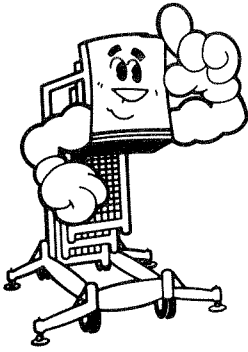
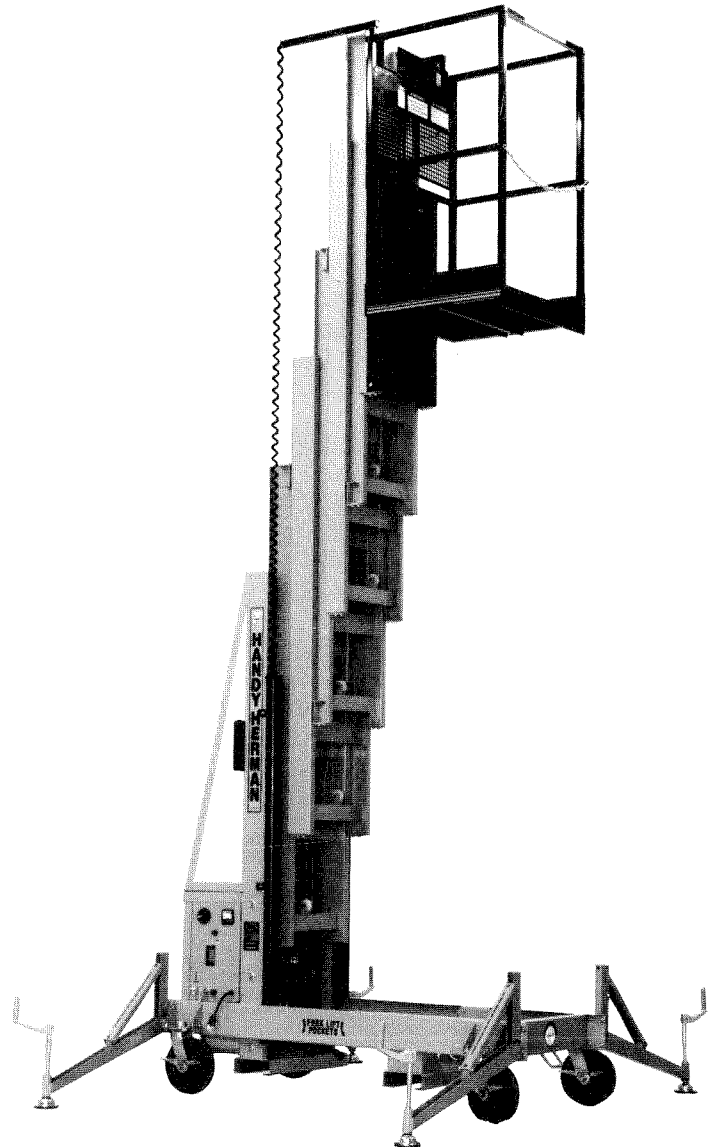


HANDY-HERMAN

Models: 016DC, 016AC
024DC, 024AC



Operating, Service and Maintenance Manual



PAC-CRAFT PRODUCTS
A DIVISION OF
MAYVILLE ENGINEERING COMPANY, INC.
715 SOUTH STREET, P.O. BOX 267
MAYVILLE, WISCONSIN 53050

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LIMITED OWNER WARRANTY

Pac Craft Products warrants its equipment, to the original purchaser only, against defects in workmanship and materials under normal use and service for one (1) year from date of authenticated purchase or date equipment is first placed in use, whichever is earlier; excluded from such warranty is the battery which carries a ninety (90) day warranty from such date of purchase and prorated thereafter up to one (1) year from such date of purchase. Warranty within such warranty period is limited to replacement or repair, at Pac Craft's option, of equipment or parts thereof shipped prepaid to Pac Craft which are found, upon inspection by Pac Craft, to be defective. Pac Craft's sole obligation and buyer's exclusive remedy hereunder shall be limited to such repair or replacement.

PAC CRAFT SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL OR CONTINGENT DAMAGES WHATSOEVER. USE OF OTHER THAN FACTORY AUTHORIZED PARTS, MISUSE, IMPROPER MAINTENANCE OR MODIFICATION OF THE EQUIPMENT VOIDS THIS WARRANTY. PARTS OTHER THAN OF OUR MANUFACTURE ARE SUBJECT TO THE ORIGINAL MANUFACTURER'S WARRANTY.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ALL SUCH OTHER WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED.

NO DEALER, SALES REPRESENTATIVE OR OTHER PERSON PURPORTING TO ACT ON BEHALF OF PAC CRAFT IS AUTHORIZED TO ALTER THE TERMS OF THIS WARRANTY OR TO IN ANY MANNER ASSUME ON BEHALF OF PAC CRAFT ANY LIABILITY OR OBLIGATION WHICH EXCEEDS PAC CRAFT'S OBLIGATIONS UNDER THIS WARRANTY.

1. INTRODUCTION

OPERATOR QUALIFICATIONS

Handy-Herman is to be operated and maintained by qualified personnel only!

To qualify for operation and maintenance of this unit, an individual must read and thoroughly understand this manual. If a proposed operator or maintenance man fails to understand any segment of this manual, his Supervisor can clarify the misunderstanding through written correspondence or a phone call to:

Pac Craft Products
Division of Mayville Engineering Company, Inc.
715 South Street, P.O. Box 267
Mayville, Wisconsin 53050
#414-387-4500

SAFETY AND LIMITATIONS

Pac-Craft designs Handy-Herman aerial work platforms to be safe and reliable. They are rugged and maneuverable but must be used only for purposes and ways intended.

The following precautions are based on common sense and on the code of safe practices developed by the Scaffold Industry Association, Inc. for the elevating work platform industry.

1. Respect your machine: do not neglect or misuse it.
2. Check jobsite for unsafe working conditions.
3. Inspect machine before using. Do not use machine if it is malfunctioning in any way.
4. Use machine only for purposes for which it was designed.
5. Never take chances. Do not use machine if your physical condition is uncertain in any way.
6. The platform and its enclosures are not insulated. Do not use near electrically energized circuits.
7. An operator of any type of work platform is subject to certain hazards that cannot be protected by mechanical means. It is therefore essential that operators be competent, careful, physically and mentally fit, and thoroughly trained in safe operation of this machine.

DESCRIPTION

General

Handy-Herman aerial work platforms are electrically actuated, hydraulically operated units. The platform is raised and lowered by mast sections. Emergency lowering and auxiliary lift controls are located at the base of the machine.

HANDY-HERMAN SPECIFICATIONS

| MODEL NO. | (EXT.) PLAT. HT. | (EXT.) WORK HT. | LIFT CAP | POWER | BASE LENGTH | BASE WIDTH | BASE WIDTH w/ OUTRIG. EXT. | PLAT. WIDTH | PLAT. LENGTH | GRND. CLEAR | APPROX. WT.† | ASCEND TIME (LOADED) | DESCEND TIME (LOADED) |
|-----------|------------------|-----------------|-------------------|------------|-----------------|----------------|----------------------------|---------------|---------------|--------------|-------------------|----------------------|-----------------------|
| 016AC | 16' (4.88m) | 22' (6.71m) | 400# (181.6kg) | AC 115V | 5'3" (1.60m) | 2'6" (.76m) | 5'2" (1.20m) | 24" (.61m) | 30" (.76m) | 3" (76mm) | 745# (338.2kg) | 35 sec. | 25 sec. |
| 016DC | 16' (4.88m) | 22' (6.71m) | 400# (181.6kg) | DC 12V | 5'3" (1.60m) | 2'6" (.76m) | 5'2" (1.20m) | 24" (.61m) | 30" (.76m) | 3" (76mm) | 806# (365.9kg) | 35 sec. | 25 sec. |
| 024AC | 24' (7.32m) | 30' (9.14m) | 300# (136.2kg) | AC 115V | 5'3" (1.60m) | 2'6" (.76m) | 5'2" (1.20m) | 24" (.61m) | 24" (.61m) | 3" (76mm) | 855# (388.1kg) | 35 sec. | 25 sec. |
| 024DC | 24' (7.32m) | 30' (9.14m) | 300# (136.2kg) | DC 12V | 5'3" (1.60m) | 2'6" (.76m) | 5'2" (1.20m) | 24" (.61m) | 24" (.61m) | 3" (76mm) | 916# (415.8kg) | 35 sec. | 25 sec. |

† Add approximately 100# (45.4kg) for skid weight.

2. OPERATION

SAFETY FEATURES

1. Emergency Stop

The emergency stop is located on the control console. Depress red knob as indicated and all functions of machine will be de-energized. Pull up on knob to reactivate circuits. (Fig. 1)

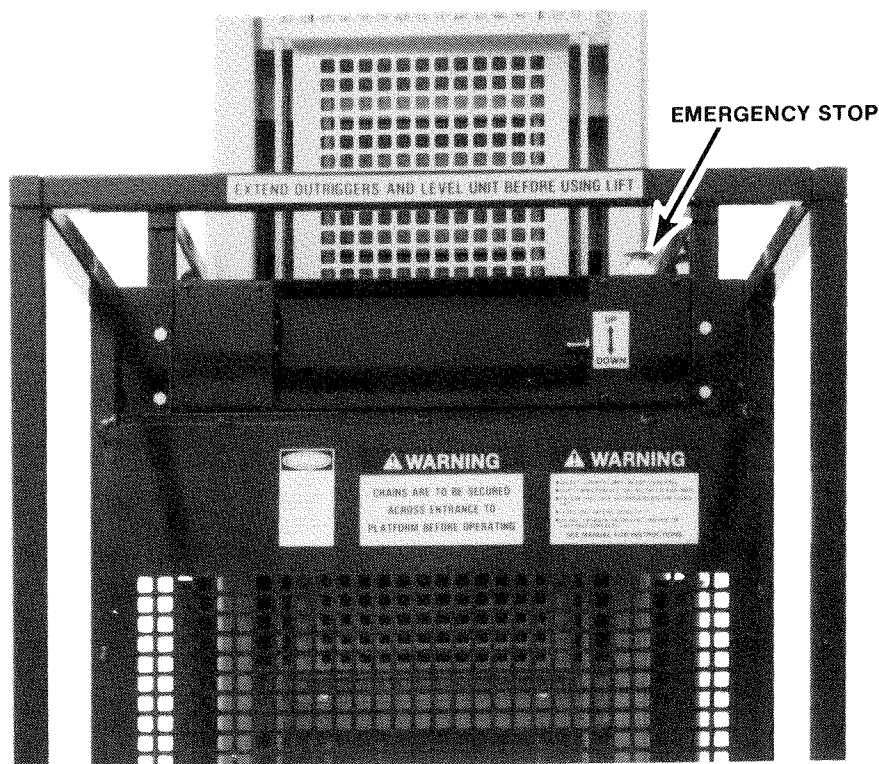


Figure 1. Emergency Stop Control

2. **Emergency Down**

The Emergency Down Control is located below the hydraulic reservoir in the rear of the unit. Pull handle on cable to allow platform to descend back to the stowed position. (Fig. 2)

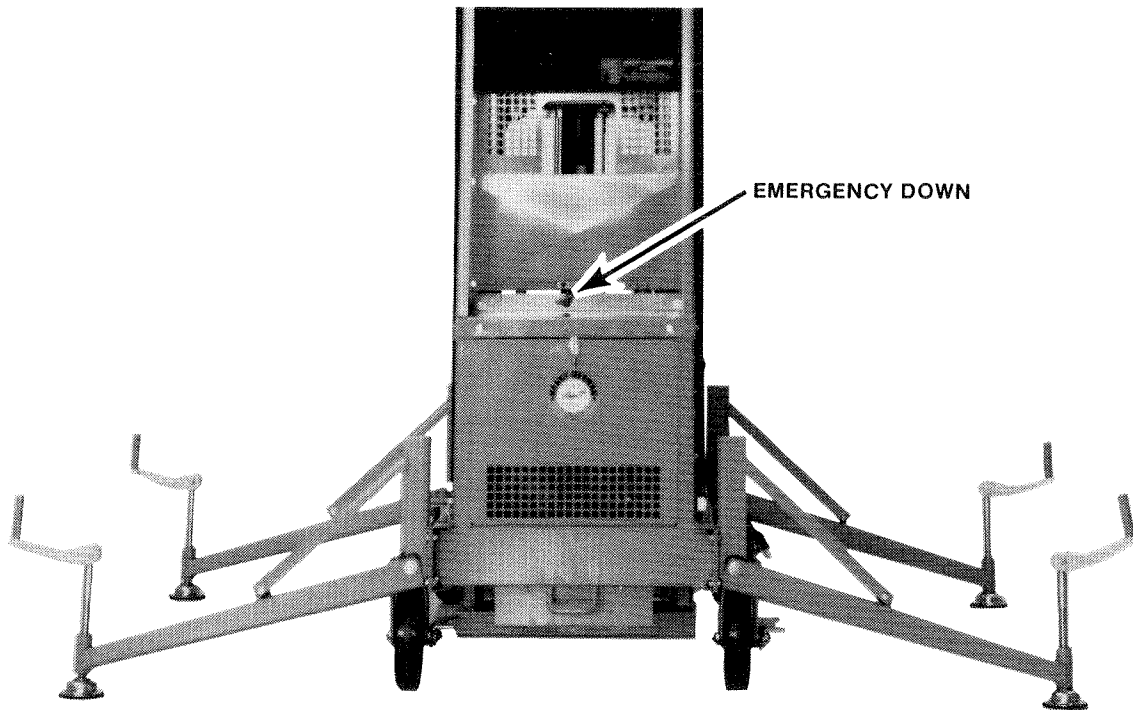


Figure 2. Emergency Down Control

3. **Caster Brakes**

Caster brakes must be set whenever platform is elevated. (Fig. 3)

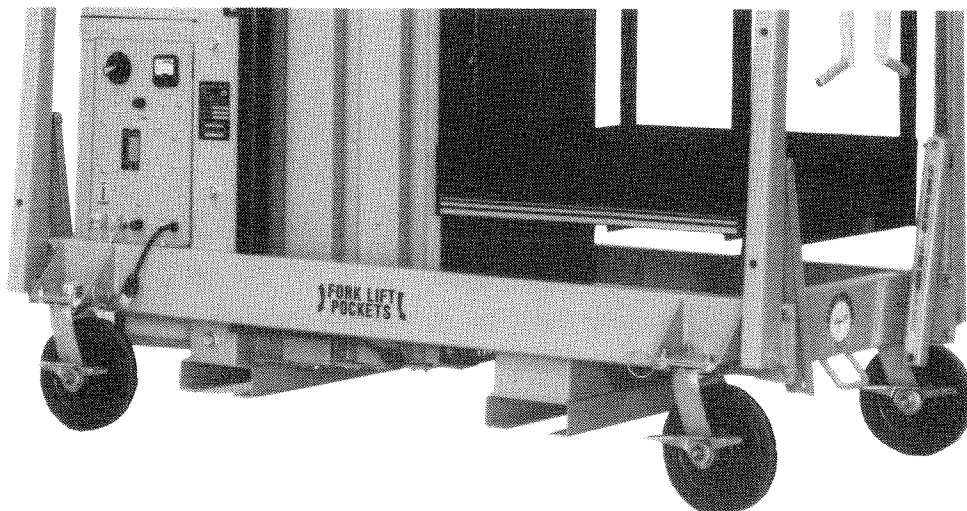


Figure 3. Caster Brakes

4. **Manual Outriggers**

Outriggers must be extended whenever platform is elevated. When positioning unit for work, leave approximately 25 inches of space for outrigger extension between the unit and any obstruction on both sides of the machine. (Fig. 4)

