## Introduction

Use this manual to do troubleshooting and maintenance procedures on the truck, and for replacement parts.

## Operator Instructions

This manual does not have operator instructions. There are operator instructions with each truck. These instructions are for you and your personnel for years of safe operation of your Crown truck. For operator instructions, refer to "Operator Manual TR 4500 Series".

## Operator Training

Crown has operator training that is available through your Crown dealer. For more on operator training, go to "Training" on www.crown.com.

## Service Training

Service training is available for all Crown trucks, module systems, wire guidance, hydraulic, and electrical systems. For more on service training, consult your Crown dealer or go to "Training" on www.crown.com.

## Replacement Parts

For correct and fast service, when you consult Crown for replacement parts, always give the truck model, data, and serial number.

For the newest service manuals, operator manuals, training, truck capacities, and truck specifications, consult your Crown dealer or go to www.crown.com.

This manual contains sections that have maintenance and replacement parts. The section descriptions are as follows:

**Service and Parts Pages Chart**

| Maintenance | | Replacement Parts | |
|---|---|---|---|
| Section | Description | Section | Description |
| MA | Safety | 1 | Power Unit Parts |
| M1 | Inspection & Lubrication | 3 | Drive Unit Parts |
| M1.91 | Componentry | 4 | Electrical Parts |
| M3 | Drive Unit | 5 | Brake Parts |
| M4 | Electrical | 6 | Steering Parts |
| M5 | Brake | 10 | Accessories |
| M6 | Steering | 12 | Labels and Decals |
| M10 | Glossary | | |

## Attaching a Tow Device to the Towed Truck

- The tow device must attach to the bottom of the truck skirt. It must supply pull and brake forces to the towed truck. The tow device must let the towed truck turn without damage to the truck skirt or the towed truck. Refer to Figure 26808.


Figure 26808

## Towing Truck Minimum Requirements

- Use the Tow Device Requirements to calculate the traction force (this traction force must be within the tow specifications of tow truck).
- The tow truck and the towed truck must be able to stop if they have to during the tow procedure.
- Attach a tow strap on the tow truck. Consult the manufacturer for more information.

## Towing Operation Instructions

**WARNING**

*Do not lift the towed truck more than 51 mm (2 in) off of the floor.*

- Make sure that the towed truck does not disengage from the tow truck during the tow procedure. Attach the towed truck to the tow truck with clamps or straps.

# Planned Maintenance

To make sure that your truck continues to move materials safely and quickly, you must do regular maintenance on your truck. Planned maintenance starts with inspection of the truck. Do all the inspections on the Operators Daily Checklist (shown previously in this section of the service manual). Next:

- Move the truck to a maintenance area with a level floor.
- Turn the truck OFF.
- Put chocks against the wheels to prevent the movement of the truck. Refer to the Control of Hazardous Energy section of the Crown Service and Parts Manual.
- Disconnect the battery.
- Lockout/Tagout the truck. Refer to the Control of Hazardous Energy section of the Crown Service and Parts Manual.
- Release the capacitance voltage in ACCESS 3. Refer to the Control of Hazardous Energy section for the correct procedures.
- Blow off the truck with low pressure air.
- Look for unwanted material in or around the truck components.
- Look for damaged components.
- Look for loose or missing fasteners.
- Look for damaged electrical wires or connectors.

Lift trucks operated in standard operating conditions, should have planned maintenance performed at the intervals that follow:

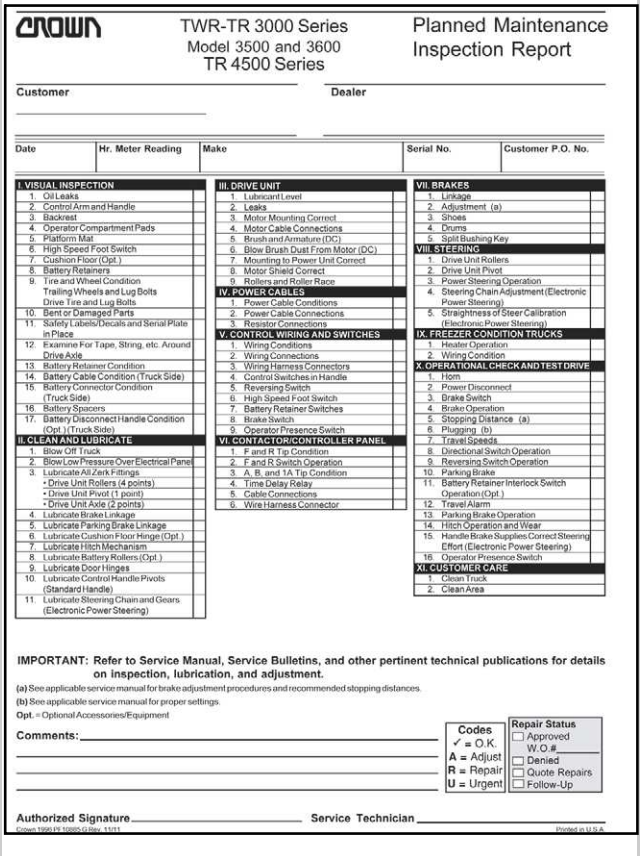
- 180 Day / 500 Hour
- 12 Month / 2,000 Hour

Lift trucks operated in environments such as those below, require the intervals to be adjusted. Consult an authorized Crown dealer to determine the proper interval for the environment.

- Freezer
- Outdoor
- Extremely dusty
- Corrosive

A planned maintenance inspection report that contains all of these items is available from Crown. Consult your Crown dealer for planned maintenance inspection reports. An example of a planned maintenance inspection report follows:

**Note:** The planned maintenance inspection report is an example and may not be the newest report.



TWR-TR 3000 Series
Model 3500 and 3600
TR 4500 Series

Planned Maintenance
Inspection Report

Customer

Dealer

| Date | Hr. Meter Reading | Make | Serial No. | Customer P.O. No. |
|---|---|---|---|---|
| | | | | |

**I. VISUAL INSPECTION**
1. Oil Leaks
2. Control Arm and Handle
3. Backrest
4. Operator Compartment Pads
5. Platform Mat
6. High Speed Foot Switch
7. Cushion Floor (Opt.)
8. Battery Retainers
9. Tire and Wheel Condition
Trailing Wheels and Lug Bolts
Drive Tire and Lug Bolts
10. Bent or Damaged Parts
11. Safety Labels/Decals and Serial Plate in Place
12. Examine For Tape, String, etc. Around Drive Axle
13. Battery Retainer Condition
14. Battery Cable Condition (Truck Side)
15. Battery Connector Condition (Truck Side)
16. Battery Spacers
17. Battery Disconnect Handle Condition (Opt.) (Truck Side)

**II. CLEAN AND LUBRICATE**
1. Blow Off Truck
2. Blow Low Pressure Over Electrical Panel
3. Lubricate All Zerk Fittings
• Drive Unit Rollers (4 points)
• Drive Unit Pivot (1 point)
• Drive Unit Axle (2 points)
4. Lubricate Brake Linkage
5. Lubricate Parking Brake Linkage
6. Lubricate Cushion Floor Hinge (Opt.)
7. Lubricate Hitch Mechanism
8. Lubricate Battery Rollers (Opt.)
9. Lubricate Door Hinges
10. Lubricate Control Handle Pivots (Standard Handle)
11. Lubricate Steering Chain and Gears (Electronic Power Steering)

**III. DRIVE UNIT**
1. Lubricant Level
2. Leaks
3. Motor Mounting Correct
4. Motor Cable Connections
5. Brush and Armature (DC)
6. Blow Brush Dust From Motor (DC)
7. Mounting to Power Unit Correct
8. Motor Shield Correct
9. Rollers and Roller Race

**IV. POWER CABLES**
1. Power Cable Conditions
2. Power Cable Connections
3. Resistor Connections

**V. CONTROL WIRING AND SWITCHES**
1. Wiring Conditions
2. Wiring Connections
3. Wiring Harness Connectors
4. Control Switches in Handle
5. Reversing Switch
6. High Speed Foot Switch
7. Battery Retainer Switches
8. Brake Switch
9. Operator Presence Switch

**VI. CONTACTOR/CONTROLLER PANEL**
1. F and R Tip Condition
2. F and R Switch Operation
3. A, B, and 1A Tip Condition
4. Time Delay Relay
5. Cable Connections
6. Wire Harness Connector

**VII. BRAKES**
1. Linkage
2. Adjustment (a)
3. Shoes
4. Drums
5. Split Bushing Key

**VIII. STEERING**
1. Drive Unit Rollers
2. Drive Unit Pivot
3. Power Steering Operation
4. Steering Chain Adjustment (Electronic Power Steering)
5. Straightness of Steer Calibration (Electronic Power Steering)

**IX. FREEZER CONDITION TRUCKS**
1. Heater Operation
2. Wiring Condition

**X. OPERATIONAL CHECK AND TEST DRIVE**
1. Horn
2. Power Disconnect
3. Brake Switch
4. Brake Operation
5. Stopping Distance (a)
6. Plugging (b)
7. Travel Speeds
8. Directional Switch Operation
9. Reversing Switch Operation
10. Parking Brake
11. Battery Retainer Interlock Switch Operation (Opt.)
12. Travel Alarm
13. Parking Brake Operation
14. Hitch Operation and Wear
15. Handle Brake Supplies Correct Steering Effort (Electronic Power Steering)
16. Operator Presence Switch

**XI. CUSTOMER CARE**
1. Clean Truck
2. Clean Area

**IMPORTANT: Refer to Service Manual, Service Bulletins, and other pertinent technical publications for details on inspection, lubrication, and adjustment.**

(a) See applicable service manual for brake adjustment procedures and recommended stopping distances.
(b) See applicable service manual for proper settings.
Opt. = Optional Accessories/Equipment

Comments:

| Codes |
|---|
| ✓ = O.K. |
| A = Adjust |
| R = Repair |
| U = Urgent |

| Repair Status |
|---|
| ☐ Approved |
| W.O.# |
| ☐ Denied |
| ☐ Quote Repairs |
| ☐ Follow-Up |

Authorized Signature Service Technician

Crown 1998 PF 10905 G Rev. 11/01 Printed in U.S.A.

