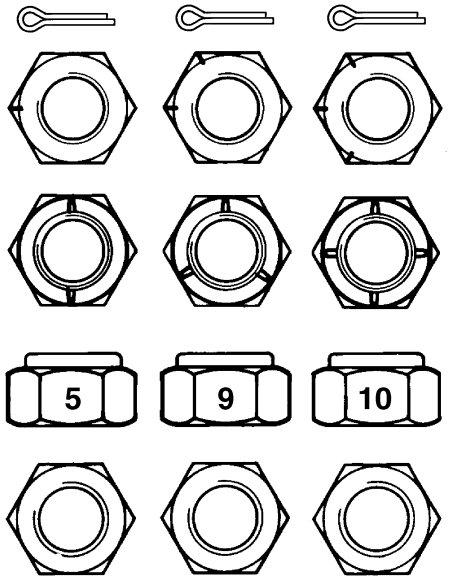
Yale®

Maintenance

METRIC AND INCH (SAE) FASTENERS



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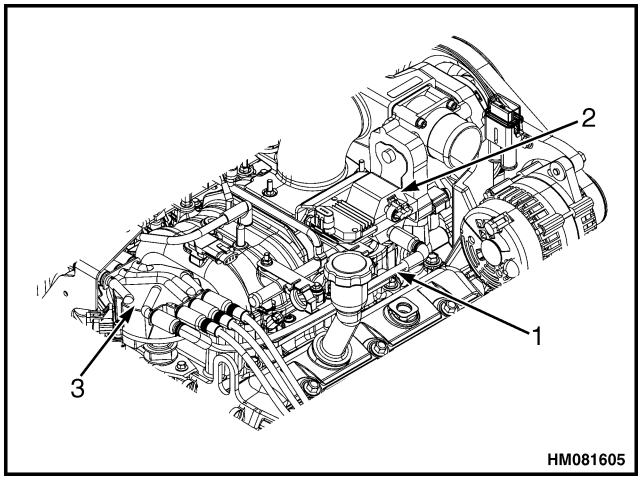
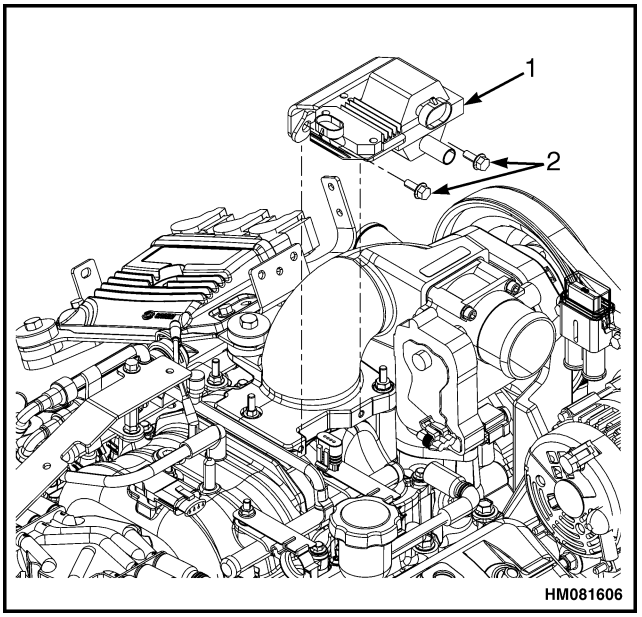


NOTE: V-6 SHOWN, V-8 SIMILAR.

1. COIL WIRE
2. COIL
3. DISTRIBUTOR

Figure 24. Ignition Coil Wire



NOTE: V -6 SHOWN, V-8 SIMILAR.

1. COIL
2. MOUNTING BOLTS

Figure 25. Ignition Coil

Ignition Control Module Replacement

REMOVE

1. Remove the engine cover. Refer to the **Frame** section for your lift truck.

2. Disconnect the electrical connector. See Figure 26.

3. Remove the screws holding the ignition control module and the heat sink to the bracket.

4. Remove the ignition control module and the heat sink.

INSTALL

CAUTION

Late model engines use a combination of standard and metric fasteners. The components affected are the starter motor, engine mounts, and flywheel housing mounting. Other components may also have a combination of fasteners. Always verify that the proper fasteners are used whenever removing or replacing any components.

1. Install the ignition control module and the heat sink on the bracket with the screws. Tighten the screws to 3.5 N•m (31 lbf in). See Figure 26.

2. Reconnect the electrical connectors.

3. Install the engine cover. Refer to the **Frame** section for your lift truck.

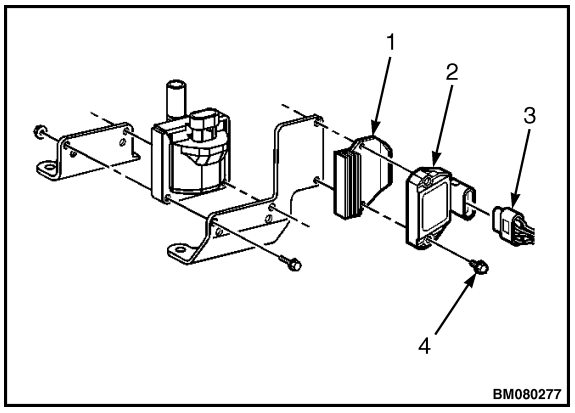


Figure 26. Ignition Control Module Assembly

CHECK	PROCEDURE	ACTION
Heater Check (If equipped)	1. Turn key switch to **ON** position or press power ON/OFF button. 2. Verify that air ducts are open. 3. Turn heater fan switch to each of the three speed select positions. ***Does fan speed increase at each switch position and does airflow increase accordingly?***	**YES:** Continue with this procedure. **NO:** Refer to Observed Symptoms, Heater Fan Does Not Operate Properly.
	NOTE: If engine is at normal operating temperature, proceed to Step 4. If engine is cold, wait until engine has reached normal operating temperature, then proceed to Step 4. *Continue:* 4. Turn heater temperature control fully counterclockwise to the maximum heat position. ***Does hot air flow from the heater air ducts?***	**YES:** Go to next check. **NO:** Refer to Observed Symptoms, Heater Airflow Does Not Reach Desired Temperature.
Dome Light Check (If equipped)	1. Turn interior cab dome light switch **ON**. ***Does dome light operate?***	**YES:** Go to next check. **NO:** Refer to Observed Symptom, Dome Light Inoperative.
Circulating (Accessory) Fan Check (If equipped)	1. Turn circulating fan switch **ON**. ***Does circulating fan operate?***	**YES:** Go to next check. **NO:** Refer to Observed Symptom, Circulating (Accessory) Fan Inoperative.

expansion volume within the bottle. The tank relief valve is installed in the tank to allow for pressure relief if the bottle is overfilled or if exposed to high temperatures.

WARNING

An alignment pin on the tank mount bracket and the alignment pin hole are used together to ensure the tank is properly installed on the truck.

If the tank is installed in a position other than its aligned' position, the pickup tube within the tank will not be in the proper orientation to ensure all the fuel in the tank is accessible. The tank is typically secured to the bracket using tank straps.

PSI CLOSED-LOOP SYSTEM

PSI LPG engines and fuel systems are designed to operate on HD-5 or HD-10 specification LPG fuel. Fuel other than HD-5 or HD-10 may cause harm to the engine's emission control system and a warranty claim may be denied on this basis if operators can readily find the proper fuel. The system is termed closed-loop' because of a closed control' loop which senses the oxygen content in the exhaust and adjusts the fuel mixture to maintain an ideal ratio of air to fuel during all operating conditions. The primary components of the fuel system are the fuel supply, direct electronic pressure regulator (DEPR), fuel mixer, electronic throttle control (ETC) device, 2-Stage convertor, engine control module (ECM), and a catalytic converter. The system operates on a slightly positive fuel pressure. Primary fuel pressure can be measured at the LD 2-Stage convertor. Secondary fuel pressure command and actual fuel pressure is monitored by the ECM. You can view these pressures using the diagnostic service tool.

Electrical Fuel Lockoff Valve

The Electric Fuel lockoff valve is an integrated assembly consisting of a 12 volt solenoid and a typically closed valve. When energized, the solenoid opens the valve and allows the fuel to flow through the assembly. The valve opens during cranking and engine run cycles. Voltage to the Electric Lock-Off Valve is controlled by the engine control module (ECM).

Direct Electronic Pressure Regulator (DEPR)

The ECI engine management system uses the DEPR to control fuel delivery for the precise fuel metering necessary for optimum combustion, fuel economy and temporary response. The DEPR is available in either a 19 mm (0.74 in.) or a 28 mm (1.10 in.) size.

The DEPR is a single-stage microprocessor based electromechanical fuel pressure regulator that incorporates a high speed/fast acting actuator. It communicates with the Engine Control Module (ECM) over a Controller Area Network (CAN) link, receiving fuel pressure commands and broadcasting DEPR operating parameters back to the ECM. The DEPR can regulate fuel pressure from -4.48 kPa (-0.6 psi) to 3.23 kPa (0.4 psi) above the Mixer air inlet pressure, providing sufficient control to adjust an engine either rich or lean during operation and starting. When the DEPR receives an output pressure command from the ECM, the valve is internally driven to produce targeted fuel pressure, the DEPR then closes the loop internally using a built in fuel pressure sensor to maintain target fuel pressure/fuel flow rate, until another external command from the ECM is received (intervals < 10 ms). The DEPR has a fuel temperature sensor that is used by the ECM to correct for variations in fuel density. This strategy provides an extremely accurate method for open loop fuel control. Then with the addition of the pre- and post-cat oxygen sensors, the pressure command transmitted form the ECM can be further adjusted using closed loop feedback.

Air Fuel Mixer

The air valve mixer is a self-contained air-fuel metering device. The mixer is an air valve design, utilizing a relatively constant pressure drop to draw fuel into the mixer from cranking speeds to full load. The mixer is mounted in the air stream ahead of the throttle control device.

When the engine begins to crank it draws in air with the air valve covering the inlet, and negative pressure begins to build. This negative pressure signal is communicated to the top of the air valve chamber through vacuum ports in the air valve assembly. A pressure/force imbalance begins to build across the air valve diaphragm between the air valve vacuum chamber and the atmospheric pressure below the diaphragm. The vacuum being created is referred to as Air Valve Vacuum (AVV). As the air valve vacuum reaches the imbalance point, the air valve begins to lift against the air valve spring. The amount of AVV generated is a direct result of the throttle position. At low engine speed the air valve vacuum and the air valve position is low thus creating a small venturi for the fuel to flow. As the engine speed increases the AVV increases and the air valve is lifted higher thus creating a much larger venturi. This air valve vacuum

Principles of Operation

The system operation is summarized as follows:

Propane is stored in the tank in a liquid form. With the tank valve open, liquid propane flows from the fuel storage tank to the regulator through a liquid fuel filter that is integrated within the regulator. Opening the main fuel shutoff solenoid allows fuel to flow into the regulator. Opening a second fuel shutoff solenoid downstream from the main shutoff solenoid allows vaporized fuel to flow to the LPG injector at the base of the carburetor. Both solenoids are normally closed and are controlled by the ECU. The fuel shutoff solenoids are opened momentarily when the ignition is first turned on to allow the system to pressurize before the engine is started and are open while the engine is running.

When the main fuel shutoff solenoid on the regulator is open, liquid propane flows into the vaporizer heat exchanger where heat from the engine coolant is used to convert the liquid fuel to vapor. The first chamber in the regulator provides gaseous propane to the LPG injector at a constant operating pressure. The second chamber in the regulator reduces the pressure for the LPG carburetor.

Fuel is supplied to the carburetor through the main supply hose while fuel is supplied to the injector through the injector hose. There is an LPG vapor filter in line between the regulator and the LPG injector to reduce the buildup of contaminants at the injector. At idle, all of the fuel to run the engine is supplied through the injector. During higher RPM and higher engine loading, fuel is supplied through the carburetor and metered with the injector to maintain the optimum air-fuel ratio. The ECU controls the fuel injector based mainly on inputs from the cam position (CMP) sensor which provides engine RPM, oxygen (O_2) sensor, MAP sensor, intake air temperature (IAT) sensor, engine coolant temperature (ECT) sensor, and throttle position sensor (TPS). Also, the ECU controls the ignition timing to reduce emissions, minimize fuel consumption, and increase engine power. See Figure 9020-10-33.

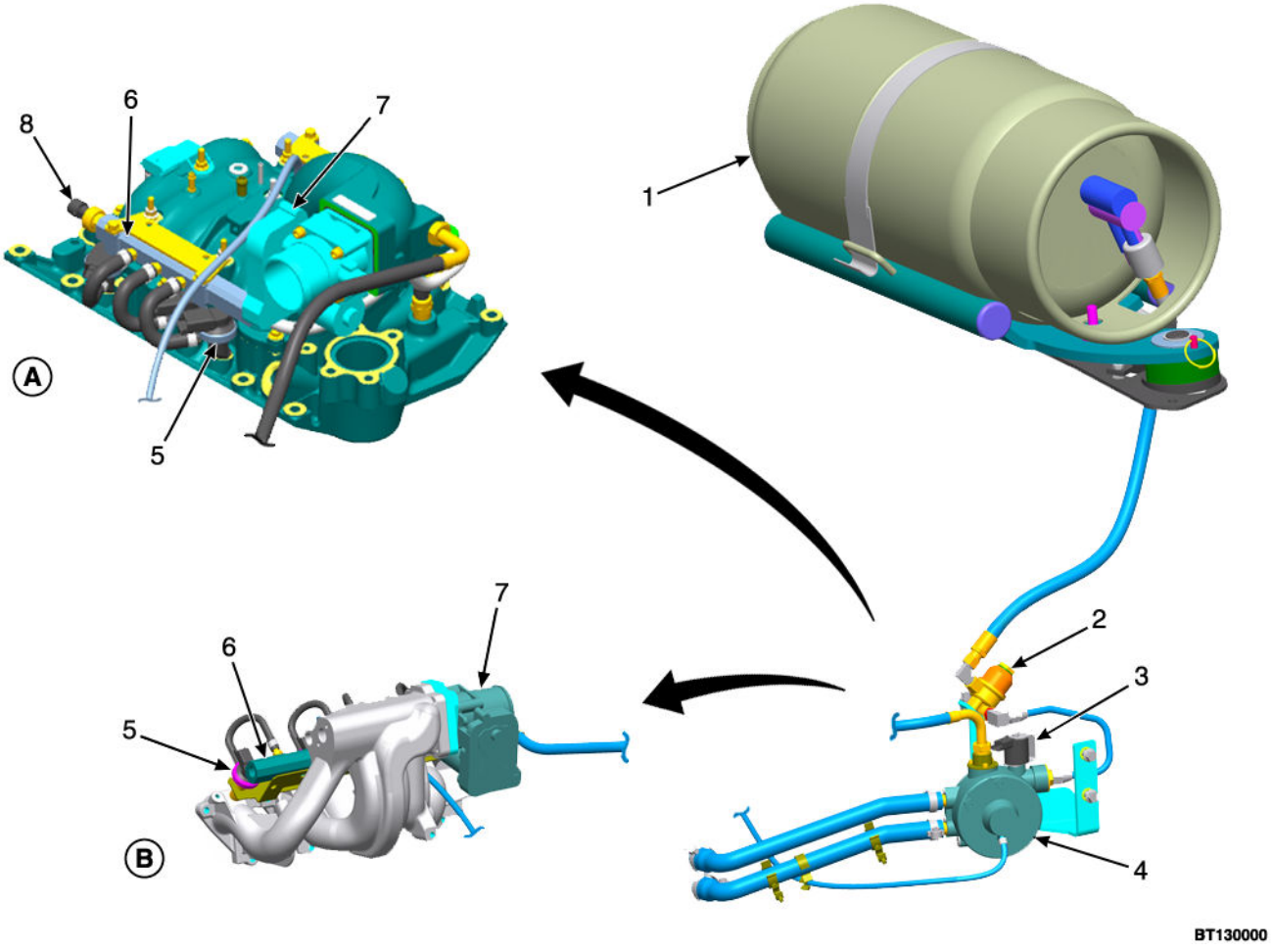
After combustion, the exhaust gases pass over the oxygen (O_2) sensor and through the three-way catalytic converter. The three-way catalytic converter aids with reaction of the spent exhaust gases to reduce tail pipe emissions of CO, HC, and NOx. Also, nickel is used in the catalyst to reduce exhaust gas odor (U.S. only).

The electronic governor is installed between the mixer and the intake manifold and is controlled by the ECU. It is composed of a governor position sensor and throttle control motor. The ECU drives the electronic governor controller motor and adjusts the opening and closing angle of the throttle valve based on the signal from the ECU. The electronic governor also controls engine idle speed which allows for improved load acceptance at idle. In addition to engine governing and idle control, the ECU can be commanded by the Vehicle System Manager (VSM) to control the governor and reduce engine speed as needed for various operating conditions including power reversals.

GM (LPG) Engine Controls

ENGINE CONTROL SYSTEM

The manufacturer of the GM 2.4L engine, fuel and emissions system is Teleflex GFI Control Systems LPG. The unique components of the GM 2.4L engine system are the fuel tank, vaporizer/regulator, injector driver module, fuel rail, and the propane injectors. The manufacturer of the GM 4.3L engine, fuel and emissions system is Teleflex GFI Control System LPG. The unique components of the GM 4.3L engine system are the fuel tank, vaporizer/regulator, two injector driver modules, fuel rail, fuel pressure sensor, and the propane injectors. See Figure 9020-10-65.



A. GM 4.3L

1. FUEL TANK
2. FUEL FILTER
3. FUEL LOCKOFF SOLENOID VALVE
4. VAPORIZER/REGULATOR

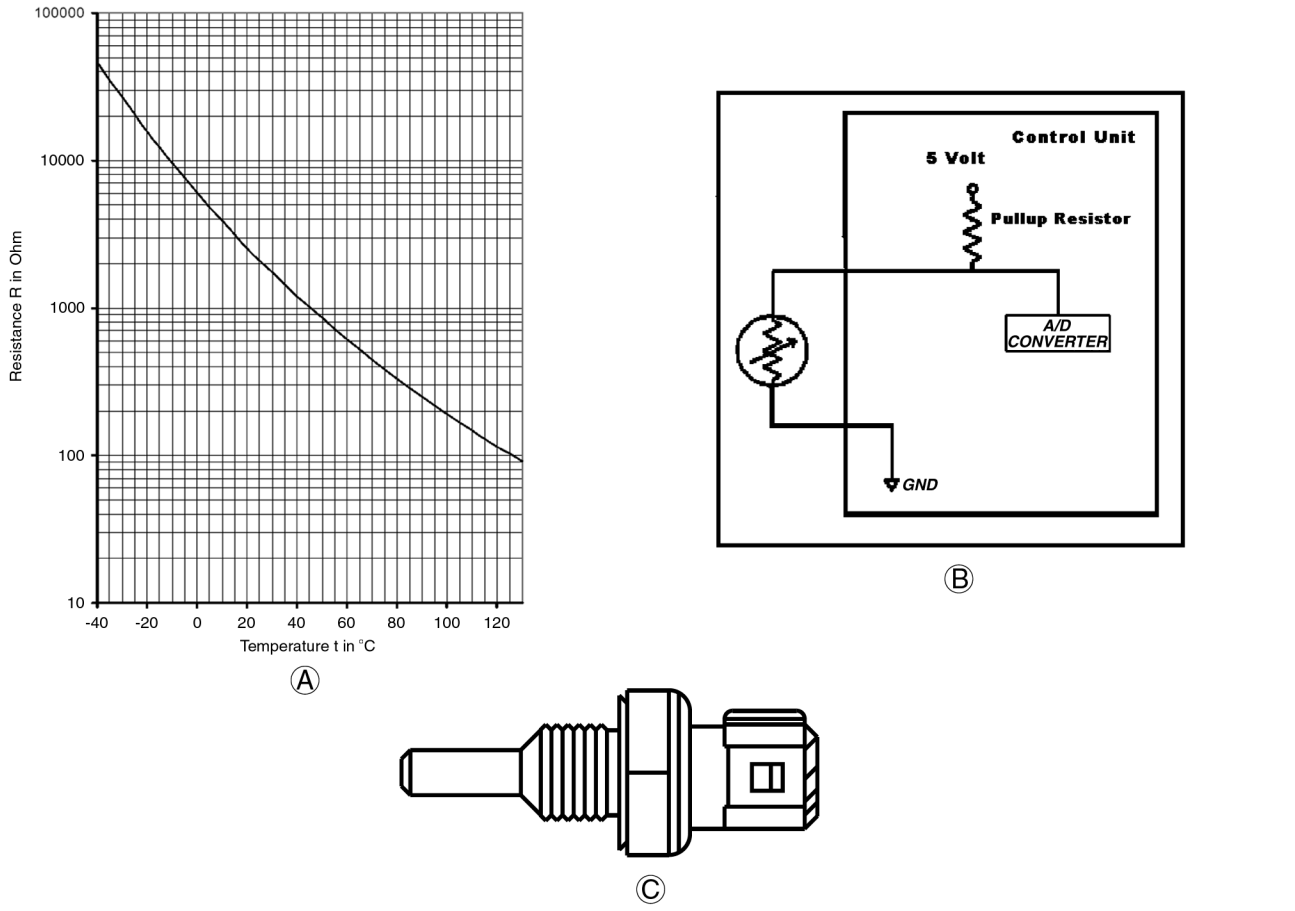
B. GM 2.4L

5. PROPANE INJECTOR
6. FUEL RAIL
7. ELECTRONIC THROTTLE
8. FUEL PRESSURE SENSOR (GM 4.3L ONLY)

Figure 9020-10-65. LPG Fuel System

Engine Coolant Temperature Sensor

The Engine Coolant Temperature (ECT) Sensor is a Negative Coefficient (as the temperature rises, the resistance drops) temperature-sensitive resistor located in the Cylinder Head. The ECU uses the reading to determine temperature related operating condition requirements for the engine. 5 volts is applied across the sensor and voltage drop is measured to determine the temperature. See Figure 9020-10-110.



A. RESISTANCE VS ENGINE COOLANT TEMPERATURE GRAPH
B. COOLANT TEMPERATURE SENSOR WIRING
C. COOLANT TEMPERATURE SENSOR

Figure 9020-10-110. Engine Coolant Temperature Sensor

Oxygen (O_2) Sensor

The oxygen (O_2) sensor (s) are mounted in the exhaust system downstream of the engine. One (O_2) sensor is prior (Pre) to the catalytic converter and if equipped, an additional (O_2) sensor is after (Post) the catalytic converter. The (O_2) sensor uses a heater circuit to bring the engine up to operating temperature quickly and maintains the temperature during idle. The heater is controlled by the ECU, which will cycle the heater to prevent sensor overheating. The Pre (O_2) is used to measure the amount of oxygen present in the exhaust stream and communicates that to the ECU via an electrical signal. The Post (O_2) sensor if equipped, is used to determine the efficiency of the catalytic converter. The amount of oxygen present in the exhaust stream indicates the fuel-air ratio. If the (O_2) sensor signal indicates that the exhaust stream is rich, the ECU will decrease or lean the fuel mixture by reducing the short term fuel correction value which

Full-Load Position Adjustment Mechanism

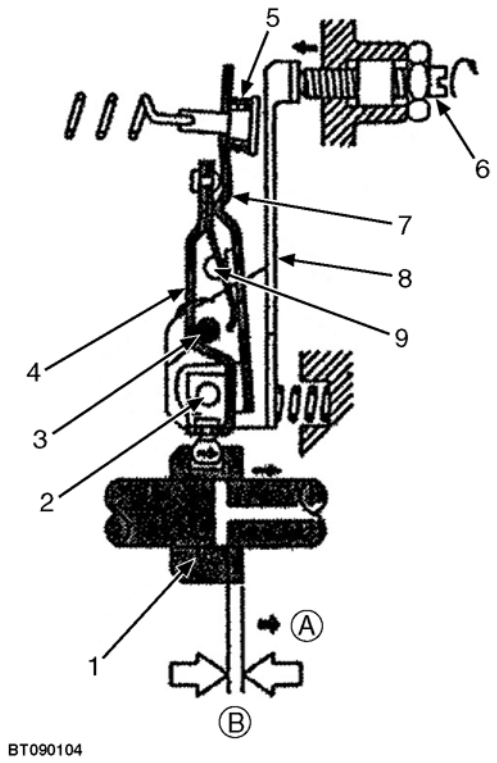


Figure 9020-10-164. Full-Load Adjustment

Legend for Figure 9020-10-164

A. FUEL INCREASE DIRECTION
B. EFFECTIVE STROKE

1. CONTROL SLEEVE
2. M2 (FULCRUM)
3. M1 (FIXED)
4. START LEVER
5. IDLE SPRING
6. FULL LOAD ADJUSTING SCREW
7. TENSION LEVER
8. CORRECTOR LEVER
9. M3

The full-load position is determined by the amount the full-load adjusting screw is driven. When the screw is driven, the corrector lever turns counterclockwise with M1 being the fulcrum to move the control sleeve to the fuel increase direction. When the screw is loosened, the control sleeve moves to the fuel decrease direction.

Engine Idle Speed Incorrect

POSSIBLE CAUSE

A. THROTTLE CABLE FREE PLAY (MAZDA, KUBOTA, YANMAR, AND CUMMINS ENGINES WITH CABLE ACTUATED THROTTLE).
B. ELECTRONIC ACTUATED THROTTLE PROBLEMS (DIESEL ENGINES ONLY).
C. GOVERNOR OUT OF ADJUSTMENT (DIESEL ENGINES ONLY).
D. FAULTY GOVERNOR (MAZDA LPG ENGINES ONLY).
E. FAULTY IDLE AIR CONTROL (MAZDA GASOLINE ENGINES ONLY).
F. FAULTY ELECTRONIC THROTTLE BODY (GM ENGINES ONLY).
G. FAULTY ENGINE COOLANT TEMPERATURE (ECT) SENSOR.
H. FAULTY THERMOSTAT (STUCK OPEN).
I. ENGINE VACUUM LEAKS (GM AND MAZDA ENGINES ONLY).
J. ENGINE LIFT PUMP NOT OPERATING PROPERLY (KUBOTA DIESEL ENGINES ONLY).
K. ACTUAL RAIL PRESSURE NOT FOLLOWING TARGET RAIL PRESSURE. (KUBOTA DIESEL ENGINES ONLY).
L. CAM AND CRANK SENSORS NOT OPERATING PROPERLY (KUBOTA DIESEL ENGINES ONLY).
M. FUEL LEAKS.
N. DIRTY AIR CLEANER.
O. POOR CYLINDER COMPRESSION.

CAUSE A - THROTTLE CABLE FREE PLAY (MAZDA, KUBOTA, YANMAR, AND CUMMINS ENGINES WITH CABLE ACTUATED THROTTLE).

PROCEDURE OR ACTION:

1. Check throttle cable for sticking/binding in sheath. Refer to the appropriate **Frame** manual, depending on lift truck model.
   Is throttle cable sticking or binding in sheath?
   YES: Replace throttle cable. Refer to the appropriate **Frame** manual, depending on lift truck model.
   NO: Go to Step 2.
2. Check throttle cable free play adjustment. Refer to the appropriate **Frame** manual, depending on lift truck model.
   Is throttle cable free play out of adjustment?
   YES: Adjust throttle cable free play. Refer to the appropriate **Frame** manual, depending on lift truck model.
   NO: For Kubota and Yanmar engines, go to CAUSE B.

CAUSE D - IGNITION SYSTEM PROBLEM (MAZDA AND GM ENGINES ONLY).

PROCEDURE OR ACTION:

1. For Mazda and GM engines:
    - Check for proper ignition voltage output with spark tester tool
    - Verify that the spark plugs are correct
    - Check spark plugs for the following:
        - Fouling (wet or black coated electrodes)
        - Cracks
        - Wear
        - Improper gap
        - Burned electrodes
        - Heavy deposits
    - Check for bare or shorted spark plug cables
2. For Mazda engines:
    - Verify that each spark plug is connected to proper tower on the distributor
    - Check for loose spark plug cable connections at ignition coil, distributor, and spark plugs
    - Check distributor rotor, cap, and towers/posts for wear or damage
    - Check ignition timing
3. For GM engines only:
    - Verify that each spark plug is connected to proper coil terminal
    - Check for loose spark plug cable connections at ignition coils and spark plugs
    - Check coil and towers/posts for wear or damage
    - Verify each coil is producing the proper ignition voltage using a spark tester

Is ignition system in good condition?
YES: Go to CAUSE E.
NO: Repair ignition system. For GM engines, refer to appropriate **GM Engine Repair** manual, depending on lift truck model. For Mazda engines, refer to appropriate **Electrical System, Mazda** manual, depending on lift truck model. If necessary, replace spark plugs.

NO: Repair fuel system. Refer to appropriate **LPG Fuel System**, **Gasoline Fuel System** or **GM Engines** manual, depending on lift truck model.

CAUSE B - IGNITION SYSTEM PROBLEM.

