Manual: **901359**
Model: **PDI**
Serial Number: **376500 and higher**

This manual is effected by the following supplements. They can be found in the Service Manual Index CD on the left side of the screen under "Supplements To Manuals."

SUPPLEMENT	TITLE
245	BATTERY SAFETY AND MAINTENANCE
349	PDI TRANS/CONTROLLER/CONTACTOR TYPE E 005468
360	DRIVE MOTOR 016052

Manual Price $35.00

PDI SERIES

POWER DRIVE INTERMEDIATE LIFT TRUCK

Serial Number 376500 and Higher

Operation

Maintenance

Repair Parts List

Big Joe Manufacturing Company • Lincolnwood, IL 60646 **MANUAL NO. 901359**

W A RNING

Do not operate this truck unless you have been authorized and trained 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, 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 and always wear foot protection.

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 as low as possible.
Always look in direction of travel.
Keep a clear view, and when load interferes with visibility, travel with load 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 nameplate for capacity 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 losing 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.

PDH, PDI, PDCM 056590 B

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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 forks or attachments, 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 and always wear foot protection.

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 as low as possible. Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load 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. Check nameplate for capacity 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 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 losing 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.

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.

Remove cardboard banded to forks. 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.

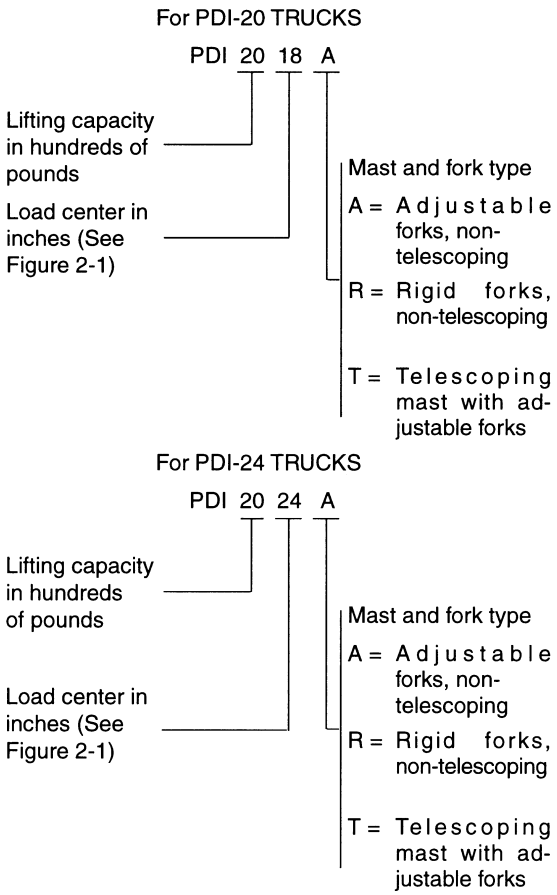
SECTION 1
DESCRIPTION

1-1. INTRODUCTION.

This publication describes the Power Drive Intermediate (PBI) 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 lift truck is identified by a model number. The model number shows truck capacity and load center. A typical model number is explained below.



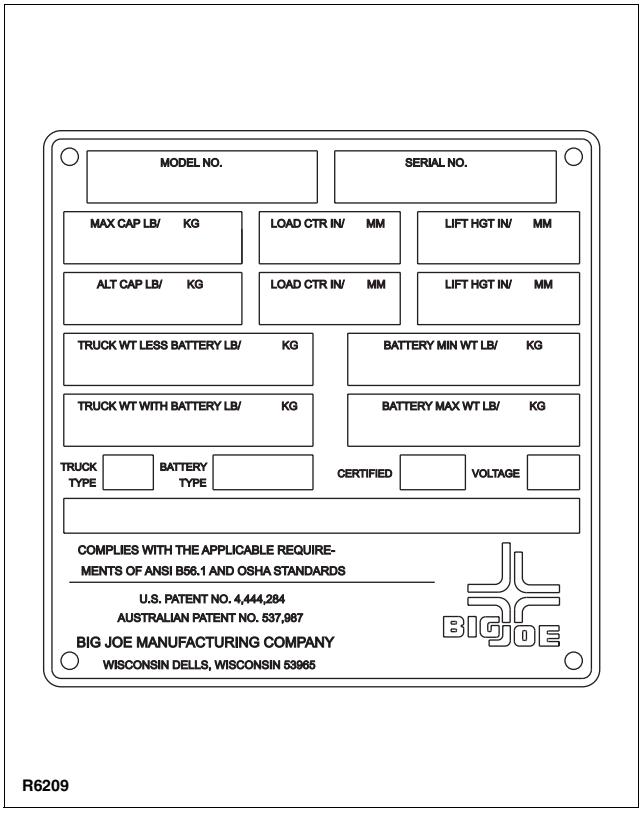


Figure 1-1 Name Plate

The model number will be found on the name plate (Figure 1-1) along with the serial number, lifting capacity, and load center. Figure 1-2 shows the locations of the trucks main components and controls.

1-2. GENERAL DESCRIPTION.

The self-propelled PDI truck, Figure 1-2, lifts and transports payloads up to 2000 pounds on either rigid or adjustable forks.

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 either a lever mounted on the chassis, optional pushbutton controls located on the steering arm, or a control box attached by a coiled cord.

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 PDI lift truck can be driven with forks raised or lowered; however, the speed is restricted when the platform is raised above a preset limit.

1-3. SAFETY FEATURES.

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

- 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.
- High speed limit switch to restrict speed when lift carriage is raised above the preset limit.
- All control functions automatically return to “OFF” when released.
- Externally accessible quick-disconnect battery plug within operator's reach.
- Separately fused control circuits and power circuits.
- Readily accessible HORN button.
- Lift carriage backrest to help stabilize the load.
- Pressure compensated flow control valve regulates maximum lowering speed within prescribed limits.
- High visibility color scheme of truck provides visual alert of trucks presence.

1-4. OPTIONS AND ACCESSORIES.

Big Joe offers many options and accessories for the PDI lift truck such as:

- Key switch
- Remote lift/lower control in control arm
- Remote control box attached by a coiled cord
- Wider lift carriage
- Cold Conditioning
- Battery Capacity Indicator with or without lift lockout
- Hourmeter for motors
- Longer carriage forks
- Dry Charged Batteries
- 240 V, 60 Hz, single phase charger
- 48 inch load backrest extension
- Adjustable straddles
- RAMS
- Boom w/hook
- Slip-on platform...smooth or diamond surface
- Roller platform
- Work platform

The most commonly used options and accessories are described in SECTION 11.

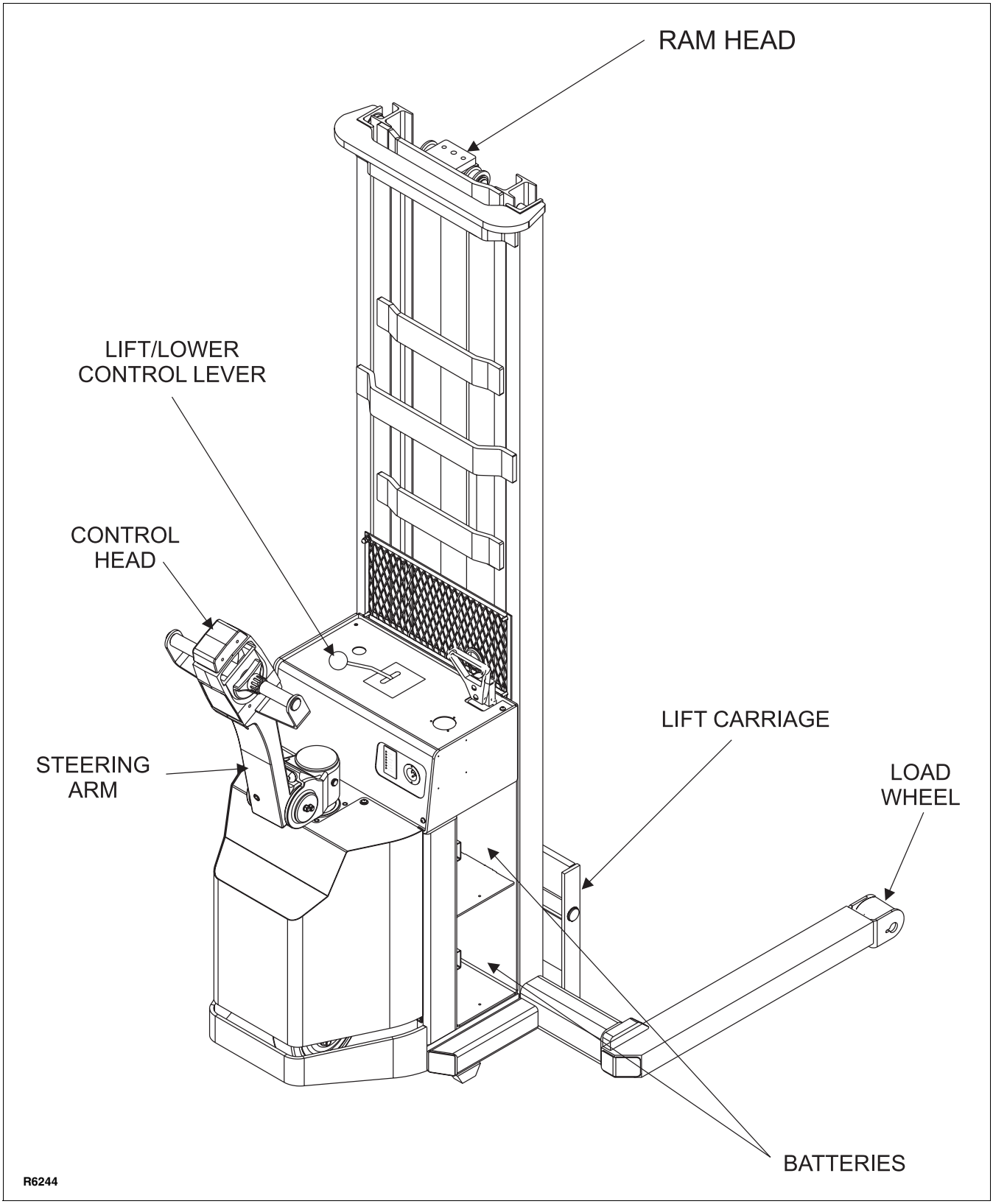


Figure 1-2 PDI Lift Truck

NOTES

SECTION 2
OPERATION

2-1. GENERAL.

This section gives detailed operating instructions for the PDI 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 PDI lift truck.

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

- Do not operate this truck unless you have been trained to do so.
- 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.
- Do not exceed the rated capacity (see name plate). Overloading may result in damage to the hydraulic system and structural components.
- 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 truck has a firm and level footing.
- Avoid overhead wires and obstructions.
- Check for obstructions when raising or lowering the lift carriage.
- Do not handle unstable or loosely stacked loads. Use special care when handling long, high, or wide loads to avoid tipping, loss of load, or striking bystanders.
- Center and carry the load as far back as possible toward the lift carriage back rest. Do not pick up loads on the tips of forks. The center-of-gravity of the load must not exceed the load center listed on the name plate. See Figure 2-1 for load center limitations.
- Pick up loads on both forks. Do not pick up loads on only one fork.
- When traveling, always lower the load as far as possible.
- When stacking pallets in racks and it is necessary to move the load in the raised position, use caution. Operate truck smoothly.
- 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.
- Do not allow anyone to stand or pass under load or lifting mechanism.

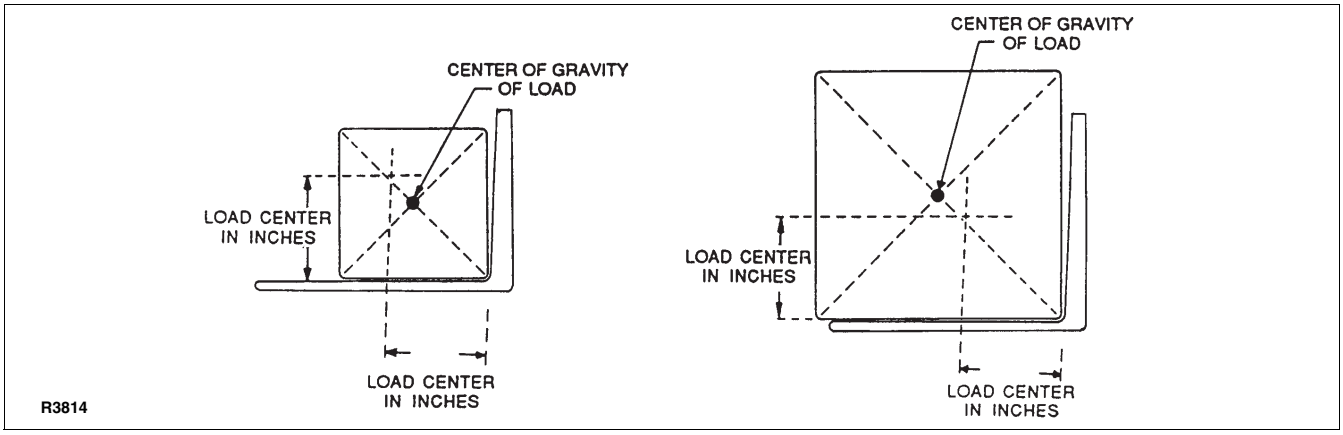


Figure 2-1 Load Center

2-3. BEFORE OPERATION

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

Figure 2-2 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.

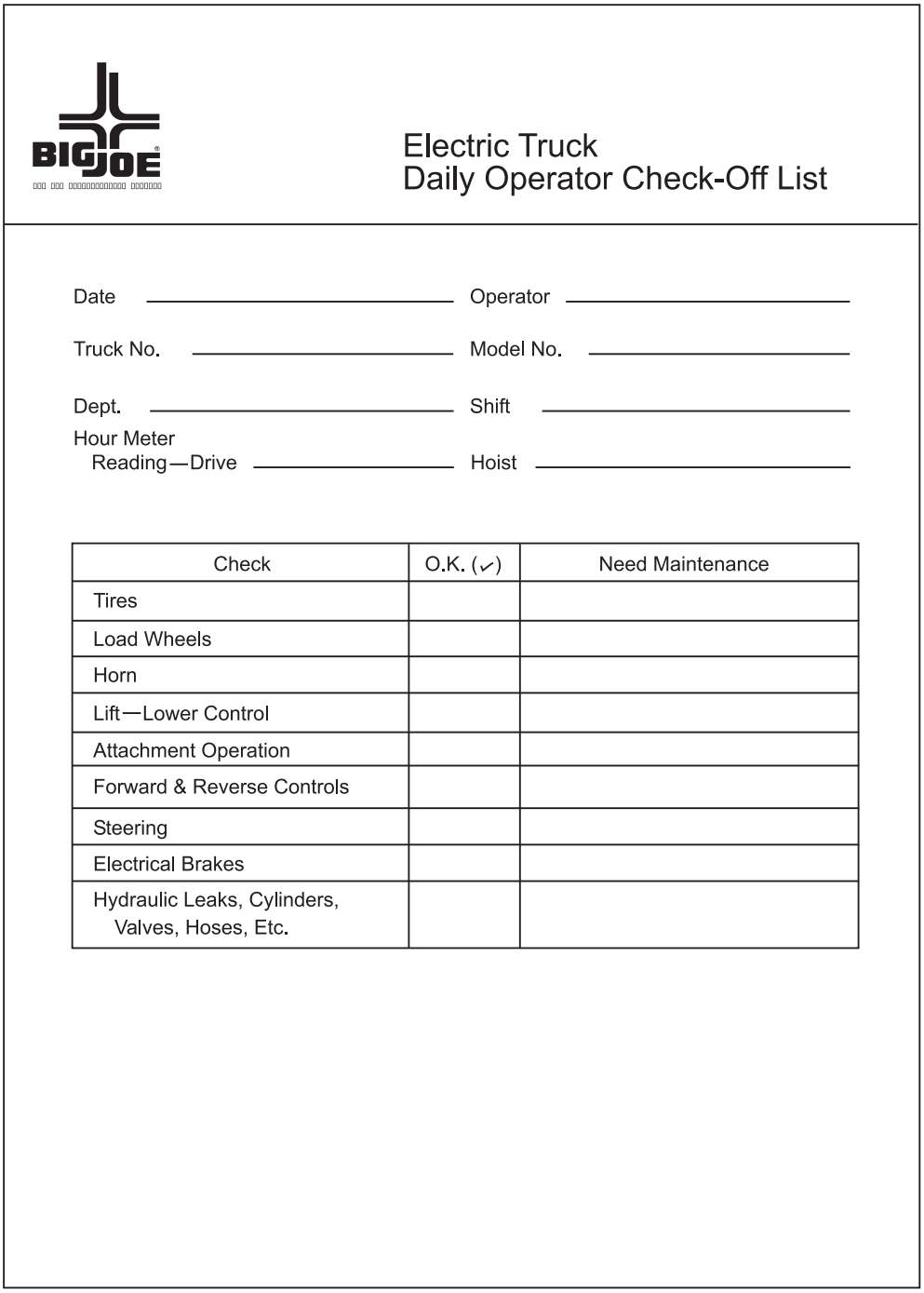
CAUTION: A QUALIFIED SERVICE TECHNICIAN should check the truck monthly for proper lubrication, proper fluid levels, brake maintenance, motor maintenance and other areas specified in the SECTION 3.

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.

Table 2-1 Operator Checks

ITEM	PROCEDURE
Transmission and hydraulic systems.	Check for signs of fluid leakage.
Forks	Check for cracks and damage; and, that they are properly secured
Chains, cables and hoses	Check that they are in place, secured correctly, functioning properly and free of binding or damage.
Guards and load backrest	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.

ITEM	PROCEDURE
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.
Battery charge	Check that battery capacity meter (if equipped) is on “F”.
High speed limit switch	Allow for enough space to operate truck in high speed. Elevate forks approximately two feet, then test drive truck to check if high speed is cut out.



BIG JOE

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		
Attachment Operation		
Forward & Reverse Controls		
Steering		
Electrical Brakes		
Hydraulic Leaks, Cylinders, Valves, Hoses, Etc.		

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Figure 2-2 Sample of Operator Check List

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. Control handles on some models have pushbuttons for raising and lowering the forks. See Figure 2-3.

When the lower portion of the triangular speed control is pressed forward, contacts are closed for travel in the forward direction. Pressing the speed control farther increases the speed of travel. Pressing the upper portion of the speed control governs the reverse speed in the same manner.

Optional are Lift and Lower pushbuttons. The Lift and Lower pushbuttons are located on top of the control head. Also optional is a Lift and Lower remote control box.

2-4.2. Steering Arm Controls.

Lowering the steering arm to the horizontal or raising to the vertical applies the brake (See Figure 2-4). 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.

2-5. DRIVING AND STOPPING PROCEDURES.

The following procedure describes driving and stopping the PDI lift truck.

1. If the lift truck is equipped with a key switch, turn it to the on position.
2. Grasp the grips of the steering arm so that the speed control can be comfortably operated by the thumbs, or the palms of the hands if rotating grips are being utilized.
3. Lower the steering arm to a comfortable position above horizontal to disengage the brake and to energize the electrical circuits.

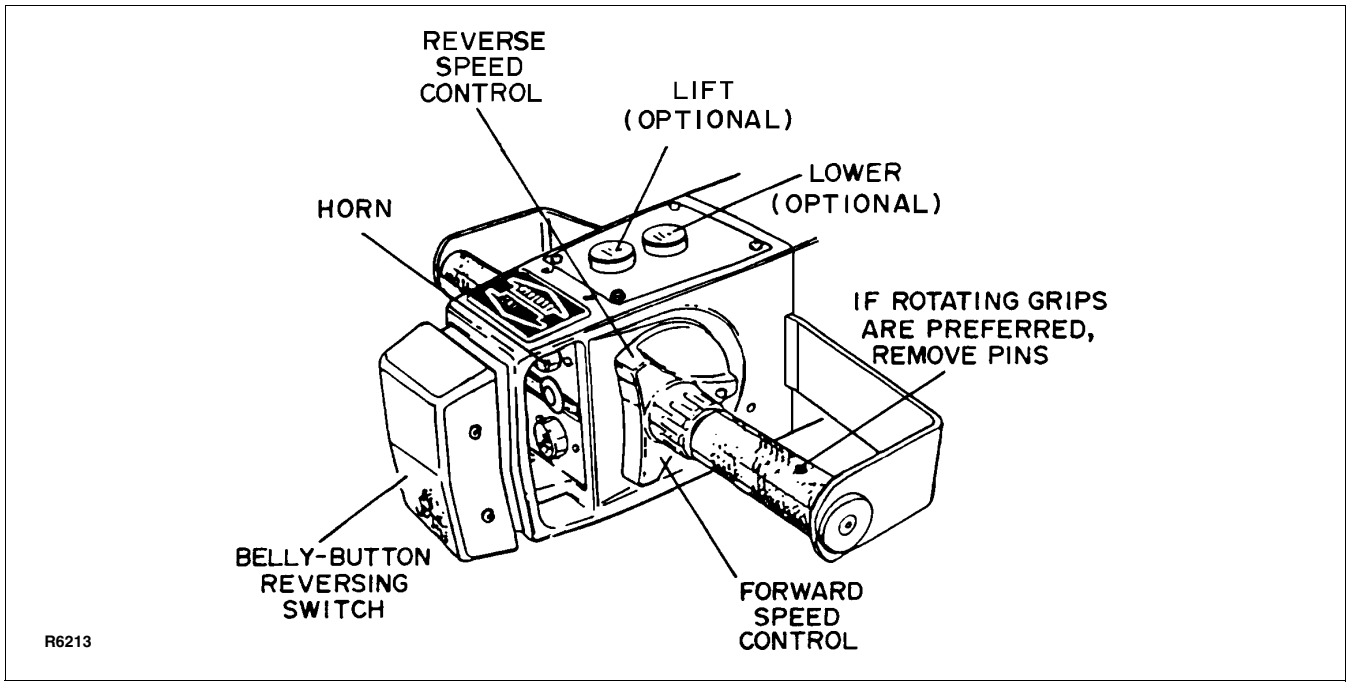


Figure 2-3 Control Handle

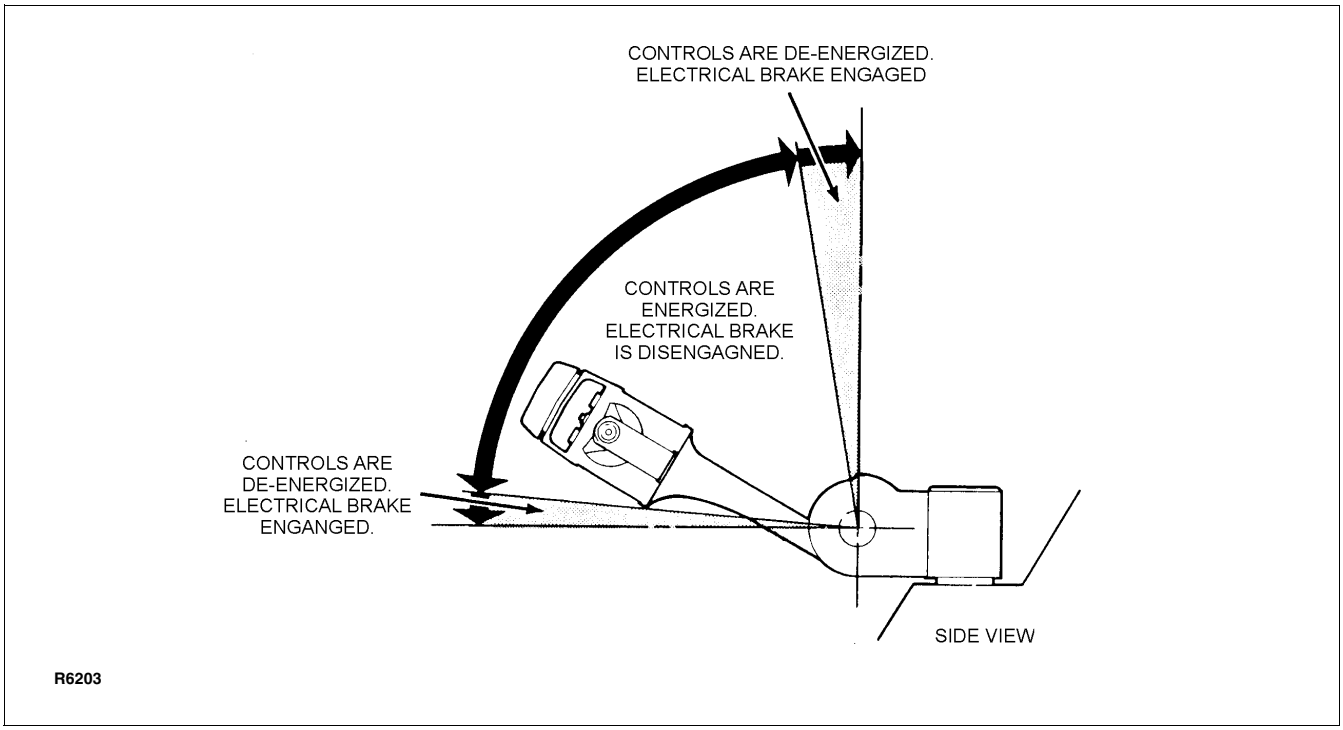


Figure 2-4 Steering Arm Braking Position

4. To move forward with the load end trailing, slowly press the lower portion of the speed control or rotate the grips downward. Press the forward speed control or rotate the grips 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 or rotate the grips upward.

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

2-6. 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. If the guard presses against the driver while the lift truck is being driven, the guard actuates a switch which changes the direction of the lift truck to opposite direction in low speed.

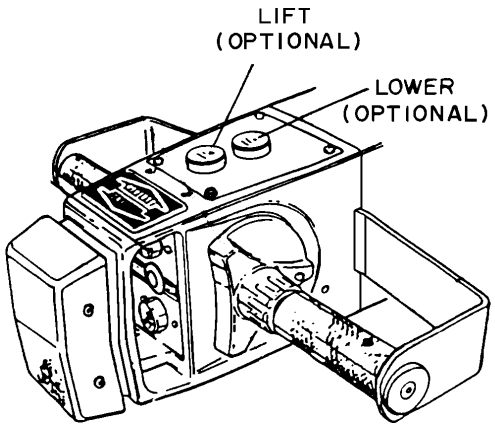
2-7. STEERING ARM RETURN SPRING.

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.

2-8. LIFT/LOWER/STOP CONTROL.

The LIFT/LOWER control, FIgure 2-4, is used to lift the forks and to regulate their lowering, The rate of rise is fixed, however, the descent of the forks is infinitely variable. The farther the control lever is moved from neutral position, the faster the forks will descend.

If the optional LIFT and LOWER pushbuttons on the control handle or optional LIFT (UP) and LOWER (DOWN) remote control box are used, the lift carriage raises and descends at a fixed rate of speed.



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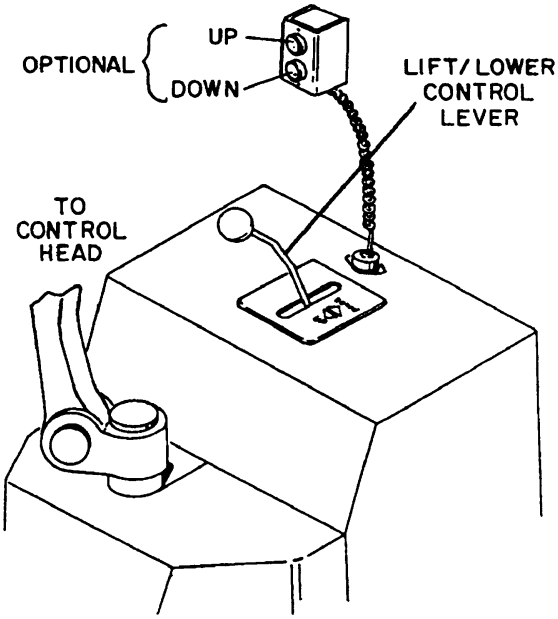

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Proceed as follows to raise and lower the forks.

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 forks. Make sure the load is centered and does not exceed capacity.

2. To raise the forks, pull LIFT control lever toward UP position (toward operator), and hold it until the forks reach the desired height; then return LIFT control lever to its neutral position. If truck is equipped with pushbuttons, push in the LIFT button and hold until lift carriage reaches desired lift height.
3. To lower the forks, push LIFT control lever toward DOWN position (away from operator), and hold it until the forks reach the desired height. Then return LIFT control to its neutral position. If truck is equipped with pushbuttons, push in and hold the LOWER button until lift carriage is at the desired height.

2-9. LOADING AND UNLOADING.

1. Move truck to location where load is to be picked up.
2. Adjust forks to maximum practical width.
3. Raise forks to desired height. Move truck into position so forks are within pallet or skid, and the load is centered over the forks and as far back as possible.
4. Raise forks slightly to lift load from rack.
5. Slowly move the truck to free load from rack. When the load is clear, lower the load, leaving enough floor clearance to maneuver truck.
6. Drive to area where load is to be placed.
7. Raise forks to desired height and move truck to align load with its new position.
8. Lower the load until it rests squarely in place and forks are free.
9. Slowly move the truck straight out, making sure the forks do not catch on the pallet. Lower the forks when they are clear.

2-10.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 3-4.

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 3-3 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. FLOODED CELL BATTERY CARE.

The life of the battery can be extended by giving it proper care. Perform a daily check of the battery whether or not the equipment is in daily use. DO NOT overcharge the battery or battery life will be shortened. DO NOT allow battery to become completely discharged (specific gravity 1.150 or less). This will also greatly shorten battery life.

CAUTION: Observe and adhere to battery safety and maintenance supplement (Document 245) and battery warning decal when servicing battery charger.

The batteries must be pulled out of the compartments in order to check the specific gravity.

1. Remove screw, washer and retainer bar by each battery Figure 3-1.

CAUTION: These batteries are heavy. Use handles on battery when lifting.

2. 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. It is not necessary to disconnect the battery cables.
3. Use a hydrometer to check specific gravity of each cell.

NOTE: Battery specific gravity readings should agree within + 0.025 from cell to cell. If variation is greater, the battery may have to be repaired or replaced.

CAUTION: Be sure that no cell plates are exposed (not covered by fluid) before charging. Add distilled water sufficient to just cover top of cell plates.

CAUTION: Use distilled water. Impurities in tap water will damage battery plates.

Table 3-1 Monthly and Quarterly Inspection and Service Chart

VISUAL CHECKS	
INTERVAL	**INSPECTION OR SERVICE**
Monthly	Check condition of drive motor commutator, brushes and springs
Monthly	Check condition of pump motor commutator, brushes and springs
Monthly	Check mechanical 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 3-7.)
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 SECTION 8)

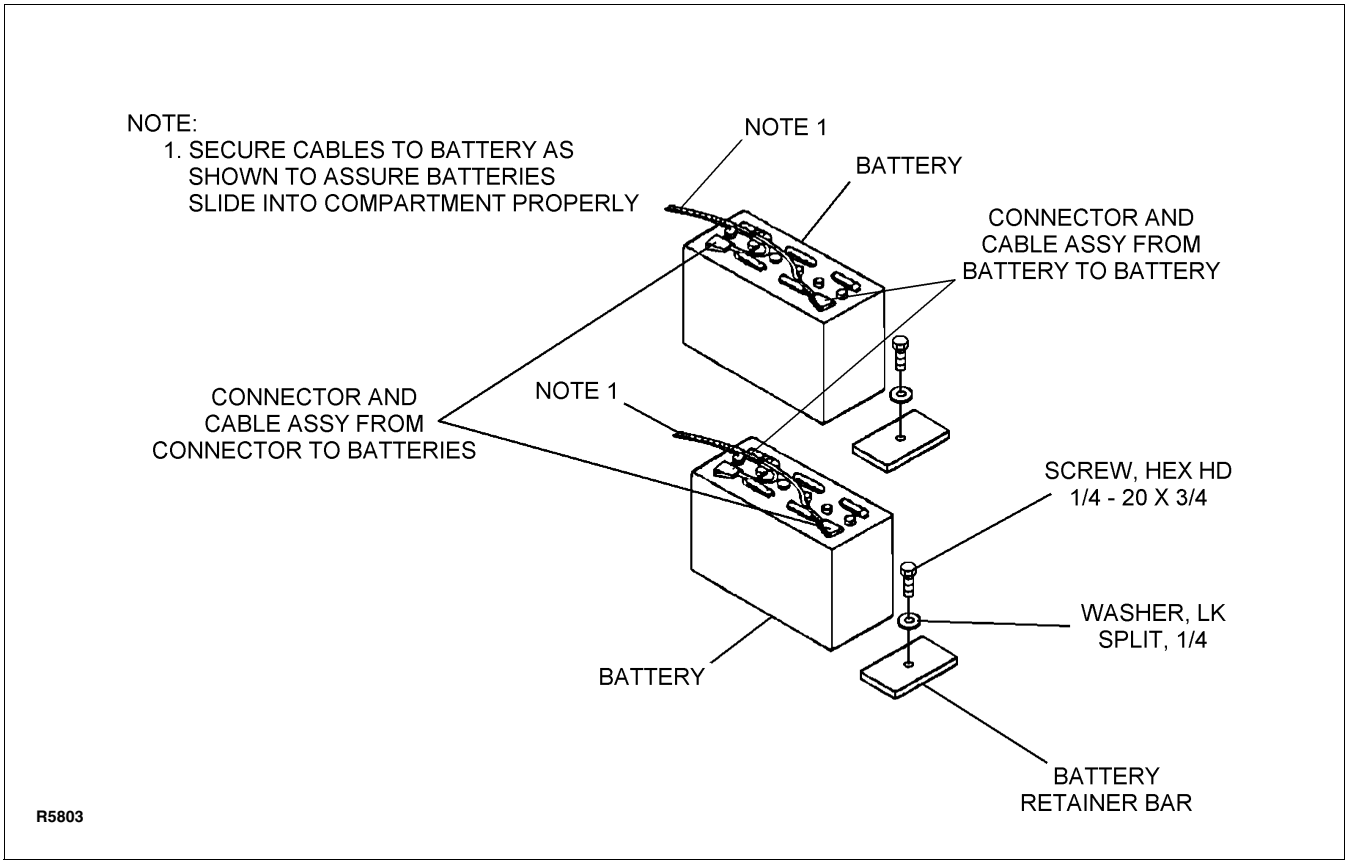


Figure 3-1 Reinstalling the Battery

4. When reinstalling the battery be sure battery cable connectors are securely attached to the battery terminals, and cables are routed and secured to the battery as shown in Figure 3-1. Reinstall and position battery retainer bar to prevent battery movement in excess of 1/2".
5. Charge the battery as described in paragraph 3-5.

3-4. ABSORBED GLASS MAT AND GEL CELL BATTERY CARE.

These 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.

Charge the battery as described in paragraph 3-5.

3-5. 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 carriage 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. Disconnect the batteries from the truck and connect batteries to the charger. Make sure connectors are mated properly.
4. Connect the AC cord to the truck and then plug into the 120 VAC power supply.

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 3-2):

   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.

3-5.1. 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.

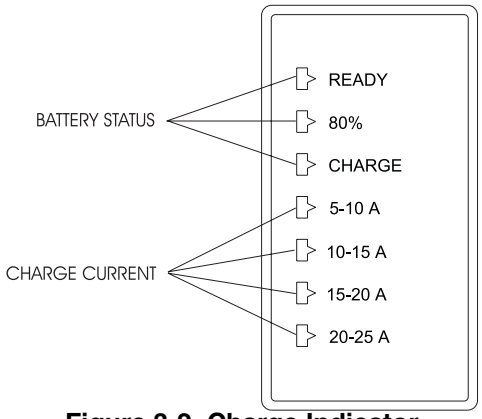


Figure 3-2 Charge Indicator

3-6. LUBRICATION.

Refer to Table 3-2 for the recommended types of grease and oil. Table 3-3 in conjunction with Figure 3-3 identifies the items requiring lubrication.

3-7. LIFT CHAIN MAINTENANCE.

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

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

No. 1	Transmission oil—EP SAE 80W-90, Part Number 055780 Transmission oil—EP SAE 10W-30, Part Number 055790 (Note)
No. 2	Grease—Lithium base, general purpose. Part Number 055750 Part Number 055753 (Note)
No. 3	Hydraulic oil-Heavy duty with a viscosity of 150 SUS foam suppressing agent and rust and oxidation inhibitors Part Number 055779 Hydraulic oil-Heavy duty with a viscosity of 100 SUS foam suppressing agent and rust and oxidation inhibitors Part Number 055784 (Note)
No. 4	SAE 30 or 40 Engine lubricating oil

NOTE: USED ON COLD CONDITIONED TRUCKS

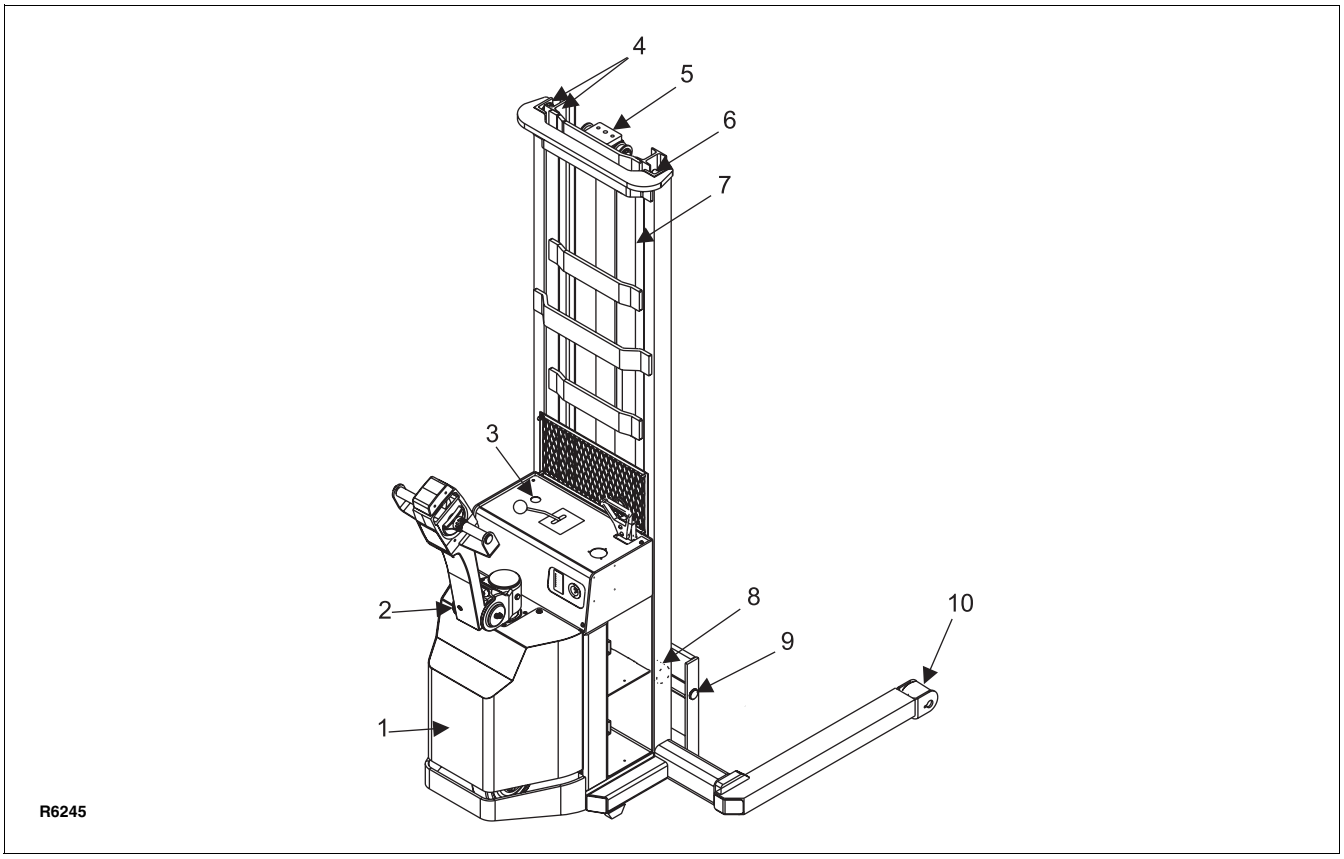


Figure 3-3 Lubrication Diagram

Table 3-3 Lubrication Chart

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

NOTES

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 4-3 or Figure 4-4) 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 BRAKING	Defective electrical brake.	Adjust or replace the electrical brake
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 forks.	Oil level too high.	Drain, then refill reservoir to "FULL" mark on dip stick.
Squealing sounds when lifting forks.	a. Oil level too low.	Add oil to reservoir.
	b. Dry channels in mast.	Apply grease.
	c. Defective mast or carriage bearing.	Replace bearing.
Forks 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.

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
Oil leaks out of lift control valve release cam.	Defective O-ring in lift control valve body.	Replace O-ring on release cam shaft.
Lift control does not return to neutral.	a. Broken return spring	Replace return spring.
	b. Foreign particles.	Clean hydraulic system and valve.
	c. Misalignment of valve clamp.	Adjust as required
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.
	d. Dirt or foreign particles lodged between check ball and seat on lift control valve.	Disassemble, clean and reassemble valve.
	e. Defective lift control valve.	Adjust, repair or replace.
	f. Valve body scored inside.	Replace valve.
	g. Battery needs charging.	Charge battery.
Forks do 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.
Forks do 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.
Forks lift, but will not go down.	Control valve in open position or defect in hydraulic system	Check the lowering control valve as well as the flow control valve, and look for obstruction in the hydraulic line. Repair or adjust as required.
Load will not hold.	a. Oil bypassing internally between check ball and control valve body.	Disassemble, clean, and reassemble. Replace worn parts as required.
	b. Worn lift cylinder packing.	Replace cylinder packing.
Forks creep downward under load when in a raised position.	Leak in hydraulic system.	Examine the lift control valve and internal check valve for obstructions preventing ball from closing completely to block oil. Look for leaking fittings in the hydraulic line. Check pump and suction line for leakage back into the reservoir. Repair or replace as required.

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
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.

4-2. BATTERY CHARGER 004987 TROUBLE-SHOOTING

Refer to Figure 4-2 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.

