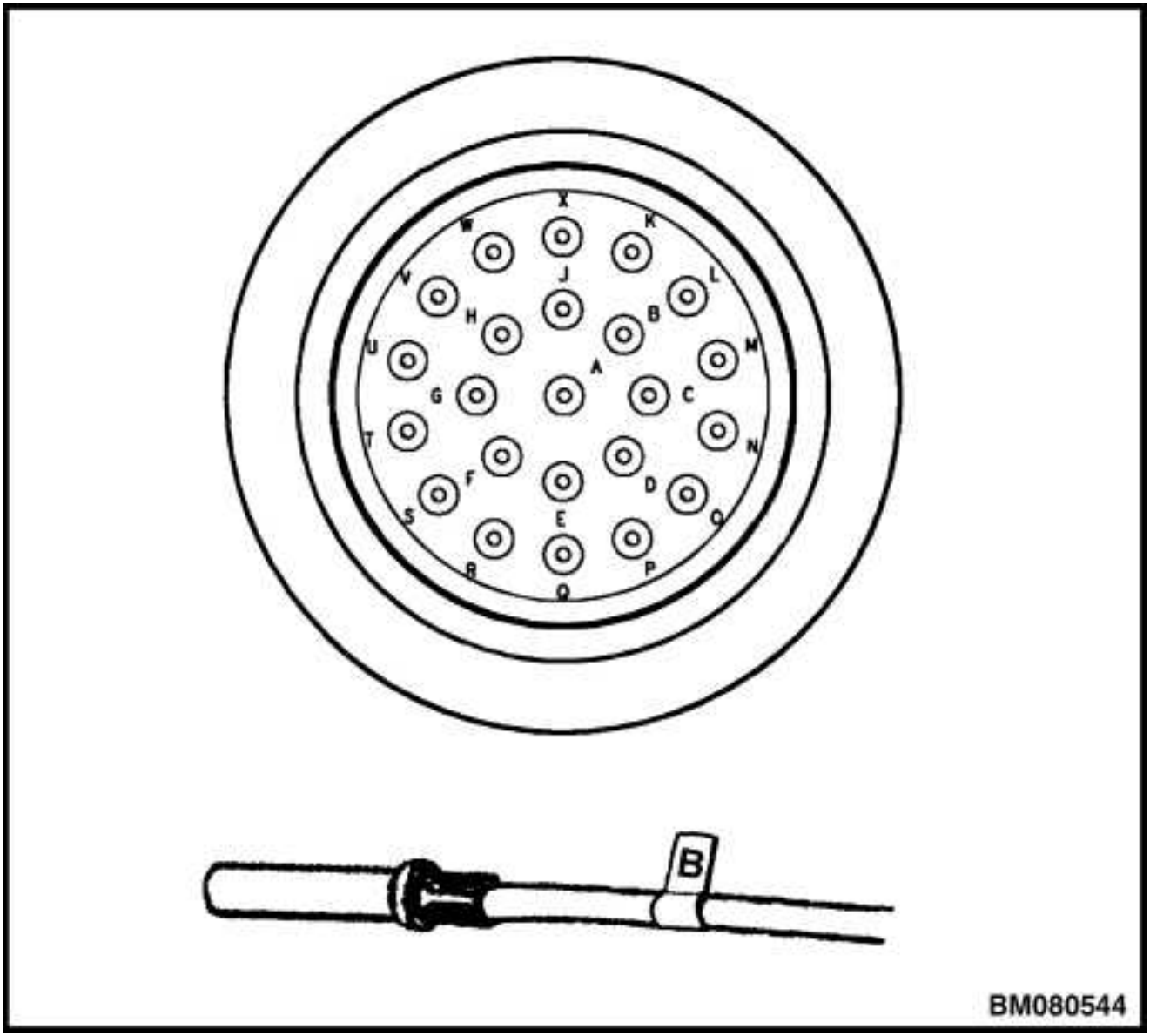


STEP 8.
Using the Deutsch Crimping Tool (Yale Part No. 150121900), crimp the new pin on the wire as shown in How to Crimp With the Deutsch Crimping Tool.



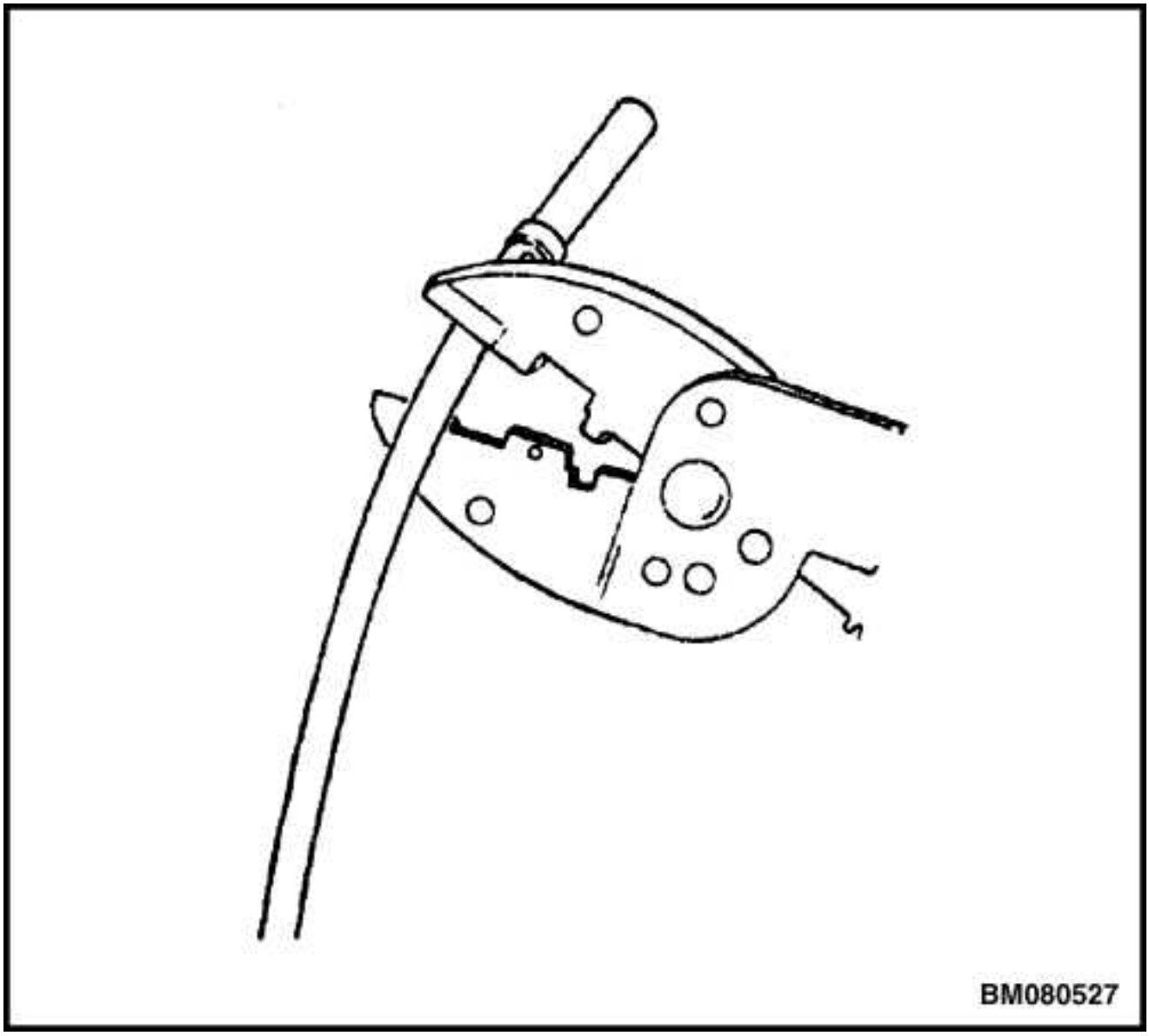
NOTE: Verify that the seal is in place on the connector plug before installing the secondary lock.

STEP 10.
Install the secondary lock. Push the lock straight in until the lock snaps into place. On 3-way secondary locks, the arrow on the lock must be oriented toward the exterior locking mechanism.



STEP 6.
Repeat STEP 2 through STEP 5 for the removal of the remaining wires.

STEP 7.
Insert the wires into the back of the new connector plug according to the number or letter on the tag and connector plug. Push the wire straight into the back of the plug until a click is felt. Slightly tug each wire to verify the



STEP 7.
Using wire strippers, 150121841, strip the wire to the recommended length shown in Table 1.

A. Crimp Height - See Table 3

1. tool crimp section marking
2. wire slot in locator
3. wire barrel
4. locator slot in contact
5. modified anvil on Micrometer

Figure 33. AMP Crimp Tool Inspection

Table 3. Crimp Height

Contact Part No.	Wire Size (AWG)	Tool Crimp Section Marking	Crimp Height
Yale Part No. 520202601	20	20-18	1.22 ±0.05 mm (0.048 ±0.002 in.)
	18	20-18	1.22 ±0.05 mm (0.048 ±0.002 in.)
	16	16	1.40 ±0.05 mm (0.055 ±0.002 in.)

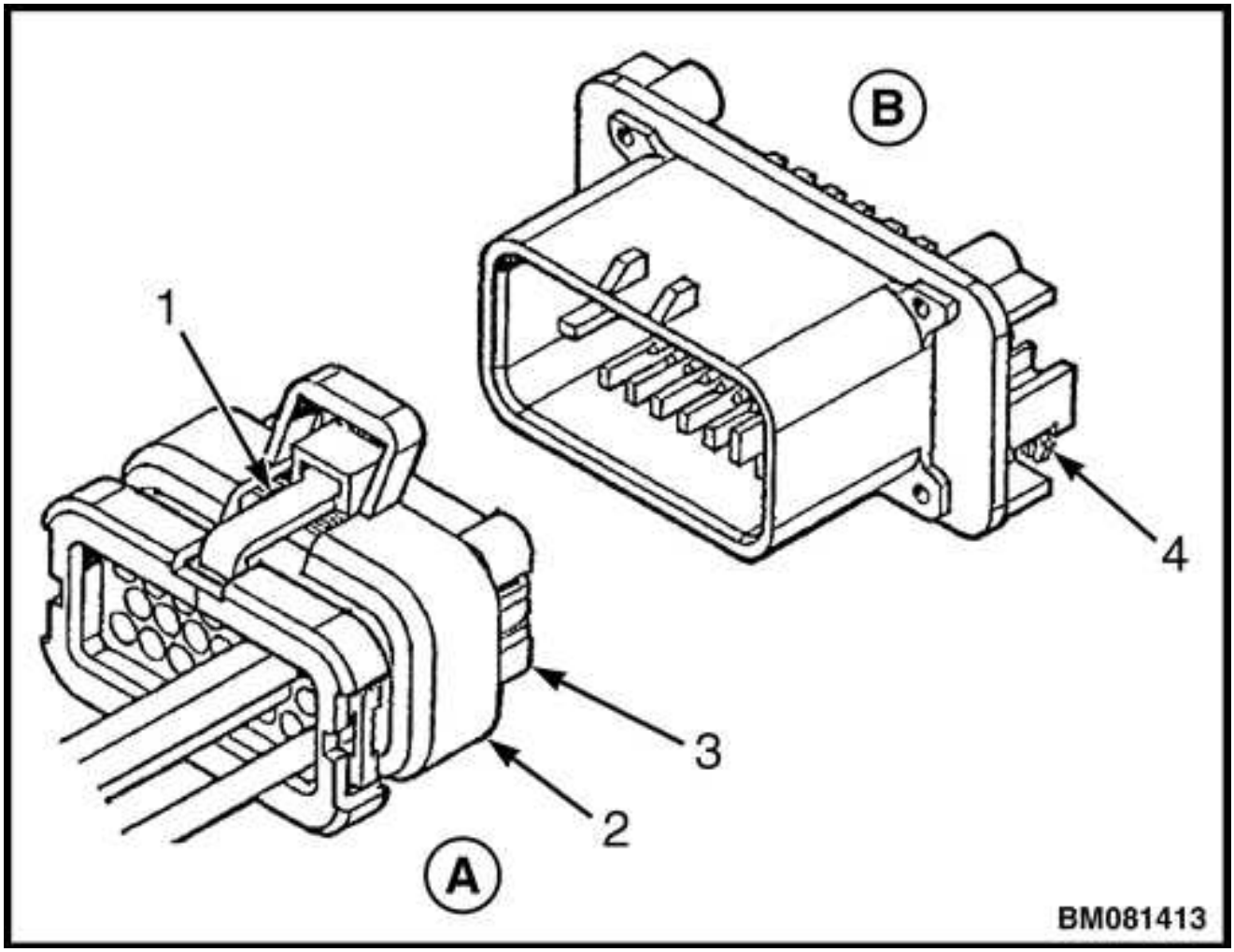
How to use AMP Hand Crimping Tool

1. Strip insulation from wire. See Stripping Wire for Use with AMP Hand Crimping Tool.

2. Hold tool so **BACK** side (wire side) faces you.

3. Release tool ratchet by squeezing tool handles then allowing them to open.

4. Holding contact by its mating portion and looking straight into crimp section, insert contact from the **FRONT** of tool into **BACK** of crimp section. Position contact as shown in Figure 34.



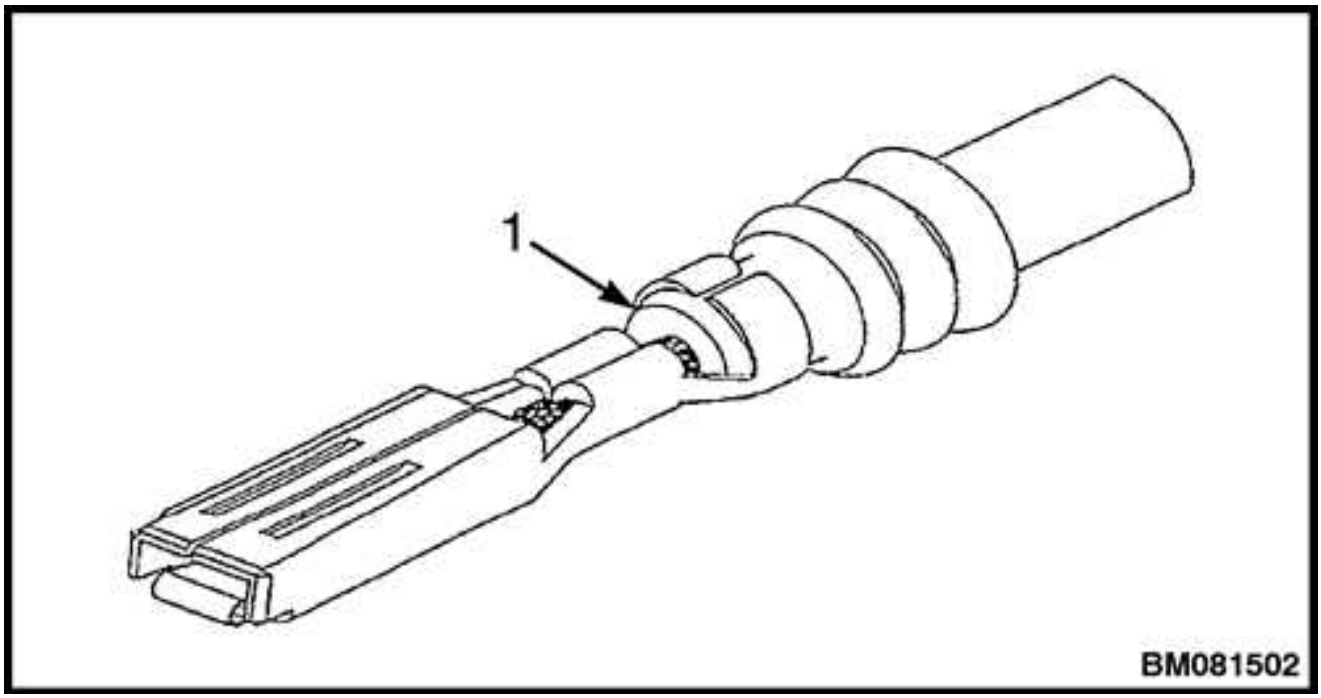
NOTE: Plug and header assembly colors are mechanically keyed to mate only with identical colors.

