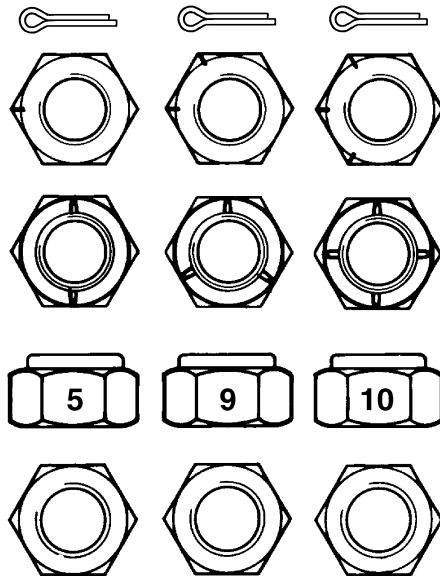


METRIC AND INCH (SAE) FASTENERS



HM210064

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CONVERSION TABLE

Table 7. Conversion Table for Metric and English units

Multiply	By	To Get	Multiply	By	To Get
Area					
inches 2 (in. 2)	× 6.452	= centimeters 2 (cm 2)	centimeters 2 (cm 2)	× 0.155	= inches 2 (in. 2)
feet 2 (ft 2)	× 0.093	= meters 2 (m 2)	meters 2 (m 2)	× 10.764	= feet 2 (ft 2)
Linear					
inches (in.)	× 25.4	= millimeters (mm)	millimeter (mm)	× 0.039	= inches (in.)
feet (ft)	× 0.305	= meters (m)	meter (m)	× 3.281	= feet (ft)
yards (yd)	× 0.914	= meters (m)	meter (m)	× 1.094	= yards (yd)
miles (mi)	× 1.609	= kilometers (km)	kilometer (km)	× 0.621	= miles (mi)
Mass					
ounces (oz)	× 28.35	= grams (g)	grams (g)	× 0.035	= ounces (oz)
pounds (lb)	× 0.454	= kilograms (kg)	kilograms (kg)	× 2.205	= pounds (lb)
tons (2,000 lb)	× 907.18	= kilograms (kg)	kilograms (kg)	× 0.001	= tons (2,000 lb)
tons (2,000 lb)	× 0.907	= metric ton (t)	metric ton (t)	× 1.102	= tons (2,000 lb)
Power					
horsepower (hp)	× 0.746	= kilowatts (kW)	kilowatts (kW)	× 1.34	= horsepower (hp)
Pressure					
pounds/in. 2 (psi)	× 6.895	= kilopascal (kPa)	kilopascals (kPa)	× 0.145	= pounds/in. 2 (psi)
pounds/in. 2 (psi)	× 0.007	= megapascal (MPa)	megapascals (MPa)	× 145.04	= pounds/in. 2 (psi)
Temperature					
(°Fahrenheit-32)	× 0.56	= °Celsius (C)	(°Celsius × 1.8) +32		= °Fahrenheit
Torque					
pound inches (lbf in.)	× 0.113	= Newton meter (N•m)	Newton meter (N•m)	× 8.851	= pound inches (lb f in.)
pound feet (lbf ft)	× 1.356	= Newton meter (N•m)	Newton meter (N•m)	× 0.738	= pound feet (lb f ft)
Velocity					
miles/hour (mph)	× 1.609	= kilometer/hour (km/h)	kilometer/hr (km/h)	× 0.621	= miles/hour (mph)
Volume					
inches 3 (in. 3)	× 16.387	= centimeters 3 (cm 3)	centimeters 3 (cm 3)	× 0.061	= inches 3 (in. 3)
inches 3 (in. 3)	× 0.016	= liters (l)	liters (l)	× 61.024	= inches 3 (in. 3)
quarts, U.S. (qt)	× 0.946	= liters (l)	liters (l)	× 1.057	= quarts, U.S. (qt)
quarts, U.S. (qt)	× 0.83	= quarts, Imp. (qt)	quarts, Imp. (qt)	× 1.205	= quarts, U.S. (qt)
gallons, U.S. (gal)	× 3.785	= liters (l)	liters (l)	× 0.264	= gallons, U.S. (gal)
gallons, U.S. (gal)	× 0.83	= gallons, Imp. (gal)	gallons, Imp. (gal)	× 1.205	= gallons, U.S. (gal)
ounces (oz)	× 29.57	= milliliters (ml)	milliliters (ml)	× 0.034	= ounces (oz)

Series Code / Model Designation Reference Table

This section is for the following models:

Series Code	European Model	Americas Model
K876	GDP80-120DF, GDP90DFL, GDP100DFS, GDP130-140EFS, GDP130-180EF, GDP120-160EF12, GDP160-180EFS9, GDP160-180EFS9, GDP160EFS12	GDP190-280DF, GDP210DFL, GDP230DFS, GDP300-330EFS, GDP300-400EF, GDP280-360EF48, GDP160-180EFS9, GDP360-EFS36, GDP360EFS48

General

The **Operator's Cab Service Manual** for Yale K876 trucks contains repair and replace procedures and checks and adjustments for the following sections:

- **Cab Repair**
- **Cab Components**
- **Air Conditioner/Heater Repair**
- **Air Conditioning Service**
- **Checks and Adjustments**

PRECAUTIONS



WARNING

Before Removal and Installation of Truck Parts, always:

1. Place the lift truck on a solid, level surface.
2. Apply the parking brake.
3. Tilt the mast completely forward.
4. Lower the carriage and inner mast completely. Make sure the lift cylinders are completely retracted.
5. Place blocks against both sides (front and back) of the tires to prevent movement of the lift truck.

When removing and installing hydraulic parts:

6. Switch the engine **OFF**.

7. Turn the key switch to the **ON** position.
8. Operate lift and tilt levers completely forward and backward to remove any trapped hydraulic pressure.
9. Apply and release the brake pedal until no resistance is felt when fully depressing the brake pedal.
10. Turn the key switch to the **OFF** position.

Disconnecting Battery Power

When switching OFF the ignition (key off), all truck systems will automatically shut down. The shutdown process controls the sequenced shutdown of all running truck processes and ensure truck controllers enter sleep mode in the correct sequence.

NOTE: Truck controllers remain connected to battery power after truck shutdown.

Disconnecting Battery Power after Truck Shutdown

Power Disconnect Switch, Prior to SN K876E02500

To disconnect truck controllers from battery power, a Power Disconnect Switch (optional equipment) is located on the left-hand side of the lift truck near the battery box. Operation of the switch is shown on the label. See Table 1.

2. Position and press the window against the operator compartment opening.
3. Press the window firmly into place.
4. Install the rear window wiper motor assembly. See the section Rear Window Wiper Motor Assembly.
5. Install the rear window wiper assembly. See the section Window Wiper Assembly Replacement.

Top Window

Remove

1. Remove the top window wiper assembly. Refer to the section Window Wiper Assembly Replacement.
2. Use window removing tool to remove the top window.
3. Scrape off excessive old glue.
4. Remove the top window from the operator compartment opening.

Install

1. Clean the window opening.

NOTE: To ensure glue thickness is 4-6 mm when window is fully installed, apply a layer slightly thicker than this when installing.

2. Install 5 mm thickness of glue to the outer edge of the top window. For glue type see Window Replacement.
3. Position the top window onto the operator compartment opening.
4. Carefully push the front side of the top window until the seal touches the front window.
5. Install the top window wiper assembly. Refer to the section Window Wiper Assembly Replacement.

Door Window

Remove

1. Remove the window edge protection seal that retains the window in the door frame. See Figure 16.

2. Remove the window.
3. With a sharp knife, slice through the adhesive line between the glued seal and the window opening.
4. Remove the glued seal from the window opening.
5. Clean the window opening and the glued seal.

Install

1. Apply a bead of adhesive to the window opening.

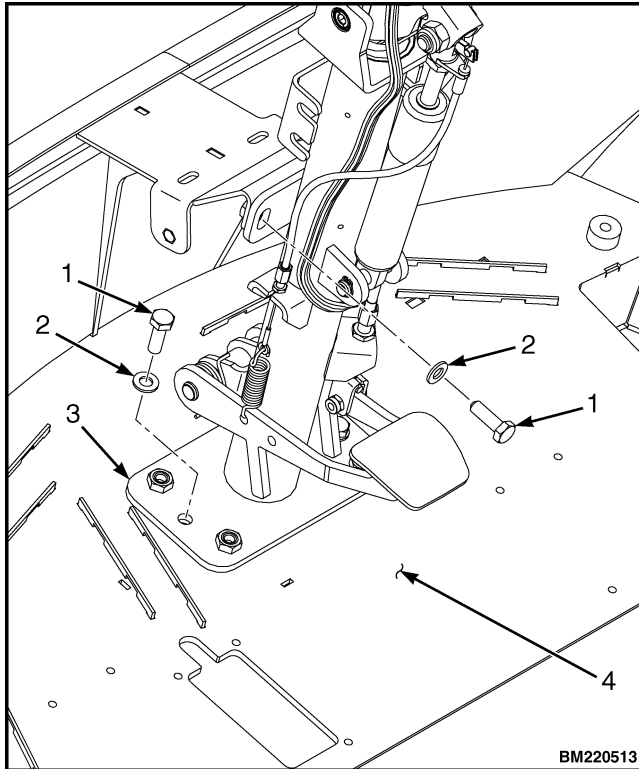
NOTE: Replace the glued seal if the seal is damaged.

2. Install the glued seal to the window opening.
3. Install the window.
4. Install the window edge protection seal.
5. Apply pressure to the window edge protection seal and the window until the window is seated.

Sliding Window and Sliding Tracks

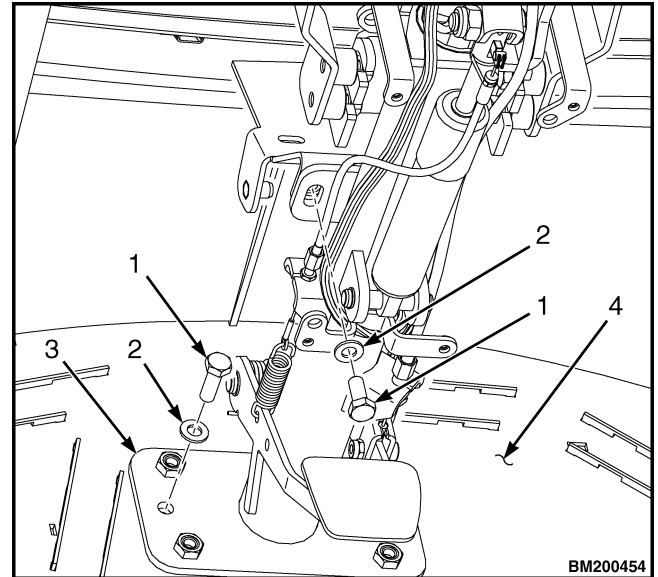
Remove

1. Open the sliding window slightly to gain access to the sliding tracks.
2. Bend each end section of the window support profile outward, to allow the sliding track to move out of the window support profile. See Figure 18.



1. CAPSCREW
2. WASHER
3. STEERING COLUMN
4. CAB ASSEMBLY

Figure 37. Steering Column Closed Cab



1. CAPSCREW
2. WASHER
3. STEERING COLUMN
4. CAB ASSEMBLY

Figure 38. Steering Column Open Cab

8. Lower the cab until it is in the fully lowered and latched position. Refer to the section Tilting the Cab.
9. Remove the two cap screws and washers that retain the steering column to the weldment on the operator cab. See Figure 37.
10. Remove the steering column.

Install

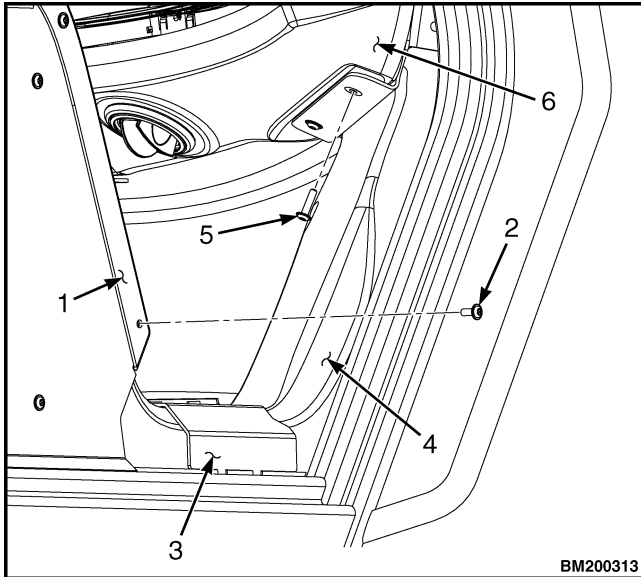
1. Position the steering column to the cab floor and install the two cap screws to retain the steering column to the weldment. See Figure 37.
2. Tilt/raise the cab until it locks in the partially open position. Refer to the section Tilting the Cab.



CAUTION

DO NOT force the steering control unit onto the steering column shaft, as damage can occur.

3. Place the steering control unit in position under the cab while aligning the steering column shaft with the slot in the steering control unit.



1. HEATER/AIR CONDITIONING COVER
2. CAPSCREW
3. BRACKET
4. AIR DUCT
5. AIR DUCT SCREW
6. DASH

Figure 60. Air Duct

Install

1. Position the air duct in the operator cab.

NOTE: The screw locations can be partially hidden by the foam cover underneath the air duct.

2. Install the four screws to retain the air duct to the underside of the dash.
3. Install the heater hose clamp to the underside of the air duct.
4. Install the bracket that retains the air duct to the floor of the operator cab.
5. Position the heater/air conditioner cover.
6. Install the six capscrews retaining the heater/air conditioner cover.

ACCESSORIES

MIRROR REPLACEMENT

NOTE: Mirrors are located at the top left-hand and right-hand front corner inside the cab.

1. Remove the capscrew behind the mirror that retains the mirror to the bracket.
2. Remove the mirror from the cab frame.
3. Position the new mirror to the cab frame.
4. Install the capscrew behind the mirror to retain the mirror to the bracket.

SUNSHADE REPLACEMENT

Top

NOTE: The top sunshade is located under the cab roof and attached to the roof liner.

1. Remove the front side of each sliding bar from the mirror brackets at the front of the cab.
2. Remove the capscrews at the left-hand and right-hand side of the sunshade that retain the sunshade to the roof liner.
3. Remove the sunshade.
4. Position the new sunshade, with the front end of each slider bar seated in the mirror bracket.
5. Install the capscrews at the left-hand and right-hand side of the sunshade to retain the sunshade to the roof liner.

Rear

NOTE: The rear sun shade is located at the rear window inside the cab and is attached to the roof liner.

NOTE: The following procedure is for removing the sunshade from the brackets. It is also possible to remove the sun shade without removing the brackets, by bending the bar slightly and pulling the bar out.

1. Remove the two capscrews that retain the bracket at the bottom of each sliding bar to the rear covers.
2. Remove the capscrew that retains the bracket at the top of each sliding bar to the roof liner.
3. Remove the sunshade.
4. Position the new sunshade.
5. Install the capscrew that retains the bracket at the top of each sliding bar to the roof liner.

MAINTENANCE, SERVICE AND REPAIRS

SAFETY PRECAUTIONS

NOTE: The following security precautions must be observed before attempting any maintenance, service, or repair to the air conditioning unit, or any its components.



WARNING

Before working on any part of the heating or air conditioning system, perform the required procedures listed in the High Voltage Enable and Disable 2200SRM2521 manual first, to ensure all power to the lithium-ion battery has been turned off. Failure to do so may result in serious injury or death.



WARNING

- The filter dryer may contain liquid refrigerant. Loosen the fitting nuts **SLOWLY** to avoid leakage. Avoid contact with exposed skin or eyes.
- Never perform any soldering or welding procedures to parts within, or in the vicinity of, the closed refrigeration circuit. The heating effect can cause pressure to increase within the unit and create a potential for explosion.
- Refrigerant bottles must be handled with care when filled. Refrigerant bottles must never be used or stored in sun or other heat sources, for extended periods of time. The highest allowable temperature of a filled refrigerant bottle must not exceed 45°C (122°F).
- Any maintenance or repair of the unit must be performed with the motor OFF, and the blower separated from the current circuit, to avoid potential injury.
- The unit may contain hot components. Wait for unit to cool completely and use caution to avoid potential injury.



CAUTION

- Repairs to the air conditioning system that require discharging and/or refilling of the refrigeration fluid must be performed only by a certified air conditioning specialist.

- Never use compressed air for leak testing. Pressurized refrigerants and air can undergo combustion when exposed to an ignition source.
- Observe the requirements of DIN EN 378-4 for maintenance and repair as well as recovery, reuse and disposal of unit.
- The refrigeration system must be kept free from chlorine and substances containing chlorine, as well as oils and greases, to avoid contamination that may cause damage to the unit.
- Personal Protective Equipment must be worn when performing all maintenance and repair tasks.
- Air conditioning unit must be emptied of all refrigerant before performing any maintenance or repair tasks.
- DO NOT drain refrigerant into the open air. Use a vacuum to suction.
- Always confirm there is no packaging material or any other residue in the unit before starting.
- In the event of an emergency, always confirm the air conditioning unit is powered OFF.
- Only refrigerant R134a must be used, according to DIN 8960.
- Please follow the safety data sheet for refrigerant R134a.
- Do not add any fluorescent additives (e.g., leak detection liquids) to the refrigerant.
- DO NOT use compressed air to clean the air conditioning unit.

GENERAL STATEMENTS FOR MAINTENANCE AND REPAIRS

NOTE: Before beginning any maintenance or repair procedures, see the Safety Precautions section above.



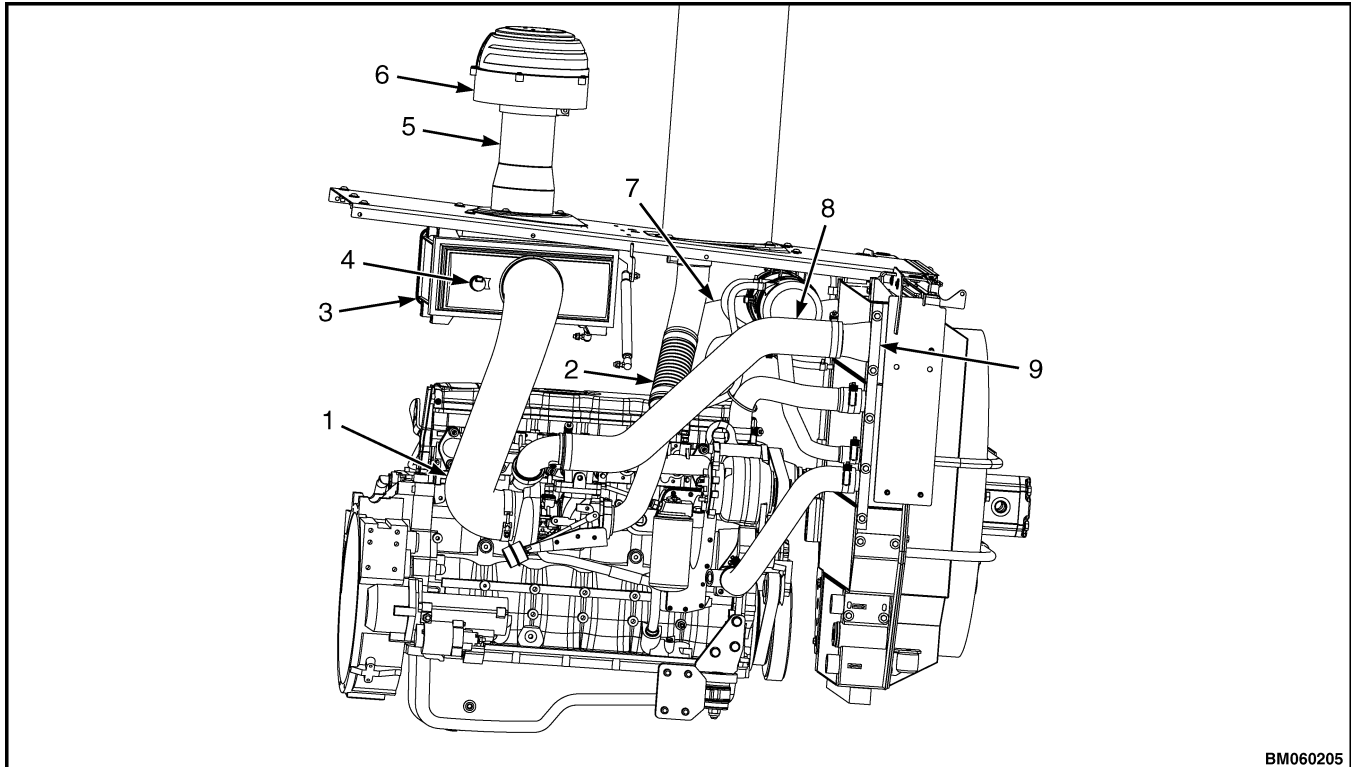
CAUTION

Repairs to the air conditioning system that require discharging and/or refilling of the refrigeration fluid must be performed only by a certified air conditioning specialist.

Residual Pressure

Residual pressure may still remain even after the unit has been emptied. This should initially be released with extreme care by first slowly loosening the connections. The connections can be fully separated, afterward.

7. On trucks with Tier 4F/Stage IV engines, tag and disconnect:
 - The connector to the CAC Temp (Charge Air Cooler Temperature) sensor on the cooling core assembly.
8. On Tier 3/Stage IIIA engines, see Figure 6:
 - Remove the U-bolt that retains the left-hand charge air cooler tube to the exhaust tube.
 - Remove the left-hand charge air cooler tube.
9. On Tier 4F/Stage IV engines and Mercedes-Benz Stage V engines, see Figure 7 or Figure 8 (depending on engine):
 - Release the clamps on the flex tube.
 - Remove the air filter hose.



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- | | |
|-------------------------|---------------------------------|
| 1. AIR FILTER HOSE | 6. PRE-CLEANER |
| 2. EXHAUST PIPE | 7. RIGHT CHARGE AIR COOLER HOSE |
| 3. AIR CLEANER ASSEMBLY | 8. LEFT CHARGE AIR COOLER HOSE |
| 4. VACUUM SWITCH | 9. CHARGE AIR COOLER |
| 5. PRE-CLEANER TUBE | |

Figure 6. Air Intake Assembly (Tier 3/Stage IIIA)

Filling the Engine Cooling System

1. Close the coolant drain valve at the right side of the engine cooling core.
2. Reinstall the coolant return hose to the water pump and tighten the clamp.
3. Turn the heater knob in the operator cabin to its hottest setting.



WARNING

Do not mix different types of coolant. BASF Glysantin G40 coolant is used and cannot be mixed with other coolants.

Ensure that BASF Glysantin G40 coolant at a 40-50% concentration is used or damage to the cooling system could occur.

4. Fill the cooling system through the radiator cap opening in the expansion tank. When refilling with coolant, use a product which meets the specifications as listed in the **Periodic Maintenance** 8000YRM2431 . Fill until coolant level has stabilized at the "MAX" mark. For coolant volume, see **Periodic Maintenance** 8000YRM2431 .
5. For Tier 3 and Tier 4F engines, the de-aeration procedures are as follows:
 1. Reinstall the radiator cap on the expansion tank.
 2. Turn the heater knob to the hottest position and run the engine until the thermostat opens. When the thermostat opens, the top coolant hose will be warm. Check for leaks.
 3. Switch off the engine, let the engine cool down to room temperature, and check that the coolant level in the expansion tank remains between the MIN and MAX mark.
 4. If the coolant has dropped beneath the MIN mark add coolant and repeat the procedure from Step 3 through Step 5.
6. For Mercedes-Benz Stage V engines the de-aeration procedures is as follows:
 1. Make sure that air can escape through the radiator cap opening. Make sure that the coolant level has stabilized at the lower end of the filler tube in the expansion tank.

2. Turn the heater knob for the cabin in the full hot position. Start the engine and retain engine speed at idle. Continue filling coolant to maintain level just below the filler neck.
3. After the thermostat has opened (top radiator hose will be warm), start revving the engine intermittently. Keep adding coolant until level in the expansion tank has stabilized. Coolant capacity is 34 liters (9 gal) for Mercedes-Benz Stage V.
4. Install the radiator cap.

Flushing the Engine Cooling System



WARNING

DO NOT remove the radiator cap from the expansion tank when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.



CAUTION

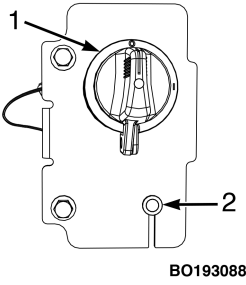

Disposal of lubricants and fluids must meet local environmental regulations.

NOTE: Use drain pans large enough to catch all coolant. For coolant volume, see **Periodic Maintenance** 8000YRM2431 .

Flush the radiator and the engine independently to avoid unnecessary contamination.

1. Drain the engine cooling system. See Draining the Engine Cooling System.
2. Close the coolant drain valve at the right side of the engine cooling core.
3. Reinstall the coolant return hose to the water pump and tighten the clamp.
4. Ensure the heater knob in the operator cabin is turned to its hottest setting.
5. Fill the cooling system with clean water through the radiator cap opening in the expansion tank. Fill until the water level has stabilized at the "MAX" mark.
6. Reinstall the radiator cap on the expansion tank.
7. Run the engine until the top radiator hose is hot.

Table 1. Power Disconnect Switch, Prior to SN K876E02500

Item	Function
<p>Power Disconnect Switch (Optional)</p>  <p>BO193088</p> <p>1. POWER DISCONNECT SWITCH 2. INDICATOR LIGHT</p>	<p>DO NOT operate the Power Disconnect Switch when the Indicator Light is ON, to avoid damage to Engine After Treatment system and truck controllers. The indicator light can stay on up to 60 minutes. The indicator light is located next to the Power Disconnect Switch.</p> <p> WARNING VSM and Telemetry system remain connected to battery power and are not affected by the operation of the Power Disconnect Switch. VSM and Telemetry system enter sleep mode when truck shutdown process has finished.</p> <p>NOTE: If not equipped with Power Disconnect Switch, remove the negative ground cable from the battery to disconnect battery power from the truck.</p> <p>NOTE: To disconnect VSM and Telemetry system from battery power, remove Fuse F127 from PDM1 or remove the negative ground cable from the battery.</p>

Main Power Relay, Starting SN K876E02500

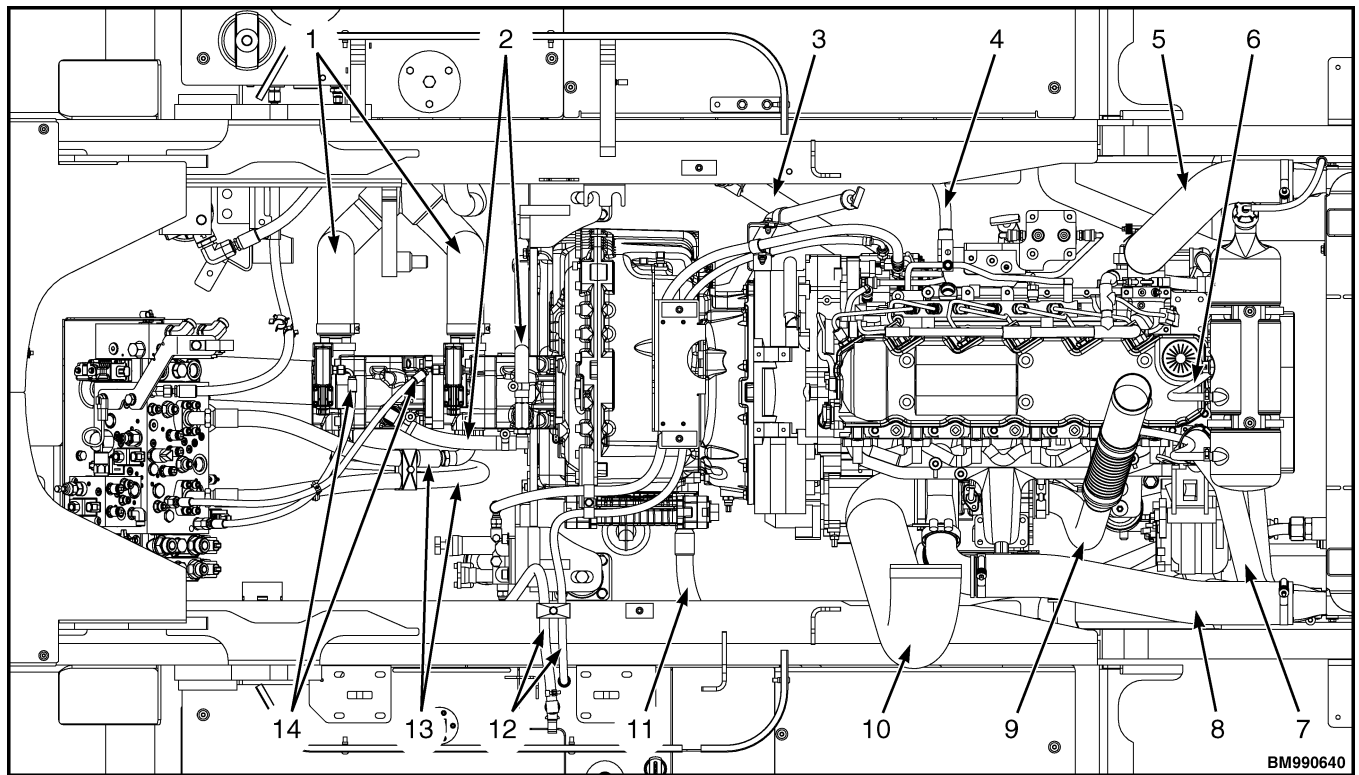
To disconnect truck controllers from battery power, a Main Power Relay (standard equipment) is located on the left-hand side of the lift truck inside the battery box. Operation of the Main Power Relay is controlled by a countdown timer, activated by switching off the ignition (key off).

The Main Power Relay will disconnect all truck controllers from battery power when truck has not been in operation for 24 hours.

To disconnect VSM and Telemetry system from battery power, a Service Disconnect Switch (optional equipment) is located inside the battery compartment. If VSM is disconnected from battery power, the Main Power Relay also disconnects all truck controllers from battery power. Operation of the switch is shown on the label. See Table 2.

6. For Cummins Tier 4F/Stage IV and Mercedes-Benz Stage V trucks: Tag and disconnect the diesel exhaust fluid (DEF) hoses from the engine.

Disconnect DEF hoses from brackets on engine and secure to the side to prevent damage during engine removal.



