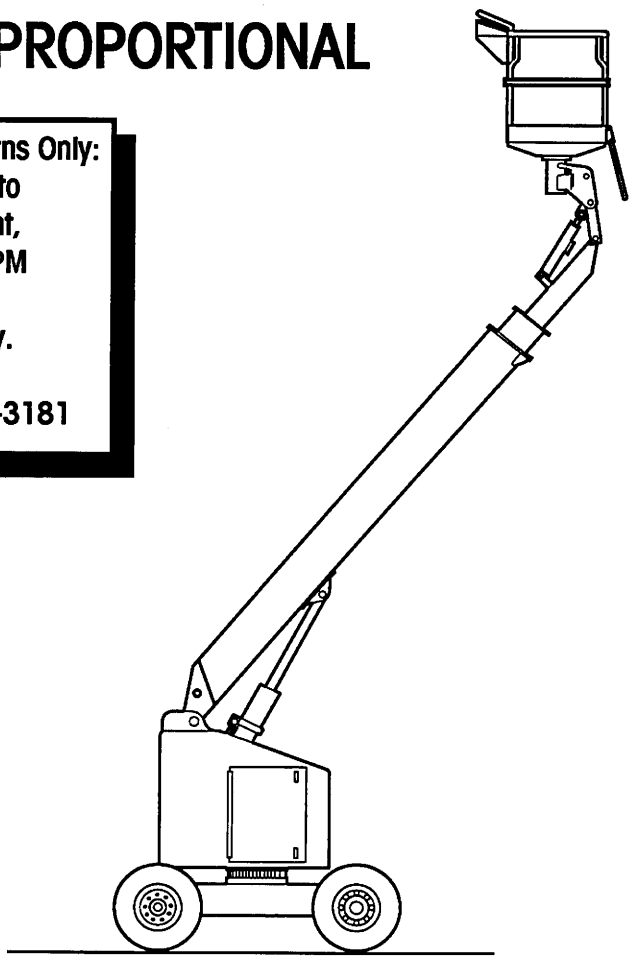
MODEL MPN SERIES

SERVICE MANUAL

ELECTRO-PROPORTIONAL

For Service Concerns Only:
Direct Phone Line to
Service Department,
8:00 AM to 5:00 PM
Central Time,
Monday thru Friday.

Phone (414) 355-3181



Part No. 89-101317 • Initial Issue dated July, 1993 •

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INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the SIMON AERIALS INC. MPN featuring Electro-Proportional controls. When used in conjunction with the Operators, Parts and Component Repair manuals (provided separately) this Service Manual will assist you in making necessary adjustments or repairs.

Simon Aerial Mobile Platforms are designed and built to provide many years of safe, dependable service. To obtain full benefits from your MPN, always follow the proper operating and maintenance procedures. Only trained, authorized personnel should be allowed to operate or service this machine. Service personnel should read and study the Operators, Service. Parts and Component Repair Manuals in order to gain a thorough understanding of the unit prior to making any repairs.

To help you recognize important safety information, we have identified warnings and instructions that directly impact on safety with the following signals:

⚠ DANGER

"DANGER" INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY. THIS SIGNAL WORD IS TO BE LIMITED TO THE MOST EXTREME SITUATIONS.

⚠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. "Caution" is permitted for property-damage-only accidents.

Service personnel and machine operators must understand and comply with all warnings and instructional decals on the body of the machine, and at the ground controls and platform control console.

⚠ DANGER

MODIFICATIONS OF THIS MACHINE FROM THE ORIGINAL DESIGN AND SPECIFICATION WITHOUT WRITTEN PERMISSION FROM SIMON ARE STRICTLY FORBIDDEN. A MODIFICATION MAY COMPROMISE THE SAFETY OF THE MACHINE, SUBJECTING USERS TO SERIOUS INJURY OR DEATH. ANY SUCH MODIFICATION WILL VOID ANY REMAINING WARRANTY.

Simon reserves the right to change, improve, modify or expand features of its equipment at any time. Specifications, models or equipment are subject to change without notice, and without incurring any obligations to change, improve, modify or expand features of previously delivered equipment.

Any procedures not found within this manual must be evaluated by the individual to assure himself that they are "proper and safe", because all possible procedures cannot be covered.

All Simon manuals are periodically updated to reflect changes that occur in the equipment. Please contact the factory with any questions you may have regarding your machine, or the availability of more recent manuals.

MACHINE SPECIFICATIONS MPN 40

Working Height	**46 Ft/** 14.02 M
Platform Height	**40 Ft/** 12.19 M
Horizontal Reach (Boom Angle 0°)	**32 Ft 4 In./** 9.86 M
Platform Capacity (unrestricted)	**500 Lbs./** 227 Kg
Platform Size	**36 In. x 60 In. x 42 In./** .91M x 1.52 M x 1.17 M
Stowed Length	**23 Ft 1 In./** 7.04 M
Stowed Height	**7 Ft 6 In./** 2.29 M
Machine Width	**5 Ft 11 In./** 1.80 M
Wheelbase	**6 Ft/** 1.83 M
Outside Turning Radius	**12 Ft/** 3.66 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**3 MPH/** 4.8 KPH
Boom Extended	**0.5 MPH/** 0.8 KPH
Ground Clearance	**8 In./** 20.3 cm
Gross Weight (approx.) (Note 1)	**20,000 Lbs./** 9,072 Kg
Gradeability (on Hard Surface) (see Note 1)	**8°/** 14%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**12 x 16.5 (9 Ply)**
Tire Pressure (Not applicable: foam filled tires)	
Wheel Lug Nut Torque (Drive Axle)	**65 Ft Lbs./** 88 Nm/ 8.98 Kg-m
Wheel Lug Nut Torque (Steer Axle)	**90 Ft Lbs./** 122 Nm/ 12.43 Kg-m
Swing Bearing Bolt Torque	**170 Ft Lbs./** 230.5 Nm/ 23.49 Kg-m
Drive Hub Bolt Torque	**80 Ft Lbs./** 108.5 Nm/ 11.06 Kg-m
Maximum Hydraulic Pressure	**2300 PSI/** 159 Bar/ 161.7 Kg/ cm^2
Hydraulic Tank Capacity	**36 Gal./** 136 Liters
Fuel Tank Capacity	**39 Gal./** 147 Liters
Electrical System	**12 Volt DC Battery**

Engine Availability:

Standard . . . Wisconsin W41770, 35 HP (26.1 Kw), Air Cooled, Gas (Dual Fuel-Optional)

Optional . . . Deutz F3L1011, 42 HP (31.3 Kw), Air Cooled, Diesel

Ford VSG 413, 50 HP (37.3 Kw), Liquid Cooled, Dual Fuel

Note 1: Weight and performance shown represent typical units, and should be used as a general guideline only. Many variables between machines can lead to significant differences in these factors. Accurate figures, when necessary for a particular application, can best be determined by testing of the specific unit.

MACHINE SPECIFICATIONS MPN 55

Working Height	**61 Ft/** 18.59 M
Platform Height	**55 Ft/** 14.52 M
Horizontal Reach (Boom Angle 0°)	**47 Ft 8 In./** 14.52 M
Platform Capacity (unrestricted)	**500 Lbs./** 227 Kg
Platform Size	**36 In. x 60 In. x 42 In./** .91M x 1.52 M x 1.17 M
Stowed Length	**27 Ft 1 In./** 8.25 M
Stowed Height	**7 Ft 11 In./** 2.41 M
Machine Width	**5 Ft 11 In./** 1.80 M
Wheelbase	**7 Ft/** 2.13 M
Outside Turning Radius	**12 Ft 2 In./** 3.71 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**23.0 MPH/** 4.8 KPH
Boom Extended	**0.5 MPH/** 0.8 KPH
Ground Clearance	**9.25 In./** 23.5 cm
Gross Weight (approx.) (Note 1)	**29,000 Lbs./** 13,154 Kg
Gradeability (on Hard Surface) (see Note 1)	**14°/** 25%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**14 x 17.5 (10 Ply)**
Tire Pressure (Not applicable: foam filled tires)	
Wheel Lug Nut Torque (Drive Axle)	**220 Ft Lbs./** 298 Nm/ 30.4 Kg-m
Wheel Lug Nut Torque (Steer Axle)	**220 Ft Lbs./** 298 Nm/ 30.4 Kg-m
Swing Bearing Bolt Torque	**170 Ft Lbs.** 231 Nm/ 23.5 Kg-m
Drive Hub Bolt Torque	**170 Ft Lbs./** 231 Nm/ 23.5 Kg-m
Maximum Hydraulic Pressure	**3000 PSI/** 207 Bar/ 210 Kg/ cm^2
Hydraulic Tank Capacity	**36 Gal./** 136 Liters
Fuel Tank Capacity	**39 Gal./** 147 Liters
Electrical System	**12 Volt DC Battery**

Engine Availability:

Standard . . . Ford LSG 423, 63 HP (47.0 Kw), Liquid Cooled, Gas or Dual Fuel

Optional . . . Deutz F4L1011, 54 HP (40.3 Kw), Air Cooled, Diesel

Wisconsin V-465, 65 HP (48.5 Kw), Air Cooled, Gas or Dual Fuel

Note 1: Weight and performance shown represent typical units, and should be used as a general guideline only. Many variables between machines can lead to significant differences in these factors. Accurate figures, when necessary for a particular application, can best be determined by testing of the specific unit.

MACHINE SPECIFICATIONS MPN 60

Working Height	**66 Ft/** 20.12 M
Platform Height	**60 Ft/** 18.29 M
Horizontal Reach (Boom Angle 0°)	**52 Ft 11 In./**16.12 M
Platform Capacity (unrestricted)	**500 Lbs./** 227 Kg
Platform Size	**36 In. x 60 In. x 42 In./** .91M x 1.52 M x 1.17 M
Stowed Length	**28 Ft 9 In./** 8.76 M
Stowed Height	**7 Ft 11 In./** 2.41 M
Machine Width	**6 Ft 11 In./** 2.10 M
Wheelbase	**7 Ft/** 2.13 M
Outside Turning Radius	**13 Ft 1 In./** 3.99 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**2.5 MPH/** 4.0 KPH
Boom Extended	**0.5 MPH/** 0.8 KPH
Ground Clearance	**9.25 In./** 23.5 cm
Gross Weight (approx.) (Note 1)	**36,800 Lbs./** 16,692 Kg
Gradeability (on Hard Surface) (see Note 1)	**13°/** 23%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**14 x 17.5 (10 Ply)**
Tire Pressure (Not applicable: foam filled tires)	
Wheel Lug Nut Torque (Drive Axle)	**220 Ft Lbs./** 298 Nm/ 30.4 Kg-m
Wheel Lug Nut Torque (Steer Axle)	**220 Ft Lbs./** 298 Nm/ 30.4 Kg-m
Swing Bearing Bolt Torque:	
(with 5/8"-11 bolts)	**170 Ft Lbs.** 231 Nm/ 23.5 Kg-m
(with 3/4"-16 bolts)	**320 Ft Lbs./** 434 Nm/ 4422 Kg-m
Drive Hub Bolt Torque	**170 Ft Lbs./** 231 Nm/ 23.5 Kg-m
Maximum Hydraulic Pressure	**3000 PSI/** 207 Bar/ 210 Kg/ cm^2
Hydraulic Tank Capacity	**36 Gal./** 136 Liters
Fuel Tank Capacity	**39 Gal./** 147 Liters
Electrical System	**12 Volt DC Battery**

Engine Availability:

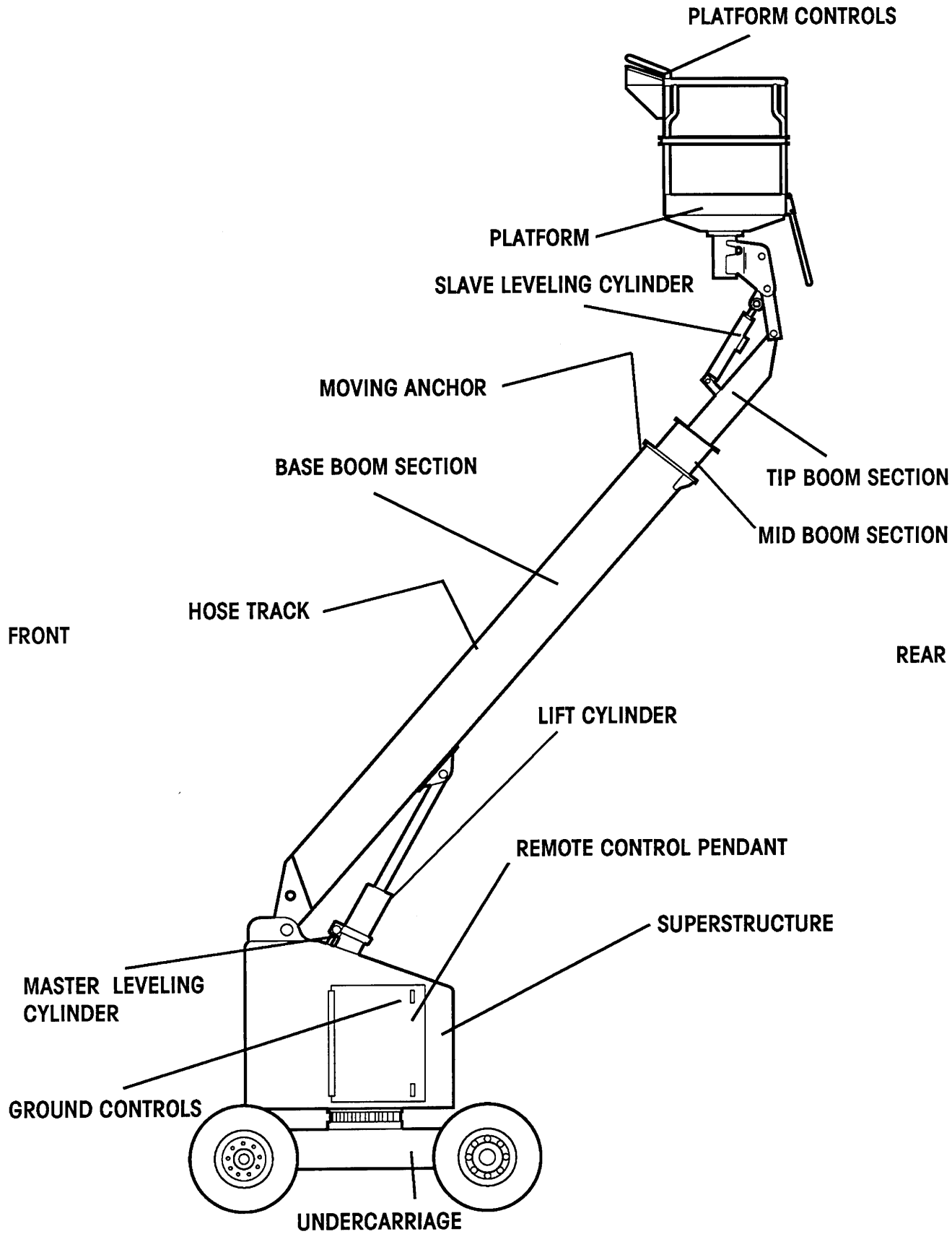
Standard . . . Ford LSG 423, 63 HP (47.0 Kw), Liquid Cooled, Gas or Dual Fuel

Optional . . . Deutz F4L1011, 54 HP (40.3 Kw), Air Cooled, Diesel

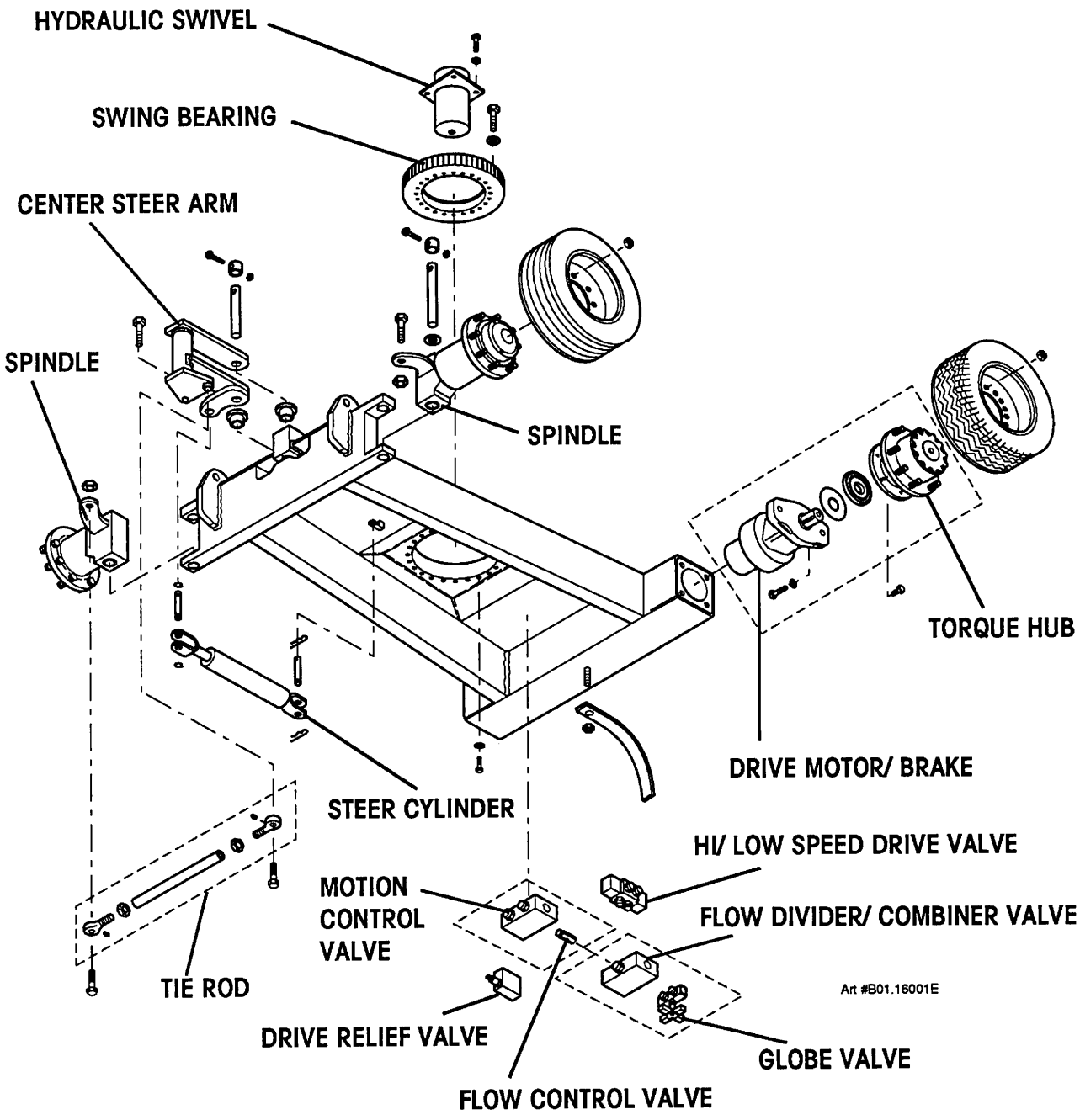
Wisconsin V-465, 65 HP (48.5 Kw), Air Cooled, Gas or Dual Fuel

Note 1: Weight and performance shown represent typical units, and should be used as a general guideline only. Many variables between machines can lead to significant differences in these factors. Accurate figures, when necessary for a particular application, can best be determined by testing of the specific unit.

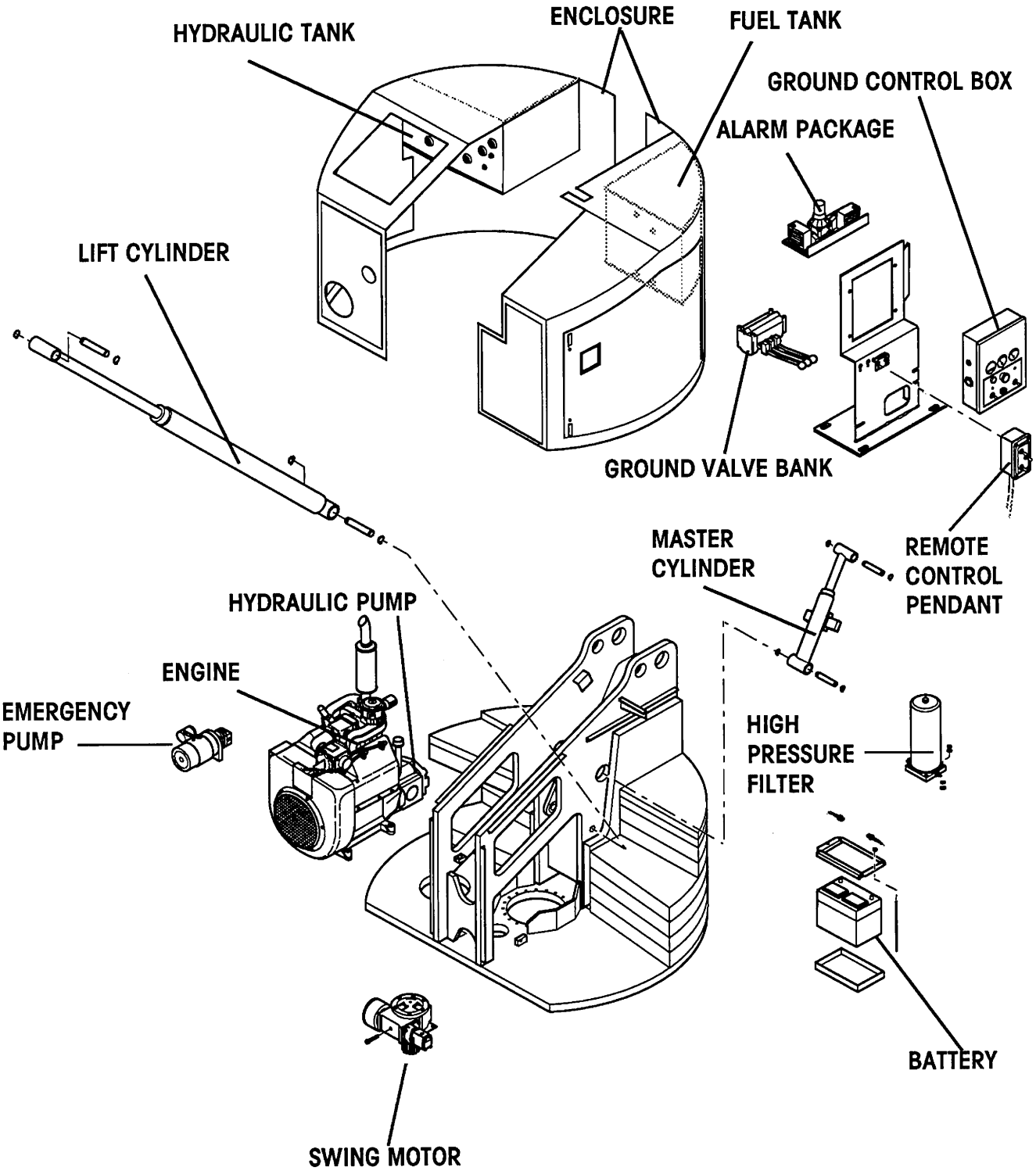
MACHINE COMPONENT LOCATOR



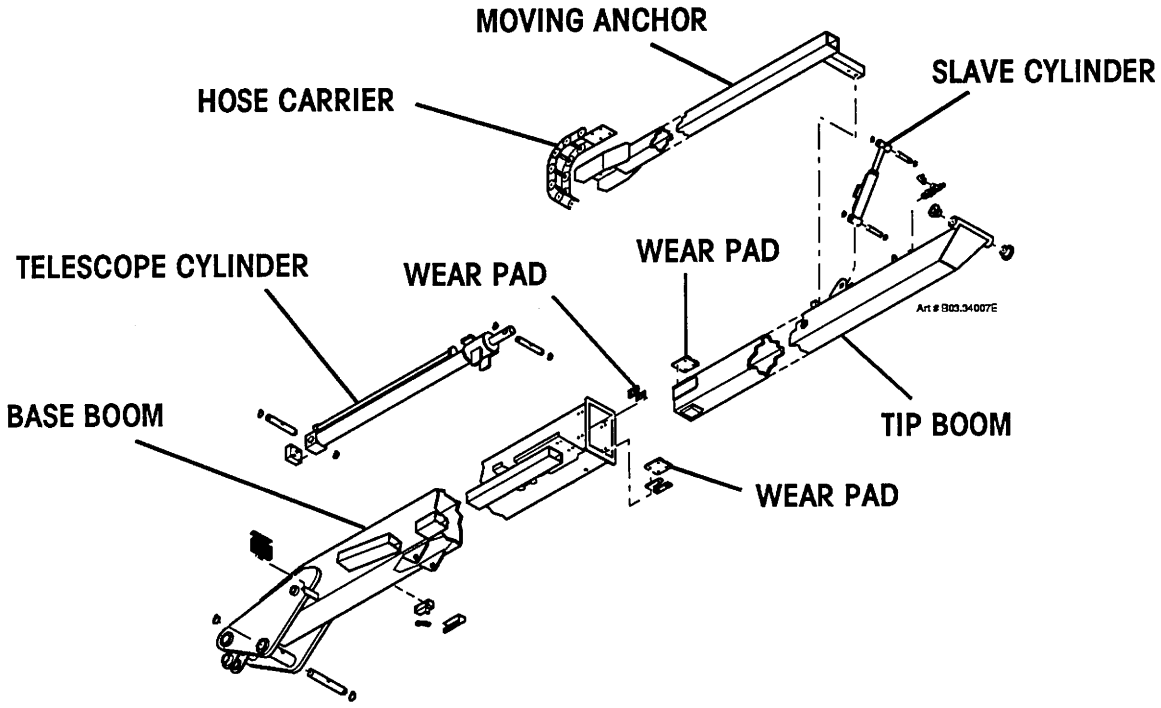
UNDERCARRIAGE COMPONENT LOCATOR



SUPERSTRUCTURE COMPONENT LOCATOR

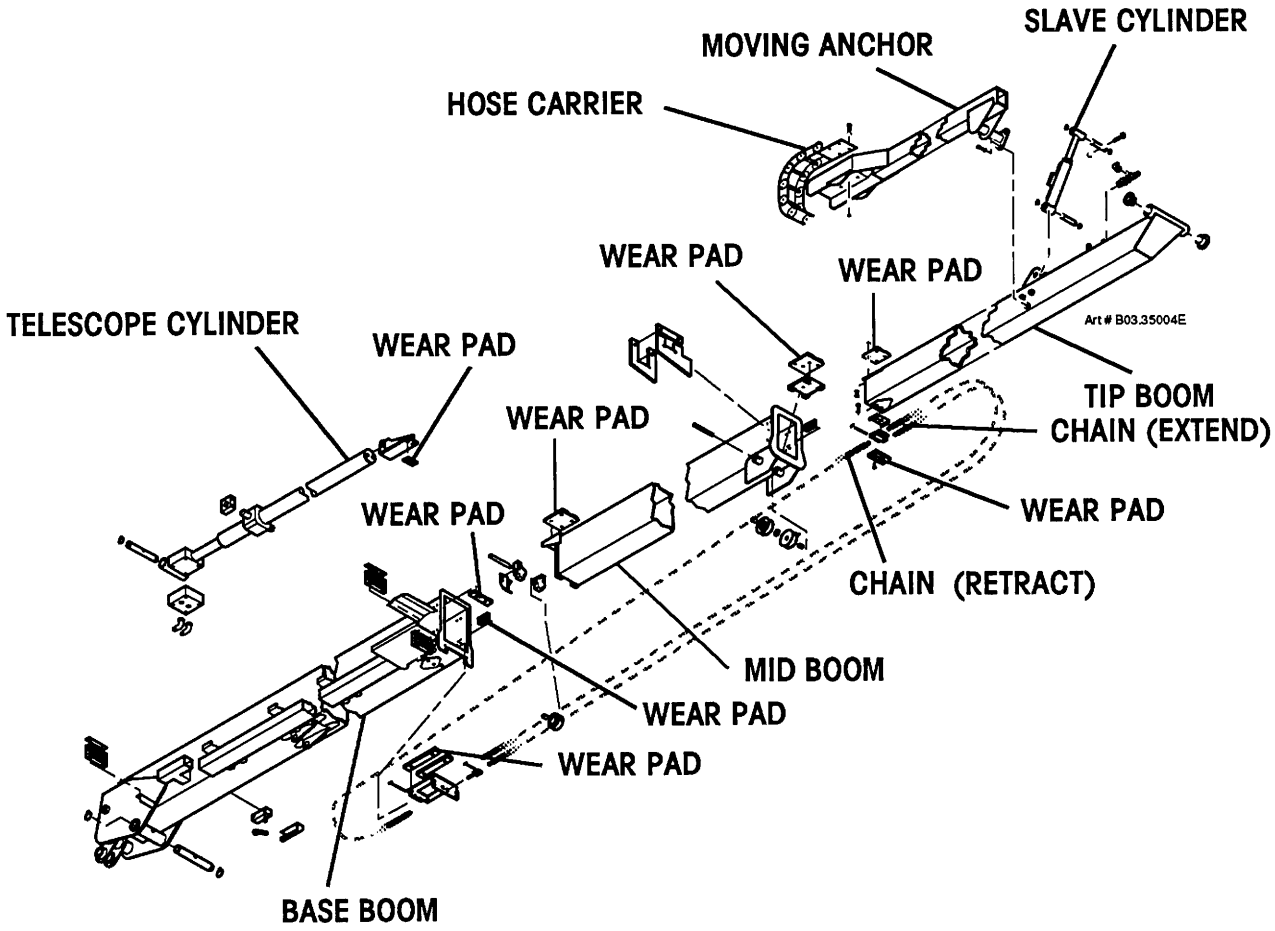


BOOM COMPONENT LOCATOR



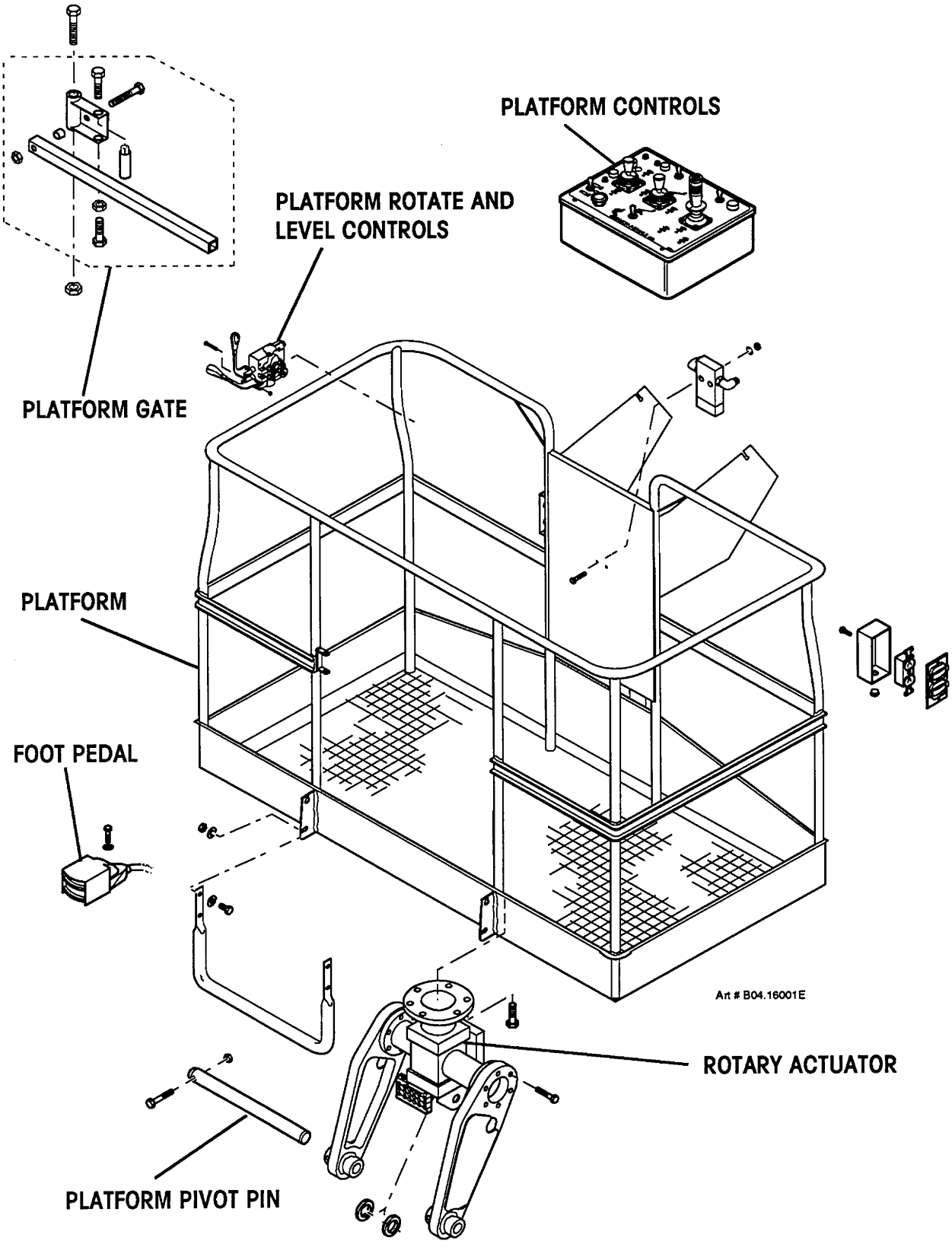
Two Section Boom.

BOOM COMPONENT LOCATOR



Three Section Boom.

