

**SERVICE REPAIR**

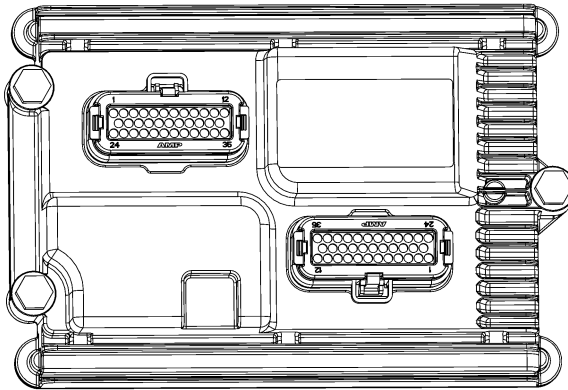
**MANUAL**

Hyster D203 (A1.3XNT, A1.5XNT A25XNT, A30NXT)  
Forklift

***HYSTER***

# **ELECTRICAL SYSTEM**

**A1.3XNT, A1.5XNT  
(A25XNT, A30XNT) [D203]**



# ***HYSTER***

# 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, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **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.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

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



### **WARNING**

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



### **CAUTION**

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

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

## TABLE OF CONTENTS

General .....	1
Discharging the Capacitors .....	2
Display Panel and Key or Keyless Switch Replacement .....	3
Display Panel, Replace .....	3
Remove .....	3
Install .....	5
Electronic and Manual Hydraulic Controls .....	6
General .....	6
Manual Hydraulic Controls .....	7
Upper Front Cover .....	7
Remove and Install .....	7
Direction Control Switch .....	7
Remove .....	7
Install .....	8
Emergency Disconnect Switch .....	10
Remove .....	10
Install .....	10
Attachment Button (Fourth Function) .....	11
Remove .....	11
Install .....	11
E-Hydraulic Controls - Test .....	12
Mini-Levers .....	12
Full Stroke Test .....	12
Function Returns to Neutral Test .....	12
Push Button Switch .....	13
E-Hydraulic Controls .....	13
Mini-levers, Remove and Install .....	13
Armrest Assembly .....	14
Remove .....	14
Install .....	16
Horn Button .....	16
Remove .....	16
Install .....	16
Direction Control Switch .....	18
Remove .....	18
Install .....	18
Emergency Disconnect Switch .....	18
Remove .....	18
Install .....	19
Momentary Switches and Function Selection Button .....	19
Remove .....	20
Install .....	20
Sensors and Switches .....	22
General .....	22
Hydraulic Motor Speed Sensor .....	22
Remove .....	22
Install .....	23
Hydraulic Motor Temperature Sensor .....	24
Remove .....	24
Install .....	24

**Thanks very much for your reading,  
Want to get more information,  
Please click here, Then get the complete  
manual**

**JustClickHere** 

**NOTE:**

**If there is no response to click on the link above,  
please download the PDF document first, and then  
click on it.**

**Have any questions please write to me:  
[admin@servicemanualperfect.com](mailto:admin@servicemanualperfect.com)**

**TABLE OF CONTENTS (Continued)**

Traction Motor Temperature Sensor .....	25
Remove .....	25
Install .....	25
Traction Motor Speed Sensor .....	26
Remove .....	26
Install .....	26
Low Level Brake Fluid Switch .....	26
Remove .....	26
Install .....	26
Service Brake Pressure Sensor .....	27
Remove .....	27
Install .....	27
Accelerator Pedal Position Sensor .....	29
Remove .....	29
Install .....	29
Seat Sensor (Operator Presence System) .....	30
Full Suspension and Swivel Seats .....	30
Remove .....	30
Install .....	30
Seat Belt Sequence Module .....	30
Remove .....	30
Install .....	31
Steering Wheel Position Sensor .....	31
Remove .....	31
Install .....	32
Horn Switch .....	32
Remove .....	32
Install .....	33
Rear Horn Button Switches .....	34
Remove .....	34
Install .....	34
Tilt Position Sensor .....	35
Remove .....	35
Install .....	35
Parking Brake Position Sensor .....	36
Remove .....	36
Install .....	36
Hydraulic Tank Level Sensor .....	38
Remove .....	38
Install .....	38
Hydraulic Filter Sensor; Lift Trucks Prior to November, 2013 .....	39
Remove .....	39
Install .....	39
Hydraulic Pressure Switch; Lift Trucks After November, 2013 .....	39
Remove .....	39
Install .....	39
Hydraulic Oil Temperature Sensor .....	40
Remove .....	40
Install .....	40
Impact Sensor .....	40

## TABLE OF CONTENTS (Continued)

Remove .....	40
Install .....	42
Load Weight Sensor .....	42
Remove .....	42
Install .....	42
Motor Controllers Replacement .....	44
General .....	44
Hydraulic Motor Controller .....	45
Remove .....	45
Install .....	48
Traction Motor Controllers .....	49
Remove .....	49
Install .....	50
Motor Controller Fans .....	51
Hydraulic Motor Controller Fan .....	51
Remove .....	51
Install .....	51
Traction Motor Controller Fan .....	51
Remove .....	51
Install .....	51
Line Contactor .....	54
Remove .....	54
Install .....	54
Vehicle Systems Manager .....	55
General .....	55
Remove .....	55
Install .....	55
Programming a New VSM and/or Display Panel .....	58
General .....	58
PC Service Tool Software .....	58
Fuses .....	59
Audible Alarm .....	61
Battery Connection .....	62
Inspect .....	62
Replacing Cables .....	62
Lights .....	64
General .....	64
Front Work Lights (LED Lights) .....	66
Remove .....	66
Install .....	66
Strobe Light .....	67
Remove .....	67
Install .....	67
LED Tail, Backup, and Brake Lights .....	68
Remove .....	68
Install .....	68
Front Marker/Turn Signal Lights .....	69
Remove .....	69
Install .....	70
Converter .....	71

## TABLE OF CONTENTS (Continued)

Remove .....	71
Install .....	71
12 Volt Outlet .....	73
Remove .....	73
Install .....	74

This section is for the following models:

A1.3XNT, A1.5XNT (A25XNT, A30XNT) [D203]



## General

The removal and replacement procedures for the following electrical components are covered in this service manual:

- Display panel
- Manual hydraulic and E-Hydraulic control components
- Motor controllers
- Sensors and switches
- Lights
- Fuses, alarm and horn
- Battery
- Vehicle System Manger (VSM)

For adjustment procedures of switches located on the linkage for the manual control valve, or for switches located on the E-Hydraulic control valve, see **Main Control Valves** 2000SRM1520.

See **AC Motor Repair** 0620SRM1515 for information on servicing and maintaining the AC hydraulic pump and traction motors and **Industrial Battery** 2240SRM0001 for information on the battery.

If any of the wire harnesses need to be repaired, see the section **Wire Harness Repair** 2200SRM1128 for repair procedures.

Some of the components used are made of plastic. When using screws to replace and install plastic components, the screws should be rotated counterclockwise until screw thread turns over the last thread in the plastic part. The screw can then be turned clockwise to make a connection. This prevents "cutting" new threads and damaging the existing thread in the plastic part.

If any welding must be done, obtain proper authorization from a Resident Service Engineer. If authorization is given, be sure to follow the procedures in the **WARNING** and **CAUTIONS** below.



### WARNING

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



### CAUTION

When an arc welder is used, always disconnect the battery connector on the lift truck. This action will prevent damage to the motor controllers.

Connect the ground clamp for the arc welder as close as possible to the weld area. This action will prevent damage to a bearing from the large current from the welder.

Before performing arc welding repairs, disconnect the motor controller and VSM connections to prevent damage to motor controllers and VSM. See sections Motor Controllers Replacement and Vehicle Systems Manager for procedures.

## 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 allow the capacitors to discharge 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 from the battery can cause personal injury or property damage.

Some checks 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 seconds 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 has been disconnected.

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

Make certain the Emergency-Disconnect 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.

1. Ensure capacitors are discharged by performing Step 2 through Step 6 below.
2. Turn key or keyless switch to **OFF** position.
3. Disconnect battery by separating the connectors.
4. Block drive wheels to prevent lift truck from moving.
5. Make sure Emergency-Disconnect switch **HAS NOT** been activated. If Emergency-Disconnect switch is activated, rotate switch to right until it pops up.
6. Press horn button. Wait 30 seconds to be sure capacitors are fully discharged.

If a torque value is not specified, go to **Metric and Inch (SAE) Fasteners** 8000SRM0231 for torque values.

## Display Panel and Key or Keyless Switch Replacement

### DISPLAY PANEL, REPLACE

#### Remove



#### WARNING

Before replacing the display panel, fully lower all parts of the mast and tilt it forward until the tips of the forks touch the ground. This action will prevent the mast from lowering suddenly if the control lever is accidentally moved.



#### 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.

Discharge capacitors as directed in Discharging the Capacitors in General section of this manual.

