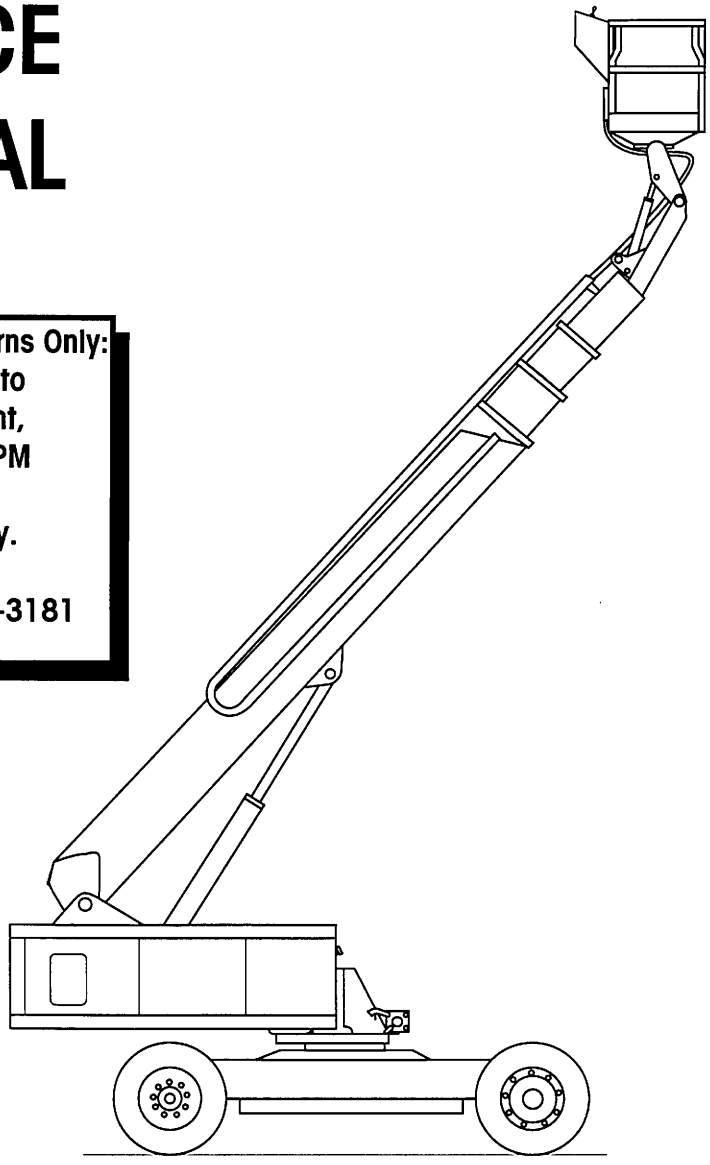
MODEL MP

With Extendable Axles
Featuring "Electro-Proportional"
Control System

SERVICE MANUAL

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



Art # A00.00130E

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INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the Mobile Platform with extendable axles and 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 Mobile Platforms are designed and built to provide many years of safe, dependable service. To obtain full benefits from your machine, 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 understand the Operators, Service, Parts and Component Repair Manuals in order to gain a thorough knowledge of the machine prior to making any repairs. Exercise all necessary safety precautions when performing maintenance not covered in this manual.

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 machine. Do not attempt to make a repair or use a procedure not specified in this manual unless you first ensure that you can do so safely, without the risk of injury to yourself or others.

⚠ DANGER

MODIFICATIONS OF THIS MACHINE FROM THE ORIGINAL DESIGN ARE STRICTLY FORBIDDEN WITHOUT WRITTEN PERMISSION FROM SIMON AERIALS INC. AND 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.

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

MACHINE SPECIFICATIONS MPH 80

Working Height	**86 Ft/** 26.21 M
Platform Height	**80 Ft/** 24.38 M
Horizontal Reach (Boom Angle 0°)	**66 Ft 10 In./** 20.37 M
Platform Capacity (Unrestricted)	**800 LBs./** 363 kg
Platform Size	**36 In. x 72 In. x 42 In./** 0.91M x 1.83 M x 1.07 M
Stowed Length	**34 Ft 11 In./** 10.64 M
Stowed Height	**9 Ft 9 In./** 2.97 M
Machine Width:	
without axles extended	**9 Ft 6 In./** 2.90 M
with axles extended	**11 Ft 8 In./** 3.56 M
Wheelbase	**12 Ft 0 In./** 3.66 M
Turning Radius, Outside	**26 Ft 0 In./** 7.92 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**2.8 MPH/** 4.5 KPH
Boom Extended	**0.5 MPH/** 0.8 KPH
Ground Clearance	**14 In./** 35.6 cm
Gross Weight (approx.) (Note 1)	**40,800 LBs./** 18,507 kg
Gradeability (on Hard Surface) (see Note 1)	**9.0°/** 16%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**15 x 22.5 (16 Ply) liquid ballasted**
Tire Pressure (Disregard for foam filled tires)	**110 PSI/** 7.58 Bar/ 7.73 Kg/ cm^2
Wheel Lug Nut Torque	**220 Ft LBs./** 298 Nm/ 30.4 Kg-m
Swing Bearing Bolt Torque	**280 Ft LBs./** 380 Nm/ 38.7 Kg-m
Drive Hub Bolt Torque	**170 Ft LBs./** 231 Nm/ 23.5 Kg-m
Maximum Hydraulic Pressure	**3000 PSI/** 207 Bar/ 211 Kg/ cm^2
Hydraulic Reservoir Capacity	**55 Gal./** 208 Liters
Fuel Reservoir Capacity	**57 Gal./** 216 Liters
Electrical System	**Three 12 Volt DC Batteries 95 Amp**

Engine Availability:

Standard . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Gasoline

Optional . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Dual Fuel
Deutz F4L912, 71 HP (53 Kw), Air Cooled, Diesel Fuel
Isuzu, 88 HP (66 Kw), Liquid Cooled, Diesel Fuel
Perkins 4.236, 81 HP (60 Kw) Liquid Cooled, Diesel Fuel

Note 1: Weight and performance shown represent typical machines, 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 machine.

MACHINE SPECIFICATIONS MP 95

Working Height	**101 Ft/** 30.78 M
Platform Height	**95 Ft/** 28.96 M
Horizontal Reach (Boom Angle 0°)	**82 Ft 6 In./** 25.15 M
Platform Capacity (Unrestricted)	**500 LBs./** 227 kg
Platform Size	**36 In. x 72 In. x 42 In./** 0.91M x 1.83 M x 1.07 M
Stowed Length	**40 Ft 8 In./** 12.4 M
Stowed Height	**9 Ft 6 In./** 2.90 M
Machine Width:	
without axles extended	**8 Ft 2 In./** 2.49 M
with axles extended	**11 Ft 8 In./** 3.56 M
Wheelbase	**10 Ft 0 In./** 3.04 M
Outside Turning Radius	**26 Ft 0 In./** 7.92 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**2.6 MPH/** 4.2 KPH
Boom Extended	**0.5 MPH/** 0.8 KPH
Ground Clearance	**14 In./** 35.6 cm
Gross Weight (approx.) (Note 1)	**46,850 LBs./** 21,251 kg
Gradeability (on Hard Surface) (see Note 1)	**7.5°/** 13%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**15 x 22.5 (16 Ply) liquid ballasted**
Tire Pressure (Disregard for foam filled tires)	**110 PSI/** 7.58 Bar/ 7.73 Kg/ cm^2
Wheel Lug Nut Torque	**220 Ft LBs./** 298 Nm/ 30.4 Kg-m
Swing Bearing Bolt Torque	**280 Ft LBs./** 380 Nm/ 38.7 Kg-m
Drive Hub Bolt Torque	**170 Ft LBs./** 231 Nm/ 23.5 Kg-m
Maximum Hydraulic Pressure	**3000 PSI/** 207 Bar/ 211 Kg/ cm^2
Hydraulic Reservoir Capacity	**55 Gal./** 208 Liters
Fuel Reservoir Capacity	**57 Gal./** 216 Liters
Electrical System	**Three 12 Volt DC Batteries 95 Amp**

Engine Availability:

Standard . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Gasoline

Optional . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Dual Fuel
Deutz F4L912, 71 HP (53 Kw), Air Cooled, Diesel Fuel
Isuzu, 88 HP (66 Kw), Liquid Cooled, Diesel Fuel
Perkins 4.236, 81 HP (60 Kw) Liquid Cooled, Diesel Fuel

Note 1: Weight and performance shown represent typical machines, 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 machine.

MACHINE SPECIFICATIONS MP 110

Working Height	**116 Ft**/ 35.36 M
Platform Height	**110 Ft**/ 33.53 M
Horizontal Reach (Boom Angle 0°)	**60 Ft 0 In.**/ 18.29 M
Platform Capacity (Unrestricted)	**500 LBs.**/ 227 kg
Platform Size	**36 In. x 72 In. x 42 In.**/ 0.91M x 1.83 M x 1.07 M
Stowed Length	**39 Ft 7 In.**/ 12.06 M
Stowed Height	**9 Ft 11.75 In.**/ 3.04 M
Machine Width:	
without axles extended	**9 Ft 6 In.**/ 2.90 M
with axles extended	**11 Ft 8 In.**/ 3.56 M
Wheelbase	**12 Ft 0 In.**/ 3.66 M
Turning Radius, Outside	**26 Ft 0 In.**/ 7.92 M
Maximum Travel Speed:	
Boom Stowed (see Note 1)	**2.8 MPH**/ 4.5 KPH
Boom Extended	**0.5 MPH**/ 0.8 KPH
Ground Clearance	**11 In.**/ 27.9 cm
Gross Weight (approx.) (Note 1)	**48,500 LBs.**/ 22,000 kg
Gradeability (on Hard Surface) (see Note 1)	**7.0°**/ 12%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**15 x 22.5 (16 Ply) liquid ballasted**
Tire Pressure (Disregard for foam filled tires)	**110 PSI**/ 7.58 Bar/ 7.73 Kg/ cm^2
Wheel Lug Nut Torque	**220 Ft LBs.**/ 298 Nm/ 30.4 Kg-m
Swing Bearing Bolt Torque	**280 Ft LBs.**/ 380 Nm/ 38.7 Kg-m
Drive Hub Bolt Torque	**170 Ft LBs.**/ 231 Nm/ 23.5 Kg-m
Maximum Hydraulic Pressure	**3000 PSI**/ 207 Bar/ 211 Kg/ cm^2
Hydraulic Reservoir Capacity	**55 Gal.**/ 208 Liters
Fuel Reservoir Capacity	**57 Gal.**/ 216 Liters
Electrical System	**Three 12 Volt DC Batteries 95 Amp**

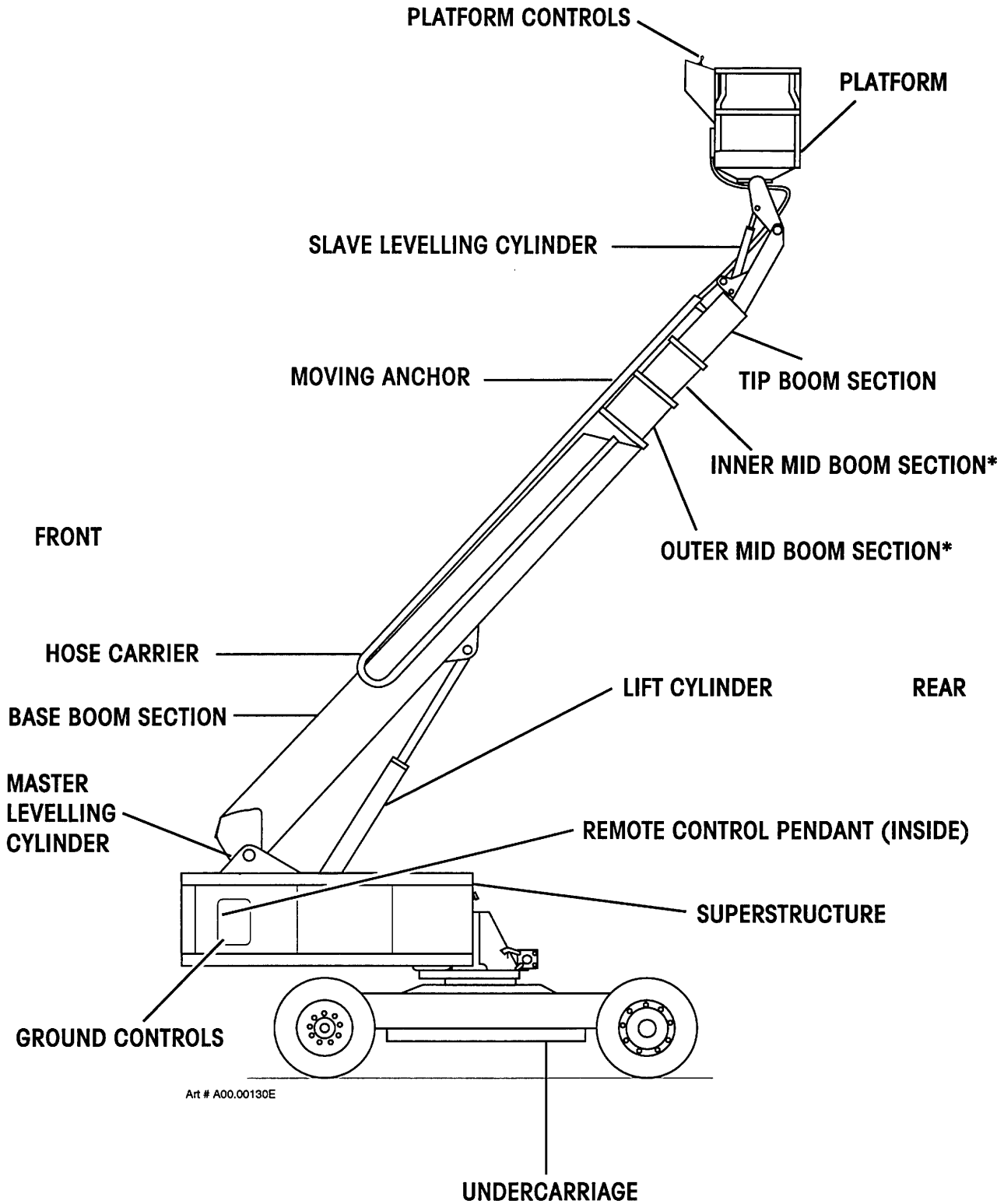
Engine Availability:

Standard . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Gasoline

Optional . . . Ford CSG 649, 110 HP (82 Kw), Liquid Cooled, Dual Fuel
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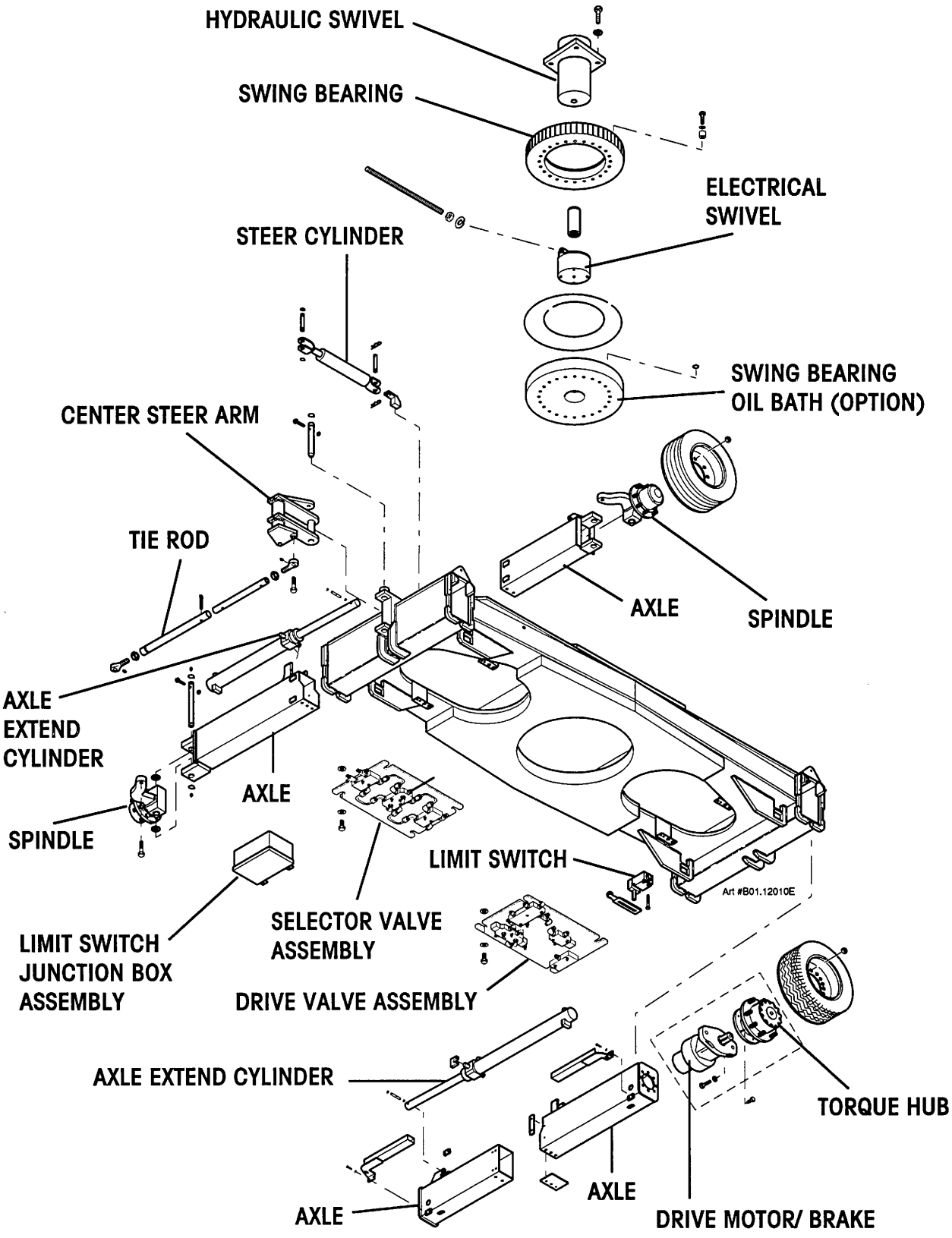
Note 1: Weight and performance shown represent typical machines, and should be used as a general guideline only. Many variables between machines can lead to significant differences in these factors. Accurate figures, when necessary for a particular application, can best be determined by testing of the specific machine.

