

OPERATORS & SAFETY Service & Maintenance Illustrated Parts

Models
10VP
15VP
20VP

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FOREWORD

The purpose of this manual is to provide users with the operating procedures essential for the promotion of proper machine operation for its intended purpose. It is important to over-stress proper machine usage. All information in this manual should be **READ** and **UNDERSTOOD** before any attempt is made to operate the machine. **YOUR OPERATING MANUAL IS YOUR MOST IMPORTANT TOOL** - Keep it with the machine. **REMEMBER ANY EQUIPMENT IS ONLY AS SAFE AS THE OPERATOR.**

BECAUSE THE MANUFACTURER HAS NO DIRECT CONTROL OVER MACHINE APPLICATION AND OPERATION, PROPER SAFETY PRACTICES ARE THE RESPONSIBILITY OF THE USER AND HIS OPERATING PERSONNEL.

ALL INSTRUCTIONS IN THIS MANUAL ARE BASED ON THE USE OF THE MACHINE UNDER PROPER OPERATING CONDITIONS, WITH NO DEVIATIONS FROM THE ORIGINAL DESIGN. ALTERATION AND/OR MODIFICATION OF THE MACHINE IS STRICTLY FORBIDDEN WITHOUT WRITTEN APPROVAL FROM JLG INDUSTRIES. PER OSHA REGULATIONS.



THIS "SAFETY ALERT SYMBOL" IS USED TO CALL ATTENTION TO POTENTIAL HAZARDS WHICH MAY LEAD TO DEATH OR SERIOUS INJURY IF IGNORED.

Safety of personnel and proper use of the machine are of primary concern, DANGER, WARNING, CAUTION, IMPORTANT, INSTRUCTIONS and NOTE are inserted throughout this manual to emphasize these areas. They are defined as follows:

DANGER

DANGER INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED WILL RESULT IN DEATH OR SERIOUS INJURY.

WARNING

WARNING INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION

CAUTION INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.

IMPORTANT

IMPORTANT OR INSTRUCTIONS PROCEDURES ESSENTIAL FOR SAFE OPERATION AND WHICH, IF NOT FOLLOWED MAY RESULT IN A MALFUNCTION OR DAMAGE TO THE MACHINE.

In this Manual "Notes" are used to provide information of special interest.

All procedures herein are based on the use of the machine under proper operating conditions, with no deviations from original design intent ... as per OSHA regulations.

READ & HEED!

The ownership, use, service, and/or maintenance of this machine is subject to various federal, state and local laws and regulations. It is the responsibility of the owner/user to be knowledgeable of these laws and regulations and to comply with them. The most prevalent regulations of this type are the Federal OSHA Safety Regulations*. Listed below, in abbreviated form are some of the requirements of Federal OSHA regulations in effect as of the date of publication of this handbook.

The listing of these requirements shall not relieve the owner/user of the responsibility and obligation to determine all applicable laws and regulations and their exact wording and requirements, and to comply with the requirements. Nor shall the listing of these requirements constitute an assumption of responsibility of liability on the part of JLG Industries, Inc.

1. Only trained and authorized operators shall be permitted to operate the aerial lift.
2. A malfunctioning lift shall be shut down until repaired.
3. The controls shall be plainly marked as to their function.
4. The controls shall be tested each day prior to use to determine that they are in safe operating condition.

5. Load limits specified by the manufacturer shall not be exceeded.
6. Instruction and warning placards must be legible.
7. Aerial lifts may be "field modified" for uses other than those intended by the manufacturer only if certified in writing by the manufacturer or an equivalent entity, such as a nationally recognized testing lab, to be in conformity to applicable OSHA safety regulations and to be at least as safe as it was prior to modification.
8. Aerial lifts shall not be used near electric power lines unless the lines have been deenergized or adequate clearance is maintained (see OSHA 29 CFR 1910.67 and 1926.400).
9. Employees using aerial lifts shall be instructed how to recognize and avoid unsafe conditions and hazards.
10. Ground controls shall not be operated unless permission has been obtained from personnel in the platform, except in case of an emergency.
11. Regular inspection of the job site and aerial lift shall be performed by competent persons.
12. Personnel shall always stand on the floor of the platform, not on boxes, planks, railing or other devices for a work position.

*Applicable Federal OSHA regulations, as of the date of publication of this manual include, but are not limited to, 29 CFR 1910.67, 29 CFR 1926.20, 29 CFR 1926.21, 29 CFR 1926.28, 29 CFR 1926.400 and 29 CFR 1926.556. Consult the current regulations for the exact wording and full text of the requirements and contact the closest Federal OSHA office for specific interpretations.

A. GENERAL

This section contains the general safety precautions which must be observed during maintenance of the aerial platform. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves or others or damage to the equipment. A maintenance program must be established by a qualified person and must be followed to ensure that the machine is safe to operate.

⚠ WARNING

MODIFICATION OF THE MACHINE WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE MACHINE IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED IS A SAFETY VIOLATION.

The specific precautions to be observed during machine maintenance are inserted at the appropriate point in the manual. These precautions are, for the most part, those that apply when servicing hydraulic and larger machine component parts.

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of component weight and never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

⚠ WARNING

SINCE THE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/OPERATOR.

B. HYDRAULIC SYSTEM SAFETY

1. It should be particularly noted that the machines hydraulic systems operate at extremely high and potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.
2. Relieve system pressure by activating the lift DOWN control with the platform completely lowered to direct any line pressure back into the return line to the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

C. MAINTENANCE**⚠ WARNING**

FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION COULD RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

- REMOVE ALL RINGS, WATCHES, AND JEWELRY WHEN PERFORMING ANY MAINTENANCE.
- DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.
- OBSERVE AND OBEY ALL DANGER, WARNING, CAUTION AND OTHER INSTRUCTIONS ON MACHINE AND IN SERVICE MANUAL.
- KEEP STANDING SURFACES AND HAND HOLDS FREE OF OIL, GREASE, WATER, ETC.
- NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL SAFETY PROPS HAVE BEEN ENGAGED OR PLATFORM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.
- BEFORE MAKING ADJUSTMENTS, LUBRICATING OR PERFORMING ANY OTHER MAINTENANCE, SHUT OFF ALL POWER CONTROLS.
- BATTERY SHOULD ALWAYS BE DISCONNECTED DURING REPLACEMENT OF ELECTRICAL COMPONENTS.
- KEEP ALL SUPPORT EQUIPMENT AND ATTACHMENTS STOWED IN THEIR PROPER PLACE.
- USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

REVISION LOG

- February 1, 1996 — Original Issue of Manual
- May 24, 1996 — Manual Revised — Numerous changes, removed illustrative photos in all sections and replaced them with line art, revised Section 9, Troubleshooting and Section 10, Parts Manual.
- July 23, 1996 — Change 1 — Pages Affected:
Revision Log — Page c
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Section 10-7 — Page 10-7-2 & 10-7-3
Section 10-8 — Pages 10-8-2 thru 10-8-6
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- February 15, 1997 — Revised.
- June 16, 1997 — Change 2 — Pages Affected:
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- September 15, 1997 — Change 3 — Pages Affected:
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1-1. GENERAL

This section prescribes the proper and safe practices for major areas of machine usage which have been divided into three basic categories: Transporting, Pre-Operation and Operation. In order to promote proper usage of the machine, it is mandatory that a daily routine be established based on instruction given in this section. A maintenance program must also be established by a qualified person and must be followed to ensure that the machine is safe to operate.

The user/operator of the machine should not accept operating responsibility until this manual has been READ and UNDERSTOOD, and operating instructions of the machine under the supervision of an experienced and qualified operator, has been completed. If there is a question on application and/or operation, JLG Industries Product Safety and Reliability personnel should be consulted.

WARNING

MODIFICATION OF THE MACHINE WITHOUT APPROVAL OF JLG INDUSTRIES, OR CERTIFICATION BY A NATIONALLY RECOGNIZED TESTING LAB TO BE IN CONFORMITY WITH APPLICABLE OSHA REGULATIONS AND ANSI STANDARDS, AND TO BE AT LEAST AS SAFE AS BEFORE MODIFICATION, IS PROHIBITED, AND IS A VIOLATION OF OSHA RULES.

1-2. ELECTROCUTION HAZARD

Minimum safe approach distances (M.S.A.D.) to energized (exposed or insulated) power lines and parts.

DANGER

DO NOT maneuver machine or personnel to distance less than M.S.A.D (See Table 1-1.). ASSUME all electrical parts and wiring are ENERGIZED unless known otherwise.

THIS MACHINE DOES NOT PROVIDE PROTECTION FROM CONTACT WITH OR PROXIMITY TO AN ELECTRICALLY CHARGED CONDUCTOR. MAINTAIN A CLEARANCE OF AT LEAST 10 ft. (3m) BETWEEN ANY PART OF THE MACHINE AND ANY ELECTRICAL LINE OR APPARATUS CARRYING UP TO 50,000 VOLTS. 1 ft. (0.3m) ADDITIONAL CLEARANCE IS REQUIRED FOR EVERY ADDITIONAL 30,000 VOLTS OR LESS. ALLOW FOR PLATFORM SWAY, ROCK OR SAG AND ELECTRICAL LINE SWAYING, (SEE FOLLOWING TABLE).

**Table 1-1.
Minimum Safe Approach Distance
(to energized power lines or parts)**

VOLTAGE RANGE (PHASE TO PHASE)	MINIMUM SAFE DISTANCE - Feet [m]
0-300V	– Avoid Contact
Over 300V to 50KV	– 10 ft. [3 m]
Over 50KV to 200KV	– 15 ft. [4.6 m]
Over 200KV to 350KV	– 20 ft. [6 m]
Over 350KV to 500KV	– 25 ft. [7.6 m]
Over 500KV to 750KV	– 35 ft. [10.6 m]
Over 750KV to 1000KV	– 45 ft. [13.7 m]

1-3. TRANSPORTING MACHINE

Before transporting (*hauling*) the machine the user/operator must be familiar with the proper procedures for transporting the machine (*see Section 4-5*), as well as the weight and size of the machine.

The user/operator should be familiar with the surrounding work area and surface before transporting the machine. The work area must be a firm surface capable of supporting the combined weight of the transport vehicle and the machine.

Note

Remember that the key to safe and proper usage is common sense and its careful application.

CAUTION

ALWAYS RELEASE THE DRIVE MOTOR BRAKES ON THE MACHINE WHEN MANUALLY PUSHING, PULLING, OR WHEN TRANSPORTING MACHINE BY FORK-LIFT TRUCK. THIS WILL ALLOW THE REAR DRIVE WHEELS, GEAR BOX DRIVE SHAFT AND GEARS TO ROTATE FREELY PREVENTING ANY DAMAGE TO THE DRIVE SYSTEM.

IF MACHINE IS PLACED ON A TRANSPORT VEHICLE, RE-ENGAGE THE BRAKES IN COMBINATION WITH PROPER MACHINE TIE DOWN, TO RESTRAIN MACHINE FROM ANY MOVEMENT DURING TRANSPORT.

ALWAYS REMEMBER TO RE-ENGAGE THE BRAKE SYSTEM BEFORE OPERATING MACHINE.

WARNING

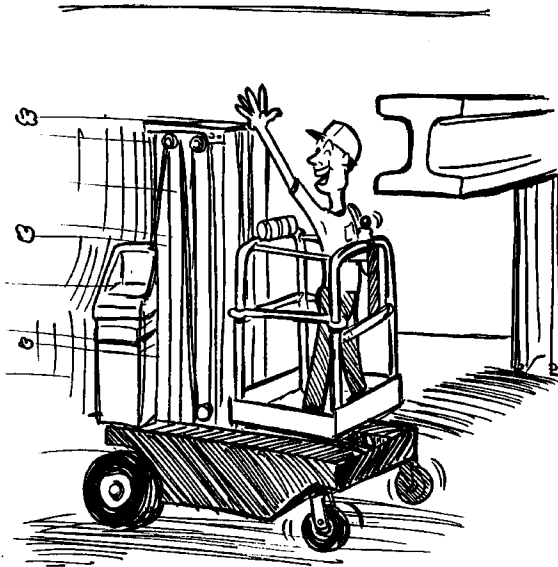
FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION AND ON MACHINE COULD RESULT IN MACHINE DAMAGE, PERSONAL INJURY OR DEATH AND IS A SAFETY VIOLATION.



**LIFT MACHINE
AT DESIGNATED LIFTING POINTS ONLY**

1-4. PRE-OPERATIONAL SAFETY

- READ YOUR MANUAL. UNDERSTAND WHAT YOU'VE READ - THEN BEGIN OPERATIONS.
- ALLOW ONLY THOSE AUTHORIZED AND QUALIFIED PERSONNEL TO OPERATE MACHINE WHO HAVE DEMONSTRATED THAT THEY UNDERSTAND SAFE AND PROPER OPERATION AND MAINTENANCE OF THE UNIT.
- AN OPERATOR MUST NOT ACCEPT OPERATING RESPONSIBILITIES UNTIL ADEQUATE TRAINING HAS BEEN GIVEN BY COMPETENT AND AUTHORIZED PERSONS.
- BEFORE OPERATION CHECK WORK AREA FOR OVERHEAD ELECTRIC LINES. (SEE *ELECTROCUTION HAZARD, SECTION 1-2.*)
- STUDY THE WORK AREA FOR AREAS TO AVOID SUCH AS; SURFACE EDGES THAT DROP-OFF, HOLES OR DIPS IN SURFACE, OR ANY UNLEVEL AREAS WHICH COULD CAUSE THE UNIT TO TIP OVER.
- ALSO BEFORE OPERATION CHECK WORK AREA FOR MACHINE TRAFFIC SUCH AS FORKLIFTS, CRANES, AND OTHER CONSTRUCTION EQUIPMENT.
- ENSURE THAT OPERATORS OF OTHER OVERHEAD AND FLOOR LEVEL MACHINES ARE AWARE OF THE AERIAL PLATFORMS PRESENCE. DISCONNECT POWER TO OVERHEAD CRANES. BARRICADE FLOOR AREA IF NECESSARY.
- PRECAUTIONS TO AVOID ALL KNOWN HAZARDS IN THE WORK AREA MUST BE TAKEN BY THE OPERATOR AND HIS SUPERVISOR BEFORE STARTING THE WORK.
- DO NOT OPERATE THIS MACHINE UNLESS IT HAS BEEN SERVICED AND MAINTAINED ACCORDING TO THE MANUFACTURERS SPECIFICATIONS AND SCHEDULE.
- ENSURE DAILY INSPECTION AND FUNCTION CHECK IS PERFORMED PRIOR TO PLACING MACHINE INTO OPERATION. HAVE AUTHORIZED PERSONNEL TAKE ANY NECESSARY CORRECTIVE ACTION BEFORE PLACING MACHINE INTO OPERATION.
- NEVER DISABLE OR MODIFY ANY SAFETY DEVICE. ANY MODIFICATION OF THE MACHINE IS A SAFETY VIOLATION AND IS A VIOLATION OF OSHA AND ANSI RULES.
- DO NOT OPERATE MACHINE WHEN EXPOSED TO HIGH WIND, RAIN OR SNOW.
- NEVER OPERATE OR RAISE PLATFORM WHEN MACHINE IS ON A TRUCK OR OTHER VEHICLE.
- APPROVED HEAD GEAR (I.E. HARD HAT, ETC.) MUST BE WORN WHEN REQUIRED BY ALL OPERATING AND GROUND PERSONNEL.
- READ AND OBEY ALL DANGER, WARNINGS, CAUTIONS AND OPERATING INSTRUCTIONS ON MACHINE AND IN THIS MANUAL.
- BE FAMILIAR WITH LOCATION AND OPERATION OF GROUND CONTROLS AND EMERGENCY CONTROLS.



ALWAYS LOOK IN DIRECTION OF TRAVEL

1-5. OPERATING SAFETY

⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING TIPPING HAZARD INSTRUCTIONS COULD CAUSE THE UNIT TO TIP OVER OR BE HARD TO CONTROL WHEN BEING MOVED, WHICH COULD RESULT IN SERIOUS INJURY OR DEATH DUE TO BEING PINNED OR CRUSHED BY THE UNIT.

• Driving Safety

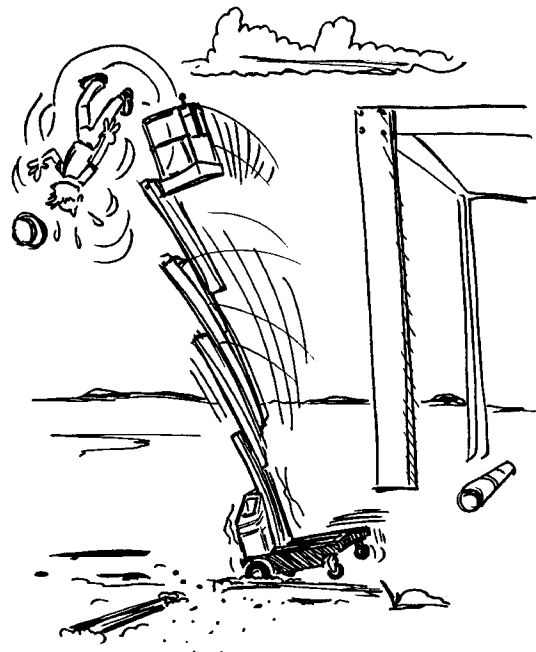
- READ YOUR MANUAL, UNDERSTAND WHAT YOU'VE READ - THEN BEGIN OPERATIONS.
- WATCH FOR OBSTRUCTIONS AROUND MACHINE AND OVERHEAD WHEN MOVING.
- CHECK TRAVEL PATH FOR PERSONS, HOLES, BUMPS, DROP-OFFS, OBSTRUCTIONS, DEBRIS, AND COVERINGS WHICH MAY CONCEAL HOLES AND OTHER HAZARDS, AS TIPPING COULD OCCUR.
- BEFORE MOVING MACHINE ON FLOORS AND OTHER SURFACES, CHECK ALLOWABLE CAPACITY OF SURFACES.
- DO NOT OPERATE MACHINE ON SOFT FOOTING THAT WILL ALLOW THE WHEELS TO SET-

TL E INTO OR BREAK THROUGH SURFACE, AS TIPPING WILL OCCUR.

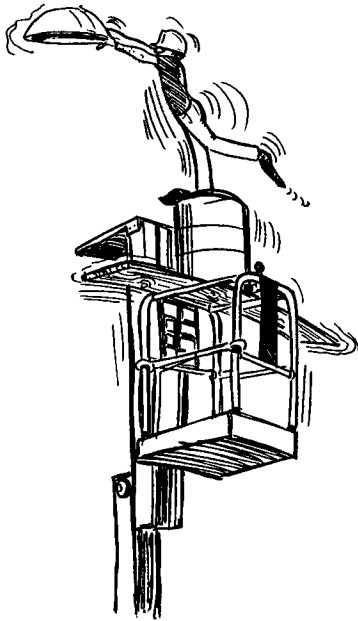
- NEVER POSITION THE UNIT SIDEWAYS ON A SLOPE.
- USE CAUTION AND CHECK CLEARANCES WHEN MOVING MACHINE IN RESTRICTED OR CLOSE QUARTERS.
- ALWAYS USE AN ASSISTANT WHEN MOVING MACHINE IN AREAS WHERE VISION IS OBSTRUCTED.

• General Operating Safety

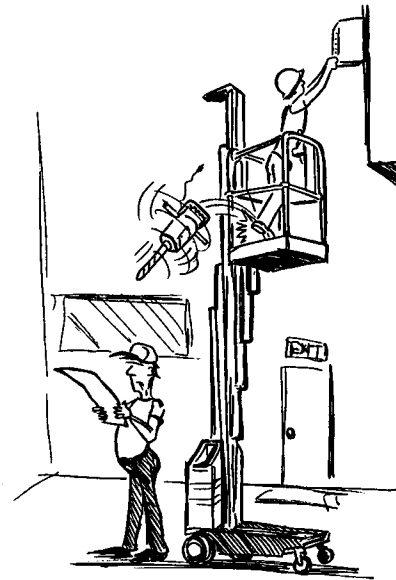
- KEEP NON-OPERATING PERSONNEL AT LEAST 6 FEET (1.8 M) AWAY FROM MACHINE DURING OPERATIONS.
- DO NOT OPERATE ANY MACHINE ON WHICH DANGER, WARNING, CAUTION OR INSTRUCTION PLACARDS OR DECALS ARE MISSING OR ILLEGIBLE.
- NEVER EXCEED MANUFACTURERS RATED PLATFORM CAPACITY - REFER TO CAPACITY DECAL ON MACHINE.



NEVER OPERATE ON SOFT OR UNEVEN SURFACES



**ALWAYS STAND ON PLATFORM FLOOR
NOT ON BOXES, PLANKS OR RAILINGS**



**KEEP EVERYONE CLEAR OF A
WORKING PLATFORM**

- NEVER OPERATE A MALFUNCTIONING MACHINE. IF A MALFUNCTION OCCURS, SHUT DOWN THE MACHINE, RED TAG IT, AND NOTIFY PROPER AUTHORITIES.
- ALL PERSONNEL MUST STAND CLEAR WHEN PLATFORM IS BEING RAISED OR LOWERED. BE SURE TO WATCH FOR OVERHEAD AND OTHER OBSTRUCTIONS.
- CHECK CLEARANCES ABOVE, ON SIDES AND BOTTOM OF PLATFORM WHEN RAISING AND LOWERING PLATFORM.
- NEVER USE THE MAST TO GAIN ACCESS TO OR LEAVE PLATFORM.
- DO NOT ATTACH OVERHANGING LOADS TO THE PLATFORM OR INCREASE THE PLATFORM SIZE WITH UNAUTHORIZED DECK EXTENSIONS OR ATTACHMENTS.
- DO NOT TIE OFF MACHINE TO ANY ADJACENT STRUCTURE. NEVER ATTACH WIRE, CABLE OR ANY SIMILAR ITEMS TO PLATFORM.
- TRANSFERS BETWEEN A STRUCTURE AND THE AERIAL PLATFORM EXPOSE OPERATING PERSONNEL TO FALL POTENTIALS. THIS PRACTICE SHOULD BE DISCOURAGED WHEREVER POSSIBLE. WHERE TRANSFER

MUST BE ACCOMPLISHED TO PERFORM THE JOB, AN APPROVED FALL PROTECTION DEVICE AND TWO SAFETY LANYARDS WILL BE USED. ONE LANYARD SHOULD BE ATTACHED TO THE AERIAL PLATFORM. THE OTHER TO THE STRUCTURE. THE SAFETY LANYARD THAT IS ATTACHED TO THE AERIAL PLATFORM SHOULD NOT BE DISCONNECTED UNTIL SUCH TIME AS THE TRANSFER TO THE STRUCTURE IS COMPLETE. WHEN RE-ENTERING THE PLATFORM THIS PROCEDURE MUST BE PERFORMED IN REVERSE. TO AVOID FALLING - USE EXTREME CAUTION WHEN ENTERING OR LEAVING PLATFORM ABOVE GROUND. ENTER OR EXIT THRU GATE ONLY. PLATFORM FLOOR MUST BE WITHIN 1 FOOT (0.3 M) OF ADJACENT - SAFE AND SECURE - STRUCTURE. ALLOW FOR ANY VERTICAL MOVEMENT OF PLATFORM (UP OR DOWN) WHEN ENTERING OR LEAVING PLATFORM.

- NO HORSEPLAY IS PERMITTED IN PLATFORM.
- DO NOT ALLOW PERSONNEL TO TAMPER WITH, SERVICE, OR OPERATE THIS MACHINE FROM THE GROUND WITH PERSONNEL IN PLATFORM EXCEPT IN AN EMERGENCY.

- DURING OPERATION KEEP ALL BODY PARTS INSIDE PLATFORM RAILINGS.
- NEVER POSITION LADDERS, STEPS, OR SIMILAR ITEMS ON UNIT TO PROVIDE ADDITIONAL REACH FOR ANY PURPOSE.
- WHEN WORKING FROM PLATFORM BOTH FEET MUST BE FIRMLY POSITIONED ON DECK.
- DO NOT EXTEND REACH LIMITS OF THIS MACHINE WITH ADDITIONAL EQUIPMENT SUCH AS PLANKS, BOXES, ETC.
- DO NOT USE LADDERS ON OR AGAINST MACHINE. DO NOT PERFORM WORK THAT WILL SUBJECT UNIT TO A HORIZONTAL FORCE OR CREATE A ROCKING MOTION OF THE PLATFORM.
- DO NOT OPERATE WITHOUT SLIDE BAR GATE (OR SWING GATE ON PLASTIC BASKET MODELS) IN PLACE AND PROPERLY CLOSED. THIS IS A SAFETY VIOLATION.
- ALWAYS ENSURE THAT POWER TOOLS ARE PROPERLY STOWED AND NEVER LEFT HANGING BY THEIR CORD FROM THE PLATFORM WORK AREA.
- AVOID ACCUMULATION OF DEBRIS ON PLATFORM WORK AREA. KEEP MUD, OIL, GREASE AND OTHER SLIPPERY SUBSTANCES FROM FOOTWEAR AND PLATFORM DECK.

2-1. GENERAL

This section provides the necessary information needed by those personnel that are responsible to place the machine in operation readiness, and lists checks that are performed prior to use of the machine. It is important that the information contained in this section be read and understood before any attempt is made to operate the machine. Ensure that all the necessary inspections have been completed successfully before placing the machine into service. These procedures will aid in obtaining maximum service life and safe operation.

⚠ IMPORTANT

SINCE THE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, THIS IS THE RESPONSIBILITY OF THE OWNER/OPERATOR.

2-2. PREPARATION FOR USE

Before a new machine is put into operation it must be carefully inspected for any evidence of damage resulting from shipment and inspected periodically thereafter, as outlined in Section 2-3, Delivery and Frequent Inspection. The unit should be thoroughly checked for hydraulic leaks during initial start-up and run. A check of all components should be made to assure their security.

All preparation necessary to place the machine in operation readiness status are the responsibility of management personnel. Preparation requires good common sense, (i.e. lift works smoothly) coupled with a series of visual inspections. The mandatory requirements are given in Section 2-4, Daily Walk Around Inspection.

It should be assured that the items appearing in the Delivery and Frequent Inspection and Functional Check are complied with prior to putting the machine into service.

2-3. DELIVERY AND FREQUENT INSPECTION

The following check list provides a systematic inspection to assist in detecting defective, damaged, or improperly installed parts. The check list denotes the items to be inspected and conditions to examine. Frequent inspection shall be performed every three (3) months or 150 hours, or more often when required by environment, severity, and frequency of usage.

• Platform Assembly

Properly secured; no visible damage; free of dirt and debris. Platform gate functions properly.

• Mast

No visible damage, abrasions and/or distortions; no binding; mast sections free of dirt or other foreign material. Sequencing cables properly secured; no visible damage; proper cable tension.

• Mast Chains & Cables

No visible damage; proper chain/cable tension; evidence of proper lubrication. Chain/cable sheaves, sheave pins and rollers properly secured; no visible damage.

• Platform Controller/(Power) Cable(s)

No visible damage; cable properly tensioned and seated in control cable sheaves; control cable sheaves not damaged and rotating freely.

• Lift Cylinder (check w/mast extended)

No rust, nicks, scratches or foreign material on piston rod. No leakage. Evidence of proper lubrication.

• Frame

No visible damage; loose or missing hardware (top and underside).

• Drive Wheels and Front Casters

Castors free rolling; no loose or missing parts; no visible damage. Drive wheel hub snap rings secure; no damage to wheel tread; electric drive motors secure; no loose or missing wires.

• Hydraulic Oil Supply

Check the hydraulic oil level of the hydraulic fluid reservoir located in the lower access hole on the rear cover. Maintain an oil level to the "Fill To Line" indicator on the side of reservoir.

If fluid level is low, see Section 7 - Specifications; Sub-Section 7-5. "Lubrication"; Table 7-1. "Recommended Hydraulic Oils" for use in machine.

• Controls - (Platform and Ground)

Controls operable; no visible damage; placards secure and legible.

• Batteries

Proper electrolyte level; cable connections tight; no visible damage; no corrosion at battery cable connections.

• Pump Motor/Hydraulic Pump/Valves and Lines

No leakage; units secure.

• Placards

No visible damage; placards secure and legible.

2-4. DAILY WALK-AROUND INSPECTION

It is the user/operator's responsibility to inspect the machine before the start of each workday. It is recommended that each user/operator inspect the machine before operation, even if the machine has already been put into service under another user/operator. This Daily Walk-Around Inspection is the preferred method of inspection.

• GENERAL

Begin the "Walk-Around Inspection" at item one listed following. Continue around machine checking each item in sequence for the conditions listed in the "Walk-Around Inspection Check list".

⚠ WARNING

TO AVOID INJURY DO NOT OPERATE MACHINE UNTIL ALL MALFUNCTIONS HAVE BEEN CORRECTED. USE OF A MALFUNCTIONING MACHINE IS A SAFETY VIOLATION.

TO AVOID POSSIBLE INJURY, BE SURE MACHINE POWER IS "OFF" DURING "WALK-AROUND INSPECTION".

Note

Do not overlook visual inspection of chassis underside. Checking this area often results in discovery of conditions which could cause extensive machine damage.

- 1. Drive and Caster Wheels** - Properly secured and lubricated. Check for any visible damage or debris, stuck to or around wheels.
- 2. Base Frame** - No visible damage; drive wheel motor components properly secured; JLG's Pot-Hole-Protection System components secure; no loose wires or cables dangling below the base; bubble level in place and functioning properly.
- 3. Battery/Battery Charger** - Proper battery electrolyte level, cables secure, no damage or corrosion.
- 4. Motor/Pump/Reservoir Unit** - Properly secured, no visible damage, no evidence of hydraulic leaks. Hydraulic oil level should be filled level with the full line, ("Fill To Line") on the side of the hydraulic reservoir. Also check that reservoir cap is properly secured.

5. **Ground Controls** - Properly secured, no loose or missing parts, no visible damage; key switch operable, no visible damage; placards secure and legible; emergency stop switch, no visible damage and properly set for operation.
6. **Mast Assembly** - Mast sections properly secured, no visible damage to mast sections, no loose or missing parts, slide pads properly secured. Mast chains/cables properly secured and lubricated. Sequencing cables properly secured and undamaged. Platform control and power cables (*on side of mast*), no visible damage; cables properly tensioned and seated in sheaves; cable sheaves not damaged and rotating freely. Speed Reduction and Pot-Hole-Protection limit switches (*top sides of mast*) secure and working properly.
7. **Manual Brake Release and Pot-Hole-Protection System Override Control** - Handles secure and undamaged; cables attached properly; controls in working order.
8. **Platform Assembly** - Secure to mast; All railings securely attached; no loose or missing parts, no visible damage; sliding entry bar in proper working order. Platform gate working

properly, no visible sign of damage (if so equipped).

9. **Platform Controls** - Platform up/down, function enable and horn buttons on faceplate working properly, no loose or missing parts, no visible damage. Joystick control secure and working properly. Placards secure and legible, emergency shut-off button set for operation. Control markings legible; Operators manual enclosed in manual storage tube.

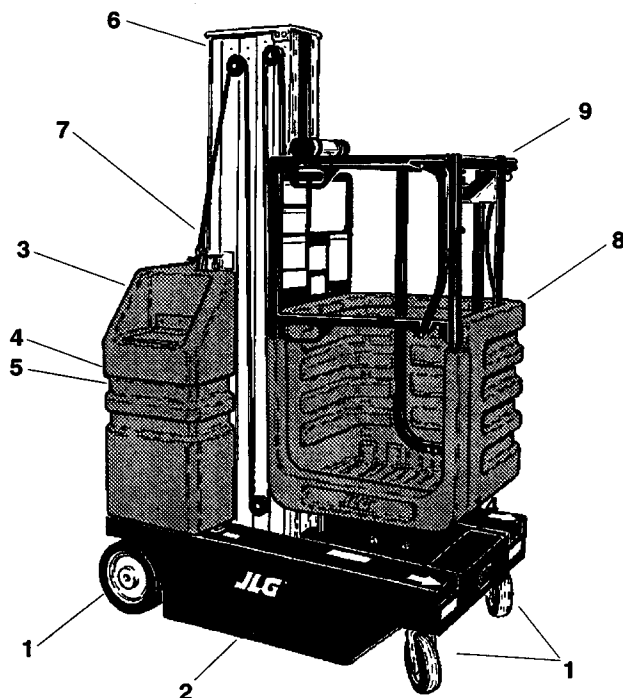
In addition to the Daily Walk-Around Inspection, be sure to include the following as part of the daily inspection:

• Batteries Charged

Start each day with fully charged batteries. (See Section 2-7. "Battery Charging")

• Overall Cleanliness

Keep oil, grease, water, etc. wiped from standing surfaces and hand holds.



Daily Walk-Around Inspection Items

1. Drive and Caster Wheels
2. Base Frame
3. Battery/Battery Charger
4. Motor/Pump/Reservoir Unit
5. Ground Controls
6. Mast Assembly
7. Manual Brake Release and Pot-Hole-Protection System Override Controls
8. Platform Assembly
9. Platform Controls

Figure 2-1. Daily Walk-Around Inspection.

• Placards

Keep all information and operating placards clean and unobstructed. Cover areas where placards are present when using the machine for spraying paint or any material which could cover these surfaces and reduce legibility.

• Operators, Safety, and Maintenance and ANSI Responsibilities Manual

Ensure a copy of these manuals are enclosed in the manual storage tube.

• Lubrication

For those parts pointed out in the Walk-Around Inspection requiring lubrication, refer to the Lubrication Chart, Figure 7-2., Section 7, for specific time interval requirements.

2-5. DAILY FUNCTIONAL CHECK

⚠ WARNING

TO AVOID INJURY DO NOT OPERATE A MACHINE UNTIL ALL MALFUNCTIONS HAVE BEEN CORRECTED. USE OF A MALFUNCTIONING MACHINE IS A SAFETY VIOLATION.

Once the walk-around inspection is complete, a functional check of all systems should be performed in an area free of overhead and ground level obstructions. Perform a functional check in accordance with the following procedures:

Set-up machine for operation, according to instructions in Section 4-3, "Lift Unit Operation".

• Ground Controls

⚠ IMPORTANT

ON NEW MACHINES WHERE THE MAST HAS NOT BEEN CYCLED THROUGH A BREAK-IN PERIOD (APPROX. 30 DAYS OF NORMAL OPERATION) MAY REQUIRE ASSISTANCE TO LOWER AN EMPTY PLATFORM DURING GROUND CONTROL TESTING. DO NOT RAISE PLATFORM BEYOND REACH OF THE OPERATOR.

1. With key switch turned to GRND position (*clockwise*), operate the platform up and down switch (*located in lower access hole with hydraulic fluid reservoir*), raise and lower platform

2 ft. to 3 ft. (.5m to 1m) several times. Check for smooth elevation and lowering of platform.

2. With platform completely lowered, check hydraulic oil level in hydraulic fluid reservoir. If necessary, add hydraulic fluid to proper level (*full line*). **NEVER USE HYDRAULIC BRAKE FLUID, refer to the Lubrication Chart (Figure 7-2) for specific requirements.**
3. Depress EMERGENCY STOP (red) button (*next to key switch*), all machine operations will be disabled if functioning properly. If ok, reset EMERGENCY STOP for operation.
4. Set key switch to PLAT (*platform operation, all the way counterclockwise*) and continue with the following steps.

• Platform Controls

5. Enter platform and check that Manual Brake Release and Pot-Hole-Protection System Override Control (*Over-center handles on both sides of mast*) are both set properly for normal operation. Make sure the joystick controller box is in the designated (marked) location.
6. On joystick controller box, check BATTERY STATUS INDICATOR for charge status of batteries.
7. Check for proper operation of the FUNCTION ENABLE pad, and that JOYSTICK CONTROLLER moves freely.
8. Activate the ENABLE button and move the JOYSTICK in all directions, if machine is operating properly it will move in the direction the joystick is pointed.
9. While driving machine (*platform down*), rotate SPEED CONTROL knob from maximum to minimum (*clockwise to counterclockwise*) checking for proper operation.
10. Elevate platform approximately 1 ft. (.3m), and drive machine, if speed cut-back is operating properly, machine should drive at low speed only.
11. Activate the ENABLE button, and operate the platform UP and DOWN buttons (*up arrow and down arrow*) to raise and lower platform 2 ft. to 3 ft. (.5m to 1m) several times. Check for smooth elevation and lowering of platform.
12. Depress the EMERGENCY STOP (red) button on the controller box, all machine operations will be disabled if functioning properly.

2-6. TORQUE REQUIREMENTS

The Torque Chart, Figure 7-1, consists of standard torque values based on bolt diameter and grade, it also specifies dry and wet torque values in accordance with recommended shop practices. This chart is provided as an aid to the user/operator in the event he/she notices a condition that requires prompt attention during the walk-around inspection or during operation until the proper service personnel can be notified. Utilizing this Torque Chart in conjunction with the Preventive Maintenance and Inspection Schedule table in Section 8, will enhance the safety, reliability, and performance of the machine.

2-7. BATTERY CHARGING & MAINTENANCE

VP Models are equipped with a 115 Volt AC - 60 Hz input battery charger. The battery charger has an output of 24 volts, with a 10 amp maximum output and a 2 amp finish rate. The charger is equipped with an amp meter gauge and a 12-hour manual timer. All VP models include an interlock device which prohibits driving the unit while the battery charger is plugged in.

At the end of the work day, the batteries should be charged for the next days work. Connect the battery charger (See Figure 2-2.) to a properly grounded receptacle using a suitable extension cord. Set the battery charger timer switch for the desired charging time. A fully charged battery will have a specific gravity of between 1.260 - 1.275 on a hydrometer.

⚠ CAUTION

WHEN ADDING DISTILLED WATER TO THE BATTERIES, A NON-METALLIC CONTAINER AND/OR FUNNEL MUST BE USED.

NO OPEN FLAMES OR SMOKING WHEN CHARGING BATTERIES.

CHARGE BATTERIES ONLY IN A WELL VENTILATED AREA.

ENSURE THAT BATTERY ACID DOES NOT COME INTO CONTACT WITH SKIN OR CLOTHING.

As with any wet cell battery, check the electrolyte level of the batteries often, adding only distilled water when required. When fully charged, battery fluid level should be 1/8" below vent tubes. (See Figure 2-3.).

- DO NOT fill to bottom of vent tubes.
- DO NOT allow fluid level to go below the top of the plates when charging or operating.

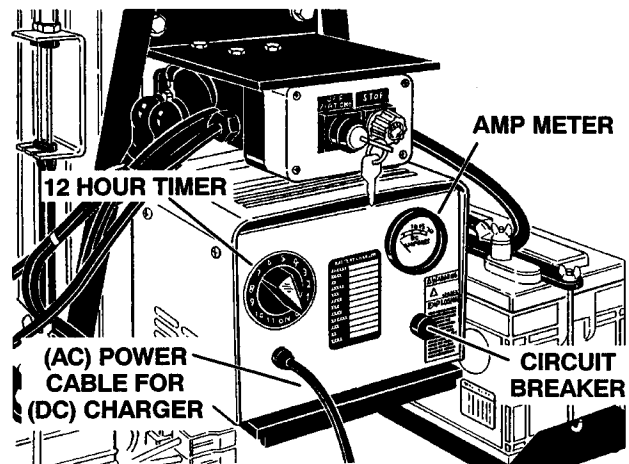


Figure 2-2. Charger Assembly.
(shown with cover removed)

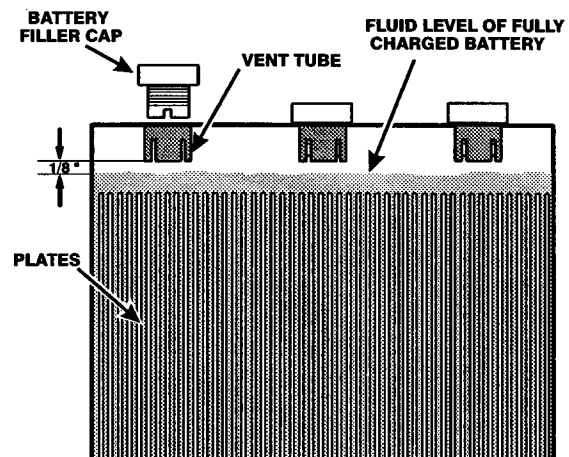


Figure 2-3. Battery Fluid Level.

3-1. GENERAL

IMPORTANT

SINCE THE MANUFACTURER HAS NO DIRECT CONTROL OVER MACHINE APPLICATION AND OPERATION, CONFORMANCE WITH GOOD SAFETY PRACTICES IN THESE AREAS IS THE RESPONSIBILITY OF THE USER AND HIS OPERATING PERSONNEL.

This section provides the necessary information needed to understand control functions. Included in this section are the operating characteristics and limitations, and functions and purposes of controls and indicators. It is important that the user/operator read and understand the proper procedures before operating the machine. These procedures will aid in obtaining optimum service life and safe operation.

3-2. PERSONNEL TRAINING

The aerial lift is a personnel handling device; therefore, it is essential that it be operated and maintained only by authorized personnel who have demonstrated that they understand the proper use and maintenance of the machine. It is important that all personnel who are assigned to and responsible for the operation and maintenance of the machine undergo a thorough training program and check out period in order to become familiar with the characteristics prior to operating the machine.

In addition, personnel operating the machine should be familiar with ANSI standard A92.6–1990, Responsibilities. This standard contains sections outlining the responsibilities of the owners, users, operators, lessors and lessees concerning safety, training, inspection, maintenance, application and operation.

Persons under the influence of drugs or alcohol or who are subject to seizures, dizziness or loss of physical control must not be permitted to operate the machine.

• Operator Training

Operator training must include instruction in the following:

1. Use and limitations of the platform controls, ground controls and emergency controls.
2. Knowledge and understanding of this manual and of the control markings, instructions and warnings on the machine itself.