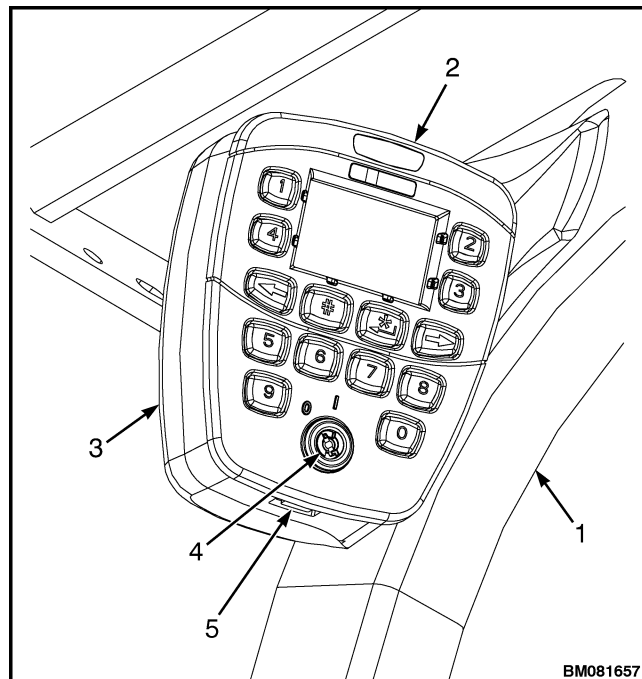


#### CAUTION

A short circuit and damage can occur if wires are not installed correctly. Make sure wire connectors do not touch the other meter 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.

**NOTE:** The display panel cannot be repaired and must be replaced as a unit, if it has a malfunction. See the **Parts Manual** for replacement part number. The key or keyless switch can be replaced without replacing the whole display panel.

The display panel is mounted inside of a display panel cover. The display panel cover is mounted to a bracket on upper right corner of overhead guard. See Figure 1.

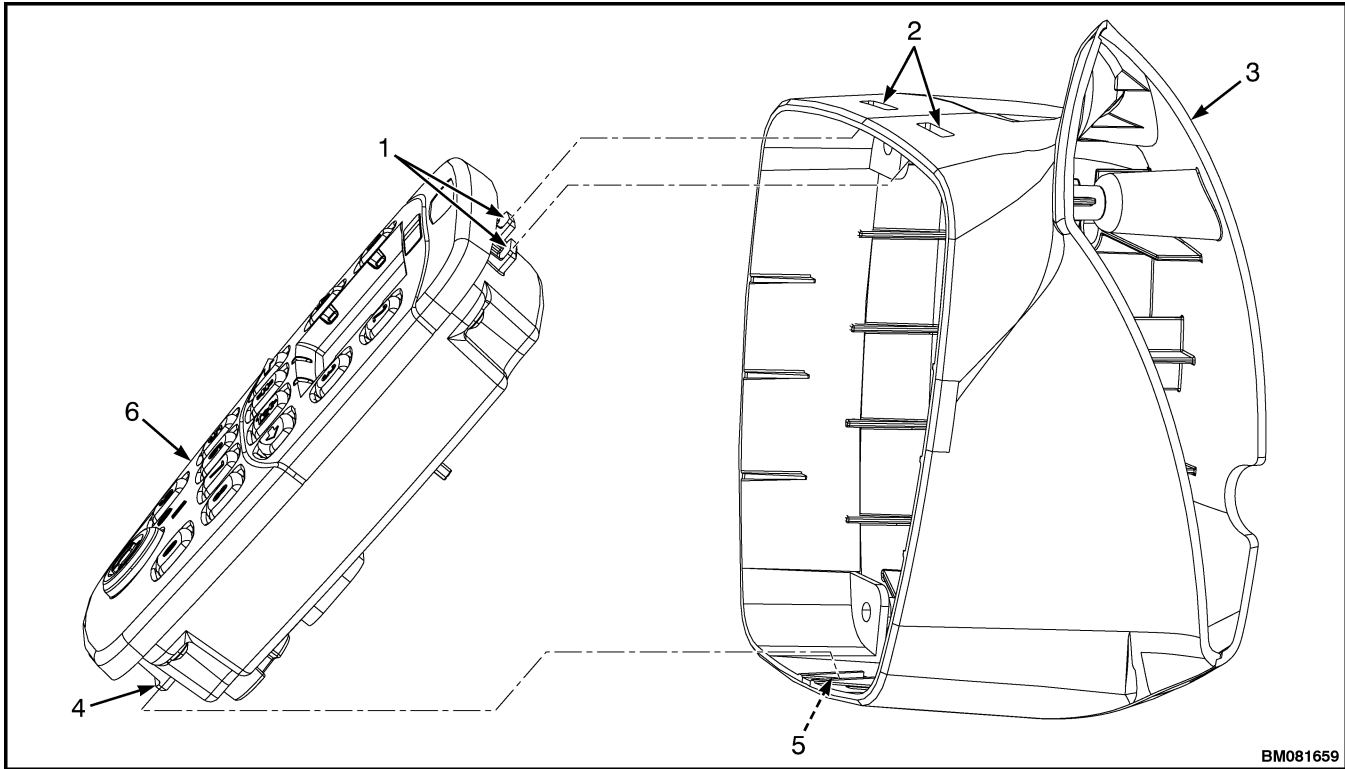


**NOTE:** STANDARD KEY SWITCH SHOWN.

1. OVERHEAD GUARD
2. DISPLAY PANEL
3. DISPLAY PANEL COVER
4. KEY OR KEYLESS SWITCH
5. SLOT

*Figure 1. Display Panel Arrangement*

1. Read and follow the **WARNING** and **CAUTION** above.
2. Insert a flat head screwdriver in slot on bottom of display panel. See Figure 1.
3. Pull screwdriver down to loosen display panel from slot. When display panel is loose from slot, pull display panel out of the display panel cover. See Figure 2.

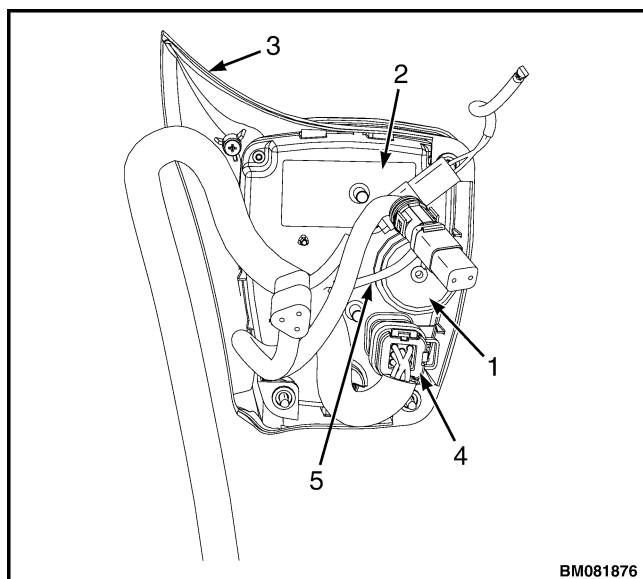


- 1. TOP NOTCHES
- 2. TOP SLOTS
- 3. DISPLAY PANEL COVER

- 4. BOTTOM NOTCH
- 5. BOTTOM SLOT
- 6. DISPLAY PANEL

**Figure 2. Display Panel Removal**

- When display panel is pulled from the display panel cover, the warning buzzer will disconnect from the rear of the display panel. See Figure 3.



**NOTE:** REAR OF DISPLAY PANEL AND DISPLAY PANEL COVER SHOWN. SOME ELECTRICAL COMPONENTS AND CONNECTIONS OMITTED FOR CLARITY.

- WARNING BUZZER
- DISPLAY PANEL
- DISPLAY PANEL COVER
- PIN CONNECTOR
- WARNING BUZZER ELECTRICAL CONNECTION

**Figure 3. Warning Buzzer**

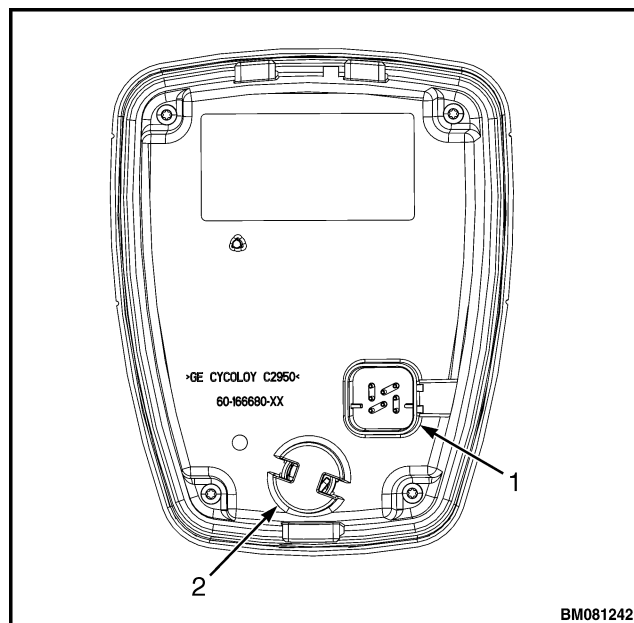
- Disconnect display wire harness from pin connector on the back of the display panel. Remove display panel from lift truck. See Figure 4.
- Remove key or keyless switch from display panel by pinching in on pinch points and pulling key or keyless switch from display panel. See Figure 5.