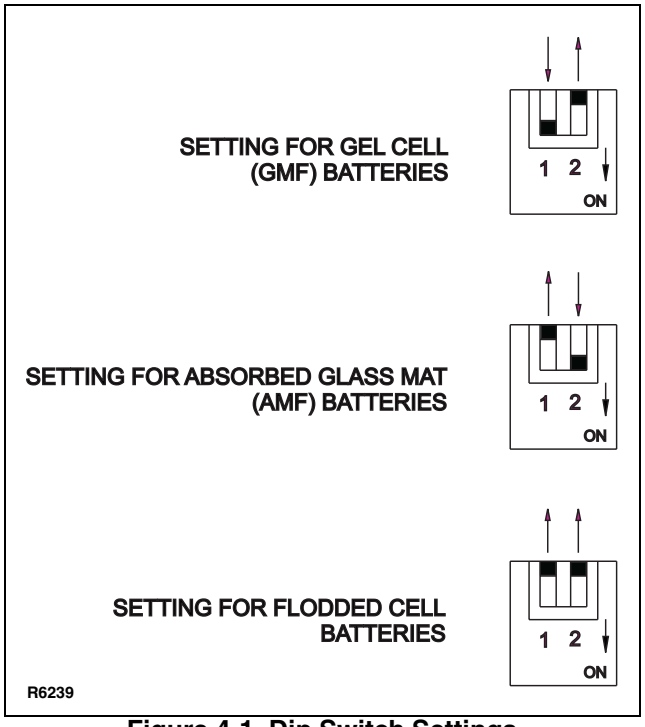


Figure 4-1. Dip Switch Settings

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.

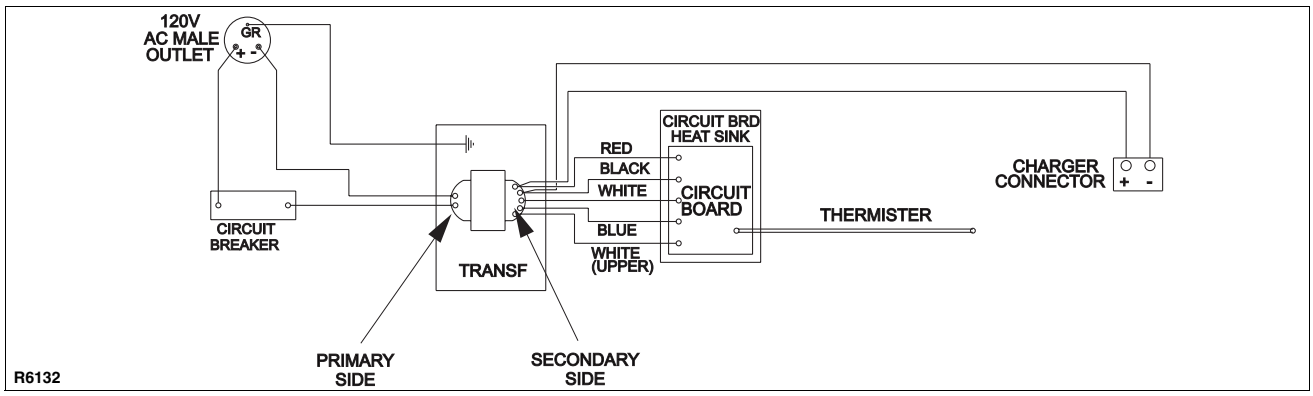


Figure 4-2. Battery Charger Wiring Diagram

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 12-28 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 847-675-8700.

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 over-voltage
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 under-voltage

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 10-1.4.

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".

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 12-28 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 fa-l-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.

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.

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.

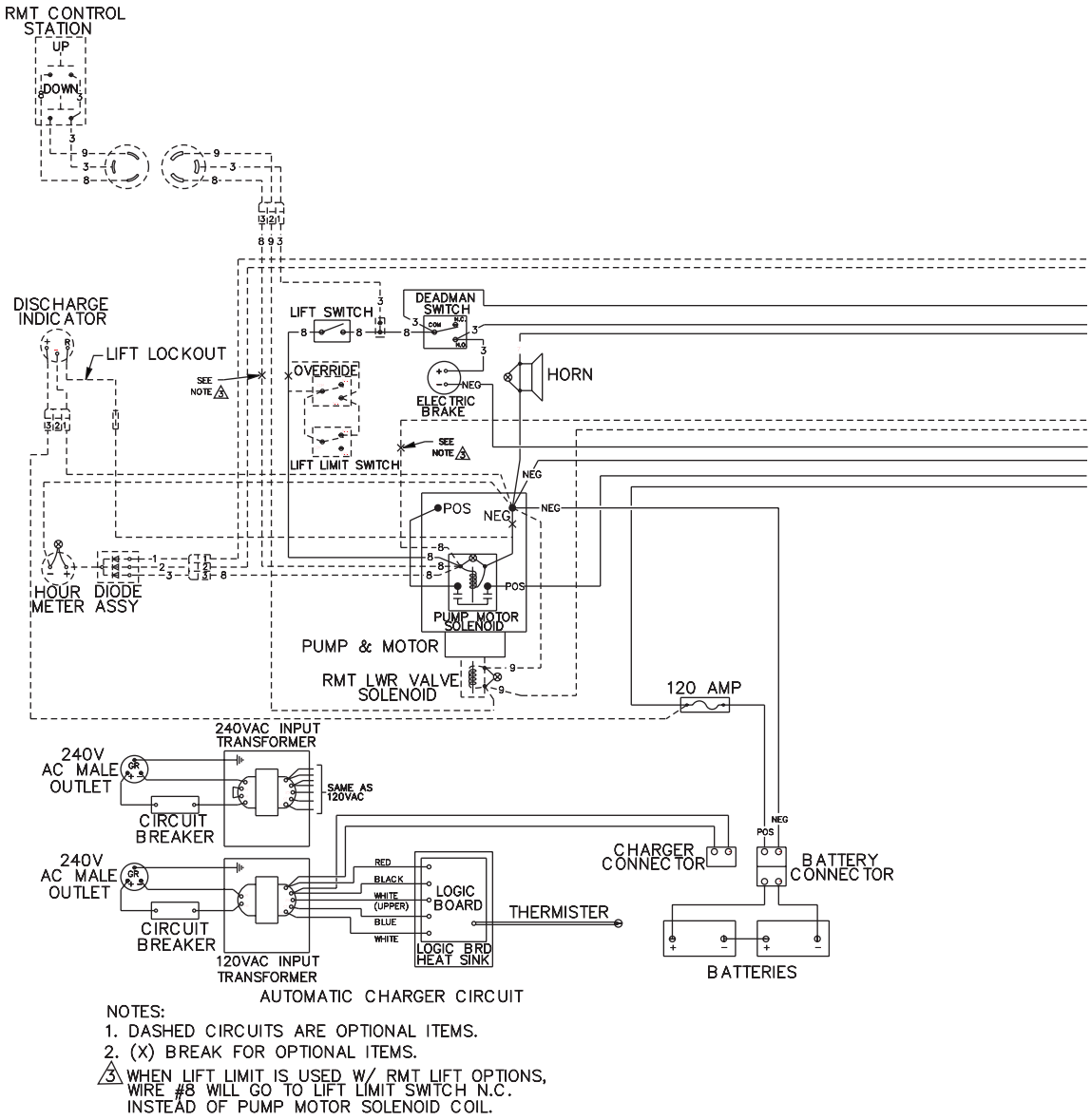


Figure 4-3 Wiring Diagram (Sheet 1)

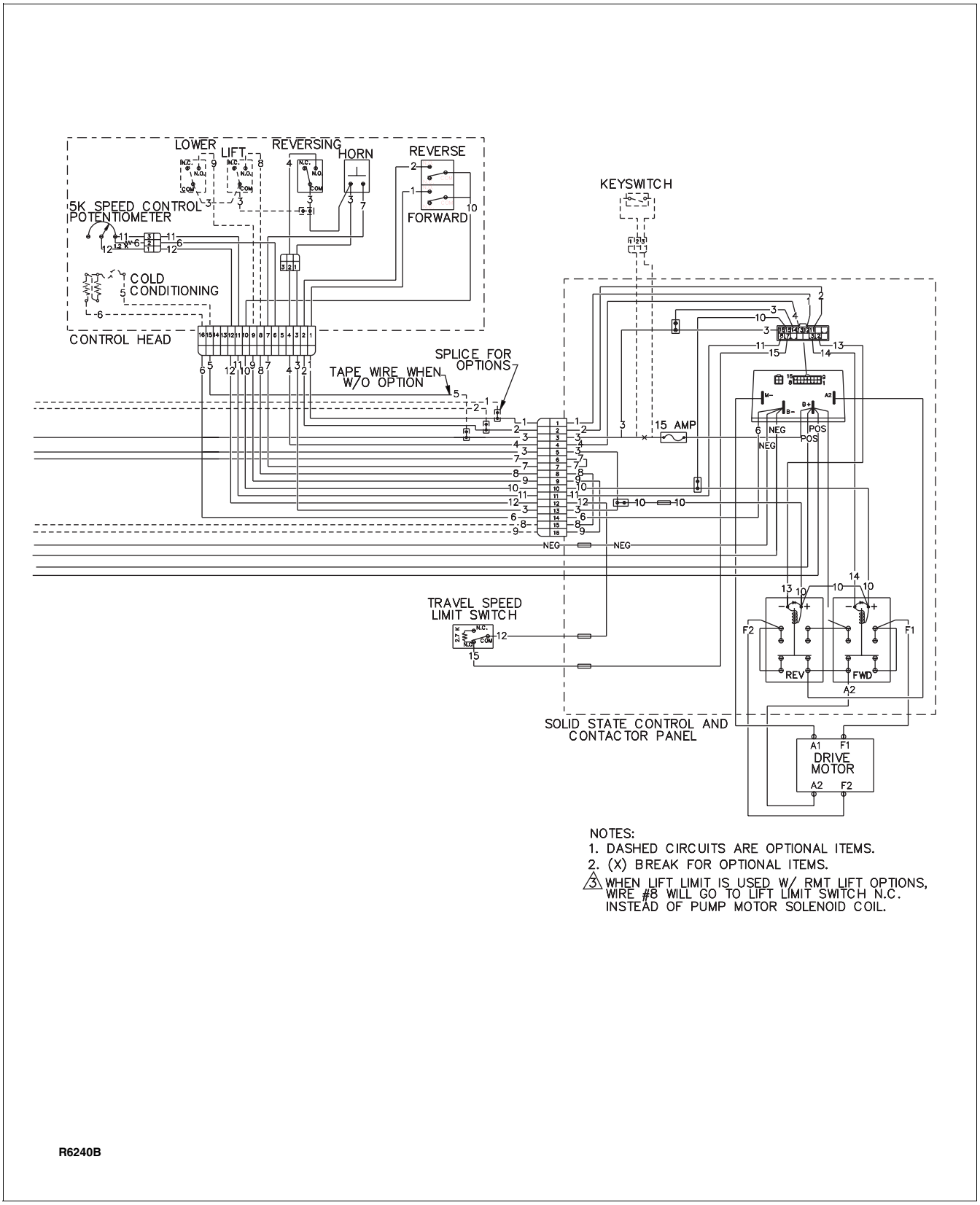
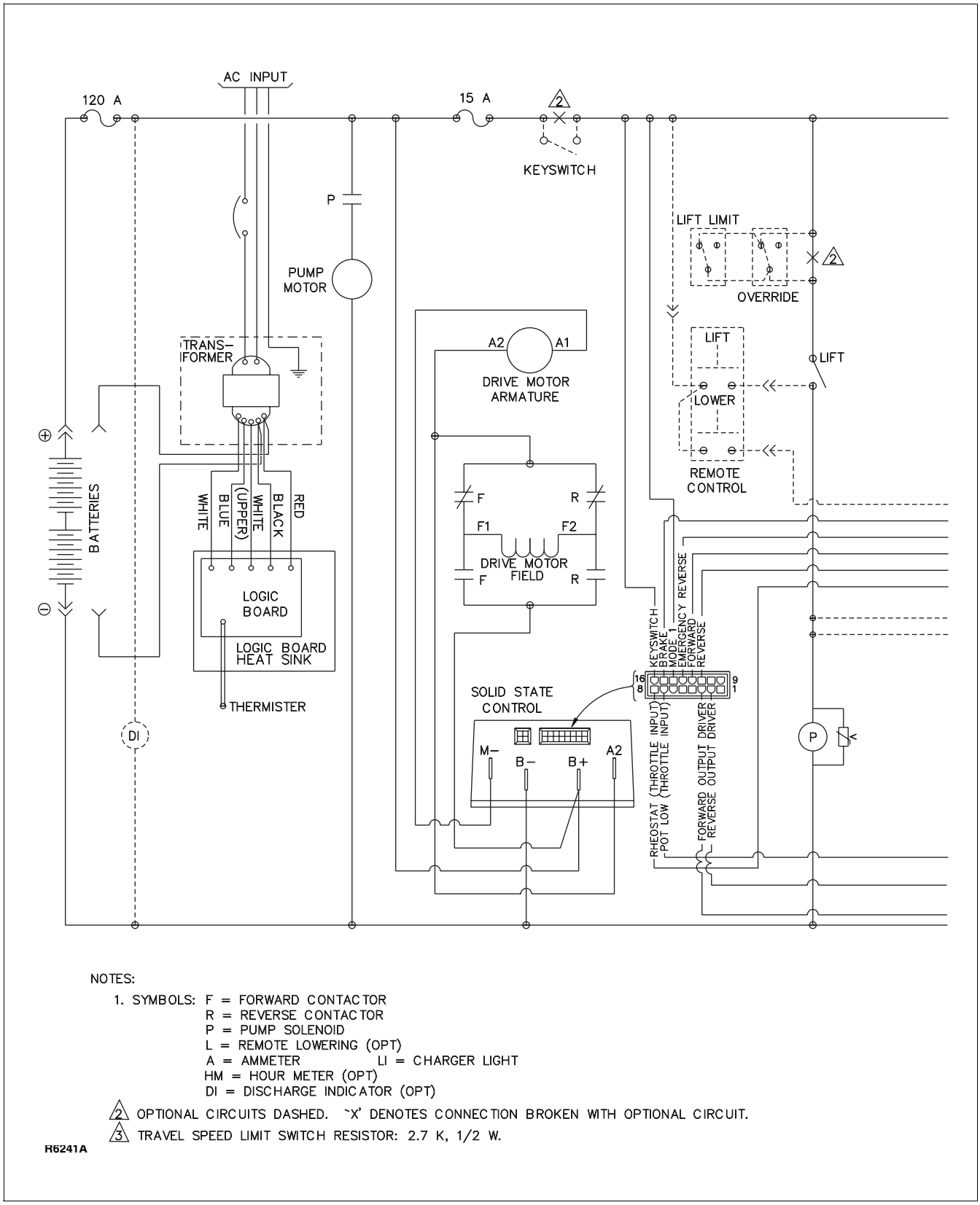


Figure 4-3 Wiring Diagram (Sheet 2)



NOTES:

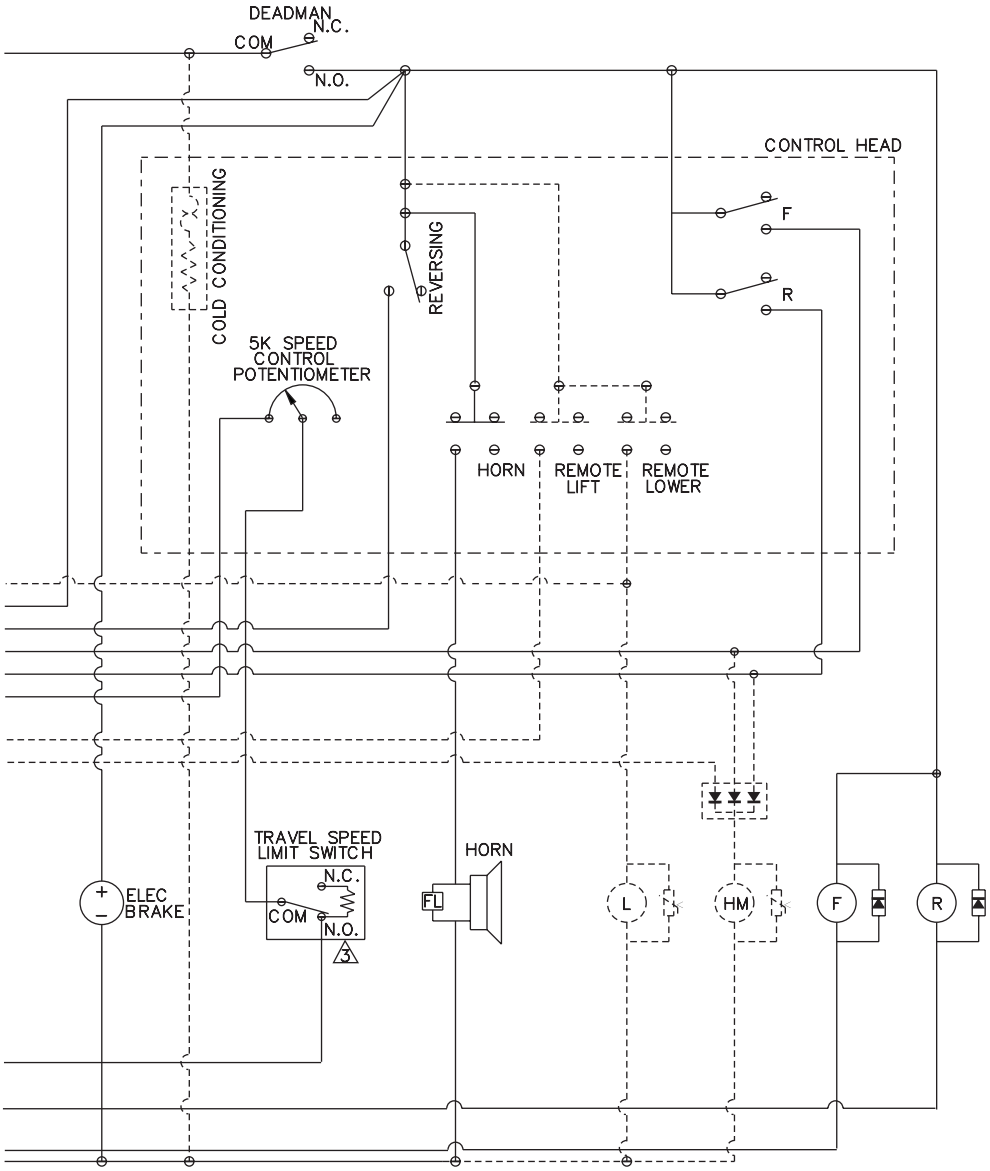
1. SYMBOLS: F = FORWARD CONTACTOR
   R = REVERSE CONTACTOR
   P = PUMP SOLENOID
   L = REMOTE LOWERING (OPT)
   A = AMMETER LI = CHARGER LIGHT
   HM = HOUR METER (OPT)
   DI = DISCHARGE INDICATOR (OPT)

2 OPTIONAL CIRCUITS DASHED. 'X' DENOTES CONNECTION BROKEN WITH OPTIONAL CIRCUIT.

3 TRAVEL SPEED LIMIT SWITCH RESISTOR: 2.7 K, 1/2 W.

H6241A

Figure 4-4 Electrical Schematic (Sheet 1)



NOTES:

1. SYMBOLS: F = FORWARD CONTACTOR
   R = REVERSE CONTACTOR
   P = PUMP SOLENOID
   L = REMOTE LOWERING (OPT)
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   DI = DISCHARGE INDICATOR (OPT)

2 OPTIONAL CIRCUITS DASHED. 'X' DENOTES CONNECTION BROKEN WITH OPTIONAL CIRCUIT.

3 TRAVEL SPEED LIMIT SWITCH RESISTOR: 2.7 K, 1/2 W.

R6241B

Figure 4-4 Electrical Schematic (Sheet 2)

NOTES

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.

5-2. COLD CONDITIONING.

The cold conditioning version of the truck differs from the standard model where necessary to improve performance in cold temperatures. Heating resistors are provided for the control head switches, and cold resistant versions of other switches and the hydraulic hoses are used. Special cold temperature lubricants are also necessary for this application.

Figure 5-1 is an electrical schematic diagram of the cold conditioning circuit. Location of electrical parts in the control head and resistor wiring of cold conditioning equipment is illustrated in Figure 5-2.

CAUTION: Cold conditioning heating resistors consume power when energized, whether truck is used or not. To avoid power waste, disconnect battery of cold conditioned truck when lengthy storage periods at temperatures low enough to energize cold conditioning equipment are planned.

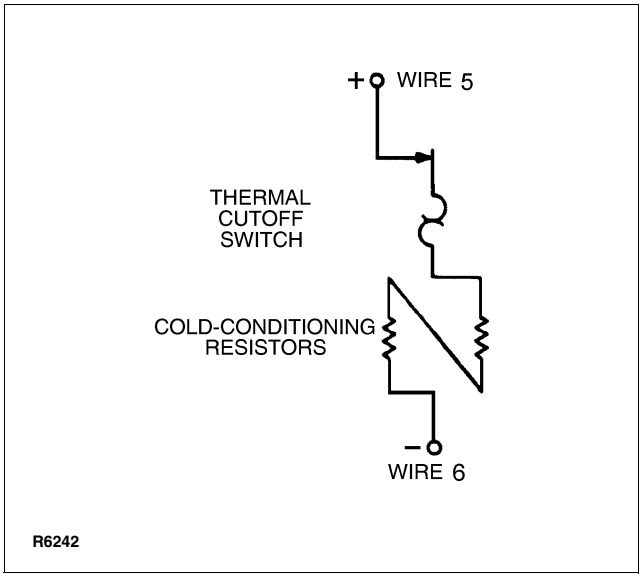


Figure 5-1 Schematic of Cold Conditioning Circuit

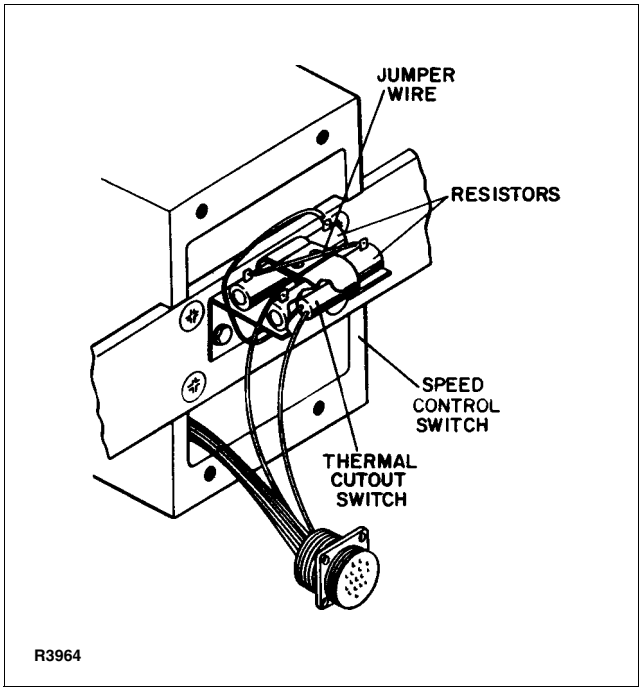


Figure 5-2 Location of Resistors and Thermal Cutout Switch

5-3. BELLY-BUTTON SWITCH ADJUSTMENT.

NOTE: Adjust the actuator gap of the belly-button switch according to the following procedure. Refer to Figure 5-3 and Figure 5-4.

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 5-4) 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 5-3) to adjust gap so that switch clicks half way through travel of casting.
4. Reinstall casting, making certain all parts are back in place.
5. 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.

6. Repeat adjustment, if necessary, until switch works properly.
7. 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.

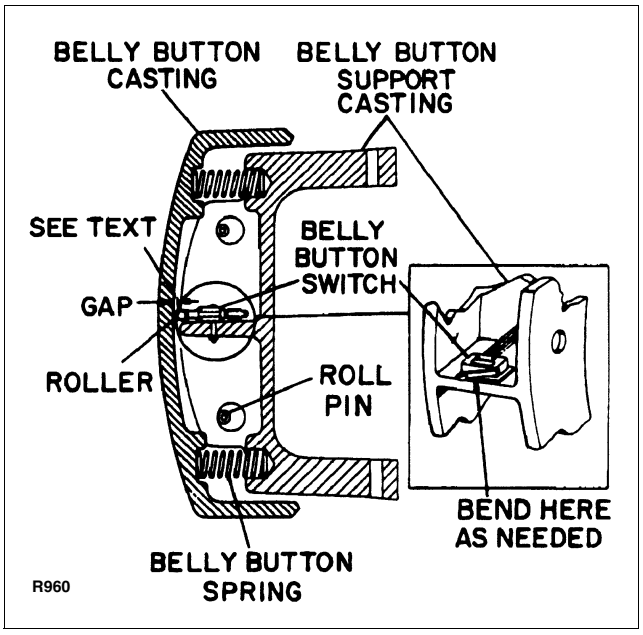


Figure 5-3 Belly-Button Switch Adjustment

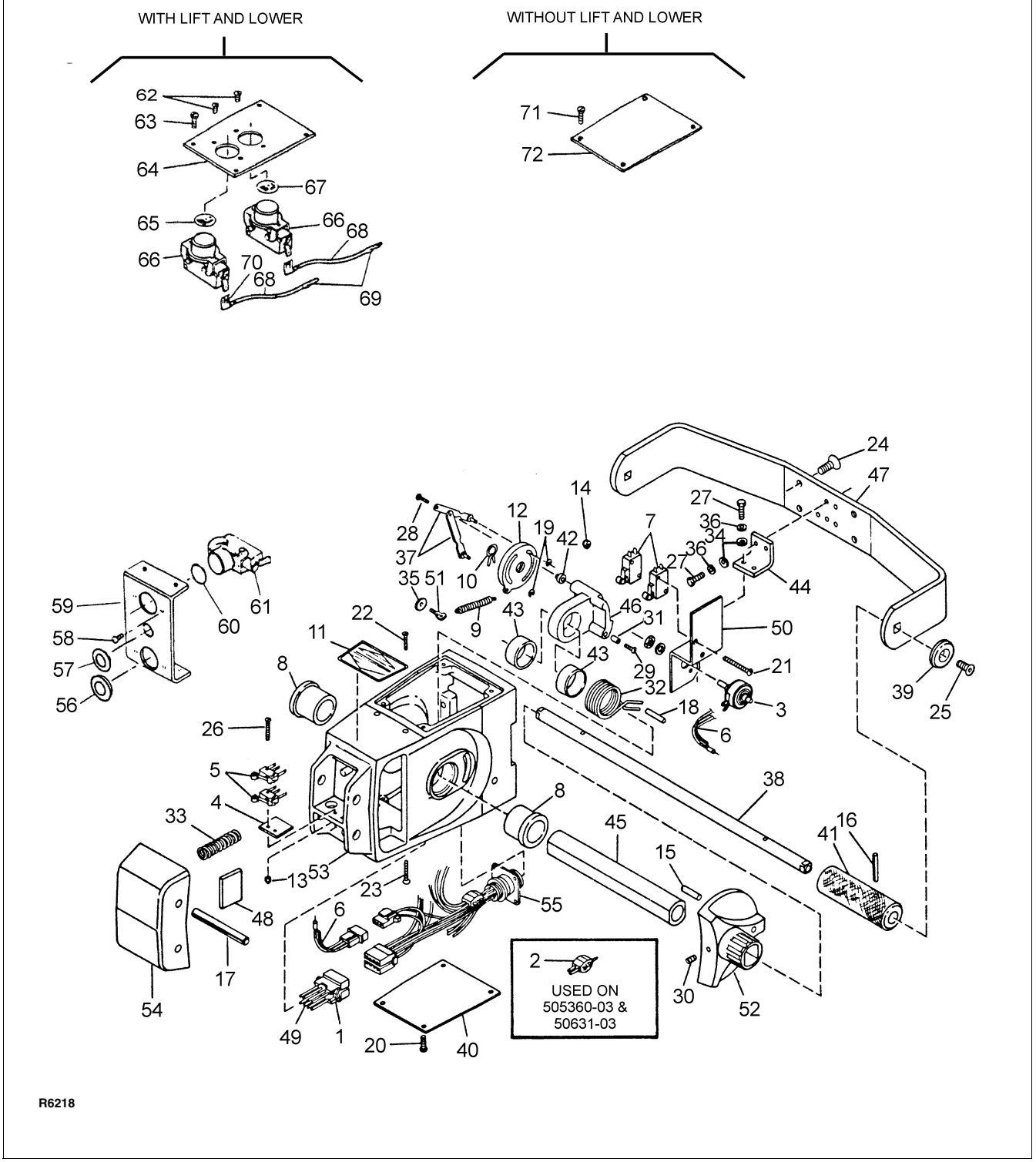


Figure 5-4 Control Head Assembly

5-4. Potentiometer Testing and Adjustment

1. Disconnect the battery
2. Remove screws (20 and 71, Figure 5-4) and access covers (40 and 72).
3. Check gap between rollers on directional switches (7) and surface of cam (46). If required, adjust position of bracket (50) 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 (52) 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 5-5) to gain access to the potentiometer. (3, Figure 5-4). Insert a screwdriver blade into the slot on the back side of the potentiometer (Figure 5-5) 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 (44, Figure 5-4) as necessary to obtain the same values. Adjust the potentiometer again if necessary.
8. Reassemble the control head.

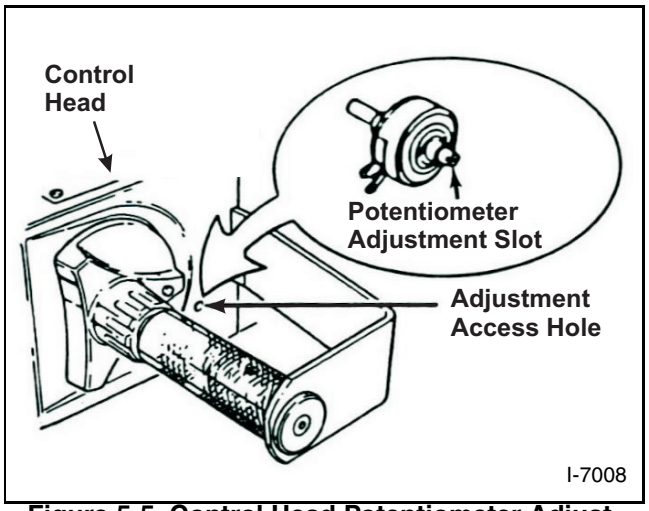


Figure 5-5. Control Head Potentiometer Adjustment

5-5. CONTROL HEAD SWITCH REPLACEMENT.

NOTE: Refer to paragraph 5-6. for speed control switch replacement.

NOTE: For access to belly-button switch, see paragraph 5-3. For access to other switches on the control head, the top cover (72, Figure 5-4) and/or switch plate (59) 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 (54) by performing step 2. in paragraph 5-3.
3. Remove top cover (72) of control head by removing four screws (71).
4. Remove switch plate (59) by removing four screws (22 and 23) on top and bottom of control handle (53).
5. Replace belly-button switches (5), speed control switches (7), horn switch (61) or lift & lower switches (66).

NOTE: If the belly-button switch is replaced, adjust it in accordance with paragraph 5-3. before using truck.

6. Replace switch plate (59) and secure with four screws (22 and 23) on top and bottom of control handle (53).
7. Replace top cover (72) on control head, and secure with four screws (71).
8. Reconnect battery.

5-6. SPEED CONTROL SWITCH RETURN SPRING REPLACEMENT.

1. Disconnect battery.
2. Remove four screws (2, Figure 5-7) securing control head (1) to steering arm (3).
3. Disconnect connector (55, Figure 5-4).
4. Remove four screws (71) securing top cover (72) to control head.
5. Disconnect speed control switches (7).
6. Remove four screws (24) securing handle guard (47) to control head.
7. Remove two socket head screws (25) and caps (39) from handle guard (47).

8. Remove handle guard with two brackets (44 and 50) and speed control switches (7) attached.
9. Remove roll pin (16) from right hand handle grip (41).
10. Remove right hand handle grip from shaft (38).
11. Remove set screw (30) from right hand control lever (52).
12. Remove right hand control lever from tube (45).
13. Observing through top cover opening, slide shaft (38) with tube (45) out left hand side of control head just enough to clear return spring (32).
14. Disengage return spring from spirol pin (18) and remove return spring.
15. Place new return spring in position, engage with spirol pin, and slide shaft (38) with tube (45) back through return spring and out right hand side of control head.
16. Install right hand control lever (52) onto tube (45), and secure with set screw (30).
17. Install right hand handle grip (41) onto shaft (38), align roll pin hole in handle grip with roll pin hole in shaft, and install roll pin.
18. Install handle guard (47), with two brackets (44 and 50) with switches (7) attached, and secure with two caps (39) and screws (25).
19. Install four screws (24) through handle guard and into control head.
20. Reconnect speed control switches (7).
21. Install top cover (72) with four screws (71).
22. Reconnect connector (55).
23. Install control head (1, Figure 5-7) onto steering arm (3) with four socket head screws (2).
24. Reconnect battery.

5-7. 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 5-6 and proceed as follows to adjust the steering arm return spring tension.

1. Disconnect the battery.
2. Hold the steering arm (10, Figure 5-6) 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.

5-8. STEERING ARM RETURN SPRING REPLACEMENT.

NOTE: Refer to Figure 5-6 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 5-6) 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.

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 5-7.
15. Reconnect battery.

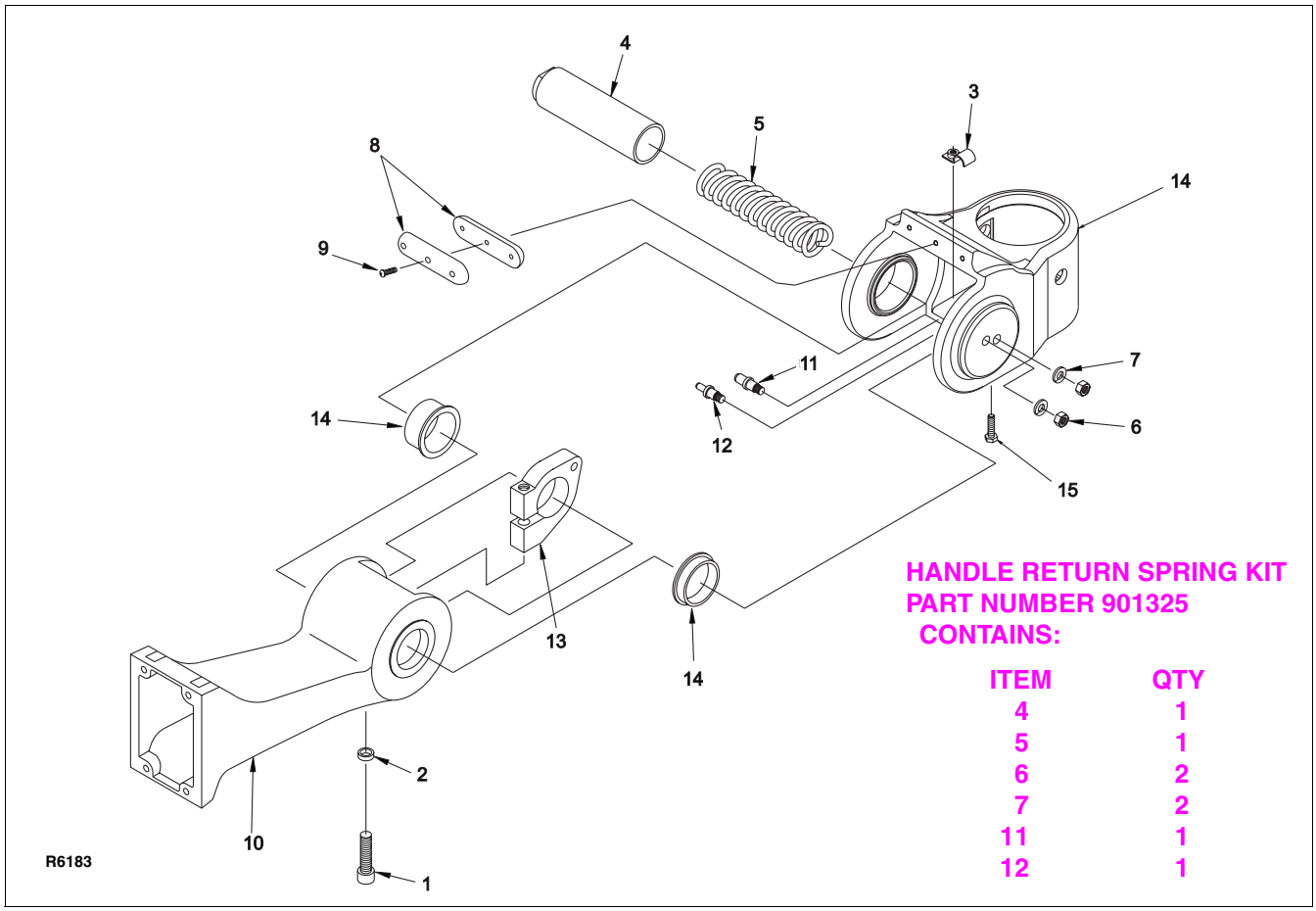


Figure 5-6 Steering Arm and Electrical Cable

5-9. 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 5-7), four lock washers (8), ring (7) and pivot tube guide (6).

NOTE: When installing the new pivot tube guide (6), refer to Figure 5-7 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.

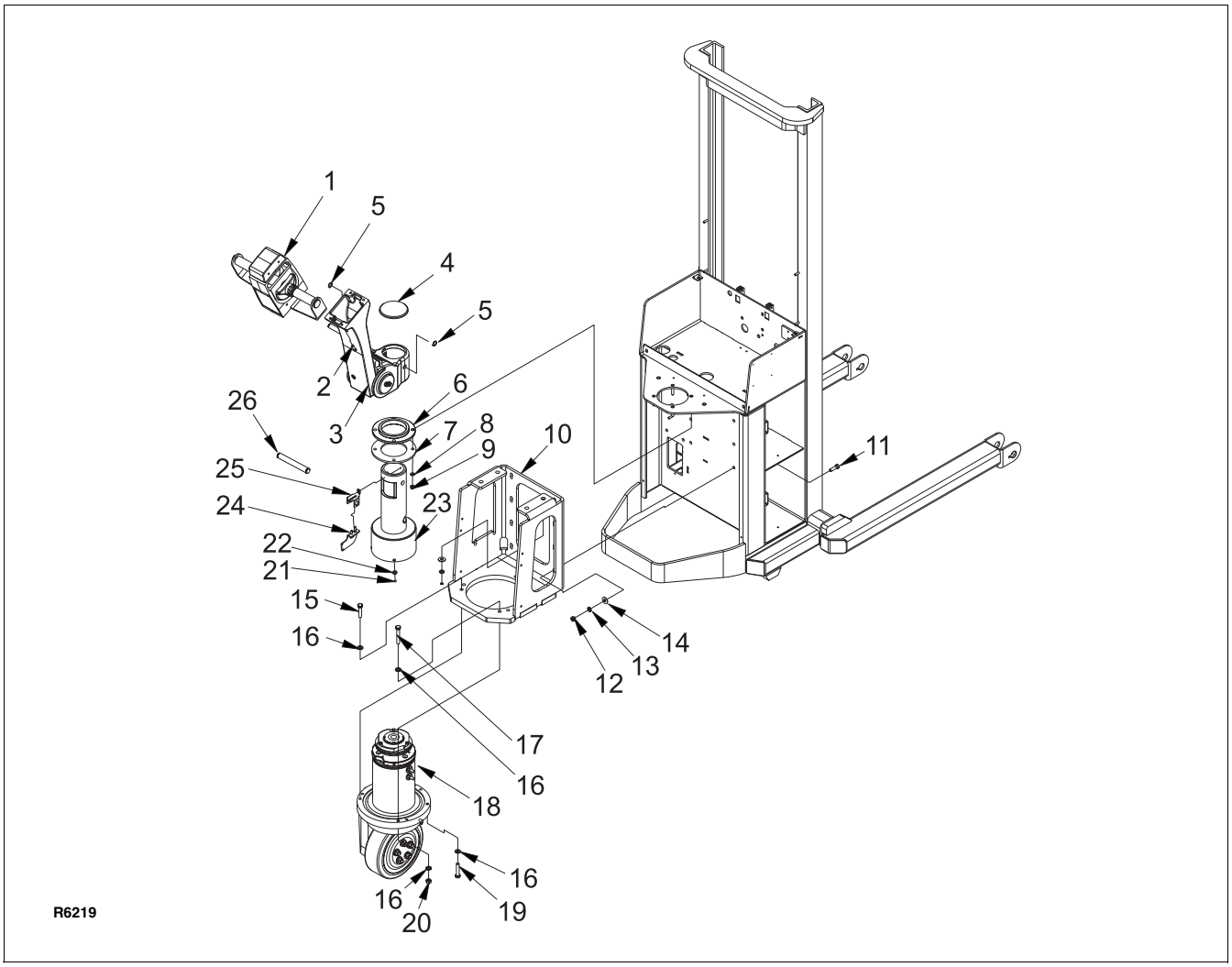


Figure 5-7 Pivot Tube and Transmission Assembly

5-10.ELECTRICAL CONTROL CABLE REPLACEMENT.

NOTE: Refer to Figure 5-8 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 5-8) 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 5-7), 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 5-8) 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) 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, Figure 5-8) 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 5-7) and pin (26) as described in SECTION 6.
28. Reconnect battery.