MACHINE COMPONENT LOCATOR



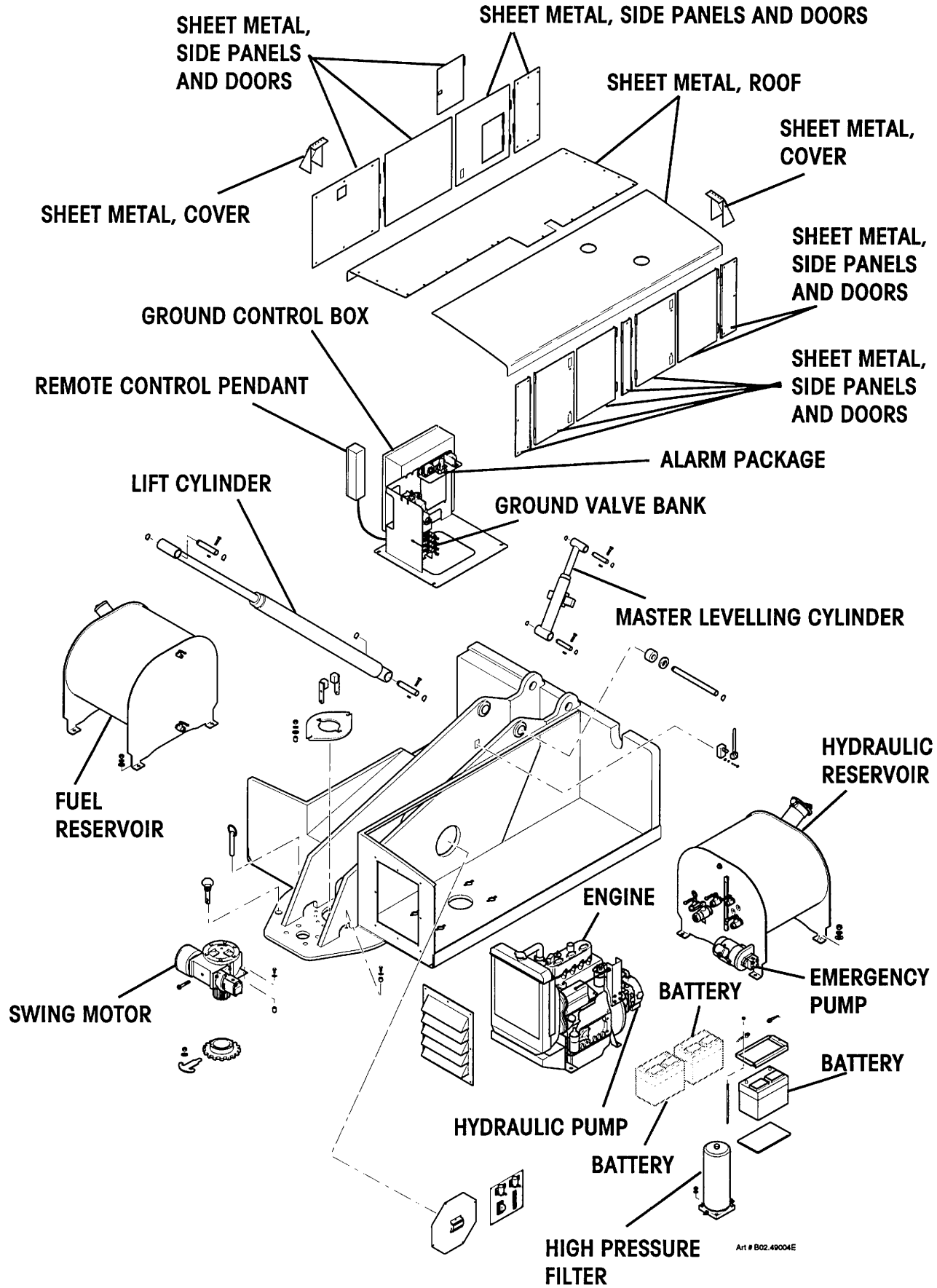
* MP 110 SHOWN, ONLY ONE MID BOOM ON MPH80 AND MP95.

UNDERCARRIAGE COMPONENT LOCATOR



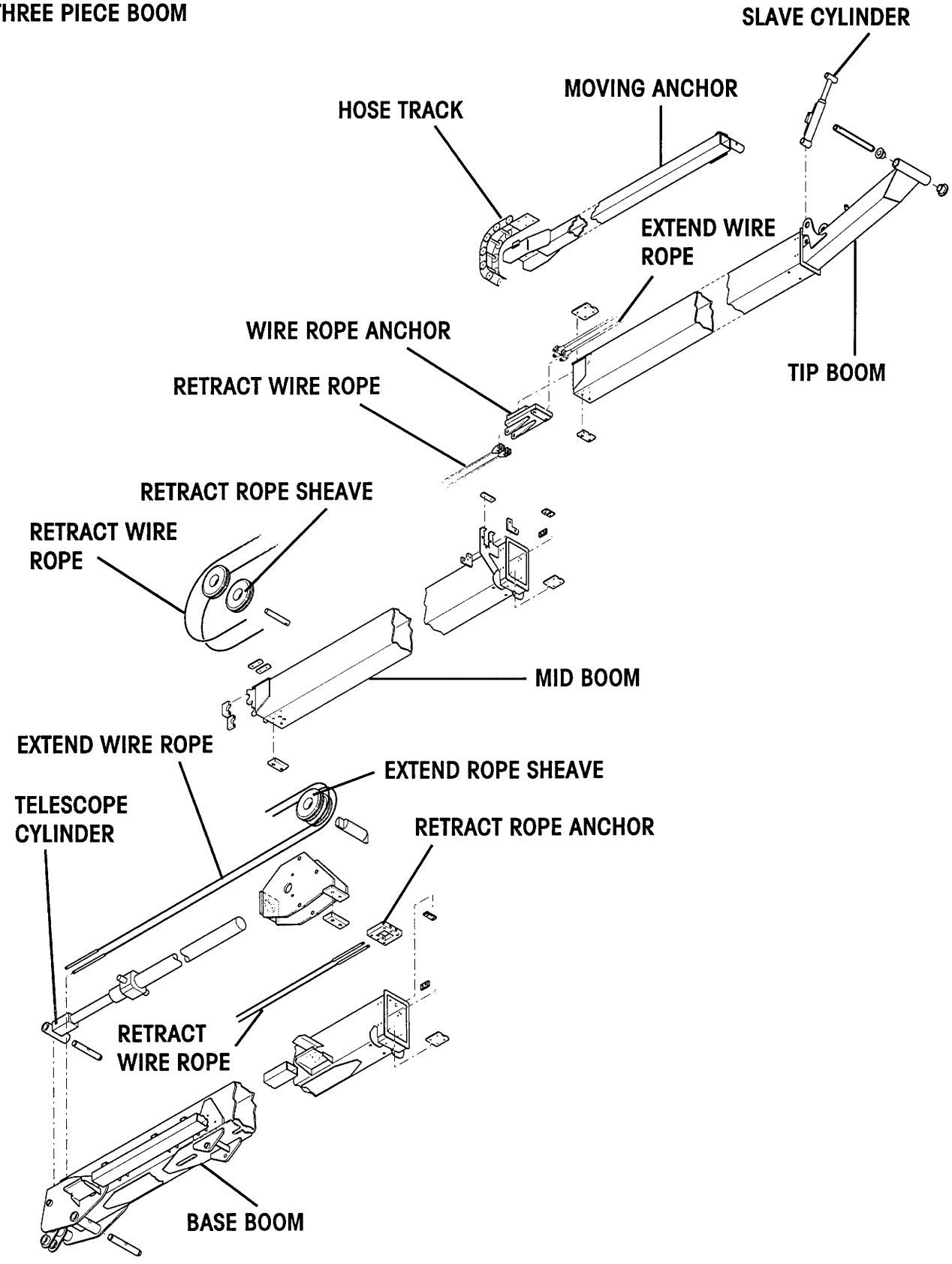
UNDERCARRIAGE FOR TWO (2) WHEEL DRIVE

SUPERSTRUCTURE COMPONENT LOCATOR

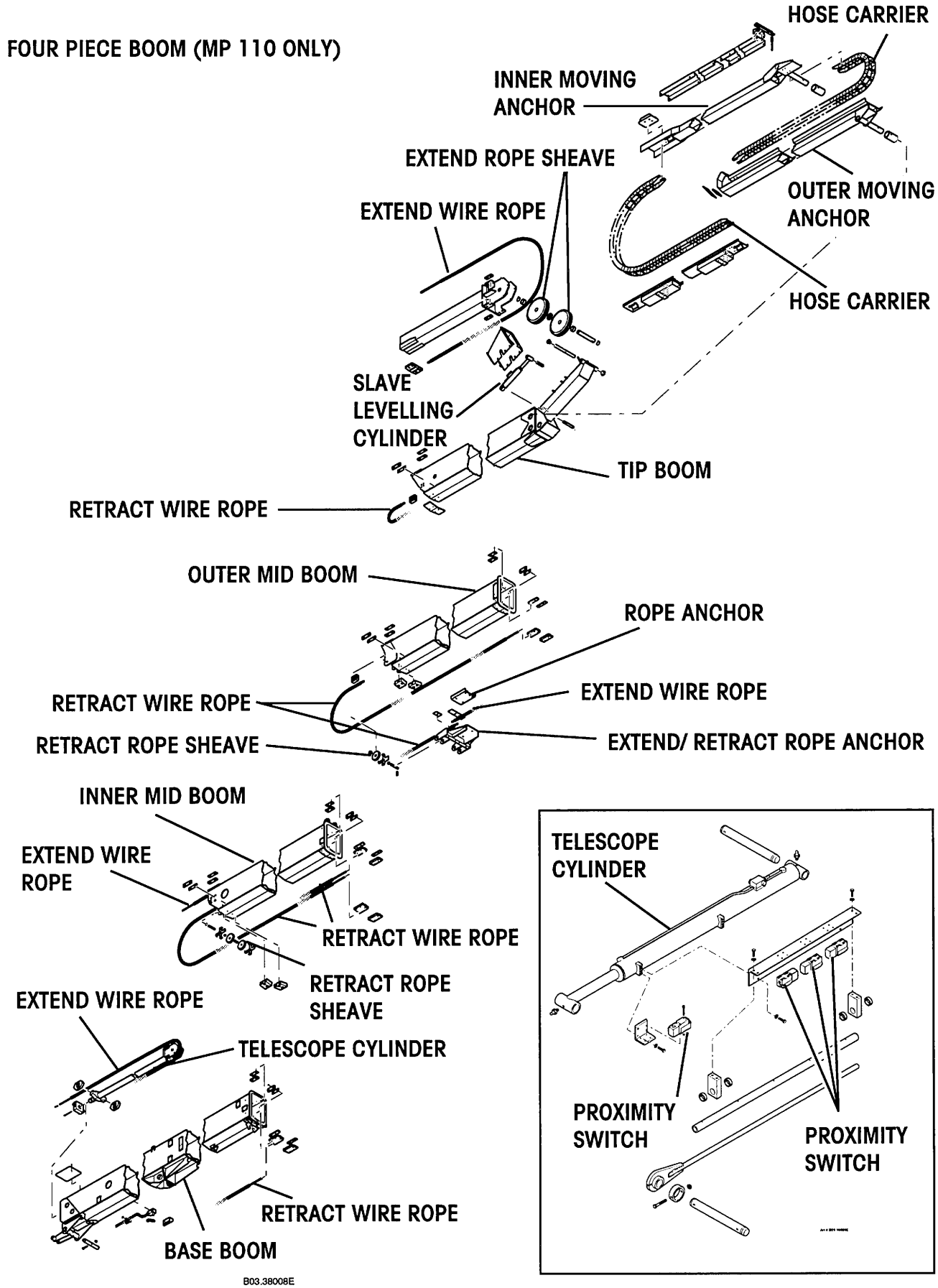


BOOM COMPONENT LOCATOR

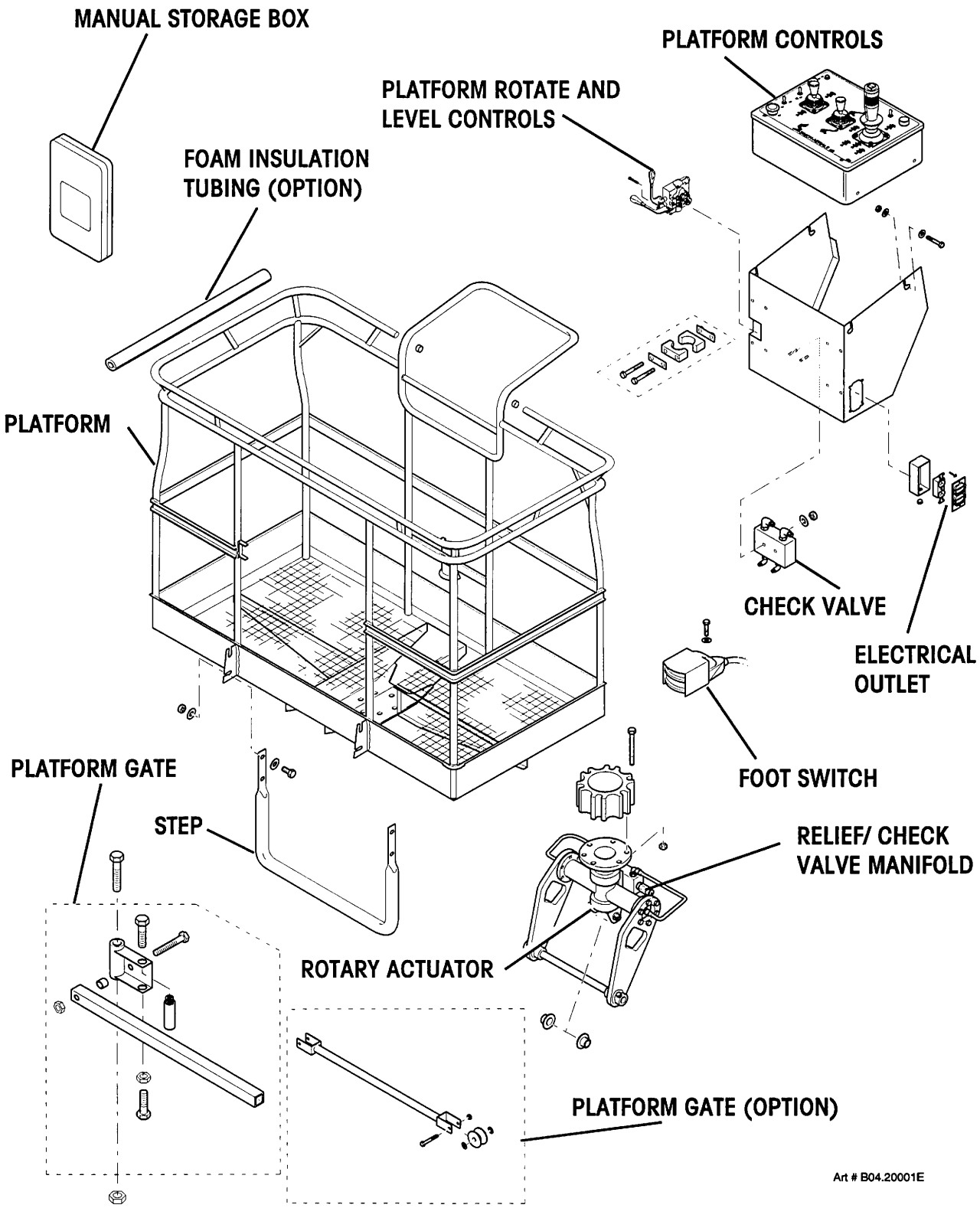
THREE PIECE BOOM



BOOM COMPONENT LOCATOR



PLATFORM COMPONENT LOCATOR

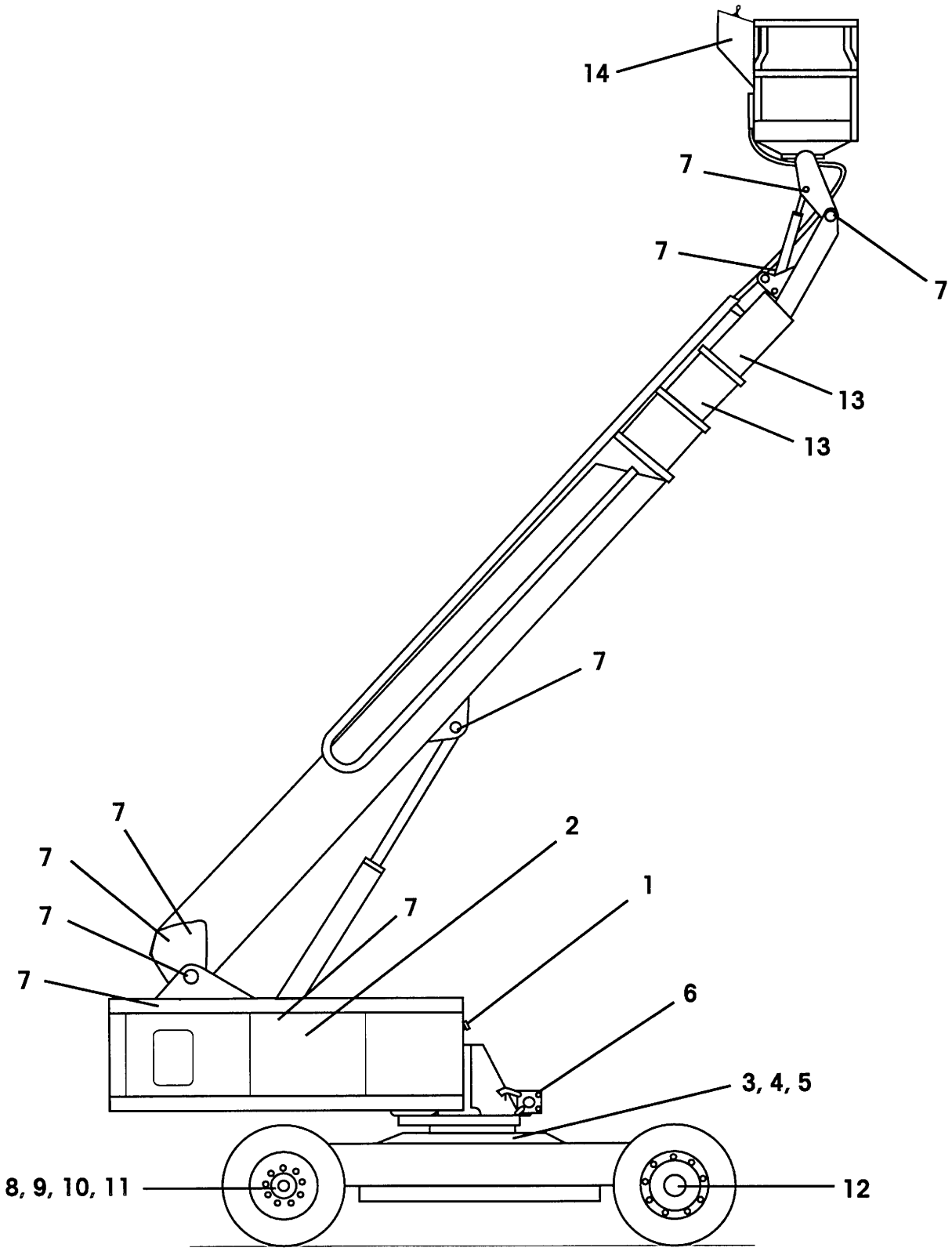


LUBRICATION CHART

NO.	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
1.	Hydraulic reservoir	Mobil DTE-13M to "Full" mark with all cylinders retracted.	Check daily, Analyze every 6 months or 500 hrs.*†, Change yearly or every 1,000 hrs.*†
2.	High pressure filter	Filter elements.	Chg. every 6 months or 500 hrs.*†
3.	Swing bearing (open style)	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hrs.*†
4.	Swing bearing gear teeth (open style)	Dry moly lube spray.	Every six (6) months or 500 hours.*
5.	"Oil bath" style swing bearing (optional)	SAE 80 W 90	Check monthly or every 100 hrs.*† Change if contaminated.
6.	Swing drive gear box	Fill to plug. SAE 140 EP or N.L.G.I. #00 EP oil.	Check bimonthly or every 200 hrs.*†, Change every 2 years or 2,000 hrs.*
7.	Boom pivot pins and Cylinder pins	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hrs.*†
8.	Wheel bearings	Lithium N.L.G.I. #2 EP. Clean and repack.	Change yearly or every 1,000 hrs.*
9.	Steering spindles	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hrs.*†
10.	Steering linkage	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hrs.*†
11.	Steering tie rod ends	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hrs.*†
12.	Drive wheel power hubs	SAE 80 W 90, SAE 90 or SAE 85-140, half full.	After first 50 hrs., then yearly or every 1,000 hrs.*†
13	Boom wear pads	Silicone spray.	Monthly or every 100 hrs.*†
14	Platform level and rotate handle pivot pins	WD 40 Spray or equivalent penetrating oil.	Monthly or every 100 hrs.*†

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

LUBRICATION DIAGRAM



Art # A00.00130E

SECTION 1: TRANSPORTATION AND EMERGENCY PROCEDURES

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TRANSPORTING THE MACHINE

Platform should be in the stowed position when the machine is being transported. Do not operate the machine while it is in transit.

