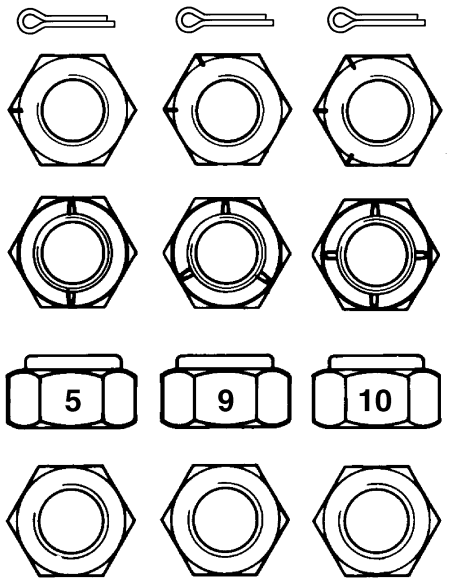
Yale®

Maintenance

METRIC AND INCH (SAE) FASTENERS



HM210064

GENERAL INSTRUCTIONS

1 Become familiar with the content, layout, and access provisions of data in this manual. This will improve your efficiency and decrease the time required to resolve the problems.

2 Use all sections of the manual for relevant information on the subject system.

3 Once you begin a troubleshooting procedure, do not skip steps.

4 If you reach the end of a procedure without resolving the problem and you are not directed to another procedure contact Resident Service Engineering through the Contact Management System.

5 Do not limit yourself, remember to apply your own experience and knowledge to assist in resolving the problems, but do not compromise safety in doing so.

6 Most of the cross-reference data in the manual will be electronically linked for rapid and easy access. Use the links wherever the cursor highlights an item as a linkable option.

As an example of this linking option:

Assume that during a procedure or test, it is necessary to refer to a different section of manual, in this case, the Light Circuit Check in the Operational Checkout part of this manual.

The instruction would read, "refer to, or see" followed by text identifying what the reference is (for hard-copy, paper manual use). When the cursor is placed over the text, it will then indicate that it is active, and left-clicking will direct the system to take you directly to that reference.

gassing of the electrolyte. Less fluid is lost, eliminating the need to add water. Venting of gases from a maintenance-free battery is done through a vent.' Most maintenance-free batteries do not have typical vent caps.' These batteries are ready for service when they leave the factory. They have a very low rate of discharge and thus, have a longer shelf life than a conventional standard battery.

BATTERY CHARGING

WARNING

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

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

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

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

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

BATTERY FAST CHARGING

WARNING

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

To fast charge the battery, perform the following steps:

1. Disconnect the truck negative (−) and then positive (+) lead. Check, and if necessary, fill the cells with distilled water to the level recommended.
2. Connect the battery to the charger following manufacturer's recommendations. Set the charger to 15-30 amps for a 12-volt battery.
3. Start the charger at a slow or low charging rate.
4. Increase the charging rate one selection' at a time.
5. Observe the charger ammeter after one minute at each selection for a 10-amp' charging rate. If necessary, select boost.
6. After the battery has charged for 3 minutes, monitor the electrolyte and look for signs of excessive gassing.
7. Reduce the charging rate until the electrolyte produces comparatively few bubbles, but basing has not stopped entirely.

The maximum charging time at the boost selection is 10 minutes for a conventional battery and 20 minutes for a maintenance-free battery. Cold temperatures can increase the time required to charge the battery. Check the charger instructions for additional details. If the battery is not accepting the required 10-ampere charging rate by the specified time, replace the battery.

The charging rate for conventional batteries may require 2 to 4 hours. The charging rate for maintenance-free batteries may require 4 to 8 hours. Once the battery is charged, check the electrolyte specific gravity after the battery has cooled for 30 minutes. The specific gravity should be between 1.230 and 1.265.

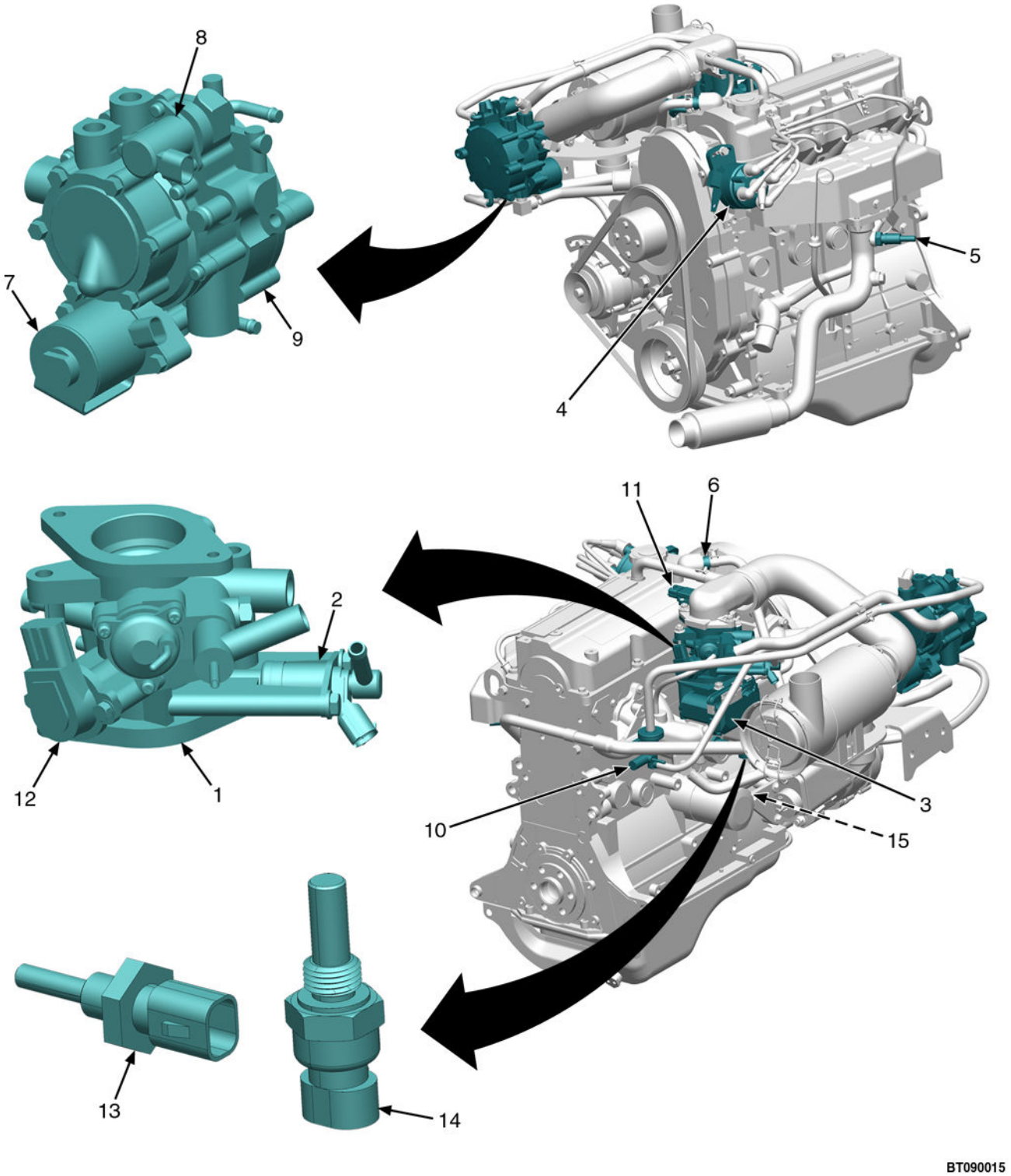


Figure 9020-10-33. LPG Control System Component Location

The GM/TGFI 4.3L LPG system components diagram is shown in Figure 9020-10-73.

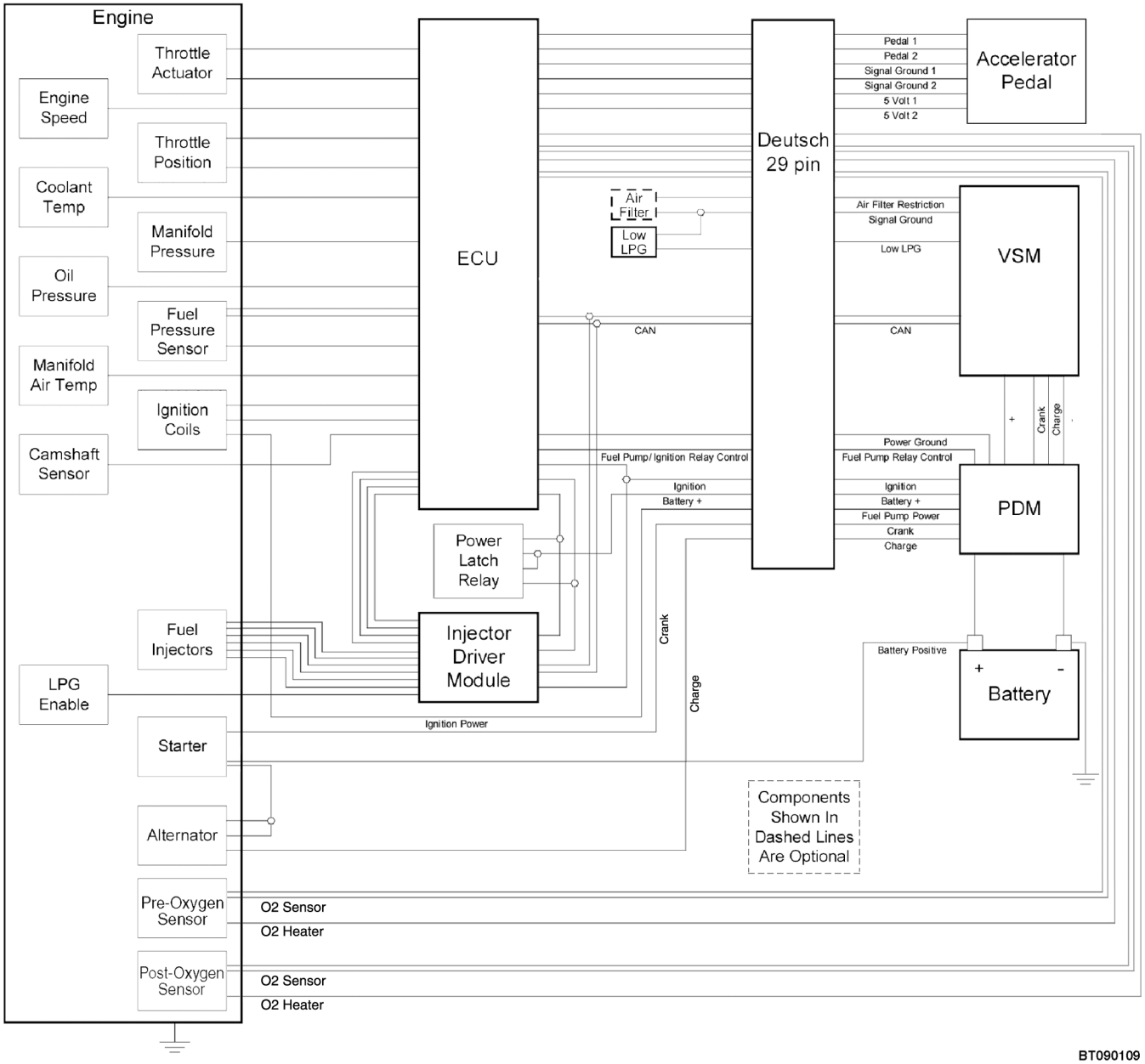


Figure 9020-10-73. GM/TGFI 4.3L LPG System Components

command changes back across the CANbus, to the DEPR, to adjust fueling.

Mixer

The mixer uses a metal piston with a sealing ring in place of a diaphragm for the purpose of reducing the mixer size for small engines, however, the same operating principal applies to all. Cranking the engine lowers pressure under the metal piston causing the piston of engine to descend. The lowered pressure lowers the metal piston against the upward pressure of the metering spring.

Approximately 1.4 kPa (0.2 psi) of pressure is required to lower the air valve off its seat. Approximately 3.4 kPa (0.5 psi) lowers the valve to the bottom of its travel in full open position.

Lowered pressure varies with engine speed and position of throttle valve opening. The air valve assembly measures the air flow into the engine by moving precisely in response to the demands of the engine and throttle valve position.

The controlled pressure drop of 1.4 kPa (0.2 psi) to 3.4 kPa (0.5 psi) set up by the metering spring provides the signal or force necessary to draw fuel into the air stream within the carburetor. The gas metering valve is attached to the air valve assembly and is shaped to admit the correct amount of fuel from the gas jet to mix with incoming air at any opening of the air valve.

Mixtures between idle and full-load conditions are controlled by the shape of the gas metering valve, which is designed to produce lean mixtures at heavier loads and higher engine speeds. The shape of the gas valve is designed for optimum air/fuel mixtures.

KUBOTA LPG ELECTRONIC COMPONENTS AND SENSORS

Temperature Manifold Absolute Pressure Sensor

TMAP sensor is mounted in the intake manifold and measures the absolute pressure as well as the temperature of the air / fuel stream. MAP data is used by the ECU for calculating airflow pressure. The temperature information from the TMAP is used for a density correction in the mass air flow calculation.

Figure 9020-10-129. Temperature Manifold Absolute Pressure Sensor

Oxygen (O_2) Sensor

An Oxygen (O_2) sensor is an essential element of a feedback control of air-fuel ratio. The sensor has a mechanism in which a zirconia tube, which is a solid electrolyte, is exposed into the exhaust gas and the outside of a zirconia tube to an exhaust gas, the inside to an atmosphere with a known oxygen concentration respectively. Any difference produced between the two sides of the zirconia tube causes electromotive force to be generated. Oxygen sensor should be installed at the catalyst inlet and outlet each.

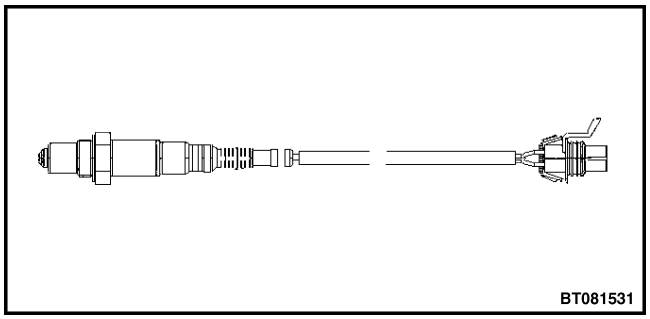


Figure 9020-10-130. Oxygen Sensor

Pre-Catalyst Oxygen Sensor

When the air-fuel ratio is rich, HC, CO, and H_2. react with the oxygen (O_2) that remains in the exhaust gas. This causes a significant reduction of the concentration of the remaining oxygen, which considerably increases the ratio of it to the concentration of oxygen contained in the atmosphere inside, increasing the electromotive force. When the air-fuel ratio is lean, the process is the other way around, resulting in a significant drop in the electromotive force near the stoichiometric ratio. That

Combination Cooler/Standard Radiator

The combination cooler is a unit that consists of two heat exchangers that are packaged together in a common framework. The combination cooler offers greater heat transfer capability for both the engine coolant and transmission fluid, since each fluid is cooled completely independent of the other. For both heat exchangers, the heat is transferred from the fluid to the air that is flowing through the cooler cores. This is not the case for a standard radiator with in-tank oil cooler. With this design, the heat from the transmission fluid is transferred into the engine coolant. This transfer of heat occurs after the engine coolant has already passed through the radiator core.

RADIATOR CAP

The radiator cap is a pressure-vent type that lets the pressure in the cooling system increase to 103 kPa (15 psi). The pressure in the system prevents vapor from forming in the coolant flowing to the engine coolant pump. This action maintains the efficiency of the engine coolant pump and performance of the cooling system. The increase in pressure also raises the boiling point of the coolant mixture to approximately 129°C (264°F) at sea level.

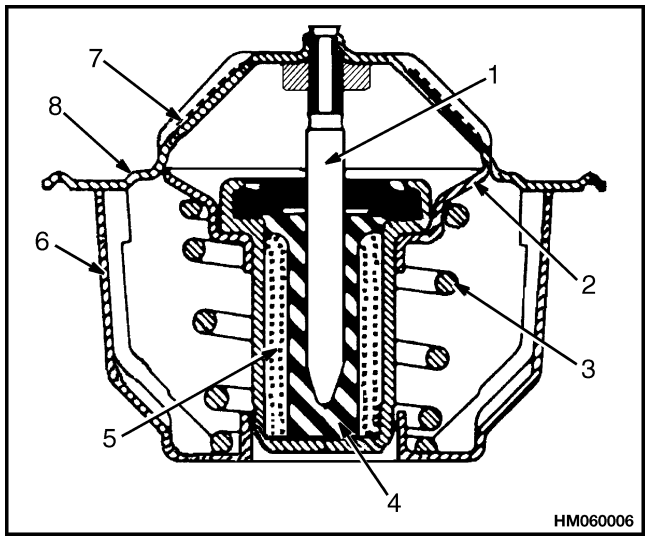
The radiator cap has a pressure valve and a vacuum valve. The pressure valve is held against its seat by a spring. The pressure valve opens when the pressure in the cooling system exceeds 103 kPa (15 psi). The vacuum valve is held against its seat by another spring. The vacuum valve opens to relieve the vacuum created when the coolant temperature decreases. This vacuum can cause the radiator top hose to collapse.

THERMOSTAT

The thermostat is a device that controls coolant flow by opening and closing to regulate coolant temperature. For Mazda engines, see Figure 9020-10-193. For Cummins, GM, and Yanmar engines, see Figure 9020-10-194.

The thermostat uses a wax pellet to control its operation. The wax pellet expands when it is heated and contracts when it is cold. When heated, the wax pellet pushes on the piston, causing the valve in the thermostat to open. As the wax pellet cools, it contracts and lets a spring close the valve. When the engine is first started and the coolant is cold, the thermostat remains closed. During this time, the coolant circulates through the engine, letting it warm quickly. As the engine becomes warm, the thermostat opens, letting coolant circulate through the radiator.

The opening and closing of the thermostat helps keep the coolant within the operating limits of the system. The same thermostat is used for summer and winter seasons. Do not operate the engine without a thermostat. The engine will take longer to warm up and can run improperly.



1. PISTON
2. VALVE SEAT
3. SPRING
4. DIAPHRAGM
5. WAX PELLET
6. FRAME
7. FLANGE
8. VENT HOLE

Figure 9020-10-193. Typical Thermostat - Mazda

Engine Is Knocking or Pinging

POSSIBLE CAUSE

A. POOR FUEL GRADE (MAZDA AND GM ENGINES ONLY).
B. INCORRECT SPARK PLUGS USED (GASOLINE AND LPG ENGINES ONLY).
C. IGNITION TIMING IS TOO ADVANCED (MAZDA ENGINES ONLY).
D. ENGINE SENSOR PROBLEMS (GM AND MAZDA ENGINES ONLY).
E. FUEL SYSTEM PROBLEM.
F. ENGINE MECHANICAL PROBLEMS (MAZDA AND GM ENGINES ONLY).
G. COOLING SYSTEM MALFUNCTION (MAZDA AND GM ENGINES ONLY).

CAUSE A - POOR FUEL GRADE (MAZDA AND GM ENGINES ONLY).

PROCEDURE OR ACTION:

1. Check the octane level of fuel being used. See **Operating Manual**.
   Is fuel grade below specifications?
   YES: Refill with fuel of correct octane level.
   NO: Go to CAUSE B.

CAUSE B - INCORRECT SPARK PLUGS USED (GASOLINE AND LPG ENGINES ONLY).

PROCEDURE OR ACTION:

1. Check for correct spark plugs. Refer to appropriate **Capacities and Specifications** manual, depending on lift truck model.
   Are correct spark plugs used?
   YES: Go to CAUSE C.
   NO: Replace spark plugs. For GM engines, refer to appropriate **GM Engine Repair** manual, depending on lift truck model. For Mazda engines, refer to appropriate **Mazda Engine** manual, depending on lift truck model.

CAUSE C - IGNITION TIMING IS TOO ADVANCED (MAZDA ENGINES ONLY).

PROCEDURE OR ACTION:

1. Check base ignition timing. Refer to appropriate **Electrical System** manual, depending on lift truck model.
   Is base ignition timing correct?
   YES: Go to Step 2.
   NO: Adjust base ignition timing. Refer to appropriate **Electrical System** manual, depending on lift truck model.
2. Check timing advance.
   Is ignition timing advance working properly?
   YES: Go to CAUSE D.
   NO: Replace distributor. Refer to appropriate **Electrical System** manual, depending on lift truck model.

CAUSE E - ENGINE MECHANICAL PROBLEM.

PROCEDURE OR ACTION:

1. Check the following:
    - Cooling system level and condition of components:
        - Radiator fins
        - Hoses
        - Thermostat
        - Overflow reservoir
        - Radiator cap
    - Improper valve timing
    - Improper ignition timing (Mazda engines only)
    - Spark plug condition
    - Air cleaner for clogging or restriction
    - Fuel filter restriction or clogging
    - Air intake leaks
    - Low engine compression
    - Throttle body malfunction
    - Fuel pump malfunction (gas only)
    - Pressure regulator malfunction (LPG only)
    - Fuel hoses for restriction or clogging
    - Exhaust system restriction
    - Damaged camshaft, worn lobes, incorrect valve lift height

    Do any of the above conditions exist?
    YES: Repair or replace malfunctioning component. Refer to appropriate **GM Engines** or **Mazda Engine** manual, depending on lift truck model.
    NO: Resume operation.

END SYMPTOM

TABLE OF CONTENTS

The Cummins Fault Codes that appear for the QSB 3.3L in the table that follows, are those codes that should be referred to your local **YALE** dealer or see **Yale Axcess Online** , QSB 3.3L Troubleshooting and Repair.

Table 9030-03-1. Cummins QSB 3.3L Fault Codes

DTC Codes	Cummins Fault Codes	Description
91-3	131	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
91-4	132	Accelerator Pedal or Lever Position Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
97-3	428	Water in Fuel Sensor Circuit – Voltage Above Normal, or Shorted to High Source
97-4	429	Water in Fuel Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
97-15	418	Water in Fuel Indicator High – Data Valid but Above Normal Operational Range – Least Severe Level
100-1	415	Oil Pressure Low – Data Valid but Below Normal Operational Range -Most Severe Level
102-2	2973	Intake Manifold Pressure Sensor Circuit – Data Erratic, Intermittent, or Incorrect
102-3	122	Intake Manifold Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
102-4	123	Intake Manifold Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
105-16	488	Intake Manifold 1 Temperature – Data Valid but Above Normal Operational Range – Moderately Severe Level
108-2	295	Barometric Pressure Sensor Circuit – Data Erratic, Intermittent, or Incorrect
108-3	221	Barometric Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
108-4	222	Barometric Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
110-16	146	Coolant Temperature High – Data Valid but Above Normal Operational Range – Moderately Severe Level
111-3	195	Coolant Level Sensor Circuit – Voltage Above Normal, or Shorted to High Source
111-4	196	Coolant Level Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
111-18	197	Coolant Level – Data Valid but Below Normal Operational Range – Moderately Severe Level
157-0	449, 1911	Fuel Pressure High – Data Valid but Above Normal Operational Range – Moderately Severe Level
157-1	2249, 559	Injector Metering Rail 1 Pressure – Data Valid but Below Normal Operational Range – Most Severe Level
157-2	554	Fuel Pressure Sensor Error – Data Erratic, Intermittent, or Incorrect
157-3	451	Injector Metering Rail #1 Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source

Legend for Figure 9030-03-16

NOTE: KUBOTA 3.8L DIESEL ENGINE HARNESS WITH DIESEL PARTICULATE FILTER (DPF) SHOWN. HARNESSES WITHOUT DPF ARE SIMILAR.

1. T244, CONTACTOR POSITIVE TERMINAL
2. T246, CONTACTOR OUT TERMINAL
3. T249, CONTACTOR NEGATIVE TERMINAL
4. T200, STARTER SOLENOID TERMINAL
5. CRP 160, RH CHASSIS HARNESS CONNECTOR
6. CRP 55, RH CHASSIS HARNESS CONNECTOR
7. CRP 83, RH CHASSIS HARNESS CONNECTOR
8. CRP 227, FUEL/WATER SEPARATOR SENSOR CONNECTOR
9. CRS 203, ENGINE CONTROL MODULE (V01)
10. CRS 204, ENGINE CONTROL MODULE (E01)
11. CPS 232, COOLANT TEMPERATURE SENSOR CONNECTOR
12. CPS 214, ALTERNATOR REGULATOR/LINE SENSOR CONNECTOR
13. CPS 201, OIL PRESSURE SENSOR CONNECTOR
14. CPS 284, IGNITION POWER FUSE (10 AMP)
15. CPS 288, FEED PUMP CONNECTOR
16. CPS 279, RESISTOR
17. CPS208, INJECTOR SET CONNECTOR
18. CRS 219, CAMSHAFT SENSOR CONNECTOR
19. CPS 203, STARTER FUSE (5 AMP)
20. CRS 225, CRANKSHAFT SENSOR CONNECTOR
21. CRS 202, INTERFACE MODULE CONNECTOR
22. CPS 287, BUS BAR CONNECTOR
23. CRS 206, LATCH RELAY CONNECTOR
24. CPS 234, AIR TEMPERATURE SENSOR
25. T258, GRID HEATER TERMINAL
26. CPS 278, EGR VALVE CONNECTOR
27. CPS 261, FUEL TEMPERATURE SENSOR CONNECTOR
28. CRS 207, SUCTION CONTROL VALVE CONNECTOR
29. CPS 69, FUEL LEVEL SENSOR CONNECTOR
30. CPS 271, CAN SERVICE TOOL CONNECTOR
31. CRS 212, BOOST PRESSURE SENSOR CONNECTOR
32. CPS 213, INTAKE THROTTLE CONNECTOR
33. CPS 254, RAIL PRESSURE SENSOR CONNECTOR
34. CPS 235, MASS AIR FLOW SENSOR CONNECTOR
35. CRP 68, AIR FILTER SENSOR CONNECTOR
36. CPS 270, DIFFERENTIAL PRESSURE SENSOR CONNECTOR
37. CPS 280, EXHAUST GAS TEMPERATURE
38. CPS 281, EXHAUST GAS TEMPERATURE
39. CPS 282, EXHAUST GAS TEMPERATURE

CAUSE C - SENSOR SIGNAL SHORTED TO SENSOR SUPPLY

PROCEDURE OR ACTION:

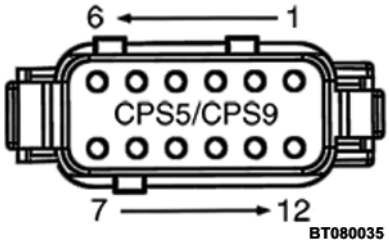
1. Set DMM to volts scale.
2. At sensor connector, using procedure for probing the harness, measure voltage across sensor signal pin and sensor ground pin.
   Is voltage equal to or greater than sensor supply voltage (approximately 5 Vdc)?
   YES: Go to Step 3.
   NO: Go to CAUSE E.
3. Disconnect sensor connector and repeat measurement from Step 2.
   Is voltage equal to or greater than approximately 5 Vdc?
   YES: If equal to 5V, go to Step 4. If above 5V, go to CAUSE D.
   NO: Replace applicable sensor. Refer to the appropriate **Electrical System** manual, depending on lift truck model.
4. Disconnect the indicated VSM or ECU connector.
5. Ensure truck power is **OFF**.
6. Change DMM to ohms scale. Verify DMM zero reading.
7. At sensor harness connector, measure resistance between the sensor signal pin and sensor supply pin.
   Is resistance less than 0.5 ohms?
   YES: The sensor signal wire and the sensor supply wire are shorted. Locate and repair/replace shorted wire/connection. Refer to the appropriate **Wire Harness Repair** manual, depending on lift truck model.
   NO: Go to CAUSE E.

CAUSE D - SENSOR SIGNAL SHORTED TO BATTERY

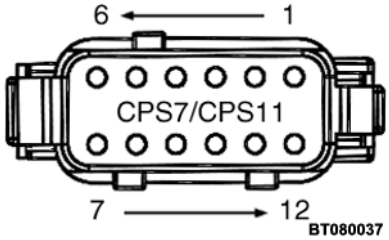
PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Disconnect the indicated connectors at sensor and VSM or applicable ECU.
3. Change DMM to volts scale.
4. At the sensor harness connector, measure the voltage across the sensor signal wire (+) and the negative (−) terminal of the battery.
   Is voltage approximately system voltage?
   YES: The signal wire is shorted to an unswitched battery source. Refer to the appropriate **Diagrams and Schematics** manual, depending on lift truck model, for unswitched battery voltage sources. Locate and repair/replace shorted wire/connection. Refer to the appropriate **Wire Harness Repair** manual, depending on lift truck model.
   NO: Go to Step 5.
5. Turn truck power **ON** and repeat Step 3.
   Is voltage approximately system voltage?
   YES: The signal wire is shorted to a switched battery source.Refer to the appropriate **Diagrams and Schematics** manual, depending on lift truck model, for switched battery voltage sources. Repair or replace shorted wire.Refer to the appropriate **Wire Harness Repair** manual, depending on lift truck model.
   NO: Go to CAUSE E.

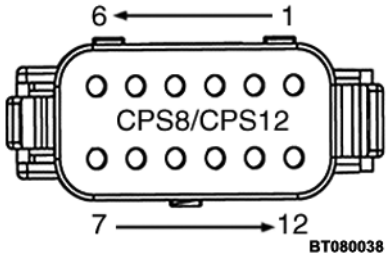
CONNECTOR(S)



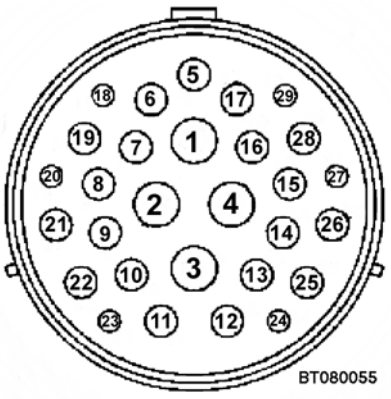
VSM Connector CPS 5 and 9



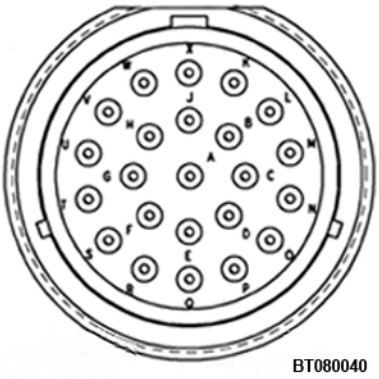
VSM Connector CPS 11



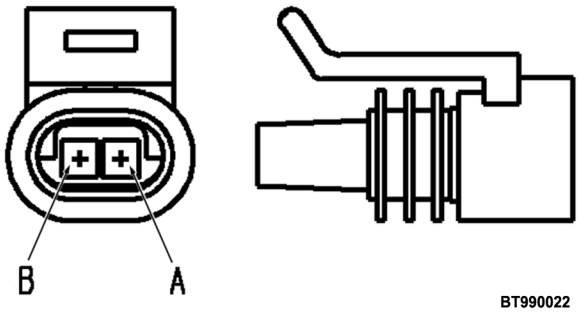
VSM Connector CPS 12



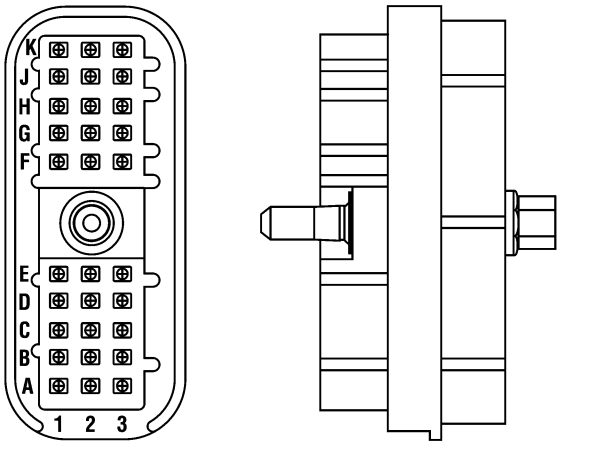
Engine Harness Connector CPS 55



XMSN Disconnect CPS 85



Wet Disk Brake Temperature Sensor Connector CPS 51



APC 214-CPS 128 Connector

CAUSE A - ELECTRONIC THROTTLE BODY STICKY

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Manually rotate/stroke throttle mechanism.
   Is throttle mechanism operating smoothly - No sticky spots?
   YES: Go to Step 3.
   NO: Inspect and adjust electronic throttle position sensor. Refer to the appropriate **Engine Fuel System** or **Frame**YRM .

