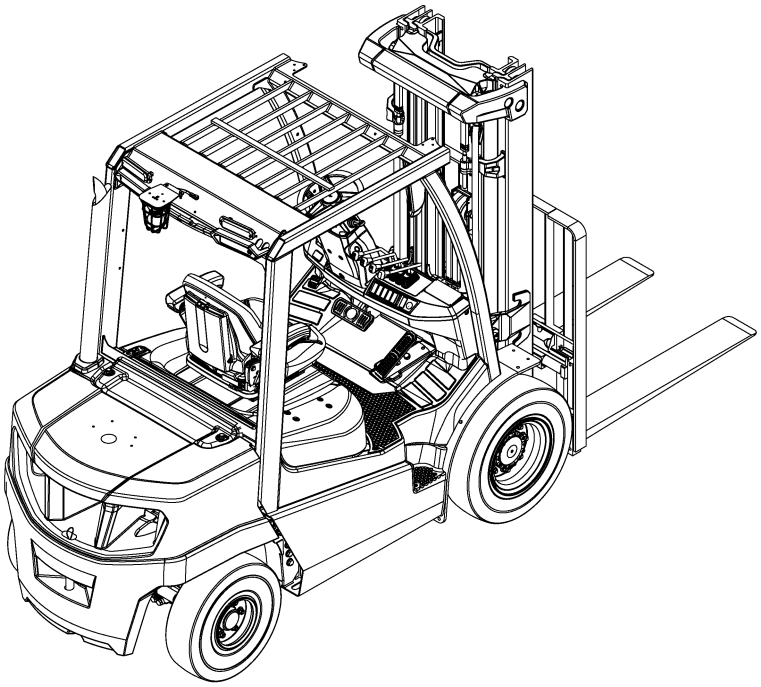
ELECTRICAL, SOFTWARE, AND CONTROLS

H2.0A, H2.5A6, H2.5A, H3.0A, H3.5A (H40A, H50A6, H60A, H70A) [R177]



HYSTER

PART NO. 4277938

2200 SRM 2304

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand; always use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section of the service manual.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER ® APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Strictly follow all **WARNING** and **CAUTION** notes in the operating manual, safety labels, service manual, and other instructions.
- Gasoline, Liquid Propane Gas (LPG), Compressed Natural Gas (CNG), Hydrogen Gas (H2), and Diesel fuels are flammable and potentially explosive. Hydraulic, transmission, and other fluids and oils are also flammable. Be sure to follow the necessary safety precautions when handling these substances or working on systems containing these substances.
- Lead acid batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.
- Lithium-ion batteries should only be used in working environments where the temperature is within the recommended operating range (typically between 0 - 40°C (32 - 104°F)). Extreme temperatures, moisture, improper charging or damage to the battery can cause a fire or explosion.
- Whenever Diagnostic tools are needed for engine, only licensed or certified persons can use Diagnostic tools.

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

WARNING

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

CAUTION

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

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

WARNING

Installing improper electrical accessories or installing an electrical accessory incorrectly can increase the risk of equipment damage, personal injury and fire. DO NOT install electrical accessories to the truck unless you have been trained and authorized to do so. Personnel installing the electrical accessories must document the changes made to the truck. DO NOT install accessories which affect the truck's compliance with standard ANSI/ITSDF B56.1, UL 558, or UL 583, or which otherwise affect the safe operation of the truck.

WARNING

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

WARNING

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

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Introduction

GENERAL
202001-001

NOTE: For any fasteners in this manual that feature standard torque specifications, please refer to **Metric and Inch (SAE) Fasteners** 8000SRM0231 for correct specifications.

DISCHARGING THE CAPACITORS

WARNING

DO NOT make repairs or adjustments unless you have been properly trained and authorized to do so. Improper repairs and adjustments can create dangerous operating conditions. DO NOT operate a lift truck that needs repairs. Report the need for repairs to your supervisor immediately. If repair is necessary, attach a DO NOT OPERATE tag on the steering wheel and disconnect the battery.

Disconnect the battery and discharge the capacitors before opening any compartment covers or inspecting or repairing the electrical system. DO NOT place tools on top of the battery. If a tool causes a short circuit, the high current flow form the battery can cause personal injury or property damage.

Some check and adjustments are performed with the battery connected. DO NOT connect the battery until the procedure instructs you to do so. Never wear any metallic items on your fingers, arms, or neck. Metal items can accidentally make an electrical connection and cause injury. Before performing any tests or adjustments, block the lift truck to prevent unexpected movement.

The capacitors in the transistor controller(s) can hold an electrical charge for about 10 minutes after the battery is disconnected. To prevent an electrical shock and personal injury, discharge the capacitor(s) before inspecting or repairing any component in the drive unit compartment. Make certain that the battery had been disconnected.

DO NOT short across the motor controller terminals with a screwdriver or jumper wire.

Make certain the Emergency-Stop Switch has not been activated. This will isolate the controller and prevent the capacitors from discharging properly. The proper way to disconnect the battery is by separating the battery connectors.

DISCHARGING THE CAPACITORS: For trucks with rapid-charge option, the horn cannot be used to discharge capacitors prior to service. Disconnect the battery, then wait five minutes before performing any service on the truck.

1. Ensure the capacitors are discharged by performing Step 2 through Step 6 below.
2. Turn the key or keyless switch to **OFF** position.
3. Disconnect the battery by separating the connector on the battery cable from the connector on the lift truck.
4. Block the drive wheels to prevent the lift truck from moving.
5. Make sure the Emergency-Stop Switch **HAS NOT** been activated. If the Emergency-Stop Switch is activated, rotate the switch to the right until it pops up.
6. Press the horn button on the steering column. Wait 30 seconds to be sure capacitors are fully discharged. If the horn does not sound when the switch is actuated, wait 10 minutes before proceeding with service.
   For lift trucks equipped with rapid-charge option, the horn cannot be used to discharge capacitors prior to service. Disconnect the battery, then wait five minutes before performing any service on the truck.

Electrical system repair

WIRE HARNESS REPAIR 202001-081

MOLEX MX150 SERIES CONNECTORS

Molex MX150 series connectors can be differentiated by their slightly rounded shell and relatively large radius corners. The Molex MX150 series connectors have multiple key configurations (A, B, C, D). These connectors are keyed to prevent connecting to non-matching connectors and are not interchangeable. The keys are located at the corners of the connector body and vary by number and angle. Typical MX150 series connectors on this truck are either a 2x4 or a 2x10 pin configuration.

Audible and tactile clicks on insertion, extraction and mating feedback facilitate reliable mating and terminal loading and removal. Plastic seal plugs are available to plug and seal unused circuits. Integral locking latch, Terminal Position Assurance (TPA), with secondary pre-loaded Connector Position Assurance (CPA) option assures that connector system is properly latched. The CPA will not move to final locked position if connector is not latched. Terminal insertion and extraction field repairs are achieved using a common screw driver, needle nose pliers, and the terminal service tool. The mat seal cap protects, securely retains, and provides strain relief to wire seal interface. Simple crimp, poke and plug application eliminates need to crimp individual wire seals.

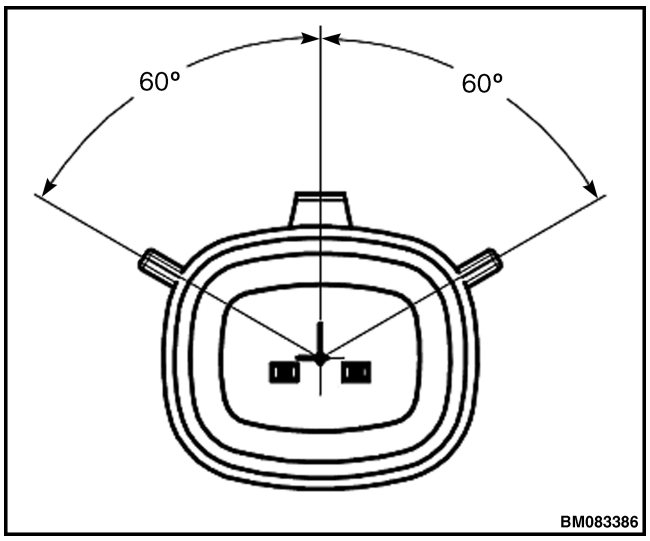


Figure 1. Connector Plug, Key A

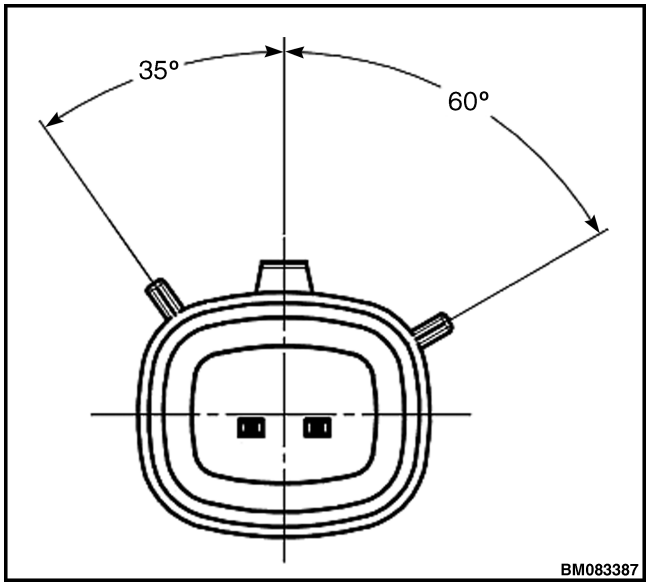


Figure 2. Connector Plug, Key B

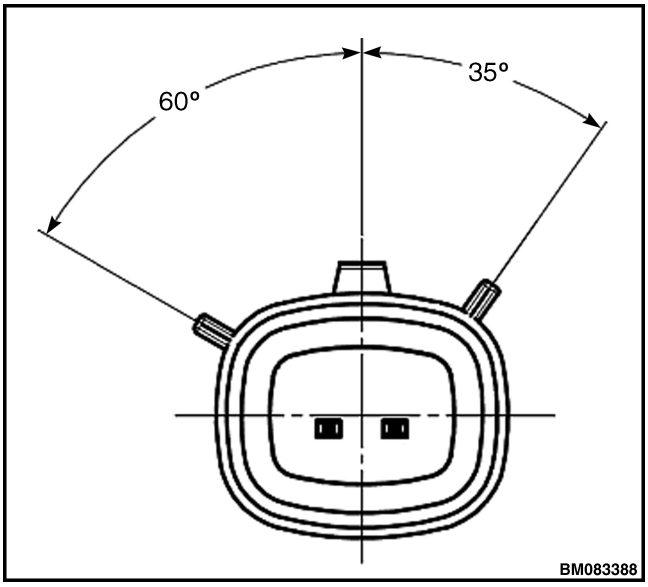


Figure 3. Connector Plug, Key C

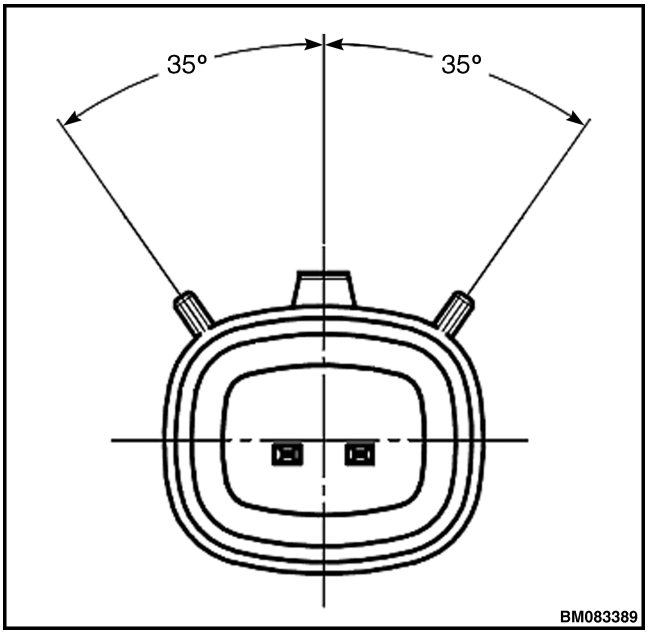


Figure 4. Connector Plug, Key D

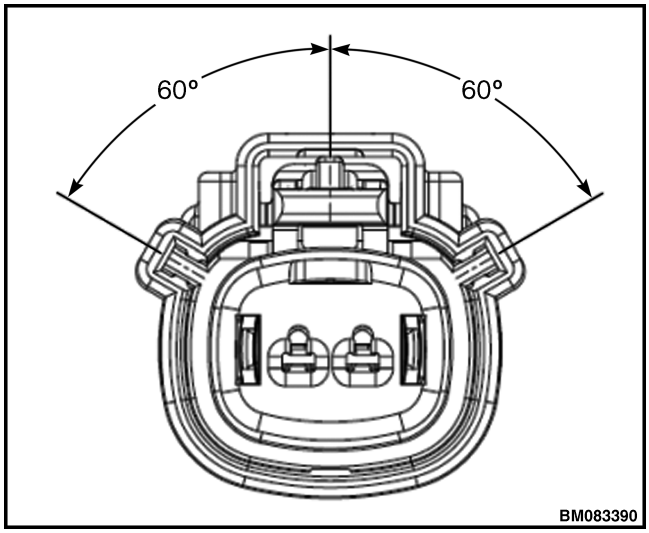


Figure 5. Connector Receptacle, Key A

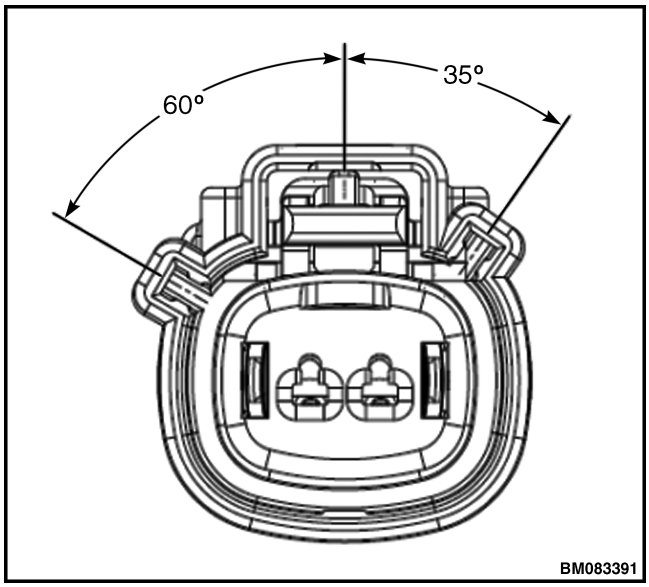


Figure 6. Connector Receptacle, Key B

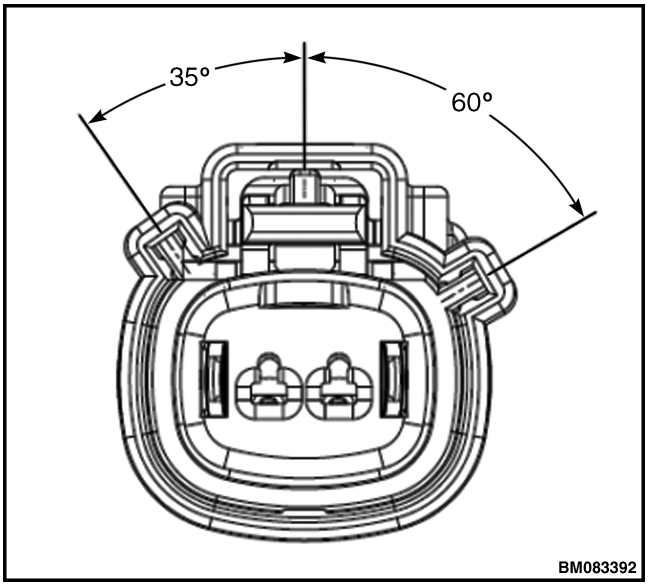


Figure 7. Connector Receptacle, Key C

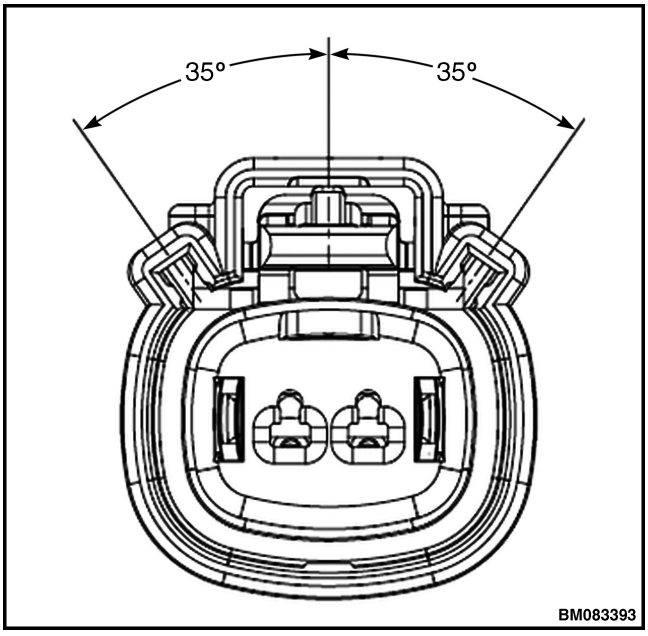
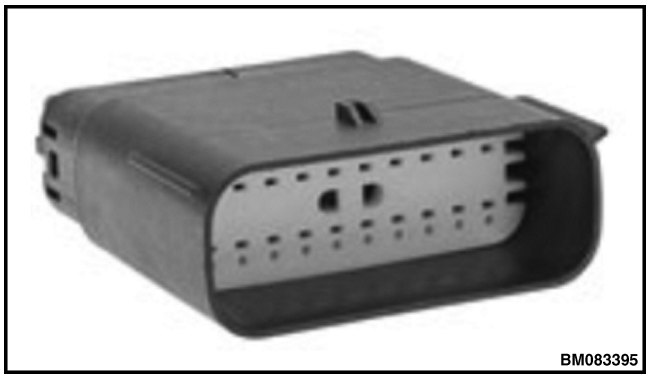


Figure 8. Connector Receptacle, Key D

NOTE: CONNECTOR PLUG SHOWN WITHOUT TERMINAL SOCKETS.

Figure 9. Connector Plug

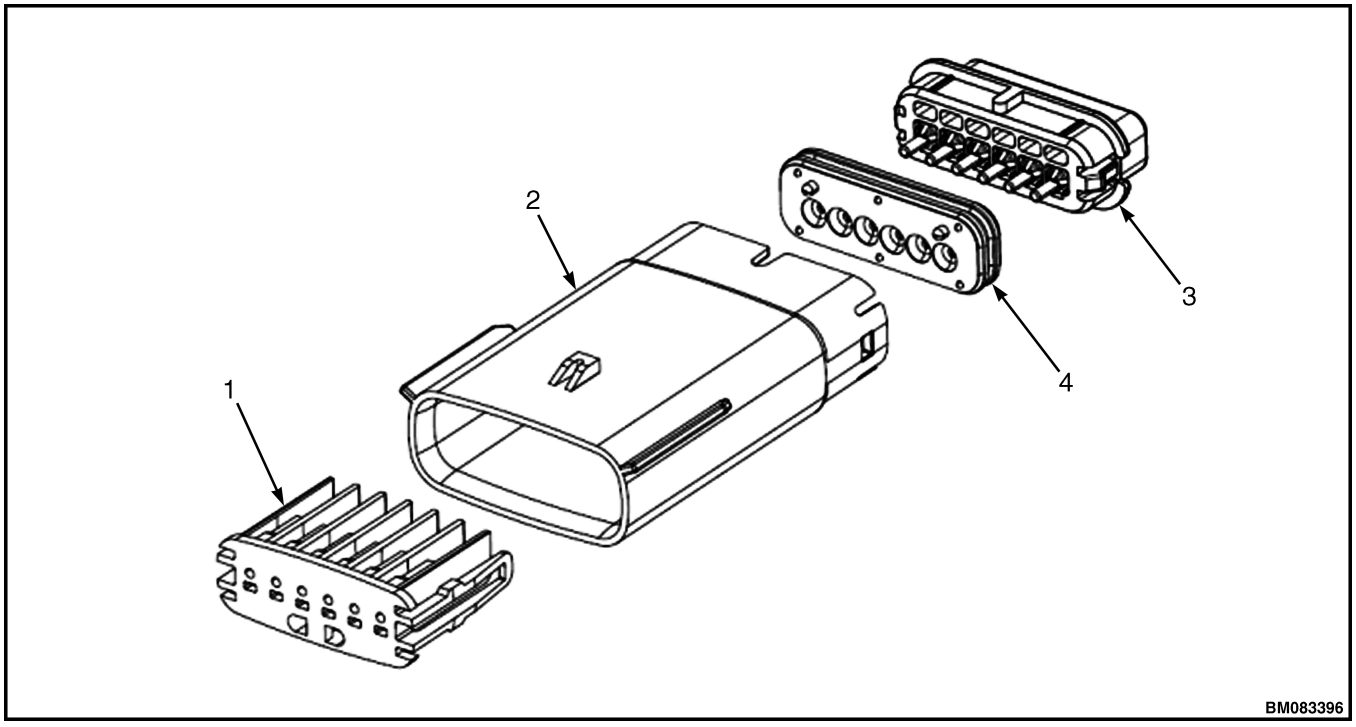


NOTE: CONNECTOR RECEPTACLE SHOWN WITHOUT TERMINAL PINS.

Figure 10. Connector Receptacle

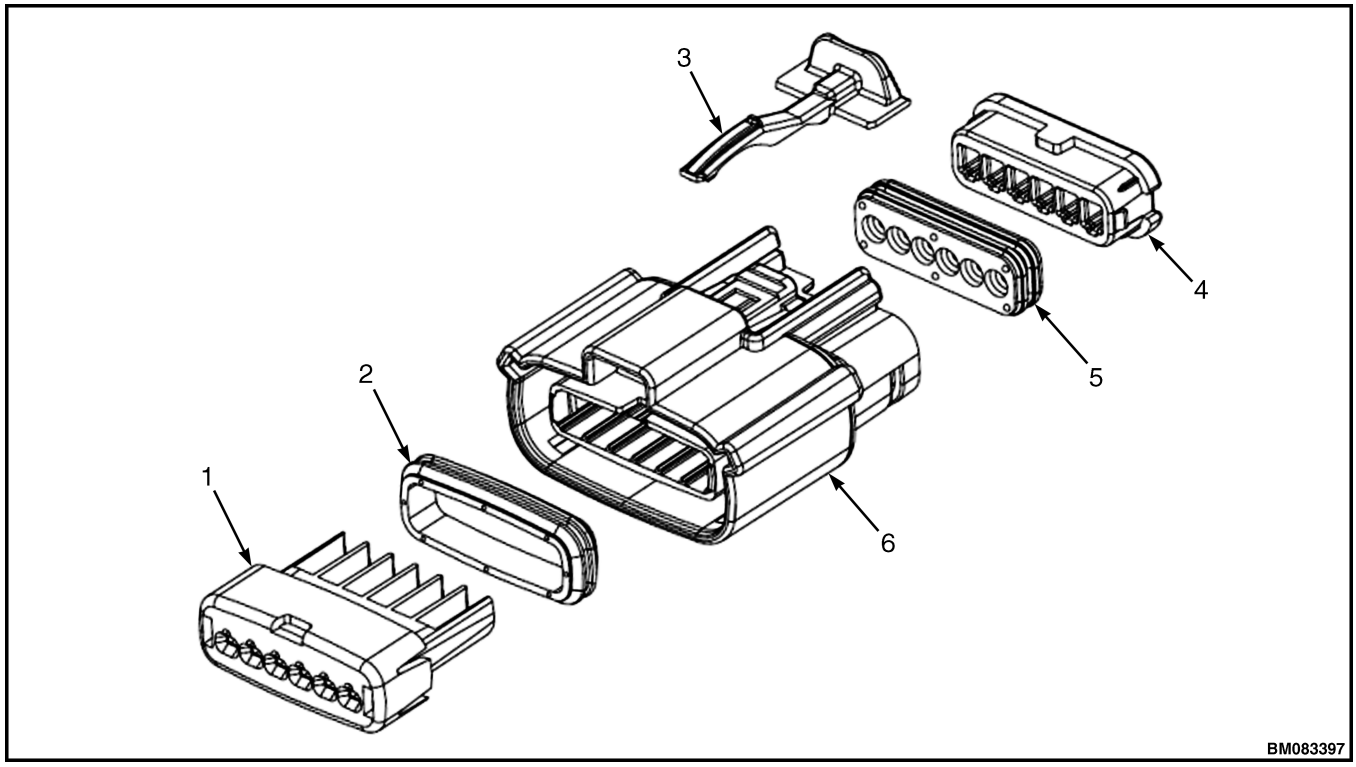
To help differentiate one Molex connector from another the color of the connector body may also be different. The plug and receptacle are the two primary functional parts to a mated set of Molex connectors. All parts to the connector assemblies are the front terminal lock, front weather seal, connector body, back weather seal, top connector latch lock, and back comb.

NOTE: All discrete components shown below for both the receptacle and plug housings are preassembled. Terminals are simply crimped and poked into the housings. No additional wire seals, wedge locks or CPA locks are required.



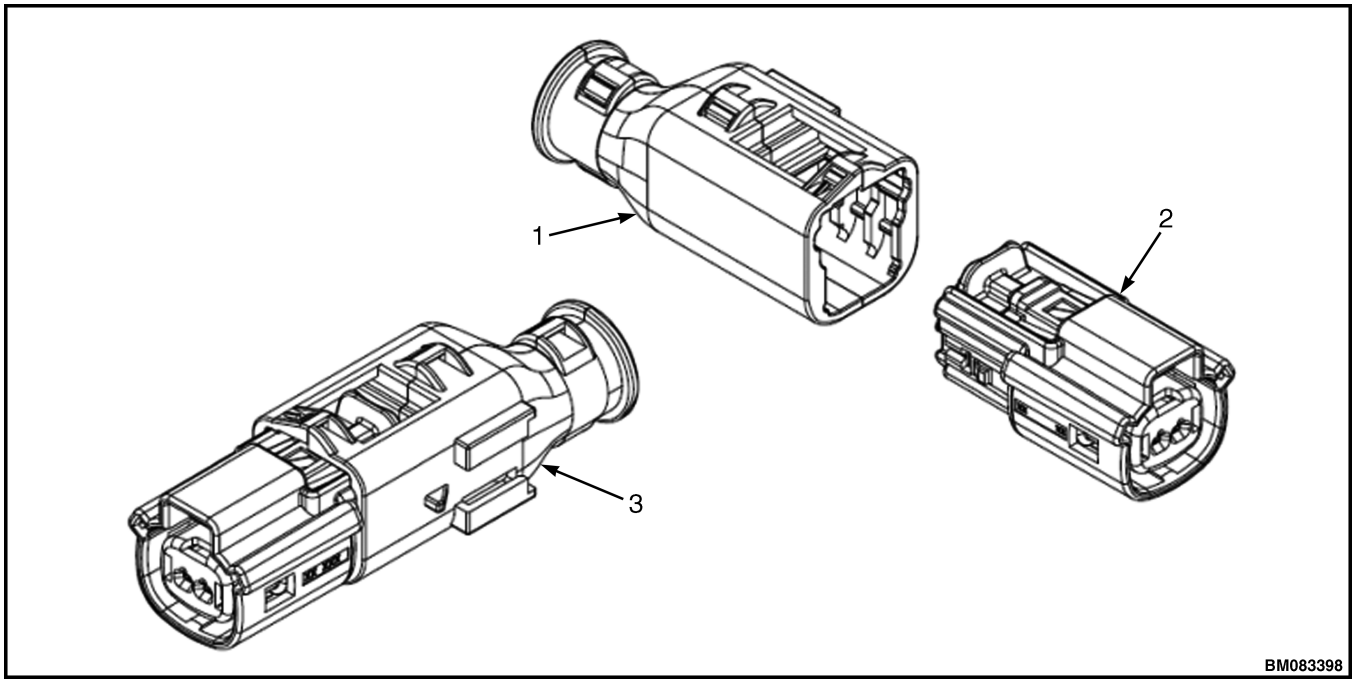
1. TERMINAL POSITION ASSURANCE (TPA)
2. CONNECTOR HOUSING
3. GROMMET CAP
4. MAT SEAL

Figure 11. Connector Receptacle (Exploded View)



1. TERMINAL POSITION ASSURANCE (TPA)
2. RING SEAL
3. CENTER POSITION ASSURANCE (CPA) - OPTIONAL
4. GROMMET CAP
5. MAT SEAL
6. CONNECTOR HOUSING

Figure 12. Connector Plug (Exploded View)



1. BACKSHELL
2. RECEPTACLE SEALED ASSEMBLY
3. BACKSHELL AND RECEPTACLE ASSEMBLED

Figure 13. Backshell and Receptacle

MX150 Locations

The MX150 connectors are used for connection to the Vehicle System Manager (VSM), IBOX, and OBOX.

Device and Connection	Molex Harness Side Connector Type					
	2x4 (Key A)	2x4 (Key B)	2x10 (Key A)	2x10 (Key B)	2x10 (Key C)	2x10 (Key D)
VSM	V1		V2	V3	V4	V5
IBOX		I1	I2			
OBOX		O1		O2		

MOLEX MX150 SERIES TERMINALS

The terminals push to seat in the Molex MX150 series connectors. The terminals are an *open* barrel design common to many applications. The Molex MX150 terminals in this way are unlike Deutsch *closed* barrel terminal. The front terminal lock is typically a lighter color than the connector body and installed on the front face of the connector body. When the front lock is engaged in the connector, the surface is even or slightly inset from the edge of the connector body. The front seal is typically a bright identifiable color to make it easier to determine it is or is not installed. When installed the front seal fits around the plug toward the back of the connector. The back seal is also a bright identifiable color and can be seen through the back terminal comb if installed.

Inspecting Wiring Terminals and Connectors

NOTE: Crimped terminals can be weak and unreliable if the terminal is not crimped on both the insulation (for strain relief) and the stripped section of wire. Intermittent (or difficult to troubleshoot) electrical problems can be avoided by creating connections that are mechanically and electrically strong.

1. Pull on terminals and wires to make sure there is a strong mechanical connection.
2. Visually inspect terminals and wiring for damage or suspect terminations.
3. Inspect the connector and weather seal before seating newly crimped terminal in the connector.
4. Repair as required.

Removing Terminated Wires from Plug Connector

NOTE: Do not attempt to remove a terminal without first disengaging the terminal from the connector. Disengaging individual tabs on a terminal will release just the individual terminal.

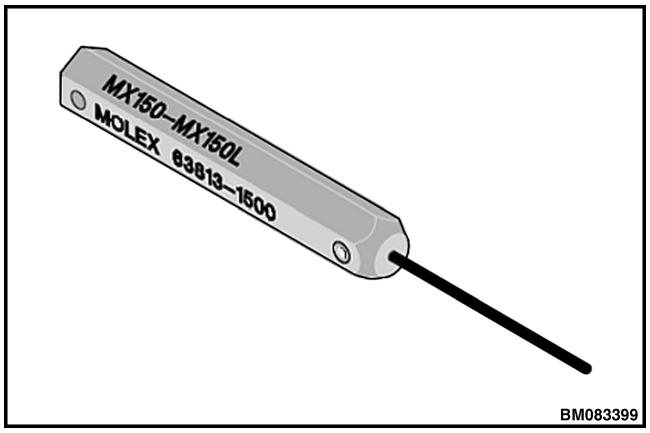
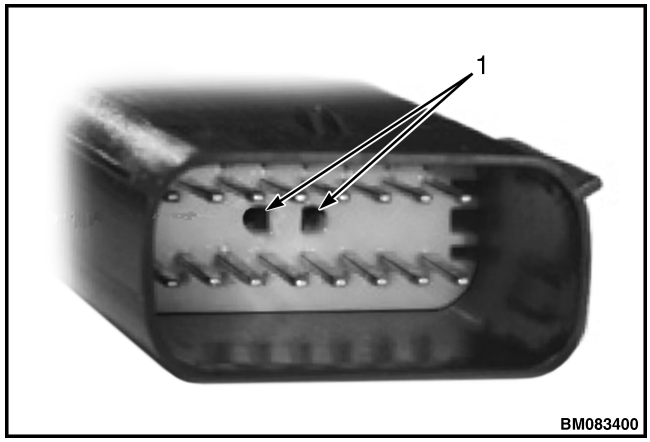


Figure 14. Molex Service Tool

1. Use standard needle nose pliers to return TPA to pre-lock position.



1. NEEDLE NOSE PLIERS INSERTION LOCATION

Figure 15. Needle Nose Pliers Insertion Location

2. Insert needle nose pliers into service hole and carefully pull TPA.

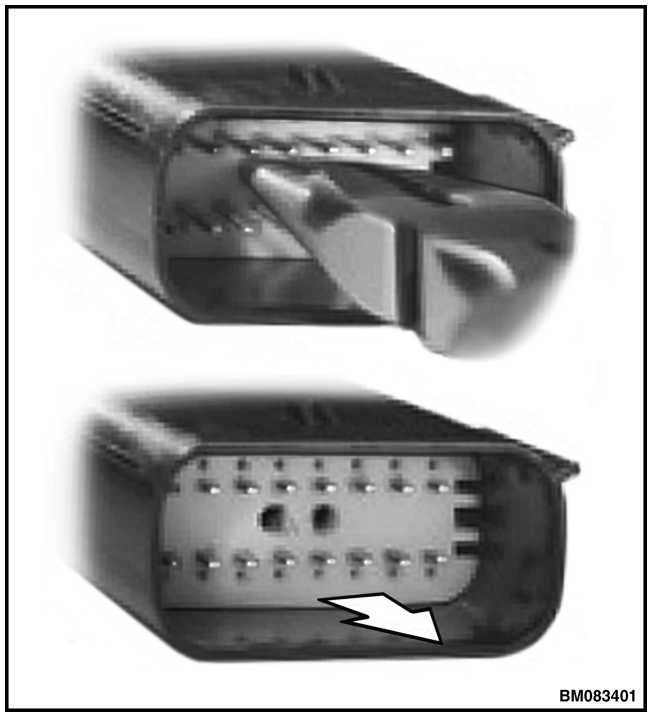
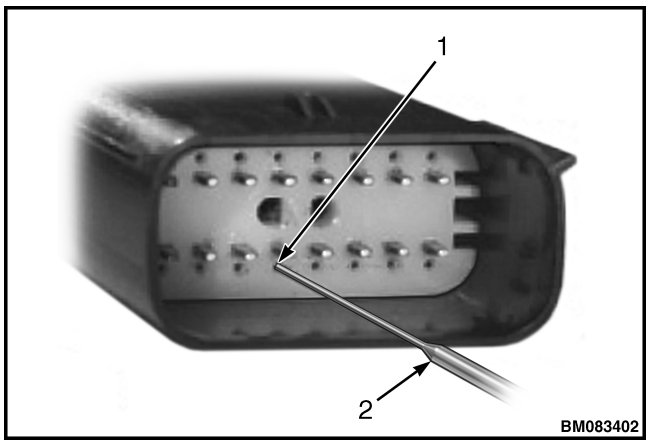


Figure 16. Needle Nose Pliers Inserted

3. Listen for loud audible click.



1. TERMINAL RELEASE SERVICE HOLE
2. SERVICE TOOL INSERTED

Figure 17. Service Tool Inserted

4. Insert service tool into the small round hole (near terminal) and press inward to release terminal from connector assembly.

5. Pull the wire out of the back of the connector.

Removing Terminated Wires from Receptacle Connector

NOTE: Do not attempt to remove terminated wiring without first disengaging the connector terminal lock. Also note the terminal lock retains all terminals in a connector. Once a lock is disengaged all terminals will be lose in the connector.

NOTE: It is not necessary to remove the terminal lock from the connector. The terminal lock only needs disengaged and moved just past the edge of the connector shell.

1. Carefully insert a standard screwdriver into the slot on top of the TPA.

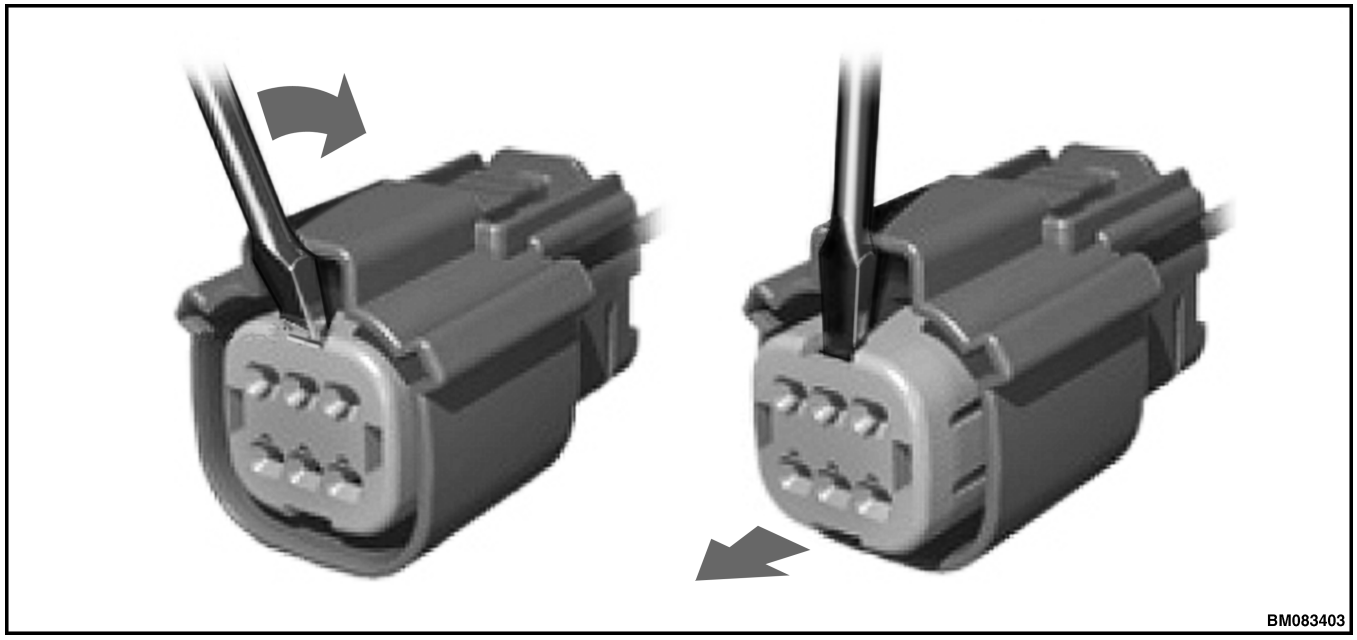
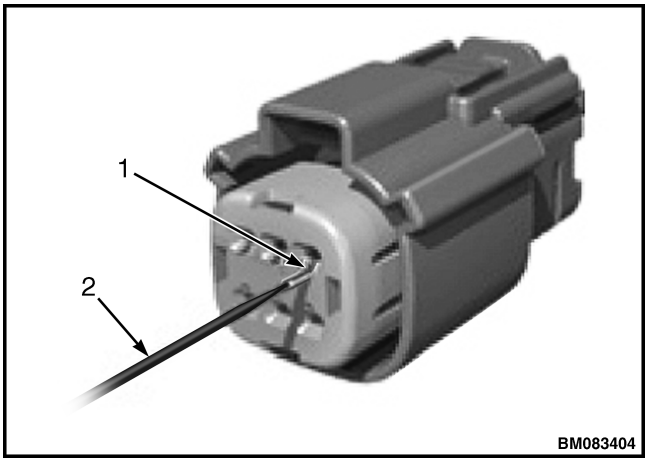


Figure 18. Inserting Screwdriver

2. Carefully pry TPA forward and listen for an audible click. TPA is now in pre-lock position.



1. TERMINAL RELEASE SERVICE HOLE
2. SERVICE TOOL INSERTED

Figure 19. Service Tool

3. Insert service tool into the small round hole (near terminal) and press inward to release terminal from connector assembly.

4. Pull terminal from rear of connector.

Installing Terminated Wires into Plug or Receptacle Connector

Assure housing TPA is in pre-lock position. Align polarization feature on terminal with keyway in seal cap. Insert terminal and push until seated. Push receptacle TPA back to locked position. Plug TPA will return to locked position when mated with receptacle housing.

Wire Terminals

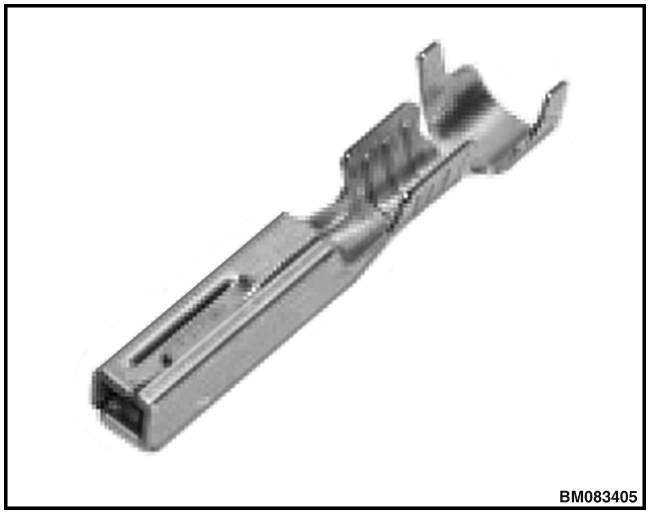


Figure 20. Receptacle Terminal

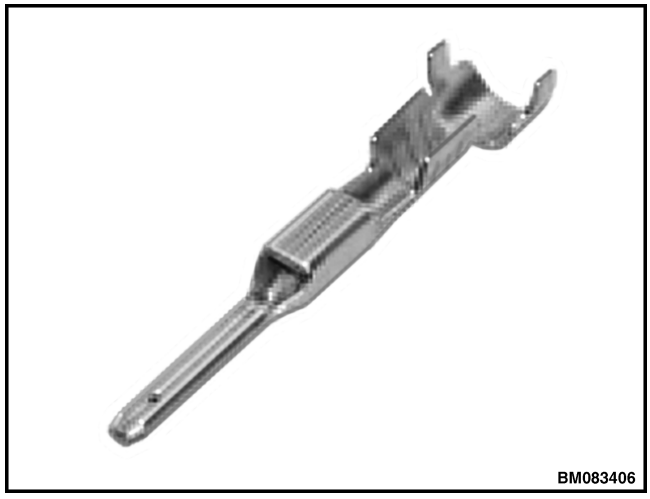


Figure 21. Blade Terminal

Unused Cavity Circuit Plug

The optional circuit plugs seal blank cavities in both plug and receptacle housings. The circuit plugs occupy and fully seal the unused cavity and can be extracted and replaced with a blade terminal or receptacle terminal.

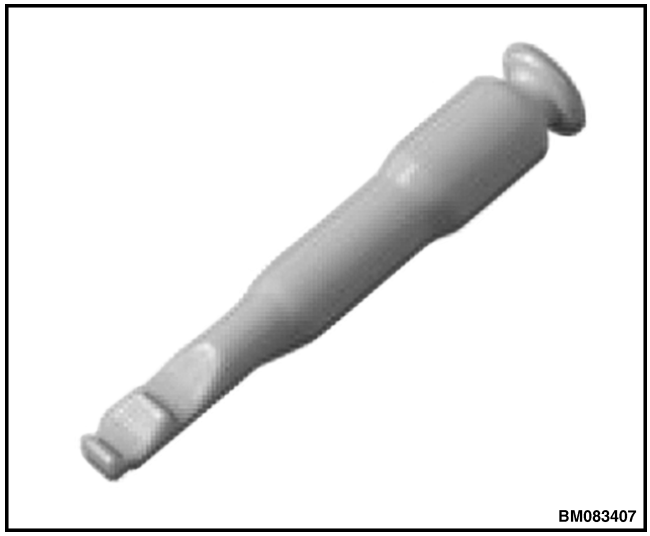


Figure 22. Unused Cavity Circuit Plug

Stripping Wire for Molex MX150 Series Terminals

NOTE: Damaging a wire during stripping can create intermittent electrical faults that are difficult to troubleshoot. After stripping a wire inspect exposed wire for nicked, cut, or pulled strands.

Repeat the process until a flawless stripped wire is exposed. When too much insulation is removed the terminal can NOT be properly secured to the insulation for strain relief.

NOTE: Mismatching the terminal size with wire gauge will create poor connections resulting in a weak connection. Insulation thickness can mislead and also lead to a poor connection. Always use a wire gauge tool for confirming accurate wire gauge size.

1. Determine the gauge of the wire to strip.
2. Choose the correct terminal type (for example MX 150) and socket type.
3. Measure the length of the crimp over the bare portion of the wire to determine the length to strip.
4. Use matching gauge cutter of wire strippers and remove the insulation from the wire.
5. Inspect wire for any damage and repeat if necessary.

Poor Wire Stripping Examples

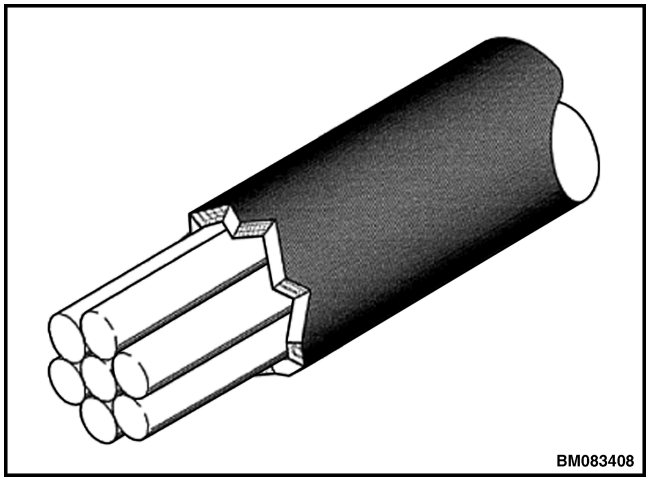


Figure 23. Irregular Insulation Cut

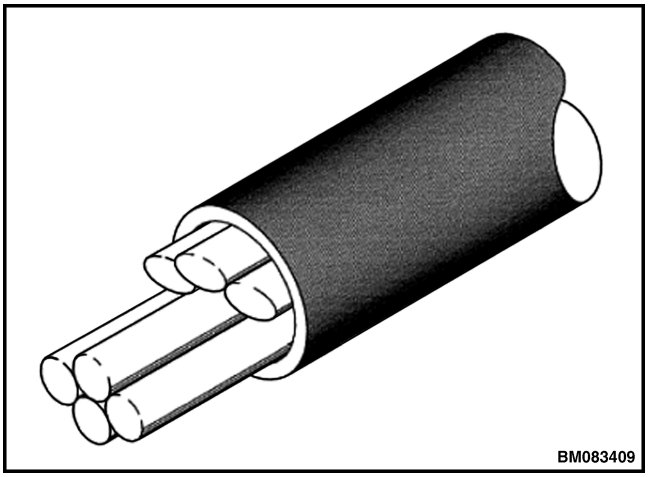


Figure 24. Cut Wire Strands

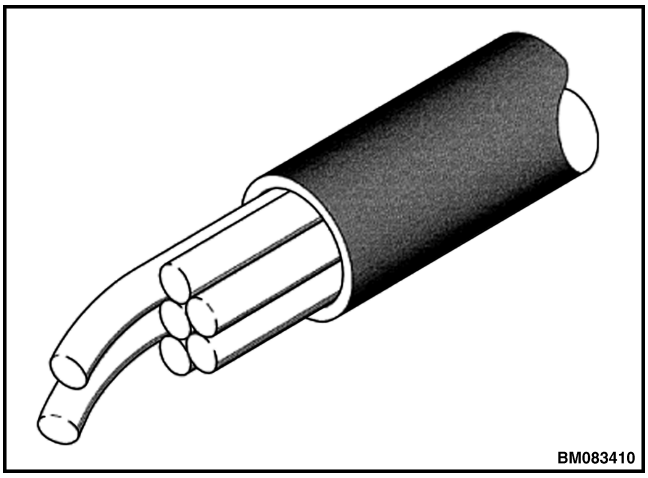


Figure 25. Pulled Wire Strands

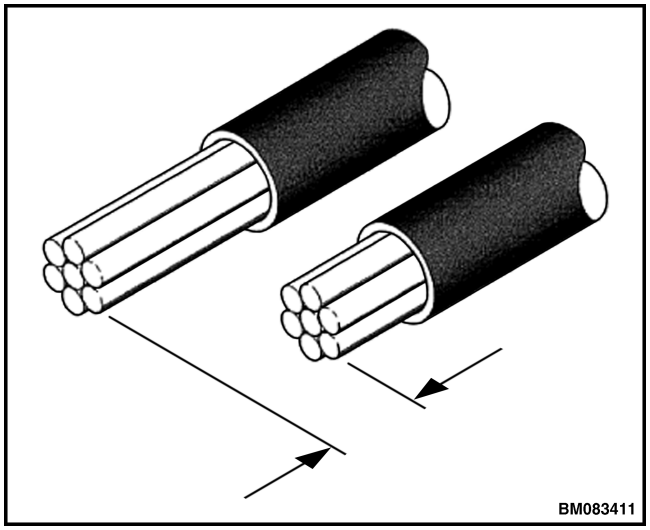


Figure 26. Wrong Strip Length

Crimping Molex MX150 Series Terminals

NOTE: Terminals can be damaged and cause intermittent electrical faults if crimping is performed poorly. Use a crimper specified for open barrel Molex terminals. A quality, preferably ratcheting, crimper with a die set for open barrel terminals will be sufficient.

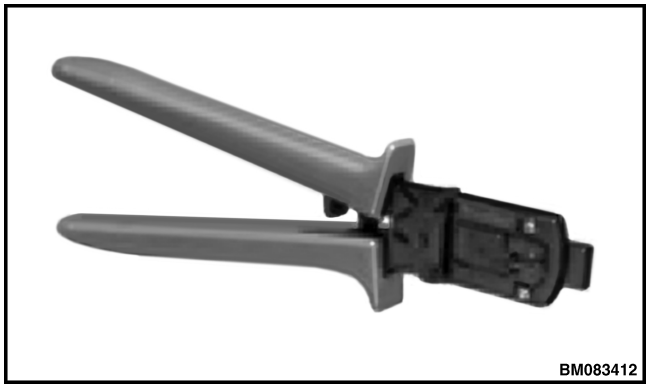
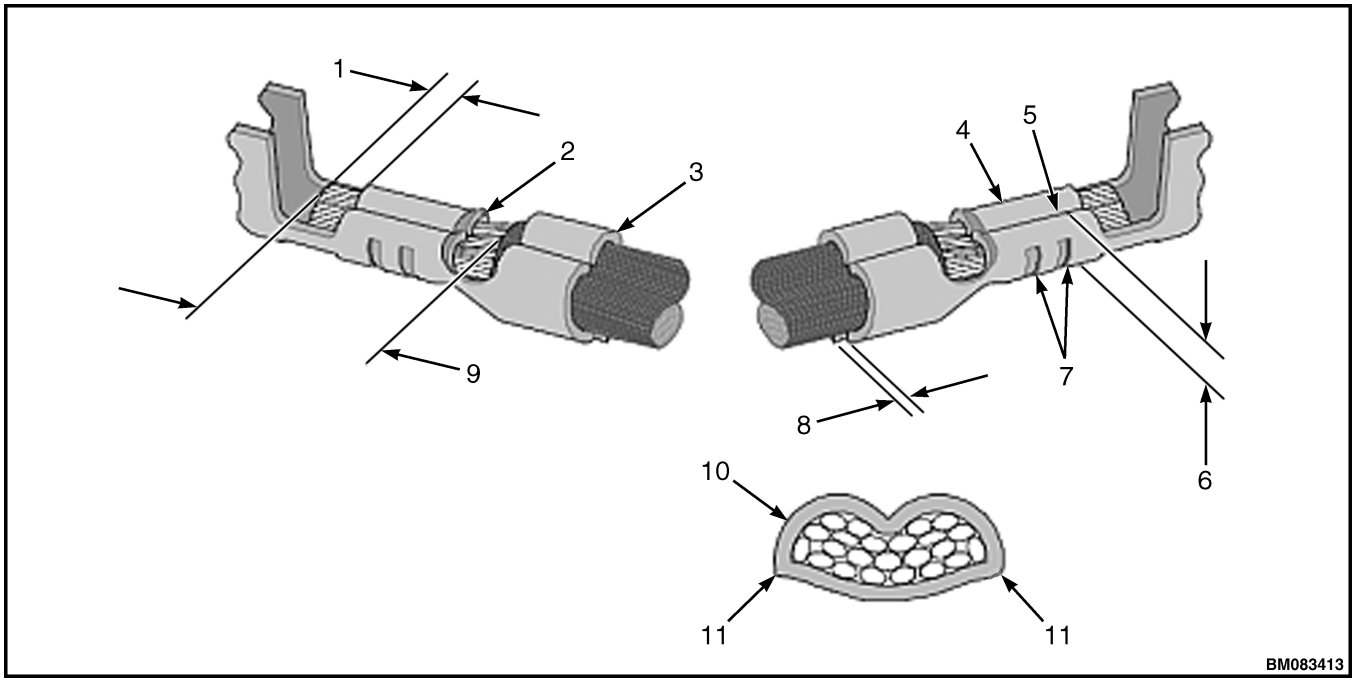


Figure 27. Molex Hand Crimp Tool

NOTE: Crimped terminals can be weak and unreliable if the terminal is not crimped on both the insulation and the conductor. Make sure the stripped wire allows both the insulation and conductor to be crimped properly. Both the insulation and exposed wire crimp locations need to be crimped.



1. BRUSH
2. BELL MOUTH
3. INSULATION CRIMP
4. CONDUCTOR CRIMP
5. SEAM
6. CRIMP HEIGHT
7. EXTRUSIONS
8. CUT-OFF TAB
9. STRIP LENGTH
10. TERMINAL CROSS SECTION VIEW
11. EXTRUSION

Figure 28. Example of Good Crimping

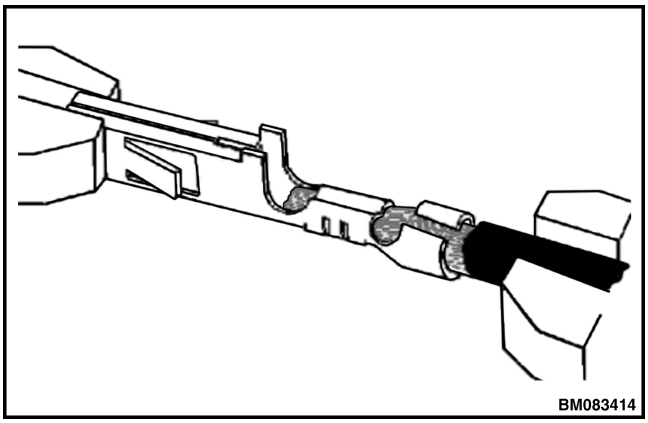


Figure 29. Example of Poor Crimping (Insulation Not Crimped)

1. Determine the type and gender of the terminal needed. Refer to the Parts Manual for current types of terminals and connectors.

2. Choose the terminal and place it in the Molex crimper.

3. Insert the wire into the terminal and check the fit to make sure bare wire and insulation can be crimped.

SENSORS, RELAYS, AND OTHER ELECTRICAL COMPONENTS REPAIR 202001-082

SENSORS, RELAYS, AND OTHER ELECTRICAL COMPONENTS REPAIR

CAUTION

Before removing and replacing any sensors or switches, ALWAYS disconnect the battery. Failure to disconnect the battery can cause damage to the sensor or switch and other electrical components. Always cover or protect the sensor or switch connector from contamination after disconnecting the harness mating part.

DO NOT use solvent-based cleaners to clean area around sensors or switches.

All sensors and switches on this truck are non-repairable parts. Replace with new sensors or switches whenever a sensor or switch malfunctions and is not operating correctly. See **Parts Manual** for replacement part numbers. Before installing new sensors or switches, use a clean cloth and make sure the area around the sensor or switch is clean and free of oils and contaminates.

When removing and replacing sensors or switches, be sure to tag connectors to aid in correct reconnecting.

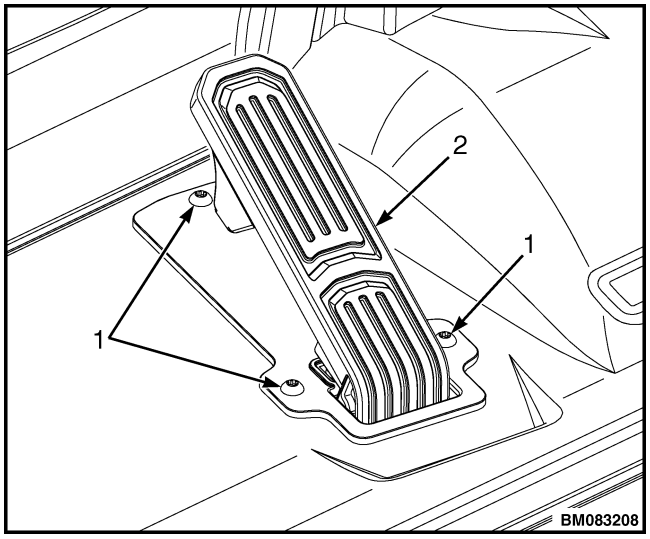
ACCELERATOR PEDAL POSITION SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the floor mat and floor plate. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

3. Remove the three screws and nuts holding the accelerator pedal to the floor plate bracket.

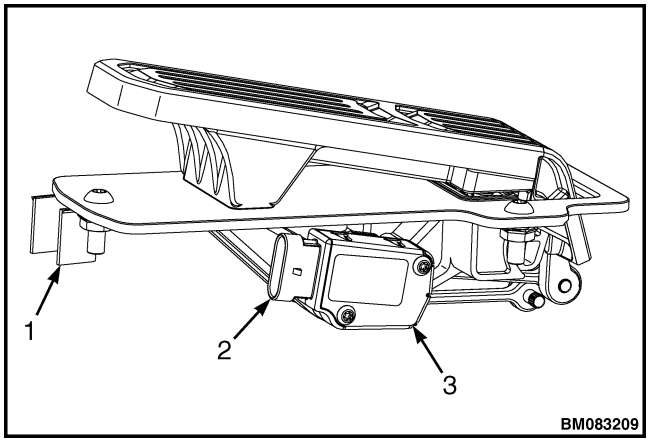


1. SCREWS AND NUTS
2. ACCELERATOR PEDAL

Figure 30. Accelerator Pedal and Floor Plate

NOTE: Some components in graphic have been removed for clarity.

4. Disconnect the electrical connector from the accelerator pedal position sensor.



1. FLOOR PLATE BRACKET
2. ELECTRICAL CONNECTOR
3. ACCELERATOR PEDAL POSITION SENSOR

Figure 31. Accelerator Pedal and Sensor

NOTE: Replace the accelerator pedal and accelerator pedal position sensor as a unit.

5. Remove the accelerator pedal and accelerator pedal position sensor from the floor plate.

Install

1. Install the accelerator pedal and accelerator pedal position sensor to the floor plate.
2. Insert the three screws to retain the accelerator pedal to the floor plate bracket and secure with the three nuts.
3. Tighten the screws to 7.6 to 11.6 N•m (5.6-8.5 lbf ft).
4. Connect the electrical connector to the accelerator pedal position sensor.
5. Install the floor mat and floor plate. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.
6. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

ENGINE AND FUEL SENSORS AND SWITCHES, YANMAR DIESEL ENGINE

Air Filter Restriction Switch

NOTE: The air filter restriction switch is an option and is a part of the Electronic Monitoring package option.

Remove

1. Raise the hood and the disconnect battery. Refer to Battery Remove and Install for details.
2. Disconnect the electrical connector from the air filter restriction switch.
3. Remove the air filter restriction switch from the air cleaner. See Figure 32.

Install

1. Install the air filter restriction switch into the air cleaner.
2. Connect the air filter electrical connector.
3. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Oil Pressure Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Disconnect the electrical connector for the oil pressure sensor.
3. Remove the oil pressure sensor. See Figure 32.

Install

1. Install the oil pressure sensor on the engine.
2. Tighten the sensor to 9 N•m (6.6 lbf ft).
3. Connect the oil pressure sensor electrical connector.
4. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Engine Speed Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Disconnect the electrical connector from the engine speed sensor.
3. Remove the capscrew from the engine speed sensor bracket. Remove the bracket and engine speed sensor. See Figure 32.

Install

1. Install the engine speed sensor to bracket. Install engine speed sensor and bracket to engine with capscrew.
2. Connect the electrical connector to the engine speed sensor.
3. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Engine Coolant Temperature (ECT) Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Drain the engine coolant from radiator before removing the ECT sensor. Refer to **Cooling system** 0700SRM2300 for procedures.
3. Disconnect the ECT sensor connector. See Figure 32.
4. Remove the ECT sensor and packing from the intake manifold. Discard copper washer.

Install

1. Install new copper washer onto the ECT sensor. Install new ECT sensor and new packing. Tighten the ECT sensor to 25-34 Nm (18-25 lbf-ft). See Figure 32.
2. Connect the ECT sensor connector.
3. Refill the radiator with engine coolant after replacing the ECT sensor. See **Periodic Maintenance** 8000SRM2305 for coolant specifications and procedures.
4. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

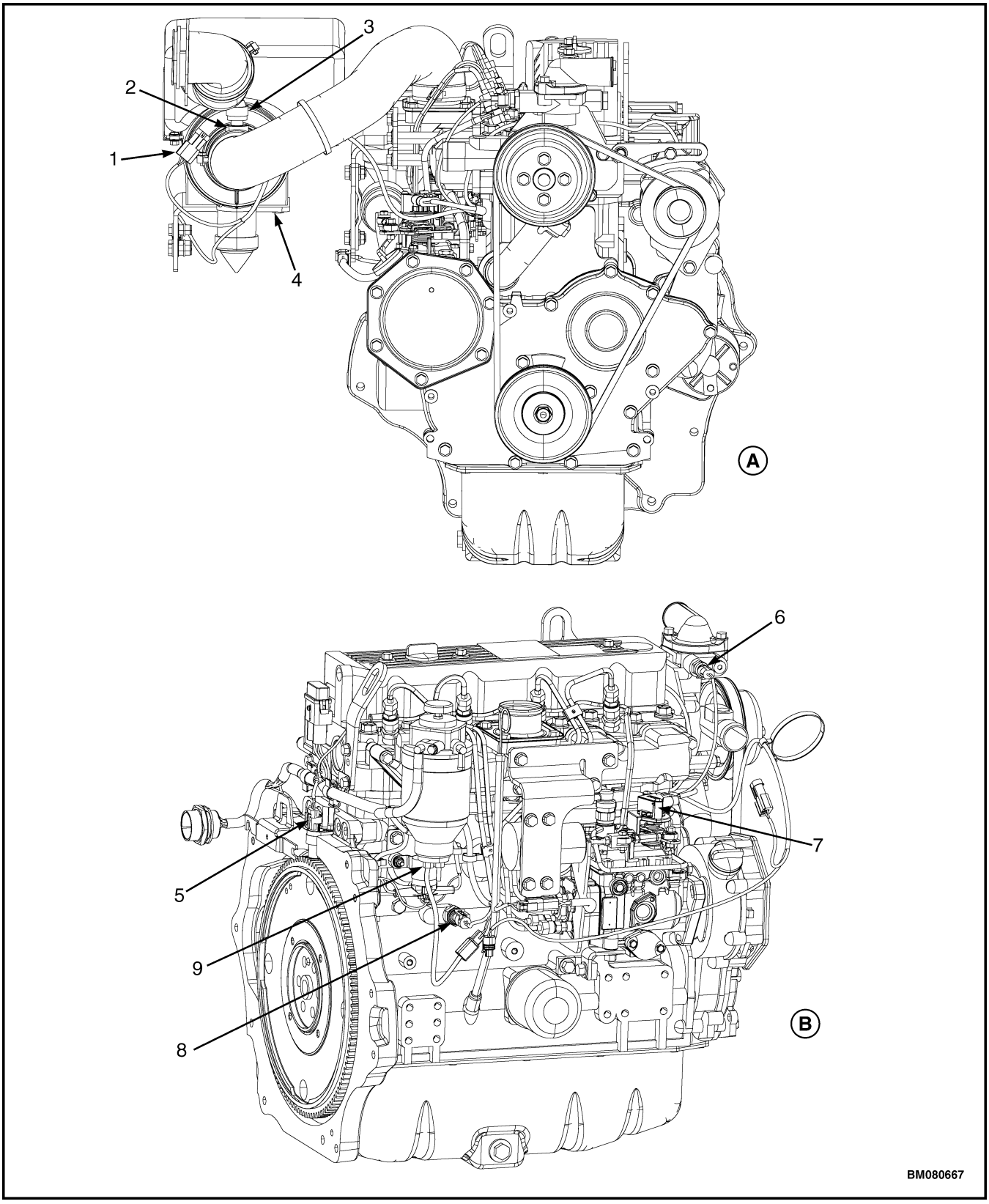


Figure 32. Yanmar Diesel Engine Sensors and Switches

Legend for Figure 32.

A. FRONT VIEW

1. AIR FILTER RESTRICTION SWITCH ELECTRICAL CONNECTOR
2. AIR CLEANER
3. AIR FILTER RESTRICTION SWITCH
4. AIR CLEANER BRACKET
5. ENGINE SPEED SENSOR

B. SIDE VIEW

6. ENGINE COOLANT TEMPERATURE SENSOR
7. THROTTLE POSITION SENSOR
8. ENGINE OIL PRESSURE SENSOR
9. FUEL/WATER SEPARATOR SENSOR

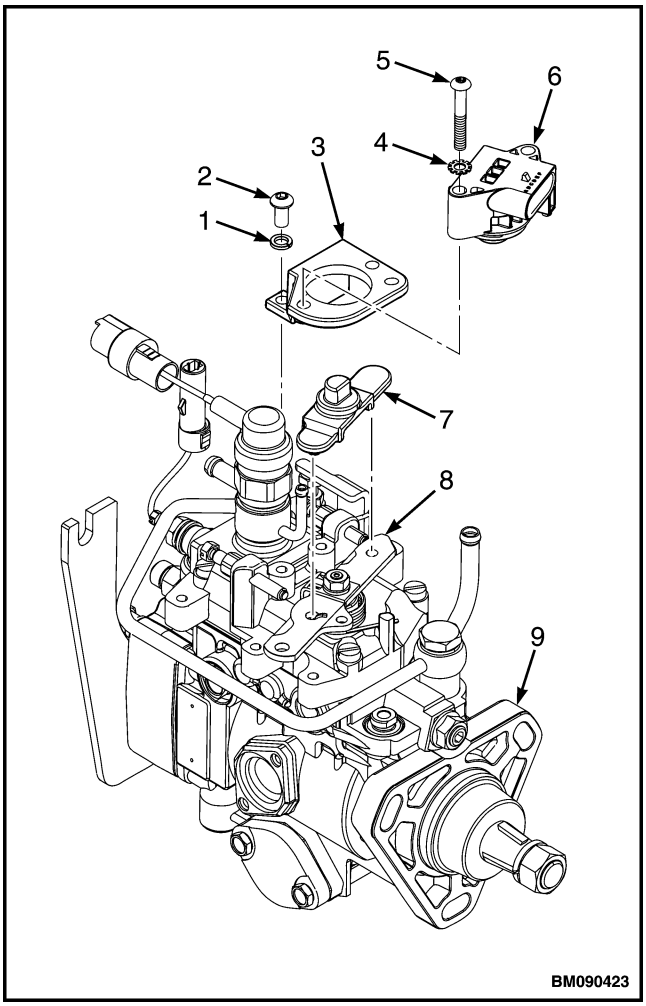
Throttle Position Sensor (TPS)

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the electrical connector from the throttle position sensor (TPS).

3. Remove Torx-head screws and TPS sensor from TPS bracket. See Figure 33.



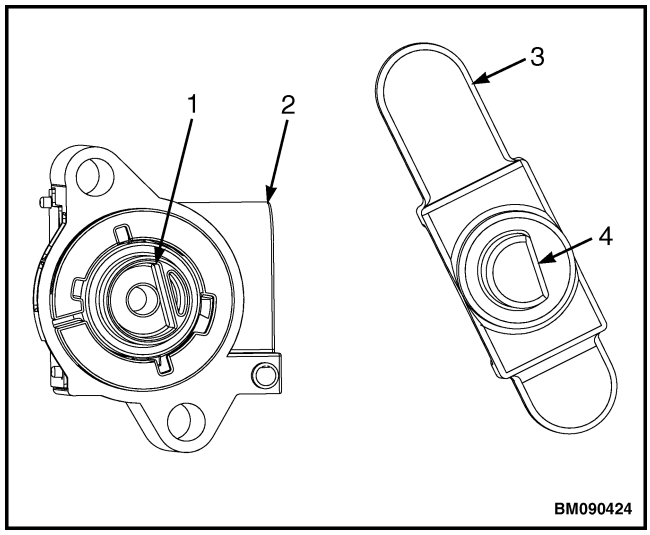
1. LOCKWASHER
2. TORX-HEAD SCREW (BRACKET)
3. TPS BRACKET
4. WASHER
5. TORX-HEAD SCREW (SENSOR)
6. THROTTLE POSITION SENSOR (TPS)
7. TPS ROTOR
8. THROTTLE LEVER
9. FUEL PUMP

Figure 33. Throttle Position Sensor (TPS) Assembly

Install

NOTE: When installing the TPS, rotate the sensor rotor clockwise to match D-shape on the TPS rotor. See Figure 34.

1. Install TPS sensor on TPS bracket with Torx-head screws. Tighten Torx-head screws to 2.25 N•m (20 lbf in).
2. Connect the TPS electrical connector.
3. Connect the battery and close the hood. Refer to Battery Remove and Install for details.



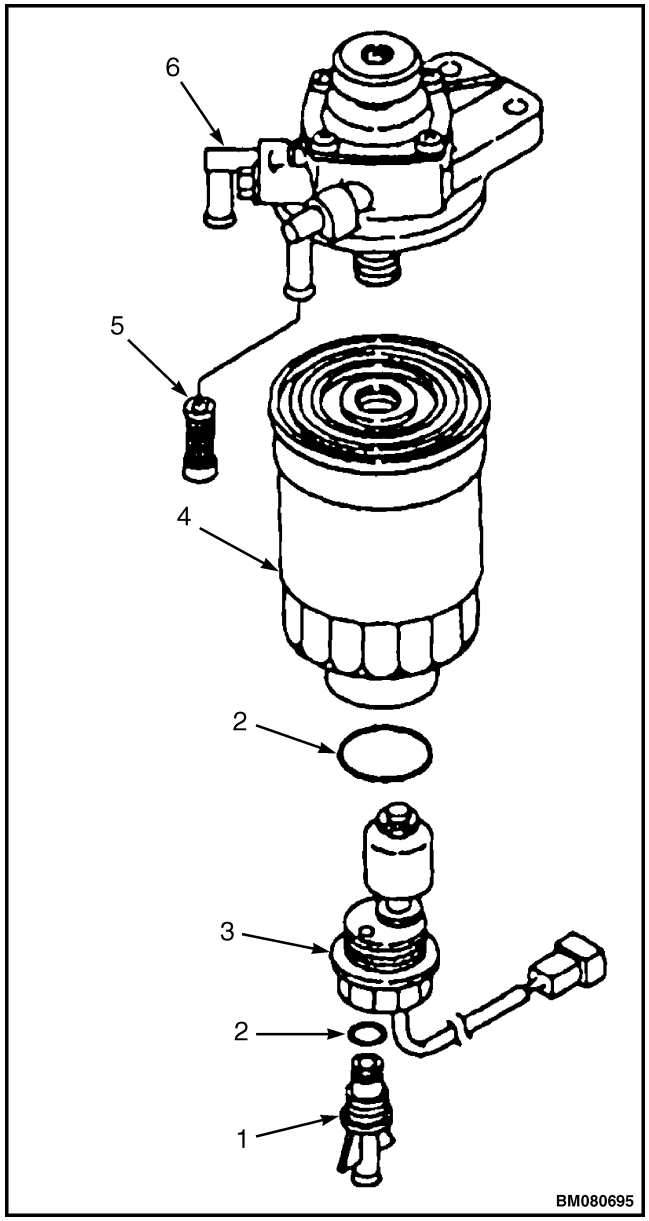
1. SENSOR ROTOR
2. TPS
3. TPS ROTOR
4. D-SHAPE

Figure 34. TPS and Rotor

Fuel/Water Separator Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Remove the drain plug from the bottom of the fuel/water separator sensor and drain water from the fuel filter. See Figure 35.
3. Disconnect the sensor from the harness.
4. Remove the sensor from the bottom of the fuel filter element body.



1. DRAIN PLUG
2. O-RING
3. FUEL/WATER SEPARATOR SENSOR
4. FUEL FILTER ELEMENT BODY
5. FUEL FILTER
6. FUEL FILTER COVER

Figure 35. Fuel/Water Separator Sensor

Install

1. Install the new sensor into the bottom of fuel filter element body. See Figure 35.
2. Connect the sensor to the harness.

3. Install the drain plug and O-ring into the bottom of fuel/water separator sensor.

4. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Glow Plug Relay

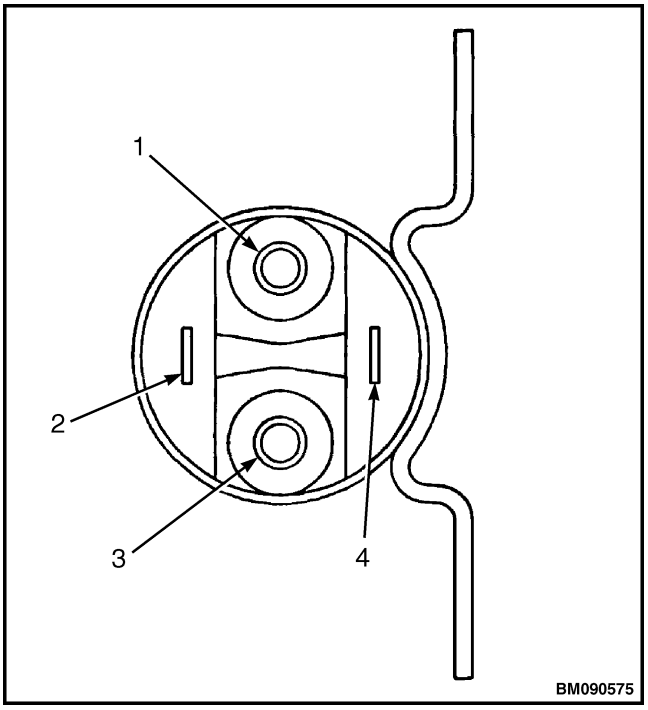
Remove

WARNING

Always disconnect the cables at the battery before you make repairs to the engine. Disconnect the cable at the negative terminal first. Install a tag on the battery terminals so that no one connects the cables on the terminals.