Fig. 1 (26814)

**CAUTION**

*If repair is necessary on the truck, or the truck is not in a safe condition:*

- *Report immediately to the nearest authority.*
- *Do not operate the truck until it is in a safe condition.*

*Do not make repairs or adjustments to the truck unless you are approved to do them.*

**Note:** You must change the lubrication and inspection intervals to decrease corrosion and wear on parts for trucks operated in environments with contamination, moisture, or corrosion.

## Component Access

This section includes covers, panels, and doors that you must open or remove when you do maintenance on the truck.

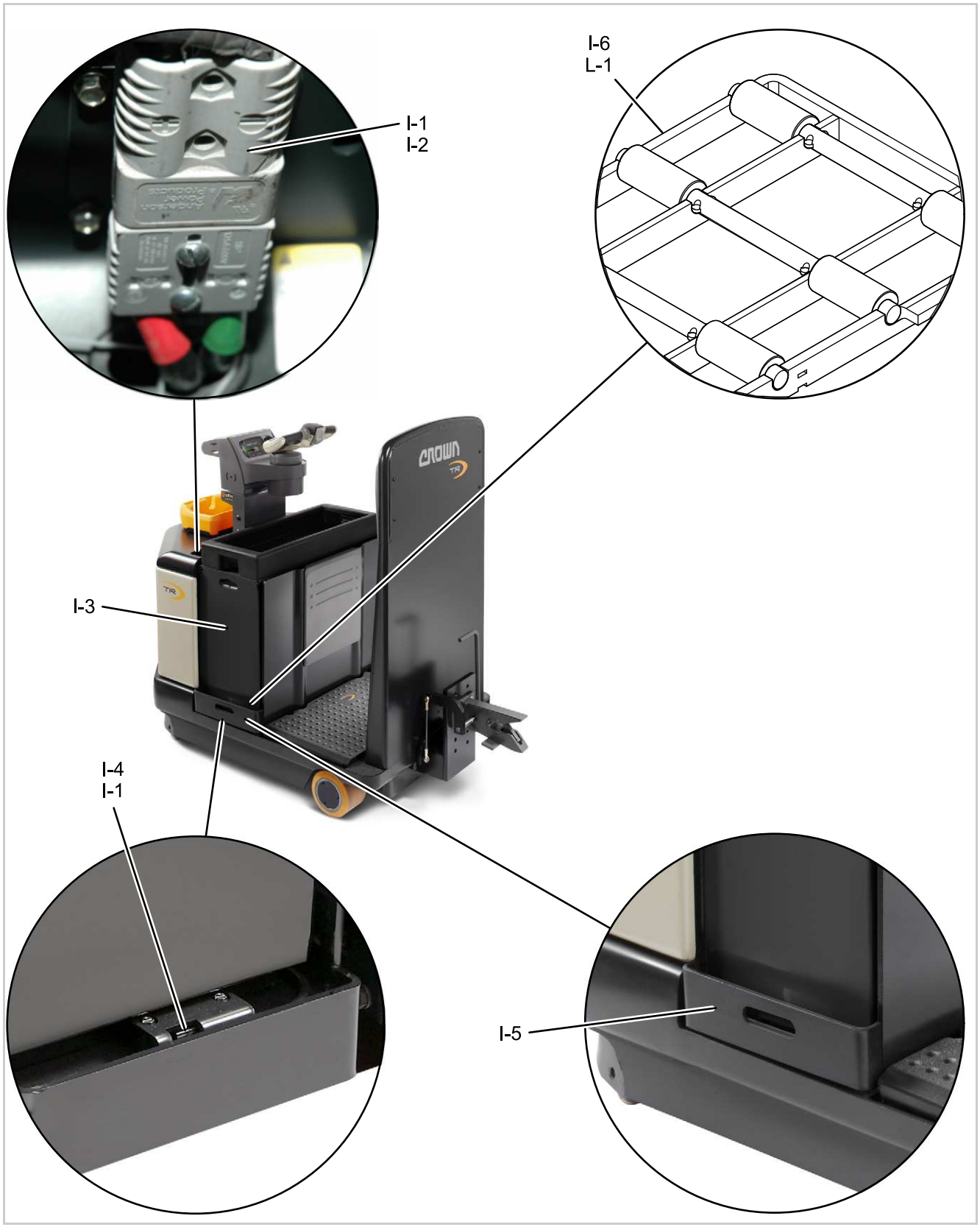



Fig. 6 (26819)

# Quick Adjustment Caster

## Adjustment

### General Notes

The brake and caster systems are adjusted at the factory to provide nominal brake and stability performance for level, smooth, dry, concrete floors and standard tire and load conditions. Upon installation, the truck's brake and stability performance should be checked to ensure acceptability. It may be necessary to modify the factory settings to properly accommodate the particular operating conditions. When a vehicle is operating over a variety of floor and load conditions, it may be impractical to adjust the brakes and casters to perform optimally for all of the different conditions.

### Caster Adjustment

To optimize and maintain the truck's brake and stability performance, the caster should be adjusted periodically to account for tire wear and also when tire replacement is necessary. Adjusting the casters up or down will affect the operating characteristics of the truck as shown in chart below.

**WARNING**

- *Increasing caster loading reduces load on the drive tire and therefore reduces braking effectiveness and traction.*
- *Reducing caster loading reduces stability.*

*Drive tire wear or replacement as well as floor conditions will effect operating characteristics of the truck, mainly:*

- *Braking/Traction*
- *Stability/Handling*
- *Steer Effort*

*Floor conditions in set up area should be consistent generally with floor conditions in the overall facility. Periodic caster adjustments may be required to maintain proper balance of these characteristics and proper operation.*

**Caster Adjustment Settings**

| Caster Adjustment | Caster Load | Drive Tire Load | Traction/Brake Performance | Stability/Handling Performance | Steer Effort |
|---|---|---|---|---|---|
| **Up** | Decreases | Increases | Increases | Decreases | Increases |
| **Down** | Increases | Decreases | Decreases | Increases | Decreases |

To adjust casters:

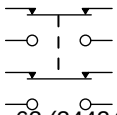
1. Rotate caster to a power unit first travel direction (as shown).
2. Raise forks completely.
3. Disconnect battery and block drive tire and forks.
4. Refer to figures and loosen the adjustment screw locknut.

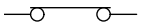
**NOTE**

*With new drive tire and caster wheels, the overall lengths of the compression springs are set from the factory to measure 75 mm (3 in).*

5. Using a 12 mm (0.5 in) hex key, rotate set screw counterclockwise (viewed from fork end of truck) for drive tire wear and clockwise for caster wheel wear.
   **Counterclockwise** rotation of set screw moves caster up (toward power unit).
   **Clockwise** rotation of set screw moves caster down (toward floor).
   Refer to Figure 16712-01 and set indicators as shown for either rubber or poly drive tire.
6. Tighten jam nut.
7. Connect battery, remove blocks and check adjustment.

**Notes:**

| Switch Symbols | | | | | | |
|---|---|---|---|---|---|---|
| Actuation | Description | No. of Terminals | Momentary | | Fully Maintained | |
| | DPDT | 8 | |  Fig. 63 (34424) | | |

| Examples (All Momentary) | | |
|---|---|---|
| | With Common (Transfer) | Without Common (Double Break) |
| Wired normally open, held open |  Figure 8119-01 |  Figure 8120-01 |
| Wired normally open, held closed |  Figure 8122 |  Figure 8123 |
| Wired normally closed, held open |  Figure 8115-01 |  Figure 8117-01 |
| Wired normally closed, held closed |  Figure 8124 |  Figure 8125 |

**How the Switch is Activated**

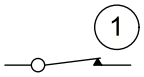
If it is necesary to include how the switch is mechanically actuated, a note will be added to the drawing (example: operator, lever or truck actuated, etc.)

**Application**

Switch application is conveyed through the abbreviation (example: HTS = Height Switch 120 in., DTS = Drive/Tow Switch).