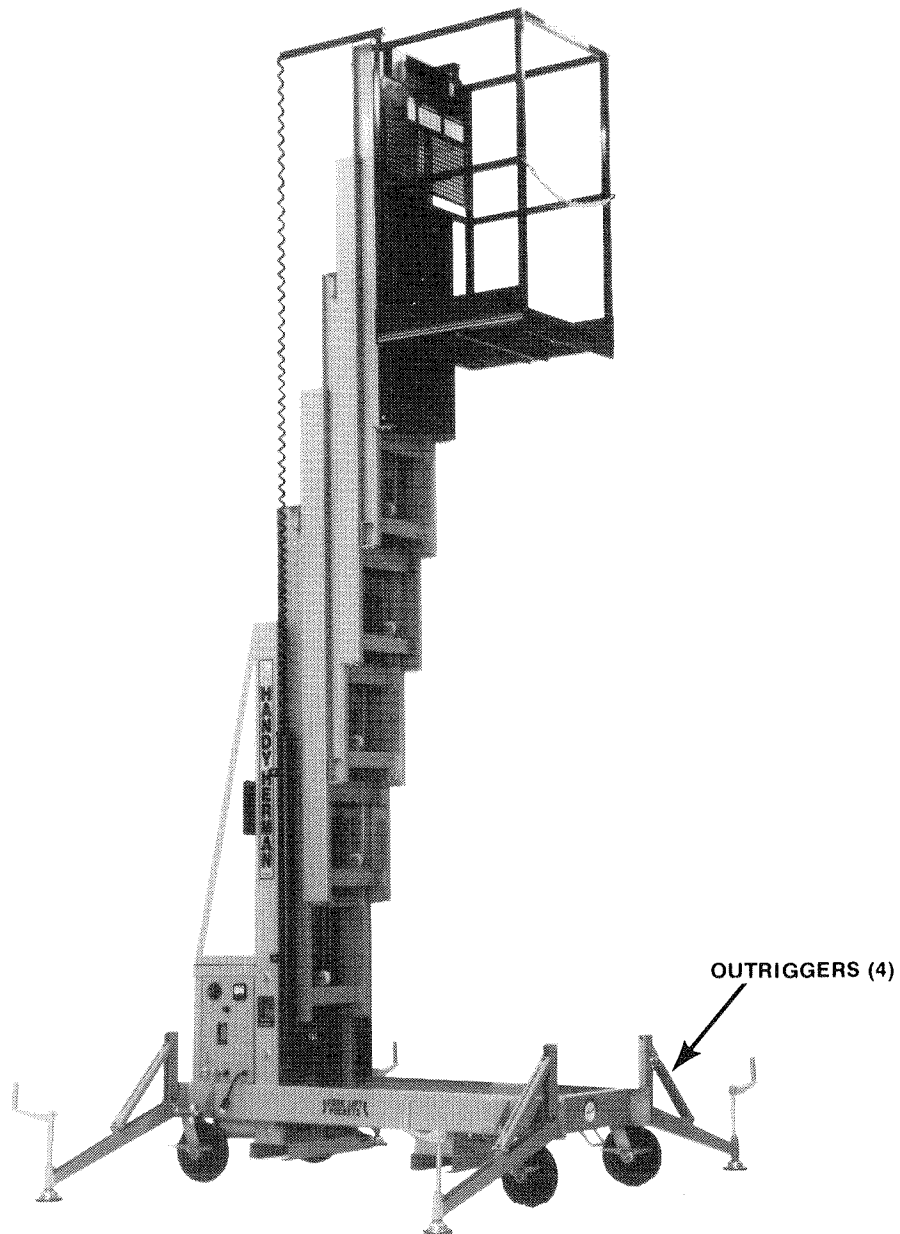


Figure 4. Manual Outriggers

OPERATING INSTRUCTIONS

A. ALL MODELS

1. Always extend and adjust all outriggers so base is level before extending.

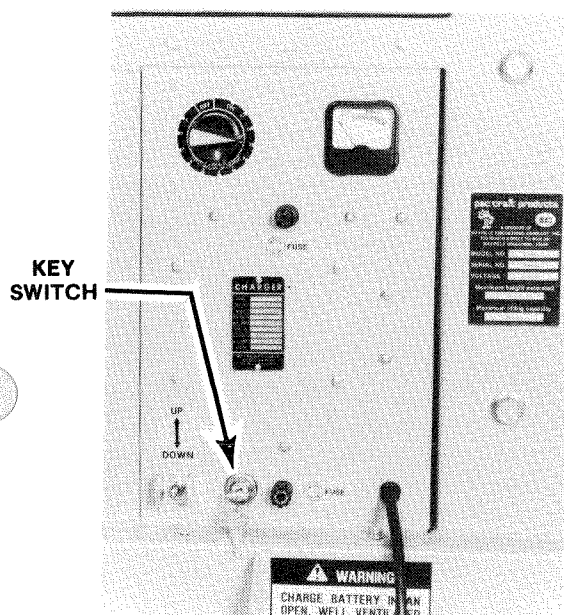


Figure 5. Key Switch Location

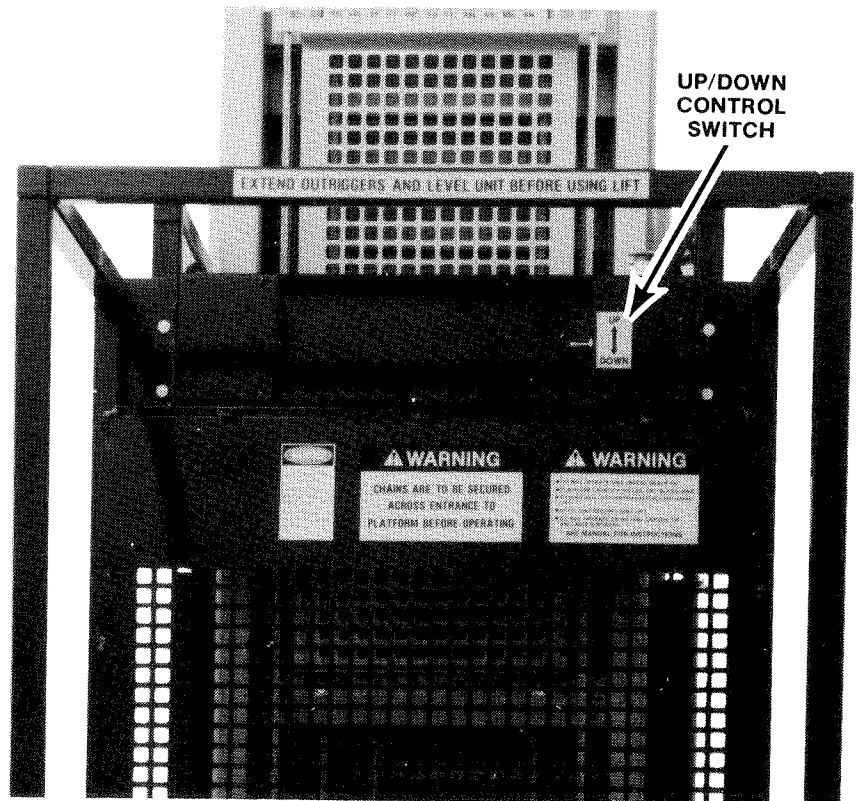


Figure 6. Control Switch Location

2. To operate the Handy-Herman you must first turn the key to the ON position. The key is located at the lower control and charger panel. (Fig. 5) You must also have battery switch in ON position for D.C. units. This is located in the opposite side panel.
3. **To Raise Platform** — Activate up/down toggle switch to UP position. To stop platform, release switch. (Fig. 6)
4. **To Lower Platform** — Activate up/down toggle switch to DOWN position. To stop platform, release switch. (Fig. 6)

GENERAL OPERATING RULES AND SAFETY

1. The following instructions must be complied with to ensure safe operation of the Handy-Herman work platform.
2. Before operation — Ensure that the machine is properly serviced. (**Do Not Use** if machine is not working properly.)
3. Inspect the unit for damaged or defective parts before each use. Any damage or defects shall be repaired before operating.
4. Ensure that safety chain is in place whenever someone is on the platform. Do not operate without platform safety chain in place.
5. Follow all applicable city, state, federal, OSHA and ANSI A92.3 safety codes for use of elevating work platforms.
6. **Do Not** use near power lines . . . Platform and enclosure are **not** insulated. Stay clear of electric wire, cables, and other overhead obstructions.
7. Do not attempt to use the unit when exposed to wind, rain, snow or ice.
8. **Do Not** elevate on incline. **Do Not** operate on uneven or soft terrain. Operate only on a firm and level surface.
9. Always check clearance around machine before elevating or lowering platform.
10. Do not exceed the load capacity of platform.
11. Always lock caster brakes before elevating platform.
12. Always extend and adjust all outriggers so base is level before boarding.
13. Maintain and lubricate unit daily.

3. MAINTENANCE

USE OF NOTES, CAUTIONS, AND WARNINGS

NOTE — Additional information to further understand instructions.

CAUTION — Denotes that failure to comply with instructions could cause damage to the equipment.

WARNING — Denotes that failure to comply with instructions would create a hazardous condition that could result in injury to personnel.

WARNING

Maintenance on the Handy-Herman series is relatively simple with a minimum of servicing required; however, with any type of lifting device, a hazard to personnel exists when maintenance is performed when platform is raised.

When possible, all maintenance should be performed through the rear of the unit.

The battery on D.C. units should be disconnected whenever working on components. **DO NOT REMOVE ANY HYDRAULIC COMPONENTS WITH PLATFORM RAISED.**

INSPECTION AND LUBRICATION

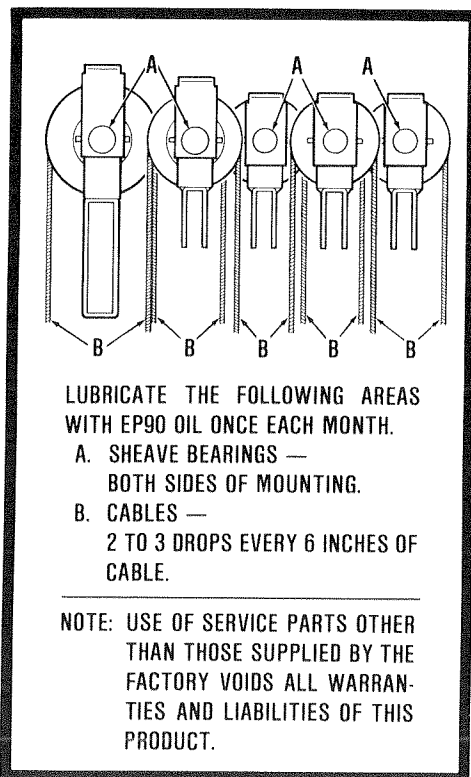
1. Visual Structural Inspection

- a. Visually check unit completely each day to insure the operators safety. Replace or repair any damaged structural members of the unit. Tighten any loose nuts, bolts, or pins. Be sure all plastic guide pads are in place and not damaged in any way. Check to see that outriggers move freely and adjustment screw turns easily.
- b. Inspect all cables for fraying or other damage daily. Look for signs of wear, broken wires on inside wrap of cables, kinking, corrosion, heat damage, etc. Replace any cable which is damaged in any way or which shows wear in any way. The cable assemblies must be ordered from your dealer to ensure that the original safety and quality specifications are met. Do not use a unit on which any cable assembly is in need of replacement.
- c. Inspect all mast sections daily to make sure that they are free of dirt or other foreign material which in any way restrict the free movement of the guide pads.

2. Lubrication

Minor lubrication will make the operation of the Handy-Herman more efficient and extend its useful life.

- a. Grease caster axles and swivel raceways monthly.
- b. Oil the leveling screws monthly.
- c. The plastic guide pads in the mast are self lubricating and should not require any maintenance. However, precautions should be taken to be sure that the paths along which the blocks move are kept clean and lightly lubricated with a dry type silicone lubricant.
- d. Lubricate wire cables and sheaves with EP 90 oil monthly.



Check and Initial Every 15 hours of USE, or Weekly

COMPONENT

| COMPONENT | MONTH | | | | | | | | | | | | |
|---|---------|-------------------------|--|--|--|--|--|--|--|--|--|--|--|
| | DAY | | | | | | | | | | | | |
| | INITIAL | | | | | | | | | | | | |
| Battery | | | | | | | | | | | | | |
| 1. Clean Battery | | | | | | | | | | | | | |
| 2. Coat Terminals | | | | | | | | | | | | | |
| Hydraulic System | | | | | | | | | | | | | |
| 1. Check Fluid Level | | | | | | | | | | | | | |
| 2. Inspect Commutator and Brushes* | | Date Last Checked _____ | | | | | | | | | | | |
| 3. Check Fittings | | | | | | | | | | | | | |
| Mast Sections | | | | | | | | | | | | | |
| 1. Oil Sheaves and Cables | | | | | | | | | | | | | |
| Main Frame | | | | | | | | | | | | | |
| 1. Grease Caster Axles and Swivel Plates (Manual) | | | | | | | | | | | | | |
| 2. Check Structure and Pivot Pins | | | | | | | | | | | | | |
| Control System | | | | | | | | | | | | | |
| 1. Check Terminals and Plugs | | | | | | | | | | | | | |
| 2. Check Cords | | | | | | | | | | | | | |

* Check every 6 months

Table 3B. Inspection and Lubrication Weekly Log.

| COMPONENT | TIME INTERVAL | | | | |
|--|----------------|----------------|---------|-----------|---------------|
| | DAILY | WEEKLY | MONTHLY | 6 MONTHS | 1 YEAR |
| Battery 1. Check Wiring 2. Check Fluid Level 3. Clean Battery Connections 4. Coat Terminals | X X | X X | | | |
| Hydraulic System 1. Check for Leaks 2. Check Fluid Level 3. Inspect Commutator and Brushes 4. Check Hoses 5. Check Fittings 6. Oil Filter (Clean) | X X | X X | | X | X |
| Mast System 1. Check for Damage 2. Oil Sheaves and Cables 3. Check for Broken Wires in Cable (Replace Immediately) | X X | | X | | |
| Main Frame 1. Grease Casters 2. Check Structure 3. Check Pivot Pins on Outriggers | X | X | | | X |
| Control System 1. Check Terminals and Plugs 2. Check Cords | | X X | | | |
| Safety Decals* 1. Check if Missing (Add if Necessary) 2. Check if Legible (Replace if Necessary) | X X | | | | |

* See page 24 for safety decals and locations.

Table 3C. Inspection & Lubrication Schedule.

SERVICING, REPLACEMENT AND ADJUSTMENTS

This section contains three basic maintenance functions:
Servicing, Replacement and Adjustments

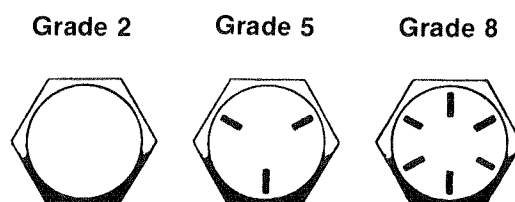
SERVICING describes items to be checked and serviced when necessary, on a daily basis, or prior to using the unit after it has been out of service for a period of time.

REPLACEMENT describes the proper method for removal and installation of replaceable components in case of failure.

ADJUSTMENT describes any adjustments necessary to ensure proper operation of the unit or adjustments required after the replacement of components, if necessary.

CAP SCREWS

NOTE: Any bolt replacement should be of same grade or greater than original bolt. Any questions, call the factory for verification.



NOTE: Use only service parts supplied by the factory.

