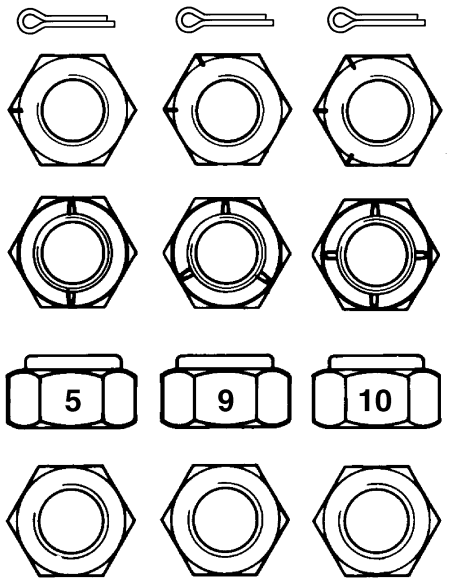
Yale®

Maintenance

# METRIC AND INCH (SAE) FASTENERS




HM210064

*Table 6. Torque Values for Inch Fasteners* (Continued)*

| Size and Pitch | | Grade 2[1] | | Grade 5[2] | | Grade 8[3] | |
|---|---|---|---|---|---|---|---|
| | | lbf ft | N•m | lbf ft | N•m | lbf ft | N•m |
| 1/2 1/2 | 13 UNC 20 UNF | 37 41 | 50 56 | 57 85 | 77 115 | 80 90 | 110 120 |
| 9/16 9/16 | 12 UNC 18 UNF | 53 59 | 72 80 | 82 91 | 110 125 | 115 130 | 155 175 |
| 5/8 5/8 | 11 UNC 18 UNF | 73 83 | 99 110 | 115 130 | 155 175 | 160 180 | 215 245 |
| 3/4 3/4 | 10 UNC 16 UNF | 130 145 | 175 195 | 200 225 | 270 300 | 280 315 | 380 425 |
| 7/8 7/8 | 9 UNC 14 UNF | 125 140 | 170 185 | 320 355 | 435 480 | 455 500 | 615 680 |
| 1 1 | 8 UNC 14 UNF | 185 210 | 255 285 | 485 540 | 655 735 | 680 765 | 925 1,040 |
| 1-1/8 1-1/8 | 7 UNC 12 UNF | 265 300 | 360 405 | 595 670 | 805 905 | 965 1,080 | 1,310 1,470 |
| 1-1/4 1-1/4 | 7 UNC 12 UNF | 375 415 | 510 565 | 840 930 | 1,140 1,260 | 1,360 1,500 | 1,850 2,050 |
| 1-3/8 1-3/8 | 6 UNC 12 UNF | 490 560 | 665 760 | 1,100 1,250 | 1,490 1,700 | 1,780 2,040 | 2,420 2,760 |
| 1-1/2 1-1/2 | 6 UNC 12 UNF | 650 735 | 885 995 | 1,460 1,650 | 1,980 2,230 | 2,370 2,670 | 3,210 3,620 |

* Unless otherwise specified [1] Approximately equal to metric Property Class 5.8 [2] Approximately equal to metric Property Class 8.8 [3] Approximately equal to metric Property Class 10.9

## COTTER (SPLIT) PINS

Cotter (split) pins are used in many applications on your forklift. They are typically used to retain parts such as pins and nuts. Cotter (split) pins are typically not used as load-bearing members. Service personnel must use new cotter (split) pins. Do not reuse a cotter (split) pin. Replacement cotter (split) pin must be of the correct size. See Table 8.

The legs of a cotter (split) pin are bent for the following reasons:

- To retain the cotter (split) pin in the part
- To provide clearance between the cotter pin legs and other parts or members. One or both cotter (split) pin legs must be bent to provide a minimum 90° angle between the legs. See Figure 2.

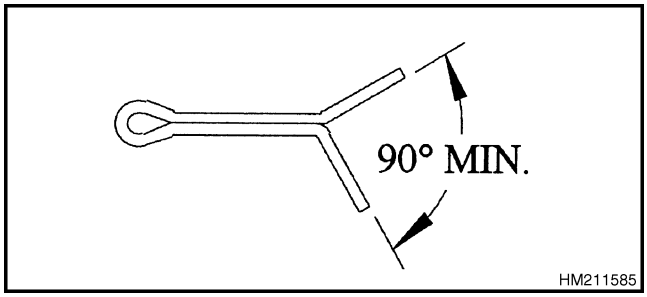
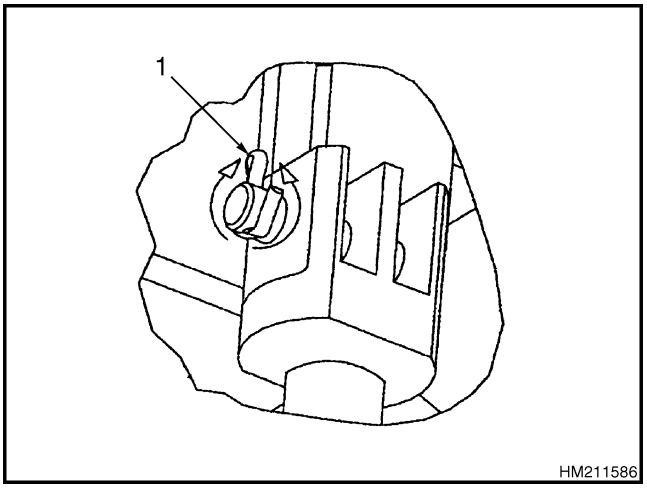



***Figure 2. Minimum Angle Between Cotter Pin Legs***

Unless otherwise specified, the legs of chain anchor cotter (split) pins are to be bent against the pin. See Figure 3.



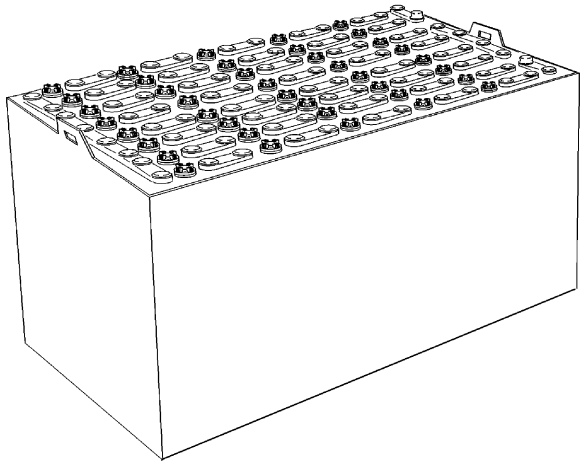

1. COTTER PIN

***Figure 3. Cotter (Split) Pins Used On Mast Chain Anchors***

Yale®

Maintenance

# INDUSTRIAL BATTERY



PART NO. 524158040

2240 YRM 0001

## Battery Inspection Report

Date _____

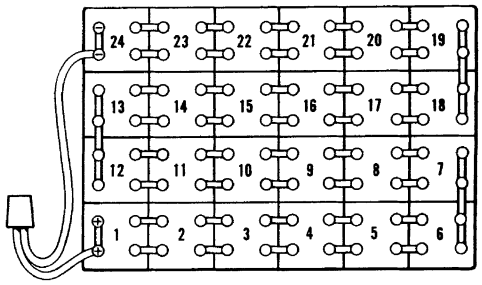
Battery No. _____ Dept. Used In _____

Battery Type _____ MFR. _____

Serial No. _____ Date New _____

Reading on Charge at _____ Amperes Charger No. _____

| CELL NO. | CELL VOLTS | POSITIVE CADMIUM | SPECIFIC GRAVITY | TEMP. | CELL NO. | CELL VOLTS | POSITIVE CADMIUM | SPECIFIC GRAVITY | TEMP. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 21 | | | | |
| 2 | | | | | 22 | | | | |
| 3 | | | | | 23 | | | | |
| 4 | | | | | 24 | | | | |
| 5 | | | | | 25 | | | | |
| 6 | | | | | 26 | | | | |
| 7 | | | | | 27 | | | | |
| 8 | | | | | 28 | | | | |
| 9 | | | | | 29 | | | | |
| 10 | | | | | 30 | | | | |
| 11 | | | | | 31 | | | | |
| 12 | | | | | 32 | | | | |




HM030012

*Figure 11. Battery Inspection Report*

## Daily Battery Record

Battery No. _____ Month _____ Year _____

Battery Type _____ MFR. _____

Serial No. _____ Date New _____

Total Cycles For Month _____ Total Cycles To Date _____

| DATE | TRUCK NO. | SPECIFIC GRAVITY IN | SPECIFIC GRAVITY OUT | TEMP. PILOT CELL | TIME ON CHARGE | TIME OFF CHARGE | INITIAL AMPS | WATER ADDED | OPERATOR |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

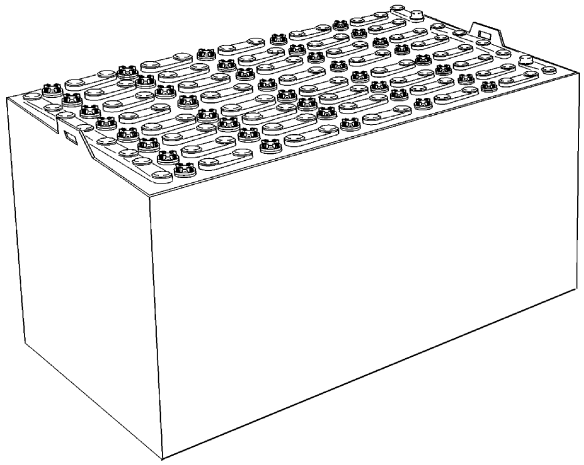
HM030013

*Figure 12. Daily Battery Report*

Yale®

Maintenance

# INDUSTRIAL BATTERY



PART NO. 524158040

2240 YRM 0001

***Legend for Figure 14.***

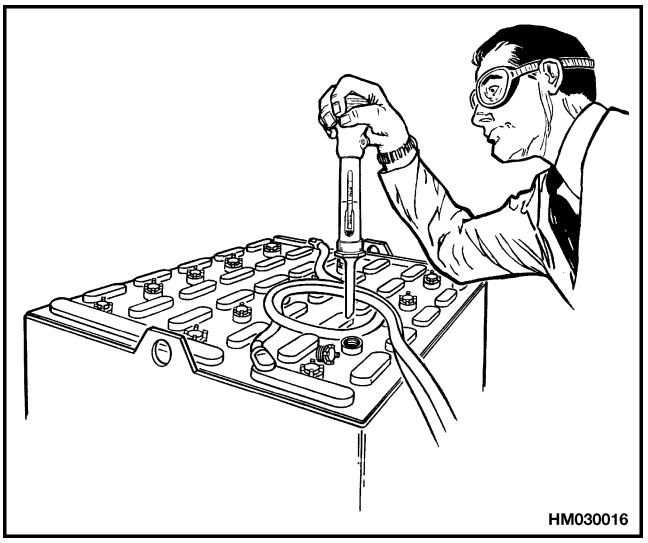
1. HIGH FLOAT MEANS HIGH SPECIFIC GRAVITY.
2. LOW FLOAT MEANS LOW SPECIFIC GRAVITY.
3. CORRECT METHOD OF READING HYDROMETER: EYE LEVEL EVEN WITH SURFACE OF ELECTROLYTE.

## BATTERY TEMPERATURE

The temperature of the electrolyte will change the reading of the specific gravity. When the temperature increases approximately 6°C (10°F), the specific gravity will decrease by 0.003 point. See Figure 15 for making specific gravity corrections. If the hydrometer you are using does not have a temperature correction, you will have to use a thermometer. Special battery thermometers are available that will indicate the correction factor directly and add or subtract the correct number of points. See Figure 16.

NEVER charge a battery at a rate that will raise the electrolyte temperature above 49°C (120°F). NEVER let a battery stay discharged for long periods. A temperature above this amount will damage the battery. The cells in the center of the battery are normally at the highest temperature. If the battery temperature is too hot, make sure the ventilation of the battery is increased and make sure the charge or discharge rate is not too high. A recommendation for a battery in service is 8 hours of use (discharge), followed by 8 hours of charging, followed by 8 hours of cooling.

To charge the battery, a direct current must pass through the cells in the opposite direction to the discharging current. The ampere-hours must be equal to the discharging ampere-hours plus the energy lost as heat. This additional amount of charge will vary according to the battery and the temperature, but the average additional charge is 12 percent. When the battery is nearly charged, the final charging must be at a low rate. A charging rate that is too high will cause heating in the battery and a high loss of water from the electrolyte. The charging of the battery must be done correctly, or the service life of the battery will be decreased.




| Specific Gravity Reading | Electrolyte Temp. | Correction Points | Correct Value |
|---|---|---|---|
| 1.210 | 31°C (88°F) | +0.003 | 1.213 |
| 1.210 | 27°C (81°F) | +0.001 | 1.211 |
| 1.210 | 25°C (77°F) | 0.000 | 1.210 |
| 1.210 | 18°C (64°F) | −0.004 | 1.206 |
| +0.001 or −0.001 for each 2 degrees C from the 25-degree base value. | | | |

***Figure 15. Specific Gravity Check***

# TABLE OF CONTENTS



This section is for the following models:

(NDR030GB, NR045GB) [B861];
(NDR030AE, NR035/040/045AE) [C815];
(NS040AF, NS050AF) [C816];
(NDR030CB, NR045CB) [D829];
(MCW025/030/040-E) [C819, D819];
(MSW030/040-E) [C820, D820];
(MRW020/030-E) [C821, D821];
(NDR035EA, NR045EA) [C861];
(NDR035EB, NR045EB) [D861];
(NDR030EA, NR035/040EA) [D815];
(NR035-40EB, NDR030EB) [E815];
(NDR030DA, NR035/040DA) [A295];
(NR035-40DB, NDR030DB) [B295];
(MSW025/030-F) [B895]

**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.**

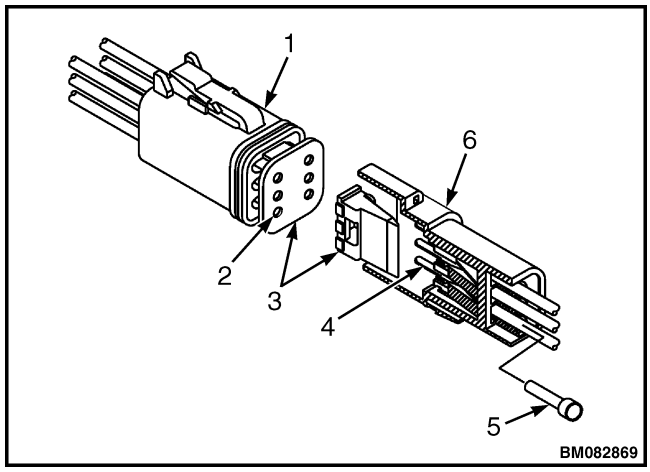
**WARNING**

**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.**

# Deutsch Connectors

## DT, DTM, AND DTP SERIES CONNECTORS

All Deutsch DT, DTM, and DTP series pin- and socket-type connectors are repaired in the same manner. See Figure 14.



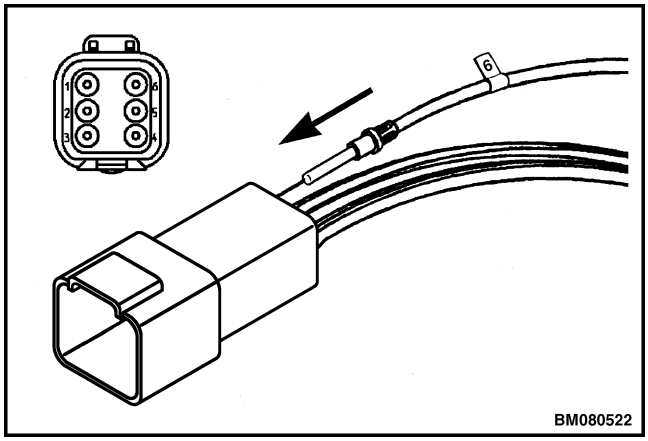

1. PLUG TYPE BODY
2. SOCKET TERMINAL
3. SECONDARY LOCK
4. PIN TERMINAL
5. CAVITY PLUG
6. RECEPTACLE CONNECTOR BODY

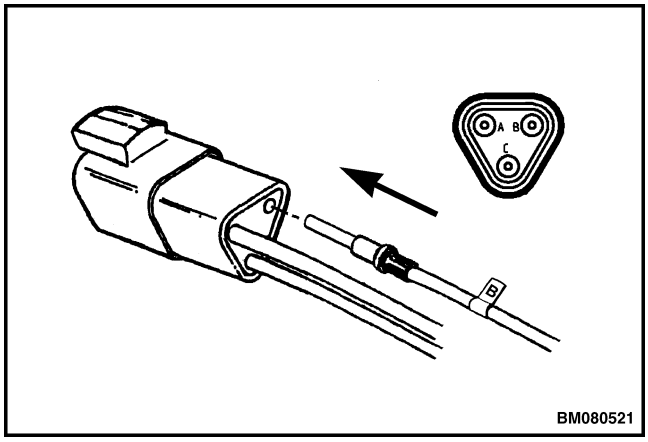
***Figure 14. Typical Deutsch Series Connector***

For examples of the DT connector receptacles, see Figure 15. See Figure 16 for the different connector receptacle secondary locks, Figure 17 for the different connector plugs, and Figure 18 for the different connector plug secondary locks.

For examples of the DTM and DTP connectors, see Figure 19 for the different connector receptacles, Figure 20 for the different connector receptacle secondary locks, Figure 21 for the different connector plugs, and Figure 22 for the different connector plug secondary locks.

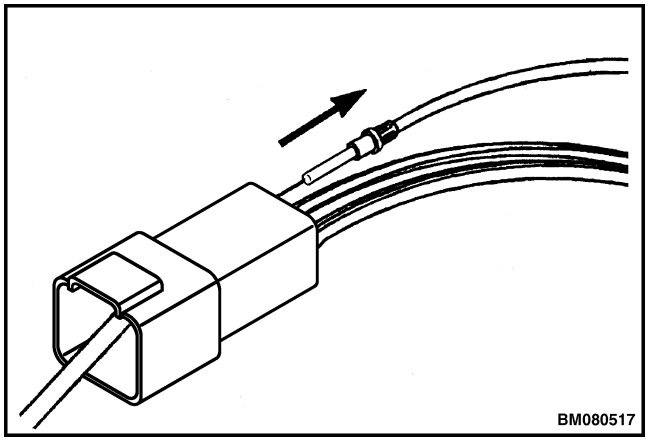
**STEP 7.**
Insert the wires into the new connector receptacle according to the number or letter on the tag and connector receptacle. Push the wires straight into the back of the receptacle until a click is felt. Slightly tug each wire to verify the wire is properly locked in place. Remove tags.

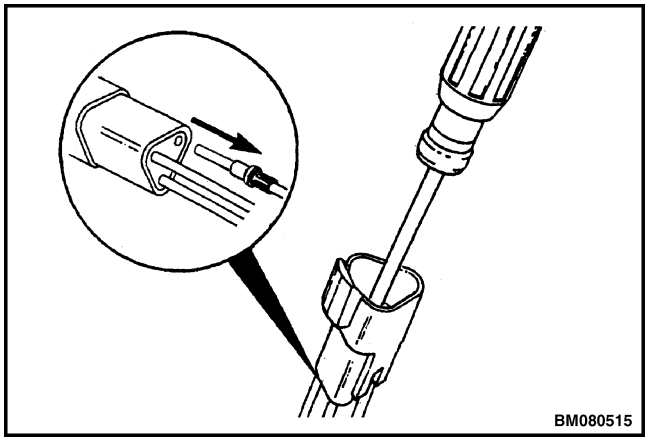


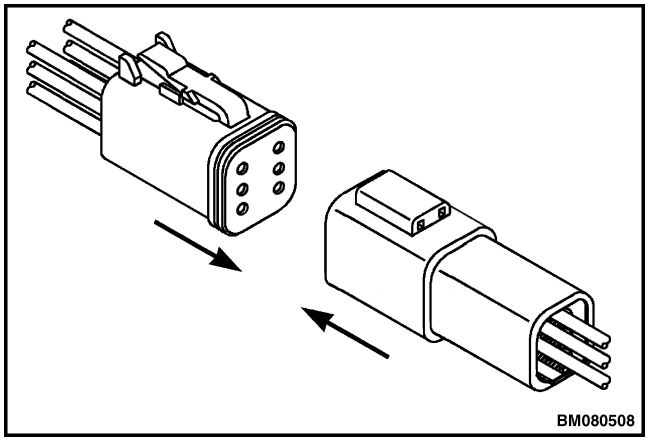

**NOTE:** Verify that the seal is in place on the connector plug before installing the secondary lock.

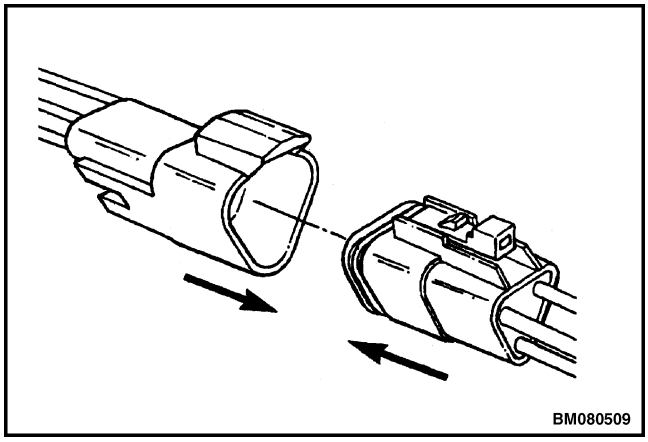
**STEP 4.**
Gently pull the wire backward while, at the same time, releasing the locking finger with the small, flat-blade screwdriver (Yale P/N 150121838) .



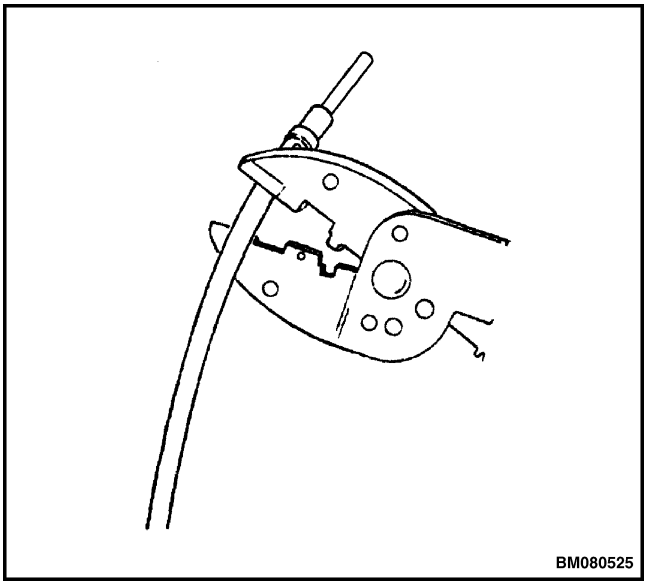



**STEP 11.**
Push the connector plug into the connector receptacle until the external locking mechanism(s) snap(s) into place.

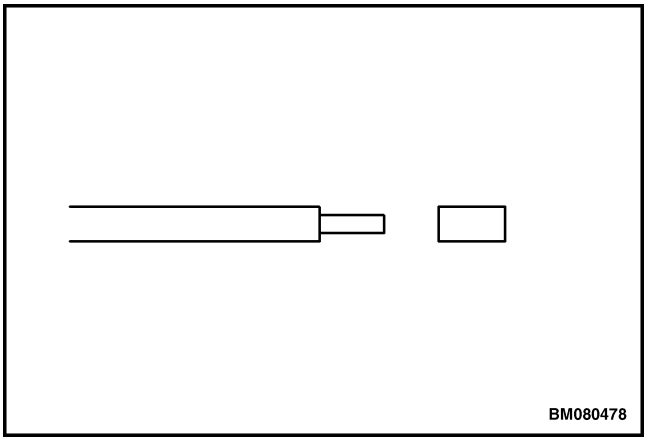


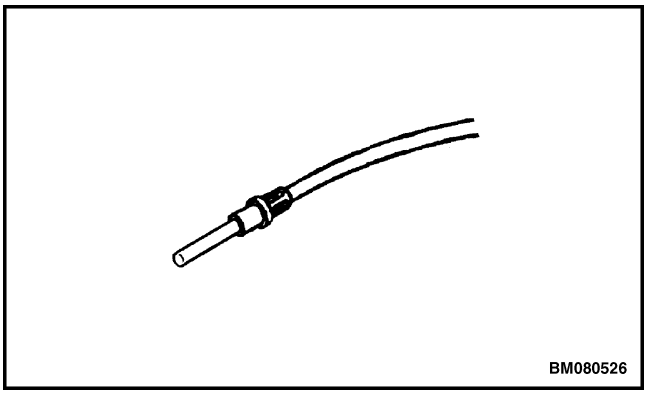
**STEP 7.**
Using wire cutters, cut the wire behind the old pin and discard old pin.




**STEP 8.**
Using wire strippers, Yale P/N 150121841 , strip the wire to the recommended length shown in Table 15.

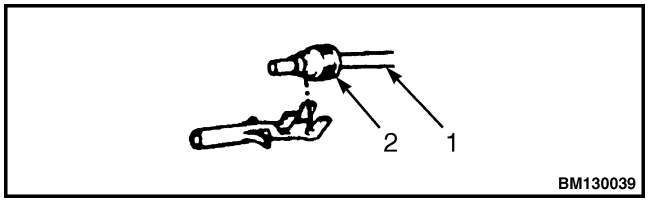



**STEP 9.**
Using the Deutsch Crimping Tool (Yale P/N 150121900) , crimp the new pin on the wire as shown in How to Crimp With the Deutsch Crimping Tool.




**NOTE:** The rear seal/grommet must be seated properly before inserting wires.

**STEP 3.**
Cut wire immediately behind cable seal.




1. WIRE
2. SEAL

**STEP 4.**
Replace terminal.

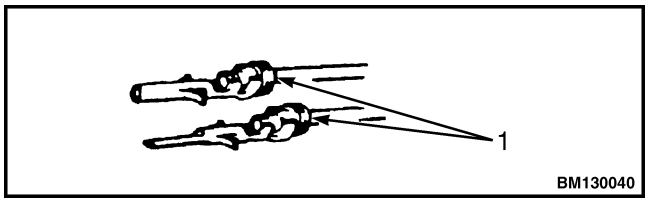
**STEP 1.**
Slip new seal onto wire.

**STEP 2.**
Strip 5 mm (0.2 in.) of insulation from wire.

**STEP 3.**
Crimp terminal over wire and seal.

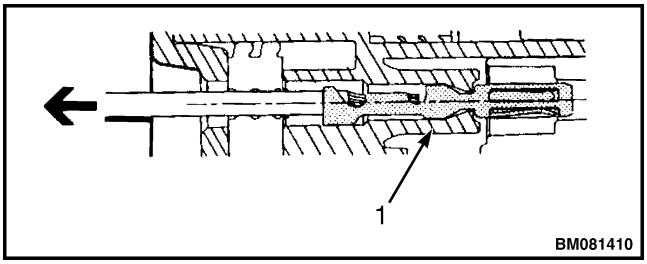
**STEP 5.**
Push terminal and connector onto wire and engage locking tabs.

**STEP 6.**
Close secondary lock hinge.




1. SEAL

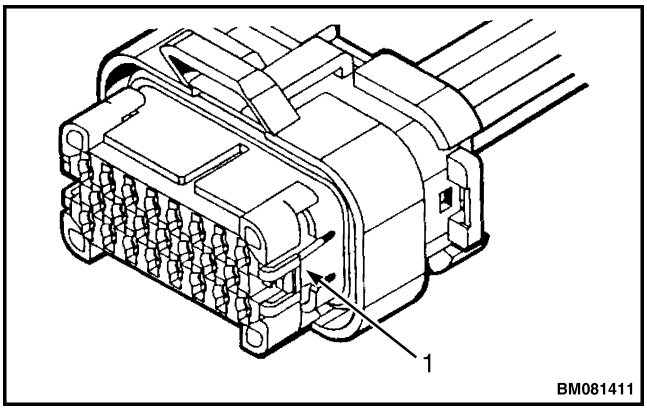
**STEP 3.**
Pull back on the contact wire with a force of 4 to 9 N (1 to 2 lbf) to be sure the retention fingers are holding the contact.




**NOTE:** PULL WIRE IN DIRECTION OF ARROW.

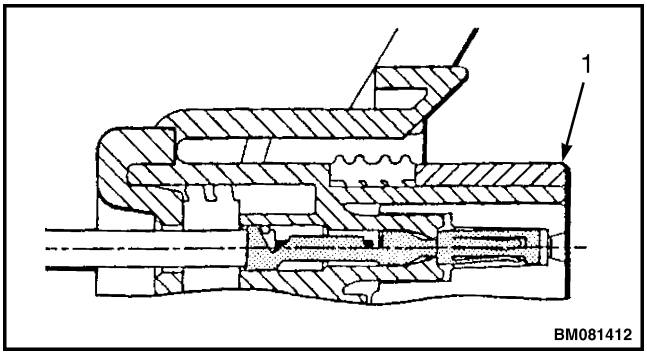
1. RETENTION FINGERS

**STEP 4.**
After all required contacts have been inserted, the wedge lock must be closed to its LOCKED position. Release the locking latches by squeezing them inward.