- | | |
|-------------------------------------|-------------------------------------|
| 1. HYDRAULIC PUMP SUCTION HOSE | 8. CHARGE AIR COOLER OUT HOSE |
| 2. PUMP DRAIN RETURN HOSE | 9. ENGINE EXHAUST PIPE |
| 3. BRAKE COOLING SUCTION HOSE | 10. AIR INTAKE HOSE |
| 4. BRAKE COOLING PRESSURE HOSE | 11. TRANSMISSION COOLING HOSES |
| 5. CHARGE AIR COOLER IN HOSE | 12. FUEL SUPPLY AND RETURN LINES |
| 6. ENGINE DE-AERATION TUBE | 13. HYDRAULIC PUMP PRESSURE HOSE |
| 7. RADIATOR SUPPLY AND RETURN HOSES | 14. HYDRAULIC PUMP LOAD SENSE LINES |

Figure 11. Engine and Transmission Hose Connections (Cummins Tier 3/Stage IIIA)

HYPASS
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Service Manuals

Manuals Available For (your Truck Code)

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

Manual	Manual Title	Release Date
CUMMINS POWERTRAIN		
	QSL9 Tier 4 CM2350 - SERVICE MANUAL	
	QSL9 Tier 4 CM2350 - WIRING DIAGRAM	
	QSL9 Tier 4 CM2350- FAULT CODE TROUBLESHOOTING MANUAL	
	QSM11 - SHOP MANUAL (OVERHAUL)	
	QSM11 - TROUBLESHOOTING AND REPAIR - BASE ENGINE	
	QSM11 - TROUBLESHOOTING AND REPAIR - FUEL SYSTEM/ELECTRONICS	
	QSM11 - WIRING DIAGRAM	
MERCEDES-BENZ POWERTRAIN		
	Mercedes-Benz OM470 240kW Stage V	

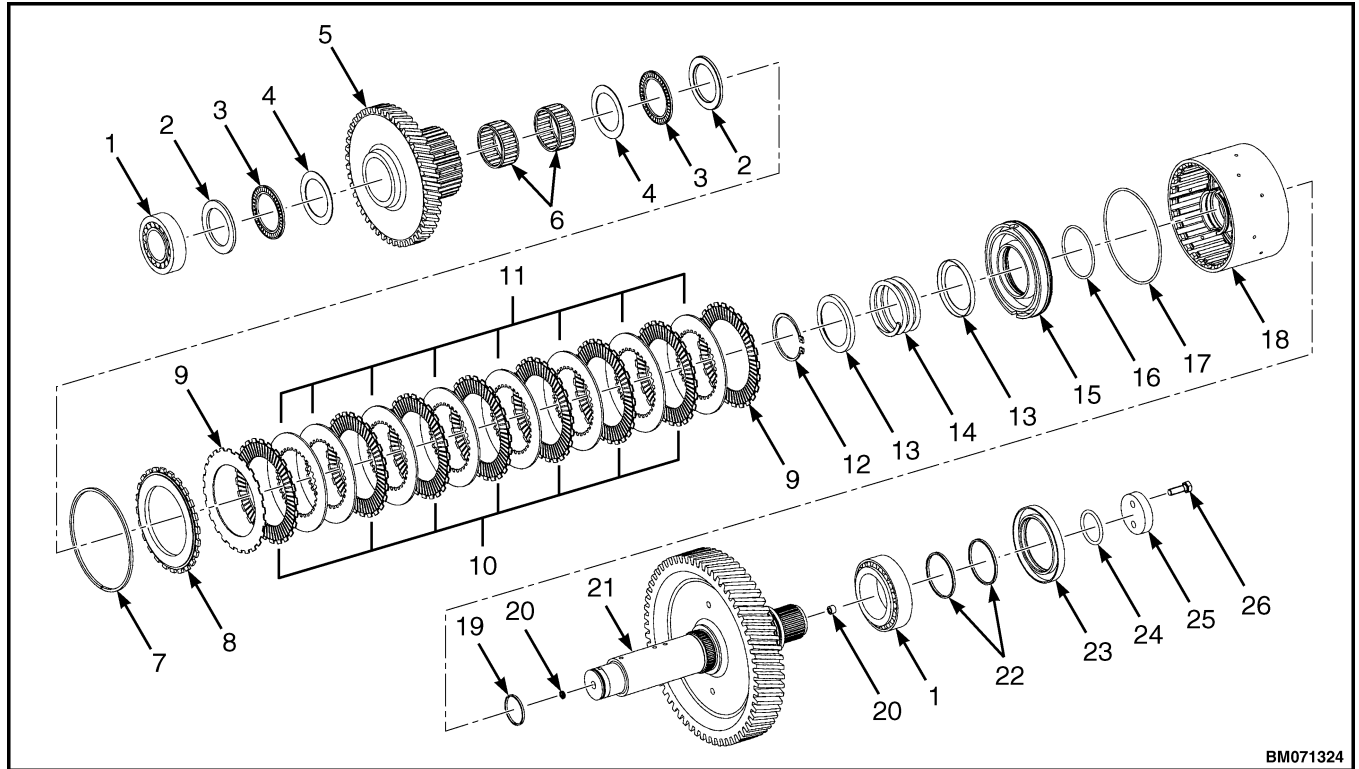
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Figure 28. HyPass Online Example Screen

TRANSMISSION ASSEMBLY

REMOVE

1. Perform the preparation steps as described in Precautions Before Removal.
2. Drain the transmission oil. See section Drain Transmission Oil.
3. Remove the hydraulic pumps from transmission. Refer to **Hydraulics** 1900YRM2423 .
4. Tag and disconnect the electrical connectors from transmission. See Figure 29 or Figure 30.
5. Tag and disconnect the transmission oil cooler lines from the transmission. Drain the excess oil into a drain pan. Put plugs and caps on openings and fittings.



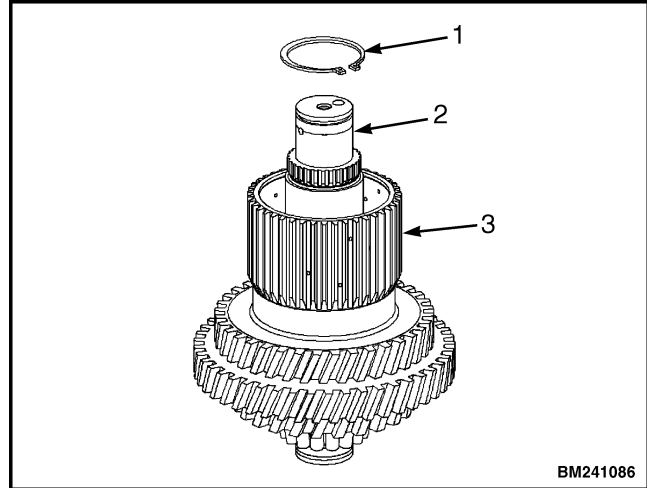
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- | | |
|-------------------------|-------------------------|
| 1. ROLLER BEARING | 14. COMPRESSION SPRING |
| 2. RUNNING DISC | 15. PISTON |
| 3. AXIAL NEEDLE BEARING | 16. INNER O-RING |
| 4. AXIAL WASHER | 17. OUTER O-RING |
| 5. IDLER GEAR | 18. CLUTCH PACK CARRIER |
| 6. NEEDLE CAGE | 19. PISTON RING |
| 7. SNAP RING | 20. SEALING CAPS |
| 8. END SHIM | 21. CLUTCH SHAFT |
| 9. OUTER FRICTION DISCS | 22. R-RINGS |
| 10. INNER DISCS | 23. SHAFT SEAL |
| 11. INNER CLUTCH DISCS | 24. O-RING |
| 12. CIRCLIP | 25. WASHER |
| 13. GUIDE RINGS | 26. SCREW |

Figure 37. Clutch K3 Assembly

STEP 3.

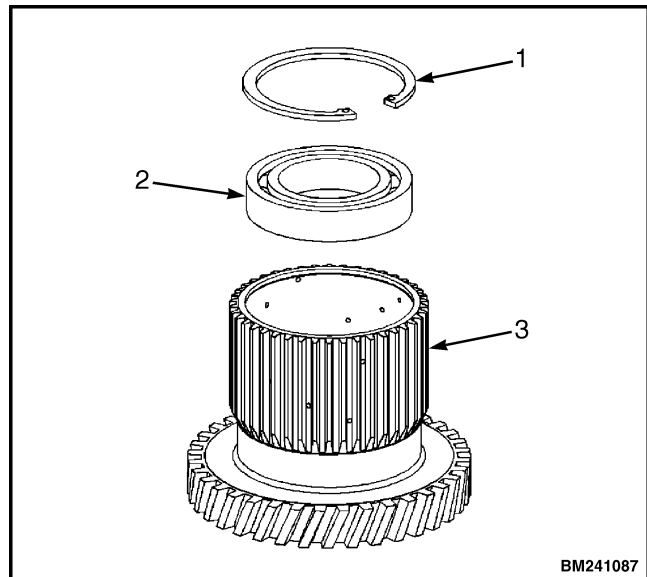
Remove the snap ring. Using a press, remove the clutch shaft from the idler gear.



1. SNAP RING
2. CLUTCH SHAFT
3. IDLER GEAR

STEP 4.

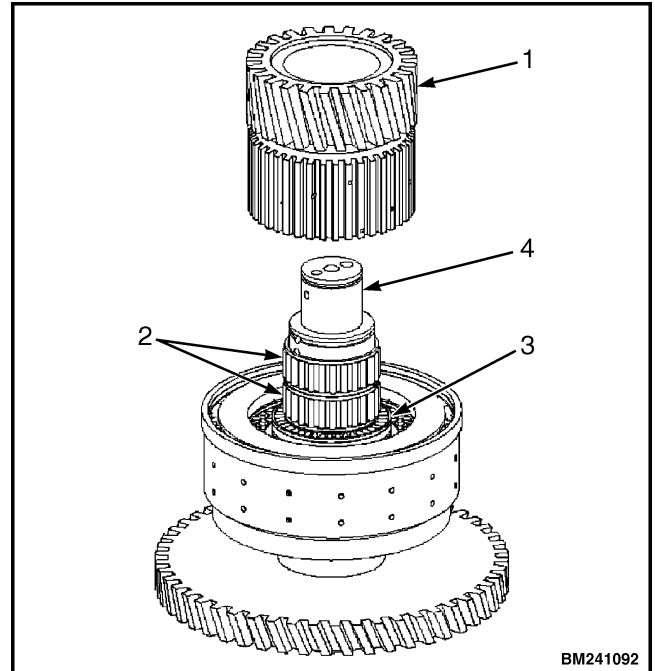
Remove snap ring and bearing from the idler gear.



1. SNAP RING
2. BEARING
3. IDLER GEAR

STEP 3.

Remove the idler gear, two needle bearings, and axial bearing assembly from the clutch shaft.

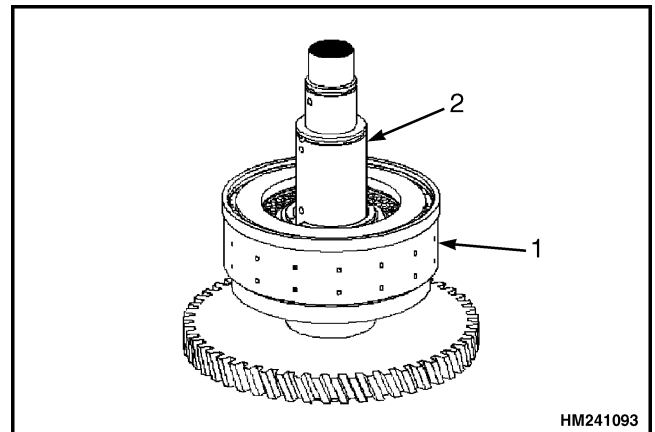


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1. IDLER GEAR
2. NEEDLE BEARING
3. AXIAL BEARING ASSEMBLY (3 PIECES)
4. CLUTCH SHAFT

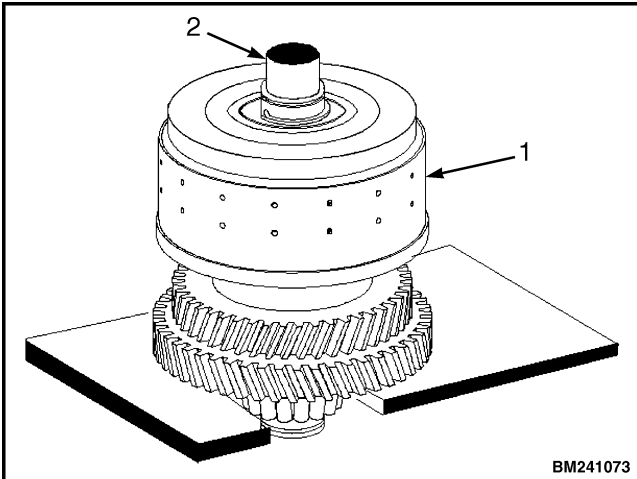
STEP 4.

Remove the clutch pack carrier from the clutch shaft.



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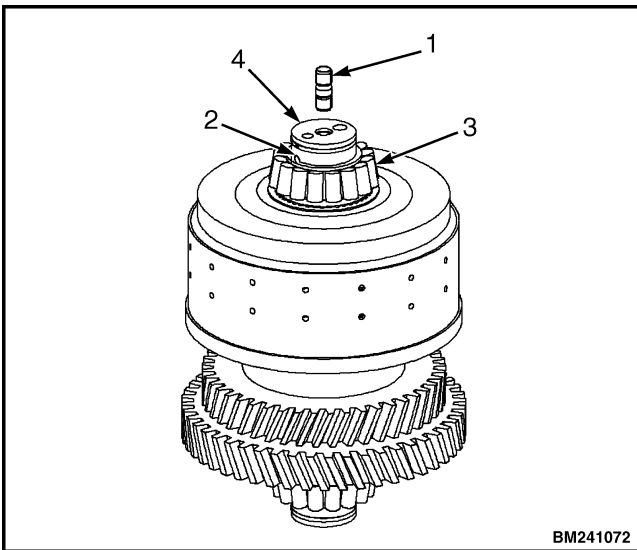
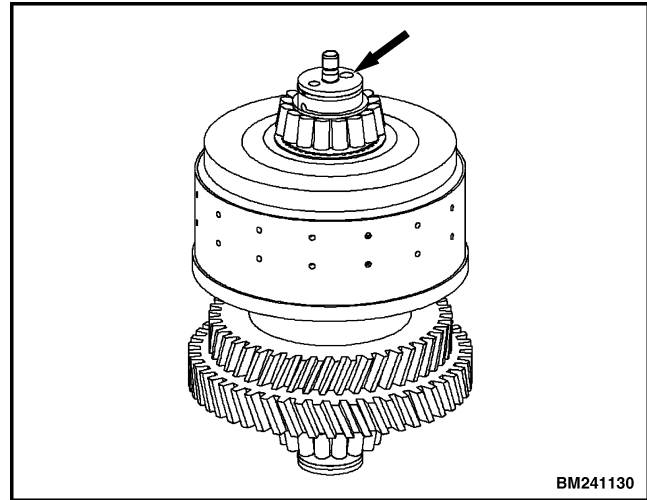
1. CLUTCH PACK CARRIER
2. CLUTCH SHAFT



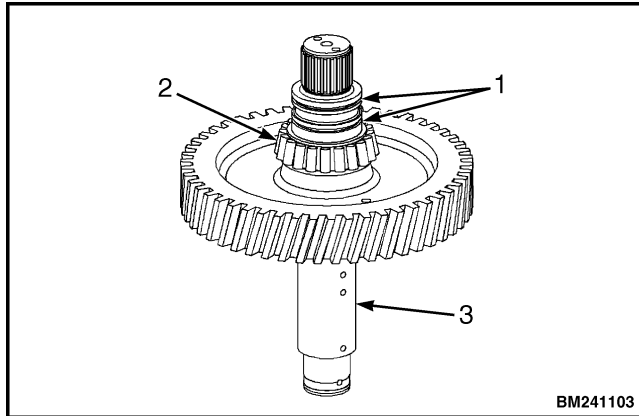
- 1. CLUTCH PACK CARRIER
- 2. CLUTCH SHAFT

17. Using a press, install the tapered roller bearing on the clutch shaft until it bottoms out. Install piston ring and threaded stud.

18. Check the opening of the clutch by applying compressed air at the bore. See arrow in the figure. The opening of the clutch must be clearly audible.

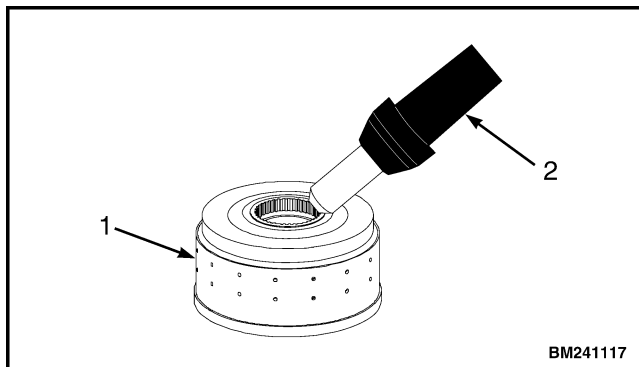


- 1. THREADED STUD
- 2. PISTON RING
- 3. TAPERED ROLLER BEARING
- 4. CLUTCH SHAFT



1. CLUTCH SHAFT
2. TAPERED ROLLER BEARING
3. PISTON RINGS

13. Turn the clutch pack carrier over so that the bottom of the carrier is facing up, and use a heat gun to heat the inner diameter to 120°C (248°F).

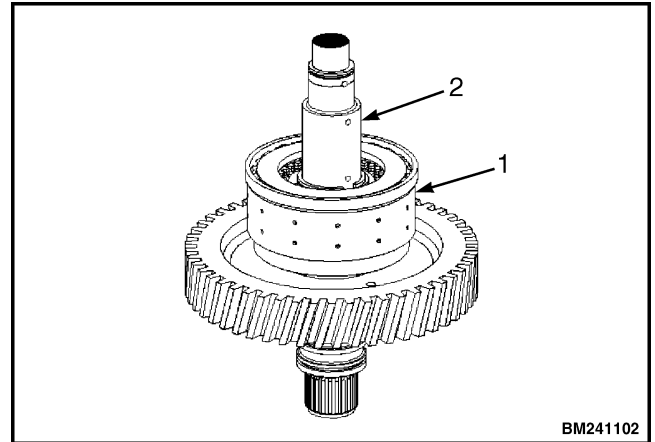


1. CLUTCH PACK CARRIER
2. HEAT GUN

**WARNING**

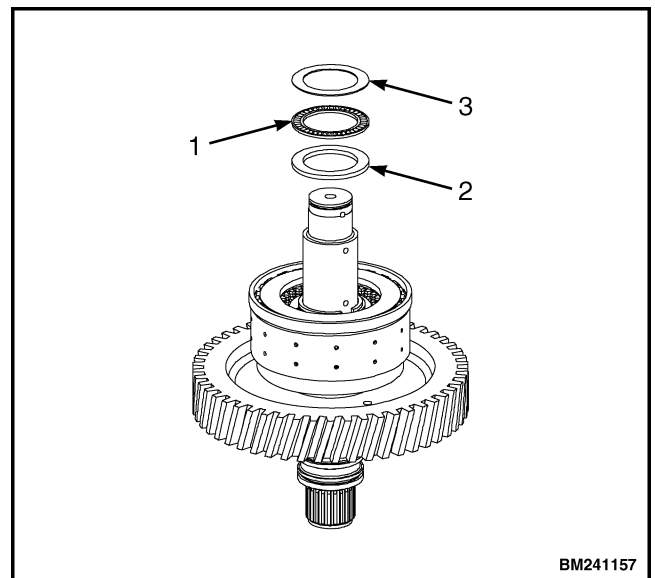
Hot parts. Wear protective clothing and gloves to prevent burns.

14. Install the clutch pack carrier on the clutch shaft until it bottoms out.



1. CLUTCH PACK CARRIER
2. CLUTCH SHAFT

15. Install the running disc (chamfer side up), axial bearing, and axial washer on the clutch shaft.



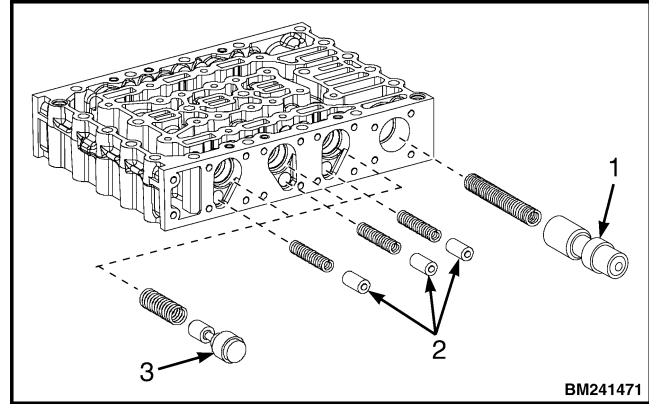
1. AXIAL BEARING
2. RUNNING DISC
3. AXIAL WASHER

NOTE: Manually align the inner teeth of the disks.

16. Install the two needle bearings and idler gear on the clutch shaft, rotating the idler gear left and right small amounts to achieve final alignment with the clutch pack.

STEP 9.

Remove the main pressure valve with spring, three vibration dampers with springs, and three follow-on slides with springs from the control valve block.



1. MAIN PRESSURE VALVE WITH SPRING
2. VIBRATION DAMPER WITH SPRING
3. FOLLOW-ON SLIDE WITH SPRING

CLEAN

Clean all metal components, except as noted below, with cleaning solvent and dry with compressed air.

The main pressure valve, vibration damper, and follow-on-slides are specially coated aluminum parts. If cleaning is required; these components are to be cleaned using transmission oil only.

ASSEMBLE

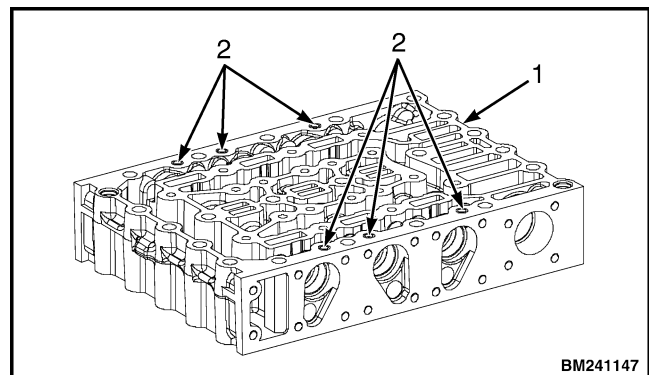
NOTE: Perform Step 1 only if a new valve body is being used.

STEP 1.

Place the control valve body on a clean, flat surface. Install the orifices concave side up until contact as shown.

INSPECT

Inspect the control valve components for any signs of wear. If components show signs of wear replace those components. If the valve body shows signs of wear, replace the entire control valve assembly. Pistons can be replaced individually.



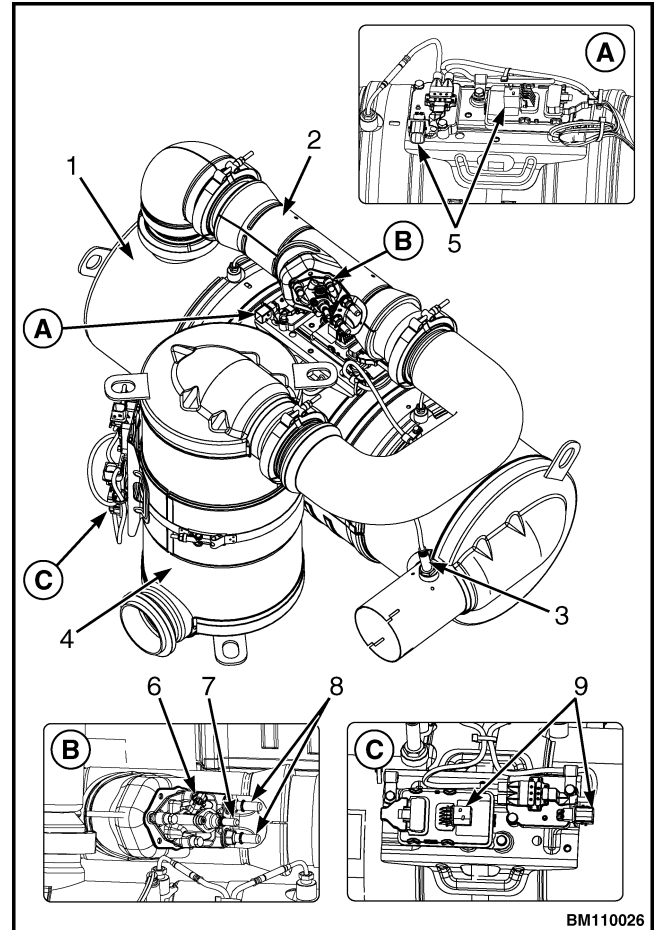
1. CONTROL VALVE BODY
2. ORIFICES

NOTE: Coat all parts with clean transmission oil prior to installation.

4. Install a new seal and move the flanges of the insulated exhaust pipe and the Diesel Oxidation Catalyst (DOC) against each other.
5. Tighten the V-band clamp to $13.5 \pm 1.5 \text{ N}\cdot\text{m}$ ($10 \pm 1 \text{ lbf ft}$).
6. Install the flange seals and install the insulation pipe to the engine.
7. Tighten the V-band clamp to $7 \pm 1 \text{ N}\cdot\text{m}$ ($5 \pm 0.7 \text{ lbf ft}$).

Exhaust After Treatment Components

NOTE: When replacing components of the EAS, make sure to replace the exhaust seals and obtain the correct and final assembly position before tightening clamps.



- A. SCR CONNECTIONS
- B. DRT CONNECTIONS
- C. DOC CONNECTIONS

1. SELECTIVE CATALYTIC REDUCER (SCR)
2. DECOMPOSITION REACTOR TUBE (DRT)
3. NOX SENSOR
4. DIESEL OXIDATION CATALYST (DOC)
5. ELECTRICAL CONNECTORS ON SCR
6. ELECTRICAL CONNECTOR ON DRT
7. DEF HOSE ON DRT
8. COOLING HOSES ON DRT
9. ELECTRICAL CONNECTORS ON DOC

Figure 55. Exhaust After Treatment Components

Install

1. Install DEF dosing valve, cap screws, and washers on engine mounting plate. See Figure 75.
2. Connect the electrical connector on the DEF dosing valve.
3. Remove plugs and connect the DEF hoses on DEF dosing valve.

DEF Dosing Valve (Mercedes-Benz Stage V)

NOTE: The DEF dosing valve is fitted on the outlet side of the exhaust after treatment unit (EATU).

Remove**WARNING**

The exhaust and exhaust components can remain hot after the vehicle stopped moving. To reduce the risk of fire, property damage, burns or other

serious personal injury, allow the exhaust system to cool before repair and prevent from using combustible materials in contact with hot exhaust or exhaust components.

1. Let the engine cool to ambient temperature.
2. Tag and disconnect the DEF hoses from DEF dosing valve. Plug all openings. See Figure 76.
3. Tag and disconnect the electrical connector from the DEF dosing valve.
4. Remove cap screws and DEF dosing valve from EATU.

**CAUTION**

- Use only solvent cleaners to clean ground or polished metal parts. Hot solution tanks or water and alkaline solutions will damage these parts. Isopropyl alcohol, kerosene, or diesel fuel can be used for this purpose.
 - If required, use a gasket scraper to remove gasket material from parts. Be careful not to damage the ground or polished surfaces.
1. Use a cleaning solvent, kerosene, or diesel fuel to clean ground or polished parts or surfaces.
NEVER USE GASOLINE.

**CAUTION**

DO NOT damage ground surfaces.

2. Remove gasket material from parts. Apply gear oil to prevent corrosion.

Parts With Rough Finishes

1. Use a cleaning solvent or a hot solution tank with a weak alkaline solution to clean parts with a rough finish.
2. Leave parts in the hot solution tank until they are completely cleaned and heated. When the parts are clean, remove them from the tank.
3. Rinse the parts with water until the alkaline solution is completely removed.

Axle Assemblies

NOTE: The exterior of a complete axle assembly can be steam cleaned to remove dirt.

NOTE: Before the axle assembly is steam cleaned, close or place a cover over all the openings. Examples of openings are the breathers or vents in the axle assembly.

Drying Cleaned Parts**CAUTION**

Dry bearings with clean paper or rags. **DO NOT use compressed air, which can cause abrasive particles to contaminate the bearings. Damage to components and reduced lining life may result.**

Immediately after cleaning, use clean paper or rags to dry parts.

Preventing Corrosion

NOTE: Parts must be clean and dry before being lubricated.

1. If assembling the parts immediately after cleaning them, lubricate the clean, dry parts with clean gear oil to prevent corrosion.
2. If storing the parts after cleaning them, apply a corrosion-preventive material to all machined surfaces. Store the parts in a special paper or other material that prevents corrosion.

INSPECT

Inspect all the parts carefully before assembling the axle shaft. Check all parts for wear, corrosion, and replace the damaged parts. Replacing worn or damaged parts will help prevent future failure of the assembly.

- Clean and repair the threads of the cap screws and the holes. Use a tap or a die of the correct size or a fine-tooth file for this purpose.

CAUTION

The threads must be clean and free of damage so accurate adjustments and correct torque values can be applied to the cap screws, nuts, and parts.

- Tighten all cap screws and nuts to the correct torque specification. Refer to the section Drive Axle Torque Specifications.

WEAR LIMITS

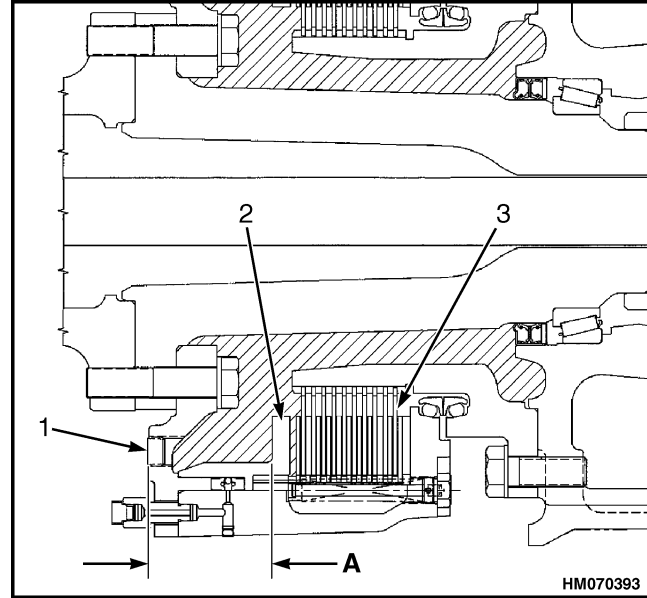
NOTE: If the thickness of any friction or stationary disc is less than or equal to the overall thickness limit, replace the full disc stack. See Table 6.

Table 6. Wear Limits

Disc	Thickness Limit
Friction Disc (5 each)	4.87 mm (0.192 in.)
Stationary Disc (5 each)	3.07 mm (0.121 in.)

Wear limit can also be established by calculating the remaining stack thickness while the brakes are still assembled.