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

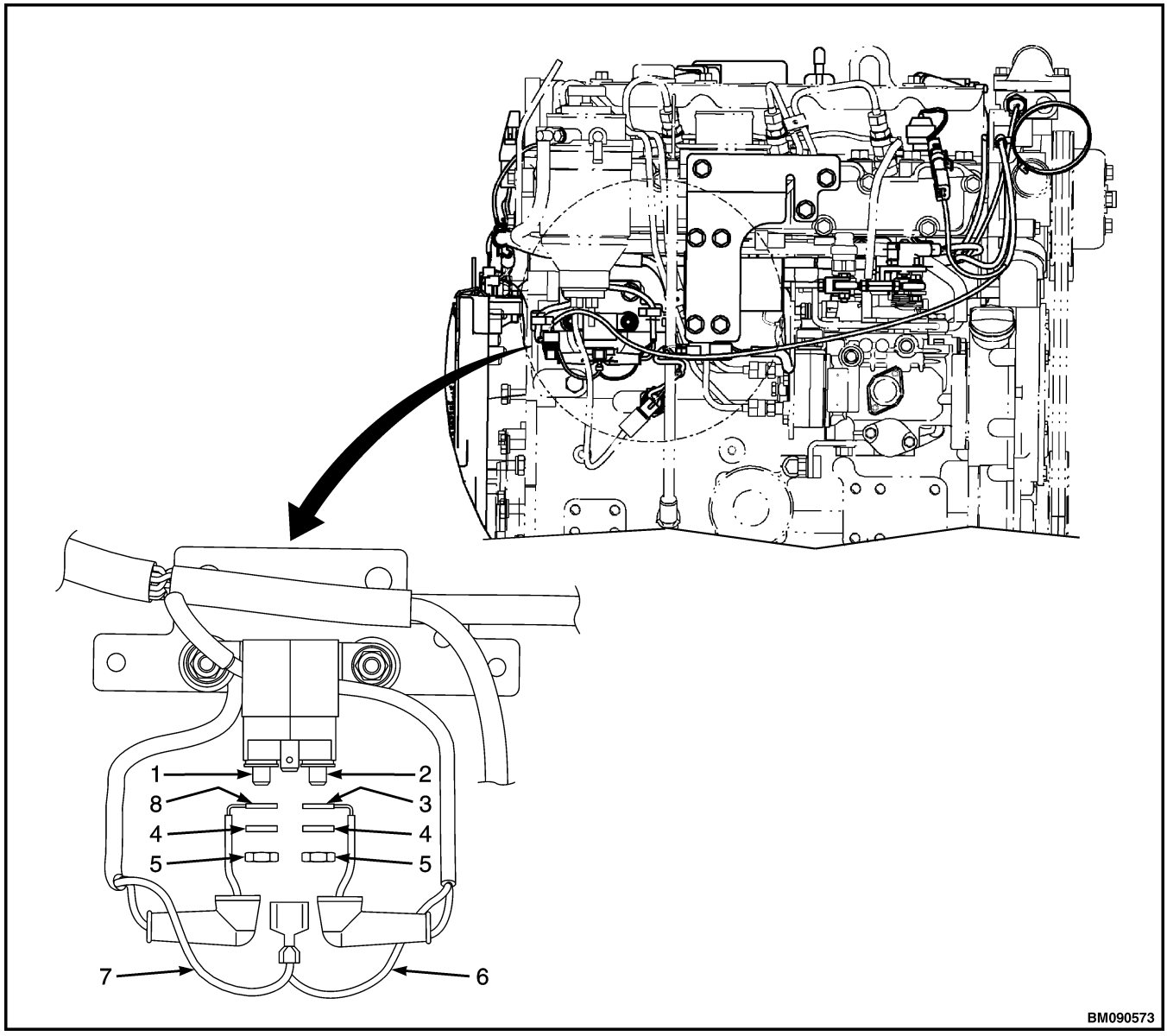
2. Tag and disconnect wiring connectors at terminals E and S. See Figure 36.



1. M TERMINAL
2. E TERMINAL
3. B TERMINAL
4. S TERMINAL

Figure 36. Glow Plug Relay Terminals

3. Slide the protective boots back on the wires for terminals B and M. See Figure 36 and Figure 37.



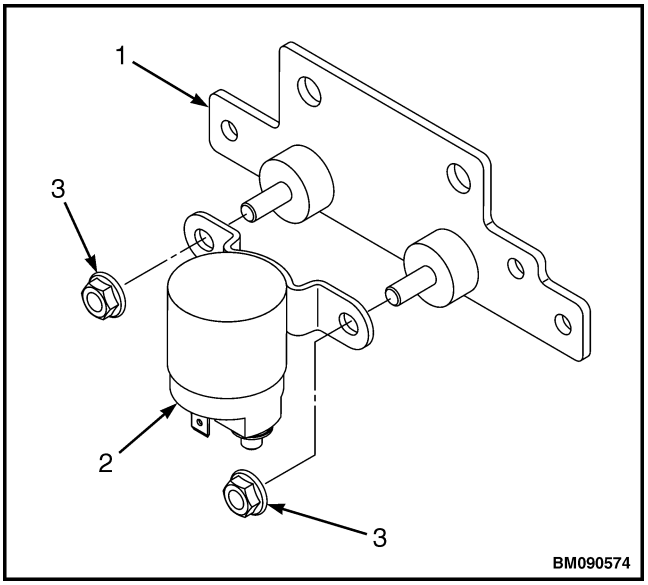
1. B TERMINAL
2. M TERMINAL
3. M TERMINAL WIRING
4. WASHER
5. NUT
6. S TERMINAL WIRING
7. E TERMINAL WIRING
8. B TERMINAL WIRING

Figure 37. Glow Plug Relay and Wiring

4. Place tags on wires for terminals B and M to properly identify them for reinstallation.

5. Remove nuts and washers retaining wires to terminals B and M.

6. Remove nuts retaining glow plug relay to mounting bracket and remove glow plug relay. See Figure 38.



NOTE: ENGINE NOT SHOWN FOR CLARITY.

1. MOUNTING BRACKET
2. GLOW PLUG RELAY
3. NUT

Figure 38. Glow Plug Relay and Mounting Bracket

Install

1. Place glow plug relay in position on mounting bracket and install retaining nuts. Tighten retaining nuts to 2.50-2.75 Nm (22.1-24.3 lbf-in). See Figure 38.

2. Connect wiring connections to terminals B and M. Install nuts and washers. Tighten nuts to 2.9-4.0 Nm (25.7-35.4 lbf-in). See Figure 36 and Figure 37.

3. Install protective boots over terminals B and M.

4. Connect electrical connectors at terminals E and S.

5. Connect battery and close hood. Refer to Battery Remove and Install for details.

ENGINE BLOCK HEATER (2.1L ENGINE)

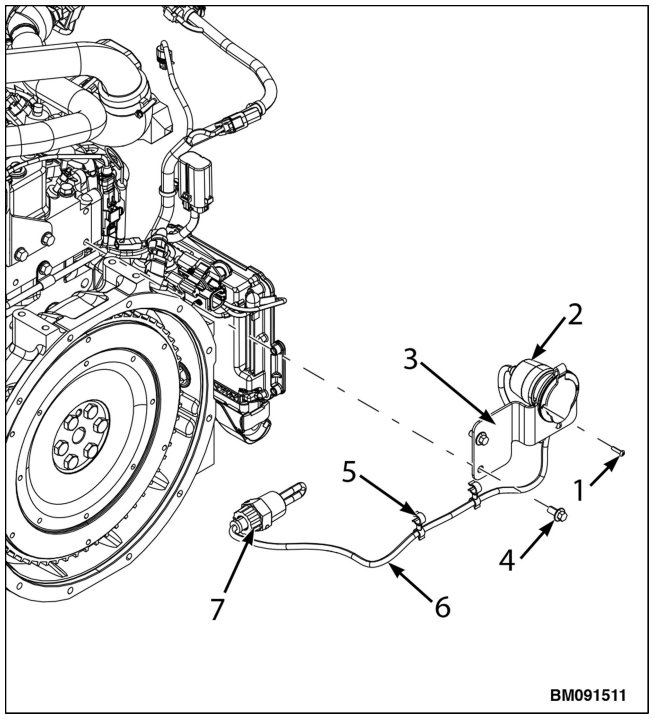
Remove

1. Locate the heater plug connected to the engine block and remove the plug. See Figure 39.

2. Unfasten the heater cable from the swivel clamps. See Figure 39.

3. Loosen the capscrews attaching the heater to the mounting bracket. See Figure 39.

4. If replacing the mounting bracket, remove the two capscrews retaining the mounting bracket to the engine block. See Figure 39.



1. SCREW
2. HEATER
3. MOUNTING BRACKET
4. SCREW
5. SWIVEL CLAMP
6. HEATER CABLE
7. HEATER PLUG

Figure 39. Engine block heater (2.1L Engine)

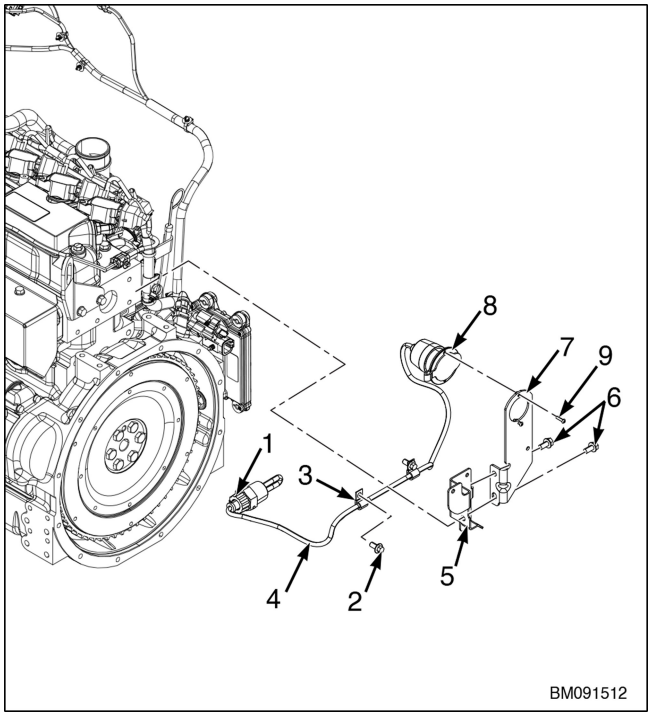
Install

1. If replacing the mounting bracket, insert the two capscrews retaining the mounting bracket to the engine block. See Figure 39.
2. Tighten to standard torque.
3. Insert the two screws to retain the heater to the mounting bracket. See Figure 39.
4. Plug the heater connector into the port on the engine block. See Figure 39.
5. Fasten the heater cable to all swivel clamps to secure to the engine block. See Figure 39.

ENGINE BLOCK HEATER (2.2L ENGINE)

Remove

1. Locate the heater plug connected to the engine block and remove the plug. See Figure 40.
2. Remove the capscrews and clamps retaining the harness cable to the engine block. See Figure 40
3. Loosen the capscrews attaching the heater to the mounting bracket. See Figure 40.
4. If replacing the mounting bracket, remove the two capscrews retaining the mounting bracket and engine harness bracket to the engine block. See Figure 40.



1. PLUG
2. SCREW
3. CLAMP
4. HEATER CABLE
5. ENGINE HARNESS BRACKET
6. SCREW
7. MOUNTING BRACKET
8. HEATER
9. SCREW

Figure 40. Engine block heater (2.2L Engine)

Install

1. If replacing the mounting bracket, insert the two capscrews retaining the mounting bracket and engine harness bracket to the engine block.
2. Tighten to standard torque.
3. Insert the two screws to retain the heater to the mounting bracket.
4. Torque to 9.7-10.7 N•m (85.9-94.7 lbf in).
5. Plug the heater connector into the port on the engine block.
6. Fasten the screws and clamps to secure to heater cable to the engine block.
7. Torque to 19.2 N•m (14.2 lbf ft).

EXHAUST GAS SENSORS

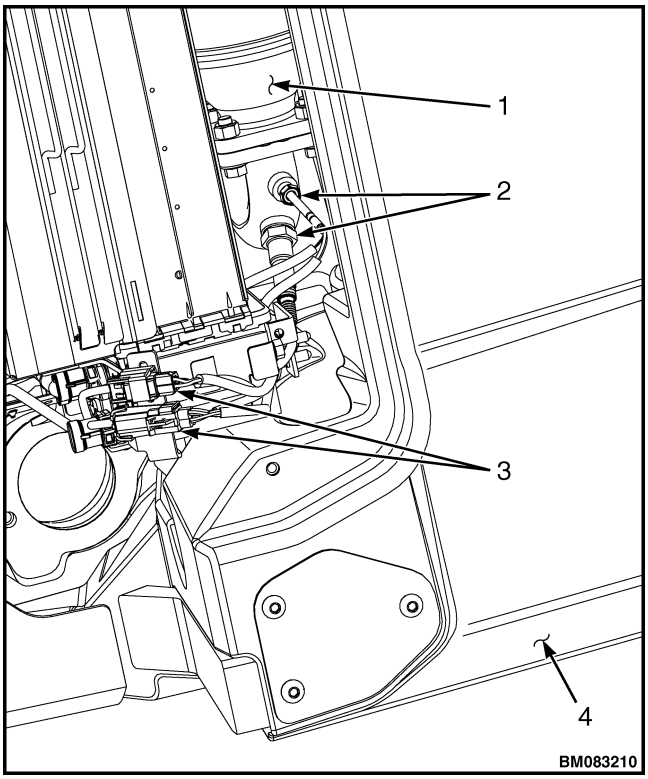
Heated O2 Sensor

NOTE: Sensor and harness are removed and installed as a unit.

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Remove radiator cover. Refer to **Frame and Main Components** 8000SRM2306 for details.

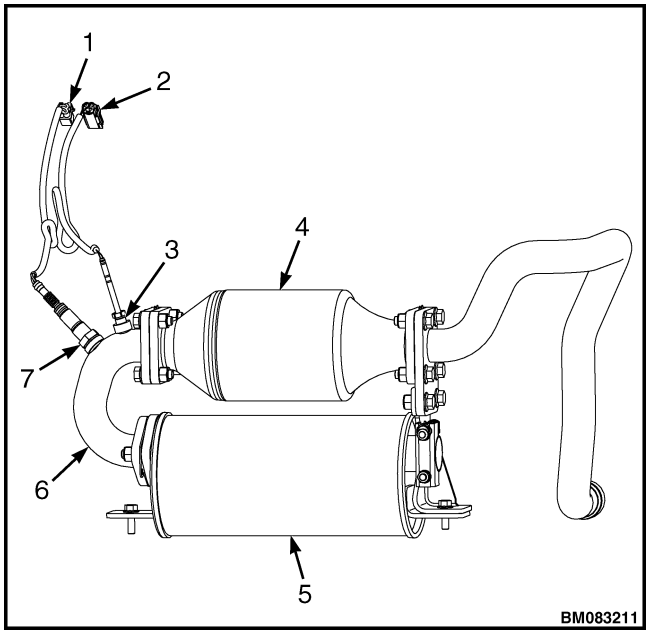


NOTE: RADIATOR COVER HAS BEEN REMOVED FOR CLARITY.

1. CATALYTIC CONVERTER
2. SENSORS
3. CONNECTORS
4. COUNTERWEIGHT

Figure 41. Overhead Sensor Reference View

3. Disconnect heated oxygen sensor harness (item 1, Figure 42).



1. HEATED OXYGEN SENSOR HARNESS
2. EXHAUST EGT SENSOR HARNESS
3. EXHAUST EGT SENSOR
4. CATALYTIC CONVERTER
5. MUFFLER
6. EXHAUST PIPE
7. HEATED OXYGEN SENSOR

Figure 42. Exhaust Gas Sensors

4. Remove heated oxygen sensor (item 7, Figure 42) from exhaust pipe (item 6, Figure 42).

Install

1. Install heated oxygen sensor (item 7, Figure 42) on exhaust pipe (item 6, Figure 42).

2. Connect heated oxygen sensor harness (item 1, Figure 42).

3. Install radiator cover. Refer to **Frame and Main Components** 8000SRM2306 for details.

4. Connect battery and close hood. Refer to Battery Remove and Install for details.

Exhaust EGT Sensor

NOTE: Sensor and harness are removed and installed as a unit.

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Remove radiator cover. Refer to **Frame and Main Components** 8000SRM2306 for details. Also refer to Figure 41 for component location.
3. Disconnect exhaust EGT sensor harness (item 2, Figure 42).
4. Remove exhaust EGT sensor (item 3, Figure 42) from exhaust pipe (item 6, Figure 42).

Install

1. Install exhaust EGT sensor (item 3, Figure 42) on exhaust pipe (item 6, Figure 42). Torque sensor 34.3-44.1 Nm (25.3-32.5 lbf-ft).
2. Connect exhaust EGT sensor harness (item 2, Figure 42).
3. Install radiator cover. Refer to **Frame and Main Components** 8000SRM2306 for details.
4. Connect battery and close hood. Refer to Battery Remove and Install for details.

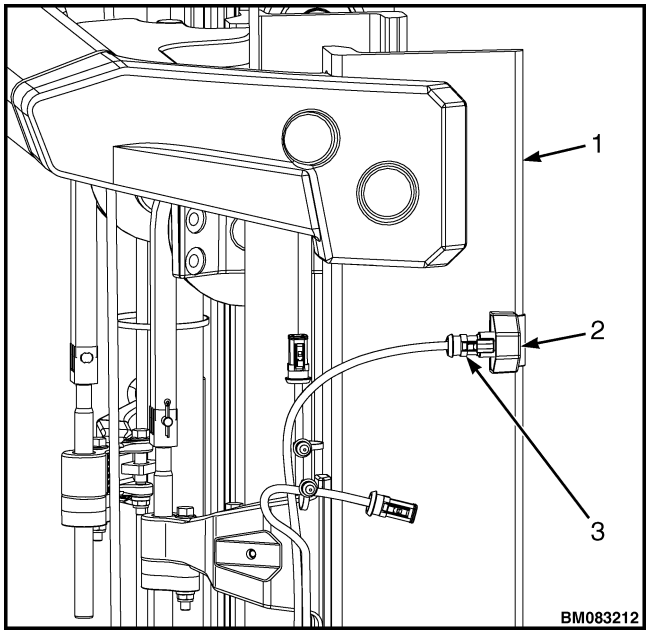
DYNAMIC STABILITY SYSTEM (DSS)

Mast Height Sensor (Discrete)

NOTE: For the sensor to function, it has a corresponding polarity controlled magnet mounted on the carriage.

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Disconnect sensor electrical connector.

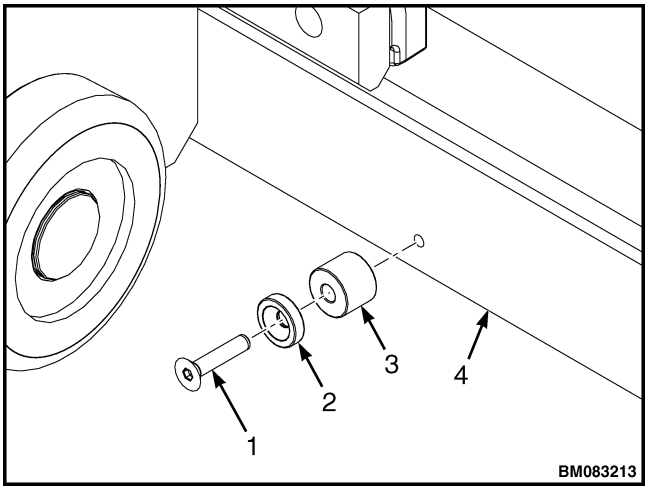


1. RIGHT HAND (RH) OUTER MAST
2. SENSOR
3. ELECTRICAL CONNECTOR

Figure 43. Mast Height Sensor (Discrete)

NOTE: Sensor is attached to mast with an adhesive, no mechanical fasteners are used.

3. Using a standard screwdriver or putty knife remove sensor from Left Hand (LH) outer mast.
4. Remove capscrew, polarity controlled magnet, and spacer from carriage.



1. CAPSCREW
2. POLARITY CONTROLLED MAGNET
3. SPACER
4. CARRIAGE

Figure 44. Carriage Magnet

Install

1. Attach spacer and polarity controlled magnet to carriage with capscrew.

NOTE: The height from the bottom of the carriage to the bottom of the sensor is 1,653 to 1,683 mm (65.1 to 66.3 in.). Make a mark at this height to locate sensor.

2. Clean area thoroughly using an isopropyl alcohol pad.

3. Apply tape primer 94 (P/N 4023802) to cleaned area.

a. Shake primer 94 well before using.

b. Apply a thin uniform coating to the bonding surface using minimum amount that will fully coat the surface.

c. Allow primer 94 to dry thoroughly before applying sensor. Usually accomplished in five minutes at room temperature.

d. Porous surface may require two applications of primer 94 for good adhesion.

WARNING

Avoid direct contact between the mast height sensor and magnet during installation. This could damage the sensor.

4. Peel off tape backing on sensor, position bottom of sensor on mark made previously. Press firmly to mounting surface.

5. Connect sensor electrical connector.

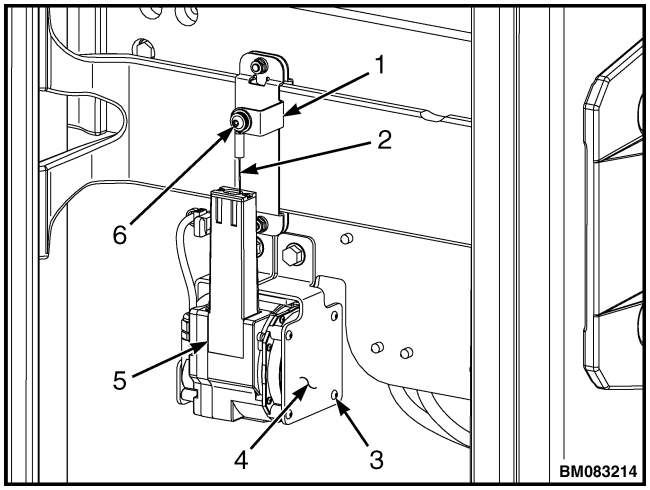
6. Connect battery and close hood. Refer to Battery Remove and Install for details.

Mast Height Sensor (Continuous)

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Remove Torx screw, washer, and locknut (item 6, Figure 45) securing stainless steel cable (item 2, Figure 45) to string pot bracket (item 1, Figure 45).

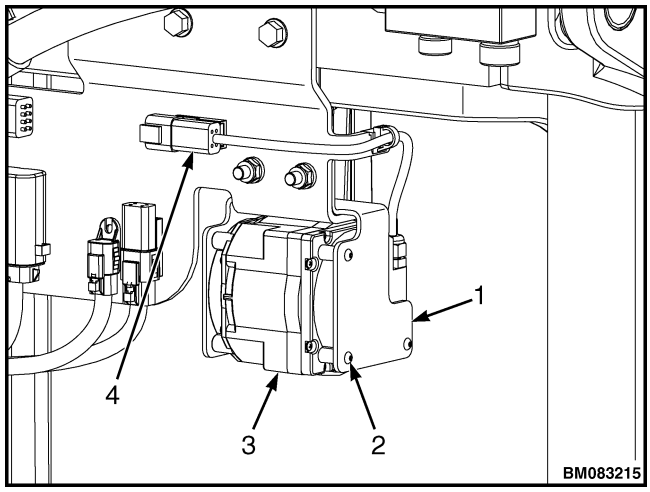


1. STRING POT BRACKET
2. STAINLESS STEEL CABLE
3. TORX SCREWS
4. SENSOR BRACKET (RH)
5. SENSOR
6. TORX SCREW, WASHER, LOCKNUT

Figure 45. Mast Height Sensor (Continuous), Rear View

3. Remove four Torx screws (item 3, Figure 45) securing sensor (item 5, Figure 45) to RH sensor bracket (item 4, Figure 45).

4. Disconnect sensor electrical connector (item 4, Figure 46).



1. SENSOR BRACKET (LH)
2. TORX SCREWS
3. SENSOR
4. SENSOR ELECTRICAL CONNECTOR

Figure 46. Mast Height Sensor (Continuous), Front View

5. Remove three Torx screws (item 2, Figure 46) securing sensor (item 3, Figure 46) to LH sensor bracket (item 1, Figure 46).

6. Remove sensor (item 3, Figure 46).

Install

1. Install sensor (item 3, Figure 46) into LH sensor bracket (item 1, Figure 46) with three Torx screws. Torque screws to 2.3 Nm (20.4 lbf-in).

2. Connect sensor electrical connector (item 4, Figure 46).

3. Install four Torx screws (item 3, Figure 45) through RH sensor bracket (item 4, Figure 45) and into sensor (item 5, Figure 45). Torque screws to 2.3 Nm (20.4 lbf-in).

4. Attach stainless steel cable (item 2, Figure 45) to string pot bracket (item 1, Figure 45) using Torx screw, washer, and locknut (item 6, Figure 45). Torque locknut to 10.9 Nm (96.5 lbf-in).

5. Connect battery and close hood. Refer to Battery Remove and Install for details.

Mast Harness Bracket (Before August 2025)

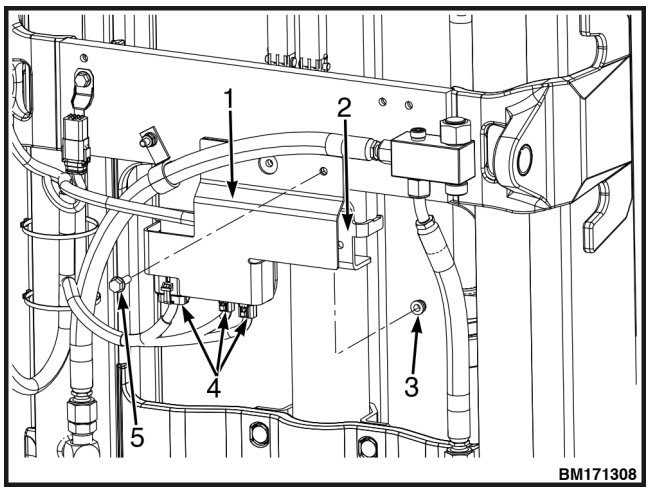
Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Remove Mast Height Sensor (Continuous). Refer to Mast Height Sensor (Continuous) for procedure.

3. Tag and disconnect harness connectors attached to bracket plates. See Figure 47.

4. Remove two capscrews and nuts securing front and rear bracket plates to mast.



1. FRONT BRACKET PLATE
2. REAR BRACKET PLATE
3. NUT
4. HARNESS CONNECTOR
5. CAPSCREW

Figure 47. Mast Harness Bracket

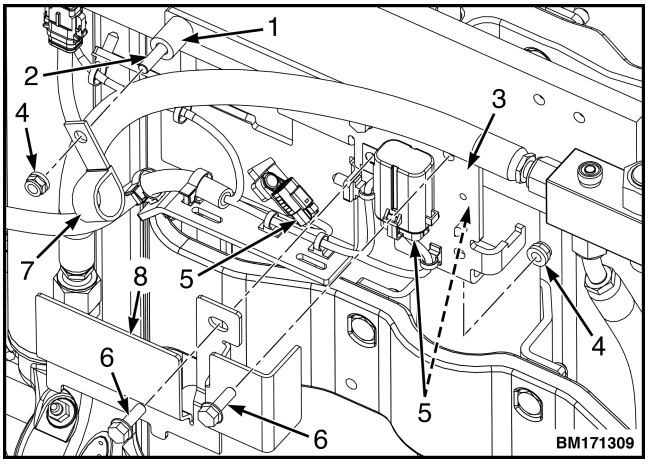
Install

1. Install two capscrews and nuts to secure front and rear bracket plates to mast. Torque capscrews to 19.2 N • m (14.7 lbf ft). See Figure 47.
2. Connect harness connectors attached to bracket plates.
3. Install Mast Height Sensor (Cont). Refer to Mast Height Sensor (Continuous) for procedure.
4. Connect battery and close hood. Refer to Battery Remove and Install for details.

Mast Harness Bracket (After August 2025)

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Tag and disconnect harness connectors attached to bracket plates. See Figure 48.



1. SPACER
2. CAPSCREW
3. REAR BRACKET PLATE
4. NUT
5. HARNESS CONNECTOR
6. CAPSCREW
7. INSULATED CLAMP
8. FRONT BRACKET PLATE

Figure 48. Mast Harness Bracket

3. Remove nut and capscrew securing insulated clamp, spacer, and rear bracket plate to mast.
4. Remove two capscrews and nuts securing rear bracket plate to mast.
5. Remove capscrew securing front bracket plate to rear bracket plate.

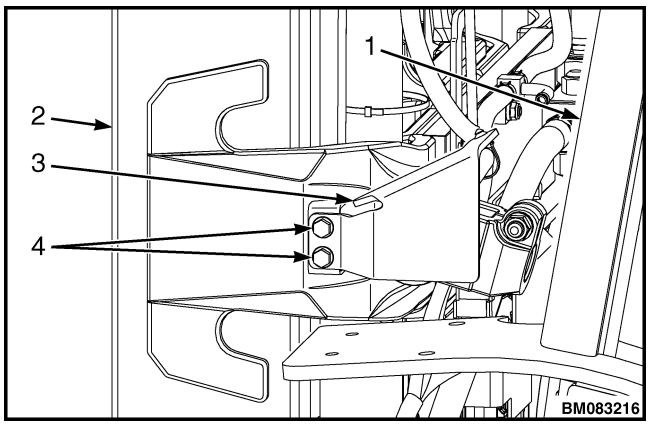
Install

1. Install capscrew to secure front bracket plate to rear bracket plate.
2. Install two capscrews and nuts to secure rear bracket plate to mast. Torque capscrews to 19.2 N • m (14.7 lbf ft).
3. Install capscrew and nut to secure rear bracket plate, spacer, and insulated clamp to mast.
4. Connect harness connectors attached to bracket plates.
5. Connect battery and close hood. Refer to Battery Remove and Install for details.

Mast Tilt Sensor

Remove

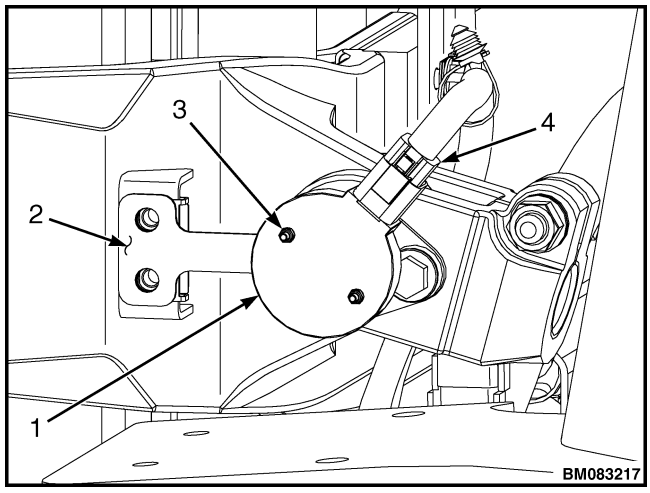
1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Remove capscrews (item 4, Figure 49) and sensor guard bracket (item 3, Figure 49), from outer mast (item 2, Figure 49).



1. FRONT, LEFT, OVERHEAD GUARD SUPPORT POST
2. OUTER MAST
3. SENSOR GUARD BRACKET
4. CAPSCREWS

Figure 49. Sensor Guard Bracket

3. Disconnect sensor wire harness connector (item 4, Figure 50).



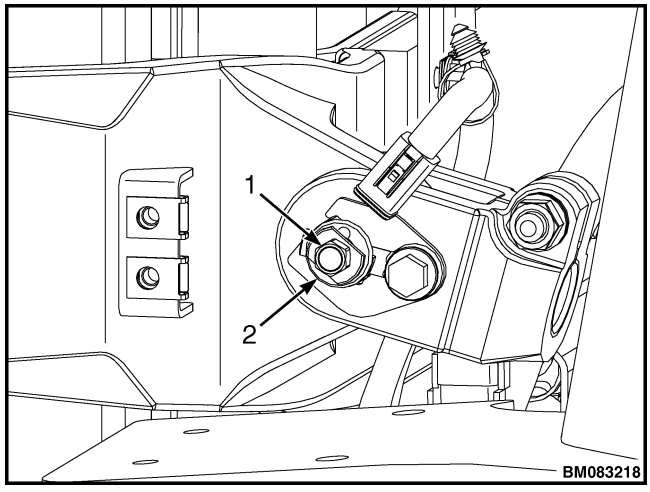
1. SENSOR
2. MAST SENSOR BRACKET
3. TORX SCREW AND NUT
4. WIRE HARNESS CONNECTOR

Figure 50. Sensor and Wire Harness

4. Remove Torx screws and nuts (item 3, Figure 50) securing sensor (item 1, Figure 50) to mast sensor bracket (item 2, Figure 50).

5. Remove sensor (item 1, Figure 50).

6. Remove tilt position magnet (item 1, Figure 51) from clevis pin (item 2, Figure 51).



1. TILT POSITION MAGNET
2. CLEVIS PIN

Figure 51. Tilt Position Magnet

Install

1. Install tilt position magnet (item 1, Figure 51) into clevis pin (item 2, Figure 51. Torque tilt position magnet to 19.2 N•m (14.2 lbf ft).

2. Attach the sensor (item 1, Figure 50) to mast sensor bracket (item 2) with Torx screws and nuts (item 3).

3. Torque the nuts to 0.9 N•m (8 lbf in).

4. Connect the sensor wire harness connector (item 4, Figure 50.

5. Attach mast sensor bracket (item 2, Figure 50), sensor (item 1, Figure 50), and sensor guard bracket (item 3, Figure 49) to outer mast (item 2, Figure 49) with capscrews (item 4, Figure 49).

6. Tighten the capscrews to 19.2 N•m (14.2 lbf ft).

7. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Speed Sensor

NOTE: Refer to Transmission Sensors (Powershift 1 transmission) for details.

Steer Axle Position Sensor

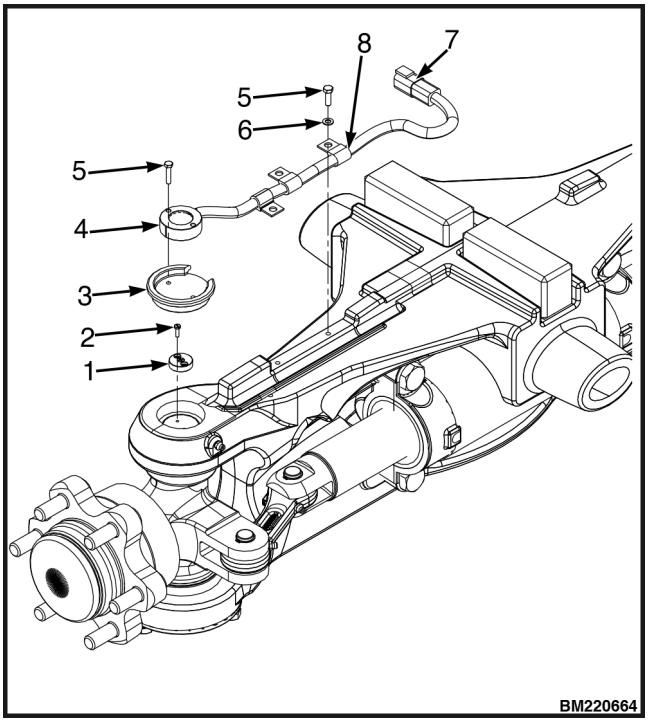
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the counterweight. Refer to **Frame and Main Components** 8000SRM2306 for details.

NOTE: The steer axle sensor and harness are replaced as a single component.

3. Disconnect steering sensor wire harness from steering axle jumper wire harness, connected to chassis harness. See Figure 52.



1. MAGNET
2. SCREW
3. CAP
4. STEER AXLE SENSOR ELECTRICAL HARNESS
5. CAPSCREW
6. WASHER
7. STEER AXLE SENSOR ELECTRICAL HARNESS CONNECTOR
8. INSULATED CLAMP

Figure 52. Steer Axle Position Sensor and Harness

4. Remove capscrews, washers, and insulated clamps.

5. Remove two capscrews, steering sensor wire harness, and cap from left-hand side of steer axle.

6. Remove screws securing magnet to top of left-hand spindle.

Install

NOTE: Air gap between magnet and sensor must not exceed 8 mm (0.31 in.).

1. Install screws and magnet on top of left-hand spindle. See Figure 52.

NOTE: Chamfer of cap and steer axle must contact each other. Cap must be aligned with machining of steer axle. Sensor must be installed with resin side upward.

2. Apply pipe thread sealant and install steering sensor wire harness, cap, and two capscrews on left-hand side of steer axle. Tighten capscrews to 3.5 to 4.0 N•m (31 to 35.4 lbf in).

NOTE: Move any steering sensor wire harness slack towards center of axle to avoid the harness being pinched at pivot point.

3. Install capscrews, washers, and insulated clamps.

4. Connect steering sensor wire harness to steering axle jumper wire harness, connected to chassis harness.

5. Install the counterweight. Refer to **Frame and Main Components** 8000SRM2306 for details.

6. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

FUEL QUALITY SENSOR (FQS) - LPG/ DUAL FUEL ENGINES

Remove

WARNING

LPG can cause an explosion. DO NOT permit any sparks or open flames in the work area.

1. Close the fuel valve on the tank.

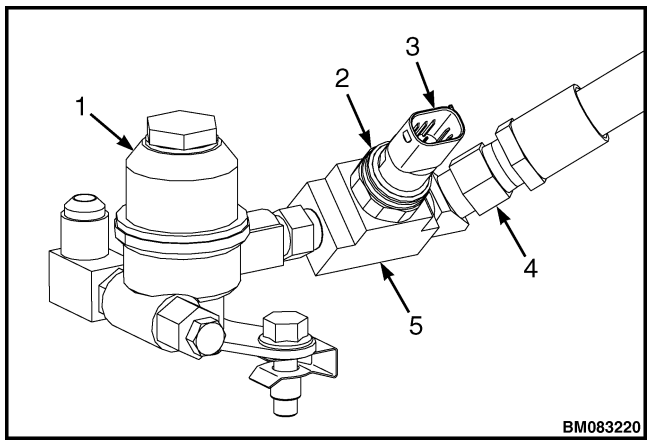
2. Run the engine until it runs out of fuel and stops. Try to start engine two to three times until it no longer starts.

3. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details. Leave the hood open to access the fuel quality sensor.

4. Disconnect the wire harness connector from the fuel quality sensor.

WARNING

A small amount of fuel may still be present in the fuel line. Use gloves to prevent burns and wear eye protection. If liquid fuel continues to flow from the connections when loosened, check to make sure the manual valve is fully closed.



1. LPG FILTER
2. FUEL QUALITY SENSOR
3. WIRE HARNESS CONNECTOR
4. FUEL SUPPLY SWIVEL CONNECTOR
5. FUEL QUALITY SENSOR VALVE BLOCK

Figure 53. Fuel Quality Sensor

5. Loosen and remove fuel quality sensor from the fuel quality sensor valve block.

Install

CAUTION

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

1. Apply pipe thread sealant to the threads of the fuel quality sensor.

2. Install the fuel quality sensor onto the fuel quality sensor valve block.

3. Connect the wire harness connector to the fuel quality sensor.

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

4. Slowly open the fuel valve on the tank.

5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

6. If the truck is equipped with a key switch, turn key switch to ON position and back to OFF position to pressurize the fuel system. If truck is equipped with a Power ON/OFF button, press Power ON/OFF button to ON and back OFF again to pressurize the system

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

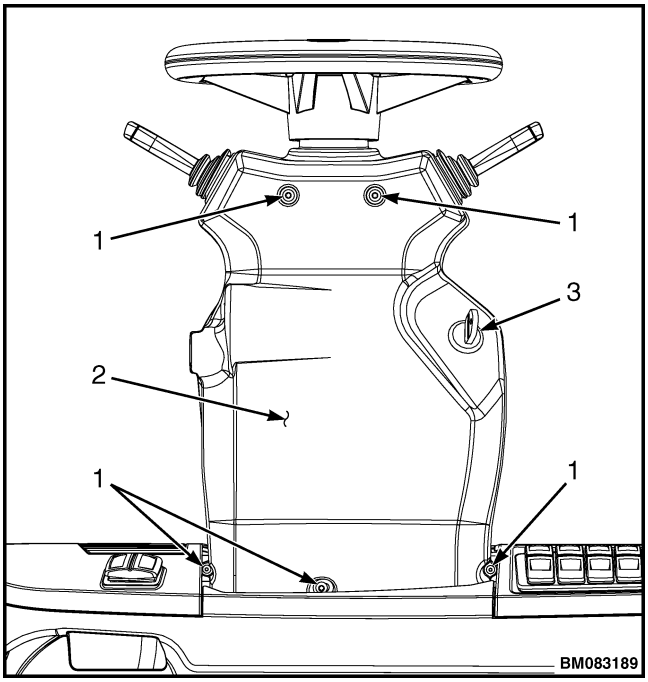
SYNCHRONOUS STEERING COLUMN SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove five screws and rear steering column cover.

NOTE: Two spring clips also connect the front and rear steering column covers. Use a flat-edged screwdriver to separate the two covers.

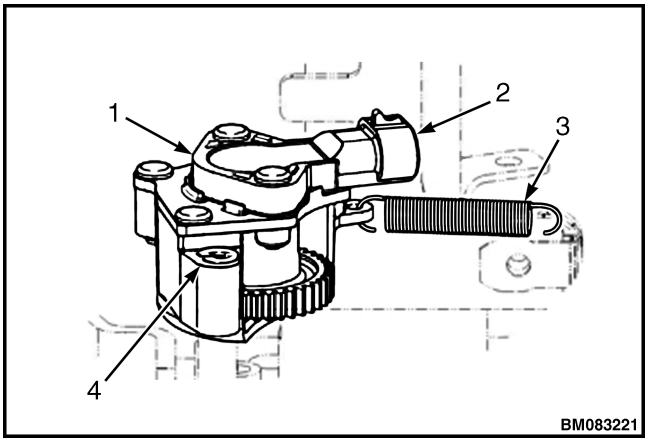


1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

Figure 54. Steering Column Cover

3. Remove the ignition switch. Refer to Truck start switch for details.

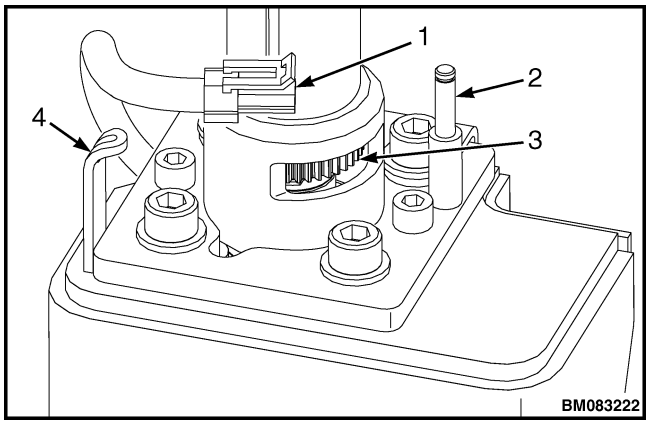
4. Disconnect the sensor electrical connector, spring, and retainer ring. See Figure 55.



1. STEERING COLUMN SENSOR
2. SENSOR ELECTRICAL CONNECTOR
3. SPRING
4. RETAINER RING (E-RING)

Figure 55. Steering Column Sensor

5. Remove the steering column sensor from the sensor mounting post.



1. SENSOR WIRING HARNESS CONNECTOR
2. SENSOR MOUNTING POST
3. STEERING COLUMN GEAR
4. SPRING BRACKET

Figure 56. Steering Column with Sensor Removed

Install

1. Install the steering column sensor to the sensor mounting post.

2. Install the retainer ring and spring, and connect the sensor electrical connector.

3. Install the ignition switch. Refer to Truck start switch for details.

4. Install steering column covers. Torque screws to 2.55 to 2.75 N•m (22.6 to 24.3 lbf in).

5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

SERVICE BRAKE PEDAL POSITION SENSOR - SINGLE PEDAL

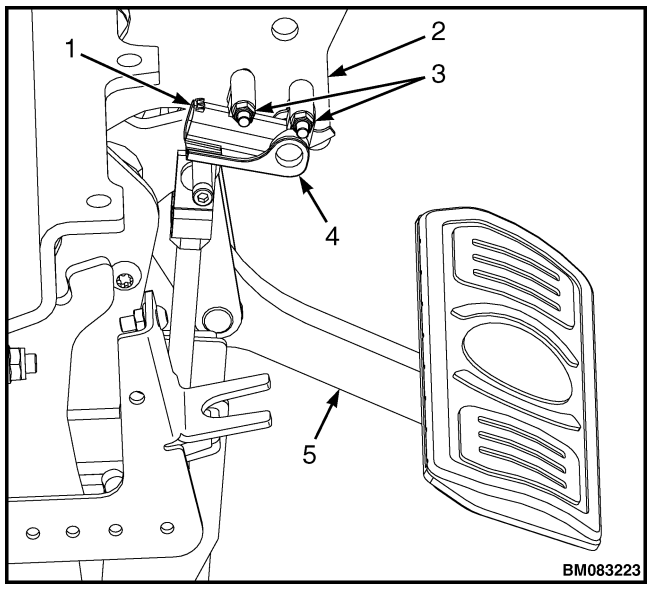
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

3. Disconnect the sensor electrical connector.

NOTE: Some components in the graphic have been removed for clarity.



1. SENSOR ELECTRICAL CONNECTOR
2. LH STEERING COLUMN BRACKET
3. CAPSCREW AND NUT
4. BRAKE PEDAL POSITION SENSOR
5. BRAKE PEDAL ARM

Figure 57. Service Brake Pedal Position Sensor

4. Remove the two capscrews and nuts securing brake pedal position sensor to LH steering column bracket.

5. Remove brake pedal position sensor from LH steering column bracket.

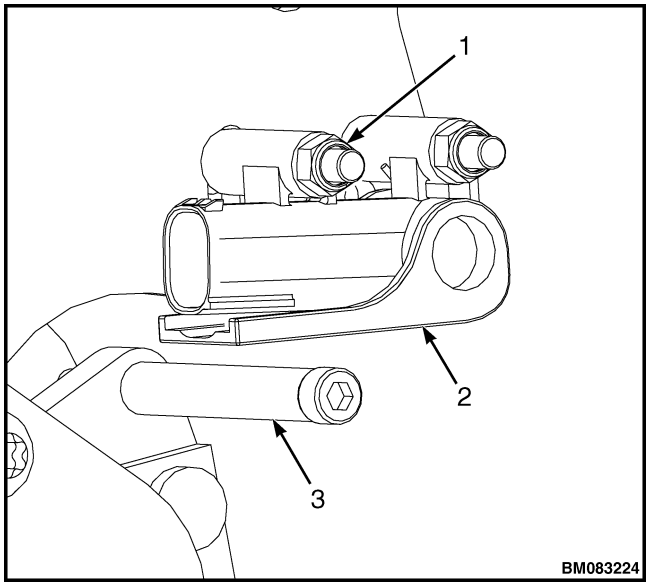
Install

1. Install brake pedal position sensor to LH steering column bracket.

2. Secure brake pedal position sensor to LH steering column bracket with two capscrews and nuts.

NOTE: Clearance between the sensor arm and spacer must be checked. The clearance range is between 1.0-2.0 mm (0.039-0.079 in).

3. Depress sensor arm until it stops. Measure the clearance between the sensor arm and spacer.



1. NUT AND CAPSCREW
2. SENSOR ARM
3. SPACER

Figure 58. Service Brake Pedal Sensor Adjustment

4. If clearance is not within the limits, loosen nut and capscrew and adjust sensor until proper clearance is achieved. Torque capscrew to 2.25 N•m (19.9 lbf in).

5. Connect the sensor electrical connector.

6. Replace the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

7. Connect battery and close hood. Refer to Battery Remove and Install for details.

BRAKE FLUID LEVEL SENSOR

Remove

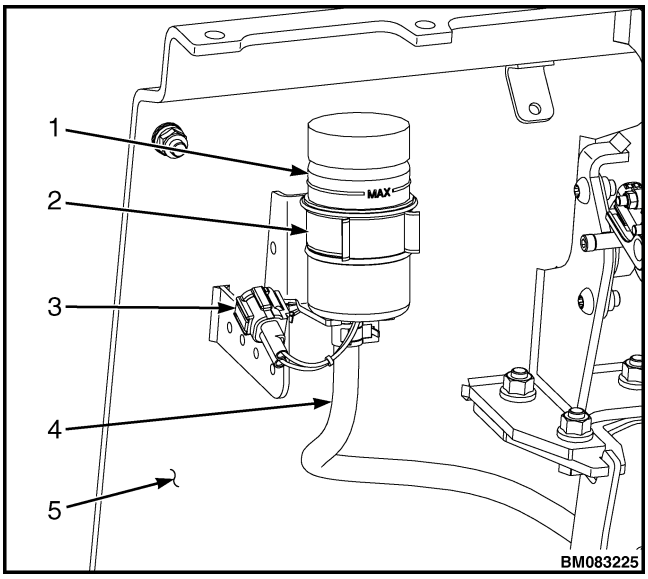
NOTE: The brake fluid level sensor is an integral part of the master brake cylinder reservoir and is located inside the reservoir. The sensor itself is not a serviceable part, the reservoir must be replaced as an assembly.

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

3. Disconnect the electrical connector from the harness.

NOTE: Some components in the graphic have been removed for clarity.



1. RESERVOIR
2. BRACKET
3. ELECTRICAL CONNECTOR
4. INLET BRAKE HOSE
5. COWL

Figure 59. Brake Fluid Level Switch

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

4. Remove the reservoir from the bracket and drain fluid from reservoir. Disconnect inlet brake hose from reservoir. Make sure air does not get into hose.

Install

1. Connect the inlet brake hose to the reservoir.

2. Install the reservoir to the bracket and fill with brake fluid. See **Periodic Maintenance** manual for brake fluid specifications.

3. Connect the electrical connector to the harness.

4. Replace the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

6. Bleed the brake system. Refer to **Drive Train** 0900SRM2301 for details.

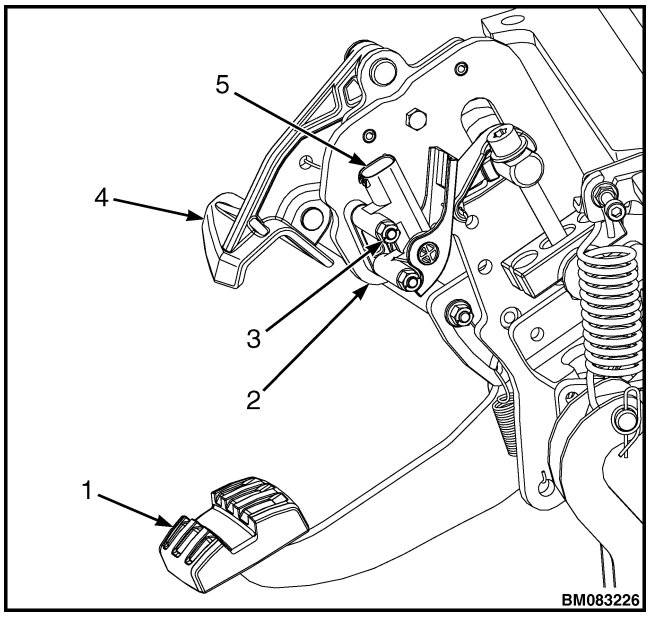
PARKING BRAKE POSITION SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

3. Disconnect the parking brake position sensor electrical connector.



1. PARKING BRAKE PEDAL
2. PARKING BRAKE POSITION SENSOR
3. PARKING BRAKE POSITION SENSOR MOUNTING HARDWARE
4. PARKING BRAKE RELEASE HANDLE
5. PARKING BRAKE POSITION SENSOR ELECTRICAL CONNECTOR

Figure 60. Parking Brake Position Sensor

4. Remove the parking brake position sensor mounting hardware.

5. Remove the parking brake position sensor.

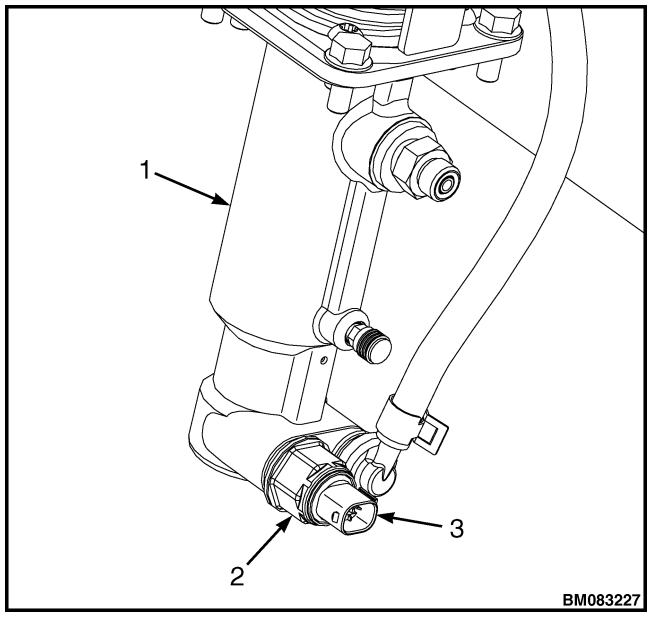
Install

1. Install the parking brake position sensor.
2. Install the parking brake position sensor mounting hardware.
3. Connect the parking brake position sensor electrical connector.
4. Install the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.
5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

SERVICE BRAKE (HYDRAULIC) PRESSURE TRANSDUCER

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Remove the floor mat and floor plate to access the service brake pressure transducer.



1. MASTER CYLINDER
2. SERVICE BRAKE PRESSURE TRANSDUCER
3. WIRE HARNESS CONNECTOR

Figure 61. Service Brake Pressure Transducer

3. Remove the wire harness connector from service brake pressure transducer.
4. Remove the service brake pressure transducer from the master cylinder.

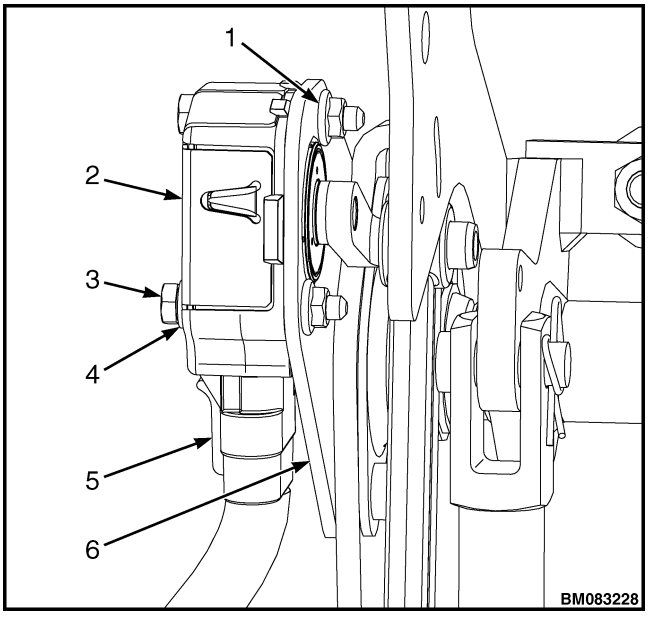
Install

1. Install the service brake pressure transducer to the master cylinder. Torque the pressure transducer to 23 to 28 N•m (17 to 21 lbf ft).
2. Connect the wire harness connector to the service brake pressure transducer.
3. Bleed the brake system. Refer to **Drive Train** 0900SRM2301 for details.
4. Install the floor mat and floor plate.
5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

SERVICE BRAKE (E-BRAKE) POSITION SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Remove the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.
3. Disconnect the E-brake position sensor connector from the E-brake position sensor.



1. NUT
2. E-BRAKE POSITION SENSOR
3. CAPSCREW
4. WASHER
5. E-BRAKE POSITION SENSOR CONNECTOR
6. E-PEDAL SENSOR PLATE

Figure 62. E-Brake Position Sensor

4. Remove capscrew, washer, nut, and E-brake position sensor from E-pedal sensor plate.

Install

1. Install the E-brake position sensor onto the E-pedal sensor plate.

2. Secure the E-brake position sensor to E-pedal sensor plate with capscrew, washer, nut. Torque the capscrew to 6.2 N•m (55 lbf in).

3. Connect the E-brake position sensor connector to the E-brake position sensor.

4. Install the kick panel and dash panel. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.

5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

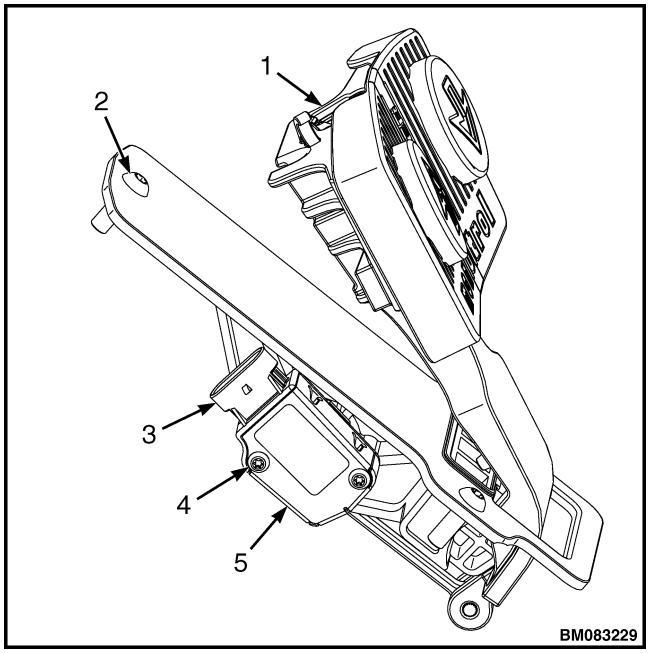
MONOTROL SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the floor mat and floor plate. Refer to **Frame and Main Components** 8000SRM2306 for details.

3. Remove the three screws securing the pedal assembly to floor.



1. PEDAL ASSEMBLY
2. SCREW
3. ELECTRICAL CONNECTOR
4. BUTTONHEAD SCREW
5. SENSOR

Figure 63. Monotrol Sensor

4. Disconnect sensor electrical connector.

5. Remove two buttonhead screws from sensor.

6. Remove sensor from pedal assembly.

Install

1. Install sensor on pedal assembly.
2. Secure sensor to pedal assembly with two buttonhead screws.
3. Connect sensor electrical connector.
4. Insert the three screws to retain the pedal to the floor plate and secure with the three nuts.
5. Tighten the screws to 7.6 to 11.6 N•m (5.6-8.5 lbf ft).
6. Install the floor mat and floor plate. Refer to **Frame and Main Components** 8000SRM2306 for details.
7. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

LOW COOLANT LEVEL SENSOR

NOTE: If the truck does not have a low coolant sensor, a plug will be installed in place of the sensor.

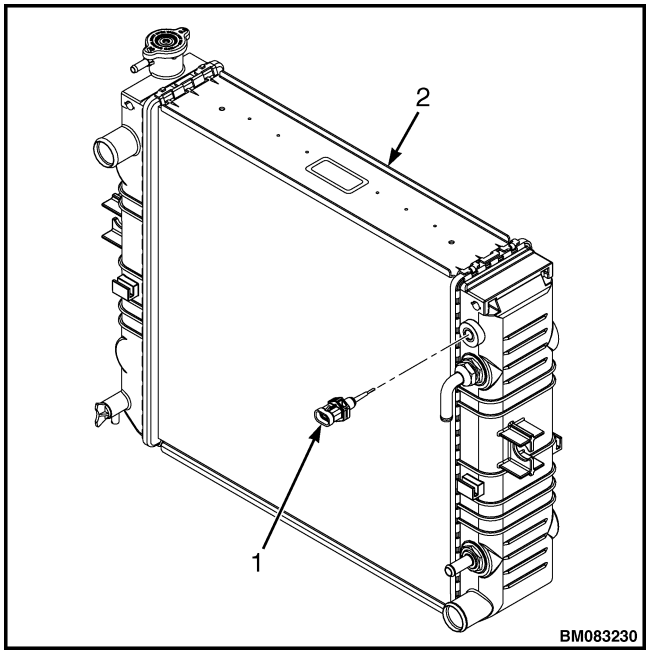
Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

2. Drain coolant from radiator. Refer to **Cooling system** 0700SRM2300 for details.
3. Disconnect the electrical connector from low coolant level sensor.



1. LOW COOLANT LEVEL SENSOR
2. RADIATOR

Figure 64. Low Coolant Level Sensor

4. Remove the low coolant level sensor from radiator.

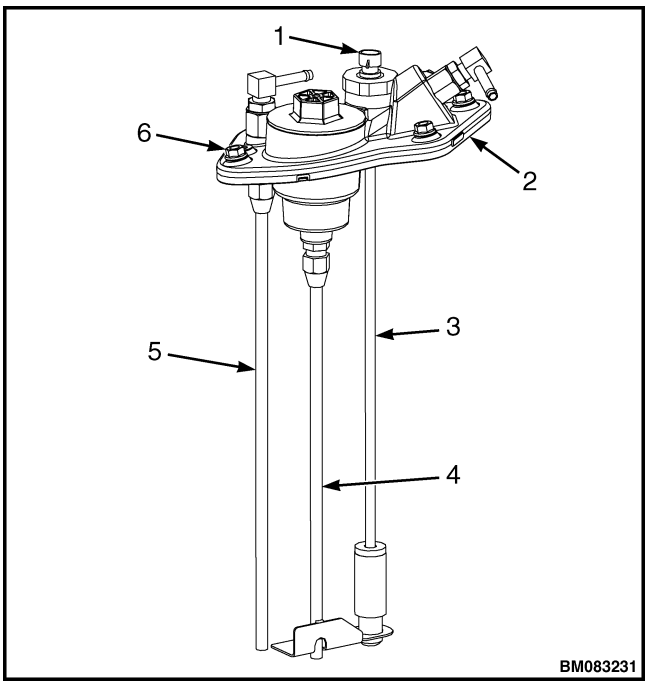
Install

1. Apply pipe thread sealant to low coolant level sensor.
2. Install low coolant level sensor into radiator. Torque the low coolant level sensor to 7 to 9 N•m (62 to 80 lbf in).
3. Connect the electrical connector to the low coolant level sensor.
4. Refill the radiator with coolant. Refer to**Cooling system** 0700SRM2300 for details.
5. Connect battery and close hood. Refer to Battery Remove and Install for details.

FUEL LEVEL SENSOR, GAS AND DIESEL ENGINES ONLY

Remove

1. Raise the hood and disconnect thte battery. Refer to Battery Remove and Install for details.
2. Disconnect the electrical connector from the fuel level sensor.



1. FUEL LEVEL SENSOR ELECTRICAL CONNECTOR
2. FUEL LEVEL SENSOR MANIFOLD
3. FUEL LEVEL SENSOR
4. FUEL SUPPLY TUBE
5. FUEL RETURN TUBE

Figure 65. Fuel Level Sensor

3. Remove the four capscrews securing fuel level sensor manifold to fuel tank (not shown).
4. Remove the fuel level sensor manifold from the fuel tank.
5. Unscrew the fuel level sensor and remove from the fuel level sensor manifold.

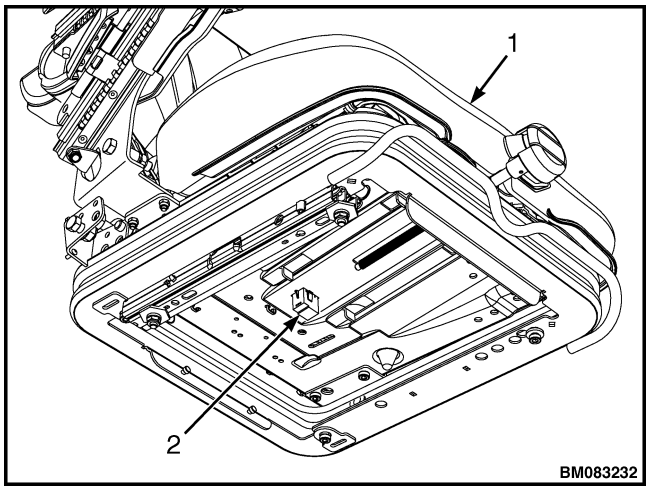
Install

1. Insert fuel level sensor into fuel level sensor manifold.
2. Install fuel level sensor manifold onto fuel tank.
3. Secure fuel level sensor manifold to fuel tank with four capscrews Torque the capscrews to 14 N•m (10.3 lbf ft).
4. Connect the electrical connector to the fuel level sensor.
5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

OPERATOR PRESENCE SENSOR

Remove

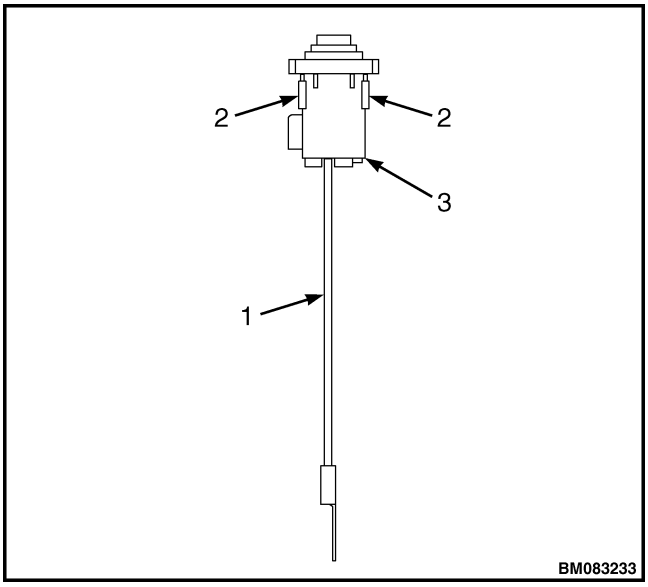
1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Disconnect the seat harness from the chassis harness.
3. Remove the seat. Refer to **Operator's Cab** 0100SRM2298 for details.
4. Locate the operator presence sensor under seat (harness not shown).



1. SEAT
2. OPERATOR PRESENCE SENSOR

Figure 66. Seat Sensor

5. Remove the operator presence sensor from seat.



1. OPERATOR PRESENCE SENSOR HARNESS
2. SPRING TABS
3. OPERATOR PRESENCE SENSOR

Figure 67. Operator Presence Sensor and Harness (Tiachang seat)

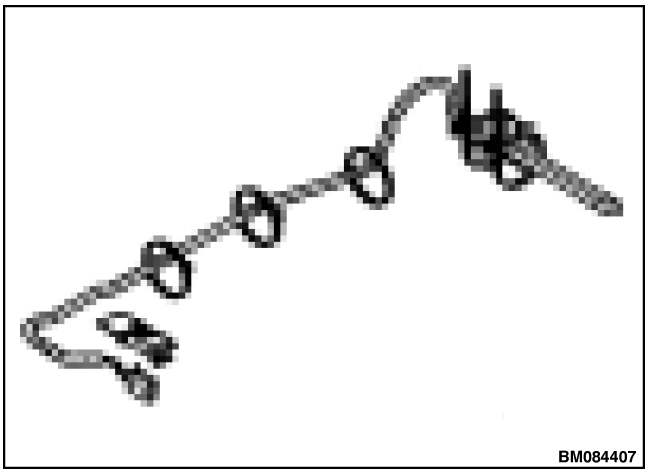


Figure 68. Operator Presence Sensor and Harness (Grammar seat)

Install

1. Install the operator presence sensor into the seat. Press the sensor firmly until it snaps into place.

2. Install the seat. Refer to **Operator's Cab** 0100SRM2298 for details.

3. Connect the seat harness to the chassis harness.

4. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

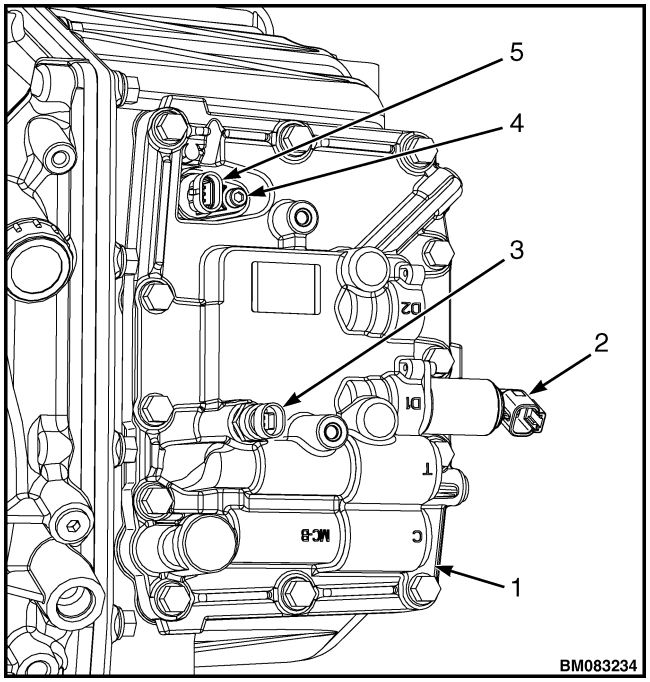
TRANSMISSION SENSORS (POWERSHIFT 1 TRANSMISSION)

Speed Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the speed sensor (item 5) from the transmission harness. Refer to Figure 69.



1. TRANSMISSION CONTROL VALVE
2. PRESSURE SENSOR
3. TEMPERATURE SENSOR
4. BOLT
5. SPEED SENSOR

Figure 69. Transmission Sensors

3. Remove the bolt (item 4) and speed sensor (item 5) from transmission control valve (item 1). Refer to Figure 69.

4. Discard the O-ring from the speed sensor.

Install

1. Install new O-ring on speed sensor.
2. Install the speed sensor (item 5) on transmission control valve (item 1). Refer to Figure 69.
3. Connect the speed sensor (item 5) to transmission harness. Refer to Figure 69.
4. Connect battery and close hood. Refer to Battery Remove and Install for details.

Pressure Sensor

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Disconnect pressure sensor (item 2) from transmission harness. Refer to Figure 69.
3. Remove pressure sensor (item 2) from transmission control valve (item 1). Refer to Figure 69.

Install

1. Install pressure sensor (item 2) on transmission control valve (item 1). Refer to Figure 69.
2. Connect pressure sensor (item 2) to transmission harness. Refer to Figure 69.
3. Connect battery and close hood. Refer to Battery Remove and Install for details.

Temperature Sensor

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Disconnect temperature sensor (item 3) from transmission harness. Refer to Figure 69.
3. Remove temperature sensor (item 3) from transmission control valve (item 1). Refer to Figure 69.

Install

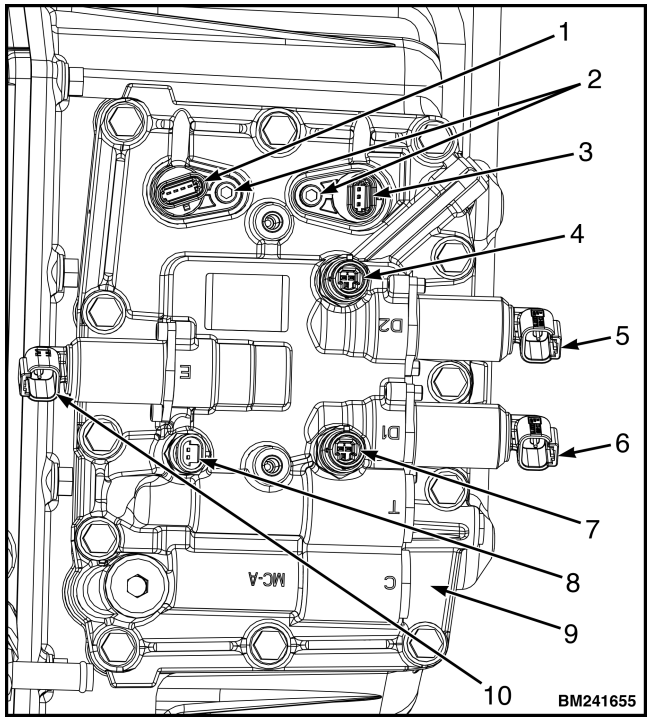
1. Install temperature sensor (item 3) on transmission control valve (item 1). Refer to Figure 69.
2. Connect temperature sensor (item 3) to transmission harness. Refer to Figure 69.
3. Connect battery and close hood. Refer to Battery Remove and Install for details.

TRANSMISSION SENSORS (DURAMATCH TRANSMISSION)

Speed Sensors

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.
2. Disconnect the Transmission Output Speed Sensor (TOSS) (item 1, Figure 70) from the transmission harness.
3. Disconnect the Transmission Input Speed Sensor (TISS) (item 3, Figure 70) from the transmission harness.
4. Remove the bolt (item 2, Figure 70) and TOSS from the transmission control valve (item 9).
5. Remove the bolt (item 2, Figure 70) and TISS from the transmission control valve (item 9).
6. Discard the O-ring from the speed sensors.



1. TRANSMISSION OUTPUT SPEED SENSOR (TOSS)
2. BOLT
3. TRANSMISSION INPUT SPEED SENSOR (TISS)
4. REVERSE PRESSURE SENSOR
5. REVERSE SOLENOID (D2)
6. FORWARD SOLENOID (D1)
7. FORWARD PRESSURE SENSOR
8. TEMPERATURE SENSOR
9. TRANSMISSION CONTROL VALVE
10. ENABLE SOLENOID

Figure 70. Transmission Sensors

Install

1. Install new O-ring on each speed sensor.

2. Install the Transmission Output Speed Sensor (TOSS) (item 1, Figure 70) on the transmission control valve (item 9) and insert the bolt (item 2) to secure.

3. Tighten the bolt to standard torque.

4. Install the Transmission Input Speed Sensor (TISS) (item 3, Figure 70) on the transmission control valve (item 9) and insert the bolt (item 2) to secure.