WARNING

This operational check requires engine operation. Be sure that the area is clear of personnel and equipment and that it is safe to operate the lift truck until normal transmission operating temperatures are achieved 93°C (200°F).

3. Turn truck power **ON** and start engine.
4. Operate accelerator pedal and observe throttle mechanism actuation response.
   Is throttle mechanism operating smoothly/tracking with accelerator operation - No sticky spots?
   YES: Go to CAUSE B.
   NO: Inspect and adjust throttle cable or accelerator pedal. Refer to the appropriate **Frame**YRM .

CAUSE B - THROTTLE MECHANISM INCORRECTLY ADJUSTED

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Adjust throttle cable or accelerator pedal. Refer to the appropriate **Frame**YRM .
3. Cycle power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does DTC reoccur?
   YES: Go to CAUSE C.
   NO: Problem not verified. resume operation.

CAUSE F - FUNCTIONAL FAILURE IN CONTROLLER

PROCEDURE OR ACTION:

1. Ensure all previous procedures have been completed.
2. Ensure truck power is **OFF**.
3. Ensure that all connections to the controller are completely inserted.
4. Ensure truck power is **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 5.
   NO: Problem corrected. Resume operation.
5. At the DSC, press **ENTER** to access Main Menu.
6. Scroll to VIEW VERSIONS, press **ENTER**.
7. Scroll to TRUCK SERIAL NUMBER, press **ENTER**.
8. View the TRUCK SERIAL NUMBER on the display.
   Does the truck serial number on display match serial number on truck nameplate (VSM Only)?
   YES: Go to Step 9.
   NO: Controller has been substituted from another truck. Replace VSM with VSM that has the correct truck serial number or obtain new VSM with correct Serial number/ CDF. See **Electrical System** 2200YRM1142.
9. **Resident Service Approval Required prior to VSM replacement for Trucks under warranty.** Make sure to indicate the DTC code(s) on the warranty claim and include an accurate problem description leading to the controller replacement.
10. For other controllers, Replace indicated controller. (ECU-ECM/GCU/TCU). See **Electrical System** 2200YRM1142. For GM 4.3L LPG engines, see **LPG Fuel System, GM 4.3L Engine with GFI** 0900YRM1242. For GM 4.3L gasoline engines, see **Gasoline Fuel System** 0900YRM1244 for all controllers.
11. Reinstall all removed components and ensure that all connectors are completely inserted.
12. Repeat Component Operational Check.

END POSSIBLE CAUSES

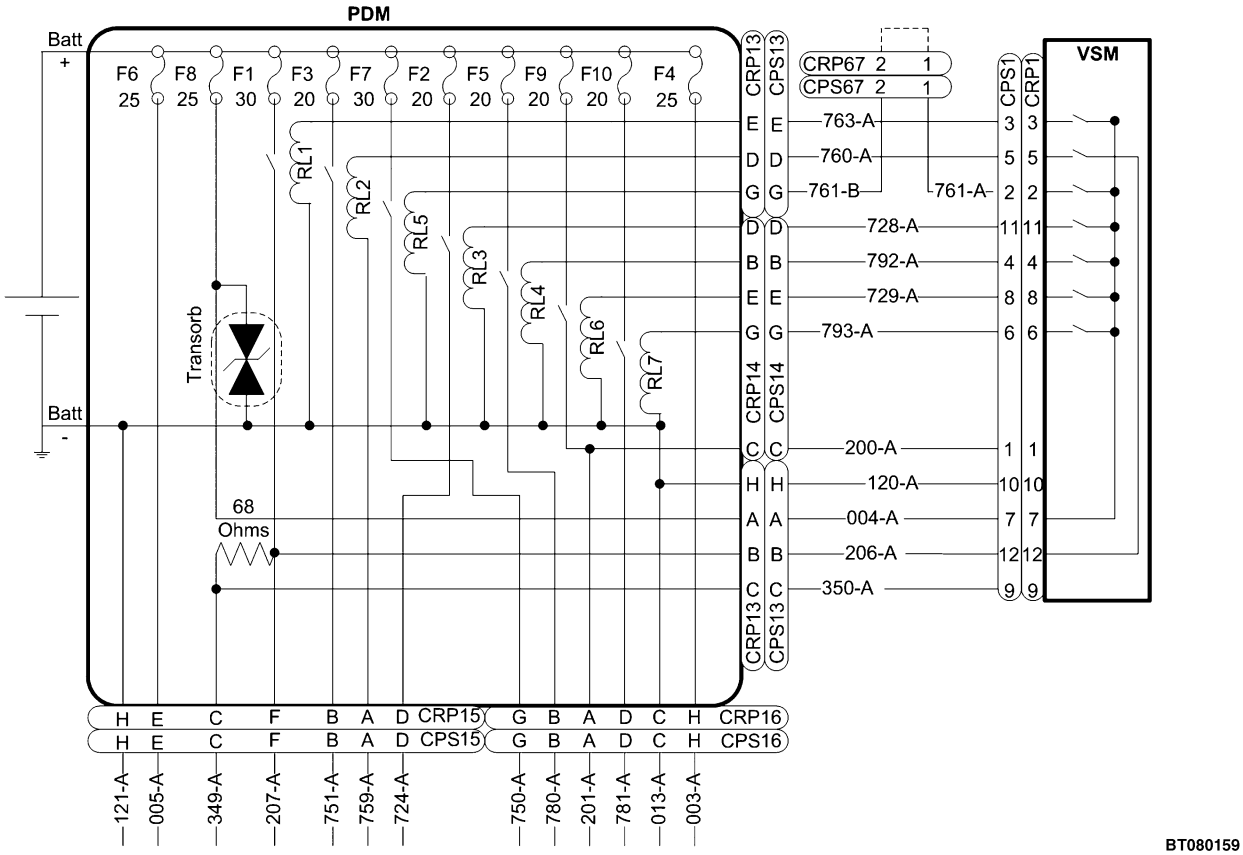
CAUSE F - FUNCTIONAL FAILURE IN CONTROLLER

PROCEDURE OR ACTION:

1. Ensure all previous procedures have been completed.
2. Ensure truck power is **OFF**.
3. Ensure that all connections to the controller are completely inserted.
4. Ensure truck power is **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 5.
   NO: Problem corrected. Resume operation.
5. At the DSC, press **ENTER** to access Main Menu.
6. Scroll to VIEW VERSIONS, press **ENTER**.
7. Scroll to TRUCK SERIAL NUMBER, press **ENTER**.
8. View the TRUCK SERIAL NUMBER on the display.
   Does the truck serial number on display match serial number on truck nameplate (VSM Only)?
   YES: Go to Step 9.
   NO: Controller has been substituted from another truck. Replace VSM with VSM that has the correct truck serial number or obtain new VSM with correct Serial number/ CDF. See **Electrical System** 2200YRM1142.
9. **Resident Service Approval Required prior to VSM replacement for Trucks under warranty.** Make sure to indicate the DTC code(s) on the warranty claim and include an accurate problem description leading to the controller replacement.
10. For other controllers, Replace indicated controller. (ECU-ECM/GCU/TCU). See **Electrical System** 2200YRM1142. For GM 4.3L LPG engines, see **LPG Fuel System, GM 4.3L Engine with GFI** 0900YRM1242. For GM 4.3L gasoline engines, see **Gasoline Fuel System** 0900YRM1244 for all controllers.
11. Reinstall all removed components and ensure that all connectors are completely inserted.
12. Repeat Component Operational Check.

END POSSIBLE CAUSES

DIAGRAMS



- WIRE # 003, (RED) = UNSWITCHED BATTERY
- WIRE # 004, (RED) = UNSWITCHED BATTERY
- WIRE # 005, (RED) = UNSWITCHED BATTERY
- WIRE # 013, (BLACK) = BATTERY GROUND
- WIRE # 120, (BLACK) = BATTERY GROUND
- WIRE # 121, (BLACK) = BATTERY GROUND
- WIRE # 200, (RED) = SWITCHED BATTERY 1 (IGN1) MONITOR
- WIRE # 201, (RED) = SWITCHED BATTERY 1 (IGN1) OUTPUT
- WIRE # 206, (RED) = SWITCHED BATTERY 3 (IGN3) MONITOR
- WIRE # 207, (RED) = SWITCHED BATTERY 3 (IGN3) OUTPUT
- WIRE # 349, (WHITE) = ALTERNATOR EXCITE OUTPUT
- WIRE # 350, (WHITE) = ALTERNATOR EXCITE MONITOR
- WIRE # 724, (WHITE) = BACK UP ALARM
- WIRE # 728, (WHITE) = BACK UP ALARM DRIVER
- WIRE # 729, (WHITE) = SWITCHED BATTERY 1 (IGN1) DRIVER
- WIRE # 750, (WHITE) = STARTER POWER
- WIRE # 751, (RED) = FUEL CONTROL/RUN
- WIRE # 759, (WHITE) = FUEL RELAY RETURN
- WIRE # 760, (WHITE) = FUEL RELAY DRIVER
- WIRE # 761, (WHITE) = START RELAY DRIVER
- WIRE # 763, (WHITE) = SWITCHED BATTERY 3 (IGN3) DRIVER
- WIRE # 780, (WHITE) = FRONT WORK LIGHTS
- WIRE # 781, (WHITE) = REAR WORK LIGHTS
- WIRE # 792, (WHITE) = FRONT WORK LIGHTS DRIVER
- WIRE # 793, (WHITE) = REAR WORK LIGHTS DRIVER

Power Supply/Distribution Schematic IGN 1 and IGN 3

Coil Driver Output OORL

Low Source Driver Is Off, High Source Driver Is Off, And Feedback Current Is Less Than Threshold.

CODES

DTC 523920-4 - REV1 Circuit OORL
DTC 523925-4 - Range1/FWD2/REV1 Return Circuit OORL
DTC 523930-4 - Clutch FWD1/Return Circuit OORL
DTC 523977-4 - Aux 2 Base/Rod Coil Driver OORL
DTC 523978-4 - Aux 1 Base/Rod Coil Driver OORL
DTC 523986-4 - Aux 3 Base/Rod Coil Driver OORL
DTC 524284-4 - Lift/Lower/Return Circuit OORL
DTC 524285-4 - Tilt Base Circuit OORL

POSSIBLE CAUSE

A. COIL DRIVER/DRIVER RETURN SHORTED TO GROUND
B. FUNCTIONAL VALVE FAILURE
C. FUNCTIONAL FAILURE IN CONTROLLER

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

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 2.
   NO: Problem not verified. Resume operation.
2. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code.
   Are any faults detected/observed?
   YES: Repair/replace connector or wiring associated with faults found. See **Electrical System** 2200YRM1142.
   NO: Go to CAUSE A.

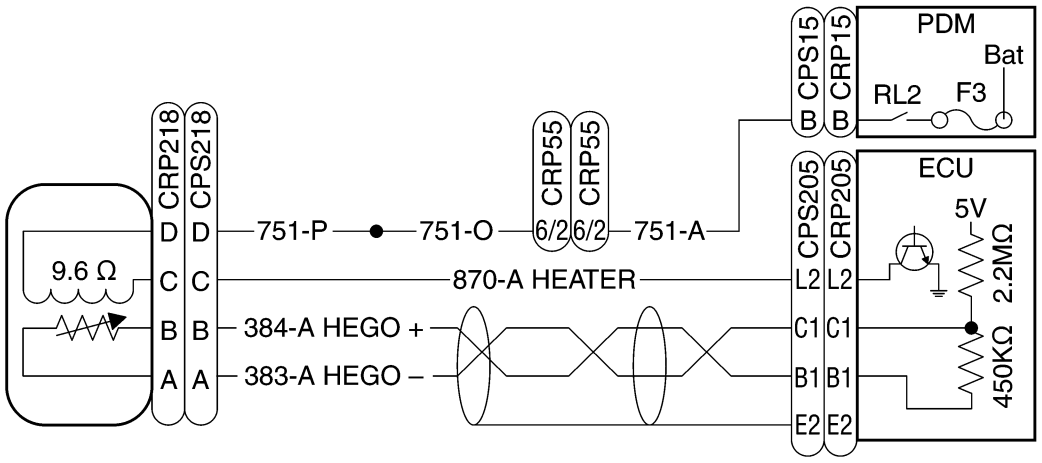
CAUSE A - COIL DRIVER/DRIVER RETURN SHORTED TO GROUND

PROCEDURE OR ACTION:

NOTE: The coil drive control signals, where two valves are shown in the schematic, share a common return.

1. Ensure truck power is **OFF**.
2. Disconnect indicated connectors from the VSM and the control valves.
3. Change DMM to ohms scale. Verify DMM zero reading.
4. Measure the resistance between each indicated pin of the VSM connector (+) and the negative (-) terminal of the battery.
   Is the resistance less than 0.5 ohms on any of the pins?
   YES: The coil driver/driver return output has a short to ground in the harness. Locate and repair/replace shorted wire/connection. See **Wire Harness Repair** 2200YRM1128.
   NO: Go to CAUSE B.

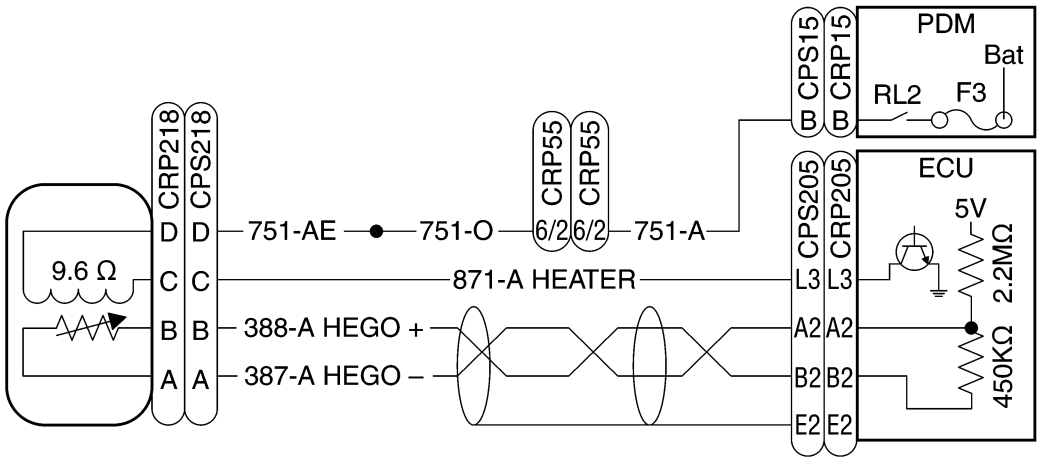
DIAGRAMS



BT080126

- WIRE # 383 = SENSOR SIGNAL (−)
- WIRE # 384 = SENSOR SIGNAL (+)
- WIRE # 751 = SENSOR HEATER POWER
- WIRE # 870 = SENSOR HEATER RETURN

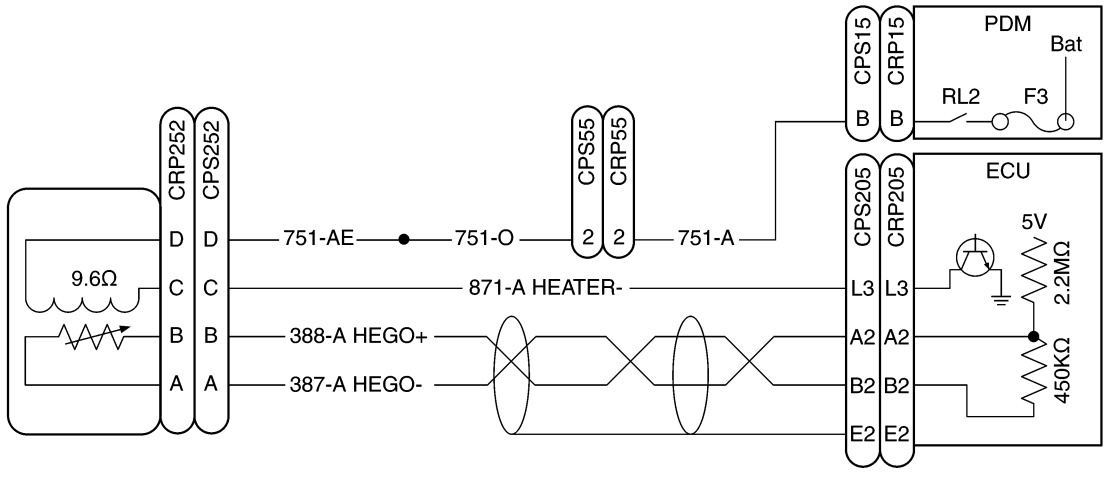
Single Oxygen (O_2) Sensor Heater Circuit Schematic



BT080271

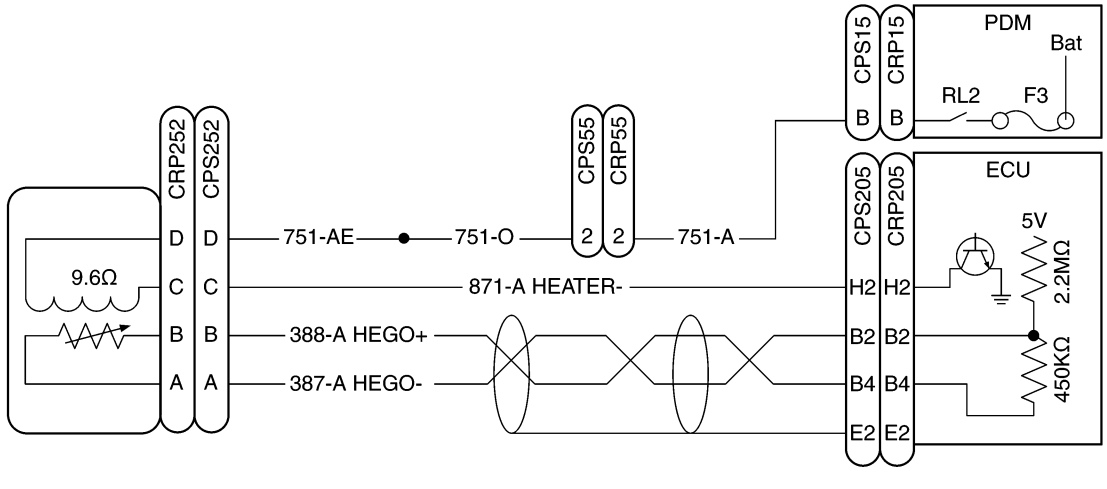
- WIRE # 383, 387 = SENSOR SIGNAL (−)
- WIRE # 384, 388 = SENSOR SIGNAL (+)
- WIRE # 751 = SENSOR HEATER POWER
- WIRE # 870, 871= SENSOR HEATER RETURN

Dual Oxygen (O_2) Sensor Heater Circuit Schematic



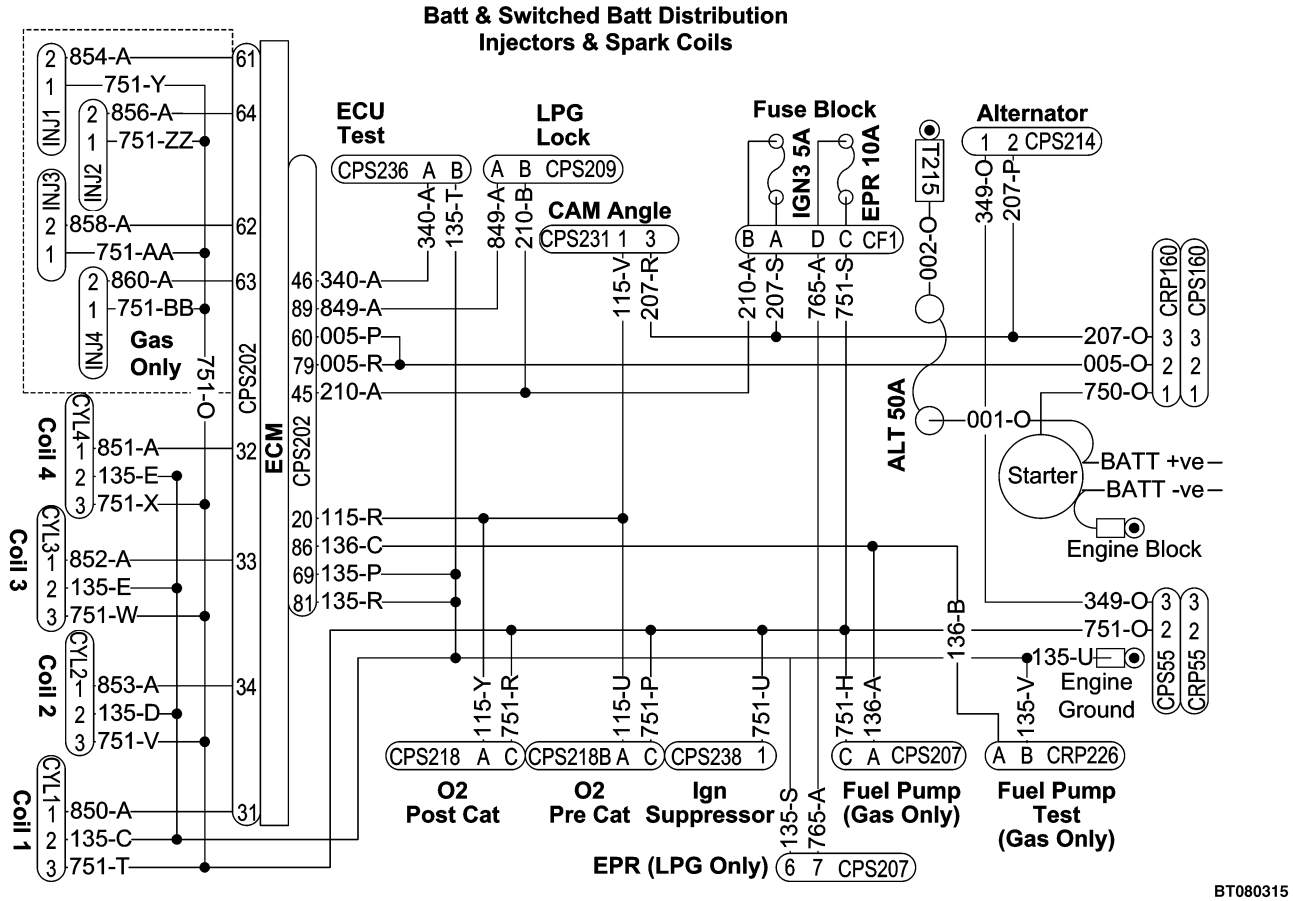
- WIRE # 387 = SENSOR SIGNAL (−)
- WIRE # 388 = SENSOR SIGNAL (+)
- WIRE # 751 = SENSOR HEATER POWER
- WIRE # 871= SENSOR HEATER RETURN

Oxygen (O_2) Sensor Heater 2 (GM 4.3L)



- WIRE # 387 = SENSOR SIGNAL (−)
- WIRE # 388 = SENSOR SIGNAL (+)
- WIRE # 751 = SENSOR HEATER POWER
- WIRE # 871= SENSOR HEATER RETURN

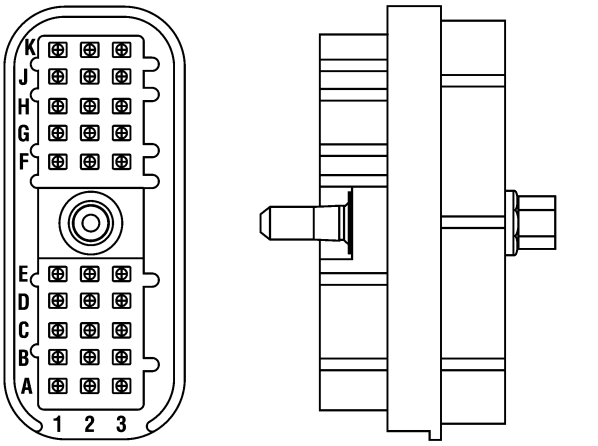
Oxygen (O_2) Sensor Heater 2 (GM 2.4L 2010)



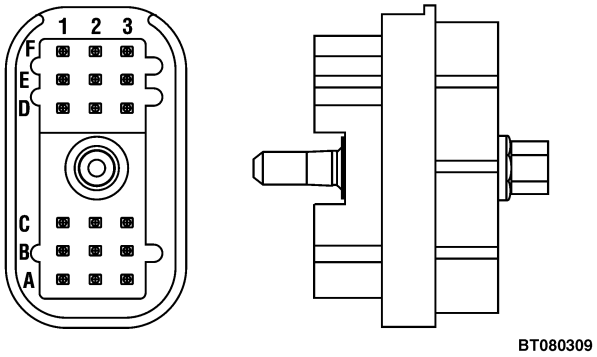
Batt & Switched Batt Distribution Injector & Spark Coils Mazda Gas/LPG (2007 Mazda EPA)

END FAULT

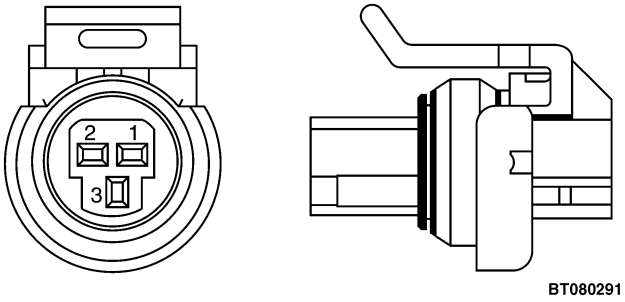
CONNECTOR(S)



APC 214-CPS 128 Connector



APC 214-CPS 129 Connector

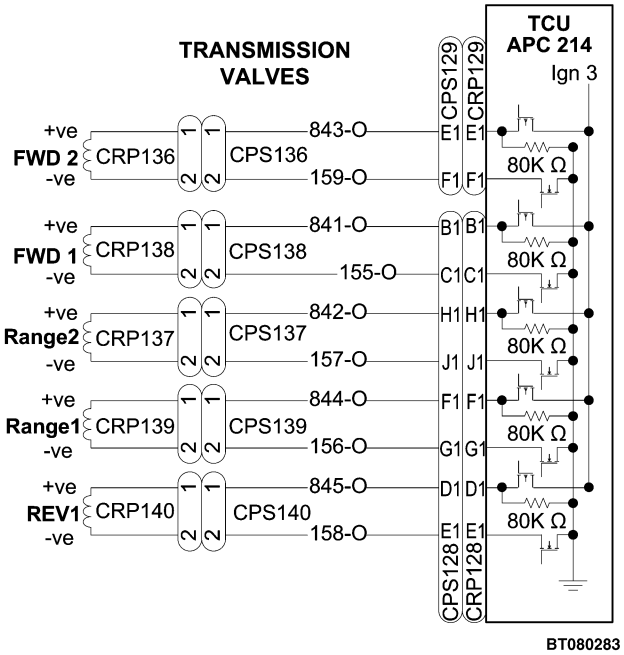


- **FWD HI PRESSURE CPS 141 CONNECTOR**
- **FWD2 PRESSURE CPS 142 CONNECTOR**
- **FWD LOW PRESSURE CPS 143 CONNECTOR**
- **REV1 PRESSURE CPS 144 CONNECTOR**
- **REV PRESSURE CPS 145 CONNECTOR**

Pressure Connector

END FAULT

DIAGRAMS



- WIRE # 843 (WHITE) = VALVE COIL SIGNAL
- WIRE # 159 (DK GRN) = VALVE COIL RETURN
- WIRE # 842 (WHITE) = VALVE COIL SIGNAL
- WIRE # 157 (DK GRN) = VALVE COIL RETURN
- WIRE # 841 (WHITE) = VALVE COIL SIGNAL
- WIRE # 155 (DK GRN) = VALVE COIL RETURN
- WIRE # 844 (WHITE) = VALVE COIL SIGNAL
- WIRE # 156 (DK GRN) = VALVE COIL RETURN
- WIRE # 845 (WHITE) = VALVE COIL SIGNAL
- WIRE # 158 (DK GRN) = VALVE COIL RETURN

Transmission Valve Coils

CODES

DTC 1348-3 - Fuel Pump Relay Control OORH
DTC 522604-3 - Fuel Relay Control OORH

POSSIBLE CAUSE

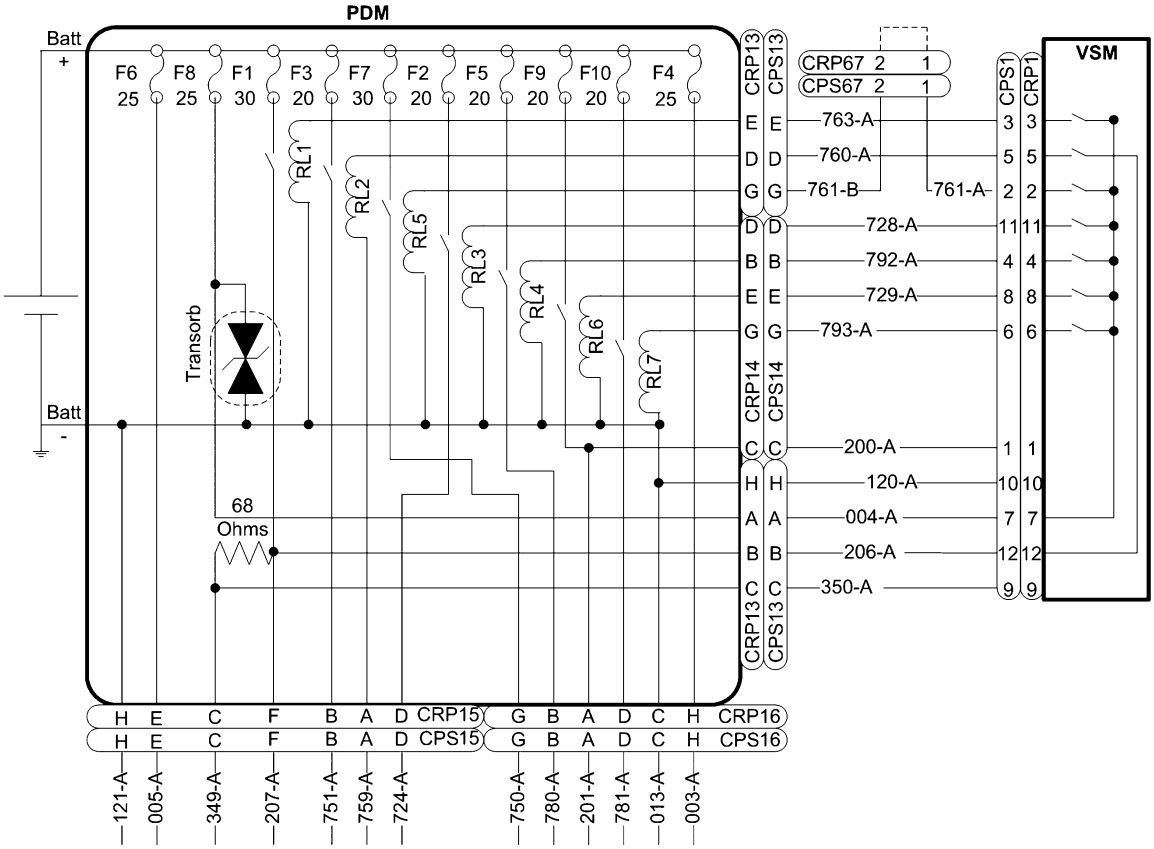
A. HARNESS SHORT CIRCUIT TO SWITCH OR UNSWITCHED BATTERY
B. FUNCTIONAL FAILURE IN CONTROLLER

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

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 2.
   NO: Problem not verified. Resume operation.
2. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code.
   Are any faults detected/observed?
   YES: Repair/replace connector or wiring associated with faults found. Refer to the appropriate **Electrical System**YRM .
   NO: Go to CAUSE A.