3. Knowledge and understanding of all safety work rules of the employer and Federal, State and Local Statutes, including training in the recognition and avoidance of potential hazards in the work place; with particular attention to the work to be performed.
4. Proper use of all required personnel safety equipment.
5. Sufficient knowledge of the mechanical operation of the machine to recognize a malfunction or potential malfunction.
6. The safest means to operate near overhead obstructions, other moving equipment, obstacles, depressions, holes, drop-offs, etc. on the supporting surface.
7. Means to avoid the hazards of unprotected electrical conductors.
8. Any other requirements of a specific job or machine application.

• Training Supervision

Training must be done under the supervision of a qualified operator or supervisor in an open area free of obstructions until the trainee has developed the ability to safely control an aerial lift in congested work locations.

• Operator Responsibility

The operator must be instructed that he has the responsibility and authority to shut down the machine in case of a malfunction or other unsafe condition of either the machine or the job site and to request further information from his supervisor or JLG Distributor before proceeding.

Note

Manufacturer or Distributor will provide qualified persons for training assistance with first machine(s) delivered and thereafter as requested by user or his personnel.

3-3. OPERATING CHARACTERISTICS AND LIMITATIONS

• General

A thorough knowledge of the operating characteristics and limitations of the machine is always the first requirement for any user, regardless of user's experience with similar types of equipment.

• Placards

Important points to remember during operation are provided at the control stations by DANGER, WARNING, CAUTION, IMPORTANT and INSTRUCTION placards. This information is placed at various locations for the express purpose of alerting personnel of potential hazards constituted by the operating characteristics and load limitations of the machine. See foreword for definitions of the above placards.

• Capacities

Raising the platform above the stowed position is based on the following criteria:

1. The machine is positioned on a smooth, firm level surface.
2. The load is within manufacturer's rated capacity.
3. All machine systems are functioning properly.

• Stability

This machine, as originally manufactured by JLG and operated within its rated capacity on a smooth, firm and level supporting surface (*check bubble level indicator on base frame*), provides a stable aerial platform for all platform positions.

3-4. CONTROLS AND INDICATORS

• Ground Controls

(See Figure 3-1.)

Note

When the machine is shut down for overnight parking or battery charging, be sure the POWER PLAT/OFF/GRND KEY SWITCH is positioned to OFF to prevent draining the batteries. For information on battery charging see SECTION 2-7, Battery Charging.

1. POWER PLAT/OFF/GROUND KEY SWITCH

A key operated power PLAT/OFF/GROUND switch located in the upper access hole of the rear cover (*on back of machine*), controls power to all functions on the machine. The machine platform controls will not operate without the key inserted and turned to the PLAT (platform) position. When the key switch is set to the GRND (*ground*) position this allows use of the platform UP/DOWN switch located next to the hydraulic oil reservoir (*lower access hole*). When left unattended removing the key will prevent unauthorized machine use.

2. PLATFORM UP/DOWN (GROUND CONTROL)

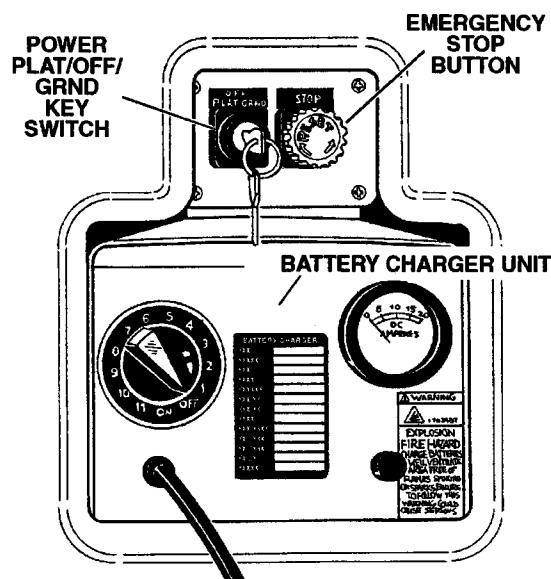
The ground operated platform control switch is located next to the hydraulic reservoir in the lower access hole of the rear cover. This three position toggle switch will raise (*lift up*) and lower (*lift down*), the platform from the ground control position when the PLAT/OFF/GRND key switch is set to the GRND (*ground*) position.

3. EMERGENCY STOP BUTTON

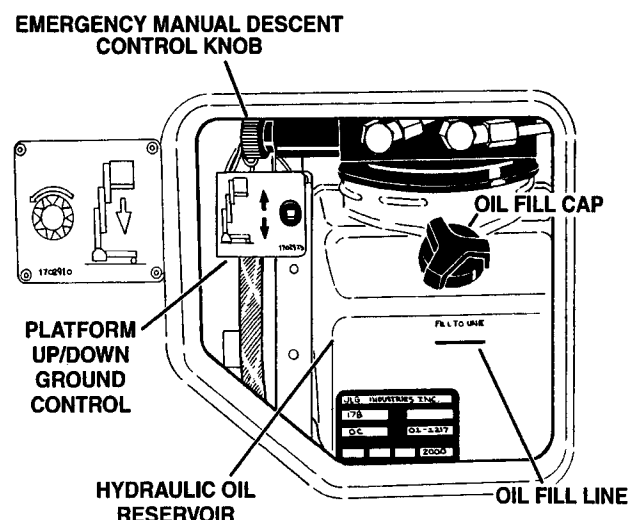
An EMERGENCY STOP (*red button*) is mounted on both the ground control station and the platform controller. When this button is depressed, all machine functions will stop. To re-activate power to the machine, turn emergency stop button clockwise until button is reset (*ground control only, platform uses a different type of reset*).

4. EMERGENCY/MANUAL DESCENT KNOB

This (*RED knurled*) knob, located on the electric/hydraulic pump-motor unit in the lower access hole of the rear cover provides for lowering of the platform in the event of an emergency or power failure. Turn knob (*counterclockwise*)



Upper Half of Rear Cover



Lower Half of Rear Cover

Figure 3-1. Ground Controls

to open the valve and lower the platform. This valve must be closed (*turned all the way clockwise*) for normal operation of the machine. (Refer to Section 6 for Emergency Descent operating procedures.)

5. HYDRAULIC OIL RESERVOIR

The hydraulic oil reservoir is housed inside the lower access hole in the rear cover. Check the hydraulic oil level visually by observing the oil level in the reservoir as compared to the FILL TO LINE indicator on the side of the reservoir. Hydraulic oil can be added if necessary through the OIL FILL CAP on top of the reservoir. DO NOT OVERFILL.

Note

Always check hydraulic oil level with oil at operating temperature and with the platform completely lowered.

• Platform Controller

(See Figure 3-2.)

The platform controller contains all the controls necessary to operate the lift from the platform.

The following is a description of each function.

1. BATTERY VOLTAGE / FAULT CODE LED INDICATORS.

The LED strip (*green when lit*) running between the pad buttons on the controller pad indicates the battery voltage level when the machine is powered-up. The graduated LED strip indicates batteries at FULL CHARGE (25 volts) when lit all the way to the top (F), and a LOW CHARGE (18 volts) at bottom (E) when one or two LEDs are illuminated.

Note

When voltage drops below 16.5 volts an error code is indicated, and the batteries require a recharge.

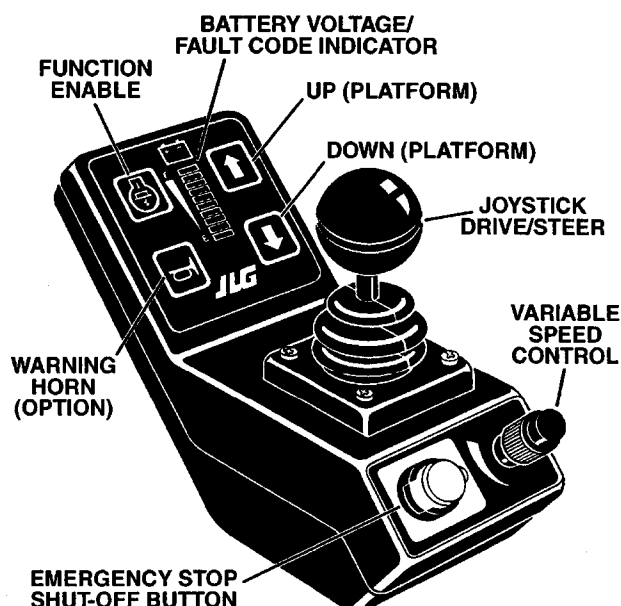


Figure 3-2. Platform Controller.

This LED strip also acts as a fault code indicator to help diagnose problems with the machines' electrical system. (See Section-9 Troubleshooting, for information about reading fault codes).

2. FUNCTION ENABLE PAD

The function of this pad is to prevent unintentional activation of a control function. This pad must be pressed before any of the platform or joystick drive functions can be operated. Once activated (*flashing green dot*), the operator has approximately three seconds to activate any of the control functions.

3. PLATFORM UP PAD (*Up Arrow*)

When pressed this pad raises the platform to a higher level, when released the upward movement is stopped.

4. PLATFORM DOWN PAD (*Down Arrow*)

When pressed this pad lowers the platform from a raised position, when released, the downward movement is stopped.

5. EMERGENCY STOP/SHUT-OFF BUTTON

An EMERGENCY STOP (*RED*) button is provided in order to immediately stop machine functions from the platform in the event of an emergency. Pressing button once engages emergency stop, pressing button again returns control of functions.

6. JOYSTICK DRIVE / STEER CONTROL

This is a Point & Go™ control which moves the machine in the direction which the stick is moved. It is a fully proportional control, the further from the center position the joystick is moved, the faster the machine travels.

EMERGENCY STOP MODE: When driving, pulling the joystick straight back in the opposite direction will make the machine stop more quickly. The machine will not go in reverse direction after machine has stopped, (*with the joystick in the full opposite direction*), until the joystick is returned to its centered position.

7. VARIABLE SPEED CONTROL

The variable speed control knob can be used to speed up or slow down drive speed of the machine. Adjust speed knob while driving machine with joystick controller, *clockwise increases speed, counterclockwise decreases speed.*

Drive speed is automatically cut from two (2) MPH max. to one-half (1/2) MPH maximum when the platform is in an elevated position. The speed control knob works with the platform in this position, but to a lesser degree.

8. WARNING HORN PAD

If machine is equipped with (*optional*) mounted horn, this pad when pressed sounds the horn.

• Brake Release Control

(See Figure 3-3.)

Standard equipment on all VP Series lifts is a braking system integrated into the electric motor drive system. The braking system is spring engaged and released electrically while the machine is being driven with the joystick controller. When the lift is at rest or the power is turned off, the brakes are automatically engaged.

If the lift must be moved around manually such as described in the following examples; the batteries become depleted and the machine needs to be moved from an aisleway, or machine is being winched onto a roll-back truck bed, etc. To release the brakes a brake release control has been provided to engage/disengage the brake system.

⚠ CAUTION

FOLLOW ALL APPLICABLE SAFETY PRECAUTIONS WHEN MANUALLY MOVING MACHINE AROUND (SEE SECTION 1-3).

Located on the right side of the mast (*bubble level side*) is a handle labeled BRAKE DISENGAGE / ENGAGE. To disengage or engage the brakes,

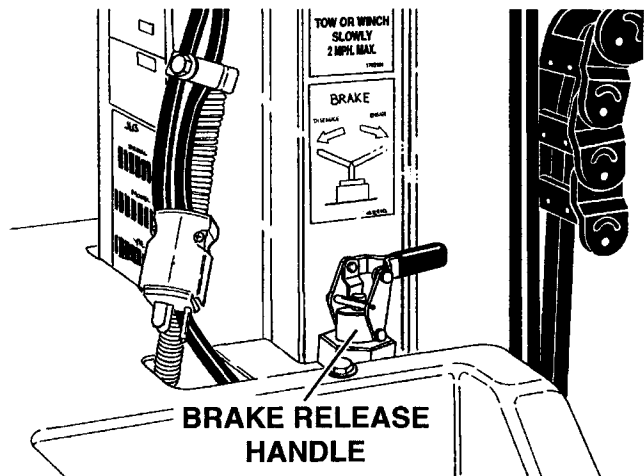


Figure 3-3. Brake Release Handle.

check the brake decal located just above the handle assembly to see which direction the handle needs to be pointed, (*brakes are DISENGAGED when the handle is pointed away from the platform towards the rear of the machine, and ENGAGED (normal operating position) when pointed toward the platform*). When brakes are disengaged the machine can then be moved around manually.

⚠ IMPORTANT

WHEN PUSHED OR PULLED MANUALLY, THE MACHINE'S BRAKES MUST BE DISENGAGED AND THE EMERGENCY STOP BUTTON SET TO THE OFF POSITION, (DEPRESSED). DO NOT ATTEMPT TO TOW OR WINCH THE MACHINE AT A SPEED GREATER THAN (2) MPH, OR DAMAGE COULD OCCUR TO THE MACHINE'S ELECTRONIC CONTROLLER BOX. (DUE TO HIGH VOLTAGE BEING GENERATED BY THE DRIVE MOTORS FEEDING BACK INTO THE CONTROLLER BOX).

⚠ CAUTION

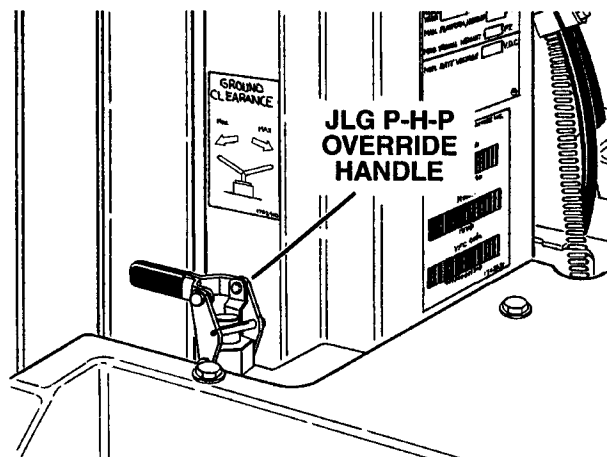
AFTER THE MACHINE HAS BEEN MOVED AND BEFORE DRIVING MACHINE, ALWAYS RE-ENGAGE THE BRAKE SYSTEM.

• **JLGs Pot-Hole-Protection Device -
Override Cable Control**

(See Figure 3-4.)

All VP Series lifts are equipped with JLGs Pot-Hole-Protection system (JLGs P-H-P). This system consists of hinged skirts, (*hinged slightly over-center to the outside*), on the bottom edge of both sides of the base frame, (*between the front caster and rear drive wheels*). The skirts have a ground clearance of approximately one half (1/2") inch and are designed to support the weight of the machine should one of its wheels drop into a hole or crack. As the machine drops onto the skirt it will limit the amount of tilt the machine will incur and reduce the likelihood of the machine tipping over. If this condition should occur while the platform is in an elevated position, the operator can then lower the platform, exit the platform, and have the machine safely removed from the situation.

For conditions where the machine must be driven in areas where obstacles higher than one half (1/2") inch (*door sills, cables, carpet, etc.*) are present, an override system is provided. The P-H-P override (GROUND CLEARANCE) consists of a handle assembly located on the left side



**Figure 3-4. JLGs Pot-Hole-Protection
Override Handle**

of the mast (*facing rear of mast, just above the rear cover next to mast*), which is attached via steel cable to both hinged skirts. To raise (*override*) the P-H-P system skirts, check the GROUND CLEARANCE decal located just above the handle assembly, (*the skirts are raised to maximum height, when the handle is pointed away from the platform towards the rear of the machine, and lowered, (normal operating position), when the handle is pointed toward the platform*).

When the P-H-P override is engaged (*skirts raised*) the machine will operate normally if the platform is fully lowered. If the platform is elevated while the override is engaged all drive functions are locked out and machine cannot be driven.

4-1. MACHINE DESCRIPTION

The JLG VP Series model line of lifts are an electric self-propelled machine, with an aerial work platform mounted to an elevating aluminum mast mechanism. The mast is raised and lowered by a hydraulic cylinder extending between mast section-1 and -2, the remaining mast sections are proportionally extended and retracted using steel chains or cables. Hydraulic pressure is supplied to the lift cylinder by an electrically powered hydraulic pump. All VP Series models feature a steel base frame with swivel caster wheels mounted on the front and fixed drive wheels on the rear of the machine. The personnel lift's intended purpose is to provide personnel (with their tools and supplies) access to areas above ground level.

The JLG VP lift has a primary controller in the platform. From the platform controller the operator can drive the unit and raise or lower the platform. Ground controls are also provided, these controls consist of a keyed power on/off/grnd switch, an emergency stop button, an emergency/manual decent valve and a platform up/down control switch.

Instructions and warnings are posted adjacent to both platform and ground operator control stations and at other places on the machine. It is extremely important that the user/operator know what instructions and warnings are placed on the machine and in the manual. And that these instructions and warning be reviewed periodically.

The JLG VP personnel lift is designed to provide efficient and safe operation when maintained and operated in accordance with instructions and warnings on the machine, in the Operating, Safety and Maintenance Manual, ANSI Responsibilities Manual and by obeying all jobsite and government rules and regulations. As with any type of machine, the operator is very important to efficient and safe operation. It is absolutely neces-

sary that the JLG VP lift be regularly maintained in accordance with this manual. Any evidence of lack of maintenance, malfunction, excessive wear, damage or modification to the machine must be reported immediately to its owner, the jobsite supervisor, or safety manager and that the machine be taken out of service until all discrepancies are corrected.

The JLG VP personnel lift is not intended to be used to lift material other than supplies which personnel in the platform require to do their job. Supplies or tools which extend outside the platform are prohibited except for JLG approved recepticals. The personnel lift must not be used as a forklift, crane, or support for overhead structure.

The total platform capacity of models 10VP, 15VP, 20VP is 350 lb. (159 kg.), uniformly distributed in the center of the platform. This means that the total combined weight of personnel, tools and supplies loaded into the platform must not exceed the above figures.

4-2. GENERAL

This section provides the necessary information needed to operate the machine. Included in this section are procedures for driving the machine, raising, lowering and loading the platform, and also transporting the machine. It is important that the user read and understand the proper procedures before operating the machine. Although some of the more important operating safety precautions will be listed in the following paragraph sections, **IT IS EXTREMELY IMPORTANT ALL SAFETY PRECAUTIONS BE READ AND UNDERSTOOD BEFORE OPERATING MACHINE.** If a "Daily Walk-Around Inspection", (see Section 2-4.) has not been performed, do so before starting set-up and operation. The operator must also be familiar with all lift controls as described in Section 3 - User/Operator Responsibilities and Machine Controls.

4-3. MACHINE OPERATION

The following sequence of basic procedures must be followed to safely operate the machine.

1. At the ground control station, set power PLAT/OFF/GRND key switch to the PLAT position to operate from platform controller, or GRND to operate from ground controls.

Note

Check that the Emergency Stop button on ground and platform controller are in the reset position for operation. Also check that Emergency/Manual Decent Control valve is closed (lower access hole in rear cover).

If LED'S are flashing a fault code on the platform controller box at machine power-up, see Section-9 Troubleshooting for information on reading fault codes.

2. Check LED strip on platform controller box for current battery charge level before operating lift to be certain charge is sufficient to complete your work task. If the battery charger is plugged into an AC outlet, drive functions on the machine will be locked out.

⚠ WARNING

WORK AREA MUST BE A SMOOTH, FIRM AND LEVEL SURFACE FREE OF HOLES, LARGE CRACKS OR DEBRIS ON SURFACE. THE WORK SURFACE MUST BE CAPABLE OF SUPPORTING THE WEIGHT OF THE MACHINE PLUS THE PLATFORM'S MAXIMUM RATED LOAD CAPACITY. ALWAYS CHECK THE BUBBLE LEVEL INDICATOR ON BASE FRAME TO BE SURE MACHINE IS LEVEL BEFORE RAISING PLATFORM.

3. Inspect work area before operating lift.

• Interlock Switch Operating Conditions

Table 4-1. shown, lists machine response to various interlock switch positions.

• Platform Loading

The platform maximum rated load capacity is displayed on a decal located on the platform. The maximum rated load capacity includes the combined weight of the operator and any materials, tools, etc. placed in the platform with the operator.

Maximum rated load capacity for each model is as follows:

10VP	350 lb. (159 kg.)
15VP	350 lb. (159 kg.)
20VP	350 lb. (159 kg.)

• Driving

⚠ WARNING

DO NOT ATTEMPT TO DRIVE MACHINE UP A RAMP (GRADE) OF GREATER THAN FIFTEEN 15% PERCENT (8-1/2° DEGREES), AS TIPPING COULD OCCUR.

DO NOT ATTEMPT TO RAISE THE PLATFORM UNLESS ALL FOUR WHEELS OF THE MACHINE ARE RESTING ON A FIRM AND LEVEL SURFACE.

1. Enter the platform and close the gate.
2. Check the floor and overhead area in the direction of travel for obstacles to avoid.

**Table 4-1.
Machine Interlock Switch Operating Conditions**

Elevation/Speed Switch	Drive Cutout (PHP System)	Tilt Status (Option)	Brake Status	Controller Response
mast retracted	skirts lowered	(not tilted)	engaged	Full drive & lift
mast retracted	skirts lowered	(not tilted)	disengaged	Drive & lift disabled
mast extended	skirts lowered	(not tilted)	engaged	Drive 25% max.
mast extended	skirts raised	(not tilted)	engaged	Drive disabled
mast extended	skirts lowered	(tilt)	engaged	Drive & lift disabled
mast extended	skirts raised	(tilt)	engaged	Drive & lift disabled
mast retracted	skirts lowered/ battery charger plugged in	(not tilted)	engaged	Drive disabled

Note

On the platform controller the ENABLE pad must be pressed and released (flashes green) before any other platform function will operate. You must activate the desired function within three (3) seconds while ENABLE pad is flashing.

3. Press and release the ENABLE pad (*flashes green*) then gently point the JOYSTICK in the direction of travel. If necessary, adjust the SPEED CONTROL on controller box (*round knurled knob*) while driving.
4. To stop, either release the JOYSTICK (*quick stop*), or slowly move the JOYSTICK back to the neutral (*center*) position (*preferred*), to bring lift to a smooth stop.

• Elevating Platform**⚠ WARNING**

DO NOT ATTEMPT TO RAISE THE PLATFORM UNLESS ALL FOUR WHEELS OF THE MACHINE ARE RESTING ON A FIRM AND LEVEL SURFACE. ALWAYS CHECK BUBBLE LEVEL INDICATOR ON BASE FRAME TO BE SURE MACHINE IS ON A LEVEL SURFACE BEFORE RAISING PLATFORM. ALSO, OBSERVE SURFACE AREA AROUND MACHINE IF IT IS TO BE MOVED (DRIVEN) WHILE PLATFORM IS ELEVATED.

1. Drive the machine to the area where overhead work is to be performed and position the machine into it's approximate work position.
2. Check bubble level indicator on base frame of machine, the bubble inside the level indicator must be inside the small center ring before attempting to raise the platform.
3. To raise the platform, press and release the ENABLE pad (*flashes green*) on the platform controller then the platform UP (*up arrow*) pad on the controller panel. Upon reaching desired elevation level release the UP (*arrow*) pad.

Note

Maximum drive speed is automatically decreased to one half (1/2) mph maximum when platform is elevated. Also, the machine cannot be driven with platform elevated, if the JLG Pot-Hole-Protection system is disengaged (handle pulled up).

4. If necessary, reposition (*drive*) lift using platform controller JOYSTICK to bring work object into reach.

• Lowering Platform**⚠ WARNING**

ENSURE AREA BENEATH PLATFORM IS FREE OF PERSONNEL AND OBSTRUCTIONS PRIOR TO LOWERING PLATFORM.

1. To lower platform, press the ENABLE pad (*flashes green*) and platform DOWN pad (*down arrow*) on the platform controller panel. Upon reaching desired lower level release the DOWN (*down arrow*) pad.

4-4. STOWING MACHINE

1. Drive machine to a well-protected and well-ventilated area.
2. Ensure the platform is fully lowered, turn power PLAT/OFF/GRND key switch to the OFF position (*centered*).
3. Park machine with brakes engaged. (*Brake Over-Center Handle down, disengaged*).
4. If necessary, remove key from POWER PLAT/OFF/GRND key switch to disable machine from unauthorized use.

Note

If required, plug in AC battery charger so machine batteries will be charged in preparation for next work day in accordance with Section 2-7, "Battery Charging".

4-5. TRANSPORTING, LIFTING AND TIE DOWN PROCEDURES

• General

All VP Series model personnel lifts may be transported to a worksite using the following methods:

- Driving the machine around on its base wheels if travel surface area permits.
- Loaded, IN AN UPRIGHT POSITION ONLY onto a heavy-duty vehicle with the payload capacity capable of supporting the full weight of the machine (*see machine weights in the following sub-section "Fork-lift Truck Transport"*).
- Moved with a fork-lift truck using the fork-lift pockets in the base frame.

⚠ IMPORTANT

THE VP SERIES CONTROLLER COULD SUSTAIN SERIOUS DAMAGE WHEN THE UNIT IS PUSHED, OR TOWED WHILE NOT UNDER POWER, FOR EXAMPLE PUSHING OR TOWING WITH OTHER MACHINERY, AT SPEEDS OF 4 MPH. DO NOT ATTEMPT TO PUSH OR TOW THE MACHINE AT SPEEDS GREATER THAN 2 MPH. ALWAYS BE CERTAIN THE MACHINES BRAKES ARE DISENGAGED AND THE EMERGENCY STOP BUTTON IS SET TO THE OFF POSITION (DEPRESSED), WHEN PUSHING, WINCHING OR TOWING.

• Driving to Work Area

All VP Series models are capable of being driven to a work area, if the surrounding travel surface permits. Follow the driving and safety instructions as noted in previous Section 4-3., Machine Operation.

• Truck Transport

⚠ CAUTION

DO NOT TRANSPORT THE MACHINE IN A HORIZONTAL POSITION DUE TO LEAKAGE OF BATTERY ACID FROM THE BATTERIES OR HYDRAULIC FLUID FROM THE HYDRAULIC RESERVOIR.

VP Series model personnel lifts may be transported to a worksite on a truck or trailer **in an upright position**. The transport vehicle must have a payload capacity capable of supporting the full weight of the machine, (*see machine weights in the following sub-section "Fork-lift Truck Transport"*). The selected transport vehicle must also be equipped with tie-down lugs strong enough to restrain the machine during transport.

JLG recommends loading the machine onto the bed of the transport vehicle using a suitable fork-lift truck or lifting with the (*optional*) crane hook, with the exception of a truck equipped with a tilting-roll-back truck bed.

The machine may be winched onto a tilted roll-back truck bed (*see important note following*) which has been rolled back to ground level. Always winch (*pull*) from the mast (*rear*) end of the machine, using the rear tie-down bar located in the base frame (*see Figure 4-1.*).

⚠ IMPORTANT

DO NOT ATTEMPT TO DRIVE MACHINE ONTO, OFF OF, OR PUSH MACHINE ONTO A TILTED ROLL-BACK TRUCK BED.

WHEN TOWING OR WINCHING, THE MACHINE'S BRAKES MUST BE DISENGAGED (*SEE SECTION 3-4. CONTROLS AND INDICATOR, SUB-SECTION "BRAKE RELEASE CONTROL"*), AND THE EMERGENCY STOP BUTTON SET TO THE OFF POSITION, (DEPRESSED).

DO NOT ATTEMPT TO TOW OR WINCH THE MACHINE AT A SPEED GREATER THAN (2) MPH, OR DAMAGE COULD OCCUR TO THE MACHINES ELECTRONIC CONTROLLER BOX, (*DUE TO HIGH VOLTAGE BEING GENERATED BY THE DRIVE MOTORS FEEDING BACK INTO THE CONTROLLER BOX*).

RE-ENGAGE THE BRAKES ONCE MACHINE IS IN PLACE WITH TRUCK BED LEVEL AND READY FOR TIE DOWN.

TIE DOWN BARS ARE PROVIDED ON BOTH ENDS OF THE BASE FRAME TO SECURE MACHINE TO BED OF TRANSPORT VEHICLE.

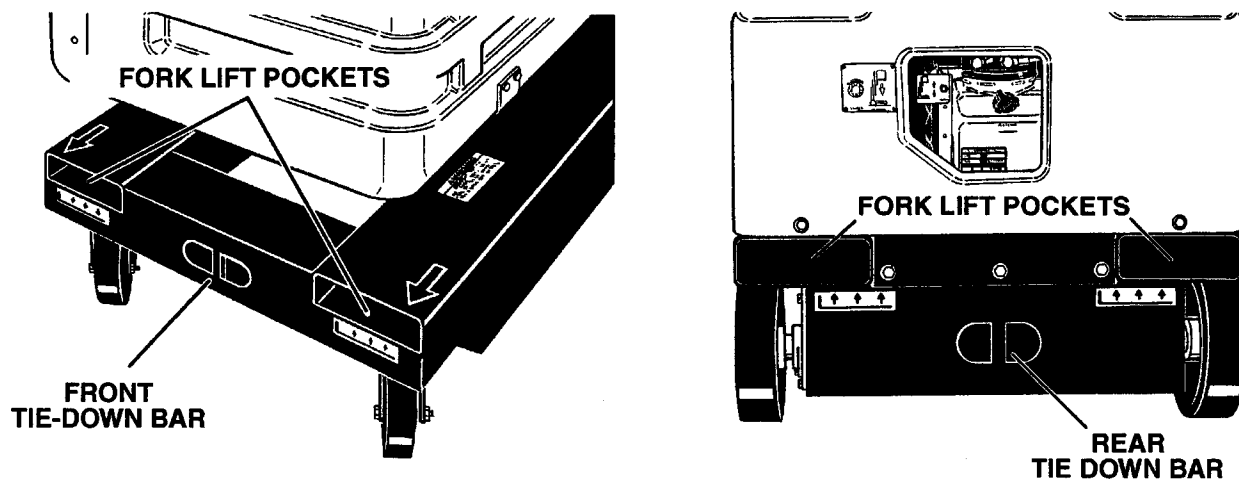


Figure 4-1. Forklift Truck Lifting Pockets and Machine Tie Down Bar Locations.

• Machine Tie-Down

With machine in position to be tied down and **brakes engaged**, use the following guidelines for restraining the machine during transport.

⚠ IMPORTANT

USE OF EXCESSIVE FORCE WHEN SECURING MACHINE (DRIVE WHEEL LOAD), CAN CAUSE DAMAGE TO THE MACHINES DRIVE COMPONENTS, I.E. AXLES, AXLE BEARINGS, TORQUE LIMITING CLUTCH, OR DRIVE GEARS.

1. Secure machine with a standard G70 transport chain (5/16" size is recommended), or DOT approved equal, attached through the tie down bars at the front and back of machine.
(See Figure 4-1.)
2. The chain should be securely bound by load binders, (5400 lb. working load), tightened with a force of approximately 100 lb. applied two feet from the pivot handle. *(i.e.. the chain is properly tightened when a 200 lb. load placed on the chain (a 200 lb. man standing on the chain), just flexes the chain.*

• Fork-lift Truck Transport

⚠ IMPORTANT

ALWAYS RELEASE THE DRIVE MOTOR BRAKES AND SET THE EMERGENCY STOP BUTTON TO THE OFF POSITION, (DEPRESSED) ON THE MACHINE WHEN MANUALLY PUSHING, PULLING, OR WHEN TRANSPORTING MACHINE BY FORK-LIFT TRUCK. THIS WILL ALLOW THE DRIVE MOTORS AND GEARS TO ROTATE WITH LEAST RESISTANCE SHOULD THE DRIVE WHEELS COME IN CONTACT WITH ANY SURFACE. IF CONTACT OF THE REAR DRIVE WHEELS DOES OCCUR WHILE FORKLIFT TRUCKING, AT SPEEDS GREATER THAN 2 MPH, DAMAGE COULD OCCUR TO THE MACHINES ELECTRONIC CONTROLLER BOX, (DUE TO HIGH VOLTAGE BEING GENERATED BY THE DRIVE MOTORS FEEDING BACK INTO THE CONTROLLER BOX).

ALWAYS REMEMBER TO RE-ENGAGE THE BRAKE SYSTEM BEFORE MACHINE OPERATION.

As standard equipment, all VP series lift models are equipped with 7-1/2 in. wide fork-lift pockets running through the base frame. This allows the machine to be either transported around a work area or lifted onto a higher level using a standard fork-lift truck.

Note

Fork-lift trucks must be capable of handling the following weights:

10VP -	879 lbs.	(399 kg.)
15VP -	1256 lbs.	(570 kg.)
20VP -	1880 lbs.	(853 kg.)

5-1. OPTIONAL EQUIPMENT

The VP Series models are available with the following optional equipment:

- 22" x 22" Platform
- Step-in Molded Platform w/Swing-up Gate
- Tool Tray
- Fluorescent Tube Caddy
- General Purpose Caddy
- Laser Positioning Light
- Lifting Hook
- Horn & Alarm
- Hourmeter
- Amber Beacon Light
- Flip Down Seat

6-1. GENERAL INFORMATION

This section provides information on procedures to be followed, and systems and controls to be used in the event an emergency situation is encountered during machine operation. Prior to operation of the machine and periodically thereafter, the entire operating manual, including this section, should be reviewed by all personnel whose responsibilities include any work or contact with the machine.

6-2. EMERGENCY CONTROLS AND THEIR LOCATIONS

⚠ WARNING

CHECK MACHINE DAILY TO MAKE SURE EMERGENCY STOP SWITCHES ARE IN PLACE AND OPERATIONAL AND THAT APPLICABLE INSTRUCTIONS ARE IN PLACE AND LEGIBLE.

• Platform Emergency Stop Switch

This (RED) button is located on the platform joystick controller box and, when depressed, will immediately stop the machine from the platform.

• Ground Emergency Stop Switch

The ground emergency stop switch (RED) button is located inside the rear cover (*upper access hole*) beside the power ON/OFF/GRND key switch. When depressed, it will immediately stop the machine.

• Manual Descent Knob

The manual descent knob is used in the event of either a total power failure, or if the operator in the platform cannot lower the platform himself. The manual descent knob (RED knurled) is located on the electric/hydraulic pump-motor unit inside the rear cover (*lower access hole, just above the hydraulic reservoir*). To lower the platform, turn the manual descent knob counterclockwise opening the valve. Turn the knob clockwise to stop descent or to close the valve. (The platform will be lowered, unpowered, using gravity.)

6-3. EMERGENCY OPERATION

• Use of Ground Controls.

⚠ IMPORTANT

KNOW HOW TO USE THE GROUND CONTROLS IN AN EMERGENCY SITUATION.

⚠ DANGER

BEFORE TOUCHING ANY PART OF THE MACHINE IN AN EMERGENCY SITUATION, FIRST DETERMINE IF MACHINE IS IN CONTACT WITH OR IN CLOSE PROXIMITY TO AN ELECTRICALLY CHARGED CONDUCTOR. THIS MACHINE DOES NOT PROVIDE PROTECTION FROM CONTACT WITH OR PROXIMITY TO AN ELECTRICALLY CHARGED CONDUCTOR. (SEE ELECTROCUTION HAZARD, SECTION 1-3.)

Ground personnel must be thoroughly familiar with the machine operating characteristics and the ground control functions (*see Section 3-4. "Controls and Indicators"*). Training should include operation of the machine, review and understanding of this section and hands-on operation of the controls in simulated emergencies.

• Operator Unable to Control Machine

⚠ IMPORTANT

IF THE PLATFORM OPERATOR IS UNABLE TO OPERATE OR CONTROL THE MACHINE FOR ANY REASON, USE THE FOLLOWING INSTRUCTIONS AS A GUIDELINE.

1. Operate the machine from the ground controls **ONLY** with the assistance of other personnel and equipment (cranes, overhead hoists, etc.) as may be required to safely remove the danger or emergency condition.
2. **DO NOT CONTINUE OPERATION IF CONTROLS DO NOT FUNCTION NORMALLY.**
3. Cranes, forklift trucks or other equipment which may be available are to be used to help remove the platform occupant and stabilize motion of the machine in case machine controls are inoperable or platform cannot be lowered with the emergency/manual decent valve.

(continued next page)

• Platform Caught Overhead

If the platform becomes jammed or snagged in overhead structures or equipment, do not continue operation of the machine from either the platform or the ground until the operator and all personnel are safely moved to a secure location. Only then should an attempt be made to free the platform using any necessary equipment and personnel. Do not attempt to move machine unless a crane, forklift or other suitable equipment is available to support machine.

• Post-Incident Inspection

Following any incident, thoroughly inspect the machine and test all functions. Do not lift platform above 10 feet (3 meters) until you are sure that all damage has been repaired and that all controls and machine components are operating correctly.

6-4. INCIDENT NOTIFICATION

It is imperative that JLG Industries, Inc. be notified immediately of any incident involving a JLG product. Even if no injury or property damage is evident, the Product Safety and Reliability Department at the factory should be contacted by telephone and provided with all necessary details.

JLG Phone: (717) 485-5161
(8am till 4:45pm EST)

It should be noted that failure to notify the Manufacturer of an incident involving a JLG Industries product within 48 hours of such an occurrence may void any warranty consideration on that particular machine.

7-1. CAPACITIES

- System Voltage**

All VP Models – 24 Volt DC
(2 - 12 volt DC batteries)

- Hydraulic Oil Reservoir**

All VP Models – 5 qts. U.S. (4.7 ltr.)

7-2. COMPONENT DATA

- Hydraulic Pump/Pump Motor Assembly**

Pump Motor - 24 Volt DC motor

Pump Displacement –

10 & 15VP – .049 cu. in./rev. (1.6cc/rev)

20VP – .098 cu. in./rev. (0.8 cc/rev)

Pump Output (Max.) –

10 & 15VP - 1.20 gpm @ 2200 psi

20VP – 0.65 gpm @ 2200 psi

Hydraulic System Pressure Relief –

10 & 15VP - 1000 psi (68.95 bar)

20VP - 2500 psi (172.3 bar)

- Rear Wheel Drive Motors**

Drive Motors - 24 Volt DC w/perm. magnet

Right angle gear

Maintenance free sealed gear

Brake shaft and drive shaft,

Integral to Motor

Parking Brake (*must be released for pushing*)

- Batteries/Battery Charger**

Batteries (2) – 12 Volt / 100 Amp Hour –
Deep Cycle Marine - RV

Battery Charger – 110 Volt A.C.

50 Hz

24 volt, 10 amp output -
with 2 amp finish

Reset Circuit Breaker

Ammeter

12 hour manual timer

Plug Interlock

7-3. PERFORMANCE DATA

- Platform Capacity (Total)**

10VP – 350 lbs. (159 kg)

15VP – 350 lbs. (159 kg)

20VP – 350 lbs. (159 kg)

- Platform Size (Standard)**

All VP Series Models – 26 in. x 26 in.
(66cm) x (66cm)

- Machine GVWeight – Max. Wheel Load**

10VP – 879 lb. (399 kg) – 365 lb. (118 psi)

15VP – 1256 lb. (570 kg) – 535 lb. (173 psi)

20VP – 1900 lb. (862 kg) – 675 lb. (218 psi)

- Machine Height (In Stowed Position)**

All VP Models - 79 in. (2m) height

- Base Footprint**

All VP Models - 32 in. (81cm) width
56 in. (1.42m) length

- Max. Platform Height (mast extended)**

10VP – 10 ft. 6 in. (3.2m)

15VP – 15 ft. (4.5m)

20VP – 19 ft. 9 in. (5.9m)

- Platform Working Height (average)**

10VP – 16 ft. 5 in. (4.8m)

15VP – 21 ft. (6.4m)

20VP – 25 ft. 9 in. (7.6m)

- Machine Drive Speed (max.)***

Platform Lowered - 2 mph (3.22 kph)

Platform Elevated - 0.5 mph (.81 kph)
(reduce by limit switch)

* Variable to maximum with speed cut back.

- Amperage Draw (average)**

Lift - 60 amps.

Drive - 15 amps.

7-4. TORQUE REQUIREMENTS

When maintenance becomes necessary or a fastener has loosened, refer to the Torque Chart, Figure 7-1 to determine proper torque value.

7-5. LUBRICATION

• Hydraulic Oil

Change the oil depending on the ambient temperatures prevailing in your area. Best performance can be obtained by utilizing ISO-Vg grade 32, 46 oil with a viscosity range between 150-250 SUS at 100 degrees F (32-54 cST at 40 degrees C). Minimum viscosity at operating temperature is 60 SUS (10cST). Maximum start-up viscosity at minimum ambient temperature is 4000 SUS (880 cST). Maximum recommended operating temperature of hydraulic oil is 150 degrees (65 degrees C).

Oils should be non-corrosive, have maximum anti-wear properties, rust and oxidation (treatment), and be non-foaming.

Recommended oils for an ambient temperature range of -10 degrees F to +100 degrees F (-23 degrees C to +38 degrees C) are as follows:

**Table 7-1.
Recommended Hydraulic Oils**

Amoco Oil Co.	Rycon Oil No. 32, 46 Amoco AW 32, 46
Cities Service Oil Co.	Citgo AW Hyd. Oil 32, 46 Citgo All Temp. Hyd. Oil
Chevron USA	Chevron EP Hyd. Oil 32, 46
Fina Oil Co.	Fina AW 32, 46 Fina Automatic Transmission Fluid Dexron II
Gulf Oil Corporation	Gulf Harmony 32 AW, 46 AW
Mobil Oil Corporation	DTE 15, 24, 25 Mobil Fluid # 300 Transmission Fluid
Sentinel Lubricants Corp.	Sentinel SH-10 Hydraulic Oil
Shell Oil Co.	Tellus Hyd. Oil 32, 46 Tellus "T" Hyd. Oil 32, 46
Texaco Inc.	Rando Oil Hd-32, 46
Union 76	XCel aw 46 (200)

• Lubrication Specifications

**Table 7-2.
Lubrication Specifications**

KEY	SPECIFICATIONS
MPG –	Multipurpose Grease having a minimum dripping point of 350° F. Excellent water resistance and adhesive qualities, and being of extreme pressure type. (Timken OK 40 pounds minimum.)
EPGL –	Extreme Pressure Gear Lube (oil) meeting API service classification GL-5 or MIL-Spec MIL-L-2105.
HO –	Hydraulic Oil. ISO-Vg grade 32, 46.