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 machine to a tow vehicle with the tow bar provided.

⚠WARNING

ALWAYS CHOCK THE WHEELS BEFORE YOU RELEASE THE TORQUE HUBS TO PREVENT UNEXPECTED MACHINE MOVEMENT.

- 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 selector valve (wander valve), located near the ground electrical box, to allow steering wheels to track behind tow vehicle.

NOTE: The tow vehicle must have sufficient braking capability in order to safely stop itself as well as the machine. Tow speed shall not exceed maximum drive speed for the machine (see Machine Specification).

TRUCK OR TRAILER TRANSPORT

⚠WARNING

ALWAYS ATTACH THE MACHINE 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 drive the machine onto the truck or trailer. (Engaging 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 object, including the bed of the truck or trailer. (Only the boom tip should rest on truck or trailer bed.)

TRUCK OR TRAILER TRANSPORT (CONTINUED)

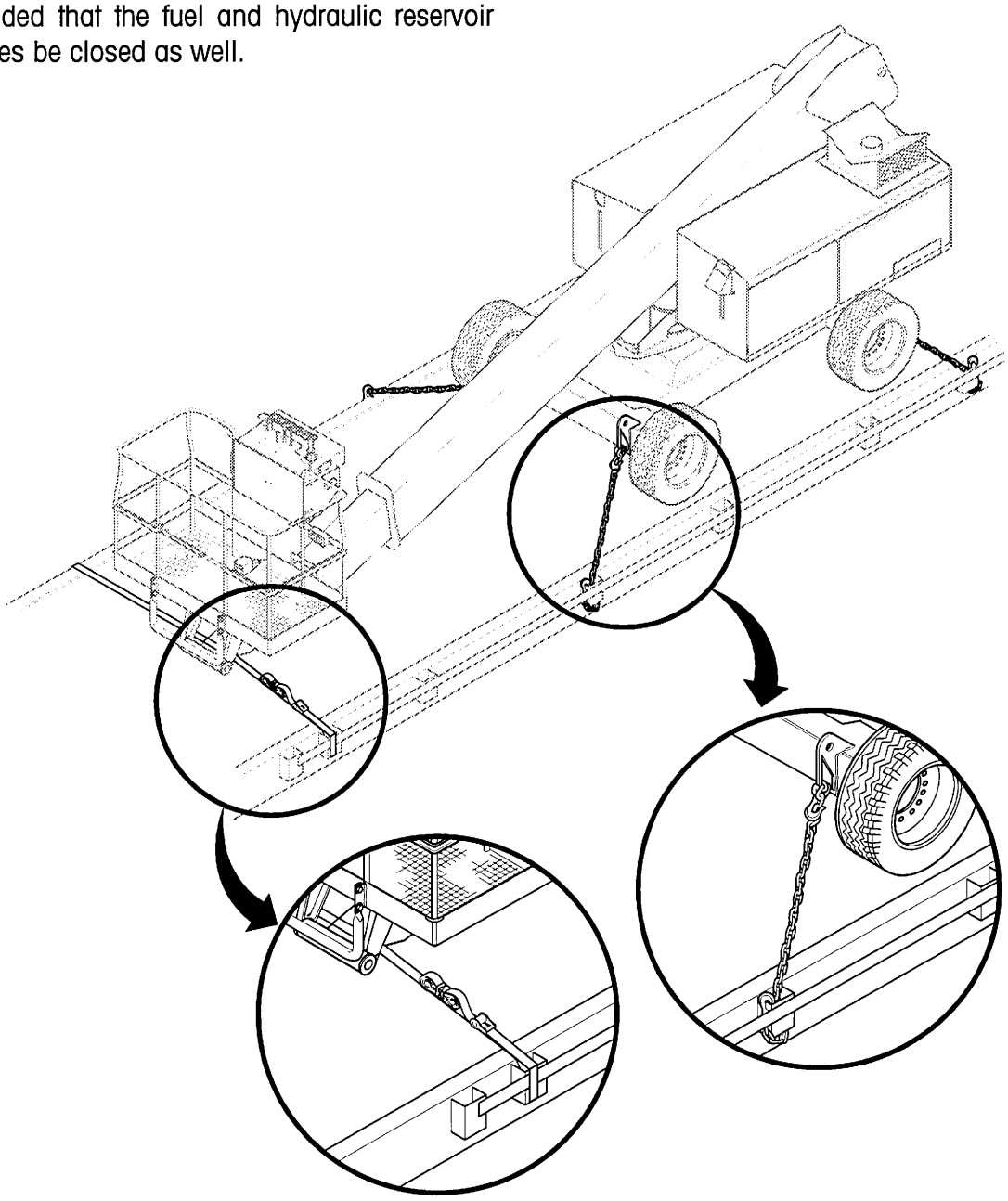
⚠ CAUTION

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 reservoir 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 in the diagram.

   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.



Recommended Tie Down Locations.

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.

1. Inspect the outside of the machine 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 (see Machine Specifications).

2. Remove the pin that locks the superstructure to the undercarriage near the swing bearing. Stow the lock pin in the location provided near by.

3. Unlock and open both side compartment doors. Inspect all fuel, electrical and hydraulic connections for damage and security.

4. Connect battery cables to batteries if they were removed for transporting. Check electrolyte level.

5. Open the fuel reservoir valve.

6. Check engine oil level, and add as required per engine manufacturer's recommendations (see engine manual).

7. Check fluid level at the sight gauge on the hydraulic reservoir and add fluid as required (see Lubrication Chart). Check that shutoff valves on the hydraulic reservoir are open.

8. Close side compartment doors.

⚠WARNING

ALWAYS ATTACH THE MACHINE TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER. WE DO NOT RECOMMEND UNASSISTED LOADING OR UNLOADING OF ANY MOBILE PLATFORM.

9. Attach the machine to a winch for unloading.

⚠WARNING

READ AND UNDERSTAND ALL SAFETY, CONTROL AND OPERATING INFORMATION FOUND ON THE MACHINE AND IN THE OPERATOR'S MANUAL BEFORE OPERATING THE MACHINE.

10. Start engine, using the ground controls.

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

    After a brief warmup period, select the "HIGH" engine speed. On the remote control pendant, press and hold the "PUMP" button and check that the hydraulic pressure is as stated in the Machine Specifications. Select the "LOW" engine speed and allow the engine to slow to idle speed. Turn off engine.

11. Remove all machine tie downs. Remove wheel chocks, if used. Switch the Ground/ Platform switch to "PLATFORM CONTROLS".

12. Enter the platform, and restart the engine using the platform controls. Select "HI" engine speed, and test all platform functions.

13. 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.

14. Carefully drive the machine off the truck or trailer.

    NOTE: The brakes are automatically released for driving, and will automatically apply when the machine stops.

15. Before placing the machine into service, all operators must read and understand the contents of the Operator's Manual.

    Upon initial unloading of the machine the Receipt Inspection Adjustment Report or the Predelivery Inspection Adjustment Report must be completed and returned to Simon Aerials Inc. in order to activate the Simon Limited Warranty.

    An Operator's Manual and a Receipt Inspection Adjustment Report are included with each machine leaving the factory.

EMERGENCY SYSTEM AND PROCEDURES

⚠ DANGER

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

EMERGENCY PUMP

The Mobile Platform has an emergency pump which can be operated from the operator's platform or remote control pendant to safely return the platform to the ground position when the machine 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, boom lower or swing) as required to safely lower the platform to ground level.

To prevent the battery from completely discharging and the emergency pump 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 of main power before returning the machine to service.

UNPOWERED EMERGENCY MOVEMENT

- Every attempt should be made to restore engine/ pump power to the machine before using this procedure.

⚠ DANGER

THIS PROCEDURE REQUIRES RELEASING THE MACHINE TORQUE HUBS, WHICH RESULTS IN NO MEANS TO STOP THE MACHINE'S TRAVEL. SIMON RECOMMENDS USING THIS PROCEDURE ONLY IN CASES OF EMERGENCY AND ONLY A SHORT DISTANCE.

BE AWARE OF MACHINE RUNAWAY ON SLOPING SURFACES.

1. Secure the machine with chains or ropes.

   The machine is equipped with tie down lugs (front and rear of undercarriage) that can be used for towing the machine. The chains or ropes must be of sufficient capacity to move the machine.

⚠ WARNING

ALWAYS CHOCK THE WHEELS BEFORE YOU RELEASE THE TORQUE HUBS TO PREVENT UNEXPECTED MACHINE MOVEMENT.

2. Chock wheels.
3. Disengage torque hubs.

⚠ WARNING

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

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.

UNPOWERED EMERGENCY MOVEMENT (CONTINUED)

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.

4. Disengage steer cylinder

After unchocking the wheels, the machine will be ready to be moved.

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

⚠ CAUTION

Do not exceed maximum drive speed for the machine (see Machine Specification).

After engine/ pump power has been restored to the machine, engage the torque hubs and connect the steer cylinder. The machine is now ready for normal operation.

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 switch.
2. Push the red "Emergency Stop" button.
3. Evaluate the nature of the failure. Return to the ground, using the emergency pump and lowering procedure (see "Emergency Pump" earlier in this section).
4. If unable to return to the ground using the platform controls and the emergency pump, contact an experienced operator to lower the machine using the emergency pump from the remote control pendant (see "Emergency Pump" earlier in this section).

⚠ 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.**

EMERGENCY LOWERING (CONTINUED)

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

⚠ DANGER

DO NOT TOUCH MACHINE !!!
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 Pump" earlier in this section).
5. Attend to the operator and render first aid if necessary.

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

⚠ DANGER

DO NOT TOUCH MACHINE !!!!

CORRECTIVE ACTION

1. Contact authorized personnel to disconnect power supply touching the machine.
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 (see "Emergency Pump" earlier in this section).**
5. Attend to the operator and render first aid.

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.

IMPORTANT: 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-13M 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-13M has proven to be suitable for use in all climates. For continued operation in temperatures below 32° F (0° C), the use of MOBIL DTE-11M may prove satisfactory.

For operation in tropical climates, the use of MOBIL DTE-15M is allowable.

FLUID CONTAMINATION CHECK

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

- Anytime 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 element is plugged.
- Anytime the hydraulic filter element shows 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.

FLUID CONTAMINATION CHECK (CONTINUED)

- Type of hydraulic fluid. (See Lubrication Chart)
- Model and serial number of machine 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 reservoir into a clean, empty container. This can be done with an oil filter cart so the fluid may be reused if analysis indicates fluid is good.

When the hydraulic reservoir 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 reservoir, flush out the reservoir. 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 the filter cart) back into the reservoir. If fluid is not usable, fill hydraulic reservoir 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 from the ground/platform switch. Press and hold the "CHOKE/GLOW PLUG" button before starting the engine. Push "ENGINE START" button 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 analysis indicates the fluid was good.

Three cycles of <u>all</u> hydraulic cylinder functions should remove old hydraulic fluid.

When the above procedures have been completed, re-connect system return hose to tank. Fill hydraulic reservoir 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. Machine 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.

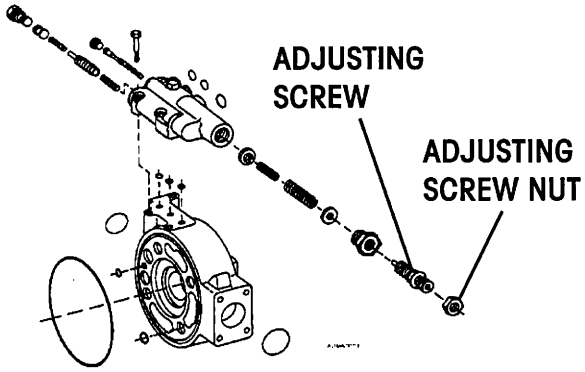
ELECTRO-PROPORTIONAL CIRCUIT

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 controller 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 reservoir.

HYDRAULIC PUMP

An engine drives the variable displacement pressure compensated radial piston pump. The pump provides hydraulic fluid flow to the functions.

As the shaft turns, the pistons move in and out radially. On the inward piston stroke fluids is drawn into the piston from the reservoir through the inlet valve and into the system. Output flow is varied by reducing or increasing the piston stroke.



Hydraulic Pump Control Valve Assembly.

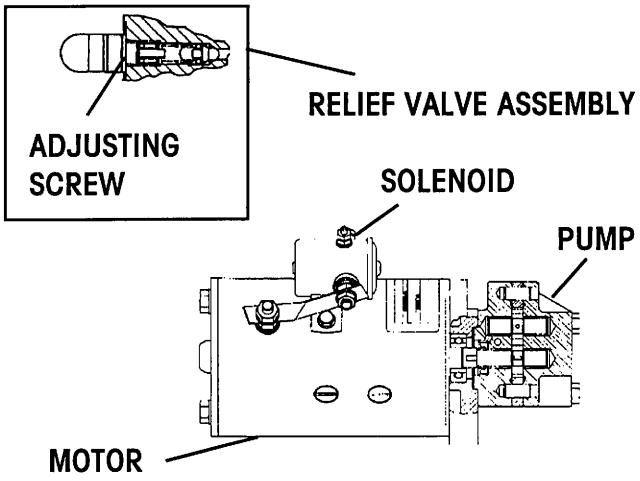
HYDRAULIC PUMP ADJUSTMENT

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 Specifications).

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 or for long durations.

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

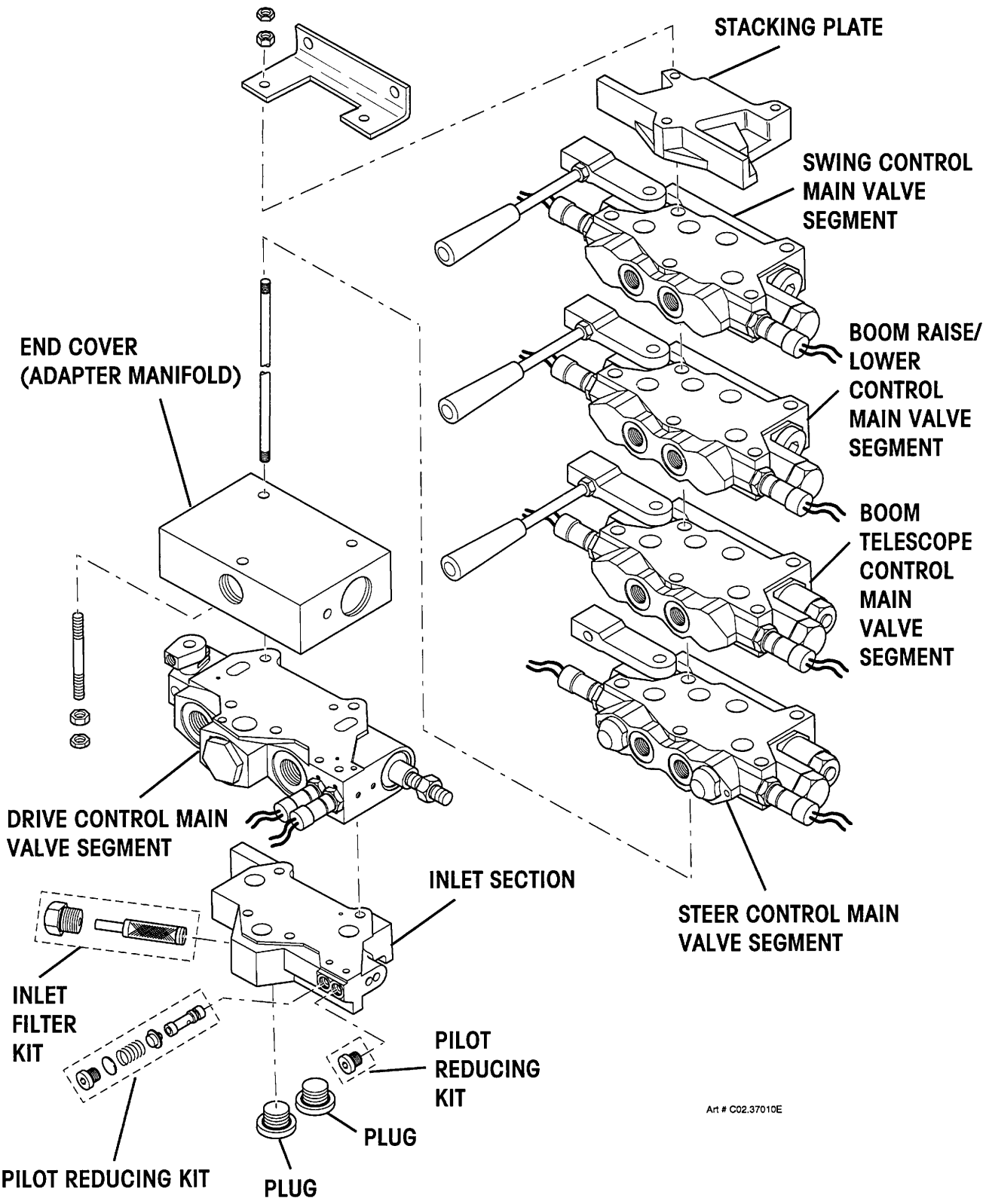


Emergency Pump.

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. See Machine Specifications for system pressure.



Ground Valve Bank Assembly.

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 bottom valve segment is the drive function. The four top valve segments are for the swing, telescope, boom lift 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.