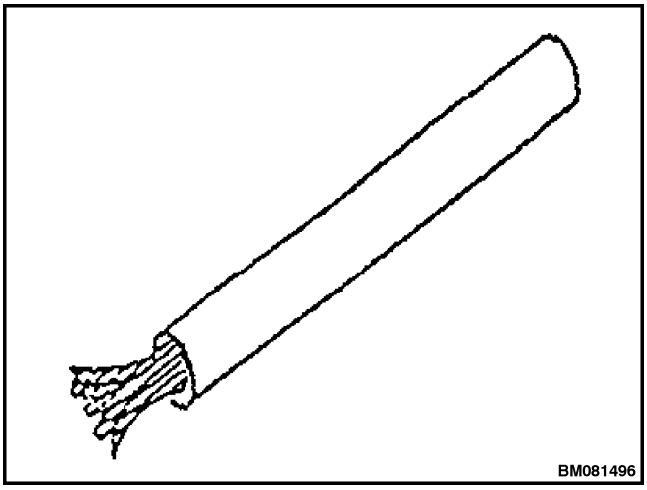

1. LOCKING LATCHES

**STEP 5.**
Slide the wedge lock into the housing until it is flush with the housing.

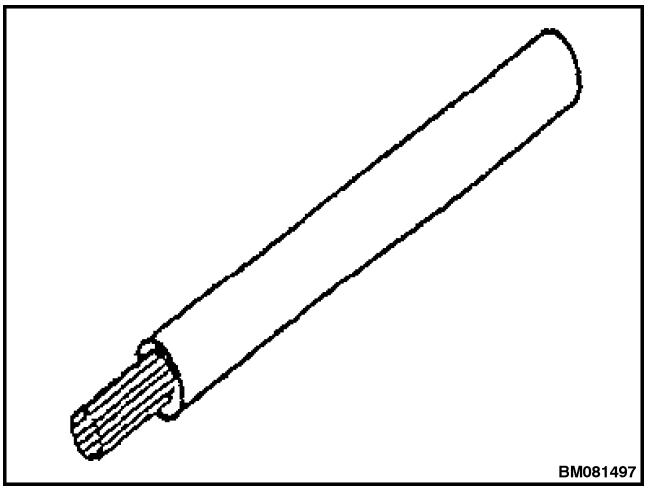



1. WEDGE LOCK

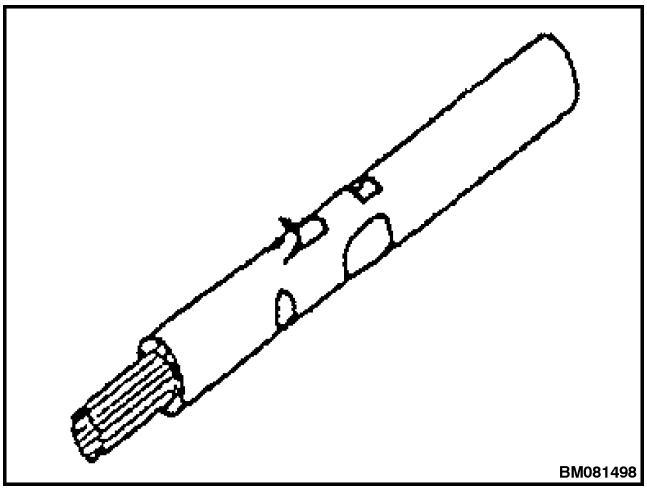
**STEP 2.**
Cut end of wire shall appear neat without any bend or stranded conductor.




**STEP 3.**
Conductor shall be free from nick, cut or scrape.




**STEP 4.**
Wire insulation must have smooth surface in a round form without damage, groove, or recessed surface.

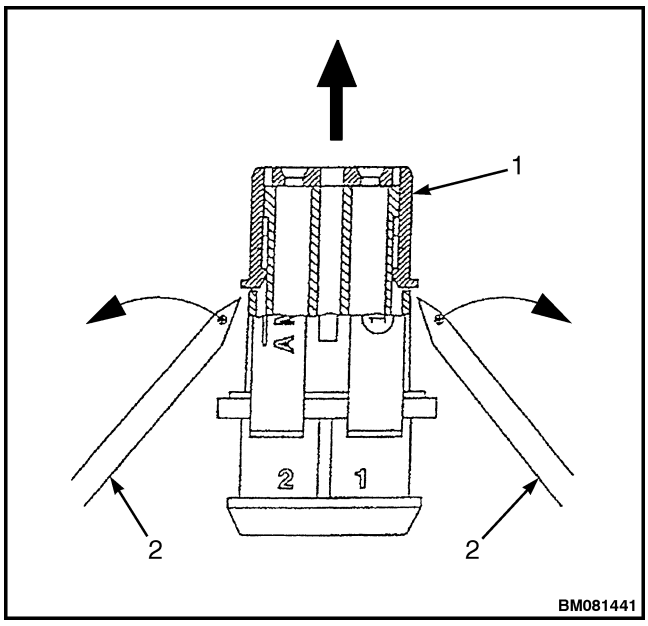


## *Removal of Contacts*

Since the locking lance of contacts can be reached from the mating side of the housings, it is necessary to remove the anti-backout device first.

**NOTE:** Perform Step 1 and Step 2 for removal of receptacle contact.

**STEP 1.**
Deflect the side arms of the anti-back out device and pull it away.




1. ANTI-BACK OUT DEVICE
2. EXTRACTION TOOL

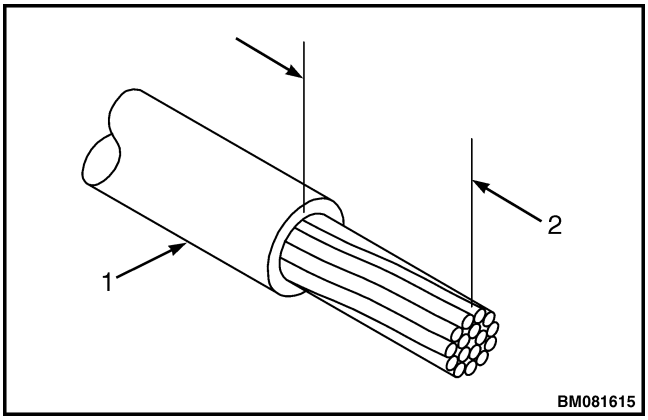



*Figure 75. Wire Strip Length*

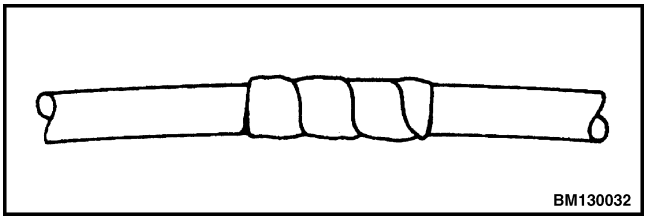
***Legend for Figure 75.***

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

***Table 13. Wire Strip Length and Crimp Measurements***

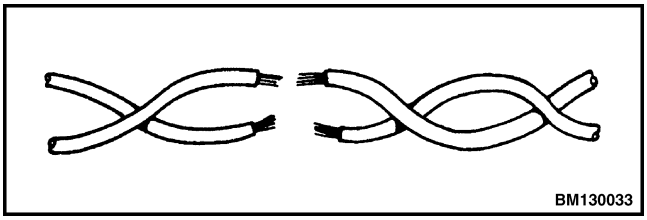
| Wire Size (AWG) | Insulation Diameter | Strip Length | Wire Barrel | | Insulation Barrel |
|---|---|---|---|---|---|
| | | | Crimp Width | Crimp Height | Crimp Width |
| 20 | 1.52 to 2.54 mm (0.06 to 0.10 in.) | 5.82 to 6.48 mm (0.229 to 0.255 in.) | 2.24 to 2.34 mm (0.088 to 0.092 in.) | 1.07 to 1.32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

**STEP 7.**
Apply electrical tape over whole bundle to secure.

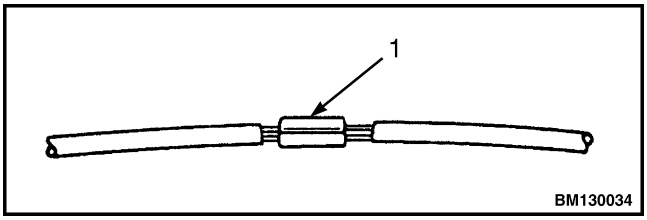



## TWISTED LEADS REPAIR

**STEP 1.**
Locate damaged wire and remove insulation as required.



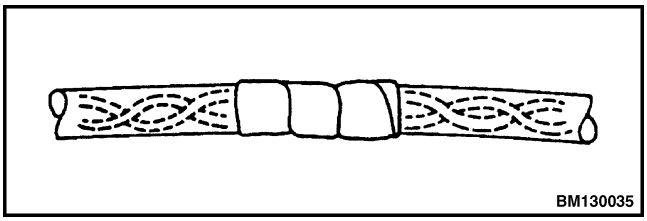

**STEP 2.**
Splice the two wires using splice clips and rosin core solder.



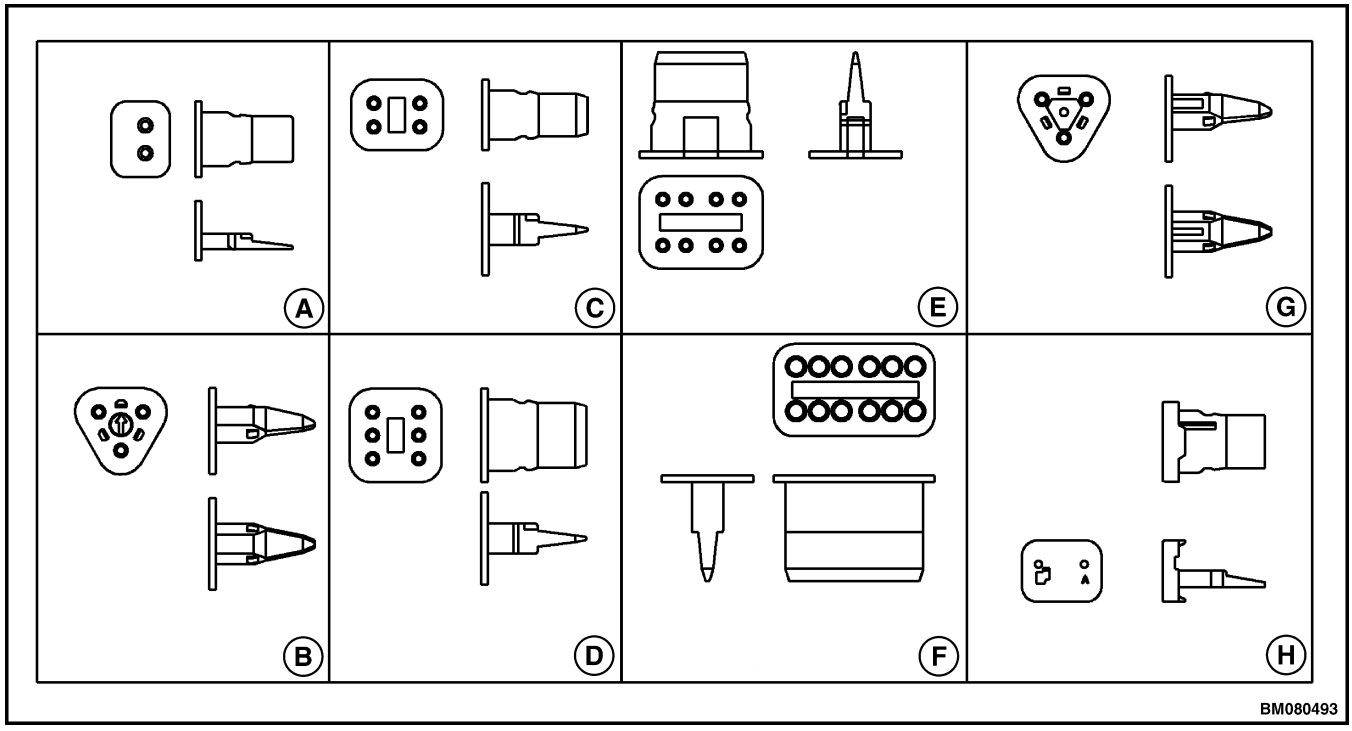

1. SPLICE AND SOLDER

**STEP 3.**
Cover splice with electrical tape to insulate from other wires.

**STEP 4.**
Twist and tape with electrical tape.



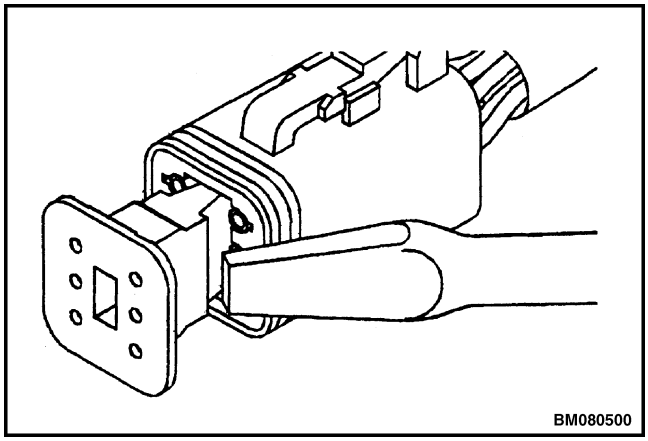
# TABLE OF CONTENTS (Continued)

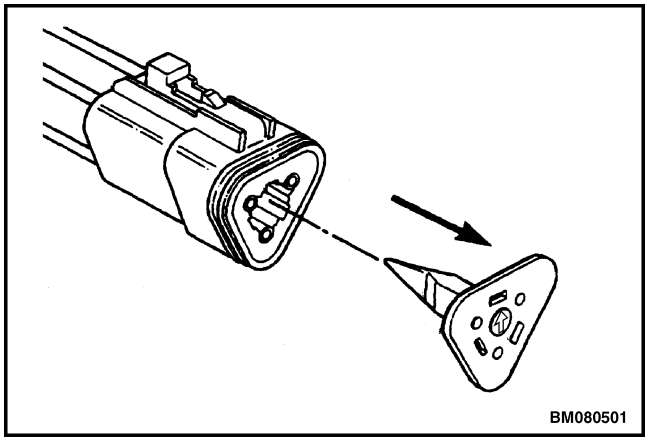



A. SECONDARY LOCK TYPE DA
B. SECONDARY LOCK TYPE DB
C. SECONDARY LOCK TYPE DC
D. SECONDARY LOCK TYPE DD
E. SECONDARY LOCK TYPE DE
F. SECONDARY LOCK TYPE DF
G. SECONDARY LOCK TYPE DG
H. SECONDARY LOCK TYPE DH

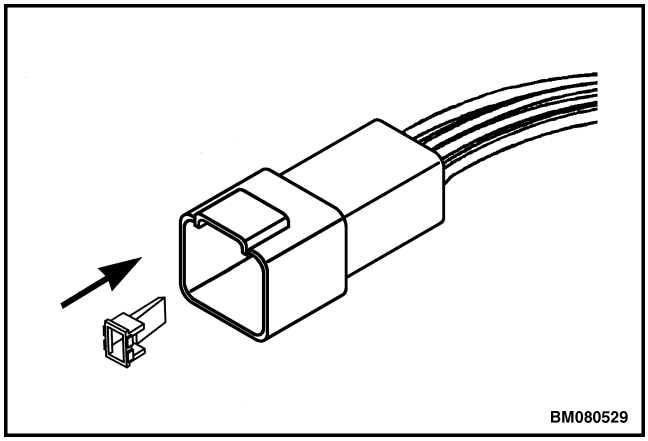
***Figure 18. DT Connector Plug Secondary Locks***

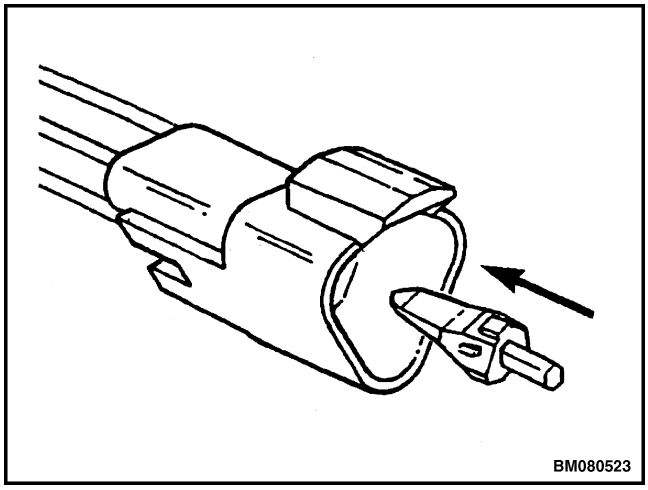
**STEP 2.**
Using a small, flat-blade screwdriver (Yale P/N 150121838) , remove the secondary lock from the connector plug.



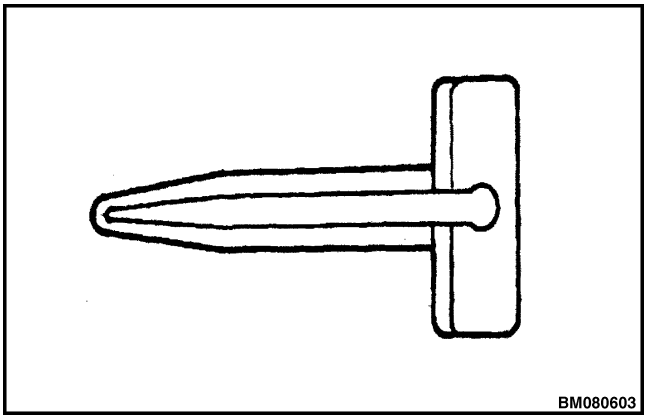



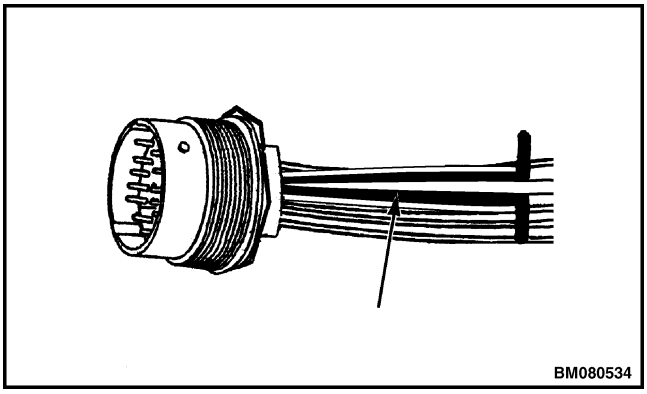
**STEP 10.**
Install the secondary lock. Push the lock straight in until the lock snaps into place.



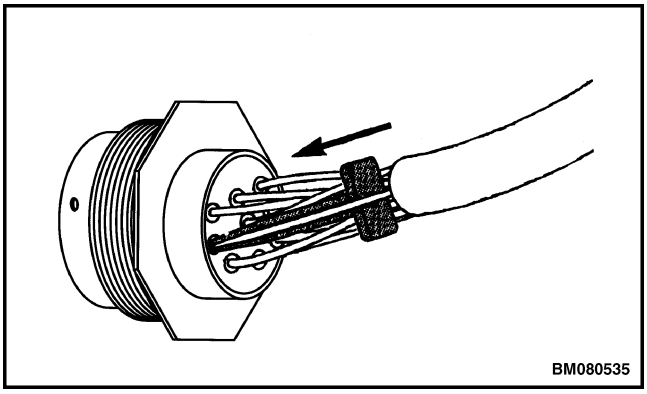
**STEP 3.**
Insert a Deutsch extraction tool over the wire being removed.



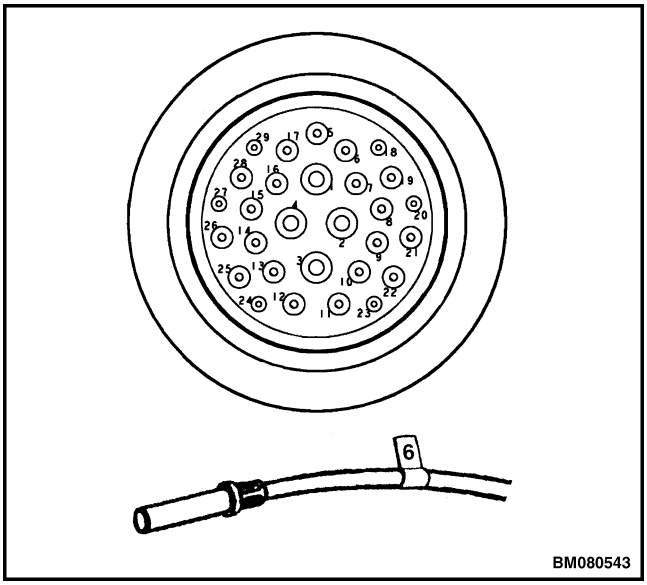

**NOTE:** Do not twist the tool or insert the tool at an angle.

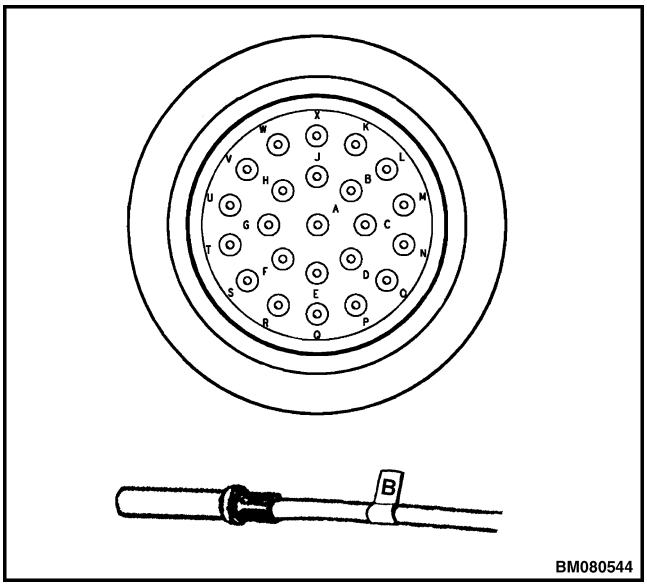
**STEP 4.**
Push the tool into the connector about 25 mm (1 in.) until it bottoms on the contact flange.

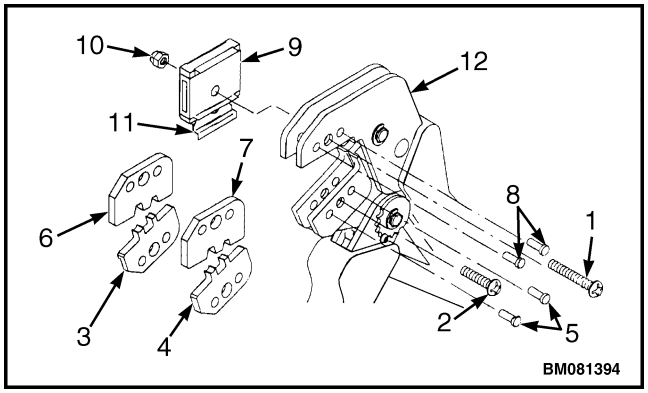



**NOTE:** If pin is difficult to remove, remove the extraction tool, turn the extraction tool 90 degrees, and reinsert the tool into the connector.

**STEP 5.**
If more than one wire is being removed, tag the wire and mark it with the corresponding number or letter on the back of the connector from which the wire was removed.






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

***Figure 36. Die Set and Locator Assembly***

## Stripping Wire for Use With AMP PRO-CRIMPER II Tool

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

**2.** See Table 4 for recommended strip length.

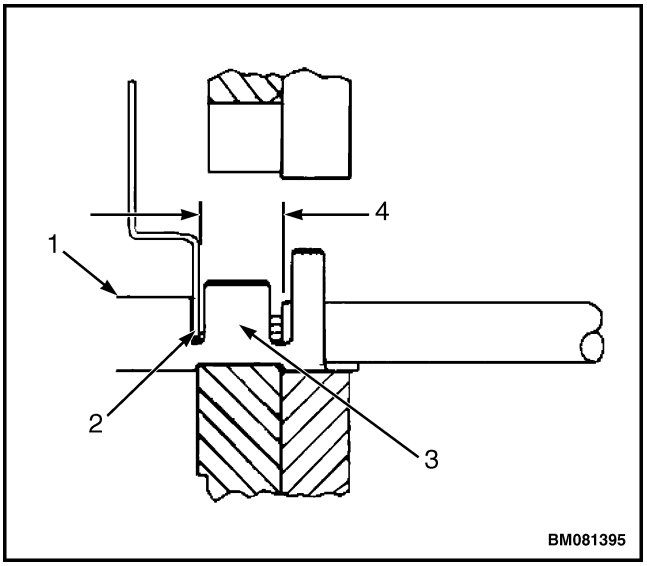
***Table 4. Strip Length for PRO-CRIMPER II Tool***

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

**CAUTION**

**DO NOT cut or nick the wire strands.**

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




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

***Figure 37. Contact and Wire Strip***

## Contact Support Adjustment

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

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

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

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

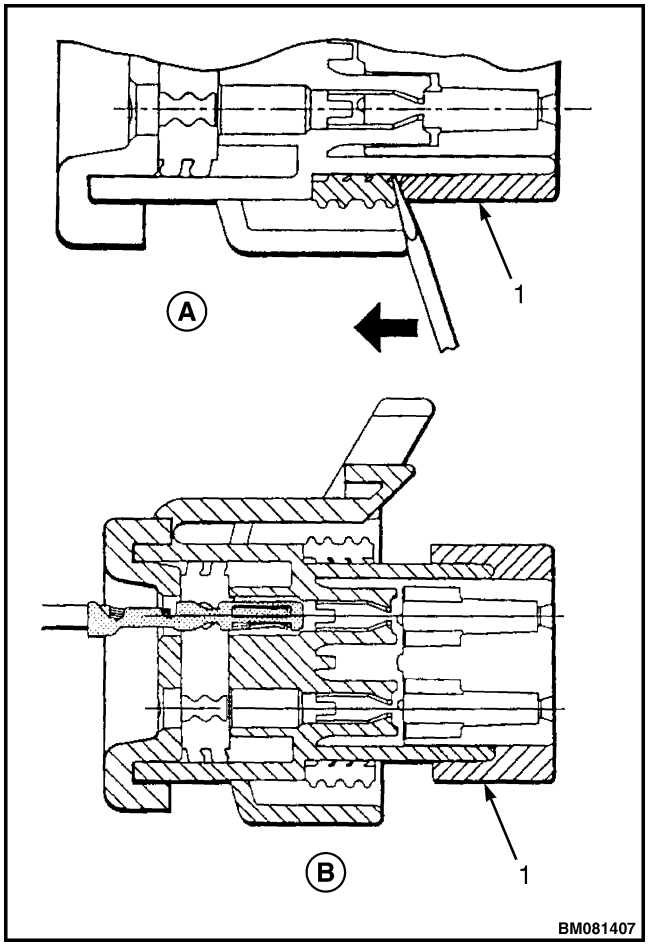
**5.** Move the contact support to eliminate bending the contact.

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

**7.** Remove and inspect the contact.

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

**STEP 1.**
Insert a screwdriver blade between the mating seal and one of the red wedge lock tabs. Pry open the wedge lock to the OPEN position.




**NOTE:** SCREWDRIVER TO BE MOVED IN DIRECTION OF ARROW.

A. CLOSED POSITION
B. OPEN POSITION

1. WEDGE LOCK TAB

### *Remove and Install Die Set and Locator Assembly*

**1.** Close tool handles until ratchet releases, remove the nut, locator assembly, upper retaining screw, lower retaining screw and four die retaining pins from tool frame. See Figure 59.

**2.** Slide wire anvil, insulation anvil, wire crimper, and insulation crimper out of tool frame. See Figure 59.

**3.** Install wire anvil and insulation anvil, with chamfered sides and marked surfaces facing outward, into moving jaw. See Figure 59.

**4.** Insert two die retaining pins. See Figure 59.

**5.** Insert lower retaining screw through moving jaw, insulation anvil, and wire anvil. Tighten lower retaining screw just enough to hold anvils in position. DO NOT tighten lower retaining screw completely. See Figure 59.

**6.** Install wire crimper and insulation crimper, with chamfered sides and marked surfaces facing outward, into stationary jaw. See Figure 59.

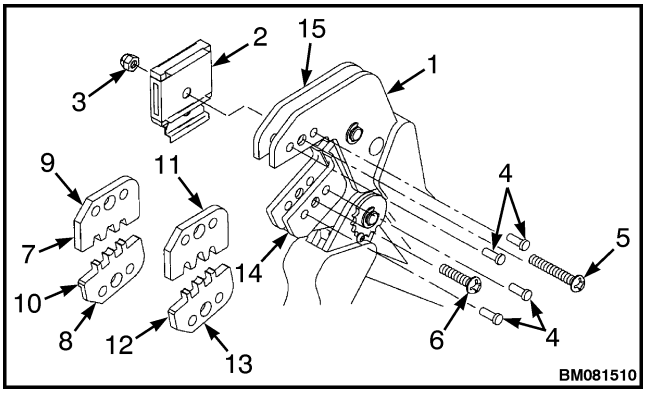
**7.** Insert two die retaining pins. See Figure 59.

**8.** Install upper die retaining screw through stationary jaw, insulation crimper, and wire crimper. Tighten upper retaining screw just enough to hold crimpers in position. DO NOT tighten upper retaining screw completely. See Figure 59.

**9.** Carefully close tool handles making sure anvils and crimpers align properly. Continue closing tool handles until ratchet in tool frame engages enough to hold anvils and crimpers in position. Tighten upper and lower retaining screws.

**10.** Install locator assembly over the end of upper retaining screw and position against tool frame. See Figure 59.

**11.** Install nut onto end of upper retaining screw and tighten enough to hold locator assembly in position while allowing locator to slide up and down. See Figure 59.