7-6. PRESSURE ADJUSTMENT

Adjust system pressure so that platform will raise with rated capacity in platform. Do not adjust system pressure higher than required to raise the load. Make pressure adjustment with oil at normal operating temperature. If pressure is set when oil is cold, platform may not raise rated load after oil has warmed.

7-7. CYLINDER SPECIFICATIONS

Note

All dimensions are given in inches (in), with the metric equivalent, centimeters (cm), given in parentheses.

**Table 7-3.
Lift Cylinder Specifications**

DESCRIPTION	BORE	STROKE	ROD DIA.
Lift Cylinder - 10VP	1.50 (3.81)	54.50 (138.43)	1.125 (2.86)
Lift Cylinder - 15VP	1.50 (3.81)	54.50 (138.43)	1.125 (2.86)
Lift Cylinder - 20VP	1.50 (3.81)	54.50 (138.43)	1.125 (2.86)

7-8. SERIAL NUMBER LOCATIONS

For machine identification, a serial number plate is affixed to the machine. The plate is located on the back of the mast, just above the mast support bracket. In addition, should the serial number plate be damaged or missing, the machine serial number is stamped on the mast and on the base frame.

VALUES FOR ZINC PLATED BOLTS ONLY														UNPLATED CAP SCREWS		
SIZE	THD	BOLT DIA. (IN.)	THREAD STRESS AREA (SQ. IN.)	SAE GRADE 5 BOLTS & GRADE 2 NUTS				SAE GRADE 8 BOLTS & GRADE 8 NUTS				UNBRAKO 1960 SERIES SOCKET HEAD CAP SCREW WITH LOC-WEL PATCH				
				CLAMP LOAD (LB.)		TORQUE (LOCTITE 262)		CLAMP LOAD (LB.)		TORQUE (LOCTITE 262)		CLAMP LOAD (LB.)	TORQUE (as received)	LB. FT.		
				(DRY OR LOC. 283) LB. IN.	(LUB.) LB. IN.	(LOCTITE 262) LB. IN.	(LOCTITE 242 OR 271) LB. IN.	(DRY OR LOC. 283) LB. IN.	(LUB.) LB. IN.	(LOCTITE 262) LB. IN.	(LOCTITE 242 OR 271) LB. IN.					
4	40	0.1120	0.00604	8	6	—	—	—	—	540	12	9	—	—	—	
	48	0.1120	0.00661	9	7	—	—	—	—	600	13	10	—	—	—	
6	32	0.1380	0.00909	580	16	12	—	—	—	820	23	17	—	—	—	
	40	0.1380	0.01015	610	18	13	—	—	—	920	25	19	—	—	—	
8	32	0.1640	0.01400	900	30	22	—	—	—	1260	41	31	—	—	—	
	36	0.1640	0.01474	940	31	23	—	—	—	1320	43	32	—	—	—	
10	24	0.1900	0.01750	1120	43	32	—	—	—	1580	60	45	—	—	—	
	32	0.1900	0.02000	1285	49	36	—	—	—	1800	68	51	—	—	—	
1/4	20	0.2500	0.0318	2020	96	75	—	105	2860	144	108	—	—	160	3180	
	28	0.2500	0.0364	2320	120	86	—	135	3280	168	120	—	—	185	3640	
5/16	18	0.3125	0.0524	3340	17	13	16	19	4720	25	18	22	30	5240	25	
	24	0.3125	0.0580	3700	19	14	17	21	5220	25	20	25	30	5800	27	
3/8	16	0.3750	0.0775	4940	30	23	28	35	7000	45	35	40	50	7750	45	
	24	0.3750	0.0878	5600	35	25	32	40	7900	50	35	45	55	8780	50	
7/16	14	0.4375	0.1063	6800	50	35	45	55	9550	70	55	63	80	10630	70	
	20	0.4375	0.1187	7550	55	40	50	60	10700	80	60	70	90	11870	75	
1/2	13	0.5000	0.1419	9050	75	55	68	85	12750	110	80	96	120	14190	110	
	20	0.5000	0.1599	10700	90	65	80	100	14400	120	90	108	135	15990	115	
9/16	12	0.5625	0.1820	11600	110	80	98	120	16400	150	110	139	165	18200	155	
	18	0.5625	0.2030	12950	120	90	109	135	18250	170	130	154	190	20300	165	
5/8	11	0.6250	0.2260	14400	150	110	135	165	20350	220	170	180	240	22600	210	
	18	0.6250	0.2560	16300	170	130	153	190	23000	240	180	204	265	25600	220	
3/4	10	0.7500	0.3340	21300	260	200	240	285	30100	380	280	301	420	33400	365	
	16	0.7500	0.3730	23800	300	220	268	330	33600	420	320	336	465	37300	400	
7/8	9	0.8750	0.4620	29400	430	320	386	475	41600	600	460	485	660	46200	585	
	14	0.8750	0.5090	32400	470	350	425	520	45800	660	500	534	725	50900	635	
1	8	1.000	0.6060	38600	640	480	579	675	51500	900	680	687	990	60600	865	
	12	1.000	0.6630	42200	700	530	633	735	59700	1000	740	796	1100	66300	915	
1-1/8	7	1.1250	0.7630	42300	800	600	714	840	68700	1280	960	1030	1400	76300	1240	
	12	1.1250	0.8560	47500	880	660	802	925	77000	1440	1080	1155	1575	85600	1380	
1-1/4	7	1.2500	0.9690	53800	1120	840	1009	1175	87200	1820	1360	1453	2000	96900	1750	
	12	1.2500	1.0730	59600	1240	920	1118	1300	96600	2000	1500	1610	2200	107300	1880	
1-1/2	6	1.500	1.1550	64100	1460	1100	1322	1525	104000	2380	1780	1907	2625	115500	2320	
	12	1.500	1.3150	73000	1680	1260	1506	1750	118100	2720	2040	2165	3000	131500	2440	
1-1/2	6	1.500	1.4050	78000	1940	1460	1755	2025	126500	3160	2360	2530	3475	140500	3040	
	12	1.500	1.5800	87700	2200	1640	1974	2300	142200	3560	2660	2844	3925	158000	3270	

Note: These torque values do not apply to cadmium plated fasteners.



SAE GRADE 5



SAE GRADE 8

Figure 7-1. Torque Chart.

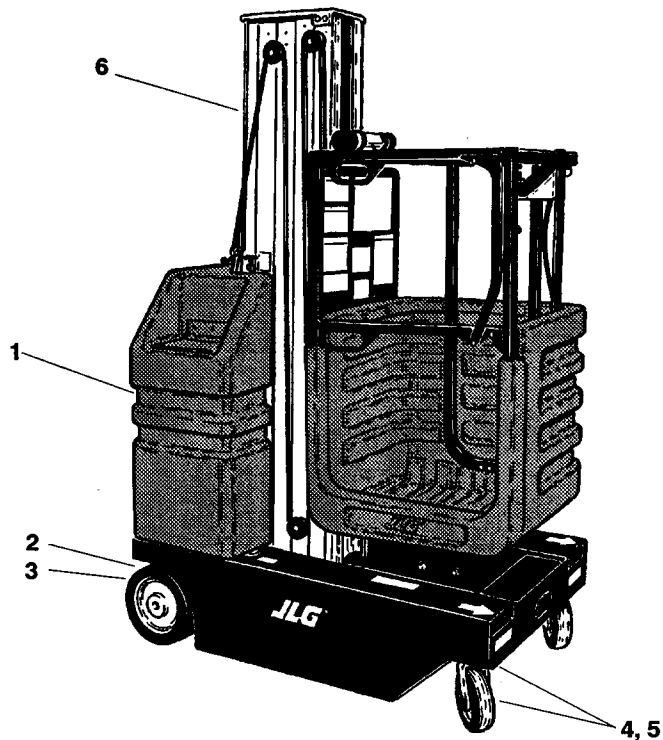


Figure 7-2. Lubrication Chart.

Table 7-4. Lubrication Intervals for Various Components

ITEM	COMPONENT	NUMBR. & TYPE LUBE POINTS	LUBE/METHOD	INTERVAL HOURS				COMMENTS
				3 MONTHS 150 Hrs.	6 MONTHS 300 Hrs.	1 YEAR 600 Hrs.	2 YEARS 1200 Hrs.	
1	Hydraulic Oil	Fill To Line on Reservoir 5 qt. Reservoir	HO - Check Hyd. Oil Level HO - Change Hyd. Oil				✓	Check oil level daily - See note 3.
2	Drive Wheel Bearings	4 - Grease Fitting	MPG - Pressure Gun	✓				
3	Drive Wheel Gear Box	2 - Gear Box	Gear Oil				✓	Check oil level - change only when serviced
4	Caster Axles	2 - Grease Fitting	MPG - Pressure Gun	✓				
5	Swivel Raceways	2 - Grease Fitting	MPG - Pressure Gun	✓				
6	Mast Chains*	2 - Per Section	Chain Lube - Brush or Spray	✓				

* VP20 Series lifts only.

Key To Lubricants: MPG - Multi-Purpose Grease

HO - Hydraulic Oil - See Table 7-1.

Notes:

1. Be sure to lubricate like items on each side of machine.
2. Recommended lubricating intervals are based on normal use. If machine is subjected to severe operating conditions, user must adjust lubricating requirements accordingly.
3. Prior to checking hydraulic oil level, operate machine through one complete cycle of lift function (full up and down). Failure to do so will result in incorrect oil level reading on hydraulic reservoir.

8-1. GENERAL

This section provides general information to assist in the performance of maintenance on the personnel lift. Descriptions, techniques and specific procedures are designed to provide the safest and most efficient maintenance for use by personnel responsible for ensuring the correct installation and operation of machine components and systems.

⚠ CAUTION

WHEN AN ABNORMAL CONDITION IS NOTED AND PROCEDURES CONTAINED HEREIN DO NOT SPECIFICALLY RELATE TO THE NOTED IRREGULARITY, WORK SHOULD BE STOPPED AND TECHNICALLY QUALIFIED GUIDANCE OBTAINED BEFORE WORK IS RESUMED.

8-2. SERVICING AND MAINTENANCE GUIDELINES**• General**

The following information is provided to assist you in the use and application of servicing and maintenance procedures contained in this chapter.

• Safety and Workmanship

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of component weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

• Cleanliness

1. The most important single item in preserving the long service life of a machine is to keep dirt and foreign materials out of the vital components. Precautions have been taken to safeguard against this. Shields, covers, seals, and filters are provided to keep the wheel bearings, mast sections and oil supply clean; however, these items must be maintained on a scheduled basis in order to function properly.
2. At any time when oil lines are disconnected, clear adjacent areas as well as the openings and fittings themselves. As soon as a line or

component is disconnected, cap or cover all openings to prevent entry of foreign matter.

3. Clean and inspect all parts during servicing or maintenance, and assure that all passages and openings are unobstructed. Cover all parts to keep them clean. Be sure all parts are clean before they are installed. New parts should remain in their containers until they are ready to be used.

• Components Removal and Installation

1. Use adjustable lifting devices, whenever possible, if mechanical assistance is required. All slings (chains, cables, etc.) should be parallel to each other and as near perpendicular as possible to top of part being lifted.
2. Should it be necessary to remove a component on an angle, keep in mind that the capacity of an eyebolt or similar bracket lessens, as the angle between the supporting structure and the component becomes less than 90 degrees.
3. If a part resists removal, check to see whether all nuts, bolts, cables, brackets, wiring, etc., have been removed and that no adjacent parts are interfering.

• Component Disassembly and Reassembly

When disassembling or reassembling a component, complete the procedural steps in sequence. Do not partially disassemble or assemble one part, then start on another. Always recheck your work to assure that nothing has been overlooked. Do not make any adjustments, other than those recommended, without obtaining proper approval.

• Pressure-Fit Parts

When assembling pressure-fit parts, use an "anti-seize" or molybdenum disulfide base compound to lubricate the mating surface.

• Bearings

1. When a bearing is removed, cover it to keep out dirt and abrasives. Clean bearings in non-flammable cleaning solvent and allow to drip dry. Compressed air can be used but do not spin the bearing.

2. Discard bearings if the races and balls (or rollers) are pitted, scored, or burned.
3. If bearing is found to be serviceable, apply a light coat of oil and wrap it in clean (waxed) paper. Do not unwrap reusable or new bearings until they are ready to install.
4. Lubricate new or used serviceable bearings before installation. When pressing a bearing into a retainer or bore, apply pressure to the outer race. If the bearing is to be installed on a shaft, apply pressure to the inner race.

• Gaskets

Check that holes in gaskets align with openings in the mating parts. If it becomes necessary to hand-fabricate a gasket, use gasket material or stock of equivalent material and thickness. Be sure to cut holes in the right location, as blank gaskets can cause serious system damage.

• Bolt Usage and Torque Application

1. Use bolts of proper length. A bolt which is too long will bottom before the head is tight against its related part. If a bolt is too short, there will not be enough thread area to engage and hold the part properly. When replacing bolts, use only those having the same specifications of the original, or one which is equivalent.
2. Unless specific torque requirements are given within the text, standard torque values should be used on heat-treated bolts, studs, and steel nuts, in accordance with recommended shop practices. (See Figure 7-1.)

• Hydraulic Lines and Electrical Wiring

Clearly mark or tag hydraulic lines and electrical wiring, as well as their receptacles, when disconnecting or removing them from the unit. This will assure that they are correctly reinstalled.

• Hydraulic System

1. Keep the system clean. If evidence of metal or rubber particles is found in the hydraulic system, drain and flush the entire system.
2. Disassemble and reassemble parts on clean work surface. Clean all metal parts with non-flammable cleaning solvent. Lubricate components, as required, to aid assembly.

• Lubrication and Servicing

Components and assemblies requiring lubrication and servicing are shown in the Lubrication Chart, Figure 7-2. Service applicable components with the amount, type, and grade of lubricant recommended in this manual, at the specified intervals. When recommended lubricants are not available, consult your local supplier for an equivalent that meets or exceeds the specifications listed.

• Batteries

Clean batteries, using a non-metallic brush and a solution of baking soda and water. Rinse with clean water. After cleaning, thoroughly dry batteries and coat terminals with an anti-corrosion compound.

• Mast Chain Inspection Procedure

⚠ WARNING

MAST CHAINS TO BE INSPECTED AND LUBRICATED EVERY THREE MONTHS.

Inspect boom chains for the following conditions:

1. **Wear:** Always inspect that segment of chain that operates over a sheave. As the chain flexes over the extend/retract sheaves, joints and plate edges very gradually wear. Chain "stretch" can be measured using a manufacturers wear scale or steel tape. When chains have elongated 3% they must be removed and replaced. Refer to Table 8-1 for proper chain specifications and allowable stretch tolerances. Peening and wear of chain plate edges are caused by sliding over a chain worn contact face of a sheave, or unusually heavy loads. All of the above require replacement of the chain and correction of the cause. Chain side wear, noticeable when pin heads and outside plates show a definite wear pattern, is caused by misalignment of the sheave/chain anchors and must be corrected promptly. Do not repair chains; if a section of chain is damaged, replace the entire chain set.
2. **Rust and Corrosion:** Rust and corrosion will cause a major reduction in the load carrying capacity of the chain, because these are primary reasons for side plate cracking. The initial lubrication at the factory is applied in a hot dip

tank to assure full penetration into the joint. Do not steam clean or degrease chains. At time of chain installation, factory lube must be supplemented by a maintenance program to provide a film of oil on the chains at all times. If chains are corroded, they must be inspected, especially the outside plates, for cracks in-line with the pins. If cracks are found, replace the chain; if no cracks are discovered, lubricate the chains by dipping in heated oil, and reinstall on the machine. Keep chains lubricated.

**Table 8-1.
Chain Stretch Tolerance**

Chain Size	Pin to Pin Measurement	Allowable Stretch 12" Span
.50" Pitch	12" or 24 pitches	.36 in.

3. **Fatigue Cracks:** Fatigue is a phenomenon that affects most metals, and is the most common cause of chain plate failures. Fatigue cracks are found through the link holes, perpendicular (90 degrees) from the pin in-line position. Inspect chains carefully after long time use and heavy loading for this type of crack. If any cracks are discovered, replace all chains, as seemingly sound plates are on the verge of cracking. Fatigue and ultimate strength failures on JLG Lifts are incurred as a result of severe abuse as design specs are well within the rated lifting capacity of these chains.
4. **Tight Joints:** All joints in the roller chain should flex freely. On roller chain, tight joints are usually caused by rust/corrosion, or the inside plates "walking" off the bushing. Limber up rusty/corroded chains (after inspecting carefully) with a heavy application of oil (preferably a hot oil dip). Tap inside "walking" plates inward; if "walking" persists, replace the chain. This type of problem is accelerated by poor lubrication maintenance practice, and most tight joint chains have been operated with little or no lubrication. Tight joints on leaf chain are generally caused by:
 - a. Bent pins or plates.
 - b. Rusty joints.
 - c. Peened plate edges.

Oil rusty chains, and replace chains with bent or peened chain components. Keep chains lubricated.

5. **Protruding or Turned Pins:** Chains operating with inadequate lube generate tremendous friction between the pin and plates (pin and bushing on roller chain). In extreme cases, this frictional torque can actually turn the pins in the outside press-fit plates. Inspect for turned pins, which can be easily spotted as the "V" flats on the pin heads are no longer in line. Replace all chains showing evidence of turned or protruding pins. Keep chains lubricated.
6. **Chain Anchors and Sheaves:** An inspection of the chain must include a close examination of chain anchors and sheaves. Check chain anchors for wear breakage and misalignment. Anchors with worn or broken fingers should be replaced. They should also be adjusted to eliminate twisting the chain for an even load distribution.

Sheaves should be inspected for worn flanges, which would indicate misalignment, and wear on the outside diameter of the sheave. A worn sheave can mean several problems, as follows:

- a. Chains too tight.
- b. Sheave bearings/pin bad.
- c. Bent/misaligned chains.

• Mast Cable Inspection Procedure

⚠ WARNING

MAST CABLES ARE TO BE INSPECTED EVERY THREE MONTHS.

⚠ CAUTION

WEAR PROTECTIVE GLOVES TO PROTECT HANDS WHEN HANDLING CABLE.

The periodic inspection shall cover the entire length of the cable. The inspection frequency shall be based on such factors as expected cable life as determined by experience on the particular application or similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. Inspection should be more frequent as cables approach the end of their useful lives.

Only the surface wires of the cable require inspection, do not attempt to open the cable. Any deterioration resulting in a appreciable loss of original strength, such as described below, shall be noted, and then a determination made if further use would constitute a hazard.

No precise rules can be given for determination of the exact time for replacement of the cables. This depends largely on the good judgment of the qualified person evaluating the cable.

Conditions such as the following shall be sufficient reason for questioning continual use of the [cable] or increasing the frequency of inspection:

1. In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.
2. One outer wire broken at the point of contact with the core of the rope which has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.
3. Wear of one-third the original diameter of outside individual wires.
4. Kinking, crushing, birdcaging or any other damage resulting in distortion of the rope structure.
5. Evidence of any heat damage from any cause.
6. Reductions from nominal diameter of more than;
 - a. 1/64th in. (0.4mm) for diameters up to and including 5/16th in. (8mm);

Also check for cracked, bent, worn, severely corroded, or improperly installed cable ends.

Inspect sheave grooves for excessive wear.

8-3. LUBRICATION INFORMATION

• Hydraulic System

1. The primary enemy of a hydraulic system is contamination. Contaminants enter the system by various means, e.g., using inadequate hydraulic oil, allowing moisture, grease, filings, sealing components, sand, etc., to enter when performing maintenance, or by permitting the pump to cavitate due to insufficient system warm-up or leaks in the pump supply.
2. The design and manufacturing tolerances of the component working parts are very close, therefore, even the smallest amount of dirt or foreign matter entering a system can cause wear or damage to the components and generally results in faulty operation. Every precaution must be taken to keep hydraulic oil clean, including reserve oil in storage.
3. Cloudy oils indicate a high moisture content which permits organic growth, resulting in oxidation or corrosion. If this condition occurs, the system must be drained, flushed, and refilled with clean oil.
4. It is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. Good grade mineral oils, with viscosities suited to the ambient temperatures in which the machine is operating, are recommended for use.

Note

Metal particles may appear in the oil of new machines due to the wear-in of meshing components.

• Hydraulic Oil

For best performance, JLG recommends the use of ISO-Vg grade 32, 46 oil with a viscosity range between 15-250 SUS at 100 degrees F (32-54 cST at 40 degrees C). Refer to Section 7 for recommended hydraulic oils.

• Changing Hydraulic Oil

1. Use of any of the recommended hydraulic oils eliminates the need for changing the oil on a regular basis. If it is necessary to change the oil, use only those oils meeting or exceeding the specifications appearing in this manual. If

unable to obtain the same type of oil supplied with the machine, consult local supplier for assistance in selecting the proper equivalent. Avoid mixing petroleum and synthetic base oils. JLG Industries recommends changing the hydraulic oil annually.

2. Use every precaution to keep the hydraulic oil clean. If the oil must be poured from the original container into another, be sure to clean all possible contaminants from the service container.
3. While the unit is shut down, a good preventive maintenance measure is to make a thorough inspection of all hydraulic components, lines, fittings, etc., as well as a functional check of each system, before placing the machine back in service.

• Lubrication Specifications

Specified lubricants, as recommended by the component manufacturers, are always the best choice, however, multi-purpose greases usually have the qualities which meet a variety of single purpose grease requirements. Should any question arise regarding the use of greases in maintenance stock, consult your local supplier for evaluation. Refer to Table 7-2 for an explanation of the lubricant key designations appearing in the Lubrication Chart.

8-4. MAST ASSEMBLY AND DISASSEMBLY PROCEDURES

The VP Series personnel lift mast sections are constructed of extruded aluminum. The mast sections are interlocked into each other when assembled, by internally mounted slide pads at the top and bottom of each mast section. The slide pads run up and down in slide pad channels on each side of the mast, these channels are coated with a special dry lubricating coating (Graphokote).

Each VP model mast assembly contains a different number of mast sections as shown following;

- 10VP** - 3 mast sections - Cable extend/retract
- 15VP** - 4 mast sections - Cable extend/retract
- 20VP** - 5 mast sections - Chain/Cable ext./ret.

Assembly procedures for all mast sections is basically the same, carefully slide the mast sections together from bottom until mast ends are even, (*when sliding mast sections together be careful not to remove any of the Graphokote coating in the slide pad channels*). Assemble the hardware to the bottom of mast section first, slide this section out the top of previous section and assemble hardware to the top of mast, (*See Figure 8-1.*). Always install slide pad shims with slide pads inserted into the slide pad channels, (*ends of mast sections even*). Applying silicone spray onto the slide pad channels before assembly will help mast sections slide easier after slide pads have been properly shimmed.

• Mast Disassembly Procedure

Note

Reference to mast sections-3/-4/-5 (platform mounting section) depends on which VP model lift you are working on.

1. After the mast assembly has been removed from the machine, lay the mast assembly down on a suitable work table with the platform mounting section on top, facing up.
2. Remove the sequencing cables and hardware from the sides of the mast assembly. Also remove the cover from the top of the mast assembly.
3. Remove cable adjust nuts from threaded ends of cable attached to the cable anchor plate on **BOTTOM** end of mast section-3/-4/-5 (*platform mounting section*). Push threaded ends of cable through anchor plate.

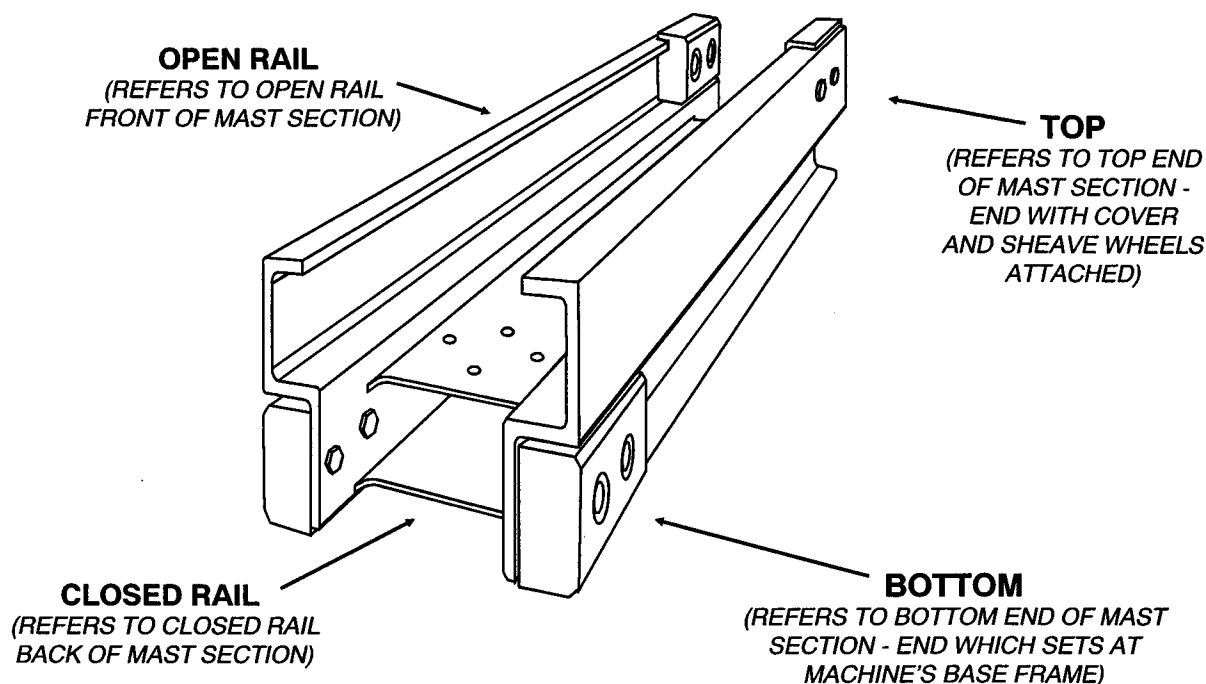


Figure 8-1. Mast Section - Assembly Reference.

4. At the TOP of mast section--3/-4/-5, pull cables out and allow to hang loose.

Note

When sliding mast sections apart, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

5. Carefully slide mast section-3/-4/-5 out BOTTOM of mast section-2/-3/-4 rails. Disassemble slide pads, shims and cable anchor plate from mast section-3/-4/-5, if necessary.

Note

Steps 6 through 10 apply to removal of mast section-4 on model 20VP lifts which have five (5) mast sections. If servicing a 15VP mast, go to step 11, or a 10VP go to step 17.

6. Remove cable adjust nuts from threaded ends of cables attached to the cable anchor plate on bottom end of mast section-4. Push threaded ends of cables through anchor plate.
7. At top of mast section-4, pull cables out and allow to hang loose.
8. Slide mast section-4 out the TOP of mast section-3 far enough to allow access to the cable sheave wheel assembly.

9. Remove countersunk-flathead screws securing cable sheave wheel assembly attach bars on both side rails at top of mast section-4 and remove sheave wheel assembly.

Note

When sliding mast sections apart, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

10. Carefully slide mast section-4 out BOTTOM of section-3. Remove slide pads, shims and cable anchor plate, if necessary.

Note

Steps 11 through 16 apply to removal of mast section-3 on 15VP (cable actuated) & 20VP (cable/chain actuated) lifts. If servicing a 10VP mast, go to step 17.

11. Remove cable/chain adjust nuts from threaded ends of cable/chain attached to the cable/chain anchor plate on BOTTOM end of mast section-3. Push threaded ends of cable/chain through anchor plate.
12. At TOP of mast section-3, pull cables/chains out and allow to hang loose, (be certain floor surface is clean and free of any metal chips or debris which may stick to lubricated chains).

13. Slide mast section-3 out TOP of mast section-2 far enough to allow access to the cable/chain sheave wheel assembly.
14. Remove countersunk-flathead screws securing cable/chain sheave wheel assembly attach bars on both side rails at TOP of mast section-3 and remove the sheave wheel assembly.

Note

Step 15 applies only to 20VP lift models which have five (5) mast sections. If servicing a 15VP mast, go to step 16.

15. While mast section-3 is still extended from section-2 remove the bolts attaching the two (2) cable assembly anchor eyelets to the TOP of mast section-3. Remove cables.

Note

When sliding mast sections apart, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

16. Carefully slide mast section-3 out BOTTOM of section-2. Remove slide pads, shims and chain anchor plate, if necessary.

Note

Removal of mast section-2 (cylinder attach section) is basically the same for all VP model lifts except where noted.

17. Slide mast section-2 out TOP of mast section-1 far enough to allow access to the cable/chain assembly anchor block/sheave wheel assembly.
18. Remove countersunk-flathead screws securing cable/chain anchor block/sheave wheel assembly attach bars on both side rails at TOP of mast section-2.
19. Slide the cable/chain anchor block/sheave wheel assembly and hydraulic cylinder out the TOP of mast section-2 far enough to allow removal of the sheave wheel attach bars, sheave wheels and sheave pin from cable/chain assembly anchor block.
20. Remove the setscrew holding the hydraulic cylinder rod into the chain assembly #444 anchor block. Lay chain assembly #444 to side.
21. Remove the hydraulic cylinder through BOTTOM of mast section-2, *be careful not to nick or score cylinder rod surface while removing.*

Note

When sliding mast sections apart, be careful not to

scratch or score the lubricating graphokote coating in the slide pad channels.

22. Carefully slide mast section-2 out BOTTOM of section-1. Remove slide pads and shims, if necessary.
23. Slide the TOP of remaining mast section-1 out over edge of work surface and remove the bolts attaching the cable/chain anchor blocks to mast section-1. Remove cable/chain assemblies from mast and lay aside.
24. Remove slide pads and shims from mast section-1.

Mast disassembly should now be complete.

• Mast Assembly

(See Figure 8-1, 8-2, 8-3 & 8-4.)

1. Place mast section-1, rail (open) side up on a clean, flat surface (*preferably a table or work bench capable of supporting the weight of the entire mast assembly*). Slide mast out over end of work surface far enough to allow access to the chain anchor attach holes at top of mast.
2. Locate the two (2) single cable/chain assemblies. Lay out each cable/chain assembly with anchor block end towards mast, and threaded end away from mast, (*be certain floor surface is clean and free of any metal chips or debris which may stick to lubricated chains*).
3. Insert the block anchor end into the top of mast section-1 and secure using two (2) 3/8"-16UNC x 2-1/2" (chain) 1-1/4" (cable) long hex head bolts, flatwashers and nuts for each attach block. Place a flatwasher under bolt head and nut.

Note

When sliding mast sections together, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

4. Locate mast section-2, carefully slide mast section-2 closed rail into section-1 open rail. Slide sections together until ends are even.

Note

Do not attach mast slide pads and shims to mast sections before assembling sections. If assembled in this manner, due to the tight fit of the slide pads in the slide pad channels, the lubricating graphokote coating could be removed from the receiving mast's slide pad channels.

5. Insert slide pads into the slide pad channels at bottom end of mast between section-1 and -2, (*one on each side of the mast*), with beveled surface facing out towards section-1.
6. Thread slide pad attaching bolts, (*two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt*), through holes in mast section-2 inside rail, into the slide pad inserts. Thread in enough to hold pad in place.
7. Shim slide pads using the following steps:

Note

Always use the an even amount of shim material behind slide pads on both sides of the mast rails. This will keep mast sections centered in rail channels and prevent any distortion of the mast section.

- a. Use two shim pieces per slide pad, a thick one and a thin one.
 - b. Start with a total thickness of approximately a .035" thick shim and a .075" thick shim.
 - c. Slide shims into place between slide pad and mast rail, tap shims in place with plastic mallet, if necessary. Tighten the slide pad mounting bolts, be sure there are no air gaps between shims, shim and mast or shim and slide pad when tightened.
 - d. Check mast section for side play. If play exists use thicker shims dividing thickness equally between both sides of mast.
 - e. When mast slide pads are shimmed properly, there should be no side to side movement of slide pad in rail channel. Mast sections should be very snug in channels but still be able to slide in channel by hand.
8. Insert slide pads into the slide pad channels (*top of mast*) between section-1 and -2, (*one on each side of the mast*), with beveled surface facing in towards section-2.
 9. Thread slide pad attaching bolts, (*two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt*), through holes in mast section-1 outside rail (*top of mast*) and into the slide pad inserts. Thread in enough to hold pad in place.
 10. Shim per instructions in step 7.

Note

If hydraulic cylinder needs to be extended, the protective caps on the extend and return ports will need to be removed. Be careful not to nick or scour rod surface when extending, also catch any oil draining

out of cylinder to avoid spillage onto work area.

11. Locate the hydraulic lift cylinder, slide the lift cylinder into the closed rail side of mast section-2 with rod end to top and port end to bottom of mast. Cylinder should extend out of mast on both ends. Return tube should be on right side when facing bottom of mast assembly.

Note

Top of cylinder assembly steps 12 and 13 applies to 20VP only. For 10VP & 15VP continue to step 14.

12. Locate chain assembly #444 (*single anchor block with two narrow chains*). Lay out chain assembly with anchor block end towards mast, (*be certain floor surface is clean and free of any metal chip or debris which may stick to lubricated chains*).
13. Insert hydraulic cylinder rod end into chain assembly #444, anchor block. Secure cylinder rod to anchor block with a 1/4"-28UNF x .50" long - Type C setscrew. Coat threads with blue Loctite # 242 before assembly.

Note

When sliding mast sections together, be careful not to scratch or score the graphokote coating in the slide pad rails.

14. Locate mast section-3, carefully slide section-3 closed rail into section-2 open rail. Slide sections together until ends are even.
15. Locate one (1) of the chain/cable anchor plates (*one with threaded holes horizontally aligned to outside of bracket*). Attach using outer set of holes in bottom of mast section-3 with two (2) 1/4"-20UNC x 3/4" long bolts, place a flat-washer under head of each bolt.
16. Slide mast section-3, approximately two feet out of the top of mast section-2.
17. Insert threaded ends of cable/chain-assembly #466 (*attached to top of mast section-1*), through holes in anchor plate attached to bottom of mast section-3. Loosely thread two (2) 3/8"-16UNC nuts onto stud threads on each chain. Cables/chains will be adjusted later in assembly.
18. Slide mast section-2 out of mast section-1 approximately one foot.

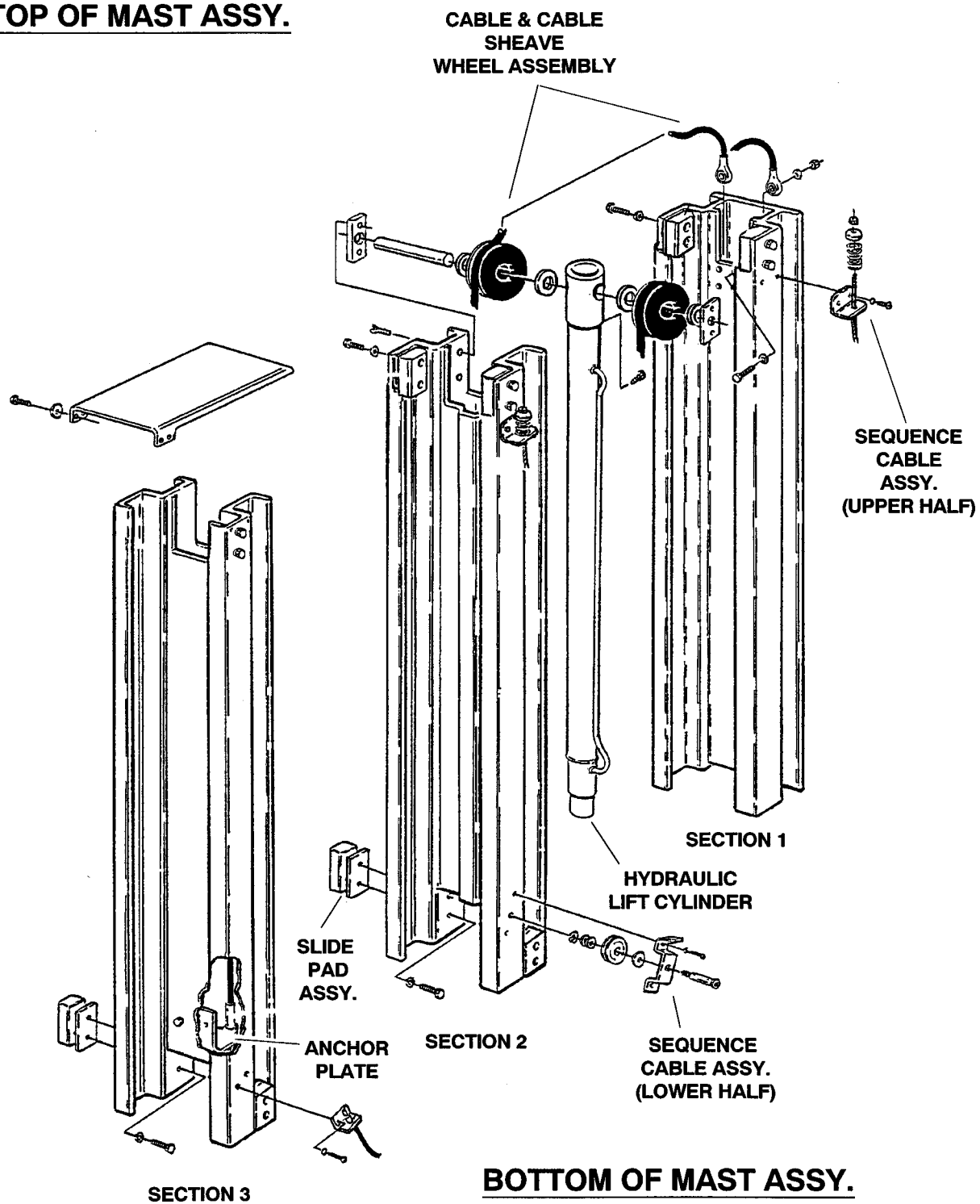
TOP OF MAST ASSY.

Figure 8-2. 10VP Mast Assembly.

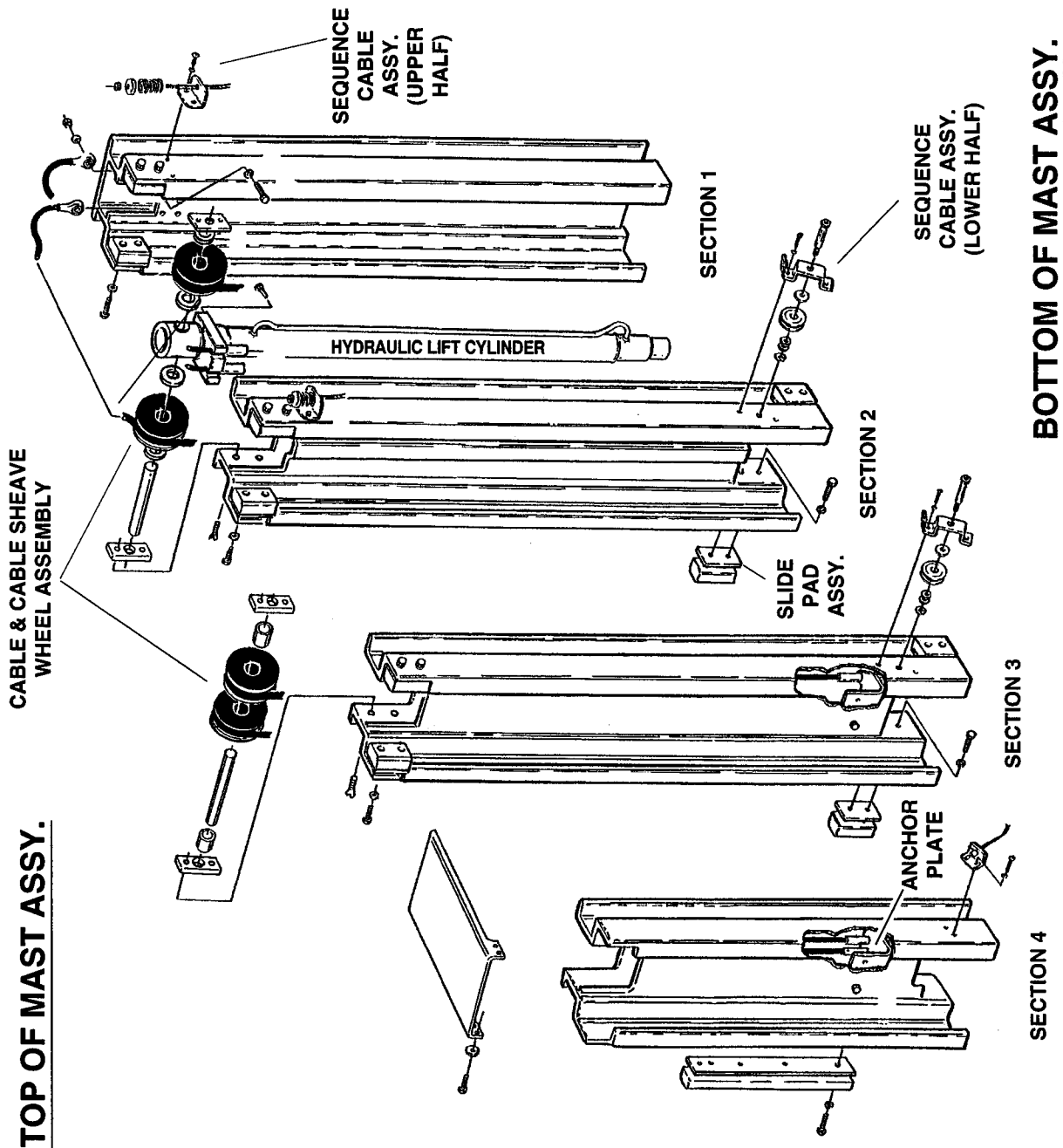


Figure 8-3. 15VP Mast Assembly.