PROCEDURE OR ACTION:

1. For Mazda and GM engines:
    - Check for proper ignition voltage output with spark tester tool
    - Verify that the spark plugs are correct
    - Check spark plugs for the following:
        - Fouling (wet or black coated electrodes)
        - Cracks
        - Wear
        - Improper gap
        - Burned electrodes
        - Heavy deposits
    - Check for bare or shorted spark plug cables
2. For Mazda engines only:
    - Verify that each spark plug is connected to proper tower on the distributor
    - Check for loose spark plug cable connections at ignition coil, distributor, and spark plugs
    - Check distributor rotor, cap, and towers/posts for wear or damage
    - Check ignition timing
3. For GM engines only:
    - Verify that each spark plug is connected to proper coil terminal
    - Check for loose spark plug cable connections at ignition coils and spark plugs
    - Check coil and towers/posts for wear or damage
    - Verify each coil is producing the proper ignition voltage using a spark tester

Is ignition system in good condition?
YES: Go to CAUSE C.
NO: Repair ignition system. Refer to appropriate **GM Engines** or **Electrical System** manual, depending on lift truck model. If necessary, replace spark plugs.

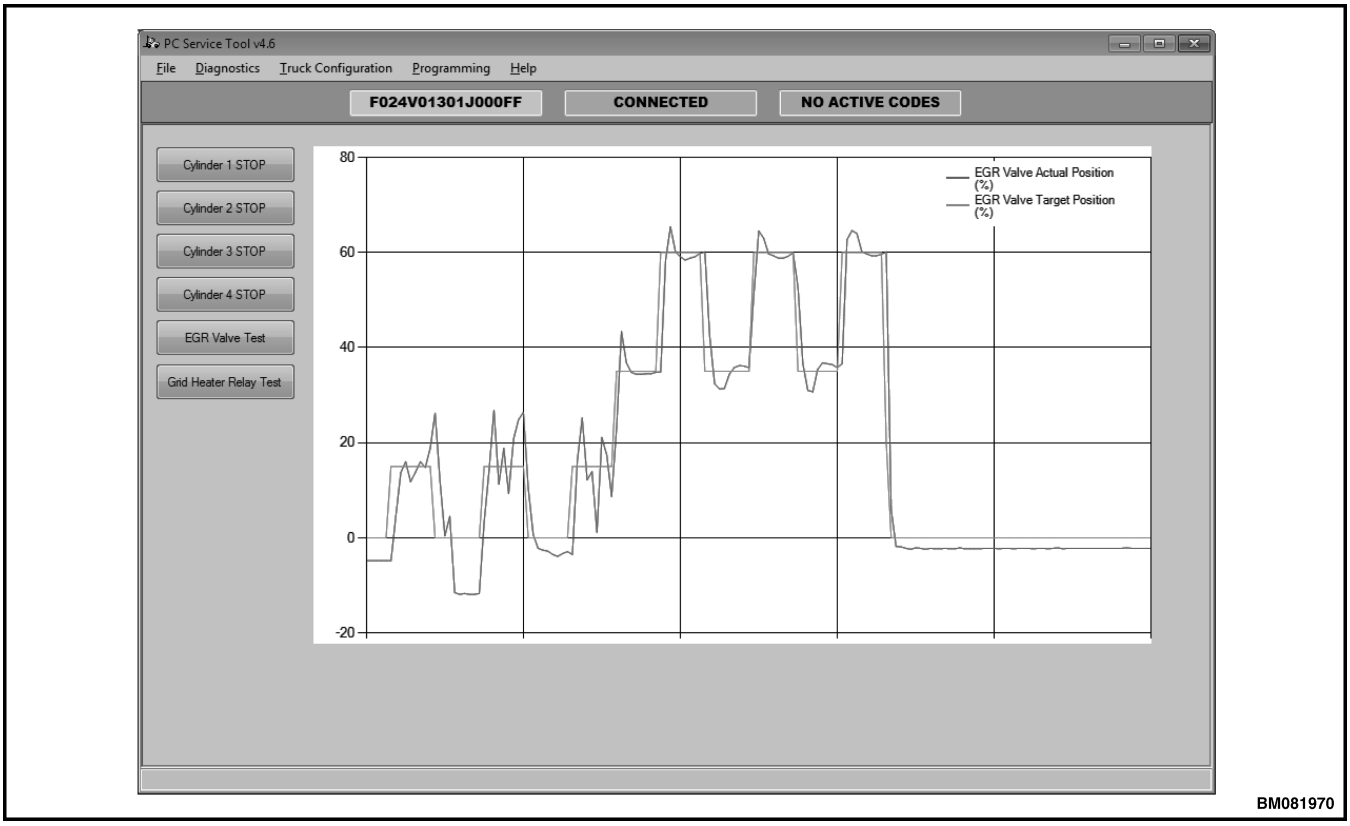


Figure 9020-40-218. Cycling the EGR Valve

Grid Heater Relay Test

Use this test to determine if the grid heater and relay are functioning properly. When the relay is enabled expect to see a 1 or 2 volt drop in battery voltage under normal conditions. See Figure 9020-40-219. No voltage drop indicates the grid heater and/or relay are not functional.

1. Connect CAN interface cable.
2. Start PC Service Tool.
3. Run the engine to temperature per conditions.
4. Click **Grid Heater Relay Stop Test** to begin.
5. Observe trace characteristics.

Diagnostic Trouble Code (DTC) Chart (Cont)

Legend for Figure 9030-03-7

NOTE: (*) IDENTIFIES POST 2007 ENGINE CONNECTORS INTERFACE. SEE POST 2007 ENGINE CONNECTIONS.

1. CPS 74, ENGINE COVER SWITCH CONNECTOR
2. CPS 80, COOLANT LEVEL CONNECTOR
3. CRP 54, BACKUP ALARM HARNESS CONNECTOR
4. CPS 79, ALTERNATE HORN BUTTON CONNECTOR
5. CPS 52, SEAT HARNESS CONNECTOR
6. CPS 78, BUS TERM 2 CONNECTOR
7. CPS 67, KEY SWITCH CONNECTOR
8. CPS 18, ACC 2 CONNECTOR
9. CPS 13, PDM CONNECTOR
10. CPS 14, PDM CONNECTOR
11. CPS 16, PDM CONNECTOR
12. CPS 15, PDM CONNECTOR
13. CPS 65, HYD FILTER CONNECTOR
14. * CPS 55, ENGINE HARNESS CONNECTOR
15. CPS 85, TRANSMISSION HARNESS CONNECTOR
16. CPS 89, HORN CONNECTOR
17. CPS 1, VSM CONNECTOR
18. CPS 9, VSM CONNECTOR
19. CPS 10, VSM CONNECTOR
20. CPS 12, VSM CONNECTOR
21. CPS 7, VSM CONNECTOR
22. CPS 5, VSM CONNECTOR
23. CPS 84, COWL HARNESS CONNECTOR
24. CPS 88, COWL HARNESS CONNECTOR
25. ACC 1 CONNECTOR
26. CPS 17, LIGHTS/CAB HARNESS CONNECTOR
27. CPS 89, HORN CONNECTOR (1.0-2.0 TON CUSHION FORKLIFTS ONLY)

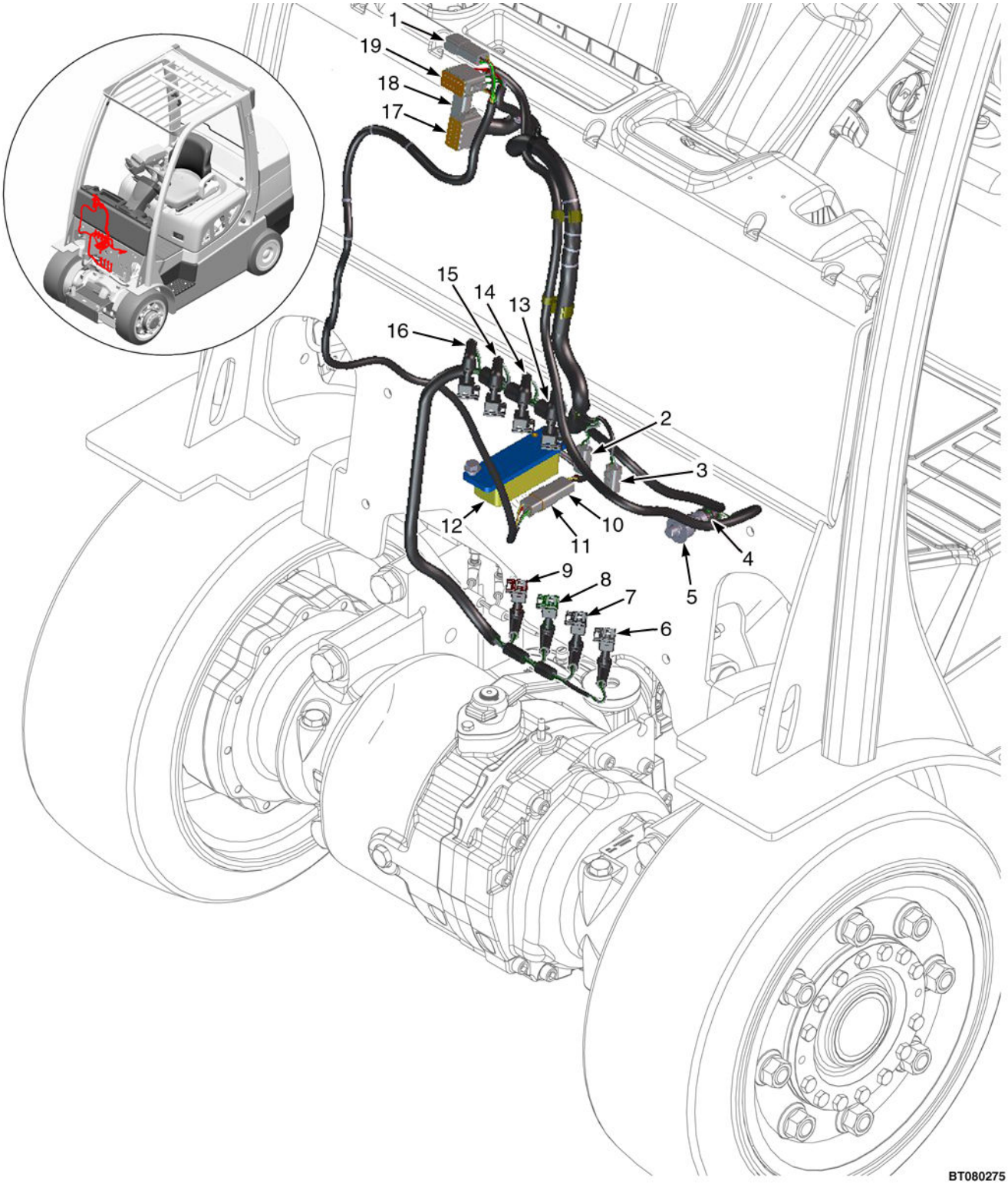
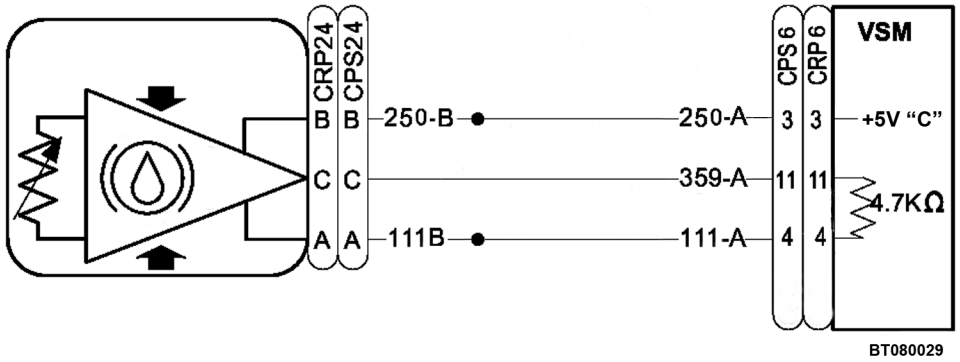


Figure 9030-03-23. 5-Function Hydraulic Harness Assembly With Impact and Load Weight Sensor

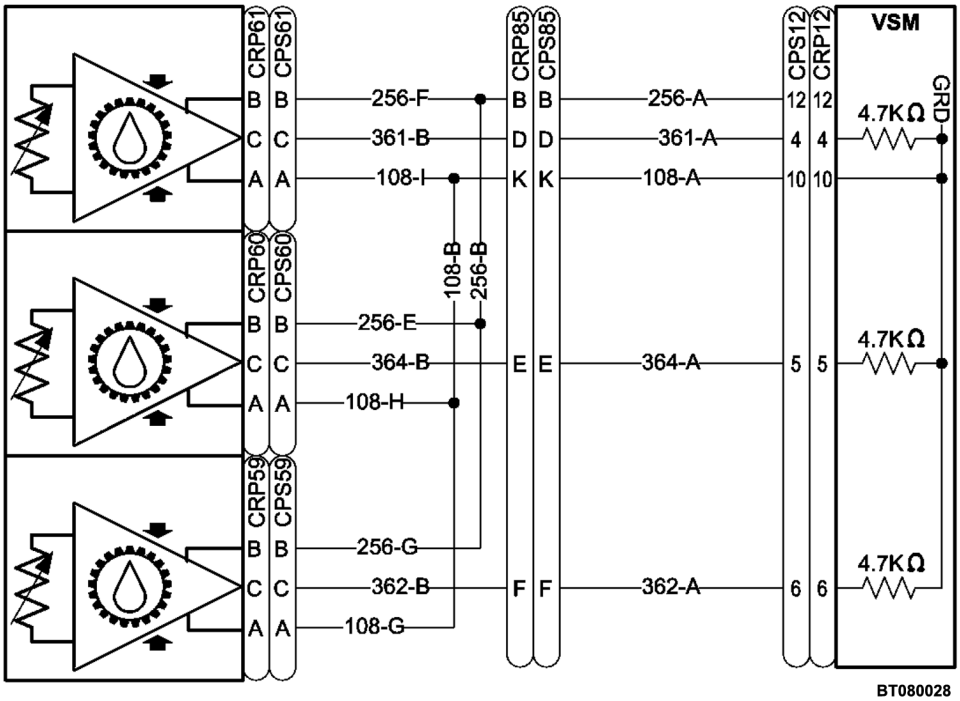
WIRE # 115 = SENSOR GROUND
WIRE # 380 = SENSOR SUPPLY
WIRE # 261 = SENSOR SIGNAL

Oil Pressure (2007 Mazda EPA)



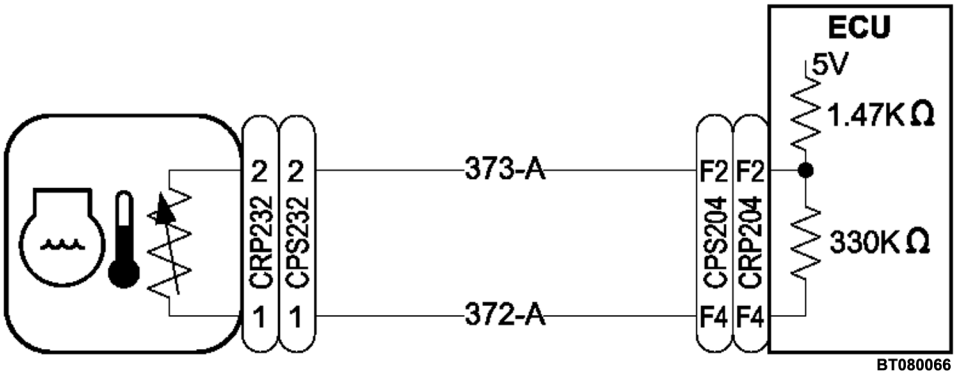
WIRE # 111, (GREEN) = SENSOR GROUND
WIRE # 250, (RED) = SENSOR SUPPLY
WIRE # 359, (WHITE) = SENSOR SIGNAL

Service Brake Pressure Schematic

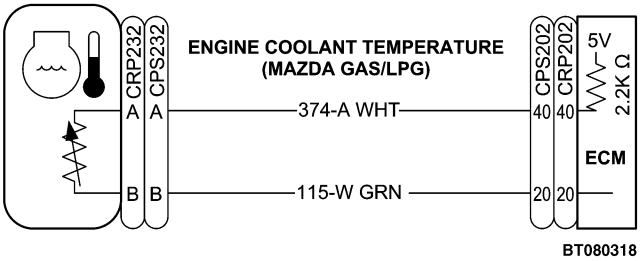


WIRE # 108, (GREEN) = SENSOR GROUND
WIRE # 256, (RED) = SENSOR SUPPLY
WIRE # 361, (WHITE) = XMSN FWD 1 PRESSURE SENSOR SIGNAL
WIRE # 362, (WHITE) = XMSN FWD 2 PRESSURE SENSOR SIGNAL
WIRE # 364, (WHITE) = XMSN REV PRESSURE SENSOR SIGNAL

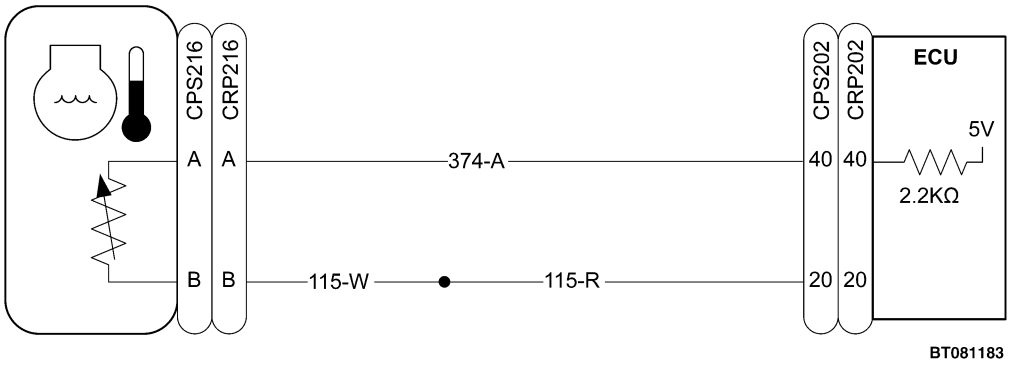
XMSN Pressure Sensors Schematic



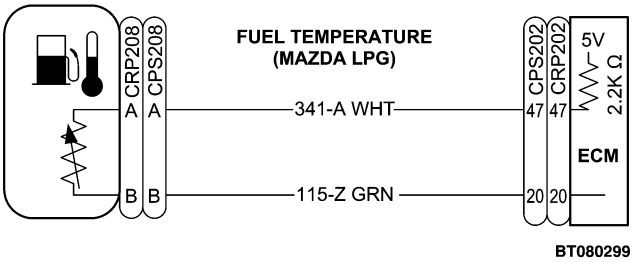
Engine Coolant Temperature Schematic (GM 2010)



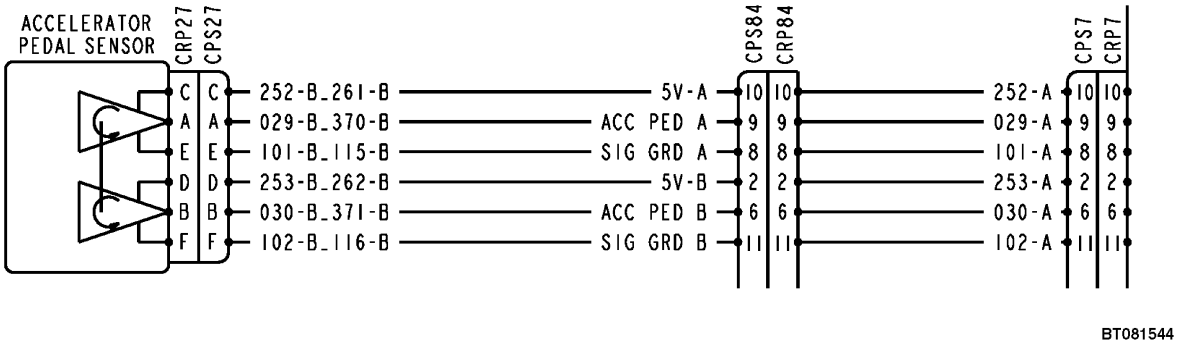
Engine Coolant Temperature Mazda Gas/LPG



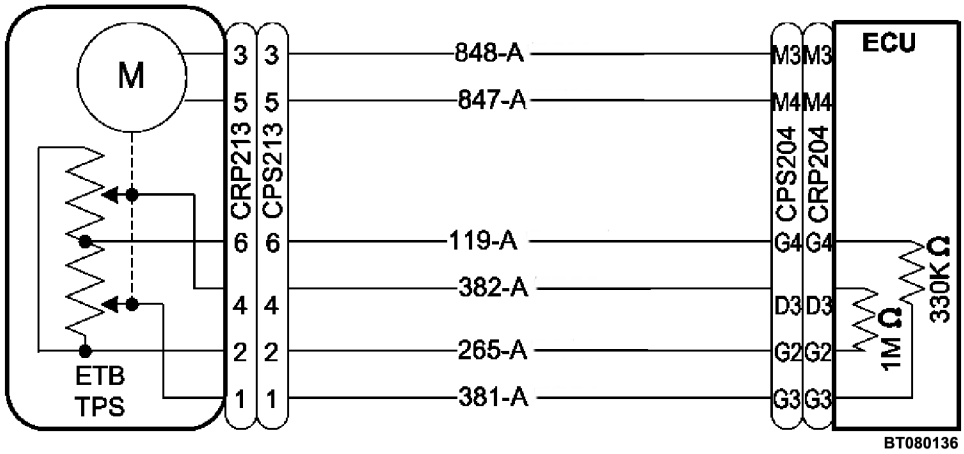
Engine Coolant Temperature (2007 Mazda EPA)



Fuel Temperature

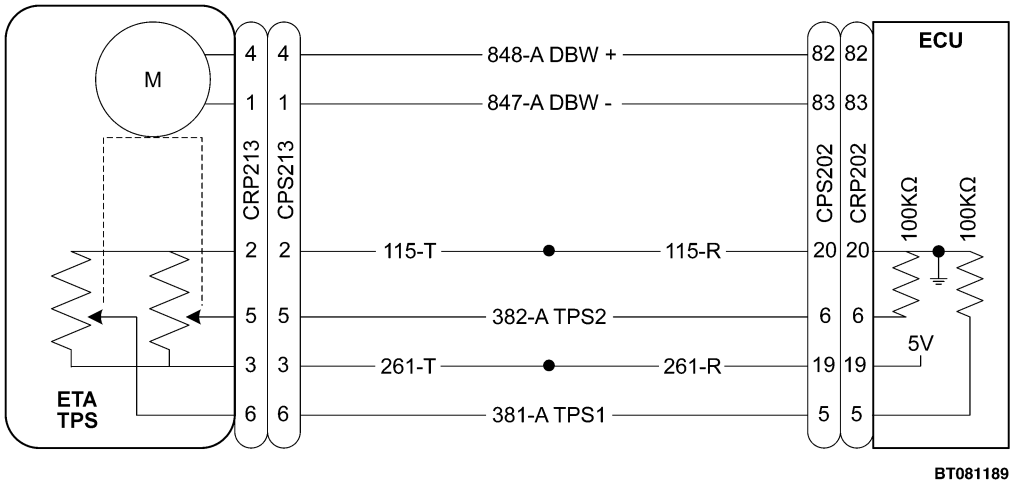


Accelerator Pedal Position Sensor (Kubota Spark Ignited 2.5L LPG)



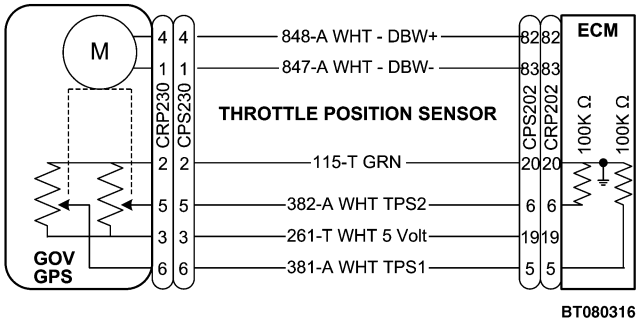
- WIRE # 119 = SENSOR GROUND
- WIRE # 265 = SENSOR SUPPLY (5 VDC)
- WIRE # 381 = SENSOR SIGNAL A
- WIRE # 382 = SENSOR SIGNAL B
- WIRE # 847 = POSITION CONTROL SIGNAL
- WIRE # 848 = POSITION CONTROL RETURN

Throttle A and B Position Sensor Schematic (GM 2010)



- WIRE # 115 = SENSOR GROUND
- WIRE # 261 = SENSOR SUPPLY (5 VDC)
- WIRE # 381 = SENSOR SIGNAL TPS 1
- WIRE # 382 = SENSOR SIGNAL TPS 2
- WIRE # 847 = POSITION CONTROL SIGNAL
- WIRE # 848 = POSITION CONTROL RETURN

Electronic Throttle Assembly Position Sensor (2007 Mazda EPA)



Govern Throttle Position Sensor

CAUSE B - RELAY/COIL DRIVER OUTPUT OPEN CIRCUIT

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Change DMM to ohms scale. Verify DMM zero reading.
3. Measure the resistance of the device driver wire between the device connector and the VSM connector.
   Is the resistance less than 0.5 ohms?
   YES: Go to CAUSE C.
   NO: The device driver circuit is open. Locate and repair/replace the open wire/connection. See **Wire Harness Repair** 2200YRM1128.

CAUSE C - RELAY/COIL DRIVER RETURN OPEN CIRCUIT

PROCEDURE OR ACTION:

1. Measure the resistance of the device driver return wire between the device connector and the PDM connector.
   Is the resistance less than 0.5 ohms?
   YES: Go to CAUSE D.
   NO: The device driver return circuit is open. Locate and repair/replace the open wire/connection. See **Wire Harness Repair** 2200YRM1128.

CAUSE D - 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.

NOTE: For Post 2007 Engine Connectors Interface, see Post 2007 Engine Connections.

12. Repeat Component Operational Check.

END POSSIBLE CAUSES

System Battery Voltage OORH

System Voltage To VSM Above Acceptable Threshold.

CODES

DTC 168-0 - System Battery Voltage OORH
DTC 168-3 - System Battery Voltage OORH
DTC 168-4 - Battery Voltage OORH (>16 volts)
DTC 522516-0 - System Battery Voltage Greater than NOR
DTC 168-15 - Battery Voltage OORH

POSSIBLE CAUSE

A. ALTERNATOR FAILURE
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.

+5 Volt Supply OORL

CODES

DTC 3509-4 - 5VE1 Sensor Supply Circuit Voltage OORL
DTC 3510-4 - 5VE2 Sensor Supply Circuit Voltage OORL
DTC 3511-4 - 5 Volt Supply 5EV3 Voltage OORL (< 4.60 volt)
DTC 1079-31 - 5VE1 & 5VE2 Simultaneously OORL
DTC 522128-4 - 5 Volt Sensor Supply OORL (TCU)
DTC 522517-4 - ECM 5v referrence OORL
DTC 524251-1 - 5 Volt Supply Circuit C OORL
DTC 524260-1 - 5 Volt Supply Circuit B OORL
DTC 524260-4 - 5VE2 Sensor Supply Circuit Voltage OORL
DTC 524261-1 - 5 Volt Supply Circuit A OORL
DTC 524261-4 - 5VE1 Sensor Supply Circuit Voltage OORL
DTC 1079-4 - 5VE1 Sensor Supply Voltage OORL
DTC 1080-4 - 5VE2 Sensor Supply Voltage OORL

POSSIBLE CAUSE

A. 5 VOLT "A" SHORTED TO GROUND
B. 5 VOLT "B" SHORTED TO GROUND
C. 5 VOLT "C" SHORTED TO GROUND
D. VSM FAILURE
E. 5 VOLT POWER SUPPLY SHORTED TO GROUND
F. 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:
   - If DTC 524261-1, go to CAUSE A.
   - If DTC 524261-4, and **SERVICE ENGINE** ICON on DSC illuminates, (Mazda Engine) go to CAUSE E.
   - If DTC 524260-1, go to CAUSE B.
   - If DTC 524251-1, go to CAUSE C.

   Repair/replace connector or wiring associated with faults found. Refer to the appropriate **Electrical System**YRM .
   NO: Go to CAUSE A.

CAUSE E - 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.