Notes:

- In a schematic, the condition of a circuit is defined using a  note (example: vehicle shown fully lowered with no operator on vehicle).
- Positive action switches are marked with the following symbol:




8126-02

## Operator Menus

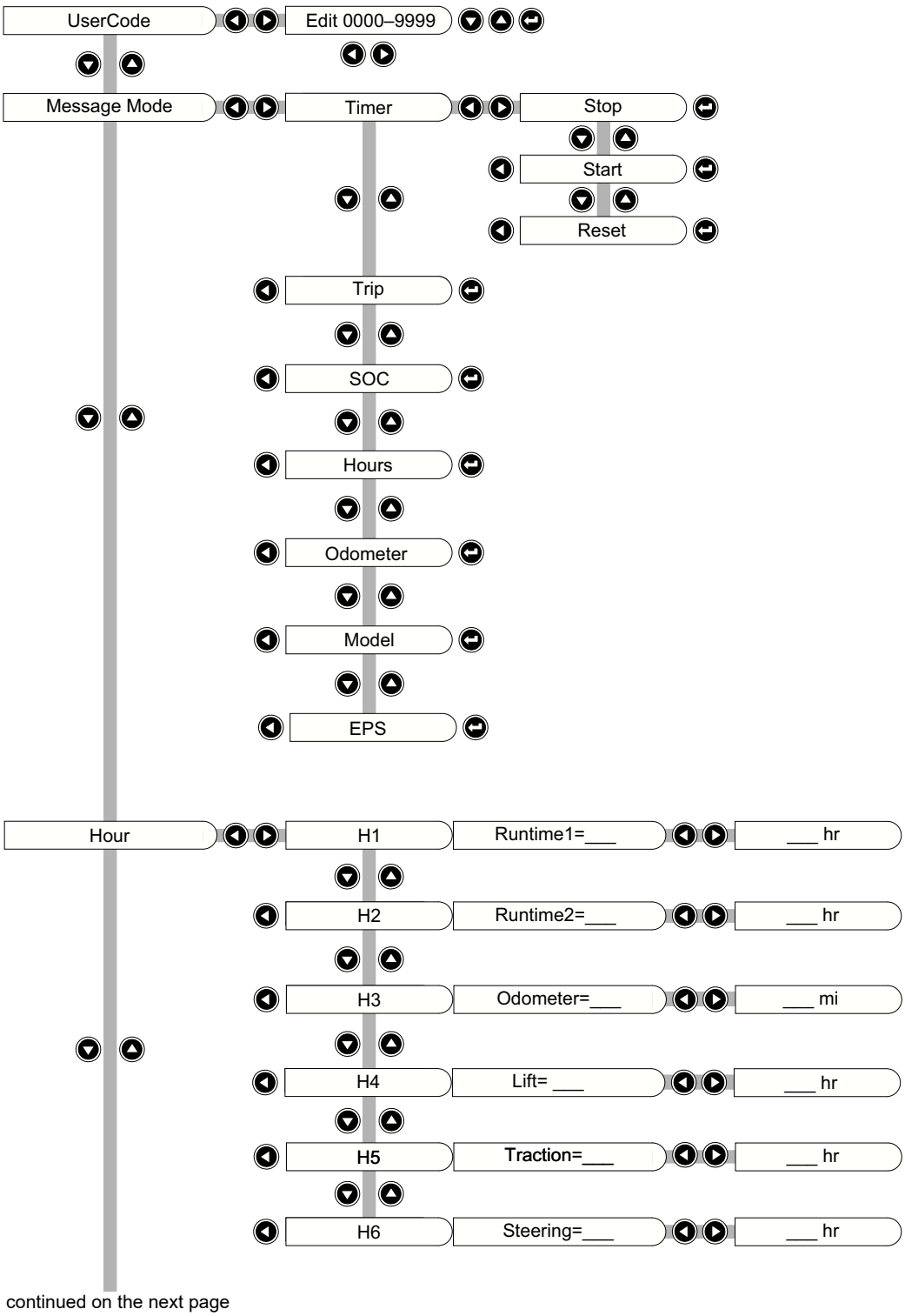



Figure 26473-01

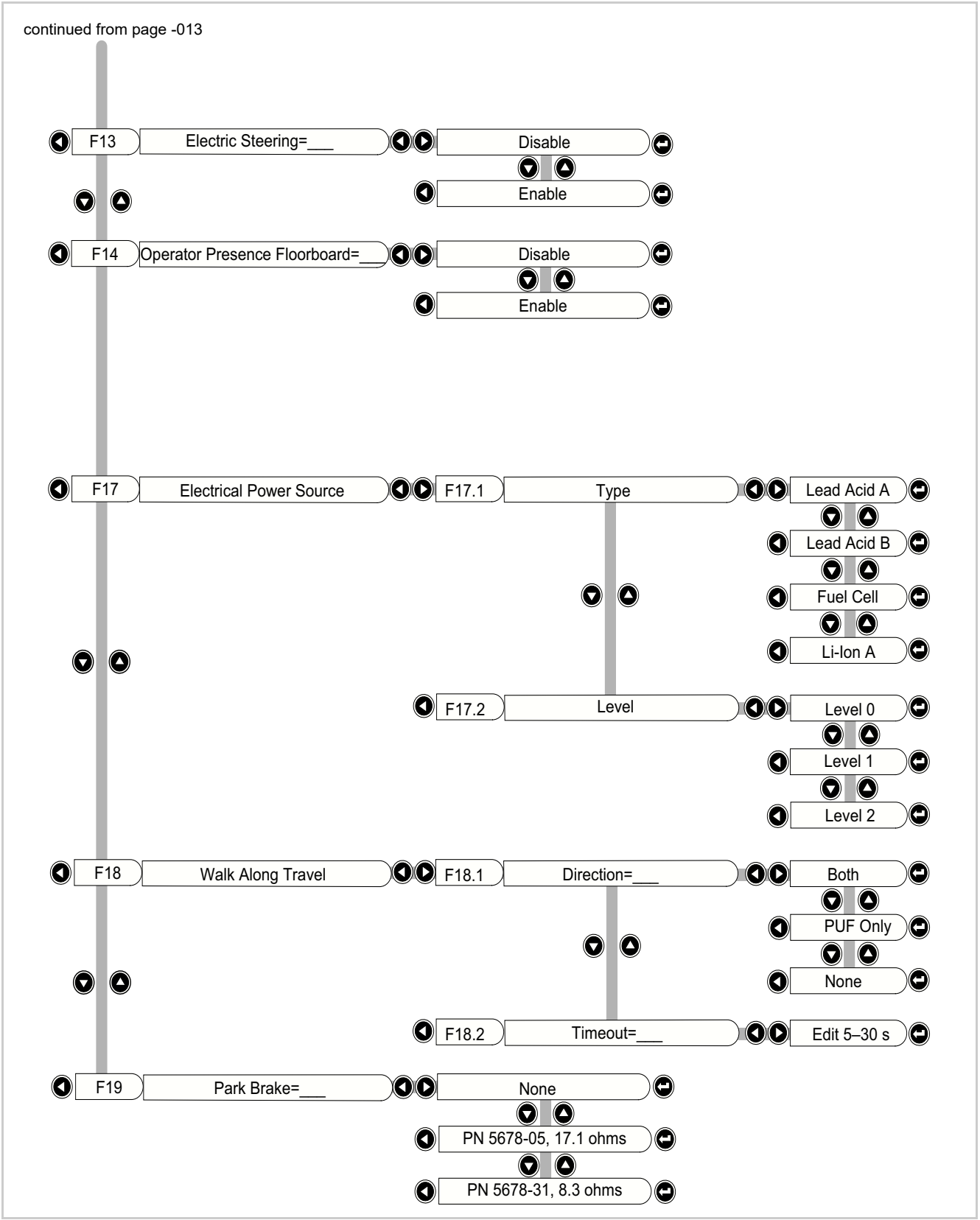



Figure 26482-01

**A2.3.13 STPS = 0/1 (Step Switch)** - The A2.3.13 STPS menu is available if BRES is closed (=1). 0 = the switch is open (the step is down), 1 = the switch is closed (the step is up).

**A2.3.14 MHSS = 0/1 (Momentary High Speed Switch)** - The A2.3.14 MHSS menu is available if the lift truck is equipped with a momentary high speed switch. 0 = the switch is open (the switch is not pressed), 1 = the switch is closed (the switch is pressed).

**A2.5 Access 5** - The A2.5 Access 5 menu is available if the F13 Electric Steering menu is set to Enable. The A2.5 Access 5 menu shows the inputs to Access 5.

**A2.5.1 Access 5 Heatsink Temp = ___ °C** - Shows the temperature of Access 5 in °C.

**A2.5.2 HMS = 0/1 (Handle Mount Switch)** - 0 = the switch is open (the steer head is unlocked and lift truck travel is disabled), 1 = the switch is closed (the steer head is locked and lift truck travel is accepted).