5. Tighten the bolt to standard torque.

6. Connect the TOSS (item 1, Figure 70) to the transmission harness.

7. Connect the TISS (item 3, Figure 70) to the transmission harness.

8. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

Pressure Sensor

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Disconnect the reverse pressure sensor (item 4, Figure 70) from the transmission harness.

3. Disconnect the forward pressure sensor (item 7, Figure 70) from the transmission harness.

4. Remove the reverse pressure sensor from the transmission control valve (item 9, Figure 70).

5. Remove the forward pressure sensor from the transmission control valve (item 9, Figure 70).

Install

1. Install the forward pressure sensor (item 7, Figure 70) on transmission control valve (item 9).

2. Install the reverse pressure sensor (item 4, Figure 70) on transmission control valve (item 9).

3. Connect the forward pressure sensor to the transmission harness. Refer to Figure 70.

4. Connect the reverse pressure sensor to the transmission harness. Refer to Figure 70.

5. Connect the battery and close hood. Refer to Battery Remove and Install for details.

Temperature Sensor

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Disconnect the temperature sensor (item 8, Figure 70) from transmission harness.

3. Remove temperature sensor from the transmission control valve (item 9, Figure 70).

Install

1. Install temperature sensor (item 8) on the transmission control valve (item 9, Figure 70).

2. Connect the temperature sensor to the transmission harness. Refer to Figure 70.

3. Connect battery and close hood. Refer to Battery Remove and Install for details.

SAHR VALVE SENSORS (POWERSHIFT TRANSMISSION)

Remove

1. See Replacing the SAHR valve (wet brake drive axle with Powershift transmission) in **Hydraulics** 1900SRM2302.

Install

1. See Replacing the SAHR valve (wet brake drive axle with Powershift transmission) in **Hydraulics** 1900SRM2302.

SAHR VALVE SENSORS AND SOLENOIDS (HYDROSTATIC TRANSMISSION)

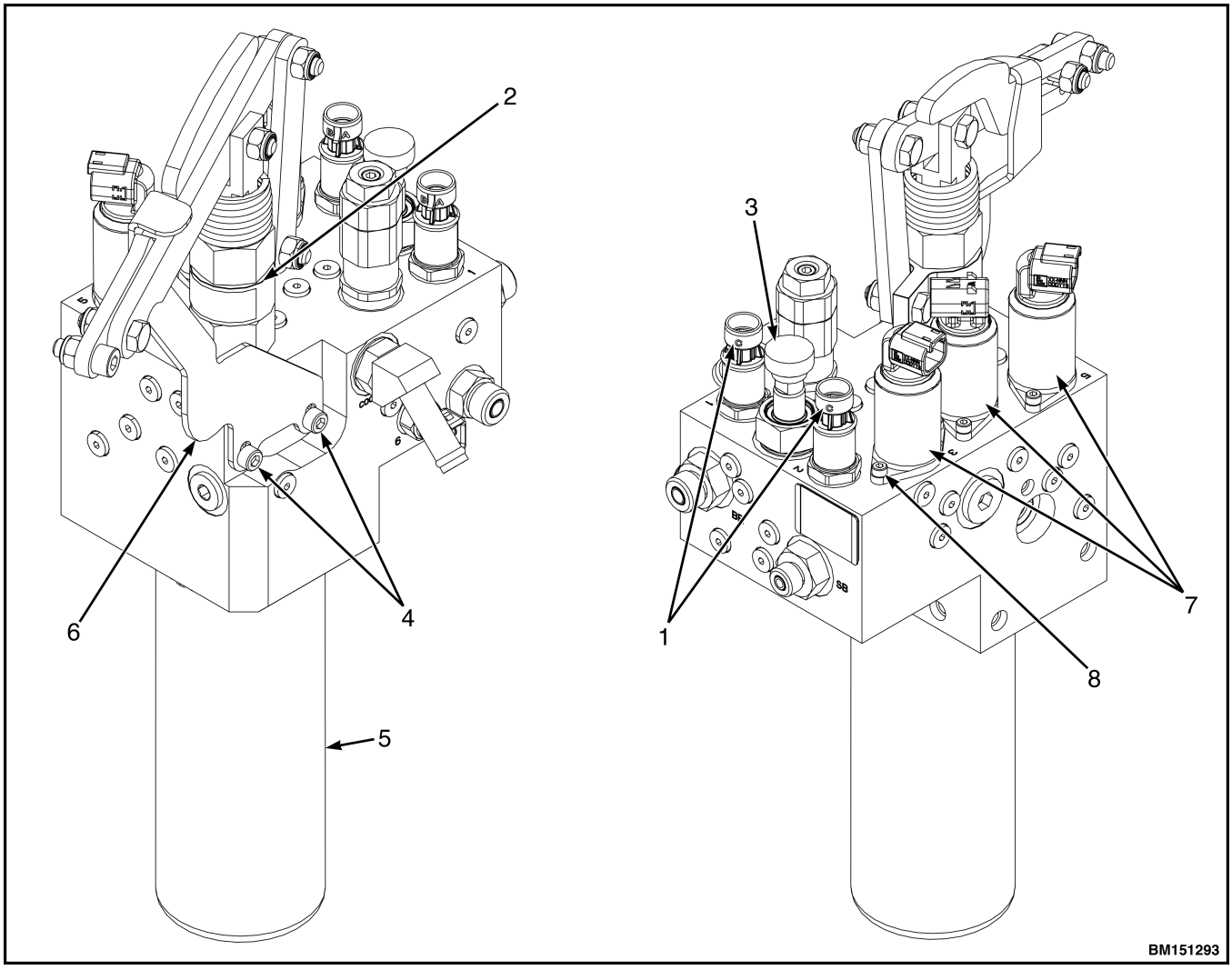
Remove

1. Remove the SAHR valve as specified in Replacing the SAHR valve (wet brake drive axle with Hydrostatic transmission)in **Hydraulics** 1900SRM2302.

2. Locate the sensors and solenoids on the SAHR valve. See Figure 71.

3. Remove the capscrews retaining each sensor or solenoid.

4. Remove the sensor or solenoid from the SAHR valve.



1. PRESSURE SENSOR
2. HAND PUMP CARTIDGE VALVE
3. MANUAL RELEASE BYPASS VALVE (PLUNGER)
4. CAPSCREW
5. ACCUMULATOR
6. HAND PUMP BRACKET
7. SOLENOID
8. CAPSCREW

Figure 71. SAHR Valve Assembly

Install

1. Install the sensor or solenoid on the SAHR valve. See Figure 71.

2. Insert the capscrews to retain each sensor or solenoid.

3. Install the SAHR valve as specified in Replacing the SAHR valve (wet brake drive axle with Hydrostatic transmission) in **Hydraulics** 1900SRM2302.

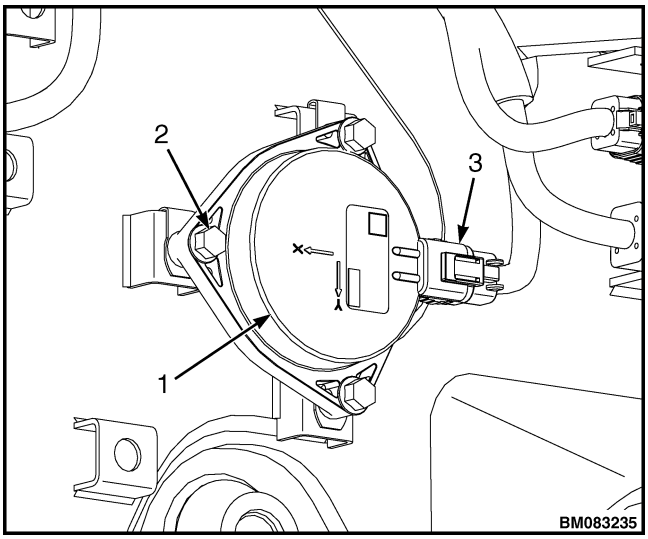
IMPACT SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the floor mat and floor plate. See **Frame and Main Components** 8000SRM2306 for removal procedures.

3. Disconnect the impact sensor from the right chassis harness.



1. IMPACT SENSOR
2. CAPSCREW
3. RIGHT CHASSIS HARNESS

Figure 72. Impact Sensor

4. Remove the three capscrews attaching the impact sensor to the mounting bracket. Remove the impact sensor from the truck.

Install

1. Install the impact sensor to the mounting bracket.

2. Insert the three capscrews to secure and torque to 10.5 N•m (93 lbf in).

3. Connect the impact sensor to the right chassis harness.

4. Install the floor mat and floor plate. See **Frame and Main Components** 8000SRM2306 for install procedures.

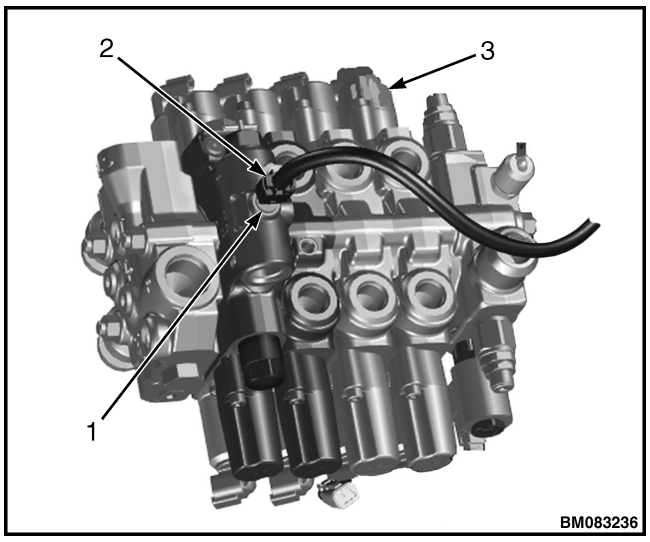
5. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

LOAD WEIGHT SENSOR

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the harness connector from the load weight sensor.



1. LOAD WEIGHT SENSOR
2. HARNESS CONNECTOR
3. CONTROL VALVE

NOTE: ELECTRONIC HYDRAULIC CONTROL VALVE SHOWN. LOAD WEIGHT SENSOR IS IN SAME POSITION ON MANUAL CONTROL VALVE. SOME COMPONENTS REMOVED FOR CLARITY.

Figure 73. Load Weight Sensor

3. Remove load weight sensor from fitting on hydraulic control valve.

Install

1. Insert the load weight sensor into the fitting. Tighten the sensor first by hand, then torque the sensor to 10 to 20 N•m (7.4 to 14.8 lbf ft).

2. Connect harness connector to load weight sensor.

3. Connect battery and close hood. Refer to Battery Remove and Install for details.

AMBIENT LIGHT SENSOR

Mounted on LH corner of OHG, the ambient light sensor automatically activates the work lights based on ambient light conditions.

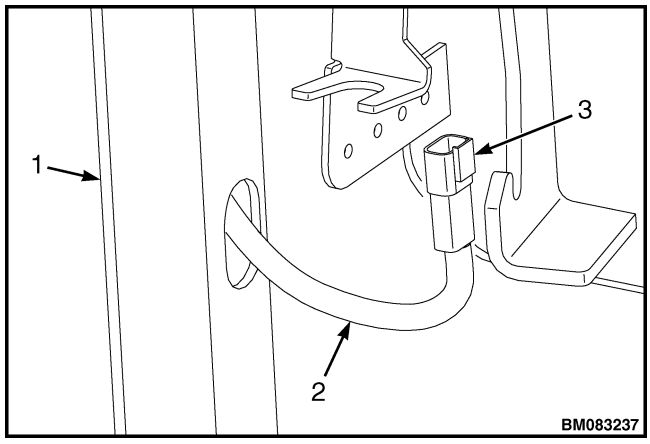
Remove

NOTE: Ambient light sensor wiring is routed through both top and front LH overhead guard support posts.

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Remove the kick panel to access the harness and electrical connector. Refer to **Frame and Main Components** 8000SRM2306 for kick panel removal.

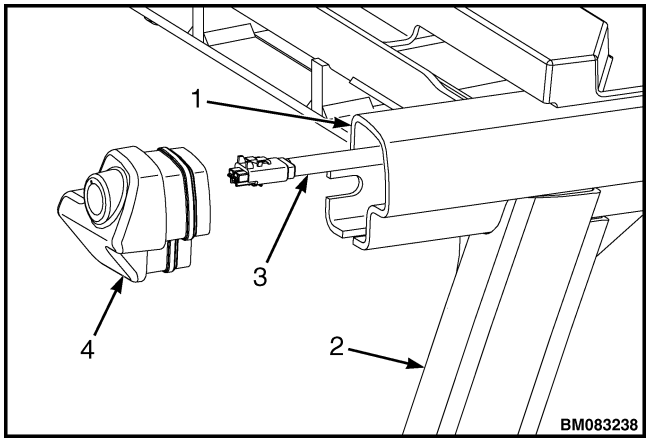
3. Disconnect the sensor electrical connector at bottom of front LH overhead guard support post.



1. FRONT LH OVERHEAD GUARD SUPPORT POST
2. HARNESS
3. ELECTRICAL CONNECTOR

Figure 74. Harness and Electrical Connector

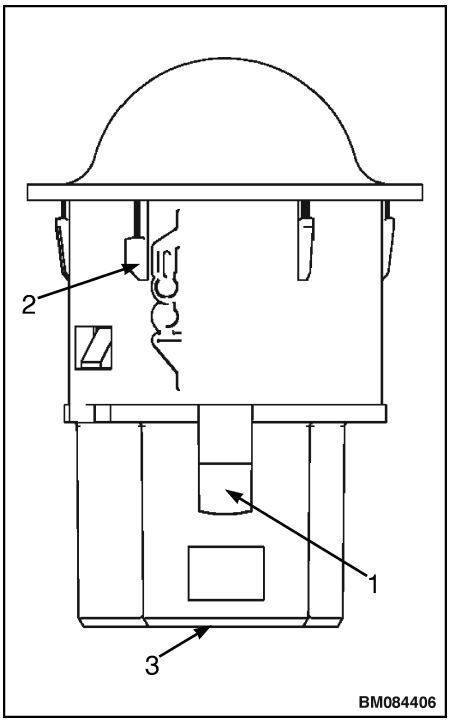
4. Carefully pry the plug with ambient light sensor from the top LH overhead guard support post.



1. TOP LH OVERHEAD GUARD SUPPORT POST
2. FRONT LH OVERHEAD GUARD SUPPORT POST
3. JUMPER
4. PLUG WITH AMBIENT LIGHT SENSOR

Figure 75. Plug with Ambient Light Sensor

5. Pull the plug with ambient light sensor, jumper, and harness out of front LH overhead guard support post.



1. SPRING TAB
2. ALIGNMENT NOTCH
3. CONNECTOR

Figure 76. Ambient Light Sensor

NOTE: It is not necessary to disconnect harness and jumper, they can remain together.

6. Disconnect jumper from plug with ambient light sensor.

7. Remove the ambient light sensor from the plug by squeezing the spring tabs and pulling.

Install

NOTE: Sensor and plug have mating notches for correct orientation. Ensure alignment notch on sensor and notch on plug are matched.

1. Install ambient light sensor into plug by squeezing spring tabs and pressing in until sensor stops.

2. Connect plug with ambient light sensor to jumper.

3. Pull jumper and harness back through front LH overhead guard support post using a fish tape or other method.

4. Firmly press plug with ambient light sensor into top LH overhead guard support post.

5. Connect the sensor electrical connector at the bottom of front LH overhead guard support post.

6. Install the kick panel. Refer to **Frame and Main Components** 8000SRM2306 for kick panel install.

7. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

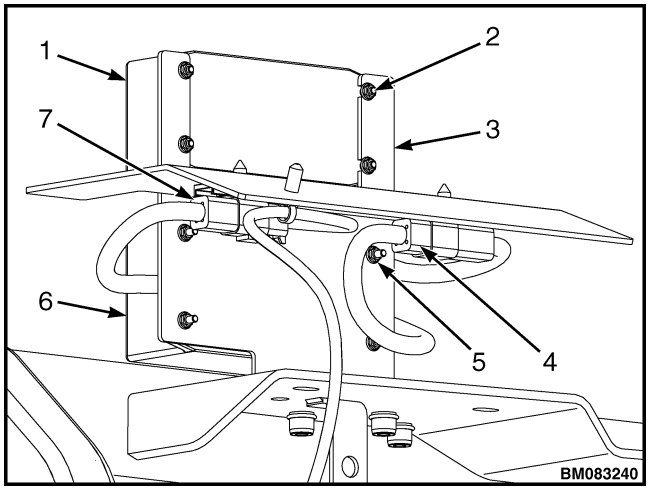
PROXIMITY SENSOR

NOTE: The proximity sensor is mounted on the overhead guard, rear canopy tube.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the CAN bus interface unit connector (item 7, Figure 77).



1. COLLISION AVOIDANCE UNIT
2. CAPSCREW AND NUT
3. BRACKET
4. COLLISION AVOIDANCE UNIT CONNECTOR
5. CAPSCREW AND NUT
6. CAN BUS INTERFACE UNIT
7. CAN BUS INTERFACE UNIT CONNECTOR

Figure 77. Proximity Sensor

3. Disconnect the collision avoidance unit connector (item 4, Figure 77).

4. Remove the four capscrews and nuts (item 2, Figure 77) and collision avoidance unit (item 1) from bracket (item 3).

5. Remove the four capscrews and nuts (item 5, Figure 77) and CAN bus interface unit (item 6) from bracket (item 3).

Install

1. Install CAN bus interface unit (item 6, Figure 77) to bracket (item 3) with four capscrews and nuts (item 5).

2. Torque the capscrews to 4.17 N•m (37.0 lbf in).

3. Install collision avoidance unit (item 1, Figure 77) to bracket (item 3) with four capscrews and nuts (item 2).

4. Torque the capscrews to 4.17 N•m (37.0 lbf in).

5. Connect the collision avoidance unit connector (item 4, Figure 77).

6. Connect the CAN bus interface unit connector (item 7, Figure 77).

7. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

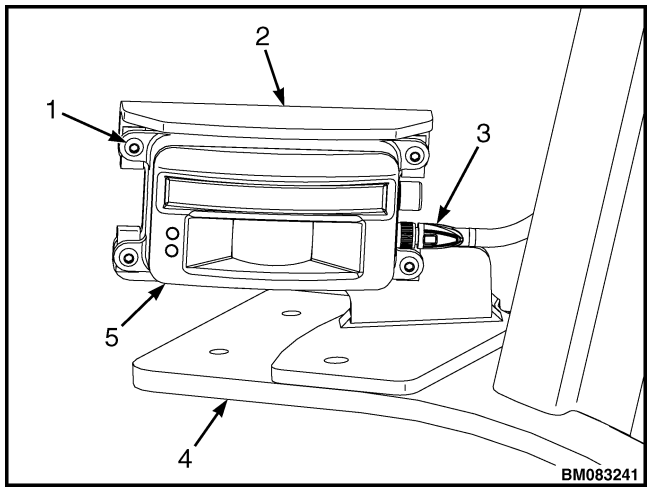
OBJECT DETECTION SENSORS (SIDE)

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the sensor cable (item 3, Figure 78) from sensor (item 5).

NOTE: One side sensor is mounted on each side of the truck, both remove and install the same. Only the left side will be shown.



1. CAPSCREW
2. BRACKET
3. SENSOR CABLE
4. LH FENDER
5. SENSOR

Figure 78. Object Detection Side Sensor

3. Remove the four capscrews (item 1, Figure 78) and sensor (item 5) from bracket (item 2).

Install

1. Install sensor (item 5, Figure 78) to bracket (item 2) with four capscrews (item 1). Torque capscrews to 14.3 Nm (10.5 lbf-ft).

2. Connect the sensor cable (item 3, Figure 78) to sensor (item 5).

3. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

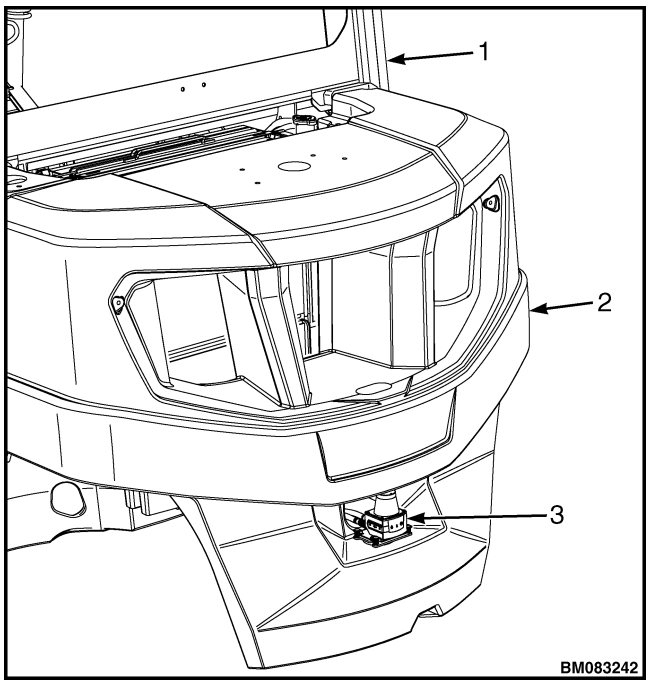
OBJECT DETECTION SENSOR (REAR)

NOTE: The rear object detection sensor is mounted in the counterweight.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. The sensor is mounted to a plate and can be removed without removing the counterweight.

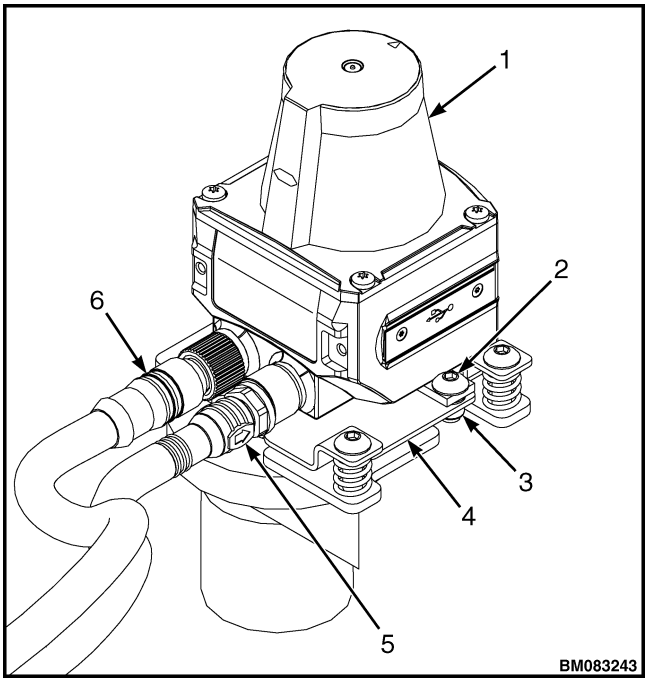


1. RH, OVERHEAD GUARD SUPPORT POST
2. COUNTERWEIGHT
3. SENSOR

Figure 79. Object Detection Rear Sensor Location

NOTE: Counterweight has been removed from graphic for clarity.

3. Disconnect the power cable (item 6, Figure 80) from sensor (item 1).



1. SENSOR
2. CAPSCREWS
3. THREADED INSERTS
4. ADJUSTMENT PLATE
5. ETHERNET CABLE
6. POWER CABLE

Figure 80. Object Detection Rear Sensor

4. Disconnect the ethernet cable (item 5, Figure 80) from the sensor (item 1).

NOTE: Discard threaded inserts and install new.

5. Remove two capscrews (item 2, Figure 80) from two threaded insert (item 3) and adjustment plate (item 4).

6. Remove sensor (item 1, Figure 80).

Install

1. Install new threaded inserts (item 3, Figure 80) into adjustment plate (item 4, Figure 80).

2. Install sensor (item 1, Figure 80) on adjustment plate (item 4) with two capscrews (item 2).

3. Connect Ethernet cable (item 5, Figure 80) to sensor (item 1).

4. Connect power cable (item 6, Figure 80) to sensor (item 1).

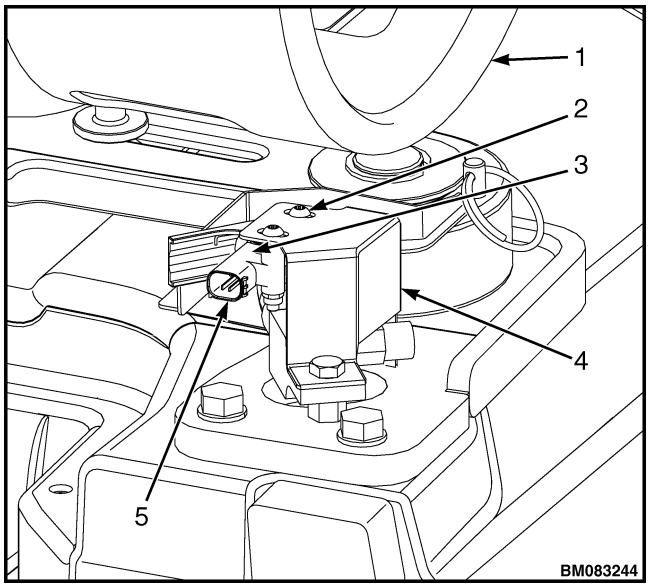
5. Connect battery and close hood. Refer to Battery Remove and Install for details.

LPG TANK INTERLOCK

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Disconnect sensor connector (item 5, Figure 81).



1. LPG TANK
2. CAPSCREW AND NUT
3. POSITION SENSOR
4. BRACKET
5. SENSOR CONNECTOR

Figure 81. LPG Tank Interlock

3. Remove the capscrews and nuts (item 2, Figure 81) from the bracket (item 4).

4. Remove the position sensor (item 3, Figure 81) from the bracket (item 4).

Install

1. Install the position sensor (item 3, Figure 81) to bracket (item 4) and secure with the capscrews and nuts (item 2).

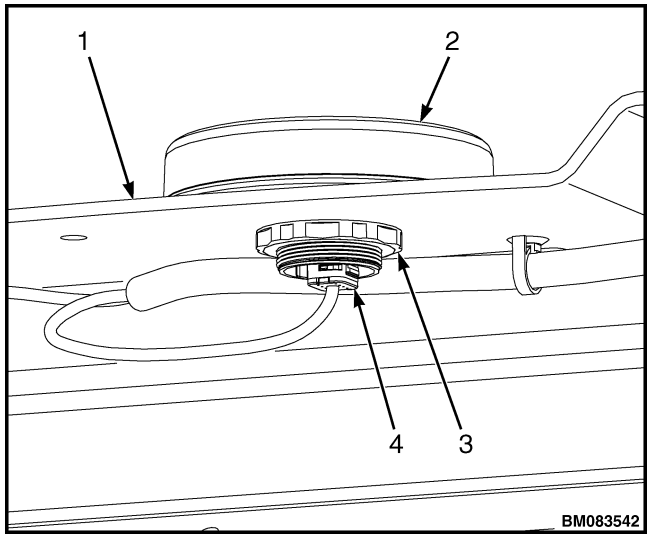
2. Connect the sensor connector (item 5, Figure 81).

3. Connect the battery and close the hood. Refer to Battery Remove and Install for details.

SMART ANTENNA

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.



1. REAR LIGHT MOUNTING BRACKET
2. ANTENNA
3. NUT
4. WIRE HARNESS

Figure 82. Smart Antenna

2. Disconnect the wire harness (item 4, Figure 82) from the antenna (item 2, Figure 82).

3. Remove the nut (item 3, Figure 82).

4. Remove the antenna (item 2, Figure 82) from the rear light mounting bracket (item 1, Figure 82).

Install

1. Install the antenna (item 2, Figure 82) on the rear light mounting bracket (item 1, Figure 82).

2. Install the nut (item 3, Figure 82). Torque the nut to 8.8 to 10 N•m (6.5 to 7.4 lbf ft).

3. Connect the wire harness (item 4, Figure 82) to the antenna (item 2, Figure 82).

4. Connect the battery. Refer to Battery Remove and Install for details.

5. Close the hood.

REAR VIEW CAMERA, (REAR MOUNTED DISPLAY)

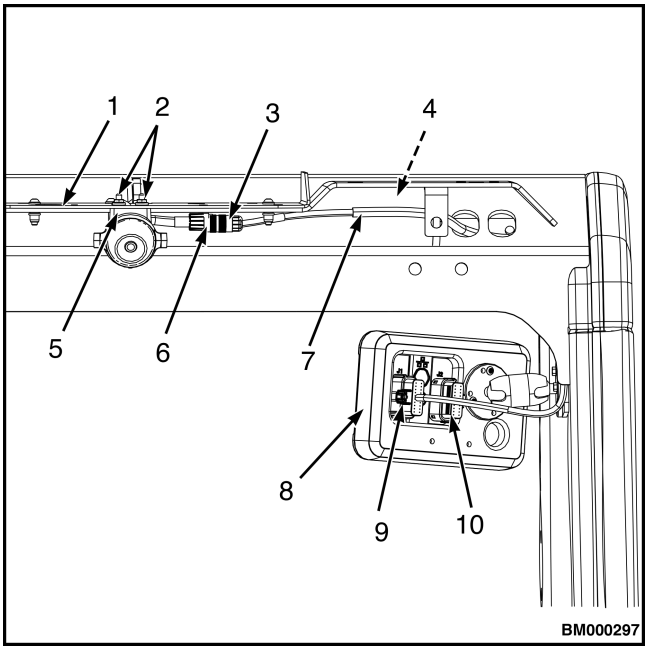
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Locate the connector CRS 108 (item 3, Figure 83) on the rear view camera wire harness (item 7) and disconnect from the connector (item 6) on the rear view camera cable.

3. Remove the two nuts (item 2, Figure 83) securing the camera assembly (item 5) to the mounting bracket, and remove the camera assembly.

4. If replacing the rear view camera wire harness, see Figure 83 and:
   - Disconnect connector CRS 105 (item 9) and connector CRS 106 (item 10) on the other end of the wire harness from the back of the display (item 8).
   - Disconnect the connector CRP596 (item 4) from the overhead guard rear harness.
   - Disconnect the clamps attaching the rear view camera wire harness to the overhead guard.
   - Remove the rear view camera wire harness from the lift truck.



1. MOUNTING BRACKET
2. NUTS
3. CONNECTOR (CRS 108)
4. CONNECTOR (CRP 596)
5. CAMERA ASSEMBLY
6. CONNECTOR
7. REAR VIEW CAMERA WIRE HARNESS
8. DISPLAY
9. CONNECTOR (CRS 105)
10. CONNECTOR (CRS 106)

Figure 83. Rear view camera with rear mounted display

Install

1. If installing new rear view camera wire harness, see Figure 83 and:

- Locate the rear view camera wire harness.
- Connect the connector CRS 105 (item 9) and connector CRS 106 (item 10) to the back of the display (item 8).
- Connect the connector CRP596 (item 4) to the overhead guard rear harness.
- Connect the clamps to secure the rear view camera wire harness to the overhead guard.

2. Align the two screws on the camera assembly with the two holes on the mounting bracket and install the two nuts (item 2, Figure 83) to secure.

3. Tighten the nuts to standard torque.

4. Connect the connector (item 7) on the rear view camera cable to connector CRS 108 (item 3, Figure 83) on the rear view camera wire harness.

5. Connect battery. Refer to Battery Remove and Install for details.

6. Close hood.

REAR VIEW CAMERA, (FRONT MOUNTED DISPLAY)

Remove

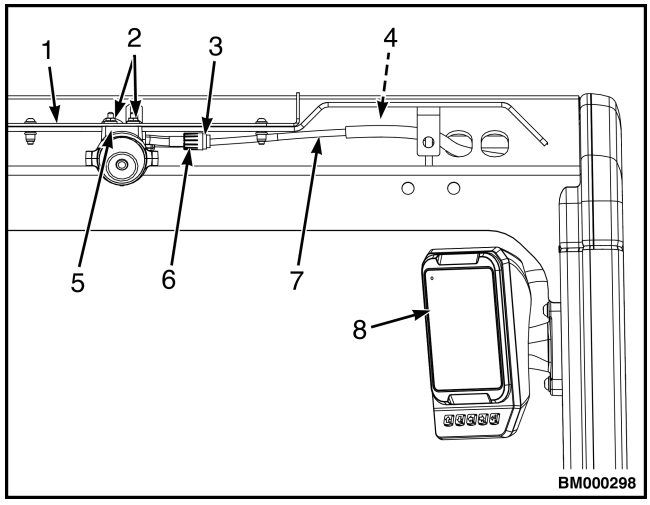
1. Raise hood and disconnect battery. Refer to Battery Remove and Install for details.

2. Locate the connector CRS 108 (item 3, Figure 84) on the rear view camera wire harness (item 7) and disconnect from the connector (item 6) on the rear view camera cable.

3. Remove the two nuts (item 2, Figure 84) securing the camera assembly (item 5) to the mounting bracket, and remove the camera assembly.

4. If replacing the rear view camera wire harness, see Figure 84 and:

- Disconnect connector on the other end of the wire harness from the back of the display (item 8).
- Disconnect the connector CRP596 (item 4) from the overhead guard rear harness.
- Disconnect the clamps attaching the rear view camera wire harness to the overhead guard.
- Remove the rear view camera wire harness from the lift truck.



1. MOUNTING BRACKET
2. NUTS
3. CONNECTOR (CRS 101)
4. CONNECTOR (CRP 595)
5. CAMERA ASSEMBLY
6. CONNECTOR
7. REAR VIEW CAMERA WIRE HARNESS
8. DISPLAY

Figure 84. Rear view camera with front mounted display

Install

1. If installing new rear view camera wire harness, see Figure 84 and:

- Locate the rear view camera wire harness.
- Connect the connector to the back of the display (item 8).
- Connect the connector CRP595 (item 4) to the overhead guard rear harness.
- Connect the clamps to secure the rear view camera wire harness to the overhead guard.

2. Align the two screws on the camera assembly with the two holes on the mounting bracket and install the two nuts (item 2, Figure 84) to secure.

3. Tighten the nuts to standard torque.

4. Connect the connector (item 7) on the rear view camera cable to connector CRS 101 (item 3, Figure 84) on the rear view camera wire harness.

5. Connect battery. Refer to Battery Remove and Install for details.

6. Close hood.

POWER DISTRIBUTION MODULE (PDM) REPAIR 202001-083

POWER DISTRIBUTION MODULE

The PDM distributes all unswitched and switched power to the lift truck. Power and ground connections are supplied directly from the battery to the PDM and then distributed. The PDM contains numerous fuses and relays.

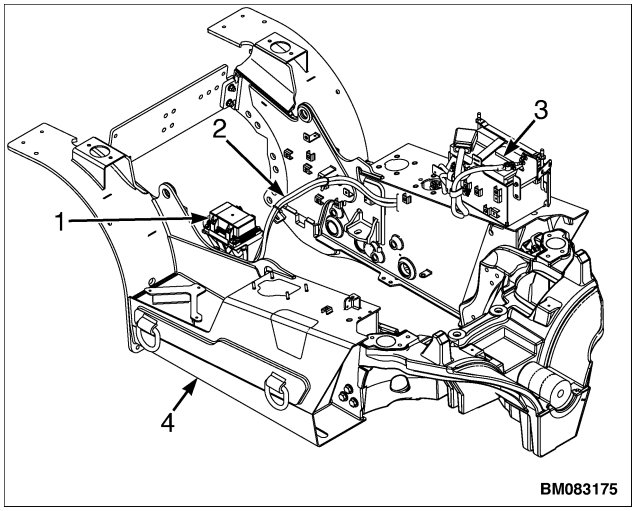
NOTE: The PDM has no serviceable components except for the relays and fuses. The relays and fuses within the PDM can be replaced. If the PDM malfunctions, replace with a new unit. See the Parts Manual for replacement part number.

Remove

NOTE: Frame shown may vary depending on model and options.

1. Raise the hood.

2. On the right side frame, disconnect battery cables or turn battery disconnect switch (if equipped) to **OFF** position. See Figure 85.

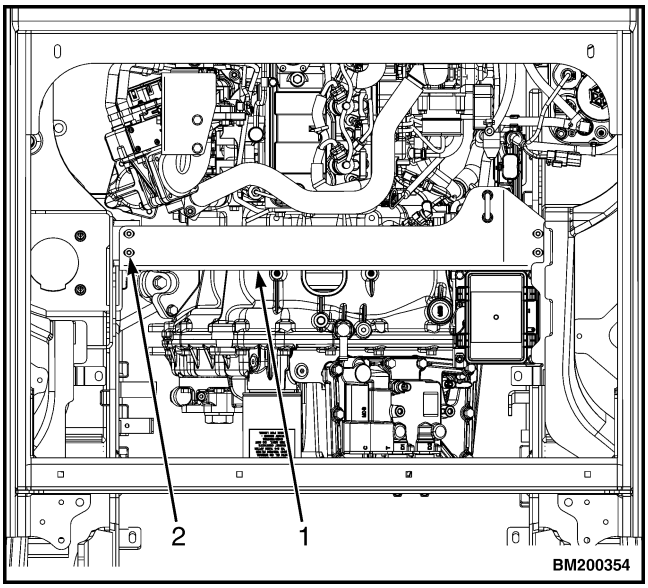


1. PDM
2. BATTERY CABLES (B+ AND B-)
3. BATTERY
4. FRAME

Figure 85. PDM Location

3. Remove the floor mat and rear floor plate.

4. Remove the four capscrews and the hood crossmember from the operator module. See Figure 86.

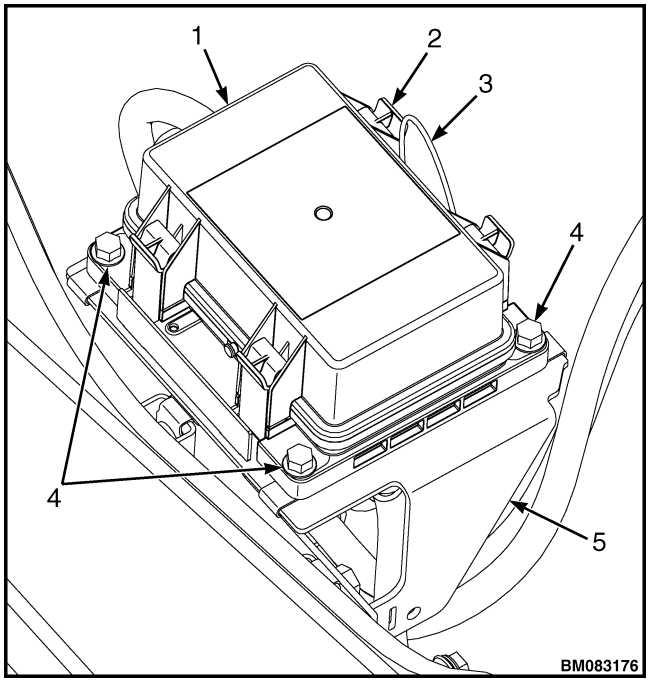


1. HOOD CROSSMEMBER
2. CAPSCREW

Figure 86. Hood crossmember

5. Loosen the three bolts shown and lift the PDM from bracket enough to access the chassis harness conectors. See Figure 87.

NOTE: Fourth bolt (not shown) does not attach to bracket.



1. PDM COVER
2. PDM COVER SPRING TABS
3. PDM COVER TETHER
4. BOLTS
5. PDM BRACKET

Figure 87. PDM and Cover

6. Disconnect the chassis harness from the PDM main power terminals located on underneath side.

7. Remove the PDM from lift truck.

Install

1. Connect the chassis harness to the PDM main power terminals.

- Torque B+ terminal (M6) to 3.9 N•m (34.5 lbf in).
- Torque B - terminal (M8) to 9 N•m (79.7 lbf in).

2. Install the PDM on the bracket and secure with the three bolts. See Figure 87. Tighten the bolts to 10.5 N•m (93 lbf in).

3. Install the hood crossmember in place on the operator module. See Figure 86.

4. Insert the four capscrews to secure the hood crossmember and tighten to standard torque. See Figure 86.

5. Connect the battery or turn the battery disconnect to the **ON** position (if equipped).

6. Install the rear floor mat and floor plate.

7. Close the hood.

Replacing PDM components (fuses and relays)

CAUTION

To reduce the risk of damaging the lift truck electrical system, only replace blown fuses with fuses of the same value, after the fuse-blowing fault has been detected and repaired.

If the lift truck is equipped with a key switch, turn key to **ON** position. If lift truck is equipped with a Power **ON/OFF** button, press button to turn system power on. Check all indicator lights for correct operation as described in the Operating Manual. Check the operation of the horn. Start the engine by turning the key switch to the Start position, if lift truck is equipped with a key switch, or press the Power **ON/OFF** button, if lift truck is equipped with this button. If any indicator lights do not operate correctly, check the fuses. Replace the failed fuse using the supplied fuse puller.

NOTE: Located on the PDM is a fuse test socket (see graphic below) for checking suspected blown fuses. Extract the suspect fuse using the fuse puller and insert into the test socket. If the LED does not illuminate the fuse has failed and must be replaced. If the LED does illuminate the fuse is acceptable.

1. Locate the cover of the PDM. See Figure 87.

NOTE: Due to proximty of the hood crossmember, the PDM cover may be difficult to remove.

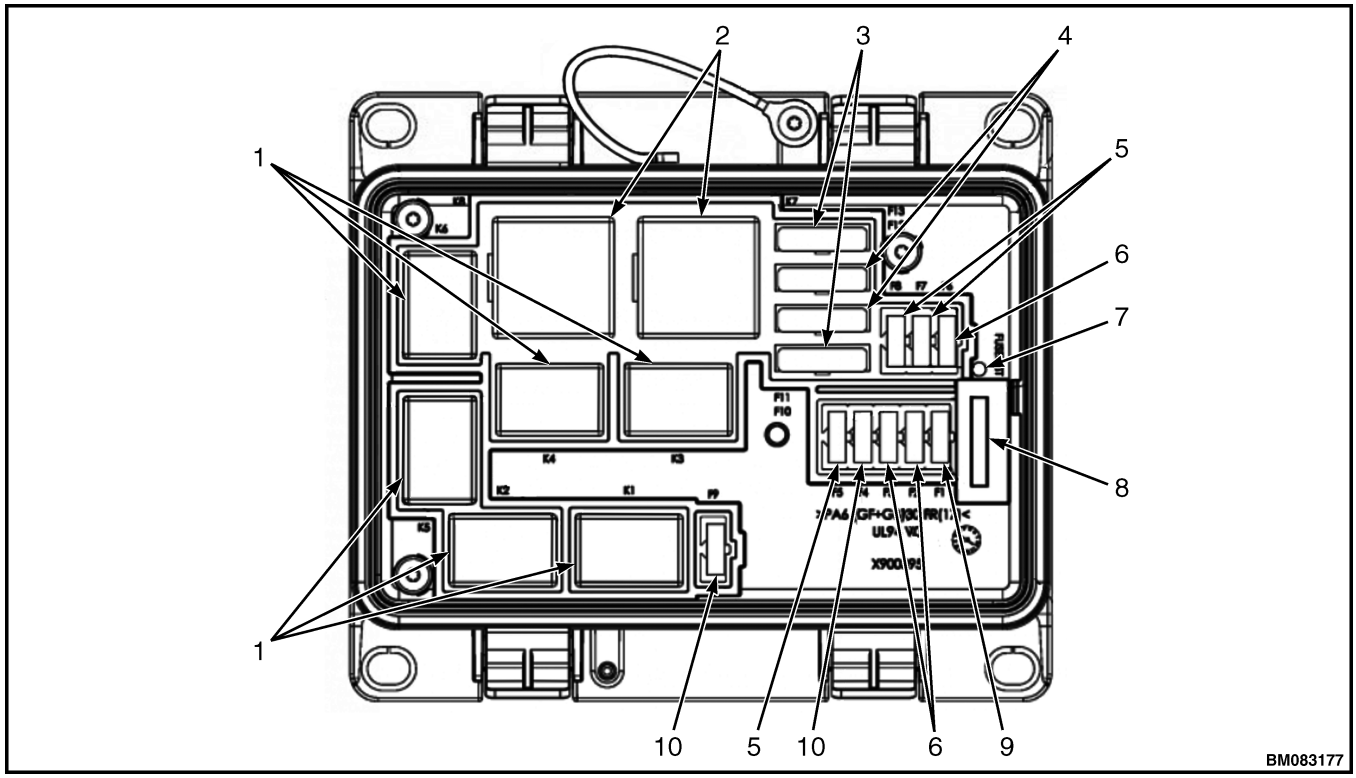
2. Press the spring tabs and lift the cover to remove. See Figure 87.

3. Locate the fuse to be replaced and remove the fuse. See the figures and tables below.

4. Insert the new fuse.

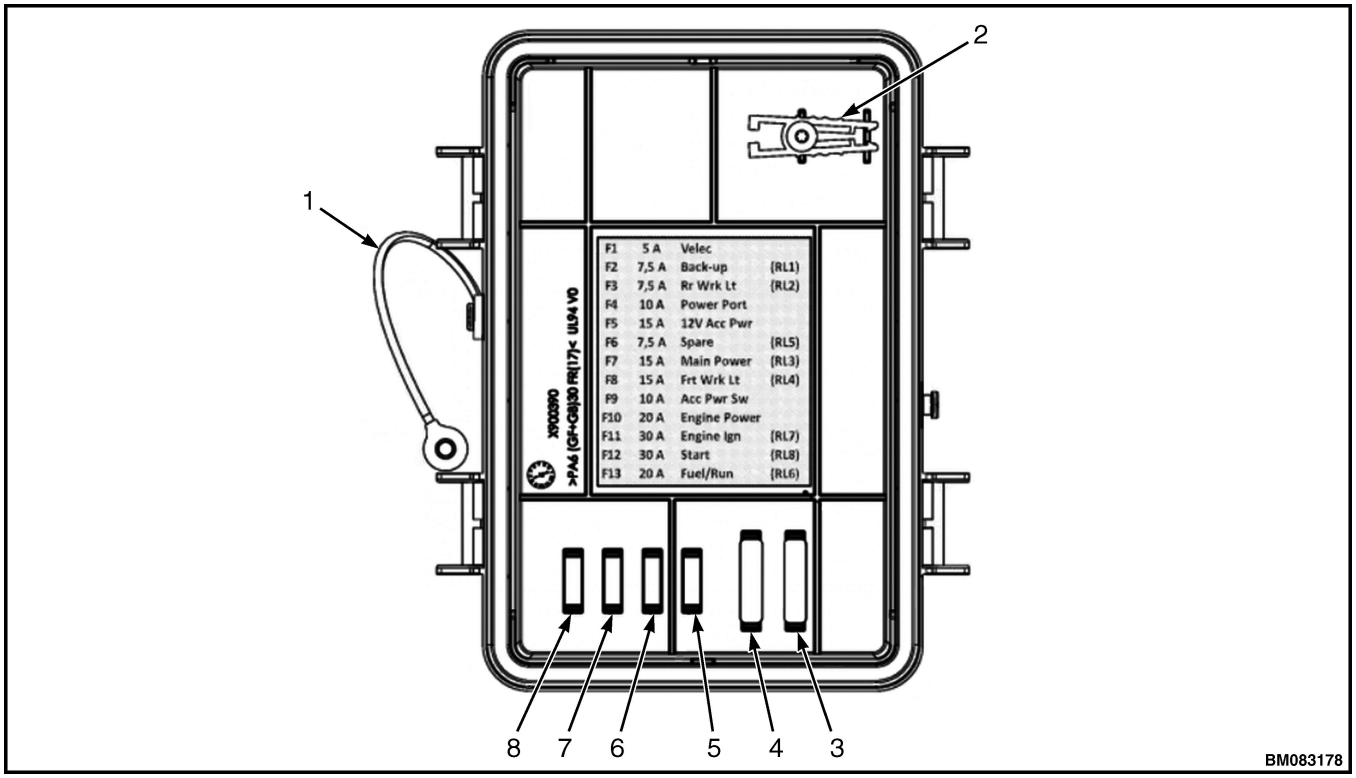
NOTE: When installing the PDM cover, make sure the tether (item 3, Figure 87) remains free and does not get pinched in between the PDM cover and the housing, or cover will not secure properly.

5. Locate the side of the cover to be installed closest to the hood crossmember, and slide that end of the cover under the crossmember. Lower the other end of the cover to secure.



1. MICRO RELAYS - 20A
2. MINI RELAYS - 30A
3. BLADE FUSE, ATO - 20A
4. BLADE FUSE, ATO - 30A
5. BLADE FUSE, ATM MINI - 15A
6. BLADE FUSE, ATM MINI - 7.5A
7. FUSE TEST LED
8. FUSE TEST SOCKET
9. BLADE FUSE, ATM MINI - 5A
10. BLADE FUSE, ATM MINI - 10A

Figure 88. PDM Fuse and Relay Locations (Cover Removed)



1. COVER TETHER
2. FUSE PULLER
3. SPARE BLADE FUSE, ATO - 30A
4. SPARE BLADE FUSE, ATO - 20A
5. SPARE BLADE FUSE, ATM MINI - 15A
6. SPARE BLADE FUSE, ATM MINI - 10A
7. SPARE BLADE FUSE, ATM MINI - 7.5A
8. SPARE BLADE FUSE, ATM MINI - 5A

Figure 89. PDM Cover (Underneath Side) and Spare Fuses

Table 1. Fuse and Relay Descriptions

Fuse	Value	Description
F1	5A	12V Velectric
F2	7.5A	Back-up
F3	7.5A	Rear Worklight
F4	10A	Power Port
F5	15A	12V Acc Power
F6	7.5A	Manual Lever Valve
F7	15A	12V VPower
F8	15A	Front Worklight
F9	10A	Acc Conn
F10	20A	12V Engine
F11	30A	Engine Ignition
F12	30A	Start

Table 1. Fuse and Relay Descriptions (Continued)

F13	20A	Fuel Run/Latch
Relay		
Micro Relay RL1 - (K1)		Back-up
Micro Relay RL2 - (K2)		Rear Worklight
Micro Relay RL3 - (K3)		Main Power
Micro Relay RL4 - (K4)		Front Worklight
Micro Relay RL5 - (K5)		OPS Solenoid
Micro Relay RL6 - (K6)		Fuel/Run
Mini Relay RL7 - (K7)		Engine Ignition
Mini Relay RL8 - (K8)		Start

BATTERY SERVICE
202001-084

BATTERY REMOVE AND INSTALL

Two types of batteries available (conventional and maintenance free), both remove and install the same.

WARNING

Whenever disconnecting or reconnecting a battery, always disconnect the negative post cable first and connect it last. If you don't do this, dangerous sparking could occur. You should never connect the battery with the key switch in the ON position or the engine running. Never lay metal tools or any other objects across the battery which could potentially cause a short circuit.

NOTE: The main battery terminals are the positive (+) and negative (–) posts. The positive (+) post is **larger** to prevent the danger of connecting the battery in reverse polarity. Reversing the polarity may damage some components and wiring in the system. A red cable is connected to the positive (+) battery post and a black cable is connected to the negative (–) post. The negative (–) cable is typically connected to the frame or engine block. The positive (+) cable is typically connected to the starter solenoid.

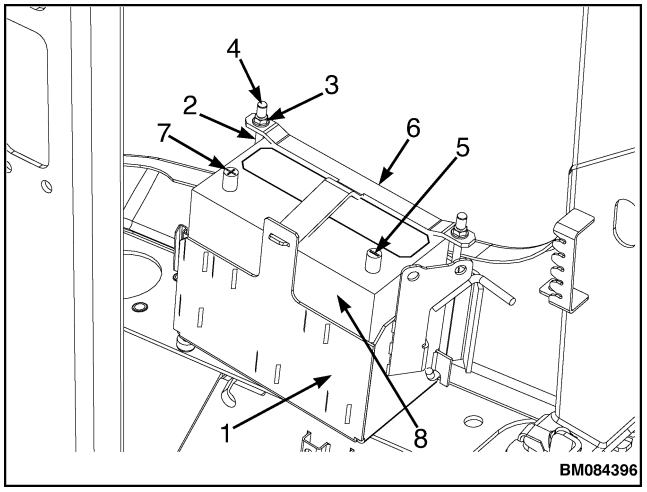
Remove

1. Open hood.

NOTE: Some components not shown for clarity.

2. Remove negative battery cable from negative battery post.

3. Remove positive battery cable from positive battery post.



NOTE: THE ABOVE GRAPHIC IS FOR ILLUSTRATIVE PURPOSES ONLY, YOUR CONFIGURATION MAY NOT APPEAR THE SAME.

1. BATTERY HOLDER
2. BATTERY HOLD DOWN LINK
3. WASHER AND NUT
4. VINYL CAP
5. NEGATIVE (-) BATTERY POST
6. BATTERY TIE DOWN BRACKET
7. POSITIVE (+) BATTERY POST
8. BATTERY

Figure 90. Battery Removal

4. Remove vinyl cap from battery hold down link.

5. Remove nut and washer from battery hold down link.

6. Remove battery tie down bracket.

7. Remove battery from battery holder.

Install

1. Install battery in battery holder.

2. Install battery tie down bracket.

3. Install washer and nut on battery hold down link. Torque nuts to 2.0-2.5 Nm (18-22 lbf-in).

4. Replace vinyl caps on battery hold down link.

5. Install positive battery cable to positive battery post.

6. Install negative battery cable to negative battery post.

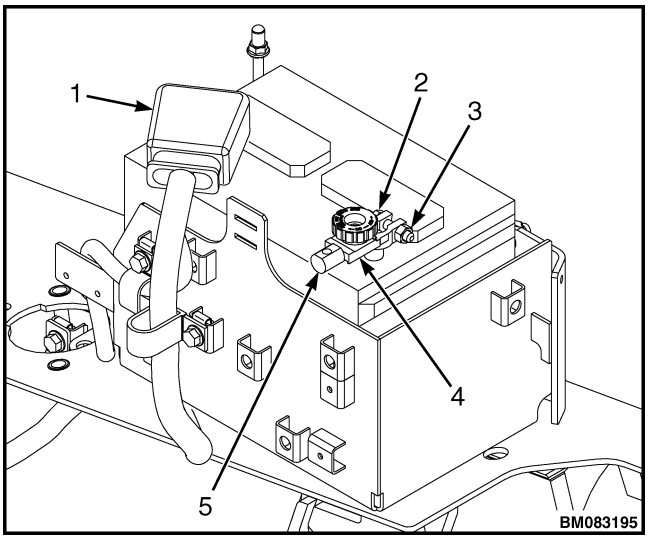
7. Close hood.

Battery Disconnect Switch (Optional)

The battery disconnect switch is an optional feature that allows the battery to be disconnected quickly. For more information on the battery disconnect switch, see Battery description in **Truck system description** 8000SRM2308.

Remove

1. Remove the negative battery cable from the terminal.
2. Loosen the bolt and nut from the disconnect switch on the negative battery terminal. See Figure 91.
3. Remove the disconnect switch from the negative battery terminal. See Figure 91.



1. POSITIVE BATTERY CABLE BOOT
2. DISCONNECT SWITCH BOLT
3. DISCONNECT SWITCH NUT
4. DISCONNECT SWITCH
5. NEGATIVE BATTERY CABLE (NOT SHOWN)

Figure 91. Battery Disconnect

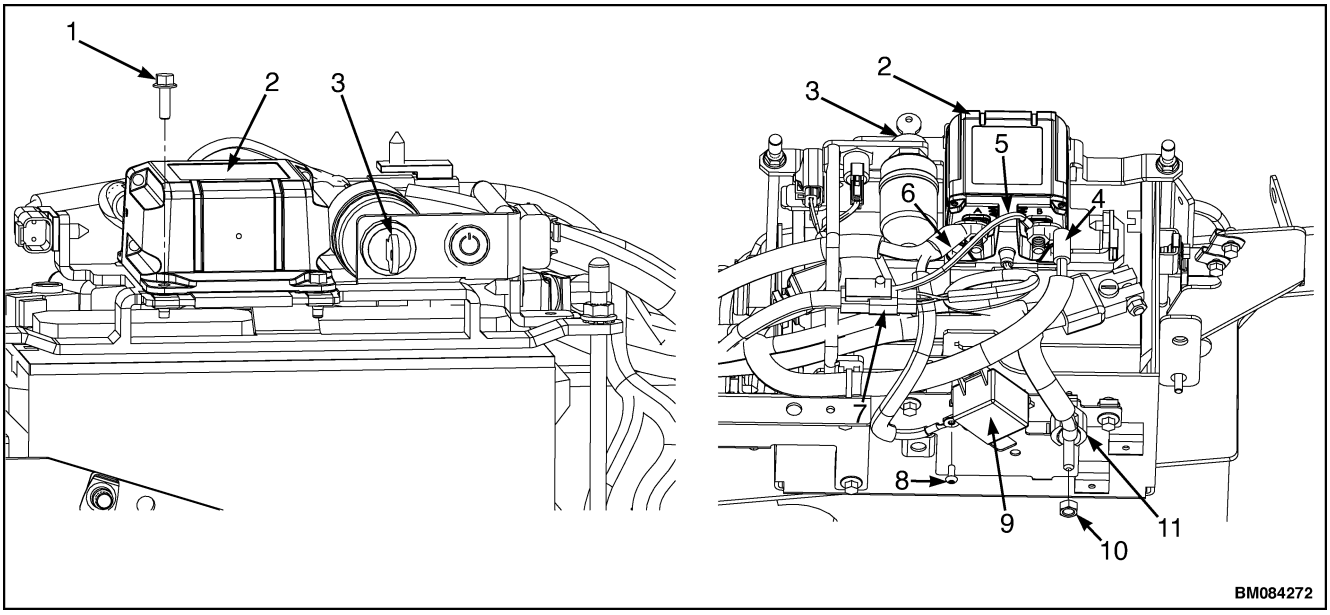
Install

1. Locate new battery disconnect switch.
2. Lower the disconnect switch onto the negative battery terminal. See Figure 91.
3. Insert the bolt and nut to secure the disconnect switch on the negative battery terminal. See Figure 91.
4. Tighten to standard torque.
5. Install negative battery cable onto terminal.

Battery Disconnect Switch (Type-S)

Remove

1. Open hood and turn the key to the **OFF** position (vertical). See Figure 92.
2. Remove negative battery cable from negative battery post.
3. Remove nut to remove negative battery cable from terminal post.
4. Remove positive battery cable from positive battery post.
5. Remove positive terminal jumper cable and Type-S wire harness ring terminal from B terminal of Bi-Stable relay.
6. Remove positive battery cables from A terminal of Bi-Stable relay.
7. Remove screw to release positive battery cable ring terminal from high current relay.
8. Disconnect Bi-Stable relay electrical connector from Type-S wire harness.
9. Remove four cap screws securing Bi-Stable relay to battery hold down.



1. CAP SCREW
2. BI-STABLE RELAY
3. REMOTE KEYSWITCH
4. POSITIVE TERMINAL JUMPER CABLE
5. RING TERMINAL (TYPE-S WIRE HARNESS)
6. POSITIVE BATTERY CABLE
7. BI-STABLE RELAY ELECTRICAL CONNECTOR
8. SCREW
9. HIGH CURRENT RELAY
10. NUT
11. TERMINAL POST

Figure 92. Battery Disconnect (Type-S)

Install

1. Install four cap screws to secure Bi-Stable relay to battery hold down. See Figure 92.

2. Connect Bi-Stable relay electrical connector to Type-S wire harness.

3. Install screw and positive battery cable ring terminal to high current relay.

4. Install positive battery cables to A terminal of Bi-Stable relay.

5. Install positive terminal jumper cable and Type-S wire harness ring terminal to B terminal of Bi-Stable relay.

6. Install positive battery cable to positive battery post.

7. Install nut and negative battery cable to terminal post.

8. Install negative battery cable to negative battery post.

9. Close hood.

LIGHT REPAIR
202001-085

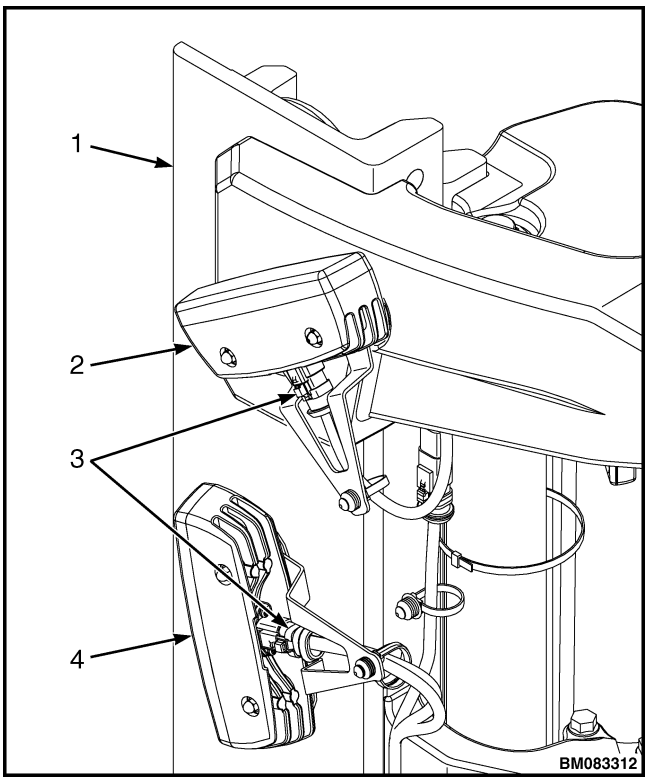
LIGHT REPAIR

LED Mast Lights

Remove

NOTE: LED mast lights are secured with neodymium magnets, no mechanical fasteners are used. Different light configurations are available: 2 lights mounted high, 2 lights mounted low, or 4 lights (2 lights mounted high and 2 lights mounted low). The 4 light configuration will be shown. Each LED light is non-serviceable and is replaced as a unit.

1. Open the hood and disconnect the battery.
2. Disconnect the electrical harness (item 3, Figure 93).



1. MAST
2. MAST LIGHT, HIGH MOUNTED
3. ELECTRICAL HARNESS
4. MAST LIGHT, LOW MOUNTED

Figure 93. Mast Lights

3. Use a standard screwdriver to carefully pry the mast light (item 2 or 4, Figure 93) from the mast (item 1, Figure 93).

Install

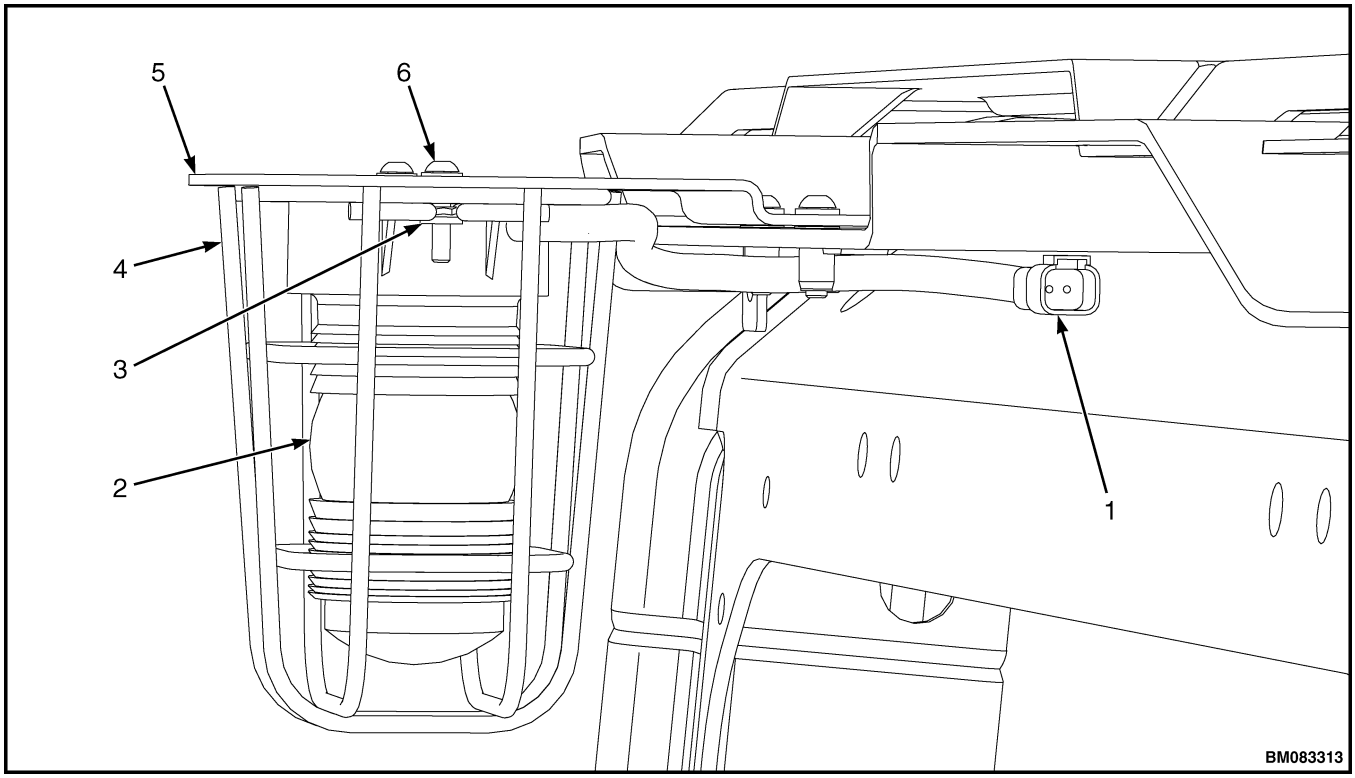
1. Install the mast light (item 2 or 4, Figure 93) to the mast (item 1, Figure 93).
2. Connect the electrical harness (item 3, Figure 93).
3. Connect the battery and close the hood.

LED Strobe Light

Remove

NOTE: If the LED strobe light malfunctions, the entire light must be replaced.

1. Open the hood and disconnect the battery.



1. ELECTRICAL HARNESS
2. STROBE LIGHT
3. NUT
4. GUARD
5. MOUNTING BRACKET
6. CAPSCREW

Figure 94. Strobe Light

2. Disconnect the electrical harness (item 1, Figure 94).

3. Remove the capscrews (item 6, Figure 94) and nuts (item 3, Figure 94), from the mounting bracket (item 5, Figure 94).

4. Remove the strobe light (item 2, Figure 94) and guard (item 4, Figure 94) from the mounting bracket (item 5, Figure 94).

Install

1. Install the strobe light (item 2, Figure 94) and guard (item 4, Figure 94) to the mounting bracket (item 5, Figure 94).

2. Install the capscrews (item 6, Figure 94) and nuts (item 3, Figure 94) to retain the strobe light and guard to the mounting bracket (item 5, Figure 94).

3. Tighten the capscrews (item 6, Figure 94) to standard torque.

4. Connect the electrical harness (item 1, Figure 94).

5. Connect the battery and close the hood.

Fork Laser Level Line

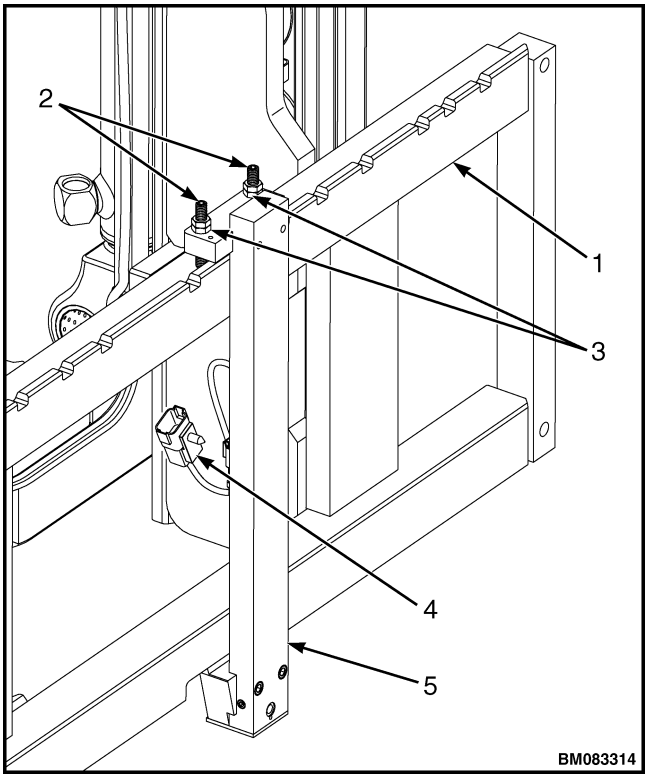
NOTE: The fork laser level projects roughly along the fork tip line. The line projected in front of the forks on the wall or racking provides the operator with an accurate and reliable indication of fork tip level from the ground. The laser will only operate if the truck is below a set speed.

Remove

NOTE: Forks are not shown for illustrative clarity.

1. Open the hood and disconnect the battery.

2. Disconnect the electrical harness (item 4, Figure 95) from the laser assembly (item 5, Figure 95).



1. CARRIAGE
2. SET SCREW
3. DOUBLE NUTS
4. ELECTRICAL HARNESS
5. LASER ASSEMBLY

Figure 95. Fork Level Laser

3. Loosen the double nuts (item 3, Figure 95).

4. Loosen the set screw (item 2, Figure 95).

5. Remove the laser assembly (item 5, Figure 95), from the carriage (item 1, Figure 95).

Install

1. Install the laser assembly (item 5, Figure 95), on the carriage (item 1, Figure 95).

2. Position the laser assembly (item 5, Figure 95) between the center of the carriage (item 1, Figure 95) and inside of the left fork (not shown).

3. Use the hardware provided to clamp the laser assembly (item 5, Figure 95), to the carriage (item 1, Figure 95).

4. Torque the set screws (item 2, Figure 95) to 6.8 N•m (60.2 lbf in).

5. Thread the first nut (item 3, Figure 95) to be flush with the plate surface. Tighten the second nut against the first.

6. Connect the electrical harness (item 4, Figure 95) to the laser assembly (item 5, Figure 95).

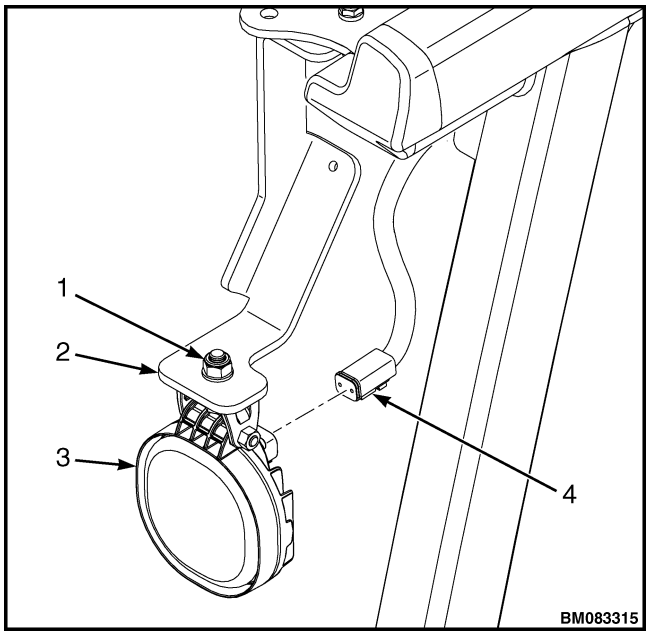
7. Connect the battery and close the hood.

Red or Blue Front Spot Light

Remove

1. Open the hood and disconnect the battery.

2. Disconnect the electrical harness (item 4, Figure 96) from the spot light (item 3, Figure 96).



1. WASHER AND NUT
2. BRACKET
3. SPOT LIGHT
4. ELECTRICAL HARNESS

Figure 96. Front Spot Light

3. Remove the washer and nut (item 1, Figure 96) and spot light (item 3, Figure 96) from the bracket (item 2, Figure 96).

Install

1. Install the spot light (item 3, Figure 96) on the bracket (item 2, Figure 96).

2. Use the washer and nut (item 1, Figure 96) to secure the spot light to the bracket. Torque nut to 5.0 Nm (44.3 lbf-in).

3. Connect the electrical harness (item 4, Figure 96) to the spot light (item 3, Figure 96).

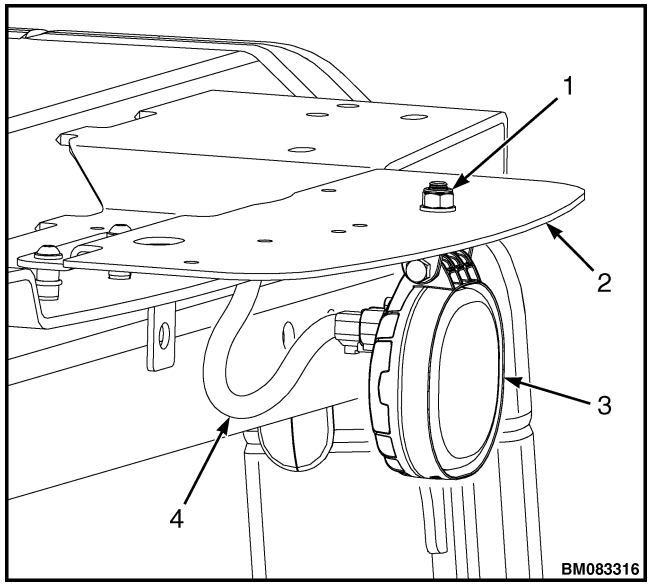
4. Connect the battery and close the hood.

Red or Blue Rear Spot Light

Remove

1. Open the hood and disconnect the battery.

2. Disconnect the electrical harness (item 4, Figure 97) from the spot light (item 3, Figure 97).



1. WASHER AND NUT
2. BRACKET
3. SPOT LIGHT
4. ELECTRICAL HARNESS

Figure 97. Rear Spot Light

3. Remove the washer and nut (item 1, Figure 97) and spot light (item 3, Figure 97) from the bracket (item 2, Figure 97).

Install

1. Install the spot light (item 3, Figure 97) on the bracket (item 2, Figure 97).

2. Use the washer and nut (item 1, Figure 97) to secure the spot light to the bracket. Torque nut to 5.0 Nm (44.3 lbf-in).