1. TOOL FRAME
2. LOCATOR ASSEMBLY
3. NUT
4. DIE RETAINING PIN
5. UPPER RETAINING SCREW
6. LOWER RETAINING SCREW
7. WIRE CRIMPER
8. WIRE ANVIL
9. CHAMFER
10. OFFSET
11. INSULATION CRIMPER
12. INSULATION ANVIL
13. CHAMFER
14. MOVING JAW
15. STATIONARY JAW

***Figure 59. Die Set and Locator Assembly***

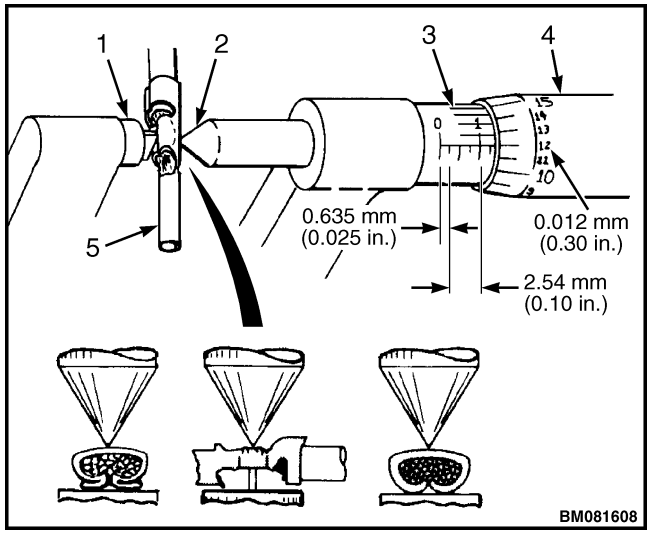
## Adjustments

### *Contact Support*

**NOTE:** Contact support is preset prior to shipment but minor adjustment may be necessary.

**1.** Make a sample crimp and determine if the contact is straight, bending upward, or bending downward.

**2.** If adjustment is required, loosen the adjustment screw holding contact support onto locator assembly. See Figure 60.




**NOTE:** SAMPLE READING SHOWN IN ILLUSTRATION EQUALS 3.489 mm (0.1374 in.).

1. ANVIL
2. SPINDLE
3. STATIONARY HANDLE
4. MOVABLE HANDLE
5. TYPICAL CONTACT

***Figure 66. Modified Micrometer***

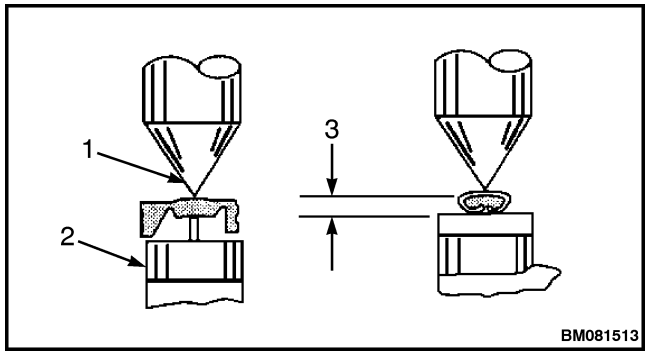
**2.** Use Table 11 to select **maximum** size wire for each crimping chamber.

***Table 11. Wire Size and Crimp Height***

| Crimp Chamber | Wire Size (AWG) | Crimp Height |
|---|---|---|
| A | 18-20 | 1.27 ±0.076 mm (0.05 ±0.003 in.) |
| B | 14-16 | 1.65 ±0.076 mm (0.065 ±0.003 in.) |

**3.** Crimp receptacle onto selected wire according to How to Use AMP Double Action Hand Tool procedure.

**4.** Using modified micrometer, measure wire barrel crimp height as shown in Figure 67. If crimp height matches measurement in Table 11, the tool is considered dimensionally correct. If not, follow manufacturers' replacement and repair procedure.




1. POSITION POINT ON CENTER OF WIRE BARREL OPPOSITE SEAM
2. MODIFIED ANVIL
3. CRIMP HEIGHT (SEE TABLE 11)

***Figure 67. Crimp Height***

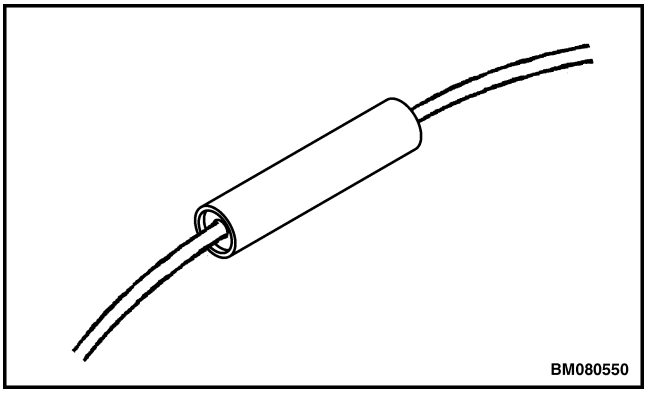
## Certi-Crimp Ratchet Inspection

The ratchet on this tool should be checked to ensure it does not release prematurely, allowing jaws to open before they have fully bottomed. Use a 0.025 mm (0.001 in.) shim suitable for checking clearance between bottoming surfaces of crimping jaws.

**1.** Select receptacle and **maximum** size wire for tool.

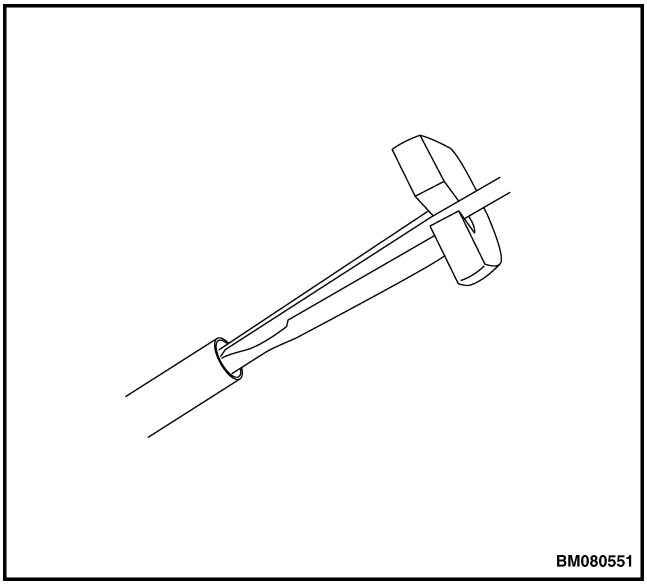
**2.** Position receptacle and wire between jaws as shown in Figure 68.

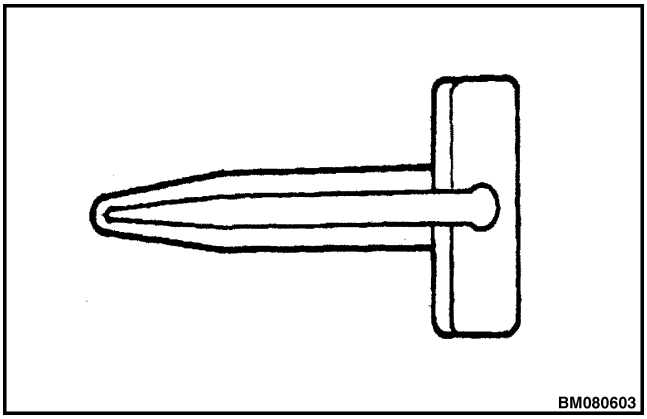
**STEP 7.**
Push the contact into the jiffy splice until a positive stop is felt. An audible snap will occur when correctly installed. Slightly tug the wire to verify the wire is properly locked in place.




## Disassemble

**STEP 1.**
Insert appropriate Deutsch extraction tool over the wire being removed.



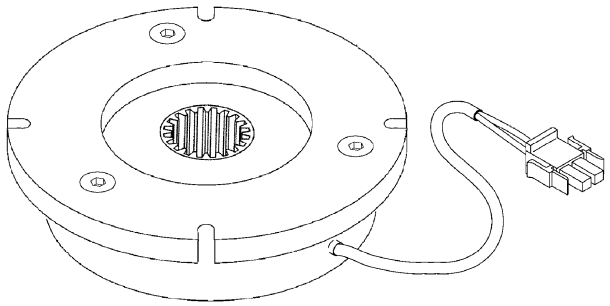



Yale®

Maintenance

# BRAKE SYSTEM

## NDR035EA, NR045EA [C861];
## NDR030EA, NR035/040EA [D815];
## NDR030DA, NR035/040DA [A295];
## NDR035EB, NR045EB [D861];
## NDR030EB, NR035/040EB [E815];
## NDR030DB, NR035/040DB [B295]



PART NO. 524233335

1800 YRM 1188

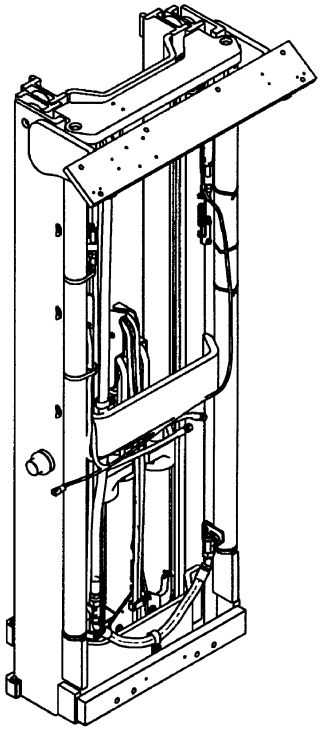
Yale®

Maintenance

# MAST

## DESCRIPTION

**NDR035EA, NR045EA [C861];**
**NDR035EB, NR045EB [D861];**
**NDR030EA, NR035/40EA [D815];**
**NR035-40EB, NDR030EB [E815];**
**NDR030DA, NR035/40DA [A295];**
**NR035-40DB, NDR030DB [B295]**



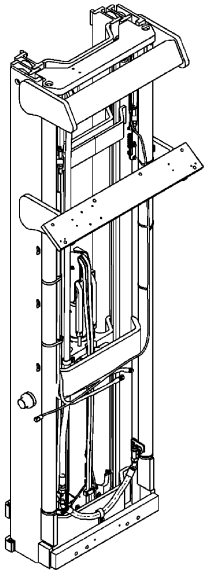
Yale®

Maintenance

# MAST

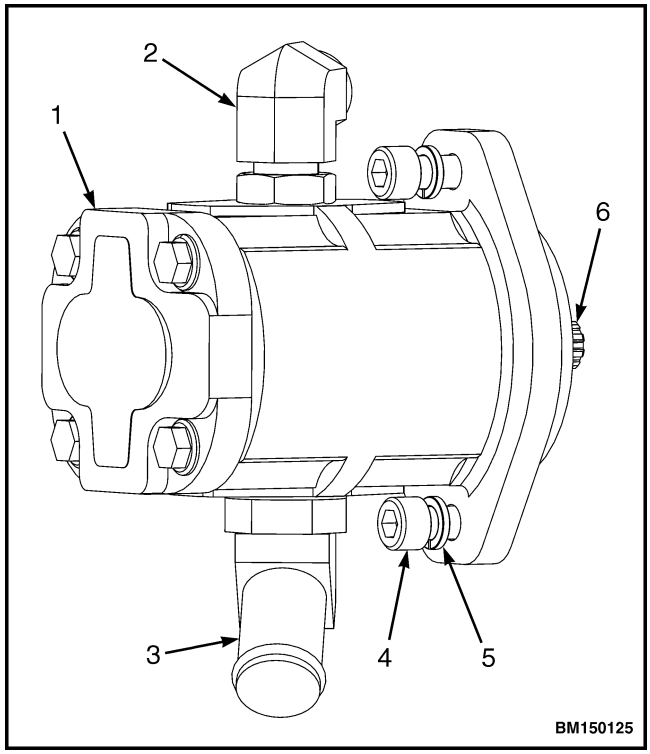
## REPAIR

### NDR035EA, NR045EA [C861];NDR035EB, NR045EB [D861];NDR030EA, NR035/040EA [D815];NR035-40EB, NDR030EB [E815];NDR030DA, NR035/040DA [A295];NR035-40DB, NDR030DB [B295]



PART NO. 524233342

4000 YRM 1195




1. HYDRAULIC GEAR PUMP
2. SUPPLY FITTING
3. PRESSURE FITTING
4. MOUNTING CAPSCREW
5. LOCKWASHER
6. PUMP SPLINES

***Figure 11. Lift Pump Components (NDR030DA, NR035/040DA)***

**NOTE:** The hydraulic system (including the mast) must be purged of air when refilling the hydraulic system with oil.

When making repairs, use the least number of fittings and connections to minimize flow resistance and the possibility of leakage. Route new hoses properly to avoid contact that may cause premature wear. Close the manual lowering valve and refill the hydraulic system with oil when repairs are complete.

Various types of fittings are used to connect hoses and hydraulic system components. Some of these include flared fittings, O-ring fittings, and flat-faced O-ring fittings. Certain fittings have properties that make them better suited for particular applications. Check the threads and mating surfaces of each fitting when removed. Fittings with O-rings should be inspected carefully and the O-ring replaced if it is brittle, cracked, or otherwise damaged. Make sure mating surfaces are clean and smooth and **DO NOT** over tighten fittings. Inspect fittings for leaks often following repairs.

## HYDRAULIC OIL

### Drain

**WARNING**

**Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.**

**Completely lower all mast components and relieve pressure by opening the manual lowering valve before disassembling any part of the lift pump or disconnecting any hydraulic hoses.**

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

**Never put your hands on pressurized hydraulic components. Highly-pressurized hydraulic oil escaping through pin-hole leaks can be injected into the skin. Visually inspect to find hydraulic leaks.**

**CAUTION**

**Disposal of lubricants and fluids must meet local environmental regulations.**

The hydraulic oil should be changed every 2000 hours or yearly. When the hydraulic system components such as the pump or cylinders have been damaged or the oil has otherwise been contaminated, the hydraulic system should be drained, flushed, and refilled with new hydraulic oil.

1. Park the lift truck on a level surface and lower the mast. Turn the key switch to the **OFF** position, and attach a **DO NOT OPERATE** tag to the control handle. Block the wheels to prevent unexpected movement.

2. Disconnect the battery power cable connector from the truck connector located on the right side of the frame. Pull the battery cable connector handle to separate the battery connector from the truck connector.

3. Remove the operator compartment cover and the drive unit compartment door to access the hydraulic tank.

## WARNING

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

3. Clean the lift chains by soaking in solvent for 30 minutes and remove all dirt and grease. Hang lift chains up and remove solvent using compressed air. Lubricate the chains by soaking them in SAE 30 engine oil for 30 minutes. Hang chains over a drip pan for one hour to remove excess oil.

4. Inspect the chain anchors and pins. Replace any parts that are worn or damaged.

## WARNING

**Be careful when cleaning with steam. Steam can cause serious burns. Wear protective clothing, gloves, and eye protection. Never expose your skin to steam.**

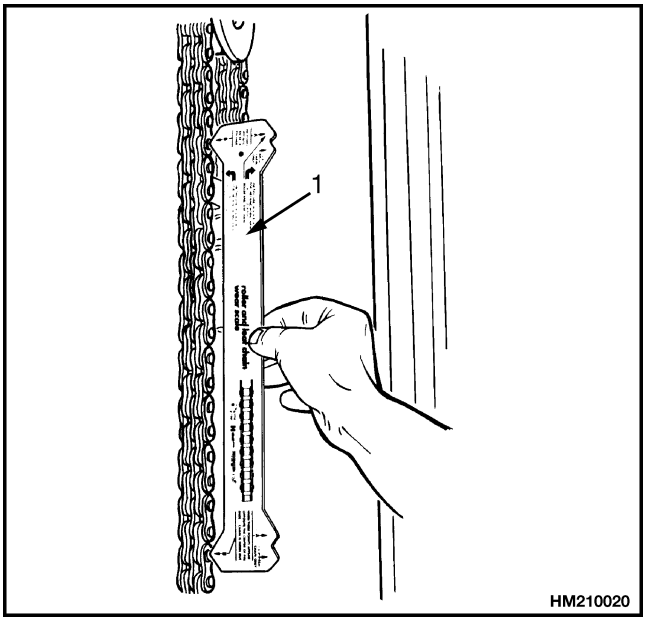
**Cleaning solvents may be flammable and toxic and can cause severe skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety precautions.**

5. Clean the mast weldments with steam or solvent.

## CAUTION

**Improper welding procedures can damage the structure of the mast or cause incorrect function of the mast. Mast components require written engineering approval before repairing or replacing. Contact your local Yale lift truck dealer for factory assistance.**

6. Inspect sliding surfaces for wear or damage. Inspect load roller contact surfaces for wear or damage. Inspect all welds for cracks.




**NOTE:** THE INSTRUCTIONS FOR MEASURING CHAIN WEAR ARE SHOWN ON THE CHAIN WEAR SCALE

1. CHAIN WEAR SCALE

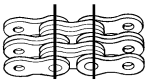
| Pitch  | Total length of 20 links (pitch) of new chain | Wear Limit The maximum length of 20 links |
|---|---|---|
| 12.7 mm (0.50 in.) | 254.0 mm (10.0 in.) | 261.6 mm (10.3 in.) |
| 15.9 mm (0.63 in.) | 317.5 mm (12.5 in.) | 327.0 mm (12.9 in.) |
| 19.1 mm (0.75 in.) | 381.0 mm (15.0 in.) | 392.4 mm (15.5 in.) |
| 25.4 mm (1.00 in.) | 508.0 mm (20.0 in.) | 523.3 mm (20.6 in.) |

***Figure 22. Lift Chains Check***

## ASSEMBLE

## WARNING

**Mast parts are heavy and can shift. Distances between parts are small. Serious injury can result if part of the body is hit by parts of the mast or reach assembly.**

**Mast assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the mast and its components.**

## WARNING

**NEVER loosen the wear plugs if a mast weldment does not move freely during checks after an adjustment. The weldments or carriage can suddenly move and cause an injury. Raise the weldment, move the key to the OFF position, and install safety chains as described in *Safety Procedures When Working Near Mast*. Loosen the wear plugs to allow movement.**

6. If necessary, operate the system so that the lift chains are the supports and carefully remove the safety chains. Raise and lower the weldments with a load. Check that there is minimum clearance, as described in Step 3, with free movement. If the weldments do not move smoothly during lowering, follow the WARNING and adjust the wear plugs equally for more clearance.

7. Repeat Step 1 through Step 6 for each weldment.

## ADJUST MAIN-LIFT CHAINS

The main lift chains must be adjusted **BEFORE** adjusting the free-lift chains.

Adjust chain anchors at main lift cylinders so top of inner mast weldment is even with top of outer mast weldment.

**NOTE:** Remove the mast operator guard if adjustment is necessary.

1. Completely lower the mast. Check to verify that the top of the outer weldment is even (±1.5 mm (0.06 in.)) with the top of the inner mast.

   a. If the top of the weldments are not even, adjust the nuts on the chain anchors until the weldments are even, and tighten the lock nuts.

   b. If the top of the weldments are even (within specification), proceed to the next step.

2. Check chain tension by pushing on both main-lift chains at the same time.

   a. If the tension is not the same, adjust the nuts on the chain anchors until the tension is the same, and tighten the lock nuts. Recheck that the top of the weldments are still within specification. See Step 1.

   b. If the tension on both chains are equal, proceed to the next step.

3. Adjust the free-lift chains. See Adjust Free-Lift Chain.

4. Check the mast operation as described in Mast Operation Check.

5. Install the mast operator guard (if removed).

## ADJUST FREE-LIFT CHAIN

**NOTE:** Make sure the forks of the reach carriage are parallel to the floor (no forward or backward tilt). The main lift chains must be adjusted **BEFORE** adjusting the free-lift chains.

1. Fully lower the carriage. With the forks level (parallel to the floor), measure the distance from the floor to the top of forks. The correct distance is 63.5 mm (2.5 in.).

2. If the distance is correct, the free-lift chains are adjusted for the correct height. Perform Step 5 next. If the distance is NOT correct, perform all of the steps.

3. Raise the mast until the free-lift cylinder chain anchors at the rear of the free-lift cylinder can be accessed from the operator compartment. Install safety chains as described in ***Safety Procedures When Working Near Mast***. Remove the mast operator guard for easier access to the chain anchors. Loosen both lock nuts at the chain anchors to make any adjustments.

4. Adjust the nuts of the chain anchors equal amounts for the correct distance (Step 1).

5. Check chain tension by pushing on both chains at the same time. If the tension is not the same, adjust the nuts on the chain anchors until the tension is the same and the distance (Step 1) is also correct. When the tension is equal on both chains, the chain sheave assembly will be level. Tighten the lock nuts.

# General

This section contains the descriptions and repair procedures for single-reach and double-reach carriages. Additional information can be found in the following sections:

For additional information on mast configurations, see **Mast** 4000YRM1195.

For additional information on hydraulic systems for models NDR035EA, NR045EA, NDR030EA, and NR035/040EA, see the section **Hydraulic System** 1900YRM1189. For additional information on hydraulic systems for models NDR030DA and NR035/040DA, see the section **Hydraulic System** 1900YRM1307.

For the recommended service intervals and regularly scheduled maintenance procedures, see the section **Periodic Maintenance** 8000YRM1197.

# Safety Procedures When Working Near Mast

### WARNING

**All chains, ropes, and lifting equipment MUST be fully examined by qualified personnel at least once a year or more at frequent intervals according to the local conditions of use.**

### WARNING

**Mast parts are heavy and can shift. Distances between parts are small. Serious injury can result if part of the body is hit by parts of the mast or the carriage.**

- **Never put any part of the body into or under the mast or carriage unless all parts are completely lowered or a safety chain is installed. Also make sure the power is off and the key is removed. Attach a DO NOT OPERATE tag to the control handle.**
- **DO NOT make repairs or adjustments unless specifically authorized to do so. Repairs and adjustments must be performed by trained service technicians.**
- **DO NOT climb on the mast or lift truck at any time. Use a ladder or personnel lift to work on the mast.**
- **Be careful of the forks. When the mast is raised, the forks can be at a height to cause an injury.**
- **Move the truck to a safe location with room to raise the mast if necessary. Block the wheels of the truck to prevent movement.**

The forks may be difficult to see when the mast is raised. Be careful not to hit your head when working around raised forks. Also, be careful not to trip over forks on or near the floor. If possible, remove forks from carriage before safety chaining mast.

**WHEN WORKING NEAR THE MAST, ALWAYS:**

- Lower the mast and carriage completely. Make sure there is no movement in the mast. Make sure all parts of the mast, that can move, are fully lowered.

  **OR**

- If the mast must be in a raised position for repairs, install a safety chain around the top or middle crossmember of the outer weldment and the crossmember of the inner weldment to secure the mast.

### WARNING

**Perform the following step from the side of the mast using a ladder. Never stand under the carriage until safety chains are installed.**

1. Remove forks from carriage if possible.
2. Raise mast to align bottom crossmember(s) of weldment(s) that move within the outer weldment with a crossmember on outer weldment. On the two-stage mast, the moving part is the inner weldment. On the three-stage mast, it is the intermediate weldment.

## CLEAN AND INSPECT

### WARNING

**Cleaning solvents can be flammable and toxic and can cause skin irritation. Always wear the proper protective equipment including eye protection and petroleum resistant gloves when handling. Always follow the recommendations of the manufacturer.**

### CAUTION

**DO NOT use steam to clean the load bearings. DO NOT use compressed air or immerse in solvent to clean the bearings. The bearings are sealed and permanently lubricated. Wipe bearings off with a clean cloth and turn to check for proper operation. Replace if movement is restricted or if bearing does not turn smoothly.**

Clean all of the parts of the front frame with solvent. Dry the parts with compressed air. Inspect the parts of the front frame for damage and wear. Replace all bushings.

## ASSEMBLE (WITH SIDESHIFT)

For the following procedures, refer to Figure 9.

1. Assemble tilt cylinder if necessary. See Tilt Cylinder.
2. Install tilt cylinder bushings and install tilt cylinder to fixed frame.
3. Install trunnion cap and hardware (12 and 25) to tilt cylinder.
4. Assemble sideshift cylinder (13 through 17) if disassembled. Refer to **Sideshift Cylinder**Repair.
5. Install bushings to fixed frame if removed.
6. Position tilting frame to fixed frame. Use a prybar to align pivot pin holes.
7. Install pivot pins (8) through tilting frame into fixed frame. Secure using pin-retaining hardware (4, 5, and 6).
8. Install wear strips (2, 3, and 19) to tilting frame.
9. Install fork carriage to tilting frame.
10. Install brackets and hardware (24) to fork carriage.
11. Install tilt cylinder nuts (20) as removed.
12. Install the selector valve. Refer to Front Selector Valve.
13. Install load backrest. See Load Backrest section.
14. Install forks. Refer to Forks.

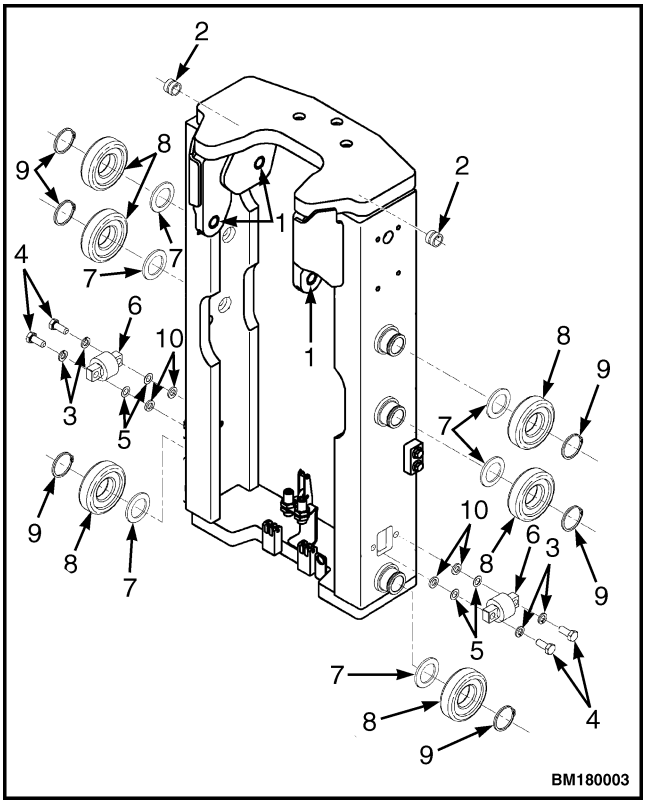
## ASSEMBLE (WITHOUT SIDESHIFT)

For the following procedures, see Figure 10.

1. Install bushings to fixed frame if removed.
2. Assemble tilt cylinder if necessary. See Tilt Cylinder.
3. Install tilt cylinder bushings and install tilt cylinder to fixed frame.
4. Install tilt cylinder trunnion cap and hardware (4 and 5).
5. Position tilting frame to fixed frame. Align pivot pin holes using a prybar.
6. Install pivot pins (8) through the tilting frame into the fixed frame. Secure in place using pin-retaining hardware (1, 2, and 3).
7. Install tilt cylinder nuts as removed.
8. Install the selector valve if removed. Refer to Front Selector Valve.
9. Install load backrest. See Load Backrest section.
10. Install forks. Refer to Forks.

# Rear Frame Assembly

For the following procedures, refer to Figure 17.




1. GREASE FITTING
2. BUSHING
3. WASHER
4. CAPSCREW
5. SHIM
6. SIDE ROLLER ASSEMBLY
7. SHIM
8. LOAD ROLLER
9. RETAINING RING
10. SHIM

***Figure 17. Rear Frame (6.9 Mast Shown) (NDR030DA and NR035/040DA)***

## REMOVE

**NOTE:** The following steps outline the procedures for removing the reach carriage assembly from a mast, which is installed to a lift truck.

**1.** Remove the forks. See Forks.

**2.** Remove the load backrest. See Load Backrest.

**3.** Remove the hardware securing the operator guard from the rear of the mast, and remove the operator guard.

### WARNING

**Reach carriage assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the components.**

**4.** Attach an overhead lifting device to the top of the reach carriage assembly:

**a.** Install heavy-duty, industrial C-clamps to each side of the rear frame. See Figure 18.

2. Check between the inside of the inner mast channels and the load roller at the top of the rear frame. Clearance should be approximately 0.5 mm (0.02 in.) with the reach assembly parallel to the channels.

3. Raise and lower the reach assembly with a load. Check that there is minimum clearance with free movement. If the reach assembly does not move smoothly during lowering, remove the reach assembly and adjust the side rollers and load rollers.

## ADJUST SIDE ROLLERS AND LOAD ROLLERS

**NOTE:** Side rollers are used only on 6.9 inch mast carriages.

1. Measure the width between the outside edges of the inner weldment in several places. Make a note of the location and the value of the maximum measurement. See Figure 30.

2. Measure and record the distance between the outside of the side rollers and load rollers of the reach assembly. See Figure 31.