PLATFORM COMPONENT LOCATOR



LUBRICATION CHART

NO.	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
1.	Hydraulic reservoir	Mobil DTE-15 to "Full" mark with all cylinders retracted.	Check daily, Analyze every six (6) months or 500 hours.*†, Change yearly or every 1,000 hours.*†
2.	High pressure filter	Filter elements.	Change every six (6) months or 500 hours.*†
3.	Swing bearing	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
4.	Swing bearing gear teeth	Dry moly lube spray.	Every six (6) months or 500 hours.*
5.	Swing drive gear box	Fill to plug. SAE 140 EP or N.L.G.I. #00 EP oil.	Check bimonthly or every 200 hours.*†, Change every 2 years or 2,000 hours.*
6.	Boom pivot pins and Cylinder pins	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
7.	Wheel bearings	Lithium N.L.G.I. #2 EP. Clean and repack.	Change yearly or every 1,000 hours.*
8.	Steering spindles	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
9.	Steering linkage	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
10.	Steering tie rod ends	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
11.	Drive wheel power hubs	SAE 80 W 90, SAE 90 or SAE 85-140, half full.	After first 50 hours., then yearly or every 1,000 hours.*†
12.	Boom wear pads	Silicone spray.	Monthly or every 100 hours.*†

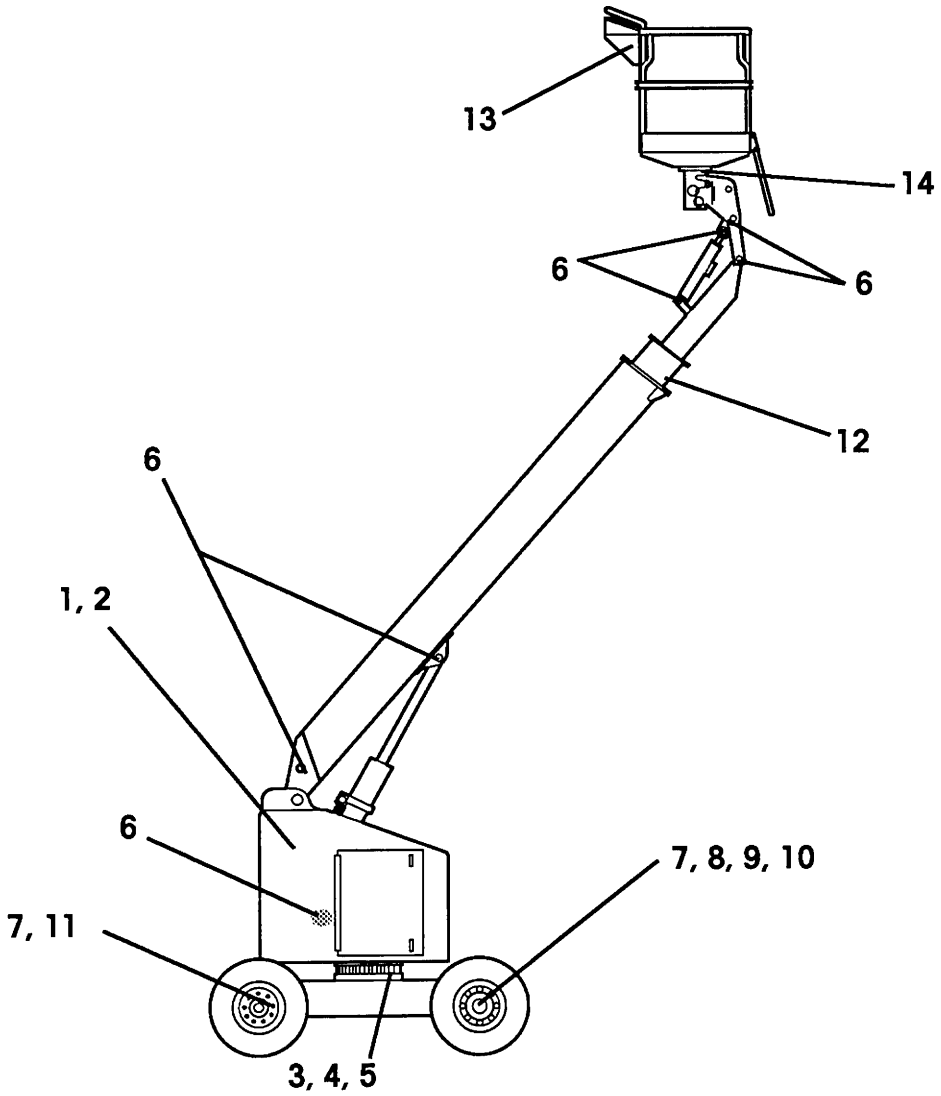
* Whichever occurs first.

† Different requirements for severe duty applications. See check lists.

LUBRICATION CHART

NO.	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
13.	Platform level and rotate valve handle pivot pins	WD 40 Spray or equivalent penetrating oil.	Monthly or every 100 hrs.*
14.	Platform rotate mechanism	Hydraulic fluid.	Yearly.

* Whichever occurs first.
† Different requirements for severe duty applications. See check lists.



SECTION 1: TRANSPORTATION AND EMERGENCY PROCEDURES

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Emergency Lowering 1-7

TRANSPORT THE UNIT

TOWING PROCEDURES

WITHOUT OPTIONAL TOWING PACKAGE:

- If optional towing package is not installed, refer to "UNPOWERED EMERGENCY MOVEMENT" in this section.

WITH OPTIONAL TOWING PACKAGE:

- Securely attach the MPN to a tow vehicle with the tow bar provided.

⚠WARNING

WHENEVER DISENGAGING THE DRIVE TORQUE HUBS OR BEFORE DISCONNECTION FROM TOWING VEHICLE, ENSURE THAT THE UNIT CANNOT ROLL.

- Disengage torque hubs.

  Type 1: remove the cap in the center of the torque hub, turn the cap so that the knob faces in, then reinstall the cap.

  Type 2: remove the large hex cap in the center of the torque hub, push in and turn screw slot in the center of the torque hub to line up with the "TOW" mark on the hub, then reinstall the cap.

- Pull steer wander control valve, located near the ground electrical panel, to allow steering wheels to track behind tow vehicle.

  The tow vehicle must have sufficient braking capability in order to safely stop itself as well as the MPN. Tow speed shall not exceed 3 mph (4.8 KPH).

TRUCK OR TRAILER TRANSPORT

⚠WARNING

ALWAYS ATTACH THE UNIT TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER. CONNECT WINCH CABLE TO THE TIE DOWN LUGS ON THE UNDERCARRIAGE. UNASSISTED LOADING OR UNLOADING OF ANY MOBILE PLATFORM IS NOT RECOMMENDED.

1. Enter the platform, and start the engine using the platform controls. Select the "OPERATING" engine speed.

2. Raise the boom to allow greater ground clearance so that the platform will clear any obstacles as the machine goes up the loading ramp.

3. Using a winch, carefully maneuver the unit onto the truck or trailer. (Selecting drive will release brakes.)

4 Lock the superstructure to the undercarriage by installing the lock pin provided.

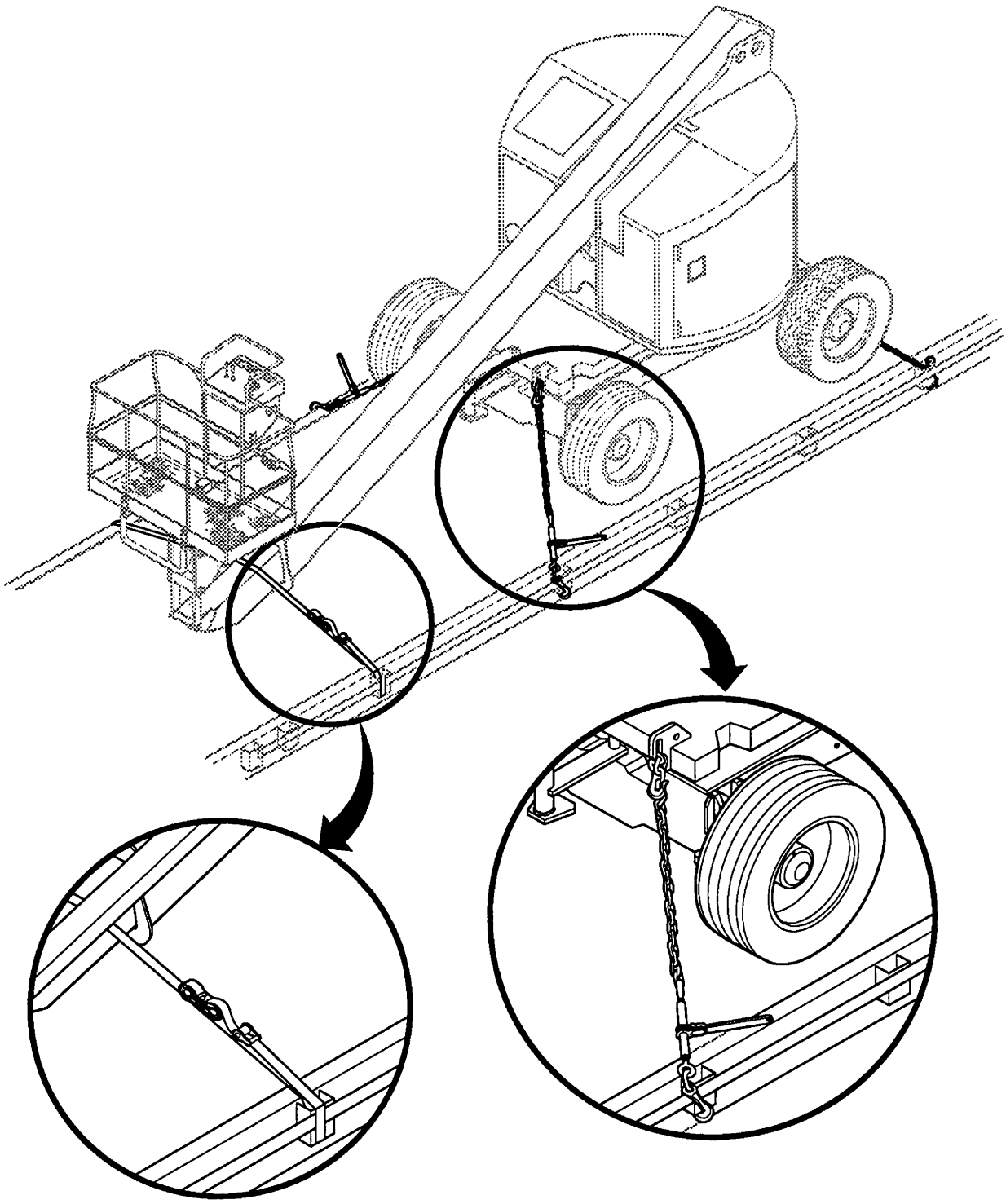
5 Ensure that the boom is fully retracted, and that the platform will **not** contact any other item, including the bed of the truck or trailer. (Only the boom tip should rest on truck or trailer bed.)

⚠ CAUTION

To avoid damaging the unit, the platform MUST NOT be tied to the trailer bed in any way.

6. The negative battery cables should be disconnected for long distance transport. It is recommended that the fuel and hydraulic tank valves be closed as well.

7. Tie down locations are located on all four corners of the undercarriage. Use four (4) 1/2 inch, "Grade 7" chains from each of the tie down lugs, and run the chains as shown. Ratchet type load binders are recommended. If using lever type load binders, wire or strap them shut, or wrap chains around them to prevent opening.



Tie Down Locations (Recommended)

UNLOADING PROCEDURES

⚠WARNING

TO AVOID A SERIOUS PERSONAL INJURY OR DEATH, ENSURE THAT THE MACHINE IS IN "LOW" DRIVE SPEED WHILE UNLOADING FROM A TRUCK OR TRAILER.

- Inspect the outside of the unit for damage (including the underside). Inspect all hoses, boom sections and cables for chafing or road damage. Confirm that all wheel lug nuts and swing bearing bolts are tight.
- Remove the pin that locks the superstructure to the undercarriage near the swing bearing. Stow the lock pin in the location provided near by.
- Unlock and open both side compartments. Inspect all fuel, electrical and hydraulic connections for damage and security.
- Connect battery cables to batteries if required. Check electrolyte level.
- Open the fuel tank valve.
- Check engine oil level, and add as required per engine manufacturer's recommendations.
- Check fluid level at the sight gauge on the hydraulic tank, and add fluid as required (see Lubrication Chart). Check that shutoff valves on the hydraulic tank are open.
- Close side compartment covers.

⚠ CAUTION

Always attach the unit to a winch when loading or unloading from a truck or trailer. We do not recommend unassisted loading or unloading of any mobile platform.

- Attach the unit to a winch for the unloading procedure.

⚠ CAUTION

Read and understand all safety, control and operating information found on the machine and in this manual before operating the unit.

- Start engine, using the ground controls. After a brief warmup period, select the "HIGH" engine speed. Activate the ground controls, and check that the hydraulic pressure is as stated on the Data Plate. Select the "LOW" engine speed and allow the engine to slow to idle speed. Turn off engine.

  NOTE: Refer to Startup Procedures and Operator Controls Descriptions in the Operator's Manual

- Remove all machine tie downs. Remove wheel chocks, if used. Switch the Ground/ Platform toggle to "PLATFORM CONTROLS".
- Enter the platform, and restart the engine using the platform controls. Select "OPERATING engine speed, and test all platform functions.
- Raise the boom so that the platform will clear any obstacles as the machine is driven down the loading ramp. It may be necessary to swing the superstructure to the side to allow greater ground clearance.
- Carefully drive the unit off the truck or trailer.

  The brakes are automatically released for driving, and will automatically apply when the unit stops.

- Before placing the unit into service, all operators must read and understand the contents of this Operator's Manual.

EMERGENCY SYSTEM AND PROCEDURES

⚠ DANGER

IF THE UNIT FAILS WHILE THE OPERATOR'S PLATFORM IS RAISED OR EXTENDED, DO NOT ATTEMPT TO CLIMB DOWN THE BOOM ASSEMBLY. SERIOUS INJURY MAY RESULT.

EMERGENCY PUMPS

The MPN Mobile Platform has one emergency pump which can be operated from the operator's platform or ground control station to safely return the platform to the ground position when the unit has lost engine power.

- Press and hold the "EMERGENCY PUMP" button on the remote control pendant, **or**
- Press and hold the "EMERGENCY PUMP" button on the platform control console.

Select the proper function (boom retract or boom lower) as desired to fit the situation.

To prevent the battery from completely discharging and the emergency pumps from overheating, release the emergency pump button to allow a 30 second rest period after every 30 seconds of operation. Once the boom has been safely lowered, correct the cause of the failure before returning the unit to service.

EMERGENCY DRIVE FUNCTION

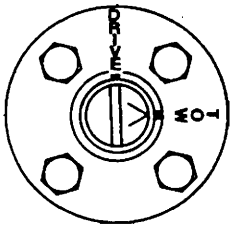
Should it be necessary to move or steer the unpowered unit, you must do the following:

- Securely attach the MPN to a tow vehicle with tow chains or similar means. Attach chains to the tie down lugs on the undercarriage.
- Disengage torque hub: remove the cap at the center of the torque hub, turn the slot so it is in the tow position, then reinstall the cap.

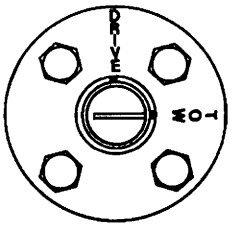
⚠ CAUTION

Whenever disengaging the drive torque hubs or before disconnection from towing vehicle, ensure that the unit cannot roll.

- Disengage steer selector valve to allow steering wheels to track behind tow vehicle. Pull out to disengage steer system.



HUB LOCKOUTS MUST BE IN THIS POSITION FOR DRIVING



HUB LOCKOUTS MUST BE IN THIS POSITION FOR TOWING

Torque Hub Identification for Disengagement.

The tow vehicle must have sufficient braking capability to stop itself as well as the MPN.

⚠ CAUTION

Do not exceed maximum drive speed for the MPN.

EMERGENCY LOWERING

It is not possible for us to foresee every emergency situation that could arise during operation of this machine. Information on the following pages describes three typical emergency situations, and lists appropriate actions that can be taken.

When faced with an emergency, above all please remember:

- Stay calm.
- Think through the situation before operating the machine.
- Get help if necessary.

SITUATION: Platform elevated, operator not incapacitated, but unit will not respond to platform controls.

POSSIBLE CONDITION:

- One or more functions not operating correctly.
- Unit movement from unselected control lever.
- Unit function will not stop unless power is switched off.

CORRECTIVE ACTION

1. Remove foot from foot pedal.
2. Push the red "Emergency Stop" Button.
3. Evaluate the nature of the failure. Return to the ground, using the emergency pumps and lowering procedure (see "Emergency Pumps").
4. If unable to return to the ground using the platform controls and the emergency pumps, contact an experienced operator to lower the machine using the emergency pumps from the pendant controls (see "Emergency Pumps").

⚠ DANGER

DO NOT TRY TO CLIMB DOWN THE BOOM.

HAVE AN EXPERIENCED OPERATOR USE THE EMERGENCY PUMPS TO SAFELY LOWER THE PLATFORM. REPORT THE INCIDENT TO YOUR SUPERVISOR IMMEDIATELY.

5. **Report the incident to your supervisor immediately.**

SITUATION: Unit elevated, with operator incapacitated at platform controls.

⚠ DANGER

DO NOT TOUCH UNIT !!!

DETERMINE THE CAUSE OF THE PROBLEM BEFORE YOU TOUCH THE MACHINE.

CORRECTIVE ACTION

1. Have someone summon first aid or rescue squad.
2. Attempt to talk to operator before taking any rescue measures.
3. **Check to see if the operator is in a pinned position, or would be endangered if platform is moved, before attempting emergency lowering procedure.**
4. After establishing that the machine is not in contact with live power lines, lower the platform using the emergency lowering procedure (see "Emergency Pumps").
5. Render first aid to the operator.

SITUATION: Platform in contact with live power lines and operator incapacitated.

⚠ DANGER

DO NOT TOUCH UNIT !!!!

CORRECTIVE ACTION

1. Contact authorized personnel to disconnect power supply touching unit.

2. Have someone summon first aid or rescue squad.

3. If operator is unconscious, check to see if he is in a pinned position, or would be endangered if platform is moved.

4. **AFTER POWER IS CUT, use the emergency lowering procedure to bring platform with operator to a safe location to render first aid (see "Emergency Pumps").**

IMPORTANT: Any incident involving personal injury must be immediately reported to the local Simon Aerials Distributorship as well as to Simon Aerials Inc.

SECTION 2:
HYDRAULIC SYSTEM

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HYDRAULIC FLUID

HANDLING PRECAUTIONS

⚠WARNING

PERSONS IN REGULAR CONTACT WITH MINERAL-BASED HYDRAULIC FLUID NEED TO BE AWARE OF THE IMPORTANCE OF THOROUGH HYGIENE, AND THE PROPER METHODS FOR HANDLING MINERAL OILS IN ORDER TO AVOID POTENTIAL HAZARDS TO HEALTH.

If mineral-based hydraulic fluid is SPLASHED INTO THE EYES, it must be WASHED OUT THOROUGHLY using abundant quantities of water. If irritation persists, medical advice should be sought.

Mineral oils act as solvents on the natural oils in the skin. FREQUENT AND PROLONGED SKIN CONTACT CAN CAUSE DERMATITIS OR SEVERE IRRITATION. Mineral-based hydraulic fluids normally present no health hazard when used properly. Protective clothing and proper washing facilities should be provided or be accessible.

⚠WARNING

HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE AND BURN THE SKIN, DAMAGE EYES, AND MAY CAUSE SERIOUS INJURY, BLINDNESS, AND EVEN DEATH.

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

IF MINERAL-BASED HYDRAULIC FLUID HAS PENETRATED THE SKIN, IT MUST BE MEDICALLY TREATED, BY A DOCTOR FAMILIAR WITH THIS TYPE OF INJURY, WITHIN A FEW HOURS.

FLUID RECOMMENDATIONS

We strongly recommend the use of MOBIL DTE-15 HYDRAULIC FLUID. An EQUIVALENT substitute can be used if absolutely necessary. Mineral-based hydraulic fluids produced by different companies will USUALLY mix with each other satisfactorily, but this IS NOT RECOMMENDED. When in doubt, consult your supplier.

MOBIL DTE-15 has proven to be suitable for use in all climates. For continued operation in temperatures below 32° F (0° C), use of MOBIL DTE-13 or DTE-11 FLUID is satisfactory.

FLUID CONTAMINATION CHECKS

Use the following as a guide to determine when analysis of the hydraulic fluid is necessary.

- Any time the hydraulic pump is replaced.
- If fluid discoloration is noticed in the hydraulic reservoir sight tube.
- If, after the first 50 hours of operation, the hydraulic filter elements are plugged.
- Any time the hydraulic filter elements show signs of metal content.
- Once every six months, under normal operating conditions.
- Every 3 months, in extremely dusty or dirty operating conditions.

The hydraulic fluid analysis must be done by a qualified laboratory. To insure that you receive accurate recommendations about the fluid being analyzed, always provide the following information with the test sample.

- Type of hydraulic fluid. (See Lubrication Chart)

- Model and serial number of unit from which sample was taken.
- Purpose of analysis: i.e. pump failure, discoloration, etc.
- Type of analysis: i.e. complete to show additive breakdown, acid buildup, viscosity, type and percent of contaminants. Comparison to new fluid and recommendations.

Comply with contamination analysis and recommendations to achieve a clean, contamination free hydraulic system.

Following the above guide will prevent premature failure of pumps, cylinder seals and drive motors, and unnecessary down time.

If system flushing and replacement of fluid is recommended, refer to the flushing procedure.

SYSTEM FLUSHING PROCEDURE

With BOOM DOWN AND FULLY RETRACTED (in stowed position), drain hydraulic fluid from hydraulic tank into a clean, empty container. This can be done with an oil filter cart so the fluid may be reused if analysis is good.

When the hydraulic tank is empty, remove suction hoses and return line hose. Remove all hoses between pump and high pressure filter. Flush the hoses. Remove hydraulic fluid filter, and flush the filter body and attaching hoses. Discard old filter element and replace.

With hoses removed from the hydraulic tank, flush out the tank. When this is completed, all the hoses removed in the previous steps should be properly reinstalled EXCEPT the system return line to tank. This hose should be lengthened to drain into the reservoir fluid container.

If the hydraulic fluid removed from the reservoir is good, it can now be pumped (through a filter cart) back into the tank. If fluid is not usable, fill hydraulic tank with filtered, fresh hydraulic fluid (refer to Lubrication Chart).

Make sure the suction lines are open to allow fluid to flow to the hydraulic pump. Loosen hose fittings at pump to allow pump to flood with hydraulic fluid, then tighten pump fittings.

Select the "GROUND CONTROLS" position of the ground/ platform toggle switch. Turn the main power key switch to the "ON" position. Switch the ignition toggle to the "ON" position. Turn key switch to "PREHEAT" and hold it there for 30 to 45 seconds. Turn keyswitch to start engine. After a brief warmup period, select the "HIGH" engine RPM setting. Press and hold "Pump Button" (Deadman) to engage pump. Briefly cycle all boom functions to flush the hydraulic components of the hydraulic fluid. Use care when doing this as hydraulic fluid is now being returned to container provided. This will remove old fluid from the hydraulic system as the boom is cycled to its maximum limits.

⚠ CAUTION

Monitor the hydraulic reservoir fluid level when cycling the unit functions, adding fluid as necessary to replace that being discharged to container at system return line. This fluid may be returned to the reservoir through a filter cart, if good.

Three cycles of ALL hydraulic cylinder functions should remove old hydraulic fluid.

When the above procedures have been completed, re-connect system return hose to tank. Fill hydraulic tank to full mark on sight gauge.

Operate all functions to their full extreme positions to insure proper operation.

Check for leaks and correct as necessary. Unit is now ready to be placed back in operation.

HYDRAULIC SYSTEM COMPONENTS

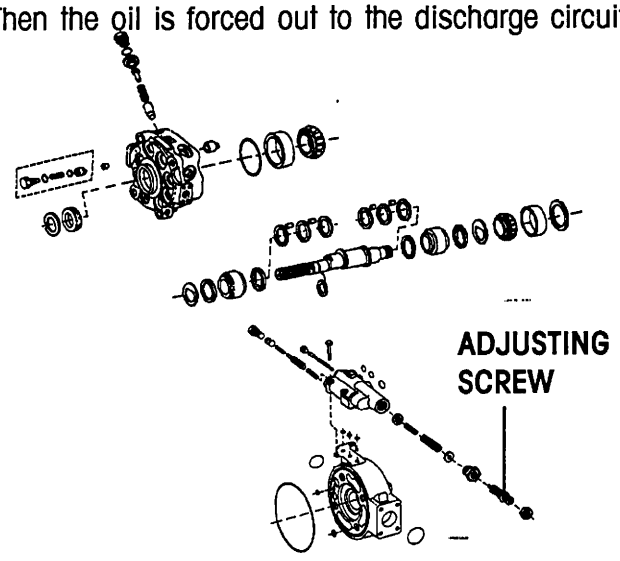
Following is a description of the Electro-Proportional Circuit and the major components of the hydraulic system.

ELECTRO-PROPORTIONAL CIRCUIT

With no function activated and the engine running, fluid flows from the hydraulic reservoir to the pump, to the high pressure filter, then to the valve bank where all valve spools block hydraulic flow. At this point the pump is providing minimum flow (0.8 GPM) at minimum pressure (100 psi). When the operator steps on the foot switch, the pump produces minimum flow at maximum operating pressure. When the operator moves a control function lever, it initiates an electrical signal to a solenoid at the valve bank and shifts a spool. This flow is metered by the platform cotroller or is set at the module by a potentiometer. The fluid is then directed to the appropriate function and the return fluid is directed back to the reservvpor.

HYDRAULIC PUMP

The pump operates using pistons that are arranged radially and operate on a cam which is driven by the input shaft. As the shaft rotates each pistor draws oil from the inlet gallery through an inlet check valve. Then the oil is forced out to the discharge circuit through the outlet check valve. Variable output flow is controlled by the increasing or decreasing distance the pistons are stroiked.

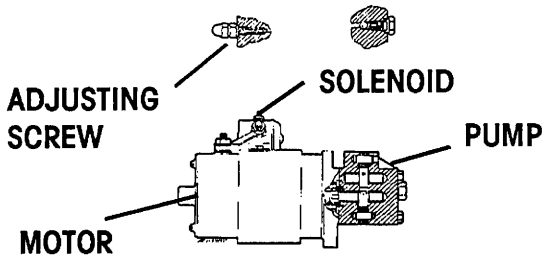


Hydraulic Pump.

HYDRAULIC PUMP ADJUSTMENT

To adjust the pressure, locate the pressure compensator adjusting screw on the load sensing housing on the control valve section of the pump assembly. Loosen the locknut and turn screw in to increase system pressure or out to decrease system pressure. System pressure should be set at a predescribed setting (see Machine Specification).

EMERGENCY PUMP



Emergency Pump.

An emergency pump is driven by an electric DC motor. This pump delivers hydraulic fluid, under pressure, to the valve bank assembly. The electric motor is of a non continuous type and will fail if used excessively.

> **Note:** This pump should only be used in emergency situations.

EMERGENCY PUMP ADJUSTMENT

Emergency pump pressure setting adjustment screw is located on the side of the pump.

To adjust the pressure on the pump, remove the cap and turn the adjusting screw in to increase pressure. To decrease pressure, turn the adjusting screw out. Pressure setting should read 2500 PSI (172 Bar/ 176 Kg/cm^2)

GROUND VALVE BANK ASSEMBLY

The ground valve bank assembly of electrohydraulic valves are designed for remote directional and proportional flow control. The spools of the main valve are hydraulically piloted by a solenoid, which uses pulse-width modulated excitation to provide proportional control.

INLET SECTION

Installed in each inlet section is a 25 micron stainless steel wire cloth pilot supply filter. Also standard is a pressure reducing valve designed to provide fluid to each pilot stage with the required pressure supply.

Pressure compensation is accomplished at the pump. Therefore, the inlet section acts primarily as a manifold inlet to the main hydraulic fluid supply and an outlet to the reservior.

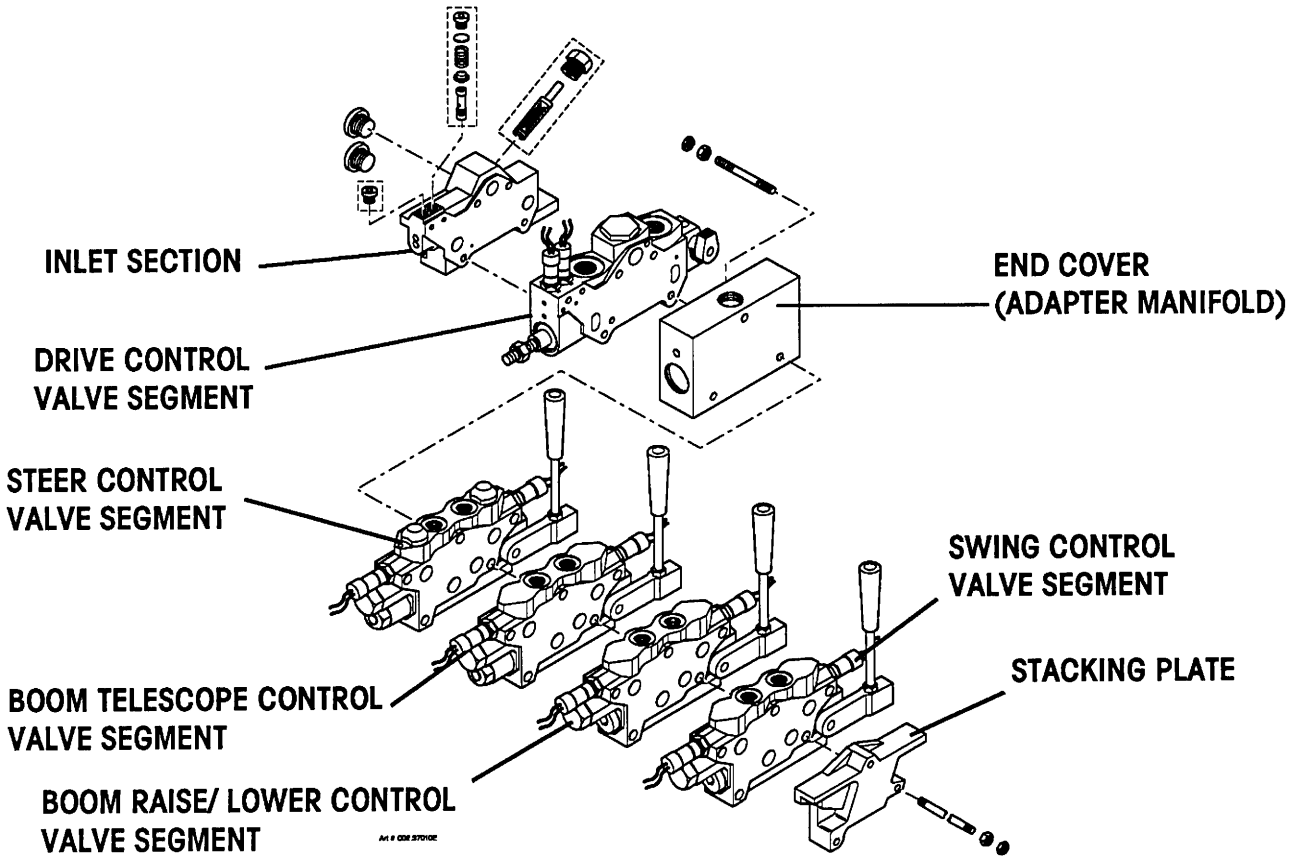
END COVER (ADAPTER MANIFOLD)

The end cover section is essentially a manifold connecting flow passages and serves to complete the sectional valve stacking.

VALVE ASSEMBLY

The top valve segment is the drive function. The four bottom valve segments are for the swing, telescope, hoist and steer functions.

The spools in the valve assembly are 4-way, 3-position closed center. Motion stops in the neutral position, where the pressure is blocked.



Ground Valve Bank Assembly.

OPERATION

To generate a proportional control pressure, the solenoid is energized 33 times per second with a pulse-width modulated electrical signal. The resulting control pressure is directly proportional to the duty cycle, or percent of "ON" time per cycle of this electrical excitation. Fluid exiting the cartridge is restricted by a fixed orifice plate; the resulting back pressure is proportional to the operator-regulated duty cycle. This pressurized fluid is then routed within the main valve segment to the end of the spool to furnish the control pressure to shift the spool to the flow required.

MAINTENANCE

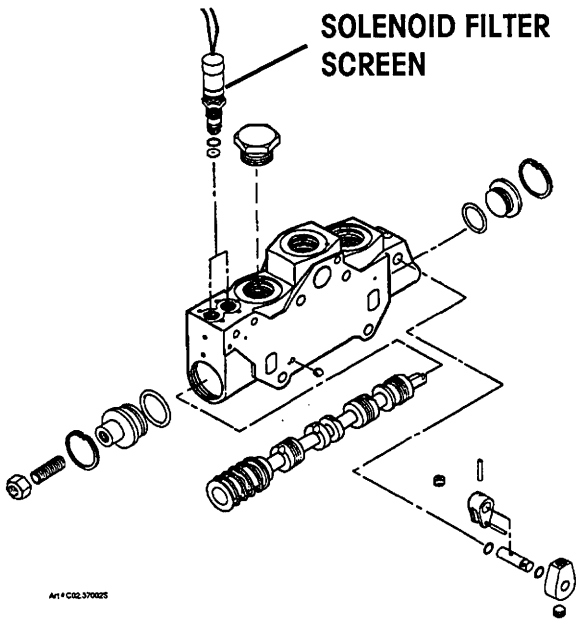
Hydraulic Circuit Line Check

Inspect hydraulic lines and connections for signs of looseness or obstruction.

Tighten loose fittings and correct any crimped hoses:

- From pump through pressure filter to valve stack.
- Lines between valve stack and reservior.
- All hoses to the cylinders.
- Tie-downs of hoses.

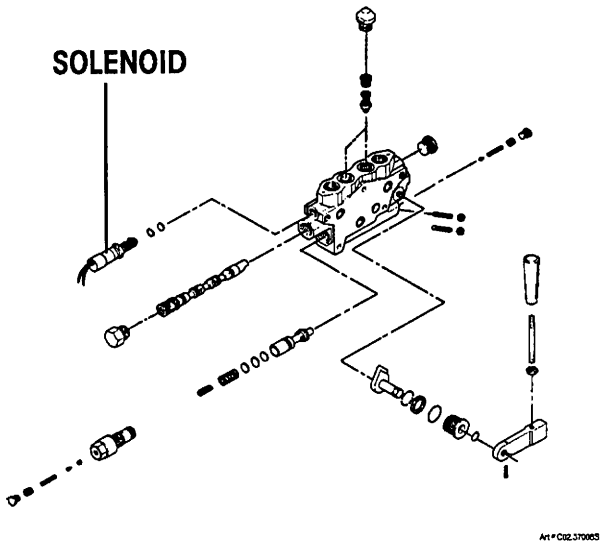
NOTE: Entrapped air in the hydraulic lines is common upon start-up and may result in temporary irregular motion. However, if after a reasonable operating period this condition persists, hydraulic lines should be bled to remove entrapped air and carefully inspected for leaks, starting with the pump suction line.



Drive Valve Segment.

Valve Assembly

The valve assembly contains one filter element which requires maintenance. The pilot filter on the inlet section is the filter element that requires cleaning. Remove and clean trapped contaminants using compressed air from the inside out. Replace damaged filter elements.



Steer, Telescope, Boom and Swing Valve Segment.

UNDERCARRIAGE VALVES

NOTE: Refer to "Machine Specifications" to determine maximum system pressure for your MP.

DRIVE RELIEF VALVE

The drive relief valve is located between the outlet of one drive motor and the inlet to the other drive motor. When the drive motors are in series (high speed drive) the valve will relieve any pressure spikes when driving and steering. In other words, this valve prevents the motors from cavitating or seeing pressure greater than 3000 PSI (207 Bar). The drive relief valve is factory set at 3,000 PSI (207 Bar) and requires no adjustments.

DRIVE VALVE ASSEMBLY

HI/ Low Speed Drive Valve

The hi/ low speed drive valve is a series parallel valve located on the undercarriage and used to control the fluid flow for travel speed. The valve is factory set and requires no adjustment.

Flow Divider Valve Assembly

The flow divider valve assembly consists of two valves: a flow divider/ combiner valve and a gate (globe) valve, which is located on the undercarriage and is in the drive circuit.

The Flow Divider/ Combiner Valve equally divides or combines hydraulic flow from the drive valve depending on direction of travel, insuring that the drive motors will have equal torque and speed.

