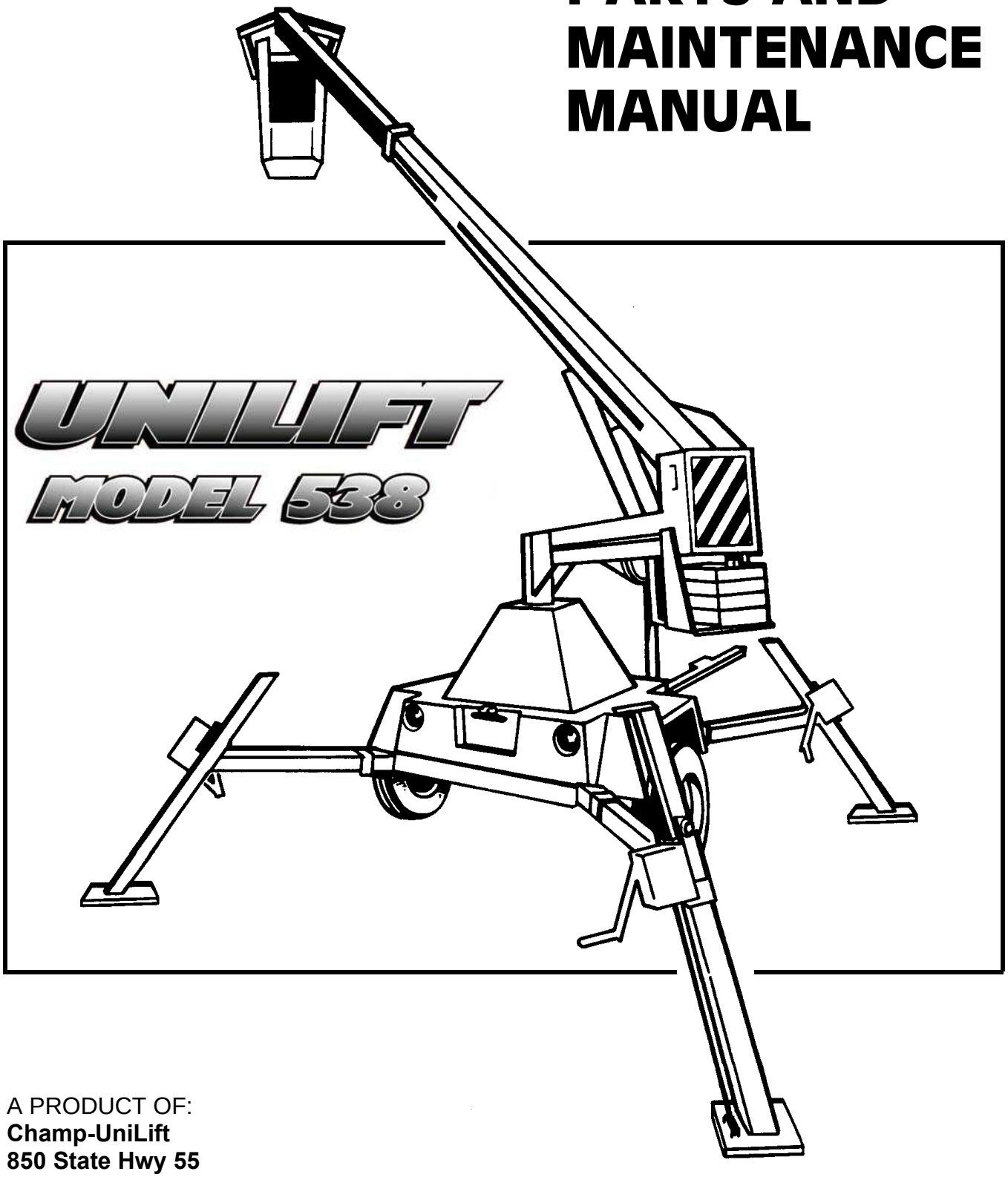
Universal Crane and Personnel Lift

PARTS AND MAINTENANCE MANUAL



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INNER BOOM ASSEMBLY REMOVAL

Refer to Figure 8-2.

1. Retract the inner boom fully and place the boom assembly into the boom cradle.
2. Pull out and set the outriggers to stabilize the unit.
3. Pull the bucket yoke lock pin and remove bucket. (See Figure 8-6)
4. Remove the access cover at the boom pivot (Figure 8-7, (1))
5. Remove the upper control cable electrical connections from the top side of the boom pivot terminal block (See Figures 5-4 or 5-4A).
6. Disconnect the hydraulic hoses (See Figure 8-1, (5)) at the hydraulic pump (1).
7. Support the weight of the inner boom and remove roller bearing assembly (1) and guide bushings (2).
8. Remove the cylinder pin (3).
9. Pull out the inner boom (32), supporting with a suitable hoist.
10. Reverse procedure to reassemble.

TELESCOPING HYDRAULIC CYLINDER REMOVAL

Refer to Figure 8-2.

1. Remove the inner boom assembly. (Follow instructions above.)
2. Remove the upper control panel and disconnect the wiring (See Figure 5-1 or 5-2).
3. Remove the roller assemblies (6).
4. Remove the cylinder pin (7).
5. Remove the mounting screws and the steel guide rod (28).
6. Pull out the cylinder assembly (11) from boom pivot end.
7. Reverse procedure to reassemble.

UPPER CONTROL CABLE REPLACEMENT

Refer to Figure 8-2.

1. Follow the instructions on this page to remove both inner boom and the telescoping cylinder.

PILOT OPERATED CHECK VALVE

Refer to Figure 8-2

1. Remove upper boom hydraulic cylinder. (Follow instructions above.)

2. Remove pilot operated check valve (12).

HYDRAULIC PUMP AND CYLINDER ASSEMBLY REMOVAL

Refer to Figure 8-1

1. Remove cover (2).

2. Disconnect fittings (7).

3. Disconnect blue, yellow, red and green leads (6) at pivot terminal block. (See Figure 5-4)

4. Disconnect power lead.

5. Disconnect screws (11) and remove hydraulic pump (1).

6. Take load off boom and remove pins (8) and (9).

7. Remove lower cylinder (3).

8. Reverse procedure to reassemble.

ROTATIONAL DRIVE ADJUSTMENT

Refer to Figure 8-3

1. Adjust main chain around 30-inch wheel (See Figure 8-3), by tightening set screw (1), located in periphery of wheel, until chain is snug but not stretched on rim. Chain should be centered on rim through 360°.

2. Sprocket tension is maintained by bolt (7) and spring (8). Adjusting stop screw with nut (6) is only used when removal of the sprocket is necessary. When properly adjusted, there will be about 1/16" clearance between the adjusting bolt and the adjacent mounting bracket. Rotate drive through 355°, making sure proper engagement is maintained through full rotation.

Refer to Figure 8-4

3. Adjust second stage drive (20), using adjustment bolt (12) at item (23) until chain is snug, but not stretched.

4. Adjust third and fourth stage belts by tightening adjusting tension screw (13) against tension spring (11) by three full revolutions of the nut after the nut first contacts the spring. Two belts will be adjusted by one adjuster. A belt deflection of ½" is correct.

ROTATIONAL DRIVE ADJUSTMENT (continued)

5. The motor drive belt must only be adjusted tight enough to operate the rotation drive. Use adjusting bolt (12) at item (5). When properly adjusted, correct belt deflection is 1". NOTE: Motor drive belt will appear loose; over tightening will cause damage to the motor bearings and premature wear to the rotation drive mechanism.

SHROUD ASSEMBLY REMOVAL

Refer to Figure 8-5

1. For ease of disassembly, rotate boom to one electrical stop.

2. Disconnect power leads to both batteries. (See Figure 8-7, Key No. 9 & 10.)

3. Remove the four screws holding the control panel (1) to the shroud (19) and set the control panel down onto the rotation assembly.

4. Remove upper and lower fiberglass inserts (17) and (18).

5. Remove all bolts at skirt of shroud (19).

6. Lift shroud (19) until trailer running light harness can be unplugged (plug located inside shroud at right side of shroud).

7. Reverse procedure to reassemble.

INSPECTION AND MAINTENANCE

Safe, reliable and economical service will be achieved if these preventative maintenance instructions are carefully followed. It is suggested that the preventative maintenance schedule included in this manual be used and kept current. Failure to provide proper maintenance will void the warranty. If an unsatisfactory condition is found, obtain immediate repair and adjustment. Failure to do so could result in unsafe operation and further damage to the unit.

DAILY

It is recommended that the following checks be performed each day before the unit is put into operation. A careful "walk around" is usually sufficient for the check.

1. Check the condition and operation of both the upper and lower control stations. Operate the up, clockwise and counter clockwise rotation, out, in, and down functions and verify proper operation.
2. Keep batteries fully charged. Batteries which are not kept at full charge will shorten operating time. Operating lift with low voltage will cause damage to solenoids.
3. Check for hydraulic leaks as evidenced by hydraulic fluid leaking from under the hydraulic pump, at the hoses, or out of the boom.
4. Visually check for loose bolts and nuts.
5. Visually check body harness, 4 ft. lanyard, and lanyard rings for wear or damage. Store body harness in a dry area, away from direct sunlight when not in use.
6. Visually check retainers on cylinder pins, lower boom to upper boom pivot pin, and the bucket and bucket yoke hinge & lock pins. Extend the inner boom and inspect the telescoping-cylinder pin and retainers.
7. Check warning and operating instruction decals for condition. Replace defaced decals immediately. Replacement decals available from the service parts department.
8. Check outrigger indicator lamp for operation (lamp should be on only when unit is set-up, ready to be operated).
9. Each time the lift is towed, check the ball coupler for proper adjustment and secure fit. If adjustment is needed, tighten the adjusting nut inside the coupler. Fit to the ball should be as tight as possible, with the locking latch still opening and closing freely. Be sure that the towing vehicle has a 2" hitch ball. Check condition of safety chains and trailer light connector.

   ⚠ **Do not** attempt to tow this lift with a hitch ball other than 2".
10. The Operator’s Manual is stored on the machine.

WEEKLY

It is recommended that the following checks, along with the daily checks, be made once a week on a given day of the week, such as Monday.

1. Check hydraulic fluid level by removing fill cap. Oil should be within 1" of the cap hole when boom is in the stored position. If necessary, add oil (Dexron III automatic transmission fluid).
2. Check battery conditions. If specific gravity is less than 1.175 or the voltage is less than 11 volts, recharge or replace battery. Add distilled water when necessary.
3. Check rotation chain and belt for proper tension. See “Rotation Drive Adjustment” on Page 3-2.
4. Carefully check all bolt tightness and re-tighten if necessary. Pay special attention to sub-frame bolts, lift mounting bolts, rotation drive bolts, and bucket mount bolts.
5. Check outriggers for functioning locking pins and signs of wear.

MONTHLY

It is recommended that the following checks be made every month, along with the checks listed in the daily and weekly lists. A good time to perform these checks would be the first Monday in each month.

1. Check the lift for structural soundness. Check all welds, booms, and lower cylinder end fittings for cracks or other signs of structural fatigue.

2. Check telescoping boom guide bearings for wear. Replace if necessary.

3. Lubricate grease fitting points. (See Figure 4-1.)

4. Check hoses and wiring harness carefully at points of wear and where they go through each entry to another component. Replace or repair as necessary.

5. Check for proper function of rotation limit switches.

6. Remove access cover at the pivot point and check upper and lower harnesses for frayed insulation. Check lower end of extension cylinder for leaks.

7. Inspect hydraulic oil for cleanliness. If cloudy or dirty, drain and replace with recommended oil.

8. Check proper function of lower boom up limit switch. (See Figure 5-3 and 5-8)

9. Check all outrigger switches for proper function.

10 Check that the lug nuts, wheels, and hubs are securely fastened.

11 Check tires for proper inflation (35 psi), wear, and damage.

ANNUALLY

1. Check hydraulic pressure. Remove the bucket, fully extend the boom and attach a 400 lb. load to the outer lanyard ring. Using the Lower Control Station, attempt to raise the load. If the unit will lift the 400 lbs. load, refer to Hydraulic Pressure Adjusting Procedure, Fig. 5-7 to correct the pressure setting.

2. Remove shroud. Clean frame, inspect welds and structure. Check axle cap screws, column and roller cap screws for tightness. Paint rusty areas as required.

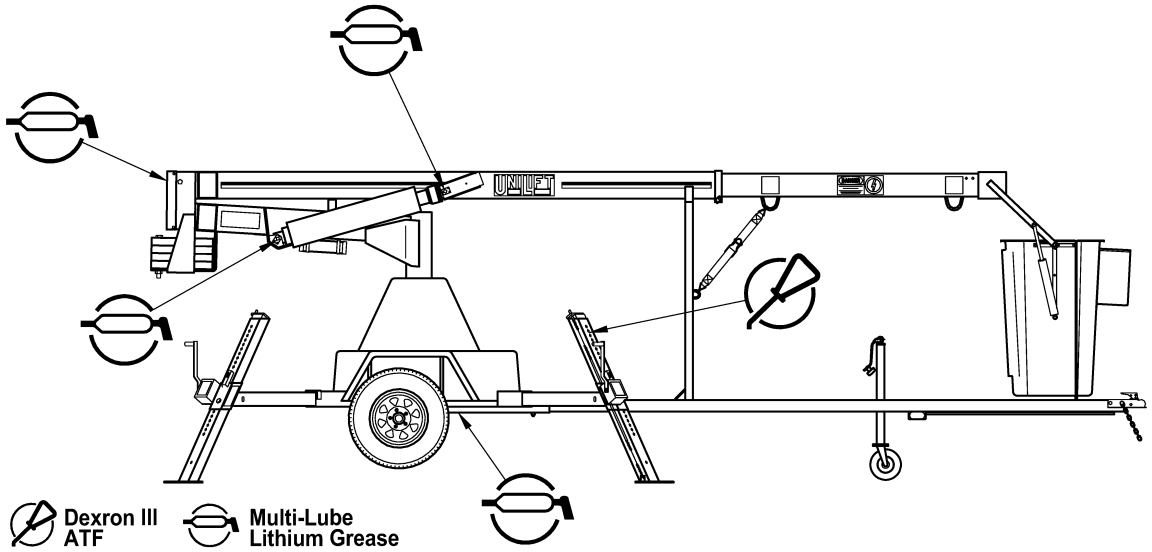


Figure 4-1
Lift/Crane Lubrication

Table 4-1 - Inspection and Maintenance Schedule

	Daily	Weekly	Monthly	Yearly
MECHANICAL				
Bolts, Nuts, Pins, and Covers (1)	✓			✓
Body Harness, 4 ft. Lanyard, & Lanyard Rings (1)	✓			✓
Cylinder Pin Retainers (1) and Boom Pivot Pin (1)	✓			✓
Bucket Hinge Pins (1) and Yoke Lock Pin (3)	✓			✓
Warning and Operating Instruction Decals (1)	✓			✓
Ball Coupler (1)(3) and Safety Chains (1)	✓			✓
Rotation Drive Chain (1)(3) and Drive Belt (1)(2)		✓		✓
Outriggers (1)(2)(5)		✓		✓
Structure and Welds (1)(5)			✓	✓
Boom Guide Bearings (1)(5)			✓	✓
Lubrication (See Figure 4-1)			✓	✓
Tires, Wheels, Hubs (1)(5)(6)			✓	✓
Rust (1)				✓
ELECTRICAL				
All Functions and Control Switches (1)(2)	✓			✓
Battery Charged (2)	✓			✓
Outrigger Indicator Lamp (2)	✓			✓
Battery Water Level (1)		✓		✓
Battery Electrolyte Condition (4)(7)				✓
Pedestal Wiring and Boom Pivot Wiring (1)(5)			✓	✓
Rotation Switches and Outrigger Switches (1)(5)			✓	✓
Battery Charger and Receptacle (1)(2)(5)			✓	✓
Terminals and Plugs (1)(3)			✓	✓
Lower-Boom Up-Limit Switch (1)(2)			✓	✓
HYDRAULIC				
Hydraulic Fluid Leaks (1)	✓			✓
Hydraulic Fluid Level (1)		✓		✓
Hydraulic Hoses (1)(3)(5)			✓	✓
Hydraulic Fluid Condition (1)(5)			✓	✓
Emergency Lowering Valve (2)			✓	✓

Notes:
(1) Visual Inspection
(2) Check Operation
(3) Tightness and Secure Fit
(4) Test Specific Gravity
(5) Signs of Wear and Fatigue
(6) Inflation - 35 psi
(7) Refer To Table 4-2

HYDRAULIC FLUID

The fluid in the hydraulic system serves as the means for power transmission, lubrication and cooling. Proper inspection and maintenance of the hydraulic system and fluid will have an important effect on how the system performs and on the life of the components.

IN-OPERATION CARE - Proper in-operation care of the hydraulic fluid includes:

1. Prevent contamination by keeping the system tight.
2. Follow the hydraulic fluid inspection intervals outlined in this manual as a minimum. Dirty and dusty operating conditions will require more frequent inspections.
3. Keep the reservoir filled properly to take advantage of the fluid's heat-dissipating properties and to prevent moisture from condensing on the inside tank walls.
4. Repair all leaks immediately.
5. If the fluid becomes "burnt" or breaks down, or if the system becomes contaminated, change the fluid immediately.

DRAINING & REFILLING THE HYDRAULIC TANK

To Drain the Hydraulic Tank:

1. Remove the pipe cap form the tee fitting on the underside of the hydraulic pump (see Figure 8-1, Item 12).
2. Attach a drain hose (1/4" NPT) to the tee fitting and place the hose in a suitable recovery container. (5-gallon minimum).
3. Using the Lower Control Station, activate the "EXTEND" function to turn on the pump and drain the hydraulic tank.
4. Release the switch immediately when the drain flow stops. This indicates that the fluid level is below the pickup-tube inlet.

NOTICE **Do not** run the hydraulic pump while the tank is empty. Operating the machine without oil in the system will damage the hydraulic pump.

To Refill the Hydraulic Tank:

1. Remove the drain hose and reinstall the pipe cap.
2. Remove the filler cap and add approximately 11-12 quarts of Dexron III automatic transmission fluid.
3. Replace the filler cap and cycle both cylinder completely.
4. Check the fluid level and add as necessary. Fluid level should be approximately 1-1/2" below the bottom of the filler neck.

Deep Cycle Batteries Diagnosis Chart

STEP 1

EXAMINE BATTERIES, CABLES, ETC.

- Batteries defective (broken post, broken case, broken cover). Repair or replace.
- Cables defective (cracked, corroded, sulfated, etc.) Repair or replace.

Batteries & cables appear ok. Check open circuit voltages.

- Approximately 0, 2, 4 volts. One or more defective cells. Replace battery. Zero volts may indicate a "dry" cell.
- Less than 5.8 volts per battery. Check electrolyte levels. If ok, recharge. Possibly a defective cell. Probably a cell with low electrolyte level.
- 5.8 to 6.1 volts. Check electrolyte levels. If ok, recharge. Probably only discharged. Possibly a cell with low electrolyte level.
- 6.3 volts or higher. Battery fully charged, possibly with "surface charge". Can also use a "load tester" to detect possible defective cells.

STEP 2

CHARGING TEST

Connect charger to batteries and then to AC lines. Set timer to "1".
Read initial charge current, and current after 15 minutes. If you have a sensitive voltmeter, connect this from post to post in parallel with each connection cable.
Voltage drop should be less than .010 volts (10MV) per cable with charge current ≥20 amps.

- Initial – over 25 amps. 15 minutes – over 10 amps. Batteries discharged. Give full charge. Possibly a defective cell.
- Initial – over 25 amps. 15 minutes – 5 - 15 amps. Batteries fully charged. Batteries old. Possibly a defective cell.
- Initial – over 15 amps. 15 minutes – less than 5 amps. Batteries fully charged. Batteries are all probably ok.
- No reading. Check charger and cirucits.

STEP 3

EXAMINATION AFTER RECHARGE

Check electrolyte gravity and temperature, and battery voltage.