- WIRE # 003 (RED) = FUSED BATTERY POWER (F4)
- WIRE # 004 (RED) = FUSED BATTERY POWER (F8)
- WIRE # 005 (RED) = FUSED BATTERY POWER (F6)
- WIRE # 013 (BLK) = BATTERY GROUND
- WIRE # 109 (BLK = VSM POWER GROUND
- WIRE # 120 (BLK) = BATTERY GROUND
- WIRE # 121 (BLK) = BATTERY GROUND
- WIRE # 200 (RED) = IGN 1 POWER (RL6) OUTPUT
- WIRE # 201 (RED) = IGN 1 POWER (RL6) OUTPUT
- WIRE # 203 (RED) = IGN 2 VSM REGULATED OUTPUT
- WIRE # 206 (RED) = IGN 3 POWER (RL1) OUTPUT
- WIRE # 207 (RED) = IGN 3 POWER (RL1) OUTPUT
- WIRE # 349 (WHITE) = ALTERNATOR EXCITE
- WIRE # 350 (WHITE) = ALTERNATOR EXCITE
- WIRE # 724 (WHITE) = BACK UP ALARM OUTPUT (RL3)
- WIRE # 728 (RED) = RELAY 3 (BACK UP ALARM) DRIVER
- WIRE # 729 (RED) = RELAY 6 (IGN 1) DRIVER
- WIRE # 750 (WHITE) = START RELAY (RL5) OUTPUT
- WIRE # 751 (RED) = FUEL RELAY (RL2) OUTPUT
- WIRE # 759 (WHITE) = FUEL RELAY RETURN (ECU)
- WIRE # 760 (RED) = RELAY 2 (FUEL PUMP) DRIVER
- WIRE # 761 (RED) = RELAY 5 (STARTER) DRIVER
- WIRE # 763, (RED) = RELAY 1 (IGN3) DRIVER
- WIRE # 780 (WHITE) = FRONT WORK LIGHTS (RL4) OUTPUT
- WIRE # 781 (WHITE) = REAR WORK LIGHTS (RL7) OUTPUT
- WIRE # 792 (RED) = RELAY 4 (FRONT WORK LIGHTS) DRIVER
- WIRE # 793 (RED) = RELAY 7 (REAR WORK LIGHTS) DRIVER

DTC 523746-2
Key Switch/ Start Switch Failure
Key switch is turned OFF and the start circuit remains active

POSSIBLE CAUSE

A. BROKEN KEY MECHANISM
B. INTERNAL DISPLAY SHORT

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 2.
   NO: Problem not verified. Resume operation.
2. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code.
   Are any faults detected/observed?
   YES: Repair/replace connector or wiring associated with faults found. See **Electrical System** 2200YRM1142.
   NO: Go to CAUSE A.

CAUSE A - BROKEN KEY MECHANISM

PROCEDURE OR ACTION:

NOTE: The key switch must be removed prior to continuing this procedure. See **Electrical System** 2200YRM1142.

1. Inspect to ensure magnet carrier is snapped in correct position on end of key switch barrel and magnet is in correct position within the carrier.
   Is magnet carrier snapped in correct position on end of key switch barrel and is magnet in correct position within the carrier?
   YES: Remove key switch. Set aside the key switch. Install a new key switch assembly. Go to Step 2.
   NO: Reinstall all removed components and ensure that all connectors are completely inserted. Go to Step 2.
2. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Replace original key switch. See **Electrical System** 2200YRM1142 then go to CAUSE B.
   NO: Problem corrected, Discard faulty key switch. Resume operation.

CAUSE B - INTERNAL DISPLAY SHORT

PROCEDURE OR ACTION:

1. Display Switch Cluster is faulty. Replace DSC, see **Electrical System** 2200YRM1142.

END POSSIBLE CAUSES

END FAULT

CAUSE D - BAD RAIL PRESSURE SENSOR

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Verify DMM to ohms scale. Verify DMM zero reading.
3. Disconnect wiring harness connector from rail pressure sensor connector.
4. Measure resistance across each pin of the rail pressure sensor and ground.
   Is resistance low or close to zero ohms?
   YES: The sensor has shorted to ground. Replace sensor. Reconnect sensor connector to wiring harness. Repeat Component Operational Check.
   NO: Go to Step 5.
5. Check for air in the fuel system leading to the High Pressure Pump (HPP).
   Is fuel system working properly?
   YES: Go to CAUSE E.
   NO: Repair air leak in fuel system. Refer to the appropriate **Electrical System** and **Engine Fuel System**YRM .

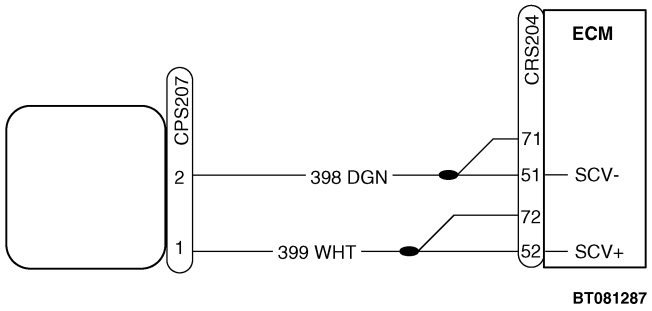
CAUSE E - BAD FUEL PUMP

PROCEDURE OR ACTION:

1. Verify fuel pump is working properly.
   Is fuel pump working properly?
   YES: Problem not verified or problem resolved. Resume operation.
   NO: Repair or replace fuel pump. Refer to the appropriate **Electrical System** and **Engine Fuel System**YRM . Repeat Component Operational Check.

END POSSIBLE CAUSES

DIAGRAMS



Suction Control Valve (Kubota)

DTC 3701-15
Excessive Particulate Matter 3
Auto/Active Regeneration Failed or Ignored

POSSIBLE CAUSE

END POSSIBLE CAUSES

CAUSE A - PARKED REGENERATION REQUEST

PROCEDURE OR ACTION:

NOTE: For more information about the DPF operating procedures and Regeneration Levels, refer to Engine Fuel System/Exhaust and Emissions, DPF regeneration.

NOTE: This DTC occurs to urge the operator to start a Parked Regeneration. Ensure the engine has reached operating temperature before continuing.

1. Move the lift truck outside or far enough away from personnel that exhaust fumes produced during regeneration will not effect them.
2. Use the Diesel Particulate Filter (DPF) display, located on the overhead guard, to initiate a Parked Regeneration request.
3. After regeneration is complete (or attempted), allow the engine to idle to cool off the exhaust system before turning power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC. Start engine.
   Does reported DTC reoccur?
   YES: Refer to Parked Regeneration Unsuccessful Diagnostic Trouble Codes.
   NO: DTC resolved. Resume operation.

END FAULT

CAUSE A - BOOST PRESSURE SENSOR WIRING FAULT

PROCEDURE OR ACTION:

NOTE: Key in ON position.

1. Disconnect the boost pressure sensor connector CRS212 and measure voltage between socket 3 and B(-).
   Is voltage 5 ± 0.5 Vdc?
   YES: Proceed to Step 2.
   NO: Inspect circuit 272-A for open or short.
2. Measure voltage between the boost pressure sensor connector CRS212, socket 3 and socket 1.
   Is voltage 5 ± 0.5 Vdc?
   YES: Disconnect battery and proceed to Step 3.
   NO: Inspect ground circuit 141-A.
3. Disconnect the ECU connector CRS204 and measure resistance between socket 14 and the boost pressure sensor connector CRS212, socket 2.
   Is resistance < 1 ohm?
   YES: Connect boost pressure sensor and ECU connector. Proceed to CAUSE B.
   NO: Inspect signal circuit 397-A for open, short, or source of excessive resistance.

CAUSE B - BOOST PRESSURE SENSOR FAULT

PROCEDURE OR ACTION:

1. Measure voltage between the boost pressure sensor, socket 2 and socket 1.
   - Key ON, engine OFF: Approx 1.0 Vdc
   - Engine at Idle: Approx 1.0 to 2.2 Vdc

   Is voltage within specifications?
   YES: Proceed to CAUSE C.
   NO: Replace faulty boost pressure sensor.

CAUSE C - ECU FAULT

PROCEDURE OR ACTION:

1. If no wiring or communication faults are present, replace faulty ECU, clear DTC and retest system.

END POSSIBLE CAUSES

DTC 4364-1
Low Conversion Efficiency
This DTC is set when the Post NOx sensor output is greater than the estimated NOx reduction efficiency.

POSSIBLE CAUSE

A. SCR SYSTEM FAULT
B. DEF INJECTOR FAULT

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

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 2.
   NO: Problem not verified. Resume operation.
2. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code. Make sure electrical connection is a good physical connection (i.e. sockets and pins are seated correctly; connector "clicks" indicating locking tab works correctly).
   Are any of the connectors/wiring damaged?
   YES: Repair/replace connector or wiring associated with faults found. Refer to appropriate **Electrical System** manual, depending on lift truck model.
   NO: Go to CAUSE A.

CAUSE A - SCR SYSTEM FAULT

PROCEDURE OR ACTION:

1. Inspect the SCR system components for damage. Refer to Step 1.
   Is SCR system damaged?
   YES: Repair or replace damaged SCR system component, clear DTC and retest system.
   NO: Proceed to Step 2.
2. Inspect DEF tank for contamination.
   Is DEF contaminated?
   YES: Drain and clean DEF tank, refill and retest system.
   NO: Proceed to Step 3.
3. Inspect Post NOx sensor connector and sensor installation.
   Is Post NOx sensor correctly installed?
   YES: Proceed to CAUSE B.
   NO: Properly install NOx sensor.

CAUSE B - DEF INJECTOR FAULT

PROCEDURE OR ACTION:

1. Using the PC Service Tool, locate and perform the ***Injector / Pump Test (ACU)*** test.
   Is injector properly injecting DEF?
   YES: Suspect faulty ACU.
   NO: Replace faulty DEF injector.

This DTC is set when abnormal voltage has been detected on the Post NOx sensor circuit or an open or short circuit is present.

CODES

DTC 3226-12 - Post NOx Sensor Error
DTC 3233-12 - Post NOx Sensor Heater Error
DTC 3226-1 - Post NOx Sensor Error Tampering
DTC 523618-2 - No Communication with Post NOx Sensor

POSSIBLE CAUSE

A. POST NOX SENSOR WIRING FAULT
B. POST NOX SENSOR CANBUS COMMUNICATION FAULT
C. POST NOX SENSOR FAULT

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

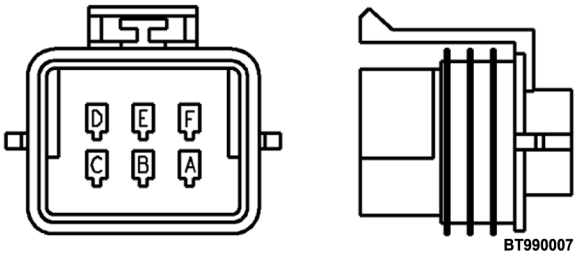
COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

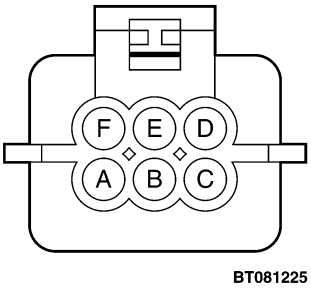
NOTE: The Post NOx Sensor is provided switched battery voltage from a 10A fuse. Ground is provided by the ECU connector V01. Sensor information is communicated over the CANbus system to the ECU and other components.

1. Turn power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Go to Step 2.
   NO: Problem not verified. Resume operation.
2. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code. Make sure electrical connection is a good physical connection (i.e. sockets and pins are seated correctly; connector "clicks" indicating locking tab works correctly).
   Are any of the connectors/wiring damaged?
   YES: Repair/replace connector or wiring associated with faults found. Refer to appropriate **Electrical System** manual, depending on lift truck model.
   NO: Go to CAUSE A.

Electrical Function Does Not Turn Off



Connectors CPS37 and CPS38



Connectors CPS37, CPS38 (2007 Mazda EPA)

POSSIBLE CAUSE

A. SHORT TO SWITCHED OR UNSWITCHED BATTERY IN HARNESS

B. FUSED RELAY CIRCUIT

C. POWER DISTRIBUTION MODULE SHORT

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. At the DSC, Enter MAIN MENU, scroll to DIAGNOSTICS, **ENTER,** scroll to GENERAL DATA DISPLAY.

NOTE: "2" button is for Front Work Lights, "3" button is for the Rear Work Lights.

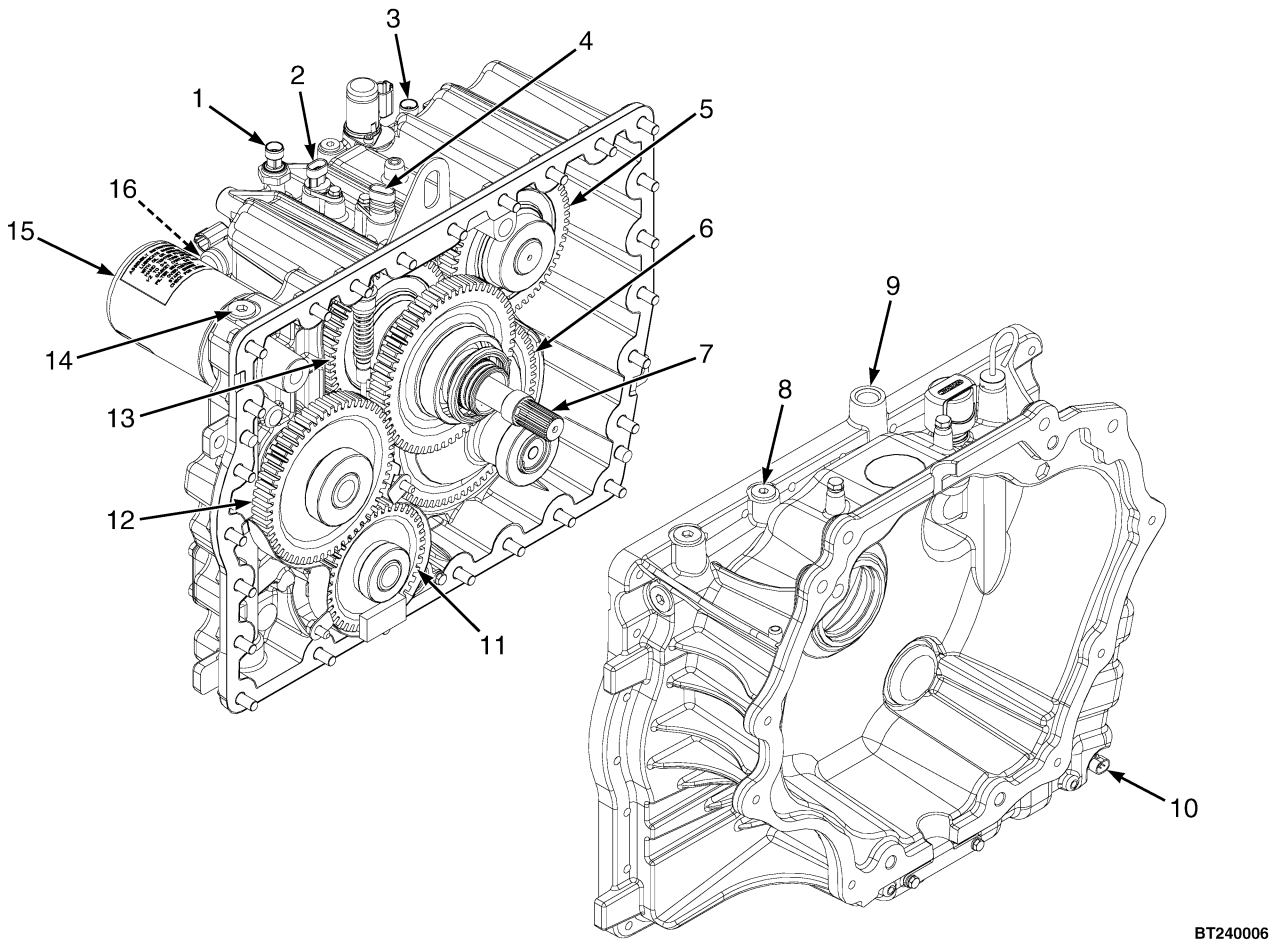
2. Scroll down until the appropriate switch appears on display. Operate relevant switch and read display.
   Does display show Switch Operating Correctly?
   YES: Go to CAUSE A.
   NO: Replace DSC.

CAUSE A - SHORT TO SWITCHED OR UNSWITCHED BATTERY IN HARNESS

PROCEDURE OR ACTION:

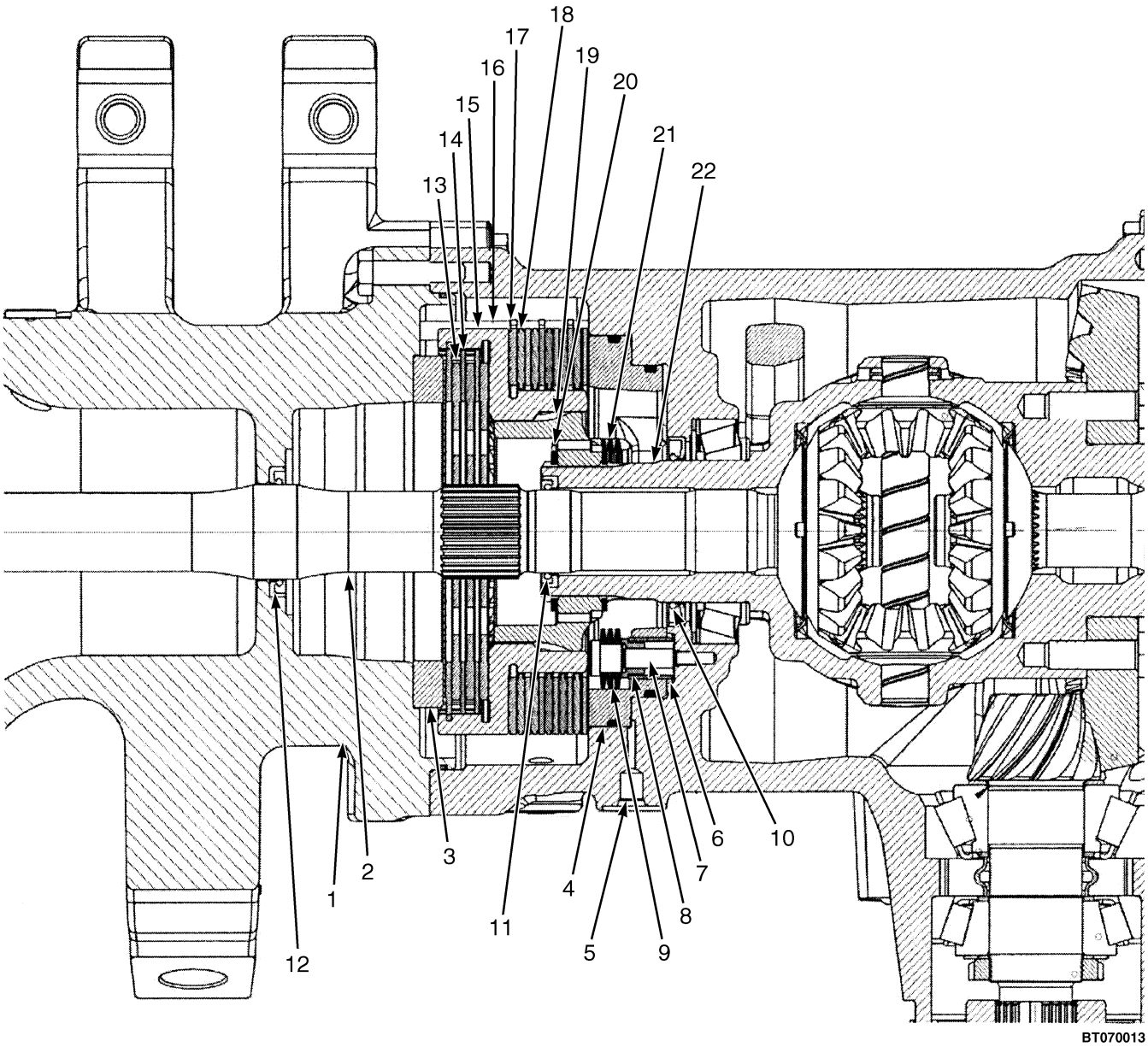
NOTE: Refer to the overall Electrical System Schematics in **Diagrams and Schematics** 8000YRM1152.

1. Turn power **OFF**. Disconnect relevant wiring harness connector from the PDM. Turn power **ON**.
   Does device continue to operate?
   YES: Go to Step 2.
   NO: Go to CAUSE B.
2. Turn power **OFF**. Inspect harness for short to battery.
   Is harness shorted to battery?
   YES: Repair or Replace harness. See **Wire Harness Repair** 2200YRM1128.
   NO: Go to CAUSE B.



1. PRESSURE TRANSDUCER, FWD CLUTCH
2. SPEED SENSOR, TISS
3. PRESSURE TRANSDUCER, REV CLUTCH
4. SPEED SENSOR, TOSS
5. REV CLUTCH ASSEMBLY
6. TRANSMISSION GEAR OUTPUT
7. MAIN INPUT SHAFT
8. BRAKE COOLING SUPPLY PORT
9. TRANSMISSION COOLING SUPPLY PORT
10. SENSOR, TEMPERATURE
11. GEAR DRIVE, CHARGE PUMP
12. GEAR DRIVE, HYDRAULIC PUMP
13. FWD CLUTCH ASSEMBLY
14. TRANSMISSION PUMP PORT
15. OIL FILTER, TRANSMISSION
16. LUBRICATION PORT (NOT SHOWN)

Figure 9040-10-5. Aluminum Transmission Gear Drive



1. LEFT TRUMPET ARM
2. LEFT HALF SHAFT
3. DRIVE PLATE
4. PISTON
5. WORKING FLUID ACTUATION PORT
6. SELF ADJUSTER SLEEVE
7. SWITCH
8. SELF ADJUSTER STOP
9. PISTON RETURN SPRINGS
10. RIGHT SIDE BRAKE CHAMBER SEAL
11. MID BRAKE CHAMBER SEAL
12. LEFT SIDE BRAKE CHAMBER SEAL
13. DIFFERENTIAL LOCKER FRICTION DISC
14. DIFFERENTIAL LOCKER SEPARATOR PLATE
15. DIFFERENTIAL LOCKER CARRIER
16. SERVICE BRAKE PINS
17. SERVICE BRAKE SEPARATOR PLATE
18. SERVICE BRAKE FRICTION DISC
19. INNER CARRIER
20. INNER CARRIER OUTBOARD RETAINING RING
21. INNER CARRIER INBOARD RETAINING RING
22. DIFFERENTIAL ASSEMBLY

Figure 9040-10-38. Wet Disc Brake Drive Axle, Service Brake Assembly, 2.0-3.5 Ton Only

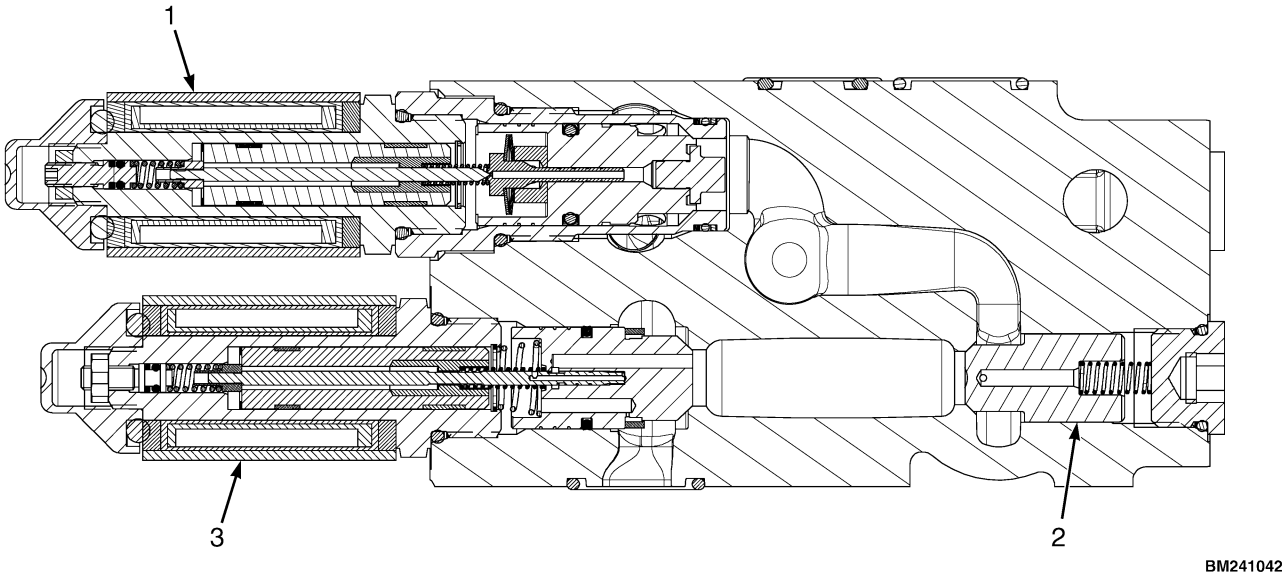
CAUSE H - TRANSMISSION INPUT SPEED SENSOR (TISS)

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Disconnect indicated sensor connector.
3. Select volts scale on DMM.
4. Turn truck power **ON**.
5. At sensor connector, measure voltage across sensor supply (+) and sensor ground (−).
   Is voltage approximately +5Vdc?
   YES: Sensor supply and sensor ground connections are OK. Go to Step 7.
   NO: Go to Step 6.
6. Move the negative (−) meter probe to a clean frame ground.
   Is voltage approximately 5 Vdc?
   YES: Sensor ground has open circuit. Locate and repair/replace open wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
   NO: Sensor supply has open circuit. Locate and repair/replace open wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
7. Disconnect sensor connection at VSM input.
8. Change DMM scale to ohms. Verify DMM zero reading.

NOTE: Make indicated measurements for both sensors if troubleshooting a TOSS sensor DTC.

9. Measure resistance of sensor signal wire(s) between VSM connector and sensor connector.
   Is resistance less than 0.5 ohms?
   YES: Go to Step 10.
   NO: Sensor signal wire(s) open circuit. Locate and repair/replace open wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
10. At the sensor harness connector, measure the resistance between the sensor signal pin and sensor ground pin. Repeat if two Signal Wires.
    Is resistance approximately 0.5 ohms?
    YES: Sensor signal wire is shorted to sensor ground wire. Locate and repair/replace shorted wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
    NO: Go to Step 11.
11. Move the negative (−) meter lead to a clean frame ground and repeat the measurement(s).
    Is resistance approximately 0.5 ohms?
    YES: Sensor signal wire is shorted to frame ground. Locate and repair/replace shorted wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
    NO: Go to Step 12.
12. Ensure truck power is **OFF**.
13. Disconnect indicated connectors from sensor and from VSM.
14. Turn truck power **ON**.
15. Change DMM to volts scale.
16. At sensor harness connector, measure voltage across sensor signal pin (+) and the negative (−) terminal of battery.
    Is voltage approximately 5Vdc or 12Vdc?
    YES: If voltage is approximately 5Vdc, go to Step 17. If voltage is approximately 12Vdc, go to Step 18.
    NO: Go to CAUSE H.
17. Sensor signal wire is shorted to a 5-volt source. Refer to appropriate **Diagrams and Schematics** manual, depending on lift truck model, to determine possible source. Locate and repair/replace shorted wire/connection. Refer to appropriate **Wire Harness Repair** manual, depending on lift truck model.
18. Sensor signal wire is shorted to a 12-volt source. Turn power **OFF** and repeat measurement from Step 16.
    Is voltage equal to battery voltage?



1. LOWER EHPV
2. LOAD CHECK VALVE
3. LIFT EHPV

Figure 9050-10-22. Lift/Lower EHPVs

For the Lift function, the (EF) passage is connected to the work port, with oil first passing through the lift load-sense chamber and passing the low leak load check valve poppet. Oil then flows from the (EF) passage into the lift cylinder. Because the unloader maintains the (EF) pressure at Standby Pressure (see Table 9050-10-1) above the lift load-sense signal, the lift flow is compensated. This means lift speed will be the same no matter how much load is on the forks, since the pressure differential is constant.

For the Lower function, the work port is connected directly to the tank. Nothing but the lowering poppet is in this circuit. The gravitational forces on the forks force the oil in the cylinder back through the work port and to the tank passage. Because this is a single-acting cylinder, the pump is not pumping any oil into the other side of the cylinder. For this reason, the lowering flow is not compensated. The speed at which the forks lower will be directly proportional to the load.

EHPV Operation

With zero current applied to the coil of the EHPV, pump pressure acts on the top of the poppet (control chamber). This creates a higher pressure at the top of the poppet (control chamber) than on the nose of the poppet, keeping the poppet seated and restricting any oil flow (closed).

Raise (Metering): As current is applied to the EHPV coil, the balanced pilot spool is raised, allowing oil to drain from the top of the poppet (control chamber) to the lift work port. This creates a pressure drop between the top of the poppet (control chamber) and the nose of the poppet. As a result, the poppet raises, allowing oil to flow from the side of the poppet to the nose. This flow of oil allows the lift function to rise. See Figure 9050-10-23.

Lower (Metering): Lift cylinder high pressure oil acts on the nose of the lowering EHPV. Some of this oil is directed to the control chamber via an internal passage. This creates a higher pressure at the top of the poppet (control chamber) than on the nose of the poppet, keeping the poppet seated. As current is applied to the EHPV coil, the pilot pin is raised, allowing oil to drain from the top of the poppet (control chamber) to tank. This creates a lower pressure on top of the poppet than on the nose of the poppet. The pressure differential causes the poppet to rise off of the seat, allowing oil to flow from the high pressure (lift work port) to tank. See Figure 9050-10-24.

Back Lash/Kick Back in Steering Wheel

POSSIBLE CAUSE

A. LOOSE STEERING AXLE COMPONENTS.
B. SPLINES OR STEERING SHAFT UNIVERSAL JOINT IN STEERING COLUMN WORN OR BROKEN.
C. STEERING RELIEF PRESSURE IS NOT SET CORRECTLY.
D. FAILED CENTERING SPRINGS IN SCU.
E. STEERING CONTROL UNIT IS ASSEMBLED INCORRECTLY OR IS DAMAGED.
F. ANTI-KICKBACK CHECK VALVE NOT WORKING PROPERLY

CAUSE A - LOOSE STEERING AXLE COMPONENTS.

PROCEDURE OR ACTION:

1. Turn steering wheel back and forth while observing steer axle wheels at slow idle.
   Do the tires respond directly to steering wheel movement?
   YES: Go to CAUSE B.
   NO: Inspect wheel studs and steering axle components for damage. Repair as required. See **Steering Axle** 1600YRM1133.

CAUSE B - SPLINES OR STEERING SHAFT UNIVERSAL JOINT IN STEERING COLUMN WORN OR BROKEN.

PROCEDURE OR ACTION:

1. Turn steering wheel back and forth while observing steer axle wheels at slow idle.
   Does the steer axle wheels movement match steering wheel movement in both directions?
   YES: Go to CAUSE C.
   NO: Inspect and repair steering column. See **Steering Axle** 1600YRM1133.

CAUSE C - STEERING RELIEF PRESSURE IS NOT SET CORRECTLY.

PROCEDURE OR ACTION:

1. Do Operational Diagnostic Procedures, Operational Checkout, Page 9010-05-12.
   Is steering relief pressure set to specification?
   YES: Adjust steering relief pressure. See Steering Relief Pressure Test and Adjustment.
   NO: Go to CAUSE D.

CAUSE D - FAILED CENTERING SPRINGS IN SCU.

PROCEDURE OR ACTION:

1. Inspect SCU.
   Are the centering springs in good condition?
   YES: Springs are OK. Go to CAUSE E.
   NO: Replace centering springs. See **Main Control Valve** 2000YRM1137.

CAUSE H - EHPV STICKING.

PROCEDURE OR ACTION:

1. Remove and inspect poppet valve. See **Main Control Valve** 2000YRM1137.
   Is poppet undamaged and moves freely in bore?
   YES: Go to CAUSE I.
   NO: Replace poppet valve.

CAUSE I - MAST LOWERING CONTROL VALVE IS STICKING.

PROCEDURE OR ACTION:

1. Inspect mast lowering control valve for proper operation. See **Mast Repairs (S/N A551, A555, A559, A661, A662, A663, A664, B507, B508, B509, B551, B555, B559, B562, B563, B564, B661, B662, B663, C515, C551, C555, C559, D507, D508, D509, D515, D562, D563, D564, E509, and E564)** 4000YRM1148.
   Is mast lowering control valve sticking?
   YES: Repair or replace mast lowering control valve.
   NO: Go to CAUSE J.

CAUSE J - STICKING UNLOADER SPOOL (LIFT FUNCTION ONLY).

PROCEDURE OR ACTION:

1. Inspect unloader valve for damage or contamination. See **Main Control Valve** 2000YRM1137.
   Is unloader free of contamination and in good condition?
   YES: Go to CAUSE K.
   NO: Clean or replace unloader valve.

CAUSE K - MAIN CONTROL VALVE LS (LOAD SENSE) RELIEF LEAKAGE.

PROCEDURE OR ACTION:

1. Check LS pressure. See Main Control Valve LS Leakage Test (E-Valve).
   Does LS pressure meet test specifications?
   YES: See Observed Symptoms-Gear Pump, Lift Function Will Not Move With Joystick or MLM Movement (E-Valve), Page 9050-33-40.
   NO: Clean or replace main relief valve. See **Main Control Valve** 2000YRM1137.

