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PDBB-20-T12

POWER DRIVE INTERMEDIATE LIFT TRUCK

Serial Number 375067 and Higher

Operation

Maintenance

Repair Parts List

Big Joe Manufacturing Company • Des Plaines, IL 60018

MANUAL NO. 901357

Rev C, 12/08/06

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WARNING

Do not operate this truck unless you have been trained and authorized to do so, and have read all warnings and instructions in operator's manual and on this truck.

Do not operate this truck until you have checked its condition. Give special attention to tires, horn, lights, battery, controller, lift system (including forks or attachments, chains, cables and limit switches), brakes, steering mechanism, guard and safety device.

Operate truck only from designated operating position. Never place any part of your body into the mast structure or between the mast and the truck. Do not carry passengers. Keep feet clear of truck.

Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.

Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that could cause truck to slide or overturn. Use special care when travelling without load as the risk of overturning may be greater.

Travel with lifting mechanism as low as possible. Always look in direction of travel. Keep a clear view, and when load interferes with visibility travel with load or lifting mechanism trailing.

Use special care when operating on ramps - travel slowly, and do not angle or turn. Travel with lifting mechanism downhill.

Do not overload truck. Check capacity plate for load weight and load center information.

When using forks, space forks as far apart as load will permit. Before lifting, be sure load is centered, forks are completely under load, and load is as far back as possible against load backrest.

Do not handle unstable or loosely stacked loads. Use special care when handling long, high or wide loads to avoid tipping the load, striking bystanders, or tipping the truck.

Do not handle loads which are higher than the load backrest or load backrest extension unless load is secured so that no part of it could fall backward.

Elevate forks or other lifting mechanism only to pick up or stack a load. Watch out for obstructions, especially overhead.

Do not lift personnel except on a securely attached specially designed work platform. **Use extreme care when lifting personnel.** Make sure mast is vertical, place truck controls in neutral and apply brakes. Lift and lower smoothly. Remain in operating position or immediate vicinity as long as personnel are on the work platform. Never transport personnel on forks or work platform.

Do not allow anyone to stand or pass under load or lifting mechanism.

When leaving truck, neutralize travel control, fully lower lifting mechanism and set brake. When leaving truck unattended, also shut off power.

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OPERATOR INSTRUCTIONS

WARNING

Do not operate this truck unless you have been trained and authorized to do so and have read all warnings and instructions in operator's manual and on this truck.

Do not operate this truck until you have checked its condition. Give special attention to Tires, Horn, Lights, Battery, Controller, Lift System, (including platform, chains, cables and limit switches), Brakes, Steering Mechanism, Guards and Safety Devices.

Operate truck only from designated operating position. Never place any part of your body into the mast structure or between the mast and the truck. Do not carry passengers. Keep feet clear of truck.

Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.

Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that could cause truck to slide or overturn. Use special care when traveling without load as the risk of overturn may be greater.

Travel with lifting mechanism in the lower position. Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load or lifting mechanism trailing, except when traveling downhill.

Use special care when operating on ramps—travel slowly, and do not angle or turn. Travel with lifting mechanism or load downhill.

Do not overload truck. Trucks are designed to handle loads up to 650 pounds at a 19” load center. Loads include personnel.

Do not handle unstable or loosely stacked loads. Use special care when handling long, high or wide loads to avoid losing the load, striking bystanders, or tipping the truck.

Elevate platform only to pick up or stack a load. Watch out for obstructions, especially overhead.

Do not allow anyone to stand or pass under load or lifting mechanism.

When leaving truck, neutralize travel control. Fully lower lifting mechanism and set brake. When leaving truck unattended, also shut off power and remove the key.

PREPARATION FOR USE

Upon receipt, visually inspect the truck. If any damage is found, report it to the carrier and to your Big Joe dealer immediately.

Check lift truck for scratches and dents. Check to make sure that the lift chains are free of slack. Inspect for oil leaks and loose wiring connections. Make certain that all accessories and attachments that were ordered are supplied.

Before the lift truck is moved, the battery must be checked, recharged if necessary, and connected. Refer to “Battery Care” in SECTION 3 for battery checking instructions.

Refer to Section 2 for operating instructions to test the brakes and lift control.

If you do not obtain the proper results, or if improper operation occurs, refer to troubleshooting in SECTION 4.

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SECTION 1
DESCRIPTION

1-1. INTRODUCTION.

This publication describes the Power Drive Intermediate (PDBB-20-T12) lift truck manufactured by Big Joe Manufacturing Company, Des Plaines, Illinois, 60018. Included are operating instructions, planned maintenance instructions, lubrication procedures, corrective maintenance procedures and a complete parts list with parts location illustrations.

Users shall comply with all requirements indicated in applicable OSHA standards and current edition of A.N.S.I. B56.1 Part II. By following these requirements and the recommendations contained in this manual, you will receive many years of dependable service from your Big Joe lift truck.

The model number will be found on the (Figure 1-1) along with the serial number, lifting capacity, and load center.

1-2. GENERAL DESCRIPTION.

Maximum load for personnel, merchandise and equipment is 650 lounds.

The forward and reverse motion is controlled by the speed controller switch in the control head. Stopping and turning is controlled by the steering arm. Lift and Lower is controlled by a control box attached to the platform.

The battery-powered lift truck is quiet and without exhaust fumes.

The reversible DC motor propels the lift truck in forward and reverse direction throughout the available speed range. The lift truck can ony be driven with platform lowered. Drive is cutout when the platform is raised above a preset limit.

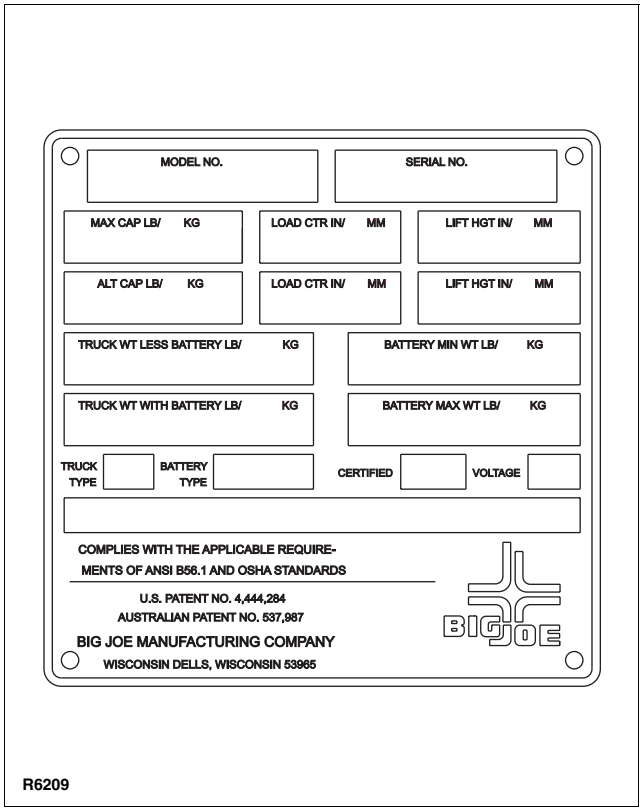

Figure 1-1 Name Plate

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1-3. SAFETY FEATURES.

The PDBB-20-T12 is designed and engineered to provide maximum safety for operator and payload. Some of the safety features incorporated into the design are:

- A platform surrounded by a chain and equipped with a safety belt and self-retracting lifeline for operator safety while the platform is in the raised position.
- Dead-man brake to apply mechanical brake and cut off drive power when the steering arm is released.
- Belly-button switch to reverse truck should the operator accidentally pin himself against a wall or obstruction when backing up.
- Travel disconnect switch to restrict movement when platform is raised above the preset limit.
- All control functions automatically return to “OFF” when released.
- Externally accessible quick-disconnect battery plug and an emergency power disconnect within operator's reach.
- Separately fused control circuits and power circuits.
- Readily accessible HORN button.
- A lowering buzzer to provide audible alert that the platfrom is being lowered.
- Pressure compensated flow control valve regulates maximum lowering speed within prescribed limits.
- An emergency lowering valve provides a means of manually lowering the operator.
- High visibility color scheme of truck and the strobe light provide visual alert of the trucks presence.
- A keyswitch toguard against unauthorized operation.

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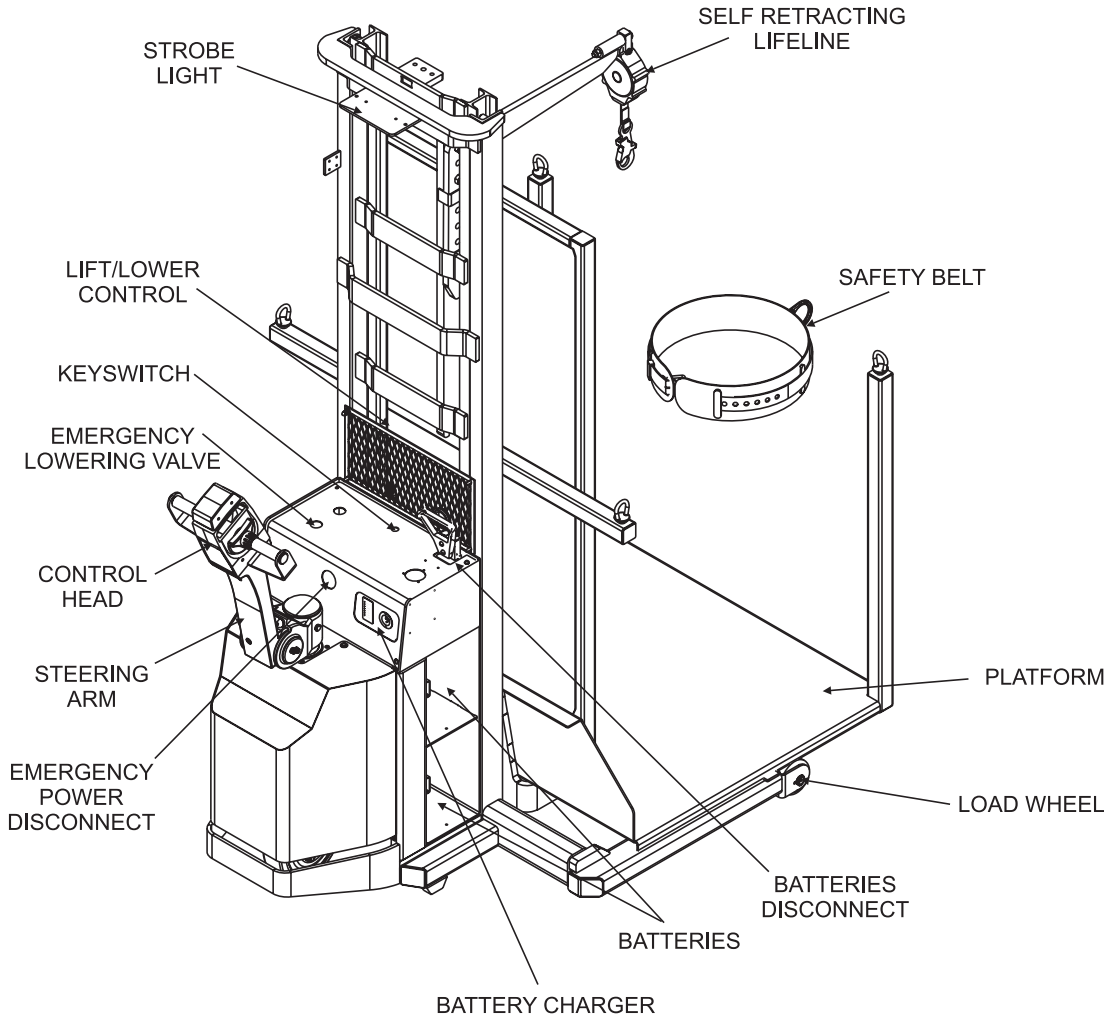

Figure 1-2 PDBB-20-T12 LIFT TRUCK

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NOTES

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SECTION 2
OPERATION

2-1. GENERAL.

This section gives detailed operating instructions for the PDBB-20-T12 lift truck. The instructions are divided into the various phases of operations, such as operating the lift, driving, and stopping. Routine precautions are included for safe operation.

2-2. OPERATING PRECAUTIONS.

WARNING: Improper operation of the lift truck may result in operator injury, or load and/or lift truck damage. Observe the following precautions when operating the PDBB-20-T12 lift truck.

The following safety precautions must be adhered to at all times.

- All warnings and instructions must be read and understood before using the equipment.
- Equipment must not be altered in any way.
- Equipment must be inspected by a qualified person on a regular basis.
- Be certain that required restraining means such as safety belts, lifelines, and chains are properly used.
- Safety belt buckles must be visually inspected to assure proper and secure connection before use.
- The self retracting lifeline should be attached to the back Dee ring only on the safety belt.
- Replace any safety belt or life line that sustains permanent deformation or is otherwise damaged.
- Be certain that the lifting mechanism is operating smoothly throughout its entire lift height, both empty and loaded.
- Be sure that mast is vertical--do not operate on a side slope.
- Be sure the platform is not tilted forward or rearward when elevated.
- Be sure the truck has a firm and level footing.
- Before personnel are elevated, mark area with cones or other devices to warn of work by elevated personnel.
- Avoid overhead wires and obstructions.
- Personnel are to remain on the platform floor. Use of railings, planks, ladders, etc., on the platform for purpose of achieving additional reach or height is prohibited.
- Personnel and equipment on the platform must not exceed the available space.
- Lower platform to floor level for personnel to enter and exit. Do not climb on any part of the truck in attempting to enter and exit.
- When traveling, always lower the load as far as possible.
- Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.
- Operate truck only from designated operating position. Never place any part of your body between the mast uprights. Do not carry passengers.

2-3. BEFORE OPERATION

Table 2-1 covers important inspection points on PDBB-20-T12 lift truck which should be checked prior to operation. Depending on use, some trucks may require additional checks.

Figure 2-1 shows a sample format for a Operator Checklist, which can be modified as necessary to fit your operation.

WARNING: Periodic maintenance of this truck by a QUALIFIED TECHNICIAN is required.

CAUTION: A QUALIFIED SERVICE TECHNICIAN should check the truck monthly for proper lubrication, proper fluid levels, brake maintenance, motor maintenance and other areas specified in the SECTION 3.

WARNING: If the truck is found to be unsafe and in need of repair, or contributes to an unsafe condition, report it immediately to the designated authority. Do not operate it until it has been restored to a safe operating condition. Do not make any unauthorized repairs or adjustments. All service must be performed by a qualified maintenance technician.

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Table 2-1 Operator Checks

ITEM	PROCEDURE
Platform chains	Verify that platform chains are present and functional.
Flashing red light	Verify that the flashing red light operates when the keyswitch is engaged.
Lowering buzzer	Verify that buzzer sounds when the DOWN button on the platform is pressed.
Safety belt and lifeline	Verify that the safety belt and self-retracting lifeline are present, installed with locking carabiner (when applicable), and functioning properly.
Transmission and hydraulic systems.	Check for signs of fluid leakage.
Chains, cables and hoses	Check that they are in place, secured correctly, functioning properly and free of binding or damage.
Guards	Check that safety guards are in place, properly secured and not damaged.
Safety signs	Check that warning labels, nameplate, etc., are in good condition and legible.
Horn	Check that horn sounds when operated.
Steering	Check for binding or looseness in steering arm when steering.
Travel controls	Check that speed controls on control handle operate in all speed ranges in forward and reverse and that belly button switch functions.
Wheels	Check drive wheel for cracks or damage. Move truck to check load for freedom of rotation.
Hydraulic controls	Check operation of lift and lower to their maximum positions.
Brakes	Check that brakes actuate when steering arm is raised to upright position, and when lowered to horizontal position.
Deadman/ Parking brake	Check that steering arm raises to upright position when released and brake applies.
Battery disconnect	Check that battery can be disconnected and reconnected. Check for connector damage.
Drive limit switch	Allow for enough space to operate truck in high speed. Elevate forks approximately two feet, then test drive truck to check if drive is cut out.

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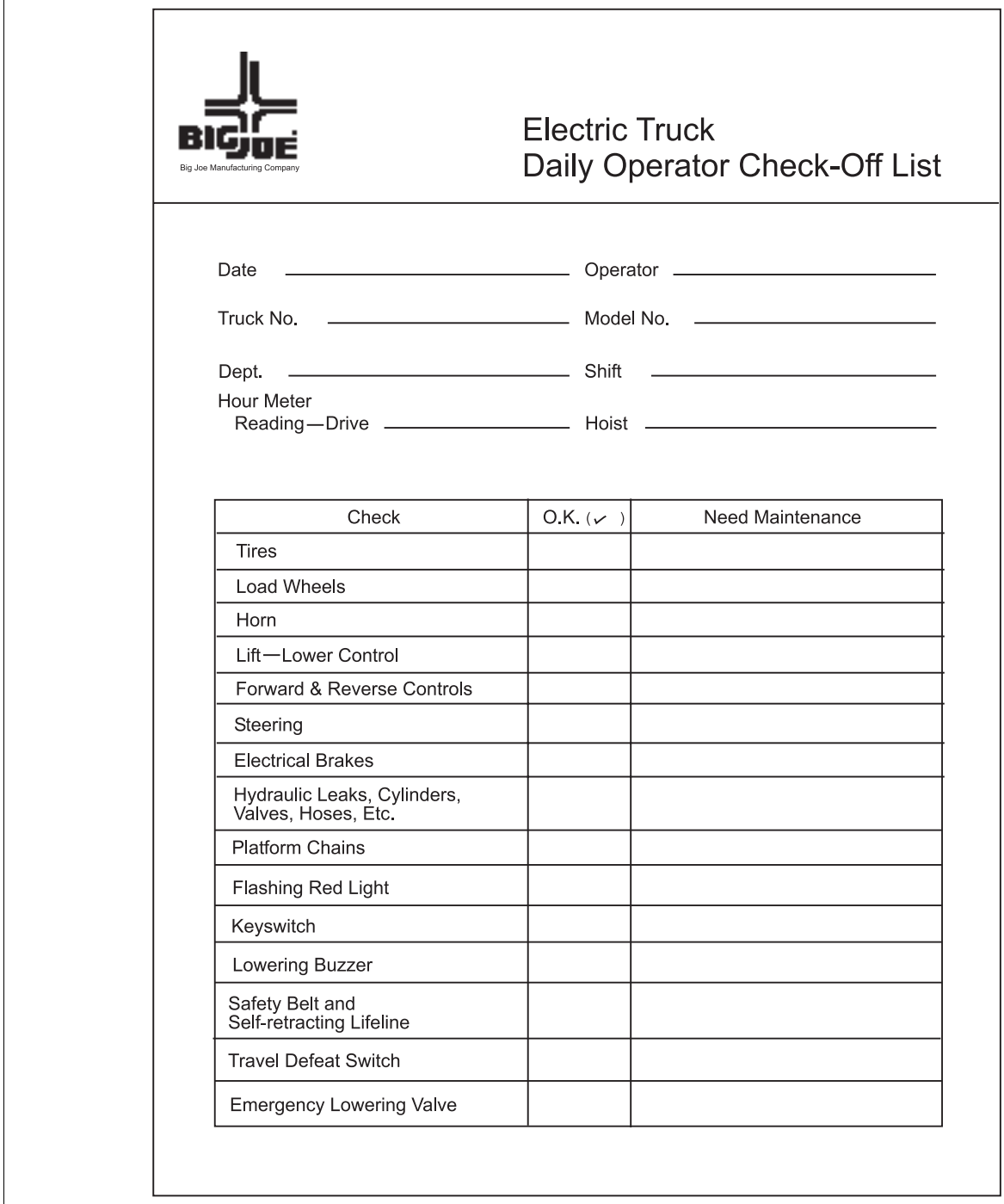

Big Joe Manufacturing Company

Electric Truck
Daily Operator Check-Off List

Date _____ Operator _____

Truck No. _____ Model No. _____

Dept. _____ Shift _____

Hour Meter
Reading—Drive _____ Hoist _____

Check	O.K. (✓)	Need Maintenance
Tires		
Load Wheels		
Horn		
Lift—Lower Control		
Forward & Reverse Controls		
Steering		
Electrical Brakes		
Hydraulic Leaks, Cylinders, Valves, Hoses, Etc.		
Platform Chains		
Flashing Red Light		
Keyswitch		
Lowering Buzzer		
Safety Belt and Self-retracting Lifeline		
Travel Defeat Switch		
Emergency Lowering Valve		

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Figure 2-1 Sample of Operator Check List

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2-4. POWER DRIVE CONTROL HANDLE.

2-4.1. Control Handle.

Two triangular shaped speed controls provide for easy thumb actuation. Controls include an infinitely variable forward and reverse speed control, a belly-button reversing switch, and a horn. See Figure 2-2.

2-4.2. Steering Arm Controls.

Lowering the steering arm to the horizontal or raising to the vertical applies the brake (See Figure 2-3). All traction control power is shut off when the brake is engaged. When the steering arm is in the upright position, the brake acts as a parking brake. Deadman braking occurs when the handle is released and spring action raises it to the vertical position.

When the lower portion of the triangular speed control knob is pressed forward, contacts are closed for first speed in the forward direction. Pressing the speed control farther closes a contact for second speed and farther, third speed. Pressing the upper portion of the speed control governs the three reverse speeds in the same manner.

2-4.3. Driving and Stopping Procedures.

The following procedure describes driving and stopping the PDBB-20-T12 lift truck.

1. Turn the key switch to the on position.
2. Grasp the grips of the steering arm so that the speed control can be comfortably operated by the thumbs.
3. Lower the steering arm to a comfortable position above horizontal to disengage the brake and to energize the electrical circuits.
4. To move forward, slowly press the lower portion of the speed control. Press the forward speed control farther to increase speed.
5. To stop, release the speed control and lower the steering arm to the horizontal position. In this position, the electrical brake activates.

   The brake may also be applied by raising the steering arm to the upright position.
6. To travel in reverse, lower the steering arm to a comfortable position and slowly press the upper portion of the speed control.

NOTE: Acceleration in reverse is the same as in the forward direction.

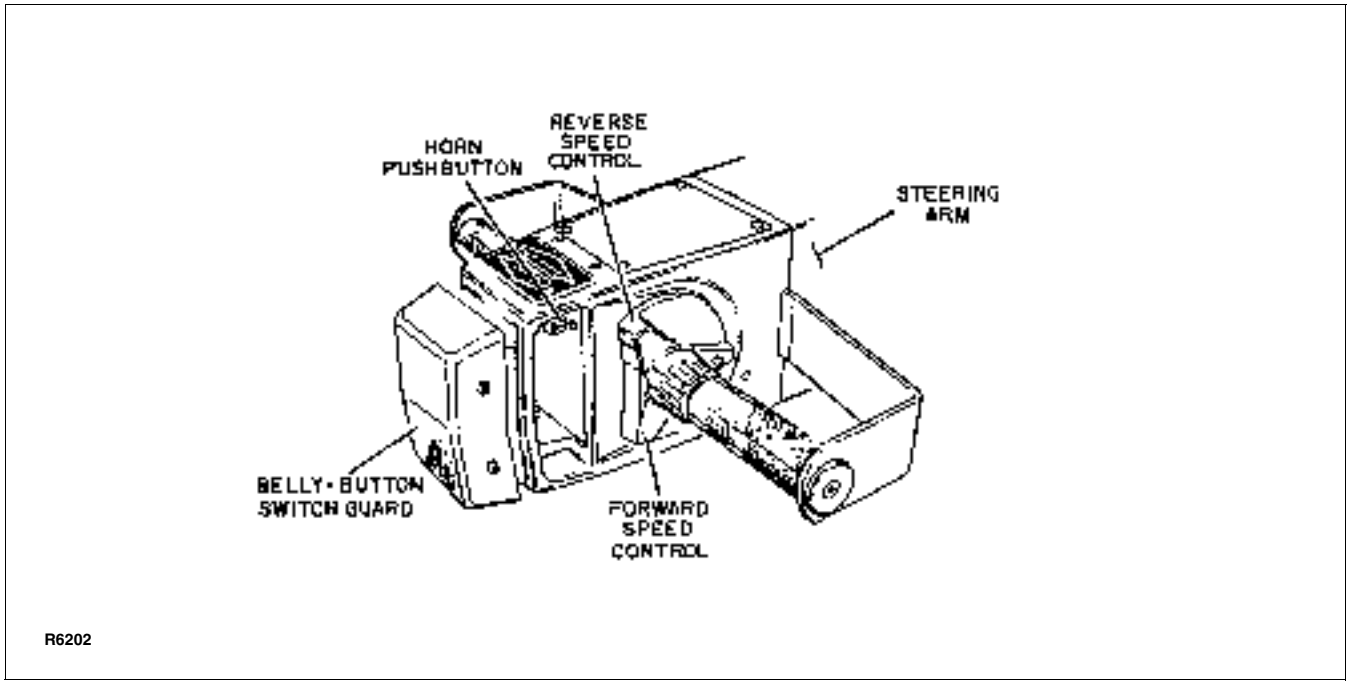

Figure 2-2 Control Handle

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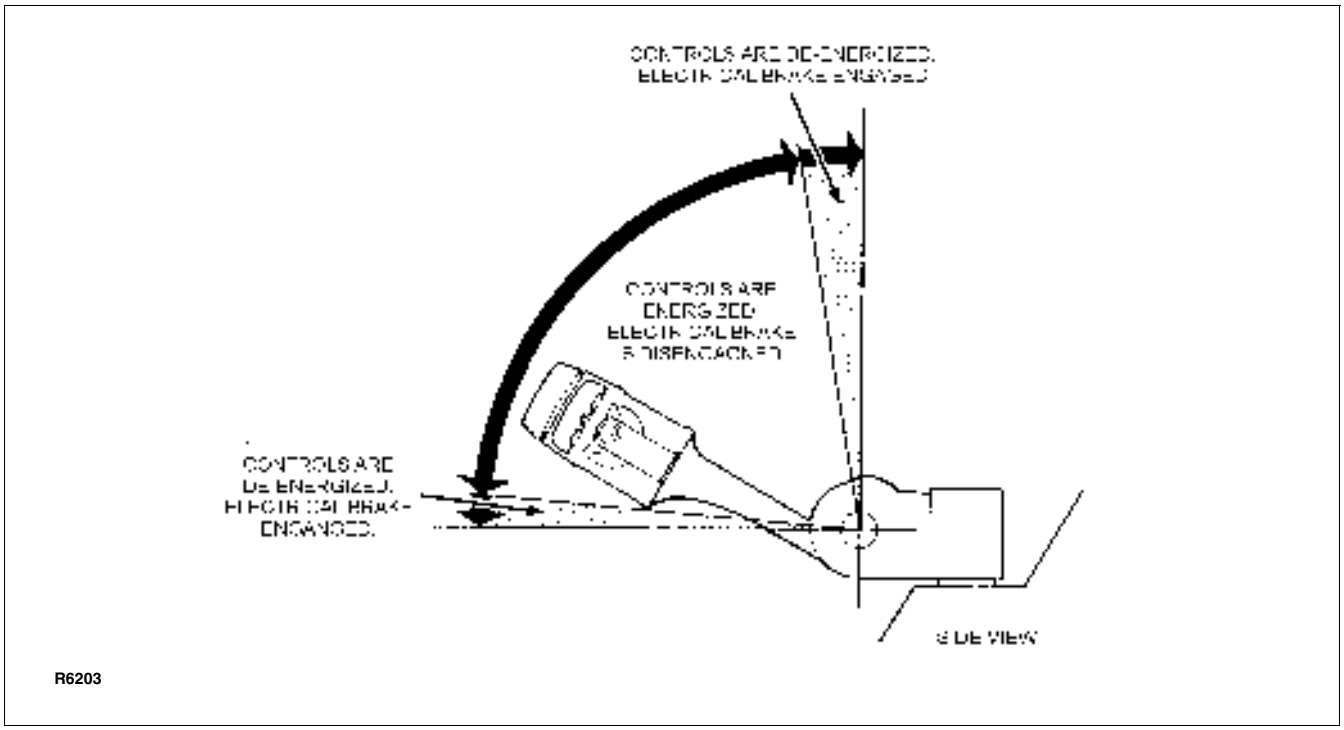

Figure 2-3 Steering Arm Braking Position

2-5. BELLY-BUTTON SWITCH GUARD.

The belly-button switch guard minimizes the possibility of the driver being pinned by the steering arm while driving the lift truck in reverse. If the guard presses against the driver while the lift truck is being driven in reverse, the guard actuates a switch which changes the direction of the lift truck to forward direction in low speed.

2-6. STEERING ARM RETURN SPRING.

The steering arm return spring automatically raises the steering arm to the upright position when the steering arm is released. If the steering arm snaps up abruptly, or does not return fully, the steering arm return spring requires adjustment. Return truck to maintenance group for adjustment.

2-7. LIFT/LOWER/STOP CONTROL.

The LIFT/LOWER/STOP pushbuttons on the platform are used raise and lower the platform at a fixed rate of speed.

Proceed as follows to raise and lower the platform.

1. If truck is equipped with a key switch, turn it to the on position.

WARNING: Check the space above the mast and the load to be sure that there is sufficient room for raising the platform. Make sure the load is centered and does not exceed capacity.

1. To raise the platform, push in the LIFT button and hold until lift carriage reaches desired lift height.
2. To lower the forks, push in and hold the LOWER button until platform is at the desired height.

2-1. PARKING.

When finished with moving loads, drive truck to its maintenance or storage area. Disconnect batteries from TRUCK receptacle and connect to CHARGER receptacle. Charge batteries as necessary. Refer to battery care instructions, paragraph 3-3.

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SECTION 3
PLANNED MAINTENANCE

3-1. GENERAL.

Planned maintenance consists of periodic visual and operational checks, parts inspection, lubrication, and scheduled maintenance designed to prevent or discover malfunctions and defective parts. The operator performs the checks in SECTION 2, and refers any required servicing to a qualified maintenance technician who performs the scheduled maintenance and any required servicing.

3-2. MONTHLY AND QUARTERLY CHECKS.

Table 3-1 is a monthly and quarterly inspection and service chart based on normal usage of equipment eight hours per day, five days per week. If the lift truck is used in excess of forty hours per week, the frequency of inspection and service should be increased accordingly. These procedures must be performed by a qualified service technician or your Big Joe service representative.

3-3. GEL CELL BATTERY CARE.

3-3.1. General.

These Gel Cell Batteries are maintenance-free. Any attempt to open the battery will void the warranty.

Ultra-deep discharging of brand new batteries should be avoided for at least 15 cycles. To dramatically extend battery life, ultra-deep discharge should be avoided. The shallower the average discharge, the longer the battery life.

3-3.2. Charging Batteries

Charging requirements will vary depending on depth of discharge and temperature. Follow safety rules when placing a battery on charge.

Proceed as follows:

1. Park truck at charging station with platform lowered and key switch off.
2. Check the condition of the AC cord, the battery connector and battery cables. If there are any cuts in the cable, any exposed wires, loose plugs or connectors, DO NOT attempt to charge the batteries. Contact appropriate personnel for repairs to be made.
3. **Serial Number 375067 to 380099:** Disconnect the batteries from the truck and connect batteries to the charger. Make sure connectors are mated properly.

   Serial Number 38100 and Higher: There is no need to switch the battery connector. An AC charging relay is used.
4. Connect the AC cord to the truck and then plug into the 120 VAC power supply.

Table 3-1 Monthly and Quarterly Inspection and Service Chart

VISUAL CHECKS	
INTERVAL	**INSPECTION OR SERVICE**
Monthly	Check drive motor for proper operation
Monthly	Check pump motor for proper operation
Monthly	Check electrical brake for proper operation
Monthly	Check load wheels for wear
Monthly	Check drive wheel for wear
Monthly	Inspect wiring for loose connections and damaged insulation
Monthly	Inspect contactor tips for excessive pitting and wear
Monthly	Check deadman brake switch for proper operation
Monthly	Check lift chain tension, lubrication & operation (See paragraph 3-5.)
Quarterly	Check lift cylinder wiper ring and packing for leakage
Quarterly	Check for excessive jerking of steering arm when stopping or starting
Semi-annually	Replace hydraulic filter assembly
Semi-annually	Inspect for chain wear (See paragraph 8-2.)

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5. The battery charger is fully automatic and will cycle automatically (depending on amount of charge needed). Charge status can be observed as follows (Refer to Figure 3-1):

   a. The top three LED's indicate charger status. At start of charge the RED (Charge) LED will be ON indicating the batteries are connected and charging. After the batteries charge to approximately 80% the Yellow LED comes ON. After a time (1 hour minimum) the Green LED comes ON indicating battery ready.

NOTE: The battery charger includes an override timer which terminates the charge if the cycle does not complete after 18 hours of charging. This time-out condition is indicated by the green LED flashing off and on, and it indicates a fault condition which should be investigated. This will occur if the charger cannot raise the battery voltage to the preset voltage limit. Possible causes indicate a battery fault, a charger fault, low AC power supply voltage, or excessive discharge. The override timer can be reset by switching the AC power to the charger off.

   b. The lower four red LED's indicate current flow. Normally at start of charge, if the batteries are discharged, all four red LEDs will be on indicating maximum 25A charge current. As the batteries charge the current drops and the LEDs go OFF as the current drops to 20A, 15A, 10A and 5A respectively.

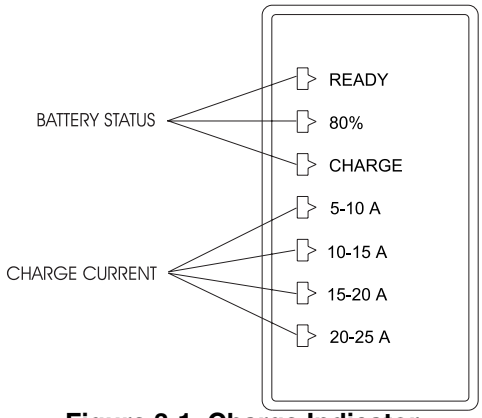
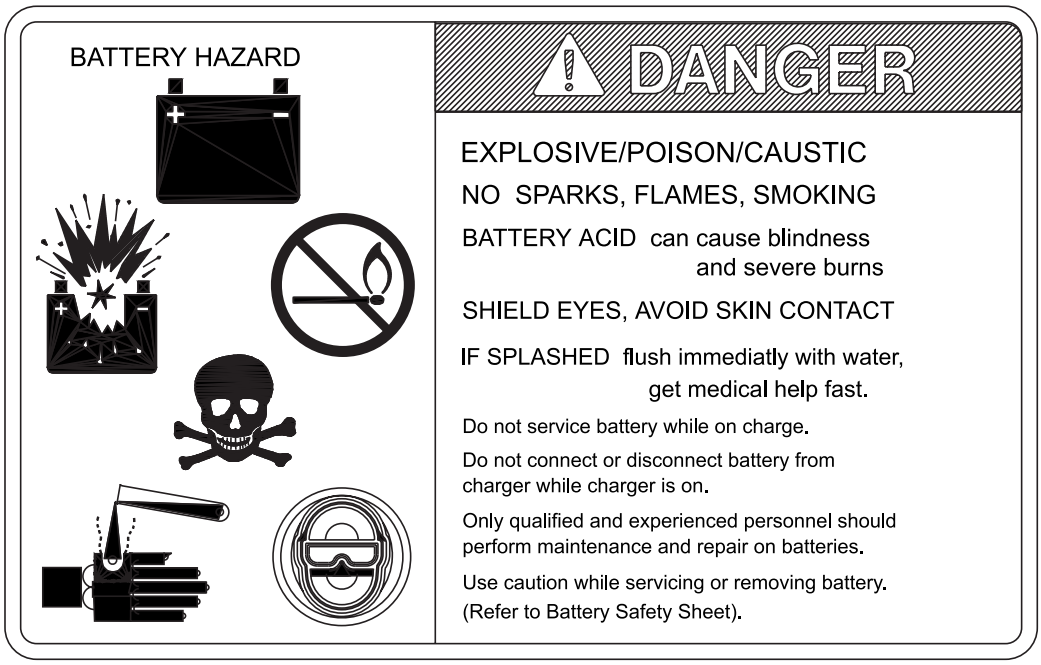


Figure 3-1 Charge Indicator



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3-3.3. Removing Batteries from Charger

1. The Green “READY“ LED stays on until the charger is unplugged from AC outlet.
2. Disconnect AC plug from the power supply and then remove it from the truck.
3. Disconnect the batteries from the charger and connect the batteries to the truck. Make sure connectors are mated properly.

3-4. LUBRICATION.

Refer to Table 3-2 for the recommended types of grease and oil. Table 3-4 identifies the items requiring lubrication.

3-5. LIFT CHAIN MAINTENANCE.

Fully raise and lower platform while observing chains as they move over all chain sheaves. Ensure chain is aligned and tracking properly and all links are pivoting freely. With platform fully lowered, spray or brush on a film of SAE 30 or 40 engine oil.

Table 3-2 Recommended Lubricants (See Table 3-4 for Application)

No. 1	Transmission oil—EP SAE 80W-90
No. 2	Grease—Lithium base, general purpose.
No. 3	Hydraulic oil-Heavy duty with a viscosity of 150 SUS (in temperatures below 32°F use 100 SUS) foam suppressing agent and rust and oxidation inhibitors. Big Joe Part No.900855 (1 gallon) 900893 (1 quart)
No. 4	SAE 30 or 40 Engine lubricating oil

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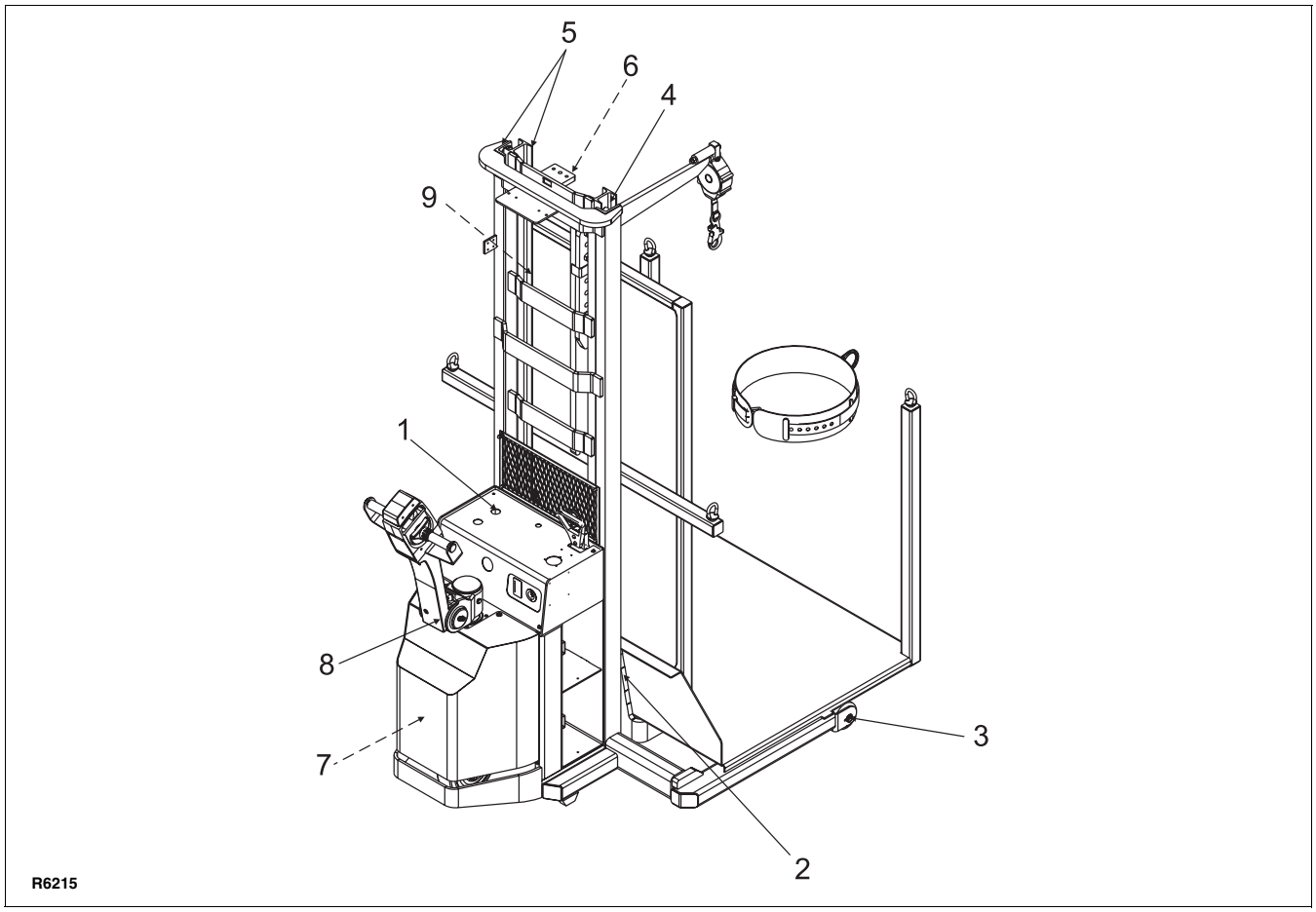

Table 3-3 Lubrication Diagram

Table 3-4 Lubrication Chart

FIG 3-3 INDEX NO.	LOCATION	METHOD OF APPLICATION	TYPE (Table 3-3)	APPLICATION OF LUBRICANT
1	Hydraulic System Capacity-6 quarts	—	No. 3	With lift carriage fully lowered, fill reservoir with hydraulic oil to "FULL" mark on dip stick.
2	Platform rollers	Gun	No. 2	Pressure lubricate.
3	Load Wheels	Gun	No. 2	Pressure lubricate.
4	Mast rollers	Gun	No. 2	Use point adapter for Female grease fitting.
5	Outer and inner mast	Brush	No. 2	Full length of channel where rollers operate
6	Ram head sheaves	Gun	No. 2	Pressure lubricate.
7	Transmission Capacity 4 1/2 pints	Can	No. 1	Fill to Hex plug (Fill level plug) level. Remove vent and fill through vent hole.
8	Steering arm elbow	Can	No. 4	1 or 2 drops each time serviced.
9	Lift Chains	Brush or Spray	No. 4	See Paragraph 3-5.

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SECTION 4
TROUBLESHOOTING

4-1. GENERAL

Table 4-1 serves as a guide to determine possible causes of trouble. The table is divided into five main categories: Truck Dead: Trouble With Travel: Trouble With Braking: Trouble With Lifting Or Lowering, and Miscellaneous malfunctions. Refer to electrical wiring diagram (Figure 4-2 or Figure 4-5) as a supplement to the troubleshooting chart or when tracing an electrical circuit.