3. Connect the electrical harness (item 4, Figure 97) to the spot light (item 3, Figure 97).

4. Connect the battery and close the hood.

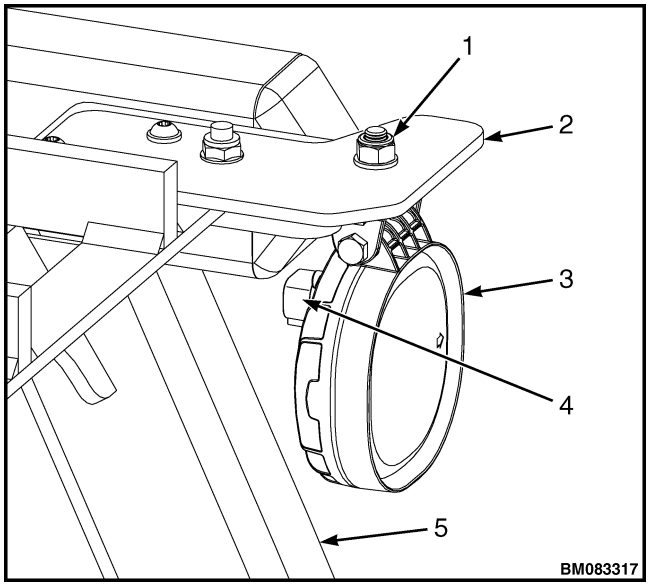
Front Work Lights

NOTE: Front work lights can be Halogen or LED. Halogen lights have replaceable bulbs, LED lights do not. Halogen light output is 600 lumen, LED light output can be either 750 lumen or 1,100 lumen. Halogen and LED both remove and install the same, only LED will be shown. Left and right lights have unique light output patterns and are not interchangeable.

Remove

1. Open the hood and disconnect the battery.

2. Disconnect the electrical harness (item 4, Figure 98) from the light (item 3, Figure 98).



1. WASHER AND NUT
2. BRACKET
3. LIGHT
4. ELECTRICAL HARNESS
5. OVERHEAD GUARD SUPPORT POST, FRONT, LH

Figure 98. Front Work Light

3. Remove the washer and nut (item 1, Figure 98) and light (item 3, Figure 98) from the bracket (item 2, Figure 98).

Install

1. Install the light (item 3, Figure 98) on bracket (item 2, Figure 98).

2. Use the washer and nut (item 1, Figure 98) to secure the light to the bracket. Torque nut to 5.0 Nm (44.3 lbf-in).

3. Connect the electrical harness (item 4, Figure 98) to light (item 3, Figure 98).

4. Connect the battery and close the hood.

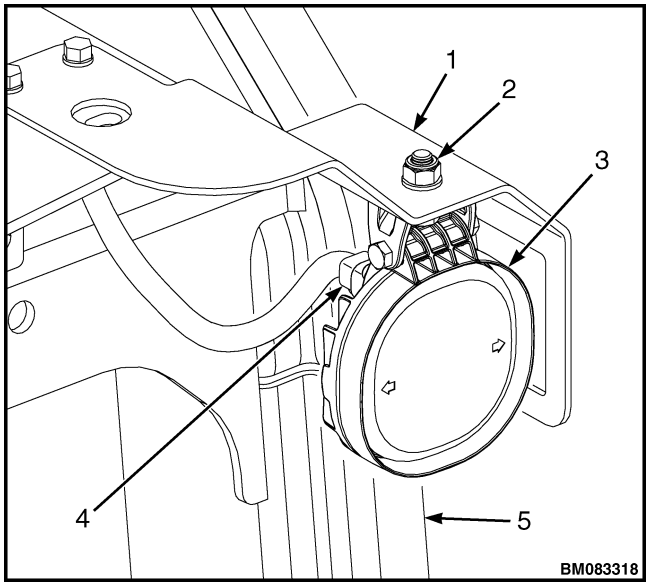
Rear Work Light

NOTE: The rear work light can be Halogen or LED. The Halogen light has a replaceable bulb, LED lights do not. Halogen light output is 600 lumen, LED light output can be either 750 lumen or 1,100 lumen. Halogen and LED both remove and install the same, only LED will be shown.

Remove

1. Open the hood and disconnect the battery.

2. Disconnect the electrical harness (item 4, Figure 99) from the light (item 3, Figure 99).



1. BRACKET
2. WASHER AND NUT
3. LIGHT
4. ELECTRICAL HARNESS
5. OVERHEAD GUARD SUPPORT POST, REAR, RH

Figure 99. Rear Work Light

3. Remove the washer and nut (item 2, Figure 99) and light (item 3, Figure 99) from the bracket (item 1, Figure 99).

Install

1. Install light (item 3, Figure 99) on bracket (item 1, Figure 99) with washer and nut (item 2, Figure 99). Torque nut to 5.0 Nm (44.3 lbf-in).

2. Use the washer and nut (item 2, Figure 99) to secure the light to the bracket. Torque nut to 5.0 Nm (44.3 lbf-in).

3. Connect the electrical harness (item 4, Figure 99) to the light (item 3, Figure 99).

4. Connect the battery and close the hood.

Rear Work Light with Red Line

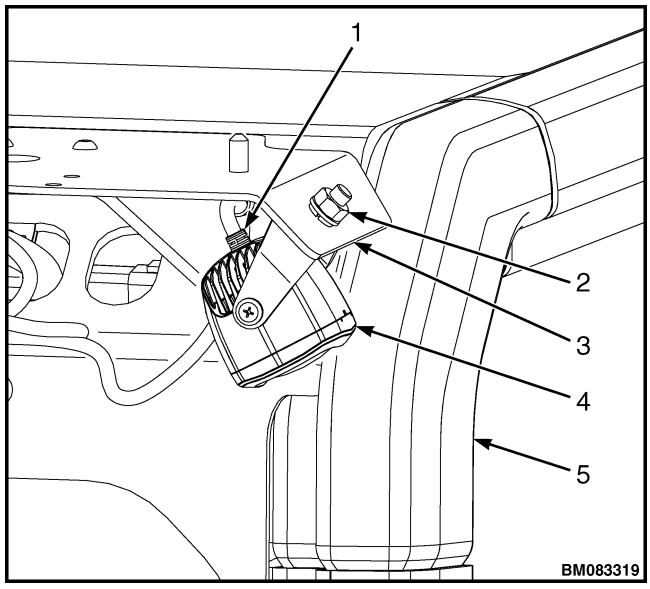
NOTE: The rear work light with red line removes and installs the same as the rear work light and is available in the same light output choices. See Rear Work Light for details.

Pedestrian Awareness Lights (PAL), Perimeter

NOTE: The perimeter pedestrian awareness lights shine a bright red line on the ground at predetermined distance away from the truck frame. The lights create a visual box around the truck to notify pedestrians and other vehicles and only activate when the truck is at low speed. Available choices are left and right, or left, right, and rear. All pedestrian awareness lights remove and install the same. Illustrations are shown for right side and rear lights.

Remove (Right Side)

1. Open hood and disconnect battery.
2. Disconnect electrical harness (item 1, Figure 100) from light (item 4, Figure 100).



1. ELECTRICAL HARNESS
2. NUT
3. BRACKET
4. LIGHT
5. OVERHEAD GUARD SUPPORT POST, REAR, RH

Figure 100. Right Side Light

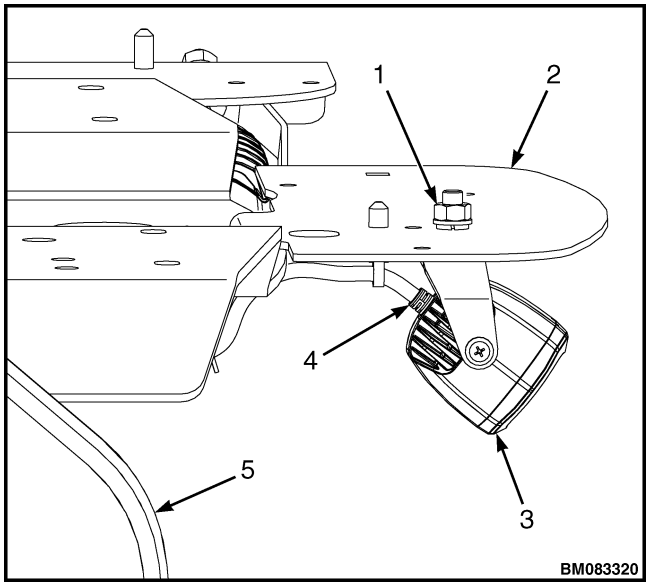
3. Remove nut (item 2, Figure 100) and light (item 4, Figure 100) from bracket (item 3, Figure 100).

Install (Right Side)

1. Attach light (item 4, Figure 100) to bracket (item 3, Figure 100) with nut (item 2, Figure 100).
2. Connect electrical harness (item 1, Figure 100) to light (item 4, Figure 100).
3. Connect battery and close hood.

Remove (Rear)

1. Open hood and disconnect battery.
2. Disconnect electrical harness (item 4, Figure 101) from light (item 3, Figure 101).



1. NUT
2. BRACKET
3. LIGHT
4. ELECTRICAL HARNESS
5. OVERHEAD GUARD SUPPORT POST, REAR, RH

Figure 101. Rear Light

3. Remove nut (item 1, Figure 101) and light (item 3, Figure 101) from bracket (item 2, Figure 101).

Install (Rear)

1. Attach light (item 3, Figure 101) to bracket (item 2, Figure 101) with nut (item 1, Figure 101).

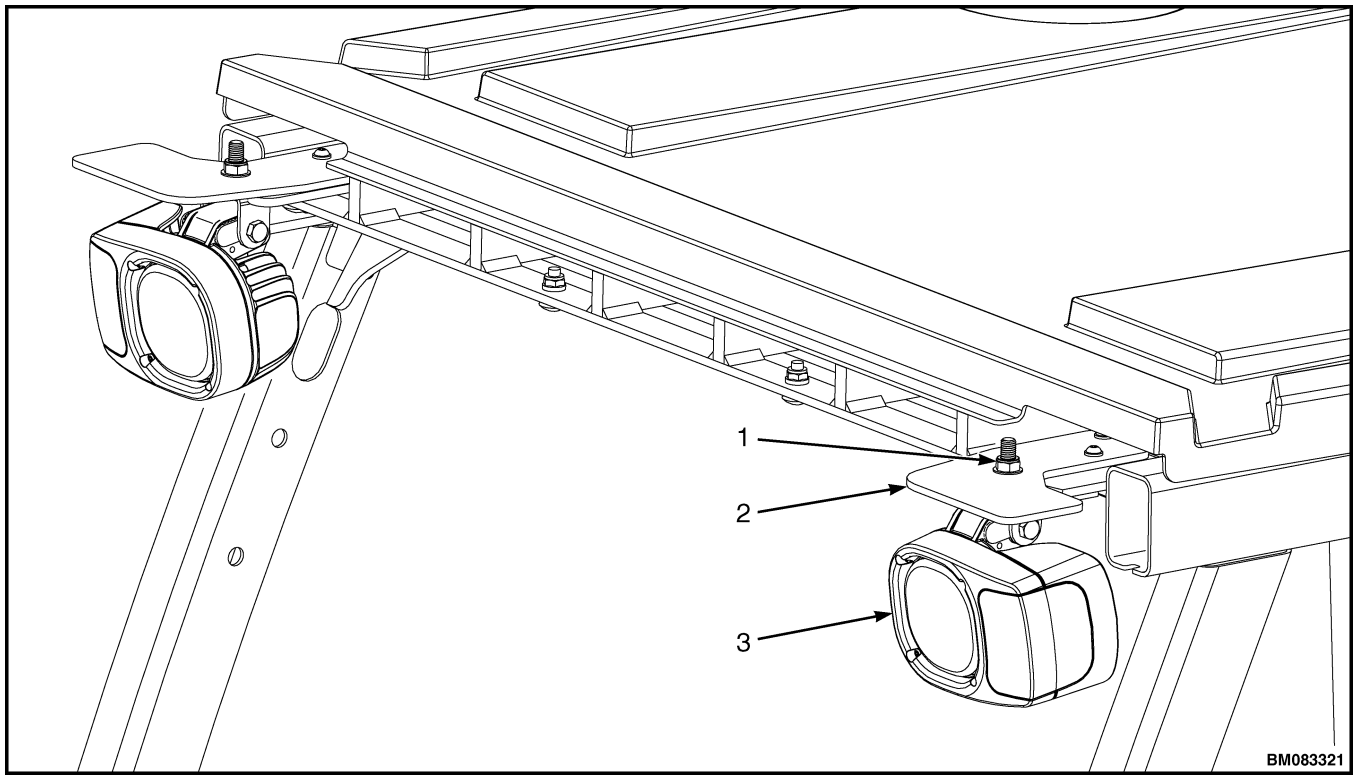
2. Connect electrical harness (item 4, Figure 101) to light (item 3, Figure 101).

3. Connect battery and close hood.

Front LED Work Light with Marker Light

Remove

1. Open the hood and disconnect the battery.



1. LOCKNUT
2. BRACKET
3. LIGHT

Figure 102. Front Marker Lights

3. Remove the locknut and washer, (item 1, Figure 102) and light (item 3, Figure 102) from the bracket (item 2, Figure 102).

Install

1. Install the light (item 3, Figure 102) on the bracket (item 2, Figure 102).

2. Use the washer and locknut (item 1, Figure 102) to secure the light to the bracket. Torque nut to 5.0 Nm (44.3 lbf-in).

3. Connect the electrical harness (not shown) to the light (item 3, Figure 102).

2. Disconnect the electrical harness (not shown) from the light (item 3, Figure 102).

4. Connect the battery and close the hood.

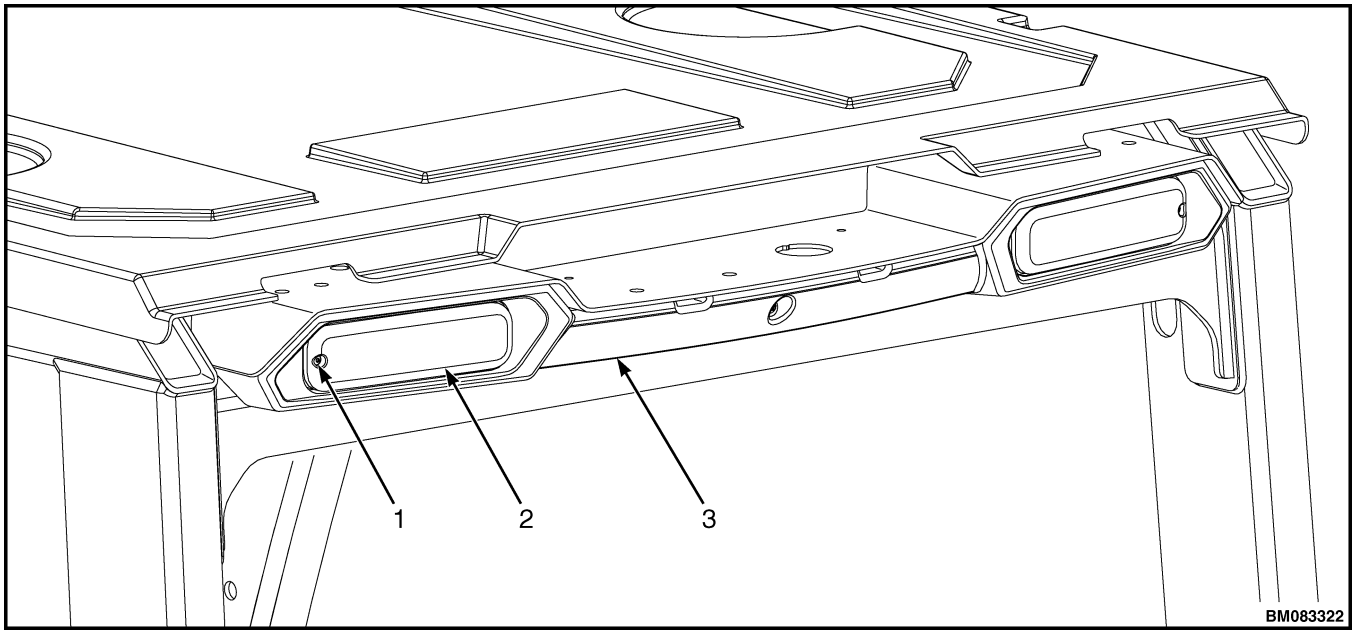
Tail Light with Stop, Brake, Reverse, Hazard, and Turn Lights

The light assembly is common for both left and right hand sides. If the light housing is broken or if an LED bulb(s) does burn out the light is replaced as a complete unit.

Remove

1. Open hood and disconnect battery.

2. Remove screw (item 1, Figure 103) from light assembly (item 2, Figure 103).



1. SCREW
2. LIGHT ASSEMBLY
3. TAIL LIGHT COVER

Figure 103. Tail Light Assembly

3. Pull light assembly (item 2, Figure 103) partially out of tail light cover (item 3, Figure 103), disconnect electrical harness (not shown), and remove light assembly (item 2, Figure 103).

Install

1. Connect electrical harness (not shown) to light assembly (item 2, Figure 103).

2. Install light assembly (item 2, Figure 103) into tail light cover (item 3, Figure 103) with screw (item 1, Figure 103).

3. Connect battery and close hood.

CONTROLLER REMOVAL AND REPLACEMENT 202001-194

CONTROLLER REMOVE AND REPLACE

Numerous controllers are used on this truck and this section will discuss the following: Vehicle System Manager (VSM), O-Box (E-Hydraulic Controller), Hydro Static Transmission (HST) controller, and I-Box (Accessory 1 and 2). The Power Distribution Module (PDM) remove and replace information will not be provided here. See Power distribution module (PDM) repair for details.

NOTE: The controllers have no serviceable components. If a controller malfunctions, replace with a new unit. See the Parts Manual for replacement part number.

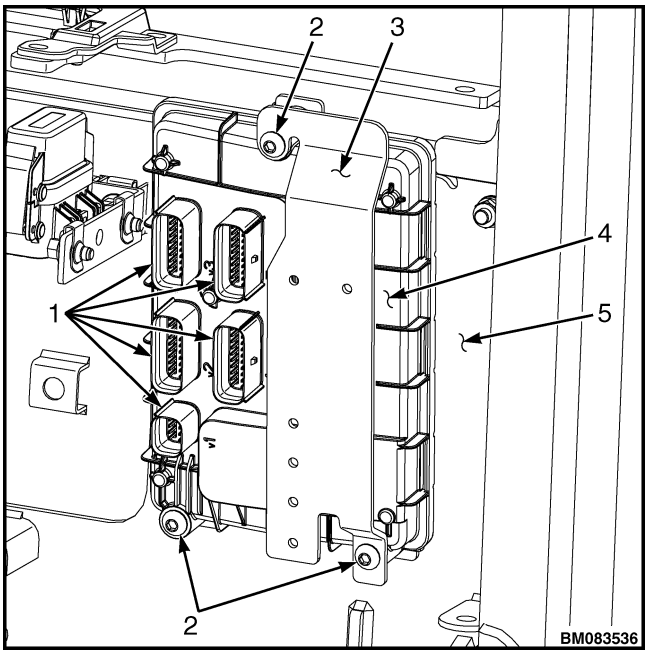
When removing and replacing a controller be sure to tag connectors to aid in correct reconnecting.

VSM

The Vehicle System Manager (VSM) is a microprocessor-powered controller which controls or monitors, directly or indirectly, every electrical device on the lift truck, except for the Electronic Control Unit (ECU) which is controlled by the engine. In addition, the VSM performs diagnostics, logs and displays Diagnostic Trouble Codes (DTC), turns on indicator lights, and sounds audible alarms.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Remove the right hand (RH) kick panel dash. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for procedure.
3. Disconnect the harness (not shown) from the electrical connectors (item 1, Figure 104).



1. CONNECTORS
2. CAPSCREW
3. HARNESS BRACKET
4. VSM
5. COWL

Figure 104. VSM

4. Remove two capscrews (item 2, Figure 104) and harness bracket (item 3, Figure 104).
5. Remove the remaining capscrew (item 2, Figure 104) and VSM (item 4, Figure 104) from the cowl (item 5, Figure 104).

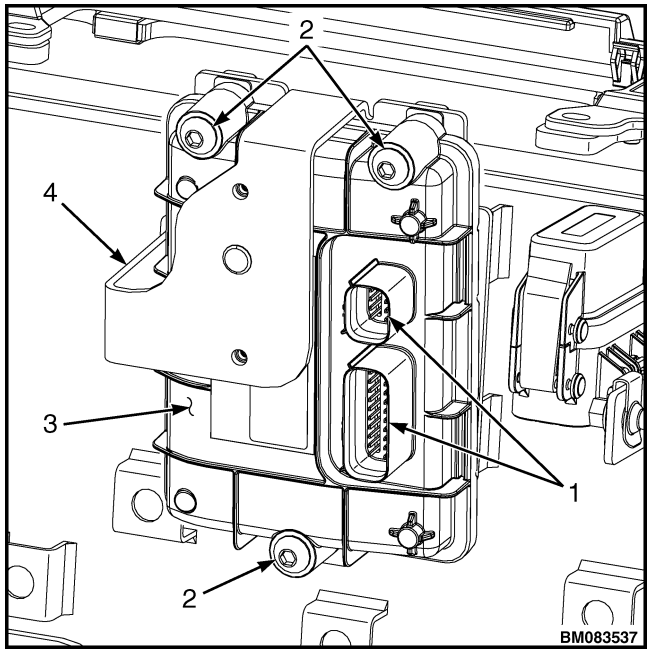
Install

1. Install the VSM (item 4, Figure 104) to the cowl (item 5, Figure 104) with one capscrew (item 2, Figure 104). Hand tighten capscrew only (full torque in next step).
2. Install the harness bracket (item 3, Figure 104) and secure with two capscrews (item 2, Figure 104). Finally torque all three capscrews to 34.8 N•m (25.7 lbf ft).
3. Connect the harness (not shown) to the electrical connectors (item 1, Figure 104).
4. Install the RH kick panel and dash. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for details.
5. Connect the battery. Refer to Battery Remove and Install for details.
6. Close the hood.

O-Box (E-Hydraulic) Controller

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.
2. Remove RH kick panel and dash. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for details.
3. Disconnect the harness (not shown) from the electrical connectors (item 1, Figure 105).



1. ELECTRICAL CONNECTORS
2. CAPSCREWS
3. E-HYDRAULIC CONTROLLER
4. MOUNTING BRACKET

Figure 105. E-Hydraulic Controller

4. Remove the capscrews (item 2, Figure 105) and E-Hydraulic controller (item 3, Figure 105) from the mounting bracket (item 4, Figure 105).

Install

1. Install the E-Hydraulic controller (item 3, Figure 105) to the mounting bracket (item 4, Figure 105) and secure with the capscrews (item 2, Figure 105). Torque capscrews to 34.8 Nm (25.7 lbf-ft).

2. Connect the harness (not shown) to the electrical connectors (item 1, Figure 105).

3. Install RH kick panel and dash. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for details.

4. Connect the battery. Refer to Battery Remove and Install for details.

5. Close the hood.

Hydro Static Transmission (HST) controller

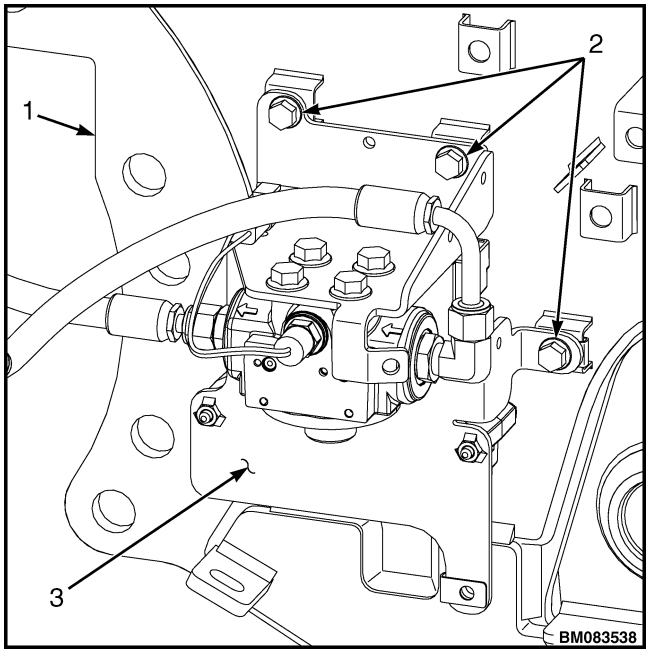
Remove

NOTE: The HST controller is mounted on the backside of the HST filter bracket. The bracket must be removed to access the HST controller.

1. Raise the hood and the disconnect battery. Refer to Battery Remove and Install for details.

2. Remove the floormat and floorplate. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for details.

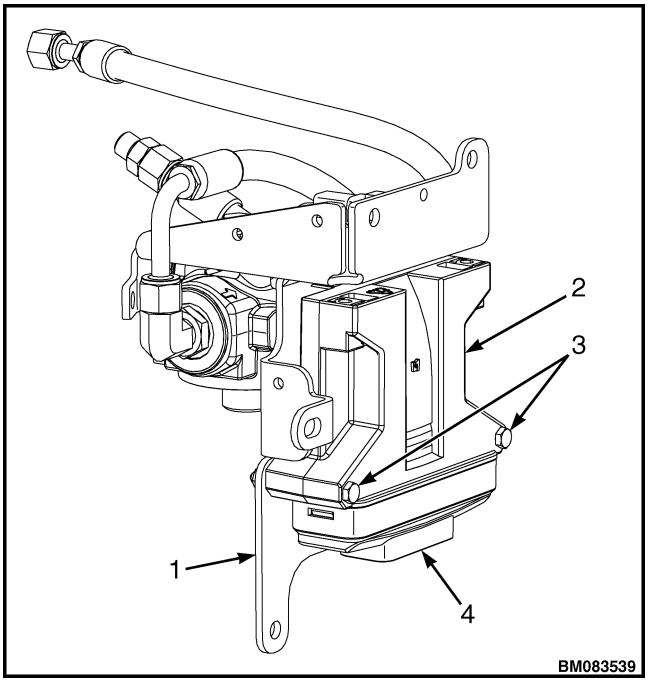
3. Remove capscrews (item 2, Figure 106) and HST filter bracket (item 3, Figure 106) from RH frame (item 1, Figure 106).



1. RH FRAME
2. CAPSCREWS
3. HST FILTER BRACKET

Figure 106. HST Filter Bracket

4. Disconnect the harness (not shown) from the electrical connector (item 4, Figure 107).



1. HST FILTER BRACKET
2. HST CONTROLLER
3. CAPSCREWS
4. ELECTRICAL CONNECTOR

Figure 107. HST Controller

5. Remove the capscrews (item 3, Figure 107) and HST controller (item 2, Figure 107) from the HST filter bracket (item 1, Figure 107).

Install

1. Install the HST controller (item 2, Figure 107) to the HST filter bracket (item 1, Figure 107 with capscrews (item 3, Figure 107). Torque capscrews to 10.5 Nm (7.7 lbf-ft).

2. Connect the harness (not shown) to the electrical connector (item 4, Figure 107).

3. Install the HST filter bracket (item 3, Figure 106) to RH frame (item 1, Figure 106) with the capscrews (item 2, Figure 106). Torque capscrews to 25.6 Nm (18.9 lbf-ft).

4. Install the floormat and floorplate. Refer to Covers repair in **Frame and Main Components** 8000SRM2306 for details.

5. Connect the battery. Refer to Battery Remove and Install for details.

6. Close the hood.

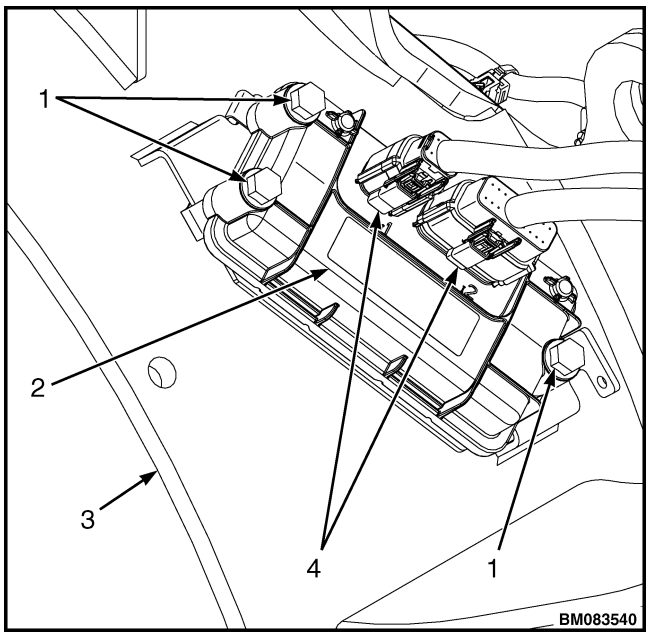
I-Box (Accessory 1)

NOTE: I-Box (Accessory 1) is located on the Left Hand (LH) fender.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the wire harness (item 4, Figure 108) from the I-Box (item 2, Figure 108).



1. CAPSCREW
2. I-BOX, ACCESSORY 1
3. LH FENDER
4. WIRE HARNESS

Figure 108. I-Box, (Accessory 1)

3. Remove the capscrews (item 1, Figure 108) and I-Box (item 2, Figure 108) from the LH fender (item 3, Figure 108).

Install

1. Install the I-Box (item 2, Figure 108) on the LH fender (item 3, Figure 108) with capscrews (item 1, Figure 108). Torque capscrews to 25.6 Nm (18.9 lbf-ft).

2. Connect the wire harness (item 4, Figure 108) to the I-Box (item 2, Figure 108).

3. Connect the battery. Refer to Battery Remove and Install for details.

4. Close the hood.

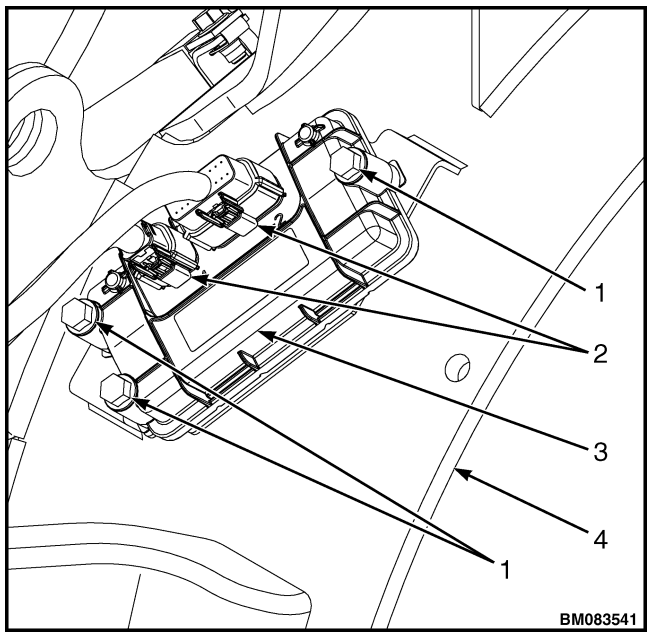
I-Box (Accessory 2)

NOTE: I-Box (Accessory 2) is located on the RH fender.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.

2. Disconnect the wire harness (item 2,Figure 109) from the I-Box (item 3, Figure 109).



1. CAPSCREW
2. WIRE HARNESS
3. I-BOX, ACCESSORY 2
4. RH FENDER

Figure 109. I-Box, (Accessory 2)

3. Remove the capscrews (item 1, Figure 109) and the I-Box (item 3, Figure 109) from RH fender (item 4, Figure 109).

Install

1. Install the I-Box (item 3, Figure 109) on the LH fender (item 4, Figure 109) with capscrews (item 1, Figure 109). Torque capscrews to 25.6 N • m (18.9 lbf ft).

2. Connect the wire harness (item 2, Figure 109) to the I-Box (item 3, Figure 109).

3. Connect the battery. Refer to Battery Remove and Install for details.

4. Close the hood.

TELEMETRY WIRELESS ASSET MANAGEMENT SYSTEM 202001-295

LEVEL 1 - WIRELESS MONITORING (WIFI GROUP)

The Level 1 Telemetry Wireless Asset Management System is comprised of the following components (see Telemetry system description in **Truck system description** 8000SRM2308 manual for more information on each component):

- A WIFI, GSM, or CDMA telemetry module
- A WIFI, GSM, or CDMA antenna (if telemetry module is GSM or CDMA supported)

Reference Number	Hyster part number	Quantity	Description
8851565	4715966	1	Telemetry Module with GSM/CDMA/ WiFi
4330659	4330659	1	Telemetry Module bracket
4312482	4045049	4	Capscrew
1616343	1616343	1	Retainer
2004005	1480237	1	Strap clamp
8851768	4716470	1	Cable-extension
8830422	4697401	1	Antenna with GSM/CDMA/WiFi

Remove Telemetry Module

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

1. Locate the telemetry module in the engine compartment, attached to the right frame.
2. Slide the seat all the way back.
3. Raise the steering column all the way up.
4. Open the hood.
5. Disconnect the battery.
6. Disconnect the two connectors (CPS505 and CPS506) on the chassis harness from the telemetry module. See Figure 110.

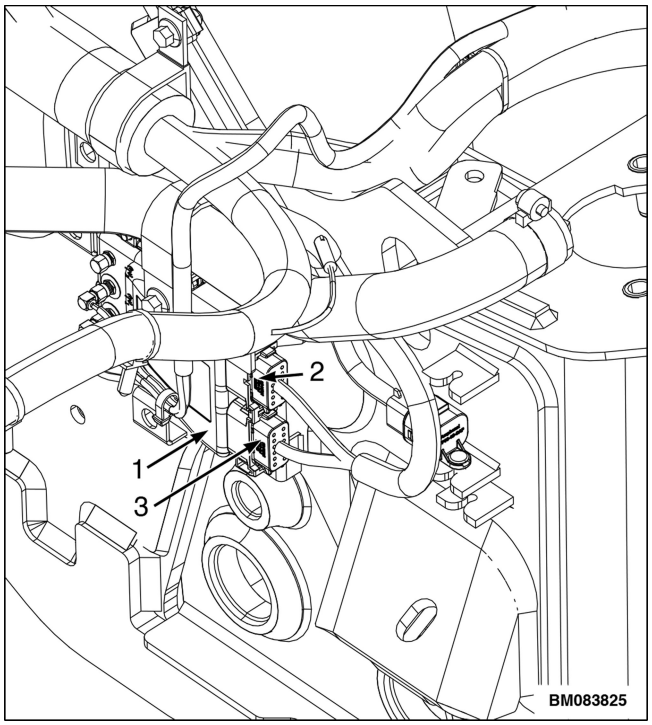
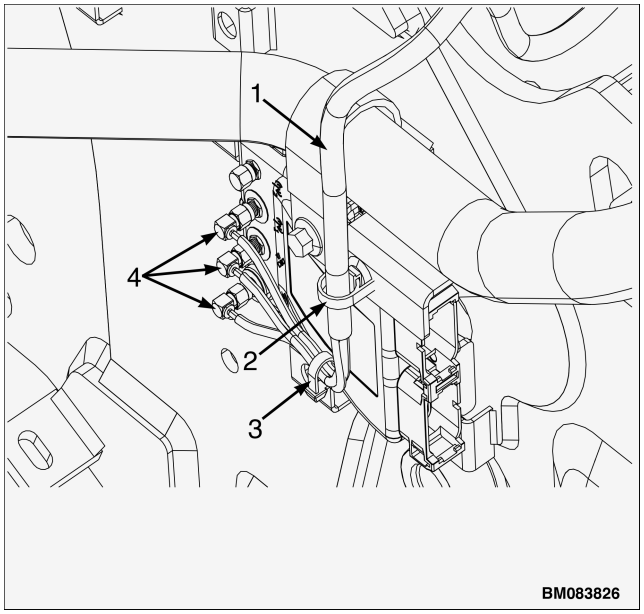


Figure 110. Telemetry Module Location

Legend for Figure 110.

1. TELEMETRY MODULE
2. CONNECTOR CPS506
3. CONNECTOR CPS505

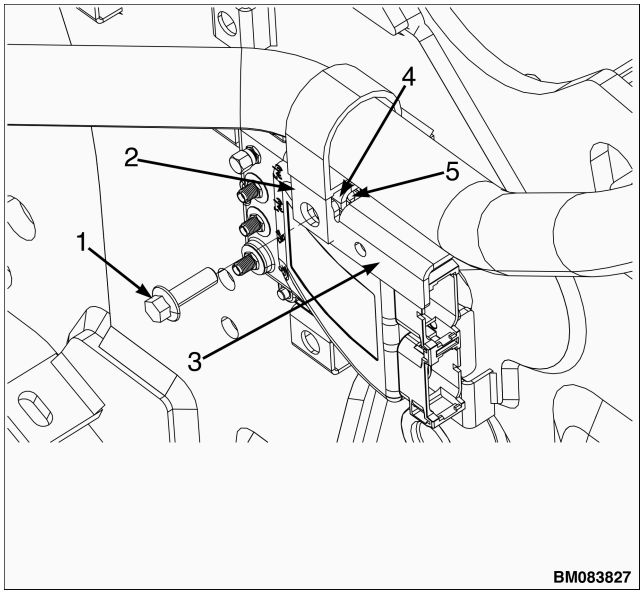
7. Disconnect the three antenna cable connectors from the telemetry module. See Figure 111.
8. Disconnect the retainer attaching the antenna cable to the mounting bracket. See Figure 111.



1. ANTENNA CABLE
2. RETAINER
3. STRAP CLAMP
4. ANTENNA CABLE CONNECTORS

Figure 111. Antenna cable

9. Remove the bolt, foldover nut, hose clamp and mounting bracket with telemetry module attached, from right frame. See Figure 112.



1. SCREW
2. HOSE CLAMP
3. MOUNTING BRACKET
4. FRAME
5. FOLDOVER NUT

Figure 112. Controller and bracket

Install Telemetry Module

1. Locate new telemetry module.

2. Use capscrew and foldover nut, to install the telemetry module with mounting bracket and the hose clamp to the right frame. See Figure 112.

3. Connect antenna connectors to the telemetry module. See Figure 111.

4. Attach the retainer on antenna cable to the telemetry module. See Figure 111.

5. Connect the two connectors (CPS505 and CPS506) on the chassis harness to the telemetry module. See Figure 110.

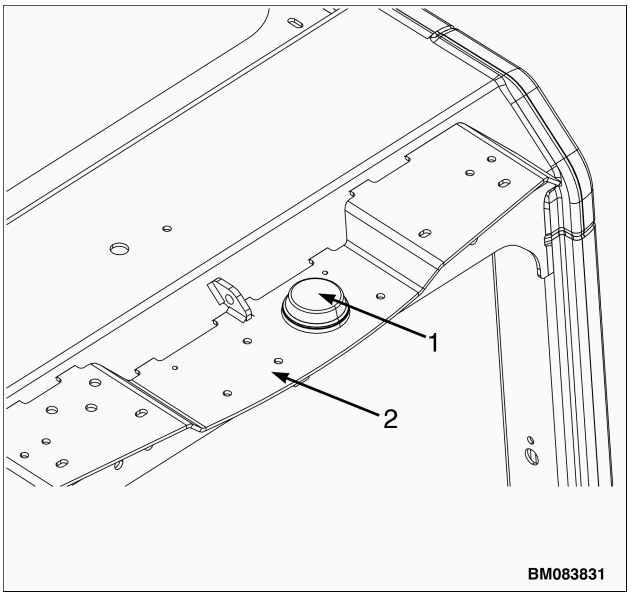
Remove Antenna

1. Disconnect the battery.

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

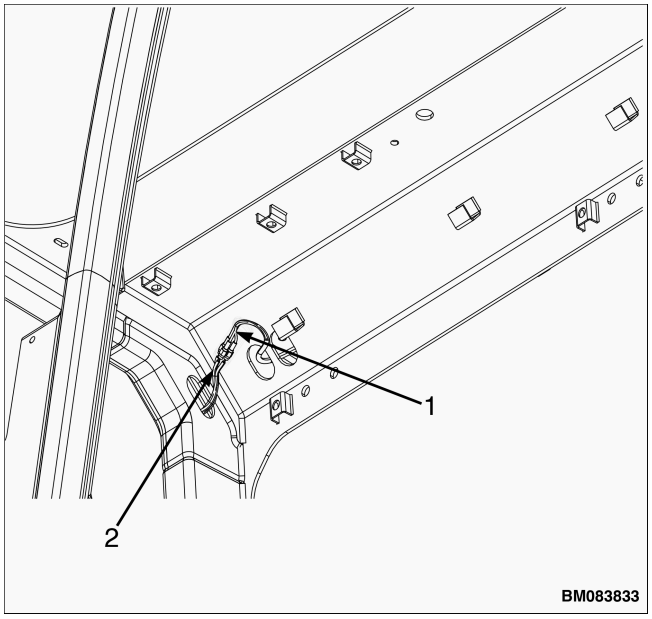
2. Locate the antenna on the overhead guard. See Figure 113.



1. ANTENNA
2. REAR LIGHT BRACKET

Figure 113. Antenna Location

3. Disconnect the antenna connector from the connector on the antenna extension harness. See Figure 114.



1. ANTENNA CONNECTOR
2. ANTENNA EXTENSION HARNESS CONNECTOR

Figure 114. Antenna connector

4. Remove nut securing antenna to rear light bracket.

Install Antenna

1. Confirm battery is disconnected.

2. Run antenna wire harness through hole in the overhead guard. See Figure 113.

3. Install nut to secure antenna to rear light bracket. See Figure 113.

4. Connect antenna connector to the connector on the antenna extension harness.

5. Connect battery and close hood.

LEVEL 2 - WIRELESS ACCESS

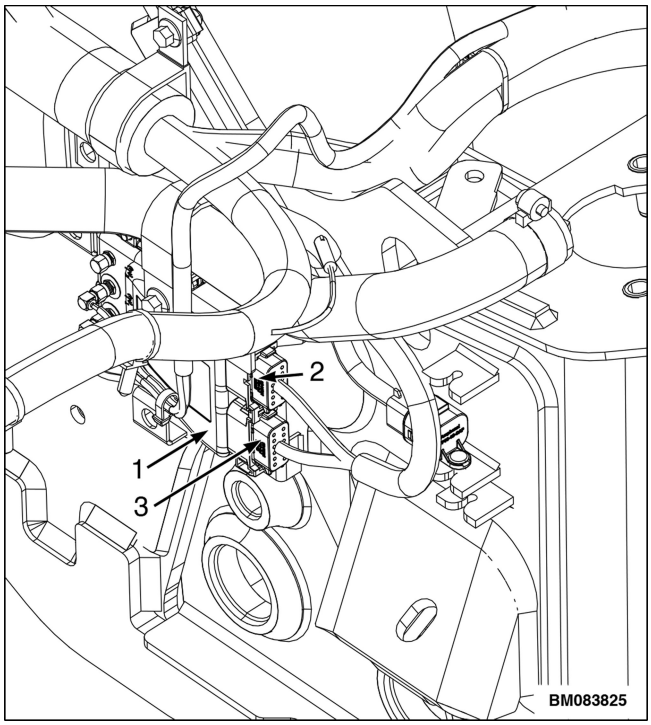
The Level 2 Telemetry Wireless Asset Management System is comprised of the following components (see Telemetry system description in **Truck system description** 8000SRM2308 manual for more information on each component):

- RF-ID reader
- Audible buzzer
- A WIFI, GSM, or CDMA telemetry module
- A WIFI, GSM, or CDMA antenna (if telemetry module is GSM or CDMA supported)

Reference Number	Hyster part number	Quantity	Description
8851565	4715966	1	Telemetry module with GSM/CDMA/ WiFi
4330659	4330659	1	Telemetry module bracket
4312482	4045049	4	Capscrew
1616343	1616343	1	Retainer
2004005	1480237	1	Strap clamp
8851768	4716470	1	Cable-extension
8830422	4697401	1	Antenna with GSM/CDMA/WiFi
8808033	4618303	1	ID Card Reader (ISO Prox)
8808034	4618304	1	ID Card Reader (Standard)
8808035	4618305	1	ID Card Reader (MIFARE Prox)
8845402	4699673	1	Bracket
4273869	4273869	2	Screw
1531557	1531557	2	Insert
8851800	4716705	1	Card reader jumper harness

Telemetry Module

The telemetry module used on lift trucks equipped with a level 2 Telemetry Wireless Asset Management System, is located in the same position as level 1 and is removed and installed using the same procedures. See Level 1 - Wireless Monitoring (WIFI Group). The main difference is on level 2, the black connector must be disconnected and connected, along with the gray connector, when removing and installing a new telemetry module. See Figure 115.



1. TELEMETRY MODULE
2. CONNECTOR CPS506 (BLACK)
3. CONNECTOR CPS505 (GRAY)

Figure 115. Telemetry Module Connectors

Antenna

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

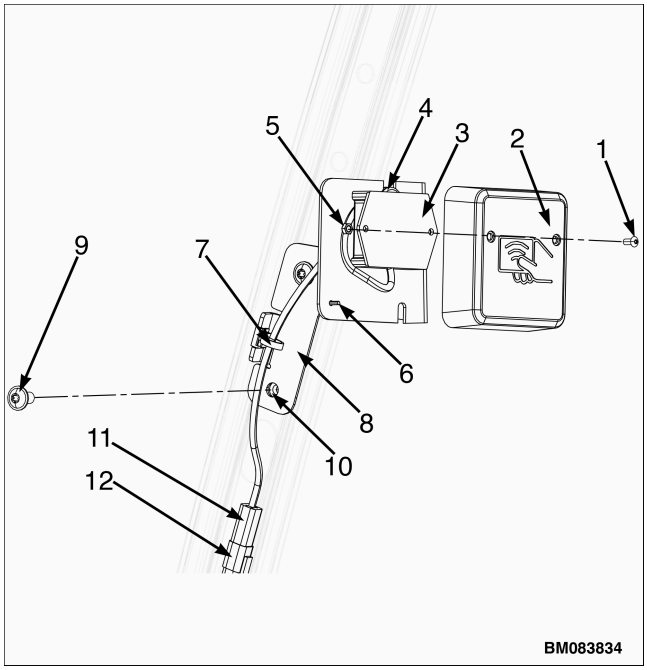
The antenna is located on the overhead guard. See Figure 113 . The procedure to remove and install the level 3 antenna is the same as level 1 and 2 antenna. See Figure 113 . The procedure to remove and install the level 2 antenna is the same as level 1 antenna. See Remove Antenna for procedure.

RF-ID Reader

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

The RF-ID reader is located on the inside of the right front leg on the overhead guard (see Remove Telemetry Module). Authorized users are allowed access to lift truck after successfully swiping an authorized identity card for the RF-ID reader to read.



1. CAPSCREW
2. RF-ID READER ENCLOSURE
3. RF-ID READER
4. GROMMET
5. NUT
6. SCREW
7. RETAINER
8. BRACKET
9. SCREW
10. INSERT
11. RF-ID READER HARNESS CONNECTOR
12. RF-ID READER HARNESS JUMPER CONNECTOR

Figure 116. RF-ID Reader

Remove

1. Open hood and disconnect the battery.

2. Locate the RF-ID reader. Figure 116.

3. Disconnect the connector on the RF-ID reader from the connector on the jumper harness.

4. Loosen the two capscrews attaching the RF-ID reader and bracket to the overhead guard. Remove the RF-ID reader. See Figure 116.

Install

1. Connect new RF-ID reader to jumper harness. See Figure 116.

2. Attach new RF-ID reader and bracket to the overhead guard using two capscrews. See Figure 116.

3. Connect the battery and close the hood.

LEVEL 3 - WIRELESS VERIFICATION

The level 3 Telemetry Wireless Asset Management System is comprised of the following components (see Telemetry system description in **Truck system description** 8000SRM2308 manual for more information on each component):

- Power (wire) harness
- Display (wire) harness
- RF-ID reader
- Audible buzzer
- A WIFI, GSM, or CDMA telemetry module
- A WIFI, GSM, or CDMA antenna (if telemetry module is GSM or CDMA supported)
- Display panel

Reference Number	Hyster part number	Quantity	Description
8851565	4715966	1	Telemetry module with GSM/CDMA/ WiFi
4330659	4330659	1	Telemetry module bracket
4312482	4045049	4	Capscrew
1616343	1616343	1	Retainer
2004005	1480237	1	Strap clamp
8851768	4716470	1	Cable-extension
8830422	4697401	1	Antenna with GSM/CDMA/WiFi
8808033	4618303	1	ID Card Reader (ISO Prox)
8808034	4618304	1	ID Card Reader (Standard)

Reference Number	Hyster part number	Quantity	Description
8808035	4618305	1	ID Card Reader (MIFARE Prox)
8845402	4699673	1	Bracket
4273869	4273869	2	Screw
1531557	1531557	2	Insert
8851800	4716705	1	Card reader jumper harness
8853540	4719231	1	Display (2.8 in.)
8853541	4719232	1	Display (5 in.)
8853542	4719232	1	Display (7 in.)
4702429	4702429	1	Display harness

Telemetry Module

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

The telemetry module used on lift trucks equipped with a level 3 Telemetry Wireless Asset Management System, is located in the same position as level 1 and level 2 and is removed and installed using the same procedure found in Remove Telemetry Module.

Antenna

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

The antenna is located on the overhead guard. See Figure 113 . The procedure to remove and install the level 3 antenna is the same as level 1 and 2 antenna. See Figure 113 for procedure.

RF-ID Reader

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

The RF-ID reader is located on the inside of the right front leg on the overhead guard (see Remove Telemetry Module). Authorized users are allowed access to lift truck after successfully swiping an authorized identity card for the RF-ID reader to read.

The procedures to remove and install a new RF-ID reader for lift trucks equipped with a level 3 system are the same as those equipped with a level 2 system. See Level 2 - Wireless Access, RF-ID Reader section for procedures.

Display Panel (Checklist)

WARNING

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL CAN CAUSE THE FORK LIFT TRUCK TO BECOME INOPERABLE OR DAMAGED AND RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. READ AND FOLLOW WARNINGS IN INSTALLATION INSTRUCTIONS.

NOTE: The Level 3 Telemetry Wireless Asset Management System uses the main display panel already installed on the lift truck. The display panel and mounting bracket are located on the right front leg of the overhead guard. This display panel will display a checklist of items that need to be inspected and checked off before the lift truck can be operated. For information on removing and installing the display panel, see **Display Repair** section in this manual.

Software

LOADING AND UPDATING VSM SOFTWARE AND TRUCK CONFIGURATION DATA FILES (CDF)S WITH HYG FIELD PROG SOFTWARE 202001-350

Use the Field Prog tool to load *.hyz* files and CDFs to the truck.

INSTALLING THE FIELD PROG SOFTWARE

The Field Prog software is obtained from HYPASS. Locate the zip file on HYPASS and download the file. Perform the following procedures to install the software.

Minimum system requirements

Software

- Windows 7 or 10
- Thorsis (formerly known as iFak) v6.xx CAN driver

Hardware

- Laptop
- Pentium class or greater processor
- 2 GB of RAM
- 20 GB hard disk
- USB port

Vehicle adapter

- CAN communications adapters, such as iFak isCAN USB, or Vector CAN XL, VN
- USB cable #4265322 for display updates

NOTE: Installation requires *Administrative* level permissions on the target computer. Windows may require the additional step of *Install as administrator*. Consult your IT resources for questions on installation.

NOTE: If you are upgrading from an existing version of Field Prog there is no need to re-install the ParkerUSB or Vansco1.9 drivers. Instead, install the Setup.msi file to get the upgrade.

1. Extract the .zip file. There are three software files inside, plus a Readme document:
   - Vansco1.9 – Driver file
   - ParkerUSB – Driver file to allow USB interface with the display
   - Setup.msi – Programming tool setup

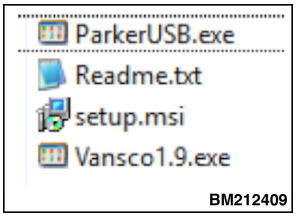


Figure 117. Install files

2. Open *Vansco 1.9.exe.*
3. Follow the prompts on the Vansco installation screens. Do not alter the destination folder. Close when complete. See Figure 118.

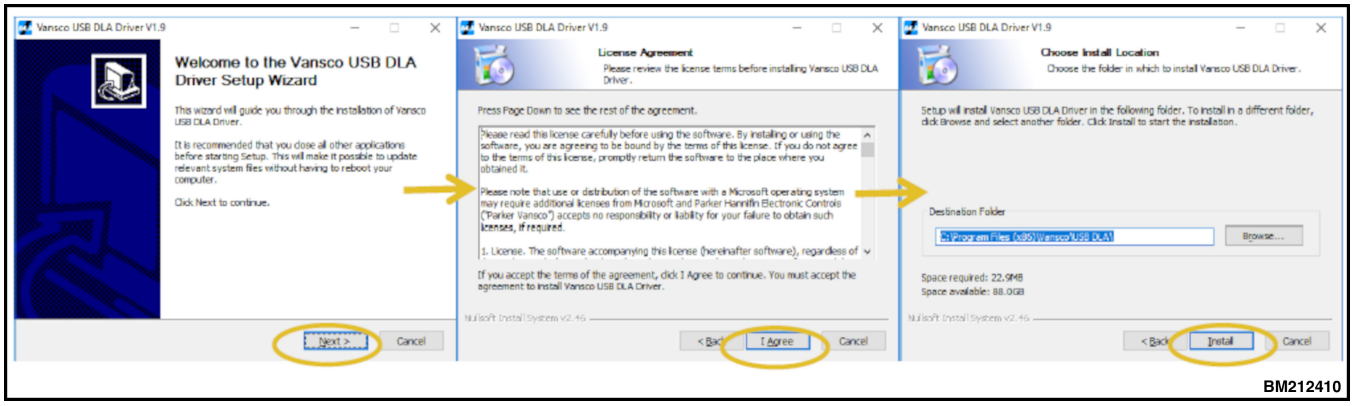


Figure 118. Installation Screens

4. Open *ParkerUSB.exe*.

5. Follow the prompts on the Parker USB screens. Do not alter the destination folder. Close when complete. See Figure 119.

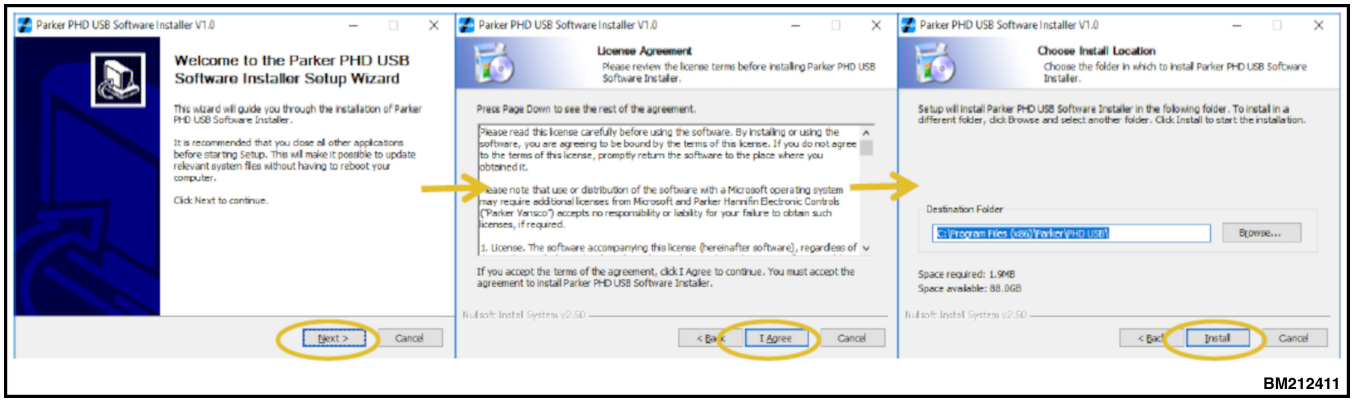


Figure 119. Parker USB Screens

6. Open the *setup.msi* file. Follow the onscreen instructions and a desktop shortcut is installed. See Figure 120.

Figure 120. Field Prog shortcut

Open the Field Prog Tool

1. Open the desktop shortcut to launch the Field Prog tool. The user interface will display. See Figure 121.

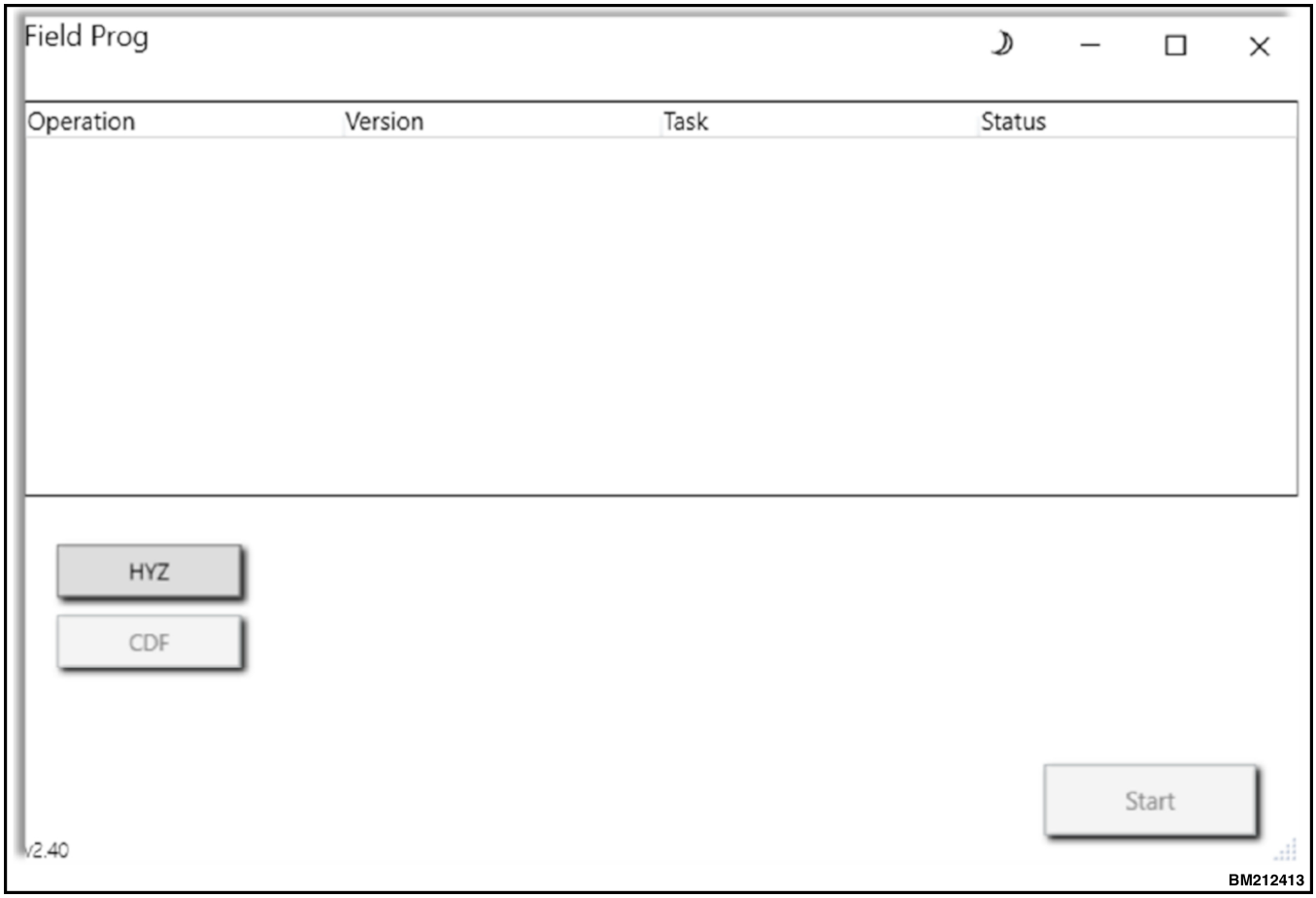


Figure 121. Field Prog User Interface

Using the Field Prog tool

1. Select the **HYZ** button. See Figure 122.

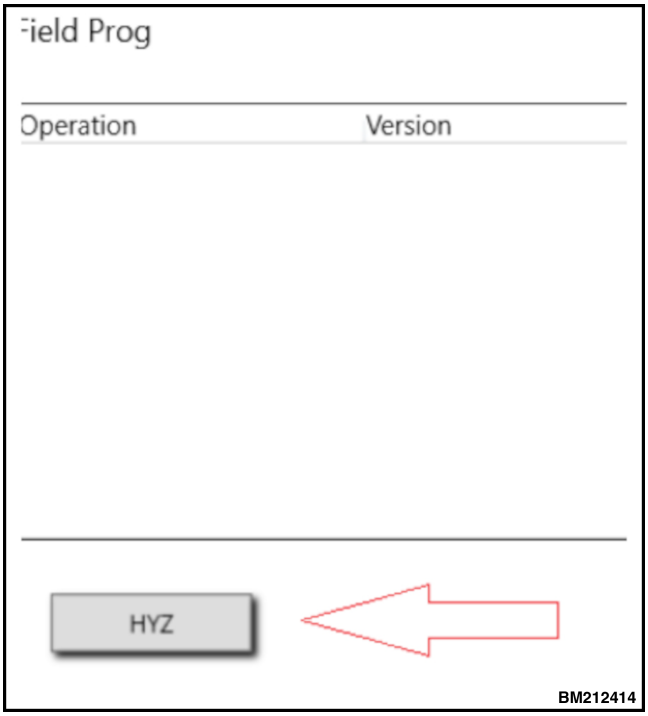


Figure 122. HYZ Button

2. Browse to the *.hyz* file to install on the truck.

3. Once the *.hyz* file has been loaded, the tool will determine if it is necessary to provide a CDF file. If a CDF is required, the button labeled **CDF** will become active. See Figure 123.

Figure 123. CDF Button

4. Select the **CDF** button and browse to the CDF file to load.

5. Once the files have been selected, a list of operations appears and the **Start** button is enabled. See Figure 124.

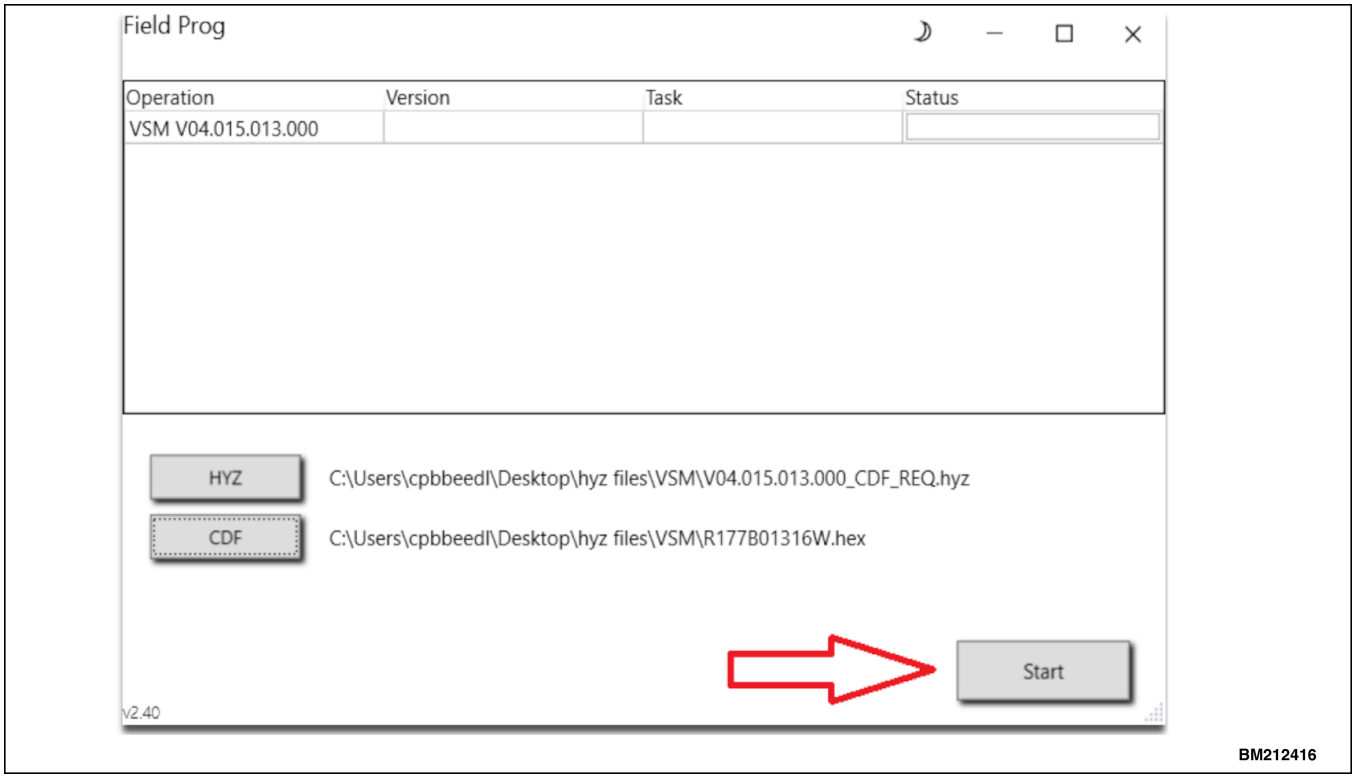


Figure 124. Start Button

6. Select the **Start** button to begin the programming operations.

7. Operations consist of any combination of CAN-based programming, USB-based display transfers, or messages and instructions to the user. For example, a list of operations could consist of several CAN-based operations that will proceed automatically, followed by a message to the user to attach the USB cable used for displays, and then a display programming operation. During each operation a progress bar will appear. See Figure 125.

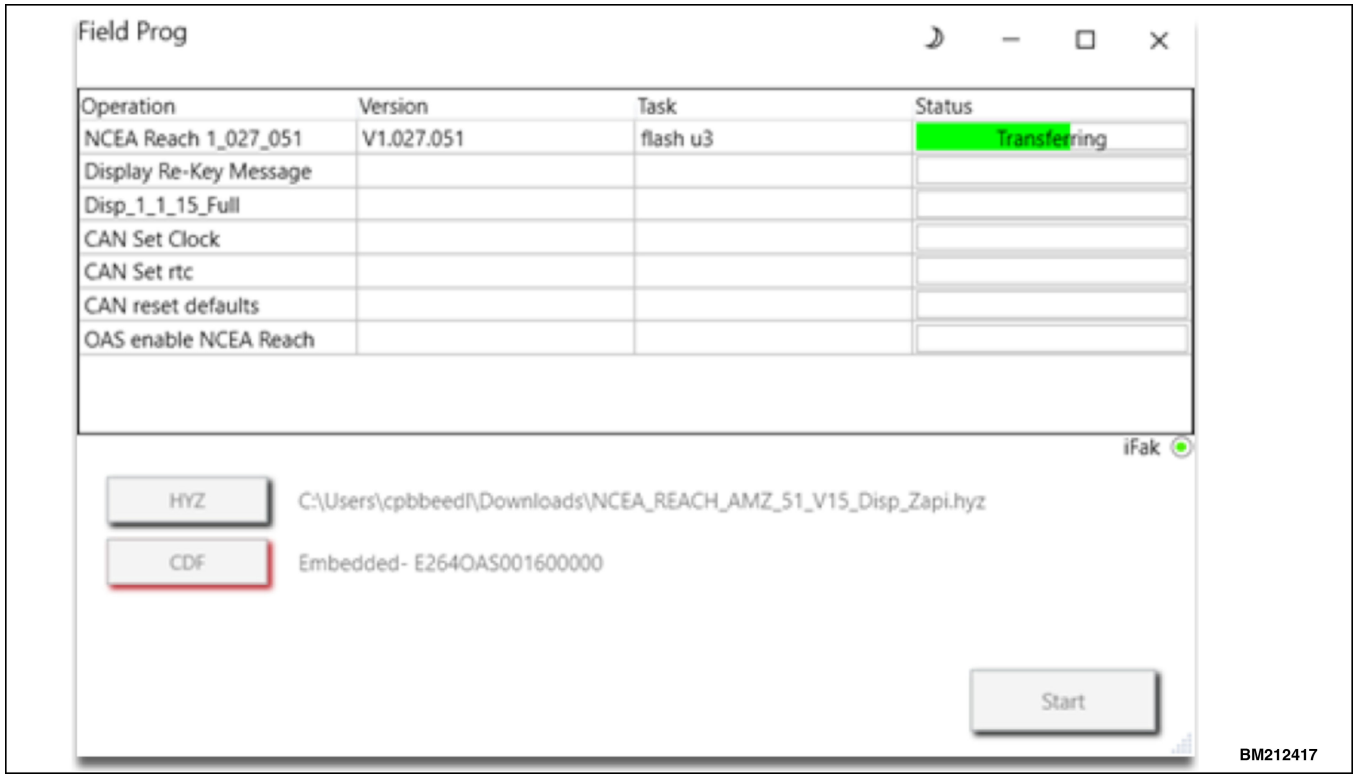


Figure 125. Progress Bar

8. For each programming operation, the status field will read either *Completed* or *Failed*. See Figure 126.

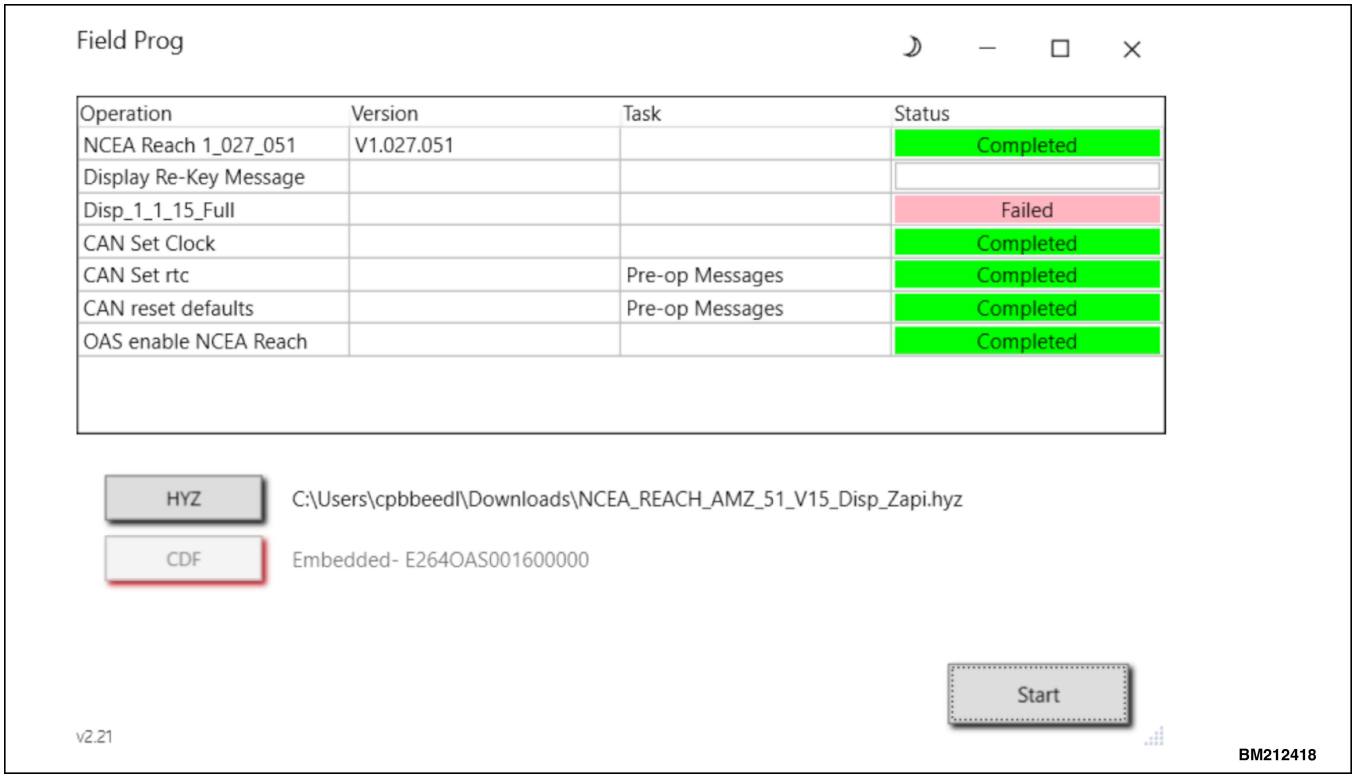


Figure 126. Status

NOTE: User messages (such as the *Display Re-key Message* above) are informational or contain instructions for the user. There is no pass/fail status attached to them. Follow any instructions in these messages.

Error behavior

As defined by the *.hyz*, some operations are critical and will stop the entire process, while others are optional and can be skipped. In some cases a failure is not critical and it is desirable to continue the process, resulting in subsequent pass or fail operations. This is to be determined by the Field Prog tool and not the user. See Figure 127.

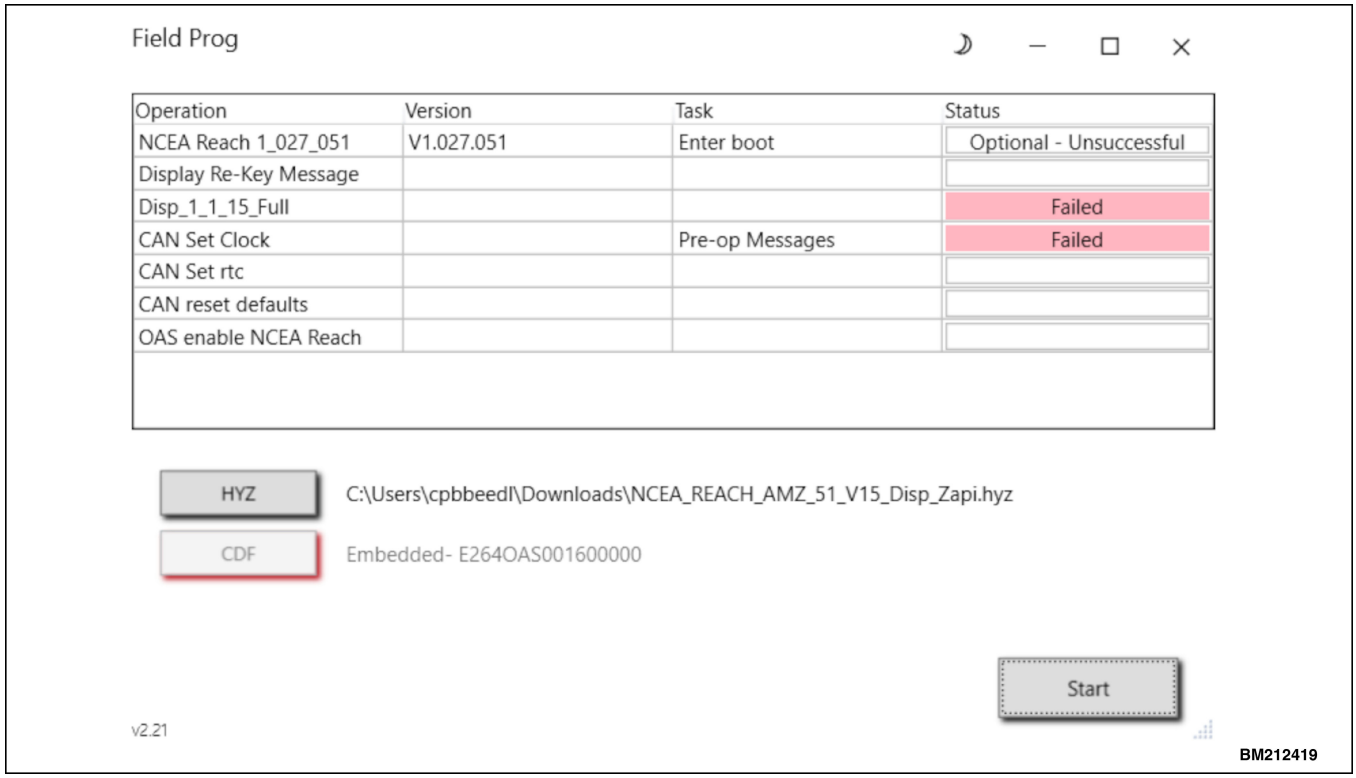


Figure 127. Optional Operation Status

CAN-based operations

Many operations require a CAN adapter. The Field Prog tool supports Thorsis (formerly iFak) adapters and will auto-detect the presence of the adapter. Certain devices made by Vector are also supported. In either case, no setup is required other than the installation of the appropriate driver from the CAN adapter vendor. The tool will select baud rates as necessary for each operation in the *.hyz* file.