END SYMPTOM

END SYMPTOM

CAUTION

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

4. Slowly loosen left steering hose fitting that goes into SCU top left port marked (L). Remove left steering hose and keep it elevated so oil is not lost. Install O-ring Face Seal (ORFS) high pressure cap on left port fitting of SCU to seal valve against high pressure leakage when steering wheel is turned.

NOTE: Turning the steering wheel by hand with engine off will generate hydraulic pressure in cylinder. If leakage is noted at this lower pressure, cylinder has excessive leakage.

5. Attempt to turn the steering wheel by hand. If oil flows out of hose at noticeable rate (approximately 50% of test specification), steering cylinder needs repair. Stop test and repair steering. If no oil flow, go to Step 6.

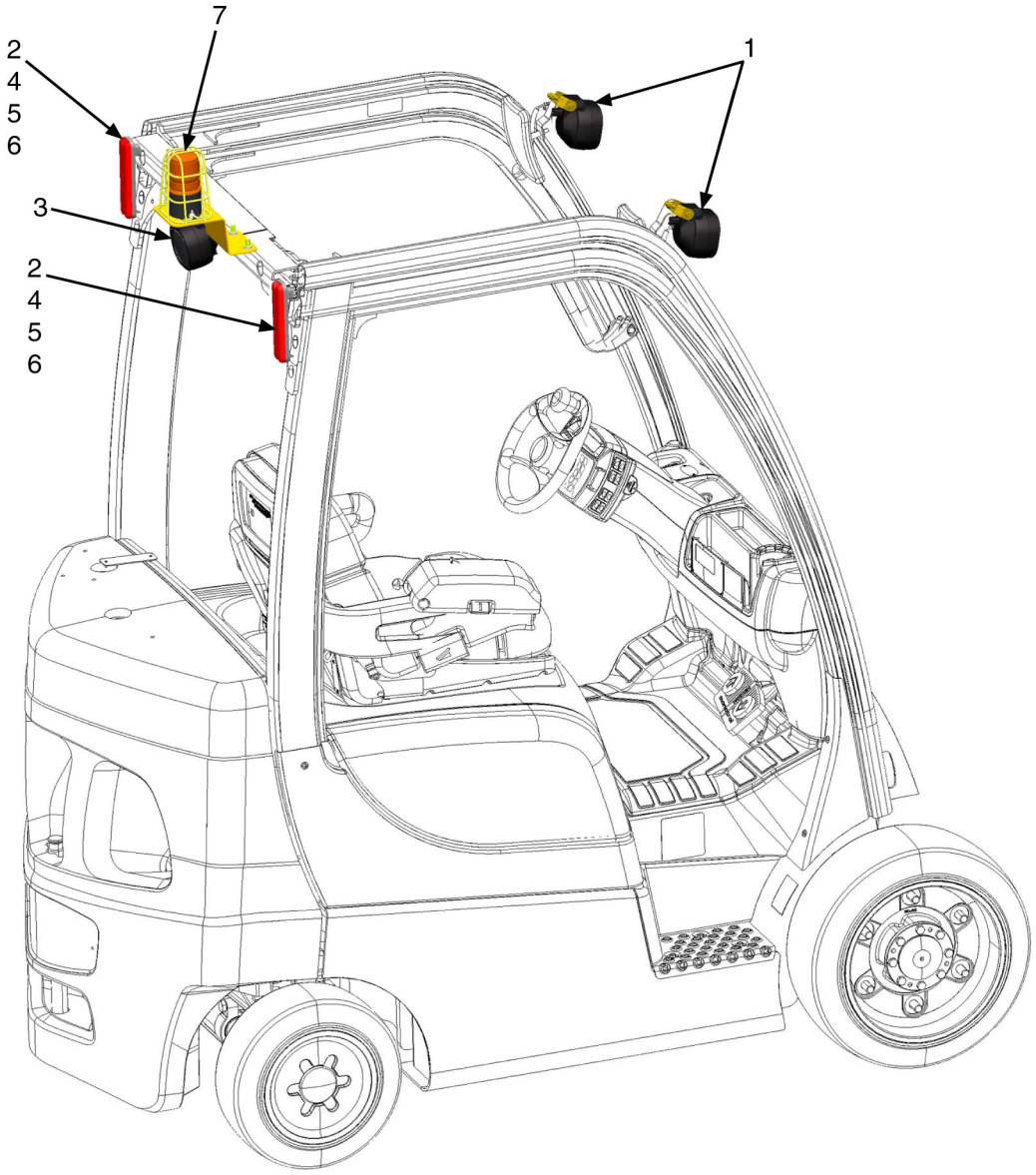
WARNING

A open steering port can expel hydraulic oil under pressure and it can be injected into skin. Seal SCU port with high pressure ORFS cap before starting engine.

6. Start engine and hold steering against right axle stop and hold. Measure oil after it starts to flow from end of removed steering hose for 1 minute.

7. Stop engine and compare measured oil to test specifications.
   - If leakage is below specifications, the steering cylinder is OK.
   - If leakage is more than specifications, remove and repair steering cylinder. See **Steering Axle** 1600YRM1133.

8. Remove caps and reinstall hose and valve covers.



1. FRONT WORK LIGHTS
2. REAR TAIL/MARKER LIGHTS
3. REAR WORK LIGHT
4. REAR TURN LIGHTS
5. REAR BACKUP LIGHTS
6. REAR STOP LIGHTS
7. STROBE LIGHTS

Figure 9060-10-16. Lights, Non Cab Configuration

CAUSE I - CHAINS LOOSE OR NOT EQUAL

PROCEDURE OR ACTION:

1. Inspect chains. For 1.0-3.5 Ton Cushion and Pneumatic Trucks, see **Mast Repairs (S/N A551, A555, A559, A661, A662, A663, A664, B507, B508, B509, B551, B555, B559, B562, B563, B564, B661, B662, B663, C515, C551, C555, C559, D507, D508, D509, D515, D562, D563, D564, E509, and E564)** 4000YRM1148. For 4.0-7.0 Ton Cushion and Pneumatic Trucks, see **Mast Repairs, 2- and 3-Stage Masts (S/N A513, A514, A613, A614, A702, A703, A704, A705, A706, A707, A751, A752, B513, B514, B586, B587, B588, B589, B590, B591, B749, B750, B751, B752, B753, B754)** 4000YRM1250. For 8.0-9.0 Ton Cushion and Pneumatic Trucks, see **Mast Repair (S/N A513, A514, A613, A614, A643, A644, A683, A684)** 4000YRM1406.
   Are chains adjusted correctly and in good condition?
   YES: Go to CAUSE J.
   NO: Adjust or repair chains. For 1.0-3.5 Ton Cushion and Pneumatic Trucks, see **Mast Repairs (S/N A551, A555, A559, A661, A662, A663, A664, B507, B508, B509, B551, B555, B559, B562, B563, B564, B661, B662, B663, C515, C551, C555, C559, D507, D508, D509, D515, D562, D563, D564, E509, and E564)** 4000YRM1148. For 4.0-7.0 Ton Cushion and Pneumatic Trucks, see **Mast Repairs, 2- and 3-Stage Masts (S/N A513, A514, A613, A614, A702, A703, A704, A705, A706, A707, A751, A752, B513, B514, B586, B587, B588, B589, B590, B591, B749, B750, B751, B752, B753, B754)** 4000YRM1250. For 8.0-9.0 Ton Cushion and Pneumatic Trucks, see **Mast Repair (S/N A513, A514, A613, A614, A643, A644, A683, A684)** 4000YRM1406.

CAUSE J - WORN LOAD ROLLERS OR STRIP BEARINGS

PROCEDURE OR ACTION:

1. Inspect load rollers and strip bearings. For 1.0-3.5 Ton Cushion and Pneumatic Trucks, see **Mast Repairs (S/N A551, A555, A559, A661, A662, A663, A664, B507, B508, B509, B551, B555, B559, B562, B563, B564, B661, B662, B663, C515, C551, C555, C559, D507, D508, D509, D515, D562, D563, D564, E509, and E564)** 4000YRM1148. For 4.0-7.0 Ton Cushion and Pneumatic Trucks, see **Mast Repairs, 2- and 3-Stage Masts (S/N A513, A514, A613, A614, A702, A703, A704, A705, A706, A707, A751, A752, B513, B514, B586, B587, B588, B589, B590, B591, B749, B750, B751, B752, B753, B754)** 4000YRM1250. For 8.0-9.0 Ton Cushion and Pneumatic Trucks, see **Mast Repair (S/N A513, A514, A613, A614, A643, A644, A683, A684)** 4000YRM1406.
   Are the load rollers and strip bearings in good condition?
   YES: Go to CAUSE K.
   NO: Adjust, repair, or replace load rollers and strip bearings as required.

CAUSE K - MAST CHANNELS ARE WORN

PROCEDURE OR ACTION:

1. Inspect mast channels for wear or damage. For 1.0-3.5 Ton Cushion and Pneumatic Trucks, see **Mast Repairs (S/N A551, A555, A559, A661, A662, A663, A664, B507, B508, B509, B551, B555, B559, B562, B563, B564, B661, B662, B663, C515, C551, C555, C559, D507, D508, D509, D515, D562, D563, D564, E509, and E564)** 4000YRM1148. For 4.0-7.0 Ton Cushion and Pneumatic Trucks, see **Mast Repairs, 2- and 3-Stage Masts (S/N A513, A514, A613, A614, A702, A703, A704, A705, A706, A707, A751, A752, B513, B514, B586, B587, B588, B589, B590, B591, B749, B750, B751, B752, B753, B754)** 4000YRM1250. For 8.0-9.0 Ton Cushion and Pneumatic Trucks, see **Mast Repair (S/N A513, A514, A613, A614, A643, A644, A683, A684)** 4000YRM1406.
   Are the mast channels in good condition?
   YES: Go to CAUSE L.
   NO: Repair or replace worn mast components.

Wheels Spinning On Uneven Floors

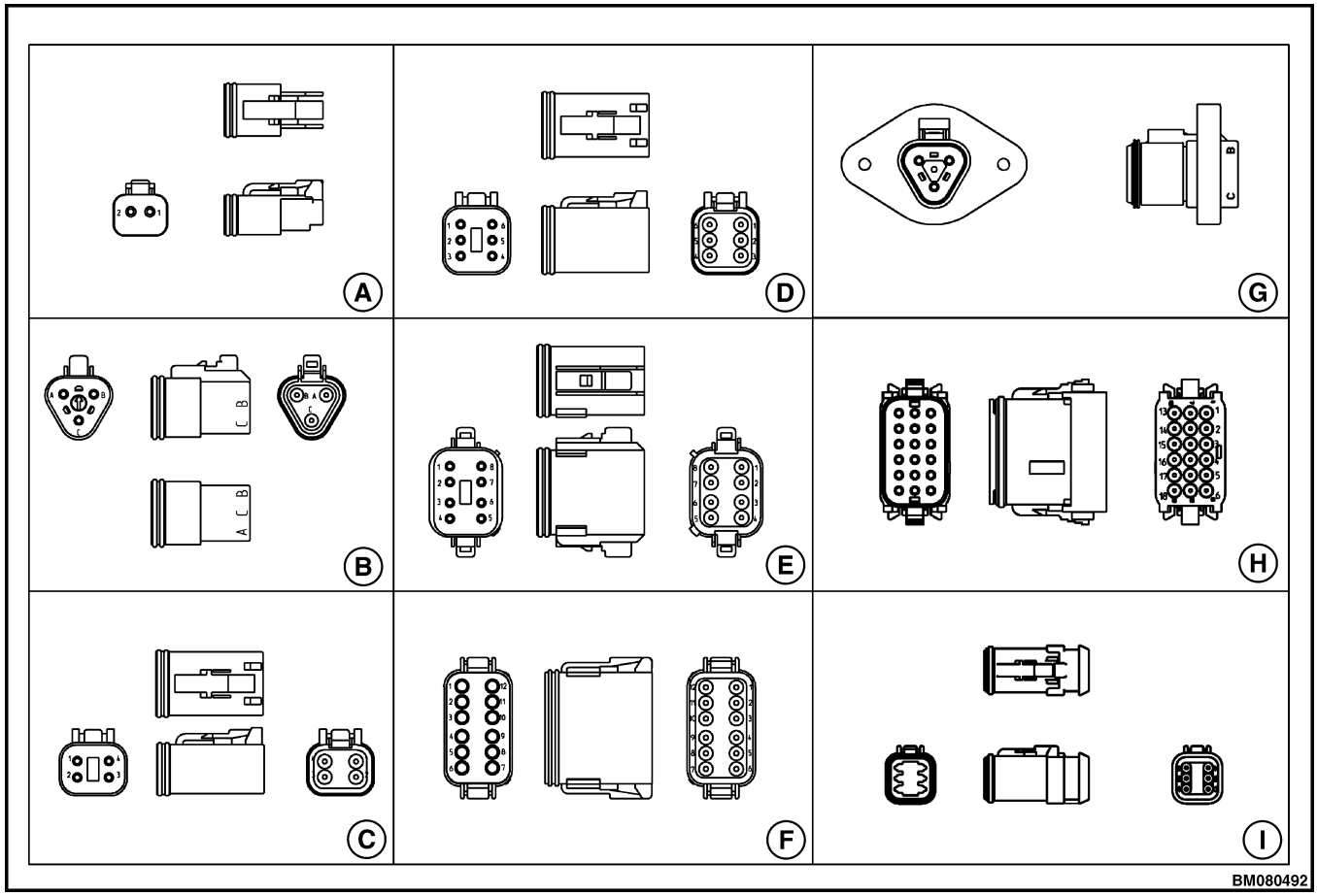
POSSIBLE CAUSE

CAUSE A - FAILED STEERING AXLE RUBBER MOUNTS

PROCEDURE OR ACTION:

NOTE: When running empty, failed rubber mount will cause the frame to be rigid because of the counterweight on the steer axle. When one drive wheel encounters a uneven floor or object it will raise the other drive wheel off ground loosing traction to move truck.

1. Inspect and repair rubber mounts. See **Steering Axle** 1600YRM1133.

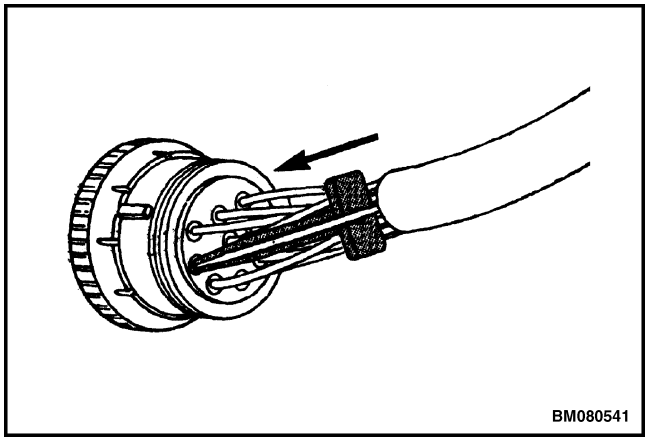


NOTE: ALL CONNECTOR PLUGS ARE SHOWN WITH THE SECONDARY LOCK INSTALLED.

A. CONNECTOR TYPE CA
B. CONNECTOR TYPE CB
C. CONNECTOR TYPE CC
D. CONNECTOR TYPE CD
E. CONNECTOR TYPE CE
F. CONNECTOR TYPE CF
G. CONNECTOR TYPE CH (SIMILAR TO TYPE CB)
H. CONNECTOR TYPE CG
I. CONNECTOR TYPE CL

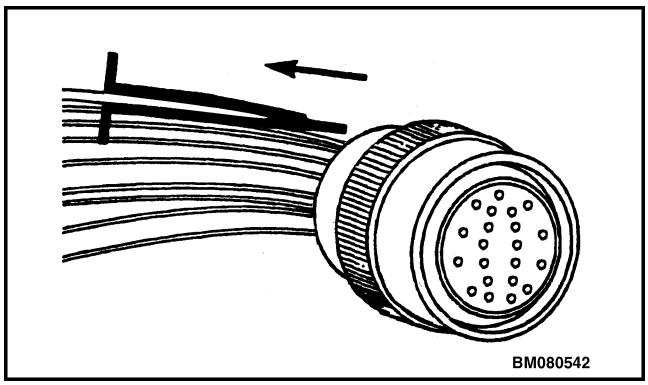
Figure 17. DT Connector Plugs

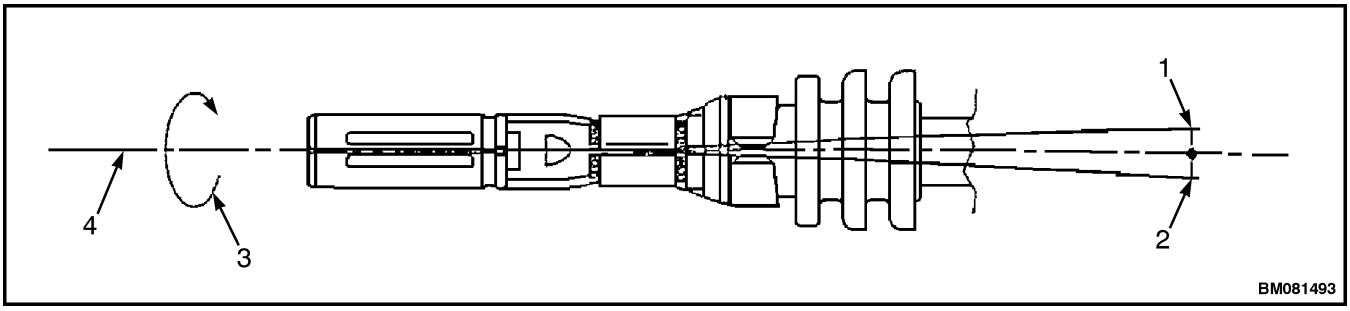
STEP 3.
Push the tool into the connector about 25 mm (1 in.) until it bottoms on the contact flange.



NOTE: If pin is difficult to remove, remove the extraction tool, turn the extraction tool 90 degrees, and reinsert the tool into the connector.

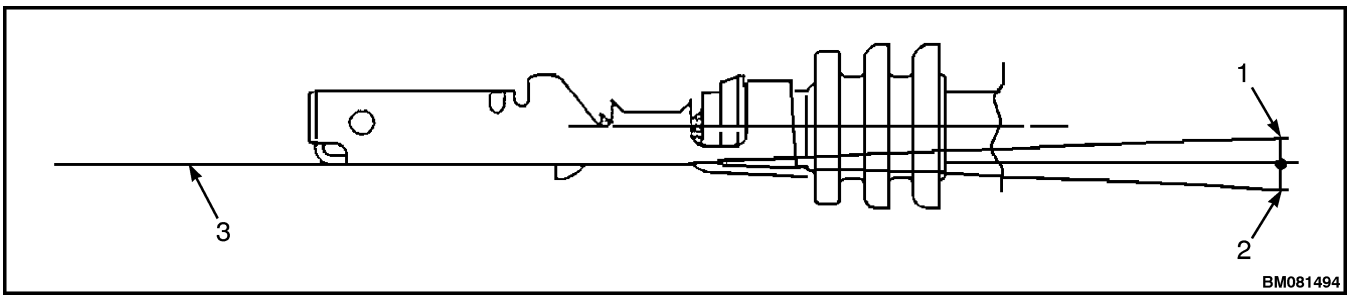
STEP 4.
Hold the tool on the contact flange and pull the wire and the connection socket out of the connector.





1. BEND RIGHT
2. BEND LEFT
3. ROLLING
4. DATUM LINE

Figure 50. Crimping Conditions Bend Right/Left



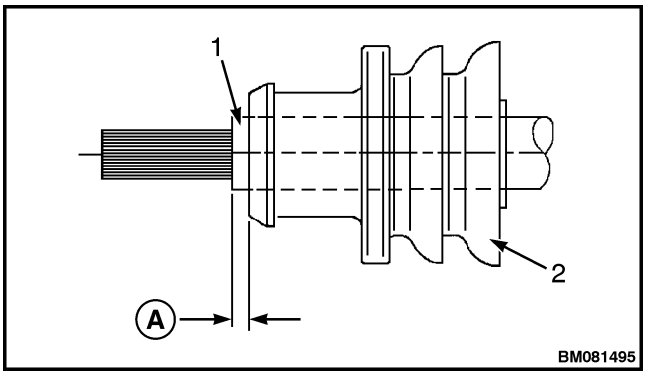
1. BEND UP
2. BEND DOWN
3. DATUM LINE

Figure 51. Crimping Conditions Bend Up/Down

Insertion of Rubber Seal on Cable

NOTE: Rubber seals are lubricated, lubrication must not be removed.

The end of cable insulation to be positioned from edge of rubber seal when rubber seal is installed on cable. See Figure 52.



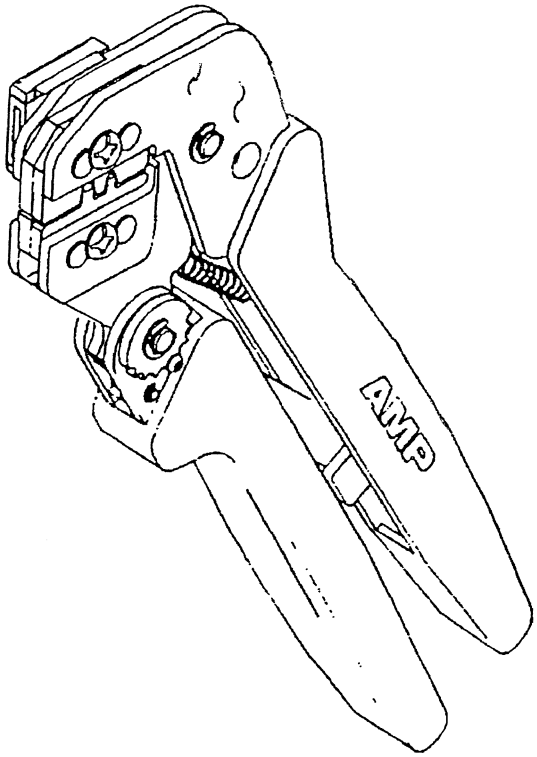
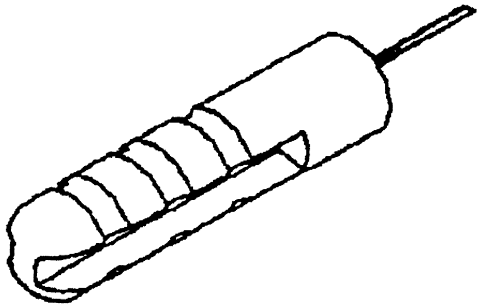
A. 0.5 mm (0.02 in.)MAX

1. WIRE INSULATION 2. RUBBER SEAL

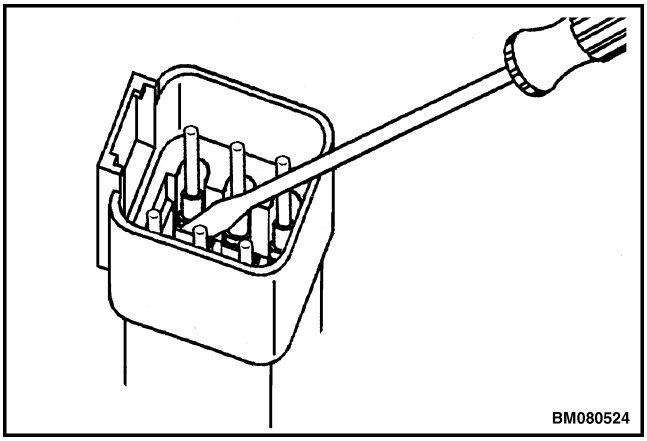
Figure 52. Rubber Seal Installed on Cable

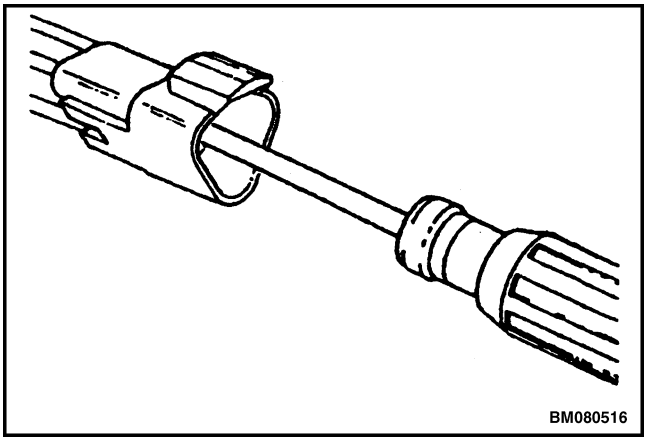
Correction or Replacement of Parts

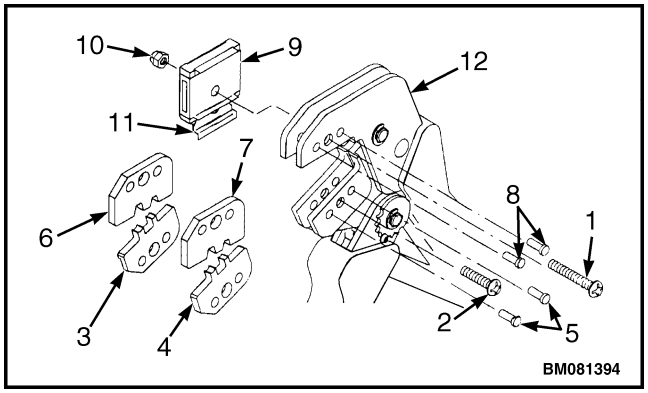
STEP 1.
When defects or improper applications are found on parts to be installed, rework or replace with new parts.

Illustration	Tool Description
 BM081429	**AMP Pro-Crimper II** - Yale P/N 580096885. With Die Set, Yale P/N 580093884. Use for crimping AMPSEAL contacts
 BM081449	**AMP Extracting Tool** - Yale P/N 580093887. AMP Receptacle and Tab Contact Extraction Tool for AMPSeal connectors

STEP 3.
Using a small, flat-blade screwdriver (Yale P/N 150121838) , release the locking finger by moving it away from the pin.







1. UPPER DIE RETAINING SCREW
2. LOWER DIE RETAINING SCREW
3. WIRE ANVIL
4. INSULATION ANVIL
5. LOWER DIE RETAINING PIN
6. WIRE CRIMPER
7. INSULATION CRIMPER
8. UPPER DIE RETAINING PIN
9. LOCATOR ASSEMBLY
10. NUT
11. LOCATOR
12. TOOL FRAME

Figure 36. Die Set and Locator Assembly

Stripping Wire for Use With AMP PRO-CRIMPER II Tool

1. Choose the correct AWG for the contact being used.

2. See Table 4 for recommended strip length.

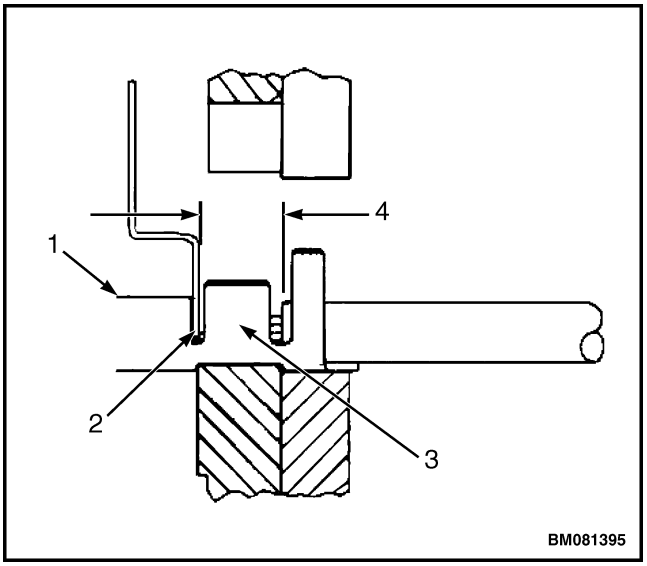
Table 4. Strip Length for PRO-CRIMPER II Tool

Wire Size (AWG)	Wire Insulation Diameter	Strip Length
16	1.7 to 2.7 mm (0.07 to 0.11 in.)	5.1 ±0.4 mm (0.20 ±0.02 in.)
18-20		

CAUTION

DO NOT cut or nick the wire strands.

3. Strip wire to recommended strip length. See Figure 37.



1. CONTACT
2. LOCATOR (IN WIRE STOP SLOT)
3. WIRE (INSERTED TO STOP)
4. STRIP LENGTH

Figure 37. Contact and Wire Strip

Contact Support Adjustment

1. Make a sample crimp. Determine if contact is straight, bent upward or downward.

2. If adjustment is required, loosen adjustment screw, DO NOT remove screw. See Figure 38.

3. Insert contact and wire into tool as shown in Figure 37. Close tool handles until the ratchet reaches the sixth clip or the contact support touches the contact.

4. Loosen the nut, slightly, that holds the locator assembly onto the tool frame. See Figure 38.

5. Move the contact support to eliminate bending the contact.

6. Tighten the nut and squeeze handles until ratchet releases.

7. Remove and inspect the contact.

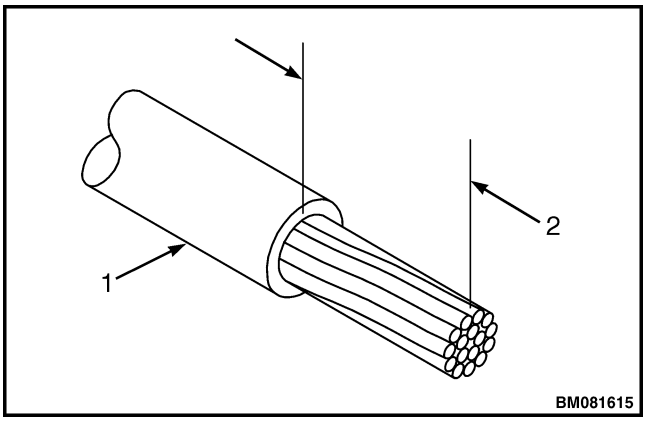
8. Make another sample crimp. If the contact is straight, tighten the adjustment screw. If the contact is bent, repeat Step 2 through Step 8.

Legend for Figure 74.

A. WIRE CONDUCTORS AND INSULATION BOTH VISIBLE IN THIS AREA
B. CONDUCTOR VISIBLE
C. INSULATION BARREL CRIMP WIDTH

1. FRONT BELLMOUTH
2. CRIMP LENGTH
3. REAR BELLMOUTH
4. WIRE BARREL CRIMP WIDTH
5. WIRE BARREL CRIMP HEIGHT
6. WIRE BARREL FLASH
7. CUTOFF TAB
8. MAX BURR

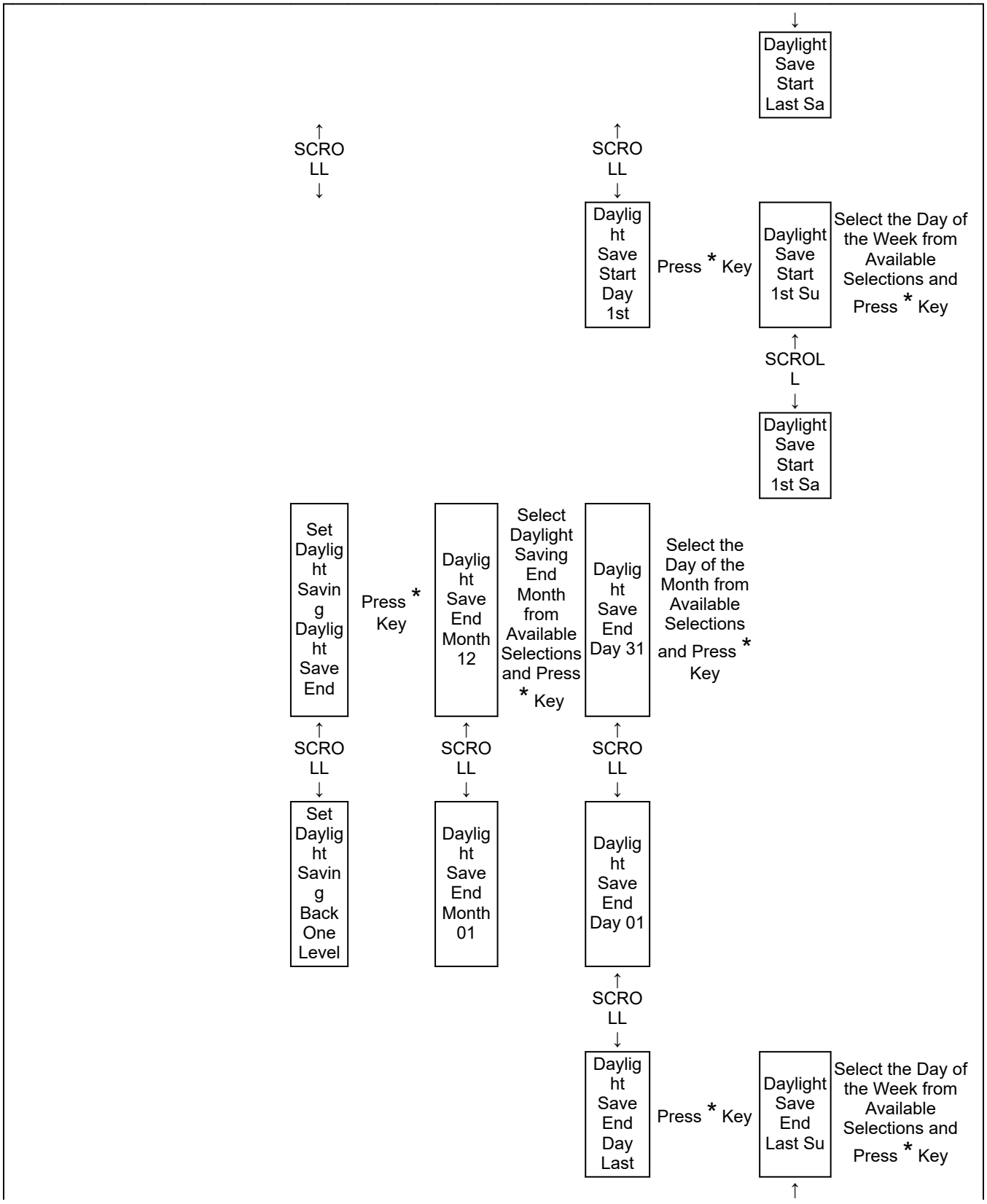
a. The most critical and compressed area is the crimp applied to the wire portion of the contact to ensure optimum electrical and mechanical performance of crimped receptacle. See Figure 75 and Table 13.