A. Plug assembly
B. header assembly

1. mating seal
2. housing
3. wedge lock
4. retention leg

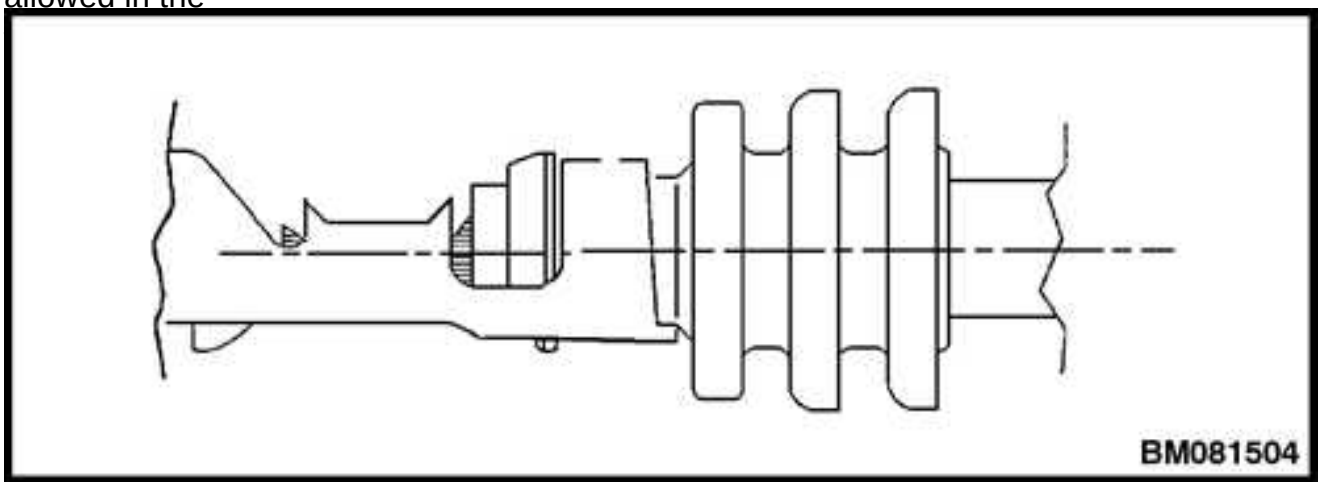
Figure 43. AMPSEAL Plug and Header Assembly

STEP 9.
Rubber seal must protrude from insulation



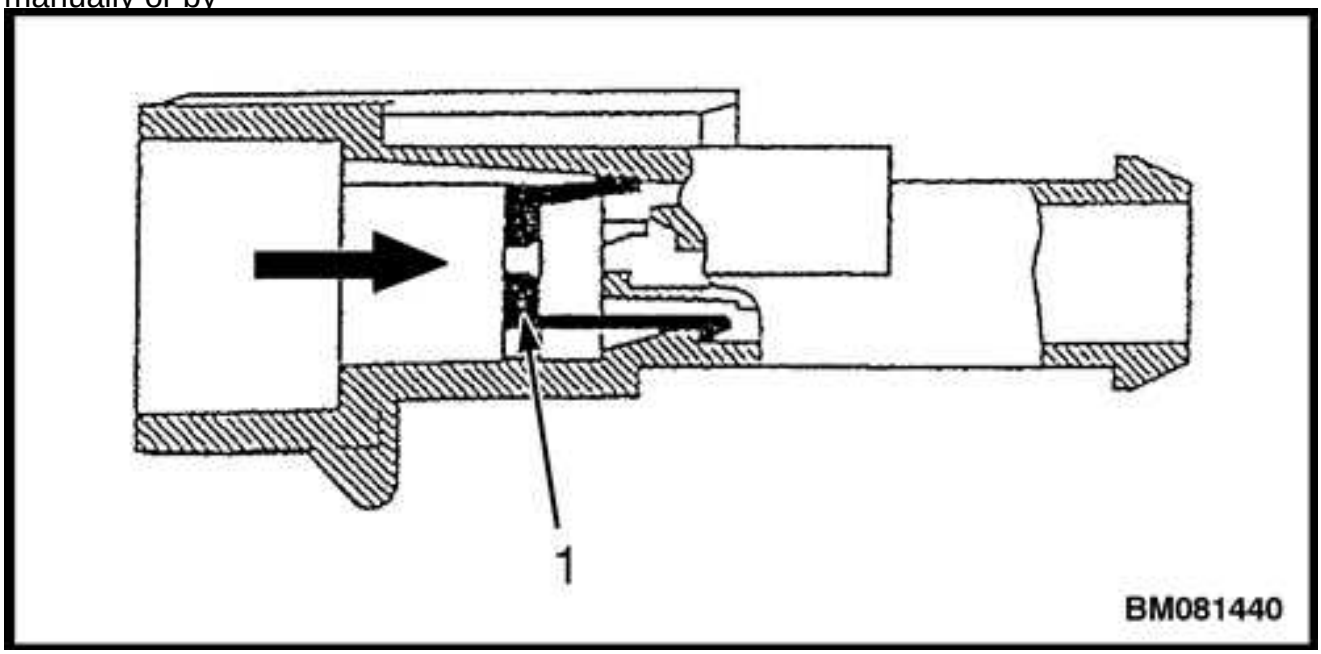
1. rubber seal

STEP 10.
No parts of insulation or rubber are allowed in the



NOTE: Different jigs are needed for position 1 and 2 housings and position 3 to 6 housings.

STEP 5.
To close the anti-backout device for tab housings, either manually or by



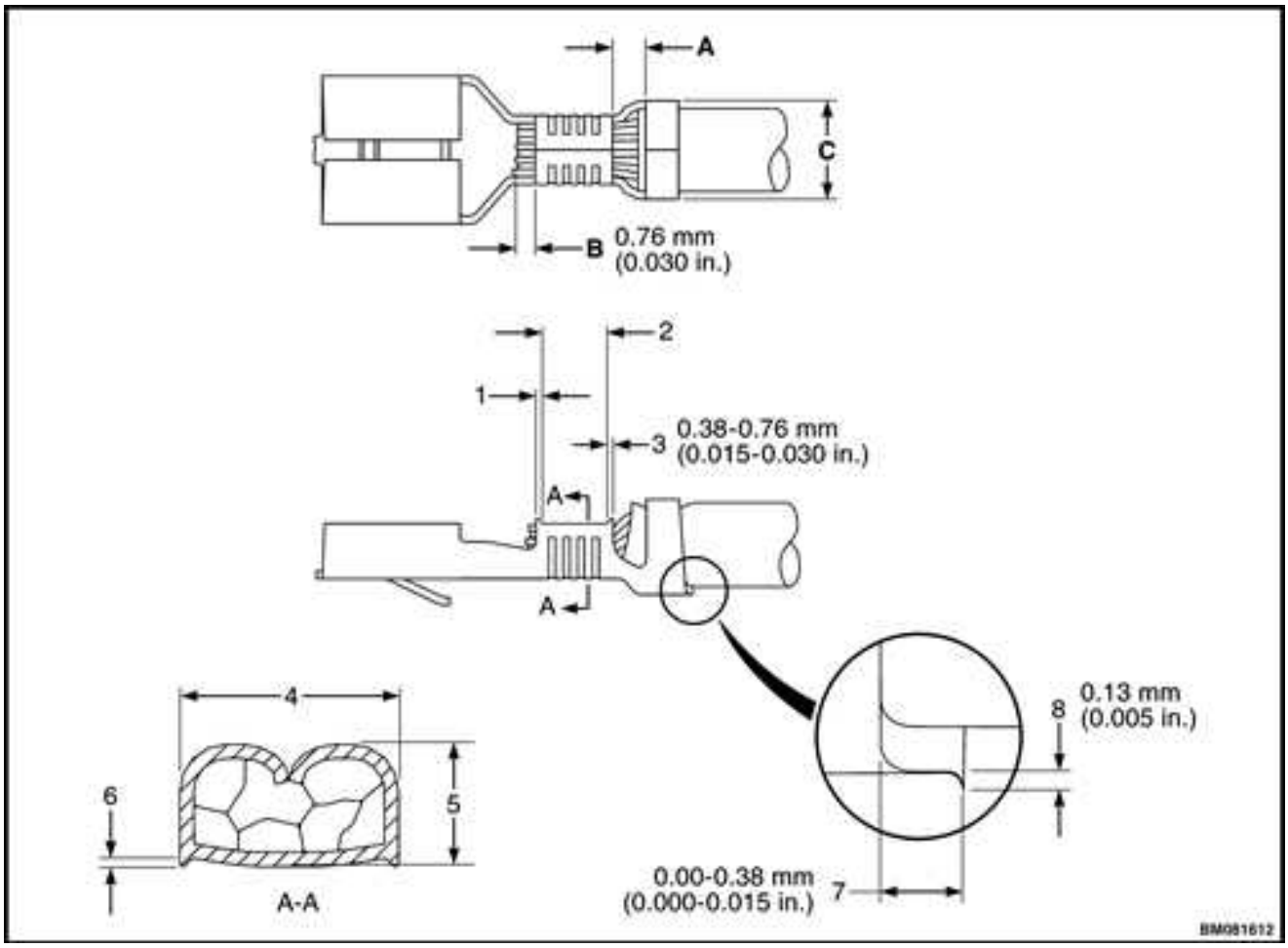
1. anti-back out device

Removal of Contacts

Since the locking lance of contacts can be reached from the mating side of the housings, it is necessary to remove the anti-backout device first.

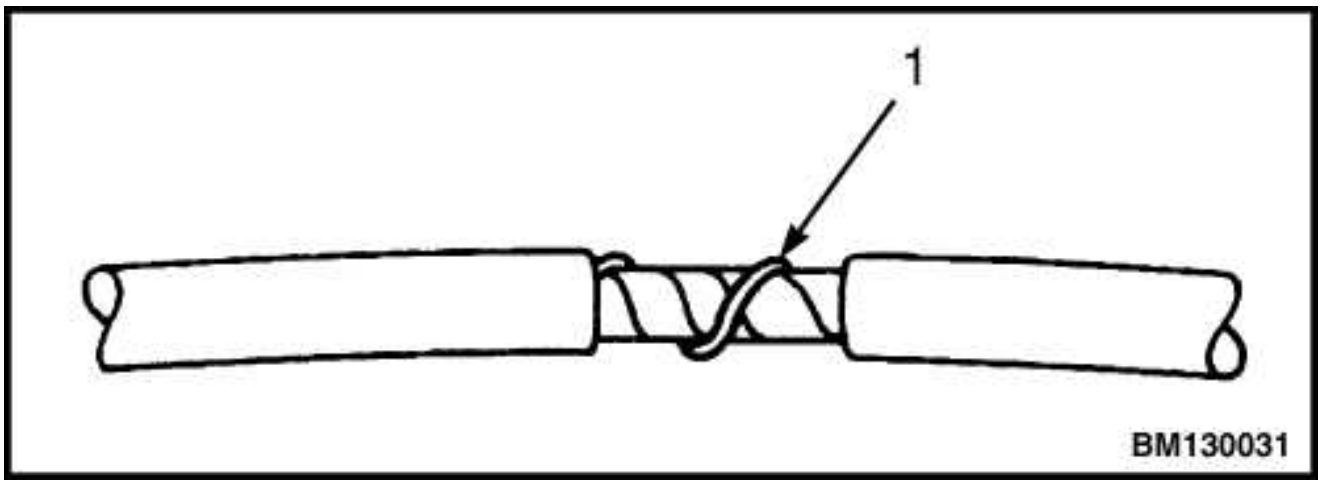
NOTE: Perform STEP 1 and STEP 2 for removal of receptacle contact.

STEP 1.
Deflect the side arms of the anti-back out device and pull it away.



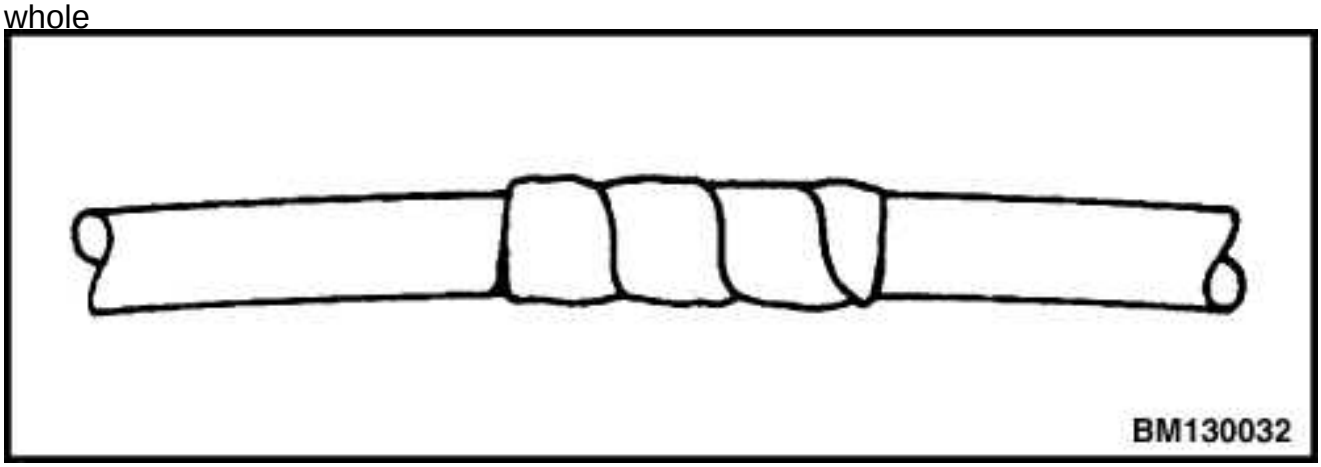
A. wire conductors and insulation both visible in this area
B. conductor visible
C. insulation barrel crimp width
1. front bellmouth
2. crimp length (see Table 13)
3. rear bellmouth
4. wire barrel crimp width (see Table 13)
5. wire barrel crimp height (see Table 13)
6. wire barrel flash
7. cutoff tab
8. max burr

Figure 76. Typical Crimp - Fastin-Faston Receptacle



1. Drain wire

STEP 7.
Apply electrical tape over whole



Twisted Leads Repair

STEP 1.
Locate damaged wire and remove insulation as required.

• Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.

• Keep the unit clean and the working area clean and orderly.

• Use the correct tools for the job.

• Keep the tools clean and in good condition.

• Always use **YALE APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.

• Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.

• Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.

• Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.

• Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.

• Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:

 **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol and word are on orange background. The CAUTION symbol and word are on yellow background.