**A2.5.3 M3 Temperature = ___ °C (Steer Motor)** - Shows the temperature of M3 in °C.

**A2.5.4 POT2 = ___ V (Steer Command Potentiometer 1)** - Shows the POT2 voltage.

**Note:** POT3 maximum left and right voltages are the opposite of POT2.

**A2.5.5 POT3 = ___ V (Steer Command Potentiometer 2)** - Shows the POT3 voltage.

**A2.5.6 POT4 (Steer Tire Position Potentiometer)** - Use the right arrow to go to the A2.5.6.1 ANGLE menu.

**A2.5.6.1 Angle = ___ Deg** - Shows the degree of the steer tire position angle.

**A2.5.6.2 Voltage = ___ V** - Shows the POT4 voltage.

**A2.5.7 RPS1 = ___ Deg (Steer Motor Position Sensor)** - Shows the angular position of the M3 sensor.

**A2.10 EPS -** Displayed if F17.2 is greater than or equal to Level 2.

**A2.10.1 Readiness - 0/1 -** 0 = not ready, 1 = ready

**A2.10.2 Bus Voltage =** Shows the bus voltage in V.

**A2.10.3 Bus Current =** Shows the bus current in A.

**A2.10.4 Temperature =** Shows the temperature of the battery in °C.

**A2.10.5 SOC =** Shows the battery state of charge in %.

**A2.10.6 SOH =** Shows the battery state of health in %.

**A2.10.7 Max Discharge Current =** Shows the max discharge current in A.

**A2.10.8 Total Ah Charge =** Shows the total Ah charge.

**A2.10.9 Total Cycles =** Shows the total cycles.

**A2.10.10 Performance Scalar =** Shows the lift truck performance scalar 0–15 (0–95%).

**A2.10.11 EWS Status - 0/1** - 0 = inactive and 1 = active

**A2.10.12 Warning Status - 0/1** - 0 = inactive and 1 = active.

**A2.10.13 Full Load - 0/1** - 0 = inactive and 1 = active.

**A2.10.14 Error Status - 0/1** - 0 = inactive and 1 = active.

**A2.10.15 Heartbeat Status -** 0 = in boot up, 4 = stopped, 5 = operational, 127 = preoperational

**A3 Outputs** - The A3 Outputs menu is available in Level 2. The A3 Outputs menu shows the outputs of monitored lift truck components.

**A3.1 Access 1** - Shows the outputs from Access 1.

**A3.1.1 ALM1 = On/Off (Operator Alarm)** - On = operator alarm is On, Off = operator alarm is Off.

**A3.1.2 BRK2 Command = ___ mA (Handle Brake)** - The A3.1.2 BRK2 Command menu is available if the F13 Electric Steering menu is set to Enable. The A3.1.2 BRK2 Command menu shows the BRK2 current in milliamperes.

**A3.1.3 Steer Command = ___ Deg** - The A3.1.3 Steer Command menu is available if the F13 Electric Steering menu is set to Enable. The A3.1.3 Steer Command menu shows the degree of the steer command angle.

**A3.3 Access 3™** - Shows the outputs from Access 3™.

**A3.3.1 Battery Voltage = ___ V** - Shows the current battery voltage.

**A3.3.2 SOC = ___ %** - Shows the percentage of remaining battery charge.

**A3.3.3 BRK1 = On/Off (Parking Brake)** - On = BRK1 is On (the parking brake is released), Off = BRK1 is Off (the parking brake is applied).

**A3.3.4 L = On/Off (Line Contactor)** - On = L is energized, Off = L is de-energized.

**A3.3.5 M1 Amps = ___ A (Traction Motor)** - Shows the M1 current in amperes.

**A3.3.7 Speed Command = ___ mph** - Shows the commanded lift truck travel speed in miles per hour.

**U4.3 Hardware Revision Level = ___** Access 1 shows this menu only if the F17.2 Level menu is set to 2.

**U4.4 Software Revision Level = ___** Access 1 shows this menu only if the F17.2 Level menu is set to 2.

**U4.5 Protocol Revision Level = ___** Access 1 shows this menu only if the F17.2 Level menu is set to 2.

**U4.6 Energy Capacity = ___ Ah/g** Access 1 shows the value in Ah/g if the F17.1 Type menu is set to FUEL CELL. Access 1 shows this menu only if the F17.2 LEVEL menu is set to 2.

**U4.7 Number of Cells = ___** Shows the number of cells in the battery. Access 1 shows this menu only if the F17.2 LEVEL menu is set to 2.

**U4.8 Max Charge Current = ___A -** Shows the maximum number of amps for charging. Access 1 shows this menu only if the F17.2 LEVEL menu is set to 2.

**U4.9 Device ID = ___** Access 1 shows this menu only if the F17.2 LEVEL menu is set to 2.

Make sure that the torsion spring (8) is above the notch in the control pod (13). Refer to Figure 26545.

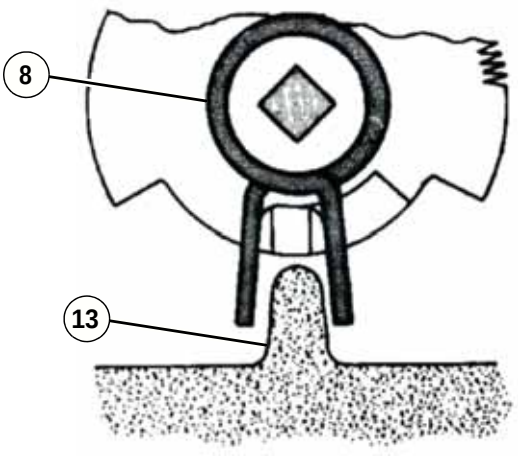



Figure 26545

8. Install the shaft (5).
9. Install as many flatwashers (12) between the cam (11) and the control pod (13) as required. The flatwashers remove the lateral movement of the replacement components on the shaft (5).
10. Install the right twist grip (2) in the yoke (3) with the arrows (14) up and near the control pod (13). You can also install the right twist grip in the yoke with the arrows up and near the yoke.
11. Align the key on the extension (4) with the right twist grip (2).
12. Install the extension (4) on the right twist grip (2) and attach the extension with the roll pins (1).
13. Install these components:
    - The insulator (4)
    - The covers (3)
    - The screws (2).

Refer to Figure 26536.

14. Do the potentiometer adjustments. Refer to Traction Accelerator Potentiometer (POT1) Adjustment with ACCESS 1 in this section.

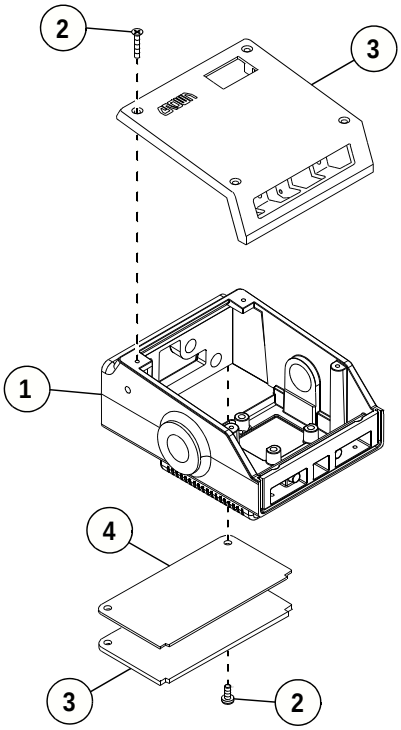



Figure 26536

## Charging

Charging requirements will vary depending on use of truck. Batteries discharged by more than one-third should be charged daily. If tees than one-third discharge, recharging should be delayed; however, they should be recharged at least once a week. If usage of truck makes it necessary, more than one battery should be available to provide ample power to the unit at all times.

**CAUTION**

*Never smoke or bring flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.*

Consult the charger manufacturer's manual covering your charger for hints on operation and maintenance. Some of the basic rules are as follows:

1. Placing battery on charge:
   - Park truck at charging station with forks lowered and key removed.
   - Unplug battery from truck.
   - Be sure charger control is in the off position.
   - Connect battery to charger and be sure connectors are mated all the way.
   - Set timer for specified time. Set for Normal (Daily Charge, all except one night a week when the Equalize [Weekend] Charge should be used).
   - Check ammeter to be sure it shows charge.
2. Removing battery from charge:
   - Be sure the charger is turned off.
   - Break the connectors, using both hands with a straight pulling motion.
   - Hang up the charger cable to prevent damage. (Broken connectors can cause poor connections and connector failures).
   - Make daily battery checks.
   - Connect battery to truck. Be sure connectors are mated all the way.

– Then proceed to Step 3.

- **If:** The voltage is 0.7–4.2 V.
  – Then replace Access 5.

**Step 3:** Turn on the tow tractor and check the voltage between CA421-4 (+) and CA421-2 (-).

- **If:** If: The voltage is not 0.7–4.2 V.
  – Then replace BRK2.
- **If:** The voltage is 0.7–4.2 V.
  – Then repair the wire between CA202 and CA421.

**Note:** Apply Nyogel 760G (P/N 127189-001) to the wire terminals. Secure the wiring harness at CA202 to the Access 5 power cables.

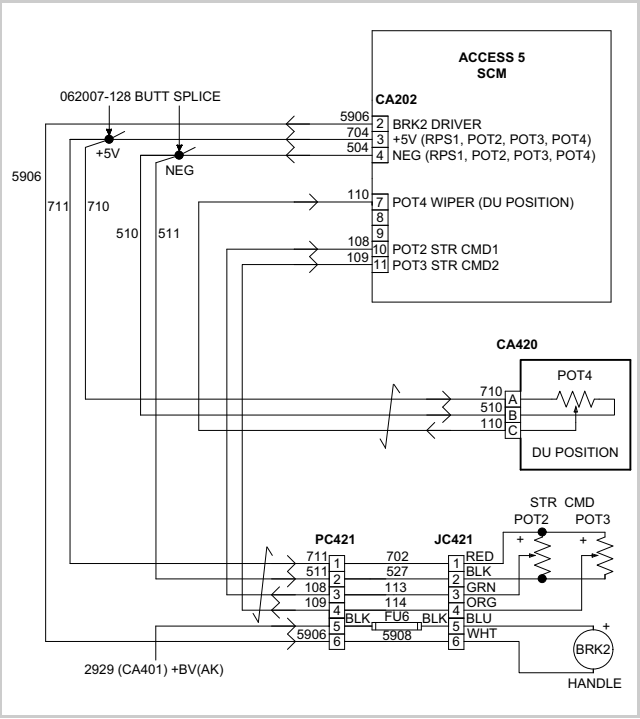



Fig. 7 (21157)

# Event Code 125

### Access 1 Lost Communication with Access 5

Access 1 has lost communication with Access 5. This can occur at power-up, or while in operation.