### Install

**NOTE:** If switch being installed uses a key, insert key into switch first.

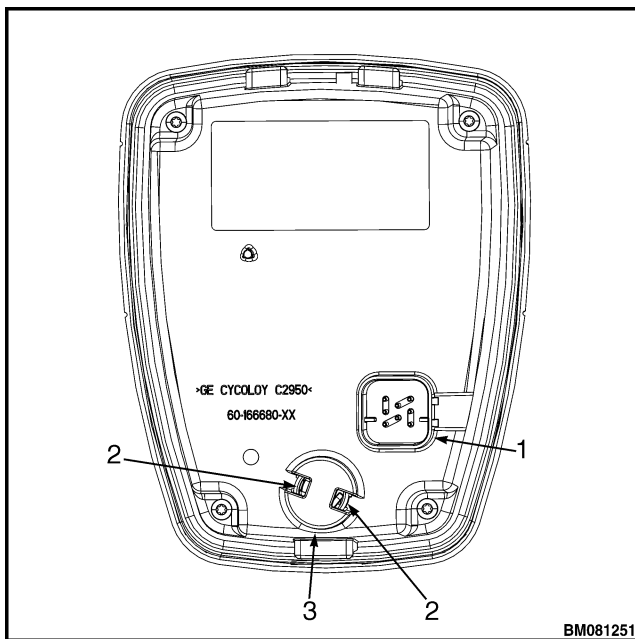
This will help install the switch into the display panel. If switch is keyless, use the knob to help install switch into display panel.

- Take new key or keyless switch and install into display panel. Match the notches on the switch with the holes on the switch cover. See Figure 5 and Figure 6. Switch will snap into place.
- Connect display wire harness to pin connector on back of the display panel. See Figure 4.
- Connect warning buzzer to back of display panel. See Figure 3.
- Insert notches on the top of display panel into slots on the top of display panel cover. See Figure 2.
- Push in the bottom of display panel until notch on the bottom slides into slot on the bottom and display panel locks into place inside the cover. See Figure 2.



- PIN CONNECTOR
- KEYSWITCH

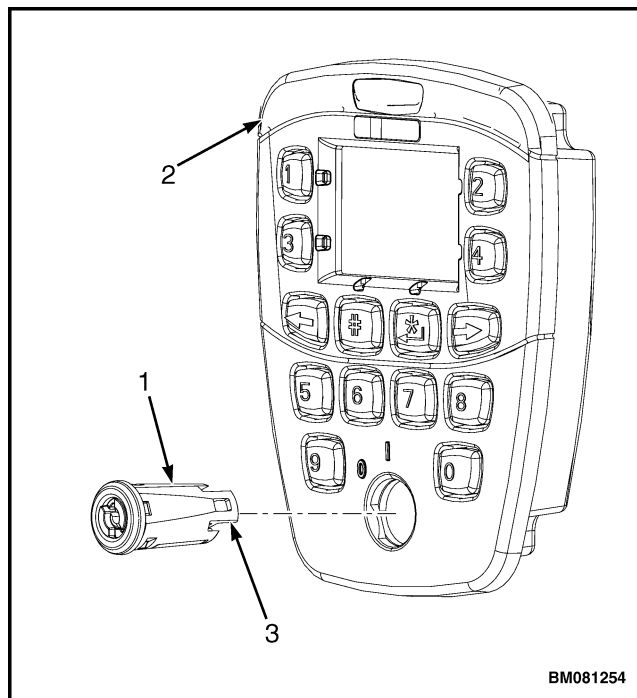
**Figure 4. Disconnecting Display Panel**



**NOTE:** BACK SIDE OF DISPLAY PANEL SHOWN.

1. PIN CONNECTOR
2. PINCH POINTS
3. KEY OR KEYLESS SWITCH COVER

*Figure 5. Key or Keyless Switch Removal*



**NOTE:** KEY SWITCH SHOWN.

1. KEY SWITCH
2. DISPLAY PANEL
3. NOTCH

*Figure 6. Key or Keyless Switch Installation*

## Electronic and Manual Hydraulic Controls

### GENERAL

#### WARNING

Before replacing any part of the manual hydraulic control assembly, fully lower all parts of the mast and tilt it forward until the tips of the forks touch the ground. This action will prevent the mast from lowering suddenly if the control lever is accidentally moved.

#### WARNING

Discharge capacitors as directed in Discharging the Capacitors in General section 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.

#### WARNING

Never wear any metallic items on your fingers, arms, or neck. Metal items can accidentally make an electrical connection and cause an injury.

#### 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.

The lift trucks covered in this service manual come standard with manual hydraulic control levers, but have the option of using electronic-hydraulic (E-Hydraulic) mini-lever controls.

In each hydraulic control arrangement, there are several electronic component parts that can be replaced if they are no longer working properly. These components are:

- **Direction Control Switch** - The Direction Control Switch (DCS) is an optional feature and is used to select the direction of travel when lift truck is equipped with a standard accelerator pedal.
- **Emergency Disconnect Switch** - The emergency disconnect switch is used to disconnect power from the controllers. The switch is operated by pushing the button down until it clicks. To reset (re-connect) the emergency disconnect switch and energize the electrical circuits, turn the switch clockwise until button pops up.
- **Attachment (Fourth Function) Button** - The attachment button is only on manual hydraulic control levers. If lift truck is equipped with a four function control valve with attachment and three levers, the last (3rd) lever controls the attachment (4th function). To engage the attachment, press and hold button on the left top side of the lever and move lever forward. To disengage the attachment press and hold button on the left top side of the lever and move lever backward. See Figure 13.

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

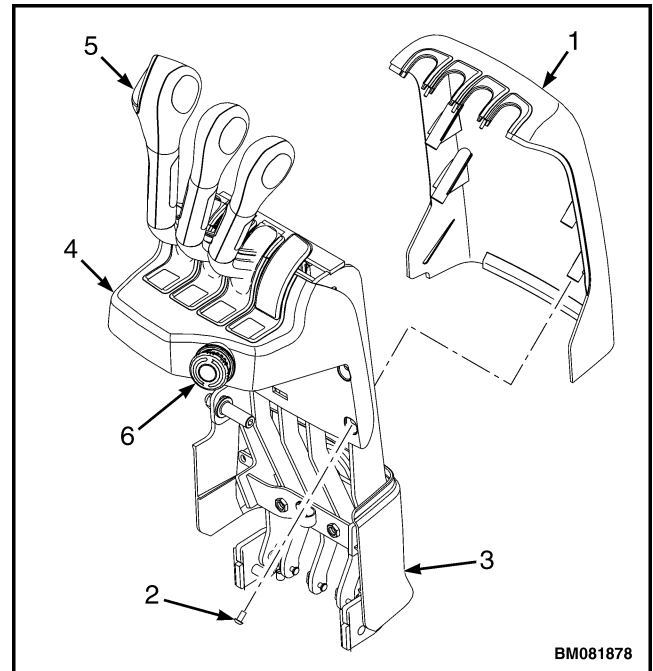
## MANUAL HYDRAULIC CONTROLS

### Upper Front Cover

#### *Remove and Install*

**NOTE:** To replace the direction control switch and emergency disconnect switch, the upper front cover must be removed first from the manual hydraulic control lever assembly as described below.

1. Read and follow the **WARNING** and **CAUTION** section in the General section above.
2. Remove four capscrews and upper front cover from hydraulic lever assembly. See Figure 7.



**NOTE:** OPTIONAL DIRECTION CONTROL SWITCH SHOWN.

1. UPPER FRONT COVER
2. CAPSCREWS
3. LOWER COVER
4. UPPER REAR COVER
5. DIRECTION CONTROL SWITCH
6. EMERGENCY DISCONNECT SWITCH

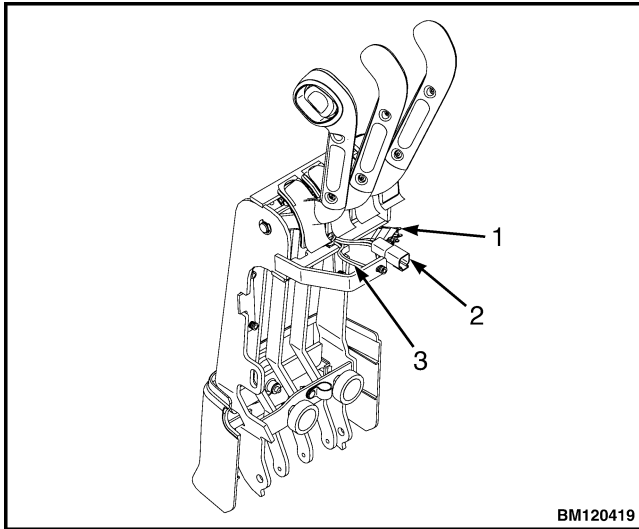
**Figure 7. Manual Hydraulic Control Lever Assembly**

3. Using four capscrews, install front cover on hydraulic lever assembly. See Figure 7.

### Direction Control Switch

#### *Remove*

1. Read and follow the **WARNING** and **CAUTION** section in the General section above.
2. Remove upper front cover. See section Upper Front Cover for procedures. Disconnect manual control valve wire harness from direction control switch. See Figure 8.