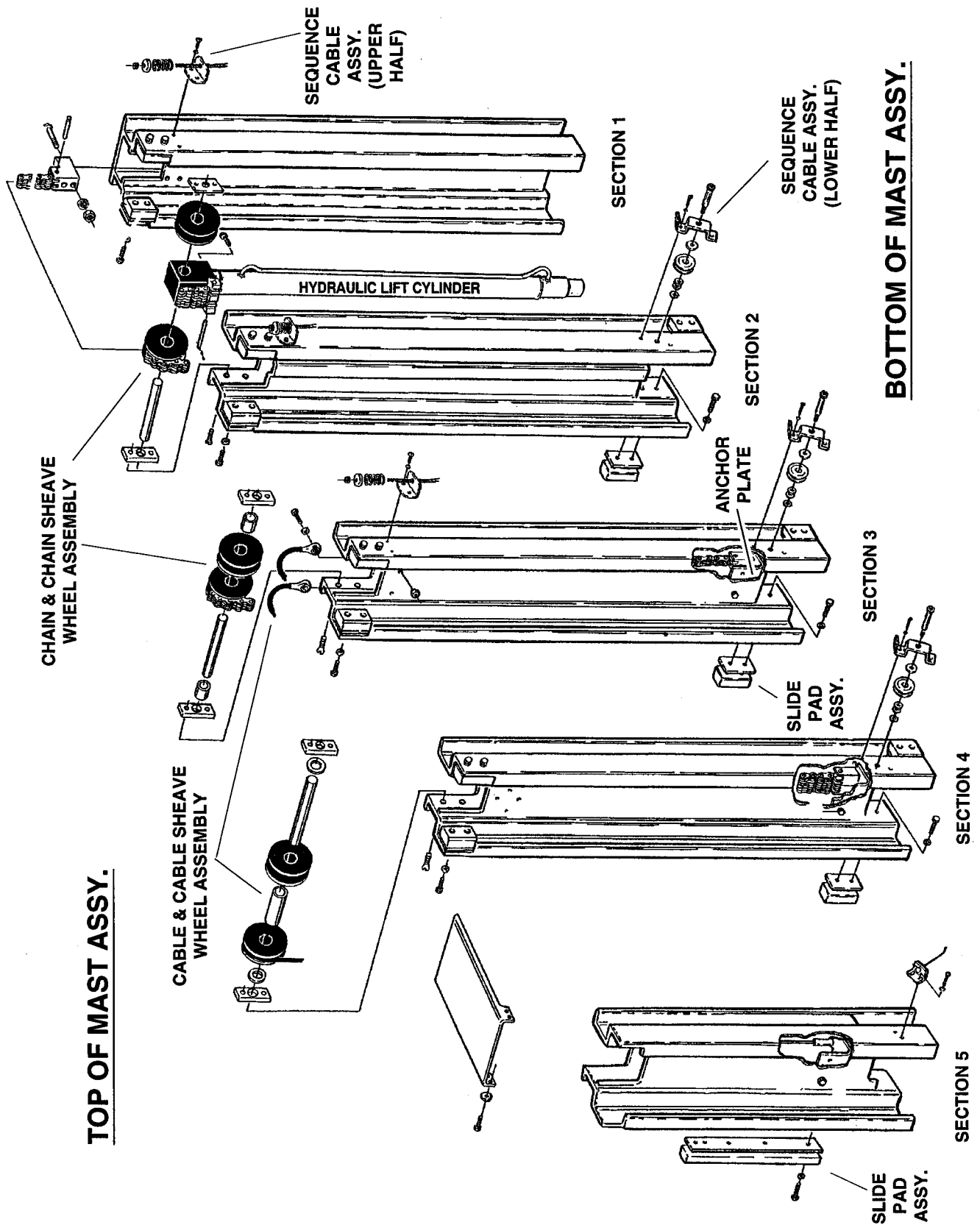


Figure 8-4. 20VP Mast Assembly.

10VP Top of Cylinder Assembly

19. Assemble cable sheave wheels to cylinder rod end and attach to mast section-2 using following steps;
 - a. Attach cable mounting tube to top of hydraulic cylinder using one (1) 1/4"-28NF x 5/8" capscrew.
 - b. Insert sheave pin through cylinder cable mounting tube on cylinder rod end.
 - c. Place a spacer tube on each side of mounting tube.
 - d. Next slide sheave wheels on onto sheave pin against spacer, on each side of mounting tube.
 - e. On outside of each sheave wheel, place another spacer tube.
 - f. On outside of spacer tubes place a sheave pin attach bar, (*rectangular plate with threaded holes on each side of pin bore hole*).
 - g. Slide the assembly with sheave pin, wheels and pin attach bars into top of mast section-2.
 - h. Attach to top of mast section-2 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws each side. Coat threads with Loctite #171 and tighten.

15VP Top of Cylinder Assembly

20. Assemble cable sheave wheels to cylinder rod end and attach to mast section-2 using following steps;
 - a. Attach cable mounting tube to top of hydraulic cylinder using one (1) 1/4"-28NF x 5/8" capscrew.
 - b. Insert sheave pin through cylinder cable mounting tube on cylinder rod end.
 - c. Place a spacer tube on each side of mounting tube.
 - d. Next slide sheave wheels on onto sheave pin against spacer, on each side of mounting tube.
 - e. On outside of each sheave wheel, place another spacer tube.
 - f. On outside of spacer tubes place a sheave pin attach bar, (*rectangular plate with threaded holes on each side of pin bore hole*).
 - g. Before sliding this assembly into the top of mast section two, locate two (2) mast extension

cable assemblies and lay their anchor ends into the slots of the cable mounting tube.

- g. Slide the assembly with sheave pin, wheels and pin attach bars into top of mast section-2.
- e. Attach to top of mast section-2 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws each side. Coat threads with Loctite #171 and tighten.

20VP Top of Cylinder Assembly

21. Assemble chain sheaves on chain assembly #444 anchor block (*attached to cylinder rod end*) and attach to mast section-2 using following steps;
 - a. Insert sheave pin through anchor block on cylinder rod end.
 - b. Place sheave wheels (*for wide chain*) on sheave pin, one each side of anchor block.
 - c. On outside of each sheave wheel, place a sheave pin attach bar, (*rectangular plate with threaded holes on each side of pin bore hole*).
 - d. Slide the whole anchor block assembly with sheave pin, wheels and pin attach bars into top of mast section-2. (*Position anchor block with narrow chains facing mast section-3*).
 - e. Attach to top of mast section-2 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws each side. Coat threads with Loctite #171 and tighten.
22. Slide mast section-2 back into section-1 until end are even.

Note

Step 23 and 24 applies to 20VP mast assembly only. 10VP and 15VP mast assembly continue at step 25.

23. Locate two mast extension cable assemblies. Attach the eyelet anchor end of each cable to the outside holes near top of mast section-3 using 3/8"-16UNC x 1-1/4" long hex head bolts, nuts and flatwashers. Place a flatwasher under bolt head and nut.

Note

When sliding mast sections together, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

24. Carefully slide mast section-3 into section-2 until ends are even. Check to make sure chain

assembly #466 (wide chains) are seating properly in chain #444 anchor block chain sheave wheels attached to mast section-2.

Note

Do not attach mast slide pads and shims to mast sections before assembling sections. If assembled in this manner, due to the tight fit of the slide pads in the slide pad channels, the lubricating graphokote coating could be removed from the receiving mast's slide pad channels.

25. Insert slide pads into the top end mast rails between section-2 and -3, *(one on each side of the mast)*, with beveled surface facing inward towards section-3.
26. Thread slide pad attaching bolts, *(two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt)*, through holes in outside rail, on top of mast section-2 and into the slide pad inserts. Thread in enough to hold pad in place.
27. Shim per instructions in step 7.
28. Insert slide pads into the bottom end mast rails between section-2 and -3, *(one on each side of the mast)*, with beveled surface facing out towards section-2.
29. Thread slide pad attaching bolts, *(two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt)*, through holes on inside rail, on bottom end of mast section-3 and into the slide pad inserts. Thread in enough to hold pad in place.
30. Shim per instructions in step 7.

Note

Assembly of 10VP mast should now be complete. To continue with 15VP assembly go to step 48. 20VP assembly continues following.

Note

When sliding mast sections together, be careful not to scratch or score the graphokote coating in the slide pad channels.

31. Locate mast section-4, carefully slide section-4 closed rail into section-3 open rail. Slide sections together until ends are even.
32. Locate one (1) of the chain/cable anchor plates *(one with two threaded holes vertically aligned in center of bracket)*. Attach through inner (vertical) set of holes at bottom of mast section-4

using two (2) 1/4"-20UNC x 3/4" long bolts, place a flatwashers under head of each bolt.

33. Slide mast section-4 out the top of mast section-3 so the chain/cable anchor plate on bottom of mast section-4 is easily accessible at top end of mast section-3. Rest the top end of mast section-4 on a support while performing next step.
34. Insert threaded ends of cable/chain assembly *(attached to anchor block on top mast section-2)* through the chain/cable anchor plate located on bottom of extended mast section-4. Loosely thread two (2) 3/8"-16UNC nuts onto stud threads on each chain. Chains will be adjusted later in assembly.

Note

When sliding mast sections together, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

35. Slide mast section-4 back into mast section-3 except for about a foot or more. Allow enough slack in cables/chains to mount sheave wheels to top of mast section-3.
36. Extend mast section-3 out far enough from section-2 mast to gain access to top of section-3.
37. Assemble cable/chain sheaves to top of mast section-3 as follows;
 - a. Locate the two cable/chain sheave wheels and slide onto sheave pin.
 - b. Slide two (2) short spacer tubes onto sheave pin, one each end of sheave pin to outside of sheave wheels.
 - c. Place two (2) sheave pin attach bars, one each end of sheave pin to outside of space tubes.
 - d. Holding complete sheave wheel assembly, slide assembly into top of mast section-3 and align threaded holes in sheave pin attach bars with holes in mast rails.
 - e. Attach to top of mast section-3 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws, each side. Coat threads with Loctite #171 and tighten.

Note

When sliding mast sections together, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

38. Slide mast section-3 back into section-2 until ends are even. (*Mast section-2 may need to be restrained to keep its slide pads from pushing out the bottom of mast section-1*).
39. While mast section-4 is still extended from section-3; locate two cable assemblies. Attach the eyelet anchor end of each cable to the inside set of holes near top of mast section-4 using 3/8"-16UNC x 1-1/4" long hex head bolts, nuts and flatwashers. Place a flatwasher under bolt head and nut.
40. While mast section-4 is still extended from section-3, assemble cable sheaves to top of mast section-4 as follows;
 - a. Locate the wide tube spacer and slide onto sheave pin.
 - b. Slide two (2) cable sheave wheels onto sheave pin, one each end of sheave pin to outside of tube spacer.
 - c. Place two (2) large flat washers, one each end of sheave pin to outside of cable sheave wheels.
 - d. Place two (2) sheave pin attach bars, one each end of sheave pin to outside of large flatwashers.
 - e. Holding complete cable sheave wheel assembly, slide assembly into top of mast section-4 and align threaded holes in sheave pin attach bars with holes in mast rails.
 - f. Attach to top of mast section-4 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws, each side. Coat threads with Loctite #171 and tighten.
42. Insert slide pads into the top end mast rails between section-3 and -4, (*one on each side of the mast*), with beveled surface facing inward towards section-4.
43. Thread slide pad attaching bolts, (*two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt*), through holes in outside rail, on top of mast section-3 and into the slide pad inserts. Thread in enough to hold pad in place.
44. Shim per instructions in step 7.
45. Insert slide pads into the bottom end mast rails between section-3 and -4, (*one on each side of the mast*), with beveled surface facing out towards section-3.
46. Thread slide pad attaching bolts, (*two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt*), through holes on inside rail, on bottom end of mast section-4 and into the slide pad inserts. Thread in enough to hold pad in place.
47. Shim per instructions in step 7.

Note

The platform mounting section (section-4 on 15VP and section-5 20VP machines) slide pads, are assembled differently than the slide pads for the other mast sections. Mast section-4/-5 slide pads may need to be assembled/disassembled several times in order to determine the correct shim stock required for proper fit.

48. Locate the remaining mast section-4/-5 (*platform mounting- mast section*). Lay mast section on flat stable surface.
49. Attach the remaining chain/cable anchor plate (*one with threaded holes vertically aligned in center of bracket*). Attach through inner (vertical) set of holes in bottom of mast section-4/-5 with two (2) 1/4"-20UNC x 3/4" long bolts, place a flatwasher under head of each bolt.
50. Complete the following steps to determine shim stock thickness required for section-4/-5;

Note

Always use the an even amount of shim material behind slide pads on both sides of the mast rails. This will keep mast sections centered in rail channels and prevent any distortion of the section.

- a. Use two shim pieces per slide pad, a thick one and a thin one.

Note

When sliding mast sections together, be careful not to scratch or score the lubricating graphokote coating in the slide pad channels.

41. Carefully slide mast section-4 back into section-3 until ends are even. Check to make sure cable/chain assemblies are seating properly in cable/chain sheave wheels attached to top of mast section-3.

Note

Do not attach mast slide pads and shims to mast sections before assembling sections. If assembled in this manner, due to the tight fit of the slide pads in the slide pad rails, the lubricating graphokote coating could be removed from the receiving mast's slide pad channels.

- b. Start with a total thickness of approximately .035" and .075" thick shim stock.

Note

To protect the lubricating graphokote coating when sliding the assembled mast section-4/-5 into section-3/-4, grind top and bottom edges of slide pads to approximately a 1/4" radius.

- c. Attach shim stock and slide pads to both sides of mast section-4/-5 using five (5) 1/4"-20UNC x 1-1/4" long, hex head cap screws per side, with flatwasher under each bolt head. *(Assemble shim stock and slide pad to mast section rail with shim stock against rail and slide pad with beveled side out).*
- d. Carefully thread the slide pad mounting bolts with flatwashers through slide pads and shim stock into threads in mast section-4/-5. Be certain there are no air gaps between shims, shim and mast or shim and slide pad when tightened.

Note

When sliding mast section-4/-5 into section-3/-4 note amount of force required to push sections together. Fit should be very snug but still be able to be pushed together by hand. If too tight, remove section-4/-5, disassemble slide pad from section-4/-5 and reduce thickness of shim stock. Open rails of section-3/-4 may be sprayed with silicone spray to help section-4/-5 slide easier.

- e. Begin sliding top of mast section-4/-5 with closed rail down engaging the slide pads into slide pad channels at bottom of mast section-3/-4's open rail. Continue to push section-4/-5 into section-3/-4 until BOTTOM ends of mast sections are even.
 - f. Check mast section for side play. If play exists use thicker shims dividing thickness equally between both sides of mast.
 - g. When mast slide pads are shimmed properly, there should be no side to side movement of slide pad in rail channel. Mast sections should be very snug in channels but still be able to slide in channel by hand.
51. Slide mast section-4/-5 to top of section-3/-4.
52. Insert threaded ends of cable assembly (attached to top of mast section--2/3) through the chain/cable anchor plate located on bottom of extended mast section-4/-5. Loosely thread two (2) 3/8"-16UNC nuts onto stud threads on

each chain. Chains will be adjusted later in assembly.

53. Slide mast section-4/-5 back into mast section-3/-4 until bottom ends of masts are even. Check to make sure cable set attached to top of section-2/-3 is seating properly in cable sheave wheels attached to top of mast section-3/-4. *(Mast sections-2, -3 and -4 may need to be restrained to keep their slide pads from pushing out the bottom of mast sections-1, -2 and -3).*
54. At bottom of mast assembly, thread all chain/cable adjusting nuts on threaded ends until they are snug against the anchor plates and all slack is removed from chains and cables. Check that chains and cables are seated in their sheave wheels at top of mast assembly. Also, ends of mast sections should be even with each other.

Mast assembly should now be complete.

8-5. MAST TO BASE FRAME INSTALLATION

CAUTION

IF BATTERIES ARE STILL MOUNTED, REMOVE BATTERIES FROM THEIR TRAYS BEFORE LAYING THE BASE FRAME IN A HORIZONTAL POSITION.

1. Using an overhead crane or suitable lifting device capable of supporting the weight of the base frame, attach a sling strap or chain to the front crossmember of the base frame. Carefully tilt the base frame back until the front is pointing up and the back is resting on the counterweight/battery trays. Be sure base is very stable and at a 90° angle to work surface before proceeding.
2. Using a sling and suitable lifting equipment (*i.e. overhead crane*) lift the mast assembly (*balanced in middle*) into position in front of the base frame.
3. Extend hydraulic cylinder out from bottom of mast assembly approximately one (1) foot. *(Caps on extend and return ports will need to be removed to extend cylinder. Catch any hydraulic fluid expelled from return port in a container to prevent spillage onto work area).*
4. Carefully position the mast into base frame assembly, *(base frame and mast assembly must be held at 90° angle to each other).*

5. Slide port end of hydraulic cylinder through hole in base frame cylinder mounting channel. *(Return port (tube side) of cylinder must be on right side facing bottom of base and mast).*
6. Align threaded hole in side of hydraulic cylinder head with hole in tab on bottom side of cylinder mounting channel. Secure hydraulic cylinder to cylinder mounting channel tab using a 5/16"-18UNC x 5/8" long hex head bolt and flat washer.
7. Carefully push mast assembly and base assembly together until the four (4) holes on bottom rear of mast align with holes in the base frame mast support crossmember.
8. Attach mast to base using four (4) 3/8"-16UNC x 1" long hex head bolts, locknuts and flatwashers, *(place a flatwasher under bolt head and nut and mount with nuts on inside of frame).*
9. Locate the two (2) mast support braces, attach to sides of base frame using a 3/8"-16UNC x 1" long hex head bolt, nut and flatwashers each brace, *(place a flatwasher under bolt head and nut and mount with nuts on inside of frame. Use access hole in bottom of frame to attach nut inside frame).*
10. Before setting machine upright on base, install a short 90° elbow fitting, flow control valve and another short 90° elbow fitting on the end of the flow control valve in the extend *(left)* port on bottom of hydraulic cylinder. Install a long 90° elbow fitting on return *(right)* port. Use sealant tape on fitting threads. Cap ports until hydraulic lines are installed.
11. Carefully set machine in an upright position on its base frame wheels.
12. Locate the mast support bracket. Attach mast support bracket to mounting holes halfway up back of mast using four (4) 3/8"-16UNC x 2-3/4" long hex head bolts, locknuts and flatwashers. *(Place a flatwasher under bolt head and nut and mount with nuts on inside of frame).*
13. Using a 4 ft. level, ensure mast is set to vertical *(plumb)* on the base frame.
14. When mast is vertical *(plumb)*, attach support braces, *(bolted to base)*, to the mast support bracket, *(bolted to mast)*, using 3/8"-16UNC x 2-3/4" long hex head bolts, nuts and flatwashers. *(Place a flatwasher under bolt head and nut and mount with nuts on inside of bracket).*

15. After securing mast to base frame, using 4 ft. level again check that mast is vertical *(plumb)* on base frame.
16. Continue installing remaining components to mast assembly, (i.e. hydraulic pump/motor/reservoir, battery charger, etc..).

8-6. MAST CHAINS/CABLES AND SEQUENCING CABLES ADJUSTMENT

• Mast Chain/Cable Adjustment

Note

Refer to Figure 8-5 for mast chain/cable routing.

1. Elevate platform until chain/cable anchor studs are accessible from the bottom of each mast section.
2. Loosen bottom locknut and tighten top nut until chain/cable is just tight.
3. Tighten bottom locknut until it is locked tight against top nut. Chain/cable should have slight tension but should not be taut.
4. Repeat steps (2) and (3) for remaining mast sections. ENSURE THAT ALL CHAINS/CABLES HAVE EQUAL TENSION.

• Sequencing Cable Adjustment

1. Check each sequencing cable on outside of masts for excessive slack. Adjust only to remove slack from cable.
2. Tighten nylock-nut just enough to remove excessive slack from sequencing cable. DO NOT overtighten cable.

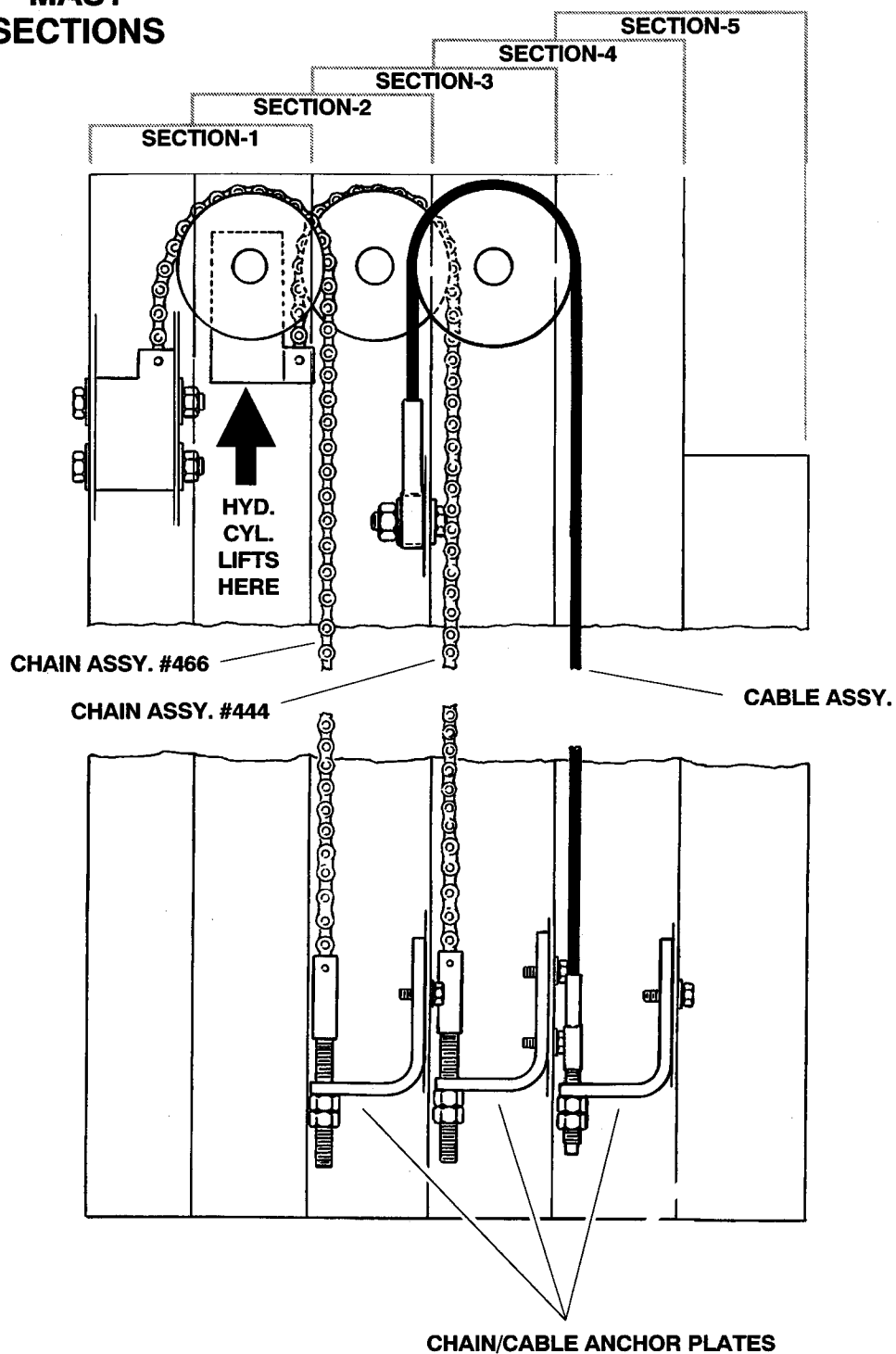
**MAST
SECTIONS**

Figure 8-5. Mast Chain/Cable Routing Diagram. (Typical 20VP)

8-7. TORQUE LIMITING CLUTCH - MAINTENANCE

VP Series machines are equipped with a torque limiting clutch coupling on each drive axle. The clutch is mounted inline on the drive axle between the drive wheel and the drive motor gear box. The clutch is designed to slip at a pre-set torque if the machines rear wheels are over-driven while the machine is being towed, pushed or forklifted, thus preventing damage to the drive gear box. Although factory pre-set, the clutch assembly and torque should be checked at the following interval:

- Every 3 months.

• Visual Inspection and Limiting Torque Checking Procedure

1. Locate the machine on a firm level surface.

Note

Lift machine from front (platform end) to allow work area at rear of machine.

⚠ WARNING

KEEP MACHINE LEVEL OR SLIGHTLY TILTED TOWARD FORKLIFT TRUCK WHEN LIFTING TO PREVENT MACHINE FROM SLIDING OFF LIFTING TINES.

2. Using a forklift truck capable of supporting the full weight of the machine, check clearance above machine and carefully lift the machine high enough to gain access to the torque limiting clutches.
3. Place a suitable jack stand capable of supporting the weight of the machine (*floor to machine bottom*) at the center of the cylinder mount under the machine to help support the machine while lifted.
4. Locate the clutch assembly on each rear drive axle and check for the following;
 - a. Check the coupling chains for any loose or missing parts, i.e. pins, links, etc., replace if necessary.
 - b. Check that the allen-head set screws on the (*large*) clutch adjusting nut are in place and secure. Tighten or replace if necessary.
 - c. Check for any debris wedged in or wrapped around the clutch coupling chains and axle shafts. Remove debris and clean area if necessary.

• Checking Clutch - Torque Setting (ft. lb.)

Note

Check that the machines brakes are engaged before applying torque to the rear drive wheels.

5. Remove the drive wheels from the drive axles.
6. Select a torque wrench capable of setting a torque of at least 185 ft. lb. Insert special tool (P/N-0080229) into a 3/4" socket on the torque wrench.
7. Slide the tool onto the end of the drive axle aligning the key on the axle shaft (*install key on axle, if necessary*), with key slot in the tool. (See Figure 8-6.)
8. Turn the torque wrench and note the torque setting when the torque limiting clutch releases. The torque (slip) setting should be set at 185 ft. lb. Check both rear drive axles.

Note

The allowable breaking torque for the torque limiting clutch can be set as much as 35 ft. lb. less than the factory setting of 185 ft. lb., but never more than the 185 ft. lb. factory setting.

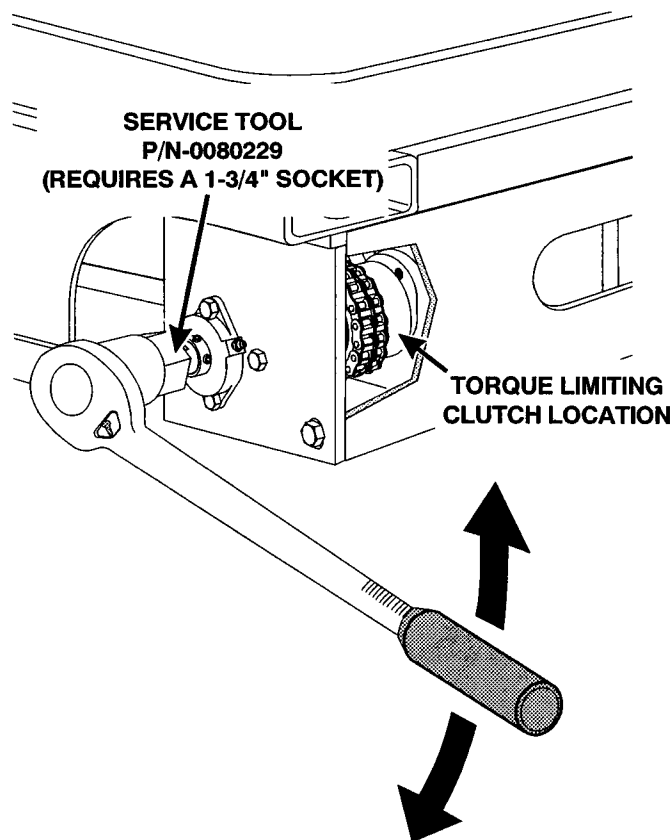


Figure 8-6. Check Torque Limit Clutch - Torque Setting.

9. If torque setting is OK, re-install the wheels and lower machine, IF NOT, see the following note.

Note

If torque setting is outside the allowable range of specifications, the torque limiting clutch will need adjustment. See Torque Limiting Clutch Adjustment following.

• **Torque Limiting Clutch Adjustment**

Note

The large adjusting nut on the side of the clutch assembly is a standard type thread.

If the torque (slip) setting of the clutch assembly is under spec (*by more than 35 ft. lb.*), the large adjusting nut must be (*tightened*) turned clockwise to increase the torque setting.

If the torque (slip) setting is over spec (*over 185 ft. lb.*) the large adjusting nut must be (*loosened*), turned counter-clockwise to decrease the torque setting.

10. Loosen the two (2) adjusting nut setscrews located on the large adjusting nut on the clutch assembly. (See Figure 8-7.)
11. Hold the drive axle steady using service tool (P/N-0080229) and the torque wrench used to check the torque setting.

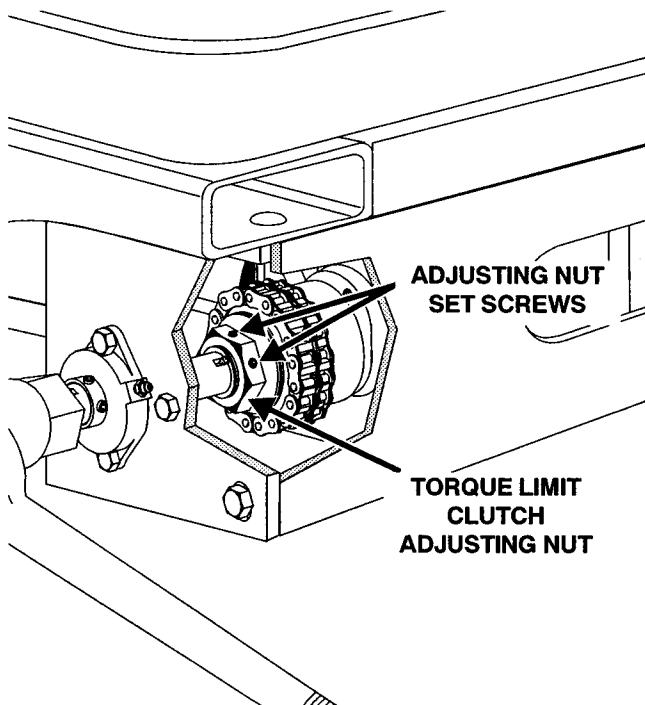


Figure 8-7. Torque Limit Clutch Adjustment Components.

12. Depending on how far off the original torque setting was (*see note at beginning of this procedure*), tighten or loosen the adjusting nut accordingly, then recheck the (slip) torque setting.
13. When proper torque setting is achieved, re-tighten the two (2) adjusting nut, setscrews.
14. Re-install the drive wheels, remove the jack stand and lower the machine to ground.

8-8. PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE

(See Table 8-2.)

The preventive maintenance and inspection checks are listed and defined in the following table (See Table 8-2., this chapter). This table is divided into two basic parts, the "AREA" to be inspected and the "INTERVAL" at which the inspection is to take place. Under the "AREA" portion of the table, the various systems along with the components that make up that system are listed. The "INTERVAL" portion of the table is divided into five columns representing the various inspection time periods. The numbers listed within the interval column represent the applicable inspection code for which that component is to be checked.

The checks and services listed in this schedule are not intended to replace any local or regional regulations that may pertain to this type of equipment nor should the lists be considered as all inclusive. Variances in interval times may occur due to climate and/or conditions and depending on the location and use of the machine.

JLG Industries requires that a complete annual inspection be performed in accordance with the "Annual Machine Inspection Report" form. Forms are supplied with each new machine and are also available from JLG Customer Service. Form must be completed and returned to JLG Industries.

⚠ IMPORTANT

JLG INDUSTRIES REQUIRES THAT A COMPLETE ANNUAL INSPECTION BE PERFORMED IN ACCORDANCE WITH THE "ANNUAL MACHINE INSPECTION REPORT" FORM.

**Table 8-2.
PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE**

AREA	INTERVAL					
	DAILY	WEEKLY	MONTHLY	3 MONTH	6 MONTH	YEARLY
PLATFORM						
1. Platform Controller (all functions)	1,11					
2. Placards and Decals	1,2					
3. Control Tags	1,2					
4. Electrical Cables	1,8					
5. Handrail and Bar Gate	1,4					
MAST						
1. Mast Chains/Cables	1,4,7,9			12		
2. Mast Sections	1,4,7					
3. Mast Sequencing Cables	1,7,9					
4. Speed/PHP Limit Switches	1,7,9					
BASE FRAME						
1. Batteries	1,3	5				
2. Battery Charger	1					
3. Power Cables to Platform	1,8					
4. Electric Motor/Hydraulic Pump Unit	1	5				
5. Hydraulic Flow Control Valve	1	5				
6. Hydraulic Hoses and Fittings	1	5				
7. Hydraulic Oil Reservoir *	3	5	4			
8. Hydraulic Oil Reservoir Breather		6,14				
9. Manual Descent Knob	1,7					
10. Lift Cylinder	1	5,6,13	4			
11. Placards and Decals	1,2					
12. Wheels and Casters	1	8,9		12		
13. Wheel Bearings			8	12		
14. Electric Drive Wheel Motors	1,7					
15. Elect. Drive Wheel Gear Box **						
16. Torque Limiting Clutch				1,6,9		
17. Power Switch, Ground Control	1,11					
18. Control Tags	1,2					
19. Placards and Decals	1,2					
20. Hoses and Cables	1,8					
21. Bubble Level Indicator	1,2					

* Inspection and Maintenance Code 10 to be performed every two years.

** Inspection and Maintenance Code 3 to be performed every two years.

Inspection and Maintenance Codes:

1. Check for proper and secure installation.
2. Check for visible damage and legibility.
3. Check for proper fluid level.
4. Check for any structural damage; cracked or broken welds; bent or warped surfaces.
5. Check for leakage.
6. Check for presence of excessive dirt or foreign material.
7. Check for proper operation and freedom of movement.
8. Check for excessive wear or damage.
9. Check for proper tightness and adjustment.
10. Drain, clean and refill.
11. Check for proper operation while pump/motor is running.
12. Check for proper lubrication.
13. Check for evidence of scratches, nicks or rust and for straightness of rod.
14. Check for condition of element; replace as necessary.

9-1. GENERAL

This section contains troubleshooting information to be used for locating and correcting most of the operating problems which may develop VP Series Personnel Lifts. If a problem should develop which is not presented in this section or which is not corrected by listed corrective actions, technically qualified guidance should be obtained before proceeding with any maintenance.

9-2. TROUBLESHOOTING INFORMATION

The troubleshooting procedures applicable to the machine are listed and defined in the following sections and tables.

Each malfunction within an individual group or system is followed by a listing of probable causes which will enable determination of the applicable remedial action. The probable causes and the remedial action should, where possible, be checked in the order listed in the tables.

It should be noted that there is no substitute for a thorough knowledge of the equipment and related systems.

It should be recognized that the majority of the problems arising in the machine will be centered in the hydraulic and electrical systems. For this reason, every effort has been made to ensure that all likely problems in these areas are given the fullest possible treatment. In the remaining machine groups, only those problems which are symptomatic of greater problems which have more than one probable cause and remedy are included. This means that problems for which the probable cause and remedy may be immediately obvious are not listed in this section.

The first rule for troubleshooting any circuit that is hydraulically operated and electrically controlled is to determine if the circuit is lacking hydraulic oil and electrical control power. This can be ascertained by overriding the bypass valve (mechanically or electrically) so that oil is available to the function valve, then overriding the function valve mechanically. If the function performs satisfactorily, the problem exists with the control circuit.

9-3. HYDRAULIC CIRCUIT CHECKS

The first reference for improper function of a hydraulic system, where the cause is not immediately apparent, should be the Troubleshooting Chart (*See Table 9-3.*). The best place to begin the problem analysis is at the power source (*pump*). Once it is determined that the pump is serviceable, then a systematic check of the circuit components, beginning with the control, would follow.

Note

For aid in troubleshooting, refer to section 10 the illustrated parts list for HYDRAULIC DIAGRAM circuits.

9-4. ELECTRICAL CIRCUIT CHECKS**• General**

The drive system on the VP series machine requires a microprocessor controlled electrical circuit to operate smoothly and accurately. All platform control functions are relayed to various machine components (*i.e. platform up/down, drive functions, etc.*) through the (MC-1) microprocessor box (*mounted under the battery charger support bracket*).

To help diagnose any problems with the components associated with the microprocessor, the MC-1 is designed with an internal fault messaging system which is displayed by LED flash sequences on the platform controller. When operating normally the LED panel on the platform controller (*center LED strip*) indicates the battery voltage status using ten (10) green LEDs. If a malfunction occurs to any of the drive components, the platform controller, or the MC-1 unit itself, these LEDs will flash a warning or error fault code to help locate the problem area. The possible causes of fault codes are outlined in the following sub-sections of this chapter.

A configuration programming kit is available for the MC-1 box, the kit allows dealer personnel to generate, modify, store and retrieve different configuration settings, it also allows retrieval of a warning/error history log. The kit P/N-2900868 is supplied with configuration software, a serial port connection cable and an instruction manual. To run the software a computer (*desktop, laptop*), must be running MS-Windows 3.1 or later.

Note

For aid in troubleshooting, refer to Section 10 the Parts list for an ELECTRICAL DIAGRAM of the various circuits. Also a pictorial overview of the elec-

tronic wiring and components are shown later in this Section, see “Figure 9-2. Pictorial Overview of VP Electrical System”.

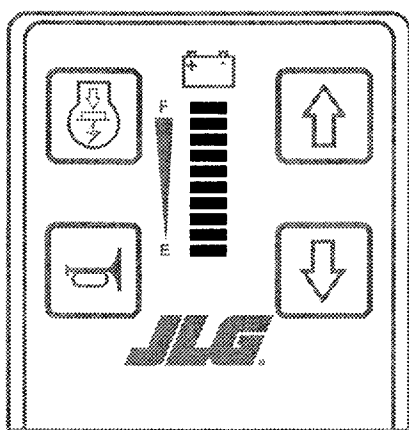


Figure 9-1.
LED Battery/ Fault Code Indicator Strip.

• LED Indicator Strip

When the machine is powered up, all function inputs should be open. If any function is active on power up, all functions will be made inoperative and a fault will be indicated at the platform controller box LED strip.

This strip has ten (10) green LEDs and is located on the platform controller box between the function touch pad buttons. See Figure 9-1.

• Fault Code Reference Tables

There are two types of fault codes which can occur to indicate a problem with the machine, these are WARNING codes and ERROR codes.

The fault codes can occur either at machine power up or during operation of the machine.

WARNING Codes (See Table 9-1.)

The WARNING will be indicated for 4 seconds and will be repeated every minute if the problem is not corrected. An audible three beeps indication is given at the beginning of each warning displayed. When a WARNING code is indicated the machine will usually function, however some machine functions may be disabled. See Table 9-1. for explanation of WARNING codes.

ERROR Codes (See Table 9-2.)

An ERROR is indicated by an audible beep and continuously fast flashing LED bar. The number of fast (rapidly) flashing LEDs indicate the particular fault message. An ERROR condition will disable the machine until the problem is corrected. The ERROR message is only reset by turning off the system, however if the problem has not been corrected the ERROR will be indicated again at machine power-up. See Table 9-2. for explanation of ERROR codes.

Note

As shown in the following WARNING and ERROR code tables, a specific number of LEDs flashing can indicate more than one WARNING or ERROR code. These charts suggest specific items to check as the probable cause for the fault code which has occurred. The fault code number is shown in the first column and the number of LEDs flashing on the platform controller LED strip is shown in the second column. Warning or error codes can only be read by using the MC-1 Controller Box Configuration Kit, P/N-2900868.