OPERATION OF VALVE ASSEMBLY

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

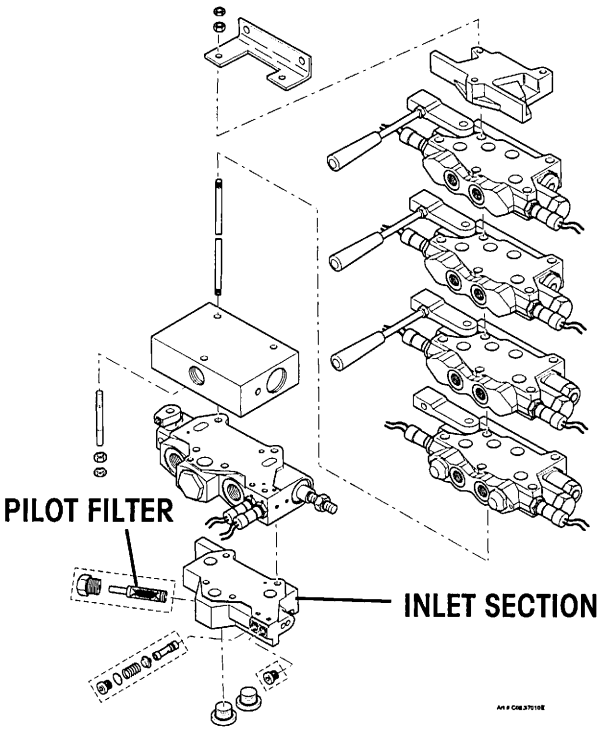
Hydraulic Circuit Line Check

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.

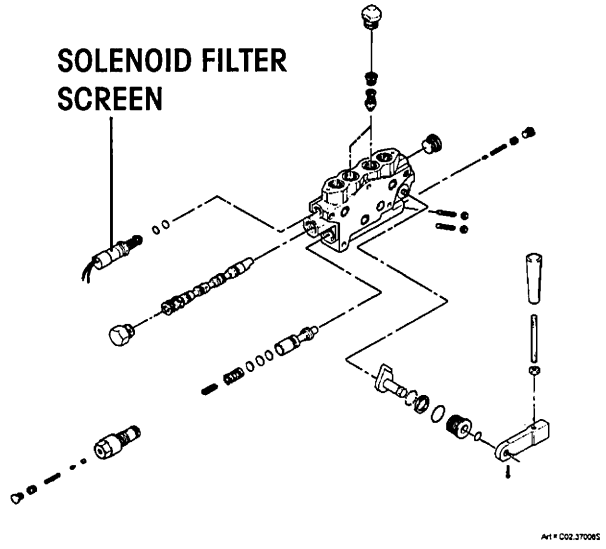


Ground Valve Bank with Pilot Filter Location.

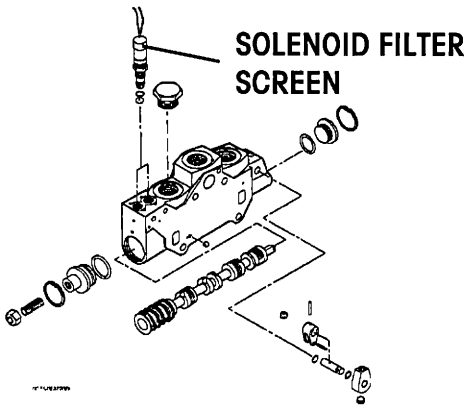
Valve Assembly

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

The valve segments each have a solenoid filter screen that should be replaced when clogged.



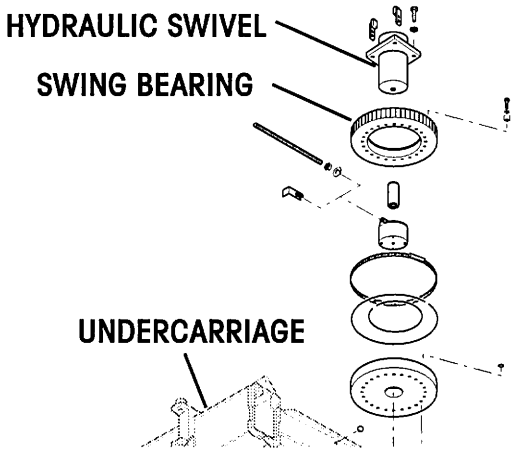
Steer, Telescope, Boom Lift and Swing Valve Segment.



Drive Valve Segment.

HYDRAULIC SWIVEL

The hydraulic swivel allows passage of fluid flow under pressure from both the steer and drive valve segments. Return flow is also passed between the upper and lower assemblies of the machine. The swivel allows for 360° of continuous rotation in either direction.



Hydraulic Swivel Location.

UNDERCARRIAGE VALVES

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

DRIVE RELIEF VALVE

The drive relief valve (used on the two wheel drive machines only) 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/ 211 Kg/ cm^2). The drive relief valve is factory set at 3,000 PSI (207 Bar/ 211 Kg/ cm^2) and requires no adjustments.

DRIVE VALVE ASSEMBLY

Solenoid Valve

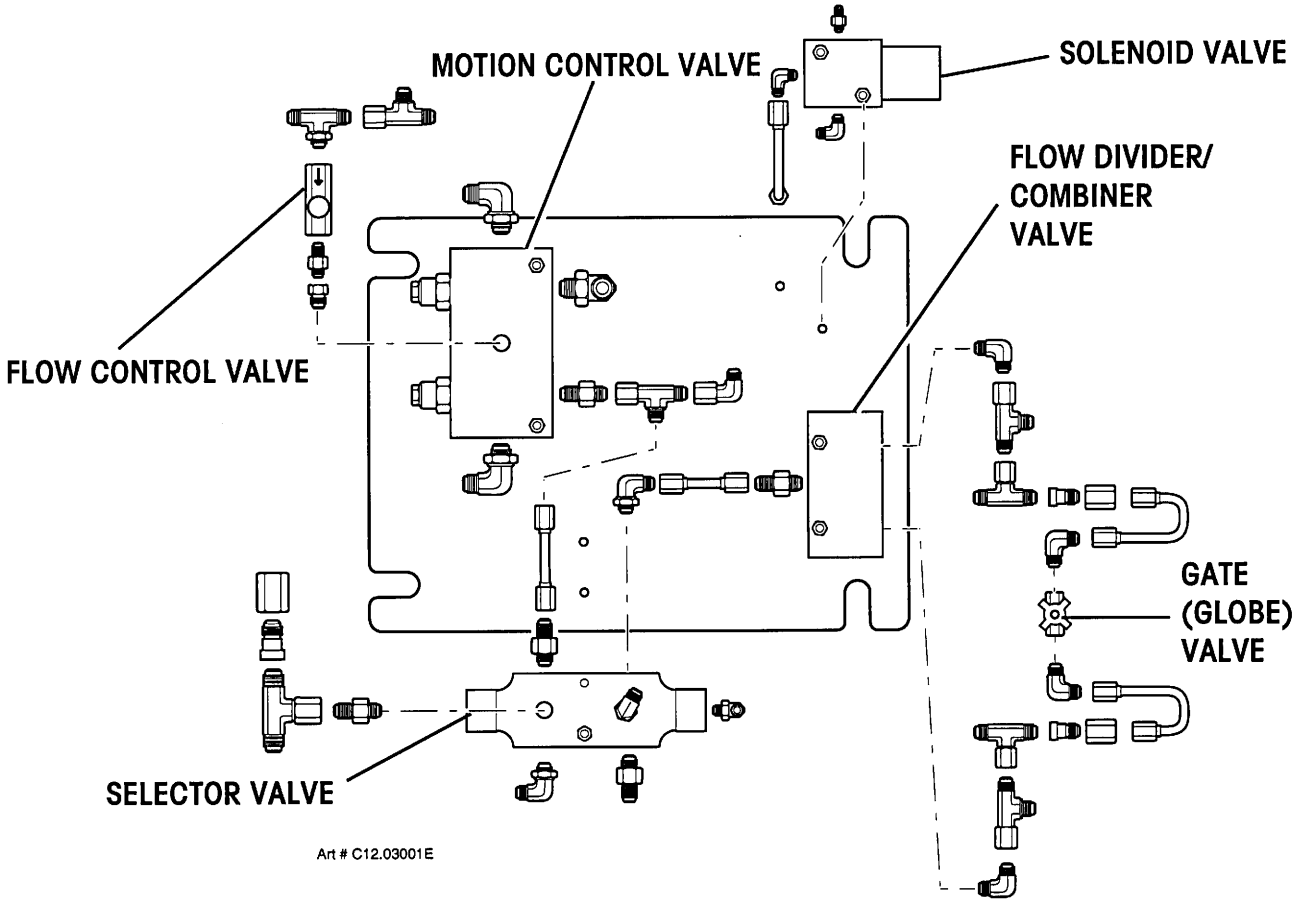
The solenoid valve signals the selector valves to provide parallel or series flow to the drive motors. The valve is factory set and requires no adjustment.

Selector Valve

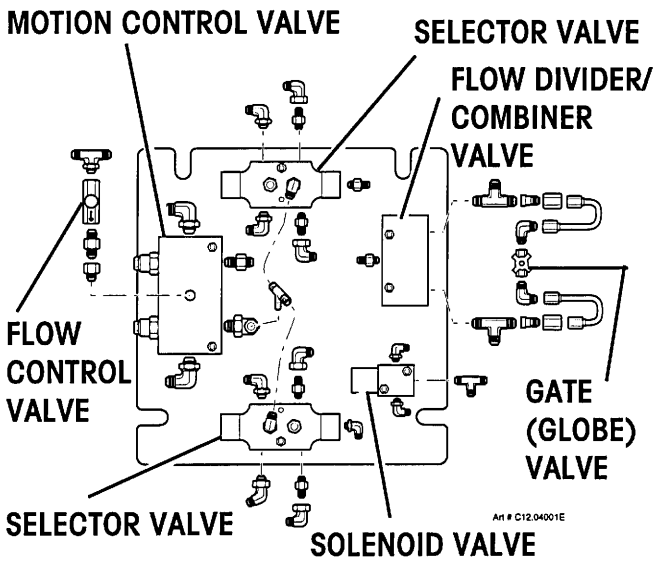
The selector valve is series parallel valve located on the undercarriage. This valve is pilot operated and directs the fluid flow to the drive motors in either parallel flow or series flow. The machine normally starts in parallel flow or low speed. For four (4) wheel drive there are two selector valves.

Flow Divider/ Combiner Valve

The flow divider/ combiner valve equally divides or combines hydraulic flow from the drive valve depending on direction of travel, ensuring that the drive motors will have equal torque and speed.



Drive Valve Assembly for Two (2) Wheel Drive.



Drive Valve Assembly for Four (4) Wheel Drive.

Gate Valve

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

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 on a slope (runaway).

Flow Control Valve

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.

SELECTOR VALVE ASSEMBLY

The selector valve assembly consists of three valves: one double parallel selector valve and two pilot operated crossover check valves. This valve assemby determines whether fluid flows to the steer cylinder or the axle extend cylinders.

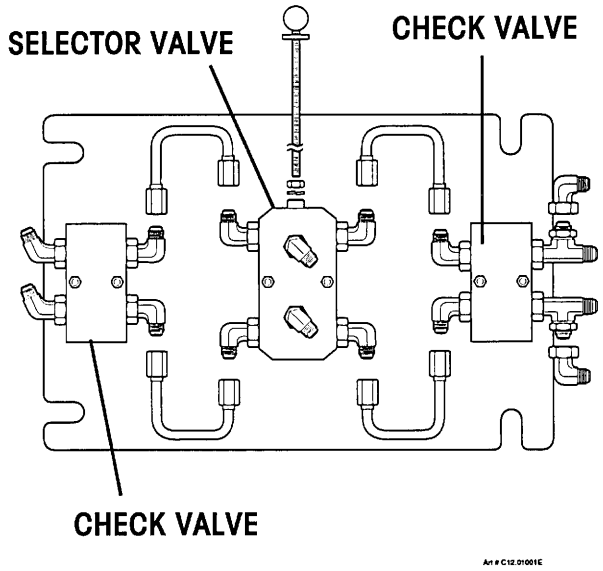
Selector Valve

A manually operated 6-way, 2-position valve. Located in the hydraulic fluid line between the hydraulic swivel and the steer cylinder. Hydraulic fluid from the steer valve segment of the ground control bank enters the selector valve and is directed to go to either steer cylinder or the axle extend cylinders.

Check Valve

One pilot operated crossover check valve prevents axle cylinder drift by preventing fluid flow to return from the axle cylinder. This allows the axle cylinder to remain extended until fluid flow is applied to retract the cylinder.

The other pilot operated crossover check valve is in the steer system and prevents return fluid flow from the steer cylinder. Thus requiring the steer cylinder to be returned to the neutral position by applying fluid flow to the steer cylinder in the opposite direction.



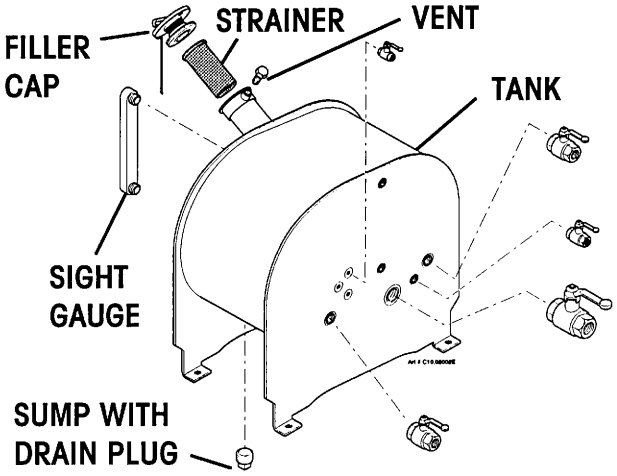
Selector Valve Assembly.

HYDRAULIC FLUID RESERVOIR

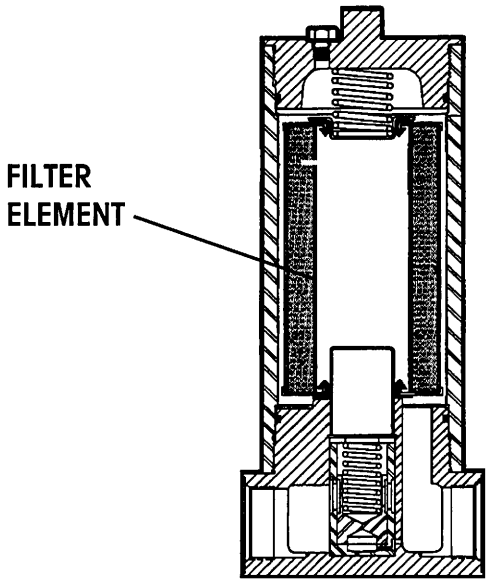
The hydraulic fluid reservoir consists of the tank, a sight gauge, a filler cap with filter, a strainer, a vent, a sump with drain plug, one valve for suction line, five valves for return lines, a valve for the emergency pump suction line and check valve for pump case drain.

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.



Hydraulic Fluid Reservoir.



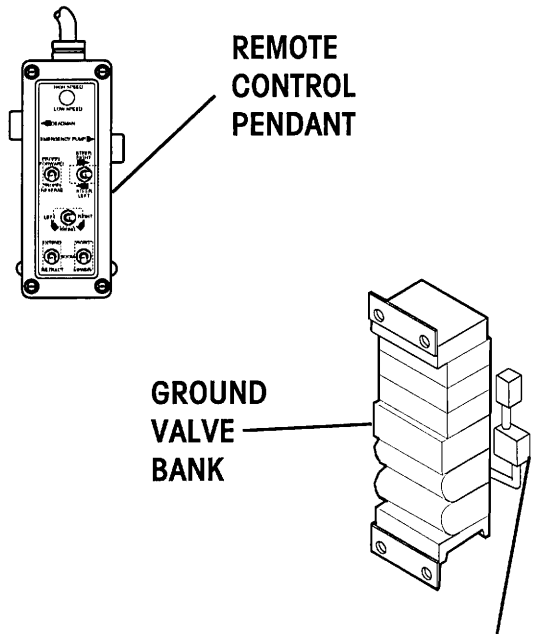
High Pressure Filter.

HIGH PRESSURE FILTER

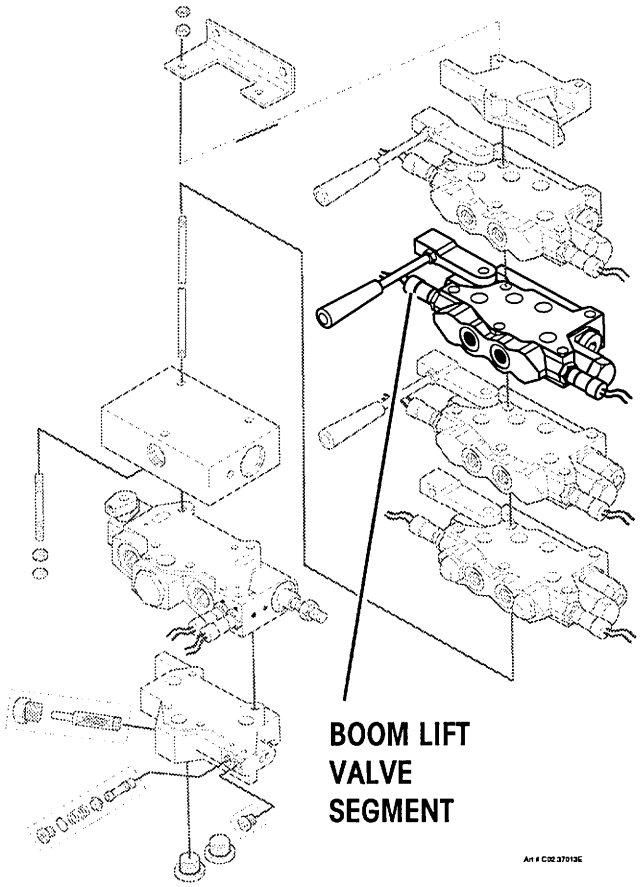
The hydraulic high pressure filter is a non-bypassing type. This filter allows maximum fluid flow as long as the filter element is free of contaminants. When the filter is clogged, it shuts down the hydraulic flow but will not crush the filter element due to a differential pressure limiting valve. The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

BOOM LIFT SYSTEM

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



Boom Lift System Components.



Ground Valve Bank Assembly.