NOTE: The Thorsis ISCAN driver version 6.0 or greater is required for 500K communications (VSM operations require these). Existing iFak CAN adapters will work with the new Thorsis version 6.xx drivers.

Display programming

1. Programming of the NCEA touch-screen displays is performed using an *.hyz* file specific to each size. On A-series trucks, these files allow programming over CAN or USB by user choice. See Figure 128.

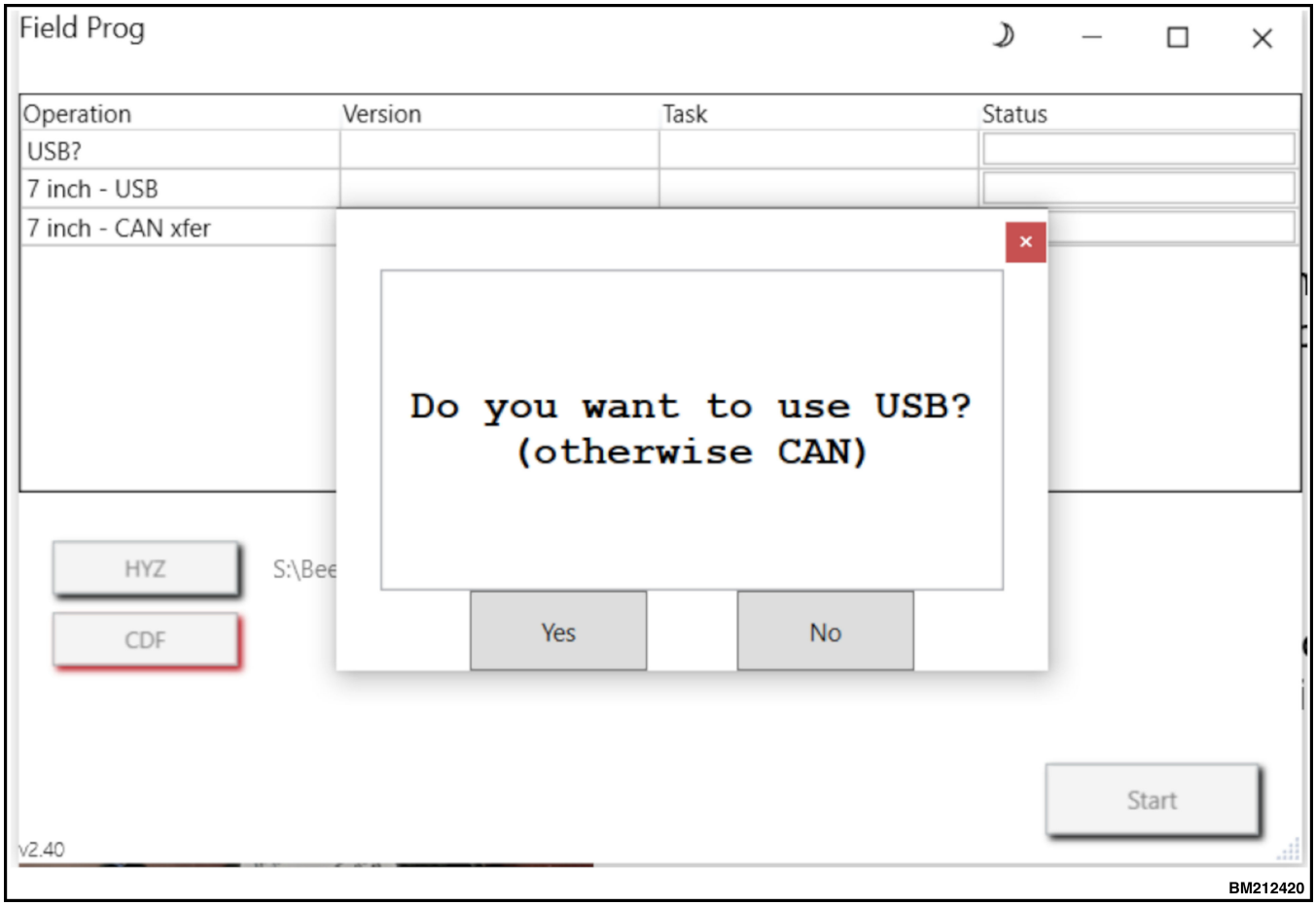


Figure 128. Can or USB

NOTE: CAN programming of the display can take upwards of 30-40 minutes for the larger displays. This would only be preferable when the USB cable is not available.

Programming the Display via USB

NOTE: This operation can only be done on-truck and requires accessing the back connector (J1) of the display. Please note J1 connector is common between all available displays. Illustrations below may not reflect the display featured on your truck.

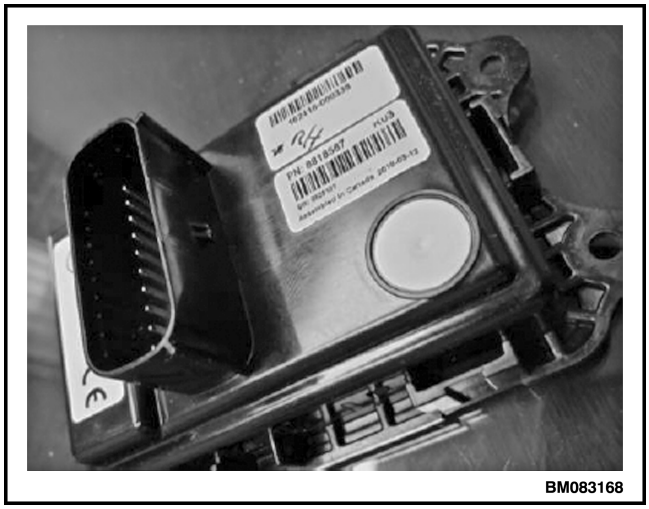
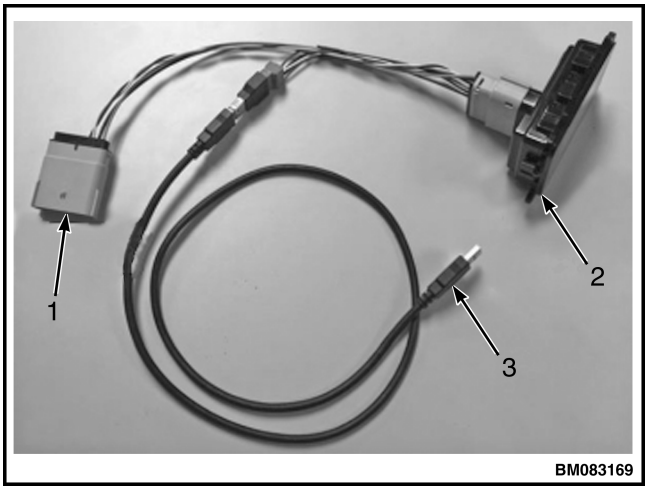


Figure 129. Backside of Display and J1 Connector



NOTE: DISPLAY CONNECTOR IS KEYED AND CAN ONLY BE INSERTED ONE WAY.

1. TO VEHICLE HARNESS (TEE)
2. DISPLAY
3. TO PC USB PORT (USB CABLE)

Figure 130. USB Cable and Connection

Use of USB cable #4265322 is required. This cable acts as a tee between the truck connector for J1 and J1 itself, thereby leveraging power from the truck.

Setup

WARNING

Whenever disconnecting or reconnecting a battery, always disconnect the negative post cable first and connect it last. If you don't do this, dangerous sparking could occur. You should never connect the battery with the key switch in the ON position or the engine running. Never lay metal tools or any other objects across the battery which could potentially cause a short circuit.

1. Disconnect battery.

2. Install tee cable.

3. Connect battery.

4. Key on truck.

5. Ensure USB cable is connected into the USB Interface harness.

NOTE: Your PC may begin recognizing the display device and installing the driver. Select **OK** or **Yes** to any driver install requests.

Run the Field Prog tool

NOTE: On some computers, it may be necessary to run Field Prog in administrator mode in order to perform a USB transfer to a display.

1. If the message appears, close the tool, right-click the shortcuts, and select **Run as administrator**.

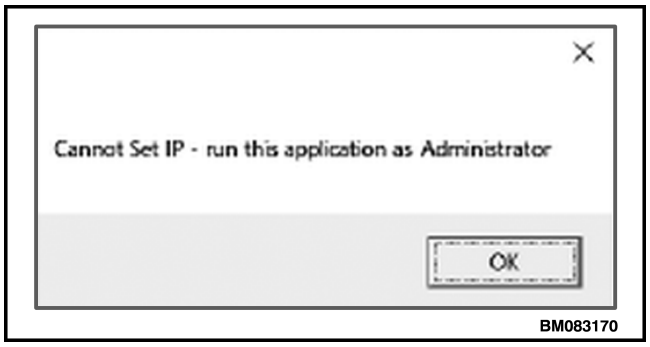


Figure 131. Run As Administrator

Language

Field Prog is localized with five built-in languages. You may select the language using the small drop-down in the bottom right corner of the tool. Upon selection, all text associated with the tool will appear in the selected language.

Figure 132. Selecting A Language

USER INTERFACE (DISPLAY) 202001-087

USER INTERFACE DISPLAY

The user interface display will turn on immediately following key on of the truck. The login screen will appear, allowing the user to log in with a five digit Service password or Operator password. The user interface features a touch screen that allows the user to efficiently navigate through menus on the display. An ambient light sensor controls the screen brightness. The procedures below contain instructions for navigating with the touch screen feature.

NOTE: The user interface display has no serviceable components and must be replaced as a unit if found defective.

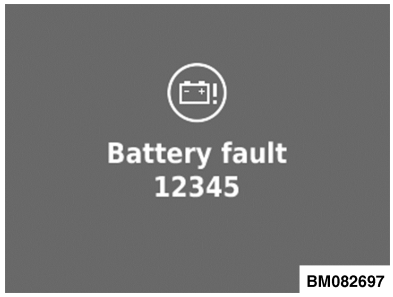
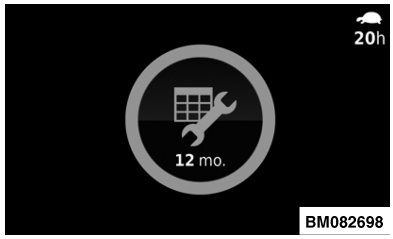
NAVIGATION KEY

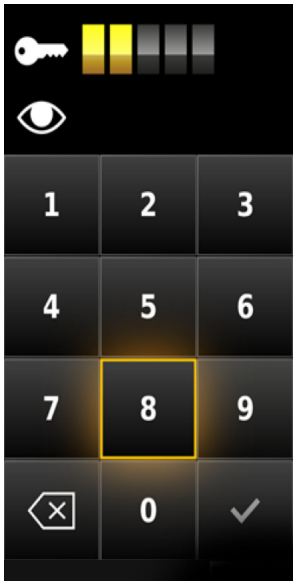
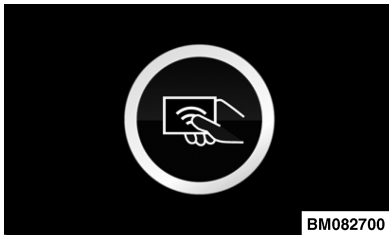
Gesture	Touch Screen
Slide up	Start from the BOTTOM of the screen, slide finger up to view information below the current screen.
Slide left	Start from the RIGHT of the screen, slide finger left to view information to the right of the current screen.
Slide right	Start from the LEFT of the screen, slide finger right to view information to the left of the current screen.
Slide down	Start from the TOP of the screen, slide finger down to view information above the current screen.
Select (Enter)	Tap an item on the screen to select it.
Tap and hold	On some items indicated in the text below, tap and hold an item on the screen to select it and view additional settings or information.
Drag (hold and move)	When possible, lists should be scrollable by dragging instead of swiping one page a time. Value of a setting may be adjustable by dragging a gauge.

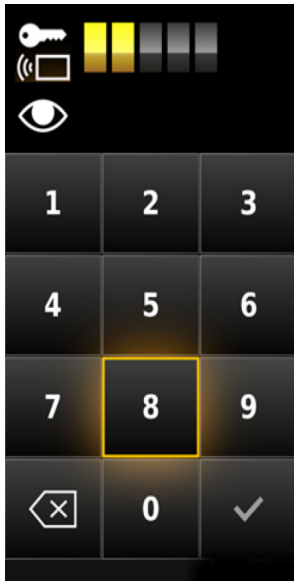
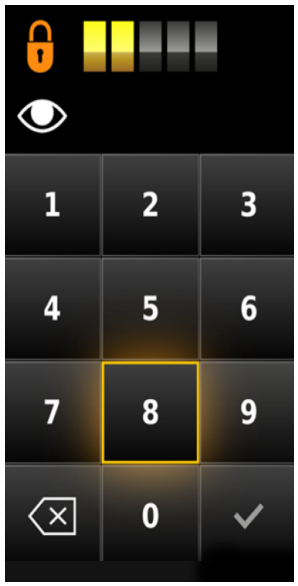
STARTUP SEQUENCE

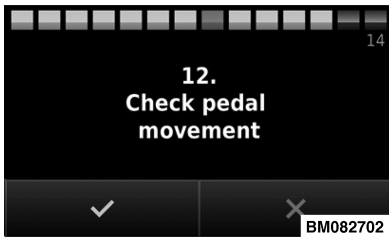
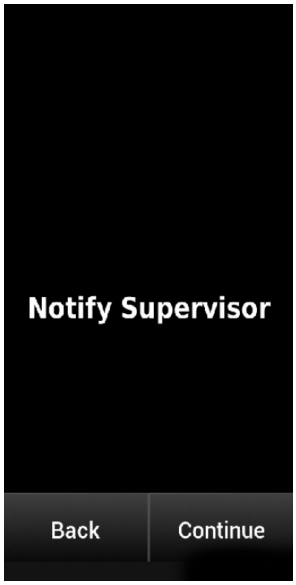
Depending on the options of the lift truck, a series of images may appear during the start-up sequence. If the following images do not appear, the option is not included on this truck.

No Operator on Seat Warning 	Some trucks may require the operator to be seated for the startup. If being seated and having the seatbelt on is also required, the seatbelt icon is shown instead of the icon shown here. This warning is shown in startup sequence until the operator sits on the seat. The warning will reappear if the operator gets off the seat at any time during the startup sequence.
Fault Screen	If an active warning exists that requires urgent attention, it may appear at startup. If no critical warnings exist, this part of the startup sequence will be skipped.

	All active critical warning notifications are shown in succession, and must be dismissed to continue startup sequence. **NOTE:** Only critical fault notifications will be shown during the startup sequence. Other active faults will appear on the operator screen after startup.
Calendar Maintenance Reminder (Optional) 	The calendar maintenance reminder indicates that periodic maintenance is due. This icon only appears if the optional feature has been enabled and the countdown has reached zero. The service interval (12 months, e.g.) will be indicated within the icon in text. The service interval can be expressed in hours of operation or in months. Another icon will appear in upper-right corner with a countdown of hours until decreased performance, unless the truck is serviced.
Hours Maintenance Reminder - Amber 	The hours maintenance reminder indicates that periodic maintenance is due. This icon only appears if the optional feature has been enabled and the countdown has reached zero. The service interval (500 hours, e.g.) will be indicated within the icon in text. The service interval will be expressed in hours of operation. Another icon will appear in upper-right corner with a countdown of hours until decreased performance, unless the truck is serviced.
Maintenance Reminder (Calendar) with Derated Traction Speed (Calendar shown) 	A red icon is shown after the countdown for decreased performance has reached zero and the derated traction speed is activated. Any key action or touch screen gesture will dismiss the screen and move to the password entry screen.
Hours Maintenance Reminder - Red	A red icon is shown after the countdown for decreased performance has reached zero and the derated traction speed is activated.

	Any key action or touch screen gesture will dismiss the screen and move to the password entry screen.
Password Entry Screen (Optional) - Password Only 	The password entry screen is used to identify the user. A PIN code icon and a progress bar with five blocks is located on the upper left corner. The accept button is greyed out until all digits are keyed in. Entered numbers may be shown or hidden.
Password Entry Screen (Optional) - RFID Only 	If an RFID card is the only method allowed for identification, a PIN code is not required. An icon of a hand holding an identification card will be displayed. A successful reading of the ID card is required to proceed.
Password and RFID (Radio Frequency IDentification) - (Optional)	If a password and an RFID card are required for identification, a PIN code is required. An icon of an identification card and the PIN code icon are both displayed. A successful reading of the ID card and password is required to proceed.

	
Password Entry Screen (Optional) - Supervisor or Service Access Only 	If supervisor or service access is required then the lock icon is displayed in the top left of the password screen. Only valid passwords with supervisor or service access allow the application to complete the login process and transition to the next screen. If an operator password is entered it will be invalid and the failed password screen will appear. **NOTE:** After a successful user validation (and card reading, if applicable) the display advances to the checklist screen.
Wrong Password Warning 1.5in	The wrong password screen appears if the entered password is invalid. The warning will have a progress bar showing how many incorrect PINs have been entered and how many are allowed. The screen will transition back to the password entry screen after 3 seconds. If attempted passwords fail 10 times, a supervisor or service password is required to gain access. The password failed count reduces to zero if access is granted or a rekey event occurs.

Checklist Screen 	**NOTE:** The truck may have a **pre-start** checklist, a **post-start** checklist, or no checklist at all depending on truck configuration. If a post-start checklist exists, the pre-start checklist must be completed first. The operator warning screen will inform the user to perform necessary actions to put the truck in an operational state in order to fulfil the post-start checklist criteria. An example of a post-start conditions is to start the truck and (or) satisfy interlock conditions. Once the post-start conditions are satisfied the checklist will continue with post-checklist items. The checklist screen, if enabled, is used to verify that the operator inspects the truck prior to operation. A series of different screens will appear for each checklist item. Examples of checklist items are: A linear progress bar appears at the top of the screen with a number representing the amount of checklist items that must be cleared. To clear a check-list item, press the GREEN "check" on the screen. If a check-list item does not clear, press the RED "X". When either button is pressed, the screen proceeds to the next list item. The failed items are updated in the logs list.
Failed Checklist Warning Screen 	If the user fails a checklist item a warning screen appears. If the user presses the Back button, the application will go back to the last checklist item. If user presses the Continue button and the checklist item is not a lockout item the checklist item is considered failed and the application will go to the next checklist item. If the user presses the Continue button and the checklist item is a lockout item the checklist lockout screen will occur.

Failed Checklist Lockout Screen 	The failed checklist lockout warning will appear if the user fails a checklist item that has a lockout condition and presses the Continue button on the failed checklist warning screen. If the user presses the Back button the application will go back to the last checklist item. If user presses the Continue button then the checklist has failed and the application will transition to the operator screen and the truck will be in a lockout condition. If lockout has occurred a service technician will be required. Examples of items that will cause a lockout condition are: starter, engine outputs, transmission and hydraulic functions disabled.

Side View Operator Screens

NOTE: At startup, switched inputs and preset heights screens appear for two seconds and slide off the screen to show operator where they are located. Some configurations may differ from this example.

Figure 133. Typical 5-inch or 7-inch Display at Startup (Portrait View)

Switched Inputs and Preset Heights

NOTE: The switched inputs (virtual switches) screen can be accessed from the operator screen and is accessible at any access level. The screen can support a maximum of 24 virtual switches stored in the truck Configuration Data File (CDF). Selections are made by touching the icon.

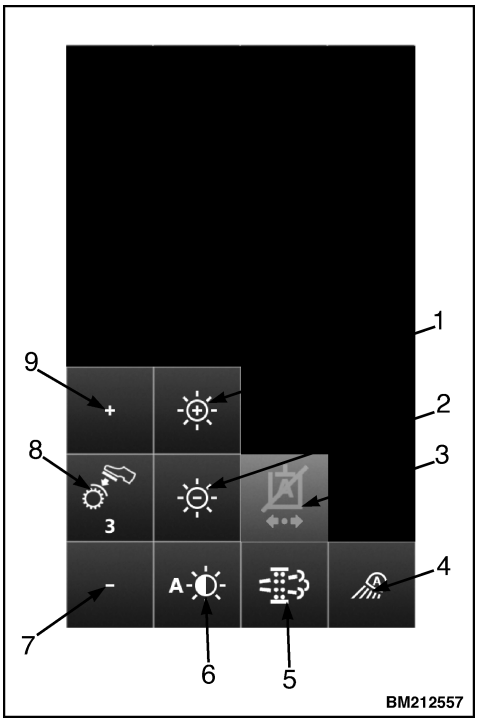


Figure 134. Switched Inputs Screen

NOTE: Switched inputs may vary based on truck configuration.

Table 2. Switched Inputs

Item number	Item	Function
1	Increase brightness	**Touch button** once to increase the brightness of the display screen.
2	Increase brightness	**Touch button** once to decrease the brightness of the display screen.
3	Auxiliary float	**Touch button** once to activate the auxiliary float, touch again to deactivate.
4	Work light	**Touch button** once to activate the work light, touch again to deactivate.
5	DPF	**Touch button** once to activate the DPF, touch again to deactivate.

Table 2. Switched Inputs (Continued)

6	Auto brightness	**Touch button** once to adapt the brightness of the display based on the operating environment.
7	Decrease inch brake overlap	**Touch button** once to increase inch brake overlap value.
8	Inch brake overlap	Icon displaying current inch brake overlap value.
9	Increase inch brake overlap	**Touch button** once to decrease inch brake overlap value.

NOTE: The preset heights screen can be accessed from the operator screen. The screen is accessible at any access level and the commonly used height settings are defined by either operator or supervisor. Selections are made by touching the icon. The blue color is used for pick and grey for place switches. Settings can be adjusted in the Settings menu under Sensors and Presets.

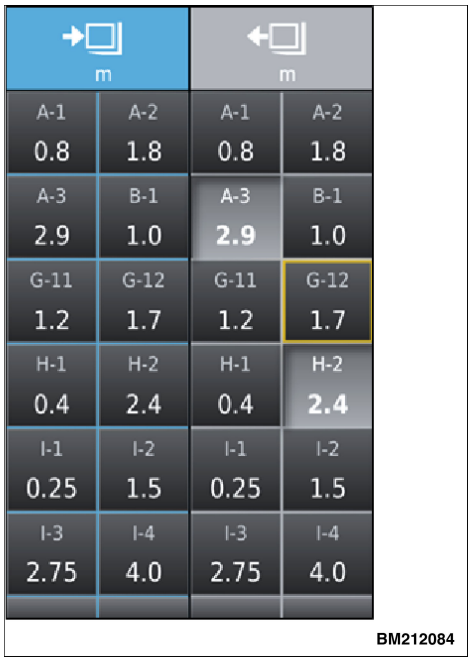


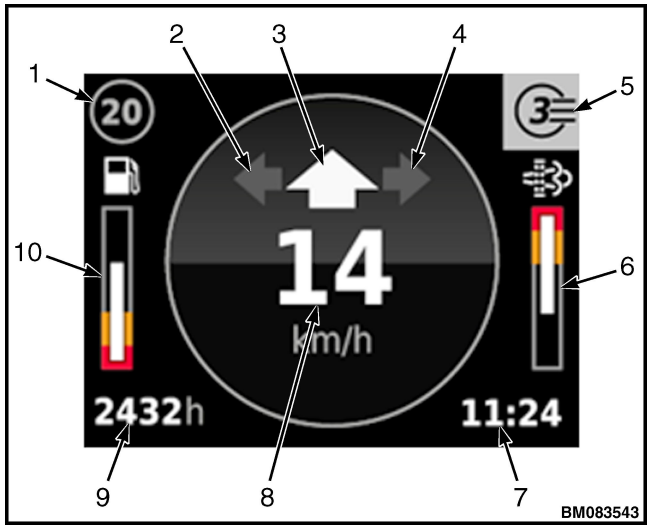
Figure 135. Preset Heights

HOME SCREEN

The Home screen is the main view of the user interface while operating the truck. After the start-up sequence has finished and all alerts have been cleared, the Home screen will appear on the display. The Home screen will display the following status information. Displays may vary based on truck configuration.

- Current vehicle speed
- Active speed limit
- Driving direction
- Turn signal indicators
- Truck operating hours
- Performance mode indicator
- Hydraulic oil, transmission oil, and engine coolant temperatures
- Clock
- Fuel levels

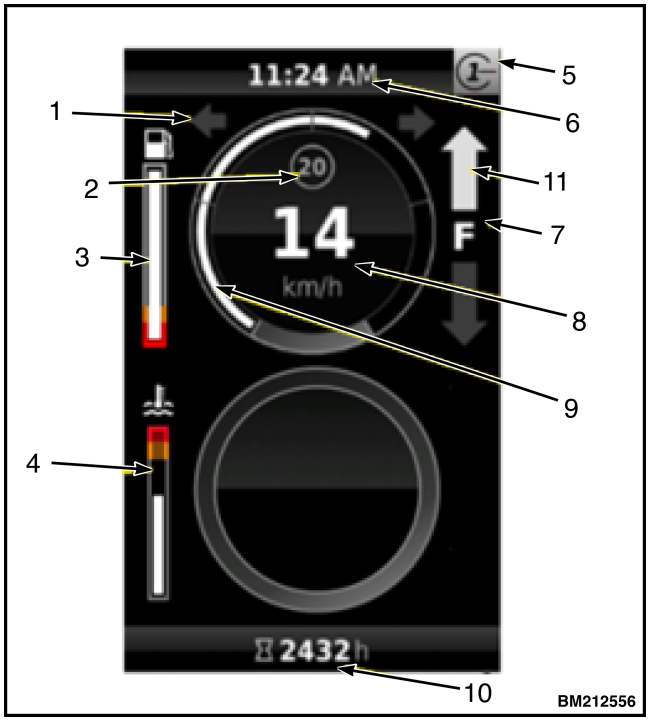
NOTE: Meters are depicted as centrally located round graphics and gauges are depicted as vertical sidebar graphics off to the sides of the display. The gauges will have an icon above them to indicate the item or area of interest they represent. White indicates a normal status, orange or red indicates limits have been exceeded. Depending on the display size there may be either one or two meters.



NOTE: THE STANDARD 2.8-INCH DISPLAY VERSION APPEARS IN LANDSCAPE FORMAT ONLY.

1. ACTIVE SPEED LIMIT
2. LEFT TURN SIGNAL
3. DRIVING DIRECTION INDICATOR (FORWARD SHOWN)
4. RIGHT TURN SIGNAL
5. PERFORMANCE MODE INDICATOR
6. GAUGE (DIESEL PARTICULATE FILTER SHOWN AS EXAMPLE)
7. CLOCK
8. CURRENT VEHICLE SPEED
9. TRUCK OPERATING HOURS
10. GAUGE (FUEL GAUGE SHOWN)

Figure 136. 2.8-inch Display - Home Screen



NOTE: THE 5-INCH OR 7-INCH DISPLAY VERSIONS CAN BE SET UP TO DISPLAY IN EITHER LANDSCAPE OR PORTRAIT FORMAT AT TIME OF MANUFACTURE.

1. TURN SIGNAL INDICATOR
2. ACTIVE SPEED LIMIT
3. FUEL LEVEL
4. COOLANT TEMPERATURE
5. PERFORMANCE MODE INDICATOR
6. CLOCK
7. DIRECTION INDICATOR LEVEL
8. CURRENT VEHICLE SPEED
9. ENGINE RPM
10. MACHINE OPERATING HOURS
11. DRIVING DIRECTION INDICATOR (FORWARD SHOWN)

Figure 137. 5-inch or 7-inch Display - Home Screen

In addition to the visible icons and or information on the home screen there are more selections not visible. These items are available by touching the screen with a finger and sliding either up or down (left or right) revealing more choices.

LOGGING IN

Once an operator password is entered, or if an operator password is not required, a 5 digit service password may also be needed to access features in the user interface. Each digit can be chosen from 0-9, by selecting the keys on the screen. Follow the procedures below, to enter password.

Log In or Out

1. From the Home screen, slide right to reveal the General Info screen.

2. From the Info screen:
   - Select **Log In** to reveal the password screen.
   - Select **Log Out** to log out.

3. The password screen will appear. A key icon in the upper left corner will display when the screen is locked. Enter 5 digit password.

4. When the correct 5 digit password is entered, a GREEN "check" button will appear in the bottom right corner. Select this button to unlock and proceed to the unlocked General Info screen.

NOTE: The General Info screen is a scrollable list of truck information items for viewing only and content will vary based on truck type. The Info screen lets the operator have a quick overview about key items of truck info. A scrollbar shall be visible on the right to indicate position in the list.

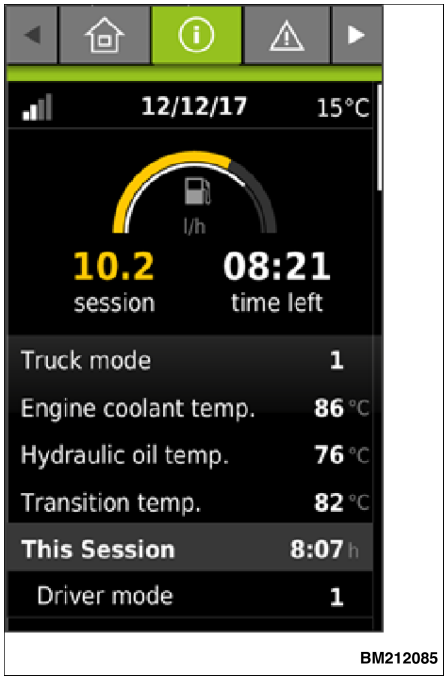
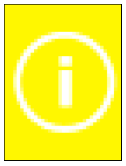
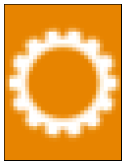


Figure 138. General Info, First Screen

Main Menu

Table 3. Main Menu Structure

Icon	Description
	Home
	Info Menu
	Alerts Menu
	Calibration Menu
	Diagnostics Menu
	Settings

VIEW THE FAULT LIST

In the event of a fault, the truck controller will send internal messages to the display. The list of faults can be viewed on the display and is located on the Alerts Menu screen.

Fault List

The fault list screen displays faults in chronological order, with the newest shown at the top. Long text that does not fit the screen is shown with three dots at the end. The fault list contains a button to clear all faults with appropriate user access. A scrollbar is visible on the right to indicate position in the list.

NOTE: A service password is not required to view the fault list. A password is required, however, to clear the fault list. See Log In procedure for more information on entering a password.

1. From the General Info screen, select the Alerts Menu from the menu bar.
2. The Fault List screen will be displayed. The faults (in chronological order) are shown with an error code and a text label, if available. The error code is shown first, so that it is always entirely visible. Impacts and checklist fails are also listed here.
3. The Fault List screen features a list of all current faults, a Clear Faults button, and a Filter button.

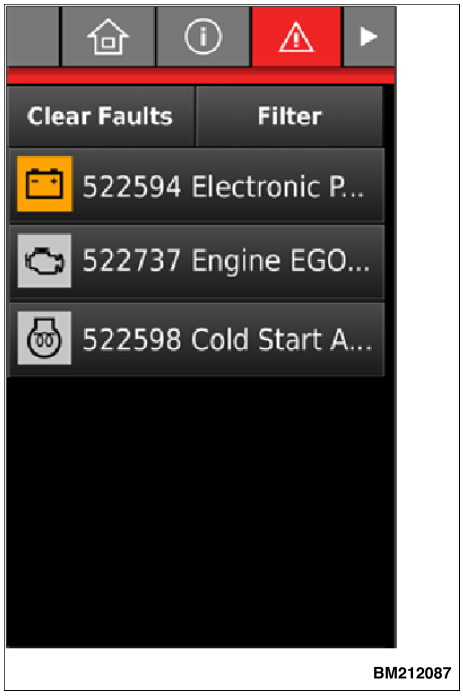


Figure 139. Fault List Screen

When a fault is selected by touching, a fault detail screen appears with further information.

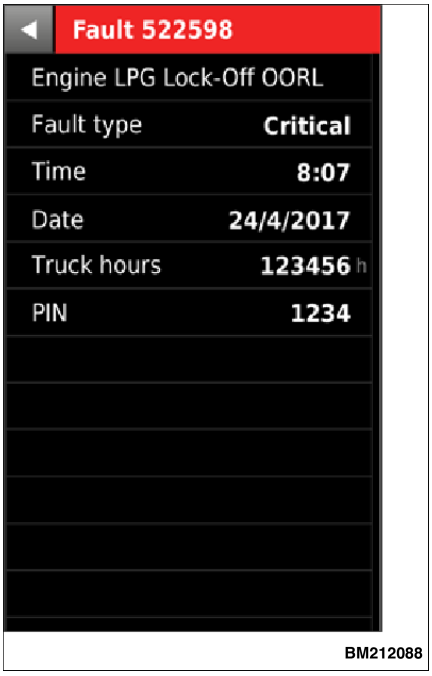


Figure 140. Fault Detail Screen

Fault Filter

Fault filters allow the user to select the types of faults to be shown. The screen is a selectable list of various fault items.

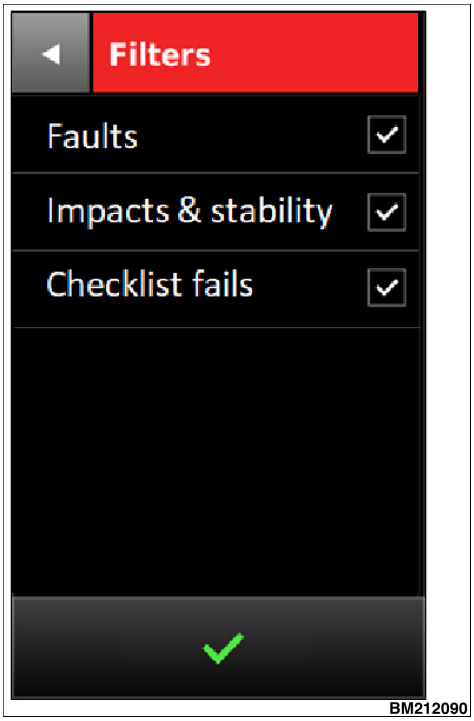


Figure 141. Fault Filter

VIEW HARDWARE AND SOFTWARE VERSIONS

The current hardware and software versions installed on the User Interface, can be viewed on the display. Follow the procedure below to view the current hardware and software versions installed on your User Interface.

1. Enter password to log in to the User Interface. See Logging in procedure for more information on entering a password.
2. Confirm you are now on the General Info screen.
3. Slide up to scroll to HW/SW Versions.
4. The installed hardware and software are shown on the left, with the current installed version of each on the right.

CALIBRATIONS

NOTE: List items may vary by truck configuration.

Calibrations has two types of layouts with variations:

- An instruction sheet to guide the user through calibration and offer a manual confirmation to actions.
- A screen with a combination of instructions and an adjustment to input a value.

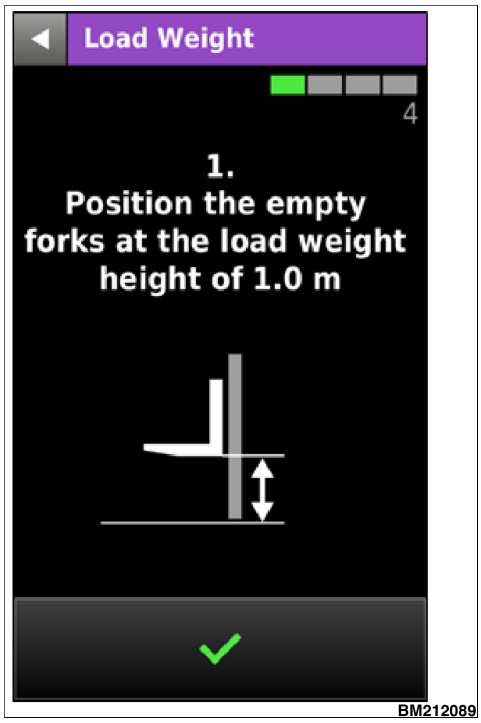


Figure 142. Calibration Instructions and Confirmation Example

Select the Calibrations icon in the menu bar. The Calibrations menu will be displayed. The Calibrations menu contains info for the the following sub-menus:

- **Hydraulics**
- **Drive**
- **Sensors/Presets**

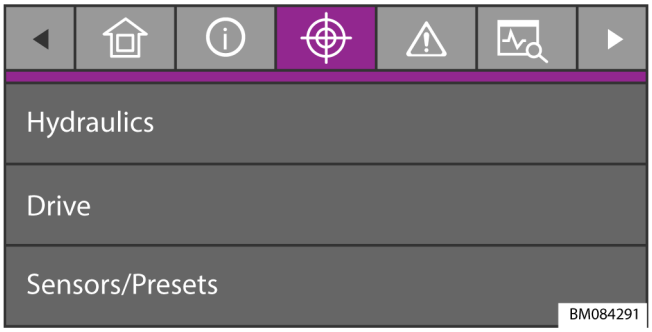


Figure 143. Hydraulics Screen

The Hydraulics menu contains information for:

- **H1c Lift/Lower**
- **H2c Tilt**
- **H3c Third Hyd Function**
- **H4c Fourth Hyd Function**
- **H5c Fifth Hyd Function**

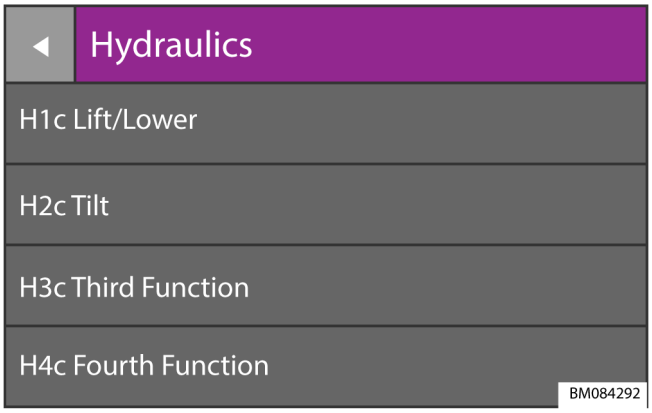


Figure 144. Hydraulic Calibrations Choices

H1c Lift/Lower

- **H1c.5 Lift Valve Output**
- **H1c.7 Lower Valve Output**
- **H1c.13 Hoist Level Calib**

H2c Tilt

- **H2c.7 Tilt FWD Output**
- **H2c.9 Tilt Back Output**
- **H2c.13 Tilt Level Calib**

H3c Third Hyd Function

- **H3c.7 Dir A Output**
- **H3c.9 Dir B Output**

- **H3c.13 Aux 1 Level Calib**

H4c Fourth Hyd Function

- **H4c.7 Dir A Output**
- **H4c.9 Dir B Output**

H5c Fifth Hyd Function

- **H5c.5 Dir A Output**
- **H5c.7 Dir B Output**

H6c Sixth Hyd Function

- **H6c.3 Dir B Calibrate**
- **H6c.5 Dir A Output**
- **H6c.7 Dir B Output**
- **H6c.9 Sixth Hydr Calib**

H7c Seventh Hyd Function

- **H7c.3 Dir B Calibrate**
- **H7c.5 Dir A Output**
- **H7c.7 Dir B Output**
- **H7c.9 Seventh Hydr Calib**

The Drive menu contains information for:

- **D2c Battery**
- **D4c Steer**
- **D5c Steer Axle**
- **D8c Traction**
- **D9c Transmission**

D2c Battery

- **D2c.1 Set Battery**

D4c Steer

- **D4c.1 Steer Wheel Range**
- **D4c.1 Steer Wheel Range**

D5c Steer Axle

- **D5c.1 Steer Range Calib**

D8c Traction

- **D8c.1 Travel Speed Calib**

D9c Transmission

- **D9c.1 Xmsn Valve Calib**

The Sensors/Presets menu contains information for:

- **S7c RTSH**
- **S12c Load Weight**

S7c RTSH

- **S7c.1 RTSH Calib**

S12c Load Weight

- **S12c.5 Load Weight Calib**

ALERTS

Select the Alarms icon in the menu bar. The Alarms menu will be displayed. The Alarms menu contains info for the the following sub-menus:

- **Clear Logs**
- **Filter**
- **Fault Number and Name Icon**

The Clear Logs menu contains information for:

- **Fault Log**
- **Impact Log**
- **Confirm**
- **Back**

Fault Log

- **Check mark**

Impact Log

- **Check mark**

Confirm

- **N/A**

Back

- **N/A**

The Filter menu contains information for:

- **Show fault Log**
- **Show impact Log**
- **Confirm**
- **Back**

Show fault Log

- **Check mark**

Show impact Log

- **Check mark**

Confirm

- **N/A**

Back

- **N/A**

The Fault Number and Name Icon

- **Type**
- **Failure**
- **Severity**
- **Occurrences**
- **First Occ**
- **First Occ Hour Meter**
- **Last Occ**
- **Last Occ Hour Meter**

DIAGNOSTICS

Select the Diagnostics icon in the menu bar. The Diagnostics menu will be displayed. The Diagnostics menu contains info for the the following sub-menus:

- **Hydraulics**
- **Drive**
- **Sensors/Presets**
- **Controllers**

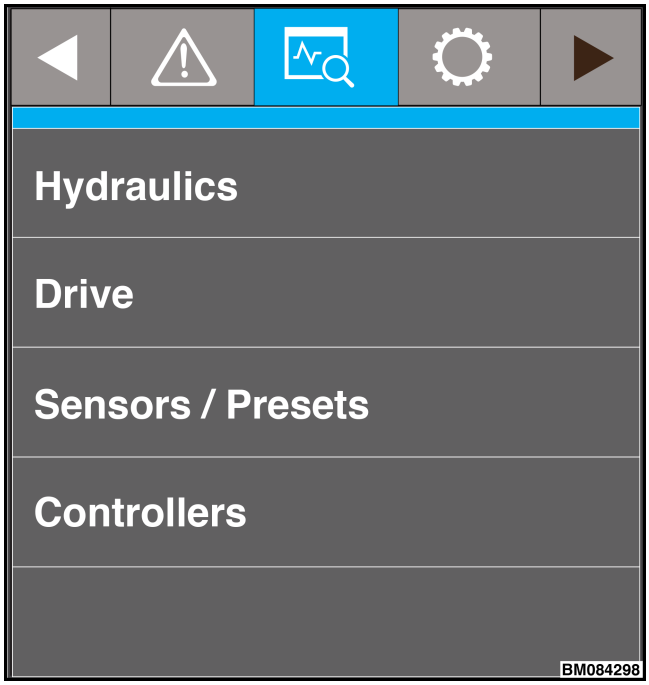


Figure 145. Diagnostics Screen

The Hydraulics menu contains information for:

- **H1d Lift/Lower**
- **H2d Tilt**
- **H3d Third Function**
- **H4d Fourth Function**
- **H9d Config**
- **H10d Levers**

H1d Lift/Lower

Select to view information for the following:

- **H1d.1 Lift Valve Output** - Displays the output in V.
- **H1d.7 Lift Pressure** - Displays the lift pressure (kPa/psi).
- **H1d.9 Lift Command** - Displays percentage.
- **H1d.11 Lower Command** - Displays percentage.
- **H1d.13 Function Switch** - Displays On/Off.
- **H1d.23 Pressure sensor** - Displays the pressure (kPa/psi).
- **H1d.35 Lower valve Output** - Displays the current output in V.
- **H1d.37 Filter Sensor** - Displays On/Off.
- **H1d.39 Function Switch 1** - Displays On/Off.

- **H1d.41 Height Sensor** - Displays voltage of the discrete lift height sensor for DSS.
- **H1d.43 Lift Height Sensor** - Displays detected height of continuous height sensor.

H2d Tilt

Select to view information for the following:

- **H2d.1 Tilt Cmnd Dir A** - Displays percentage.
- **H2d.3 Tilt Cmnd Dir B** - Displays percentage.
- **H2d.5 Coil Current** - Displays voltage in mA.
- **H2d.13 Hyd Func Switch 2** - Displays On/Off.
- **H2d.15 Tilt Sensor** - Displays voltage of sensor in mV.
- **H2d.17 Coil Current Dir A** - Displays the output in mA.
- **H2d.19 Coil Current Dir B** - Displays the output in mA.
- **H2d.21 Tilt Lever Pos** - Displays voltage of lever sensor in mV.
- **H2d.23 Tilt Sense Pos** - Displays degree.
- **H2d.25 Calib Tilt Sensor Pos** - Displays degree.
- **H2d.27 Valve Cur Cmd** - Displays the output in mA.
- **H2d.29 Valve Cur Resp** - Displays the output in mA.

H3d Third Hyd Function

Select to view information for the following:

- **H3d.1 3rd Cmnd Dir A** - Displays percentage.
- **H3d.3 3rd Cmnd Dir B** - Displays percentage.
- **H3d.5 Coil Current** - Displays the output in mA.
- **H3d.13 Aux 3 Switch** - Displays On/Off.
- **H3d.15 Ret Pos Prox Sensor** - Displays On/Off.

H4d Fourth Hyd Function

Select to view information for the following:

- **H4d.1 4th Cmnd Dir A** - Displays percentage.
- **H4d.3 4th Cmnd Dir B** - Displays percentage.
- **H4d.5 Coil Current** - Displays the output in mA.
- **H4d.13 Aux 4 Switch** - Displays On/Off.

H9d Config

Select to view information for the following:

- **H9d.1 OPS Man Hyd Solenoid** - Displays On/Off.
- **H9d.3 Hyd Temp** - Displays degree (°C/°F).
- **H9d.5 Hyd Anti-Stall Solenoid** - Displays On/Off.

H10d Levers

Select to view information for the following:

- **H10d.1 Lift/Lower Input** - Displays percentage.
- **H10d.3 Tilt Input** - Displays percentage.
- **H10d.5 Aux 1 Input** - Displays percentage.
- **H10d.7 Aux 2 Input** - Displays percentage.
- **H10d.9 Aux 3 Input** - Displays percentage.
- **H10d.11 F-N-R**

The Drive menu contains information for:

- **D1d Engine**
- **D2d Battery**
- **D4d Steer**
- **D8d Traction**
- **D9d Transmission**
- **D10d Brakes**
- **D11d Pedals**

D1d Engine

Select to view information for the following:

- **D1d.1 Throttle A**
- **D1d.3 Throttle B**
- **D1d.5 Throttle %**
- **D1d.9 Gasoline ECU TPS**
- **D1d.11 Throttle Sens Supply A**
- **D1d.13 Throttle Sens Supply B**
- **D1d.15 Engine Speed** - Displays the current speed of the engine in RPM.
- **D1d.17 Gasoline ECU Speed** - Displays the current speed in RPM.
- **D1d.19 Requested Speed** - Displays the requested speed of the engine in RPM.

- **D1d.21 Target Idle Speed** - Displays the target idle speed in RPM.
- **D1d.23 Governed Speed** - Displays the governed speed in RPM.
- **D1d.25 Governing Status**
- **D1d.27 Torque Mode** - Displays status.
- **D1d.29 Actual Engine Torque**
- **D1d.31 Requested Torque**
- **D1d.33 Actual Ign Timing**
- **D1d.35 Desired Ign Timing**
- **D1d.37 Inlet Air Temp**
- **D1d.39 Manifold Abs Press**
- **D1d.41 Fuel Cntr Status Sn 1** - Displays on or off status of the fuel control solenoid.
- **D1d.43 Fuel Cntr Status Sn 2** - Displays on or off status of the fuel control solenoid.
- **D1d.45 Short Term Fuel Trim 1**
- **D1d.47 Short Term Fuel Trim 2**
- **D1d.49 Long Term Fuel Trim 1**
- **D1d.51 Long Term Fuel Trim 2**
- **D1d.53 Long Term Fuel Trim**
- **D1d.55 O2 Sensor 1 Volt**
- **D1d.57 O2 Sensor 2 Volt**
- **D1d.59 Emissn 02 Sensor1 Heat Duty**
- **D1d.61 Emissn 02 Sensor2 Heat Duty**
- **D1d.63 Idle Air Ctrl Vlv**
- **D1d.65 Test Mode Status**
- **D1d.67 Engine Coolant Temp** - Displays engine coolant temperature.
- **D1d.69 Coolant Temp-ECU** - Displays ECU coolant temperature.
- **D1d.71 Engine Oil Pressure** - Displays engine oil pressure.
- **D1d.73 Engine Starter Output** - Displays engine starter ouput (On/Off).
- **D1d.75 ECU Ign Voltage**
- **D1d.77 ECU Make**
- **D1d.79 ECU Mode**
- **D1d.81 MIL Lamp** - Displays On/Off status.
- **D1d.83 Fuel/Water Sens** - Displays voltage of the fuel/water sensor.
- **D1d.85 Air Filter Sens** - Displays voltage of the air filter sensor.
- **D1d.87 Glow Plug/Air Grid Htr** - Displays on or off status of the flow plug/air grid heater.
- **D1d.89 Throttle Act PWM Duty** - Displays on or off status.
- **D1d.91 Accel Pos Sens** - Displays the current position of the accelerator position sensor in voltage.
- **D1d.93 Cold Start Timing Adv**

D2d Battery

Select to view information for the following:

- **D2d.5 Truck Voltage** - Displays the current voltage.

D4d Steer

Select to view information for the following:

- **D4d.3 Steer Angle** - Displays the current steer angle in degrees.
- **D4d.35 Steer Wheel Sensor** - Displays the current steer wheel in degrees.
- **D4d.37 Steer Axle Sensor**

D8d Traction

Select to view information for the following:

- **D8d.2 Travel Speed** - Displays the current truck speed in kph/mph.

D9d Transmission

Select to view information for the following:

- **D9d.1 Xmsn Input Speed** - Displays input speed in RPM.
- **D9d.3 Xmsn Output Speed** - Displays output speed in RPM.
- **D9d.4 Xmsn Fwd 1 Cmd Press** - Displays pressure in mBar.
- **D9d.5 Xmsn Fwd 1 Press** - Displays pressure in mBar.
- **D9d.7 Xmsn Fwd 2 Press** - Displays pressure in mBar.
- **D9d.8 Xmsn Rev Cmd Press** - Displays reverse command pressure in mBar.
- **D9d.9 Xmsn Rev Press** - Displays reverse pressure in mBar.
- **D9d.11 Xmsn Oil Temp** - Displays transmission oil temperature.
- **D9d.12 Xmsn Cmd Fwd 1 Valve** - Displays command forward 1 valve in mA.
- **D9d.13 Xmsn Fwd 1 Valve** - Displays forward 1 valve in mA.

- **D9d.15 Xmsn Fwd 2 Valve** - Displays forward 1 valve in mA.
- **D9d.16 Xmsn Cmd Rev Valve** - Displays command reverse valve in mA.
- **D9d.17 Xmsn Rev Valve** - Displays reverse valve in mA.
- **D9d.19 Enable Valve** - Displays status.
- **D9d.21 Enable Vlv Cur** - Displays enable valve current voltage in mA.
- **D9d.23 TOSS Dir** - Displays Transmission Output Shaft Speed direction status (Rev/N/Fwd).
- **D9d.25 Current Dir** - Displays current direction status (Rev/N/Fwd).
- **D9d.27 Selected Dir** - Displays selected direction status (Rev/N/Fwd).
- **D9d.29 Selected Dir Channel A** - Displays status in mV.
- **D9d.31 Selected Dir Channel B** - Displays status in mV.

D10d Brakes

Select to view information for the following:

- **D10d.1 Brake Pres** - Displays brake pressure in kPa/psi.
- **D10d.3 Park Brake Sens** - Displays parking brake sensor output in mV.
- **D10d.5 Brake Fluid Lev** - Displays brake fluid level status (OK).
- **D10d.7 Auto Park Brake Sw** - Displays auto park brake status (On/Off).
- **D10d.9 Push Btn Status** - Displays push button engaged or disengaged status.

D11d Pedals

Select to view information for the following:

- **D11d.1 Accelerator A** - Displays accelerator output in mV.
- **D11d.3 Accelerator B** - Displays accelerator output in mV.
- **D11d.5 Accelerator %** - Displays status.
- **D11d.11 Brake %** - Displays status.
- **D11d.13 Inch Brake Sensor** - Displays output.
- **D11d.15 Inching pedal** - Displays status.
- **D11d.17 Monotrol/FDC pedal** - Displays status.
- **D11d.19 Douple pedal** - Displays status.

The Sensors/Presets menu contains information for:

- **S1d Impact**
- **S5d Telemetry**
- **S12d Load Weight**

S1d Impact

Select to view information for the following:

- **S1d.1 Accel X-Axis**
- **S1d.3 Accel Y-Axis**

S5d Telemetry

Select to view information for the following:

- **S5d.1 CoAP last Conn. Date**
- **S5d.3 CoAP last Conn. Time**

S12d Load Weight

Select to view information for the following:

- **S12d.1 Load Weight Sens** - Displays load weight sensor output in mV.

The Controllers menu contains information for:

- **C5d Switches/Buttons**
- **C6d Occupancy**

C5d Switches/Buttons

Select to view information for the following:

- **C5d.21 Armrest Switch** - Displays armrest switch status.

SETTINGS

Select the Settings icon in the menu bar. The Settings menu will be displayed.

- **PX Mode X**
- **Hydraulics**
- **Drive**
- **Sensors/Presets**
- **Operators**
- **Maintenance**
- **Truck Setup**
- **Controllers**

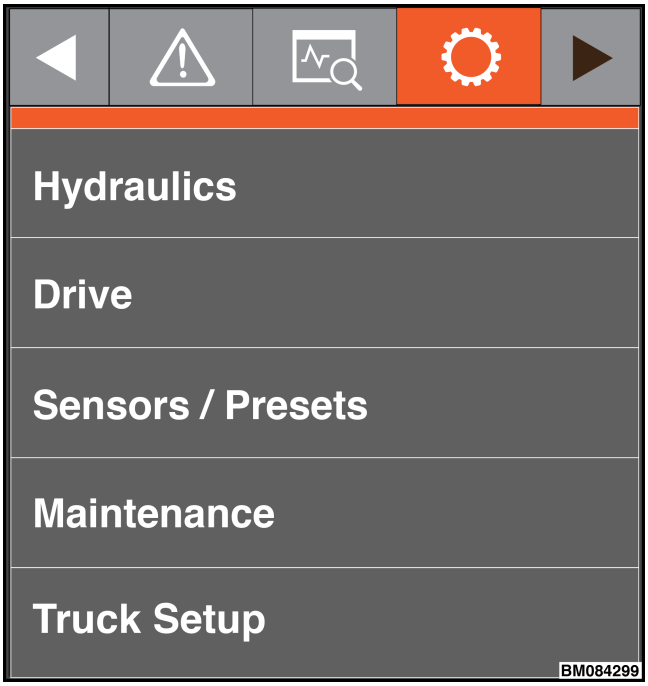


Figure 146. Settings Screen

Performance

From the PX Mode X menu, the user can modify the following settings for:

- **PX Mode X**

PX Mode X

Select to view information for the following:

- **PX.1 Travel Speed Fwd**
- **PX.5 Travel Speed Rev**
- **PX.13 Regen Braking**
- **PX.15 Lift Speed**
- **PX.19 Lower Speed**
- **PX.43 Tilt Speed Fwd**
- **PX.45 Tilt Speed Back**
- **PX.73 Steer Ratio**
- **PX.75 Engine Mode**

Hydraulics

From the Hydraulics menu, the user can modify the following settings for each of the hydraulic functions:

- **H1 Lift/Lower**
- **H2 Tilt**
- **H3 Third Hyd Function**
- **H4 Fourth Hyd Function**
- **H5 Fifth Hyd Function**
- **H8 Pump**

H1 Lift/Lower

Select to view information for the following:

- **H1.3 Ret To Set Height**
- **H1.5 Lift Soft Stop**
- **H1.7 Lower Soft Stop**
- **H1.13 Height Sensor**
- **H1.15 End of Stroke Height**
- **H1.17 Lift Speed Ramp**
- **H1.19 Lower Speed Ramp**
- **H1.61 Lift On Response**
- **H1.63 Lift Off Response**
- **H1.65 Lower On Response**
- **H1.67 Lower Off Response**
- **H1.69 Max Flow Spd Lift**
- **H1.71 Max Flow Spd Lower**

H2 Tilt

Select to view information for the following:

- **H2.3 Ret To Set Tilt (RTST)**
- **H2.5 RTST Pause Dur**
- **H2.7 RTST Override Dir**
- **H2.13 Ramp Speed Fwd**
- **H2.15 Ramp Speed Back**
- **H2.17 RTST Delay**
- **H2.19 RTST Enhanced**
- **H2.21 Tilt FWD On Response**
- **H2.23 Tilt FWD Off Response**
- **H2.25 Tilt BK On Response**
- **H2.27 Tilt BK Off Response**
- **H2.29 Max Flow Spd Tilt FWD**
- **H2.31 Max Flow Spd Tilt BK**

H3 Third Hyd Function

Select to view information for the following:

- **H3.3 Func Speed Dir A**
- **H3.5 Func Speed Dir B**
- **H3.9 Ramp Speed Dir A**

- **H3.11 Ramp Speed Dir B**.
- **H3.13 Interlock Delay**
- **H3.21 Dir A On Response**
- **H3.23 Dir A Off Response**
- **H3.25 Dir B On Response**
- **H3.27 Dir B Off Response**
- **H3.29 Max Flow Spd Dir A**
- **H3.31 Max Flow Spd Dir B**
- **H3.33 Max Flow Rate**

H4 Fourth Hyd Function

Select to view information for the following:

- **H4.3 Func Speed Dir A**
- **H4.5 Func Speed Dir B**
- **H4.9 Ramp Speed Dir A**
- **H4.11 Ramp Speed Dir B**.
- **H4.13 Interlock Delay**
- **H4.17 Dir A On Response**
- **H4.19 Dir A Off Response**
- **H4.21 Dir B On Response**
- **H4.23 Dir B Off Response**
- **H4.25 Max Flow Spd Dir A**
- **H4.27 Max Flow Spd Dir B**
- **H4.29 Maximum Flow Rate**

H5 Fifth Hyd Function

Select to view information for the following:

- **H5.15 Dir A On Response**
- **H5.17 Dir A Off Response**
- **H5.19 Dir B On Response**
- **H5.21 Dir B Off Response**
- **H5.25 Max Flow Spd Dir A**
- **H5.27 Max Flow Spd Dir B**
- **H5.29 Maximum Flow Rate**

H8 Pump

Select to view information for the following:

- **H8.1 Minimum Standby**

H9 Config

Select to view information for the following:

- **H9.1 Lever/Joy Type**
- **H9.17 Anti Chain Slack**

Drive

From the Drive menu, the user can modify the following settings:

- **D1 Engine**
- **D2 Battery**
- **D4 Steer**
- **D8 Traction**

D1 Engine

- **D1.1 Acceleration**
- **D1.3 Restore ECU Def**
- **D1.23 DPF Regen Inhibit**
- **D1.25 Fan Auto Reversal**
- **D1.27 Fan Auto Rev Inhibit**

D2 Battery

- **D2.1 Type**
- **D2.3 BDI Startup Full**
- **D2.5 BDI Full**
- **D2.7 BDI Empty**
- **D2.9 BDI Reset**
- **D2.11 Lift INT-Battery**
- **D2.19 Voltage**
- **D2.21 Ahr Capacity**
- **D2.39 Battery Gate Sw**

D4 Steer

- **D4.1 Steer Effort**

D8 Traction

- **D8.10 Pwr Reversal Rate**
- **D8.12 Inch/Brake Overlap**
- **D8.30 Curve Cutback**
- **D8.37 Auto Dec Mode**
- **D8.38 Regen Brake Rate**
- **D8.39 Zonal Speed Ctrl**
- **D8.40 Gear lock**
- **D8.41 Acceleration Rate**
- **D8.59 Op Spd Lim Enable**
- **D8.61 Op Spd Lim FWD**
- **D8.63 Op Spd Lim Rev**

Sensors/Presets

From the Sensors/Presets menu, the user can modify the following settings:

- **S1 Impact**
- **S3 Cameras**
- **S4 Mast presets**
- **S5 Telemetry**

S1 Impact

- **S1.1 Impact Sensor** - Choose enable or disable.
- **S1.3 Impact OP Filter** - Choose enable or disable.
- **S1.5 Impact Logging** - Choose enable or disable.
- **S1.7 Mark Events Crit** - Choose enable or disable.
- **S1.9 Impact Shutdown** - Choose enable or disable.
- **S1.11 Shutdown Timeout** - Choose enable or disable.
- **S1.13 Impact Audible Alarm** - Choose enable or disable.
- **S1.15 Impact Visible Alarm** - Choose enable or disable.
- **S1.17 Soft Impacts/Day** - Choose number of impacts per day.
- **S1.19 Hard Impacts/Day** - Choose number of impacts per day.
- **S1.21 Clear Derate Events** - Choose Yes or No.
- **S1.23 VSM Threshold Count** - Choose number.
- **S1.25 Soft Imp Thold H** -
- **S1.27 Soft Imp Thold V** -
- **S1.29 Hard Imp Thold H** -
- **S1.31 Hard Imp Thold V** -
- **S1.33 Shutdown Thold H** -
- **S1.35 Shutdown Thold V** -
- **S1.37 Sensor Orientation** - Choose number.

S3 Mast presets

- **S3.1 Camera 1** - Choose enable or disable.
- **S3.3 Camera 2** - Choose enable or disable.
- **S3.7 Camera 1 Mode** - Choose enable or disable.
- **S3.9 Camera 2 Mode** - Choose enable or disable.

S4 Mast presets

- **S4.1 Preset Hts** - Choose enable or disable.
- **S4.3 Place Offset** - Choose the offset parameter (cm).
- **S4.5 Preset Ht 1** - Choose a height parameter for preset (m/in.).
- **S4.7 Preset Ht 2** - Choose a height parameter for preset (m/in.).
- **S4.9 Preset Ht 3** - Choose a height parameter for preset (m/in.).
- **S4.11 Preset Ht 4** - Choose a height parameter for preset (m/in.).
- **S4.13 Preset Ht 5** - Choose a height parameter for preset (m/in.).
- **S4.15 Preset Ht 6** - Choose a height parameter for preset (m/in.).
- **S4.17 Preset Ht 7** - Choose a height parameter for preset (m/in.).
- **S4.19 Preset Ht 8** - Choose a height parameter for preset (m/in.).
- **S4.21 Preset Ht 9** - Choose a height parameter for preset (m/in.).
- **S4.23 Preset Ht 10** - Choose a height parameter for preset (m/in.).

Telemetry

- **S5.1 Show Card ID** - Choose enable or disable.
- **S5.3 AP Mode Request** - Choose on/off.
- **S5.5 Force Server Connect** - Choose enable or disable.
- **S5.7 Connection Type** - Choose between Auto detect and Wlan.
- **S5.9 Truck Lockout** - Choose enable or disable.

Operators

From the Operators menu, the user can modify the following settings:

- **Password**
- **Add New**
- **OX Operator/Supervisor/Service X**

Password

- **Enable/Disable** - Choose enable or disable.

Add New

- **O1.1 Password** - Select password.
- **O1.5 Access Level** - Select level of access (Operator, Supervisor or Service Technician).
- **O1.9 Allowed Performance Mode** - Choose performance mode between Eco and Power options.

OX Operator/Supervisor/Service X

- **OX.3 Password** - Select password.
- **OX.5 Access Level** - Select level of access (Operator, Supervisor or Service Technician).
- **OX.7 Delete** - Choose yes/no.
- **OX.9 Allowed Performance Mode** - Choose performance mode between Eco and Power options.
- **OX.11 No Operator Timeout** - Choose enable or disable.

Maintenance

From the Maintenance menu, the user can modify the following settings:

- **M.1 Reminder**
- **M.2 Checklist**

M.1 Reminder

- **M1.1 Reminder** - Select between 0-6.
- **M1.3 Interval** - Choose enable or disable.

M.2 Checklist

- **M2.1 Checklist** - Choose enable or disable.
- **M2.3 Checklist Frequency** - Choose the frequency at which the checklist displays.
- **M2.5 Operator Options** - Choose frequency of Opertor Options change.
- **M2.7 Technician Access** - Choose level of technician access.
- **M2.9 Shift 1 Start Time** - Choose time.
- **M2.11 Shift 2 Start Time** - Choose time.
- **M2.13 Shift 3 Start Time** - Choose time.
- **M2.15 Shift 4 Start Time** - Choose time.
- **M2.17 Question Time Limit**
- **M2.19 No Response Shutdown**
- **M2.21 Pre Start Overtime**
- **M2.23 Post Start Overtime**
- **M2.25 Pre Shutdown**
- **M2.27 Post Shutdown**
- **M2.29 Checklist Recall**

Truck Setup

From the Truck Setup menu, the user can modify the following settings for each of the truck setup functions:

- **T1 - Display**
- **T2 - Lights**
- **T3 - Time Out**
- **T4 - Alarms**
- **T5 - Switches**
- **T6 - Inputs**

T1 Display

- **T1.1 Units** - Choose between Metric or Imperial.
- **T1.3 Language** - Operator Language. Choose from list.
- **T1.5 Time** - Enter the digits for time.
- **T1.7 Time Format** - Select either 12h or 24h.
- **T1.23 Brightness** - Select percentage.
- **T1.25 Auto Dim** - Choose enable or disable.
- **T1.50 Restore Defaults** - Select yes/no.

T2 Lights

- **T2.1 Front Work** - Choose enable or disable.
- **T2.3 Rear Work** - Choose enable or disable.
- **T2.5 Interior Dome** - Choose enable or disable.
- **T2.7 Aux Work** - Choose enable or disable.
- **T2.11 Turn Signal** - Choose enable or disable.
- **T2.25 Ambient Light Sensor** - Choose enable or disable.
- **T2.27 Fork Laser Spd Thresh** - Choose enable or disable.

T3 Time Out

- **T3.3 Auto Shutdown Delay** - Choose time (minutes).
- **T3.5 Empty Seat** - Choose time (minutes).
- **T2.11 Auto Light** - Choose time (minutes).

T4 Alarms

- **T4.1 Visible Alarm** - Choose number.
- **T4.3 Audible Alarm** - Choose number.
- **T4.7 DSS Aud Alert En** - Choose enable or disable.
- **T4.9 DSS Aud Alert Dur** - Choose number.
- **T4.11 FWD Audible Alarm** - Choose enable or disable.
- **T4.13 FWD Alarm Spd Thresh** - Choose speed threshold (kph/mph).
- **T4.15 Rev Audible Alarm** - Choose enable or disable.
- **T4.17 Rev Alarm Spd Thresh** - Choose speed threshold (kph/mph).

T5 Switches

- **T5.1 Front Lights** - Choose enable or disable.
- **T5.3 Rear Lights** - Choose enable or disable.
- **T5.5 Dome Lights** - Choose enable or disable.
- **T5.7 Operator Fan** - Choose enable or disable.

T6 Inputs

- **T6.1 Hyd Input Type** - Hydraulic Input Type. Choose enable or disable.
- **T6.3 Dir Ctrl Input** - Direction Control Input Type. Choose enable or disable.
- **T6.5 Interim Wiper Delay** - Enter the digits for time (sec.).

Controllers

From the Truck Setup menu, the user can modify the following settings for each of the truck setup functions:

- **C6 - Occupancy**

C6 Occupancy

- **C6.9 Seat Belt Switch**

POWERTRAIN PROTECTION SYSTEM WITH ENGINE SHUTDOWN

This option automatically shuts down the engine should any of the following 3 situations occur: engine oil pressure falls below a safe limit (30 second count down prior to engine shutdown), engine coolant level falls beneath its safe limit (30 second countdown prior to engine shutdown), engine coolant temperature rises above a safe limit - 116°C (241°F or higher) - (30 second count down prior to engine shutdown).

POWERTRAIN EMPTY SEAT ENGINE SHUTDOWN

The empty seat option tracks the Operator Presence Switch (OPS) signal and creates an engine shutdown timer when the operator leaves the seat and the OPS signal is lost. The time-to-shutdown can be programmed in the truck display, and the factory setting for time to shutdown is 15 minutes (900 seconds). The user can configure the shutdown between 0 and 30 minutes with supervisor level access. The shutdown sequence does not change other interlocking feature functionality like the seat belt interlock and sequential seat belt.

On trucks with manual park brakes, the brake will need to be set separately from the truck shutting down. On automatic and push-button park brake configurations the brake will apply when the engine is shutdown.

Figure 147. Empty Seat Engine Shutdown

LOSS OF COMMUNICATIONS

If the user interface display does not detect communication from the VSM for 3 seconds, the Loss of Comms screen will appear. See Figure 148.

When communication between the VSM and display is returned, the display will return to the previous screen.

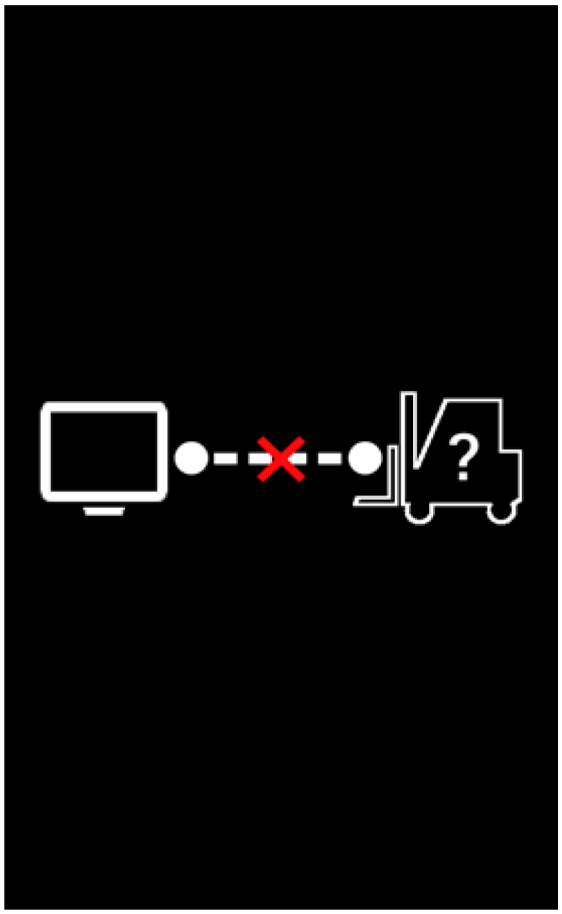


Figure 148. Loss of Comms screen

DISPLAY ICONS

NOTE: The display icons in the following table will vary with truck configuration. For location on the display please refer to the operator manual for details.