**Step 1:** Check resistance between CAN HI and CAN LO terminals. With CA202 and CA401 connected and fully seated, resistance should be 59–61 Ω between CA202-15 and CA202-23, or CA401-8 and CA401-9.

- **If:** Resistance is at 59–61 Ω.
  – Then disconnect Access 1 connector (CA401) and check resistance between pins 8 and 9 on the Access 1 module. Resistance at this point should be 119–121 Ω.
- **If:** Resistance is not 120 Ω.
  – Then replace Access 1.
- **If:** Resistance is 120 Ω.
  – Then disconnect Access 5 connector (CA202) and check resistance between pins 15 and 23 on the Access 5 module. Resistance at this point should be 119–121 Ω.
- **If:** Resistance is not 120 Ω.
  – Then replace Access 5.
- **If:** Resistance is 120 Ω.
  – Then check wiring harness for short between CAN HI and CAN LO, or for open in CAN HI or CAN LO.
- **If:** If: Short or open is detected.
  – Then replace harness.

**Step 2:** Turn on the tow tractor. Check that Access 5 is staying powered by checking for battery positive at pin CA202-1.

- **If:** Event still exists.
  – Then replace Access 5.
- **If:** Event still exists.
  – Then replace Access 1.

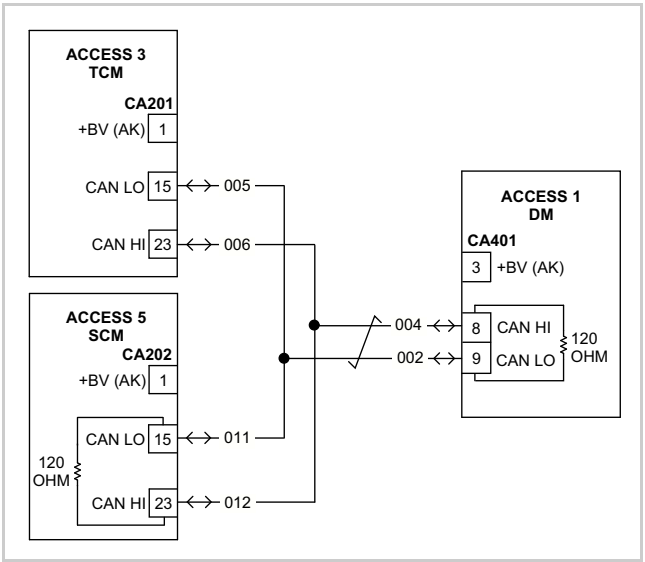



Fig. 8 (21156-03)

ensure that battery is in good condition, proper voltage for battery (12 V or 24 V cells) and battery charger is in good working order.

- **If:** Battery is less than 28 V.
  - Then proceed to Step 2.

**Step 2:** See if the line contactor (L) has opened during a regen brake with the battery at full charge.

- **If:** Battery has recently come off the battery charger.
  - Then the battery can temporarily go over the limit with a harsh regen brake.
- **If:** Battery just came off battery charger and performed a regen brake.
  - Then battery is fully charged to maximum and drops in voltage within a few minutes with normal use.
- **If:** Battery has not been charged recently.
  - Then proceed to Step 3.

**Step 3:** Determine if the line contactor (L) is in good working order with good tips and return spring.

- **If:** Line contactor (L) tips or spring are bad.
  - Then repair or replace line contactor (L).
- **If:** Line contactor (L) is functioning properly.
  - Then check the wiring going to the line contactor (L) coil.
- **If:** Wire terminals are bad.
  - Then repair or replace harness.
- **If:** Harness is OK.
  - Then proceed to Step 4.

**Step 4:** Check the power connections of the line contactor (L) and Access 3™.

- **If:** Connections are bad.
  - Then replace terminals.
- **If:** Connections are OK.
  - Then proceed to Step 5.

**Step 5:** Measure voltage of FU1 and check battery terminals for OK connections.

- **If:** Connections are bad.
  - Then replace terminals.
- **If:** Voltage insufficient.
  - Then replace FU1.
- **If:** Connections are OK.
  - Then replace battery to ensure that battery is not defective.

**Step 6:** Check TR1 (39.5 Ω) assembly on line contactor (L). Check line contactor terminal threads for excess wear and replace line contactor as necessary. Torque line contactor bolts 9.6 N m (85 in lb) - do not over tighten.

- **If:** Event still exists.
  - Then replace Access 3™ (configure Access 3™ replacement in Utilities Menu U2).

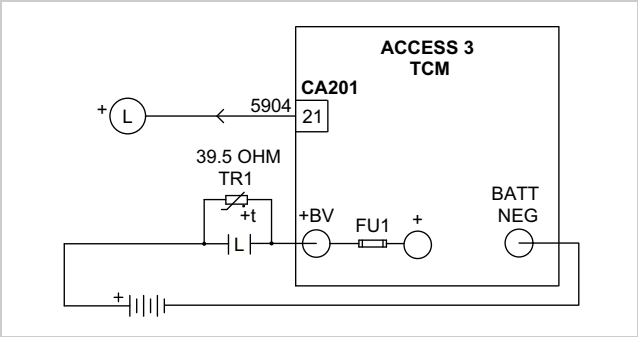



Fig. 14 (25288)

# Event Code 320

**Access 3™ Low Supply Voltage**

Internal regulated voltage in Access 3™ drops below a percentage of the regulated supply voltage.

**Step 1:** Check voltage at battery with battery disconnected.

- **If:** Voltage is less than 17 V.
  - Then recharge or replace battery.
- **If:** Event still exists.
  - Then check condition of battery or adjust Performance Menu P4 setting.
- **If:** Voltage is more than 17 V.
  - Then proceed to Step 2.

**Step 2:** Check the condition of the battery terminals on both ends of battery connector.

- **If:** Connections are bad.
  - Then replace the terminals.
- **If:** Connections are OK.
  - Then proceed to Step 3.

**Step 3:** Check the condition of connections at the line contactor (L), battery positive, and battery negative terminals. Ensure that terminals are torqued 9.6 N m (85 in lb) and threads are in good condition.

**Step 4:** Check condition of FU1.

- **If:** FU1 shows any damage to the element, viewing glass or terminals.
  - Then replace with a new fuse.
- **If:** No damage visible.

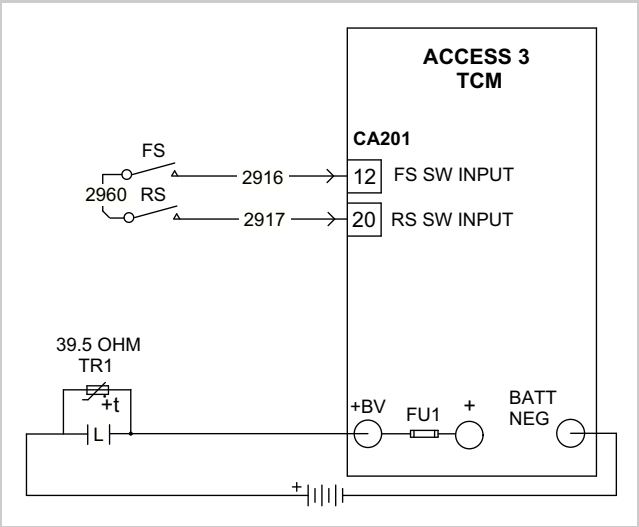



Fig. 24 (21161)

# Event Code 346

**DC Bus Charging Timeout**

Occurs on start-up when the software in Access 3™ detects that the DC Supply voltage (as measured at the battery positive and battery negative terminals) is too low to ensure reliable operation. If the voltage is < 23 V, this event code will log. DC Bus is normally precharged through KYS input (CA201-1). After turning on the tow tractor, DC Bus must be precharged to full voltage within 3 seconds. TR1 across the line contactor (L) contacts helps to precharge the DC Bus.

**Step 1:** Turn off the tow tractor and measure continuity across the pump contactor (P) power terminals with the battery disconnected.

- **If:** Resistance measured is < 10 Ω.
  - Then replace pump contactor (P).
- **If:** Resistance measured is > 10 Ω.
  - Then connect the battery, turn on the tow tractor, check the pump contactor (P) coil driver by checking voltage at CA201-18 using battery negative on the Access 3™ for negative reference.
- **If:** Voltage is < 5 V without a raise input on CA201-10.
  - Then check wiring for pinched or shorted wires.
- **If:** Wires are shorted or pinched.
  - Then repair or replace wires.
- **If:** Wires are OK.
  - Then proceed to Step 6.
- **If:** Voltage is > 5 V but < 20 V.
  - Then check wires for short to frame.
- **If:** Wires are shorted to frame.
  - Then repair or replace harness.
- **If:** Wires are not shorted to frame.
  - Then proceed to Step 6.
- **If:** Voltages are > 20 V and M2 continues to run.
  - Then look for short to frame or miswire.