- Gravities – low & uniform. Temperature – ambient. Cells overfilled, flushed or spilled. Insufficient recharge; give an equalizing charge.
- Gravities – vary. Temperature – ambient. Check levels; add water to low cells; give an equalizing charge.
- Gravities – vary. Temperature – varies. "Hot" cells may be defective.
- Gravities – high & uniform. Temperature – slightly above ambient. Batteries probably ok for service or test below.

STEP 4

DISCHARGE TEST

Run the **UniLift** . Check the voltages and/or gravities after running.
OR
Attach a 75 amp load bank. Check the voltage and/or gravities after running.

6 Volt UniLift Battery Discharge Test – Normal Readings

VOLTAGE UNDER LOAD	SPECIFIC GRAVITY	INTERPRETATION
5.95 to 6.10	1.255 to 1.280	Fully charged batteries at beginning of discharge
5.60	1.200 to 1.210	Batteries 50% discharged (after 40 or more minutes at 75 amps)
5.20 to 5.35	1.140 to 1.165	Batteries at end of discharge (after 80 or more minutes at 75 amps)

STORAGE OF BATTERIES

⚠ WARNING See safety precautions on page 4-7 before servicing batteries

Deep cycle batteries should be fully charged, clean and dry if they are to be stored for any length of time. Store in an unheated, dry area. Check the specific gravity of the electrolyte periodically with a hydrometer or boost charge every three months. If the specific gravity is being checked, recharge the battery when it reaches 1.220. The time it takes the battery to reach 1.220 depends on its condition and the temperature. The colder the storage area, the slower the battery will self-discharge. A normal time between charges is three months.

NOTICE

New deep cycle batteries do not have their full capacity until they have been cycled several times (somewhere between 5 and 40 cycles). Therefore, they can be excessively discharged early in their application, thereby shortening their service life. Accordingly, it is advisable to limit operation of new lifts or older lifts with new batteries to well below their advertised range for at least the first 5 cycles and then gradually increase the range.

Table 4-2 - Battery Charge State

APPROXIMATE STATE OF CHARGE
Specific Gravity

CHARGED	1.300 INITIAL FULL CHARGE	1.280 INITIAL FULL CHARGE	1.265 INITIAL FULL CHARGE
100%	1.300	1.280	1.265
75%	1.255	1.240	1.225
50%	1.215	1.200	1.190
25%	1.180	1.170	1.155
DISCHARGED	1.160	1.140	1.120

NOTE: Cell Temperature 80° F (26.7° C)

⚠ CAUTION

Although battery products do contain lead, the products - in their finished, packaged condition - do not pose any significant risk to individuals who are exposed to battery products being utilized in a proper manner. The batteries should be secured in an upright position and plastic vent caps should be secured to the batteries at all times. If the batteries become damaged or need to be replaced, dispose of the batteries through a licensed scrap battery agent.

BATTERY REPLACEMENT

519530	6V Deep Cycle 220 Amp Hr	BCI #GC2	(S/N: . . .1999)
519607	6V Deep Cycle 250 Amp Hr	-	(S/N: 2000 - . . .)

SAFETY PRECAUTIONS

DANGER OF EXPLODING BATTERIES

Batteries contain sulfuric acid and produce explosive mixtures of hydrogen and oxygen. Because self-discharge action generates hydrogen gas even when the battery is not in operation, make sure batteries are stored and worked on in a well-ventilated area. ALWAYS wear ANSI Z87.1 (U.S. standard) approved safety glasses and face shield or splash proof goggles when working on or near batteries:

- **Always wear proper eye, face and hand protection.**
- **Keep all sparks, flames and cigarettes away from the battery.**
- **Never try to open a battery with non-removable vents. (See Fig. 1 for the wording and symbols currently used on vent caps.)**
- **Keep removable vents tight and level except when servicing electrolyte.**
- **Make sure work area is well ventilated.**
- **Never lean over battery while boosting, testing or charging.**
- **Exercise caution when working with metallic tools or conductors to prevent short circuits and sparks.**

SAFE CHARGING

Never attempt to charge a battery without first reviewing the instructions for the charger being used. In addition to the charger manufacturer's instructions, these general precautions should be followed:

- **Always wear proper eye, face and hand protection.**
- **Always charge batteries in a well-ventilated area.**
- **Keep vents tight and level.**
- **Unplug the charger before connecting the leads to the battery to avoid dangerous sparks.**
- **Never try to charge a visibly damaged or frozen battery.**
- **Connect the charger leads to the battery; red positive (+) lead to the positive (+) terminal and black negative (-) lead to the negative (-) terminal. Be sure the Key Switch and all electrical accessories are turned off.**
- **Make sure that the charger leads to the battery are not broken, frayed or loose.**
- **If the battery becomes hot, or if violent gassing or spewing of electrolyte occurs, unplug the charger temporarily.**
- **Unplug charger before removing charger leads from the battery to avoid dangerous sparks.**

Figure 4-2 - Danger/Poison Warning Message

HANDLING BATTERY ACID

Battery acid, or electrolyte, is a solution of sulfuric acid and water that can destroy clothing and burn the skin. Use extreme caution when handling electrolyte and keep an acid neutralizing solution - such as baking soda or household ammonia mixed with water - readily available. When handling batteries:

- **Always wear proper eye, face and hand protection.**
- **If the electrolyte is splashed into an eye, immediately force the eye open and flood it with clean, cool water for at least 15 minutes. Get prompt medical attention.**
- **If electrolyte is taken internally, drink large quantities of water or milk. DO NOT induce vomiting. Get prompt medical attention.**
- **Neutralize with baking soda any electrolyte that spills on a vehicle or in the work area. After neutralizing, rinse contaminated area clean with water.**

To prepare electrolyte of a specific gravity, always pour the concentrated acid slowly into the water; **DO NOT pour water into the acid.** Always stir the water while adding small amounts of acid. If noticeable heat develops, allow the solution to cool before continuing to add acid.

TROUBLE SHOOTING

Before beginning any trouble shooting procedures, check and make sure the batteries are at the proper voltage level. Low battery voltage can cause erratic operation and difficulty in trouble shooting the electrical system.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Dead controls at both base and platform.	Dead batteries.	Recharge or replace batteries.
	Lower control station keyswitch (1KS) turned OFF or defective.	Turn switch to ENABLE or replace defective keyswitch.
	Circuit breaker (1CR) tripped or defective.	Reset or replace circuit breaker.
	Lower control station emergency stop pushed in or defective.	Twist switch to release or replace defective switch.
	Outriggers not properly set.	Reset outriggers - green light will come on.
	Outrigger switch(es) defective.	Replace defective switch(es).
	Platform control station ON-OFF switch OFF or defective. (S/N: 1098 - 1423)	Turn switch ON or replace defective switch.
	Blown fuse (1FU) in 5° switch circuit.	Replace fuse.
	5° switch (8LS) activated or defective.	Level unit or replace defective switch.
	Leveling switch relay (7CR) defective.	Replace defective leveling switch relay.
Controls at base OK, Platform control station dead.	ON-OFF switch at platform control station turned OFF or defective. (S/N: 1098-1423).	Turn switch to ENABLE or replace defective switch.
	Emergency Stop switch at platform control station disabled or defective. (S/N: 2235 - ...)	Activate switch to ENABLE or replace defective switch.
	Platform control-lower control switch at base defective	Replace switch.
	Platform control station DOWN OVERIDE-OFF-ENABLE switch not actuated.	Hold switch to ENABLE and use controls.
	Batteries low	Charge batteries.
	Broken wiring or loose connection from base to platform control station.	Repair or replace wiring (run continuity check).
Controls at base OK, Platform control station intermittent.	Batteries low.	Charge batteries.
	Defective wiring in telescoping boom.	Repair or replace platform control cable.
	Defective wiring from base to lower boom terminal strip.	Repair or replace lower control cable.
No rotation - all other controls OK.	Defective rotation motor.	Repair or replace rotation motor.
	Rotation Interlock Relay (5CR) defective.	Replace relay.
	Rotation switch (4S) defective.	Replace switch.
	Belt or chain slipping or broken.	Repair or replace broken part(s).
	Worn or broken drive sprocket.	Replace drive sprocket.
	Broken wiring or loose connection.	Repair or replace wiring.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
No CW rotation - all other controls OK.	1CR or 4CR solenoid defective (S/N: 1098-1423).	Replace solenoid.
	CW rotation solenoid (2CR) defective.	Replace solenoid.
	CW limit switch (2LS) defective.	Replace CW limit switch.
	Rotation switch (4S) defective.	Replace switch.
	Rotation motor (1M) defective.Broken, loose or shorted wiring.	Repair or replace motor.Repair or replace defective wiring.
No CCW rotation - all other controls OK.	2CR or 3CR solenoid defective (S/N: 1098-1423).	Replace solenoid.
	CCW rotation solenoid (1CR) defective.	Replace solenoid.
	CCW limit switch (1LS) defective.	Replace CW limit switch.
	Rotation switch (4S) defective.	Replace switch.
	Rotation motor (1M) defective.	Repair or replace motor.
	Broken, loose or shorted wiring.	Repair or replace defective wiring.
Rotation intermittent.	Loose belt in rotation drive	Rotate boom to point of intermittent rotation. Determine which belt is slipping and tighten that belt.
	Drive pulley on rotation motor loose	Tighten drive pulley setscrew.
	Poor engagement of the drive sprocket	Adjust or replace drive sprocket.
	Defective rotation motor	Replace rotation motor.
	Loose connection on the rotation motor.	Tighten connections on rotation motor.
Rotation OK, but no other functions.	Pump solenoid (8CR) defective (S/N: 1098-1423).	Replace solenoid.
	Pump solenoid (4CR) defective.	Replace solenoid.
	Hydraulic pump or pump motor defective.	Repair or replace hydraulic pump.
	Defective diode assembly.	Replace diode assembly.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Platform control station - no RAISE and/or LOWER.	RAISE/LOWER switch at platform control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Platform control station - no RETRACT and/or EXTEND	RETRACT/EXTEND switch at platform control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Platform control station - no CW and/or CCW rotation.	Rotation switch at platform control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Platform control station OK, pedestal controls dead or intermittent.	Platform control/lower control switch at base defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Base only - no RAISE and/or LOWER.	RAISE/LOWER switch at lower control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Base only - no RETRACT and/or EXTEND.	RETRACT/EXTEND switch at lower control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Base only - no CW and/or CCW rotation.	Rotation switch at lower control station defective.	Replace switch.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
No RAISE at platform control station or base - all other functions OK.	Up limit switch (7LS) activated or defective.	Adjust or replace limit switch.
	UP interlock solenoid (10CR) defective (S/N: 1098-1423).	Replace solenoid.
	Defective diode assembly.	Replace diode assembly.
	Defective pump solenoid (4CR).	Replace pump solenoid.
	Pump solenoid (8CR) defective (S/N: 1098-1423).	Replace pump solenoid.
	Defective UP solenoid valve in pump assembly.	Repair or replace pump assembly.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
No LOWER at platform control station or base - all other functions OK.	Defective LOWER solenoid valve in pump assembly.	Repair or replace pump assembly.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
No EXTEND at platform control station or base - all other functions OK.	EXTEND interlock solenoid (9CR) defective (S/N: 1098-1423).	Replace solenoid.
	Defective diode assembly.	Replace diode assembly.
	Defective pump solenoid (4CR).	Replace pump solenoid.
	Pump solenoid (8CR) defective (S/N: 1098-1423).	Replace pump solenoid.
	Defective EXTEND solenoid valve in pump assembly.	Repair or replace pump assembly.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
No RETRACT at platform control station or base - all other functions OK.	Defective diode assembly.	Replace diode assembly.
	Defective pump solenoid (4CR).	Replace pump solenoid.
	Pump solenoid (8CR) defective (S/N: 1098-1423).	Replace pump solenoid.
	Defective RETRACT solenoid valve in pump assembly.	Repair or replace pump assembly.
	Pilot operated check valve defective.	Repair or replace cheek valve.
	Loose, broken, or shorted wiring.	Repair or replace defective wiring.
Slow start and stop of RETRACT/EXTEND and RAISE/LOWER movements.	Low hydraulic fluid.	Replace lost fluid and repair leak(s).
	Dirt or foreign material in hydraulic system.	Drain and replace hydraulic fluid.
	Pressure relief valve set too low.	Adjust pressure relief valve to 1250 psi maximum.
	Batteries low.	Recharge batteries.
	Defective pump/motor assembly.	Repair or replace pump/motor assembly.
Two movements occur when only one switch is activated	Shorted wiring.	Repair or replace defective wiring.
	Defective diode(s).	Replace diode assembly.

ELECTRICAL SYSTEM DESCRIPTION

The following section contains detailed explanations of the control panel and other electrical components. This information will be very helpful when used with the trouble shooting chart beginning on Page 5-1.

CONTROL PANEL (S/N: 1424 and up)

The standard control panel has 5 solenoids mounted on it (units equipped with an optional 5° leveling switch will have another solenoid mounted on the battery hold down). The solenoids are designated 1CR, 2CR, 3CR, 4CR, & 5CR. The solenoids are identified on the Electrical Diagram, and the physical locations are shown in Figure 8-10 - Lower Control Panel Assembly, in the Parts Section.

3CR - Battery Shut-off Solenoid
The battery shut-off solenoid (3CR) switches the battery power going to the hydraulic pump and rotation motor. 3CR is off (contact open) until a function (in, out, up, down, rotation) is activated. When the solenoid is energized, the contact closes, supplying battery current to the hydraulic pump and/or rotation motor. When the function switch is released the solenoid de-energizes and the contact opens.

4CR - Pump Relay
The pump relay (4CR) turns on the hydraulic pump motor during RAISE, RETRACT, and EXTEND functions. The pump does not operate during the LOWER function.

5CR - Rotation Interlock Relay
The rotation interlock relay (5CR) supplies electrical power to the rotation motor circuit when either CW or CCW rotation is activated. The 5CR contact serves as a safety interlock in that it breaks positive (+) current going to either 1CR or 2CR when the rotation switch is released.

1CR & 2CR - Rotation Positive Switching Relays
1CR controls CCW rotation, while 2CR controls CW rotation. The direction of travel is determined by switching the polarity of the rotation motor wires using 1CR & 2CR relays.

Optional **7CR - Leveling Switch Relay**
The leveling switch relay (7CR) is used as a relay with the optional 5° safety switch. The 7CR contact is normally closed, allowing the unit to operate. Whenever the 5° switch is activated, 7CR energizes and opens the contact prohibiting up, out, and rotation functions. The machine will allow in and down functions only.

BATTERY CHARGER CONTROL CIRCUIT

The battery charger is powered by 110 VAC. The receptacle is located directly beneath the ammeter assembly on the shroud. The black lead from the battery charger is connected to the ground terminal on the battery. The red lead from the battery charger is connected to the battery charger cutout relay (6CR). From 6CR the circuit connects to the ammeter then continues on to the positive battery terminal. The purpose of the battery charger cutout relay (6CR) is to protect the battery charger while the batteries are charging and the lift is in use. Whenever a function is activated, 6CR is energized and opens the contact on the positive feed to the batteries until the function is discontinued.

DIODE ASSEMBLIES

The unit is equipped with three diode assemblies. The description, location, and function of the diode assemblies follows.

Diode Assembly on Pump Relay (4CR)
The red and green wires from the RETRACT/EXTEND switch, and the blue wire from the RAISE/LOWER switch each have a diode soldered in line. The three diodes form a single line with a ring terminal that connects to the small coil terminal on 4CR (pump relay). Depending on which function is being used (RETRACT, EXTEND, or RAISE), 4CR is energized which allows the hydraulic motor and pump to operate with the corresponding solenoid valve in the pump valve assembly. The purpose of the diode assembly on 4CR is to insure that only one solenoid valve is open in the pump valve assembly at any given time.

Diode Assemblies cont'd.

For example:
The red wire controls the RETRACT solenoid valve; the green wire controls the EXTEND solenoid valve; and the blue wire controls the RAISE solenoid valve. If the diode on the blue (up) wire is defective, and the EXTEND function is activated (green line energized), the unit could possibly raise at the same time. If the diode on the green (EXTEND) wire is defective, and the RETRACT function is activated, the pump would run but no movement would occur since both solenoid valves would be open at the same time.

Any time a pump problem is encountered, such as erratic operation or incorrect RETRACT, EXTEND, or RAISE functions, the diode assembly is the first component to check. Remember, a diode should only allow current flow in one direction, otherwise it is defective.

Diode Assembly on Battery Charger Cutout Relay (6CR)
The white wire from 1CR (ccw rotation), the orange wire from 2CR (cw rotation), and the brown wire from 4CR (pump relay) each have a diode soldered in line. The three diodes form a single line with a ring terminal that connects to the small coil terminal on 6CR (battery charger cutout relay). Whenever the cw or ccw rotation switch is activated, or a function that runs the hydraulic pump is used, the 6CR (battery charger cutout relay) contact opens.

If the diode in the brown wire from 4CR (pump relay) is defective, the hydraulic pump will also turn on when the rotation switch is activated. If a diode in the orange or white wires is defective, the unit will also rotate when a hydraulic pump function (RETRACT, EXTEND or RAISE) is used.

Diode Assembly on Rotation Interlock Relay (5CR)
The white wire from 1CR (ccw rotation relay) and the orange wire from 2CR (cw rotation relay) have a diode soldered in line. The two diodes form a single line with a ring terminal that connects to the small coil terminal on 5CR (rotation interlock relay). Whenever the cw or ccw directional switch is activated 5CR is energized, closing the contact and allowing power to reach the 1CR and 2CR contacts that control direction in the rotation motor circuit.

If either of these diodes are defective, current will reach both 1CR (ccw rotation relay) and 2CR (cw rotation relay). This will cause the rotation motor to lock-up and not move either direction.

SAFETY SWITCHES

Outrigger Safety Switches
The unit is equipped with four outrigger safety switches wired in series. The switches are mounted on the frame, underneath each horizontal outrigger. The switches are activated when all four outriggers are pulled out to the locked position and cranked up. When properly set, the outrigger places pressure on the safety switch arm, causing the contact to close. When all four outriggers are properly set, the green light on the control panel will be on, and the unit is operable. When the outriggers are not properly set (wheels not ½" off the ground), boom movements can cause an outrigger to "unload" and open the switch contact, resulting in intermittent operation.

To test the set-up: *Put on the body harness, enter the bucket, and attach the lanyard. Extend the boom all the way out, and raise the bucket 2-3 feet. Activate and hold the "DOWN" switch until the boom is completely lowered, contacting the boom stop block (a slight bouncing may occur in the bucket). Repeat this procedure throughout the full range of rotation. Any intermittent motion, or blinking of the green light, indicates that the outriggers need to be reset (refer to "Setting the Outriggers" in the Operator's Manual).*

Up Limit Switch
This switch is used to prevent the boom from being raised too high and causing as over-center condition. The up limit switch is mounted at the rear of the boom, behind the cover plate directly above the counterweights. If this switch becomes defective, the pump motor will still run, but the boom will not raise

Rotation Limit Switch
The unit is equipped with two rotation limit switches. The rotation limit switches are mounted below the rotation wheel behind the batteries. When one of the switches is activated, travel in that direction is stopped. The machine will still rotate the opposite way. If a rotation limit switch is defective, it will prevent rotation in that direction.