Table 4. Display Icons

PDO Value	Indicator	Icon
1	DPF Inhibit	

Table 4. Display Icons (Continued)

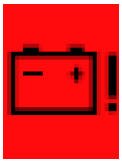
2	Battery Low Amber	
3	Battery Low (Red)	
4	Battery Fault (Red) (appears when a power supply fault is detected)	
5	Stop Engine	
6	Maint Reminder Calendar Amber	
7	Maint Reminder Calendar Red	
8	Maint Reminder Hours Amber	
9	Maint Reminder Hours Red	
10	Low LPG Fuel Red	

Table 4. Display Icons (Continued)

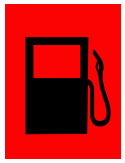
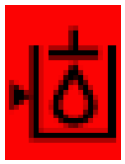
11	Low Fuel Amber	
12	Low Fuel Red	
13	Air Filter Restrictions	
14	Fan Reversal	
15	Hyd Fluid Level Amber	
16	Hyd Fluid Level Red	
17	Low Coolant Level Amber	
18	Low Coolant Level Red	
19	Trans Brake	

Table 4. Display Icons (Continued)

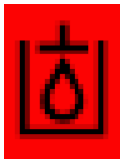
20	Low Oil Pressure	
21	DPF Fuel Water Separator	
25	Overheat Controller	
28	Brake Fluid Res Low	
29	Brake Overheat	
30	Brake System Pressure	
31	Hydraulic Derate (should be grey)	
32	Hyd Oil Temp Amber	
33	Hyd Oil Temp Red	

Table 4. Display Icons (Continued)

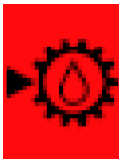
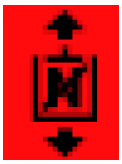
34	Hyd Filter Restriction	
35	Trans Temp Overheat Amber	
36	Trans Temp Overheat Red	
37	Trans Oil Level	
38	Cycle Key Switch	
40	Overhead Obstruction	
41	Slack Chain Restriction	
43	Release Accel Pedal	
44	Hyd Function Out of Neutral	

Table 4. Display Icons (Continued)

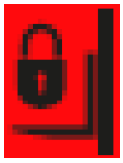
45	Lift Lockout	
46	Truck Derate Amber	
47	Truck Derate Red	
48	Truck Disabled	
49	Press Brake Pedal	
50	Reduced Production Limits (Derate)	
65	Washer Fluid Low	
66	Sped Block Heater	
67	Parking Brake	BO210840

Table 4. Display Icons (Continued)

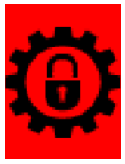
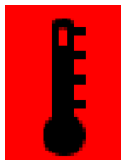
71	Seat Belt	
72	Glow Plugs	HO191641
78	Trans Lockout	
82	Soft Impact	
83	Hard Impact	
87	Over Temp Amber	
88	Over Temp Red	
89	Override Active	
90	Operator Presence	

Table 4. Display Icons (Continued)

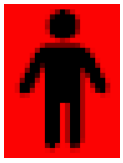
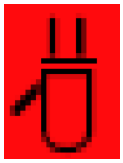
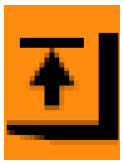
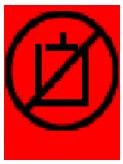
91	Operator Presence 2	
92	Operator Door	
96	Load Weight Over Capacity Amber	
97	Load Weight Over Capacity Red	
100	Lift Limit	
101	Lift Limit Override	
106	Hydraulic Disable	
111	SRO Status	
112	Generic Interlock	

Table 4. Display Icons (Continued)

113	Fault Steering	
114	Hydraulic Fault	BO210832
115	Display Fault	
117	Cruise Control	
118	Controller Fault (appears when a controller or network fault is detected)	
121	Check Engine Amber	
122	Check Engine Red (appears when an engine fault is detected)	
126	Brake Pressure	
128	Aux Motor Status	

Table 4. Display Icons (Continued)

129	Alert (appears when an operator station fault is detected)	
130	Lift Interrupt	
131	Lower Interrupt	
132	Key Switch	
133	Key Cycle Indicator	
134	DPF Regen Required Indicator	
135	DPF High Temp Indicator	
136	DPF Regen Complete Indicator	
137	DPF Regen Fail Indicator	

Table 4. Display Icons (Continued)

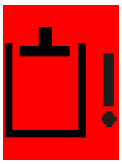
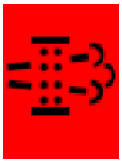
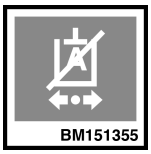
138	DPF Fault Indicator	BO210869
139	Calibration Required Amber	
140	Calibration Required Red (appears when a calibration required fault is detected)	
141	Hydraulic Fault Amber	
142	Hydraulic Fault Red (appears when a hydraulic fault is detected)	
144	DPF Regen Required Indicator (flashing)	
145	DPF Regen Waiting Indicator	
146	DPF Regen Required Indicator Red (flashing)	
147	DSS High Lift Sensor Verification Icon	

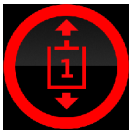
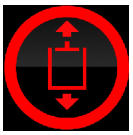
Table 4. Display Icons (Continued)

148	DSS High Lift Sensor Status	
149	Park Brake Failure	
150	Transmission Brake Active	
151	Hydraulic Oil Temperature Low	
152	Coolant Over Temperature Amber	
153	Coolant Over Temperature Red	
154	Hydraulic Fault	

Table 5. E-Hydraulic Icons

Title	Function	Icon
Auxiliary Pressure Relief Switch Unpressed and Pressed Button	Software function standard on all E- Hydraulic Trucks. Not available on manual hydraulic trucks. After pressing the switch on the display, the controller will stop auxiliary flow and vent the pressurized oil that is trapped between the hydraulic control valve and the attachment (or quick connectors/line caps if no attachment is installed). Hydraulic oil vents back to oil tank. This will make changing front end equipment easier and cleaner.	
Auxiliary Pressure Relief Switch Disabled Button		

PDO Value	Interlock	Icon
1	Seat belt	
2	Park brake	
3	Operator presence 1	
4	Operator presence 2	
5	Belly pan	
6	Battery gate	

PDO Value	Interlock	Icon
7	Battery is out	
8	Generic SRO, Operator presence 3	
9	Operator door	
10	Realease throttle	
11	Release control handle	
12	Out of neutral	
13	Press brake	
14	Operator lockout	
15	Out of neutral 1	
16	Out of neutral generic	

PDO Value	Interlock	Icon
17	Generic hydraulic interlock	
18	Key switch	
19	Configuration update in progress	
20	Configuration updated	
21	Cycle key switch	
22	Truck in gear	
23	Engine not running	
24	LPG tank interlock	
25	Single point seat belt	

DISPLAY MENUS

Calibrations		
Hydraulics	**Drive**	**Sensors/Presets**
Table 6	Table 7	Table 8

Table 6. Hydraulics

Hydraulic menu item	Submenu item	Service procedure
H1 Lift/Lower	H1c.5 Lift Valve Output	Lift valve calibration
	H1c.7 Lower Valve Output	Lower valve calibration
H2 Tilt	H2c.7 Tilt FWD Output	Tilt forward valve calibration
	H2c.9 Tilt Back Output	Tilt back valve calibration
	H2c.11 Tilt Calib	Not applicable
	H2c.13 Tilt Lever Calib	Tilt lever calibration
H3 Third Hyd Function	H3c.7 Dir A Output	Auxiliary valve direction A calibration
	H3c.9 Dir B Output	Auxiliary valve direction B calibration
H4 Fourth Hyd Function	H4c.7 Dir A Output	Auxiliary valve direction A calibration
	H4c.9 Dir B Output	Auxiliary valve direction B calibration
H5 Fifth Hyd Function	H5c.5 Dir A Output	Auxiliary valve direction A calibration
	H5c.7 Dir B Output	Auxiliary valve direction B calibration

Table 7. Drive

Drive menu item	Submenu item	Service procedure
D4c Steer	D4c.1 Steer Wheel Range	Not applicable
D5c Steer Axle	D5c.1 Steer Range Calib	Not applicable
D8c Traction	D8c.1 Travel Speed Calib	Not applicable
D9c Transmission	D9c.1 Xmsn Valve Calib	Not applicable

Table 8. Sensors/Presets

Sensor/Presets menu item	Submenu item	Service procedure
S7c RTSH	S7c.1 RTSH Calib	Not applicable
S12c Load Weight	S12c.5 Load Weight Calib	Load weight calibration

Diagnostics

Hydraulics	Drive	Sensors/Presets	Controllers
Table 9	Table 10	Table 11	Table 12

Table 9. Hydraulics

Hydraulic menu item	Submenu item
H1d Lift/Lower	H1d.1 Lift Valve Output
	H1d.7 Lift Pressure
	H1d.9 Lift Command
	H1d.11 Lower Command
	H1d.13 Function Switch
	H1d.23 Pressure sensor
	H1d.35 Lower valve Output
	H1d.37 Filter Sensor
	H1d.41 Height Sensor
	H1d.43 Lift Height Sensor
	H1d.49 Hoist Lever Pos.
H2d Tilt	H2d.1 Tilt Cmnd Dir A
	H2d.3 Tilt Cmnd Dir B
	H2d.5 Coil Current
	H2d.13 Hyd Func Switch 2
	H2d.17 Coil Current Dir A
H2d Tilt	H2d.19 Coil Current Dir B
	H2d.21 Tilt Lever Pos
	H2d.23 Tilt Sense Pos
	H2d.25 Calib Tilt Sensor Pos

Table 9. Hydraulics (Continued)

	H2d.27 Valve Cur Cmd
	H2d.29 Valve Cur Resp
H3d Third Hyd Function	H3d.1 3rd Cmnd Dir A
	H3d.3 3rd Cmnd Dir B
	H3d.5 Coil Current
	H3d.13 Aux 3 Switch
	H3d.15 Ret Pos Prox Sensor
	H3d.49 Aux 2 Lever Pos
H4d Fourth Hyd Function	H4d.1 4th Cmnd Dir A
	H4d.3 4th Cmnd Dir B
	H4d.5 Coil Current
	H4d.13 Aux 4 Switch
	H4d.25 Unclamp Button
	H4d.49 Aux 2 Lever Pos
H9d Config	H9d.1 OPS Man Hyd Solenoid
	H9d.3 Hyd Temp
	H9d.5 Hyd Anti-Stall Solenoid
	H9d.9 Actual Pump Flow
H10d Levers	H10d.1 Lift/Lower Input
	H10d.3 Tilt Input
	H10d.5 Aux 1 Input
	H10d.7 Aux 2 Input
	H10d.9 Aux 3 Input
	H10d.11 F-N-R

Table 10. Drive

Drive menu item	**Submenu item**
D1d Engine	D1d.1 Throttle A
	D1d.3 Throttle B
	D1d.5 Throttle %
	D1d.15 Engine Speed
	D1d.17 Gasoline ECU Speed

Table 10. Drive (Continued)

D1d.19 Requested Speed
D1d.21 Target Idle Speed
D1d.23 Governed Speed
D1d.25 Governing Status
D1d.27 Torque Mode
D1d.29 Actual Engine Torque
D1d.31 Requested Torque
D1d.33 Actual Ign Timing
D1d.35 Desired Ign Timing
D1d.37 Inlet Air Temp
D1d.39 Manifold Abs Press
D1d.41 Fuel Cntr Status Sn 1
D1d.43 Fuel Cntr Status Sn 2
D1d.45 Short Term Fuel Trim 1
D1d.47 Short Term Fuel Trim 2
D1d.49 Long Term Fuel Trim 1
D1d.51 Long Term Fuel Trim 2
D1d.53 Long Term Fuel Trim
D1d.55 O2 Sensor 1 Volt
D1d.57 O2 Sensor 2 Volt
D1d.59 Emissn 02 Sensor1 Heat Duty
D1d.61 Emissn 02 Sensor2 Heat Duty
D1d.63 Idle Air Ctrl Vlv
D1d.65 Test Mode Status
D1d.67 Engine Coolant Temp
D1d.69 Coolant Temp-ECU
D1d.71 Engine Oil Pressure
D1d.73 Engine Starter Output
D1d.75 ECU Ign Voltage
D1d.77 ECU Make
D1d.79 ECU Mode
D1d.81 MIL Lamp
D1d.83 Fuel/Water Sens
D1d.85 Air Filter Sens
D1d.87 Glow Plug/Air Grid Htr
D1d.91 Accel Pos Sens

Table 10. Drive (Continued)

	D1d.93 Cold Start Timing Adv
D4d Steer	D4d.35 Steer Wheel Sensor
	D4d.37 Steer Axle Sensor
D8d Traction	D8d.2 Travel Speed
D9d Transmission	D9d.1 Xmsn Input Speed
	D9d.3 Xmsn Output Speed
	D9d.4 Xmsn Fwd 1 Cmd Press
	D9d.5 Xmsn Fwd 1 Press
	D9d.7 Xmsn Fwd 2 Press
	D9d.8 Xmsn Rev Cmd Press
	D9d.9 Xmsn Rev Press
	D9d.11 Xmsn Oil Temp
	D9d.12 Xmsn Cmd Fwd 1 Valve
	D9d.13 Xmsn Fwd 1 Valve
	D9d.15 Xmsn Fwd 2 Valve
	D9d.16 Xmsn Cmd Rev Valve
	D9d.17 Xmsn Rev Valve
	D9d.21 Xmsn Enable Vlv Cur
	D9d.23 Xmsn TOSS Dir
	D9d.25 Xmsn Current Dir
	D9d.27 Xmsn Selected Dir
	D9d.29 Xmsn Selected Dir Channel A
	D9d.31 Xmsn Selected Dir Channel B
	D9d.33 Xmsn Source of PI curve
D10d Brakes	D10d.1 Brake Pres
	D10d.3 Park Brake Sens
	D10d.5 Brake Fluid Lev
	D10d.7 Auto Park Brake Sw
	D10d.9 Push Btn Status
D11d Pedals	D11d.1 Accelerator A
	D11d.3 Accelerator B
	D11d.5 Accelerator %

Table 10. Drive (Continued)

	D11d.11 Brake %
	D11d.13 Inch Brake Sensor
	D11d.15 Inching pedal
	D11d.17 Monotrol/FDC pedal
	D11d.19 Double pedal

Table 11. Sensors/Preset

Sensors/Preset menu item	Submenu item
S1d Impact	S1d.1 Accel X-Axis
	S1d.3 Accel Y-Axis
S5d Telemetry	S5d.1 CoAP last Conn. Date
	S5d.3 CoAP last Conn. Time
S12d Load Weight	S12d.1 Load Weight Sens

Table 12. Controllers

Controllers menu item	Submenu item
C5d Switches/Buttons	C5d.21 Armrest Switch

Settings

Hydraulics	Drive	Sensors/ Presets	Operators	Maintenance	Truck setup
Table 13	Table 14	Table 15	Table 16	Table	Table 17

Table 13. Hydraulics

Hydraulics menu item	Submenu item
H1 Lift/Lower	H1.3 Ret To Set Height
	H1.5 Lift Soft Stop
	H1.7 Lower Soft Stop
	H1.13 Height Sensor

Table 13. Hydraulics (Continued)

Hydraulics menu item	Submenu item
	H1.15 End of Stroke Height
	H1.17 Lift Speed Ramp
	H1.19 Lower Speed Ramp
	H1.61 Lift On Response
	H1.63 Lift Off Response
	H1.65 Lower On Response
	H1.67 Lower Off Response
	H1.69 Max Flow Spd Lift
	H1.71 Max Flow Spd Lower
H2 Tilt	H2.3 Ret To Set Tilt (RTST)
	H2.5 RTST Pause Dur
	H2.7 RTST Override Dir
	H2.13 Ramp Speed Fwd
	H2.15 Ramp Speed Back
	H2.17 RTST Delay
	H2.19 RTST Enhanced
	H2.21 Tilt FWD On Response
	H2.23 Tilt FWD Off Response
	H2.25 Tilt BK On Response
	H2.27 Tilt BK Off Response
	H2.29 Max Flow Spd Tilt FWD
	H2.31 Max Flow Spd Tilt BK
H3 Third Hyd Function	H3.3 Func Speed Dir A
	H3.5 Func Speed Dir B
	H3.9 Ramp Speed Dir A
	H3.11 Ramp Speed Dir B
	H3.13 Interlock Delay
	H3.21 Dir A On Response
	H3.23 Dir A Off Response
	H3.25 Dir B On Response
	H3.27 Dir B Off Response
	H3.29 Max Flow Spd Dir A
	H3.31 Max Flow Spd Dir B

Table 13. Hydraulics (Continued)

Hydraulics menu item	Submenu item
	H3.33 Max Flow Rate
H4 Fourth Hyd Function	H4.3 Func Speed Dir A
	H4.5 Func Speed Dir B
	H4.9 Ramp Speed Dir A
	H4.11 Ramp Speed Dir B.
	H4.13 Interlock Delay
	H4.17 Dir A On Response
	H4.19 Dir A Off Response
	H4.21 Dir B On Response
	H4.23 Dir B Off Response
	H4.25 Max Flow Spd Dir A
	H4.27 Max Flow Spd Dir B
	H4.29 Maximum Flow Rate
H5 Fifth Hyd Function	H5.15 Dir A On Response
	H5.17 Dir A Off Response
	H5.19 Dir B On Response
	H5.21 Dir B Off Response
	H5.25 Max Flow Spd Dir A
	H5.27 Max Flow Spd Dir B
	H5.29 Maximum Flow Rate
H8 Pump	H8.1 Minimum Standby
H9 Config	H9.1 Lever/Joy Type
	H9.17 Anti Chain Slack

Table 14. Drive

Drive menu item	Submenu item
D1 Engine	D1.1 Acceleration
	D1.3 Restore ECU Def
	D1.23 DPF Regen Inhibit
	D1.25 Fan Auto Reversal
	D1.27 Fan Auto Rev Inhibit

Table 14. Drive (Continued)

Drive menu item	Submenu item
D2 Battery	D2.1 Type
	D2.3 BDI Startup Full
	D2.5 BDI Full
	D2.7 BDI Empty
	D2.9 BDI Reset
	D2.11 Lift INT-Battery
	D2.19 Voltage
	D2.21 Ahr Capacity
	D2.39 Battery Gate Sw
D4 Steer	D4.1 Steer Effort
D8 Traction	D8.12 Inch/Brake Overlap
	D8.30 Curve Cutback
	D8.37 Auto Dec Mode
	D8.38 Regen Brake Rate
	D8.39 Zonal Speed Ctrl
	D8.40 Gear lock
	D8.41 Acceleration Rate
	D8.59 Op Spd Lim Enable
	D8.61 Op Spd Lim FWD
	D8.63 Op Spd Lim Rev

Table 15. Sensors/Presets

Sensors/Presets menu item	Submenu item
S1 Impact	S1.1 Impact Sensor
	S1.3 Impact OP Filter
	S1.5 Impact Logging
	S1.7 Mark Events Crit
	S1.9 Impact Shutdown
	S1.11 Shutdown Timeout
	S1.13 Impact Audible Alarm
	S1.15 Impact Visible Alarm
	S1.17 Soft Impacts/Day

Table 15. Sensors/Presets (Continued)

Sensors/Presets menu item	Submenu item
	S1.19 Hard Impacts/Day
	S1.21 Clear Derate Events
	S1.23 VSM Threshold Count
	S1.25 Soft Imp Thold H
	S1.27 Soft Imp Thold V
	S1.29 Hard Imp Thold H
	S1.31 Hard Imp Thold V
	S1.33 Shutdown Thold H
	S1.35 Shutdown Thold V
	S1.37 Sensor Orientation
S4 Mast presets	S4.1 Preset Hts
	S4.3 Place Offset
	S4.5 Preset Ht 1
	S4.7 Preset Ht 2
	S4.9 Preset Ht 3
	S4.11 Preset Ht 4
	S4.13 Preset Ht 5
	S4.15 Preset Ht 6
	S4.17 Preset Ht 7
	S4.19 Preset Ht 8
	S4.21 Preset Ht 9
	S4.23 Preset Ht 10
S5 Telemetry	S5.1 Show Card ID
	S5.3 AP Mode Request
	S5.5 Force Server Connect
	S5.7 Connection Type
	S5.9 Truck Lockout

Table 16. Operators

Operators menu item	Submenu item
Password	Enable/Disable
Add New	O1.1 Password

Table 16. Operators (Continued)

Operators menu item	Submenu item
	O1.5 Access Level
	O1.9 Allowed Performance Mode
OX Operator/Supervisor/Service X	OX.3 Password
	OX.5 Access Level
	OX.7 Delete
	OX.9 Allowed Performance Mode
	OX.11 No Operator Timeout

Maintenance menu item	Submenu item
M.1 Reminder	M1.1 Reminder
	M1.3 Interval
M.2 Checklist	M2.1 Checklist
	M2.3 Checklist Frequency
	M2.5 Operator Options
	M2.7 Technician Access
	M2.9 Shift 1 Start Time
	M2.11 Shift 2 Start Time
	M2.13 Shift 3 Start Time
	M2.15 Shift 4 Start Time
	M2.17 Question Time Limit
	M2.19 No Response Shutdown
	M2.21 Pre Start Overtime
	M2.23 Post Start Overtime
	M2.25 Pre Shutdown
	M2.27 Post Shutdown
	M2.29 Checklist Recall

Table 17. Truck Setup

Tuck Setup menu item	Sebmenu item
T1 - Display	T1.1 Units
	T1.3 Language
	T1.5 Time

Table 17. Truck Setup (Continued)

Tuck Setup menu item	Sebmenu item
	T1.7 Time Format
	T1.23 Brightness
	T1.25 Auto Dim
	T1.50 Reset Defaults
T2 - Lights	T2.1 Front Work
	T2.3 Rear Work
	T2.5 Interior Dome
	T2.7 Aux Work
	T2.11 Turn Signal
	T2.25 Ambient Light Sensor
	T2.27 Fork Laser Spd Thresh
T3 - Time Out	T3.3 Auto Shutdown Delay
	T3.5 Empty Seat
	T3.11 Auto Light
T4 - Alarms	T4.1 Visible Alarm
	T4.3 Audible Alarm
	T4.7 DSS Aud Alert En
	T4.9 DSS Aud Alert Dur
	T4.11 FWD Audible Alarm
	T4.13 FWD Alarm Spd Thresh
	T4.15 Rev Audible Alarm
	T4.17 Rev Alarm Spd Thresh
T5 - Switches	T5.1 Front Lights
	T5.3 Rear Lights
	T5.5 Dome Lights
	T5.7 Operator Fan
T6 - Inputs	T6.1 Hyd Input Type
	T6.3 Dir Ctrl Input
	T6.5 Interim Wiper Delay

Calibrations

TRANSMISSION WARM-UP 202001-349

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 the test equipment.

1. Install any required testing equipment.
2. Place a capacity load on the forks to prevent the wheels from turning.
3. Start the 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 brake pedal or the park brake. Applying the brake will release the clutches in the transmission.

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

NOTE: If oil temperature is heated to over 100°C (212°F), the temperature test will fault and must be attempted again when oil cools.

6. Compare the temperature reading on the display to the desired temperature specifications of 50 to 75°C (122 to 167°F).
7. Repeat Step 2 through Step 5 until oil temperature is at test specifications.
8. Once temperature reaches correct specifications, proceed with test or calibration.

HYDRAULIC VALVE CALIBRATION WARM-UP 202001-300

CALIBRATIONS

The following procedures are to be performed whenever any hydraulic calibration items are performed.

NOTE: Prior to performing the following calibration procedures, cycle all hydraulic functions to ensure there is no air trapped in the hydraulic system.

To ensure there that the oil temperature is optimal, warm up the hydraulic fluid until it is within a range of 50 to 65°C (120 to 149°F).

1. Switch the truck ignition ON.
2. Run the engine at a high idle.
3. Place the transmission into NEUTRAL.
4. Apply the park brake.
5. Bleed the air from the system. Cycle lift/lower, tilt and auxiliary controls completely 2 or 3 times. Repeat if necessary.
6. Activate tilt at relief pressure until the hydraulic fluid temperature is within the optimum range.

NOTE: Once the calibration warm-up has been performed, it is no longer necessary to turn off the vehicle to perform the other calibrations

7. Proceed to calibrate desired hydraulic functions.

DSS CALIBRATIONS 202001-301

RETURN TO SET TILT CALIBRATION

The following procedure must be performed every time the tilt sensor is removed or replaced.

1. Enter service password (see User interface (display) for instructions).
2. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.
3. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.
4. Select **Hydraulics**.

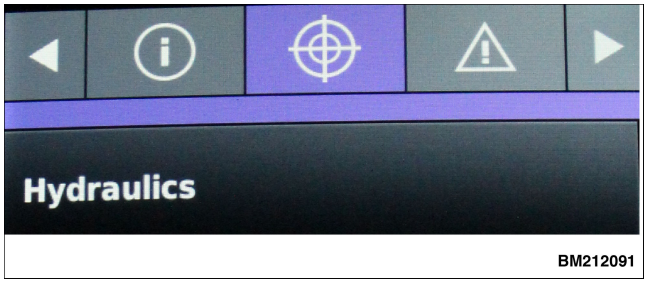


Figure 152. Hydraulics Screen

5. Select **H2 Tilt**.

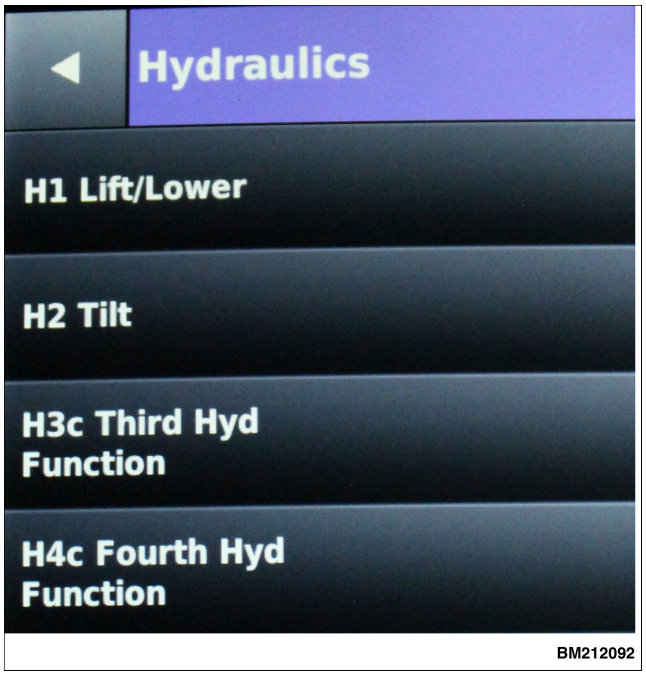


Figure 153. Hydraulic Calibration Choices

6. Select **H2c.11 Tilt Sensor Calibration**. See Figure 154.

Figure 154. Tilt screen

7. Follow the prompt on the display and tilt the mast to vertical position (0°). Select the green check mark.
8. Tilt the mast to the full FORWARD tilt position. Select the green check mark.
9. Tilt the mast to the full VERTICAL position. Select the green check mark.
10. Tilt the mast to the full BACKWARD tilt position. Select the green check mark.
11. Check the screen for calibration result:
    - **Calibration Success** will display if the calibration was successful. Press green check mark to close calibration.
    - **Calibration Failure** will display if the calibration was unsuccessful. Calibration screen will close automatically.

STEER AXLE ANGLE SENSOR CALIBRATION

The following procedure must be performed every time the steer axle angle sensor is removed or replaced.

1. Enter service password (see User interface (display) for instructions).

2. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

3. Select **Drive**. See Figure 155.

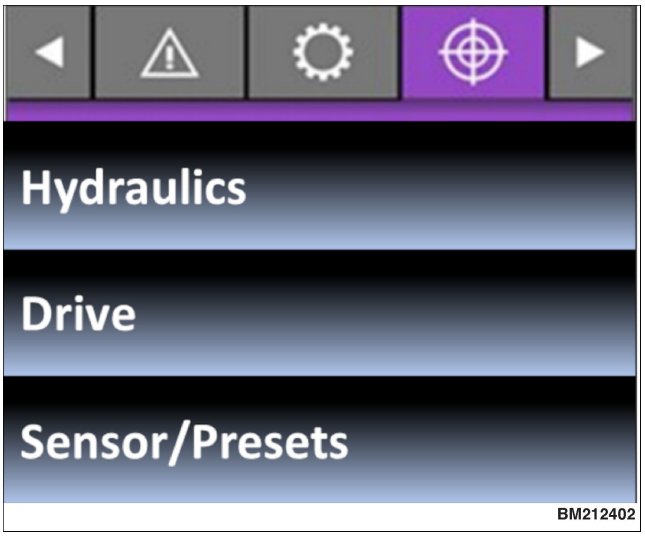


Figure 155. Select Drive

4. Select **D5c Steer Axle**. See Figure 156.

Figure 156. Select Steer Axle

5. Select **D5c Steer Range Calib**. See Figure 157.

Figure 157. Select Steer Range Calibration

6. Follow the prompt on the display and steer fully clockwise. Select the green check mark. See Figure 158.

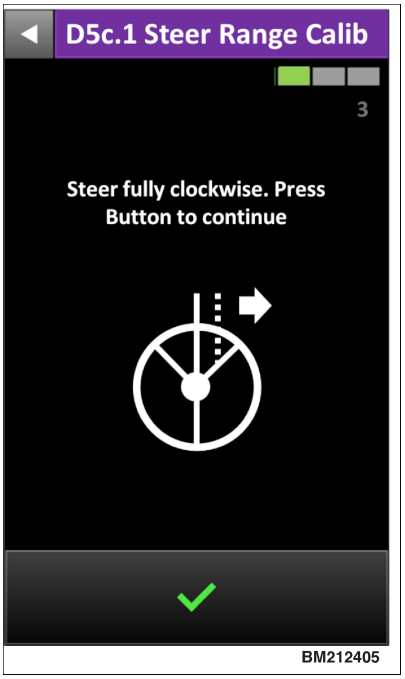


Figure 158. Steer Range Calibration (Screen 1)

7. Steer fully counter-clockwise. Select the green check mark. See Figure 159.

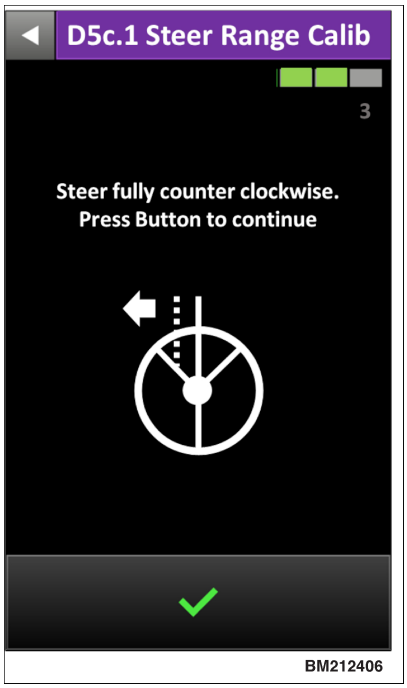


Figure 159. Steer Range Calibration (Screen 2)

8. Position the steer wheels to the straight ahead position. Select the green check mark. See Figure 160.

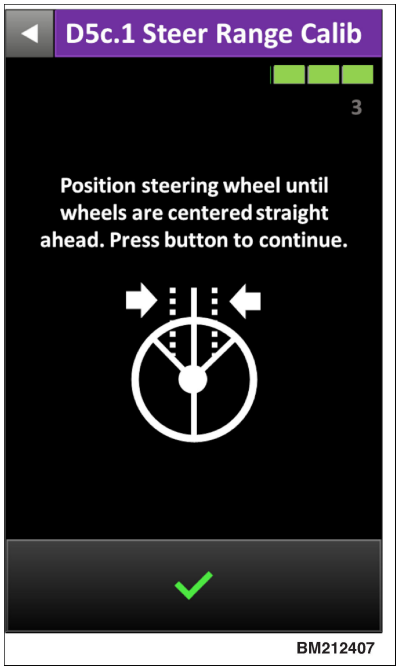


Figure 160. Steer Range Calibration (Screen 3)

9. Check the screen for calibration result:
   - **Calibration Success** will display if the calibration was successful. Press green check mark to close calibration. See Figure 161.
   - **Calibration Failure** will display if the calibration was unsuccessful. Calibration screen will close automatically.

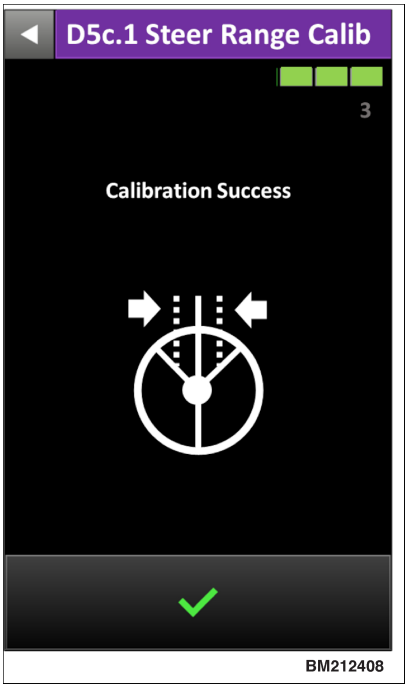


Figure 161. Calibration Success Screen

SYNCHRONOUS STEERING KNOB SET POINT

The following procedure must be performed every time the steer system components are removed or replaced and when a new knob position is desired.

1. Enter service password (see User interface (display) for instructions).

2. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

3. Select **Drive**. See Figure 162.

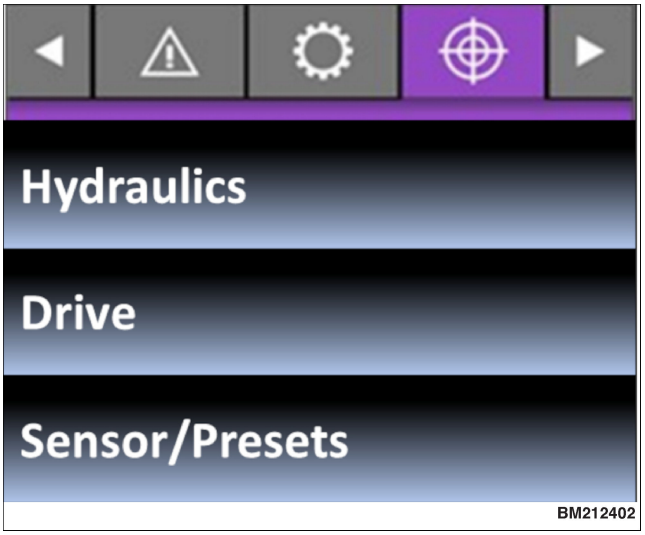


Figure 162. Select Drive

4. Select **D4c Steer**.
5. Select **D4c.3 Sync Steer**.
6. Follow the prompt on the display. Select the green check mark.
7. Apply the park brake and engage the service brake. The service brake must remain applied throughout the remainder of the calibration procedure.
8. Turn the steering wheel to desired center position. Select the green check mark.
9. Check the screen for calibration result:
   - **Calibration Success** will display if the calibration was successful. Press green check mark to close calibration. See Figure 161.
   - **Calibration Failure** will display if the calibration was unsuccessful. Calibration screen will close automatically.
10. After successful calibration, cycle the steering wheel to bring the steering tires into alignment with the desired knob orientation. Rotate the steering wheel from lock to lock twice. Once completed, the steering tires will be in the straight ahead position when the knob is in the calibrated position.

LIFT VALVE CALIBRATION 202001-302

LIFT VALVE THRESHOLD CALIBRATION

The following procedure must be performed every time the lift valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).
2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.
3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.
4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.
5. Select **Hydraulics**. See Figure 163.

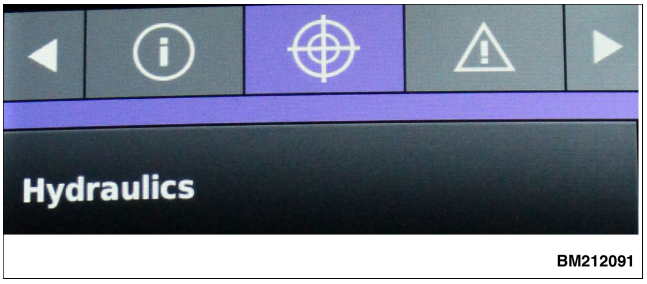


Figure 163. Hydraulics Screen

6. Select **H1 (Lift/Lower)**. See Figure 164.

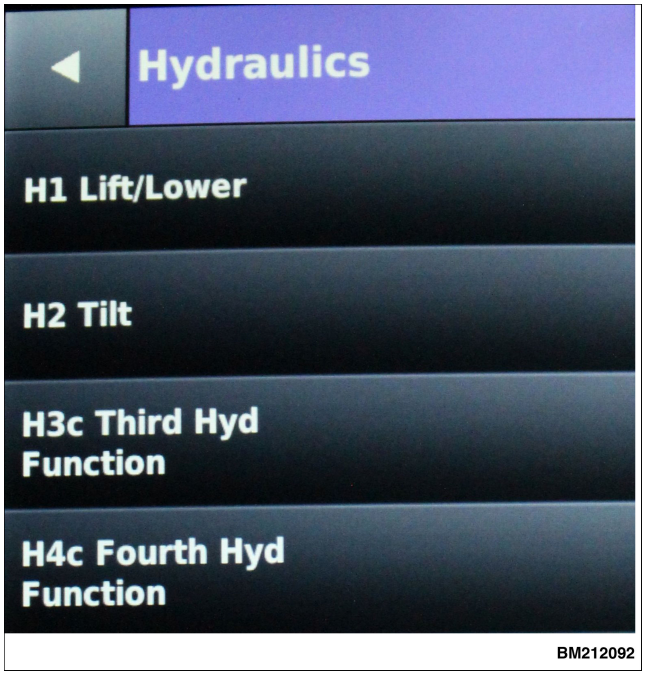


Figure 164. Hydraulic Calibration Choices

7. Select **H1c.5 Lift Valve Output**. See Figure 165.

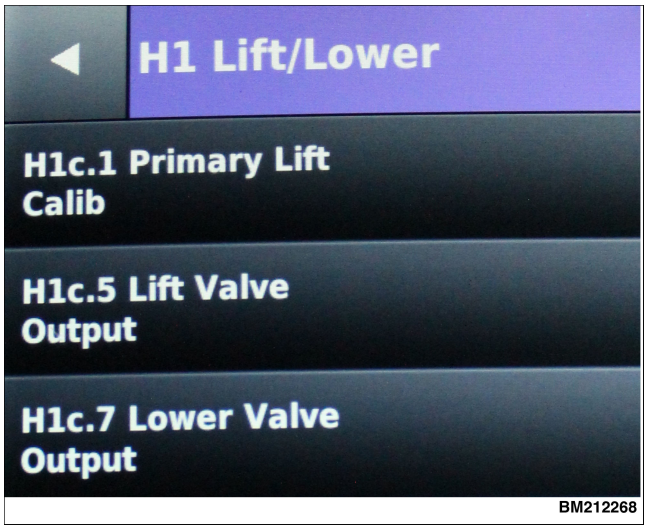


Figure 165. H1 Lift/Lower

8. Follow the prompt on the display to pull the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. Pull the lever back between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pulling the lever fully to 100%. Return the lever to neutral.

11. Pull the lever back between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

LOWER VALVE CALIBRATION 202001-303

LOWER VALVE THRESHOLD CALIBRATION

The following procedure must be performed every time the lower valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).
2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.
3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.
4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.
5. Select **Hydraulics**. See Figure 166.

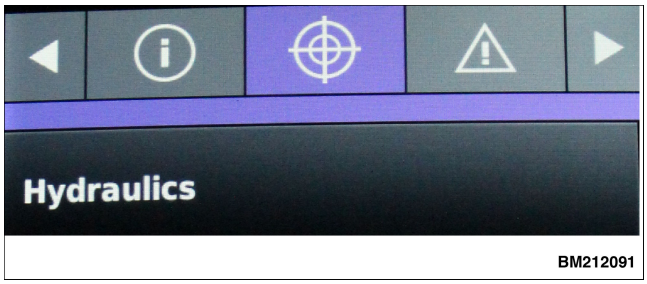


Figure 166. Hydraulics Screen

6. Select **H1 (Lift/Lower)**. See Figure 167.

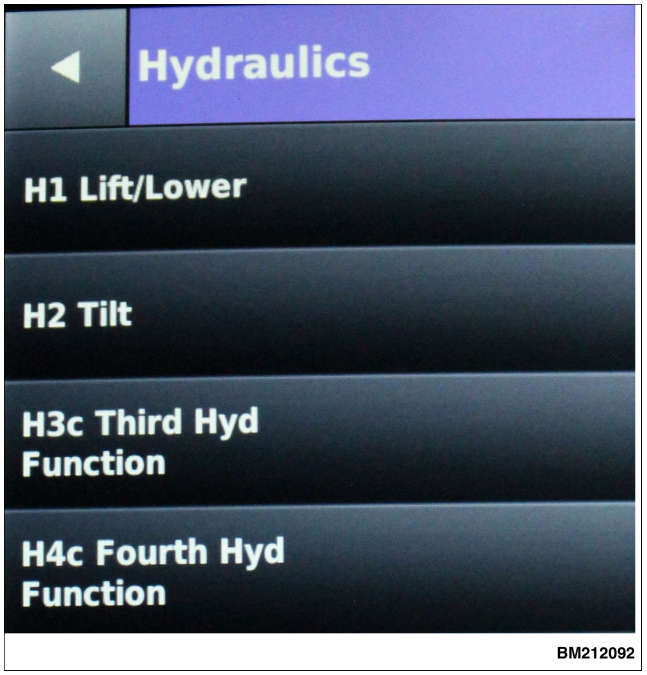


Figure 167. Hydraulic Calibration Choices

7. Select **H1c.7 Lower Valve Output**. See Figure 168.

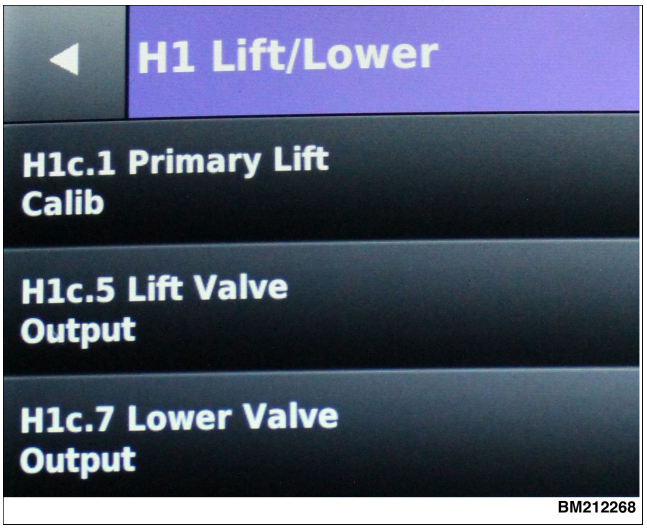


Figure 168. H1 Lift/Lower

8. Follow the prompt on the display to PUSH the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pushing the lever fully to 100%. Return the lever to neutral.

11. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

TILT BACK VALVE CALIBRATION 202001-304

TILT BACK VALVE OUTPUT THRESHOLD CALIBRATION

The following procedure must be performed every time the tilt valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).

2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.

3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.

4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

5. Select **Hydraulics**. See Figure 169.

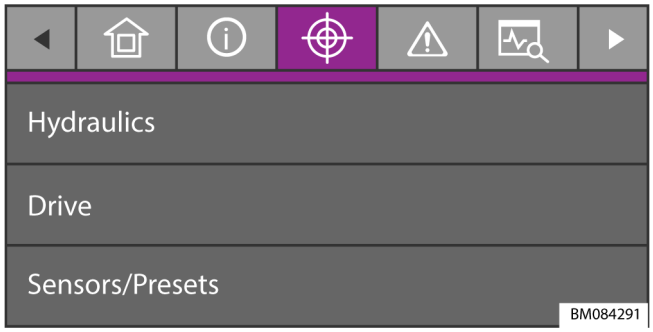


Figure 169. Hydraulics Screen

6. Select **H2 Tilt**. See Figure 170.

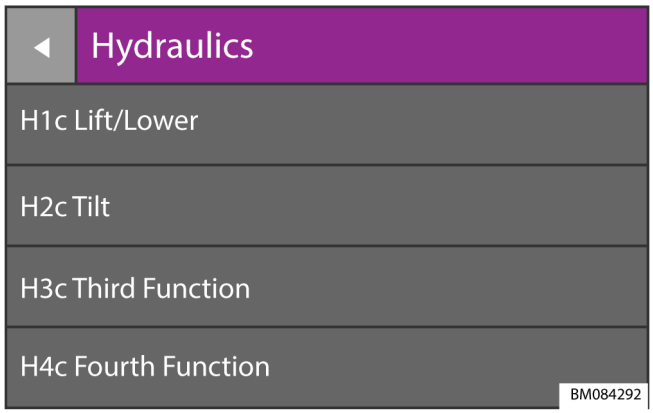


Figure 170. Hydraulic Calibration Choices

7. Select **H2c.9 Tilt BWD Output**. See Figure 171.

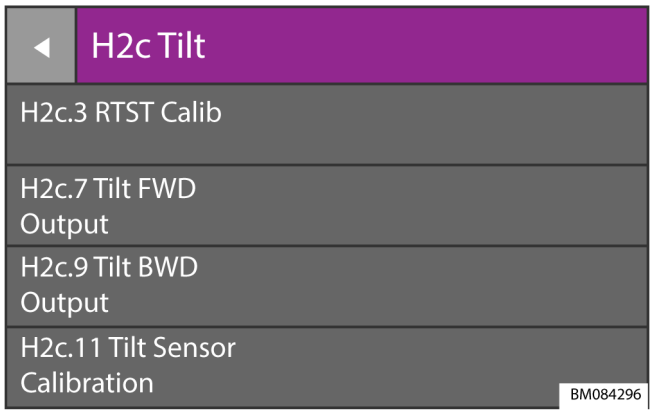


Figure 171. H2 Tilt

8. Follow the prompt on the display to PULL the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. PULL the lever back between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pulling the lever fully to 100%. Return the lever to neutral.

11. PULL the lever back between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

TILT FORWARD VALVE CALIBRATION 202001-305

TILT FORWARD VALVE OUTPUT THRESHOLD CALIBRATION

The following procedure must be performed every time the tilt valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).

2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.

3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.

4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

5. Select **Hydraulics**. See Figure 172.

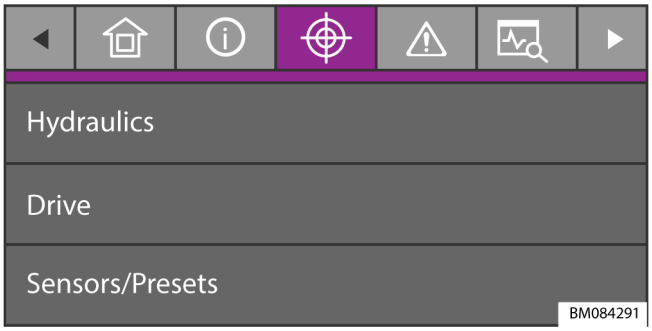


Figure 172. Hydraulics Screen

6. Select **H2c Tilt**. See Figure 173.

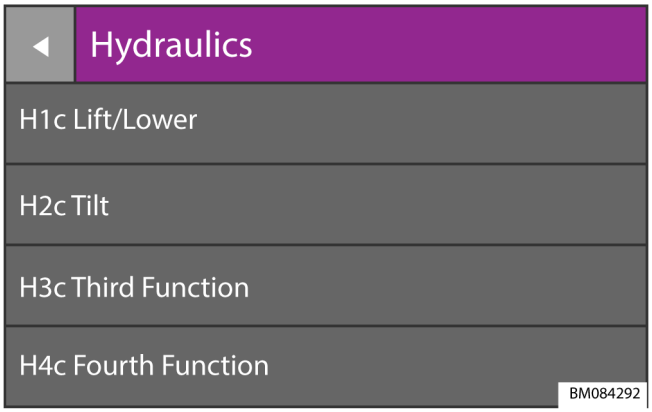


Figure 173. Hydraulic Calibration Choices

7. Select **H2c.7 Tilt FWD Output**. See Figure 174.

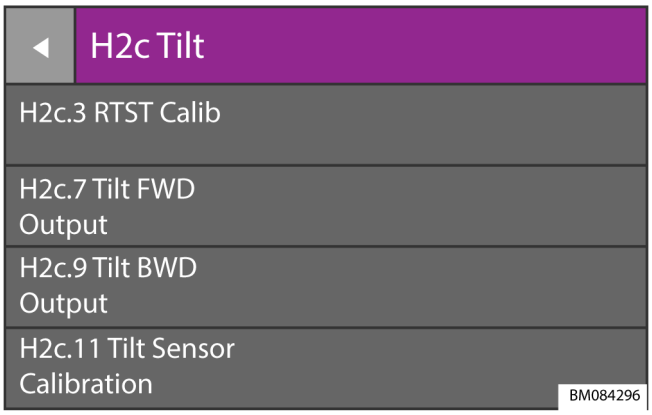


Figure 174. H2 Tilt

8. Follow the prompt on the display to PUSH the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pushing the lever fully to 100%. Return the lever to neutral.

11. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

AUXILIARY VALVE DIRECTION A CALIBRATION 202001-306

AUXILIARY 1 OR 2 DIRECTION A VALVE OUTPUT THRESHOLD CALIBRATION

The following procedure must be performed every time the auxiliary function valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).

2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.

3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.

4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

5. Select **Hydraulics**. See Figure 175.

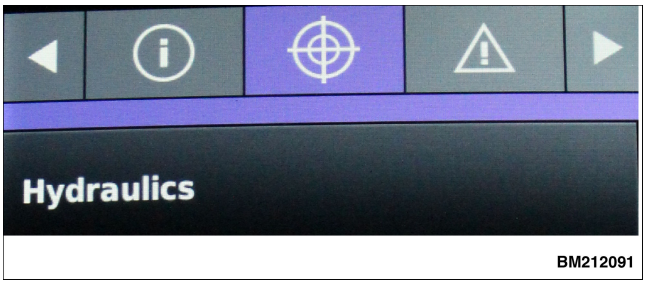


Figure 175. Hydraulics Screen

6. Select Auxiliary valve option. See Figure 176.
   - For third function, select **H3c Third Hyd Function**.
   - For fourth function, select **H4c Fourth Hyd Function**.

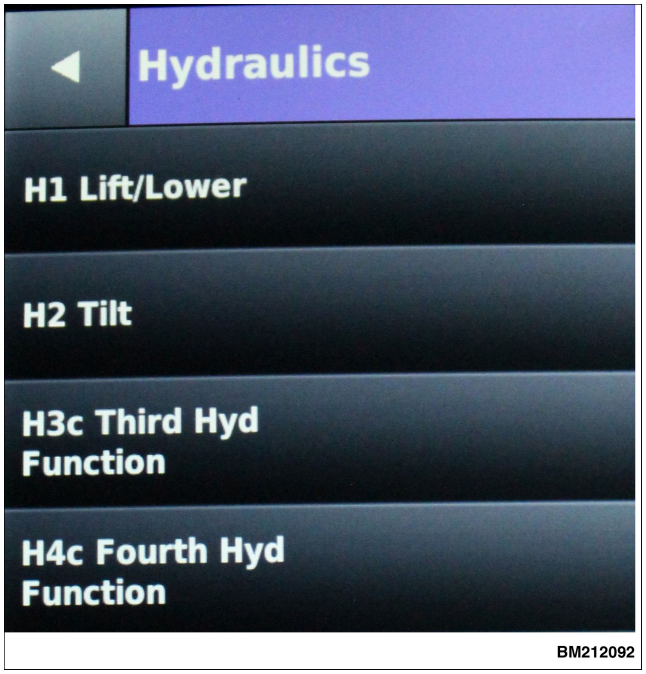


Figure 176. Hydraulic Calibration Choices

7. Select function.
   - For third function, select **H3c.7 Dir A Output**. See Figure 177.
   - For fourth function, select **H4c.7 Dir A Output**. See Figure 178.

Figure 177. Third function

Figure 178. Fourth function

8. Follow the prompt on the display to PUSH the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pushing the lever fully to 100%. Return the lever to neutral.

11. PUSH the lever forward between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

AUXILIARY VALVE DIRECTION B CALIBRATION 202001-307

AUXILIARY 1 OR 2 DIRECTION B VALVE OUTPUT THRESHOLD CALIBRATION

The following procedure must be performed every time the auxiliary function valve is changed, valve components have been serviced, or oil type is changed.

1. Enter service password (see User interface (display) for instructions).

2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.

3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.

4. From the HOME screen on the User Interface display, select the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

5. Select **Hydraulics**. See Figure 179.

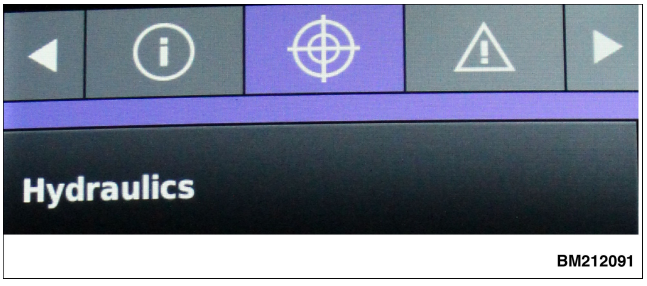


Figure 179. Hydraulics Screen

6. Select Auxiliary valve option. See Figure 180.
   - For third function, select **H3c Third Hyd Function**.
   - For fourth function, select **H4c Fourth Hyd Function**.

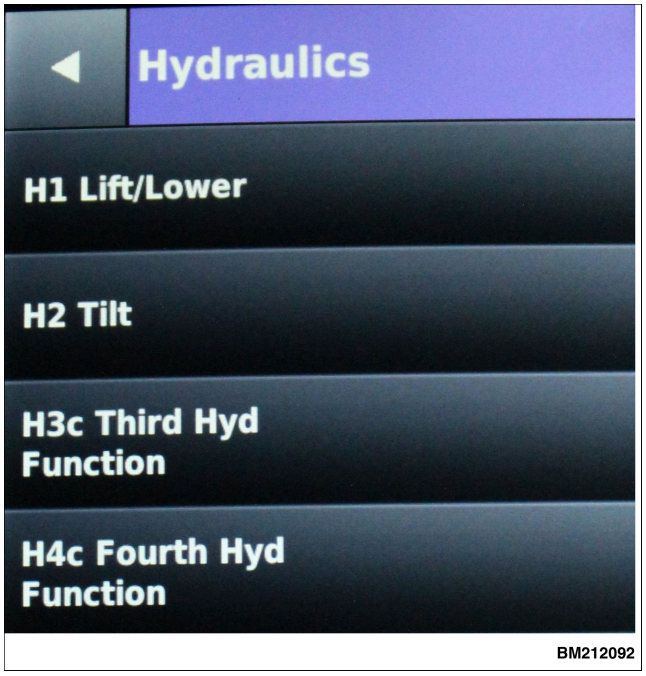


Figure 180. Hydraulic Calibration Choices

7. Select function.
   - For third function, select **H3c.9 Dir B Output**. See Figure 181.
   - For fourth function, select **H4c.9 Dir B Output**. See Figure 182.

Figure 181. Third function

Figure 182. Fourth function

8. Follow the prompt on the display to PULL the lever fully to 100%. Return the lever to neutral.

NOTE: This will increase the commanded current by a one step increment of 10 mA when the lever IS NOT at neutral. When lever IS at neutral, there will be no current sent.

9. PULL the lever backward between 50-75% stroke and hold to see if motion has started.

10. If motion has not started, repeat pulling the lever fully to 100%. Return the lever to neutral.

11. PULL the lever backward between 50-75% stroke and hold to see if motion has started.

NOTE: Repeating the 100% actuation will continue to increase the current in increments of 10 mA. There are a total of 30 increments available.

12. Once motion is seen, press the green check mark to save the value.

During calibration of a specific function, all other functions can be operated normally. Pulling back on the lever is for all of the B-direction functions and pushing the lever forward is for the A-direction functions.

TRANSMISSION CALIBRATION (BASIC) 202001-218

NOTE: Before calibrating a new transmission, confirm you have the current version of PC Service Tool.

NOTE: Before performing any test or calibration on the transmission, the oil in the transmission must reach a specified temperature. See Transmission warm-up for procedure.

PREPARE

1. Locate the NCEA service diagnostic wire harness for your lift truck. See **Parts Manual** for correct part number.
2. Connect the round 9-pin connector on the service diagnostic harness to the truck.
3. Locate the iFak adapter. Connect CPS A connector on the service diagnostic harness to the iFak adapter.
4. Connect the USB connector on the iFak to your computer.
5. Launch isCAN Configurator on your computer and setup the iFak adapter.
   a. Verify your adaptor shows in the device tree.
   b. Add your adaptor if not shown.
   c. Verify the serial number shown matches the serial number on the adapter.
   d. Search the attached device and select OK.
6. Set **Vendor** to *Thorsis Technologies*.
7. Set **Device** to the attached CAN adapter you are using.
8. Set communication speed to 500k Baud.
9. Launch PC Service Tool.

CALIBRATIONS PROCEDURES

1. Turn ignition ON.
2. Connect programming tools to truck.
3. Connect to PC Service Tool.
4. From the **Truck configuration** menu, select *Transmission Valve Calibration*. See Figure 183.

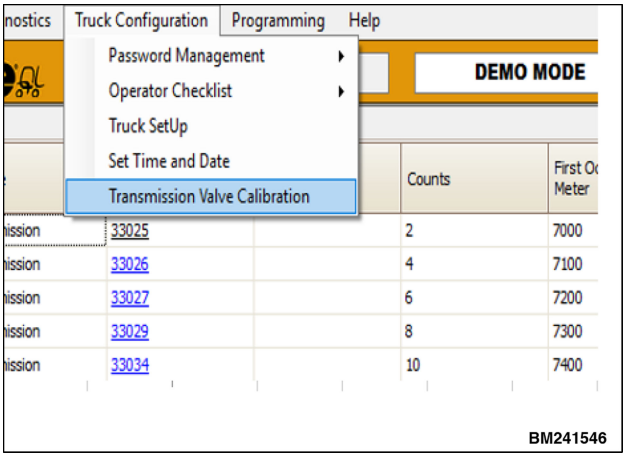


Figure 183. Truck configuration

5. From the Transmission Valve Calibration screen, select FWD or REV for the appropriate valve. See Figure 184.

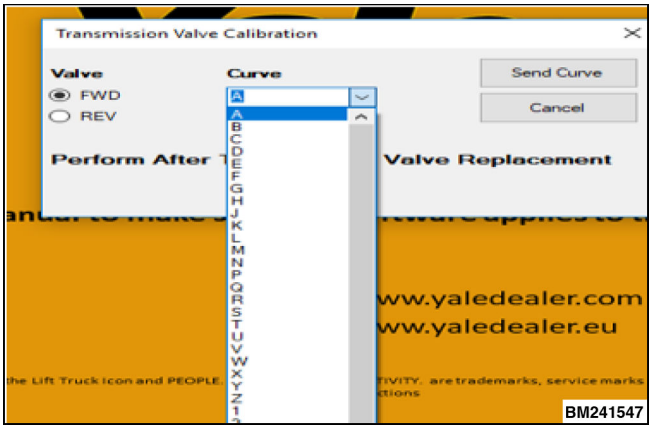


Figure 184. Transmission valve calibration screen

6. Locate the serial number on the replacement valve. See Figure 185.

Figure 185. Valve serial number

7. Select the last letter or number on the valve serial number, and select it from the **Curve** drop-down menu. See Figure 184.

8. Select *Send Curve*. See Figure 184.

TRANSMISSION CALIBRATION (ADVANCED) 202001-333

NOTE: Before performing any test or calibration on the transmission, the oil in the transmission must reach a specified temperature. See Transmission warm-up for procedure.

NOTE: Perform the following calibration whenever a proportional control valve is replaced or at the discretion of qualified service technician based upon transmission behavior.

NOTE: Calibration procedure lasts approximately 10 minutes to complete. Do not initiate calibration procedure if you do not have sufficient time to complete the full routine.

CALIBRATIONS PROCEDURES

1. Place truck in Neutral.

2. Apply park brake.

3. The Home/Operator screen will now appear on the display. Navigate to the Calibration screen.

4. Swipe left or right or use button key pad to get to calibration screen.

5. Select **Drive** calibration.

6. Select **D9c Xmsn**.

7. Select **D9c.1 Xmsn Valve Calib**.

8. A notification regarding required XMSN oil temperature will appear.

Figure 186. Instructions

9. Acknowledge oil temperature notification.

10. A notification regarding application of service brake and parking brake will appear.

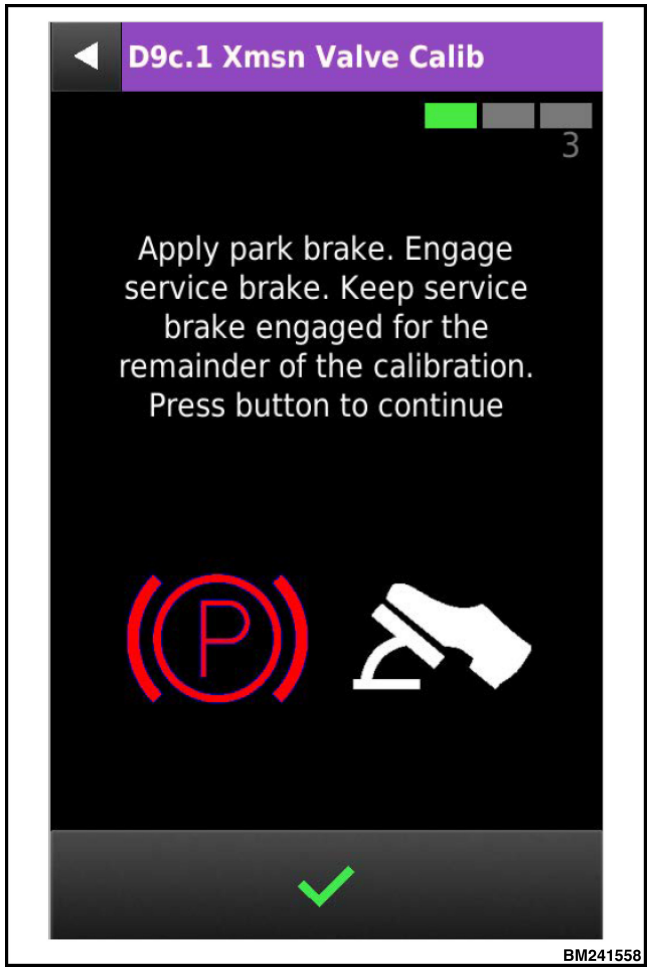


Figure 187. Further Instructions

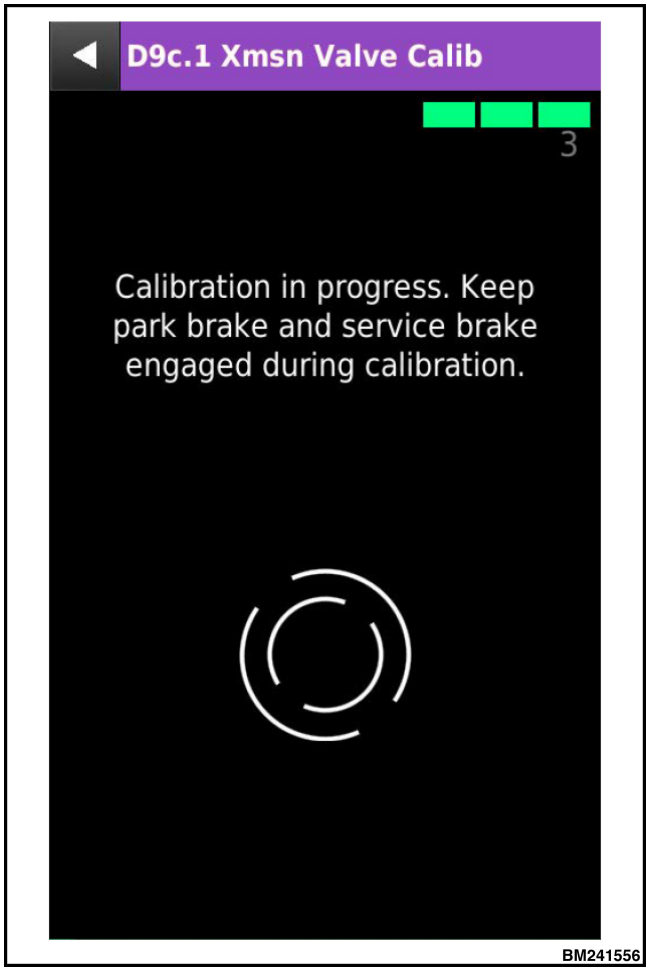


Figure 188. Calibration Routine

11. Acknowledge brake notification.

12. Calibration will now begin.

NOTE: If the park or service brakes are released during the calibration, the calibration will fail and the truck will revert to previous or default calibration values.

NOTE: On trucks with a neutral direciton control command position, leaving that position will cause the calibration to fail, and revert to previous or default calibration values.

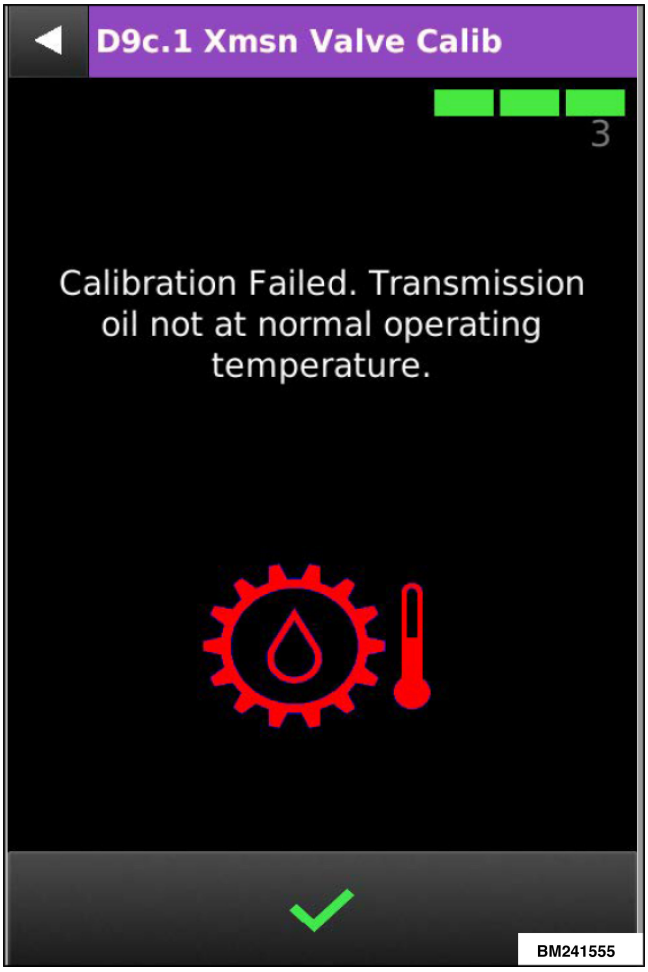


Figure 189. Calibration Failed Due to Change of Status

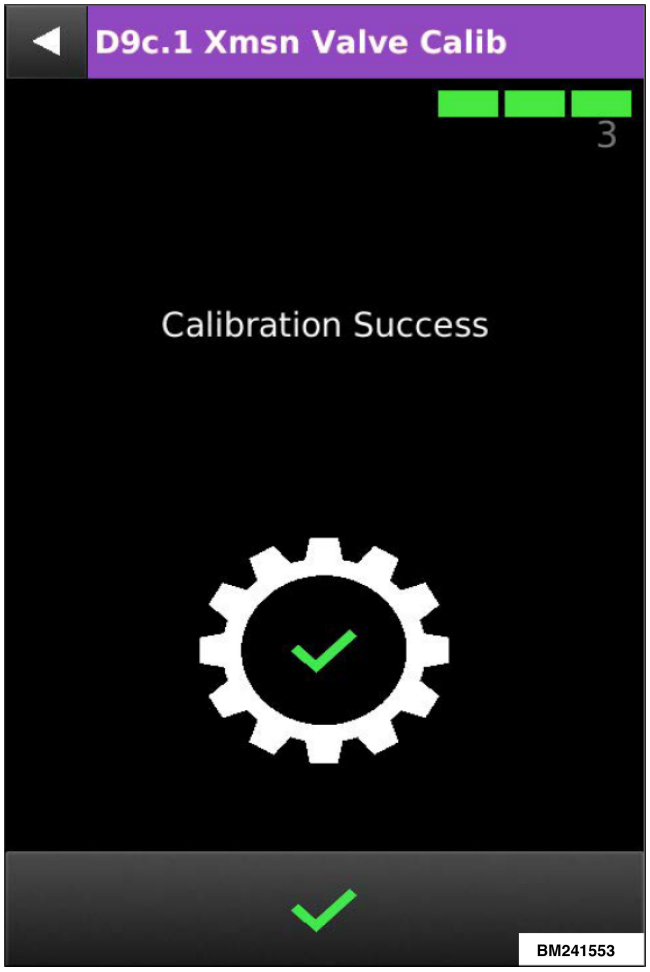


Figure 190. Calibration Success

NOTE: Throughout the calibration routine, you may feel the transmission engaging slightly against the brakes as the clutch packs fill and evacuate. This is normal behavior. Keep the park and service brakes applied.

13. One of the following notifications will appear:

- **Calibration Success**
- **Calibration Fail**

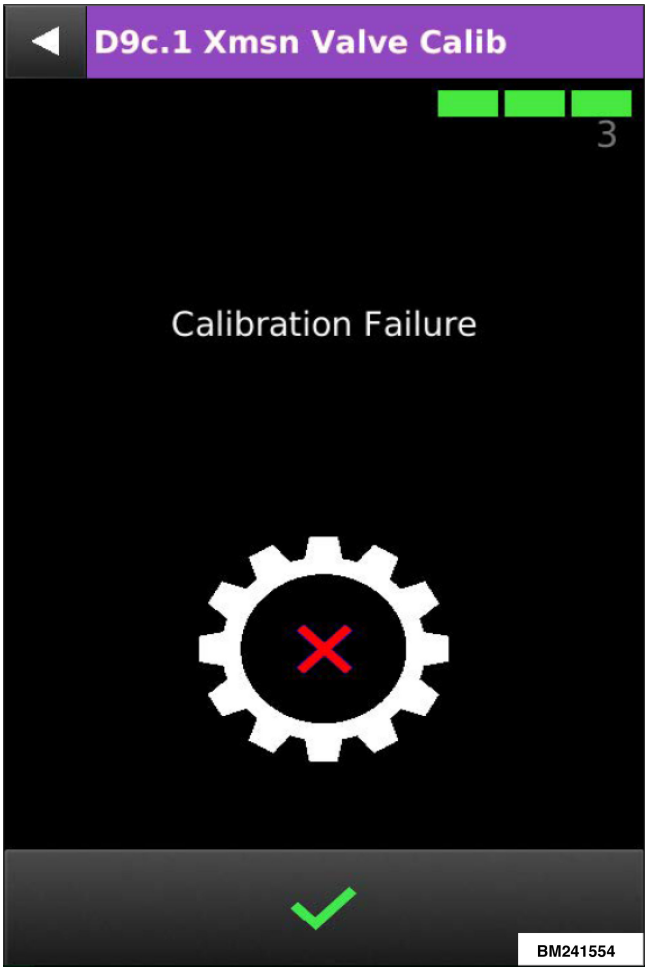


Figure 191. Calibration Failure

14. If calibration was successful, press the green check to close the calibration. If calibration was unsuccessful, acknowledge the display prompt.

LOAD WEIGHT CALIBRATION 202001-425

The following calibration procedure must be performed any time the pressure transducer is replaced.

Perform the following procedure when load weights are not displayed within +/- 50kg of load capacity.

1. Enter service password or use RFID card for authentication (see User interface (display) for instructions).

2. Start the truck engine.

3. Position the mast in a vertical position and raise the forks above normal carry height.

NOTE: For instructions on navigating the various display screens, see User interface (display).

4. On the User Interface display, select the **Calibrations** icon from the menu bar. The **Calibrations** menu screen will be displayed. See Figure 192.

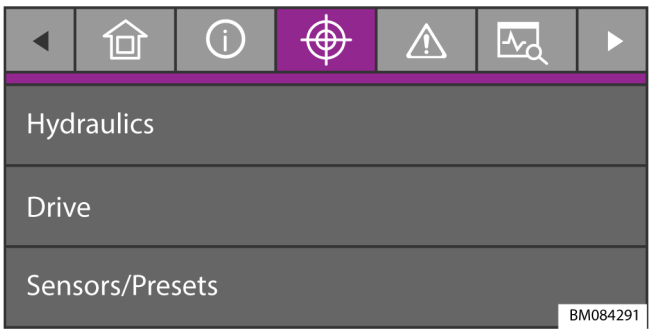


Figure 192. Calibrations menu

5. Select **Sensors/Presets**. See Figure 192.

6. Select **S12c Load Weight**. See Figure 193.

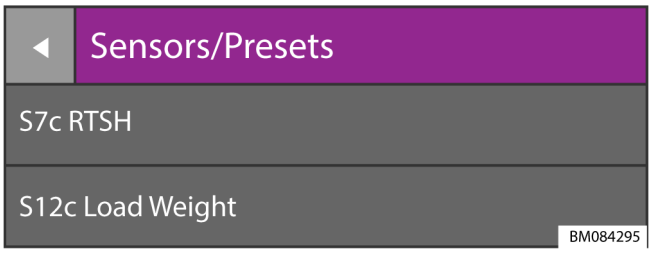


Figure 193. Sensors/Presets menu

7. Select **S12c.5 Load Weight Calib**. See Figure 194.

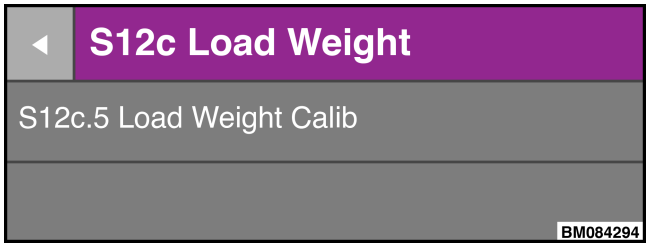


Figure 194. Load Weight menu

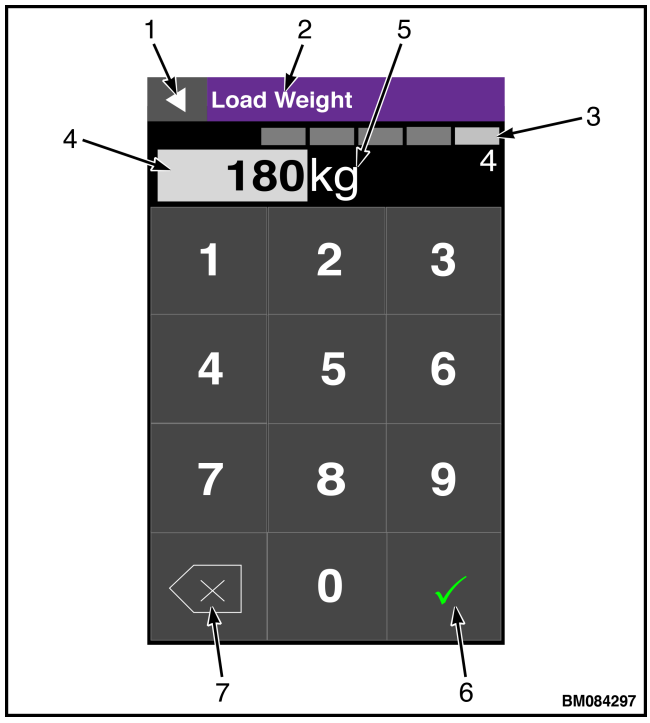
8. With NO load on the forks, tilt the mast to full vertical position and lift the forks/attachment above normal carry height (0.3 m (1 ft)) position.

9. Lower the forks/attachment to normal carry height (0.3 m (1 ft)) position. Press the green check mark to lock in the measurement.

10. With a load of known weight, tilt mast to vertical position and lift forks/attachment above normal carry height (0.3 m (1 ft)) position.

11. Lower the forks/attachment to normal carry height (0.3 m (1 ft)) position. Press the green check mark to lock in the measurement.