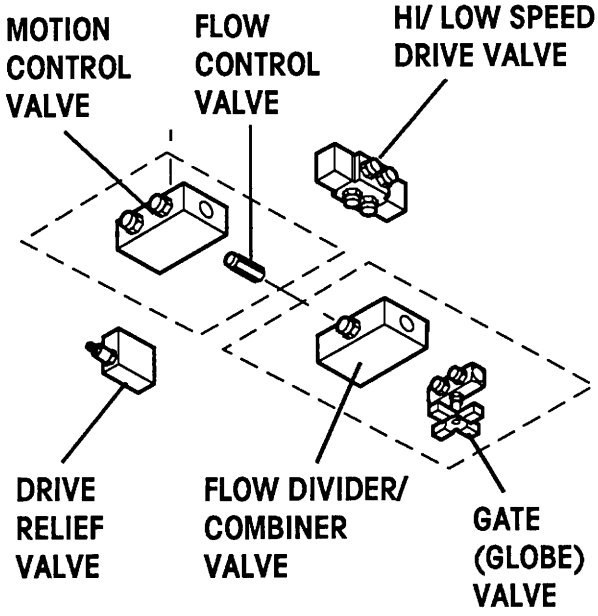
The Gate (globe) Valve allows hydraulic fluid to transfer from one drive motor to the other. When making turns the outside tire turns faster and requires more hydraulic fluid flow. Since the flow divider gives each motor equal flow the globe valve will allow the transfer of hydraulic fluid from the inside wheel to the outside wheel and prevent tire scrubbing on hard surfaces. For good performance in most conditions, the setting should be 1-1/2 turns open from the closed position.

Motion Control Valve Assembly

The motion control valve assembly consists of two valves: a motion control valve and a flow control valve. This valve assembly, which is in the drive circuit, is located on the undercarriage on the other end of the drive valve assembly from the flow divider valve assembly.

The Motion Control Valve restrains return flow from the drive motors to prevent cavitation and the drive motors from running ahead of pump flow. Also located in the motion control valve manifold is a shuttle valve which provides hydraulic pressure to release the drive motor brakes in either forward or reverse. This valve set-up controls speed decending a grade (runaway).

The Flow Control Valve meters the hydraulic fluid flow released from the spring applied hydraulically released brake assemblies for a smooth braking action. The valve setting is 2 to 3 turns from the closed position.



Drive Valve Assembly.

HYDRAULIC FLUID RESERVOIR

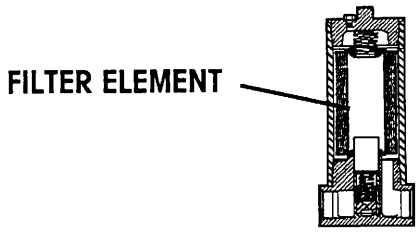
The hydraulic fluid reservoir consists of the tank, a sight gauge, a filler cap with filter, a strainer, a vent, one valve for suction line, five valves for return lines and a valve for the emergency pump suction line.

HYDRAULIC RESERVOIR MAINTENANCE

Check tank for signs of leakage. Inspect tank securing bolts for tightness. Clean cap filter by flushing with clean water and dry thoroughly.

HIGH PRESSURE FILTER

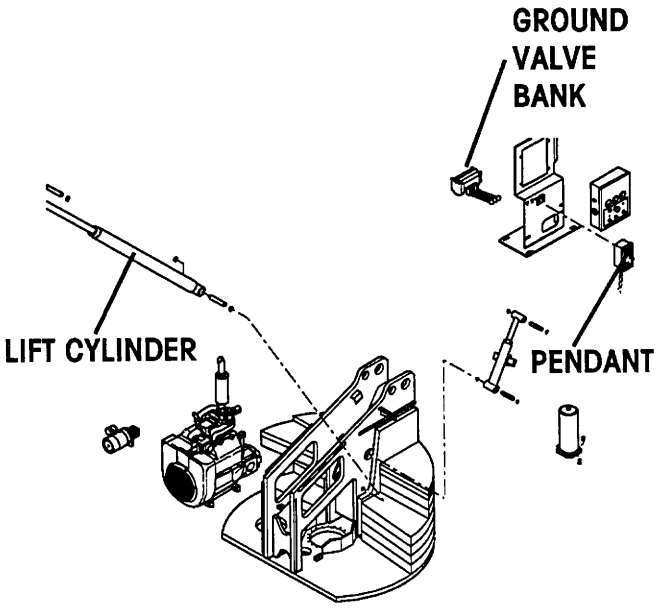
The hydraulic high pressure filter is a non-bypassing filter. This filter allows maximum fluid flow as long as the filter element is free of contaminants. When the filter is clogged, it shuts down the hydraulic flow but will not crush the filter element due to a differential pressure limiting valve. The build-up of pressure across the filter will affect system performance and act as an indication of a clogged filter.



High Pressure Filter.

BOOM LIFT SYSTEM

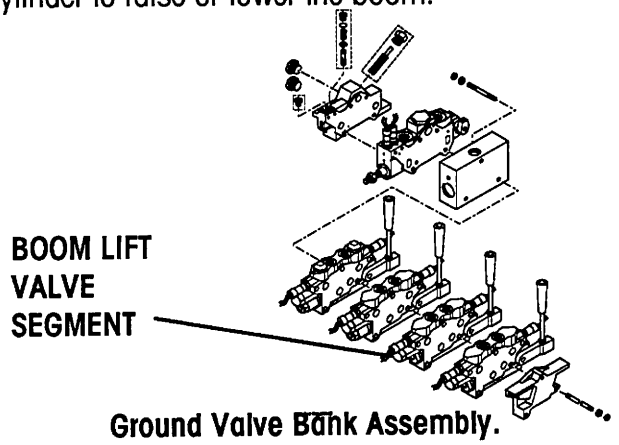
The boom lift system consists of a hydraulic valve segment on the ground valve bank, a flow control valve, a lift cylinder with a counterbalance (holding) valve, a lift toggle switch on the pendant and a control lever on the platform console.



Boom Lift System Components.

BOOM LIFT VALVE SEGMENT

When the boom control lever on the platform control or the boom control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the boom lift (hoist) valve segment. This allows hydraulic fluid at the correct pressure to be sent to the proper end of the lift cylinder to raise or lower the boom.



Ground Valve Bank Assembly.

FLOW CONTROL VALVE

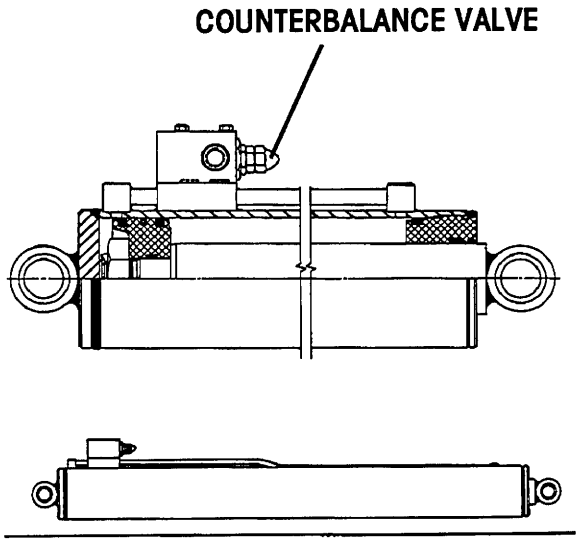
The flow control valve, located at the "boom up" outlet on the boom lift (hoist) valve segment, controls boom down speed. The flow control valve allows full hydraulic fluid flow for the boom up function. For the boom down function, the flow control valve meters the hydraulic fluid flow, thus allowing a smooth descent.

Flow Control Valve Adjustment

If boom bounces while descending, adjust the valve clockwise until the boom descends smoothly.

LIFT CYLINDER

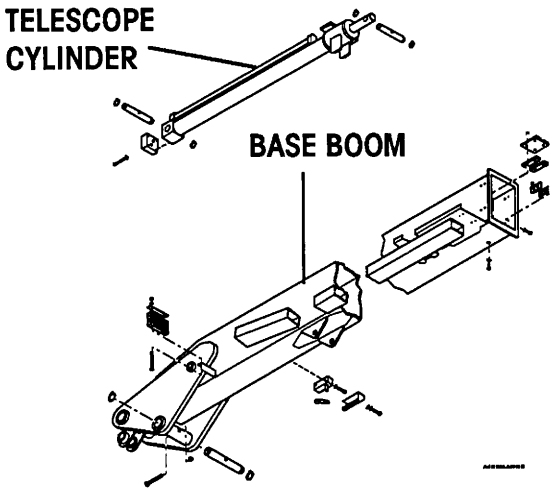
The boom lift function is controlled by a double acting cylinder. The cylinder contains a counterbalance (holding) valve, which will prevent unintended movement of the cylinder should a hose or fitting develop a leak. When the boom is lowered, fluid flows to the rod end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the base end of the cylinder to flow back to the hydraulic reservoir. When the boom section is raised, fluid flows to the base end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the rod end of the cylinder to flow back to the hydraulic reservoir.



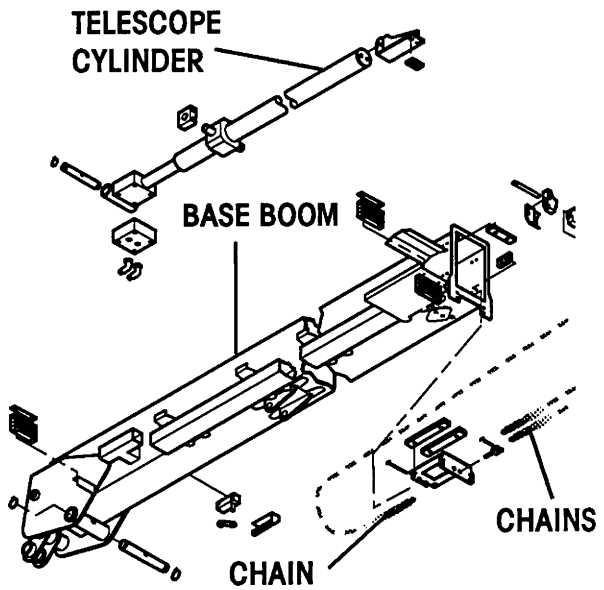
Lift Cylinder.

BOOM TELESCOPE (EXTEND) SYSTEM

The boom telescope system consists of a hydraulic valve segment on the ground valve bank, a pressure relief valve, a telescope cylinder with two counterbalance (holding) valves, and a mechanical extension (chains) on three section booms, a extend toggle switch on the pendant and a control lever on the platform console.



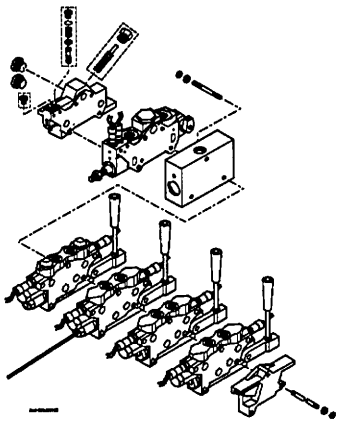
Boom Telescope System Components on Two Section Booms.



Boom Telescope System Components on Three Section Booms.

BOOM EXTEND VALVE SEGMENT

When the boom telescope control lever on the platform control or the boom telescope control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the boom telescope (extend) valve segment. This allows hydraulic fluid at the correct pressure to be sent to the proper end of the telescope cylinder to extend or retract the boom.



BOOM TELESCOPE VALVE SEGMENT

Ground Valve Bank Assembly.

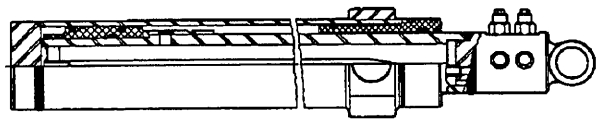
PRESSURE RELIEF VALVE

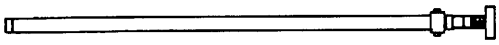
The pressure relief valve limits the pressure on the base end of the cylinder to 1800 PSI (124 Bar/ 126.5 Kg/cm^2) to prevent the cylinder rod from buckling. The pressure relief vlave is factory set at 1800 PSI (124 Bar/ 126.5 Kg/cm^2) and needs no adjustment.

TELESCOPE (EXTEND) CYLINDER

The telescope (extend) cylinder controls the extending and retracting of the boom. The cylinder contains two counterbalance (holding) valves, which prevent unintended movement of the cylinder should a hose or fitting develop a leak. When the boom section is extended, fluid flows to the base end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the rod end of the cylinder to flow back to the reservoir. When the boom section is retracted, fluid flows to the rod end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the base end of the cylinder to flow back to the reservoir.

The telescope cylinder is connected to the base and mid boom sections only. The tip boom section is chain operated (see Mechanical Components Section).



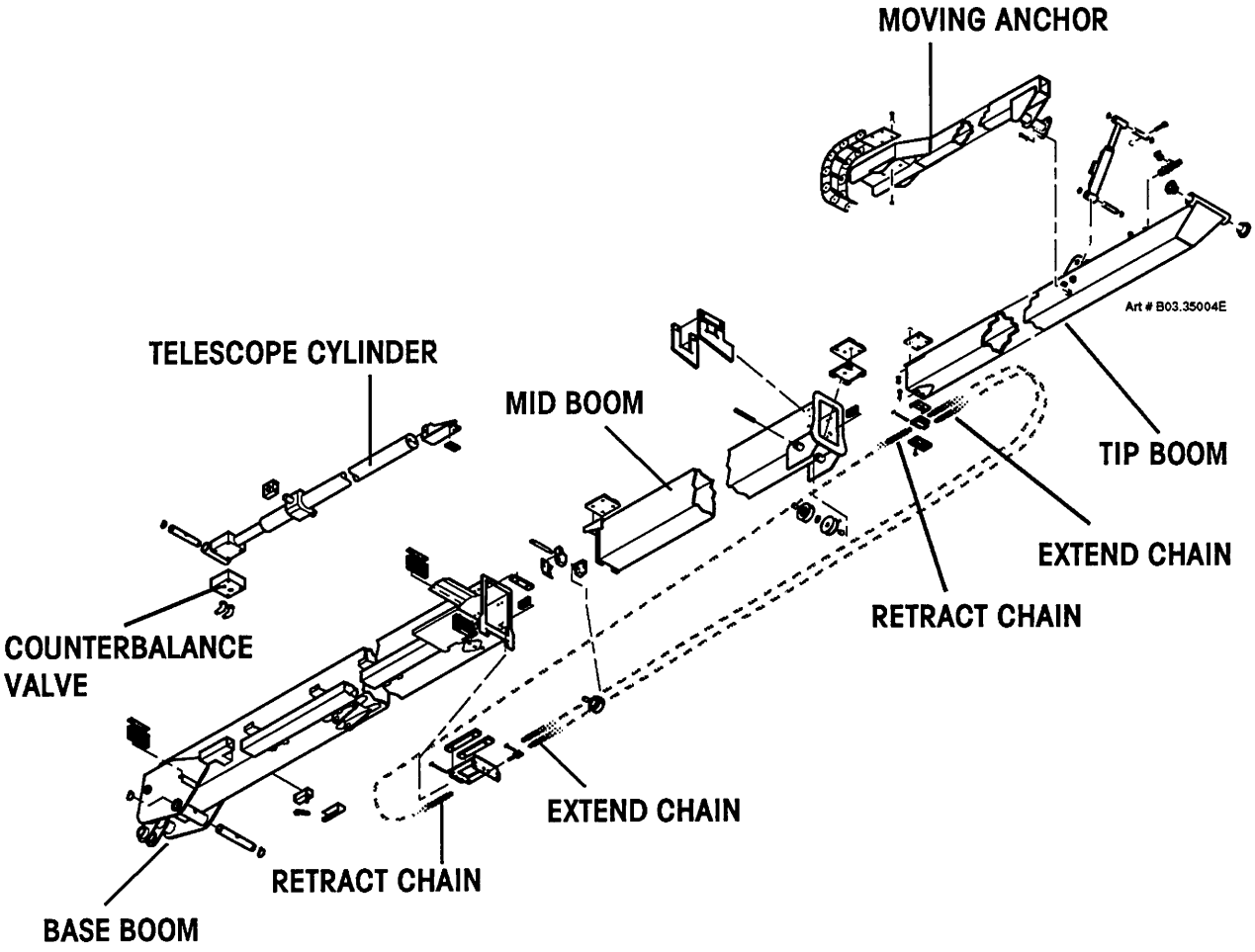


Telescope (Extend) Cylinder.

MECHANICAL EXTEND FUNCTION

On units having three boom sections, the third boom section is extended and retracted using chains. Two chains are used to extend the boom and one chain to retract the boom. The chains are anchored at one end to a bracket on the base boom, are routed around sheaves mounted on the mid boomsection and are anchored at the other end to the tip boom (see illustration below). As the telescope cylinder extends or retracts the mid boom, the chains and sheaves cause the tip boom to extend or retract at the same rate.

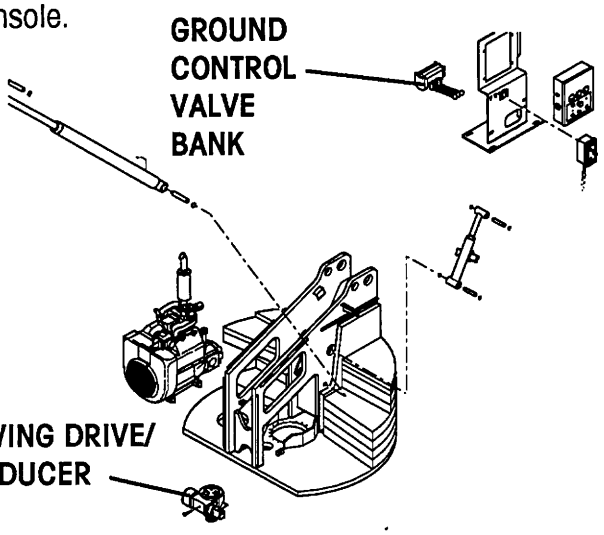
Two chains are used for the extend function because those chains support the load in the platform, especially at higher boom angles.



Boom telescope Function.

SUPERSTRUCTURE SWING SYSTEM

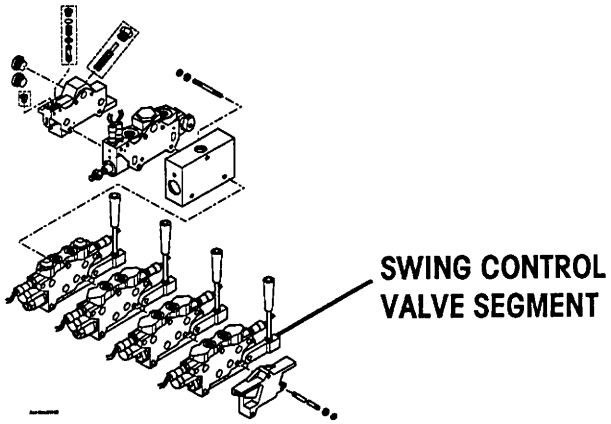
The superstructure swing system consists of a hydraulic valve segment on the ground valve bank, swing drive/ reducer assembly, hydraulic motor, an integral brake assembly (MPN 60), a toggle switch on the pendant and a control lever on the platform console.



Superstructure Swing System Components.

SWING VALVE SEGMENT

When the swing control lever on the platform control or the swing control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the swing valve segment. This allows hydraulic fluid at the correct pressure to be sent to the swing drive motor.



Ground Valve Bank.

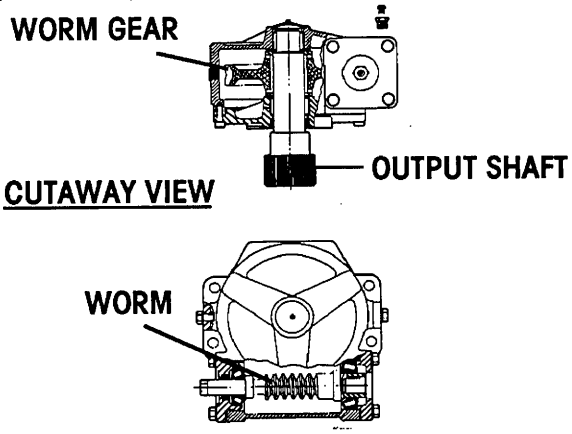
SWING DRIVE MOTOR/ REDUCER ASSEMBLY

There are two variations of the swing drive motor/ reducer assemblies used on the MPN series. The MPN 60 has an integral brake assembly.

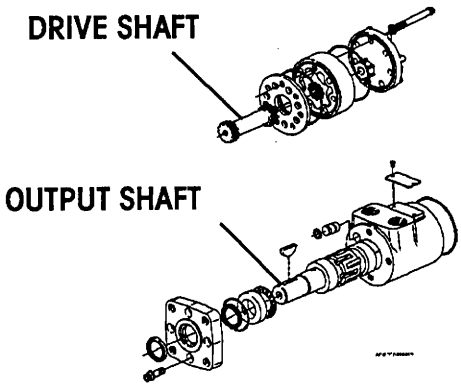
Worm Gear Swing Reducer

The worm gear swing reducer used on the MPN 40 allows the motor output to be reduced to a fractional speed and greatly increasing motor torque. This allows the superstructure to rotate at a slow controlled speed when fluid power is applied to the swing drive motor.

A pilot operated check valve (swing lock valve) is placed in the swing motor hydraulic circuit to prevent the superstructure from rotating when not engaged by the swing directional control valve.



MPN 40 Worm Gear Type Swing Reducer.



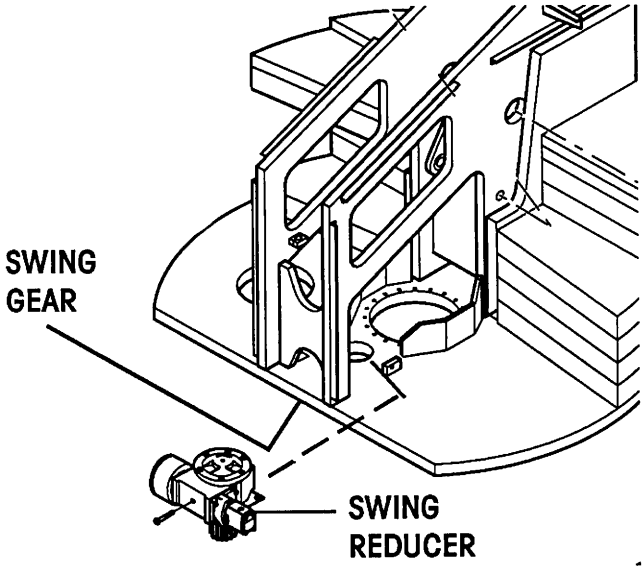
Swing Motor.

Swing Gear and Pinion Shaft Adjustment

To adjust the swing gear on the MPN, loosen the gearbox side lock bolts and jack screws. Adjust the front lock bolts and jack screws.

> **NOTE:** Adjust so the swing reducer pinion gear mates to the large swing bearing gear with zero backlash and no preload. Excessive backlash will lead to jerky or erratic rotation and possible breakage of gear teeth. Excessive preload will lead to premature wear and possible breakage of gear teeth.

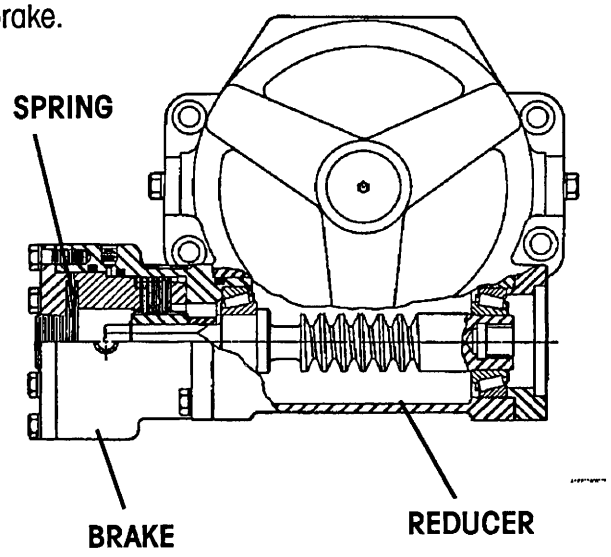
Retighten the side lock bolts and jack screws. Torque the swing pinion gear guard bolts (see "Machine Specification").



Swing Reducer Adjustment.

Integral Brake Assembly (MPN 60)

The integral brake assembly is spring applied and hydraulic released at a pressure of approximately 250 PSI (17 Bar/ 17.6 Kg/cm^2). Hydraulic fluid flow is transferred through a shuttle assembly located on the swing motor so that whichever direction is selected, fluid flow will be diverted to release the brake.



MPN 60 Swing Drive Reducer with Integral Brake.

SWING SYSTEM MAINTENANCE

Grease the bearing (see lubrication chart) or check the optional "oil bath" style swing bearing enclosure monthly for metal shavings or other contamination.

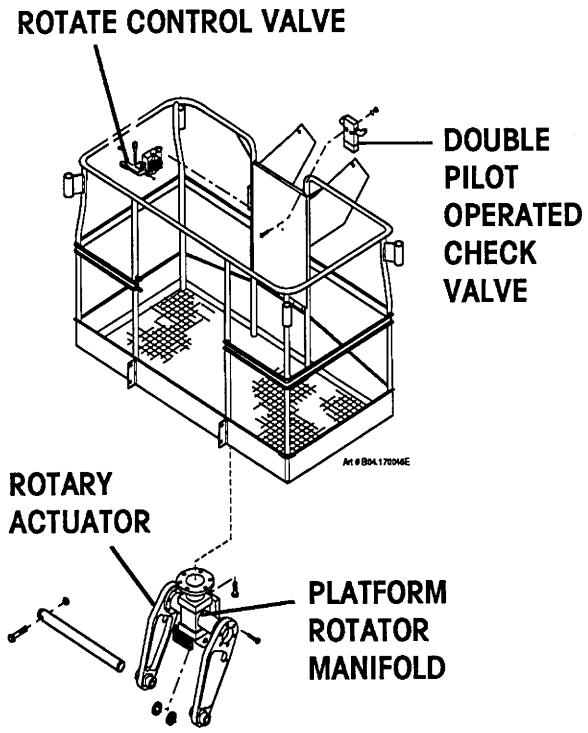
Change the oil if contaminated (see Lubrication Chart).

Check the fluid level in the swing drive gear box every other month (see Lubrication Chart).

Change the fluid in the swing drive gear box every two years (see Lubrication Chart).

PLATFORM ROTATE SYSTEM

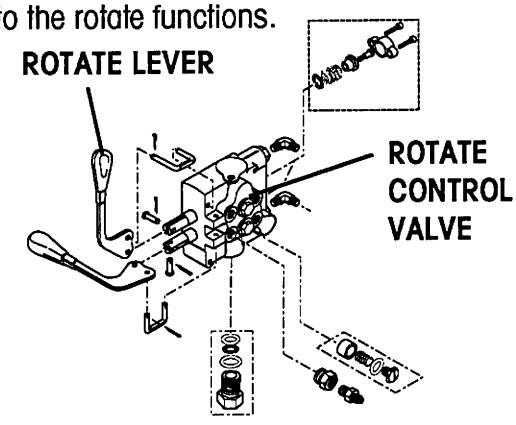
The platform rotate system consists of a a platform rotate control valve, a double pilot operated check valve, a rotary actuator and a platform rotator manifold. The platform rotate system can only be operated from the platform control console.



Platform Rotate System Components.

ROTATE CONTROL VALVE

This valve is a three position, four way valve which is manually operated. This control valve directs fluid flow to the rotate functions.



Rotate Control Valve.

DOUBLE PILOT OPERATED CHECK VALVE

The double pilot operated check valve acts as a locking component for the rotary actuator and prevents the platform from rotating except when the rotate circuit is activated. When the platform rotate circuit is activated, partial flow is piloted over to the return side of the pilot operated check to unseat the check valve and thus unlock the rotary actuator.

ROTARY ACTUATOR

The rotary actuator is a rack and pinion type. Hydraulic fluid enters the actuator from either side depending on the control valve direction and moves the rack, causing the pinion shaft to rotate.

Rotary Actuator Maintenance

Change the hydraulic fluid once every year (see Lubrication Chart). A seal kit and bearing kit are available for repair (see figure facing page).

ROTARY ACTUATOR (3 SECTION BOOM)

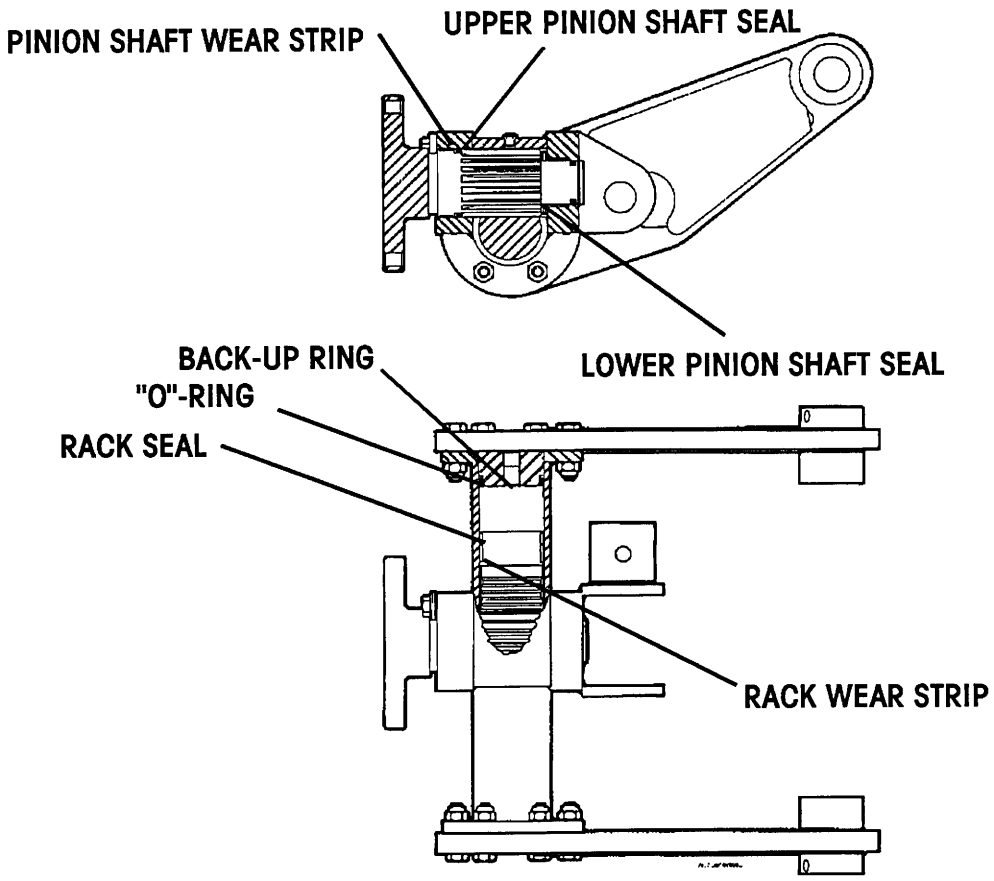
The rotary actuator is a helical type. Hydraulic fluid enters the actuator from the center inlet. Internal porting allows the actuator to turn in either direction.

Rotary Actuator Maintenance

Change the hydraulic fluid once every year (see Lubrication Chart). A seal kit and bearing kit are available for repair (see figure facing page).

PLATFORM ROTATOR MANIFOLD

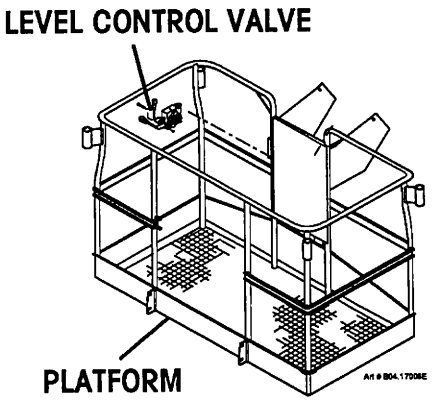
The platform rotator manifold is mounted as an integral part of the rotary actuator. The platform rotator manifold acts as a pressure relief valve to prevent damage to the rotary actuator.

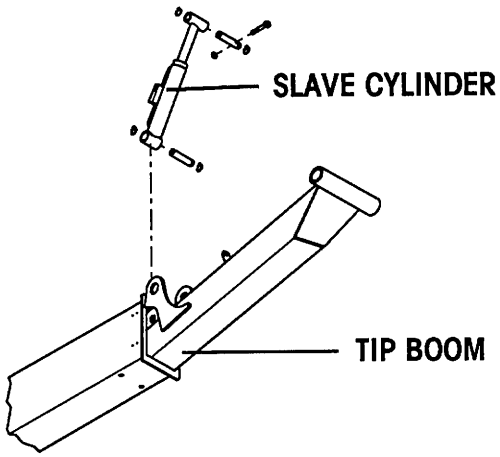


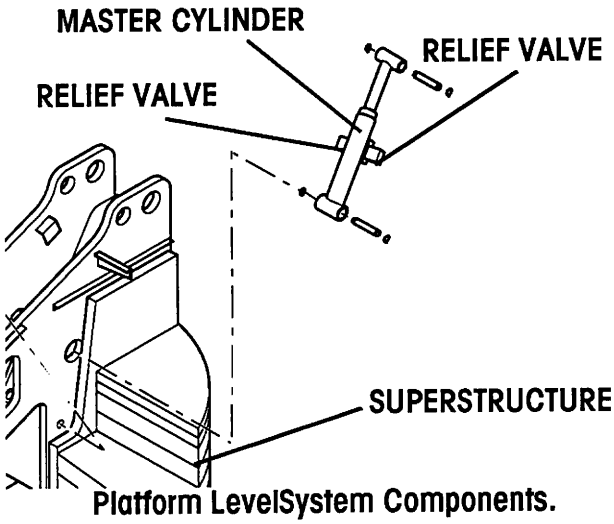
Rotary Actuator.

PLATFORM LEVEL SYSTEM

The platform level system consists of a level control valve, slave leveling cylinder with a counterbalance (holding) valve, master leveling cylinder, and two relief valves.







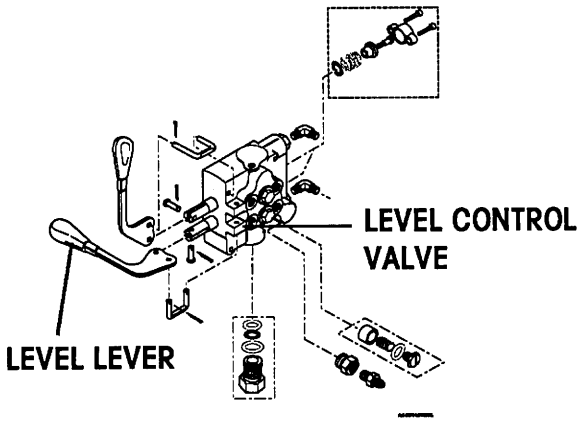
Platform LevelSystem Components.

The platform leveling system automatically keeps the platform level, using a master/ slave cylinder arrangement. As the boom is raised or lowered, fluid is forced from one cylinder to the other in a closed loop, which keeps the platform parallel to the ground in any boom position. Due to slight internal leakage, fluid may at times need to be added to the leveling circuit through the platform level control valve.

The platform level system is only controlled from the platform.

LEVEL CONTROL VALVE

This valve is a three position, four way valve which is manually operated. This control valve directs fluid flow to the level functions.



Level Control Valve.