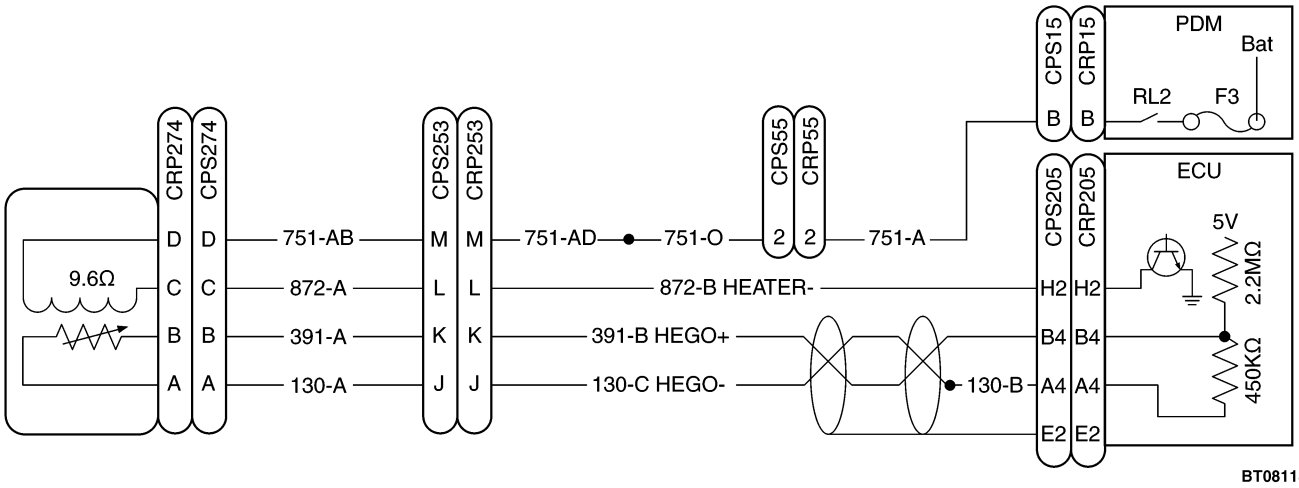
END POSSIBLE CAUSES

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. Refer to the appropriate **Electrical System**YRM .
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). Refer to the appropriate **Electrical System** and **Engine Fuel System**YRM for all controllers.
11. Reinstall all removed components and ensure that all connectors are completely inserted.
12. Repeat Component Operational Check.

END POSSIBLE CAUSES



- WIRE # 130 = SENSOR SIGNAL (−)
- WIRE # 391 = SENSOR SIGNAL (+)
- WIRE # 751 = SENSOR HEATER POWER
- WIRE # 872= SENSOR HEATER RETURN

Oxygen (O_2) Sensor Heater 2 (GM 4.3L 2010)

Spark Coil Primary Short to Power

CODES

DTC 1268-6 - Spark Coil #1 Primary Short to Power
DTC 1269-6 - Spark Coil #2 Primary Short to Power
DTC 1270-6 - Spark Coil #3 Primary Short to Power
DTC 1271-6 - Spark Coil #4 Primary Short to Power

POSSIBLE CAUSE

A. IGNITION COIL WIRING SHORTED TO POWER
B. IGNITION COIL FAILURE

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

COMPONENT OPERATIONAL CHECK

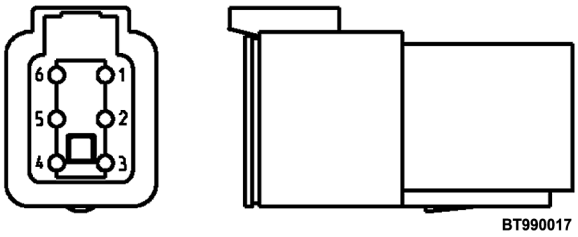
PROCEDURE OR ACTION:

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). See Harness Assembly Data.
   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.

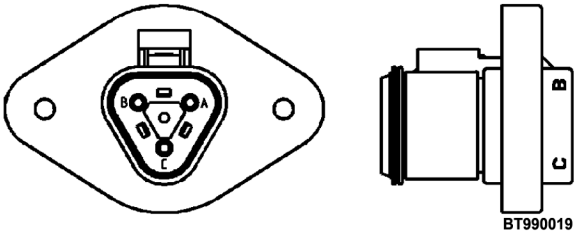
CAUSE A - IGNITION COIL WIRING SHORTED TO POWER

PROCEDURE OR ACTION:

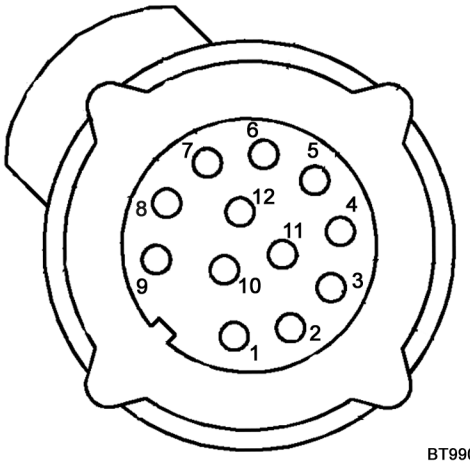
1. Disconnect ignition coil connector and check for short to power on the ignition coil harness.
   Is continuity present?
   YES: Inspect ignition coil harness for short to power.
   NO: Proceed to CAUSE B.



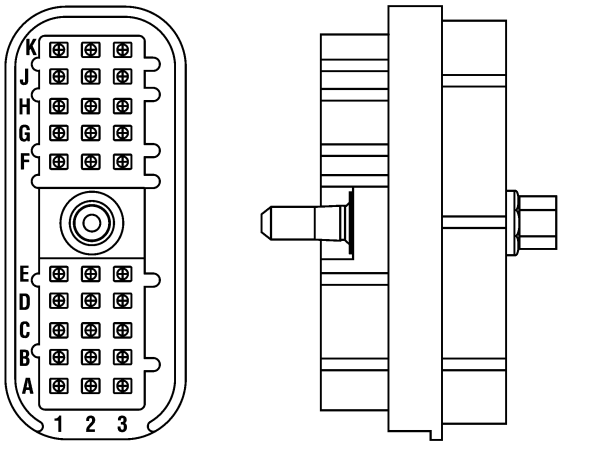
Armrest Disconnect CPS 90



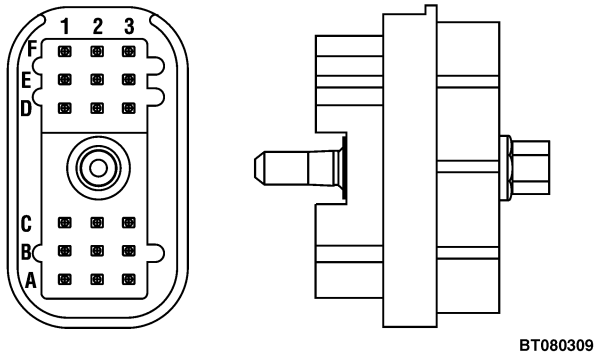
Diagnostic Connector CPS 111



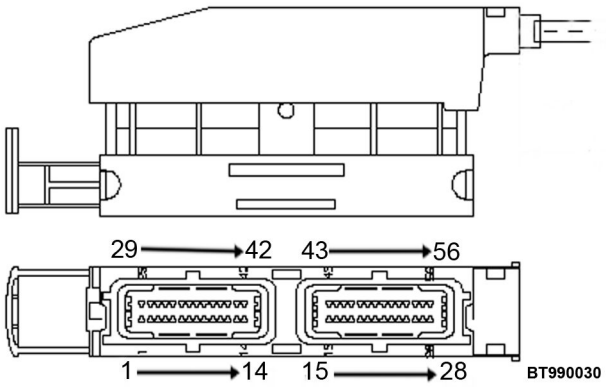
MLM/Joystick Connector CPS 112



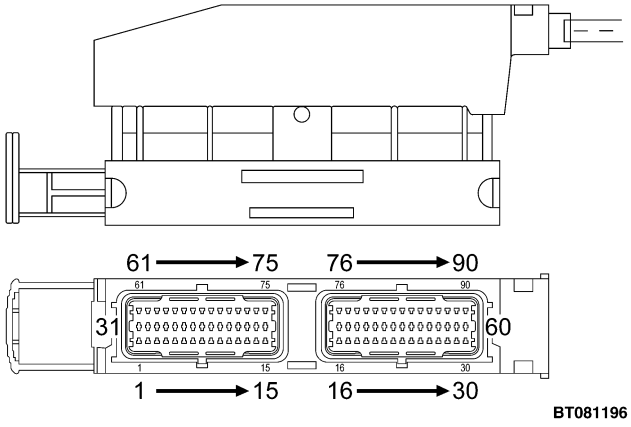
APC 214-CPS 128 Connector



APC 214-CPS 129 Connector

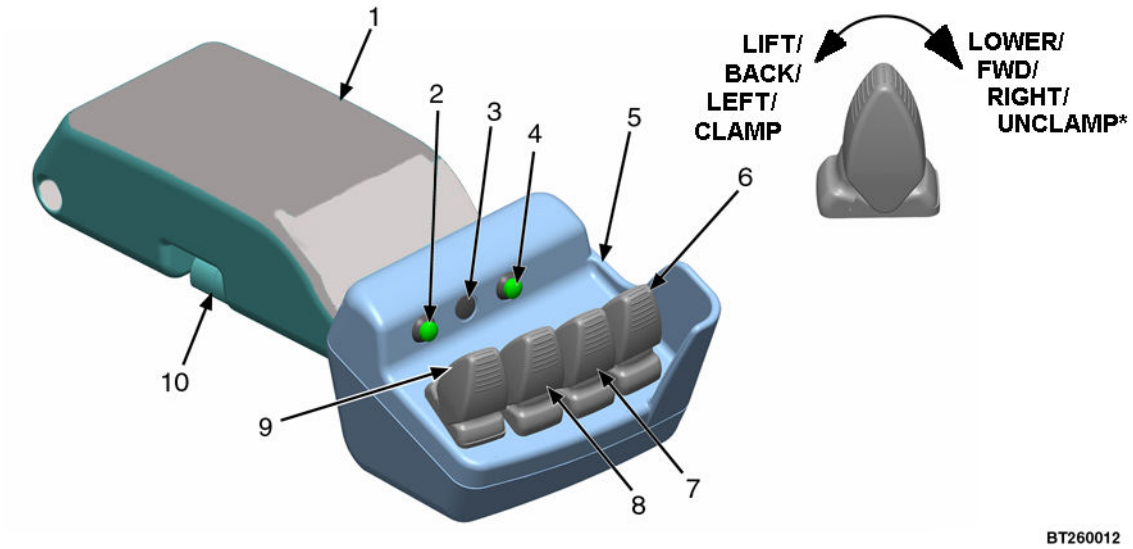


Mazda ECU Connector CPS 202



GM (2011) and Mazda ECU Connector CPS 202 (2007 Mazda EPA and 2011 GM)

DIAGRAMS



1. ARM REST
2. SWITCH - MOMENTARY
3. OVER RIDE SWITCH
4. PLUG (SWITCH - MOMENTARY)
5. MLM HOUSING
6. LIFT/LOWER CONTROL LEVER
7. TILT CONTROL LEVER
8. AUXILIARY HYDRAULIC FUNCTIONS (3RD LEVER)
9. AUXILIARY HYDRAULIC FUNCTIONS (4TH LEVER)
10. DETENT BUTTON

Mini Lever Module (MLM) (Generation 1)

DTC 522801-13
Electrohydraulic Valve Calibration

POSSIBLE CAUSE

A. ELECTROHYDRAULIC VALVE CALIBRATION REQUIRED

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 - ELECTROHYDRAULIC VALVE CALIBRATION REQUIRED

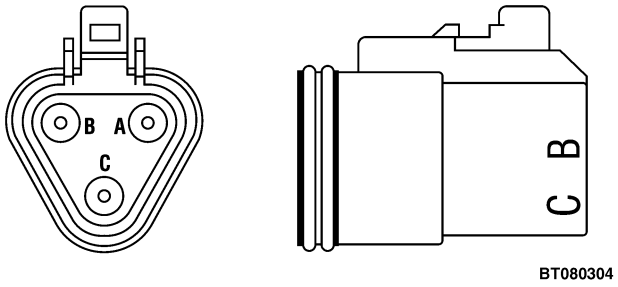
PROCEDURE OR ACTION:

1. Electrohydraulic Valve Calibration Required. See **Calibration Procedures** 8000YRM1134.

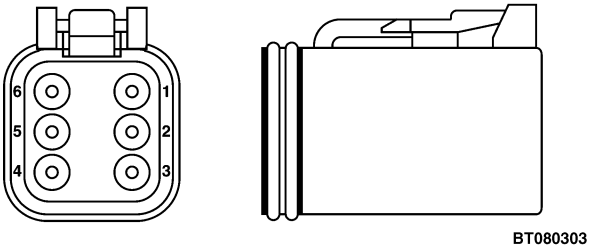
END POSSIBLE CAUSES

END FAULT

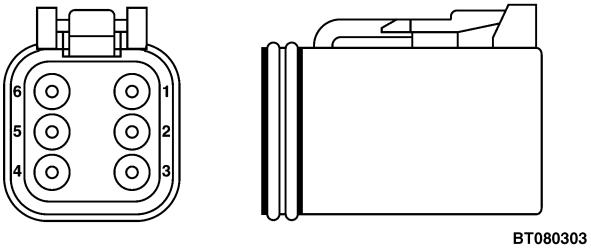
CONNECTOR(S)



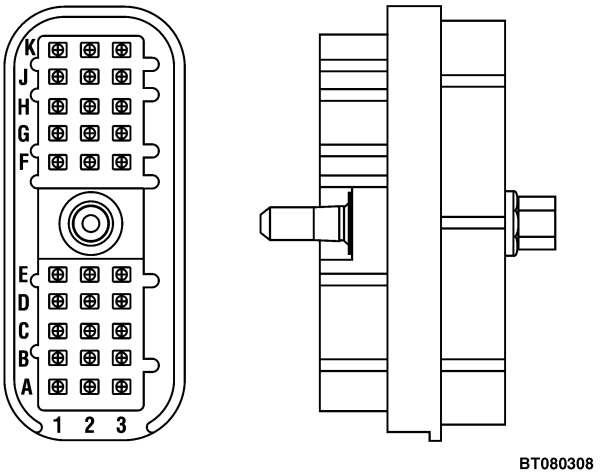
Intermediate Speed CPS 63 Connector



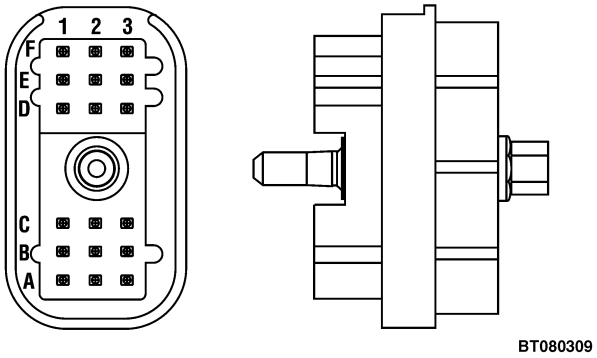
TISS CPS 134 Connector



TOSS CPS 135 Connector



APC 214-CPS 128 Connector



APC 214-CPS 129 Connector

END FAULT

Calibration - Algorithm Failed

CODES

DTC 522197-14 - Range2 Calibration Error Cause Algorithm Failed
DTC 522198-14 - Range1 Calibration Error Cause Algorithm Failed
DTC 522199-14 - REV1 Calibration Error Cause Algorithm Failed
DTC 522200-14 - FWD2 Calibration Error Cause Algorithm Failed
DTC 522201-14 - FWD1 Calibration Error Cause Algorithm Failed
DTC 522201-16 - Clutch Calibration Error Cause Algorithm Failed

POSSIBLE CAUSE

A. INCORRECT PARAMETER IN APT FILE

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 - INCORRECT PARAMETER IN APT FILE

PROCEDURE OR ACTION:

1. Reprogram the TCU using the Dana Dashboard.
2. Cycle power to **OFF** for no less than 30 seconds, and then to **ON** to clear displayed DTC.
   Does DTC reoccur?
   YES: Go to Step 3.
   NO: Problem not verified. Resume operation.
3. Contact your local **YALE** dealer or see **Yale Axcess Online** .

END POSSIBLE CAUSES

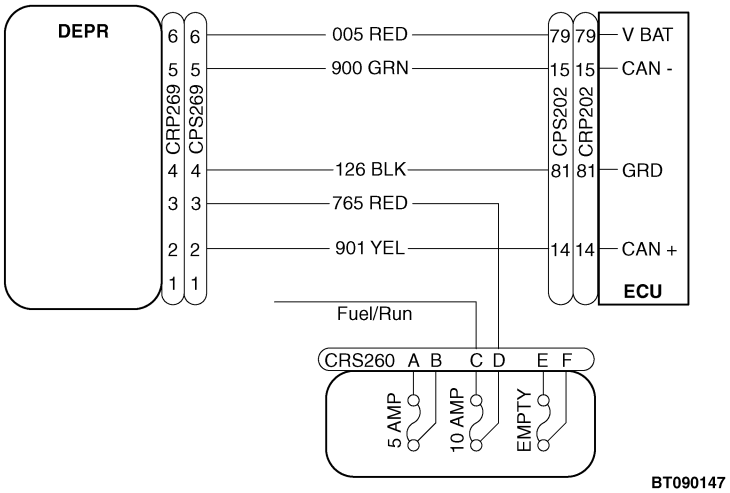
END FAULT

CAUSE A - HARNESS RELAY COIL OPEN CIRCUIT

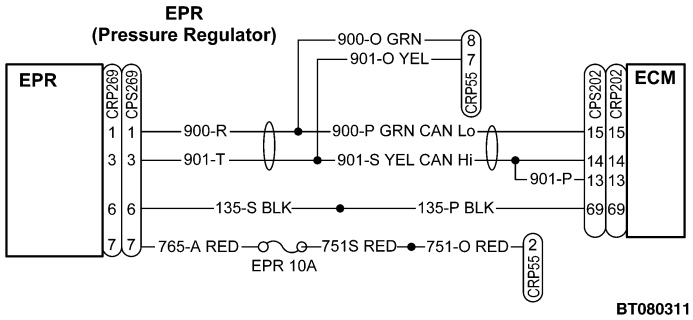
PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Change DMM to volts scale.
3. Turn truck power **ON**.
4. At the fuel relay ECM connection using the approved connector back probe method, measure volts between the ECM connector and vehicle ground.
   Is voltage approximately system voltage?
   YES: Go to CAUSE B.
   NO: Fuel pump relay circuit is opened. Go to Step 5.
5. At the engine to main harness connection using the approved connector back probe method, measure volts between connector and vehicle ground.
   Is voltage approximately system voltage?
   YES: Wire connector has open circuit between the ECM connector and the engine to main harness connector. Locate and repair/replace open wire/connection. Refer to the appropriate **Wiring Harness Repair**YRM .
   NO: Go to Step 6.
6. Refer to power distribution module mini-schematic. Measure voltage between the PDM connection output for relay coil RL2 and vehicle ground.
   Is voltage approximately system voltage?
   YES: Wire connector has open circuit between the PDM connector and the engine to main harness connector. Locate and repair/replace open wire/connection. Refer to the appropriate **Wiring Harness Repair**YRM .
   NO: Go to Step 7.
7. Refer to power distribution module mini-schematic. Measure voltage between the PDM connection input for relay coil RL2 and vehicle ground.
   Is voltage approximately system voltage?
   YES: PDM or RL2 has open circuit. Replace relay and repeat Step 6. If test doesn't equal approximately battery voltage after Step 6, replace PDM.
   NO: Go to Step 8.
8. Refer to power distribution module mini-schematic. Measure voltage between the VSM connection output for relay coil RL2 and vehicle ground.
   Is voltage approximately system voltage?
   YES: Wire connector has open circuit between the PDM and VSM. Locate and repair/replace open wire/connection. Refer to the appropriate **Wiring Harness Repair**YRM .
   NO: Go to CAUSE C.

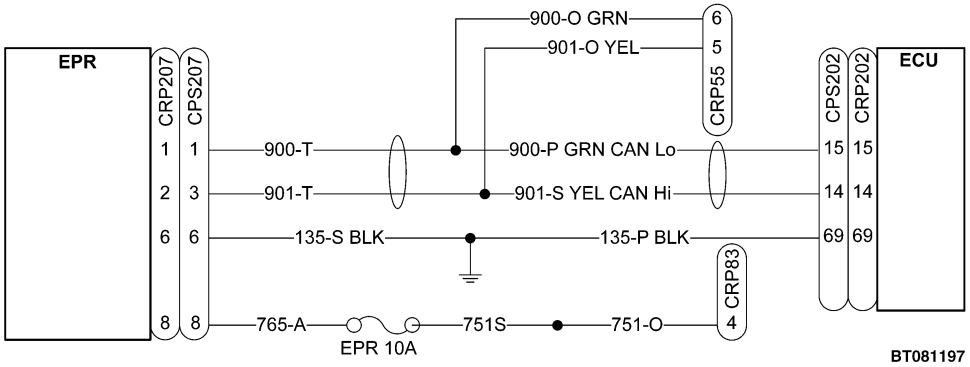
DIAGRAMS



Direct Electronic Pressure Regulator (4.3L LPG GM-PSI)



EPR Pressure Regulator



EPR Pressure Regulator (2007 Mazda EPA)

END FAULT

CAUSE B - 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 C.
   NO: Repair air leak in fuel system. Refer to the appropriate **Electrical System** and **Engine Fuel System**YRM .

CAUSE C - BAD SUCTION CONTROL VALVE (SCV) (KUBOTA ONLY)

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Set DMM to ohms scale.
3. Disconnect wiring harness connector from SCV connector.
4. Measure resistance across each pin of the SCV and ground.
   Is resistance zero or less than specifications?
   YES: The SCV has shorted to ground. Replace SCV. Reconnect SCV connector to wiring harness. Go to Step 3.
   NO: Go to CAUSE D.
5. Turn truck power **ON** and start engine.
   Does reported DTC reoccur?
   YES: Go to CAUSE D.
   NO: Problem not verified or problem resolved. Resume operation.

CAUSE D - BAD FUEL PUMP

PROCEDURE OR ACTION:

1. Verify fuel pump is working properly.
   Is fuel pump working properly?
   YES: Go to CAUSE E.
   NO: Repair or replace fuel pump. Refer to the appropriate **Electrical System** and **Engine Fuel System**YRM . Repeat Component Operational Check.

DTC 1485-2
Main Relay Abnormal
Main Relay Stuck Closed

POSSIBLE CAUSE

A. MAIN RELAY SHORTED TO GROUND
B. WIRING HARNESS FAILURE
C. RELAY FAILURE
D. 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 of the connectors/wiring damaged?
   YES: Repair/replace connector or wiring associated with faults found. Refer to the appropriate **Electrical System**YRM . Repeat Step 1.
   NO: Go to CAUSE A.

CAUSE A - MAIN RELAY SHORTED TO GROUND

PROCEDURE OR ACTION:

1. Ensure truck power is **OFF**.
2. Set DMM to ohms scale. Verify DMM zero reading.
3. Disconnect applicable connector at ECM.
4. Measure resistance of sensor signal wire between ECM connector and sensor connector.
   Is resistance less than 0.5 ohms?
   YES: Go to CAUSE C.
   NO: Sensor signal wire has open circuit. Locate and repair/replace open wire/connection. Refer to the appropriate **Wiring Harness Repair**YRM .

CAUSE B - 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. Refer to the appropriate **Electrical System**YRM .
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. Refer to the appropriate **Electrical System** and **Fuel System**YRM .
11. Reinstall all removed components and ensure that all connectors are completely inserted.
12. Repeat Component Operational Check.

END POSSIBLE CAUSES

END FAULT

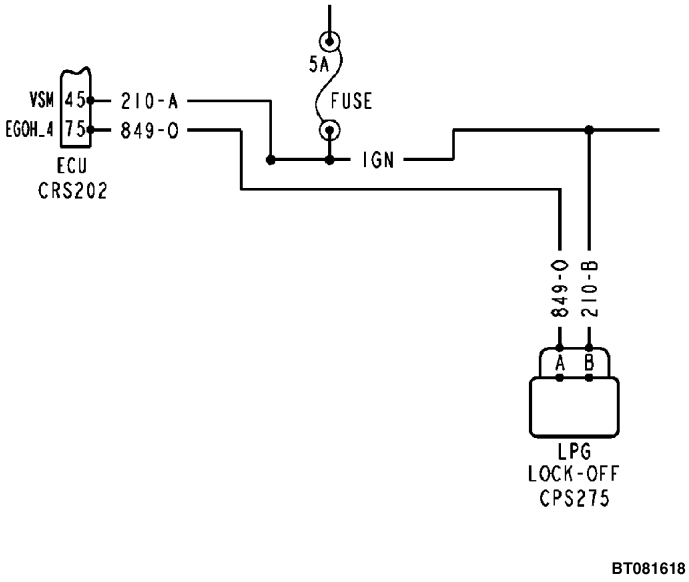
CAUSE C - FAULTY CONTROLLER

PROCEDURE OR ACTION:

1. If no faults are evident and fault code remains, suspect faulty controller.

END POSSIBLE CAUSES

DIAGRAMS



Troubleshooting Scene

END FAULT

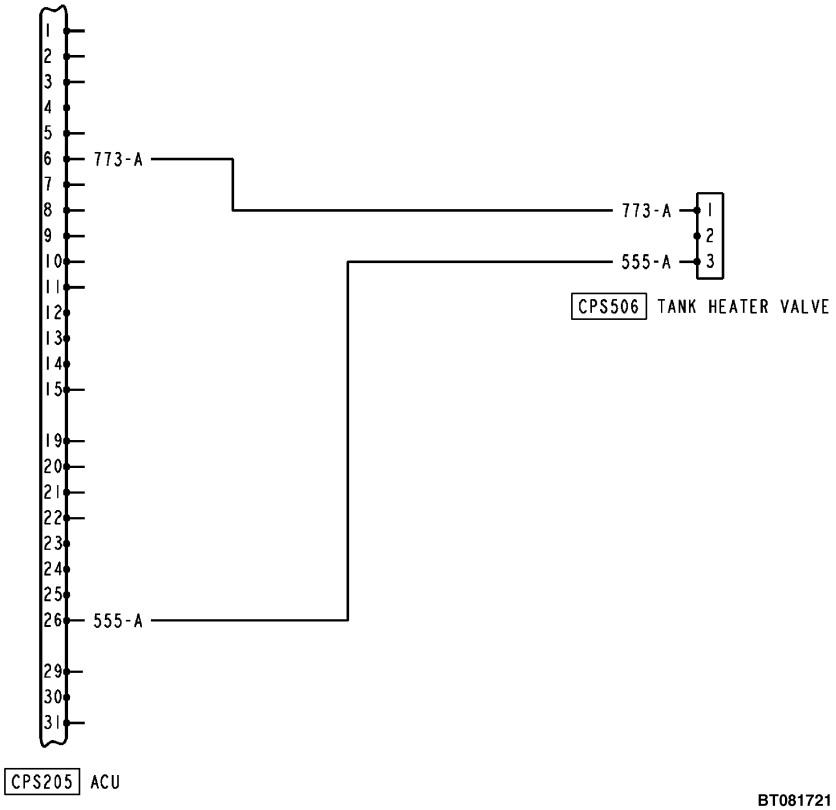
CAUSE B - TANK HEATER VALVE FAULT

PROCEDURE OR ACTION:

1. Measure resistance between the heater valve, pin 1 and pin 3.
   Is resistance between 9 and 13 ohms? (Room temperature)
   YES: Proceed to Step 2.
   NO: Replace faulty tank heater valve.
2. Connect heater valve connector CPS506 and disconnect ACU connector CPS205. Measure resistance between the ACU connector CPS205, socket 26 and socket 6.
   Is resistance between 9 and 13 ohms? (Room temperature)
   YES: Suspect faulty ACU.
   NO: Inspect circuits 773-A and 555-A for source of excessive resistance.

END POSSIBLE CAUSES

DIAGRAMS



Troubleshooting Scenes

CAUSE A - DELIVERY TUBE HEATER WIRING FAULT

PROCEDURE OR ACTION:

NOTE: Key in ON position.

1. Connect PC Service Tool and locate active test setting ***Delivery Line Heater ON / OFF Function (ACU)***. Disconnect delivery tube heater and actuate heater ON. Measure voltage between the delivery tube heater connector CPS500, socket 1 and B(-).
   Is voltage 12 ± 1.5 Vdc?
   YES: Proceed to Step 2.
   NO: Inspect ACU voltage supply circuit 769-A for open or short. s
2. Continue to actuate ***Delivery Line Heater ON / OFF Function (ACU)***. Measure voltage between the delivery tube heater connector CPS500, socket 1 and socket 2.
   Is voltage 12 ± 1.5 Vdc?
   YES: Disconnect battery and proceed to CAUSE B.
   NO: Inspect ground circuit 221-B for open or short. Inspect splice S221 for loose, damaged, or corroded terminal

CAUSE B - DELIVERY TUBE HEATER FAULT

PROCEDURE OR ACTION:

1. Measure resistance between the delivery tube heater pin 1 and pin 2.
   Is resistance approximately 3.2 Ohms?
   YES: Proceed to CAUSE C.
   NO: Replace faulty delivery tube heater.

CAUSE C - ACU FAULT

PROCEDURE OR ACTION:

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

END POSSIBLE CAUSES

CAUSE A - POST NOX SENSOR WIRING FAULT

PROCEDURE OR ACTION:

NOTE: Key in ON position.