TABLE OF CONTENTS

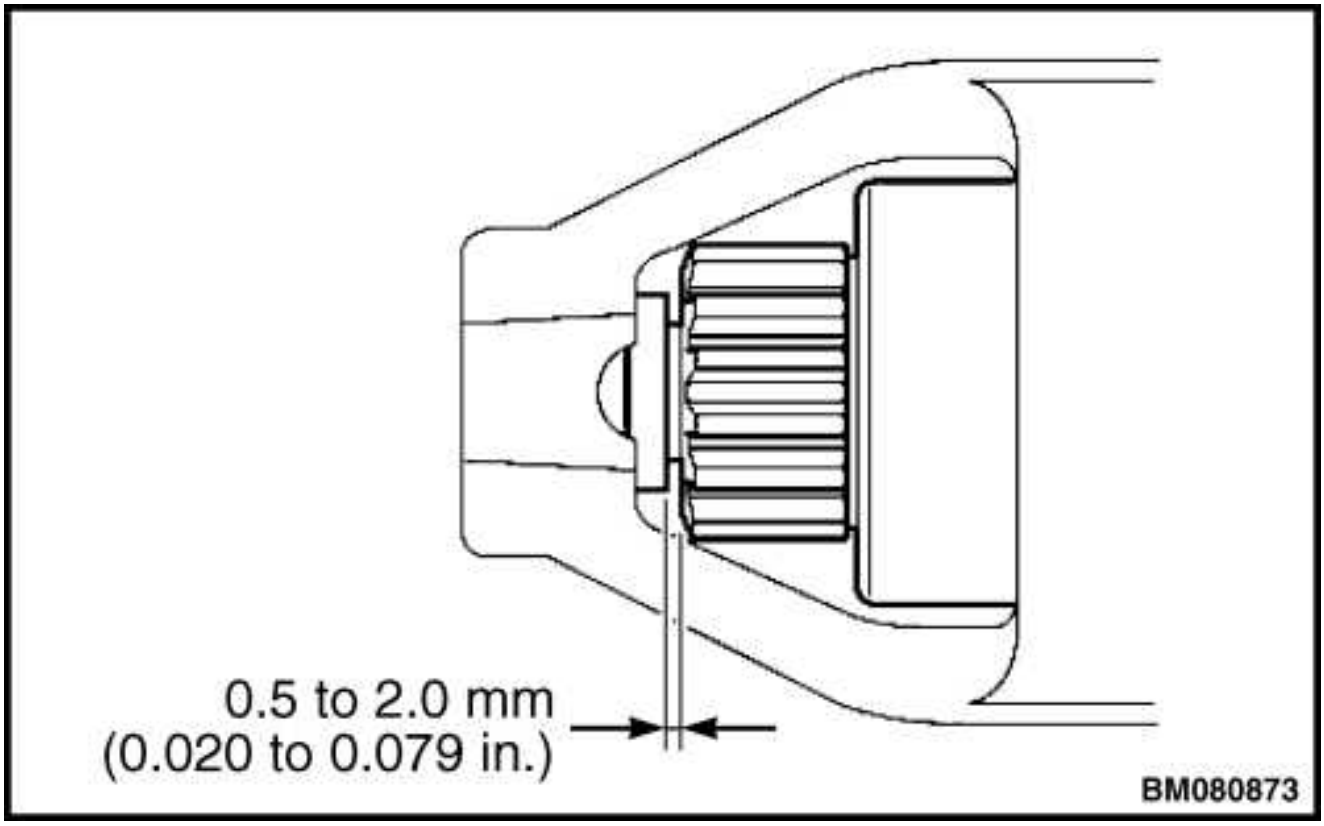


Figure 17. Pinion Gap

Alternator Repair

General

CAUTION

- **Connecting the battery in reverse polarity allows high current to flow from the battery to the alternator, damaging the diodes and regulator.**
- **DO NOT remove the battery terminal while engine is operating. This procedure may sometimes cause a surge in voltage, damaging the diodes and regulator.**
- **DO NOT use a high-voltage tester such as a Megger because it may damage the diodes and regulator.**
- **Always disconnect the battery terminal when charging the battery with a quick charger. If the terminals are not disconnected during rapid charging, the diodes or regulator may be damaged.**
- **When steam cleaning, take care not to spray steam directly on the alternator.**
- **If the L and B terminals are short-circuited during operation, the rectifier (diode trio) may be damaged.**
- **DO NOT connect a load over 1 A on the L terminal.**
- **DO NOT ground the L terminal while engine is operating.**

NOTE: Always use a fully-charged battery.

The alternator is connected as shown in Figure 18 and Figure 19.

3. intake manifold
4. vacuum hose

Intake Air Temperature (IAT) Sensor, LPG Engines

Remove

1. Disconnect the battery.

2. Disconnect the wiring harness connector from the sensor connector.

3. Remove the sensor and aluminum seal washer. See Figure 33.

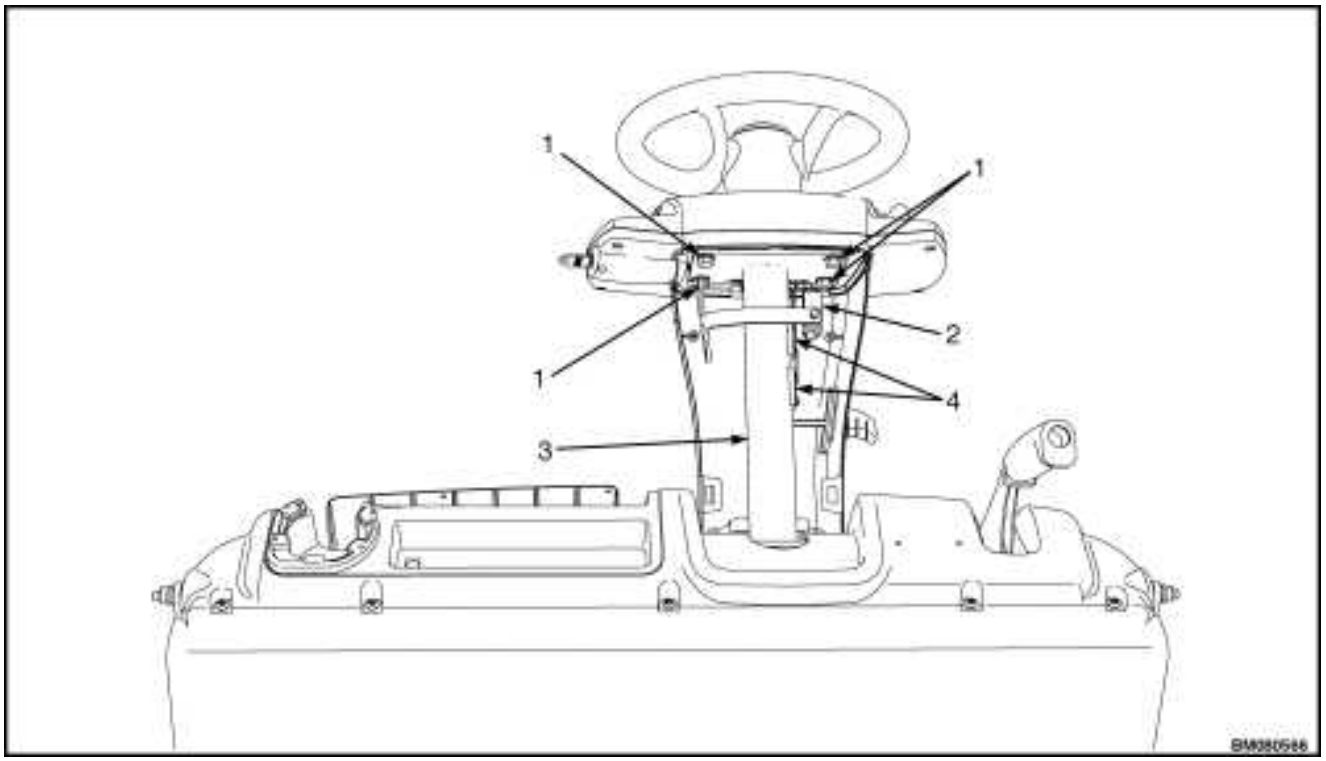
Install

1. Install the IAT sensor and new aluminum seal washer. Tighten the IAT sensor to 7.9 to 11.7 N•m (70 to 104 lbf in).

2. Connect the wiring harness connector to the sensor connector.

3. Connect the battery.

Figure 3.



NOTE: Top down view shown.

1. bolts
2. Display Switch Cluster harness
3. steering column
4. horn wires (contact pads)

Figure 5. Display Switch Cluster Removal

Direction Control Lever

Remove

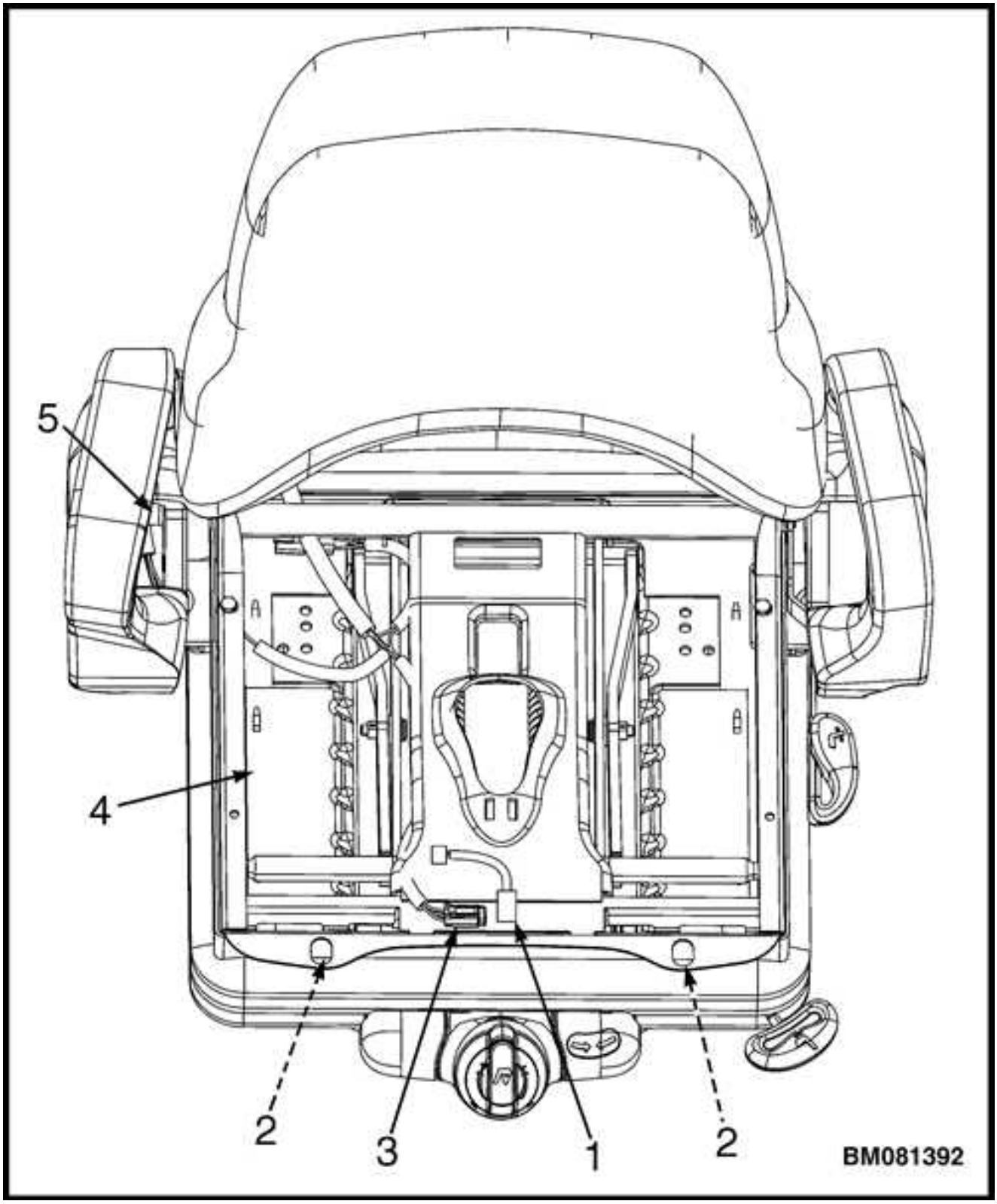
NOTE: The direction control lever is located on left side of Display Switch Cluster. The direction control lever is non-repairable and must be replaced as an assembly. See the **Parts Manual** for replacement part number.

1. Insert two small, flat-blade or Phillips screwdrivers, with a 3.175 mm (0.125 in.) or less, wide blade or die end, into the opening on the Display Switch Cluster on an outward angle enough to compress the spring tab on the direction control lever. See **A**, Figure 6.

2. Pry the spring tab toward the body of the direction control lever or turn signal lever and, at the same time, pull on the handle of the lever enough to free the tab of the interior lock of the Display Switch Cluster. See **B**, Figure 6.

3. Repeat the previous steps on the opposite side of the direction control lever. Remove the direction control lever from the Display Switch Cluster.

Install



1. seat sensor	4. seat base
2. cushion pins	5. to chassis harness
3. seat harness	

Figure 20. Seat Sensor, Full-Suspension Seat

2. Remove the key.

NOTE: Tag electrical connector prior to disconnect to aid in correct reconnect.

3. Disconnect the LED light from light harness. See Figure 33.

4. Remove screw, LED light, and clip nut from mounting bracket. Pull LED light downward to remove it from mounting bracket. See Figure 33.

Install

1. Install new clip nut, LED light, and screw onto mounting bracket. See Figure 33.

2. Connect LED light to light harness as tagged during removal. See Figure 33.

3. Connect the battery. Close the hood.

Reflectors

Remove

1. Raise the hood. Disconnect the battery.

2. Remove screw, reflector assembly, and clip nut from mounting bracket. See Figure 33.

3. Remove reflector lens from reflector base. See Figure 33.

Install

1. Install new reflector lens onto reflector base. See Figure 33.

2. Install clip nut, reflector assembly, and screw onto mounting bracket. See Figure 33.

3. Connect the battery. Close the hood.

88.9 mm (3.500 in.)	91.4 mm (3.600 in.)	87.4 mm (3.440 in.)	015429100	
101.6 mm (4.000 in.)	113.3 mm (4.460 in.)	98.8 mm (3.890 in.)	015429200	
127.0 mm (5.000 in.)	128.5 mm (5.060 in.)	123.7 mm (4.870 in.)	015429400	
152.4 mm (6.000 in.)	153.9 mm (3.060 in.)	138.7 mm (5.460 in.)	052670500	

Yale Materials Handling Corp.
1400 Sullivan Dr.,
Greenville, NC 27834-2011

3. Load Roller

4. Inspect the load backrest extension for cracks and damage.

5. If the lift truck is equipped with an integral sideshift carriage or attachment, inspect the parts for cracks and wear. Make sure the parts that fasten the integral sideshift carriage or attachment to the carriage are in good condition.

WARNING

Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.

WARNING

Never check for leaks by putting hands on hydraulic lines or components under pressure. Hydraulic oil under pressure can be injected into the skin.

6. Visually inspect hoses/fittings for hydraulic leaks; hose cover for cuts, cracks or exposed reinforcement; defective/broken clamping devices or sheaves; proper tracking during operation. Adjust/repair/replace hose/components as necessary.

7. Check that the lift chains are correctly lubricated. Use SAE 30 engine oil as necessary to lubricate the lift chains.

8. Inspect the lift chains for cracks or broken links, and worn or turned pins. See Figure 8.

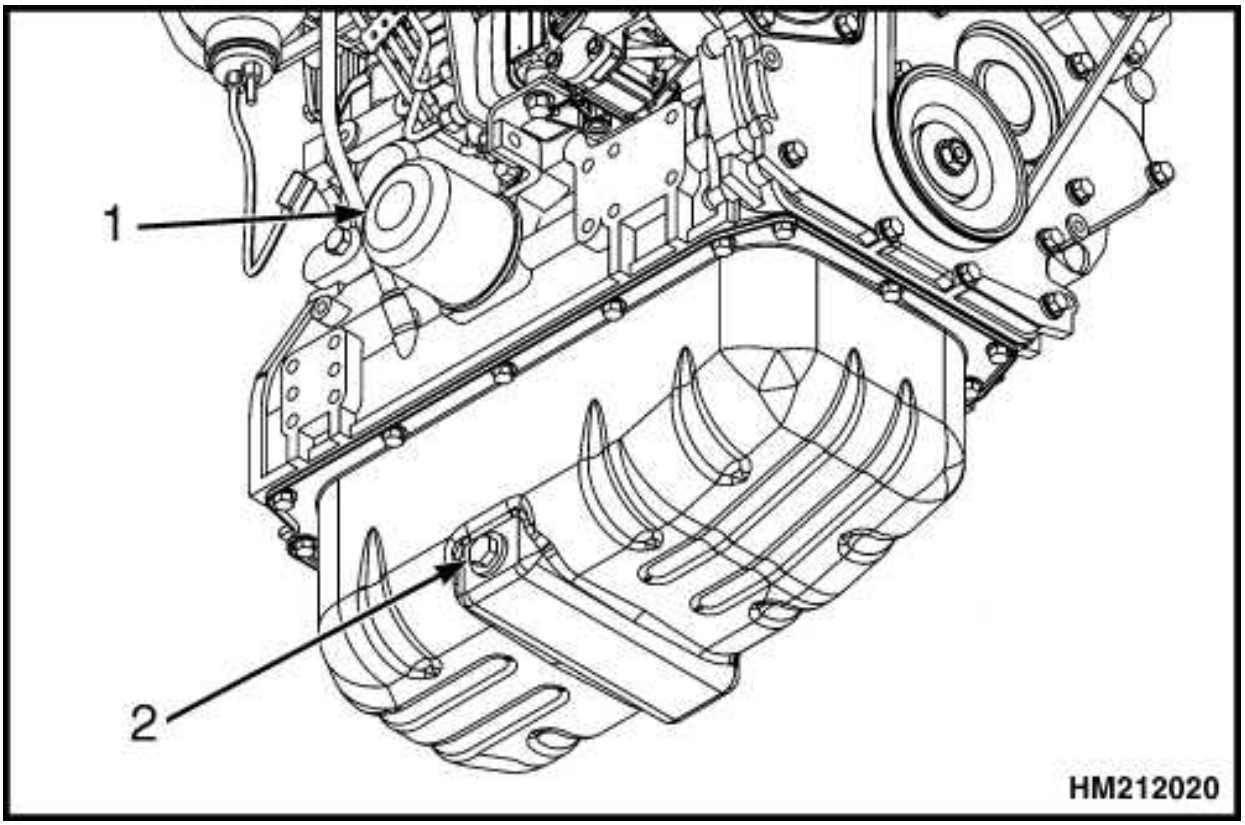
9. Inspect the chain anchors and pins for cracks and damage.