1. EMERGENCY DISCONNECT SWITCH CONNECTOR
2. MANUAL CONTROL VALVE WIRE HARNESS
3. DIRECTION CONTROL SWITCH CONNECTOR

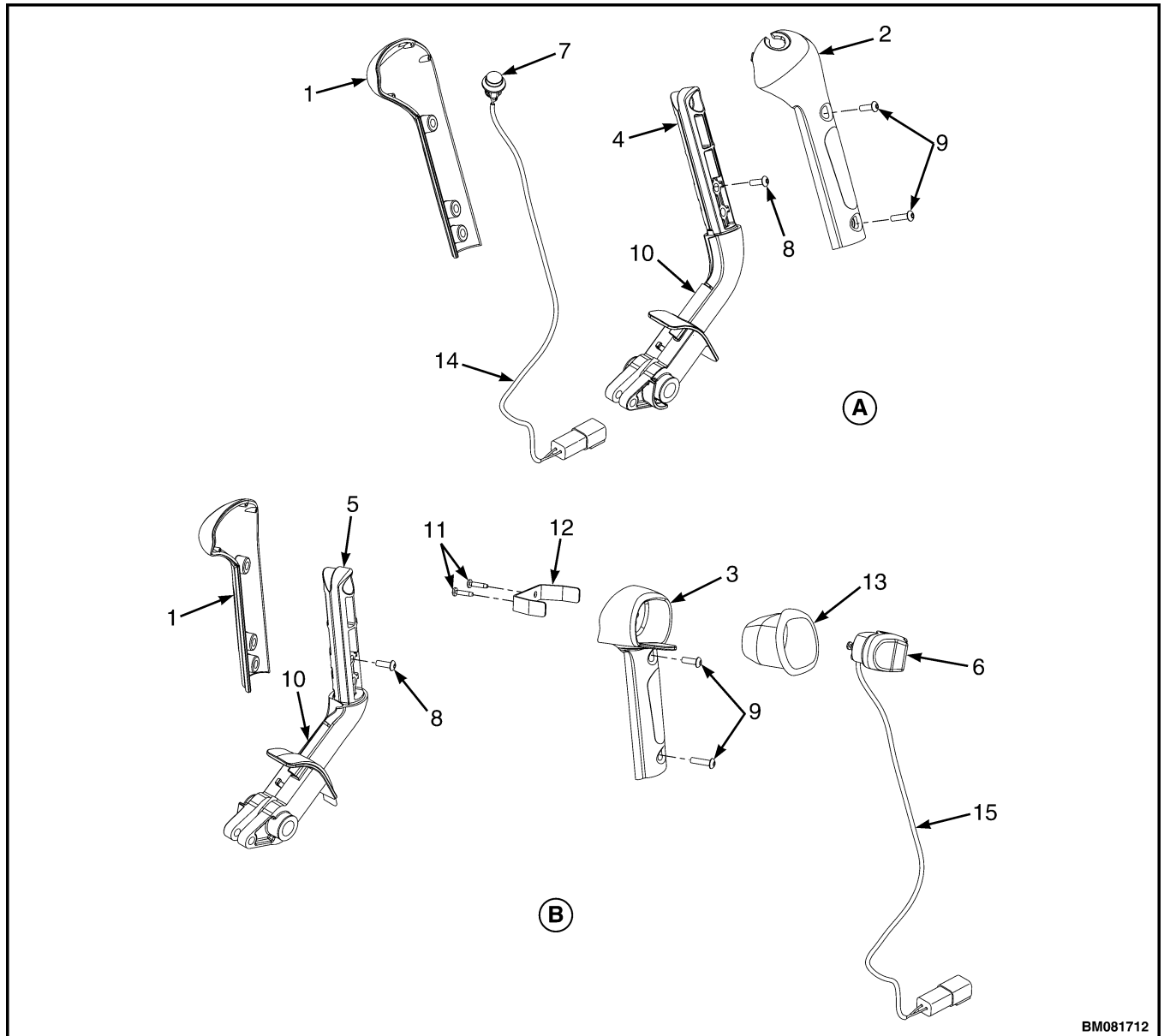
**Figure 8. Manual Control Levers Assembly  
Electrical Components**

3. Remove two outer capscrews and lift/lower with Direction Control Switch handle from manual lift/lower lever. See Figure 9.
4. Remove one inner capscrew and palm side grip handle from manual lift lever. See Figure 9.
5. Remove Direction Control Switch cable from cable track. See Figure 9.
6. Remove two screws, Direction Control Switch retainer, Direction Control Switch cup, and Direction Control Switch from lift/lower with Direction Control Switch handle. See Figure 10.

### **Install**

1. Install DCS into DCS cup. See Figure 10.
2. Install DCS cup and DCS into lift/lower Direction Control Switch handle. See Figure 10.
3. Install DCS retainer onto back side of DCS cup, inside lift/lower with DCS handle. See Figure 10.
4. Install two screws through retainer and DCS cup into DCS. See Figure 10.
5. Route DCS cable through cable track on manual lift/lower lever. See Figure 9.
6. Install palm side handle and one capscrew on manual lift/lower lever. See Figure 9.
7. Install lift/lower with DCS handle and two outer capscrews on manual lift/lower lever. Tighten outer capscrews 1.35 to 1.65 N•m (11.9 to 14.6 lbf in). See Figure 9.
8. Install upper front cover. See section Upper Front Cover for procedures.





BM081712

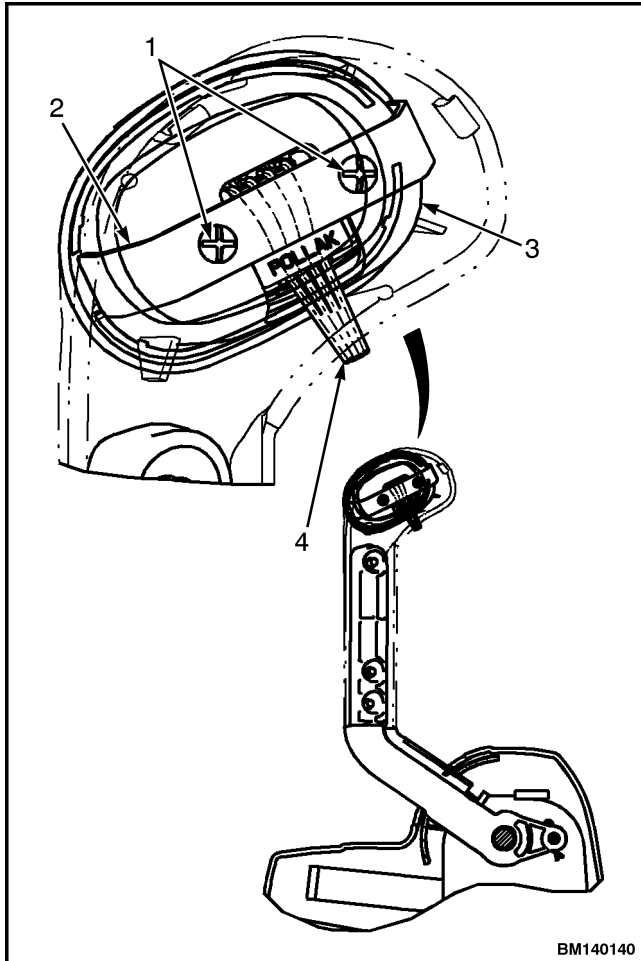
**A. AUX HANDLE WITH DUAL FUNCTION**

**B. LIFT/LOWER WITH DIRECTION CONTROL SWITCH**

- 1. PALM SIDE GRIP HANDLE
- 2. ATTACHMENT SWITCH HANDLE
- 3. LIFT/LOWER WITH DIRECTION CONTROL SWITCH HANDLE
- 4. MANUAL AUX 2 LEVER
- 5. MANUAL LIFT LEVER
- 6. DIRECTION CONTROL SWITCH
- 7. ATTACHMENT PUSH-BUTTON
- 8. INNER CAPSCREW

- 9. OUTER CAPSCREW
- 10. CABLE TRACK
- 11. SCREW
- 12. DIRECTION CONTROL SWITCH RETAINER
- 13. DIRECTION CONTROL SWITCH CUP
- 14. PUSH-BUTTON CABLE
- 15. DIRECTION CONTROL SWITCH CABLE