Figure 5-1
Upper Control Panel Wiring
S/N E100-1423

ITEM	PART NO.	QTY	DESCRIPTION
1	513926	1	Toggle Switch On-Off
2	4500317	1	Jumper Wire Assy.
3	513925	3	Toggle Switch On-Off-On
4	590588	1	Control Plate

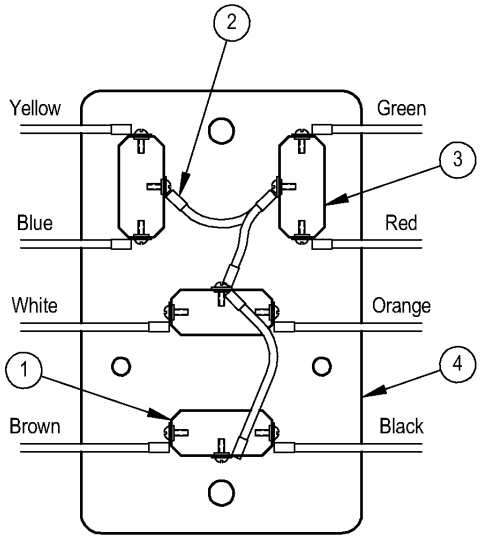
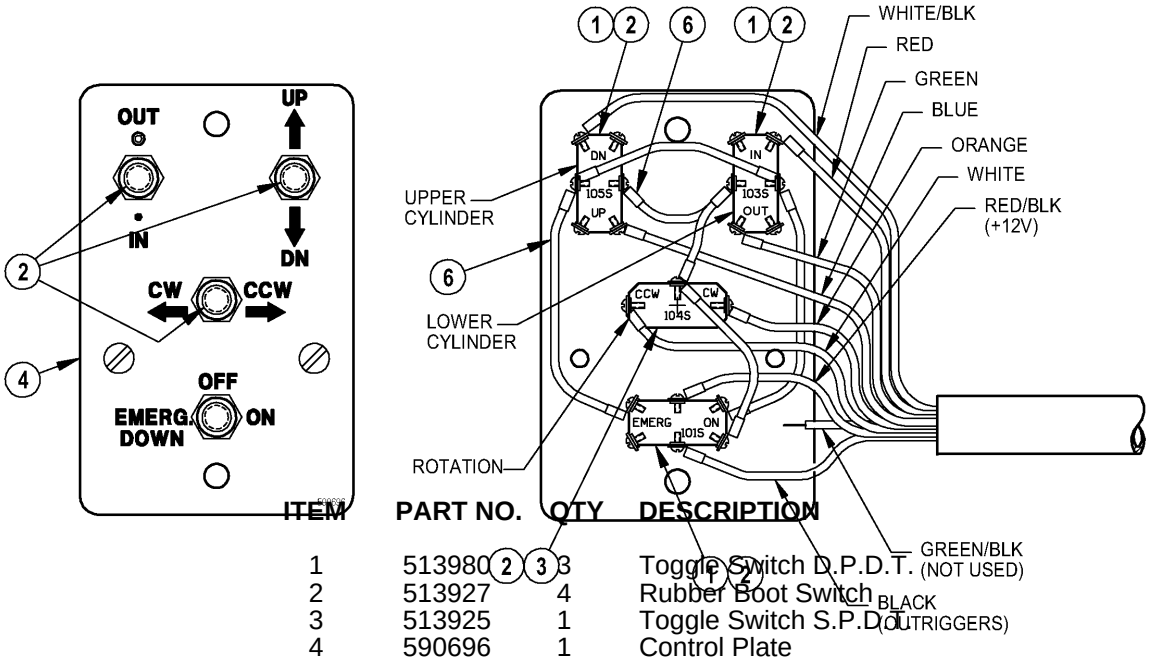
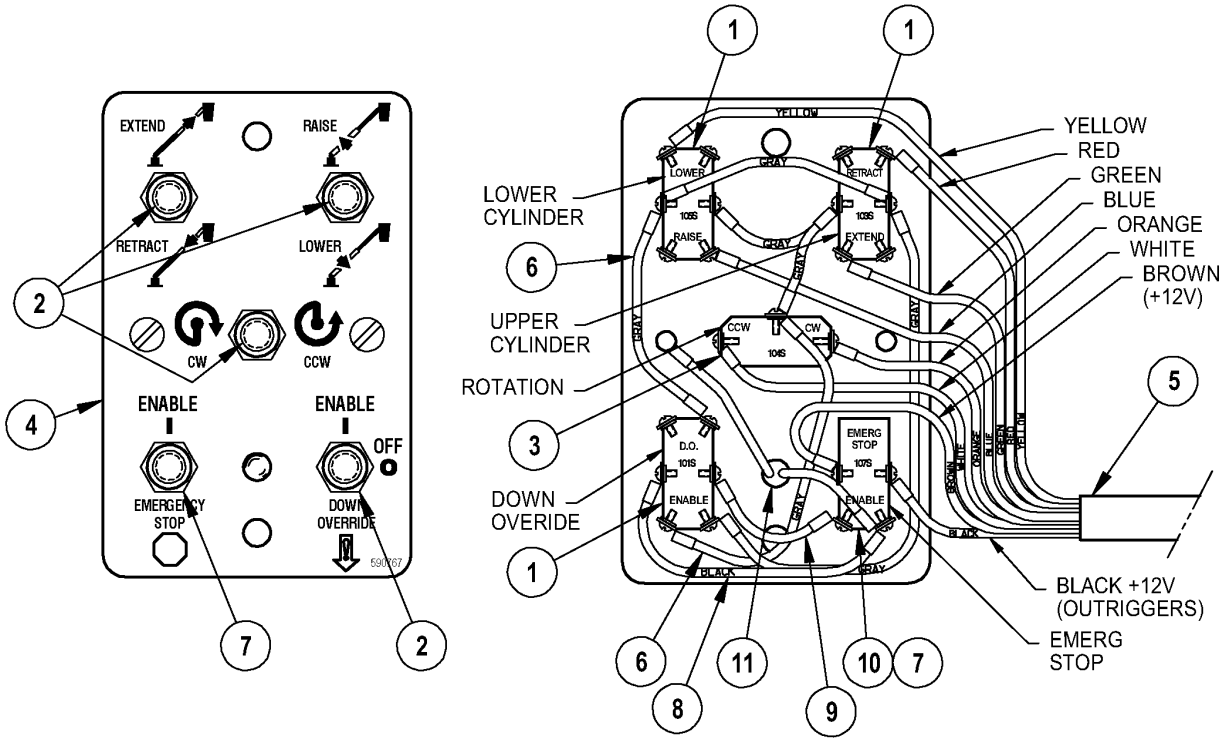


Figure 5-2
Upper Control Panel Wiring
S/N 1424 - 2234



ITEM	PART NO.	QTY	DESCRIPTION
1	513980	3	Toggle Switch D.P.D.T.
2	513927	4	Rubber Boot Switch
3	513925	1	Toggle Switch S.P.D.T.
4	590696	1	Control Plate
5	4500470	1	Coil Cable Wire
6	4500840	2	Gray Wire

Figure 5 - 2A
Upper Control Panel Wiring
S/N 2235 -



KEY NO.	PART NO.	DESCRIPTION
1	513980	Switch - Toggle D.P.D.T.
2	513927	Black Rubber Boot
3	513925	Switch - Toggle S.P.D.T.
4	590767	Control Plate
5	4500470	Coil Cable Wire Assy
6	4500840	Gray Wire Assy
7	513927R	Red Rubber Boot
8	4500954	Black Wire Assy
9	4500955	Brown Wire Assy
10	513986	Switch - Toggle D.P.S.T
11	519615	Lamp - Miniature Yellow

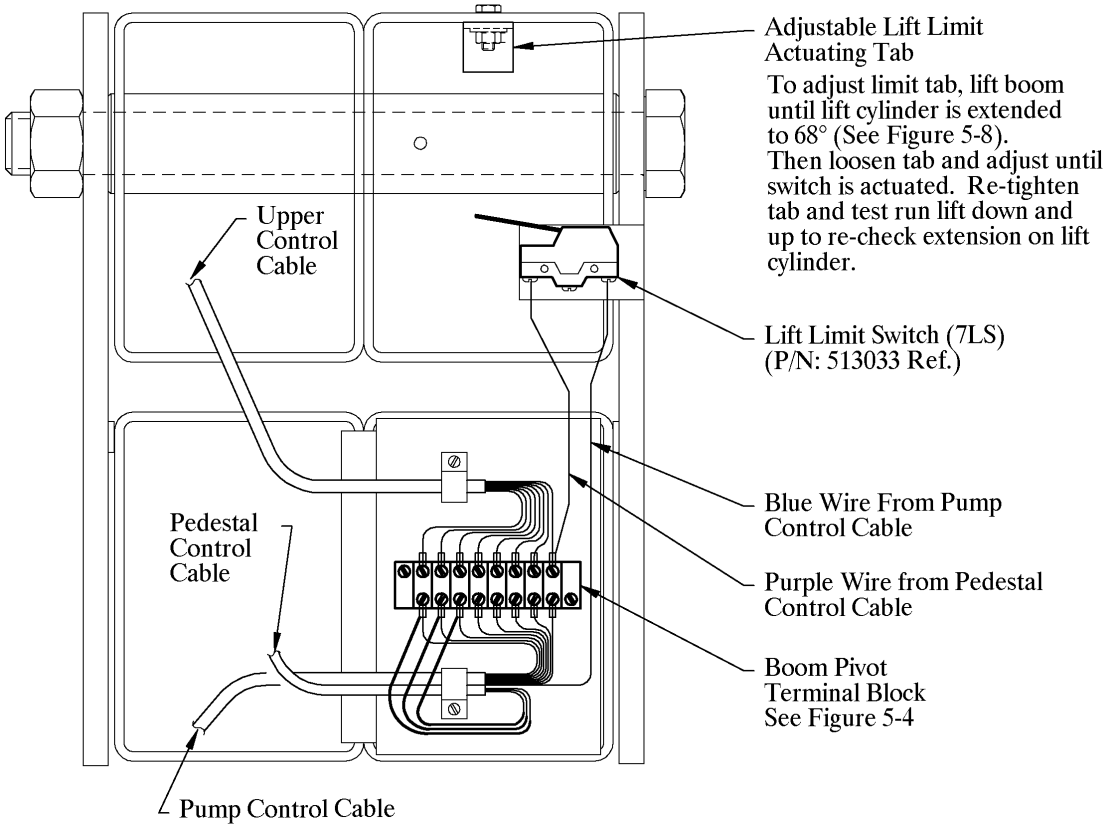


Figure 5-3
Upper to Lower Boom Wiring
S/N 1098-1423 (1988-1992)

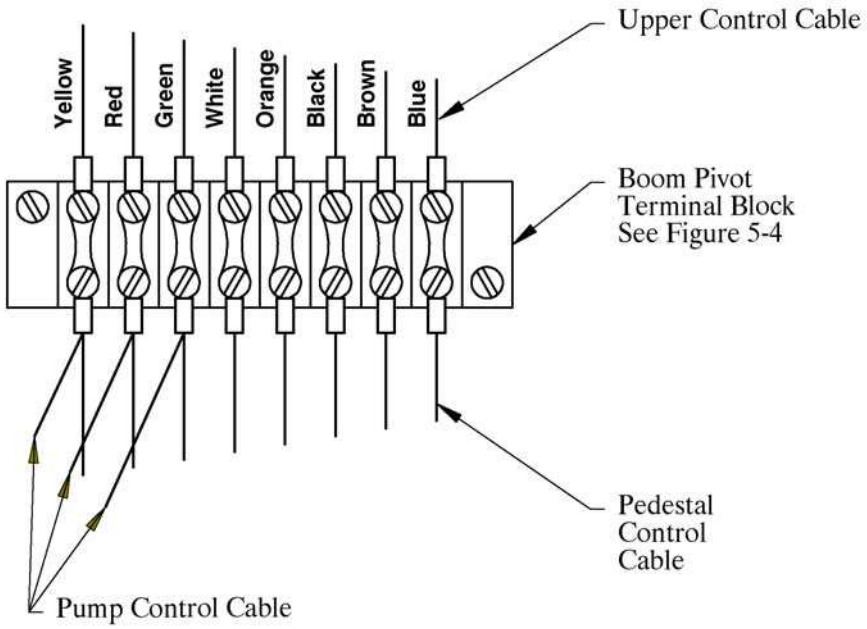
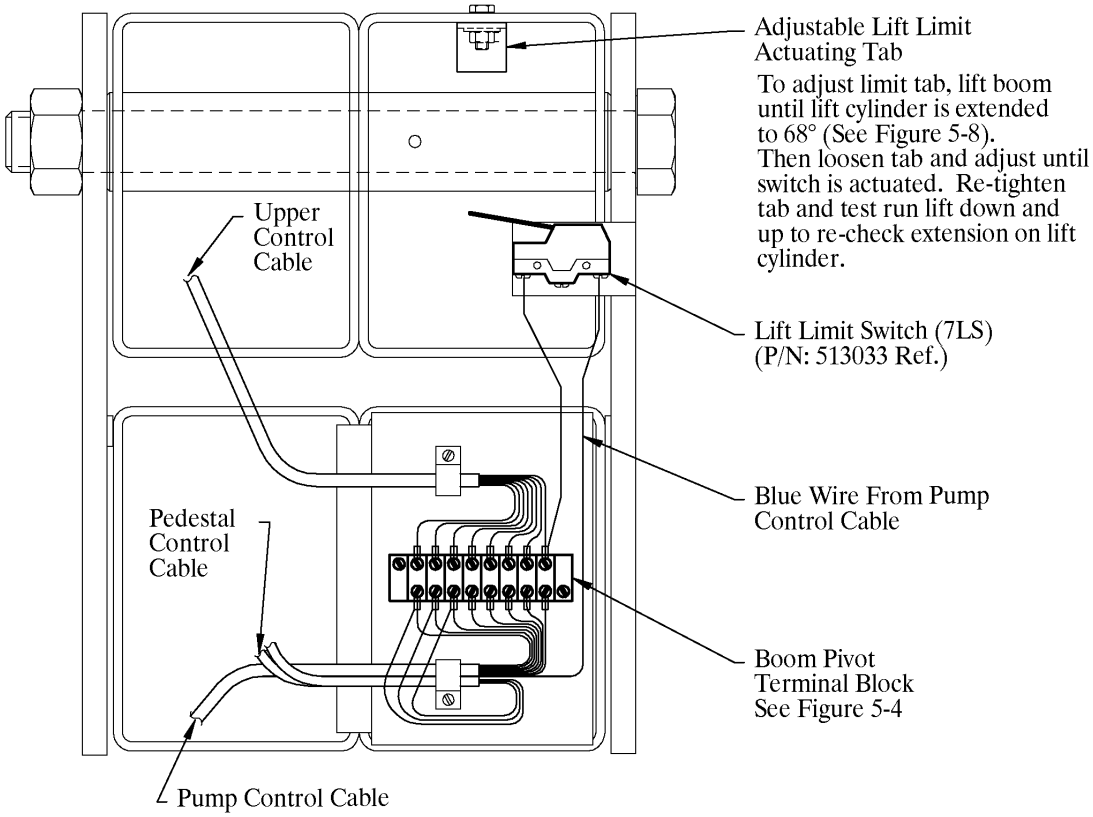


Figure 5-4
Upper to Lower Boom Wiring
S/N 1098-1423 (1988-1992)

Figure 5-3A



Upper to Lower Boom Wiring
S/N 1424 & Up (1993-)

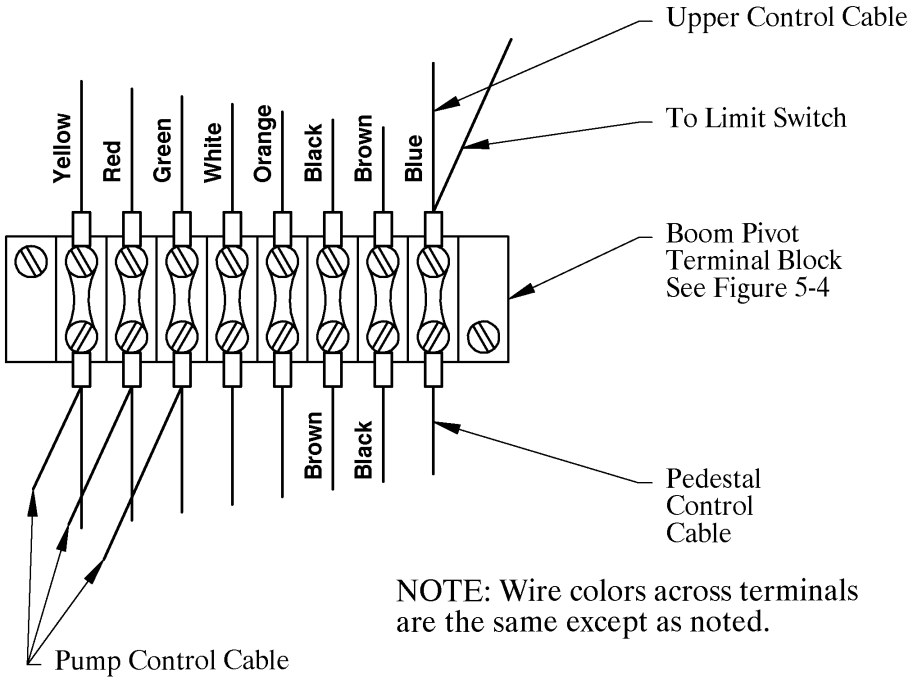


Figure 5-4A
Upper to Lower Boom Wiring
S/N 1424 & Up (1993-)

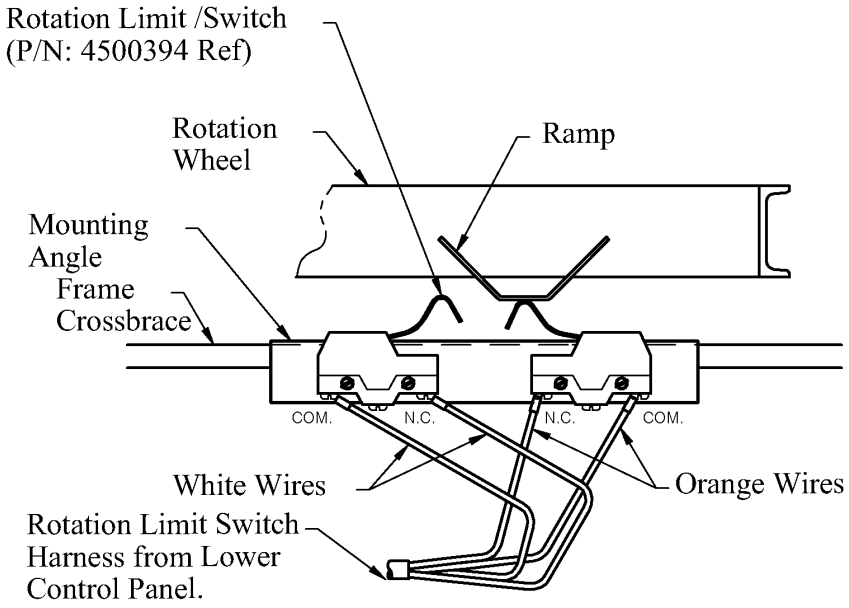


Figure 5-5
Rotation Limit Switch Wiring

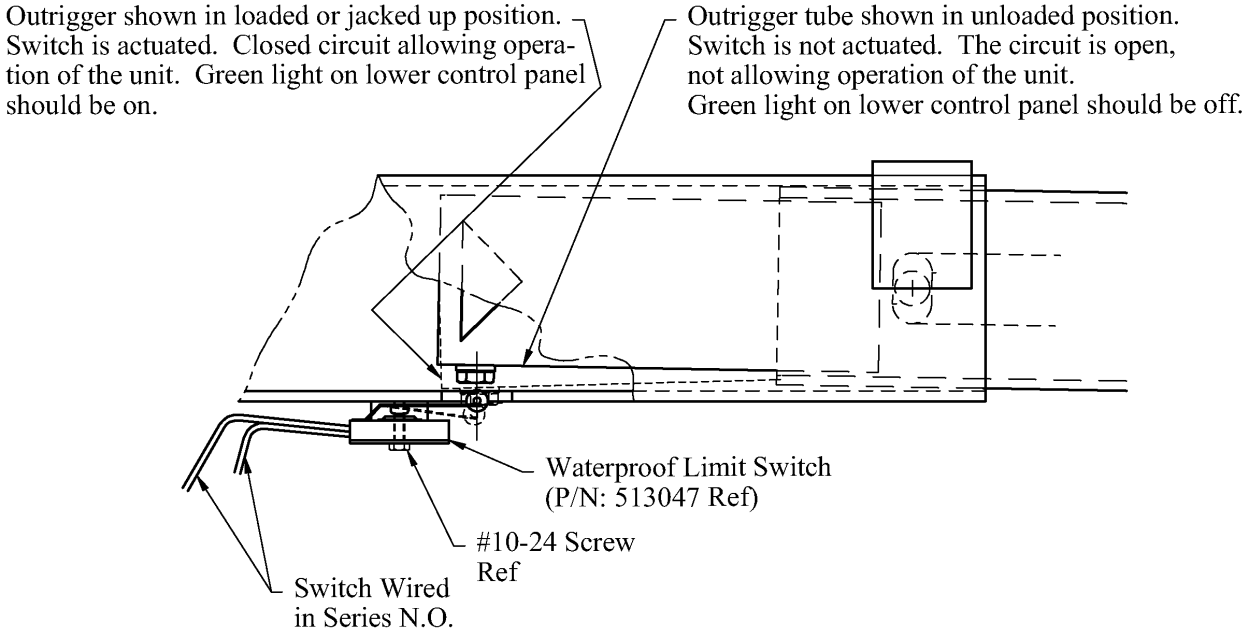
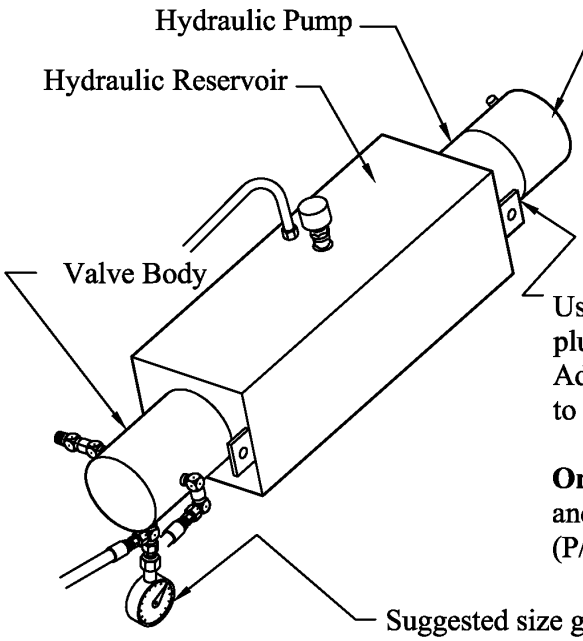