10. Make sure the lift chains are adjusted so that they have equal tension. **Adjustments or replacement of the lift chains must be done by authorized personnel.**

Figure 22. Engine Oil and Oil Filter Change - Mazda FE

Yanmar 2.6L Engine Oil and Oil Filter Change

Change the engine oil and oil filter. See Figure 23. Apply clean oil to gasket of new filter. Install new filter. Turn filter until gasket touches, then tighten 1/2 to 3/4 turn with your hand. Fill engine with oil, as specified in Maintenance Schedule, until full mark reached on the dipstick. Start engine. Check area around oil filter for leaks, shut engine off and check oil dipstick, if low add oil.



NOTE: Bottom view of engine shown.

1. oil filter	2. drain plug

Figure 23. Engine Oil and Oil Filter Change - Yanmar 2.6L

Hydraulic System

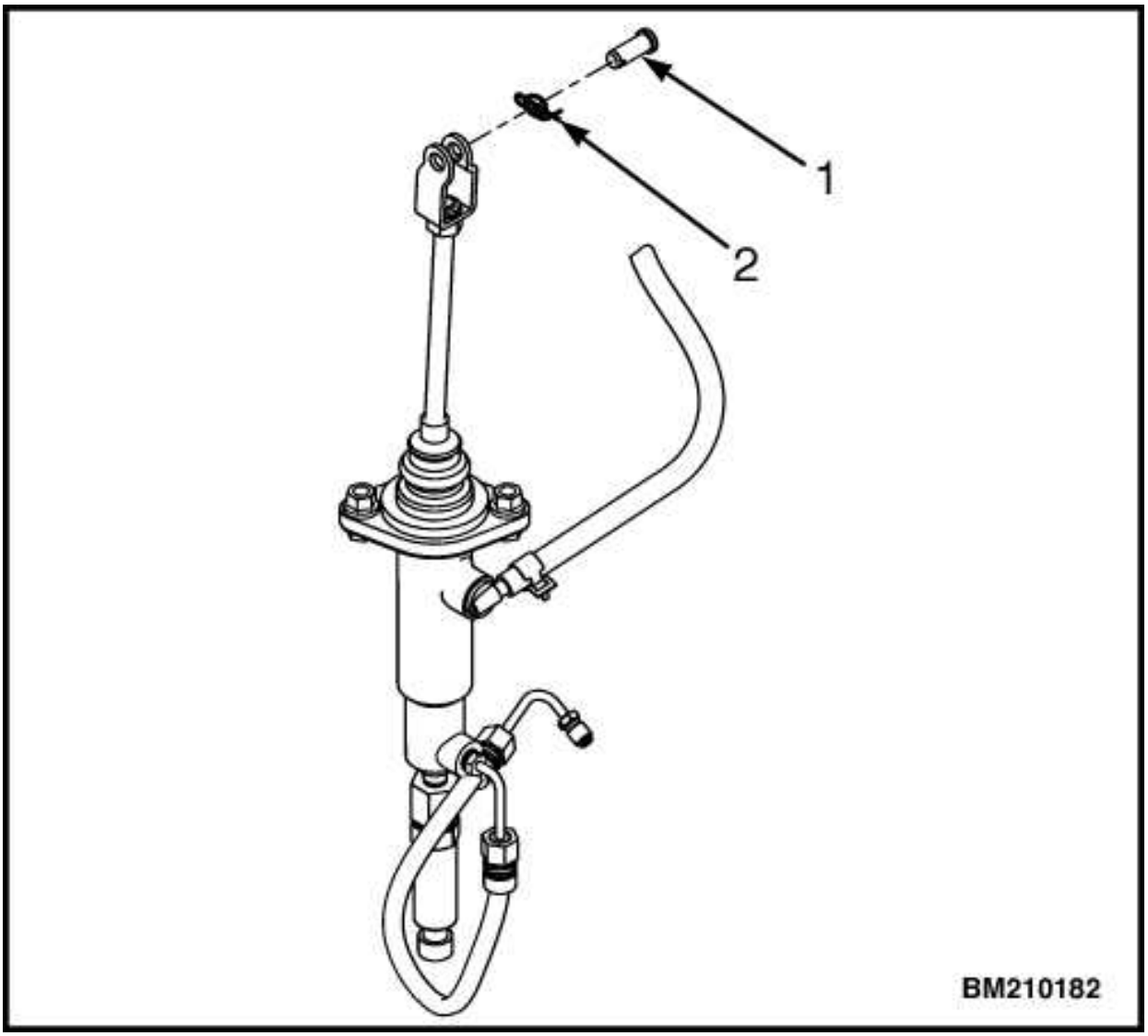
Hydraulic Filter Element, Replace

Remove

WARNING

At operating temperature, the hydraulic oil is HOT. DO NOT permit the hot oil to touch the skin and cause a burn.

Figure 40.

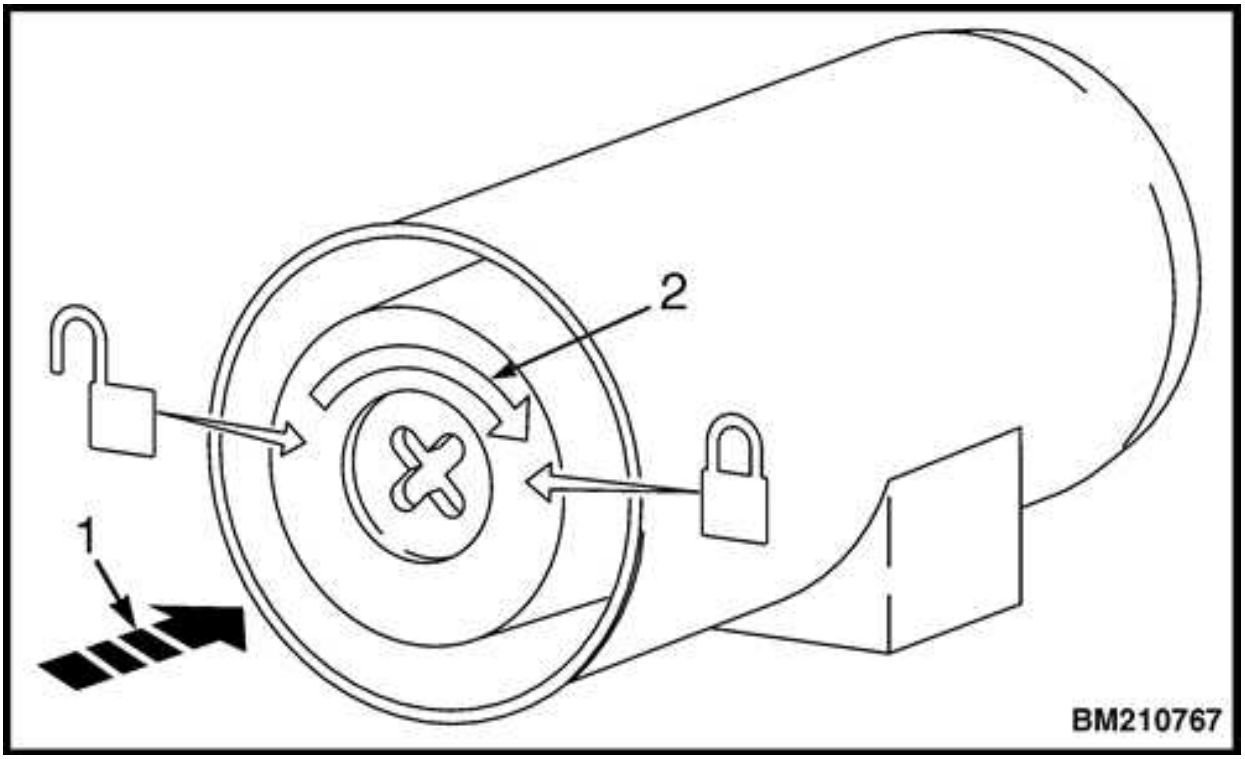


1. rod end pin
2. cotter pin (locking)

Figure 40. Master Brake Cylinder Rod End Pin Lubrication

Manual Hydraulic Levers Lubrication

Lubricate the bushings for the manual hydraulic levers. Use spray lubricant as listed in the Maintenance Schedule. See Figure 41.



1. push in
2. twist to lock

Figure 55. Air Filter Label

CAUTION

During cover installation, DO NOT force the cover on the canister. To do so will result in damage to the filter element, cover, and possibly the canister.

NOTE: If the filter element is properly installed, the cover will fit easily into the canister with no gap between the cover and the canister. If the cover does not fit easily, the filter element is not installed properly. DO NOT use a cover that is bent, damaged, or missing latches.

9. Install the cover into the canister and ensure the **INLET** arrow is in line with the canister inlet.

NOTE: DO NOT use the latches to pull the cover down against the canister. If the cover does not fit completely against the canister with no gaps, the element is not installed correctly.

10. Fasten the latches to secure the cover to the canister. Make sure the latches penetrate the slots in both the canister and the cover.

11. Inspect the entire air intake system for leaks. Inspect all clamps for tightness and tighten if necessary. Inspect all hoses for damage. Replace damaged hoses. Inspect the dust evacuation valve for damage. If damaged, replace the dust evacuation valve.

PCV Valve

Install a new PCV valve. See Figure 56.

DO NOT try to start the engine by pushing or towing the lift truck. Damage to the hydraulic system can occur if engine is started by pushing or towing lift truck.

If the battery becomes discharged and requires a booster battery to start the engine, follow these procedures carefully when connecting the jumper cables:

1. Disconnect the negative battery terminal of the lift truck being started.

2. Always connect positive jumper cable to positive terminal of discharged battery and negative jumper cable to negative terminal.

3. Always connect jumper cable, that is the ground cable, last.

4. Always connect jumper cables to discharged battery before connecting them to booster battery.

Jump-Starting a Lift Truck Using Another Lift Truck

WARNING

To prevent possible arcing between the two lift trucks, make sure that the lift trucks are not touching.

CAUTION

DO NOT try to start the engine by pushing or towing the lift truck. Damage to the hydraulic system can occur if engine is started by pushing or towing lift truck.

1. Always connect positive jumper cable to positive terminal of discharged battery and negative jumper cable to negative terminal.

2. Always connect jumper cable, that is the ground cable, last.

3. Always connect jumper cables to discharged lift truck battery before connecting them to the fully-charged lift truck battery.

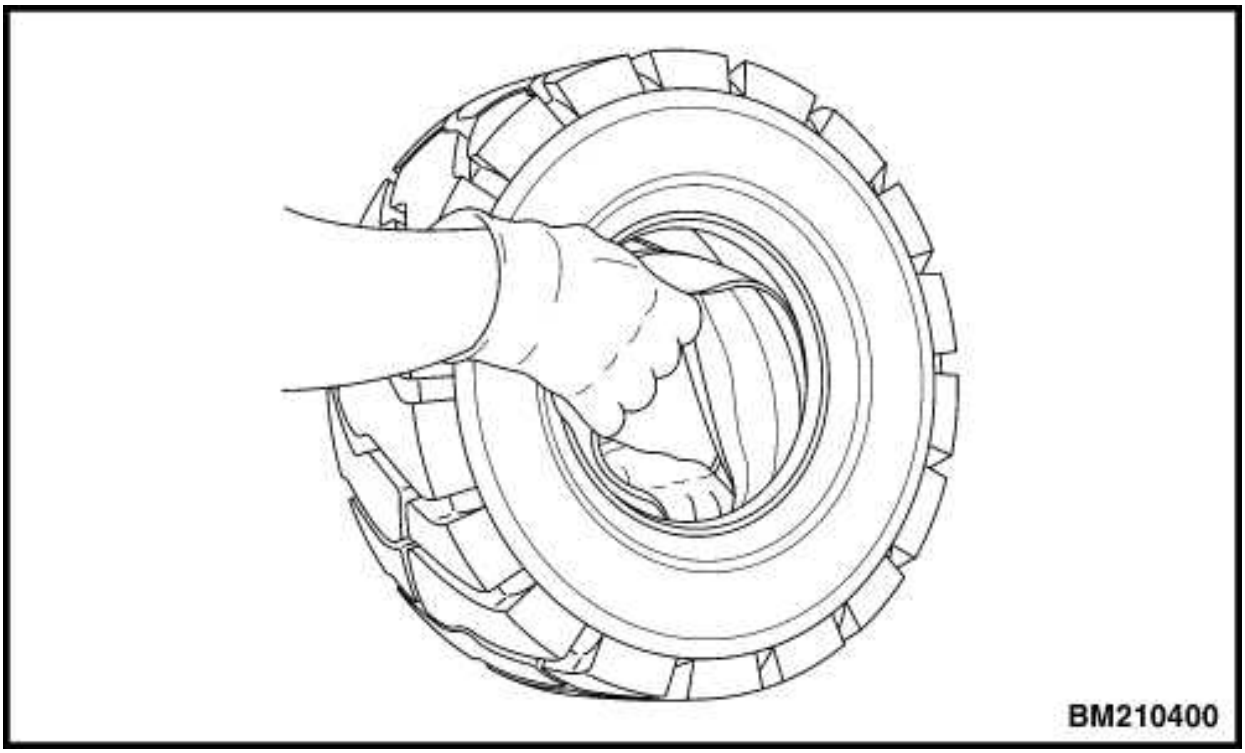
Welding Repairs

WARNING

Welding can cause a fire or an explosion. Always follow the instructions in the Frame section if a fuel or hydraulic tank must be welded. Make sure there is no fuel, oil, or grease near the weld area. Make sure there is good ventilation in the area where the welding must be done.

DO NOT heat, weld, or bend forks. Forks are made of special steel using special methods. The strength of the overhead guard can be reduced by welding or heating. Get information from your dealer for Yale lift trucks before welding on a mast.

Forklift frames and components may be painted with a catalyzed paint such as polyurethane or a two-part primer. Welding, burning, or other heat sufficient to cause thermal decomposition of the paint may release isocyanates. These chemicals are allergic sensitizers to the skin and respiratory tract and overexposure may occur without odor warning. Should work be performed, utilize good industrial hygiene practices including removal of all paint (prime and finish coats) to the metal around the area to be welded, local ventilation, and/or supplied-air respiratory protection.



STEP 4.
Apply lubricant to the rim. If a four-piece wheel is being used, lubricate the advance band. Slide the tire and the TBS onto the wheel.

Line up the valve hole in the TBS with the valve slot in the wheel. Lubricate and insert the valve into the valve hole. Make sure it is fully inserted.

Hydraulic System Relief Pressures

Item	Specification
Oil Temperature for Setting Relief Pressure	50 to 65°C (122 to 149°F)
Primary Relief Valve Pressure (High Idle)	21.4 ±0.48 MPa (3103 ±70 psi)
Secondary Relief Valve Pressure (High Idle)	15.50 ±0.48 MPa (2248 ±70 psi)

Steering System

Item	Quantity	
Oil Temperature for Setting Relief Pressure	50 to 65°C (122 to 149°F)	
Steering Relief Pressure at 800 rpms	11.0 ±0.3 MPa (1595 ±43.5 psi)	
Steering Cylinder Stroke (Each Side)	135.2 mm (5.3 in.)	
Inside Steering Tire Angle	82.3°	
Number of Turns Lock to Lock	3.50	
Turning Radius (±50 mm NO LOAD)	**Outside**	**Inside**
GLC050LX (A967)	2062	75
GLP/GDP20-25LX (GLP/GDP050LX) (A974)	2236	103

Stall Speeds

Engine	Transmission	New Engine	Broken-In Engine (30 hrs)
Mazda FE LPG	Single Speed Powershift	1820 rpm*	1865 rpm*
Yanmar 2.6L Diesel	Single Speed Powershift	1752 rpm*	1845 rpm*
	*±100 rpm		

Mast Speeds

NOTE: Lift speed is measured in meters/sec (inch/sec) at governed engine RPM with full open valve and 65°C (149°F) oil temperature.