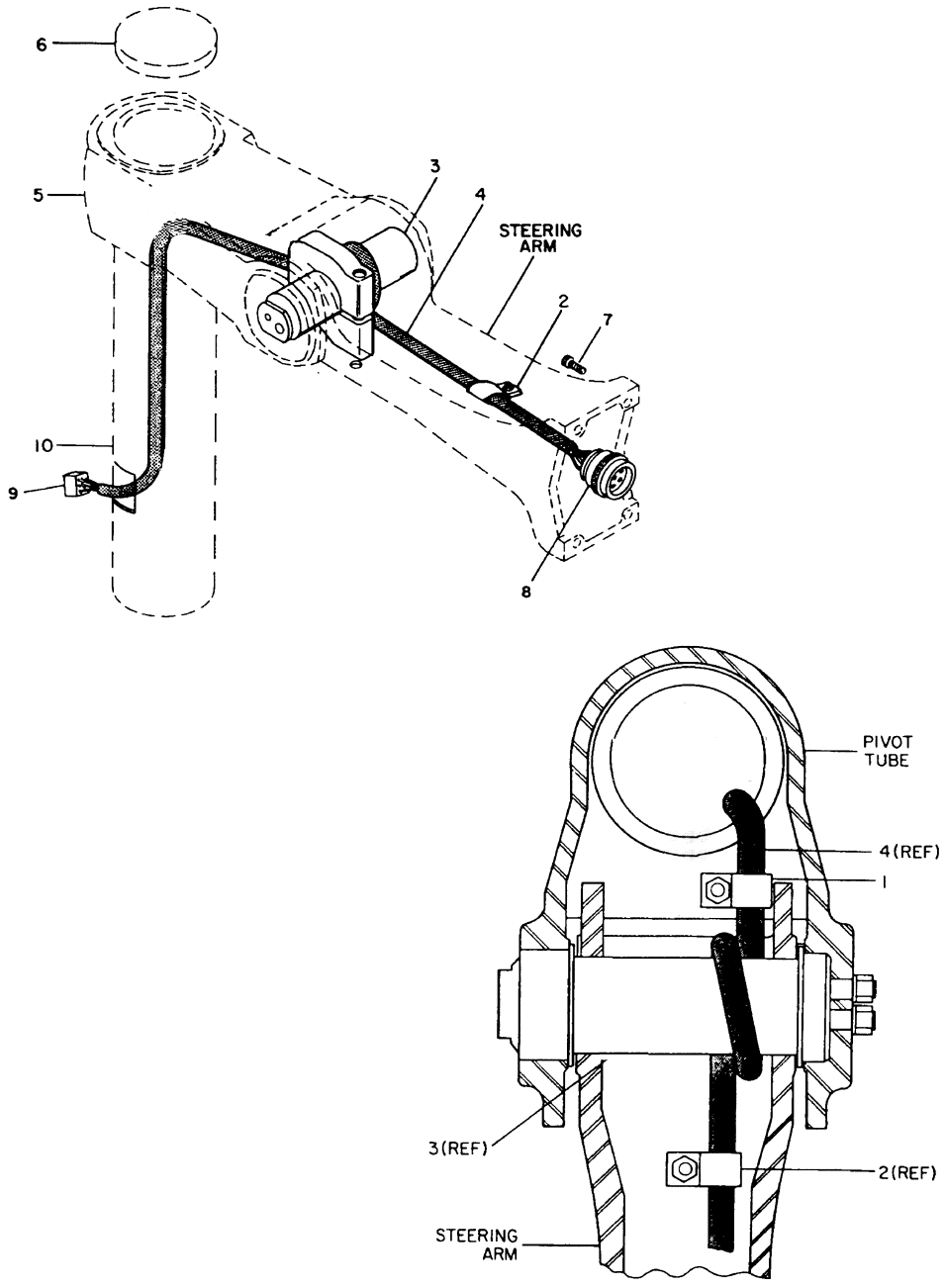


Figure 5-8 Electrical Control Cable Replacement

NOTES

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.

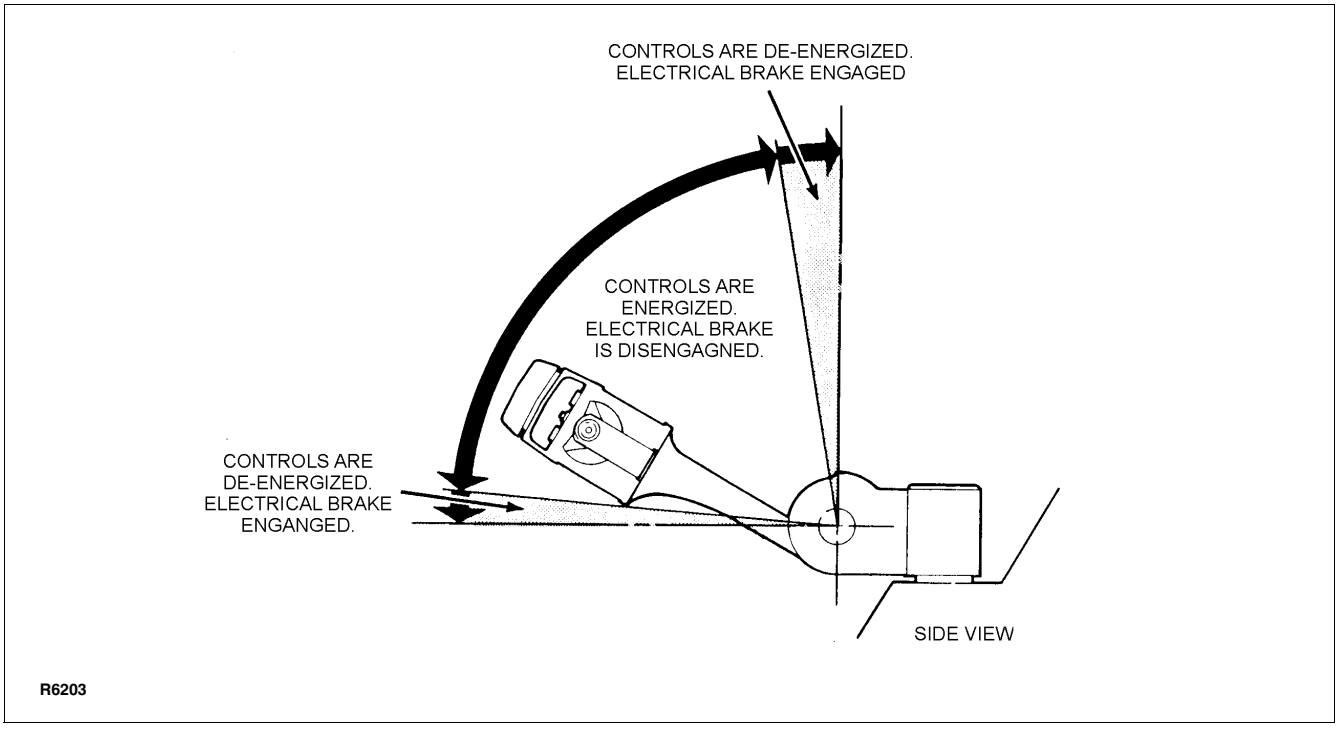


Figure 6-1 Brake Engage/Disengage

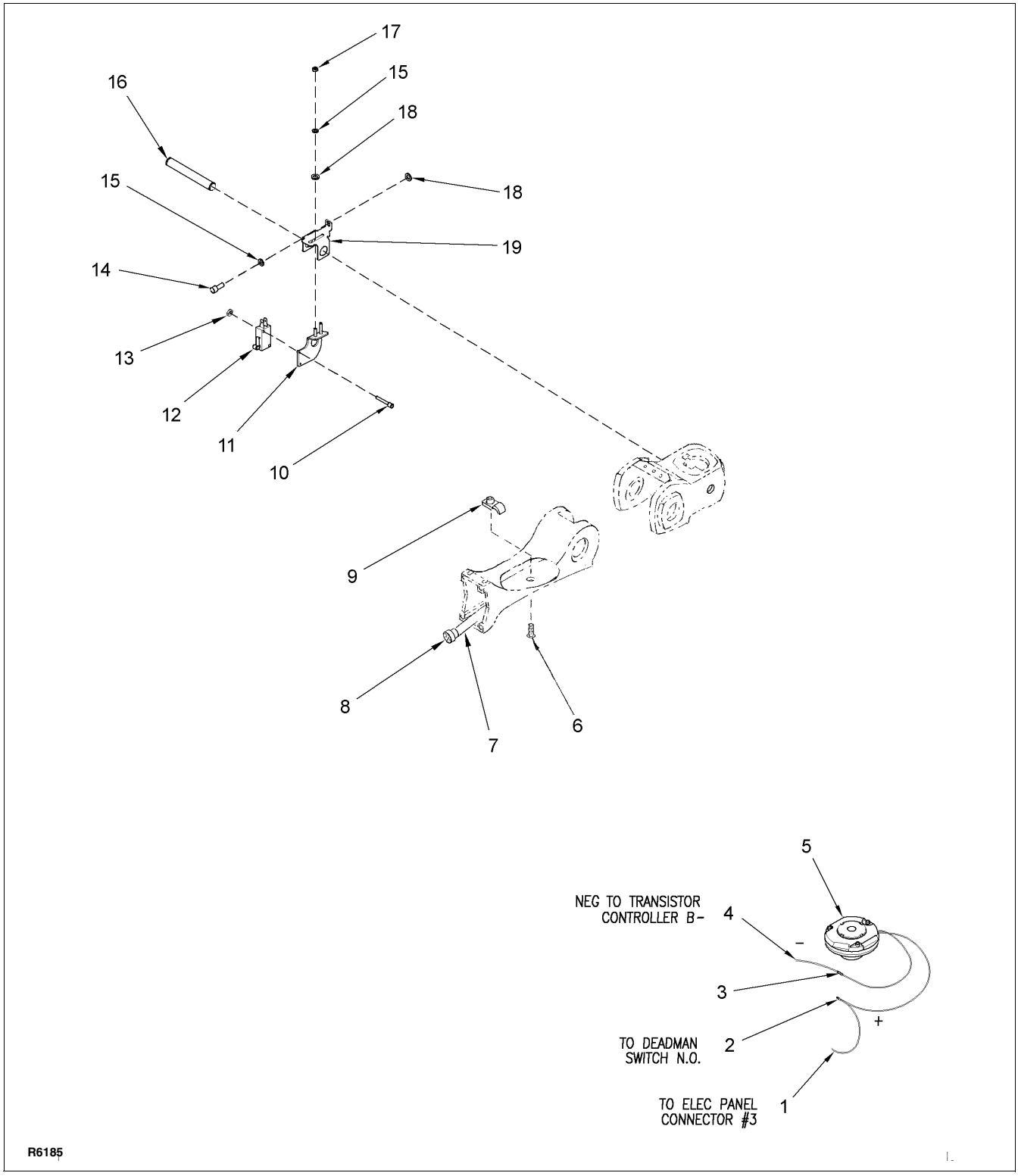


Figure 6-2 Brake and Actuator

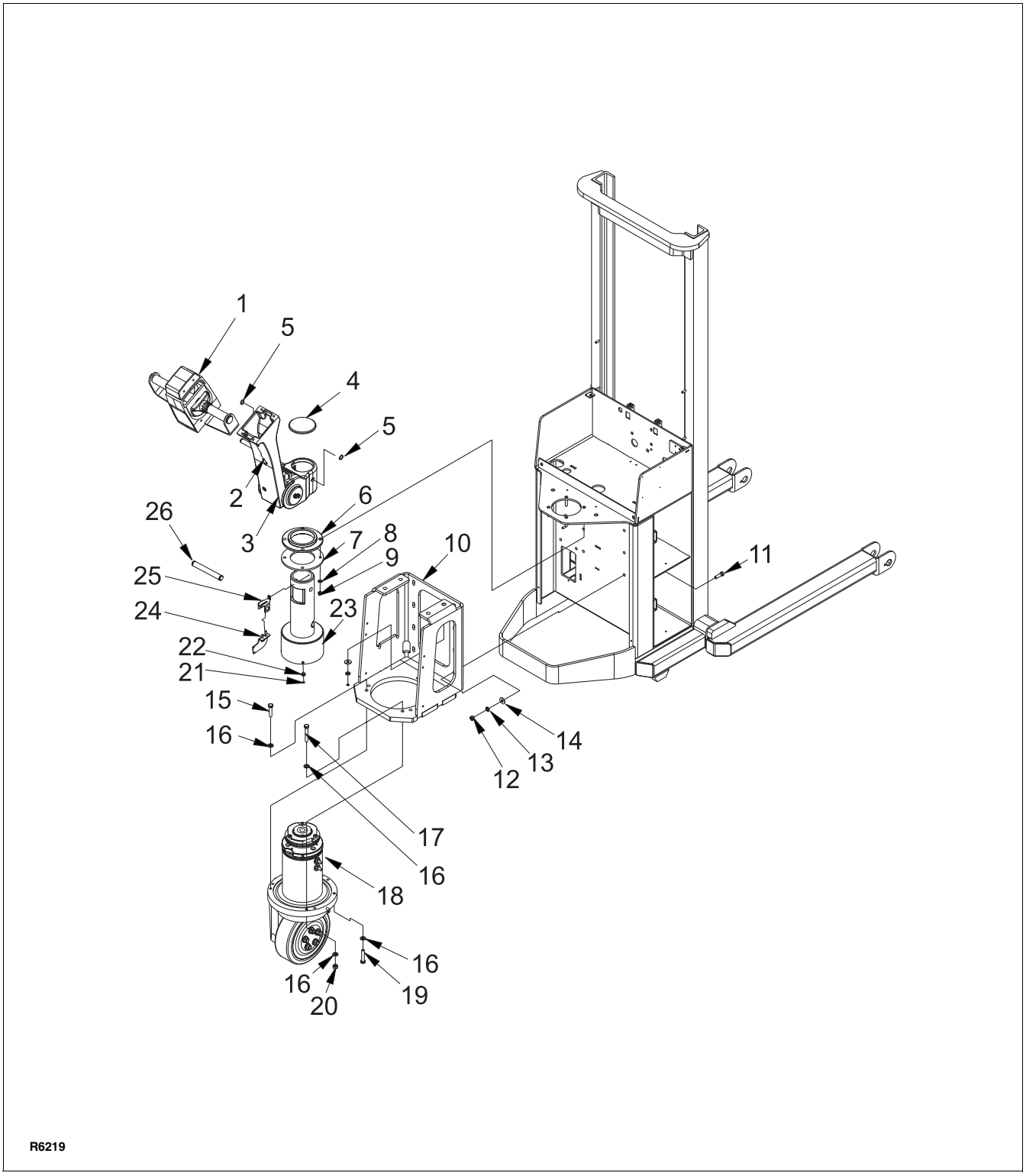


Figure 6-3 Pivot Tube and Transmission Assembly

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

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).

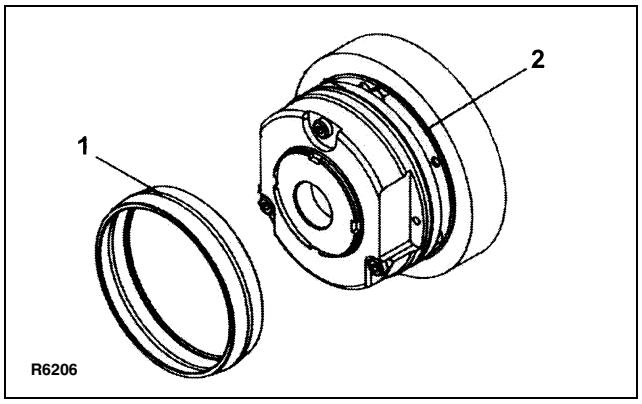


Figure 6-4 Dust Ring Removal

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.

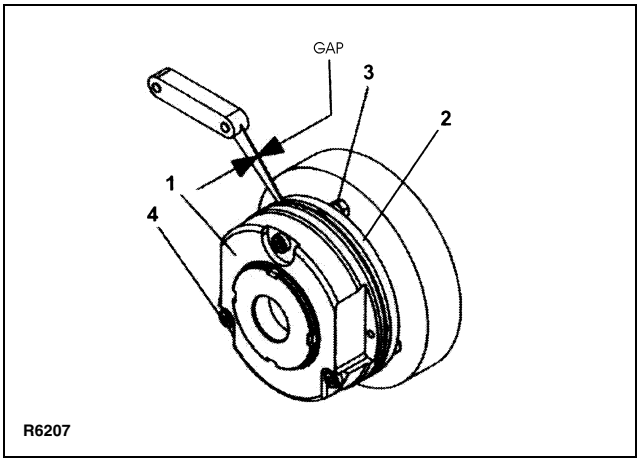


Figure 6-5 Brake Adjustment

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. 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.

6-3.3. 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).

6-3.4. 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.

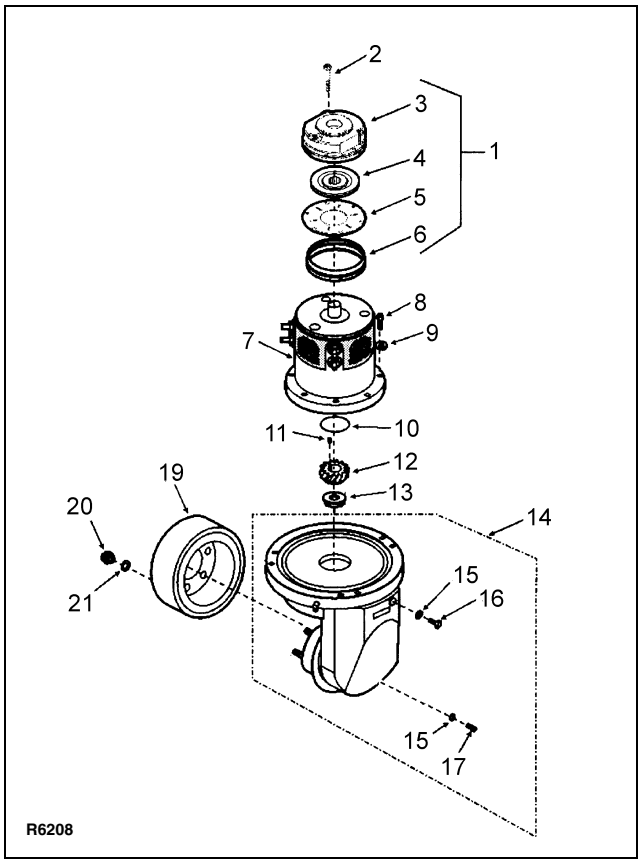


Figure 6-6 Transmission/Motor/Brake Assembly

NOTES

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).

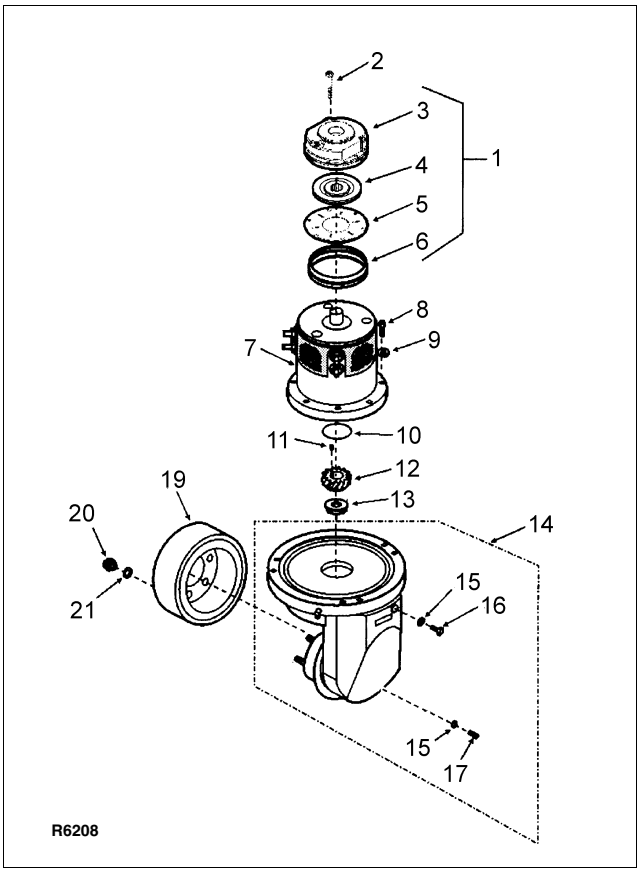


Figure 7-1 Transmission/Motor/Brake Assembly

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.

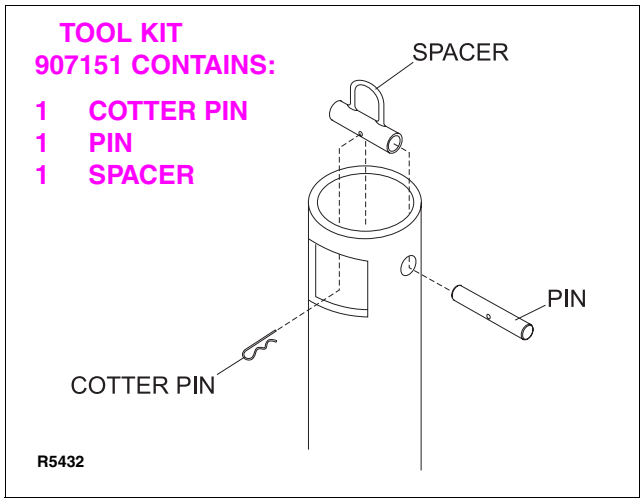


Figure 7-2 Pivot Tube Removal Tool

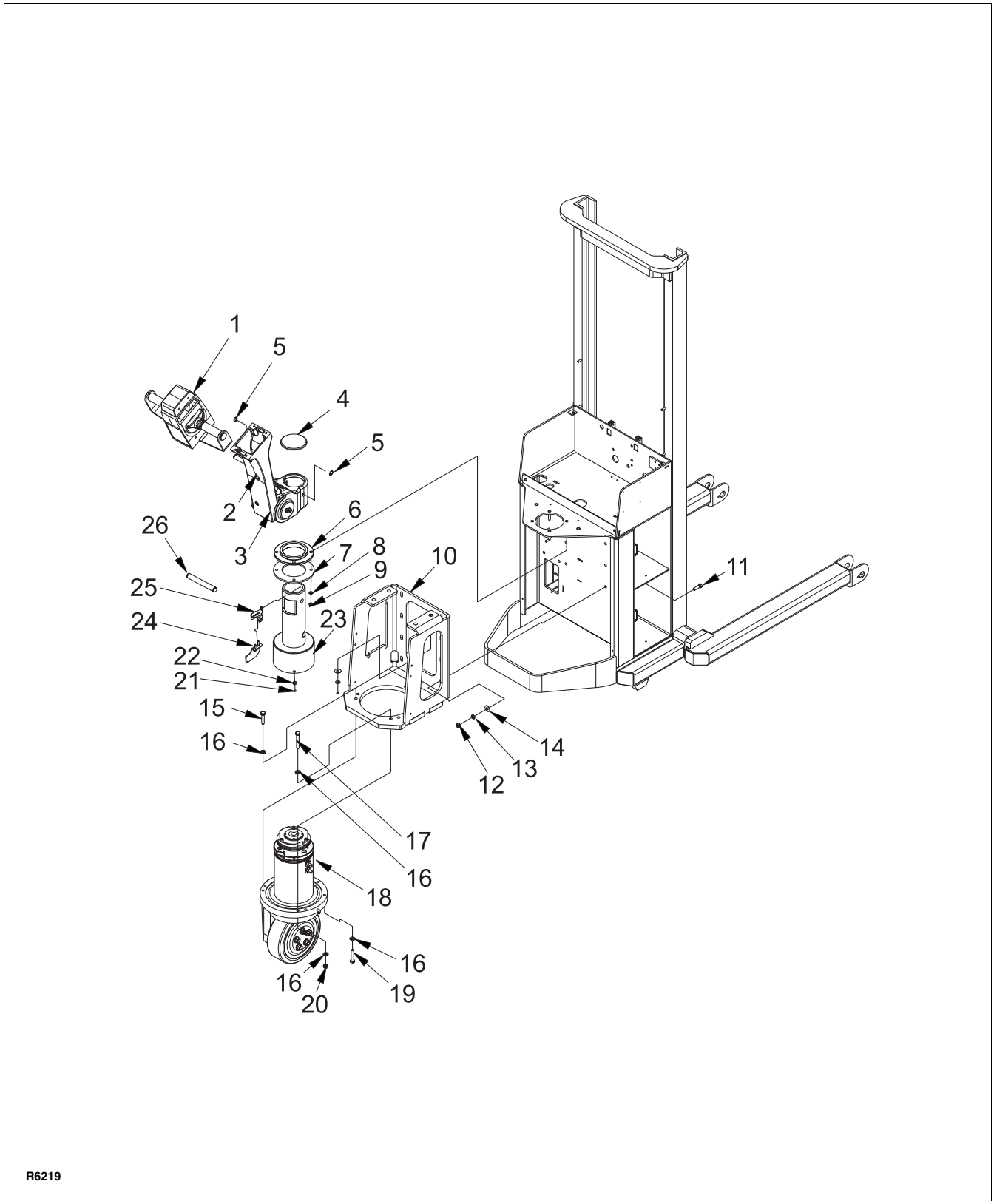


Figure 7-3 Pivot Tube and Transmission Assembly

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 transmission/motor/brake assembly.

NOTE: Pivot tube flanged bushing is covered in paragraph 5-9.

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

NOTE: Electric brake removal is covered in paragraph 6-3.2. and electric brake adjustment is covered in paragraph 6-3.2.

NOTE: The drive motor is covered in paragraph 10-3.

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

1. Position pivot tube (23, Figure 7-3) on the transmission/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.

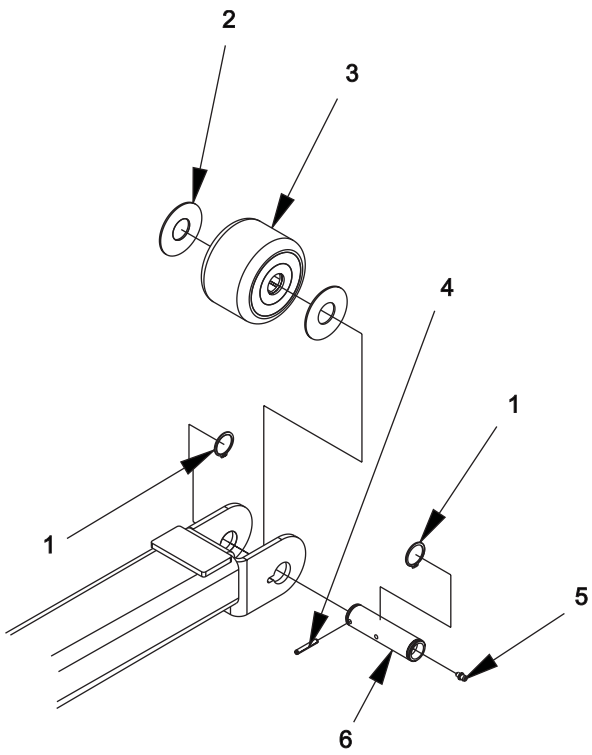
CAUTION: Be sure to observe cable routing and positioning when reinstalling electrical control cable to prevent cable damage.

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.

7-4. LOAD WHEELS (STANDARD).

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

R6188

Figure 7-4 Load Wheels (Standard)

7-5. LOAD WHEELS (FLUSH AXLE).

NOTE: Refer to Figure 7-5 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 snap ring (1, Figure 7-5) securing the load wheel axle (5).
4. Remove axle (5) 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 ring (1).
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.

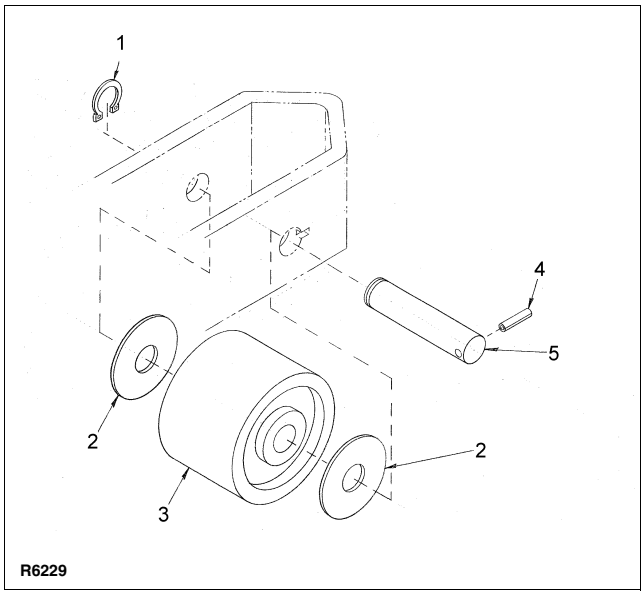


Figure 7-5 Load Wheels (Flush Axle)

7-6. ADJUSTABLE STRADDLE LIFT TRUCKS.

Parts on the adjustable straddle lift trucks are identical to the fixed straddle except for the removable straddle and the attaching hardware as shown in Figure 7-6. Perform the following procedure to adjust the straddles to a desired width.

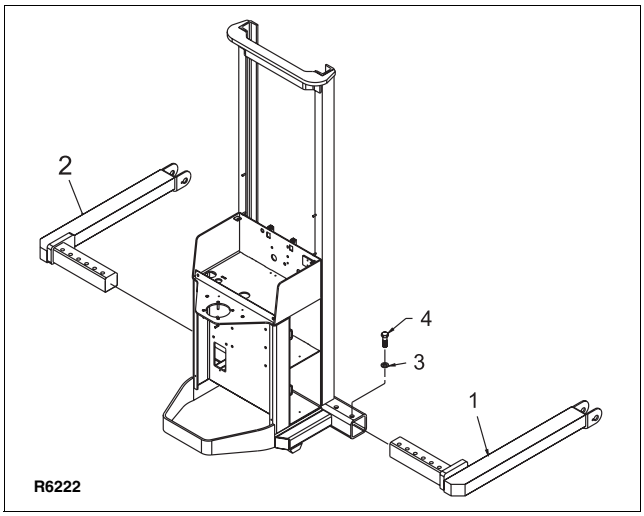


Figure 7-6 Adjustable Straddle Frame

1. Set brake in locked position.

CAUTION: Do not raise truck higher than necessary for load wheels to clear floor when performing next step or truck can flip over.

2. Raise one side of frame just enough for the straddle load wheel to clear the ground.
3. Remove two bolts (4, Figure 7-6) and two washers (3) from raised side of lift truck.
4. Slide straddle to dimension desired.

NOTE: Minimum spread of straddle legs is 38 inches and maximum spread is 50 inches.

5. Lubricate and reinstall two washers (3) and two bolts (4).

NOTE: Retighten bolts to 200 ft.-lbs.

CAUTION: All bolts must engage straddles and both straddles must be adjusted with equal number of holes exposed on each side.

6. Lower straddle to the floor and raise the other side just enough to clear straddle load wheels from the floor.
7. Repeat steps 3. through 5. on the opposite side of the truck.
8. Lower truck straddle to the floor.
9. Recheck that both straddles are adjusted with equal number of holes exposed on each side.

SECTION 8
ELEVATION SYSTEM SERVICING

8-1. GENERAL.

The elevation system includes the outer mast, inner mast (telescopic and full free lift models), lift carriage, lift chains, lift cylinder, and ram head.

8-2. LIFT CHAIN LENGTH ADJUSTMENT.

8-2.1. Telescopic and Non-Telescopic.

1. Lower carriage (22, Figure 8-1 or 13, Figure 8-2) fully, then disconnect battery.

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

2. Loosen top jam nuts (11, Figure 8-1 or 18, Figure 8-2) on adjusting bolts (10, Figure 8-1 or 17, Figure 8-2).
3. Take up slack in both lift chains with hex nut (14, Figure 8-1 or 16, Figure 8-2) on the adjusting bolt. Strive for equal tension on chains.
4. Align adjusting bolts so each clevis pin is parallel to ram head (4, Figure 8-1 or 8, Figure 8-2).

CAUTION: At least 3 full threads must be present below hex nut (14, Figure 8-1 and 16, Figure 8-2) 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.

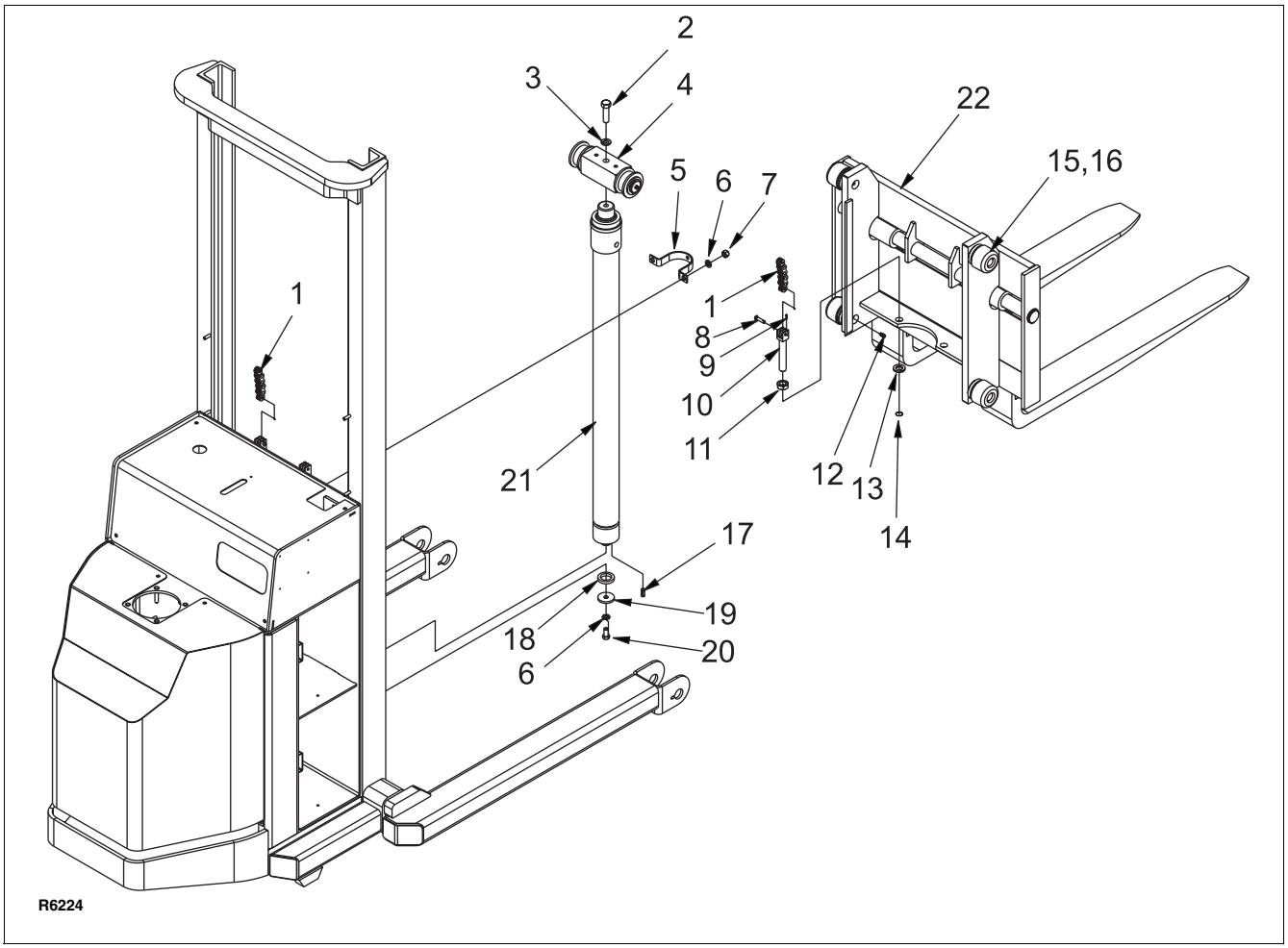


Figure 8-1 Elevation System (Non-Telescopic)

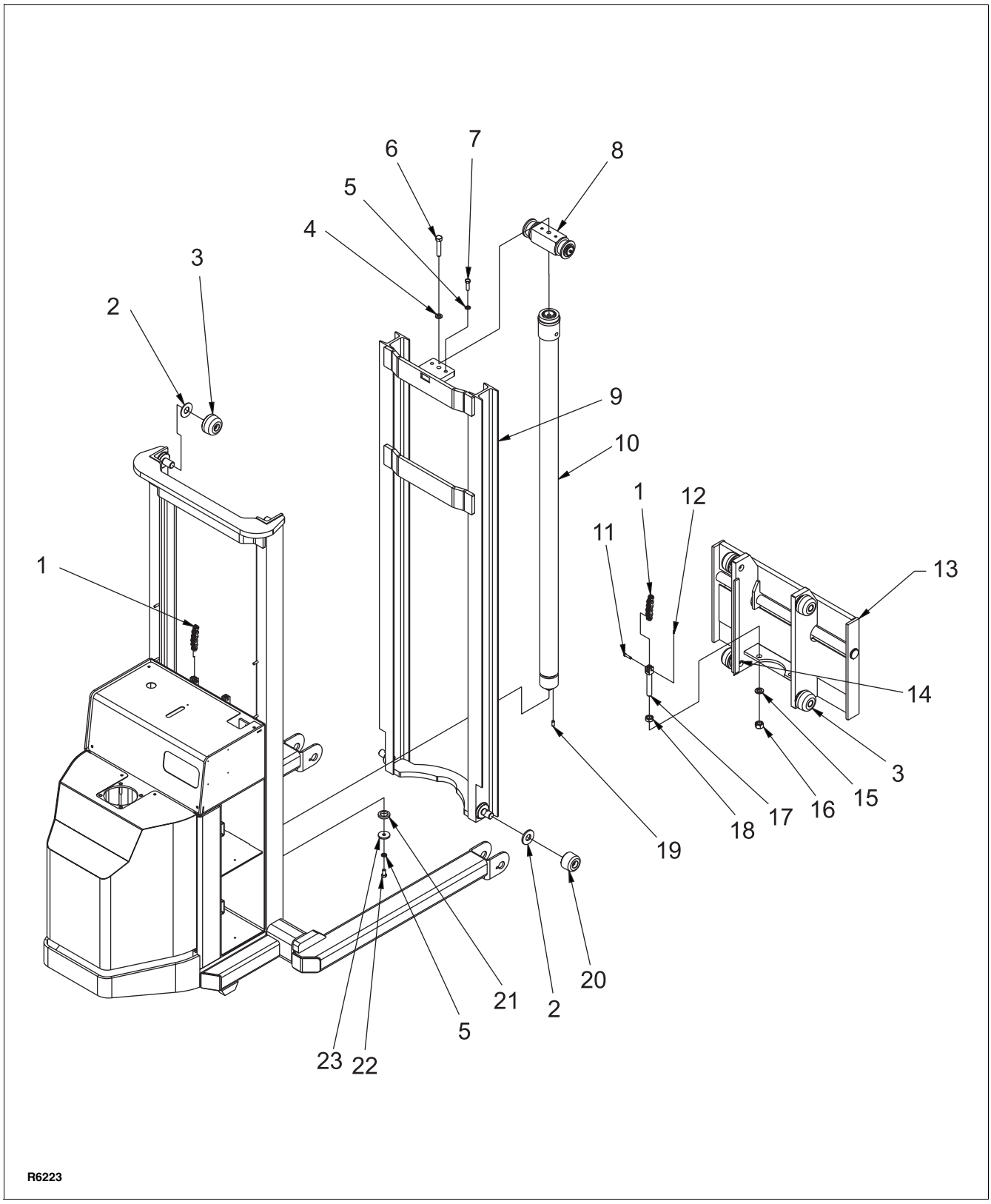


Figure 8-2 Elevation System (Telescopic)

8-2.2. Full Free Lift.

1. Lower carriage (30, Figure 8-3) fully, then disconnect battery.

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

2. Loosen top jam nuts (27) on adjusting bolts (26).
3. Take up slack in both lift chains with hex nut (29) on the adjusting bolt. Strive for equal tension on chains.

CAUTION: At least 3 full threads must be present below hex nut (29) after completion of adjustment.

4. Align adjusting bolts so each clevis pin is parallel to sheave (11).
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.

8-3. 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 carriage and forks.

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.

8-4. LIFT CHAIN REPLACEMENT.

8-4.1. Telescopic and Non-Telescopic.

1. Place a solid block on floor under the vertical members nearest the center of the lift carriage.
2. Lower carriage 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 (9, Figure 8-1 or 12, Figure 8-2) and clevis pin (8, Figure 8-1 or 11, Figure 8-2) from end of chain connected to mast cross brace.
4. Remove cotter pin (9, Figure 8-1 or 12, Figure 8-2) and clevis pin (8, Figure 8-1 or 11, Figure 8-2) from chain adjusting bolt (10, Figure 8-1 or 17, Figure 8-2).
5. Remove chain from ram head assembly (4, Figure 8-1 or 8, Figure 8-2) and lay aside for repair.
6. Position new chain in place on ram head assembly.
7. Install cotter pin and clevis pin on chain adjusting bolt.
8. Connect end of chain to mast cross brace with cotter pin and clevis pin.
9. Adjust chain according to paragraph 8-2.

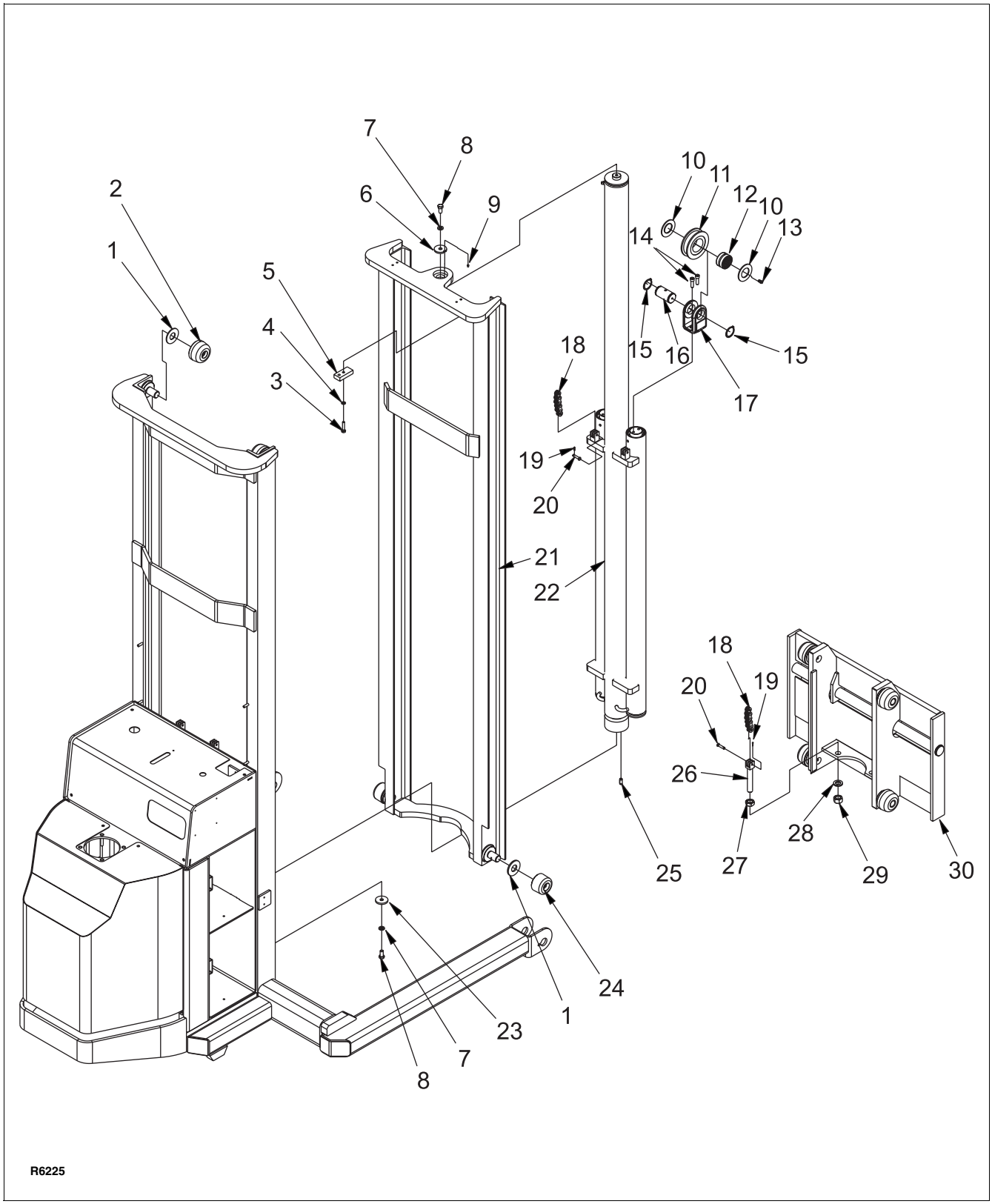


Figure 8-3 Elevation System (Full Free Lift)

8-4.2. Full Free Lift.