Table 4-1 Troubleshooting Chart

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TRUCK DEAD		
Truck will not run nor will lift system operate.	a. 120 Amp fuse blown.	Check fuse and replace if defective.
	b. Battery dead or disconnected.	Check battery quick-disconnect plug and check battery voltage.
	c. Keyswitch defective.	Bypass keyswitch to determine if it is malfunctioning.
	d. 15 amp control circuit fuse blown.	Check fuse and replace if defective.
	e. Defective wiring.	Check for open circuit. Repair as required.
TROUBLE WITH TRAVEL	Defective transistor controller.	Refer to Paragraph 4-3.
TROUBLE WITH LIFTING OR LOWERING		Check hydraulic oil level. Before further troubleshooting, fill hydraulic reservoir so that oil is to "FULL" mark on dip stick. Tighten all electrical connections.
Oil sprays or flows from the top of the lift cylinder.	Defective packing in lift cylinder or too much oil in reservoir.	Overhaul lift cylinder and install new packing, seal, and wiper ring.
Oil foaming from vent cap on hydraulic reservoir.	Leak in suction line between the pump and the reservoir or oil too high.	Check oil filter. Replace if necessary. Tighten fittings. Inspect line and replace if necessary.
Oil splashes out of vent when lowering platform.	Oil level too high.	Drain, then refill reservoir to "FULL" mark on dip stick.
Squealing sounds when lifting platform.	a. Oil level too low.	Add oil to reservoir.
	b. Dry channels in mast.	Apply grease.
	c. Defective mast or platform bearing.	Replace bearing.
Platform does not lift to top. Pump motor runs.	a. Oil level too low.	Add oil to reservoir.
	b. Load larger than capacity.	Refer to nameplate on side of mast for maximum load capacity.
	c. Batteries need charging.	Recharge.

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Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
Weak, slow or uneven action of hydraulic system.	a. Defective pump.	Check pressure.
	b. Defective lift cylinder.	Clean system and valve.
	c. Load larger than capacity.	Refer to name plate on side of mast for maximum load capacity.
	g. Battery need charging.	Charge battery.
Platform does not lift, motor does not run.	a. Battery is dead or disconnected.	Check and recharge if required.
	b. Defective wiring.	Check and repair as required.
	c. Defect in electrical system for operating pump motor.	Check pump motor switch on lift control valve, as well as the solenoid relays. Repair or replace.
Platform does not lift, motor runs.	Defective in hydraulic system.	Check the oil level in the reservoir and the oil lines to the lift cylinder, and repair as required. If normal, check the hydraulic pump, oil filter, and lift control valve. Repair or replace.
Load will not hold.	b. Worn lift cylinder packing.	Replace cylinder packing.
Platform creeps downward under load when in a raised position.	Leak in hydraulic system.	Look for leaking fittings in the hydraulic line. Check pump and suction line for leakage back into the reservoir. Repair or replace as required.
MISCELLANEOUS		
Steering arm does not return to the upright position.	a. Return spring improperly adjusted.	Readjust spring tension.
	b. Binding brake linkage or electrical cable.	Check and free the binding item.
	c. Broken spring	Replace.
Truck moves forward when arm is pulled down.	a. Belly-button switch defective.	Check for short, and repair or replace as necessary.
	b. Short in control head.	Check wiring and repair as required.
	c. Short in wiring harness through pivot tube.	Replace.
Steering arm jerks excessively when starting or stopping the truck.	a. Worn steering arm pivot bushings.	Replace bushings.
	b. Drive wheel tire worn.	Replace drive wheel.
Drive motor is jerky.	Motor commulator worn.	Replace motor.

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4-2. GEL CELL BATTERY CHARGER 004987 TROUBLESHOOTING

Refer to Figure 4-2, Figure 4-3, or Figure 4-4 for part identification. Be sure the batteries are connected to the charger and the AC cord is connected to 120 VAC power supply.

4-2.1. Dip Switch Setting (Figure 4-1)

The DIP switches on the Printed Circuit Board (PCB) must be set for Gel Cell Batteries. Check that switch 1 is ON and switch 2 is OFF.

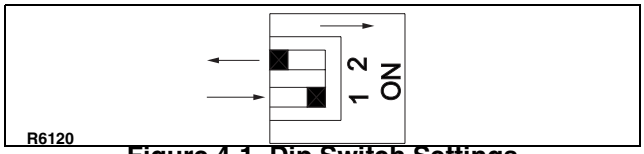

Figure 4-1. Dip Switch Settings

4-2.2. Thermistor

There is a temperature sensing thermistor plugged into a 2-pin socket marked THERM on the PCB. Check that this is firmly connected or the battery voltage control will not work properly.

4-2.3. Circuit Breaker Testing

Using a multimeter set to measure 120 VAC, check each side of the circuit breaker to ground. If 120 VAC was not indicated on both sides, replace the circuit breaker.

4-2.4. Power Transformer Testing

The two 0.250” tabs are the primary side of the transformer and five #10 screw lugs are the secondary side. Test the Transformer as follows:

1. Using a multimeter set to measure at least 120 VAC, verify that AC Power supply 120V 60Hz input is present at the transformer primary terminals. If 120 VAC was not indicated, check the circuit breaker and wiring.
2. Using a multimeter set to measure at least 50 VAC, verify the transformer secondary terminals as follows:
   a. Verify 25 VAC from blue wire to each white wire.
   b. Verify 50 VAC from the white wire to white wire.
   c. If these voltages were not indicated, replace the transformer.

4-2.5. Circuit Board Testing

The circuit board has a built in diagnostic test at power-up.

1. Switch the AC supply OFF and then ON, watching the 3 upper LEDs on the PCB. The 3 LEDs should light briefly in sequence Green-Yellow-Red when power is applied. This indicates the transformer is OK and that power is getting to the PCB.
2. If the battery DC is connected to the charger correctly, the Red LED should come ON immediately after this test sequence.
3. If the Green-Yellow-Red LED test sequence does not show at power-up, or if it cycles constantly Green-Yellow-Red, the PCB assembly should be replaced.
4. If the Red or Yellow charging LED does not stay ON after the test sequence, check that the batteries are connected to the charger.
5. Using a multimeter set to measure at least 30 VDC, verify DC Voltage from Black to Red wire is as follows:
   a. If the Red charging LED is on and the Yellow charging LED is off, voltage from black to red wire should be at least 24 VDC.
   b. If the Red and Yellow charging LEDs are on, voltage should be 29 ±1 VDC.
   c. If there is no Voltage, check the wiring and connections from the charger to the battery terminals. Battery Voltage must be correct polarity and more than 1 Volt to commence charging.

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4-3. TRANSISTOR CONTROLLER TROUBLE-SHOOTING

4-3.1. Fault Detection.

An internal microcontroller automatically maintains surveillance over the functioning of the controller. When a fault is detected, the appropriate fault code is signaled via the LED, externally visible on the side of controller (See Figure 11-21 for LED location on controller). The diagnostic codes flashed by the LED are listed in Table 4-4.

If the fault is critical, the controller is disabled. More typically, the fault is a remediable condition - for example, an undervoltage fault is cleared when the condition is removed.

The automatic fault detection system includes:

- contactor coil open / shorted driver (F/R and shunt contractor)
- contactor driver overcurrent / contactor coil short
- contactor welded
- emergency reverse circuit check
- M- output fault
- memory checks upon start-up
- overvoltage cutback
- power supply out of range (internal)
- throttle fault
- undervoltage cutback
- watchdog (external and internal)
- watchdog (internal)

4-3.2. Hand Held Programmer.

A hand held programmer is available that is designed specifically for use with the controller. It serves dual functions of reading diagnostic data provided by the controller and adjusting certain performance values of the controller. The programmer (**Part Number 005472-02)** is available through your Big Joe dealer. If you require dealer location information contact Big Joe Manufacturing Co. phone number 847-298-9800.

4-3.3. Fault Recording.

Fault events are recorded in the controller's memory. Multiple occurrences of the same fault are recorded as one occurrence.

The fault event list can be loaded into the programmer for readout. The Special Diagnostics mode provides access to the controller's diagnostic history file - the entire fault event list created since the diagnostic history file was last cleared. The Diagnostics mode, on the other hand, provides information about only the currently active faults.

4-3.4. Fault Recovery (including recovery from disable).

Almost all faults require a cycling of the KSI or brake input to reset the controller and enable operation. The only exceptions are shown in Table 4-2.

Table 4-2. Fault Recovery Exceptions.

FAULT	RECOVERY
anti-tiedown	release and re-select Mode 1
contactor overcurrent	when condition clears
emergency reverse	BB re-applied or brake cycled
HPD	lower throttle to below HPD threshold
overvoltage	when battery voltage drops below overvoltage
SRO	when proper sequence is followed
thermal cutback	when temperature comes within range
throttle fault	clears when condition gone
undervoltage	when battery voltage rises above undervoltage

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4-3.5. General Checkout.

Carefully complete the following checkout procedure. If you find a problem during the checkout, refer to Paragraph 4-3.7. for further information.

The checkout can be conducted with or without the handheld programmer (See Paragraph 4-3.2.). The checkout procedure is easier with a programmer. Otherwise, observe LED for codes.

CAUTION: Put the vehicle up on blocks to get the drive wheel off the ground before beginning these tests.

Turn the keyswitch off and make sure that the brake is applied (brake switch open), the throttle is in neutral, and the forward/reverse switches are open.

Do not stand, or allow anyone else to stand, directly in front of or behind the vehicle during the tests.

1. If a programmer is available, connect it to the programmer connector.

2. Turn the keyswitch on. The programmer should "power up" with an initial display, and the controller's Status LED should begin steadily blinking a single flash. If neither happens, check for continuity in the keyswitch circuit and controller ground.

3. If you are using a programmer, put it into the diagnostic mode by pressing the "DIAGNOSTICS" key. The display should indicate "No Known Faults."

   Release the brake by pulling down the control arm into the operating position. The LED should continue blinking a single flash and the programmer should continue to indicate no faults. If there is a problem, the LED will flash a diagnostic code and the programmer will display a diagnostic message. If you are conducting the checkout without a programmer, look up the LED diagnostic code in Table 4-4.

   When the problem has been corrected, it may be necessary to cycle the brake in order to clear the fault code.

4. With the brake released, select a direction and operate the throttle. The motor should begin to turn in the selected direction. If it does not, verify the wiring to the forward/reverse switches, forward/reverse contactors, and motor. The motor should run proportionally faster with increasing throttle. If not, refer to Paragraph 4-3.7.

5. If you are using a programmer, put it into the test mode by pressing the "TEST" key. Scroll down to observe the status of the forward, reverse, brake, emergency reverse, and mode switches. Cycle each switch in turn, observing the programmer. Each input should show the correct state on the programmer.

6. Check the controller's fault detection circuitry as described in paragraph 10-3.4.

7. Take the vehicle off the blocks and drive it in a clear area. It should have smooth acceleration and good top speed.

8. Test the plug braking of the vehicle. Verify that the plug braking option is as desired (variable or fixed).

9. Verify that all options, such as high pedal disable (HPD), static return to off (SRO), and anti-tiedown, are as desired.

10. Check to see whether the emergency reverse (belly button) feature is working correctly. Verify that the circuit is operational by momentarily disconnecting one of the emergency reverse wires. The vehicle should be disabled and a fault indicated.

4-3.6. Adjustment.

To change a parameter (Table 4-3) using the programmer, press the "PROGRAM" key, and scroll down the Program Menu until the desired parameter is the top line of the display. Press the appropriate "CHANGE VALUE" key ("up" or "down") until the desired number is reached. The parameter is now set at the desired value. All programming occurs in real time. That is, the parameter can be changed while the vehicle is in operation.

Some parameters have dependencies on other parameters. When the programmer is being used to adjust a parameter and a limit is reached, the display will stop changing. To see why the display has stopped changing, press the "MORE INFO" key. If the limit is related to another parameter, that information will be displayed; changing the value of the related parameter may allow the original parameter to be adjusted further. Otherwise, the display simply says "Max Limit" or "Min Limit".

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Table 4-3. Adjustment Settings

Function	Setting
Creep Speed	7
Mode 1 Plugging Current Limit	Not Used
Mode 1 Acceleration Rate	Not Used
Mode 2 Plugging Current Limit	80
Mode 2 Acceleration Rate	1.0
Mode 2 Maximum Speed	100

4-3.7. Diagnostics and Troubleshooting.

The controllers provide diagnostics information to assist in troubleshooting drive system problems. The diagnostics information can be obtained in two ways: reading the appropriate display on the programmer or observing the fault codes issued by the Status LED. The Status LED is located on side of the controller (See Figure 11-21 for location of LED on controller).

4-3.7.1. LED Diagnostics

During normal operation, with no faults present, the Status LED flashes a single flash at approximately 1 flash/second. If the controller detects a fault, a 2-digit fault identification code is flashed continuously until the fault is corrected. For example, code "3,2" - welded direction contactor - appears as:

¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤
(3,2) (3,2) (3,2)

The codes are listed in Table 4-4. For suggestions about possible causes of the various faults, refer to Table 4-5. Troubleshooting Chart.

Operational faults - such as overtemperature - are cleared as soon as operation is brought within range. Non-operational faults - such as a throttle fault - usually require the brake or keyswitch to be cycled after the problem is remedied.

Table 4-4. LED Codes

LED CODE		EXPLANATION
LED Off	■	no power or defective controller
Solid On	□	defective controller
Single Flash	¤	controller operational; no faults
1,2	¤ ¤	hardware fail-safe error
1,3	¤ ¤ ¤	M- fault or motor output short
1,4	¤ ¤ ¤ ¤	sequencing fault (SRO)
2,1	¤ ¤ ¤	5kΩ-0 or throttle wiper input fault
2,2	¤ ¤ ¤ ¤	emergency reverse circuit check fault (BB wiring)
2,3	¤ ¤ ¤ ¤ ¤	high-pedal-disable fault (HPD)
2,4	¤ ¤ ¤ ¤ ¤ ¤	throttle pot low open or shorted to B+ or B-
3,1	¤ ¤ ¤ ¤	contactor or shunt driver overcurrent
3,2	¤ ¤ ¤ ¤ ¤	welded direction contactor
3,3	¤ ¤ ¤ ¤ ¤ ¤	[reserved for future use]
3,4	¤ ¤ ¤ ¤ ¤ ¤ ¤	missing contactor or shunt
4,1	¤ ¤ ¤ ¤ ¤	low battery voltage
4,2	¤ ¤ ¤ ¤ ¤ ¤	overvoltage
4,3	¤ ¤ ¤ ¤ ¤ ¤ ¤	thermal cutback
4,4	¤ ¤ ¤ ¤ ¤ ¤ ¤ ¤	[reserved for future use]

Note: Only one fault is indicated at a time, and faults are not queued up.

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4-3.7.2. Programmer Diagnostics

With a programmer, diagnostics and troubleshooting is more direct than with the LED alone. The programmer presents complete diagnostic information in plain language - no code to decipher. Faults are displayed in the Diagnostic Menu, and the status of the controller inputs/outputs is displayed in the Test Menu.

The following 4-step process is generally used for diagnosing and troubleshooting an inoperative vehicle: (1) visually inspect the vehicle for obvious problems; (2) diagnose the problem, using the programmer; (3) test the circuitry with the programmer; and (4) correct the problem. Repeat the last three steps as necessary until the vehicle is operational.

Refer to Table 4-5 for suggestions covering a wide range of possible faults.

Table 4-5. Troubleshooting Chart

LED CODE	PROGRAMMER LCD DISPLAY	EXPLANATION	POSSIBLE CAUSE
1-2	HW FAILSAFE	hardware fail-safe error	1. Controller defective
1,3	M- SHORTED	M- output shorted	1. M- output shorted to ground. 2. Direction contactor not closing. 3. Direction contactor not closing fast enough. 4. Internal motor short to ground.
1,4	SRO	SRO Fault	1. Improper sequence of KSI, brake, and direction inputs. 2. Wrong SRO type selected. 3. Brake or direction switch circuit open. 4. Sequencing delay too short.
2,1	THROTTLE FAULT 1	5kΩ-0 or wiper fault	1. Throttle input wire open. 2. Throttle input wire shorted to ground or B+ 3. Throttle pot defective. 4. Wrong throttle type selected.
2,2	BB WIRING CHECK	emergency reverse wiring fault	1. BB wire open. 2. BB check wire open.
2,3	HPD	HPD sequencing fault	1. Improper seq. of KSI, brake, throttle inputs 2. Wrong HPD type selected. 3. Misadjusted throttle pot.
2,4	THROTTLE FAULT 2	Pot Low broken or shorted	1. Pot Low wire open. 2. Pot Low wire shorted. 3. Wrong throttle type selected.

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Table 4-5. Troubleshooting Chart (Continued)

LED CODE	PROGRAMMER LCD DISPLAY	EXPLANATION	POSSIBLE CAUSE
3,1	CONT DRVR OC	driver output overcurrent	1. Direction contactor coil shorted. 2. Shunt field shorted.
3,2	DIR CONT WELDED	welded direction contactor	1. Direction contactor stuck closed.
3,4	MISSING CONTACTOR	missing contactor or shunt	1. Direction contactor coil open. 2. Direction contactor coil missing. 3. Shunt field open. 4. Wire to shunt or direction contactor open.
4,1	LOW BATTERY VOLTAGE	low battery voltage	1. Battery voltage <16 volts. 2. Corroded battery or controller terminal. 3. Loose battery or controller terminal.
4,2	OVERVOLTAGE	overvoltage	1. Battery voltage >33V 2. Vehicle operating with charger attached.
4,3	THERMAL CUTBACK	over-/under-temp. cutback	1. Temperature >85°C or <-25°C. 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. Operation in extreme environments.

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NOTES

USED ON TRUCKS
SERIAL NUMBERS
375067 TO 379100,
379105 TO 379110,
379112 TO 379133,
379135 TO 179138,
379141 TO 379147,
379183 TO 379186

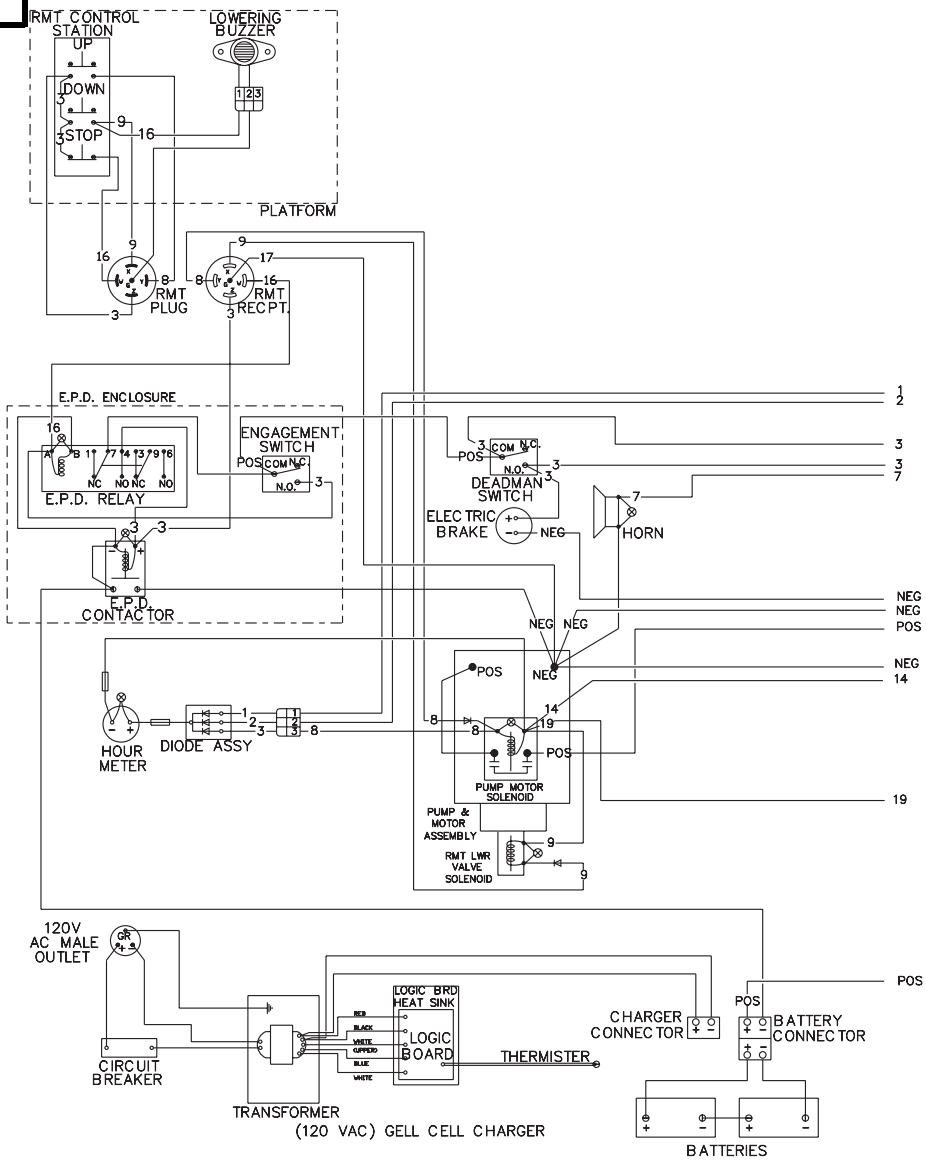

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Figure 4-2 Wiring Diagram (Sheet 1)

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USED ON TRUCKS
SERIAL NUMBERS
375067 TO 379100,
379105 TO 379110,
379112 TO 379133,
379135 TO 179138,
379141 TO 379147,
379183 TO 379186

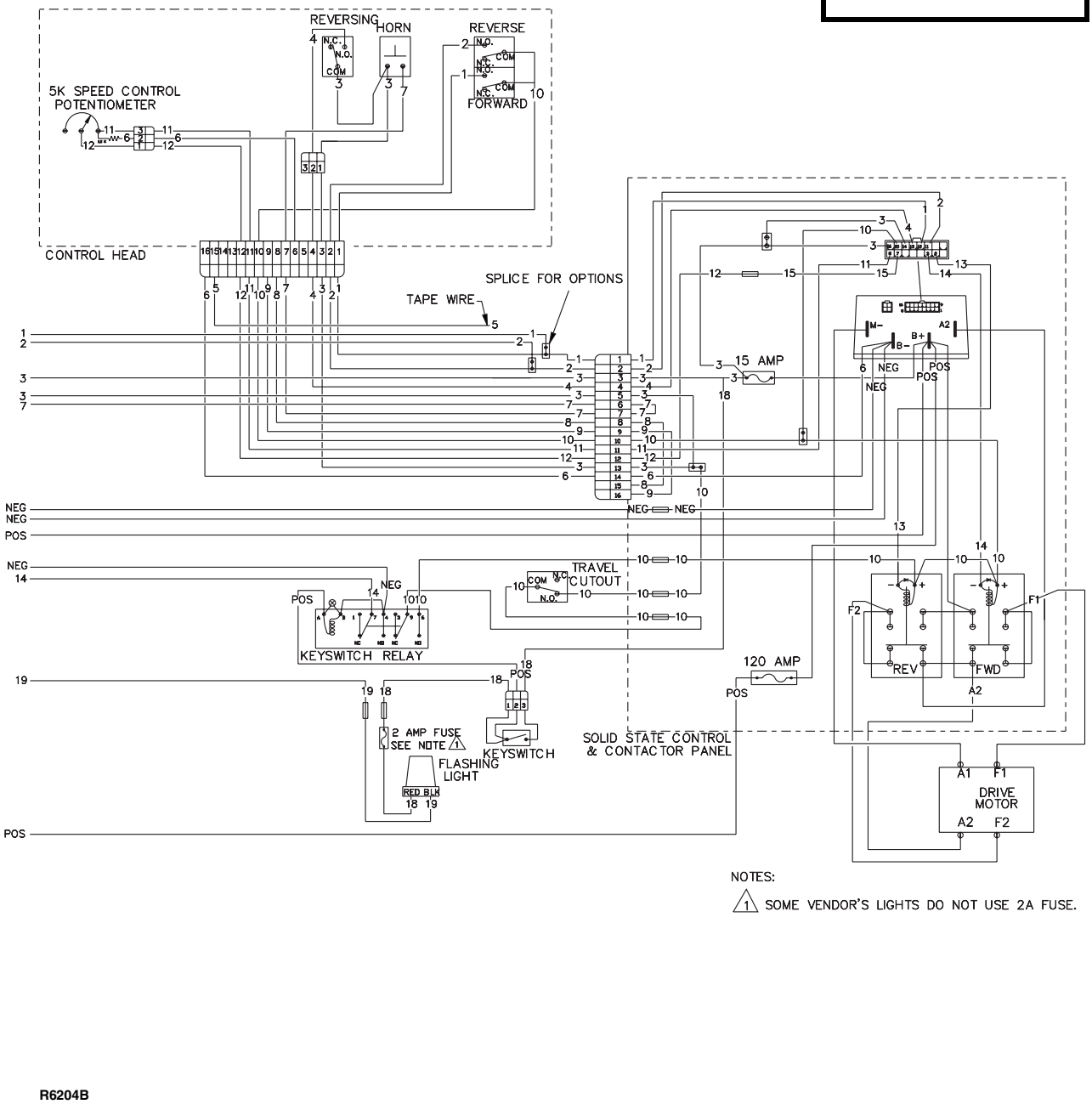

Figure 4-2 Wiring Diagram (Sheet 2)

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USED ON TRUCKS
SERIAL NUMBERS
379101 TO 379104,
379111, 379134,
379139 TO 379140,
379148 TO 379182,
379187 TO 280099

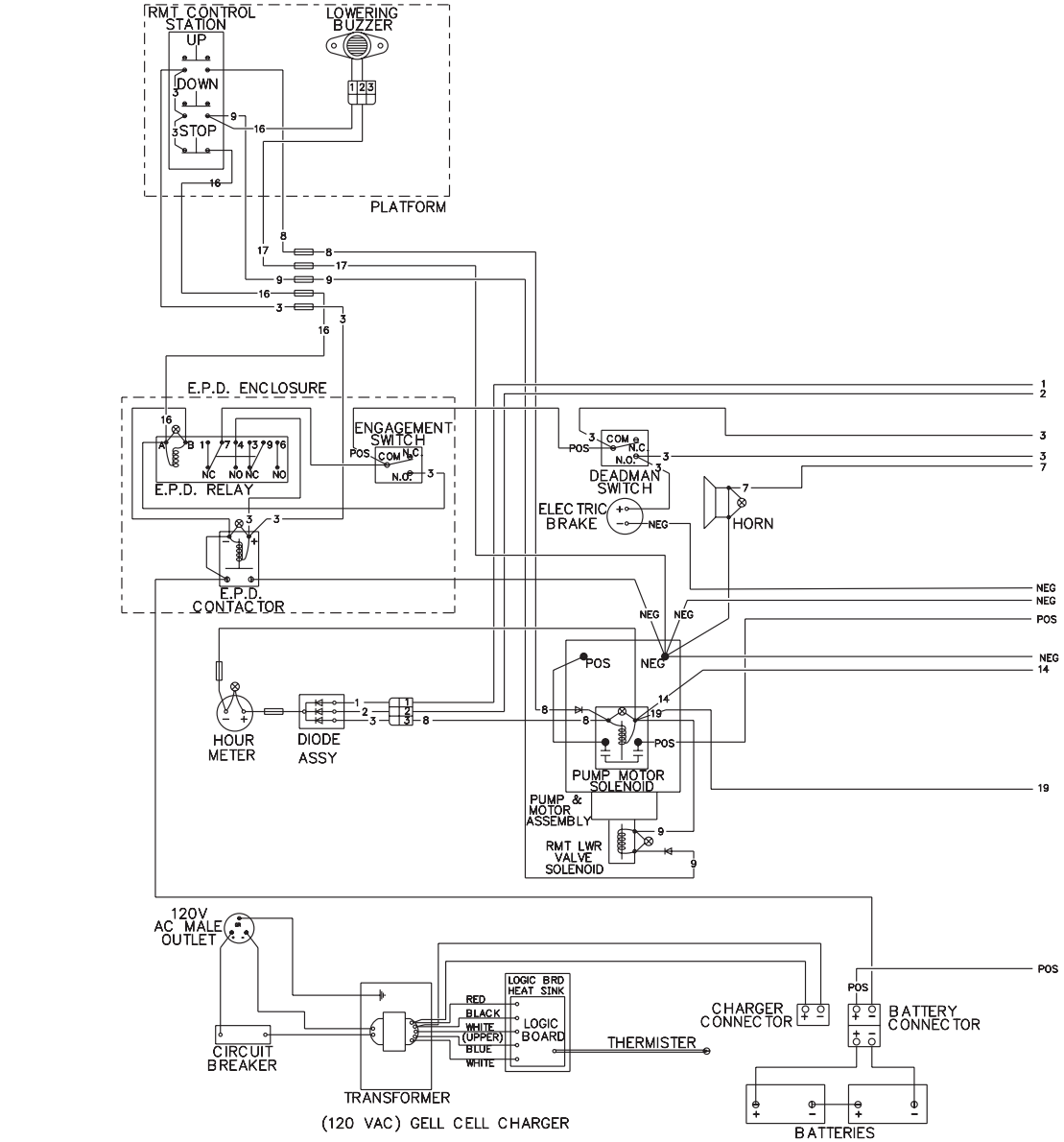

Figure 4-3 Wiring Diagram (Sheet 1)

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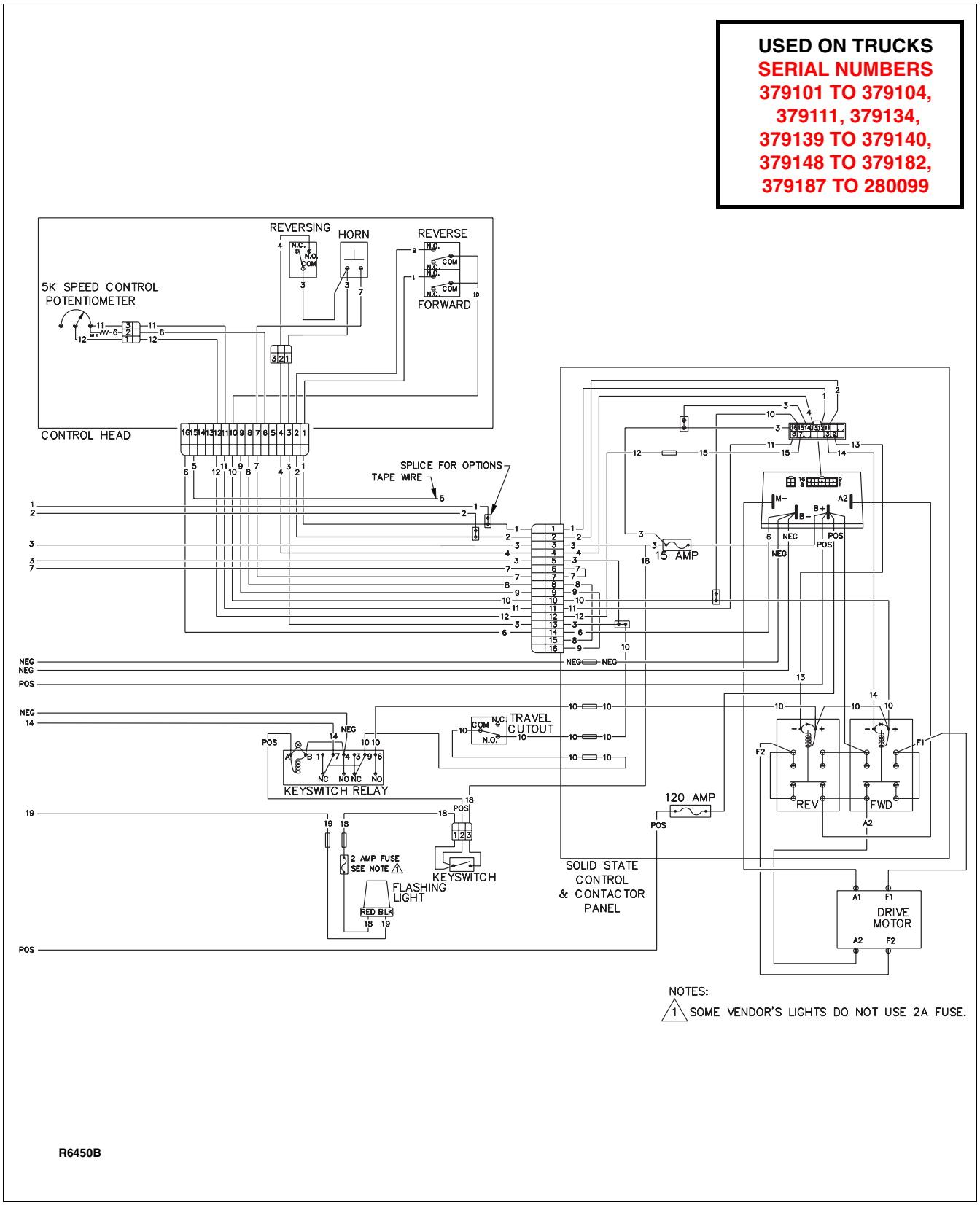

Figure 4-3 Wiring Diagram (Sheet 2)

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USED ON TRUCKS
SERIAL NUMBERS
380100 AND HIGHER

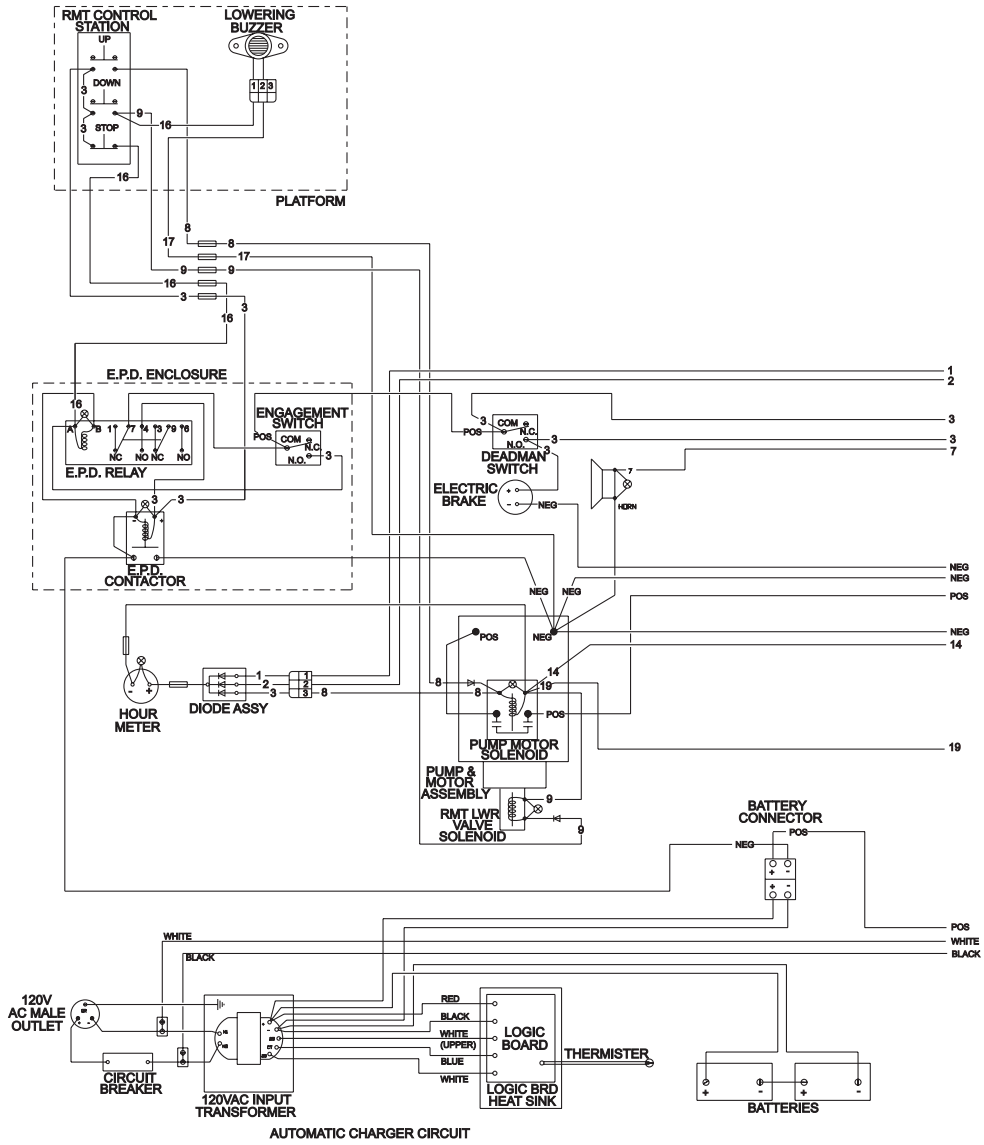

Figure 4-4 Wiring Diagram (Sheet 1)

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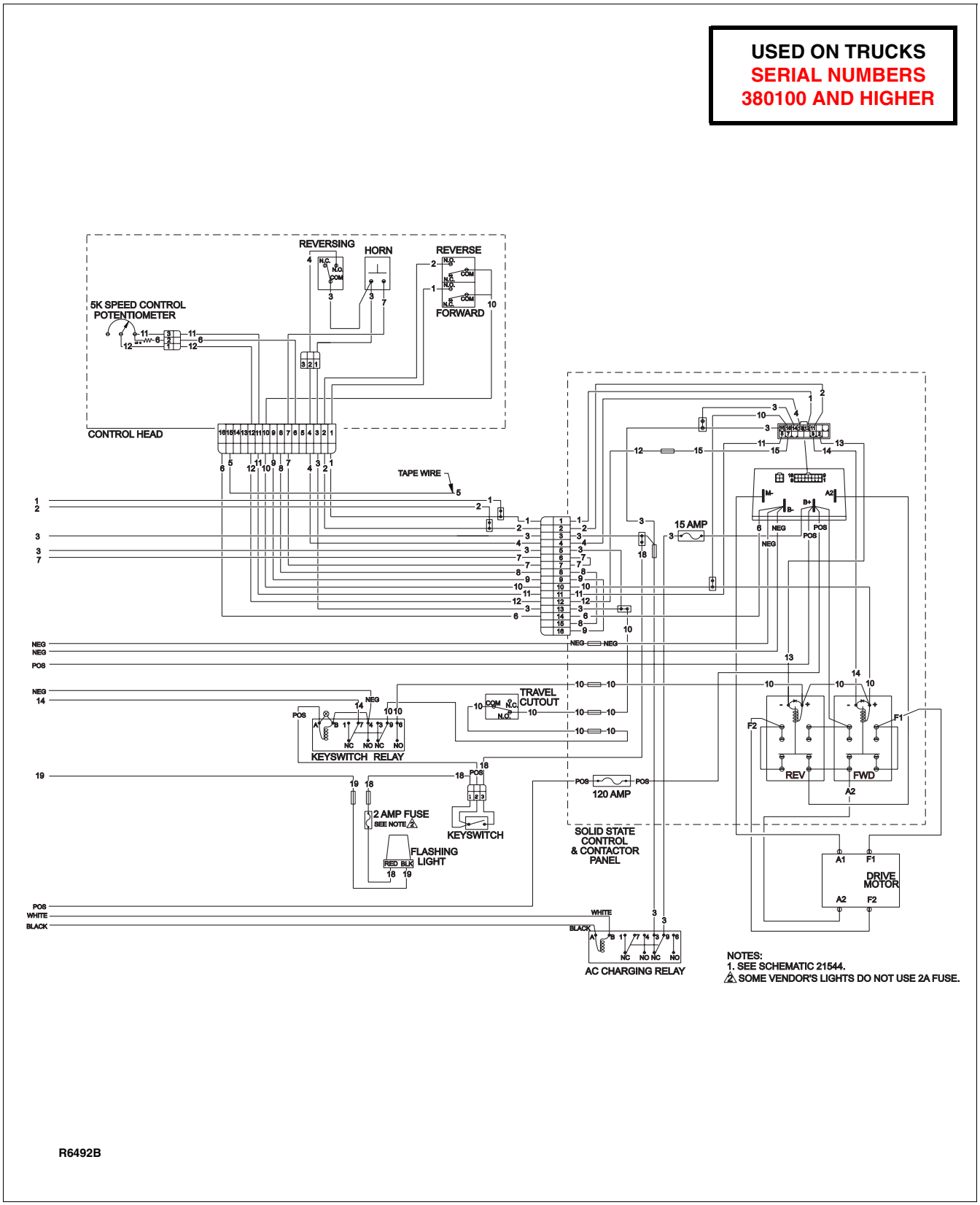

Figure 4-4 Wiring Diagram (Sheet 2)

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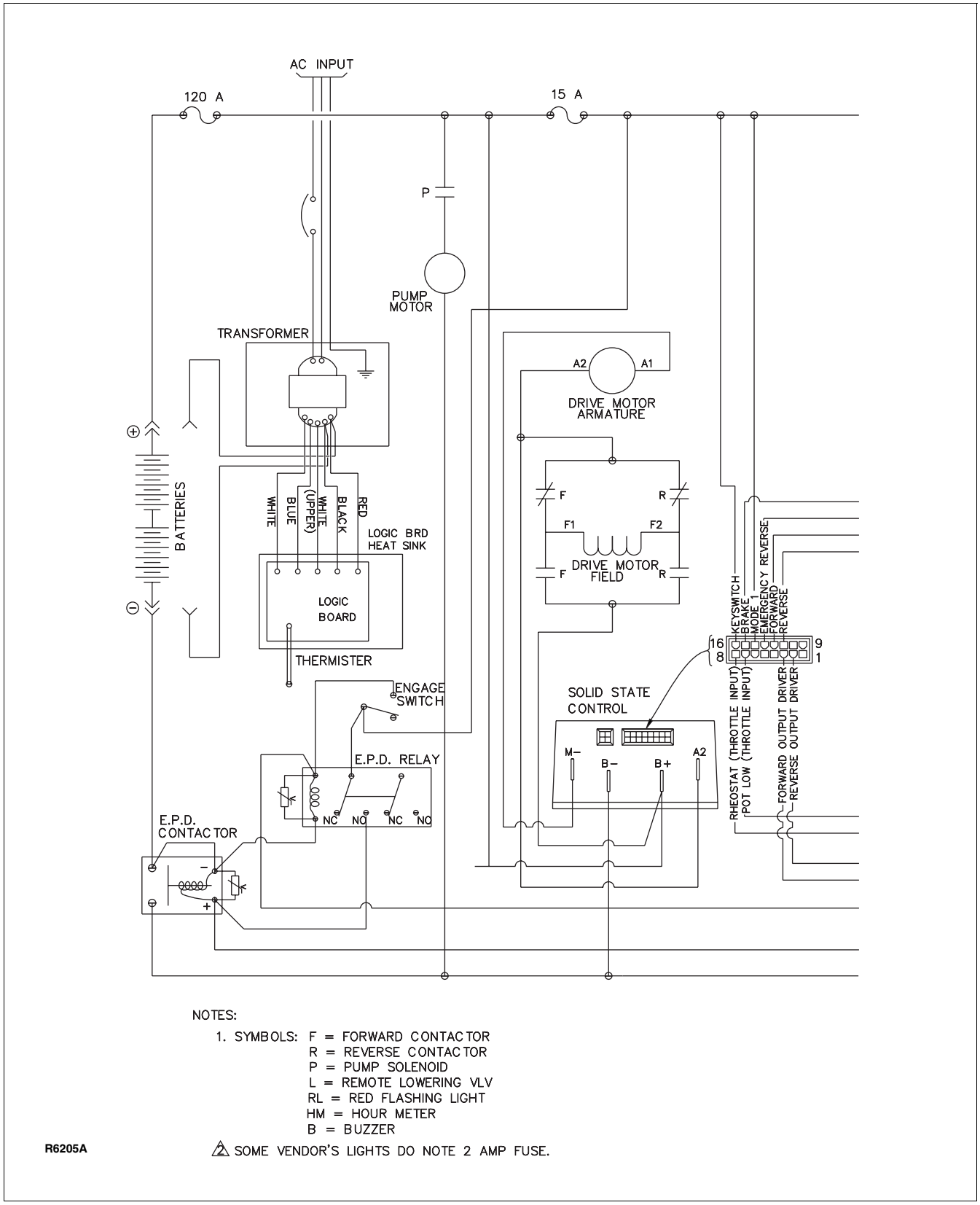

NOTES:

1. SYMBOLS: F = FORWARD CONTACTOR
   R = REVERSE CONTACTOR
   P = PUMP SOLENOID
   L = REMOTE LOWERING VLV
   RL = RED FLASHING LIGHT
   HM = HOUR METER
   B = BUZZER

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⚠2 SOME VENDOR'S LIGHTS DO NOTE 2 AMP FUSE.