1. Run the engine for 30 seconds to make sure the brake accumulator is sufficiently charged.
2. Stop the engine.
3. Drain the brake housing.
4. Remove the wear limit inspection plug.
5. Measure and note the distance from the housing to the piston. The distance will be approximately 127 mm (5 in.). See Figure 87.



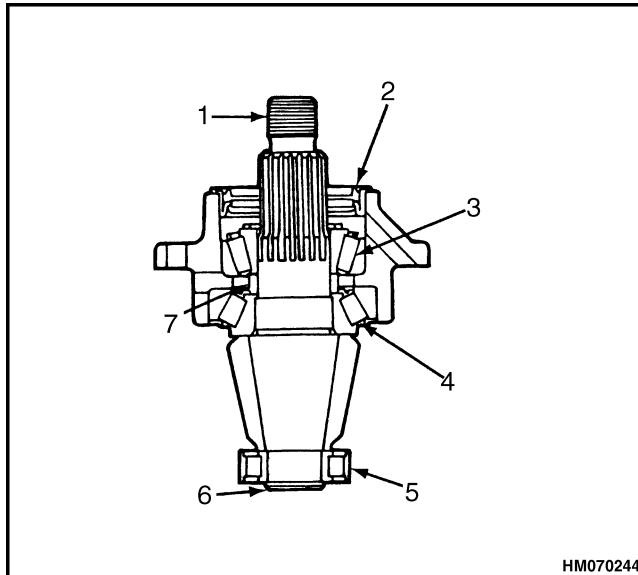
A. DISTANCE FROM HOUSING TO PISTON

1. WEAR LIMIT INSPECTION PLUG
2. BRAKE PISTON
3. BRAKE DISCS

Figure 87. Wear Limit Measurement

6. Allow a helper to apply and hold the brakes. Measure and note the distance from the housing to the piston again.
7. Calculate the brake stroke. The brake stroke is the difference between the measurement noted in Step 5 and the measurement noted in Step 6.
8. If the brake stroke is 13 mm (0.525 in.) or more, the brake discs must be replaced. For new brakes, the brake stroke will be 3 to 7 mm (0.134 to 0.269 in.).
9. Reinstall the wear limit inspection plug.
10. Refill and bleed the brake housing. Refer to the section Fill.

11. Remove the outer bearing cone from the pinion carrier.



1. DRIVE PINION
2. TRIPLE OIL SEAL
3. OUTER BEARING (CUP AND CONE)
4. INNER BEARING (CUP AND CONE)
5. NOSE BEARING
6. SNAP RING
7. BEARING SPACER

Figure 107. Drive Pinion

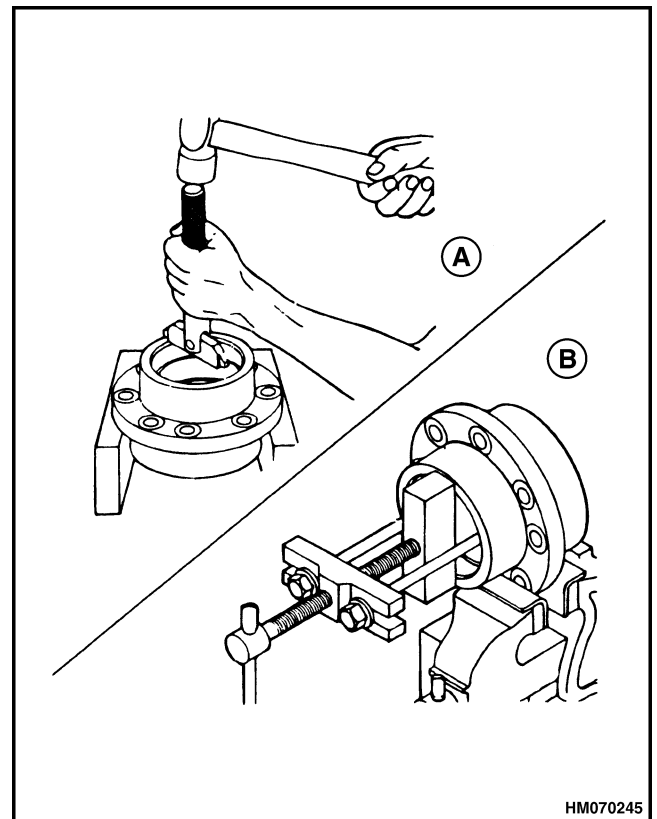
12. Inspect the inner and outer bearing cones and replace if necessary. If the bearing cones need to be replaced, the bearing cups must also be replaced. Proceed as follows:
- a. Remove the inner and outer bearing cups from the inside of the pinion carrier. Use either a press and sleeve, bearing puller, small drift pin, or bearing driver. See Figure 108. If a press is used, provide support for the pinion carrier under the flange area with metal or wood blocks.
 - b. Remove the bearing spacer from the drive pinion with a bearing puller. See Figure 108.



CAUTION

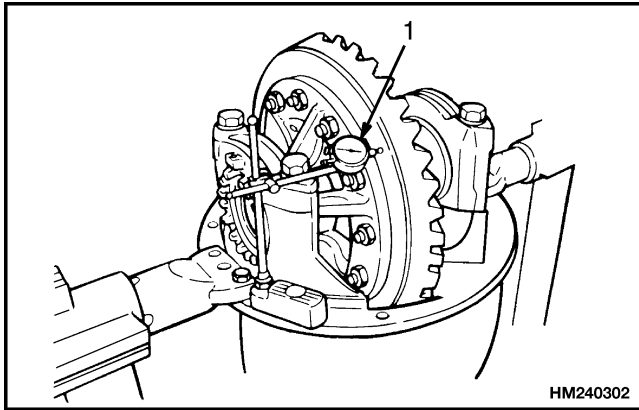
The puller must fit under the inner race of the cone to correctly remove the cone without damage.

- c. Remove the inner bearing cone from the drive pinion with a press or bearing puller. See Figure 107.



- A. BEARING DRIVER
- B. BEARING PULLER

Figure 108. Bearing Driver and Puller



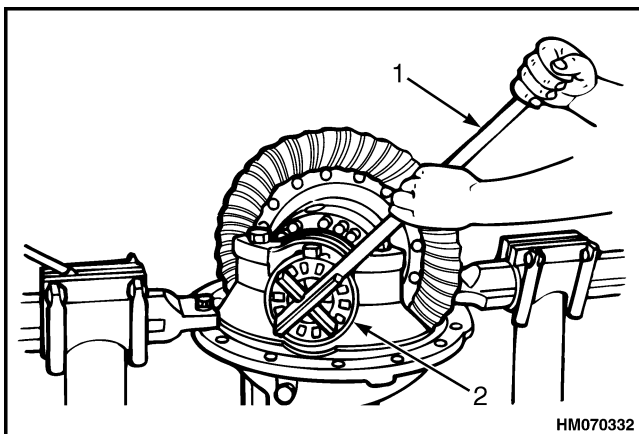
1. DIAL INDICATOR

Figure 140. Bearing Preload Adjustment

CAUTION

Always use a tool that engages two or more opposite notches in the adjustment ring. A T-bar spanner-type wrench can be used for this purpose. Make sure the wrench fits correctly so that the lugs will not be damaged.

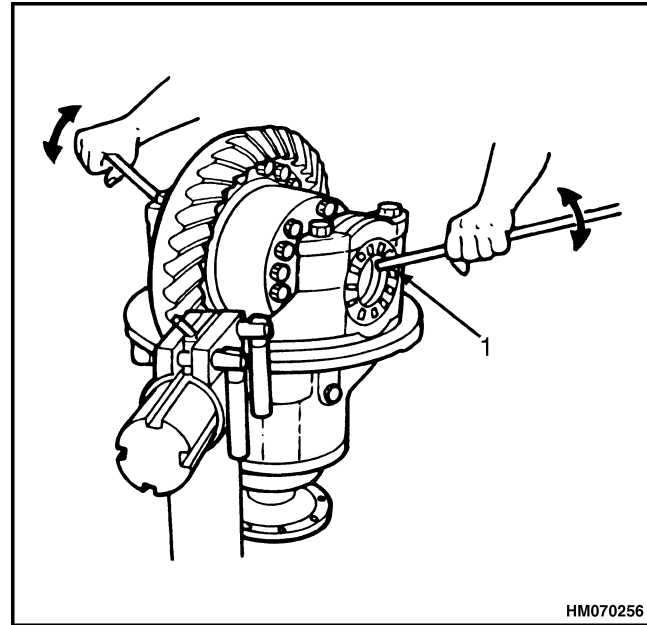
2. Use a T-bar wrench to loosen the bearing adjustment ring that is on the opposite side of the ring gear and the dial indicator, until a small amount of end play shows on the dial indicator. See Figure 141.



1. T-BAR WRENCH
2. ADJUSTMENT RING

Figure 141. T-Bar Wrench and Adjustment Ring

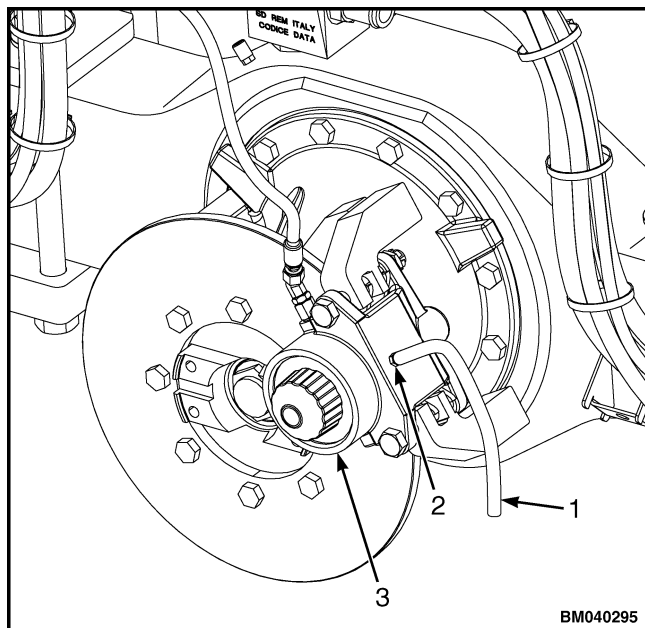
3. Use one of the methods below to move the differential assembly left and right while reading the dial indicator.
 - a. Use two pry bars that fit between the bearing adjustment rings and ends of the differential case. The pry bars must not touch the differential bearings. See Figure 142.



1. PRY BAR (MUST NOT TOUCH BEARINGS)

Figure 142. Ring Gear Movement Check

- b. Use two pry bars between the differential case or ring gear and the carrier at locations other than described in Step a. The pry bars must not touch the differential bearings. See Figure 143.



1. CLEAR TUBE
2. BLEEDER SCREW
3. PARKING BRAKE

Figure 160. Clear Tube and Bleeder Screw

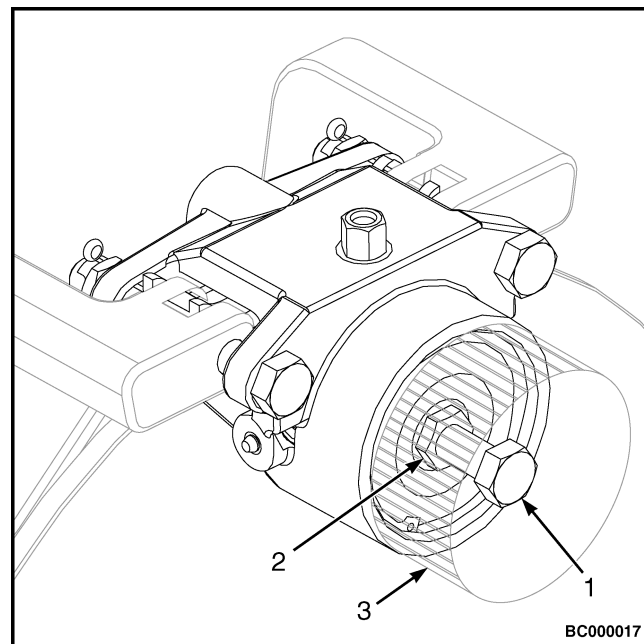
6. Place the other end of the clear tube in a suitable container.
7. Apply the parking brake.
8. Loosen the bleeder screw until no air bubbles appear in the clear tube and suitable container and tighten the bleeder screw.
9. Tighten the bleeder screw to 12 - 16 N•m (9 - 12 lbf ft).
10. Remove the clear tube from the bleeder screw.
11. Lower the cab until it is in the fully lowered and latched position. Refer to manual **Operator's Cab** 0100YRM2420 .
12. Apply the parking brake several times.
13. Check for hydraulic leaks.

PARKING BRAKE PADS ADJUSTMENT

NOTE: Parking brake adjustment is required when new parking brake caliper pads or a new parking brake disc is installed, and after repairs to improve braking performance.

NOTE: Always make parking brake adjustments when the parking brake is cold. The parking brake must be in the released position during the adjustment procedure.

1. Place blocks in front of and behind the tires to prevent movement of the lift truck.
2. Start the engine.
3. Release the parking brake.
4. Remove the screw cap. See Figure 161.
5. Release lock nut and turn adjustment bolt clockwise until brake pads touch brake rotor.
6. Turn adjustment bolt counterclockwise and set clearance as specified in Table 9.
7. Hold setscrew in position and tighten lock nut.
8. Replace screw cap and tighten.
9. Operate brake valve several times and check braking efficiency of parking brake on a slope.



1. ADJUSTMENT BOLT
2. LOCK NUT
3. SCREW CAP

Figure 161. Parking Brake Adjustment

**WARNING**

DO NOT try to locate hydraulic leaks by putting hands on pressurized hydraulic components. Hydraulic oil can be injected into the body by pressure.

21. Check for leaks.
22. Check hydraulic tank oil level. If needed, top off the hydraulic tank with clean hydraulic oil as specified in manual **Periodic Maintenance** 8000YRM2431 .

SPINDLE**REMOVE AND DISASSEMBLE**

1. Perform the preparation steps as described in Preparation for Removal.

NOTE: The final steering components can be removed with the steering axle installed on the lift truck. If the steering axle must be removed, see section Steering Axle Assembly, Remove.

2. Remove wheel hub. See section Wheel Hubs, Remove and Disassemble.

3. Remove cap screw, washers, lock plate, nut, and anchor pin from tie rod. See Figure 175.
4. Remove cap screws, washers, and both king pin covers from steering axle. Remove and discard O-rings.
5. Remove setscrew and nut from spindle.

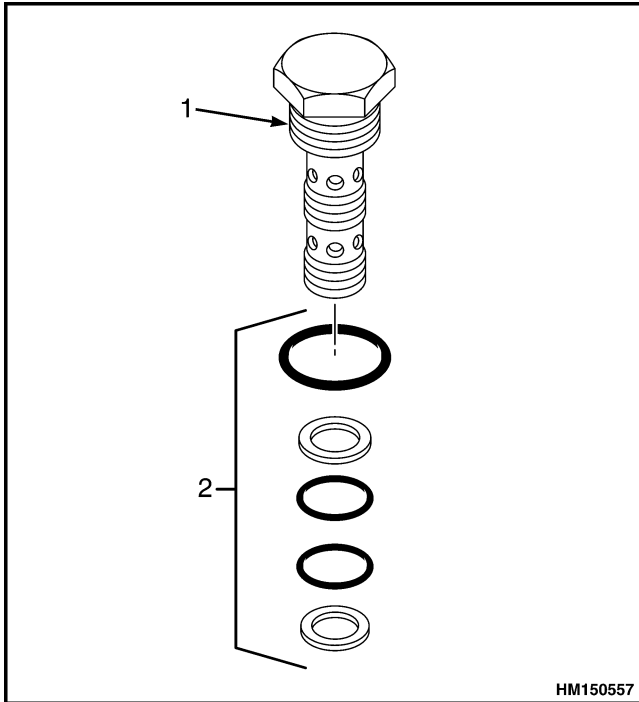
**WARNING**

Make sure the lifting device has the rated capacity of 34 kg (75 lb) or damage to equipment and/or personal injury can occur.

6. Attach a lifting device to spindle and take in slack.
7. Use a brass drift or a hydraulic press to remove the king pin.
8. Carefully remove spindle from steering axle and set on a clean, level surface.
9. Carefully remove the bearing cup, O-ring, thrust plate, and thrust spacer from the spindle, making sure not to damage the parts. Discard the O-ring.
10. Remove thrust spacer pins from spindle.

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1. SHUTTLE VALVES
2. O-RINGS

Figure 10. Shuttle Valves

INSPECT

1. Check all Shuttle Valves for damage or abnormal wear. If none is present, replace all O-rings. See Figure 10.

COMPONENT FUNCTIONALITY TEST

If visual inspection reveals no damages on the ball and seats, the Shuttle Valve is functioning properly and may be reinstalled.

INSTALL

1. Reinstall each Shuttle Valve back into the Main Control Valve. Tighten by hand.
2. Torque the Shuttle Valves to 26 to 30 N•m (19 to 22 lbf ft).

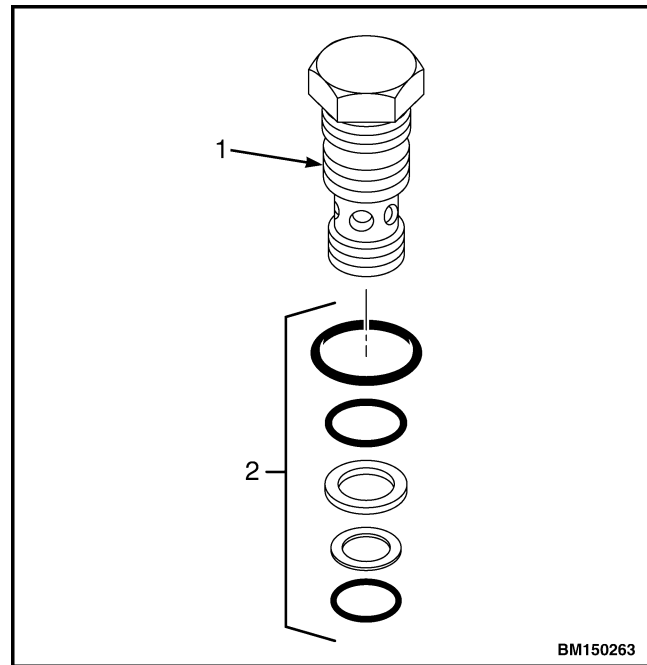
LOGIC VALVE (N)

Remove

1. Remove Logic Valve (N) from Main Control Valve Mid Section. See Figure 5.

Clean

1. Clean Logic Valve and remove O-rings. See Figure 11.



1. LOGIC VALVE
2. O-RINGS

Figure 11. Logic Valve

Inspect

1. Check Logic Valve for damage or abnormal wear. If none is present, replace O-rings. See Figure 11.

Component Functionality Test

With a clean, suitable tool, press the logic spool into the cartridge. If the logic spool moves smoothly against the spring, the Logic Valve is functioning properly and may be reinstalled.

Install

1. Reinstall Logic Valve into Main Control Valve Mid Section. Tighten by hand.
2. Torque Logic Valve to 45 to 50 N•m (33 to 37 lbf ft).

Install 16-18T

1. Position carriage valve on carriage.
2. Install three cap screws and washers that retain carriage valve to carriage.
3. Remove plugs and caps from hydraulic lines and ports.
4. Connect supply and return hoses.
 - a. For pin type carriages see Figure 27.
 - b. For DFSSFP carriages see Figure 27 and hydraulic schematic.
5. See Table 4 for the location of connectors on solenoids.

Table 4. Carriage Valve Connections 16-18T

	1st Spool	2nd Spool	3rd Spool	4th Spool	5th Spool
Pin Type					
Connector	CPS152	CPS151	CPS149	–	–
Function	Aux 3	Aux 2	Aux 0	–	–
Hydraulic Connection	LH Fork Positioner	RH Fork Positioner	Side Shift	–	–
DFSSFP with individual and simultaneous fork positioning					
Connector	CPS152	CPS149	CPS151	CPS150	–
Function	Aux 3	Aux 0	Aux 2		–
Hydraulic Connection	LH Fork Positioner	RH Fork Positioner	LH and RH Fork Positioner	Auxiliary	–
DFSSFP with simultaneous fork position and 2 Aux. *)					
Connector	CPS153A	CPS149	CPS153B	CPS151	CPS152
Function	Aux 1A	Aux 0	Aux 1B	Aux 2	Aux 3
Hydraulic Connection	LH Fork Positioner	LH and RH Fork Positioner	RH Fork Positioner	5th Function	6th Function
NOTE: *) An additional Splitter Harness connects CPR150 with both 1st spool and 3rd spool.					

Section 2 - Steering System Repair

STEERING CONTROL UNIT

REMOVE

NOTE: The steering control unit cannot be repaired. If damaged or malfunctioning, the unit must be replaced.

1. Place the lift truck on a solid, level surface.
2. Lower the carriage until the lift cylinders are fully retracted to make sure the system is fully depressurize.
3. Tilt the mast completely forward.
4. Shut down the engine and turn the key switch to the **OFF** position.
5. Place blocks on both sides (front and back) of the tires to prevent movement of the lift truck.
6. Turn the key switch to the **ON** position. **DO NOT START THE ENGINE.**

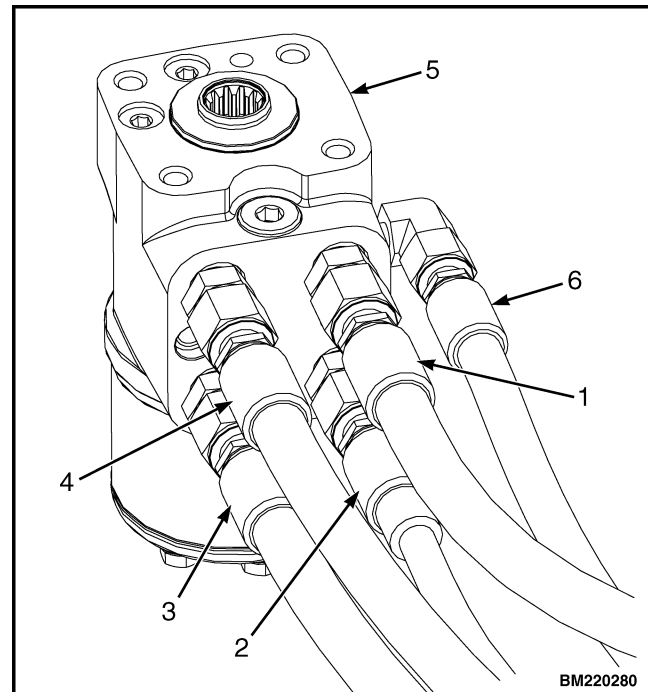


WARNING

Step 7, Step 8, and Step 9 must be performed to relieve the trapped or stored hydraulic pressure from the hydraulic system, or serious personal injury may occur.

7. Apply brake pedal 10 to 20 times until accumulated hydraulic brake pressure is released.
8. Use the emergency lowering button and operate the tilt function fully backward to remove the hydraulic pressure from the tilt system.
9. Use the emergency lowering button and operate the lowering function to remove the hydraulic pressure from the lift system. Ensure the lift cylinders are completely retracted.
10. Turn the key switch to the **OFF** position.
11. Raise the cab to the fully open position to gain access to the steering control unit. Refer to the manual **Operator's Cab** 0100YRM2265 .

12. Tag and disconnect the five hydraulic hoses from the steering control unit. Place caps and plugs on the five hydraulic hoses and the open ports of the steering control unit. See Figure 40.



1. HOSE(L)
2. HOSE (R)
3. HOSE (P)
4. HOSE (T)
5. STEERING CONTROL UNIT
6. HOSE (LS)

Figure 40. Steering Control Unit



WARNING

The steering control unit weighs approximately 6 kg (13.2 lb) and can cause serious injury if the steering control unit is not lifted properly or falls. Ensure the steering control unit is properly supported before removing the cap screws and washers.

13. Remove the four cap screws and washers that retain the steering control unit to the underside of the operator's cab. See Figure 41.

11. Lower the cab until it is in the fully lowered and latched position. Refer to the manual **Operator's Cab** 0100YRM2265 .
12. Apply the parking brake several times.
13. Check for hydraulic leaks.

PARKING BRAKE EMERGENCY RELEASE

NOTE: When no hydraulic pressure is available, the parking brake can be released manually.

1. Place the lift truck on a solid, level surface.
2. Place blocks in front of and behind the tires to prevent movement of the lift truck.
3. Tilt the mast to the maximum forward position.
4. Raise (side tilt) the cab to the fully open position to gain access to the parking brake. Refer to the manual **Operator's Cab** 0100YRM2265 .
5. Remove the screw cap from the pressure ring.
6. Loosen the lock nut.
7. Turn the adjustment screw counterclockwise until the parking brake is released. Emergency release requires approximately 40 N•m (30 lbf ft) torque on the adjustment screw.
8. Use a screwdriver to push the parking brake caliper pads away from the parking brake disc to create clearance.
9. Keep the adjustment screw in position and tighten the lock nut securely.
10. Install and hand-tighten the screw cap.
11. Lower the cab until it is in the fully lowered and latched position. Refer to the manual **Operator's Cab** 0100YRM2265 .
12. After the cab has been fully lowered and latched, adjust the parking brake prior to lift truck operation. Refer to the section Parking Brake Adjustment.

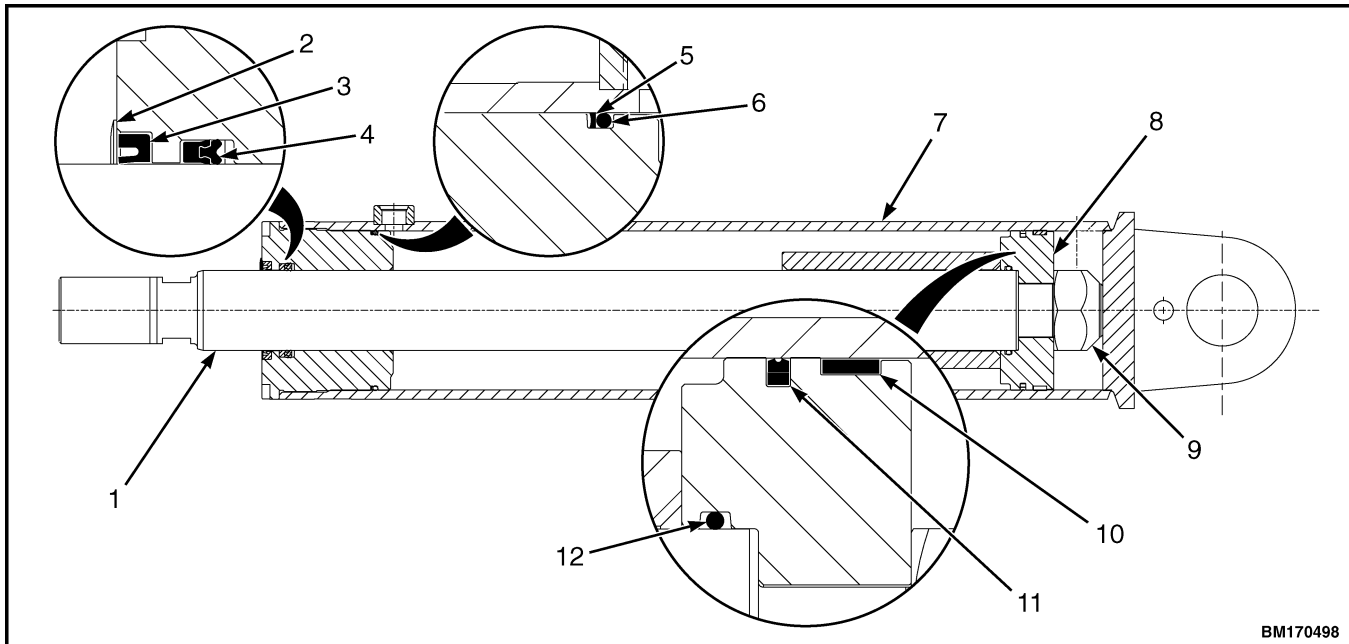
BRAKE FLOW DISTRIBUTION MANIFOLD

REMOVE

1. Place the lift truck on a solid, level surface.
2. Place blocks in front of and behind the tires to prevent movement of the lift truck.
3. Tilt the mast to the maximum forward position.
4. Place a clean and suitable container under the hydraulic tank. Remove the drain plug at the bottom of the hydraulic tank and drain the hydraulic oil [approximately 150 liter (40 gal)] from the hydraulic tank.
5. Raise (side tilt) the cab to the fully open position to gain access to the brake flow distribution manifold. Refer to the manual **Operator's Cab** 0100YRM2265 .

NOTE: Before disconnecting the hydraulic hoses, place a suitable container under the hydraulic hose connections to catch the hydraulic oil from the hydraulic hoses.

6. Tag and disconnect the hydraulic return line filter hose, hydraulic brake treadle valve hose, and hydraulic brake cooling valve hose on top of the brake flow distribution manifold. Place a cap on the hydraulic hoses and on the open ports of the brake flow distribution manifold.
7. Tag and disconnect the coolant supply and return hoses from the brake flow distribution manifold. Place a cap on the coolant supply and return hoses and on the open ports of the brake flow distribution manifold. See Figure 55.



1. ROD
2. HOLE PLUG
3. ROD WIPER
4. ROD SEAL
5. BACKUP RING
6. O-RING

7. CYLINDER SHELL
8. PISTON
9. LOCK NUT
10. GUIDE RING
11. PISTON SEAL
12. O-RING

Figure 65. Tilt Cylinder Assembly

CAUTION

Be careful not to damage the smooth surface of the piston rod when installing the piston rod into the cylinder shell in a horizontal position (parallel to the cylinder shell).

NOTE: Keep the piston rod in the center of the cylinder shell during installation to prevent damage to the parts.

3. Lubricate cylinder shell bore with clean hydraulic oil. Push piston rod assembly into cylinder shell.
4. Push gland onto cylinder shell. Lubricate threads of cylinder shell with clean oil and tighten gland to 550 to 600 N•m (400 to 450 lbf ft).
5. Assemble rod end onto rod.

DE-AERATION OF THE TILT CYLINDERS BEFORE START-UP

WARNING

During de-aeration of the tilt cylinders, the mast (or other equipment) must be disconnected from the tilt cylinders. Load holding force is lost during Step 2 of the de-aeration process. Secure the mast (or other equipment) by using a suitable lifting device and straps, to hold it in position, and disconnect the tilt cylinders before executing the de-aeration process.

1. Install the tilt manifold including fittings and connect the tilt cylinders and hoses. The tilt cylinders must be fully retracted.
2. Remove the caps from the measuring fittings (minimess) in ports MB1 and MB2 and connect a transparent drain hose to the fittings.
3. Fully extend the tilt cylinders by operating the control lever in the Operator Cabin.

NOTE: Many coils include a suppressor diode that could give a false short circuit reading. Therefore, measure coil resistance in both directions. If one of the measurements indicates a short circuit, this measurement can be ignored.