12. Enter the weight of the known load into the display. See Figure 195.



1. BACK BUTTON
2. CALIBRATION DESCRIPTION
3. STEP COUNT AND PROGRESS BAR
4. NUMERIC VALUE ENTERED
5. UNIT OF MEASURE
6. CONFIRMATION BUTTON
7. BACK SPACE

Figure 195. Calibrations numerical input screen

13. Press the green check mark to lock in the measurement.

14. Display will indicate the calibration is completed.

TILT LEVER CALIBRATION 202001-427

TILT LEVER CALIBRATION

1. Enter service password on the display or use RFID card for authentication (see User interface (display) for instructions).

2. Perform hydraulic valve calibration warm-up. See Hydraulic valve calibration warm-up. Leave the truck running after performing calibration warm-up.

3. Use the lift control to position the carriage 0.6 m (2 ft) from the ground with NO load on the forks/attachment.

4. Press the **Calibrations** icon in the menu bar. The **Calibrations** screen will be displayed.

5. Select **Hydraulics**. See Figure 196.

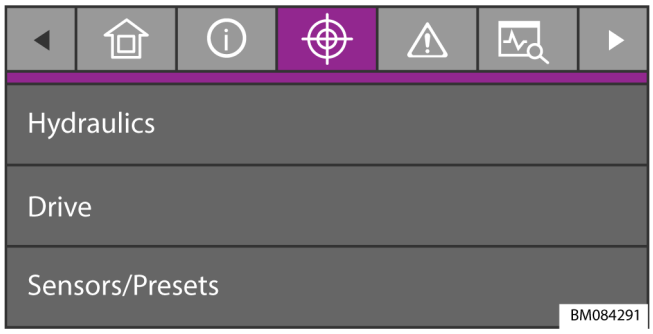


Figure 196. Hydraulics Screen

6. Select **H2c Tilt**. See Figure 197.

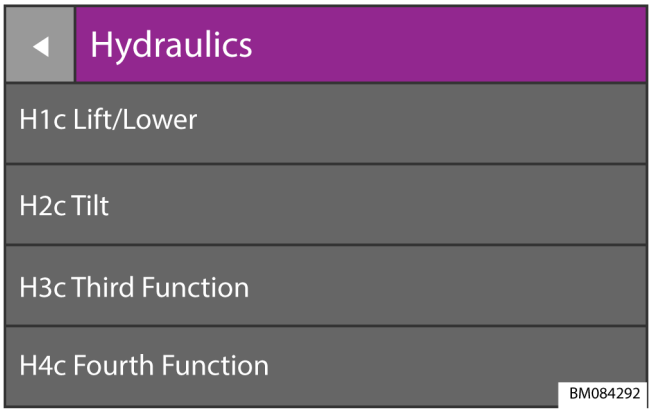


Figure 197. Hydraulic Calibration Choices

7. Select **H2c.13 Tilt Lever Calib**. See Figure 198.

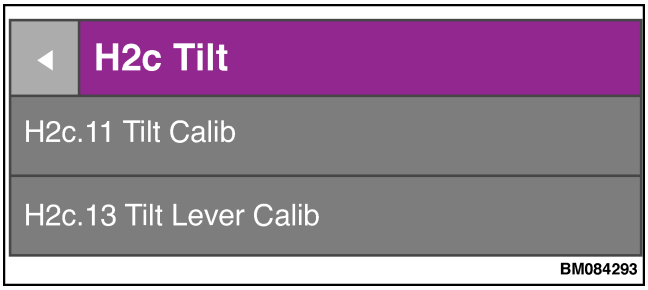


Figure 198. H2 Tilt

8. With no load, lift the forks/attachment just above normal carry height (0.3 m (1 ft)) and tilt the mast to full vertical position. Press the green check mark to continue.

9. Tilt the lever forward until there is slight movement in the hydraulic system, then return the lever to neutral position. Press the green check mark to continue.

10. Tilt the lever to full forward position, then return the lever to neutral position. Press the green check mark to continue.

11. Return the mast to full vertical position.

12. Tilt the lever backward until there is slight movement in the hydraulic system, then return the lever to neutral (0.3 m (1 ft)) position. Press the green check mark to continue.

13. Tilt the lever to full backward position, then return lever to neutral (0.3 m (1 ft)) position. Press the green check mark to continue.

14. The lift truck will validate that sensor values are within an acceptable range.
    - If valid, the display will indicate calibration completed and store the new calibration settings.
    - If invalid, the display will indicate calibration failed and restore previous calibration settings.

Operator controls repair

STEERING COLUMN REPAIR 202001-088

DESCRIPTION

This section describes repair procedures for the steering column assembly. The steering column assembly mounts to the cowl inside the operator compartment. See Figure 199.

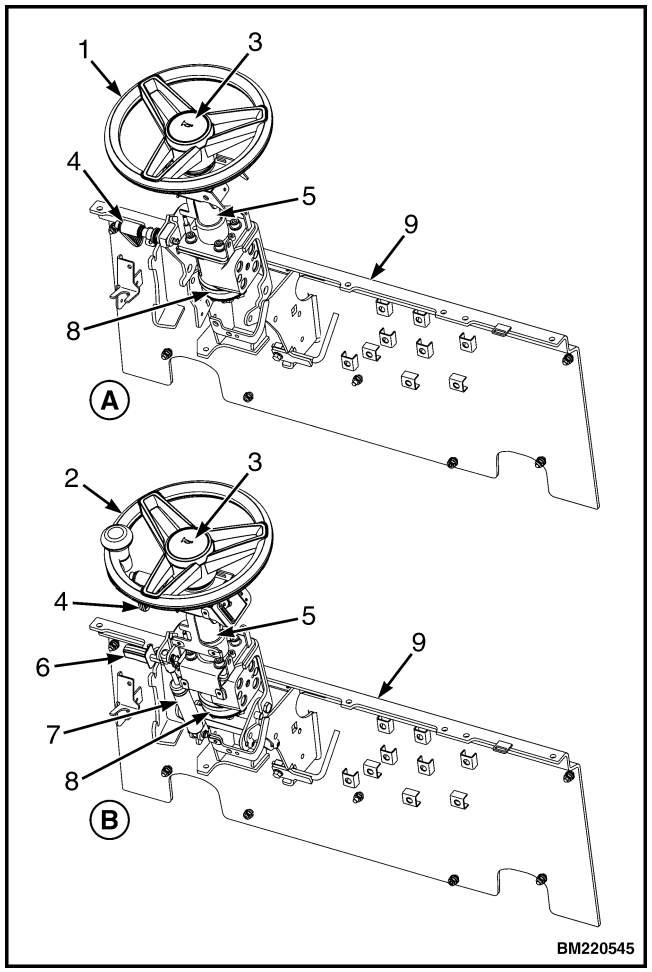


Figure 199. Steering column and cowl

Legend for Figure 199.

A. TILT STEERING COLUMN
B. TILT AND TELESCOPE STEERING COLUMN

1. STEERING WHEEL
2. STEERING WHEEL WITH SPINNER KNOB
3. HORN BUTTON
4. TILT LOCK HANDLE
5. STEERING COLUMN
6. GAS SPRING LEVER HANDLE
7. GAS SPRING
8. STEERING CONTROL UNIT
9. COWL

STEERING COLUMN ASSEMBLY, REMOVE

1. Put chocks on each side (front and back) of the tires to prevent the truck from moving.

Battery disconnect

WARNING

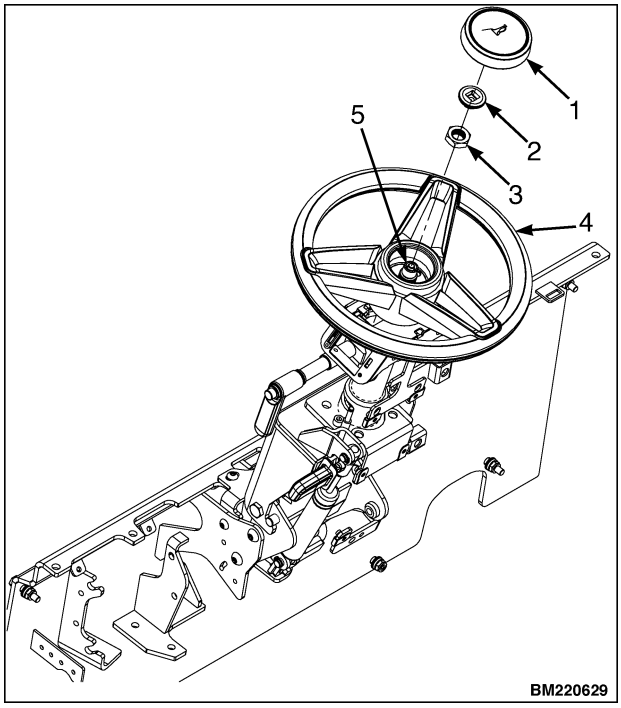
Disconnect the battery before removing any covers to avoid injury to personnel.

1. Raise the hood and disconnect the battery. Attach a tag on the battery connector or negative battery cable stating, **DO NOT CONNECT BATTERY**. Refer to section Battery disconnect switch for procedures. Move the steering column to most FORWARD position, toward the cowl.

Remove operator controls from steering column

1. Disconnect and remove the truck start switch and ignition switch from the steering column. Refer to section Truck start switch for procedures.

2. Remove the horn button assembly and disconnect the electrical wires. Remove the large hex nut and steering wheel from the steering column. See Figure 200.



1. HORN BUTTON COVER
2. HORN BUTTON
3. STEERING COLUMN HEX NUT
4. STEERING WHEEL
5. STEERING COLUMN ROD

Figure 200. Horn button

3. If present, remove the directional control lever from the steering column. Refer to section Direction control lever (steering column) for procedures.

4. If present, remove the turn signal lever from the steering column. Refer to section Turn signal lever for procedures.

5. If present, remove the wiper control lever from the steering column. Refer to section Wiper control lever for procedures.

Remove covers, tilt only steering column

1. Remove five screws (item 12, Figure 201) from rear cover, tilt (item 9, Figure 201) and steering column assembly.

Using a screwdriver remove two clips (item 5, Figure 201) from steering column assembly.

Remove rear cover, tilt (item 9, Figure 201), two foldover nuts (item 8, Figure 201), and front cover, tilt (item 2, Figure 201) from steering column assembly.

Remove covers, tilt and telescope steering column

1. Remove the four screws (item 12, Figure 201) from the upper rear cover (item 10, Figure 201) and steering column assembly.

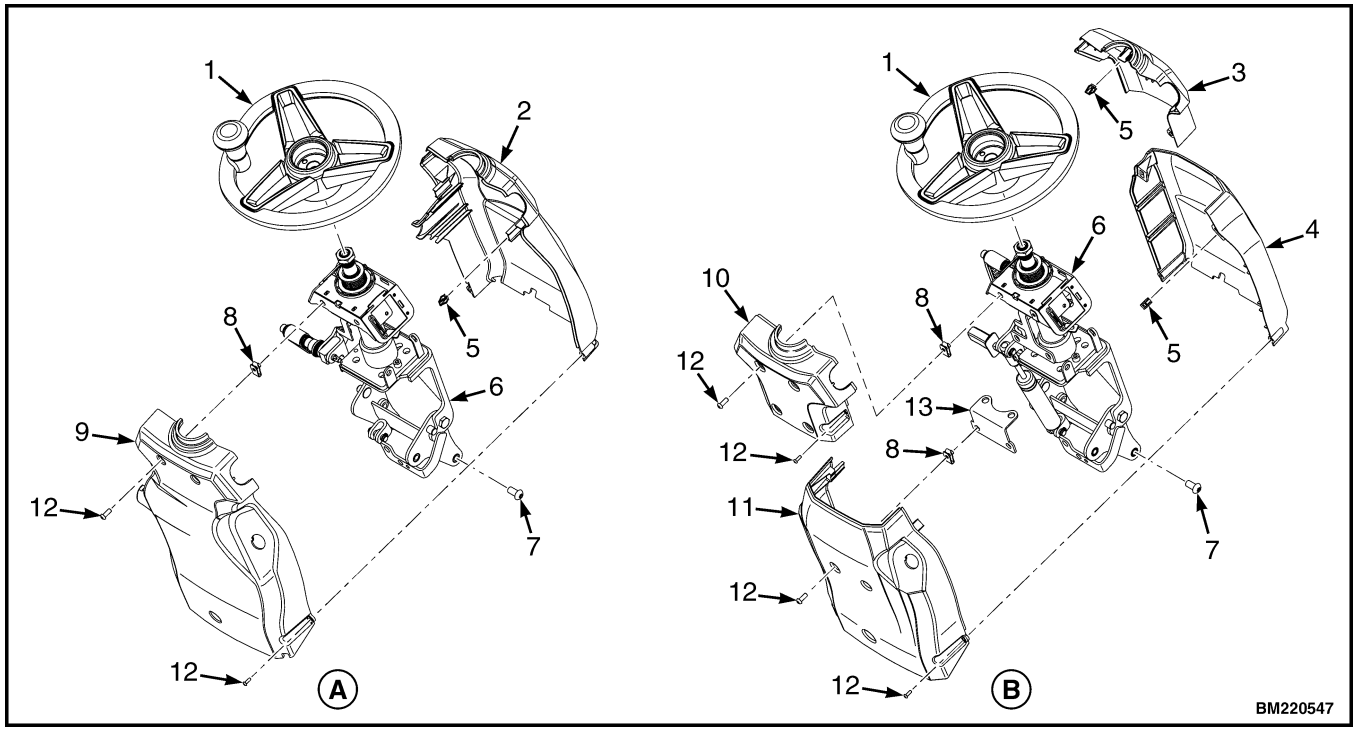
Remove the upper rear cover and two foldover nuts (item 8, Figure 201) from the steering column assembly.

Remove the five screws (item 12, Figure 201) from the lower rear cover (item 11, Figure 201) and steering column assembly.

Remove the lower rear cover, two foldover nuts (item 8, Figure 201) and bracket (item 13, Figure 201) from the steering column assembly.

Using a screwdriver remove four clips (item 5, Figure 201) from steering column assembly.

Remove the upper front cover (item 3, Figure 201) and lower front cover (item 4, Figure 201) from the steering column assembly.



A. STEERING COLUMN, TILT ONLY

1. STEERING WHEEL
2. FRONT COVER, TILT
3. UPPER FRONT COVER, TILT AND TELESCOPE
4. LOWER FRONT COVER, TILT AND TELESCOPE
5. CLIP
6. STEERING COLUMN ASSEMBLY
7. BUTTON-HEAD SCREW

B. STEERING COLUMN, TILT AND TELESCOPE

8. FOLDOVER NUT
9. REAR COVER, TILT
10. UPPER REAR COVER, TILT AND TELESCOPE
11. LOWER REAR COVER, TILT AND TELESCOPE
12. SCREW
13. BRACKET

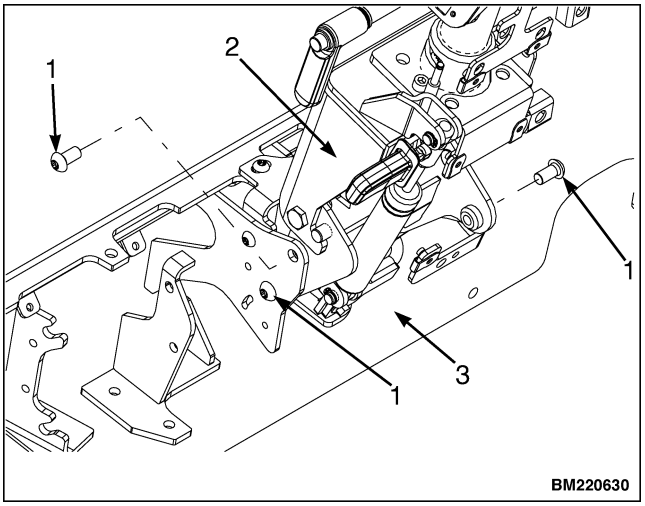
Figure 201. Steering Column Remove/Install

Remove steering pump

1. Remove the steering pump from the steering column. Refer to section **Steering Pump Repair** in **Hydraulics** 1900SRM2302 for procedures.

Remove steering column assembly from truck

1. Remove the four button-head screws attaching the steering column assembly to the cowl and remove the steering column assembly. See Figure 202.



1. BUTTON HEAD CAPSCREW
2. STEERING COLUMN ASSEMBLY
3. COWL

Figure 202. Steering column

STEERING COLUMN, DISASSEMBLE

Tilt only

1. Remove the upper unit including the nut, horn actuator, dust cover, flasher, and horn switch from the middle weldment. See Figure 203.
2. Remove the tilt handle assembly and washer, serrated clamp from the middle weldment. See Figure 203.
3. Remove the tilt bar assembly from the lower weldment. See Figure 203.
4. Remove the lower pivot assembly and middle weldment from the lower weldment. See Figure 203.

Tilt and telescope

1. Remove the upper unit including the nut, horn actuator, dust cover, horn switch, flasher, telescoping lock, and internal gear wheel from the middle weldment. See Figure 203.
2. Remove the gas spring assembly from the middle and lower weldments. See Figure 203.
3. Remove the lower pivot assembly and middle weldment from the lower weldment. See Figure 203.

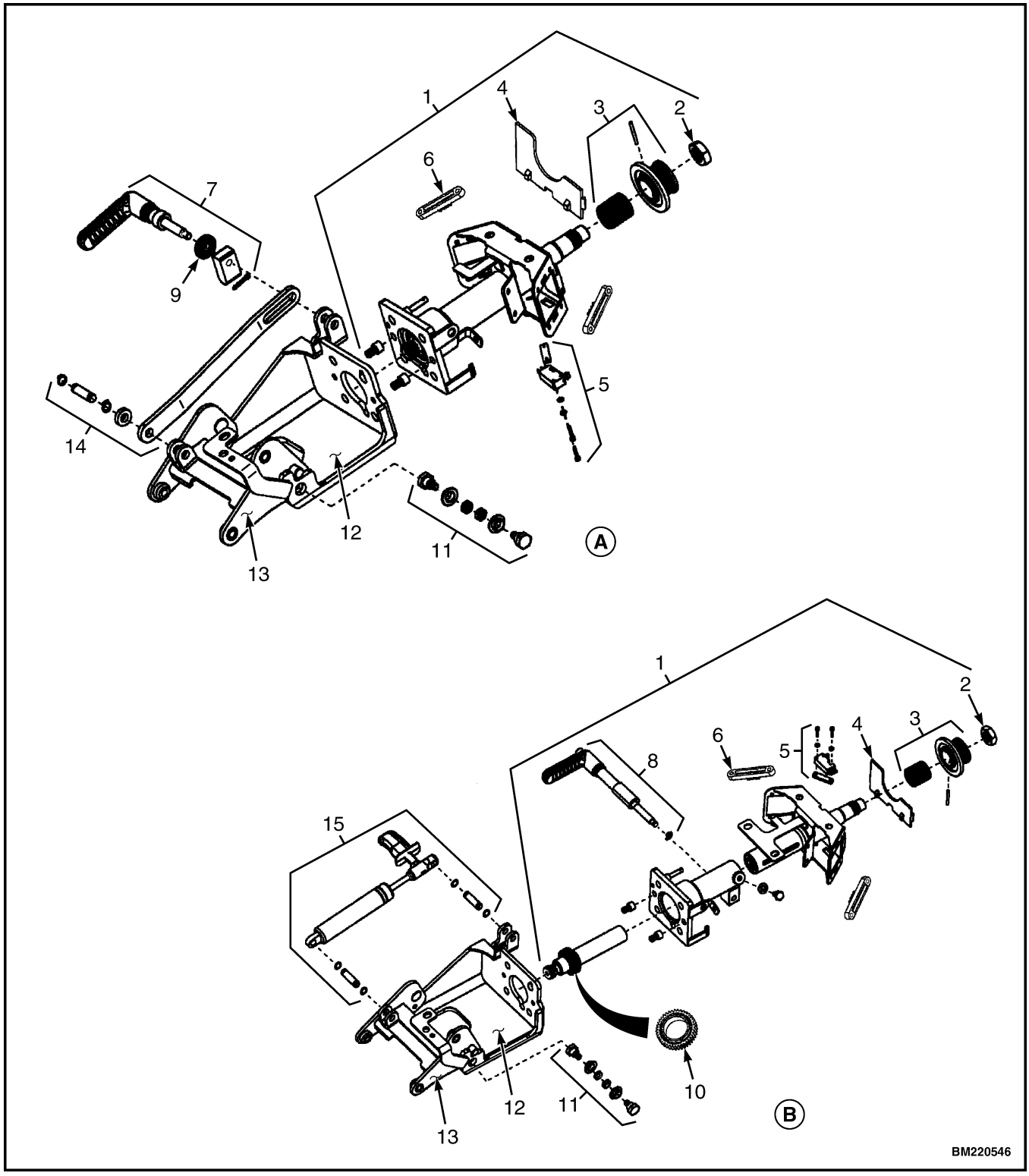


Figure 203. Steering Column

Legend for Figure 203.

A. STEERING COLUMN, TILT ONLY

1. UPPER UNIT
2. NUT
3. HORN ACTUATOR
4. DUST COVER
5. HORN SWITCH
6. FLASHER
7. TILT HANDLE
8. TELESCOPING LOCK

B. STEERING COLUMN, TILT AND TELESCOPE

9. WASHER
10. INTERNAL GEAR WHEEL
11. LOWER PIVOT
12. MIDDLE WELDMENT
13. LOWER WELDMENT
14. TILT BAR
15. GAS SPRING

STEERING COLUMN, ASSEMBLE

Tilt only

1. Install the tilt bar assembly to the lower weldment. See Figure 203.

2. Install the lower pivot assembly and middle weldment to the lower weldment. See Figure 203.

3. Install the washer, serrated clamp and tilt handle assembly to the middle weldment. See Figure 203.

4. Install the upper unit including the horn switch, flasher, dust cover, horn actuator, and nut to the middle weldment. See Figure 203.

Tilt and telescope

1. Install the lower pivot assembly and middle weldment to the lower weldment. See Figure 203.

2. Install the gas spring assembly to lower and middle weldments. See Figure 203.

3. Install the upper unit including the internal gear wheel, telescoping lock, flasher, horn switch, dust cover, horn actuator, and nut to the middle weldment. See Figure 203.

STEERING COLUMN ASSEMBLY, INSTALL

Install steering column assembly in truck

1. Align the new steering column with the four holes in the cowl. See Figure 202.

2. Insert the four button head capscrews that attach the steering column to the cowl. See Figure 202. Tighten to standard torque.

Install steering pump

1. Install the steering pump on the steering column. Refer to section **Steering Pump Repair** in **Hydraulics** 1900SRM2302 for procedures.

Install covers, tilt only steering column

1. Install two clips (item 5, Figure 201) and front cover, tilt (item 2, Figure 201) on the steering column assembly.

Install two foldover nuts (item 8, Figure 201) and rear cover, tilt (item 9, Figure 201) on the steering column assembly.

Install five screws (item 12, Figure 201) on rear cover, tilt and steering column assembly. Tighten screws to 2.55 to 2.75 N•m (22.6 to 24.3 lbf in).

Install covers, tilt and telescope steering column

1. Install two clips (item 5, Figure 201) and lower front cover (item 4, Figure 201) on the steering column.

Install two clips (item 5, Figure 201) and upper front cover (item 3, Figure 201) on the steering column.

Install bracket (item 13, Figure 201) and two foldover nuts (item 8, Figure 201) on the steering column.

Install lower rear cover (item 11, Figure 201) and five screws (item 12, Figure 201) on the steering column. Tighten screws to 2.55 to 2.75 N•m (22.6 to 24.3 lbf in).

Install upper rear cover (item 10, Figure 201) and four screws (item 12, Figure 201) on the steering column. Tighten screws to 2.55 to 2.75 N•m (22.6 to 24.3 lbf in).

Install operator controls on steering column

1. If removed, install the wiper control lever on the steering column. Refer to section Wiper control lever for procedures.
2. If removed, install the turn signal lever on the steering column. Refer to section Turn signal lever for procedures.
3. If removed, install direction control lever on the steering column. Refer to section Direction control lever (steering column) for procedures.
4. Place the steering wheel on the steering column. See Figure 200.
5. Install the hex nut on steering column and tighten. Install horn button assembly and connect electrical wires. See Figure 200.
6. Install and connect truck start switch and ignition switch on steering column. Refer to section Truck start switch for procedures.

Connect battery

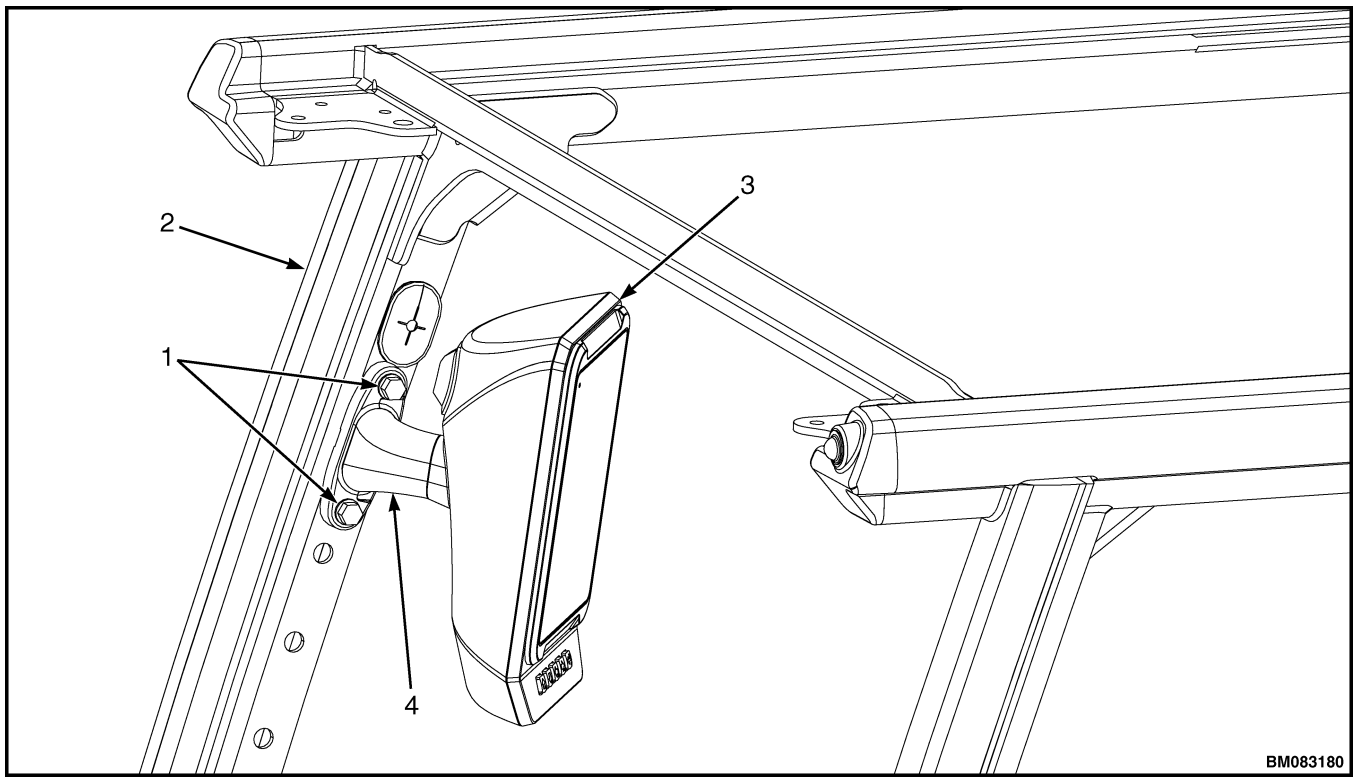
1. Remove tag, connect the battery and lower the hood.

DISPLAY REPAIR 202001-089

DISPLAY REMOVE AND INSTALL

The user interface display is mounted on a bracket located on the front, right A-post. Three display sizes are available (2.8-inch, 5-inch, and 7-inch) and they all utilize the same mounting bracket and fasteners. The following procedure is identical for any of the display sizes.

Remove



1. CAPSCREWS
2. A-POST
3. USER INTERFACE DISPLAY
4. MOUNTING BRACKET

Figure 204. User interface display (7-inch shown)

WARNING

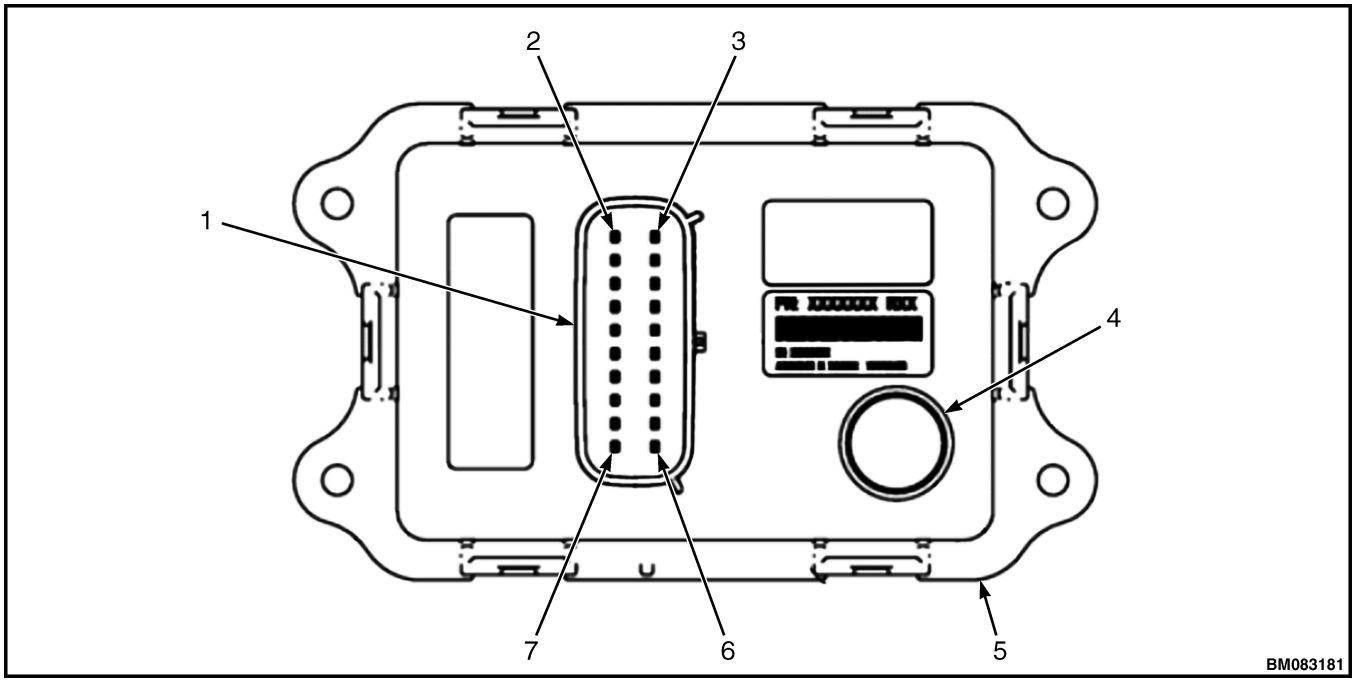
Disconnect the battery before doing any work on the electrical system. Serious injury to personnel and/or damage to lift truck components can occur if battery is not disconnected.

1. Disconnect the battery or turn the battery disconnect switch **OFF** (if equipped).
2. Disconnect the electrical connector from the user interface display.
3. Remove the two capscrews from the mounting bracket on the A-post.
4. Remove user interface display and bracket from lift truck.

Install

1. Connect the electrical connector to the user interface display.
2. Attach the user interface display and mounting bracket to the A-post.
3. Install the two mounting bracket capscrews and torque to 25.6 N•m (19 lbf ft).
4. Connect the battery or turn the battery disconnect switch **ON** (if equipped).

Pinout descriptions for the 2.8-inch display



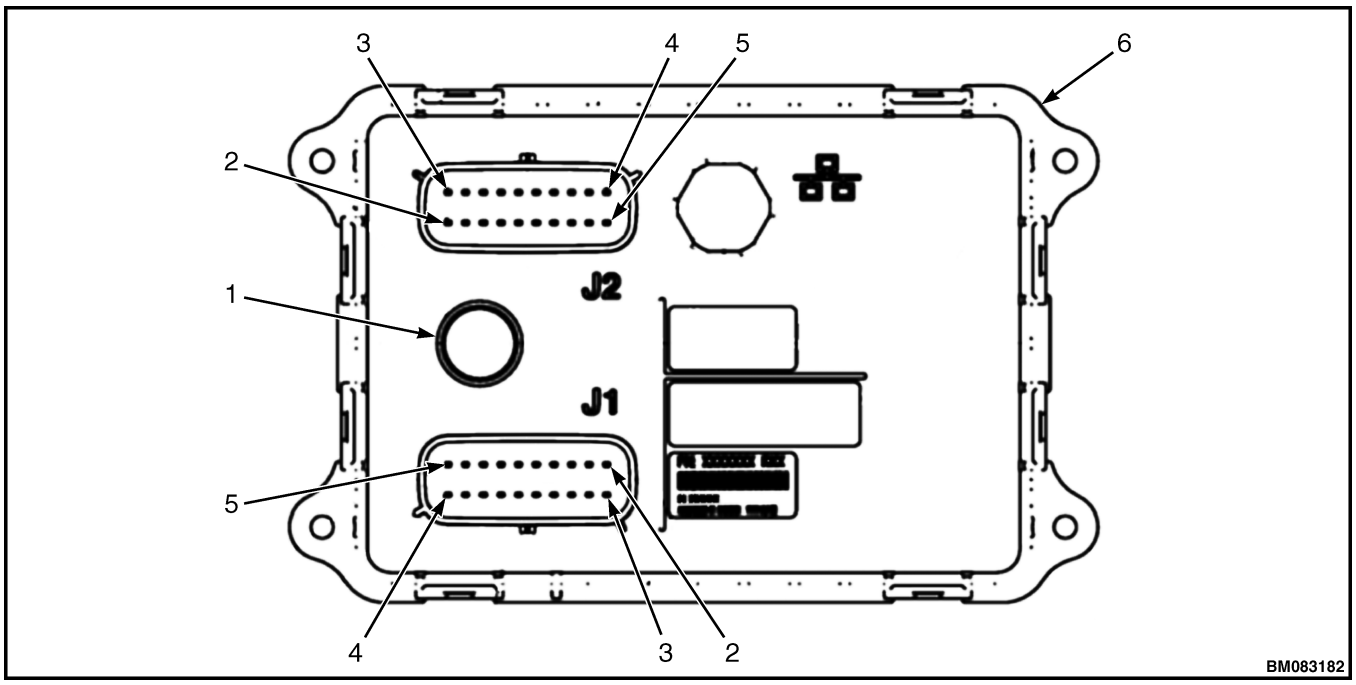
1. J1 CONNECTOR
2. PIN #11
3. PIN #1
4. MEMBRANE VENT
5. BACKSIDE OF DISPLAY
6. PIN #10
7. PIN #20

Figure 205. 2.8-inch display

Table 18. J1 connector pinout table (2.8-inch display)

J1 Connector Pinout	
1	Input7_AD (Analog or Digital Input)
2	Input1_AD (Analog or Digital Input)
3	Input6_AD (Analog or Digital Input)
4	Output2_0A5_LS (Low-Side Output)
5	CAN1_TERM (CAN Termination)
6	CAN1_SHLD (CAN Shield)
7	CAN1_L (CAN Low)
8	CAN1_H (CAN High)
9	GND (Negative Battery)
10	+VBATT (Positive Battery)
11	Input5_AD (Analog or Digital Input)
12	Input4_AD (Analog or Digital Input)
13	Input3_AD (Analog or Digital Input)
14	Input2_AD (Analog or Digital Input)
15	USB_D-
16	USB_D+
17	USB_GND
18	VSensor1 (5V Sensor Supply) / USB_VBUS
19	VSensor2 (12V Buzzer Supply)
20	Output1_0A5_LS (Low-Side Output)

Pinout descriptions for the 5-inch display.



1. MEMBRANE VENT
2. PIN #11
3. PIN #1
4. PIN #10
5. PIN #20
6. BACKSIDE OF DISPLAY

Figure 206. 5-inch display

Table 19. J1 connector pinout table (5-inch display)

Pin	Type	Description
1	Analog or Digital Input	Input7_AD
2	Analog or Digital Input	Input1_AD (
3	Analog or Digital Input	Input6_AD
4	Low-Side Output	Output2_0A5_LS
5	CAN Termination	CAN1_TERM
6	CAN Shield	CAN1_SHLD
7	CAN Low	CAN1_L
8	CAN High	CAN1_H
9	GND	GROUND
10	Positive Battery	+VBATT
11	Analog or Digital Input	Input5_AD
12	Analog or Digital Input	Input4_AD
13	Analog or Digital Input	Input3_AD
14	Analog or Digital Input	Input2_AD

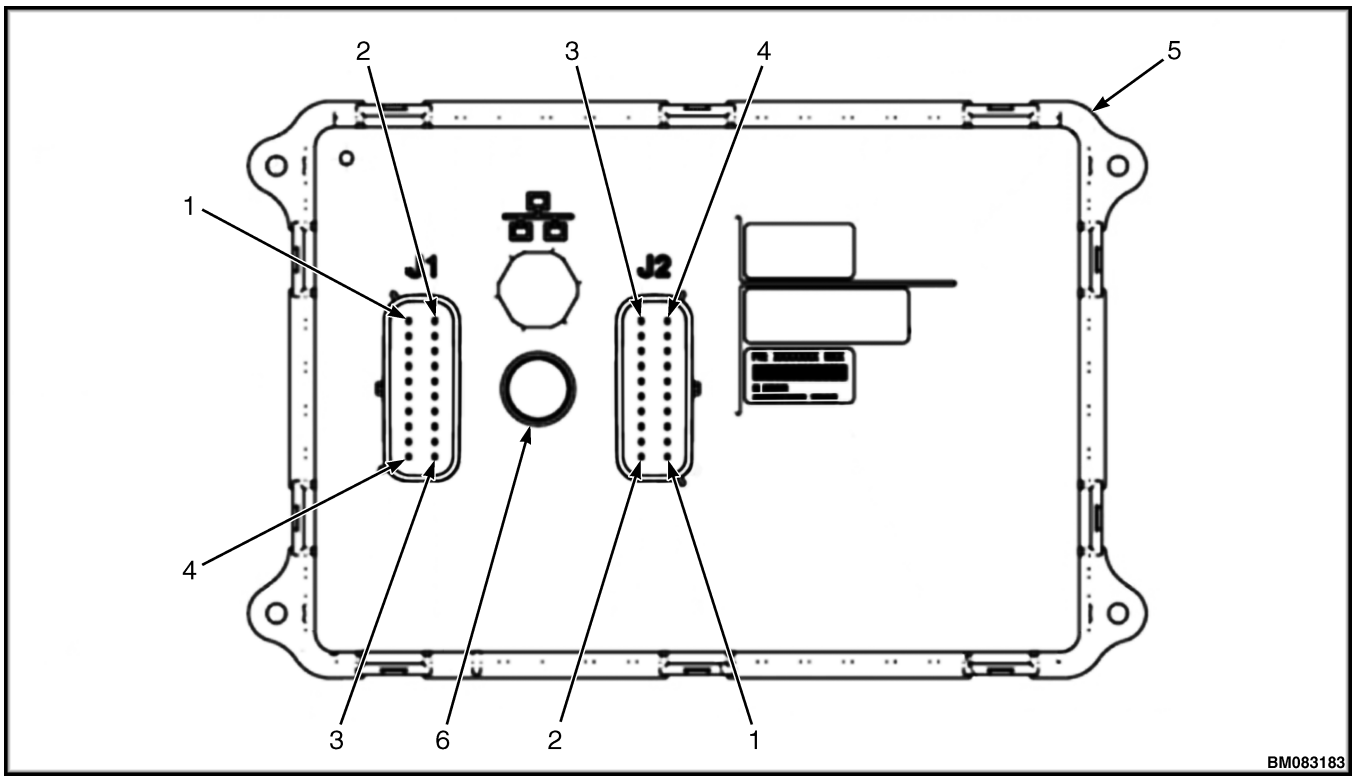
Table 19. J1 connector pinout table (5-inch display) (Continued)

15	USB_D-	USB_D-
16	USB_D+	USB_D+
17	Ground	USB_GND
18	USB_VBUS	USB_VBUS
19	12V Buzzer / Video Supply	VSensor2
20	Low-Side Output	Output1_0A5_LS

Table 20. J2 connector pinout table (5-inch display)

Pin	Type	Description
1	Digital or Frequency Input	Input10_DF
2	Digital or Frequency Input	Input9_DF
3	Not Connected	Not Connected
4	Not Connected	Not Connected
5	Not Connected	Not Connected
6	GND	Video1_GND
7	Power	Video1
8	Not Connected	Not Connected
9	GND	Ground
10	12V Buzzer / Video Supply	VSensor2 (Same as J1-19)
11	GND	Ground
12	GND	Ground
13	Analog or Digital Input	Input8_AD
14	5V	VSensor3
15	Reserved for Test	Reserved for Test
16	Reserved for Test	Reserved for Test
17	Not Connected	Not Connected
18	Not Connected	Not Connected
19	Not Connected	Not Connected
20	Not Connected	Not Connected

Pinout descriptions for the 7-inch display.



1. PIN #10
2. PIN #20
3. PIN #11
4. PIN #1
5. BACKSIDE OF DISPLAY
6. MEMBRANE VENT

Figure 207. 7-inch display

Table 21. J1 and J2 connector pinout table (7-inch display)

Pin	Description	
	J1 Connector Pinout	J2 Connector Pinout
1	Input7_D (Digital Input)	Input10_DF (Digital or Frequency Input)
2	Input1_D (Digital Input)	Input10_DF (Digital or Frequency Input)
3	Input6_D (Digital Input)	CAN2_SHLD
4	Output2_0A5_LS (Low-Side Output)	CAN2_L
5	CAN1_TERM (CAN Termination)	CAN2_H
6	CAN1_SHLD (CAN Shield)	Video1_GND
7	CAN1_L (CAN Low)	Video1
8	CAN1_H (CAN High)	Video2
9	GND (Negative Battery)	Video2_GND

Table 21. J1 and J2 connector pinout table (7-inch display) (Continued)

10	+VBATT (Positive Battery)	VSensor2 (Same as J1-19)
11	Input5_D (Digital Input)	Ground
12	Input4_D (Digital Input)	Ground
13	Input3_D (Digital Input)	Input8_D (Digital Input)
14	Input2_D (Digital Input)	VSensor3 (5V Sensor Supply)
15	USB_D-	Reserved for Test
16	USB_D+	Reserved for Test
17	USB_GND	NC
18	USB_VBUS	NC
19	VSensor2 (Buzzer / Video 12V Supply)	NC
20	Output1_0A5_LS (Low-Side Output)	NC

OPERATOR BUTTONS AND SWITCHES REPAIR 202001-090

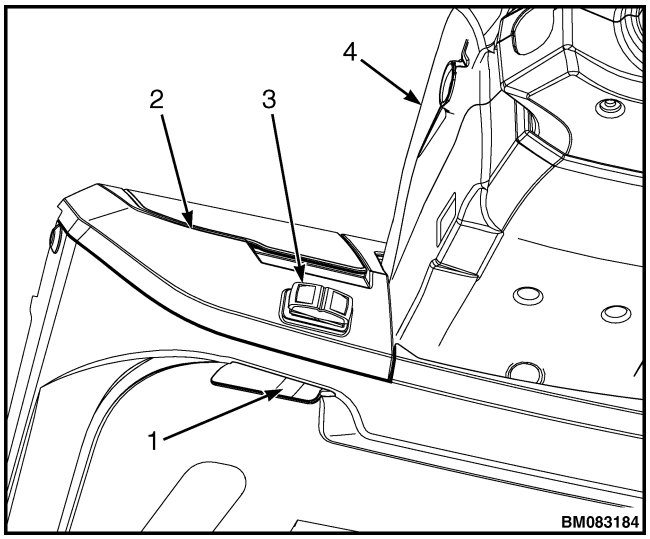
PARK BRAKE ROCKER SWITCH

The park brake rocker switch is located on the left side of the dash.

NOTE: Some parts are not shown for illustrative clarity.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install for details.



1. WIRE HARNESS
2. LEFT HAND DASH
3. PARK BRAKE ROCKER SWITCH
4. STEERING COLUMN COVER

Figure 208. Park brake rocker switch

NOTE: The park brake rocker switch can be accessed from underneath through the opening in the kick panel.

2. Disconnect the wire harness from the park brake rocker switch.

3. Squeeze the spring clips on both sides of the switch, push upward and remove the park brake rocker switch.

Install

1. Install the park brake rocker switch and press firmly to engage the spring clips.

2. Connect the wire harness to the park brake rocker switch.

3. Connect the battery and close the hood. Refer to Battery Remove and Install.

DASH PANEL CONTROL MODULE

The dash panel control module contains up to six rocker switches listed below in order from left to right. If a function is not required a blank will be installed in place of the designated switch.

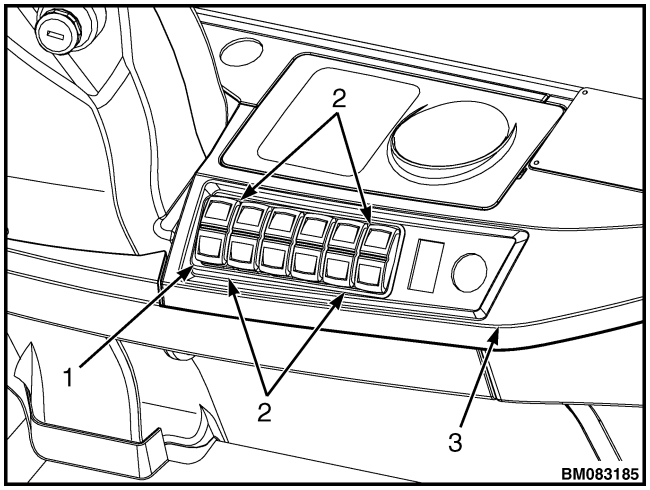
NOTE: The dash panel control module is removed as a unit. Individual switches cannot be removed. If a switch fails the entire control module must be replaced. Individual switch covers, however, can be removed if they become damaged.

1. Work Light
2. Mast-Mounted Work Light
3. Fork Laser Light
4. Hazard Warning Lights
5. LPG or Unleaded (Bi-Fuel option only)
6. Cooling Fan Reverse

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Locate the control module on the right side of dash.

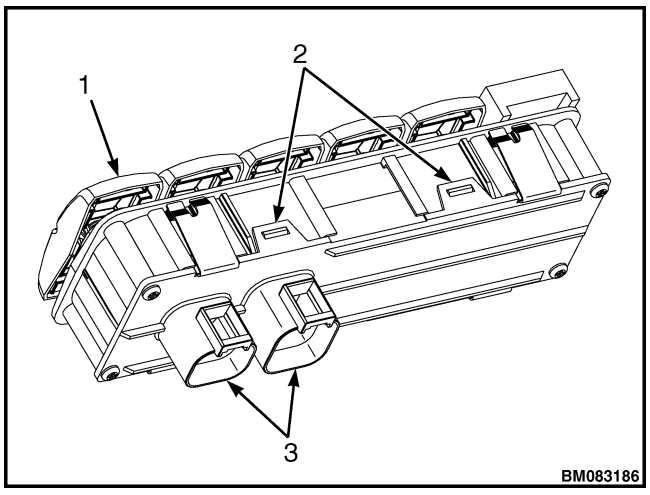


1. CONTROL MODULE
2. TOOL INSERTION LOCATIONS
3. RIGHT SIDE DASH PANEL

Figure 209. Dash panel control module location

3. Gently insert a thin metal tool (such as a small standard screwdriver) at locations shown in Figure 210 to release control module retaining spring clips.

4. Lift the control module upward and disconnect the harness connectors from the backside of the controller.



1. ROCKER SWITCH
2. CONTROL MODULE SPRING TABS
3. HARNESS CONNECTORS

Figure 210. Dash Panel Control Module

5. Remove the control module from the right side dash panel.

Install

1. Connect the harness connectors to the backside of the control module.

2. Press the control module firmly into the right side dash panel until an audible click is heard.

3. Connect the battery and close the hood. Refer to Battery Remove and Install.

CAB PANEL CONTROL MODULE

The cab panel control module contains up to six rocker switches listed below in order from left to right. If a function is not required a blank will be installed in place of the designated switch.

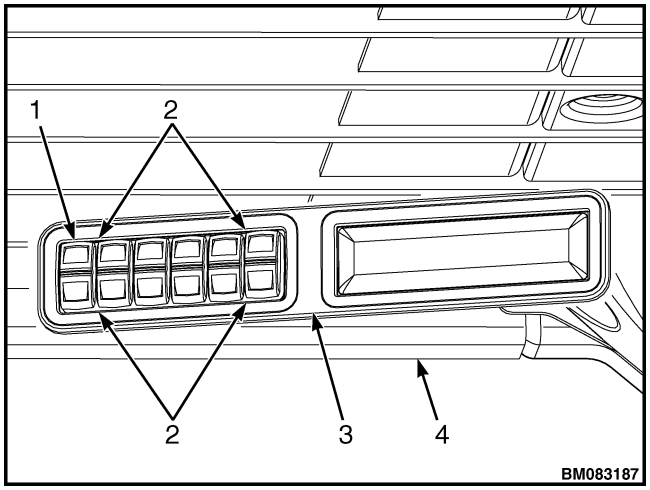
NOTE: The cab control module is removed as a unit. Individual switches cannot be removed. If a switch fails the entire control module must be replaced. Individual switch covers, however, can be removed if they become damaged.

1. Front Wiper and Intermittent
2. Front Wiper, Washer, Single Wipe
3. Top Wiper
4. Rear Wiper, Washer
5. Heated Front Screen
6. Heated Rear Screen

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Locate the control module on the cab headliner.

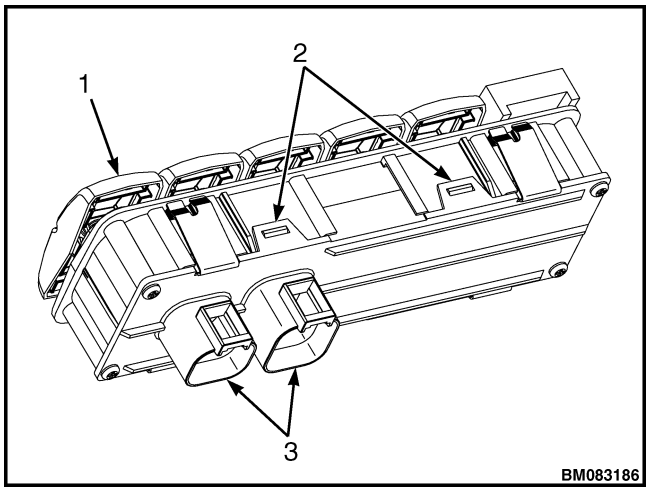


1. CAB PANEL CONTROL MODULE
2. TOOL INSERTION LOCATIONS
3. CONTROL MODULE AND RADIO BEZEL
4. TOP RIGHT OVERHEAD GUARD SUPPORT POST

Figure 211. Cab panel control module location

3. Gently insert a thin metal tool (such as a small standard screwdriver) at locations shown above to release the control module retaining spring clips.

4. Pull the control module outward and disconnect the harness connectors from backside.



1. ROCKER SWITCH
2. CONTROL MODULE SPRING TABS
3. HARNESS CONNECTORS

Figure 212. Cab panel control module

5. Remove the control module from the cab headliner.

Install

1. Connect the harness connectors to the backside of the control module.

2. Install the control module into the cab headliner.

3. Press the cab panel control module firmly into the control module and radio bezel until an audible click is heard.

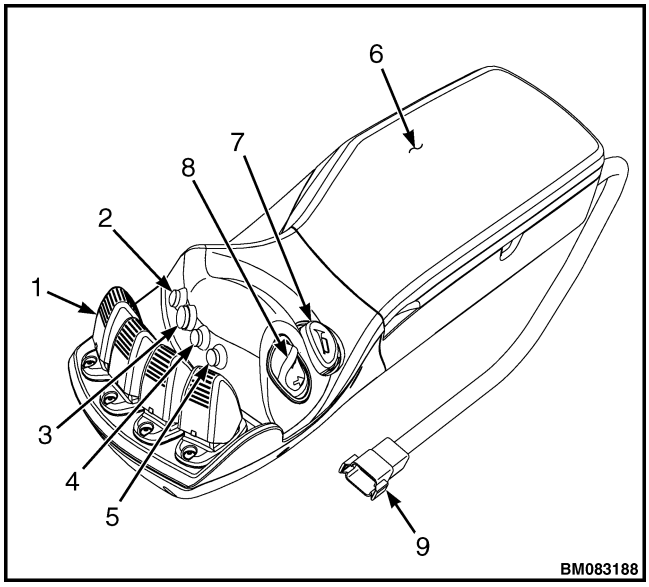
4. Connect the battery and close the hood. Refer to Battery Remove and Install.

MINI-LEVER MODULE

CAUTION

The following procedure should only be performed by trained certified technicians. The removal and replacement of the mini-levers 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: The graphic below illustrates the maximum amount of push buttons and switches available. Configurations will vary depending on available options.

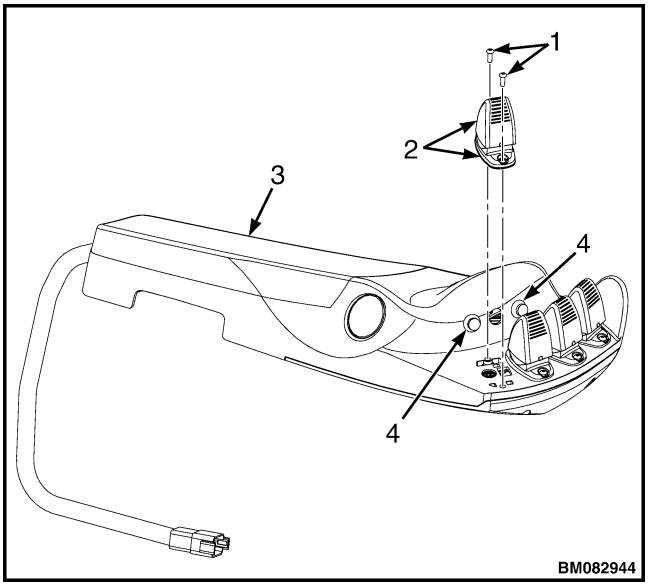


1. MINI-LEVER SWITCHES
2. PUSH BUTTON, UNCLAMP
3. PUSH BUTTON, DUAL FUNCTION
4. PUSH BUTTON, RETURN TO SET TILT (RTST) OVERRIDE
5. PUSH BUTTON, SHELF HEIGHT SELECT OVERRIDE
6. CUSHION COMPARTMENT LID
7. HORN SWITCH
8. DIRECTION CONTROL SWITCH
9. HARNESS CONNECTOR

Figure 213. Armrest and levers

Remove

1. Remove the two button head capscrews and mini-lever from the armrest.



1. BUTTON HEAD CAPSCREWS
2. MINI-LEVER
3. ARMREST
4. PUSH (OVERRIDE) BUTTON

Figure 214. Mini-lever removal

Install

NOTE: Before installing the new mini-lever, check Parts Manual for correct part number to the ensure correct mini-lever is being installed.

1. Install the new mini-lever onto the armrest using two button head capscrews.

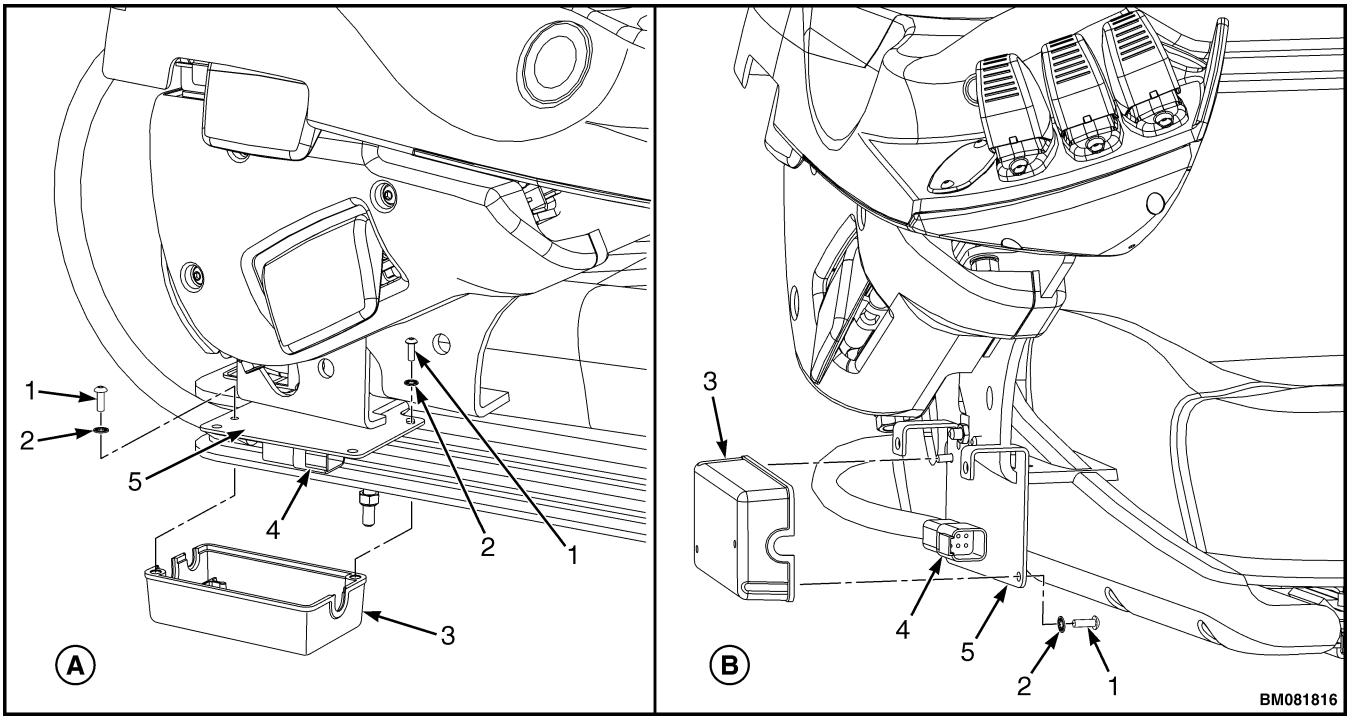
ARMREST ASSEMBLY

Remove

1. Open the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the two capscrews and washers from the cover plate and remove the seat box. Disconnect the main control wire harness from the armrest harness.

NOTE: Some parts and electrical connections removed for clarity.

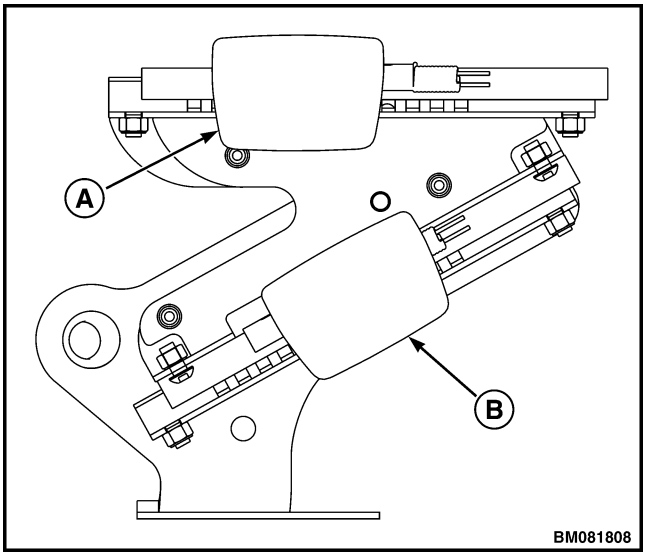


A. FULL SUSPENSION AND SWIVEL SEATS
B. NON SUSPENSION SEATS

1. CAPSCREWS
2. WASHERS
3. SEAT BOX
4. ARMREST HARNESS CONNECTOR
5. COVER PLATE

Figure 215. Seat box cover removal

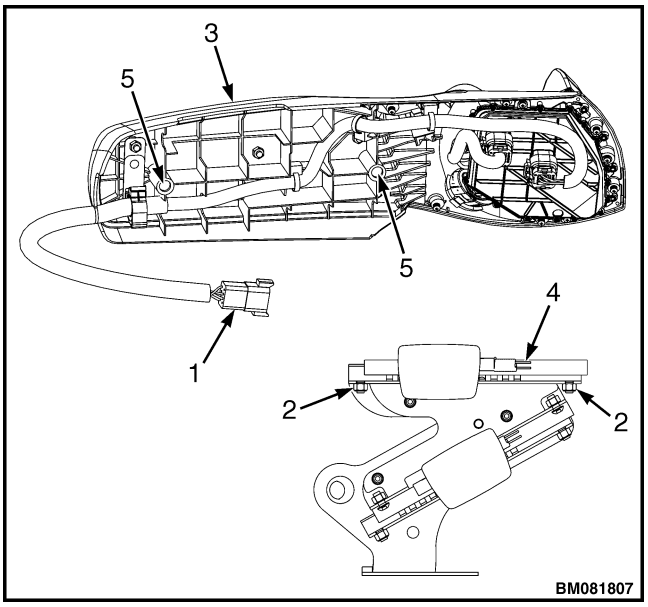
3. Pull up on the handle and slide the armrest all the way forward and remove the flange capscrews from under the armrest mounting bracket that attaches the armrest to mounting bracket. Pull up on the handle and slide the armrest all the way back and remove the other flange capscrews.



A. HANDLE MOVES ARMREST FORWARD OR BACKWARD
B. HANDLE MOVES ARMREST UP OR DOWN

Figure 216. Armrest adjustment handles

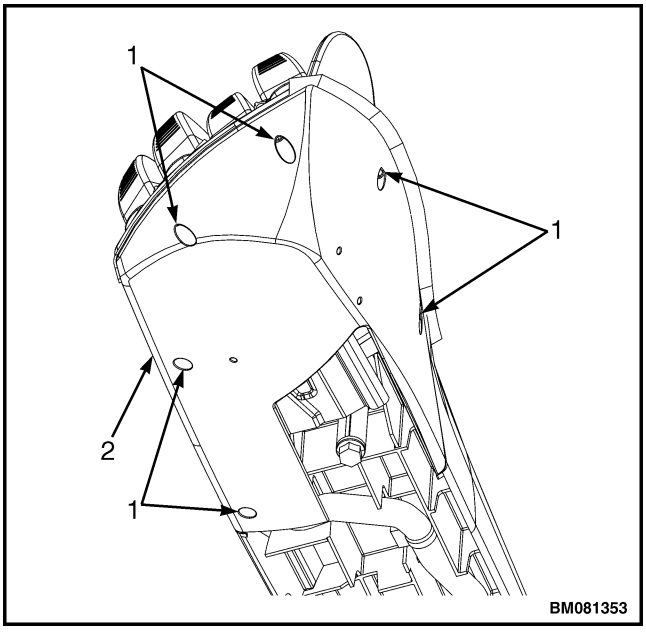
4. Remove armrest from armrest mounting bracket.



1. CONTROL WIRE HARNESS
2. FLANGE CAPSCREWS
3. ARMREST
4. ARMREST MOUNTING BRACKET
5. HOLES FOR FLANGE CAPSCREWS

Figure 217. Armrest and mounting bracket

5. Remove the six socket head screws that fasten the bottom and top armrest covers together. Remove the bottom armrest cover from the armrest.



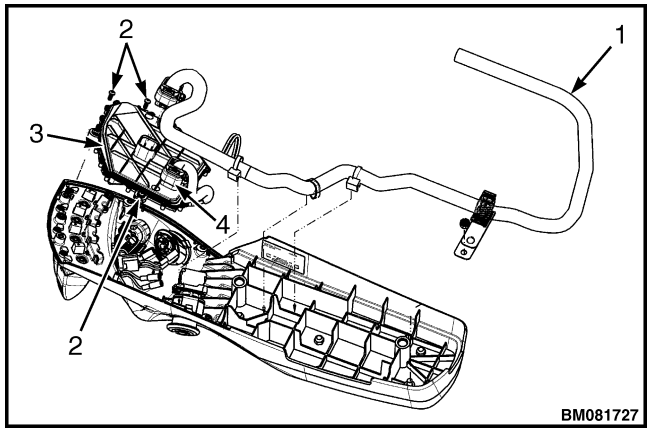
1. SOCKET HEAD SCREWS
2. BOTTOM ARMREST COVER

Figure 218. Bottom armrest cover removal

NOTE: The push (override) buttons operate optional features. The lift truck may be equipped with more than one push (override) button depending on the number of hydraulic functions on the lift truck. If the lift truck is not equipped with this feature, there will be a plug covering the electrical connector on the PCB (Printed Circuit Board) cassette.

6. Disconnect the push (override) button connector from the PCB cassette.

7. Remove the three socket screws from the PCB cassette and remove the PCB cassette from the armrest.



1. TO CONTROL WIRE HARNESS
2. SOCKET HEAD SCREWS
3. PCB CASSETTE
4. PUSH (OVERRIDE) BUTTON CONNECTOR

Figure 219. PCB cassette removal

Install

1. Install the PCB cassette to the armrest with three socket head screws.

2. If the lift truck is equipped, connect the push (override) button connector to the PCB cassette.

3. Install the bottom armrest cover to the armrest with six socket head screws.

4. Install the armrest onto the mounting bracket with flange capscrews. Tighten the flange capscrews to 13 to 15 N•m (115 to 132 lbf in).

5. Connect the wire harness to the armrest. Install the seat box to the cover plate with two capscrews and washers. Tighten capscrews to 1.2 N•m (10.6 lbf in).

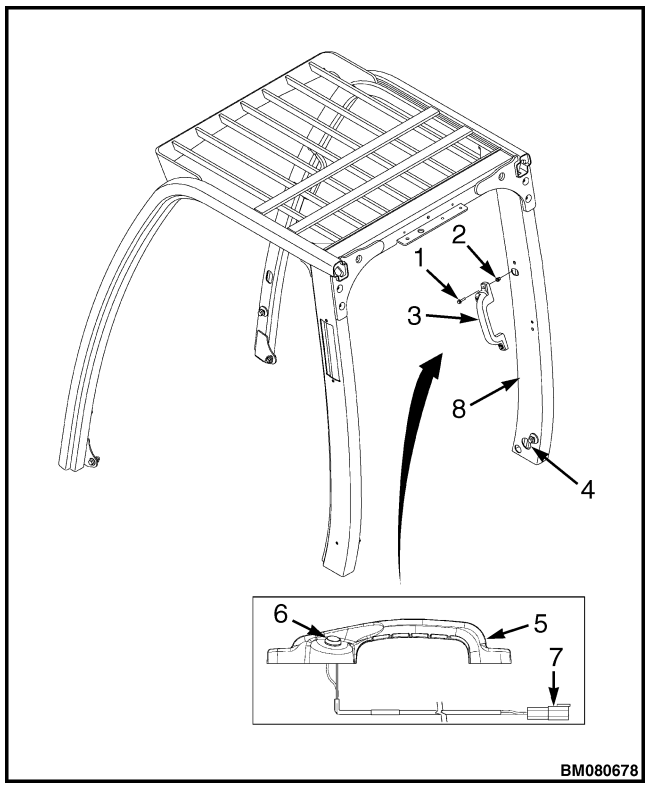
6. Connect the battery and close the hood. Refer to Battery Remove and Install.

REAR DRIVE HANDLE WITH HORN BUTTON

A rear drive handle (with horn button) is located on the right, rear overhead guard leg. The addition of the horn button allows an operator to use the horn while reverse driving without having to remove their hands from the steering wheel.

Remove

1. Raise hood and disconnect battery. Refer to Battery Remove and Install.



1. CAPSCREWS
2. INSERT
3. HANDLE AND SWITCH ASSEMBLY
4. HOLE
5. HANDLE
6. REAR HORN BUTTON SWITCH
7. ELECTRICAL CONNECTOR
8. OVERHEAD GUARD LEG

Figure 220. Rear drive handle and horn button

2. Disconnect the rear horn button switch electrical connector from the chassis harness.

3. Remove the two capscrews and inserts that attach the rear horn button switch and handle to the right rear overhead guard leg.

4. Remove the switch and handle assembly from the overhead guard leg, pulling the wire and connector through the holes in the overhead guard leg.

Install

1. Insert the wire and connector in the hole in the overhead guard leg and thread wire until the connector can be pulled through bottom hole in the overhead guard leg.

2. Attach the handle and switch assembly to the overhead guard leg with the two capscrews and inserts. Torque capscrews to 2.55–2.75 N•m (22.6–24.3 lbf in).

3. Connect the rear horn switch electrical connector to the chassis harness.

4. Connect the battery and close the hood. Refer to Battery Remove and Install.

STEERING WHEEL HORN SWITCH

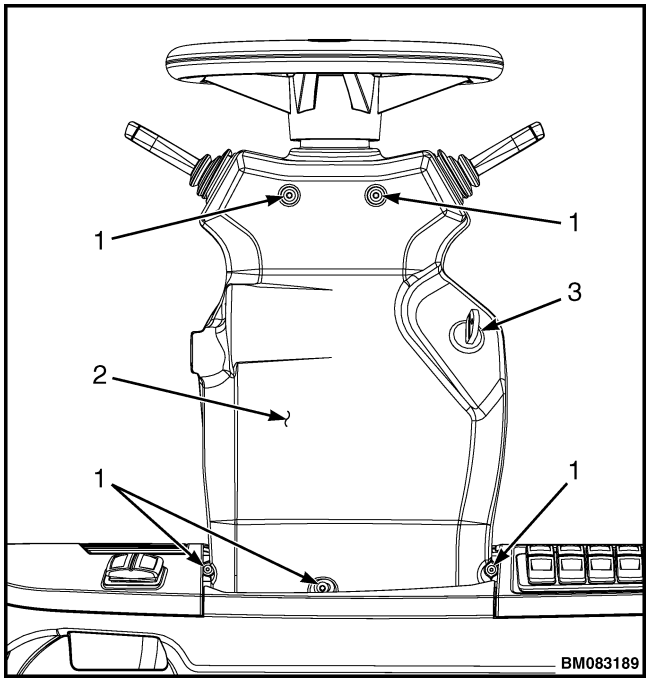
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the ignition switch. Refer to Truck start switch for details.

3. Remove the five screws and rear steering column cover.

NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate the two covers.



1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

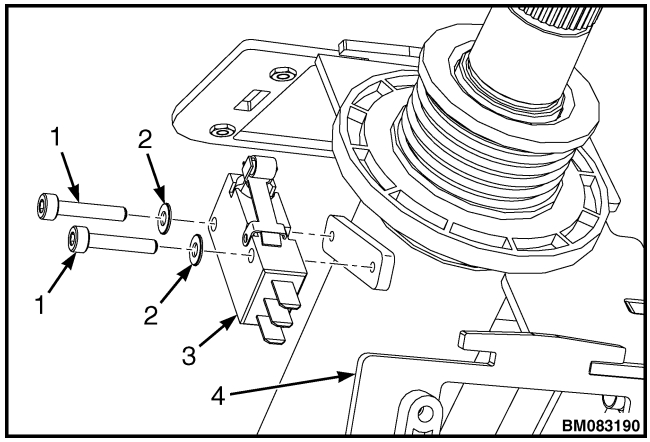
Figure 221. Steering column cover

4. Remove the turn signal (or direction control lever) for access to the horn switch electrical connector. See Direction control lever (steering column) or Turn signal lever.

5. Disconnect the horn switch electrical connector.

6. Remove the two screws and two washers securing the horn switch to front lever bracket.

NOTE: The front lever bracket has been removed from the graphic for clarity.



1. SCREWS
2. WASHERS
3. HORN SWITCH
4. LEFT LEVER BRACKET

Figure 222. Horn switch

7. Remove the horn switch.

Install

1. Install the horn switch.

2. Secure the horn switch to the front lever bracket with the two screws and two washers.

3. Connect the horn switch electrical connector.

4. Install the turn signal (or direction control lever). See Direction control lever (steering column) or Turn signal lever.

5. Install the steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).

6. Install the ignition switch. Refer to Truck start switch for details.

7. Connect the battery and close the hood. Refer to Battery Remove and Install.

DIRECTION CONTROL LEVER (STEERING COLUMN)

NOTE: The direction control lever (FNR) is located on the left side of the steering column.

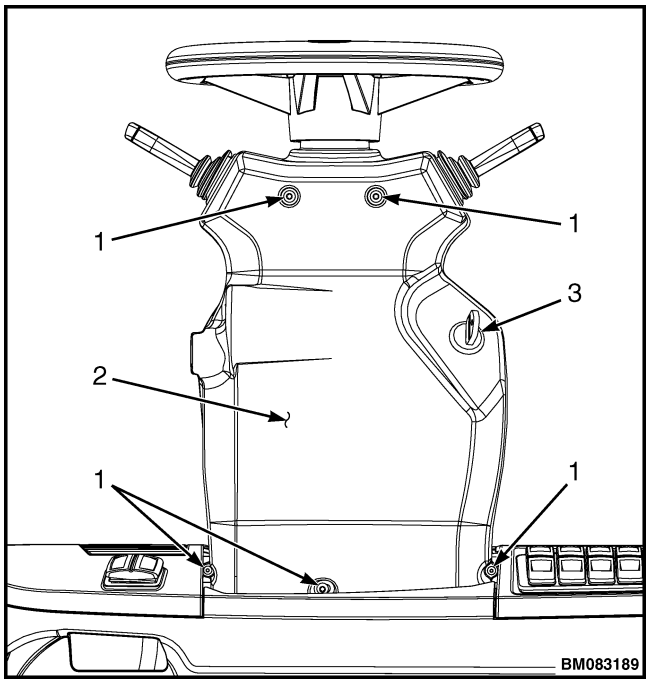
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the ignition switch. Refer to Truck start switch for details.

3. Remove the five screws and rear steering column cover.

NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate to two covers.