1. BATTERY (DC ONLY)

WARNING

NEVER SMOKE OR USE OTHER COMBUSTIBLES NEAR BATTERY WHILE SERVICING BATTERY OR OTHER COMPONENTS. PROVIDE PLENTY OF VENTILATION. PRESENCE OF HYDROGEN FUMES COULD LEAD TO EXPLOSION!

Handy-Herman battery models are supplied with a heavy duty deep-cycle battery. The care and maintenance of your battery has much to do with how well your Handy-Herman functions. Battery wiring and water level should be checked daily. After using Handy-Herman continuously for a period of time, it is recommended that the battery be brought to a full charge as soon as possible. If the battery is allowed to remain discharged, the lead plates will harden and become sulfated. This will shorten their life as much as over-charging. In this sulfated condition the battery fails to deliver its rated capacity or come up to full charge. Several long, slow charges and fast discharges are then necessary to correct the sulfation and hardened plates. It is recommended that once a month the battery be given an equalizing charge of 25% over the regular charge. The equalizing charge must always be given at a low rate to eliminate excessive gassing. Whenever battery temperature reaches 125° F, the charging rate should be reduced or the battery taken off charge and allowed to cool to room temperature.

Do not overfill. When the cells are filled too full, the battery fluid will expand as it becomes warm from charging causing fluid to seep out. Each time this happens, the solution weakens by adding water. Loss of ampere hour capacity will result.

WARNING

NEVER SMOKE OR USE OTHER COMBUSTIBLES NEAR BATTERY. MAKE SURE THERE IS PLENTY OF VENTILATION. HYDROGEN FUMES COULD LEAD TO EXPLOSION.

a. **Checking and Filling** (Every 15 hours of use or when recharging)

- (1) Remove rear guard.
- (2) If there is any dirt or corrosion on battery, wash with solution of 5 teaspoons baking soda per quart of warm water.
- (3) Remove battery caps and check fluid.
- (4) Fill, if needed, as follows:
 - (a) Before charging, fluid must be above plates in battery.
 - (b) After charging, fill to split ring.

CAUTION

Do not overfill. Fluid will expand as it becomes warm from charging and seep out of the battery. When water is then added, the solution is weakened and a loss of ampere hour capacity results.

Never add acid to battery. The solution is at its proper strength when the battery is manufactured. Use distilled water and keep fluid up to proper level. When required, water should be added to battery **after** charging, unless water level is below the top of the plates.

- (5) Coat terminals with petroleum jelly or equivalent coating.

b. **Charging Notes**

- (1) The surrounding temperature has a great effect on the power reserve in a battery.
 - (a) A battery 100% charged at 80° F.
 - drops to 65% at 32° F.
 - drops to 40% at 0° F.
 - (b) A battery 46% charged at 80° F.
 - drops to 32% at 31° F.
 - drops to 21% at 0° F.
- (2) When battery temperature reaches 125°, battery should be taken off charge and cooled to room temperature or the charging rate should be lowered.

- (3) Battery should be brought to full charge as soon as possible after continuous use. (Lead plates in discharged batteries become hardened and sulfated. The battery eventually will not deliver its rated capacity or come up to a full charge. Several long slow charges and fast discharges help restore plate condition.)
- (4) Once a month, battery should be given an equalizing charge of 25% over regular charge. Charge must be given at low rate to avoid gassing.

c. **Charging**

- (1) Remove rear guard.
- (2) Remove caps, check fluid level and if needed, fill to cover plates.

NOTE

After charging, fill to split ring.

- (3) Plug charger into 120 VAC, 60 HZ power source.
- (4) Turn timer clockwise to "ON" position.
- (5) Charge until meter reads in finish area or near zero (0). (Charge will turn off automatically when timer runs out.)
- (6) Unplug charger.
- (7) Check that fluid level is up to split rings and reinstall caps.

d. **Battery Replacement**

- (1) Completely lower unit.
- (2) Remove rear guard.
- (3) Remove nuts from battery hold down and remove hold down.
- (4) Remove battery cables.
- (5) Remove battery.

2. **HYDRAULIC SYSTEM**

a. **General Maintenance**

CAUTION

It is important to maintain the hydraulic system continually to keep the oil clean and to prevent possible damage to the system.

- (1) Check the suction and return hoses and fittings (Fig. 7) for leakage or damage each day. Tighten or replace when necessary to prevent loss of hydraulic oil.
- (2) If platform does not stay up, check and clean manual valve, solenoid valves and flow control valve in manifold block. Be sure platform is in stowed (down) position and reservoir is drained when removing any components. Replace valves in original position.

b. **Check and Fill Hydraulic Reservoir**

- (1) Lower platform completely.

- (2) Unscrew the breather cap (Fig. 7) located inside frame member and fill the reservoir with hydraulic fluid conforming to MIL. Spec. 0-5606, Flowmite 150 Hydraulic fluid or a good grade SAE 10W hydraulic oil.

NOTE

The reservoir should be filled within 2" of top with the platform in its lowest position. Do not overfill because when oil warms it will expand and overflow reservoir.

- (3) Should oil become contaminated, disconnect suction hose and drain reservoir into suitable container. Unscrew suction filter and remove from reservoir. Drain remaining oil from system.
- (4) Clean suction filter in solvent.
- (5) Reassemble components and fill reservoir with clean oil.

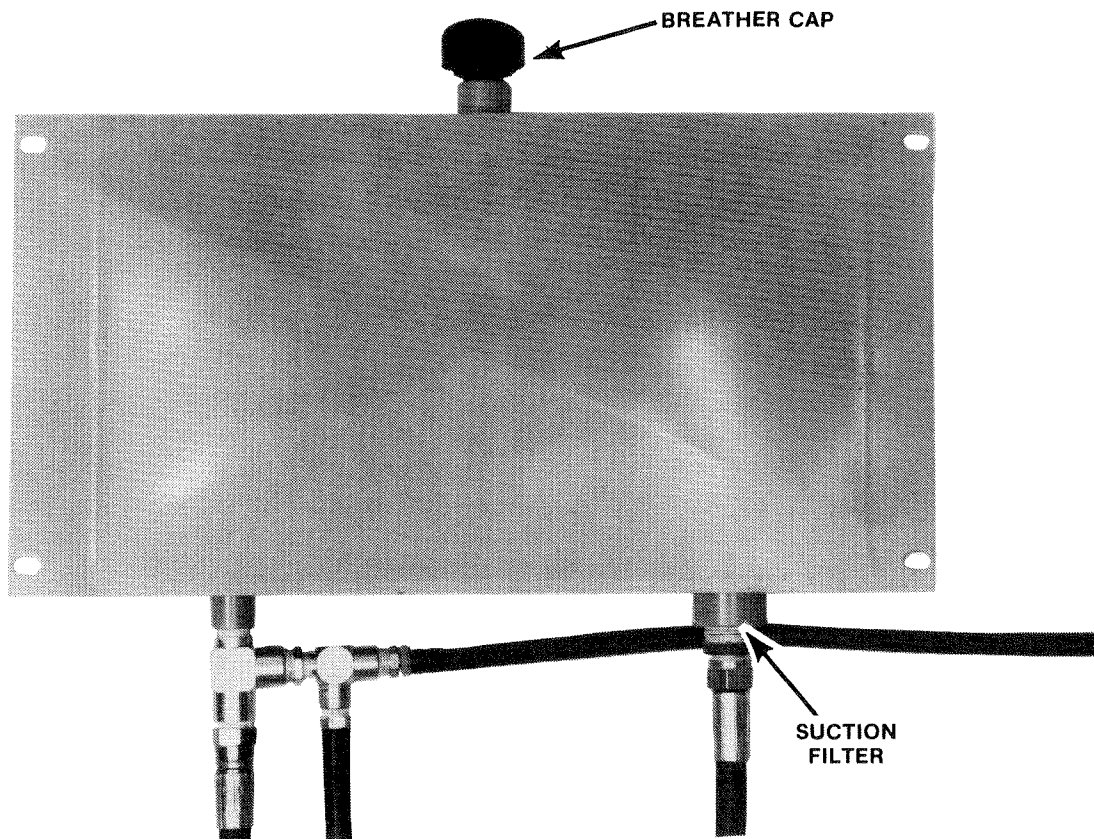


Figure 7. Filling Hydraulic Reservoir and Checking Hydraulic Oil Filter

c. Hydraulic System Bleeding

The Handy-Herman hydraulic system is self-bleeding. After the system has been drained, such as during the replacement of a hydraulic system component, actuate the platform full up and down for two cycles and recheck the reservoir fluid level between each cycle. Fill as required.

d. **Flow Control Valve**

- (1) Raise unit to fully extended position.
- (2) Depress DOWN switch and open or close flow control valve, as necessary, to adjust descent speed of platform to about 9" per second.

e. **Hydraulic Pump Motor Servicing**

- (1) Common maintenance of DC motors is brush replacement. It is recommended that brushes be checked and replaced if necessary along with commutator inspection approximately every six months. The time element will greatly vary depending on how the machine is being used and the condition of the battery. It is to your advantage to keep the battery fully charged and in top condition to eliminate service problems in general and to extend the life of the motor and brushes.
- (2) Common maintenance on AC motors is minor. It should be kept clean and free of obstructions. The motors need no oiling.

f. **Hydraulic Pump and Motor Replacement**

- (1) The hydraulic pump or motor can be replaced together or separately.
- (2) Disconnect positive and negative cables from motor.
- (3) If only motor has to be replaced, unbolt pump from motor leaving hoses connected on pump.
- (4) Remove four bolts securing motor to base and remove motor.
- (5) If only hydraulic pump has to be replaced disconnect hoses from pump.
- (6) Remove four bolts securing pump to the motor and remove pump.
- (7) Motor and pump can be removed by disconnecting cables, hoses, and removing four bolts from base.
- (8) Install new or repaired motor or pump in reverse order of removal.
- (9) Refill reservoir to replace fluid lost during disassembly.
- (10) Raise and lower platform twice to bleed system. Check the fluid level after cycling and fill as required.

3. **BRAKES**

NOTE

Brakes are caster mounted on all four casters and are foot operated.

- a. Adjust brake tension of foot pedal to proper tension while having caster raised for free spinning.

4. HYDRAULIC LIFT CYLINDER

a. Replacement

- (1) Lower platform completely.
- (2) Remove both battery cables.
- (3) Remove two cables which wrap around first mast section (mast section with cylinder mounted inside).
- (4) Remove pin on top of cylinder rod.
- (5) Wrap chain, sling, or looped cable around top spacer on first mast section.
- (6) Lift first mast section until the cylinder is clear of all center braces. (All the other mast sections will raise with the first.)
- (7) Remove pin from bottom of cylinder, lift out of base mounting bracket and unbolt manifold block from cylinder.
- (8) Replace cylinder and reassemble in opposite order of removal.

5. LIFT CABLES

Adjust the lift cables as follows: Extend all outriggers and level base. Raise the platform to the maximum extended height and then lower it while operator and another person check to see that all sheaves are turning. Also check for cable damage or wear as described above. After completely lowering the platform turn power off on machine and remove mast guards. Adjust the cables until they are just snug against the retainer. Do not overtighten the cables so as to raise the platform from its resting position. Make sure that the hex lock nuts are turned onto the threaded cable ends with at least one thread extending through the nut. Check both ends of cable.

Replace all mast guards.

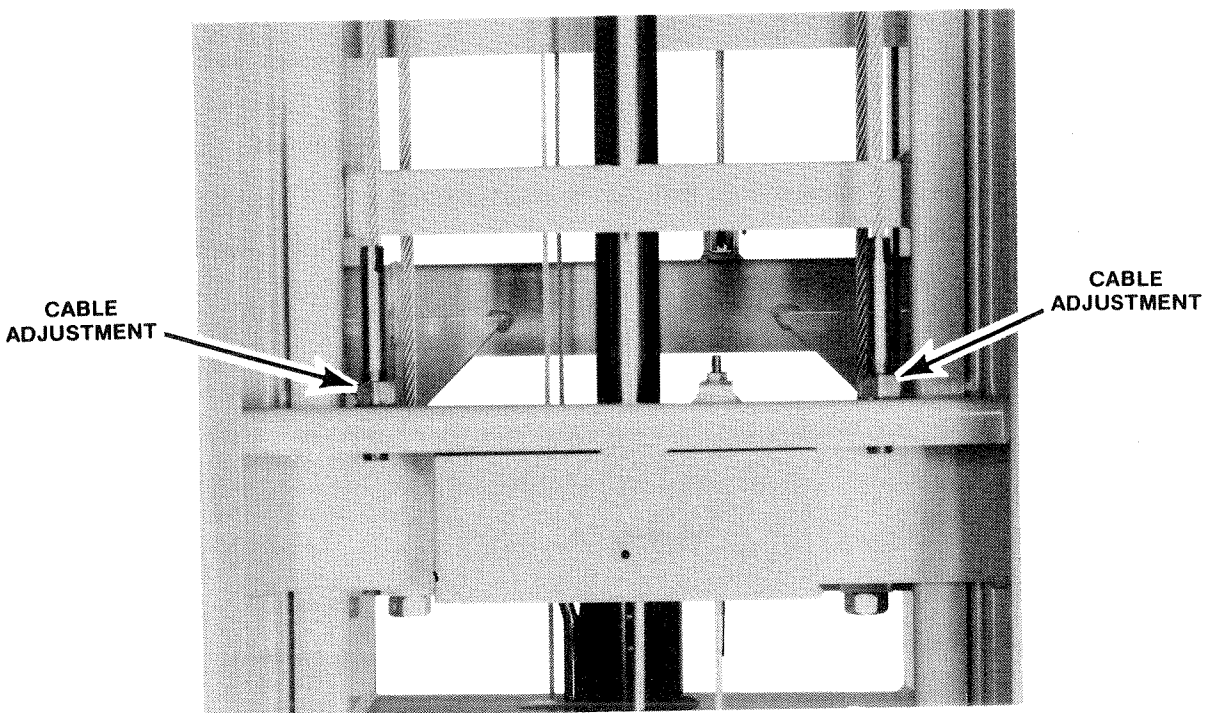


Figure 8. Adjusting Lift Cables

4. TROUBLESHOOTING

| PROBLEM | POSSIBLE CAUSES | REPAIR PROCEDURE |
|---|---|--|
| No LIFT motion pump not operating). (All Models) | 1. Blown fuse. | 1. Check fuse and replace if necessary. |
| | 2. Dead battery. | 1. Check and charge battery as directed in MAINTENANCE section. |
| | 3. Electrical circuit defective. | 1. Refer to electrical schematic. |
| | 4. Worn brushes. | 1. Replace. |
| | 5. Shorted armature. | 1. Replace motor. |
| | 6. Defective motor start solenoid. | 1. Replace start solenoid. |
| | 7. Defective emergency stop switch or solenoid. | 1. Replace switch or solenoid. |
| | 8. Defective key switch. | 1. Replace key switch. |
| | 9. Defective UP switch. | 1. Replace UP switch. |
| | 10. Defective battery disconnect. | 1. Replace battery disconnect. |
| No LIFT motion (pump operating) (All Models) | 1. Hydraulic fluid level low. | 1. Add fluid (see MAINTENANCE section). |
| | 2. Pump cavitation caused by improper fluid for temperature conditions. | 1. Drain reservoir and bleed system. Use only recommended type fluids (see MAINTENANCE section). |
| | 3. Defective UP valve or coil. | 1. Replace UP valve or coil. |
| | 4. Electrical circuitry defective. | 1. Refer to electrical schematic. |
| | 5. Defective emergency down valve. | 1. Replace emergency down valve. |
| Ascent speed slow or erratic. | 1. Weak battery (DC only). | 1. Charge battery (see MAINTENANCE section). |
| | 2. Loose connections in electrical circuitry. | 1. Perform visual inspection and ensure all connections are secure. |
| | 3. Momentary short in wiring. | 1. Refer to electrical schematic. |
| | 4. Bent structural members. | 1. Replace damaged members as necessary (see visual structural inspection in MAINTENANCE section). |