Figure 5-6
Outrigger Limit Switch Wiring

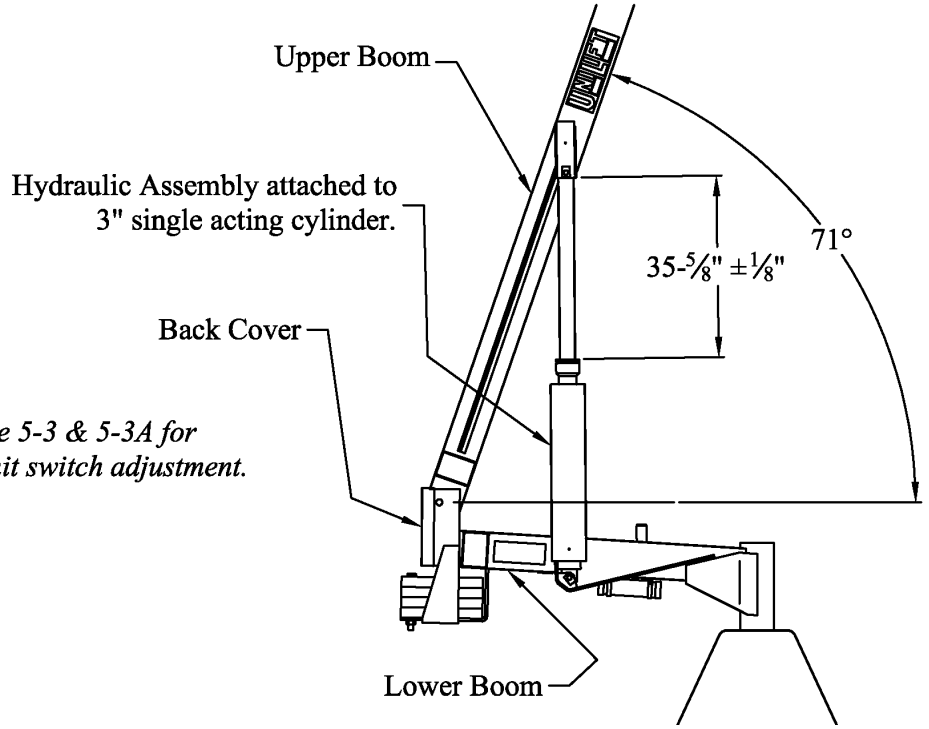


NOTE: The telescoping boom must be fully extended, and the fluid must be cold when setting the hydraulic system pressure.

Use a 1/4" Allen Wrench to remove the lower hole plug (hold a rag under the plug for drippage). Adjust inner screw, using a flat blade screw driver, to a hydraulic pressure setting of 1350 - 1400 PSI.

On Models Beginning 1992, a 3/16" Allen Wrench and 9/16" socket is required. A special tool kit (P/N 529044) is available for this adjustment.

Figure 5-7
Hydraulic Pressure Adjusting Procedure



Note: See Figure 5-3 & 5-3A for details of lift limit switch adjustment.

Figure 5-8
Lift Cylinder Length For Lift Limit Switch Adjustment

ELECTRICAL DIAGRAM

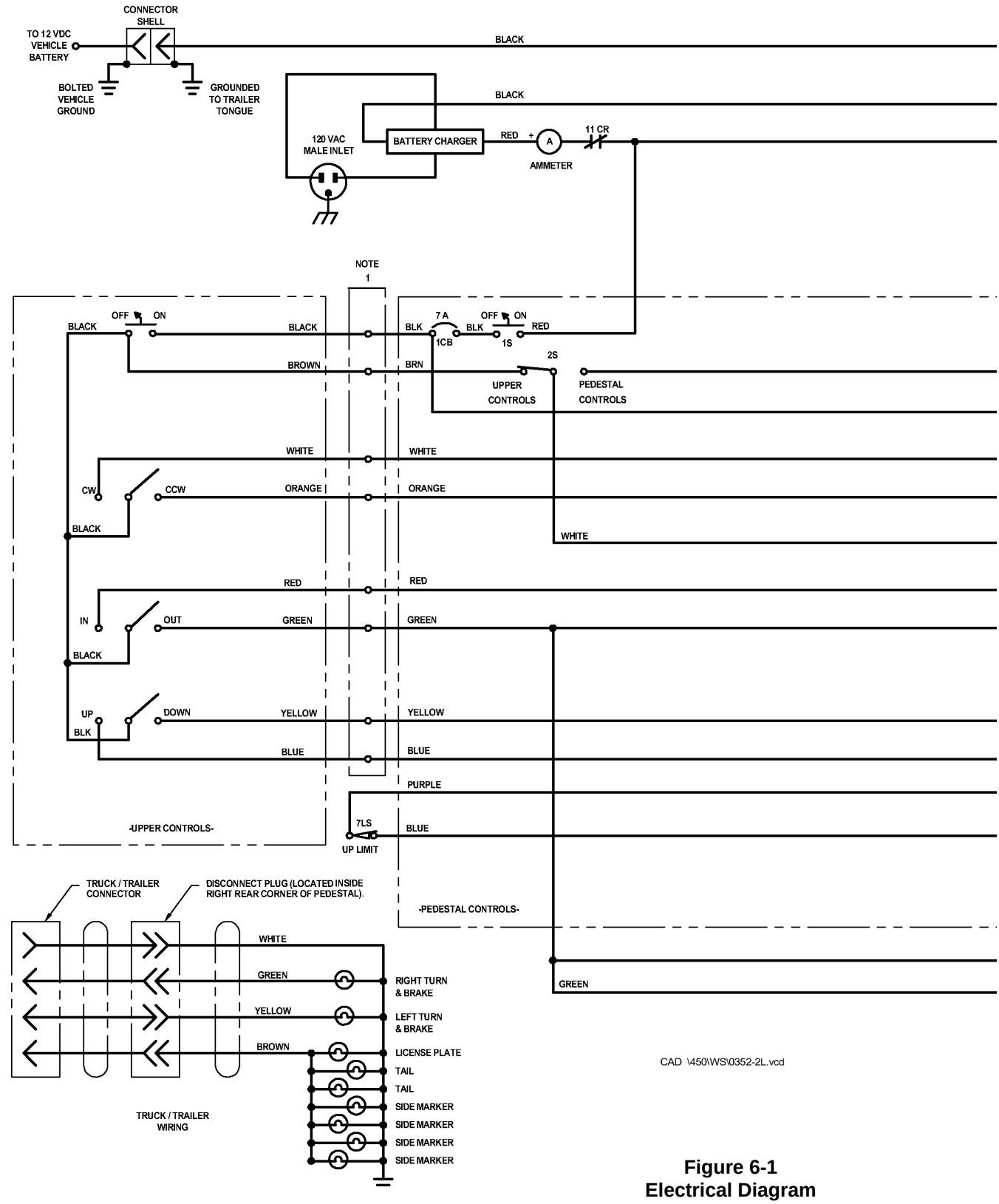
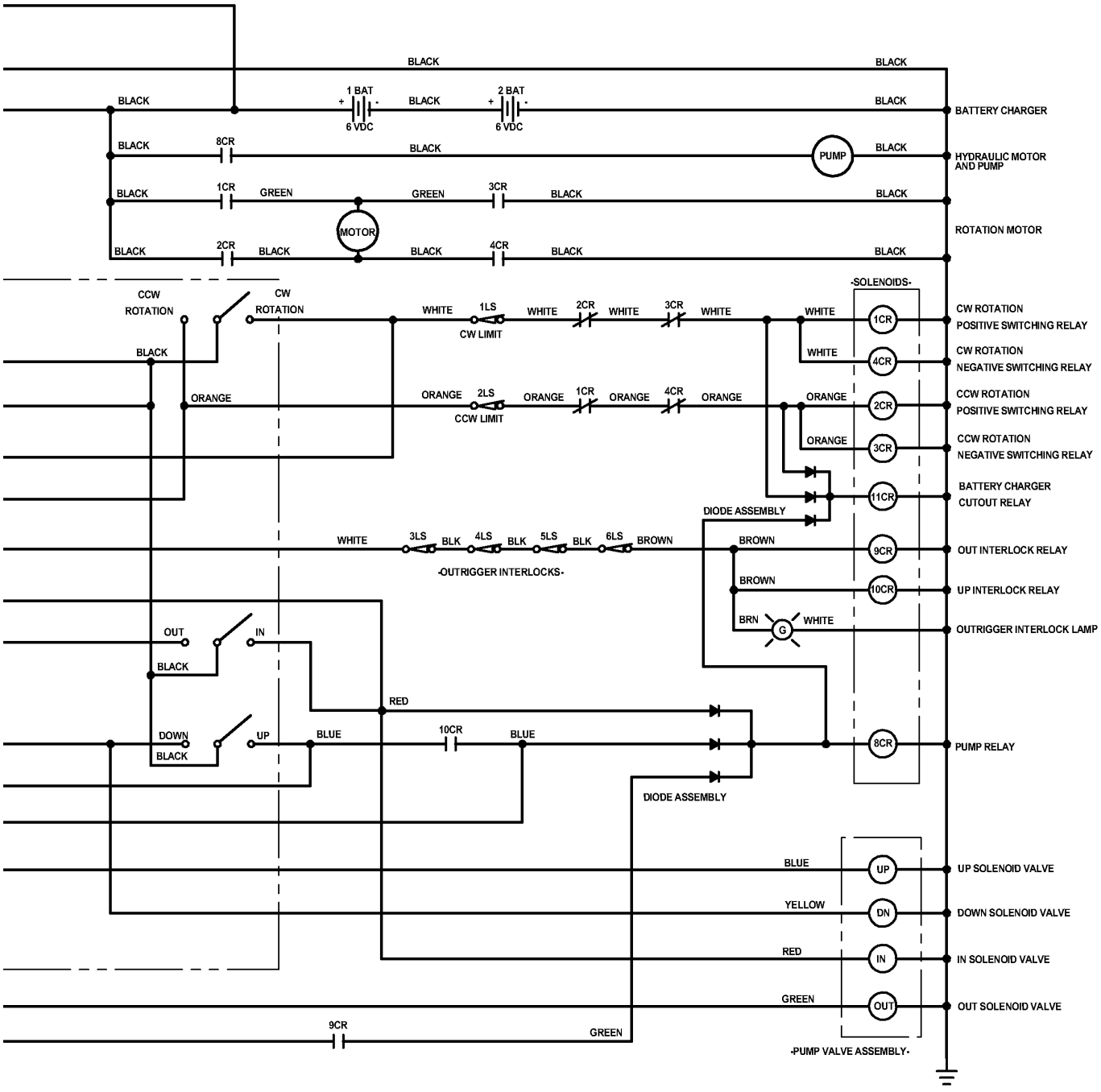


Figure 6-1
Electrical Diagram



NOTE:
1. 1. BOOM PIVOT TERMINAL BLOCK.
2. ALL DIODES ARE IN5402 3 AMP 200 PIV OR IN5408 3 AMP 1000 PIV (6) PLACES.
3. USED ON S/N 1098 TO 1424.

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ELECTRICAL DIAGRAM

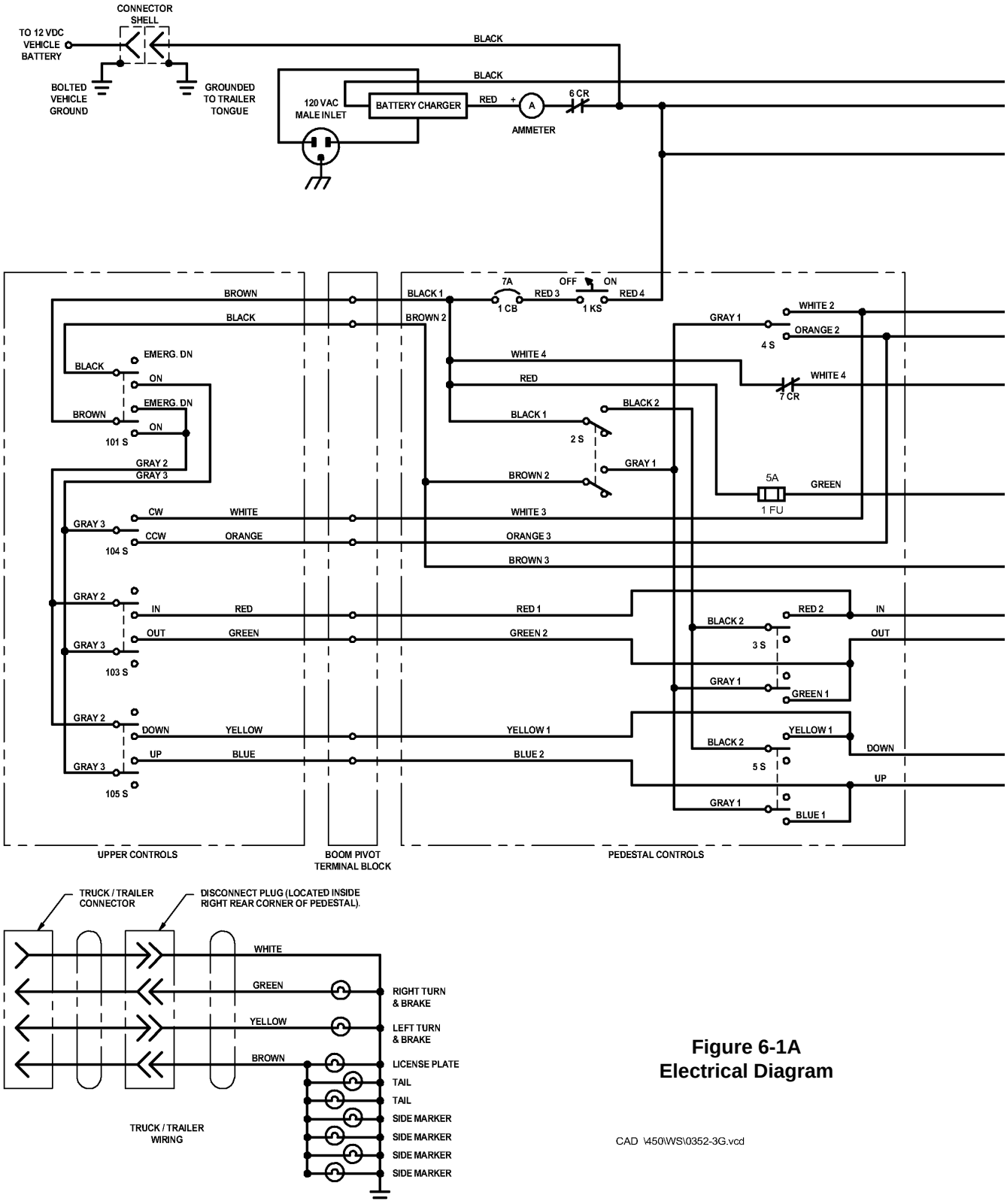

Figure 6-1A
Electrical Diagram

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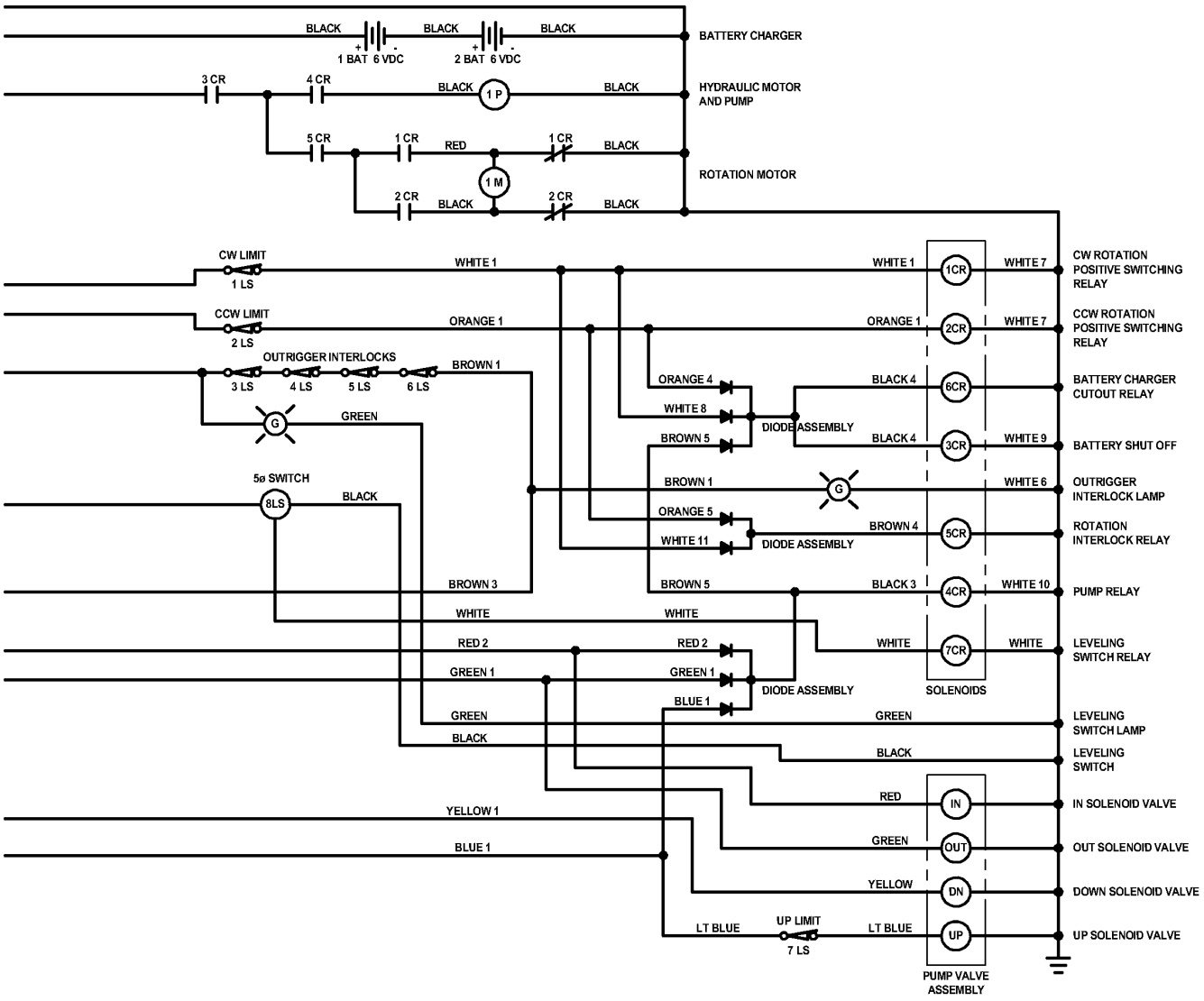