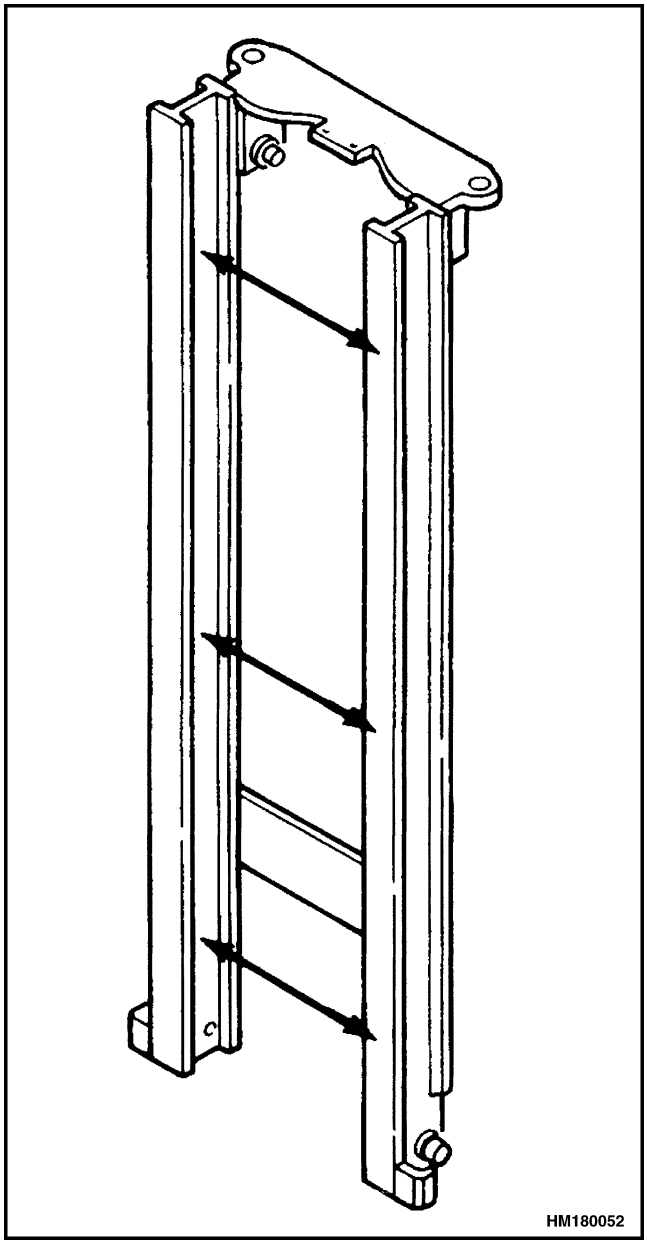



***Figure 30. Measuring Channel Width***

# TABLE OF CONTENTS

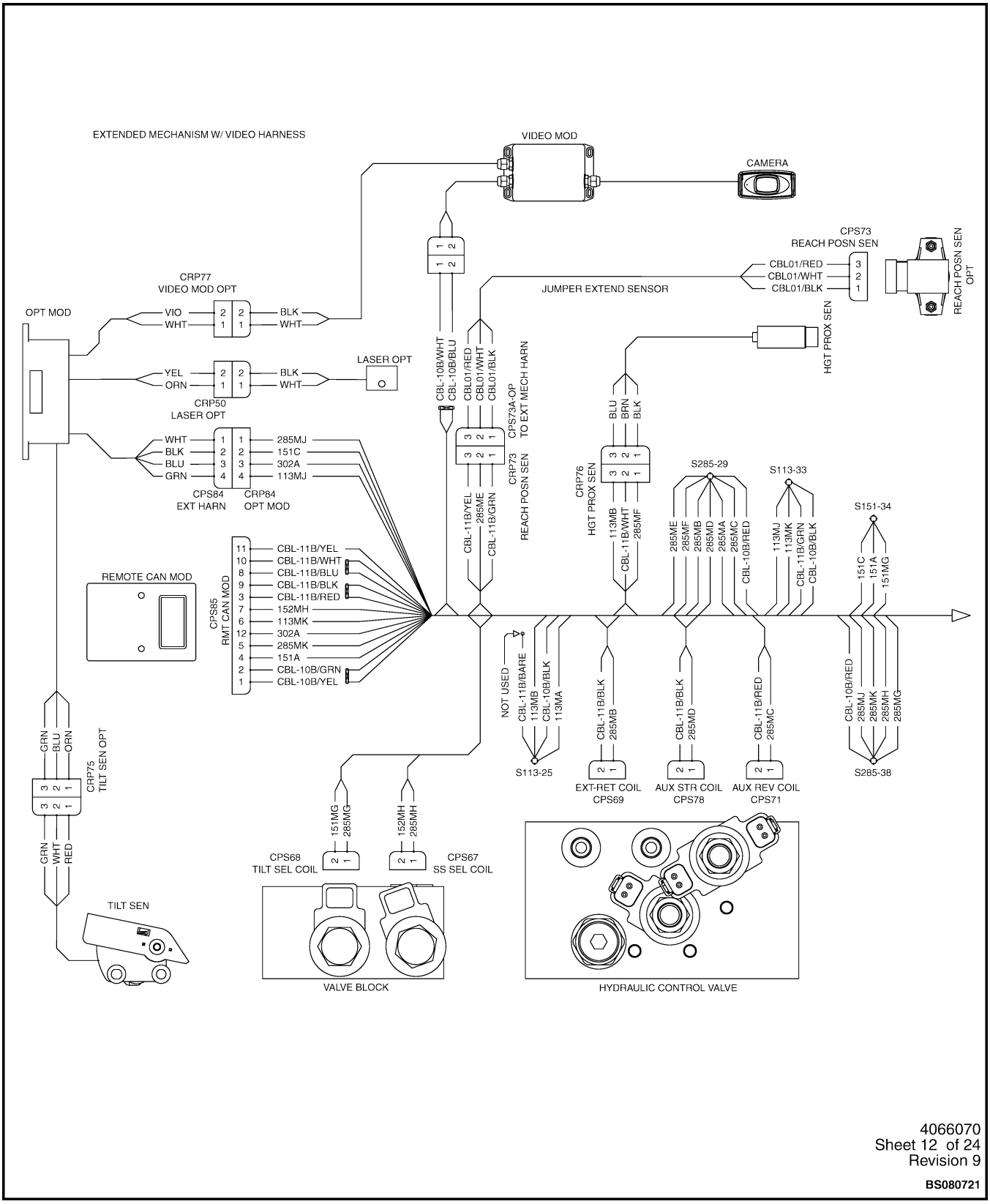



***Figure 1. Schematic/Wiring Diagram (Sheet 12 of 24)***

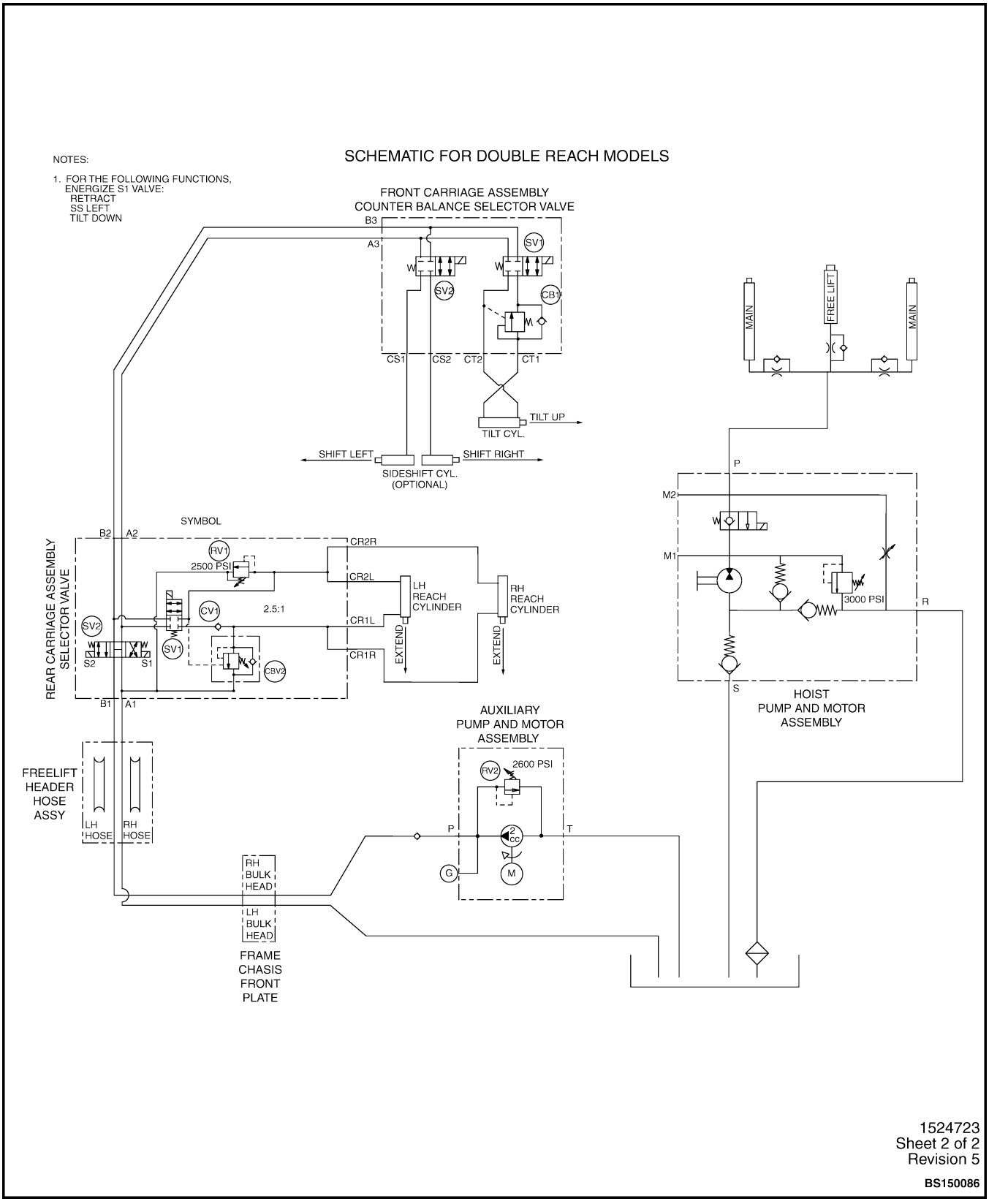



***Figure 2. Hydraulic Schematic for NR045EB, NDR035EB, NR035EB, NR040EB, and NDR030EB (Sheet 2 of 2)***

## MANUAL LOWERING VALVE

### NDR030/035EB and NR030/040/045EB

**WARNING**

**Allow no on under or near the lift mechanism or load during the manual lowering procedure.**

**Always verify that there are no obstructions beneath the lift mechanism or load before attempting to lower the mast manually.**

The manual lowering valve is located on the main lift pump manifold beside the hydraulic tank. The manual lowering valve can be opened by turning the valve knob counterclockwise to relieve pressure from the hydraulic system. This can be used to manually lower the mast in case of malfunction or to relieve pressure from the system before servicing the hydraulics. If the mast leaks down during operation, lower the mast and check that the knob is completely closed (turn clockwise). Always close the manual lowering valve after use. See Figure 6.

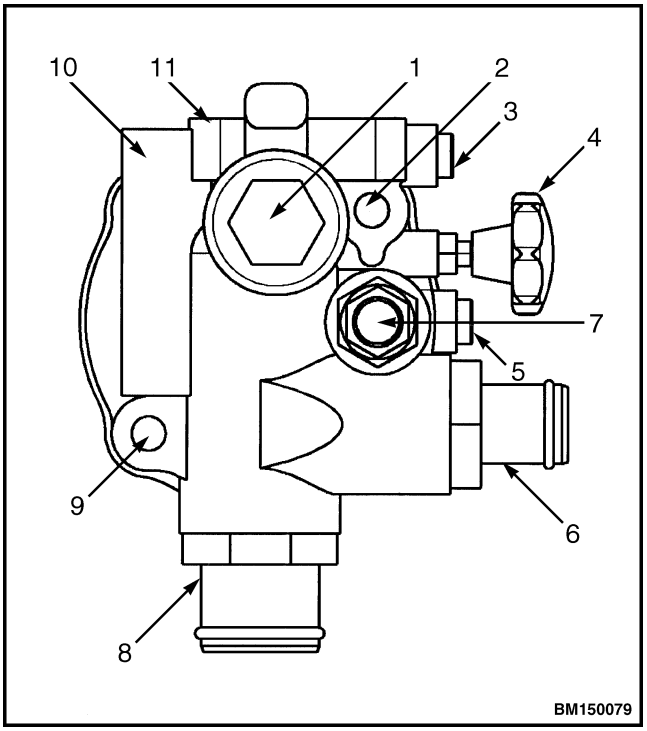
### NDR030DB and NR035/040DB

**WARNING**

**Allow no on under or near the lift mechanism or load during the manual lowering procedure.**

**Always verify that there are no obstructions beneath the lift mechanism or load before attempting to lower the mast manually.**

Manual lowering is accomplished by pushing in the manual lowering valve knob and turning it counterclockwise 180° until the knob pops back out. See Figure 7. This will open the valve and the mast will begin lowering at a controlled rate. Push the load holding check valve knob in and turn it clockwise 180° until it pops back out to close. See Figure 7.




1. LOWERING CONTROL VALVE
2. UPPER MOUNTING HOLE
3. M2 TEST PORT
4. MANUAL LOWERING VALVE KNOB
5. M1 TEST PORT
6. RETURN FITTING
7. RELIEF VALVE
8. SUPPLY FITTING
9. LOWER MOUNTING HOLE
10. OVERRUN CHECK VALVE
11. PRESSURE FLANGE

***Figure 6. Pump (Valve Manifold)***

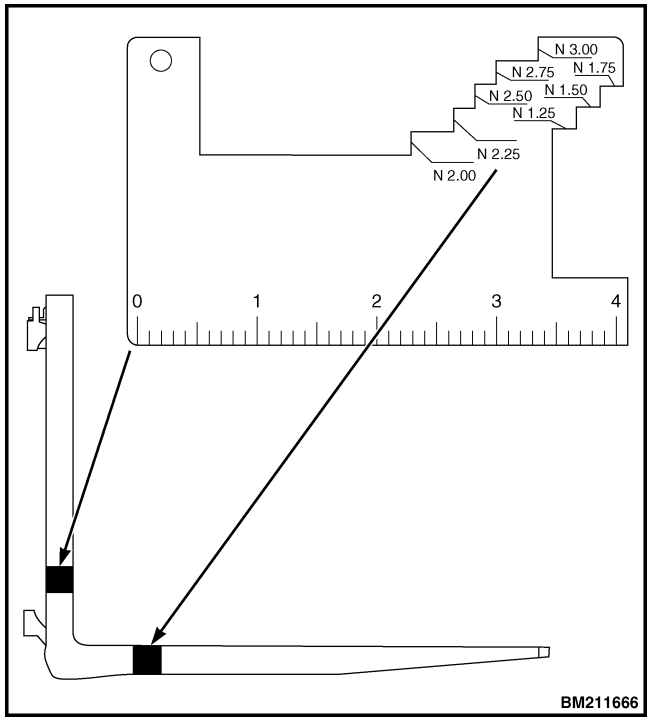



*Figure 12. Fork Wear Check*

## Lift Chain Check

**NOTE:** The chains must be inspected in the area of chain that passes over the chain sheave during the first portion of a lift. Those links will show maximum wear.

1. Apply a 1/2 capacity load to the forks and raise approximately 25 mm (1 in.) off the floor. Inspect the lift chains for wear or damage. A lift chain becomes longer when it is worn. If a chain is 3% longer than a new lift chain, the lift chain must be replaced. If a chain scale is available, check the lift chain as shown in Figure 13. If a chain scale is not available, measure 20 links of the lift chain. Compare the measurement with the lengths given in Figure 13. Lower and remove the load when complete.

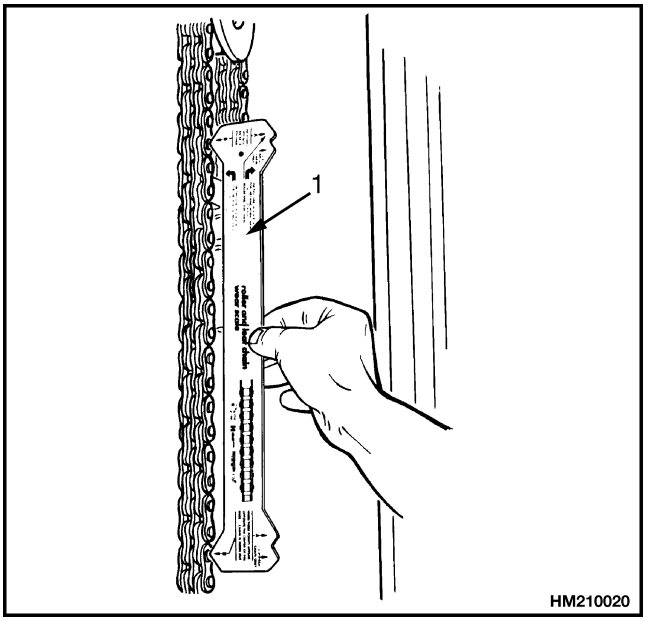
2. Inspect the chain anchors and pins. Replace any parts that are worn or damaged.

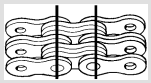
3. Completely lower the mast. Check to verify that the top of the outer weldment is even (±1.50 mm (0.06 in.)) with the top of the inner mast.

4. Check chain tension by pushing on both main-lift chains at the same time.

5. Fully lower the carriage. With the forks level (parallel to the floor), measure the distance from the floor to the top of forks. The correct distance is 63.5 mm (2.5 in.).

6. Check chain tension by pushing on both chains at the same time. When the tension is equal on both chains, the chain sheave assembly will be level. If the tension is not the same, adjust the lift chains so the tension is the same and the fork height is also correct.




| Pitch  | Total length of 20 links (pitch) of new chain | Wear Limit The maximum length of 20 links |
|---|---|---|
| 12.7 mm (0.5 in.) | 254.0 mm (10.0 in.) | 261.6 mm (10.3 in.) |
| 15.90 mm (0.63 in.) | 317.5 mm (12.5 in.) | 327.0 mm (12.9 in.) |
| 19.10 mm (0.75 in.) | 381.0 mm (15.0 in.) | 392.4 mm (15.5 in.) |
| 25.4 mm (1.0 in.) | 508.0 mm (20.0 in.) | 523.3 mm (20.6 in.) |

**NOTE:** THE INSTRUCTIONS FOR MEASURING CHAIN WEAR ARE SHOWN ON THE CHAIN WEAR SCALE (YALE® PART NO. 580037684).

1. CHAIN WEAR SCALE

*Figure 13. Lift Chains Check*

5. Visually check the tips for pitting, burning, or wear.

6. Check that the resistance of the contactor coil is within 32 ±5 ohms. Readings not within specification indicate the following:

   High Resistance - Corrosion or an open coil

   Low Resistance - Shorted or a burnt coil

7. Check the voltage drop across the contactor tips. Set the voltage scale of the meter to the lowest range, higher than battery voltage (50 volts for a 36-volt battery, etc.). On SPNO contactors, read the voltage across the contactor with the tips open. Battery voltage should drop to zero or near zero as the tips close.

   A voltage drop of 2 volts or more across the closed tips indicates a poor contact or high resistance. Check for burned or worn tips, incorrect size, or mismatched tips. Also check for an incorrect gap setting on contactors with adjustable point gaps. Repair as necessary. See **Electrical System** 2200YRM1612.

## FORKS, CHECK

### WARNING

**DO NOT try to correct fork tip alignment by bending the forks or adding shims. Replace bent forks.**

**Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Replace damaged forks. Forks are to be replaced only in sets and not individually.**

1. Inspect forks for cracks and wear. Check that fork tips are aligned as shown in Figure 22. Check that bottom of fork is not worn (item 4, Figure 22).

### CAUTION

**Remove fork latch pins if adding a fork positioner attachment. Damage to forks and other carriage components can occur if fork latch pins are not removed prior to using attachment.**

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

3. Inspect fork wear. Ensure heel wear is not more than 10% of original thickness. If fork wear is more than 10%, fork must be replaced or rerated.

   Perform fork wear inspection using a BOL256N1 caliper ruler Hyster P/N 4092984 Yale P/N 550088603 as follows. See Figure 23.

   a. Determine normal thickness of "N" of fork using scale or ruler portion of caliper ruler. Measurement has to be done on fork shank using caliper ruler.

   b. Position caliper at end of heel internal radius (item 4, Figure 22) with opening corresponding to measured thickness of fork shank in Step a above. (e.g. for N 1.75 use N 1.75 opening). This is typically the section of fork where wear is greatest. Note that opening distance has been reduced by 10% from nominal thickness.

   c. If fork enters opening, it is mandatory to replace it. DANGER OF BREAKING. Furthermore, a 10% reduction in fork blade thickness results in 20% reduction in operating capacity.

## HYDRAULIC SYSTEM

### Drain

### WARNING

**Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.**

**Completely lower forks to relieve hydraulic pressure before disassembling any part of the lift pump or disconnecting any hydraulic hoses.**

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

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

### CAUTION

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

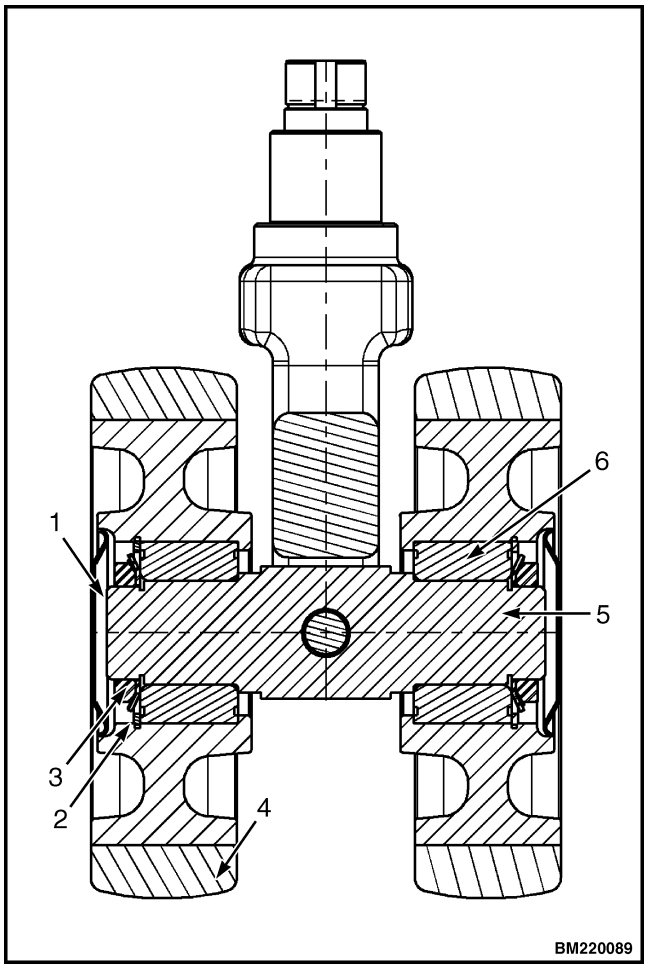
**Disposal of lubricants and fluids must meet local environmental regulations.**

## CAUTION

**Use a hammer and a suitable brass or aluminum driver when removing bearings to avoid damage to the bearings and/or caster wheel.**

**The bearings are removed and replaced by pressing on the outer race of the bearing only. Pressing on the inner race will damage the bearing.**

6. Remove the bearing by pressing it from the wheel hub using a suitable brass or aluminum driver.




1. BEARING CAP
2. BEARING LOCKWASHER
3. BEARING LOCK NUT
4. CASTER WHEEL
5. AXLE SHAFT
6. BEARING

***Figure 35. Caster Wheels***

7. Inspect the caster wheel for damage to the bonded wheel surface and cracks in the hub or wheel material. Replace any wheel that is damaged, cracked, or has large cracks or large chunks of the outside material missing. Replace wheels in sets if damaged.

## Install

## WARNING

**Cleaning solvents can be flammable and toxic and can cause skin irritation. Wear protection when handling solvents and always follow the recommendations of the manufacturer.**

1. Clean all parts with solvent and inspect thoroughly. Replace damaged parts as necessary.

## CAUTION

**The bearings are replaced by pressing on the outer race of the bearing only. Pressing or tapping on the inner race will damage the bearing.**

**Replace bearings in sets to maintain proper wheel loading and operation.**

2. Press new bearings into wheel assemblies. Use a suitable brass or aluminum driver when installing bearings to avoid damage to bearings and/or wheels. See Figure 35. Bearings must be replaced in sets.

3. Install the caster wheels to the axle shaft.

## CAUTION

**Replace bearings in sets to maintain proper wheel loading and operation.**

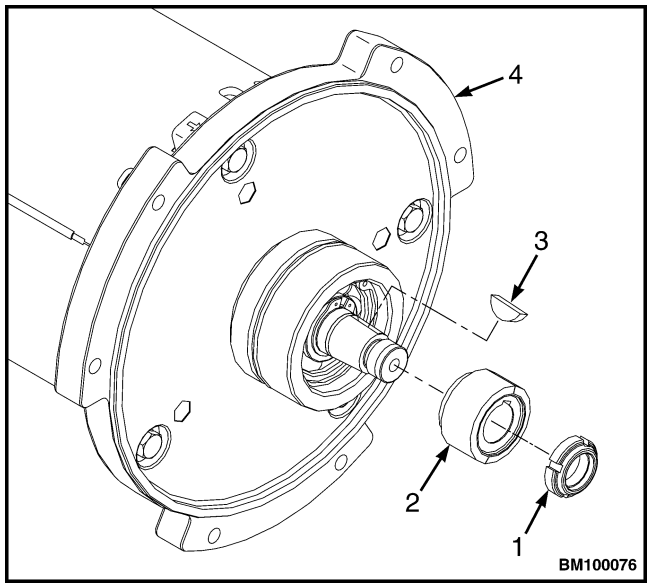
4. Install the bearing lockwashers and lock nuts onto the axle shaft.

5. Torque the bearing lock nuts to 136 N•m (100 lbf ft).

6. Ensure the caster wheels rotate freely and smoothly and are securely mounted on the axle shaft. Stake the bearing lockwashers in place.

3. Using special tool, remove slotted nut from drive end of traction motor shaft. See Figure 4.

4. Remove input pinion and woodruff key from drive end of traction motor. See Figure 4.




1. SLOTTED NUT
2. INPUT PINION
3. WOODRUFF KEY
4. TRACTION MOTOR

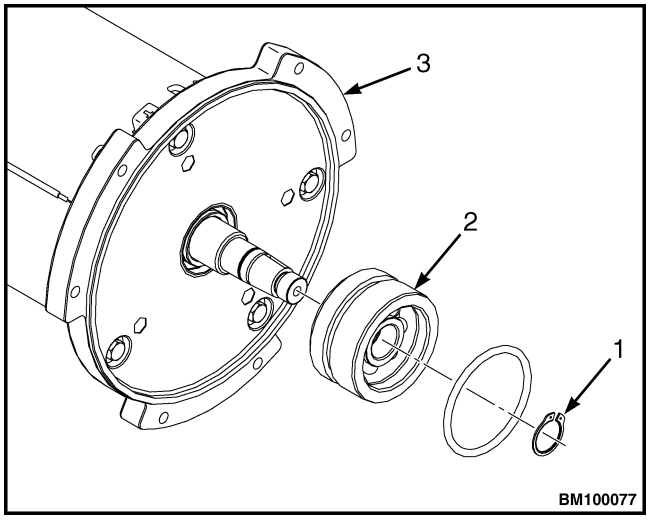
***Figure 4. Slotted Nut/Pinion Removal***

## WARNING

**The bearing and seal assembly is installed with a snap ring. Applying force on the bearing without first removing the snap ring could cause damage to the traction motor or personal injury.**

**NOTE:** The bearing and seal assembly, O-ring and snap ring is serviced as a single part number. If any component is damaged and needs to be replaced, the assembly will need to be replaced.

5. Remove snap ring and bearing and seal assembly from traction motor. See Figure 5.




**NOTE:** SOME COMPONENTS SHOWN FOR REFERENCE PURPOSES ONLY.

1. OUTER SNAP RING
2. INNER SNAP RING
3. BEARING AND SEAL ASSEMBLY
4. O-RING
5. TRACTION MOTOR

***Figure 5. Drive-End Bearing and Seal Removal***

6. Remove four hex bolts, four flat washers, four lock washers and traction motor drive end cover from traction motor. See Figure 6.

Yale®

Maintenance

# MASTER DRIVE UNIT
# S/N D801N03000L=>
# S/N A474N03000L=>
# S/N A497N030000L=>
# S/N E826N03000L=>

**NDR030EB, NR035-040EB [E815];NDR030DB, NR035-040DB [B295];NDR035EB, NR045EB [D861];SS030BF [A474];FS030BF [A497];OS 030EF [D801];OS030BF [E826];MPC060-VG [A372];MPC080-VG [A283];MPE060-VG [B292];MPE080-VG [B287];MTR005-F, MTR007-F [C903];MPR080VG, MPR100VG [A284];MEP060VH [C292]; MPE080VH [C287]**

**PART NO. 550073167** **0630 YRM 1609**

3. Align both the MDU with the screw holes and the steer gear with the axle pilot hole. Carefully raise the frame and remove the blocks. Lower the frame and align the capscrew holes in the large ball bearing steering gear and the frame.

4. Install the capscrews and lockwashers that fasten the steering gear and MDU to the frame. Use cross pattern to tighten the capscrews to the appropriate torque. Make sure the steering bearing is in the correct position around the complete circumference. See Figure 3.

5. Fill the MDU to the level/fill plug using the proper oil. The proper lubricants are listed in the **Operating Manual** or see:
   - **Periodic Maintenance** 8000YRM1617 for lift truck models NDR035EB, NR045EB (D861), NDR030EB, NR035-040EB (E815) and NDR030DB, NR035-040DB (B295)
   - **Periodic Maintenance** 8000YRM1472 for lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826)
   - **Periodic Maintenance** 8000YRM1635 for lift ruck models MPC060-VG (A372) and MPC080-VG (A283)
   - **Periodic Maintenance** 8000YRM1644 for lift truck models MPE060-VG (B292) and MPE080-VG (B287)
   - **Periodic Maintenance** 8000YRM2105 for lift truck models MPE060VH (C292) and MPE080VH (C287)
   - **Periodic Maintenance** 8000YRM1705 for lift truck models MPR080VG, MPR100VG (A284)

   Add oil slowly. The oil passes through the bearings to the lower part of the MDU.

**WARNING**

**The motor is heavy. Use appropriate lifting equipment to avoid personal injury.**

6. Install the traction motor onto the MDU.

   See **A/C Motor Repair S/N A474N03000L=> S/N A497N030000L=> S/N D801N02161L=> S/N E826N01917L=>** 0620YRM1621 for lift truck models NDR035EB, NR045EB (D861), NDR030EB, NR035-040EB (E815), NDR030DB, NR035-040DB (B295), MPC060-VG (A372), MPC080-VG (A283), MPE060-VG (B292) and MPE080-VG (B287), MPE060VH (C292) and MPE080VH (C287) .

   See **AC Motor Repair** 0620YRM1461 for lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826) .

   See **AC Motor Repair** 0620YRM1695 for lift truck models MPR080VG, MPR100VG (A284) .

# Troubleshooting

| PROBLEM | POSSIBLE CAUSE | PROCEDURE OR ACTION |
|---|---|---|
| Lift truck will not move. | Traction motor not operating. | Repair or replace traction motor. |
| | Damaged gears or bearings. | Replace drive unit. |
| Master drive unit makes noise. | Internal drive train, gear, or bearing noise. | Replace master drive unit. |
| Oil leaks at the wheel shaft. | Radial sealing ring damaged or worn. | Replace master drive unit. |
| | Damaged race on input- and/or wheel shaft. | Replace master drive unit. |

# Steering Handle Assembly

## FIXED HANDLE

### Description

The steering handle assembly links the lift truck operator to the lift truck steering system. See Figure 7 and Figure 8. As the operator rotates the steering handle, the handle rotates a steering sensor in the steering handle assembly. The steering sensor senses the direction and speed of the steering handle's rotation and sends signals to the steering controller to steer the lift truck.