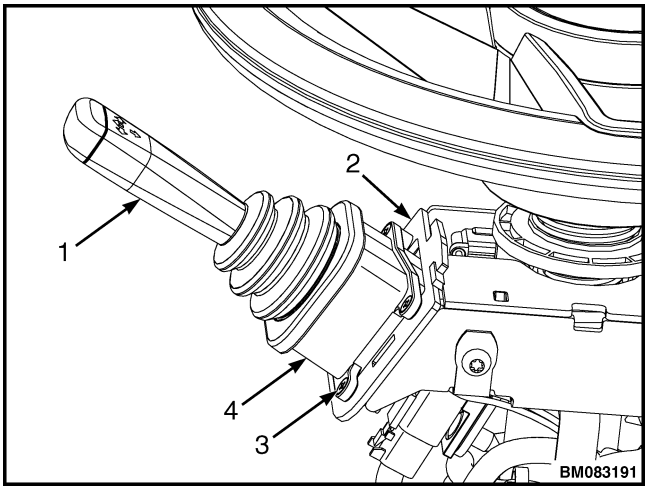


1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

Figure 223. Steering Column Cover

4. Disconnect the lever assembly electrical connector on right side of steering column.

5. Remove the four screws securing the adapter and lever assembly to the lever bracket.



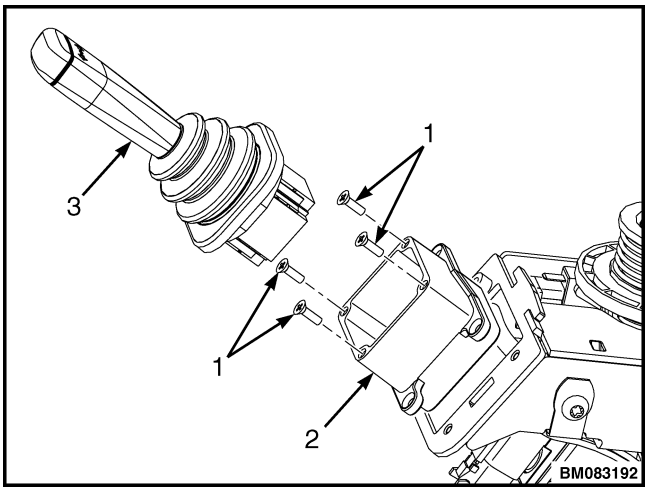
1. LEVER ASSEMBLY
2. LEVER BRACKET
3. SCREWS
4. ADAPTER

Figure 224. Direction (FNR) control lever

6. Remove the adapter and lever assembly from lever the bracket.

7. Remove the four screws securing the lever assembly to the adapter.

NOTE: Steering wheel removed from the graphic for clarity.



1. SCREWS
2. ADAPTER
3. LEVER ASSEMBLY

Figure 225. Lever assembly and adapter

8. Remove the lever assembly from the adapter.

Install

1. Install the lever assembly to the adapter.

2. Secure the lever assembly to the adapter with the four screws. Torque screws to 0.66 N•m (5.8 lbf in).

3. Install the lever assembly and adapter to the lever bracket.

4. Secure the lever assembly and adapter to the lever bracket with the four screws. Torque screws to 0.66 N•m (5.8 lbf in).

5. Connect the lever assembly electrical connector on the right side of the steering column.

6. Install steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).

7. Install the ignition switch. Refer to Truck start switch for details.

8. Connect the battery and close the hood. Refer to Battery Remove and Install.

TURN SIGNAL LEVER

NOTE: The turn signal lever may be located on either the left or right side of the steering column, both remove and install the same way. Only one view will be shown in this procedure.

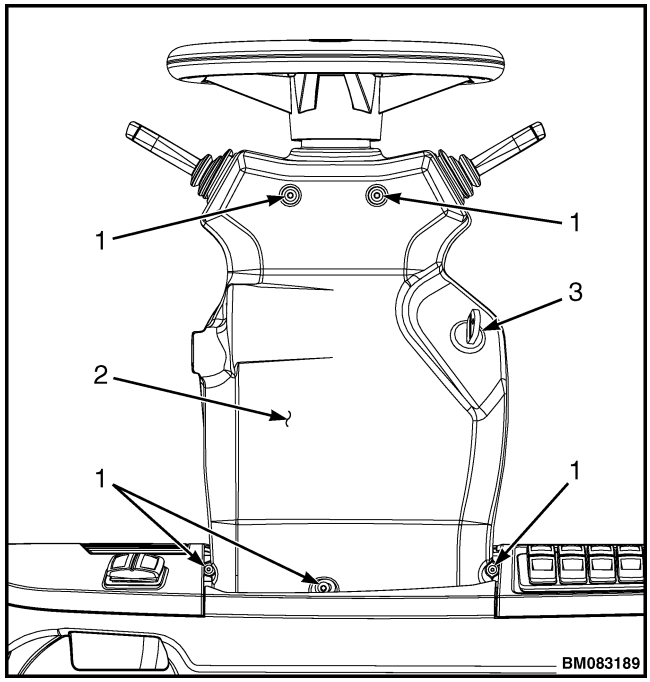
Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the ignition switch. Refer to Truck start switch for details.

3. Remove the five screws and rear steering column cover.

NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate to two covers.

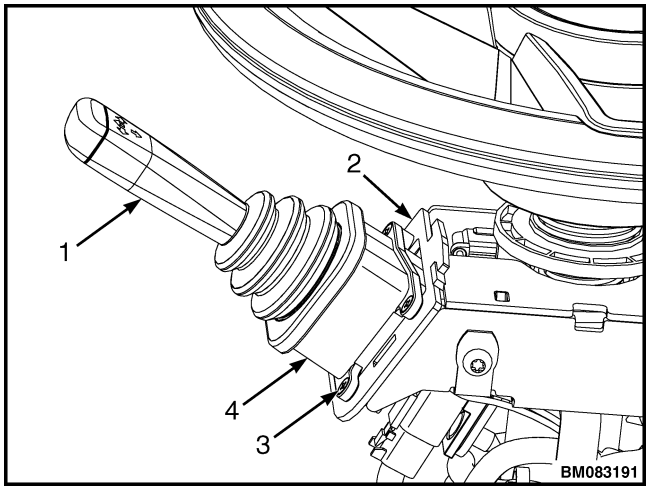


1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

Figure 226. Steering column cover

4. Disconnect the turn signal lever assembly electrical connector on the right (or left) side of the steering column.

5. Remove the four screws securing the adapter and turn signal lever assembly to the lever bracket.



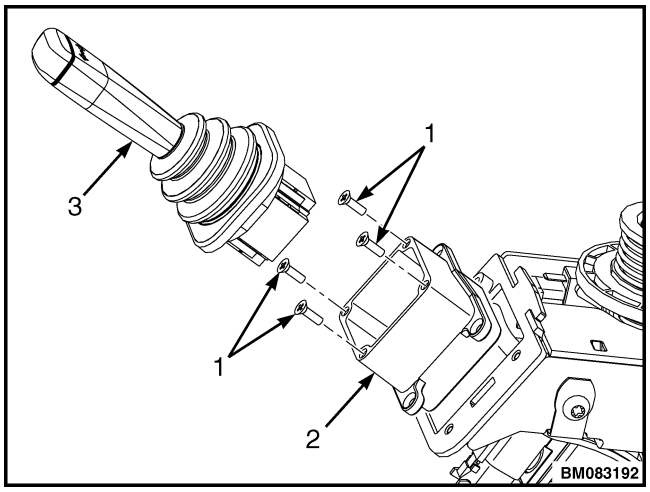
1. TURN SIGNAL LEVER ASSEMBLY
2. LEVER BRACKET
3. SCREWS
4. ADAPTER

Figure 227. Turn signal lever

6. Remove the adapter and turn signal lever assembly from the lever bracket.

7. Remove the four screws securing the turn signal lever assembly to adapter.

NOTE: Steering wheel removed from the graphic for clarity.



1. SCREWS
2. ADAPTER
3. TURN SIGNAL LEVER ASSEMBLY

Figure 228. Turn signal lever assembly and adapter

8. Remove the turn signal lever assembly from the adapter.

Install

1. Install the lever assembly to the adapter.
2. Secure the lever assembly to the adapter with four screws. Torque screws to 0.66 N•m (5.8 lbf in).
3. Install the lever assembly and adapter to the lever bracket.
4. Secure the lever assembly and adapter to the lever bracket with the four screws. Torque screws to 0.66 N•m (5.8 lbf in).
5. Connect the lever assembly electrical connector on the right side of steering column.
6. Install the steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).
7. Install the ignition switch. Refer to Truck start switch for details.
8. Connect the battery and close the hood. Refer to Battery Remove and Install.

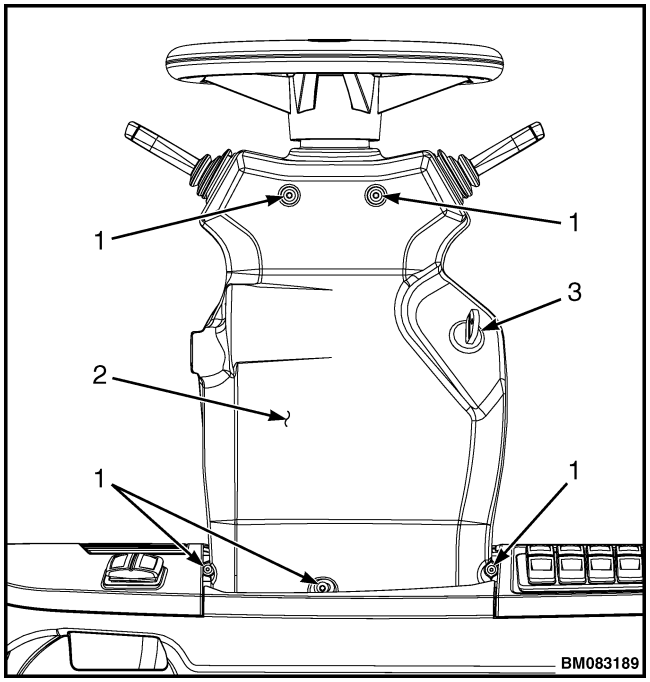
WIPER CONTROL LEVER

NOTE: The wiper control lever is located on the right side of the steering column.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.
2. Remove the ignition switch. Refer to Truck start switch for details.
3. Remove the five screws and rear steering column cover.

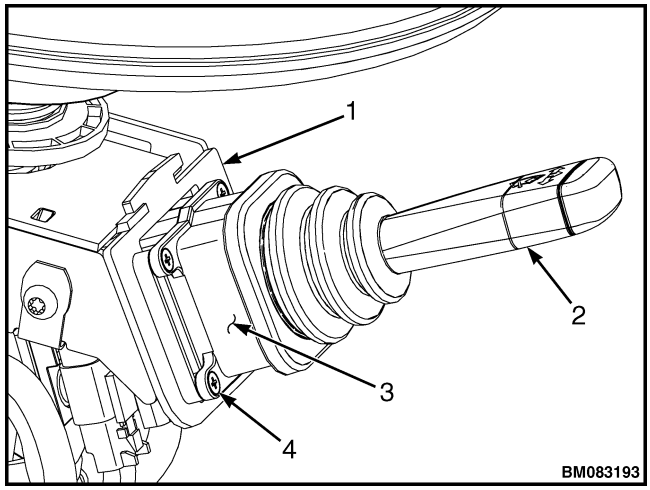
NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate the two covers.



1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

Figure 229. Steering column cover

4. Disconnect the wiper control lever assembly electrical connector on the right side of the steering column.
5. Remove the four screws securing the adapter and wiper control lever assembly to the lever bracket.



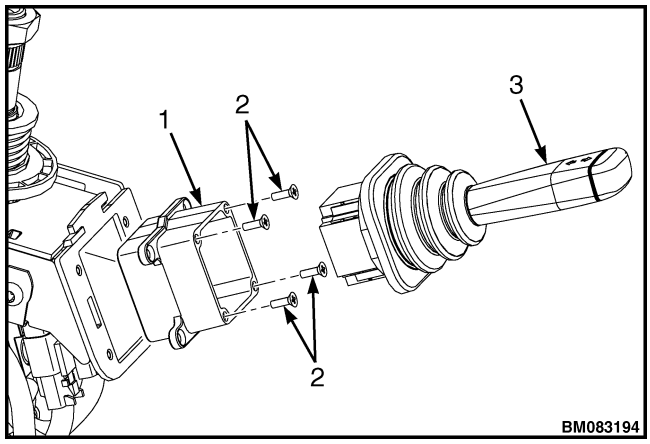
1. LEVER BRACKET
2. WIPER CONTROL LEVER ASSEMBLY
3. ADAPTER
4. SCREWS

Figure 230. Wiper control lever

6. Remove the adapter and wiper control lever assembly from the lever bracket.

7. Remove the four screws securing the wiper control lever assembly to the adapter.

NOTE: Steering wheel removed from the graphic for clarity.



1. ADAPTER
2. SCREWS
3. WIPER CONTROL LEVER ASSEMBLY

Figure 231. Wiper control lever assembly and adapter

8. Remove the wiper control lever assembly from the adapter.

Install

1. Install the lever assembly to the adapter.

2. Secure the lever assembly to the adapter with the four screws. Torque screws to 0.66 N•m (5.8 lbf in).

3. Install the lever assembly and adapter to the lever bracket.

4. Secure the lever assembly and adapter to the lever bracket with the four screws. Torque screws to 0.66 N•m (5.8 lbf in).

5. Connect the lever assembly electrical connector on right side of steering column.

6. Install the steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).

7. Install the ignition switch. Refer to Truck start switch for details.

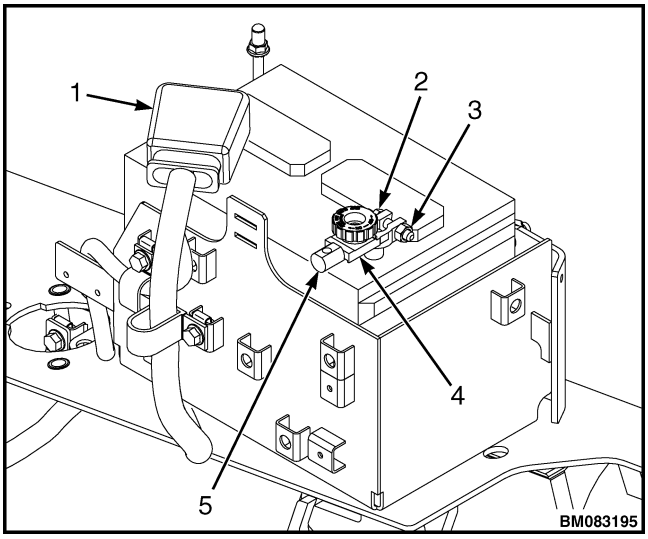
8. Connect the battery and close the hood. Refer to Battery Remove and Install.

BATTERY DISCONNECT SWITCH

NOTE: The battery disconnect switch is located on the battery negative post.

Remove

1. Open the hood and turn the disconnect switch to the **OFF** position.



1. POSITIVE BATTERY CABLE BOOT
2. DISCONNECT SWITCH BOLT
3. DISCONNECT SWITCH NUT
4. DISCONNECT SWITCH
5. NEGATIVE BATTERY CABLE (NOT SHOWN)

Figure 232. Disconnect Switch

2. Remove the disconnect switch bolt and nut.

3. Remove the negative battery cable bolt and nut (not shown).

4. Remove the negative battery cable from the disconnect switch.

5. Remove the disconnect switch from the battery post.

Install

1. Install the disconnect switch on the battery post.

2. Insert the negative battery cable into the disconnect switch.

3. Insert the negative battery cable bolt and nut. Tighten nut securely.

4. Install the disconnect switch bolt and nut. Tighten nut securely.

5. Close the hood.

TRUCK START SWITCH

The truck start switch will be one of the following types: with a key, without a key and with a knob, push button, or push button with remote key.

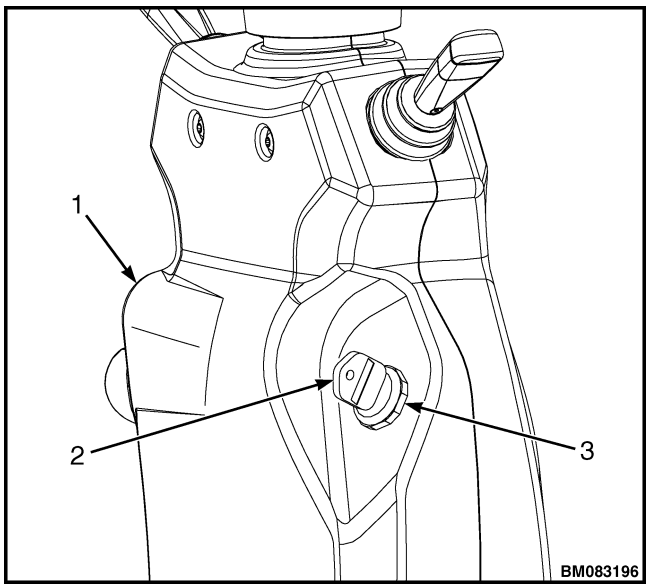
Keyed switch

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the key from the ignition switch.

3. Remove the facenut from the ignition switch.

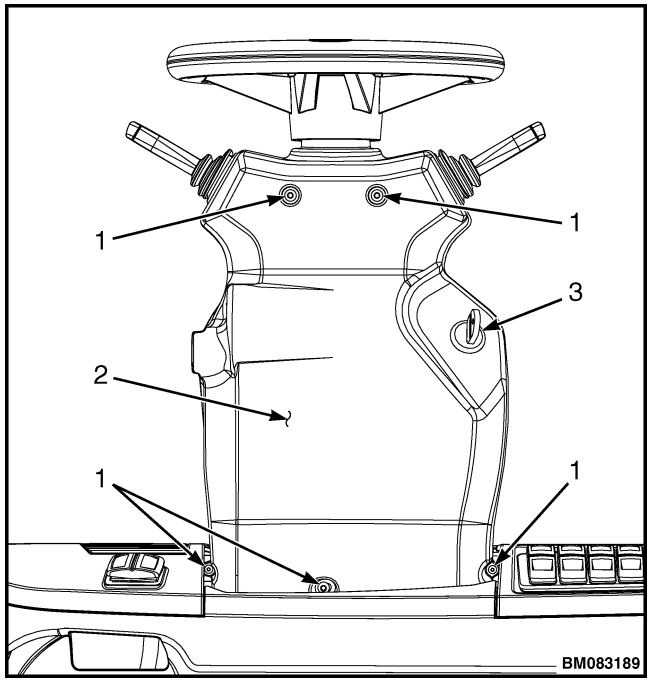


1. STEERING COLUMN COVER
2. KEY
3. FACENUT

Figure 233. Ignition switch with key

4. Remove the five screws and rear steering column cover.

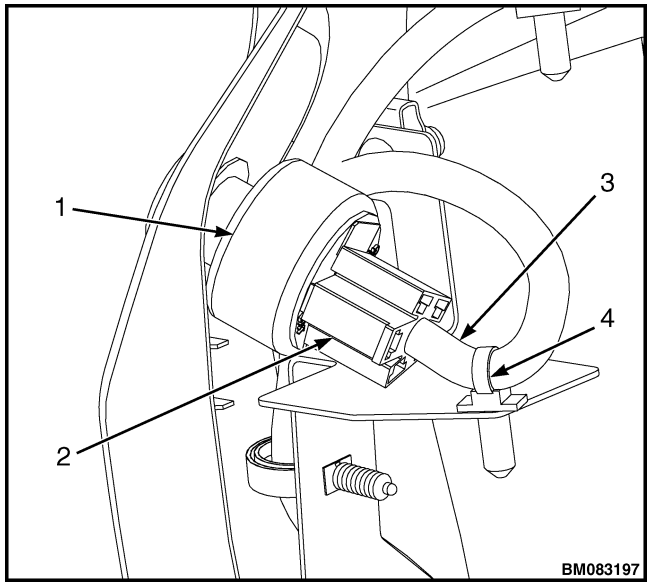
NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate the two covers.



1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. IGNITION SWITCH

Figure 234. Steering column cover

5. Remove the cable clip from the wire harness.



1. IGNITION SWITCH
2. ELECTRICAL CONNECTOR
3. WIRE HARNESS
4. CABLE CLIP

Figure 235. Ignition switch and connector

6. Disconnect the ignition switch electrical connector from the ignition switch.

7. Remove ignition switch.

Install

1. Install the ignition switch.

2. Connect the ignition switch electrical connector to the ignition switch.

3. Install the cable clip to the wire harness.

4. Install the facenut on the ignition switch and tighten.

5. Install the steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).

6. Insert the key in the ignition switch.

7. Connect the battery and close the hood. Refer to Battery Remove and Install.

Keyless switch with Knob

NOTE: The keyless switch with knob removes and installs the same as the keyed switch. The only difference is a molded knob with a key blank (metal insert) in place of a key.

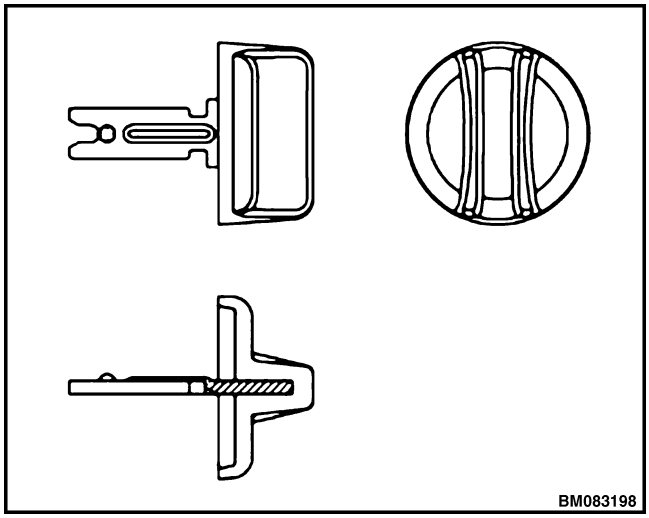


Figure 236. Molded knob with key blank

For remove and install follow Keyed switch procedures.

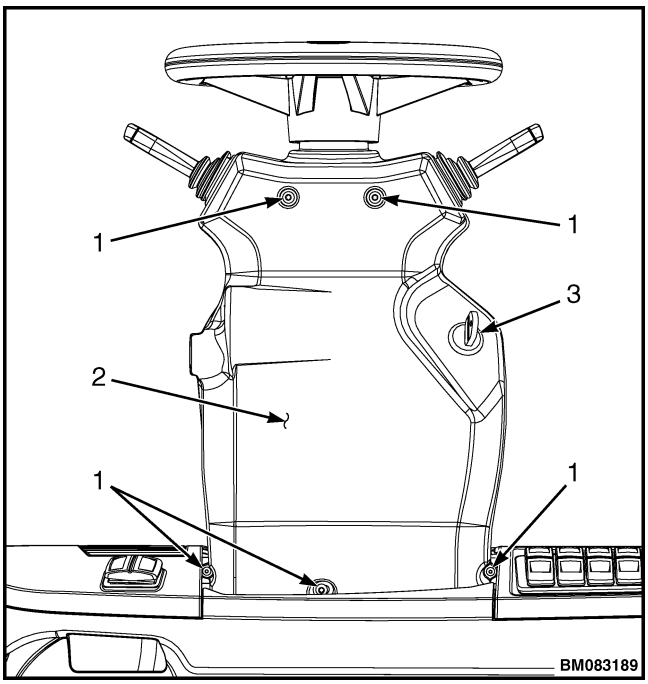
Push button switch

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.

2. Remove the five screws and rear steering column cover.

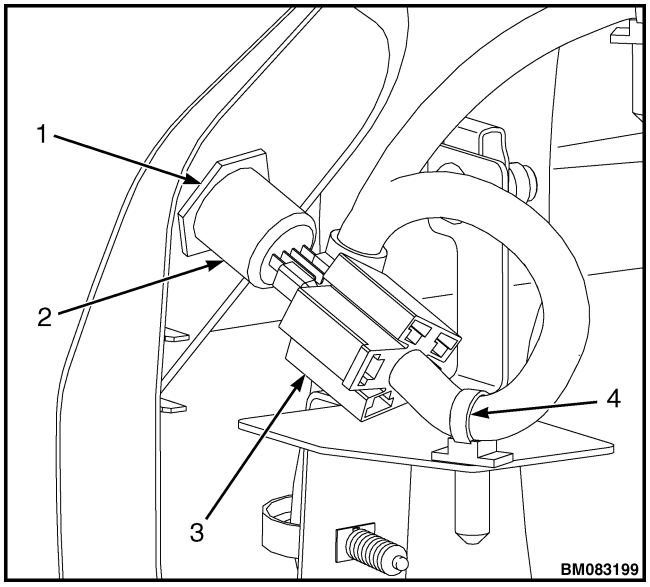
NOTE: Two spring clips also connect the front and rear steering column covers. Use a screwdriver to separate the two covers.



1. TORX SCREWS
2. REAR STEERING COLUMN COVER
3. PUSH BUTTON SWITCH

Figure 237. Steering column cover

3. Remove the cable clip from the wire harness.



1. NUT
2. PUSH BUTTON SWITCH
3. ELECTRICAL CONNECTOR
4. CABLE CLIP

Figure 238. Push button switch and connector

4. Disconnect the electrical connector from the push button switch.

5. Remove the nut.

6. Remove the push button switch from the steering column cover.

Install

1. Install the push button switch into the steering column cover.

2. Install and tighten the nut.

3. Connect the electrical connector to the push button switch.

4. Install the cable clip to the wire harness.

5. Install the steering column covers. Torque screws to 2.55–2.75 N•m (22.6–24.3 lbf in).

6. Connect the battery and close the hood. Refer to Battery Remove and Install.

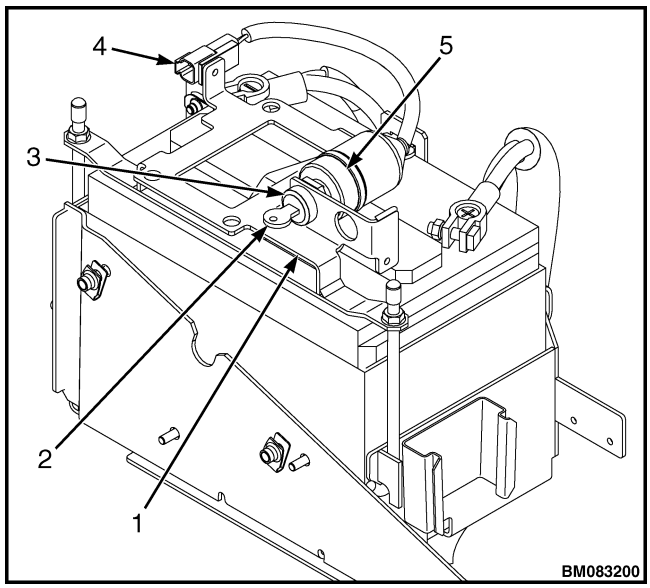
Push button with remote key switch

NOTE: The remote key switch (ON-OFF) is located under the right side of the seat and connects (or disconnects) power to the push button switch. To operate, turn the switch to the ON position and press start push button.

For push button remove and install refer to Push button switch. This section will focus on the remote key switch.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.
2. Disconnect the wire harness connector and remove from the battery hold down bracket.



1. BATTERY HOLD DOWN BRACKET
2. KEY
3. KNURLED FACENUT
4. WIRE HARNESS CONNECTOR
5. SWITCH ASSEMBLY

Figure 239. Remote with key switch

3. Remove the key from the switch assembly.
4. Remove the knurled facenut from the switch assembly.
5. Remove the switch assembly from the battery hold down bracket.

Install

1. Install the switch assembly to the battery hold down bracket.
2. Attach the knurled facenut switch assembly and tighten.
3. Insert the key into the switch assembly.
4. Connect the wire harness connector to the battery hold down bracket.
5. Connect the battery and close the hood. Refer to Battery Remove and Install.

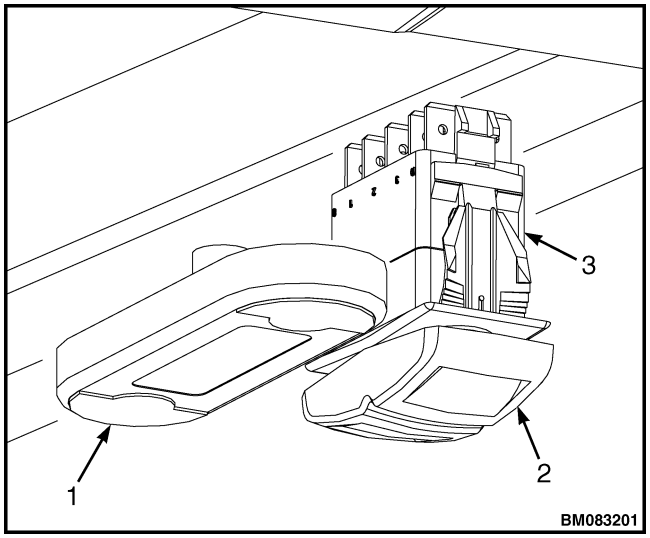
DOME LIGHT SWITCH

The dome light rocker switch is located on the right side of the cab and is mounted in the headliner.

NOTE: Headliner graphic is currently unavailable at this time.

Remove

1. Raise the hood and disconnect the battery. Refer to Battery Remove and Install.
2. Gently pry the rocker switch from the headliner.



1. DOME LIGHT
2. ROCKER SWITCH
3. CONNECTOR

Figure 240. Dome light and rocker switch

3. Disconnect the electrical connector.

4. Remove the rocker switch from the headliner.

Install

1. Connect the electrical connector.
2. Insert the rocker switch into the headliner.
3. Connect the battery and close the hood. Refer to Battery Remove and Install.

E-HYDRAULIC CONTROLS REPAIR 202001-091

WARNING

Discharge capacitors as directed in General section at the beginning of this manual.

Disconnect the battery before doing any work on the electrical system. Serious injury to personnel and/or damage to lift truck components can occur if battery is not disconnected.

CAUTION

A short circuit and damage can occur if wires are not installed correctly. Make sure wire connectors do not touch the other metal terminals or wire connectors, metal brackets, or the bracket mounting nuts. Make sure the wires are not pulled tight and are not touching other parts to damage the insulation.

E-HYDRAULIC CONTROLS - TEST

Mini-levers

Perform all of the following test procedures to ensure mini-levers operate properly.

See User interface (display) for instructions to view Lever output Value. With Service Password, view Diagnostics – Hydraulic Data Display – Hydraulic Input.

Full stroke test

Check for full stroke of mini-lever. Use the Display Switch Cluster (DSC) or install the Service Tool to monitor functions.

1. Operate each lever to full stroke, forward and backward, and allow lever to snap back to center.
2. **(DO NOT start)**. Turn key switch to **ON** position.
3. Display the electro-hydraulic diagnostics menu on the dash display panel. Operate each lever to full stroke forward and read input.
   - Is lever output ≥ -92%?
   - **YES:** Go to Step 4.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
4. Operate each lever to full stroke backward and read input.
   - Is lever output ≥ +92%?
   - **YES:** Mini-lever is supplying full stroke.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
5. If mini-lever continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online.**

Function returns to neutral test

Check to confirm function returns to neutral (0%). Use DSC or install the Service Tool to monitor functions.

1. Stroke each lever to full stroke, forward and backward, and allow lever to snap back to center.
2. **(DO NOT start)**. Turn key switch to **ON** position.
3. Display the electro-hydraulic diagnostics menu on the dash display panel.
   - Is each lever output = 0%?
   - **YES:** Go to Step 4.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
4. Operate each lever to full stroke forward and slowly release (1-2 seconds from full stroke). Read output when fully released.
   - Is each lever output = 0%?
   - **YES:** Go to Step 5.

- **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

5. Operate each lever to full stroke back and slowly release (1-2 seconds from full stroke). Read output when fully released.

- Is each lever output = 0%?
- **YES:** Mini-lever function is returning to neutral.
- **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

6. If mini-lever continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online**.

Push (override) button

1. Operate the push (override) button to confirm it is functioning properly.

2. If system does not function, see procedures below for repair or replacement. Upon completion, rerun the test.

3. If push (override) button continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online**.

GENERAL

WARNING

Before replacing any part of the electronic hydraulic control assembly, fully lower all parts of the mast and tilt it forward until the tips of forks touch the ground. This action will prevent mast from lowering suddenly if the control lever is accidently moved.

WARNING

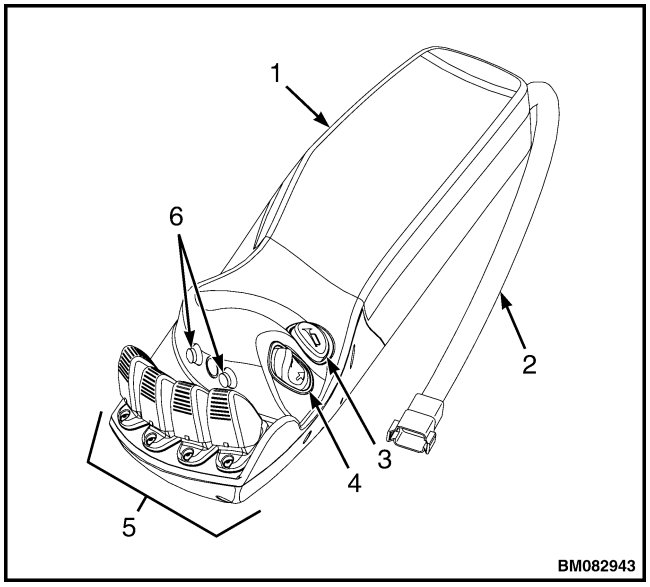
Never wear any metallic items on your fingers, arms, or neck. Metal items can accidently make an electrical connection and cause an injury.

NOTE: Prior to performing the following procedures, the E-hydraulic controls - TEST must be performed.

NOTE: The mini-levers do not need to be calibrated.

NOTE: The Direction Control Switch (DCS) is an optional feature on lift trucks equipped with electronic-hydraulic controls. See Figure 241.

The line of trucks covered in this manual come standard with manual hydraulic levers, but have the option of using electronic-hydraulic controls. See Figure 241. If the Mini-Levers Module (MLM), or mini-levers malfunction, replace with new part. See the **Parts Manual** for replacement parts.



1. ARMREST
2. TO WIRE HARNESS
3. HORN BUTTON
4. DIRECTION CONTROL SWITCH
5. MINI-LEVERS
6. PUSH (OVERRIDE) BUTTON

Figure 241. E-Hydraulic controls arrangement

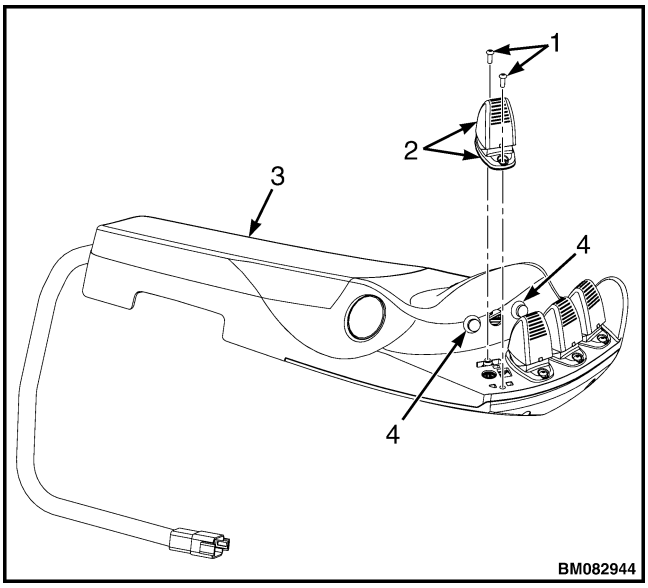
MINI-LEVERS, REMOVE AND INSTALL

CAUTION

The following procedure should only be performed by Hyster trained certified technicians. The removal and replacement of the mini-levers 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.

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Remove two capscrews and mini-lever from armrest. See Figure 242.



1. CAPSCREWS
2. MINI-LEVER
3. ARMREST
4. PUSH (OVERRIDE) BUTTON

Figure 242. Mini-lever removal

NOTE: Before installing new mini-lever, check **Parts Manual** for correct part number to be sure correct mini-lever is being installed.

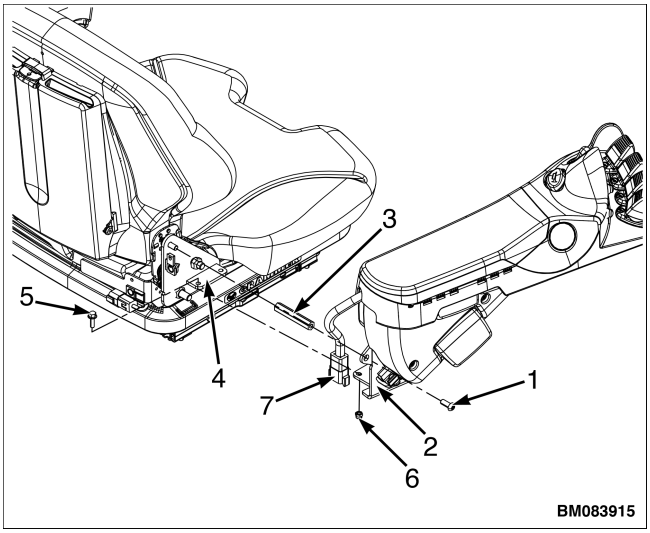
3. Install new mini-lever onto armrest using two capscrews. See Figure 242.

ARMREST ASSEMBLY

Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Disconnect the main E-Hydraulic control wire harness from E-Hydraulic armrest harness. See Figure 243.

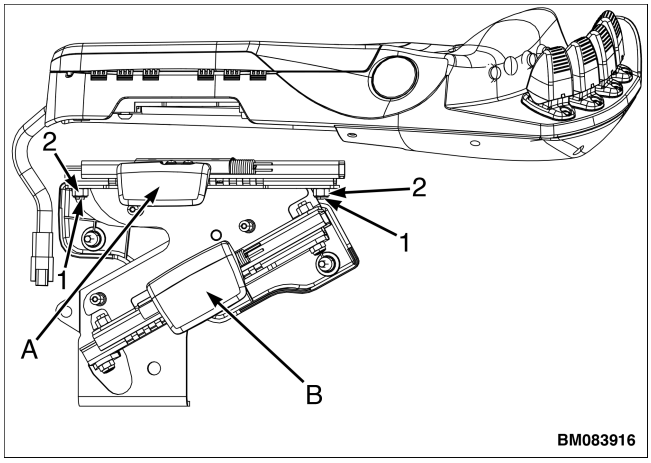


NOTE: SOME COMPONENT PARTS AND ELECTRICAL CONNECTIONS OMITTED FOR CLARITY.
NOTE: FULL SUSPENSION SEAT IS SHOWN. NON-SUSPENSION SEATS WILL BE SIMILAR.

1. CAPSCREW
2. ARMREST AND SLIDER
3. SPACER
4. ARMREST SLIDER MOUNTING BRACKET
5. SCREW
6. LOCKNUT
7. E-HYDRAULIC ARMREST HARNESS CONNECTOR

Figure 243. E-hydraulic armrest

3. Pull up on handle (see A, Figure 244) and slide armrest all the way forward to reveal the rear flange capscrew.



A. HANDLE MOVES ARMREST FORWARD OR BACKWARD
B. HANDLE MOVES ARMREST UP OR DOWN

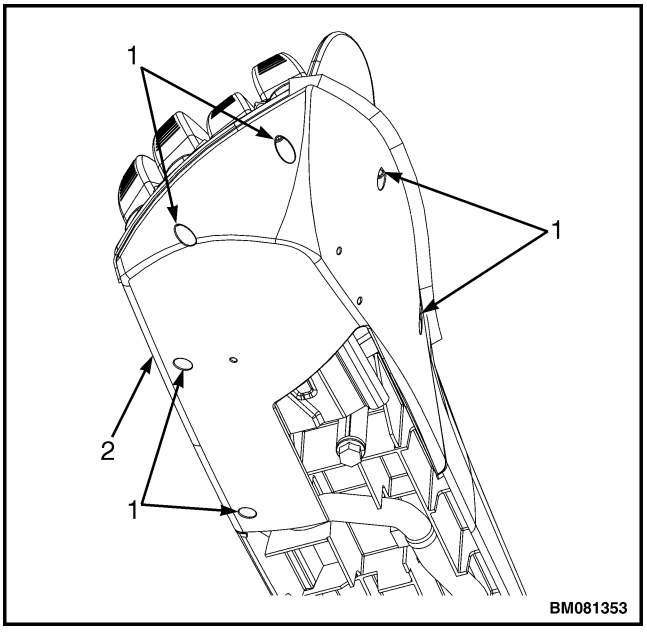
1. FLANGE CAPSCREWS
2. LOCKNUTS

Figure 244. Armrest adjustment handles

4. Remove flange capscrew from under the armrest mounting bracket that attaches the armrest to the mounting bracket. Pull up on handle and slide armrest all the way back to reveal the front flange capscrew. Remove the front flange capscrew.

5. Remove the armrest from the armrest mounting bracket.

6. Remove six socket head screws that fasten the bottom and top armrest covers together. See Figure 245. Remove the bottom armrest cover from armrest.



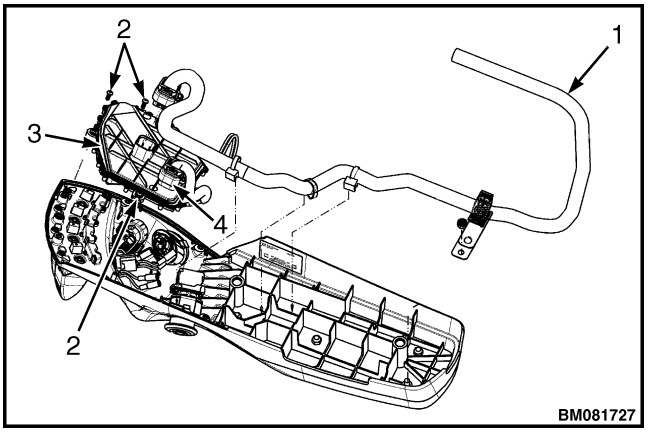
1. SOCKET HEAD SCREWS
2. BOTTOM ARMREST COVER

Figure 245. Bottom armrest cover removal

NOTE: The push (override) button is an optional feature. Your lift truck may be equipped with one or more push (override) button depending on the number of hydraulic functions on the lift truck. If lift truck is not equipped with this feature, there will be a plug covering the electrical connector on the PCB cassette.

7. Disconnect the push (override) button connector from PCB cassette. See Figure 246.

8. Remove three socket screws from PCB cassette and remove PCB cassette from armrest. See Figure 246.



1. TO E-HYDRAULIC CONTROL WIRE HARNESS
2. SOCKET HEAD SCREWS
3. PCB CASSETTE
4. PUSH (OVERRIDE) BUTTON CONNECTOR

Figure 246. PCB cassette removal

Install

1. Install PCB cassette to armrest with three socket head screws. See Figure 246.

2. If lift truck is equipped, connect the push (override) button connector to PCB cassette. See Figure 246.

3. Install bottom armrest cover to armrest with six socket head screws. See Figure 246.

4. Install new armrest onto mounting bracket with flange capscrews. Tighten flange capscrews to 13 to 15 N•m (115 to 132 lbf in).

5. Connect E-hydraulic wire harness to armrest. See Figure 243. Install seat box to cover plate with two capscrews and washers. Tighten capscrews to 1.2 N•m (10.6 lbf in).

6. Connect the battery.

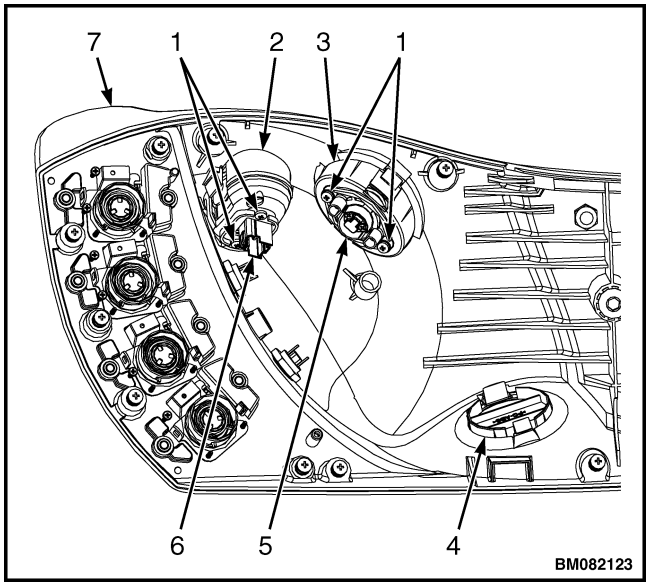
HORN BUTTON

Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Remove the armrest from the armrest mounting bracket. Remove the bottom armrest and PCB cassette. See section Armrest assembly for removal procedures.

3. Remove the two screws that attach the horn button to the armrest. See Figure 247. Remove horn button from armrest.



NOTE: PUSH (OVERRIDE) BUTTON CONNECTIONS NOT SHOWN FOR CLARITY.

1. HEAD SCREWS
2. DIRECTION CONTROL SWITCH ADAPTER*
3. HORN BUTTON ADAPTER
4. PLUG
5. HORN SWITCH
6. DIRECTION CONTROL SWITCH CONNECTOR
7. ARMREST

*Direction Control Switch is an optional feature.

Figure 247. Switch arrangement and connections, E-hydraulic mini-levers

Install

1. Install the new horn switch and two screws onto the armrest. See Figure 247.

2. Install the armrest and PCB cassette to the armrest and install the armrest to the armrest mounting bracket. See the section Armrest assembly for installation procedures.

DIRECTION CONTROL SWITCH

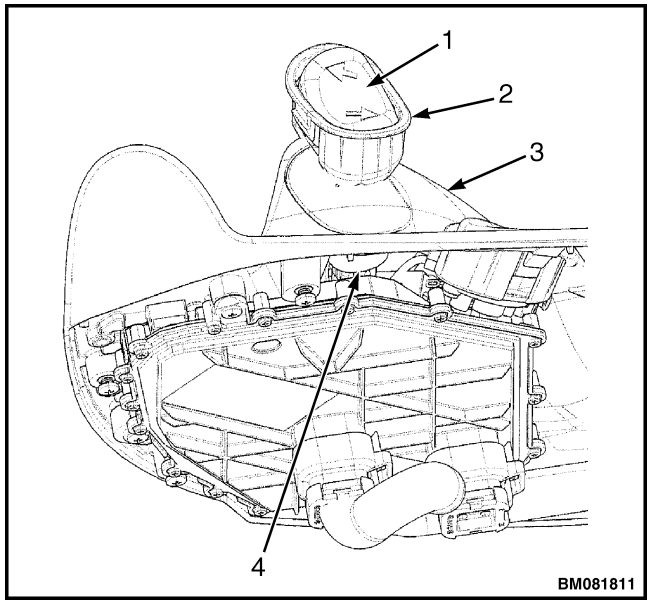
NOTE: The Direction Control Switch (DCS) is an optional feature on lift trucks covered in this manual that are equipped with electro-hydraulic controls.

Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Remove the armrest from the armrest mounting bracket. Remove the bottom armrest cover. See section Armrest assembly for removal procedures.

3. Remove the Direction Control Switch (DCS) assembly from the armrest by compressing the clips on either side of the bezel and carefully pulling the assembly out. Disconnect the E-Hydraulic control wiring harness from the Direction Control Switch. See Figure 248.



1. DIRECTION CONTROL SWITCH
2. BEZEL
3. ARMREST
4. E-HYDRAULIC CONTROL VALVE WIRING HARNESS

Figure 248. Direction control switch replacement

4. Remove DCS from bezel. See Figure 248.

Install

1. Insert the new Direction Control Switch into the bezel. See Figure 248.

2. Connect the E-Hydraulic control valve wiring harness to the DCS. Install the DCS assembly into the armrest by compressing clips on either side of the bezel and pushing the assembly into armrest until the clips latch. See Figure 248.

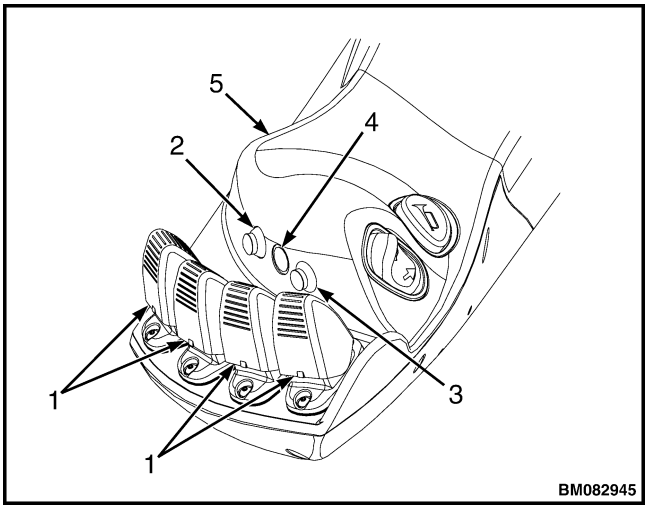
3. Install armrest cover to armrest, and install armrest to armrest mounting bracket. See section Armrest assembly for installation procedures.

PUSH (OVERRIDE) BUTTON

On lift trucks equipped with E-Hydraulic controls, there may be optional push (override) buttons located behind the second, third, or fourth mini-lever. See Figure 249. The push (override) button located behind the second mini-lever is used to override the Return To Set Tilt (RTST) function. By pressing this switch, the RTST parameters are overridden and the mast is allowed to tilt unrestricted.

If the lift truck is equipped with a clamp attachment, the last mini-lever on the right controls the clamp function. Behind this lever will be a push (override) button. To engage the clamp, move the mini-lever backward. To disengage the clamp, push the push (override) button behind the mini-lever and move mini-lever forward.

The different configurations of push (override) button discussed in this section may not be found on your lift truck.



NOTE: NOT ALL LIFT TRUCK MAY HAVE ALL PUSH (OVERRIDE) BUTTON SHOWN.

1. MINI-LEVERS
2. PUSH (OVERRIDE) BUTTON (CLAMP)
3. PUSH (OVERRIDE) BUTTON (RTST)
4. BUTTON PLUG
5. ARMREST HOUSING

Figure 249. Push (override) button location

Remove

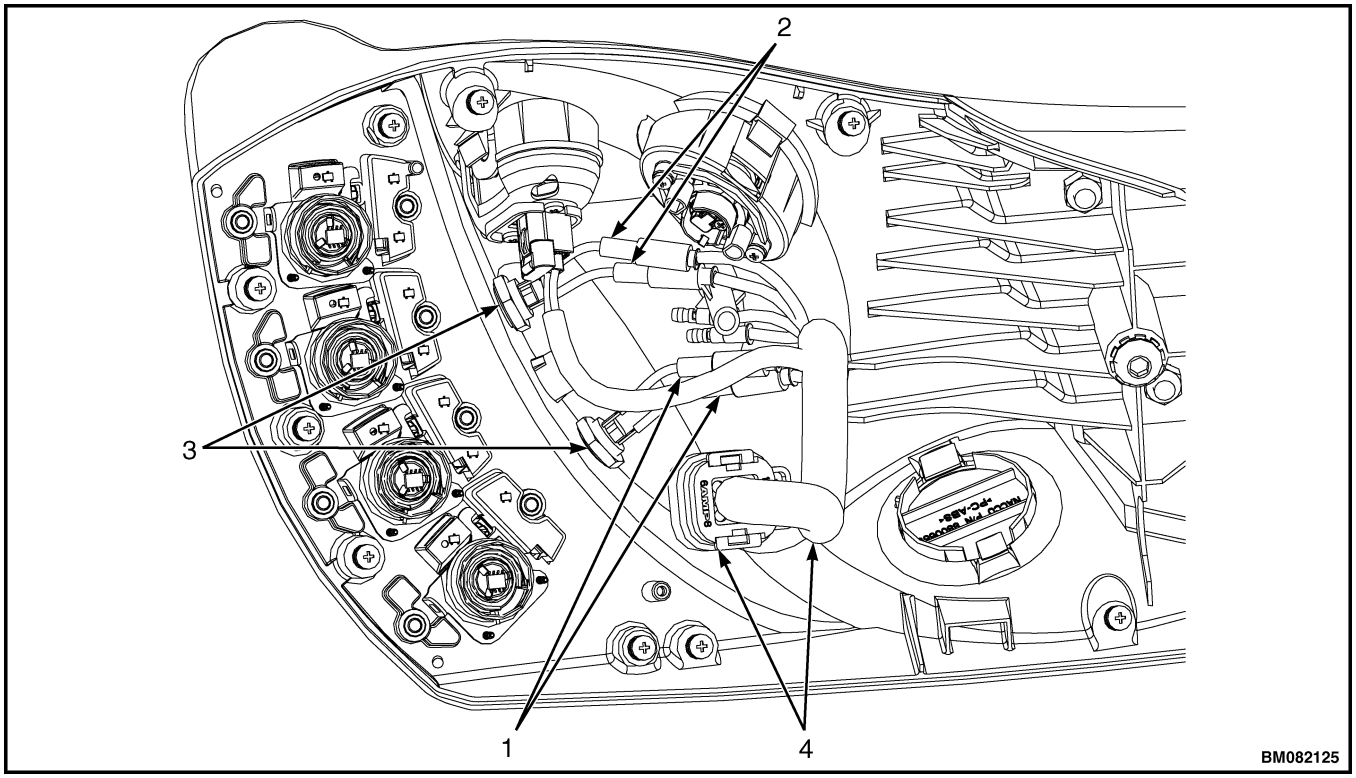
1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Remove the armrest from the armrest mounting bracket. Remove the bottom armrest and PCB cassette. See procedures in Armrest assembly section above.

NOTE: Tag wires prior to disconnecting to aid in reconnecting.

3. Pull push (override) button connectors apart to disconnect them from the wire harness. See Figure 250.

4. If push (override) button is being replaced, remove the lock nut from the back of the green, round, push button. Remove the push button switch from the armrest. See Figure 250.



1. CLAMP BUTTON (SWITCH) CONNECTION
2. RTST BUTTON (SWITCH) CONNECTION
3. LOCKNUT
4. PUSH (OVERRIDE) BUTTON WIRE HARNESS AND CONNECTOR

Figure 250. Push (override) button replacement

Install

1. Install the new green, round push (override) button assembly through the armrest housing.

2. Install and tighten the lock nut on push (override) button and armrest. See Figure 250.

3. Connect the push (override) button connector to the wire harness. See Figure 250.

4. Install the armrest and PCB cassette to the armrest and install the armrest to the armrest mounting bracket. See the section Armrest assembly for installation procedures.

5. Connect the E-hydraulic wire harness to the armrest. See Figure 243.

JOYSTICK CONTROLS REPAIR 202001-453

WARNING

Discharge capacitors as directed in General section at the beginning of this manual.

Disconnect the battery before doing any work on the electrical system. Serious injury to personnel and/or damage to lift truck components can occur if battery is not disconnected.

CAUTION

A short circuit and damage can occur if wires are not installed correctly. Make sure wire connectors do not touch the other metal terminals or wire connectors, metal brackets, or the bracket mounting nuts. Make sure the wires are not pulled tight and are not touching other parts to damage the insulation.

JOYSTICK CONTROLS - TEST

Joystick levers

Perform all of the following test procedures to be sure joystick levers operate properly.

See User interface (display) for instructions to view Lever Output Value. With Service Password, view Diagnostics – Hydraulic Data Display – Hydraulic Input.

Full stroke test

Check for full stroke of joystick lever. Use the Display Switch Cluster (DSC) or install the Service Tool to monitor functions.

1. Stroke each lever to full stroke, forward and backward, and allow lever to snap back to center.
2. Stroke each lever to full stroke, left and right, and allow lever to snap back to center.
3. **(DO NOT start)**. Turn key switch to **ON** position.
4. Display the electro-hydraulic diagnostics menu on the dash display panel. Operate each lever to full stroke forward and read input.
   - Is lever output ≥ -92%?
   - **YES:** Go to Step 5.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
5. Operate each lever to full stroke backward and read input.
   - Is lever output ≥ -92%?
   - **YES:** Go to Step 6.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
6. Operate each lever to full stroke left and read input.
   - Is lever output ≥ -92%?
   - **YES:** Go to Step 7.
   - **NO:** Mini-lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
7. Operate each lever to full stroke right and read input.
   - Is lever output ≥ +92%?
   - **YES:** Joystick lever is supplying full stroke.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
8. If joystick lever continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online.**

Function returns to neutral test

Check to confirm function returns to neutral (0%). Use DSC or install the Service Tool to monitor functions.

1. Stroke each lever to full stroke, forward and backward, and allow lever to snap back to center.
2. Stroke each lever to full stroke, left and right, and allow lever to snap back to center.
3. **(DO NOT start)**. Turn key switch to **ON** position.
4. Display the electro-hydraulic diagnostics menu on the dash display panel.
   - Is each lever output = 0%?
   - **YES:** Go to Step 5.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.
5. Operate each lever to full stroke forward and slowly release (1-2 seconds from full stroke). Read output when fully released.
   - Is each lever output = 0%?
   - **YES:** Go to Step 6.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

6. Operate each lever to full stroke back and slowly release (1-2 seconds from full stroke). Read output when fully released.
   - Is each lever output = 0%?
   - **YES:** Go to Step 7.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

7. Operate each lever to full stroke left and slowly release (1-2 seconds from full stroke). Read output when fully released.
   - Is each lever output = 0%?
   - **YES:** Go to Step 8.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

8. Operate each lever to full stroke right and slowly release (1-2 seconds from full stroke). Read output when fully released.
   - Is each lever output = 0%?
   - **YES:** Joystick lever function is returning to neutral.
   - **NO:** Joystick lever is not working properly. See procedures below for repair or replacement. Upon completion, rerun the test.

9. If joystick lever continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online**.

GENERAL

WARNING

Before replacing any part of the electronic hydraulic control assembly, fully lower all parts of the mast and tilt it forward until the tips of forks touch the ground. This action will prevent mast from lowering suddenly if the control lever is accidently moved.

WARNING

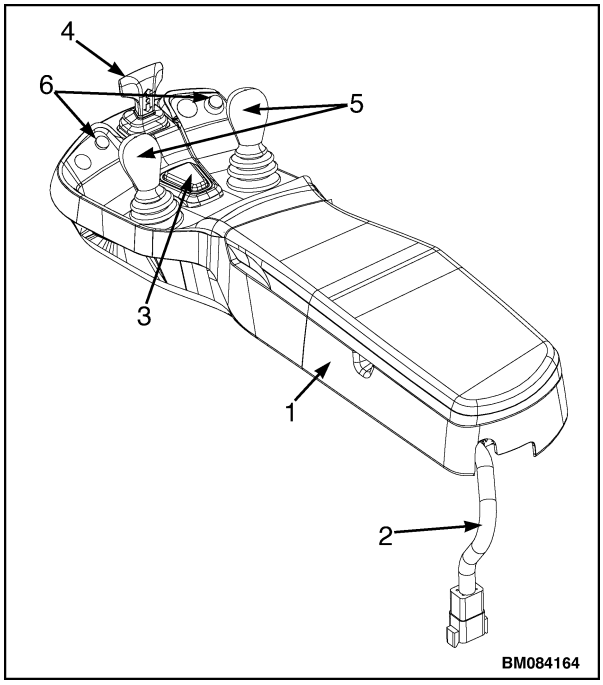
Never wear any metallic items on your fingers, arms, or neck. Metal items can accidently make an electrical connection and cause an injury.

NOTE: Prior to performing the following procedures, the Joystick controls - TEST must be performed.

NOTE: The mini-levers do not need to be calibrated.

NOTE: The Direction Control Switch (DCS) is an optional feature on lift trucks equipped with electronic-hydraulic controls. See Figure 251.

The line of trucks covered in this manual come standard with manual hydraulic levers, but have the option of using electronic-hydraulic controls. The following steps describe procedure for removing the electronic-hydraulic joystick control armrest. See Figure 251. If components of the joytick armrest or the joystick levers malfunction, replace with new part. See the **Parts Manual** for replacement parts.



1. ARMREST
2. TO WIRE HARNESS
3. HORN BUTTON
4. DIRECTION CONTROL SWITCH
5. JOYSTICK LEVERS
6. AUXILIARY FUNCTION BUTTONS

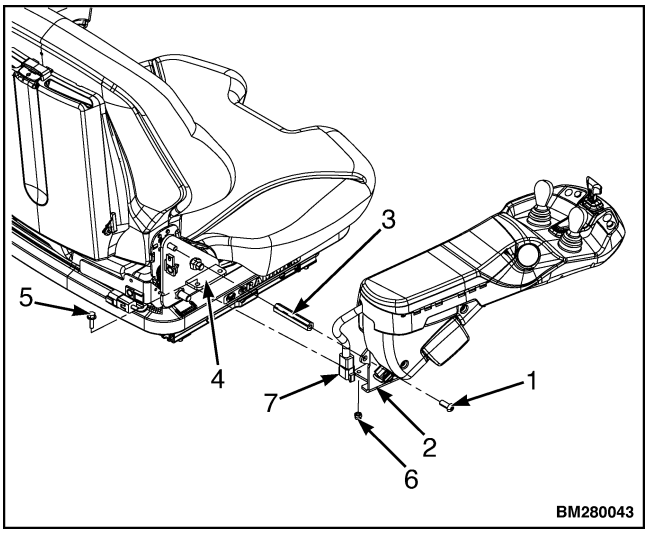
Figure 251. Joystick controls arrangement

ARMREST ASSEMBLY

Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

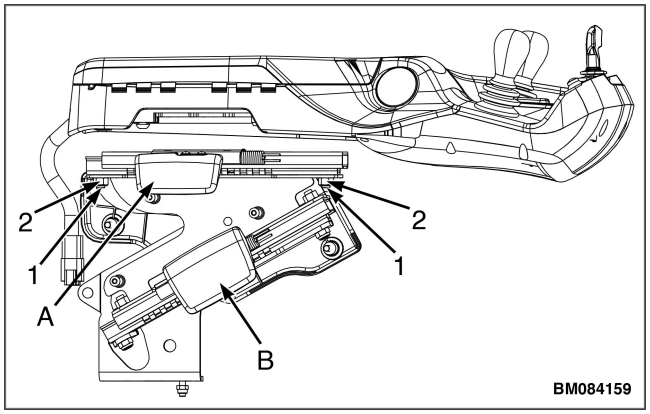
2. Disconnect the E-Hydraulic control wire harness from the E-Hydraulic armrest harness. See Figure 252.



1. CAPSCREW
2. ARMREST AND SLIDER
3. SPACER
4. ARMREST SLIDER MOUNTING BRACKET
5. SCREW
6. LOCKNUT
7. E-HYDRAULIC ARMREST HARNESS CONNECTOR

Figure 252. E-hydraulic armrest

3. Pull up on the handle (see A, Figure 253) and slide the armrest all the way forward to reveal the rear flange capscrew.



A. HANDLE MOVES ARMREST FORWARD OR BACKWARD
B. HANDLE MOVES ARMREST UP OR DOWN

1. FLANGE CAPSCREWS
2. LOCKNUTS

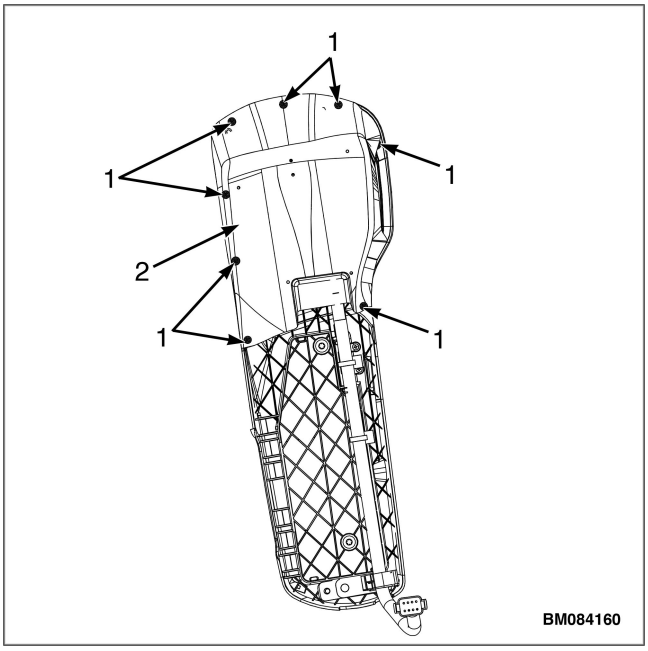
Figure 253. Armrest adjustment handles

4. Remove the rear flange capscrew and locknut from under the armrest mounting bracket that attaches the armrest to the mounting bracket. See Figure 253.

5. Pull up on the handle and slide the armrest all the way back to reveal the front flange capscrew. Remove the front flange capscrew and locknut. See Figure 253.

6. Remove the armrest from the armrest mounting bracket.

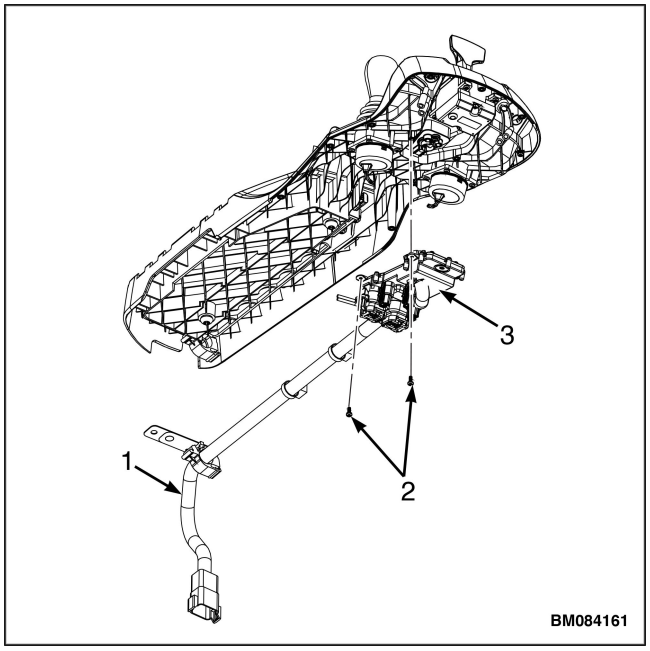
7. Remove the eight socket head screws that fasten the bottom and top armrest covers together. See Figure 254. Remove the bottom armrest cover from the armrest.



1. SOCKET HEAD SCREWS
2. BOTTOM ARMREST COVER

Figure 254. Bottom armrest cover removal

8. Remove the four socket screws from the PCB cassette and remove the PCB cassette and wire harness from the armrest. See Figure 255.



1. TO E-HYDRAULIC CONTROL WIRE HARNESS
2. SOCKET HEAD SCREWS
3. PCB CASSETTE

Figure 255. PCB removal

Install

1. Install the PCB cassette and wire harness and secure with the four socket head screws. See Figure 255. Tighten to standard torque.

2. Install the bottom armrest cover to the armrest with the eight socket head screws. See Figure 254.

3. Install new armrest onto the mounting bracket with flange capscrews. See Figure 253. Tighten the flange capscrews to standard torque.

4. Connect the E-Hydraulic amrest wire harness to the main E-hydraulic control wire harness.

5. Connect the battery.

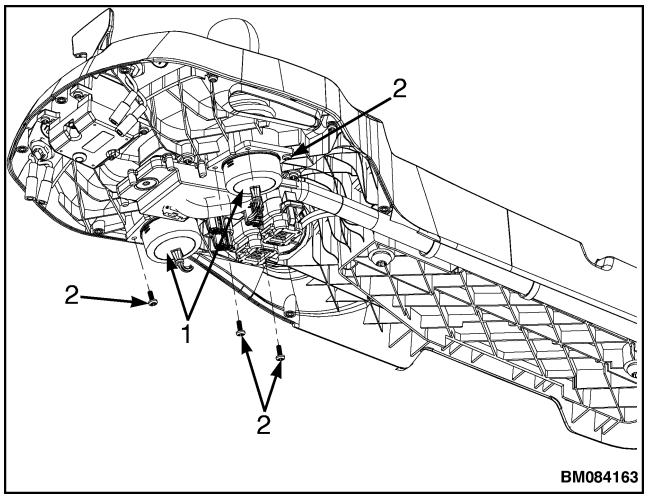
JOYSTICK CONTROL LEVERS

CAUTION

The following procedure should only be performed by Hyster trained certified technicians. The removal and replacement of the joystic levers 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.

Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.
2. Remove the armrest from the armrest mounting bracket. See Armrest assembly.
3. Remove the bottom cover and PCB cassette. See Armrest assembly.
4. From the underside of the armrest, locate the two joystick levers and disconnect the wire harness from the joystick levers. See Figure 256.



1. JOYSTICK LEVERS
2. CAPSCREWS

Figure 256. Joystick levers

5. Loosen the four capscrews retaining each joystick lever. See Figure 256.
6. Remove the joystick lever.

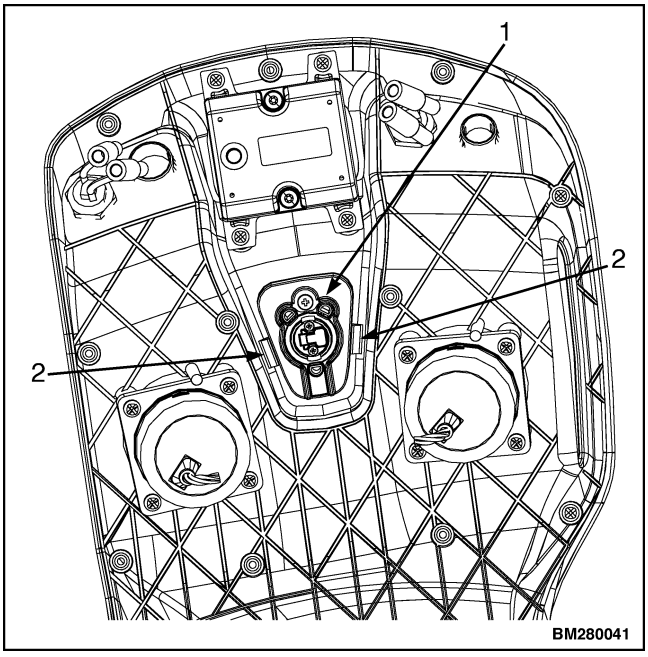
Install

1. Install the new joystick lever in place and insert the four screws. See Figure 256. Tighten the screws to standard torque.
2. Connect the wire harness to the joystick levers.
3. Install the bottom cover. See Armrest assembly.
4. Install the armrest to the armrest mounting bracket. See Armrest assembly.

HORN BUTTON

Remove

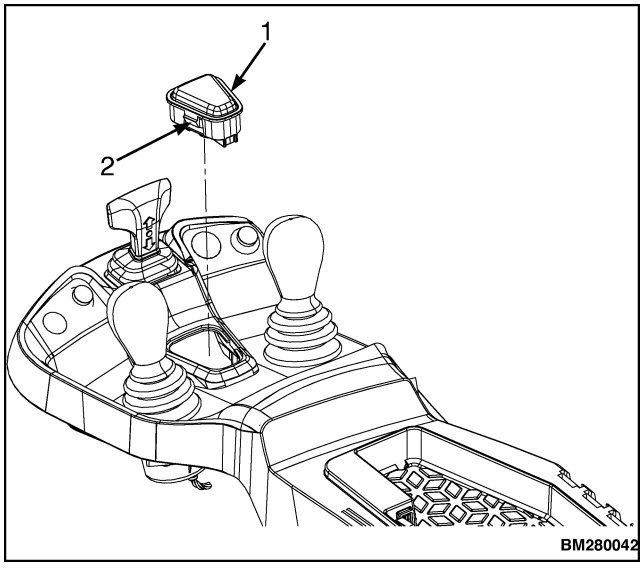
1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.
2. Remove the armrest from the armrest mounting bracket. See Armrest assembly.
3. Remove the bottom cover and PCB cassette. See Armrest assembly.
4. From the underside of the armrest, locate the two tabs on the side of the horn button. See Figure 257.



1. HORN BUTTON
2. TABS

Figure 257. Horn button

5. Press the two tabs and push the horn button while pulling it free from the top of the armrest, to remove. See Figure 258.



1. HORN BUTTON
2. TABS

Figure 258. Horn button remove/install

Install

1. Install the new horn button onto the armrest and push until the two tabs are secured in the armrest. See Figure 258.

2. Install the PCB cassette to the armrest. See Armrest assembly.

3. Install the bottom cover. See Armrest assembly.

4. Install the armrest to the armrest mounting bracket. See Armrest assembly.

DIRECTION CONTROL SWITCH

NOTE: The Direction Control Switch (DCS) is an optional feature on lift trucks covered in this manual that are equipped with electro-hydraulic controls.

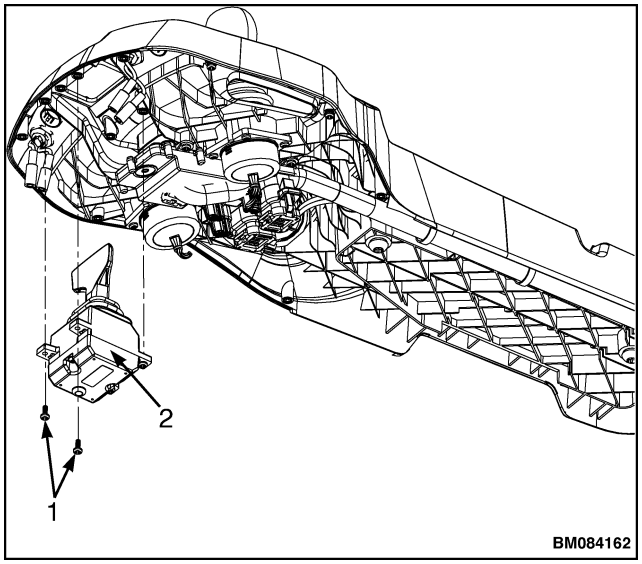
Remove

1. Confirm the battery is disconnected and the capacitors have been discharged. See **WARNING** and **CAUTION** above.

2. Remove the armrest from the armrest mounting bracket. See Armrest assembly.

3. Remove the bottom armrest cover. See Armrest assembly.

4. Loosen the four screws retaining the DCS switch to the armrest. See Figure 259.



1. SCREWS
2. DIRECTION CONTROL SWITCH

Figure 259. Direction Control Switch

5. Remove the DCS from the armrest and disconnect the wire harness.

Install

1. Connect the wire harness to the the new DCS and install the new DCS into place in the armrest. See Figure 259.
2. Insert the four screws to secure the DCS. See Figure 259. Tighten to standard torque.
3. Install the bottom armrest cover and insert the eight screws. See Armrest assembly.
4. Tighten the screws to standard torque.
5. Install the armrest to the armrest mounting bracket. See Armrest assembly.