Table 9-1.
MC-1 WARNING CODES
 (Indicated by 3 beeps, then slow flashing LEDs)

WARNING CODE	LEDS FLASHING	PROBABLE CAUSE	REMEDY
0	10	Enter Code - Security Code has been activated and must be entered before operation	Enter Code or deactivate using MC-1 configuration software.
1	8	Charger Connected	Unplug Charger
3	2	Brake Status Switch Open - Parking brake manually released	Reset Parking Brake
3	2	Brake manual release lever obstructed (located at drive motor brake)	Clear obstruction and reset lever
3	2	Defective parking brake status switch (located at drive motor brake)	Replace Switch
3	2	Defective pin 11 at X105 (BRN wire) connection or improper wiring	Properly attach wires or pin
3	2	Improper wiring at parking brake status switch	Properly attach wires
3	2	Improper wiring from parking brake status switch to ground	Properly attach wires
4	5	Configuration Lost - Drive Characteristic has changed	Reprogram using MC-1 software
5	6	Current Measurement faulty - Drive characteristic may have changed	Cycle on-off and reprogram if necessary
6	7	High Temperature in controller	Reduce power
7	7	Motor Stalled	Check drive wheels and motors
9	1	Battery Low (< 18v) and power reduced	Charge Batteries
12	9	Speed Control Potentiometer defective	Replace Joystick
13	4	Drive Cutout Input Open - PHP bar must be down to drive while elevated	Lower PHP
13	4	PHP bar is down, but drive is disabled - Defective wiring at D-connector	Properly attach wire (RED/BLU) or pin 12 of X105 connector
13	4	PHP bar is down, but drive is disabled - Defective ground wiring	Properly attach wires
13	4	PHP bar is down, but drive is disabled - Defective switch	Replace switch
14	3	Tilt Switch open - Slope greater than 2 degrees	Lower Platform and move to level ground
14	3	No Tilt Switch - open circuit at Pin 2 of X101 (WHT wire)	Properly attach pin or wire connections
14	3	No Tilt Switch - open circuit to ground	Check ground wire connections (BLK1 wire)
14	3	Tilt Switch open - defective switch	Replace Tilt Switch
25	—	Joystick E. Stop Counter	Controller Log Only
26	—	Configuration Access Counter	Controller Log Only

Table 9-2.
MC-1 ERROR CODES
 (Indicated by rapid LED flashing and periodic beep)

ERROR CODE	LEDS FLASHING	PROBABLE CAUSE	REMEDY
0	8	System Overvoltage - Charger	Unplug Charger
0	8	System Overvoltage - Driving down long steep grade	Operate ground controls to reduce voltage
1	7	Controller Overtemperature	Turn unit off and allow to cool
2	8	Drive Motor Plug - Open Circuit - check connectors X103 & X104	Properly attach wires or pins A1 & A2
2	8	Drive Motor Plug - Open Circuit - check motor connections at motor	Properly attach wires or pins (WHT & BLK wires)
3	6	Brake Safety Relay	Replace Controller
4	2	Brake Short Circuit	Replace Brake
5	2	Brake Left Open Circuit - D-connectors to X103 & X104 switched	Switch D-connectors - Left Motor to X103; Right Motor to X104
5	2	Brake Left Open Circuit - Check pins 3 & 5 of X103 and brake wires	Properly attach wires or pins
5	2	Brake Left Open Circuit - Check brake wires or plug at drive motor	Properly attach wires or pins
6	2	Brake Right Open Circuit - Check pins 2 & 5 of X104 and brake wires	Properly attach wires or pins
6	2	Brake Right Open Circuit - Check brake wires or plug at drive motor	Properly attach wires or pins
7	2	Brake Open Circuit on one or both brakes	See above
8	9	Switch Short Circuit (Joystick)	Replace Joystick Box
9	6	Power Circuit Defect	Replace Controller
10	1	Battery Low (< 16.5 v)	Charge Battery
11	9	Check pins & wire connections at X102 & joystick box connector	Properly attach wires or pins
11	9	Joystick defective	Replace Joystick Box
12	8	Check pins & wire connections at X102 & joystick box connector	Properly attach wires or pins
12	8	Joystick Box	Replace Joystick Box
16	7	Current Limiting - Motor Short Circuit - Gearmotor defective	Replace Gearmotor
21	6	36v supply	Replace controller
24	5	Configuration Lost	Reprogram using MC-1 software, if error reoccurs then replace controller
25	6	RAM ROM	Replace controller

(Continued next page)

Table 9-2. (continued)
MC-1 ERROR CODES
(Indicated by rapid LED flashing and periodic beep)

ERROR CODE	LEDS FLASHING	PROBABLE CAUSE	REMEDY
26	6	If voltage @ pin 5 (RED2) of X101 is 20v w/24v @ Battery or if ground controls and operating lift up clears error:	
		Defective main contactor	Replace main contactor
		Battery cables loose or corroded	Clean & tighten battery cables
26	6	If 0v @ pin 5 of X101, check connection @ pin 7 & 14 of X102	Properly attach wires or pins
26	6	Connection @ pin 5 of X101 bad	Properly attach wires or pins
26	6	Defective Power Relay	Replace Relay
26	6	Defective Power Relay ground wire	Properly attach wire
27	6	Safety Circuit - Joystick - check pin 6 @ X102 (Red Wire)	Properly attach wire or pin
27	6	Safety Circuit - Joystick - check pin 3 @ joystick connector (Red Wire)	Properly attach wire or pin
27	6	Defective Joystick - Normal voltage @ pin 6 of X102 (Red Wire): Joystick centered 5v, Joystick not centered 0v	Replace Joystick
27	6	Safety Circuit - Defective Controller	Replace Controller
28	6	Current Measurement	Replace Controller
29	6	Drive Circuit Left - Defective Controller	Replace Controller
31	6	Drive Circuit Right - Defective Controller	Replace Controller
32	1	Output driver defect - check for short in Hourmeter, Horn, Alarm or Power Relay	Replace defective component
32	1	Output Driver Defective - Defective Controller	Replace Controller
35	8	Communication Error - Check Pins 5 & 13 of X102 (Orange & Blue Wires)	Properly attach wires or pins
35	8	Communication Error - Check Pins 4 & 5 at Joystick (Orange & Blue Wires)	Properly attach wires or pins
35	8	Defective Joystick	Replace Joystick
35	8	Defective Controller	Replace Controller
36	6	Watch Dog	Replace Controller
38	6	EEPROM	Replace Controller
39	6	Software Error	Replace Controller

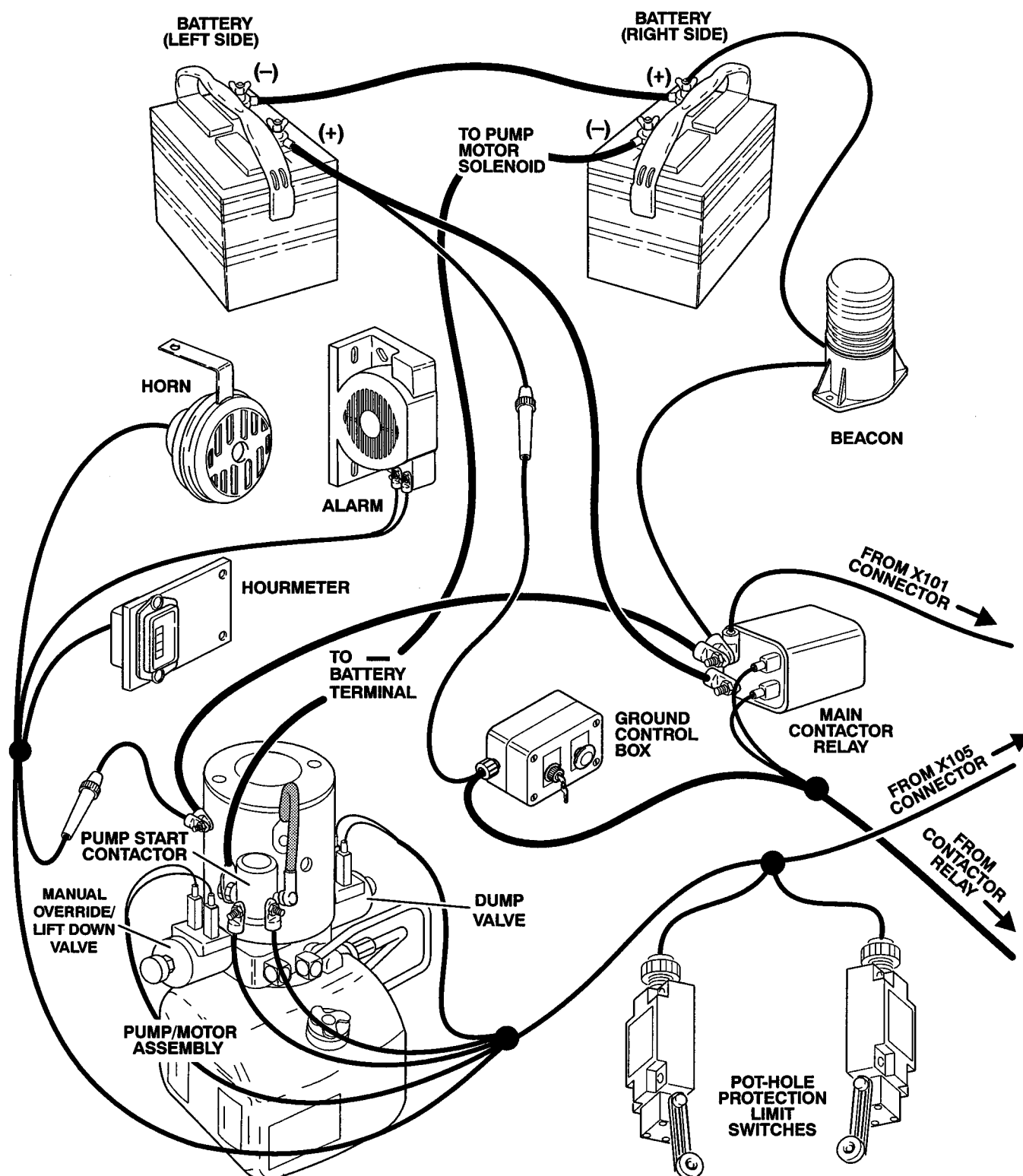


Figure 9-2. Overview of Electrical System. (Sheet 1 of 2)

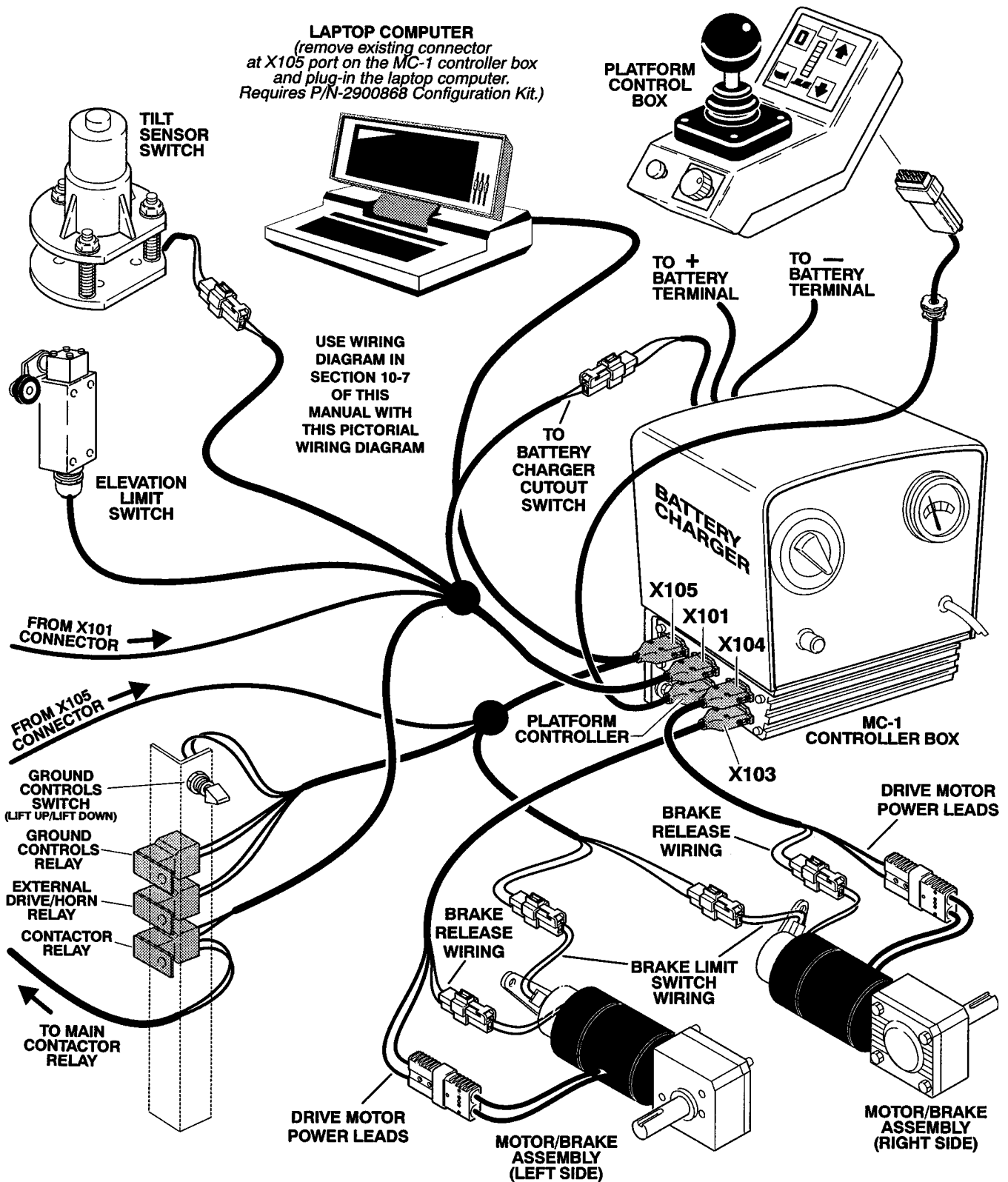


Figure 9-2. Overview of Electrical System. (Sheet 2 of 2)

Table 9-3.
MISCELLANEOUS PROBLEMS
 (no warning or error code displayed)

TROUBLESHOOTING CHART		
TROUBLE	PROBABLE CAUSE	REMEDY
Unit will not Power-up at platform or ground		
	Battery Dead Improper battery cable connection Key Switch fuse blown Main Contactor not functioning	Charge Battery Properly connect cable Replace fuse Replace main contactor
Unit will not power-up at platform		
	Broken pin or bad wire connection at X101 connector Power relay not functioning Bad connection at power relay Main contactor not functioning Broken pin or bad wire connection at X102 connector Broken pin or bad wire connection at Joystick box connector Broken wire internal to controller joystick wire (check continuity) Bad joystick box - check pin voltages at X102 connector; Normal with Platform E-stop closed: Pin 8 - 6v; Pin 5 - 24v Normal with Platform E-stop open: Pin 8 - 0v; Pin 15 - 0v	Replace connector or properly connect wire Replace relay Properly attach wires Replace main contactor Replace connector or properly connect wire Replace connector or properly connect wire Replace harness Replace Joystick box
Unit will not lift or lower from ground or platform		
	Lift lower fuse blown	Replace fuse
Unit will not lift or lower from ground		
	Ground controls relay not functioning	Replace relay
Unit will not lift from ground or platform		
	Lift valve or pump contactor not functioning	Replace
Unit will not lower from ground or platform		
	Lift down valve not functioning	Replace
Brake won't manually release		
	Parking Brake dragging Cable has stretched If power is ON @ Joystick, then turn OFF	Replace Brake Adjust cable slack. Turn key switch to OFF

(Continued on next page)

Table 9-3.
MISCELLANEOUS PROBLEMS (continued)
 (no warning or error code displayed)

TROUBLESHOOTING CHART		
TROUBLE	PROBABLE CAUSE	REMEDY
Unit continually steers to one side		
	Parking brake dragging Gearmotor defective Joystick out of calibration	Replace brake Repair or replace Calibrate joystick
Drive motor makes noise		
	Parking brake not releasing Gearmotor defective	Replace brake Repair or replace
Unit drives slow when platform is lowered		
	Mast elevation limit switch defective Bad connection at pin 1 of X101 Bad ground wire connection	Replace limit switch Properly attach wire or pin Properly attach wire or pin
Unit acceleration/deceleration not acceptable		
	Controller settings need to be customized	Program controller using MC-1 software kit
Drive/steer erratic		
	Motor brush loose	Properly attach brush spring
Mast Noise		
	Cable sheave dry Mast slides dry Cylinder Noise	Lubricate Lubricate Add lubricant to hydraulic oil
Mast will not descend w/o weight in platform		
	Mast slides tight or dry	Lubricate mast and add weight to empty platform
MC-1 software will not communicate		
	Serial port address unclear - Normal: 03E8 for COM1, 03F8 for COM2 Poor cable connection	Change serial port address settings Properly attach connectors

Table 9-4.
HYDRAULIC – TROUBLESHOOTING

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Unit lowers by itself		
	Manual descent valve open. Hydraulic hose and/or fittings loose causing a hydraulic pressure leak. Lift DOWN solenoid valve not functioning. Seal in hydraulic cylinder leaking. Check valve not closing.	Close manual descent valve. Tighten hydraulic hose and/or fittings. Replace Lift DOWN solenoid valve. Replace seals. See hydraulic diagram, Section-10.
Unit leaking hydraulic oil.		
	Hydraulic hose and/or fittings loose. Valve and/or plug loose. Breather cap on tank is saturated or clogged with oil. Hydraulic oil tank over-filled.	Tighten hydraulic hose and/or fittings. Tighten valve and/or plug. Replace breather cap on tank. Lower oil level to full mark on dipstick.
Unit lowers very slowly.		
	Flow control valve not functioning. Seal in hydraulic cylinder leaking. Check valve not closing.	Replace flow control valve. Replace seals. See hydraulic diagram, Section-10.
Unit makes noise while raising and lowering.		
	Mast sections need lubrication. Cylinder noisy.	Spray graphokote in mast slide pad rails with silicone lubricant. Spray with silicone spray. Also check for proper hydraulic oil type in reservoir.

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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-1		BASE ASSEMBLY COMPONENTS (DRIVE WITHOUT SLIP-CLUTCHES) (PRIOR TO S/N0130001285)	Ref.	
		BASE ASSEMBLY (STANDARD PARTS)	Ref.	
-1	4845123	Base Weldment	1	
-2	0181832	Angle, Motor Mounting (Right)	1	
-3	0181833	Angle, Motor Mounting (Left)	1	
-4	4845248	Mount, Motor (Rear)	1	
-5				
-6	0641707	Bolt 7/16"-14NC x 7/8"	4	
-7	4845258	Battery Box Weldment	1	
-8		Wheel Options:	2	
	4860161	Polyurethane (Standard)		
	4860163	Non-Marking (Optional)		
-9	0440221	Bearing	2	
-10	3160212	Drive Motor Assembly (See Figure 10-1-2 for Breakdown)	2	
-11	4860164	Caster Wheel Assembly	2	
		Wheel (1 Per Assembly)	2	
		Bearing (1 Per Assembly)	2	
-12	0630446	Bolt, Carriage	4	
-13	3900221	Screw, Flathead	6	
-14	1060639	Cable, Brake	1	
	4160159	Spring, Return (Not Shown - Located under handle)	1	
-15	3760393	Ring, Retaining	2	
-16	Not Used			
-17	0641608	Bolt 3/8"-16NC x 1"	20	
-18	4751600	Flatwasher 3/8"	44	
-19	3311605	Locknut 3/8"-16NC	21	
-20	0641406	Bolt 1/4"-20NC x 3/4"	A/R	
-21	3311405	Locknut 1/4"-20NC	A/R	
-22	4751400	Flatwasher 1/4"	16	
-23	3539659	Plate, Spacer 1/8"	1	
-24	3539660	Plate, Spacer 5/64"	1	
-25	Not Used			
-26	0256851	Brake Assembly	2	
	7014117	Switch, Micro (1Per Assembly)	2	
	7014118	Disc, Friction (1Per Assembly)	2	
-26A	7014119	Gear (1Per Assembly)	2	
	7014120	Setscrew(2 Per Assembly)	4	
	7014122	Screw - Brake Release Brkt Mounting (2 Per Assy)	4	
	7014123	Locknut - Brake Release Brkt Mounting (2 Per Assy)	4	
	7014124	Washer - Brake Release Brkt Mounting (4 Per Assy)	8	
	7014125	Spring - Brake Release Brkt Mounting (2 Per Assy)	4	
-27	3930808	Capscrew #8-32NC x 1/2"	8	
-28	4750800	Flatwasher #8	8	
-29	4711700	Flatwasher 7/16" Narrow	4	
-30	4845363	Cover, Motor - Right Side	1	
-31	4845364	Cover, Motor - Left Side	1	
-32	2820086	Loom, Wire	7in/18cm	
-33	0100035	Loctite #222 (Not Shown)	A/R	
-34	0641609	Bolt 3/8"-16NC x 1 1/8"	16	
-35	4160154	Spring, Compression	2	
-36	4751000	Flatwasher #10	2	
-37	4460648	Connector, Terminal	2	
-38	0100019	Loctite #272 (Not Shown)	A/R	
-39	0100011	Loctite #242 (Not Shown)	A/R	
-40	3020017	Grease, Multi-Purpose (Not Shown)	A/R	

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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-1		BASE ASSEMBLY COMPONENTS (DRIVE WITHOUT SLIP-) CLUTCHES) (PRIOR TO S/N0130001285) (CONTINUED)	Ref.	
	0256167	BASE ASSEMBLY - 10VP (VARIABLE PARTS)	Ref.	K
-51 to -57	Not Required			
	0256169	BASE ASSEMBLY - STANDARD 15VP (VARIABLE PARTS)	Ref.	K
-51	4845260	Counterweight	2	
-52	0902256	Bracket, Counterweight Hold-Down	2	
-53 to -57	Not Required			
	0256791	BASE ASSEMBLY - CSA 15VP (VARIABLE PARTS)	Ref.	D
-51	4845260	Counterweight	2	
-52	0902256	Bracket, Counterweight Hold-Down	2	
-53 to -56	Not Required			
-57	4845401	Counterweight - CSA (Not Shown - Located at Rear of Base)	1	
	0256171	BASE ASSEMBLY - STANDARD 20VP (VARIABLE PARTS)	Ref.	K
-51	4845261	Counterweight	2	
-52	Not Required			
-53	4845291	Counterweight	1	
-54	0641810	Bolt 1/2"-13NC x 1 1/4"	4	
-55	3311805	Locknut 1/2"-13NC	4	
-56	4751800	Flatwasher 1/2"	8	
-57	Not Required			
	0256792	BASE ASSEMBLY - CSA 20VP (VARIABLE PARTS)	Ref.	D
-51	4845261	Counterweight	2	
-52	Not Required			
-53	4845291	Counterweight	1	
-54	0641810	Bolt 1/2"-13NC x 1 1/4"	4	
-55	3311805	Locknut 1/2"-13NC	4	
-56	4751800	Flatwasher 1/2"	8	
-57	4821228	Counterweight - CSA (Not Shown - Located at Rear of Base)	1	
		MAST SUPPORT INSTALLATION (STANDARD PARTS)	Ref.	
-101	4845247	Channel, Lift Cylinder Mounting	1	
-102	Not Used			
-103	0641609	Bolt 3/8"-16NC x 11/8"	11	
-104	4751600	Flatwasher 3/8"	24	
-105	3311605	Locknut 3/8"-16NC	12	
-106	2420140	Gauge, Level	1	
-107	0641505	Bolt 5/16"-18NC x 5/8"	1	
-108	4711500	Flatwasher 5/16" Narrow	1	
-109	0641612	Bolt 3/8"-16NC x 1 1/2"	1	
-110	1320041	Clamp	1	
-111	0641404	Bolt 1/4"-20NC x 1/2"	1	
-112	4711400	Flatwasher 1/4" Narrow	2	
-113	3311401	Nut 1/4"-20NC	1	
-114	0100011	Loctite #242 (Not Shown)	A/R	

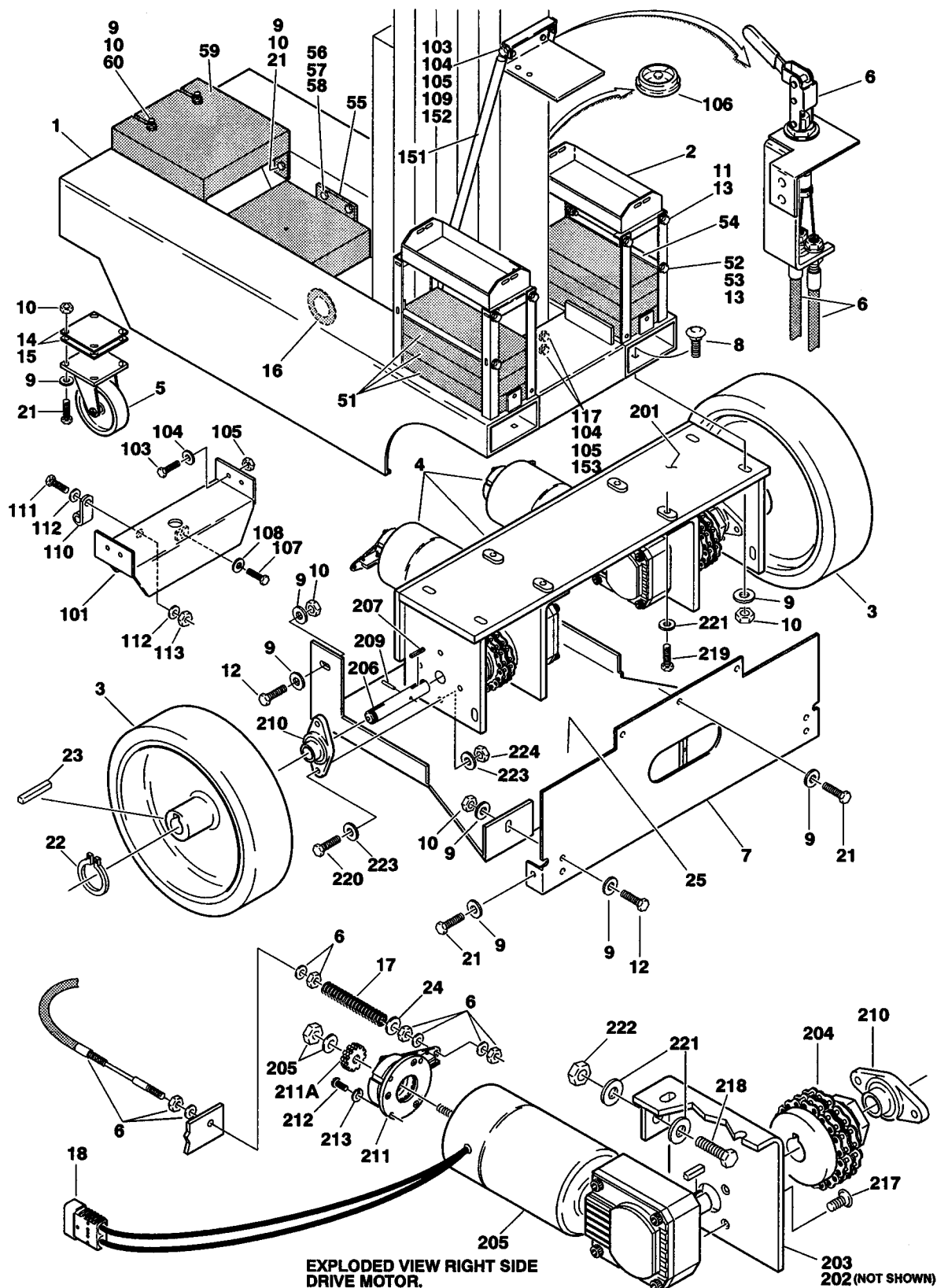
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-1		BASE ASSEMBLY COMPONENTS (DRIVE WITHOUT SLIP-CLUTCHES) (PRIOR TO S/N 0130001285) (CONTINUED)	Ref.	
	0256197	MAST SUPPORT INSTALLATION - STANDARD MACHINE (VARIABLE PARTS)	Ref.	B
-151	0880124	Brace	2	
-152 to -153	Not Required			
	0256793	MAST SUPPORT INSTALLATION - CSA MACHINES (VARIABLE PARTS)	Ref.	B
-151	0880125	Brace	2	
-152	4700952	Shim .03 (Not Shown)	1	
-153	4700953	Shim .06 (Not Shown)	2	
	4700954	Shim .03 (Not Shown)	2	

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FIGURE 10-1-2. BASE ASSEMBLY (DRIVE WITH SLIP-CLUTCHES) (S/N 0130001285 TO PRESENT).



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-2		BASE ASSEMBLY COMPONENTS (DRIVE WITH SLIP-CLUTCHES) (S/N 0130001285 TO PRESENT)	Ref.	
		BASE ASSEMBLY (STANDARD PARTS)	Ref.	
-1	4845479	Base Weldment	1	
-2	4845258	Battery Box Weldment	2	
-3		Wheel Options:	2	
	4860161	Polyurethane (Standard)		
	4860163	Non-Marking (Optional)		
-4	0257241	Drive Assembly - Rear (See Items 201-224 for Breakdown)	1	
-5	4860164	Caster Wheel Assembly	2	
	7016619	Bearing (1 Per Assembly)	2	
-6	1060639	Cable, Brake	1	
	4160159	Spring, Return (Not Shown - Located under handle)	1	
-7	4845474	Rear Plate Weldment	1	
-8	0630446	Bolt, Carriage 3/8"-16NC x 1"	4	
-9	4751600	Flatwasher 3/8"	A/R	
-10	3311605	Locknut 3/8"-16NC	A/R	
-11	0641406	Bolt 1/4"-20NC x 3/4"	8	
-12	0641609	Bolt 3/8"-16NC x 1 1/8"	4	
-13	4751400	Flatwasher 1/4"	A/R	
-14	3539659	Plate, Spacer 1/8"	1	
-15	3539660	Plate, Spacer 5/64"	1	
-16	2820086	Loom, Wire	4in/10cm	
-17	4160154	Spring, Compression	2	
-18	4460648	Connector, Terminal	2	
-19	3020017	Grease, Multi-Purpose (Not Shown)	A/R	
-20	0100011	Loctite #242 (Not Shown)	A/R	
-21	0641608	Bolt 3/8"-16NC x 1"	A/R	
-22	3760393	Ring, Retainer	2	
-23	2860026	Key, Wheel	2	
-24	4751000	Flatwasher #10	2	
-25	3570172	Cover, Motor	1	
	0257230	BASE ASSEMBLY - 10VP (VARIABLE PARTS)	Ref.	2
-51 to -60	Not Required			
	0257229	BASE ASSEMBLY - STANDARD 15VP (VARIABLE PARTS)	Ref.	2
-51	4845260	Counterweight	2	
-52	0641408	Bolt 1/4"-20NC x 1"	8	
-53	3311605	Locknut 3/8"-16NC	16	
-54	0902256	Bracket, Counterweight Hold-Down	2	
-55 to -60	Not Required			
	0257237	BASE ASSEMBLY - CSA 15VP (VARIABLE PARTS)	Ref.	2
-51	4845260	Counterweight	2	
-52	0641408	Bolt 1/4"-20NC x 1"	8	
-53	3311605	Locknut 3/8"-16NC	16	
-54	0902256	Bracket, Counterweight Hold-Down	2	
-55 to -58	Not Required			
-59	4845401	Counterweight - CSA	1	
-60	0630512	Bolt, Carriage 3/8"-16NC x 2 3/4"	2	

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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-2		BASE ASSEMBLY COMPONENTS (DRIVE WITH SLIP-CLUTCHES) (S/N 0130001285 TO PRESENT) (CONTINUED)	Ref.	
	0257228	BASE ASSEMBLY - STANDARD 20VP (VARIABLE PARTS)	Ref.	2
-51	4845261	Counterweight	2	
-52 to -54	Not Required			
-55	4845291	Counterweight	1	
-56	0641810	Bolt 1/2"-13NC x 1 1/4"	4	
-57	3311805	Locknut 1/2"-13NC	4	
-58	4751800	Flatwasher 1/2"	8	
-59 to -60	Not Required			
	0257228	BASE ASSEMBLY - CSA 20VP (VARIABLE PARTS)	Ref.	2
-51	4845261	Counterweight	2	
-52 to -54	Not Required			
-55	4845291	Counterweight	1	
-56	0641810	Bolt 1/2"-13NC x 1 1/4"	4	
-57	3311805	Locknut 1/2"-13NC	4	
-58	4751800	Flatwasher 1/2"	8	
-59	4821228	Counterweight - CSA	1	
-60	0641634	Bolt 3/8"-16NC x 4 1/4"	2	
		MAST SUPPORT INSTALLATION (STANDARD PARTS)	Ref.	
-101	4845478	Channel, Lift Cylinder Mounting	1	
-102	Not Used			
-103	0641609	Bolt 3/8"-16NC x 11/8"	11	
-104	4751600	Flatwasher 3/8"	24	
-105	3311605	Locknut 3/8"-16NC	12	
-106	2420140	Gauge, Level	1	
-107	0641505	Bolt 5/16"-18NC x 5/8"	1	
-108	4711500	Flatwasher 5/16" Narrow	1	
-109	0641612	Bolt 3/8"-16NC x 1 1/2"	1	
-110	1320041	Clamp	1	
-111	0641404	Bolt 1/4"-20NC x 1/2"	1	
-112	4711400	Flatwasher 1/4" Narrow	2	
-113	3311401	Nut 1/4"-20NC	1	
-114	0100011	Loctite #242 (Not Shown)	A/R	
	0256197	MAST SUPPORT INSTALLATION - STANDARD MACHINE (VARIABLE PARTS)	Ref.	3/C
-151	0880124	Brace	2	
-152 to -153	Not Required			
	0256793	MAST SUPPORT INSTALLATION - CSA MACHINES (VARIABLE PARTS)	Ref.	3/C
-151	0880125	Brace	2	
-152	4700952	Shim .03 (Not Shown)	1	
-153	4700953	Shim .06 (Not Shown)	2	
	4700954	Shim .03 (Not Shown)	2	

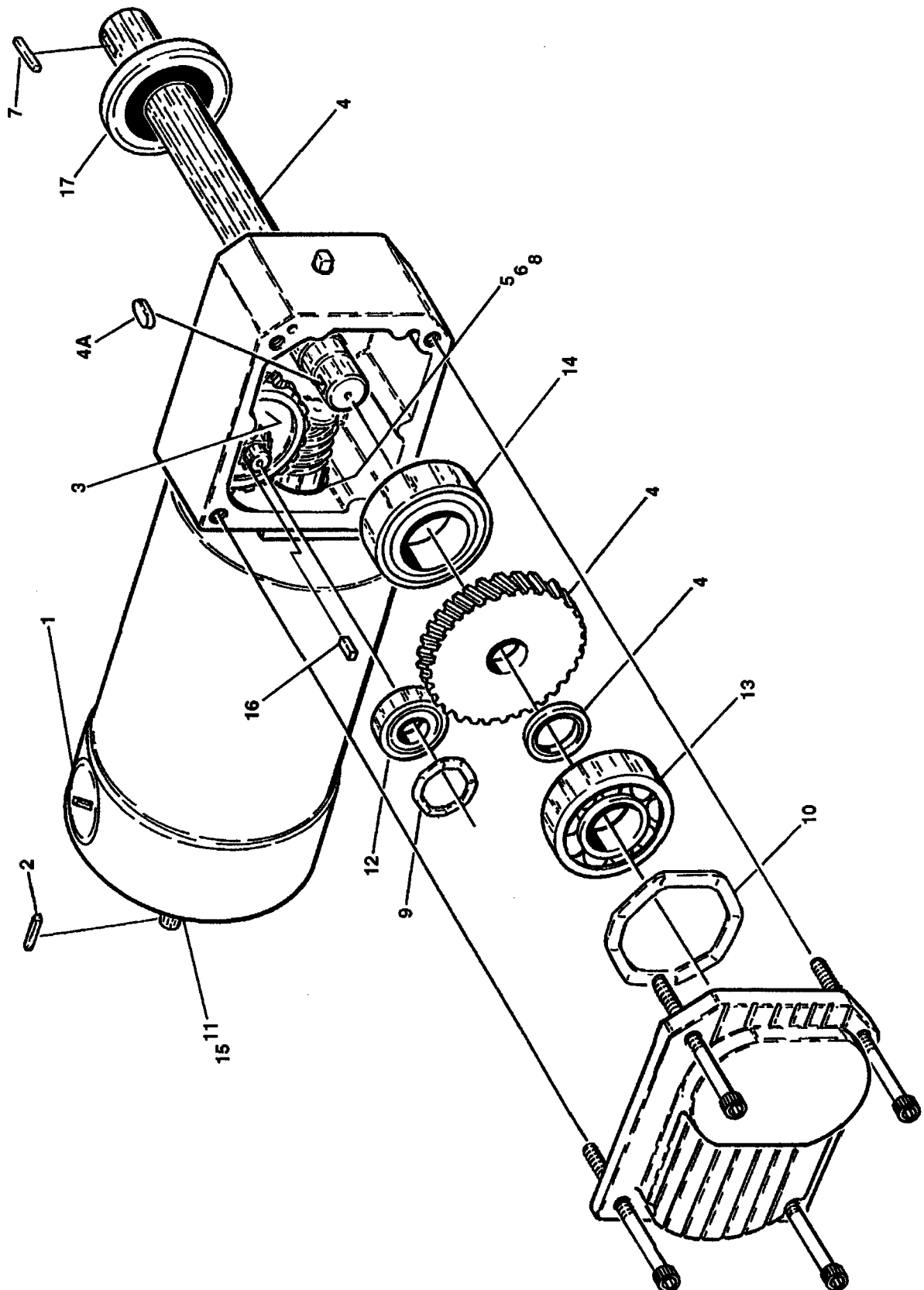
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-2		BASE ASSEMBLY COMPONENTS (DRIVE WITH SLIP-CLUTCHES) (S/N 0130001285 TO PRESENT) (CONTINUED)	Ref.	
	0257241	DRIVE ASSEMBLY - REAR	Ref.	3/C
-201	4845473	Drive Attachment Weldment	1	
-202	3570168	Plate, Motor Mounting - Left	1	
-203	3570169	Plate, Motor Mounting - Right	1	
-204	1400126	Slip-Clutch	2	
	7016685	Bearing (1 Per Assembly)	2	
-205	3160217	Wheel Drive Motor Assembly (See Figure 10-1-3 for Breakdown)	2	
-206	4040259	Shaft, Drive	2	
-207	2860027	Key, Clutch	2	
-208	Not Used			
-209	3440520	Rollpin	2	
-210	0440221	Bearing, Flange	4	
-211	0256851	Brake Assembly	2	
	7014117	Switch, Micro (1Per Assembly)	2	
	7014118	Disc, Friction (1Per Assembly)	2	
-211A	7014119	Gear (1Per Assembly)	2	
	7014120	Setscrew(2 Per Assembly)	4	
-212	3930808	Capscrew #8-32NC x 1/2"	8	
-213	4750800	Flatwasher #8	8	
-214	0100035	Loctite #222 (Not Shown)	A/R	
-215	0100011	Loctite #242 (Not Shown)	A/R	
-216	0100019	Loctite #272 (Not Shown)	A/R	
-217	3900221	Capscrew, Countersunk Socket Head 5/16"-18NC x 3/4"	6	
-218	0641610	Bolt 3/8"-16NC x 1 1/4"	2	
-219	0641609	Bolt 3/8"-16NC x 1"	4	
-220	0641711	Bolt 7/16"-14NC x 1 3/8"	8	
-221	4751600	Flatwasher 3/8"	8	
-222	3311605	Locknut 3/8"-16NC	2	
-223	4711700	Flatwasher 7/16" Narrow	16	
-224	3311705	Locknut 7/16"-14NC	8	

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FIGURE 10-1-3. WHEEL DRIVE MOTOR ASSEMBLY.



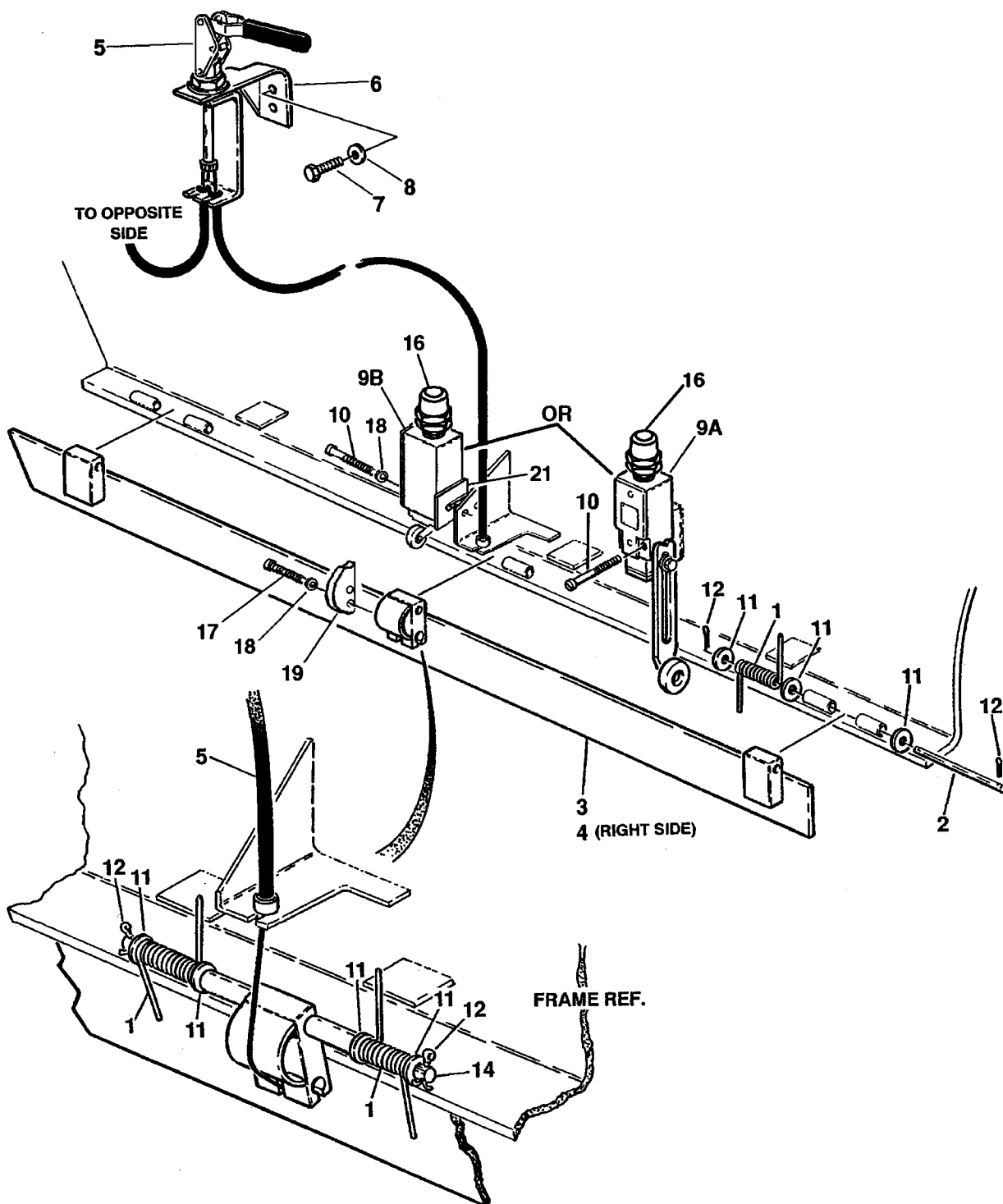
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-3		DRIVE MOTOR ASSEMBLY	Ref.	
	3160212	DRIVE MOTOR ASSY (DRIVE WITHOUT SLIP-CLUTCH)	Ref.	F
-1	7018000	Brush Kit	1	
-2	7018001	Key, Shaft	1	
-3	7018002	Gear and Pinion Assembly	1	
-4	7018003	Gear and Drive Shaft Assembly	1	
-4A	7018007	Key, Shaft	1	
-5	7018004	Seal, Lip	1	
-6	7018005	Ring, Retainer	1	
-7	2680025	Key, Shaft (5/8" Length)	1	
-8	7018008	Bearing	2	
-9	7018009	Washer, Wavy	1	
-10	7018010	Washer, Wavy	1	
-11	7018011	Washer, Wavy	1	
-12	7018012	Bearing 32mm x 12mm x 10mm	2	
-13	7018013	Bearing 47mm x 20mm x 14mm	1	
-14	7018014	Bearing 47mm x 25mm x 12mm	1	
-15	Consult Factory	Bearing	1	
-16	7018015	Key	1	
-17	7018026	Seal, Lip	1	
	3160217	DRIVE MOTOR ASSEMBLY (DRIVE WITH SLIP-CLUTCH)	Ref.	D
-1	7018000	Brush Kit	1	
-2	7018001	Key, Shaft	1	
-3	7018002	Gear and Pinion Assembly	1	
-4	7018019	Gear and Drive Shaft Assembly	1	
-4A	Consutl Factory	Key, Shaft	1	
-5	7018004	Seal, Lip	1	
-6	7018005	Ring, Retainer	1	
-7	2860028	Key, Shaft	1	
-8	7018008	Bearing	2	
-9	7018009	Washer, Wavy	1	
-10	7018010	Washer, Wavy	1	
-11	7018011	Washer, Wavy	1	
-12	7018012	Bearing 32mm x 12mm x 10mm	2	
-13	7018013	Bearing 47mm x 20mm x 14mm	1	
-14	7018014	Bearing 47mm x 25mm x 12mm	1	
-15	Consult Factory	Bearing	1	
-16	Consult Factory	Key	1	
-17	7018026	Seal, Lip	1	

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FIGURE 10-1-4. JLG POTHOLE PROTECTION INSTALLATION.