NOTE: The TULC, Pre NOx, and Post NOx sensors share 10A Fuse and power supply circuit 209-J.

1. Disconnect the Post NOx Sensor (Bank 1, Sensor 2) connector CPS252 and measure voltage between socket 1 and B(-).
   Is voltage 12 ± 0.5 Vdc?
   YES: Disconnect battery and proceed to Step 2.
   NO: Inspect circuit 209-N for open or short to ground. If Pre NOx and TULC Sensor fault codes are also set, inspect 10A Fuse at CPS283 Fuse Holder connector.

NOTE: The TULC, Pre NOx, and Post NOx sensors share ground splice S121B. If additional faults are present, inspect ground circuit 121-H and ECM ground splice S121A.

2. Measure resistance between the Post NOx connector CPS252, sockets 2 and B(-).
   Is resistance < 1 ohm?
   YES: Connect battery and proceed to CAUSE B.
   NO: Inspect ground circuits 121-L for open or source of excessive resistance.

CAUSE B - POST NOX SENSOR CANBUS COMMUNICATION FAULT

PROCEDURE OR ACTION:

1. Measure voltage between the Post NOx sensor connector CPS252, socket 3 and B(-).
   Is CAN HI voltage approximately 2.5 Vdc?
   YES: Proceed to Step 2.
   NO: Inspect CAN HI circuit for open or short. If voltage is 0 volts, the CAN HI circuit is shorted to ground or open. If voltage is above 5 volts, the CAN HI circuit is shorted to power.
2. Measure voltage between the Post NOx sensor connector CPS252, socket 4 and B(-).
   Is CAN LO voltage approximately 2.5 Vdc?
   YES: Disconnect battery and proceed to Step 3.
   NO: Inspect CAN LO circuit for open or short. If voltage is 0 volts, the CAN LO circuit is shorted to ground or open. If voltage is above 5 volts, the CAN LO circuit is shorted to power.
3. Measure resistance between the Post NOx sensor connector CPS252, socket 3 and socket 4.
   Is resistance 60 ± 6 ohms?
   YES: No communication faults are present, connect battery and proceed to CAUSE C.
   NO: If resistance is 120 ohms, the CANbus has an open circuit or a missing or damaged termination resistor. If resistance is 0 ohms, the CANbus circuits are shorted together.

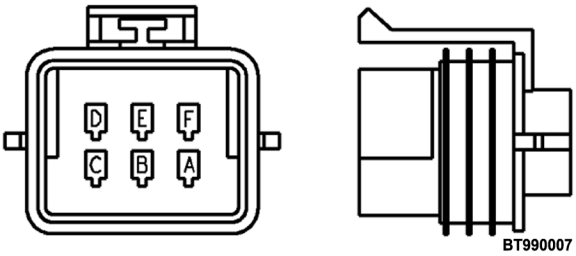
CAUSE C - POST NOX SENSOR FAULT

PROCEDURE OR ACTION:

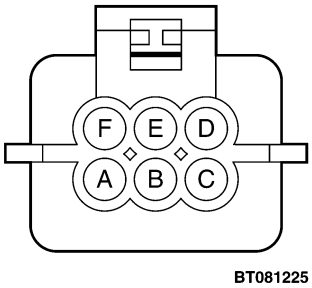
1. If no wiring or communication faults are present, replace faulty NOx sensor, clear DTC and retest system.

END POSSIBLE CAUSES

Electrical Functions Do Not Operate



Connectors CPS37 and CPS38



Connectors CPS37, CPS38 (2007 Mazda EPA)

POSSIBLE CAUSE

A. FUSE BLOWN/SHORT CIRCUIT IN POWER CONNECTION

B. RELAY CONTACTS DO NOT CLOSE WHEN COIL IS ENERGIZED

C. OPEN CIRCUIT IN HARNESS

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 DSC display.
   Does DSC display show Switch operating correctly?
   YES: Go to CAUSE A.
   NO: Replace DSC.

CAUSE A - FUSE BLOWN/SHORT CIRCUIT IN POWER CONNECTION

PROCEDURE OR ACTION:

1. Locate device fuse.
   Is fuse value correct?
   YES: Go to Step 2.
   NO: Replace with correct value fuse and check device for correct operation.
2. Disconnect harness connector at device. Turn power **ON**. Actuate device push button.
3. Using a DMM, measure for voltage across harness connector pins.
   Is battery voltage present?
   YES: Replace device and check circuit operation.
   NO: Go to CAUSE B.

Horn Failure

END SYMPTOM

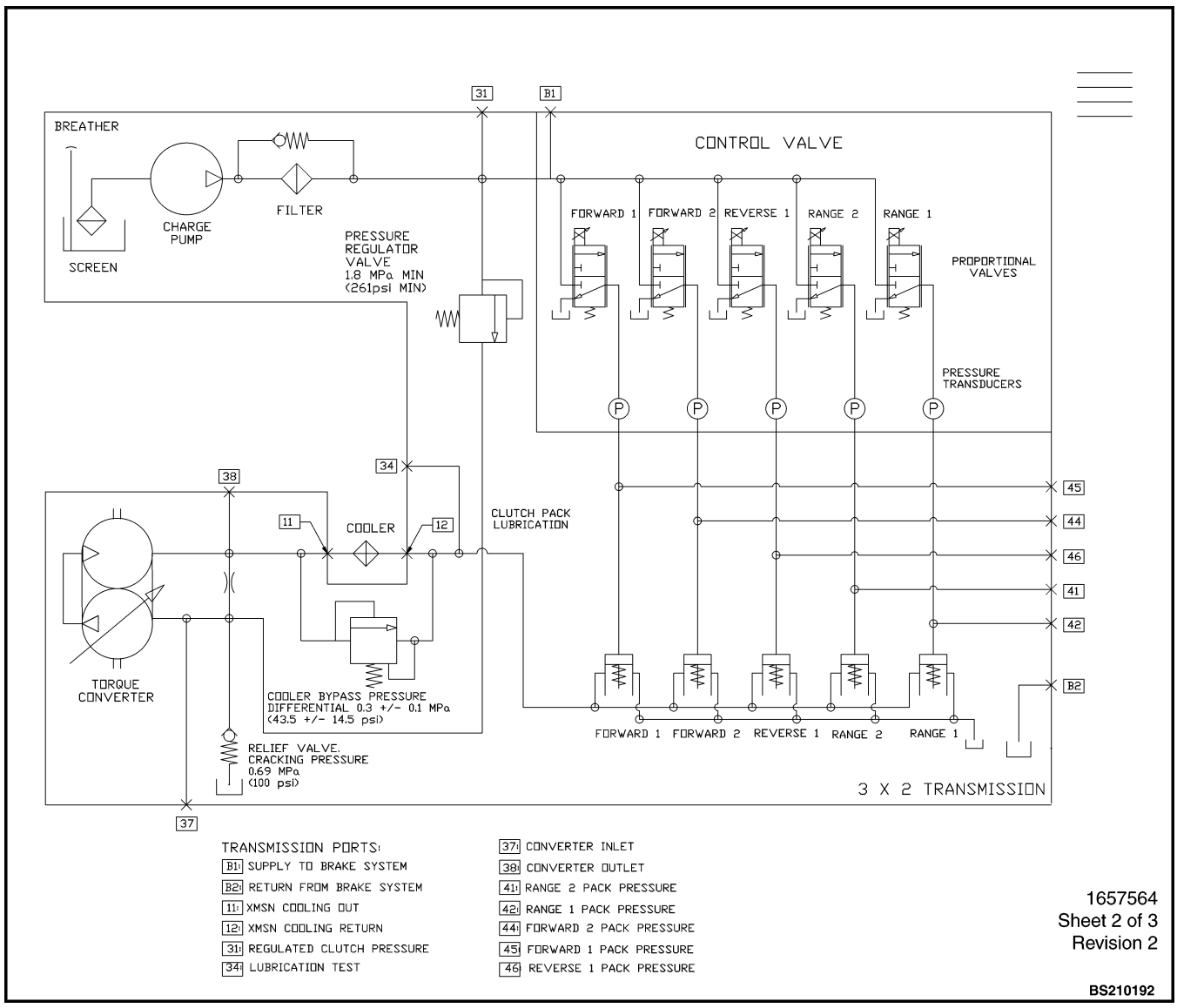


Figure 9040-10-24. 3 X 2 Transmission Hydraulic Schematic

Table 9040-10-2. Three-Speed Transmission Electronic Proportional Controls

Transmission Speed	Range1	Range2	FWD1	FWD2	REV1
FWD1	X		X		
FWD2		X	X		
FWD3		X		X	
REV1	X				X
REV2		X			X

CAUSE D - BRAKE SHOES OR SPRINGS ARE NOT INSTALLED CORRECTLY.

PROCEDURE OR ACTION:

1. Check that brake adjustor is visible and brakes are correctly adjusted. Adjustment is 0.026 mm (0.001 in.) diameter per one notch of star wheel. With a minimum drum radius of 155 mm (6.10 in.), properly adjusted brake shoe clearance is 0.1 - 0.35 mm (0.004 - 0.014 in.) at maximum point of shoe width.
   Is brake shoes and brake drum clearance out of adjustment?
   YES: Inspect brake shoe installation and adjustment. Refer to appropriate **Brake System** manual, depending on lift truck model.
   NO: Go to CAUSE E.

CAUSE E - DAMAGED OR CONTAMINATED BRAKE SHOES.

PROCEDURE OR ACTION:

1. Inspect brake shoes for contamination or damage.
   Is brake shoes contaminated or damaged?
   YES: Replace brake shoes as necessary. Refer to appropriate **Brake System** manual, depending on lift truck model.
   NO: Go to CAUSE F.

CAUSE F - WHEEL CYLINDER IS LEAKING.

PROCEDURE OR ACTION:

1. Inspect for oil or brake fluid around tire and wheel assemblies.
   Is oil or brake fluid present around tire or wheel assemblies?
   YES: Repair or replace wheel cylinder. Refer to appropriate **Brake System** manual, depending on lift truck model. Inspect for cause of wheel cylinder leakage and correct as necessary. Inspect brake shoes for contamination, replace as necessary.
   NO: Go to CAUSE G.

CAUSE G - BRAKE DRUM IS DISTORTED.

PROCEDURE OR ACTION:

1. Inspect brake drum for distortion.
   Is brake drum distorted?
   YES: Repair or replace brake drum. Refer to appropriate **Brake System** manual, depending on lift truck model.
   NO: Go to CAUSE H.

CAUSE H - BACK PLATE IS DAMAGED.

PROCEDURE OR ACTION:

1. Raise front axle so both wheels are off ground. Secure lift truck. Refer to appropriate **Periodic Maintenance** manual, depending on lift truck model.
2. Inspect back plate for damage.
   Is back plate damaged?
   YES: Replace back plate. Refer to appropriate **Brake System** manual, depending on lift truck model.
   NO: Go to CAUSE I.

Group 40
Tests and Adjustments

Transmission Warm-up Procedure

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

Table 9040-40-4. Test Specifications

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

Table 9040-40-5. Service Tools

Transmission Temperature can be read directly from DSC

WARNING

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

1. Install test equipment as called out in test.
2. Put a capacity load on the forks to prevent the wheels from turning. Start engine and operate engine at fast idle speed.

CAUTION

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

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

3. Put the lift truck against an object that cannot move. Put the transmission in FORWARD, and slowly push the accelerator pedal to full throttle. Stall the torque converter for 15 seconds. Return direction control to neutral for 30 seconds to allow oil to circulate and torque converter to cool.
4. Read temperature on DSC and compare to temperature specifications of test to be performed.
5. Repeat Step 2 and Step 3 until oil temperature is at test specifications.
6. When temperature is at test specifications, proceed with test.

Transmission Pressure Test

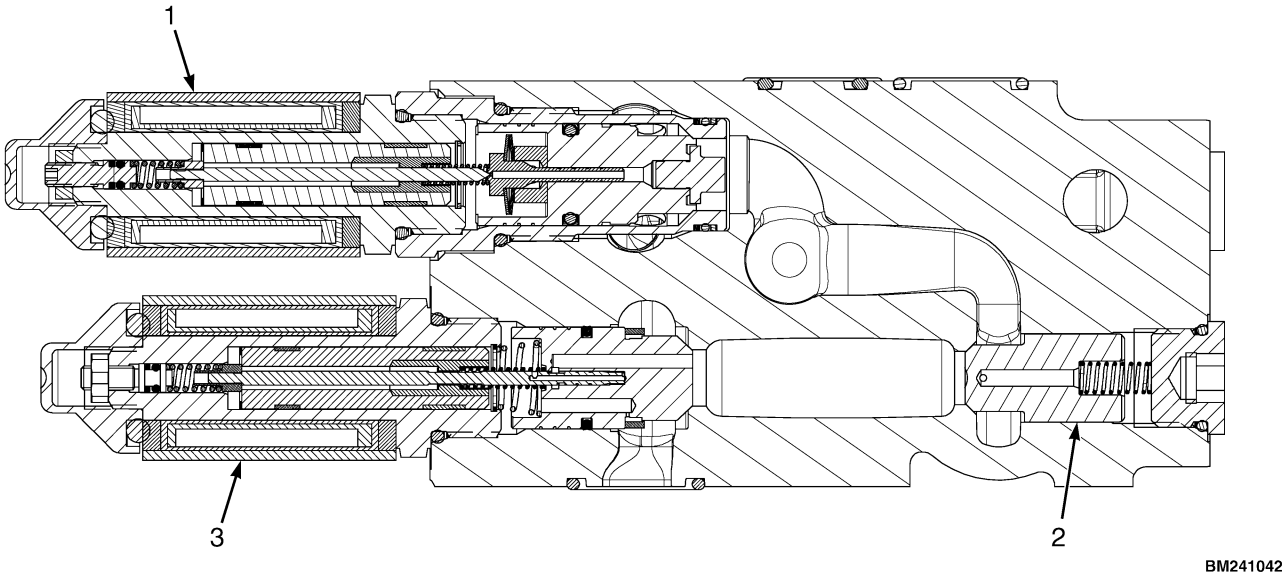
Do the following before performing the transmission pressure test:

- Resolve engine DTC's and performance issues.
- Make sure that all transmission observed symptoms have been checked. See Observed Symptoms, Page 9040-30-1.
- Make sure that transmission is filled to correct oil level. See **Operating Manual**.
- Make sure that all transmission filters are cleaned or replaced.
- Connect a tachometer to the engine. Engine RPM can also be read from the DSC.

Service Tools

NOTE: Use a pressure gauge suitable for use with transmission oils with a pressure range of 0 - 3450 kPa (0 - 500 psi).

- For port locations, see Figure 9040-40-43, Figure 9040-40-42, Figure 9040-40-44, or Figure 9040-40-45.



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.

Abnormal Steer Axle Noise

POSSIBLE CAUSE

A. WHEEL IS LOOSE.
B. STEER WHEEL CONTACTING STEERING AXLE OR CHASSIS.
C. TIE ROD AND/OR BUSHINGS ARE WORN.
D. WHEEL OR SPINDLE BEARING LUBRICATION IS INADEQUATE.
E. WHEEL OR SPINDLE BEARING FAILURE.
F. STEERING AXLE BUSHINGS WORN.
G. STEERING AXLE DAMAGED.

CAUSE A - WHEEL IS LOOSE.

PROCEDURE OR ACTION:

1. Inspect wheels, lug nuts and studs for damage.
   Are wheels, lug nuts and studs damaged or loose?
   YES: If loose, tighten wheel lugs. Repair or replace damaged parts. See **Periodic Maintenance** 8000YRM1150. For 6.0-7.0 Ton Cushion Trucks, see **Periodic Maintenance** 8000YRM1319. For 6.0-7.0 Ton Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1322. For 8.0-9.0 Ton Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1407.
   NO: Go to CAUSE B.

CAUSE B - STEER WHEEL CONTACTING STEERING AXLE OR CHASSIS.

PROCEDURE OR ACTION:

1. Inspect steer wheels, steering axle, and chassis.
   Are wheels contacting steering axle or chassis?
   YES: Repair or replace steer wheel or steering axle, or repair chassis. See **Steering Axle** 1600YRM1133.
   NO: Go to CAUSE C.

CAUSE C - TIE ROD AND/OR BUSHINGS ARE WORN.

PROCEDURE OR ACTION:

1. Inspect tie rod and bushing.
   Are tie rods and bushing in good condition?
   YES: Go to CAUSE D.
   NO: Repair or adjust tie rods or bushings. See **Steering Axle** 1600YRM1133.

CAUSE D - WHEEL OR SPINDLE BEARING LUBRICATION IS INADEQUATE.

NOTE: See **Operating Manual** for lubrication procedures.

PROCEDURE OR ACTION:

1. Lubricate wheel and spindle bearings.
   Did the bearings lack lubrication?
   YES: Service lift truck per **Operating Manual** instructions.
   NO: Go to CAUSE E.

Lift/Lower Continues To Move For Awhile After Joystick or MLM Is Released (E-Valve)

POSSIBLE CAUSE

A. RAMP RATE NOT SET CORRECTLY.
B. ELECTRO-HYDRAULIC POPPET VALVE (EHPV) POPPET VALVE STICKING.
C. EHPV PILOT PIN ASSEMBLY STICKING.

CAUSE A - RAMP RATE NOT SET CORRECTLY.

PROCEDURE OR ACTION:

WARNING
Unexpected movement of hydraulic function can cause injury or death. Do not operate the lift truck until problem has been repaired.

1. Adjust setting using DSC until operation is acceptable to operator. If symptom is still present, go to CAUSE B.

CAUSE B - ELECTRO-HYDRAULIC POPPET VALVE (EHPV) POPPET VALVE STICKING.

PROCEDURE OR ACTION:

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

CAUSE C - EHPV PILOT PIN ASSEMBLY STICKING.

PROCEDURE OR ACTION:

1. Remove and inspect pilot pin assembly for excessive debris or bent pin. See **Main Control Valve** 2000YRM1137.
   Is pilot pin assembly dirty or is pin bent?
   YES: Clean or replace pilot pin assembly.
   NO: See Observed Symptoms-Gear Pump, Lift Function Will Not Move With Joystick or MLM Movement (E-Valve), Page 9050-33-40.

END SYMPTOM

Tilt Forward Will Not Function When Activated (Manual Valve)

POSSIBLE CAUSE

A. TILT CONTROL VALVE IS STUCK IN CLOSED POSITION.
B. TILT CONTROL VALVE EXHAUST HOLES PLUGGED IN VALVE.

CAUSE A - TILT CONTROL VALVE IS STUCK IN CLOSED POSITION.

PROCEDURE OR ACTION:

1. Inspect tilt control valve and exhaust orifices. See **Main Control Valve** 2000YRM1137.
   Does the control valve piston move freely and are exhaust orifices open?
   YES: Go to CAUSE B.
   NO: Clean or replace tilt control valve spool.

CAUSE B - TILT CONTROL VALVE EXHAUST HOLES PLUGGED IN VALVE.

PROCEDURE OR ACTION:

1. Inspect valve section. See **Main Control Valve** 2000YRM1137.
   Are exhaust holes open?
   YES: Valve is OK. See Observed Symptoms-Gear Pump, Auxiliary Function is Slow or Does Not Function (Manual Valve), Page 9050-33-11.
   NO: Clean or replace valve.

END SYMPTOM

No Secondary Function (Tilt or Aux)

POSSIBLE CAUSE

A. MLM/JOYSTICK CONTROL MALFUNCTION.
B. CALIBRATION OF OUTPUT THRESHOLD IS TOO HIGH.
C. STUCK SPOOL IN CONTROL VALVE.
D. SECONDARY RELIEF PRESSURE TOO LOW.
E. NOT ENOUGH PILOT PRESSURE BEING PRODUCED BY PPRV.
F. TILT CONTROL SPOOL PISTON STICKING (TILT FORWARD ONLY).

CAUSE A - MLM/JOYSTICK CONTROL MALFUNCTION.

PROCEDURE OR ACTION:

1. Check the DSC for DTC.
   Is a DTC displayed?
   YES: Go to DTC diagnostic procedure.
   NO: Check for full stroke of lever. Use DSC or install the Service Tool to monitor functions.

PROCEDURE OR ACTION:

2. Stroke each lever to full stroke and allow to snap back to center.
3. **(Do not start.)** Turn key switch to **ON** position or press power ON/OFF button.
4. See **User Interface - Service Technician** 2200YRM1131. Follow instructions to view Lever Input Value. With Service Password, view Diagnostics – Hydraulic Data Display – Hydraulic Input.
5. Operate each lever to full stroke forward and read input.
   Is lever Input = - 92%?
   YES: Go to Step 6.
   NO: Replace lever. See **Electrical System** 2200YRM1142.
6. Operate each lever to full stroke backward and read input.
   Is lever Input = + 92%?
   YES: Go to CAUSE B.
   NO: Replace lever. See **Electrical System** 2200YRM1142.

CAUSE B - CALIBRATION OF OUTPUT THRESHOLD IS TOO HIGH.

PROCEDURE OR ACTION:

1. Check calibration threshold at DSC. See **Calibration Procedures** 8000YRM1134.
   Does setting meet specifications for your lift truck?
   YES: Go to CAUSE C.
   NO: Decrease setting to specification or until operation is acceptable to operator.

Flow Compensator Margin Test and Adjustment (Single Pump)

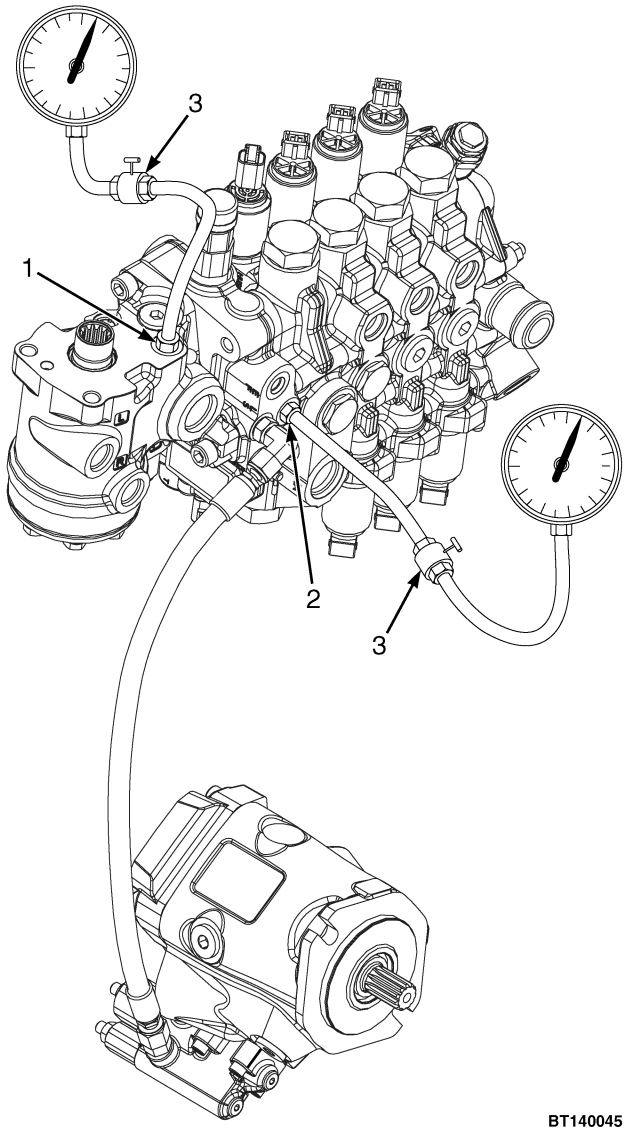
This test is to determine if the Variable Displacement Pump (VDP) is hydraulically supplying the flow that is being demanded by the function. The margin pressure (pump pressure minus load sense pressure) has to be set correctly in order to "stroke" the pump and produce flow as demanded by the hydraulic function.

Table 9050-45-28. Test Specifications

Engine Speed	Idle Speed
Oil Temperature	50 to 65°C (122 to 150 °F)
Margin Pressure	**For 2.0-3.5 Ton Lift Trucks:** 1.25 MPa (181 psi)**For 4.0-5.5 Ton Lift Trucks:** 1.40 MPa (203 psi)

Table 9050-45-29. Service Tools

Needle Valve	QTY (2)
0 to 3.4 MPa (0 to 500 psi) Pressure Gauge	
0 to 6.9 MPa (0 to 1000 psi) Pressure Gauge	
Pressure Port "P" Test Port Size	SAE #4 O-ring Port (7/16-20 UNF)
Load Sense "LS" Test Port Size	SAE #4 O-ring Port (7/16-20 UNF)



1. "P" DIAGNOSTIC PORT WITH HOSE AND GAUGE
2. LOAD SENSE (LS) DIAGNOSTIC PORT WITH HOSE AND GAUGE
3. NEEDLE VALVE

Figure 9050-45-68. Flow Compensator Pressure Margin Test Setup

Lighting Control

DESCRIPTION

The truck in the Non-Cab configuration can be equipped with lights as shown in Figure 9060-10-16. As described below, some of the truck lights are operator activated while the other lights operate in response to truck activities. The operation of the lights are dependent on the selected software option. For lighting systems on lift trucks with optional cab, refer to Figure 9060-10-17.

Group 30
Observed Symptoms

Abnormal Channel Wear

POSSIBLE CAUSE

A. MAST DAMAGED
B. MAST CHANNELS LACK LUBRICATION
C. CHAINS ARE LOOSE OR NOT EQUAL
D. MAST IS SHIMMED INCORRECTLY
E. LOAD ROLLERS ARE NOT ROTATING FREELY WITHIN CHANNEL
F. DAMAGED OR WORN LOAD ROLLERS OR STRIP BEARINGS
G. LIFT CYLINDER BINDING

CAUSE A - MAST DAMAGED

NOTE: See **Operating Manual**.

PROCEDURE OR ACTION:

1. Visually inspect mast for damage.
   Is the mast in good condition?
   YES: Go to CAUSE B.
   NO: Repair or replace damaged components. 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 B - MAST CHANNELS LACK LUBRICATION

PROCEDURE OR ACTION:

1. Inspect grease on mast channels.
   Is a thin coat of grease spread evenly on channels?
   YES: Go to CAUSE C.
   NO: Apply grease to mast sliding surfaces. For 1.0-2.0 Ton Cushion and Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1207. For 2.0-3.5 Ton Cushion and Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1150. For 4.0-5.5 Ton Cushion and Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1248. For 6.0-7.0 Ton Cushion Trucks, see **Periodic Maintenance** 8000YRM1319. For 6.0-7.0 Ton Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1322. For 8.0-9.0 Ton Pneumatic Trucks, see **Periodic Maintenance** 8000YRM1407.

CAUSE G - LIFT CYLINDER BINDING

PROCEDURE OR ACTION:

1. Remove cylinder. For 1.0-5.5 Ton Cushion and Pneumatic Trucks, See **Cylinder Repair (Mast S/N A551, A555, A559, A661, A662, A663, A66, 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)** 2100YRM1139. For 6.0-9.0 Ton Cushion or Pneumatic Trucks, See **Cylinder Repair (Mast S/N A513, A514, A613, A614, B513, B514)** 2100YRM1328.
2. Manually extend cylinder exterior.
   Does cylinder extend freely?
   YES: Mast is loose. See Observed Symptoms, Mast is Loose, Page 9070-30-33.
   NO: Service or replace cylinder. For 1.0-5.5 Ton Cushion and Pneumatic Trucks, See **Cylinder Repair (Mast S/N A551, A555, A559, A661, A662, A663, A66, 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)** 2100YRM1139. For 6.0-9.0 Ton Cushion or Pneumatic Trucks, See **Cylinder Repair (Mast S/N A513, A514, A613, A614, B513, B514)** 2100YRM1328.

END SYMPTOM

Group 70
Fault Mode Indicator Reference

FAULT MODE INDICATOR (FMI) REFERENCE LIST

There are additional FMI codes that define characteristics of other failures but are not listed here because they are not used in the lift truck systems. For a complete listing of these FMI codes, refer to SAE Specification J1939-73.