Figure 4-5 Electrical Schematic (Sheet 1)

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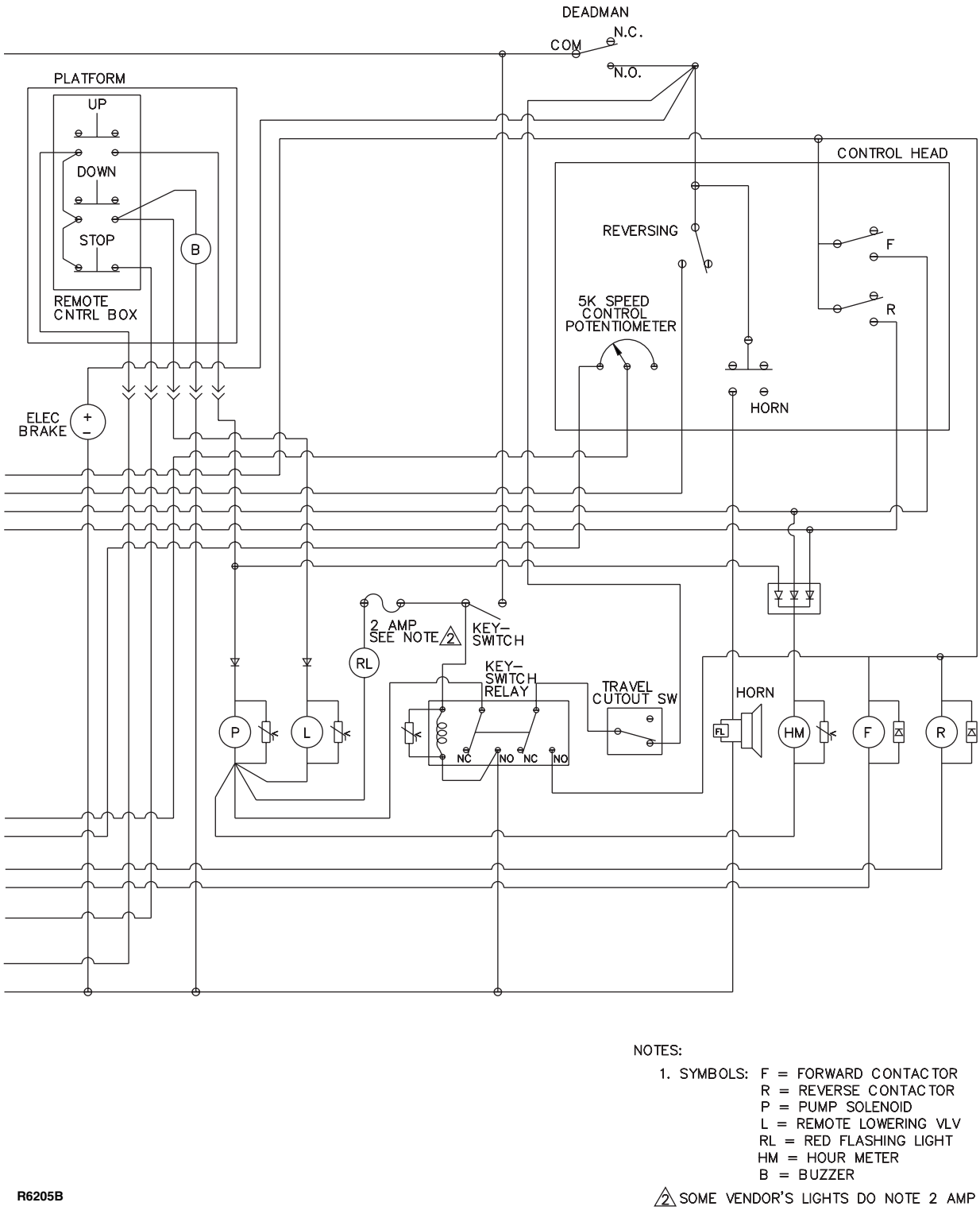

Figure 4-5 Electrical Schematic (Sheet 2)

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NOTES

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SECTION 5
STEERING ARM, CONTROL HEAD AND PIVOT TUBE SERVICING

5-1. GENERAL.

The following procedures cover adjustments, replacement, and repair of the steering arm, control head, and related assemblies and components. The procedures are independent of each other unless specifically referenced.

Speed controls are located on the inner hand grips. The control head provides an infinitely variable forward and reverse speed control.

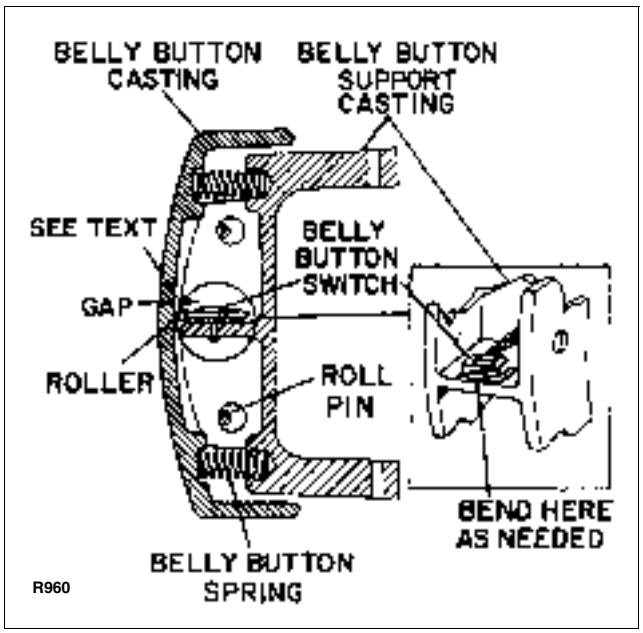

Figure 5-1 Belly-Button Switch Adjustment

5-2. BELLY-BUTTON SWITCH ADJUSTMENT.

NOTE: Adjust the actuator gap of the belly-button switch according to the following procedure. Refer to Figure 5-1 and Figure 5-2.

NOTE: All electrical connections should be tagged with identifying labels before disconnecting.

1. Disconnect battery.

CAUTION: While removing the belly-button casting, two springs (needed for reassembly) will fall free.

2. Being careful to catch and retain the belly-button springs (4, Figure 5-2) that may fall from the control head (9) as the belly-button casting (1) is removed, drive out the roll pins (2) that secure the belly-button casting.

CAUTION: A misaligned switch will either almost constantly (switch clicks early in travel) or fail to operate (switch clicks late in travel).

WARNING: Test switch in an open area to avoid being accidentally pinned.

3. Bend actuator lever of belly-button switch (Figure 5-1) to adjust gap so that switch clicks half way through travel of casting.
4. Reinstall casting temporarily to test switch.
5. Repeat adjustment, if necessary, until switch works properly.
6. Reinstall casting, making certain all parts are back in place.
7. Check operation of the belly-button switch by pressing the belly-button casting while listening for the “click” that indicates that the switch has actuated.

NOTE: The click should be heard when the belly-button casting has moved about 50 per cent of its normal travel distance. If the click is heard at the beginning of travel, the switch may actuate at inappropriate times. If the click is heard near the end of travel, the switch could be unreliable and may not actuate in some instances.

8. Reconnect battery and electrical connections.

WARNING: Testing of belly-button switch in operation should be limited to areas clear of obstacles against which an operator could be pinned. Use first speed, reverse.

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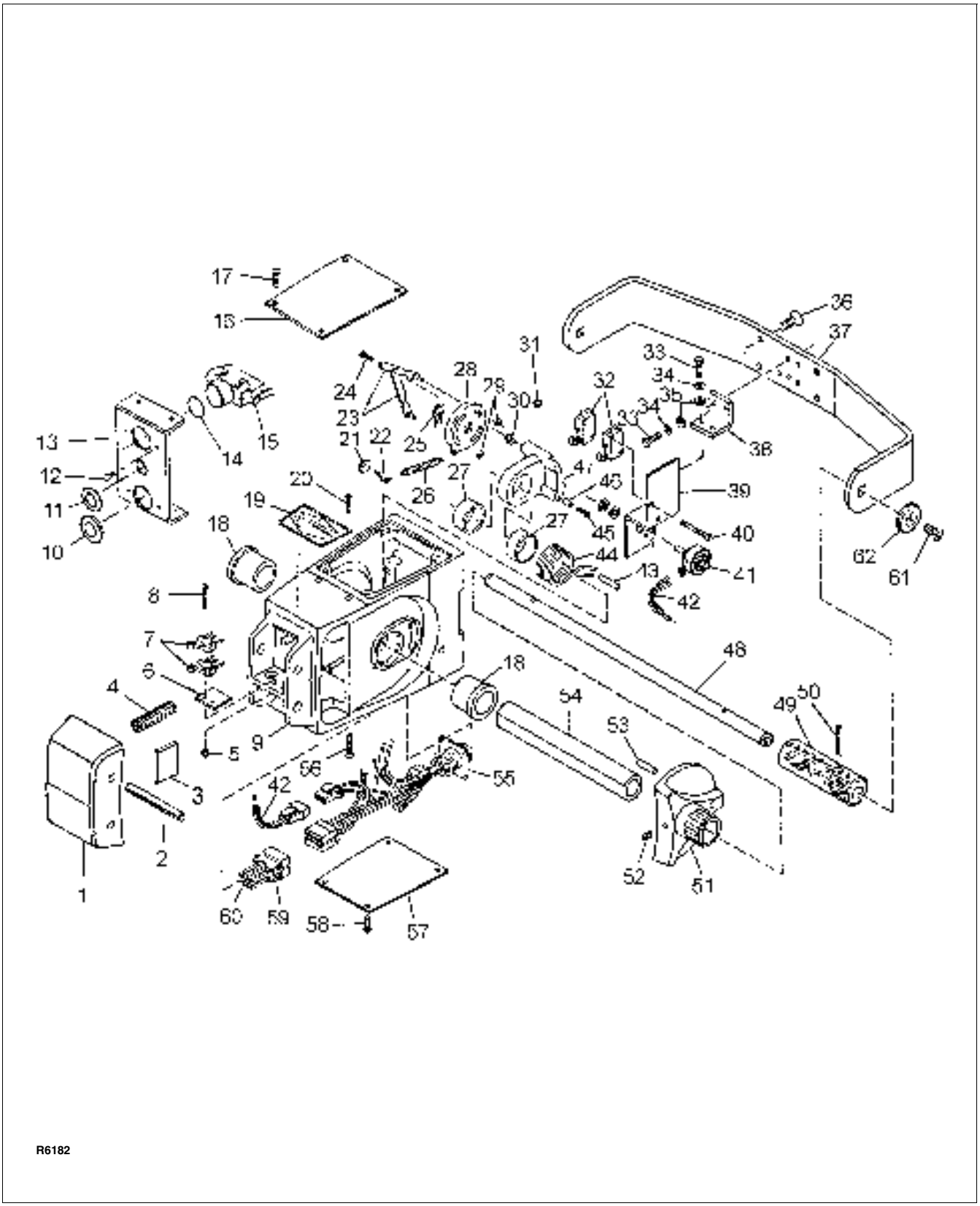

Figure 5-2 Control Head Assembly

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5-3. Potentiometer Testing and Adjustment

1. Disconnect the battery
2. Remove screws (17 and 58, Figure 5-2) and access covers (16 and 57).
3. Check gap between rollers on directional switches (32) and surface of cam (47). If required, adjust position of bracket (39) to obtain a 0.03-0.06 inch clearance.
4. Disconnect the electrical control cable from the electrical control panel. Set an ohmmeter to the RXIK (1000) scale and connect across pin contacts of wires 7 and 11 at the control cable pin housing.
5. Slowly press the control lever (51) in the forward direction until a click indicating forward switch closure is heard. Ohmmeter should indicate 4550 ohms (± 250 ohms).
6. If incorrect reading is obtained, use access hole, in the side of the control head (Figure 5-3) to gain access to the potentiometer. (41, Figure 5-2). Insert a screwdriver blade into the slot on the back side of the potentiometer (Figure 5-3) and turn slightly. Vary the amount and direction of screwdriver rotation until the specified value is achieved.
7. Repeat step 5. while pressing control lever in reverse direction. Meter readings should be the same as for the forward direction (± 200 ohms). If meter readings are not the same, adjust position of bracket (38, Figure 5-2) as necessary to obtain the same values. Adjust the potentiometer again if necessary.
8. Reassemble the control head.

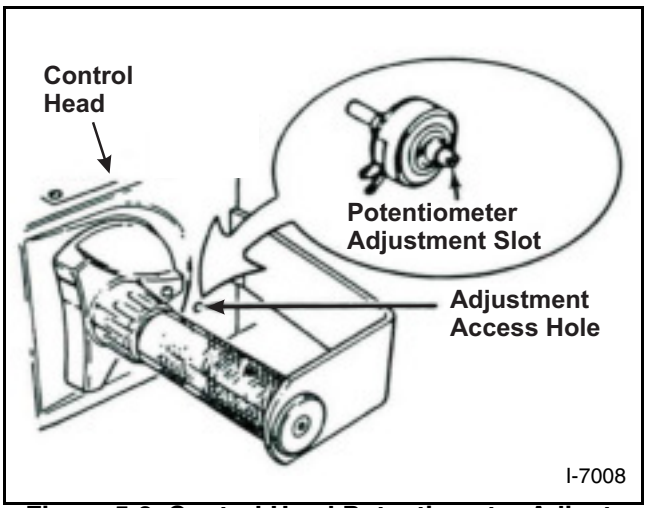

Figure 5-3. Control Head Potentiometer Adjustment

5-4. CONTROL HEAD SWITCH REPLACEMENT.

NOTE: Refer to paragraph 5-5. for speed control switch replacement.

NOTE: For access to belly-button switch, see paragraph 5-2. For access to other switches on the control head, the top cover (16, Figure 5-2) and/or switch plate (13) must be removed.

NOTE: All electrical connections should be tagged with identifying labels before disconnecting.

1. Disconnect battery.
2. If necessary to gain access to defective belly-button switch, remove belly-button casting (1) by performing step 2. in paragraph 5-2.
3. Remove top cover (16) of control head by removing four screws (17).
4. Remove switch plate (13) by removing four screws (20 and 56) on top and bottom of control handle (9).
5. Replace belly-button switches (7), speed control switch (32), or horn switch (15).

NOTE: If the belly-button switch is replaced, adjust it in accordance with paragraph 5-2. before using truck.

6. Replace switch plate (13) and secure with four screws (20 and 56) on top and bottom of control handle (9).
7. Replace top cover (16) on control head, and secure with four screws (17).
8. Reconnect battery.

5-5. SPEED CONTROL SWITCH RETURN SPRING REPLACEMENT.

1. Disconnect battery.
2. Remove four screws (2, Figure 5-5) securing control head (1) to steering arm (3).
3. Disconnect connector (55, Figure 5-2).
4. Remove four screws (17) securing top cover (16) to control head.
5. Disconnect speed control switches (32).
6. Remove four screws (36) securing handle guard (37) to control head.
7. Remove two socket head screws (61) and caps (62) from handle guard (37).
8. Remove handle guard with two brackets (38 and 39) and speed control switches (32) attached.

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9. Remove roll pin (50) from right hand handle grip (49).
10. Remove right hand handle grip from shaft (48).
11. Remove set screw (52) from right hand control lever (51).
12. Remove right hand control lever from tube (54).
13. Observing through top cover opening, slide shaft (48) with tube (54) out left hand side of control head just enough to clear return spring (44).
14. Disengage return spring from spirol pin (43) and remove return spring.
15. Place new return spring in position, engage with spirol pin, and slide shaft (48) with tube (54) back through return spring and out right hand side of control head.
16. Install right hand control lever (51) onto tube (54), and secure with set screw (52).
17. Install right hand handle grip (49) onto shaft (48), align roll pin hole in handle grip with roll pin hole in shaft, and install roll pin.
18. Install handle guard (37), with two brackets (38 and 39) and switches (32) attached, and secure with two caps (62) and screws (61).
19. Install four screws (36) through handle guard and into control head.
20. Reconnect speed control switches (32).
21. Install top cover (16) with four screws (17).
22. Reconnect connector (55).
23. Install control head (1, Figure 5-5) onto steering arm (3) with four socket head screws (2).
24. Reconnect battery.

5-6. STEERING ARM RETURN SPRING ADJUSTMENT.

The tension on the steering arm return spring should allow the steering arm to return gently to the upright position. Excessive tension on the steering arm return spring will cause the steering arm to snap up and may cause damage to the electrical cable, brake linkage, or the spring itself. If the steering arm does not return fully, check for binding in the brake linkage or wiring harness before making any adjustments. If they do not bind, refer to Figure 5-4 and proceed as follows to adjust the steering arm return spring tension.

1. Disconnect the battery.
2. Hold the steering arm (10, Figure 5-4) in the upright position and make sure the arm cannot fall.
3. Insert a 5/16 allen wrench through hole in bottom of steering arm and loosen screw (1). The spring tube (4) will rotate counterclockwise when screw is loosened.
4. With a pair of vise grip pliers, grip the flat surfaces of the spring tube assembly (4) and rotate clockwise 180 degrees.
5. Hold spring tube assembly in rotated position and tighten screw (1) to secure.
6. Check the spring action by lowering the steering arm and returning it to the upright position two or three times.
7. If necessary, repeat steps 2. through 6., increasing or decreasing amount of rotation of the spring tube assembly until steering arm returns gently to full upright position.
8. Reconnect battery.

5-7. STEERING ARM RETURN SPRING REPLACEMENT.

NOTE: Refer to Figure 5-4 for the following procedure.

NOTE: The steering arm return spring is replaced while the steering arm is in the upright position.

1. Disconnect battery.

NOTE: The steering arm has a tendency to fall downward when the tension on the return spring is released.

2. Hold steering arm (10, Figure 5-4) in upright position and make sure the arm cannot fall.
3. With a piece of chalk or crayon, draw a straight line from center of spring tube assembly (4) into pivot cap (14), marking radial position of tube, to facilitate reinstallation.
4. Insert a 5/16 allen wrench through hole in bottom of steering arm and loosen screw (1).

CAUTION: Unless properly supported, steering arm will drop out of pivot cap when spring tube is removed.

5. Put a block under steering arm at pivot cap.

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6. With a pair of vise-grip pliers, grip the flat surfaces of spring tube assembly (4), and slowly pull it free from the steering arm, pivot cap and tube clamp (13).

NOTE: Steering arm return spring (5) will remain inside the spring tube assembly (4).

7. Remove steering arm return spring (5) from spring tube assembly (4).
8. Lubricate the ends and outer surface of the new steering arm return spring (5) with a lithium base general purpose grease.
9. Insert spring into spring tube assembly and press in, making sure that one spring loop eye fits over the roll pin at the closed end of the spring tube assembly.
10. Slide spring tube assembly into pivot cap (14) and steering arm (10) through tube clamp (13) and through loop of electrical cable.
11. Align radial position of spring tube assembly in accordance with line drawn in step 3. Slowly rotate spring tube assembly a few degrees each way until the steering arm return spring snaps into place over spring pins (11 and 12) then tighten screw (1).
12. Apply engine lubricating oil (No. 2) to the steering arm elbow.
13. Remove block from under steering arm.
14. Adjust tension on steering arm return spring as explained in paragraph 5-6.
15. Reconnect battery.

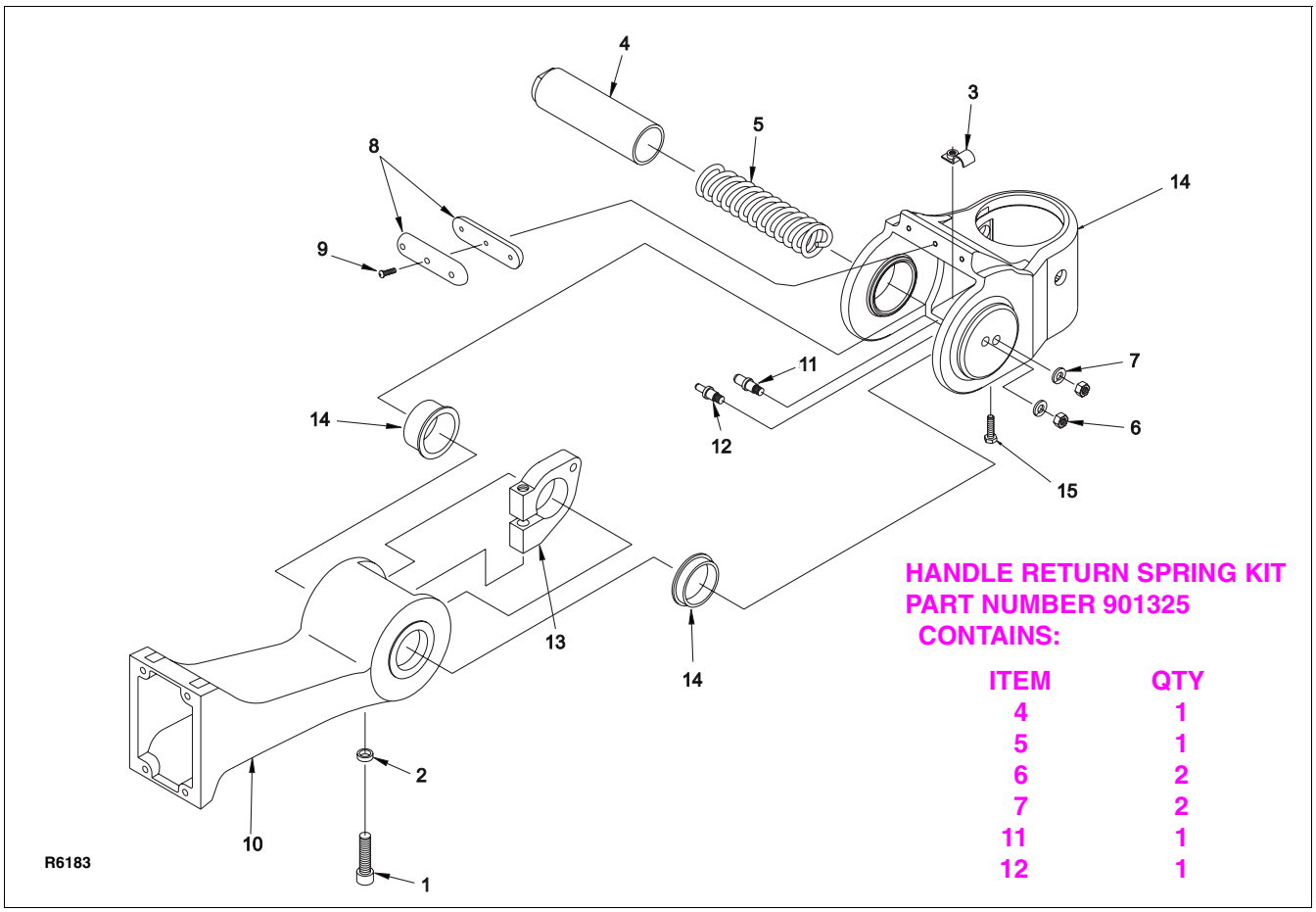

Figure 5-4 Steering Arm and Electrical Cable

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5-8. PIVOT TUBE FLANGED BUSHING REPLACEMENT.

NOTE: Replacement of the pivot tube and flanged bushing requires the removal of the steering arm and pivot cap, and transmission/motor/brake assembly.

NOTE: All electrical connections and cabling should be tagged with identifying labels before disconnecting.

NOTE: A chain hoist is required for this procedure.

1. Remove the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
2. Remove four nuts (9, Figure 5-5), four lock washers (8), ring (7) and pivot tube guide (6).

NOTE: When installing the new pivot tube guide (6), refer to Figure 5-5 to be sure it is positioned properly.

3. Place new pivot tube guide (6) in the frame opening and secure with ring (7), four lock washers (8), and four nuts (9).
4. Reinstall the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
5. Check truck for proper operation before returning to service.

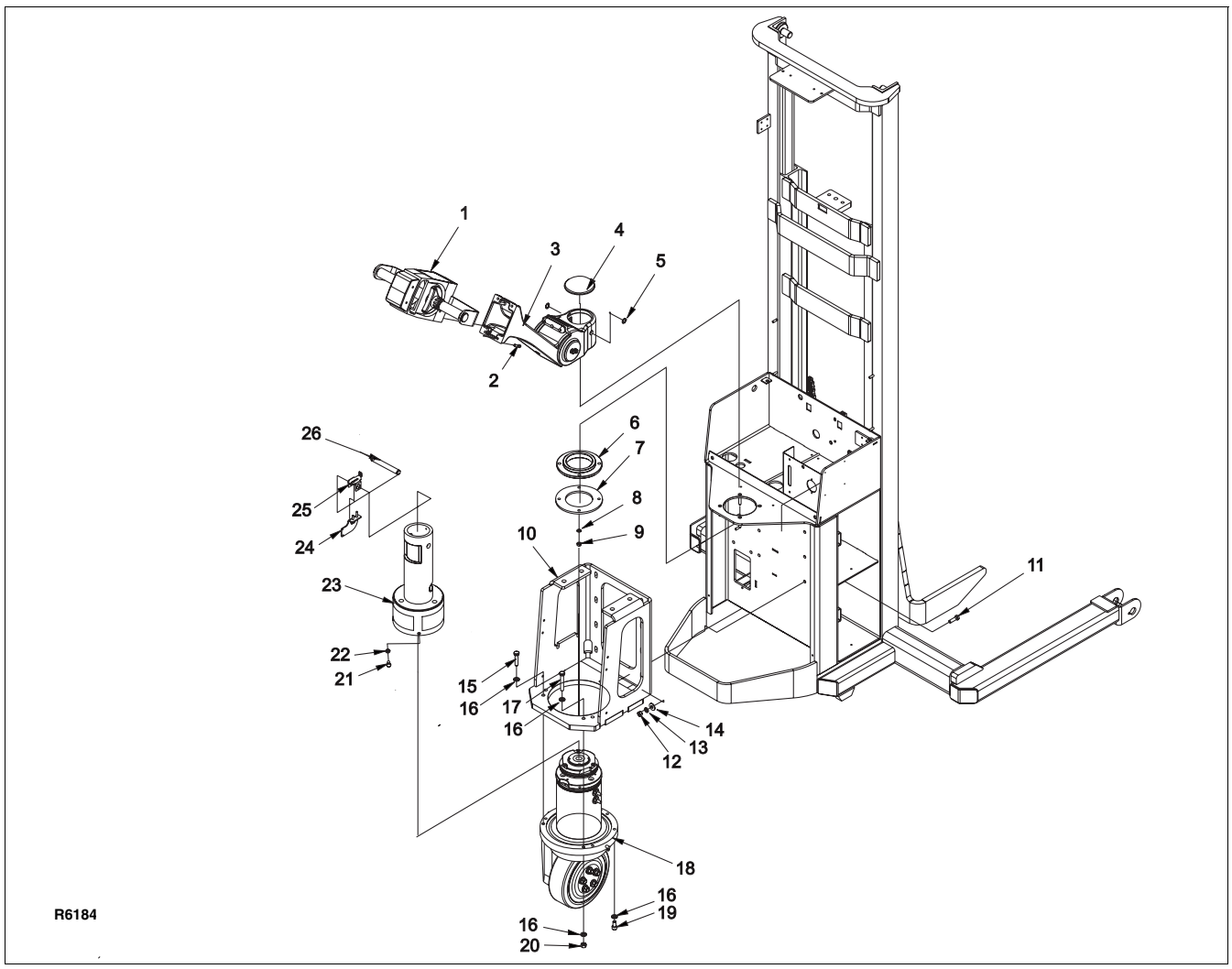

Figure 5-5 Pivot Tube and Transmission Assembly

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5-9. ELECTRICAL CONTROL CABLE REPLACEMENT.

NOTE: Refer to Figure 5-6 while performing the following procedure.

1. Disconnect battery.

NOTE: When removing control head in the following step, be sure to hold it in place until cable is disconnected.

2. Remove four screws (7, Figure 5-6) that secure control head to steering arm.
3. Disconnect connector (8), and set aside control head.
4. Use Amp Extraction Tool, **Part Number 900750** to push out and disconnect wire pins from connector (8).
5. Remove cable clamps (1, 2) and loosen loop of cable that surrounds the spring tube assembly (3).
6. Remove pivot cap cover (6).
7. Remove snap rings (5, Figure 5-5), pin (26) and the deadman switch as described in SECTION 6.
8. Pull disconnected end of old cable through steering arm and pivot cap, then up through pivot cap cover opening.
9. Tape the disconnected end of the old cable to the connector (9, Figure 5-4) on the new cable.
10. Grease the new cable with a lithium-base grease or silicone spray.
11. Remove base access cover.
12. Disconnect old connector (9, Figure 5-6) from electrical control panel.
13. Disconnect cable wire number 7 from the horn.

NOTE: When performing step 14., be sure to leave enough cable exposed through pivot cap cover opening to loop around spring tube assembly and reach through steering arm to control head.

14. Draw new cable into pivot tube (10) by pulling old cable out through the base access opening.
15. Untape the end of old cable from connector (9) end of new cable.
16. Connect the new cable connector (9) to the connector on the electrical control panel.
17. Route and connect cable wire number 7 to the horn.
18. Wipe off excess grease or silicone spray from exposed parts of the cable.
19. Route connector (8) end of cable under spring tube assembly (3) and out the opening at the elbow.
20. Eliminate cable slack in pivot tube (10); then secure cable with cable clamp (1).

CAUTION: Improper cable loop adjustment while performing the following step will damage the cable. If too tight, the cable will tear when the steering arm is in the up position. If too loose, the cable will buckle or be pinched when the steering arm is in the down position.

21. Loop cable around spring tube assembly (3) as illustrated and push connector (8) end of cable through steering arm.
22. Secure cable with cable clamp (2).

NOTE: Although a new connector (8) is supplied with the new cable, it is not attached. The new connector (8) must be attached to the wire connector pins of the new cable. Each wire is numbered and must be connected to its corresponding pin receptacle number in the connector.

23. Plug the wire pins into their corresponding receptacles in the connector (8).
24. Position the control head close enough to the steering arm to reach the connector (8).
25. Reconnect the connector (8) to the corresponding connector in the control head.
26. Secure the control head to the steering arm with the four screws (7).
27. Install and adjust the deadman switch, snap rings (5, Figure 5-5) and pin (26) as described in SECTION 6.
28. Reconnect battery.

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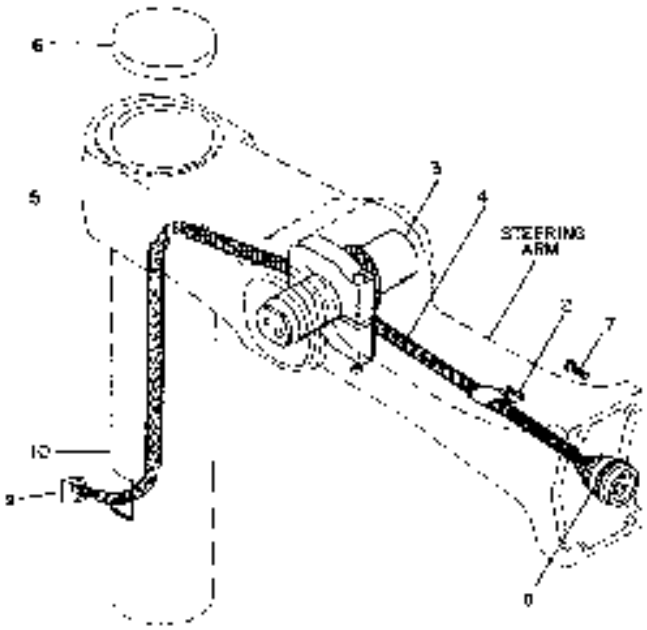

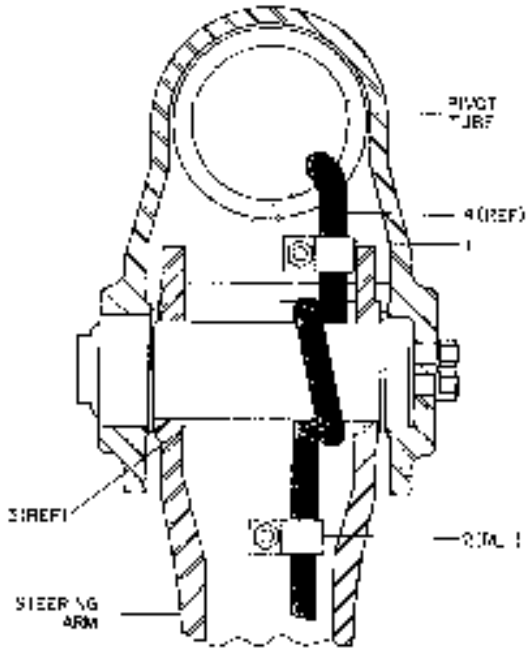

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Figure 5-6 Electrical Control Cable Replacement

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SECTION 6
BRAKE SERVICING

6-1. DEADMAN SWITCH ADJUSTMENT

If the electrical brake does not engage when the steering arm is raised or lowered into the shaded area in Figure 6-1, proceed as follows:

1. Disconnect battery connections.
2. Remove pivot cap cover (4, Figure 6-3).
3. Loosen nuts (17, Figure 6-2) and adjust deadman switch (12) so that switch clicks when the control arm is raised and lowered to the shaded areas shown in Figure 6-1.
4. Tighten nuts (17).
5. Reinstall pivot cap cover (4, Figure 6-3).
6. Reconnect battery.
7. Check truck for proper operation before returning to service.
8. If necessary, adjust the electric brake as described in paragraph 6-3.1.

6-2. DEADMAN SWITCH REPLACEMENT

1. Disconnect battery connections.
2. Remove pivot cap cover (4, Figure 6-3).
3. Remove one snap ring (5) and drive out pin (26) until it clears bracket (19, Figure 6-2).
4. Remove screw (14), lock washer (15) and washer (18) securing bracket (19).
5. Pull bracket (19) up, disconnect the wires and remove the brackets and switch (12).
6. Remove nuts (13), screws (10) and switch (12).
7. Secure the new switch to bracket (11) with screws (10) and nuts (13).
8. Reconnect the wires to switch (12), position in the pivot tube and secure bracket (19) with screw (14), lock washer (15) and washer (18).
9. Drive pin (26, Figure 6-3) back in place and secure with snap ring (5).
10. Adjust the deadman switch as describe in paragraph 6-1.

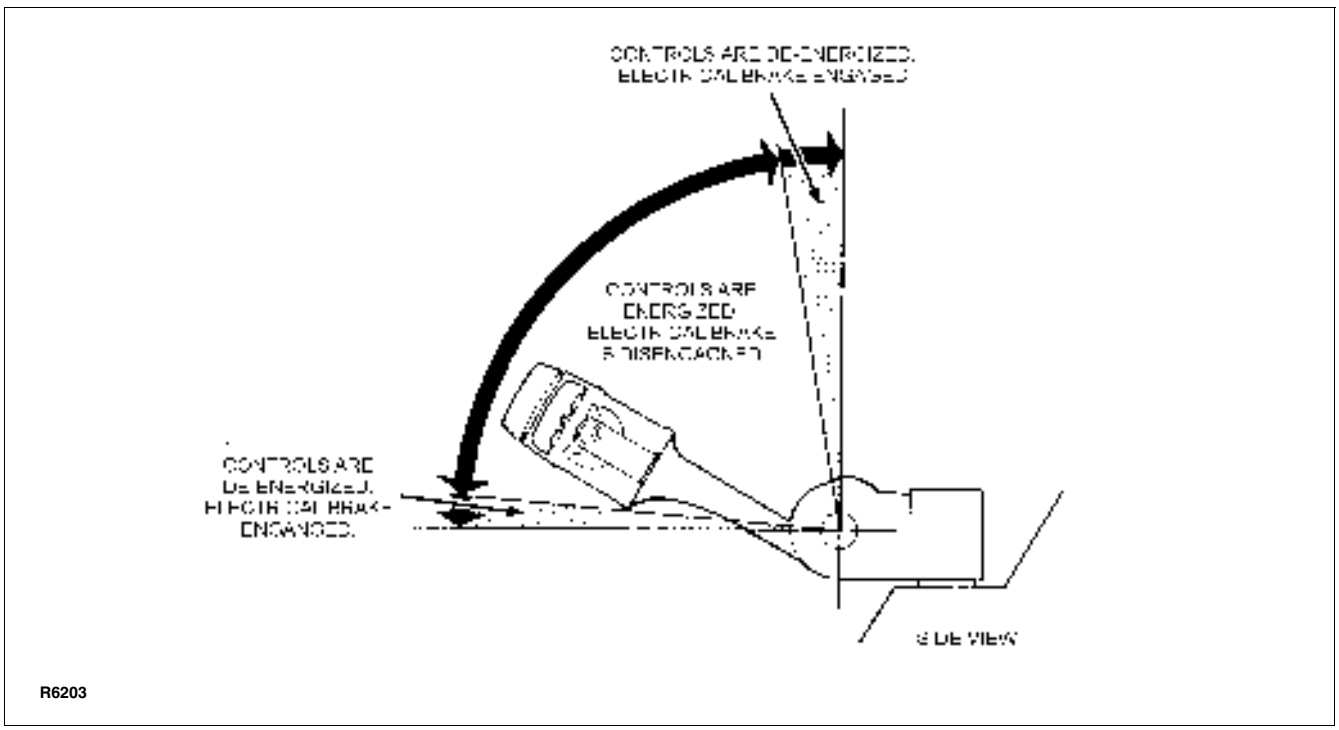

Figure 6-1 Brake Engage/Disengage

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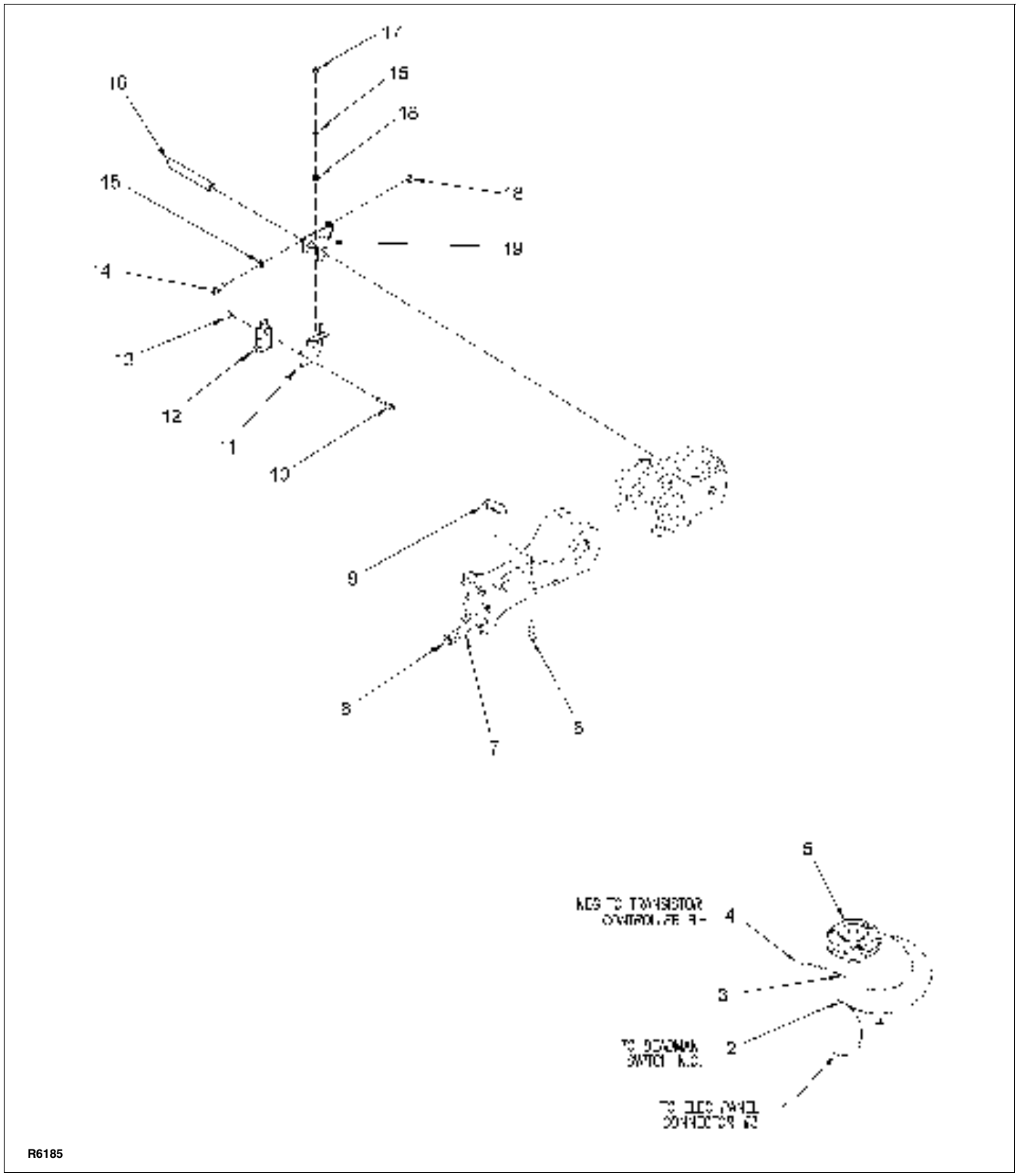

Figure 6-2 Brake and Actuator

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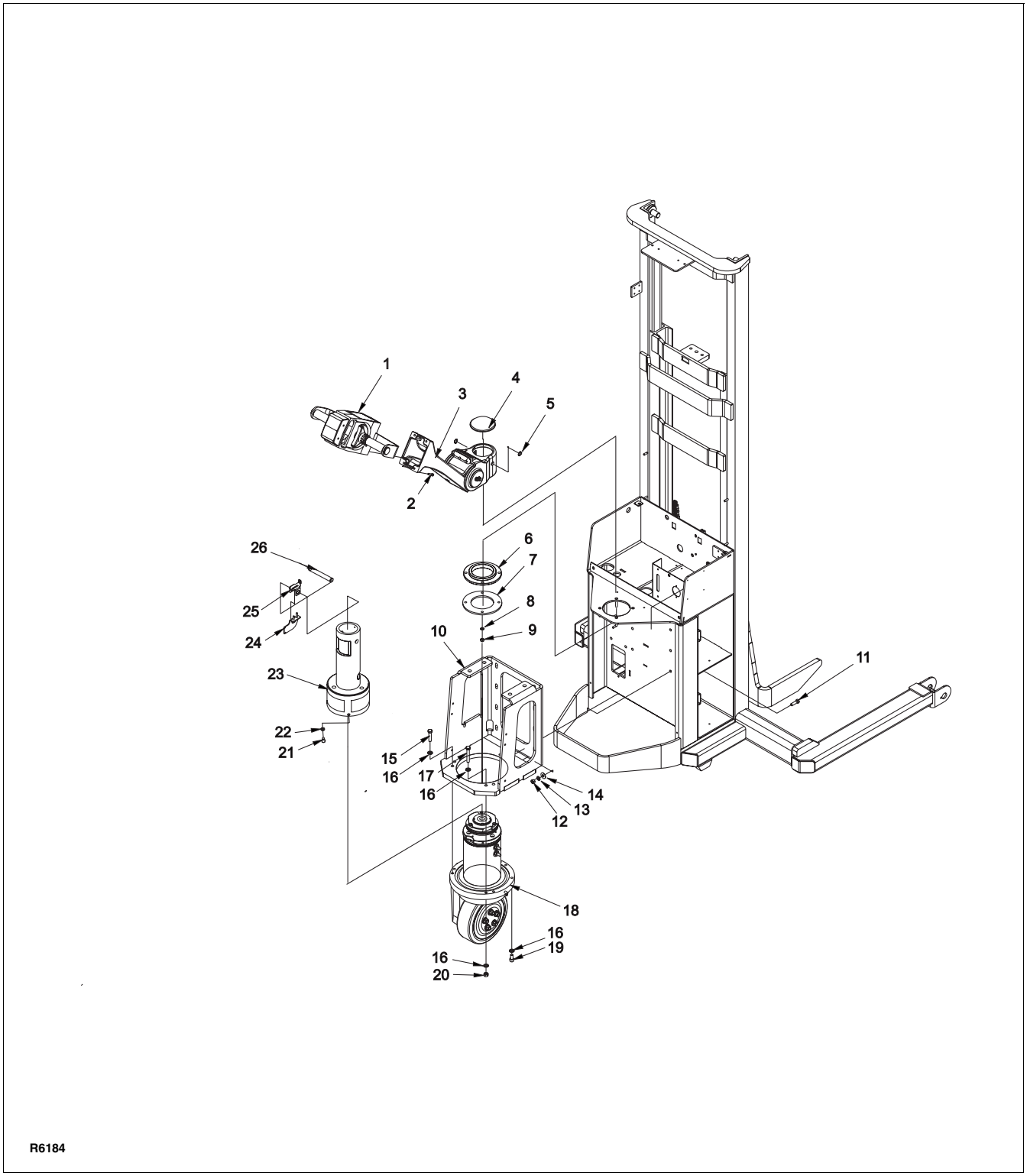

Figure 6-3 Pivot Tube and Transmission Assembly

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6-3. ELECTRIC BRAKE

The electric brake is spring applied, electrically disengagned. The brake can be adjusted for normal wear or the rotor can be replaced.