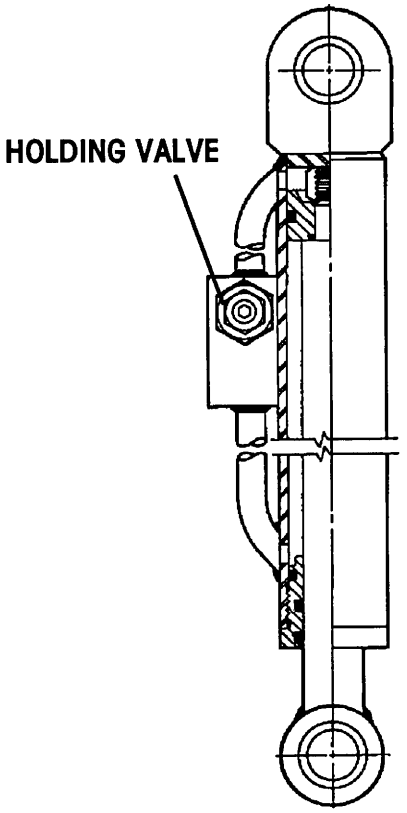
MASTER LEVEL CYLINDER

The master leveling cylinder is a double acting cylinder located between the upper frame of the superstructure and the boom hoist cylinder. Whenever the boom is raised or lowered, the master cylinder is forced to extend or retract. The fluid displacement from the master level cylinder is in turn sent up the boom to the slave level cylinder. This forces the slave level cylinder to move the same distance as the master level cylinder.

SLAVE LEVEL CYLINDER

The slave leveling cylinder is a double acting cylinder located between the tip boom and the platform. This cylinder controls the position of the platform relative to the tip boom.

The slave leveling cylinder contains two holding valves. The holding valves prevent platform movement in the event of hose failure.



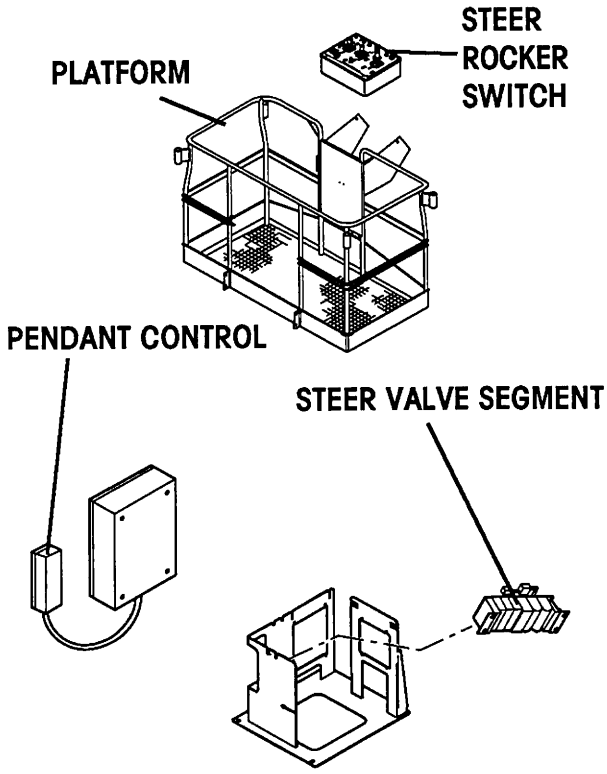
Slave Level Cylinder.

RELIEF VALVES

The relief valves are factory set at 3000 PSI (207 Bar/ 211 Kg/cm^2) and prevent high pressure spikes in the leveling circuit that could result in component damage. High pressure spikes can occur when the platform is manually controlled for leveling, which causes the slave level cylinder to bottom out before the master level cylinder stops moving as the boom is lowered.

STEER SYSTEM

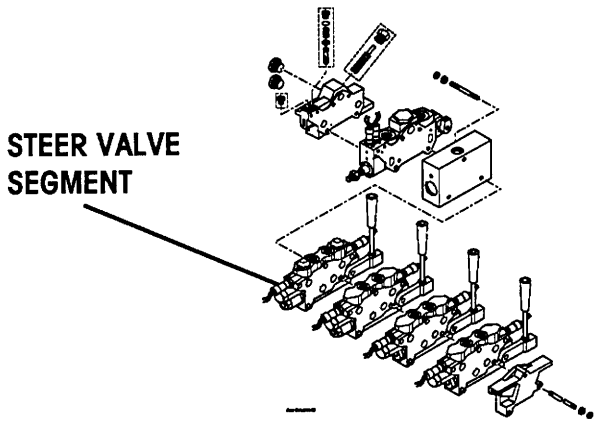
The steering system consists of a steer valve segment, hydraulic swivel, a steer cylinder, a steer toggle switch on the pendant control and a steer rocker switch on the drive lever at the platform control console.



Steer System Components.

STEER VALVE SEGMENT

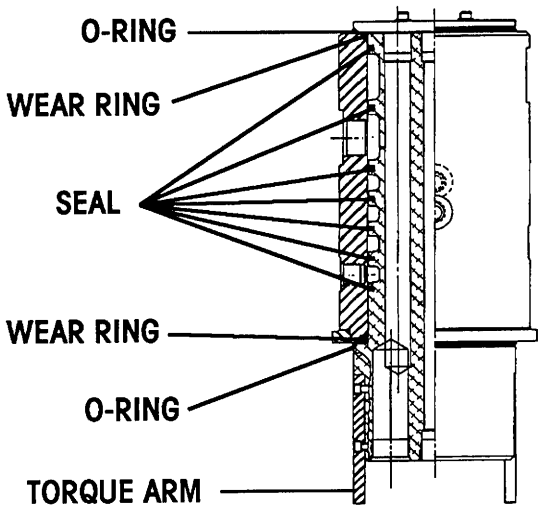
When the steer control lever on the platform control or the steer control toggle switch on the control pendant, is activated an electrical signal is transmitted to the valve solenoid in the steer segment. This allows hydraulic fluid to be sent to the steer cylinder.



Ground Valve Bank.

HYDRAULIC SWIVEL

The hydraulic swivel allows passage of hydraulic fluid from the steer valve segment in the superstructure to the steer cylinder in the undercarraige and back. The swivel allows for 360° of continuous superstructure rotation in either direction.



Hydraulic Swivel.

STEER CYLINDER

The cylinder is double acting and is directly connected to the steering linkage assembly. This cylinder powers all steering movements.

STEER DISCONNECT KNOB (OPTION)

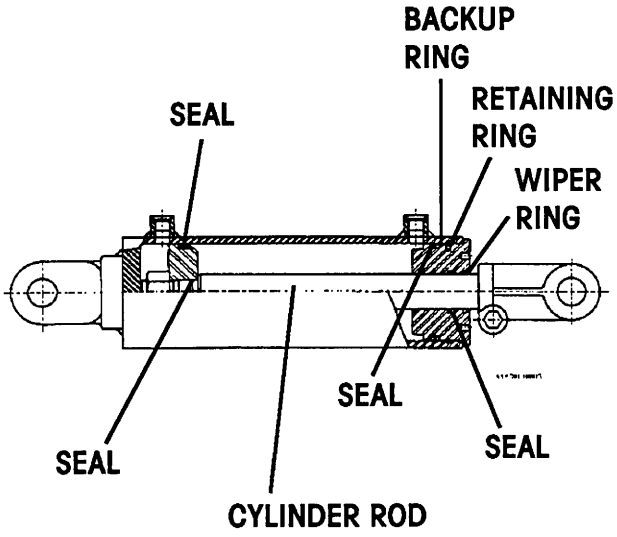
The steer disconnect knob must be pushed in to engage the steer system. Pull the steer disconnect knob out before towing to disengage steer system.

STEER SYSTEM MAINTENANCE

Check all pins on steering linkage and steer cylinder for excessive play, and ensure that all clips are in place and secure.

Lubricate linkage as required (see Lubrication Chart).

Check cylinder and hoses for hydraulic fluid leakage and security.



Steer Cylinder.

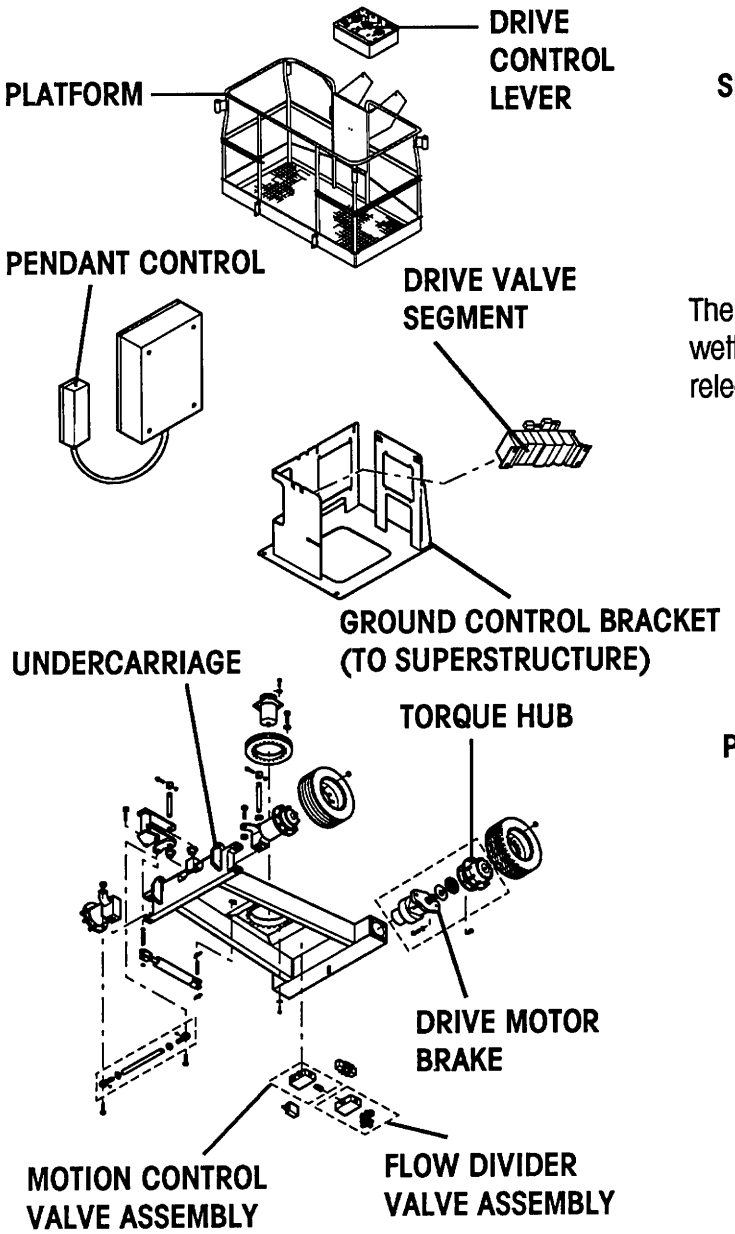
SECTION 3:
DRIVE SYSTEM

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DRIVE SYSTEM COMPONENTS

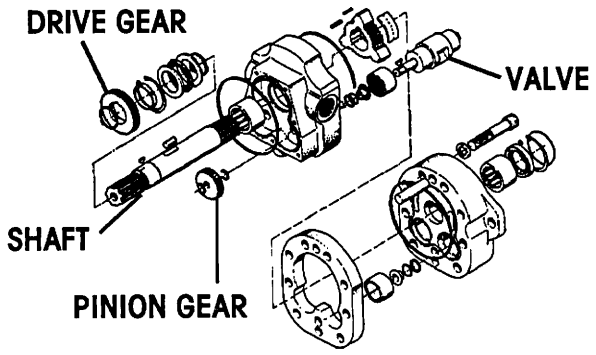
The MPN is propelled by two hydraulic drive motors with integral brake assemblies. There is also a 4-wheel drive option which uses two hydraulic motors without brakes and two hydraulic drive motors with integral brake assemblies. The drive circuit consists of the two hydraulic drive motor/ brake assemblies, the drive valve segment, a selector valve, the drive valve assembly, a drive relief valve, a brake metering valve, a toggle switch on the pendant control and a platform drive control lever (joystick).



Drive System Components.

DRIVE MOTOR AND BRAKE ASSEMBLY

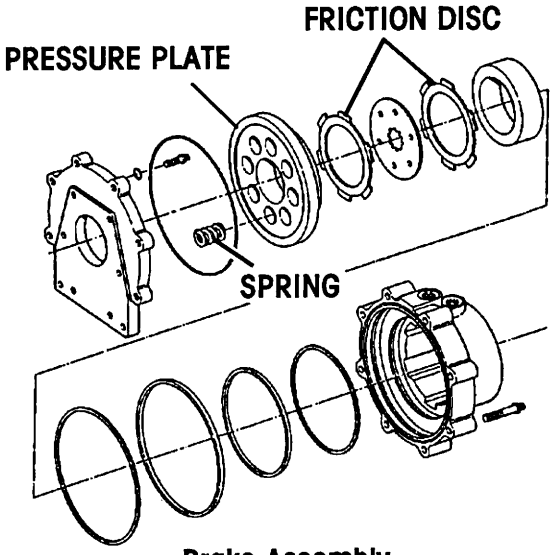
The drive motor is keyed to a shaft which in turn is splined on both ends. One end of the splined shaft is used for the brake while the other end is inserted into the gear reducer assembly.



Motor Assembly.

The brake assembly is a disc type brake. It is a wetted disc which is spring applied with hydraulic release.

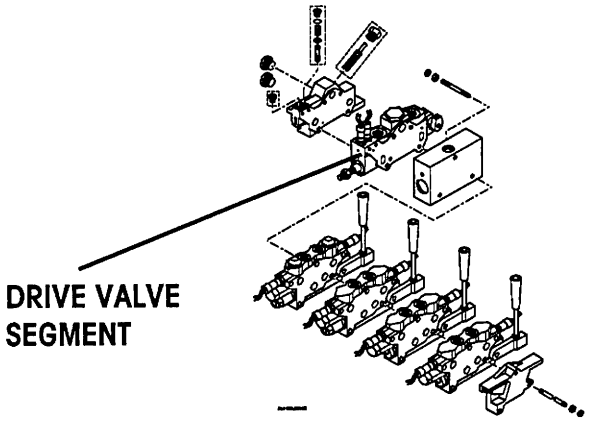
NOTE: Internal leakage in the motor is passed through the brake disc and back to the main hydraulic reservior through the two case drain lines thereby cooling the brake and preventing brake disc wear.



Brake Assembly.

DRIVE VALVE SEGMENT

When the drive control lever on the platform control or the propel control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the drive valve segment. This allows hydraulic fluid at the correct pressure to be sent to the drive circuit. The drive valve segment is part of the ground valve bank and is located on the superstructure.



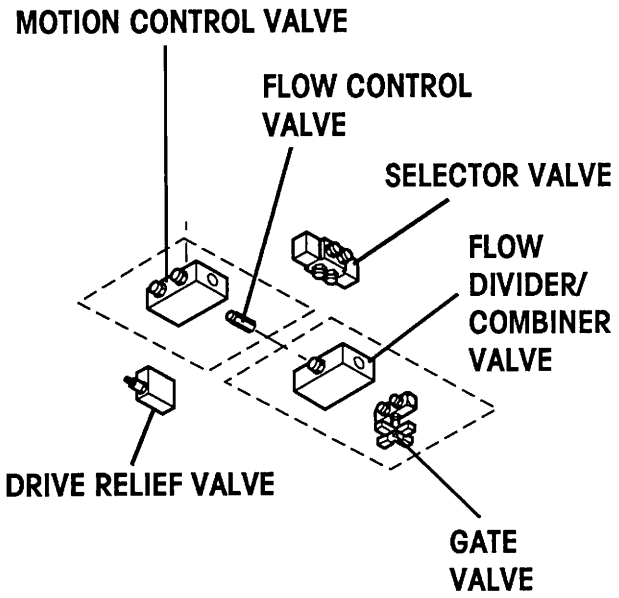
Ground Valve Bank.

DRIVE VALVE ASSEMBLY

The drive valve assembly consists of the selector valve, motion control valve assembly and flow divider valve assembly. The drive valve assembly is mounted on a plate located on the undercarriage.

SELECTOR VALVE

The selector valve used in the drive system allows for a pilot pressure to shift the directional control spool changing the drive system flow from series flow to parallel flow. This then allows the unit to go from low speed to high speed drive.



Drive Valve Assembly.

MOTION CONTROL VALVE ASSEMBLY

The motion control valve assembly consists of two valves: a motion control valve and a flow control valve, which is mounted on the top of the motion control valve.

Motion Control Valve

This valve shuttles hydraulic fluid flow to the integral brake assemblies and produces a back pressure in the drive system using two counterbalance valves to preventing uncontrolled movement.

Flow Control Valve

The flow control valve meters the hydraulic fluid flow released from the spring applied brake assemblies; therefore, giving a smooth braking action.

The proper flow control valve adjustment is 2 to 3 turns from the closed position. This position allows the operator a smooth braking function.

FLOW DIVIDER VALVE ASSEMBLY

The flow divider valve assembly consists of two valves: a flow divider/ combiner valve and a gate (globe) valve, which is mounted on the the flow divider/ combiner valve.

Flow Divider/ Combiner Valve

This valve divides output of pump equally to each drive motor (parallel). In a turning situation, hydraulic fluid will force the internal spools to flow fluid to the outboard driving wheel.

Gate (Globe) Valve

This valve allows hydraulic fluid to pass from one drive wheel to the other when the unit is in a turn (differential action).

Gate (globe) valve can be adjusted as to the amount of fluid allowed to pass but the correct setting should be 1-1/2 turns open from the closed position. In this position the motors will load slightly and allow a metered flow of hydraulic fluid to pass to the outboard driving wheel.

DRIVE RELIEF VALVE

The drive relief valve is located on the underside of the undercarriage, on the side wall. This valve is factory set at 3000 PSI (207 Bar/ 211 Kg/cm^2) and requires no adjustments. This valve assures that the drive system will receive only this pressure while in the drive mode.

BRAKE METERING VALVE

The brake metering valve meters the hydraulic fluid flow released from the spring applied brake assemblies; therefore, giving a smooth braking action.

BRAKE METERING VALVE ADJUSTMENT

The valve is set at the wide open position for shipment and should be reset at 1-1/2 turns from the closed position. This position allows the operator a smooth braking function.

TOGGLE SWITCH ON THE PENDANT CONTROL

To operate the drive function from the ground, use the "Propel" toggle switch on the pendant control. See "Section 4: Electrical System" for switch replacement.

PLATFORM CONTROL HANDLE (JOYSTICK)

To operate the drive function from the platform, use the platform control handle. See "Section 3: Electrical System" for control handle adjustment or replacement.

SECTION 4:
ELECTRICAL SYSTEM

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ELECTRICAL SYSTEM

The following section is a description of maintenance for the major components of an MP electrical system.

BATTERY

A 12 volt battery supplies the electrical current required to operate the electrical circuits for an MPN.

BATTERY MAINTENANCE (IN STORAGE)

Follow these procedures for maintenance of batteries on a machine not in use:

Keep batteries clean. Electrolyte of "wet" batteries should be checked regularly, and kept at proper levels.

Never stack one battery directly on top of another, because post or container damage can result. If batteries are stored individually, place supporting boards between layers. Do not stack more than three high, and rotate stock so that the oldest batteries are used first.

"Wet" batteries should be kept fully charged. A "wet" battery, while in storage, should be recharged to full charge at the following intervals:

If stored at:	Recharge:
Below 40° F (4° C)	None required
40° to 60° F (4° to 15° C)	Every 2 months
Above 60° F (15° C)	Every month

BATTERY MAINTENANCE (IN USE)

Check battery and surrounding area for signs of damage or corrosion.

Check battery terminals for:

- **Corrosion.** Regularly clean connections and apply a non-metallic grease or protective spray to retard corrosion.
- **Loose connections.** Be sure all cable connections are tight, and that good contact is made to terminals.
- **Broken or frayed cables.** Be sure all cable connections are good, and that no loose or broken wires are exposed. Replace as needed.

Check battery electrolyte level. Replenish the electrolyte, if necessary. Remove vent caps before filling, and USE ONLY DISTILLED WATER. Fill all cells to the proper level. Do not overfill. Fill to level indicator (or 1/2 inch over the top of the separators if there is no level indicator). Fill after charging to prevent overflow of acid due to expansion. Do not use a hose to add water to batteries.

Allowing the electrolyte level to drop below the top of the separators will lead to shortened battery life. Excessive water usage can indicate that a battery has been overcharged, has been subjected to excessively high temperatures, or is nearing the end of its service life.

Keep battery clean. Wash the top of the battery, making sure all vent caps are in place. Do not allow cleaning water or other foreign matter to enter the cells. Use a solution of bicarbonate of soda and water to wash the battery if there is an accumulation of acid.

BATTERY PREVENTIVE MAINTENANCE

Once a month, after the battery has been charged, spot check the specific gravity of two or more cells. A fully charged battery should indicate 1.28 specific gravity. If low readings are noted, check the following:

- Check terminals for corrosion, loose connections and broken or frayed cables.
- Check all cells with a hydrometer for variation in specific gravity. A variation of 0.03 points or more between cells is cause for concern. Mark the low cells.

Recheck specific gravity of all cells after recharging.

BATTERY REPLACEMENT

To remove the battery, follow these procedures:

⚠WARNING

BEFORE REMOVING BATTERY FROM THE UNIT, TURN OFF THE IGNITION SWITCH. THERE SHOULD BE NO POWER TO THE MACHINE.

⚠ CAUTION

Always disconnect the negative battery cables first.

Remove bolts holding battery to superstructure.

Lift the battery from the superstructure. Put the battery to the side and dispose of properly.

⚠ CAUTION

Always connect the positive battery cable first.

To install the battery, lift and position it on superstructure. Secure battery in position with wing nuts and battery hold downs. Connect battery cables.

MOVEMENT ALARM

The movement alarm is activated as soon as the platform console drive controller or drive toggle switch on the pendant control is moved off the center "Neutral" position.

⚠WARNING

THE MOVEMENT ALARM IS PROVIDED FOR YOUR PROTECTION, AND THE PROTECTION OF PERSONS WORKING IN THE IMMEDIATE AREA. DISABLING THIS IMPORTANT SAFETY DEVICE MAY RESULT IN DEATH OR SERIOUS INJURY.

The movement alarm is located behind the ground control cabinet on a support weldment. To replace it, remove the movement alarm from the weldment and disconnect the wires.

TILT ALARM

The tilt alarm gives an audible warning when the machine is five degrees or more out of level. It is located behind the ground control cabinet on a support weldment. To replace the tilt alarm, remove it from the support and disconnect the wires.

TILT ALARM TEST

The alarm can be tested by manually tipping the alarm sensor. This "Push-to-Test" feature enables tilt alarm to be tested without losing its adjustment.

Individually push down on each of the three fastened corners of the tilt alarm.

There should be enough travel to cause the alarm to sound as each corner is pressed (there is approximately a three second delay).

If the alarm does not sound, the flange nuts have been tightened too far. Loosen the nut on the 90° corner and repeat this test procedure.

TILT ALARM ADJUSTMENT

The tilt alarm can be adjusted. Before attempting to adjust the alarm, park the machine on a flat, level surface.

Level the base of the alarm by tightening each of the three flange nuts to take up approximately one half of its spring's travel. During the remainder of the adjustment procedure, DO NOT ADJUST THE NUT ON THE 90° CORNER.

Check to be sure the electrical connections are correct. Slowly tighten the nut on one of the two corners ADJACENT to the 90° corner until the light-emitting diode (LED) just turns on, indicating that the circuit is closed. Note the position of the nut.

Loosen the nut (LED will go out), carefully counting the number and fraction of turns until the LED lights up again. Divide that number by two and tighten the nut by this number of turns.

Adjust the nut on the OTHER corner adjacent to the 90° corner in the same manner. The alarm is now level, to the degree of accuracy determined by the nut adjustments and the surface on which the machine is sitting. Test the tilt alarm for proper function.

RELAYS

There are relays located in the ground control cabinet. (Refer to the schematic at the end of this manual for relay functions and interconnect.)

CIRCUIT BREAKERS

There is one 20 amp circuit breaker mounted on the face of the ground control cabinet, and two 20 amp circuit breaker inside the ground control cabinet.

If the 20 amp circuit breaker is tripped, re-set it by pushing in the button. If the breaker trips again, the cause of the high current draw must be corrected prior to further operation. If the breakers inside the cabinet are tripped by heat of the current draw, they will reset themselves when they cool down.

LIMIT SWITCHES

There are limit switches for the boom telescope, and boom hoist functions. The boom telescope limit switch is located on the lower right side of the base boom. The boom hoist limit switch is located on the center post of the superstructure.

Unless the boom hoist and telescope limit switches are closed as shown on the unit electrical schematic at the end of this manual, the unit will only be able to travel at creep speed.

EMERGENCY PUMP

There is an emergency pump mounted at the base of the hydraulic tank. It is activated when the Emergency Pump push button on either the platform control console or the remote control pendant is pressed. When either push button is pressed and held, the emergency pump circuit is energized, allowing hydraulic functions (drive, steer or boom functions) should the engine powered hydraulic pump be disabled.

EMERGENCY STOP BUTTONS

There is an emergency stop button on the ground control box, and one on the platform controls.

When the emergency stop buttons are pressed, all functions stop immediately and the wheel brakes are automatically applied. Pull the button out to reset.

To replace the emergency stop button, open the ground control box or open the platform control console to gain access for button removal. Remove the appropriate button mounting screws and wires.

PENDANT SWITCH REMOVAL

To replace a pendant switch or button, remove the four pendant cover screws to gain access for button removal. Remove the appropriate button mounting screws and wires.

GROUND CONTROL CABINET SWITCH REMOVAL

To replace a ground control switch or button, disengage the ground control cover retaining screws to gain access for switch or button removal. Remove the appropriate button mounting screws and wires.

PLATFORM CONSOLE SWITCH REMOVAL

To replace a platform switch or button, remove the two platform console screws and swing the console up on its hinge, to gain access for button removal. Remove the appropriate switch or button mounting screws and wires.

DRIVE/ STEER CONTROLLER

Forward or backward travel of the unit is operated by a "single axis" lever on the platform control console. Flipping the switch on top of the lever steers the unit to the left or right.

The degree of lever motion required to begin travel, and the degree of lever motion required to achieve maximum speed are individually adjusted.

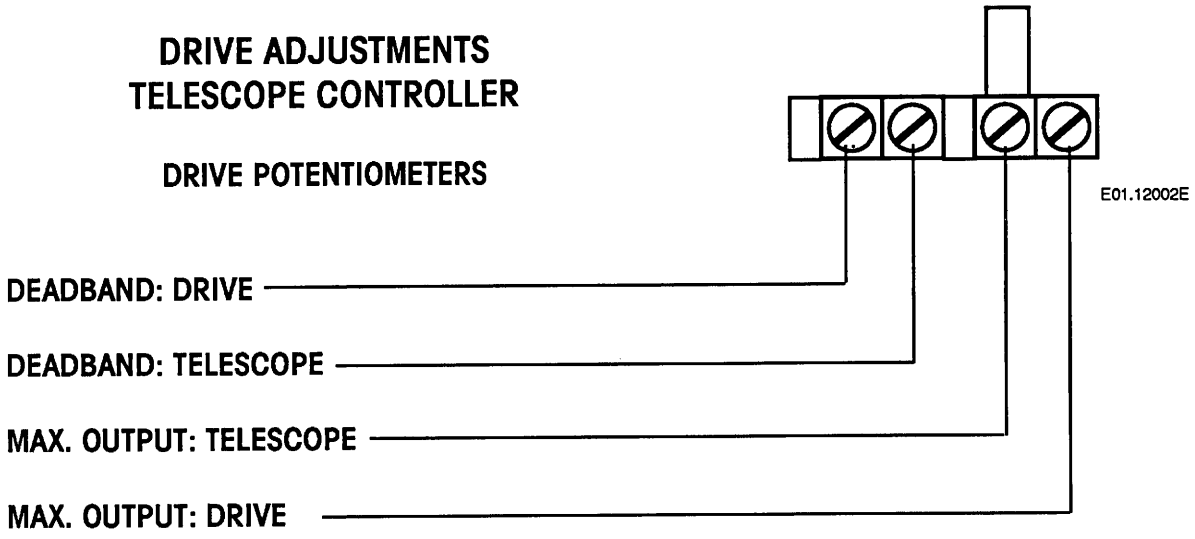
On the Drive Card, located at the bottom of the telescope lever assembly, there is a separate adjustment for "Lo Threshold" (Deadband), which determines when motion starts as the control is moved from the "Neutral" position. There is another separate adjustment that determines the degree of control movement corresponding to the maximum hydraulic valve opening, "Hi Threshold" (Max. Output).

To adjust for Lo Threshold (Deadband) or Hi Threshold (Max. Output) on the Drive Card:

1. Turn appropriate Lo Threshold (Deadband) potentiometer fully counter-clockwise.
2. Push control lever forward until a proximity switch inside the control clicks.
3. Turn the Lo Threshold (Deadband) potentiometer clockwise to permit first flow (first movement).
4. Push control lever fully forward.
5. Turn the Hi Threshold (Max. Output) potentiometer to just permit maximum flow. If turned too high, full flow will occur at a lesser control angle and some controllability will be lost.

DRIVE ADJUSTMENTS
TELESCOPE CONTROLLER

DRIVE POTENTIOMETERS



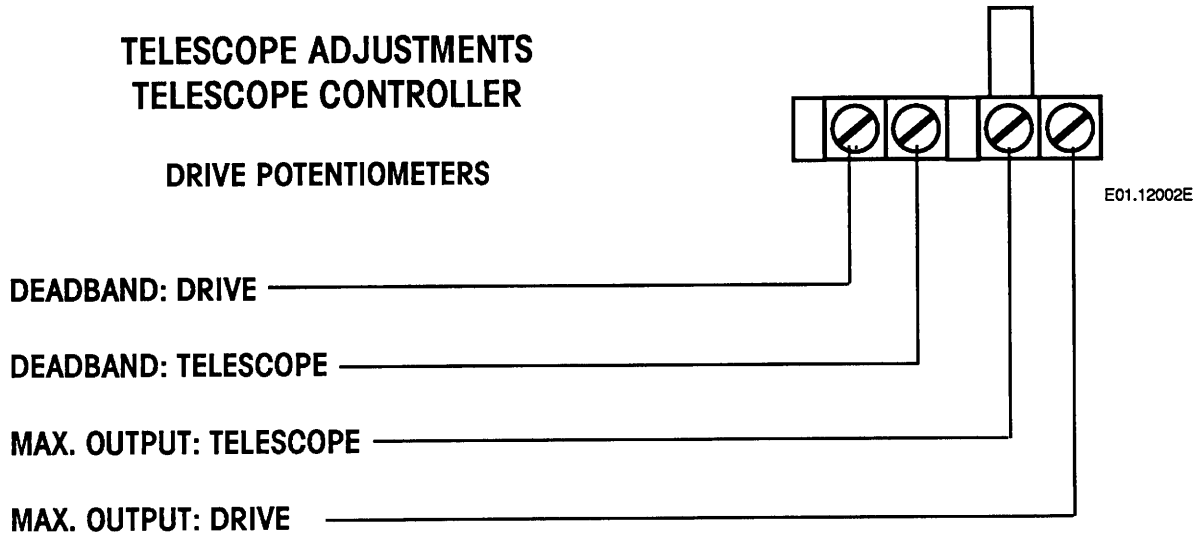
BOOM TELESCOPE CONTROLLER

Telescoping of the boom is controlled by a "single axis" lever on the platform control console. Backward and forward movement of the lever controls the extending and retracting functions of the boom.

On the Drive Card, located at the bottom of the lever assembly, there is a separate adjustment for "Lo Threshold" (Deadband), which determines when motion starts as the control is moved from the "Neutral" position. There is another separate adjustment that determines the degree of control movement corresponding to the maximum hydraulic valve opening, "Hi Threshold" (Max. Output).

To adjust for Lo Threshold (Deadband) or Hi Threshold (Max. Output) on the Drive Card:

1. Turn appropriate Lo Threshold (Deadband) potentiometer fully counter-clockwise.
2. Push control lever forward until a proximity switch inside the control clicks.
3. Turn the appropriate Lo Threshold (Deadband) potentiometer clockwise to permit first flow (first movement).
4. Push control lever fully forward.
5. Turn the Hi Threshold (Max. Output) potentiometer to just permit maximum flow. If turned too high, full flow will occur at a lesser control angle and some controllability will be lost.



BOOM/ SWING CONTROLLER

On the boom/ swing controller, there are two (2) Driver Cards with a total of eight adjustment potentiometers. The upper Driver Card adjustments are for boom raise and lower functions, while the lower Driver Card adjustments are for superstructure swing left and right functions.

Each function (raise, lower, swing right, swing left) has two (2) adjustments: "Threshold" and "Maximum Gain". Threshold (Deadband) is the position of the controller lever when a function motion starts. Maximum Gain (Max. Output) is the position of the controller lever when a function motion is at maximum speed.

To adjust for Threshold (Deadband):

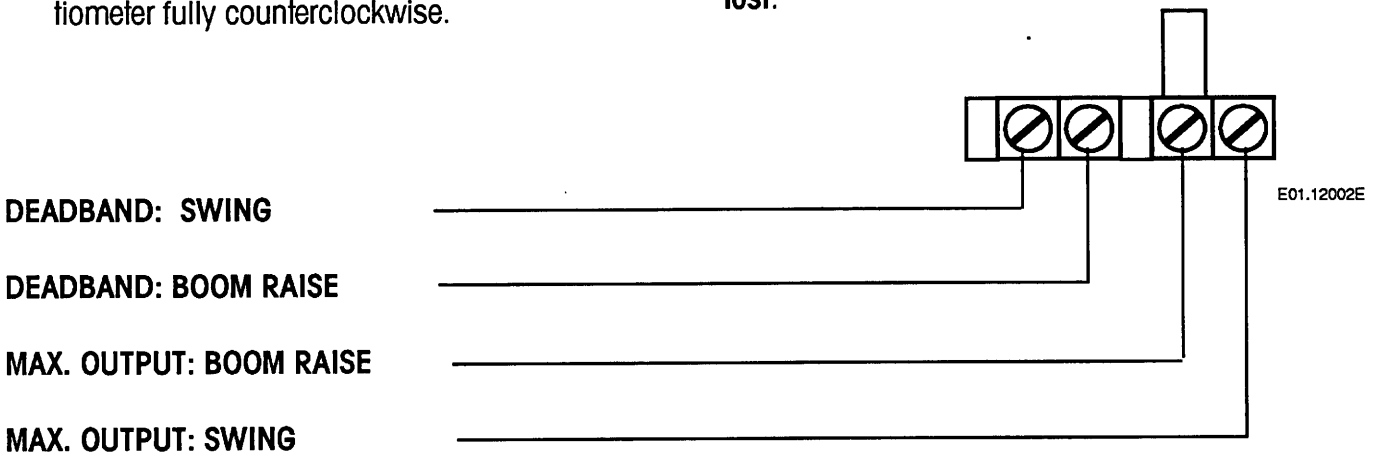
1. Turn appropriate Threshold (Deadband) potentiometer fully counterclockwise.
2. Move control lever in appropriate direction from neutral position until a proximity switch inside the control clicks.
3. Turn the appropriate Threshold (Deadband) potentiometer clockwise to permit first flow (first movement).

To adjust for Maximum Gain (Max. Output):

1. Move control lever fully in appropriate direction.
2. Turn the appropriate Maximum Gain (Max. Output) potentiometer to just permit function maximum speed.

⚠ CAUTION

If turned too high, full flow will occur at a lesser control angle and some controllability will be lost.



Upper Driver Card Potentiometers.

CREEP SPEED ADJUSTMENTS

There are two separate locations for adjustments for creep speed: an adjustment in the ground control cabinet is for setting creep speed as operated from the remote control pendant; and, an adjustment in the platform control console is for setting creep speed as operated from the platform.

When the boom is raised to above horizontal or extended, the unit should travel a maximum of 0.5 M.P.H. (0.8 K.P.H).