**Step 2:** Check voltage at battery terminals with battery disconnected.

- **If:** Voltage is < 23 V.
  - Then recharge or replace battery.
- **If:** Voltage is > 23 V.
  - Then proceed to Step 2.

**Step 3:** Check the condition of the battery terminals.

- **If:** Connections are bad.
  - Then replace the terminals.
- **If:** Connections are OK.
  - Then proceed to Step 3.

**Step 4:** Turn off the tow tractor and check the condition of connections at line contactor (L), FU1, and battery positive, and battery negative terminals. Ensure terminals are torqued to 9.6 N m (85 in lb) and threads are in good condition.

**Step 5:** Turn on the tow tractor and check voltage loss of FU1. Measure DC voltage between battery negative and battery positive terminals. Measure DC voltage between battery negative and battery positive terminals and calculate the voltage difference between the two measurements.

- **If:** FU1 voltage loss is 0.5 V or greater.
  - Then replace with a new fuse.

**Step 6:** Measure voltage between Access 3™ battery negative and battery positive terminals.

- **If:** Voltage is < 23 V.
  - Then check TR1 (39.5 Ω). Repair or replace as necessary.
- **If:** Voltage is > 23 V.
  - Then replace Access 3™ (configure Access 3™ replacement in Analyzer menu U2).

**Step 4:** On Access 5 pin 5 and 6, verify that CH1 or CH2 are not open. If not open, check to see if they are shorted to battery negative.

- **If:** No shorts or open wires are located.
  - Then proceed to Step 5.

**Step 5:** Replace TR1 on the line contactor (L).

- **If:** Event code is still logged.
  - Then replace M3.
- **If:** Event code is still logged.
  - Then replace Access 5.

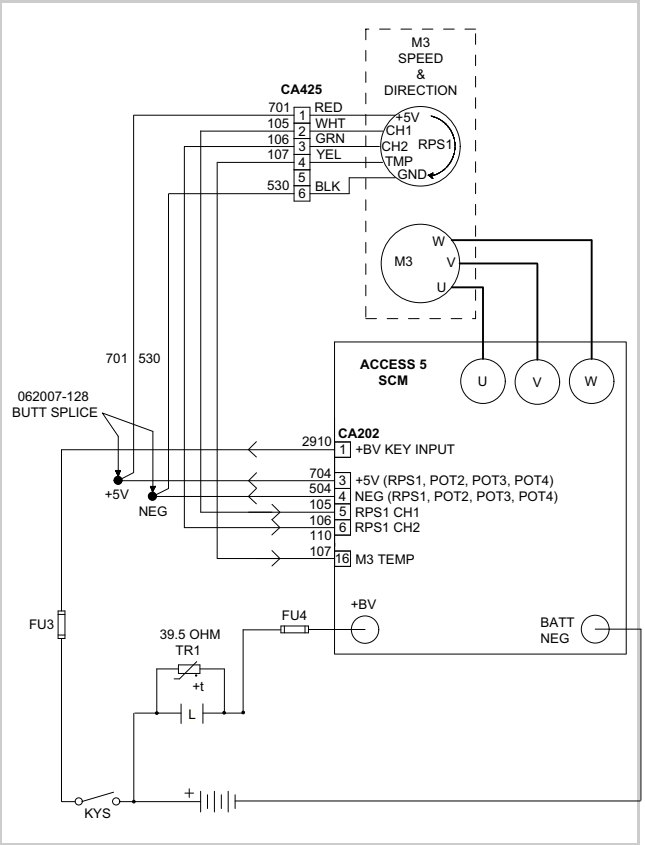



Fig. 38 (21166-01)

# Event Code 546

### DC Bus Charging Timeout

Occurs at start-up when the software in Access 5 detects that the DC Supply voltage (as measured at battery positive and battery negative terminals) is too low to ensure reliable operation. If voltage is less than 23 V, this event code will log. DC Bus is normally precharged through KYS input (CA202-1). After turning on the tow tractor, DC Bus must be precharged to full voltage within 10 seconds. TR1 across the line contactor (L) contacts helps to precharge the DC Bus.

**Step 1:** Check voltage at battery terminals with battery disconnected.

- **If:** Voltage is less than 23 V.
  - Then recharge or replace battery.
- **If:** Voltage is more than 23 V.
  - Then proceed to Step 2.

**Step 2:** Check the condition of the battery terminals.

- **If:** Connections are bad.
  - Then replace the terminals.
- **If:** Connections are OK.
  - Then proceed to Step 3.

**Step 3:** Turn off the tow tractor and check the condition of connections at line contactor (L), FU4, and battery positive, and battery negative terminals. Ensure that terminals are torqued 9.6 N m (85 in lb) and threads are in good condition.

**Step 4:** Turn on the tow tractor and check voltage loss of FU4. Measure DC voltage between battery negative and battery positive terminals. Measure DC voltage between battery negative terminal and fuse block and calculate the voltage difference between the two measurements.

- **If:** FU4 voltage loss is 0.5 V or greater.
  - Then replace fuse.

**Step 5:** Measure voltage between Access 5 battery negative terminal and fuse block.

- **If:** Voltage is less than 23 V.
  - Then check TR1 (39.5 Ω). Repair or replace as necessary.
- **If:** Voltage is more than 23 V.
  - Then replace Access 5.

**Notes:**

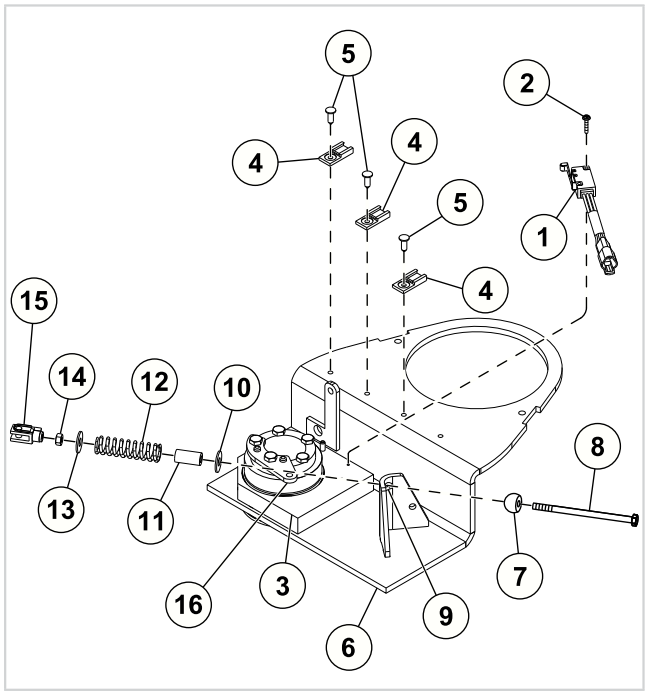



Fig. 9 (26586)

9. Turn the screw (1, Fig. 26587) until it is tight.
   ⇨ The dimension between the inner surfaces of the flatwashers (2) must be 59.69 mm (2.35 in).
10. Install the nut (3) on the fork joint with the spring pin (4) until the nut is tight.