1. Place a solid block on floor under the vertical members nearest the center of the lift carriage.
2. Lower carriage 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 (19, Figure 8-3) and clevis pin (20) from end of chain connected to lift cylinder (22).
4. Remove cotter pin (19) and clevis pin (20) from chain adjusting bolt (26).
5. Remove chain from sheave (11) and lay aside for repair.
6. Position new chain in place on sheave (11).
7. Install clevis pin (20) and cotter pin (19) on chain adjusting bolt (26).
8. Connect end of chain to lift cylinder (22) with clevis pin (20) and cotter pin (19).
9. Adjust chain according to paragraph 8-2.

8-5. LIFT CYLINDER REMOVAL.

8-5.1. Non-Telescopic.

NOTE: Refer to Figure 8-1 for the following procedure.

1. With the brake set and the lift truck wheels securely blocked, raise forks approximately three feet from floor and position blocks or strong supports under lift carriage (22).
2. Lower lift carriage fully onto support.
3. Disconnect battery.
4. Hold lift control lever forward and, at the same time, manually push lift cylinder ram (4) down as far as possible.
5. Remove overflow tubing retainers along the side of the lift cylinder assembly (21).

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

6. Disconnect hose assembly from bottom of lift cylinder and overflow tubing from top of lift cylinder.
7. Lift chains clear of ram (4) and lay chains aside.
8. Remove cap screw and lock washer (3 and 4) and lift ram head (4) from lift cylinder (21).
9. Remove screw (20), lock washer (6), plain washer (19), and spacer (18) from base of cylinder (21).

WARNING: Support lift cylinder before performing step 10. to prevent cylinder from falling.

10. Remove nuts (7) and lock washers (6) that secure clamp (5) and remove clamp.
11. Raise lift cylinder assembly up and out of truck.

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

12. Reinstall lift cylinder in reverse order of removal.
13. Adjust chain according to paragraph 8-2.

8-5.2. Telescopic.

NOTE: Refer to Figure 8-2 for the following procedure.

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 (9, Figure 8-2).
2. Lower inner mast onto support. Check that arrangement is secure before proceeding.
3. Disconnect battery.
4. Remove two cap screws (6), two lock washers (4) one cap screw (7) and one lock washer (5) that join the top of the inner mast (9) to the ram head (8).
5. Hold lift control lever forward 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. Remove overflow tubing retainers alongside of the lift cylinder assembly (10).

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

7. Disconnect hose assembly from bottom of lift cylinder. Disconnect overflow tubing from top of lift cylinder (10).
8. Lift chains clear of ram (8) and lay them aside.
9. Remove screw (22), lock washer (5), plain washer (23) and spacer (21) from underside of cylinder.

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

10. Tilt lift cylinder (10) and ram head (8) forward from their position in the lift truck.
11. Lift ram head from lift cylinder.
12. Raise lift cylinder assembly up and out of truck.

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

13. Reinstall lift cylinder in reverse order of removal.
14. Adjust chain according to paragraph 8-2.

8-5.3. Full Free Lift.

NOTE: Refer to Figure 8-3 for the following procedure.

1. Fully lower the lift carriage.
2. Disconnect battery.

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

3. Disconnect hose at the bottom of the lift cylinder.
4. Remove connector, flow control valve, elbows and nipple at the bottom of the lift cylinder.
5. Using another lift truck or suitable jack, raise lift carriage far enough to remove chains from around sheaves (11). Lay chains aside and lower lift carriage.
6. Remove screw (8), lock washer (7), and flat washer (6) securing the top of lift cylinder (15) to the inner mast (11).
7. Remove screw (8), lock washer (7), and flat washer (23) securing the bottom of lift cylinder (22) to the outer mast (21).

WARNING: Lift cylinder must be supported during the next step.

8. Support lift cylinder and using another lift truck or suitable jack, raise inner mast (21) far enough to clear top of lift cylinder.
9. Lift cylinder up and out of truck.
10. Remove the yoke sheaves as described in paragraph 8-7.

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

11. Reinstall lift cylinder in reverse order of removal.
12. Adjust chain according to paragraph 8-2.

8-6. RAM HEAD REMOVAL.

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

8-6.1. Non-Telescopic.

NOTE: Refer to Figure 8-1 for the following procedure.

1. With the brake set and the lift truck wheels securely blocked, lower the lift carriage fully, then disconnect battery.
2. Slacken the lift chains by loosening the nut (14) below the chain adjusting bolt (10). Then lift chains off sheaves and lay them on mast support.
3. Remove cap screw (2) and lockwasher (3) and lift ram head assembly (4) from lift cylinder (21).

8-6.2. Telescopic.

NOTE: Refer to Figure 8-2 for the following procedure.

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 (9).
2. Lower inner mast onto support. Check that arrangement is secure before proceeding.
3. Disconnect battery.
4. Remove two cap screws (6), two lock washers (4), one cap screw (7) and one lock washer (5) that join the top of the inner mast (9) to the ram head (8).
5. Hold lift control lever forward and, at the same time, manually push the ram down as far as possible. The chains will become slack.
6. Lift ram head (8) from lift cylinder (10).

8-7. YOKE SHEAVE REPLACEMENT (FULL FREE LIFT).

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

1. Lower the lift carriage fully.
2. Disconnect the battery.
3. Slacken the lift chains by loosening nut (29, Figure 8-3) below adjusting bolt (26) on the lift carriage.
4. Lift the lift chains off sheaves (11) and lay on the mast support.
5. Remove snap ring (15) and slide pin (16) out of sheave (11). Sheave (11), bearing (12), and thrust washers (10) will fall free.
6. Yoke sheave (17) can now be removed by removing screws (14).
7. Reinstall yoke sheave in reverse order of removal.
8. Adjust lift chains as described in paragraph 8-2.

8-8. LUBRICATION OF MAST.

NOTE: Refer to Figure 8-1, Figure 8-2 and Figure 8-3.

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

1. Grease fittings (13, Figure 8-3) on lift carriage rollers (2 and 24) and sheaves (11).
2. Grease fittings on ram head (4, Figure 8-1 or 8, Figure 8-2).

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.

NOTES

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. Lower the lift carriage fully.
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.

NOTE: A schematic diagram of the hydraulic system is shown in Figure 9-1.

9-2. FLOW CONTROL VALVE REPLACEMENT.

NOTE: Figure 9-2 and Figure 9-3 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 forks approximately three feet from floor. Position blocks or strong supports under the inner mast (on telescopic and full free lift models) 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.

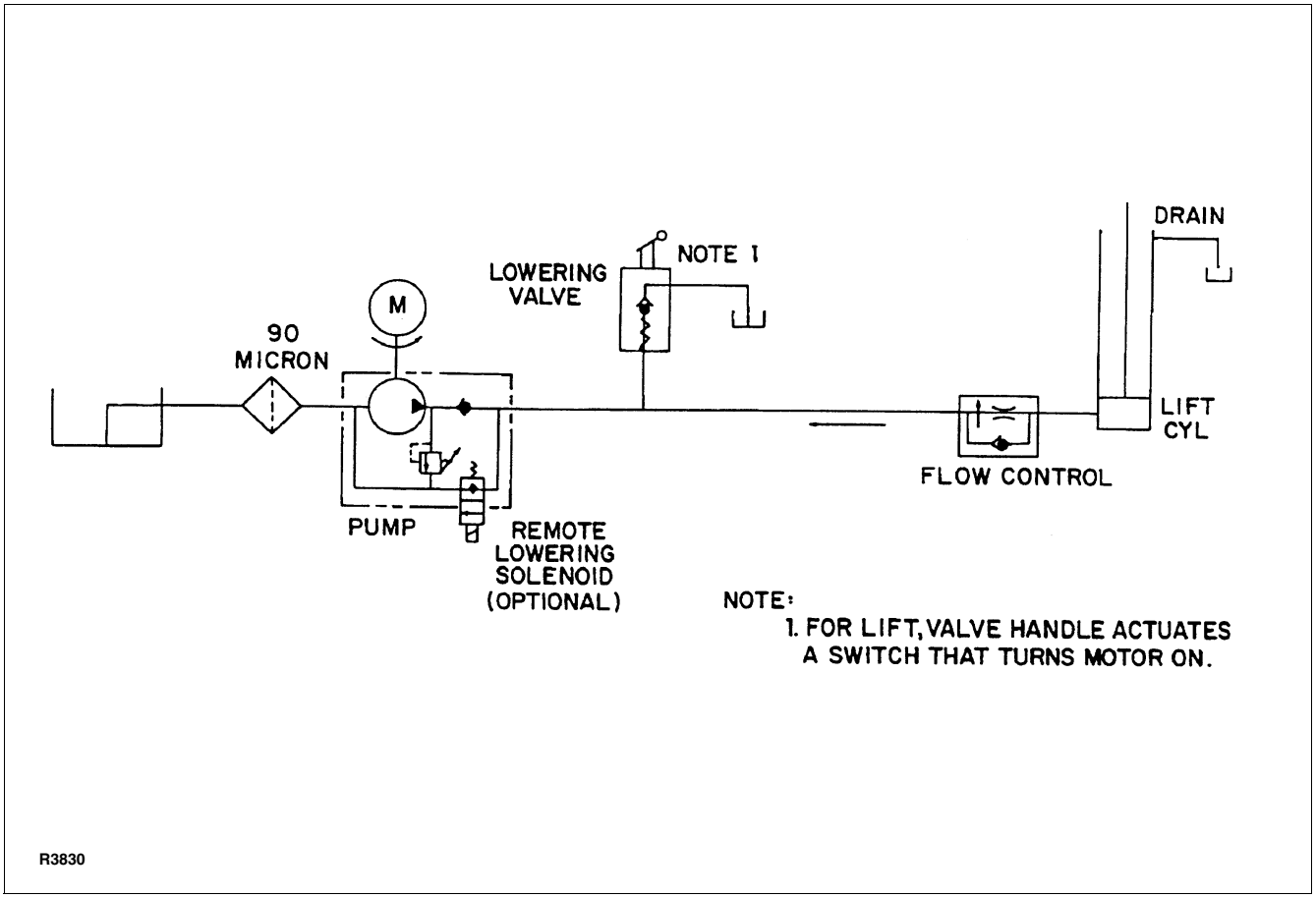


Figure 9-1 Hydraulic System Schematic

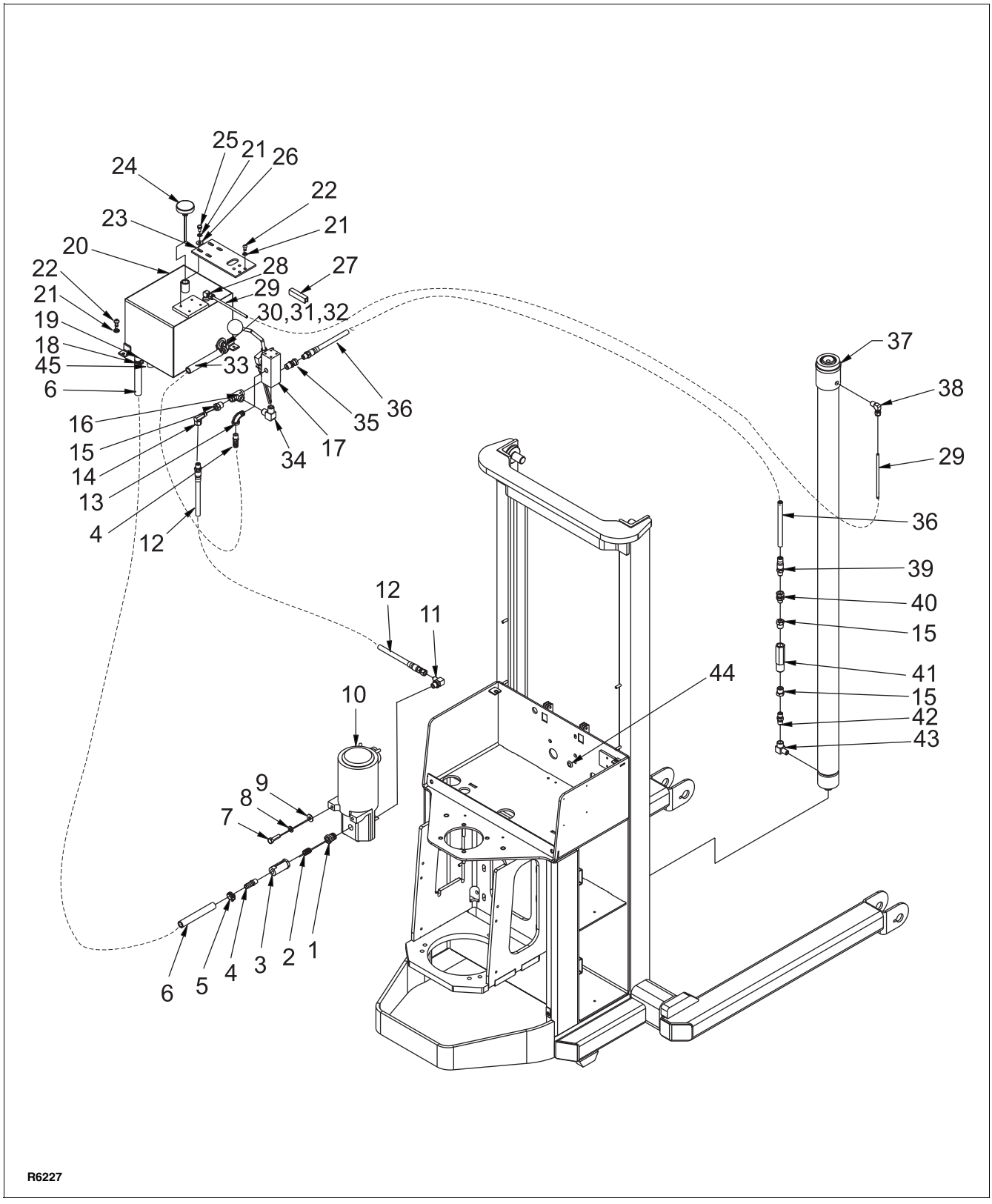


Figure 9-2 Hydraulic System (Telescopic and Non-Telescopic)

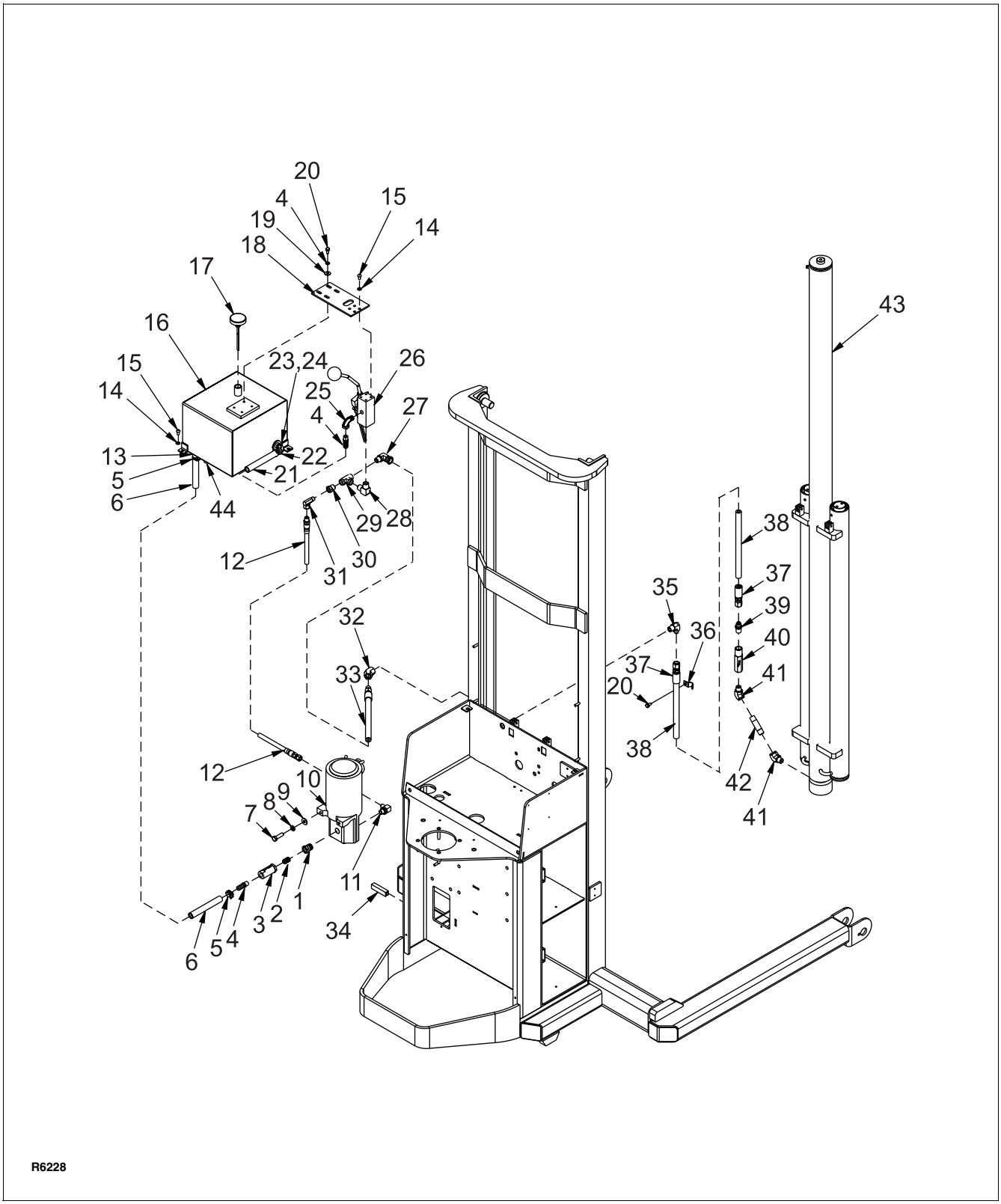


Figure 9-3 Hydraulic System (Full Free Lift)

4. On telescopic models remove the two cap screws and two lock washers securing the top of the inner mast to the ram head.
5. Hold lift control forward, and at the same time manually push the ram of the lift cylinder 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 (36, Figure 9-2 or 38, Figure 9-3) and fittings from flow control valve (41, Figure 9-2 or 40, Figure 9-3).
7. Remove flow control valve.
8. Install new flow control valve (36, Figure 9-2 or 38, Figure 9-3) with direction arrow on flow control valve pointing toward lift cylinder.
9. Reconnect fittings and hose (36, Figure 9-2 or 38, Figure 9-3).
10. On telescopic models resecure ram head with the two cap screws and lock washers.
11. Reconnect battery.
12. Raise forks, then remove supports.
13. Check oil level on dip stick. If low, fill to ``FULL'' mark on dip stick with hydraulic oil described in SECTION 3.
14. Check for leaks.

9-3. SUCTION LINE FILTER REPLACEMENT.

NOTE: Refer to Figure 9-2 or Figure 9-3 for the following procedure.

1. Lower lift carriage fully to insure that all pressure is relieved from hydraulic system.
2. Remove reservoir drain plug (45, Figure 9-2 or 44, Figure 9-3), and drain oil into suitable container.
3. Remove clamp (5, Figure 9-2 or Figure 9-3), tubing (6, Figure 9-2 or Figure 9-3) and nipple (4, Figure 9-2 or Figure 9-3) from filter (3, Figure 9-2 or Figure 9-3).
4. Unscrew filter from nipple (2, Figure 9-2 or Figure 9-3).
5. Install new filter on nipple (2, Figure 9-2 or Figure 9-3).
6. Install nipple (4, Figure 9-2 or Figure 9-3), tubing (6, Figure 9-2 or Figure 9-3) and clamp (5, Figure 9-2 or Figure 9-3) onto new filter.
7. Clean the drain plug (45, Figure 9-2 or 44, Figure 9-3) thoroughly.
8. Re-install the drain plug.

NOTE: Refill only with hydraulic oil 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.

9. Remove reservoir vent cap, fill reservoir to ``FULL'' mark on the dip stick with hydraulic oil described in SECTION 3.

9-4. LINE OR FITTING REPLACEMENT.

WARNING: Lift carriage 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. Lower lift carriage fully.

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

2. Remove reservoir drain plug (45, Figure 9-2 or 44, Figure 9-3), and drain oil into 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 hydraulic oil 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.

6. Remove reservoir vent cap, fill reservoir to ``FULL'' mark on the dip stick with hydraulic oil described in SECTION 3.

NOTES

9-5. LIFT/LOWER CONTROL VALVE.

9-5.1. Adjustment.

NOTE: The lift/lower control valve is properly adjusted, inspected, and checked thoroughly before leaving the factory. The valve should rarely need readjusting; but if adjustment is necessary, the following procedure should be used to set the valve for lowering and the hydraulic pump switch for lifting.

NOTE: Refer to Figure 9-4, Figure 9-5 and Figure 9-6 for the following procedure.

1. Raise lift carriage part way with a moderate load on the forks to build up pressure in the hydraulic system.

CAUTION: Prevent lift control valve clamp (8, Figure 9-5 or Figure 9-6) from slipping off the release cam (3), or the handle return spring (7) will slip by the roll pins (6).

2. Loosen upper nut (9, Figure 9-5 or Figure 9-6) on lift control valve clamp (8).
3. Using the point where the lift control knob and handle come together as a reference point, push handle forward 3/4 inch from neutral position (see Figure 9-4).

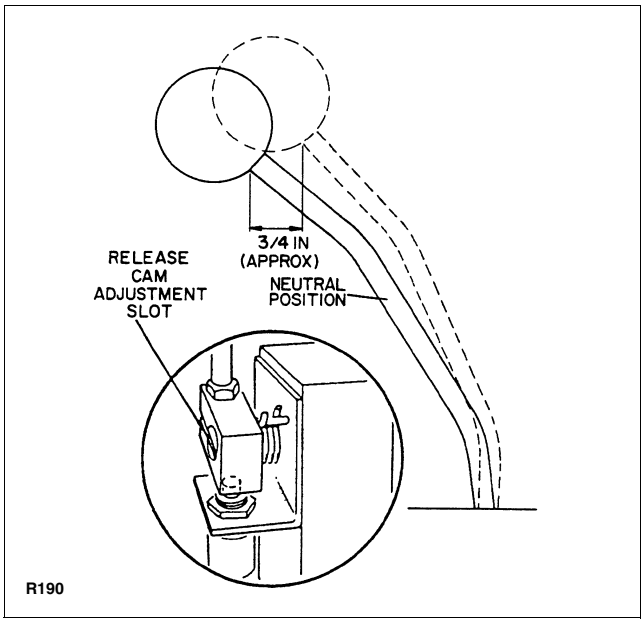


Figure 9-4 Lift/Lower Control Valve Adjustment

4. With a screwdriver in slot of release cam, rotate 1/8 turn clockwise. This is to make sure check ball is seated in valve seat.

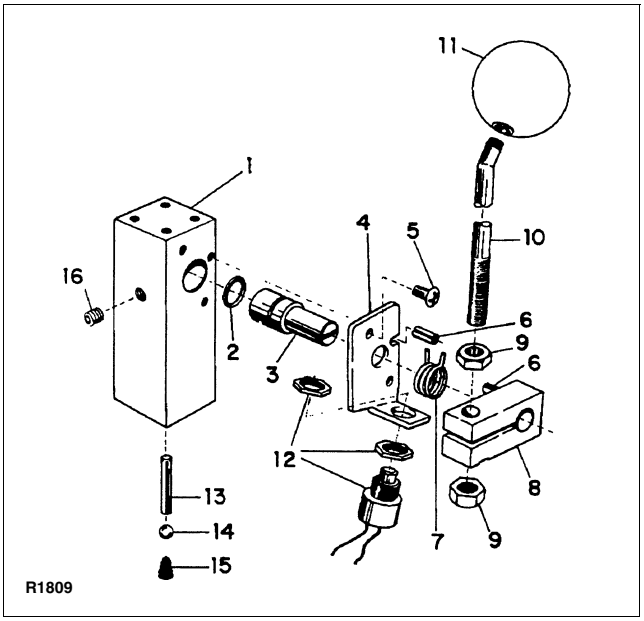


Figure 9-5 Lift/Lower Control Valve (Standard)

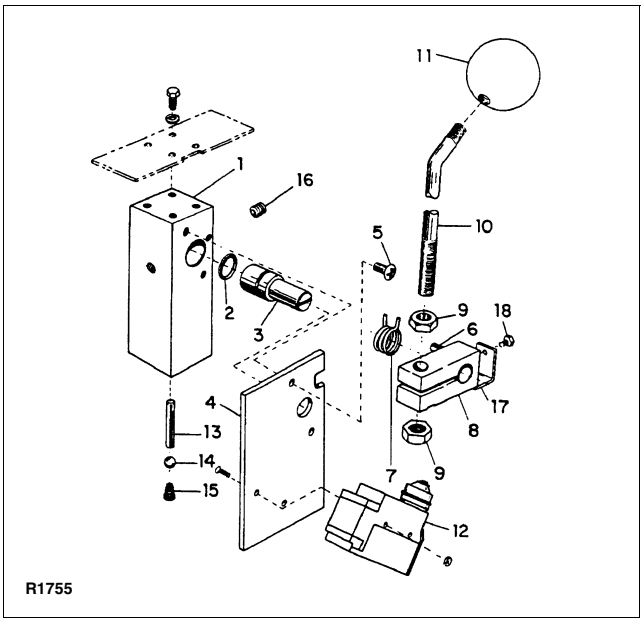


Figure 9-6 Lift/Lower Control Valve (Cold Conditioning)

5. With a screwdriver in slot of release cam, rotate counterclockwise until a definite resistance is felt. (Resistance is felt as the pin resting on check ball pushes against the hydraulic pressure in system.) At this point release cam action has moved pin (13, Figure 9-5 or Figure 9-6) down against check ball (14). Rotation of release cam beyond this point pushes ball away from valve seat and opens system, allowing lift carriage to descend.
6. Tighten upper nut (9).

9-5.2. Disassembly.

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

NOTE: Refer to Figure 9-4, Figure 9-5 and Figure 9-6 for the following procedure.

1. Lower lift carriage fully.
2. Disconnect battery.
3. Hold lift/lower control forward and, at the same time, manually push the ram of the lift cylinder down as far as possible.
4. Remove pump motor switch (12, Figure 9-5 or Figure 9-6) and lay aside.

NOTE: Disconnecting of wires is not necessary.

5. Disconnect tubing (33, Figure 9-2 or 21, Figure 9-3) from lift/lower control valve (17, Figure 9-2 or 26, Figure 9-3).
6. Disconnect hose assemblies (12 and 36, Figure 9-2 or 12 and 33 Figure 9-3).
7. Remove lift/lower control valve (17, Figure 9-2 or 26, Figure 9-3) complete with hydraulic fittings (13 and 34, Figure 9-2 or 25 and 28, Figure 9-3) by removing the four screws (22, Figure 9-2 or 15, Figure 9-3) and lock washers (21, Figure 9-2 or 14, Figure 9-3) securing the valve to the mounting bracket (23, Figure 9-2 or 18, Figure 9-3).
8. Remove hydraulic fittings.
9. Loosen lower nut (9, Figure 9-5 or Figure 9-6) securing lift control handle (10) to valve clamp (8) and slide handle with clamp from release cam (3).
10. Remove handle return spring (7).
11. Remove two screws (5) securing switch bracket (4) to valve body (1), then remove switch bracket.
12. The release cam (3) and O-ring (2) can now be pulled from the valve body (1).

NOTE: Install new parts as required during reassembly of the lift control valve.

13. To reassemble, install O-ring (2, Figure 9-5 or Figure 9-6) and release cam (3) onto valve body (1).
14. Install switch bracket (4) onto valve body (1) with two screws (5).
15. Install handle return spring (7) onto release cam (3).
16. Install valve clamp (8) with handle (10) onto release cam (3) and tighten lower nut (9).
17. Install hydraulic fittings (13 and 34, Figure 9-2 or 25 and 28, Figure 9-3) onto control valve (17, Figure 9-2 or 26, Figure 9-3).
18. Install lift/lower control valve (17, Figure 9-2 or 26, Figure 9-3) onto mounting bracket (23, Figure 9-2 or 18, Figure 9-3) with four lock washers (21, Figure 9-2 or 14, Figure 9-3) and four screws (22, Figure 9-2 or 15, Figure 9-3).
19. Reconnect hose assemblies (12 and 36, Figure 9-2 or 12 and 33, Figure 9-3) to hydraulic fitting (34, Figure 9-2 or 17, Figure 9-3).
20. Reconnect tubing (33, Figure 9-2 or 21, Figure 9-3) to control valve.
21. Install pump motor switch (12, Figure 9-5 or Figure 9-6) onto switch bracket (4).
22. Reconnect battery.

9-5.3. Pump Motor Switch Adjustment.

When the release cam (3, Figure 9-5 or Figure 9-6) is properly set, it may be necessary to readjust the hydraulic pump motor switch (12). For proper switch action and precise control of the lift carriage, a clearance of approximately 0.010 inch should be maintained between the switch actuator button and the lift control valve clamp (8).

1. To adjust the pump motor switch for proper clearance, loosen the two nuts holding the switch in the switch bracket.
2. Raise or lower the position of the switch by turning the upper nut.
3. When there is a 0.010 inch clearance between the switch actuator button and lift control valve clamp, tighten the lower nut against the bracket to lock the switch in place.

9-6. 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.

9-6.1. 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.

NOTE: See Figure 9-2 or Figure 9-3 for the following procedure.

1. Disconnect battery.
2. Drain hydraulic oil from reservoir into suitable container.
3. Label, then disconnect wires from solenoid.
4. Label, then disconnect tubing (6, Figure 9-2 or Figure 9-3) and hose (12, Figure 9-2 or Figure 9-3) from the pump (10, Figure 9-2 or Figure 9-3).
5. Remove the pump and motor assembly by removing the two hex head screws securing the assembly, then lift the assembly from the frame.
6. Remove the four hex head screws securing pump (2, Figure 9-7) from motor (5).
7. Separate the pump (2) from motor (5) and remove coupling (4) and gasket (3).

NOTE: When reassembling the pump to the motor, always use a new gasket (3).

8. Position coupling (4) and new gasket (3) on motor (5).
9. Install pump (2) and secure with the four hex head screws.

9-6.2. 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.

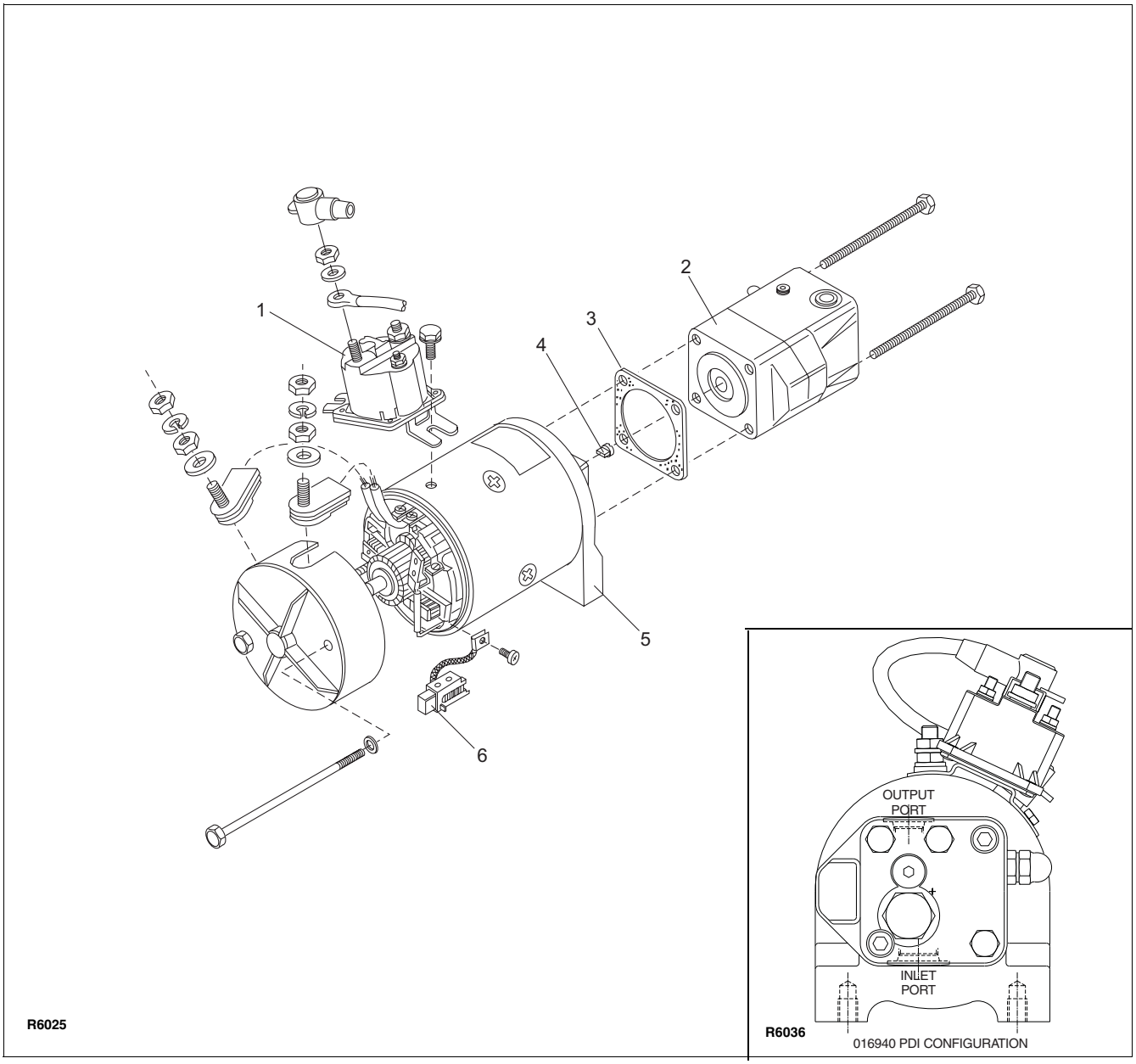


Figure 9-7 Hydraulic Pump and Motor Assembly

9-7. LIFT CYLINDER REPAIR.

9-7.1. Non-Telescopic and Telescopic.

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 9-8) 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 (8) and O-ring (7). Remove seal (9) from piston (8).
7. Install new O-ring (7), piston (8), new seal (9), and nut (10) onto cylinder ram (5).
8. 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.

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

NON-TELESCOPIC PACKING KIT PART NUMBER 907123 CONTAINS:

ITEM	QTY
2	1
4	1
7	1
9	1
10	1

TELESCOPIC PACKING KIT PART NUMBER 907138 CONTAINS:

ITEM	QTY
2	1
4	1
7	1
9	1

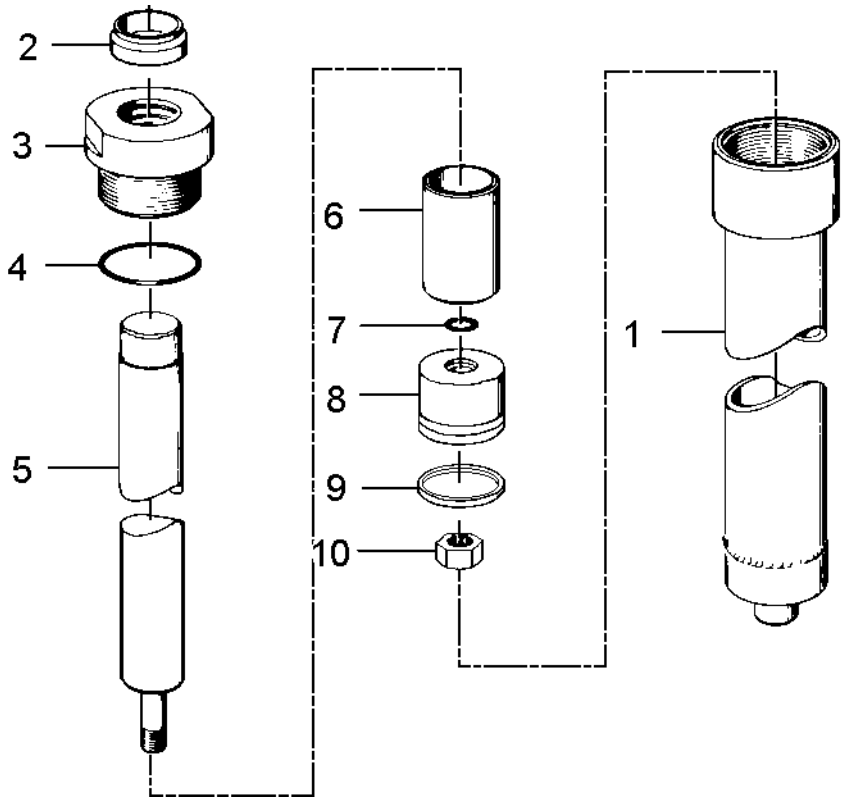


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Figure 9-8 Lift Cylinder (Non-Telescopic and Telescopic)

9-7.2. Full Free Lift.

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 weldment (1, Figure 9-9) in vise and remove the snap ring retainer (3) and square head pipe plug (2).
2. Pull outward on the cylinder base (9) until wear ring (14) contacts the cylinder base. Continued pulling will bring the cylinder head (4) out of the tube.
3. Use a strap wrench to hold the cylinder rod (13) and unscrew cylinder base (9) from cylinder rod. Remove cylinder head (4) from cylinder rod.

CAUTION: As cylinder rod (13) is pulled out of cylinder tube, catch the two halves of wear ring (14) which will be freed and may fall and be damaged.

4. The cylinder rod (13) may now be pulled out of the tube. Support it carefully and catch the two halves of the wear ring (14) as they are free. Continue to pull on the cylinder rod until the piston (12) is out of the tube.
5. If piston is worn or damaged hold the cylinder rod (13) with a strap wrench and take off Flexloc lock nut (11). Pull piston free of the rod.
6. Examine bore of center cylinder tube of the cylinder assembly (1), and surfaces of the cylinder rod (13), piston (12), and wear ring halves (14). Replace all unsatisfactory parts and proceed with the following steps:
   a. Remove hydraulic cylinder wiper ring (7) and "U"-cup rod seal (8) from inside of cylinder head (4), and "O" ring (5) and back-up ring (6) from outside of cylinder head.
   b. Clean and dry all parts.
   c. Discard all used "O" rings and seals and replace them with new ones during reassembly.
   d. Coat all new "O" rings and seals with hydraulic fluid during reassembly.
7. Assemble FFL center cylinder by reversing the disassembly procedure. For ease of assembly when assembling threaded parts, apply a coating of white lead replacement to the threads--except for the threads of the cylinder base (9) which are to be coated with Loctite 222 adhesive (24).
8. If either or both of the outer cylinders of FFL cylinder assembly must be repaired, proceed as follows:

CAUTION: As cylinder rod of either outer cylinder is pulled out of cylinder tube, the two halves of wear ring (22) may fall free and be damaged hitting the floor. Be sure to catch these pieces.