To determine current creep speed setting of the unit:

- Raise the boom to above horizontal.
- Drive the unit forward.

NOTE: At creep speed, a tire will make one complete revolution in approximately 20 seconds.

Adjust the appropriate creep speed potentiometer to achieve one complete tire revolution in approximately 20 seconds. (Refer to following figures for potentiometer locations.)

BOOM ADJUSTMENT (GROUND CONTROL)

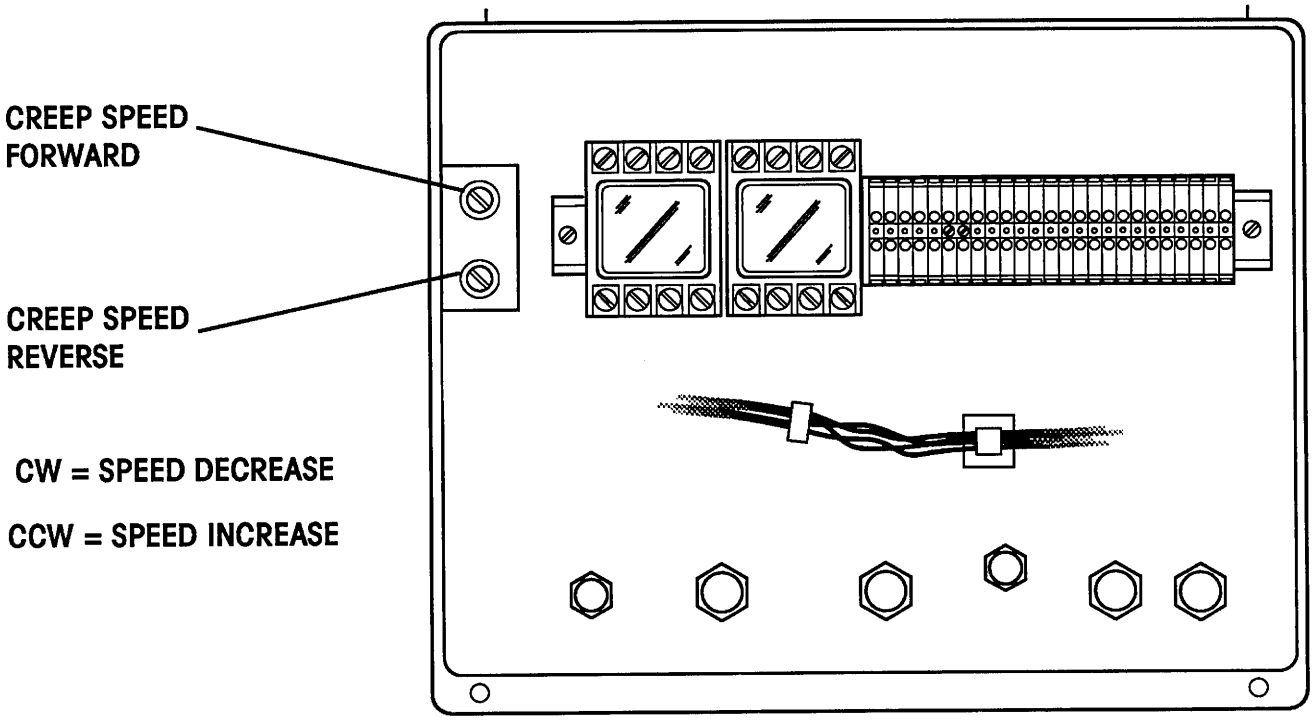
Boom function speed as controlled from the remote pendant should be set so that the platform is not subjected to jostling, shaking or jerking when the boom is raised, lowered, extended or retracted, or superstructure swing.

To adjust the boom functions speed:

- While holding the Deadman button, raise the boom by pressing the Boom Hoist Control Switch to the hoist position.

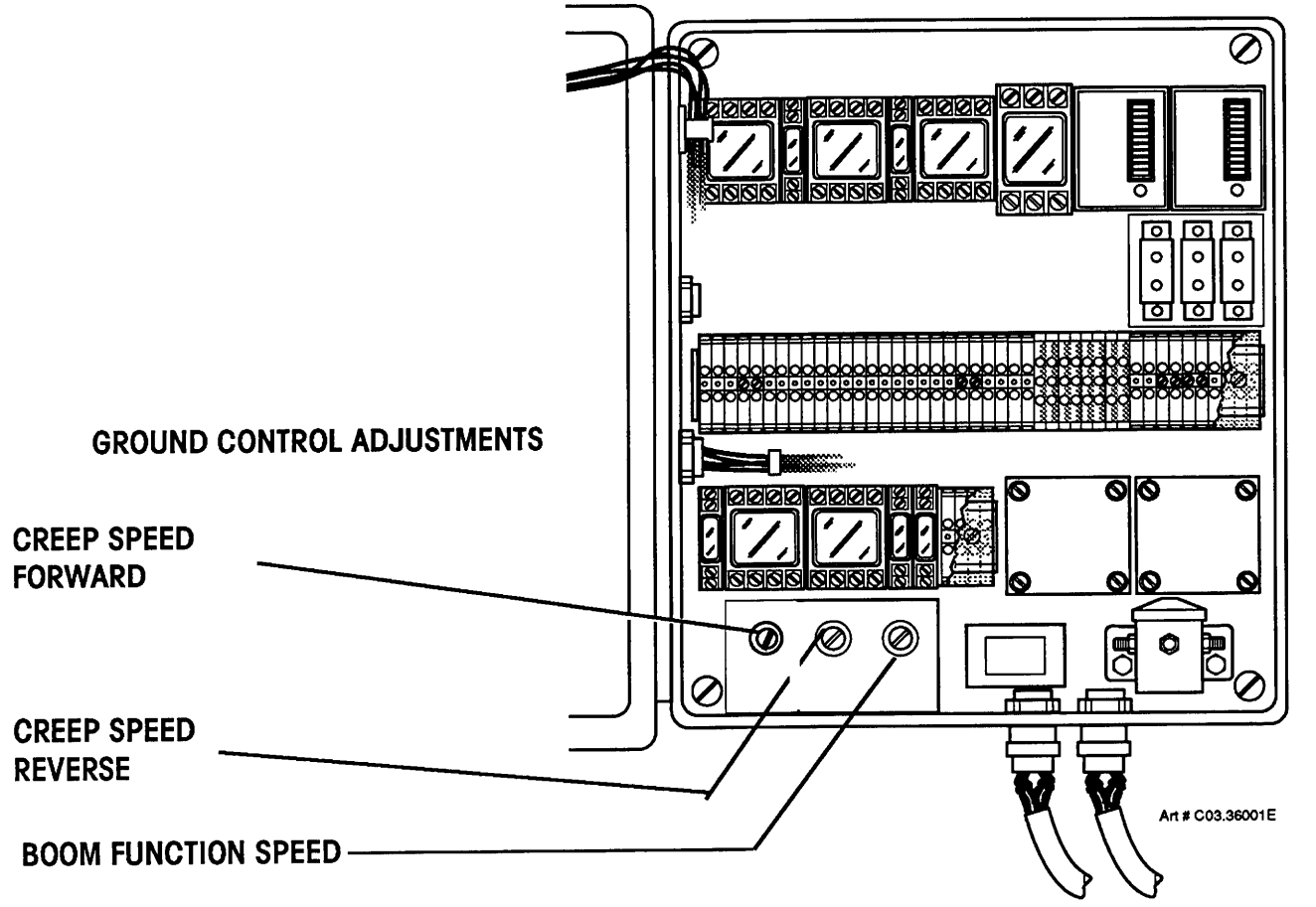
NOTE: If no boom jostling occurs, no adjustment is required.

- If necessary, turn the boom functions speed potentiometer so that the platform moves smoothly, without being jostled. (Refer to following figure for potentiometer location.)



Art # C08.18002E

PLATFORM CONTROL ADJUSTMENTS



Art # C03.36001E

GROUND CONTROL ADJUSTMENTS

SECTION 5:
MECHANICAL COMPONENTS

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MECHANICAL COMPONENTS

Following is a description of the major mechanical components of the MP.

TIRES

Tires used are calcium filled or the optional foam filled. Inspect tires for cuts, sidewall damage or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation.

CHANGING TIRES

⚠WARNING

CALCIUM FILLED AND/OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

When a tire change is necessary, follow these steps:

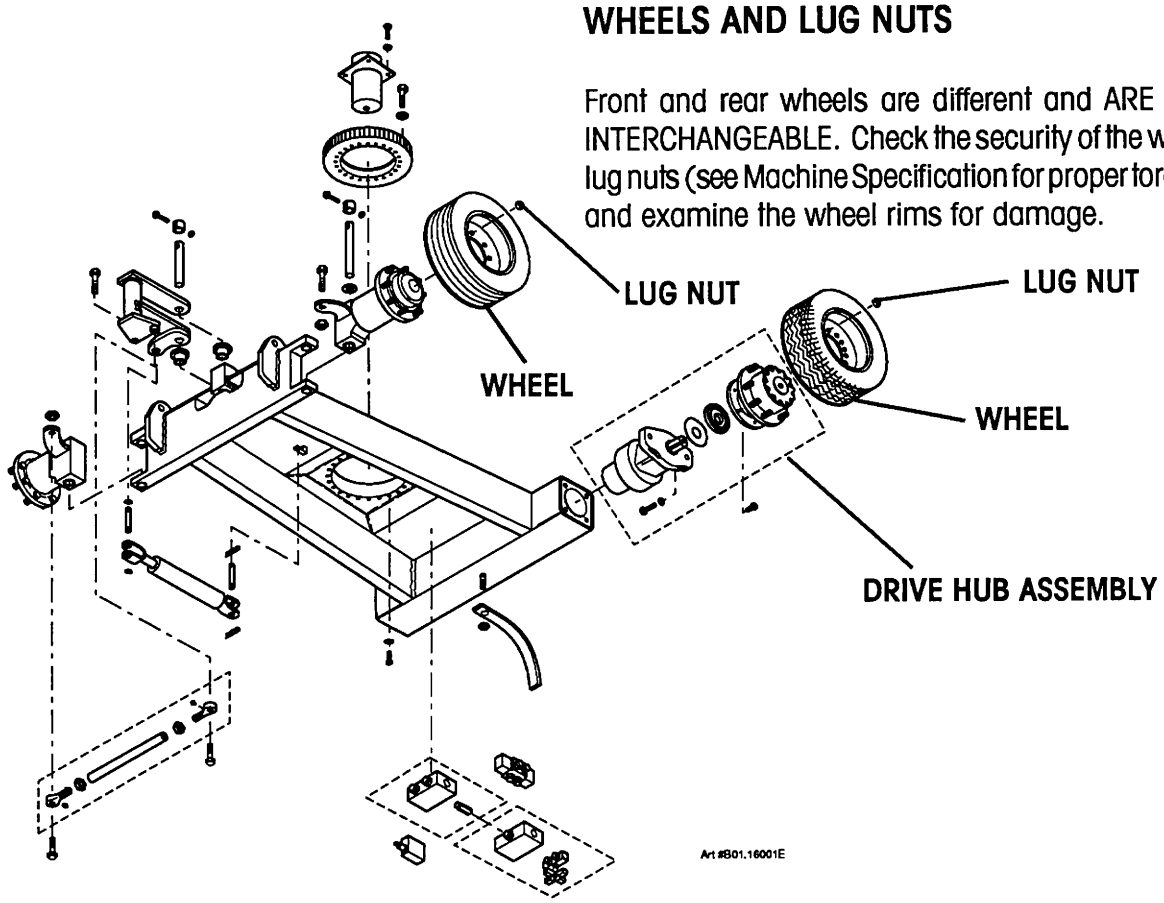
⚠ CAUTION

ALWAYS BLOCK THE WHEELS before you raise the machine.

1. Block wheels and raise an end of the machine.
2. Loosen and remove lug nuts. Pull off the wheel assembly and tire.
3. Replace the tire and reinstall.
4. Fasten lug nuts and tighten to proper torque (see Machine Specifications).
5. Lower the machine and remove the blocks.

WHEELS AND LUG NUTS

Front and rear wheels are different and ARE NOT INTERCHANGEABLE. Check the security of the wheel lug nuts (see Machine Specification for proper torque) and examine the wheel rims for damage.



Wheel Assembly and Drive Hub Assembly Location.

DRIVE HUB ASSEMBLY

Drive hub assembly consists of a hydraulic motor and torque hub.

DRIVE HUB ASSEMBLY REMOVAL

1. Block the steer wheels and raise the machine at the drive end.

⚠WARNING

CALCIUM FILLED AND/OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

2. Remove tire and wheel assembly:
   a. Loosen and remove the lug nuts.
   b. Pull off the tire and wheel assembly.

⚠ CAUTION

Plug all open hydraulic fittings to prevent contamination by dirt or other foreign objects.

3. Disconnect hoses to the drive hub assembly.
4. Loosen and remove eight capscrews and flat washers on the drive hub assembly.
5. Slide off hydraulic motor and toque hub as one unit.

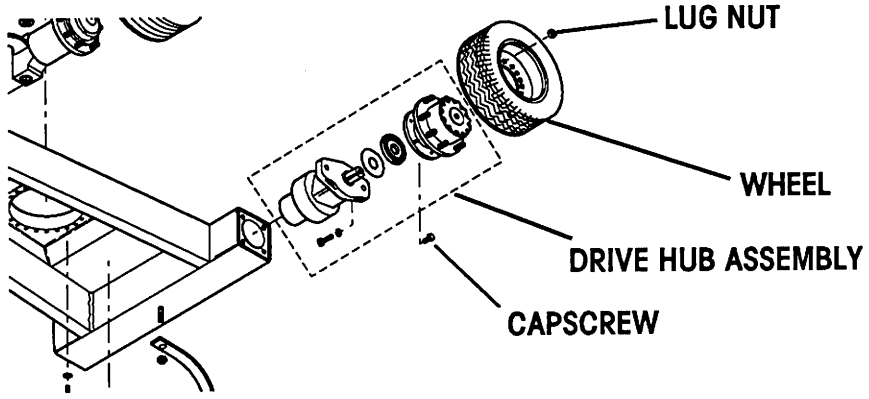
DRIVE HUB ASSEMBLY INSTALLATION

1. Align the drive hub assembly (hydraulic motor and torque hub) with the axle tube assembly.
2. Install and torque the eight capscrews with flat washers.
3. Connect hydraulic hoses to the drive hub assembly.

⚠WARNING

CALCIUM FILLED AND/OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

4. Install tire and wheel assembly:
   a. Position tire and wheel assembly.
   b. Install and torque lug nuts.
5. Lower the machine and remove the steer wheel blocks.



Undercarriage With Tire and Wheel Assembly, Torque Hub and Drive Motor.

STEER CYLINDER PINS

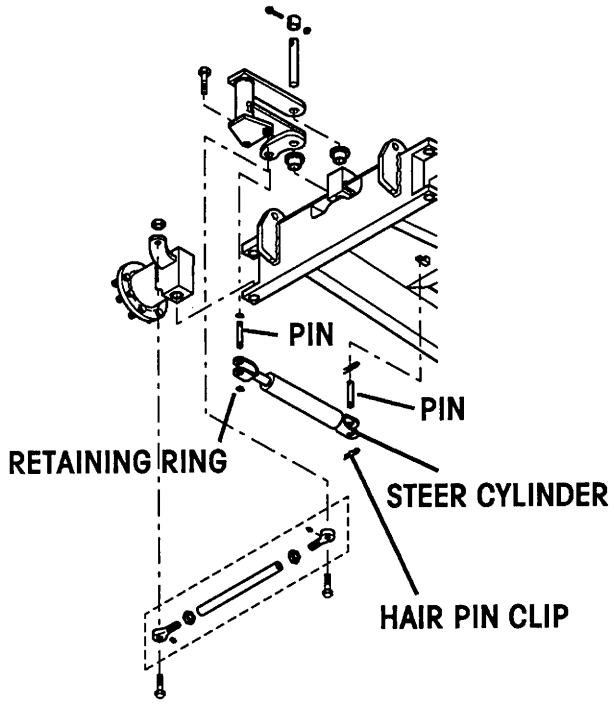
Check all pins for wear. If pin rotates, check for a missing retaining ring. If wear is detected, the pin must be replaced.

ROD END CYLINDER PIN REPLACEMENT

1. Remove retaining rings.
2. Remove the pin.
3. Install new pin and retaining rings.
4. Apply grease to pin.

BASE END CYLINDER PIN REPLACEMENT

1. Remove hair pin clips.
2. Remove the pin.
3. Install new pin and hair pin clips.
4. Apply grease to pin.



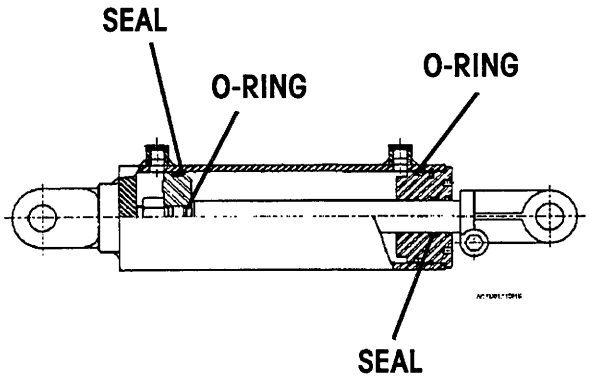
Steer Cylinder and Tie Rod Assembly.

STEER CYLINDER

The steer cylinder is of the double acting type. Check the cylinder for hydraulic fluid leaks.

STEER CYLINDER SEAL REPLACEMENT

1. Disconnect the hydraulic hoses.
2. Remove the steer cylinder pin.
3. Remove the cylinder.



Steer Cylinder.

4. Clean the end of the cylinder.
5. Loosen the end cap and withdraw it over the piston rod.

⚠ CAUTION

Take care not to damage the rod surface and guard against dirt entering the system.

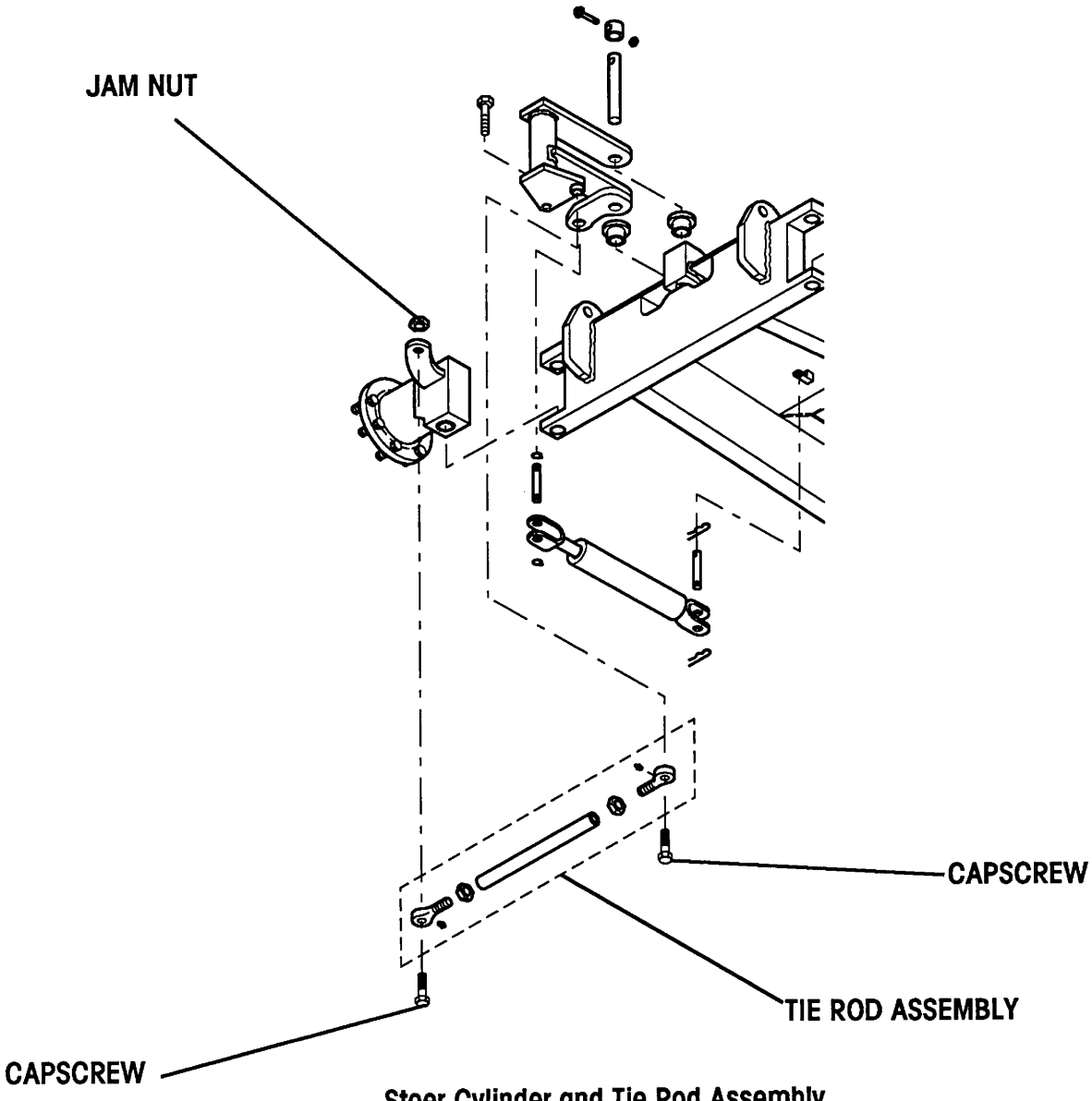
6. Remove the rod and piston assembly.
7. Replace the seals and o-rings.
8. Install the rod and piston assembly.
9. Install and tighten the end cap.
10. Connect the hydraulic hoses.

TIE ROD ASSEMBLY

Check for a bent or broken tie rod. Replace if bend or broken.

TIE ROD ASSEMBLY REPLACEMENT

1. Remove capscrews and jam nuts at both ends.
2. Remove tie rod assembly.
3. Install new tie rod assembly and attach it with the capscrews and jam nuts.

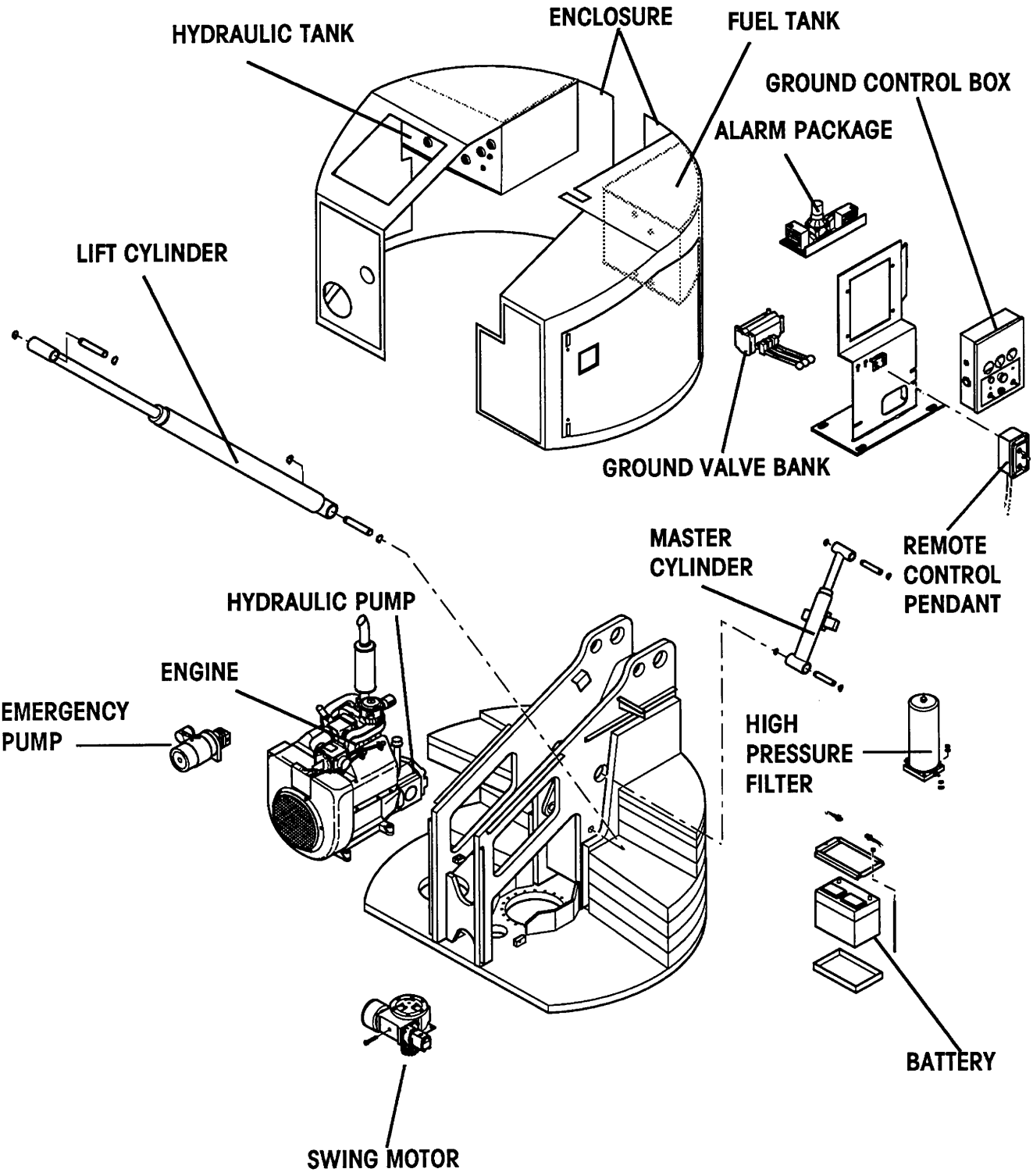


Steer Cylinder and Tie Rod Assembly.

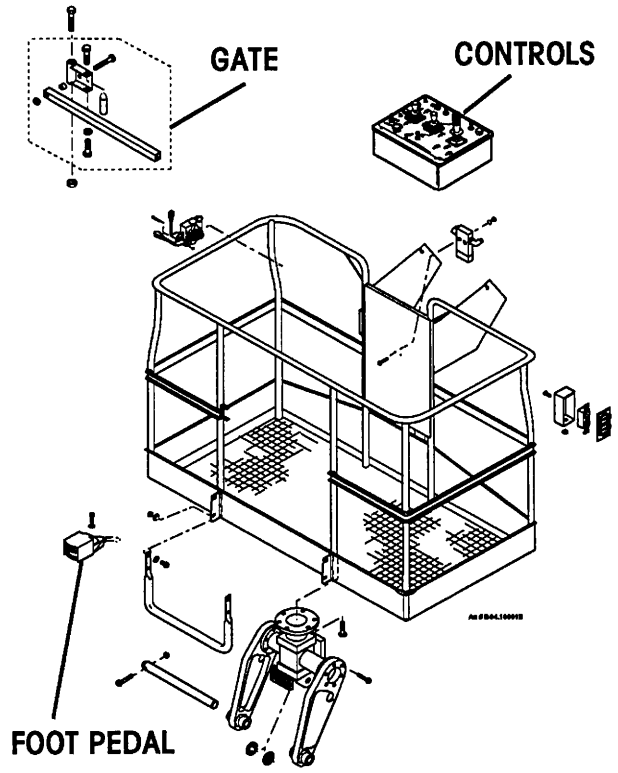
SUPERSTRUCTURE

The superstructure consists of two compartments; one is the engine compartment and the other is the hydraulic compartment.

Steam clean the superstructure once a year, and inspect all welds and brackets. Check for cylinder pins that turn in their mountings, which will indicate sheared pin lock bolts.



Components Found on the Superstructure.



Platform Components.

PLATFORM

Steam clean the platform and inspect all welds and brackets. Check all the hydraulic and electrical components.

HOSES AND CABLES

Inspect all hoses and electrical cables for security and damage. Check for leaks at fittings. ANY DAMAGED HOSES OR CABLES SHOULD BE RE-PLACED.

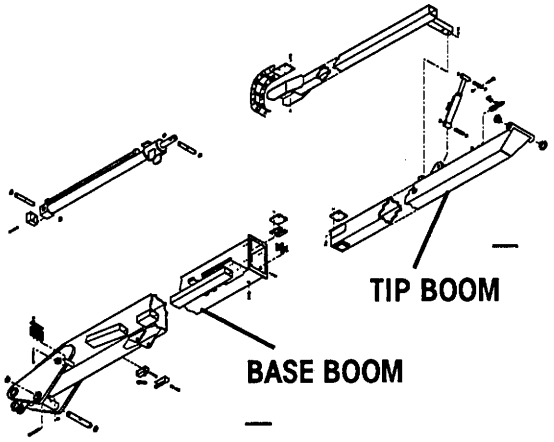
Cables and hoses should be examined for rubbing and chafing, especially in the swing bearing area and the hose track area.

MISCELLANEOUS EQUIPMENT

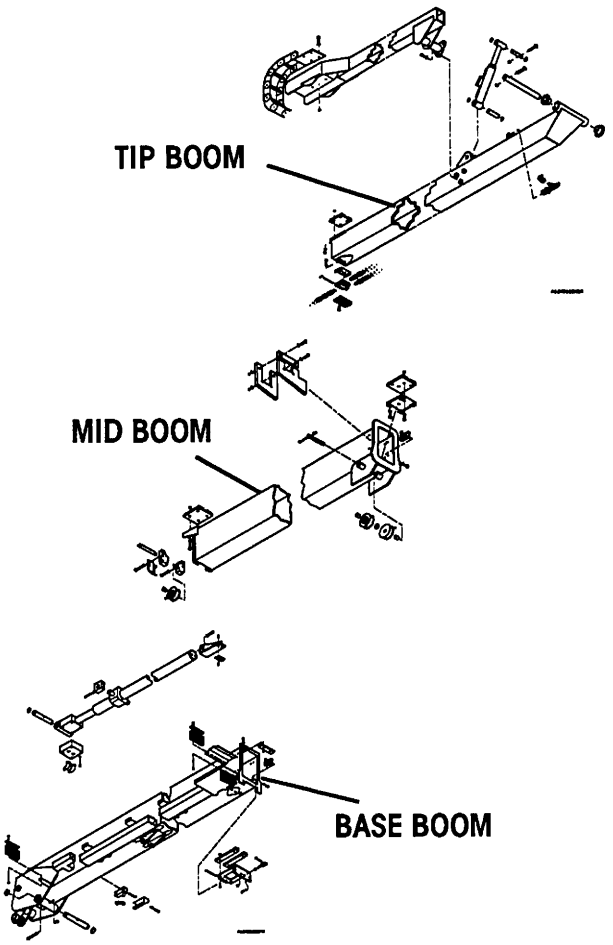
Check all miscellaneous equipment mounted on the machine for secure attachment. Check for evidence of oil or hydraulic fluid leakage.

BOOM

Clean the boom once a year and inspect along the boom structure, especially all welds and brackets.



Two Section Boom.

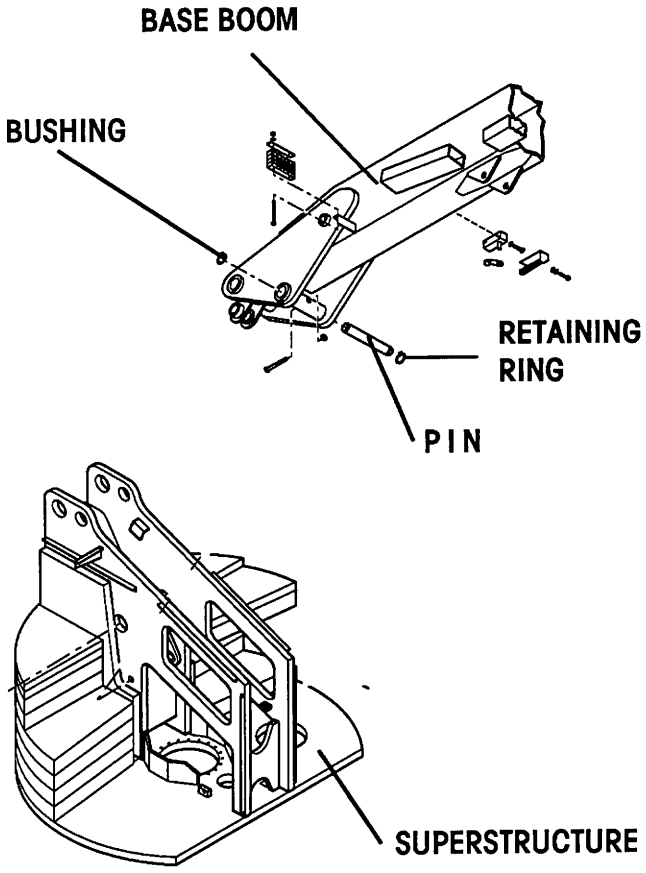


Three Section Boom.

BOOM PIVOT PIN AND BUSHING REPLACEMENT

IMPORTANT: It is necessary to maintain the correct alignment between the boom and side plates during this operation. Any relative movement will make fitting of the pin bearing more difficult.

1. SUPPORT THE BOOM securely (on a boom stand or similar rigid platform).
2. Remove the retaining ring, and drive out the boom pivot pin, taking care not to damage the inner bore.
3. Check bushing and replace if necessary.
4. Install new pivot pin and retaining ring.
5. Apply grease to pin.



Boom Pin and Bushing.

WEAR PADS

Boom sections are protected from wear caused by in and out movement by nylon wear pads mounted at several places along their length. The nylon wear pads should be checked for wear approximately every six months. Fully retract the boom, and check the gap between the wear pad and the boom section.

Wear pads are located at the top front tip of the boom and at the bottom and side rear of the base boom. The telescope cylinder wear pad can not be seen without boom disassembly. Replace this pad after every 5000 hours.

On three piece booms wear pads are also located at the top rear of the base boom, top front of the mid boom, top bottom and side rear of the boom and boom chain anchor.

The telescope cylinder wear pad and the chain anchor wear pad can not be seen without boom disassembly. Replace these pads after every 5000 hours of operation.