NOTE:
1. ALL DIODES ARE IN5402 3 AMP 200 PIV OR IN5408 3 AMP 1000 PIV (8) PLACES.
2. USED ON S/N 1424 - 2234

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ELECTRICAL DIAGRAM

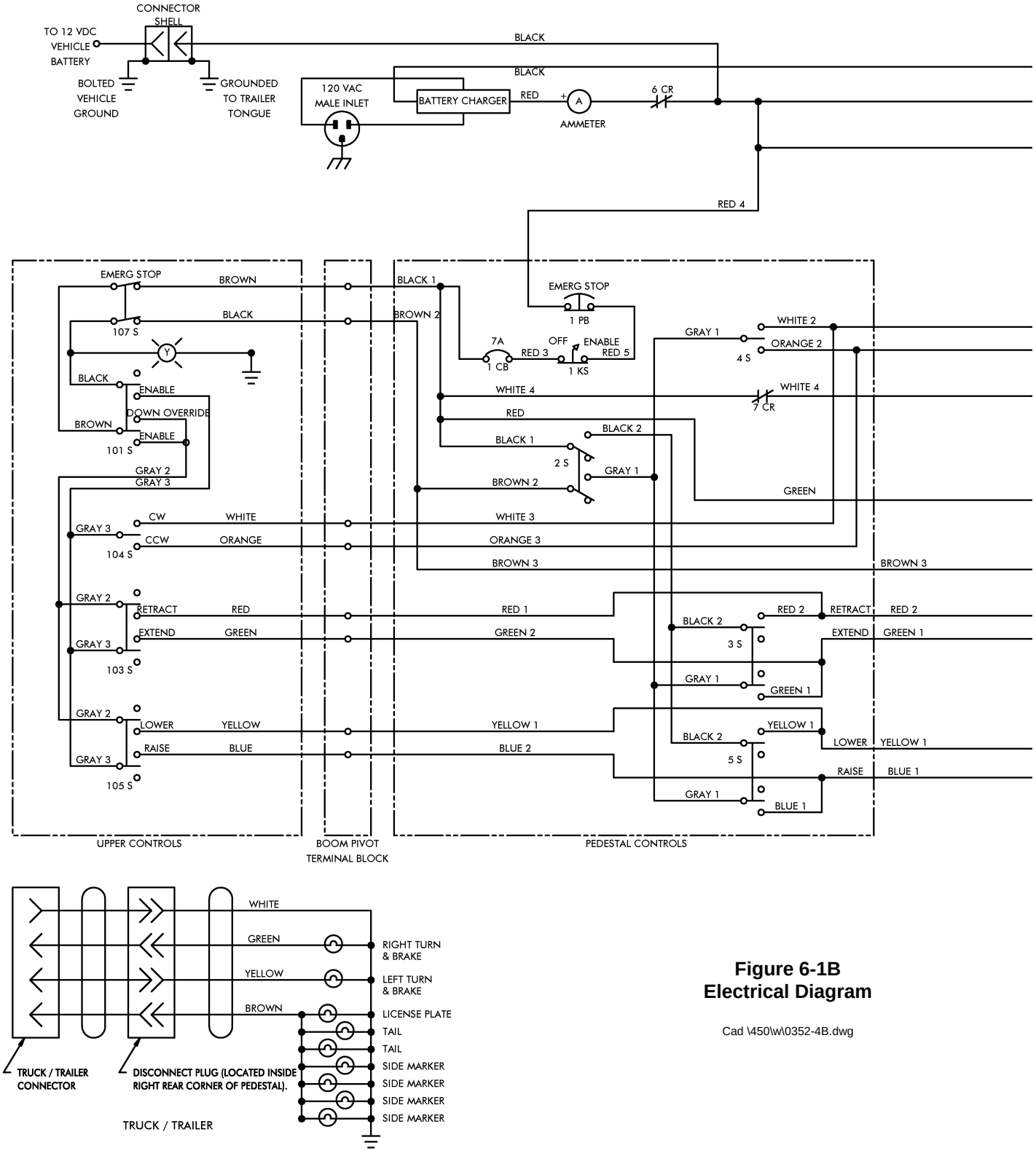

Figure 6-1B
Electrical Diagram

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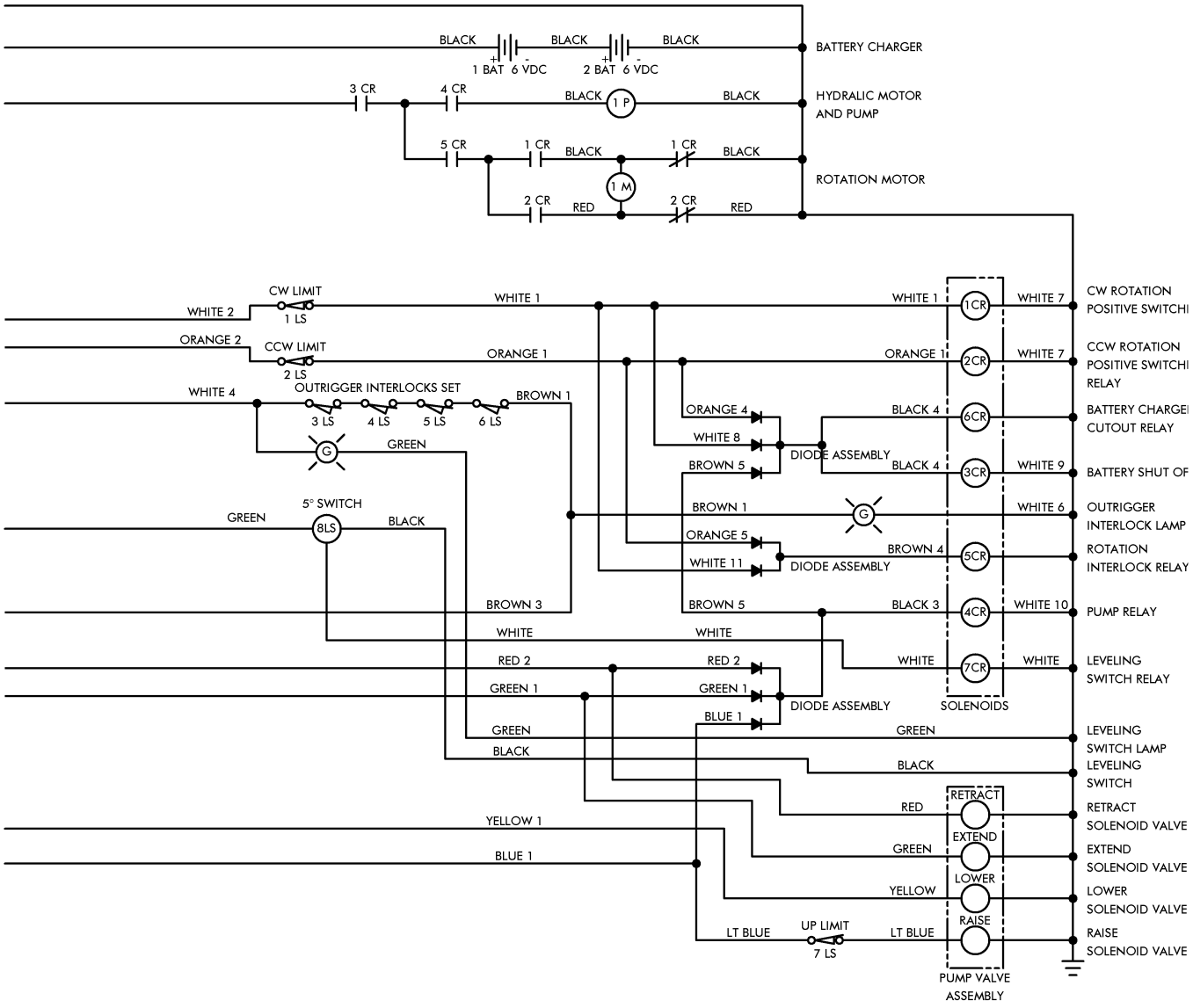

NOTE:
1. ALL DIODES ARE IN5402 3 AMP 200 PIV OR IN5408 3 AMP 1000 PIV (8) PLACES.

2. USED ON S/N 2235 & UP

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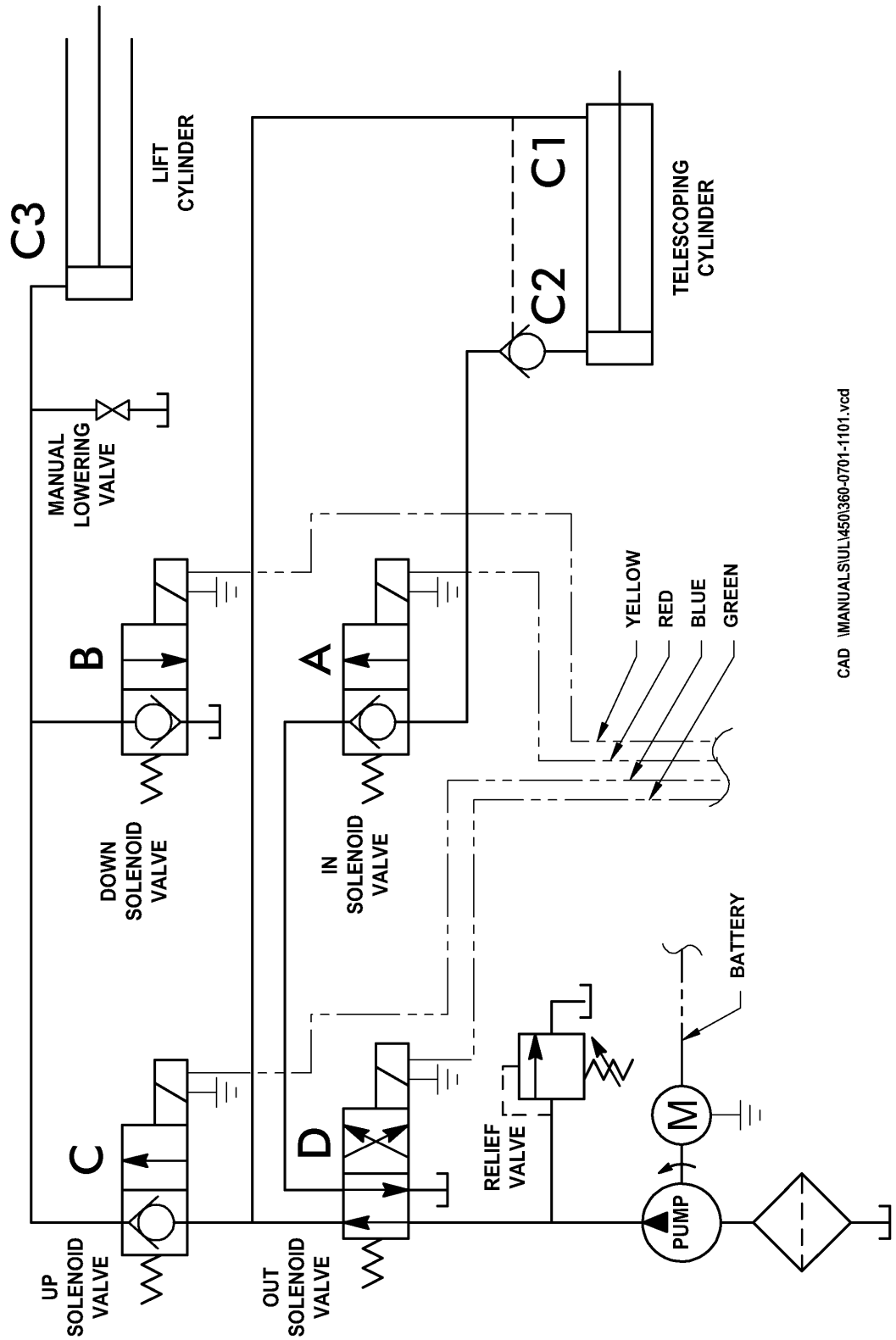
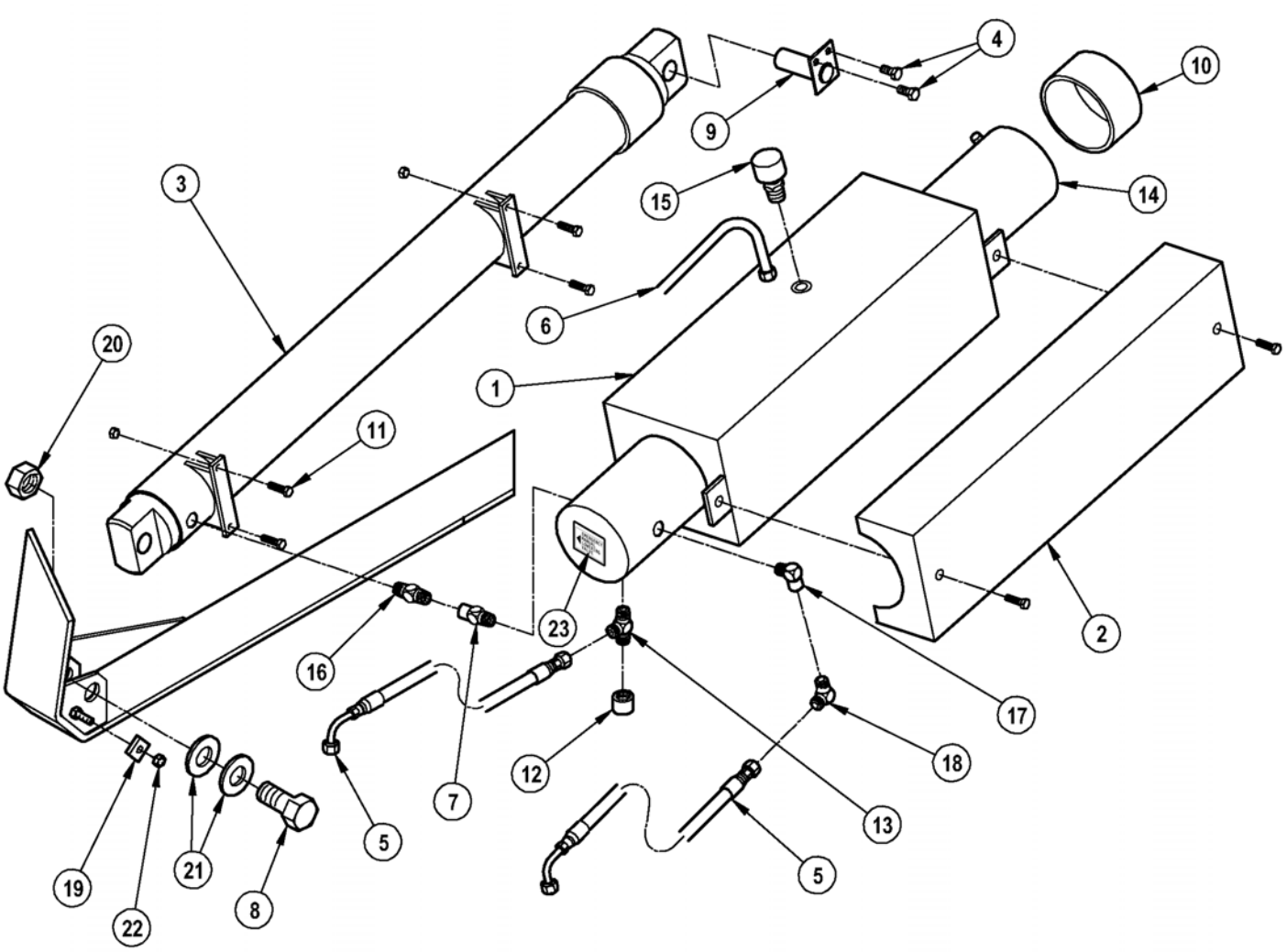
HYDRAULIC DIAGRAM



PARTS

Figure 8 - 1
Hydraulic Pump / Reservoir / Lower Cylinder Assembly



KEY NO.	PART NO.	DESCRIPTION	KEY NO.	PART NO.	DESCRIPTION
1	524009	Hydraulic Pump	8	40815	Screw, HHC 1"-8 x 3-1/2"
	529061	4 way 2 pos Cartridge S/N 2500&up	9	4500020-4	Cylinder Pin
	529062	2 way 2 pos Cartridge (3) ½" stem	10	539234	Motor Cover
	529063	Large Coil	11	40206	Bolt, 3/8"-16 x 1-1/4"
	529064	Small Coil (3)	12	522086	Pipe Cap
	529036	Tank O-Ring (2)	13	522548	Pipe Tee
	529037	Oil Tank	14	529038	12 VDC Motor
	529039	Manual Lowering Valve			(Part of Item 1)
2	4500207	Pump Cover	15	529015	Breather
3	524010	Lift Cylinder	16	522069	1/4" Nipple
	529028	Packing Set	17	522547	90° Street Elbow
	529029	Wiper	18	522541	90° Elbow
	524027	Lift Cylinder (S/N 2300,2302-2349)	19	4500957	Lock Plate
	524027-30	Seal Kit (S/N 2300,2302-2349)	20	50224	Locknut, 1 - 8"
4	4500391	Bolt w/Hole	21	55264	Washer, SAE Flat 1"
5	520050	72" Hose	22	51710	5/16-18 Unitorque Nut
6	529045	Control Lead	23	590568	Lowering Valve Decal
7	522068	1/4" Swivel			