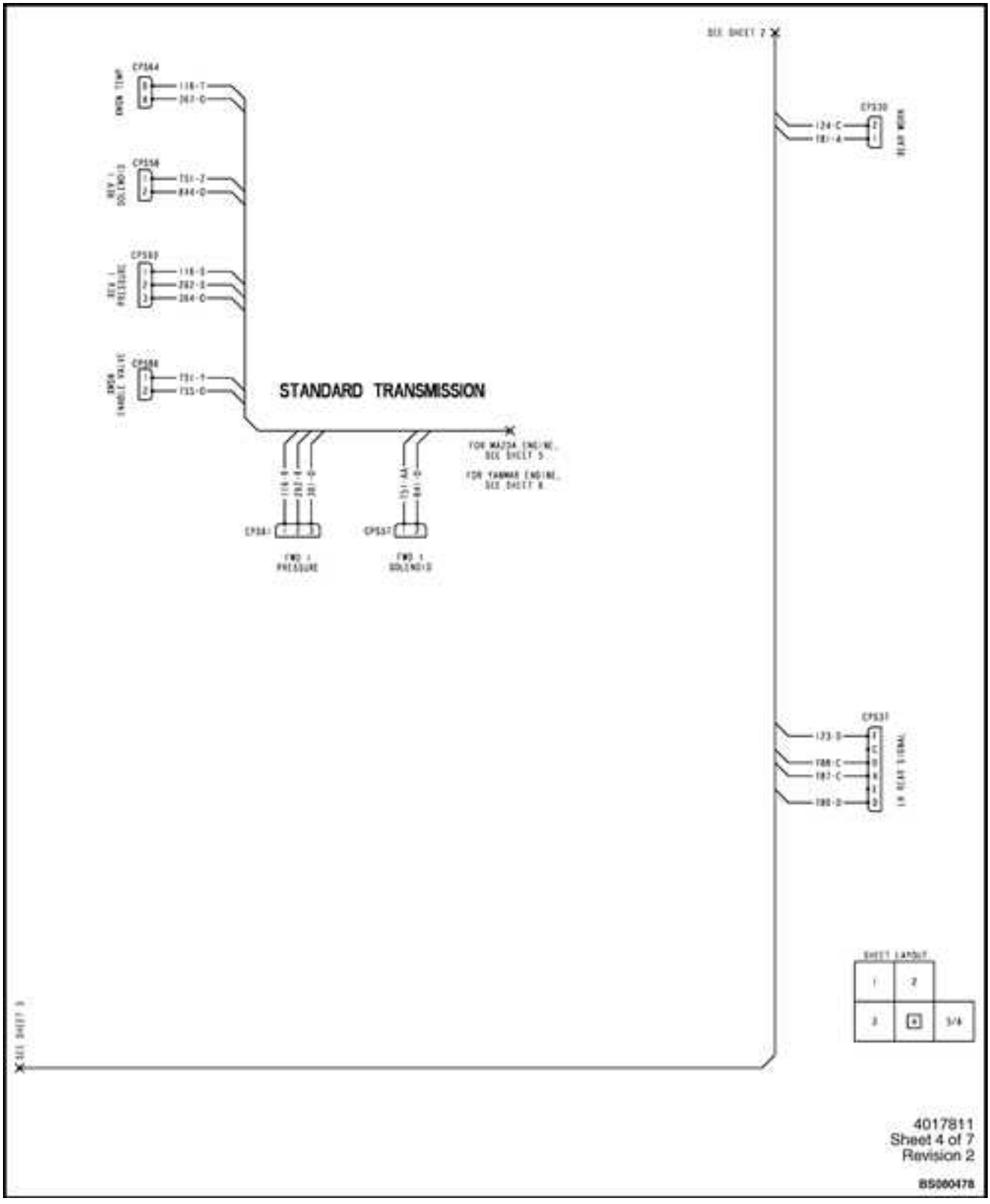


Figure 2. Wiring Diagram (Sheet 4 of 7)

1. With engine running, release park brake. **2.** Slowly apply park brake and note when park brake light comes ON. ***Does light come on before park brake reaches first click of engagement?***		**YES:** Park brake sensor is OK. Go to next check. **NO:** Adjust park brake sensor. See **Brake System** 1800 YRM 1135.

.

Park Brake Check

BT260002

WARNING

Ensure load is secured so it will not move when mast is tilted fully forward.

1. Stop lift truck in an uphill direction with rated load on 15% grade or less, and apply park brake.

YES: Park brake is OK. Go to next check.
NO: Adjust park brake. See **Brake System** 1800 YRM 1135.

A standard battery has one vent cap for each cell. The caps serve two purposes: First, they close the opening in the cell cover through which the electrolyte level is checked and water added, and second, they provide a vent for the escape of gases formed when the battery is charging. Each cell within the battery has a potential voltage of approximately 2 volts. A 12-volt battery will have six cells connected in series.

Conventional Standard Battery

A conventional standard battery, when new, contains fully-charged elements and is filled with electrolyte at the factory. It will not maintain its charged condition during storage and must be recharged periodically. A standard battery requires periodic measurement and adjustment of the electrolyte levels. Access the electrolyte within each cell through the battery vent caps. The electrolyte level should be checked daily. The electrolyte should be 6.35 to 12.7 mm (1/4 to 1/2 in.) above the plate separators, so that the tops of the battery plates are covered. The battery should be filled with distilled water and never overfilled. Do not add electrolyte to the battery unless it has been lost by spillage.

Always wait until after checking battery specific gravity before adding distilled water to the battery. This will ensure a true reading. If the electrolyte level is too low to check specific gravity, add distilled water, operate in circuit for a few minutes to mix the distilled water and electrolyte, then check the specific gravity. Specific gravity testing procedures are covered later.

Standard batteries that are stored for long periods of time without recharging form lead sulfate crystals on the wires of the positive plates and could cause permanent damage. In some instances, if the sulfation is not too severe, a slow charge rate for a longer than normal period could restore the battery to normal operating condition.

Maintenance-Free Battery

A Maintenance-Free battery operates similarly to a conventional standard battery. The use of lead-calcium plates instead of lead-antimony in their construction increases the ability of the battery to accept an overcharge, thus greatly reducing bubbling and gassing of the electrolyte. Less fluid is lost, eliminating the need to add water. Venting of gases from a maintenance-free battery is done through a ‘vent.’ Most maintenance-free batteries do not have typical ‘vent caps.’ These batteries are ready for service when they leave the factory. They have a very low rate of discharge and thus, have a longer shelf life than a conventional standard battery.

Battery Charging

WARNING

Safety is very important while charging batteries. Always wear safety goggles, protective clothing, and rubber gloves when charging a battery. Keep sparks and flames away from the battery. Make sure the work area is well-ventilated. When charging and discharging, a lead acid storage battery generates harmful fumes and gases. This gas is very explosive.

The amount of electrical current a battery can produce is limited by the amount of chemical reaction which can take place within it. When the chemical reaction in the battery has ended, either through defect or long use, it can no longer produce a flow of electrical current. In most instances, if the battery is not defective, it can be recharged.

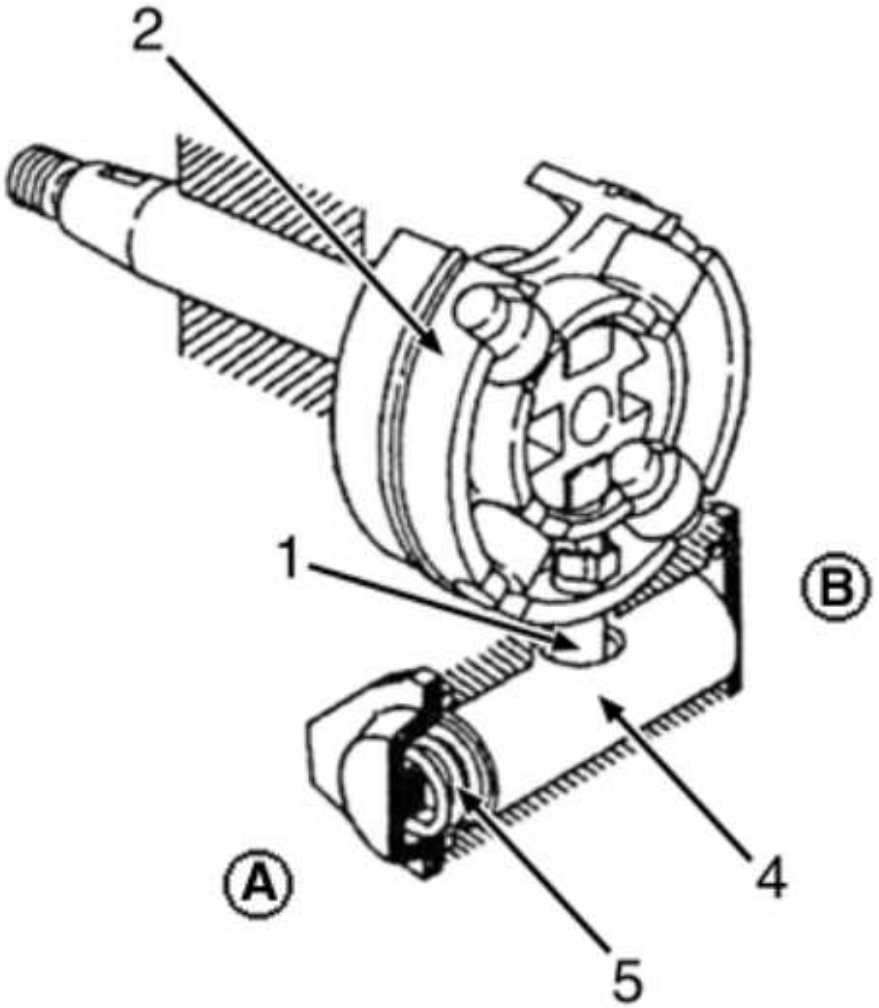
The battery charge is maintained by the truck charging system. If a component in the charging system fails or if a truck system is drawing current while the truck is not running, the battery charge may be depleted. In these circumstances, external charging of the battery may be required. Batteries are charged by reversing their flow of current. Batteries can be recharged in two ways, either Fast Charging or Slow Charging.

A battery that is in satisfactory condition but requires recharging will accept a large amount of charging current without undesirable effects. This type of battery may be charged quickly at a high rate with a battery ‘fast charger.’ The reaction of the battery itself to fast charging will indicate the amount of charging current it can accept without damage. NEVER allow the battery electrolyte to heat above 49°C (120°F).

A battery that becomes sulfated will not accept a high rate of charging current without possible damage. Its sulfated condition provides increased resistance to current flow within the battery. Flow of high current through this kind of resistance creates heat. Damage that may occur includes plate warping, boiling of the electrolyte, and possible damage of the separators. Also, the cell caps, covers, and battery case may be damaged or distorted. A battery that has become sulfated must be charged over a long period of time at a low rate of charge.

Battery Fast Charging

the roller holder via the roller holder pin. When the piston moves in the direction to compress the timer spring, the roller holder moves in the advance direction (opposite direction of driveshaft rotation) to advance the injection timing. Thus, the timer controls the fuel injection timing according to the fuel pressure in the pump chamber. See Figure 9020-10-13, Page 9020-10-.

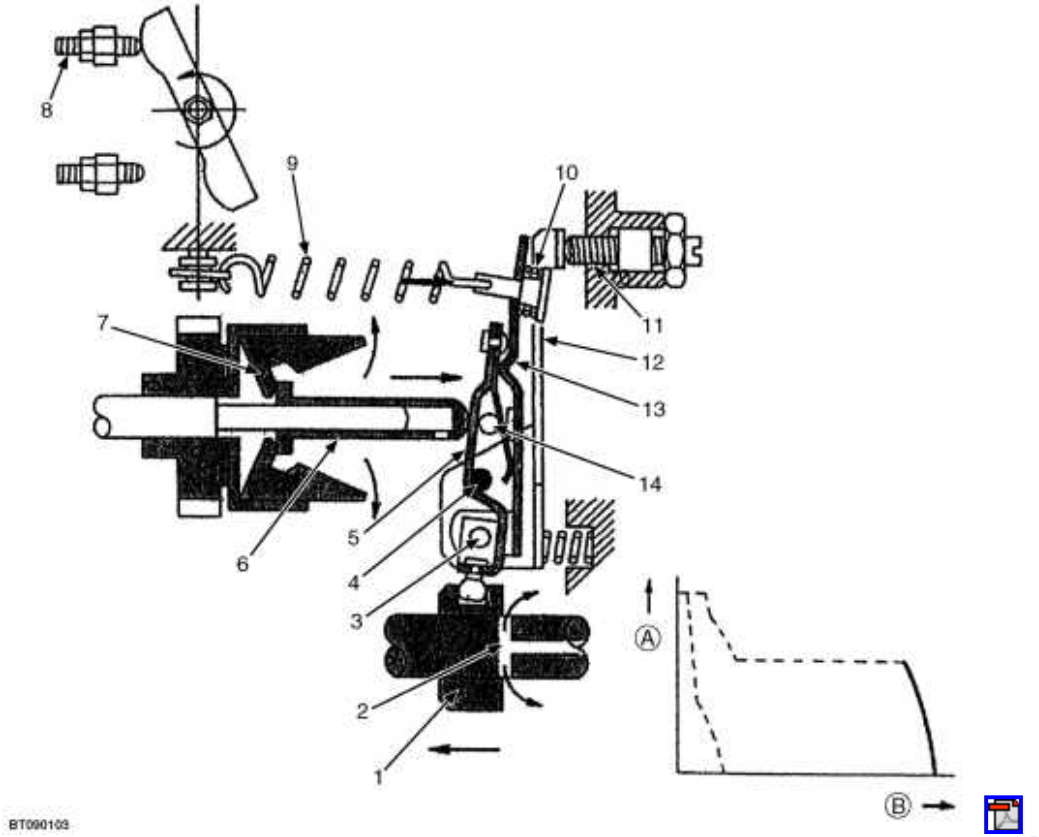


BT090071

A. Low Pressure Side
B. High Pressure Side

1. Roller Holder Pin
2. Roller Holder
4. Timer Piston

At No-Load Maximum Speed Control



A. Injection Volume
B. Pump RPM
1. Control Sleeve
2. Cutoff Port
3. M2 (fulcrum)
4. M1 (fixed)
5. Start Lever
6. Governor Spring
7. Flyweight
8. Maximum Speed Stopper Bolt
9. Governor Spring
10. Idle Spring
11. Full-Load Adjusting Screw
12. Corrector Lever
13. Tension Lever
14. M3 (Press-in Pin)

Figure 9020-10-31. Injection Volume At No Load Maximum Speed

When the engine revolutions increase and the flyweight centrifugal force exceeds the governor spring set force, the governor sleeve moves making the governor lever assembly turn clockwise with fulcrum M2. As a result, the control sleeve moves in the direction of no-injection (to the left) for controlling speed so as not to exceed the full-load maximum speed. When the accelerator pedal is not pressed down fully, the set force of the governor spring changes accordingly in order to achieve governor control based on the governor spring set force during partial load operation.

- Check fuel tank level. Fill tank if necessary.
- Verify diesel fuel in tank is correct.
- Verify fuel tank shutoff valves are fully open.

NOTE: Perform the following checks when **ordinary** exhaust color is observed.

- Check for air in fuel system.
- Check for clogged fuel filter and clogged fuel strainers.
- Check for clogged or cracked fuel lines.
- Verify supply fuel to injection pump is sufficient.

NOTE: Perform the following checks when **white** colored exhaust is observed.

- Check for air in fuel system.
- Check fuel injection pump timing is correct.
- Check for clogged fuel filter and clogged fuel strainers.
- Check for water in fuel system.
- Check fuel injection nozzles for any uneven spray patterns and injection volume.

NOTE: Perform the following checks when **black** colored exhaust is observed.

- Check fuel injection pump timing is correct.
- Check fuel injection nozzles for poor spray patterns and uneven injection volume.

Is fuel system working properly?

YES: Go to Cause B for diesel engines or go to Cause C for Mazda engines.

NO: Repair fuel system. For Mazda LPG engines, see **Mazda Engine**, **FE and F2** 600 YRM 1122 or **LPG Fuel System**, **Mazda FE and F2 Emission Compliant Engines** 900 YRM 1326. For Yanmar diesel engines, see **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205.

Cause B - Electronic Actuated Throttle Problems.

PROCEDURE OR ACTION:

Inspect that the E-throttle actuator is stroking correctly. For Yanmar diesel engines, see **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205.

Is E-throttle actuator stroking correctly?

YES: Go to Cause C.

NO: Adjust E-throttle actuator. For Yanmar diesel engines, see **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205.

Cause C - Engine mechanical problems.

PROCEDURE OR ACTION:

1. Check for low cylinder compression. Perform an engine compression test. See Tests and Adjustments, Engine Compression Test, Page 9020-40-.