⚠ CAUTION

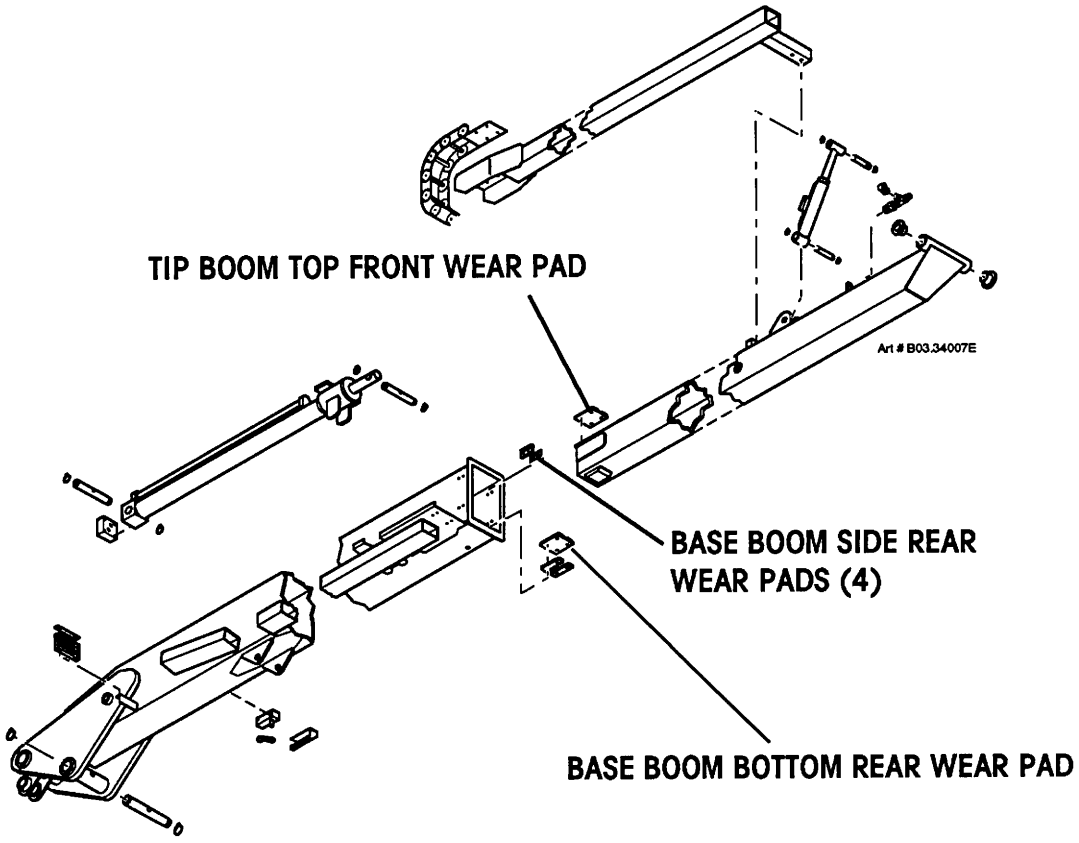
If a pad wears to approximately 3/8" (9.5 mm) thick, it should be replaced or shimmed. Generally, only the bottom pad at the upper end and the top pad at the lower end of the boom will show wear.

Rear (Upper End) Wear Pad Replacement

1. Fully retract the boom.
2. Remove the bolts, lockwashers and nuts holding the upper and side wear pad.
3. The upper and side wear pads should slide out.
4. Use a crane to hold the boom section off the bottom wear pad.
5. Remove the bottom wear pad.
6. Install new wear pads with bolts, lockwashers and nuts.

Front (Lower End) Wear Pad Replacement

1. Fully retract the boom.
2. Access can now be gained to the front top pad retaining bolts, lockwashers and nuts.
3. Remove bolts, washers and nuts; wear pad will easily fall out.
4. Install new wear pad with bolts, lockwashers and nuts.



Boom Wear Pads (Two Piece Boom).

BOOM CHAIN (FOR THREE PIECE BOOMS)

On three piece booms, the telescope cylinder acts only on the mid boom section and chains are used to extend and retract the tip boom. Two chains extend the tip boom section and keep it from retracting. A third chain retracts the tip boom section and prevents it from extending. All chains are anchored to the rear of the base boom and the front of the tip boom and loop around sheaves on the mid boom section. As the mid boom section is extended or retracted by the telescope cylinder, the chain and sheave arrangement carries the tip boom section with it.

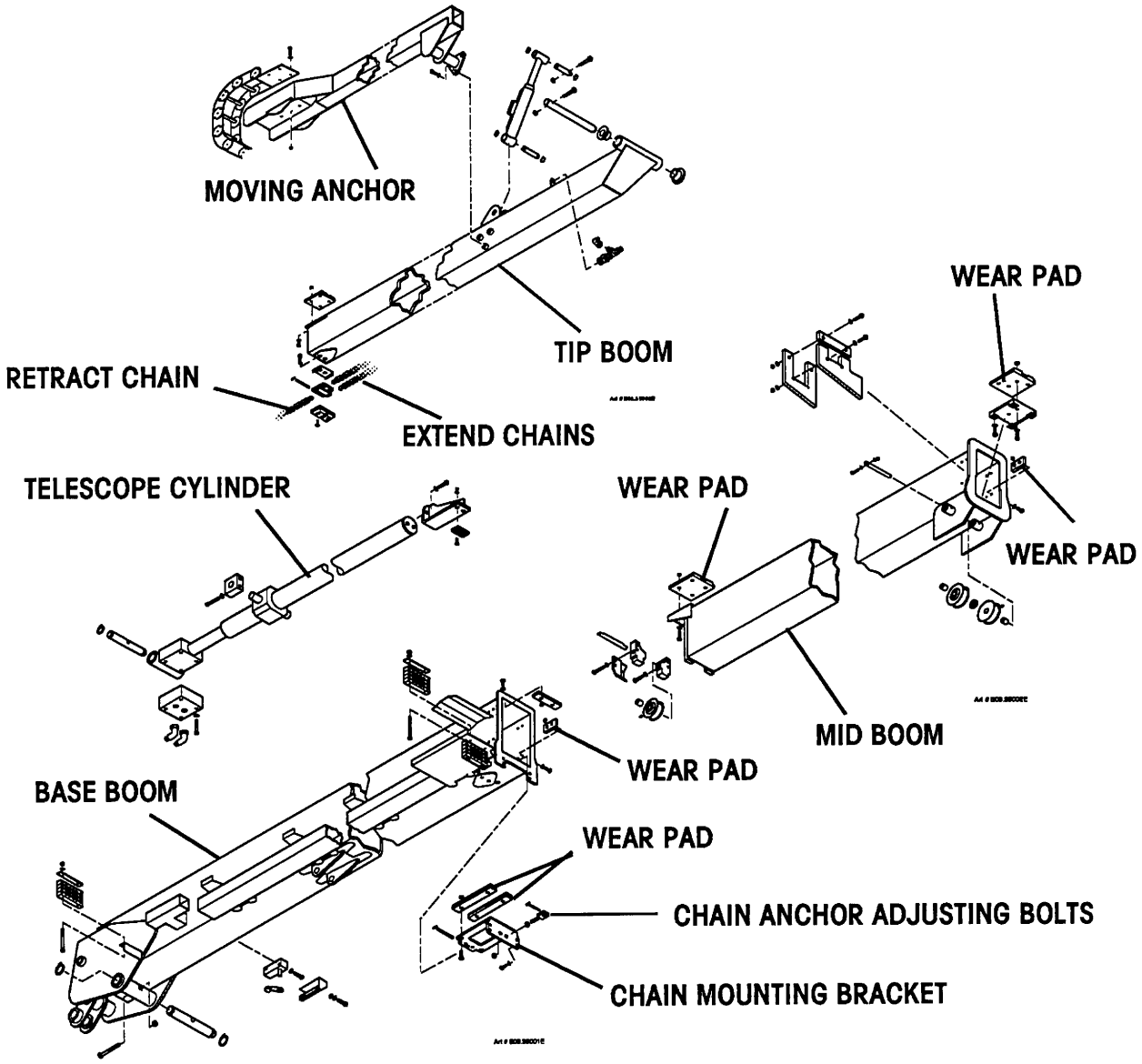
Boom Chain Adjustment

A properly adjusted boom chain should have one inch of droop or sag for every ten feet of boom (60 foot boom should have a 6 inch droop or sag).

To adjust the chain tension, tighten or loosen the chain anchor adjusting bolts located on the base boom section.

⚠ CAUTION

Maintain equal tension on both chains for proper operation.



Boom Chain and Wear Pads.

Boom Chain Replacement

Chain replacement is recommended after every 5000 hours. Replace the chain anchor wear pad at this time as well.

To disassemble the boom:

NOTE: This procedure requires two people. DO NOT attempt the procedure alone.

1. Retract boom and center between the drive tires.

   NOTE: The boom must have room to fully extend and there must be at least 30 feet (9 meters) of drive room in front of the unit. Also there must be room to swing the unit to each side.

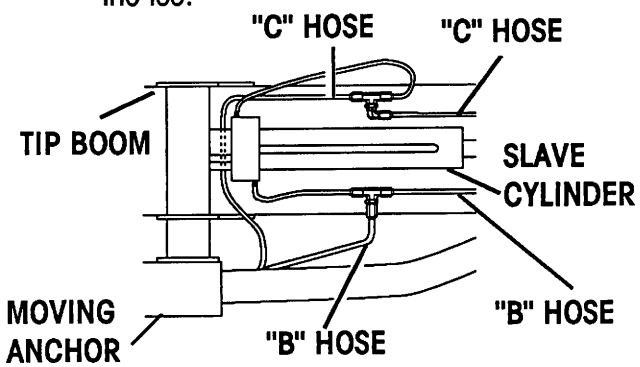
2. Disconnect moving anchor and platform from mid and tip boom:

⚠ CAUTION

Plug all open hydraulic fittings to prevent contamination by dirt or other foreign objects.

   a. Disconnect the two hoses marked "B" from the tee. Plug ends of the hoses and the tee.

   b. Then disconnect the two hoses marked "C" from the tee. Plug the ends of the hoses and the tee.

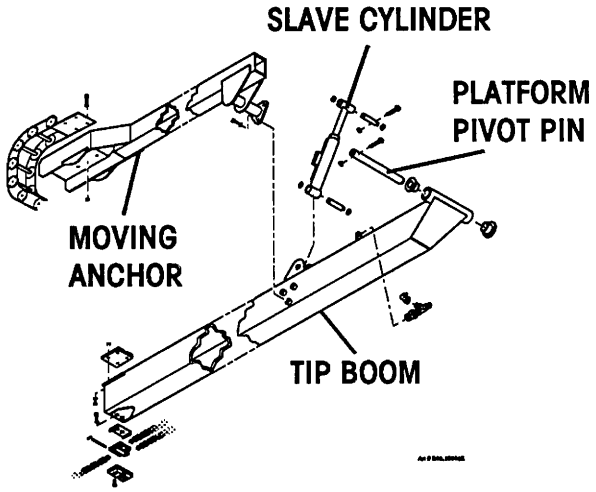


Hose Disconnect Locations.

   c. Remove the hoses from the hose clamp.

   d. Detach the slave cylinder from the platform and secure it to the tip boom with a rope.

   NOTE: Slave cylinder is secured to the tip boom to prevent damage to the cylinder when pulling the mid and tip boom out of the base boom.



Moving Anchor and Tip Boom.

   e. Remove the hex head capscrew and locknut on each side of the platform pivot pin.

   f. Pound out the pivot pin; the flange bearing should remain in position.

⚠ CAUTION

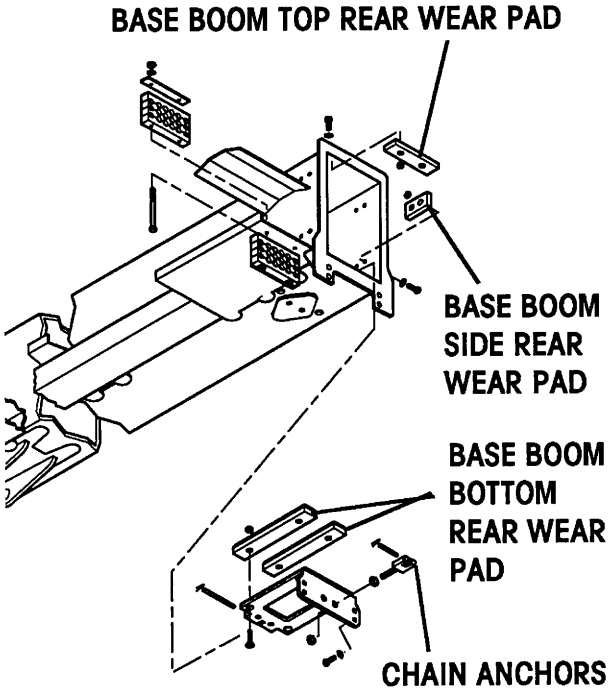
Support the platform with a stand or similar rigid platform or a crane.

   g. Support the platform.

   h. Release the moving anchor from the tip boom. Remove the capscrew and nut holding the retainer to the moving anchor and the tip boom. Support the moving anchor.

⚠ CAUTION

Support the moving anchor with a boom stand or similar rigid platform.



Base Boom Wear Pads.

3. Remove the two chain anchors from the under side of the base boom.

4. Fully extend the boom.

   NOTE: The mid boom will extend; however, the tip boom section will not extend.

5. Boom down until the end of the tip boom is resting on the ground. This releases pressure on the wear pads.

6. Remove the wear pads, shims and blocks from the rear bottom of the base boom.

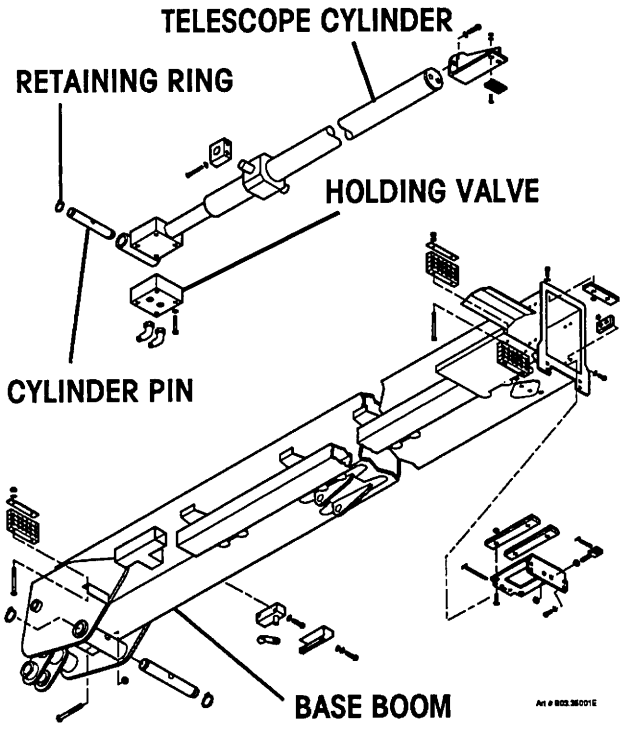
7. Boom up enough so the mid boom almost has clearance from the base boom (the tip boom remains resting on the ground). This releases pressure on the remaining wear pads.

8. Swing boom to the right and remove the base boom right side wear pads. Swing boom to the left and remove the base boom left side wear pads.

9. Remove telescope cylinder pin and retaining ring holding the cylinder to the base boom.

10. Disconnect the hydraulic hoses from the telescope cylinder holding valve.

11. Support the platform with a stand or similar rigid platform or a crane.



Base Boom and Telescope Cylinder.

12. Keep the mid boom centered in the base boom. Slowly drive the unit forward. The mid and tip booms remain in position and the machine including the base boom will pull away.

⚠ CAUTION

Support the mid and tip boom sections with a forklift or overhead crane of sufficient weight capacity, but not until the mid boom front wear pads approach the end of the base boom. Do not let the mid and tip boom sections drop out of the base boom.

NOTE: When using a forklift, place the forks level to the bottom of the mid boom and the boom to the back of the forks. Raise the forks to just touch the mid boom with only the one folk closest to the platform.

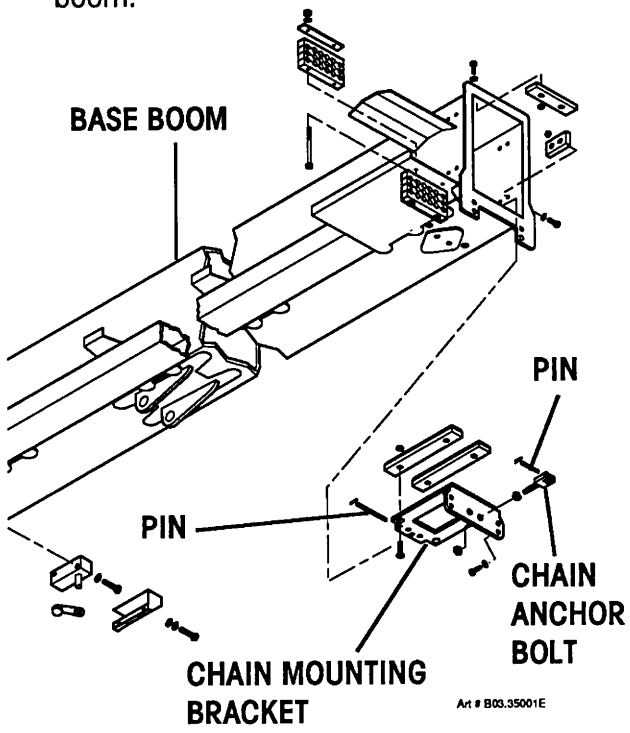
⚠ CAUTION

Do not lift the mid boom at all or it will pop up with force when it leaves the base boom, which may cause damage to the telescope cylinder and/ or the boom.

NOTE: Drive machine forward so there is at least 3 feet (1 meter) of clearance from the mid and tip booms. Keep the telescope (extend) cylinder centered in the base boom.

13. Place mid and tip boom sections on boom supports.

14. Remove chain mounting bracket from base boom.



Boom Chain Anchor Bolt.

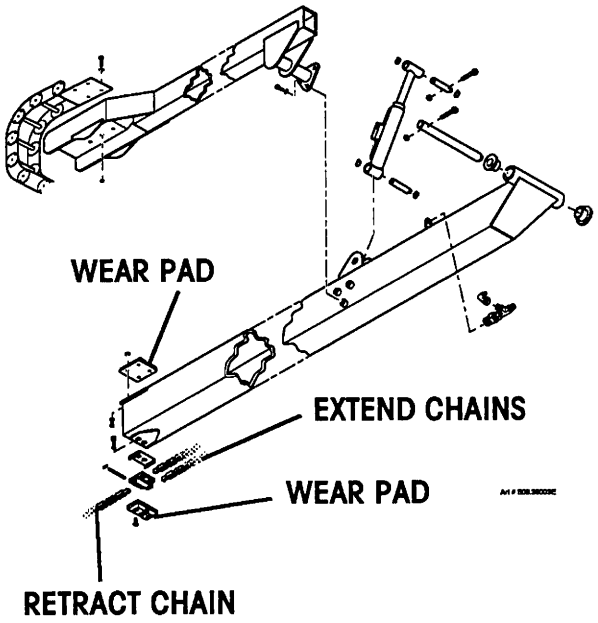
15. Remove 1 retract and 2 extend chains.

    a. Remove pins holding chains to the anchor and bracket.

    b. Remove master links from the base boom chain block at the tip.

    c. Attach a 1/4 inch rope to each of the two extend chain ends.

    NOTE: Be sure the ropes are long enough to allow the chain removal and still be accessible from both ends of the boom.



Retract, Extend Chains and Tip Boom Wear Pads.

16. Remove the chain anchor at the bottom front of the tip boom.

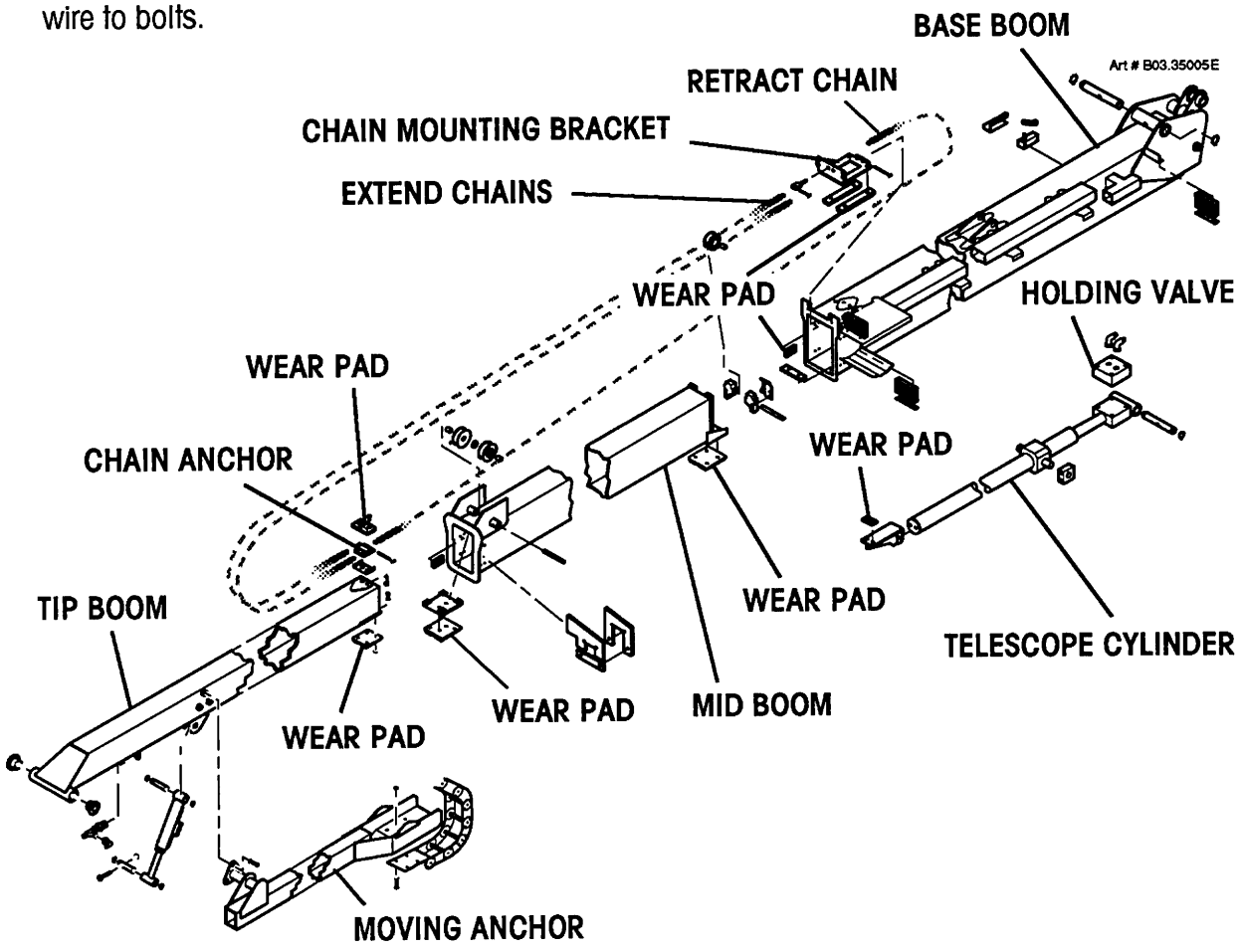
17. Pull chain anchor and 3 chains out of the tip boom.

18. Remove front tip boom wear pads and mid boom rear wear pads. Remember to release the pressure on the wear pads.

To assemble the boom, first flip the boom upside down using a crane:

NOTE: Boom is assembled upside down.

1. Lay ou the 2 new extend chains and the 1 new retract chain. Refer to Illustrated Parts Catalog for correct chain lengths.
2. Attach chains to tip boom chain anchor block with pins and secure with cotter pins.
3. Replace chain anchor wear pad.
4. Install chain block to tip boom, be sure pin retainer plate is positioned to keep pin in place.
5. Torque caphead mounting bolts and add safety wire to bolts.
6. Replace the upper wear pad at the base of tip boom.
7. Coil chain and place inside tip boom.
8. Clean out mid boom.
9. Insert tip boom into mid boom.
10. Assemble rear of mid boom:
    a. Run single chain around sheave and back to top of mid boom.
    b. Connect chain to base boom chain mounting bracket with pin and cotter pin.
    c. Bolt on anchor wear pad and bracket.



Boom Chains and Wear Pads Replacement (Boom Upside Down).

d. Feed 2 extend chains through opening at rear of mid boom, around sheaves and back over mid boom.

e. Attach chains to chain anchor bolts with pin and cotter pin. Reassemble bolts to chain mounting bracket.

11. Replace wear pad on cylinder.

12. Slide cylinder into boom.

NOTE: When assembling boom upside down, pad faces upward.

13. Mount cylinder to mid boom using cylinder mounting blocks and bolts with lockwashers.

14. Torque bolts.

15. Install bottom wear pad to rear of mid boom.

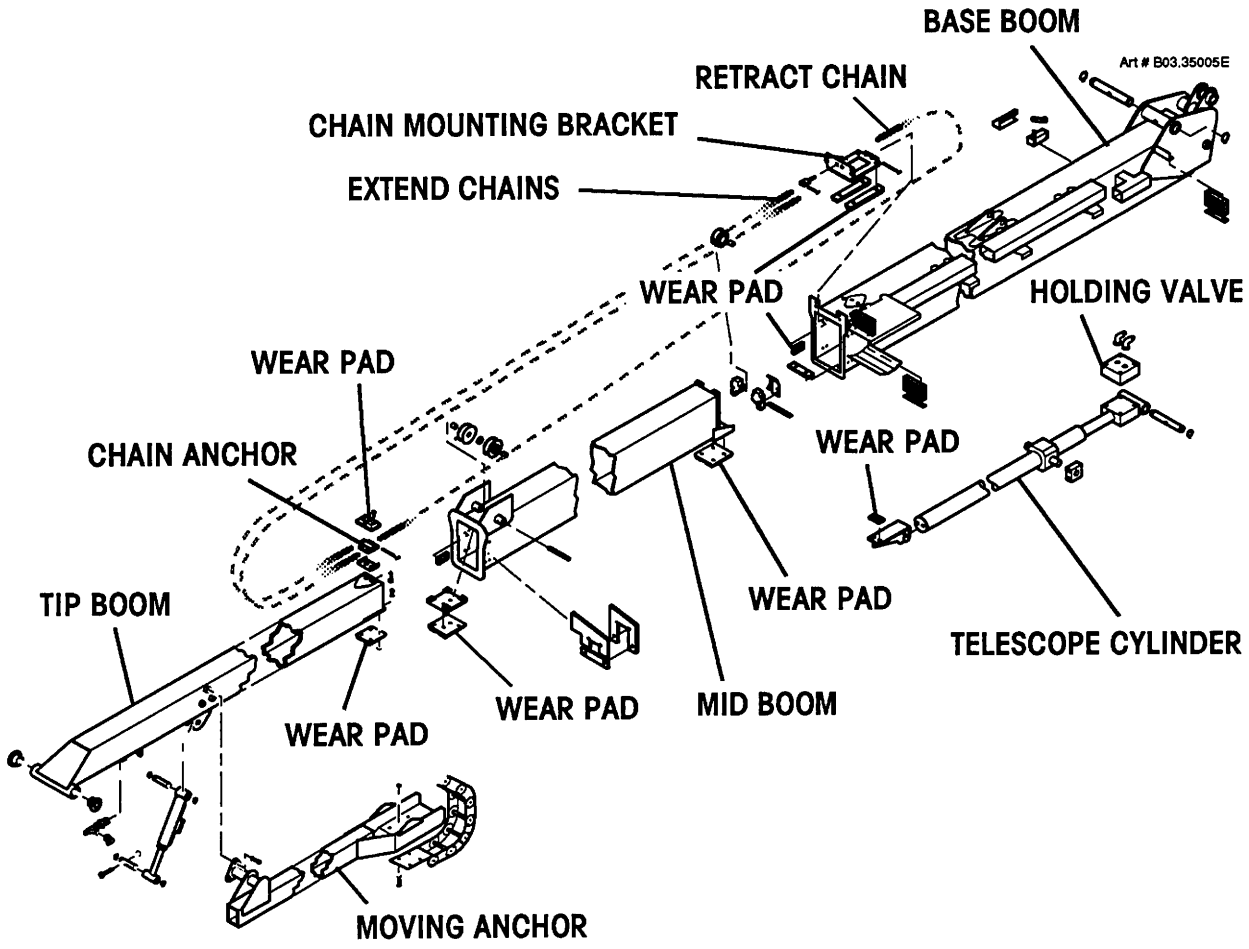
16. Install side wear pads to rear of mid boom.

17. Using a crane, flip entire boom assembly right side up.

18. Slide mid and tip boom assembly into base boom.

19. Align chain mounting bracket and bolt on to base boom.

20. Install side and bottom wear pads to rear of base boom.



Boom Chains and Wear Pads Replacement (Boom Upside Down).

21. Tighten chain anchor adjusting bolts and install a second nut on each take-up.

22. Install top and side wear pads on rear of base boom.

23. Attach cylinder to rear of base boom with pin and snap rings.

24. To install moving anchor:

    a. Slide the moving anchor with platform attached back on the moving anchor guide.

    b. Install moving anchor retainer.

    c. Install capscrew and nut holding the retainer.

25. To install platform:

    a. Align the rotary actuator arm weldments on the tip boom.

    b. Install pivot pin. It will be necessary to pound in the pin. Install the capscrew and locknut on each side of the pivot pin.

    c. Release the secured slave cylinder and attach it to the platform with a pivot pin, two retaining rings, capscrew and locknut.

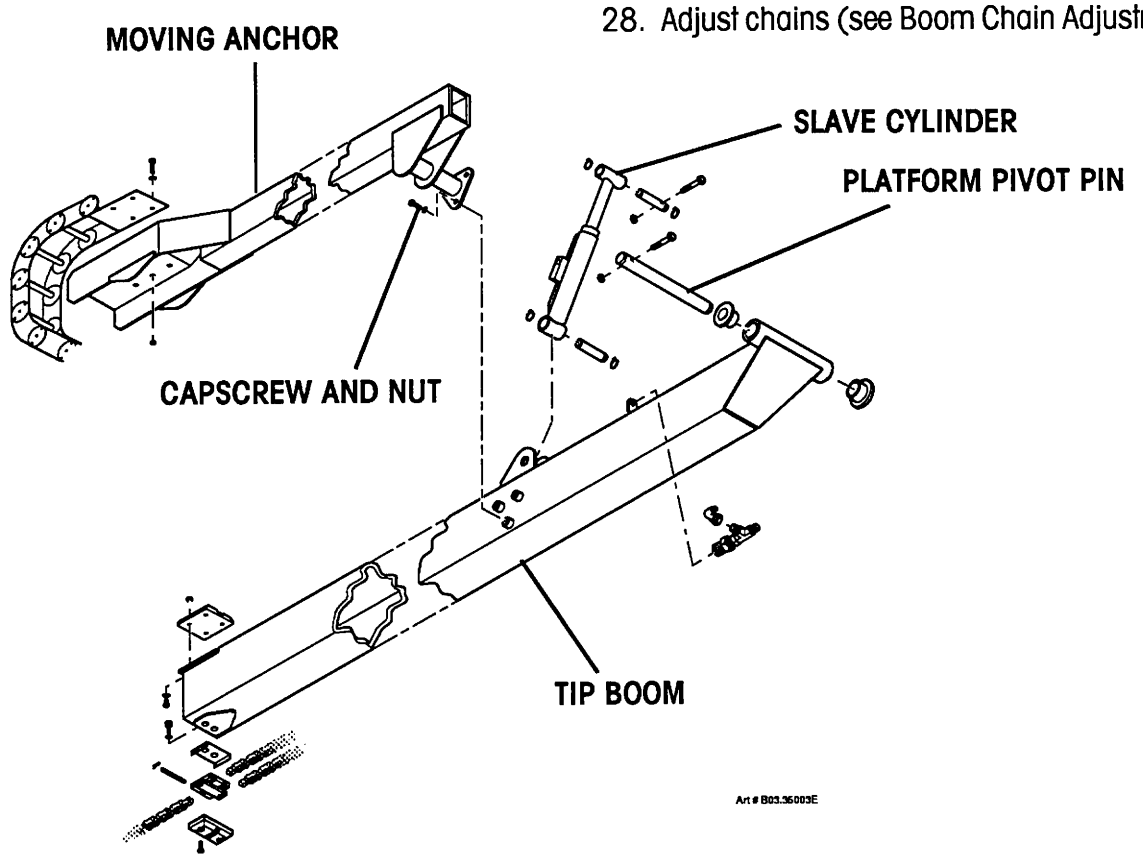
    d. Connect the two hoses marked "C" to the tee.

    e. Connect the two hoses marked "B" to the tee.

26. Bleed the system by cycling the telescope cylinder at least three times.

27. Test boom operation.

28. Adjust chains (see Boom Chain Adjustments).



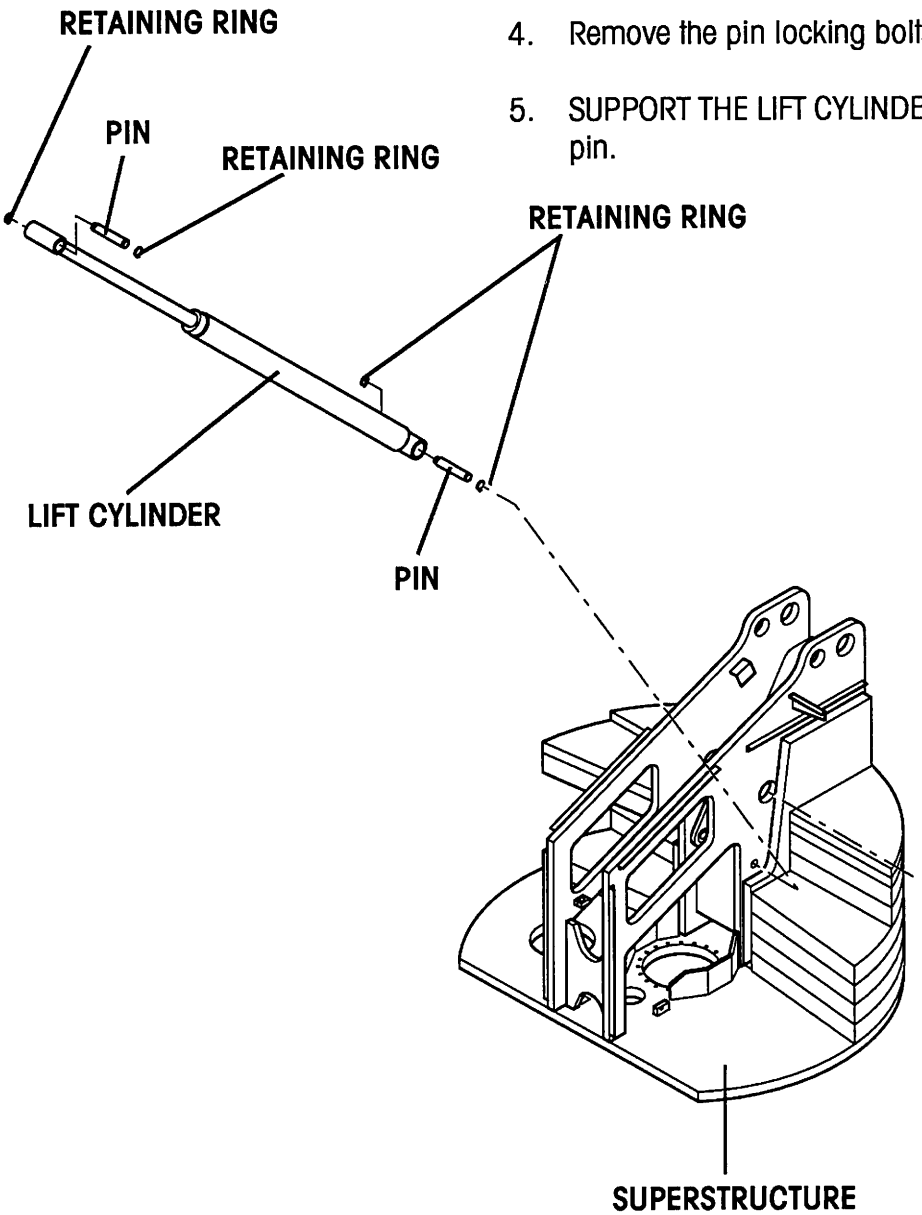
Tip Boom and Moving Anchor.

BOOM LIFT CYLINDER

The boom lift cylinder is of the double acting type. During operation, the cylinder should not leak, but a slight dampness at the rod seal is acceptable. The pins should be checked for wear. Check the pin locking bolts for tightness. The cylinder and holding valve should be inspected for fluid leakage, damage and security.