- Measure the static resistance values of the coils and relays and then compare it to the vendor specification.

REPAIR AND TEST

Remove the ground cable from the battery, or use the power disconnect switch, if equipped, when doing repairs. Refer to General for battery disconnect procedure. Replace or repair the defective components after the cause of failure has been established. Replace the fuse found defective.

After the repair, do a test to make sure that the proper repair has been made and that there are no other faults in the circuit.

HARNESSES AND CONNECTORS

HARNESSES OVERVIEW

Wires are bound together in wire harnesses to secure against the adverse effects of vibration, abrasion and moisture. The description of wire harnesses follows from its location in the truck or from the functions it connects with.

An overview of the different harnesses that belong to the different truck options and their connector numbers is shown in Figure 3, Figure 4, Figure 5, and Figure 6.

Table 6. Powertrain Harness Connectors (Tier 4F/Stage IV - QSB4.5)

Item	Connector	Description
1	CPS88	Water-In-Fuel (WIF) Sensor
2	CPS248	Shaft Output Speed Sensor
3	CPS249	Sump Temperature Sensor
4	CPS250	Torque Converter Temperature Sensor
5	CPS245	Engine Speed Sensor
6	CPS160	Transmission Hydraulic Block
7	CPS251	Filter Pressure Sensor
8	CPS247	Transmission Internal Speed Sensor
9	CPS246	Turbine Speed Sensor
10	TR21	Alternator B+
11	CPS3	Powertrain Harness to Frame Harness
12	CPP1	AC Clutch
13	CPS39	Cross Over Connector
14	CPS262	Engine Control Module (ECM)
15	CPS475	Exhaust After Treatment System (EAS)
16	CPS180	Alternator
17	TR20	Alternator B+
18	TR6	Alternator
19	CPS189	DEF Harness to Frame Harness
20	TR13	Starter Solenoid

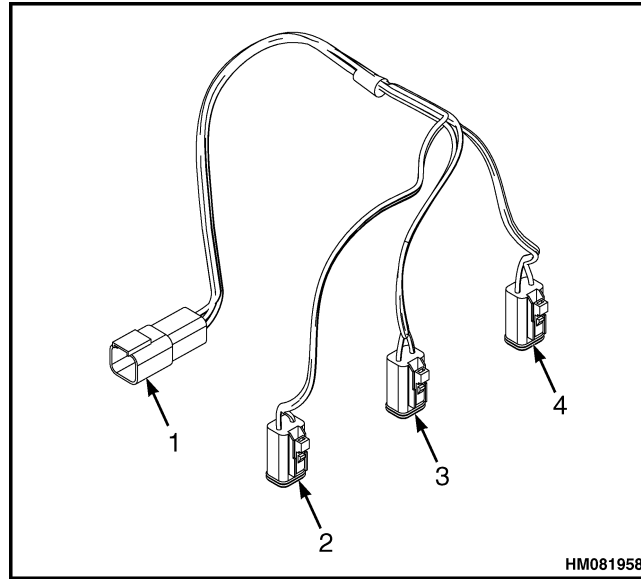
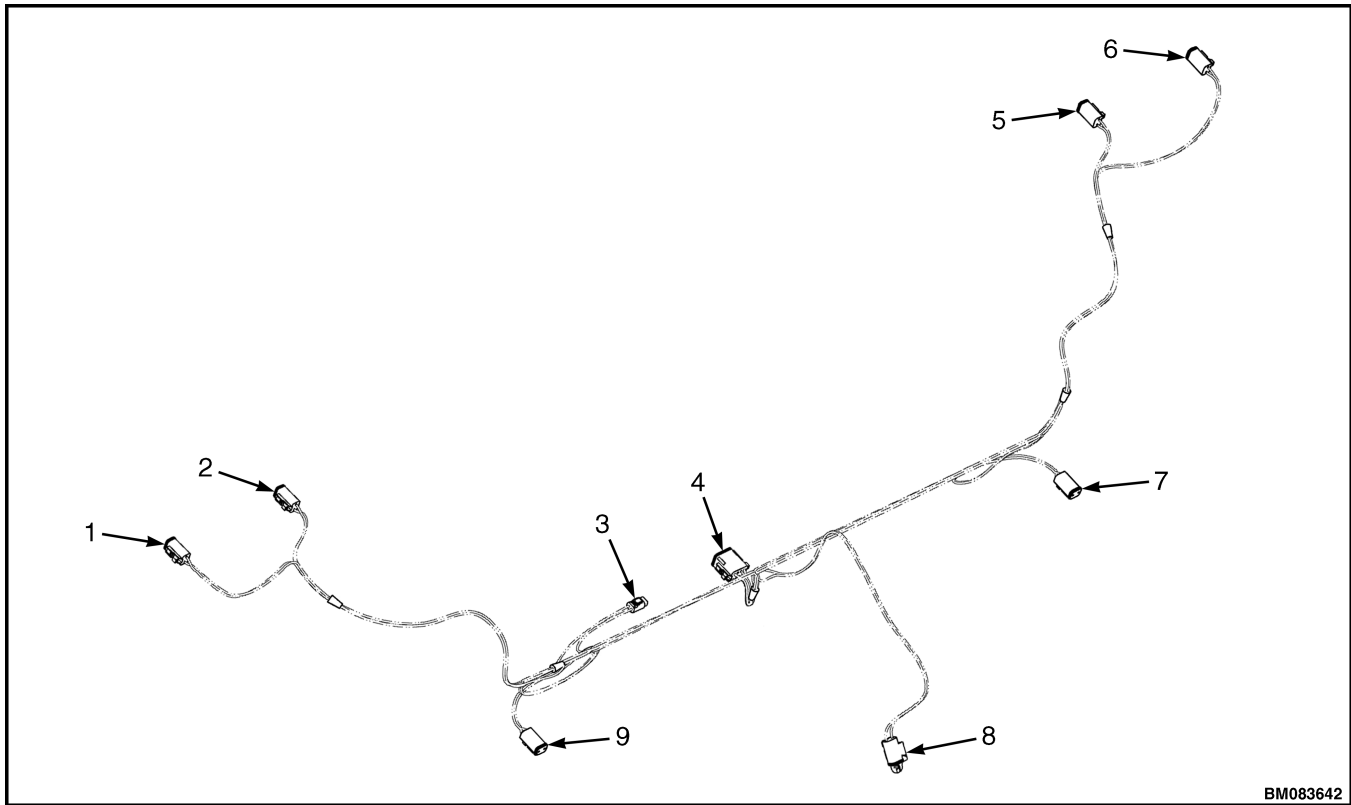


Figure 19. Washer Pump Harness Connectors

Table 15. Washer Pump Harness Connectors

Item	Connector	Description
1	CRP28	Washer Pump Harness to Cab Floor Harness
2	CPS20	Front Washer Pump
3	CPS38	Top Washer Pump
4	CPS95	Rear Washer Pump



BM083642

Figure 32. Cab Lights Harness Connectors

Table 28. Cab Lights Harness Connectors

Item	Connector	Description
1	CPS701	LH Outer Flood Light
2	CPS702	LH Inner Flood Light
3	CPS43	Beacon Light
4	CPS64	Cab Lights Harness to Cab Roof Harness
5	CPS42	RH Inner Flood Light
6	CPS41	RH Outer Flood Light
7	CPS40	RH Rear Drive Light
8	CPS474	Blue Spot/Reverse Light
9	CPS700	LH Rear Drive Light

HVAC CONTROLS MENU

The user may quickly adjust various heating and cooling settings by accessing the HVAC Controls Menu.

1. From the *Home* screen, slide UP. The HVAC Controls Menu will now display.
2. Select one of the following buttons:

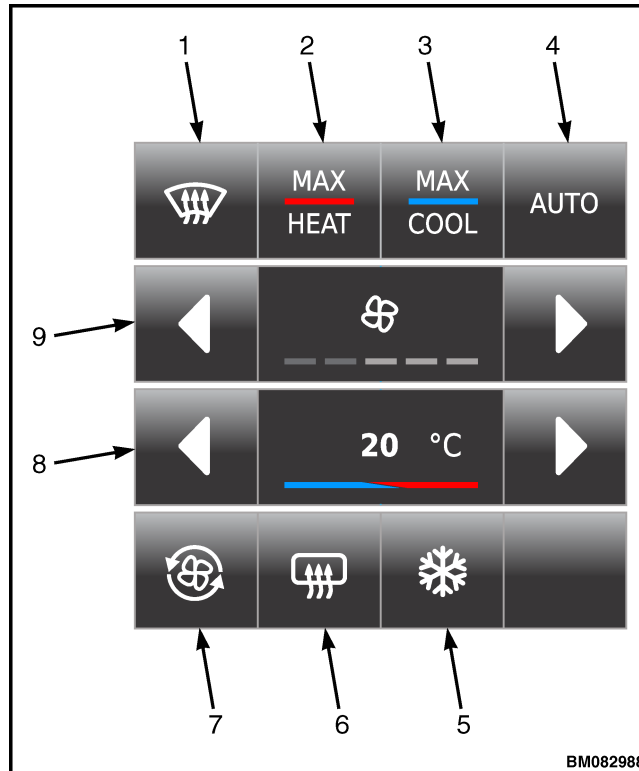



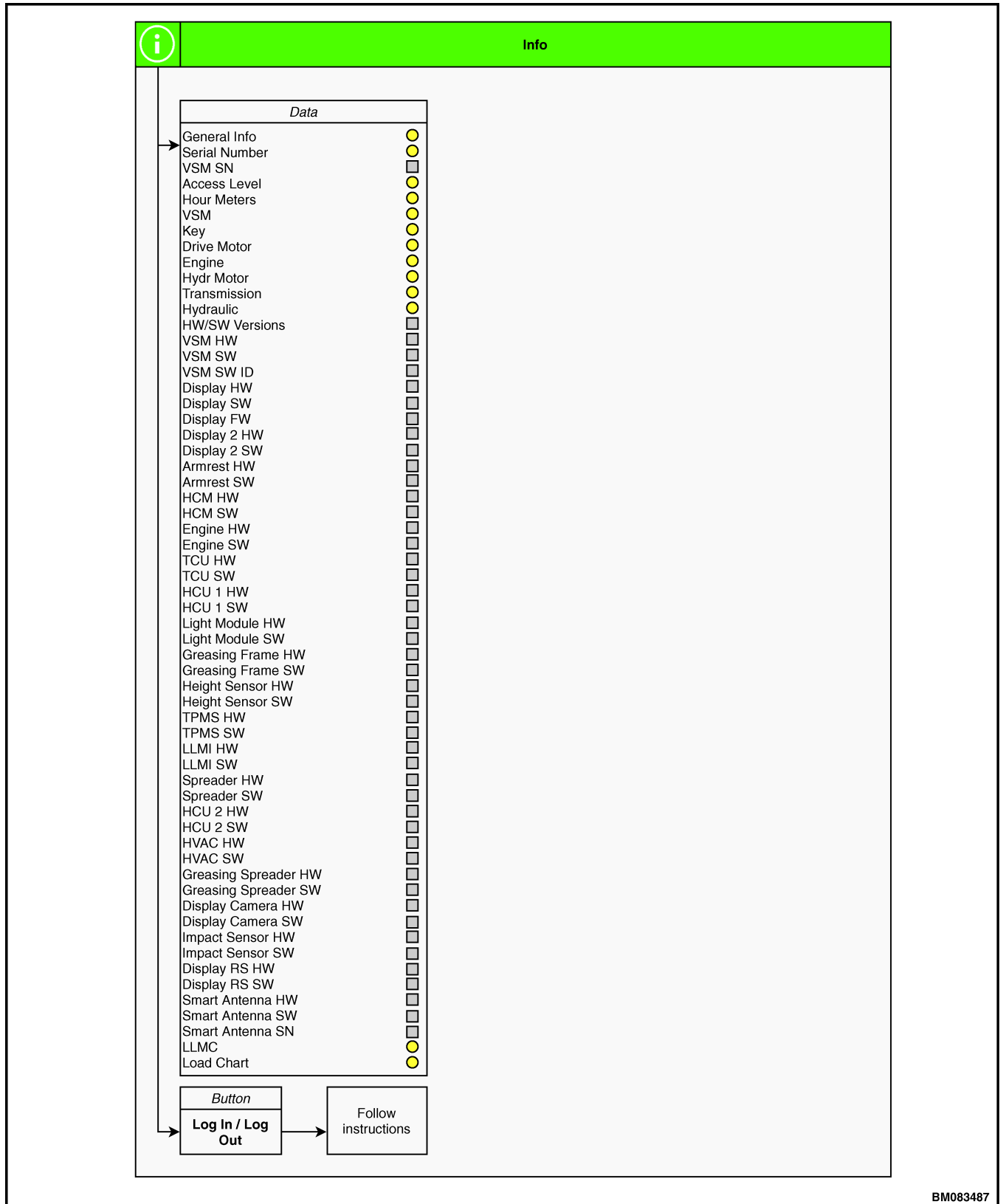


Figure 56. HVAC Controls

1	 <p>BO192672</p>	Defrost Button	<p>TOUCH BUTTON to activate defrost mode. When defrost mode is activated, the A/C compressor is turned on, blower is turned on full speed, heater valve is fully opened and window heater is activated.*</p>
2	 <p>BO192673</p>	Max Heat Button	<p>TOUCH BUTTON to activate maximum heat mode.</p>
3	 <p>BO192674</p>	Max Cool Button	<p>TOUCH BUTTON to activate maximum cool mode.</p>



BM083487

Figure 75. Display Menu Flow Chart (Sheet 3 of 30)

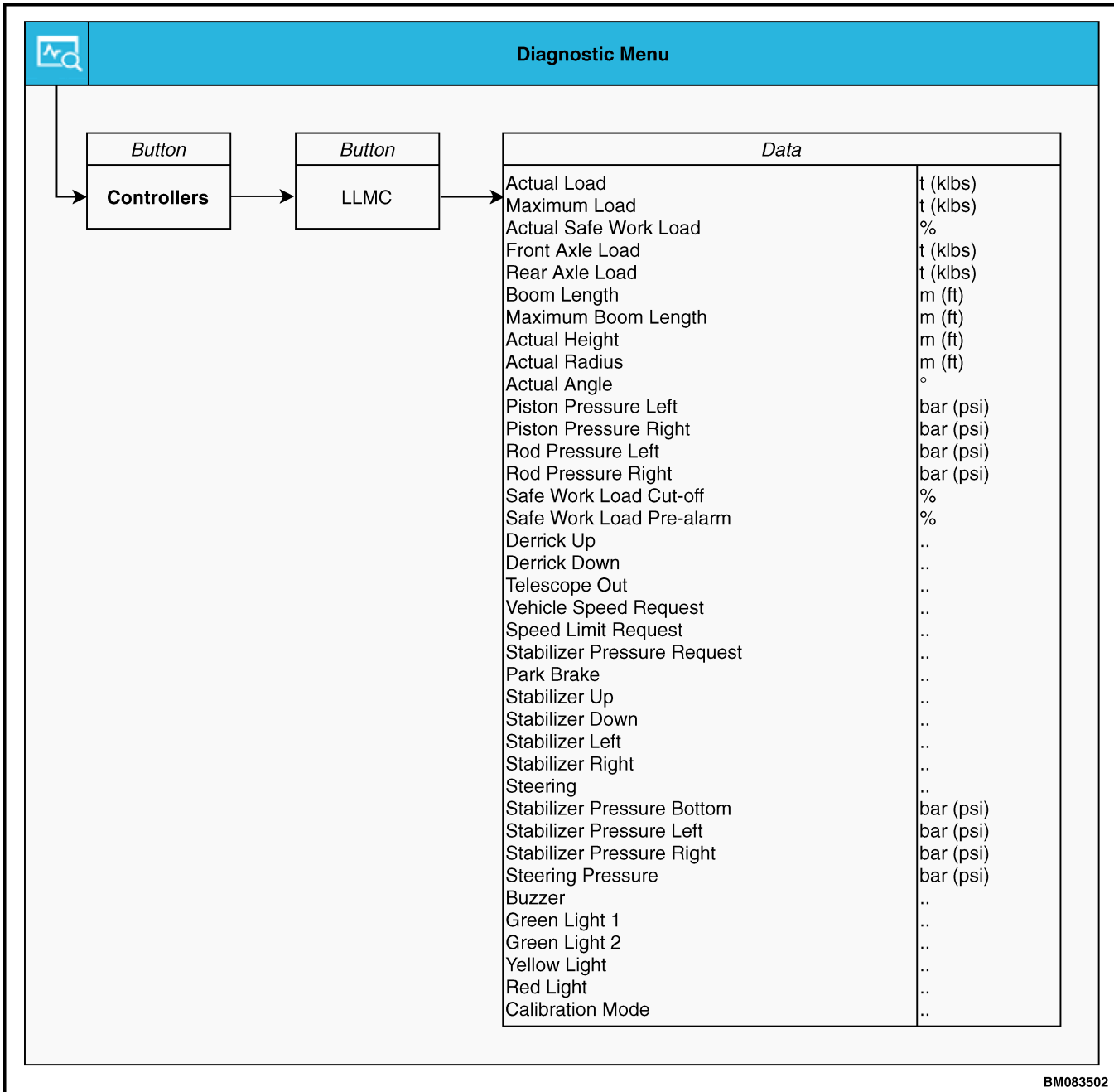


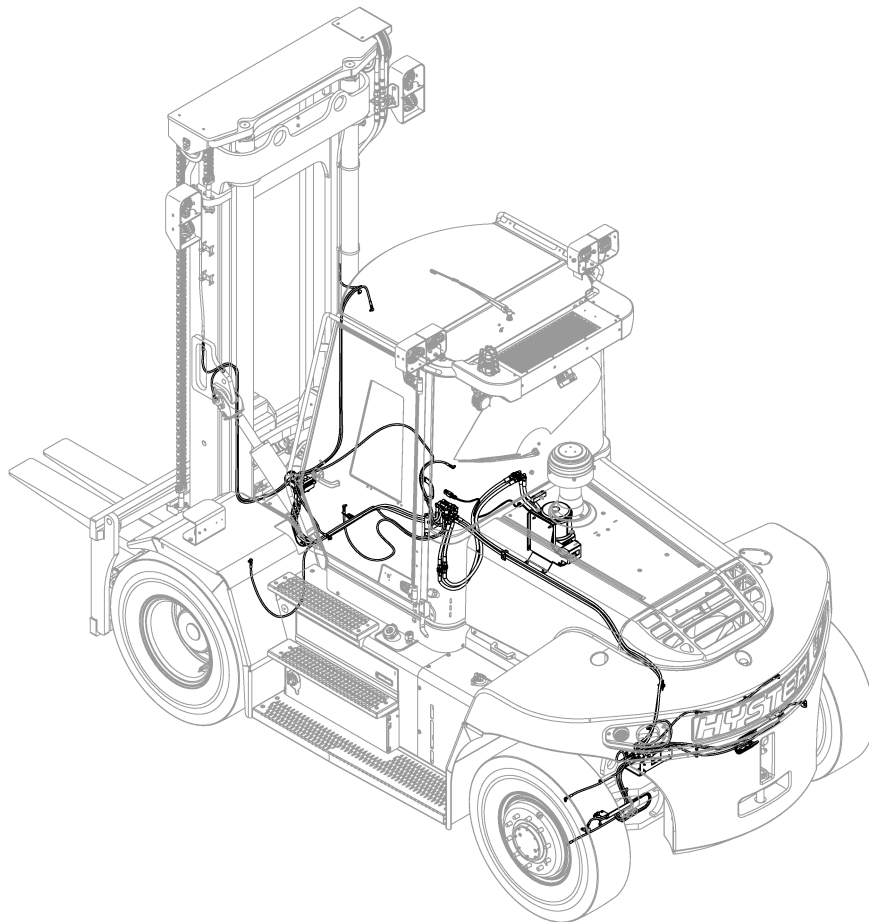
Figure 75. Display Menu Flow Chart (Sheet 18 of 30)

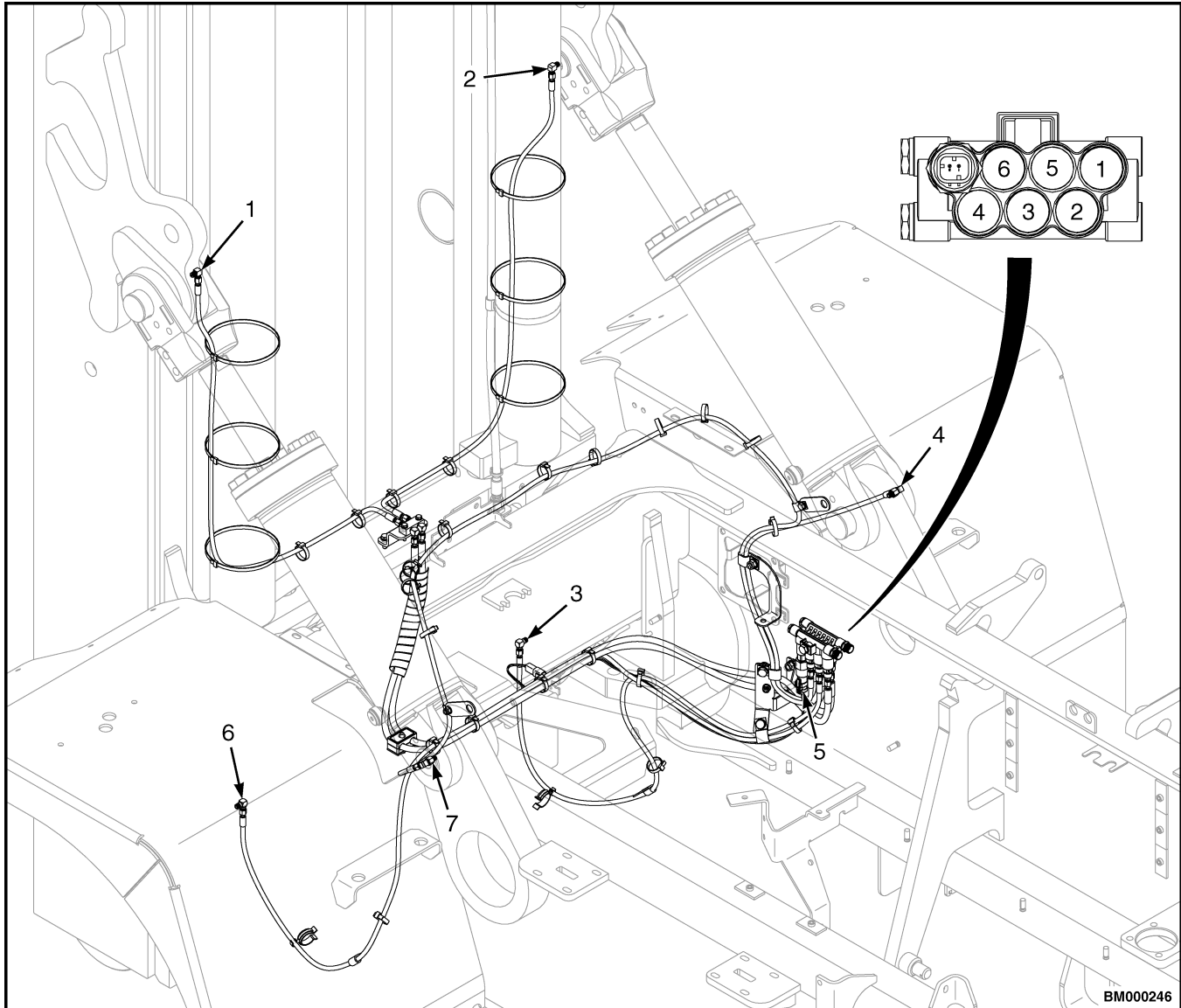


Maintenance

AUTOMATIC GREASING

SERVICE MANUAL





- | | |
|-------------------------|---------------------------------|
| 1. LH TILT CYLINDER | 5. PRESSURE SWITCH BASE HARNESS |
| 2. RH TILT CYLINDER | 6. LH MAST MOUNTING PIN |
| 3. RH MAST MOUNTING PIN | 7. LH TILT PIVOT PIN |
| 4. RH TILT PIVOT PIN | |

Figure 8. Greasing Lines Front End 16-18T

STEP 2.

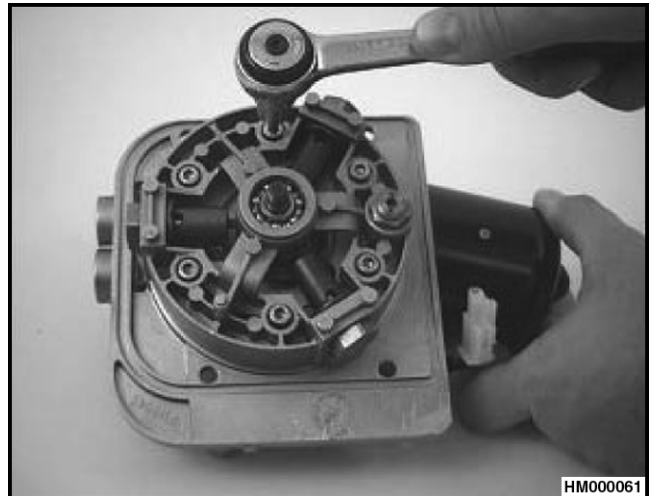
Inspect the O-ring of the grease channel. Replace O-ring if necessary.



NOTE: Make sure the grease channels coincide.

STEP 3.

Install the plunger-housing back into the pump assembly. Replace the copper rings. Torque to 7.5 N•m (5.5 lbf ft).



ELECTRIC PUMP MOTOR

Disassemble

STEP 1.

Remove grease reservoir. Refer to Grease Reservoir, Disassemble for removing the reservoir.

STEP 2.

Remove protection cover of pump unit.

STEP 3.

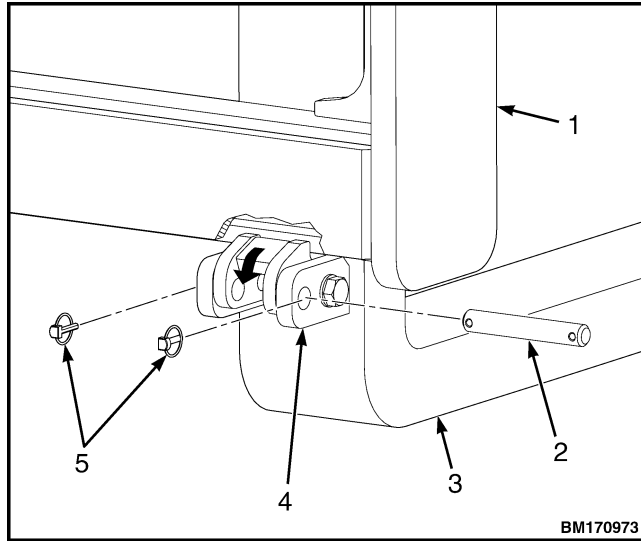
Remove thread adapter.

STEP 4.

Remove the pump assembly.

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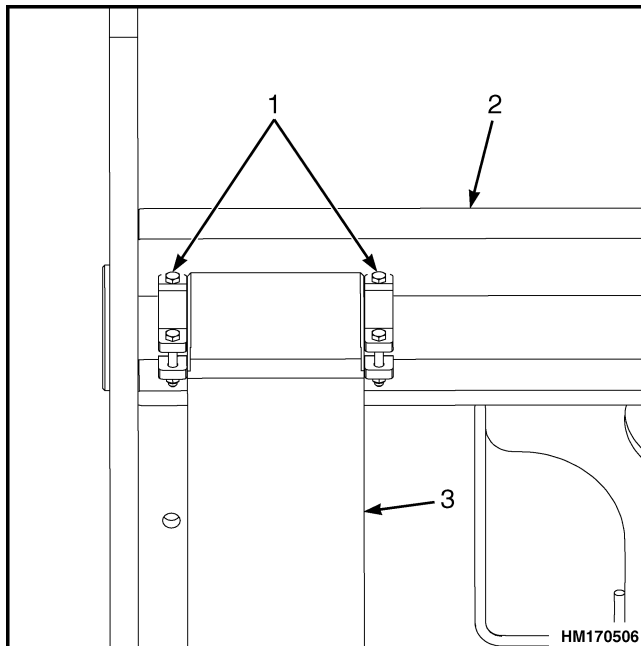
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Install.....	66
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Remove.....	66



- | | |
|---------------------|-----------------|
| 1. CARRIAGE | 4. BRACKET |
| 2. FORK LOCKING PIN | 5. RETAINER PIN |
| 3. FORK | |

Figure 7. Unlock the Forks

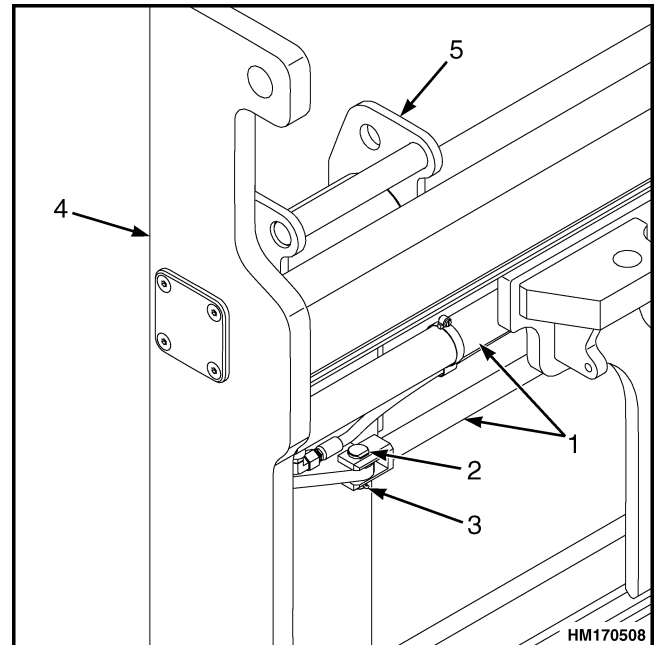
- On carriages with manual fork positioning: remove clamps that secure forks. See Figure 8.



- | |
|---------------|
| 1. FORK CLAMP |
| 2. CARRIAGE |
| 3. FORK |

Figure 8. Fork Clamps

- Position forks in front of hoist chains.
- Place a pallet on a hydraulic jack or hand pallet wagon. Place pallet under one of forks. Lift pallet at least 5 cm (2 in.) off the ground.
- Place mast in a vertical position and lower mast until fork is stable on pallet.
- Remove bracket pin that links fork positioner cylinder with fork guide. See Figure 9.



- | |
|-----------------------------|
| 1. FORK POSITIONER CYLINDER |
| 2. BRACKET PIN |
| 3. SPLIT PIN |
| 4. CARRIAGE |
| 5. FORK GUIDE |

Figure 9. Fork Guide Installation

- Retract fork positioner cylinder and stop engine.
- Attach top of fork guide to a lifting device. Fork guide weighs 24 kg (53 lb) . Put tension on lifting device until it carries weight of fork guide.
- Remove four cap screws and pin bracket that retain fork pin in carriage. See Figure 10.