   Does engine pass compression test?

   YES: For Mazda, check for vacuum leaks and resume operation. For Yanmar diesel engines, see Tests and Adjustments, Engine Compression Test (Yanmar Diesel), Page 9020-40-.

   NO: Go to Step 2.

2. For **Mazda** engines, check engine for the following:
   - Severe worn camshaft.
   - Intake/Exhaust valve seizure.
   - Seized or broken piston ring.
   - Worn piston ring, piston or cylinder.
   - Seized crankpin metal or bearing.

POSSIBLE CAUSE

A. Defective thermostat.

Cause A - Defective thermostat.

PROCEDURE OR ACTION:

Operate lift truck to ensure engine is at operating temperature.

Is the engine coolant temperature staying below approximately 65.5°C (150°F) after the forklift has been in operation for more than 15 minutes?

YES: Check to see if the thermostat is stuck open. Replace thermostat. Depending on your lift truck see **Mazda Engine**, **FE and F2** 600 YRM 1122, **LPG Fuel System**, **Mazda FE and F2 Emission Compliant Engines** 900 YRM 1326, or **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205.

NO: Resume operation

END SYMPTOM

Engine Oil Pressure is Low

POSSIBLE CAUSE

A. Engine oil system problem.
B. Engine oil pressure sensor problem.
C. Engine mechanical problem.

Cause A - Engine oil system problem.

PROCEDURE OR ACTION:

Check for the following:

- Insufficient engine oil level.
- Clogged engine oil filter.
- Engine oil leakage.
- Incorrect engine oil.
- Insufficient delivery capacity of trochoid oil pump.
- Defective pressure regulating valve.

Is engine oil system faulty?

YES: Fill engine with correct oil to proper level. Replace oil filter, gaskets and trochoid oil pump as necessary. See **Operating Manual** and depending on your lift truck see **Mazda Engine**, **FE and F2** 600 YRM 1122, **LPG Fuel System**, **Mazda FE and F2 Emission Compliant Engines** 900 YRM 1326, or **Yanmar Diesel Engines**, **2.6L and 3.3L** 600 YRM 1205.

NO: Go to Cause B.

Cause B - Engine oil pressure sensor problem.

PROCEDURE OR ACTION:

Check and verify the following:

- Verify engine oil pressure sensor connector is plugged in.
- Check the engine oil pressure sensor wiring for shorts and broken wires.
- Check engine oil pressure sensor for proper operation with PC Service Tool.

Are Sensor and sensor wiring/connector faulty?

- **TOUCH OR SMELL** — High operating temperatures and excessive wear can sometimes produce an odor or visual evidence that can be linked to other faults or conditions.
- In general, let your senses and your experience assist you in resolving the problem in the most efficient manner. Ask yourself:
  - What is required for this device or operation to function correctly?
  - Where are the devices/parts located?
  - Has this problem been reported before? If so, how frequently? Use the fault history logs to help identify repeated problems. This can be very helpful in analyzing faults of an intermittent nature which may be difficult to duplicate.
  - Has repair work, disassembly or other maintenance work been performed on suspect device or system recently?
- Once these questions have been considered, proceed with the DTC resolution as per the procedure, using any additional information to assist in resolving the discrepancy.

Diagnostic Trouble Codes

Diagnostic Trouble Codes

The Diagnostic Trouble Codes that appear in the table that follows are those codes that have been posted in the memory of the Display or the ECU. They will be displayed via the DSC upon detection and will remain in the applicable fault history logs until service intervention clears the logs.

The DTC list is comprised of the DTC number and a brief description of the fault item. The displayed code is in accordance with the SAE specification J1939-73 and is made up of the SPN and FMI numbers. (FMI code definitions can be found in Fault Mode Indicator Reference, Fault Mode Indicator (FMI) Reference List, Page 9080-70-).

Diagnostic Trouble Code (DTC) Chart

DTC DESCRIPTIONPAGE NO.

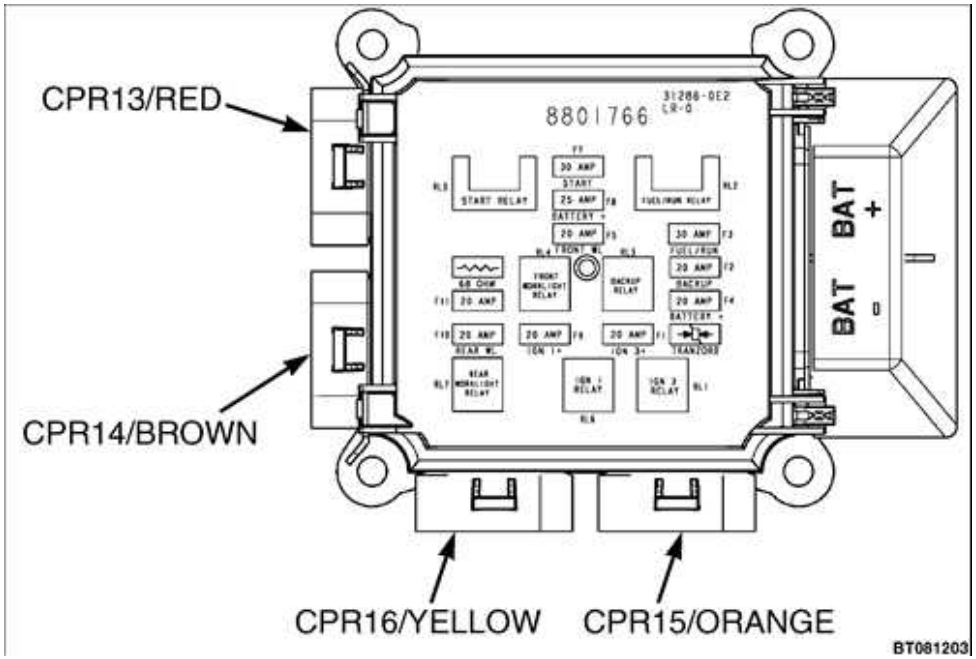


Figure 9030-10-2. Power Distribution Module (PDM)

4. DISPLAY SWITCH CLUSTER (DSC) — The DSC combines all the display and operator control functions into one unit. It is mounted on the steering column. The DSC is the main operator interface providing operator input through the levers and push buttons and outputs to operator through messages and warning icons.

5. WIRING HARNESS ASSEMBLIES — Fundamental to the operation of the truck, the wire harnesses have been designed to ensure trouble free, reliable electrical operation and ease of service. This has been achieved through the following:

- Sealed, locking connectors (90% Deutsch)
- No ring terminals except for heavy current connections
- No spade terminals
- Standardized harness routing
- Color Coded Keyed connectors
- Correctly gauged wire for each application

All engine and transmission connections to the main truck harness are made through single independent connectors for each function.

NOTE: No other CAN devices are to be connected to the CANbus without approval from Yale Company.

All of the controllers on the truck are joined by a communication link called a CANbus (Controlled Area Network bus). This is similar to the links used to connect computers in an office, often referred to as a Local Area Network or LAN. The CANbus conforms to the SAE (Society of Automotive Engineers) J1939 standards and consists of a twisted pair of wires that are contained in its own jacket. Multiple pieces of information can be sent on this bus, an operation commonly referred to as multiplexing. This CANbus system is also used on the AC electric trucks and while the electrical hardware is the same, a different communication language is used.

Each of the twisted wires is uniquely color-coded. For correct operation, the extreme ends of the CANbus wiring must be terminated with 120 ohm resistors.

Yellow = CAN Hi
Green = CAN Lo
DkBlu/Pink = CAN Hi (Mazda)

END FAULT

524223-0
524225-0

TSP Transmission Pressure Greater Than Commanded Pressure

CODES

DTC 524223-0 - XMSN Reverse Pressure Greater Than Commanded Pressure
DTC 524225-0 - XMSN Forward Pressure Greater Than Commanded Pressure

POSSIBLE CAUSE

A. Sensor Supply Open Circuit
B. Sensor Failure
C. Functional Failure — Mechanical
D. Functional Failure in Controller

NOTE

Please refer to the end of this procedure for supporting diagrams.

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Go to Component Operational Check.

Cause A - Sensor Supply Open Circuit

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Disconnect indicated sensor connector.
3. Turn truck power **ON**.
4. Change DMM to volts scale.
5. At sensor harness connector, measure voltage across sensor supply pin (+) and sensor ground pin (–).

Is voltage approximately 5 Vdc?

YES: Sensor supply circuit is OK. Go to Cause B.

NO: Go to Step 6.

6. Move negative (–) meter probe to a clean frame ground.

Is voltage approximately 5 Vdc?

YES: Sensor ground has open circuit. Locate and repair/replace open wire/connection. See **Wire Harness Repair** 2200 YRM 1128.

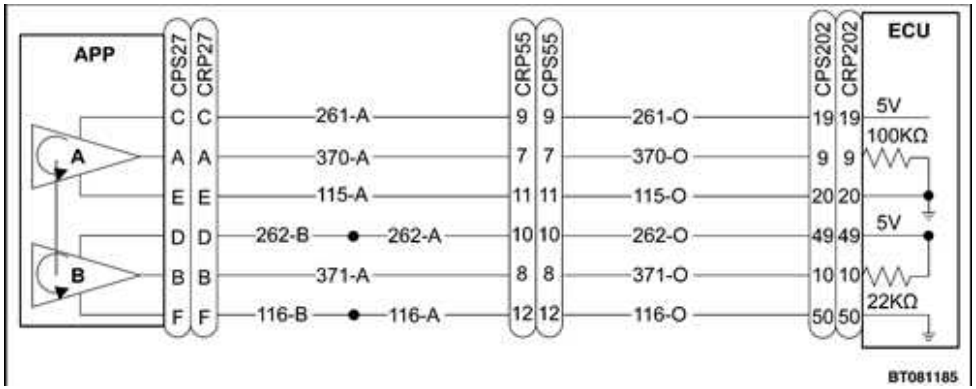
NO: Sensor supply has open circuit. Locate and repair/replace open wire/connection. See **Wire Harness Repair** 2200 YRM 1128.

Cause B - Sensor Failure

PROCEDURE OR ACTION:

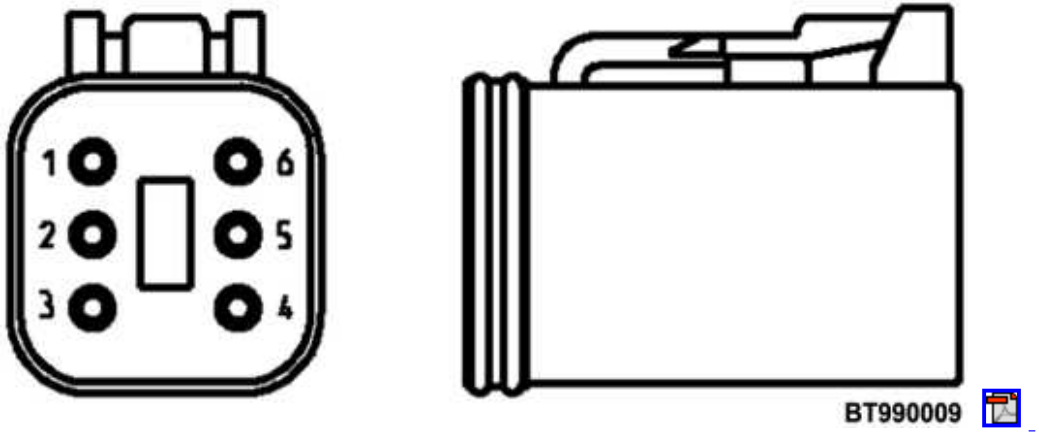
1. Ensure truck power is **OFF**.
2. Replace sensor. See **Electrical System** 2200 YRM 1427 or **Electrical System**, **Mazda FE and F2Emission Compliant Engines** 2200 YRM 1327.

NOTE: Do not discard original sensor after removal.

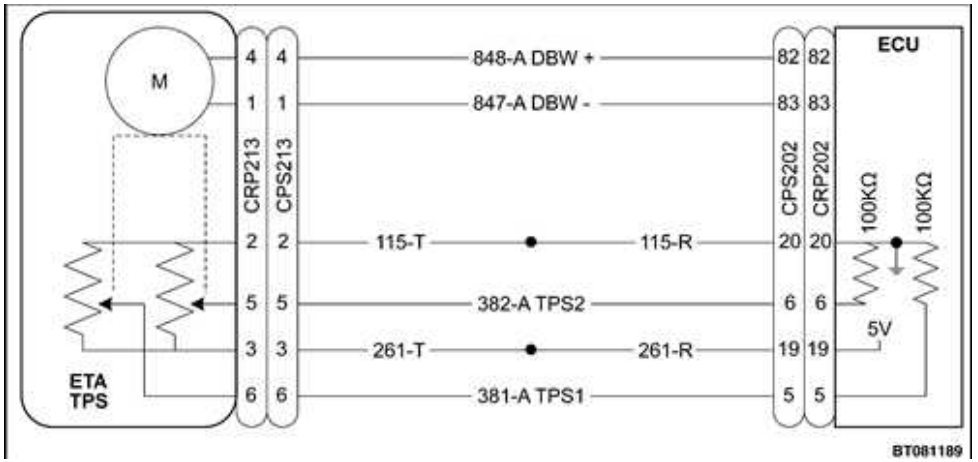


Accelerator Pedal Position

CONNECTOR(S)

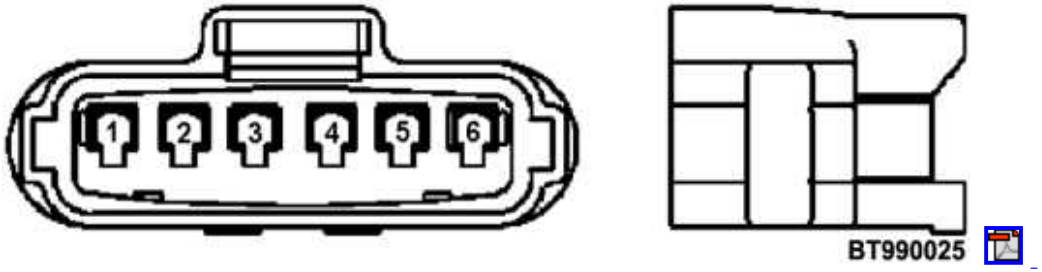


Accelerator Pedal Position Sensor Connector CPS 27



Throttle Position Sensor

CONNECTOR(S)



Throttle Position Sensor Connector CPS 213

PROCEDURE OR ACTION:

1. Ensure all previous procedures have been completed.
2. Ensure truck power is **OFF**.
3. Ensure that all connections to the controller are completely inserted.
4. Ensure truck power is **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.

Does reported DTC reoccur?

YES: Go to Step 5.

NO: Problem corrected. Resume operation.

5. At the DSC, press **ENTER** to access Main Menu.
6. Scroll to VIEW VERSIONS, press **ENTER**.
7. Scroll to TRUCK SERIAL NUMBER, press **ENTER**.
8. View the TRUCK SERIAL NUMBER on the display.

Does the truck serial number on display match serial number on truck nameplate (ECU Only)?

YES: Go to Step 9.

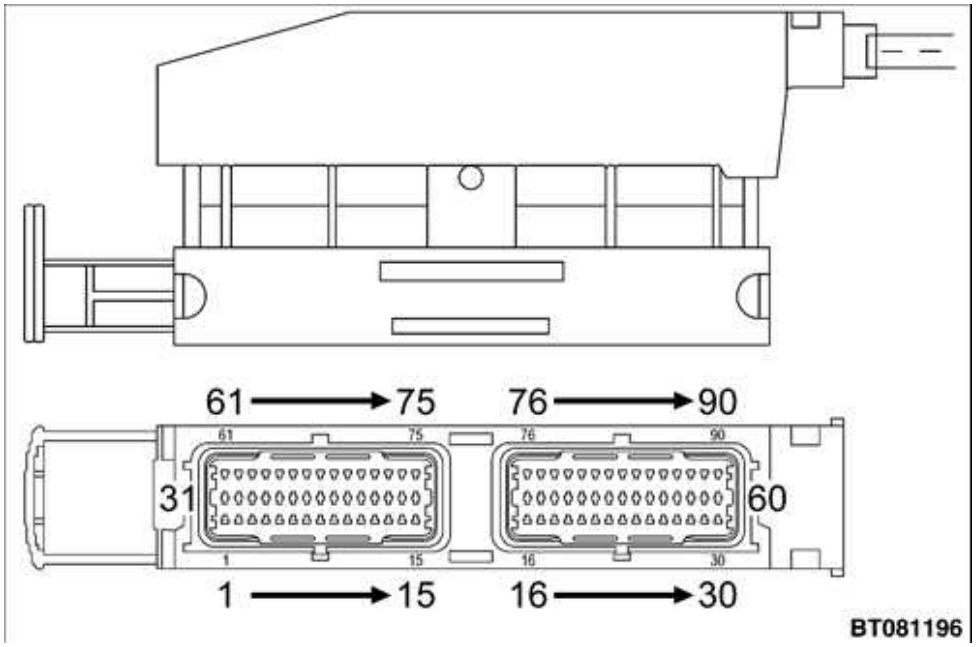
NO: Controller has been substituted from another truck. Replace (ECU-ECM/GCU/TCU) with (ECU-ECM/GCU/TCU) that has the correct truck serial number or obtain new (ECU-ECM/GCU/TCU) with correct Serial number/ CDF. See **Electrical System** 2200 YRM 1427 or **Electrical System**, **Mazda FE and F2Emission Compliant Engines** 2200 YRM 1327.