**Figure 9. Manual Hydraulic Control Handles**



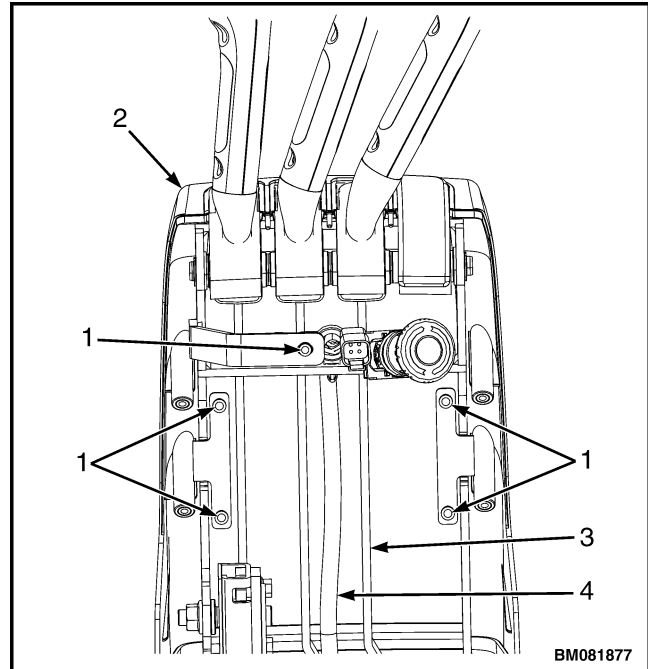
1. SCREW
2. DIRECTION CONTROL SWITCH RETAINER
3. DIRECTION CONTROL SWITCH CUP
4. DIRECTION CONTROL SWITCH CABLE

**Figure 10. Direction Control Switch**

### Emergency Disconnect Switch

#### Remove

1. Read and follow the **WARNING** and **CAUTION** section in the General section above.
2. Remove upper front cover. See section Upper Front Cover above for procedures.
3. Remove five socket head capscrews from upper rear cover. See Figure 11. Pull cover forward to generate enough space to disconnect the emergency disconnect switch wires. See Figure 8.



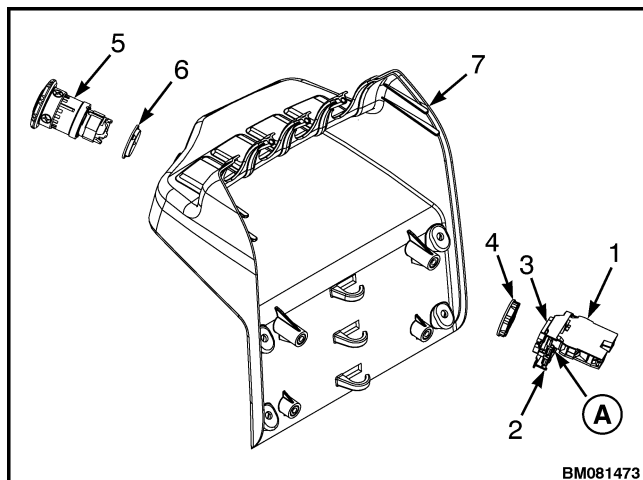
1. SOCKET HEAD SCREWS
2. UPPER REAR COVER
3. LEVER LINKAGE
4. MANUAL HYDRAULICS WIRE HARNESS

**Figure 11. Upper Rear Cover Removal**

4. Disconnect the Direction Control Switch if lift truck is equipped with this feature. See Figure 8.
5. Insert screwdriver or other flat tipped tool into slot on side of switch. Pull tool up to remove the emergency disconnect switch, switch adapter, and lock from upper rear cover. See Figure 12.
6. Remove nut from upper rear cover. Remove emergency disconnect button and bushing from hole in upper rear cover. See Figure 12.

#### Install

1. Insert the emergency disconnect button and bushing into hole in upper rear cover. See Figure 12. Place nut on button and turn it clockwise to secure emergency disconnect button and bushing in hole. Tighten nut to 2 N•m (18 lbf in).
2. Connect wires to emergency disconnect switch. Tighten screws to 0.8 N•m (8.55 lbf in) typical; 1.2 N•m (10.7 lbf in) maximum.



#### A. INSERT SCREWDRIVER HERE

1. EMERGENCY DISCONNECT SWITCH
2. SWITCH ADAPTER
3. LOCK
4. NUT
5. EMERGENCY DISCONNECT BUTTON
6. BUSHING
7. UPPER REAR COVER
8. HOLE

**Figure 12. Emergency Disconnect Switch Replacement**

3. Install switch adapter and lock onto emergency disconnect button assembly. Install switches, by pushing switches onto switch adapter until switches clicks into place. Connect main wire harness to emergency disconnect switch. See Figure 8.
4. Connect the Direction Control Switch if lift truck is equipped with this function. See Figure 8.
5. Install and tighten five socket head capscrews to secure upper rear cover to manual lever assembly. See Figure 12.
6. Install upper front cover. See section Upper Front Cover for procedures.

### Attachment Button (Fourth Function)

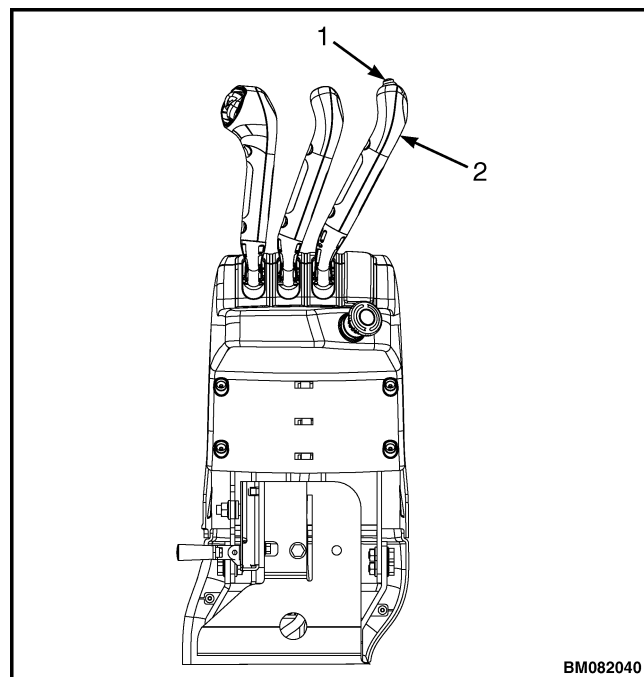
#### Remove

1. Read and follow the **WARNING** and **CAUTION** section in the General section above.

2. Remove upper front cover. See section Upper Front Cover for procedures. Disconnect manual control valve wire harness from direction control switch. See Figure 8.
3. Remove two outer capscrews and attachment switch handle from manual aux 2 lever. See Figure 9.
4. Remove one inner capscrew and palm side grip handle from manual aux 2 lever. See Figure 9.
5. Remove push-button cable from cable track. See Figure 9 and Figure 13.

#### Install

1. Route push-button cable through cable track on manual aux 2 lever. See Figure 9 and Figure 13.
2. Install palm side handle and one inner capscrew on manual aux 2 lever. See Figure 9.



1. ATTACHMENT BUTTON
2. THIRD MANUAL CONTROL LEVER

**Figure 13. Attachment Button**

**NOTE:** Ensure attachment push-button is in correct position on attachment switch handle by aligning notches and flats during assembly.

3. Install attachment switch handle and two outer capscrews on manual aux 2 lever. Tighten outer capscrews 1.35 to 1.65 N•m (11.9 to 14.6 lbf in).
4. Install upper front cover. See section Upper Front Cover for procedures.

## E-HYDRAULIC CONTROLS - TEST

### Mini-Levers

Perform all of the following test procedures to be sure mini-levers operate properly.

See **User Interface Service Technician** 2200SRM1336 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 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. Turn key switch to **ON** position.
3. Display electro-hydraulic diagnostics menu on 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 not working properly. See procedures for each generation of MLM for repair or replacement. Upon completion, rerun 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 not working properly. See procedures for each generation of MLM for repair or replacement. Upon completion, rerun 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 Service Tool to monitor functions.

1. Stroke each lever to full stroke, forward and backward, and allow lever to snap back to center.
2. Turn key switch to **ON** position.
3. Display electro-hydraulic diagnostics menu on dash display panel.
  - Is each lever output = 0%?
  - **YES:** Go to Step 4.
  - **NO:** Mini-lever is not working properly. See procedures for each generation of MLM for repair or replacement. Upon completion, rerun 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 for each generation of MLM for repair or replacement. Upon completion, rerun 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 for each generation of MLM for repair or replacement. Upon completion, rerun test.
6. If mini-lever continues to not function, contact your local **Hyster** dealer or see **Hyster Hypass Online**.

### Push Button Switch

1. Validate push button switch operates properly by operating applicable function.
2. If system does not function, see procedures for each generation of MLM for repair or replacement. Upon completion, rerun test.
3. If push button switch continues to not function properly, contact your local **Hyster** dealer or see **Hyster Hypass Online**.

### E-HYDRAULIC CONTROLS

The lift trucks covered in this service manual may be equipped with optional E-Hydraulic control mini-levers. See Figure 14. Each mini-lever can be replaced separately if one malfunctions. Like manual control levers, E-Hydraulic control mini-levers can be equipped with an optional attachment function (either the third or fourth mini-lever). There is a momentary switch behind the mini-lever (either the third or fourth mini-lever) that engages and disengages the attachment function. If attachment function quits working, mini-lever and momentary switch may need to be replaced. See sections Mini-levers, Remove and Install and Momentary Switches and Function Selection Button for replacement procedures.