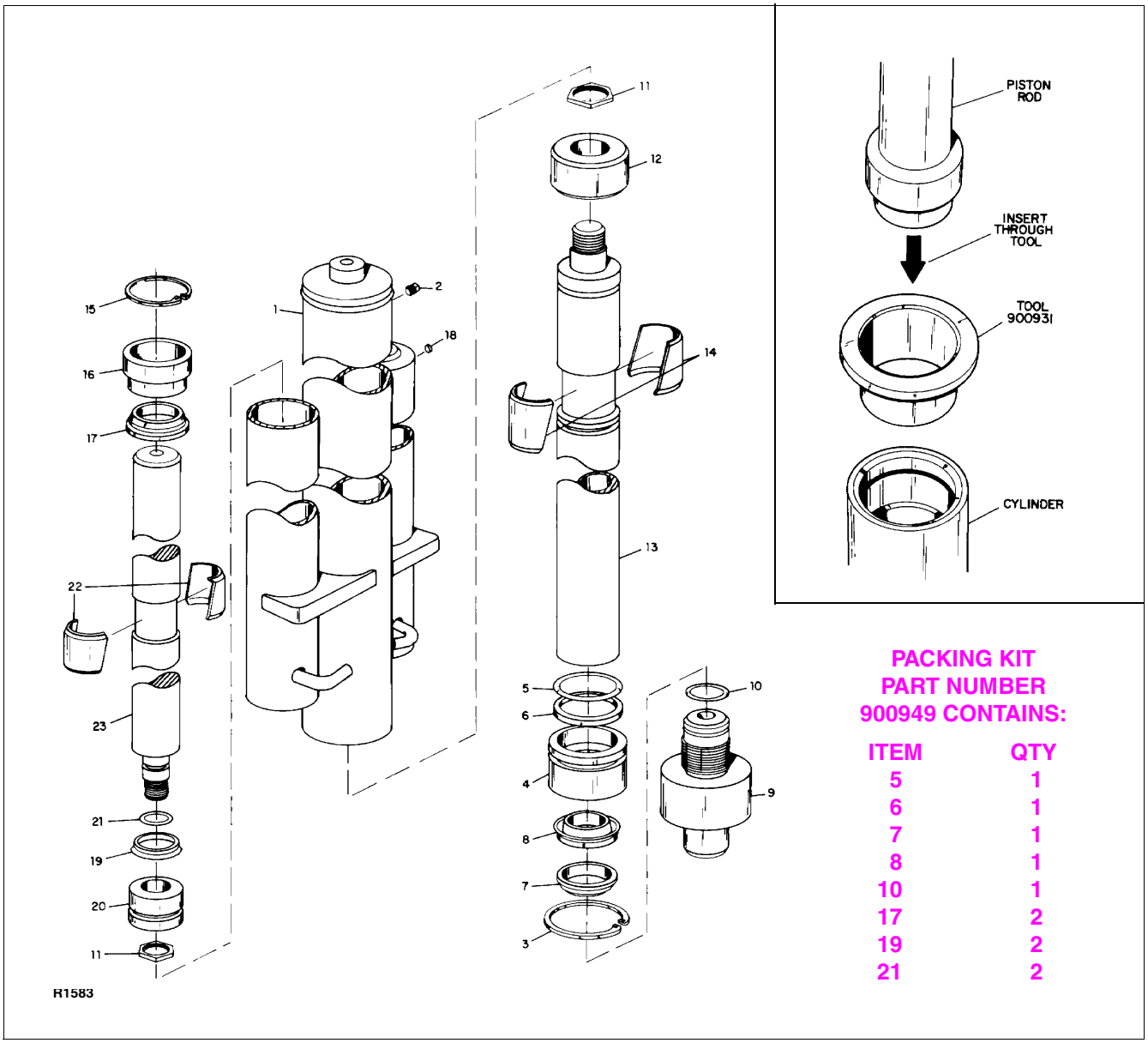
   a. Remove snap ring retainer (15).
   b. Pull outward on the cylinder rod (23) until wear ring (22) pushes cylinder head (16) out of cylinder tube.
   c. A little more pulling will release the halves of the wear ring.
   d. Catch these pieces for reuse if in good conditions.
   e. Carefully support cylinder rod (23) and pull it outward to free it and piston (20) from the tube. If the piston is worn or damaged, or to replace "O" ring (21), hold the rod with a strap wrench and remove Flexloc lock nut (11) and pull piston free of rod.
   f. Examine bore of cylinder tube being repaired, surface of cylinder rod (23) and wear ring halves (22) for scoring, scratching, or other damage.
   g. Replace all unsatisfactory parts and proceed with the following steps:
      (1) Remove and discard "O" ring (21) and "U" cup seal (19).
      (2) Clean all parts and replace all "O" rings and seals during reassembly.

CAUTION: Reassembly of the lift cylinder requires the use of special tool, part number 900931, to prevent damage to cylinder packing.

      (3) Insert special tool part number 900931, into the end of the cylinder, as shown in Figure 9-9 (inset).

(4) Coat rings and seals with hydraulic fluid during replacement.

(5) Assembly FFL outer cylinder(s) by reversing the disassembly procedure. For ease of assembly, when assembling threaded parts, apply a coating of white lead replacement to the threads.



PACKING KIT PART NUMBER 900949 CONTAINS:

ITEM	QTY
5	1
6	1
7	1
8	1
10	1
17	2
19	2
21	2

Figure 9-9 Lift Cylinder (Full Free LIft)

NOTES

SECTION 10
ELECTRICAL COMPONENTS

10-1. ELECTRICAL CONTROL PANEL

10-1.1. 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 assure proper performance settings intended for that particular truck. See Figure 12-28 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.

10-1.2. Cleaning

1. Disconnect battery connector (6, Figure 10-2).
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.

10-1.3. 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.

10-1.4. 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 keyswitch 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.

10-1.5. Panel Removal

1. Disconnect battery connector (6, Figure 10-2).
2. Remove the motor compartment cover.
3. Tag and disconnect all electrical wires and cables from the transistor control electrical contactor panel (3, Figure 10-1).
4. Remove four screws (1) and four lock washers (2) and remove the electrical panel (3).

10-1.6. Panel Disassembly and Reassembly

1. Refer to Figure 12-28 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, Figure 12-28), 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.

10-1.7. Panel Installation

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

10-2. PUMP MOTOR.

Refer to applicable Figure 12-27 for motor disassembly. The pump is replaceable but not repairable. When replacing pump be sure to install the gasket between pump and motor.

10-3. DRIVE MOTOR.

Refer to Figure 12-7 for motor disassembly.

10-4. BATTERY CHARGER.

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

Refer to Figure 12-29 for removal of the battery charger. Refer to Figure 12-30 for disassembly and part number information.

10-5. HIGH SPEED LIMIT SWITCH.

1. Disconnect wiring from high speed limit switch (18, Figure 10-1), then remove hardware securing switch mounting bracket (14) 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. Secure the new switch (18) to bracket (14).
4. Reconnect wiring to switch.

10-6. HORN.

1. Disconnect wiring and suppressor (6, Figure 10-1) from horn (4), then remove nut (10), lockwasher (9) and washer (8) securing horn.
2. Remove horn.
3. Position new horn in place, reinstall nut, lockwasher and flat washer, then reconnect wiring and suppressor (6).

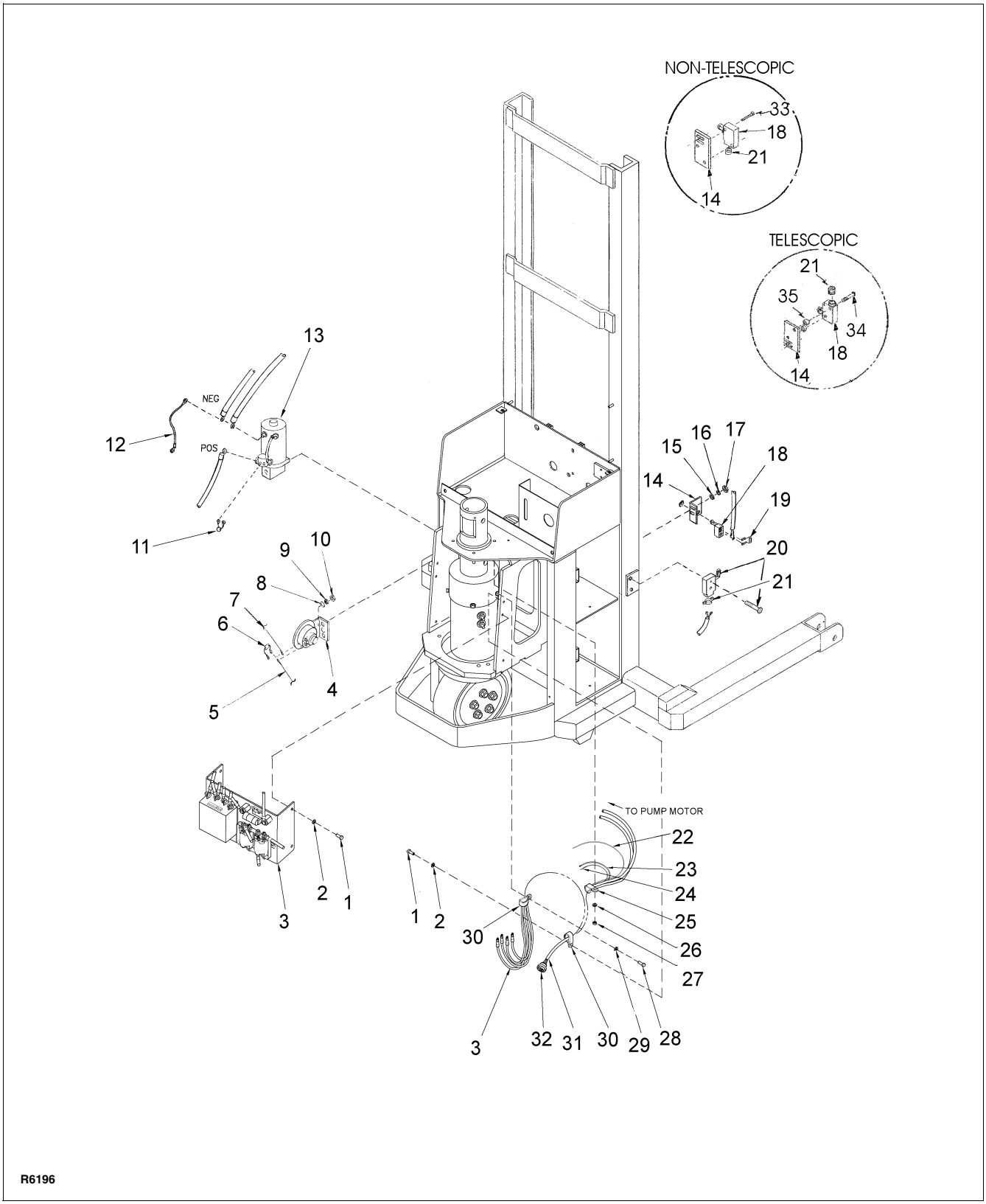


Figure 10-1 Electrical Components

10-7.BATTERIES.

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

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

1. Disconnect battery connector (6, Figure 10-2).

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

2. Remove screw (13), washer (3) and retainer bar (14).
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 battery connector (6, Figure 10-2) from battery terminals.
5. Disconnect cable (12) from battery terminals.
6. Connect battery connector (6) on battery terminals.
7. Connect cable (12) on terminals of new battery, and slide battery back into compartment, being careful not to damage cables.
8. Reinstall and position retainer bar (14) to prevent battery movement in excess of 1/2".

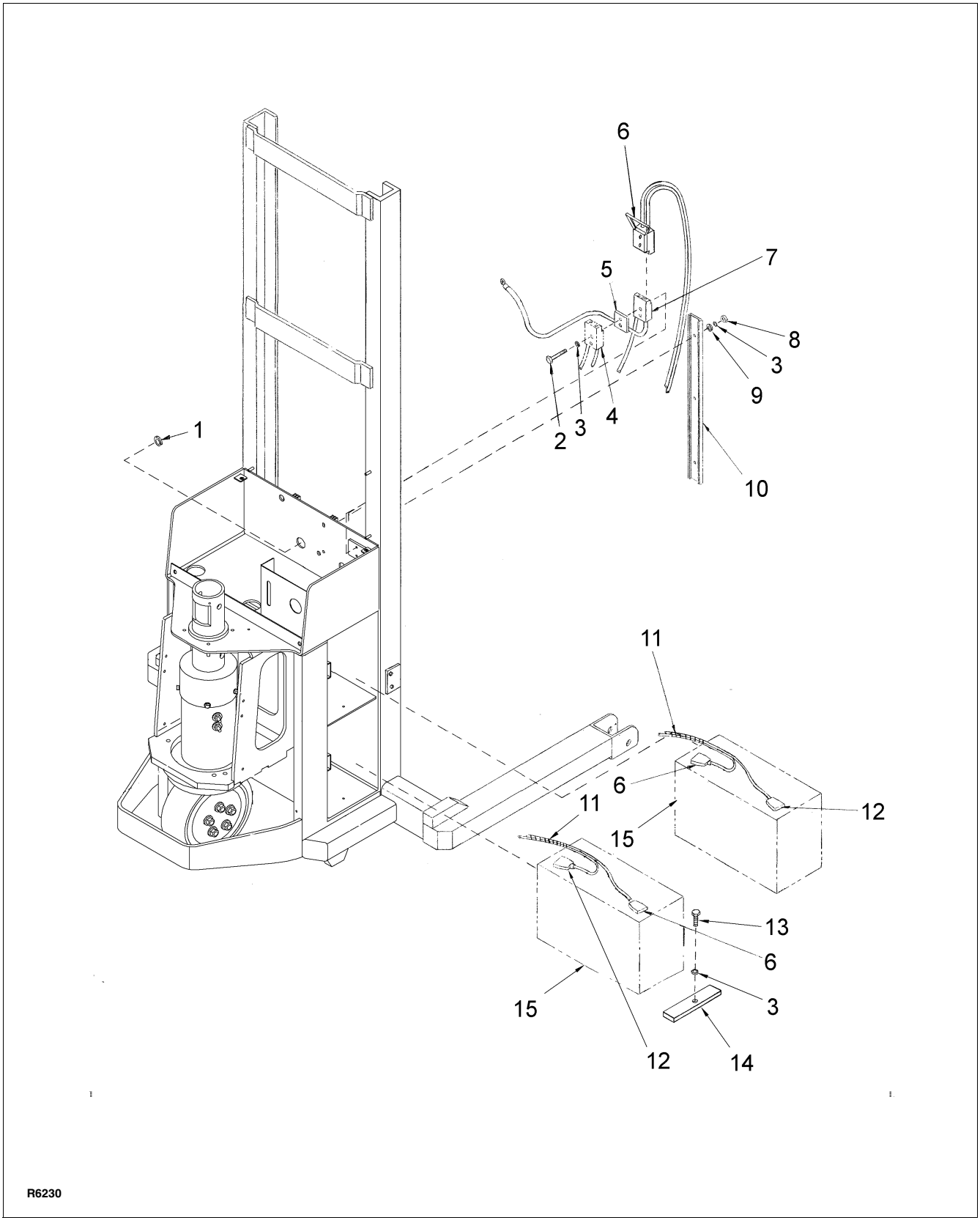


Figure 10-2 Batteries and Emergency Power Disconnect

NOTES

SECTION 11
OPTIONAL EQUIPMENT

11-1. KEYSWITCH

Those trucks which have a keyswitch installed will have the wiring modified. The modification is shown in Figure 12-31, the wiring diagram Figure 4-3 and the electrical schematic Figure 4-4.

11-2. HOUR METER

The hour meter is attached to the motor circuits to indicate actual usage of the drive and lift function. Refer to Figure 12-32 for replacement parts and to the wiring diagram Figure 4-3 and the electrical schematic Figure 4-4 for wiring information.

11-3. BATTERY CAPACITY INDICATOR.

Refer to Figure 12-33 for the battery capacity indicator replacement parts. Figure 12-33 includes the indicator with and without the lift lockout feature.

11-4. REMOTE CONTROL.

Figure 12-34 identifies the part required for the optional lift and lower remote control. Included are wiring details for both the control head pushbutton switches and the umbilical connected control box.

11-5. REMOTE CONTROL INSTALLATION

Refer to wiring diagrams shown in Figure 12-34 for reference. Refer to subparagraph 11-5.1. for installation of pushbutton box remote control. Refer to subparagraph 11-5.2. for lift/lower controls in the control head.

Numbers in parenthesis are parts list item number for Figure 12-34.

11-5.1. PUSHBUTTON BOX REMOTE CONTROL

1. Add solenoid to pump.
2. Connect a piece of wire (1, Figure 12-34, Frame A) from lowering solenoid (2) to negative side of pump motor.
3. Connect wire 8 from pump motor solenoid to terminal 3 on connector (3).
4. Connect wire 9 from remaining terminal on lowering solenoid (2) to terminal 2 on remote connector (3).
5. Connect wire from remote connector (14) terminal 1 to deadman switch terminal 3.

11-5.2. CONTROL HEAD LIFT/LOWER

1. Add solenoid to pump.
2. Connect a piece of wire (1, Figure 12-34, Frame B) from lowering solenoid (2) to negative side of pump motor.
3. Connect wire 8 from pump motor solenoid to terminal 11 of connector on panel.
4. Connect wire 9 from lowering solenoid (2) to terminal 13 of connector on panel.
5. Connect a jumper between terminals 10 and 11 on back side connector on panel.
6. Connect a jumper between terminals 12 and 13 on back side of connector on panel.

NOTES

SECTION 12
ILLUSTRATED PARTS BREAKDOWN

Following is an illustrated parts breakdown of assemblies and parts associated with the PDI Lift Truck.

SEE FIGURE 12-2
FOR COLD CONDITIONING

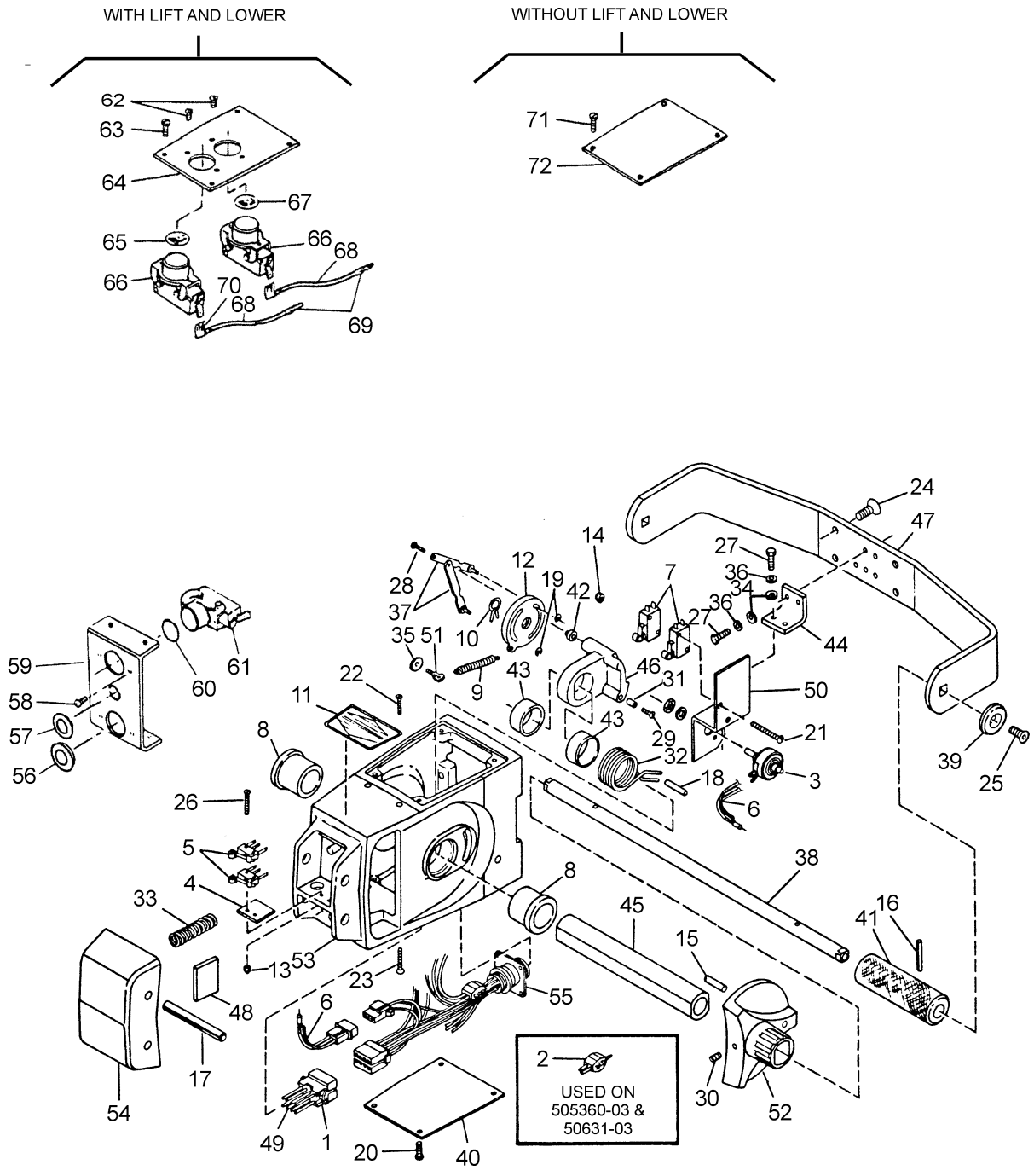


Figure 12-1 Control Head Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	505360-01	CONTROL HEAD (STANDARD)	1
—	505360-03	CONTROL HEAD (LIFT/LOWER)	1
—	506311-01	CONTROL HEAD W/COLD CONDITIONING) (STANDARD)	1
—	506311-03	CONTROL HEAD W/COLD CONDITIONING) (LIFT/LOWER)	1
1	005647	PIN HOUSING	1
2	005649	SPLICE, TAP, WIRE	1
3	017580	POTENTIOMETER	1
4	018202	SWITCH INSULATOR	1
5	020669	MICRO SWITCH	2
6	505323	POTENTIOMETER WIRE HARNES	1
7	020775	MICRO SWITCH	2
8	052956	FLANGED BEARING	2
9	053366	RETURN SPRING	1
10	056131	HOSE CLAMP	1
11	056617	FORWARD-REVERSE DECAL	1
12	057262	POTENTIOMETER DISK	1
13	059633	HEX LOCK NUT, 2-56	2
14	059634	HEX LOCK NUT, 4-40	2
16	060942	ROLL PIN, 1/8 X 1-1/4	2
17	061016	ROLL PIN, 1/4 X 3	2
18	061200-01	SPIROL PIN, 3/16 X 1	1
19	061750	“E” RETAINER RING	2
20	067416	PAN HD SCREW, 6-32 X 1/2	4
21	068180	ROUND HD SCREW, 4-40 X 1-1/2	2
22	069462	FLAT HD SLOTTED SCREW, 6-32 X 3/4	2
23	069463	FLAT HD SLOTTED SCREW, 6-32 X 1	2
24	069478	PHILIPS FLAT HD SCREW, 1/4-20 X 3/4	4
25	069715	SOCKET FLAT HD SCREW, 1/4-20 X 3/4	2
26	070486	PAN HD SCREW, BRASS	2
27	072400-01	SLOTTED HEX SCREW, 6-32 X 1/2	4
28	072415	PAN HD SCREW, THREAD CUTTING, 4-40 X 5/8	1
29	072415	PAN HD SCREW, THREAD CUTTING, 4-40 X 5/8	1
30	073461	SOCKET SET SCREW	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
31	074711	CONNECTING ROD SPACER	1
32	075088	RETURN SPRING	1
33	075510	COMPRESSION SPRING	2
34	077007	WASHER	4
35	077032	WASHER, 3/16 X 1/2 X 13GA	1
36	077204	SPLIT LOCK WASHER #6	4
37	400546	CONNECTING ROD ASSEMBLY	2
38	402827	SHAFT	1
39	402828	CAP	2
40	402830	COVER	1
41	404421	TUBE	2
42	402835	SPACER	1
43	402836	SPACER	2
44	402837	BRACKET	1
45	402839	TUBE	1
46	402840	CAM	1
47	402841	HANDLE GUARD	1
48	402843	PAD	2
49	504538-01	WIRE ASSEMBLY	5
50	505052	SWITCH BRACKET ASSEMBLY	1
51	066052	THUMB SCREW, 6-32	1
52	800272	CONTROL LEVER	2
53	800273	CONTROL HANDLE	1
54	800274	COVER	1
55	023197	WIRE HARNESS	1
56	053215-02	HOLE PLUG	1
57	053215-03	HOLE PLUG	1
58	067415	PAN HD SCREW, 6-32 X 1/4	2
59	402842	SWITCH PLATE	1
60	056619-01	HORN DECAL	1
61	020698	PUSHBUTTON SWITCH	1
62	067415	PAN HD SCREW, 6-32 X 1/4	4
63	067416	PAN HD SCREW, 6-32 X 1/2	4
64	402832	TOP COVER	1
65	056619-03	LIFT DECAL	1
67	056619-04	LOWER DECAL	1
66	020697	PUSHBUTTON SWITCH	2
68	023014	WIRE	A/R
69	005643	PIN CONTACT	2
70	021208	TERMINAL	6
71	067416	PAN HD SCREW, 6-32 X 1/2	4
72	402830	TOP COVER	1

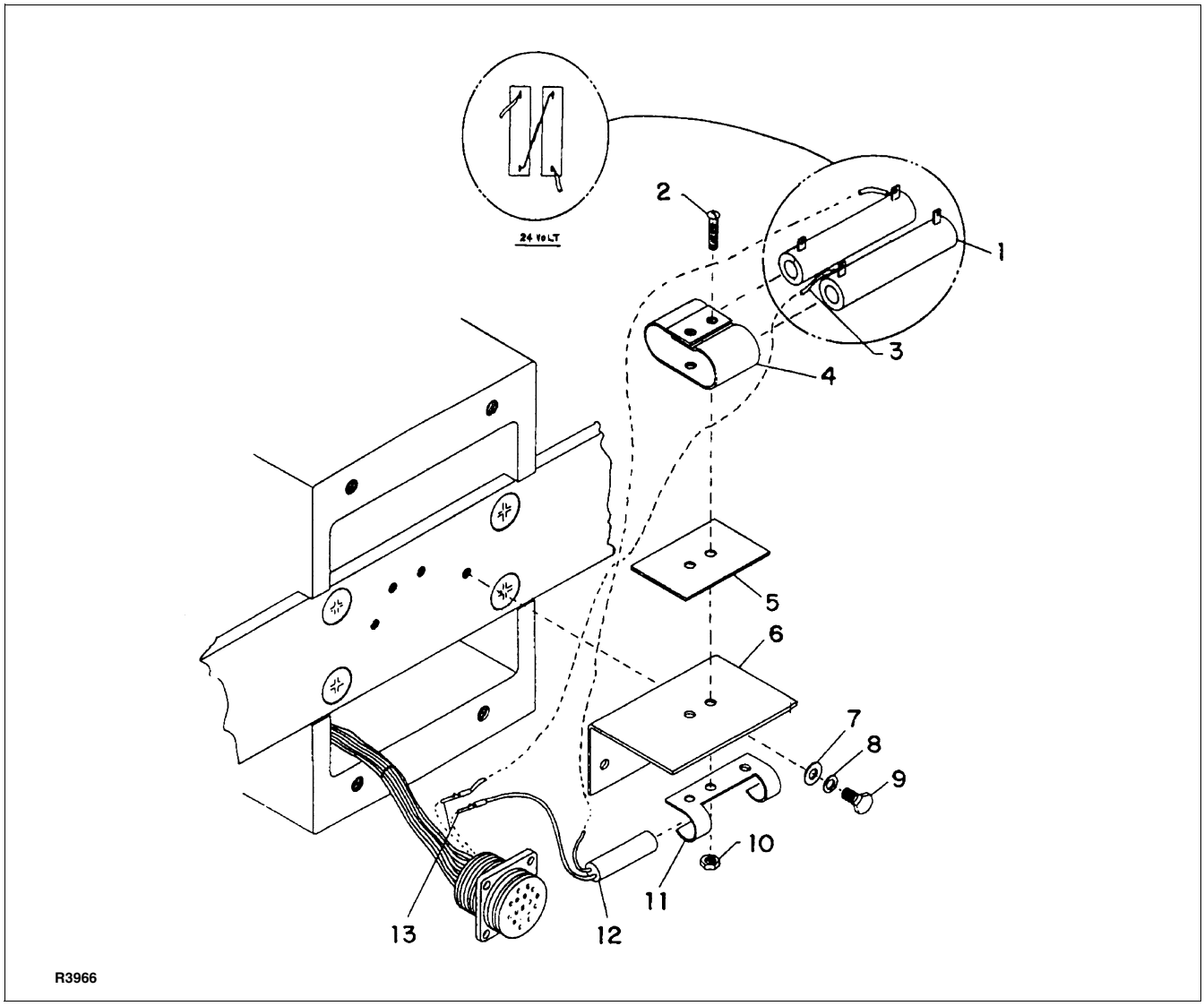


Figure 12-2 Cold Conditioning, Control Head

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	018909	RESISTORS	2
2	068187	SCREW	2
3	023014	WIRE	A/R
4	400544	BRACKET, RESISTOR	1
5	018214	INSULATOR, SWITCH	1
6	402829	BRACKET	1
7	077007	WASHER, FLAT	2
8	077204	LOCKWASHER	2
9	072400-01	SCREW	2
10	059632	NUT, HEX, 5-40	2
11	400044	BRACKET THERMAL CUTOUT	1
12	020736	THERMAL CUTOUT SWITCH	1
13	005643	CONTACT PIN	2

A/R - AS REQUIRED

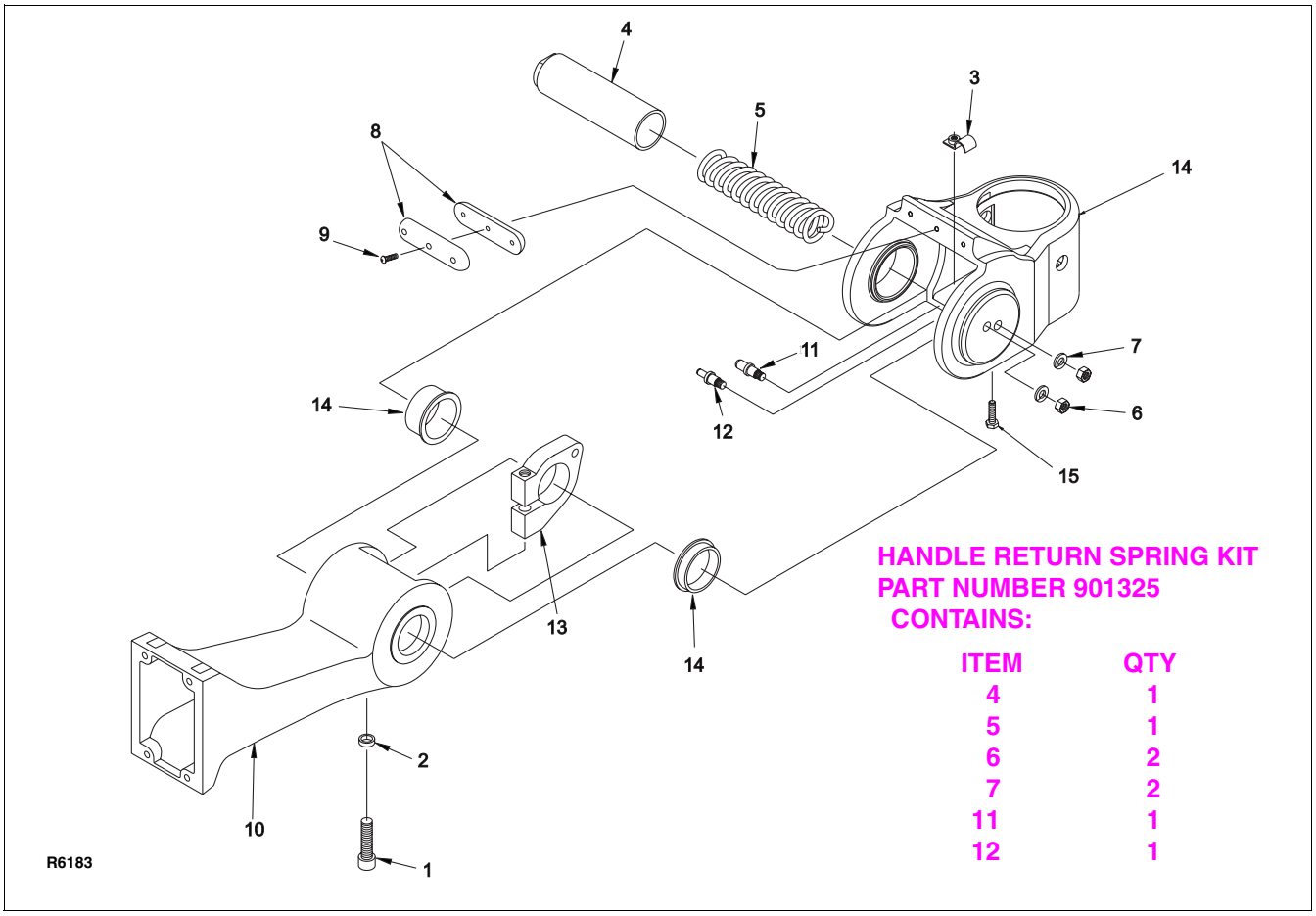


Figure 12-3 Steering Arm

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

INDEX NO.	PART NO.	PART NAME	NO. REQD.
8	052876	. BUMPER	2
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	063478	. SCREW, HEX CAP, 1/4-20 X 3/4	1

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

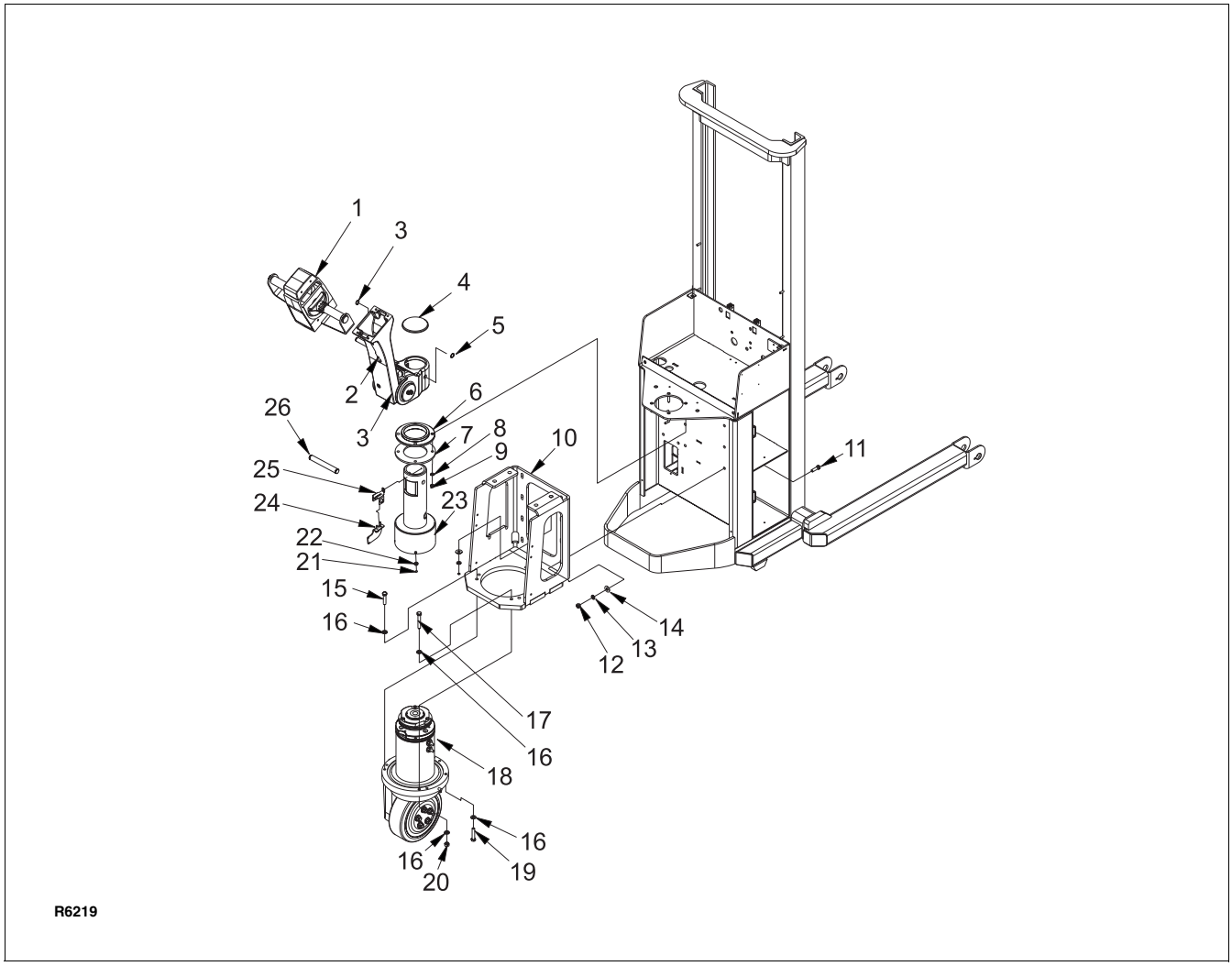


Figure 12-4 Pivot Tube Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	—	CONTROL HEAD (FIGURE 12-1)	REF
2	065481	SCREW, SOC HD, 1/4-20 X 1	3
3	—	CONTROL ARM (FIGURE 12-3)	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	4
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	12
13	077211	WASHER, LOCK, 3/8	12
14	077056	WASHER, FLAT, 3/8	12

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 12-6)	REF
19	067443-01	SCREW, HHC, METRIC, M10 X 50	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 12-5)	REF
25	—	BRACKET, MTG, SWITCH (FIGURE 12-5)	REF
26	402452	PIN	1

NOTES

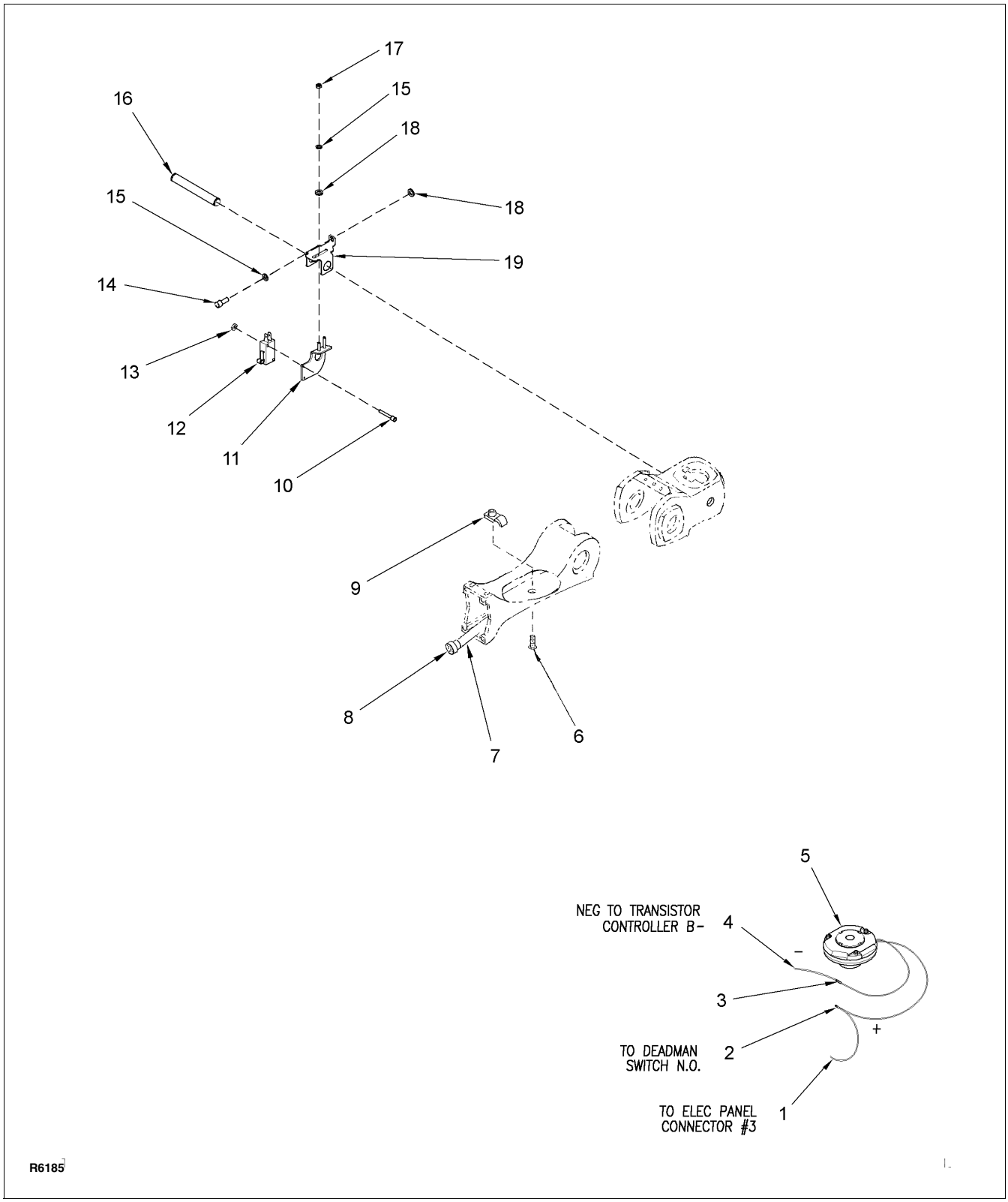


Figure 12-5 Brake and Actuator

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	023238-29	WIRE ASSY (FIGURE 12-26)	REF
2	021249	TERMINAL, SLIP ON, 3/16	1
3	005433	SPLICE, BUTT, CRIMP	1
4	023238-30	WIRE ASSY (FIGURE 12-26)	REF
5	—	BRAKE (FIGURE 12-6)	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
11	506199	BRACKET ASSY, SWITCH MOUNTING	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
12	020775	SWITCH, DEADMAN (WITHOUT COLD CONDITIONING)	1
12	020799	SWITCH, DEADMAN (WITH COLD CONDITIONING)	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 12-4)	REF
17	059416	NUT, HEX, 10-32	1
18	077030	WASHER, FLAT, #10	2
19	404329	BRACKET, SWITCH MOUNTING	2