Table 9080-70-4. FMI

FMI #	Description
0	Data Valid but Above Normal Operational Range - Most Severe Level
1	Data Valid but Below Normal Operational Range - Most Severe Level
2	Data Erratic, Intermittent or Incorrect
3	Voltage Above Normal or Shorted to High Source (OORH)
4	Voltage Below Normal or Shorted to Low Source (OORL)
5	Current Below Normal or Open Circuit (OC)
6	Current Above Normal or Grounded Circuit
7	Mechanical System not Responding or Out of Adjustment
8	Abnormal Frequency or Pulse Width or Period
9	Abnormal Update Rate
10	Abnormal Rate of Change (AROC)
11	Root Cause Not Known
12	Bad Intelligent Device or Component
13	Out of Calibration
14	Special Instructions

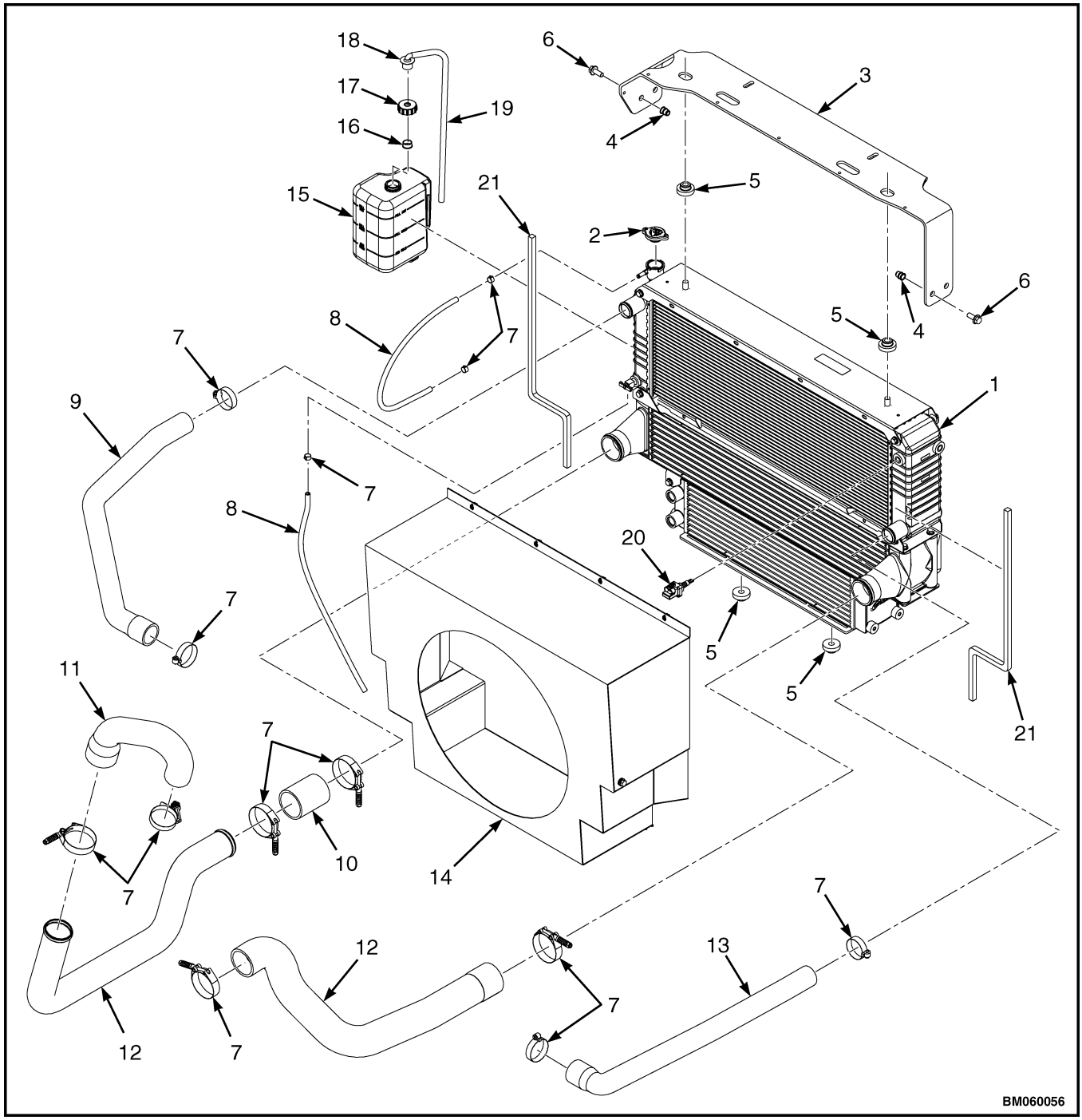


Figure 15. Kubota 3.8L Cooling System for Lift Truck Model GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (B909)

- GLC050LX (A967)
- GLP20-25LX (GLP050LX) (A974)
- GLP20-35VX (GP/GLP040-070VX) (B875)
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP16VX, GLP18VX, GLP20SVX (GP/GLP030VX, GP/GLP035VX, GP/GLP040SVX) (C810)

NOTE: Perform Step 13 for lift truck models

- GC/GLC030-035VX, GC/GLC040SVX (C809)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLP20-25LX (GLP050LX) (A974)

13. For lift trucks equipped with Mazda FE or F2 engines, remove the capscrews and washers retaining the fan.

See Figure 31 for lift truck models equipped with Mazda 2.0L and 2.2L engines

- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLC050LX (A967)
- GLP20-25LX (GLP050LX) (A974)
- GLP20-35VX (GP/GLP040-070VX) (B875)
- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP16VX, GLP18VX, GLP20SVX (GP/GLP030VX, GP/GLP035VX, GP/GLP040SVX) (C810)

14. Remove the fan.

INSPECT

WARNING

DO NOT try to repair a damaged fan. If a fan has a bent blade or is cracked, install a new fan. A damaged fan can break during use and cause damage or serious injury.

1. Inspect the fan for any damage.

2. If the fan is damaged, replace the entire fan.

FAN INSTALLATION

WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while installing fan assembly.

1. Install the lower portion of the shroud in the retaining clips and lean the shroud toward the engine.

2. Install the spacer, washers, and capscrews to the fan. Tighten the capscrews to 52 N•m (38 lbf ft).

See Figure 29 for lift truck models equipped with GM 2.4L, Yanmar 2.6L, Yanmar3.0L or Yanmar 3.3L engine:

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

See Figure 30 for lift truck models equipped with Yanmar 2.6L engine.

- GDP20-25LX (GDP050LX) (A974)

See Figure 32 for lift truck models equipped with GM 4.3L engine:

- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/ GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)

See Figure 33 for lift truck models equipped with Cummins 4.5L engine:

- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/ GDP080, 090, 100, 110, 120VX) (F813)

10. Repeat the procedure for the other tie rod.

11. Remove the lift truck from blocks.

TIE RODS

GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875), GC/GLC030-035VX, GC/GLC040SVX (C809), GLP/GDP16-18VX, GLP/GDP20SVX (GP/GLP/GDP030-035VX, GP/GLP/GDP040SVX) (C810), GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813), GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879), GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878), and GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP170VX36, GLP/GDP190VX) (A909, B909)

Remove

WARNING

PUTTING THE LIFT TRUCK ON BLOCKS

The lift truck must be put on blocks for some types of maintenance and repair. The removal of the mast, drive axle, battery, or counterweight assemblies will cause large changes in the center of gravity. When the lift truck is put on blocks, put additional blocks in the following positions:

- **If the mast and drive axle are removed, put blocks under the counterweight so the lift truck cannot fall backward.**
- **If the counterweight is removed, put blocks under the mast so that the lift truck cannot fall forward.**

Put the lift truck on blocks on a solid, even, and level surface. Verify the blocks or stands have enough capacity to hold the lift truck. Use additional blocks next to the tires as necessary to prevent movement of the lift truck. Verify the lifting devices used during repairs can lift the weight of the parts and assemblies.

See the Operating Manual or Periodic Maintenance section for your lift truck model, for the procedures to put the lift truck on blocks.

Gear Pump Specifications

Table 1. Hydraulic Gear Pumps for Lift Truck Models GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809) and GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX, (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)

Model	Engine	Displacement	Governed Speed	Main Relief Valve Pressure - Mpa (PSI)	Pump Flow Rate - LPM (GPM)
GC/GLC030VX, GC/GLC035VX, GC/ GLC040SVX (C809) GLP/ GDP16VX, GLP/ GDP18VX, GLP/ GDP20SVX (GP/GLP/ GDP030VX, GP/GLP/ GDP035VX, GP/GLP/ GDP040SVX) (C810)	Mazda 2.0L	24.0 cc/rev	2400 rpm	19.31 MPa (2800 psi)	56.1 liter/min (14.8 gal/min)
GC/GLC030VX, GC/GLC035VX, GC/ GLC040SVX (C809) GLP/ GDP16VX, GLP/ GDP18VX, GLP/ GDP20SVX (GP/GLP/ GDP030VX, GP/GLP/ GDP035VX, GP/GLP/ GDP040SVX) (C810)	Yanmar 2.6L	29.4 cc/rev	2400 rpm	19.31 MPa (2800 psi)	68.7 liter/min (18.1 gal/min)

NOTES

4. Install new O-rings into the side of tilt control valve section. Install the auxiliary I control valve section on the four tie rods. See Figure 18.

5. Install the anti-stall valve into the auxiliary I control valve section. Install new O-rings into the side of auxiliary I control valve section. See Figure 15.

6. Install the auxiliary II control valve section on the four tie rods. Install new O-rings into the side of auxiliary II control valve section.

7. Install the outlet control valve section. See Outlet Control Valve Section, Install.

Tilt Control Valve Section

Remove

1. Remove the outlet control valve section. See Outlet Control Valve Section, Remove.

2. Remove the auxiliary control valve section. See Auxiliary Control Valve Sections, Remove.

3. Remove the tilt control valve section from the lift/lower control valve section.

4. Remove and discard O-rings from the side of lift/lower control valve section.

See Figure 21 for lift truck models

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)

See Figure 22 for lift truck models

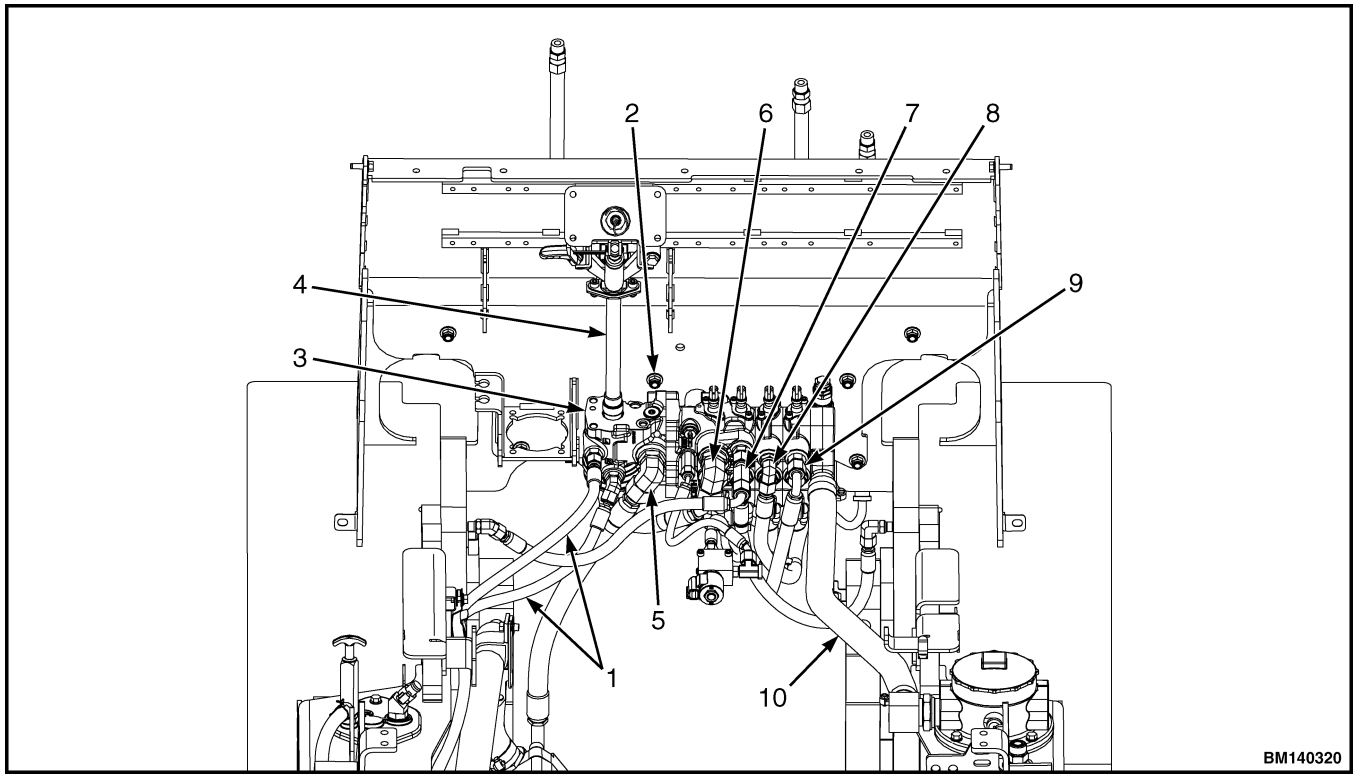
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)

Disassemble

NOTE: Disassemble the tilt control valve section only as needed to accomplish the repairs required.

NOTE: Perform Step 1 for lift truck models

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)
- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)



1. STEERING SYSTEM HOSES
2. SCU MOUNTING CAPSCREWS
3. STEERING CONTROL UNIT (SCU)
4. STEERING COLUMN
5. HYDRAULIC INLET HOSE
6. LIFT/LOWER HOSE
7. TILT HOSE
8. AUXILIARY I HOSE
9. AUXILIARY II HOSE
10. RETURN HOSE

Figure 38. Hydraulic Hose Removal, Manual Control Valve Without OPS and Dual Hydraulic Tanks, Lift Truck Models GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (F818)

SECONDARY RELIEF VALVE

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

See Figure 2 for lift truck models

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)

See Figure 3 for lift truck models

- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)

If lift truck is equipped with a manual control valve,

See Figure 31 for lift truck models without OPS

- GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
- GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
- GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
- GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)

See Figure 32 for lift truck models without OPS

- GLC/GDC60VX, GLC/GDC70VX, (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)

See Figure 33

- For lift trucks equipped with OPS.

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

2. Loosen jam nut. For lift truck equipped with an electro-hydraulic control valve, see Figure 62.

For lift trucks equipped with a manual control valve,

See Figure 63

- For lift trucks without OPS.

See Figure 64

- For lift trucks with OPS.

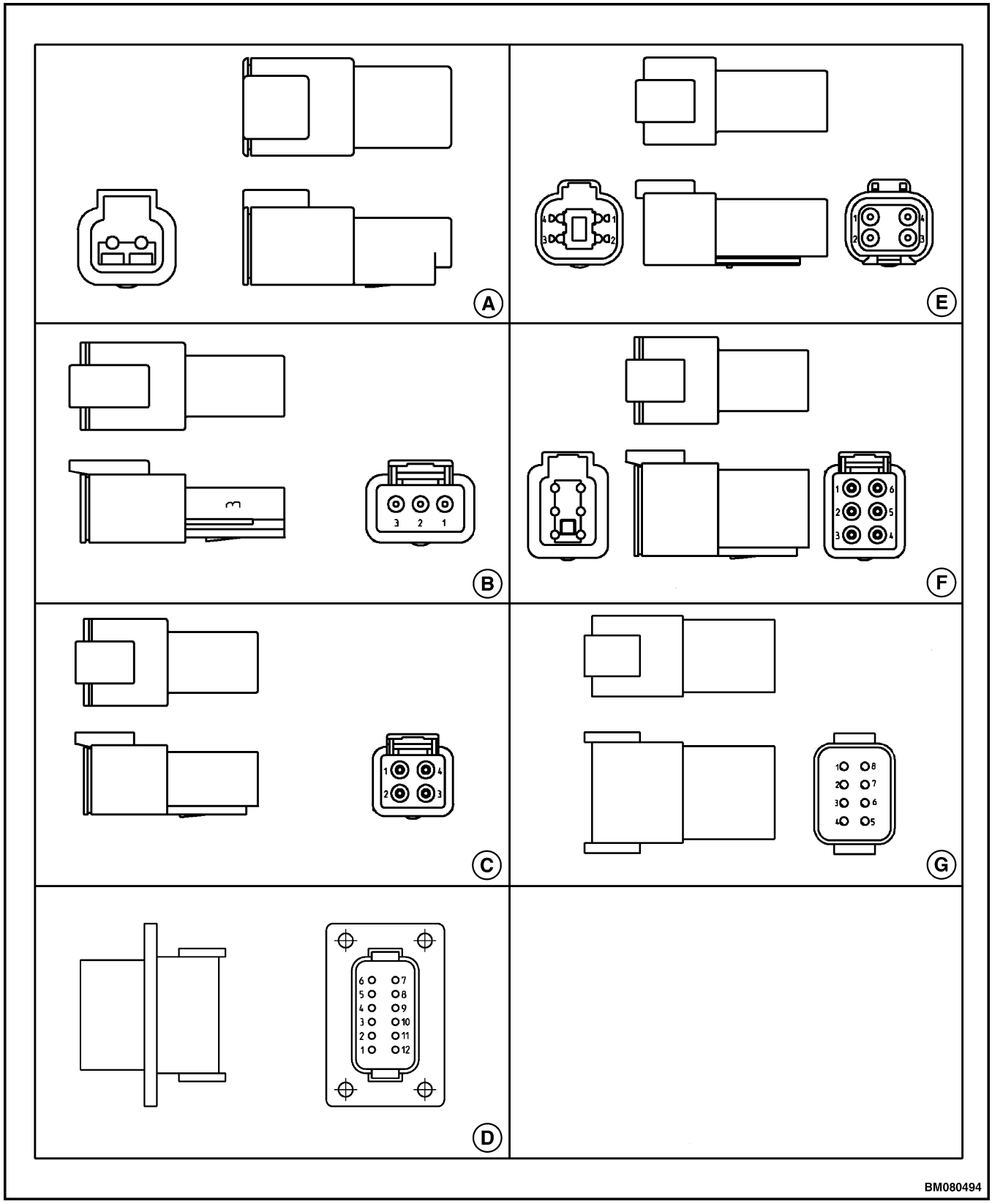
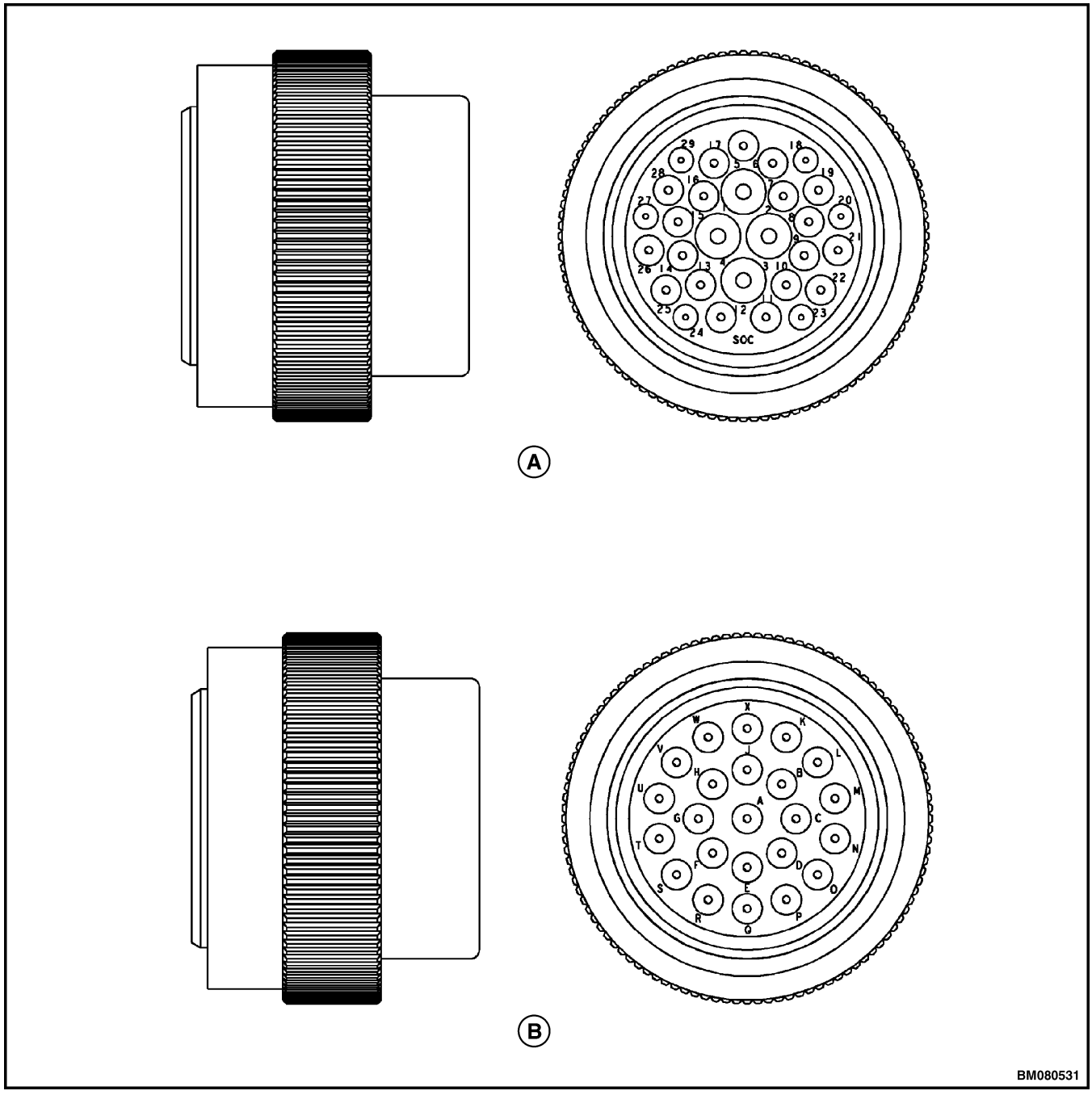


Figure 19. DTM and DTP Connector Receptacles



A. TYPE 1 B. TYPE 2

Figure 24. HD Connector Plugs

DESCRIPTION FOR PLUG CONNECTOR AND HEADER ASSEMBLY

The plug assembly will accept multiple socket contacts. See Figure 43. The head assembly is designed to be fastened to the enclosure by four self-tapping screws. The screw length will depend on panel thickness.

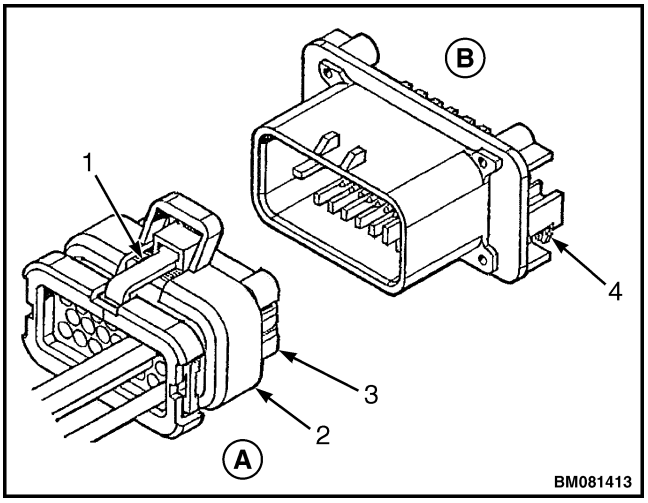


Figure 43. AMPSEAL Plug and Header Assembly

Legend for Figure 43.

NOTE: PLUG AND HEADER ASSEMBLY COLORS ARE MECHANICALLY KEYED TO MATE ONLY WITH IDENTICAL COLORS.

A. PLUG ASSEMBLY
B. HEADER ASSEMBLY

1. MATING SEAL
2. HOUSING
3. WEDGE LOCK
4. RETENTION LEG

Panel mounting cutout requirements shown in Figure 44. Maximum panel thickness to be 2 mm (0.08 in.) for proper clearance.

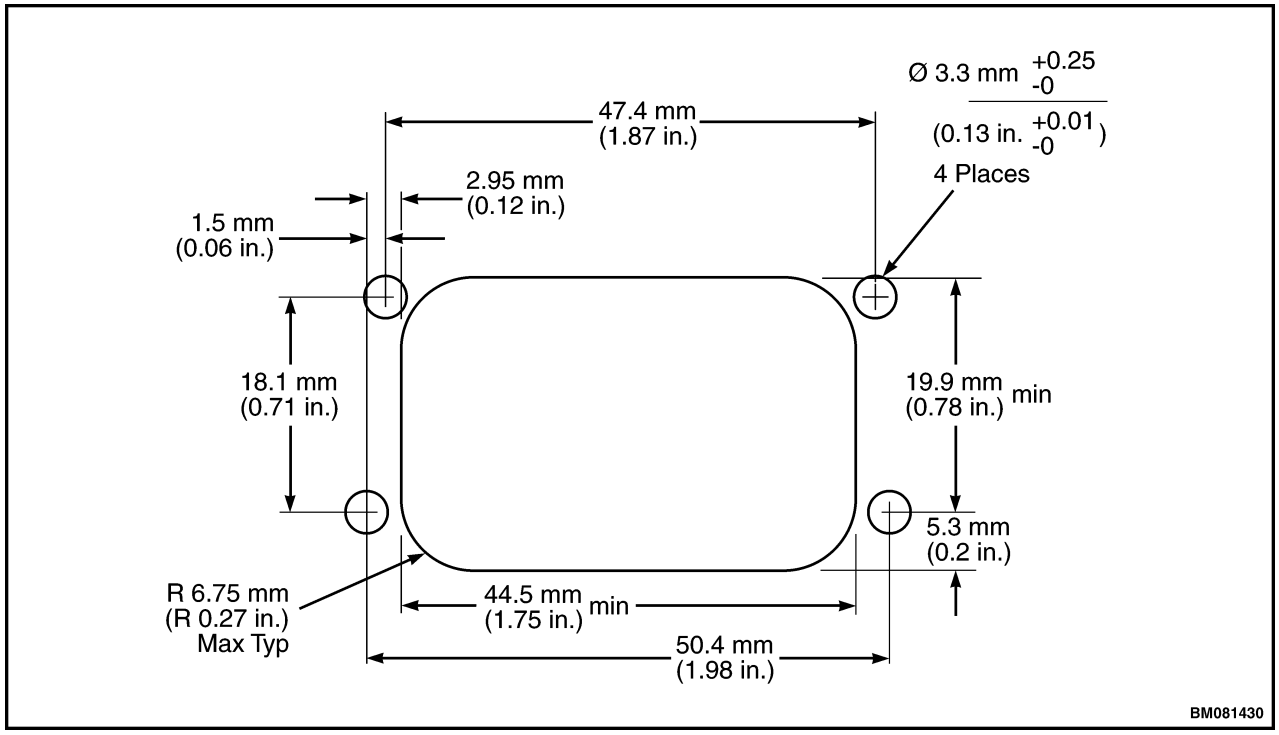


Figure 44. AMPSEAL Plug and Header Assembly Panel Mounting

Table 13. Wire Strip Length and Crimp Measurements

Wire Size (AWG)	Insulation Diameter	Strip Length	Wire Barrel		Insulation Barrel
			Crimp Width	Crimp Height	Crimp Width
20	1.52 to 2.54 mm (0.06 to 0.10 in.)	5.82 to 6.48 mm (0.229 to 0.255 in.)	2.24 to 2.34 mm (0.088 to 0.092 in.)	1.07 to 1.32 mm (0.042 to 0.052 in.)	2.49 to 2.59 mm (0.98 to 0.102 in.)
	2.16 to 3.18 mm (0.085 to 0.125 in.)				3.5 to 3.61 mm (0.138 to 0.142 in.)
18	3.05 to 4.32 mm (0.120 to 0.170 in.)	6.23 to 6.48 mm (0.245 to 0.255 in.)	2.74 to 2.84 mm (0.108 to 0.112 in.)	1.5 to 1.6 mm (0.059 to 0.063 in.)	4.01 to 4.11 mm (0.158 to 0.162 in.)
	3.05 to 4.06 mm (0.120 to 0.160 in.)	5.41 to 5.66 mm (0.213 to 0.223 in.)			
	3.5 to 3.68 mm (0.120 to 0.145 in.)				
	2.54 to 4.42 mm (0.100 to 0.170 in.)			1.37 to 1.42 mm (0.054 to 0.058 in.)	4.52 to 4.62 mm (0.178 to 0.182 in.)
				1.47 to 1.57 mm (0.054 to 0.062 in.)	4.01 to 4.11 mm (0.158 to 0.162 in.)
	2.16 to 3.18 mm (0.085 to 0.125 in.)	6.22 to 6.48 mm (0.245 to 0.255 in.)	2.24 to 2.34 mm (0.088 to 0.092 in.)	1.35 to 1.45 mm (0.053 to 0.057 in.)	3.5 to 3.61 mm (0.138 to 0.142 in.)
		5.82 to 6.07 mm (0.229 to 0.239 in.)		1.17 to 1.27 mm (0.046 to 0.050 in.)	
	1.52 to 2.54 mm (0.060 to 0.100 in.)	6.22 to 6.48 mm (0.245 to 0.255 in.)		1.35 to 1.45 mm (0.053 to 0.057 in.)	2.49 to 2.59 mm (0.098 to 0.102 in.)
		5.82 to 6.07 mm (0.229 to 0.239 in.)		1.17 to 1.27 mm (0.046 to 0.050 in.)	
	2.2 to 4.44 mm (0.090 to 0.175 in.)	5.1 to 6.1 mm (0.200 to 0.240 in.)	2.74 to 2.84 mm (0.108 to 0.112 in.)	1.42 to 1.52 mm (0.056 to 0.060 in.)	4.52 to 4.62 mm (0.178 to 0.182 in.)