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SECTION 10-1 BASE

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-1-4	0256088	JLG POTHOLE PROTECTION INSTALLATION	Ref.	G
-1	4160158	Spring, Torsion	8	
-2	3422585	Pin, Hinge	4	
-3		Pothole Protector Weldment (Right Side)	1	
	4845244	Prior to and including S/N 0130000573		
	4845397	S/N 0130000574 to Present		
-4		Pothole Protector Weldment (Left Side)	1	
	4845245	Prior to and including S/N 0130000573		
	4845396	S/N 0130000574 to Present		
-5	1060638	Cable	1	
-6	0902262	Cable Attach Weldment	1	
-7	0641404	Bolt 1/4"-20NC x 1/2"	2	
-8	4711400	Flatwasher 1/4" Narrow	2	
-9		Switch, Limit	A/R	
-9A	4360397	Prior to and including S/N 0130000502		
-9B	4360401	S/N 0130000503 to Present		
-10	3910624	Screw #6-32NC x 1 1/2"	4	
-11	4751000	Flatwasher #10	12	
-12	3450302	Pin, Cotter 3/32" x 1/2"	12	
-13	3020017	Grease, Multi-Purpose	A/R	
-14	3422586	Pin, Hinge	2	
-15	0100011	Loctite #242 (Not Shown)	A/R	
-16	4460662	Connector, Strain Relief	2	
-17	3910610	Screw #6-32NC x 5/8"	4	
-18	4750600	Flatwasher #6	8	
-19	1100100	Cam	2	
-20	0100035	Loctite #222 (Not Shown)	A/R	
-21	3539939	Plate, Shim	2	
-22	4761000	Lockwasher #10	4	
-23	4240032	Tie-Strap (Not Shown)	2	

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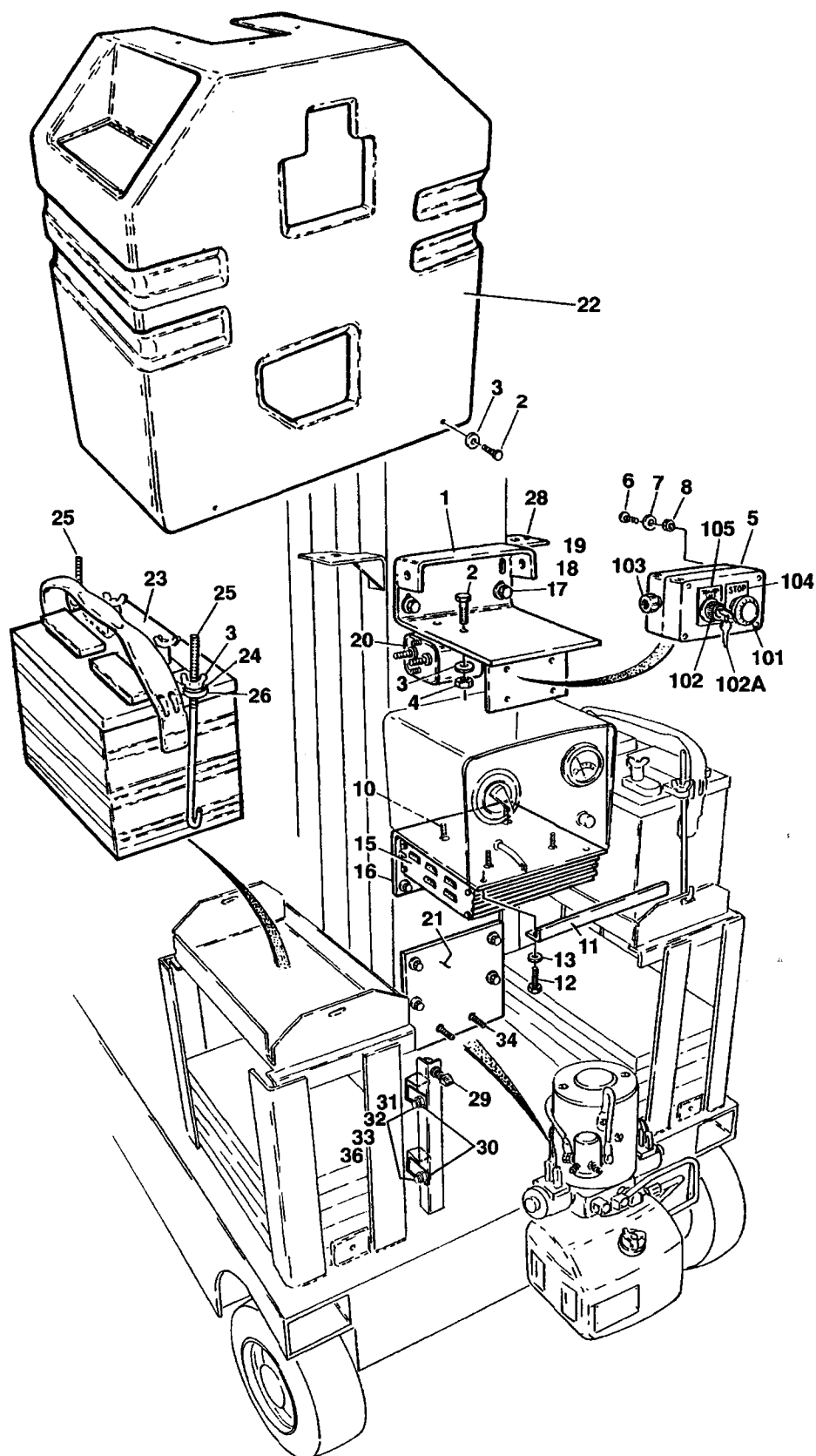
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SECTION 10-2 CONTROLS

FIGURE 10-2-1. GROUND CONTROLS/POWER PACK INSTALLATIONS.



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-1		GROUND CONTROLS/POWER PACK INSTALLATIONS	Ref.	
	0256143	GROUND CONTROLS/POWER PACK INSTALLATION	Ref.	8
	0256912/0256926/0256928	CSA COMPONENTS INSTALLATIONS	Ref.	---
-1	0902248	Bracket, Ground Controls	1	
	3570094	Plate, Hood Mounting (CSA Only)	1	
-2	0641406	Bolt 1/4"-20NC x 3/4"	9	
-3	4751400	Flatwasher 1/4"	19	
-4	3311405	Locknut 1/4"-20NC	2	
-5	0861039	Ground Control Assembly (See Items 101-105 For Breakdown)	1	
-6	3910812	Screw, Machine #8-32NC x 3/4"	4	
-7	4750800	Flatwasher #8	8	
-8	3310805	Locknut #8-32NC	4	
-9	Not Used			
-10	0741407	Screw, Flathead 1/4"-20NC x 7/8"	4	
-11	0181857	Angle	1	
-12	0641406	Bolt 1/4"-20NC x 3/4"	4	
-13	4711400	Flatwasher 1/4" Narrow	4	
-14	0100011	Loctite #242	A/R	
-15	1600238	Controller Assembly	1	
		Note: Alum Colored Controllers are interchangeable. Black Colored Controllers are not available and not interchangeable with Alum Colored Controllers. Consult Factory for replacement.		
	2900868	Controller Configuration Kit	1	
-16	0902250	Bracket, Battery Charger	1	
-17	0641608	Bolt 3/8"-16NC x 1"	10	
-18	4751600	Flatwasher 3/8"	20	
-19	3311605	Locknut 3/8"-16NC	10	
-20	3740120	Relay	1	
-21	3539565	Plate, Pump Mounting	1	
-22	2680432	Hood	1	
-23	0400122	Battery (Wet)	2	
	Consult Factory	Battery (Dry)	2	
-24	3300202	Wingnut 1/4"-20NC	4	
-25	0630504	J-Bolt	4	
-26	0362604	Bar, Hold-Down (Prior to S/N 0130001409)	2	
	0362658	Bar, Hold-Down (S/N 0130001409 to Present))	2	
-27	Not Used			
-28	4845266	Bracket, Brake Release	1	
-29	4360314	Switch, Ground	1	
-30	3740069	Relay	2	
-31	3911010	Screw, Machine #10-24NC x 3/4"	2	
-32	4751000	Flatwasher #10	4	
-33	3311001	Nut #10-24NC	2	
-34	0741605	Screw, Countersunk 3/8-16NC x 5/8"	2	
-35	0100051	Grease, Battery (Not Shown)	A/R	
-36	4761000	Lockwasher #10	2	

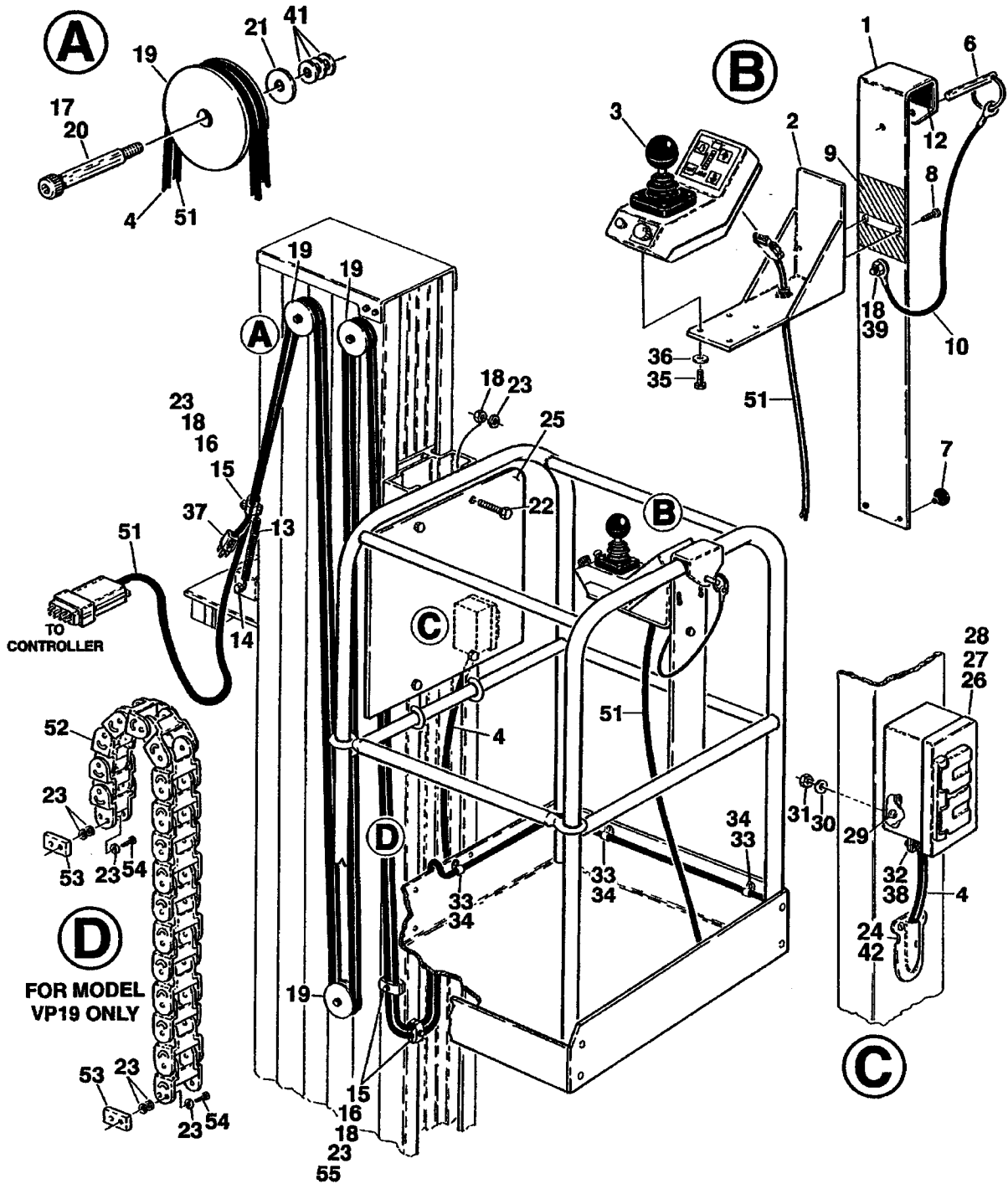
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-1		GROUND CONTROLS/POWER PACK INSTALLATIONS (CONTINUED)	Ref.	
	0861039	GROUND CONTROL ASSEMBLY	Ref.	A
-101	7017701	Switch, Push-Turn to Reset (Emergency Stop)	1	
	7017703	Block, Contact - N.C.	2	
	7017715	Button - Red	1	
-102	7017700	Switch, Key (Lift)	1	
	7017702	Block, Contact - N.O.	2	
-102A	7017704	Key, Replacement	1 set	
-103		Strain Relief Connector Options:	1	
	7012637	Connector, Strain Relief (CG16)		
	7017713	Connector, Strain Relief (CG20)		
-104	7017706	Nameplate - Emergency Stop	1	
-105	7017705	Nameplate - Select	1	

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FIGURE 10-2-2. PLATFORM CONTROLS AND CABLES INSTALLATIONS.



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-2		PLATFORM CONTROLS AND CABLES INSTALLATIONS	Ref.	
		PLATFORM CONTROLS AND CABLES INSTALLATION (STANDARD PARTS)	Ref.	
-1	4845339	Plate, Control Mounting	1	
-2	4845265	Bracket, Control Box Mounting	1	
-3	See Note	Platform Control Box Assembly Options: S/Ns 0130000001 to 0130000033, 0130000041 and 0130000060 to 0130000085 Note: 1600237 Box (Metallic/Front Plug in) is no longer available. Replace with 1600243 Box (Black Plastic/Rear Plug in) and Newer Style Platform Harness. See heading at top of Items 101-107 of this Parts List for Harness List.	1	
	1600243	S/Ns 0130000034 to 0130000040, 010000042 to 0130000059 and 0130000086 to Present		
-4	1060564	Cable, Electrical 10VP 15VP 20VP	A/R 13.5ft/4.m 19ft/5.8m 23ft/7m	
-5	Not Used			
-6	3422551	Pin, Hitch	1	
-7	0940074	Bumper	2	
-8	3900228	Screw, Shoulder #4-40NC	2	
-9	4420055	Tape	6in/15cm	
-10	1060380	Cable, Lanyard	1	
-11	Not Used			
-12	4280296	Pad, Wear	9in/23cm	
-13	4160130	Spring, Extension	1	
-14	3311605	Locknut 3/8"-16NC	1	
-15	1320238	Clamp	3	
-16	0641410	Bolt 1/4"-20NC x 1 1/4"	3	
-17	0100019	Loctite #271	A/R	
-18	3311405	Locknut 1/4"-20NC	A/R	
-19	3580231	Sheave, Cable 10VP and 15VP 20VP	A/R 1 3	
-20	3900200	Screw, Shoulder 5/16-18NC x 1 1/4"	A/R	
-21	4751500	Flatwasher 5/16"	A/R	
-22	0641406	Bolt 1/4"-20NC 3/4"	4	
-23	4711400	Flatwasher 1/4" Narrow	A/R	
-24	4460566	Connector, Strain Relief - 90°	1	
-25	3380424	Panel, Control	1	
-26	0860946	Box, Electrical	1	
-27	4460190	Receptacle, Electrical	1	
-28	4060092	Cover, Weatherproof	1	
-29	0721005	Screw, Machine #10-24NC x 5/8"	2	
-30	4761000	Lockwasher #10	2	

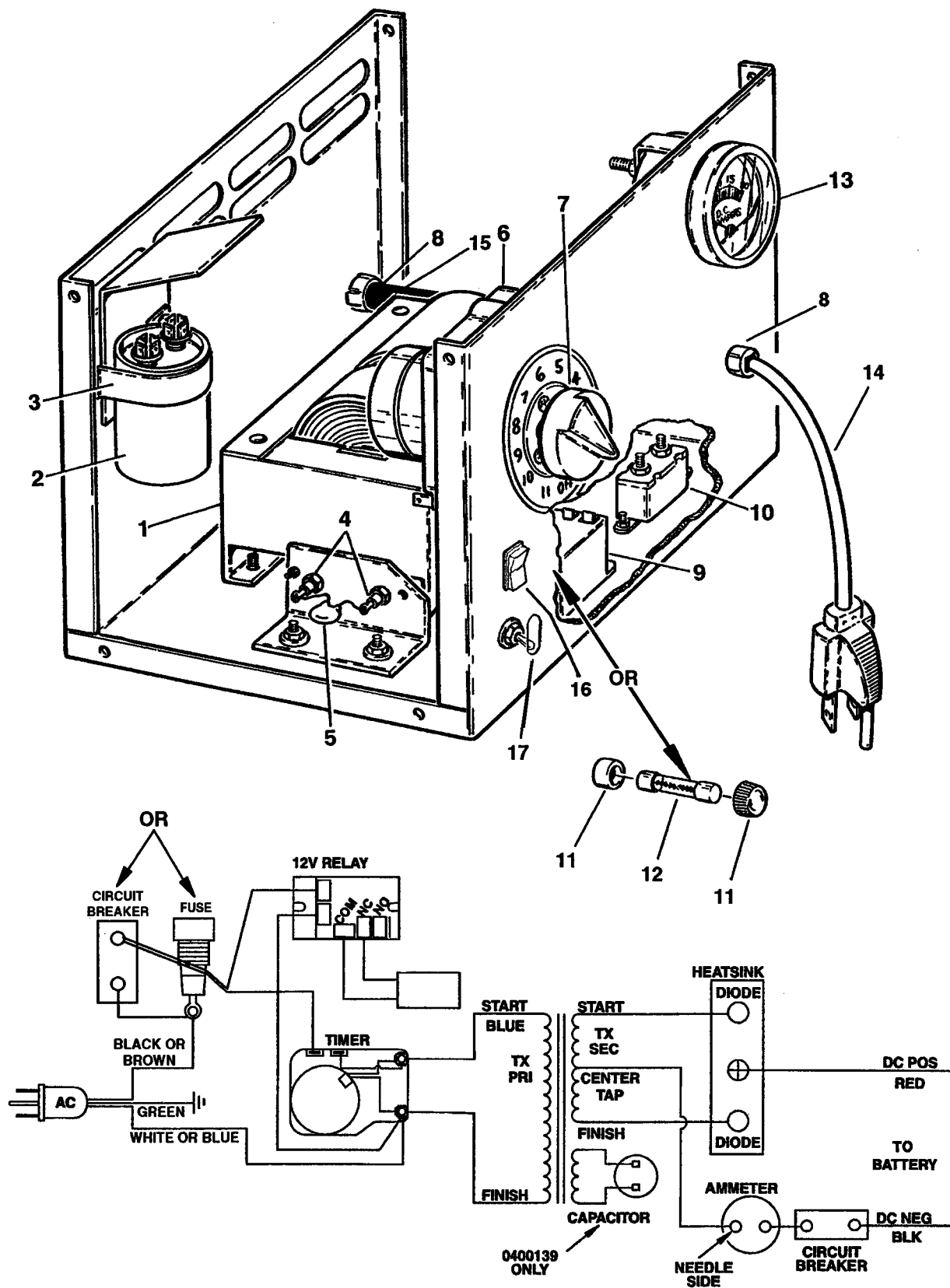
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-2		PLATFORM CONTROLS AND CABLES INSTALLATIONS (CONTINUED)	Ref.	
-31	3311001	Nut #10-24NC	2	
-32	4460023	Connector, Strain Relief	1	
-33	1320227	Clamp, Cable	7	
-34	1020008	Button, Nylon	7	
-35	3900212	Screw, Machine #4 -40NC x 3/8"	4	
-36	4750400	Flatwasher #4	4	
-37	Supply Locally	Plug, Electrical	1	
-38	0960407	Bushing	1	
-39	0641404	Bolt 1/4"-20NC x 1/2"	1	
-40	0100011	Loctite #242 (Not Shown)	A/R	
-41	4751000	Flatwasher #10	3	
-42	3300047	Nut, Conduit	1	
	0256133	PLATFORM CONTROLS AND CABLES INSTALLATION - 10VP (VARIABLE PARTS)	Ref.	10
-51	4921815	Platform Console Harness Assembly (See Section 10-7 For Breakdown)	1	
-52 to -55	Not Required			
	0256132	PLATFORM CONTROLS AND CABLES INSTALLATION - 15VP (VARIABLE PARTS)	Ref.	10
-51	4921812	Platform Console Harness Assembly (See Section 10-7 For Breakdown)	1	
-52	1180344	Carrier	1	
-53	3539612	Plate, Spacer	2	
-54	0641408	Bolt 1/4"-20NC x 1"	4	
-55	0641416	Bolt 1/4"-20NC x 2"	1	
	0256134	PLATFORM CONTROLS AND CABLES INSTALLATION - 20VP (VARIABLE PARTS)	Ref.	10
-51	4921816	Platform Console Harness Assembly (See Section 10-7 For Breakdown)	1	
-52 to -55	Not Required			

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FIGURE 10-2-3. BATTERY CHARGER ASSEMBLIES.



SECTION 10-2 CONTROLS

SECTION 10 - 2 CONTROLS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-3		BATTERY CHARGER ASSEMBLIES Note: Battery Charger Serial Number Nameplate located on front of charger. To decode build date, look at first line for Charger Spec and Date Code. Prior to Mid-February 1996 Example: BA515 (Spec) AT (Date Code). First Letter in the Date Code indicates month (A-January/B-February/C-March/etc. with exception of the Letter 'I' which is not used). Second Letter indicates year (P-1994/S-1995/T-1996). After mid-February 1996 Example: BA515 (Spec) 9631 (Date Code). First and second digits in the Date Code indicates year. Third and fourth digits indicate the week of manufacture.	Ref.	
	0400139	BATTERY CHARGER ASSEMBLY - 120VAC/60HZ (BA863 CHARGER SPEC PRIOR TO DATE CODE 9648)	Ref.	B
-1	7011693	Transformer	1	
-2	7011692	Capacitor	1	
-3	7011542	Strap, Capacitor	1	
-4	7011559	Diode	2	
-5	7011596	Varistor	1	
-6	7011639	Timer	1	
-7	7011505	Knob, Timer	1	
-8	7011528	Connector, Strain Relief	2	
-9	7011690	Relay (Prior to Date Code 9614)	1	
	7018506	Relay (Date Code 9614 to Present)	1	
-10	7011509	Breaker, Circuit	1	
-11	7011507	Holder, Fuse	1	
-12	7011548	Fuse - 10 Amp	1	
-13	7011691	Ammeter	1	
-14	7011698	AC Cord Assembly	1	
-15	7018505	DC Harness Assembly	1	
-16 to -17	Not Required			
	0400154	BATTERY CHARGER ASSEMBLY - 120VAC/60HZ (BA863 CHARGER SPEC DATE CODE 9648 TO PRESENT)	Ref.	A
-1	7011693	Transformer	1	
-2	7011692	Capacitor	1	
-3	7011542	Strap, Capacitor	1	
-4	7011559	Diode	2	
-5	7011596	Varistor	1	
-6	7011639	Timer	1	
-7	7011505	Knob, Timer	1	
-8	7011528	Connector, Strain Relief	2	
-9	7018506	Relay	1	
-10	7011509	Breaker, Circuit - DC	1	
-11	Not Required			
-12	Not Required			
-13	7011691	Ammeter	1	
-14	7011698	AC Cord Assembly	1	
-15	7018505	DC Harness Assembly	1	
-16	7018514	Breaker, Circuit - AC	1	
-17	Not Required			

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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-3		BATTERY CHARGER ASSEMBLIES (CONTINUED)	Ref.	
	0400152	BATTERY CHARGER ASSEMBLY - 200-240VAC/50HZ (BA864 CHARGER SPEC)	Ref.	A
-1	7018534	Transformer	1	
-2	7011692	Capacitor	1	
-3	7011560	Strap, Capacitor	1	
-4	7011559	Diode	2	
-5	7018537	Varistor	1	
-6	7011636	Timer	1	
-7	7011505	Knob, Timer	1	
-8	7011528	Connector, Strain Relief	2	
-9	7018535	Relay	1	
-10	7011509	Breaker, Circuit	1	
-11	Not Required			
-12	Not Required			
-13	7011691	Ammeter	1	
-14	7018515	AC Cord Assembly	1	
-15	7018505	DC Harness Assembly	1	
-16	7018536	Breaker, Circuit - AC	1	
-17	Not Required			
	0400142	BATTERY CHARGER ASSEMBLY - 100VAC/50-60HZ (BA856 CHARGER SPEC)	Ref.	A
-1	7011696	Transformer	1	
-2	Not Used			
-3	Not Used			
-4	7011559	Diode	2	
-5	7011596	Varistor	1	
-6	7011639	Timer	1	
-7	7011505	Knob, Timer	1	
-8	7011528	Connector, Strain Relief	2	
-9	701690	Relay	1	
-10	7011509	Breaker, Circuit - DC	1	
-11	7011507	Holder, Fuse	1	
-12	7011548	Fuse - 10 Amp	1	
-13	7011691	Ammeter	1	
-14	7011698	AC Cord Assembly	1	
-15	7018505	DC Harness Assembly	1	
-16 to -17	Not Required			
	0400155	BATTERY CHARGER ASSEMBLY - 100VAC/50-60HZ (BA983 CHARGER SPEC)	Ref.	A
-1	7018541	Transformer	1	
-2	7011692	Capacitor	1	
-3	7011542	Strap, Capacitor	1	
-4	7011559	Diode	2	
-5	7011596	Varistor	1	
-6	7011639	Timer	1	

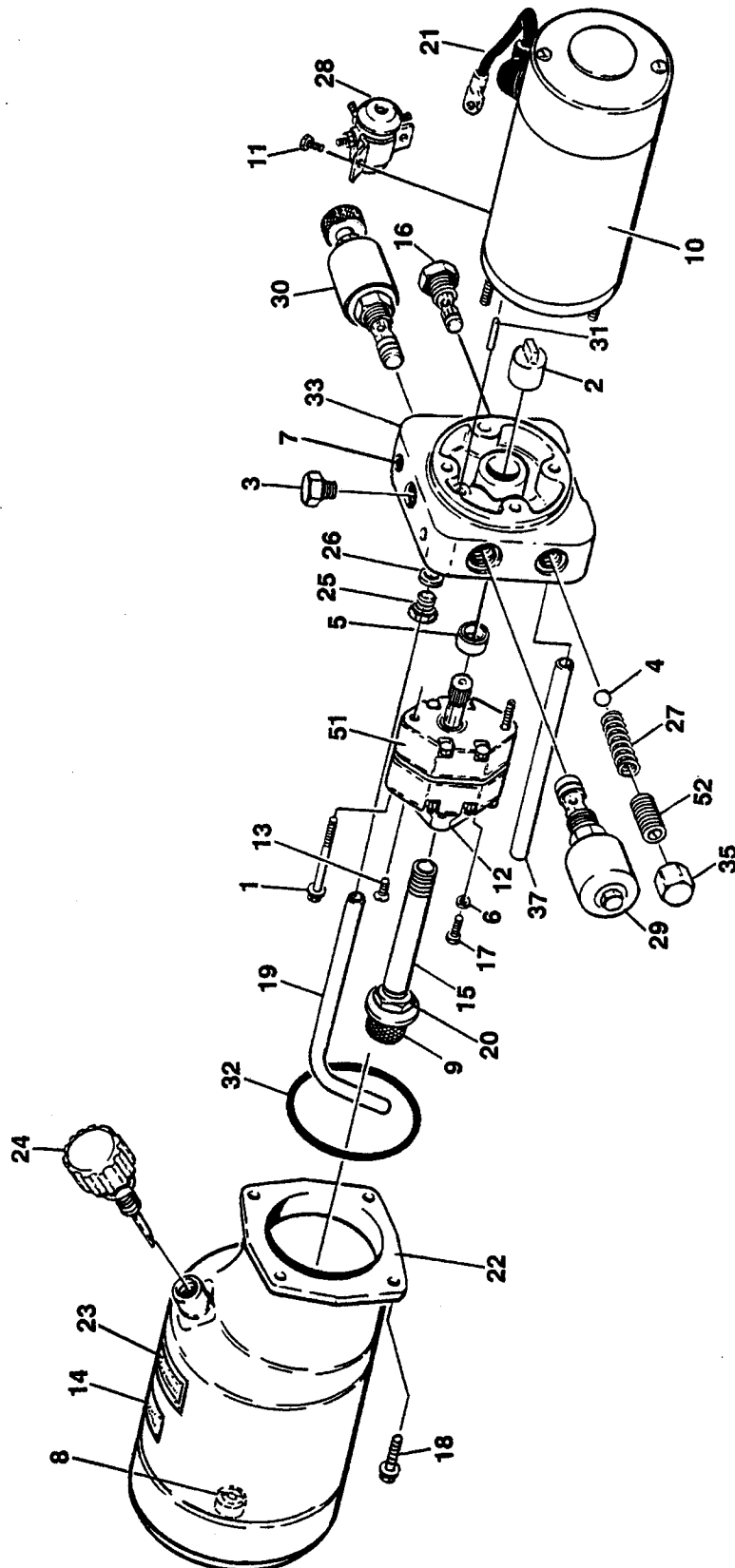
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-3		BATTERY CHARGER ASSEMBLIES (CONTINUED)	Ref.	
-7	7011505	Knob, Timer	1	
-8	7011528	Connector, Strain Relief	2	
-9	7018506	Relay	1	
-10	7011509	Breaker, Circuit - DC	1	
-11	Not Required			
-12	Not Required			
-13	7011691	Ammeter	1	
-14	Consult Factory	AC Cord Assembly	1	
-15	7018505	DC Harness Assembly	1	
-16	7018514	Breaker, Circuit - AC	1	
-17	7011552	Switch, Toggle - 50-60Hz	1	

SECTION 10-2 CONTROLS

FIGURE 10-2-4. PUMP/MOTOR/TANK ASSEMBLIES.



SECTION 10-2 CONTROLS

SECTION 10 - 2 CONTROLS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-4		PUMP/MOTOR/TANK ASSEMBLIES	Ref.	
		PUMP/MOTOR/TANK ASSEMBLY (STANDARD PARTS)	Ref.	
-1	0641522	Bolt 5/16"-18NCx 2 3/4"	2	
-2	PMP-835E-11	Coupling	1	
-3	7013714	Plug	1	
-4	7013715	Ball	1	
-5	7013716	Seal, Shaft	1	
-6	7013717	Washer	1	
-7	Not Serviced	Plug, Shipping	1	
-8	7013722	Magnet	1	
-9	7013723	Filter - 149 Micron	1	
-10	7016710	Motor	1	
	7016718	Brush Kit	1	
-11	7013758	Screw 1/4"-20NC	2	
-12	7013727	Cover	1	
-13	7013728	Screw M6 x 1	2	
-14	Not Serviced	Nameplate - Serial Number	1	
-15	7016719	Pipe, PCV	1	
-16	7013708	Valve, Check Cartridge	1	
-17	0641508	Bolt 5/16"-18NC x 1"	1	
-18	7016721	Bolt #12-24NC x 1/2"	4	
-19	7013791	Tube, Return	1	
-20	7016722	Nut 3/8" NPT	1	
-21	7013759	Cable, Electrical	1	
-22	7016712	Tank, Plastic	1	
-23	7016713	Decal - Tank Fill Line	1	
-24	7016714	Breather	1	
-25	7013792	Nut, Compression	1	
-26	7013793	Sleeve, Compression	1	
-27	7013733	Spring	1	
-28	7016711	Solenoid, Start	1	
-29	7016716	Valve, Solenoid Cartridge	1	
-30	7016723	Valve, Manual Override Cartridge	1	
-31	7013766	Pin	1	
-32	7013743	O-Ring	1	
-33	Not Serviced	Endhead	1	
-34	Not Used			
-35	7013750	Cap	1	
-36	7013720	Plug 1/16"	2	
-37	7016724	Tube	1	
	3600254	PUMP/MOTOR/TANK ASSEMBLY (10VP and 15VP) (VARIABLE PARTS)	Ref.	B
-51	7016717	Pump Assembly	1	
	7013701	Seal Kit - 7016717 Pump	1	
-52	7013770	Screw, Valve Adjustment	1	

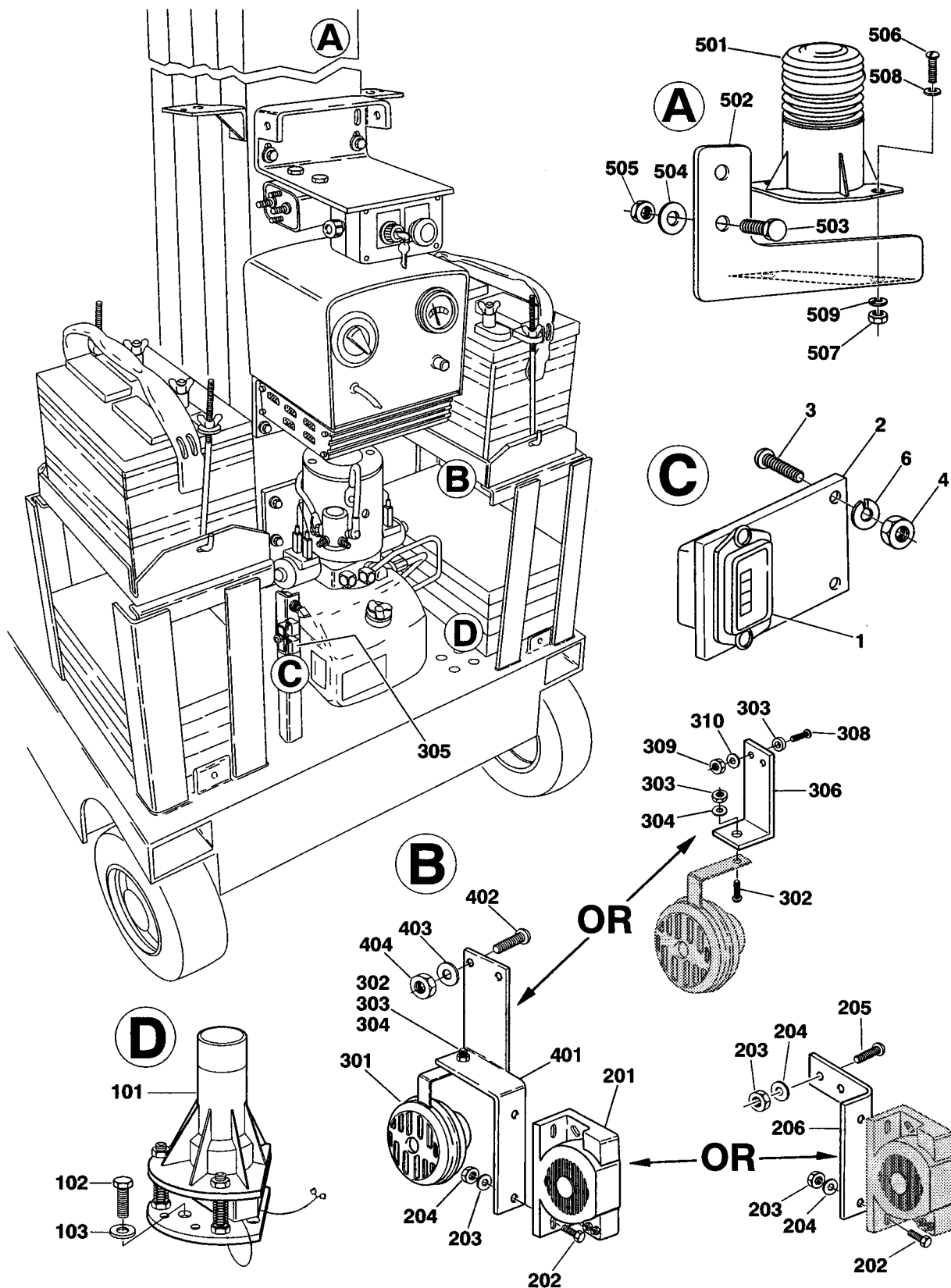
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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-4		PUMP/MOTOR/TANK ASSEMBLIES (CONTINUED)	Ref.	
	3600255	PUMP/MOTOR/TANK ASSEMBLY (20VP) (VARIABLE PARTS)	Ref.	B
-51	7013747	Pump Assembly	1	
	7013701	Seal Kit - 7013747 Pump	1	
-52	7013770	Screw, Valve Adjustment	1	

SECTION 10-2 CONTROLS

FIGURE 10-2-5. OPTION INSTALLATIONS.



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SECTION 10-2 CONTROLS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-5		OPTION INSTALLATIONS	Ref.	
	0256541	HOURLMETER INSTALLATION - OPTION	Ref.	B
-1	2420165	Gauge, Hourmeter	1	
-2	0902296	Bracket	1	
-3	3910608	Screw, Machine #6-32NC x 1/2"	4	
-4	3310601	Nut #6-32NC	4	
-5	Not Used			
-6	4760600	Lockwasher #6	4	
	0256545	TILT INDICATOR INSTALLATION - OPTION	Ref.	3
-101	4360435	Switch, Tilt	1	
-102	0641408	Bolt 1/4"-20NC x 1" (Prior to S/N 0130001233)	4	
	4300106	Stud, Grooved (S/N 0130001233 to Present)	4	
-103	4711400	Flatwasher 1/4" Narrow (Prior to S/N 0130001233 Only)	4	
-104	3311405	Locknut 1/4"-20NC (Prior to S/N 0130001233 Only)	4	
	0256540	ALARM INSTALLATION - OPTIONAL	Ref.	B
-201	0140033	Alarm (Remove Ground Strap Before Installing)	1	
-202	0641406	Bolt 1/4"-20NC x 3/4"	2	
-203	3311405	Locknut 1/4"-20NC	4	
-204	4711400	Flatwasher 1/4" Narrow	4	
-205	3911410	Screw, Machine 1/4"-20NC x 5/8"	2	
-206	0902356	Bracket (With Alarm Only)	1	
	0256539	HORN INSTALLATION - OPTIONAL	Ref.	C
-301	0140022	Horn	1	
-302	0641507	Bolt 5/16"-18NC x 7/8"	1	
-303	3311505	Locknut 5/16"-18NC	1	
-304	4711500	Flatwasher 5/16" Narrow	2	
-305	3740069	Relay	1	
-306	0902354	Bracket (With Horn Only)	1	
-307	3539964	Spacer	1	
-308	3911416	Screw, Machine 1/4"-20NC x 1"	2	
-309	3311405	Locknut 1/4"-20NC	2	
-310	4711400	Flatwasher 1/4" Narrow	2	
-311	3911010	Screw, Machine #10-24NC x 5/8"	1	
-312	3311001	Nut #10-24NC	1	
-313	4751000	Flatwasher #10	2	
-314	4761000	Lockwasher #10	1	
	0256538	BRACKET INSTALLATION - ALARM/HORN OPTION	Ref.	A
-401	0902295	Bracket	1	
-402	3911410	Screw, Machine 1/4"-20NC x 5/8"	2	
-403	3311401	Nut 1/4"-20NC	2	
-404	4711400	Flatwasher 1/4" Narrow	2	

SECTION 10-2 CONTROLS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-2-5		OPTION INSTALLATIONS (CONTINUED)	Ref.	
	0256546	BEACON LIGHT INSTALLATION	Ref.	C
-501		Beacon Light Assembly Options:	1	
	2920119	Prior to S/N 23604		
	2920146	S/N 23604 to Present		
-501A	7016319	Bulb, Light	1	
-501B		Amber Lens Options:	1	
	7016320	Lens - 3 1/8" Height		
	7016372	Lens - 4 1/8" Height		
-502	0902297	Bracket	1	
-503	0641610	Bolt 3/8"-16NC x 1 1/4"	2	
-504	3311605	Locknut 3/8"-16NC	2	
-505	4711600	Flatwasher 3/8" Narrow	4	
-506	3911010	Screw, Machine #10-24NC x 5/8"	2	
-507	3311001	Nut #10-24NC	2	
-508	4751000	Flatwasher #10	2	
-509	4761000	Lockwasher #10	2	

SECTION 10-3 MAST

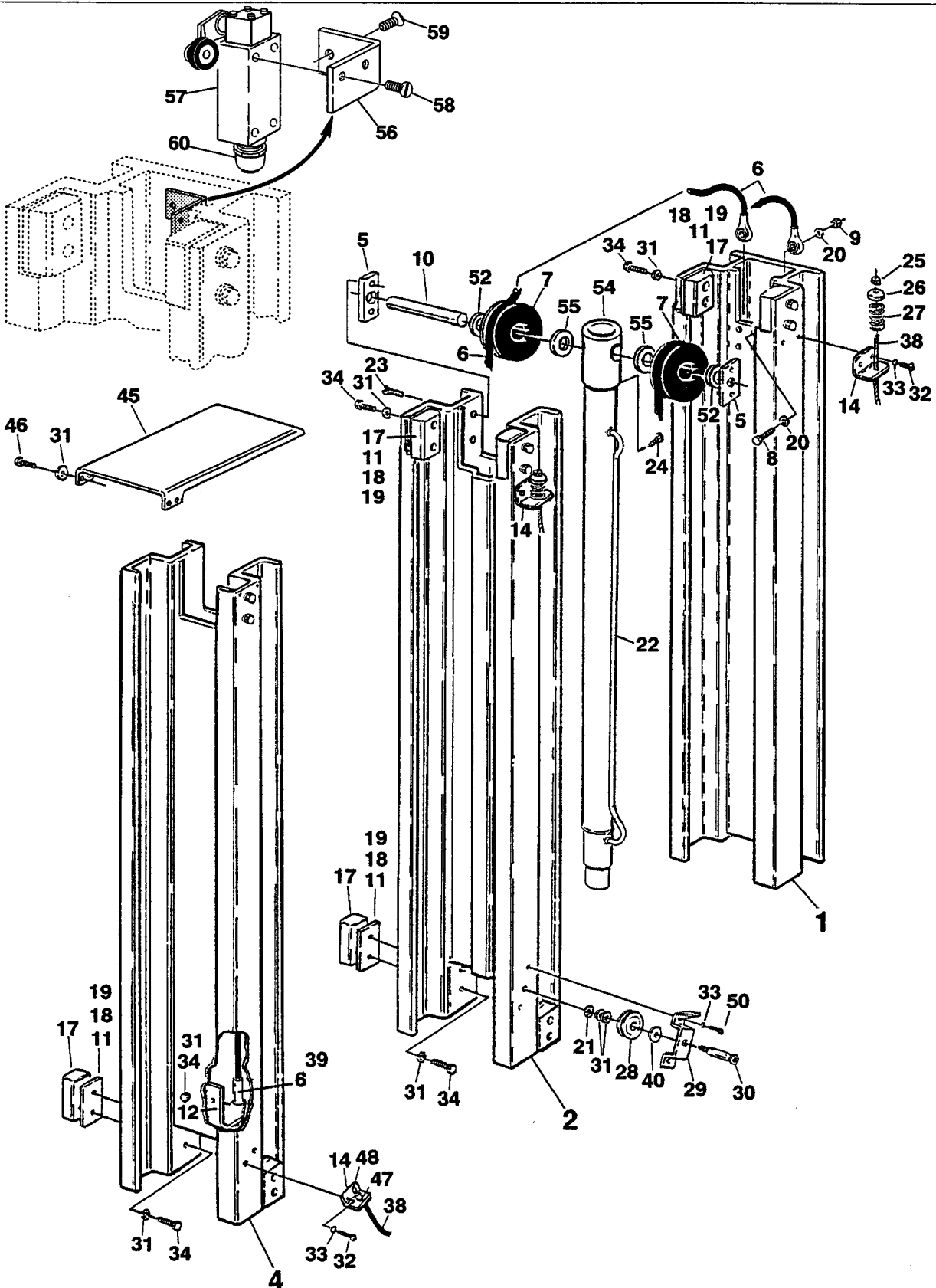
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SECTION 10-3 MAST

FIGURE 10-3-1. MAST ASSEMBLY - 10VP.