LIFT CYLINDER PIVOT PIN REPLACEMENT

1. Support the boom securely (on a boom stand or similar rigid platform).
2. Operate the boom lift control to release hydraulic pressure and remove any load on the lift cylinder.
3. Remove the retaining ring.
4. Remove the pin locking bolts and nuts.
5. SUPPORT THE LIFT CYLINDER and remove the pin.



Lift Cylinder Removed from Superstructure.

6. Install new pin and locking bolts and nuts (lubricate bolts before installation) and retaining ring.

7. Apply grease to pin.

LIFT CYLINDER SEAL REPLACEMENT (ON MACHINE)

1. Support the boom securely (on a boom stand or similar rigid platform).

2. Operate the boom lift control to release hydraulic pressure and remove any load in the lift cylinder circuit.

3. Clean the end of the cylinder, and loosen the cylinder end cap by several turns.

4. Remove the rod end pivot pin, and support the cylinder barrel.

5. Loosen the end cap completely, and withdraw it carefully over the piston rod.

⚠ CAUTION

Take care not to damage the rod surface and guard against dirt entering the system.

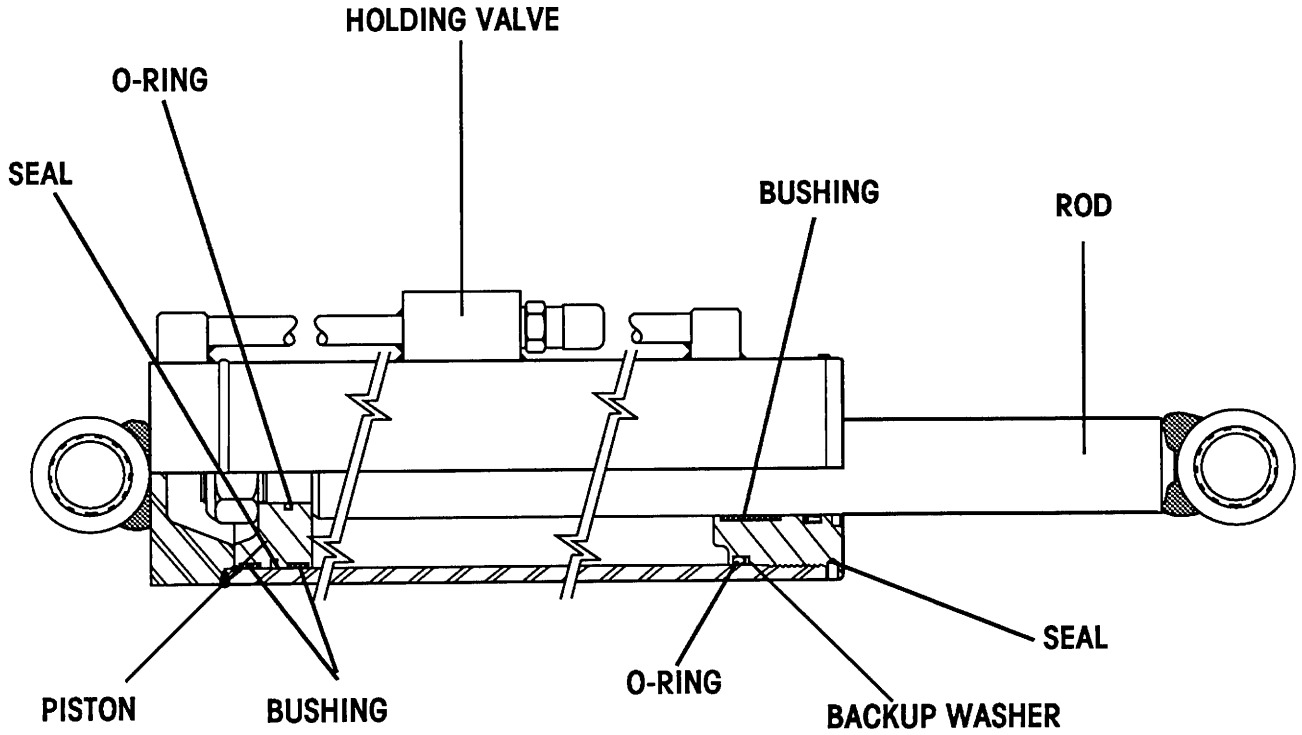
6. Remove the rod and piston assembly.

7. Replace the seals and backup rings.

8. Reassemble the lift cylinder, again AVOIDING DIRT, AND ROD DAMAGE.

9. Tighten the end cap.

10. Install rod end pin.



Lift Cylinder.

BENCH REPLACEMENT OF LIFT CYLINDER SEALS

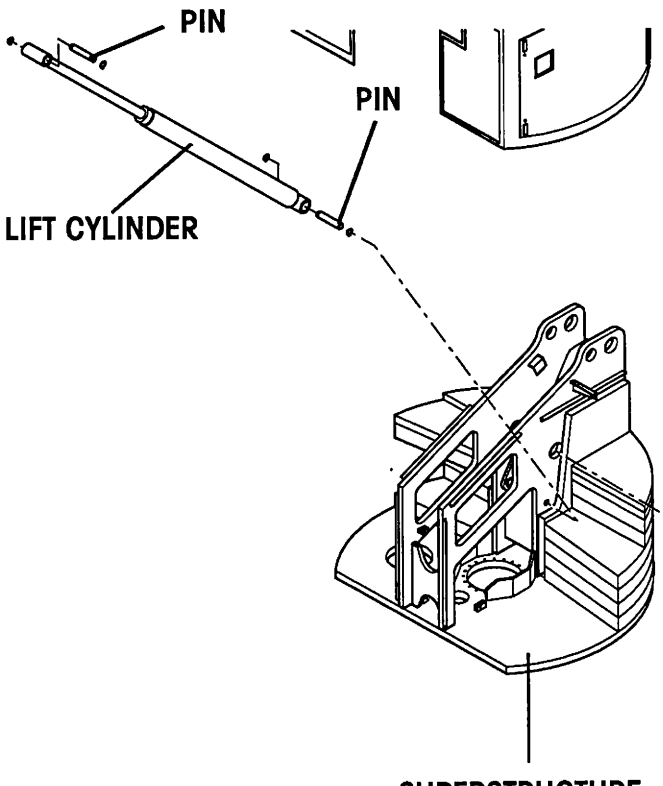
The lift cylinder can also be removed from the machine for seal replacement.

1. Operate boom lift to horizontal position.
2. SUPPORT THE BOOM (on a boom stand or similar rigid platform) at horizontal position.
3. Disconnect the hydraulic hoses from cylinder.
4. Support the cylinder with a crane.
5. Remove the rod end cylinder pin.

⚠ CAUTION

The cylinder will fall if not supported when the rod end pin is removed.

6. Remove the base end cylinder pin.



Lift Cylinder Removed from Superstructure.

7. Move the cylinder to a bench for examination.
8. Extend the cylinder, and examine the protruding rod for score marks and damage.
9. Clean the holding valve and examine for signs of leakage.
10. Clean the end of the cylinder.
11. Loosen the end cap, and withdraw it carefully over the piston rod.

⚠ CAUTION

Take care not to damage the rod surface and guard against dirt entering the system.

12. Remove the rod and piston assembly.

NOTE: It is recommended that the backup rings be replaced when seals are changed.

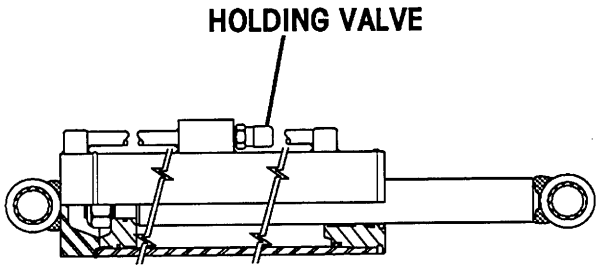
13. Replace the seals and backup rings and reassemble the cylinder; AVOIDING DIRT AND ROD DAMAGE.
14. Tighten the end cap.
15. Install the base end of the cylinder on the machine.
16. Connect all the hydraulic hoses.
17. Extend the lift cylinder and install the rod end to the boom.
18. Remove cylinder support.
19. Remove boom support.
20. BLEED THE SYSTEM after reinstalling the cylinder.

HOLDING VALVE INSPECTION

1. Stop the engine, and activate the boom lift control lever several times to dissipate residual pressure.

2. If the cylinder subsequently begins to move, the holding valve is faulty and the cartridge should be replaced.

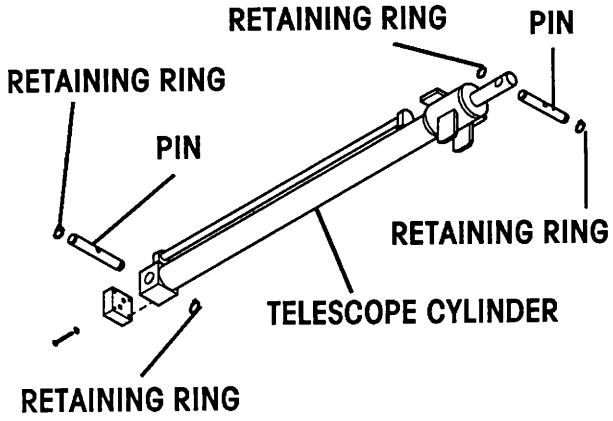
NOTE: The holding valve is pre-set at the factory and is not adjustable.



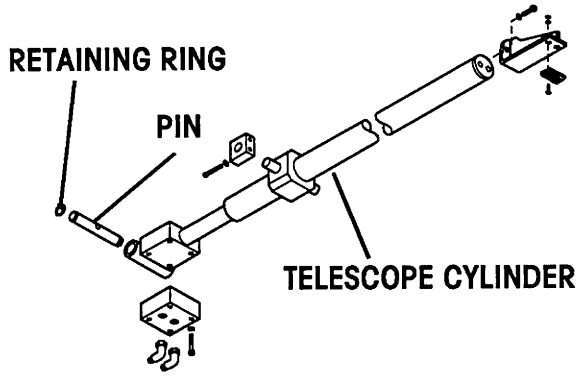
Lift Cylinder.

BOOM TELESCOPE (EXTEND) CYLINDER

The function of the telescope (extend) cylinder is to extend and retract the upper boom segments to allow positioning of the work platform. The double acting cylinder must be removed from the machine before a thorough inspection can be carried out.



Telescope Cylinder Pin (Two Section Boom).



Telescope Cylinder Pin (Three Section Boom).

TELESCOPE (EXTEND) BOOM CYLINDER PIN REPLACEMENT

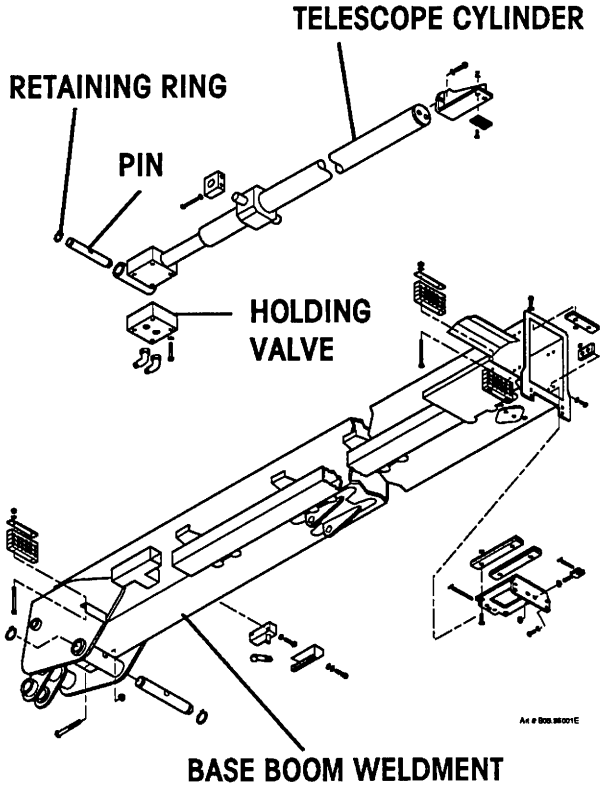
1. Remove the retaining ring.

2. SUPPORT THE CYLINDER and remove the base end pin.

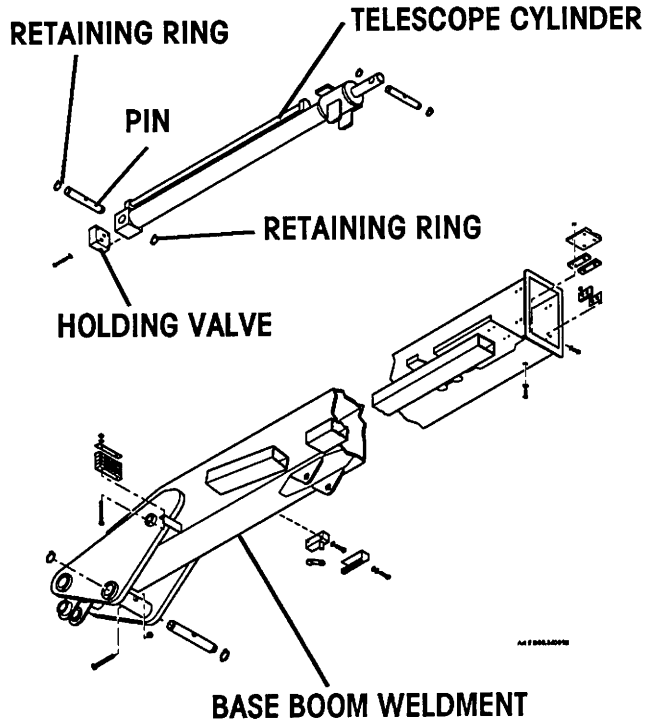
3. Install new pin and retaining ring. Cylinder must be lined up for ease of installation.

TELESCOPE (EXTEND) CYLINDER REMOVAL

1. Elevate the boom to the horizontal position.
2. SUPPORT THE BOOM (on a boom stand or similar rigid platform).
3. Disconnect the hydraulic hoses from the cylinder.
4. Remove the retaining ring and pin from the base end of the cylinder.
5. Remove the mounting block bolts (only on three section boom).
6. Using a crane, withdraw the cylinder from the boom.



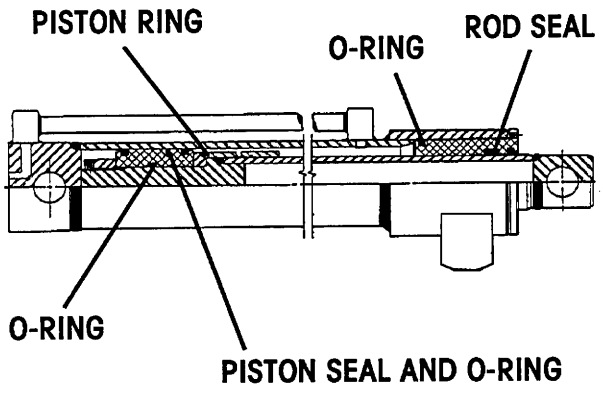
Telescope (Extend) Cylinder Replacement forThree Section Boom.



Telescope (Extend) Cylinder Replacement forTwo Section Boom.

TELESCOPE CYLINDER SEAL REPLACEMENT

1. Remove the end cap from the cylinder.
2. Pull the cap and rod straight out of the cylinder barrel.
3. Remove the nut from the end of the rod.
4. Slip off the collar.
5. Examine the rod and seals for signs of damage or wear.
6. Remove the old seals and backup rings.
7. Install new seals and backup rings.



Telescope (Extend) Cylinder.

TELESCOPE CYLINDER INSTALLATION

1. SUPPORT THE UPPER BOOM (on a boom stand or similar rigid platform) IN THE HORIZONTAL POSITION.
2. Using a crane, slide the telescope cylinder into the boom.
3. Install the mounting block bolts (on three section boom), cylinder pin retaining ring and hoses.
4. BLEED THE SYSTEM after reinstalling cylinder.

HOLDING VALVE INSPECTION

1. Stop the engine, and activate the telescope control lever several times to dissipate residual pressure.
2. If the cylinder subsequently begins to move, the holding valve is faulty and the cartridge should be replaced.

NOTE: The holding valve is pre-set at the factory and is not adjustable.

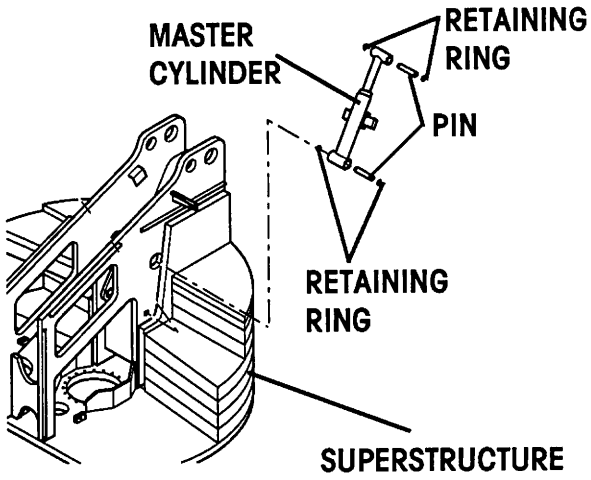
PLATFORM LEVEL CYLINDERS

The platform level system automatically keeps the platform level, using a master/ slave cylinder arrange. As the boom is raised or lowered, fluid is forced from one cylinder to the other in a closed loop, which keeps the platform parallel to the ground in any boom position. The platform level cylinders (master and slave) are of the double acting type.

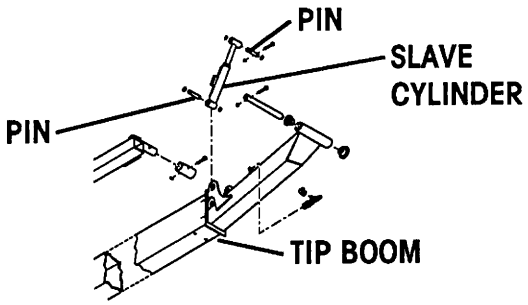
1. Check pivot pins for wear.
2. Check the pivot pin locking bolts for tightness.
3. Inspect the cylinders for fluid leakage, damage and security.
4. Replace the seals whenever the cylinder is serviced.

PLATFORM LEVEL CYLINDER PIN REPLACEMENT

1. SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders.



Master Cylinder Pin Replacement.



Slave Cylinder Pin Replacement.

2. Remove the retaining ring, the pin locking bolts and nuts, and remove the pin.

3. Install new pin, locking bolts and nuts (lubricate bolts before installation) and retaining ring.

4. Apply grease to pin.

LEVEL CYLINDER SEAL REPLACEMENT

1. Lower the boom all the way.

2. SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders.

3. Remove the lock collar and pin. Slave cylinder seals can be replaced on the machine. Master cylinder must be removed for seal replacement.

4. Clean the end of the cylinder.

5. Unscrew the end cap and pull the cap and rod straight out of the cylinder barrel.

⚠ CAUTION

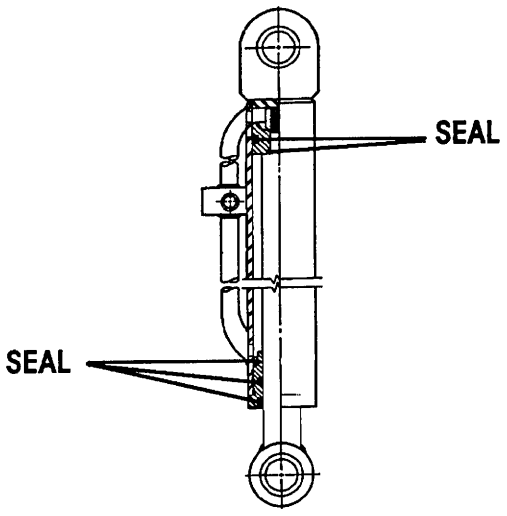
Take care not to damage the rod surface, and guard against dirt entering the system.

6. Remove the split pin and nut from the end of the rod.

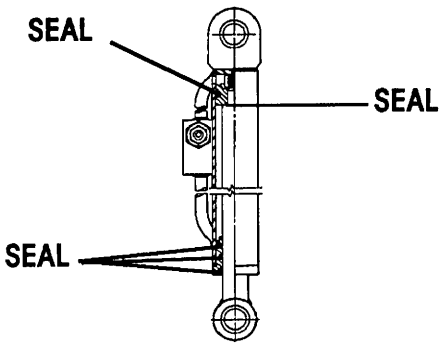
7. Slip off the collar.

8. Examine the rod and seals for signs of damage or wear.

9. Remove the old seals and install a new seal kit.



Master Level Cylinder.



Slave Level Cylinder.

BLEEDING THE PLATFORM LEVELING CIRCUIT

After a platform level cylinder has been repaired or replaced, or if the platform does not remain level with the raising and lowering of the boom, the platform leveling circuit may need to be bled.

NOTE: Assistance is required in order to perform the bleeding procedure. One person is needed to operate the platform level control, while the second person bleeds the system.

1. With boom retracted, check the hydraulic fluid level in the tank.

⚠WARNING

HYDRAULIC FLUID WILL BE FORCIBLY EJECTED FROM B AND C FITTINGS. LOOSEN NIPPLE SLOWLY.

2. Slightly loosen the B and C hose fittings at the base of the master leveling cylinder.

3. With the platform near ground, operate the platform level control to move the platform fully backward and forward. Perform procedure five (5) times in order to expel any air from the system.

⚠WARNING

CARE MUST BE TAKEN WHEN OPERATING LEVEL CONTROL. AIR IN CYLINDERS CAN CAUSE UNCONTROLLED PLATFORM MOTION.

4. Tighten the B and C hose fittings and top off the hydraulic tank.

5. Repeat the procedure as required until all air is expelled.

6. After bleeding the leveling circuit, raise boom to full elevation and then fully lower boom to ensure that platform remains level.

7. Check platform level control lever for proper operation.

SECTION 6:
MAINTENANCE SCHEDULE

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General Maintenance Tips 6-3
First Three Months of Operation 6-3
Routine Servicing 6-3
- Daily Service 6-4
- Monthly Service 6-4
- Semi-Annual Service 6-5
- Annual Service 6-5
- Four Year Interval Service 6-5

Daily Operational Checklist 6-6
Monthly Operational Checklist 6-9
Semi-Annual Operational Checklist 6-11

MAINTENANCE SCHEDULE

The Simon MPN with Electro-proportional control system is designed to require a minimum amount of maintenance. However, it is essential that the specified services be performed at the indicated intervals, and that the instructions contained in this manual are followed to ensure safety and reliability.

⚠ DANGER

DEATH OR SERVERE INJURY MAY RESULT IF MACHINE OPERATED IN AN UNSAFE CONDITION. DO NOT OPERATE ANY MACHINE IF UNSAFE OPERATING CONDITION.

GENERAL MAINTENANCE TIPS

- ALWAYS clean the surrounding area before opening hydraulic components.
- Never open a hydraulic system when there are contaminants in the air.
- Never leave components or hoses open. They must be protected from contamination (including rain) at all times.
- Use only recommended lubricants (see Lubrication Chart in front of this machine). Improper lubricants or incompatible lubricants may be as harmful as no lubrication.
- Watch for makeshift "fixes", which can jeapordize safety as well as lead to more costly repairs.
- Any work platform found not to be in safe operating condition should be removed from service until repaired. All repairs should be made by authorized personnel in conformance with the manufacturer's operating, maintenance, and repair manuals.

FIRST THREE MONTHS OF OPERATION

As with any new machine, minor fluid leaks may occur until the various hydraulic components and pipe fittings are fully seated.

It is particularly important that, for the first three months of operation, all hydraulic components, hoses and pipe fittings be checked regularly for leaks and tightness, and corrective action taken as required.

Correction of minor fluid leaks and general tightening of machine components during this initial period are not considered as reimbursible expenses under the Simon Limited Warranty.

The hydraulic pump, electric motor, cylinders and pressure valves are self-lubricating.

ROUTINE SERVICING

NOTE: The following recommendations are based on advice of suppliers, and the requirements of various safety regulations. They should be followed with discretion based on factors such as amount and type of machine usage, environmental conditions, and local safety regulations.

IMPORTANT: Make certain that the unit is inspected per the operational checklists at the end of this section.

DAILY SERVICE

Hydraulic System

Before checking the hydraulic fluid level, ensure that the machine booms are stowed in the traveling position, and the machine is standing on level ground. Fluid level must be to full mark on sight gauge, located on the side of tank. Refer to Lubrication Chart for correct grade of hydraulic fluid.

After checking the hydraulic fluid level, ensure that the filler cap is secure to prevent entry of water or other impurities into the tank.

Tire Condition

Check that the tires are not damaged and the tires have the correct tire pressure.

Platform Rails and Safety Gate

Check security of platform top rail safety gate.

Control Valves

Control valves must be checked for correct operation. Check that all control valve handles automatically return to the center (neutral) position.

Steering

Check the steering cylinder for fluid leakage. Inspect steering linkage for signs of wear.

Batteries

Check the electrolyte level in battery cells. Replenish with distilled water, if necessary.

Pivot Pins

Examine all pivot pins on booms and cylinders to ensure that they are positively secured in position.

Test All Machine Systems

Test the operation of the drive assembly, including drive motor and steering.

Test the operation of all machine boom functions.

Checklist

Perform all items on the Daily Checklist found later in this section.

MONTHLY SERVICE

Hydraulic System

Pressurize the hydraulic circuit and inspect the system for any signs of leakage, particularly at flexible hoses, connections and hydraulic components.

Check hydraulic fluid color. If the hydraulic fluid does not flow clear amber, but has a cloudy appearance, it is usually an indication that water is present. A dark brown color, accompanied by a strong "burnt" smell, indicates that the fluid has overheated. If either condition occurs, a complete hydraulic fluid and filter change will be necessary.

The cause of hydraulic fluid deterioration should be investigated and rectified. Have fluid analyzed by a qualified laboratory.

Chassis Bolts

Check all bolts for signs of looseness. Refer to numbers 6, 7, 9, 10, 11, 16 and 17 in monthly checklist.

Cylinders

Check all cylinders for hydraulic fluid leakage.

Pivot Pins and Grease Fittings

Lubricate all pivot pins and grease fittings.

Platform Mounting

Check that platform weldments and platform frame members are in good condition.

Checklist

Perform all items on the Monthly Checklist found later in this section.

SEMI-ANNUAL SERVICE

Boom Cylinders

Fully retract, then extend the boom lift cylinder. At each extreme position, check that there is no movement between cylinder rod and bearing housing, or between cylinder cap and tube.

Fully retract, then extend the boom telescope cylinder. At each extreme position, check that there is no movement of the cylinder pin.

High Pressure Filter

Change the high pressure filter element.

In severe use applications, more frequent filter changes will be necessary.

Checklist

Perform all items on the Semi-Annual Checklist found later in this section.

ANNUAL SERVICE

Flexible Hoses

Inspect all hoses over their complete length. Replace any hoses showing looseness or corrosion at the end fittings. Replace hoses exhibiting cracking, blistering or excessive wear of outer protective covering.

Hydraulic Fluid

If the hydraulic system has been properly maintained, the fluid should only need to be changed once each year. This, of course, will depend on machine application, amount of use, temperature, atmospheric conditions and other factors.

Hydraulic Fluid Tank

Carefully check the condition of the fluid inside the tank to ensure that it flows easily and is of clear, amber color. In cases of gross contamination, it will be necessary to completely drain and refill the entire hydraulic system.

Place a suitable waste oil container under the drain tap, or attach a suitable hose from the drain tap to the container.

Open the drain tap, and completely drain the fluid from the tank.

Clean or replace the suction hose, and close the drain tap. Refill the tank to the correct level.

Structural Examination

A thorough examination of the machine should be carried out for signs of corrosion, misalignment, material fractures, and other damage. Particular attention should be given to the condition of welded joints.

FOUR YEAR INTERVAL SERVICE

Pivot Pins and Bearings

Remove the pivot pins for examination. Check the pivot pin bearings with the pivot pins removed. Replace with the correct type of pins and bearings, as necessary.

DAILY OPERATIONAL CHECKLIST

All checks must be completed before operation of the unit.

These checklists can be copied as needed to aid in performing these inspections.

DATE: _____ **INSPECTED BY:** _____

MODEL NUMBER: _____ **SERIAL NUMBER:** _____

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your Simon MPN clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT DAILY INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform a visual inspection of all machine components, i.e. missing parts, torn or loose hoses, hydraulic fluid leaks, torn or disconnected wires, or damaged tires etc. Open both compartment doors to inspect components inside.
_____	2. Check fuel, engine oil and coolant levels.
_____	3. Check hydraulic fluid level. The level should be at the line marked on the sight gauge with the unit in stowed position.
_____	4. Check that all shutoff valves on hydraulic tank are open (parallel to flow).

Continued on following page . . .

DAILY OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	5. Check tires for damage.
_____	6. Check wheel lug nuts for tightness.
_____	7. Check hoses for worn areas.
_____	8. Check hose carrier to verify that it is not bent or sagging.
_____	9. Inspect safety belt connections, and check for worn areas on the belts.
_____	10. Check platform rails and gate latch for damage.
_____	11. Check pivot pins for security.
_____	12. Check that all warning and instructional labels are legible and secure.
_____	13. Start engine. Check that hydraulic pressure is as stated on the data plate.
_____	14. Check that the tilt alarm is working properly.
_____	15. Check that no attempt had been made to override the drive interlock system by a previous operator.
_____	16. When all pre-inspection checks have been completed, the operator is ready to test the ground controls for proper operation.
_____	17. Check platform controls for proper operation.
_____	18. With the platform raised, check for the smooth operation of low speed drive.
_____	19. Follow engine daily service requirements. Refer to the Engine Maintenance Manual supplied with your MPN.

Continued on following page . . .

DAILY OPERATIONAL CHECKLIST (CONTINUED)

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

NOTE: Do not grease wear pads in dusty or sandblast environments. There are boots and guards available to extend unit life in these applications. Consult Simon Aerials Service Department.

DAILY

INITIAL	DESCRIPTION
_____	20. Inspect cylinder boots, valve spool boots, etc., for cuts or other damage after every eight (8) hours of service. Repair or replace if necessary.
_____	21. Check hydraulic system for leakage after every eight (8) hours of operation.
_____	22. Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your MPN.

WEEKLY

INITIAL	DESCRIPTION
_____	23. Inspect condition of hydraulic fluid in the reservoir. Fluid should have a clear amber color.
_____	24. Lubricate all grease fittings (see Lubrication Chart).
_____	25. Check oil level in swing drive (see Lubrication Chart).
_____	26. Check oil level in power hubs.
_____	27. Apply lubricant to swing bearing and drive pinion gear (see Lubrication Chart).
_____	28. Check the steering cylinder for fluid leakage. Inspect steering linkage for signs of wear.

MONTHLY OPERATIONAL CHECKLIST

DATE: _____ INSPECTED BY: _____

MODEL NUMBER: _____ SERIAL NUMBER: _____

These checklists can be copied as needed to aid in performing these inspections.

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your Simon MPN clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT MONTHLY INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Daily Operational Checklist.
_____	2. Lubricate all grease fittings (see Lubrication Chart).
_____	3. Apply lubricant to swing bearing and drive pinion gear (see Lubrication Chart).
_____	4. Inspect condition of hydraulic fluid in the reservoir. Fluid should have a clear amber color.
_____	5. Check hydraulic system for leaks, examine hoses for signs of excessive wear, chafing or twisting. Adjust the hoses and/ or replace them if necessary .
_____	6. Inspect the work platform and boom structure for signs of damage and broken welds. Check all bolts (including cab rotate bolts) for tightness.
_____	7. Clean and lubricate all valve spool linkages.
_____	8. Check for unit damage, broken welds, loose bolts, improper or make-shift repairs.

Continued on following page . . .

INITIAL	DESCRIPTION
_____	9. Check protective rubber cover around hoses at moving anchor, tip boom, boom hose passages, and at swing bearing.
_____	10. Check torque of swing bearing bolts (see "Machine Specifications").
_____	11. Check adjustment and security of swing drive. Check torque of swing drive mounting bolts (see "Machine Specifications"). There should be a slight amount of backlash between the turntable and undercarriage when properly adjusted.
_____	12. Check oil level in swing drive gear box (see Lubrication Chart).
_____	13. Check oil level in power hubs (see Lubrication Chart).
_____	14. Check that tires are not leaning in or out.
_____	15. Check that wheel spindles turn freely, with no end play.
_____	16. Check torque hub mounting bolts (see "Machine Specifications").
_____	17. Check wheel lug nut torque (see "Machine Specifications").
_____	18. Check that the boom does not drift with a full load, no hydraulic pressure (engine off) and the control valve in the "BOOM DOWN" position.
_____	19. Inspect boom chains. Lubricate as required (see chart).
_____	20. Check to make sure boom sections are not dented or bent.
_____	21. Check that all adjustable flow valves are locked. Check settings if any are not locked.
_____	22. Check fuel shutoff rack for proper operation. Loosen lever arm and lubricate with WD-40 or equivalent.
_____	23. Check battery electrolyte level and connections. Follow engine monthly service requirements. Refer to the Engine Maintenance Manual.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

EVERY 90 DAYS

INITIAL	DESCRIPTION
_____	24. Replace high pressure filter element.

SEMI-ANNUAL OPERATIONAL CHECKLIST

DATE: _____ **INSPECTED BY:** _____

MODEL NUMBER: _____ **SERIAL NUMBER:** _____

These checklists can be copied as needed to aid in performing these inspections.

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your Simon MPN clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT SIX MONTH INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Daily and Monthly Operational Checklists.
_____	2. Have hydraulic fluid sample analyzed at a test laboratory. Comply with test results and recommendations to ensure long, trouble free operation.
	NOTE: If hydraulic fluid has been regularly maintained, it should only require changing once every year, depending on maintenance, temperature, application, duty cycle, and atmospheric conditions.
_____	3. Clean and lubricate all electrical switches with an electrical contact cleaner and ensure that the switches operate freely in all positions.
_____	4. Check the electrical mounting and hardware connections for security.
_____	5. Replace high pressure filter elements.
_____	6. Drain and replace fluid from swing drive and power hubs. If badly contaminated, it may be necessary to disassemble and inspect components.

Continued on following page . . .

SEMI-ANNUAL OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	7. Lubricate all hydraulic valve spool linkages.
_____	8. Repack front wheel bearings.
_____	9. Follow engine semi-annual service requirements. Refer to the Engine Maintenance Manual supplied with your MPN.

SECTION 7:
TROUBLESHOOTING

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GENERAL TROUBLESHOOTING TIPS

Before investigating a malfunction, check the following items:

- The Main Power Key Switch should be in the "ON" position.
- Control Selector Switch is in the correct position.
- The Foot Pedal Switch is pressed and held for platform console operation.
- Deadman Button is pressed and held for ground control operation.
- Check that battery connections are secure and battery is fully charged.
- Check that the Emergency Stop Button is released.
- Check that the Emergency Stop Cable has not been activated.
- Check that the ball valve in pump supply line is open.
- Check that hydraulic fluid is at the correct level.

Common Causes of Hydraulic System Malfunctions:

- Incompatible hydraulic fluids mixed, destroying the additives and causing varnish build up resulting in the valves to stick.
- Water in the hydraulic fluid due to a damp climate and reservoir pressurization inoperative.
- Improper hydraulic fluid used; viscosity too high cold climates, viscosity too low warm climates.

  NOTE: Mobil DTE-15 is a multiple viscosity oil that is light enough for cold climates and resists thinning in warm climates.

- Fuel in the hydraulic fluid, lowers the viscosity and lubricity of the fluid.