TROUBLESHOOTING (CONTINUED)

| PROBLEM | POSSIBLE CAUSES | REPAIR PROCEDURE |
|--|--|---|
| Ascent speed slow or erratic (continued) | 5. Restriction in hydraulic hose. | 1. Replace defective hydraulic line. |
| | 6. Defective or jammed seals in hydraulic lift cylinder. | 1. Replace hydraulic cylinder. |
| | 7. Gear or gear cavity worn or damaged. | 1. Replace pump. (See REPLACEMENT section.) |
| | 8. Worn brushes in motor. | 1. Replace brushes. |
| | 9. Defective valves. | 1. Check V1 on cylinder manifold. |
| | 10. Loose intake hose or oil filter. | 1. Tighten. |
| | 11. Defective down valve in manifold or in cylinder. | 1. Replace. |
| | 12. Defective emergency down valve. | 1. Replace. |
| Descent speed slow. | 1. Flow control out of adjustment. | 1. Adjust (see ADJUSTMENT section). |
| | 2. Friction in structural members. | 1. Lubricate and check for damaged members and cracked welds. (See MAINTENANCE.) 2. Replace damaged structural members. This is to be done by factory authorized personnel only. |
| | 3. Obstruction in hydraulic hose. | 1. Replace defective hose. |
| | 4. Defective down valve. | 1. Replace valve. |
| Unit will not descend. | 1. Down signal not applied to down solenoid. | 1. Check fuse. 2. Check battery charge. 3. Check faulty wiring. Refer to wiring diagram. |
| | 2. Faulty down solenoid. | 1. Replace worn solenoid. |
| Unit creeps down. | 1. Damaged seal in lift cylinder. | 1. Replace hydraulic cylinder (see MAINTENANCE section). |
| | 2. Defective down valve. | 1. Replace valve. |
| | 3. Defective emergency down valve. | 1. Replace valve. |

ELECTRICAL WIRING DIAGRAM

016DC 12 VOLT

024DC 12 VOLT

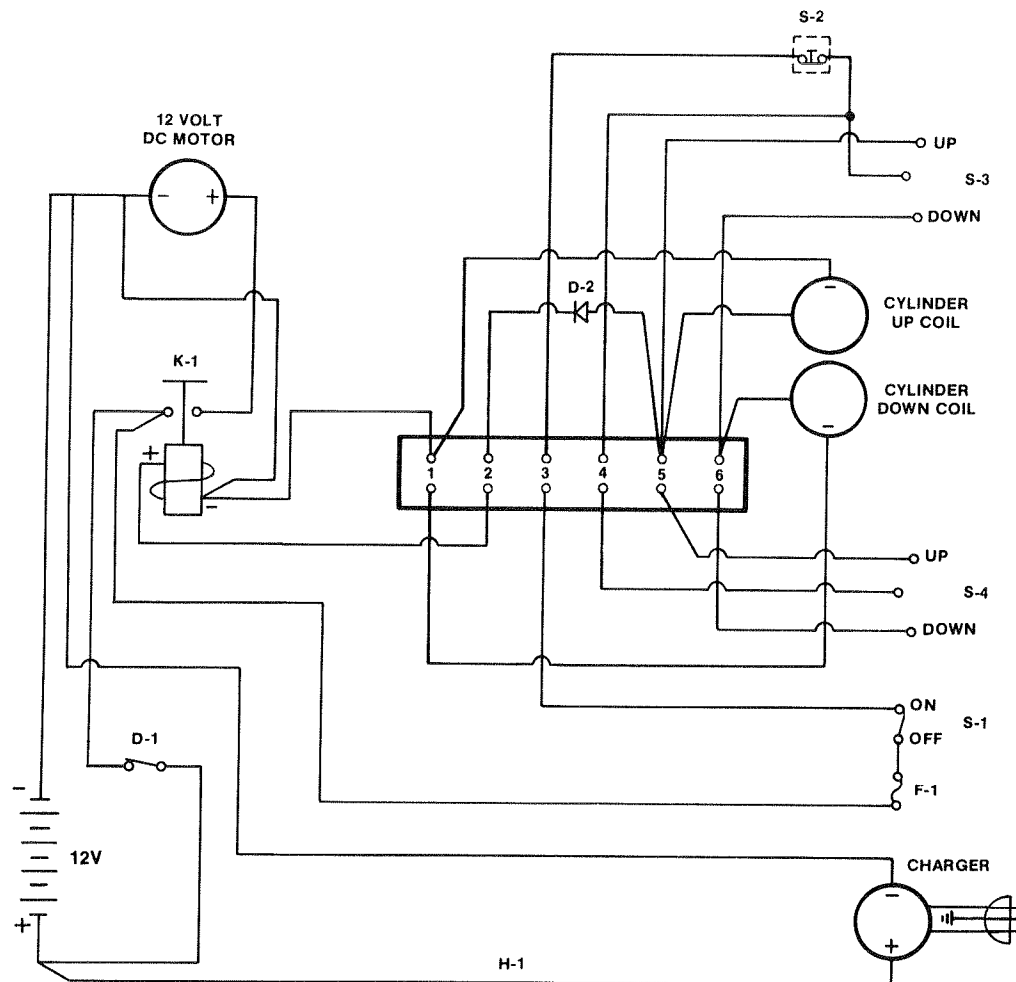


Figure 9.

Symbol Identification for Figure 9.

| Symbol | Description | Part No. |
|--------|----------------------|----------|
| F-1 | Fuse | 6190 |
| D-1 | Battery Disconnect | 6468 |
| D-2 | Diode Assembly | 6536 |
| H-1 | Wiring Harness | 6494 |
| K-1 | Start Solenoid | 6411 |
| S-1 | Key Switch | 5936 |
| S-2 | Emergency Stop | 5681 |
| S-3 | Platform Control | 5230 |
| S-4 | Lower Control Switch | 5230 |
| | Charger | 6382 |
| | Battery | 6390 |
| | 12 Volt DC Motor | 6387 |
| | Coils | 6415 |

ELECTRICAL WIRING DIAGRAM

016AC

024AC

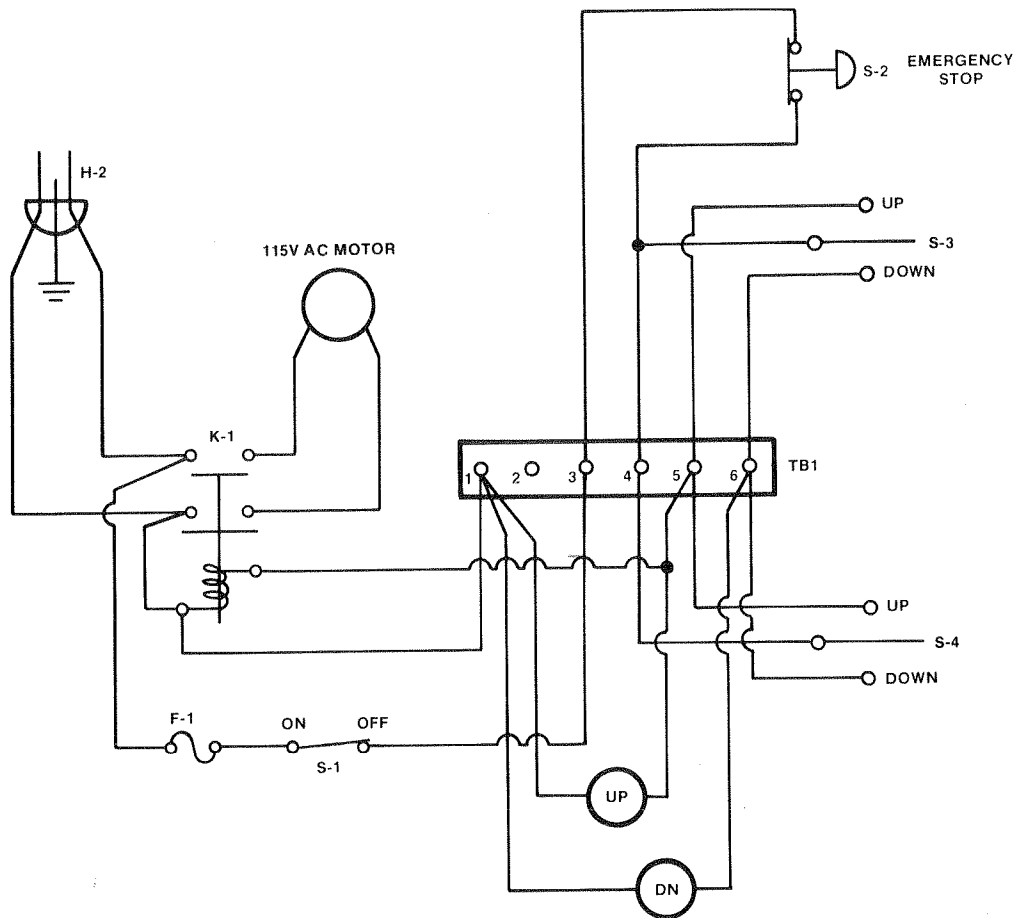


Figure 10.

Symbol Identification for Figure 10.

| Symbol | Description | Part No. |
|--------|----------------------|----------|
| F-1 | Fuse | 6190 |
| H-1 | Wire Harness | 6508 |
| H-2 | AC Cord | 6454 |
| K-1 | Relay | 5397 |
| S-1 | Key Switch | 5936 |
| S-2 | Emergency Stop | 5681 |
| S-3 | Platform Control | 5230 |
| S-4 | Lower Control Switch | 5230 |
| TB-1 | Terminal Board | 6470 |
| | Coils | 6528 |
| | AC Motor | 6401 |

HYDRAULIC SCHEMATIC **MANIFOLD BLOCK (ALL MODELS)**

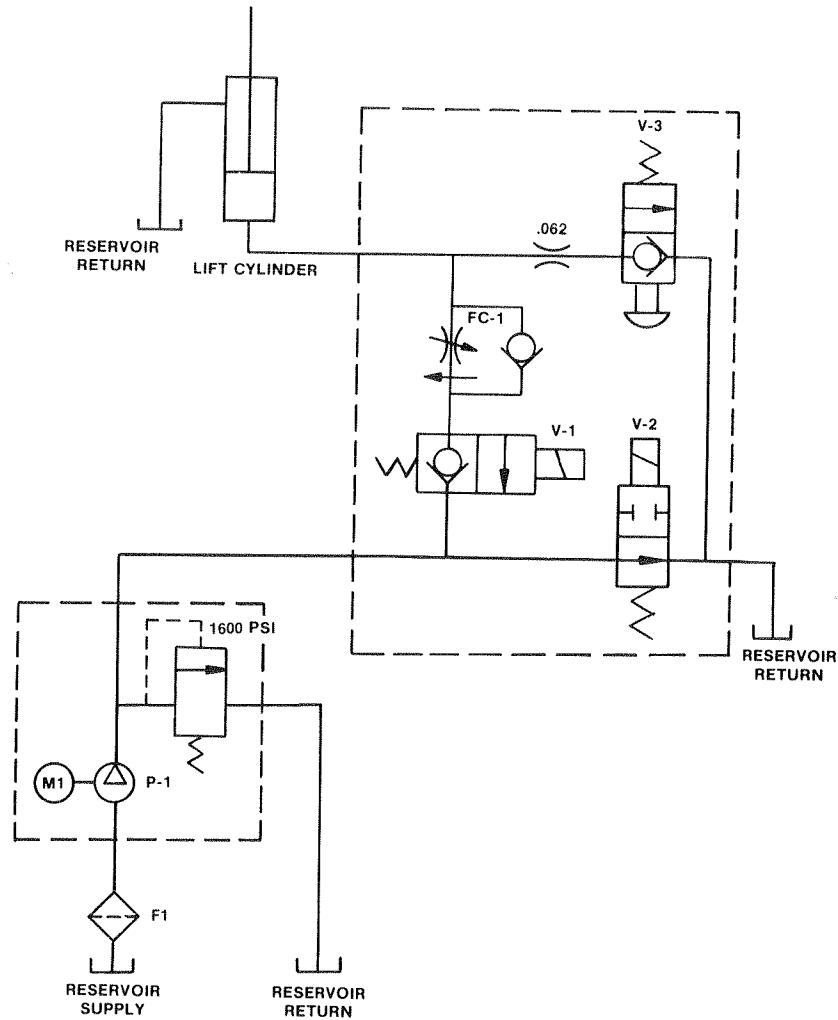


Figure 11.

Symbol Identification for Figure 11.

| Symbol | Description | Part Number | |
|--------|---|-------------|-------|
| | | DC | AC |
| F-1 | Tank Filter | 6377 | 6377 |
| FC-1 | Flow Control "O" Ring Kit | 5963 | 5963 |
| | | 5475 | 5475 |
| M-1 | Motor | 6387 | 6401 |
| P-1 | Pump | 6383 | 6402 |
| V-1 | 2-Way N.C. Valve "O" Ring Kit Valve Only Coil Only | 6453 | 6506 |
| | | 5475 | 5475 |
| | | 5964X | 5964X |
| | | 6415 | 6528 |
| V-2 | 2-Way N.O. Valve "O" Ring Kit Valve Only Coil Only | 6452 | 6505 |
| | | 5475 | 5475 |
| | | 5962X | 5962X |
| | | 6415 | 6528 |
| V-3 | Manual Pull - Emergency Down "O" Ring Kit | 5435 | 5435 |
| | | 5475 | 5475 |

HYDRAULIC MANIFOLD

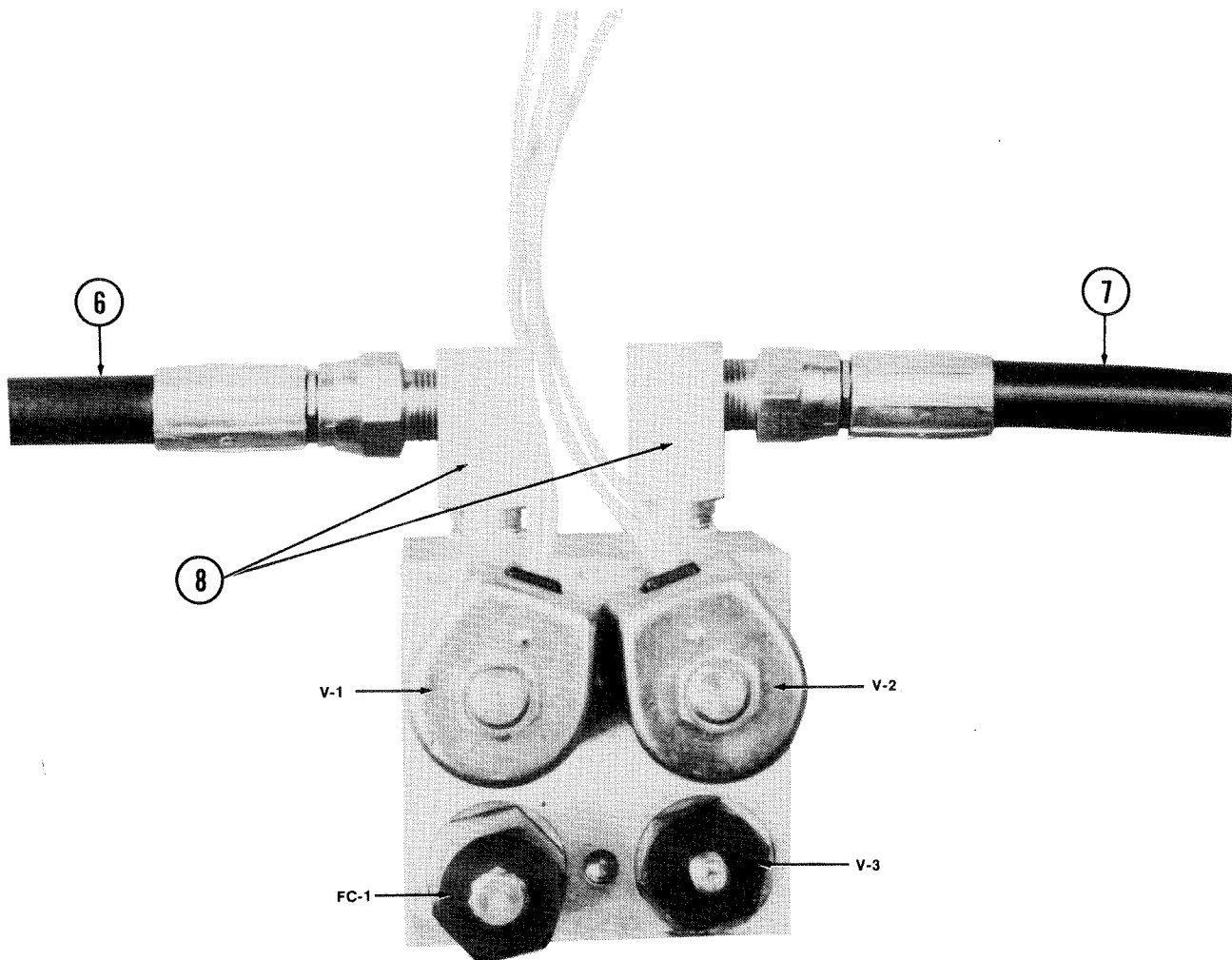


Figure 12.