6-3.1. Brake Adjustment Serial Number 376500 to 377143

NOTE: Adjustment of the brake requires the removal of the steering arm and pivot cap, and transmission/motor/brake assembly.

NOTE: All electrical connections and cabling should be tagged with identifying labels before disconnecting.

NOTE: A chain hoist is required for this procedure.

1. Remove the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
2. Remove four screws (21, Figure 6-3) and four lock washers (22).
3. Remove pivot tube (23) from the transmission/motor/brake assembly (18).
4. Remove dust ring (1, Figure 6-4).

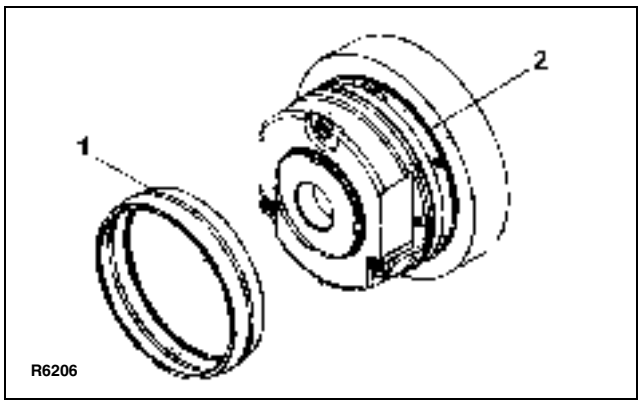

Figure 6-4 Dust Ring Removal

5. Using a standard feeler gauges, check the gap between anchor plate (2, Figure 6-5) and magnet body (1). The gap should be 0.012” (0.3 mm).
6. If necessary, adjust the gap as follows:
   a. Loosen the three bolts (4) by half a turn.
   b. The threaded collars (3) which surround bolts (4) can then be screwed into magnet body (1) by turning counterclockwise.
   c. Turn the three bolts (4) clockwise until the gap measured in step 5. is 0.012” (0.3 mm).
   d. The threaded collars (3) are then screwed clockwise until they bottom.
   e. Finally tighten bolts (4) and recheck the gap as described in step 5.

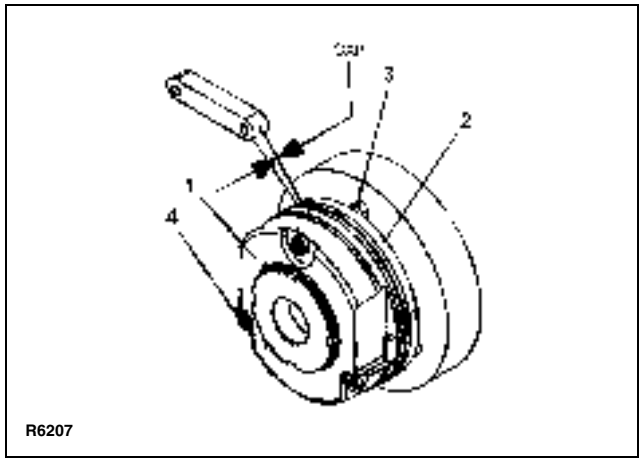

Figure 6-5 Brake Adjustment

7. Reinstall dust ring (1, Figure 6-4).
8. Reinstall the pivot tube (23, Figure 6-3) onto the transmission/motor/brake assembly (18) and secure with four screws (21) and four lock washers (22).
9. Reinstall the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
10. Check truck for proper operation before returning to service.

6-3.2. Brake Adjustment Serial Number 377144 and Higher

1. Working thru the openings in pivot tube (23, Figure 6-3), free dust ring (1, Figure 6-4).
2. Using a standard feeler gauges, check the gap between anchor plate (2, Figure 6-5) and magnet body (1). The gap should be 0.012” (0.3 mm).
3. If necessary, adjust the gap as follows:
   a. Working thru the three holes in pivot tube (23, Figure 6-3), loosen the three bolts (4, Figure 6-5) by half a turn.
   b. The threaded collars (3) which surround bolts (4) can then be screwed into magnet body (1) by turning counterclockwise.
   c. Turn the three bolts (4) clockwise until the gap measured in step 5. is 0.012” (0.3 mm).
   d. The threaded collars (3) are then screwed clockwise until they bottom.
   e. Finally tighten bolts (4) and recheck the gap as described in step 5.
4. Slide dust ring (1, Figure 6-4) back into position.

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5. Check truck for proper operation before returning to service.

6-3.3. Removal

NOTE: Adjustment of the brake requires the removal of the steering arm and pivot cap, and transmission/motor/brake assembly.

NOTE: All electrical connections and cabling should be tagged with identifying labels before disconnecting.

NOTE: A chain hoist is required for this procedure.

1. Remove the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
2. Remove four screws (21, Figure 6-3) and four lock washers (22).
3. Remove pivot tube (23) from the transmission/motor/brake assembly (18).
4. Remove three bolts (4, Figure 6-5) and remove the electric brake from the drive motor.

6-3.4. Disassembly and Reassembly

1. Remove dust ring (6, Figure 6-6).
2. Remove friction plate (5) and rotor (4) from magnetic body assembly (3).
3. Install new friction plate (5) and rotor (4) in magnetic body assembly (3).
4. Reinstall dust ring (6).

6-3.5. Installation

1. Position the electric brake on the drive motor and install three bolts (4, Figure 6-5).
2. Reinstall the pivot tube (23, Figure 6-3) onto the transmission/motor/brake assembly (18) and secure with four screws (21) and four lock washers (22).
3. Reinstall the pivot tube with transmission/motor/brake assembly as described in SECTION 7.
4. Check truck for proper operation before returning to service.

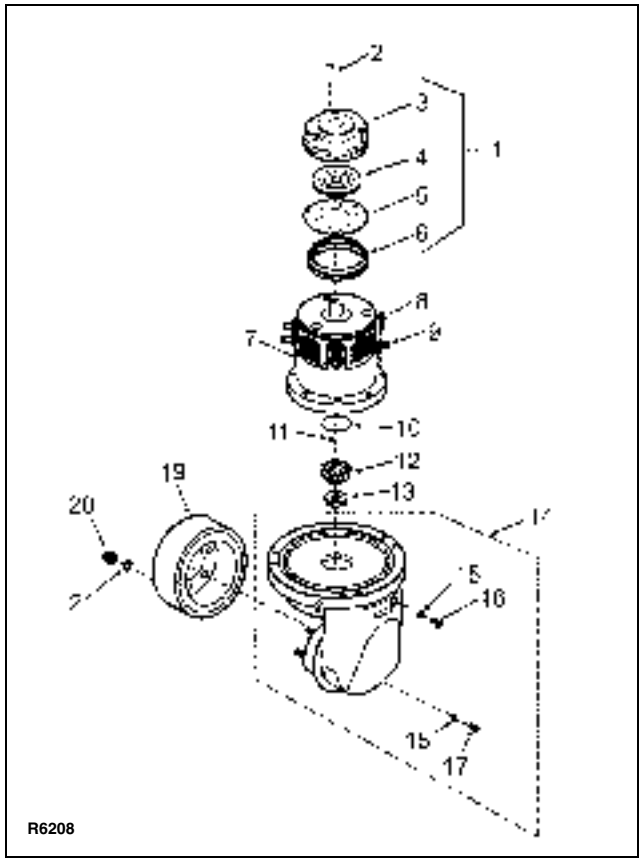

Figure 6-6 Transmission/Motor/Brake Assembly

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NOTES

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SECTION 7
TRANSMISSION, DRIVE WHEEL, AND LOAD WHEEL SERVICING

7-1. DRIVE WHEEL REMOVAL.

1. Raise the rear of the truck using jacks or other suitable means so that drive wheel is off the floor.
2. Remove the five lug nuts (20, Figure 7-1) and washers (21).
3. Remove wheel assembly (19).
4. Position the new drive wheel on the lugs and secure with washers (21) and lug nuts (20).
5. Tighten lug nuts (20) to 58 lb ft (80 Nm).

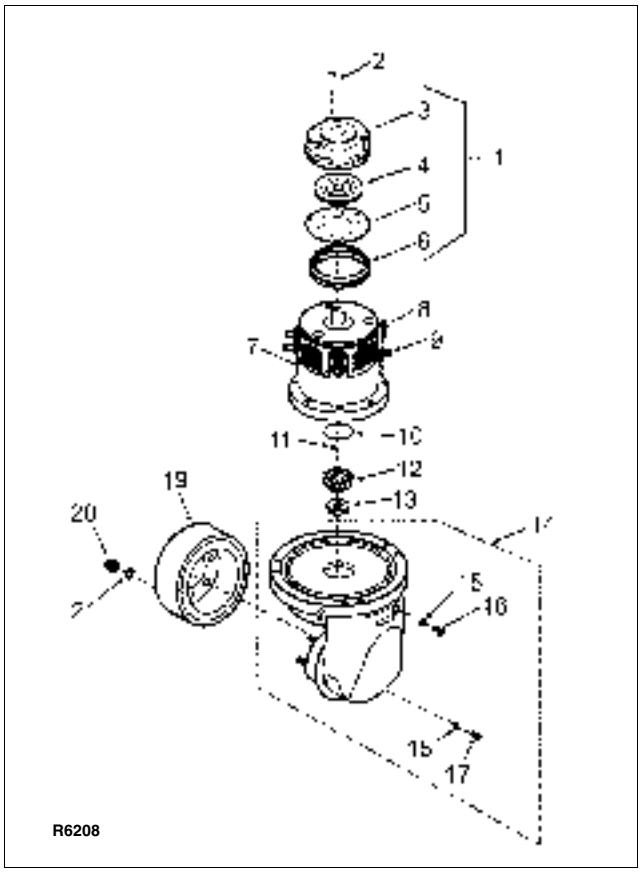

Figure 7-1 Transmission/Motor/Brake Assembly

7-2. TRANSMISSION, MOTOR AND BRAKE ASSEMBLY REMOVAL.

NOTE: All electrical connections and cabling should be tagged with identifying labels before disconnecting.

NOTE: A chain hoist is required for this procedure.

1. Disconnect battery.
2. Block load wheels securely.
3. Disconnect the electrical control cable from the electrical control panel.
4. Disconnect the wire to the horn.
5. Disconnect the four cables connected to the drive motor.
6. Remove pivot cap cover (4, Figure 7-3).
7. Remove the deadman switch, snap rings (5) and pin (26) as described in 6-2.
8. Remove control arm (3) with control head (1), and electrical control cable from pivot tube assembly.
9. Using a suitable means, raise truck frame around drive wheel enough to provide clearance for removal of the transmission/motor/brake assembly (18).
10. Position a chain hoist above the pivot tube.
11. Use tool kit part number 907151 to connect a chain to pivot tube as follows:
    a. Position spacer, Figure 7-2, inside the pivot tube.
    b. Insert the pin through the pivot tube and secure with the cotter pin.
    c. Attach chain hoist to the spacer and apply tension to the hoist.

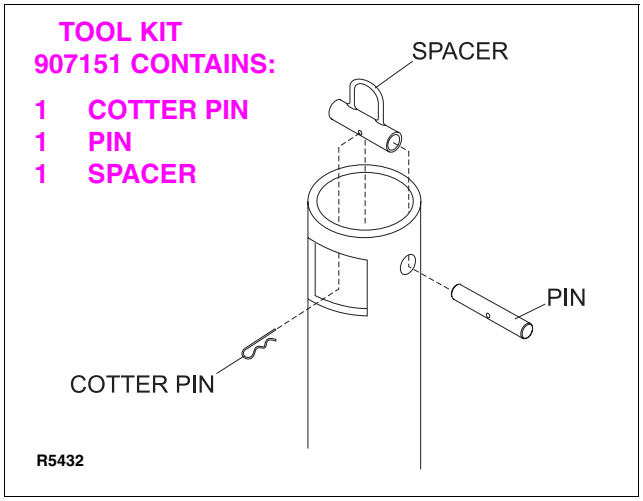

Figure 7-2 Pivot Tube Removal Tool

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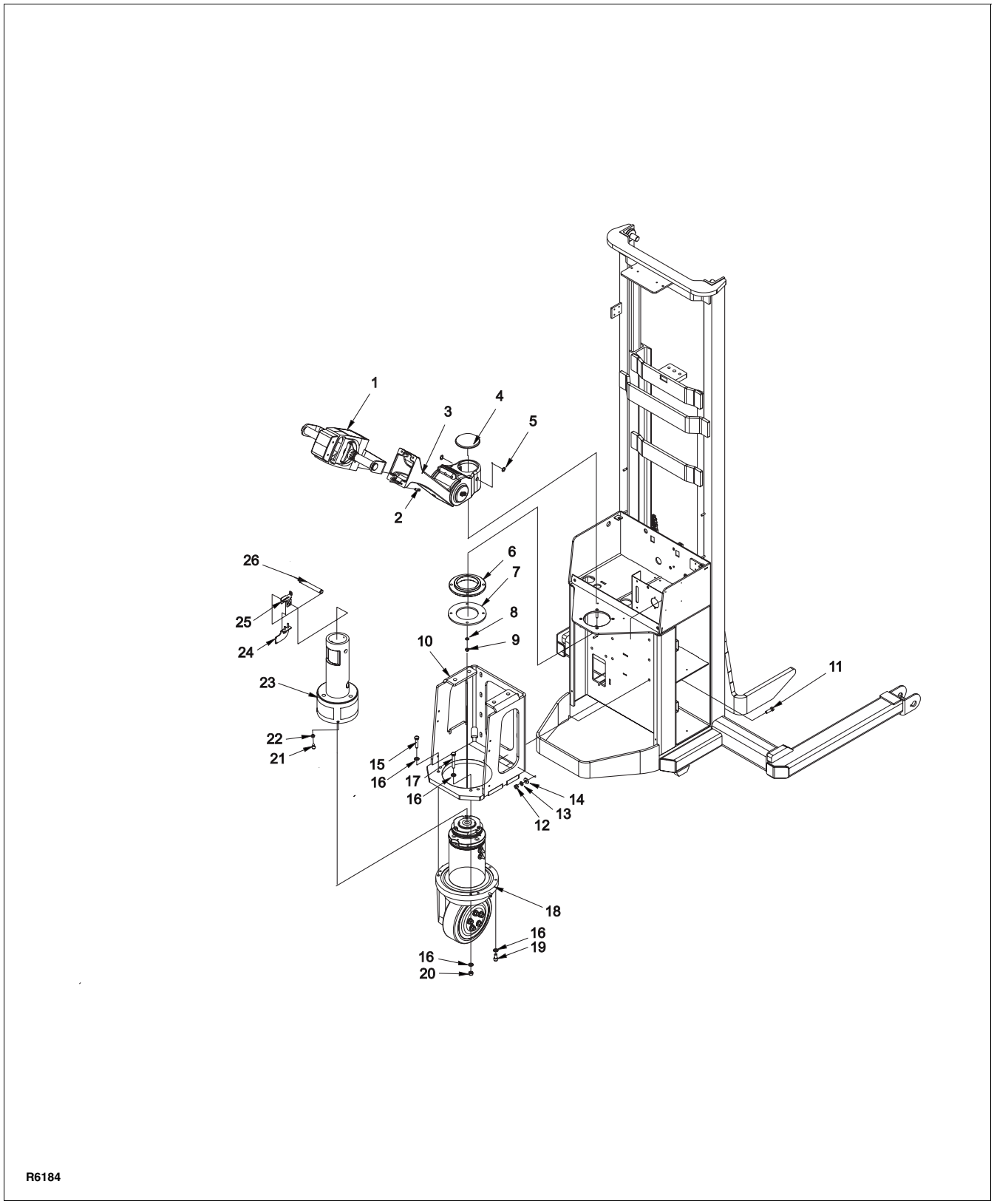

Figure 7-3 Pivot Tube and Transmission Assembly

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12. Remove screw (19, Figure 7-3) with lock washer (16) from transmission (18).
13. Remove nut (20), screw (17), and two lock washers (16).
14. Remove five screws (15) and five lock washers (16).
15. Slowly lower the pivot tube with transmission/motor/brake assembly out the bottom of the frame.

WARNING: The following step requires two people as heavy lifting is involved.

16. Lift out the pivot tube and transmision/motor/brake asembly.

NOTE: Pivot tube flanged bushing is covered in paragraph 5-8.

17. Remove the four screws (21) and four lock washers (22) and remove pivot tube (23).

NOTE: Electric brake removal is covered in paragraph 6-3.3. and electric brake adjustment is covered in paragraph 6-3.1.

NOTE: The drive motor is covered in paragraph 10-5.

7-3. TRANSMISSION, MOTOR AND BRAKE ASSEMBLY INSTALLATION.

1. Position pivot tube (23, Figure 7-3) on the transmision/motor/brake assembly and secure with four screws (21) and four lock washers (22).
2. Connect hoist chain to pivot tube as described in paragraph 7-2.
3. Slowly raise the pivot tube with transmission, being careful to check for alignment with the pivot tube guide (6) and bracket (10).
4. Install five screws (15) and five lock washers (16).
5. Install nut (20), screw (17), and two lock washers (16).
6. Install screw (19) with lock washer (16).
7. Lower the truck frame fully and remove the lifting device.

CAUTION: Be sure to observe cable routing and positioning when reinstalling electrical control cable to prevent cable damage.

8. Install the control arm (3) with control head (1), and electrical control cable on pivot tube assembly.
9. Install and adjust the deadman switch, snap rings (5) and pin (26) as described in SECTION 6.
10. Install pivot cap cover (4).
11. Connect the electrical control cable to the electrical control panel.
12. Connect the wire to the horn.
13. Connect the four cables connected to the drive motor.
14. Reconnect battery.
15. Remove the blocks from the load wheels.
16. Check truck for proper operation before returning to service.

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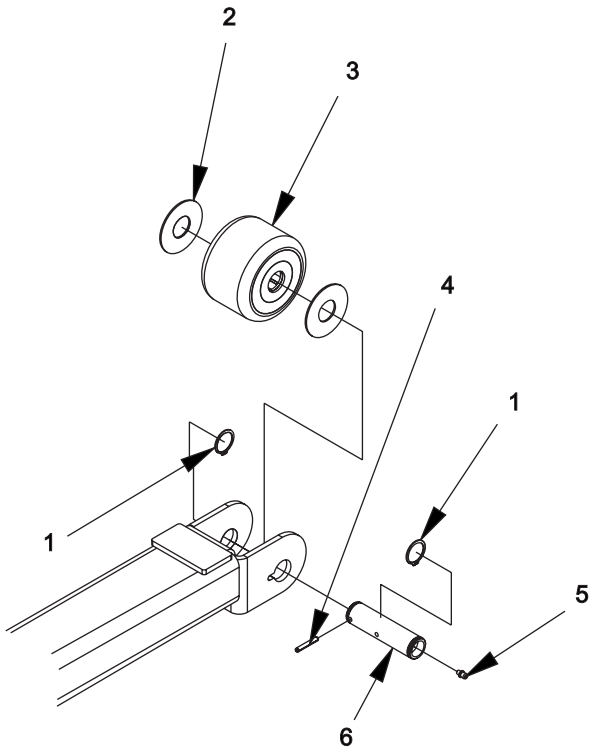
7-4. LOAD WHEELS.

NOTE: Refer to Figure 7-4 for the following procedure.

1. Block the caster wheels and remaining load wheel securely, and set the brakes.
2. Raise front end of lift truck with a jack or another lift truck. Place strong supports under straddle leg immediately in back of wheel housing so that the load wheel being replaced is held approximately one inch from the floor.
3. Remove the two snap rings (1, Figure 7-4) securing the load wheel axle (6).
4. Remove axle (6) with roll pin (4). Load wheel (3) will drop free, along with two spacers (2), one on each side, which position wheel on axle.
5. Remove the bearing from wheel (3).
6. Clean and check bearing for defects. Replace bearing if defective.
7. Lubricate bearing.
8. Reinstall the bearing into load wheel (3).
9. Position load wheel (3) and spacers (2) in straddle leg with axle holes aligned.
10. Install axle (6) with roll pin (4) through straddle leg and load wheel.
11. Install snap rings (1) on both end of axle.
12. Lubricate axle through grease fitting (5).
13. Remove supports from under straddle leg, lower front end of lift truck, remove wheel blocks, and release brakes.



LOAD WHEEL AND AXLE KIT PART NUMBER 901326 CONTAINS:

ITEM	QTY
1	2
2	2
3	1
4	1
5	1
6	1

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Figure 7-4 Load Wheels

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SECTION 8
ELEVATION SYSTEM SERVICING

8-1. GENERAL.

The elevation system includes the outer mast, inner mast, platform, lift chains, lift cylinder, and ram head.

8-2. LIFT CHAIN WEAR INSPECTION

Both lift chains should be replace when either chain is worn enough to increase it's length by 3% or more. To make this determination proceed as follows.

Using a section of chain that sees the most frequent operation over the chain sheaves, isolate a vertical portion under tension from the weight of platform.

Measure the distance between pin centers on 20 vertical links. If the section measures 12.88" or more, the chain should be replaced.

New chain anchor pins should be installed when chains are replaced. Never replace a partial section of chain and never repair a damaged chain. Refer to paragraph 8-4. when installing new chain.

8-3. LIFT CHAIN LENGTH ADJUSTMENT.

1. Lower the platform fully, then disconnect battery.

WARNING: Before attempting any adjustment, make certain power is disconnected.

2. Loosen top jam nuts (17, Figure 8-1) on adjusting bolts (16).
3. Take up slack in both lift chains with hex nut (15) on the adjusting bolt. Strive for equal tension on chains.
4. Align adjusting bolts so each clevis pin is parallel to ram head (9).

CAUTION: At least 3 full threads must be present below hex nut (15) after completion of adjustment.

5. Tighten jam nuts securely while maintaining alignment of adjusting bolts.
6. Reconnect battery.
7. Test chain by operating carriage. If slack is still apparent, repeat above procedure.

8-4. LIFT CHAIN REPLACEMENT.

1. With the lift truck wheels securely blocked and with brake set, raise forks approximately three feet from floor and position blocks or strong supports under inner mast (4, Figure 8-1).
2. Lower platform until it is supported by the block and the load chains are slack, then disconnect battery.

WARNING: Before attempting any actual replacement, make certain power is disconnected.

3. Remove cotter pin (12, Figure 8-1) and clevis pin (11) from end of chain connected to mast cross brace.
4. Remove cotter pin (12) and clevis pin (11) from chain adjusting bolt (16).
5. Remove chain from ram head assembly (9) and lay aside for repair.
6. Position new chain in place on ram head assembly (9).
7. Connect one end of the chain to adjusting bolt (16) and secure with clevis pin (11) and cotter pin (12).
8. Connect the other end of the chain to mast cross brace with clevis pin (16) and cotter pin (16).
9. Adjust chain according to paragraph 8-3.

8-5. LIFT CYLINDER REMOVAL.

1. With the lift truck wheels securely blocked and with brake set, raise platform approximately three feet from floor and position blocks or strong supports under inner mast (4, Figure 8-1).
2. Lower inner mast onto support. Check that arrangement is secure before proceeding.
3. Disconnect battery.
4. Remove two cap screws (7), two lock washers (8), one cap screw (6) and one lock washer (5) that join the top of the inner mast (4) to the ram head (9).
5. Open the emergency lowering valve and, at the same time, manually push the ram down as far as possible. The chains will become slack and need not be removed.
6. Close the emergency lowering valve.
7. Remove overflow tubing retainers alongside of the lift cylinder assembly (10).

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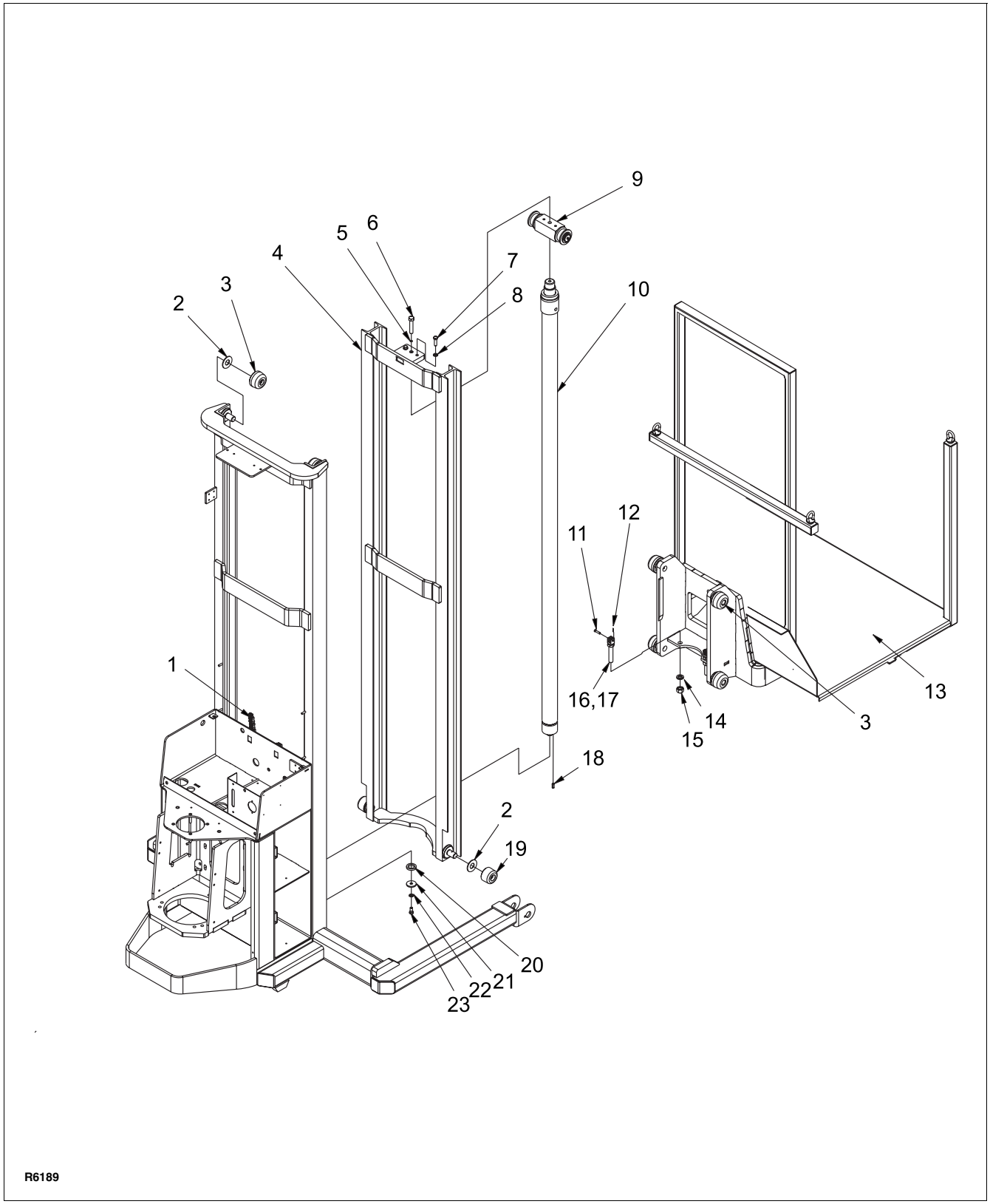

Figure 8-1 Elevation System

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WARNING: Before disconnecting any hydraulic line, be sure the system is not under pressure.

8. Disconnect hose assembly from bottom of lift cylinder. Disconnect overflow tubing from top of lift cylinder (10).
9. Lift chains clear of ram head (9) and lay them aside.
10. Remove screw (23), lock washer (22), plain washer (21) and spacer (20) from underside of cylinder.

WARNING: Support lift cylinder before performing the following steps to prevent cylinder from falling.

11. Tilt the lift cylinder (10) and ram head (9) forward from their position in the lift truck.
12. Lift ram head from lift cylinder.
13. Raise lift cylinder assembly up and out of truck.

NOTE: Disassembly of lift cylinder is covered in SECTION 9.

14. Reinstall lift cylinder in reverse order of removal.
15. Adjust chain according to paragraph 8-3.

8-6. RAM HEAD REMOVAL.

WARNING: Make certain power is disconnected before attempting to remove ram head.

1. With the lift truck wheels securely blocked and with brake set, raise platform approximately three feet from floor and position blocks or strong supports under inner mast (4, Figure 8-1).
2. Lower inner mast onto support. Check that arrangement is secure before proceeding.
3. Disconnect battery.
4. Remove two cap screws (7), two lock washers (8), one cap screw (6) and one lock washer (5) that join the top of the inner mast (4) to the ram head (9).
5. Open the emergency lowering valve and, at the same time, manually push the ram down as far as possible. The chains will become slack and need not be removed.
6. Close the emergency lowering valve.
7. Lift chains clear of ram head (9) and lay them aside.
8. Lift ram head (25) from lift cylinder (24).

8-7. LUBRICATION OF MAST.

Fully lower platform, then apply a (Lithium base) general purpose grease, using a lubrication gun, to the following components:

1. Grease fittings on platform rollers (3, Figure 8-1).
2. Grease fittings on ram head (9).

Using a brush, apply the same Lithium base general purpose lubricant to the full length of the mast channel where the rollers ride. Upon completion, operate the mast to allow lubricant to spread evenly.

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SECTION 9
HYDRAULIC SYSTEM SERVICING

9-1. RELIEVING SYSTEM PRESSURE.

WARNING: Hydraulic system pressure must be relieved before removing hydraulic system components. Use the following procedure to relieve system pressure:

1. Fully lower the platform.
2. Obtain a suitable container to catch any oil that may escape when opening a line.
3. Open the low pressure line at any convenient connection near the component that is to be repaired or replaced.

9-2. FLOW CONTROL VALVE REPLACEMENT.

NOTE: Figure 9-1 show the relationship of all components in the hydraulic system. Refer to these figures for the following procedure.

1. With the lift truck wheels securely blocked and with the brake set, raise platform approximately three feet from floor. Position blocks or strong supports under the inner mast (on telescopic model) or under lift carriage (on non telescopic model) while hydraulic system is under repair.
2. Lower inner mast or lift carriage onto supports. Check that the arrangement is secure before proceeding.
3. Disconnect battery.

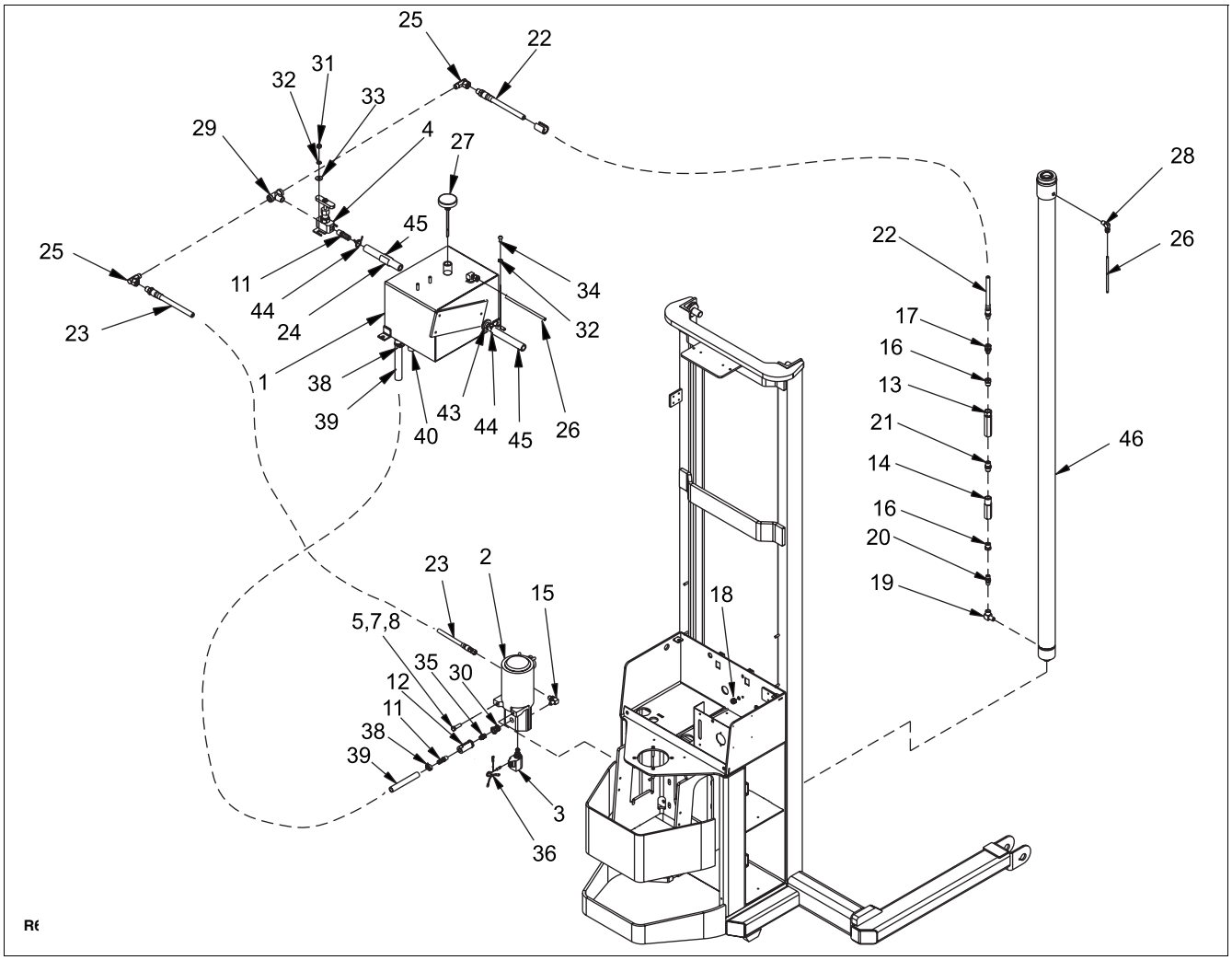

Figure 9-1 Hydraulic System

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4. Remove the two cap screws and two lock washers securing the top of the inner mast to the ram head.
5. Open the emergency lowering valve and, at the same time, manually push the ram down as far as possible. The chains will become slack and need not be removed.

NOTE: A small amount of hydraulic oil will drain from the system when the hydraulic line is disconnected. Use rags or suitable container to catch the draining oil.

6. Disconnect hose (22, Figure 9-1) and remove connector (17), reducer (16), relief valve (13) and nipple (21) from flow control valve (14).
7. Remove flow control valve.
8. Install new flow control valve (14) with direction arrow on flow control valve pointing toward lift cylinder.
9. Reinstall nipple (21), relief valve (13), reducer (16), and connector (17).
10. Reconnect hose (22).
11. Resecure ram head with the two cap screws and lock washers.
12. Reconnect battery.
13. Check oil level on dip stick. If low, fill to ``FULL'' mark on dip stick with Big Joe hydraulic oil **Part Number 900855**.
14. Raise forks, then remove supports.
15. Check for leaks.

9-3. SUCTION LINE FILTER REPLACEMENT.

1. Lower platform fully to insure that all pressure is relieved from hydraulic system.
2. Remove reservoir drain plug (40, Figure 9-1), and drain oil into suitable container.
3. Remove clamp (38) and tubing (39) from nipple (11).
4. Remove nipple (11) from filter (12).
5. Unscrew filter (12) from nipple (35).
6. Install new filter (12) on nipple (35).
7. Install nipple (11) on filter (12).
8. Install tubing (39) and clamp (39) onto nipple (11).
9. Clean the drain plug (40) thoroughly.
10. Re-install the drain plug.

NOTE: Refill only with Big Joe hydraulic oil **Part Number 900855** and only while carriage is fully lowered. Refill until oil is to the ``FULL'' mark on the dip stick. Reservoir holds about 1-1/2 gallons of oil.

11. Remove reservoir vent cap (27), fill reservoir to ``FULL'' mark on the dip stick, and replace vent cap.

9-4. LINE OR FITTING REPLACEMENT.

WARNING: Platform must be fully lowered before performing maintenance on the hydraulic system.

NOTE: Leaking hydraulic fittings can sometimes be remedied by simply tightening the fitting. If this does not remedy the leak, the fitting or line must be replaced.

1. Fully lower the platform.

CAUTION: Hydraulic oil can dissolve the battery case. Wipe off any spilled oil immediately.

2. Remove the reservoir drain plug and drain the hydraulic oil into a suitable container.
3. Remove the leaking line or fitting and replace it with a new one.
4. Clean the drain plug thoroughly.
5. Re-install the drain plug.

NOTE: Refill only with Big Joe hydraulic oil **Part Number 900855** and only while the carriage is fully lowered. Refill until oil is to the ``FULL'' mark on the dip stick. Reservoir holds about 1-1/2 gallons of oil.

6. Remove the reservoir vent cap, fill the reservoir to the ``FULL'' mark on the dip stick, and replace the vent cap.

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9-5. HYDRAULIC PUMP AND MOTOR ASSEMBLY.

A defective hydraulic pump must be replaced as a complete unit, but the pump motor can be repaired (see SECTION 10, Electrical Components Servicing.

9-5.1. Pump and Motor Assembly Removal.

WARNING: Before disconnecting any hydraulic lines, make sure the forks are lowered completely and the system is not under pressure.

1. Disconnect battery.
2. Drain hydraulic oil from reservoir into suitable container.
3. Label, then disconnect wires from solenoid.
4. Label, then disconnect tubing (39, Figure 9-1) and hose (23) from the pump and motor assembly (2).
5. Remove the pump and motor assembly by removing the two screws (5), two lock washers (8) and two flat washers (7).
6. To separate the pump from the motor, remove the four hex head screws that connect the pump to the motor end housing.

NOTE: When reassembling the pump to the motor, always use a new gasket.

9-5.2. Hydraulic Pressure Adjustment.

WARNING: Improper setting of the hydraulic pump pressure by an unauthorized person can damage the hydraulic system and void your warranty.

NOTE: The hydraulic pump is factory set to lift a load at the rated capacity of the truck. The pressure relief valve should rarely need adjustment. If the truck fails to lift a load that is within the truck capacity rating, adjust as follows:

1. Remove the cap nut from the hydraulic pump.
2. Insert a screwdriver blade in the screw slot.

CAUTION: Do not set pressure any higher than that required to lift a load of the rated capacity of the truck.

3. Turn the screwdriver clockwise to increase hydraulic pressure; counterclockwise to decrease pressure.
4. Install the cap nut on the hydraulic pump.

9-6. LIFT CYLINDER REPAIR.

NOTE: Removal procedures are covered in SECTION 8.

CAUTION: To prevent cylinder damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.

1. Secure lift cylinder assembly in a vise and remove gland nut (3, Figure 9-2) with wiper ring (2) and O-ring (4).
2. Pull out cylinder ram (5).
3. Remove lift cylinder tube (1) from vise.

CAUTION: To prevent damaging the finish on the ram, use proper pipe clamp vise with non-marring jaws.

4. Secure ram (5) in vise.
5. Remove nut (11).
6. Pull off piston (14) and O-ring (7). Remove seal (15) from piston (14).

NOTE: Install packing kit 907123.

7. Coat seal (15) and piston (14) liberally with petroleum jelly. Install new seal (15) on piston (14).
8. Install new O-ring (7), piston (14), and nut (11) onto cylinder ram (5).
9. Remove cylinder ram (5) from vise.

CAUTION: To prevent cylinder damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.

10. Secure lift cylinder tube (1) in vise.
11. Install cylinder ram (5) into cylinder tube (1).
12. Install new O-ring (4) and wiper ring (2) on gland nut (3).
13. Install gland nut (3) in cylinder tube (1).
14. Remove lift cylinder assembly from vise.

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PACKING KIT PART NUMBER 907123 CONTAINS:

ITEM	QTY
2	1
4	1
7	1
11	1
15	1

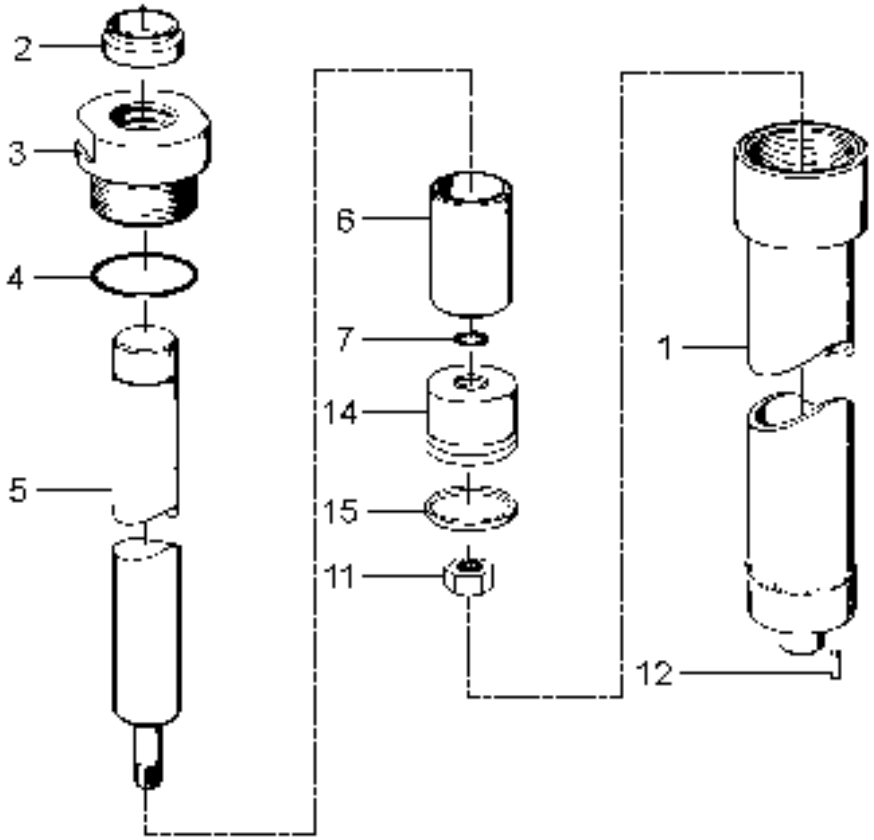

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Figure 9-2 Lift Cylinder

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SECTION 10
ELECTRICAL COMPONENTS

10-1.BATTERIES.