1. WIRE INSULATION
2. STRIP LENGTH (SEE TABLE 13)

Figure 75. Wire Strip Length

Table 24. Set Daylight Saving Time Menu (Continued)



Setup Hydraulics

RETURN TO SET TILT DELAY/ON/OFF

If the lift truck is configured for optional return to set tilt, this function can be used to set the time delay before allowing tilt to resume. This function is adjusted by selecting a time period from the menu selection. The function can be set to delay from 0.1 sec. to 3.0 sec. The function can also be deactivated using the OFF setting. Using the continuous setting will cause tilt to stop and hold at the set point until the function is returned to neutral or the override button is pressed.

From the Setup Hydraulics menu, select *Tilt SetPoint Delay* and press the * key. See Table 28. Using the scroll keys, select the desired setting from the menu selections. When finished, press the * key to save your selection and access the Exit Options menu.

Table 28. Tilt Delay Menu

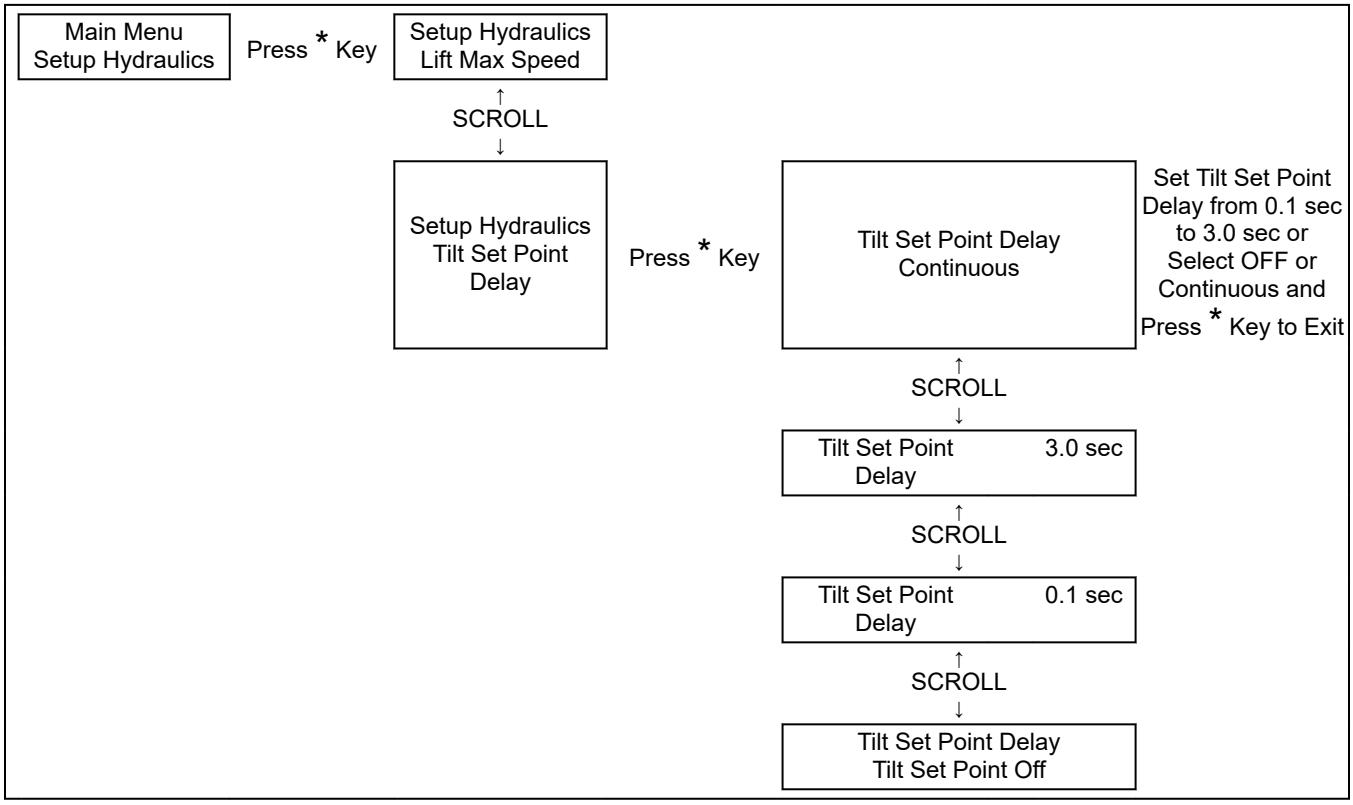
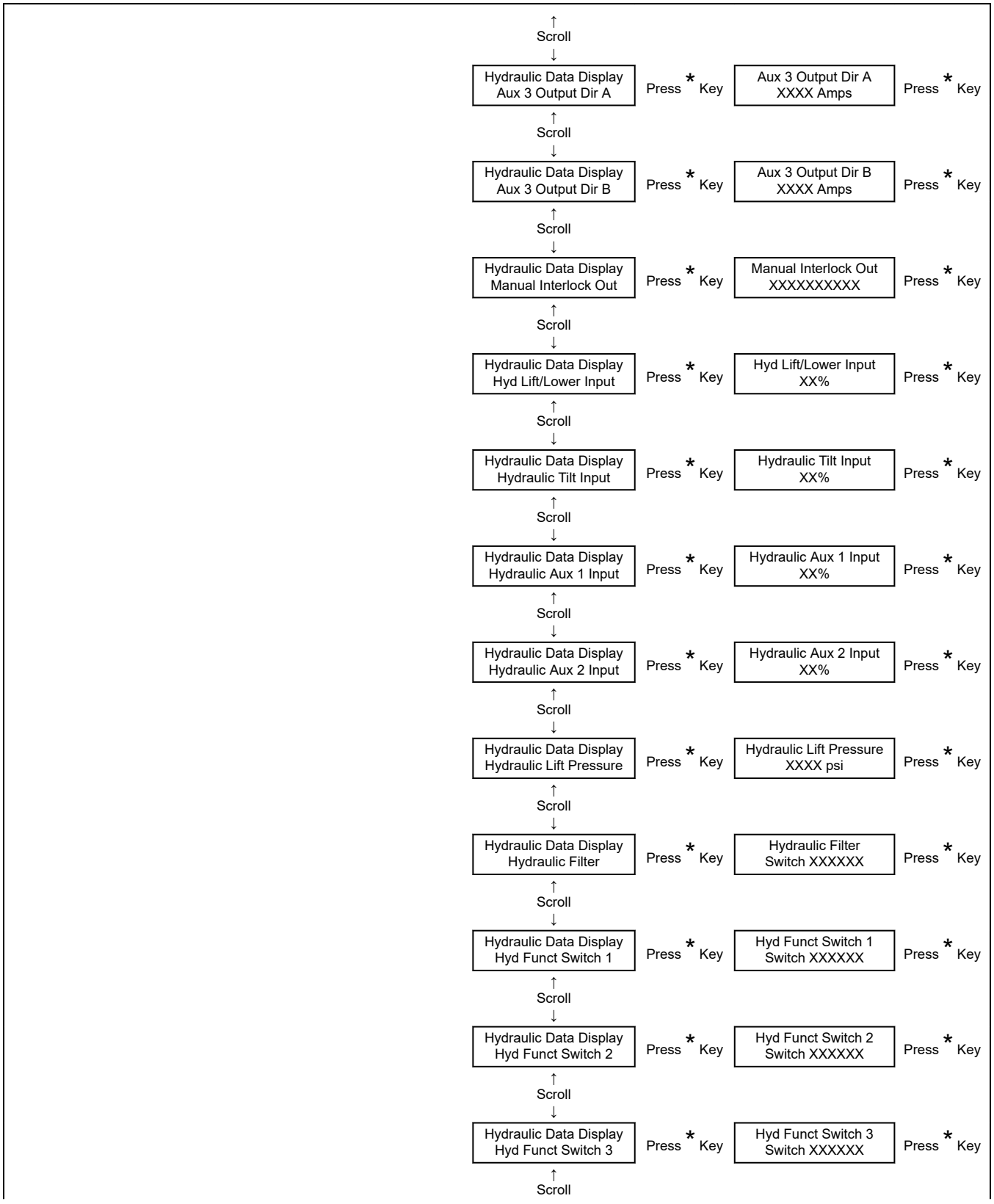


Table 19. Hydraulic Data Display (Continued)



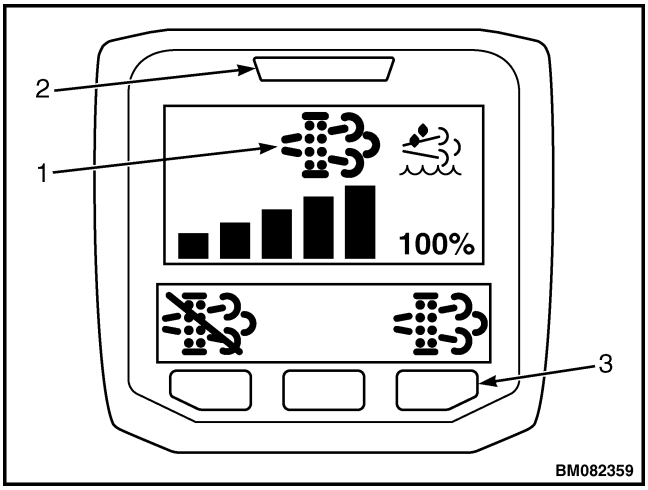


Figure 42. Parked Regeneration Request

WARNING

Prior to initiating the Parked Regeneration process, move the lift truck to a location suitable for elevated exhaust gas temperatures. Make sure the suitable location is free of combustible materials, liquids, and gasses. Failure to do so could cause serious injury to operator and/or serious damage to property.

2. To initiate the Parked Regeneration process, the operator needs to push the Parked Regeneration Initiate Button after all of the following conditions have been met. See Figure 42.

- Engine Running
- Park Brake **ON**
- Transmission in Neutral
- Accelerator pedal **NOT** depressed
- Soot Meter displays 3, 4, or 5 bars

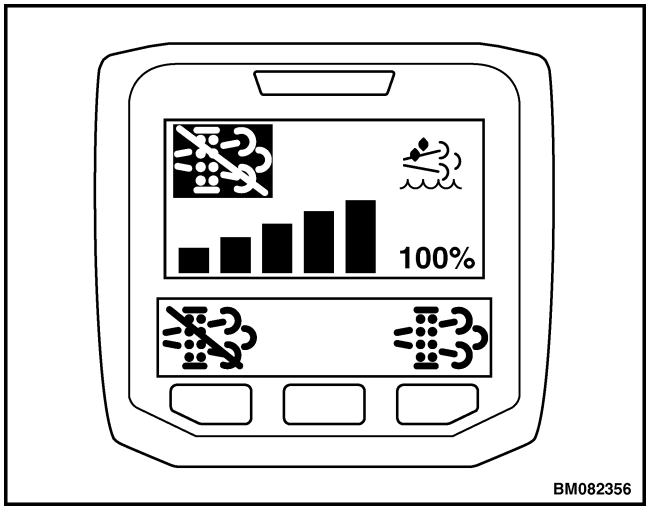


Figure 43. DPF Display - 5 Bar Soot Meter

3. When Parked Regeneration is in process the High Temperature Icon will be displayed. See Figure 44.

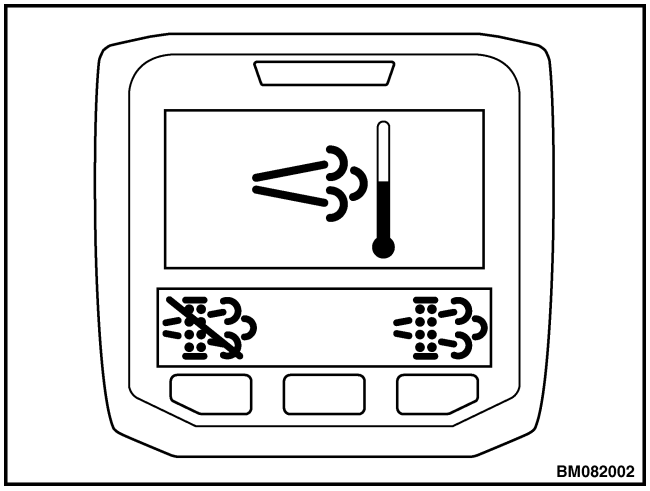
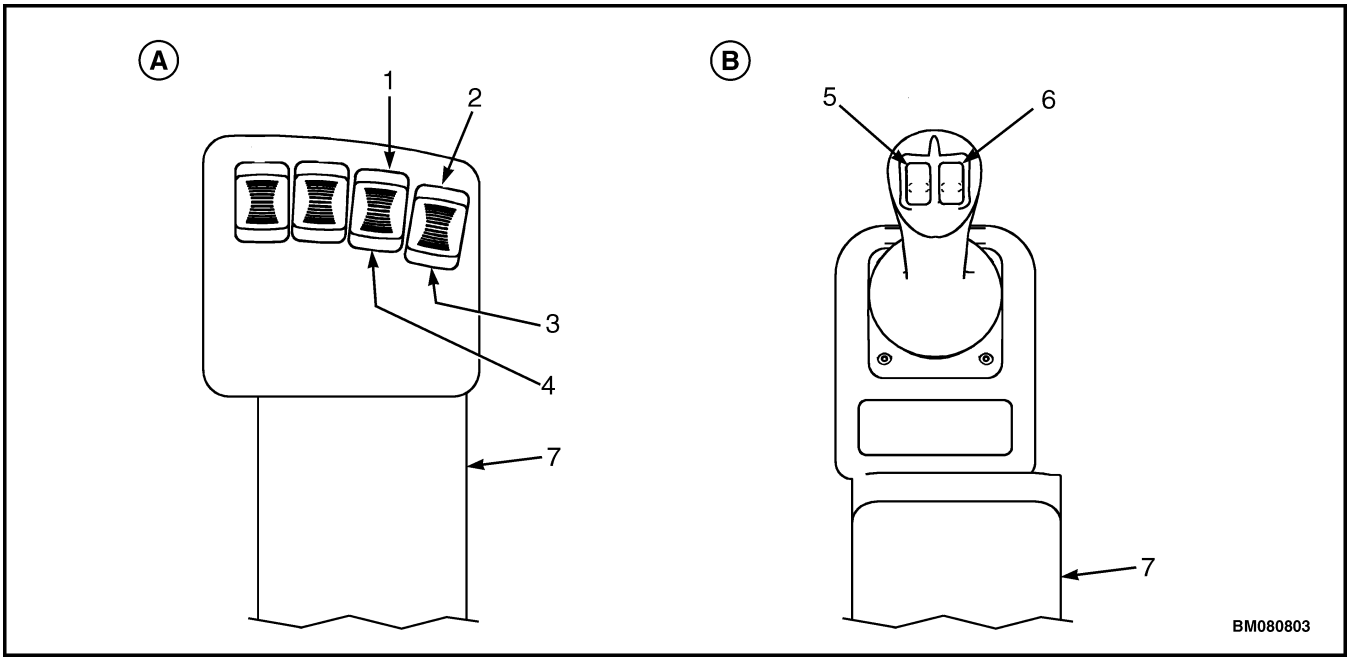


Figure 44. High Temperature Icon

4. Following a successful Parked Regeneration the unit will return to Regeneration Level 0.

5. If Parked Regeneration process is initiated before lift truck has warmed up properly, the Engine Warming Up Icon will be displayed. See Figure 45.



A. E-HYD CONTROLS

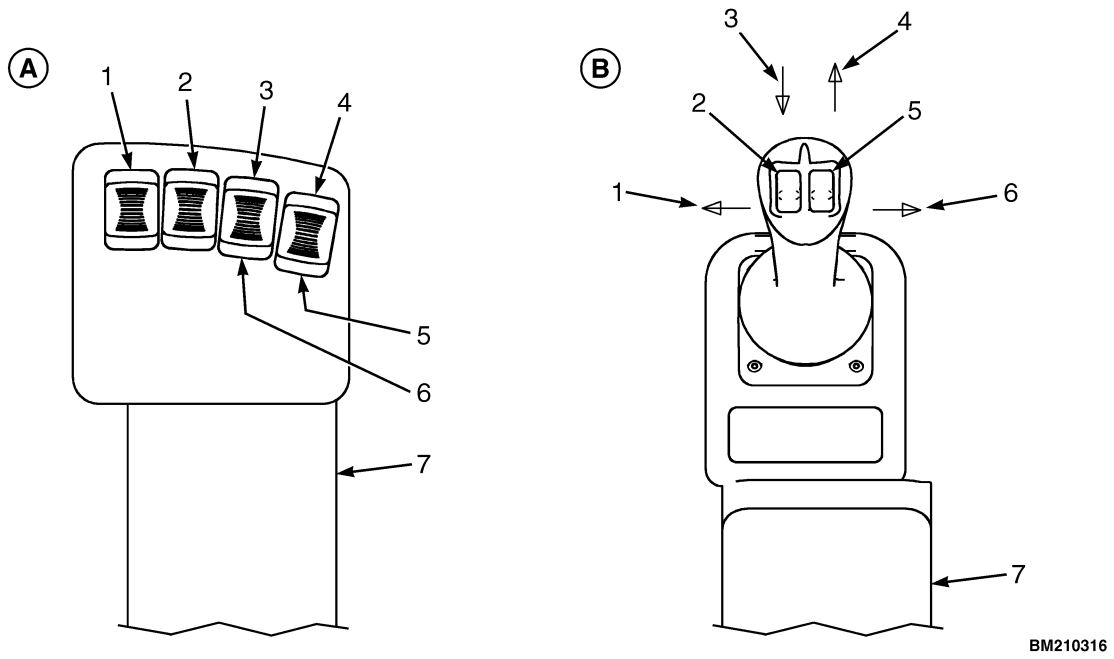
1. AUX 1 OR AUX 2 - DIRECTION A (↑) / DIRECTION B (↓)
2. AUX 2 OR AUX 3 - DIRECTION A (↑) / DIRECTION B (↓)
3. FOURTH LEVER
4. THIRD LEVER

B. JOYSTICK CONTROLS

5. AUX 1 - DIRECTION A (↑) / DIRECTION B (↓)
6. AUX 2 - DIRECTION A (↑) / DIRECTION B (↓)
7. SEAT ARMREST

Figure 2. Auxiliary Functions

Table 16. Proc_Cal_014: Load Weight Zero Point (Continued)



A. E-HYD CONTROL LEVERS

LIFT/LOWER	TILT	*AUX 1 OR AUX 2	*AUX 2 OR AUX 3	*FOURTH LEVER
DIRECTION LIFT ↓	DIRECTION BACK ↓	DIRECTION A ↑	DIRECTION A ↑	*THIRD LEVER
DIRECTION LOWER ↑	DIRECTION FWD ↑	DIRECTION B ↓	DIRECTION B ↓	SEAT ARMREST

*AUX 2 IS IN THE FOURTH LEVER LOCATION EXCEPT AS FOLLOWS: WITH 5 FUNCTION VALVE WITH CLAMPING ATTACHMENT, AUX 2 IS IN THE THIRD LEVER LOCATION.

A. JOYSTICK

TILT BACK	AUX 1	LIFT ↓	AUX 2	TILT FORWARD
	DIRECTION A ↑	↑ LOWER	DIRECTION A ↑	SEAT ARMREST
	DIRECTION B ↓		DIRECTION B ↓	

Step 1: Press ⇧ or ⇩	**Until You See:**	Main Menu Calibrations
Step 2: Press * One Time	**You Will See:**	Calibrations Lift Valve Output
Step 3: Press ⇧ or ⇩	**Until You See:**	Calibrations Load Weight Set Zero
Step 4: Press * One Time	**You Will See:**	Load Weight Set Zero Press * with No Load

Action 4: Lower The Empty Forks/Attachment Approximately 51 mm (2 in.), Wait One Second And Immediately Press * One Time.

Perform Proc_Cal_003: Save and Exit if not performing additional calibration procedures.

Table 10. Proc_Cal_008: Aux 1 Dir A Valve Output Threshold (Continued)

NOTE: Optional for initial manufacture: Use the same pressure setting for both Dir A and Dir B of this function to provide uniform flow outputs. **Action 4:** Until the pressure is just above the standby pressure (as the needle moves on an analog gage). Note that the pressure reading may oscillate. Hold control steady and.....		
Action 5: WATCH for Attachment Movement. When it first starts to move slowly, HOLD control steady and.....		
Press * One Time while holding the control.		
Action 4: STOP activating the Aux 1 Dir A Control. LOOK at the display. Go to the Calibration Step below that matches your display.		
If You See.....	Result out of range Repeat Calibration	
Press * One Time	**You Will See:**	Aux 1 Valve Output Dir A Press * at Creep
Return to Action 3. ***Pressure Method: Perform Actions 3, 4, and 6 again.*** ***Visual Method: Perform Actions 3, 5, and 6 again.***		
If You See.....	Aux 1 Valve Output Dir B Press * at Creep	
To Continue with Calibrations.....		
Go to Action 3 of Proc_Cal_009.		
To Quit and Save....		
Step 1: Press ⇧ or ⇩	**Until You See:**	Aux 1 Valve Output Dir B Back 1 Level
Step 2: Press * One Time	**You Will See:**	Calibrations Back 1 Level
Perform Proc_Cal_003: Save and Exit.		

ADDITIONAL FILTER CADDY FUNCTIONS

Filter caddying as described in the previous section, takes part in the final step of recuperating a hydraulic system after a major component failure. Filter caddies are useful for additional service procedures:

- Transferring and pre-filling new oil from storage when filling hydraulic reservoir.
- Conditioning the hydraulic fluid (cleaning the fluid already in the system).
    - Certain hydraulic system contaminations make it impractical to clean and one needs to determine the benefits of using a caddy filter. For example, to clean oil that is heavily contaminated (to the level of ISO 24/23/20) makes no sense if the condition of the additive package is already degraded. Therefore, before conditioning fluid, check condition of the additive package through oil analysis.

HOW TO HANDLE DIFFERENT FLUIDS

Special care is needed when handling different types of oil. Mixing oils of a different nature, such as hydraulic oil and tractor hydraulic fluids, is not recommended.

The additive concentrations and types are different. Tractor fluids have EP additives that are not fully compatible with AW additives from hydraulic oils. Mixing oils brings changes of viscosity and the possible loss of oil film strength. Oil additives tend to fight over polar surfaces, increasing production of soft metals.

When using a filter caddy with different oils, it is a recommended practice to have different sets of hydraulic filters for use with different oil types. The filter caddy operator should switch to a different filter set matched to the oil type being filtered. Store the alternate filters in properly identified plastic bags that protect them from contamination.

WATER REMOVAL FILTERS

Some water removal filters are made of water absorbent material. They can also act as particle removal units, but their primary function is to remove free water. Most oils have some level of water content, especially those containing calcium additives. Monitoring water content and having a water removal filter permanently installed is a recommended practice. This keeps water content in the range considered acceptable.

Legend for Figure 4.

A. TWO-STAGE LFL MAIN LIFT CYLINDER

1. GLAND
2. O-RING
3. WIPER RING
4. BACKUP RING
5. ROD SEAL
6. WEAR RING
7. ROD

B. THREE-STAGE FFL MAIN LIFT CYLINDER

8. SPACER
9. CHECK VALVE
10. PISTON SEAL
11. PISTON RING
12. WASHER
13. SNAP RING
14. SHELL

CLEAN

WARNING

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

WARNING

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

CAUTION

DO NOT allow cleaning solvent to come in contact with rubber components. It will damage those components.

Clean all metal parts in solvent and dry with compressed air.

INSPECT

NOTE: See the **Parts Manual** for all replacement parts.

- Inspect the gland for damage to the threads and the seal surfaces. If damaged, replace gland.
- Inspect the piston for any damage to the seal surfaces. If damaged, replace piston.
- Inspect the rod for damage to the rod surface and ensure that the rod is not bent. If damaged, replace rod.
- Inspect the inner surface of the cylinder tube for damage. If damaged, replace cylinder assembly.

ASSEMBLE

NOTE: To prevent damage to sealing surfaces, use brass tools when installing seals and O-rings.

1. Lubricate all internal parts of main lift cylinder with clean hydraulic oil. Use new O-rings, seals and wear rings. See Figure 4.

2. Install O-ring on check valve.

WARNING

Be careful when removing or installing snap rings. These snap rings can come loose during removal or installation with enough force to cause an injury. Always use the correct snap ring pliers and wear eye and face protection during removal or installation.

3. Install check valve, washer, and snap ring in base of piston. See Figure 4.

NOTE: For two-stage LFL mast, go to Step 4. For three-stage FFL mast, go to Step 5.

4. Install spacer, backup ring, piston seal, and wear ring on rod and piston. See Figure 4.

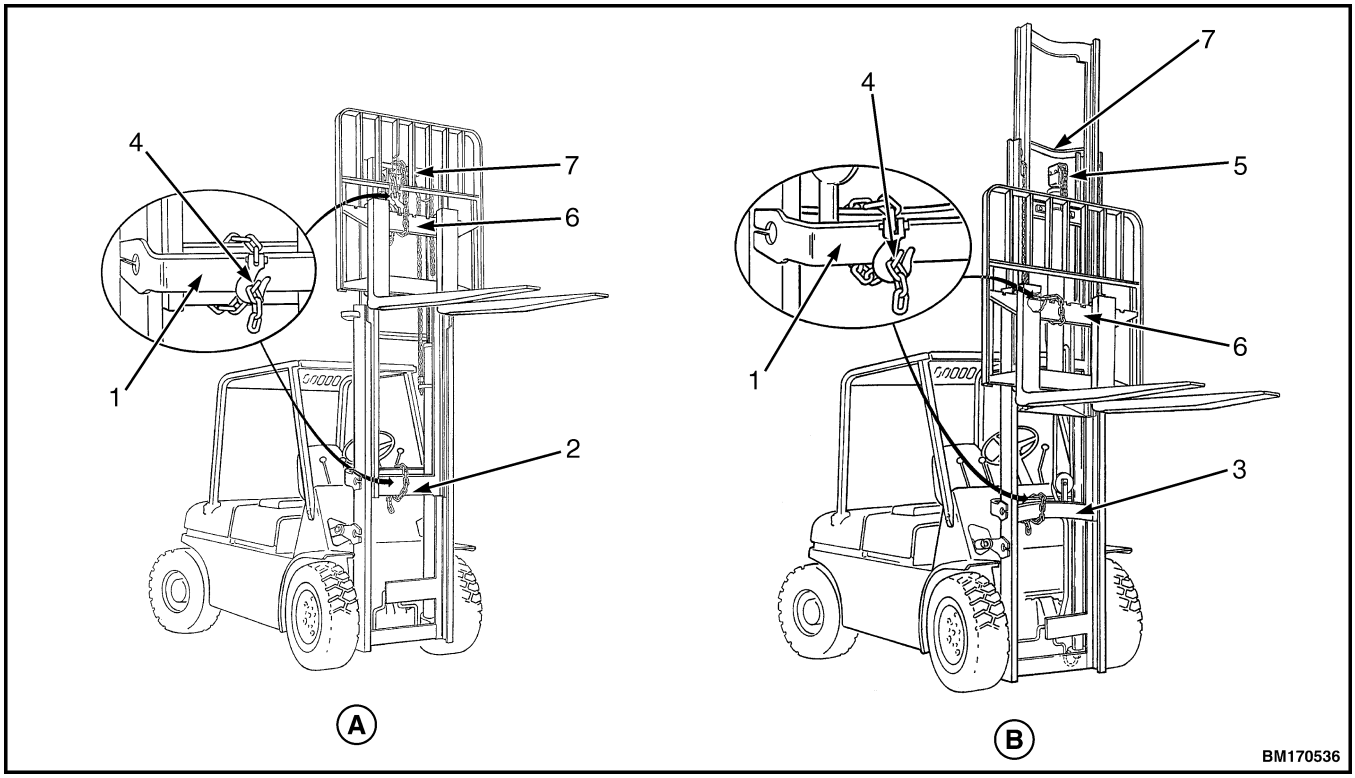
5. Install spacer, backup ring, piston seal, wear ring, and piston ring on rod and piston. See Figure 4.

6. Push piston and rod assembly into cylinder shell.

7. Install new wear ring, rod seals, backup rings, wiper ring, and O-ring on gland.

8. Install gland into cylinder shell and tighten gland to 340 to 410 N•m (250 to 300 lbf ft).

9. Repeat Step 1 through Step 8 for the opposite main lift cylinder.



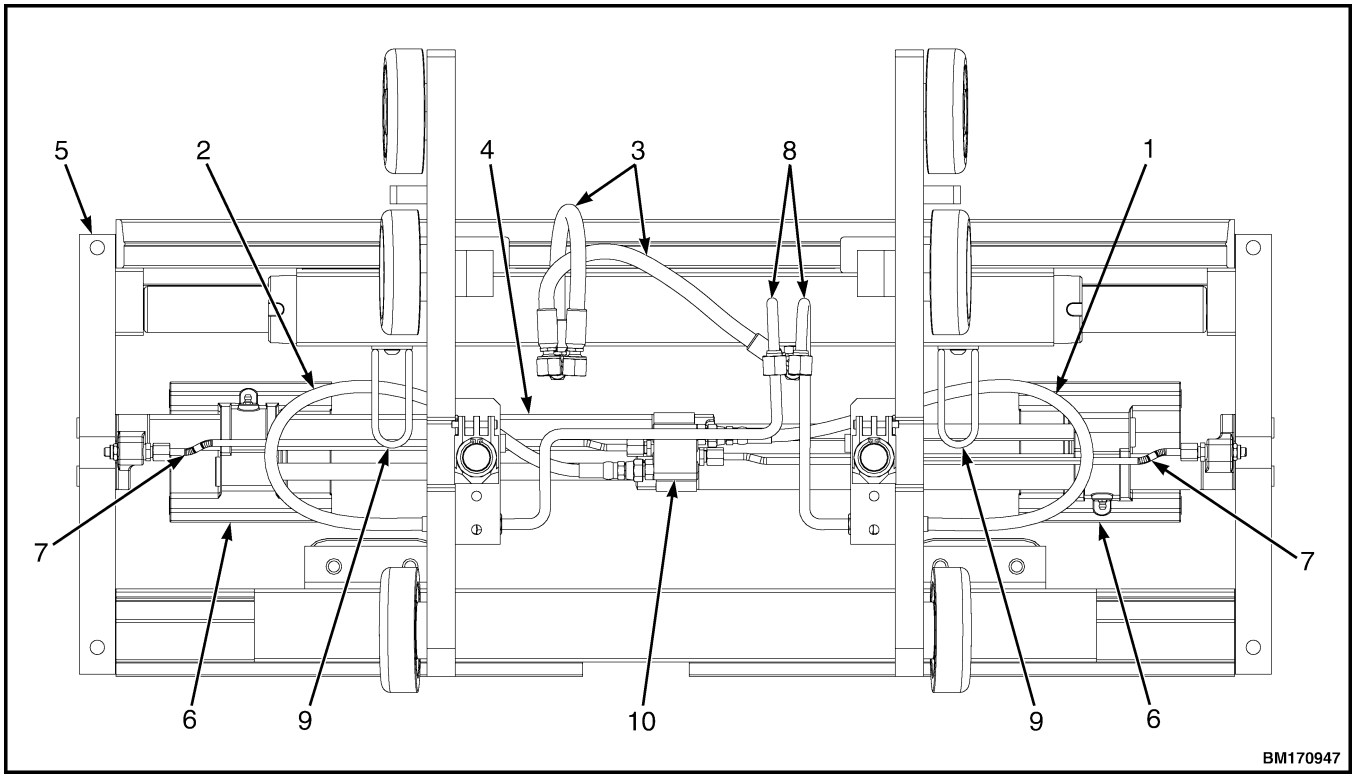
A. TWO-STAGE LFL MAST

1. OUTER WELDMENT
2. INNER WELDMENT
3. INTERMEDIATE WELDMENT
4. HOOK

B. THREE-STAGE FFL MAST

5. FREE-LIFT CYLINDER
6. CROSSMEMBER
7. CROSSMEMBER

Figure 2. Two-Stage LFL and Three-Stage FFL Masts

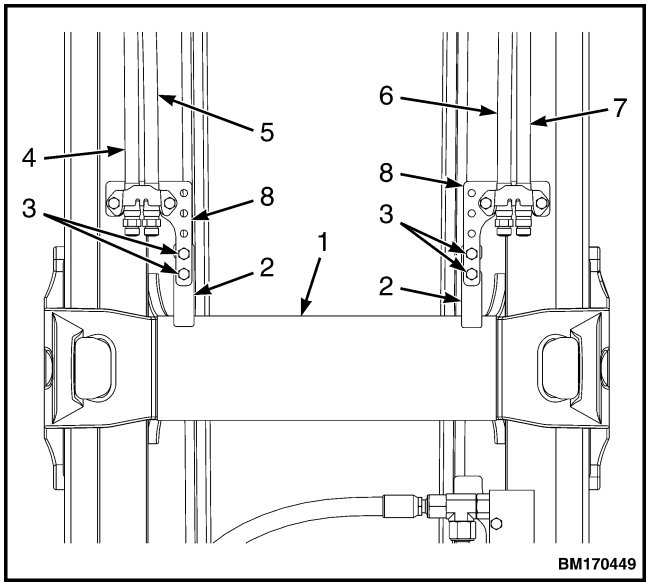


NOTE: BACK (DRIVER'S) VIEW SHOWN.