Set Travel and Braking

Upon entering the Set Travel and Braking menu, the following menu functions are visible to the supervisor:

- Speed Limit
- Acceleration Rate
- Auto-Deceleration Rate
- Set Power Reversal Rate
- Set Inching/Brake Overlap

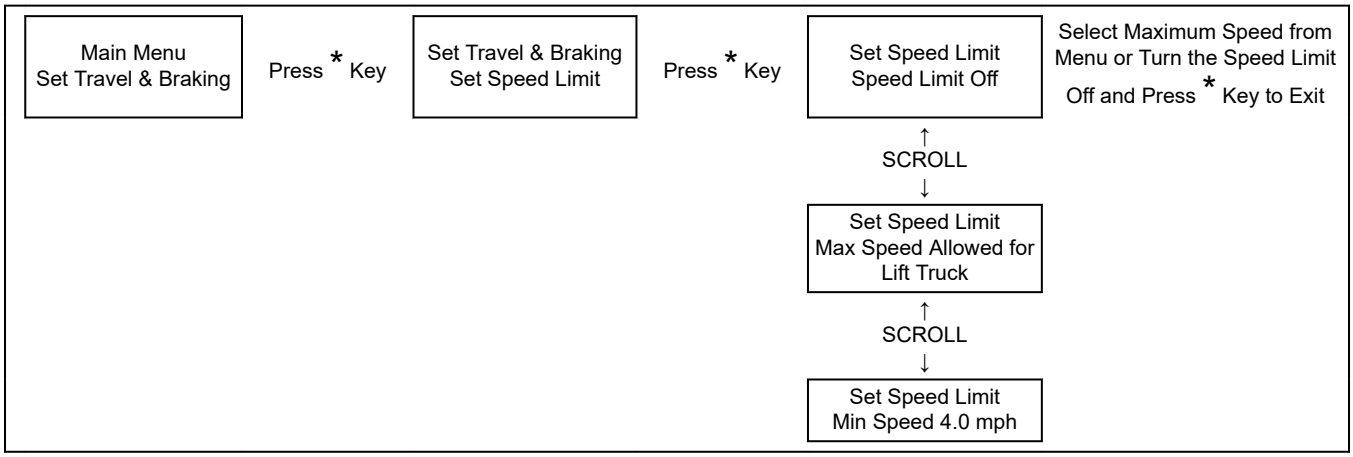
Use the scroll keys to move to the desired function and press the * key to select the function.

SPEED LIMIT

If the lift truck is configured for optional speed limit, this function can be used to adjust or deactivate the truck speed limit. Speed may be set from a minimum of 7 kph (4 mph) up to the maximum allowed for the lift truck model being adjusted. The speed may be set in 1 kph (0.5 mph) increments. Setting the speed limit higher than the maximum allowed for the lift truck model being adjusted will cause this function to be deactivated.

From the Set Travel and Braking menu, select *Set Speed Limit* and press the * key. Enter the desired limit for maximum truck speed or use the scroll keys to select *Speed Limit Off*. See Table 16. Press the * key to save your selection and access the Exit Options menu.

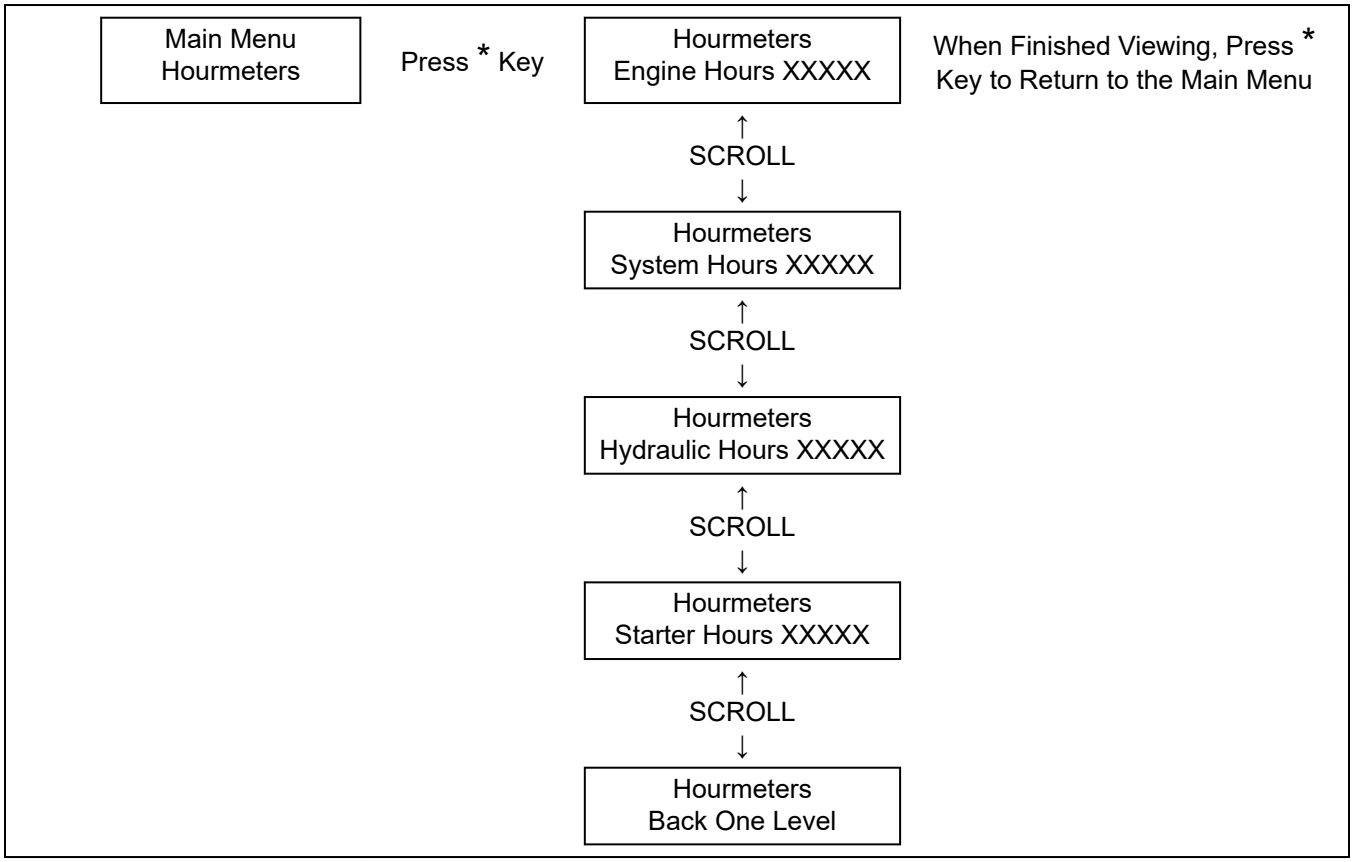
Table 16. Speed Limit Menu



Hourmeters

This function allows the service technician access to the various hourmeter readings available on the lift truck. When this menu is accessed, you can view the engine hours, system hours, and starter hours. See Table 4. If the lift truck is equipped with optional electro-hydraulics, hydraulic hours will also be shown in the menu. The hourmeters are accessible with the engine running.

Table 4. Hourmeters Menu



Engine hours accumulate any time the engine is running.

System hours accumulate anytime system power is on.

Hydraulic hours accumulate anytime a powered hydraulic function is being used.

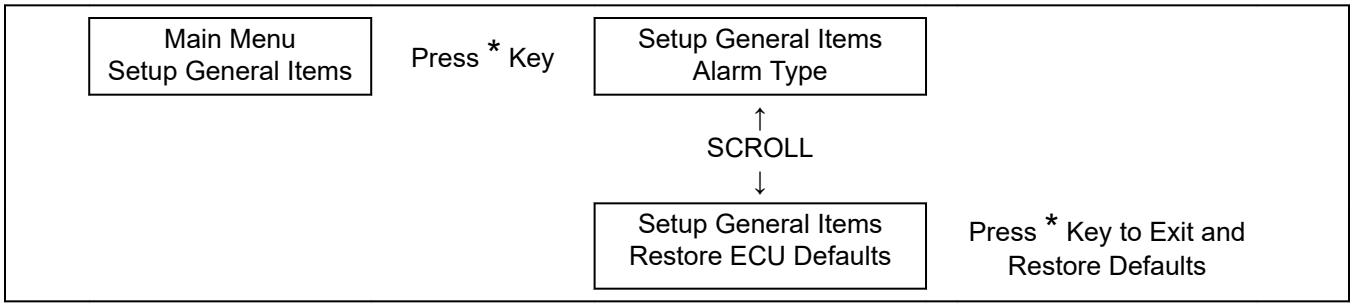
Starter hours accumulate anytime the engine starter solenoid is activated.

RESTORE ENGINE CONTROLLER DEFAULT CALIBRATION

If the lift truck is equipped with a GM or PSI engine, this function can be used to restore the system to the factory default values.

From the Setup General Items menu, select *Restore ECU Defaults*. Press the * key, scroll to the Exit Options menu, and choose the *Save and Exit* menu item. See Table 46. Press the * key to restore default values.

Table 46. Restore Settings Menu



IMPACT SENSOR - ENABLE/DISABLE

This function will allow the service technician to enable or disable the optional impact sensor.

Table 47. Impact Sensor Enable/Disable

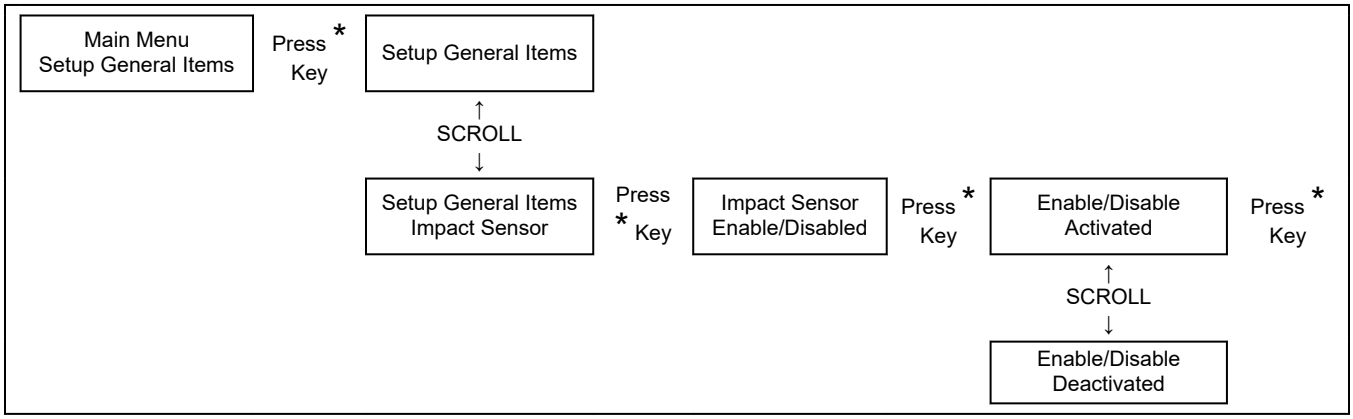
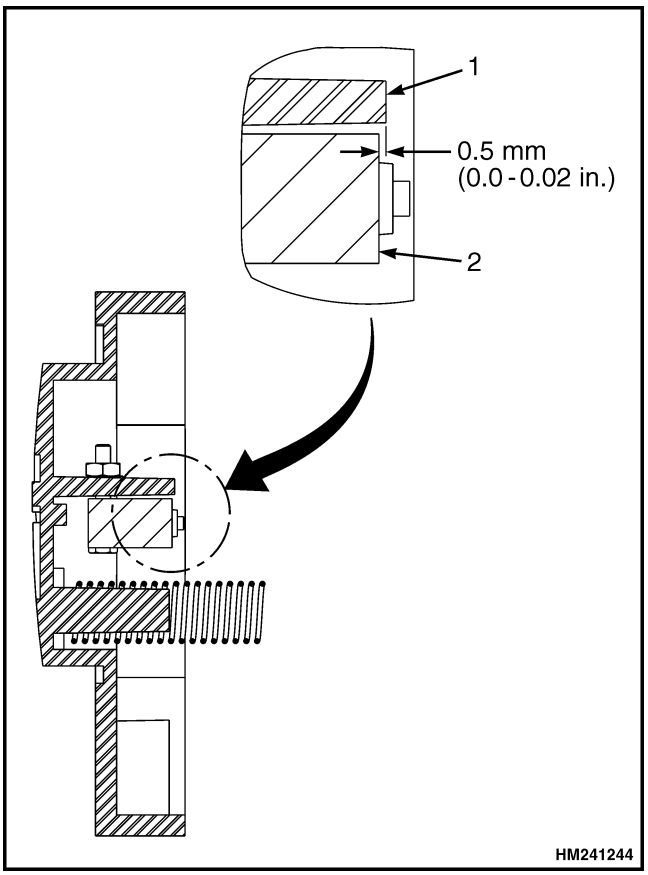


TABLE OF CONTENTS (Continued)

Install

1. Install microswitch and two hex head screws in pedal pad. Coat exposed threads of hex head screws with Loctite™ 222 (Yale P/N 501702901) . Install two lockwashers and nuts on hex head screws. DO NOT tighten nuts at this time. Repeat for the other microswitch.

2. Put wires through hole in pedal frame. The white banded wire is for the reverse microswitch, and the blue banded wire is for the forward microswitch. Adjust each microswitch in its mount so that the measurement between the edge of the mount and the base of the microswitch equals 0.0 to 0.5 mm (0.0 to 0.02 in.). Tighten mounting nuts of each microswitch as adjustment is completed. See Figure 24.



1. MICROSWITCH MOUNT
2. MICROSWITCH BASE

Figure 24. Microswitch Adjustment

3. Install wiring harness in pedal frame. Install foam lock seal and u-clip. Install pedal pad and springs in pedal frame. Coat threads of four pan head screws with Loctite 222 (Yale P/N 501702901) . Install pan head screws, lockwashers, and washers in pedal pad. Tighten pan head screws to 2.25 to 2.50 N•m (19 to 22 lbf in).

4. Install Foot Directional Control pedal assembly onto the truck. Follow installation procedures in one of the following sections:

   One And Two Speed Powershift Transmissions 1300YRM1129 for lift truck models

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

   One and Two Speed Transmissions 1300YRM1569 for lift truck models

   - GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (H813, J813)
   - GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (F818)

   Three-Speed Powershift Transmission Repair 1300YRM1317 for lift truck models

   - GLP/GDP60VX, GLP/GDP70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C878, D878, E878)
   - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909, B909)

   Two-Speed Powershift Transmission Repair 1300YRM1343 for lift truck models

   - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (F879)

LOAD WEIGHT SENSOR

Remove

1. To access the battery, remove the floor mat and floor plate, on lift truck models below. Disconnect the battery.
   - GLP/GDP60VX, GLP/GDP70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C878, D878, E878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909, B909)

   To access the battery, raise the hood, on lift truck models below. Disconnect the battery.
   - GC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809)
   - GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810)
   - GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX) (A910)
   - GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)
   - GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818)
   - GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)
   - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
2. Disconnect the harness connector from the load weight sensor. See Figure 46.
3. Remove the load weight sensor from the special fitting on hydraulic control valve.

- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (J813)
- GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (F879)

2. Disconnect electrical connector from boost sensor.

3. Remove two hose clamps and hose from boost sensor and air intake housing. See Figure 74.

4. Remove two capscrews from boost sensor. See Figure 74.

5. Remove boost sensor from air intake housing. See Figure 74.

Install

NOTE: If boost sensor has been identified as faulty, replace boost sensor with new one.

1. Install boost sensor onto air intake housing. See Figure 74.

2. Install two capscrews to boost sensor. Torque to 30 to 39 N•m (22 to 28 lbf ft). See Figure 74.

3. Install hose and two hose clamps to boost sensor and air intake housing. See Figure 74.

4. Connect electrical connector to boost sensor.

5. Connect battery and lower the hood on lift truck models
   - GLP/GDP60VX, GLP/GDP70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (E878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (B909)
   - GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (J813)
   - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (F879)

Throttle Valve Assembly and Air Intake Heater

Remove

1. To access battery, raise hood, on lift truck models below. Disconnect the battery.
   - GLP/GDP60VX, GLP/GDP70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (E878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (B909)
   - GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (J813)
   - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (F879)

2. Disconnect electrical connector from air intake sensor and boost sensor.

3. Disconnect electrical connections from air intake heater terminal nuts.

4. Remove two flange nuts and two flange bolts from air intake housing. See Figure 74.

5. Remove air intake housing and gasket from throttle valve assembly. Discard gasket. See Figure 74.

6. Remove throttle valve assembly and gasket from air intake heater. Discard gasket. See Figure 74.

7. Remove air intake heater and gasket from intake manifold. Discard gasket. See Figure 74.

8. Remove two studs from intake manifold. See Figure 74.

Install

NOTE: If throttle valve assembly or air intake heater have been identified as faulty, replace with new one.

1. Install two studs into intake manifold. See Figure 74.

2. Install new gasket and air intake heater onto studs and intake manifold. See Figure 74.

3. Install new gasket and throttle valve assembly onto two studs and air intake heater. See Figure 74.

4. Install new gasket and air intake housing onto two studs and throttle valve assembly. See Figure 74.

5. Install two flange bolts through air intake housing, throttle valve assembly and air intake heater into intake manifold. See Figure 74.

CAUTION

The following procedure should only be performed by Yale trained and certified technicians. The removal and replacement of the mini-levers and push button switch should be done in a clean environment whenever possible and on an electrically grounded surface. Do not touch any printed circuit board (PCB) surface to prevent damage from electrostatic voltage.

NOTE: Warranty seal will be broken when the MLM housing is opened.

3. Remove the MLM lower housing screws using a No. 25 torx driver. See Figure 104.

4. Remove the MLM housing bottom.

5. Disconnect all mini-levers from main PCB connectors. See Figure 100.

6. Disconnect the main PCB to MLM wire harness connector.

7. Remove the screws from the metal MLM backing plate using a No. 20 torx driver. See Figure 100.

8. Remove metal backing plate. Make sure wires are clear and not pinched.

CAUTION

DO NOT touch any printed circuit board (PCB) surface to prevent damage from electrostatic voltage. Handle only by edges of the PCB.

9. Remove the screws securing the main PCB using a No. 10 Torx driver.

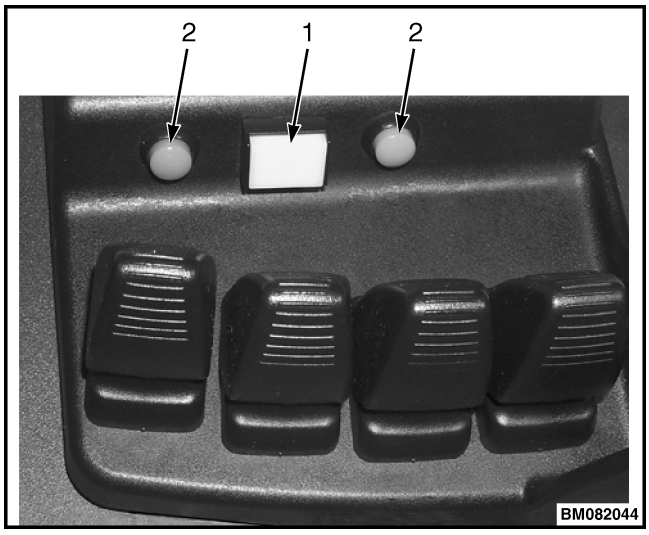
10. Remove the main PCB.

CAUTION

DO NOT TRY TO REMOVE THE CONNECTOR BY PULLING ON THE WIRES.

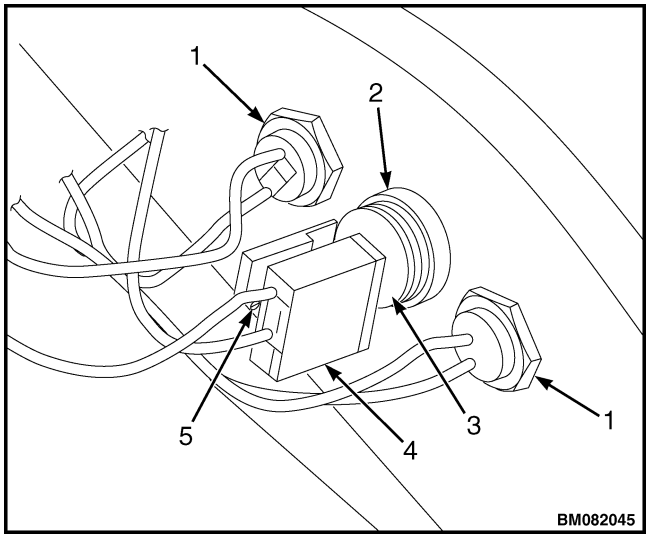
11. Disconnect push button switch connector from mini-lever connection. Carefully grip plug with flush cutting wire cutters. Gently work the plug out of the socket. See Figure 101.

12. If replacing yellow, rectangular toggle switch, go to Step 13. Remove lock nut from back of green, round momentary switch. See Figure 106. Remove push button switch from housing.



1. TOGGLE SWITCH
2. MOMENTARY SWITCH

Figure 105. Push Button Switches



1. LOCKNUT
2. KNURL NUT
3. BLACK CYLINDER
4. BLUE CONNECTOR
5. RED SCREW

Figure 106. Push Button Switch Housing

Table 4. Proc_Cal_002: Hydraulic Valve Calibration Warm Up and Air Bleed (Continued)

NOTE: Optional for initial manufacture. **Information:** To ensure that the oil temperature is optimal, warm up the hydraulic fluid until it is within a range of 50 to 65°C (122 to 149°F).
Action: • **Ignition:** ON • **Engine:** High Idle • **Transmission:** Neutral • **Park Brake:** ON
Step 1: (Optional hoist valve air bleed): Activate Lift Control from neutral to full lift and back to neutral at a rate of one or two times per second. Repeat until the lift function is operating smoothly and there is no mast movement upon engine start.
Step 2: (Optional cylinder air bleed): Cycle function completely two or three times; repeat if necessary.
NOTE: Optional for initial manufacture. Step 3: (Required warm up for service): Activate tilt at relief pressure until the hydraulic fluid temperature is within the optimum range 50 to 65°C (12 to 149°F).
Step 4: Proceed to calibrate desired electro-hydraulic functions.
Information: You do not need to **START** or turn **OFF** the vehicle if you are performing other procedures.

Proc_Cal_003: Save and Exit

WHEN TO PERFORM

Must be performed after any calibration except Procedure 016, Transmission Valve Calibration.

WHY PERFORM

Calibration processes do not automatically save their results until this routine is run.

HOW TO PERFORM

WARNING

Keep yourself and all others clear of the lift mechanism. Never allow anyone under or on the forks.

Never put hands, arms, head, or legs through the mast or near the carriage or lift chains. This warning applies not only to the operator but also the helper. A helper must not be near the load or the lift mechanism while the operator is attempting to handle a load. The lift mechanism has moving parts with close clearances that can cause serious injury.

Refer to Table 5 for the procedures on how to perform Proc_Cal_003: Save and Exit.

Table 18. Proc_Cal_016: Transmission Valve Calibration (Continued)

Watch display countdown. When completed successfully.....	**You Will See:**	Calibrations Calibrate Xmsn Valve
Perform Proc_Cal_003: Save and Exit.		

Proc_Cal_016A: Transmission Valve Calibration-Electronic Extended Function

NOTE: The information contained in the transmission calibration procedures described below, apply to all lift trucks covered in this manual **EXCEPT** lift truck models:

- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878, F878)
- GLP/GDP60VX, GLP/GDP70VX, GP70VXS6, GP70VXS9 (GLP/GDP135VX. GLP/GDP155VX, GP155VXS) (G878)
- GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909, B909)
- GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GDP170VX, GDP175VX36, GDP190VX) (C909, D909)

For the models listed above, see Proc_Cal_016B: Trans. Valve Calibration-Electronic and Electronic Extended Function for calibration procedures.

APPLICABLE SYSTEM/OPTION

Techtronix and Techtronix 332 Transmissions

WHEN TO PERFORM

Performed whenever disassembling or replacing the transmission, the transmission valve, or the transmission pressure sensors.

CALIBRATION ORDER

1. Proc_Cal_001

NOTE: Brakes must be properly adjusted and functioning prior to performing this procedure.

2. Proc_Cal_016A

WHY PERFORM

Performed to compensate for clutch pack control valve pressure in relation to valve command current tolerances.

HOW TO PERFORM

WARNING

Keep yourself and all others clear of the lift mechanism. Never allow anyone under or on the forks.

Never put hands, arms, head, or legs through the mast or near the carriage or lift chains. This warning applies not only to the operator but also the helper. A helper must not be near the load or the lift mechanism while the operator is attempting to handle a load. The lift mechanism has moving parts with close clearances that can cause serious injury.

WARNING

Keep park brake applied, full service brake applied, and full accelerator applied during entire time that automated transmission valve calibration is occurring.

Refer to Table 19 for the procedures on how to perform Proc_Cal_016: Transmission Valve Calibration.

Wet Brake System

Make sure the park brake levers are adjusted before the parking brake cables are adjusted. For park brake lever adjustment procedures, see:

- S4.0, 4.5, 5.5FT, S5.5FTS (S80, 100, 120FT; S80, 100FTBCS; S120FTS; S120FTPRS) (G004, H004, J004)
- H4.0FT5/FT6; H4.5FTS5, H4.5FT6; H5.0-5.5FT (H80, 90, 100, 110, 120FT) (N005, P005, R005, S005, U005)

Drive Axle and Differential Assembly Repair (Wet Brake) 1400YRM1246 for lift truck models

- GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818, G818)
- GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813, K813)
- S6.0FT, S7.0FT (S135FT, S155FT) (D024, E024, F024, G024)

Drive Axle and Differential Assembly Repair 1400YRM1318 for lift truck models

- GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)
- H6.0FT, H7.0FT (H135FT, H155FT) (H006, J006, K006)
- H8.0FT, H8.0FT9, H9.0FT (H170FT, H175FT36, H190FT) (A299, B299)

Drive Axle and Differential Assembly Repair 1400YRM1344 for lift truck models

- GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)
- GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909, B909)

Lift Trucks With a Pedal or Forward Reverse LeverFoot Directional Control

The switch energizes the seat warning circuit when hand lever is released. This switch puts the transmission in **NEUTRAL** by de-energizing the direction solenoid. There is also a switch on the left-hand side of bracket. This switch prevents engine from starting unless parking brake is applied.

CAUTION

On lift trucks equipped with the wet brake system, check the dash display to verify the transmission oil is at operating temperature, 49 to 66°C (120 to 150°F) before adjusting the parking brake adjustment knob.

1. To adjust the parking brake, perform the following:

   a. Turn the adjustment knob to raise the equalized link and tighten the parking brake cables. DO NOT tighten the adjustment knob so that the brake is applied when the lever is released.

      For dry brake system, see Figure 16.

      For wet brake system:

      See Figure 17 for lift truck models

      - GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (E818, F818), GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813 K813)
      - GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (G818) , manufactured before April, 2015

      See Figure 18 for lift truck models

      - GLC40, 45, 55VX; GLC55SVX; (GC/GLC080, 100, 120VX; GC/GLC080, 100VXBCS; GC/GLC120SVX; GC/GLC120VXPRS) (G818) , manufactured after September, 2016

      See Figure 19 for lift truck models

      - GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879) and GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878)

      See Figure 20 for lift truck models

      - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909, B909)

Transmission Repair

REMOVE

NOTE: Perform this step for lift truck models GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879) .

1. Remove engine and transmission as a combination. For removal procedures see **Frame** 0100YRM1316.

NOTE: Perform this step for lift truck models shown.

2. There are two procedures to remove transmission from lift truck frame, the first is to remove engine and transmission as a combination and the second is to remove transmission only, for removal procedures

   See **Frame** 0100YRM1321 for lift truck models

   - GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909)

   See **Frame** 0100YRM1581 for lift truck models

   - GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (E878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (B909)

   See **Frame** 0100YRM1948 for lift truck models

   - GLP/GDP60VX, GLP/GDP70VX (GLP/GDP135VX, GLP/GDP155VX) (F878)
   - GLP/GDP60VX, GLP/GDP70VX, GP70VXS6, GP70VXS9 (GP/GLP/GDP135VX. GP/GLP/GDP155VX, GP155VXS) (G878)
   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GDP170VX, GDP175VX36, GDP190VX) (C909)

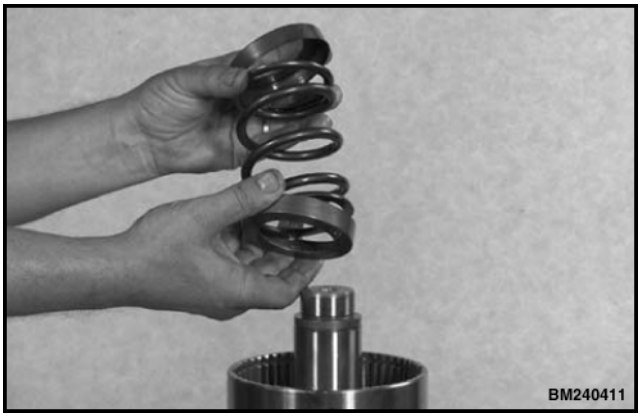
   See **Frame** 0100YRM2293 for lift truck models

   - GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GDP170VX, GDP175VX36, GDP190VX) (D909)

TORQUE CONVERTER, REMOVE

1. Remove internal snap ring securing plug and O-ring.
2. Remove plug and O-ring. Discard O-ring.
3. Remove internal snap ring from torque converter assembly.
4. Remove external snap ring from turbine shaft inside torque converter assembly.
5. Slide torque converter off of turbine and stator shafts.