### Remove

1. Turn the key to the **OFF** position and disconnect the battery connector.
2. Loosen the compartment door mounting capscrews (2) and open the compartment door. See Figure 9.
3. Disconnect the wiring from the steering handle assembly at the harness connector. Remove the clamps securing the steering unit wiring to the frame.
4. If removing the mounting plate from the lift truck, loosen the capscrews (1) holding the steering handle assembly to the compartment door. Remove the steering handle assembly from the lift truck. Place the assembly on a clean work surface

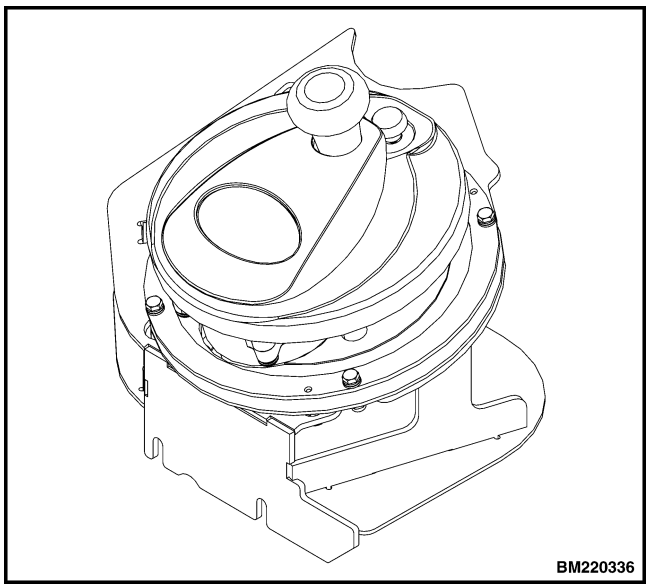



*Figure 7. Steering Handle Assembly (Sidestance)*

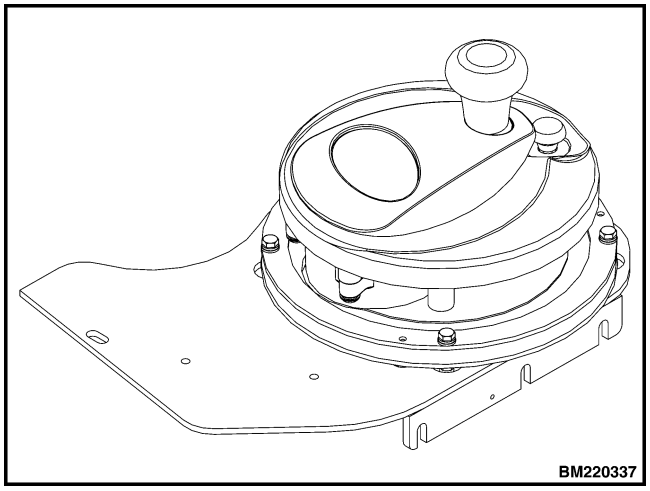



*Figure 8. Steering Handle Assembly (Fore/Aft Stance)*

*Table 1. Caster Specifications*

| Truck Series | Battery Compartment | | Spring O.D. | | Mast Max Fork Height mm (in.) | Dimension "3" | Dimension "5" | Dimension "7" |
|---|---|---|---|---|---|---|---|---|
| | mm | (in.) | mm | (in.) | | mm | mm | mm |
| B295 E815 | 368.3 and 419.1 | (14.5) and (16.5) | 53 | (2.09) | Less than 6375 mm (251 in.) | 70 to 74 | 9.5 | 2 to 4 |
| | 368.3 and 419.1 | (14.5) and (16.5) | 53 | (2.09) | More than 6350 mm (250 in.) | 70 to 74 | 6.5 | 2 to 4 |
| D861 | 419.1 | (16.5) | 53 | (2.09) | Less than 6375 mm (251 in.) | 70 to 74 | 9.5 | 2 to 4 |
| | 419.1 | (16.5) | 53 | (2.09) | More than 6350 mm (250 in.) | 70 to 74 | 6.5 | 2 to 4 |
| | 469.9 and 546.1 | (18.5) and (21.5) | 60 | (2.36) | Less than 8153 mm (321 in.) | 75 to 79 | 9.5 | 2 to 4 |
| | 469.9 and 546.1 | (18.5) and (21.5) | 60 | (2.36) | More than 8128 mm (320 in.) | 75 to 79 | 6.5 | 2 to 4 |

## Spring Replacement

### *Remove Spring Assembly*

**NOTE:** Battery must be installed in truck with no load on forks.

**1.** Ensure the lift truck is on a flat and level floor.

**2.** Disconnect the battery connectors and discharge the capacitors.

**3.** Raise the rear of the lift truck approximately 50 mm (2 in.).

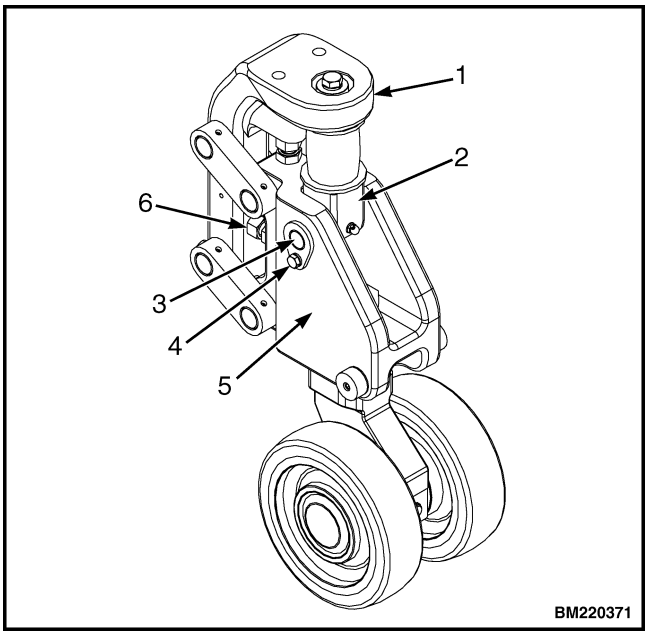
**4.** Loosen jam nut and screw in the lower adjustment capscrew. See Figure 21.

**5.** On steered units, remove steer motor to access the caster spring.

**CAUTION**

**Make sure the spring assembly has free play before removing the pin.**

**6.** Remove retaining capscrew and slide pin from lower support housing. Remove spring assembly.




1. UPPER SUPPORT HOUSING
2. SPRING ASSEMBLY
3. PIN
4. RETAINING CAPSCREW
5. LOWER SUPPORT HOUSING
6. LOWER ADJUSTMENT CAPSCREW

*Figure 21. Caster Spring Removal*

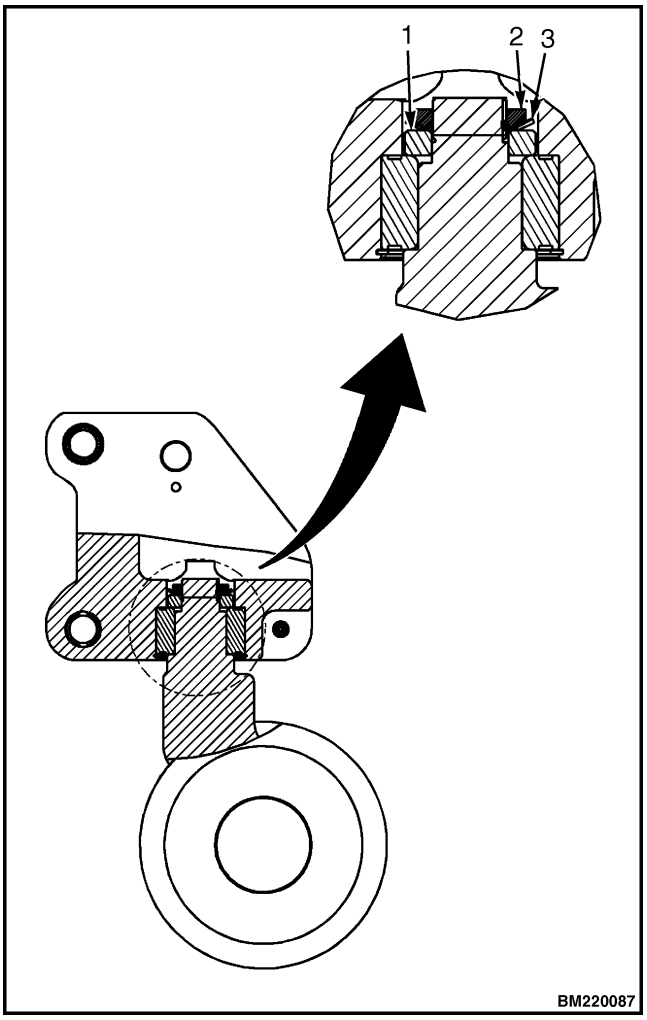
3. Unstake the bearing lockwasher from the bearing lock nut and remove the lock nut and lockwasher.

4. Remove the caster wheel from the axle shaft.

**CAUTION**

**Use a hammer and a suitable brass or aluminum driver when removing bearings to avoid damage to the bearings and/or caster wheel.**

**The bearings are removed and replaced by pressing on the outer race of the bearing only. Pressing on the inner race will damage the bearing.**

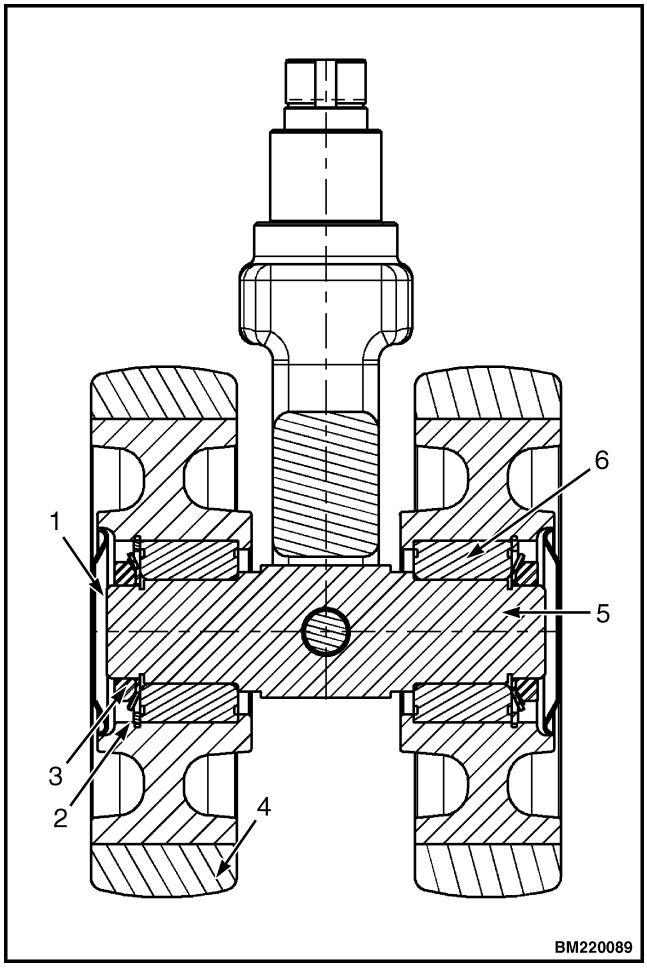



1. SPACER
2. BEARING LOCK NUT
3. LOCKING WASHER

*Figure 38. Caster Wheels From Lower Support*

5. Remove the bearing by driving it from the wheel hub using a suitable brass or aluminum driver.

6. Inspect the caster wheel for damage to the bonded wheel surface and cracks in the hub or wheel material. Replace any wheel that is damaged, cracked, or has large cracks or large chunks of the outside material missing. Replace wheels in sets if damaged.




1. BEARING CAP
2. BEARING LOCKWASHER
3. BEARING LOCK NUT
4. CASTER WHEEL
5. AXLE SHAFT
6. BEARING

*Figure 39. Caster Wheels*

# General

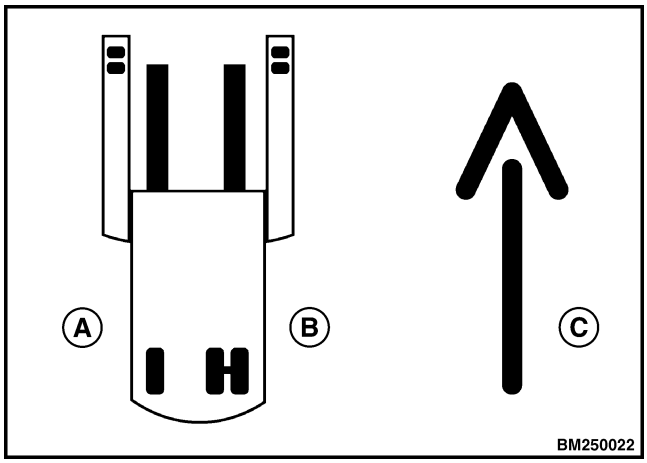
**WARNING**

**DO NOT make repairs or adjustments unless you have been properly trained and specifically authorized to do so. Repairs and adjustments that are incorrect 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, disconnect the battery and attach a DO NOT OPERATE tag to the control handle.**

This section contains descriptions of the frame components, repair procedures, and assembly information. These components include the frame weldment, door, floor plate, and covers. The overhead guard and base arms are also covered in this section.

Throughout this section, forward will refer to travel in the direction of the forks, and left and right will be from the perspective of an operator in the operator compartment facing the forks. See Figure 1.




**A.** LEFT
**B.** RIGHT
**C.** FORWARD

***Figure 1. Travel Orientation***

# Painting Instructions

## WARNING

**Some frames and components are painted with polyurethane paint. 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 irritants. Overexposure may occur without odor warning. When heat must be applied, use good industrial hygiene practices, including removal of all paint (prime and finish coats) to the metal around the area to be heated. Use local ventilation, and/or supplied, air-respiratory protection.**

**Cleaning solvents may be flammable and/or toxic and may cause skin irritation. Always wear proper eye and skin protection.**

**Always use solvents and paints in an area with adequate ventilation. DO NOT use solvents or paints near heat, fire, or electrical equipment that can make sparks. Follow the paint manufacturer's instructions and precautions.**

## CAUTION

**DO NOT put tape on cylinder rods to protect from paint. Use a thick layer of multipurpose grease to protect cylinder rods. Cylinders can be damaged if operated with tape on the cylinder rod.**

1. Clean the surface to be painted. Use a solvent on surfaces to be painted to remove grease and oil before sanding. **DO NOT** use solvent to clean new paint. Make sure all oil and grease is removed.
2. Use sandpaper to remove the top surface of paint and rust from the metal. All metal surfaces where the paint has been removed to the bare metal must be primed. Apply primer BEFORE applying the paint.
3. Protect all surfaces that will not be painted. **DO NOT** paint:

   All Plastic Covers
   Steering Handle
   Dash Display
   Control Handles
   Labels and Information Plates
   Operator Pads
   Tires and Load Wheels
   Chains and Hoses
   Battery Connectors
   All Switches
   Cylinder Rods
   Pumps and Motors
   Wiring Harnesses or Connectors

## CAUTION

**Protect electrical components, wiring, and electrical contacts from overspray.**

4. Paint the surfaces using Yale approved paints. Follow the proper paint scheme for your lift truck model (refer to the **Parts Manual** for specific information on paint for your lift truck).
5. Install new safety labels. See Safety Labels Replacement.

# Description

The hydraulic system uses an AC induction motor and gear-type pump to supply hydraulic pressure for the main lift functions. Lift pump and motor assemblies are available in a variety of combinations. See Table 1.

***Table 1. Main Lift Pump and Motor Configurations***

| Motor | Pump | Availability |
|---|---|---|
| 36V | 25cc | NDR030EB and NR035-040EB |
| 36V EE Option | 20cc | All Models |
| 36V 4500 lb Standard | 25cc | All Models |
| 36V 4500 lb High Performance | 28cc | NDR030EB and NR035-040EB |

# Control Handle

## SIDESTANCE CONTROL HANDLE

The control handle provides operator control for travel, lift, lower, tilt, sideshift, horn, and reach functions. See Figure 3.

Travel is activated by moving the control handle in the direction of travel. Pushing the handle away from operator provides **Forward Travel**. Pulling the handle toward operator provides **Reverse Travel**. The travel speed for both forward and reverse directions is proportional to the distance the handle is moved; the further the distance, the faster the lift truck travels.

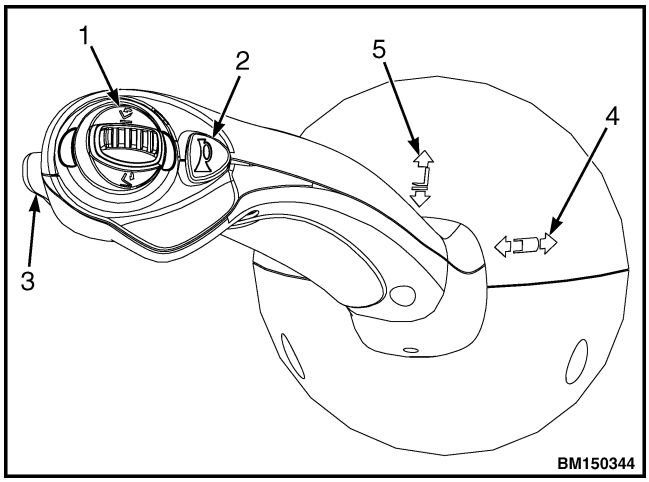
**NOTE:** Diagonal movement of handle will control both travel and a hydraulic function simultaneously.

The control handle also controls the lift/lower functions. When the control handle is pushed downward, the carriage lowers. When the handle is pulled upward, the carriage lifts. The speed of the mast is proportional to the distance the control handle is moved.

**NOTE:** During lift truck operation, the auxiliary functions can only be operated one at a time.

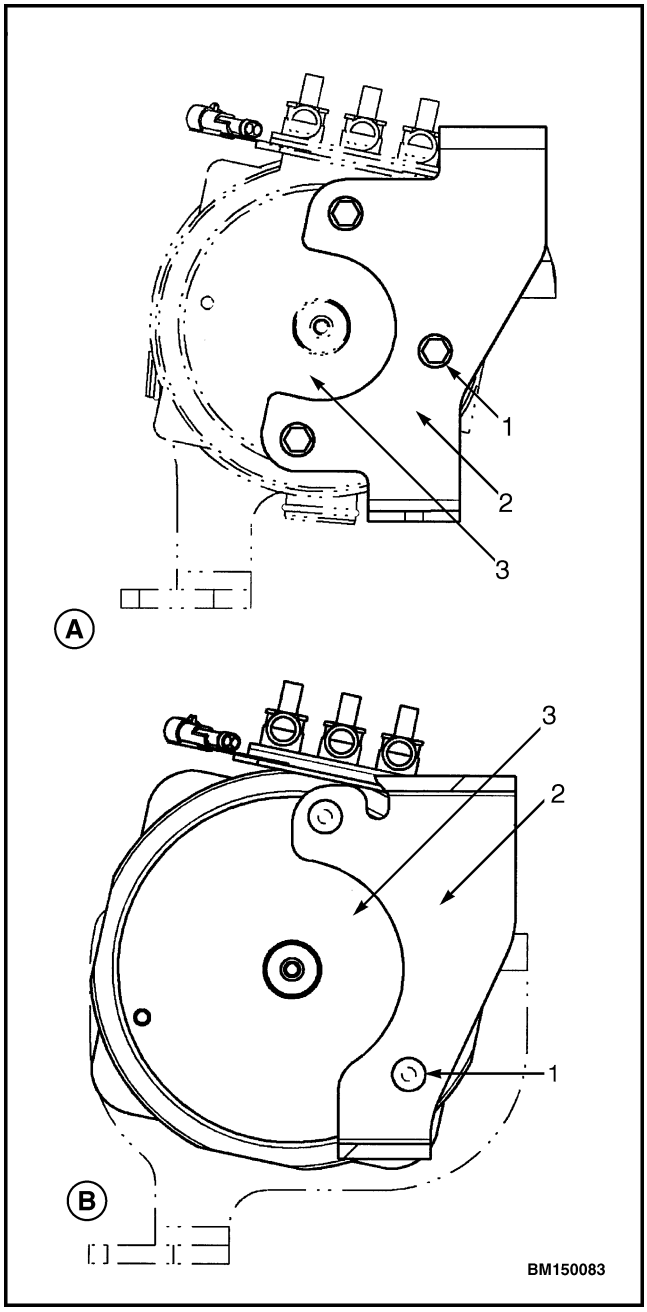
The sideshift left and sideshift right functions are controlled by simultaneously depressing the function select button and moving the auxiliary function control into the Reach (sideshift left) or Retract (sideshift right) command position. See Figure 4.

A thumb operated Reach/Retract and Tilt up/Tilt down control located on the face of the operator's control handle, controls tilt and reach/retract. See Figure 4. To tilt forward, move the thumb control down. To tilt back, move the thumb control up. To reach, move the thumb control to the left. To retract, move the thumb control to the right.




1. TILT/SIDESHIFT/REACH AND RETRACT CONTROL
2. HORN BUTTON
3. AUXILIARY FUNCTION SELECT BUTTON
4. TRAVEL
5. LIFT/LOWER

***Figure 3. Control Handle***




A. STANDARD 24- OR 36-VOLT
B. 4500 LB OR EE OPTION

1. CAPSCREW
2. MOUNTING BRACKET
3. MOTOR END HEAD

***Figure 15. Mounting Brackets (Terminal End)***

**2.** Attach a sling and an overhead lifting device to the lift pump and motor assembly.

**3.** Position the lift pump and motor assembly into the lift truck as removed.

**4.** Install the capscrew into the mounting bushing of each motor mount.

**5.** Install the return and supply hoses as removed.

**6.** Install the pressure hose end with new O-ring into the pressure port. Install the retaining flanges onto the pump and hose, and install the four capscrews and washers. Tighten each screw until the retaining flanges are pressed lightly to the pump. Alternately tighten each screw 1/8$^{th}$ turn until each capscrew is torqued to 40 N•m (30 lbf ft).

**7.** Connect the wiring to the motor terminals as removed.

**NOTE:** Models with displacement-type cylinders have significantly different filling procedures than models with piston-type cylinders. Fill the hydraulic system using the appropriate procedures for your model to ensure proper operation. Refer to Fill.

**8.** Fill the hydraulic system to the proper level.

**9.** Engage the battery connector, turn the key switch to the **ON** position, and fully cycle the hydraulic system several times to check for proper operation.

**10.** Install the operator compartment cover(s) as removed. Remove the **DO NOT OPERATE** tag from the control handle and remove the blocks from the wheels.

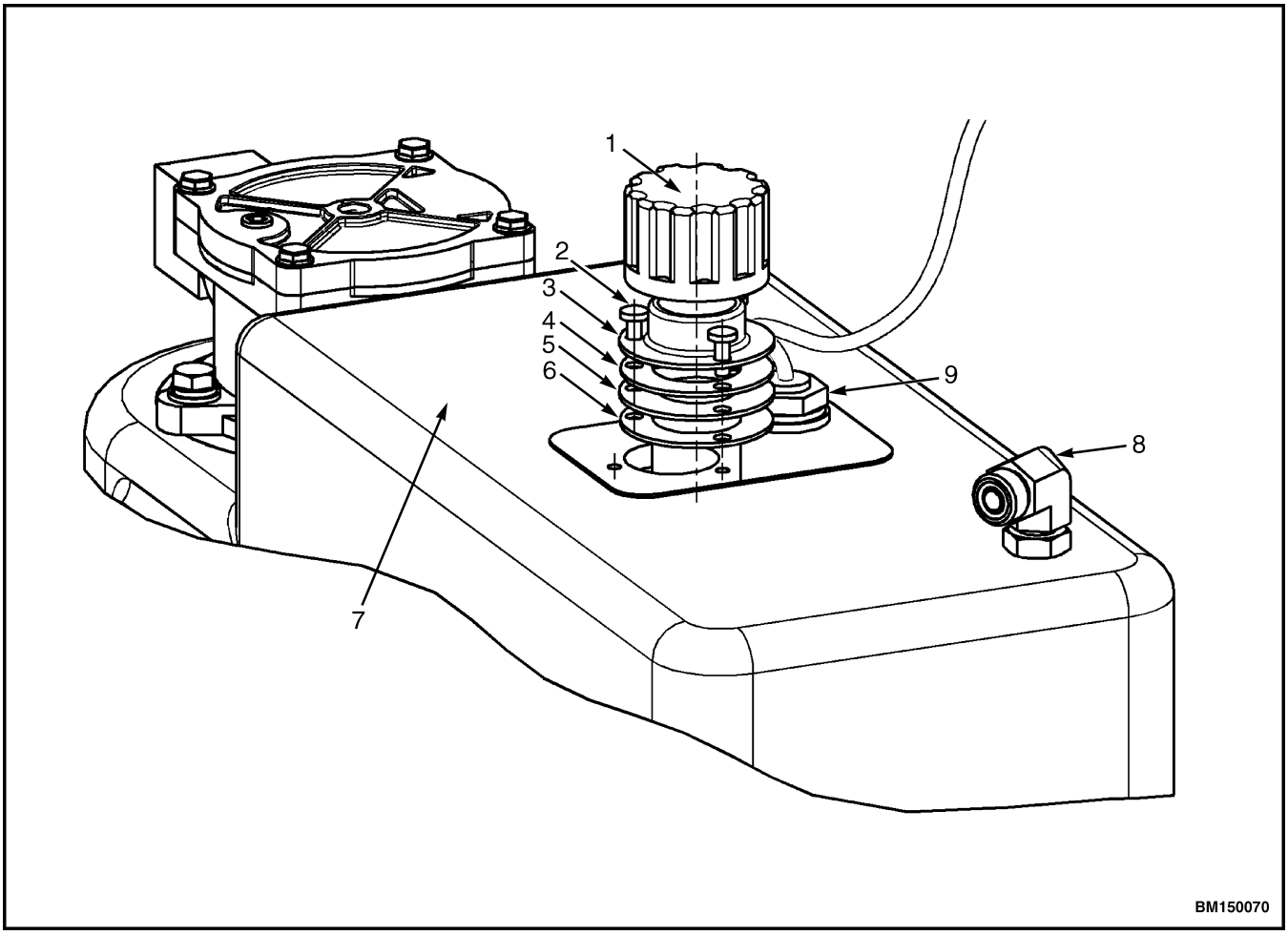
## LIFT PUMP

### WARNING

**Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.**

**Completely lower all mast components and relieve pressure by opening the manual lowering valve before disassembling any part of the lift pump or disconnecting any hydraulic hoses.**

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




1. BREATHER CAP
2. SCREW
3. CAP MOUNT
4. UPPER GASKET
5. SCREEN ASSEMBLY
6. LOWER GASKET
7. HYDRAULIC TANK
8. AUXILIARY RETURN
9. LOW OIL INDICATOR SWITCH

***Figure 26. Breather Assembly***

## Filter Assembly

**NOTE:** For instructions on replacing the filter element, refer to Oil Filter in this section.

**1.** Remove the hose clamp and disconnect the lift pump return hose, if attached. Cap and plug all hoses and ports to prevent spills and contamination.

**2.** The lift pump return fitting may be removed at this time, if necessary.

**3.** Remove the two capscrews securing the filter assembly to the tank. See Figure 27.

## SECTION 9030

# ELECTRICAL SYSTEM

## TABLE OF CONTENTS

*Table 9030-03-4. Node 40 Status Codes (Continued)*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 40 | 074 | The Steer Controller has detected that the Steer Motor has stalled. |
| 40 | 085 | The Steer Controller has detected low input key voltage or a fault in the key input circuit. |
| 40 | 086 | The Steer Controller has detected low DC Bus voltage or a fault in the DC Bus circuit. |
| 40 | 087 | The Steer Controller has detected high DC Bus voltage or a fault in the DC Bus circuit. |

*Table 9030-03-5. Node 41 Status Codes (Optional)*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 41 | 060 | The Steer Caster Controller has detected a fault in the Steer Caster Motor circuit. |
| 41 | 061 | The Steer Caster Controller has detected an open in the Steer Caster Motor circuit. |
| 41 | 062 | The Steer Caster Controller has detected a fault in the Steer Caster Motor Encoder. |
| 41 | 072 | The Steer Caster Controller has detected that the Steer Motor angle and Steer Caster angle do not agree. |
| 41 | 073 | The Steer Caster Controller has detected a Center Proximity Switch fault or Steer Caster Angle circuit fault. |
| 41 | 085 | The Steer Caster Controller has detected low input key voltage or a fault in the key input circuit. |
| 41 | 086 | The Steer Caster Controller has detected low DC Bus voltage or a fault in the DC Bus circuit. |
| 41 | 087 | The Steer Caster Controller has detected high DC Bus voltage or a fault in the DC Bus circuit. |

*Table 9030-03-6. Node 50 Status Codes*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 50 | 060 | The Lift Pump Controller has detected a fault in the Lift Motor circuit. |
| 50 | 061 | The Lift Pump Controller has detected an open in the Lift Motor circuit. |
| 50 | 062 | The Lift Pump Controller has detected a fault in the Lift Motor Encoder. |
| 50 | 068 | The Lift Pump Controller had detected DC Bus voltage too low. |
| 50 | 069 | The Lift Pump Controller has detected a fault in the capacitor charge. |

*Table 9030-03-7. Node 51 Status Codes (Americas Only)*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 51 | 060 | The Auxiliary Pump has detected a fault in the Auxiliary Pump Motor circuit. |
| 51 | 061 | The Auxiliary Pump has detected an open in the Auxiliary Pump Motor circuit. |

## DTC xx105
## CANBus Communications - Caster Steer

### POSSIBLE CAUSE

**A. CANBUS COMMUNICATION FAULT**
**B. CASTER STEER CONTROLLER WIRING FAULT**

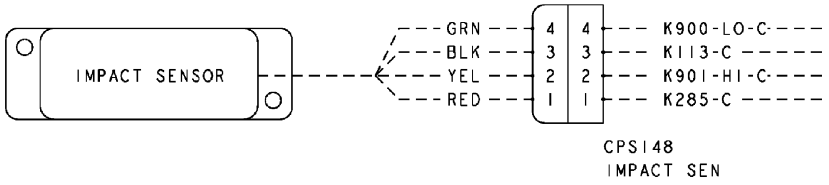
**NOTE**
Please refer to the end of this procedure for supporting diagrams.