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-1	0801069	MAST ASSEMBLY - 10VP	Ref.	D
-1	1271313	Channel, Mast - #1	1	
-2	1271238	Channel, Mast - #2	1	
-3	Not Used			
-4	1271316	Channel, Mast - #3	1	
-5	0362377	Bar, Sheave Pin	2	
-6	1060546	Cable Assembly	2	
-7	3580217	Cable, Sheave	2	
-8	0641610	Bolt 3/8"-16NC x 1 1/4"	2	
-9	3311605	Locknut 3/8"-16NC	2	
-10	3422361	Pin, Sheave	1	
-11	4070860	Shim 5/64"	15	
-12	0901992	Bracket - Bottom	1	
-13	Not Used			
-14	0902047	Bracket	1	
-15	Not Used			
-16	Not Used			
-17	3340704	Pad, Slide	8	
-18	4070861	Shim 1/32"	3	
-19	4070862	Shim 1/64"	10	
-20	4751600	Flatwasher 3/8"	2	
-21	4761600	Lockwasher 3/8"	1	
-22	1683201	Lift Cylinder Assembly (See Section 10-5 For Breakdown)	1	
-23	3900192	Capscrew, Flathead 3/8"-16NC x 1/2"	4	
-24	3900206	Capscrew 1/4"-28NF x 5/8"	1	
-25	3311405	Locknut 1/4"-20NC	1	
-26	4740414	Cupwasher	1	
-27	4160124	Spring	1	
-28	3580228	Sheave, Cable	1	
-29	0902042	Bracket, Pulley	1	
-30	3900187	Screw, Shoulder 5/16"-18NC x 1/2"	1	
-31	4711400	Flatwasher 1/4" Narrow	34	
-32	3900191	Screw #10-24NC x 3/4"	2	
-33	4761000	Lockwasher #10	8	
-34	0641406	Bolt 1/4"-20NC x 3/4"	12	
-35	Not Used			
-36	Not Used			
-37	Not Used			
-38	1060541	Cable, Sequence	1	
-39	3311601	Nut 3/8"-16NC	4	
-40	4751500	Flatwasher 5/16"	1	
-41	3340709	Pad, Slide	2	
-42	Not Used			
-43	Not Used			
-44	Not Used			

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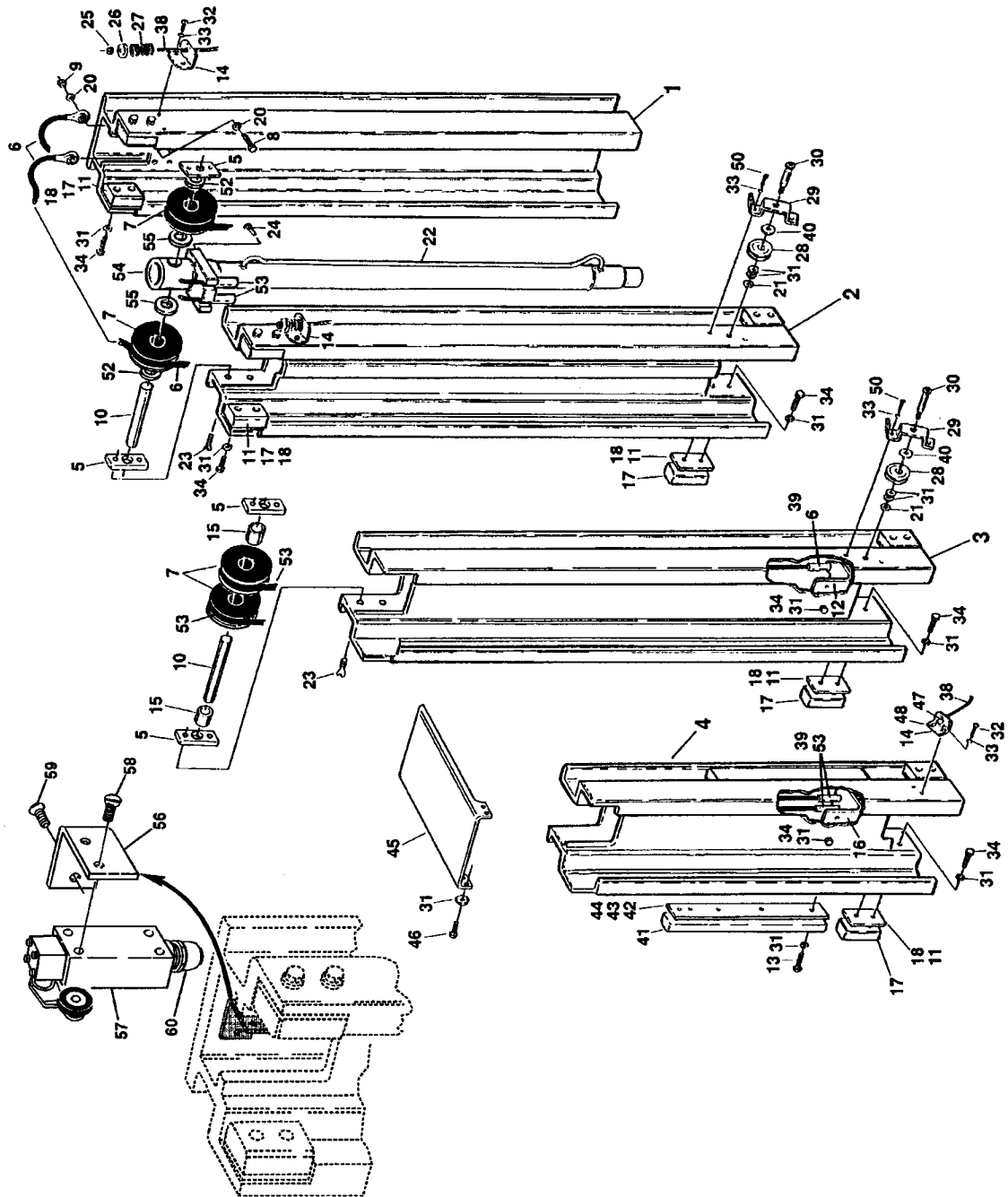
SECTION 10-3 MAST

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-1	0801069	MAST ASSEMBLY - 10VP (CONTINUED)	Ref.	
-45	4060877	Shield, Cover	1	
-46	0641404	Bolt 1/4"-20NC x 1/2"	4	
-47	4220160	Sleeve, Stop	1	
-48	4460121	Connector, Cap	1	
-49	3020028	Lubricant, Graphkote	A/R	
-50	3900205	Screw, Phillips	2	
-51	0100071	Loctite	A/R	
-52	4566838	Tube, Spacer	2	
-53	Not Used			
-54	4566846	Tube, Cylinder Cable Mounting	1	
-55	4566960	Tube, Spacer	2	
-56	0902285	Bracket, Limit Switch	1	
-57	4360437	Switch, Limit	1	
-58	3911020	Screw, Machine #10-24NC x 1 1/4"	2	
-59	0740602	Screw, Socket Head Countersunk #6-32NC x 1/4"	2	
-60	4460662	Connector, Strain Relief	1	

	2901420	Mast Kit (Includes Items 1-4)	1	

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FIGURE 10-3-2. MAST ASSEMBLY - 15VP.



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-2	0801048	MAST ASSEMBLY - 15VP	Ref.	C
-1	1271313	Channel, Mast - #1	1	
-2	1271238	Channel, Mast - #2	1	
-3	1271314	Channel, Mast - #3	1	
-4	1271312	Channel, Mast - #4	1	
-5	0362377	Bar, Sheave Pin	4	
-6	1060546	Cable Assembly	2	
-7	3580217	Cable, Sheave	4	
-8	0641610	Bolt 3/8"-16NC x 1 1/4"	2	
-9	3311605	Locknut 3/8"-16NC	2	
-10	3422361	Pin, Sheave	1	
-11	4070860	Shim 5/64"	15	
-12	0901992	Bracket - Bottom	1	
-13	0641410	Bolt 1/4"-20NC x 1 1/4"	10	
-14	0902047	Bracket	2	
-15	4566487	Tube, Spacer	2	
-16	0901993	Bracket, Bottom	1	
-17	3340704	Pad, Slide	10	
-18	4070861	Shim 1/32"	3	
-19	4070862	Shim 1/64"	10	
-20	4751600	Flatwasher 3/8"	2	
-21	4761600	Lockwasher 3/8"	2	
-22	1683201	Lift Cylinder Assembly (See Section 10-5 For Breakdown)	1	
-23	3900192	Capscrew, Flathead 3/8"-16NC x 1/2"	8	
-24	3900206	Capscrew 1/4"-28NF x 5/8"	2	
-25	3311405	Locknut 1/4"-20NC	2	
-26	4740414	Cupwasher	2	
-27	4160124	Spring	2	
-28	3580228	Sheave, Cable	2	
-29	0902042	Bracket, Pulley	2	
-30	3900187	Screw, Shoulder 5/16"-18NC x 1/2"	2	
-31	4711400	Flatwasher 1/4" Narrow	46	
-32	3900191	Screw #10-24NC x 3/4"	4	
-33	4761000	Lockwasher #10	8	
-34	0641406	Bolt 1/4"-20NC x 3/4"	30	
-35	Not Used			
-36	Not Used			
-37	Not Used			
-38	1060541	Cable, Sequence	2	
-39	3311601	Nut 3/8"-16NC	8	
-40	4751500	Flatwasher 5/16"	2	
-41	3340709	Pad, Slide	2	
-42	4070875	Shim 5/64"	A/R	
-43	4070876	Shim 3/64"	A/R	
-44	4070877	Shim 1/64"	A/R	

SECTION 10-3 MAST

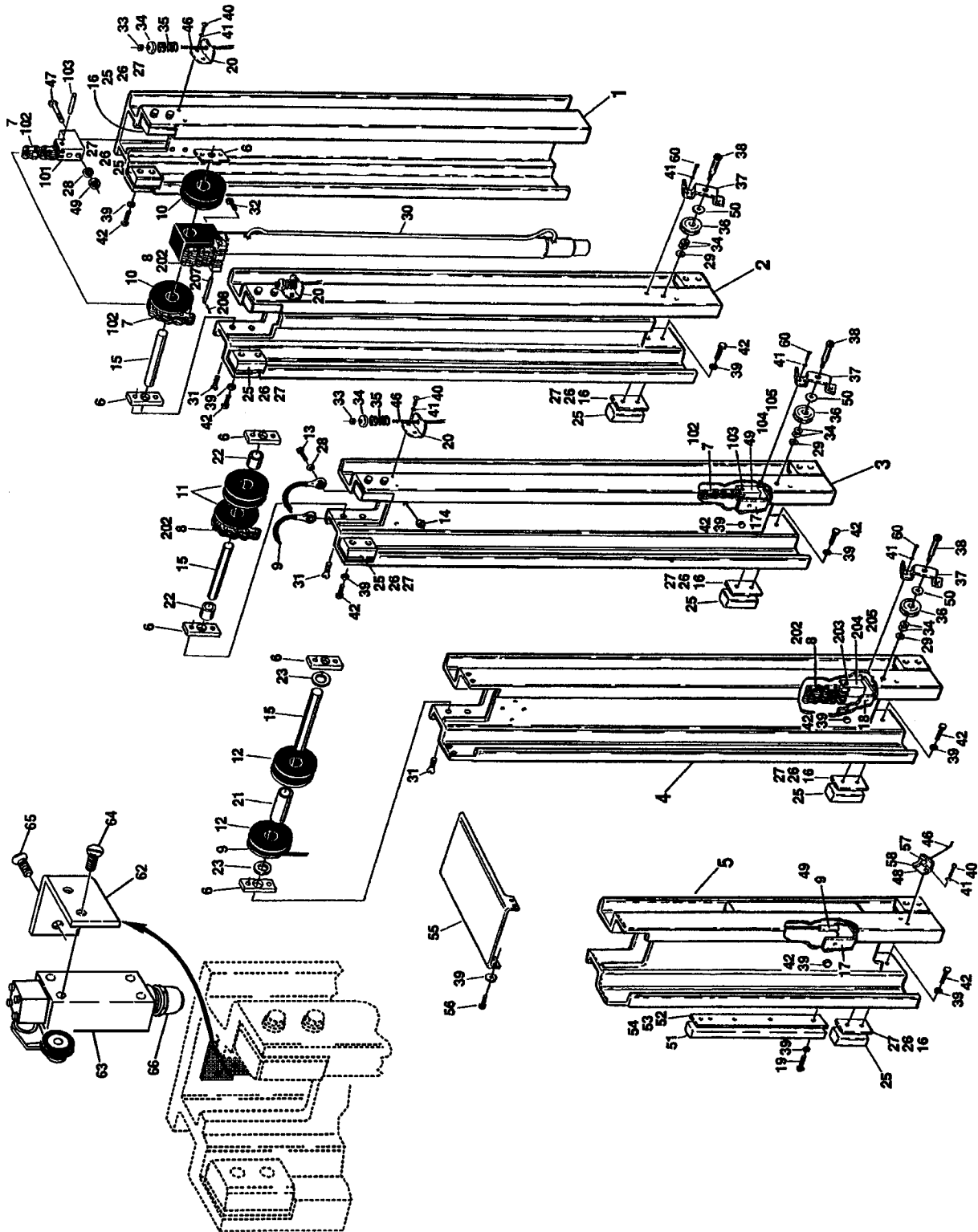
SECTION 10 - 3 MAST

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-2	0801048	MAST ASSEMBLY - 15VP (CONTINUED)	Ref.	
-45	4060877	Shield, Cover	1	
-46	0641404	Bolt 1/4"-20NC x 1/2"	4	
-47	4220160	Sleeve, Stop	2	
-48	4460121	Connector, Cap	2	
-49	3020028	Lubricant, Graphkote	A/R	
-50	3900205	Screw, Phillips	4	
-51	0100071	Loctite	A/R	
-52	4566838	Tube, Spacer	2	
-53	1060598	Cable, Mast Extension	2	
-54	4845132	Tube, Cylinder Cable Mounting	1	
-55	4566960	Tube, Spacer	2	
-56	0902285	Bracket, Limit Switch	1	
-57	4360437	Switch, Limit	1	
-58	3911020	Screw, Machine #10-24NC x 1 1/4"	2	
-59	0740602	Screw, Socket Head Countersunk #6-32NC x 1/4"	2	
-60	4460662	Connector, Strain Relief	1	

	2901421	Mast Kit (Includes Items 1-4)	1	

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FIGURE 10-3-3. MAST ASSEMBLY - 20VP.



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FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-3	0801070	MAST ASSEMBLY - 20VP	Ref.	C
-1	1271313	Channel, Mast - #1	1	
-2	1271238	Channel, Mast - #2	1	
-3	1271239	Channel, Mast - #3	1	
-4	1271312	Channel, Mast - #5	1	
-5	1271314	Channel, Mast - #4	1	
-6	0362377	Bar, Sheave Pin	6	
-7	1260305	Chain Assembly - #466 (See Items 101-106 for Breakdown)	2	
-8	1260306	Chain Assembly - #444 (See Items 201-206 for Breakdown)	2	
-9	1060546	Cable Assembly	2	
-10	3580227	Sheave, Chain - #466	2	
-11	3580226	Sheave, Chain - #444	2	
-12	3580217	Cable, Sheave	2	
-13	0641610	Bolt 3/8"-16NC x 1 1/4"	2	
-14	3311605	Locknut 3/8"-16NC	6	
-15	3422361	Pin, Sheave	3	
-16	4070860	Shim 5/64"	16	
-17	0901992	Bracket - Bottom	2	
-18	0901993	Bracket, Bottom	1	
-19	0641410	Bolt 1/4"-20NC x 1 1/4"	10	
-20	0902047	Bracket	3	
-21	4566486	Tube, Spacer	1	
-22	4566487	Tube, Spacer	2	
-23	4712600	Flatwasher 1" Narrow	2	
-24	Not Used			
-25	3340704	Pad, Slide	14	
-26	4070861	Shim 1/32"	2	
-27	4070862	Shim 1/64"	9	
-28	4751600	Flatwasher 3/8"	8	
-29	4761400	Lockwasher 1/4"	3	
-30	1683201	Lift Cylinder Assembly (See Section 10-5 For Breakdown)	1	
-31	3900192	Capscrew, Flathead 3/8"-16NC x 1/2"	12	
-32	3900206	Capscrew 1/4"-28NF x 5/8"	1	
-33	3311405	Locknut 1/4"-20NC	3	
-34	4740414	Cupwasher	3	
-35	4160124	Spring	3	
-36	3580228	Sheave, Cable	3	
-37	0902042	Bracket, Pulley	3	
-38	3900187	Screw, Shoulder 5/16"-18NC x 1/2"	3	
-39	4711400	Flatwasher 1/4" Narrow	68	
-40	3900191	Screw #10-24NC x 3/4"	8	
-41	4761000	Lockwasher #10	14	
-42	0641406	Bolt 1/4"-20NC x 3/4"	32	
-43	Not Used			
-44	Not Used			

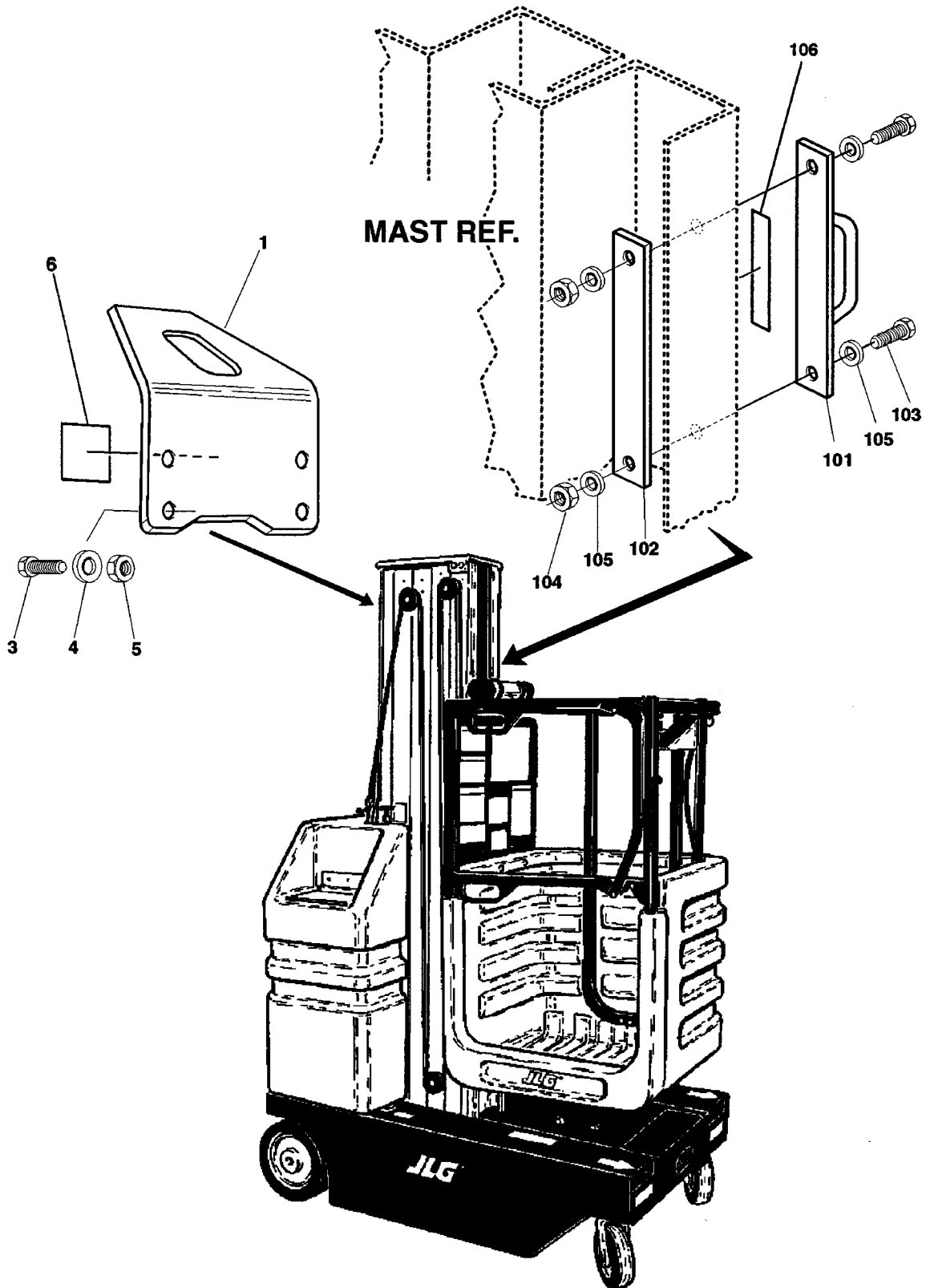
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SECTION 10 - 3 MAST

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-3	0801070	MAST ASSEMBLY - 20VP (CONTINUED)	Ref.	
-45	Not Used			
-46	1060541	Cable, Sequence	3	
-47	0641620	Bolt 3/8"-16NC x 2 1/2"	4	
-48	0902084	Bracket	1	
-49	3311601	Nut 3/8"-16NC	16	
-50	4751500	Flatwasher 5/16"	3	
-51	3340709	Pad, Slide	2	
-52	4070875	Shim 5/64"	A/R	
-53	4070876	Shim 3/64"	A/R	
-54	4070877	Shim 1/64"	A/R	
-55	4060877	Shield, Cover	1	
-56	0641404	Bolt 1/4"-20NC x 1 1/2"	4	
-57	4220160	Sleeve, Stop	3	
-58	4460121	Connector, Cap	3	
-59	3020028	Lubricant, Graphkote	A/R	
-60	3900205	Screw, Phillips	6	
-61	0100071	Loctite	A/R	
-62	0902285	Bracket, Limit Switch	1	
-63	4360437	Switch, Limit	1	
-64	3911020	Screw, Machine #10-24NC x 1 1/4"	2	
-65	0740602	Screw, Socket Head Countersunk #6-32NC x 1/4"	2	
-66	4460662	Connector, Strain Relief	1	
	2901422	----- Mast Kit (Includes Items 1-5)	1	
	1260305	CHAIN ASSEMBLY - #466 CHAIN	Ref.	B
-101	0561156	Block	1	
-102	1260299	Chain	68in/1.73m	
-103	3422265	Pin	2	
	3450201	Pin, Cotter 1/16" x 1/2"	4	
-104	0561150	Block	1	
-105	4300111	Stud	1	
-106	0100019	Loctite #RC640 (Not Shown)	A/R	
	1260306	CHAIN ASSEMBLY - #444 CHAIN	Ref.	B
-201	0561159	Block	1	
-202	1260298	Chain	137in/3.48m	
-203	3422346	Pin, Grooved	2	
-204	0561151	Block	2	
-205	4300111	Stud	2	
-206	0100062	Loctite #RC640 (Not Shown)	A/R	
-207	3422266	Pin	1	
-208	3450201	Pin, Cotter 1/16" x 1/2"	2	

SECTION 10-3 MAST

FIGURE 10-3-4. MAST MOUNTED COMPONENTS.



SECTION 10-3 MAST

SECTION 10-3 MAST

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-3-4		MAST MOUNTED COMPONENTS	Ref.	
	0255019	CRANE HOOK INSTALLATION	Ref.	C
-1	3538591	Plate, Hook	1	
-2	Not Used			
-3	0641609	Bolt 3/16"-16NC x 1 1/8"	4	
-4	4711600	Flatwasher 3/16" Narrow	4	
-5	3311601	Nut 3/16"-16NC	4	
-6	1701500	Decal - Lifting Lug (Prior to S/N 0130001293)	1	
	1703455	Decal - Lifting Lug (S/N 0130001293 to Present)	1	
	1282728	SAFETY ATTACH INSTALLATION (STANDARD PARTS)	Ref.	B
-101	4845345	Safety Attach Weldment	1	
-102	3539814	Plate, Backing	1	
-103	0641812	Bolt 1/2"-13NC x 1 1/2"	2	
-104	3271805	Locknut 1/2"-13NC	2	
-105	4751800	Flatwasher 1/2"	4	
	0256559	SAFETY ATTACH INSTALLATION (COMMON OPTION) (VARIABLE PARTS)	Ref.	B
-106	1702612	Decal - Lanyard Attach	1	
	0257114	SAFETY ATTACH INSTALLATION (GM/HERTZ OPTION) (VARIABLE PARTS)	Ref.	-
-106	1703175	Decal - Lanyard Attach	1	

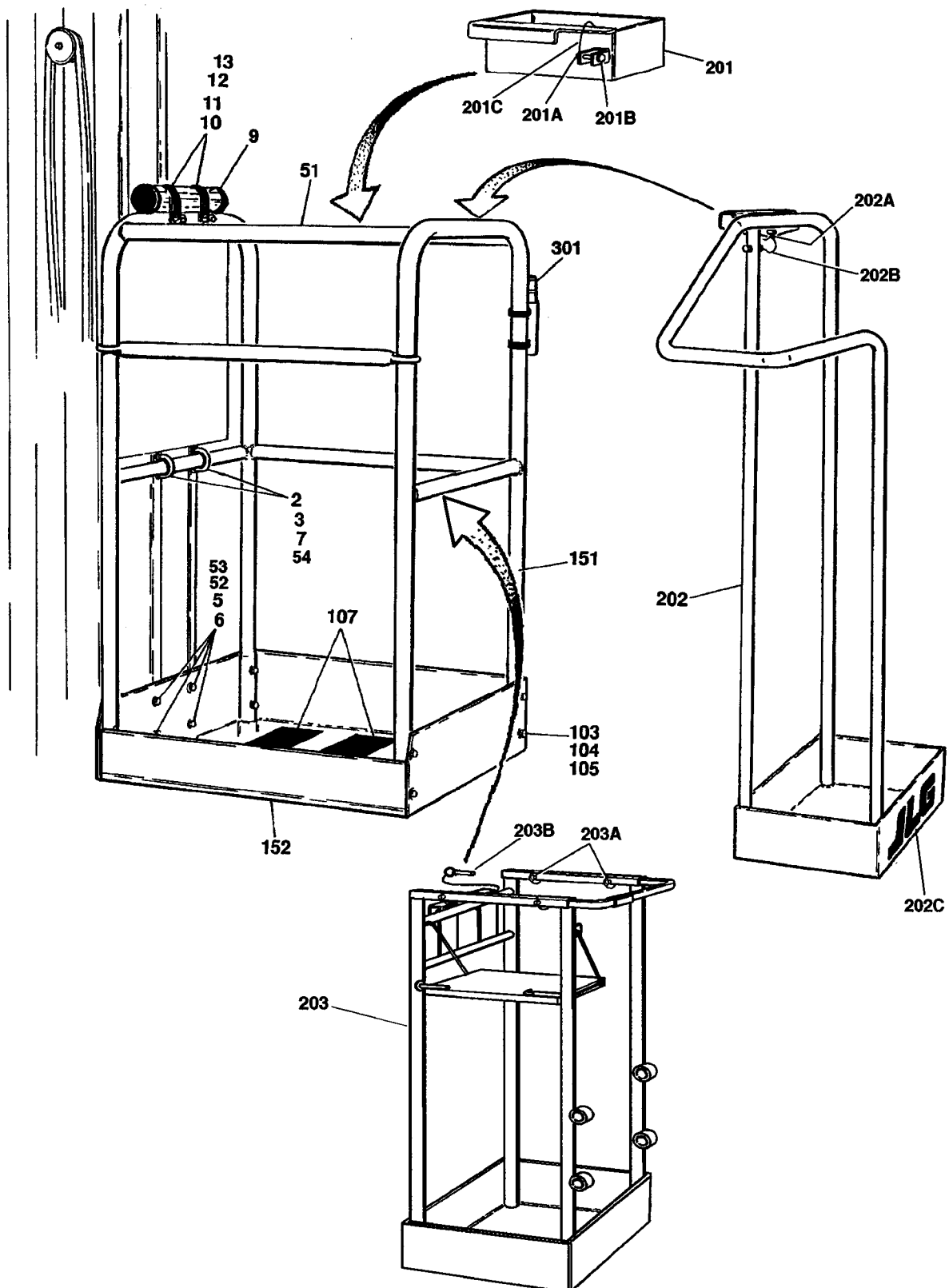
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SECTION 10-4 PLATFORM

FIGURE 10-4-1. PLATFORM COMPONENTS INSTALLATION.



SECTION 10-4 PLATFORM

SECTION 10 - 4 P L A T F O R M

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-4-1		PLATFORM COMPONENT INSTALLATIONS	Ref.	
		ALUMINUM PLATFORM INSTALLATION (STANDARD PARTS)	Ref.	
-1	Not Used			
-2	1320211	U-Bolt	2	
-3	4711500	Flatwasher 5/16" Narrow	4	
-4	0641408	Bolt 1/4"-20NC x 1"	4	
-5	4711400	Flatwasher 1/4"	8	
-6	3311405	Lock Nut 1/4"-20NC	4	
-7	3311501	Nut 5/16"-18NC	4	
-8	0100011	Loctite #242 (Not Shown)	A/R	
-9	4566780	Manual Tube Options	1	
-10	1320219	Tube Clamp Options	2	
-11	0630486	Screw 5/16"-18NC x 1" (May 1995 to Present)	2	
-12	4751500	Flatwasher 1/4" (May 1995 to Present)	2	
-13	3311505	Locknut 5/16"-18NC (May 1995 to Present)	2	
	0254880	ALUMINUM PLATFORM INSTALLATION - 22" x 22"	Ref.	RL-B
		STANDARD MACHINES (VARIABLE PARTS)		
-51	3510472	Platform Weldment - 22" x 22"	1	
-52	0641408	Bolt 1/4"-20NC x 1"	4	
-53 to -54	Not Required			
	0256926	ALUMINUM PLATFORM INSTALLATION - 22" x 22"	Ref.	-
		CSA MACHINES (VARIABLE PARTS)		
-51	3510472	Platform Weldment - 22" x 22"	1	
-52	0641416	Bolt 1/4"-20NC x 2"	4	
-53	4070955	Shim, Platform (Floorpan)	1	
-54	4070956	Shim, Platform (Midrail)	2	
	0254879	ALUMINUM PLATFORM INSTALLATION - 26" x 26"	Ref.	B
		STANDARD MACHINES (VARIABLE PARTS)		
-51	3510471	Platform Weldment - 26" x 26"	1	
-52	0641408	Bolt 1/4"-20NC x 1"	4	
-53 to -54	Not Required			
	0256912	ALUMINUM PLATFORM INSTALLATION - 26" x 26"	Ref.	-
		CSA MACHINES (VARIABLE PARTS)		
-51	3510471	Platform Weldment - 26" x 26"	1	
-52	0641416	Bolt 1/4"-20NC x 2"	4	
-53	4070955	Shim, Platform (Floorpan)	1	
-54	4070956	Shim, Platform (Midrail)	2	
		PLATFORM ASSEMBLIES (STANDARD PARTS)	Ref.	
-101	Not Used			
-102	Not Used			
-103	0641414	Bolt 1/4"-20NC x 1 3/4"	8	
-104	4751400	Flatwasher 1/4"	16	
-105	3311405	Locknut 1/4"-20NC	8	
-106	Not Used			
-107	4420039	Tape, Non-Skid	A/R	

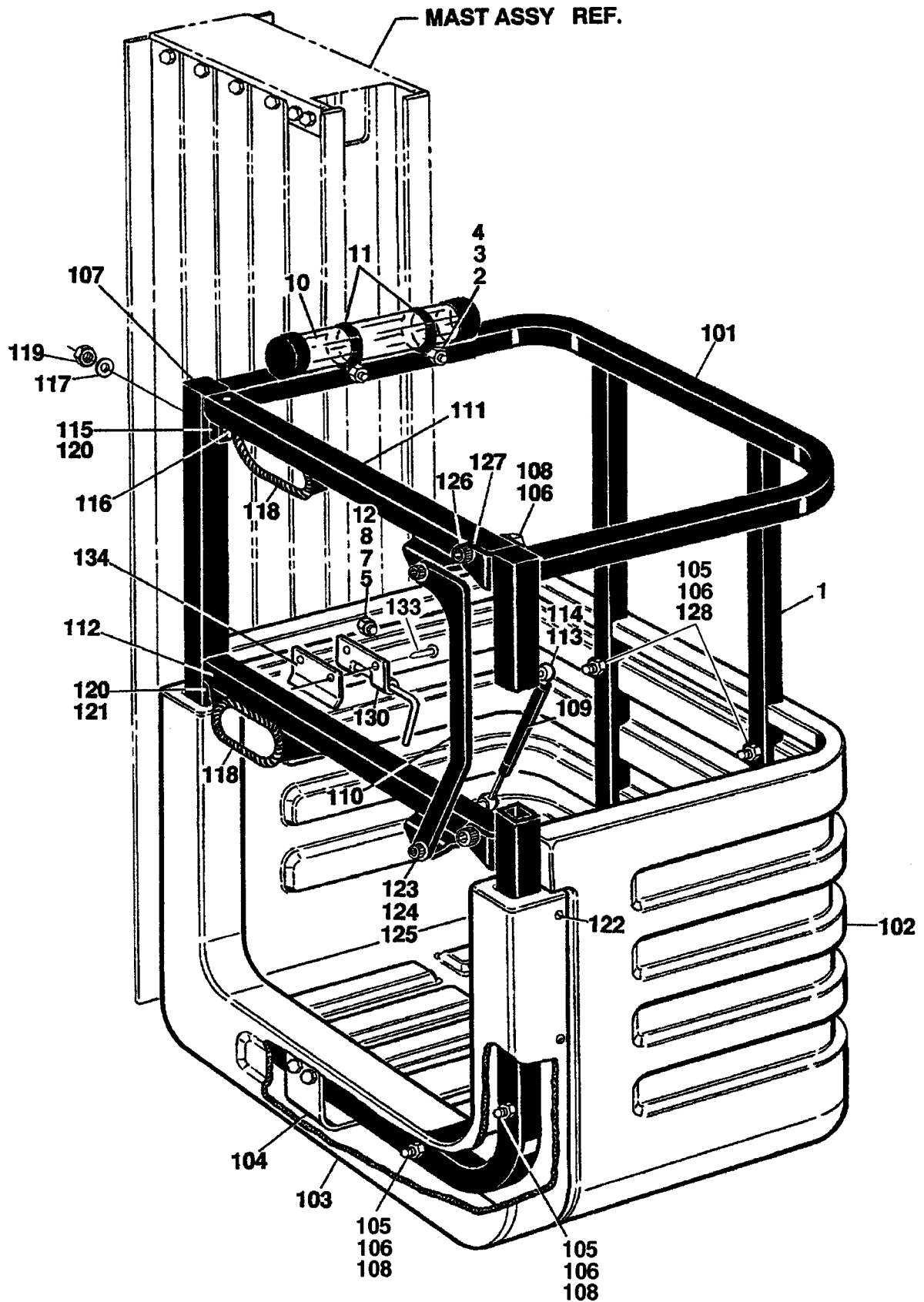
SECTION 10-4 PLATFORM

SECTION 10 - 4 PLATFORM

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-4-1		PLATFORM COMPONENTS INSTALLATION (CONTINUED)	Ref.	
	3510472	PLATFORM ASSEMBLY - 22" x 22"	Ref.	D
-151	3640969	Rail Weldment	1	
-152	3538105	Plate, Bottom	1	
	3510471	PLATFORM ASSEMBLY - 26" x 26"	Ref.	D
-151	3640966	Rail Weldment	1	
-152	3537698	Plate, Bottom	1	
		OPTIONAL PLATFORM ATTACHMENTS	Ref.	
-201	0255036	Tool Tray Assembly	1	-
-201A	0902079	Bracket, Mounting	1	
-201B	3421453	Pin, Snap	1	
-201C	1060380	Cable, Lanyard	1	
-201D	1702365	Decal - JLG	1	
-202	0255040	Tube Caddy Assembly	1	-
-202A	3421453	Pin, Snap	1	
-202B	1060380	Cable, Lanyard	1	
-202C	1702365	Decal - JLG	1	
-203	0256442	Utility Caddy Assembly	1	C
-203A	3421453	Pin, Snap	2	
-203B	3422551	Pin, Hitch	2	
-204		Decal - Caddy Placement Options (Not Shown):	1	
	1703088	English		
	1703123	Japanese		
	1703117	Latin America Spanish		
-205		Decal - Capacity Options (Not Shown):	1	
	1703087	English		
	1703122	Japanese		
	1703116	Latin America Spanish		
	0255853	LASER LOCATOR INSTALLATION (OPTIONAL)	Ref.	A
-301	4656847	Tube, Mounting	1	
	1320218	Clamp, Spring	2	
	0750802	Screw #8 x 1/4"	2	
	2920127	Pointer, Laser	1	
	4460425	Connector, Strain Relief	1	

SECTION 10-4 PLATFORM

FIGURE 10-4-2. FIBERGLASS PLATFORM INSTALLATION.