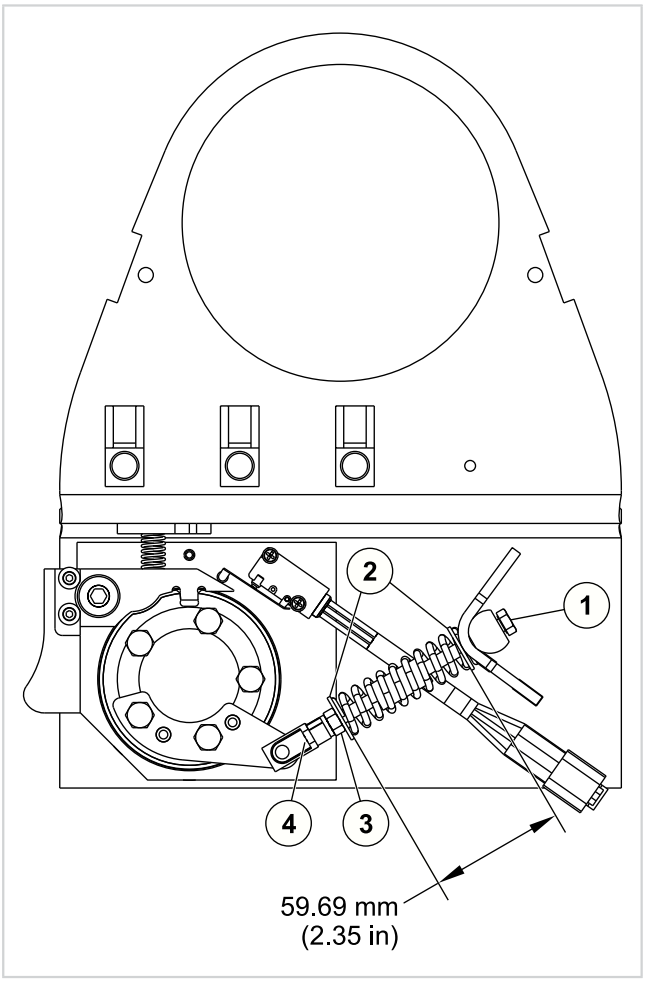
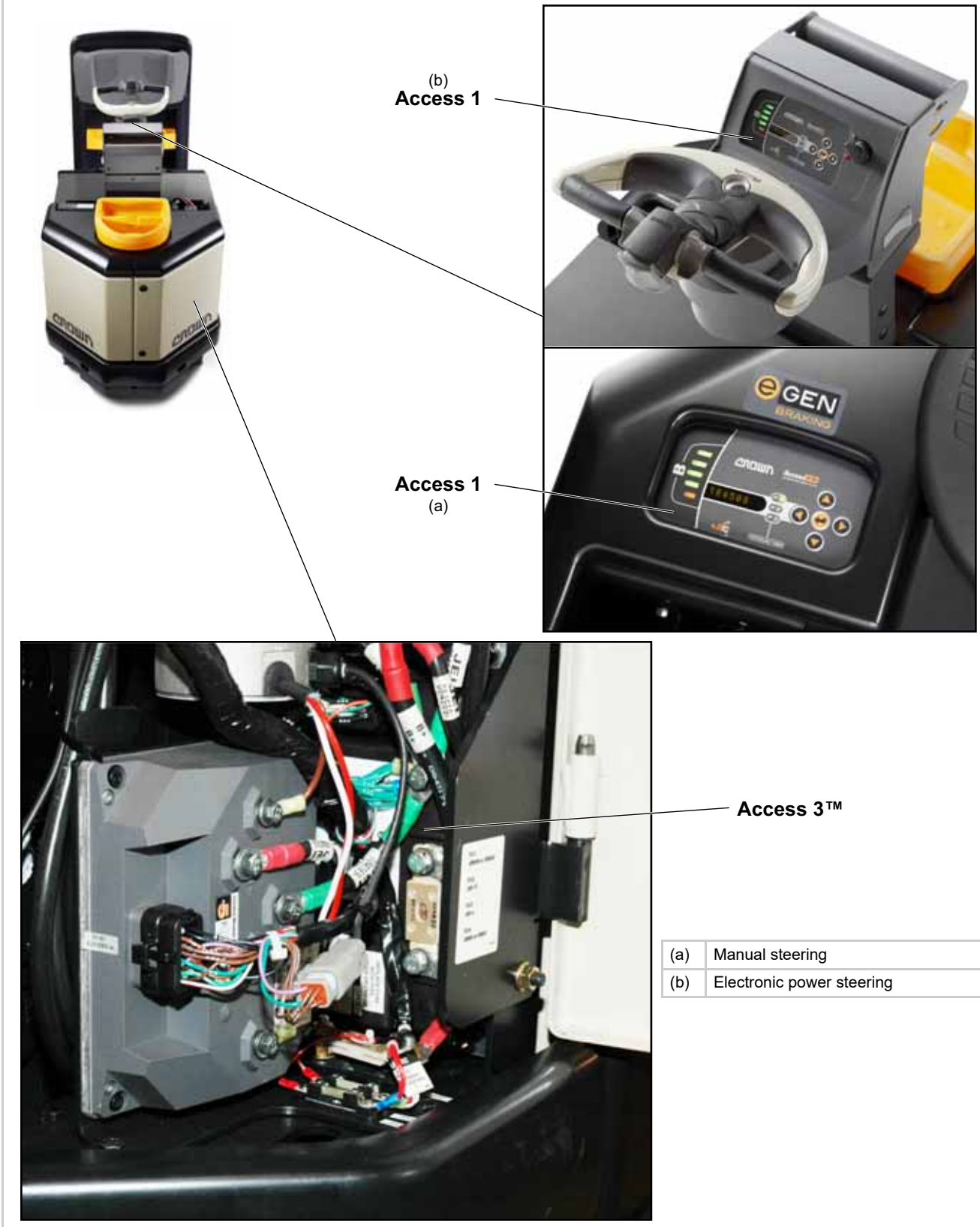



Fig. 10 (26587)

## BRK2 Installation

Refer to Figure 26588-01.

1. Install the bushings (1), torsion spring (2), and spacer ring (9) on BRK2 (3).
2. Align BRK2 (3) with the three holes (4) on the steer head (5).
3. Apply some thread-locking adhesive (061004-012) to the three screws (6).
4. Start the three screws (6) in BRK2 (3). Keep them loose until the torsion spring (2) is set.
5. Below the steer head (5), set the torsion spring (2) with a standard screwdriver. Turn the torsion spring clockwise until it catches on the steer head.
6. Torque the three screws (6) to 27 Nm (20 ft lb).
7. Apply some thread-locking adhesive (061004-012) to the two screws (7) that secure the cover.
8. Install the cover (8) on the steer head (5) with the two screws (7).




| | |
|---|---|
| (a) | Manual steering |
| (b) | Electronic power steering |

Fig. 3 (26687-01)

| | |
|---|---|
| (a) | Electronic power steering |

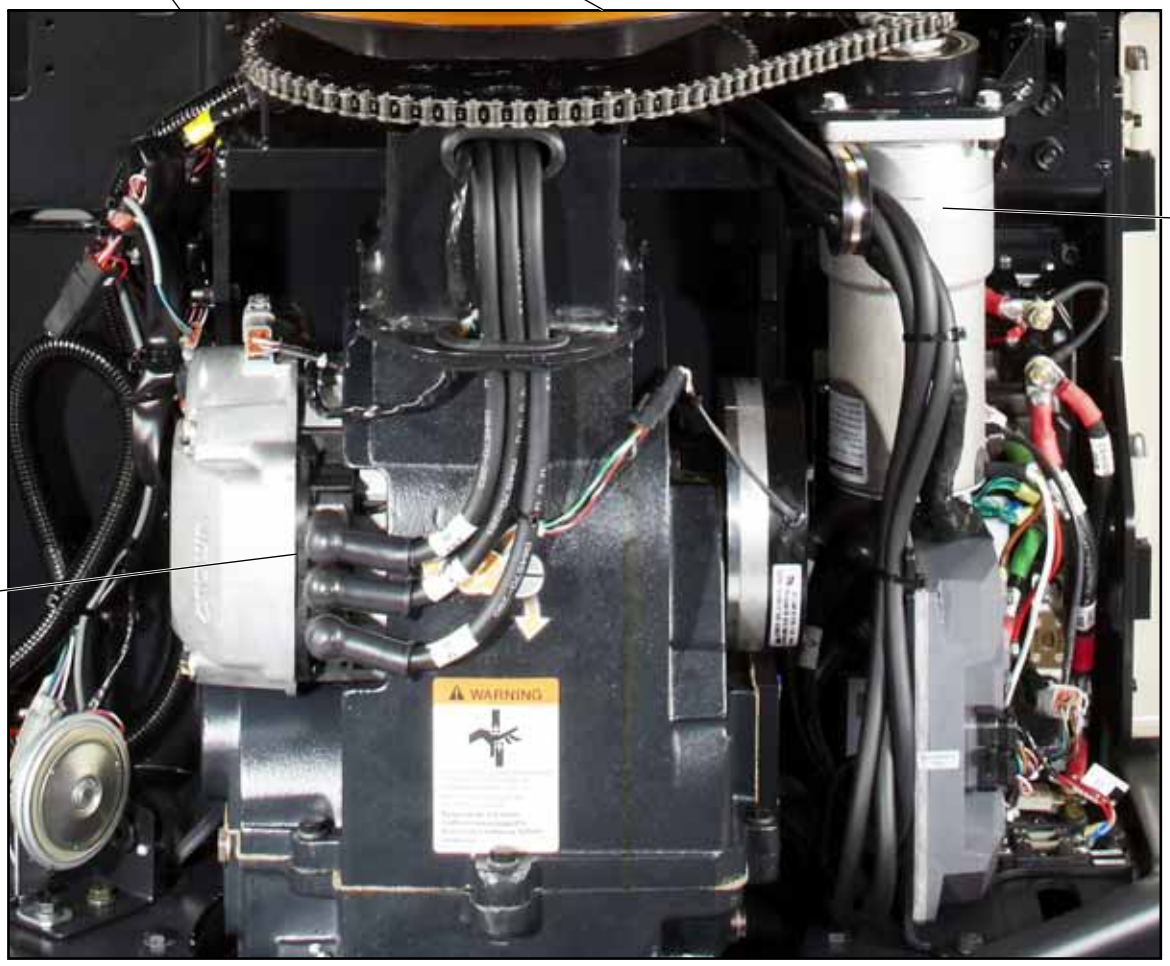



Fig. 8 (26692-01)


| | |
|---|---|
| (a) | Manual steering |
| (b) | Electronic power steering |

Fig. 13 (26697-01)