BOOM LIFT VALVE SEGMENT

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

FLOW CONTROL VALVE

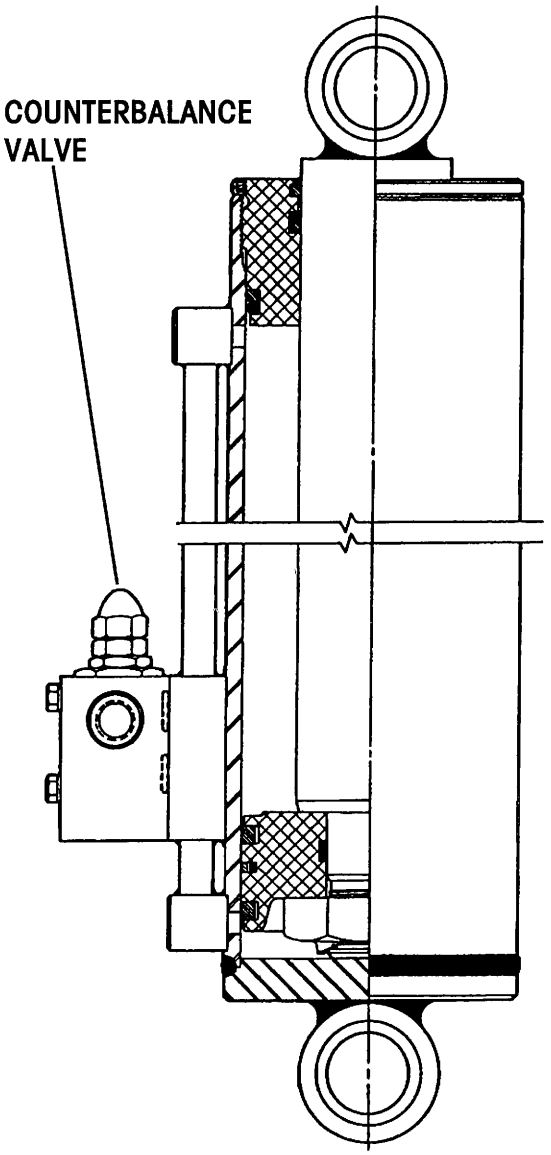
The flow control valve, located at the "boom up" outlet on the boom lift valve segment, controls boom down speed. The flow control valve allows full hydraulic fluid flow to "boom up" function. For the "boom down" function, the flow control valve meters the hydraulic fluid flow, thus allowing a smooth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

Flow Control Valve Adjustment

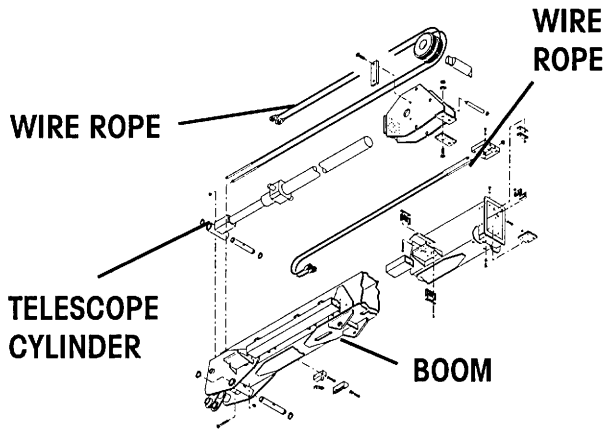
If boom bounces while descending, adjust the valve clockwise (turn needle valve) until the boom descends smoothly.

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 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.



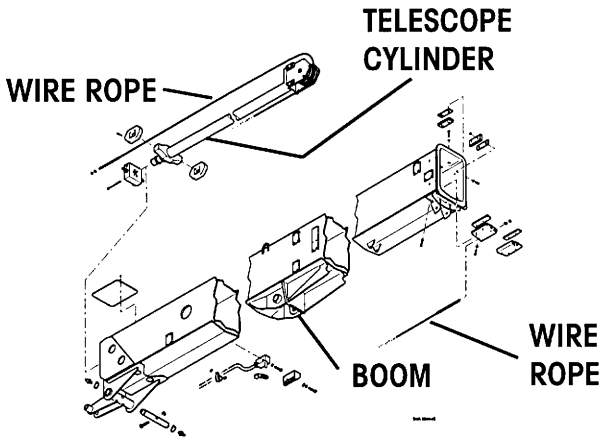
Lift Cylinder.



Boom Telescope System Components for Three Piece Boom.

BOOM TELESCOPE SYSTEM

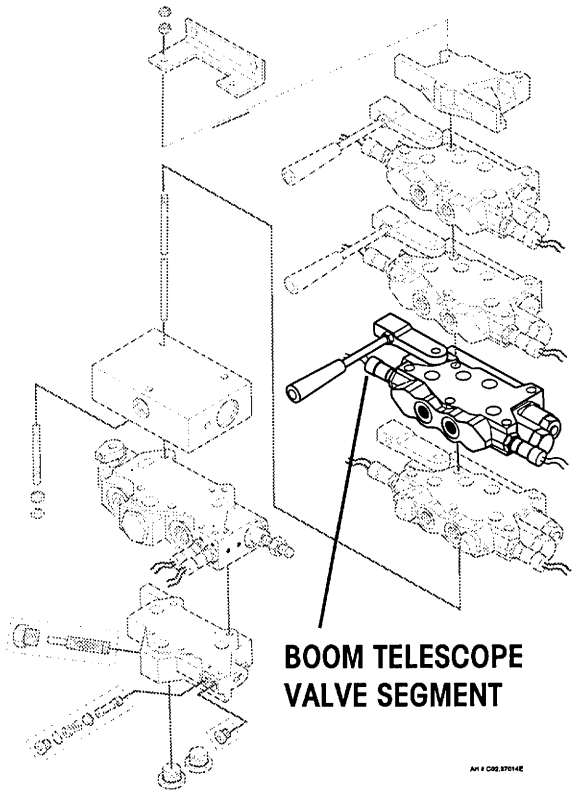
The boom telescope system consists of a hydraulic valve segment on the ground valve bank, a pressure relief valve, a telescope cylinder with two counterbalance (holding) valves, wire ropes and sheave for extend/ retract, an extend toggle switch on the pendant and a control lever on the platform console.



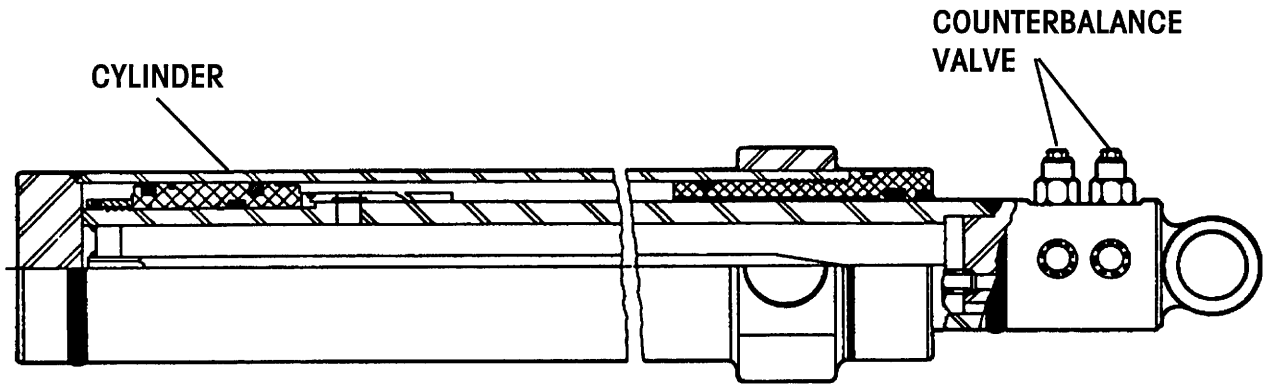
Boom Telescope System Components for Four Piece Boom.

BOOM TELESCOPE VALVE SEGMENT

When the boom telescope control lever on the platform control console or the boom telescope control toggle switch on the remote control pendant is activated, an electrical signal is transmitted to the valve cartridge in the boom telescope 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.



Ground Valve Bank Assembly.



Telescope Cylinder for Three Piece Boom.

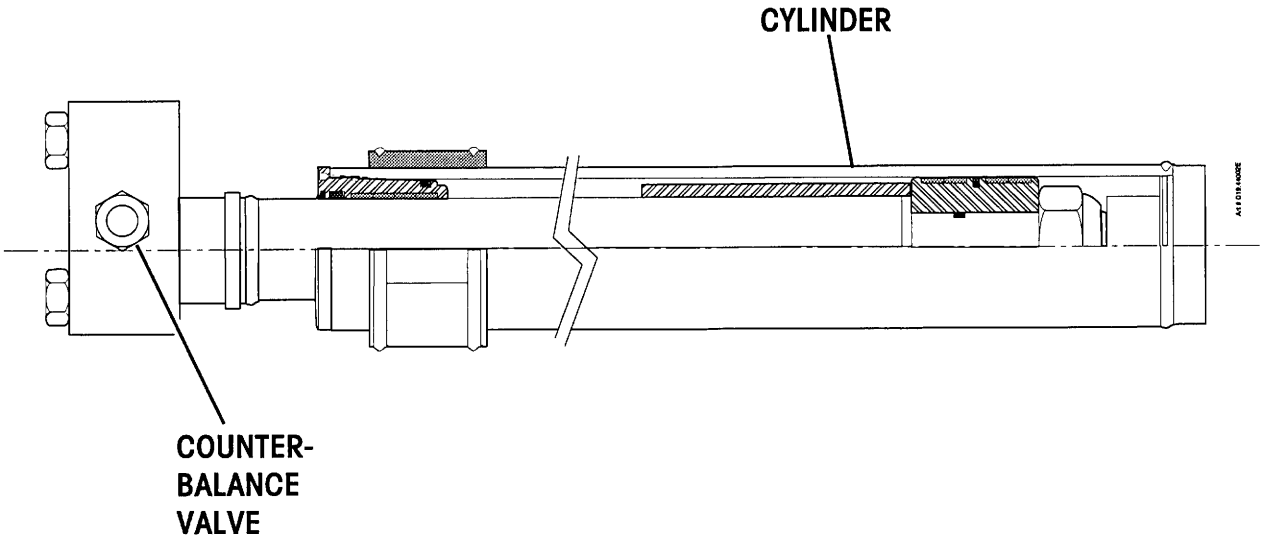
TELESCOPE CYLINDER

The telescope 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 wire rope (cable) operated (see Mechanical Components Section).

PRESSURE RELIEF VALVE

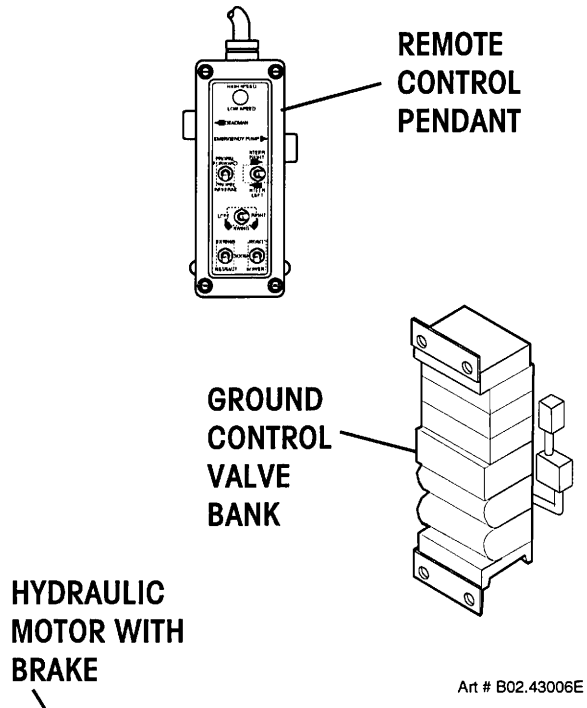
The pressure relief valve limits the pressure on the base end of the cylinder to prevent the cylinder rod from buckling. The pressure relief valve is factory set and needs no adjustment.



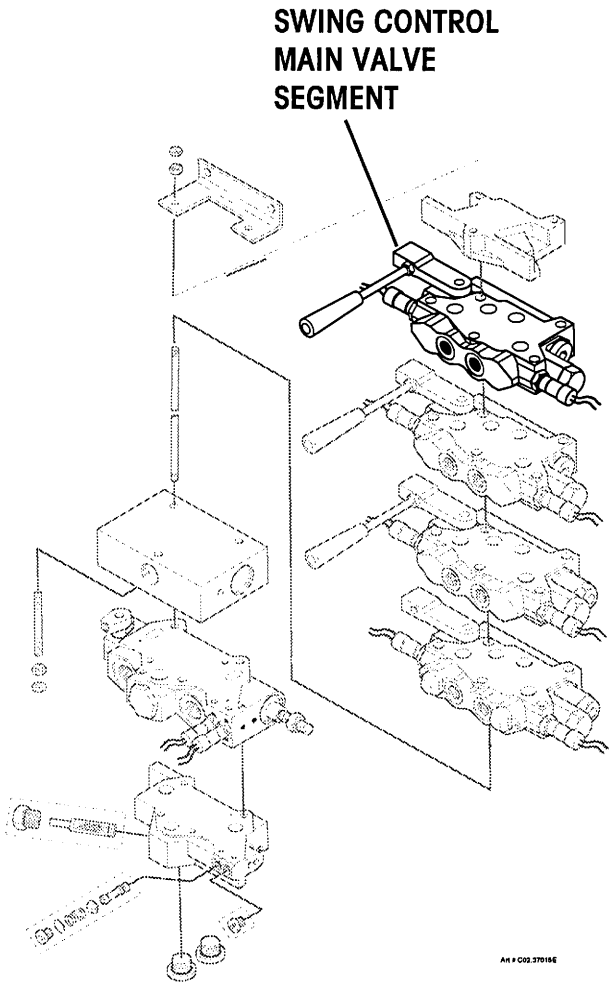
Telescope Cylinder for Four Piece Boom.

SUPERSTRUCTURE SWING SYSTEM

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



Superstructure Swing System Components.



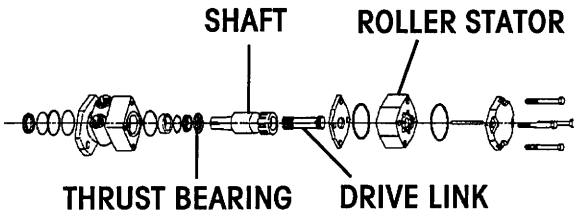
Ground Valve Bank.

SWING VALVE SEGMENT

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

SWING DRIVE/ REDUCER ASSEMBLY

The swing drive/ reducer assembly allows the rotating motor power to be reduced to a fractional speed thus increasing motor torque. This then allows the superstructure to rotate at a controlled speed when fluid power is applied to the swing drive.



Swing Drive Motor.

Swing Drive/ Reducer Assembly Adjustment

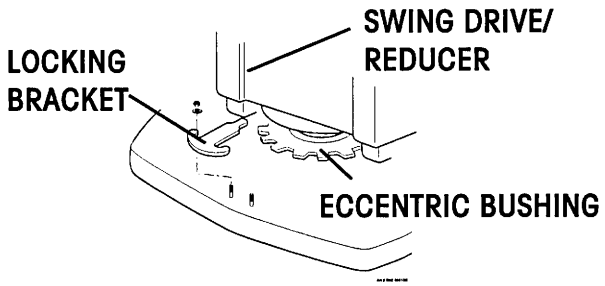
There should be zero backlash between the swing gear and pinion shaft. Do not pre-load the pinion shaft to the swing bearing.

> **NOTE:** There is no backlash or pinion pre-load adjustments.

To adjust the swing drive/ reducer assembly, the eccentric bushing located under the reducer must be turned. Remove the locking bracket that holds the eccentric bushing in place. The locking bracket is located on the superstructure in front of the swing reducer.

Next loosen the capsrews holding the swing drive/ reducer to the superstructure and turn the eccentric bushing with a punch.

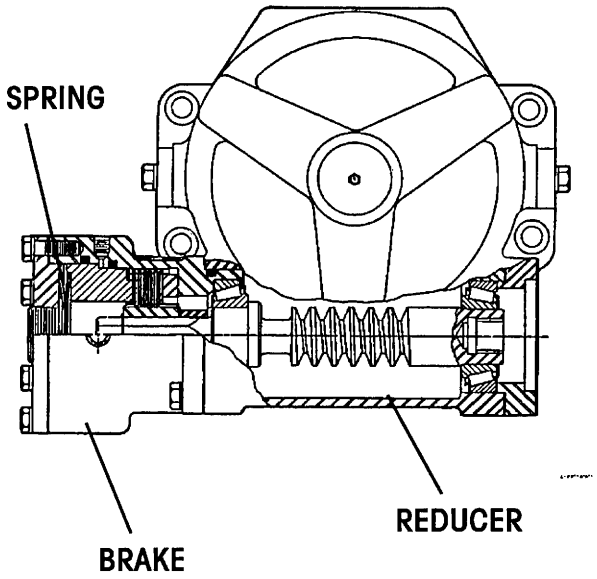
Replace the locking bracket and torque the capsrews (see Torque Specification).



Swing Drive/ Reducer Assembly Adjustment.

Integral Brake Assembly

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



Swing Drive Reducer with Integral Brake.

SWING SYSTEM MAINTENANCE

Check the oil in the "oil bath" swing bearing enclosure monthly for metal shavings or other contamination.

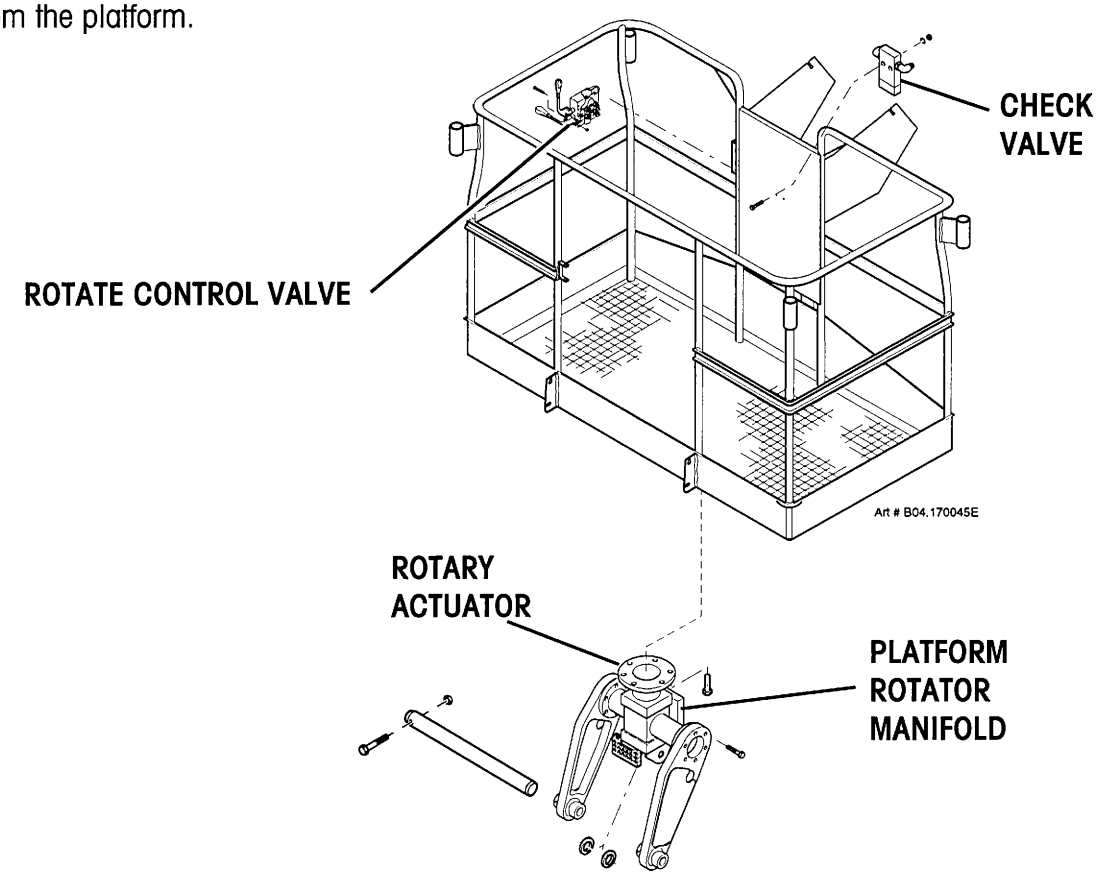
Change the oil if contaminated (see Lubrication Chart).