Figure 8 - 2
Telescoping Boom - Lower Boom Assembly

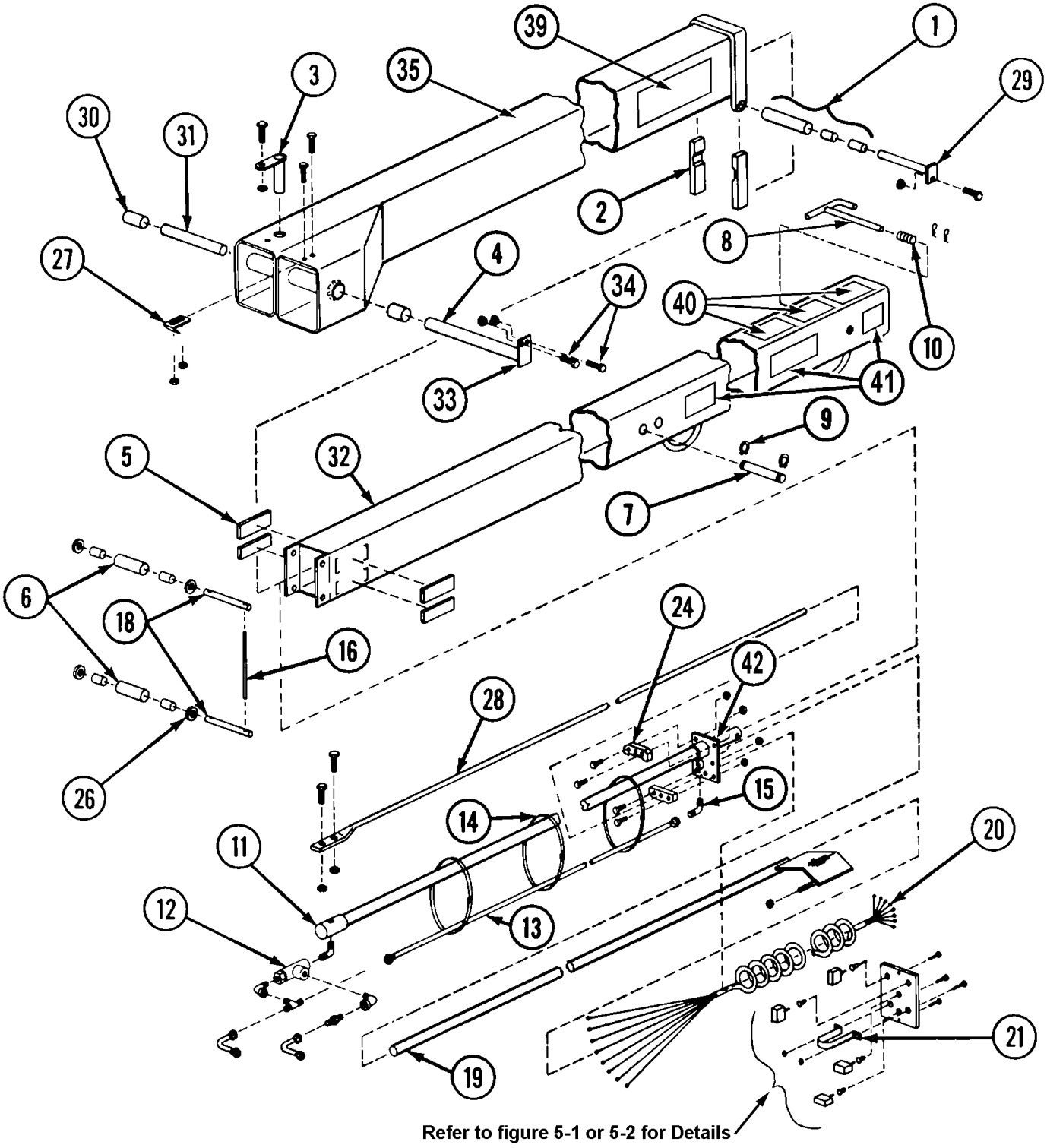
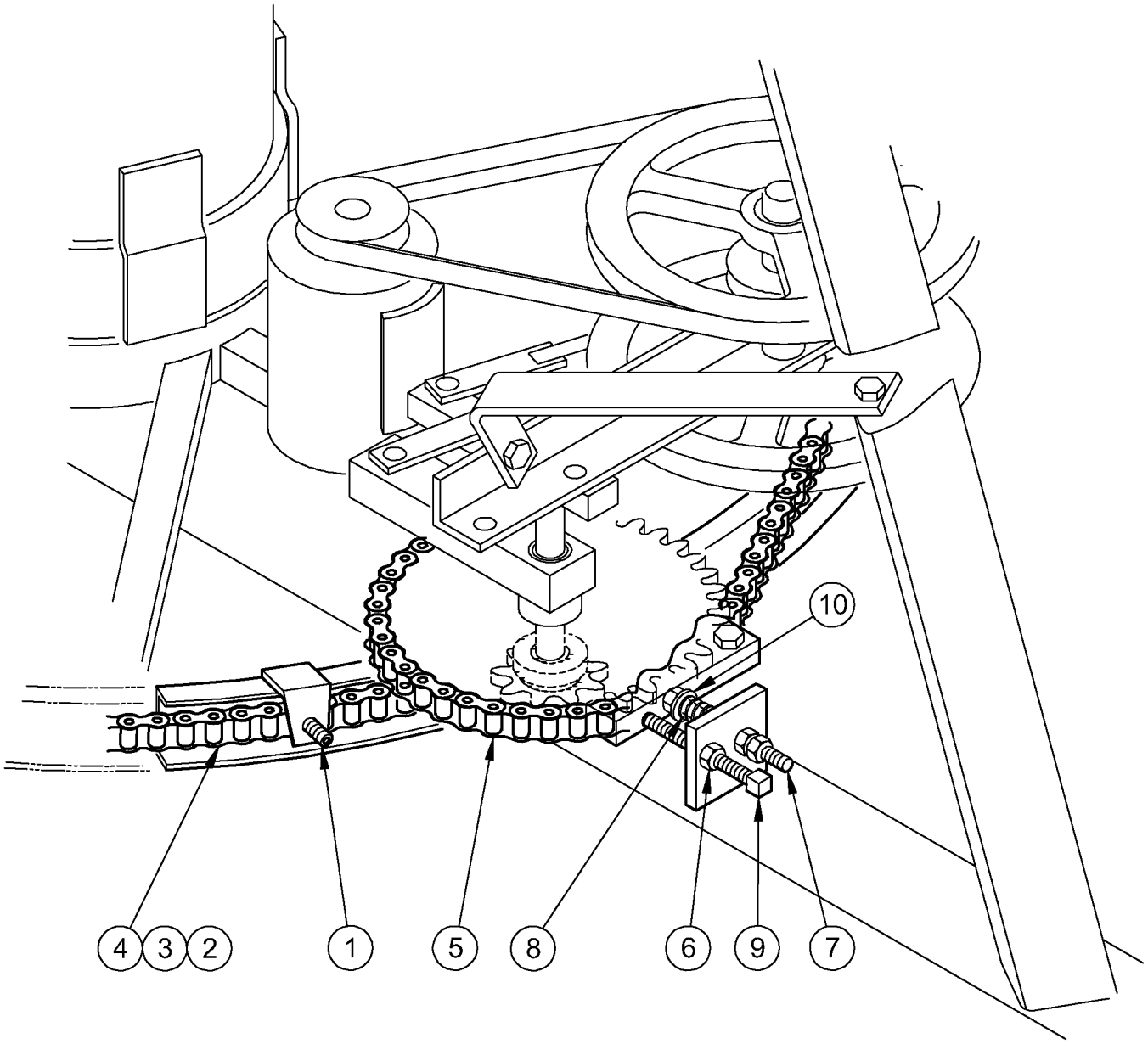


Figure 8 - 2
Telescoping Boom - Lower Boom Assembly

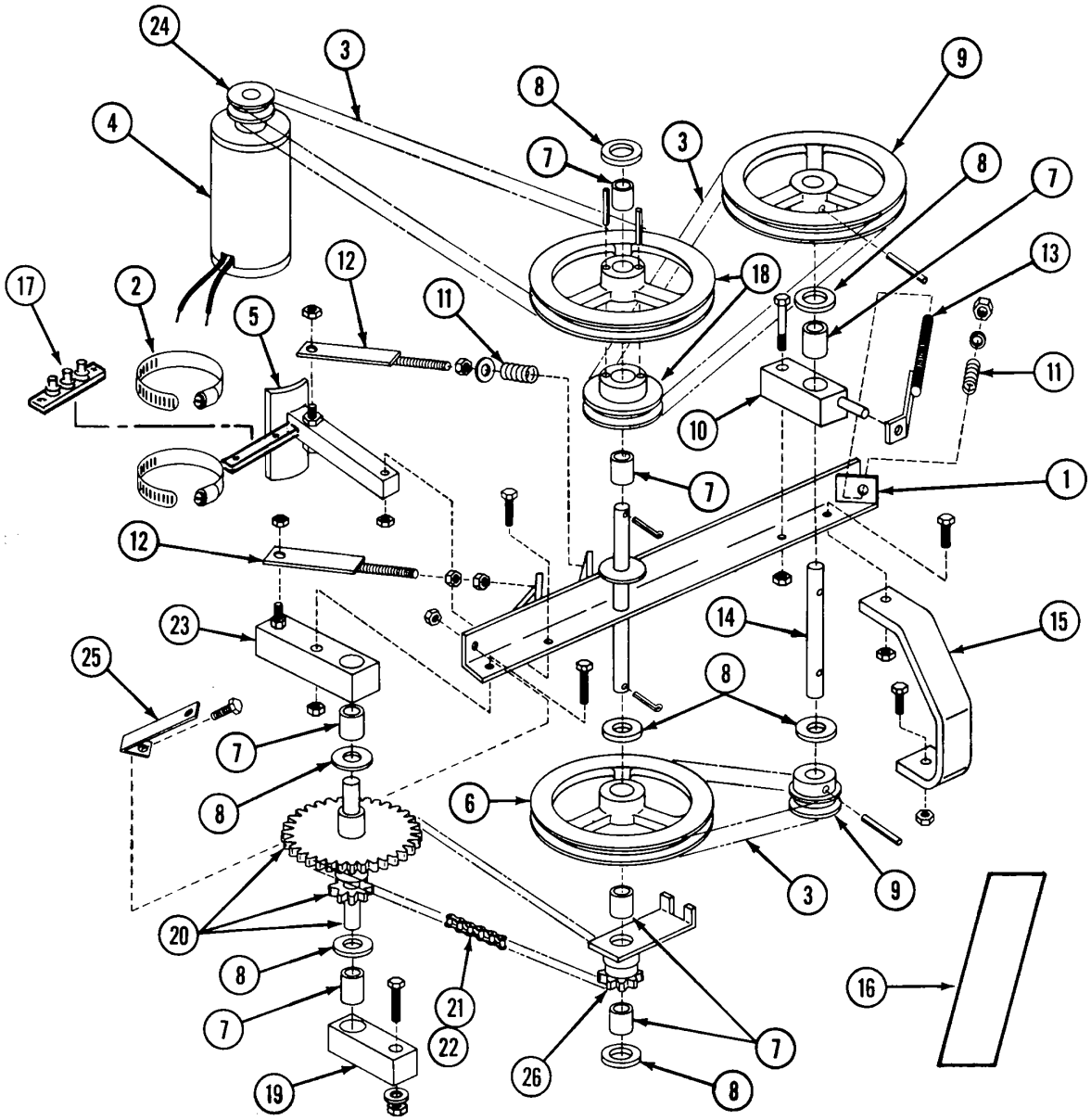
KEY NO.	PART NO.	DESCRIPTION	
1	4500154-2	Roller w/Bearings	
2	4500217	Guide	
3	4500020-2	Cylinder Pin	
4	4500049	Pivot Shaft	
5	4500152	Guide	
6	4500154-1	Roller w/Bearings (2 req'd.)	
7	4500156	Cylinder Pin	
8	4500150	Bucket Yoke Lock Pin	
9	531219	Snap Ring	
10	537030	Spring	
11	- - -	Telescoping Cylinder	(S/N to . . . 2299)
	4500132	Cylinder Assembly (Includes Items 11-15, 19, 24, 28)	
	529026	Packing Set	(S/N to . . . 2299)
	529027	Wiper	(S/N to . . . 2299)
	529032	Piston Cup (2)	(S/N to . . . 2299)
	529033	Piston O-Ring	(S/N to . . . 2299)
	529035	Cylinder Nut	(S/N to . . . 2299)
	- - -	Telescoping Cylinder	(S/N 2300, 2302-2349)
	529058	Gland Seal Kit	(S/N 2300, 2302-2349)
	529059	Piston Seal Kit	(S/N 2300, 2302-2349)
	4501000	Telescoping Cylinder	(S/N 2350 - . . .)
	529060	Seal Kit	(S/N 2350 - . . .)
12	4500140	Pilot Check Valve Assembly	
	523029	Pilot Check Valve	
13	520049	122" Hose	
14	514526	Tie Strap	
15	522541	Fitting	
16	4500149	Retaining Rod	
18	4500153	Roller Pin	
19	4500085	Conduit	
20	4500470	Upper Control Cable	
21	4500277	Coil Support Bracket	
24	4500135	Guide	
26	531112	Nylon Washer	
27	4500415	Upper Boom Limit Tab	
28	4500469	Guide Rod	
29	4500042-2	Roller Pin	
30	535086	Bearing	
31	4500022	Spacer	
32	4500468	Inner Boom	
33	4500021	Tab	
34	4500391	Bolt w/Hole	
35	4500018A	Upper Boom	
36	- - -		
37	- - -		
38	- - -		
39	590700	UniLift Decal (2) (534 & 538)	
	590582	FlexLift Decal (2) (345 & 538)	
40	590577	Danger Decal	
	590578	Caution Decal	
	590564	Danger Decal	
41	590637	500 Lbs. Decal (2)	
	590576	Danger Decal (2)	
	590630	300 Lbs. Decal (2) (385 & 538)	
42	4500137	Guide Plate	

Figure 8 - 3
Main Drive Chain Assembly



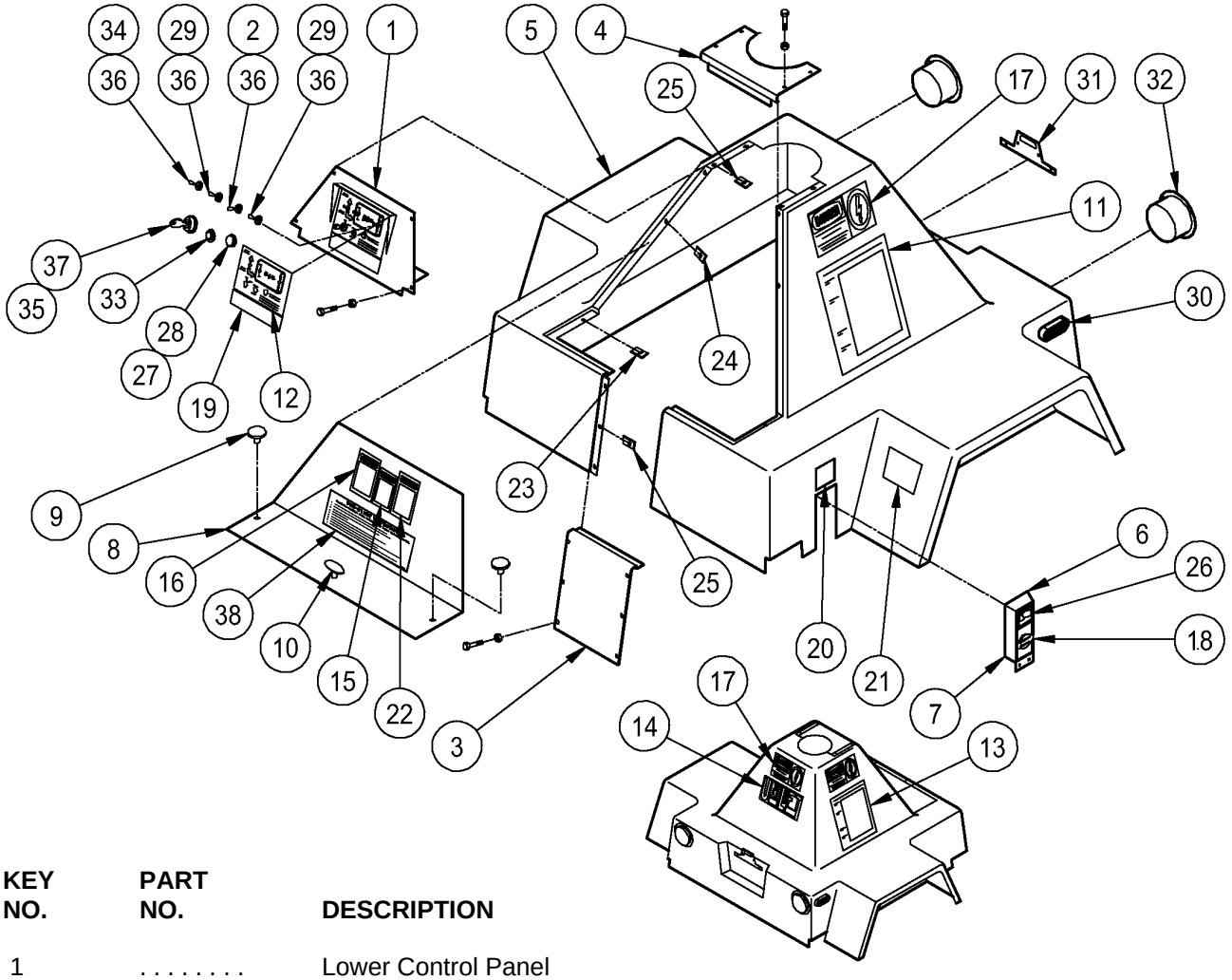
KEY NO.	PART NO.	DESCRIPTION
1	90047	Chain Adjustment Screw, 1/2"-13 x 2" lg.
2	534313	Chain, No. 50
3	534314	Connecting Link, No. 50
4	534315	1/2 Link, No. 50
5	4500182	Drive Sprocket Assembly
6	50410	Lock Nut, 5/16"-18"
7	40110	Hex Hd. Bolt, 5/16"-18 x 2-1/2" lg.
8	537033	Spring
9	28396	3/8"-16 x 2-3/4" Ferry Bolt
10	50012	3/8"-16" Hex Nut

Figure 8 - 4
Rotation Drive Assembly



KEY NO.	PART NO.	DESCRIPTION	KEY NO.	PART NO.	DESCRIPTION
1	4500180	Rotation Bracket	14	4500025-3	Shaft (Part of Item 9)
2	531313	Motor Clamp	15	4500412	Brace
3	509004	Belt (3 req'd.)	16	590702	Belt Adjustment Decal
4	4500925	Rotation Motor w/Pulley (S/N: 2126 & up)	17	514080	Terminal Strip (S/N: 2126 & up)
5	4500924	Motor Mount (S/N: 2126 & up)	18	4500228	Double Pulley
6	509005	Pulley	19	4500231A	Bracket w/Bearing
7	535087	Bearing	20	4500182	Drive Sprocket Ass'y.
8	531112	Washer	21	534308	No. 40 Chain - 36"
9	4500185	Pulley Ass'y. w/Block & Shaft	22	534309	No. 40 Connecting Link
10	4500190A	Block w/Bearing (Part of Item 9)	23	4500189A	Mount Block w/Bearing
11	537029	Spring	24	509008	Pulley (S/N: 2126 & up)
12	4500186	Adjusting Screw	25	4500278	Strap
13	4500197	Adjusting Screw	26	4500187A	Sprocket, Bracket & Bearing

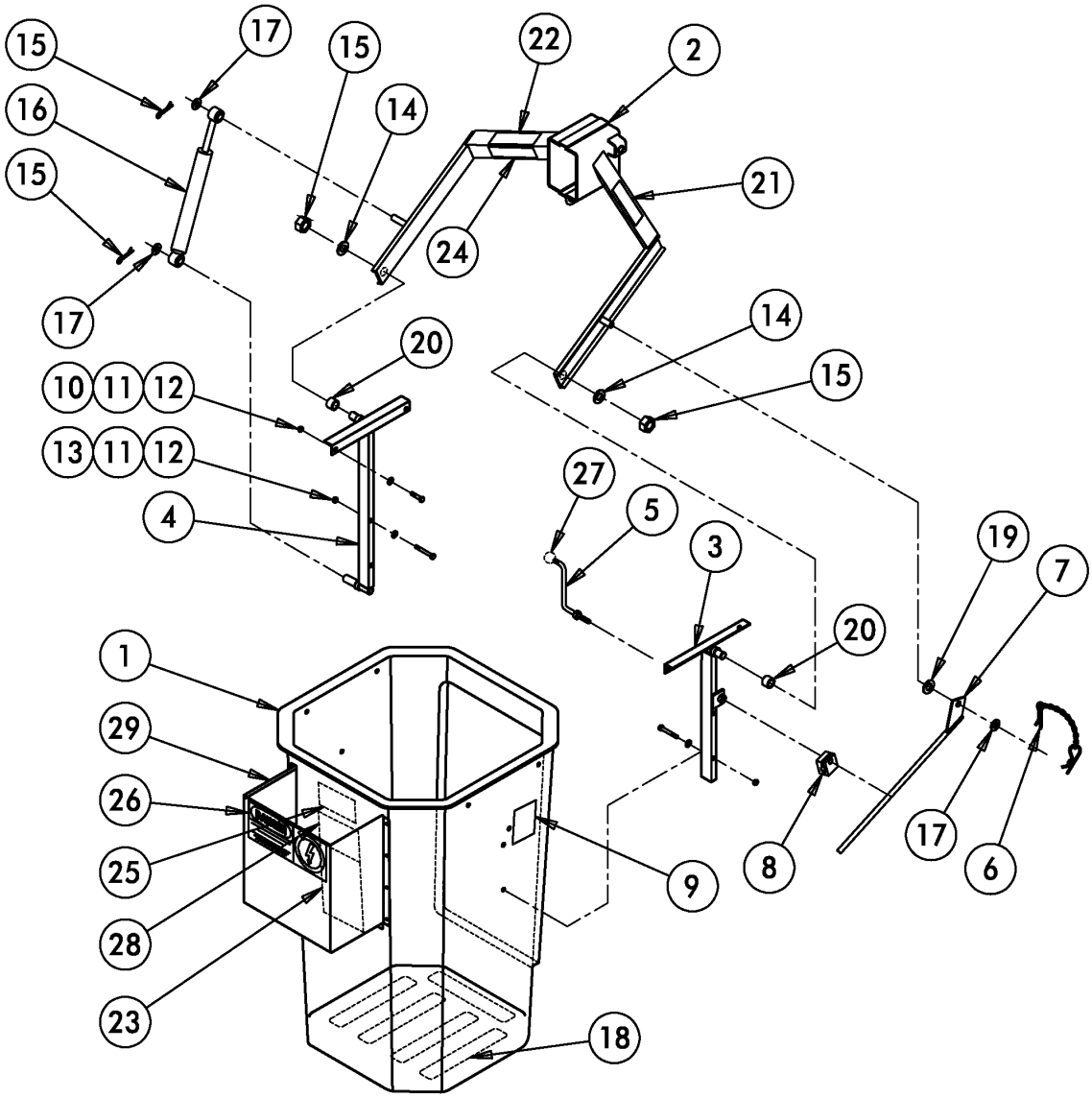
Figure 8 - 5
Shroud Assembly



KEY NO.	PART NO.	DESCRIPTION
1	. . . . .	Lower Control Panel (See Figures 8-9 & 8-10)
2	513925	Toggle Switch - DPDT
3	4500328-1	Bottom Insert
4	4500327-1	Top Insert
5	. . . . .	Shroud
6	4500289	Ammeter & Receptacle Assy.
7	4500288	Panel
8	4500283	Access Cover w/ Knob
9	596002	Access Cover Knob
10	596001	Handle
11	590585	Crane Decal (L.H. Side)
12	590583	Switch Plate - Lower Control
13	590567	Bucket Decal (R.H. Side)
14	590700	UniLift Decal
15	590578	Caution Decal
16	590577	Danger Decal
17	590576	Danger Decal
18	512250	Receptacle
19	590575	Interlock Decal
20	590574	Charger Decal
21	590570	Outrigger Decal (Jack Type)
22	590564	Danger Decal