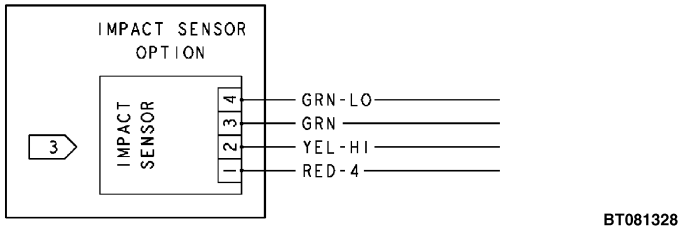
### COMPONENT OPERATIONAL CHECK

**PROCEDURE OR ACTION:**

1. Conduct a visual inspection of all connectors/wiring associated with the fault code.
   ***Are any faults detected/observed?***
   **YES:** Repair/replace connector or wiring associated with faults found. Refer to the appropriate **Electrical System**YRM.
   **NO:** Proceed to Step 2.
2. Re-key the vehicle.
   ***Is the code still present?***
   **YES:** Proceed to Step 3.
   **NO:** Problem may be intermittent.
3. Locate input diagnostics (D2.10) and verify caster steer controller communication (D2.10.41).
   ***Is the controller online?***
   **YES:** Fault may be intermittent.
   **NO:** Proceed to Step 4.
4. Using input diagnostics (D2.10), determine if other nodes are offline.
   ***Are other nodes offline?***
   **YES:** Suspect short to frame.
   **NO:** Proceed to CAUSE A.

## DIAGRAMS

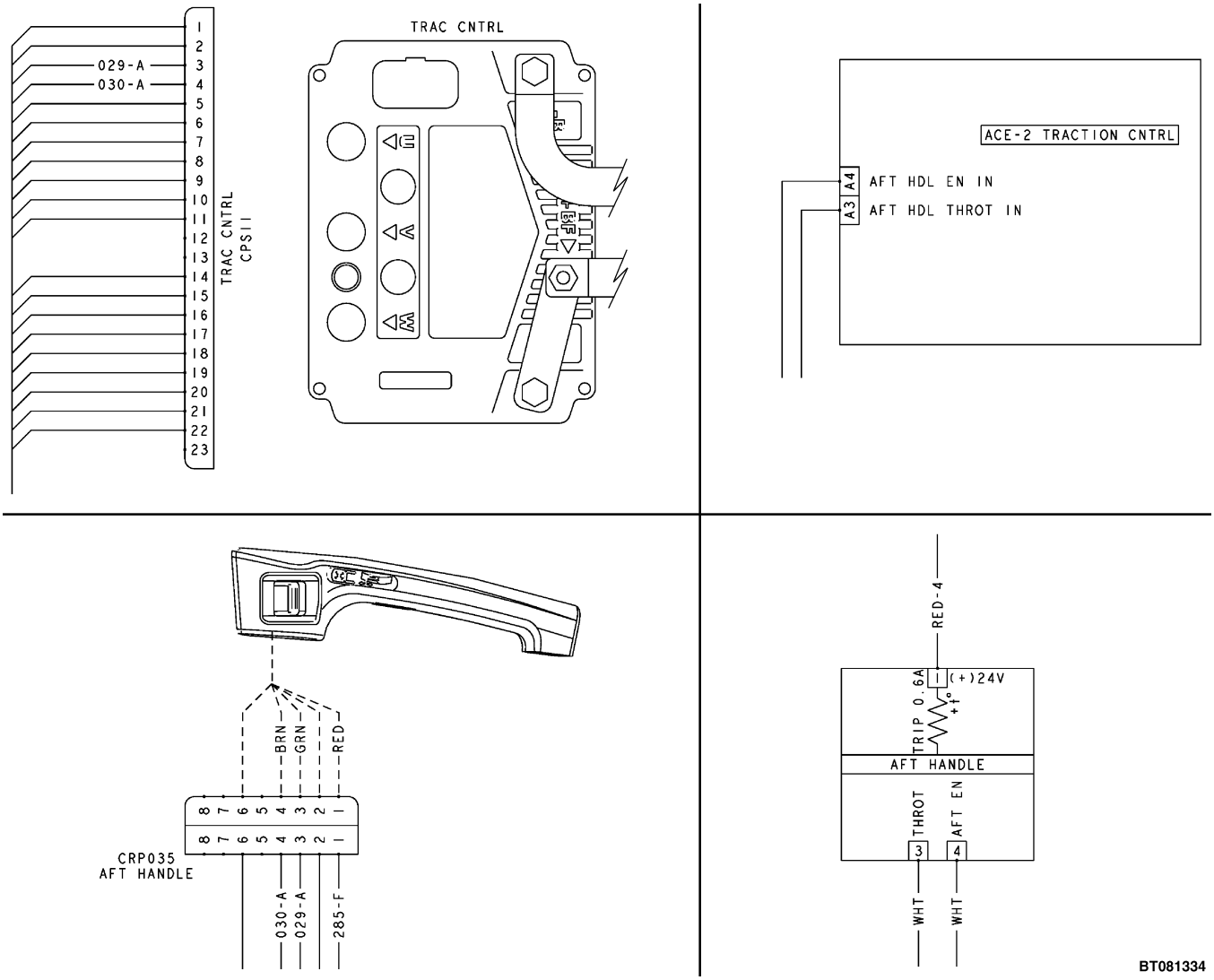



**Troubleshooting Scenes**

## END FAULT

## DIAGRAMS




**Troubleshooting Scenes**

## END FAULT

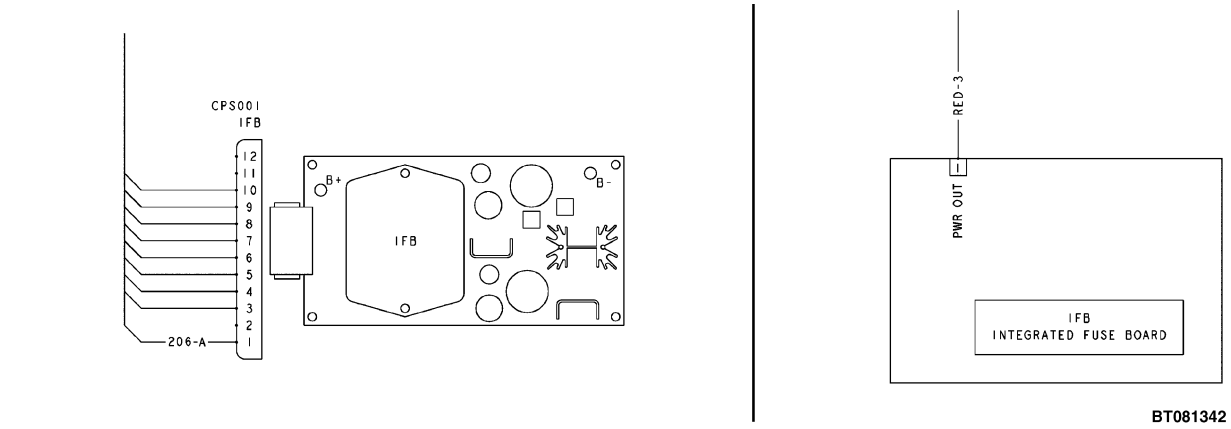
## CAUSE C - FAULTY TRACTION CONTROLLER

**PROCEDURE OR ACTION:**

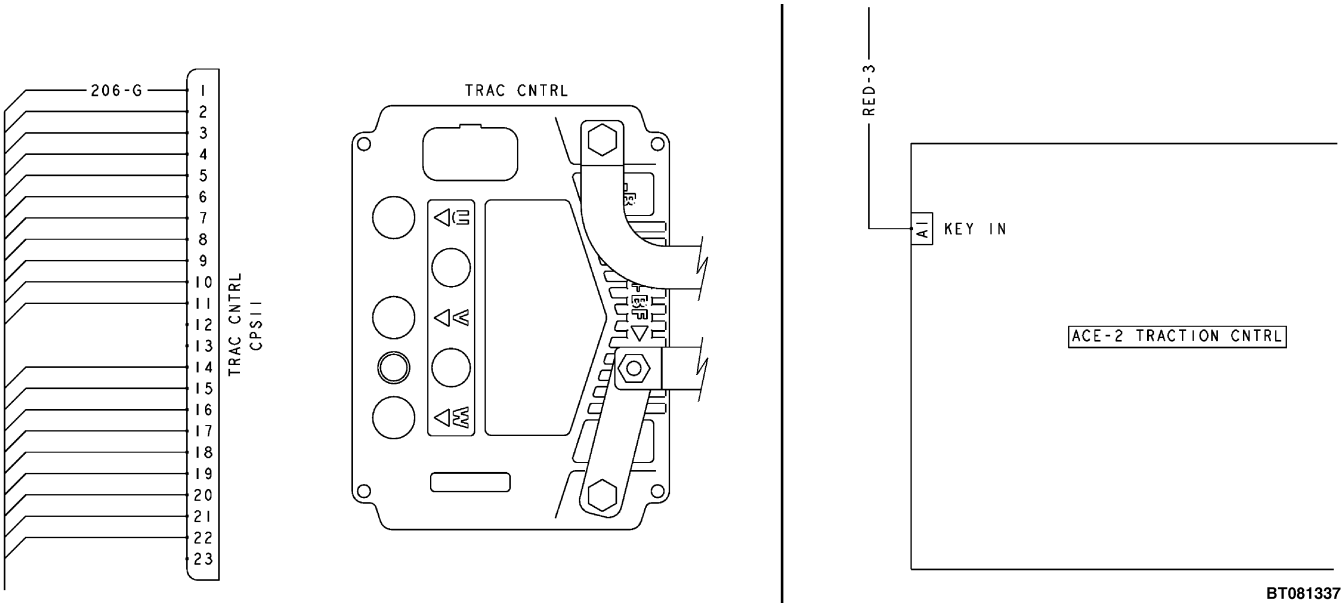
1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Cause A Troubleshooting Scenes**




**Cause B Troubleshooting Scenes**

**END FAULT**

**CAUSE A - CENTER PROXIMITY SWITCH WIRING FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position

1. Disconnect center proximity switch connector CPS051 and measure between socket 1 and B(-).
   ***Is voltage 24 ± 2.5 Vdc / 36 ± 3.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 2.
   **NO:** Inspect circuit 285-P for open or short.
2. Disconnect the main steer controller connector CPS059. Measure resistance between the controller connector CPS059, socket A13 and the center proximity switch connector CPS051, socket 3.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to Step 3.
   **NO:** Inspect ground circuit 102 for open or short.

**NOTE:** Key in OFF position.

3. Measure resistance between the main steer controller connector CPS059, socket A12 and the center proximity switch connector CPS051, socket 2.
   ***Is resistance <1 ohm?***
   **YES:** Connect battery and the center proximity switch connector CPS051. Proceed to CAUSE B.
   **NO:** Inspect ground input circuit 515-P for open, short, or source of excessive resistance.

**CAUSE B - CENTER PROXIMITY SWITCH FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Turn the steer tiller right of center to provide sensor ground.

**NOTE:** Key in ON position.

1. Connect Breakout Kit #580002086 to the steer controller connector CPS059 and measure continuity between socket A12 and A13.
   ***Is continuity present when steering is turned to right?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace center proximity switch.

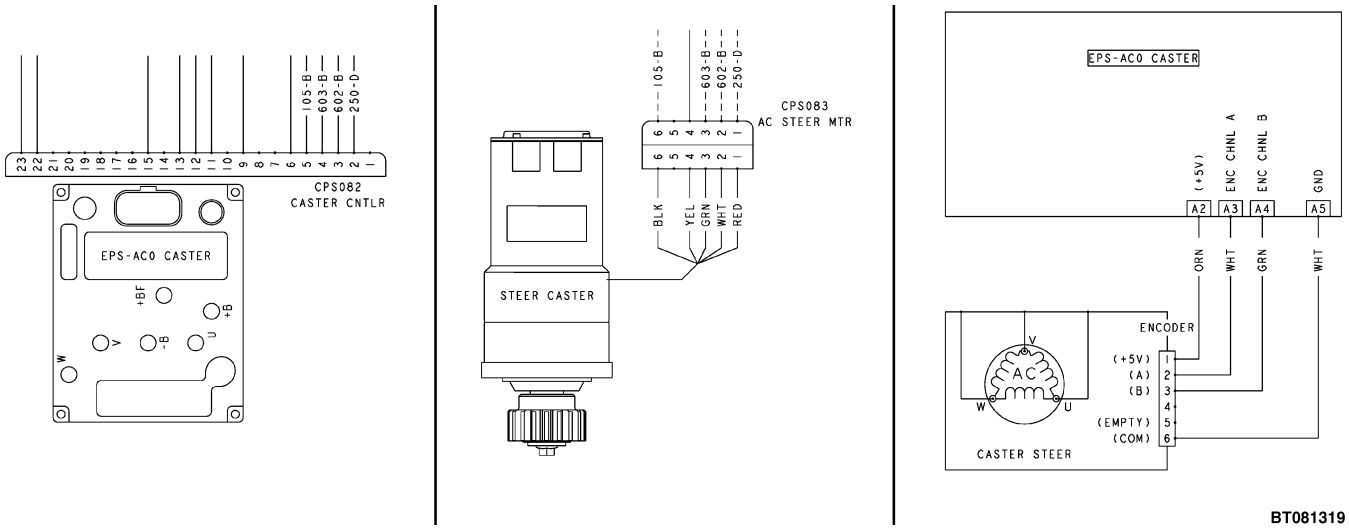
**CAUSE C - FAULTY STEER CONTROLLER**

**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Troubleshooting Scenes**

**END FAULT**

## CAUSE A - ENCODER WIRING FAULT

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position.

1. Disconnect the pump encoder connector CPS016 and measure voltage between socket 1 and B(-).
   ***Is voltage 12 ± 1.5 Vdc?***
   **YES:** Proceed to Step 2.
   **NO:** Inspect circuit 280-A for open or short.

**NOTE:** Key in ON position.

2. Measure voltage between the pump encoder connector CPS016, socket 1 and socket 4.
   ***Is voltage 12 ± 1.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 3.
   **NO:** Inspect ground circuits 103-B and 103-A for open or short.
3. Disconnect the pump controller connector CPS12. Measure resistance between socket A14 of the pump controller connector and socket 2 of the encoder connector CPS016.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to Step 4.
   **NO:** Inspect signal circuit 580-A for open or source of excessive resistance.
4. Measure resistance between socket A7 of the pump controller connector and socket 3 of the encoder connector CPS016.
   ***Is resistance <1 ohm?***
   **YES:** Connect battery and pump encoder. Proceed to CAUSE B.
   **NO:** Inspect signal circuit 579-A for open or source of excessive resistance.

## CAUSE B - ENCODER FAULT

**PROCEDURE OR ACTION:**

**NOTE:** Operate pump while performing this test.

1. Connect Breakout Kit #580002086 to the pump controller and measure voltage between socket A14, A7 and B(-).
   ***Does voltage signal relate to pump motor operation?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty encoder.

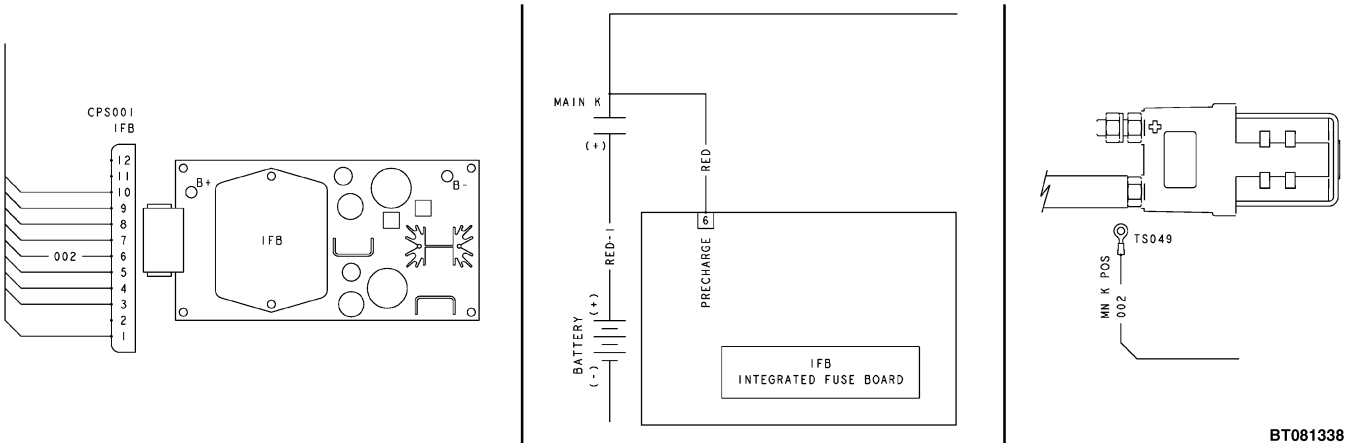
## CAUSE C - FAULTY PUMP CONTROLLER

**PROCEDURE OR ACTION:**

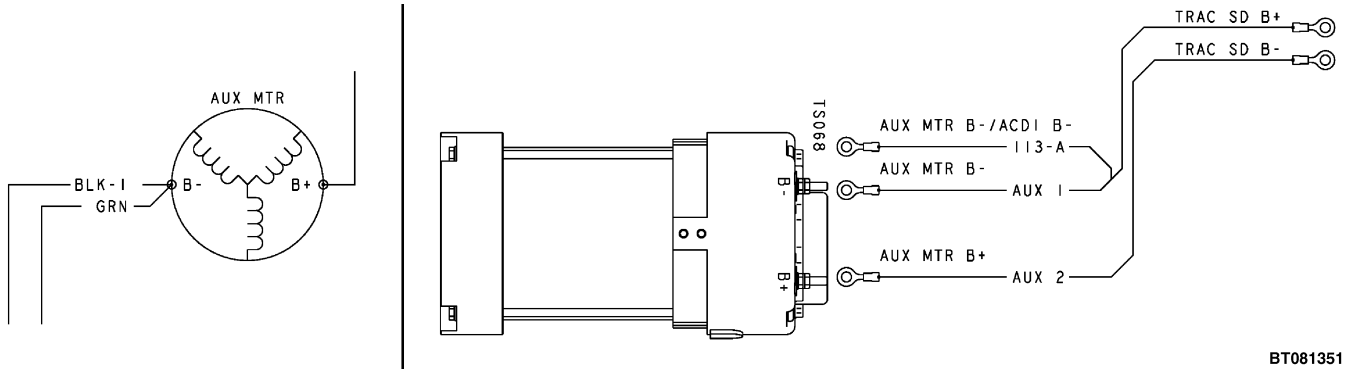
1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Cause A and Cause B Troubleshooting Scenes**




**Cause C Troubleshooting Scenes**

**END FAULT**

**CAUSE A - LOAD HOLD COIL WIRING FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position

1. Disconnect load hold coil connector CPS052 and measure voltage between socket 1 and B(-).
   ***Is voltage 24 ± 2.5 Vdc / 36 ± 3.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 2.
   **NO:** Inspect circuit 206-S for open or short. Inspect for loose or damaged coil terminals.
2. Disconnect the CAN I/O connector CPS031 and the load hold/lift coil connector CPS052. Measure resistance between the CAN I/O connector CPS031, socket A34 and the load hold/lift coil connector CPS052, socket 2.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to CAUSE B.
   **NO:** Inspect ground control circuit 811 for open or short.

**CAUSE B - LOAD HOLD COIL FAULT**

**PROCEDURE OR ACTION:**

1. Measure resistance between the load hold coil's positive and negative terminals.
   ***Is resistance 40 ± 4.0 ohms?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty load hold coil.

**CAUSE C - FAULTY CAN I/O CONTROLLER**

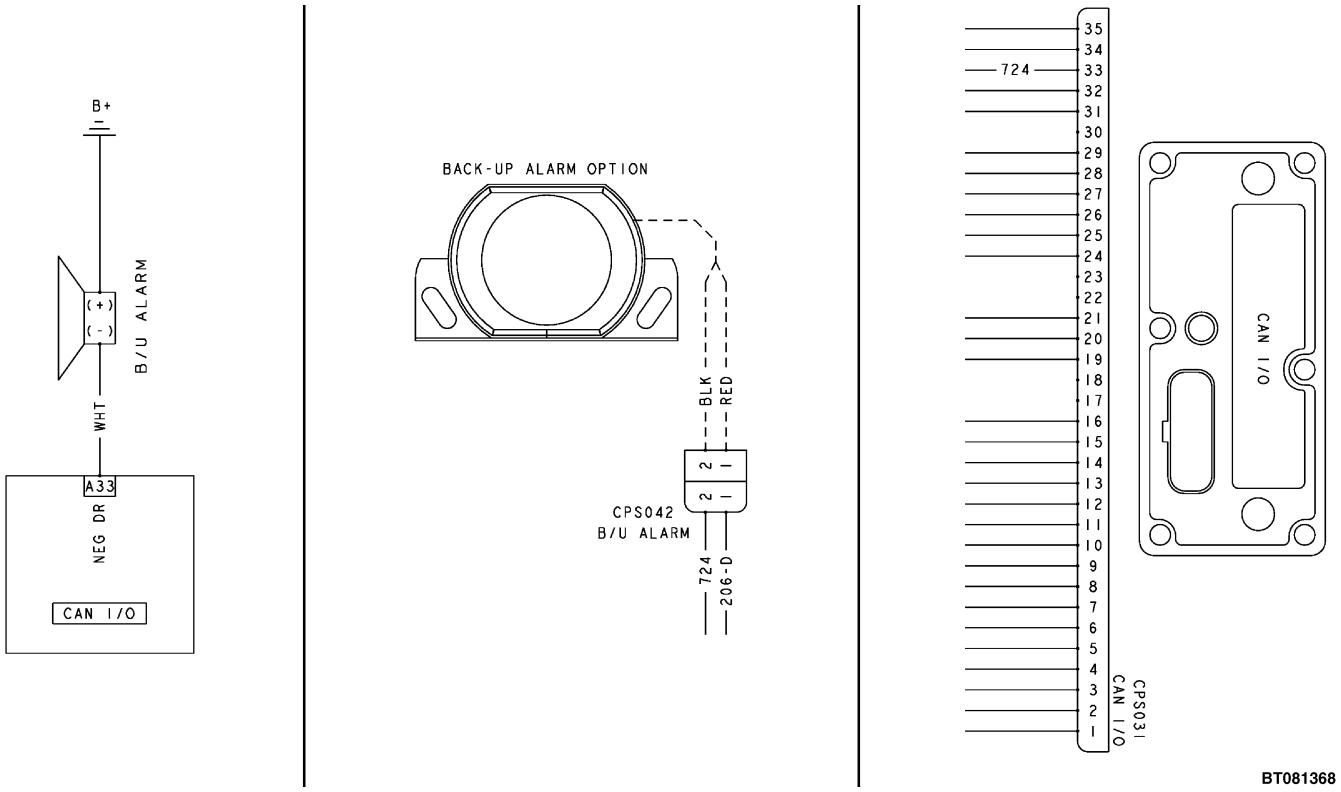
**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

---

**END POSSIBLE CAUSES**

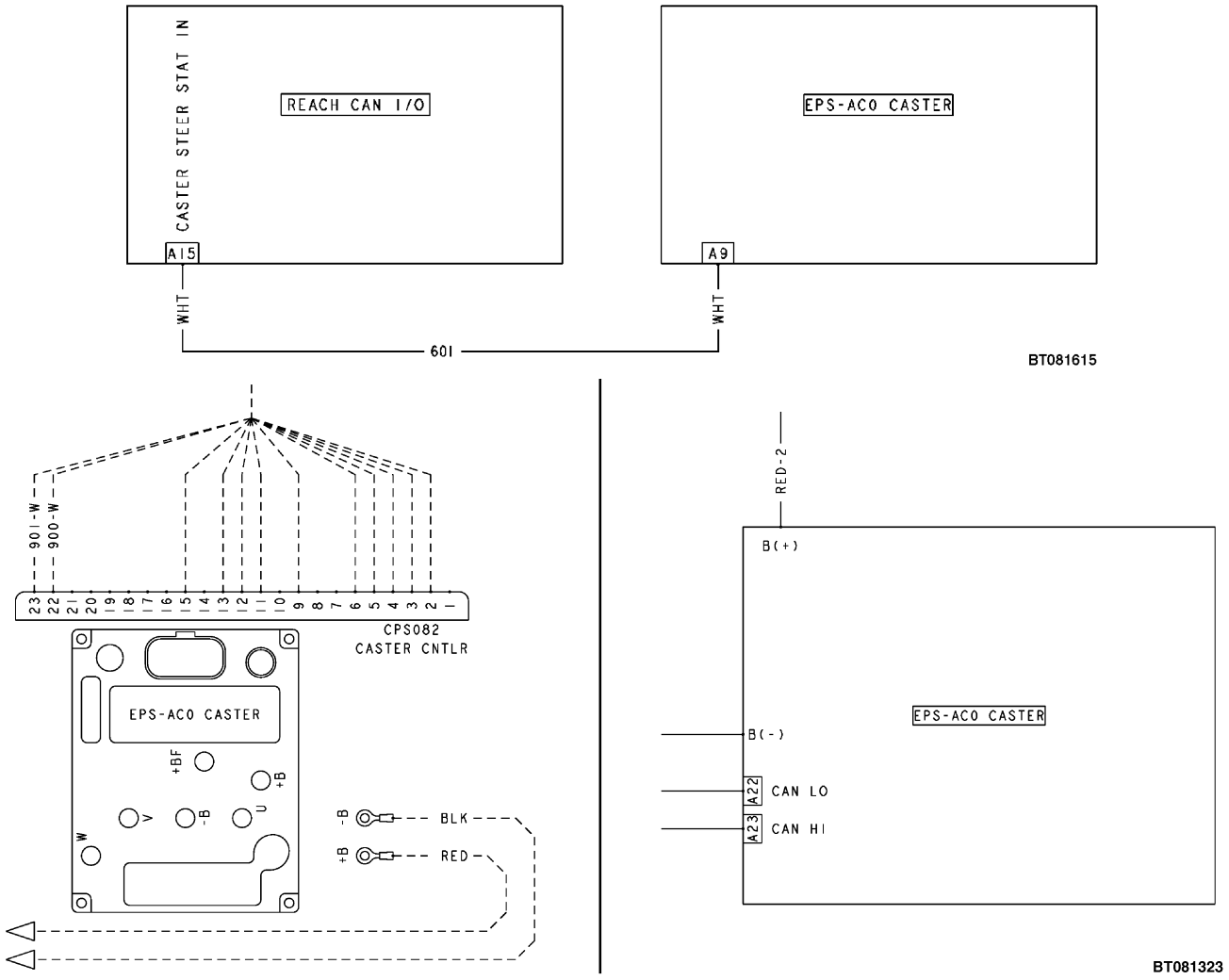
## DIAGRAMS




**Troubleshooting Scenes**

## END FAULT

## DIAGRAMS




**Troubleshooting Scenes**

**END FAULT**

## CAUSE B - SIDE SHIFT COIL FAULT

**PROCEDURE OR ACTION:**

1. Measure resistance between the side-shift coil positive and negative terminals.
   ***Is resistance 40 ± 4.0 ohms?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty side-shift coil.

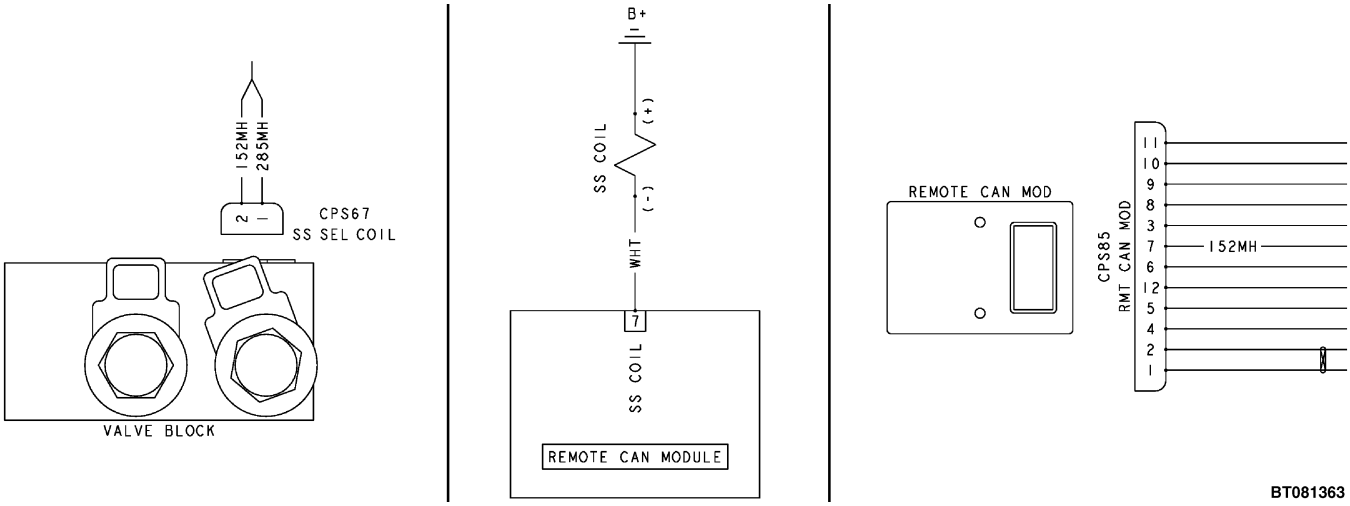
## CAUSE C - FAULTY REMOTE MODULE

**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Remote Module Troubleshooting Scenes**

**END FAULT**

# How To Use This Troubleshooting Manual

## GENERAL INSTRUCTIONS AND SAFETY INFORMATION

**WARNING**

**DO NOT add to or modify the lift truck. Any modification that affects the safe operation of the truck cannot be undertaken without written authorization of the Yale company.**

**Any change to the lift truck, the tires, or its equipment can change the lifting capacity. The lift truck must be rated as equipped and the nameplate must show the new rating capacity.**

**WARNING**

**The technician must be aware of, and follow, all general safety precautions that are published in the Operating Manual and that are posted as Safety Decals on and in the lift truck.**

Before starting, the technician should be familiar with certain policies, requirements, and instructions used in the troubleshooting procedures. Using the troubleshooting procedures correctly helps the technician to perform the procedure safely and prevents damage to the machine and support equipment.