#### Mini-levers, Remove and Install



#### CAUTION

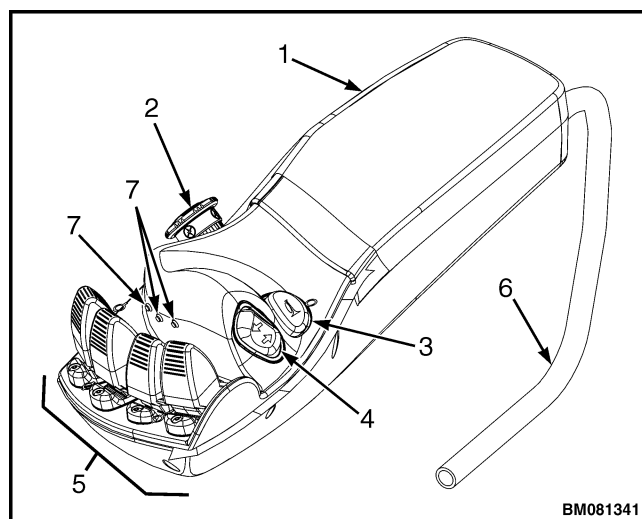
The following procedure should only be performed by Hyster trained certified technicians. The removal and replacement of the mini-levers should be done in a clean environment whenever possible and on an electrically grounded surface.

**DO NOT touch any printed circuit board (PCB) surface to prevent damage from electrostatic voltage.**

1. Read and follow **WARNING** and **CAUTION** section in General section above.
2. Remove two capscrews that secure mini-lever to armrest. Remove mini-lever from armrest. See Figure 15.

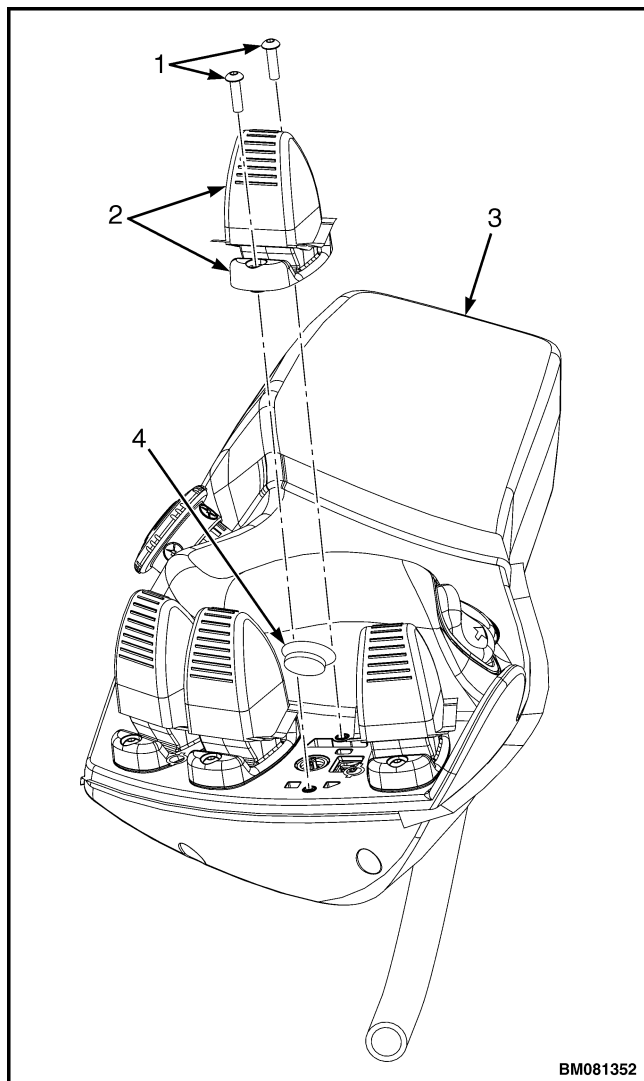
**NOTE:** Before installing new mini-lever, check **Parts Manual** for correct part number to be sure correct mini-lever is being installed.

3. Install new mini-lever onto armrest using two capscrews.



1. ARMREST
2. EMERGENCY DISCONNECT SWITCH
3. HORN BUTTON
4. DIRECTION CONTROL SWITCH
5. MINI-LEVERS
6. WIRE HARNESS
7. MOMENTARY SWITCHES

**Figure 14. E-Hydraulic Controls Arrangement**



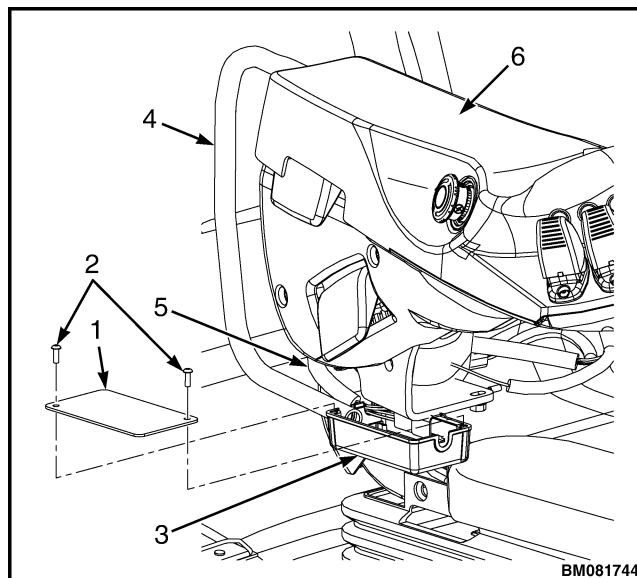
1. CAPSCREWS
2. MINI-LEVER
3. ARMREST
4. MOMENTARY SWITCH

**Figure 15. Mini-Lever Removal**

## Armrest Assembly

### Remove

1. Read and follow **WARNING** and **CAUTION** in General section above.
2. Remove two capscrews from seat box cover and remove cover from seat box. Disconnect main E-Hydraulic control wire harness from E-Hydraulic armrest harness. See Figure 16.

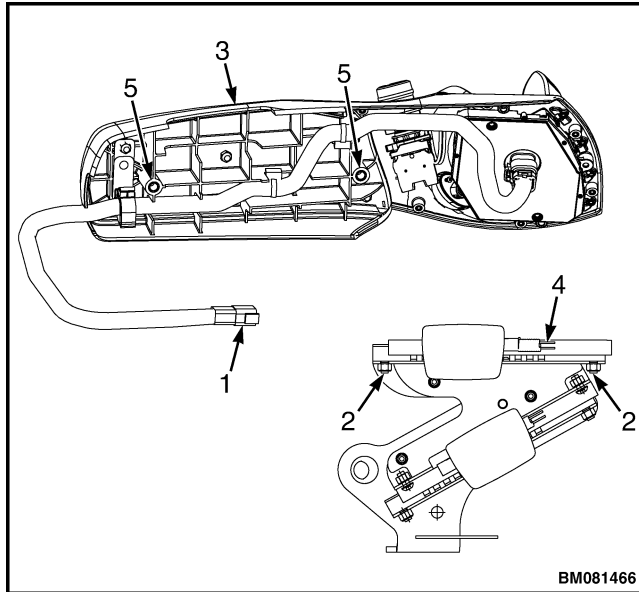


**NOTE:** COMPONENTS PARTS AND ELECTRICAL CONNECTIONS OMITTED OR MOVED FOR CLARITY.

1. SEAT BOX COVER
2. CAPSCREWS
3. SEAT BOX
4. E-HYDRAULIC ARMREST HARNESS
5. OPERATOR PRESENCE SYSTEM HARNESS
6. ARMREST

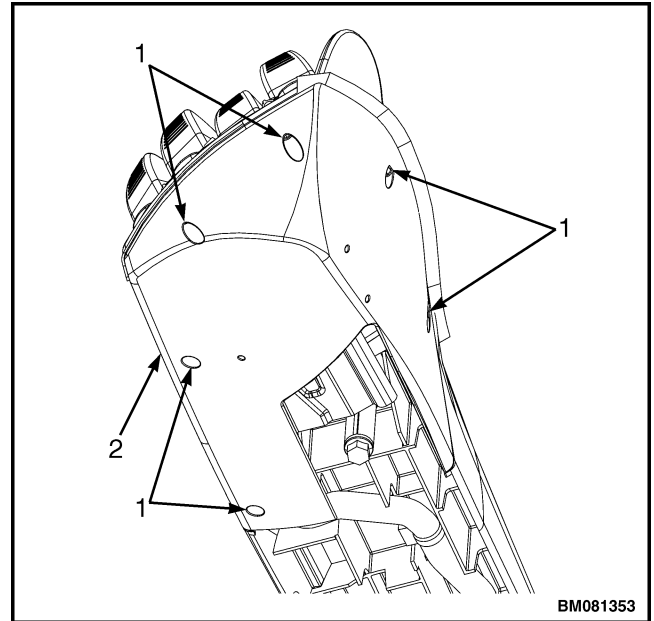
**Figure 16. Seat Box Cover Removal**

3. Pull up on handle (see Figure 18) and slide armrest all the way forward and remove flange capscrew from under armrest mounting bracket that attaches armrest to mounting bracket. Pull up on handle and slide armrest all the way back and remove other flange capscrew. See Figure 17.
4. Remove armrest from armrest mounting bracket.
5. Remove six socket head screws that fasten bottom and top armrest covers together. See Figure 19.
6. Remove five socket head capscrews from bottom armrest cover and armrest. Remove bottom armrest cover.