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

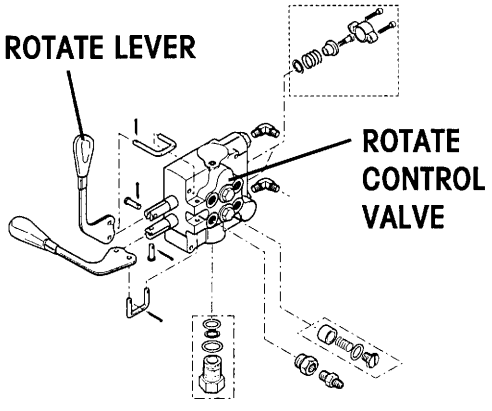
The platform rotate system consists of a rotate control valve, a double pilot operated check valve, a rotary actuator and a platform rotator manifold. The platform rotate system can only be operated from the platform.



Platform Rotate System Components.

ROTATE CONTROL VALVE

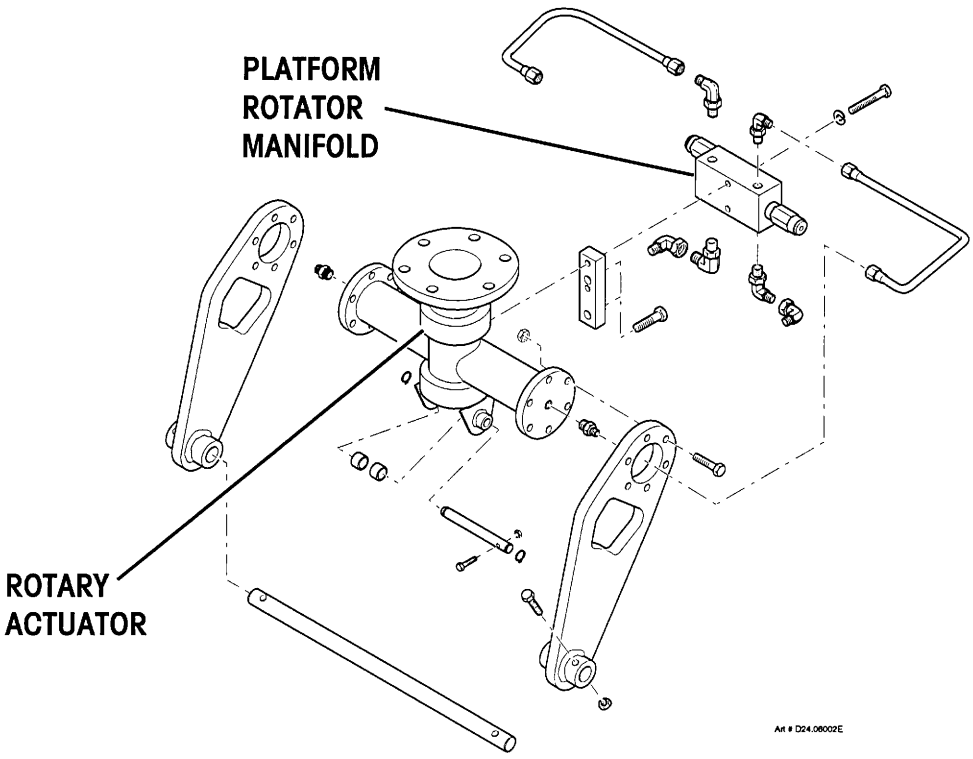
A manually operated 4-way, 3-position valve. This control valve directs fluid flow to the rotate functions.



Rotate Control Valve.

CHECK VALVE

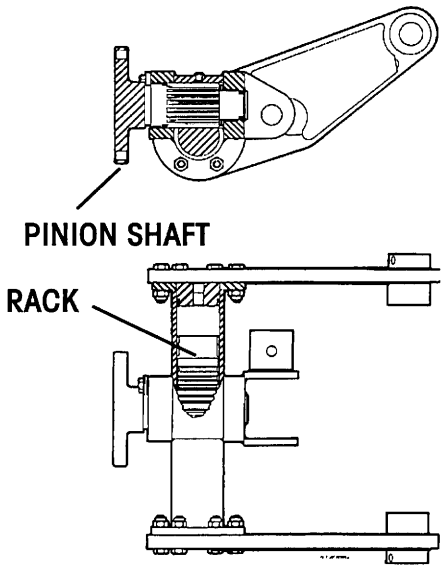
The double pilot operated check valve acts as a locking component for the rotary actuator and prevents the platform from rotating except when the rotate circuit is activated. When the platform rotate circuit is activated, partial flow is piloted over to the return side to open the check valve and thus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



Rotary Actuator and Platform Rotator Manifold.

ROTARY ACTUATOR

The rotary actuator for the top mounted platform 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.

The rotary actuator for the front end mounted platform is a helical type. Hydraulic fluid enters the actuator from one of two ports depending on direction of rotation. Fluid under pressure will bear on the piston and force the piston sleeve up or down depending on rotation direction. The helical gear teeth engage with the shaft and causes rotation of the platform.

Rotary Actuator Maintenance

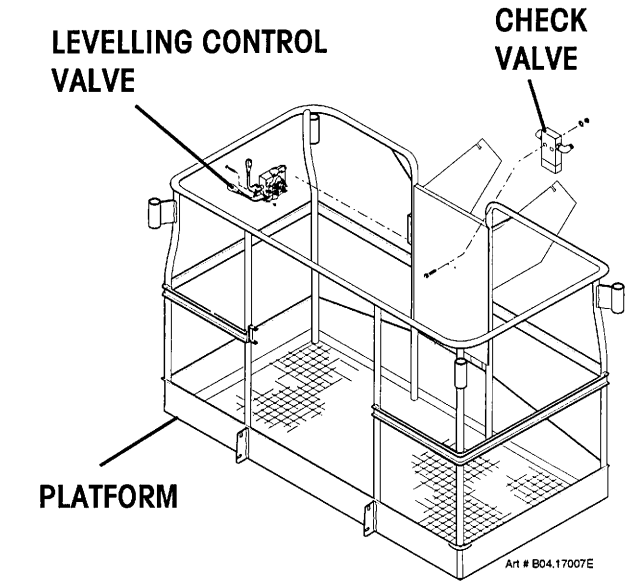
Check the end cap torque every 800 hours or once a year.

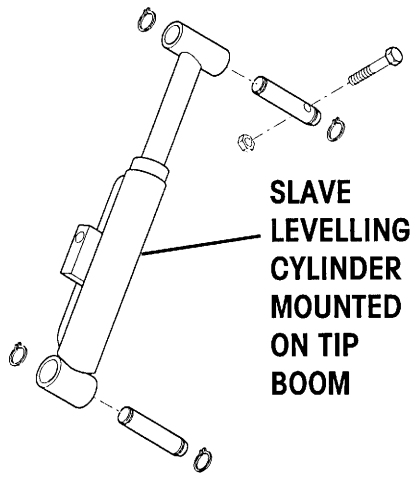
PLATFORM ROTATOR MANIFOLD

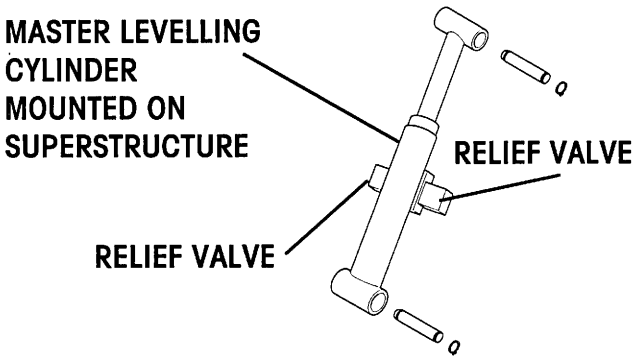
The platform rotator manifold is mounted as an integral part of the rotary actuator. The platform rotator manifold acts as a pressure relief valve to prevent damage to the rotary actuator.

PLATFORM LEVELLING SYSTEM

The platform levelling system consists of a levelling control valve, slave levelling cylinder with a counterbalance (holding) valve, master levelling cylinder, double pilot operated check valve and two relief valves.







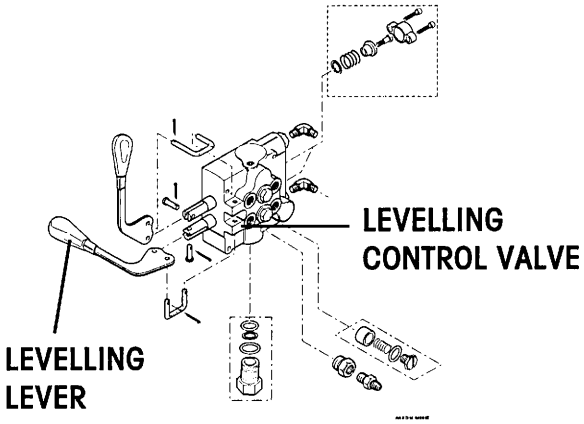
Platform Levelling System Components.

The platform levelling 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 levelling circuit through the platform levelling control valve.

The platform levelling system is only controlled from the platform.

LEVELLING CONTROL VALVE

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



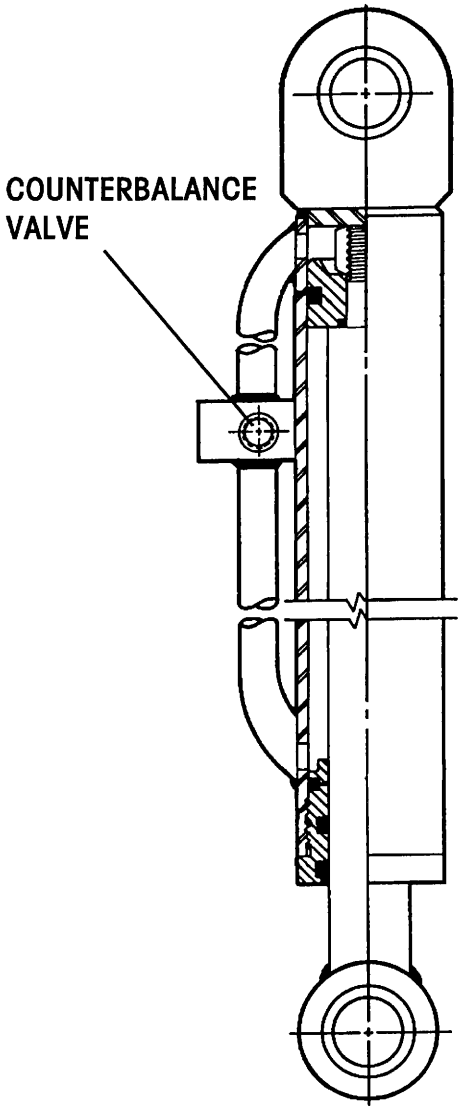
Levelling Control Valve.

CHECK VALVE

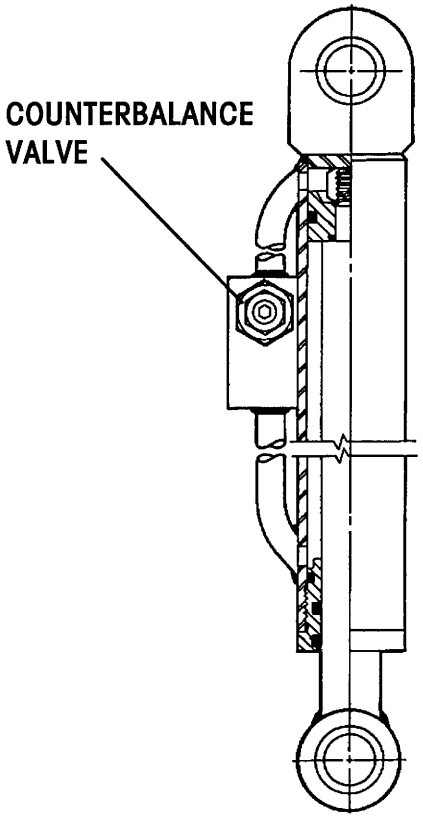
The double pilot operated check valve acts as a locking component for the levelling function and allows the automatic levelling function to control platform levelling. When the manual levelling circuit is activated, partial flow is piloted over to the return side to open the check valve and thus allow manual control of levelling.

MASTER LEVELLING CYLINDER

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



Master Levelling Cylinder.



Slave Levelling Cylinder.

SLAVE LEVELLING CYLINDER

The slave levelling cylinder is a double acting cylinder located between the tip boom and the rotary actuator. This cylinder controls the position of the platform relative to the tip boom (helps keep it almost parallel to the ground).

The cylinder contains two counterbalance (holding) valves, which prevent unintended movement of the cylinder should a hose or fitting develop a leak.

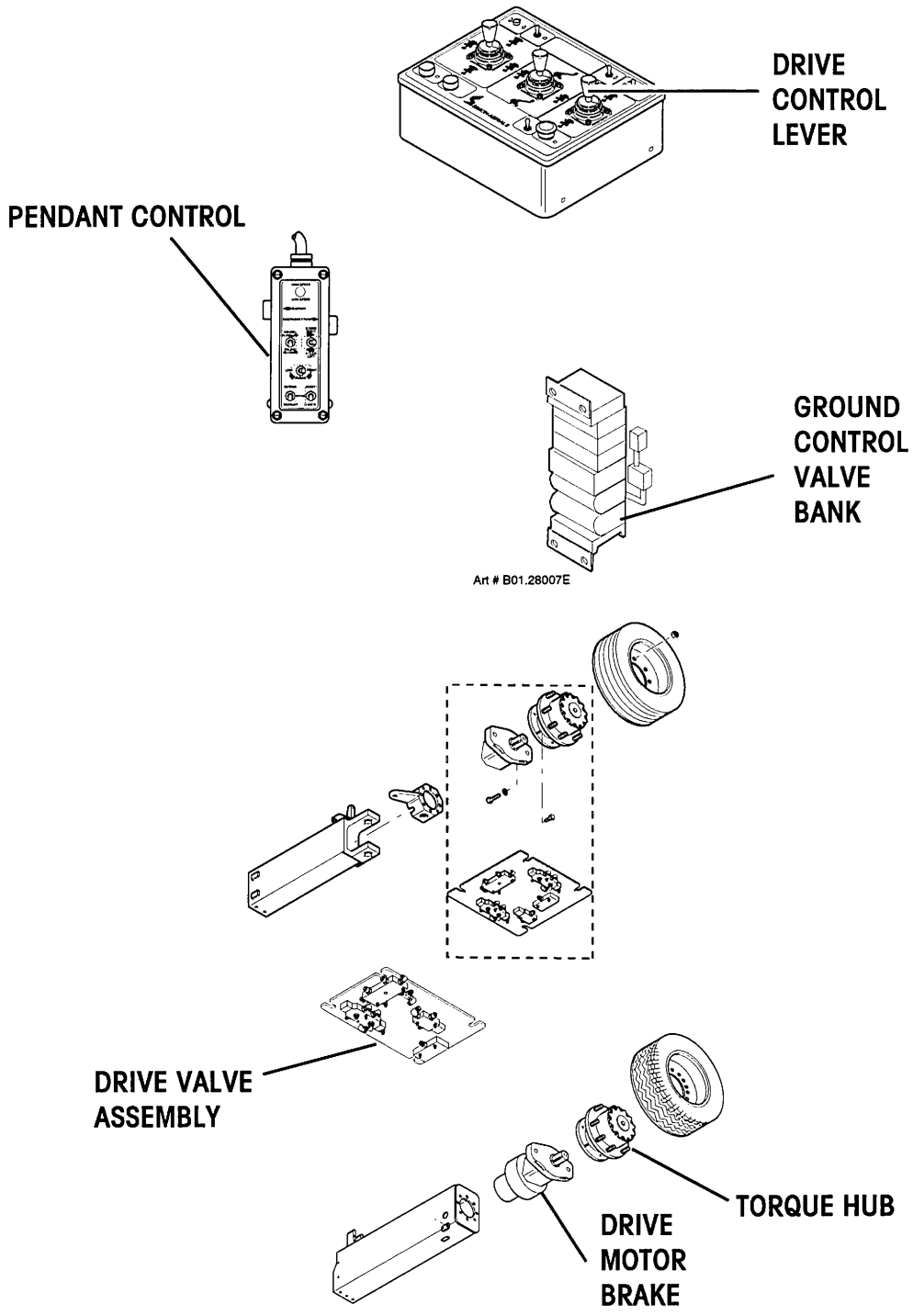
RELIEF VALVE

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

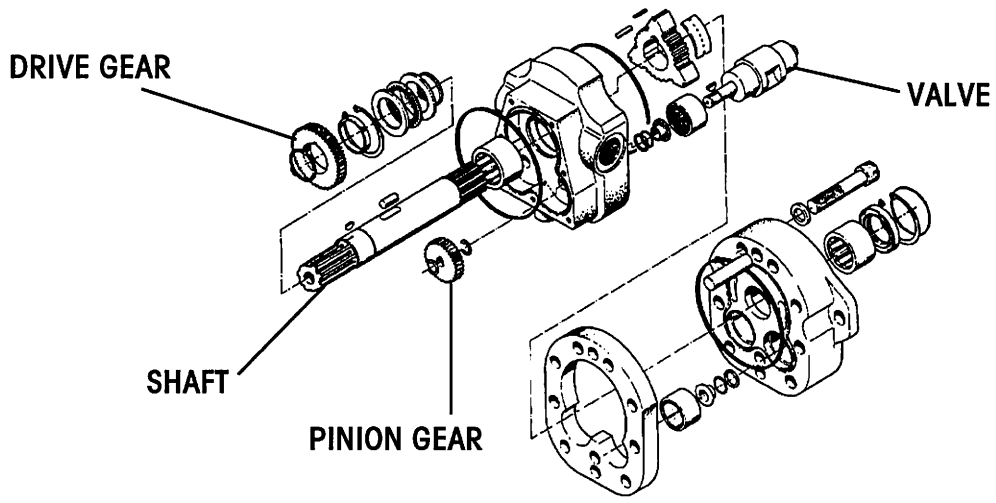
DRIVE SYSTEM

The two (2) wheel drive circuit consists of two hydraulic drive motor/ brake assemblies, the drive valve segment, a selector valve, the drive valve assembly, a brake metering valve, a drive relief valve, a toggle switch on the remote control pendant and a drive control lever on the platform control console.

The four (4) wheel drive circuit consists of two hydraulic drive motor/ brake assemblies, two hydraulic drive motors without brakes, the drive valve segment, a selector valve, the drive valve assembly, a brake metering valve, a toggle switch on the remote control pendant and a drive control lever on the platform control console.



Drive System Components.