NOTE: Batteries are removed from the right side of the truck. When installing a new battery, be sure handles are securely fastened to battery, battery cables are securely attached to battery terminals, and cables are routed and secured to the battery as shown in Figure 10-1 or Figure 10-2.

CAUTION: Failure to properly route and wrap battery cables can damage cables and make battery installation difficult.

1. Turn key to off, and remove from key switch.

NOTE: Batteries are heavy. Use care when sliding out of battery compartment.

2. Remove screw (19), washer (21) and retainer bar (22).
3. Remove batteries from the right side of the truck. The battery connecting cables are sufficiently long to allow batteries to be placed on the floor.
4. Disconnect cables (18) from battery terminals.
5. Connect cables (18) on terminals of new battery, and slide battery back into compartment, being careful not to damage cables.
6. Reinstall and position retainer bar (22) to prevent battery movement in excess of 1/2".

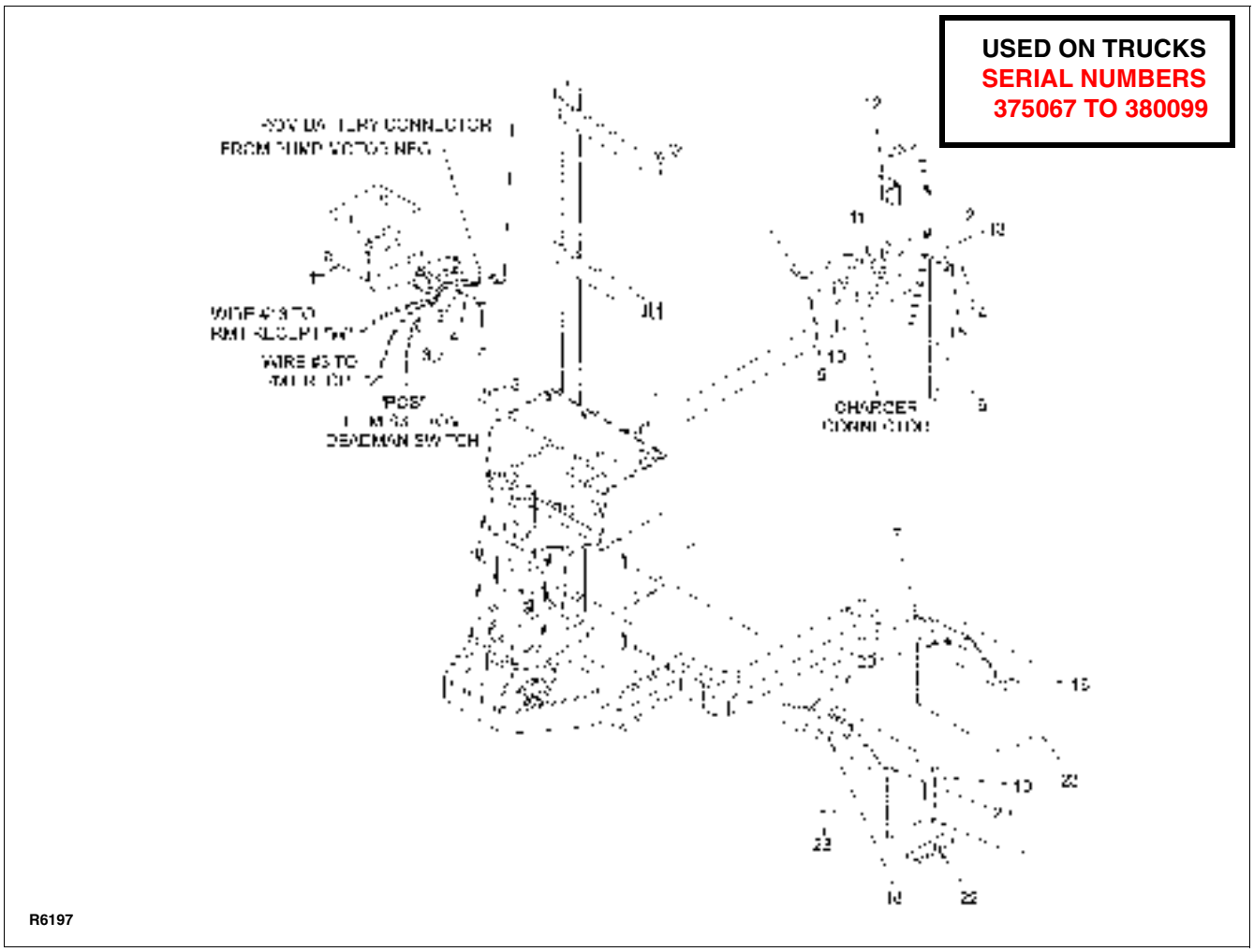

Figure 10-1 Batteries and Emergency Power Disconnect

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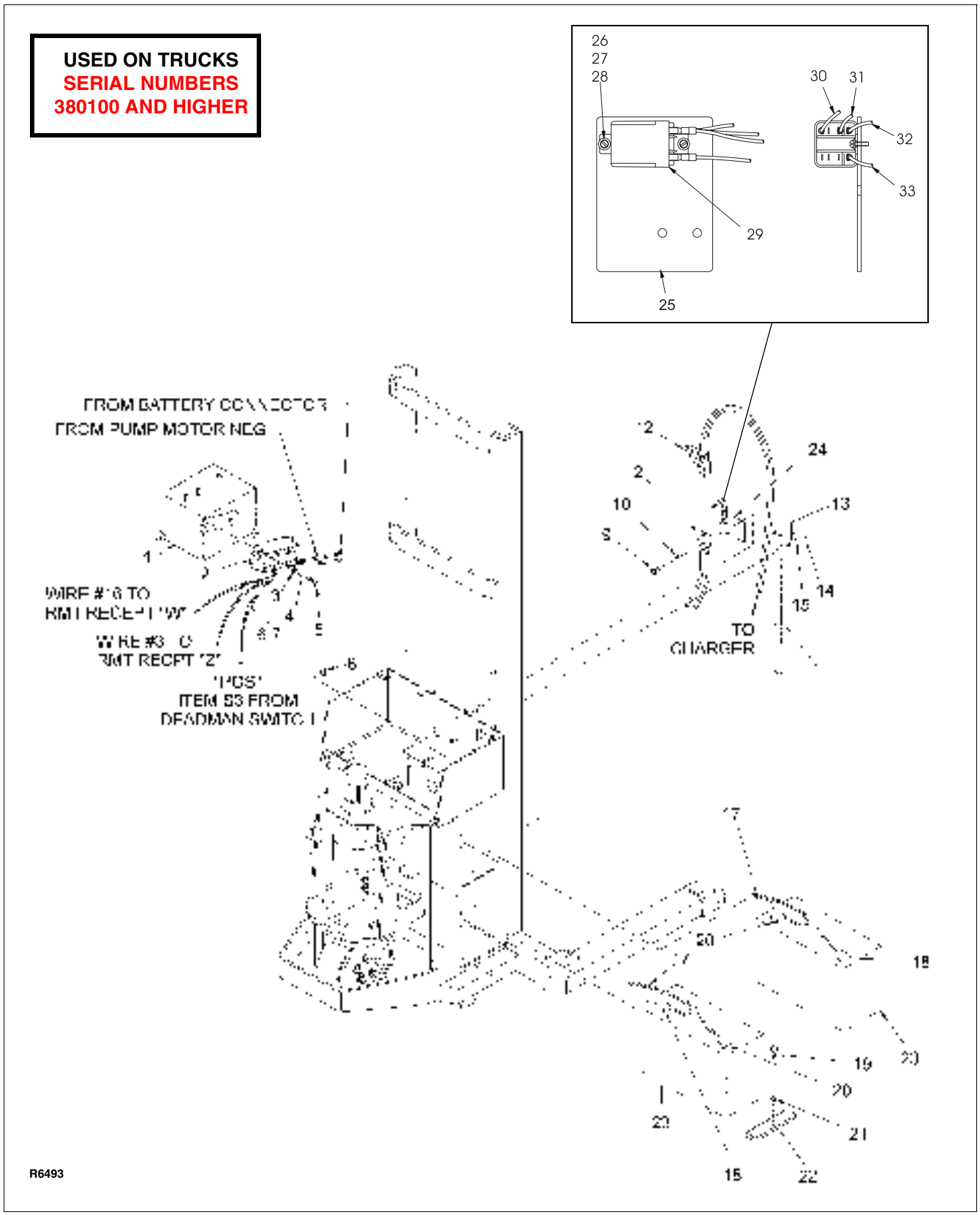

Figure 10-2 Batteries and Emergency Power Disconnect

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10-2. EMERGENCY POWER DISCONNECT

The emergency power disconnect is located in front of the steering arm as shown in Figure 10-1 or Figure 10-2. Refer to Figure 10-3 for disassembly of the complete emergency power disconnect. Refer to Figure 10-4 for disassembly of the contactor.

10-3. ELECTRICAL CONTROL PANEL

10-3.1. Maintenance

There are no user-serviceable parts inside the controllers. No attempt should be made to open the controller. Opening the controller may damage it and will void the warranty.

The transistor controller is programmed at the factory specifically for the truck model on which it is equipped. It is important to replace the controller with the correct preprogrammed unit to asure proper performance settings intended for that particular truck. See Figure 11-21 for the preprogrammed controller number.

It is recommended that the controller exterior be cleaned periodically, and if a handheld programmer is available, this periodic cleaning provides a good opportunity to check the controller's diagnostic history file. It is also recommended that the controller's fault detection circuitry be checked whenever the vehicle is serviced.

10-3.2. Cleaning

1. Remove power by disconnecting the battery.
2. Discharge the capacitors in the controller by connecting a load (such as a contactor coil or a horn) across the controller's B+ and B- terminals.
3. Remove any dirt or corrosion from the bus bar area. The controller should be wiped clean with a moist rag. Allow it to dry before reconnecting the battery.
4. Make sure the connections to the bus bars are tight. Use two well insulated wrenches for this task in order to avoid stressing the bus bars.

10-3.3. Diagnostic History

The handheld programmer can be used to access the controller's diagnostic history file. When the programmer is connected to the unit, the error log file is automatically uploaded into the handheld programmer.

To see the present status of the unit, use the Menu Navigation Key to select:

Faults->System Faults.

To access this log, use the Menu Navigation Key to select:

Faults->Fault History.

The faults are shown as a code and descriptive text. If there are multiple faults, you have to scroll through the list using the Up and Down Buttons on the Menu Navigation Key.

The faults may be intermittent faults, faults caused by loose wires, or faults caused by operator errors. Faults such as contactor faults may be the result of loose wires; contactor wiring should be carefully checked out. Faults such as HPD or overtemperature may be caused by operator habits or by overloading.

After a problem has been diagnosed and corrected, clearing the diagnostic history file is advisable. This allows the controller to accumulate a new file of faults. By checking the new diagnostic history file at a later date, you can readily determine whether the problem was indeed completely fixed.

To clear the diagnostic history file, select:

Faults->Clear Fault History.

You will be asked to confirm your actions. Use the increment arrow (+) for yes and decrement arrow (-) to cancel and not clear the Fault History.

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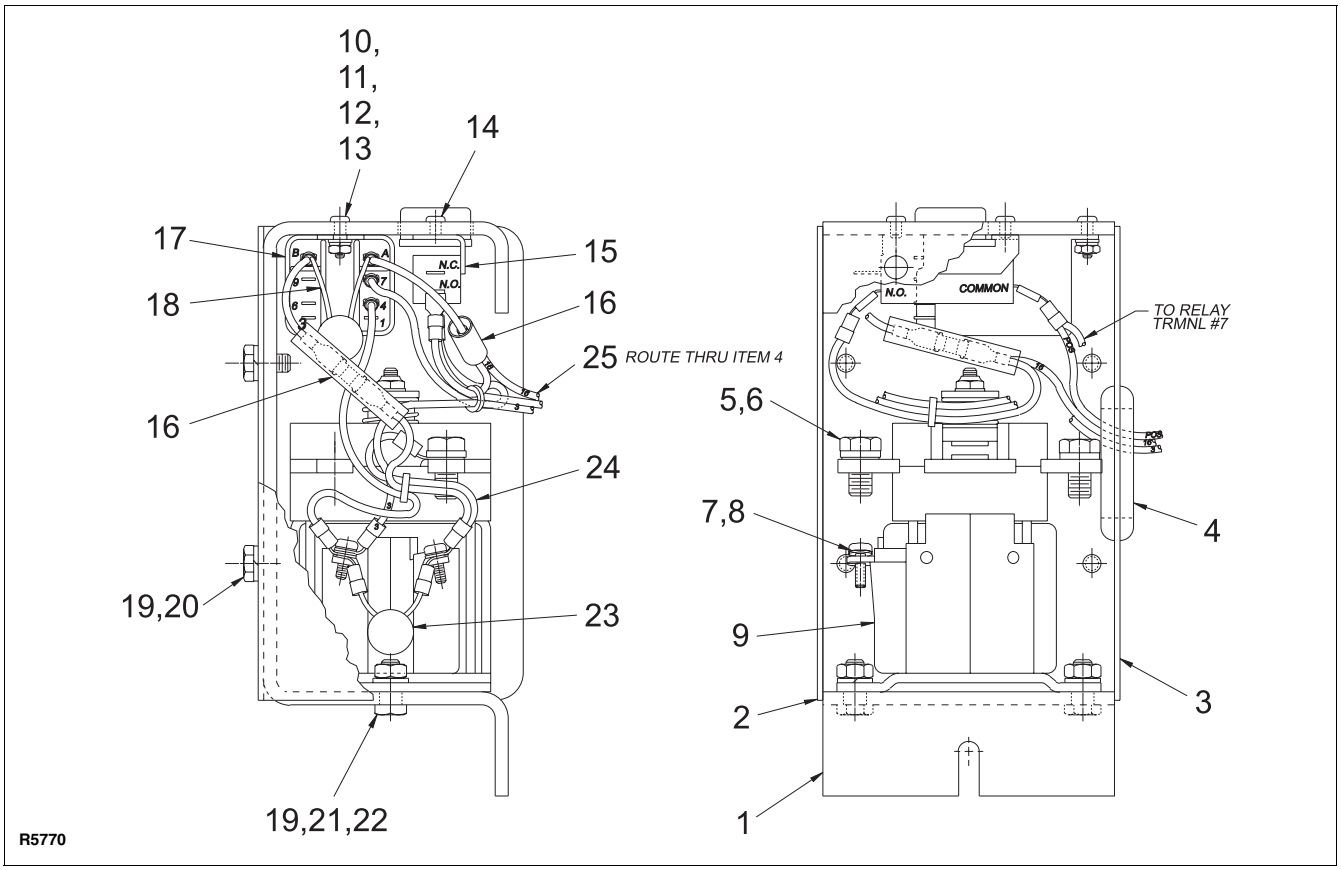

Figure 10-3. Emergency Power Disconnect

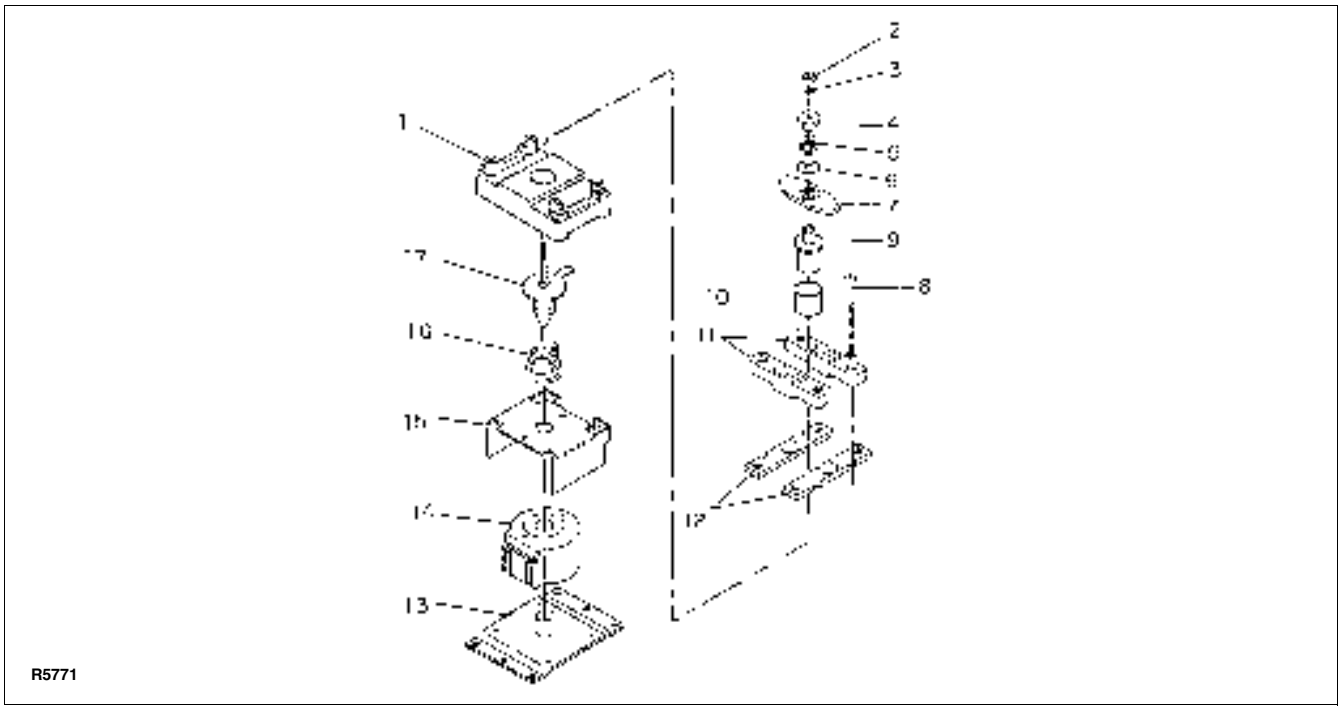

Figure 10-4. Contactor

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10-3.4. Test the Fault Detection Circuitry

1. Put the vehicle up on blocks to get the drive wheel off the ground.
2. Disconnect the battery and make sure the key-switch is off.
3. Using an inline fuse holder fitted with a 10 amp fuse and alligator clips, connect the controller's M- and B- terminals.
4. Turn the keyswitch on, release the brake and apply the throttle. The motor should not operate, and the direction contactors should not pull in.
5. Leave the keyswitch on and remove the inline fuse wire. The vehicle status should continue to remain off.
6. Cycle the keyswitch off and on, release the brake, and apply the throttle. The vehicle should now operate normally.

10-3.5. Panel Removal

1. Disconnect the battery.
2. Remove the motor compartment cover.
3. Refer to Figure 10-5 and tag and disconnect all electrical wires and cables from the transistor control electrical contactor panel.
4. Remove four screws (29, Figure 10-6) and four lock washers (28) to release and remove the electrical panel.

10-3.6. Panel Disassembly and Reassembly

1. Refer to Figure 10-5 for identity of components of the electrical panel and remove defective components as required.
2. Be sure to make note of the location of bussbars (7 and 8), when removing contactors, to facilitate reassembly.
3. Upon reassembly of the electrical panel, inspect each connection to ensure that a good positive contact is made at all wire and cable connections.

10-3.7. Panel Installation

Install the electrical panel assembly in reverse of instructions for removal.

10-4. PUMP MOTOR.

Refer to applicable Figure 11-20 for motor disassembly. The pump is replaceable but not repairable. When replacing pump be sure to install the gasket between pump and motor.

10-5. DRIVE MOTOR.

Refer to Figure 11-19 for motor disassembly.

10-6. BATTERY CHARGER.

Refer to Figure 11-24 thru Figure 11-28 for disassembly and part number information.

NOTE: Refer to paragraph 4-2. for troubleshooting of battery charger.

10-7. TRAVEL LIMIT SWITCH.

10-7.1. Serial Number 375067 to 377143

1. Disconnect wiring from travel limit switch (13, Figure 10-6), then remove nuts (12), lockwashers (11), and washers (10) securing switch mounting bracket (9) to frame.
2. Remove travel limit switch from bracket, and install new switch onto bracket.

NOTE: Bracket must be positioned so that switch is operated when platform is down.

3. Position new switch (13) on bracket (9), and secure with washers (10), lockwashers (11), and nuts (12).
4. Reconnect wiring to switch.

10-7.2. Serial Number 377144 and Higher

1. Disconnect wiring from travel limit switch (13, Figure 10-6), then remove screws (12), lockwashers (11), and washers (10) securing switch mounting bracket (9) to frame.
2. Remove travel limit switch from bracket, and install new switch onto bracket.

NOTE: Bracket must be positioned so that switch is operated when platform is down.

3. Position new switch (13) on bracket (9), and secure with washers (10), lockwashers (11), and screws (12).
4. Reconnect wiring to switch.

10-8. HORN.

1. Disconnect wiring and suppressor (37, Figure 10-6) from horn (35), then remove nut (41), lockwasher (40) and washer (39) securing horn.
2. Remove horn.
3. Position new horn in place, reinstall nut, lockwasher and flat washer, then reconnect wiring and suppressor (37).

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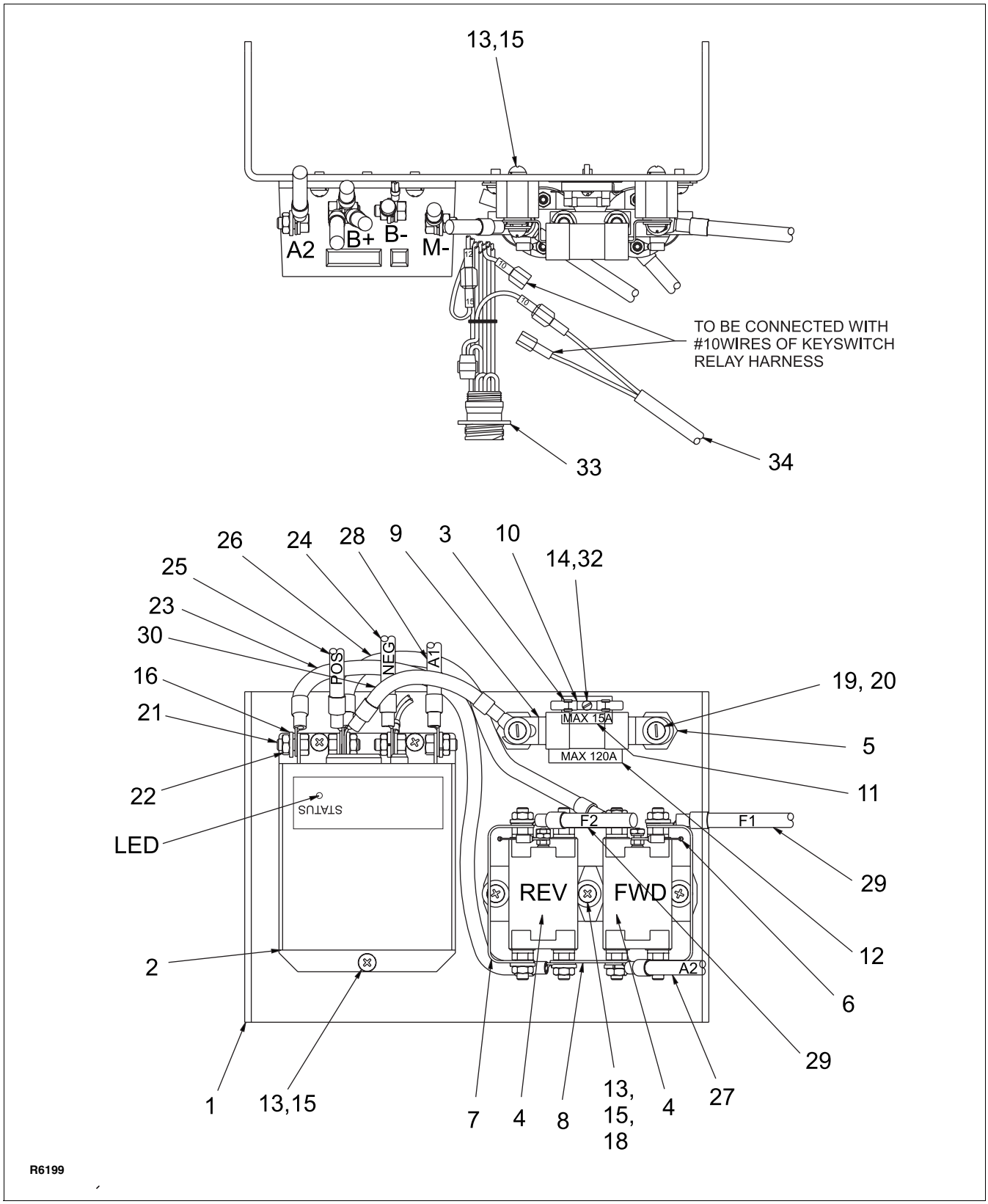

Figure 10-5. Transistor Control Electrical Contactor Panel

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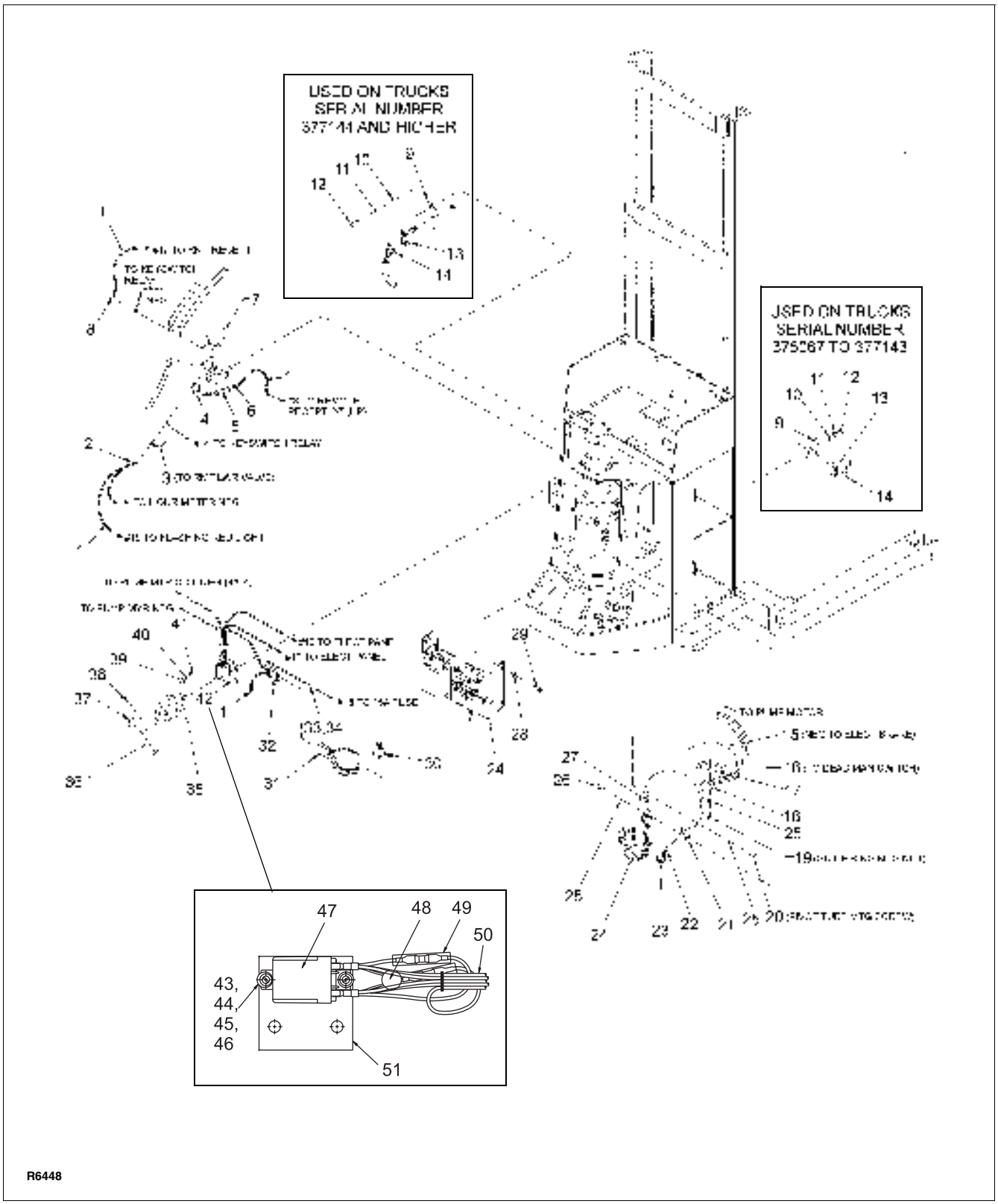

Figure 10-6 Electrical Components

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NOTES

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SECTION 11
ILLUSTRATED PARTS BREAKDOWN

Following is an illustrated parts breakdown of assemblies and parts associated with the PB-PDBB-20-T12 Lift Truck.

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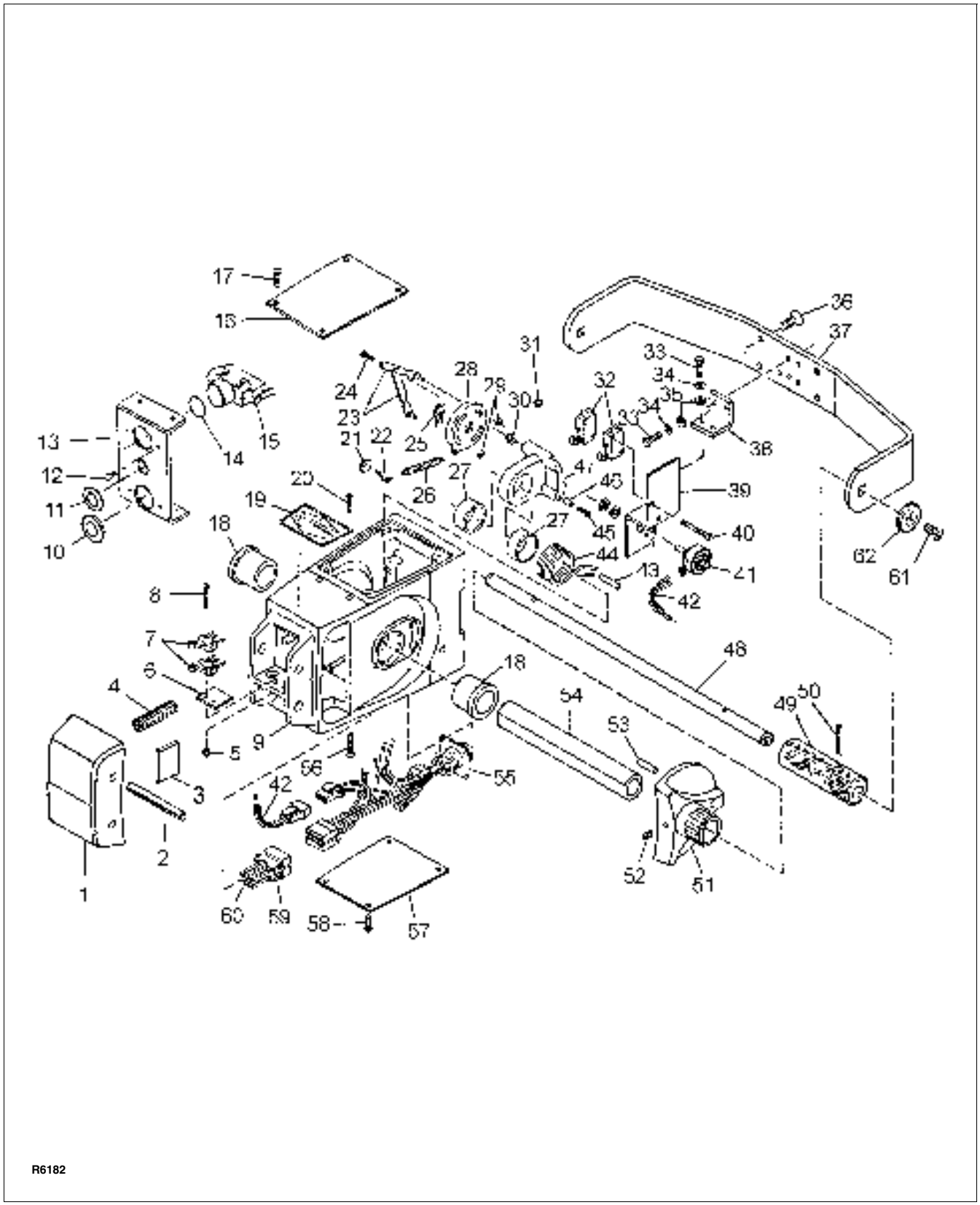

Figure 11-1 Control Head Assembly

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	505360-01	CONTROL HEAD STANDARD	1
1	800274	COVER	1
2	061016	ROLL PIN, 1/4 X 3	2
3	402843	PAD	2
4	075510	COMPRESSION SPRING	2
5	059633	HEX LOCK NUT, 2-56	2
6	018202	SWITCH INSULATOR	1
7	020669	MICRO SWITCH	2
8	070486	PAN HD SCREW, BRASS	2
9	800273	CONTROL HANDLE	1
10	053215-02	HOLE PLUG	1
11	053215-03	HOLE PLUG	1
12	067415	PAN HD SCREW, 6-32 X 1/4	2
13	402842	SWITCH PLATE	1
14	056619-01	HORN DECAL	1
15	020698	PUSHBUTTON SWITCH	1
16	402830	TOP COVER	1
17	097416	PAN HD SCREW, 6-32 X 1/2	4
18	052956	FLANGED BEARING	2
19	056617	FORWARD-REVERSE DECAL	1
20	069462	FLAT HD SLOTTED SCREW, 6-32 X 3/4	2
21	077032	WASHER, 3/16 X 1/2 X 13GA	1
22	066052	THUMB SCREW, 6-32	1
23	400546	CONNECTING ROD ASSEMBLY	2
24	072415	PAN HD SCREW, THREAD CUTTING, 4-40 X 5/8	1
25	056131	HOSE CLAMP	1
26	053366	RETURN SPRING	1
27	402836	SPACER	2
28	057262	POTENTIOMETER DISK	1
29	061750	“E” RETAINER RING	2
30	402835	SPACER	1
31	059634	HEX LOCK NUT, 4-40	2
32	020775	MICRO SWITCH	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
33	072400-01	SLOTTED HEX SCREW, 6-32 X 1/2	4
34	077204	SPLIT LOCK WASHER #6	4
35	077007	WASHER	4
36	069478	PHILIPS FLAT HD SCREW, 1/4-20 X 3/4	4
37	402841	HANDLE GUARD	1
38	402837	BRACKET	1
39	505052	SWITCH BRACKET ASSEMBLY	1
40	068180	ROUND HD SCREW, 4-40 X 1-1/2	2
41	017580	POTENTIOMETER	1
42	505323	POTENTIOMETER WIRE HARNES	1
43	061200-01	SPIROL PIN, 3/16 X 1	1
44	075088	RETURN SPRING	1
45	072415	PAN HD SCREW, THREAD CUTTING, 4-40 X 5/8	1
46	074711	CONNECTING ROD SPACER	1
47	402840	CAM	1
48	402827	SHAFT	1
49	404421	TUBE	2
50	060942	ROLL PIN, 1/8 X 1-1/4	2
51	800272	CONTROL LEVER	2
52	073461	SOCKET SET SCREW	2
53	060579	DOWEL PIN, 1/4 X 15/16	2
54	402839	TUBE	1
55	123197	WIRE HARNESS	1
56	069463	FLAT HD SLOTTED SCREW, 6-32 X 1	2
57	402830	BOTTOM COVER	1
58	067416	PAN HD SCREW, 6-32 X 1/2	4
59	005647	PIN HOUSING	1
60	504538-01	WIRE ASSEMBLY	5
61	069715	SOCKET FLAT HD SCREW, 1/4-20 X 3/4	2
62	402828	CAP	2

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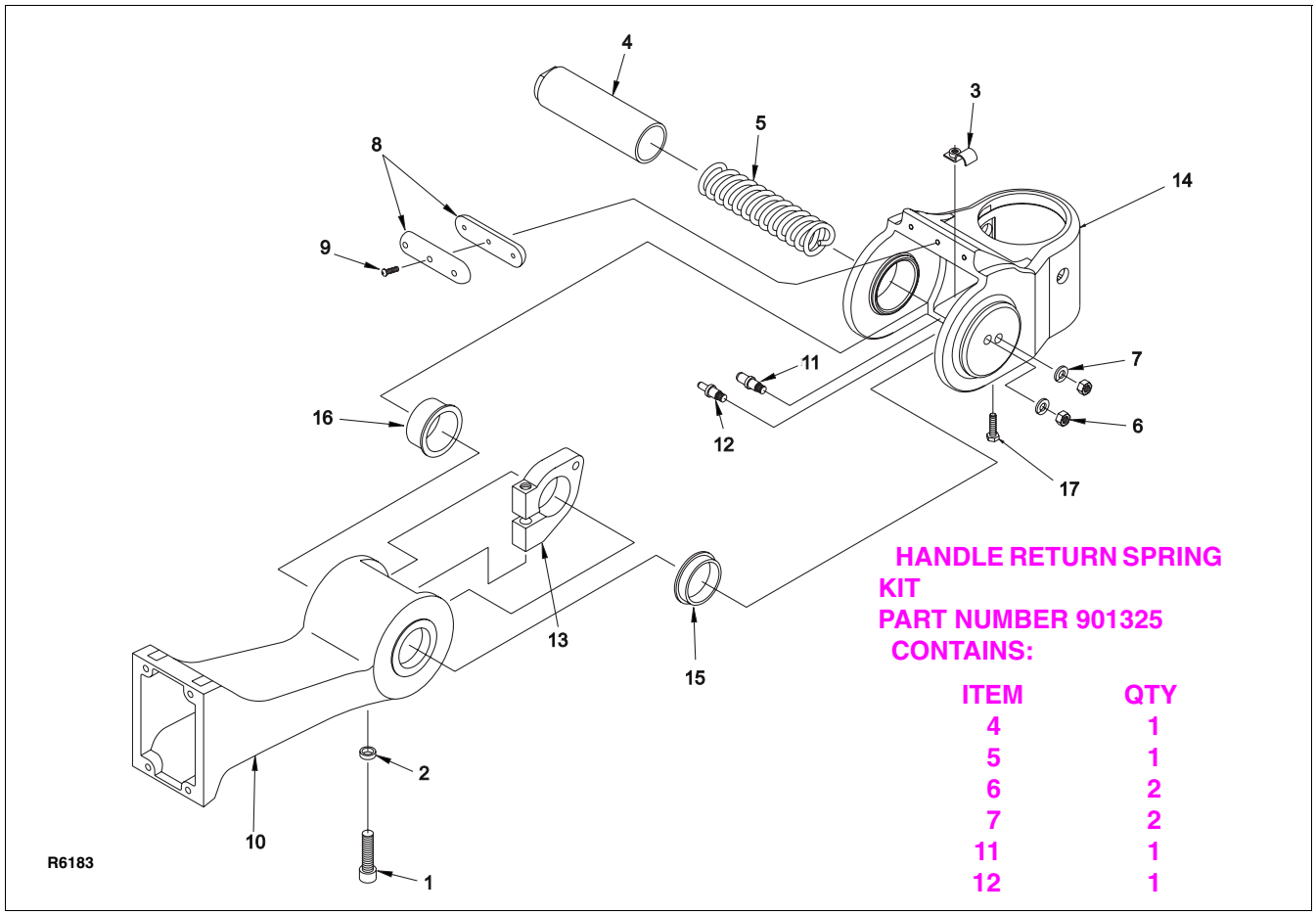

Figure 11-2 Steering Arm

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506244-01	CONTROL ARM ASSY	1
1	065569	. SCREW, 7/16-14 X 2-1/4	1
2	401127	. SPACER	1
3	504364	. CLAMP ASSY	1
4	501371 *	. HOUSING SPRING	1
5	075060 *	. SPRING	1
6	059426 *	. NUT, HEX, 5/16-18	2
7	077210 *	. WASHER, LOCK, SPLIT, 5/16	2
8	052876	. BUMPER	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	071377	. SCREW, 10-32 X 3/4	3
10	800275	. HANDLE	1
11	285302 *	. PIN SPRING	1
12	285303 *	. PIN SPRING	1
13	404322	. CLAMP	1
14	402455	. PIVOT CAP ASSY	2
15	052922	. . BUSHING, FLANGED	1
16	052925	. . BUSHING, FLANGED	1
17	063478	. SCREW, HEX CAP, 1/4-20 X 3/4	1