Carriage Assembly 8-16T

Remove



WARNING

Keep control of lift chains when disconnecting them from carriage. Use wire to temporarily connect ends of lift chains to mast. This procedure will prevent lift chains from falling and causing an injury or damage.

NOTE: Carriage removal is necessary for inspection and replacement of load rollers and bearing blocks. All other serviceable carriage components can be replaced with carriage installed in mast. See **Assembly Guide 8000YRM2427** for carriage weights.

1. Remove forks. See section Forks.
2. Place lift truck on a solid, level surface.
3. Apply parking brake.
4. Tilt mast slightly backwards.
5. Switch engine **OFF**.
6. Turn key switch to **ON** position.
7. Operate lift and tilt levers completely forward and backward to remove any trapped hydraulic pressure.
8. Apply and release brake pedal until brake lights no longer come **ON** when brake pedal is fully depressed and no resistance is felt when fully depressing the brake pedal.
9. Turn key switch to the **OFF** position.
10. Place blocks at front and back of all tires to prevent movement of lift truck.
11. Attach a lifting device to carriage. Make sure that lifting device is correctly positioned to pull carriage in lifting direction of mast only.
12. Operate lifting device until lift chains of mast are slack.
13. Disconnect lift chains from anchor chain. Remove split pin and washer from chain pin and remove chain pin.

14. Attach a strap through lower end of each chain.
15. Attach straps around the upper tilt cylinder brackets.
16. Connect a rope between strap at chain and tilt cylinder brackets. The ropes must have twice the length of the carriage height.
17. Disconnect electric mast cable from carriage bracket and remove cable clamp. Place caps on all open electrical connectors.
18. Tag and disconnect header hoses at carriage bracket. Place plugs and caps at open fittings.
19. Attach a 4 m (13 ft) long rope to header hoses and tie rope to the upper tilt cylinder bracket. This is to prevent hoses from being pulled over the sheave, and to give them sufficient slack when inner mast goes up.
20. Start engine and operate lift cylinders to raise inner mast until mast channels are well above upper load rollers of carriage.
21. Move lifting device with carriage away from mast and put carriage on blocks on the ground with load rollers facing up.
22. Lower mast completely and shut down engine.

Install

1. Place blocks at front and back of all tires to prevent movement of lift truck.



WARNING

Use caution when removing or installing the snap rings used to fasten the load rollers to the stub shafts. The snap rings can come loose with force if not properly removed or installed. Wear eye and face protection when the snap rings are removed or installed.

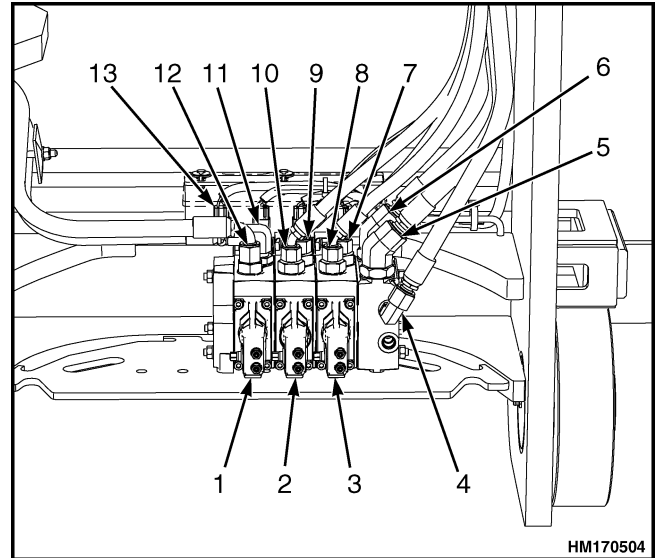
2. Inspect rollers on carriage. If replacement is required, remove snap ring and load roller from stub shaft. Install a new load roller and snap ring. See Carriage Load Rollers 8-16T, Replace .
3. Make sure the carriage bearing blocks are correctly adjusted. See Carriage Bearing Blocks, Install.

Carriage Valve 16-18T

Remove

NOTE: The solenoids and end caps can be replaced individually, by removing the four retaining cap screws for each of these items, see Figure 44. After an end cap or solenoid has been removed, the spool can be inspected. When replacing end caps or solenoids, always use new seals. Tighten the bolts to 26 to 30 N•m (230 to 266 lbf in). For the replacement of one of the valve sections it is necessary to remove and disassemble the entire control valve.

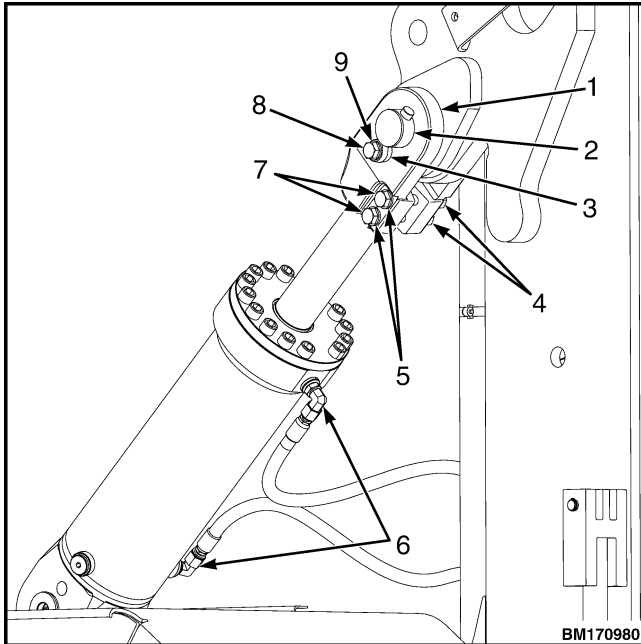
1. Place lift truck on a solid, level surface.
2. Apply parking brake.
3. Tilt mast completely forward.
4. Lower carriage and inner mast completely. Make sure lift cylinders are completely retracted.
5. Switch engine **OFF**.
6. Turn key switch to the **ON** position.
7. Operate lift and tilt levers completely forward and backward to remove any trapped hydraulic pressure.
8. Apply and release brake pedal until brake lights no longer come **ON** when the brake pedal is fully depressed.
9. Operate lift and tilt levers completely forward and completely backward to remove any trapped hydraulic pressure.
10. Turn key switch to the **OFF** position.
11. Place blocks against both sides (front and back) of tires to prevent movement of lift truck.
12. Tag and disconnect electrical connectors from the solenoids on the carriage valve. See Figure 43.
13. Tag and disconnect hydraulic supply and return hoses from hoses that connect to carriage valve.
14. Place plugs and caps on ends of all open hydraulic lines and ports.



1. SIDE SHIFT
2. RH FORK POSITIONER
3. LH FORK POSITIONER
4. PORT T0
5. PORT T
6. PORT P
7. PORT A - FORK POSITIONER LH PISTON SIDE
8. PORT B - FORK POSITIONER LH ROD SIDE
9. PORT B - FORK POSITIONER RH ROD SIDE
10. PORT A - FORK POSITIONER RH PISTON SIDE
11. PORT B - SIDE SHIFT PISTON SIDE
12. PORT A - SIDE SHIFT ROD SIDE
13. ELECTRICAL CONNECTIONS

Figure 43. Carriage Valve 16-18T

15. Remove three cap screws from bracket at the bottom of carriage that retain carriage valve. See Figure 44.
16. Remove carriage valve from the carriage.



1. ROD END
2. ANCHOR PIN
3. EYE BOLT
4. WASHER
5. RELIEF VALVE
6. HYDRAULIC CONNECTION
7. CAP SCREW
8. CAP SCREW
9. WASHER

Figure 59. Tilt Cylinder 16-18T

13. Disconnect lifting device from lifting eyes of outer mast.
14. Remove caps at base of lift cylinders and plugs in hydraulic hoses.
15. Connect hydraulic hose at base of each lift cylinder.
16. Remove plugs at end of hydraulic header hoses.
17. Remove caps from fittings at lower mast bracket.
18. Connect hydraulic header hoses to lower mast bracket.
19. Connect mast cable with frame harness connector.
20. Install carriage to mast. Refer to section Carriage Assembly 16-18T, Install.

21. Start engine and operate hydraulic system. Check that mast and carriage operate correctly.



WARNING

DO NOT try to locate hydraulic leaks by placing hands on pressurized hydraulic components. Hydraulic oil can be injected into body by pressure.

22. Check for leaks.
23. Remove blocks on both sides (front and back) of tires.

Three-Stage Mast

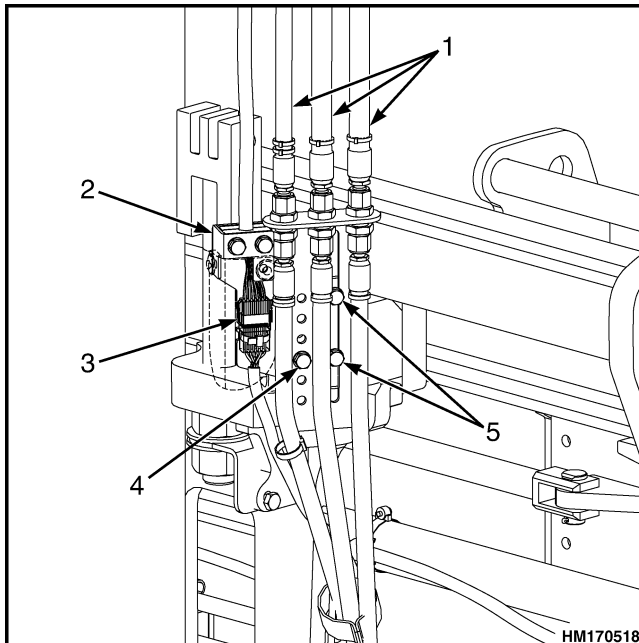
NOTE: Three-stage mast is only applicable for the 8-16t model.

Remove

NOTE: For component weights of the mast, see **Assembly Guide 8000YRM2427** .

1. Remove carriage. See section Carriage Assembly, Carriage Assembly 8-16T.
2. Lower mast and make sure lift cylinders are completely retracted.
3. Switch engine **OFF**.
4. Turn key switch to **ON** position.
5. Operate the lift and tilt levers completely forward and completely backward to remove any trapped hydraulic pressure.
6. Apply and release the brake pedal until the brake lights no longer come **ON** when the brake pedal is fully depressed.
7. Turn key switch to **OFF** position.
8. Remove lift chains. See sections Lift Chains and Top Chain Anchor 8-16T Remove Lift Chains and Top Chain Anchor, Carriage Lift Chains and Chain Anchors , Remove.
9. Disconnect electric mast cable from the frame harness.

3. Install two pins with roller sets at sheave bracket. Make sure that bigger rollers are located at sheave for electric cable. Tighten pins to 100 N•m (73 lbf ft).
4. Put carriage bracket in highest position.
5. Adjust fittings on carriage bracket to compensate for slightly different hose lengths, and attach hoses to fittings on bracket. Make sure they are placed in the same order as on bracket near sheaves.
6. Slide carriage bracket down to put header hoses under tension. Required elongation is between 1% and 2%.
7. Move bracket in a position that best matches with hole for locking bolt. Insert and tighten bolt that locks hose bracket to carriage.
8. Tighten two adjustment bolts. See Figure 74.
9. Put tension on electric cable and tighten retaining clamp.



1. HEADER HOSES
2. MAST CABLE CLAMP
3. MAST CABLE CONNECTOR
4. LOCKING BOLT
5. ADJUSTMENT BOLT

Figure 74. Header Hose Connections 16-18T

Electric Mast Cable 8-16T

Remove

1. Switch engine **OFF** and disconnect battery cables. Refer to Safety Procedures for battery disconnect procedure.
2. Disconnect electric mast cable from frame harness.
3. Open hose clamps retaining electric cable to right hand lift cylinder and the right hand side of the outer mast.
4. Remove cable clamp at upper mast bracket. See Figure 53.
5. Remove hose sheave cap.
6. Remove cable from sheave.
7. Disconnect cable from carriage bracket. See Figure 73.
8. Remove electric cable.

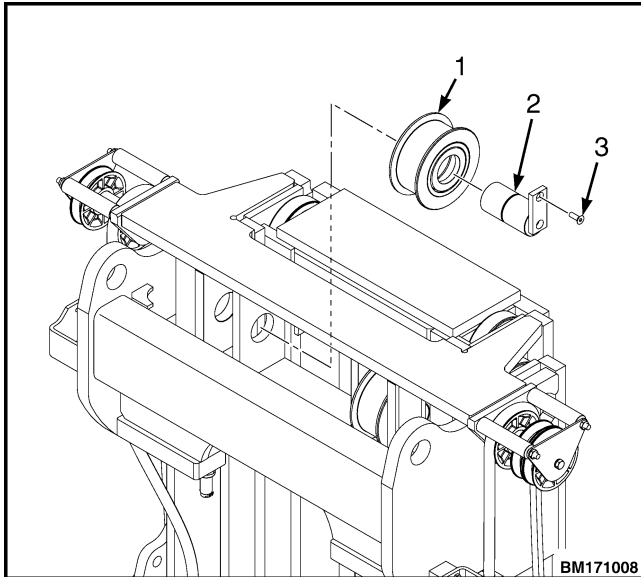
Install

1. Put middle of electric cable over sheave.
2. Install hose sheave cap and connect electric mast cable with connector at carriage bracket.
3. Install cable clamp at carriage bracket. Provide some slack at carriage side for event that electric mast cable has to be repositioned.
4. Insert connector at mast side in mast bracket and install clamp ring. Reconnect mast cable with frame harness. See Figure 73.
5. Install clamps that attach electric cable to mast.
6. Tension carriage side of cable and install clamp on upper mast bracket.

Electric Mast Cable 16-18T

Remove

1. Lower mast completely.
2. Switch engine **OFF**.
3. Disconnect battery power. Refer to Safety Procedures for battery disconnect procedure.



1. CHAIN SHEAVE
2. SHEAVE PIN
3. CAP SCREW

Figure 91. Intermediate Mast Chain Sheave

Install

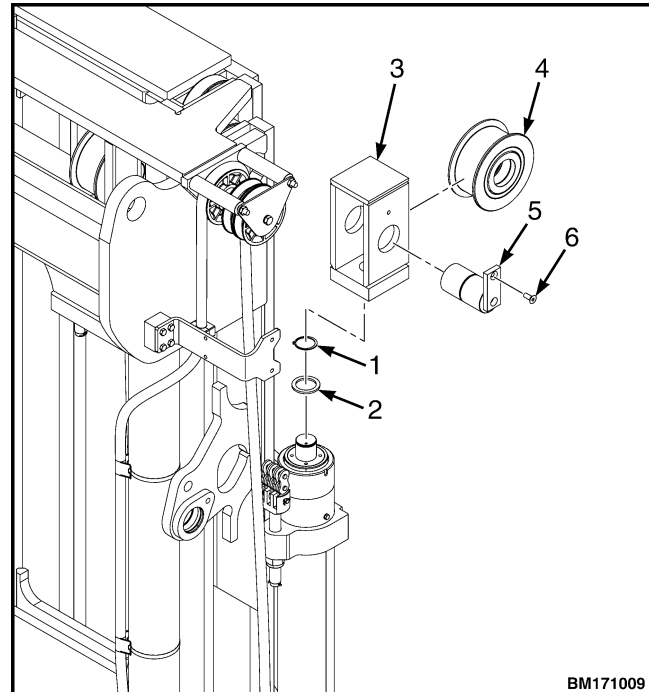
1. Use a strap to position chain sheave on intermediate mast.
2. Insert pin into sheave.
3. Install cap screw and washer.
4. Reinstall lift chains and adjust chain length as needed. See section Mast Lift Chains and Chain Anchors, Install.

Inner Mast Chain Sheave

Remove

1. Place truck on a solid, level surface.
2. Put blocks of approximately 30 cm (1 ft) under inner mast and lower mast until inner mast rests on blocks.
3. Operate lever for lowering until lift cylinders are retracted completely and lift chains are slack.
4. Turn engine **OFF**.
5. Remove carriage lift chains. See section Carriage Lift Chains and Chain Anchors, Remove.

6. Guide a lifting strap around chain sheave and use a lifting device to support the sheave.
7. Remove cap screw and chain sheave pin. See Figure 92.
8. Remove chain sheave from chain sheave support bracket.



1. LOCK RING
2. RING
3. CHAIN SHEAVE SUPPORT BRACKET
4. SHEAVE PIN
5. CHAIN SHEAVE
6. CAP SCREW

Figure 92. Inner Mast Chain Sheave

Install

1. Use a strap to position chain sheave in chain sheave support bracket.
2. Insert pin into sheave.
3. Install cap screw.
4. Reinstall lift chains and adjust chain length as needed. See section Carriage Lift Chains and Chain Anchors, Install.

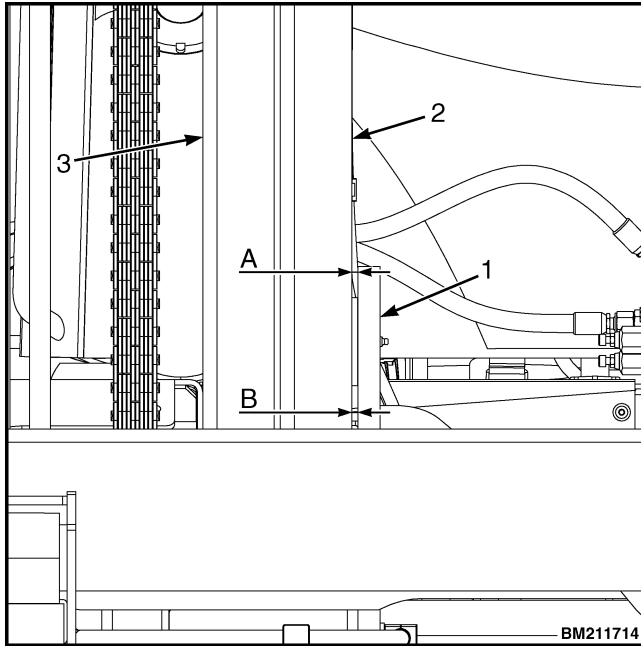
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- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

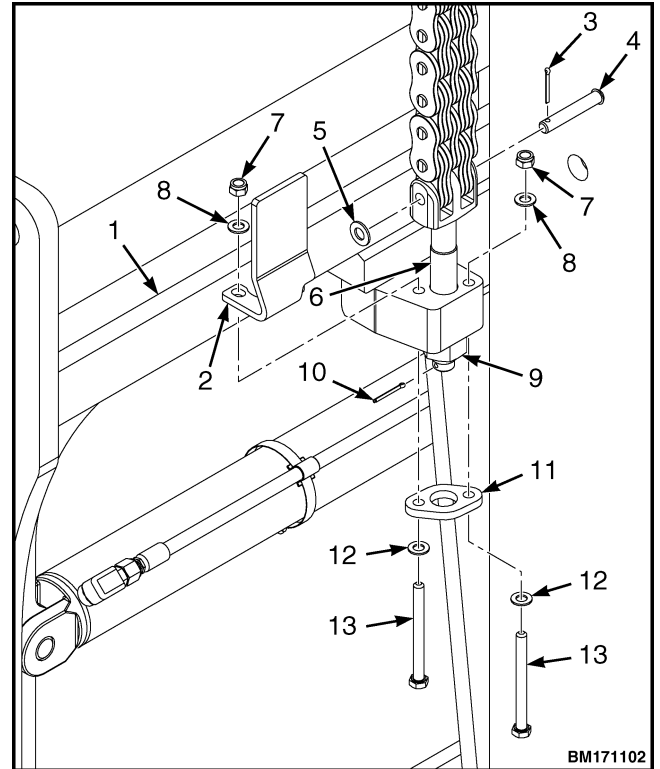
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- A. MEASURING POINT A
- B. MEASURING POINT B

- 1. CARRIAGE
- 2. INNER MAST
- 3. OUTER MAST

Figure 105. Carriage Alignment



- 1. CARRIAGE
- 2. BRACKET
- 3. SPLIT PIN
- 4. CHAIN PIN
- 5. WASHER
- 6. CHAIN ANCHOR
- 7. NUT
- 8. WASHER
- 9. LARGE NUT
- 10. SPLIT PIN
- 11. SECURING PLATE
- 12. WASHER
- 13. CAP SCREW

Figure 106. Chain Anchor on Carriage 8-16T

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Yale® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- 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.
- 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

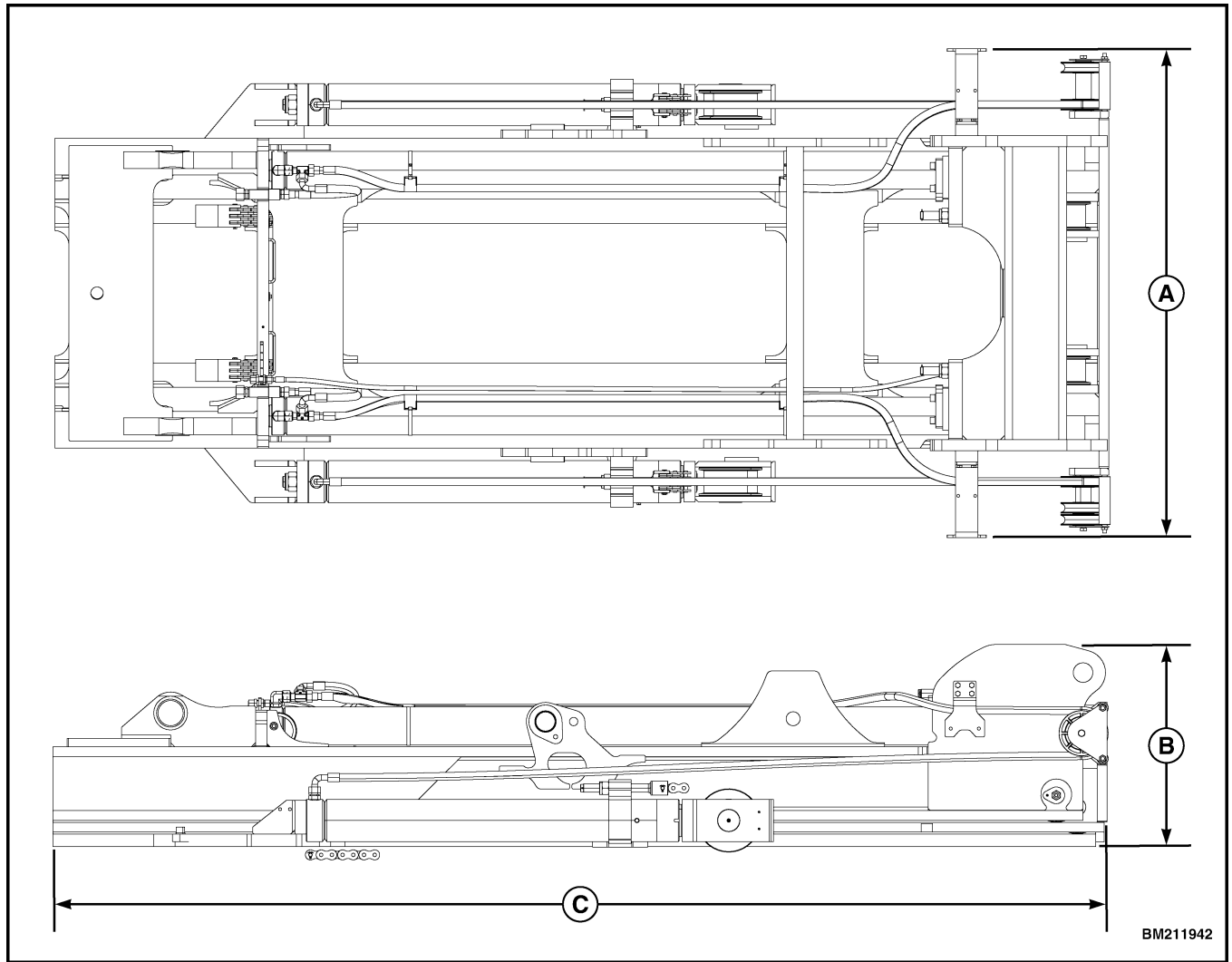
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



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.



A. WIDTH

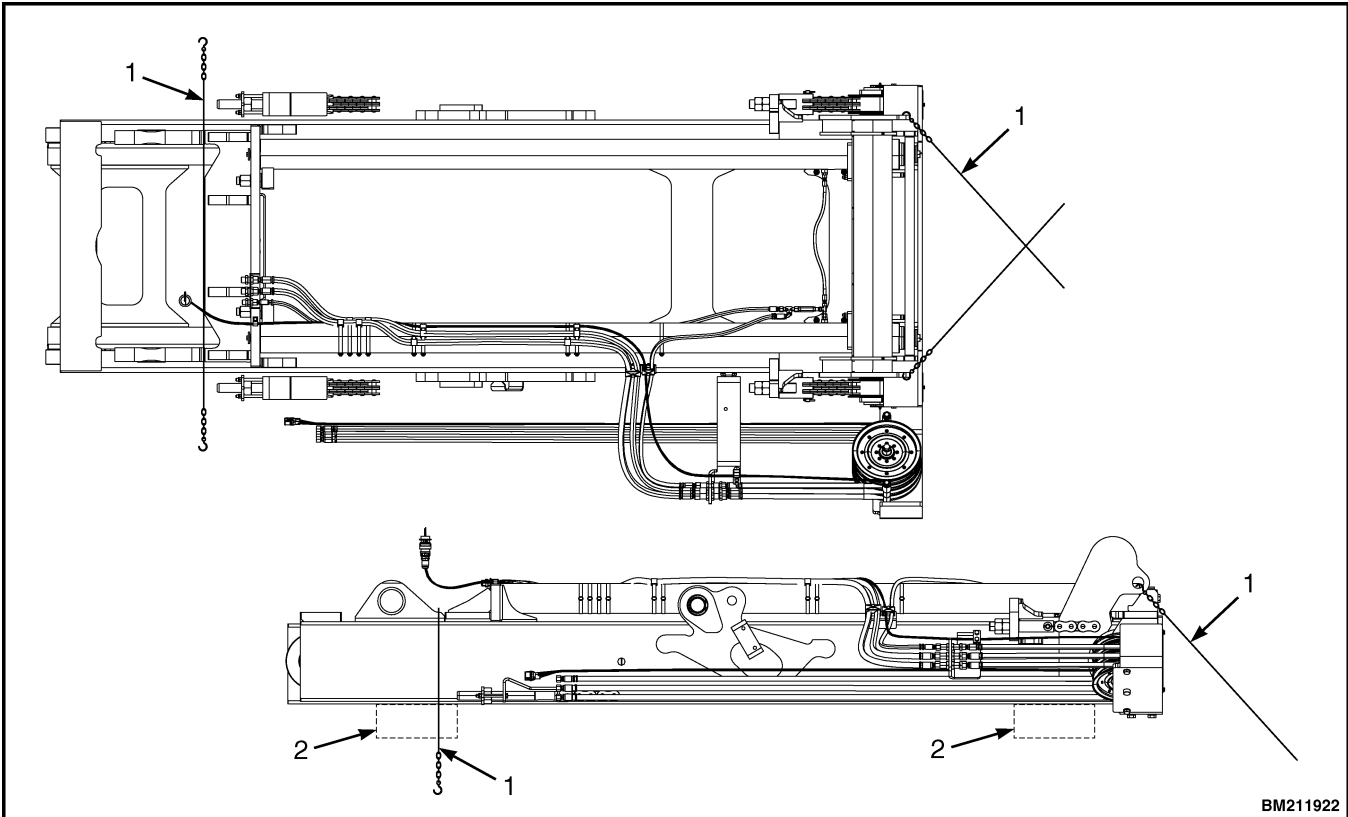
B. HEIGHT

C. LENGTH

Figure 7. 3-Stage NFL Mast Width, Height, and Length [GDP80-160 (GDP190-360)]

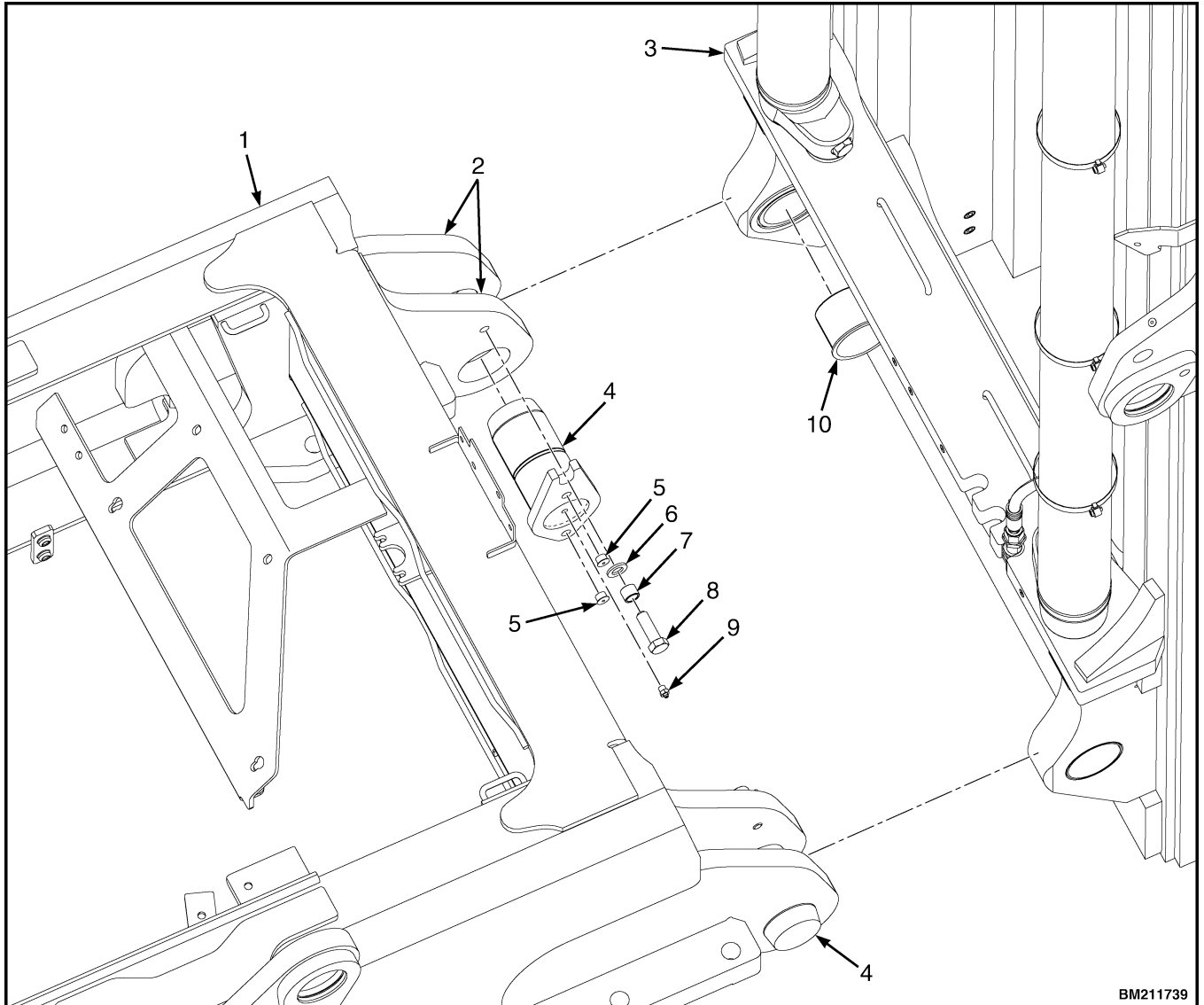
Table 6. 2-Stage NFL Mast

Truck Model	Lift Height	Truck Height ^{1, 2}	Width (A)	Height (B)	Length (C)	Weight
GDP80-90 (GDP190-210)	3,175 mm (125 in.)	3,010 mm (118.5 in.)	1,592 mm (62.7 in.)	468 mm (18.4 in.)	2,873 mm (113.1 in.)	1,878 kg (4,140 lb)
	3,425 mm (134.8 in.)	3,135 mm (123.4 in.)			2,998 mm (118.0 in.)	1,934 kg (4,264 lb)
	3,675 mm (144.7 in.)	3,260 mm (128.3 in.)			3,123 mm (123.0 in.)	1,990 kg (4,387 lb)
	3,925 mm (154.5 in.)	3,385 mm (133.3 in.)			3,248 mm (127.9 in.)	2,047 kg (4,513 lb)



- 1. SLING AND TIE DOWN POINT
- 2. WOODEN BLOCKS OR PALLETS

Figure 15. Mast Tie Down and Block Placement [GDP160-180 (GDP360-400)]



BM211739

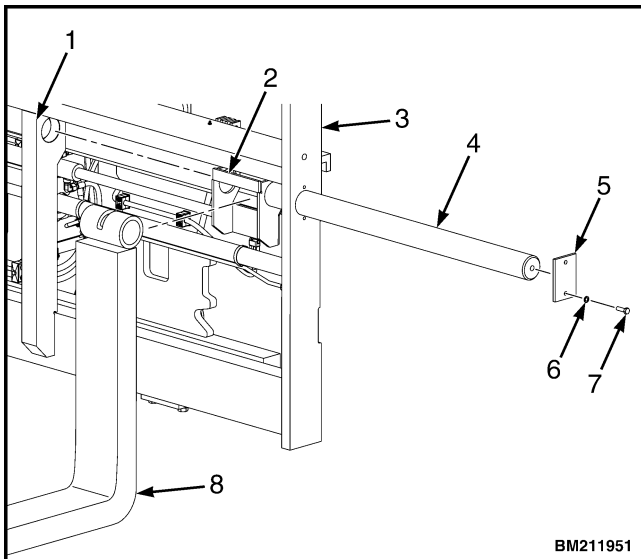
- 1. FRAME
- 2. MAST MOUNTS ON FRAME
- 3. MAST
- 4. MAST PIN
- 5. PLUGS

- 6. WASHER
- 7. SPACER
- 8. CAP SCREW
- 9. GREASE FITTING
- 10. BUSHING

Figure 30. Mast Mount to Frame

NOTE: A spacer may have been installed between the two fork pins in the central carriage bracket that holds the two inner ends of the fork pins. Make sure that this possibly installed spacer is put back.