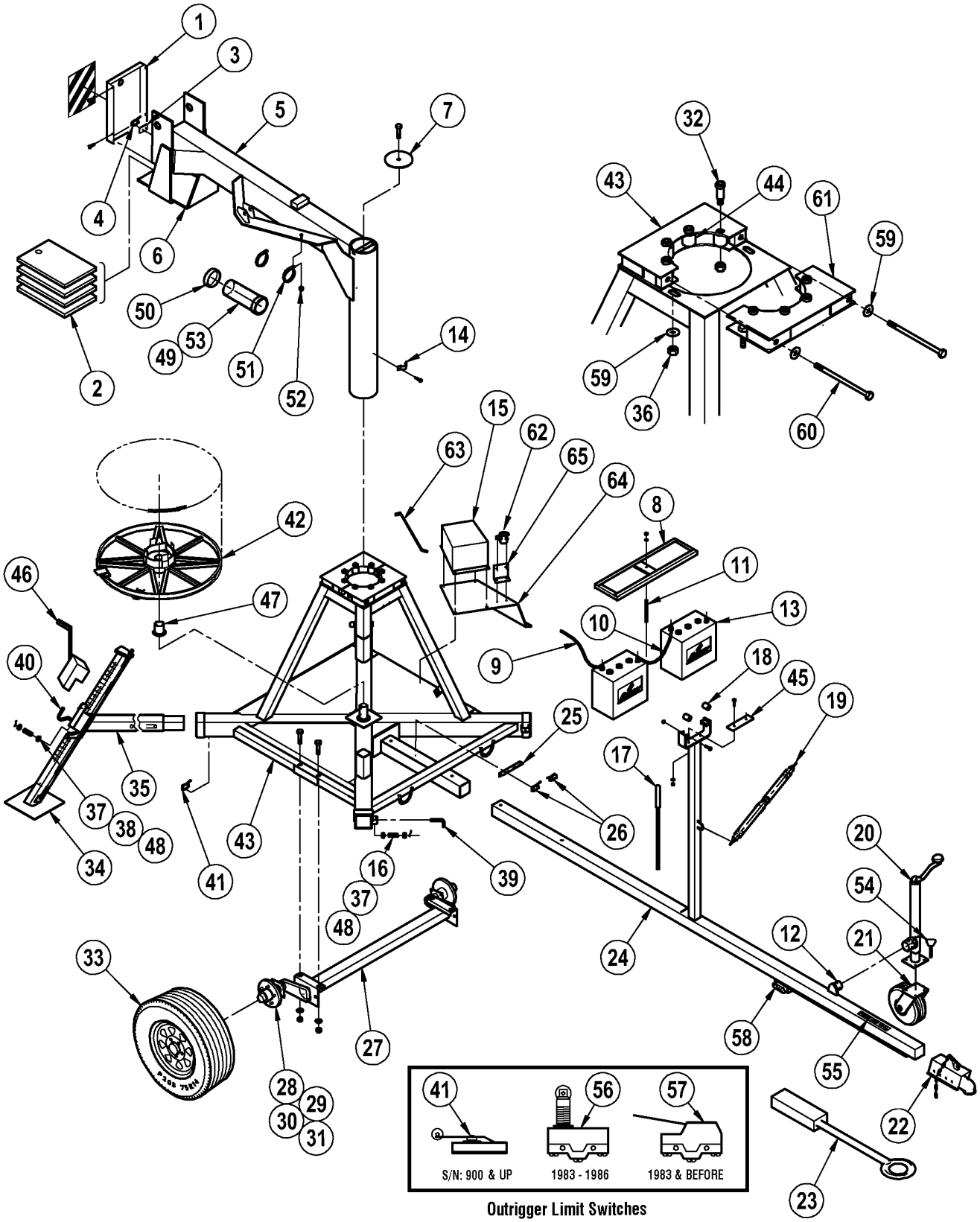
KEY NO.	PART NO.	DESCRIPTION
23	533077	5/16"-18 Caged Nut
24	533076	1/4"-20 Caged Nut
25	533075	#8 U-Nut Fastener
26	519570	Ammeter
27	519552	Bulb
28	519551	Lampholder
29	513980	Toggle Switch DPDT
30	519609	Red Side Light
31	519529	License Plate Bracket
32	519528	Tail Light
33	519027	7A Circuit Breaker
34	513981	Toggle Switch - DPDT
35	513930	Rubber Key Switch Boot
36	513927	Rubber Switch Boot
37	513928	Key Switch
38	590770	Pre-Start Inspection Decal

Figure 8 - 6
Bucket Assembly
(P/N: 4500176A Ref.)



KEY NO.	PART NO.	DESCRIPTION	KEY NO.	PART NO.	DESCRIPTION
1	4500177A	Bucket W/Decals & Tool Tray	16	539032	Shock Absorber
2	4500178A	Bucket Yoke	17	55260	5/8" SAE Flat Washer
3	4500962	R.H. Side Support	18	596019	Anti-Slip Strips
4	4500963	L.H. Side Support	19	531112	Washer
5	4500926	Lock Lever	20	535089	Bronze Bushing
	4500930	Lock Lever W/Knob	21	590565	Warning Decal
6	4500201	Hair Pin Assy.	22	590566	Outrigger Decal
7	4500160	Position Lock Shaft	23	590704	Instruction Decal
8	4500173	Bucket Lock Collar	24	590575	Interlock Decal
9	590750	Lock Direction Decal	25	590748	Body Harness Decal
10	40205	3/8-16 x 1" HHC Screw	26	590576	Danger Decal
11	55005	3/8" Flat Washer	27	596034	Knob
12	50412	3/8-16 Esna Hex Nut	28	590703	Caution Decal
13	40210	3/8-16 x 2-1/4" HHC Screw	29	4520479A	Tool Tray w/Decal
14	55262	3/4" SAE Flat Washer	30	532051	Body Harness (Not Shown)
15	50220	3/4"-10 Locknut			

Figure 8 - 7
Main Frame Assembly

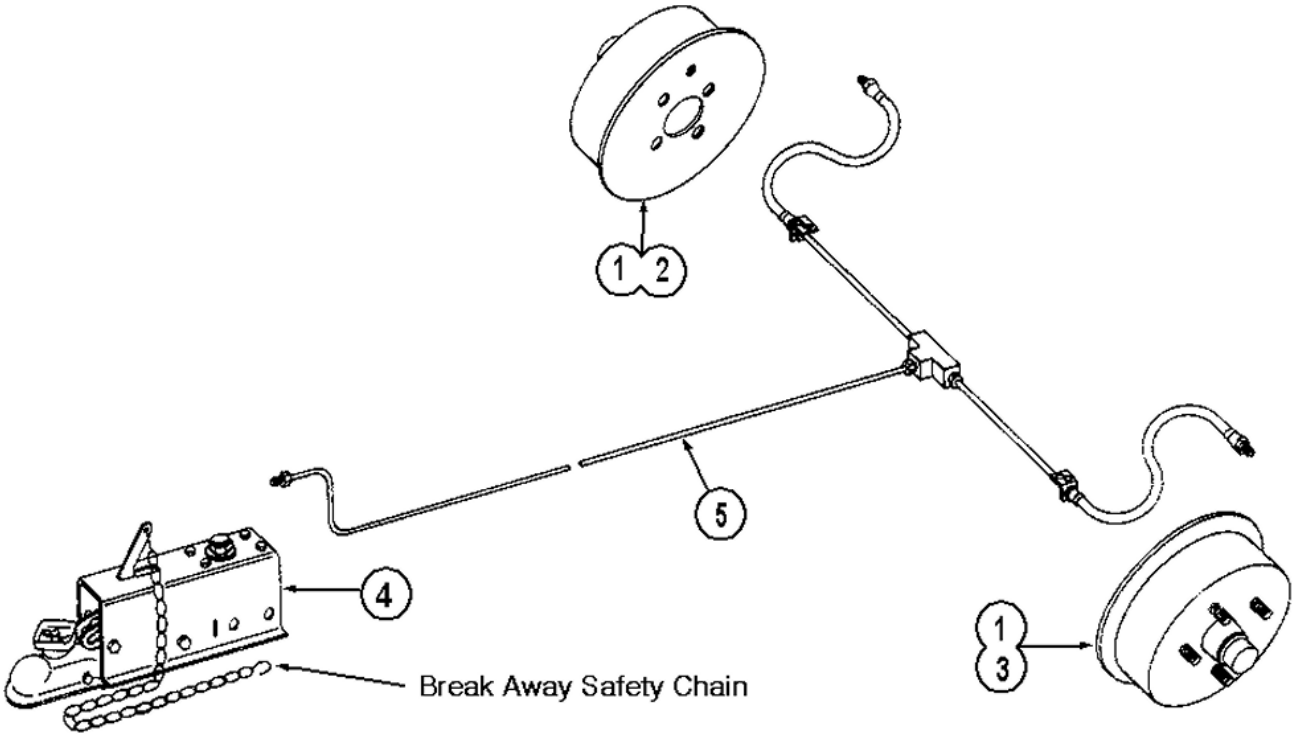


Outrigger Limit Switches

Figure 8 - 7
Main Frame Assembly

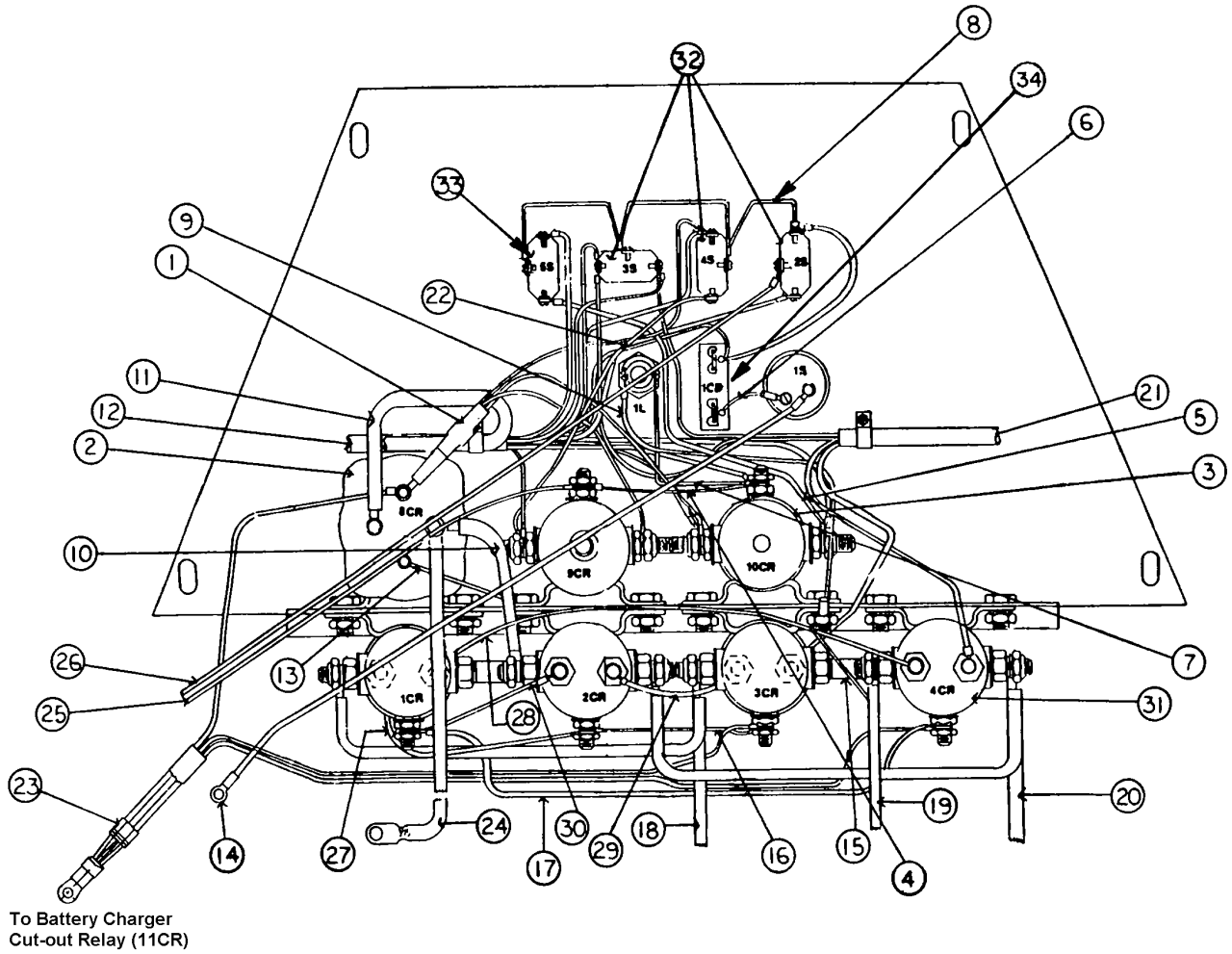
KEY NO.	PART NO.	DESCRIPTION
1	4500216A	Rear Access Cover
	590586	Red/White Decal
	590590	Grease Fitting Decal
2	4500229	Counterweight
3	4500416	Mount Plate
4	513033	Limit Switch
5	4500036A	Column & Lower Boom
6	4500244	Counterweight Bracket
7	4500126	Column Cover
8	4500912	Battery Hold Down
9	4500300-4	6" Cable
10	4500300-3	12" Cable
11	4500284-2	Threaded Rod
12	539054	Jack Mounting Tube
13	519607	Battery, 6 VDC (2 Req'd)
14	514525	Cable Clamp
15	519616	Battery Charger S/N 2358- . . .
	515140	Cut-Out Relay
	4500501	Charger Conversion Kit (for early models)
16	537030	Spring
17	4500062-2A	Jack Handle w/Grip
	596003	Vinyl Grip
18	539026	Rubber Bumper
19	532042	Tie-Down Strap
20	4500732	Screw Jack
21	539335	8" Caster
22	539241	2" Ball Coupler
	4500293	Safety Chain (not shown)
23	4500899	Pintle Hitch Assembly
24	4500227	Tongue (S/N: . . . - 2169)
	4500932	Tongue (S/N: 2170 - . . .)
25	4500340	Switch Bracket S/N: to 2183, 2185, 2186
	4500937	Switch Bracket S/N: 2184, 2188 - . . .
26	4500394	Rotation Limit Switch
27	4500496	Axle w/Hubs
28	539315	Hub
29	539316	Inner Bearing
30	539317	Outer Bearing
31	539320	Grease Seal
32	533092-3	5/8" x 1-1/4" Shoulder Bolt
33	4500333	Tire & Rim
34	4500065	Vertical Outrigger
35	4500482	Horizontal Outrigger
	4500888	Horizontal Outrigger, Crank Type (Ref. Fig. 8-11)
36	50216	½" - 13 Lock Nut
37	531112	Nylon Washer
38	537032	Spring
39	4500151-1	Lock Pin
40	4500886	Lock Pin - Crank Style
41	513047	Outrigger Switch (S/N 900 & up)
42	4500050A	Rotation Drive Wheel (S/N 239 & up)
43	4500077	Frame
44	4500047	Column Guide Roller (8 Req'd.)
45	596022	Rubber Pad
46	. . . . .	Crank Installation (See Figure 8-11)
47	535088	Main Pivot Bearing
48	56566	Cotter Pin, 1/8" x 1"
49	539062	Tube Assembly
50	539063	Cap
51	531122	Clamp
52	50412	Hex Esna Nut, 3/8"-16
53	4500360	Operator's & Parts Manual
54	539064	Pin & Ring (Part of Item 20)
55	590699	Tongue Load Decal
56	513041	Outrigger Switch (4) (1983-1986)
	4500423-1	Switch Mounting Bracket
	4500423-2	Switch Mounting Bracket
57	513033	Outrigger Switch (4) (1983 & Before)
	4500281	Actuator
58	519608	Amber Side Light
59	55207	½" Lock Washer
60	40423	½-13" x 7" Bolt
61	4520035	Front Column Guide
62	515140A	Cut-Out Relay
63	4500499	Charger Strap
64	4500498	Charger Bracket
65	4500864	Relay Mounting Bracket

Figure 8 - 8
Surge Brake Assembly



KEY NO.	PART NO.	DESCRIPTION
1	539326	Hub & Drum Assembly
2	539327	R.H. 10 X 2 1/4 Brake Shoe Assembly
3	539328	L.H. 10 X 2 1/4 Brake Shoe Assembly
4	539329	Actuator, Model 60 Brake
5	539330	Kit, Hydraulic Fitting & Tubing

Figure 8 - 9
Lower Control Panel Assembly
(P/N: 4500680 Ref.) S/N 1098-1423



KEY NO.	PART NO.	DESCRIPTION	KEY NO.	PART NO.	DESCRIPTION
1	4500439	Diode Assembly	18	4500302-1	Cable-Black/Red
2	515062	Solenoid	19	4500301	Cable-Black
3	515029	Solenoid (2 Req'd)	20	4500302-2	Cable-Black
4	4500444	Wire-Brown	21	4500678	Harness, Rotation Limit
5	4500440	Wire-Blue	22	4500442	Wire-Green
6	4500308-2	Wire-Black	23	4500492	BC Diode Assembly
7	4500443	Wire-Brown	24	4500300-1	Cable-Black
8	4500317	Wire-Black	25	4500341-2	Wire-Brown
9	4500441	Wire-White	26	4500341-3	Wire-White
10	4500300-4	Cable-Black	27	4500675-1	Wire-Orange
11	4500300-2	Cable, Pump Power-Black	28	4500675-2	Wire-Orange
12	4500310	Harness, Lower Control	29	4500675-3	Wire-White
13	4500466	Wire-Black	30	4500675-4	Wire-White
14	4500464	Wire-Red	31	515140	Solenoid (4 Req'd)
15	4500304-2	Jumper, Bus Bar (2 Req'd)	32	513925	Switch On-Off-On (3 Req'd)
16	4500303-1	Wire-Orange	33	513929	Switch On-[On]
17	4500303-2	Wire-White	34	519027	Circuit Breaker