* **HANDLE RETURN SPRING KIT PART NUMBER 901325**

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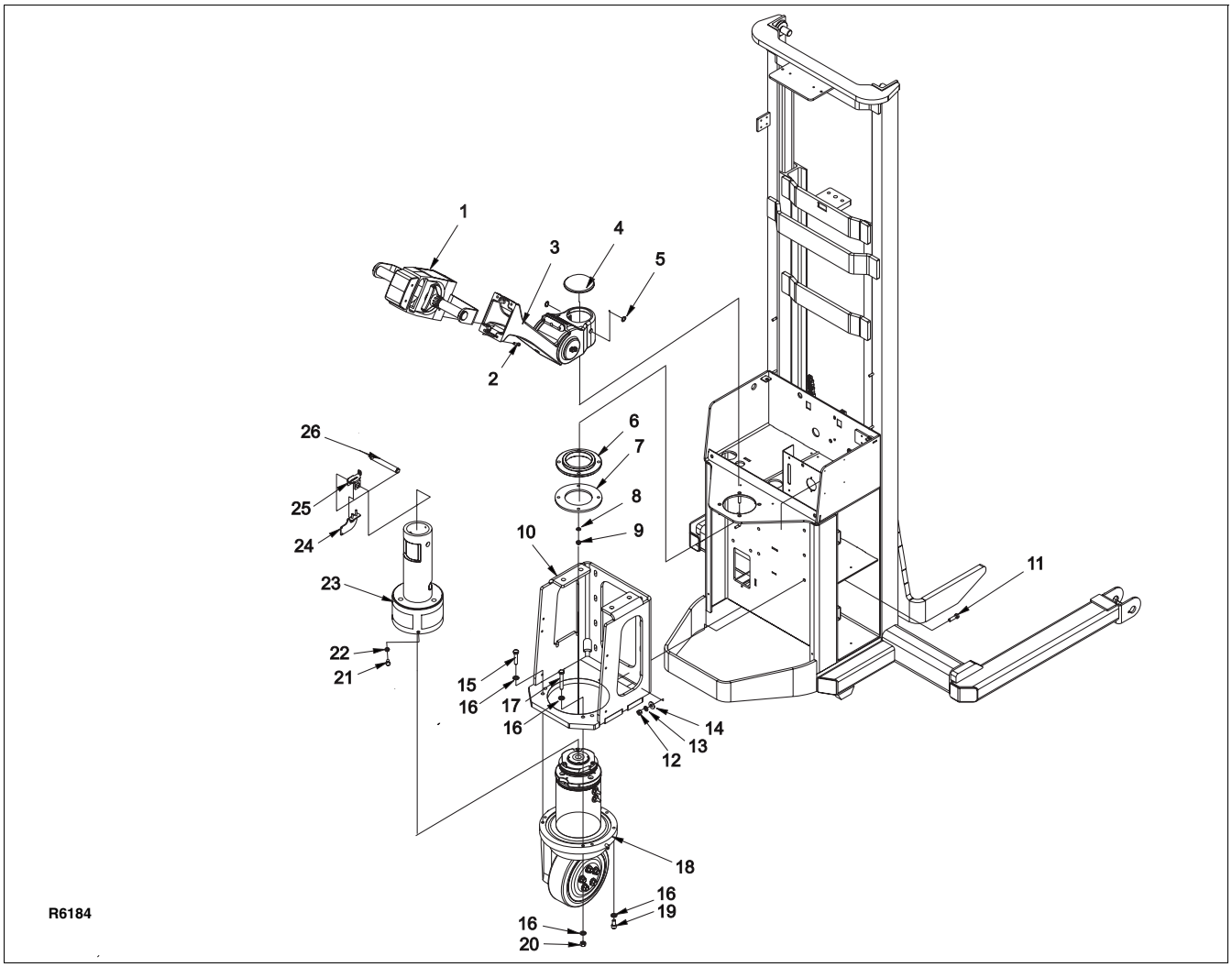

Figure 11-3 Pivot Tube Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	—	CONTROL HEAD (FIGURE 11-1)	REF
2	065481	SCREW, SOC HD, 1/4-20 X 1	3
3	—	CONTROL ARM (FIGURE 11-2)	REF
4	402459	CAP	1
5	061716	SNAP RING, EXT, 5/8" DIA	2
6	403323	GUIDE PIVOT TUBE	1
7	404324	RING, GUIDE CLAMP	1
8	077210	WASHER, LOCK, SPLIT, 5/16	8
9	059426	NUT, HEX, 5/16-18	4
10	404317	BRACKET, ZF DRIVE	1
11	064607	SCREW, HEX HD, 3/8-16 X 1-1/4	8
12	059429	NUT, HEX, 3/8-16	8
13	077211	WASHER, LOCK, 3/8	8
14	077056	WASHER, FLAT, 3/8	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
15	067443-02	SCREW, HHC, METRIC, M10 X 45	5
16	077212	WASHER, LOCK, 7/16	8
17	067443-03	SCREW, HHC, METRIC, M10 X 65	1
18	—	TRANSMISSION, MOTOR AND BRAKE ASSEMBLY (FIGURE 11-5)	REF
19	067443-03	SCREW, HHC, METRIC, M10 X 20	1
20	059475-01	NUT, HEX, METRIC, M10 X 1.5	1
21	063552	SCREW, HEX HD, 5/16-18 X 5/8	4
22	077210	WASHER, LOCK, SPLIT, 5/16	4
23	506198	PIVOT TUBE WELDMENT	1
24	—	BRACKET ASSY, MTG, SWITCH (FIGURE 11-4)	REF
25	—	BRACKET, MTG, SWITCH (FIGURE 11-4)	REF
26	402452	PIN	1

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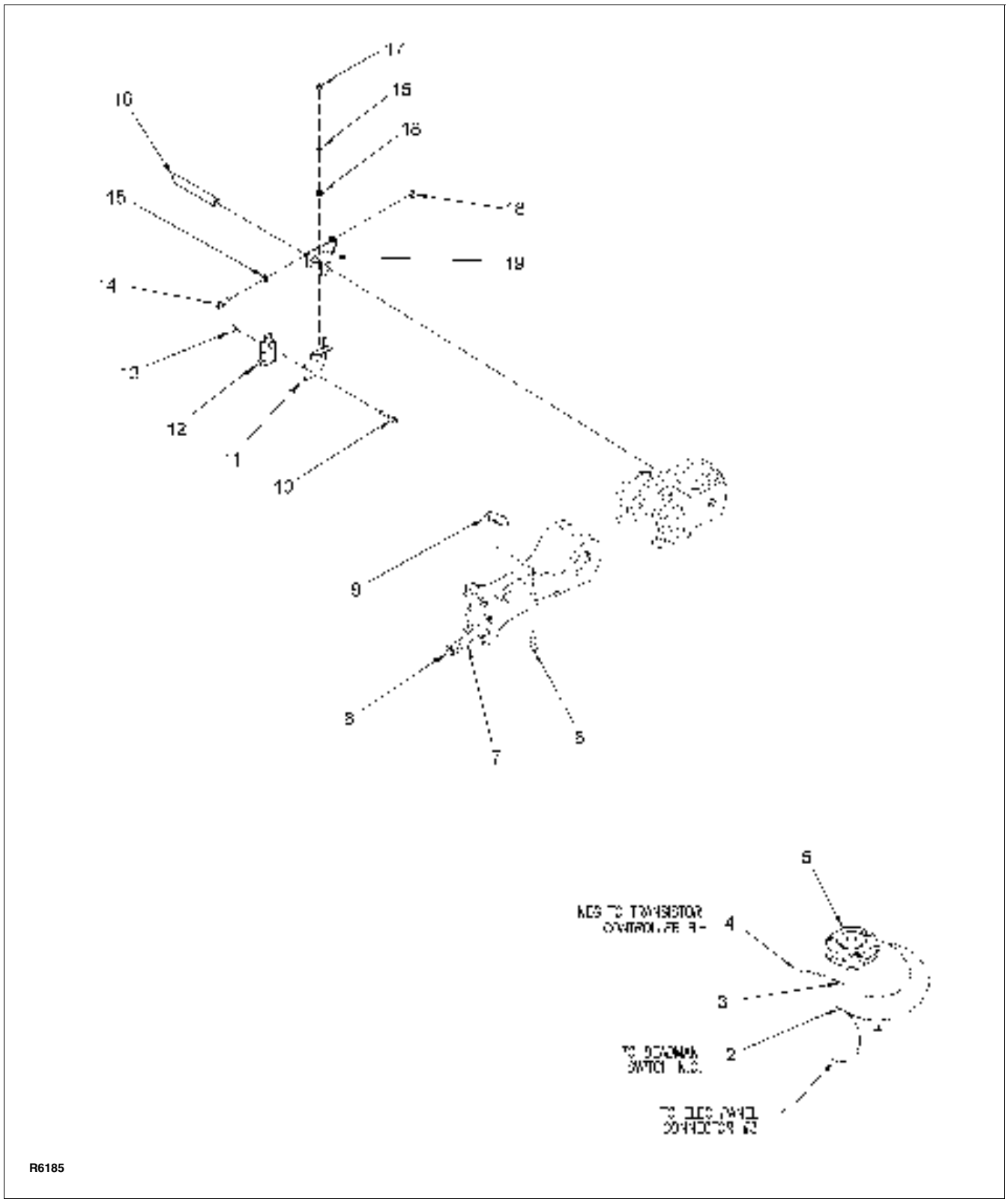

Figure 11-4 Brake and Actuator

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	023238-29	WIRE ASSY (FIGURE 11-16)	REF
2	021249	TERMINAL, SLIP ON, 3/16	1
3	005422	SPLICE, BUTT, CRIMP	1
4	023238-30	WIRE ASSY (FIGURE 11-16)	REF
5	—	BRAKE (FIGURE 11-5)	REF
6	069478	SCREW, FLAT 1/4-20 X 3/4	1
7	023252	WIRE HARNESS	1
8	005640	CONNECTOR	1
9	504364	CLAMP ASSY	1
10	065472	SCREW, SHC, 4-40 X 3/4	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
11	506199	BRACKET ASSY, SWITCH MOUNTING	1
12	020775	SWITCH, DEADMAN	1
13	059634	NUT, HEX, NYLOK, 4-40	2
14	065451	SCREW, SHC, 10-32 X 3/8	1
15	077207	WASHER, LOCK, #10	2
16	—	PIN (FIGURE 11-3)	REF
17	059416	NUT, HEX, 10-32	1
18	077030	WASHER, FLAT, #10	2
19	404329	BRACKET, SWITCH MOUNTING	1

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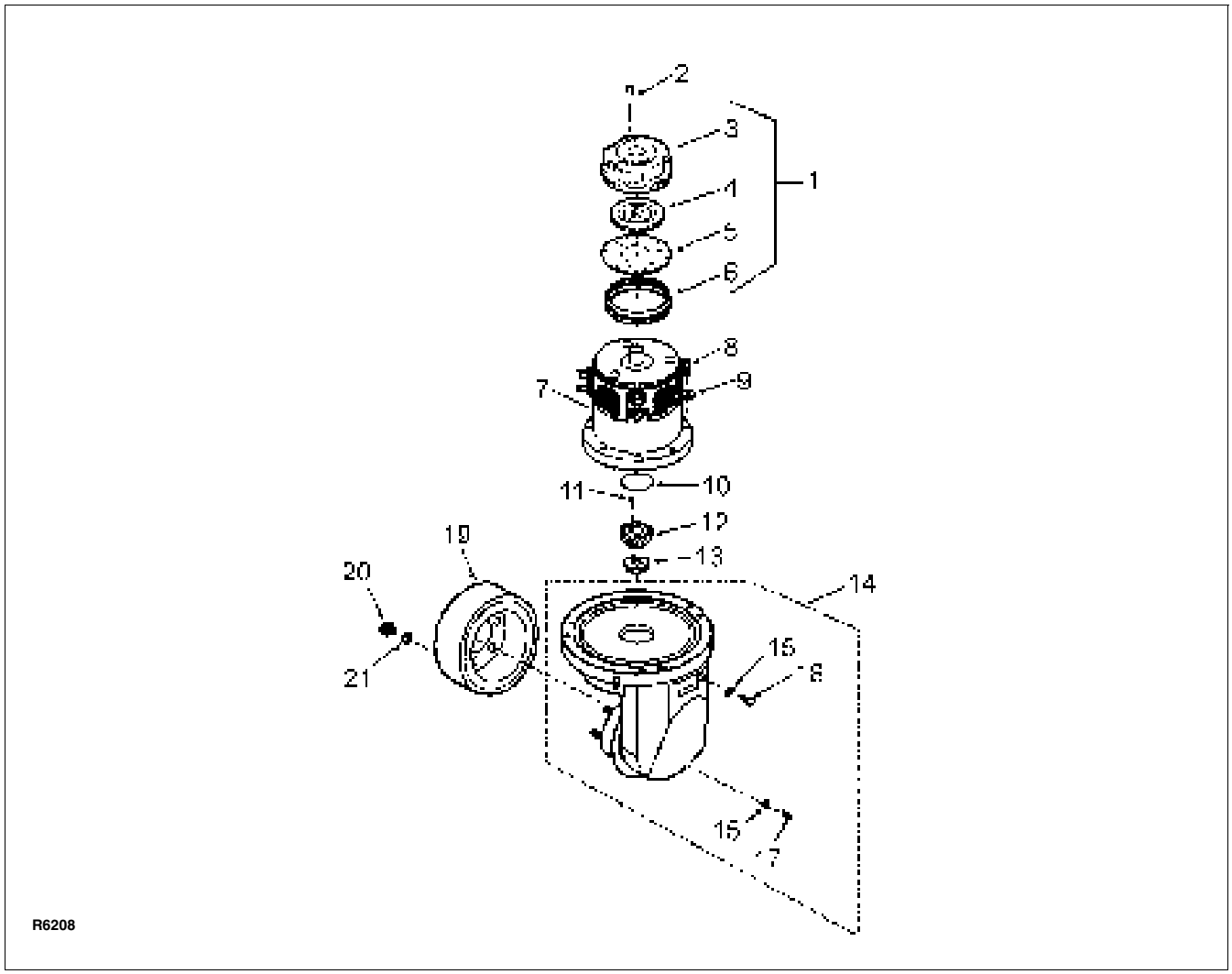

Figure 11-5 Transmission, Motor and Brake Assy

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506162	TRANSMISSION, MOTOR AND BRAKE ASSY	
1	901775	. ELECTRIC BRAKE	1
2	901776	. . BOLT	3
3	901777	. . MAGNET BODY ASSEMBLY	1
4	901778	. . ROTOR	1
5	901779	. . FRICTION PLATE	1
6	901780	. . DUST RING	1
7	—	. MOTOR (FIGURE 11-19)	1
8	901781	. SCREW, SOCKET HEAD, M8 X 20-10.9	8
9	901782	. WASHER A8,4	8

INDEX NO.	PART NO.	PART NAME	NO. REQD.
10	901783	. O-RING, 65 X 2,5	1
11	901784	. KEY, WOODRUFF, 3 X 5	1
12	901785	. PINION	1
13	901786	. NUT, SLOTTED, M12 X 1,5	1
14	901790	. TRANSMISSION	1
15	901787	. SEAL RING	2
16	901788	. OIL FILLER PLUG, M14 X 1,5-5,8	1
17	901789	. OIL DRAIN PLUG, M14 X 1,5-PM	1
19	506161-01	. WHEEL ASSY	1
20	901721	. LUG NUT	5
21	901720	. WASHER	5

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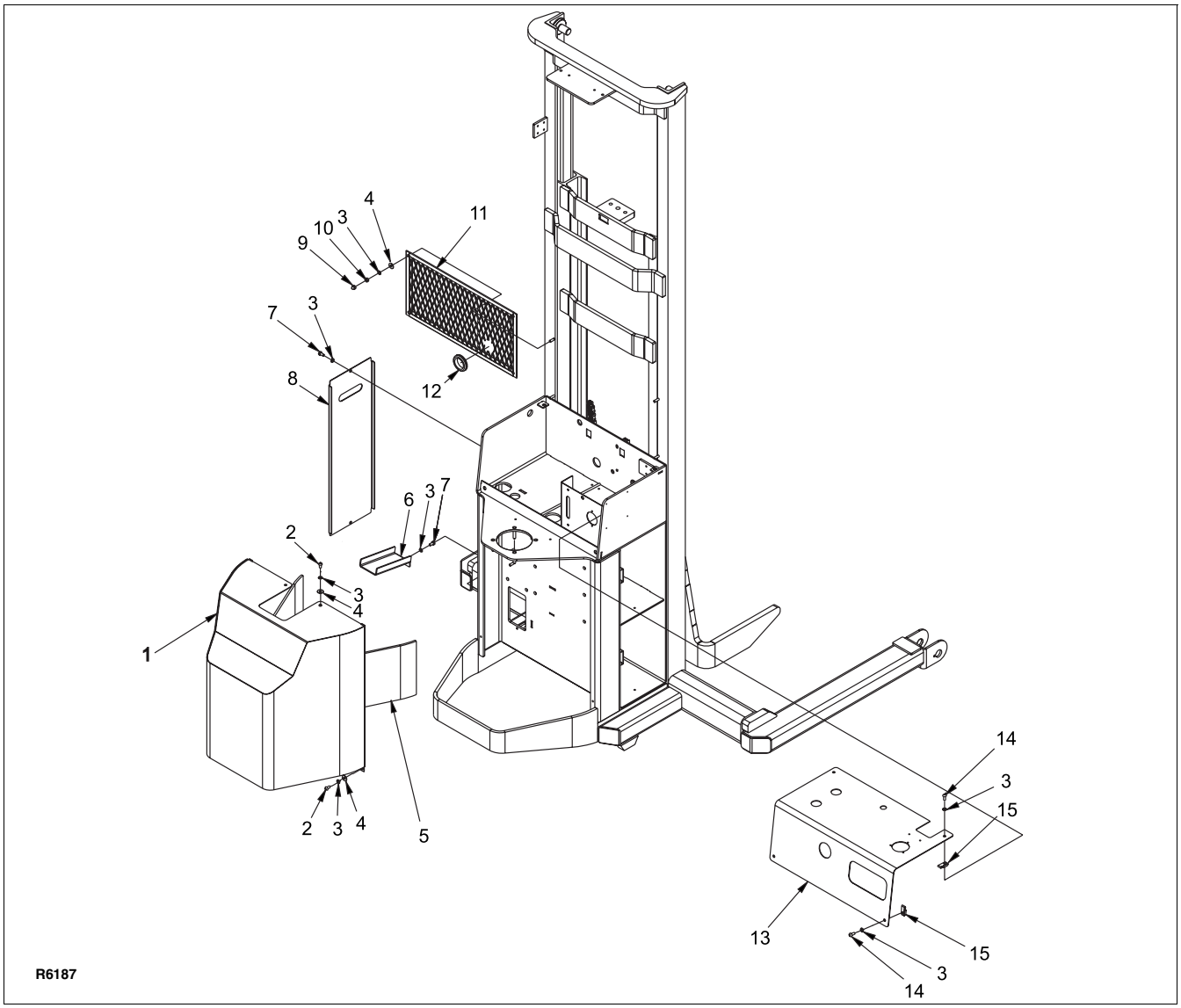

Figure 11-6 Base and Frame

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	506200	COVER, WELDMENT	1
2	070476	SCREW, RD HD, 1/4-20 X 1/2	4
3	077209	WASHER, SPLIT, LOCK, 1/4	15
4	077031	WASHER, FLAT NO. 1/4	8
5	060106	SOUNDPROOF PAD	1
6	404319	TROUGH, DRIP	1
7	065476	SCREW, HEX HD, 1/4-20 X 1/2	3
8	404320	COVER, PUMP	1
9	059423	NUT, HEX, ACORN CAP, 1/4-20	4
10	059421	NUT, HEX, 1/4-20	4
11	504579	SCREEN	1
12	057511	GROMMET, 1-1/2" ID X 1-34" HOLE	1
13	404333*	COVER, TOP	1
13	404920**	COVER, TOP	1
14	070476	SCREW, RD HD PHILLIPS, 1/4-20 X 1/2	9
15	059925-01	NUT, U-CLIP	4

* **SERIAL NUMBER 375037 TO 380099**

** **SERIAL NUMBER 380100 AND HIGHER**

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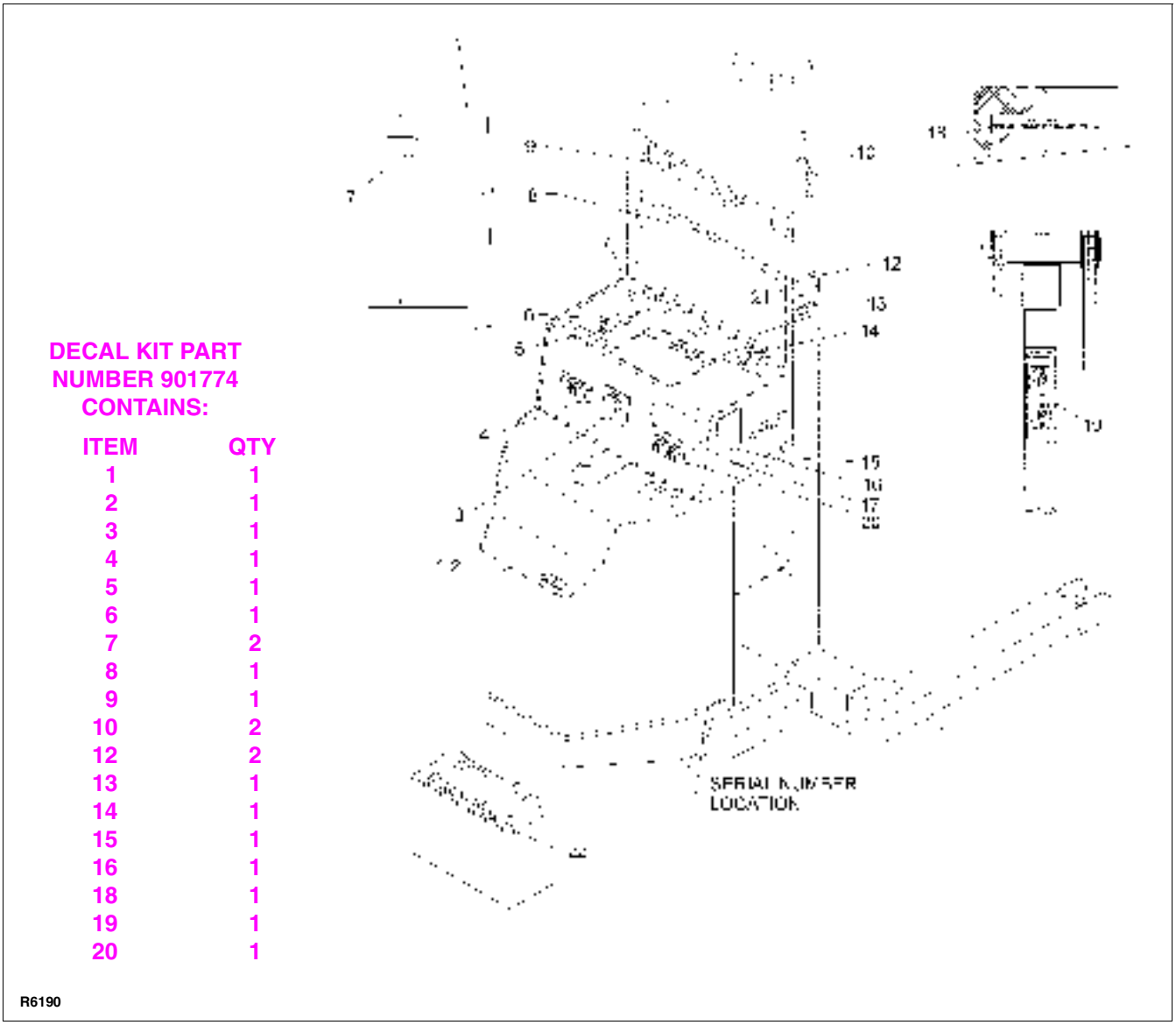

Figure 11-7 Decal Location

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	056595	CASTING LOGO	1
2	056596-08	INSERT PDI	1
3	20574	EPD DECAL	1
4	056654	NOTICE DECAL	1
5	11177	EMERGENCY LOWERING DECAL	1
6	056626	OIL LEVEL	1
7	056564	CAUTION DECAL	2
8	056494	CAUTION DECAL	1
9	056499	NO RIDING DECAL	1
10	056632	SMALL MAST DECAL	2
12	056683	AMERICAN DECAL	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
13	056590	WARNING DECAL	1
14	056644	TRUCK-CHARGE DECAL	1
15	056646	INSTR-CHARGER	1
16	061334	NAMEPLATE	1
17	066050	SCREW, DRIVE, RD HD, #2 U X 1/4	4
18	21765	CAPACITY DECAL	1
19	056625	WARNING DECAL	1
20	056659	CHARGER INSTRUCTIONS	1
21	056689	DECAL-KEYSWITCH	1
22	23495	DECAL-BATTERY, SEALED	1

* **INCLUDED IN DECAL KIT PART NUMBER 901774**

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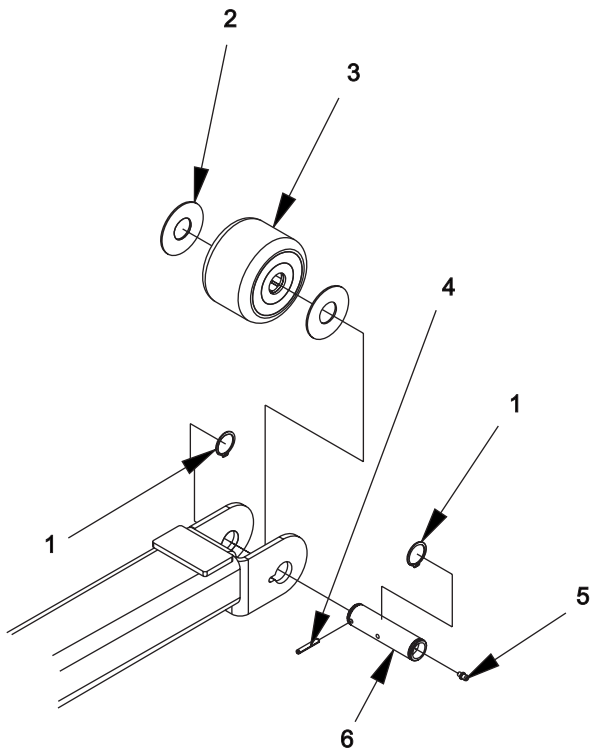

LOAD WHEEL AND AXLE KIT
PART NUMBER 901326
CONTAINS:

ITEM	QTY
1	2
2	2
3	1
4	1
5	1
6	1

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Figure 11-8 Load Wheels

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	—	LOAD WHEEL	2
1	061725*	. SNAP RING	2
2	077033*	. SPACER WASHER	2
3	078409*	. LOAD WHEEL ASSY (4 IN. DIAMETER)	1
4	060974*	. PIN, ROLL	1
5	025713*	. GREASE FITTING	1
6	270306*	. AXLE	1

* **INCLUDED IN LOAD WHEEL AND AXLE KIT PART NUMBER 901326 (1 KIT PROVIDES FOR 1 LOAD WHEEL)**

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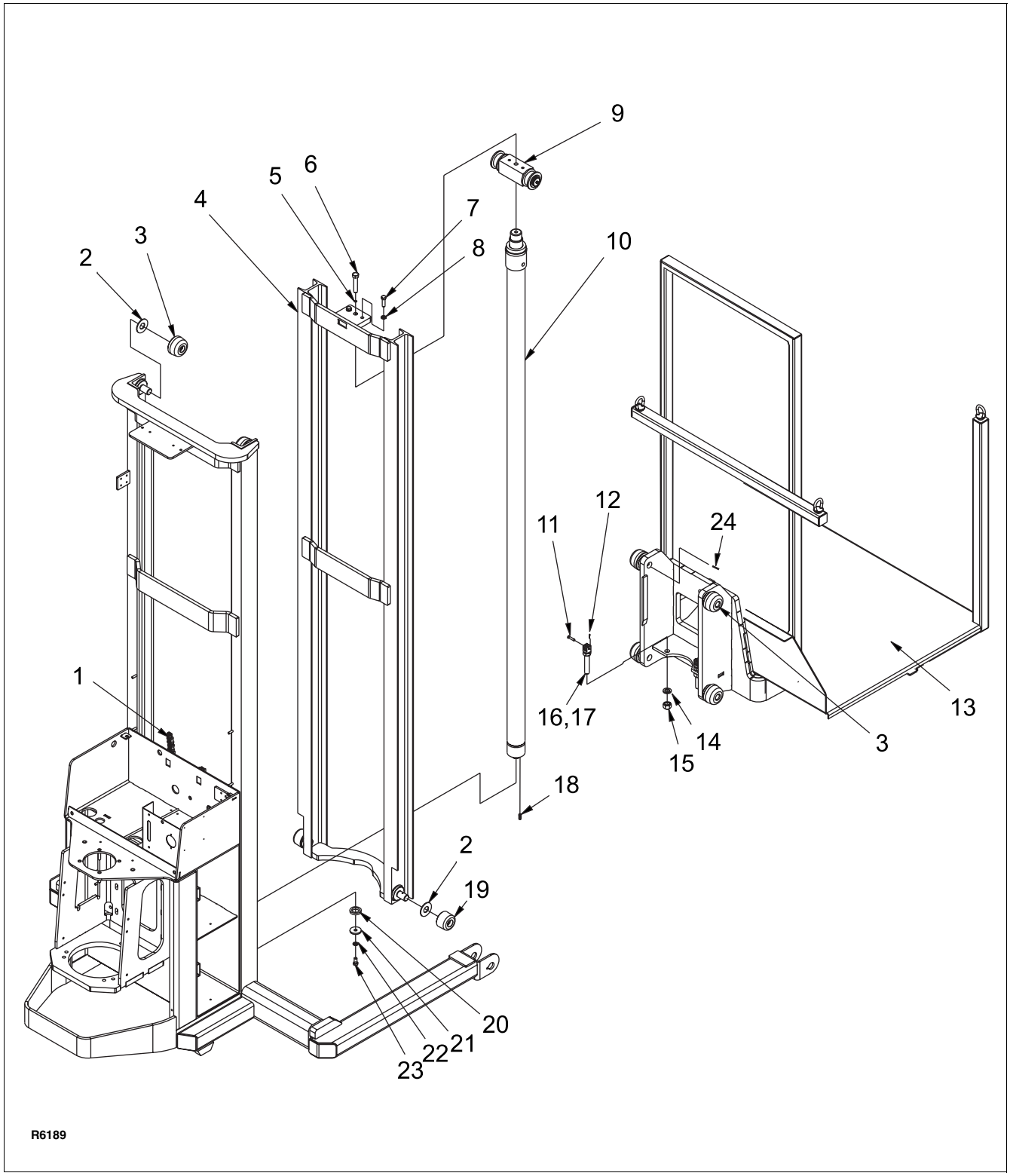

Figure 11-9 Elevation System

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	402034	CHAIN (7.76 FT EACH)	2
2	053000	SHIM	A/R
2	053001	SHIM	A/R
2	053002	SHIM	A/R
2	053003	SHIM	A/R
3	901366	ROLLER ASSEMBLY	2
—	062326	. ROLLER	2
—	051102	. BEARING	2
4	506202-05	INNER MAST	1
5	077207	WASHER, LOCK, #10	1
6	063717	SCREW, HEX HD, 1/2-13 X 2-1/2	1
7	064607	SCREW, HEX HD, 3/8-16 X 1-1/4	2
8	077211	WASHER, LOCK, 3/8	2
9	505807	RAM HEAD ASSY	1
10	—	LIFT CYLINDER (FIGURE 11-13)	REF
11	402055	CHAIN PIN	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
12	060402	COTTER PIN	4
13	—	PLATFORM (FIGURE 11-10)	REF
14	077215	WASHER, LOCK	2
15	059445	NUT, HEX	2
16	402051	ADJUSTING BOLT	2
17	059545	NUT, JAM, 5/8-18	2
18	061023	PIN, ROLL, 5/16 DIA X 3/4 LG	1
19	901365	ROLLER ASSEMBLY	2
—	051102	. BEARING	2
—	062325	. ROLLER	2
20	404330	SPACER, JACK STAND	1
21	077076	WASHER, FLAT, 13/32 X 1-1/2 X 7 GA	1
22	077211	WASHER, LOCK, 3/8	1
23	063717	SCREW, HEX HD, 1/2-13 X 2-1/2	1
24	025713	FITTING-GREASE, 3/16 DRV	6

A/R - AS REQUIRED

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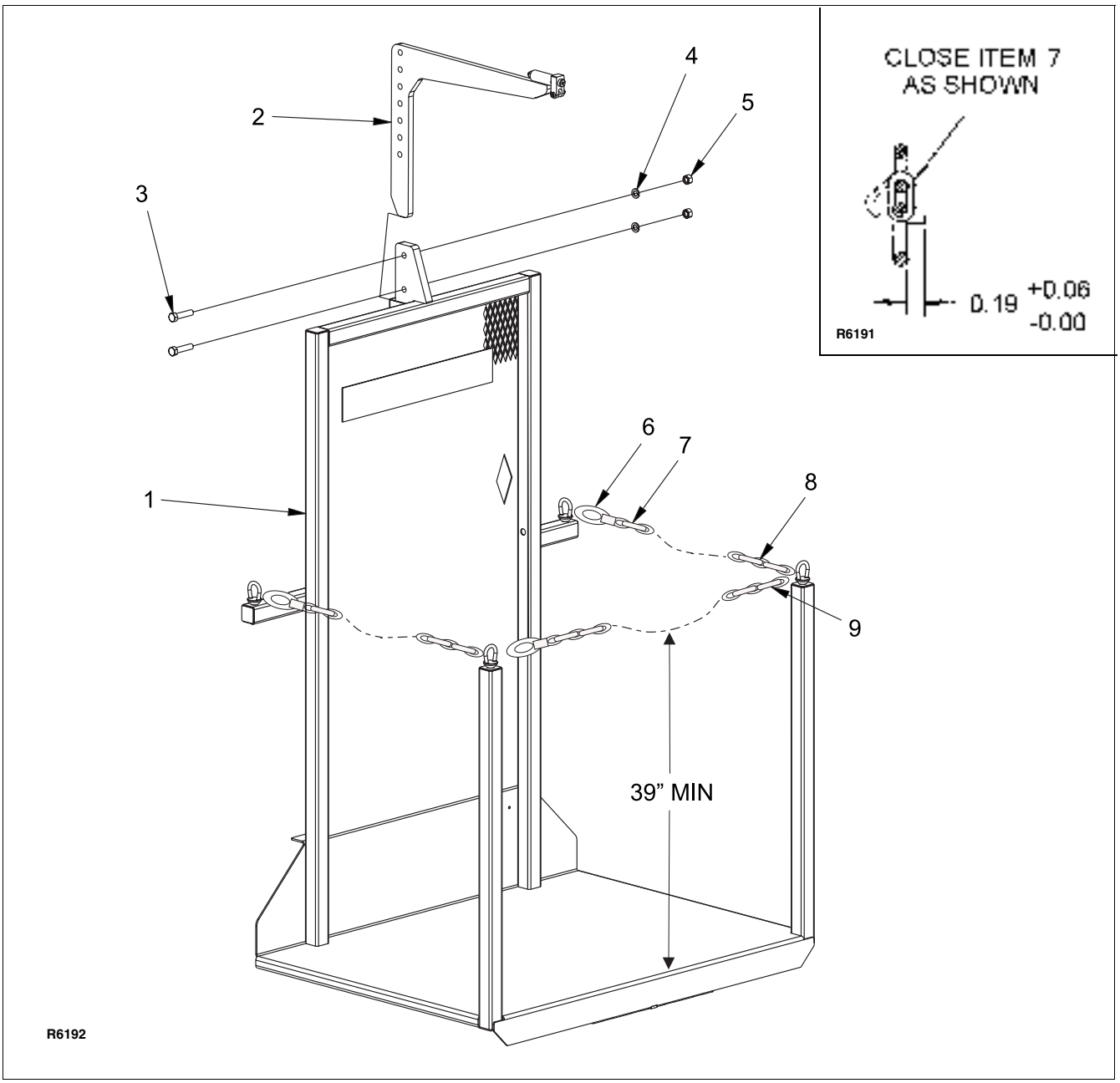

Figure 11-10 Platform

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506242	PLATFORM, CARRIAGE AND BOOM ASSY	1
1	20538	. PLATFORM, WELDMENT	1
2	—	. BOOM ASSY (FIGURE 11-11)	REF
3	065815	. SCREW, HHC, 5/8-11 UNC X 2.75	2
4	077215	. WASHER, LOCK, SPLIT, 3/8	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
5	059444	. NUT, HEX, 5/8-11	2
6	074602	ROPE SNAP	3
7	074603	COLD SHUT	6
8	055628	CHAIN, SIDE (33 LINKS)	2
9	055628	CHAIN, FRONT (44 LINKS)	1

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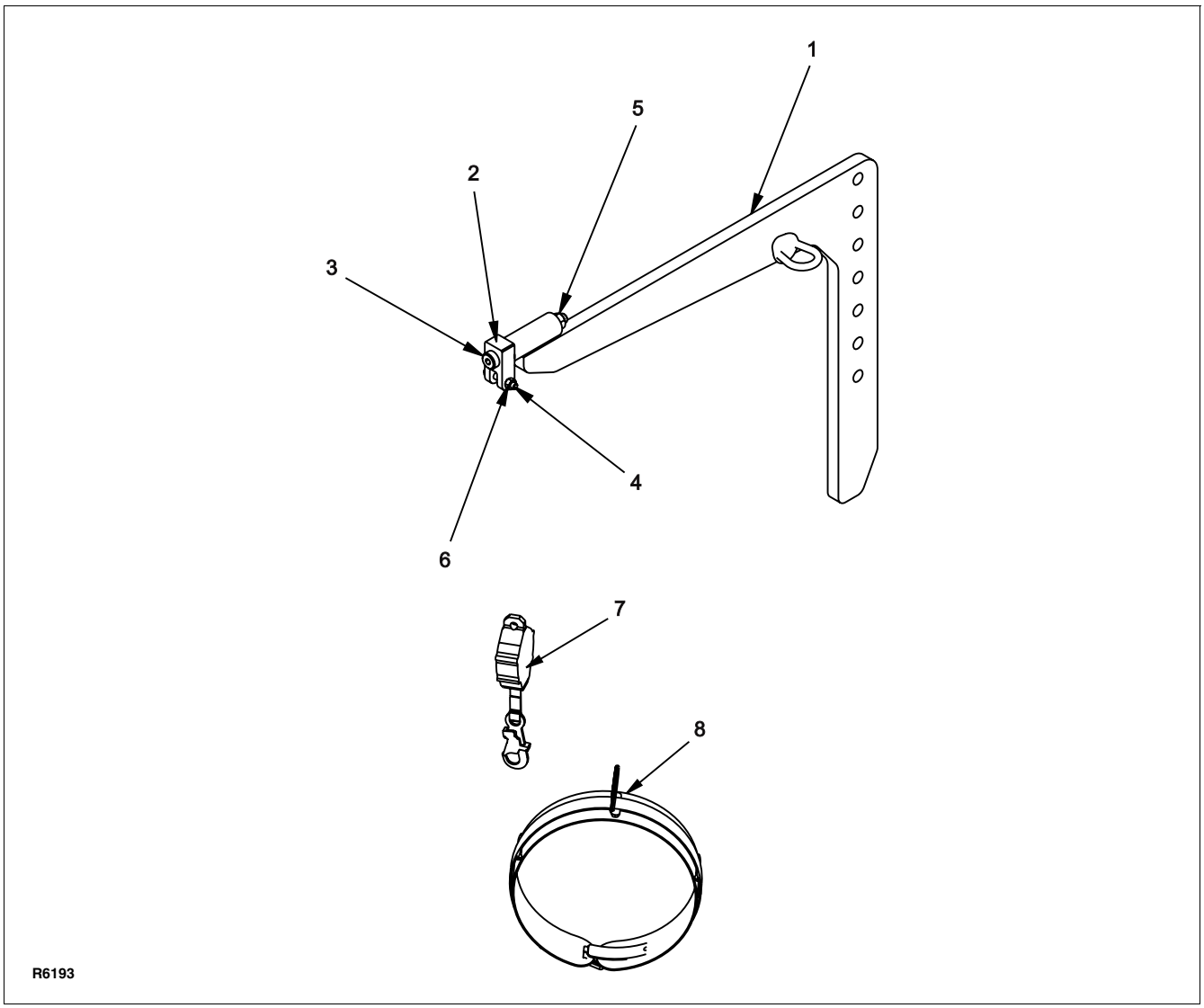

Figure 11-11 Boom, Self Retracting Lifeline And Safety Belt

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506195	BOOM ASSY.	1
1	506194	. BOOM WELDMENT	1
2	404282	. YOKE	1
3	052776	. SHOULDER BOLT - 5/8 X 4.25	1
4	052775	. SHOULDER BOLT - 3/8 X 1.25	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
5	059637	. NUT, NYLOCK, 1/2-13	1
6	059426	. NUT, HEX, 5/16-18	1
7	074011-01	SELF RETRACTING LIFELINE	1
8	908118-01	SAFETY BELT, SINGLE “D” RING	1
—	908119	PAD, SAFETY BELT	1

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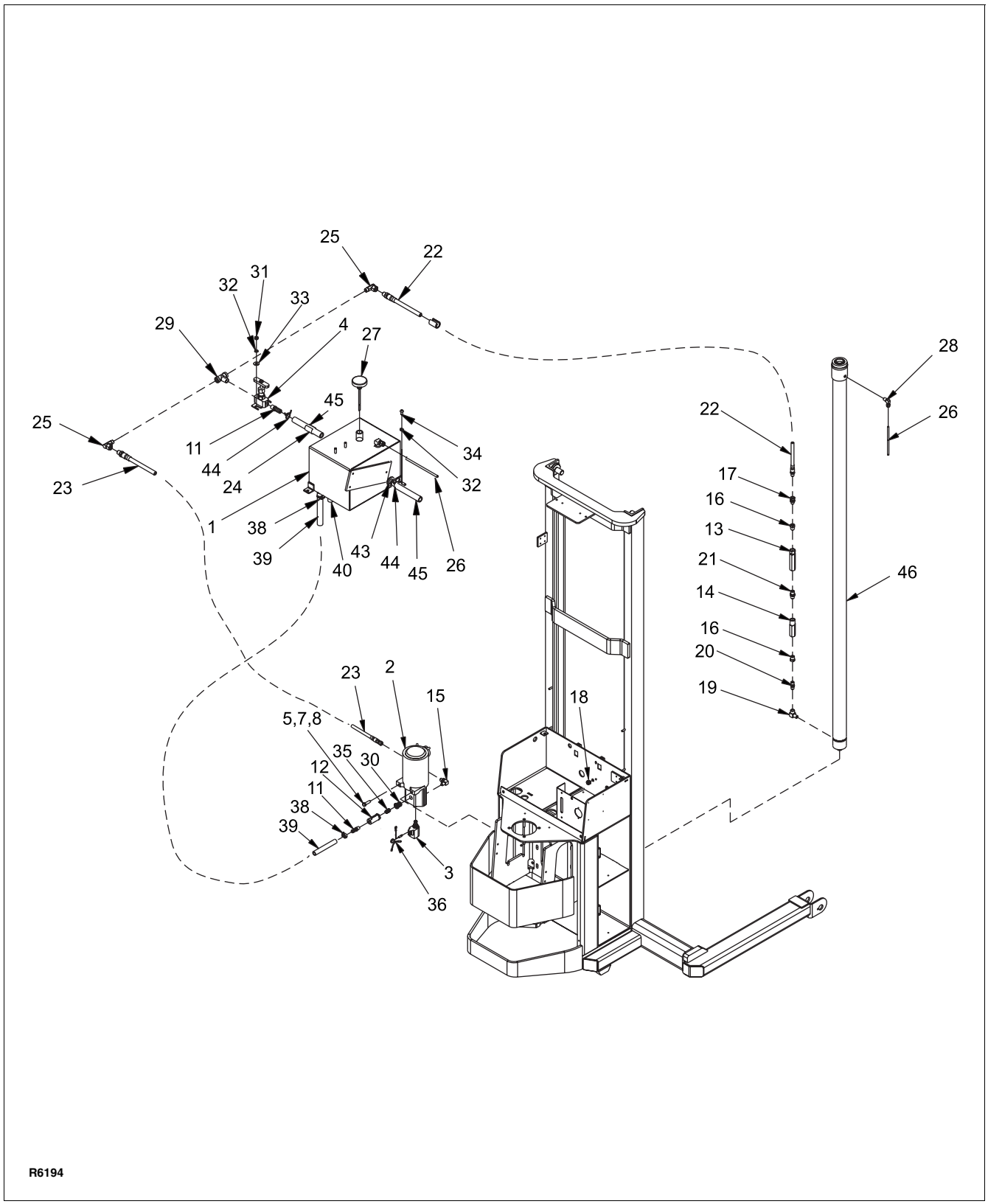