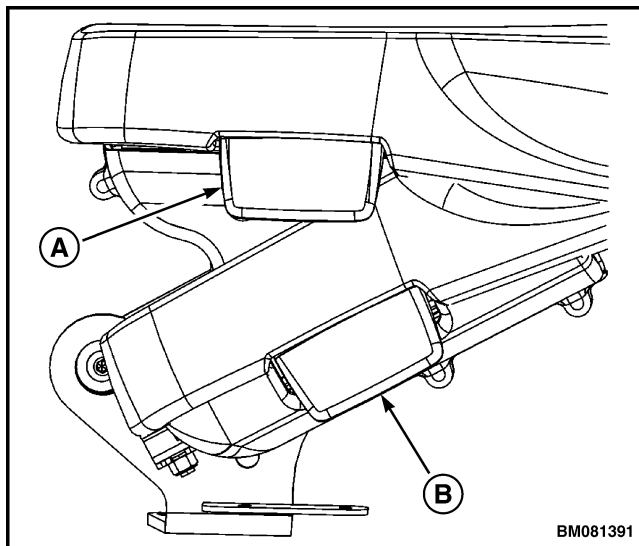
1. E-HYDRAULIC CONTROL WIRE HARNESS
2. FLANGE CAPSCREWS
3. ARMREST
4. ARMREST MOUNTING BRACKET
5. HOLES FOR FLANGE CAPSCREWS

**Figure 17. E-Hydraulic Armrest and Mounting Bracket**



1. SOCKET HEAD SCREWS
2. BOTTOM ARMREST COVER

**Figure 19. Bottom Armrest Cover Removal**

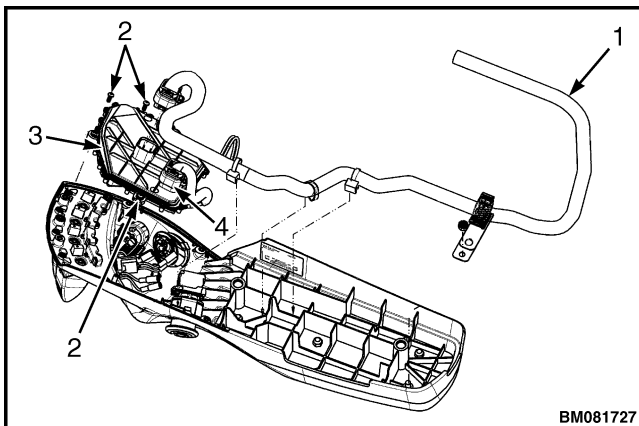


- A. HANDLE MOVES ARMREST FORWARD OR BACKWARD
- B. HANDLE MOVES ARMREST UP OR DOWN

**Figure 18. Armrest Adjustment Handles**

**NOTE:** The momentary switches and function selection button are optional features. If lift truck is not equipped with these features, there will be a plug covering electrical connector on PCB cassette.

7. Disconnect momentary switches/function selection button connector from PCB cassette. See Figure 20.
8. Remove three socket screws from PCB cassette and remove PCB cassette from armrest. See Figure 20.



1. TO E-HYDRAULIC CONTROL WIRE HARNESS
2. SOCKET HEAD SCREWS
3. PCB CASSETTE
4. MOMENTARY SWITCHES/FUNCTION SELECTION BUTTON CONNECTOR

**Figure 20. PCB Cassette Removal**

### Install

1. Install PCB cassette to armrest with three socket head screws. See Figure 19.
2. If lift truck is equipped, connect momentary switches/function selection button connector to PCB cassette. See Figure 19.

3. Install bottom armrest cover to armrest with five socket head screws. See Figure 18.
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. Install six socket head screws that fasten bottom and top armrest covers together. See Figure 18.
6. Connect E-hydraulic wire harness to armrest. See Figure 17. Install seat box cover to seat box with two capscrews. See Figure 16. Tighten capscrews to 1.2 N·m (10.6 lbf in).
7. Connect battery.

### Horn Button

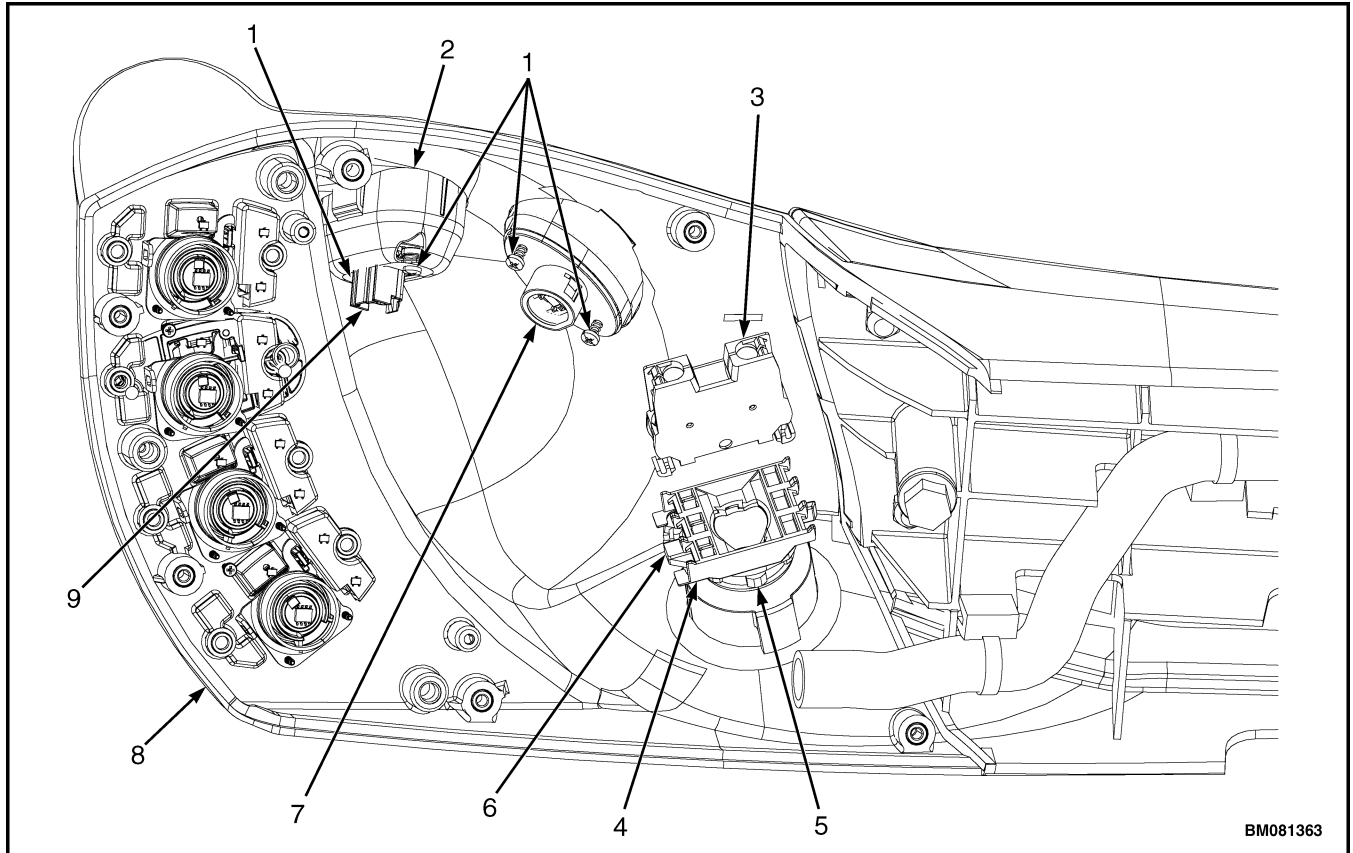
#### Remove

1. Read and follow **WARNING** and **CAUTION** section in General section above.
2. Remove armrest from armrest mounting bracket. Remove bottom armrest and PCB cassette. See section Armrest Assembly for removal procedures.
3. Remove two Phillips head screws that attach horn button to armrest. See Figure 21. Remove horn button from armrest.

#### Install

1. Insert new horn switch into armrest and secure switch to armrest with two Phillips head screws. See Figure 21.
2. Install armrest and PCB cassette to armrest and install armrest to armrest mounting bracket. See section Armrest Assembly for installation procedures.





**NOTE:** MOMENTARY SWITCHES AND FUNCTION SELECTION BUTTON CONNECTIONS NOT SHOWN FOR CLARITY. SEE FIGURE 25 FOR MOMENTARY SWITCHES AND FUNCTION SELECTION BUTTON CONNECTIONS.