TROUBLESHOOTING CHART

Problem	Probable Cause	Solution
• Execssive heat will cause excessive wear on seals and metal parts due to lowered viscosity. Symptoms to watch for are: pump case turns brown, hydraulic fluid darkens and premature pump failure.	• Excessive water in the hydraulic fluid.	• Drain and flush hydraulic system.
	• Improper oil viscosity.	• Replace hydraulic fluid with the correct fluid.
	• Improper lubrication and hydraulic fluid.	• Drain and flush hydraulic system.
	• Pump cam bearing failure.	• Rebuild pump as required.
	• Open stroke flow valve.	• Close pump stroke valve.
	• Foot pedal blocked closed.	• Unblock foot pedal.
• Water in hydraulic fluid. Symptoms to watchfor are: pitting and etching of pump pistons with pump piston cam wear causing heat build up and premature pump failure.	• Damp climate.	• Drain and flush hydraulic system.
	• Hydraulic fitting or port open to contaminants.	• Drain and flush hydraulic system. Replace worn pump components.
	• Reservoir pressurization inoperative.	• Check pressure.
• Varnish, the dark brownish residue left from oxidation of hydraulic fluids. Symptoms to watch for are: residue will cause pistons and spools to stick and will hang up moving parts with close tolerances.	• Incompatible fluids or poor quality fluids.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant.
	• Excessive heating of the fluids.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid.
• Poor lubrication, parts break through lubricant causing metal to metal contact. Symptoms to watch for are: heads of pump pistons worn to shape of cam and excessive heat build up.	• Hydraulic fluid viscosity low.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid.
	• Improper or poor grade hydraulic fluid or lubricant without proper anti wear additives.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Cavitation, a gaseous condition within the fluid stream where the pressure is reduced to the vapor pressure of the fluid. The higher the system pressure the more violent the reaction will be. Symptoms to watch for are: pitting and etching of pump pistons.	• Low reservoir fluid level.	• Add hydraulic fluid.
	• Air leaks in suction line.	• Repair any suction hose leaks.
	• Improper hydraulic fluid.	• Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid.
	• Vaporization of water.	• Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid.
	• Hydraulic fluid system has not been warmed before using full system pressure.	• Warm up system before using full system pressure.
	• Pump speed too high.	• Ensure reservoir pressurization is operating properly and adjust pump speed.
• Boom trac cross braces breaking.	• Hose skiving in the boom trac.	• Check hydraulic pressure and adjust if necessary.
	• System pressure too high, causing boom hoses to shrink more than normal.	• Check hydraulic pressure and adjust if necessary.
	• Hoses too tight in the trac.	• Adjust hose tension.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Boom trac sagging.	• Trac pin holes stretched usually caused by a damaged "I" beam support. • Overhead guard is damaged. If the guard is damaged, the trac could get caught and could also tear off the moving anchor. • Improper lubrication and cleaning.	• Check "I" beam support and replace if necessary. • Replace overhead guard and any other items damaged due to a damaged guard. • Follow proper lubrication and cleaning procedures.
• Engine won't crank.	• Starter motor relay (SR1), starter motor interlock relay (CR1), low oil pressure/ high water temperature/ time delay relay (CR10), Power relay (CR3), ground/ platform switch (TGS2), ground toggle, platform ignition and start (TGS4) is faulty or an engine failure.	• A breakdown in any one of these components will cause the engine not to crank. Trace the available voltage to starter motor relay (SR1). Replace the component(s) that are faulty.
• Throttle actuator doesn't work.	• Throttle high speed timer relay, high speed solenoid, ground/ platform switch, ground or platform Hi speed toggle switches, CB1 or the key switch.	• A breakdown in any one of these components will cause the actuator not to function. Trace the available voltage through the circuit. Replace the component(s) that are faulty.
• Movement alarm will not sound.	• Movement alarm relay (CRM), horn or switch card on drive handle is bad.	• A breakdown in any one of these components will cause the alarm not to function. Trace the available voltage to the horn. Replace the com-ponent(s) that are bad.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Lift (hoist) cylinder drifts down.	1. Holding valve cartridge dirty or faulty. 2. Cylinder packing is damaged.	1. Clean, repair or replace the holding valve. 2. Replace cylinder packing.
Ground Control (Pendant) • Telescope, swing, hoist functions don't operate.	1. Pendant toggle switces have no voltage. 2. #1 or #5 potentiometer (depending on circuit) out of adjustment or failed. 3. #1 or #5 PWM Driver Module out of adjustment. 4. Valve is stuck. 5. Damaged hydraulics or cylinders.	1. Check voltage available to the toggle switches. 2. Adjust or replace #1 or #5 potentiometer. 3. Adjust maximum output on PWM Driver board or replace. 4. Manually engage valve spool. 5. Inspect components.
• Drive function does not operate.	1. Toggle switch has no voltage. 2. Creep speed potentiometer out of adjustment or failed. 3. PWM Driver Module out of adjustment or failed. 4. Ground drive speed control relays are bad.	1. Check voltage available to the toggle switches. 2. Adjust or replace creep speed potentiometer. 3. Adjust maximum output on PWM Drive board or replace. 4. Ensure proper operation of ground drive speed control relays or replace.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Ground Control (Pendant) (Cont.)		
• No steer function.	1. Steer toggle switch is bad.	1. Check voltage available to the toggle switch.
	2. Steer/ axle valve.	2. Steer/ axle valve is not fully engaged.
	3. Pilot operated check valve.	3. Pilot operated check valve is dirty. Remove, clean and/ or replace.
	4. Faulty steer cylinder.	4. Possibly plugged steer ports or damaged cylinder packing. Inspect, repair or replace steer cylinder.
Platform Control		
• No drive function.	1. Platform drive speed control relay (CRC), drive potentiometer is bad.	1. Ensure platform drive speed control relay (CRC) is working properly. If boom is extended, confirm potentiometer is functioning. Repair or replace both components.
	2. Loose wires on control card or module.	2. Tighten wires on control card or module and ensure proper location.
	3. Driver board card or module out of adjustment or faulty.	3. Adjust card or module according to specifications. Replace faulty card.
	4. Brakes do not release.	4. Check pressure supply to brakes. If no pressure, consult factory.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No drive function (continue).	5. No hydraulic fluid flow available to the drive motors.	5. Test for available fluid flow at the wheel motors.
	6. Drive valve spool is stuck.	6. Manually engage and check for proper operation. Replace if faulty.
	7. Diverter valve not fully shifted.	7. Inspect, repair or replace.
	8. Motor shafts are sheared.	8. Inspect, repair or replace.
	9. Torque hubs are damaged.	9. Inspect, repair or replace.
• No lift (hoist) function.	1. Loose wires on Y-axis driver board or control module.	1. Tighten Y-axis wires on driver board or control module.
	2. Driver board out of adjustment or faulty.	2. Adjust driver board to specifications or replace.
	3. Axle limit switches are not fully engaged.	3. Identify which one or more of the switches is not engaged. Repair or replace switch.
	4. Lift (hoist) spool valve stuck.	4. Manually engage lift (hoist) spool and check for operation.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No lift (hoist) function (continued).	6. Holding valves not operating properly.	6. Remove, clean, inspect, replace and test unit operation.
	7. Faulty cylinder.	7. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder.
• No extend or retract function/ boom only extends 3 meters.	1. Loose wires on control card.	1. Tighten wires and ensure proper location.
	2. Driver board out of adjustment or a faulty card.	2. Adjust or replace cards.
	3. Faulty micro switch in control handle.	3. Test and replace if faulty.
	4. Axle switches not fully engaged.	4. Identify which one or more of the switches is not engaged. Repair or replace switch.
	5. Spool valve stuck.	5. Manually engage spool and check for proper operation. Replace if faulty.
	6. Pressure reducing valve.	6. Possibly leaking to tank. Inspect, clean and retest. Replace if faulty.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No swing function.	1. Loose wires on control card.	1. Tighten wires and ensure proper location.
	2. X-axis driver board or control module out of adjustment or faulty.	2. Adjust or replace X-axis driver board or control module.
	3. Spool valve stuck.	3. Manually engage swing spool and check for proper operation. Replace if faulty.
	4. Brake on swing box not releasing.	4. Check for proper pressure to release brake. Adjust pressure.

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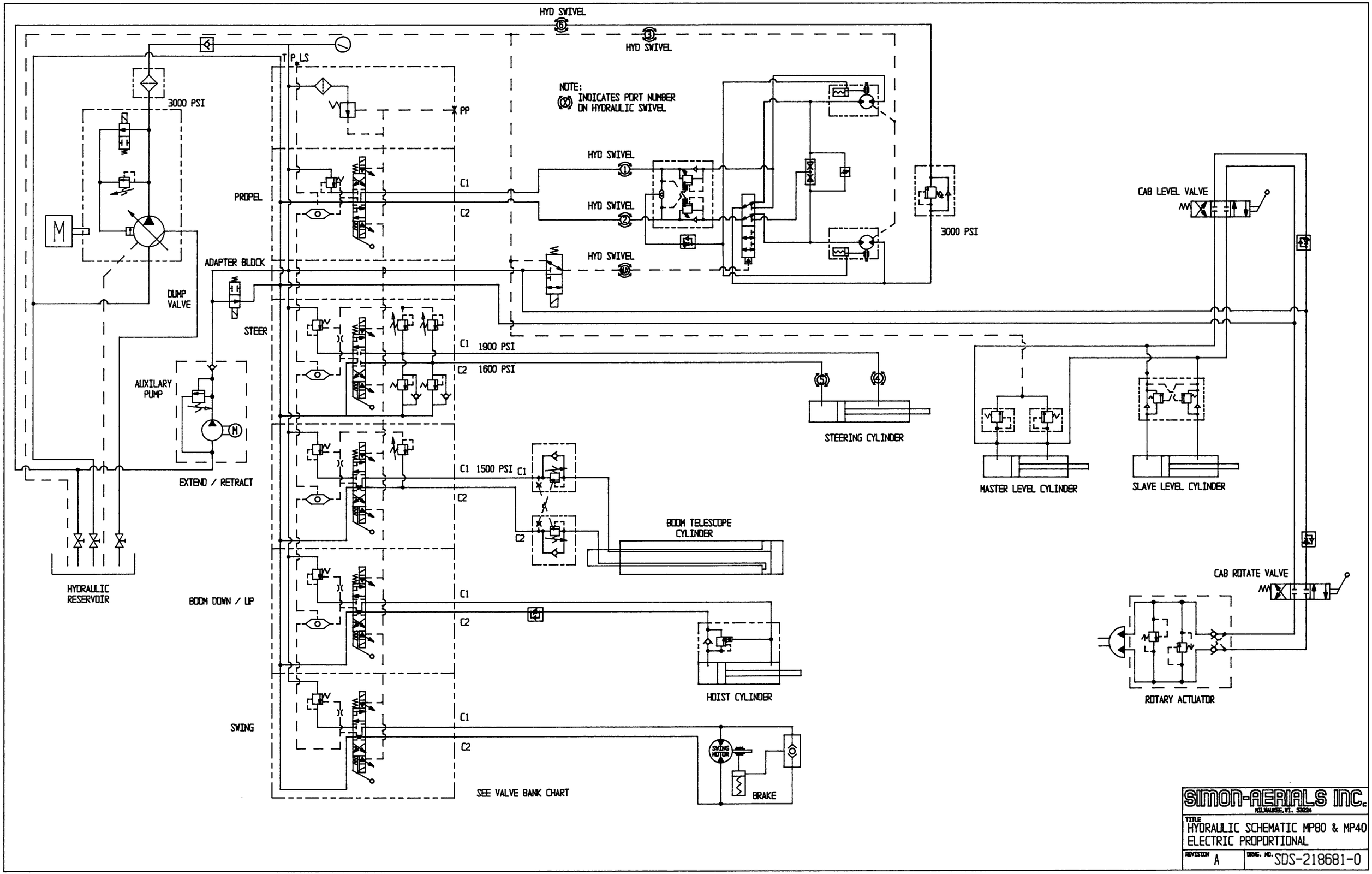
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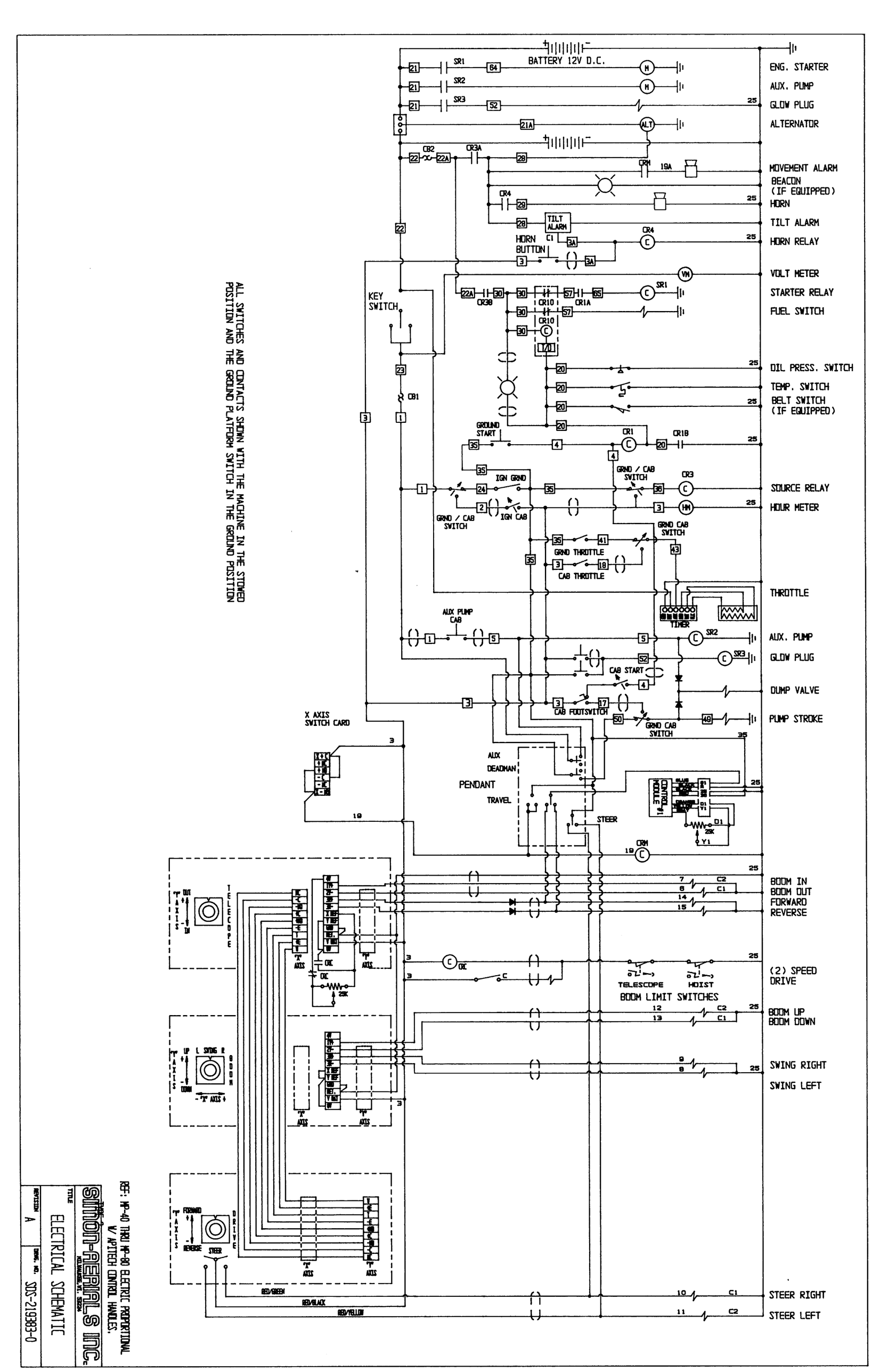
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SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
HYDRAULIC SCHEMATIC MP80 & MP40
ELECTRIC PROPORTIONAL

REVISION	DRWG. NO.
A	SDS-218681-0

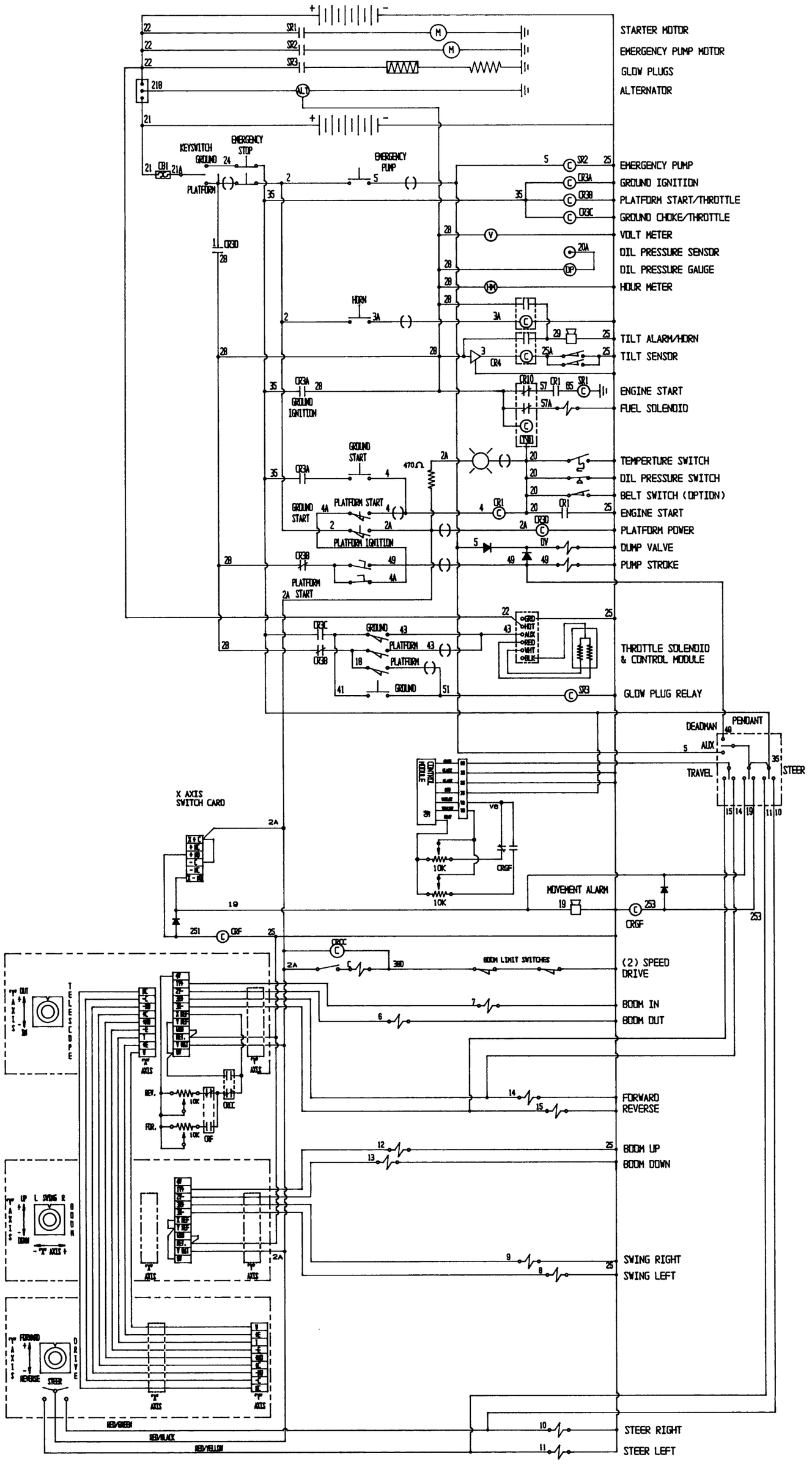


REF: MP-40 THRU MP-80 ELECTRIC PROPORTIONAL W/ APITECH CONTROL HANDLES.

SIMON-AERIALS INC.
KOLMAR, PA. 18324

TITLE: ELECTRICAL SCHEMATIC

REVISION	DRWG. NO.
A	SDS-219383-0



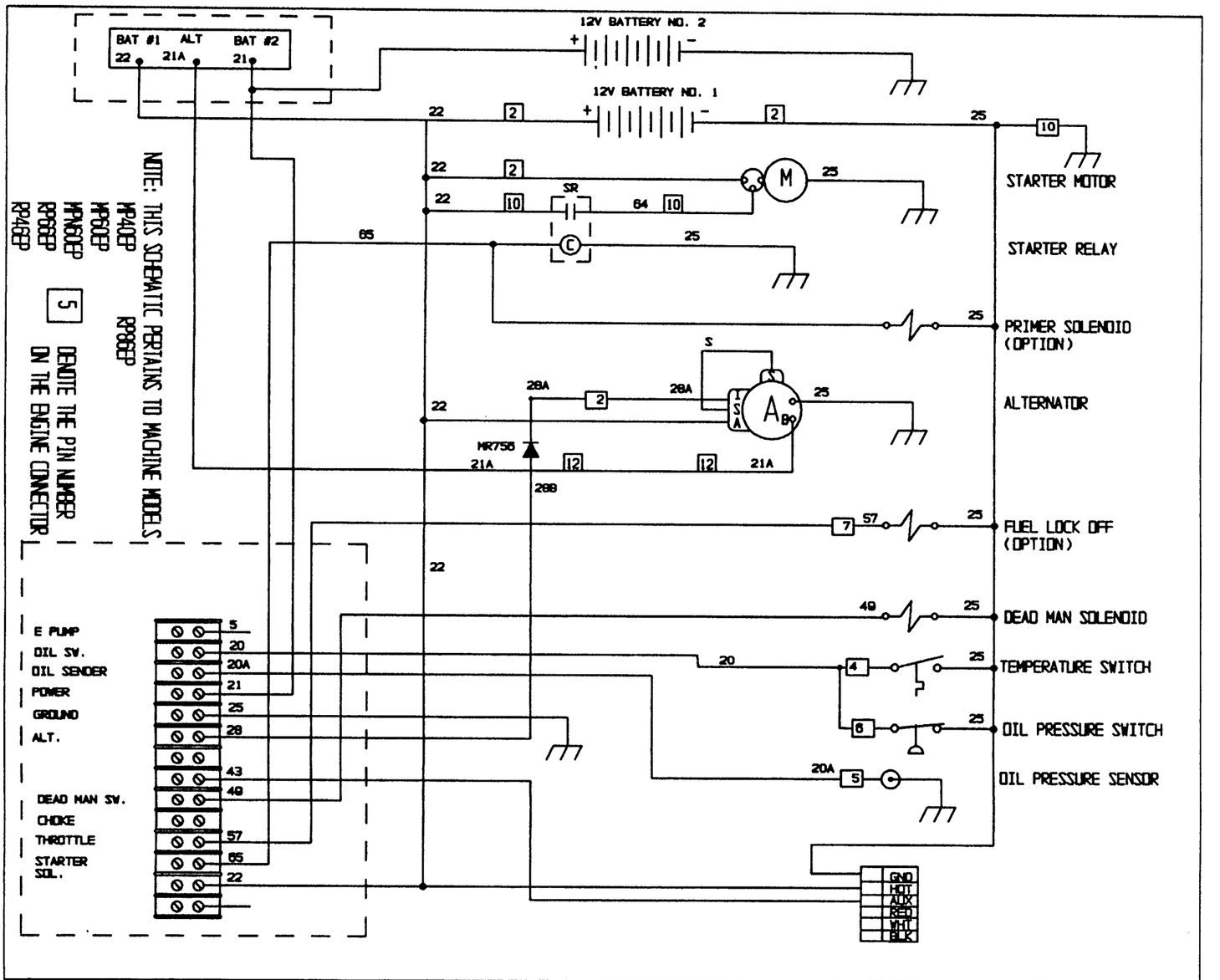
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

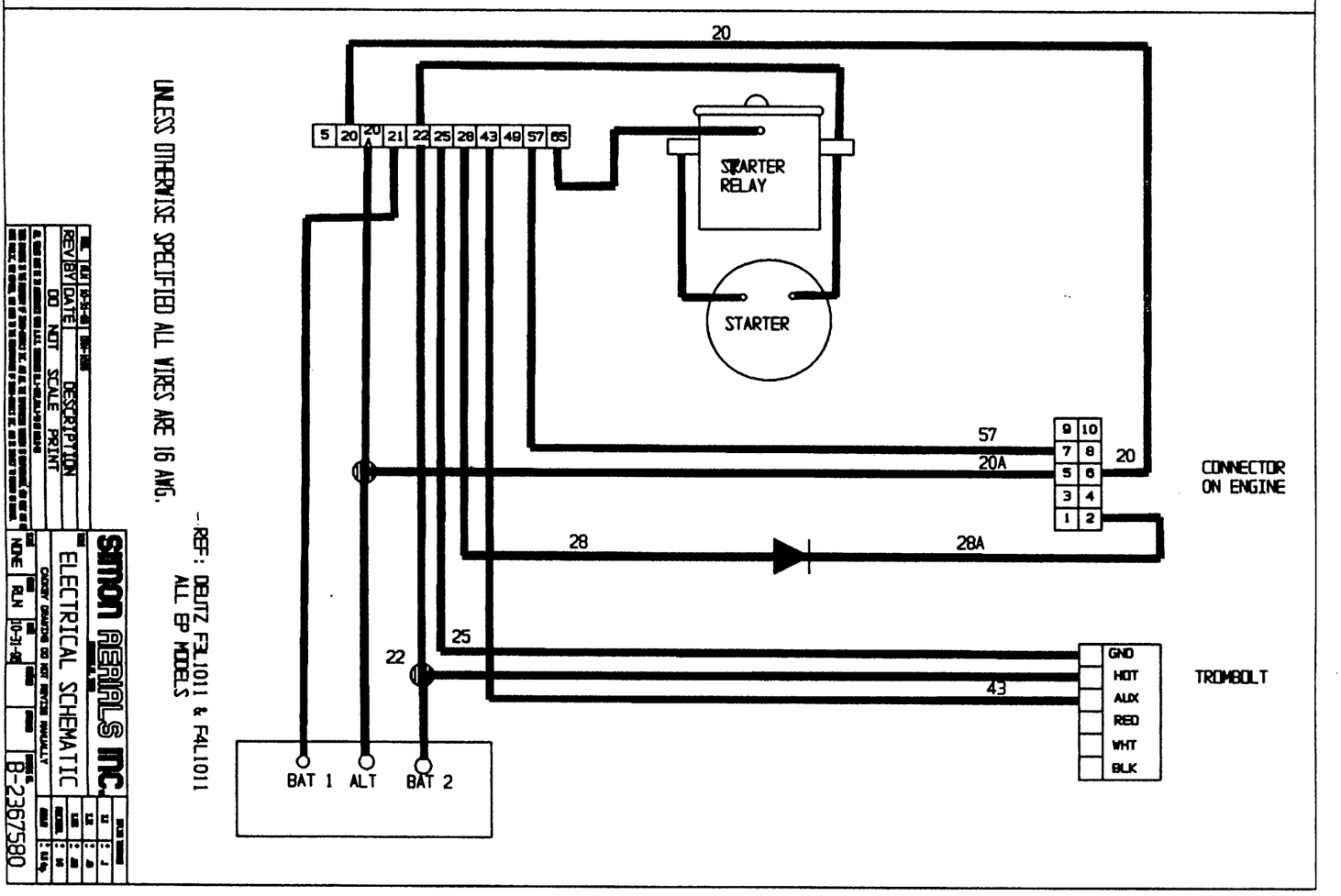
TITLE: ELECTRICAL SCHEMATIC
MP-80 ELECTRIC PROPORTIONAL

DRWG. NO. SDS 2308570

REVISION

(MP-80 W/14-00 GROUND REV.)


BAT #1 ALT BAT #2
22 21A 21
12V BATTERY NO. 2
12V BATTERY NO. 1
STARTER MOTOR
STARTER RELAY
PRIMER SOLENOID (OPTION)
ALTERNATOR
FUEL LOCK OFF (OPTION)
DEAD MAN SOLENOID
TEMPERATURE SWITCH
OIL PRESSURE SWITCH
OIL PRESSURE SENSOR
MR756
E PUMP
OIL SW.
OIL SENDER
POWER
GROUND
ALT.
DEAD MAN SW.
CHOKE
THROTTLE
STARTER SOL.
GND
HOT
AUX
RED
WHT
BLK
NOTE: THIS SCHEMATIC PERTAINS TO MACHINE MODELS
MP40EP
MP60EP
MP60DEP
RP60EP
RP46EP
RP86EP
5 DENOTE THE PIN NUMBER ON THE ENGINE CONNECTOR


5 20 20A 21 22 25 28 43 49 57 65
STARTER RELAY
STARTER
CONNECTOR ON ENGINE
TROMBOLT
BAT 1 ALT BAT 2
UNLESS OTHERWISE SPECIFIED ALL WIRES ARE 16 AWG.
REF: DEUTZ F3L1011 & F4L1011 ALL EP MODELS
ELECTRICAL SCHEMATIC
SIMON AERIALS INC.
B-2367580

STARTER MOTOR SOLENOID
EMERGENCY PUMP MOTOR
ALTERNATOR
EMERGENCY PUMP
GROUND IGNITION
PLATFORM START/THROTTLE
GROUND CHOKE/THROTTLE
VOLT METER
OIL PRESSURE SENSOR
OIL PRESSURE GAUGE
MOVEMENT ALARM
HORN
TILT ALARM
TILT SENSOR
ENGINE START
FUEL SOLENOID
HOUR METER
TEMPERATURE SWITCH
OIL PRESSURE SWITCH
BELT SWITCH (OPTION)
ENGINE START
PLATFORM POWER
DUMP VALVE
PUMP STROKE
THROTTLE SOLENOID & CONTROL MODULE
DEADMAN
PENDANT
AUX
TRAVEL
STEER
(2) SPEED DRIVE
BOOM IN
BOOM OUT
FORWARD REVERSE
BOOM UP
BOOM DOWN
SWING RIGHT
SWING LEFT
STEER RIGHT
STEER LEFT
CONTROL MODULE #6
BOOM LIMIT SWITCHES
LOCATED ON UNDERCARRIAGE TRI-FLOW VALVE
X AXIS SWITCH CARD
KEYSWITCH
EMERGENCY STOP
TILT SENSOR WITH BLACK CASE
2 AMP FUSE
TELESCOPE
DRIVE
SWING R
L
UP
DOWN
FORWARD
REVERSE
STEER
RED/BLACK
RED/YELLOW
RED/GREEN

NOTE: ALL WIRE SIZE TO BE 16 GA. EXCEPT AS NOTED.

2/0	#2/0 AWG
2	#2 AWG
4	#4 AWG
10	#10 AWG
12	#12 AWG
14	#14 AWG
X2	DOUBLE WIRES

REF: ELECTRO - PROPORTIONAL CONTROLS
MP60 4WD W/TRI-FLOW
DEUTZ 1011

REV	BY	DATE	DESCRIPTION
REL	JTS	4/16/96	ORN-1557

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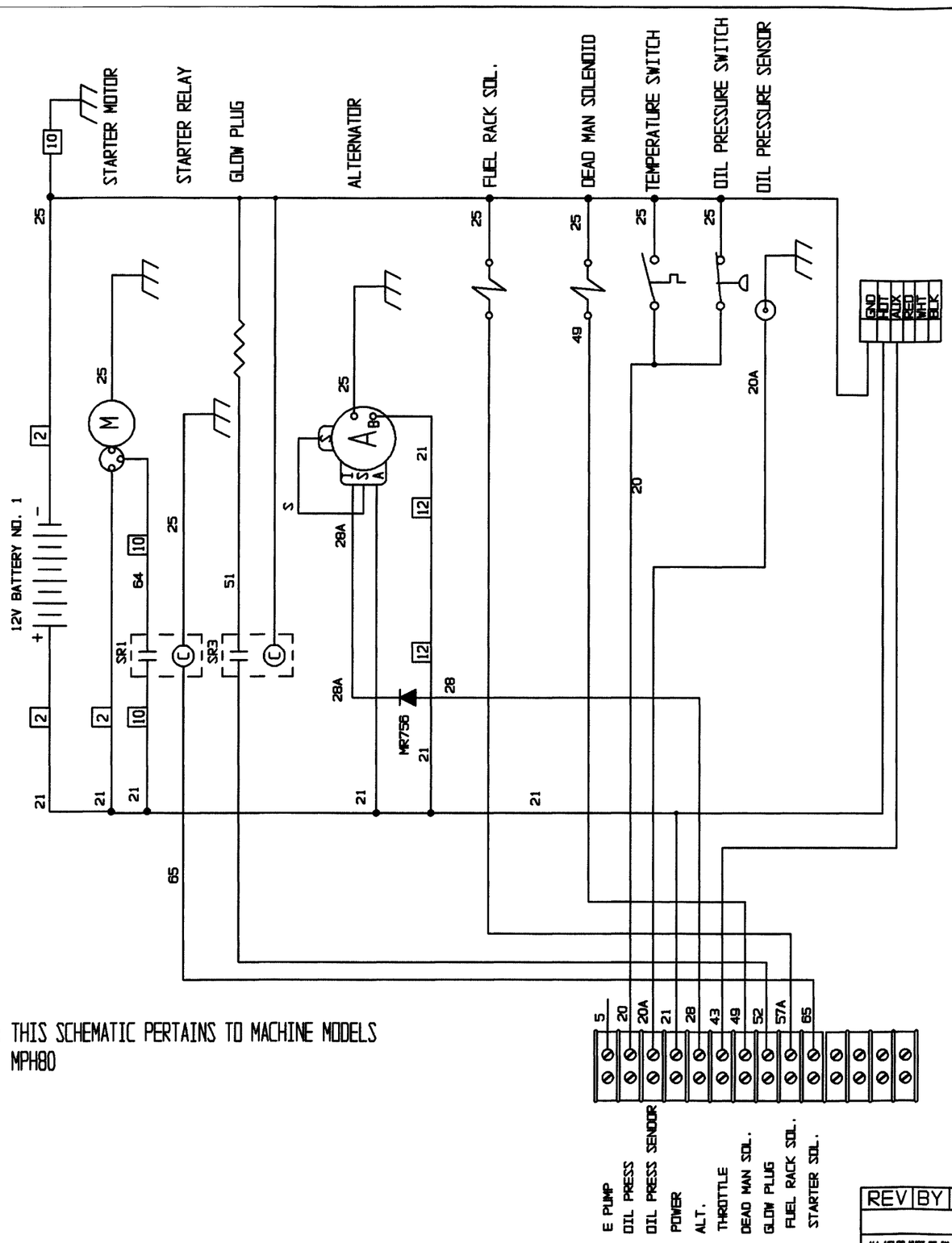
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TITLE: ELECTRICAL SCHEMATIC

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SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
1/1	JTS	4/16/96			D-2360580

UNLESS OTHERWISE SPECIFIED	
X.X	± .1
X.XX	± .05
X.XXX	± .015
FRACTIONAL	± 1/8
ANGULAR	± 0.5 deg.



NOTE: THIS SCHEMATIC PERTAINS TO MACHINE MODELS
MPH80

REV	BY	DATE	DESCRIPTION
A	RLN	2-5-97	ECN-2981
REL	RLN	1-2-97	ECN-2910

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TITLE: ELECTRICAL SCHEMATIC
PERKINS 4.236 FH

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SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
NONE	RLN	1-2-97			B-2370400

IMPLIED TOLERANCE	
X.X	± .1
X.XX	± .05
X.XXX	± .015
FRACTIONAL	± 1/8
ANGULAR	± 0.5 deg.