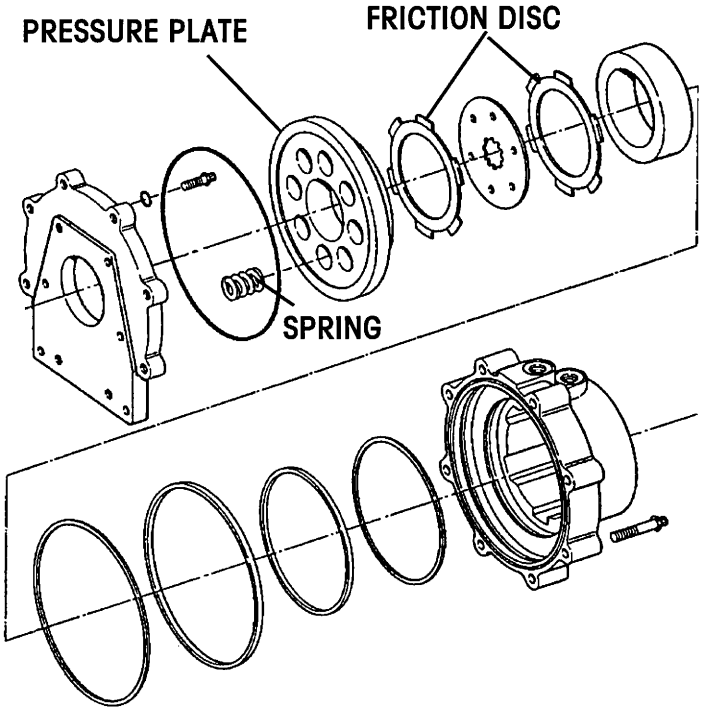
Motor Assembly.

DRIVE MOTOR AND BRAKE ASSEMBLY

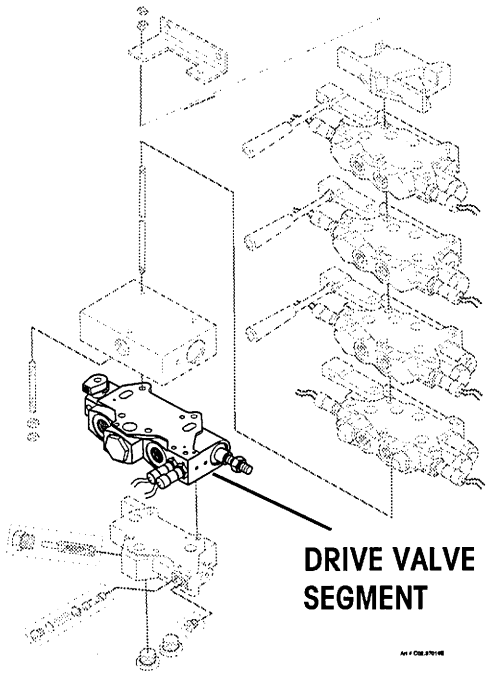
The drive motor is keyed to a shaft which is splined on both ends. One end of the splined shaft is used for the brake while the other end is inserted into the gear reducer assembly.

The brake assembly is a disc type. It is a wetted disc which is spring applied and hydraulically released.

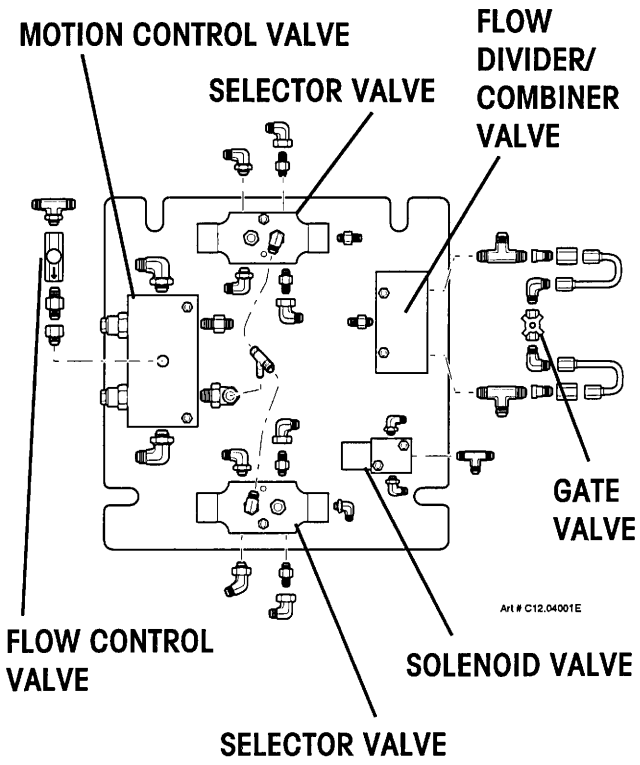
NOTE: Internal leakage of the motor is passed through the brake disc and back to the main hydraulic reservoir through the two case drain lines thereby cooling the brake and preventing brake disc wear.



Brake Assembly.



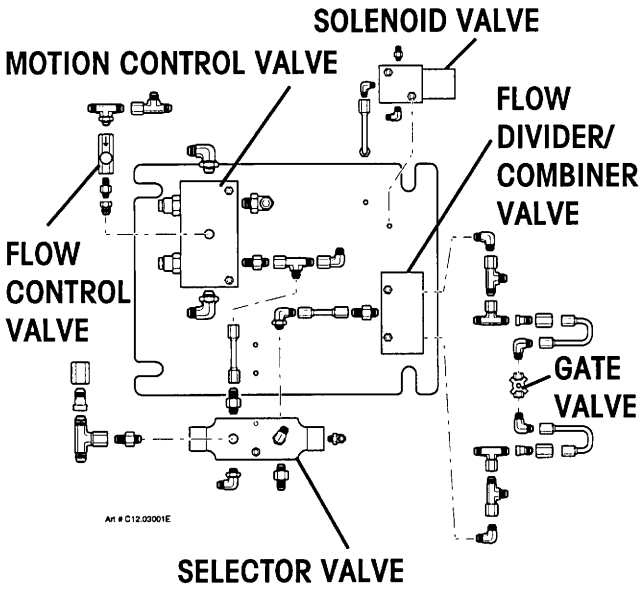
Ground Valve Bank.



Four (4) Wheel Drive Valve 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 pulsar 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.



Two (2) Wheel Drive Valve Assembly.

DRIVE VALVE ASSEMBLY

The drive valve assembly consists of a selector valve(s), a solenoid valve, motion control valve, flow control valve, flow divider/ combiner valve and a gate valve. The drive valve assembly is mounted on a plate located on the undercarriage. See Drive Valve Assembly earlier in this section.

TOGGLE SWITCH ON THE REMOTE CONTROL PENDANT

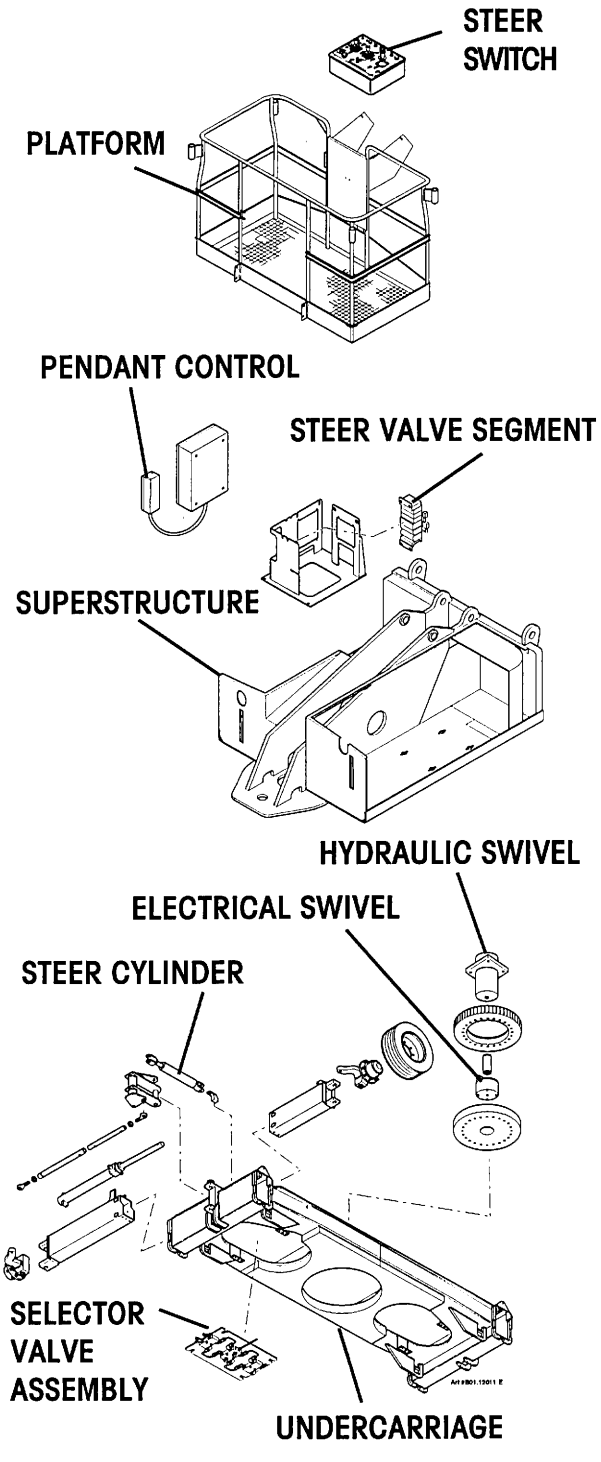
To operate the drive function from the ground, use the "Propel" (Drive) toggle switch on the remote control pendant. See "Section 3: Electrical System" for switch replacement.

DRIVE CONTROL LEVER

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

STEER SYSTEM

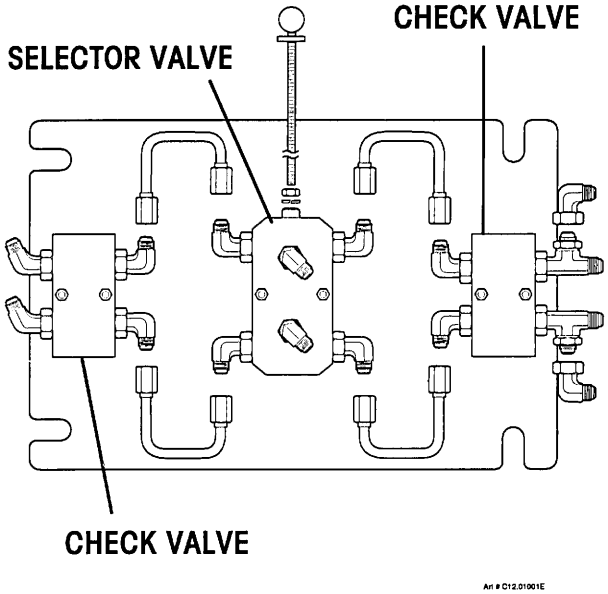
The steer system consists of a selector valve assembly, a steer valve segment, a steer cylinder, a steer toggle switch on the remote control pendant and a steer switch on top of the drive control lever at the platform control console.



Steer System Components.

SELECTOR VALVE ASSEMBLY

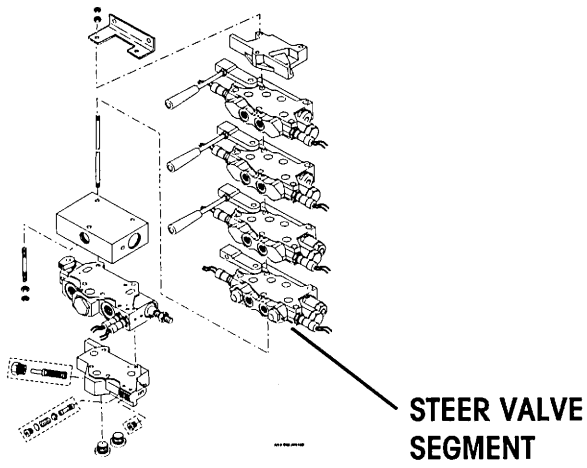
The selector valve assembly consists of three valves: one double parallel selector valve and two pilot operated crossover check valves. This valve assemby determines whether fluid flow should go to the steer cylinder or the axle extend cylinders. See Selector Valve Assembly earlier in this section.



Selector Valve Assembly.

STEER VALVE SEGMENT

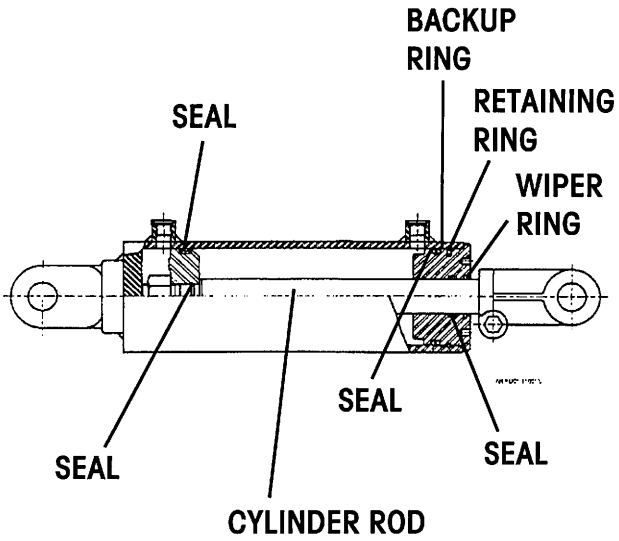
When the steer switch on the platform control console or the steer control toggle switch on the remote control pendant, is activated an electrical signal is transmitted to the pulsar in the steer segment. This allows hydraulic fluid to be sent to the steer cylinder.



Ground Valve Bank.

STEER CYLINDER

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



Steer Cylinder.

STEER SYSTEM MAINTENANCE

Check all pins on steering linkage and steer cylinder for excessive play. Replace pins if there is excessive play.

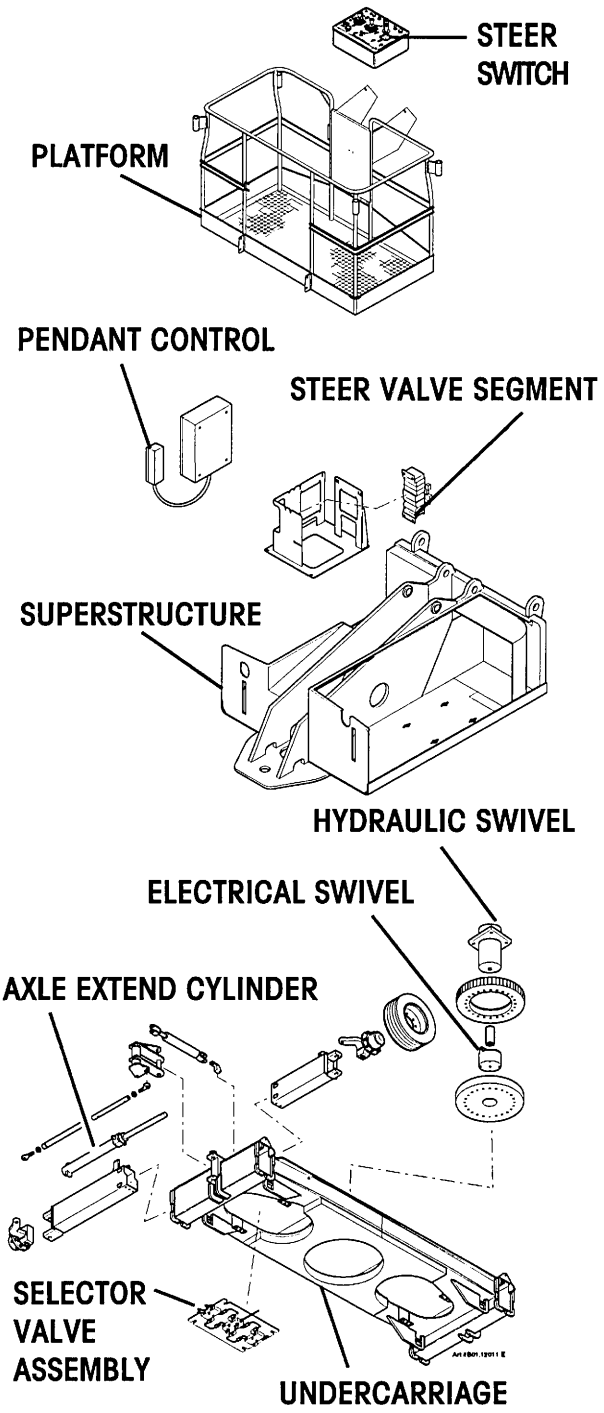
Ensure that all clips are in place and secure.

Lubricate linkage as required (see Lubrication Chart).

Check cylinder and hoses for hydraulic fluid leakage and security.

AXLE EXTEND SYSTEM

The axle extend system consists of the selector valve assembly, the steer valve segment, two axle extend cylinders, axle stops, steer toggle switch on the pendant and the steer switch at the platform control console.

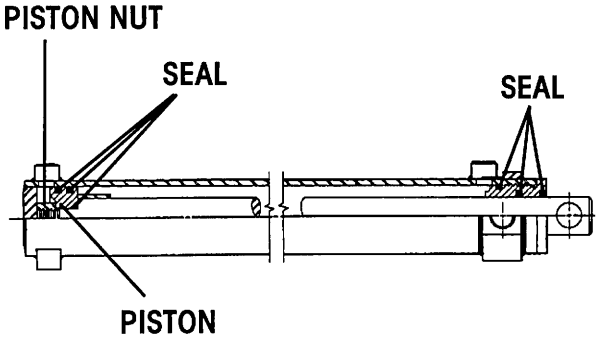


Steer System Components.

The axle extend system utilizes the same hydraulic circuit as the steer system until the selector valve is positioned to extend the axles; then the hydraulic fluid is diverted to the axle extend cylinders.

AXLE EXTEND CYLINDER

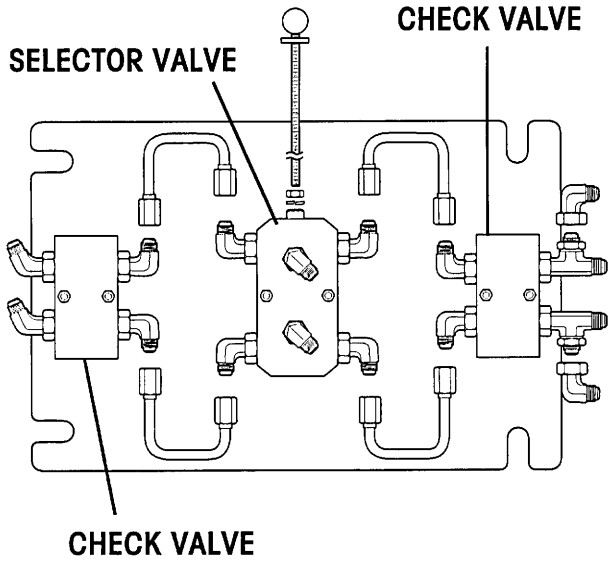
The cylinders are double acting and are directly connected to extend axles. These cylinders power all axle extend/ retract movement.