1. FORK POSITIONER HYDRAULIC HOSE (OPEN)
2. FORK POSITIONER HYDRAULIC HOSE (CLOSE)
3. INTEGRAL SIDESHIFT CARRIAGE HYDRAULIC HOSES
4. FORK POSITIONER CYLINDER
5. OUTER FRAME
6. FORK CARRIER
7. RELIEF TUBE ASSEMBLY
8. TUBE ASSEMBLY
9. HOSE GUIDE
10. MANIFOLD

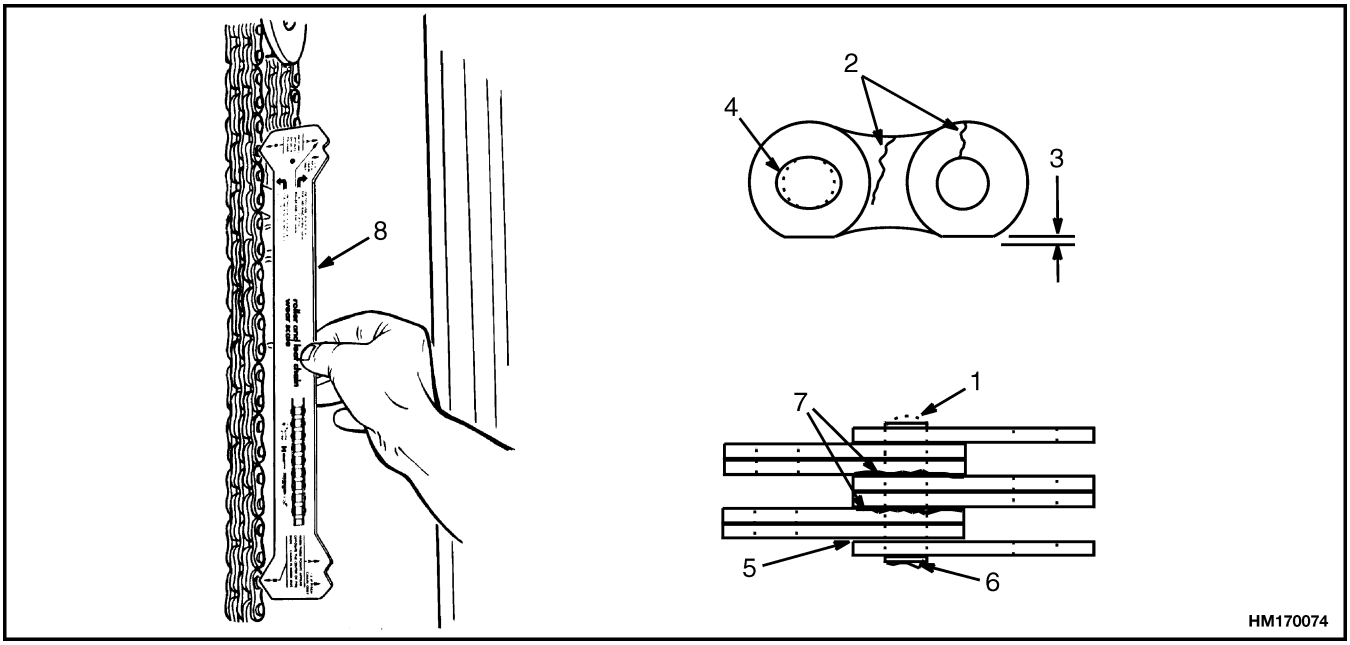
Figure 36. Hydraulic Connections, Fork Positioner Cylinder

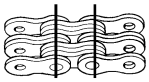
5. With no load on the forks, check the header hose adjustment by operating the mast through the full lift cycle two times. When properly adjusted, the hoses will not be so tight that they compress when they pass over the hose sheaves nor will they be so loose that they touch the load backrest or any crossmember that is next to a sheave. If necessary, repeat adjustment procedure until the hoses are properly adjusted.



1. MID-OUTER CROSSMEMBER
2. BRACKET
3. MOUNTING HARDWARE
4. HEADER HOSE **B**
5. HEADER HOSE **A**
6. HEADER HOSE **D**
7. HEADER HOSE **C**
8. PLATE

Figure 74. Header Hose Adjustment, Two-Stage LFL Mast



Pitch 	Total Length of 20 Links (Pitch) of New Chain	Wear Limit - The Maximum Length of 20 Links
12.7 mm (0.5 in.)	254.0 mm (10.0 in.)	261.6 mm (10.3 in.)
15.9 mm (0.6 in.)	317.5 mm (12.5 in.)	327.0 mm (12.9 in.)
19.1 mm (0.8 in.)	381.0 mm (15.0 in.)	392.4 mm (15.4 in.)
25.4 mm (1.0 in.)	508.0 mm (20. in.)	523.3 mm (20.6 in.)

NOTE: THE INSTRUCTION FOR MEASURING CHAIN WEAR ARE SHOWN ON THE CHAIN WEAR SCALE.

1. WORN PIN
2. CRACKS
3. EDGE WEAR
4. HOLE WEAR
5. LOOSE LEAVES
6. DAMAGED PIN
7. RUST
8. CHAIN WEAR SCALE

Figure 113. Lift Chain Check

4. Lubricate lift chains by soaking them in SAE 30 engine oil for 30 minutes. Hang chains over a drip pan for one hour to remove excess oil.

NOTE: Chain anchor pins **Must** be replaced anytime chains are replaced.

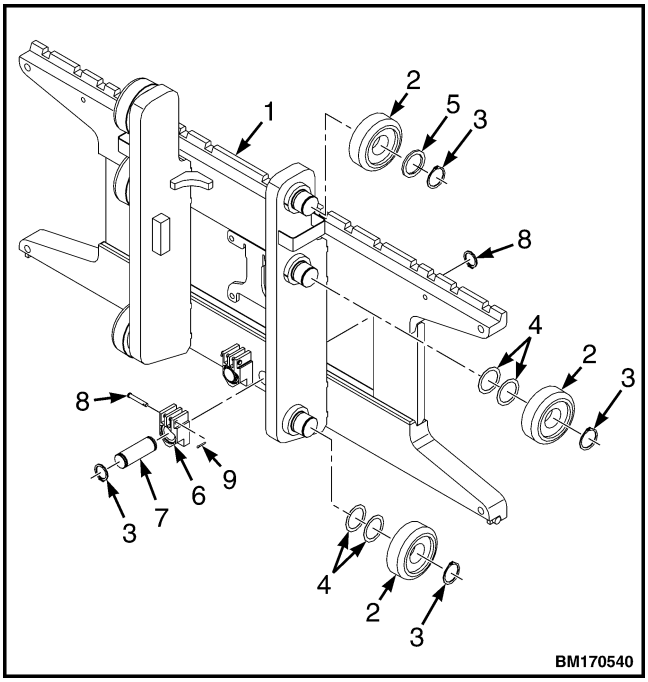
5. Inspect chain anchors, chain anchor pins, and chain anchor restraints. Replace any parts that are worn or damaged.

WARNING

Cleaning solvents may be flammable and toxic and can cause severe skin irritation. When using commercial cleaning solvents, always comply with solvent manufacturer's recommended safety precautions.

WARNING

Steam can cause serious burns. Wear protective clothing, gloves, and eye protection. Never expose your skin to steam.



1. CARRIAGE
2. LOAD ROLLER
3. SNAP RINGS
4. SHIM
5. SPACER
6. CHAIN ANCHOR
7. ANCHOR PIN
8. CHAIN PIN
9. COTTER PIN

Figure 153. Carriage Adjustments, Three-Stage FFL Mast

5. Check lateral movement of carriage:

a. Fully lower carriage to ground.

b. Place hand or small pry bar between top of carriage side plate and the inner channel flange. See Figure 150.

c. Move carriage back and forth and check movement.

d. Carriage lateral movement must not be greater than 2.5 mm (0.10 in.).

e. If carriage lateral movement is greater than 2.5 mm (0.10 in.), add or remove shims and repeat Step a through Step d until correct movement is achieved.

CAUTION

Too much grease will cause the rollers to slide and wear flat areas on the rollers and introduce contamination into and on mast channels.

6. After adjustment, lubricate channels with a thin layer of grease. Adjust hydraulic hoses and make sure connections are correct, if the carriage is equipped with hydraulic attachments.

WARNING

The hydraulic oil is hot at normal operating temperatures. Be careful when draining the oil.

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

CAUTION

Protect the hydraulic system from dirt and contaminants when servicing the hydraulic system.

CAUTION

DO NOT bend tube assemblies during removal.

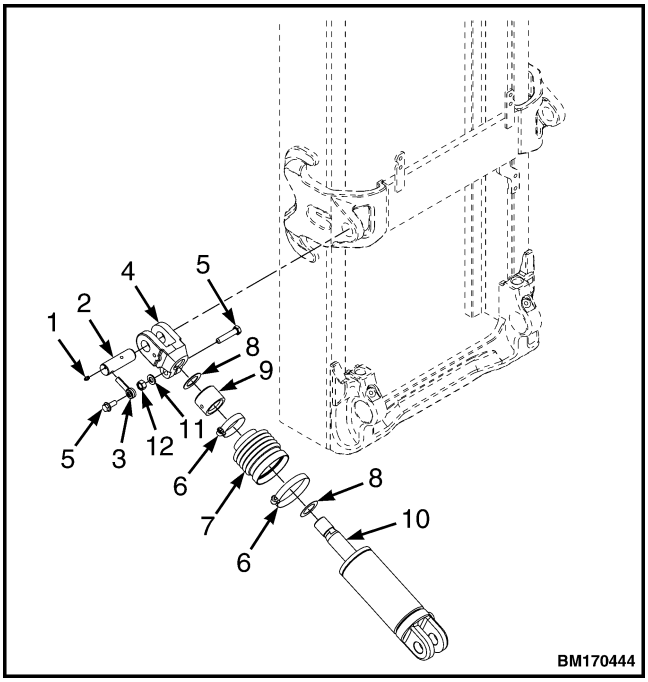
NOTE: Tag all hydraulic hoses, lines, and fittings prior to removal to aid in installation.

3. Disconnect and cap tube assemblies (8, Figure 31) from header hoses.
4. Remove capscrews and washers and remove lower hooks from retainer plates on inner frame. See Figure 32.
5. Install lifting eye in hole (7, Figure 32) on outer frame of integral sideshift carriage. Use a lifting device with a capacity of 62 kg (136 lb), to lift outer frame with fork positioner attached. See Figure 33 .
6. Disconnect relief tube assembly and hydraulic hoses (open and close) from fork positioner. See Figure 31.

NOTE: Make note of shims used to aid in reassembly.

7. Remove capscrews, lockwashers, and shims from integral sideshift carriage. See Figure 32.
8. Remove fork positioner from outer frame.

   For procedures to repair the fork positioner cylinder, see **Cylinder Repair (Mast S/N F507, F508, F562, F563)** 2100YRM1668



1. GREASE FITTING
2. PIVOT PIN
3. ANCHOR PIN
4. ROD END
5. CAPSCREW
6. CLAMP
7. BOOT
8. SHIM
9. SPACER
10. TILT CYLINDER
11. WASHER
12. NUT

Figure 70. Mast Mounting, Tilt Cylinder With Boot, Lift Truck Models ERP22-35VL (ERP045-070VL) (A976)

8. Connect hydraulic lines to lowering control valve.

9. Install the carriage as described in the section Carriages Repair, Two-Stage LFL Mast.

WARNING

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

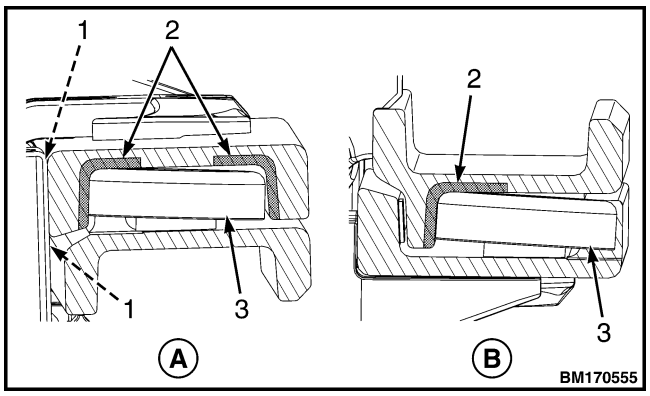
10. Check tilt cylinder adjustments as described in **Cylinder Repair (Mast S/N F507, F508, F562, F563)** 2100YRM1668. Operate mast and check for leaks and correct operation. Check lift chains as described in Lift Chains Adjustment section in this manual.

NOTE: Before checking for mast side kicking, the mast must be fully assembled to include the carriage, forks, load backrest and any attachments.

11. Raise the mast, without a load to its full height and check for side kicking. Mast side kicking is when the mast moves either to the right or left as it is being raised to its full height. If the mast is side kicking, see the Mast Adjustments section in this manual for procedures to correct mast side kicking.

NOTE: Load rollers and sheaves have sealed bearings and do not need additional lubrication.

12. Lubricate sliding surfaces and load roller surfaces along full length of channels as shown in Figure 71. Apply lubricant only to surfaces indicated.



A. UPPER LOAD ROLLERS
B. LOWER LOAD ROLLERS

1. LUBRICATE STRIP BEARING SURFACES
2. LUBRICATE LOAD ROLLER SURFACES
3. LOAD ROLLER

Figure 71. Lubricate Mast

Header Hose Installation and Adjustment

Remove

Read and follow the Safety Procedures When Working Near Mast as well as all **WARNINGS** and **CAUTIONS** before removing any header hoses.

NOTE: Access to some of the fittings can be difficult. If necessary, operate the hydraulic system to move mast weldments or the carriage. Make sure the hydraulic system does not have pressure as described in Step 1.

Legend for Figure 109.

1. OUTER MAST
2. STUBSHAFT
3. LOAD ROLLER
4. SNAP RING
5. SHIM
6. COTTER PIN
7. PIN
8. CHAIN ANCHOR
9. RING
10. NUT
11. CHAIN ANCHOR RESTRAINT
12. CAPSCREW
13. INTERMEDIATE MAST
14. LIFT CHAIN
15. WEAR STRIP
16. O-RING
17. LUBE CAPSCREW
18. LUBE FITTING
19. WASHER

c. Loosen six (three on each side) capscrews on crosshead plate. Remove middle capscrew. See Figure 149.

d. Move free-lift header hose roller assembly up to increase hose tension, and down to decrease hose tension. See Figure 149.

2. To adjust main lift header hoses, perform the following:

a. Raise inner mast and place a block under inner mast.

b. Chain inner mast weldment to outer or intermediate mast weldment. See Safety Procedures When Working Near Mast in this manual.

c. Lower inner mast onto block.

d. Loosen upper bracket above mid-outer crossmember and then lower upper bracket until correct hose tension is achieved. Tighten nut to 18 N•m (159 lbf in). See Figure 148.

Mast Adjustments

LOAD ROLLER, ADJUST

NOTE: Shims are installed on both sides of the load rollers. **DO NOT** add to or remove shims from the stub shafts. To change the position of the roller on the stub shaft, move the shims from one side of the load roller to the other.

During assembly, the shim arrangement will be approximately the same as before disassembly. Check the clearance and adjust shims after repairs have been completed.

1. The load rollers control the alignment of the mast uprights. See Figure 150. The alignment conditions are provided on a list below with the most important condition first.

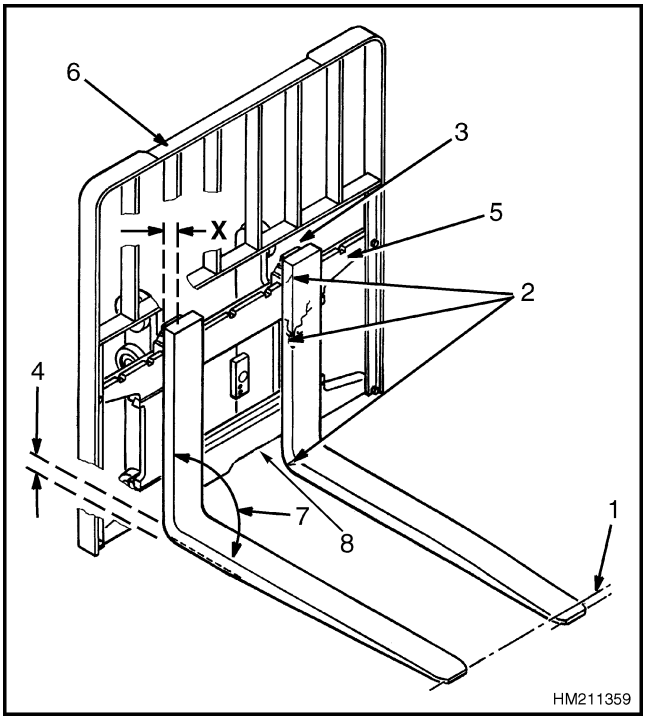
2. A fork can be removed from the carriage for replacement of the fork or other maintenance. Lift lock pin and slide a hook fork to the fork removal notch on carriage. See and . Lower fork onto blocks so that the bottom hook of the fork moves through fork removal notch. Lower carriage further so that the top hook of fork is disengaged from the top carriage bar. Move carriage away from the fork, or use a lifting device to move fork away from the carriage.

Inspect

1. Inspect forks for cracks and wear. Check that the fork tips are aligned as shown in .

2. Check that the bottom of fork is not worn. See , item 4.

3. Replace any damaged or broken parts that are used to keep the forks locked in position.



Length of Forks	3% Dimension
915 mm (36 in.)	27 mm (1.10 in.)
1067 mm (42 in.)	32 mm (1.26 in.)
1220 mm (48 in.)	37 mm (1.46 in.)
1372 mm (54 in.)	41 mm (1.61 in.)
1524 mm (60 in.)	46 mm (1.81 in.)
1830 mm (72 in.)	55 mm (2.17 in.)

1. TIP ALIGNMENT (MUST BE WITHIN 3% OF FORK LENGTH)
2. CRACKS
3. LATCH DAMAGE
4. HEEL OF FORK (MUST BE 90% OF DIMENSION X)
5. CARRIAGE
6. LOAD BACKREST EXTENSION
7. MAXIMUM ANGLE 93°
8. FORK REMOVAL NOTCH

Figure 20. Forks Check

4. Install new O-rings on drain plugs. Install drain plugs. Tighten the drain plugs to 40 N•m (29.5 lbf ft).

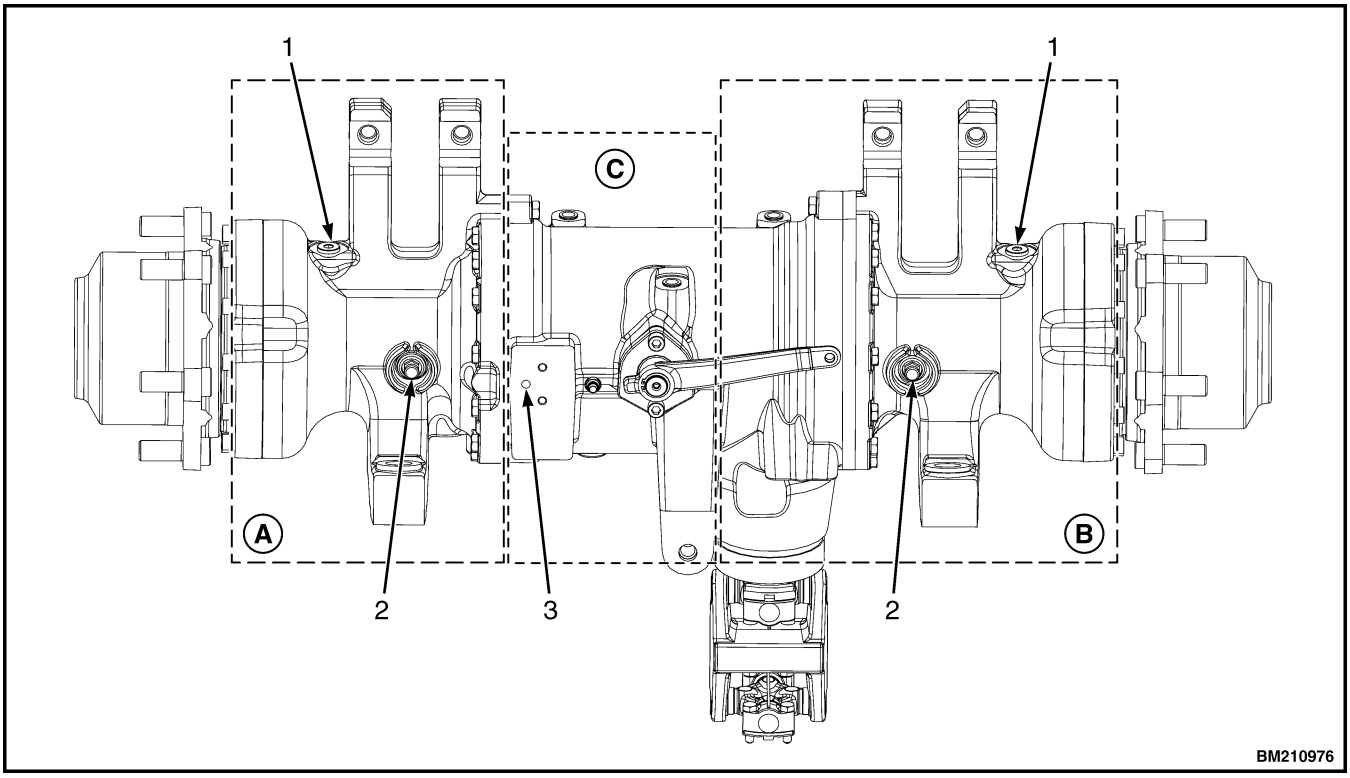
CAUTION

Before adding oil, ensure the truck is parked and on level ground.

5. Add oil at the fill/level port for the right and left planetary housing until the oil/fill level port has overflowed. The correct oil is shown in the Maintenance Schedule or Figure 72.

6. Install new O-ring on planetary fill/level plugs. Install fill/level plugs.

7. The center section (cooling chamber) will fill with fluid automatically as it circulates through and back to the transmission.



A. LEFT PLANETARY HOUSING - USE SAE 80W/90
B. RIGHT PLANETARY HOUSING - USE SAE 80W/90
C. CENTER SECTION (COOLING HOUSING) - USE JDM J20C

1. OIL FILL/LEVEL PLUG
2. OIL BREATHER
3. COOLING OIL INLET PORT

Figure 72. Oil Application Diagram

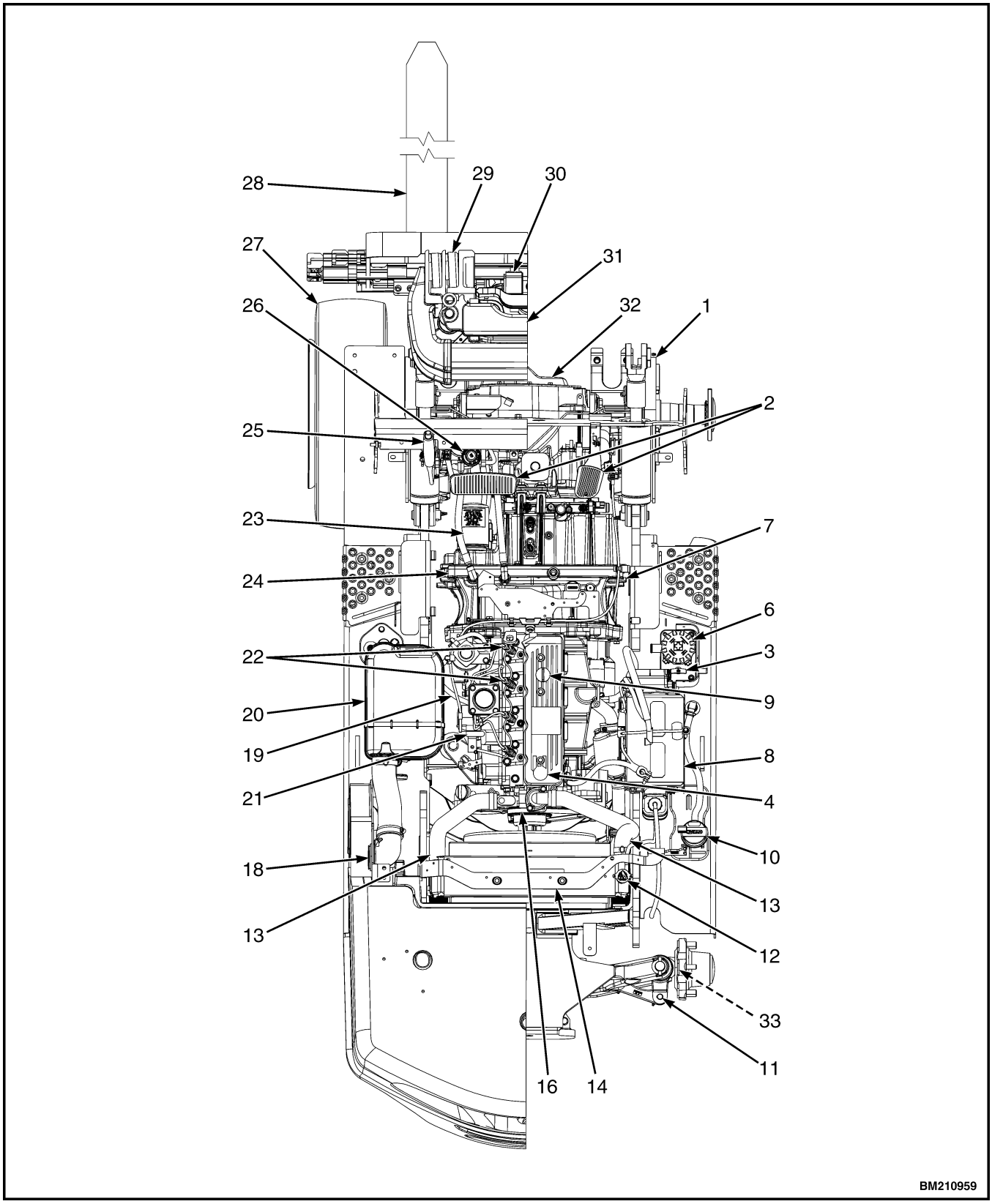
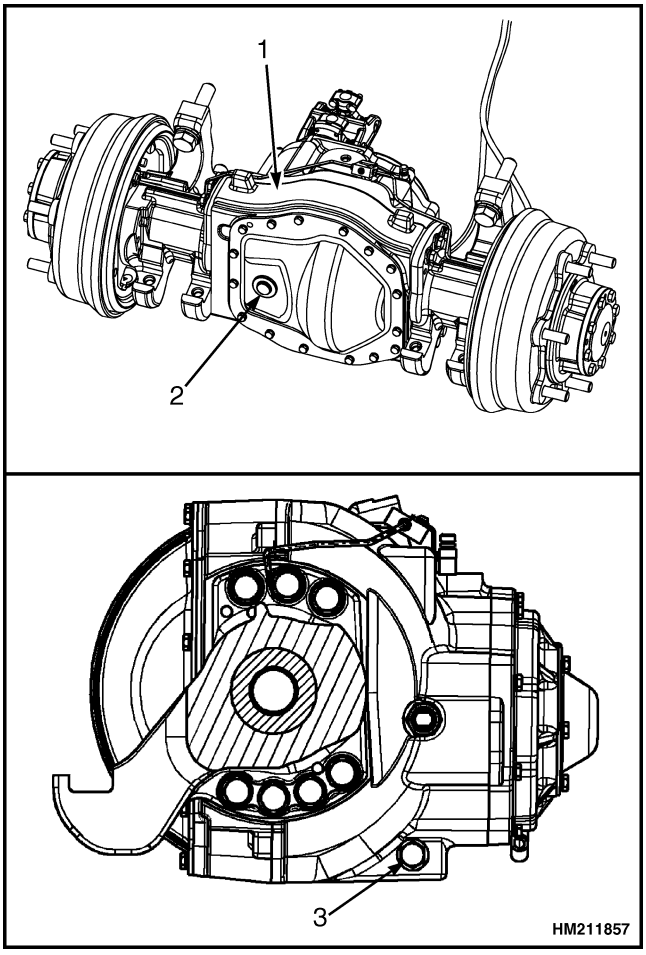


Figure 4. Yanmar 2.6L and 3.3L Diesel Truck

DIFFERENTIAL AND DRIVE AXLE OIL (DRY BRAKE)

The differential and drive axle use the same oil supply. The oil level must be between 0 to 10 mm (0 to 0.40 in.) below the bottom edge of fill hole. The fill hole for checking oil level is on the front of the differential housing. Remove fill plug and check fluid level by sticking a finger into the fill hole to feel if fluid level is at the bottom edge of the fill hole. See Figure 48. If oil is low, add oil shown in the Maintenance Schedule until oil level is between 0 to 10 mm (0 to 0.40 in.) below the bottom edge of fill hole. Install fill plug and check for leaks.



1. DRIVE AXLE
2. CHECK/FILL PLUG
3. DRAIN PLUG

Figure 48. Drive Axle Fluid Fill

Install Tire on Wheel

WARNING

Damage to the tire and wheel assembly and injury or death can occur if you do not do the follow procedures:

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure that all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

WARNING

DO NOT use a steel hammer on the wheel. Use a rubber, lead, plastic, or brass hammer to put parts together.

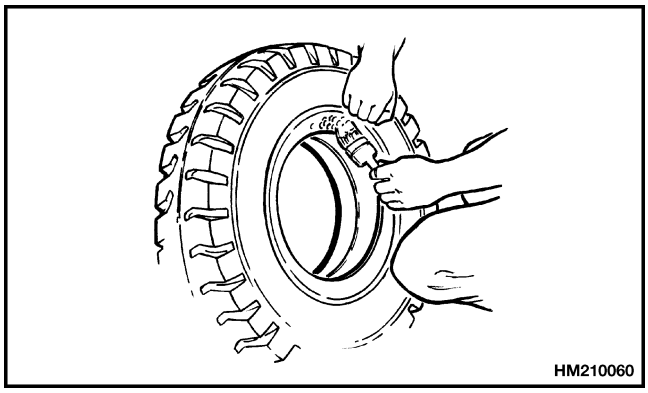
WARNING

DO NOT lubricate the tire bead with antifreeze or petroleum-based liquid. Vapors from these liquids can cause an explosion during inflation or use.