- e. Slide the fork pin through the fork pin tube to its final mounting position in the center block on the carriage.
- f. Install two cap screws, washers, and retainer plate to retain the fork pin to the carriage.
- g. Repeat Step a through Step f to install the other fork.
- h. Apply grease to the brackets of the fork hanger and the fork positioning cylinder.



1. CENTER BLOCK
2. FORK GUIDE
3. CARRIAGE
4. FORK PIN
5. RETAINER PLATE
6. WASHERS
7. CAP SCREW
8. FORK

Figure 53. Pin Type Forks Install (3-Stage Mast Trucks)

6. Adjust lift chain and fork height. See section Lift Chain and Fork Height Adjustment.
7. Adjust header hose and electrical cable tension. See section Header Hose and Cable Tension Adjustment.

Hook Type Forks

1. Put the mast in a vertical position and lower the carriage almost completely.



WARNING

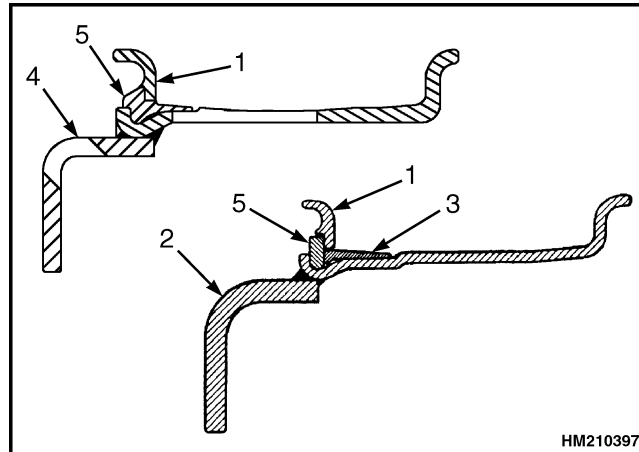
Each fork can weigh up to 590 kg (1,235 lb), depending on fork type. Verify the lifting device has the rated capacity to lift the fork or personal injury can occur.

2. Place each fork on a pallet. Install one fork at the time.
3. Turn key switch to the **ON** position and start the engine.
4. Tilt the mast about five degrees forward.
5. Move one fork until the fork guide on the carriage is aligned under the fork's top hook. Lower fork onto fork guide. Repeat for other fork. See Figure 54 or Figure 55 (depending on truck version).
6. Carefully raise the mast until the fork tips are slightly lifted.
7. Make sure that the forks are properly seated and that the fork retainer bracket at the heel of the forks is correctly positioned.
8. Install the retainer ring and locking pin on both fork retainer brackets.
9. Apply grease to the brackets of the fork hanger and the fork positioning cylinder.

REMOVE PNEUMATIC TIRE FROM WHEEL

NOTE: For GDP80-160 (GDP190-360) trucks, there are two types of wheels used. If pneumatic shaped solid rubber tires are installed, the four-piece wheel assemblies must be used. If pneumatic tires are installed, the three-piece wheel assemblies must be used. See Figure 72.

For GDP160-180 (GDP360-400) trucks, only pneumatic tires are used; for which three-piece wheel assemblies must be used. See Figure 73.



1. SIDE FLANGE
2. WHEEL RIM FOR SOLID TIRE
3. FLANGE SEAT
4. WHEEL RIM FOR PNEUMATIC TIRE
5. LOCK RING

Figure 72. Types of Wheels [GDP80-160 (GDP190-360)]

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Yale® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- 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.
- 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.

LABEL REPLACEMENT



WARNING

Check **WARNING** and **CAUTION** labels for damage. Replace damaged labels. Refer to the **Parts Manual** for the labels and locations of the labels.



CAUTION

If a mast with a different size or an accessory carriage is installed, the capacity rating can change. Changes in the size of drive tires can also change the capacity rating. For a replacement nameplate, contact your **Yale Dealer**. The nameplate information is a safety item and must be correct.

1. Make sure the surface is dry and has no oil or grease. **DO NOT** use solvent on new paint. Clean the surface of old paint using a cleaning solvent.
2. Remove the paper from the back of the label. **DO NOT** touch the adhesive surface.
3. Carefully hold the label in the correct position above the surface. The label cannot be moved after it touches the surface. Put the label on the surface. Make sure all air is removed from under the label and the corners and edges are tight.

If the labels or information plates are missing or damaged, they must be replaced. Refer to the **Parts Manual** for the labels and locations of the labels.

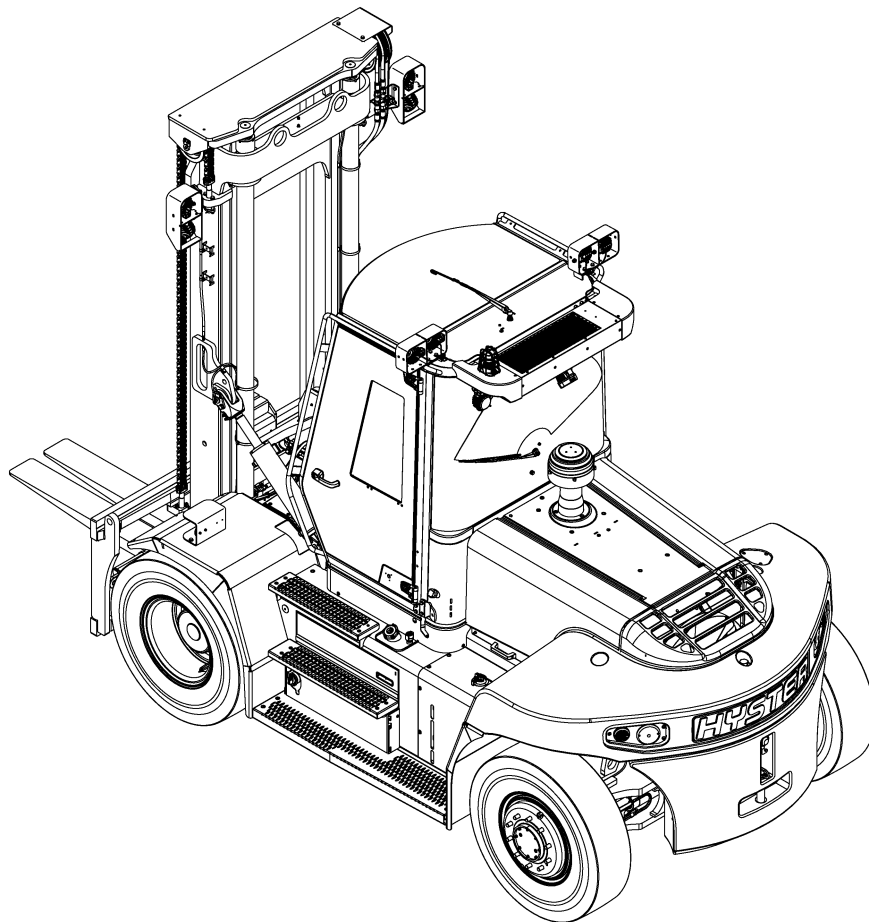
3-STAGE FFL LIFTING SPEED				
MODEL / PUMP CAPACITY	NO LOAD		RATED LOAD	
	2ND STAGE	FREELIFT	2ND STAGE	FREELIFT
	(m/s)	(m/s)	(m/s)	(m/s)
	(ft/min)	(ft/min)	(ft/min)	(ft/min)
H13-16XD6, H10XD12, H300-360XD, H210-250XD48 / 126cc	0.42	0.42	0.39	0.39
	82.7	82.7	76.8	76.8
3-STAGE FFL LOWERING SPEED				
MODEL / PUMP CAPACITY	NO LOAD		RATED LOAD	
	2ND STAGE	FREELIFT	2ND STAGE	FREELIFT
	(m/s)	(m/s)	(m/s)	(m/s)
	(ft/min)	(ft/min)	(ft/min)	(ft/min)
H13-16XD6, H10XD12, H300-360XD, H210-250XD48 / 126cc	0.39	0.37	0.41	0.39
	76.8	72.8	80.7	76.8

UPRIGHT LIFTING AND LOWERING SPEEDS 13-16T				
Engine: OM 934 129 kW Stage V				
2-STAGE NFL				
MODEL / PUMP CAPACITY / MAST TYPE:	LIFTING SPEED		LOWERING SPEED	
	RATED LOAD	NO LOAD	RATED LOAD	NO LOAD
	(m/s)	(m/s)	(m/s)	(m/s)
	(ft/min)	(ft/min)	(ft/min)	(ft/min)
H13-16XD6, H10XD12 / 126cc	0.41	0.46	0.50	0.48
	80.7	90.6	98.4	94.5
H6XD-EC3 / 111cc	0.60	0.60	0.50	0.48
	118.1	118.1	98.4	94.5
H7XD-EC4 / 111cc	0.58	0.60	0.50	0.48
	114.2	118.1	98.4	94.5



Maintenance

PERIODIC MAINTENANCE SERVICE MANUAL



Section 2 - Safety Procedures Before Starting Maintenance

PRECAUTIONS



WARNING

DO NOT operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a DO NOT OPERATE tag in the operators area. Remove the key from the key switch.

1. Put the lift truck on a level surface.
2. Lower the carriage and forks.
3. Switch the engine OFF.
4. Apply the parking brake.
5. Open the hood and check for leaks and conditions that are not normal.
6. Clean any oil or fuel spills.
7. Verify all surfaces are free of oils, lubricants, fuels, fluids, and organic dust or fibers (paper, wood, cotton, wool, agricultural grass/grain, etc.).

MAKING CHECKS FROM THE DRIVER SEAT WITH ENGINE RUNNING



WARNING

Exhaust from internal combustion engines contains carbon monoxide and other harmful chemicals. Carbon monoxide is a colorless, odorless poison and can cause unconsciousness or death without warning. Long-term exposure to exhaust or chemicals in the exhaust can cause cancer, birth defects, and other reproductive harm. Avoid exposure to engine exhaust:

- DO NOT use diesel engines indoors where soot can accumulate.
- If engines are operated in confined spaces, maintain adequate ventilation or vent exhaust to the outside. DO NOT exceed applicable air contaminant limits.
- Follow the inspection and maintenance schedule and procedures in this manual. DO NOT alter exhaust, ignition, or fuel systems.

Fire Hazard

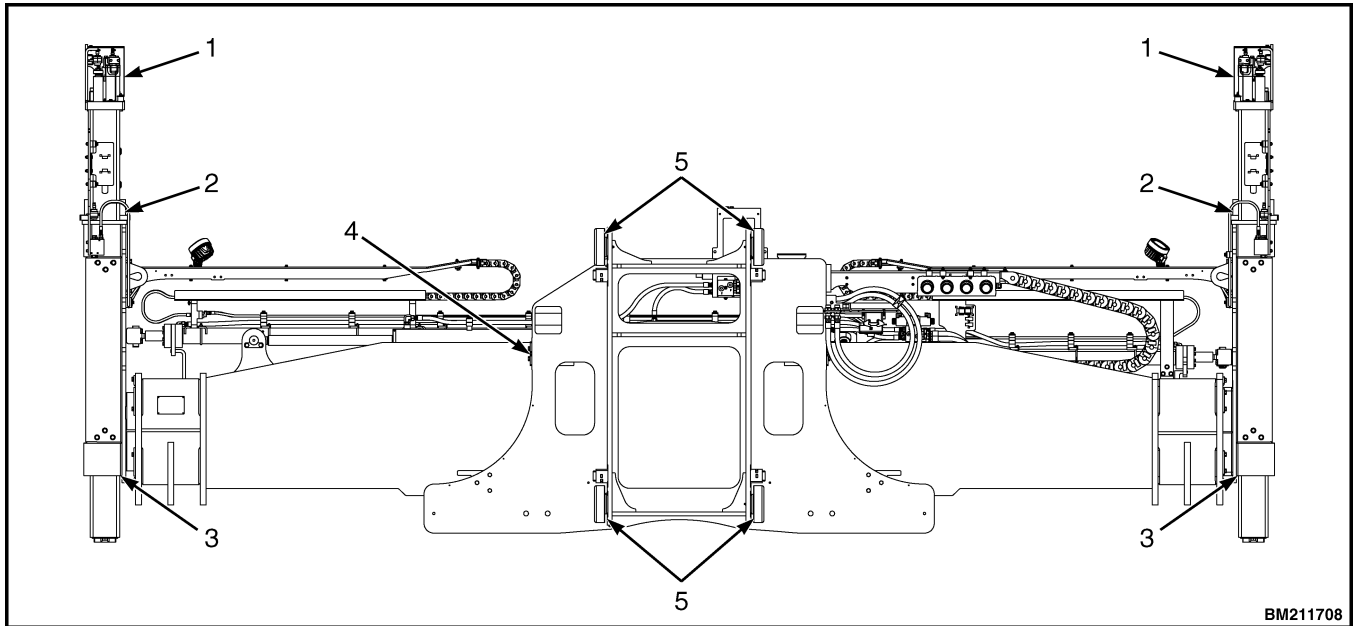
The hot engine surfaces and exhaust of internal combustion engine-powered lift trucks can present fire hazards when operating in areas containing flammable gases, vapors, liquids, dusts, or fibers. Engine and exhaust component surface temperatures can exceed the ignition temperatures of common solvents, fuels, oil, paper, and other organic materials (wood, wheat, cotton, etc.). Exhaust-emitted sparks can ignite these materials as well. Engine and exhaust surface temperatures increase after engine shutoff, presenting increased fire hazard. Check the engine compartment immediately following the lift truck operation in areas containing combustible dusts, fibers, or paper and remove any foreign material.

Operate the lift truck only in areas that have been approved for lift truck operation.

FASTEN YOUR SEAT BELT! The seat belt is installed to help the operator stay on the truck if the lift truck tips over.

Make sure that the area around the lift truck is clear before starting the engine or making any operational checks. Be careful when making the checks. If the lift truck is stationary during a check, apply the parking brake and put the transmission in **NEUTRAL**. Make the checks carefully.

**PERIODIC MAINTENANCE SCHEDULE -
ELME 580 SERIES CONTAINER
ATTACHMENT**



BM211708

- | | |
|----------------------------|------------------------|
| 1. TWIST LOCK | 4. SIDE SHIFT WEAR PAD |
| 2. SLIDER PAD | 5. CARRIAGE ROLLERS |
| 3. EXTENSION BEAM WEAR PAD | |

Figure 8. Container Attachment Maintenance Points

PERIODIC MAINTENANCE

Inspect and Adjust

Table 12. Inspect and Adjust

Every 250 Hours		
Attachment	<ul style="list-style-type: none"> • Check for damage, cracks and distortion. • Check spreader control system and spreader operation. • Check for hydraulic leaks. Repair as required. • Make sure wear pad retainers are tightened to 63 N•m (46.4 lbf ft). 	See Page 4-25
Twist Locks (Container Locking Mechanism)	<ul style="list-style-type: none"> • Monitor wear and check for possible damage. Repair as required. 	See Page 4-80
Every 500 Hours		
Wear Pads Carriage	<ul style="list-style-type: none"> • Check for wear of the Nylon wear pads and replace before metal to metal contact between carriage and mast occurs. 	See Page 4-82

ENGINE AIR FILTER



CAUTION

If the air filter container is not cleaned during maintenance or replacement of the air filter, dirt will gradually build up in the filter housing. This may cause the filter unit to function incorrectly. If the filter element has been forced into place, the filter housing can crack over time, allowing dirt to enter into and damage the engine.

NOTE: The air filter housing should not be opened until an air filter element replacement or an inspection is required. See Figure 26.

Daily

If the Air Filter Restriction symbol on the display is **ON** replace the main filter element. Record the hour meter reading at replacement.

Every third time the main filter is replaced, also replace the safety element. Clean the inside of the housing when changing filters.

Every 500 Hours

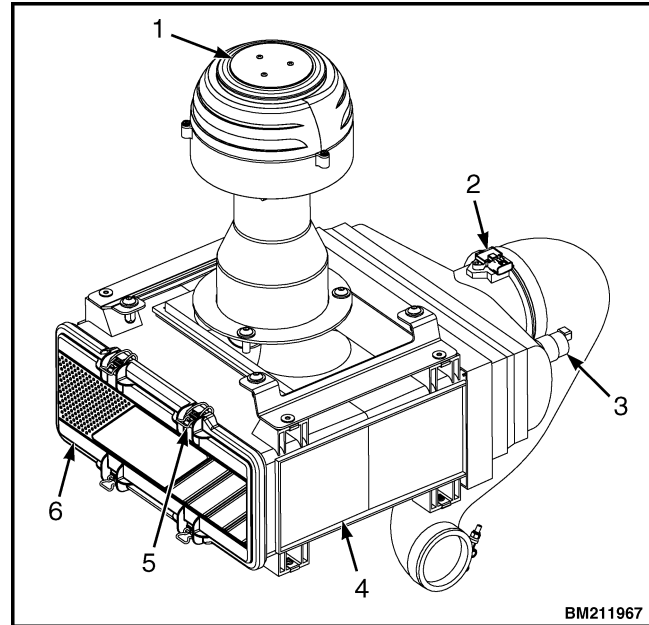
Verify maintenance records to establish if normal air filter replacement is due. Make sure the Engine Air Filter Vacuum Switch performs properly.

If required, replace the filter element, clean the inside of the housing and record filter replacement. See **Parts Manual**.

At every third replacement of the Main Element, also replace the Safety Filter Element.

For Tier 4F/Stage IV engines, test functioning of the Engine Air Filter Warning Light, if it is suspected to malfunction. The vacuum switch should switch **ON** at a vacuum of 6.4 kPa (0.93 psi). Replace as required.

For Cummins Tier 3/Stage IIIa and Mercedes-Benz Stage V, test functioning of the Engine Air Filter Warning Light, if it is suspected to malfunction. The vacuum switch should switch **ON** at a vacuum of 5.4 kPa (0.78 psi). Replace as required.



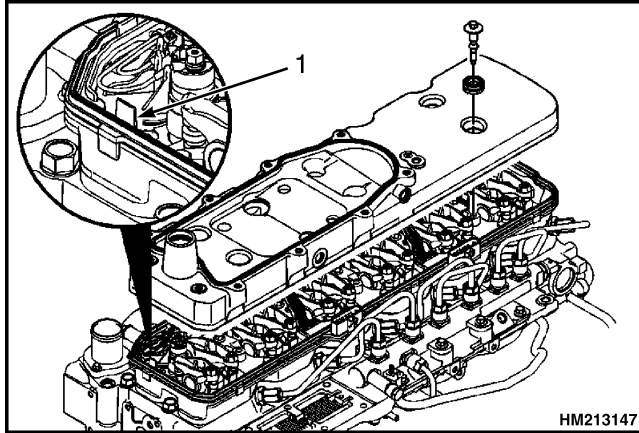
1. PRECLEANER
2. TBAP (TEMPERATURE BAROMETRIC PRESSURE) SENSOR (TIER 4F ONLY)
3. VACUUM SWITCH
4. AIR FILTER HOUSING
5. CLIP
6. AIR FILTER HOUSING COVER

Figure 26. Engine Air Filter (Tier 4F Shown)

ENGINE AIR INTAKE PIPING AND CHARGE AIR HOSES

Daily

Inspect the intake and charge air hoses for wear points and leakage. Look for loose clamps and punctures that can allow ingress of dirt into the engine. See Figure 27.



1. LOCATING TAB

Figure 59. Rocker Lever Cover Install

5. Install the rocker lever cover mounting cap screws and isolators.

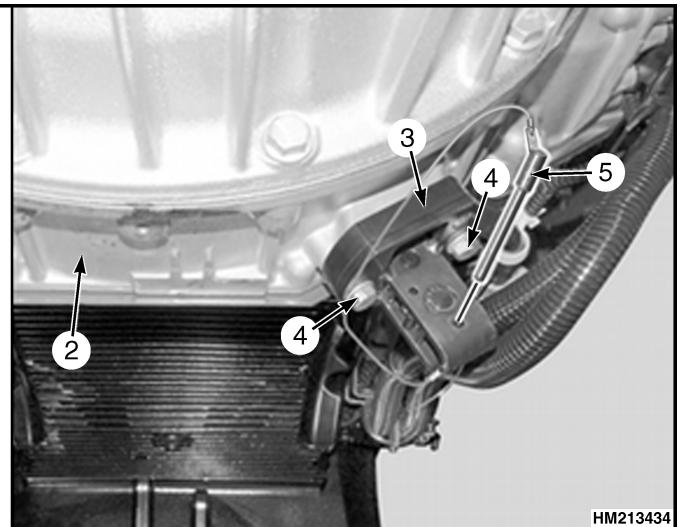
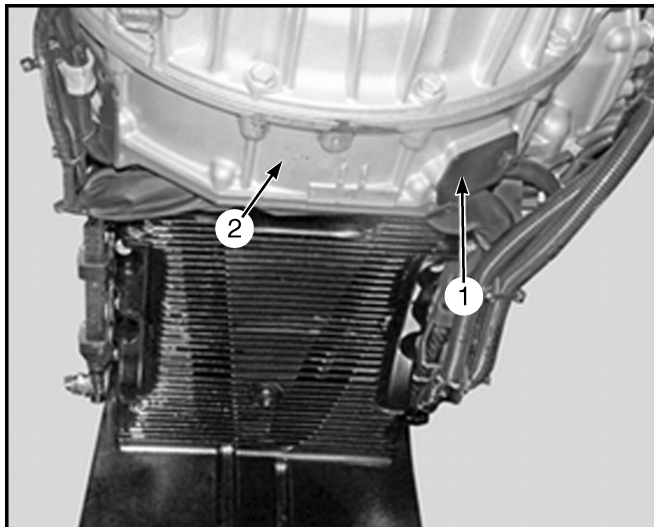
6. Tighten the mounting cap screws to 24 N•m (17.7 lbf ft), starting with the center cap screws.
7. Connect the wiring harness connectors to the rocker lever cover gasket. See Figure 49.
8. Start the engine and check for leaks.

ENGINE VALVE ADJUSTMENT (MERCEDES-BENZ STAGE V)

EVERY 2,000 HOURS

Mount turning device onto flywheel housing. See Figure 60.

1. Remove cover on flywheel housing.



1. COVER
2. FLYWHEEL HOUSING
3. TURNING DEVICE

4. BOLTS
5. PIN

Figure 60. Turning Device

2. Align turning device with starter ring gear and screw down on flywheel housing with screw/bolts. Torque screws to 30 N•m (22 lbf ft).

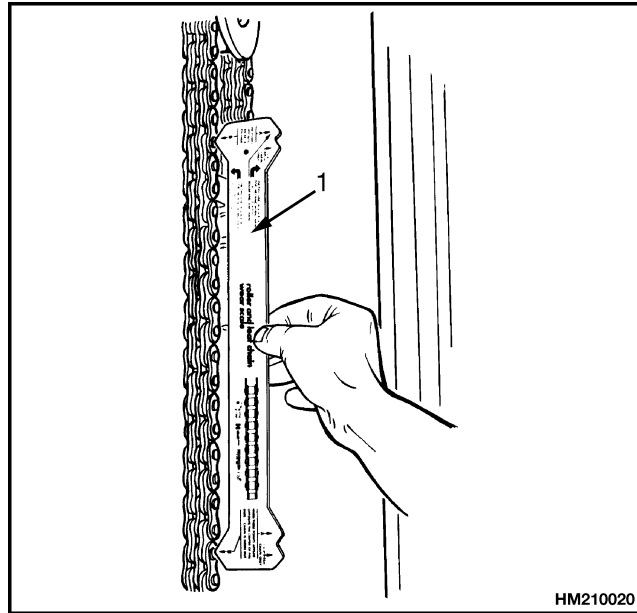
NOTE: The turning device can also be used to insert pin as a blocking device.

Remove Cover

1. Disconnect battery power. Refer to General for battery disconnect procedure.

NOTE: If no leakage is determined, the profiled seal of the cylinder head cover can be reused.

2. Check contoured gasket of the cylinder head cover for leakage.



1. CHAIN WEAR SCALE

Pitch	Total Length of 20 Links (Pitches) of New Chain	Wear Limit - Maximum Length of 20 Links
31.75 mm (1.25 in.) 38.10 mm (1.50 in.)	635 mm (25 in.) 762 mm (30 in.)	654 mm (27.75 in.) 785 mm (30.9 in.)
44.45 mm (1.75 in.)	889 mm (35 in.)	916 mm (36.1 in.)
50.8 mm (2.0 in.)	1,016 mm (40 in.)	1,046.5 mm (41.2 in.)

Figure 77. Measuring Chain Elongation

Lift Chain Wear and Damage

Every 250 Hours

Inspect and replace if any of the following conditions occur, see Figure 78:

- 1 Wear of any plate exceeds 5% of the original dimension. See Figure 78.
- 2 Wear of any pin exceeds 5% of the original dimension.
- 3 Broken, damaged or missing chain link plates.
- 4 Damaged, turned or protruding link pins.
- 5 Stiff articulation between chain links.
- 6 Presence of lubricant, which is brown colored by rust.

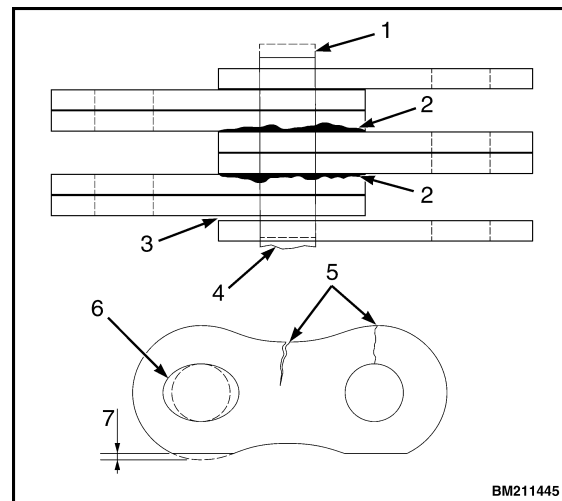


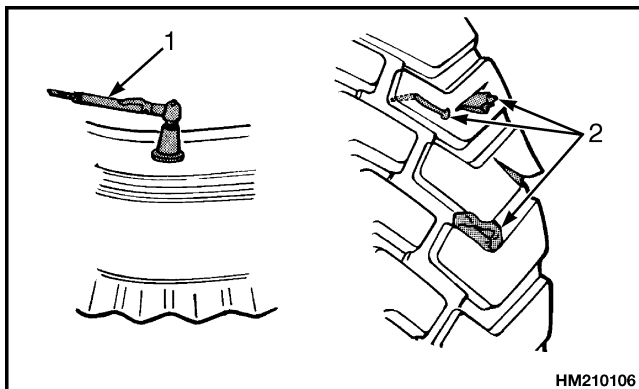
Figure 78. Lift Chain Check

For replacement procedures see **Front End** 4000YRM2426 , section **Mast Repair**.

Daily and Every 250 Hours

Keep the tires at the correct air pressure as specified on the lift truck name plate. Using a tire pressure gauge, check the tire pressure when the tires are at ambient temperature. If it is necessary to add air to a tire that is warm, check one of the other tires on the same axle and add air to the tire that has lowest pressure so that the air pressures are equal. The air pressure of warm tires must always be equal to or greater than the specification for air pressure for cold tires.

Check the tires for damage. See Figure 101. Inspect the tread and remove any objects that will cause damage. Remove any wire, straps, or other material wrapped around the axle. Check for loose or missing hardware. Check for bent or damaged rims. Inspect wheel components for deformation, corrosion and fractures.