Symbol Identification for Figure 12.

| Symbol | Description | Part Number | |
|--------|-------------------------|-------------|------|
| | | AC | DC |
| V-1 | 2-Way Valve (N.C.) | 6506 | 6453 |
| V-2 | 2-Way Valve (N.O.) | 6505 | 6452 |
| V-3 | Manual Pull Valve | 5435 | 5435 |
| FC-1 | Flow Control Valve | 5963 | 5963 |
| | Coils Only | 6528 | 6415 |
| 6 | Hose - Tank to Manifold | 6430 | 6430 |
| 7 | Hose - Pump to Manifold | 6429 | 6429 |
| 8 | Fitting Elbow | 6360 | 6360 |

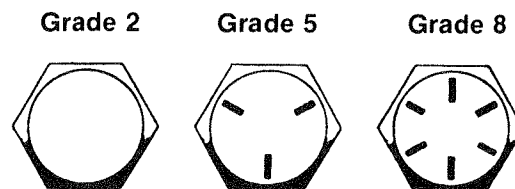
5. PARTS CATALOG

IMPORTANT REPLACEMENT PART NOTES

1. CAPSCREWS

ANY BOLT REPLACEMENT SHOULD BE OF THE SAME GRADE OR GREATER THAN ORIGINAL BOLT. ANY QUESTIONS, CALL FACTORY FOR VERIFICATION.

Grade markings for cap screws grades 2, 5, and 8 are based on SAE J429. Markings may be raised or depressed (manufacturer's option).



2. BATTERY

Replacement battery **MUST WEIGH AT LEAST 60 POUNDS**, to maintain the stability factor of the machine.

3. CASTERS

Casters must be replaced with manufacturer's replacement casters to maintain stability factor of the machine.

4. DECALS AND LABELS

All decals and labels are furnished at no charge. Refer to the following part numbers when requesting decals. See page 24 for proper location of specific safety decals.

| Part No. | Description | |
|----------|-------------|-----------|
| 2903 | 016AC | Decal Kit |
| 2904 | 016DC | Decal Kit |
| 2905 | 024AC | Decal Kit |
| 2906 | 024DC | Decal Kit |

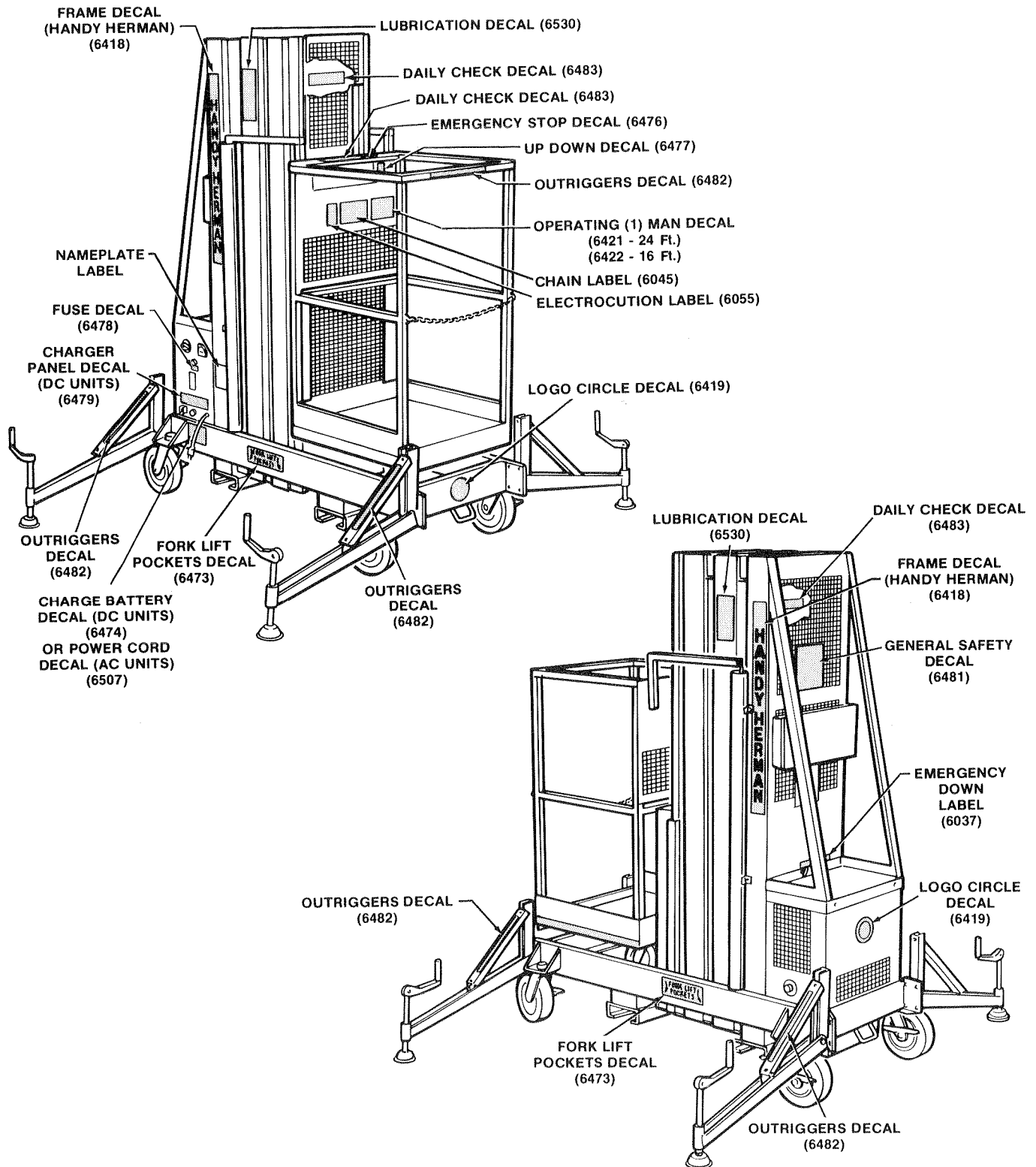
IMPORTANT

When servicing machine check to see if decals shown in diagram below are in place and legible. If not, they must be added or replaced.

NOTE: Make sure capacity decals match capacity of machine.

IMPORTANT

When servicing machine check to see if decals shown in diagram below are in place and legible. If not, they must be added or replaced.



NOTE: Make sure capacity decals match capacity of machine on nameplate.

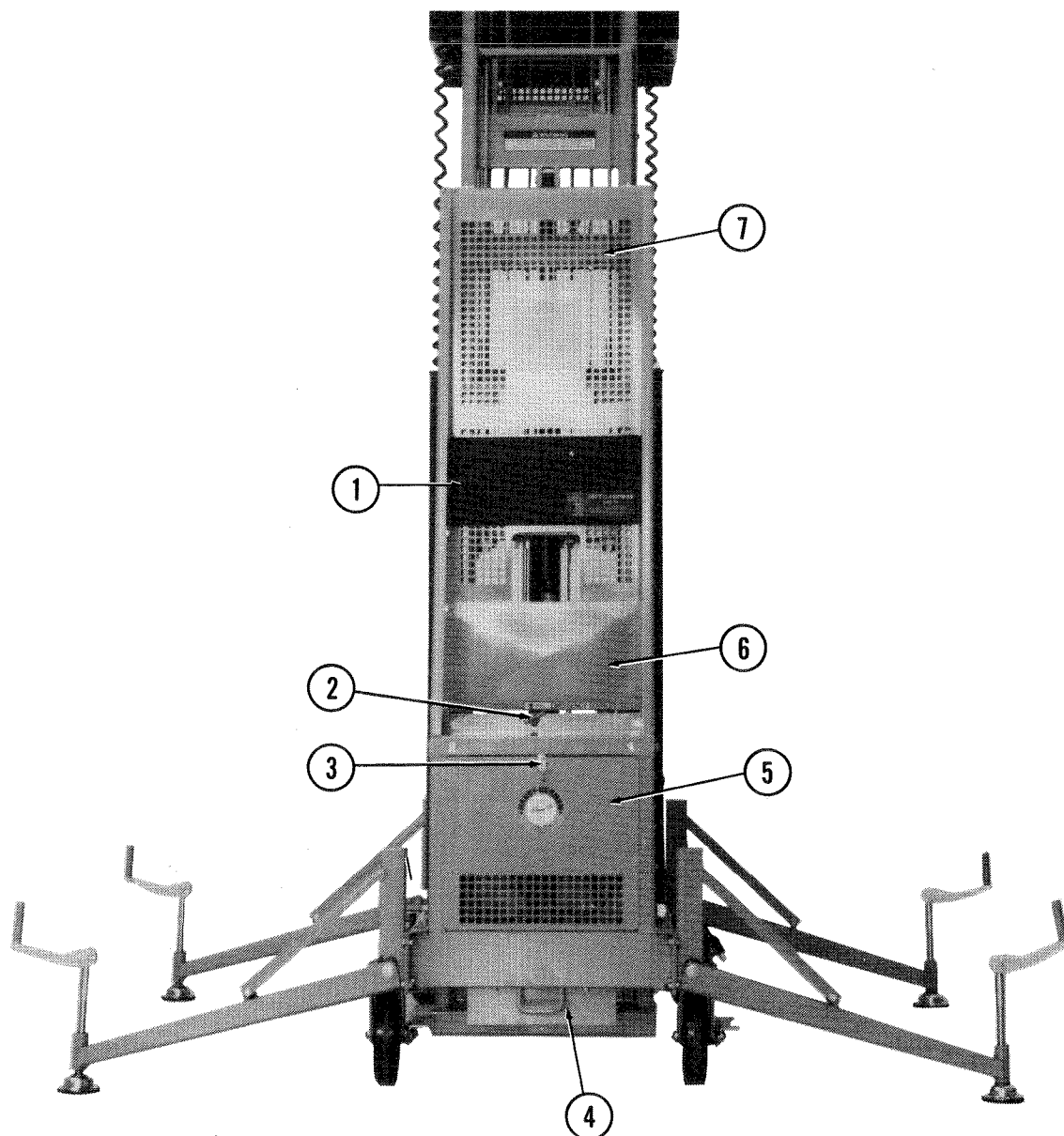


Figure 13.

| Item | Description | 016AC Part No. | 024AC Part No. | 016DC Part No. | 024DC Part No. |
|------|----------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | Box - Service Manual | 6311 | 6311 | 6311 | 6311 |
| 2 | Emergency Down Assy. | 2817 | 2817 | 2817 | 2817 |
| 3 | Lock | 6413 | 6413 | 6413 | 6413 |
| 4 | Battery Tray | | | 2754 | 2754 |
| 5 | Panel - Rear Entry | 2755 | 2755 | 2755 | 2755 |
| 6 | Reservoir Weldment | 2723 | 2723 | 2723 | 2723 |
| 7 | Rear Mast Guard | 2750 | 2750 | 2750 | 2750 |

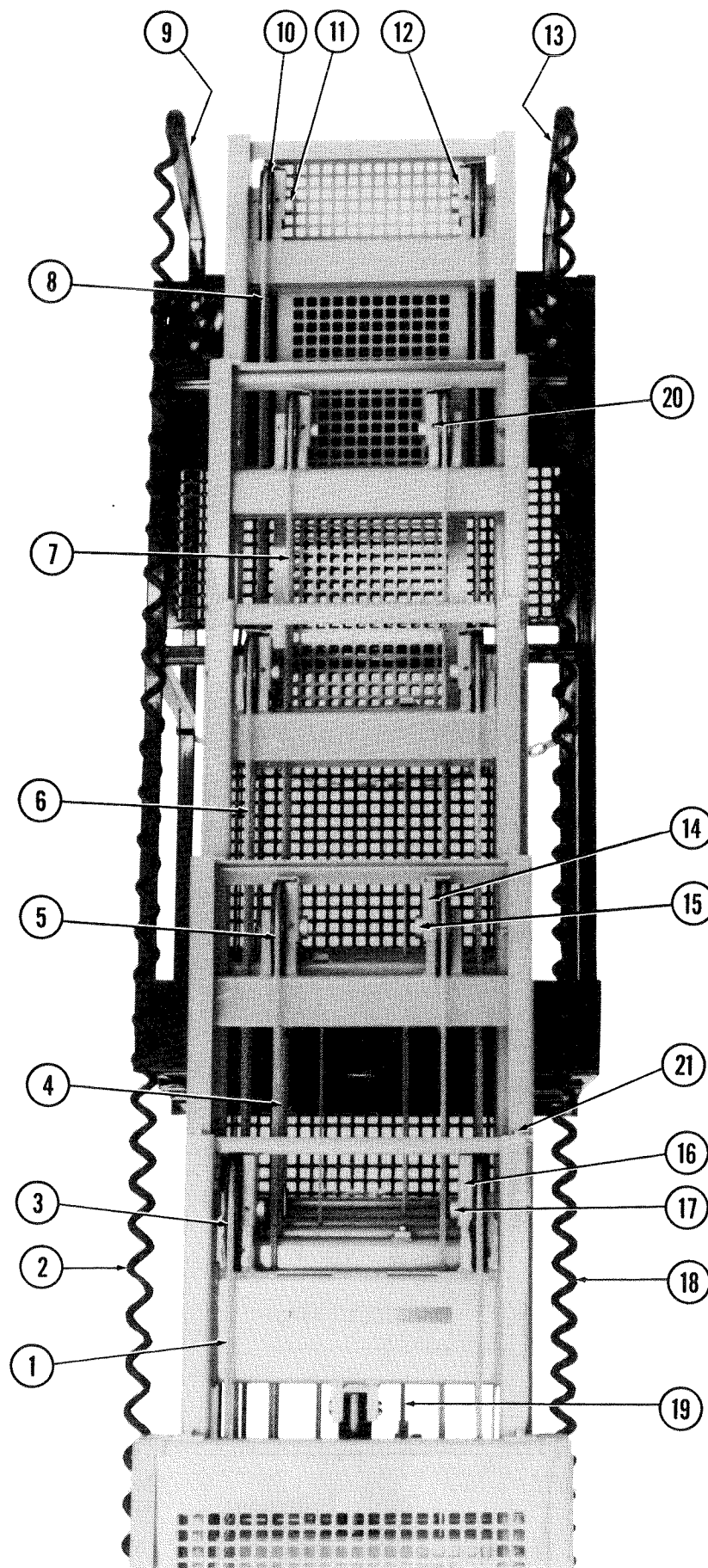


Figure 14.