## Schematic - Manual Steer

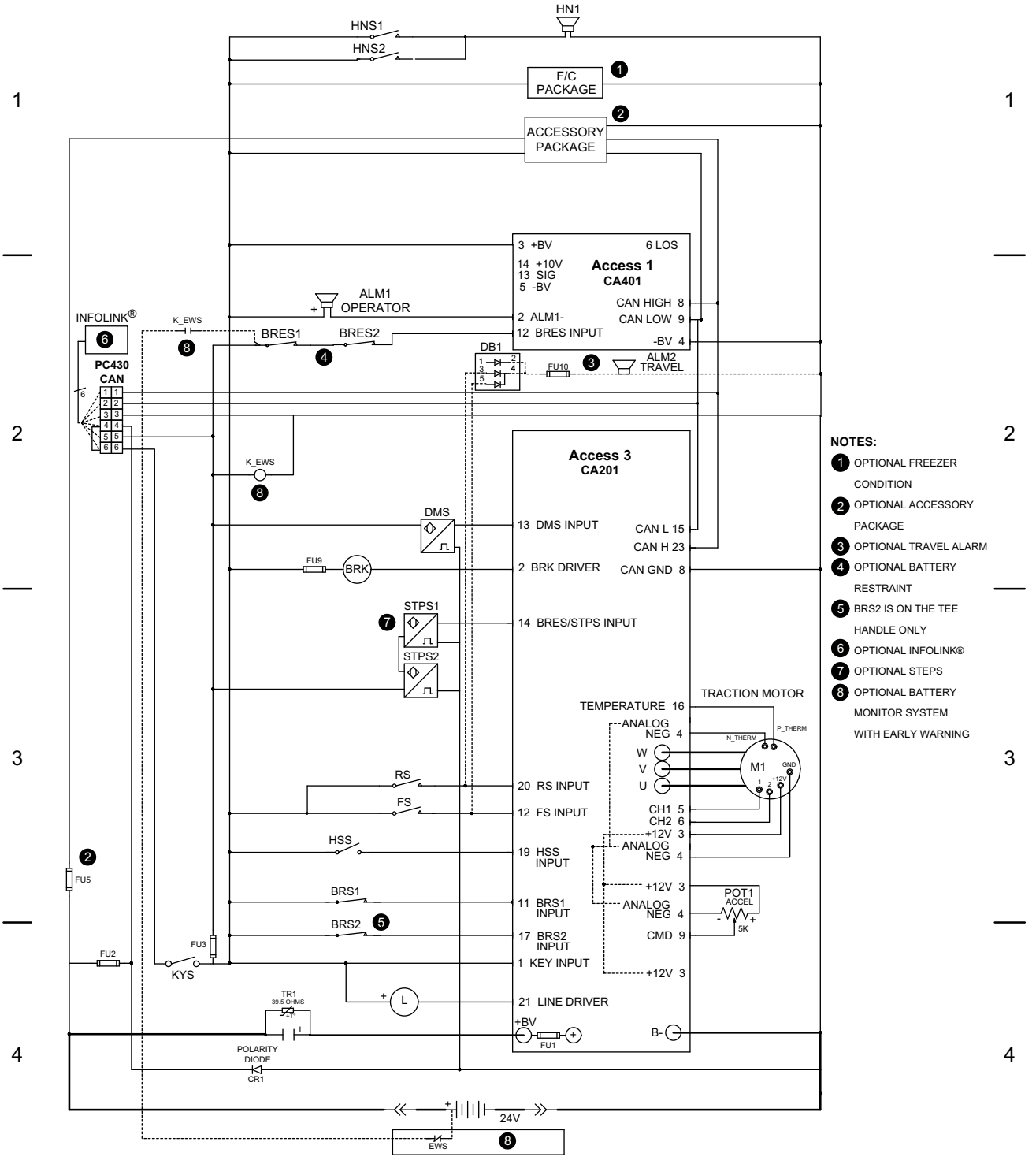
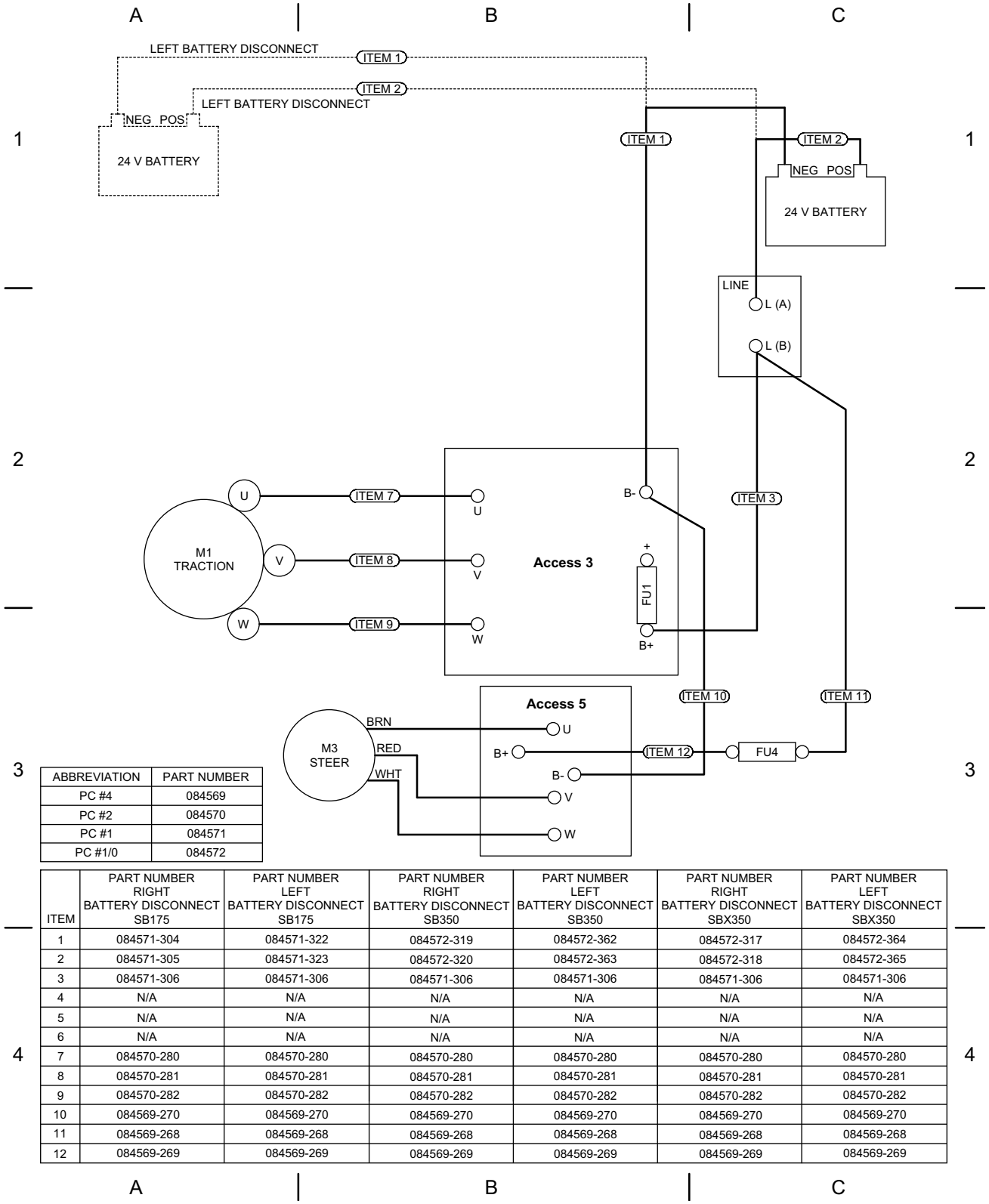



Figure 151522 E 1 of 2

## Power Cables - Electronic Power Steering




| ABBREVIATION | PART NUMBER |
|---|---|
| PC #4 | 084569 |
| PC #2 | 084570 |
| PC #1 | 084571 |
| PC #1/0 | 084572 |

| ITEM | PART NUMBER RIGHT BATTERY DISCONNECT SB175 | PART NUMBER LEFT BATTERY DISCONNECT SB175 | PART NUMBER RIGHT BATTERY DISCONNECT SB350 | PART NUMBER LEFT BATTERY DISCONNECT SB350 | PART NUMBER RIGHT BATTERY DISCONNECT SBX350 | PART NUMBER LEFT BATTERY DISCONNECT SBX350 |
|---|---|---|---|---|---|---|
| 1 | 084571-304 | 084571-322 | 084572-319 | 084572-362 | 084572-317 | 084572-364 |
| 2 | 084571-305 | 084571-323 | 084572-320 | 084572-363 | 084572-318 | 084572-365 |
| 3 | 084571-306 | 084571-306 | 084571-306 | 084571-306 | 084571-306 | 084571-306 |
| 4 | N/A | N/A | N/A | N/A | N/A | N/A |
| 5 | N/A | N/A | N/A | N/A | N/A | N/A |
| 6 | N/A | N/A | N/A | N/A | N/A | N/A |
| 7 | 084570-280 | 084570-280 | 084570-280 | 084570-280 | 084570-280 | 084570-280 |
| 8 | 084570-281 | 084570-281 | 084570-281 | 084570-281 | 084570-281 | 084570-281 |
| 9 | 084570-282 | 084570-282 | 084570-282 | 084570-282 | 084570-282 | 084570-282 |
| 10 | 084569-270 | 084569-270 | 084569-270 | 084569-270 | 084569-270 | 084569-270 |
| 11 | 084569-268 | 084569-268 | 084569-268 | 084569-268 | 084569-268 | 084569-268 |
| 12 | 084569-269 | 084569-269 | 084569-269 | 084569-269 | 084569-269 | 084569-269 |

Figure 151527 A 2 of 2