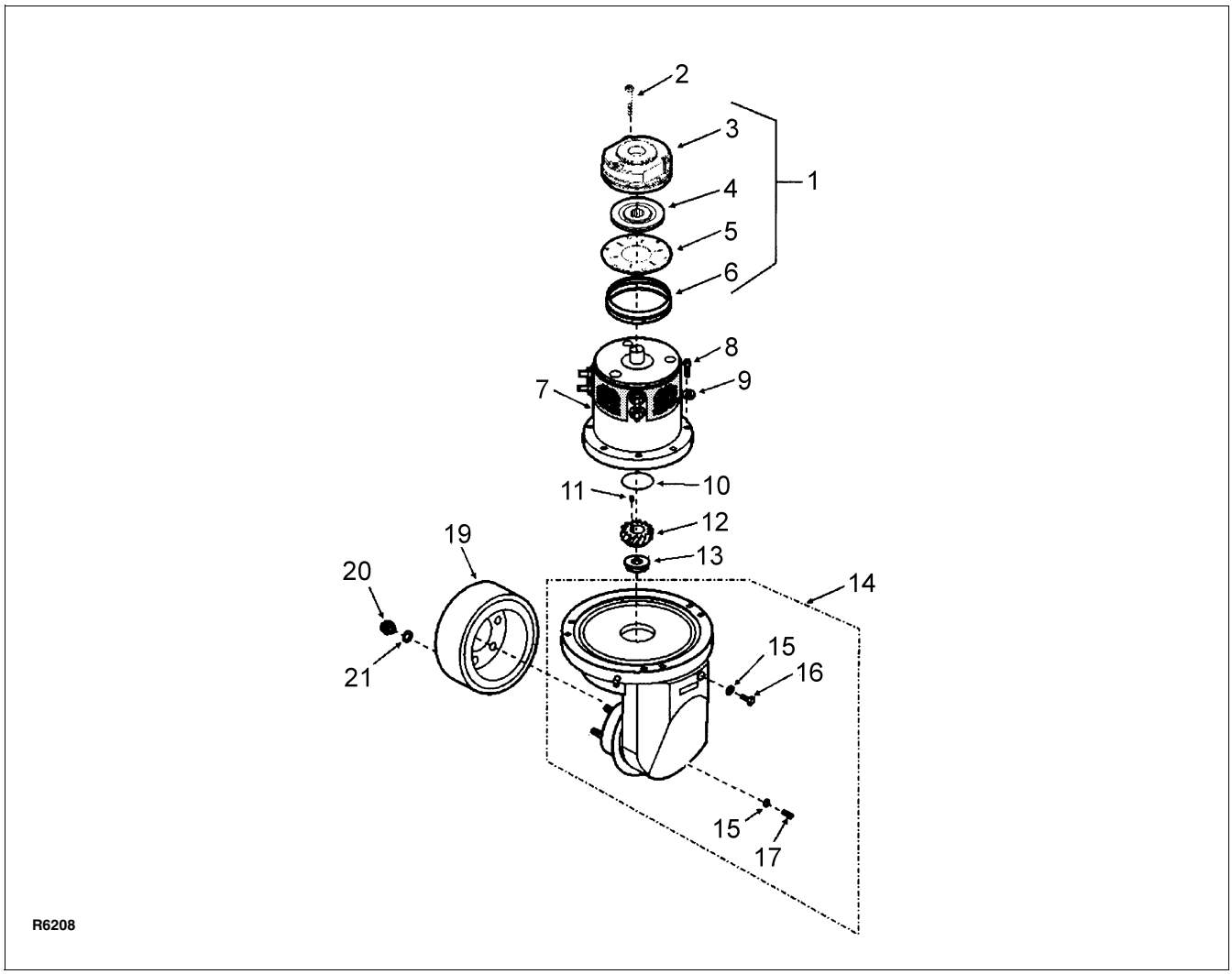


Figure 12-6 Transmission, Motor and Brake Assy

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 12-7)	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

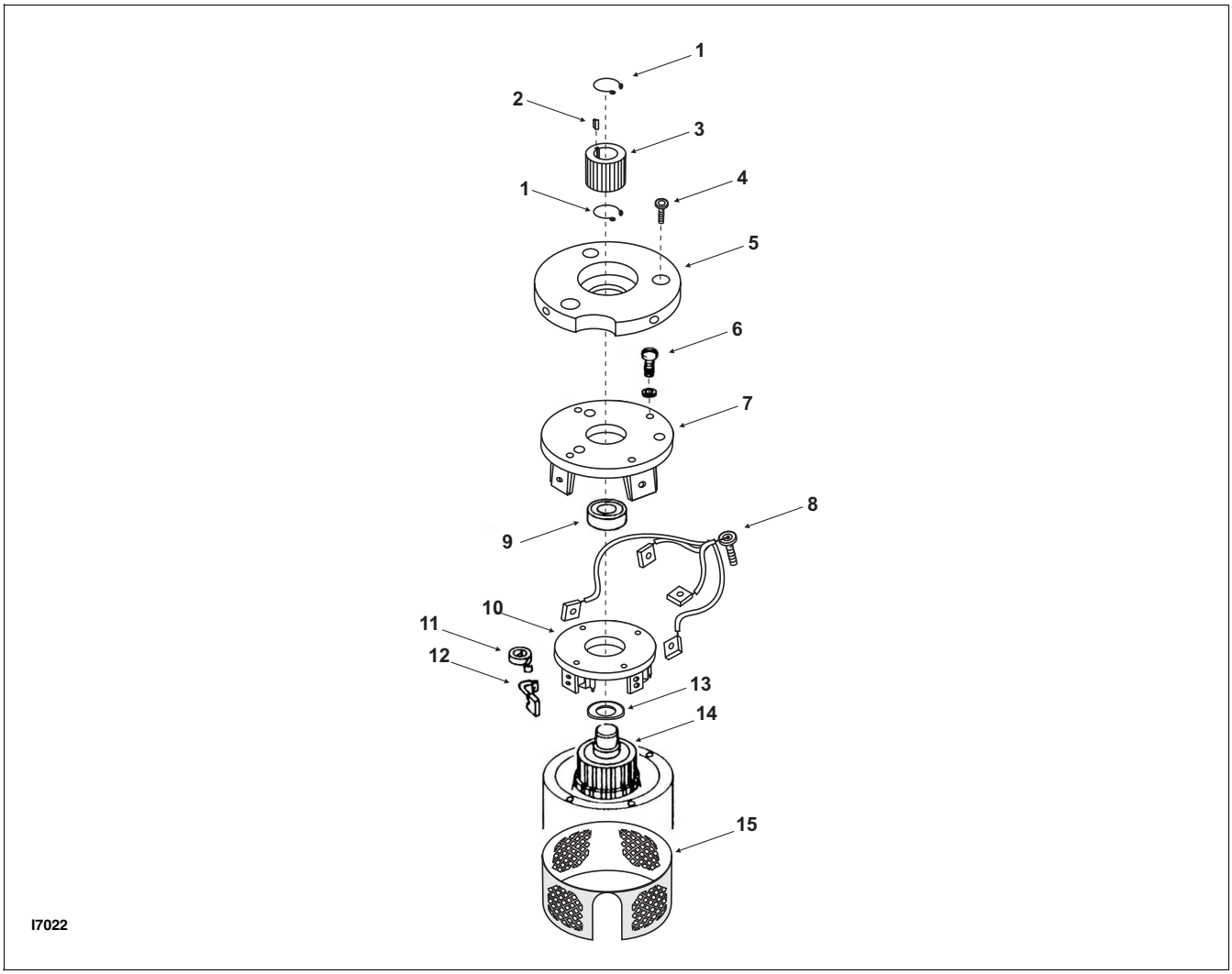


Figure 12-7 Drive Motor

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 ASEMBLY	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

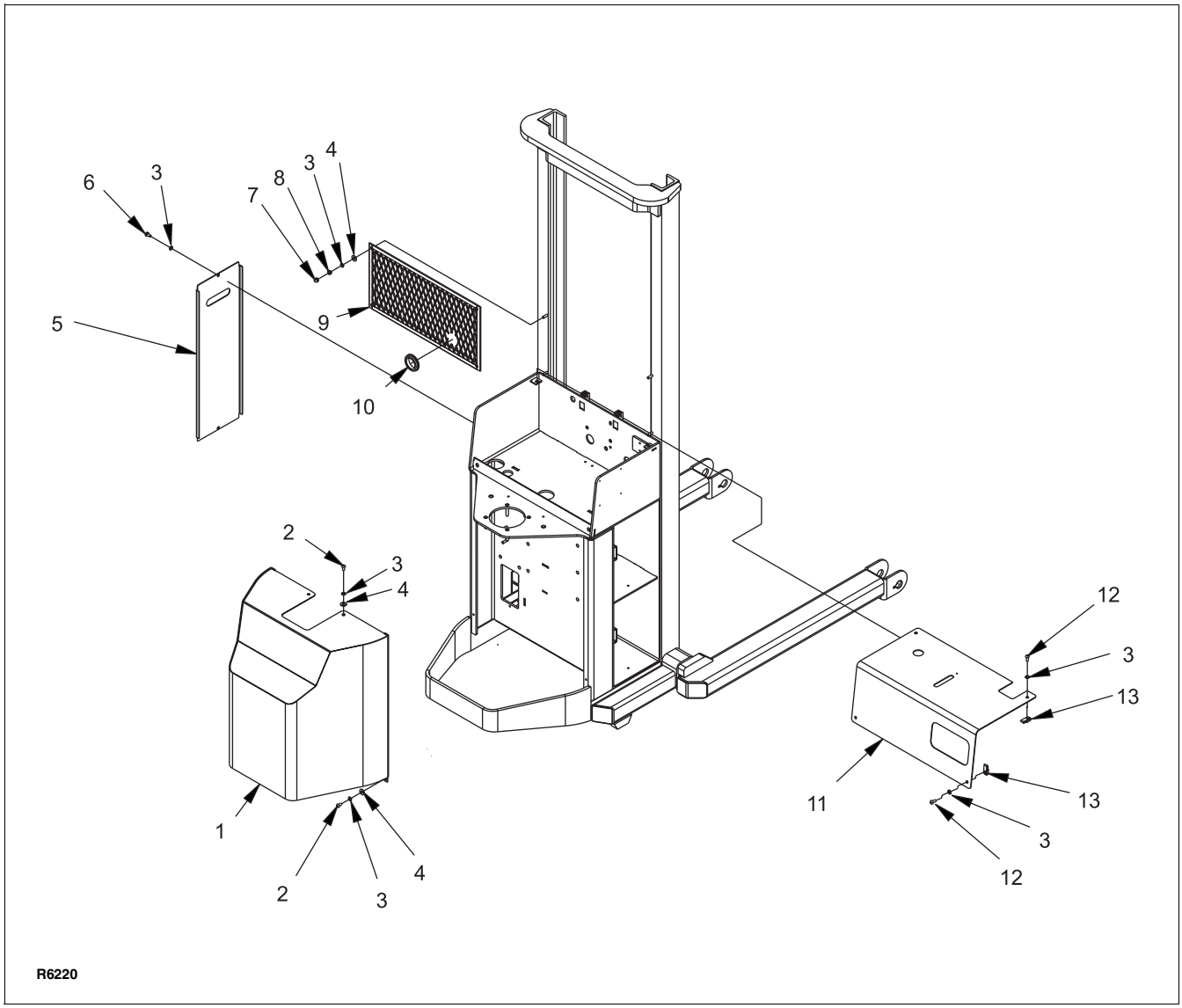


Figure 12-8 Base and Frame

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	14
4	077031	WASHER, FLAT NO. 1/4	8
5	404320	COVER, PUMP	1
6	065476	SCREW, HEX HD, 1/4-20 X 1/2	3
7	059423	NUT, HEX, ACORN CAP, 1/4-20	4
8	059421	NUT, HEX, 1/4-20	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	504579	SCREEN	1
10	057511	GROMMET, 1-1/2” ID X 1-34” HOLE	1
11	404462	COVER, TOP	1
12	070477	SCREW, RD HD PHILLIPS, 1/4-20 X 1/2	9
13	059925-01	NUT, U-CLIP	4

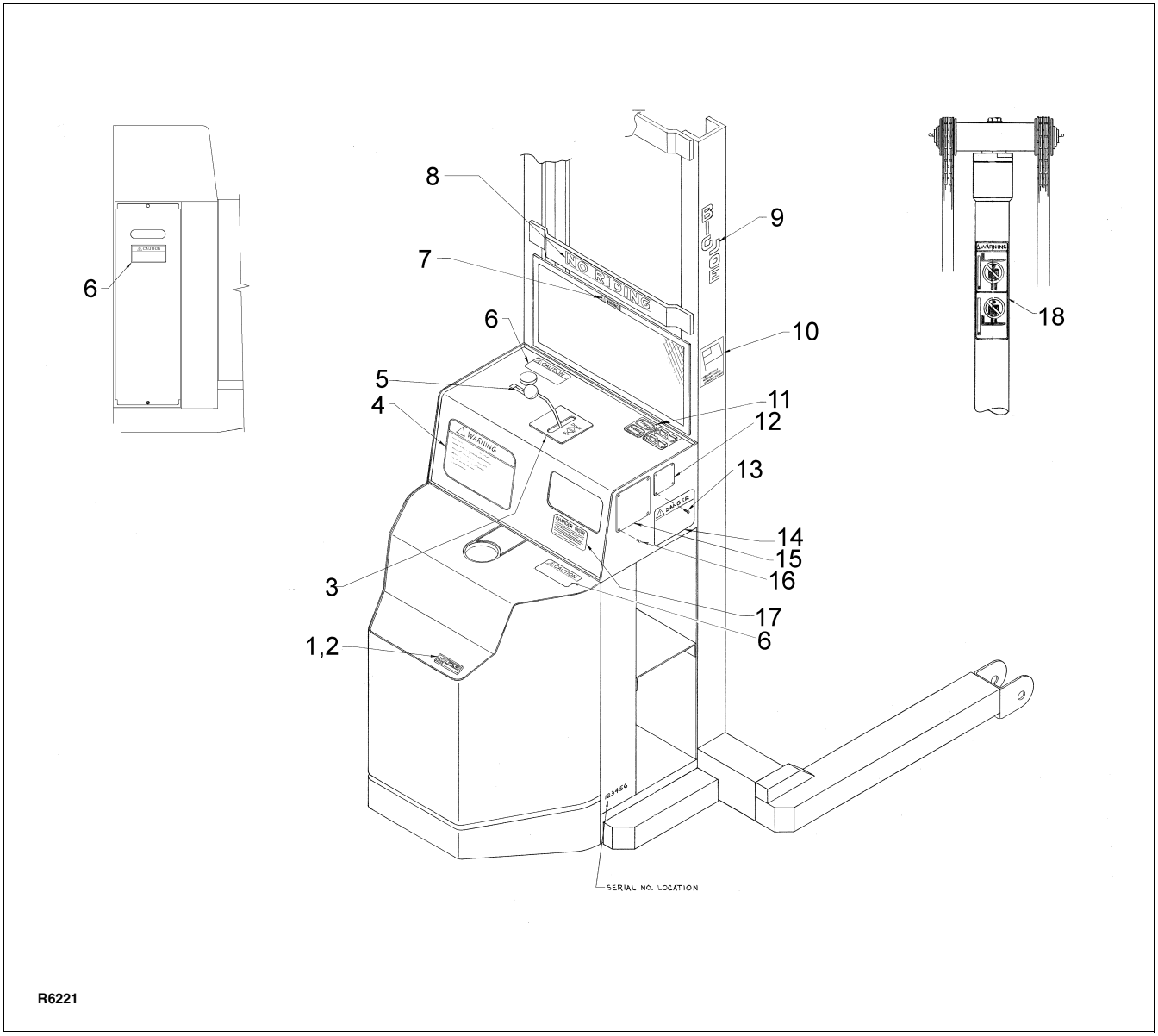


Figure 12-9 Decal Location

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	056595	CASTING LOGO	1
2	056596-08	INSERT PDI	1
3	056478	EPD DECAL	1
4	056590	WARNING DECAL	1
5	056626	OIL LEVEL	1
6	056654	CAUTION DECAL	3
7	056494	CAUTION DECAL	1
8	056499	NO RIDING DECAL	1
9	056632	SMALL MAST DECAL	2
10	056683	AMERICAN DECAL	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
11	056644	TRUCK-CHARGE DECAL	1
12	061299	TYPE “E” NAMEPLATE	1
13	066050	SCREW, DRIVE, RD HD, #2 U X 1/4 (TYPE “E”)	4
14	056646	INSTR-CHARGER	1
15	061334	NAMEPLATE (STANDARD)	1
15	061335	NAMEPLATE (WITH ATTACH)	1
16	066050	SCREW, DRIVE, RD HD, #2 U X 1/4	4
17	056659	CHARGER INSTRUCTIONS	1
19	056625	WARNING DECAL	1

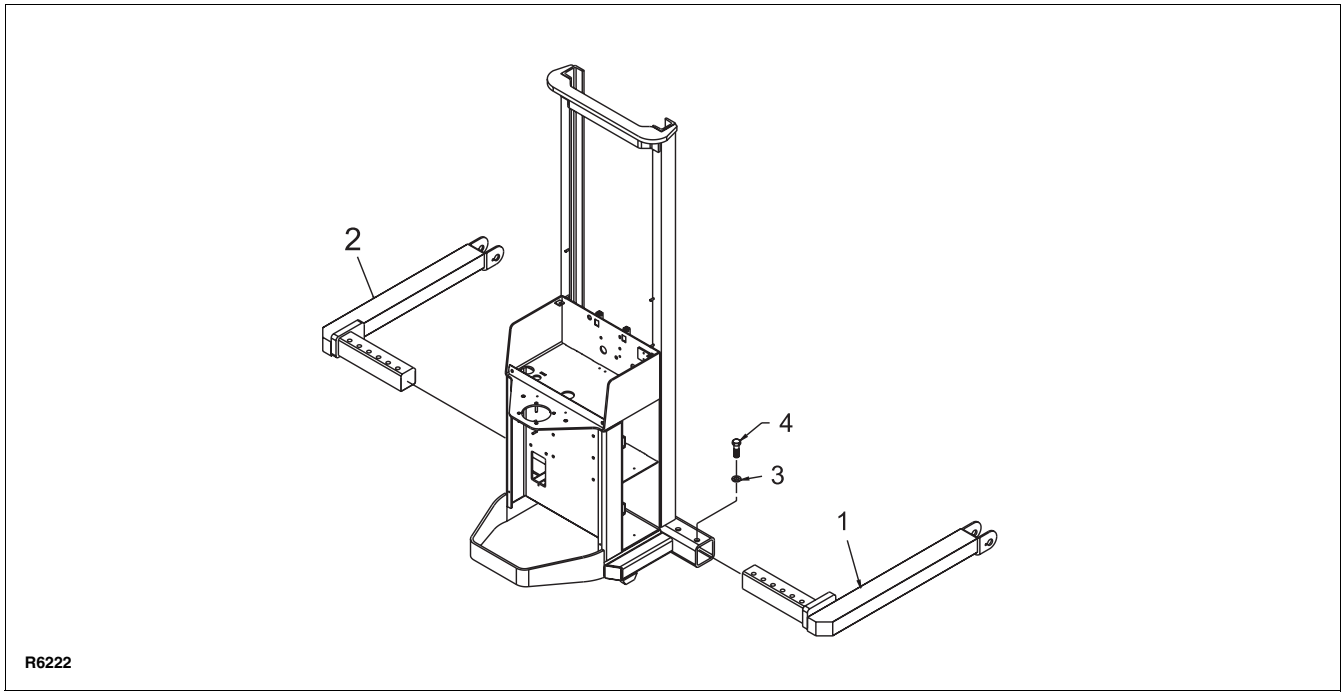


Figure 12-10 Adjustable Straddle Frame

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	506204-01	RIGHT HAND STRADDLE (PDI 24 W/4" WHEEL)	1
1	506204-02	RIGHT HAND STRADDLE (PDI 18 W/4" WHEEL)	1
1	506306-01	RIGHT HAND STRADDLE (PDI 24 W/6" WHEEL)	1
1	506306-02	RIGHT HAND STRADDLE (PDI 18 W/6" WHEEL)	1
1	506328-01	RIGHT HAND STRADDLE (PDI 24 W/4" WHEEL, FLUSH AXLE)	1
1	506328-02	RIGHT HAND STRADDLE (PDI 18 W/4" WHEEL, FLUSH AXLE)	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
2	506203-01	LEFT HAND STRADDLE (PDI 24 W/4" WHEEL)	1
2	506203-02	LEFT HAND STRADDLE (PDI 18 W/4" WHEEL)	1
2	506307-01	LEFT HAND STRADDLE (PDI 24 W/6" WHEEL)	1
2	506307-02	LEFT HAND STRADDLE (PDI 18 W/6" WHEEL)	1
2	506327-01	LEFT HAND STRADDLE (PDI 24 W/4" WHEEL, FLUSH AXLE)	1
2	506327-02	LEFT HAND STRADDLE (PDI 18W/4" WHEEL, FLUSH AXLE)	1
3	077217	WASHER	4
4	063870	HEX HEAD BOLTS	4

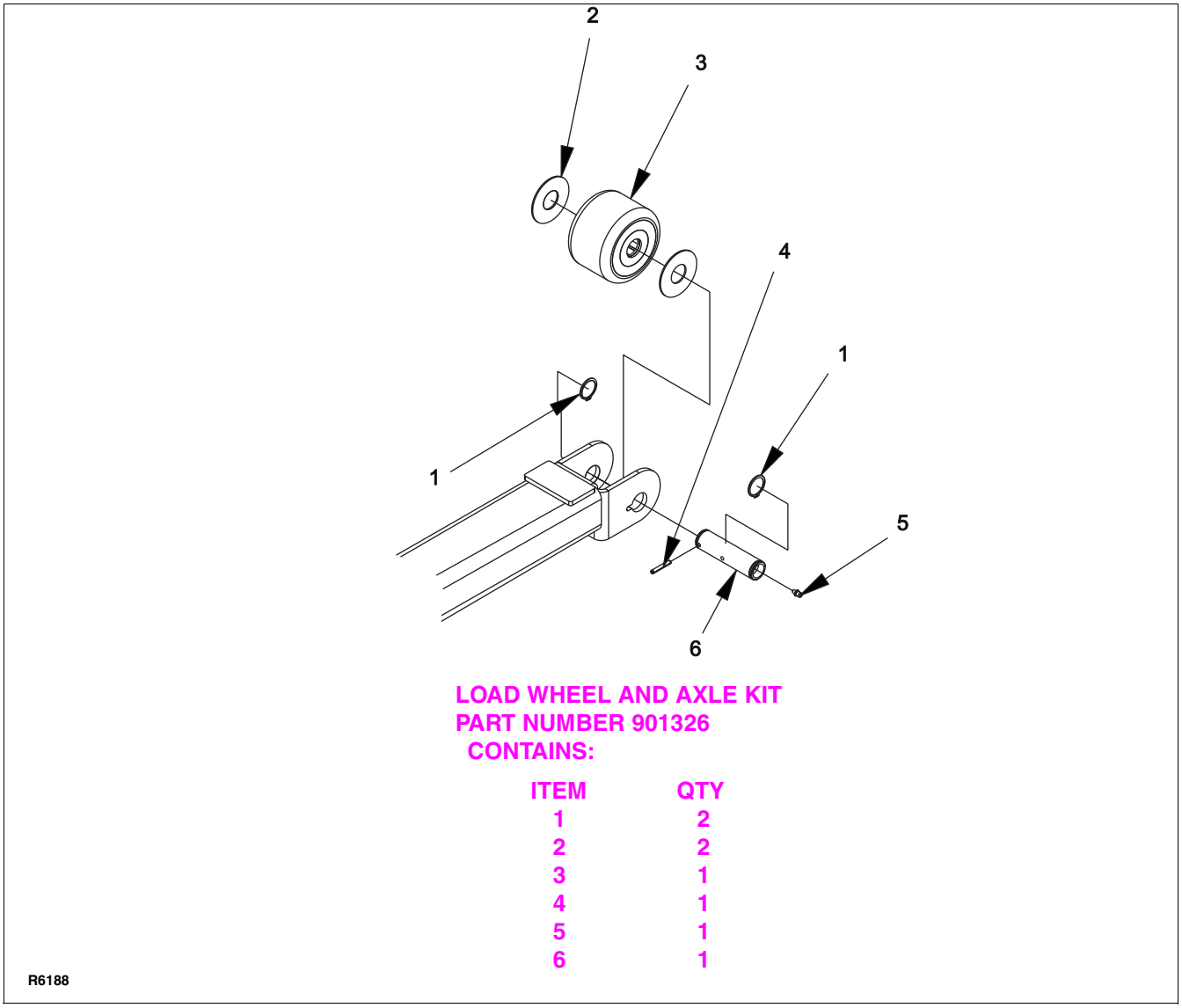
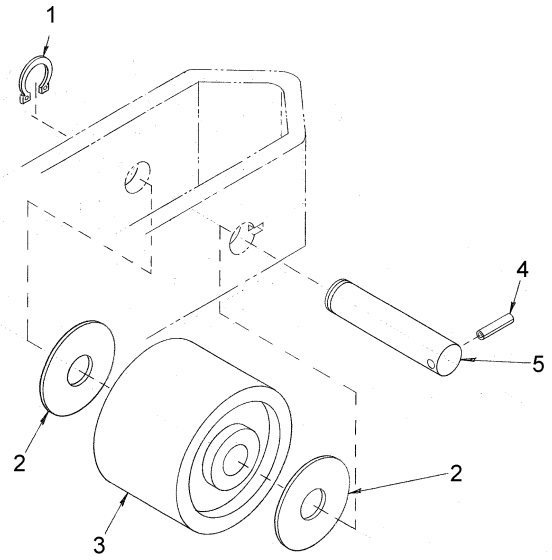


Figure 12-11 Load Wheels (Standard)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	—	WHEEL AND AXLE ASSY	2
1	061725*	. SNAP RING	2
2	077033*	. SPACER WASHER	2
3	078451	. LOAD WHEEL ASSY (4 IN. STEEL)	1
3	078409*	. LOAD WHEEL ASSY (4 IN. POLY)	1
3	078223	. LOAD WHEEL ASSY (3 IN. STEEL)	1
3	078256	. LOAD WHEEL ASSY (3 IN. POLY)	1
3	078651	. LOAD WHEEL ASSY (6 IN. STEEL)	1
3	078614	. LOAD WHEEL ASSY (6 IN. POLY)	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)**



R6229

Figure 12-12 Load Wheels (Flush Axle) (Adjustable Straddle Only)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	—	WHEEL AND AXLE ASSY	2
1	061725	. SNAP RING	1
2	077033	. SPACER WASHER	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
3	078414	. LOAD WHEEL ASSY (4 IN.)	1
4	060976	. PIN, ROLL	1
5	050703	. AXLE	1

NOTES

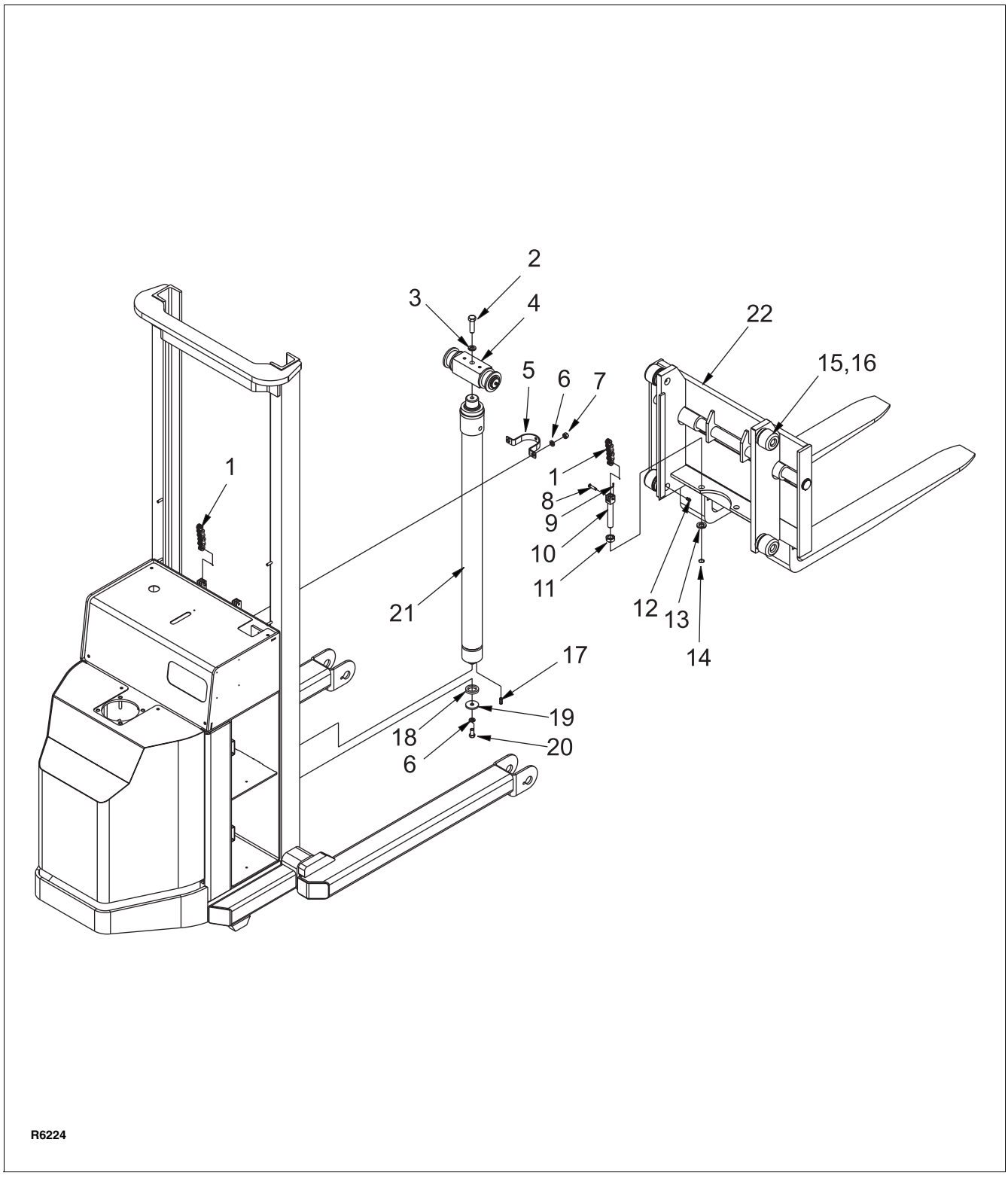


Figure 12-13 Elevation System (Non-Telescopic)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	402034	CHAIN (PDI R5 & A5) (7.75 FT TOTAL)	2
1	402034	CHAIN (PDI R6 & A6) (9.75 FT TOTAL)	2
1	402034	CHAIN (PDI A7) (11.75 FT TOTAL)	2
2	064711	SCREW, HEX HD, 1/2-13 X 1-3/4	1
3	077213	WASHER, LOCK, SPLIT, 1/2	1
4	505807	RAM HEAD ASSY	1
5	101071	CLAMP TUBING	1
6	077211	WASHER, LOCK, 3/8	3
7	059429	NUT, HEX, 3/8-16	2
8	402055	CHAIN PIN	4
9	060402	COTTER PIN	4
10	402051	ADJUSTING BOLT	2
11	059545	NUT, JAM, 5/8-18	2
12	025712	FITTING-GREASE, DRIVE, 3/16	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
13	077215	WASHER, LOCK	2
14	059445	NUT, HEX	2
15	901365	ROLLER ASSEMBLY	2
—	051102	. BEARING	2
—	062325	. ROLLER	2
16	053000	SHIM	A/R
16	053001	SHIM	A/R
16	053002	SHIM	A/R
16	053003	SHIM	A/R
17	061023	PIN-ROLL, 5/16 DIA X 3/4’ LG	1
18	404330	SPACER, JACK STAND	1
19	077076	WASHER, FLAT, 13/32 X 1-1/2 X 7 GA	1
20	063603	SCREW, HEX HD, 3/8-16 X 3/4	1
21	—	LIFT CYLINDER (FIGURE 12-19)	REF
22	—	CARRIAGE (FIGURE 12-16)	REF

A/R - AS REQUIRED

PDI R5 - RIGID FORKS 5 FOOT LIFT
PDI R6 - RIGID FORKS 6 FOOT LIFT
PDI A5 - ADJUSTABLE FORKS 5 FOOT LIFT
PDI A6 - ADJUSTABLE FORKS 6 FOOT LIFT
PDI A7 - ADJUSTABLE FORKS 7 FOOT LIFT

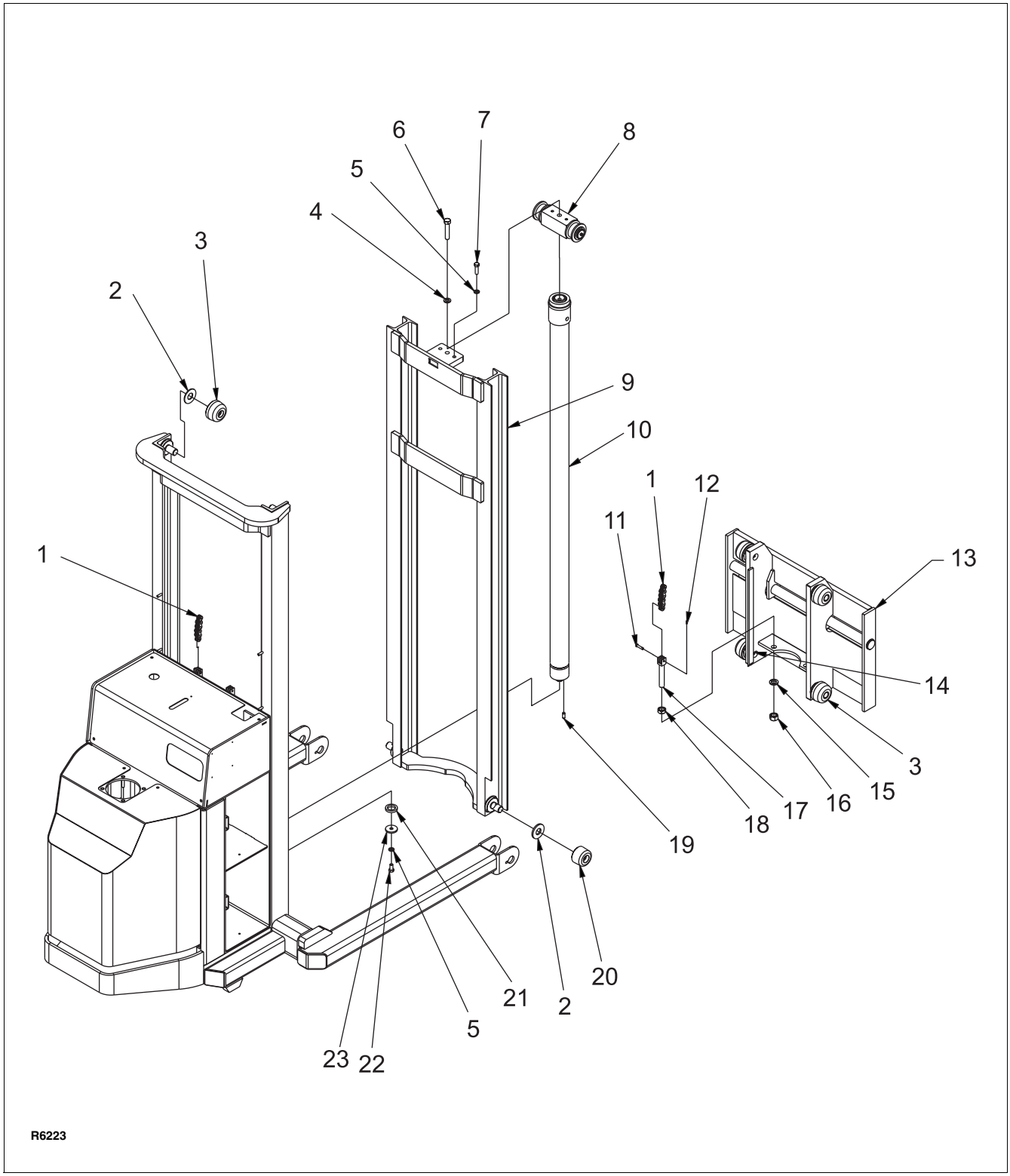


Figure 12-14 Elevation System (Telescopic)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	402034	CHAIN (PDI T8) (15.40 FT TOTAL)	2
1	402034	CHAIN (PDI T9) (17.40 FT TOTAL)	2
1	402034	CHAIN (PDI T10) (19.40 FT TOTAL)	2
1	402034	CHAIN (PDI T11) (21.40 FT TOTAL)	2
1	402034	CHAIN (PDI T12) (23.40 FT TOTAL)	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	6
—	062326	. ROLLER	2
—	051102	. BEARING	2
4	077213	WASHER, LOCK, SPLIT, 1/2	1
5	077211	WASHER, LOCK, 3/8	3
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	505807	RAM HEAD ASSY	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	506202-01	INNER MAST (PDI T8)	1
9	506202-02	INNER MAST (PDI T9)	1
9	506202-03	INNER MAST (PDI T10)	1
9	506202-04	INNER MAST (PDI T11)	1
9	506202-05	INNER MAST (PDI T12)	1
10	—	LIFT CYLINDER (FIGURE 12-19)	REF
11	402055	CHAIN PIN	4
12	060402	COTTER PIN	4
13	—	CARRIAGE (FIGURE 12-16)	REF
14	025712	FITTING-GREASE, DRIVE, 3/16	4
15	077215	WASHER, LOCK	2
16	059445	NUT, HEX	2
17	402051	ADJUSTING BOLT	2
18	059545	NUT, JAM, 5/8-18	2
19	061023	PIN-ROLL, 5/16 DIA X 3/4’ LG	1
20	901365	ROLLER ASSEMBLY	2
—	051102	. BEARING	2
—	062325	. ROLLER	2
21	404330	SPACER, JACK STAND	1
22	063603	SCREW, HEX HD, 3/8-16 X 3/4	1
23	077076	WASHER, FLAT, 13/32 X 1-1/2 X 7 GA	1

A/R - AS REQUIRED

PDI T8 - 8 FOOT LIFT
PDI T9 - 9 FOOT LIFT
PDI T10 - 10 FOOT LIFT
PDI T11 - 11 FOOT LIFT
PDI T12 - 12 FOOT LIFT

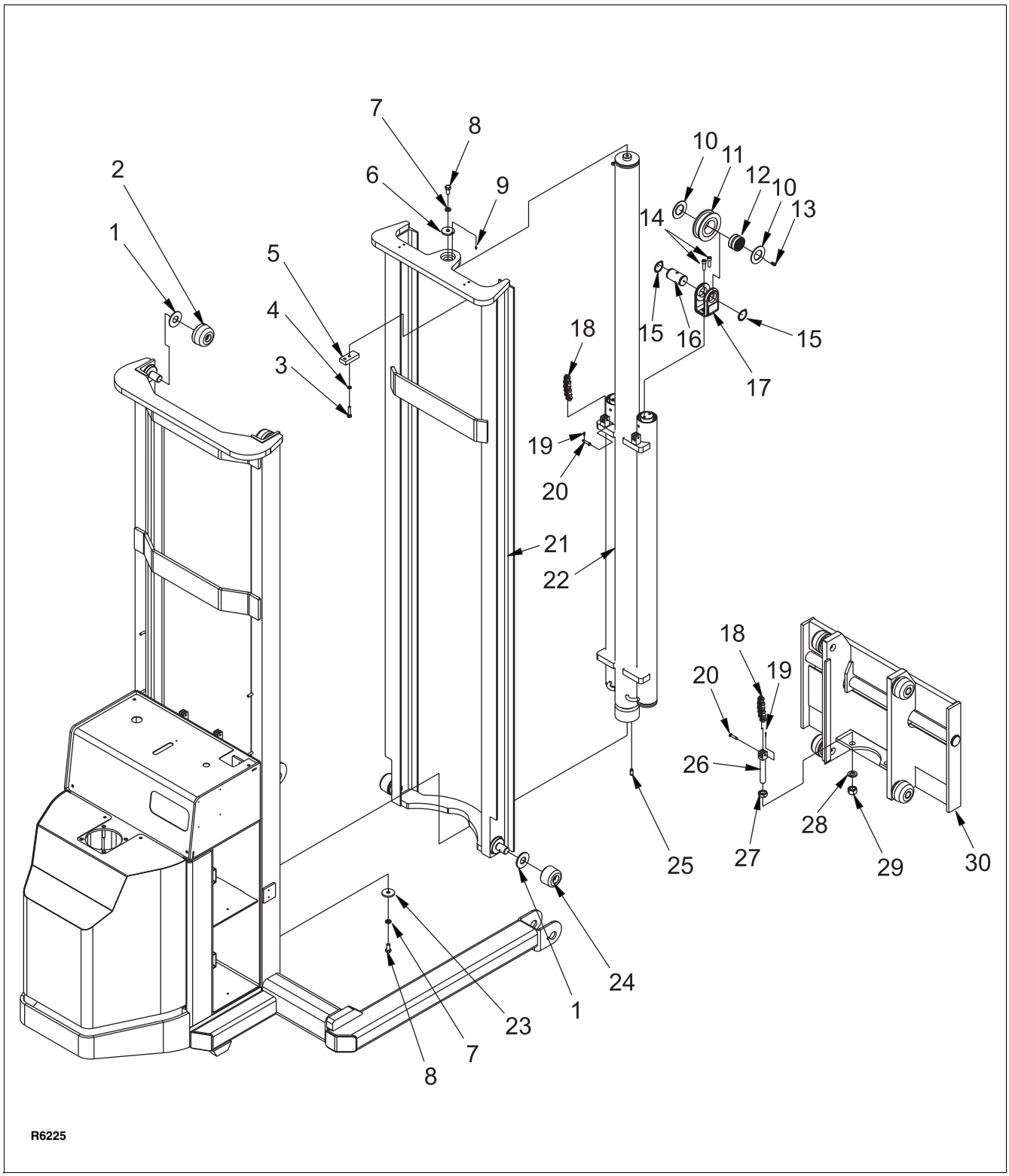


Figure 12-15 Elevation System (Full Free Lift)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	053000	SHIM	A/R
1	053001	SHIM	A/R
1	053002	SHIM	A/R
1	053003	SHIM	A/R
2	901366	ROLLER ASSEMBLY	6
—	062326	. ROLLER	1
—	051102	. BEARING	1
3	063482	SCREW, HEX HD, 1/4-20 X 1-1/4	4
4	077209	WASHER, LOCK, 1/4	4
5	403811	BLOCK-STOP	2
6	800297	WASHER	1
7	077211	WASHER, LOCK, 3/8	2
8	063603	SCREW, HEX HD, 3/8-16 X 3/4	2
9	073460	SCREW-SET, #10-24 X 1/4	1
10	053012	WASHER, THRUST	4
11	289205	SHEAVE-HEAVY DUTY	2
12	051145	BEARING	2
13	025712	FITTING-GREASE, DRIVE, 3/16	6
14	065555	SCREW, SHCS, 5/16-18 X 1	4
15	061729	RING-SNAP, EXT, 1-1/4	2
16	401639	PIN-SHEAVE	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
17	800246	YOKE-SHEAVE	2
18	402034	CHAIN (PDI FFL 106”) (7.5 FT TOTAL)	2
18	402034	CHAIN (PDI FFL 130”) (8.5 FT TOTAL)	2
19	060402	COTTER PIN	4
20	402055	CHAIN PIN	4
21	506212-01	INNER MAST (PDI FFL 106”)	1
21	506212-02	INNER MAST (PDI FFL 130”)	1
22	—	LIFT CYLINDER (FIGURE 12-21)	REF
23	077076	WASHER, FLAT, 13/32 X 1-1/2 X 7 GA	1
24	901365	ROLLER ASSEMBLY	2
—	051102	. BEARING	1
—	062325	. ROLLER	1
25	061023	PIN-ROLL, 5/16 DIA X 3/4’ LG	1
26	402051	ADJUSTING BOLT	2
27	059545	NUT, JAM, 5/8-18	2
28	077215	WASHER, LOCK	2
29	059445	NUT, HEX	2
30	—	CARRIAGE (FIGURE 12-16)	REF