9. **Resident Service Approval Required prior to ECU replacement for Trucks under warranty.** Make sure to indicate the DTC code(s) on the warranty claim and include an accurate problem description leading to the controller replacement.
10. For other controllers, Replace indicated controller. (ECU-ECM/GCU/TCU). See **Electrical System** 2200 YRM 1427 or **Electrical System**, **Mazda FE and F2Emission Compliant Engines** 2200 YRM 1327.
11. Reinstall all removed components and ensure that all connectors are completely inserted.
12. Repeat the Cause A after installing the new (ECU-ECM/GCU/TCU).

END POSSIBLE CAUSES

DIAGRAMS

Engine Harness Connector CPS 55



ECU Connector CPS 202

END FAULT

96-3
96-4

TSP Fuel Level Sensor Out Of Normal Limits

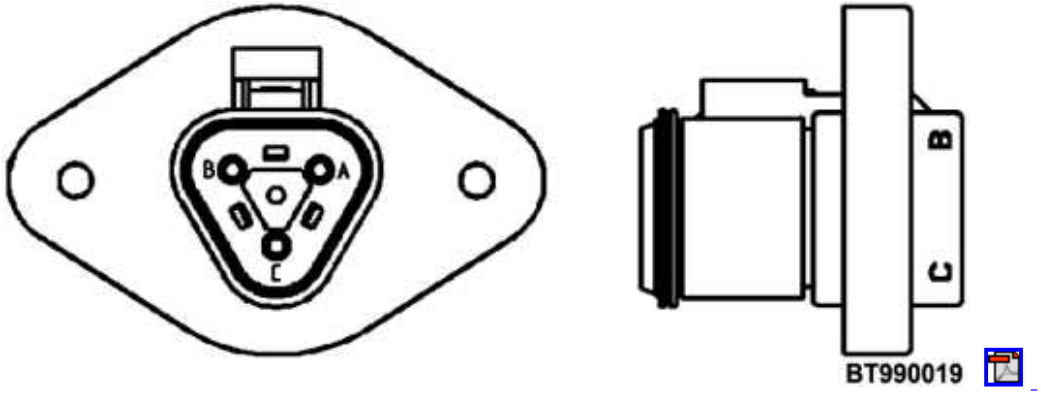
Sensor/Switch Value Above or Below Acceptable Threshold

CODES

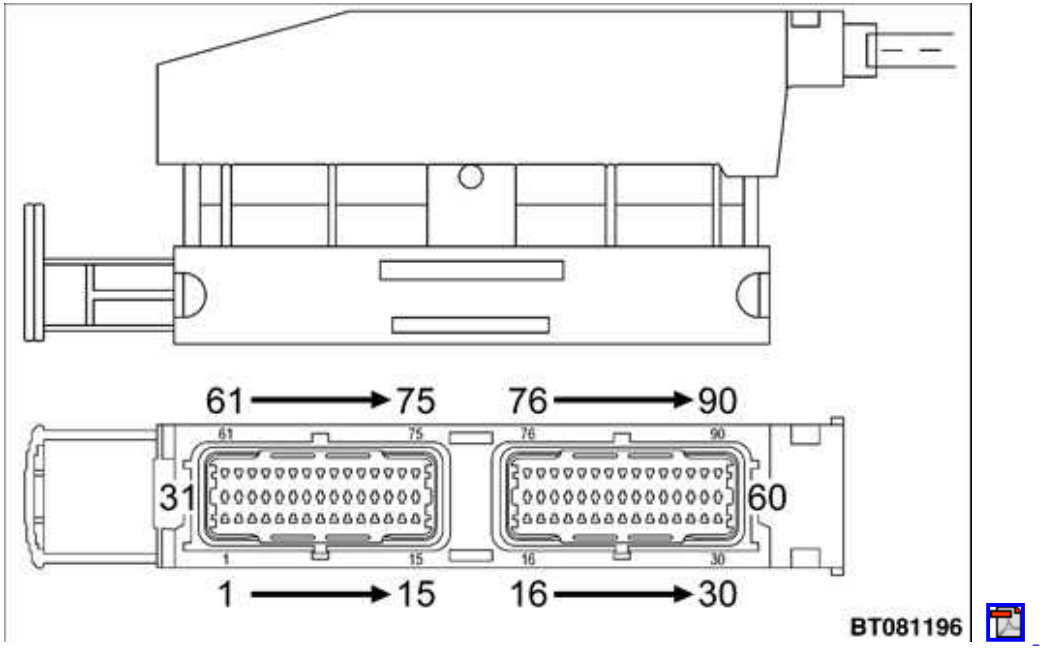
DTC 96-3 - Fuel Level Sensor OORH
DTC 96-4 - Fuel Level Sensor OORL

POSSIBLE CAUSE

A. Sensor Signal Shorted To Battery
B. Sensor Signal/Return Open Circuit
C. Sensor Signal Shorted To Ground
D. Sensor Failure
E. Functional Failure in Controller



Diagnostic Connector CPS 111



ECU Connector CPS 202

END FAULT

524233-14
524234-14
524236-XX

TSP Memory Integrity Fault

END FAULT

523767-2
523769-2
524206-2
524208-2
524209-2

TSP DSC Pushbutton(s) Stuck

CODES

DTC 523767-2 - DSC Fault - Arrow Down Button Stuck
DTC 523769-2 - DSC Fault - Arrow Up Button Stuck
DTC 524206-2 - DSC Fault - Rear Worklight Button Stuck
DTC 524208-2 - DSC Fault - Front Worklight Button Stuck
DTC 524209-2 - DSC Fault - Hourmeter Button Stuck

POSSIBLE CAUSE

A. Button Failure

NOTE

Please refer to the end of this procedure for supporting diagrams.

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Go to Component Operational Check.

Cause A - Button Failure

PROCEDURE OR ACTION:

1. Disconnect battery + connection.
2. Replace display. See **Electrical System** 2200 YRM 1427 or **Electrical System**, **Mazda FE and F2Emission Compliant Engines** 2200 YRM 1327.
3. Restore battery connection.
4. Turn truck power **ON** and press both the Scroll arrow buttons for two seconds.

Are any fault codes (DTCs) displayed?

YES: Go to the troubleshooting procedure as indicated by the DTC(s) and follow the troubleshooting procedures.

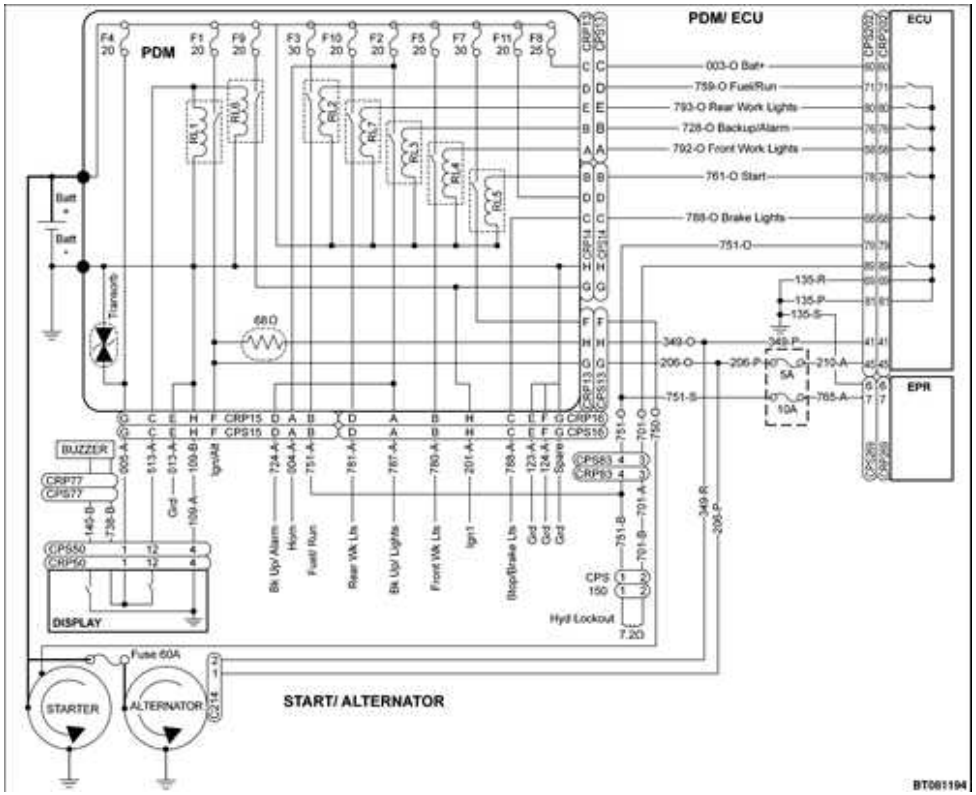
NO: Problem has been corrected. Resume operation.

END POSSIBLE CAUSES

DIAGRAMS

END FAULT

523550-3



Power Distribution Schematic

END FAULT

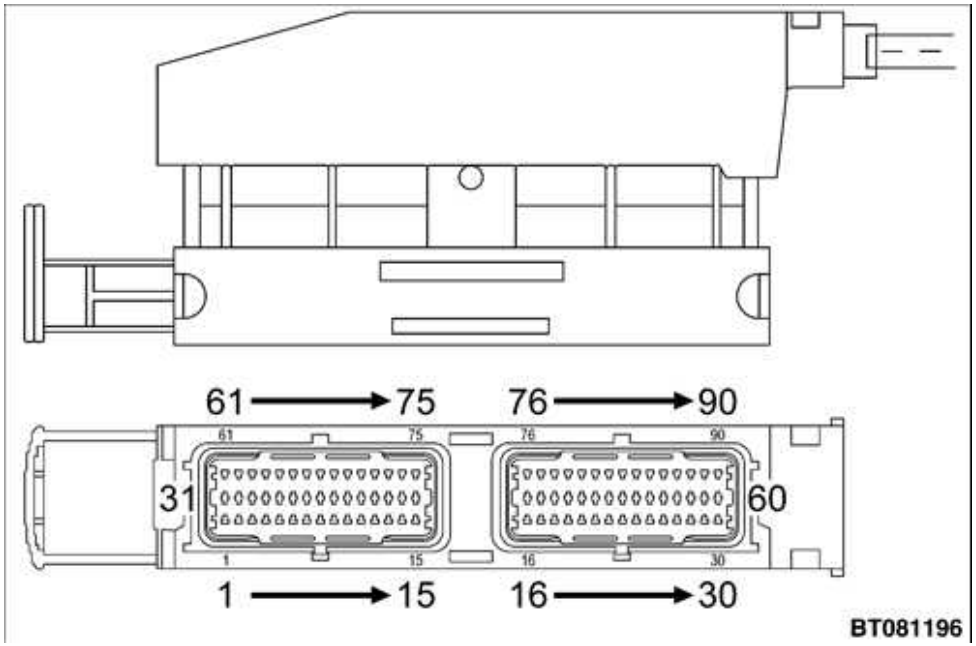
190-2
190-4
190-8
522752-2
522752-4

TSP Crank and CAM Sensor Data Loss/Erratic/Synchronization

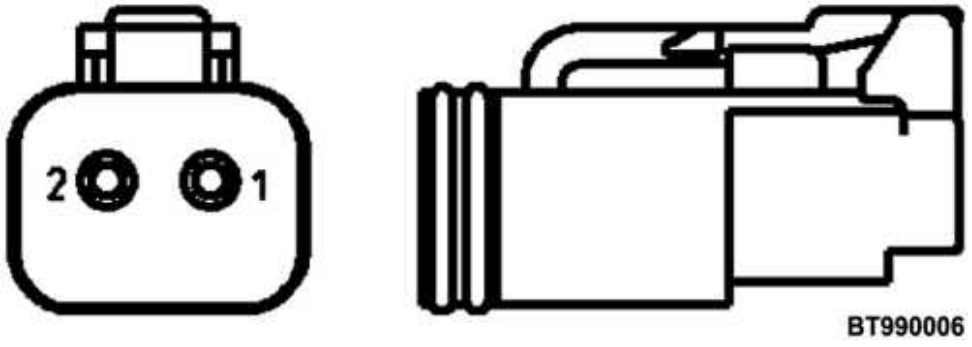
CODES

DTC 190-2 - Crank Loss (CAM Pulse without Crank Pulse)
DTC 190-4 - Crank Loss (CAM Pulse without Crank Pulse)
DTC 190-8 - Crank/CAM Synchronization
DTC 522752-2 - Crank Loss (CAM Pulse without Crank Pulse)
DTC 522752-4 - CAM Loss (Crank Pulse without CAM Pulse)

POSSIBLE CAUSE



ECU Connector CPS 202



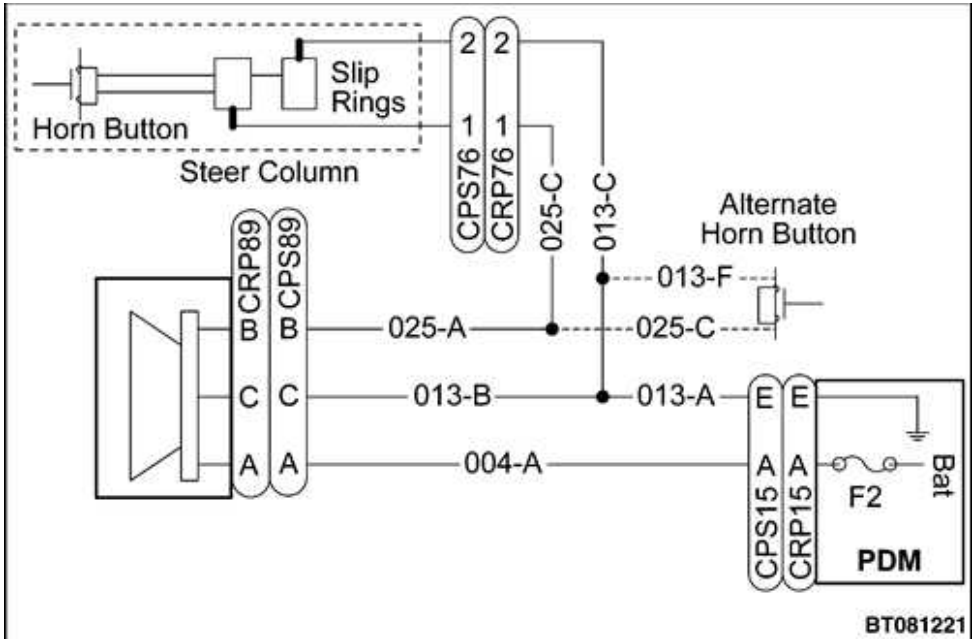
Connectors CPS 239

END FAULT

524227-4

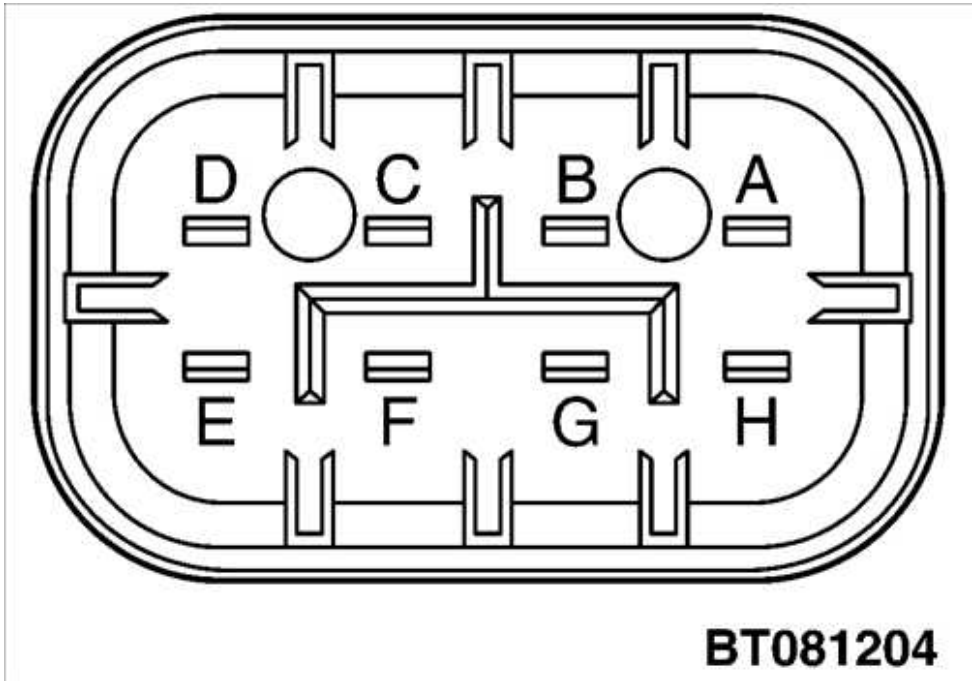
TSP Manual Hydraulic Lockout Coil Driver OORL