1. CHECK TIRE PRESSURE
2. CHECK FOR DAMAGE

Figure 101. Tire Check

TIRE PRESSURE MONITORING SYSTEM (TPMS)

The Tire Pressure Monitoring System (TPMS) measures and displays tire temperature and pressures. Based on pre-set threshold values the TPMS warns the truck operator for tire over and under pressure and high temperature.

The TPMS parameters will be displayed in the cabin display. The TPMS view can be found in the displays 'menu structure.

The following actual parameters are presented in the TPMS view:

- Actual tire temperature
- Actual tire Pressure

The following warnings will be presented in the TPMS view:

- Low pressure alarm (by default set to -10% of the nominal tire pressure per name plate).
- Low pressure warning (by default set to -6% of the nominal tire pressure per name plate).
- High pressure alarm (by default set to +40% of the nominal tire pressure per name plate).
- High temperature warning (by default set to 90°C).
- Low battery (wheel sensor).
- Signal loss (no signal received from wheel sensor in the last minutes).
- Error status

Fluid	Specification	Truck/Engine Type	Quantity
Differential Oil	MIL-PRF-2104F, API-GL-5, SAE 80W-90 (-26°C (-15°F) and up), SAE 85W-140 (-12°C (10°F) and up)	–	28 liter (29.6 gal)
Engine Oil:	ACEA E5, E7, or E9 / API CH-4, CI-4, CJ-4, or CK-4	Cummins Tier 3/Stage IIIA	18 liter (19 qt)
	ACEA E9 / API CJ-4 or CK-4	Cummins Tier 4F/Stage IV	
	Mercedes-Benz Low SPash multi grade service engine oils 228.51 or 228.52 (*see Approved Oil, Fluids and Grease notes)	Mercedes-Benz Stage V	28.5 liter (30.1 qt)
Hydraulic System Oil	JDM-J20C	Cummins Tier 3/Stage IIIA and Tier 4F/Stage IV	Initial Fill: 258 liter (68.2 gal)
			Change: 215 liter (56.8 gal)
		Mercedes-Benz Stage V	Initial Fill: 207 liter (54.7 gal)
			Change: 164 liter (43.3 gal)
Planetary Gear Oil (each side)	MIL-PRF-2104F, API-GL-5, SAE 80W-90 (-26°C (-15°F) and up), SAE 85W-140 (-12°C (10°F) and up)	–	4.1 liter (4.3 qt)
Transmission Oil	Shell Spirax S4 ATF HDX (Factory Fill)	–	Initial Fill: 31 liter (32.8 qt)
	Oils listed in ZF TE-ML 03	–	Change: 23 liter (24.3 qt)
Cab Tilt System	JDM-J20C	–	1 liter (1.05 qt)
Fuel			
Fuel	See Approved Fuel and Engine Oil	–	294 liter (77.7 gal)
Fluids			
Air Conditioner Refrigerant	R134a	–	1,200 +/- 50 grams (45.8 +/- 1.8 oz)
Coolant	BASF GLYSANTIN READY MIX G40	Cummins Tier 3/Stage IIIA	26 liter (27.5 qt)
		Cummins Tier 4F/Stage IV	28 liter (29.6 qt)
	BASF GLYSANTIN READY MIX G40 (Factory Fill)	Mercedes-Benz Stage V	34 liter (35.9 qt)



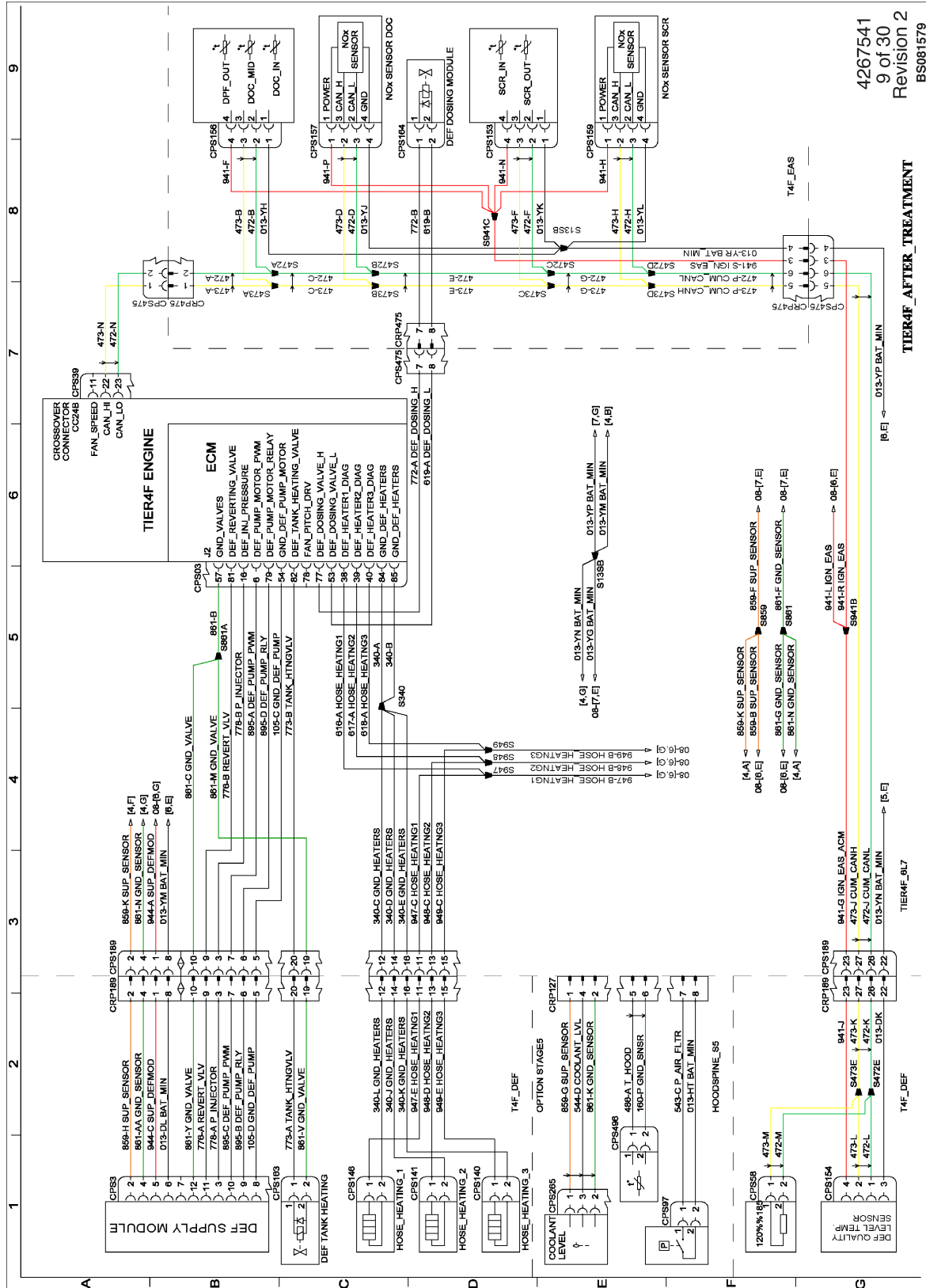
WARNING

Installing improper electrical accessories or installing an electrical accessory incorrectly can increase the risk of equipment damage, personal injury and fire. **DO NOT** install electrical accessories to the truck unless you have been trained and authorized to do so. Personnel installing the electrical accessories must document the changes made to the truck. **DO NOT** install accessories which affect the truck's compliance with standard EN 1175:2020.



WARNING

California Proposition 65 - Operating, servicing and maintaining a powered industrial truck can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.



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Figure 11. Electrical Schematics (Sheet 9 of 30)

	1	2	3	4	5	6	7	8	9
A	HARNES REFDES FUNCTION								
	VAM_CPS220	CabinRoof-SmartAntenna							
	VAM_CPS400	CabinRoof-Temperature							
	VAM_CPS482	VAM_BLACK							
	VAM_CPS483	VAM_BLACK							
	VAM_CPS484	VAM_GPS							
	VAM_CPS485	VAM_DATA							
	VAM_CPS486	VAM_LIGHT							
	VAM_BEACON_CPS487	VAM_BEACON_LIGHTS							
	VAM_BEACON_CPS474	BlueSpotReverse							
B	HARNES REFDES FUNCTION								
	CAB_FLOOR_CPS228	CabFloor-WasherPumps							
	CAB_FLOOR_CPS229	CabFloor-WasherPumps							
	CAB_FLOOR_CPS300	CoveredBackWasherFloor							
	CAB_FLOOR_CPS301	ThrottleMotorOnPedal							
	CAB_FLOOR_CPS332	InchingPedal							
	CAB_FLOOR_CPS378	WiperFront							
	CAB_FLOOR_CPS212	DiodeBlock							
	CAB_FLOOR_CPS213	Hom-							
	CAB_FLOOR_CPS431	DoorLeft							
C	HARNES REFDES FUNCTION								
	CAB_LIGHTS_CPS400	InnerFloorLightRight							
	CAB_LIGHTS_CPS401	OuterFloorLightRight							
	CAB_LIGHTS_CPS402	InnerFloorLightLeft							
	CAB_LIGHTS_CPS403	OuterFloorLightLeft							
	CAB_LIGHTS_CPS404	BeaconLight							
	CAB_LIGHTS_CPS405	CabinRoof-CabinLights							
	CAB_LIGHTS_CPS700	RearFloorLightLeft							
	CAB_LIGHTS_CPS701	OuterFloorLightLeft							
	CAB_LIGHTS_CPS702	InnerFloorLightLeft							
D	HARNES REFDES FUNCTION								
	CAB_LTS_REAR_CPS400	RearDriveLightRight							
	CAB_LTS_REAR_CPS401	RearDriveLightLeft							
	CAB_LTS_REAR_CPS402	CabinRoof-CabinLights							
	CAB_LTS_REAR_CPS474	BlueSpotReverse							
	CAB_LTS_REAR_CPS700	RearDriveLightLeft							
	HARNES REFDES FUNCTION								
	CAB_REAR_CPS1	SPED							
	CAB_REAR_CPS19	DiagnosisVehicleCAN							
	CAB_REAR_CPS74	WiperRear							
E	HARNES REFDES FUNCTION								
	CAB_REAR_CPS116	ACunit							
	CAB_REAR_CPS145	Accessory							
	CAB_REAR_CPS216	Communication							
	CAB_REAR_CPS228	CPCL_X1							
	CAB_REAR_CPS229	CPCL_X2							
	CAB_REAR_CPS230	CPCL_X3							
	CAB_REAR_CPS350	RearViewDisplay							
	CAB_REAR_CPS410	CabinRoof-CabinRoof							
	CAB_REAR_CPS411	CabinRoof-CabinRoof							
F	HARNES REFDES FUNCTION								
	CAB_REAR_CPS434	FRB_X1							
	CAB_REAR_CPS435	FRB_X2							
	CAB_REAR_CPS436	FRB_X4							
	CAB_REAR_CPS437	FRB_X5							
	CAB_REAR_CPS442	VSM_V2							
	CAB_REAR_CPS443	VSM_V3							
	CAB_REAR_CPS444	VSM_V4							
	CAB_REAR_CPS465	VSM_V5							
	CAB_REAR_CPS466	VSM_V6							
G	HARNES REFDES FUNCTION								
	CAB_REAR_CPS425	Frame-Cabin							
	CAB_REAR_CPS426	DiagnosisZF							
	CAB_REAR_CPS432	Armrest							
	CAB_REAR_CPS448	TemperatureOutside							
	CAB_REAR_CPS449	Diagnosis							
	CAB_REAR_CPS468	DiagnosisCBB02							

Figure 26. Electrical Schematics (Sheet 24 of 30)

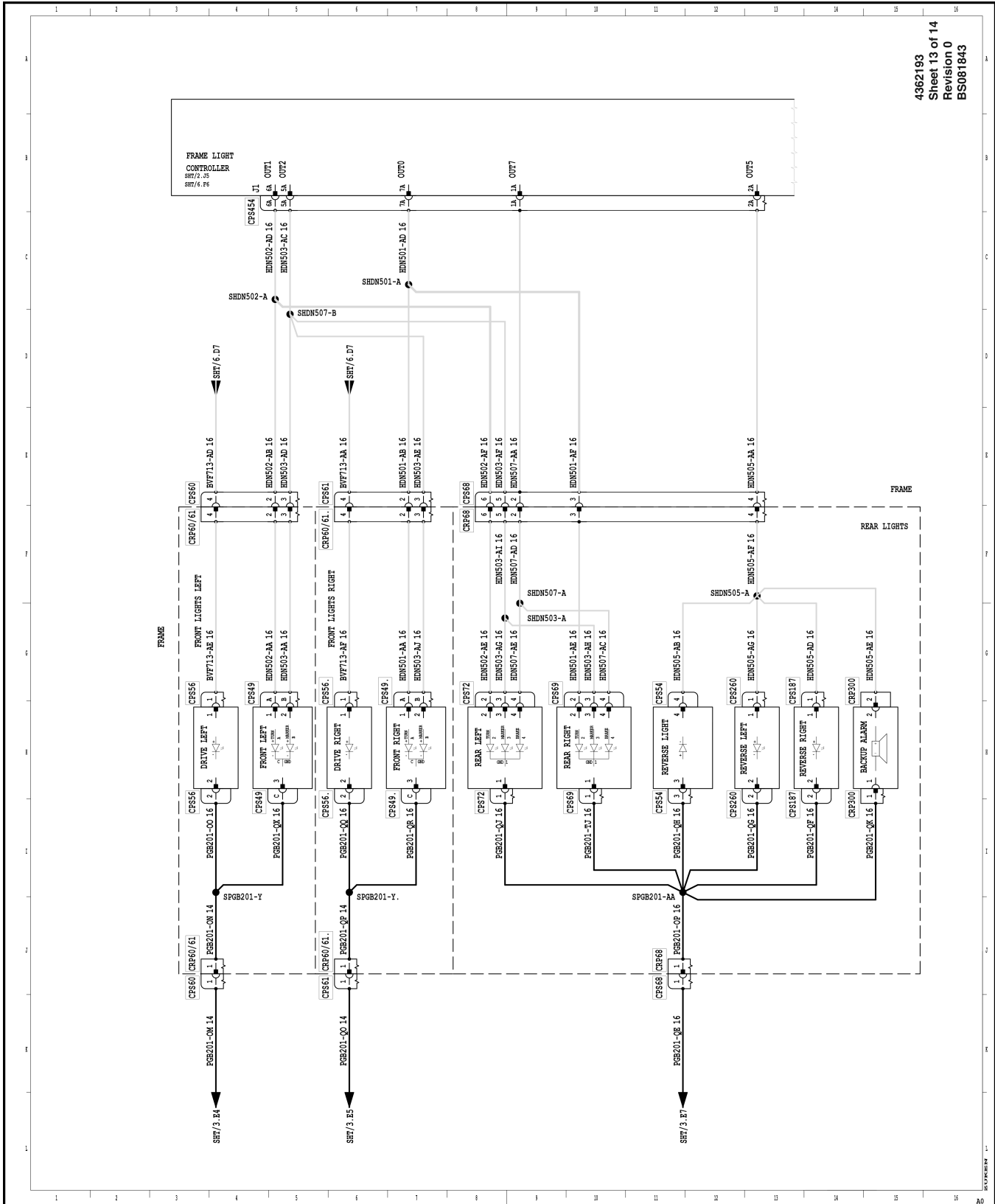
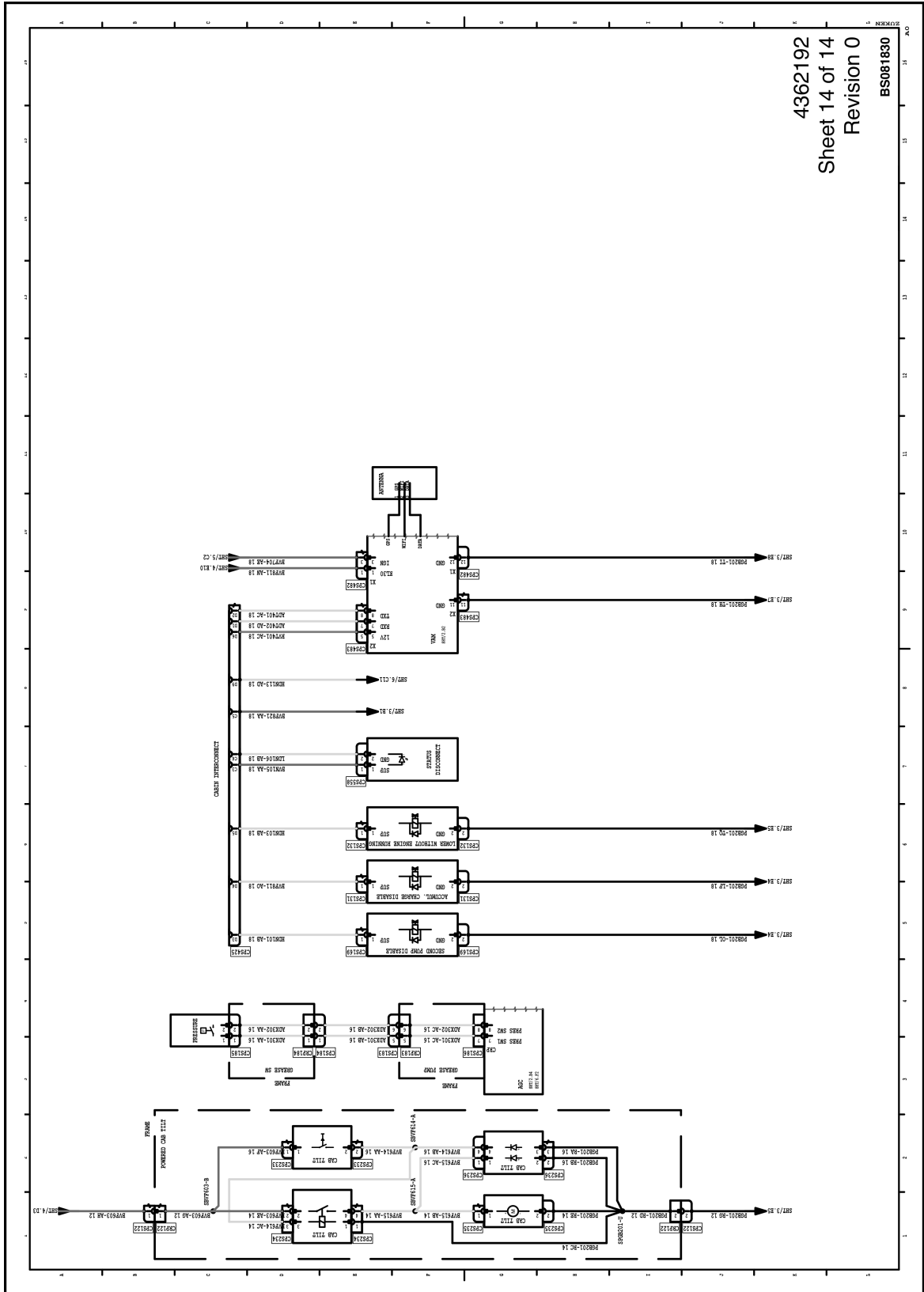


Figure 71. Electrical Schematics (Sheet 13 of 14)



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Figure 86. Electrical Schematics (Sheet 14 of 14)

Section 1 - Troubleshooting

TROUBLESHOOTING - SYMPTOM BASED

MAST

Troubleshooting Procedures

NOTE: Each main control valve section has status LEDs that can aid in troubleshooting procedures. If the LED is red, the spool is not changing position with the input command.

Each section also has a hexagon shaft that visibly rotates when the spool changes position. With the electrical connector disconnected, this shaft can be rotated to manually change the spool position.

Table 1. Mast Troubleshooting Procedures

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Mast lifts or lowers slowly or not at all	Flow settings of hydraulic control unit is too low.	Adjust hydraulic control flow settings.
	Relief valve adjusted wrong.	Adjust relief valve.
	Mast wear pads worn or adjusted too tight.	Replace or adjust mast wear pads.
	Mast lift cylinder is damaged.	Repair or replace mast lift cylinder.
	Hydraulic pump is damaged.	Repair or replace hydraulic pump.
	Directional control valve is damaged.	Repair or replace directional control valve.
	Mast lift cylinder hoses have restrictions.	Replace hoses.
	Lift interrupt is active.	Replace joystick.
Mast tilts slowly or not at all.	Flow settings of hydraulic control unit is too low.	Adjust hydraulic control flow settings.
	Relief valve adjusted wrong.	Adjust relief valve.
	Tilt cylinder(s) is damaged.	Replace or repair tilting cylinder.
	Directional control valve is damaged.	Repair or replace directional control valve.
	Hydraulic pump is damaged.	Repair or replace hydraulic pump.
	Tilt cylinder hoses have restrictions.	Replace hoses.
	Lift interrupt is active.	Replace joystick.

System	Fault code	Severity	Alarm	Display icon	Display description
ABS	00791-07	Warning	Off	183	WSS Wheel End
ABS	00792-07	Warning	Off	183	WSS Wheel End
ABS	00793-07	Warning	Off	183	WSS Wheel End
ABS	00794-07	Warning	Off	183	WSS Wheel End
ABS	00789-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00790-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00791-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00792-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00793-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00794-08	Warning	Off	183	WSS Erratic Sensor Signal
ABS	00789-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00790-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00791-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00792-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00793-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00794-13	Warning	Off	183	WSS Tire Size Calibration
ABS	00815-13	Warning	Off	183	WSS Configuration Error
ABS	00168-04	Warning	Off	183	Battery Voltage Too Low
ABS	00168-03	Warning	Off	183	Battery Voltage Too High
ABS	00938-04	Warning	Off	183	PMV REL Solenoid Shorted to Ground
ABS	00939-04	Warning	Off	183	PMV REL Solenoid Shorted to Ground
ABS	00940-04	Warning	Off	183	PMV REL Solenoid Shorted to Ground
ABS	00941-04	Warning	Off	183	PMV REL Solenoid Shorted to Ground

CABIN TIP*Table 12. Cabin Tip Fault Code Table*

Fault Code	Severity	Audible Alarm	Display Description
00001-08	Warning	Off	Left Actuator Hall Sensor Error
00002-03	Warning	Off	Left Actuator Overvoltage
00003-04	Warning	Off	Left Actuator Undervoltage
00004-07	Warning	Off	Left Actuator End Of Stroke Error
00005-00	Warning	Off	Left Actuator Temperature Error
00006-19	Warning	Off	Left Actuator Heartbeat Error
00007-22	Warning	Off	Left Actuator SMPS Error
00008-06	Warning	Off	Left Actuator Overcurrent
00009-12	Warning	Off	Left Actuator Current Measurement Error
00010-08	Warning	Off	Right Actuator Hall Sensor Error
00011-03	Warning	Off	Right Actuator Overvoltage
00012-04	Warning	Off	Right Actuator Undervoltage
00013-07	Warning	Off	Right Actuator End Of Stroke Error
00014-00	Warning	Off	Right Actuator Temperature Error
00015-19	Warning	Off	Right Actuator Heartbeat Error
00016-22	Warning	Off	Right Actuator SMPS Error
00017-06	Warning	Off	Right Actuator Overcurrent
00018-12	Warning	Off	Right Actuator Current Measurement Error

Table 18. Cummins Fault Code Table (Table 1 of 2) (Continued)

97-15	418	Off	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Least Severe Level
175-16	421	Off	Engine Oil Temperature 1	Engine Oil Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
111-2	422	Off	Engine Coolant Level	Coolant Level - Data erratic, intermittent or incorrect
175-2	425	Off	Engine Oil Temperature 1	Engine Oil Temperature - Data erratic, intermittent or incorrect
97-3	428	Off	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage Above Normal or Shorted to High Source
97-4	429	Off	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage Below Normal or Shorted to Low Source
558-2	431	Off	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Data Erratic, Intermittent, or Incorrect
558-13	432	Continues	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration
100-2	435	Off	Engine Oil Pressure	Engine Oil Rifle Pressure - Data Erratic, Intermittent, or Incorrect
105-2	436	Off	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data erratic, intermittent or incorrect
168-18	441	Off	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level
168-16	442	Off	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Moderately Severe Level
157-0	449	Continues	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Most Severe Level
157-3	451	Off	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Above Normal or Shorted to High Source
157-4	452	Off	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Below Normal or Shorted to Low Source
1349-3	483	Off	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage Above Normal or Shorted to High Source
1349-4	484	Off	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage Below Normal or Shorted to Low Source
626-18	487	Off	Engine Start Enable Device 1	
105-16	488	Off	Engine Intake Manifold Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
191-18	489	Off	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level
1377-2	497	Off	Engine Synchronization Switch	Multiple Unit Synchronization Switch - Data Erratic, Intermittent, or Incorrect
3514-3	515	Off	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage Above Normal or Shorted to High Source

Table 18. Cummins Fault Code Table (Table 1 of 2) (Continued)

4363-16	3235	Continues	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4340-3	3237	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage Above Normal or Shorted to High Source
4340-4	3238	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage Below Normal or Shorted to Low Source
4342-3	3239	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage Above Normal or Shorted to High Source
4342-4	3241	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage Below Normal or Shorted to Low Source
3363-7	3242	Off	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Mechanical System Not Responding or Out of Adjustment
3060-18	3243	Off	Engine Cooling System Monitor	
3936-7	3245	Off	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Mechanical system not responding or out of adjustment
4809-16	3247	Continues	Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Intake Temperature	
4810-15	3249	Off	Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Outlet Temperature	
4765-16	3251	Continues	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
3242-16	3253	Continues	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range
3242-15	3254	Off	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range
3246-16	3255	Continues	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range
3246-15	3256	Off	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range
4340-5	3258	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current Below Normal or Open Circuit

Table 19. Cummins Fault Code Table (Table 2 of 2) (Continued)

7026-3	4934	Off	Engine Diesel Fuel Metering Valve	
7026-4	4935	Off	Engine Diesel Fuel Metering Valve	
5380-11	4936	Off	Engine Fuel Valve 1 Preliminary FMI	
5380-13	4937	Off	Engine Fuel Valve 1 Preliminary FMI	
4353-31	4947	Off	Aftertreatment 1 Diesel Exhaust Fluid Doser Heating Mode Request	
6655-3	4951	Off	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Above Normal or Shorted to High Source
6655-4	4952	Off	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Below Normal or Shorted to Low Source
3353-3	4953	Off	Alternator 1 Status	
3353-4	4954	Off	Alternator 1 Status	
3490-16	4955	Off	Aftertreatment 1 Purge Air Actuator	
6713-13	4956	Off	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Out of Calibration
6713-31	4957	Off	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Condition Exists
7026-2	4958	Off	Engine Diesel Fuel Metering Valve	
7026-31	4959	Off	Engine Diesel Fuel Metering Valve	
7026-9	4961	Off	Engine Diesel Fuel Metering Valve	
5491-31	5115	Off	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay 1	
520754-2	5122	Off	Manufacturer Assignable SPN	
669-5	5123	Off	Engine Fuel 1 Injector Cylinder 19	
670-5	5124	Off	Engine Fuel 1 Injector Cylinder 20	
2006-9	5133	Off	Source Address 6	
111-17	5167	Off	Engine Coolant Level 1	
2900-19	5173	Off	Transmission Engine Crank Enable	

Table 20. ACM Fault Table (Continued)

3516-1	BC0D01	Aftertreatment 1 Diesel Exhaust Fluid Concentration Data Valid But Below Normal Operational Range - Most Severe Level	Use Xentry for description and troubleshooting.
3516-10	BC0D0A	Aftertreatment 1 Diesel Exhaust Fluid Concentration Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3516-11	BC0D0B	Aftertreatment 1 Diesel Exhaust Fluid Concentration Root Cause Not Known	Use Xentry for description and troubleshooting.
3516-13	BC0D0D	Aftertreatment 1 Diesel Exhaust Fluid Concentration Out Of Calibration	Use Xentry for description and troubleshooting.
3516-14	BC0D0E	Aftertreatment 1 Diesel Exhaust Fluid Concentration Special Instructions	Use Xentry for description and troubleshooting.
3516-16	BC0D10	Aftertreatment 1 Diesel Exhaust Fluid Concentration Data Valid But Above Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
3516-18	BC0D12	Aftertreatment 1 Diesel Exhaust Fluid Concentration Data Valid But Below Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
3516-19	BC0D13	Aftertreatment 1 Diesel Exhaust Fluid Concentration Received Network Data In Error	Use Xentry for description and troubleshooting.
3516-20	BC0D14	Aftertreatment 1 Diesel Exhaust Fluid Concentration Data Drifted High	Use Xentry for description and troubleshooting.
3516-21	BC0D15	Aftertreatment 1 Diesel Exhaust Fluid Concentration Data Drifted Low	Use Xentry for description and troubleshooting.
3516-3	BC0D03	Aftertreatment 1 Diesel Exhaust Fluid Concentration Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3516-4	BC0D04	Aftertreatment 1 Diesel Exhaust Fluid Concentration Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
3516-7	BC0D07	Aftertreatment 1 Diesel Exhaust Fluid Concentration Mechanical System Not Responding Or Out Of Adjustment	Use Xentry for description and troubleshooting.
3516-9	BC0D09	Aftertreatment 1 Diesel Exhaust Fluid Concentration Abnormal Update Rate	Use Xentry for description and troubleshooting.
3517-1	BD0D01	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Data Valid But Below Normal Operational Range - Most Severe Level	Use Xentry for description and troubleshooting.
3517-10	BD0D0A	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3517-11	BD0D0B	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Root Cause Not Known	Use Xentry for description and troubleshooting.
3517-13	BD0D0D	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Out Of Calibration	Use Xentry for description and troubleshooting.
3517-14	BD0D0E	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Special Instructions	Use Xentry for description and troubleshooting.
3517-17	BD0D11	Aftertreatment 1 Diesel Exhaust Fluid Tank Level 2 Data Valid But Below Normal Operating Range - Least Severe Level	Use Xentry for description and troubleshooting.

Table 20. ACM Fault Table (Continued)

5397-11	15150B	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent Root Cause Not Known	Use Xentry for description and troubleshooting.
5397-14	15150E	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent Special Instructions	Use Xentry for description and troubleshooting.
5397-16	151510	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent Data Valid But Above Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
5399-16	171510	DPF Thermal Management Active Data Valid But Above Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
5399-31	17151F	DPF Thermal Management Active Condition Exists	Use Xentry for description and troubleshooting.
5435-11	3B150B	ISP_SOOT_SENS Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
5435-7	3B1507	Aftertreatment 1 Diesel Exhaust Fluid Pump State Mechanical System Not Responding Or Out Of Adjustment	Use Xentry for description and troubleshooting.
5443-0	431500	Aftertreatment 1 Hydrocarbon Dosing System Data Valid But Above Normal Operational Range - Most Severe Level	Use Xentry for description and troubleshooting.
5443-15	43150F	Aftertreatment 1 Hydrocarbon Dosing System Data Valid But Above Normal Operating Range - Least Severe Level	Use Xentry for description and troubleshooting.
5443-16	431510	Aftertreatment 1 Hydrocarbon Dosing System Data Valid But Above Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
5488-3	701503	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 5 State Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
5488-4	701504	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 5 State Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
5488-5	701505	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 5 State Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
5503-13	7F150D	Aftertreatment 1 Fuel Mass Rate Out Of Calibration	Use Xentry for description and troubleshooting.
5569-3	C11503	Diesel Particulate Filter 1 Soot Sensor ECU Internal Temperature Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
5569-4	C11504	Diesel Particulate Filter 1 Soot Sensor ECU Internal Temperature Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
5713-20	511614	EDU Module High Side Switch 2 Pump/Heater Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.