A/R - AS REQUIRED

PDI FFL 106” LIFT
PDI FFL 130” LIFT

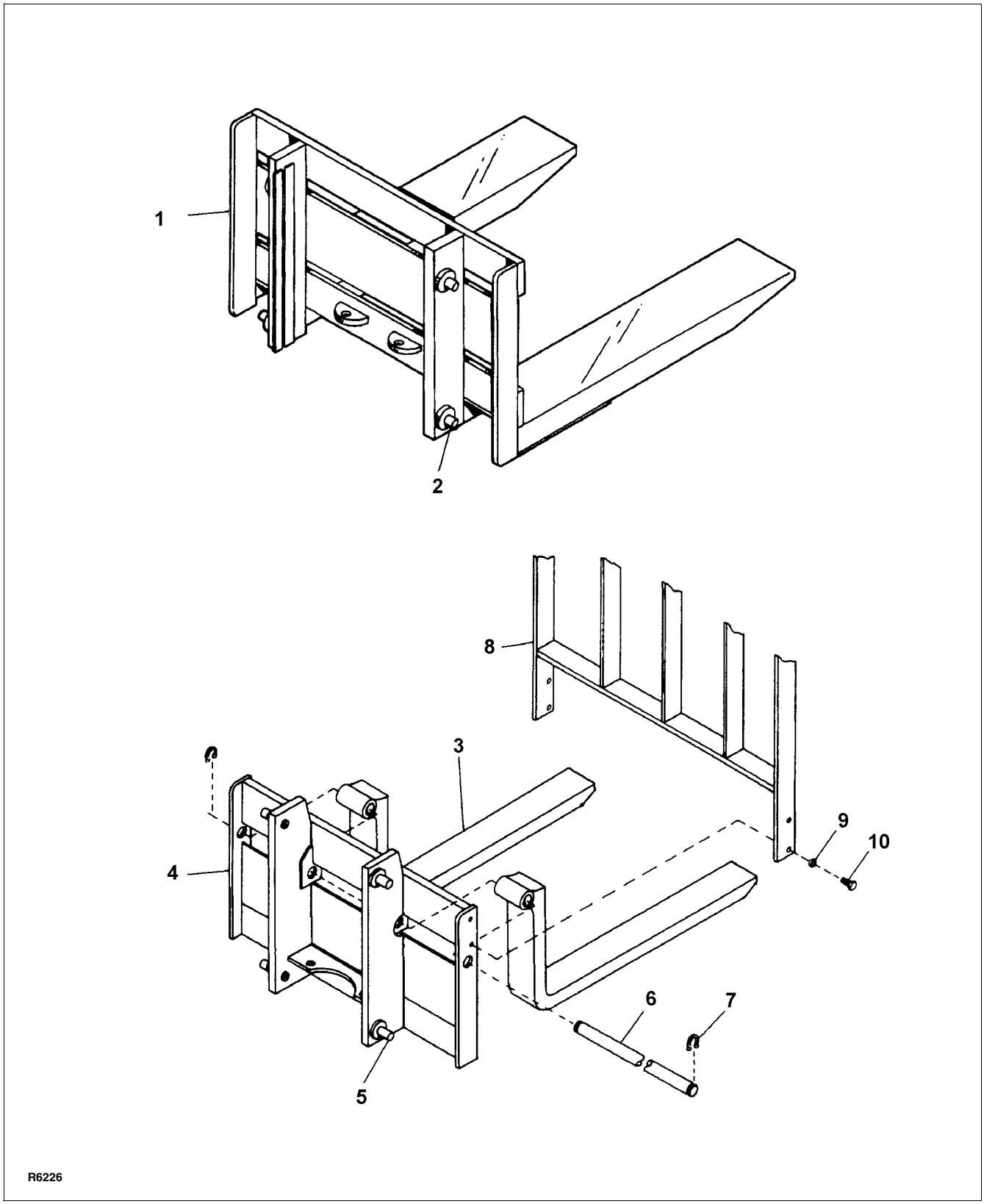


Figure 12-16 Lift Carriage

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	SEE CHART 1	LIFT CARRIAGE, RIGID FORK,	1
2	074805	. SPINDLE	4
3	SEE CHART 3	FORKS PDI-2018	2
3	SEE CHART 4	FORKS PDI-2024 ONLY	2
4	SEE CHART 2	LIFT CARRIAGE, ADJUSTABLE FORK	1
5	074805	. SPINDLE	4
6	296401	. SHAFT, 24 IN WIDE CARRIAGE 1 INCH RING	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
6	276605	. SHAFT, 24 IN WIDE CARRIAGE FOR 1-1/4 INCH RINGS	1
6	276611	. SHAFT, 36 IN WIDE CARRIAGE FOR 1-1/4 INCH RINGS	1
7	061725	. SNAP RING, 1 INCH (USED ON 296401)	2
7	061729	. SNAP RING, 1-1/4 (USED ON 276605 AND 276611)	2
8	504605-01	BACK REST 48" (OPTIONAL)	1
9	077213	WASHER, LOCK, SPLIT, 1/2	4
10	063705	SCREW, HEX CAP, 1/2-13 X 1	4

CHART 1 RIGID LIFT CARRIAGE (26" WIDE)

	PDI-2018					PDI-2024			
FORK LENGTH	26	30	36	42	48	30	36	42	48
PART NO.	504590-01	504590-02	504590-03	504590-04	504590-05	504628-01	504628-02	504628-03	504628-04

CHART 2 ADJUSTABLE FORK LIFT CARRIAGE

	PDI-2018					PDI-2024				
CARRIAGE WIDTH	24			36		24			36	
	NON-TEL	TEL	FFL	NON-TEL	TEL	NON-TEL	TEL	FFL	NON-TEL	TEL
PART NO.	504589-01	504589-02	504589-09	504589-03	504589-04	504589-05	504589-06	504589-10	504589-07	504589-04

CHART 3 PDI-2018 ADJUSTABLE FORKS (3" WIDE)

CARRIAGE WIDTH	24				36			
FORK LENGTH	30	36	42	48	30	36	42	48
FORK PART NO. FOR RIGID FRAME TRUCK (STD.)	503612	503613	503614	503615	500763	501413	501882	501883
FORK PART NO. FOR ADJUSTABLE STRADDLE TRUCK (OPTIONAL)	506236-01	506236-02	506236-03	506236-04	506262-01	506262-02	506262-03	506262-04

CHART 4 PDI-2024 ADJUSTABLE FORKS (4" WIDE)

FORK LENGTH	30	36	42	48
FORK PART NO. FOR RIGID FRAME TRUCK (STD.)	057122-01	057122-02	057122-03	057122-04
FORK PART NO. FOR ADJUSTABLE STRADDLE TRUCK (OPTIONAL)	057120-01	057120-02	057120-03	057120-04

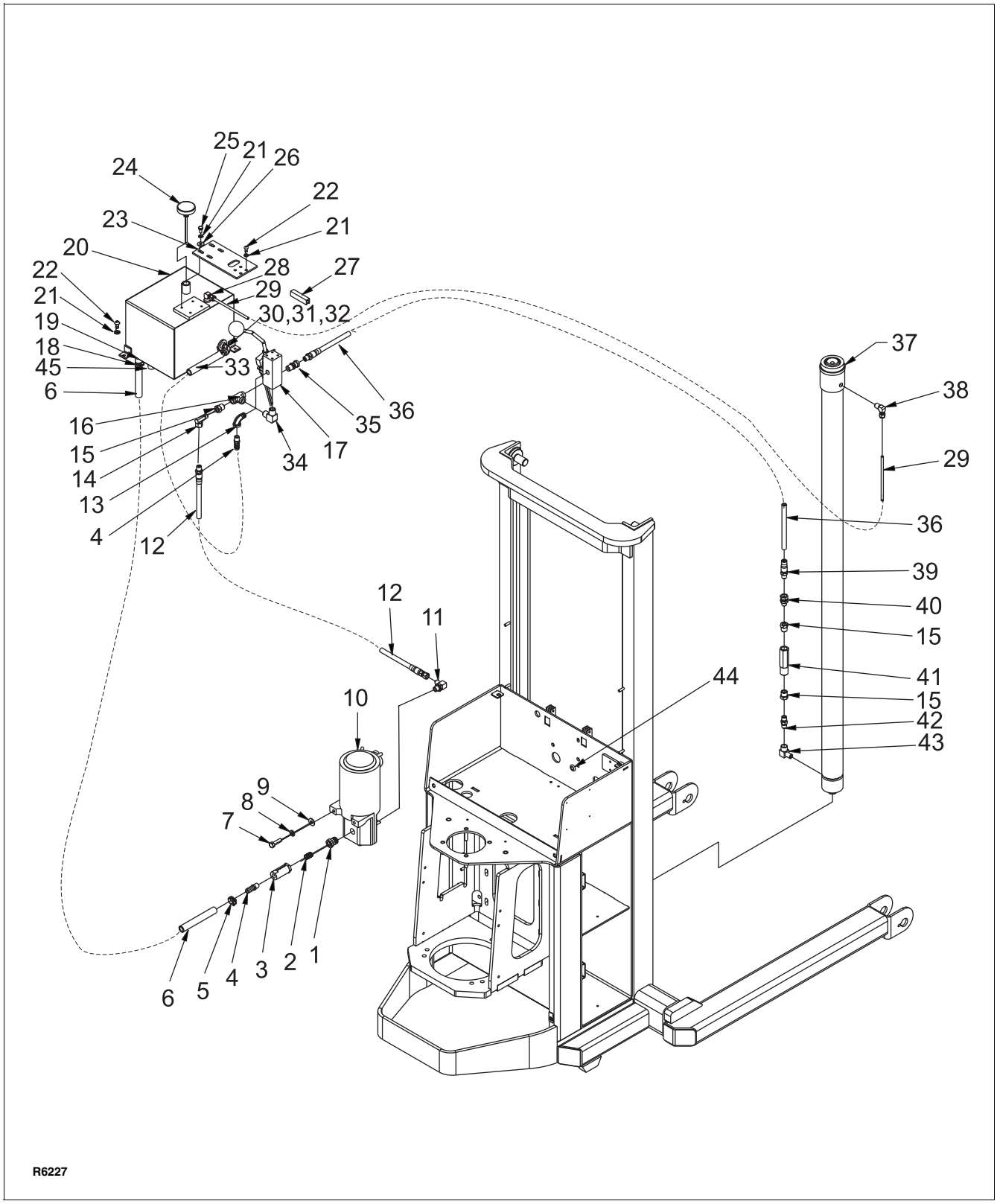


Figure 12-17 Hydraulic System (Non-Telescopic and Telescopic)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	025113	ADAPTER, FEM, 3/4 SAE X 1/4 NPT	1
2	026133	NIPPLE, PIPE, 1/4 CLOSE	1
3	035107	FILTER ASSY	1
4	026131	NIPPLE, HOSE, BARED, 1/4	2
5	056110	CLAMP, HOSE	2
6	290000	TUBING, VINYL, 3/4" OD X 1/2 ID	A/R
7	064607	SCREW, HEX HD, 3/8-16 X 1-1/4	2
8	077211	WASHER, LOCK, 3/8	2
9	077011	WASHER, 3/8 X 7/8 X 14 GA	2
10	—	PUMP & MOTOR (FIGURE 12-27)	REF
11	025536	ADAPTER, ELBOW	1
12	504592-05	HOSE ASSY	1
13	026701	ELBOW, STREET, 90°, 1/4 NPT	1
14	025116	ELBOW, 90°, SWIVEL 1/4 NPT	1
15	026500	REDUCER	3
16	027107	TEE, PIPE, 3/8 NPT	1
17	—	LIFT CONTROL VALVE ASSY (FIGURE 12-22 OR FIGURE 12-23)	REF
18	026151	NIPPLE, HOSE, BARB, 1/2 X 3/8	1
19	026315	PLUG, 1/4 NPT, MAGNETIC	1
20	506280	RESERVOIR	1
21	077209	WASHER, LOCK, 1/4	10
22	070476	SCREW, PH RD HD, 1/4-20 1/2	6
23	402259	BRACKET, VALVE MOUNTING	1
24	504578	BREATHER & DIPSTICK	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
25	065476	SCREW, HEX HD, 1/4-20 X 1/2 FULL	4
26	077031	WASHER, FLAT, 1/4	4
27	062503	CHANNEL, RUBBER, 1/4" SLOT, 2.5" LG	1
28	025501	ADAPTER, ELBOW	1
29	290000	TUBING, VINYL, 1/4" OD X 0.180 ID	A/R
30	026701	ELBOW, STREET, 90°, 1/4 NPT	1
31	026131	NIPPLE, HOSE, BARED, 1/4	1
32	056118	CLAMP, SPRING, HOSE	2
33	290000	TUBING, VINYL, 3/4" OD X 1/2 ID	A/R
34	025538	ELBOW, MALE, 90°, 3/8 NPT	1
35	025134	COUPLING, SWIVEL NUT. 3/8 NPT	1
36	282700	HOSE, PRESSURE, 1/4" ID	A/R
37	—	LIFT CYLINDER (FIGURE 12-19)	REF
38	025501	ELBOW, 90°, 1/4 NPT, TUBE	1
39	026913	FITTING, HOSE, 1/4, 1/4 NPT MALE	2
40	025313	CONNECTOR, SWL NUT, 1/4 NPT	1
41	047110	VALVE, FLOW CONTROL	1
42	026110	NIPPLE, HEX, 1/4 NPT	1
43	026708	ELBOW, STREET, 90°, 1/4 NPT	1
44	057510	GROMMET, RUBBER, 3/8 X 5/8, 1/4 TH	1
45	026315	PLUG, 1/4 NPT MAGNETIC	1

A/R - AS REQUIRED

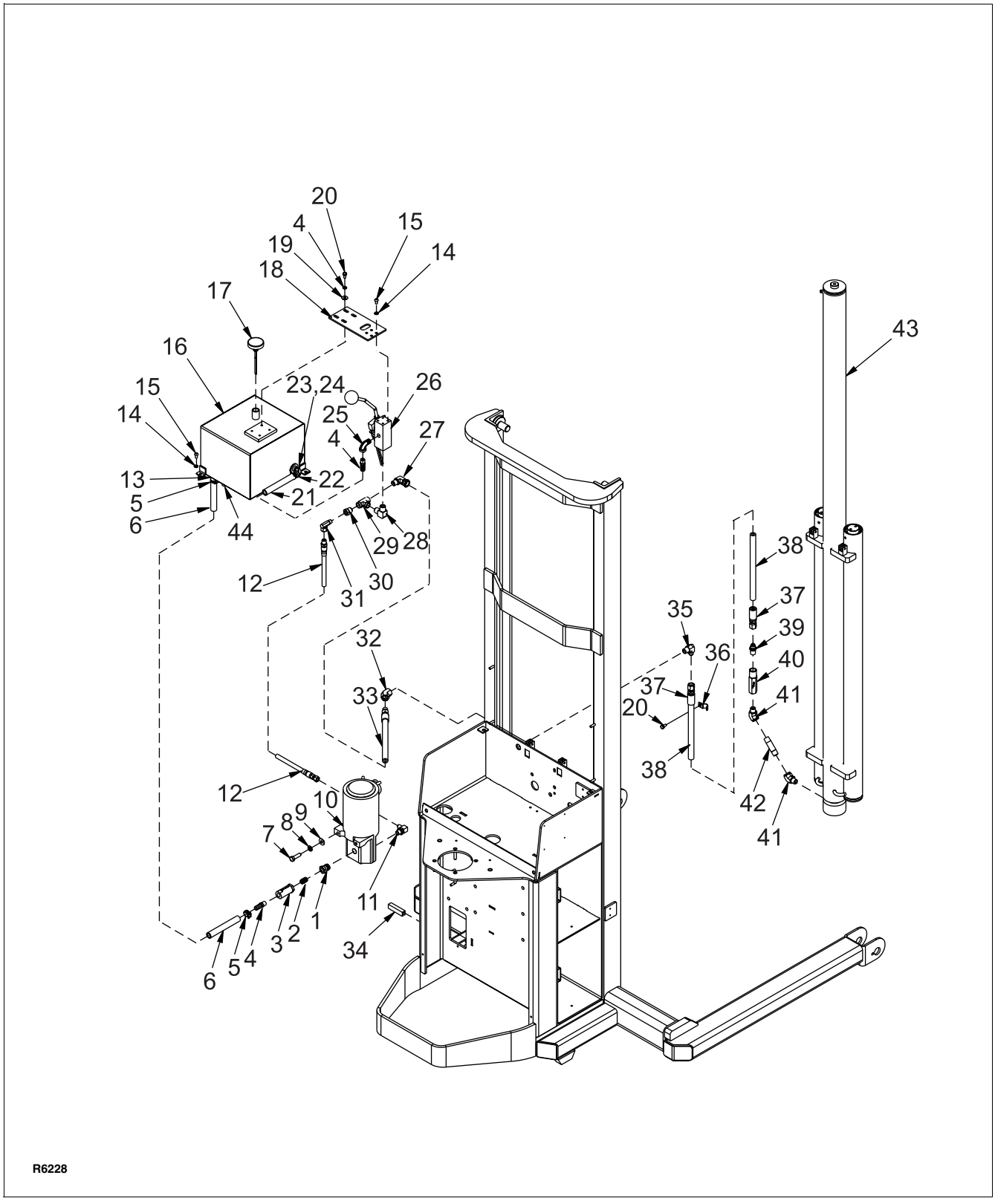


Figure 12-18 Hydraulic System (Full Free Lift)

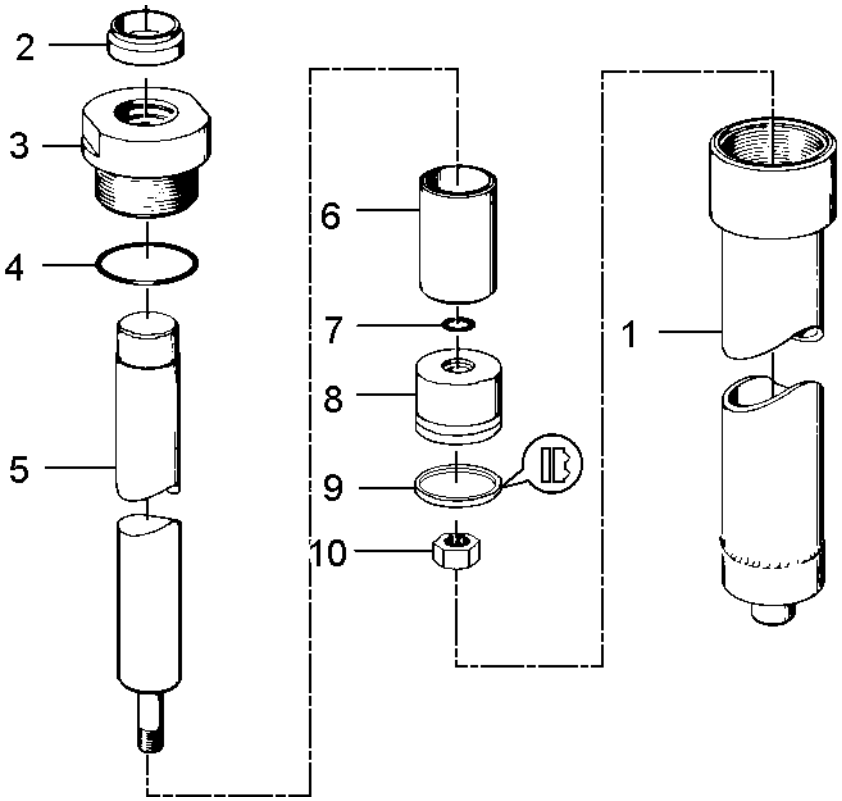
INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	025113	ADAPTER, FEM, 3/4 SAE X 1/4 NPT	1
2	026133	NIPPLE, PIPE, 1/4 CLOSE	1
3	035107	FILTER ASSY	1
4	026131	NIPPLE, HOSE, BARED, 1/4	2
5	056118	CLAMP, HOSE	2
6	290000	TUBING, VINYL, 3/4” OD X 1/2 ID	A/R
7	064607	SCREW, HEX HD, 3/8-16 X 1-1/4	2
8	077211	WASHER, LOCK, 3/8	2
9	077011	WASHER, 3/8 X 7/8 X 14 GA	2
10	—	PUMP & MOTOR (FIGURE 12-27)	REF
11	025536	ADAPTER, ELBOW	1
12	504592-05	HOSE ASSY	1
13	026151	NIPPLE, HOSE, BARB, 1/2 X 3/8	1
14	077209	WASHER, LOCK, 1/4	10
15	070476	SCREW, PH RD HD, 1/4-20 1/2	6
16	506283	RESERVOIR	1
17	505097	BREATHER & DIPSTICK	1
18	402259	BRACKET, VALVE MOUNTING	1
19	077031	WASHER, FLAT, 1/4	4
20	065476	SCREW, HEX HD, 1/4-20 X 1/2 FULL	5
21	290000	TUBING, VINYL, 1/4” OD X 0.180 ID	A/R
22	056118	CLAMP, SPRING, HOSE	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
23	026701	ELBOW, STREET, 90°, 1/4 NPT	1
24	026131	NIPPLE, HOSE, BARED, 1/4	1
25	026701	ELBOW, STREET, 90°, 1/4 NPT	1
26	—	LIFT CONTROL VALVE ASSY (FIGURE 12-22 OR FIGURE 12-23)	REF
27	025516	ELBOW, 90°, SWIVEL 3/8 NPT	1
28	025538	ELBOW, MALE, 90°, 3/8 NPT	1
29	027107	TEE, PIPE, 3/8 NPT	1
30	026500	REDUCER	1
31	025116	ELBOW, 90°, SWIVEL 1/4 NPT	1
32	025544	ELBOW, 45°, 3/8 FEM	1
33	504199-13	HOSE ASSY, 3/8, MALE 3/8 NPT	1
34	062503	CHANNEL, RUBBER, 1/4” SLOT, 2.5” LG	A/R
35	025116	ELBOW, 90°, 3/8 JIC	1
36	502474	CLAMP & NUT ASSY	1
37	026917	FITTING, 3/8 HOSE, 9/16 JIC SWVL	2
38	282900	HOSE, PRESSURE, 3/8” ID	1
39	026912	CONNECTOR, MALE, 3/8 NPT X 3/8 JIC	1
40	047123	VALVE, FLOW CONTROL, 7 GPM	1
41	02671	ELBOW, STREET, 3/8 X 45°	2
42	026322	NIPPLE	1
43	—	LIFT CYLINDER (FIGURE 12-21)	REF
45	026315	PLUG, 1/4 NPT MAGNETIC	1

A/R - AS REQUIRED

PACKING KIT PART NUMBER 907123 CONTAINS:

ITEM	QTY
2	1
4	1
7	1
9	1
10	1



R6232

Figure 12-19 Lift Cylinder (Non-Telescopic)

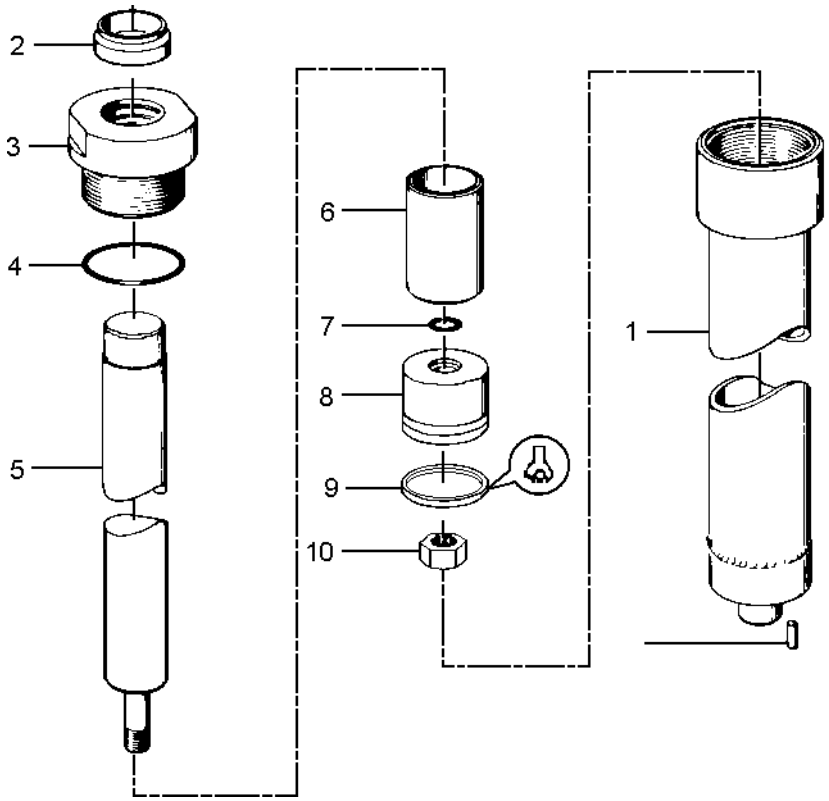
LIFTING HEIGHT (INCHES)		PDI R5 & A5 3 & 4" LOAD WHEEL	PDI R6 & A6 3 & 4" LOAD WHEEL	PDI A7 3 & 4" LOAD WHEEL	PDI R5 6" LOAD WHEEL	PDI R6 6" LOAD WHEEL	QTY
INDEX NO.	PART NAME	PART NO.	PART NO.	PART NO.	PART NO.	PART NO.	
—	HYD. LIFT CYLINDER ASSY	500773	500774	500775	504556	504557	1
1	. TUBE	—	—	—	—	—	1
2*	. WIPER RING	049508	049508	409508	409508	409508	1
3	. GLAND NUT	800023	800023	800023	800023	800023	1
4*	. TOP O-RING	042122	042122	042122	042122	042122	1
5	. RAM	—	—	—	—	—	1
6	. RAM STOP	296001	296001	296001	400978	400978	1
7*	. BOTTOM O-RING	042105	042105	042105	042105	042105	1
8	. PISTON	403863	403863	403863	403863	403863	1
9*	. PSP SEAL	042205-01	042205-01	042205-01	042205-01	042205-01	1
10*	. JAM NUT, 3/4-16	800293	800293	800293	800293	800293	1

*** 907123 PACKING KIT INCLUDES ITEMS 2, 4, 7, 9 AND 10.**

PDI R5 - RIGID FORKS 5 FOOT LIFT
PDI R6 - RIGID FORKS 6 FOOT LIFT
PDI A5 - ADJUSTABLE FORKS 5 FOOT LIFT
PDI A6 - ADJUSTABLE FORKS 6 FOOT LIFT
PDI A7 - ADJUSTABLE FORKS 7 FOOT LIFT

PACKING KIT PART NUMBER 907138 CONTAINS:

ITEM	QTY
2	1
4	1
7	1
9	1
10	1



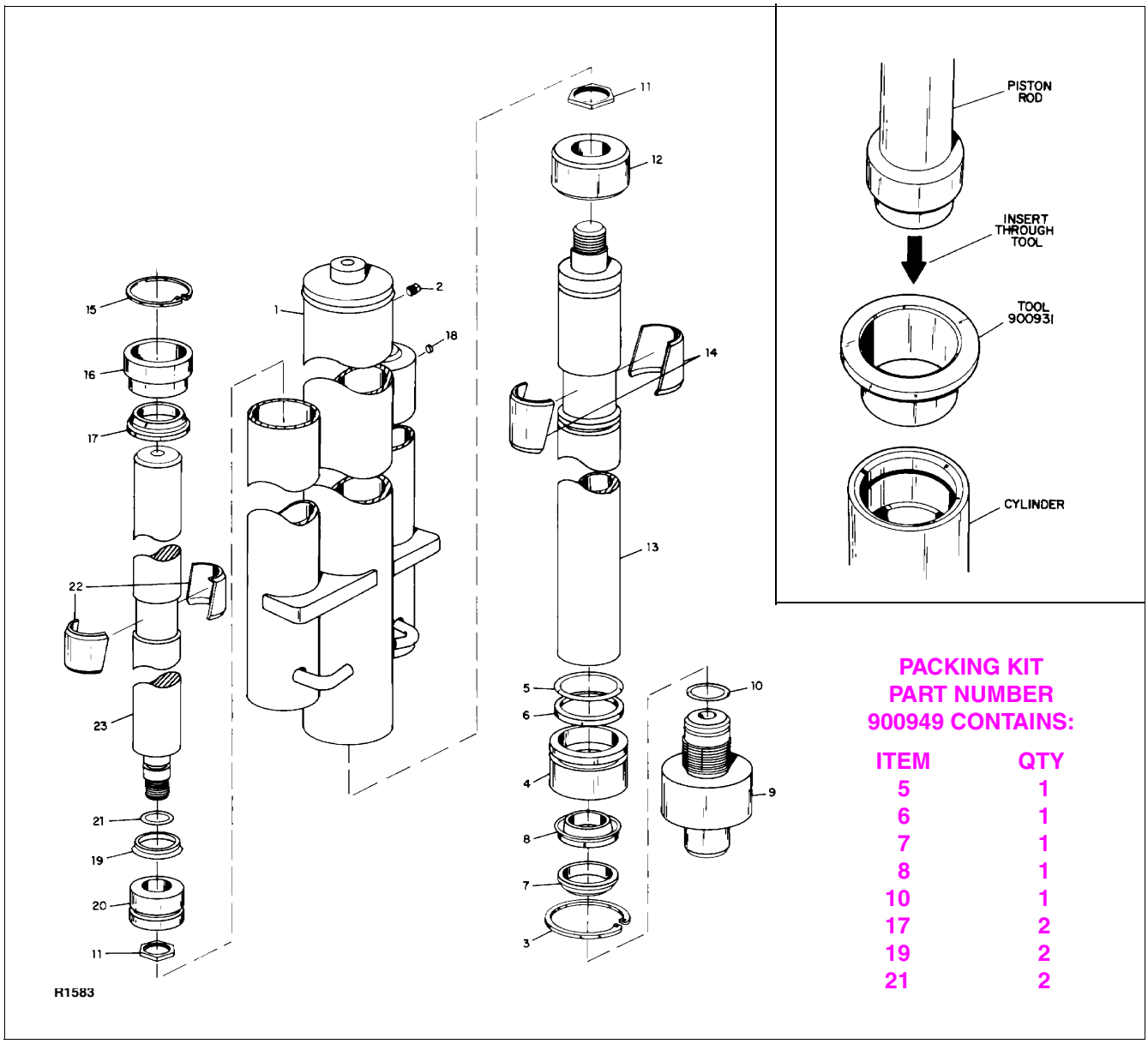
R6232

Figure 12-20 Lift Cylinder (Telescopic)

LIFT HEIGHT (INCHES)		PDI T8	PDI T9	PDI T10	PDI T11	PDI T12	QTY
INDEX NO.	PART NAME	PART NO.	PART NO.	PART NO.	PART NO.	PART NO.	
—	HYD. LIFT CYLINDER ASSY	503600	503601	503602	503603	503604	1
1	. TUBE	—	—	—	—	—	1
2*	. WIPER RING	049508	049508	049508	049508	049508	1
3	. GLAND NUT	800023	800023	800023	800023	800023	1
4*	. TOP O-RING	042122	042122	042122	042122	042122	1
5	. RAM	—	—	—	—	—	1
6	. RAM STOP	400860	400860	400860	400860	400860	1
7*	. BOTTOM O-RING	042105	042105	042105	042105	042105	1
8	. PISTON	403717	403717	403717	403717	403717	1
9*	. U CUP SEAL 1-1/2 X 2 X 3/8	043130	043130	043130	043130	043130	1
10*	. JAM NUT, 3/4-16	800293	800293	800293	800293	800293	1

*** 907138 PACKING KIT INCLUDES ITEMS 2, 4, 7, 9 AND 10**

PDI T8 - 8 FOOT LIFT
PDI T9 - 9 FOOT LIFT
PDI T10 - 10 FOOT LIFT
PDI T11 - 11 FOOT LIFT
PDI T12 - 12 FOOT LIFT



PACKING KIT PART NUMBER 900949 CONTAINS:

ITEM	QTY
5	1
6	1
7	1
8	1
10	1
17	2
19	2
21	2

Figure 12-21 Lift Cylinders (Full Free Lift)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	503996-01	FFL CYLINDER ASSEMBLY 106 IN. LIFT HEIGHT	1
—	503996-02	FFL CYLINDER ASSEMBLY 130 IN. LIFT HEIGHT	1
1	503995-01	. FFL CYLINDER WELDMENT 106 IN. LIFT HEIGHT	1
1	503995-02	. FFL CYLINDER WELDMENT 130 IN. LIFT HEIGHT	1
2	026308	. SQUARE HD PLUG, 1/4 NPT	1
3	061825	. SNAP RING RETAINER	1
4	401645	. CYLINDER HEAD, 2.50 DIA.	1
5	042150*	. "O" RING	1
6	042151*	. BACK-UP RING	1
7	049517-02*	. HYDRAULIC CYLINDER WIPER RING	1
8	043132*	. "U" CUP ROD SEAL	1
9	401652	. CYLINDER BASE, 2.50 DIA	1
10	042149*	. "O" RING	1
11	059128	. FLEXLOC LOCK NUT	3
12	401642	. PISTON, 2.5 DIA.	1
13	503992-01	. CYLINDER ROD, 106 LIFT HT	1
13	503992-02	. CYLINDER ROD, 130 LIFT HT	1
14	401641	. WEAR RING	1
15	061824	. SNAP RING RETAINER	2
16	401584	. CYLINDER HEAD, 2.00 DIA.	2
17	049517-01*	. CYLINDER HD WIPER RING	2
18	029103	. BREATHER PLUG	2
19	043130*	. "U" CUP SEAL	2
20	401384	. PISTON, 2.00 DIA.	2
21	042136*	. "O" RING	2
22	401646	. WEAR RING	2
23	401642-01	. CYLINDER ROD, 106 LIFT HT	2
23	401642-02	. CYLINDER ROD, 130 LIFT HT	2
—	055706	LOCTITE 222 ADHESIVE	A/R
—	900893	HYDRAULIC OIL (QUART)	AR
—	900855	HYDRAULIC OIL (GALLON)	AR

A/R - AS REQUIRED

*** INCLUDED IN PACKING KIT PART NUMBER 900949**

SPECIFY TRUCK MODEL NUMBER, LIFT HEIGHT, AND SERIAL NUMBER WHEN ORDERING LIFT CYLINDER PARTS.

BALL CHECK KIT
PART NUMBER
900132 CONTAINS:

ITEM	QTY
13	1
14	1
15	1

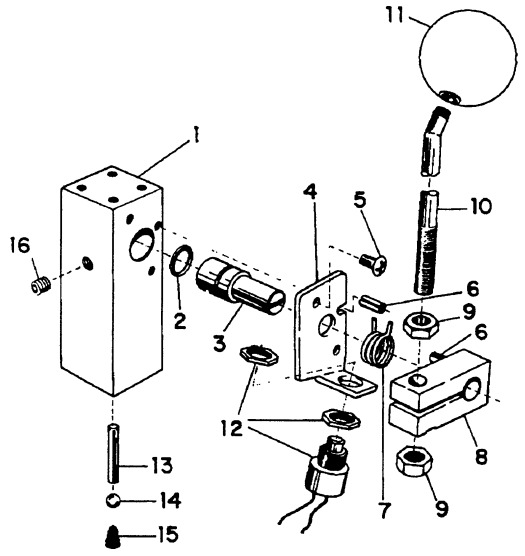


Figure 12-22 Lift Control Valve (Standard)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	504216-07	LIFT CONTROL VALVE ASSY	1
1	240501	. VALVE BODY	1
2	042104	. O-RING	1
3	304611	. RELEASE CAM	1
4	052803	. SWITCH BRACKET	1
5	070475	. PHILLIPS ROUND HD SCREW, 1/4-20 X 3/8	2
6	060937	. ROLL PIN, 1/8 X 5/8	2
7	075015	. HANDLE RETURN SPRING	1
8	257401	. LIFT CONTROL VALVE CLAMP	1
9	059529	. JAM NUT, 3/8-24	2
10	057702	. HANDLE	1
11	057952	. KNOB	1
12	504594	. PUMP MOTOR SWITCH/W NUTS	1
13*	060608	. PIN, 5/32 X 1-1/4	1
14*	051404	. CHECK BALL	1
15*	075052	. COMPRESSION SPRING	1
16	026310	. PLUG, 3/8	1

* 900132 BALL CHECK KIT, INCLUDES 13, 14, 15

BALL CHECK KIT
PART NUMBER
900132 CONTAINS:

ITEM	QTY
13	1
14	1
15	1

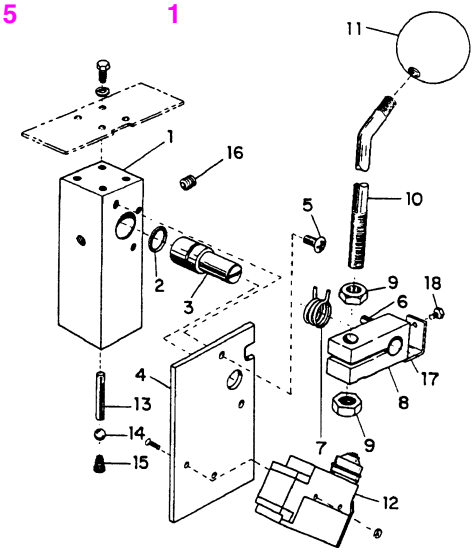


Figure 12-23 Lift Control Valve (Cold Conditioning)

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	503209-02	LIFT CONTROL VALVE ASSY	1
1	240501	. VALVE BODY	1
2	042104	. O-RING	1
3	304611	. RELEASE CAM	1
4	400045	. SWITCH BRACKET	1
5	070475	. PHILLIPS ROUND HD SCREW, 1/4-20 X 3/8	2
6	060937	. ROLL PIN, 1/8 X 5/8	2
7	075015	. HANDLE RETURN SPRING	1
8	400097	. LIFT CONTROL VALVE CLAMP	1
9	059529	. JAM NUT, 3/8-24	2
10	057701	. HANDLE	1
11	057952	. KNOB	1
12	020690	. PUMP MOTOR SWITCH/W NUTS	1
13*	060608	. PIN, 5/32 X 1-1/4	1
14*	051404	. CHECK BALL	1
15*	075052	. COMPRESSION SPRING	1
16	026310	. PLUG, 3/8	1
17	400051	. BRACKET	1
18	065476	. SCREW, SOCKET HD, 1/4-20 X 1/2	1

* 900132 BALL CHECK KIT, INCLUDES 13, 14, 15

NOTES

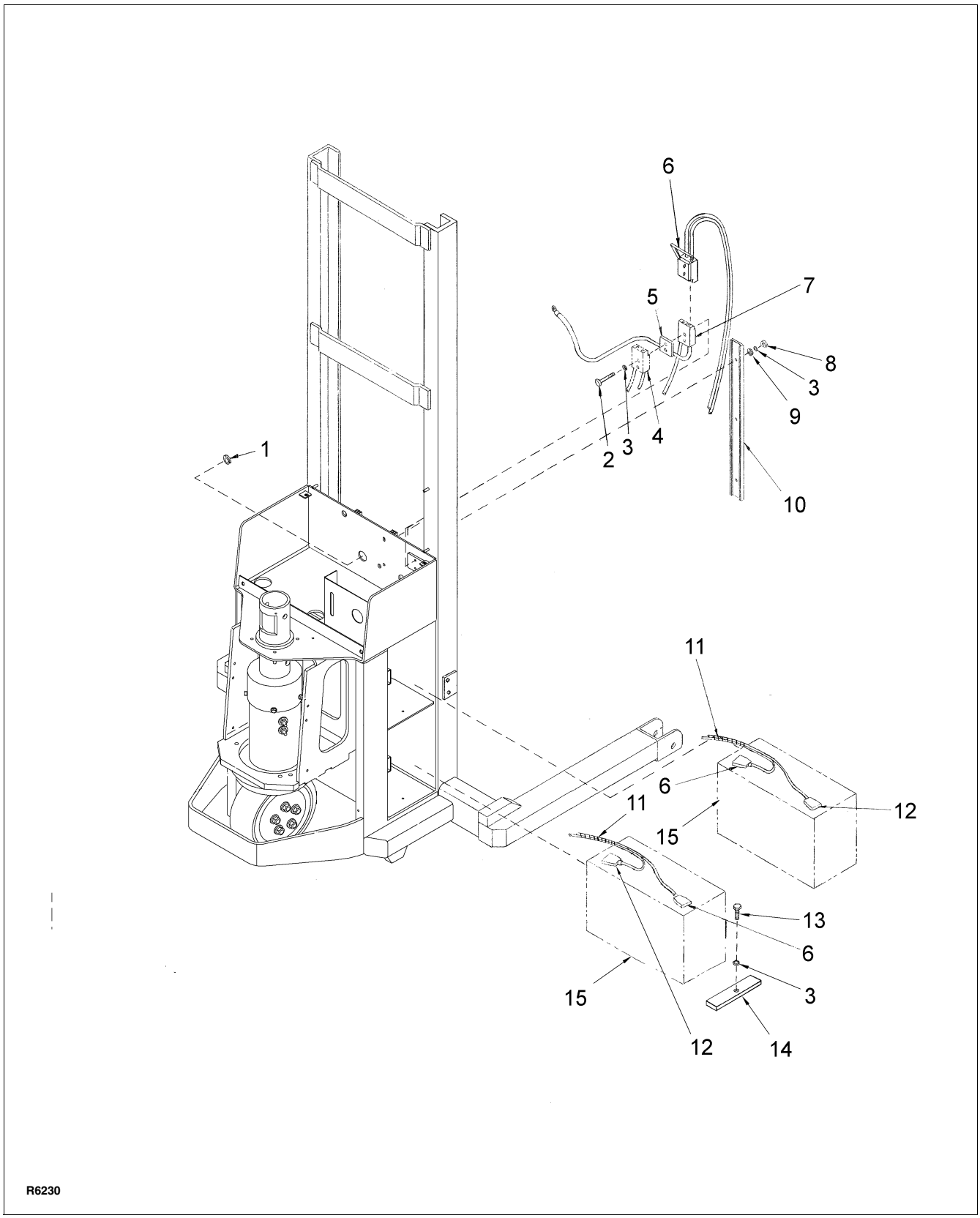


Figure 12-24 Batteries

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	057508	GROMMET	1
2	063486	SCREW, HEX CAP, 1/4-20 X 2-1/4	2
3	077209	WASHER, LOCK, 1/4	9
4	—	CHARGER CONNECTOR ASSY (FIGURE 12-30)	1
5	402264	SPACER	1
6	504608	BATTERY CONNECTOR ASSY	1
7	505546-04	BATTERY CONNECTOR ASSY	1
8	059421	NUT, HEX, 1/4-20	5
9	077031	WASHER, FLAT	5
10	402258	CHANNEL	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
11	056128	SPIROBAND	A/R
12	504609	CABLE ASSY	1
13	063478	SCREW, HEX CAP, 1/4-20 X 3/4	2
14	404571	BAR, BATTERY RETAINER	2
15	003217	BATTERY, FLOODED WET CELL, (STD)	2
15	003217-01	BATTERY, FLOODED DRY CELL	2
15	003216	BATTERY, ABSORBED GLASS MAT, AMF (OPT)	2
15	003215	BATTERY, GEL CEL, GMF (OPT)	2