## HOW TO USE DIAGNOSTIC TROUBLESHOOTING MANUAL

**Manual Layout:**

**Section:** This manual consists of one section which is further divided into groups.

- 9030 – Electrical System

**Groups:** The 9030 Electrical System is divided into two groups that identify specific electrical troubleshooting procedures.

- 03 – General Maintenance/Diagnostic Data

  The General Maintenance and Diagnostic Data group includes general troubleshooting, discharging the capacitors, basic electrical troubleshooting, multiplexing, User Iterface, and status codes and descriptions.
- 20 – Diagnostic Trouble Codes

  The Diagnostic Trouble Codes group includes all troubleshooting procedures for status codes reported by a given Node or system.

For a listing of all Diagnostic Trouble Codes and descriptions, see the Status Codes section of this manual.

## GENERAL INSTRUCTIONS

1. Become familiar with the content, layout, and access provisions of data in this manual. This will improve your efficiency and decrease the time required to resolve the problems.
2. Once you begin a troubleshooting procedure, do not skip steps.
3. If you reach the end of a procedure without resolving the problem and you are not directed to another procedure contact Resident Service Engineering through the Contact Management System.
4. Do not limit yourself, remember to apply your own experience and knowledge to assist in resolving the problems, but do not compromise safety in doing so.
5. Most of the cross-reference data in the manual will be electronically linked for rapid and easy access. Use the links wherever the cursor highlights an item as a linkable option.

*Table 9030-03-4. Node 40 Status Codes (Continued)*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 40 | 072 | The Steer Controller has detected that the MTS Sensor and Center Proximity Switch do not agree. |
| 40 | 073 | The Steer Controller has detected a steer Center Proximity Switch fault or Steer Angle circuit fault. |
| 40 | 074 | The Steer Controller has detected that the Steer Motor has stalled. |
| 40 | 085 | The Steer Controller has detected low input key voltage or a fault in the key input circuit. |
| 40 | 086 | The Steer Controller has detected low DC Bus voltage or a fault in the DC Bus circuit. |
| 40 | 087 | The Steer Controller has detected high DC Bus voltage or a fault in the DC Bus circuit. |

*Table 9030-03-5. Node 41 Status Codes (Optional)*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 41 | 060 | The Steer Caster Controller has detected a fault in the Steer Caster Motor circuit. |
| 41 | 061 | The Steer Caster Controller has detected an open in the Steer Caster Motor circuit. |
| 41 | 062 | The Steer Caster Controller has detected a fault in the Steer Caster Motor Encoder. |
| 41 | 072 | The Steer Caster Controller has detected that the Steer Motor angle and Steer Caster angle do not agree. |
| 41 | 073 | The Steer Caster Controller has detected a Center Proximity Switch fault or Steer Caster Angle circuit fault. |
| 41 | 085 | The Steer Caster Controller has detected low input key voltage or a fault in the key input circuit. |
| 41 | 086 | The Steer Caster Controller has detected low DC Bus voltage or a fault in the DC Bus circuit. |
| 41 | 087 | The Steer Caster Controller has detected high DC Bus voltage or a fault in the DC Bus circuit. |

*Table 9030-03-6. Node 50 Status Codes*

| NODE | STATUS | DESCRIPTION |
|---|---|---|
| 50 | 060 | The Lift Pump Controller has detected a fault in the Lift Motor circuit. |
| 50 | 061 | The Lift Pump Controller has detected an open in the Lift Motor circuit. |
| 50 | 062 | The Lift Pump Controller has detected a fault in the Lift Motor Encoder. |
| 50 | 068 | The Lift Pump Controller had detected DC Bus voltage too low. |
| 50 | 069 | The Lift Pump Controller has detected a fault in the capacitor charge. |

## DTC xx105
## CANBus Communications - Caster Steer

### POSSIBLE CAUSE

**A. CANBUS COMMUNICATION FAULT**
**B. CASTER STEER CONTROLLER WIRING FAULT**

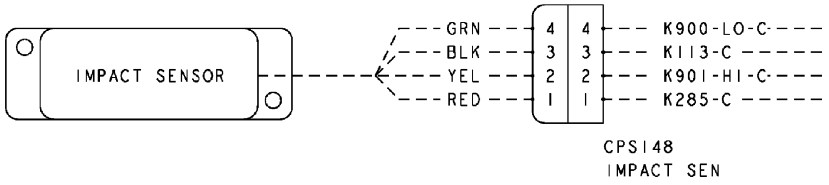
**NOTE**
Please refer to the end of this procedure for supporting diagrams.

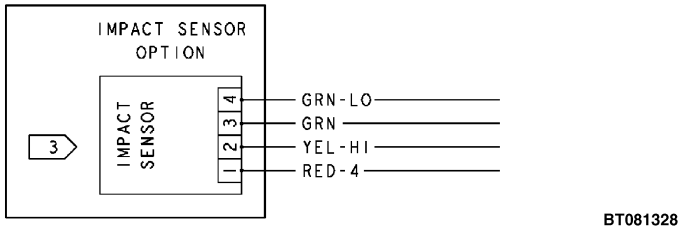
### COMPONENT OPERATIONAL CHECK

**PROCEDURE OR ACTION:**

1. Conduct a visual inspection of all connectors/wiring associated with the fault code.
   ***Are any faults detected/observed?***
   **YES:** Repair/replace connector or wiring associated with faults found. Refer to the appropriate **Electrical System**YRM.
   **NO:** Proceed to Step 2.
2. Re-key the vehicle.
   ***Is the code still present?***
   **YES:** Proceed to Step 3.
   **NO:** Problem may be intermittent.
3. Locate input diagnostics (D2.10) and verify caster steer controller communication (D2.10.41).
   ***Is the controller online?***
   **YES:** Fault may be intermittent.
   **NO:** Proceed to Step 4.
4. Using input diagnostics (D2.10), determine if other nodes are offline.
   ***Are other nodes offline?***
   **YES:** Suspect short to frame.
   **NO:** Proceed to CAUSE A.

## DIAGRAMS

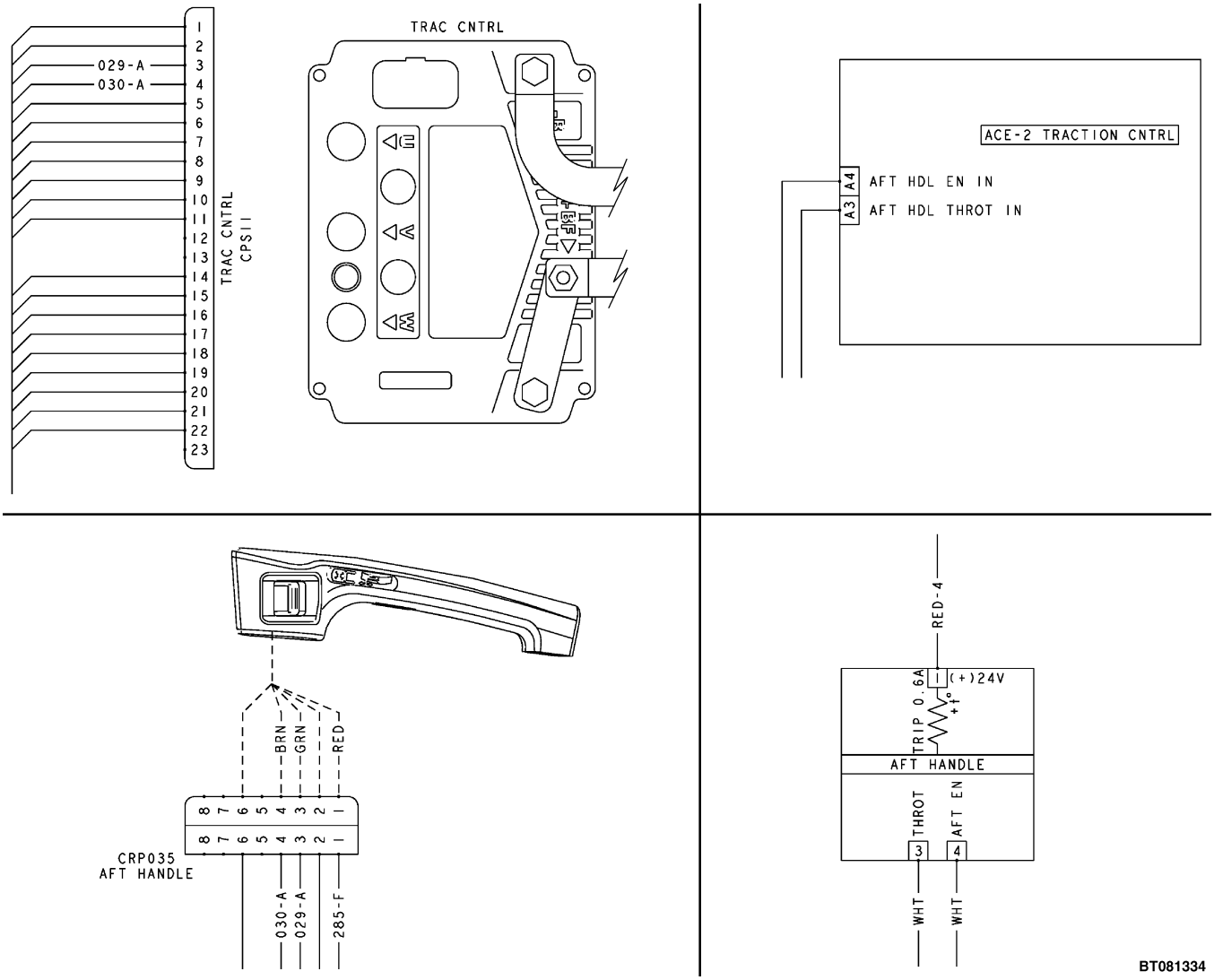



**Troubleshooting Scenes**

## END FAULT

## DIAGRAMS




**Troubleshooting Scenes**

## END FAULT

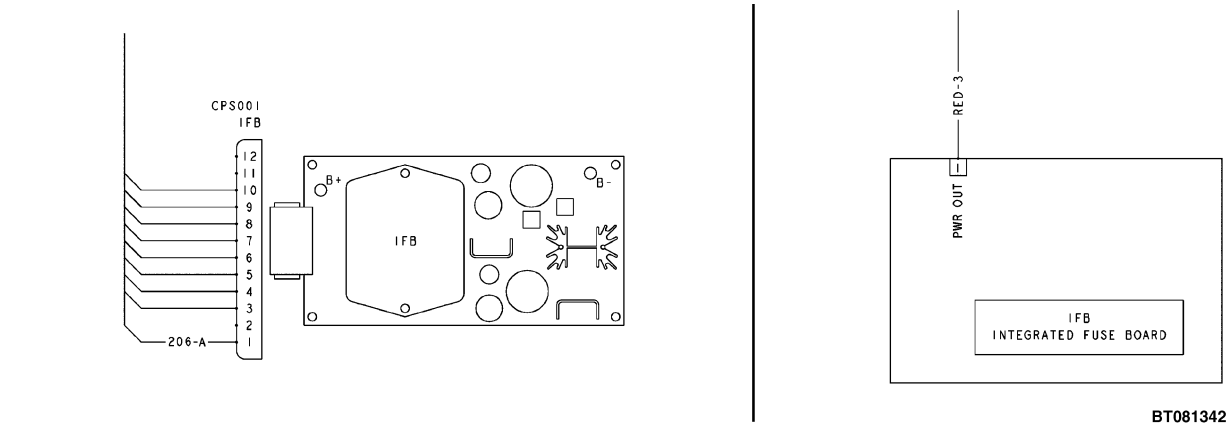
## CAUSE C - FAULTY TRACTION CONTROLLER

**PROCEDURE OR ACTION:**

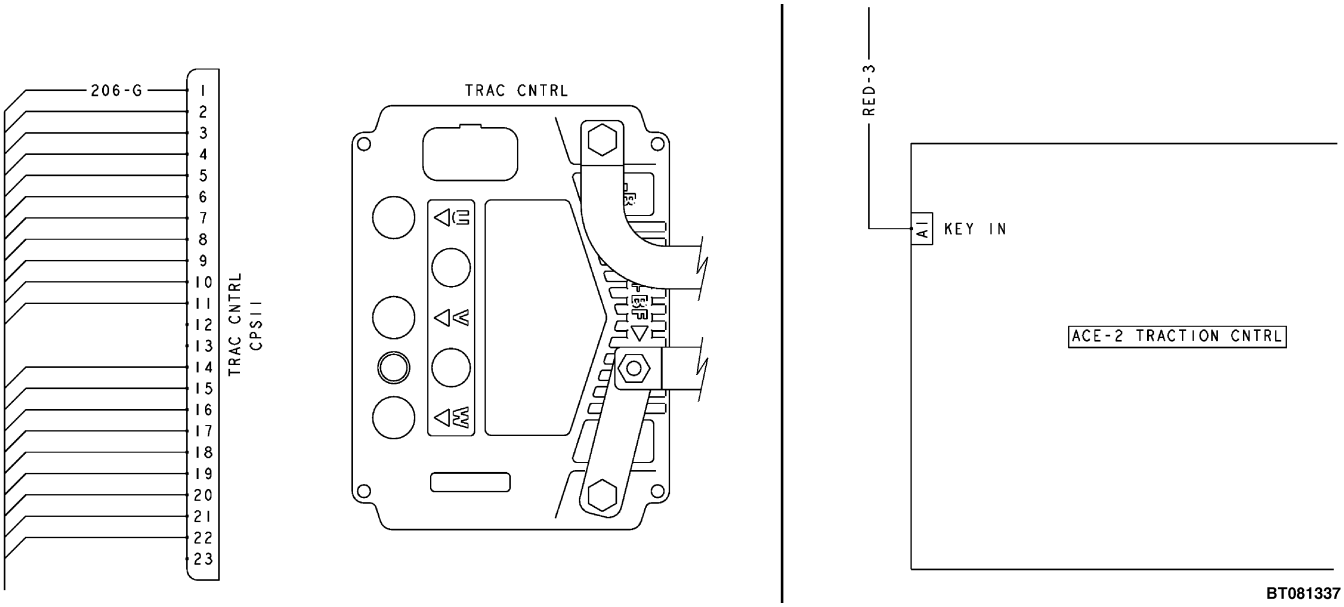
1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Cause A Troubleshooting Scenes**




**Cause B Troubleshooting Scenes**

**END FAULT**

**CAUSE A - CENTER PROXIMITY SWITCH WIRING FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position

1. Disconnect center proximity switch connector CPS051 and measure between socket 1 and B(-).
   ***Is voltage 24 ± 2.5 Vdc / 36 ± 3.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 2.
   **NO:** Inspect circuit 285-P for open or short.
2. Disconnect the main steer controller connector CPS059. Measure resistance between the controller connector CPS059, socket A13 and the center proximity switch connector CPS051, socket 3.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to Step 3.
   **NO:** Inspect ground circuit 102 for open or short.

**NOTE:** Key in OFF position.

3. Measure resistance between the main steer controller connector CPS059, socket A12 and the center proximity switch connector CPS051, socket 2.
   ***Is resistance <1 ohm?***
   **YES:** Connect battery and the center proximity switch connector CPS051. Proceed to CAUSE B.
   **NO:** Inspect ground input circuit 515-P for open, short, or source of excessive resistance.

**CAUSE B - CENTER PROXIMITY SWITCH FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Turn the steer tiller right of center to provide sensor ground.

**NOTE:** Key in ON position.

1. Connect Breakout Kit #580002086 to the steer controller connector CPS059 and measure continuity between socket A12 and A13.
   ***Is continuity present when steering is turned to right?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace center proximity switch.

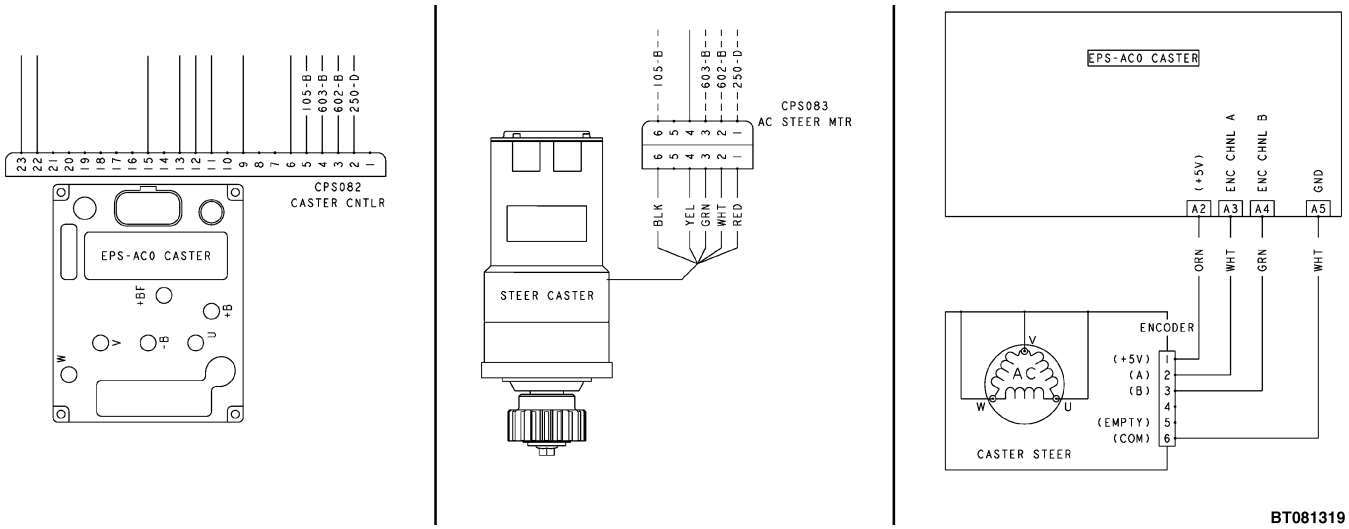
**CAUSE C - FAULTY STEER CONTROLLER**

**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Troubleshooting Scenes**

**END FAULT**

## CAUSE A - ENCODER WIRING FAULT

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position.

1. Disconnect the pump encoder connector CPS016 and measure voltage between socket 1 and B(-).
   ***Is voltage 12 ± 1.5 Vdc?***
   **YES:** Proceed to Step 2.
   **NO:** Inspect circuit 280-A for open or short.

**NOTE:** Key in ON position.

2. Measure voltage between the pump encoder connector CPS016, socket 1 and socket 4.
   ***Is voltage 12 ± 1.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 3.
   **NO:** Inspect ground circuits 103-B and 103-A for open or short.
3. Disconnect the pump controller connector CPS12. Measure resistance between socket A14 of the pump controller connector and socket 2 of the encoder connector CPS016.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to Step 4.
   **NO:** Inspect signal circuit 580-A for open or source of excessive resistance.
4. Measure resistance between socket A7 of the pump controller connector and socket 3 of the encoder connector CPS016.
   ***Is resistance <1 ohm?***
   **YES:** Connect battery and pump encoder. Proceed to CAUSE B.
   **NO:** Inspect signal circuit 579-A for open or source of excessive resistance.

## CAUSE B - ENCODER FAULT

**PROCEDURE OR ACTION:**

**NOTE:** Operate pump while performing this test.

1. Connect Breakout Kit #580002086 to the pump controller and measure voltage between socket A14, A7 and B(-).
   ***Does voltage signal relate to pump motor operation?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty encoder.

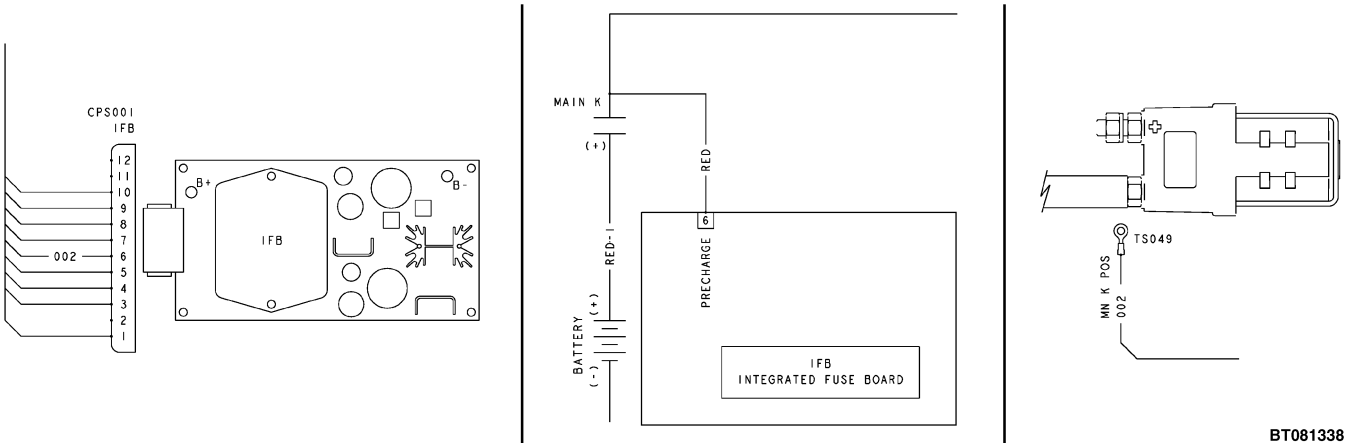
## CAUSE C - FAULTY PUMP CONTROLLER

**PROCEDURE OR ACTION:**

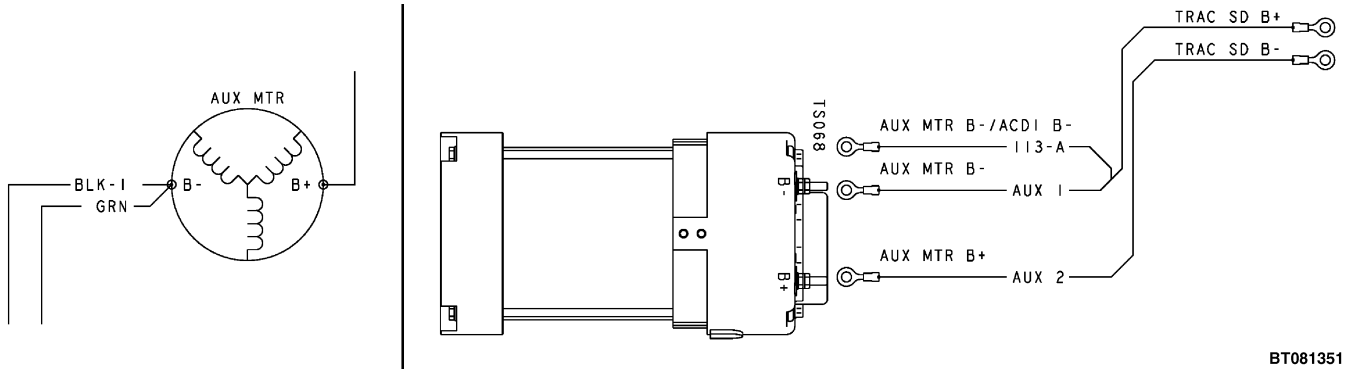
1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Cause A and Cause B Troubleshooting Scenes**




**Cause C Troubleshooting Scenes**

**END FAULT**

**CAUSE A - LOAD HOLD COIL WIRING FAULT**

**PROCEDURE OR ACTION:**

**NOTE:** Key in ON position

1. Disconnect load hold coil connector CPS052 and measure voltage between socket 1 and B(-).
   ***Is voltage 24 ± 2.5 Vdc / 36 ± 3.5 Vdc?***
   **YES:** Disconnect battery and proceed to Step 2.
   **NO:** Inspect circuit 206-S for open or short. Inspect for loose or damaged coil terminals.
2. Disconnect the CAN I/O connector CPS031 and the load hold/lift coil connector CPS052. Measure resistance between the CAN I/O connector CPS031, socket A34 and the load hold/lift coil connector CPS052, socket 2.
   ***Is resistance <1 ohm?***
   **YES:** Proceed to CAUSE B.
   **NO:** Inspect ground control circuit 811 for open or short.

**CAUSE B - LOAD HOLD COIL FAULT**

**PROCEDURE OR ACTION:**

1. Measure resistance between the load hold coil's positive and negative terminals.
   ***Is resistance 40 ± 4.0 ohms?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty load hold coil.

**CAUSE C - FAULTY CAN I/O CONTROLLER**

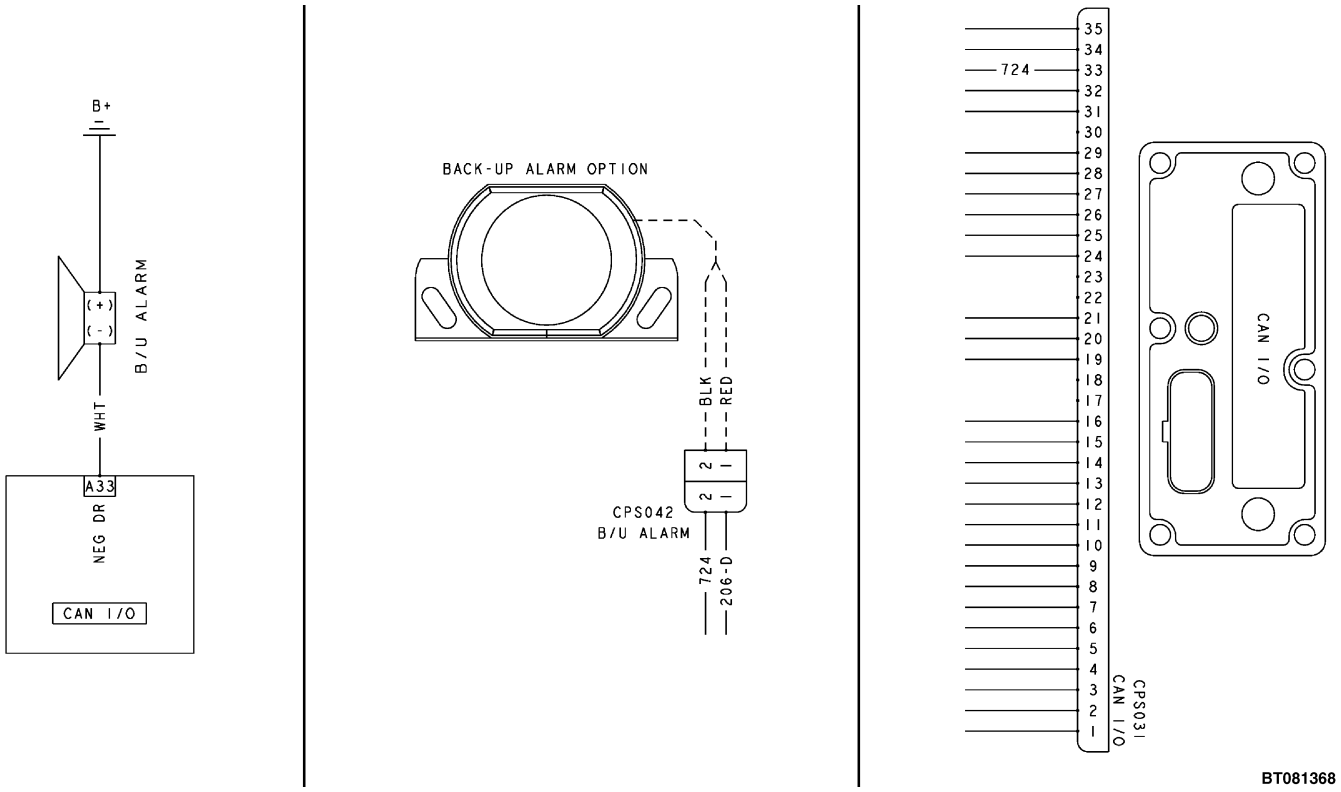
**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

---

**END POSSIBLE CAUSES**

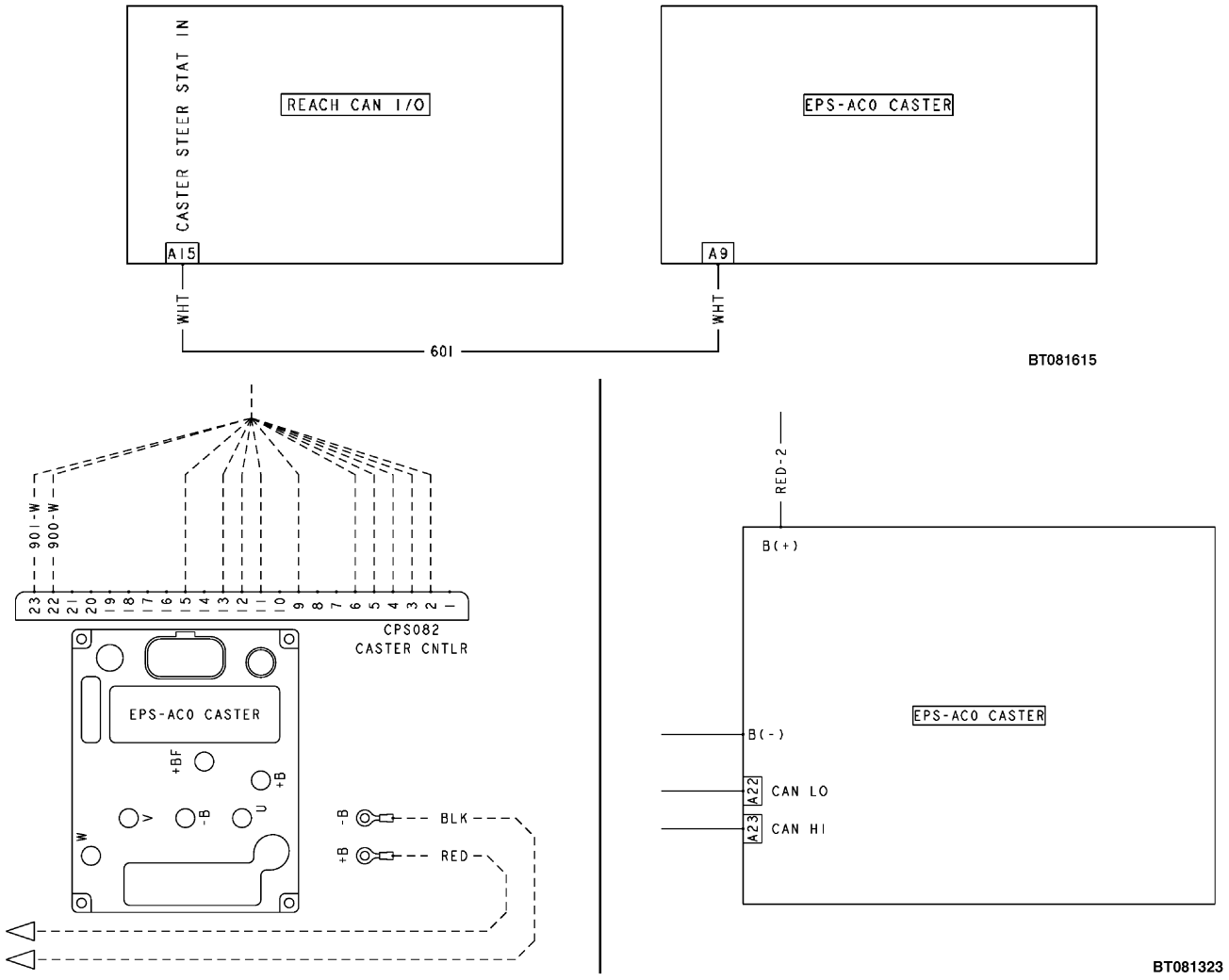
## DIAGRAMS




**Troubleshooting Scenes**

## END FAULT

## DIAGRAMS




**Troubleshooting Scenes**

**END FAULT**

## CAUSE B - SIDE SHIFT COIL FAULT

**PROCEDURE OR ACTION:**

1. Measure resistance between the side-shift coil positive and negative terminals.
   ***Is resistance 40 ± 4.0 ohms?***
   **YES:** Proceed to CAUSE C.
   **NO:** Replace faulty side-shift coil.