WARNING

DO NOT mix brands of rubber sealing rings and tires. Serious injury to personnel or damage to the lift truck can occur if the rubber sealing rings are not compatible with the tire brand.

STEP 1.
Clean interior and exterior bead of the tire. Lubricate tire beads and the inside of the tire, up to the tire shoulders. Apply lubricant to the entire underside of the TBS or TSR. Use lubricant approved by the tire manufacturer.



NOTE: If the wheel rim width is less than 152 mm (6 in.), the TBS will contain one valve hole to accommodate the needle valve. If the wheel rim width is greater than 152 mm (6 in.), the TBS will have two holes for the needle valve.

One hole is centrally located and the other is offset, to ensure the correct positioning of the valve in the valve slot. The valve hole that is not used should be sealed with a small plastic plug.

11. Disconnect the remaining coolant hoses from the radiator and cap them to prevent leakage.

12. On lift trucks equipped with a Mazda engine and Basic Powershift Transmission, disconnect the throttle linkage (see the section **2-Speed Powershift Transmission Repair** 1300YRM1690. Disconnect the exhaust system.

13. Remove the radiator fan pulley, shroud, and fan assembly. See the section **Cooling System** 0700YRM1674 for the removal procedures.

WARNING

All fuels are very flammable and can burn or cause an explosion. DO NOT use an open flame to check the fuel level or to check for leaks in the fuel system.

No smoking.

Breathing fuel vapor may cause nausea, unconsciousness or death. Long term exposure to gasoline vapors may cause liver or kidney damage and cancer. Avoid breathing vapor.

14. Disconnect the fuel lines at the engine. Put caps on fuel lines to prevent fuel leakage.

NOTE: Lift trucks equipped with Yanmar diesel engine do not have an ECM.

15. Disconnect the electronic control module (ECM) connector and governor controller from the side of the frame before removing the engine from the truck.

16. Disconnect the engine harness connectors from the right hand chassis harness connectors before removing the engine from the truck.

17. Use the access port on the side of engine and remove the four bolts that attach the flywheel to the torque converter. See Figure 21.

18. Connect a lifting device to the engine. Put a block under the transmission housing to support the transmission.

NOTE: Perform Step 19 for lift trucks equipped with iron housing transmission.

19. Remove capscrews from transmission bell housing.

NOTE: Perform Step 20 through Step 22 for lift trucks equipped with aluminum housing transmission.

20. Remove two capscrews, two washers, and converter housing cover from torque converter housing. See Figure 22.

21. Remove four flange bolts from torque converter housing and flywheel housing on transmission side. See Figure 22.

22. Remove six hex head capscrews and six lock washers from flywheel housing and torque converter housing on flywheel housing side. See Figure 22.

General

This section contains instructions for removal, disassembly, repair, assembly, installation, checks, and adjustments for the Mazda 2.2L engine. The engine specifications are provided at the end of the section.

Additional information on the Mazda 2.2L engine can be found in the following:

See section **Gasoline Fuel System, Mazda 2.2L Engine** 0900YRM1676 for lift truck models

- GC040-070VX, GC055SVX) (B910)
- GP040-070VX (C875)

See section **LPG Fuel System, Mazda 2.2L Engine** 0900YRM1675 for lift truck models

- GLC20-35VX (GLC040-070VX, GC/GLC055SVX) (B910)
- GLP20-35VX (GLP040-070VX) (C875)

See section **Electrical System, Mazda 2.2L Engine** 2200YRM1686 for lift truck models

- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (B910)
- GLP20-35VX (GP/GLP040-070VX) (C875)

SERIAL NUMBER

The engine serial number is located on the top left hand side of the cylinder head cover. See Figure 1.

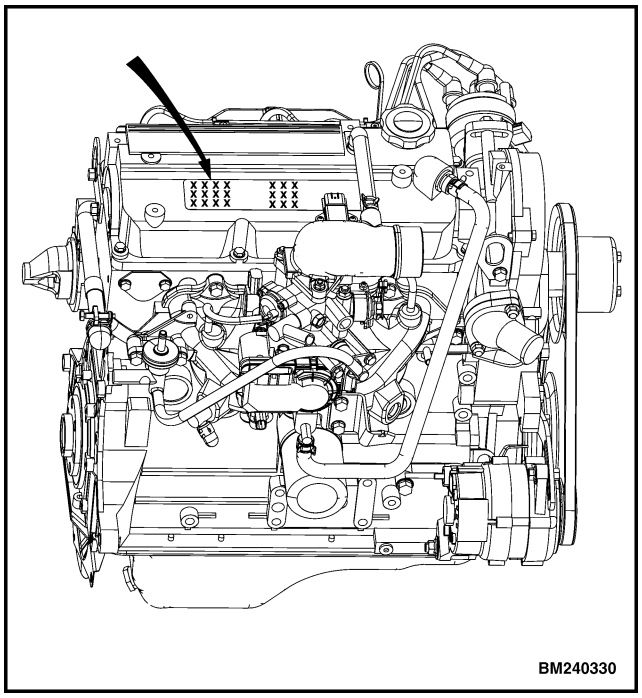
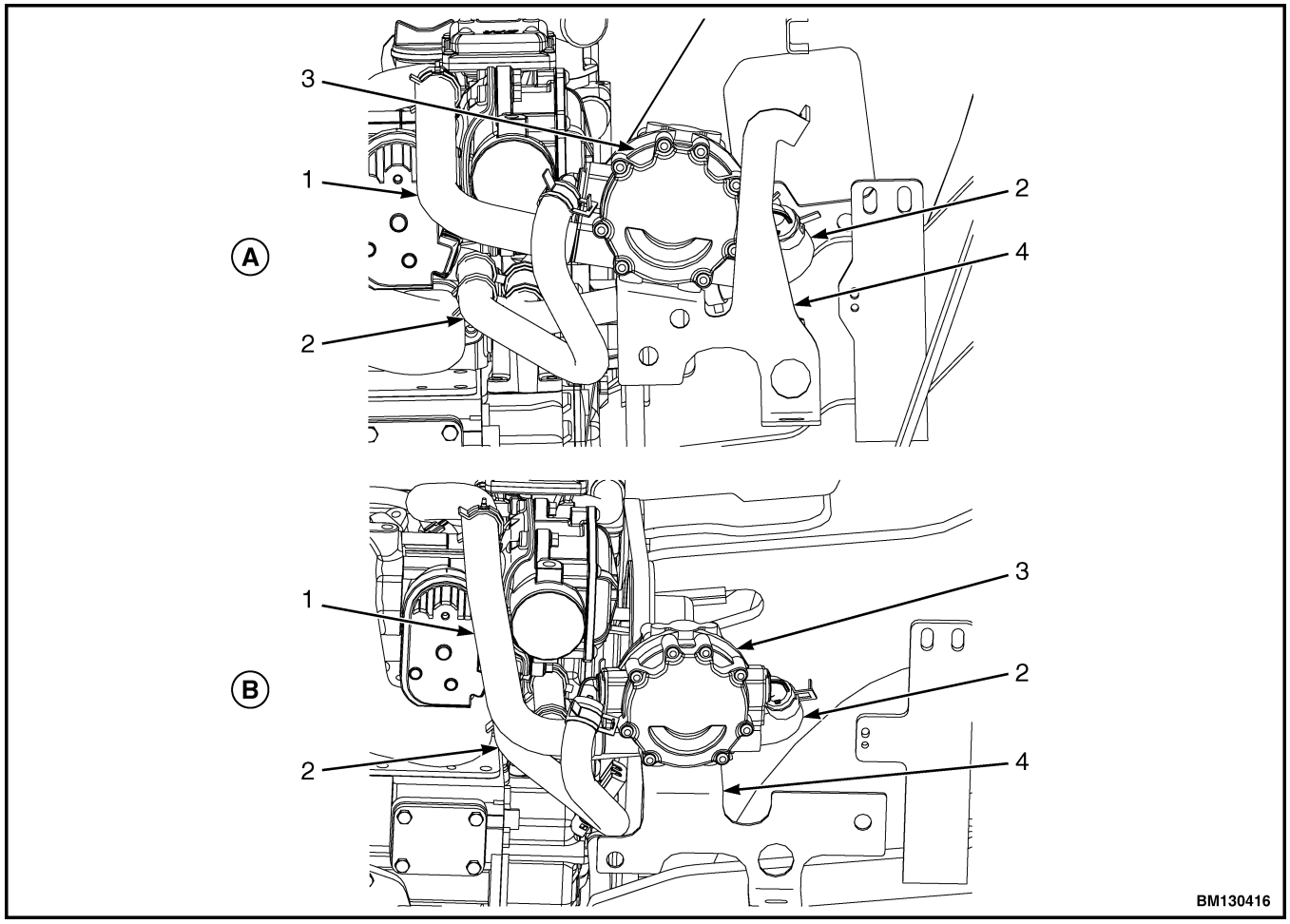


Figure 1. Engine Serial Number Location

Engine Removal and Installation

The removal and installation procedures for the engine are not included in this section. See section **Frame** 0100YRM1672 for procedures to remove and install the engine.



A. VAPORIZER AND MOUNTING BRACKET FOR LIFT TRUCK MODELS GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (B910, C910)
B. LPG CONVERTER AND MOUNTING BRACKET FOR LIFT TRUCK MODELS GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (C875, D875)

1. FUEL VAPOR HOSE
2. COOLANT HOSE
3. VAPORIZER
4. MOUNTING BRACKET

Figure 14. Vaporizer

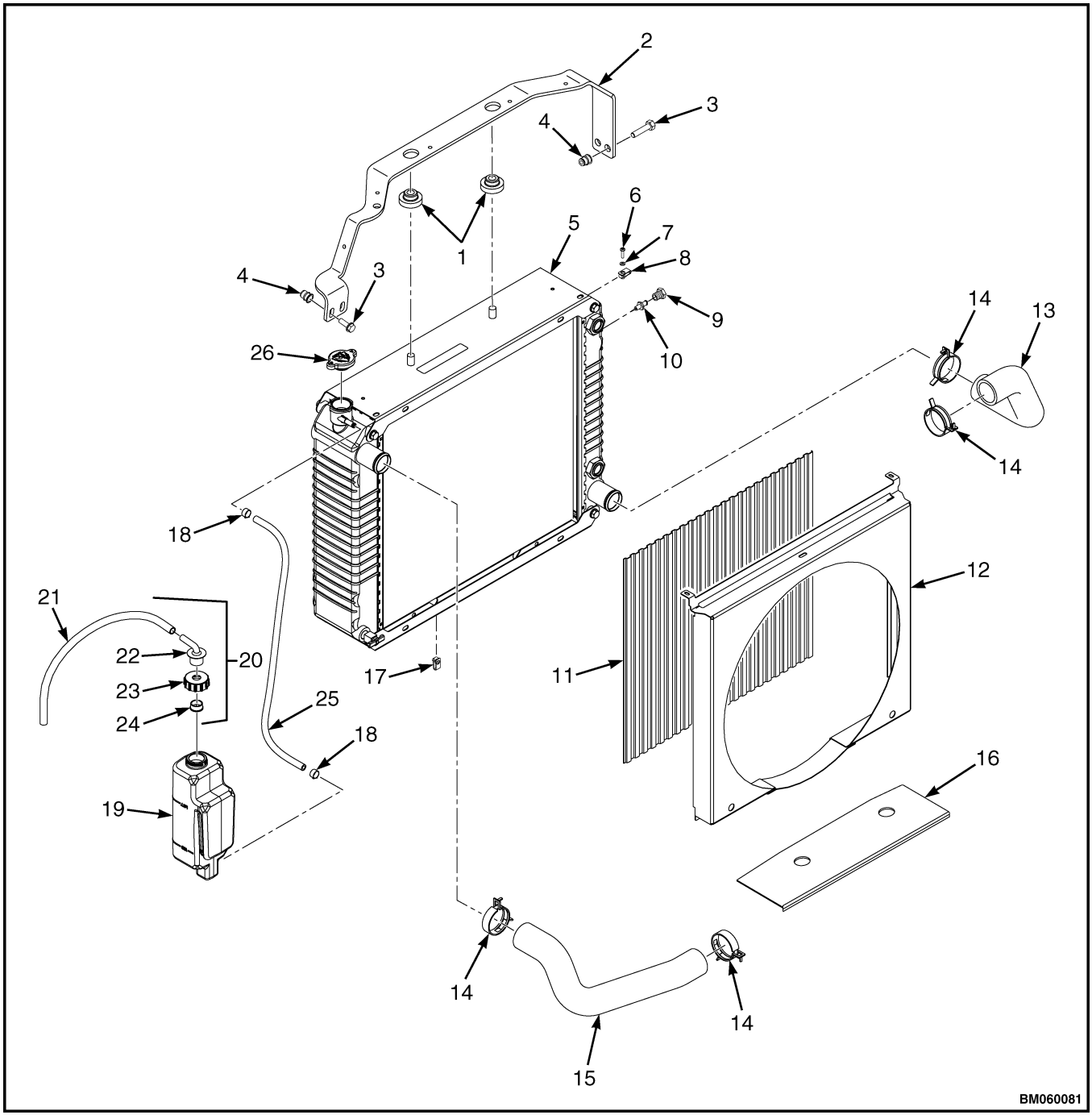


Figure 3. Cooling System with Internal Oil Cooler, Yanmar Engine

Legend for Figure 3

1. ISOLATOR
2. UPPER RADIATOR BRACKET
3. CAPSCREW
4. INSERT
5. RADIATOR
6. SCREW
7. WASHER
14. CLAMP
15. UPPER HOSE
16. HEAT SHIELD
17. CLIP
18. CLAMP
19. RESERVOIR
20. OUTLET ASSEMBLY

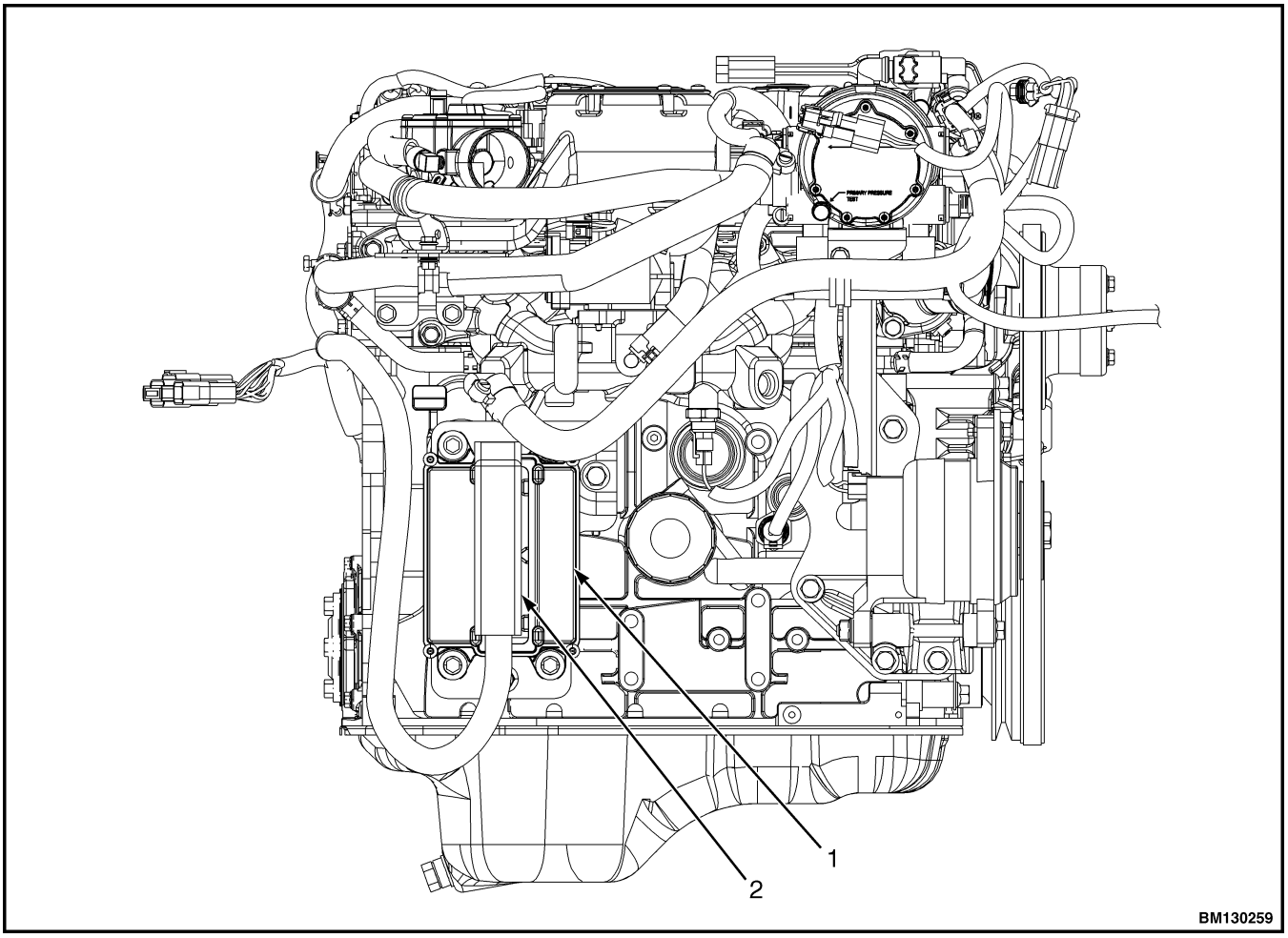
Control System

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

ENGINE CONTROL UNIT (ECU)

Remove

1. Disconnect negative battery cable.



1. ECU
2. WIRE HARNESS CONNECTOR

Figure 30. ECU and Wire Harness Connector

2. Disconnect wire harness connector from ECU. See Figure 30.

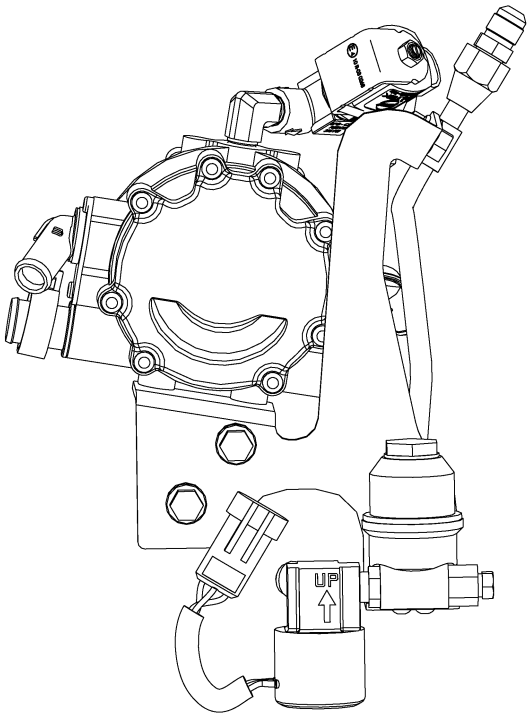
3. Remove capscrews and ECU from mounting bracket. See Figure 31.

Yale®

Maintenance

LPG FUEL SYSTEM, KUBOTA 2.5L ENGINE

GLC20-35VX (GLC040-070VX, GLC55SVX) [B910, C910];GLP20-35VX (GLP040-070VX) [C875, D875]



PART NO. 550096320

0900 YRM 1677

Methanol Test (ASTM D-4864)

This test is used to identify levels of methanol found in LPG fuel. Methanol is an additive that is used in LPG fuel to avoid freezing issues when the water content in LPG fuel is high.

Copper Corrosion (ASTM D-1838)

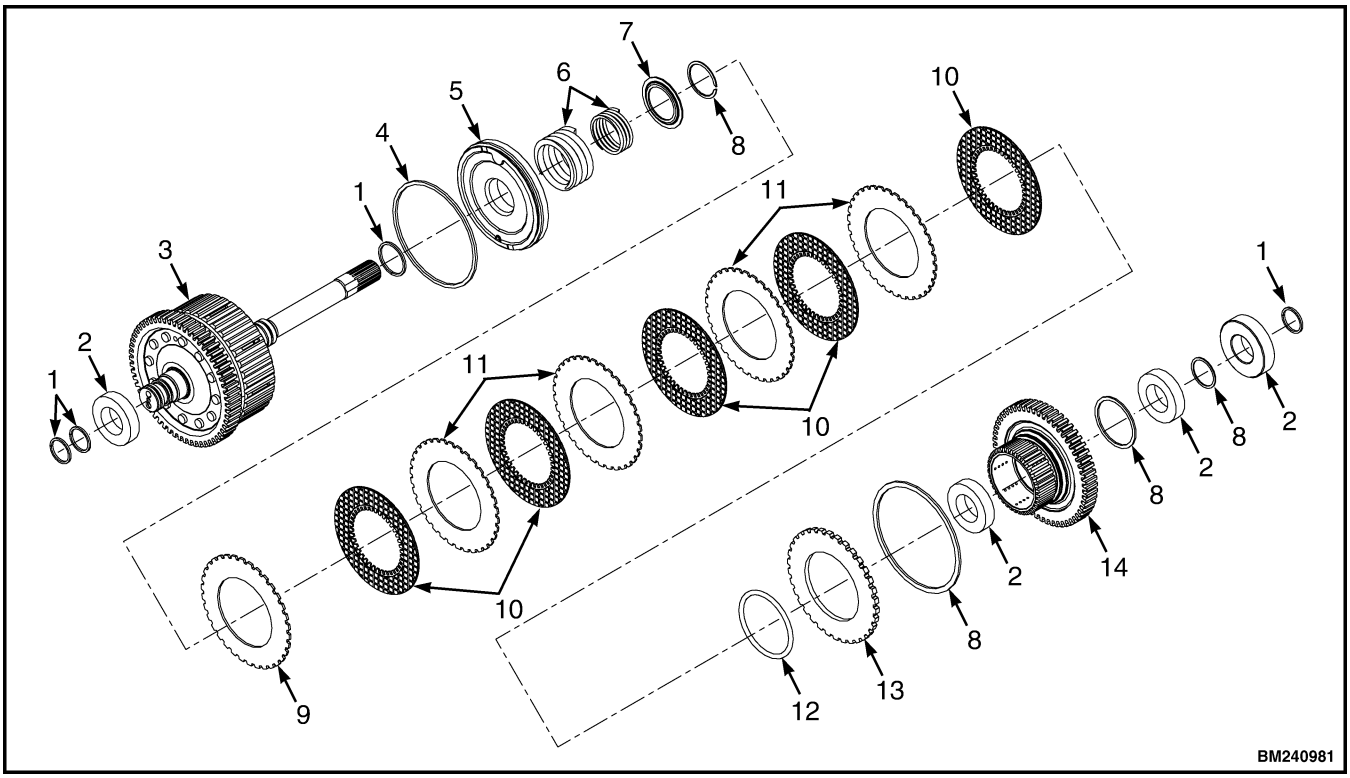
The Copper Corrosion test method is used to determine the compounds present in LPG fuel that can be corrosive to copper.

WHERE TO SEND LPG FUEL SAMPLES FOR TESTING

NOTE: If LPG sample will be taken from a new LPG tank, the tank must be fully purged of air before taking the sample. It is recommended to fill and purge the tank with LPG fuel at least three times before taking a sample.

NOTE: It is recommended that all results from LPG fuel tests be provided to the supplier and to customer. The supplier should act to correct any deficiencies in LPG fuel quality and ensure that it meets HD-5 quality requirements. This will eliminate repetitive fuel system component failures. If a fuel supplier is not willing to make changes as required by the test results, then **Yale** recommends that the customer find another fuel supplier.

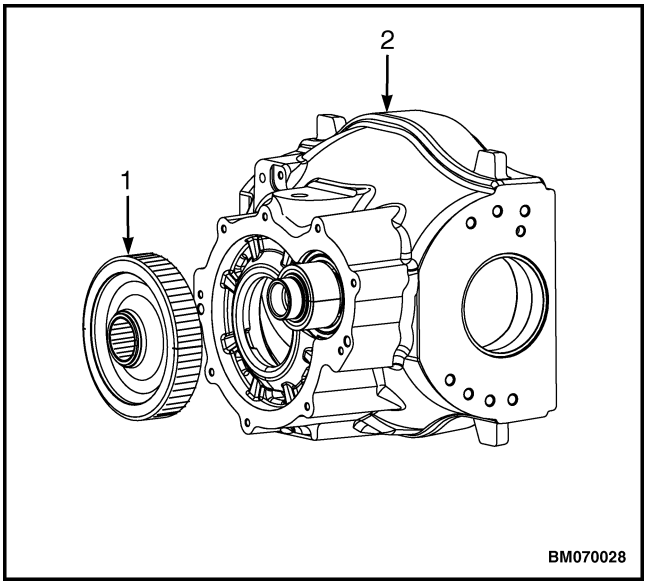
Dealership locations that would like to have their LPG fuel analyzed, can contact Core Laboratories Inc. at (281) 478-1300, or go to their website at http://www.corelab.com/saybolt. Core laboratories will provide all information needed for successfully obtaining an LPG sample for testing and all requirements necessary to safely package and ship the LPG sample for testing.



1. SEAL
2. BEARING
3. GEAR ASSEMBLY DRUM
4. PISTON SEAL
5. PISTON
6. SPRING
7. SPRING GUIDE
8. SNAP RING
9. CONICAL PLATE
10. FRICTION DISK
11. SEPARATOR PLATE
12. PRESSURE PLATE O-RING
13. PRESSURE PLATE
14. OUTPUT GEAR

Figure 27. Forward Clutch Pack Assembly

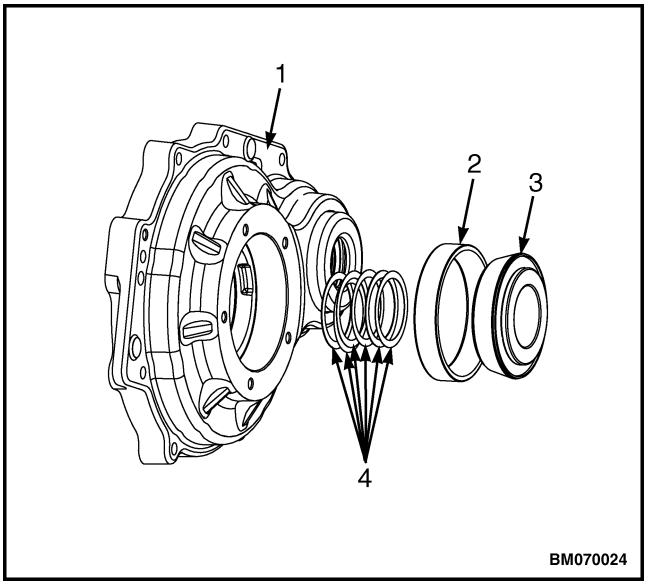
STEP 11.
Remove the driven gear.



1. DRIVEN GEAR
2. CENTER SECTION

NOTE: When removing the outer bearing, be sure to retain the shims.

STEP 12.
For lift truck models CLG20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (B910) , remove the outer bearing and shims. Use a press or suitable soft drift to remove the bearing cup.

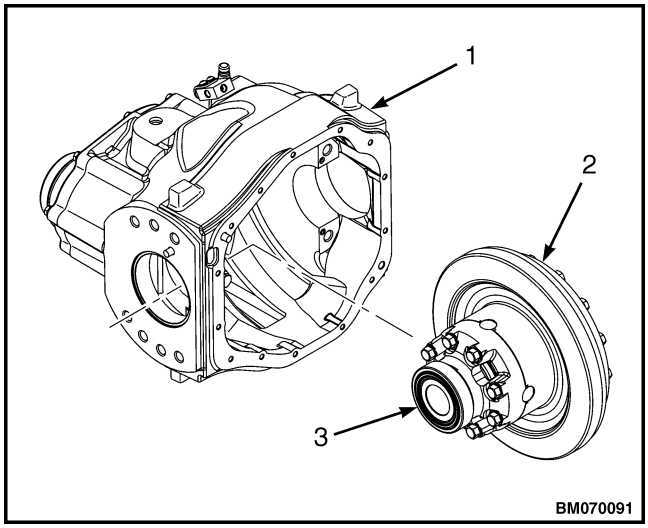


1. DROP BOX
2. BEARING CUP
3. OUTER BEARING
4. SHIMS

TABLE OF CONTENTS

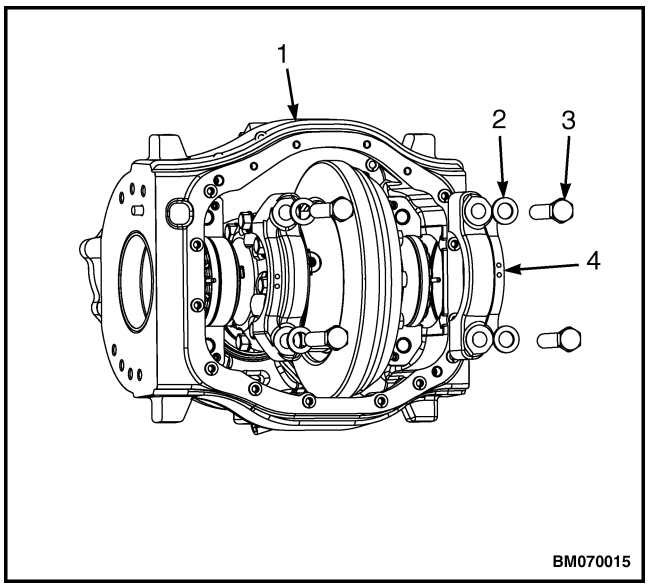
This section is for the following models:

GLC20-35VX (GC/GLC40-70VX, GC/ GLC055SVX) [B910];
GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [C875]



1. CENTER SECTION
2. DIFFERENTIAL ASSEMBLY
3. TAPERED ROLLER BEARING AND CUP

STEP 2.
Install the bearing caps in the same location as removed. Install capscrews and washers. Tighten the capscrews finger tight only.



1. CENTER SECTION
2. WASHER
3. CAPSCREW
4. BEARING CAP

8. Lubricate back plate with a small amount of lithium grease where brake shoes touch. Install brake shoes on anchor and engage thepush rods of wheel cylinder. Engage theparking brake lever in slot in parking brake cable as brake shoes are installed on back plate.

9. Put an anchor pin, that holds brake shoes, through back plate. Put a spring seat, spring, and retainer on anchor pin. Push retainer onto anchor pin and rotate retainer 90 degrees. Make sure retainer is in correct position.

10. Install link, parking brake, and spring between parking brake lever and brake shoe.

11. Install other spring retainer, that holds brake shoes. Make sure parking brake link and spring are correctly engaged after spring retainers are installed.

12. Install anchor guide on anchor. Install pivot plate on its anchor.

13. Lubricate adjuster cable where it slides in pivot plate groove.

14. Fasten link to adjuster wheel actuator and put cable around pivot plate. Raise adjuster wheel actuator against spring tension and connect link to anchor.

WARNING

Be sure to install the white return spring first and then the black return spring. See Figure 7. Improper assembly can result in brake failure and/or component damage.

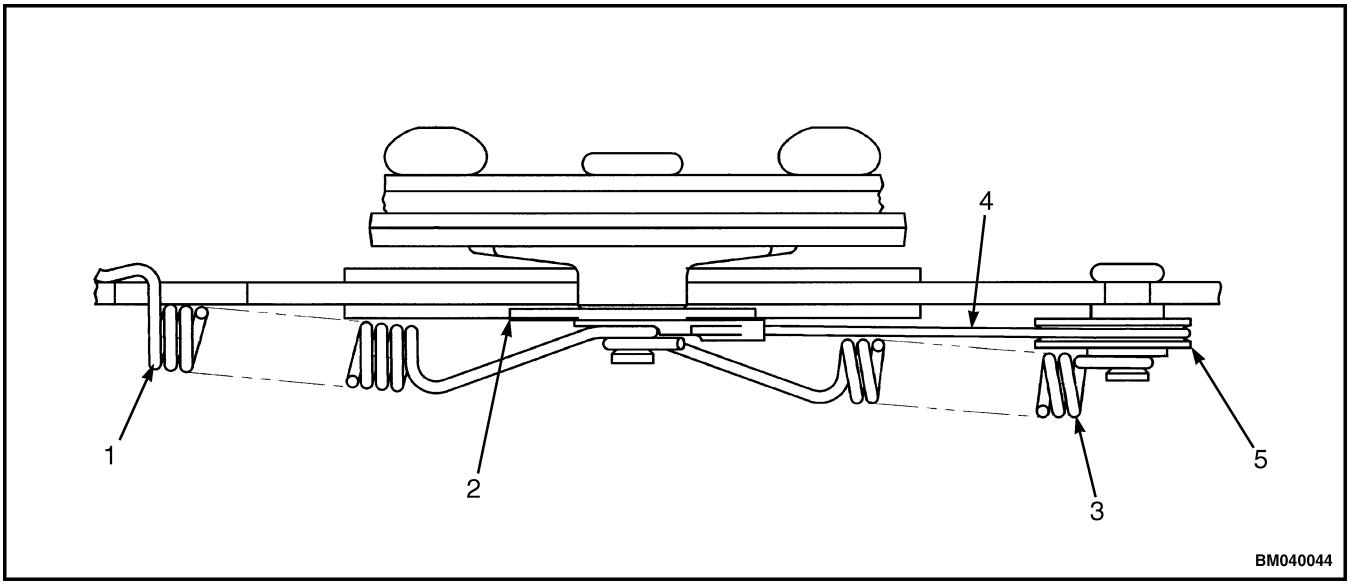
NOTE: The shape of return springs permits them to be installed correctly in only one position. The arrangement of return springs on anchors is shown in Figure 6 and Figure 7.