A/R - AS REQUIRED

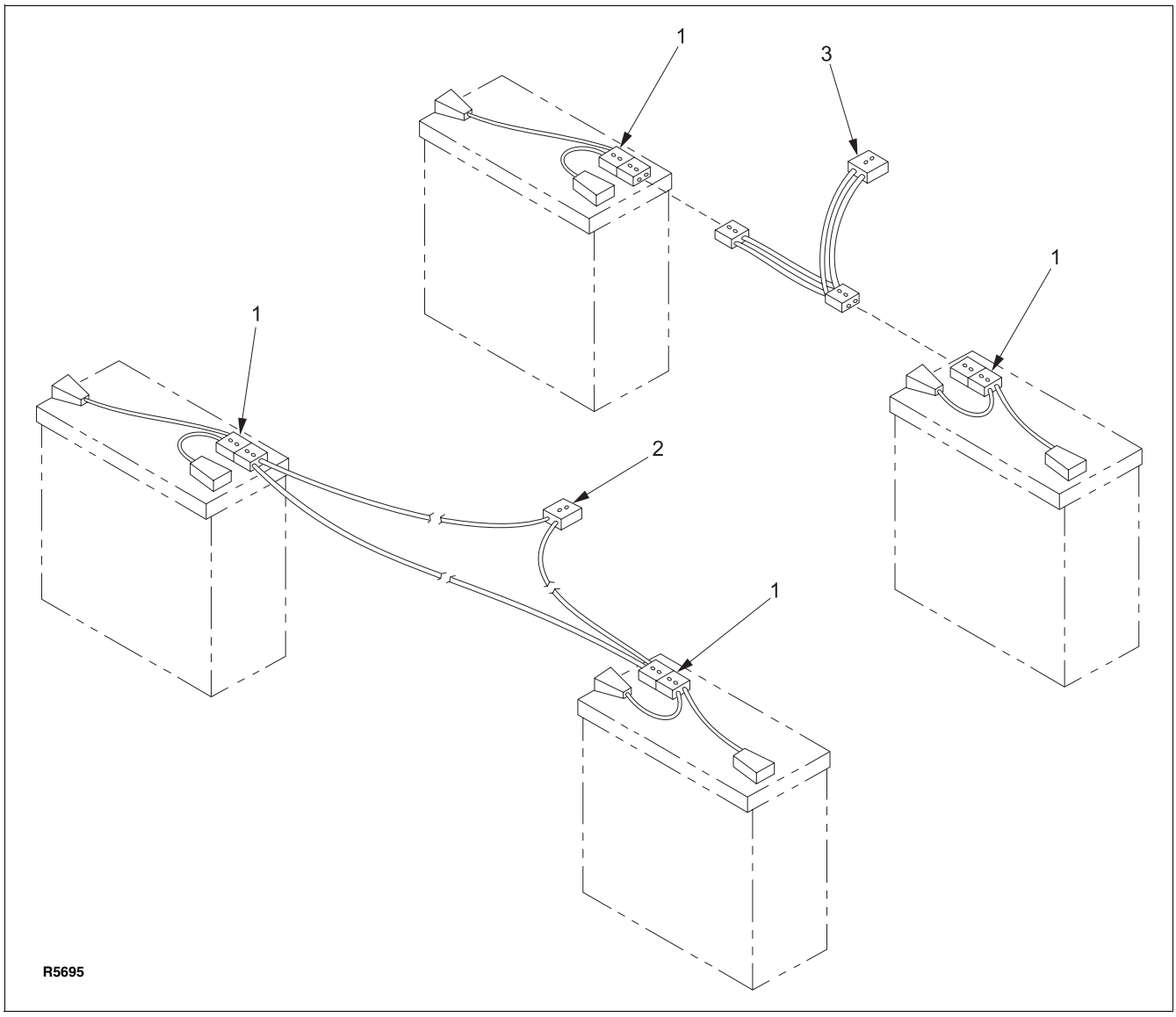


Figure 12-25 Quick Disconnect Cable Installation

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	505632	QUICK DISCONNECT CABLE KIT	
1	505630	CONNECTOR ASSEMBLY BATTERY	4
2	505631	CONNECTOR ASSEMBLY BATTERY	1
3	505649	CORD ASSY-CHARGING, EXTERNAL	1

NOTES

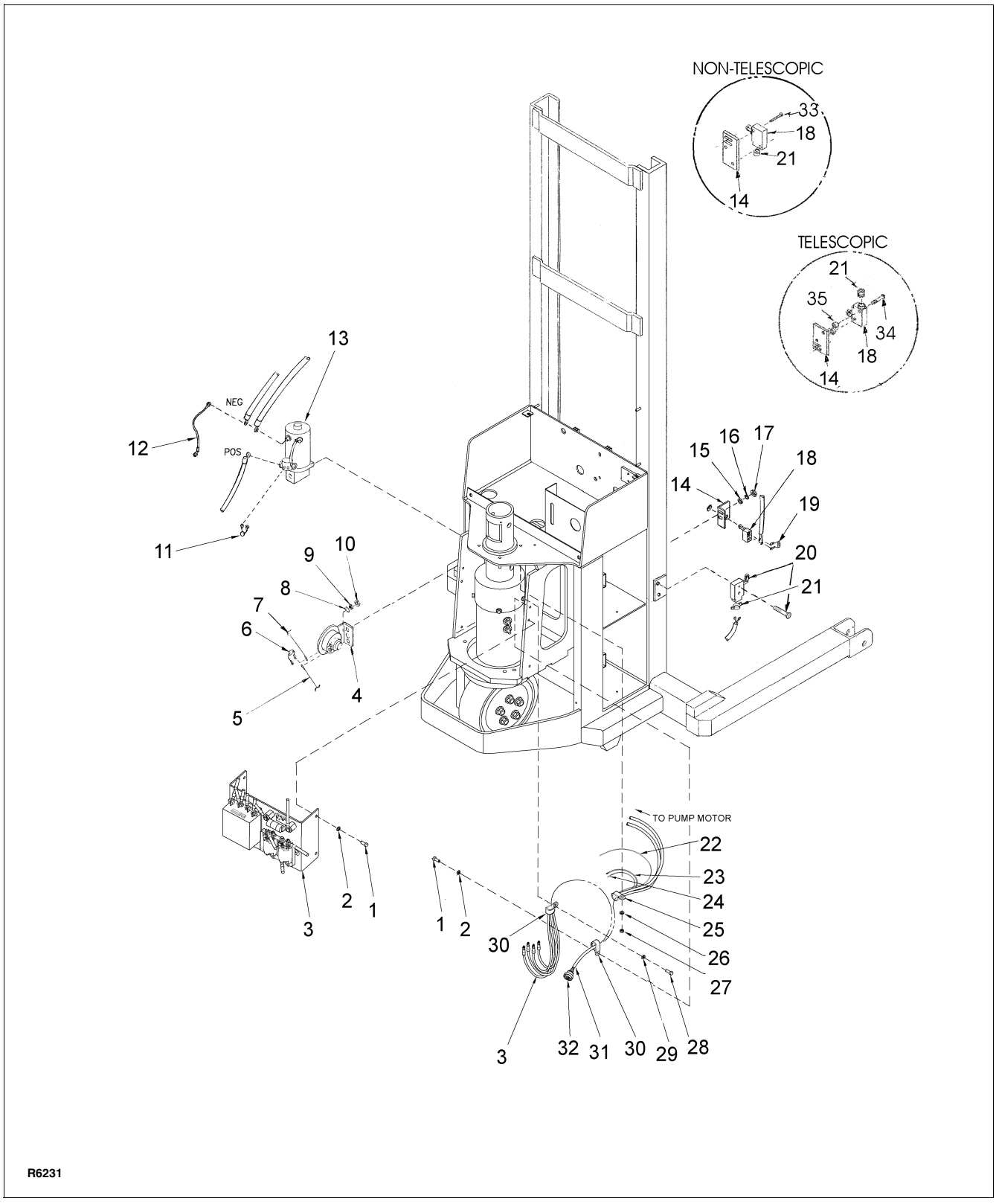


Figure 12-26 Electrical Components

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	063553	SCREW, HHC, 5/16-18 X 3/4	5
2	077210	WASHER, LOCK, SPLIT, 5/16	5
3	—	PANEL ASSY (FIGURE 12-28)	REF
4	009602	HORN	1
5	023238-04	WIRE ASSY	1
6	504096	SUPPRESSOR, HORN	1
7	023238-08	WIRE ASSY	1
8	077031	WASHER, FLAT	2
9	077209	WASHER, LOCK, 1/4	2
10	059421	NUT, HEX, 1/4-20	2
11	504097	SUPPRESSOR, SOLENOID	1
12	023238-07	WIRE ASSY	1
13	—	PUMP AND MOTOR ASSY (FIGURE 12-27)	REF
14	402255	BRACKET, MOUNTING, SWITCH (NON-TELESCOPIC AND TELESCOPIC) (STANDARD)	1
14	402276	BRACKET, MOUNTING, SWITCH (NON-TELESCOPIC AND TELESCOPIC) (COLD CONDITIONING)	1
15	077031	WASHER, FLAT (NON-TELESCOPIC AND TELESCOPIC)	2
16	077209	WASHER, LOCK, 1/4 (NON-TELESCOPIC AND TELESCOPIC)	2
17	059421	NUT, HEX, 1/4-20 (NON-TELESCOPIC AND TELESCOPIC)	2
18	020673	SWITCH, LIMIT (NON-TELESCOPIC AND TELESCOPIC) (STANDARD)	1
18	020770	SWITCH, LIMIT (NON-TELESCOPIC AND TELESCOPIC) (COLD CONDITIONING)	1
19	505881	RESISTOR ASSY(NON-TELE-SCOPIC AND TELESCOPIC)	1
20	020703	SWITCH, LIMIT (FULL FREE LIFT) (STANDARD)	1
20	020689	SWITCH, LIMIT (FULL FREE LIFT) (COLD CONDITIONING)	1
21	005405	STRAIN RELIEF (STANDARD)	1
21	019910	STRAIN RELIEF (COLD CONDITIONING)	1
22	023238-30	WIRE ASSY, NEG TO ELECT BRAKE (FIGURE 12-5)	1
23	023276	HARNESS ASSY, TO DEADMAN SWITCH	1
24	023238-29	WIRE ASSY (FIGURE 12-5)	1
25	056141	CLAMP, CABLE	1
26	077210	WASHER, LOCK, SPLIT, 5/16	1
27	—	NUT, GUIDE RING MOUNTING	1
28	—	SCREW, PIVOT TUBE MOUNTING	1
29	077210	WASHER, LOCK, SPLIT, 5/16	1
30	056135	CLAMP, LOOP, CUSHIONED	2
31	023252	WIRE HARNESS (FIGURE 12-5)	REF
32	005642	CONTACT, PIN	3
33	071381	SCREW, TRUSS HD, 10-32 X 1-1/4	2
34	071383	SCREW, TRUSS HD, 10-32 X 1-3/4	2
35	402277	SPACER	2

A/R - AS REQUIRED

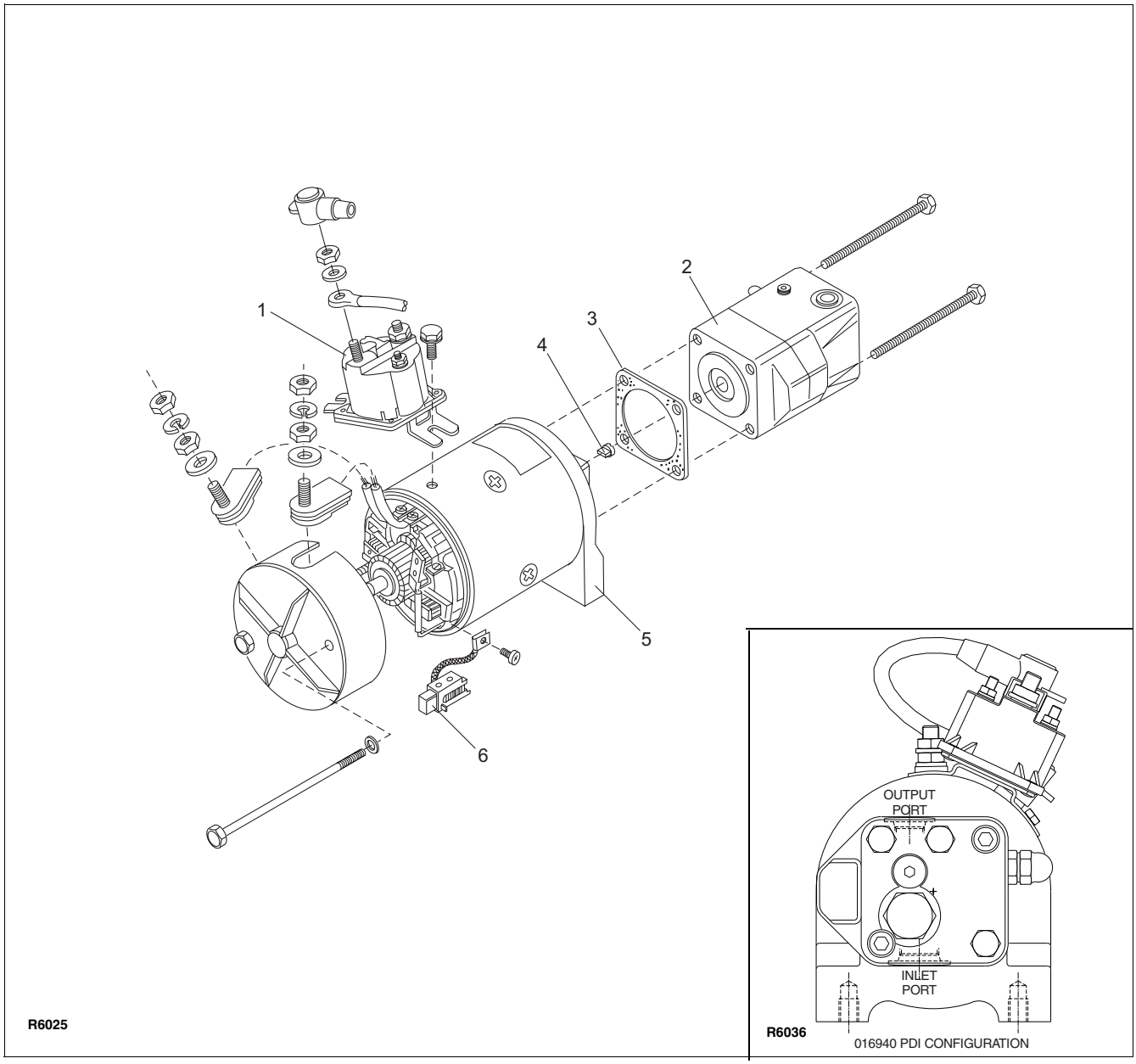


Figure 12-27 Hydraulic Pump and Motor Assembly

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

NOTES

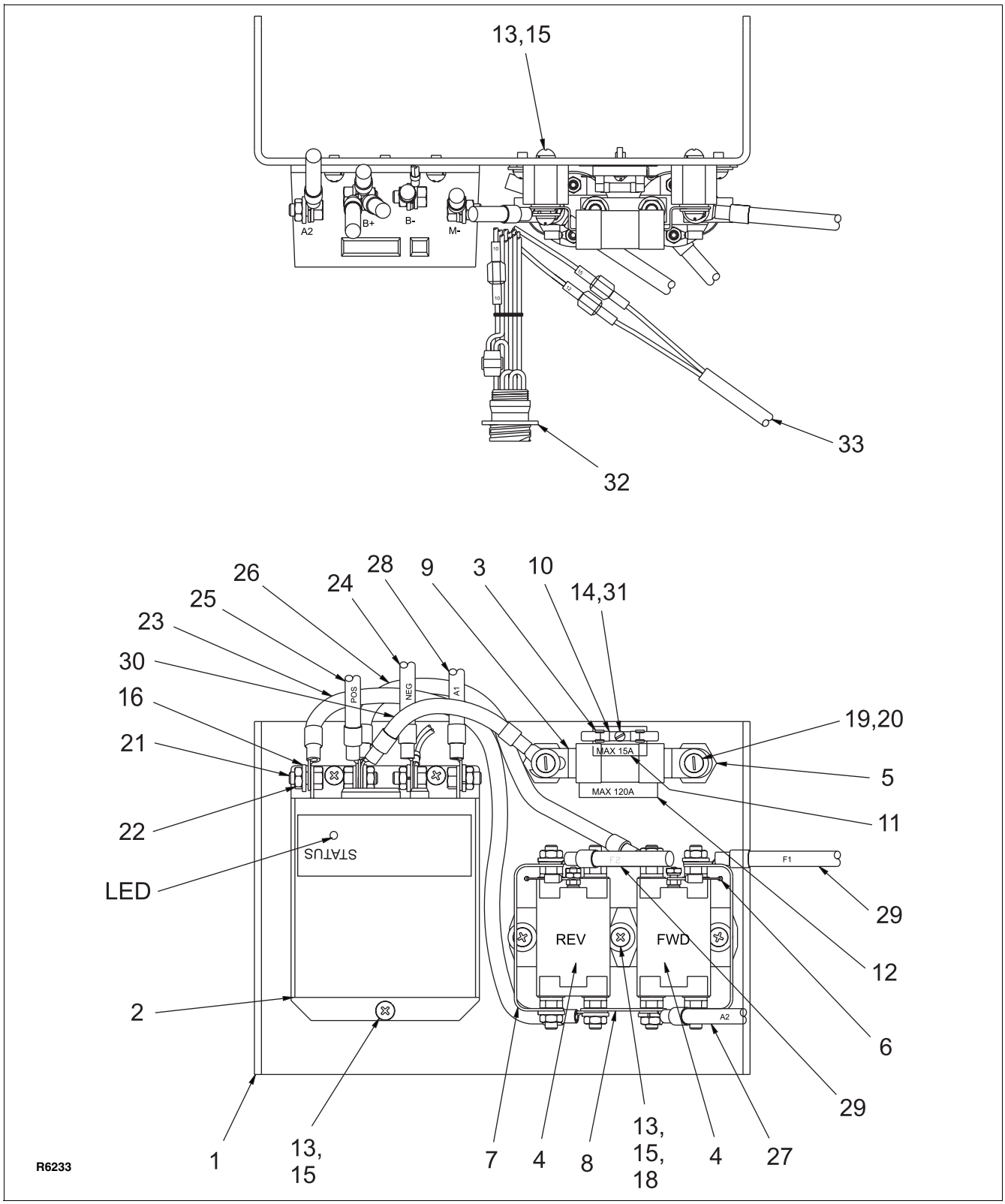


Figure 12-28 Electrical Control Panel

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506284	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	077105	WASHER, FLAT 1/4, BRASS	4
20	070489	. SCREW, SL RD HD BRASS, 1/4-20 X 5/8	2
21	063552	. 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	1

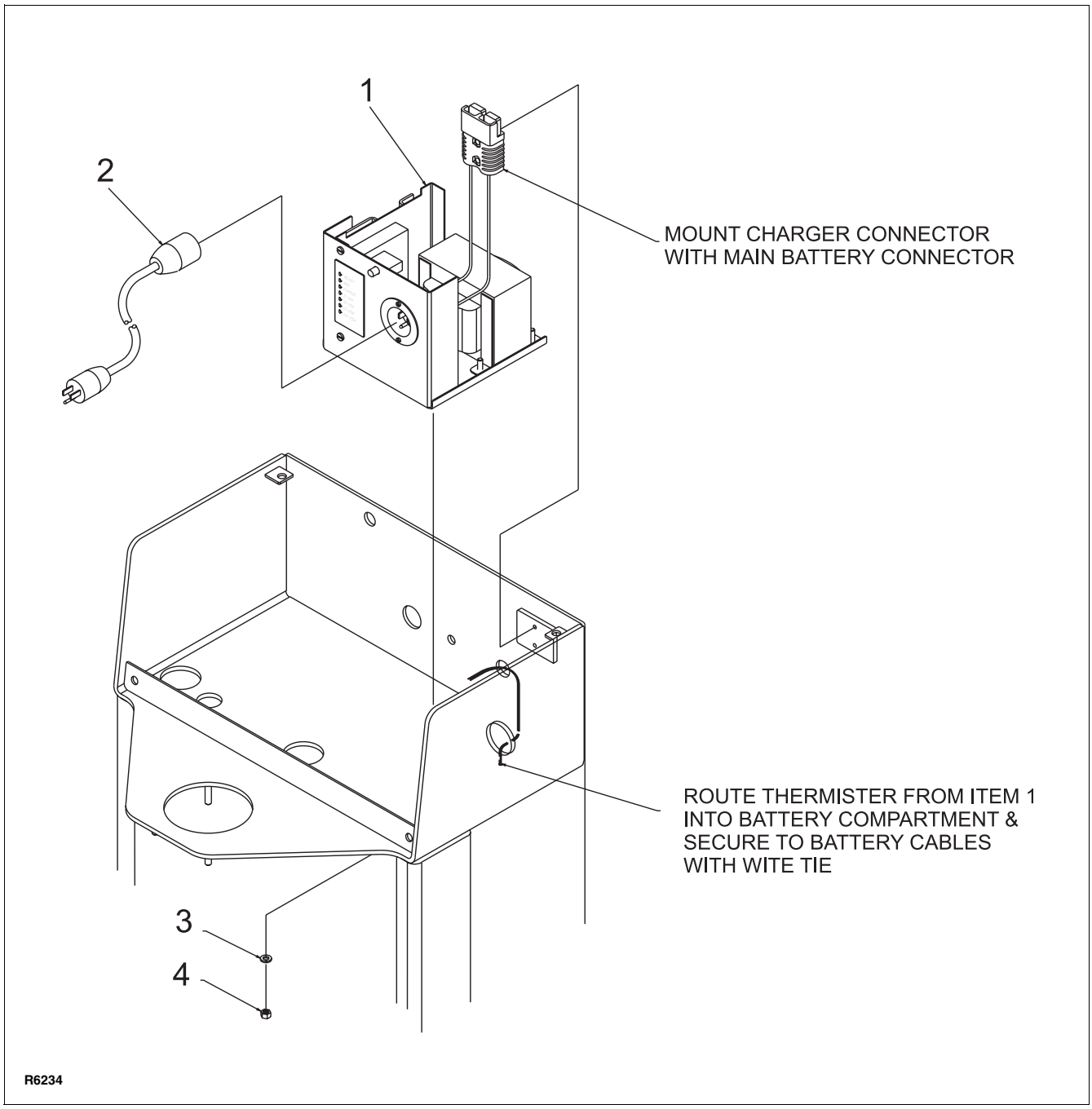


Figure 12-29 Battery Charger Installation

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	506320-01	CORD ASSY, 120 V	1
1	506320-02	CORD ASSY, 240 V	1
3	—	CHARGER-24V, 25 AMP (FIGURE 12-30)	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

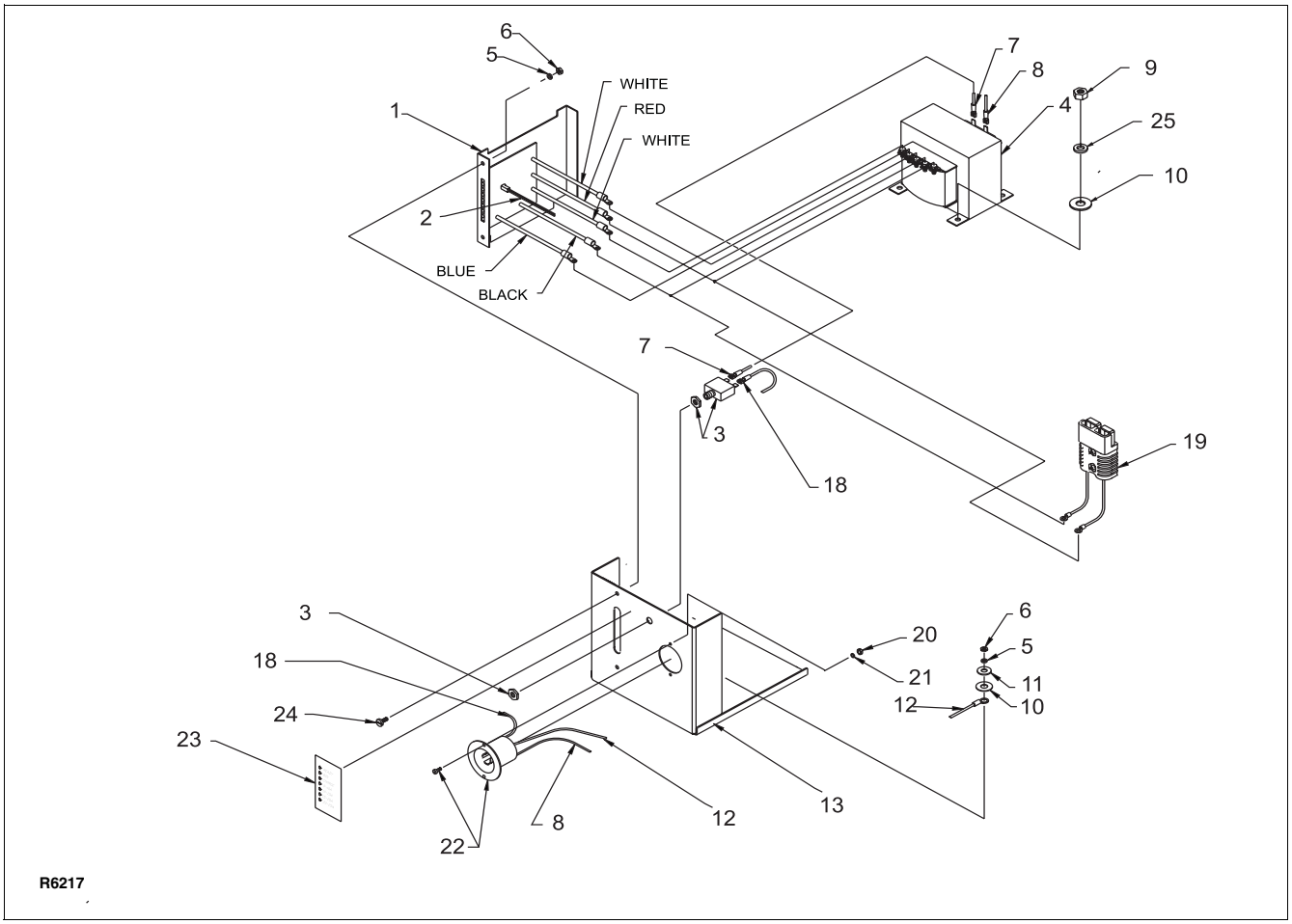


Figure 12-30 Battery Charger

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	506320-01	CHARGER-120 V (STANDARD)	1
—	506320-02	CHARGER-230 V (OPTIONAL)	1
1	904075	. PCB ASSY WITH HEATSINK 120 V	1
1	xxxxxx	. PCB ASSY WITH HEATSINK 240 V	1
2	904074	. . THERMISTOR-120 V	1
2	xxxxxx	. . THERMISTOR-240 V	1
3	003403	. CIRCUIT BREAKER-AUTO RESET	1
4	904076	. TRANSFORMER-120 V	1
4	xxxxxx	. TRANSFORMER-240 V	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
19	506178	. CONNECTOR ASSY - CHARGER	1
20	059412	. NUT-HEX, 6-32	2
21	077204	. WASHER - LOCK, SPLIT, #6	2
22	005454	. CONNECTOR - INLET FLANGED-120 V	1
22	005455	. CONNECTOR - INLET FLANGED-230 V	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

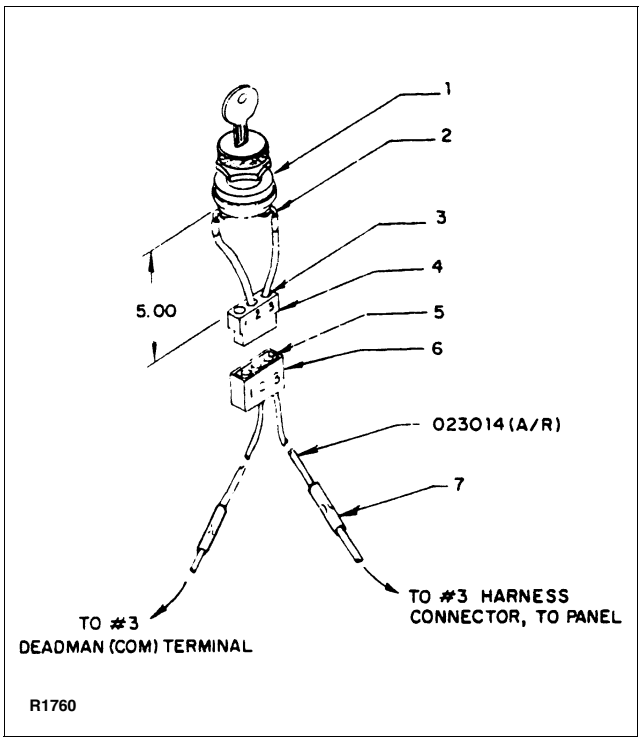


Figure 12-31 Optional Keyswitch

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	020725	SWITCH, KEY	1
2	021203	TERMINAL, RING NO. 10	2
3	005627	CONTACT	2
4	005648	HOUSING, SOCKET, FREE HANGING	1
5	005626	CONTACT, MALE	2
6	005647	CONNECTOR	1
7	005433	CONNECTOR, IN-LINE	2

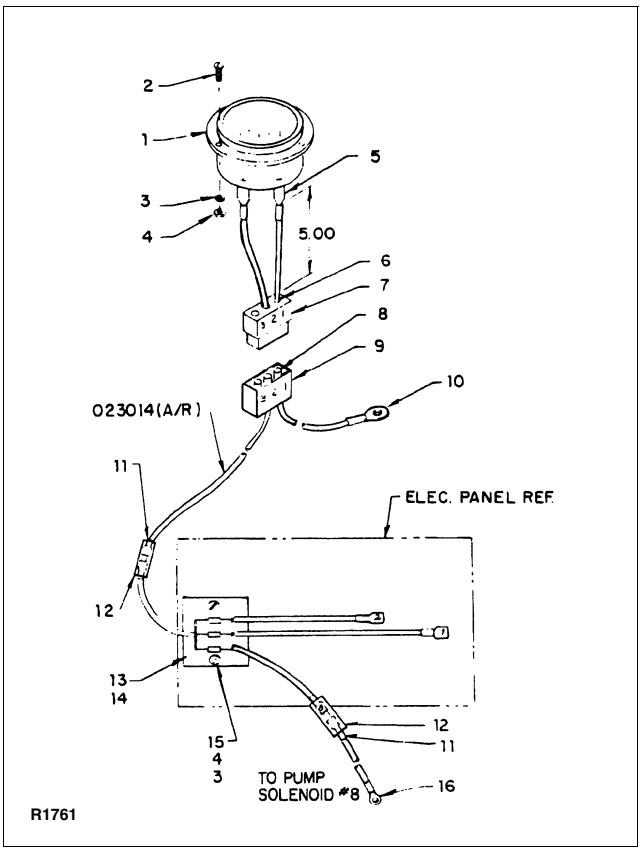


Figure 12-32 Optional Hour Meter

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	015604	HOUR METER	1
2	068179	SCREW, RD HD, 5-40 X 5/8	3
3	077203	WASHER, LOCK, SPLIT NO. 5	5
4	059410	NUT, HEX, 5-40	5
5	021718	TERMINAL, SLIP ON, 1/4 INSULATED	2
6	005627	CONTACT	2
7	005648	HOUSING, SOCKET, FREE HANGING	1
8	005626	CONTACT, MALE	2
9	005647	CONNECTOR	1
10	021207	TERMINAL, RING, 5/16	1
11	021204	TERMINAL, QUICK CONNECT, FEMALE	2
12	005422	CONNECTOR, IN-LINE INSULATED	2
13	005992	DIODE ASSEMBLY	1
14	010610	PAD, INSULATING DIODE	1
15	068177	SCREW, RD HD, 5-40 X 3/8	2
16	021203	TERMINAL, RING NO. 10	1
—	504096	SPIKE SUPPRESSOR	1

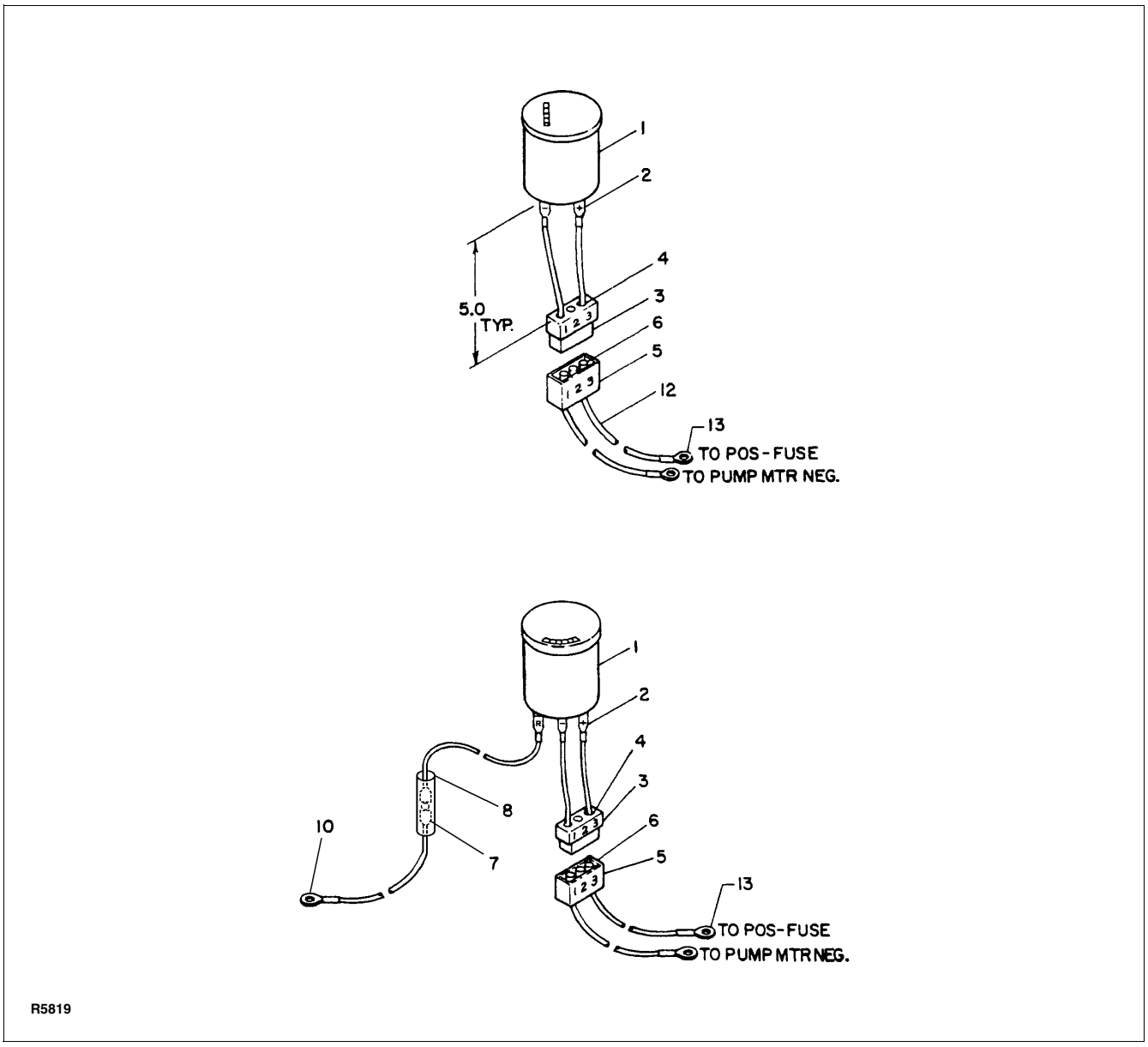


Figure 12-33 Optional Battery Capacitor Indicator

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	010617-02	METER, BATTERY CAPACITY, 24 V W/O LIFT LOCKOUT	1
1	010618-02	METER, BATTERY CAPACITY, 24 V W/LIFT LOCKOUT	1
2	021718	TERMINAL, SLIP ON, 1/4 INSULATED	2 OR 3
3	005648	HOUSING, SOCKET, FREE HANGING	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
4	005627	CONTACT AMP	2
5	005647	CONNECTOR	1
6	005626	CONTACTS, MALE	2
7	021204	TERMINAL, FEMALE	2
8	005422	CONNECTOR, INLINE	1
10	021203	TERMINAL, RING, NO. 10	1
12	023014	WIRE, 18 GAUGE, STRANDED	A/R
13	021207	TERMINAL, RING, 5/16	2

A/R - AS REQUIRED

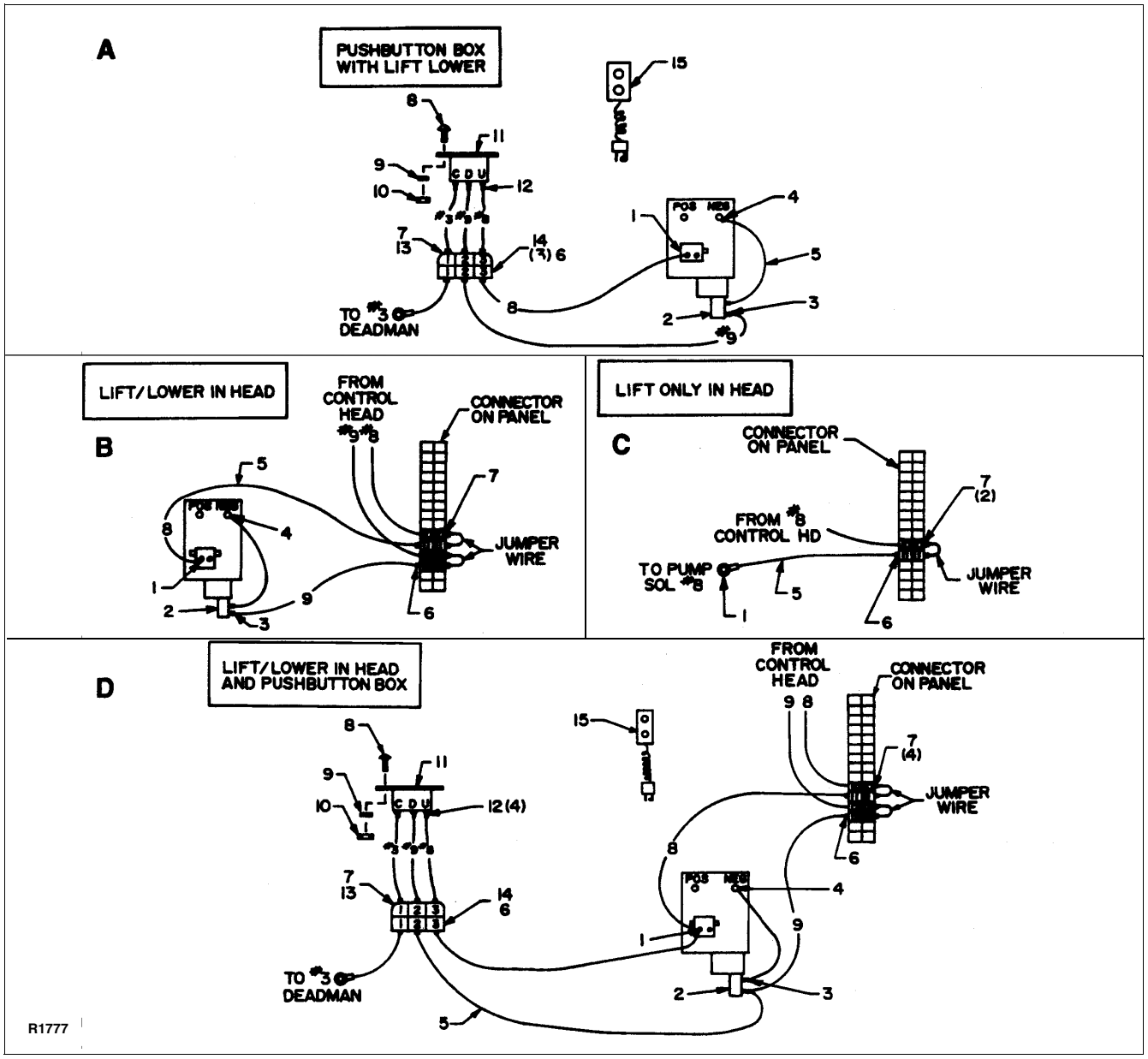


Figure 12-34 Optional Remote Control Installation

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	021203	TERMINAL, RING 8-10 STUD	1
2	048133	SOLENOID, 24 V	1
3	021718	TERMINAL, SLIP ON, 1/4 INSULATED	1
4	021207	TERMINAL, RING, 5/16	1
5	023014	WIRE, 18 GAUGE STRANDED	A/R
6	005626	CONTACTS, MALE	1
7	005627	CONTACTS, AMP	4
8	068177	SCREW, RD HD, 5-40 X 3/8	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	077203	WASHER, LOCK, SPLIT, NO. 5	2
10	059410	NUT, HEX 5-40	2
11	017800	PLUG, FEMALE, FLUSH MOUNT	1
12	021236	TERMINAL, RING, NO. 6	4
13	005648	HOUSING SOCKET, FREE HANGING	1
14	005647	CONNECTOR	1
15	501736	REMOTE ASSEMBLY PUSHBUTTON	1

A/R - AS REQUIRED

Big Joe Manufacturing Company