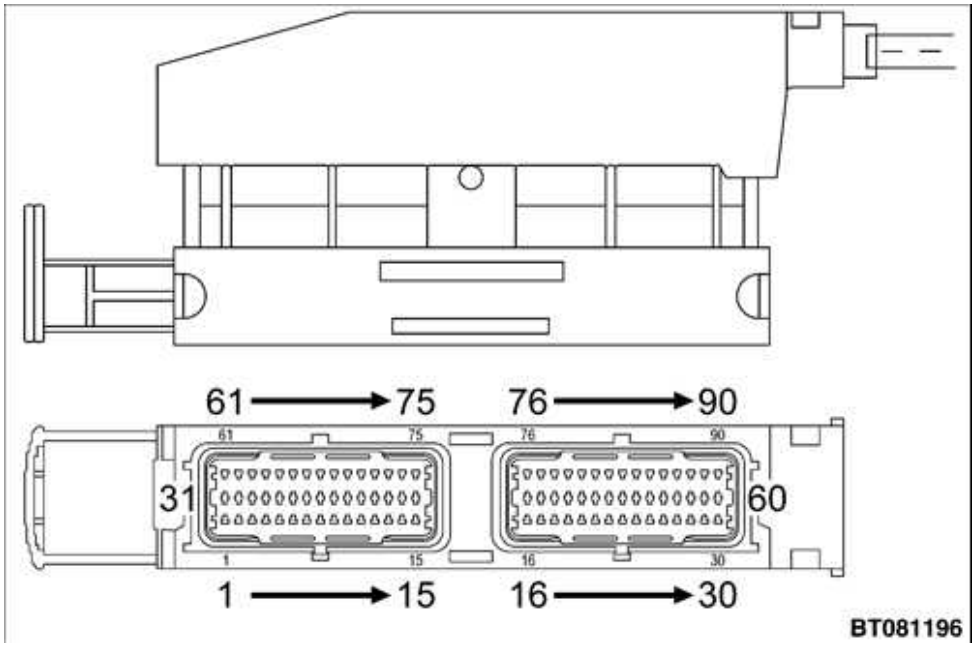
CODES



Horn Schematic

CONNECTOR(S)





CPS 202

POSSIBLE CAUSE

A. LPG Low Fuel Switch Connection Open Circuit/Faulty LPG Level Switch/ECU Failure.

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Inspect and check all wiring associated with the non working electrical function and ensure that all connections/connectors are properly seated then recheck that the device is operating correctly.

Are any faults found associated with non-electrical functions?

YES: Correct faults. Faults are no longer present, resume operation.

NO: Go to Cause A.

Cause A - LPG Low Fuel Switch Connection Open Circuit/Faulty LPG Level Switch/ECU Failure.

PROCEDURE OR ACTION:

1. Disconnect LPG switch connector CPS 70.
2. Turn Truck Power **ON**.
3. Connect CPS 70 Pin A and B together.

Does the LPG low fuel icon turn on?

YES: LPG low fuel switch is faulty. Replace LPG low fuel switch. See **Frame** 100 YRM 1423.

NO: Go to Step 4.

4. Ensure truck power is **OFF**.
5. Disconnect CPS 202.

1. PARK BRAKE LEVER
2. ADJUSTMENT KNOB
3. PARK BRAKE CABLES
4. INCHING/BRAKE PEDAL
5. MASTER CYLINDER
6. BRAKE ASSEMBLY
7. SWITCH

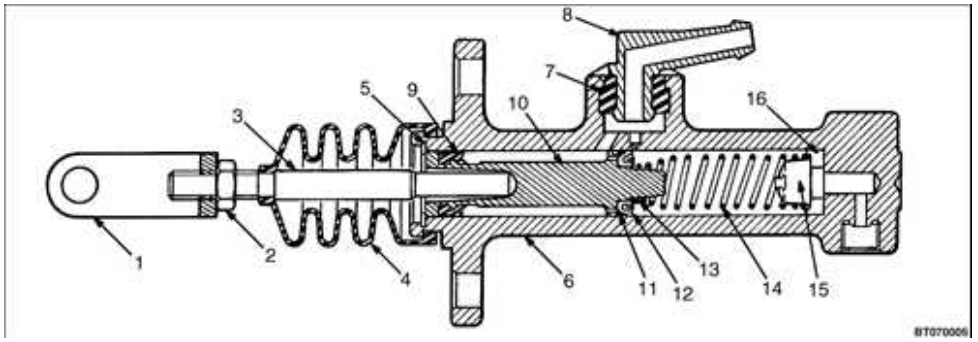
Figure 9040-10-9. Brake System

Master Cylinder

The master cylinder is designed for a single-circuit system. The master cylinder has a piston that operates in the bore of the master cylinder. See Figure 9040-10-10, Page 9040-10-.

NOTE: The reservoir is located to the right of the park brake and is attached to the cowl.

The reservoir is equipped with an indicator for low fluid level. A float in the reservoir moves up and down with the fluid level. When the fluid level is low, a magnet on the float activates a switch in the bottom of the reservoir. This switch signals the ECU which illuminates a light on the Display Switch Cluster (DSC).



1. ROD END
2. NUT
3. PUSH ROD
4. BOOT
5. SNAP RING
6. CYLINDER HOUSING
7. SEAL
8. FITTING
9. PISTON SEAL
10. PISTON
11. SPACER
12. PISTON CUP
13. RETAINER
14. SPRING
15. CHECK VALVE

- Repeat if symptom has improved but is still unsatisfactory.

NO: Resume Operation.

END SYMPTOM

Group 40
Tests and Adjustments

Transmission Warm-up Procedure

Use this procedure to get the transmission oil temperature to test specification. Install the test equipment on lift truck before starting this procedure to prevent handling of hot component or oil.

Table 9040-40-1. Test Specifications

Engine Speed	2000 rpm
Oil Temperature	49 - 66°C (120 - 150 °F)

WARNING

Hot transmission oil can cause serious burns to skin. Do not touch hydraulic components or oil during test. Make sure transmission oil has cooled to safe temperature before removing test equipment.

1. Install test equipment as called out in test.

2. Put a capacity load on the forks to prevent the wheels from turning. Start engine and operate engine at fast idle speed.

CAUTION

Do not hold the throttle open for more than 15 seconds at a time. Permit the engine to operate at idle speed for 30 seconds between tests. Release the accelerator immediately if the engine speed increases to the speed limit of the governor.

NOTE: Do not apply the inching/brake pedal or the parking brake. These controls will release the clutches in the transmission.

3. Put the lift truck against an object that cannot move. Put the transmission in FORWARD, and slowly push the accelerator pedal to full throttle. Stall the torque converter for 15 seconds. Return direction control to neutral for 30 seconds to allow oil to circulate and torque converter to cool.

4. Read temperature on DSC and compare to temperature specifications of test to be performed.

5. Repeat Step 2 and Step 3 until oil temperature is at test specifications.

6. When temperature is at test specifications, proceed with test.

Transmission Pressure Test

Do the following before performing the transmission pressure test:

PROCEDURE OR ACTION:
Inspect steering axle for damage.

Is steering axle in good condition?

YES: Resume operation while monitoring systems to locate source of noise.

NO: Repair as required. See **Steering Axle** 1600 YRM 1425.

Abnormal Steering Wheel Vibration

POSSIBLE CAUSE

A. Worn tires.
B. Low oil level in tank.
C. Air was not removed after repair to the hydraulic system.
D. Steering axle components worn.

Cause A - Worn tires.

PROCEDURE OR ACTION:
Inspect tires.

Are tires worn?

YES: Replace tires. See **Periodic Maintenance** 8000 YRM 1424.

NO: Go to Cause B.

Cause B - Low oil level in tank.

PROCEDURE OR ACTION:

NOTE: Cavitation of a hydraulic pump will cause noise and it is caused by air in the hydraulic oil. The hydraulic pump suction oil must be free of air and unrestricted to pump.
Check hydraulic oil level in tank.

Is oil at correct level?

YES: Go to Cause C.

NO: Add oil to correct level. See **Periodic Maintenance** 8000 YRM 1424.

Cause C - Air was not removed after repair to the hydraulic system.

PROCEDURE OR ACTION:
Check service record of lift truck.

Was hydraulic system repaired recently?

YES: Check the repaired hose connections. Remove air from system by cycling function full stroke of steering cylinder in each direction.

NO: Go to Cause D.

Cause D - Steering axle components worn.

PROCEDURE OR ACTION:
Operate truck to determine if vibration is hydraulic or mechanical.

Is the vibration caused by hydraulics?

YES: See Observed Symptoms-Gear Pump, Abnormal Hydraulic Noise and/or Vibration, Page 9050-33-.

Figure 9050-43-2. Unloader Valve Test Setup

1. Lower forks to ground and stop engine. Apply park brake.

2. Remove panel that covers main control valve.

WARNING

Hot hydraulic oil can cause serious burns to skin. Do not touch hydraulic components or oil during test. Make sure hydraulic oil has cooled to safe temperature before installing or removing test equipment.

WARNING

Hydraulic oil under pressure can be injected into skin. Lower forks to ground and relieve all circuit pressure before removing test plugs from valve.

CAUTION

Do not permit dirt or other contaminants to enter the hydraulic system. Disconnected hoses, tubes, open valves, cylinder fittings, and ports should be protected with clean caps or plugs.

3. Install one hose in LS test port and the other hose in EF main pressure test port on the control valve. See Figure 9050-43-2, Page 9050-43-.

NOTE: Test gauges must be calibrated. Gauge accuracy is very important for this test. A pressure differential gauge or switching block should be used so both readings are on same gauge. If you do not have this equipment, you will need to switch gauges to verify gauge readings.

4. Check hydraulic temperature. If not within specifications, see Tests and Adjustments-Gear Pump, Hydraulic Warm-up Procedure, Page 9050-43-. Operate until temperature is at test specifications.

5. Operate the engine at governed speed. Measure EF pressure and LS pressure simultaneously. The unloader margin is the difference between the two pressure readings (EF – LS pressure). If the pressure margin is below specification, go to Step 6.

6. If the pressure margin is below specification, proceed as follows:

   - Remove unloader spool and check for a broken spring or contamination. See **Main Control Valve** 2000 YRM 1137.
   - Check main relief valve for contamination or broken spring. See **Main Control Valve** 2000 YRM 1137.

7. If actions performed in Step 6 do not solve the problem, replace hydraulic control valve monoblock assembly. See **Main Control Valve** 2000 YRM 1137.

8. Remove test equipment and reinstall plugs in control valve.

Lift Cylinder Leakage Test

Hydraulic leakage causes heat and poor performance in a hydraulic system. This test is done to determine if the leakage is in the cylinder or the hydraulic control valve.

Table 9050-43-7. Test Specifications

Engine Speed	0 rpm
Oil Temperature	35 - 65°C (95 - 150 °F)
Maximum Carriage Travel in 10 minutes	102 mm (4.0 in.)

Table 9050-43-8. Service Tools

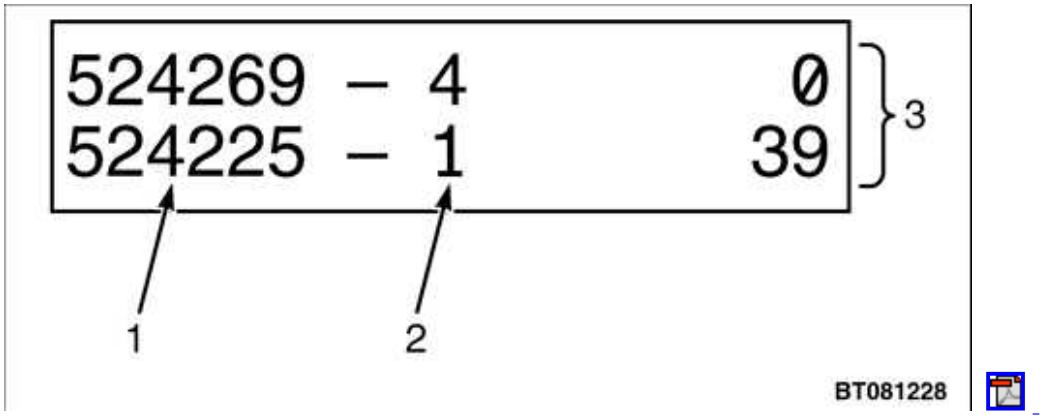
Tape measure or ruler
Gate Valve rated at 24 MPa (3500 psi) minimum

1. Inch/Brake Overlap setting
2. Engine Hours Meter

Figure 9060-10-4. LCD Display

The Inch/Brake Overlap Setting can be found in the upper left corner of the display. The amount of adjustment is a ten-point range with 1 being minimum and 10 being maximum. The scroll buttons are used to adjust the overlap. For further adjustments, see **Brake System** 1800 YRM 1135

When in diagnostic mode, fault log history will be displayed on the LCD. DTC's are displayed in sequence, the last generated DTC will be displayed first. The scroll push buttons can be used to view the other DTC's.



1. Suspect Parameter Number (SPN)
2. Fault Mode Indicator (FMI)
3. Source Address

Figure 9060-10-5. LCD Display

Control Inputs, Right Side

The control inputs on the right side of the DSC enable the operator to turn on truck power, initiate the start sequence and operate lights. See Figure 9060-10-6, Page 9060-10-.

For additional details on these elements, see the **Operating Manual**.

Cause D - Mast is shimmed incorrectly.

PROCEDURE OR ACTION:

NOTE: A mast that is shimmed too loose will cause the rollers to ride up on the flange edge and produce a flaring wear pattern.
Inspect mast and carriage shimming. See **Mast Repair** 4000 YRM 1431.

Is mast shimmed correctly?

YES: Go to Cause E.

NO: Adjust or repair as required.

Cause E - Load rollers are not rotating freely within channel.

PROCEDURE OR ACTION:
Inspect mast channel rollers. See **Mast Repair** 4000 YRM 1431.

Do the rollers rotate freely?

YES: Go to Cause F.

NO: Replace load rollers. See **Mast Repair** 4000 YRM 1431.

Cause F - Damaged or worn load rollers or strip bearings.

PROCEDURE OR ACTION:
Inspect load rollers and strip bearings. See **Mast Repair** 4000 YRM 1431.

Are the load rollers and strip bearings in good condition?

YES: Go to Cause G.

NO: Adjust, repair, or replace load rollers and strip bearings as required. See **Mast Repair** 4000 YRM 1431.

Cause G - Lift cylinder binding.

PROCEDURE OR ACTION:

1. Remove cylinder. See **Cylinder Repair** 2100 YRM 1139.
2. Manually extend cylinder exterior.

Does cylinder extend freely?

YES: Mast is loose. See Observed Symptoms, Mast is Loose, Page 9070-30-.

NO: Service or replace cylinder. See **Cylinder Repair** 2100 YRM 1139.

END SYMPTOM

Abnormal Hose Wear

POSSIBLE CAUSE

A. Mast damaged.
B. Hoses rubbing on components.
C. Improper hose routing.
D. Hydraulic relief pressure set too high.