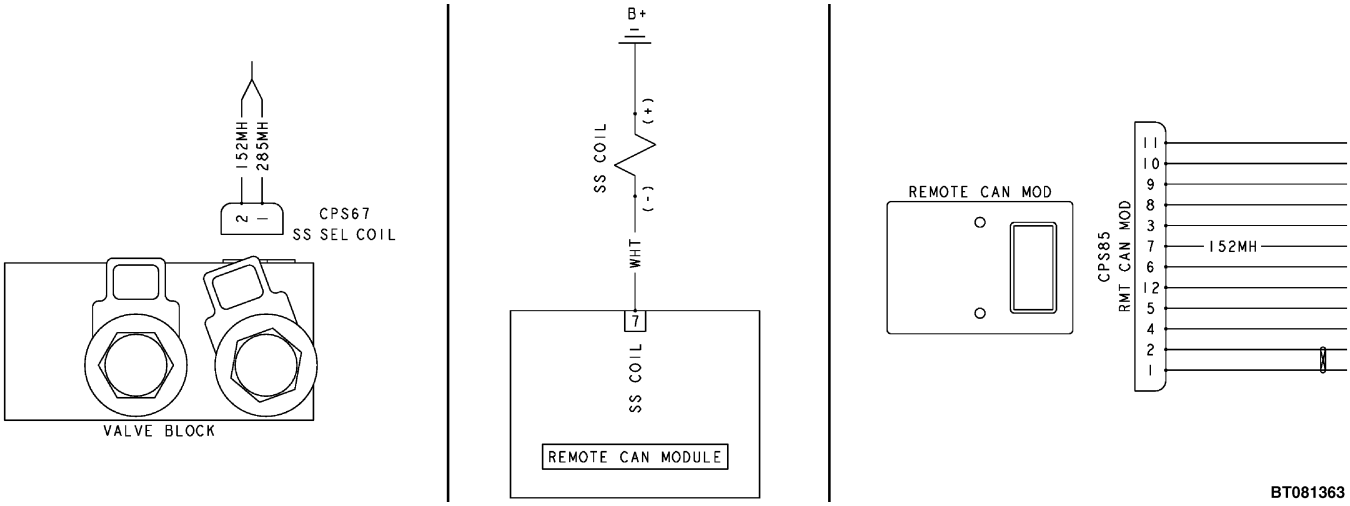
## CAUSE C - FAULTY REMOTE MODULE

**PROCEDURE OR ACTION:**

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

**END POSSIBLE CAUSES**

## DIAGRAMS




**Remote Module Troubleshooting Scenes**

**END FAULT**

# TABLE OF CONTENTS (Continued)



This section is for the following models:

(NDR035EB, NR045EB) [D861];
(NDR030EB, NR035/040EB) [E815];
(NDR030DB, NR035/040DB) [B295]

**The controller checks the following functions:**

- Checks the temperature and gives both low- and high-temperature thermal protection to the controller.
- Electronically checks the traction circuit for malfunctions and prevents traction motor operation if a failure occurs.
- Regulates the current in the motor circuit and automatically reduces the current and prevent damage.
- Checks for incorrect battery usage.
- Checks for and protects from stall conditions.

## CONTROLLER REMOVAL

1. Move lift truck to a safe, level area. Turn the key switch to the **OFF** position and remove the key. Attach a DO NOT OPERATE tag to the multifunction control handle. Put blocks under drive wheels to keep lift truck from moving. See **Periodic Maintenance** 8000YRM1617 - How To Put A Lift Truck On Blocks.

### WARNING

**Disconnect the battery and separate the connector before opening the compartment cover or inspecting/repairing the electrical system. If a tool causes a short circuit, the high-current flow from the battery can cause a personal injury or property damage.**

**NOTE:** Controllers and dash displays should not be exchanged between other trucks for periods of longer than 10 hours for testing purposes. Controller nodes may acquire higher hours from a donor truck if this practice is used and the original truck hour meter readings cannot be recovered to lower hour level readings. Additionally non-programmed devices may assume the truck serial number that they are installed in.

2. Disconnect and separate battery connector. Remove the cover and discharge the capacitors. Refer to Discharging the Internal Capacitors.

3. Unplug connectors from traction or hydraulic motor controller. Tag and disconnect wires to terminals.

4. Remove four cap screws and lock washers and carefully remove the necessary controller from the aluminum heat sink plate.

## INSTALL

1. Make certain the mounting surface for the controllers are clean. There should be no dirt between the frame and the controllers. Align the controllers in lift truck with holes and install lock washers and cap screws. Tighten the Traction or Hydraulic Controller mounting cap screws to 7 to 8 N•m (62 to 71 lbf in). If mounting the aluminum heat sink for either pump or traction controllers to the frame, tighten screws to 10 to 12 N•m (89 to 106 lbf in). Refer to **A/C Motor Repair S/N A474N03000L=> S/N A497N030000L=> S/N D801N02161L=> S/N E826N01917L=>** 0620YRM1621 for phase cable torque specifications.

## LOW-VOLTAGE PROTECTION FUNCTION

This function protects the controller and the battery. The controller will not operate correctly if there is less than 18 volts from the battery. The battery current drain increases as the battery voltage decreases. The battery may still operate the lift truck to move it for battery charging or replacement.

## INSTALL

1. Install new control handle, four flange bolts and lock nuts into multifunction control handle mounting bracket weldment. See Figure 20.

2. Connect ground wire to terminal on control handle. Connect control handle wire harness connector to wire harness. See Figure 20.

3. Install lower half calotte, upper half calotte, and two screws. See Figure 20.

4. Install control handle lower cover and reconnect the switches. Install the top cover over control handle and on to multifunction control handle mounting bracket weldment. See Figure 20.

5. Install one socket head cap screws and one button head cap screws into control handle top cover. See Figure 20.

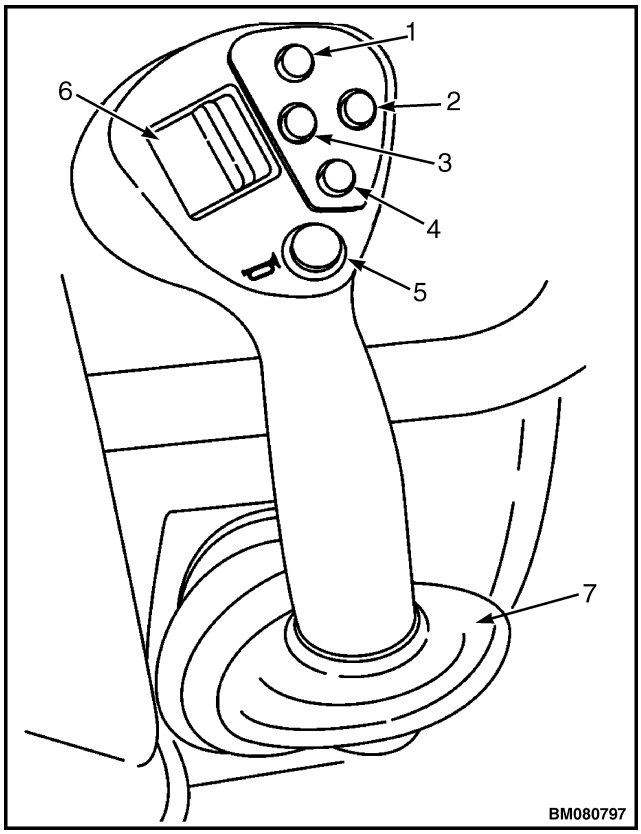
6. Install control handle back cover and three socket head cap screws into multifunction control handle mounting bracket weldment. See Figure 20.

**NOTE:** If during the cover installation the control handle is rubbing on the cover, the control handle mounting hardware or cover hardware should be adjusted to allow free movement of the calotte cover within the handle cover.

# Forward-Stance Controls

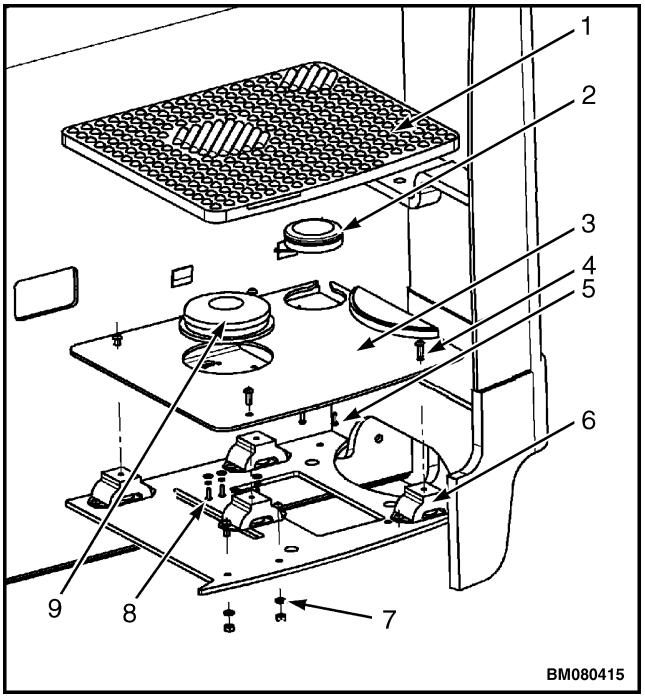
## CONTROL HANDLE FUNCTIONS

The forward-stance models utilize a different control configuration than the multifunction control handle on side-stance models. The operator directs forward and reverse movement by pushing the control handle in the desired direction. There is no side-to-side movement of the forward-stance control handle. The lift functions are controlled by a paddle switch on the face of the control handle. Sideshift and tilt functions are controlled by button switches located to the right of the paddle switch facing the operator. A button switch located below the lift/lower paddle activates the horn. Another paddle switch, which controls the reach functions, is located on the opposite side of the grip and is operated with the index finger. See Figure 21.




1. TILT DOWN
2. SIDESHIFT RIGHT
3. SIDESHIFT LEFT
4. TILT UP
5. HORN BUTTON
6. LIFT/LOWER
7. PALM REST

***Figure 21. Forward Stance Control Handle***




1. FLOOR MAT ({FREEZER OPTION ONLY} FREEZER TRUCK NON SKID FLOOR PLATE)
2. OPERATOR SENSING SWITCH
3. MOUNTING PLATE (FREEZER MOUNTING PLATE)
4. MOUNTING PLATE SCREWS
5. SWITCH MOUNTING HARDWARE
6. MOUNTING FEET
7. MOUNTING FEET HARDWARE
8. SWITCH MOUNTING HARDWARE
9. BRAKE SWITCH

***Figure 34. Foot Switch Assemblies***

## FREEZER FLOOR PLATE REPAIR

See Figure 34, for the following freezer floor plate procedures.

### General

The freezer option floor plate consists of two different freezer floor plate configurations. The standard freezer floor plate uses two heater pads to warm the foot switches. The operator comfort option has a large heater pad that warms the switches as well as provides operator foot warming. The system is turned on by a thermostat located on the front right side of the truck frame under the front cover. Once the thermostat reaches 13°C (56 °F) it closes and latches the two relays that turn the heaters on. When the floor plate temperature at the floor thermostat reached 40°C (105°F) the lower thermostat opens and un-latches the relay circuits. The heater circuit is 20 amp fuse protected and the relay latching circuit is 2 amp fuse protected in the freezer harness.

**WARNING**

**Capacitors inside the controllers can hold an electrical charge after the battery is disconnected. Discharge the capacitors before servicing the electrical system to prevent injury or electronic damage.**

1. Move the lift truck to a safe, level area and completely lower the mast. Turn the key switch to the OFF position and attach a DO NOT OPERATE tag to the control handle. Block the drive wheel to prevent unexpected movement.
2. Disconnect the battery power cable connector from the truck connector located on the right side of the frame. Pull the battery cable connector handle to separate the battery connector from the truck connector.
3. Discharge the capacitors.
4. Remove the four cap screws securing the top skid plate to the lower isolation mounts
5. Lift the floor plate on its side and disconnect the foot switch connectors and freezer heater connections from the wiring harness. Remove the floor plate from the lift truck.

**NOTE:** Replace only the components necessary to complete the repairs

6. If replacing the heater pad, remove the two cap screws securing the skid plate to the floor plate, see Figure 35. The comfort heater pad is stuck to the floor plate on one side only. Note the installation for later replacement if required.

6. Replace the fan switch:
   a. Disconnect the wiring connectors from the fan switch.
   b. Remove the locking nut from the switch and remove the switch from the lower casing.
   c. Position the new switch into the lower casing. Install the locking nut to the switch.
   d. Install the terminal connectors to the new switch as removed.
7. Replace the fan wiring:
   a. Disconnect the wiring connectors from the fan switch.
   b. Remove the connector from the end of the fan wiring by cutting the wires near the connector or by disassembling the connector. Refer to **Wire Harness Repair** 2200YRM1128.
   c. Pull wires out of the grommet in the upper casing. If the grommet is damaged or brittle, replace the grommet.
   d. Install new wiring through the grommet. Connector pin ends should be located on the outside of the upper casing.
   e. Install the wiring connectors to the fan switch terminal as removed.
   f. Assemble the connector to the pin ends of the wiring. Refer to **Wire Harness Repair** 2200YRM1128.
8. Position the upper casing of the fan assembly to the lower casing. Install the four screws securing casings together. See Figure 48.
9. Position the fan assembly onto the overhead guard as removed. Install the two capscrews and retaining hardware securing fan in place.
10. Connect the fan wiring connector to the options harness. Connect the battery. Turn the key switch to the **ON** position and test for proper operation.
11. Replace the operator compartment covers as removed. Engage the battery connectors and remove the **DO NOT OPERATE** tag from the control handle. Remove the drive wheel blocks and test for proper operation.

# Impact Sensor

The impact sensor is located beneath the operator compartment cover and is mounted to the frame of the lift truck with two screws and washers. If the lift truck hits (or is hit) with enough force to activate the sensor (as set), the impact sensor alerts the master controller that an impact has occurred. A warning will then be displayed on the dash display. The lift truck can also be programmed to respond to impacts by limiting truck functions until the sensor is reset by a supervisor or service technician. An operator cannot reset the impact sensor.

## REMOVE

1. Park the lift truck in a safe, level area and completely lower the mast.
2. Turn the key switch to the **OFF** position and disconnect the battery.
3. Remove the operator compartment cover and discharge the capacitors. See Discharging the Internal Capacitors.
4. Locate the impact sensor mounted to the frame of the lift truck. See Figure 49.

6. Connect the battery and turn the key switch to the **ON** position.

7. In a safe area, test the lift truck travel speeds with the reach carriage assembly retracted and again with it extended to ensure the retract sensor is functioning properly. The lift truck traction controls should function only at mast up speed reduction 7 kph (4.5 mph) speed when the reach carriage is extended.

# Tilt Leveling

## REMOVE

1. Park the lift truck in a safe, level area and completely lower the mast.

2. Turn the key switch to the **OFF** position and disconnect the battery.

3. Disconnect the switch wiring from the option module.

4. Remove the capscrews securing the switch to the reach carriage. See Figure 64.

# General

## INTRODUCTION

The Common Control System (CCS) was developed to achieve a commonality of programming traits and display menus across a wide range of fork lift products. The ability to use one common programming method increases the effectiveness of the supervisor through similarity of functions when using the display interface and display menus and sub-menus. Whenever differences in menu structures appear between products they will be noted in the applicable service manual for that product. Some terms and descriptions in this manual may be generic in scope and not represent the actual truck being serviced. Any questions regarding this manual should be directed to the factory service representative.

## DESCRIPTION

The User Interface Service Supervisor Manual describes the functions of the display panel that are available to the supervisor. With a proper supervisor-level password, a supervisor can access menu items that are not visible at the operator-level access.

**NOTE:** The initial set up of supervisor passwords must be performed by a service technician accessing the menu system with a service-level password. The supervisor password must be set up before a supervisor can access the menu functions.

The dash display is a multifunction device. It contains a button keypad, a series of LED indicator lights, and an LCD screen. See Figure 1.

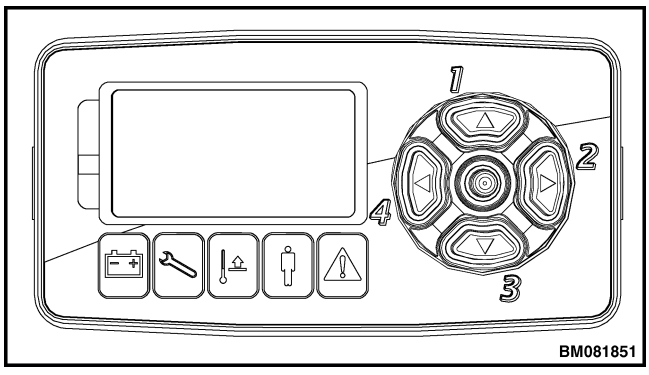



***Figure 1. Dash Display***

### Button Keypad

The button keypad is located on the right side of the display. It consists of four buttons arranged in a circle with a fifth button in the center. The buttons are numbered 1 through 5, starting with button 1 at the top and continuing clockwise and ending with button 5 situated in the center of the keypad.

### LED Indicator Lights

The LED indicator lights are located on the display below the LCD screen and to the left of the button keypad. The lights illuminate to notify the operator of certain conditions. The function of each light (in order from left to right) is as follows:

- Battery
- Wrench
- Thermometer
- Operator Pedal
- Warning

### LCD Screen

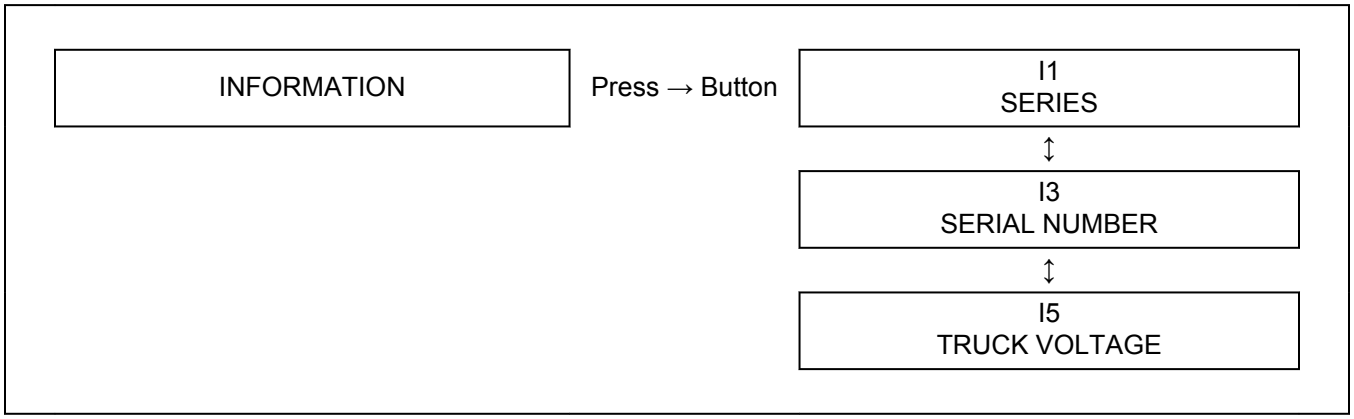
The LCD screen displays the following when the key is in the **ON** position:

1. Battery Charge Indicator
2. Hourmeter (Tenths)
3. Hourmeter (Hours)
4. Throttle Command
5. Actual Speed
6. Steer Tire Position
7. Run Direction
8. Performance Mode

## INFORMATION

The Information menu displays specific information about the lift truck. The parameters are installed at the factory and cannot be changed. Scroll through the Information menu using the UP (#1) and DOWN (#3) buttons and press the RIGHT (#2) button to enter the desired selection. Press the LEFT (#4) button to return to the previous menu.

***Table 8. Information Menu***




### I1 Series

Series is visiable but is reserved for future use. Currently all trucks show **"ABCD001234FGH"**

### I3 Serial Number

The Serial Number parameter displays the serial number for the lift truck and does not have any functions. It is for information only.

### I5 Truck Voltage

The Truck Voltage parameter displays the voltage of the lift truck and does not have any functions. It is for information only.

# TABLE OF CONTENTS (Continued)



This section is for the following models:

(NDR035EB, NR045EB) [D861];
(NDR030EB, NR035/040EB) [E815];
(NDR030DB, NR035/040DB) [B295]

## SETTINGS

The Settings menu contains parameters which affect various lift truck settings. See Table 7. Scroll through the Settings menu using the UP (#1) and DOWN (#3) buttons and press the RIGHT (#2) button to enter the desired selection. Press the LEFT (#4) button to return to the previous menu.

***Table 7. Settings Menu***

**NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing.**

| | | |
|---|---|---|
| SETTINGS | Press → Button | S1 METRIC |
| | | ↕ |
| | | S2 USER PERFORMANCE |
| | | ↕ |
| | | S3 TIMEOUT |
| | | ↕ |
| | | S4 BATTERY TYPE |
| | | ↕ |
| **NOTE:** * If OTHER is selected as Battery Type, BDI functions will be disabled. | | S5 * BDI STARTUP FULL |
| | | ↕ |
| **NOTE:** * If OTHER is selected as Battery Type, BDI functions will be disabled. | | S6 * BDI FULL |
| | | ↕ |
| **NOTE:** * If OTHER is selected as Battery Type, BDI functions will be disabled. | | S7 * BDI EMPTY |
| | | ↕ |
| **NOTE:** * If OTHER is selected as Battery Type, BDI functions will be disabled. | | S8 * BDI RESET |
| | | ↕ |
| | | S9 LIFT INTERRUPT |
| | | ↕ |
| | | S10 AUDIBLE WARNING |
| | | ↕ |
| | | S11 VISUAL WARNING |
| | | ↕ |

*Table 15. D2.30 Traction Menu (Continued)*

**NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing.**

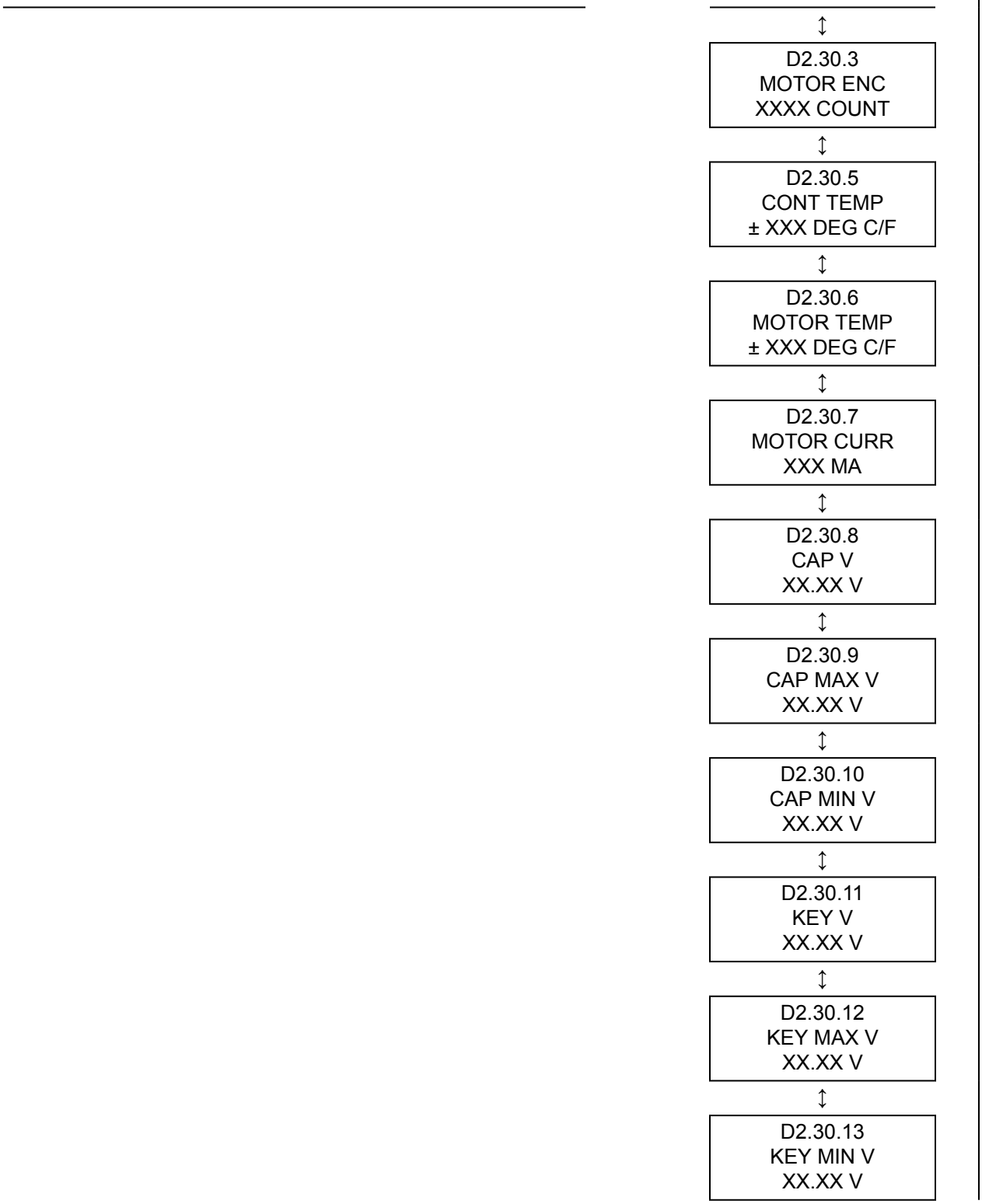


*Table 22. D2.90 CAN I/O Menu (Continued)*

**NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing.**

D2.90.26
HORN CONNECT
NO/YES

↕

D2.90.28
CONT FAN CONNECT
NO/YES

↕

D2.90.30
COMP FAN CONNECT
NO/YES

↕

D2.90.32
TFD COIL CONNECT
NO/YES

↕

D2.90.34
ER COIL CONNECT
NO/YES

↕

D2.90.36
SS COIL CONNECT
NO/YES

↕

D2.90.38
AUX REV CONNECT
NO/YES

↕

D2.90.40
AUX FWD CONNECT
NO/YES

↕

D2.90.42
LOWER CONNECT
NO/YES

↕

D2.90.44
BACKUP CONNECT
NO/YES

↕

3. Display should read **running**.
4. When **completed** is displayed, press 4 to exit calibration.
5. Key truck **OFF** and **ON** to ensure calibration is complete.

**To calibrate the AFT Handle:**

1. On the display, press 2.
2. Push the AFT handle forward and release.
3. Leave the AFT handle in the neutral position.
4. On the display, press 5 (center button), to save.

## C1 Steer Wheel

| NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing. | | |
|---|---|---|
| CALIBRATE | Press → Button | C1<br>MAIN STEER CAL<br>CALIBRATE |

## C4 Throttle

| NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing. | | |
|---|---|---|
| CALIBRATE | Press → Button | C4<br>THROTTLE<br>CALIBRATE |

## C6 Fork Tare Up

| NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing. | | |
|---|---|---|
| CALIBRATE | Press → Button | C6<br>FORK TARE UP<br>X.XX V |

## C7 Fork Tare Down

| NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing. | | |
|---|---|---|
| CALIBRATE | Press → Button | C7<br>FORK TARE DOWN<br>X.XX V |