| Item | Description | 016AC Part No. | 024AC Part No. | 016DC Part No. | 024DC Part No. |
|------|-----------------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 5/16" Wire Rope Assy. | 6375 | 6375 | 6375 | 6375 |
| 2 | Retractable Control Cord | 6512 | 6512 | 6398 | 6398 |
| 3 | 5" Sheave Assy. | 2886 | 2886 | 2886 | 2886 |
| 4 | 1/4" Wire Rope Assy. | 6376 | 6376 | 6376 | 6376 |
| 5 | 4-1/4" Sheave Assy. | 2885 | 2885 | 2885 | 2885 |
| 6 | 1/4" Wire Rope Assy. | 6376 | 6376 | 6376 | 6376 |
| 7 | 1/4" Wire Rope Assy. | — | 6376 | — | 6376 |
| 8 | 1/4" Wire Rope Assy. | — | 6376 | — | 6376 |
| 9 | Wire Support R.H. | 2812 | 2806 | 2812 | 2806 |
| 10 | 3-3/4" Sheave | 6378 | 6378 | 6378 | 6378 |
| 11 | Pulley Pivot Pin | 2681 | 2681 | 2681 | 2681 |
| 12 | Cable Retaining Brkt. | 2700 | 2700 | 2700 | 2700 |
| 13 | Wire Support L.H. | 2813 | 2807 | 2813 | 2807 |
| 14 | Cable Retaining Brkt. | 2839 | 2839 | 2839 | 2839 |
| 15 | Pulley Pivot Pin | 2794 | 2794 | 2794 | 2794 |
| 16 | Cable Retaining Brkt. | 2796 | 2796 | 2796 | 2796 |
| 17 | Pulley Pivot Pin | 2794 | 2794 | 2794 | 2794 |
| 18 | 110V Retractable Cord | 6389 | 6389 | 6389 | 6389 |
| 19 | Retractor Cable | 6403 | 6403 | 6403 | 6403 |
| | Retractor Cable, Cyl. Sect. | 6448 | 6448 | 6448 | 6448 |
| | Pulley - Retractor Cable | 2747 | 2747 | 2747 | 2747 |
| 20 | Expansion Pin | 6416 | 6416 | 6416 | 6416 |
| 21 | Slide Retainer | 2769 | 2769 | 2769 | 2769 |

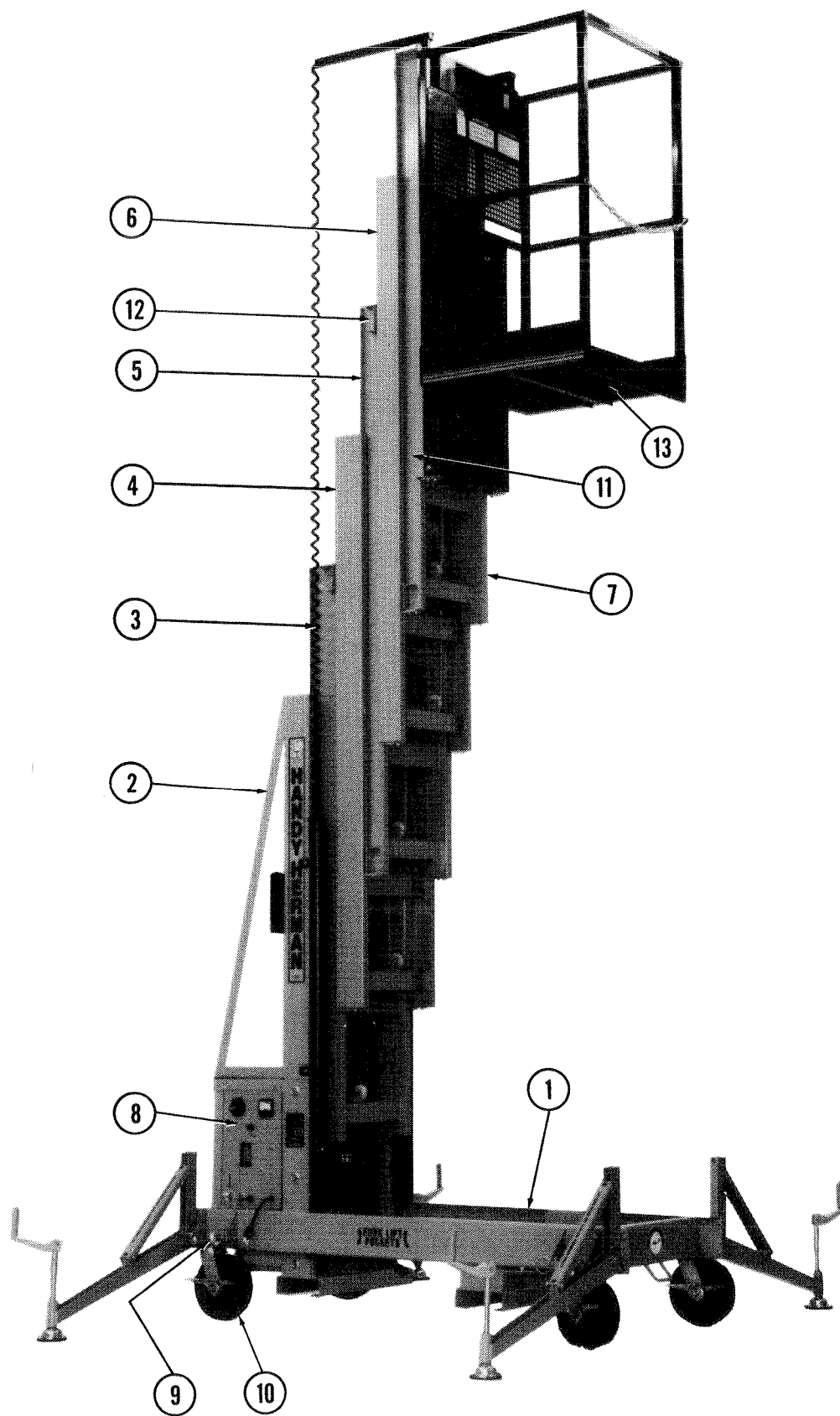


Figure 15.

| Item | Description | 016AC Part No. | 024AC Part No. | 016DC Part No. | 024DC Part No. |
|------|------------------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | Base Weldment | 2673 | 2673 | 2673 | 2673 |
| 2 | Main Mast Weldment | 2685 | 2685 | 2685 | 2685 |
| 3 | Mast Section - Cylinder | 2699 | 2699 | 2699 | 2699 |
| 4 | Outer Mast Section | 2834 | 2834 | 2834 | 2834 |
| 5 | Inner Mast Section | 2720 | 2709 | 2720 | 2709 |
| 6 | Outer Mast Section | | 2708 | | 2708 |
| 7 | Inner Mast Section | | 2720 | | 2720 |
| 8 | Panel Assy. (Charger or 110) | Detail | Detail | Detail | Detail |
| 9 | Leveling Circle | 6412 | 6412 | 6412 | 6412 |
| | Base - Level | 2867 | 2867 | 2867 | 2867 |
| | Cover - Level | 2866 | 2866 | 2866 | 2866 |
| 10 | Caster, Swivel, w/Brake | 6388 | 6388 | 6388 | 6388 |
| 11 | Platform Mast Section | 2710 | 2710 | 2710 | 2710 |
| 12 | Guide Pad | 6409 | 6409 | 6409 | 6409 |
| 13 | Platform Weldment | Detail | Detail | Detail | Detail |

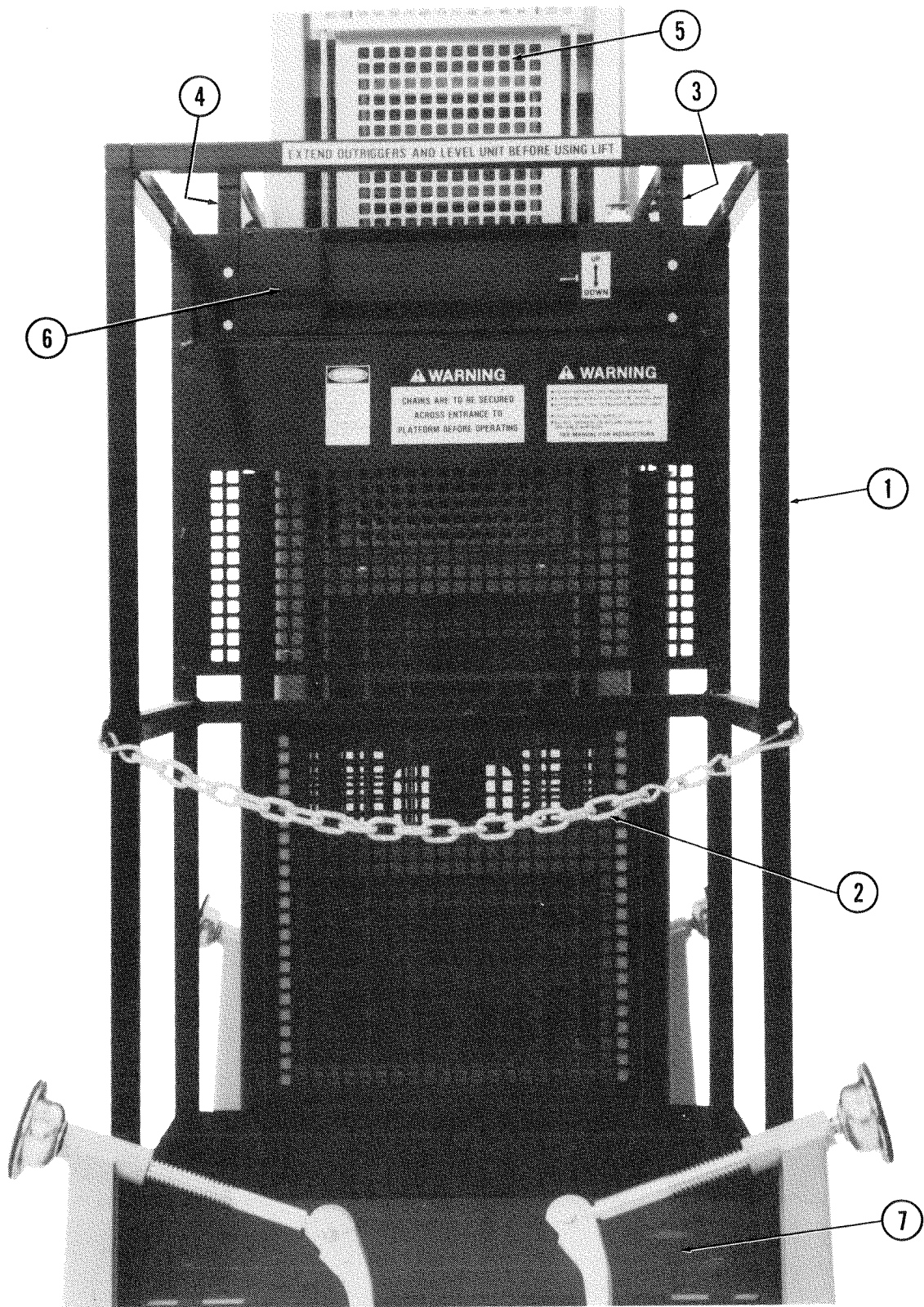


Figure 16.

| Item | Description | 016AC Part No. | 024AC Part No. | 016DC Part No. | 024DC Part No. | Narrow Part No. |
|------|------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| 1 | Platform Weldment | 2643 | 2642 | 2643 | 2642 | 2800 |
| 2 | Safety Chain Assy. | 2756 | 2756 | 2756 | 2756 | 2863 |
| 3 | Wire Support Weld R.H. | 2812 | 2806 | 2812 | 2806 | 2806 |
| 4 | Wire Support Weld L.H. | 2813 | 2807 | 2813 | 2807 | 2807 |
| 5 | Guard Front | 2757 | 2757 | 2757 | 2757 | — |
| 6 | Upper Control Box | 2803 | 2803 | 2803 | 2803 | 2803 |
| | Switch Bracket | 2804 | 2804 | 2804 | 2804 | 2804 |
| | Outlet Bracket | 2805 | 2805 | 2805 | 2805 | 2805 |
| | Duplex Receptacle | 5381 | 5381 | 5381 | 5381 | 5381 |
| | Switch Emergency Down | 5631 | 5631 | 5631 | 5631 | 5631 |
| | Switch Toggle | 5230 | 5230 | 5230 | 5230 | 5230 |
| 7 | Floor Board | 6405 | 6386 | 6405 | 6386 | 6501 |

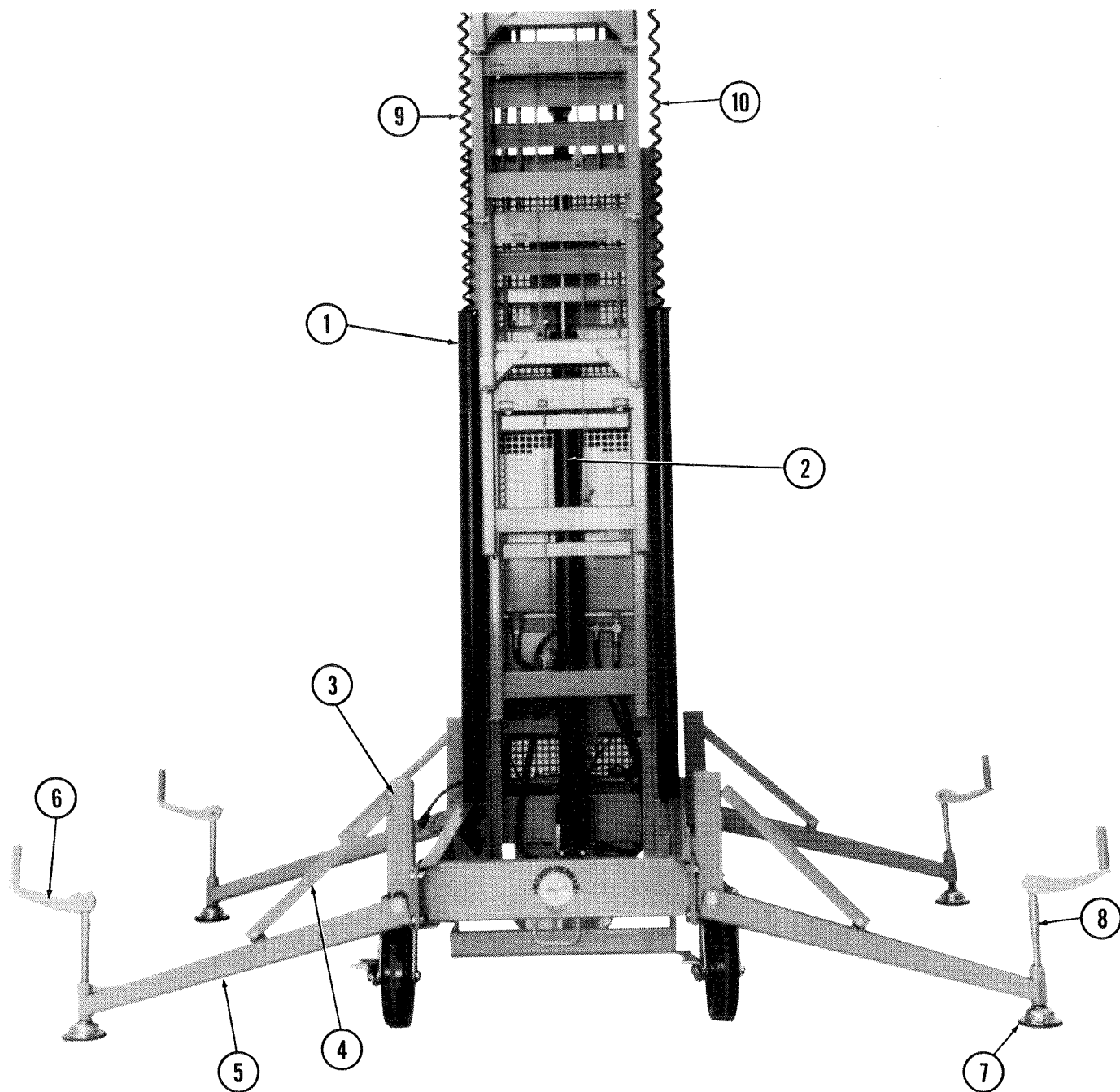


Figure 17.