Table 21. CPC4 Fault table (Continued)

558-6	2E0206	Idle Validation Switch 2 Circuit shorted to Ubat. The two idle switches are not synchronous (check AP)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13
569-9	390209	J1939 EAC1 Message is missing or not available	Check J1939 link connection to Electronic Axle Control
571-4	3B0204	Engine Brake Disable push-button shorted to Ground or pressed too long	Check wiring of associated pin Check parameters 13/19 (Selection), 13/62 (Fault Detect Ena) for correct configuration of input pin 4/18
596-13	54020D	J1939 Cruise Control Enable Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/22 (CC ON OFF Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address
596-19	540213	J1939 Cruise Control Enable Switch Signal from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/22 (CC ON OFF Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address
597-13	55020D	J1939 Service Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/29 (Service Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address
597-19	550213	J1939 Service Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/29 (Service Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address
598-2	560202	Clutch switch status not plausible	Check wiring of Clutch Switch and Driveline Open Status
599-4	570204	Cruise Control SET and RESUME Circuits shorted to GND (SET and RESUME applied at the same time)	Check wiring of associated pins
600-13	58020D	J1939 Cruise Control Coast Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/24 (CC Set Cst Res Accel Sw Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address

Table 22. MCM Fault Table (Table 1 of 2) (Continued)

1033-17	90411	Total ECU Run Time Data Valid But Below Normal Operating Range - Least Severe Level	Use Xentry for description and troubleshooting.
1033-18	90412	Total ECU Run Time Data Valid But Below Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
103-4	670004	Engine Turbocharger 1 Speed Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
1071-3	2F0403	Cooling Fan Drive Output Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
1071-4	2F0404	Cooling Fan Drive Output Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
1071-5	2F0405	Cooling Fan Drive Output Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
1072-2	300402	Engine (Compression) Brake Output #1 Data Erratic, Intermittent Or Incorrect	Use Xentry for description and troubleshooting.
1072-3	300403	Engine (Compression) Brake Output #1 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
1072-4	300404	Engine (Compression) Brake Output #1 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
1072-5	300405	Engine (Compression) Brake Output #1 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
1072-7	300407	Wheel-Based Vehicle Speed Abnormal Update Rate	Use Xentry for description and troubleshooting.
1073-2	310402	Engine (Compression) Brake Output #2 Data Erratic, Intermittent Or Incorrect	Use Xentry for description and troubleshooting.
1073-3	310403	Engine (Compression) Brake Output #2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
1073-4	310404	Engine (Compression) Brake Output #2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
1073-5	310405	Engine (Compression) Brake Output #2 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
1077-14	35040E	Engine Fuel Injection Pump Controller Special Instructions	Use Xentry for description and troubleshooting.
1077-3	350403	Engine Fuel Injection Pump Controller Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
1077-4	350404	Engine Fuel Injection Pump Controller Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
1077-5	350405	Engine Fuel Injection Pump Controller Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
1077-6	350406	Engine Fuel Injection Pump Controller Current Above Normal Or Grounded Circuit	Use Xentry for description and troubleshooting.
108-3	6C0003	Barometric Pressure Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.

Table 22. MCM Fault Table (Table 1 of 2) (Continued)

3659-10	4B0E0A	Engine Injector Cylinder #1 Actuator 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3659-3	4B0E03	Engine Injector Cylinder #1 Actuator 2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3659-4	4B0E04	Engine Injector Cylinder #1 Actuator 2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
3659-5	4B0E05	Engine Injector Cylinder #1 Actuator 2 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
3659-6	4B0E06	Engine Injector Cylinder #1 Actuator 2 Current Above Normal Or Grounded Circuit	Use Xentry for description and troubleshooting.
3660-10	4C0E0A	Engine Injector Cylinder #2 Actuator 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3660-3	4C0E03	Engine Injector Cylinder #2 Actuator 2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3660-4	4C0E04	Engine Injector Cylinder #2 Actuator 2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
3660-5	4C0E05	Engine Injector Cylinder #2 Actuator 2 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
3660-6	4C0E06	Engine Injector Cylinder #2 Actuator 2 Current Above Normal Or Grounded Circuit	Use Xentry for description and troubleshooting.
3661-10	4D0E0A	Engine Injector Cylinder #3 Actuator 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3661-3	4D0E03	Engine Injector Cylinder #3 Actuator 2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3661-4	4D0E04	Engine Injector Cylinder #3 Actuator 2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
3661-5	4D0E05	Engine Injector Cylinder #3 Actuator 2 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
3661-6	4D0E06	Engine Injector Cylinder #3 Actuator 2 Current Above Normal Or Grounded Circuit	Use Xentry for description and troubleshooting.
3662-10	4E0E0A	Engine Injector Cylinder #4 Actuator 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3662-3	4E0E03	Engine Injector Cylinder #4 Actuator 2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3662-4	4E0E04	Engine Injector Cylinder #4 Actuator 2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.
3662-5	4E0E05	Engine Injector Cylinder #4 Actuator 2 Current Below Normal Or Open Circuit	Use Xentry for description and troubleshooting.
3662-6	4E0E06	Engine Injector Cylinder #4 Actuator 2 Current Above Normal Or Grounded Circuit	Use Xentry for description and troubleshooting.
3663-10	4F0E0A	Engine Injector Cylinder #5 Actuator 2 Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
3663-3	4F0E03	Engine Injector Cylinder #5 Actuator 2 Voltage Above Normal, Or Shorted To High Source	Use Xentry for description and troubleshooting.
3663-4	4F0E04	Engine Injector Cylinder #5 Actuator 2 Voltage Below Normal, Or Shorted To Low Source	Use Xentry for description and troubleshooting.

Table 23. MCM Fault Code Table (Table 2 of 2) (Continued)

521120-18	A0F3F2	Charge Air Cooler Outlet Differential Pressure Data Drifted Low	Use Xentry for description and troubleshooting.
521120-31	A0F3FF	EGR_LBD_FEEDBACK Data Valid But Above Normal Operating Range - Moderately Severe Level	Use Xentry for description and troubleshooting.
521121-16	A1F3F0	Engine Coolant Pump Outlet Temperature Abnormal Rate Of Change	Use Xentry for description and troubleshooting.
521121-18	A1F3F2	Engine Exhaust Gas Recirculation 1 Temperature Data Erratic, Intermittent Or Incorrect	Use Xentry for description and troubleshooting.
521121-31	A1F3FF	EGR System Monitor Condition Exists	Use Xentry for description and troubleshooting.
521122-16	A2F3F0	Engine Intake Air Mass Flow Rate Data Valid But Below Normal Operational Range - Most Severe Level	Use Xentry for description and troubleshooting.
521122-18	A2F3F2	Engine Turbocharger 1 Compressor Intake Temperature Data Drifted High	Use Xentry for description and troubleshooting.
521122-31	A2F3FF	EGR System Monitor Mechanical System Not Responding Or Out Of Adjustment	Use Xentry for description and troubleshooting.
521123-18	A3F3F2	LAMBDA_DEV_NOX Data Erratic, Intermittent Or Incorrect	Use Xentry for description and troubleshooting.
521124-3	A4F3E3	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521124-4	A4F3E4	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521124-5	A4F3E5	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-10	A6F3EA	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-11	A6F3EB	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-13	A6F3ED	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-14	A6F3EE	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-2	A6F3E2	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-31	A6F3FF	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521126-9	A6F3E9	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521127-16	A7F3F0	Engine Coolant System Thermostat Data Valid But Below Normal Operational Range - Most Severe Level	Use Xentry for description and troubleshooting.
521127-18	A7F3F2	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521128-16	A8F3F0	Engine Coolant Pump Outlet Temperature Data Valid But Below Normal Operating Range - Least Severe Level	Use Xentry for description and troubleshooting.
521128-18	A8F3F2	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521129-16	A9F3F0	Engine Turbocharger 1 Speed Data Valid But Above Normal Operating Range - Least Severe Level	Use Xentry for description and troubleshooting.
521129-18	A9F3F2	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.
521130-16	AAF3F0	Engine Intake Air Mass Flow Rate Data Erratic, Intermittent Or Incorrect	Use Xentry for description and troubleshooting.
521130-18	AAF3F2	FMM_AS_ET_TEST2 Condition Exists	Use Xentry for description and troubleshooting.

HYDRAULIC CONTROLLER

NOTE: The following actions are common to all Hydraulic Controller fault codes:

- **Controller Action:** Store fault and send fault to the display.
- **Operator Action:** Stop machine & contact service for troubleshooting.

- **Fault Cause:** Open load detected (Open circuit, no current draw). Over Load (Current draw > 3 Amps). Possible open circuit. Possible short circuit.
- **Troubleshooting:** Diagnose via Display, check pin value. Check actuation, values, wiring, connectors. Measure voltage. Cycle ignition to reset fault.

HYDRAULIC CONTROLLER 1*Table 27. Hydraulic Controller 1 Fault Code Table*

Fault Code	Display Description	Severity	Audible Alarm
08001-12	HCU1 Pin31 open load / over load / over temperature / mode error	Log Only	Off
08002-12	HCU1 Pin32 open load / over load / over temperature / mode error	Log Only	Off
08003-12	HCU1 Pin33 open load / over load / over temperature / mode error	Log Only	Off
08004-12	HCU1 Pin34 open load / over load / over temperature / mode error	Log Only	Off
08005-12	HCU1 Pin35 open load / over load / over temperature / mode error	Disabled	Off
08006-12	HCU1 Pin36 open load / over load / over temperature / mode error	Disabled	Off
08007-12	HCU1 Pin37 open load / over load / over temperature / mode error	Log Only	Off
08008-12	HCU1 Pin38 open load / over load / over temperature / mode error	Log Only	Off
08009-12	HCU1 Pin39 open load / over load / over temperature / mode error	Log Only	Off
08010-12	HCU1 Pin40 open load / over load / over temperature / mode error	Log Only	Off
08011-12	HCU1 Pin41 open load / over load / over temperature / mode error	Log Only	Off
08012-12	HCU1 Pin42 open load / over load / over temperature / mode error	Log Only	Off
08013-12	HCU1 Pin43 open load / over load / over temperature / mode error	Log Only	Off
08014-12	HCU1 Pin44 open load / over load / over temperature / mode error	Log Only	Off
08015-12	HCU1 Pin45 open load / over load / over temperature / mode error	Log Only	Off
08016-12	HCU1 Pin46 open load / over load / over temperature / mode error	Log Only	Off

Table 30. Spreader Fault Code Table (Continued)

Fault Code	Display Description	Fault Description	Fault Cause and Conditions	Troubleshooting
09184-22	Sensor Unlocked Right front Error	Unlocked RH front sensor fault	Unlocked RH front sensor fault	Check sensor S4.1 Check wiring
09185-22	Sensor Unlocked Right rear Error	Unlocked RH rear sensor fault	Unlocked RH rear sensor fault	Check sensor S4.2 Check wiring

Table 31. Spreader (Innovation) Fault Code Table (Table 1 of 3) (Continued)

System	Fault Code	Severity	Alarm	Display Icon	Display Description	Fault Description
Spreader EN1175	520348-2	Critical	Off	214	2nd Left Locked Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520348-3	Critical	Off	214	2nd Left Locked Sensor Voltage	Above Normal
Spreader EN1175	520348-4	Critical	Off	214	2nd Left Locked Sensor Voltage	Below Normal
Spreader EN1175	520348-5	Critical	Off	214	2nd Left Locked Sensor Current	Below Normal
Spreader EN1175	520348-6	Critical	Off	214	2nd Left Locked Sensor Current	Above Normal
Spreader EN1175	520349-0	Critical	Off	214	2nd Right Locked Sensor Data	Out of Range
Spreader EN1175	520349-2	Critical	Off	214	2nd Right Locked Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520349-3	Critical	Off	214	2nd Right Locked Sensor Voltage	Above Normal
Spreader EN1175	520349-4	Critical	Off	214	2nd Right Locked Sensor Voltage	Below Normal
Spreader EN1175	520349-5	Critical	Off	214	2nd Right Locked Sensor Current	Below Normal
Spreader EN1175	520349-6	Critical	Off	214	2nd Right Locked Sensor Current	Above Normal
Spreader EN1175	520350-0	Critical	Off	214	2nd Left Unlocked Sensor Data	Out of Range
Spreader EN1175	520350-2	Critical	Off	214	2nd Left Unlocked Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520350-3	Critical	Off	214	2nd Left Unlocked Sensor Voltage	Above Normal
Spreader EN1175	520350-4	Critical	Off	214	2nd Left Unlocked Sensor Voltage	Below Normal
Spreader EN1175	520350-5	Critical	Off	214	2nd Left Unlocked Sensor Current	Below Normal
Spreader EN1175	520350-6	Critical	Off	214	2nd Left Unlocked Sensor Current	Above Normal
Spreader EN1175	520351-0	Critical	Off	214	2nd Right Unlocked Sensor Data	Out of Range
Spreader EN1175	520351-2	Critical	Off	214	2nd Right Unlocked Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520351-3	Critical	Off	214	2nd Right Unlocked Sensor Voltage	Above Normal

Table 31. Spreader (Innovation) Fault Code Table (Table 1 of 3) (Continued)

System	Fault Code	Severity	Alarm	Display Icon	Display Description	Fault Description
Spreader EN1175	520399-0	Warning	Off	213	ISO Sensor Front Right Data	Out of Range
Spreader EN1175	520399-2	Warning	Off	213	ISO Sensor Front Right Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520399-3	Warning	Off	213	ISO Sensor Front Right Voltage	Above Normal
Spreader EN1175	520399-4	Warning	Off	213	ISO Sensor Front Right Voltage	Below Normal
Spreader EN1175	520399-5	Warning	Off	213	ISO Sensor Front Right Current	Below Normal
Spreader EN1175	520399-6	Warning	Off	213	ISO Sensor Front Right Current	Above Normal
Spreader EN1175	520400-0	Warning	Off	213	ISO Sensor Rear Right Data	Out of Range
Spreader EN1175	520400-2	Warning	Off	213	ISO Sensor Rear Right Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520400-3	Warning	Off	213	ISO Sensor Rear Right Voltage	Above Normal
Spreader EN1175	520400-4	Warning	Off	213	ISO Sensor Rear Right Voltage	Below Normal
Spreader EN1175	520400-5	Warning	Off	213	ISO Sensor Rear Right Current	Below Normal
Spreader EN1175	520400-6	Warning	Off	213	ISO Sensor Rear Right Current	Above Normal
Spreader EN1175	520401-0	Warning	Off	213	WTP Sensor Front Left Data	Out of Range
Spreader EN1175	520401-2	Warning	Off	213	WTP Sensor Front Left Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520401-3	Warning	Off	213	WTP Sensor Front Left Voltage	Above Normal
Spreader EN1175	520401-4	Warning	Off	213	WTP Sensor Front Left Voltage	Below Normal
Spreader EN1175	520401-5	Warning	Off	213	WTP Sensor Front Left Current	Below Normal
Spreader EN1175	520401-6	Warning	Off	213	WTP Sensor Front Left Current	Above Normal
Spreader EN1175	520402-0	Warning	Off	213	WTP Sensor Rear Left Data	Out of Range
Spreader EN1175	520402-2	Warning	Off	213	WTP Sensor Rear Left Data	Erratic, Intermittent or Incorrect

Table 32. Spreader (EN1175) Fault Code Table (Table 2 of 3) (Continued)

System	Fault Code	Severity	Alarm	Display Icon	Display Description	Fault Description
Spreader EN1175	520450-0	Warning	Off	213	Front RH Leg Shoulder Out Sensor Data	Out of Range
Spreader EN1175	520450-2	Warning	Off	213	Front RH Leg Shoulder Out Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520450-3	Warning	Off	213	Front RH Leg Shoulder Out Sensor Voltage	Above Normal
Spreader EN1175	520450-4	Warning	Off	213	Front RH Leg Shoulder Out Sensor Voltage	Below Normal
Spreader EN1175	520450-5	Warning	Off	213	Front RH Leg Shoulder Out Sensor Current	Below Normal
Spreader EN1175	520450-6	Warning	Off	213	Front RH Leg Shoulder Out Sensor Current	Above Normal
Spreader EN1175	520451-0	Warning	Off	213	Front RH Leg Shoulder In Sensor Data	Out of Range
Spreader EN1175	520451-2	Warning	Off	213	Front RH Leg Shoulder In Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520451-3	Warning	Off	213	Front RH Leg Shoulder In Sensor Voltage	Above Normal
Spreader EN1175	520451-4	Warning	Off	213	Front RH Leg Shoulder In Sensor Voltage	Below Normal
Spreader EN1175	520451-5	Warning	Off	213	Front RH Leg Shoulder In Sensor Current	Below Normal
Spreader EN1175	520451-6	Warning	Off	213	Front RH Leg Shoulder In Sensor Current	Above Normal
Spreader EN1175	520452-0	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Data	Out of Range
Spreader EN1175	520452-2	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520452-3	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Voltage	Above Normal
Spreader EN1175	520452-4	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Voltage	Below Normal
Spreader EN1175	520452-5	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Current	Below Normal
Spreader EN1175	520452-6	Warning	Off	213	Rear RH Leg Shoulder Out Sensor Current	Above Normal
Spreader EN1175	520453-0	Warning	Off	213	Rear RH Leg Shoulder In Sensor Data	Out of Range
Spreader EN1175	520453-2	Warning	Off	213	Rear RH Leg Shoulder In Sensor Data	Erratic, Intermittent or Incorrect

Table 32. Spreader (EN1175) Fault Code Table (Table 2 of 3) (Continued)

System	Fault Code	Severity	Alarm	Display Icon	Display Description	Fault Description
Spreader EN1175	520532-4	Warning	Off	213	Adj. TWL Right Out Valve Voltage	Below Normal
Spreader EN1175	520532-5	Warning	Off	213	Adj. TWL Right Out Valve Current	Below Normal
Spreader EN1175	520532-6	Warning	Off	213	Adj. TWL Right Out Valve Current	Above Normal
Spreader EN1175	520532-7	Warning	Off	213	Adj. TWL Right Out Valve Mechanical	Not Responding
Spreader EN1175	520532-31	Disabled	Off		Adj. TWL Right Out Valve Function	Prohibited
Spreader EN1175	520533-0	Warning	Off	213	Adj. TWL Left In Valve Data	Out of Range
Spreader EN1175	520533-2	Warning	Off	213	Adj. TWL Left In Valve Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520533-3	Warning	Off	213	Adj. TWL Left In Valve Voltage	Above Normal
Spreader EN1175	520533-4	Warning	Off	213	Adj. TWL Left In Valve Voltage	Below Normal
Spreader EN1175	520533-5	Warning	Off	213	Adj. TWL Left In Valve Current	Below Normal
Spreader EN1175	520533-6	Warning	Off	213	Adj. TWL Left In Valve Current	Above Normal
Spreader EN1175	520533-7	Warning	Off	213	Adj. TWL Left In Valve Mechanical	Not Responding
Spreader EN1175	520533-31	Disabled	Off		Adj. TWL Left In Valve Function	Prohibited
Spreader EN1175	520534-0	Warning	Off	213	Adj. TWL Right In Valve Data	Out of Range
Spreader EN1175	520534-2	Warning	Off	213	Adj. TWL Right In Valve Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520534-3	Warning	Off	213	Adj. TWL Right In Valve Voltage	Above Normal
Spreader EN1175	520534-4	Warning	Off	213	Adj. TWL Right In Valve Voltage	Below Normal
Spreader EN1175	520534-5	Warning	Off	213	Adj. TWL Right In Valve Current	Below Normal
Spreader EN1175	520534-6	Warning	Off	213	Adj. TWL Right In Valve Current	Above Normal
Spreader EN1175	520534-7	Warning	Off	213	Adj. TWL Right In Valve Mechanical	Not Responding

Table 33. Spreader (EN1175) Fault Code Table (Table 3 of 3) (Continued)

System	Fault Code	Severity	Alarm	Display Icon	Display Description	Fault Description
Spreader EN1175	520582-2	Warning	Off	213	Left Rear Twistlock light Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520582-3	Warning	Off	213	Left Rear Twistlock light Voltage	Above Normal
Spreader EN1175	520582-4	Warning	Off	213	Left Rear Twistlock light Voltage	Below Normal
Spreader EN1175	520582-5	Warning	Off	213	Left Rear Twistlock light Current	Below Normal
Spreader EN1175	520582-6	Warning	Off	213	Left Rear Twistlock light Current	Above Normal
Spreader EN1175	520583-0	Warning	Off	213	Right Front Twistlock light Data	Out of Range
Spreader EN1175	520583-2	Warning	Off	213	Right Front Twistlock light Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520583-3	Warning	Off	213	Right Front Twistlock light Voltage	Above Normal
Spreader EN1175	520583-4	Warning	Off	213	Right Front Twistlock light Voltage	Below Normal
Spreader EN1175	520583-5	Warning	Off	213	Right Front Twistlock light Current	Below Normal
Spreader EN1175	520583-6	Warning	Off	213	Right Front Twistlock light Current	Above Normal
Spreader EN1175	520584-0	Warning	Off	213	Right Rear Twistlock light Data	Out of Range
Spreader EN1175	520584-2	Warning	Off	213	Right Rear Twistlock light Data	Erratic, Intermittent or Incorrect
Spreader EN1175	520584-3	Warning	Off	213	Right Rear Twistlock light Voltage	Above Normal
Spreader EN1175	520584-4	Warning	Off	213	Right Rear Twistlock light Voltage	Below Normal
Spreader EN1175	520584-5	Warning	Off	213	Right Rear Twistlock light Current	Below Normal
Spreader EN1175	520584-6	Warning	Off	213	Right Rear Twistlock light Current	Above Normal

Table 36. Transmission Fault Code Table (Continued)

Fault Code	Supplier Code	Display Description	Fault Description	Controller Reaction	Troubleshooting
5431-9	0x66	Engine speed limit function does not work properly during stall or output speed limit function	<ul style="list-style-type: none"> - Engine controller is defective - Interference on CAN-Bus 	OP-Mode: normal After selection neutral only limited gears available, depending on application	<ul style="list-style-type: none"> - Check engine controller - Check wire of CAN-Bus - Check cable to engine controller - Engine controller may ignore speed limit command from TCU via TSC1 message.
5440-2	0x69	Reference engine torque signal - defective	<p>CAN signal for reference of engine torque is defective</p> <ul style="list-style-type: none"> - Engine controller is defective - Interference on CAN-Bus 	OP-Mode: substitute clutch control	<ul style="list-style-type: none"> - Check engine controller - Check wire of CAN-Bus - Check cable to engine controller
5450-2	0x6A	Engine Actual torque signal - defective	<p>CAN signal is defective.</p> <ul style="list-style-type: none"> - Discontinuity on CAN bus. - Engine control unit has internal defect. 	OP-Mode: substitute clutch control	<p>In case of automatic reset a sporadic electrical failure or bus overload is assumed.</p> <ul style="list-style-type: none"> - Check power supply of control unit. - Check CAN wiring for discontinuities, in particular for defective plug connection like corroded or damaged plug contact.

Table 36. Transmission Fault Code Table (Continued)

Fault Code	Supplier Code	Display Description	Fault Description	Controller Reaction	Troubleshooting
5700-0	0xB7	Oil over temperature sump	<p>Transmission sump oil temperature exceeds released range.</p> <ul style="list-style-type: none"> - Cooling system defective. - Load permanently too high. 	<p>Inching is deactivated.</p> <p>Transmission switches to clutch cut-off (CCO).</p> <p>Engine performance is derated.</p> <p>Gear range limitation is enabled.</p> <p>If the fault code is active for more than 60 sec, then the transmission shifts to neutral.</p> <p>OP-Mode: normal</p>	<p>Reason for increased heat input into transmission must be localized.</p> <ul style="list-style-type: none"> - Cool down the machine. Shift the transmission to Neutral. - Check oil level. - Check transmission oil cooler for pollution and damage. - Check connecting tubes from transmission to cooler for damage. - Check transmission oil temperature using a diagnostic tool. If the measured oil temperature does not decrease during vehicle idle after some minutes, then change temperature sensor. - To allow gear engagement if the fault code has been active for more than 60 sec, then switch the ignition off and then on. Gear engagement is then allowed for at least 60 sec.
5720-0	0xB9	Over speed engine	<p>Input shaft speed exceeds the maximum permitted speed. Retarder is applied (if configured).</p> <ul style="list-style-type: none"> - Engine is over speeding. 	<p>Retarder applies if configured</p> <p>OP-Mode: normal</p>	<ul style="list-style-type: none"> - Reduce engine speed. - To avoid permanent damage remain within the specified speed range.

Fault Code	Display Icon	Display Description	Fault Description	Severity	Audible Alarm	Controller Action	Troubleshooting
							5. Check the function of the alternator as well as the settings of the alternator control unit and replace both if necessary.
523000-4	148	Battery undervoltage	The control unit detects a voltage of < 9.00 volt (12 V device) or < 16.00 volt (24 volt device) on the supply input terminal 30. <ul style="list-style-type: none"> • The alternator control unit has an internal defect. • Vehicle battery not sufficiently charged. • Wiring or plug connection defective (supply or ground cable). • Control unit parameters incorrectly set. 	Critical	On	Transmission Shutdown	The cause of the missing or insufficient voltage on terminal 30 must be located. <ol style="list-style-type: none"> 1. Check the fuse of the terminal 30 control units. 2. If the error occurs after a (sluggish) vehicle start, check the vehicle battery. Recharge the battery to ensure that it is sufficiently charged. 3. Make sure that the control unit has a stable voltage supply. Check the stability of the voltage with Testman. 4. Check the wiring between the alternator and the control unit, in particular with regard to defective plug connections such as corroded or damaged plug contacts. Pay special attention to the ground wiring. 5. Check the function of the alternator as well as the settings of the alternator control unit and replace both if necessary.

Fault Code	Display Icon	Display Description	Fault Description	Severity	Audible Alarm	Controller Action	Troubleshooting
523140-6	147	Resistance sensor input 1 (ER1) short to ground: Sump temperature	<p>The measured line resistance between the connected component and the control unit is too high or the voltage on the control unit output is too low.</p> <ul style="list-style-type: none"> Wiring or plug connection contacts vehicle ground. Component has an internal defect. Control unit has an internal defect. 	Warning	Off	Normal	<ol style="list-style-type: none"> Switch the ignition off, unplug the control unit and measure the resistance of the connected component using a terminal tester. Check the wiring between the connected component and the control unit, in particular with regard to defective plug connections such as corroded or damaged plug contacts. Check the function of the connected component and replace it if needed. Replace the control unit if the error continues to occur.
523155-3	147	Current sensor input 2 (EI2) overvoltage: Oil Filter Restriction Switch	<p>The measured voltage at the input is too high.</p> <ul style="list-style-type: none"> Wiring or plug connection is defective. Component has an internal defect. Control unit has an internal defect. 	Warning	Off	Normal	<p>The cause of the incorrect voltage must be located.</p> <ol style="list-style-type: none"> Check the wiring, in particular with regard to defective plug connections such as corroded or damaged plug contacts. Check the correct wiring of the pins. Check the function of the connected component or replace the component. Replace the control unit if the error continues to occur.

Fault Code	Display Icon	Display Description	Fault Description	Severity	Audible Alarm	Controller Action	Troubleshooting
							<ol style="list-style-type: none"> 4. Check the function of the connected component and replace it if needed. 5. Replace the control unit if the error continues to occur.
523215-8	148	Current output driver 4 (AIM04) short circuit to another valve	<p>The measured line resistance between the proportional valve and the control unit is too high or the voltage on the control unit output is too low.</p> <ul style="list-style-type: none"> • Wiring or plug connection contacts another proportional valve. • Proportional valve has an internal defect. • Control unit has an internal defect. 	Critical	On	Transmission Shutdown	<ol style="list-style-type: none"> 1. Switch the ignition off, wait 10 seconds and switch the ignition back on. Check if the error is still active. 2. Check if the error occurs with an additional proportional valve or with which valve the error is bypassed. 3. Check the wiring between the proportional valve and the control unit, in particular with regard to defective plug connections such as corroded or damaged plug contacts. 4. Switch the ignition off, unplug the control unit, and measure the resistance of the proportional valve using a terminal tester. 5. Check the function of the proportional valve and replace it if needed. 6. Replace the control unit if the error continues to occur.
523220-2	148	Current output driver 5 (AIM05) unknown electrical component	If this error occurs, an electrical component has been connected to the output although it should not be used.	Critical	On	Transmission Shutdown	<ol style="list-style-type: none"> 1. Using the circuit diagram, check if a component is assigned to the output.

Fault Code	Display Icon	Display Description	Fault Description	Severity	Audible Alarm	Controller Action	Troubleshooting
523280-5	148	Digital current output driver 1 (ADM1) open circuit	TCU detected a wrong voltage at the output pin that looks like an open circuit for this output pin. <ul style="list-style-type: none"> Cable is defective and has no connection to TCU. Connector has no connection to TCU. Device has an internal defect. 	Critical	On	Transmission Shutdown	<ol style="list-style-type: none"> Check the cable from TCU to the device at ADM1. Check the connectors. Check the resistance of the device at ADM1.
523280-6	148	Digital current output driver 1 (ADM1) short to ground	TCU detected a wrong voltage at the output pin that looks like a short circuit to vehicle ground. <ul style="list-style-type: none"> Cable is defective and is contacted to vehicle ground. Connector pin is contacted to vehicle ground. Device has an internal defect. 	Critical	On	Transmission Shutdown	<ol style="list-style-type: none"> Check the cable from TCU to the device at ADM1. Check the connectors. Check the resistance of the device at ADM1.
523280-12	148	Digital current output driver 1 (ADM1) defect	TCU detected overtemperature or an internal error at the digital output.	Critical	On	Transmission Shutdown	Change TCU
523281-3	148	Digital current output driver 2 (ADM2) short to battery	TCU detected a wrong voltage at the output pin that looks like a short circuit to battery voltage. <ul style="list-style-type: none"> Cable is defective and is contacted to battery voltage. 	Critical	On	Transmission Shutdown	<ol style="list-style-type: none"> Check the cable from TCU to the device at ADM2. Check the connectors. Check the resistance of the device at ADM2.

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