STEP 6.
Remove spring and spring retainers (2).

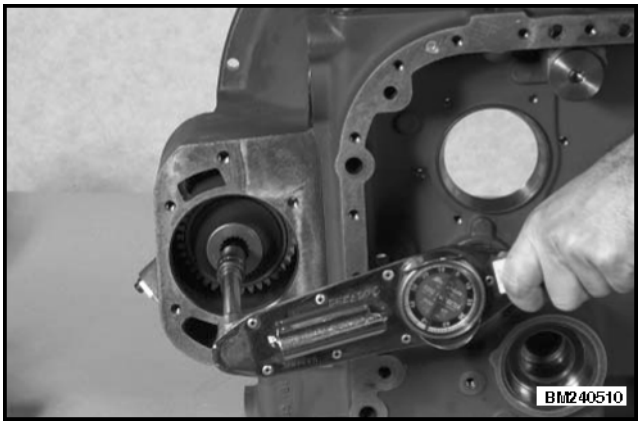


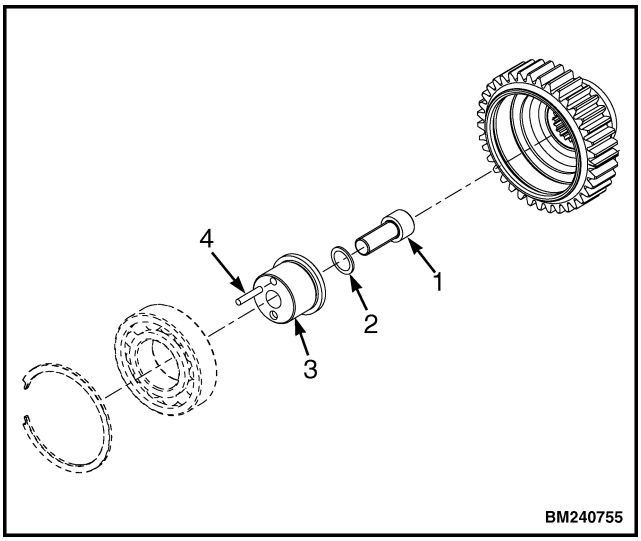
STEP 7.
Remove piston, and discard inner and outer piston seals.

FORWARD 2, Disassemble

Refer to Figure 7.

STEP 6.
Install pump drive gear assembly, bearing support, pin, lockwasher, and capscrew. Tighten to 122 N•m (90 lbf ft). See Pump Drive Gear, Assemble procedures.





1. CAPSCREW
2. LOCKWASHER
3. BEARING SUPPORT
4. PIN

5. Install ignition switch onto hood support bracket. Connect ignition switch harness to rear harness.

6. Connect right hand chassis harness to rear harness connector.

7. Install rear harness conduit clips to hood support assembly.

See Figure 9 for lift truck models

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

See Figure 10 for lift truck models

- GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909)

8. For lift trucks equipped with GM 4.3L engine and GM 5.7L engine, connect the air inlet hose to hood support assembly. Close right and left side door assembly.

9. For lift trucks equipped with Cummins 4.5L and Kubota 3.8L engine, connect the air inlet hose to silencer and hood support assembly. Close right and left side hood door assembly.

10. Connect battery and install front and rear floor plates and floor mats. Figure 7.

See Figure 31 for lift truck models equipped with Kubota 3.8L Diesel Engine.

32. For lift trucks equipped with GM 4.3L engine, remove lock nut, snubbing washer, and bottom isolator from frame. See Figure 32.

33. For lift trucks equipped with QSB 3.3L, Cummins 4.5L, and Kubota 3.8L diesel engines, remove lock nut, capscrew, special washer, snubbing washer, top isolator, and bottom isolator from engine mount, crossmember, and frame. See Figure 32.

34. For lift trucks equipped with GM 5.7L engine, remove lock nut, snubbing washer, and bottom isolator from frame. See Figure 32.

WARNING

The engine is heavy. Make sure that any lifting device has enough capacity to lift the engine. The engine can weigh approximately 363 kg (800 lb).

CAUTION

When separating the engine away from the transmission, place a piece of plywood in front of radiator to keep the engine from damaging the radiator.

CAUTION

Keep the engine level when the engine is separated from the transmission to prevent damage to drive plate.

35. Use the lifting device to carefully move the engine away from the torque converter. Make sure all hoses, wires, and cables are disconnected from the engine, then lift the engine from the frame and place engine on blocks.

NOTE: Perform Step 36 for lift trucks equipped with GM 4.3L and GM 5.7L engine.

36. Remove capscrews from flywheel housing and engine block. Remove flywheel housing.

37. For lift trucks equipped with Kubota 3.8L diesel engine, remove eight capscrews and washers from right and left side engine mounts and engine. Remove engine mounts.

38. For lift trucks equipped with GM 4.3L engine, remove capscrew and special washer from crossmember. See Figure 32.

39. For lift trucks equipped with Cummins 4.5L diesel engine, remove snubbing washer and top isolator from frame. See Figure 32.

40. For lift trucks equipped with QSB 3.3L diesel engine, remove bottom isolators from mounting plates. Figure 32.

41. For lift trucks equipped with QSB 3.3L diesel engine, remove six flange nuts, capscrews, and mounting plates from frame. See Figure 32.

42. For lift trucks equipped with GM 5.7L engine, remove snubbing washer and top isolator from frame. See Figure 32.

43. For lift trucks equipped with GM 4.3L engine, remove flange bolt from right side engine mount to flywheel housing. See Figure 32.

44. For lift trucks equipped with GM 4.3L engine, remove three flange bolts securing crossmember to right side engine mount. Remove crossmember. See Figure 32.

45. For lift trucks equipped with GM 4.3L engine, remove snubbing washer and top isolator from frame. See Figure 32.

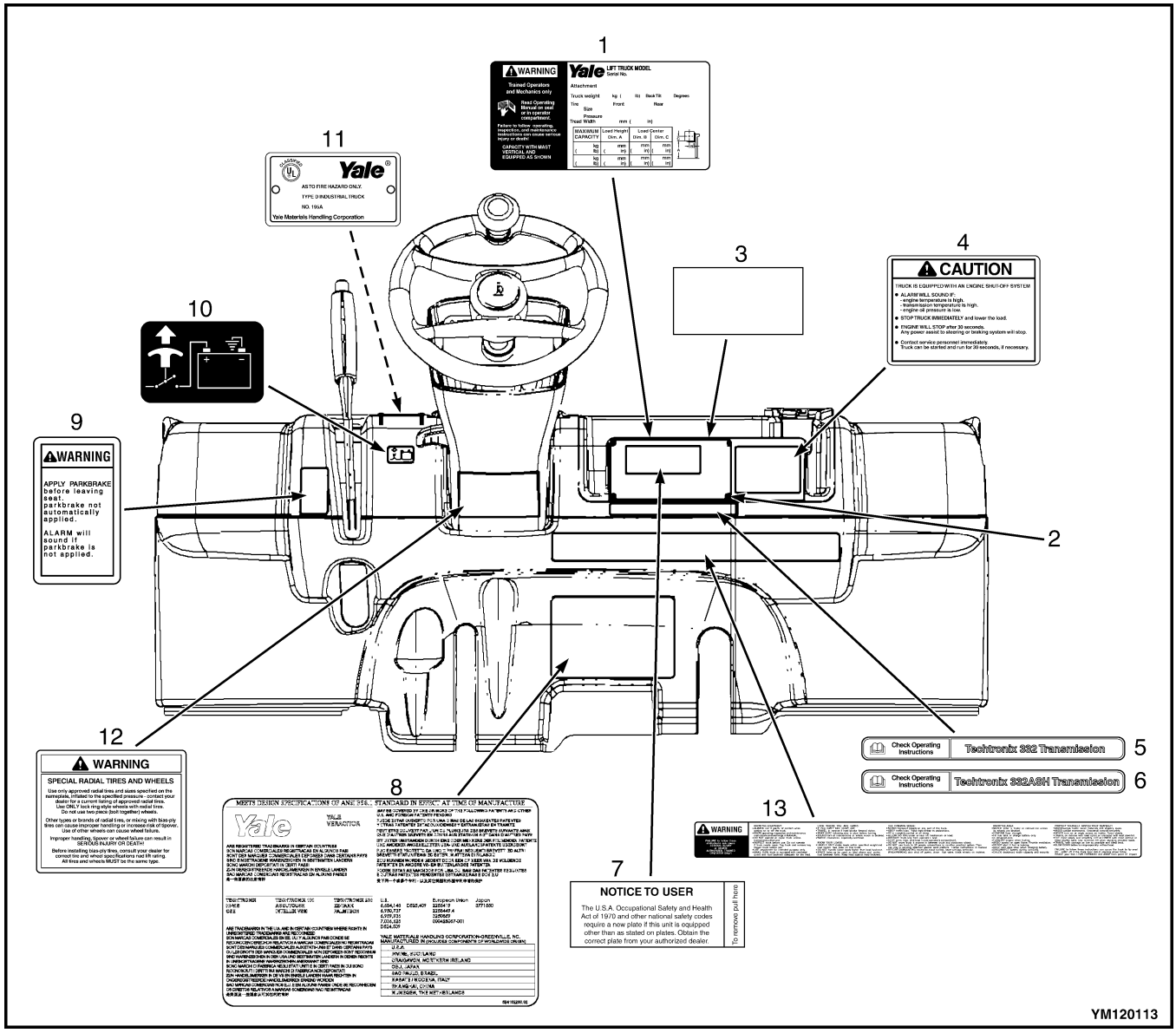
46. For lift trucks equipped with GM 4.3L engine, remove three flange bolts securing right side engine bracket to engine block. Remove right side engine mount. Remove pin from right side engine mount. See Figure 32.

47. For lift trucks equipped with QSB 3.3L and Cummins 4.5L diesel engines, remove four flange bolts securing engine mounts to engine block. See Figure 32.

48. For lift trucks equipped with GM 5.7L engine, remove two flange bolts and spacers from right and left side engine mounts and flywheel housing. See Figure 32.

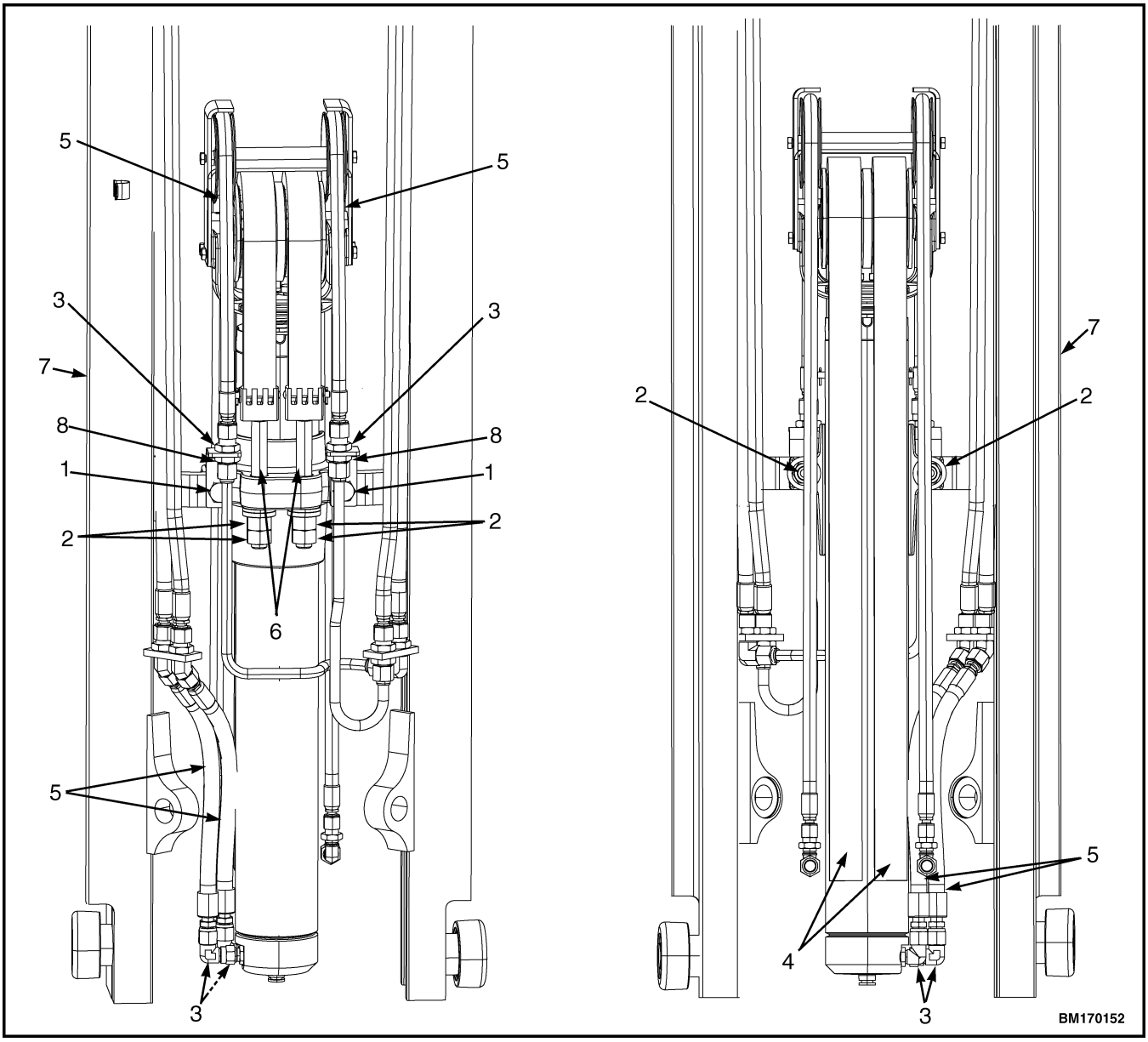
49. For lift trucks equipped with GM 5.7L engine, remove six flange bolts from right and left side engine mounts and cross member. Remove pins from engine mounts. See Figure 32.

50. For lift trucks equipped with GM 5.7L engine, remove six capscrews, washers, and right and side engine mount from engine block. See Figure 32.



1. NAMEPLATE
2. RIVET
3. COVER
4. DRIVE TRAIN PROTECTION LABEL
5. TECHTRONIX 332 TRANSMISSION LABEL
6. TECHTRONIX 332ASH TRANSMISSION LABEL
7. NAMEPLATE TAG
8. PATENTS AND TRADEMARK LABEL
9. PARK BRAKE WARNING LABEL
10. BATTERY SWITCH LABEL
11. INSPECTION PLATE
12. RADIAL TIRE WARNING LABEL
13. OPERATOR WARNING LABEL

Figure 57. Safety Labels (Interior) for Lift Truck Models GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GDP170VX, GDP175VX36, GDP190VX) (A909)



NOTE: BOTTOM CROSSMEMBER OF THE INNER MAST HAS BEEN REMOVED FOR CLARITY.

A. REAR VIEW

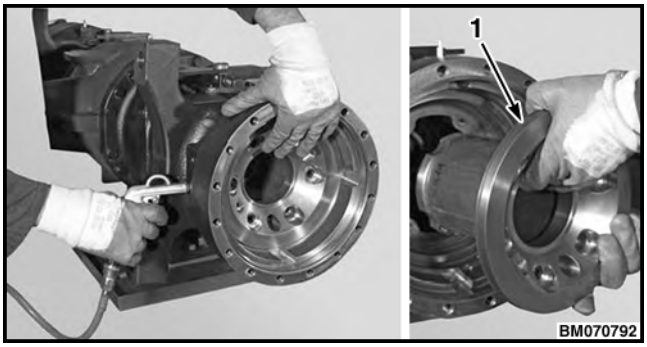
B. FRONT VIEW

1. CAPSCREW
2. LOCK NUT
3. HYDRAULIC FITTINGS
4. CHAIN
5. HOSE
6. CHAIN ANCHOR
7. INNER MAST
8. HOSE MOUNTING BRACKET

Figure 19. Free-Lift Cylinder Removal for Lift Truck Models and GLP/GDP60VX, GLP/GDP70VX (GP/GLP/GDP135VX, GP/GLP/GDP155VX) (C878, D878, E878) GLC/GDC60VX, GLC/GDC70VX (GC/GLC/GDC135VX, GC/GLC/GDC155VX) (C879, D879, E879, F879)


Yale

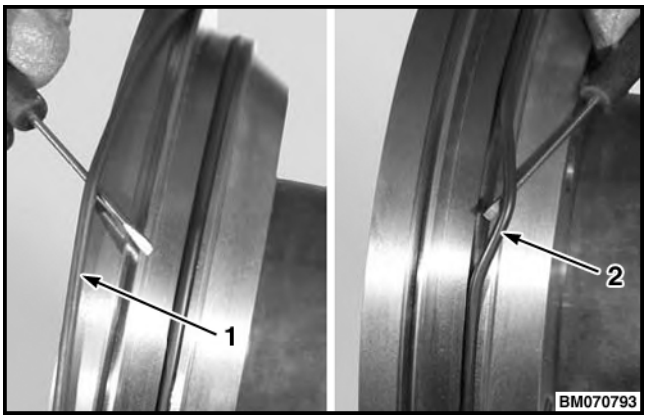
STEP 11.
Slowly apply compressed air through the brake fluid port to extract the entire piston.



1. PISTON

NOTE: The O-rings must be replaced each time the unit is disassembled.

STEP 12.
Remove and discard the O-rings from the piston.

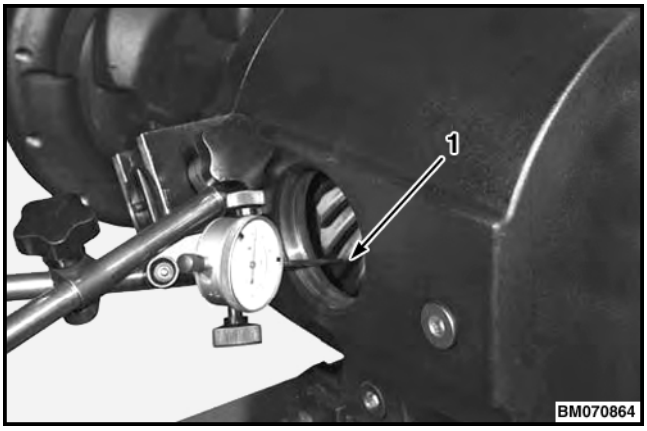


1. O-RING
2. O-RING

NOTE: If replacing the brake discs and/or piston seals only, go to Clean and Inspect and then Assemble and Install, Step 5.

STEP 7.
Position a dial indicator with a long tip through the hole for the plug.

Position the tip on the side of a tooth of the bevel gear, approximately 5 mm (0.197 in.) from the outer rim. Preload by approximately 1 mm (0.039 in.) and zero the dial indicator.

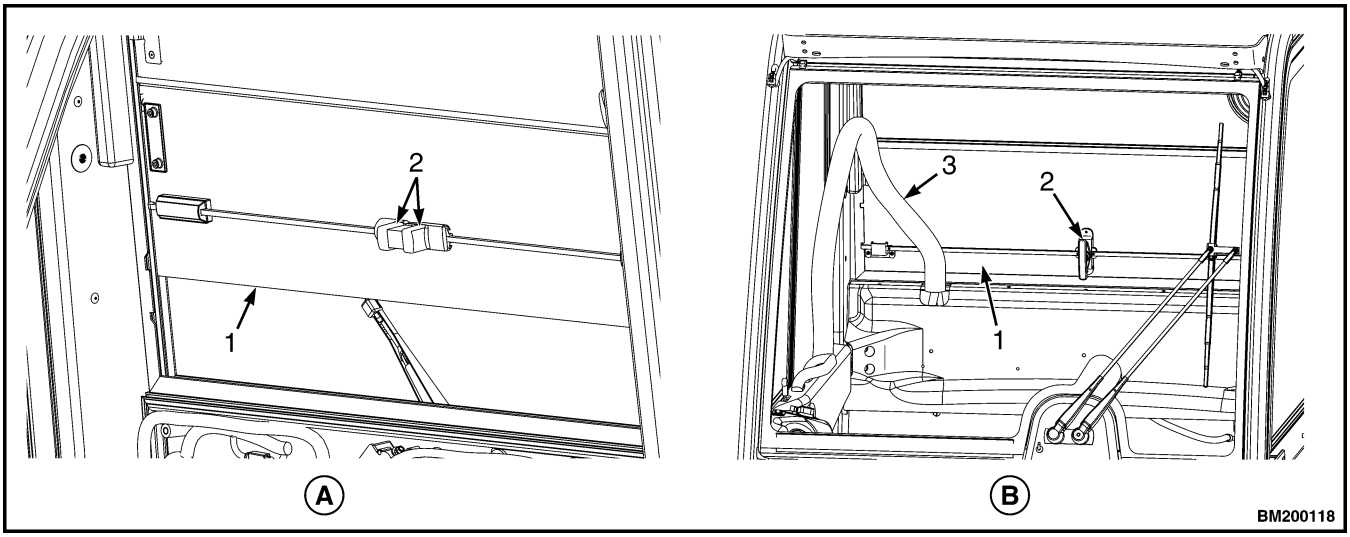


1. DIAL INDICATOR TIP

STEP 8.
Hold the bevel pinion in position and move the bevel gear in both directions to check the clearance between the bevel pinion and bevel gear. See Table 1.

Table 1. Bevel Set Specifications

Drive Axle Part No.	Axle Overall Ratio	Bevel Set Ratio	Clearance	
			Minimum	Maximum
580064079	14.8	32/13	0.20 mm (0.0079 in.)	0.28 mm (0.0110 in.)
580064080	15.4	36/14	0.18 mm (0.0071 in.)	0.23 mm (0.0091 in.)
580073454	16.9	31/11	0.20 mm (0.0079 in.)	0.28 mm (0.0110 in.)



A. LIFT TRUCKS MODELS GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875, C875) AND GLP/GDP40VX5/VX6, GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813) WITHOUT AIR CONDITIONING.
B. LIFT TRUCKS MODELS GLP/GDP40VX5/VX6, GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (G813, H813, J813) WITH AIR CONDITIONING.

1. REAR BOTTOM WINDOW
2. RELEASE LATCH
3. AC HOSE

Figure 3. Rear Bottom Window for Lift Trucks Models GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875, C875) and GLP/GDP40VX5/VX6, GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813, G813, H813, J813)

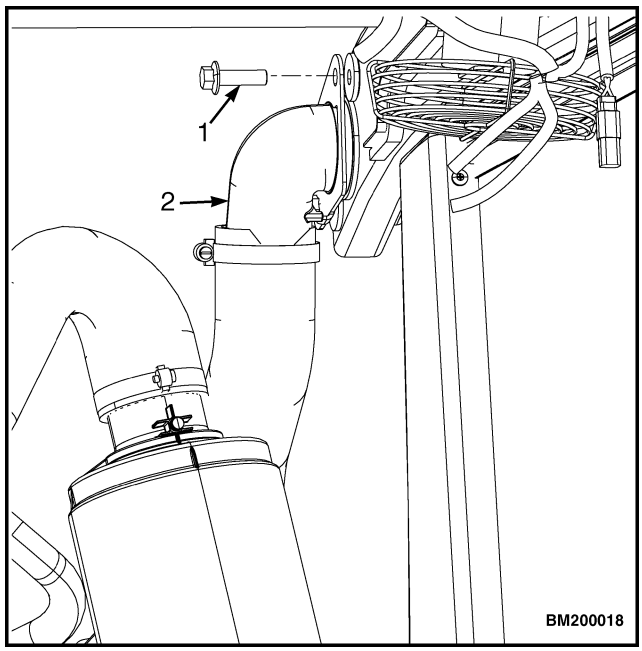


Figure 4. Air Filter Hose Removal

Legend for Figure 4

NOTE: AIR FILTER HOSE FOR GLP/GDP40VX5/VX6, GLP/GDP45SVX5, GLP/GDP45VX6, GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (F813) SHOWN. AIR FILTER HOSE FOR OTHER LIFT TRUCK MODELS ARE SIMILAR.

1. CAPSCREW
2. AIR FILTER HOSE

Heater Assembly

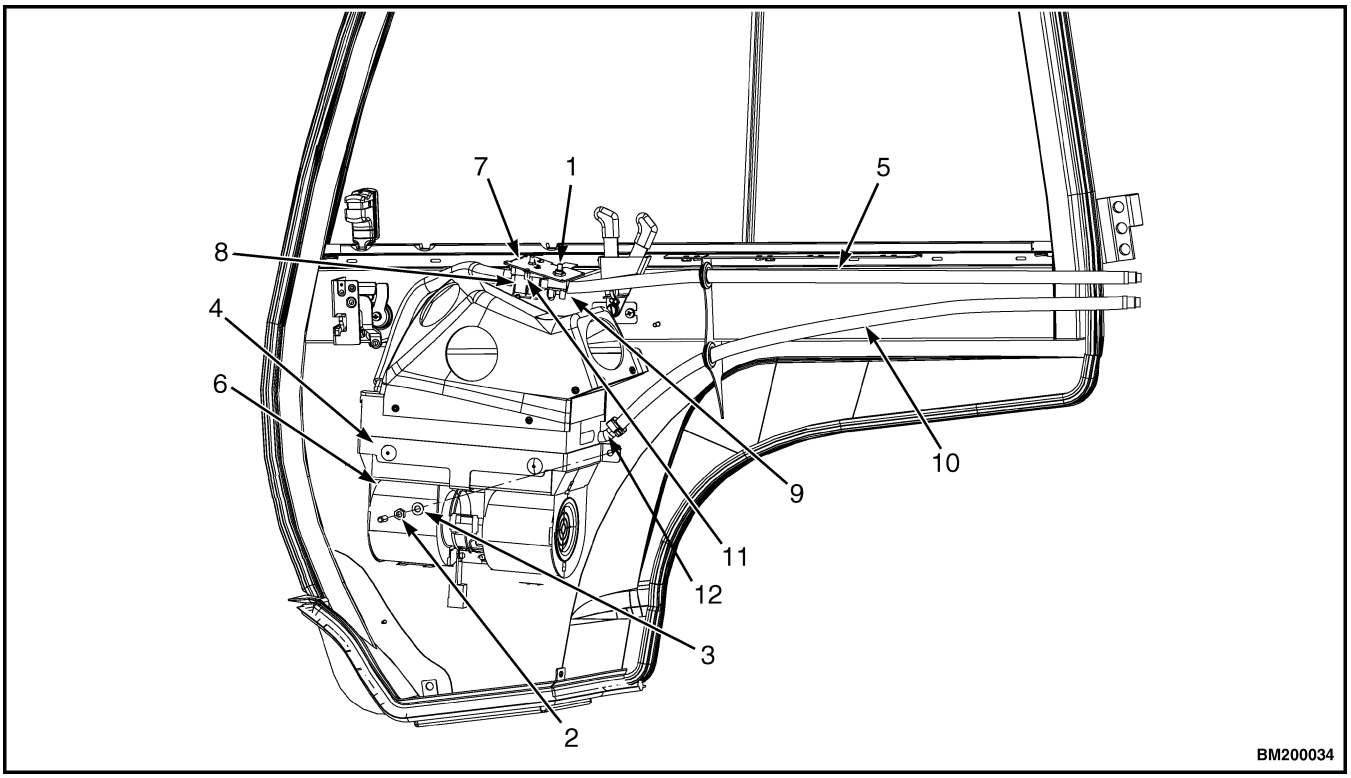
NOTE: The heater assembly is non-repairable, replace as a complete unit. See **Parts Manual**.

1. Remove lock nut from heater valve and switch plate. See Figure 42.
2. Disconnect heater switch connector from heater switch.
3. Remove two screws from heater valve and switch plate and remove plate.
4. Disconnect supply hose at heater valve and disconnect return hose from heater coil.
5. Remove two nuts and washers from heater assembly bracket. Remove heater assembly and bracket from door frame.

Air Conditioner and Heater Unit Assembly

NOTE: Only lift truck models GLP/GDP40VX5/VX6; GLP/GDP45SVX5, GLP/GDP45VX6; GLP/GDP50-55VX (GP/GLP/GDP080, 090, 100, 110, 120VX) (G813, H813, J813) with a Cummins QSB 3.3L or Kubota diesel engine may be equipped with an air conditioner/heater unit.