| Item | Description | 016AC Part No. | 024AC Part No. | 016DC Part No. | 024DC Part No. |
|------|-------------------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | Coil Cord Tube Weldment | 2884 | 2884 | 2884 | 2884 |
| 2 | Cylinder Assy. | Detail | Detail | Detail | Detail |
| 3 | Outrigger Mtg. Brkt. Weldment | 2653 | 2653 | 2653 | 2653 |
| 4 | Outrigger Brace | 2657 | 2657 | 2657 | 2657 |
| 5 | Outrigger Arm Weldment | 2649 | 2649 | 2649 | 2649 |
| 6 | Jack Handle | 5438 | 5438 | 5438 | 5438 |
| 7 | Outrigger Pad | 2749 | 2749 | 2749 | 2749 |
| 8 | Adjustment Screw | 2658 | 2658 | 2658 | 2658 |
| 9 | 110V Retractable Cord | 6389 | 6389 | 6389 | 6389 |
| 10 | Retractable Control Cord | 6512 | 6512 | 6398 | 6398 |

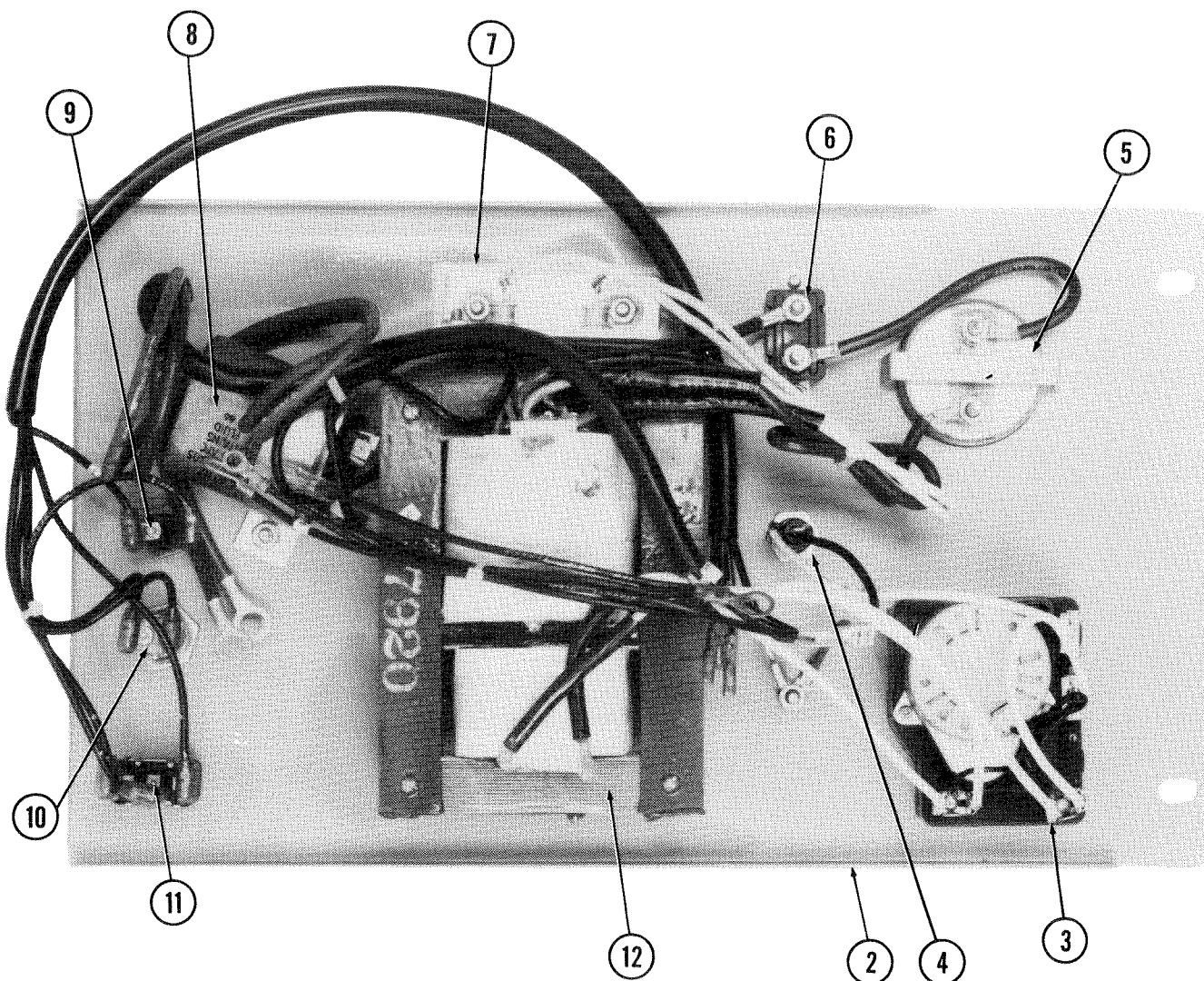


Figure 18. DC Control Panel Assembly

| Item | Description | Part No. |
|------|---|----------|
| 1 | DC Control Panel Assembly (As Shown) | 2874 |
| 2 | Charger Panel | 2721 |
| 3 | Timer | 6518 |
| | Dial - Timer | 6519 |
| 4 | Fuse Holder* | 6527 |
| 5 | Ammeter | 6520 |
| 6 | Circuit Breaker | 6522 |
| 7 | Rectifier Assembly | 6521 |
| 8 | Condenser | 6517 |
| 9 | Fuse Holder | 5265 |
| | Fuse (10 Amp) | 6190 |
| 10 | Key Switch | 5936 |
| 11 | Toggle Switch | 5230 |
| 12 | Transformer | 6516 |
| * | Fuse for 6527 (15 Amp) | 6526 |

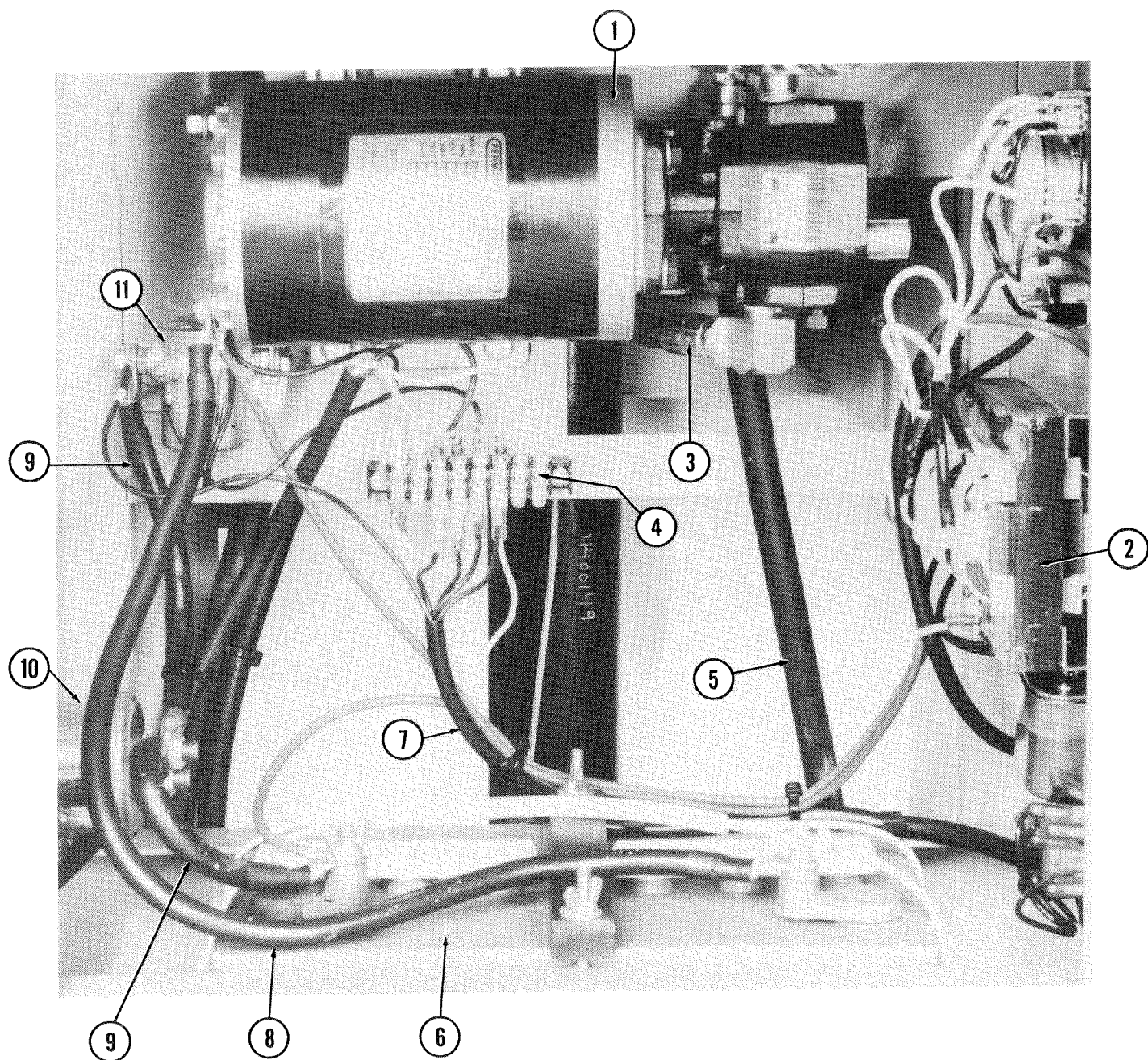


Figure 19.

| Item | Description | Part Number | |
|------|---|-------------|---------|
| | | AC Unit | DC Unit |
| 1 | Pump and Motor Assy. | Fig. 22 | Fig. 21 |
| 2 | Charger/AC Panel Assy. | Fig. 20 | Fig. 18 |
| 3 | Hose - Tank to Pump | 6437 | 6437 |
| 4 | Terminal Block | | 6470 |
| 5 | Hose - Pump to Manifold | 6429 | 6429 |
| 6 | Battery 12V | | 6390 |
| 7 | Main Harness | 6508 | 6494 |
| 8 | Battery Cable | | 6427 |
| 9 | Battery Cable | | 6428 |
| 10 | Switch Battery Disconnect | | 6468 |
| | Side Panel | 2728 | 2728 |
| | Face Plate - Switch | | 6469 |
| 11 | Contactor 12V | | 6411 |
| 12 | Battery Cable (Contactor to Motor) Not Shown | | 6208 |

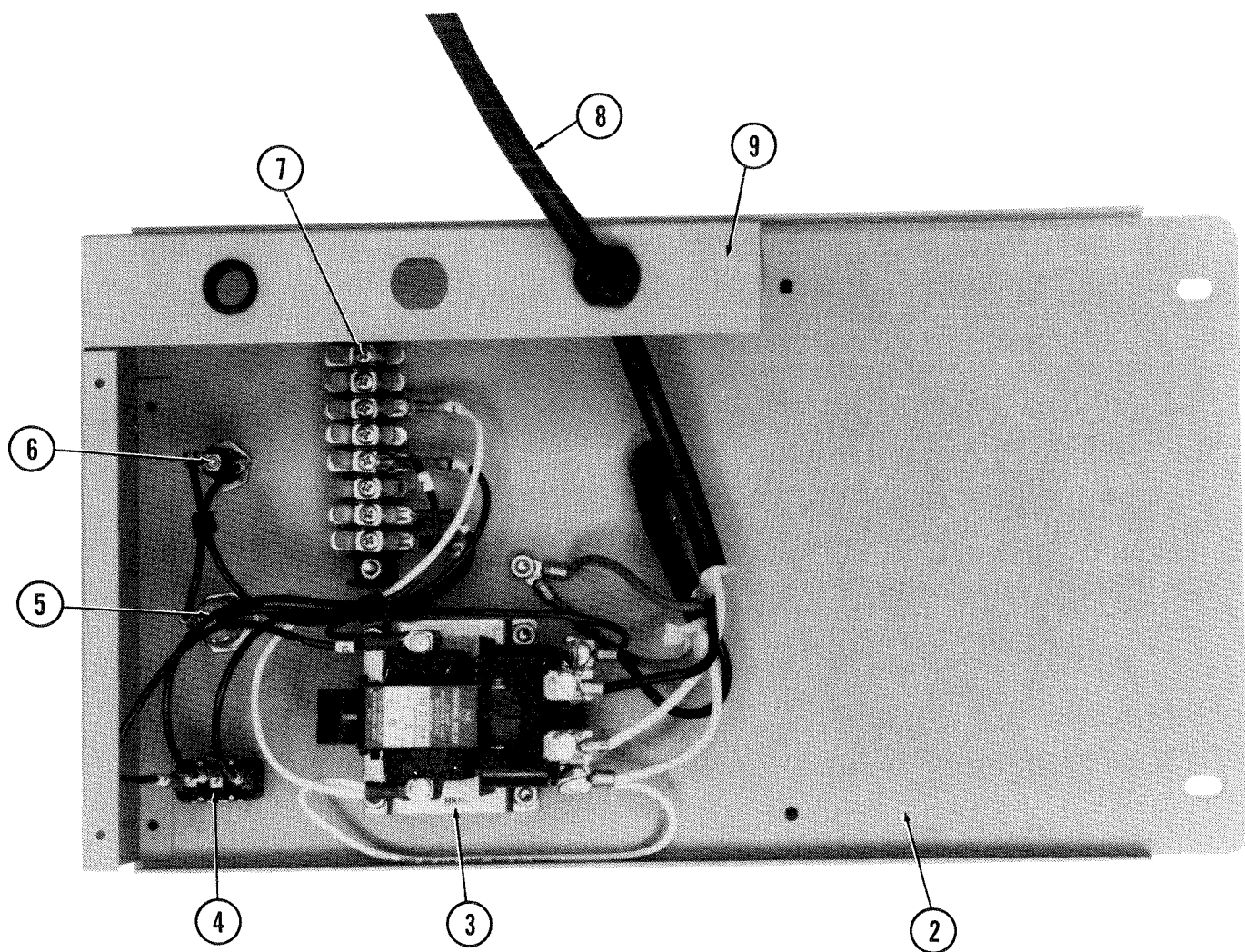


Figure 20. AC Control Panel Assembly

| Item | Description | Part No. |
|------|---|----------|
| 1 | AC Control Panel Assembly (As Shown) | 2873 |
| 2 | Side Panel 110 | 2729 |
| 3 | Relay | 5397 |
| 4 | Toggle Switch | 5230 |
| 5 | Key Switch | 5936 |
| 6 | Fuse Holder | 5265 |
| | Fuse | 6190 |
| 7 | Terminal Bracket | 6470 |
| 8 | Power Cord AC | 6454 |
| 9 | Safety Bracket AC | 2842 |
| | Cover (Not Shown) | 2843 |