Figure 11-12 Hydraulic System

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	506264	RESERVOIR	1
2	—	PUMP & MOTOR (FIGURE 11-20)	REF
3	048133	SOLENOID VALVE, LOWERING	1
4	11125	VALVE, RELEASE	1
5	064607	SCREW, HEX HD, 3/8-16 X 1-1/4	9
6	—	NOT USED	
7	077056	WASHER, FLAT, 3/8	9
8	077211	WASHER, LOCK, 3/8	9
9	—	NOT USED	3
10	—	NOT USED	7
11	026131	NIPPLE, HOSE, BARED, 1/4	2
12	035107	FILTER ASSY	1
13	048124	VALVE, RELIEF, PILOT	1
14	047110	VALVE, FLOW CONTROL	1
15	025501	ADAPTER, ELBOW	1
16	026500	REDUCER	2
17	025313	CONNECTOR, SWL NUT, 1/4 NPT	1
18	057510	GROMMET, RUBBER, 3/8 X 5/8, 1/4 TH	1
19	026708	ELBOW, STREET, 90°, 1/4 NPT	1
20	026110	NIPPLE, HEX, 1/4 NPT	1
21	026109	NIPPLE, HEX, 3/8 NPT	1
22	504591-04	HOSE ASSY	1
23	504592-04	HOSE ASSY	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
24	20594	SHEATH, HOSE	2
25	025116	ELBOW, 90°, SWIVEL 1/4 NPT	2
26	282500	TUBING, VINYL, 1/4” OD X 0.180” ID	A/R
27	504578	BREATHER & DIPSTICK	1
28	025501	ELBOW, 90°, 1/4 NPT, TUBE	1
29	027118	TEE, MALE BRANCH, 1/4 NPT	1
30	025113	ADAPTER, FEM, 3/4 SAE X 1/4 NPT	1
31	059421	NUT, HEX, 1/4-20 UNC	2
32	077209	WASHER, LOCK, 1/4	4
33	077031	WASHER, FLAT, 1/4	2
34	070476	SCREW, PH RD HD, 1/4-20 1/2	2
35	026133	NIPPLE, PIPE, 1/4 CLOSE	1
36	505837	SUPPRESSOR ASSY, LOWER SOL	1
38	056110	CLAMP, HOSE	2
39	290000	TUBING, VINYL, 3/4” OD X 1/2 ID	A/R
40	026315	PLUG, 1/4 NPT, MAGNETIC	1
41	—	NOT USED	1
43	026131	NIPPLE, HOSE, BARED, 1/4	1
44	056118	CLAMP, SPRING, HOSE	2
45	290000	TUBING, VINYL, 3/4” OD X 1/2 ID	A/R

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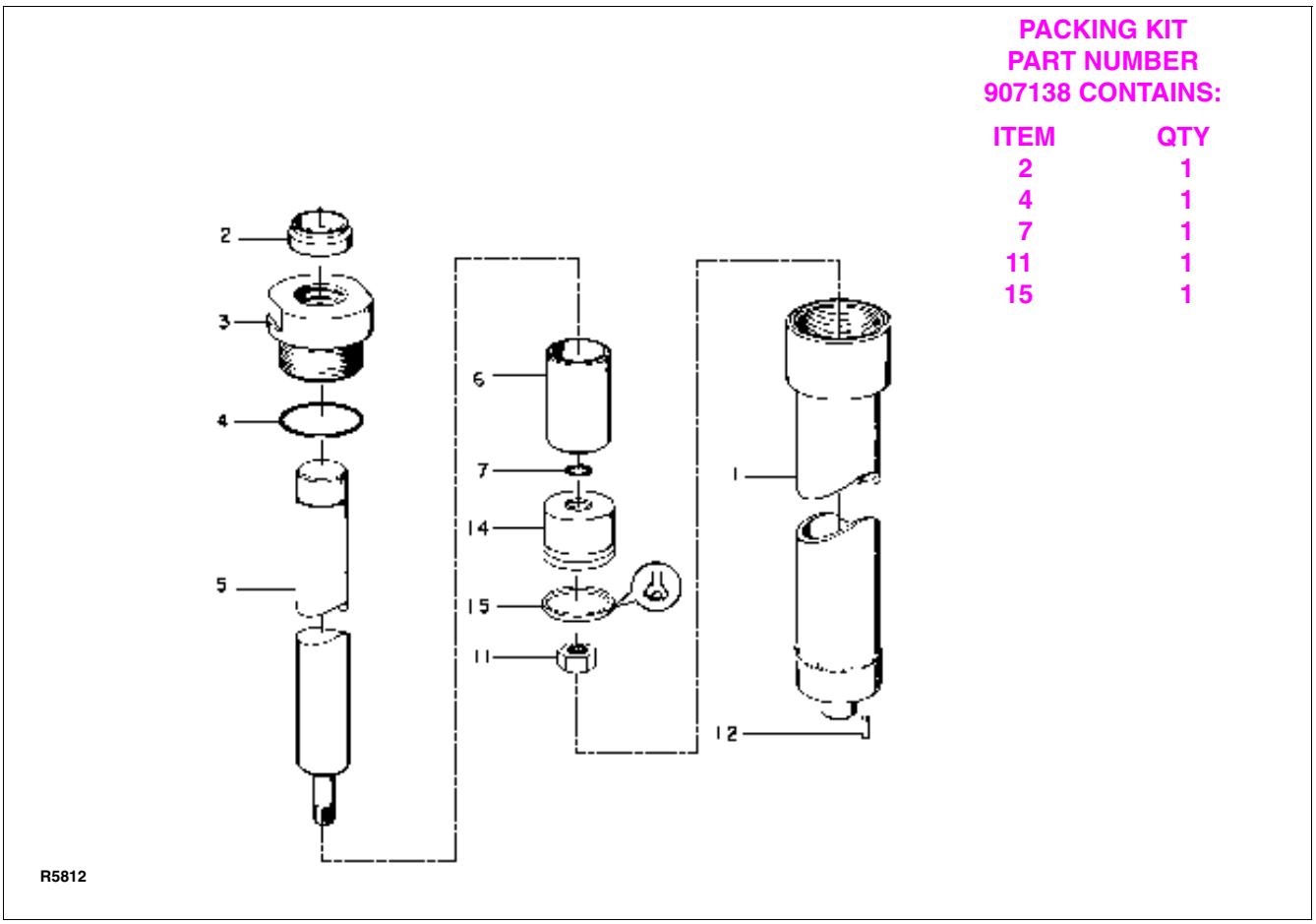

Figure 11-13 Lift Cylinder

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	503604	HYD. LIFT CYLINDER ASY	1
1	503609	. TUBE	1
2	049508 *	. WIPER RING	1
3	800023	. GLAND NUT	1
4	042122 *	. TOP O-RING	1
5	274608	. RAM	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
6	400860	. RAM STOP	1
7	042105 *	. BOTTOM O-RING	1
11	800293 *	. JAM NUT, 3/4-16	1
12	—	. ROLL PIN (FIGURE 11-9)	REF
14	403717	. PISTON	1
15	043130 *	. PSP SEAL	1

* 907138 PACKING KIT INCLUDES ITEMS 2, 4, 7, 11 AND 15

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NOTES

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USED ON TRUCKS
SERIAL NUMBERS
375067 TO 380099

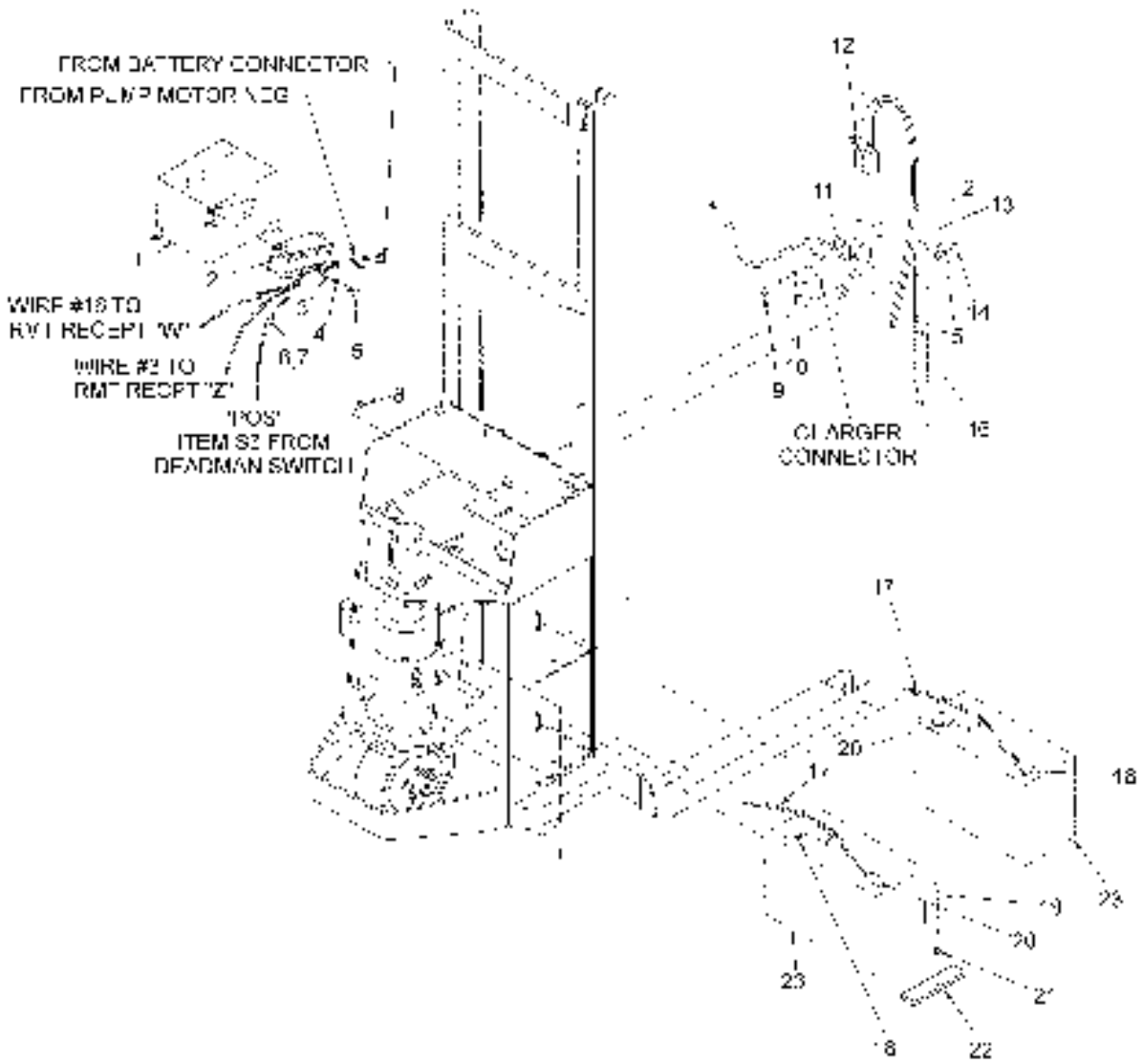

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Figure 11-14 Batteries

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	—	HYD RESERVOIR (FIGURE 11-12)	REF
2	—	EPD CONTACTOR ASSY (FIGURE 11-22)	REF
3	077031	WASHER, FLAT	3
4	077209	WASHER, LOCK, 1/4	3
5	065476	SCREW	3
6	055422	CONNECTOR, IN LINE	3
7	021718	TERMINAL, 1/4 SPADE	3
8	057508	GROMMET	1
9	063486	SCREW, HEX CAP, 1/4-20 X 2-1/4	2
10	077209	WASHER, LOCK, 1/4	2
11	402264	SPACER	1
12	504608	BATTERY CONNECTOR ASSY	1
13	077031	WASHER, FLAT	3
14	059421	NUT, HEX, 1/4-20	3
15	077209	WASHER, LOCK, 1/4	3
16	402258	CHANNEL	1
17	056128	SPIROBAND	A/R
18	504609	CABLE ASSY	1
19	063478	SCREW, HEX CAP, 1/4-20 X 3/4	2
20	504608	BATTERY CONNECTOR ASSY	1
21	077209	WASHER, LOCK, 1/4	2
22	404571	BAR, BATTERY RETAINER	2
23	003216	BATTERY, GEL CELL	2

A/R - AS REQUIRED

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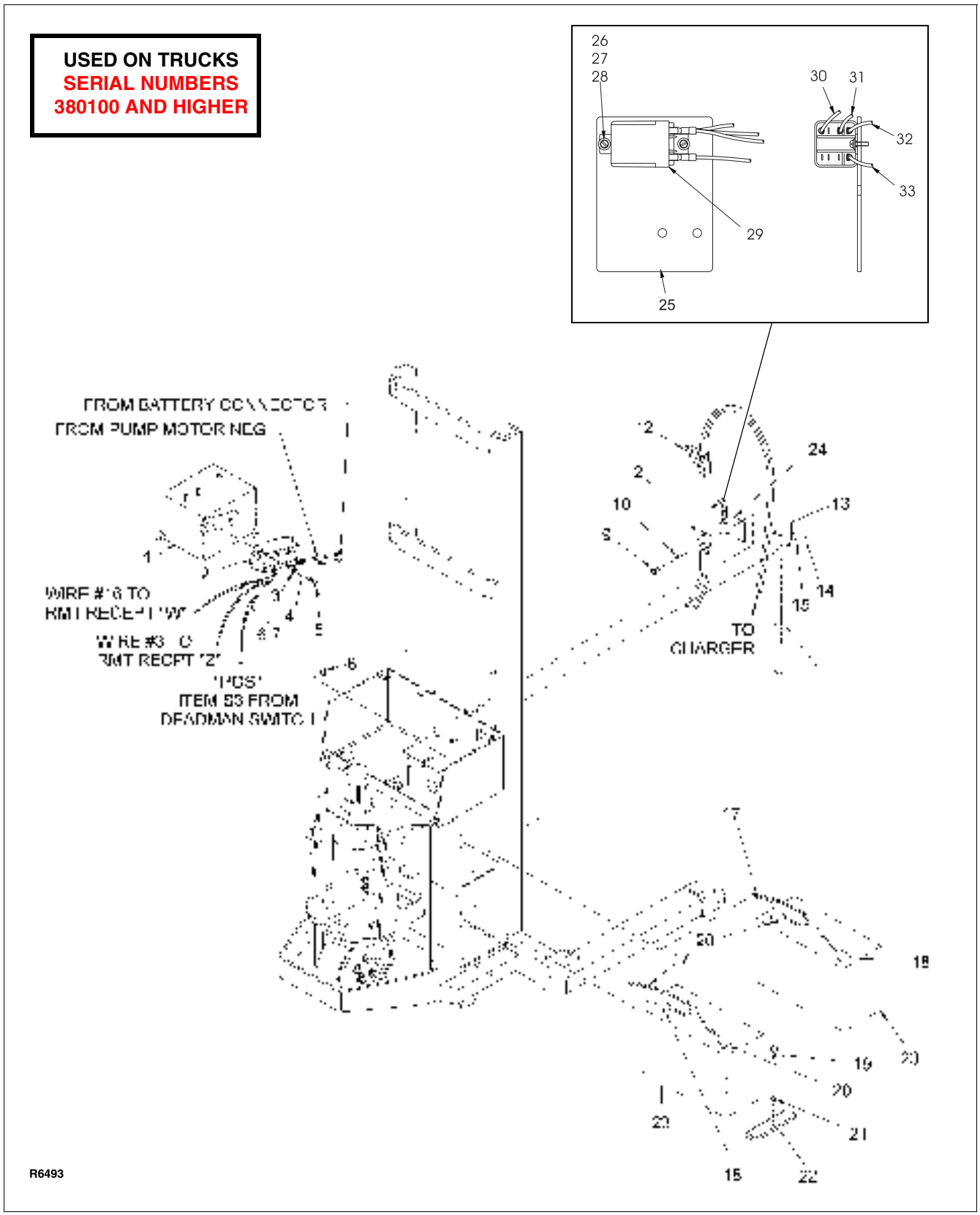

Figure 11-15 Batteries

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	—	HYD RESERVOIR (FIGURE 11-12)	REF
2	—	EPD CONTACTOR ASSY (FIGURE 11-22)	REF
3	077031	WASHER, FLAT	3
4	077209	WASHER, LOCK, 1/4	3
5	065476	SCREW	3
6	055422	CONNECTOR, IN LINE	3
7	021718	TERMINAL, 1/4 SPADE	3
8	057508	GROMMET	1
9	063486*	SCREW, HEX CAP, 1/4-20 X 2-1/4	2
9	063482**	SCREW, HEX CAP, 1/4-20 X 2-1/4	2
10	077209	WASHER, LOCK, 1/4	2
11	402264	SPACER	1
12	506480	BATTERY CONNECTOR ASSY	1
13	077031	WASHER, FLAT	3
14	059421	NUT, HEX, 1/4-20	3
15	077209	WASHER, LOCK, 1/4	3

INDEX NO.	PART NO.	PART NAME	NO. REQD.
16	402258	CHANNEL	1
17	056128	SPIROBAND	A/R
18	504609	CABLE ASSY	1
19	063478	SCREW, HEX CAP, 1/4-20 X 3/4	2
20	504608	BATTERY CONNECTOR ASSY	1
21	077209	WASHER, LOCK, 1/4	2
22	404571	BAR, BATTERY RETAINER	2
23	003216	BATTERY, GEL CELL	2
24	506482-01	AC RELAY	
25	404960	. PLATE-MTG, RELAY	1
26	068231	. SCREW-RD HD, #6-32 X 1/2	2
27	077204	. WASHER-LOCK, SPLIT, #6	2
28	077007	. WASHER-FLATE, #6	2
29	018411	. RELAY	1
30	023267-08	. WIRE ASSY-BLACK, #3	1
31	023267-08	. WIRE ASSY-BLACK, #3	1
32	023267-07	. WIRE ASSY-WHITE	1
33	023267-06	. WIRE ASSY-BLACK	1

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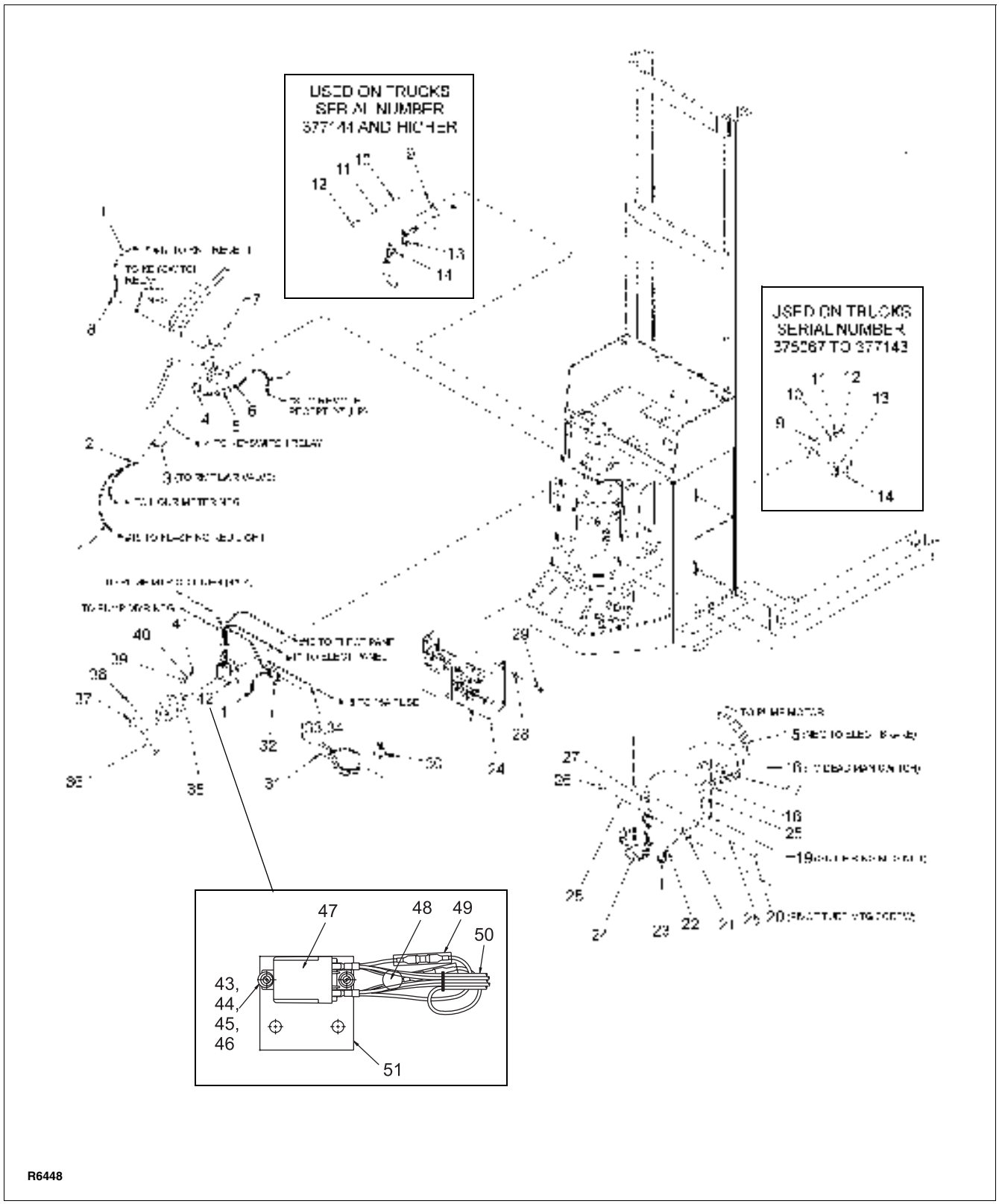

Figure 11-16 Chassis Mounted Electrical Components

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	20624	WIRE HARNESS	1
2	021203	TERMINAL, RING	2
3	023238-14	WIRE ASSY	1
4	505921	SUPPRESSOR, SOLENOID	1
5	005422	CONNECTOR, IN LINE	1
6	021718	TERMINAL, 1/4 SPADE	1
7	—	PUMP AND MOTOR ASSY (FIGURE 11-20)	REF
8	021207	TERMINAL, RING, 5/16	1
9	402255*	BRACKET, MOUNTING, SWITCH	1
9	404607**	BRACKET, MOUNTING, SWITCH	1
10	077031	WASHER, FLAT	2
11	077209	WASHER, LOCK, 1/4	2
12	059421*	NUT, HEX, 1/4-20	2
12	065476**	SCREW	2
13	020673	SWITCH, LIMIT	1
14	021210	TERMINAL, FORK, INSUL, #6	1
15	023238-30	WIRE ASSY	1
16	023276	HARNESS ASSY, DEADMAN	1
17	023238-29	WIRE ASSY	1
18	056141	CLAMP, CABLE	1
19	—	NUT	1
20	—	SCREW	1
21	056135	CLAMP, LOOP, CUSHIONED	1
22	023252	WIRE HARNESS (FIGURE 11-4)	REF
23	005642	CONTACT, PIN	3
24	—	PANEL ASSY (FIGURE 11-21)	REF
25	077210	WASHER, LOCK, SPLIT, 5/16	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
26	063553	SCREW, HHC, 5/16-18 X 3/4	1
27	056135	CLAMP, LOOP, CUSHIONED	1
28	077210	WASHER, LOCK, SPLIT, 5/16	4
29	063553	SCREW, HHC, 5/15-18 X 3/4	4
30	020725	KEYSWITCH	1
31	20607	HARNESS AND CONNECTOR ASSY	1
32	005626	CONTACTOR, PIN	2
33	023001	WIRE, 16 GA, RED	A/R
34	005649	SPLICE, TAP, WIRE	1
35	009602	HORN	1
36	023238-04	WIRE ASSY	1
37	504096	SUPPRESSOR, HORN	1
38	023238-08	WIRE ASSY	1
39	077031	WASHER, FLAT	2
40	077209	WASHER, LOCL, 1/4	2
41	059421	NUT, HEX, 1/4-20	2
42	20598	RELAY ASY, KEYSWITCH	1
43	068177	. SCREW, RD HD, #5-40 X 3/8	2
44	077203	. WASHER, LOCK, SPLIT, #5	2
45	077007	. WASHER	2
46	077032	. WASHER, 3/16 X 1/2 X 13 GA	2
47	018409-02	. RELAY-MOUNT, FLANGE, 24V	1
48	505321	. SUPPRESSOR ASSY	1
49	005422	. CONNECTOR-INLINE, INSUL	2
50	20572	. HARNESS	1
51	404429	. MOUNTING PLATE	1

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*** USED ON TRUCKS SERIAL NUMBER 375067 TO 377143**

**** USED ON TRUCKS SERIAL NUMBER 377144 AND HIGHER**

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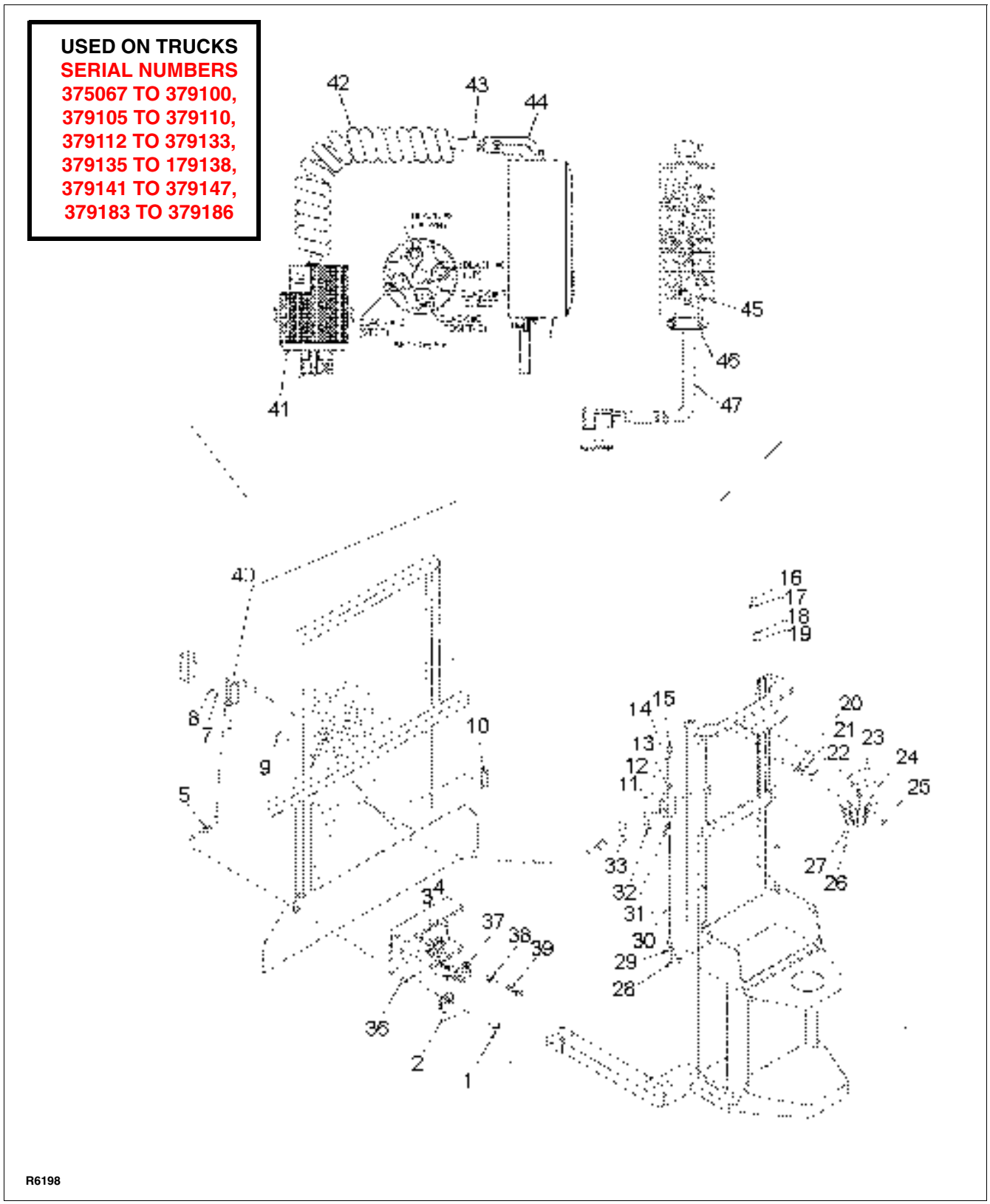

Figure 11-17 Platform Mounted Electrical Components

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	059421	NUT, HEX, 1/4-20	1
2	800257	CLAMP, HALF	1
3	056113	TIE, WIRE, NYLON, 6-3/8”	1
4	056111	TIE, WIRE, NYLON, 4”	1
5	057517	GROMMET	1
7	077207	WASHER, LOCK, SPLIT, #10	2
8	071375	SCREW, PHILLIPS, TRUSS HD MACH, 10-24 X 3/8	2
9	057517	GROMMET	1
10	11155	MOUNTING PLATE	1
11	071379	SCREW, PHILLIPS, TRUSS HEAD	4
12	005315	CONDUIT BOX	1
13	005317	CONNECTOR	1
14	20414	CONDUIT, 1/2”	1
15	005318	ELBOW	1
16	059421	NUT, HEX, 1/4-20	2
17	077209	WASHER, LOCK, SPLIT, 1/4	2
18	059416	NUT, HEX, REGULAR 10-32	2
19	077207	WASHER, LOCK, SPLIT, #10	2
20	056122	CLAMP, HALF	1
21	077207	WASHER, LOCK, SPLIT, #10	1
22	071376	SCREW, TRUS, #10-32 X 1/2	1
23	013609-02	FLASHING RED LIGHT	1
—	901470	. FUSE AND HOLDER (IF EQUIPPED)	
—	901469	. FUSE (IF EQUIPPED)	

INDEX NO.	PART NO.	PART NAME	NO. REQD.
24	013610	GUADE, LAMP	1
25	071376	SCREW, TRUS, #10-32 X 1/2	2
26	063480	SCREW, HEX CAP, 1/4-20 X 1	2
27	077031	WASHER	2
28	005318	ELBOW	1
29	20624	WIRE BUNDLE	1
30	20415	CONDUIT, 1/2”	1
31	005317	CONNECTOR	1
32	31	OUTLET	1
33	005320	COVER	1
34	—	NOT USED	
35	—	NOT USED	
36	11874	GUARD	1
37	11590	BUZZER	1
38	077203	WASHER, LOCK, SPLIT, #5	2
39	068180	SCREW, RD HD, #5-40 X 1/1/2	2
40	11151	SWITCH BOX ASSY	1
41	017815	. PLUG	1
42	907199	. CABLE	1
43	278600	. TUBING (5”)	1
44	005415	. CONNECTOR	1
45	021210	. SPADE TERMINAL	6
46	005405	. STRAIN RELIEF	1
47	907175	. CABLE ASSY	1
48	020785	. BOX ASSY, RMT CNTRL	1

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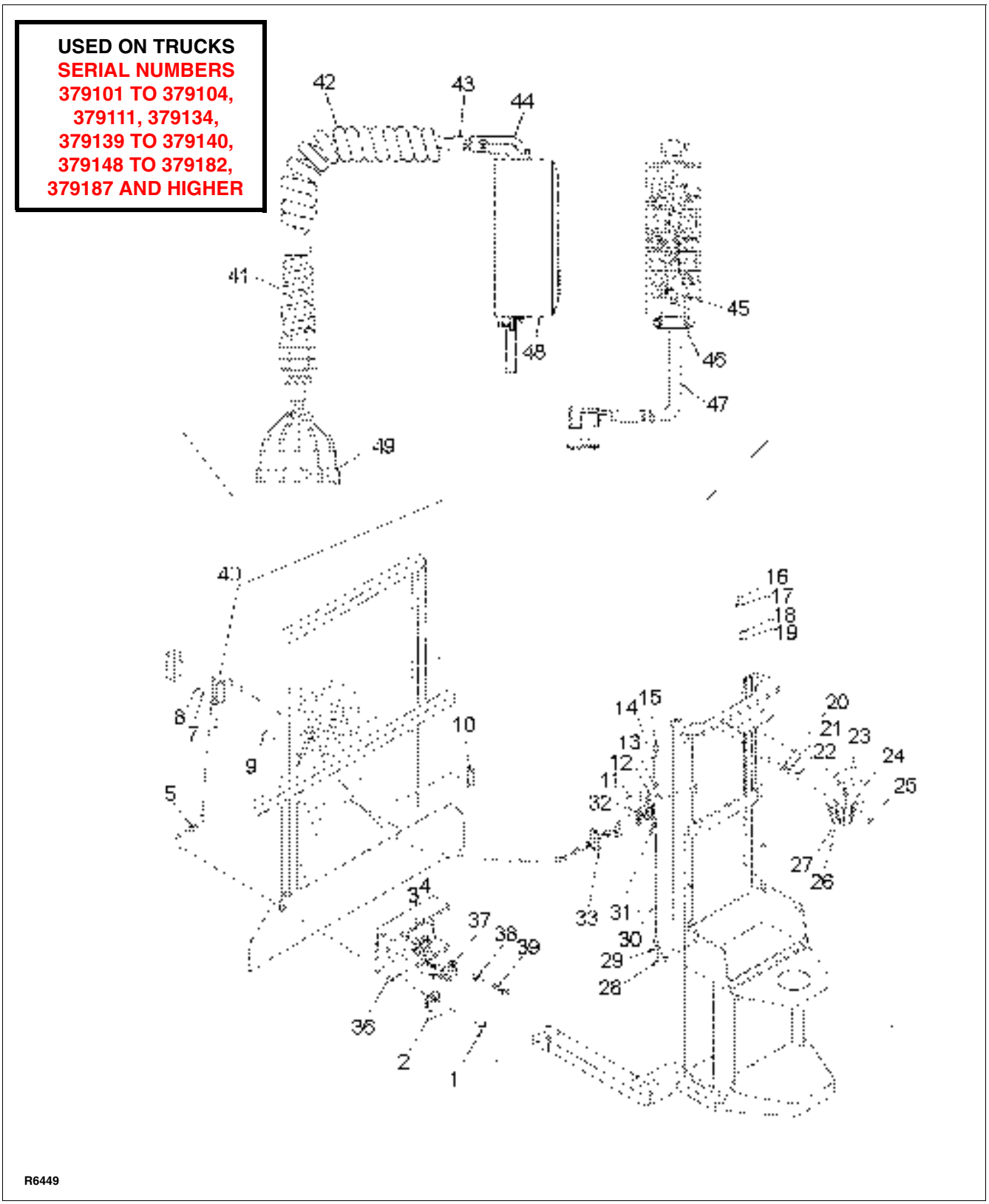

Figure 11-18 Platform Mounted Electrical Components

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	059421	NUT, HEX, 1/4-20	1
2	800257	CLAMP, HALF	1
3	056113	TIE, WIRE, NYLON, 6-3/8”	1
4	056111	TIE, WIRE, NYLON, 4”	1
5	057517	GROMMET	1
7	077207	WASHER, LOCK, SPLIT, #10	2
8	071375	SCREW, PHILLIPS, TRUSS HD MACH, 10-24 X 3/8	2
9	057517	GROMMET	1
10	11155	MOUNTING PLATE	1
11	071379	SCREW, PHILLIPS, TRUSS HEAD	4
12	005315	CONDUIT BOX	1
13	005317	CONNECTOR	1
14	20414	CONDUIT, 1/2”	1
15	005318	ELBOW	1
16	059421	NUT, HEX, 1/4-20	2
17	077209	WASHER, LOCK, SPLIT, 1/4	2
18	059416	NUT, HEX, REGULAR 10-32	2
19	077207	WASHER, LOCK, SPLIT, #10	2
20	056122	CLAMP, HALF	1
21	077207	WASHER, LOCK, SPLIT, #10	1
22	071376	SCREW, TRUS, #10-32 X 1/2	1
23	013609-02	FLASHING RED LIGHT	1
—	901470	. FUSE AND HOLDER (IF EQUIPPED)	
—	901469	. FUSE (IF EQUIPPED)	

INDEX NO.	PART NO.	PART NAME	NO. REQD.
24	013610	GUADE, LAMP	1
25	071376	SCREW, TRUS, #10-32 X 1/2	2
26	063480	SCREW, HEX CAP, 1/4-20 X 1	2
27	077031	WASHER	2
28	005318	ELBOW	1
29	20624	WIRE BUNDLE	1
30	20415	CONDUIT, 1/2”	1
31	005317	CONNECTOR	1
32	005321	OUTLET	1
33	005320	COVER	1
34	—	NOT USED	
35	—	NOT USED	
36	11874	GUARD	1
37	11590	BUZZER	1
38	077203	WASHER, LOCK, SPLIT, #5	2
39	068180	SCREW, RD HD, #5-40 X 1/1/2	2
40	11151	SWITCH BOX ASSY	1
41	017815	. PLUG	1
42	907199	. CABLE	1
43	278600	. TUBING (5”)	1
44	005415	. CONNECTOR	1
45	021210	. SPADE TERMINAL	6
46	005405	. STRAIN RELIEF	1
47	907175	. CABLE ASSY	1
48	020785	. BOX ASSY, RMT CNTRL	1

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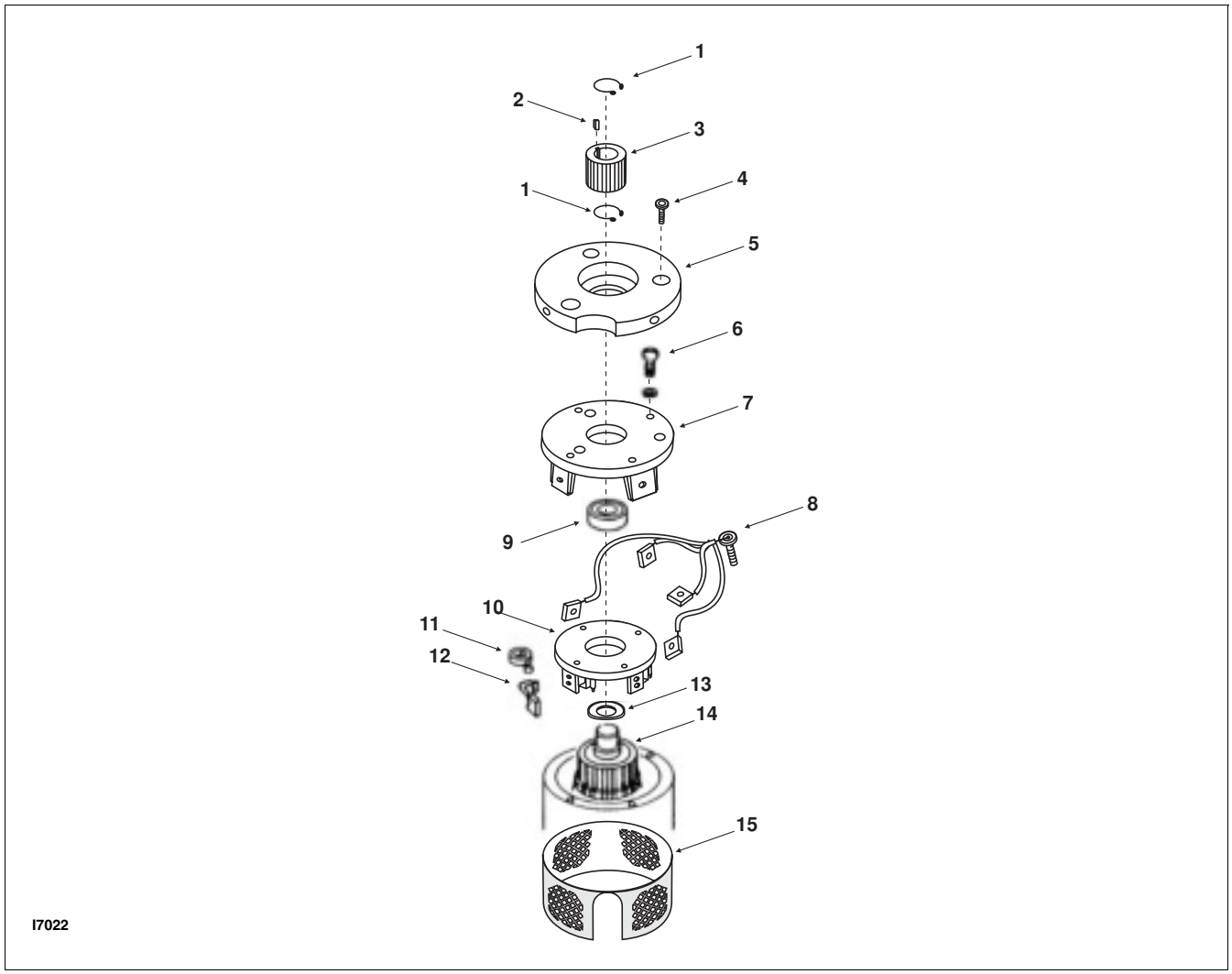

Figure 11-19 Drive Motor

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	016051	MOTOR, DRIVE	1
1	901722	. CLIP, SPRING	2
2	901723	. WOODRUFF KEY	1
3	901724	. GEAR, SPLINED	1
4	067435-01	. ALLEN HEAD COUNTERSUNK SCREW, METRIC, M8 X 35MM	3
5	404189	. MOTOR, END PLATE	1
6	901725	. BOLT, HEX HEAD	4
7	901726	. HEAD, COMMUTATOR END	1
8	901727	. BRUSH LEAD AND TERMINAL CONNECTOR	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	901728	. BEARING, COMMUTATOR END	1
10	901729	. BRUSH BOX ASSEMBLY	1
11	901730	. SPRING, BRUSH (SET OF FOUR)	1
12	901731	. BRUSH (SET OF FOUR)	1
13	901732	. WASHER, SPRING	1
14	901733	. ARMATURE ASSEMBLY	1
15	901734	. HEADBAND ASSEMBLY	1