SECTION 10-4 PLATFORM

SECTION 10 - 4 PLATFORM

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-4-2		FIBERGLASS PLATFORM INSTALLATION	Ref.	
	0254980	PLATFORM INSTALLATION - STANDARD MACHINES	Ref.	B
	0256928	PLATFORM INSTALLATION - CSA MACHINES	Ref.	-
-1	3510454	Platform Assembly (See Item 101-134 for Breakdown)	1	
-2	0641518	Bolt 5/16"-18NC x 2 1/4"	2	
-3	4711500	Flatwasher 5/16"	4	
-4	3311505	Locknut 5/16"-18NC	2	
-5	3300356	Nut 5/16"-18NC	2	
-6	0100019	Loctite #271 (Not Shown)	A/R	
-7	4300115	Stud 5/16"-18NC x 3"	2	
-8	3311501	Nut 5/16"-18NC	2	
-9	0100011	Loctite #242 (Not Shown)	A/R	
-10	4566563	Tube, Manual (Prior to May 1995)	1	
	4566780	Tube, Manual (May 1995 to Present)	1	
-11	1320110	Clamp, Tube (Prior to May 1995)	2	
	1320219	Clamp, Tube (May 1995 to Present)	2	
-12	4070958	Shim (CSA Only)	1	
	3510454	PLATFORM ASSEMBLY	Ref.	C
-101	3640923	Rail	1	
-102	3510477	Basket	1	
-103	4060882	Cover	1	
-104	0362384	Bar, Support	1	
-105	0641416	Bolt 1/4"-20NC x 2"	10	
-106	4751400	Flatwasher 1/4"	22	
-107	3520072	Cap	2	
-108	3311405	Locknut 1/4"-20NC	12	
-109	4160125	Spring, Gas	1	
-110	0362347	Link, Gate	1	
-111	3640924	Rail, Gate (Top)	1	
-112	3640990	Rail, Gate (Bottom)	1	
-113	4751500	Flatwasher 5/16"	1	
-114	3311501	Nut 5/16"-18NC	1	
-115	3340746	Pad, Gate Rest	1	
-116	3911032	Screw, Machine #10-24NC x 2"	4	
-117	4751000	Flatwasher #10	8	
-118	4060804	Flex-Trim	2 Ft.	
-119	3311001	Nut #10-24NC	4	
-120	4070890	Shim, Gate Stop	2	
-121	3340754	Pad, Gate Latch	1	
-122	3900177	Screw, Plastite	6	
-123	3900202	Bolt, Shoulder 1/4" x 1/4"	2	
-124	4740429	Washer, Nylon	4	
-125	3311005	Locknut #10-24NC	2	
-126	3900203	Bolt, Shoulder 5/16" x 1 1/2"	2	
-127	4740428	Washer, Nylon	4	
-128	3300151	Nut, Acorn 1/4"-20NC	2	
-129	0100011	Loctite #242 (Not Shown)	A/R	
-130	2940082	Latch, Gate	1	
-131	Not Used			
-132	Not Used			
-133	3820024	Rivet	2	
-134	4070894	Shim, Gate Latch	1	

SECTION 10-5 CYLINDERS

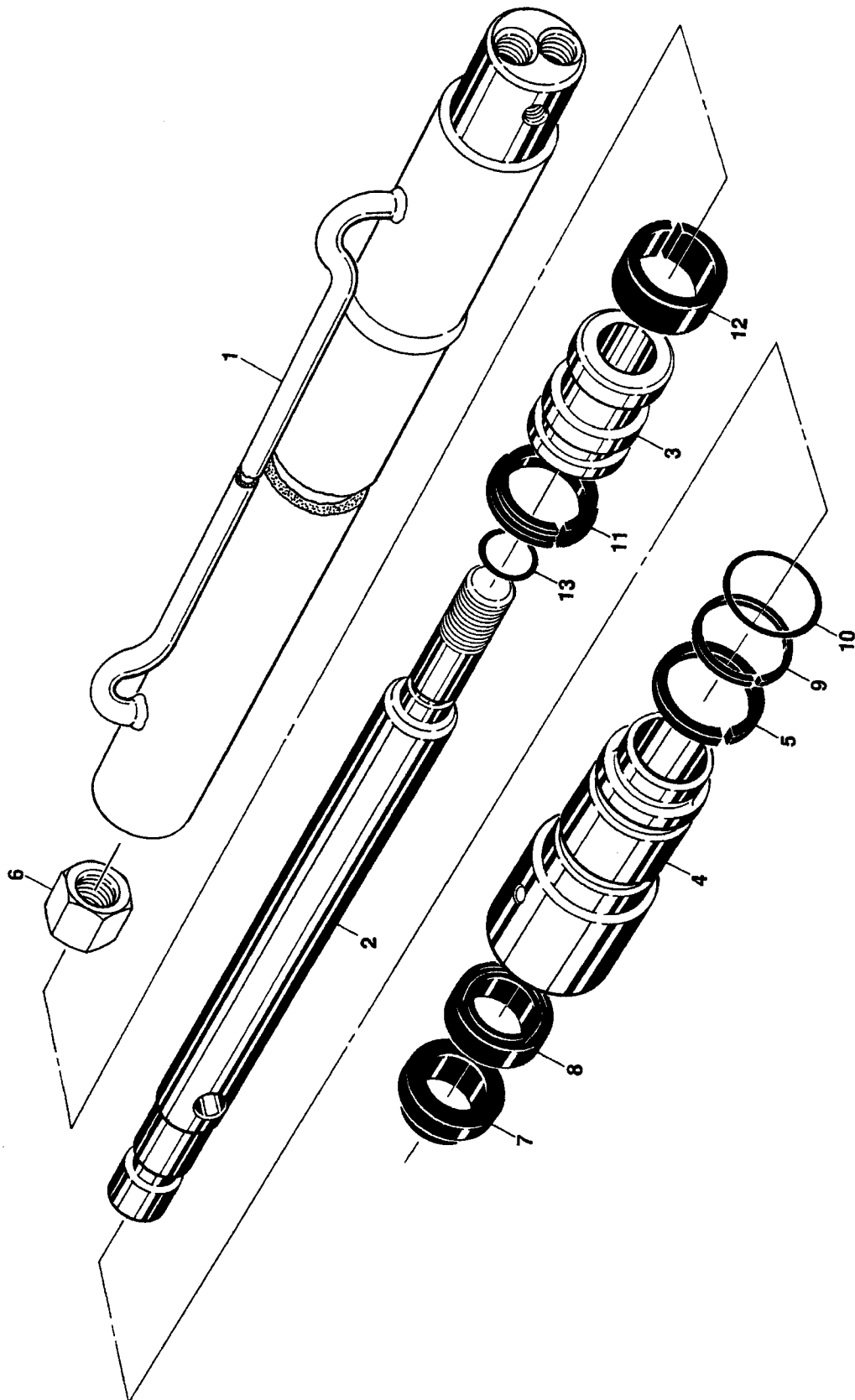
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10-5-1	Lift Cylinder Assembly	10-5-2
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SECTION 10-5 CYLINDERS

FIGURE 10-5-1. LIFT CYLINDER ASSEMBLY.



SECTION 10-5 CYLINDERS

SECTION 10 - 5 CYLINDERS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10—5—1	1683201	LIFT CYLINDER ASSEMBLY	Ref.	
—1	Not Serviced	Barrel	1	
—2	7003250	Rod	1	
—3	7003249	Piston	1	
—4	7003248	Head	1	
—5	7003247	Ring, Retaining	1	
—6	7003246	Locknut	1	
—7	Kit	Wiper, Rod	1	
—8	Kit	Seal, Rod	1	
—9	Kit	Ring, Back-up	1	
—10	Kit	O-Ring	1	
—11	Kit	Seal, Piston	1	
—12	Kit	Ring, Wear	1	
—13	Kit	O-Ring	1	
	7003245	Seal Kit (Includes Items 7-13)	1	

SECTION 10-6 HYDRAULICS

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10-6-1	Hydraulic Diagram	10-6-2
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SECTION 10 - 6 HYDRAULIC

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SECTION 10-6 HYDRAULIC

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-6-1		HYDRAULIC DIAGRAMS	Ref.	
	2792252	HYDRAULIC DIAGRAM - 10VP AND 15VP	Ref.	2
	2792253	HYDRAULIC DIAGRAM - 20VP	Ref.	2
-1	2220875	Fitting, 90°	1	
-2	2221021	Fitting, Straight	1	
-3	2220472	Fitting, 90°	1	
-4	2220603	Fitting, Straight	1	
-5	2220507	Fitting, 90°	1	
-6	2220473	Fitting, 90°	1	
-7	4567186	Tube	1	
-8	4566950	Tube	1	
-9	4640956	Valve, Flow Control (10VP and 15VP)	1	
	4640900	Valve, Flow Control (20VP)	1	
-10	3600254	Pump/Motor/Tank Assembly (10VP and 15VP) (See Section 10-2 For Breakdown)	1	
	3600255	Pump/Motor/Tank Assembly (20VP) (See Section 10-2 For Breakdown)	1	
-11	0100020	Sealant, Pipe	A/R	
-12	2221022	Fitting, Straight	1	

SECTION 10 - 6 HYDRAULIC

SECTION 10-7 ELECTRICAL

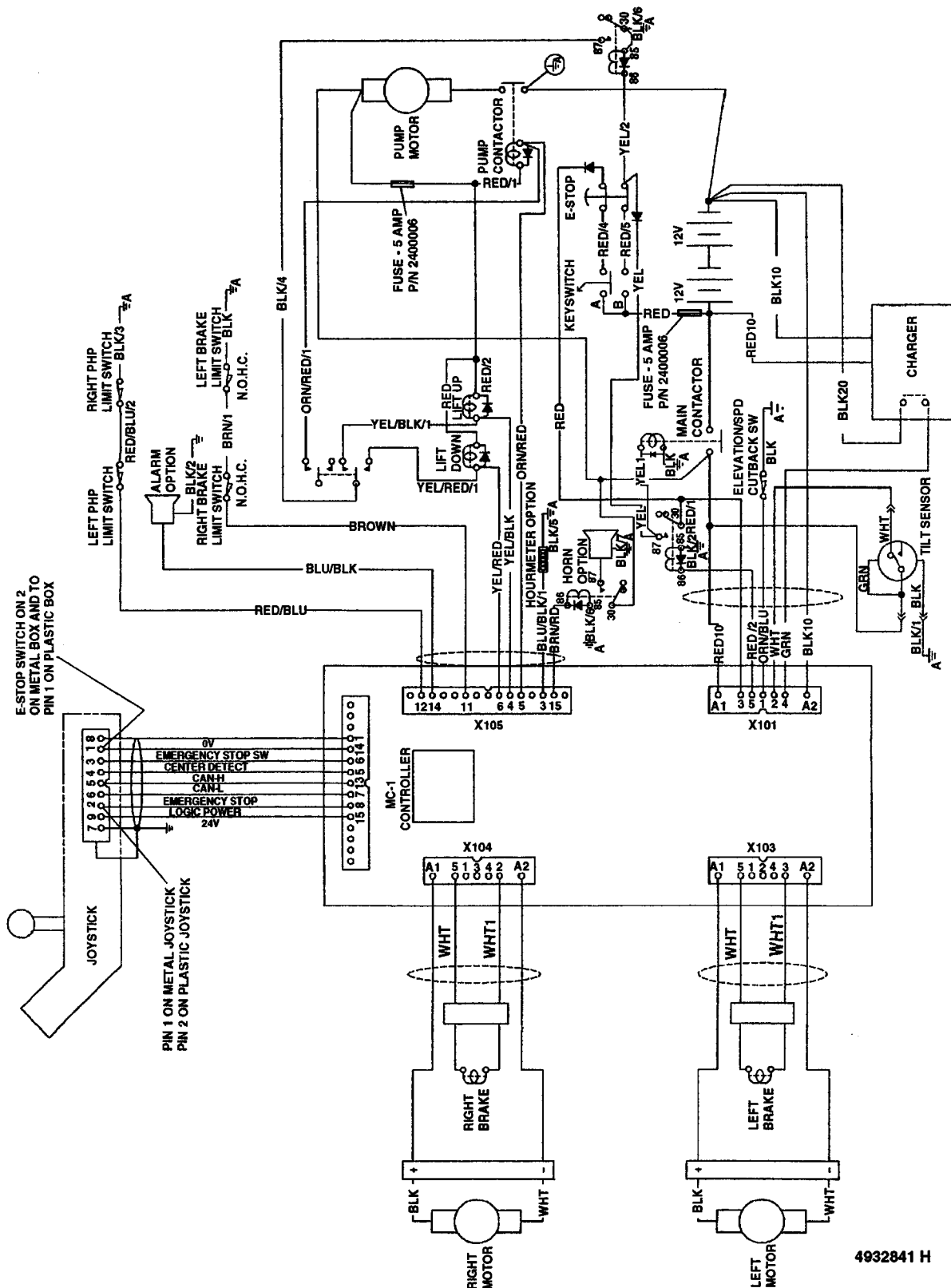
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SECTION 10-7 ELECTRICAL

FIGURE 10-7-1. ELECTRICAL DIAGRAM - STANDARD.

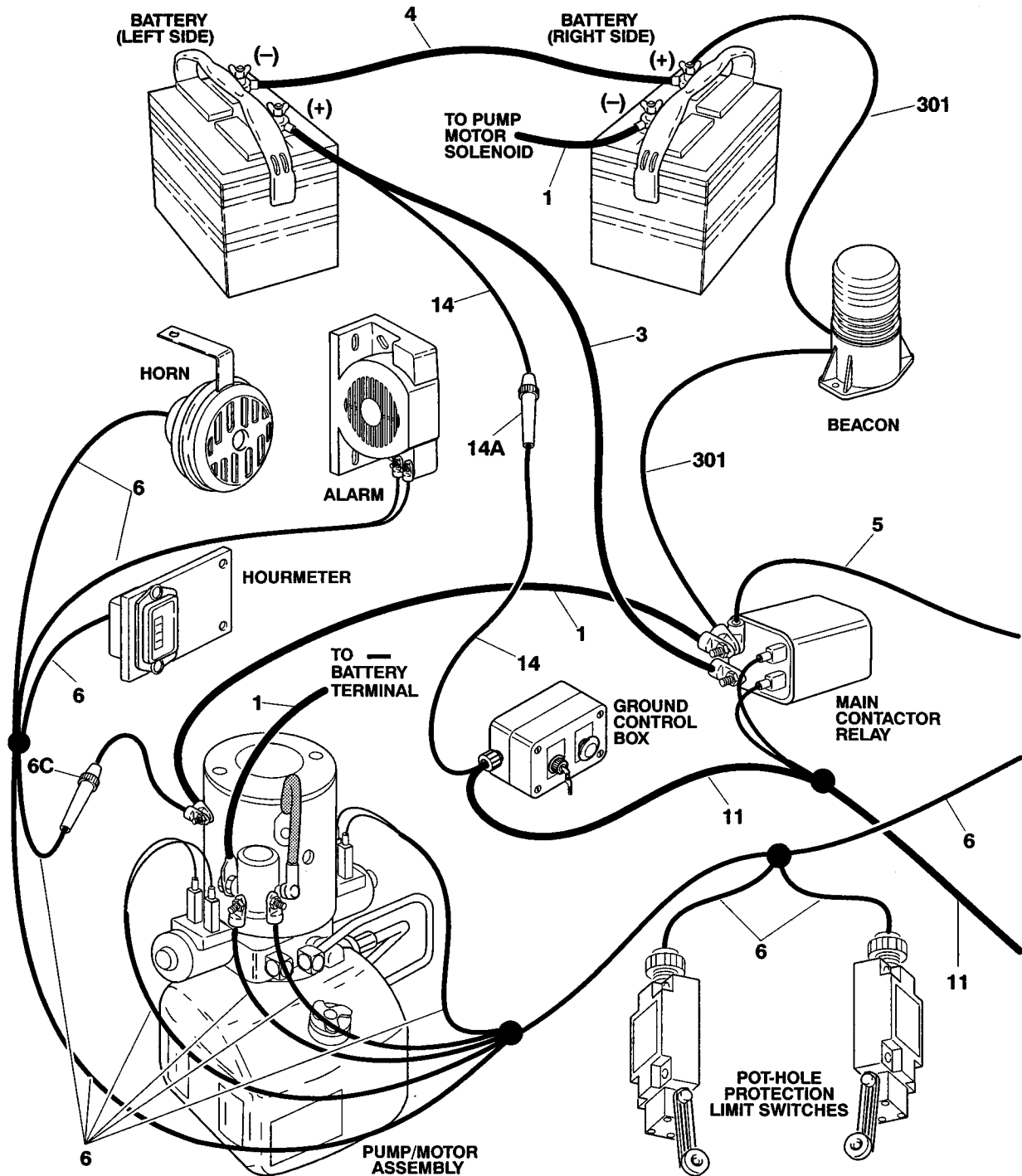


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SECTION 10-7 ELECTRICAL

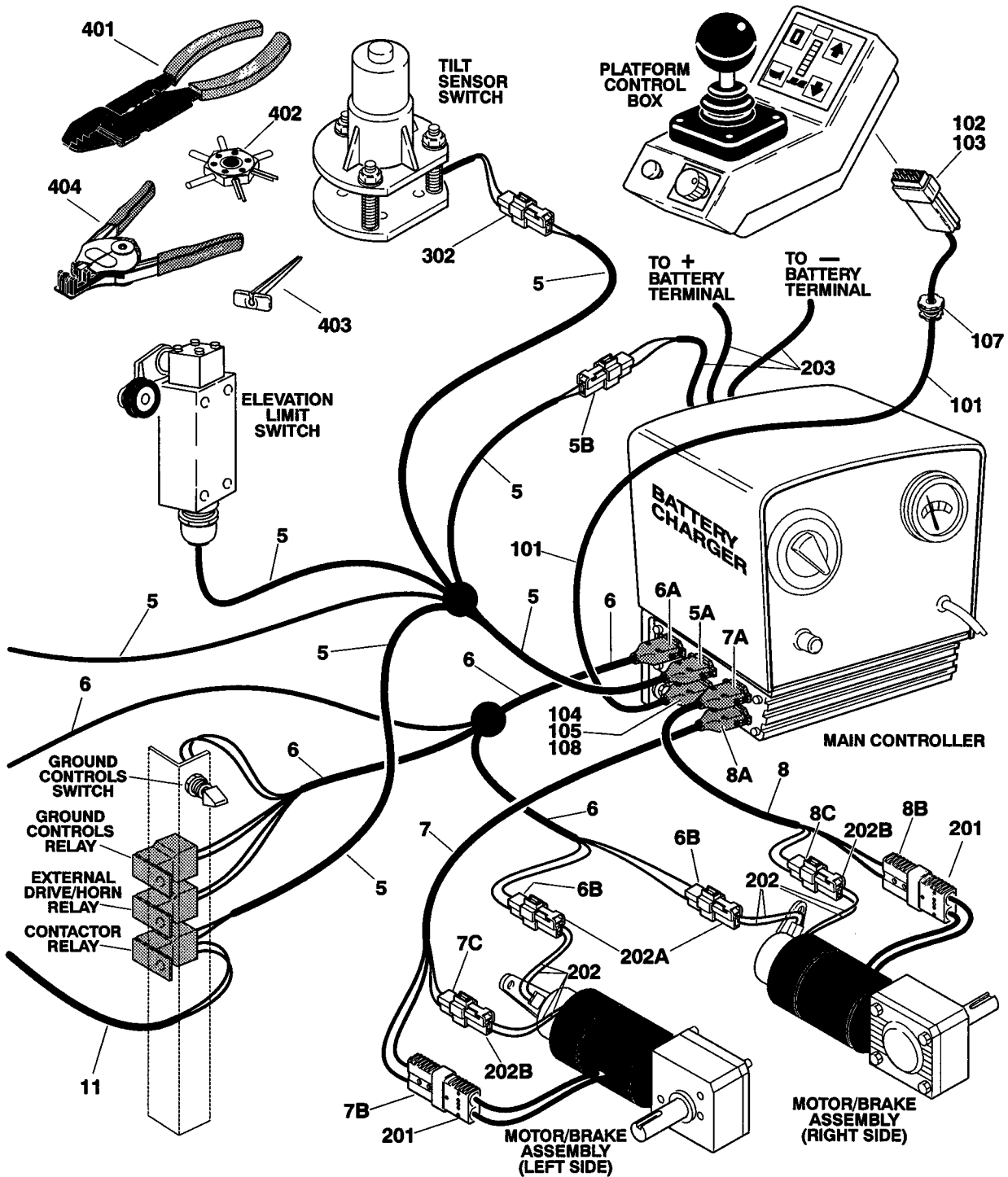
SECTION 10-7 ELECTRICAL

FIGURE 10-7-2. HARNESS AND CABLES INSTALLATION (SHEET 1 OF 2).



SECTION 10-7 ELECTRICAL

FIGURE 10-7-2. HARNESS AND CABLES INSTALLATION (SHEET 2 OF 2).



SECTION 10-7 ELECTRICAL

SECTION 10-7 ELECTRICAL

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-7-2		HARNESS AND CABLES INSTALLATION	Ref.	
	4932841	ELECTRICAL DIAGRAM - STANDARD	Ref.	H
-1	1060620	Cable, Battery	2	
-2	Not Used			
-3	1060619	Cable, Battery	1	
-4	1060618	Cable, Battery	1	
-5	4921826	Harness - Ground Control	1	D
	3990010	Diode	2	
-5A	4460646	Receptacle - 5 Pin	1	
	4460647	Shell, Receptacle	2	
-5B	4460320	Connector, Female - 2 Position	1	
	4460368	Socket	2	
-6	4921825	Harness - Valve and Limit Switch	1	H
	3990010	Diode	5	
-6A	4460681	Receptacle - 15 Pin	1	
	4460643	Shell, Receptacle	1	
	4460684	Socket	8	
-6B	4460424	Connector, Male - 2 Position	2	
	4460267	Pin	2	
	4460268	Socket	2	
-6C	2400006	Fuse - 5 Amp	1	
	4460044	Fuseholder	1	
-7	4921824	Harness - Left Side Drive Motor	1	B
-7A	4460644	Receptacle - 5 Pin	1	
	4460645	Pin	2	
-7B	4460648	Receptacle - 2 Position	1	
-7C	4460320	Connector, Female - 2 Position	1	
	4460267	Pin	1	
	4460268	Socket	2	
-8	4921823	Harness - Right Side Drive Motor	1	A
-8A	4460644	Receptacle - 5 Pin	1	
	4460645	Shell, Receptacle	2	
-8B	4460648	Receptacle - 2 Position	1	
-8C	4460320	Connector, Female - 2 Position	1	
	4460267	Pin	1	
	4460268	Socket	2	
-9	Not Used			
-10	Not Used			
-11	4921948	Harness - Main Contactor	1	-
	3990010	Diode - 6 Amp	2	
-12	Not Used			
-13	Not Used			
-14	4921888	Harness - Keyswitch Power	1	-
-14A	2400006	Fuse - 5 Amp	1	
	4460044	Fuseholder	1	

SECTION 10-7 ELECTRICAL

SECTION 10-7 ELECTRICAL

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-7-2		HARNESS AND CABLES INSTALLATION (CONTINUED)	Ref.	
		PLATFORM CONSOLE HARNESS ASSEMBLIES	Ref.	
		Used With 1600237 Platform Control Box:		
	4921815	10VP	Ref.	D
	4921812	15VP	Ref.	C
	4921816	20VP	Ref.	D
		Used With 1600243 Platform Control Box:		
	4921878	10VP	Ref.	C
	4921879	15VP	Ref.	C
	4921880	20VP	Ref.	C
-101	1060616	Cable, Electrical - 18/8	A/R	
-102		Receptacle Options:	1	
	4460639	9 Pin		
	4460671	12 Pin		
-103		Receptacle Shell Options:	1	
	4460640	For 9 Pin Receptacle		
	4460672	For 12 Pin Receptacle		
-104	4460682	Receptacle - 15 Socket	1	
-105	4460643	Shell, Receptacle (For 15 Socket Receptacle)	1	
-106	Not Used			
-107	4460023	Connector, Strain Relief	1	
-108	4460683	Pin	8	
		MISCELLANEOUS HARNESSES AND COMPONENTS	Ref.	
-201	4460648	Receptacle - 2 Position (Located at Drive Motor)	2	
-202	Not Available	Harness Assembly - Brake	2	
-202A	4460320	Connector, Female - 2 Position	1	
	4460268	Socket	1	
	4460267	Pin	1	
-202B	4460424	Connector, Male - 2 Position	1	
	4460268	Socket	1	
	4460267	Pin	1	
-203	7018505	DC Battery Charger Harness Assembly	1	
		ACCESSORIES HARNESSES AND COMPONENTS	Ref.	
-301	Not Available	Beacon Light Harness Assembly	1	
-302	4460445	Receptacle - 3 Position (Attach to #5 for Tilt Sensor)	1	
	4460227	Pin	3	
		TOOLS	Ref.	
-401	7002821	Crimper (For Wire to Pin/Socket Connections)	1	
-402	7002823	Extractor (For Removal of Pins/Sockets from Connectors)	1	
-403	4460467	Extractor - 16-18 Gauge (For Removal of Pins/Sockets from Deutsch Connectors)	1	
	4460510	Extractor - 12-14 Gauge (For Removal of Pins/Sockets from Deutsch Connectors)	1	
-404	8896941	Stripper, Wire	1	

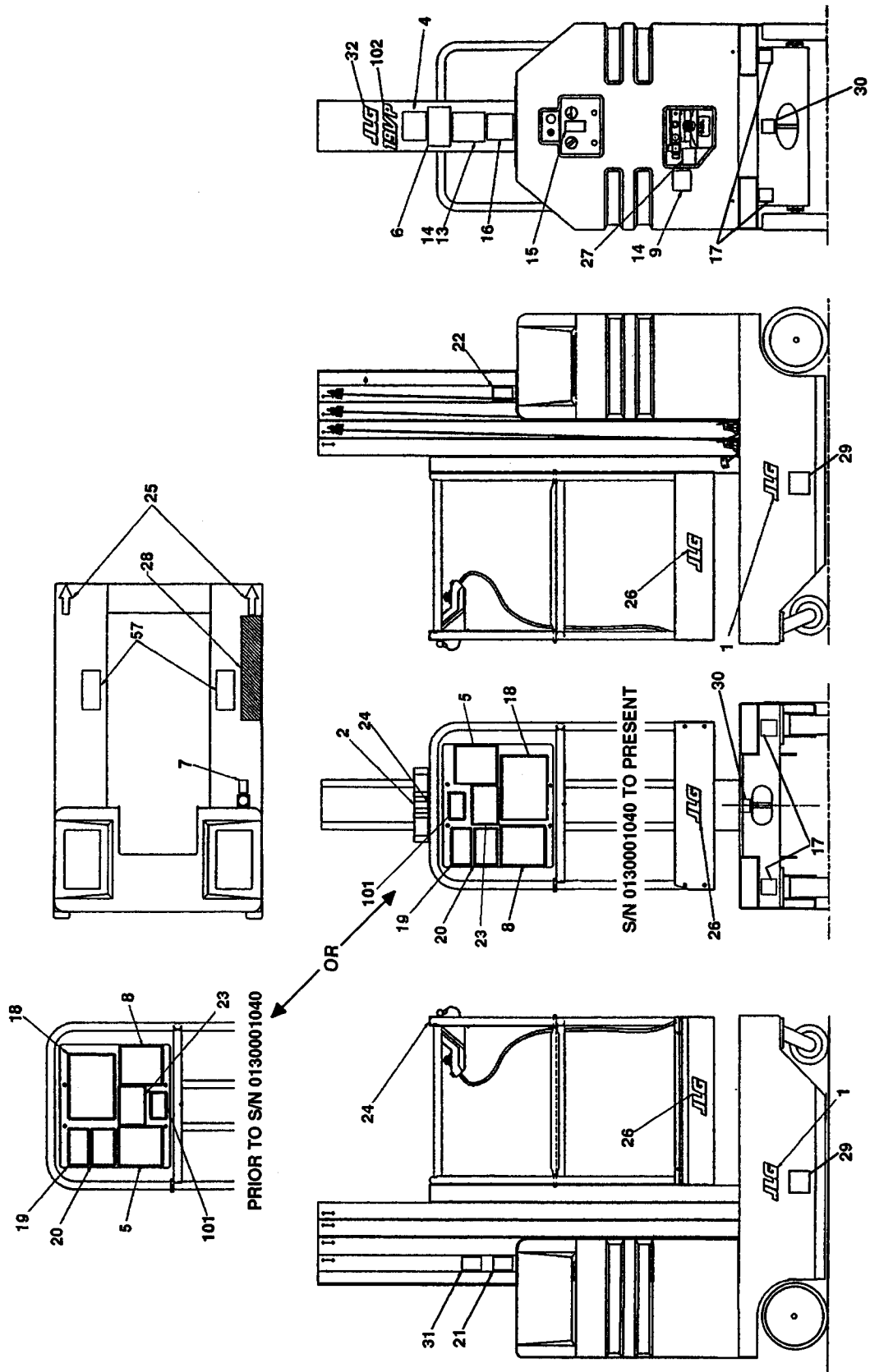
SECTION 10-8 DECALS

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SECTION 10-8 DECALS

FIGURE 10-8-1. DECALS INSTALLATION - USA/CANADA.



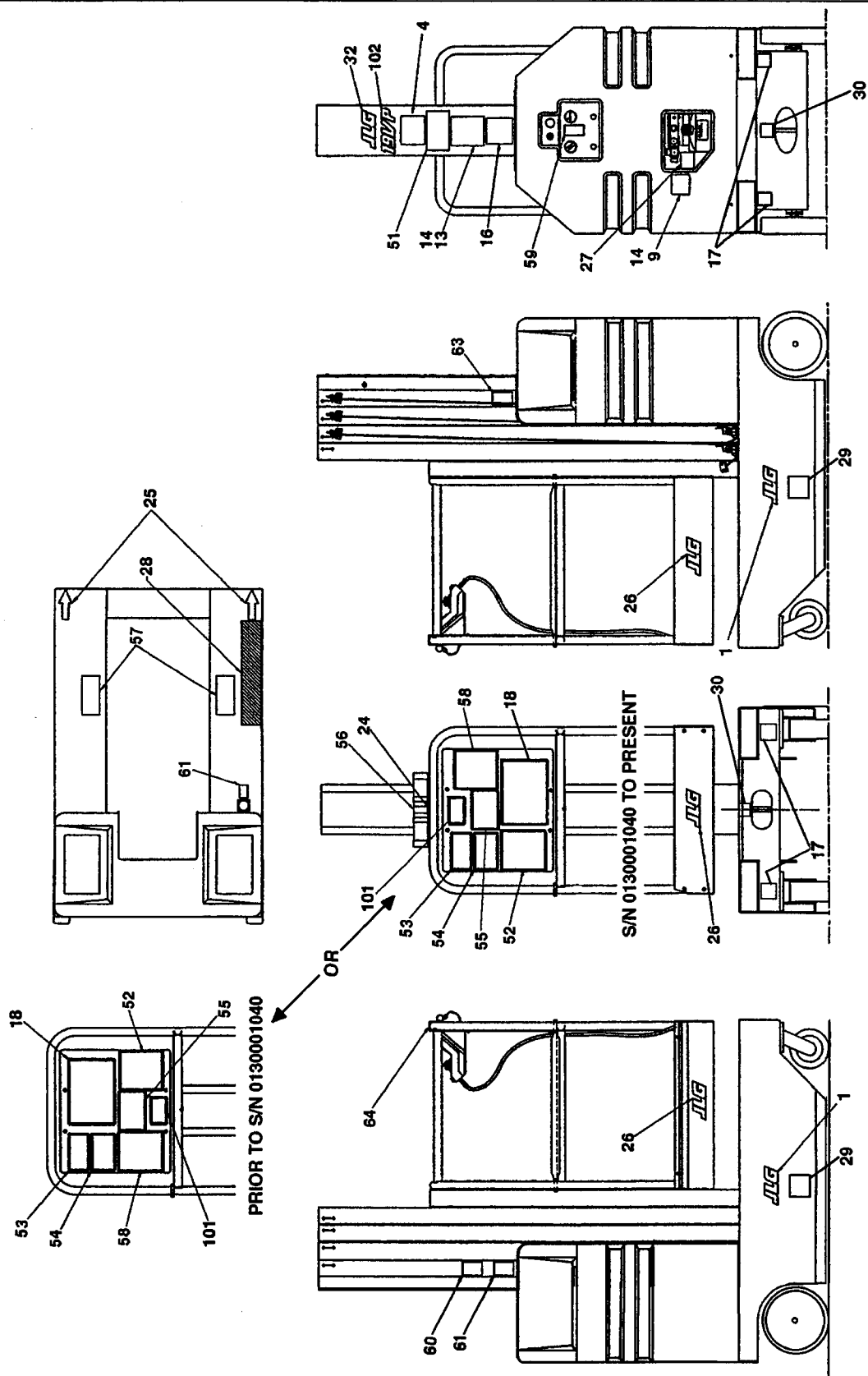
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SECTION 10 - 8 DECALS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-8-1		DECALS INSTALLATION - USA/CANADA	Ref.	
	0256240	DECALS INSTALLATION - STANDARD MACHINES (ALL) AND CSA MACHINES (FEBRUARY 1997 TO PRESENT) (STANDARD PARTS)	Ref.	H
	0256247	DECALS INSTALLATION - CSA MACHINES PRIOR TO FEBRUARY 1997 (STANDARD PARTS)	Ref.	E
-1	1701612	Decal - JLG (Prior to S/N0130001227)	2	
	1702365	Decal - JLG (S/N0130001227 to Present)	2	
-2	1702110	Decal - Instructions	1	
-3	1702364	Decal -Crushing	2	
-4	3251813	Decal - USA	1	
-5	1702361	Decal - Electrocution Hazard	1	
-6	1702885	Decal - Daily Checklist	1	
-7	1702886	Decal - Leveling	1	
-8	1702887	Decal - Operation	1	
-9	1702922	Decal - Manual Descent	1	
-10	Not Used			
-11	Not Used			
-12	Not Used			
-13	Consult Factory	Nameplate, Serial Number	1	
-14	3820006	Rivet	8	
-15	1702437	Decal - Explosion/Fire Hazard	1	
-16	1702631	Decal - Bar Code	1	
-17	1703073	Decal - Forklift Area	4	
-18	1702905	Decal - Joystick	1	
-19	1703129	Decal - Pothole Protection	1	
-20	1703137	Decal - Brakes	1	
-21	1703128	Decal - Brakes Symbol	1	
-22	1703127	Decal - Ground Clearance Symbol	1	
-23	1702282	Decal - Warning	1	
-24	3252136	Nameplate - Control Box Location	1	
-25	1702921	Decal - Arrow	2	
-26	1701612	Decal - JLG	3	
-27	1702923	Decal - Ground Controls	1	
-28	4420039	Tape, Friction	16in/41cm	
-29	1703072	Decal - Forklift Area	2	
-30	1702300	Decal - Tie-Down	2	
-31	1703191	Decal - Tow/Winching	1	
-32	1701612	Decal - JLG	1	
		DECALS INSTALLATION (OPTIONAL PARTS)	Ref.	
-101		Decal - Capacity	1	
	1702108	Prior to S/N 0130001227		
	1703243	S/N 0130001227 to Present		
-102		Decal - Model Designation	1	
	1702881	10VP		
	1702882	15VP		
	1702883	20VP		

SECTION 10-8 DECALS

FIGURE 10-8-2. DECALS INSTALLATION - JAPANESE/LATIN AMERICAN.



SECTION 10-8 DECALS

SECTION 10 - 8 DECALS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-8-2		DECALS INSTALLATION - JAPANESE/LATIN AMERICAN	Ref.	
	1282534	DECALS INSTALLATION (STANDARD PARTS)	Ref.	I
-1	1702365	Decal - JLG	2	
-2 to -3	Not Used			
-4	3251813	Decal - USA	1	
-5 to -7	Not Used			
-8	Not Used			
-9	1702922	Decal - Manual Descent	1	
-10 to -12	Not Used			
-13	Consult Factory	Nameplate, Serial Number	1	
-14	3820031	Rivet	8	
-15	Not Used			
-16	1702631	Decal - Bar Code	1	
-17	1703073	Decal - Forklift Area	4	
-18	1702905	Decal - Joystick	1	
-19 to -24	Not Used			
-25	1702921	Decal - Arrow	2	
-26	1701612	Decal - JLG	3	
-27	1702923	Decal - Ground Controls	1	
-28	4420039	Tape, Friction	16in/41cm	
-29	1703072	Decal - Forklift Area	2	
-30	1702300	Decal - Tie-Down	2	
-31	Not Used			
-32	1701612	Decal - JLG	1	
	0256246	DECALS INSTALLATION - JAPANESE(VARIABLE PARTS)	Ref.	D
-51	1703057	Decal - Daily Checklist	1	
-52	1703058	Decal - Operation	1	
-53	1703135	Decal - Pothole Protection	1	
-54	1703143	Decal - Brakes	1	
-55	1703061	Decal - Warning	1	
-56	1702476	Decal - Instructions	1	
-57	1702495	Decal -Crushing	2	
-58	1702456	Decal - Electrocutation Hazard	1	
-59	1702527	Decal - Explosion/Fire Hazard (DC Only)	1	
-60	1703197	Decal - Tow/Winch	1	
-61	1703205	Decal - Leveling	1	
-62	1703222	Decal - Brakes Symbol	1	
-63	1703228	Decal - Ground Clearance Symbol	1	
-64	1703234	Nameplate - Control Box Location	1	
	0256248	DECALS INSTALLATION - LATIN AMERICAN (VARIABLE PARTS)	Ref.	5
-51	1703062	Decal - Daily Checklist	1	
-52	1703063	Decal - Operation	1	
-53	1703136	Decal - Pothole Protection	1	
-54	1703144	Decal - Brakes	1	
-55	1703065	Decal - Warning	1	
-56	1702473	Decal - Instructions	1	
-57	1702492	Decal -Crushing	2	

SECTION 10-8 DECALS

FIGURE & ITEM NO	PART NUMBER	DESCRIPTION	QTY.	REV.
10-8-2		DECALS INSTALLATION - JAPANESE/LATIN AMERICAN (CONTINUED)	Ref.	
-58	1702453	Decal - Electrocuting Hazard	1	
-59	1702425	Decal	1	
-60	1703198	Decal - Tow/Winching	1	
-61	1703202	Decal - Leveling	1	
-62	1703219	Decal - Brakes Symbol	1	
-63	1703225	Decal - Ground Clearance Symbol	1	
-64	1703231	Nameplate - Control Box Location	1	
		DECALS INSTALLATION (VARIABLE PARTS)	Ref.	
-101		Decal - Capacity	1	
	1702056	Japanese Spec		
	1703235	Latin America Spec		
-102		Decal - Model Designation	1	
	1702881	10VP		
	1702882	15VP		
	1702883	20VP		

SECTION 10-9 RECOMMENDED SERVICE PARTS STOCK

10VP/15VP/20VP

The following lists will service fleets of machines (built to current production per date on the front cover) with emergency repair parts which can be installed in the field. Parts from the list should be replaced when inventory is depleted to keep service parts stock supplied. For further information, contact your JLG dealer or the JLG Parts Department..

JLG PART NO.	DESCRIPTION	QTY. PER FLEET SIZE		
		1-4	5-9	10 or more
STANDARD PARTS				
1060639	Cable (Figure 10-1-1)	1	1	1
7014117	Switch, Micro (Figure 10-1-1)	1	1	1
1060638	Cable (Figure 10-1-3)	1	1	1
4360401	Switch, Limit (Figure 10-1-3)	1	1	1
3740120	Relay (Figure 10-2-1)	1	1	1
4360314	Switch, Ground Control (Figure 10-2-1)	1	1	1
3740069	Relay (Figure 10-2-1)	1	1	1
7017701	Switch, Push-Pull (Figure 10-2-1)	1	1	1
7017702	Block, Contact - N.O. (Figure 10-2-1)	1	1	1
7017703	Block, Contact - N.C. (Figure 10-2-1)	1	1	1
7017700	Switch, Key (Figure 10-2-1)	1	1	1
7017704	Key, Replacement (Figure 10-2-1)	1	1	1
1600243	Control Box Assembly (Figure 10-2-2)	1	1	1
7011639	Switch, Timer (Figure 10-2-3)	1	1	1
7011509	Breaker, Circuit (Figure 10-2-3)	1	1	1
7018514	Breaker, Circuit ((Figure 10-2-3)	1	1	1
7018506	Relay (Figure 10-2-3)	1	1	1
7013723	Filter, Hydraulic (Figure 10-2-4)	4	8	12
7016714	Breather, Hydraulic (Figure 10-2-4)	1	2	3
4360437	Switch, Limit (Figure 10-3-1, 10-3-2 and 10-3-3)	1	1	1
3990010	Diode (Figure 10-7-2)	2	2	2
2400006	Fuse - 5 Amp (Figure 10-7-2)	2	2	2
VARIABLE PARTS				
4360435	Switch, Tilt (Optional) (Figure 10-2-5)	1	1	1
2940082	Latch, Gate (Fiberglass Platform) (Figure 10-4-2)	1	1	1

SECTION 10-10 SPECIAL OPTIONS

Note: The following list is to accomodate machines with special equipment. Options may not be applicable to all models. For more specific information contact the JLG Parts Department.

SECTION 10-10 SPECIAL OPTIONS

PART NUMBER	DESCRIPTION	QTY
	MISCELLANEOUS OPTIONS LIST	Ref.
0256789	Camera Mount Assembly	Ref.
1670815	Cover - Travel/Storage	Ref.
0256719	CSA Decals Installation	Ref.
	Special Tools:	Ref.
0080229	Adapter, Torque Setting Socket (To Set Slip-Clutch Torque)	1
2900868	Computer Analyzer Kit (Includes Analyzer, Cable and Instruction Sheet)	1
7002821	Crimper (For Wire to Pin/Socket Connections)	1
7002823	Extractor (For Removal of Pins/Sockets from Connectors)	1
4460467	Extractor 16-18 Gauge (For Removal of Pins/Sockets from Deutsch Connectors)	1
4460510	Extractor 12-14 Gauge (For Removal of Pins/Sockets from Deutsch Connectors)	1
7016654	Screwdriver, Magnetic	1
7004275	Seal Tool - 1"	1
7004276	Seal Tool - 1 1/2"	1
7002826	Seal Tool - 2"	1
8896941	Stripper, Wire	1



TRANSFER OF OWNERSHIP

To: JLG, Gradall, Lull and Sky Trak product owner:

If you now own, but ARE NOT the original purchaser of the product covered by this manual, we would like to know who you are. For the purpose of receiving safety-related bulletins, it is very important to keep JLG Industries, Inc. updated with the current ownership of all JLG products. JLG maintains owner information for each JLG product and uses this information in cases where owner notification is necessary.

Please use this form to provide JLG with updated information with regard to the current ownership of JLG Products. Please return completed form to the JLG Product Safety & Reliability Department via facsimile (717) 485-6573 or mail to address as specified on the back of this form.

Thank you,
Product Safety & Reliability Department
JLG Industries, Inc.
1 JLG Drive
McConnellsburg, PA 17233-9533
Telephone: (717) 485-5161
Fax: (717) 485-6573

NOTE: Leased or rented units should not be included on this form.

Mfg. Model: _____

Serial Number: _____

Previous Owner: _____

Address: _____

City: _____ State: _____

Zip: _____ Telephone: (_____) _____

Date Of Transfer: _____

Current Owner: _____

Address: _____

City: _____ State: _____

Zip: _____ Telephone: (_____) _____

Who in your organization should we notify?

Name: _____

Title: _____

Please cut on the dotted line and fax to 717-485-6573





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