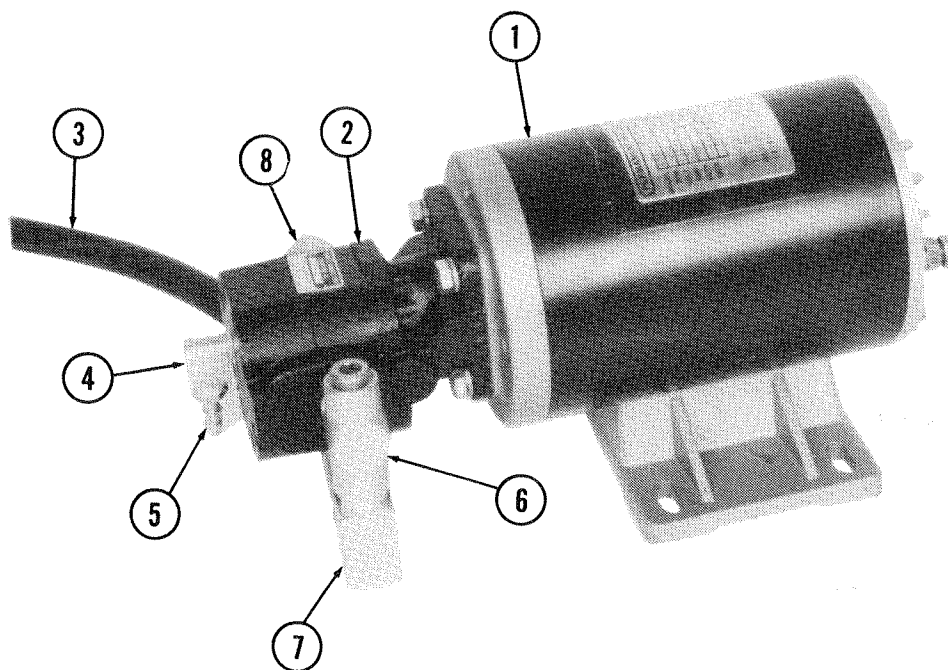


Figure 21.

| Item | Description | Part No. |
|------|---------------------------|----------|
| 1 | Motor DC | 6387 |
| 2 | Pump DC | 6383 |
| 3 | Hose - Pump to Manifold | 6429 |
| 4 | Street Elbow L.P. | 5122 |
| 5 | Bayonet Fitting | 5052 |
| 6 | Fitting, Tee | 6446 |
| 7 | Fitting, Elbow (SPLL.) | 6360 |
| 8 | Fitting Street Elbow H.P. | 5472 |

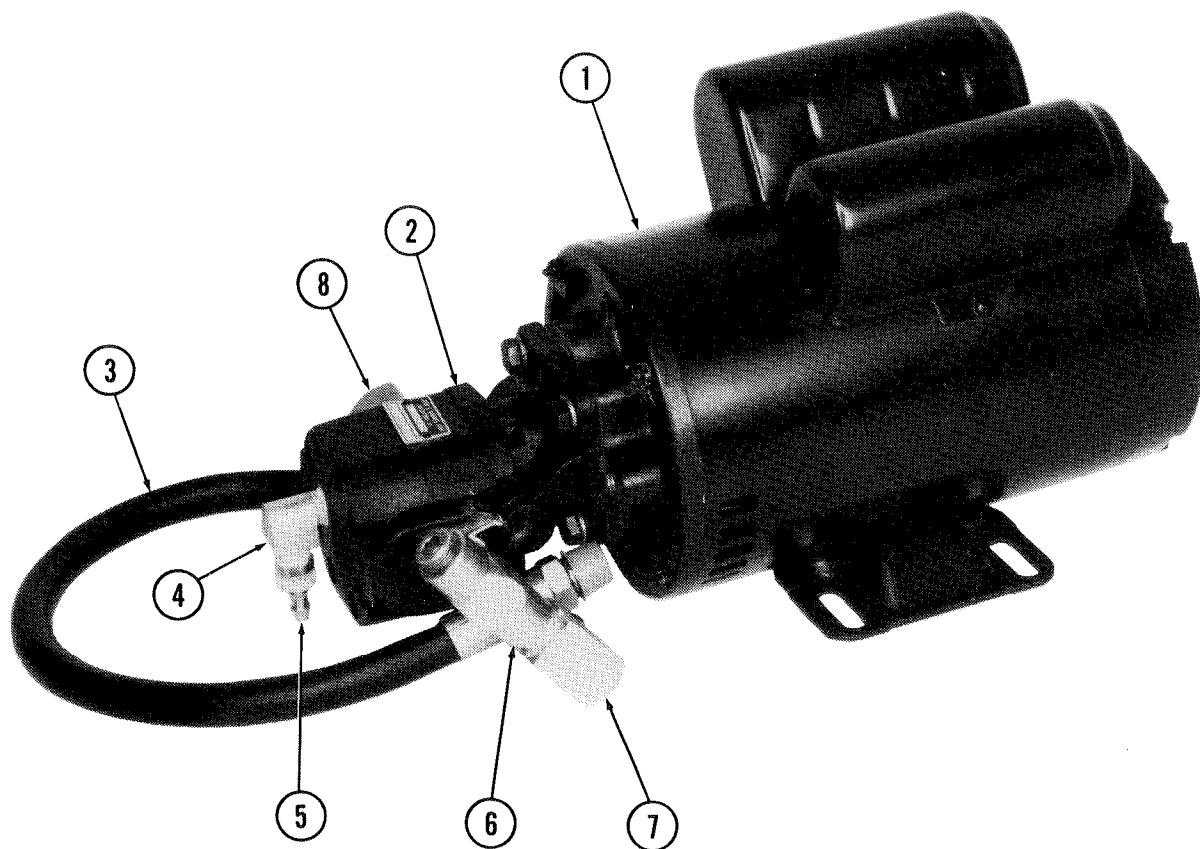


Figure 22.

| Item | Description | Part No. |
|------|----------------------------|----------|
| 1 | Motor AC | 6401 |
| 2 | Pump AC | 6402 |
| 3 | Hose - Pump to Manifold | 6429 |
| 4 | Street Elbow L.P. | 5122 |
| 5 | Bayonet Fitting | 5052 |
| 6 | Fitting, Tee | 6446 |
| 7 | Fitting, Elbow (SPLL.) | 6360 |
| 8 | Fitting, Street Elbow H.P. | 5472 |

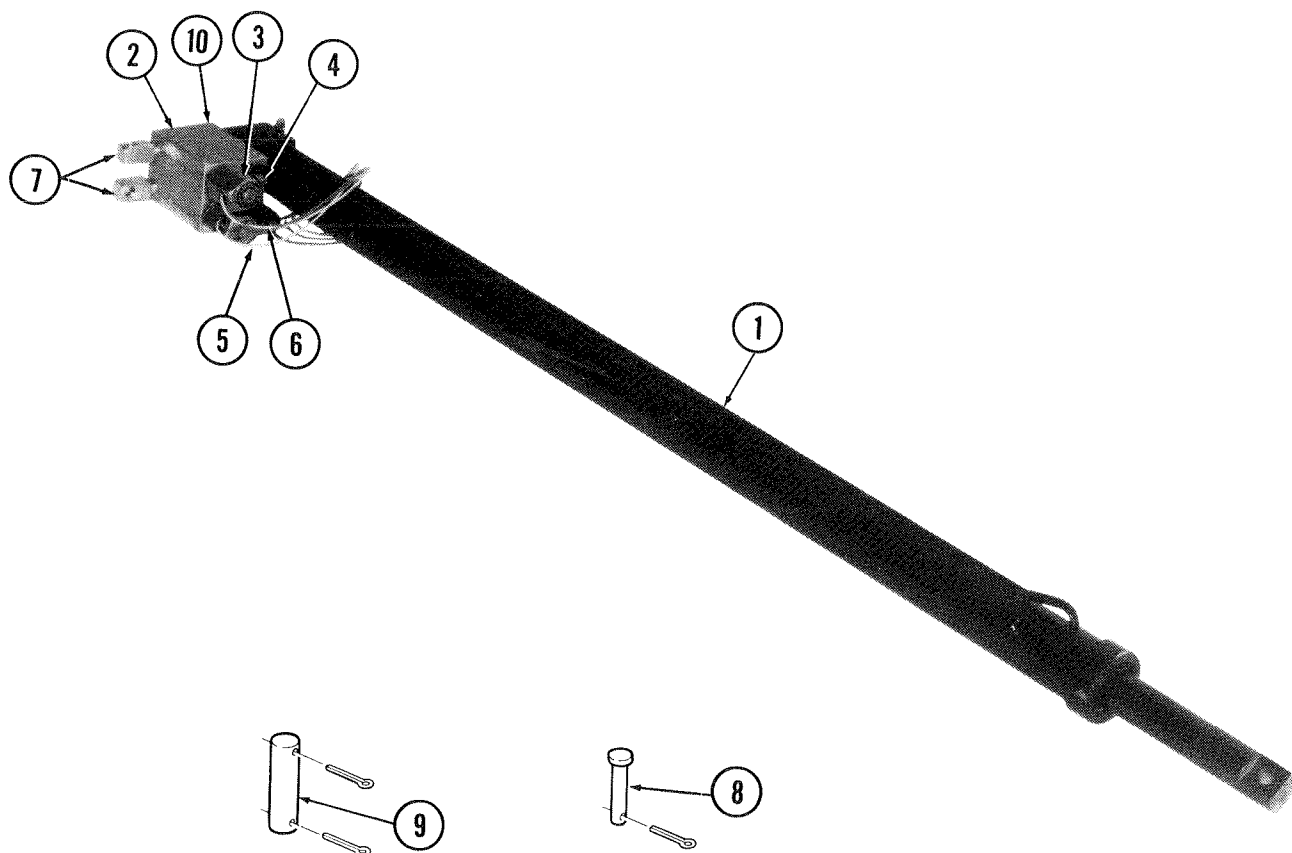


Figure 23.

| Item | Description | Part Number | |
|------|---------------------------|-------------|---------|
| | | AC Unit | DC Unit |
| 1 | Hydraulic Cylinder | 6373 | 6373 |
| 2 | Manifold | 2730 | 2730 |
| 3 | Valve 2-Way (N.O.) | 6505 | 6452 |
| 4 | Valve - Manual Pull | 5435 | 5435 |
| 5 | Valve 2-Way (N.C.) | 6506 | 6453 |
| 6 | Valve - Flow Control | 5963 | 5963 |
| 7 | Fitting Elbow | 6360 | 6360 |
| | Coils | 6528 | 6415 |
| 8 | Cyl. Pin, Upper | 6406 | 6406 |
| | Cotter Pin | 5920 | 5920 |
| 9 | Cyl. Pin, Lower | 2766 | 2766 |
| | Cotter Pin | 5290 | 5290 |
| 10 | O-Ring - Manifold to Cyl. | 6426 | 6426 |

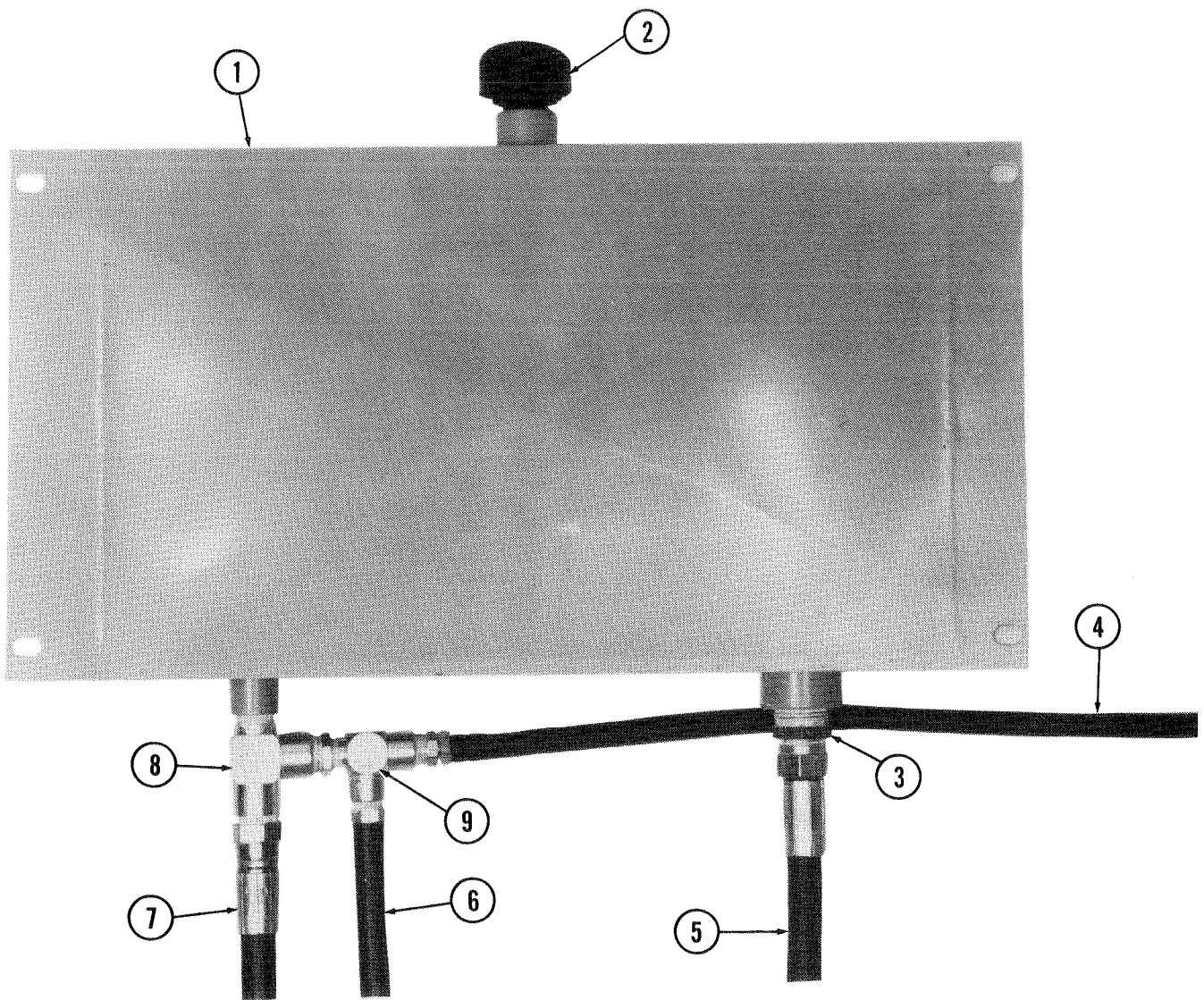


Figure 24.

| Item | Description | Part No. |
|------|------------------------------|----------|
| 1 | Reservoir Weldment | 2723 |
| 2 | Breather Cap | 6284 |
| 3 | Filter | 6377 |
| 4 | Hose - Return Line 1/4 I.D. | 6030 |
| 5 | Hose - Tank to Pump | 6437 |
| 6 | Hose - Return Line 5/16 I.D. | 6458 |
| 7 | Hose - Tank to Manifold | 6430 |
| 8 | Fitting - Tee | 5533 |
| 9 | Fitting - Tee | 6154 |