- |  |                                       |
|--|---------------------------------------|
| 1. PHILLIPS HEAD SCREWS                | 6. LOCK                               |
| 2. DIRECTION CONTROL SWITCH ADAPTER    | 7. HORN SWITCH                        |
| 3. EMERGENCY DISCONNECT SWITCH         | 8. ARMREST                            |
| 4. EMERGENCY DISCONNECT SWITCH ADAPTER | 9. DIRECTION CONTROL SWITCH CONNECTOR |
| 5. NUT                                 |                                       |

**Figure 21. Switch Arrangement and Connections, E-Hydraulic Mini-Levers**

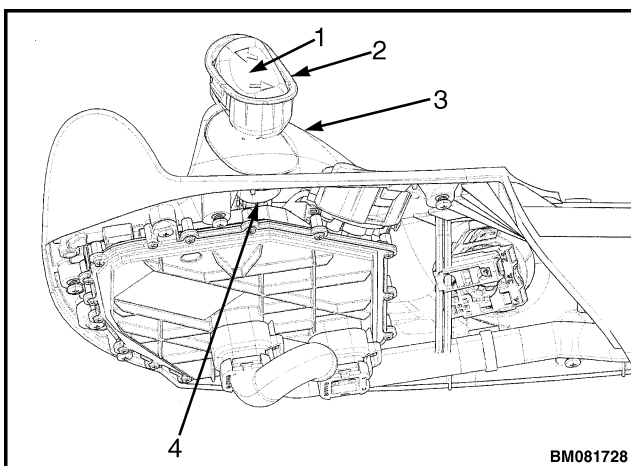
## Direction Control Switch

### Remove

1. Read and follow **WARNING** and **CAUTION** section in General section above.
2. Remove armrest from armrest mounting bracket. Remove bottom armrest cover. See section Armrest Assembly for removal procedures.
3. Remove Direction Control Switch (DCS) assembly from armrest by compressing clips on either side of bezel and carefully pulling assembly out. Disconnect E-Hydraulic control valve wiring harness from DCS. See Figure 22.
4. Remove DCS from bezel. See Figure 22.

### Install

1. Insert new DCS into bezel. See Figure 22.
2. Connect E-Hydraulic control valve wiring harness to DCS. Install DCS assembly into armrest by compressing clips on either side of bezel and pushing assembly into armrest until clips latch. See Figure 22.
3. Install armrest cover to armrest, and install armrest to armrest mounting bracket. See section Armrest Assembly for installation procedures.

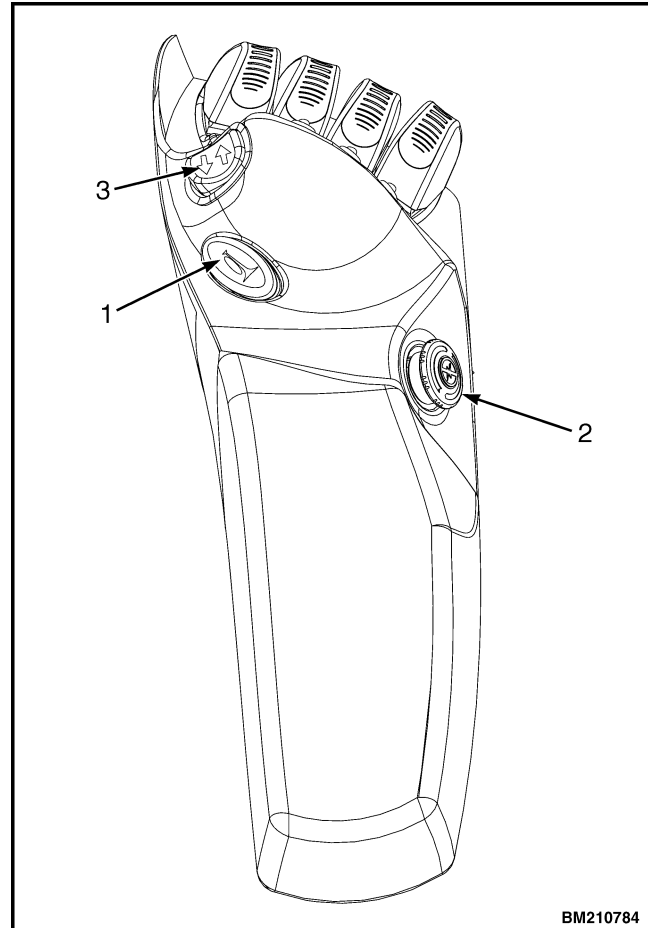


1. DIRECTION CONTROL SWITCH
2. BEZEL
3. ARMREST
4. E-HYDRAULIC CONTROL VALVE WIRING HARNESS

**Figure 22. Direction Control Switch Replacement**

## Emergency Disconnect Switch

Both E-Hydraulic controls and manual hydraulic controls use the same emergency disconnect switch. See Figure 23.



1. HORN BUTTON
2. EMERGENCY DISCONNECT SWITCH
3. DIRECTION CONTROL SWITCH

**Figure 23. Emergency Disconnect Switch Location, E-Hydraulic Controls**

### Remove

1. Read and follow **WARNING** and **CAUTION** section in General section above.
2. Remove armrest from armrest mounting bracket. Remove bottom armrest and PCB cassette. See section Armrest Assembly for removal procedures.
3. Disconnect wires from emergency disconnect switch.

4. Insert screwdriver or other flat tipped tool into slot on side of switch. See Figure 12. Pull tool up to remove emergency disconnect switch, switch adapter, and lock from underneath armrest.
5. Remove nut from underneath armrest. See Figure 21. Remove emergency disconnect button and bushing from top part of armrest.

### Install

1. Insert emergency disconnect button and bushing into hole in top part of armrest.
2. Place nut on button and turn it clockwise to secure emergency disconnect button and bushing to armrest. Tighten nut to 2 N·m (18 lbf in). See Figure 12 or Figure 21.
3. Install switch adapter and lock onto emergency disconnect button assembly. Install switches, by pushing switches onto switch adapter until switches clicks into place.
4. Connect wires to emergency disconnect switch. Tighten screws to 0.8 N·m (8.55 lbf in) typical; 1.2 N·m (10.7 lbf in) maximum.
5. Install armrest and PCB cassette to armrest and install armrest to armrest mounting bracket. See section Armrest Assembly for installation procedures.

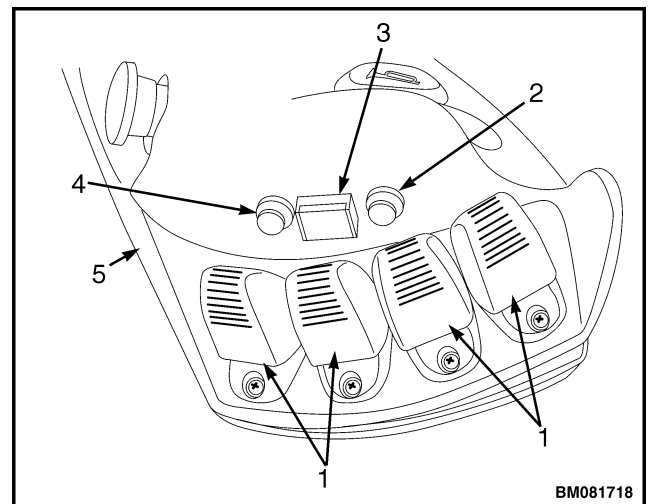
### Momentary Switches and Function Selection Button

**NOTE:** The different configurations of switches and buttons discussed in this section may not be found on your lift truck. See **Operating Manual** for your lift truck's configuration.

On lift trucks equipped with E-Hydraulic controls, there may be two optional momentary switches (green buttons) and a function selection button (yellow button) located behind the second, third, or fourth mini-lever. See Figure 24. The momentary switch 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 three mini-levers and a four function control valve, there will be a function selection button behind the third mini-lever. Pressing this button allows the third mini-lever to switch between the third and fourth functions. If the lift truck is equipped with four mini-levers and a five function control valve, the function selection button will be located behind the fourth mini-lever. Pressing the button allows the fourth mini-lever to switch between the fourth and fifth functions.

If the lift truck is equipped with an attachment, the last mini-lever on the right controls the attachment function. Behind this lever will be a momentary switch. To engage the attachment, move the mini-lever backward. To disengage the attachment, push the momentary switch behind the mini-lever and move mini-lever forward.



**NOTE:** ALL POSSIBLE MOMENTARY SWITCHES AND FUNCTION SELECTION BUTTON CONFIGURATIONS SHOWN. NOT ALL LIFT TRUCK MAY HAVE ALL SWITCHES AND BUTTONS SHOWN. SEE THE **OPERATING MANUAL** FOR YOUR LIFT TRUCK'S CONFIGURATION.

1. MINI-LEVERS
2. MOMENTARY SWITCH (RTST)
3. FUNCTION SELECTION BUTTON
4. MOMENTARY SWITCH (CLAMP)
5. ARMREST HOUSING

**Figure 24. Momentary Switches and Function Selection Button Location**