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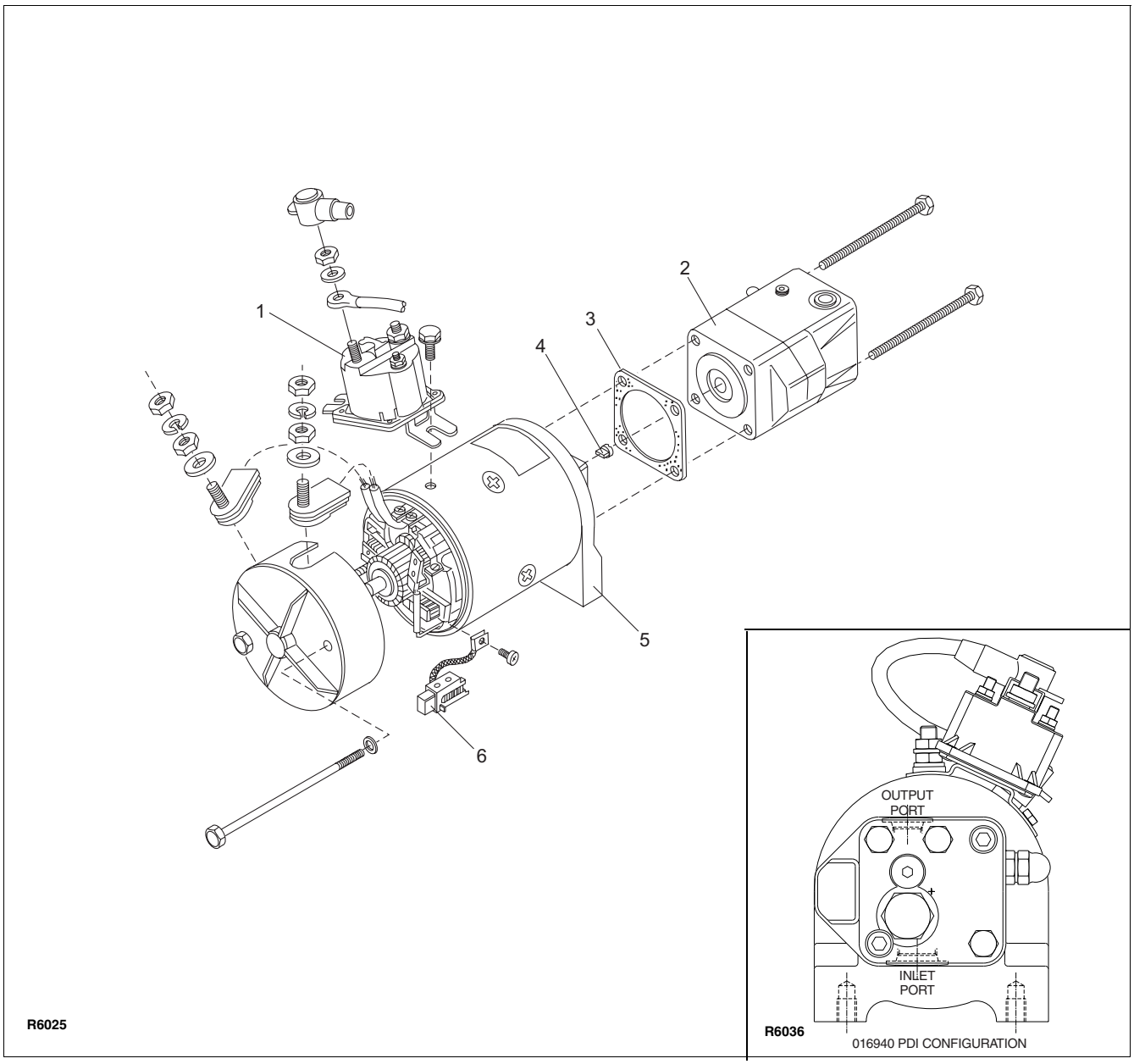

Figure 11-20 Hydraulic Pump and Motor Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	016940	PUMP AND MOTOR ASSY	REF
1	906003	. SOLENOID	1
2	906004	. PUMP, COMPLETE	1
3	906005	. GASKET	1
4	906006	. COUPLING	1
5	906007	. MOTOR ASSY	1
6	906008	. . BRUSH AND HOLDER KIT	1

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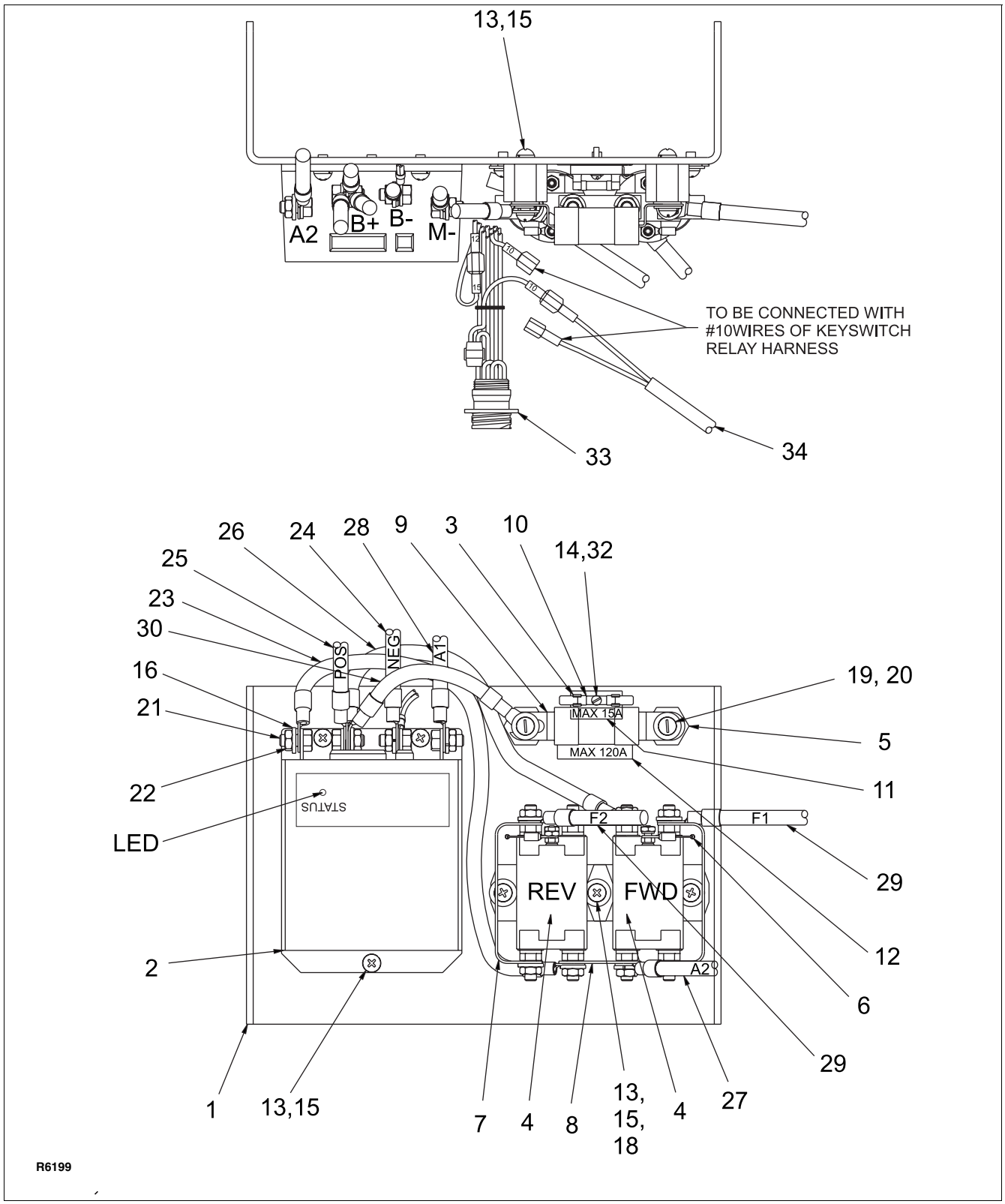

Figure 11-21 Electrical Control Panel

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INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506240	ELECTRICAL PANEL ASSEMBLY	1
1	404321	. BRACKET, ELECT PANEL	1
2	005468	. CONTROLLER, TRANSISTER, 250A, 24V	1
3	008904	. FUSE HOLDER	1
4	005667	. SOLENOID, CONNECTOR, 24V	2
5	010614	. STANOFF, INSULATOR	2
6	005996	. DIODE ASSY	2
7	403548	. BUSSBAR	2
8	403549	. BUSSBAR	2
9	008918	. FUSE, 120 AMP	1
10	008910	. FUSE, 15 AMP	1
11	056504	. DECAL, FUSE (15 AMP)	1
12	056562	. DECAL, FUSE (120 AMP)	1
13	070476	. SCREW, RD HD PHILLIPS, 1/4-20 UNC X 1/2	8
14	077204	. WASHER, LOCK #6	1
15	077209	. WASHER, LOCK 1/4	8
16	077210	. WASHER, LOCK 5/16	4
18	077031	. WASHER, FLAT 1/4	3
19	077031	. WASHER, FLAT 1/4, BRASS	4
20	070489	. SCREW, SL RD HD BRASS, 1/4-20 X 5/8	2
21	070489	. SCREW, HEX RD HD, 5/16-18 X 5/8	4
22	059526	. NUT, HEX, JAM, 5/16-18	4
23	504611-45	CABLE ASSY, #6 (CONTL A2 TO REV CONTR)	1
24	504611-37	CABLE ASSY, #6 (CONTL B- TO PUMP MTR NEG)	1
25	504611-38	CABLE ASSY, #6 (CONTL B+ TO PUMP MTR SOL POS)	1
26	504611-42	CABLE ASSY, #6 (CONTL B+ TO FWD CONTR)	1
27	504611-40	CABLE ASSY, #6 (FWD CONTR TO DRV MTR A2)	1
28	504611-27	CABLE ASSY, #6 (CONTL M TO DRIVE MTR A1)	1
29	504611-28	CABLE ASSY, #6 (REV CONTL TO DRIVE MTR F2)	1
29	504611-28	CABLE ASSY, #6 (FWD CONTL TO DRIVE MTR F1)	1
30	504611-20	CABLE ASSY, #6 (CONTL B+ TO 300 AMP FUSE)	1
32	068230	SCREW, RD HD , 6-32 X 3/8	1
33	023275	HARNES ASSY, PANEL, XSTR	1
34	506245	CABLE ASSY, HIGH SPEED CUTOUT	

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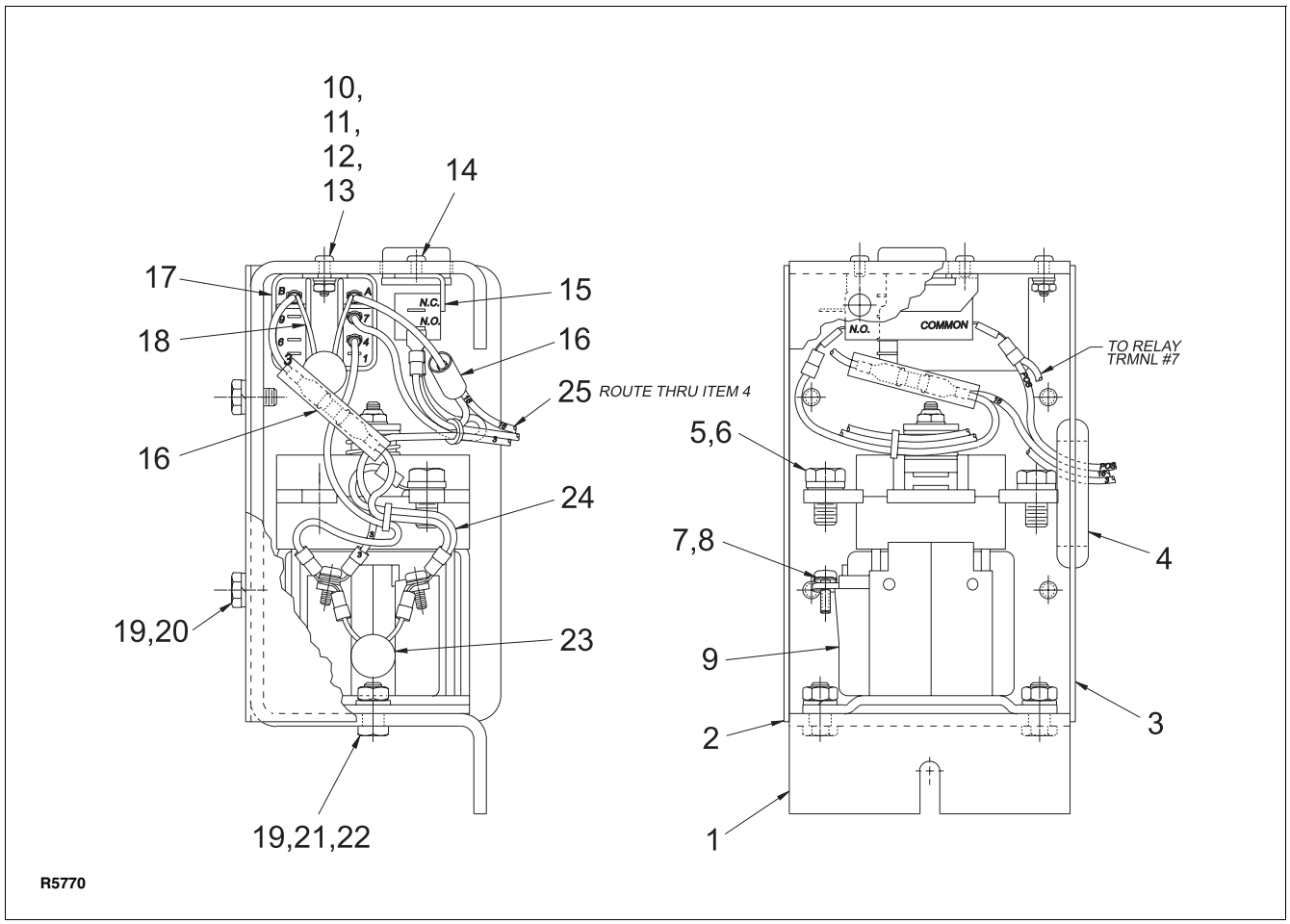

Figure 11-22 Emergency Power Disconnect

INDEX NO.	PART NO.	PART NAME	NO. REQD.
	20798	CONTACTOR ASSY-EPD (WITH EXTERNAL CABLES & BATTERY CONNECTOR - SEE FIGURE 11-21)	1
	20575	. CONTACTOR ASSY-EPD (WITHOUT EXTERNAL CABLES & BATTERY CONNECTOR)	1
1	20554	. . BRACKET-MTG, CONTACTOR, EPD	1
2	20555	. . COVER-LH, MTG BRACKET	1
3	20556	. . COVER-RH, MTG BRACKET	1
4	057511	. . GROMMET, 1-1/2 ID	1
5	077210	. . WASHER-LOCK, SPLIT, 5/16	3
6	067440	. . SCREW, HEX HD	3
7	077205	. . WASHER-LOCK, SPLIT, #8	2
8	067425	. . SCREW	2
9	903176	. . CONTACTOR	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
10	059412	. . NUT-HEX, 6-32	2
11	077204	. . WASHER-LOCK, SPLIT, #6	2
12	077007	. . WASHER	2
13	067416	. . SCREW-PAN HD, #6-32 X 1/2	2
14	067415	. . SCREW-PAN HD, #6-32 X 1/4	2
15	020698	. . SWITCH-PUSHBUTTON, RED	1
16	005422	. . CONNECTOR-INLINE, INSUL	2
17	018409-02	. . RELAY-MOUNT, FLANGE, 24V	1
18	505321	. . SUPPRESSOR ASSY	1
19	077209	. . WASHER-LOCK, SPLIT, 1/4	6
20	065476	. . SCREW-HEX HD, 1/4-20 X 1/2	4
21	059421	. . NUT-HEX, 1/4-20	2
22	063477	. . SCREW-HEX HD, 1/4-20 X 5/8 GR 5	2
23	504097	. . SUPPRESSOR ASSY-SPIKE	1
24	20578	. . CABLE	1
25	20570	. . CABLE	1

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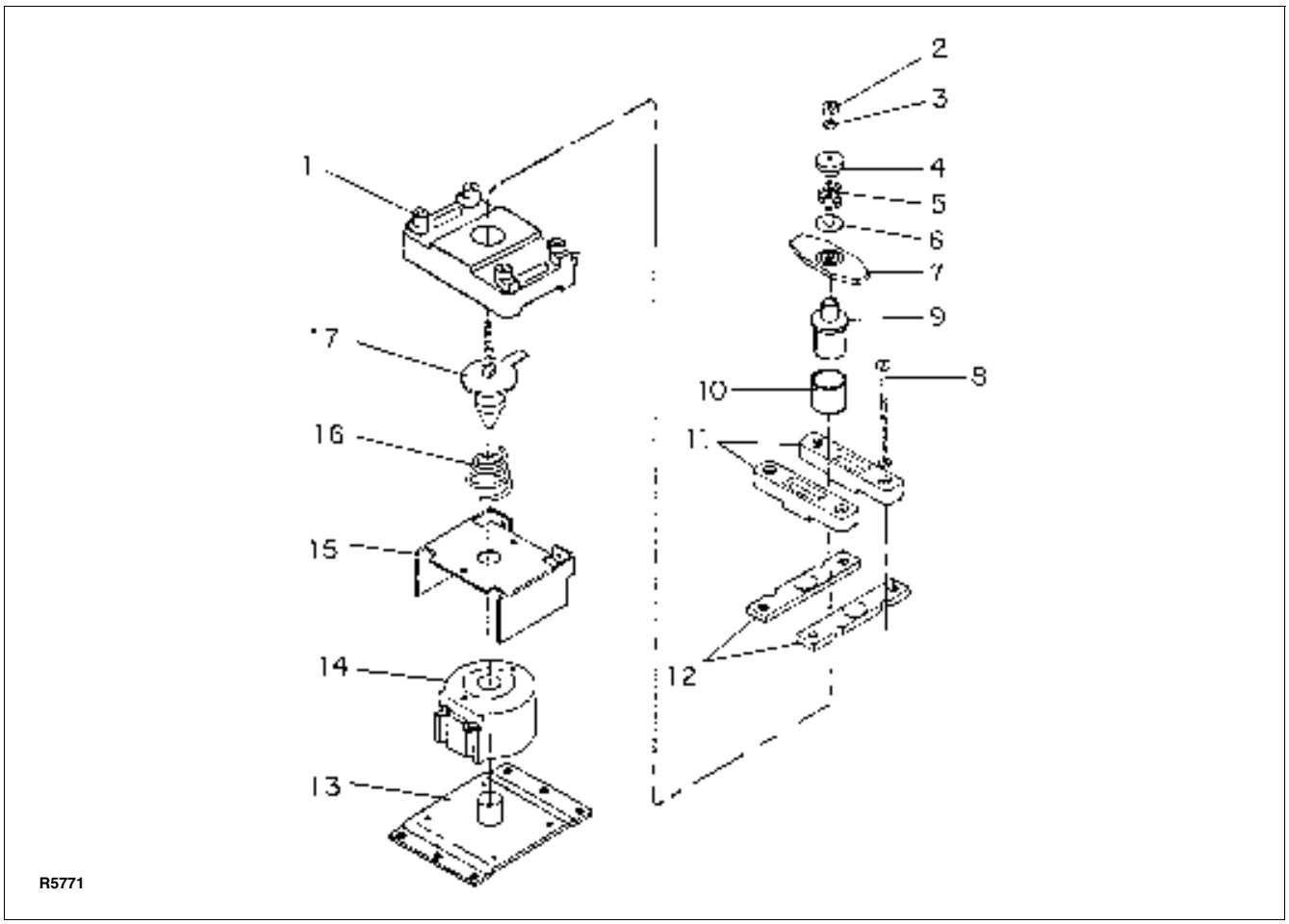

Figure 11-23 Contactor

INDEX NO.	PART NO.	PART NAME	NO. REQD.
	903176	CONTACTOR	1
1	903206	. BUS BASE	2
2	—	. NUT	1
3	—	. WASHER	1
4	903705	. TIP SPRING RETAINER	1
5	903106	. SPRING, MOVABLE (GOLD)	1
6	903166	. SPRING SEAT	1
7	903182	. MOVABLE TIP ASSEMBLY	1
8	—	. MOUNTING SCREW	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	903169	. MOVABLE TIP CARRIER	1
10	903172	. PLUNGER BUSHING	1
11	903208	. CONTACT SPACER	2
12	903179	. BUS ASSEMBLY	2
13	903180	. MAGNET BASE ASSEMBLY	1
14	903174	. COIL	1
15	—	. MAGNET FRAME	1
16	903178	. RETURN SPRING	1
17	903181	. ARMATURE ASSEMBLY	1

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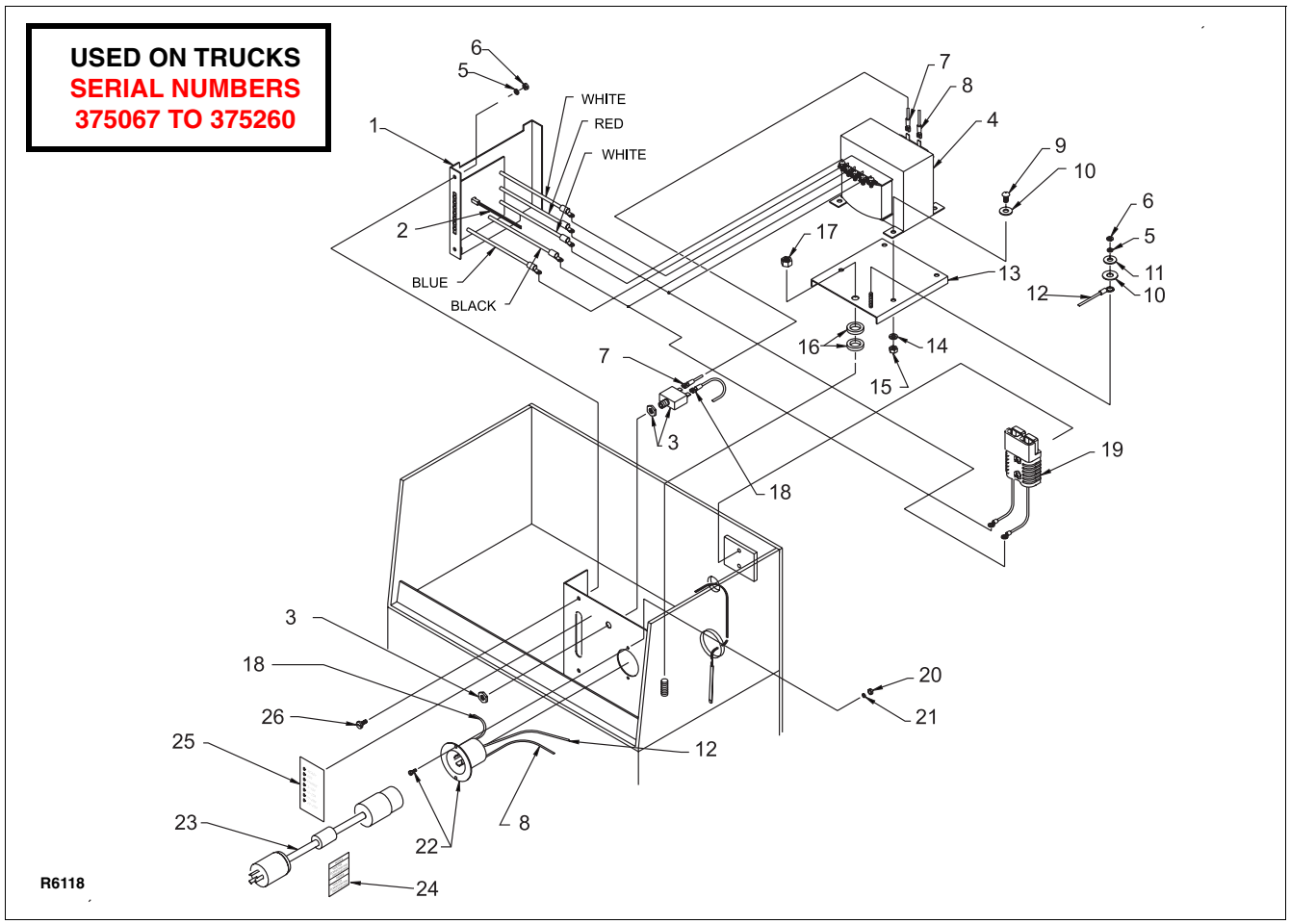

Figure 11-24 Gel Cell Battery Charger

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	004987	CHARGER KIT-24V, 25 AMP	1
1	904075	. PCB ASSY WITH HEATSINK	1
2	904074	. . THERMISTOR	1
3	003403	. CIRCUIT BREAKER-AUTO RESET	1
4	904076	. TRANSFORMER	1
5	077208	WASHER-LOCK, SPLIT, #12	3
6	059416	NUT-HEX, 10-32	3
7	023238-25	WIRE ASSEMBLY	1
8	505676-03	WIRE ASSEMBLY	1
9	070476	SCREW-PH RD HD, 1/4-20 X 1/2	4
10	077031	WASHER, 5/16 X 3/4 X 16 GA	5
11	077032	WASHER, 3/16 X 1/2 X 13 GA	1
12	023238-27	WIRE ASEMBLY	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
13	505992	BRACKET, CHARGER	1
14	077209	WASHER-LOCK, SPLIT, 1/4	4
15	077421	NUT-HEX, 1/4-20	4
16	077064	WASHER, 0.641 X 1.062 X 7 GA	2
17	059429	NUT-HEX, 3/8-16	1
18	026238-26	WIRE ASEMBLY	1
19	506178	CONNECTOR ASSY - CHARGER	1
20	059412	NUT-HEX, 6-32	2
21	077204	WASHER - LOCK, SPLIT, #6	2
22	005461	CONNECTOR - INLET FLANGED	1
23	23884	CORD ASSY - BREAK-A-WAY	1
24	056685	. LABEL - CHANGER CORD	1
25	056681	DECAL - CHARGER, LED	1
26	071376	SCREW - PH TR HD, 10-32 X 1/2	2

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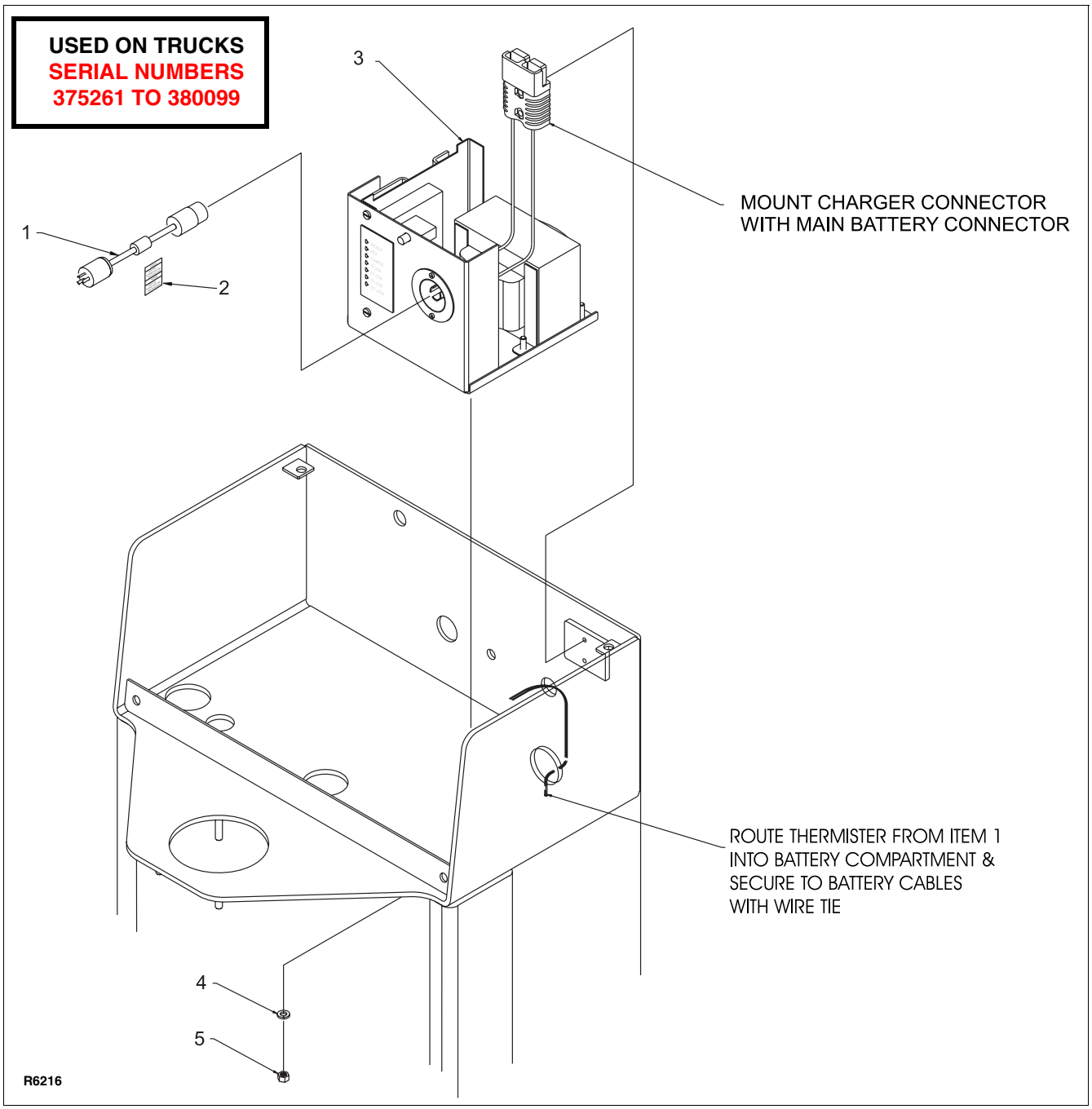

Figure 11-25 Gel Cell Battery Charger Installation

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	23884	CORD ASSY - BREAK-A-WAY	1
2	056685	. LABEL - CHANGER CORD	1
3	—	CHARGER-24V, 25 AMP (FIGURE 11-26)	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
4	077210	WASHER, LOCK, SPLIT, 5/16	2
5	059426	NUT, HEX, 5/16-18	2

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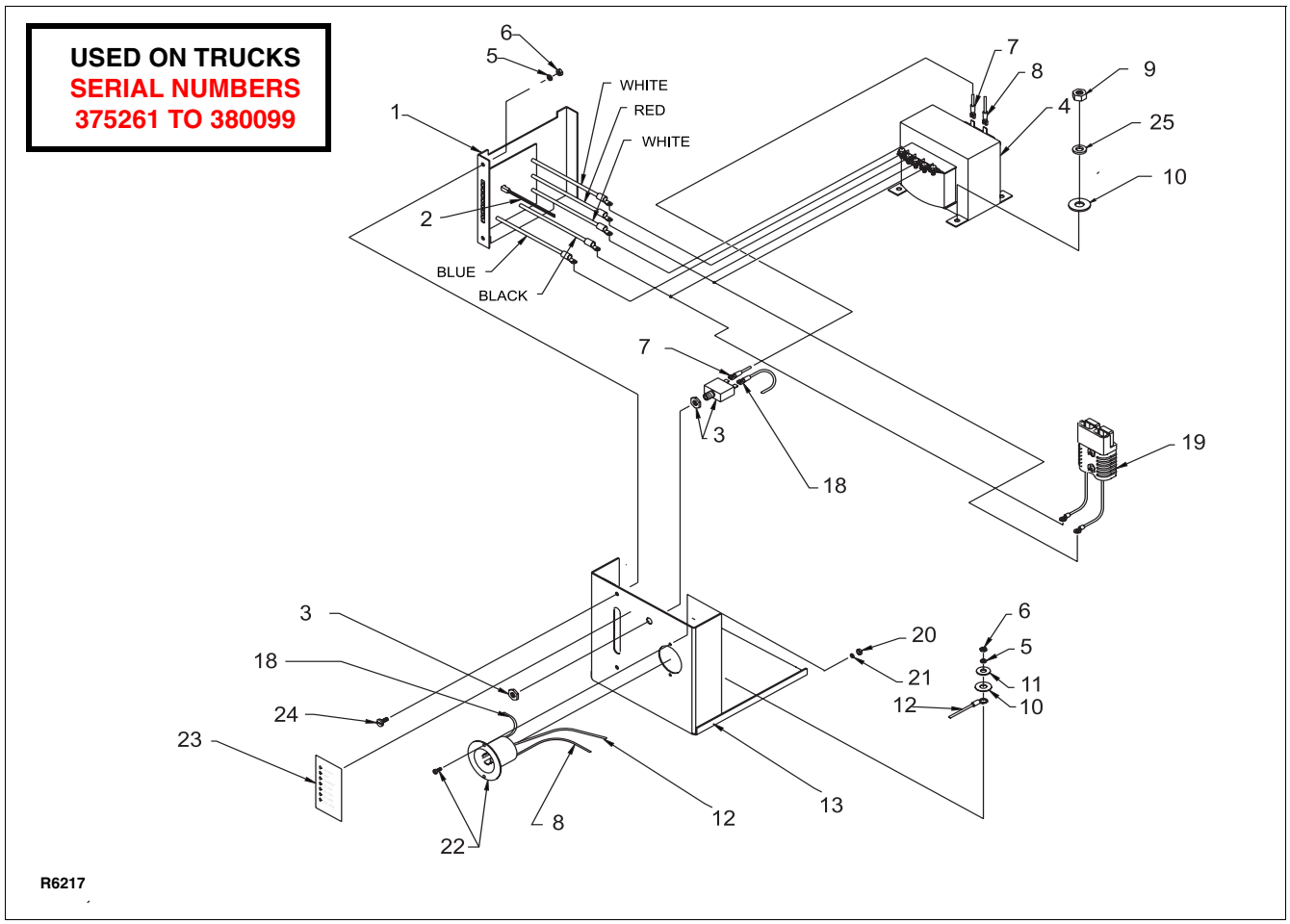

Figure 11-26 Gel Cell Battery Charger

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506320-03	CHARGER-24V, 25 AMP	1
1	904075	. PCB ASSY WITH HEATSINK	1
2	904074	. . THERMISTOR	1
3	003403	. CIRCUIT BREAKER-AUTO RESET	1
4	904076	. TRANSFORMER	1
5	077208	WASHER-LOCK, SPLIT, #12	3
6	059416	NUT-HEX, 10-32	3
7	023238-25	WIRE ASSEMBLY	1
8	505676-03	WIRE ASSEMBLY	1
9	059421	NUT, HEX, 1/4-20	4
10	077031	WASHER, 5/16 X 3/4 X 16 GA	5

INDEX NO.	PART NO.	PART NAME	NO. REQD.
11	077032	WASHER, 3/16 X 1/2 X 13 GA	1
12	023238-27	WIRE ASEMBLY	1
13	506173	BRACKET, CHARGER	1
18	026238-26	WIRE ASEMBLY	1
19	506178	CONNECTOR ASSY - CHARGER	1
20	059412	NUT-HEX, 6-32	2
21	077204	WASHER - LOCK, SPLIT, #6	2
22	005461	CONNECTOR - INLET FLANGED	1
23	056681	DECAL - CHARGER, LED	1
24	071376	SCREW - PH TR HD, 10-32 X 1/2	2
25	077209	WASHER, SPLIT, LOCK, 1/4	4

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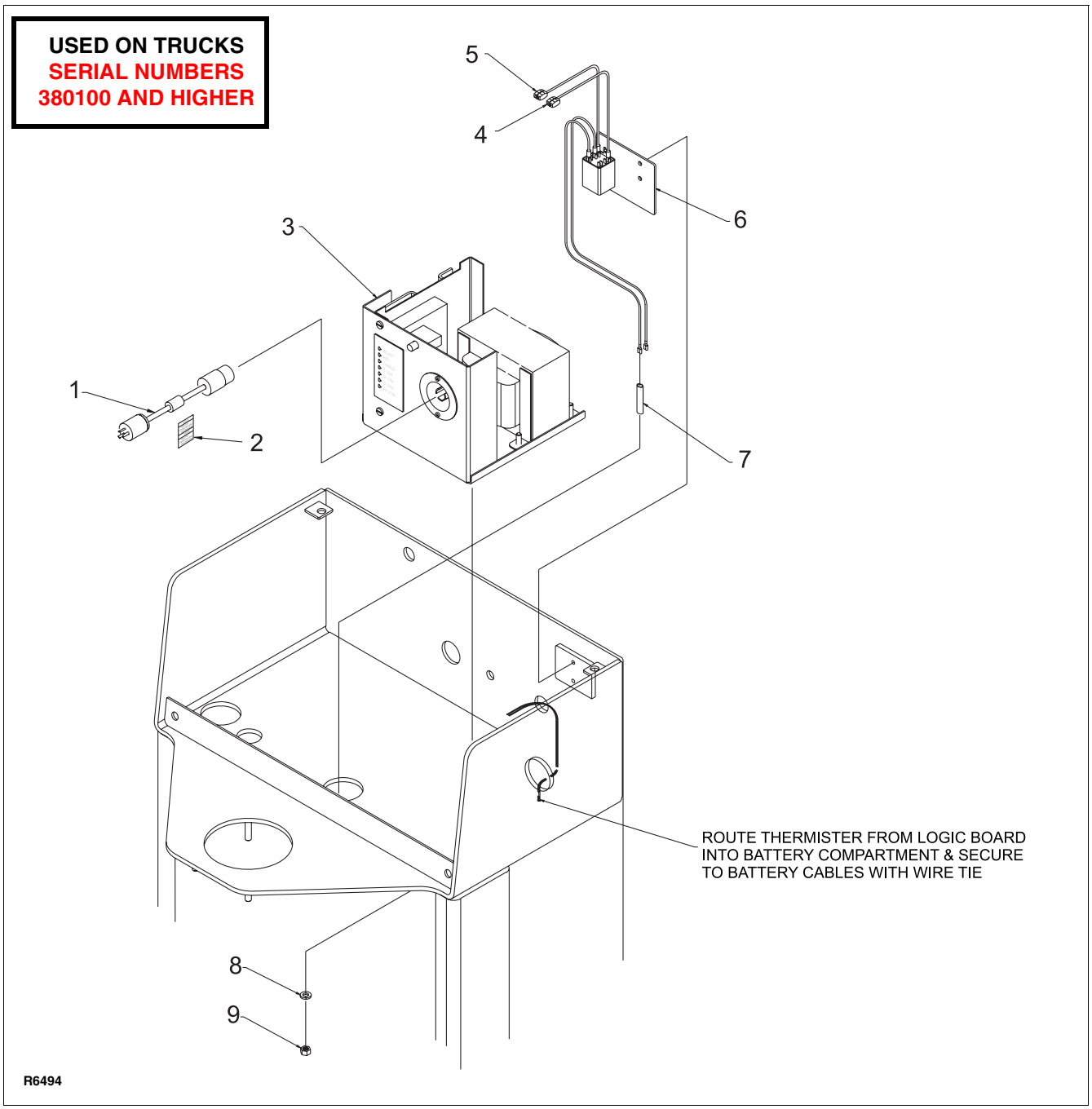

Figure 11-27 Gel Cell Battery Charger Installation

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	23884	CORD ASSY - BREAK-A-WAY	1
2	056685	. LABEL - CHANGER CORD	1
3	—	CHARGER-24V, 25 AMP (FIGURE 11-26)	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
4	077210	WASHER, LOCK, SPLIT, 5/16	2
5	059426	NUT, HEX, 5/16-18	2

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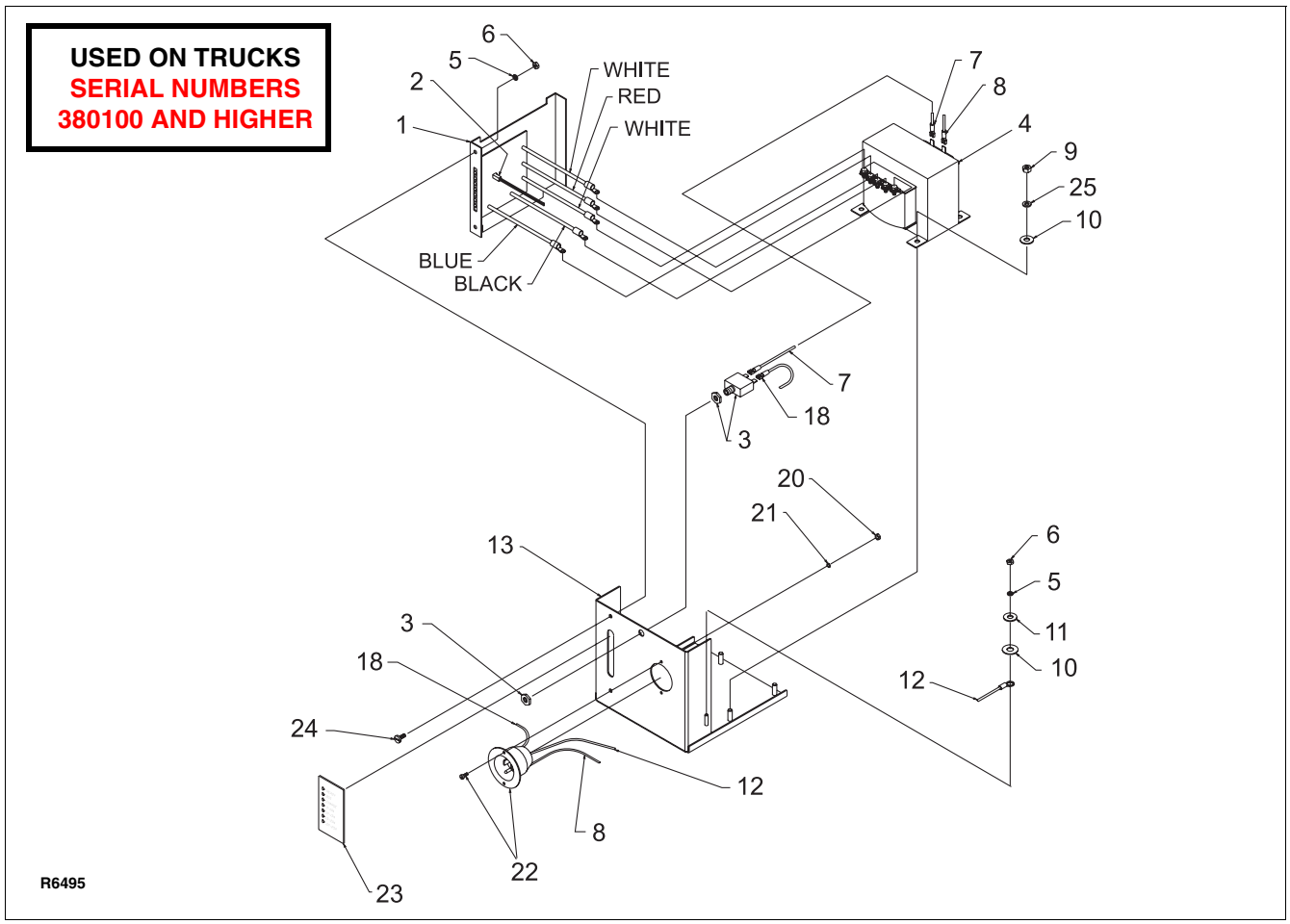

Figure 11-28 Gel Cell Battery Charger

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506320-03	CHARGER-24V, 25 AMP	1
1	904075	. PCB ASSY WITH HEATSINK	1
2	904074	. . THERMISTOR	1
3	003403	. CIRCUIT BREAKER-AUTO RESET	1
4	904076	. TRANSFORMER	1
5	077208	WASHER-LOCK, SPLIT, #12	3
6	059416	NUT-HEX, 10-32	3
7	023238-25	WIRE ASSEMBLY	1
8	505676-03	WIRE ASSEMBLY	1
9	059421	NUT, HEX, 1/4-20	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
10	077031	WASHER, 5/16 X 3/4 X 16 GA	5
11	077032	WASHER, 3/16 X 1/2 X 13 GA	1
12	023238-27	WIRE ASEMBLY	1
13	506173	BRACKET, CHARGER	1
18	026238-26	WIRE ASEMBLY	1
20	059412	NUT-HEX, 6-32	2
21	077204	WASHER - LOCK, SPLIT, #6	2
22	005461	CONNECTOR - INLET FLANGED	1
23	056681	DECAL - CHARGER, LED	1
24	071376	SCREW - PH TR HD, 10-32 X 1/2	2
25	077209	WASHER, SPLIT, LOCK, 1/4	4

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