15. Using correct tools, install return springs as follows:

a. Install white spring.

b. Install black spring.

c. Verify that return springs are properly installed as shown in Figure 7.



1. RETURN SPRING
2. ANCHOR GUIDE
3. RETURN SPRING
4. ADJUSTER ACTUATOR LINK
5. PIVOT PLATE

Figure 6. Return Springs

CLEAN

WARNING

Cleaning solvents can be flammable and toxic, can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

WARNING

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

Clean all components in solvent. Dry components with compressed air. DO NOT dry components with a cloth. Make sure all surfaces are free of scratches and sharp edges.

INSPECT

Check the control valve seal, drive shaft seal, and retaining ring for wear or damage and replace if necessary. Check the rest of the variable displacement pump assembly. If any parts other than the control valve seal, drive shaft seal, and retaining ring are worn or damaged, replace with a new variable displacement pump.

ASSEMBLE

1. Coat seal with clean hydraulic oil. Install seal, control valve, and four socket head screws on VDP. See Figure 14.
2. Apply clean hydraulic oil to shaft seal and retaining ring. Install shaft seal and retaining ring onto drive shaft.

INSTALL

1. Install the suction adapter and tighten flange hardware 70 to 77 N•m (52 to 57 lbf ft). Position suction adapter as shown in:

   Figure 16 for lift trucks equipped with a 1-speed aluminum transmission housing.

   Figure 17 for lift trucks equipped with a 2-speed iron transmission housing.

2. Clean the VDP flange and transmission mounting surface and put a 3 to 5 mm (0.118 to 0.197 in.) bead of Loctite™ 515 (Yale P/N 520042831) on VDP flange or transmission mounting surface. Hold VDP pump in correct position on the transmission. Install two socket head screws on VDP and transmission housing. Tighten socket head screws to 38 N•m (28 lbf ft).
3. Connect hydraulic lines to VDP and steering control unit. Tighten flange head capscrews at the VDP, using sequence shown in Figure 15, to 52 to 58 N•m (38 to 43 lbf ft).

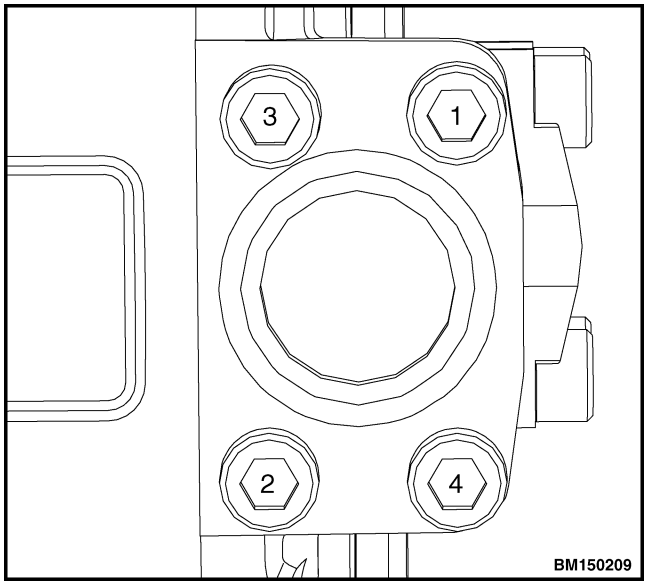


Figure 15. Torque Tightening Sequence, Flange Head Capscrews

4. Position the hydraulic lines as shown in:

   Figure 16 for lift trucks equipped with a 1-speed aluminum transmission housing.

   Figure 17 for lift trucks equipped with a 2-speed iron transmission housing.

   Figure 18 for lift trucks equipped with both a 1-speed and 2-speed transmission.

7. Remove the two SCU mounting capscrews, and move the SCU approximately 1.3 cm (0.5 in.) to the left. Lower the SCU until the steering shaft is disengaged. Remove the SCU from the lift truck.

See Figure 22 for lift truck models without OPS

See Figure 23 for lift truck models with OPS

8. Remove and discard two O-rings from main control valve. For lift truck models equipped with manual control valve, with or without OPS, the two O-rings are located between the SCU and control valve.

9. For lift truck models equipped with manual control valve with OPS, disconnect solenoid assemblies from cowl wire harness.

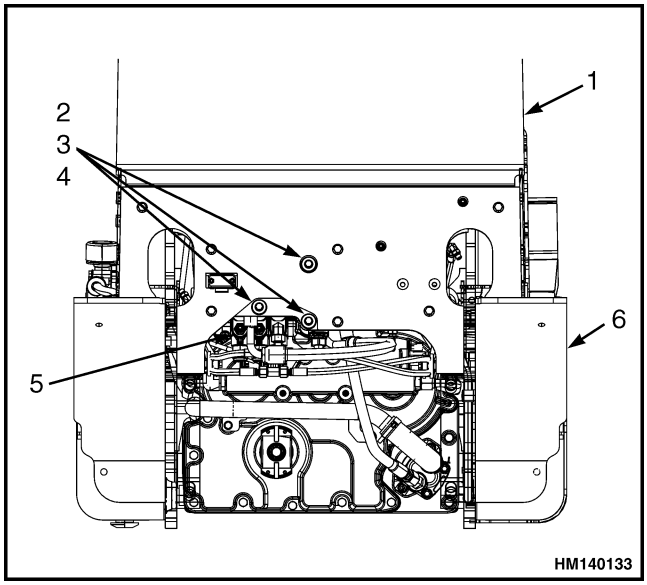
WARNING

The main control valve weighs approximately 30.5 kg (67 lb). Use a lifting device capable of lifting the main control valve to avoid the possibility of injury to personnel.

10. Support the main control valve. Remove three mounting capscrews, washers, inserts and the manual control valve from the lift truck.

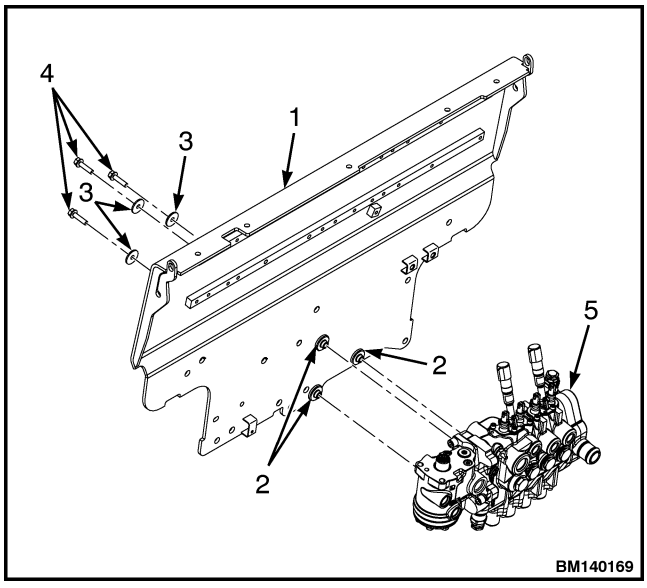
See Figure 24 for lift truck models without OPS

See Figure 25 for lift truck models with OPS



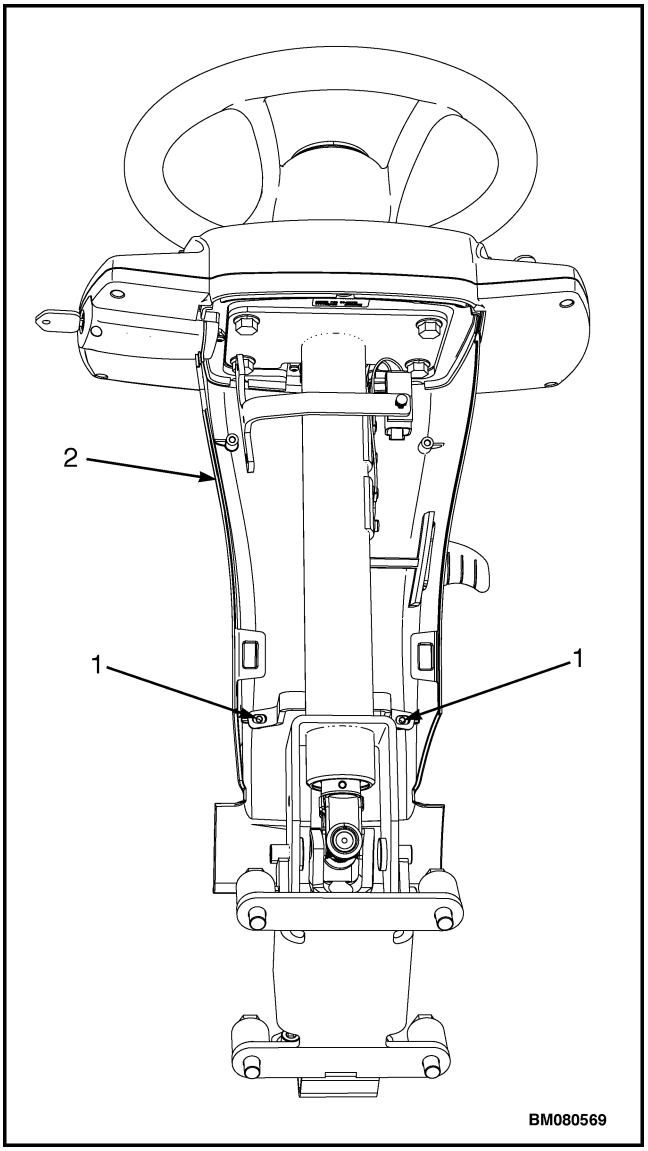
1. COWL
2. INSERT
3. WASHER
4. CAPSCREW
5. MAIN CONTROL VALVE
6. FRAME

Figure 24. Manual Main Control Valve Without OPS Removal



1. COWL
2. INSERT
3. WASHER
4. CAPSCREW
5. MANUAL CONTROL VALVE WITH OPS

Figure 25. Manual Main Control Valve With OPS Removal



1. SCREWS
2. LOWER STEERING COLUMN COVER

Figure 8. Lower Steering Column Cover Removal

DISASSEMBLE

1. Remove steering shaft retention clip (4, Figure 9).

2. Remove horn contact pads.

3. Remove lower strut pivot pin from the gas cylinder. See Figure 9.

4. Remove steering column pivot bolts and steering shaft.

ASSEMBLE

1. Install steering column pivot bolts and install steering shaft.

2. Install lower strut pivot pin in the gas cylinder. See Figure 9.

3. Install horn contact pads.

4. Install steering shaft retention clip.

INSTALL

1. Lubricate end of steering shaft with multipurpose grease. Install end of steering shaft into steering control unit.

2. Install steering column to cowl using four bolts. Tighten bolts to 38 N•m (28 lbf ft). See Figure 9.

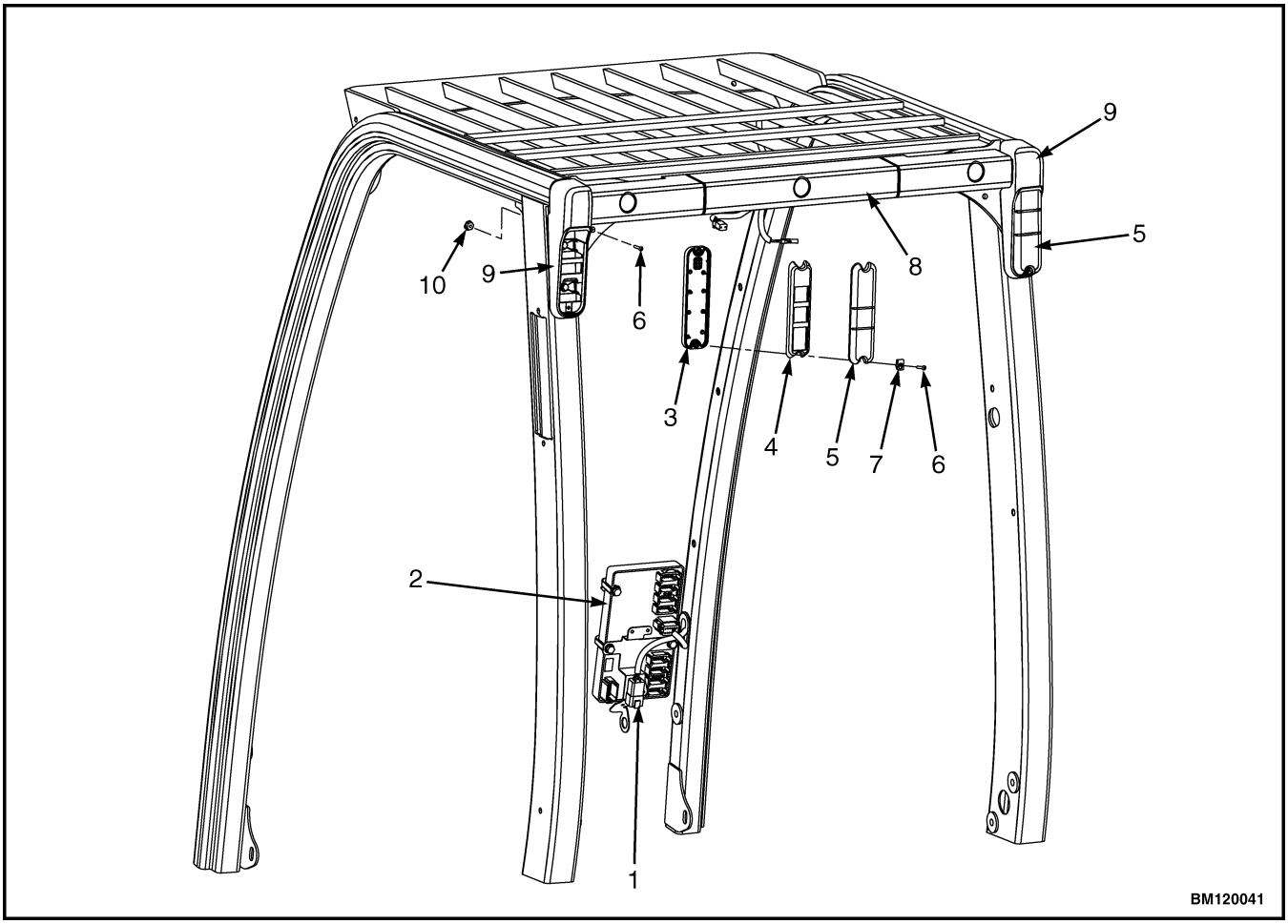
3. Connect Display Switch Cluster harness to Display Switch Cluster panel. Install Display Switch Cluster harness on steering column. See section Display Switch Cluster for procedures.

4. Install upper steering column cover by aligning the two latches and pushing down until latched. See Figure 8.

5. Install steering wheel and instrument display panel. See section Display Switch Cluster.

6. Move steering column to its lowest position and install upper steering column cover. See Figure 2.

7. Connect battery and close hood. See Figure 7.



1. CHASSIS LIGHT HARNESS
2. VEHICLE SYSTEM MANAGER
3. MOUNTING BRACKET
4. REFLEX LENS
5. LED LIGHT LENS
6. SCREW
7. CLIP NUT
8. CROSSMEMBER
9. LED LIGHT HOUSING
10. INSERT

Figure 54. LED Tail, Backup, and Brake Lights Replacement

Tire Sizes

Truck	Drive Tires	Steer Tires
GLC20-25VX (GC/GLC040-050VX) (B910)	21 × 7 × 15	16 × 5 × 10.5
GLC30VX (GLC055SVX-GLC060VX) (B910)	21 × 8 × 15	16 × 6 × 10.5
GLC35VX (GLC070VX) (B910)	21 × 9 × 15	16 × 6 × 10.5
GLP/GDP20-25VX (GP/GLP/GDP040-050VX) (C875)	7.00 x 12	6.00 x 9
GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (C875)	28 x 9	6.50 x 10

Capacities

Item	Quantity	Specifications
Fuel Capacity		
Gas GLC20-35VX (GC040-070VX, GC055SVX) (B910)	40.5 liter (10.7 gal)	86 Octane
Gas GP040-070VX (C875)	52.0 liter (13.7 gal)	86 Octane
LPG GLC20-35VX (GLC040-070VX, GLC055SVX) (B910)	29.9 liter (7.9 gal) 15.2 kg (33.5 lb)	LPG-HD 5, HD 10
LPG GLP20-35VX (GLP040-070VX) (C875)	29.9 liter (7.9 gal) 15.2 kg (33.5 lb)	LPG-HD 5, HD 10
Diesel GP040-070VX (C875) Trucks Only	52.0 liter (13.7 gal)	Diesel No. 2
Engine Oil (With Oil Filter)		
Mazda	4.2 liter (4.4 qt)	−7°C (20°F) and below SAE 5W-20 16°C (60 °F) and below SAE 5W-30 −18°C (0°F) and above SAE 10W-30 API SM ILSAC GF4 SAE J2362

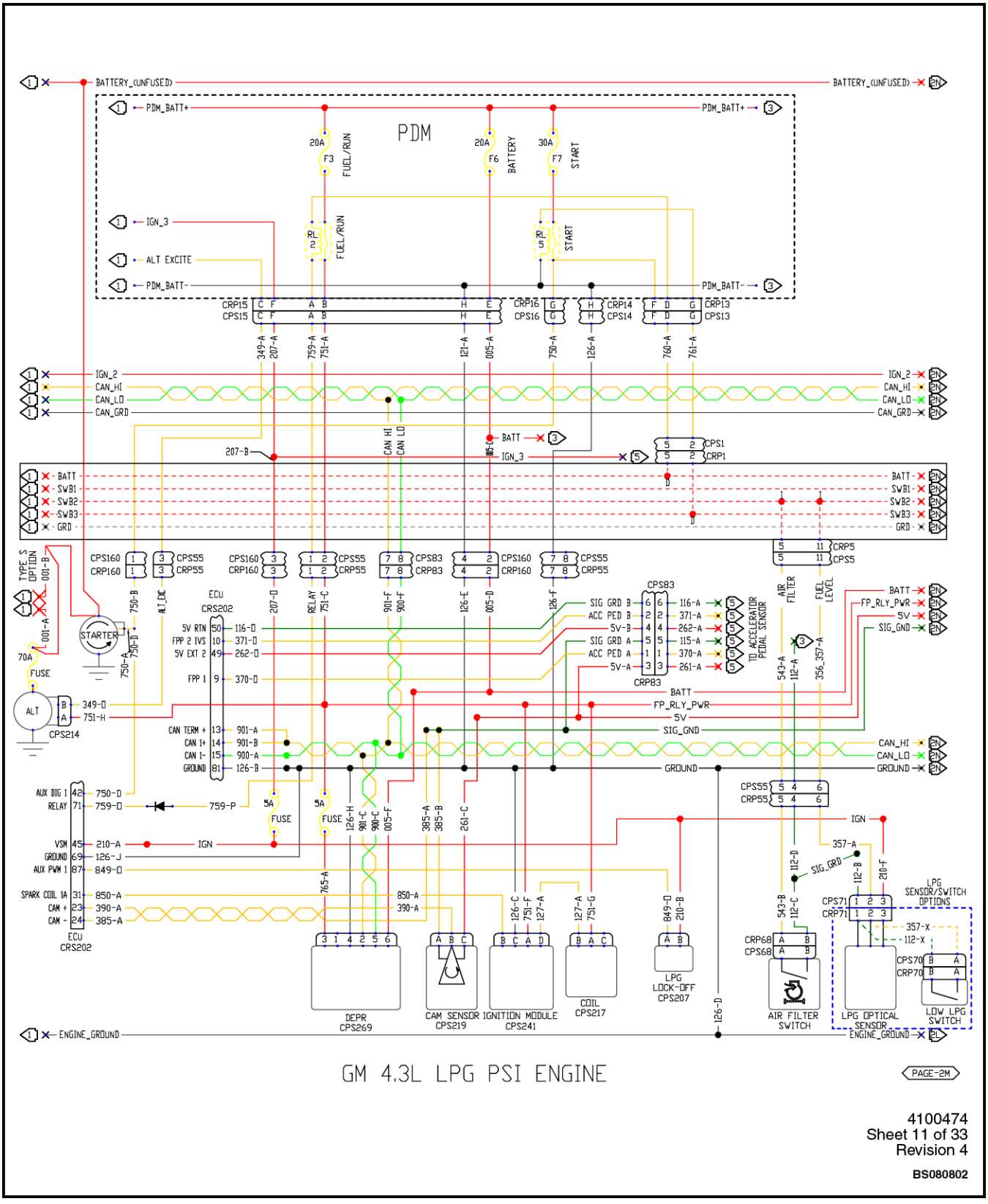


Figure 7. GM 4.3L LPG PSI Engine Electrical Schematic (Sheet 1 of 2)

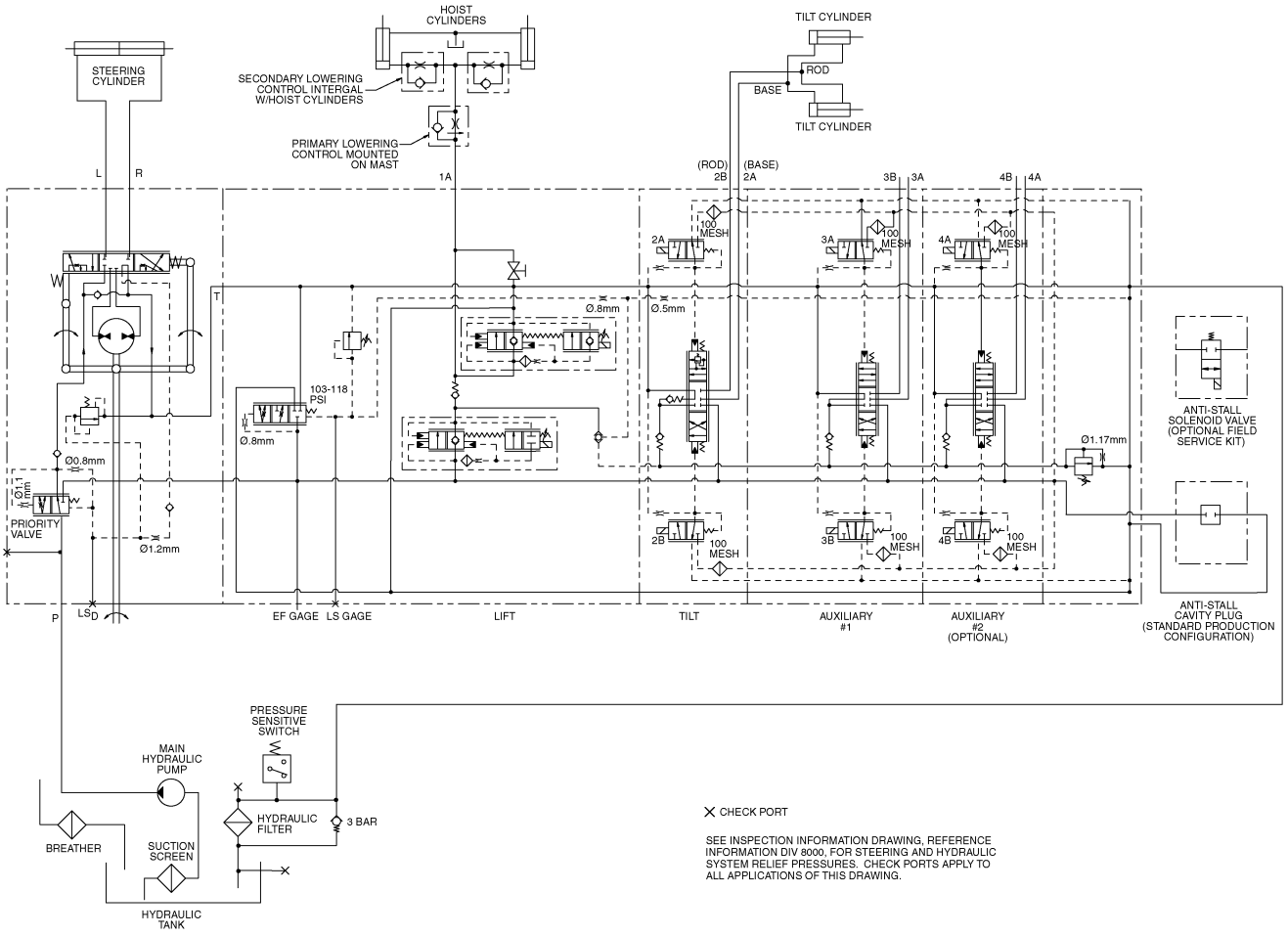


Figure 48. Electronic Control Valve Hydraulic Schematic for Lift Truck Models GC/GLC030VX, GC/ GLC035VX, GC/GLC040SVX (C809) and GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/

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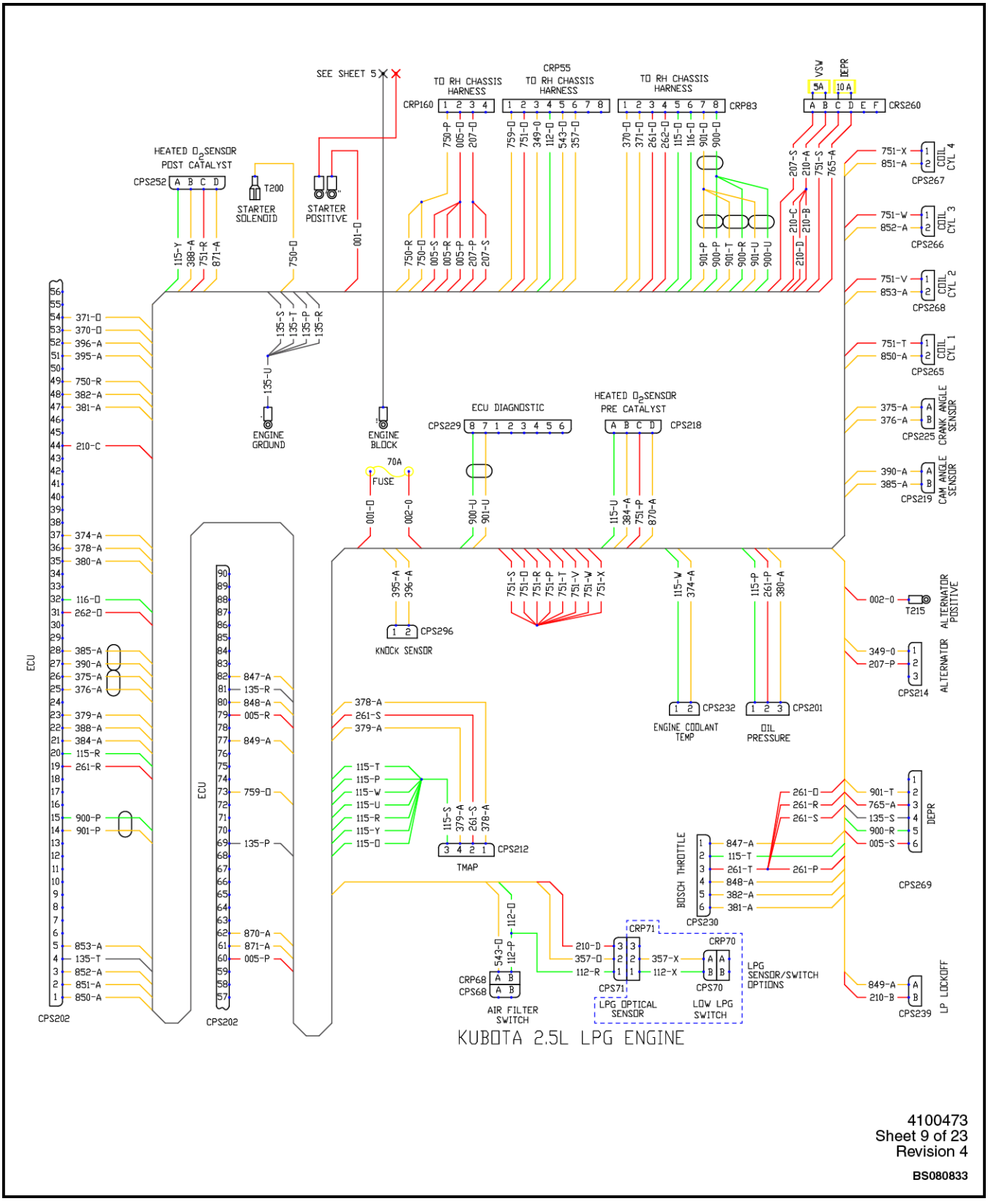


Figure 33. Kubota 2.5L LPG Engine Wiring Diagram

TABLE OF CONTENTS (Continued)

This section is for the following models:

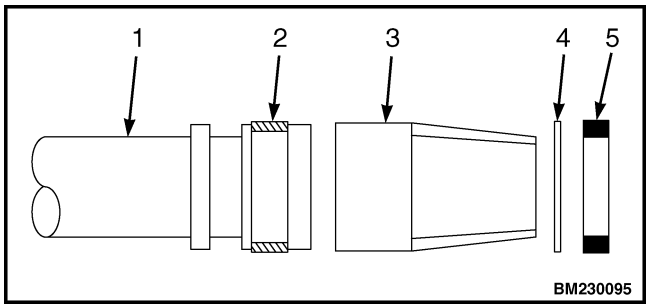
GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) [B910, C910];
GLP/GDP20-35VX (GP/GLP/GDP040-070VX) [C875, D875]

Seal Kit Installation

EXTERNAL INSTALLATION (SEAL AND BACK-UP RING)

NOTE: It is recommended that seal is heated in hydraulic oil prior to installation to make it more flexible and pliable.

1. Lubricate seal, back-up ring, external installation sleeve and piston rod groove with hydraulic fluid.
2. Install wear ring onto piston rod assembly. See Figure 29.
3. Slide external installation sleeve over piston rod assembly and wear ring.
4. Install back-up ring into piston rod groove. See Figure 29.
5. Slide seal over external installation sleeve and into piston rod groove.
6. Remove external installation sleeve. See Figure 29.

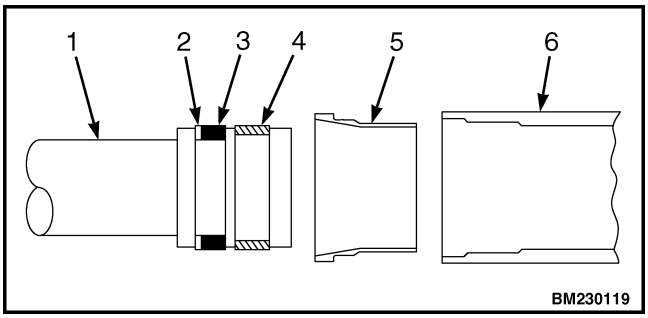


1. PISTON ROD ASSEMBLY
2. WEAR RING
3. EXTERNAL INSTALLATION SLEEVE
4. BACK-UP RING
5. SEAL

Figure 29. Cylinder External Seal Installation

INTERNAL INSTALLATION (PISTON ROD ASSEMBLY)

1. Insert internal installation sleeve into end of cylinder tube. See Figure 30.
2. Install piston rod assembly into cylinder tube.
3. Remove internal installation sleeve from cylinder tube and piston rod assembly. See Figure 30.



1. PISTON ROD ASSEMBLY
2. BACK-UP RING
3. SEAL
4. INTERNAL INSTALLATION SLEEVE
5. CYLINDER TUBE
6. WEAR RING

Figure 30. Cylinder Internal Installation

Torque Specifications

TILT CYLINDERS

Piston Rod Nut

GLC20-25XV (GC/GLC040-050VX, GC/GLC055SVX) (B910, C910) and GLP/GDP20-25VX (GP/GLP/GDP040-050VX) (C875, D875)

170 to 220 N•m (125 to 162 lbf ft)

GLC30-35XV (GC/GLC060-070VX) (B910, C910) and GLP/GDP30-35VX (GP/GLP/GDP060-070VX) (C875, D875)

320 to 400 N•m (240 to 295 lbf ft)