Figure 8 - 10
Lower Control Panel Assembly
(P/N: 4500953 Ref.) S/N 1424 & Up

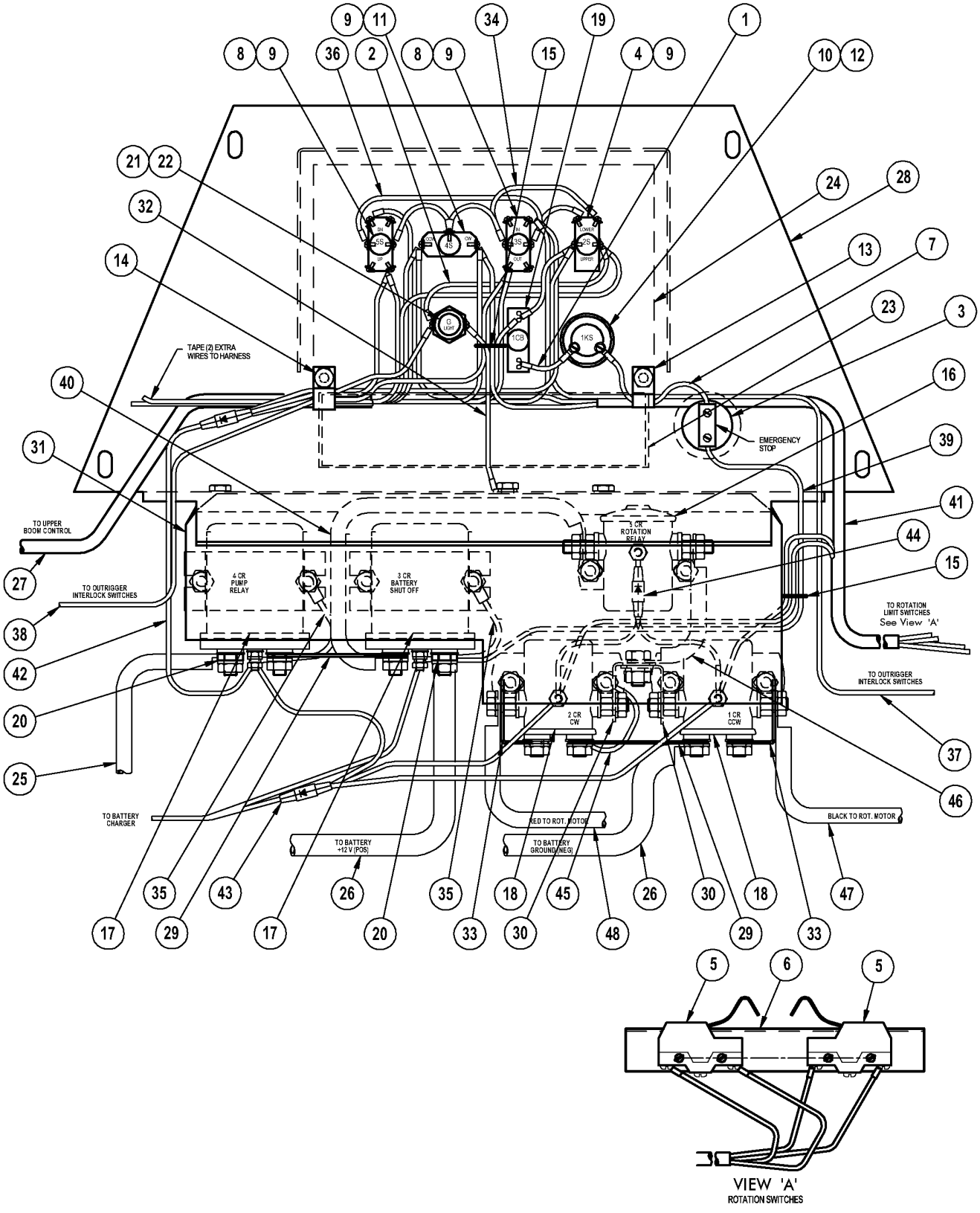
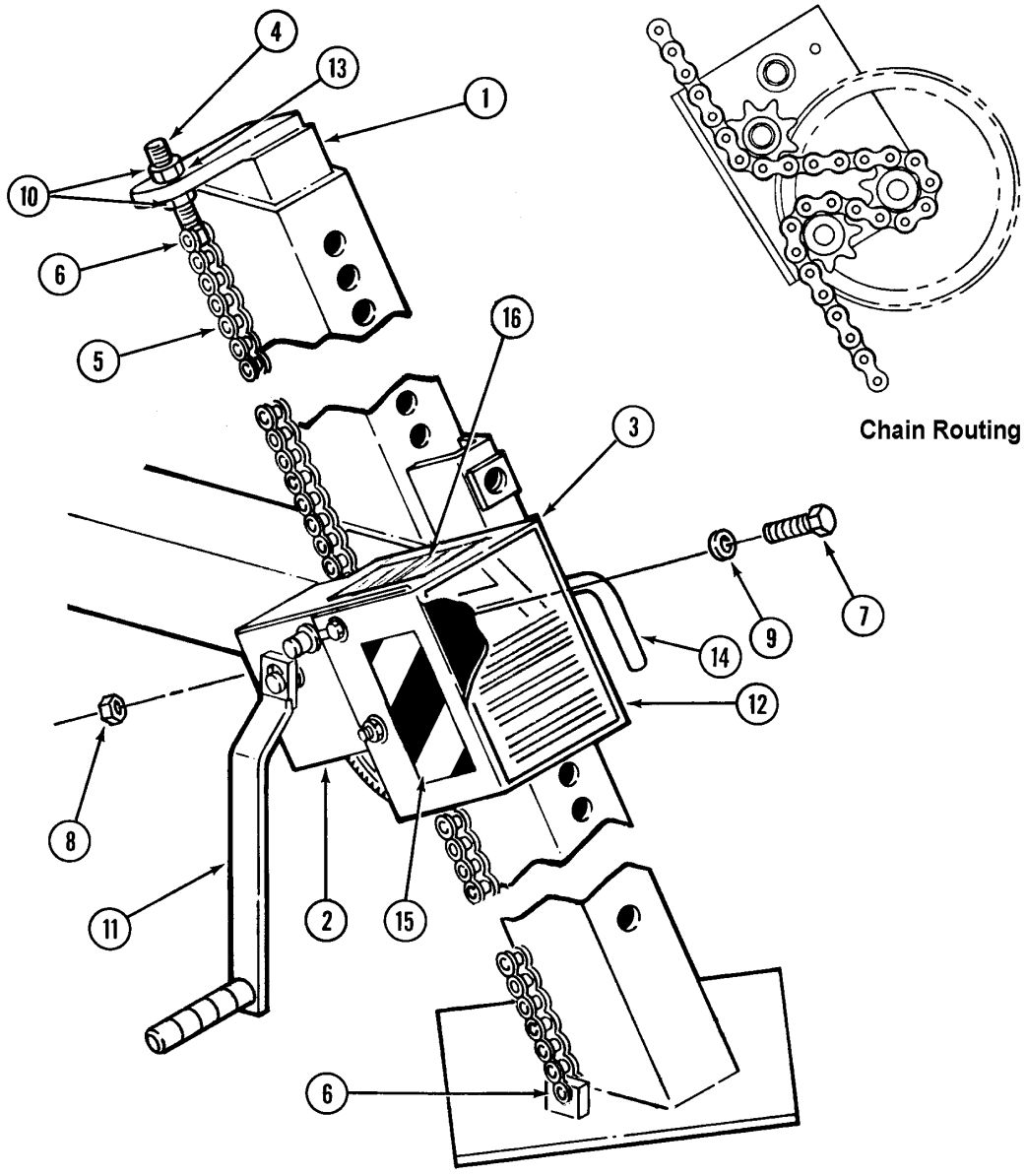


Figure 8 - 10
Lower Control Panel Assembly
(P/N: 4500953 Ref.) S/N 1424 & Up

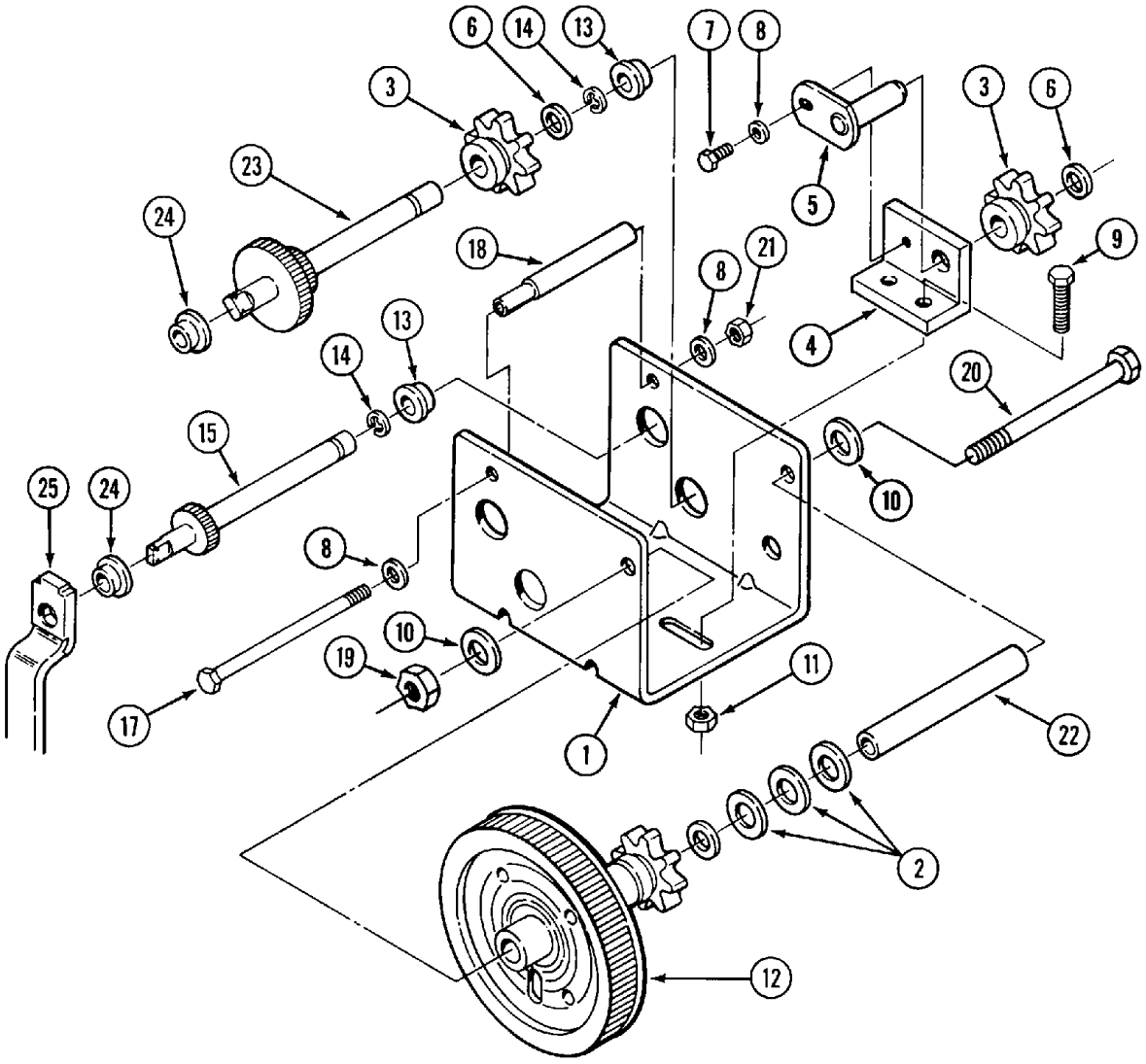
KEY NO.	PART NO.	DESCRIPTION
1	4500855	Wire/A Red 3
2	4500866	Wire/A Brown 3
3	513938	Emergency Stop Switch (S/N: 2235. . .)
4	513981	Toggle Switch D.P.D.T. (MOM.)
5	4500394	Limit Switch
6	4500937	Angle Bracket
7	4500956	Wire/A Red 5
8	513980	Toggle Switch D.P.D.T.
9	513927	Rubber Boot Switch
10	513928	Key Switch
	513988	3-position switch (optional)
11	513925	Toggle Switch S.P.D.T.
12	513930	Rubber Key Switch Boot
13	514522	Cable Clamp
14	514525	Cable Clamp
15	514527	Tie Wire
16	515029	Solenoid S.P.N.O
17	515062	Solenoid 200 A S.P.N.O.
18	515140	Solenoid S.P.D.T.
19	519027	Circuit Breaker
20	519258	Spacer
21	519551	Lamp Holder/Lens
22	519552	Bulb
23	590575	Hyd Operation System Decal
24	590766	Lower Control Decal
25	4500300-2	Pump Cable/A Black
26	4500300-1	Battery Cable/A Black
27	4500310	Lower Control Loom Cable/A
28	4500679	Panel/w Lower Control
29	4500834	Buss Bar
30	4500835	Buss Bar Inner Angle
31	4500836	Plate/w Panel Mounting
32	4500837	Wire/A - White 5
33	4500838	Buss Bar - Outer Angle
34	4500840	Wire/A - Gray 1
35	4500841	Wire/A - White 8 & 9
36	4500842	Wire/A - Black 2
37	4500843	Wire/A White 4
38	4500844	Wire/A - Brown 1
39	4500845	Wire/A Red 4
40	4500846	Cable/A Red 4 Ga.
41	4500847	Cable/A Rotation Limit
42	4500849	Wire/A - Diode RGB
43	4500850	Wire/A - Diode OBW
44	4500851	Wire/A - Diode OW
45	4500852	Wire/A - White 7
46	4500853	Cable/A Red 4 Ga.
47	4500854-1	Cable/A Black Rot. Motor
48	4500854-2	Cable/A Red Rot. Motor

Figure 8 - 11
Crank Outrigger Installation
(P/N: 4500883 Ref.)



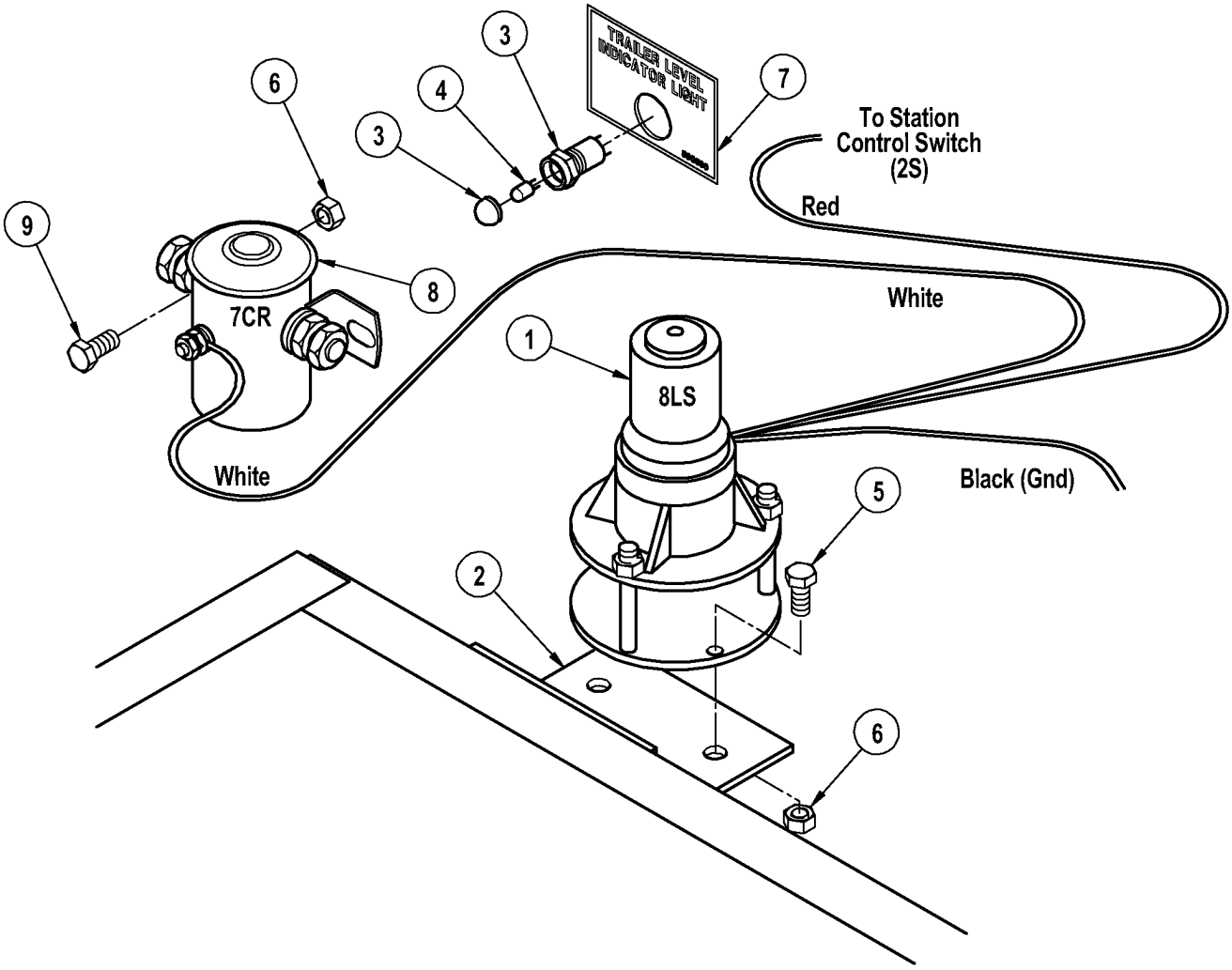
KEY NO.	PART NO.	DESCRIPTION
1	4500879	Tube Weldment
2	4500880	Crank Assembly (See Figure 8-12) S/N: 900 -2227
	4500943	Crank Assembly (See Figure 8-12) S/N: 2228 - . . .
3	4500882A	Crank Guard w/Decals
4	4500887	Screw Modified
5	534327	Chain, No. 50
6	534314	Connecting Link
7	40206	Hex Hd. Cap Screw, 3/8"-16 x 1-1/4"
8	50412	Hex Esna Nut, 3/8"-16
9	55005	Flat Washer, 3/8"
10	50618	Hex Jam nut, 5/8"-11
11	539066	Crank Handle
12	590701	Instruction Decal
13	55205	Lockwasher, 5/8"
14	4500886	Lock Pin (See Figure 8-7)
15	590765	Release Lock Pin
16	590587	Yellow & Black Decal

Figure 8 - 12
Outrigger Crank Assembly
(P/N: 4500943 Ref.)



KEY NO.	PART NO.	DESCRIPTION
1	4500893	Base Modified (S/N: 900 - 2227)
	4500946	Base Modified (S/N: 2228 - . . .)
2	55258	Flat Washer, 1/2" SAE
3	4500881	Sprocket Modified
4	4500876	Mounting Angle
5	4500885	Pin & Paddle Weldment
6	533122	Thrust Washer
7	40001	Hex Hd. Screw, 1/4"-20 x 1/2"
8	55003	Flat Washer, 1/4"
9	40207	Hex Hd. Screw, 3/8"-16 x 1-1/2"
10	55005	Flat Washer, 3/8"
11	50412	Hex Esna Nut, 3/8"-16
12	4500892	Reel Weldment (S/N: 900 -2227)
	4500945	Reel Weldment (S/N: 2228 - . . .)
13	539065-30	Shaft Bushing
14	539065-31	E-Ring
15	539065-32	Primary Drive Shaft (S/N: 900 - 2227)
	539075-50	Primary Drive Shaft (S/N: 2228 - . . .)
16	533122	Thrust Washer
17	539065-34	Ratchet Bolt
18	539065-35	Ratchet Sleeve
19	539065-36	Locknut
20	40220H	High-Strength Bolt
21	539065-38	Locknut
22	539065-39	Reel Spacer
23	539065-40	Intermediate Drive Shaft (S/N: 900 -2227)
	539075-51	Intermediate Drive Shaft (S/N: 2228 - . . .)
24	539065-41	Shaft Bushing
25	539066	Crank Handle

Figure 8 -13
Leveling Safety Switch Option
(P/N: 4500908 Ref.)



KEY NO.	PART NO.	DESCRIPTION
1	513979	5° Safety Switch
2	4500864	Switch Mounting Bracket
3	519551	Lamp Holder
4	519552	Lamp
5	40003	1/4-20 x 3/4" Bolt
6	50408	1/4-20 ESNA Nut
7	590690	Decal, “Level Indicator Light”
8	515029	Solenoid
9	40005	1/4-20 x 1" Bolt

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