NOTE: The procedures in this section remove air conditioner/heater unit assembly from right side door. For procedures to remove or replace other components of air conditioner/heater unit assembly, go to Heater and Air Conditioner Assembly section.



1. LOCK NUT
2. NUT
3. WASHER
4. HEATER ASSEMBLY BRACKET
5. SUPPLY HOSE
6. HEATER ASSEMBLY
7. HEATER VALVE AND SWITCH PLATE
8. HEATER VALVE
9. HEATER SWITCH
10. RETURN HOSE
11. SCREWS
12. HEATER COIL

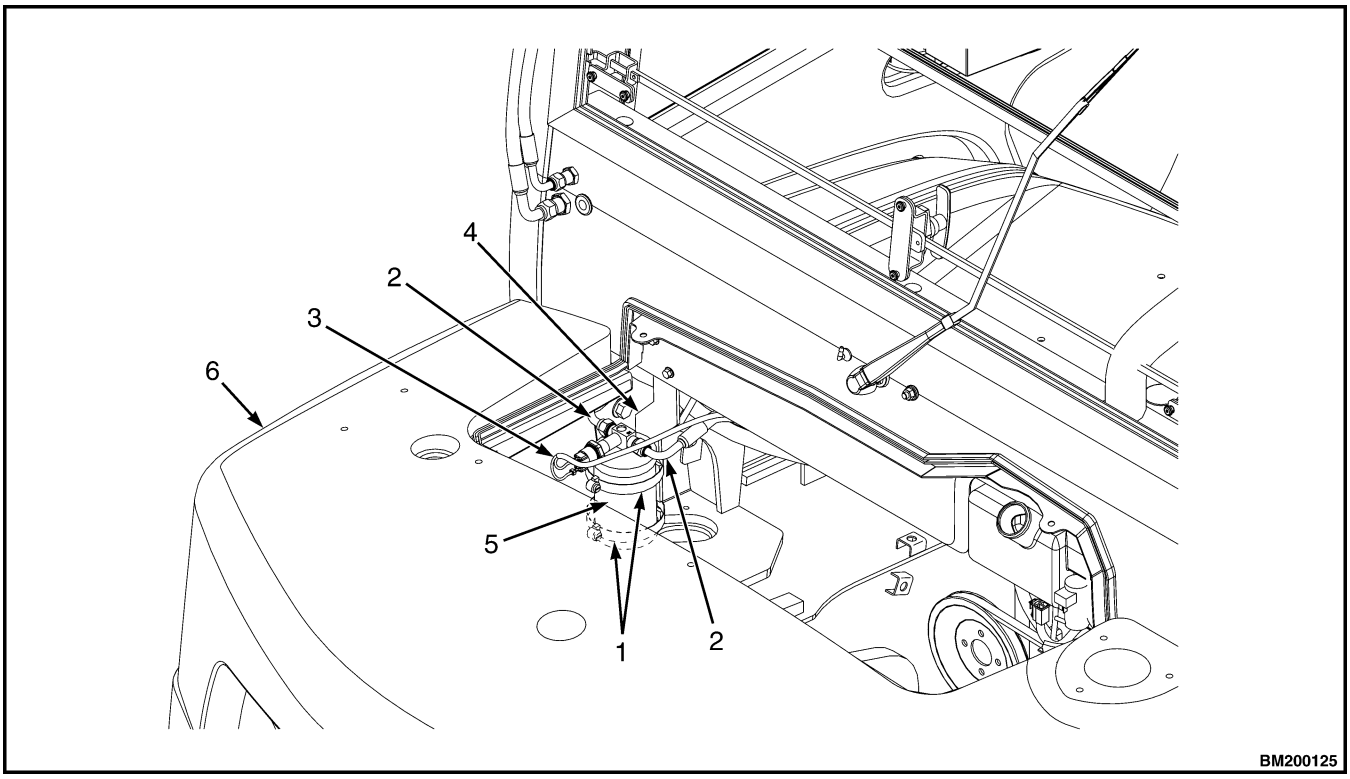
Figure 42. Heater Assembly Removal

Install

1. Attach air conditioner receiver/drier unit to mounting bracket using two strap clamps. See Figure 72.
2. Connect AC hoses to air conditioner receiver/drier unit. See Figure 72.
3. Connect air conditioner wire harness to air conditioner receiver/drier unit. See Figure 72.
4. Install radiator cover. See Figure 71.
5. Connect battery and close hood.

AIR CONDITIONER COMPRESSOR

For removal and replacement instructions on air conditioner compressor, contact your local **YALE** dealer or see **Yale Axcess Online**.



1. STRAP CLAMP
2. AC HOSE CONNECTIONS
3. AC WIRE HARNESS
4. MOUNTING BRACKET
5. AC RECEIVER/DRIER UNIT
6. COUNTERWEIGHT

Figure 72. Air Conditioner Receiver/Drier Unit

6. To repair fork positioner cylinders, see service manual section **Cylinder Repair (Mast S/N A513, A514, A613, A614, B513, B514)** 2100YRM1328 for procedures.

Clean and Inspect

WARNING

Cleaning solvents can be flammable and toxic, and 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.

1. Use steam or cleaning solvent to clean the metal parts of the fork positioner. Dry with compressed air.
2. Inspect fork positioner for wear or damage. Inspect welds for cracks.
3. Clean exterior surface of the fork positioner cylinders with cleaning solvent or steam. Dry with compressed air.

Assemble

1. Slide fork carriers onto fork positioner cylinders. Install cylinders into the holes in the center plate. See Figure 12.
2. Install the cylinders, fork carriers, and center plate into holes in fork positioner frame.
3. Install lugs to cylinder rod end anchors with capscrew and washer. See Figure 12.
4. Secure fork positioner cylinders, fork carriers, and center plate to fork positioner frame with two nuts. Tighten nuts to 145 N•m (107 lbf ft).

Install

1. Connect lifting device to fork positioner frame (see Figure 10) and lift frame up and align fork carriers with the top of the forks.
2. Secure fork positioner frame to integral sideshift using six mounting socket head capscrews. See Figure 10. Tighten mounting socket head capscrews to 145 N•m (107 lbf ft).
3. Remove protective caps and plugs from hydraulic lines and cylinder ports. Connect lines to fork positioner cylinders and fork positioner valve body as tagged during removal. See Figure 11.
4. Operate the fork positioners through several complete cycles and check for any leaks at the fittings and cylinder rod ends and to force any air in the system to the hydraulic tank.

Lift Truck Lifting Capacity

Model	Weight
GLP/GDP80VX (GLP/GDP170VX)	8,000 kg (17,000 lb)*
GLP/GDP80VX9 (GLP/GDP175VX36)	8,000 kg (17,500 lb)**
GLP/GDP90VX (GLP/GDP190VX)	9,000 kg (19,000 lb)*
*Load center at 600 mm (24 in.) **Load center at 900 mm (36 in.)	

Counterweight Weights

Model	Weight
GLP/GDP80VX (GLP/GDP170VX)	3135 kg (6911 lb)
GLP/GDP80VX9 (GLP/GDP175VX36)	4020 kg (8863 lb)
GLP/GDP90VX (GLP/GDP190VX)	3600 kg (7937 lb)

Tire Sizes

Truck	Dual Drive Tires	Steer Tires
GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (GLP/GDP170VX, GLP/GDP175VX36, GLP/GDP190VX) (A909)	8.25 x 15 Pneumatic Radial 300 x 15 Solid Pneumatic	8.25 x 15 Pneumatic Radial 300 x 15 Solid Pneumatic
GLP/GDP80VX, GLP/GDP80VX9, GLP/GDP90VX (European Models Only)	**Single Drive Tires**	**Steer Tires**
	300 x 65 R15 Pneumatic Radial	8.25 x 15 Pneumatic Radial 300 x 15 Solid Pneumatic

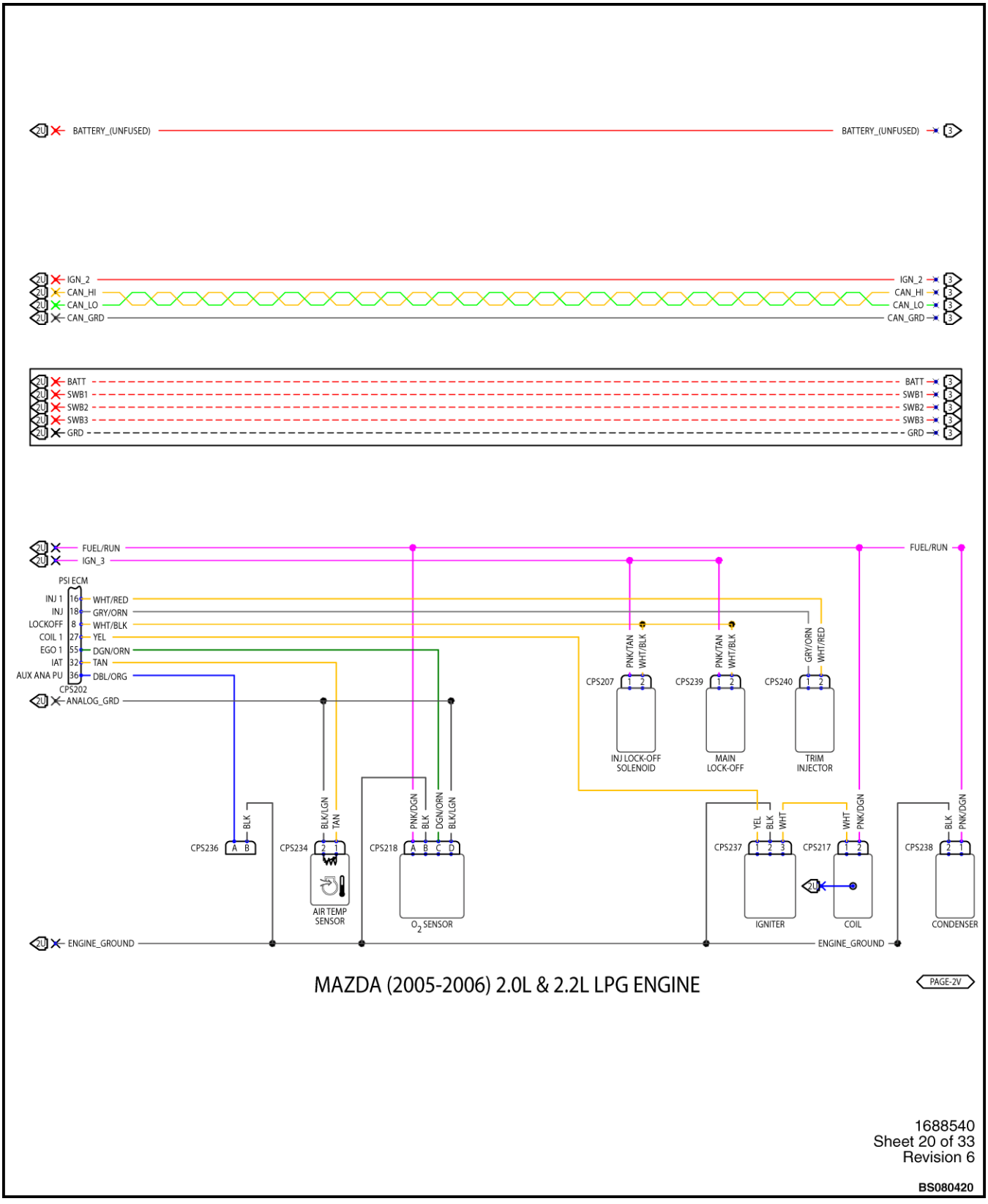


Figure 11. Mazda (2005-2006) 2.0L and 2.2L LPG Engine Electrical Schematic (Sheet 2 of 2)

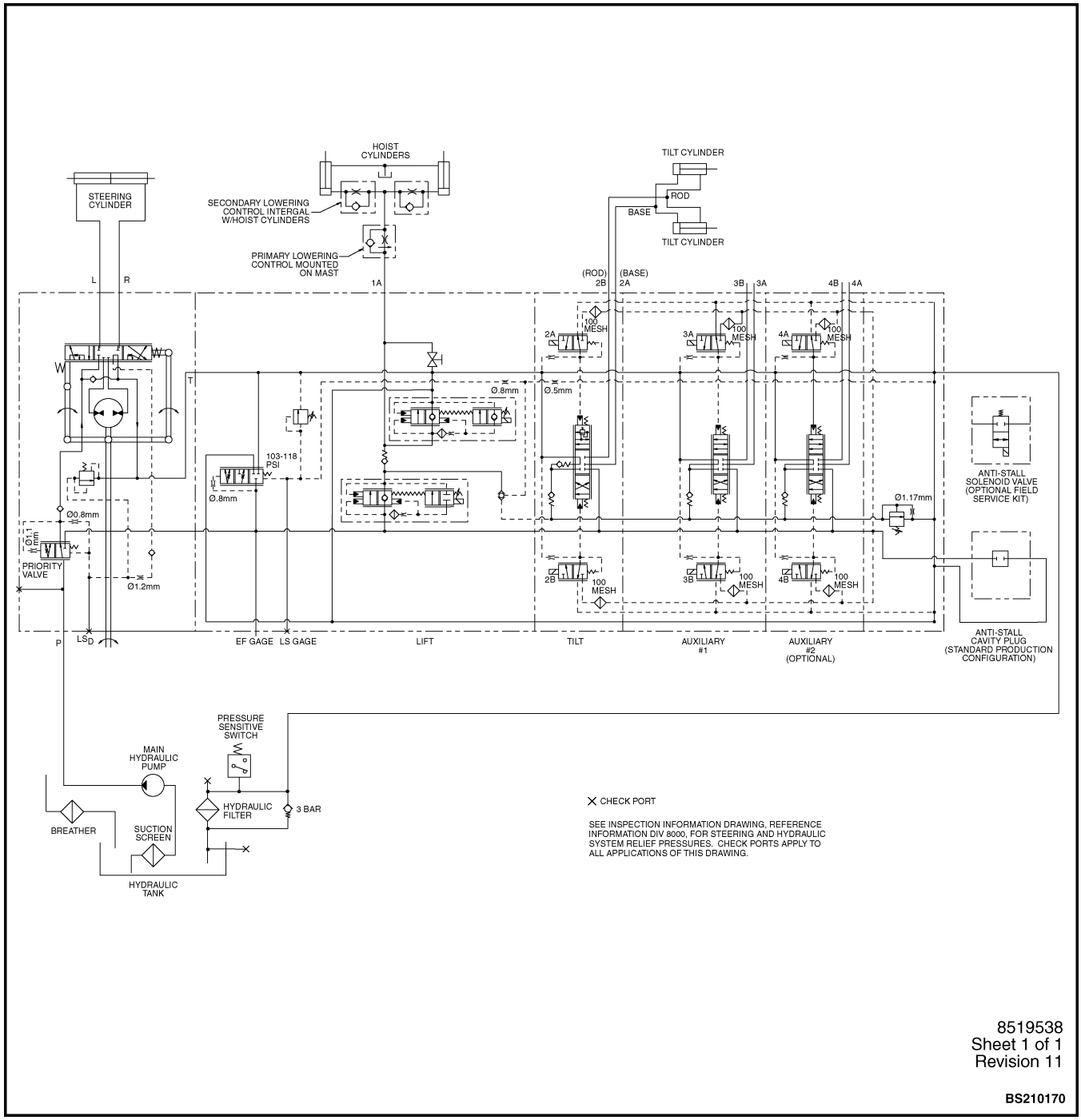
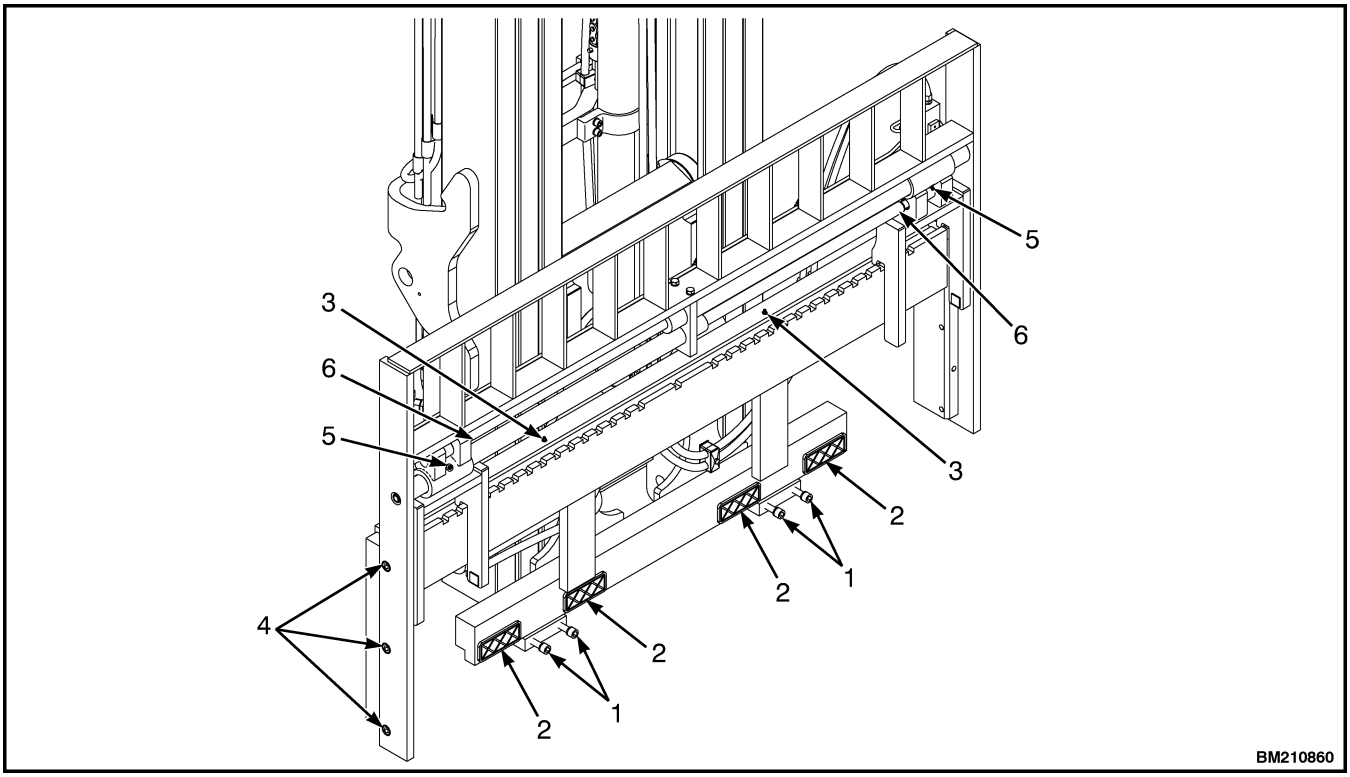


Figure 45. Electronic Control Valve Hydraulic Schematic for Lift Truck Models , Equipped With Hydraulic Gear PumpGC/GLC030VX, GC/GLC035VX, GC/GLC040SVX (C809), GLP/GDP16VX, GLP/GDP18VX, GLP/GDP20SVX (GP/GLP/GDP030VX, GP/GLP/GDP035VX, GP/GLP/GDP040SVX) (C810), GLC20-35VX (GC/GLC040-070VX, GC/GLC055SVX (A910), GLP/GDP20-35VX (GP/GLP/GDP040-070VX) (B875)

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	500 hr/ 6 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	4000 hr/ 2 yr	Procedure or Quantity	Specification
	Mast Integral Sideshift Carriage Sliding Surfaces (Upper and Lower Bearings)	X	L	X			Lubricate as Required (2 fittings for Upper Bearings) and (4 Lower Bearing Strips) Check Bearing Strips for Wear	Multipurpose Grease See **NOTE 7**. 2.5 mm (0.10 in.) Minimum Thickness
	Mast Fork Positioner	X	L	X			Lubricate as Required 2 Fittings	Multipurpose Grease See **NOTE 7**.
	Mast Fork Positioner Cylinder Rod Anchors	X	L	X			Lubricate as Required 2 Anchors	Multipurpose Grease See **NOTE 7**.
	Mast Fork Positioner Socket Head Mounting Capscrews		X				Check Torque 6 Capscrews	145 N•m (110 lbf ft)
	Tilt Cylinder Ends		L				4 Fittings	Multipurpose Grease See **NOTE 7**.
	Brake Actuation Valve Rod End Pin		L					Engine Oil SAE J2362
	Brake System Accumulator				C			See **Parts Manual**
10	Steering Axle Spindle Bearings			L			2 Fittings	Multipurpose Grease See **NOTE 7**.
11	Steering Axle Tie Rods		L				4 Fittings	Multipurpose Grease See **NOTE 7**.
41	Wheel Bearings Steer Wheels				L		Check Grease	Multipurpose Grease See **NOTE 7**.
2	Pedals, Levers, Seat Rails, Cables, Hinges, Linkages, and Rod End Pins			L			Lubricate as Necessary	Use Silicone Spray Yale Part No. 504236201
21	Parking Brake Adjustment		X				Adjust as Necessary	Must Hold a Full Capacity Load on a 15% Grade.

X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation



NOTE: LOWER BAR ON INTEGRAL SIDESHIFT CARRIAGE OMITTED TO SHOW LOWER BEARING STRIPS.

1. INTEGRAL SIDESHIFT CARRIAGE MOUNTING CAPSCREWS
2. LOWER BEARING STRIPS
3. LUBE FITTING FOR UPPER BEARINGS
4. FORK POSITIONER SOCKET HEAD MOUNTING CAPSCREWS
5. FORK POSITIONER CARRIER LUBE FITTINGS
6. FORK POSITIONER CYLINDER ROD ANCHORS

Figure 41. Integral Sideshift Carriage With Fork Positioners, Lubrication Points

7. Check the torque for the fork positioner socket head mounting capscrews, if lift truck is equipped with a fork positioner. The torque values for these capscrews are 145 N•m (110 lbf ft).

3. Apply a rubber lubricant or a soap solution to the tire bead and tube.

4. Install new tire flap.

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.

5. Make sure rim is the correct size for tire. Lubricate part of wheel that contacts bead and flap.

CAUTION

DO NOT use pneumatic-shaped, solid tires on two-piece bolt together drive wheels. Spinning may occur.

6. Install the three-piece or four piece wheel in the tire a shown in Install Three-Piece or Four-Piece Wheel in Tire.

7. Install the two-piece wheel in the tire as shown in Install Tire on Two-Piece Wheel.

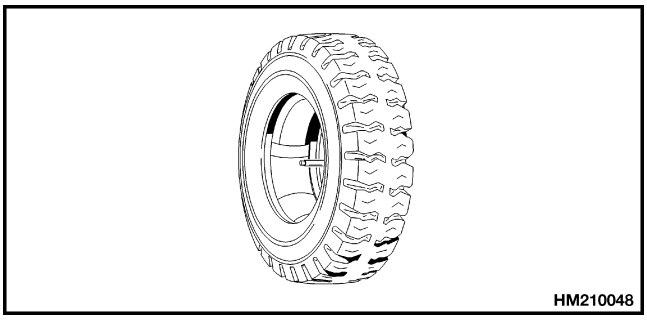
Install Three-Piece or Four-Piece Wheel in Tire

WARNING

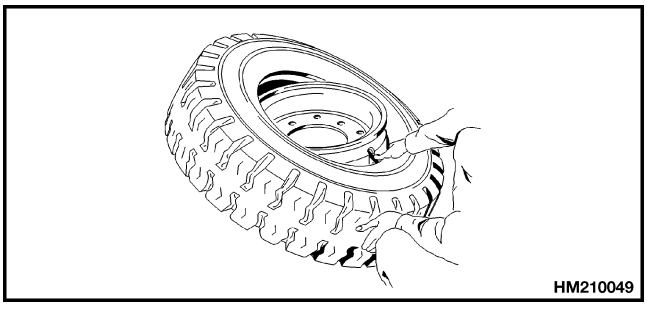
Make sure all of the air pressure is removed from the tire before a wheel is disassembled. Air pressure in the tires can cause the tire and rim parts to explode causing serious injury or death.

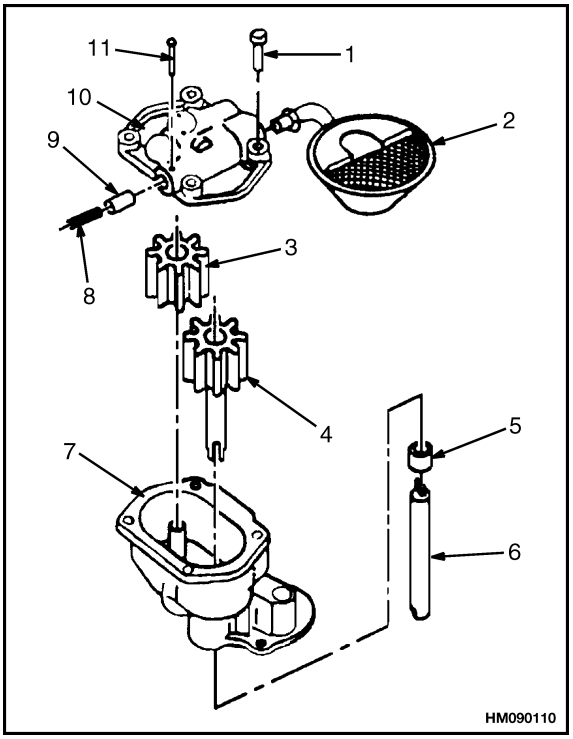
Keep tire tools in firm contact with the wheel parts. If the tool slips, it can move with enough force to cause an injury.

STEP 1.
Install inner tube and rubber flap in tire.



STEP 2.
Install wheel rim in tire. Make sure stem of inner tube is aligned with slot in rim.





1. CAPSCREW
2. SCREEN
3. DRIVEN GEAR
4. DRIVE GEAR
5. RETAINER
6. SHAFT
7. HOUSING
8. PRESSURE VALVE RELIEF SPRING
9. PRESSURE RELIEF VALVE
10. COVER
11. RETAINING PIN

Figure 27. Oil Pump Assembly

Oil Pump, Install

1. Install the oil pump screen.

a. The oil pump screen must have a good press fit into the oil pump body. Use a sealant when replacement of tube and screen assembly is necessary. Do not damage tube during installation.

b. Place the oil pump in a soft jawed vise.

c. Use a soft-faced hammer in order to tap the oil pump screen into the pump body. See Figure 28.

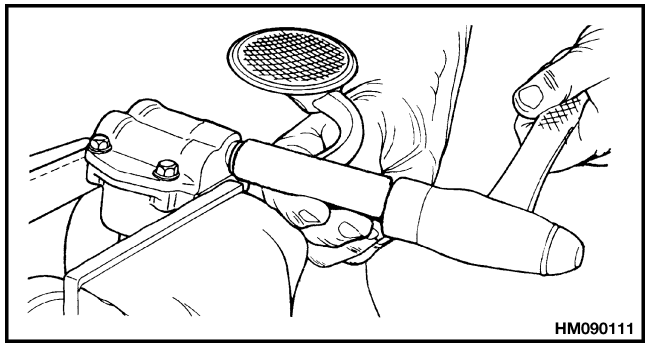
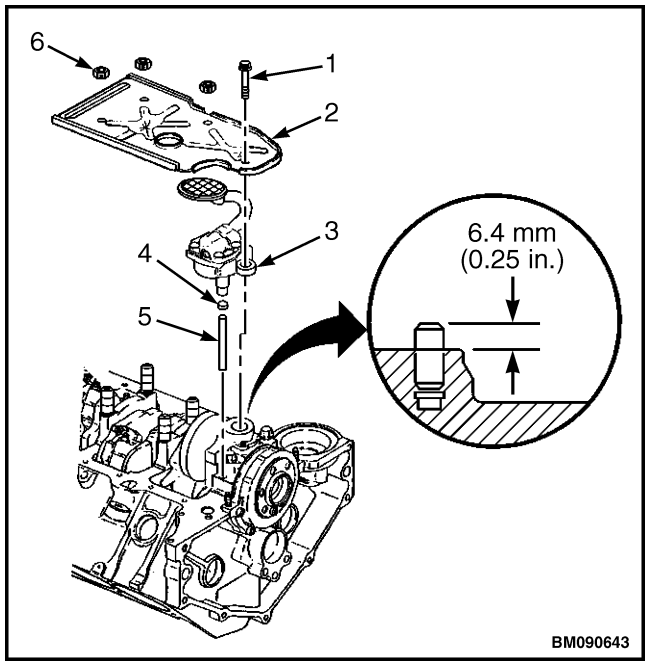


Figure 28. Oil Pump Tube and Screen Installation

d. The oil pump screen must align parallel with the bottom of the oil pan when the oil pan is installed.

e. Install the oil pump driveshaft and the NEW oil pump driveshaft retainer. See Figure 29.



1. CAPSCREW
2. OIL PUMP ASSEMBLY
3. ENGINE
4. DRIVE SHAFT RETAINER
5. DRIVE SHAFT
6. OIL DEFLECTOR NUTS

Figure 29. Oil Pump Installation