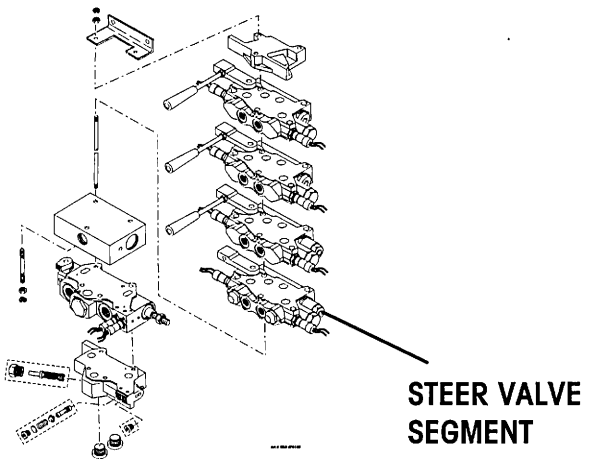
Axle Extend Cylinder.

SELECTOR VALVE ASSEMBLY

The selector valve assembly consists of three valves: one double parallel selector valve and two pilot operated crossover check valves. This valve assemby determines whether fluid flows to the steer cylinder or the axle extend cylinders. See Selector Valve Assembly earlier in this section.



Selector Valve Assembly.



Ground Valve Bank.

STEER VALVE SEGMENT

When the selector valve is in "axle extend" position and the steer control toggle on the end of the drive lever at the platform control or the steer control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the steer valve segment. This allows hydraulic fluid at the correct pressure to be sent to the steer cylinder or axle extend cylinders.

SECTION 3:
ELECTRICAL SYSTEM

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ELECTRICAL SYSTEM

The following section is a description of maintenance for the major electrical components of the machine.

BATTERY

Two 12 volt batteries supply the electrical current required to operate the electrical circuits. An additional 12 volt battery is used to supply the electrical current for the emergency pump.

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 1/2 inch above the top of the separators.

Never stack one battery directly on top of another, because post or container damage can result. If batteries are stored individually, place supporting wooden 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)

Follow these procedures for maintenance of batteries on a machine 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 posts to retard corrosion.
- **Loose connections.** Be sure all cable connections are tight, and that good contact is made with post 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 acid accumulation.

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 1.250 to 1.280 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 0.030 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 batteries, follow these procedures:

⚠WARNING

BEFORE REMOVING BATTERIES 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 batteries from the superstructure. Put the batteries to the side and dispose of properly.

⚠ CAUTION

Always connect the positive battery cable first.

To install batteries lift and position them on superstructure. Secure batteries in position with wing nuts and battery hold downs. Connect battery cables.

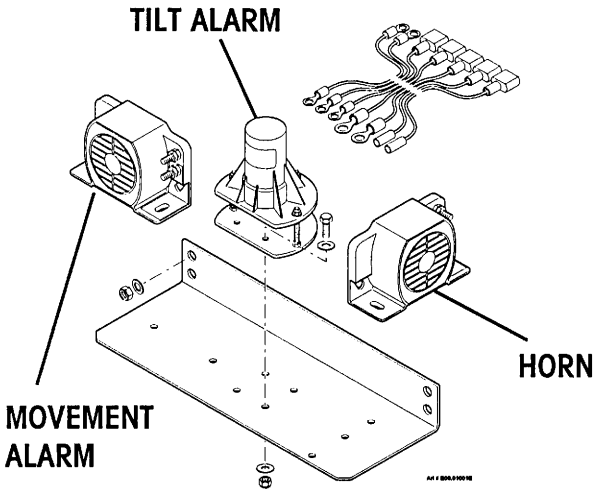
MOVEMENT ALARM

The movement alarm is activated as soon as the platform console drive controller or drive toggle switch on the remote control pendant 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 box on the ground control bracket. To replace it, remove the movement alarm from the ground control bracket and disconnect the wires.



Alarm Package.

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 box on the ground control bracket. To replace the tilt alarm, remove it from the ground control bracket and disconnect the wires.

TILT ALARM TEST

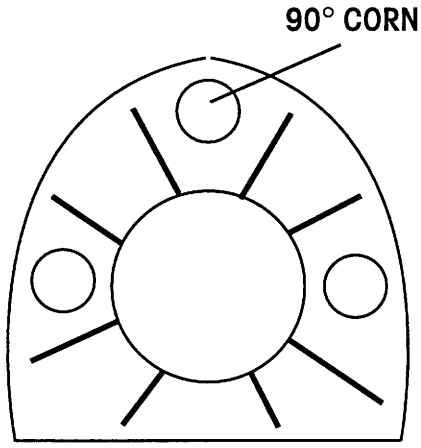
The alarm can be tested by manually tipping the alarm sensor. This "Push-to-Test" feature enables tilt alarm to be tested without losing its adjustment.

1. Extend or raise the boom to trip the limit switches.
2. Individually push down on each of the three fastened corners of the tilt alarm.
3. There should be enough travel to cause the alarm to sound as each corner is pressed (there is approximately a three second delay).
4. 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.

1. 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.



Tilt Alarm 90° Corner.

2. 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.
3. 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.
4. 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.

HORN

The horn gives an audible warning. If the horn does not function, check the wiring. If wiring is correct, replace it.

The horn is located behind the ground control box on the ground control bracket. To replace it, remove the horn from the ground control bracket and disconnect the wires.

ELECTRIC SWIVEL

The electric swivel allows electrical contact between a rotating superstructure and a stationary undercarriage.

RELAY

Relays are located in the platform console; and, the rest of the relays are located in the ground control box. (Refer to the schematic at the end of this manual for relay functions and interconnect.)

CIRCUIT BREAKER

There is one 20 amp circuit breaker mounted on the face of the ground control box.

If there are any work lights, head lights or tail lights an additional 20 amp circuit breaker is found inside the ground control box.

If the 20 amp circuit breaker is tripped, reset 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 of the machine.

LIMIT SWITCH

There are limit switches mounted on the undercarriage as safety devices for the axle extension, boom telescope, and boom lift functions. The axle extension limit switches are at each of the four axles. The boom telescope limit switch is located on the lower right side of the base boom. There are also several limit switches for the telescope and lift functions. The boom lift limit switch is located on the center post of the superstructure.

Unless the axle extend limit switches are closed as shown on the machine's electrical schematic at the end of this manual, the boom cannot be raised above horizontal or extended beyond the telescope limit switch on the boom.

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

EMERGENCY PUMP

There is one 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) to be operational. The ignition circuit must be on to power the control handles.

EMERGENCY STOP BUTTON

There are two emergency stop buttons: one on the remote control pendant, and the other on the platform control console.

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

To replace the remote control pendant emergency stop button, remove the four pendant cover screws to gain access for button removal. Remove the appropriate button mounting screws and wires.

To replace the platform control console emergency stop button, remove the two platform control console screws and swing the console up on its hinges, to gain access for button removal. Remove the appropriate button mounting screws and wires.

REMOTE CONTROL PENDANT SWITCH REMOVAL

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

GROUND CONTROL BOX 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 CONTROL CONSOLE SWITCH REMOVAL

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

DRIVE CONTROLLER

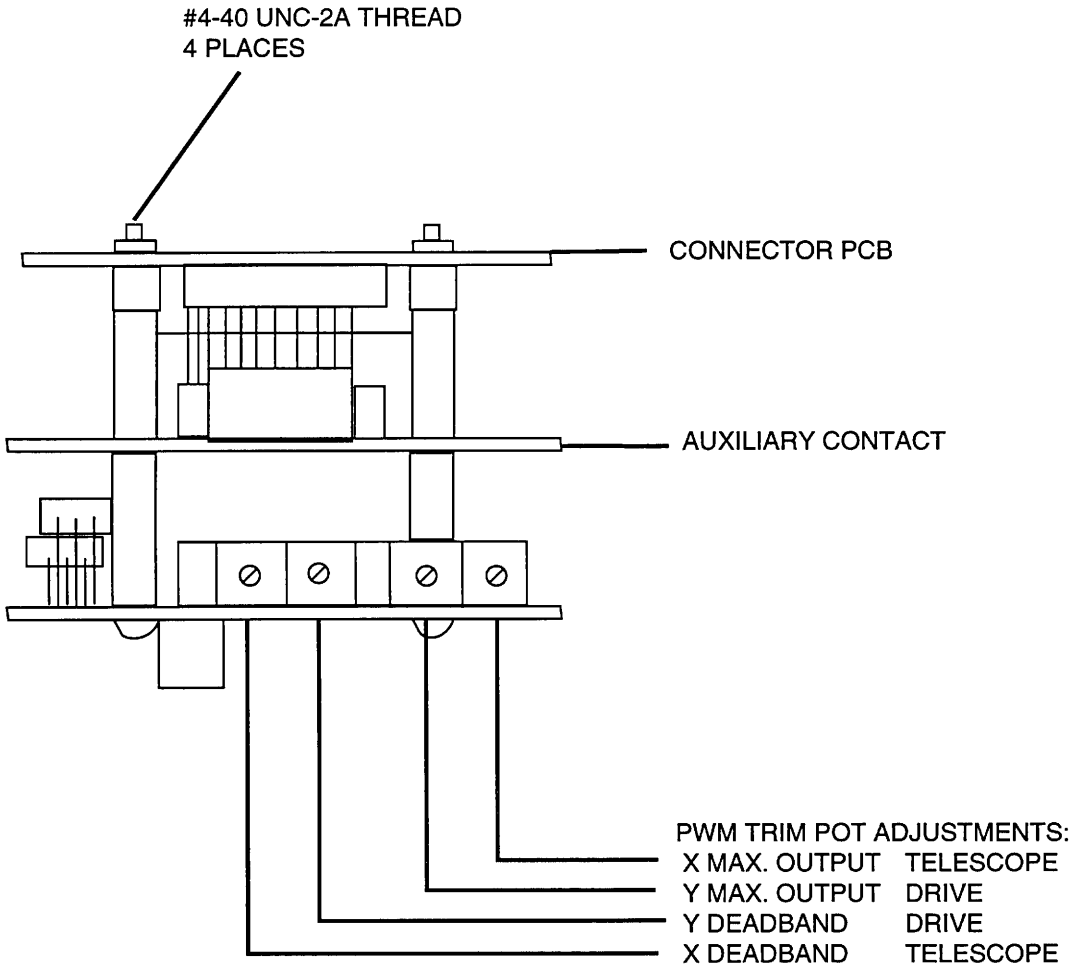
Forward or backward travel of the machine is operated by a "single axis" lever on the platform control console.

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

On the Drive Card, located at the bottom of the lever assembly, there is a separate adjustment for "Lo Threshold" (Deadband), which determines when movement starts as the controller is moved from the "Neutral" position. There is another separate adjustment that determines the degree of controller 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 counterclockwise.
2. Push control lever forward until a proximity switch inside the control lever clicks.
3. Turn the Lo Threshold (Deadband) potentiometer clockwise to permit initial 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 and Telescope Cards.

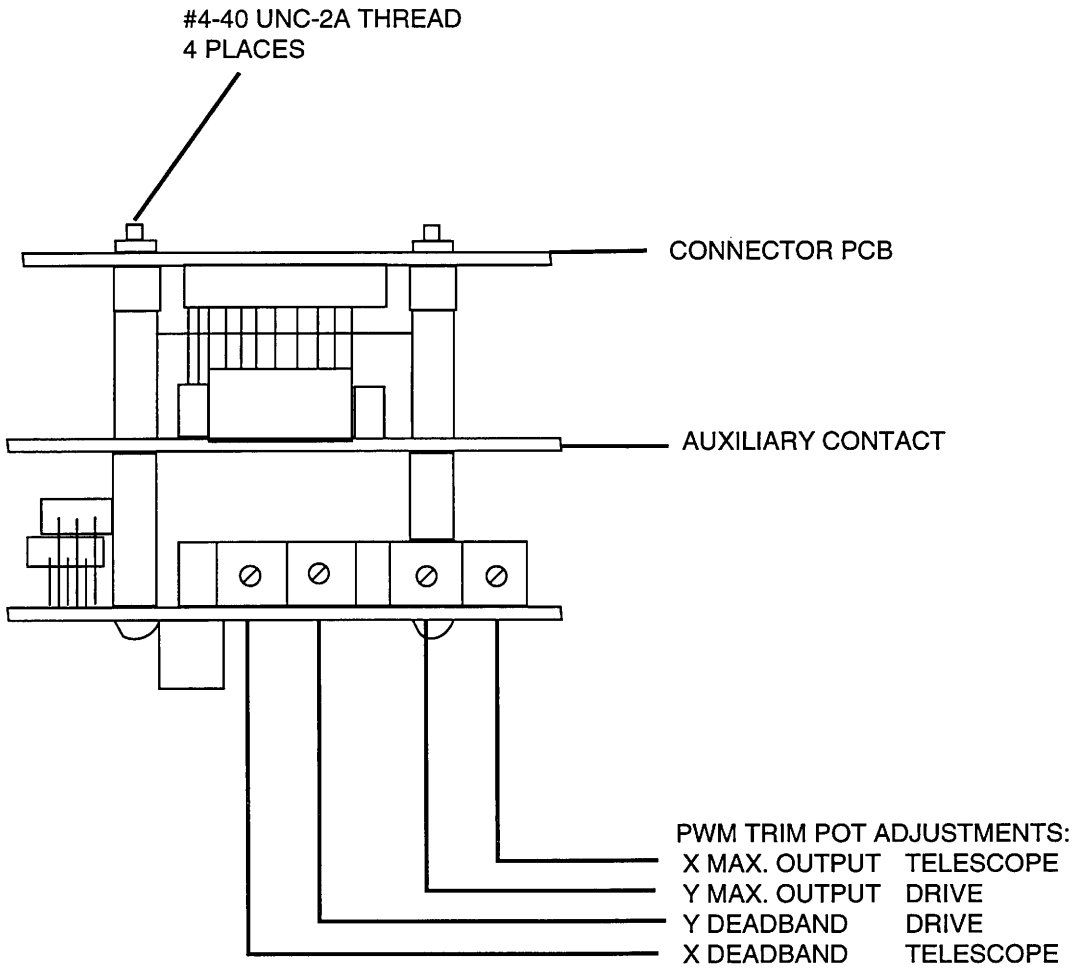
BOOM TELESCOPE CONTROLLER

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 extension and retraction functions of the boom.

On the Drive Card, located at the bottom of the drive control lever assembly, there is a separate adjustment for "Lo Threshold" (Deadband), which determines when movement starts as the controller is moved from the "Neutral" position. There is another separate adjustment that determines the degree of controller 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 counterclockwise.
2. Push control lever forward until a proximity switch inside the control lever clicks.
3. Turn the appropriate Lo Threshold (Deadband) potentiometer clockwise to permit initial 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 and Telescope Cards.

The boom telescope function has four additional adjustments on a separate Ramp Card (refer to following table).

boom extend	push forward	A1: Acceleration
		D1: Deceleration
boom retract	pull back	A2: Acceleration
		D2: Deceleration

To adjust the acceleration or deceleration rate (ramp speed) of a function on the Ramp Card:

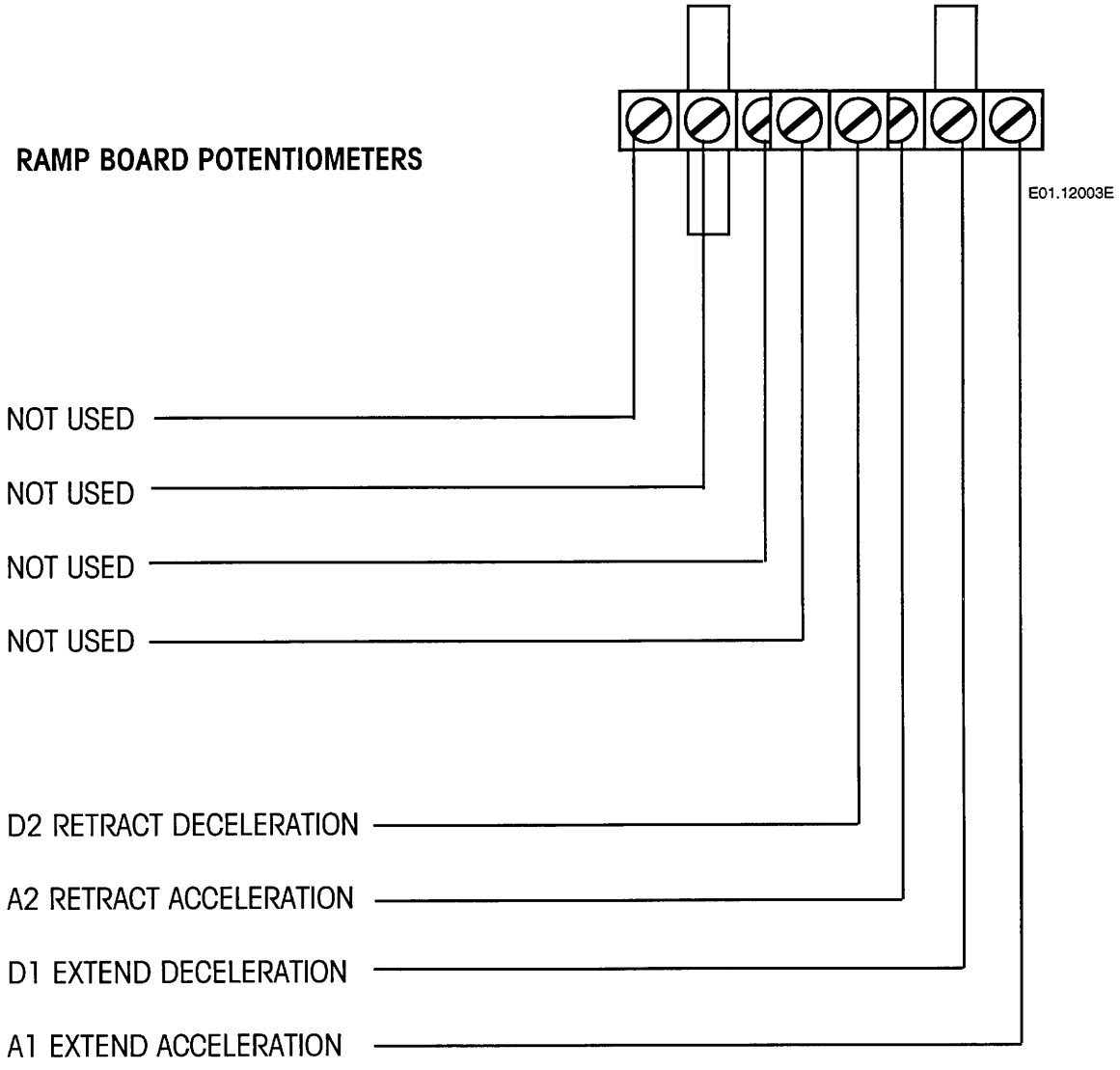
1. Turn the appropriate potentiometer(s) fully counterclockwise.
2. Turn the adjustment one-half the available rotation of the potentiometer(s).

NOTE: All potentiometers rotate 270°, from fully closed to fully open.

3. While moving the controller, adjust appropriate potentiometer for desired acceleration, or deceleration rate.

NOTE: Counterclockwise potentiometer rotation decreases delay (ramp) time. Clockwise potentiometer rotation increases delay (ramp) time.

RAMP BOARD POTENTIOMETERS



BOOM LIFT/ SWING CONTROLLER

On the boom lift/ swing controller, there are two (2) Driver Cards with a total of eight adjustable 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):

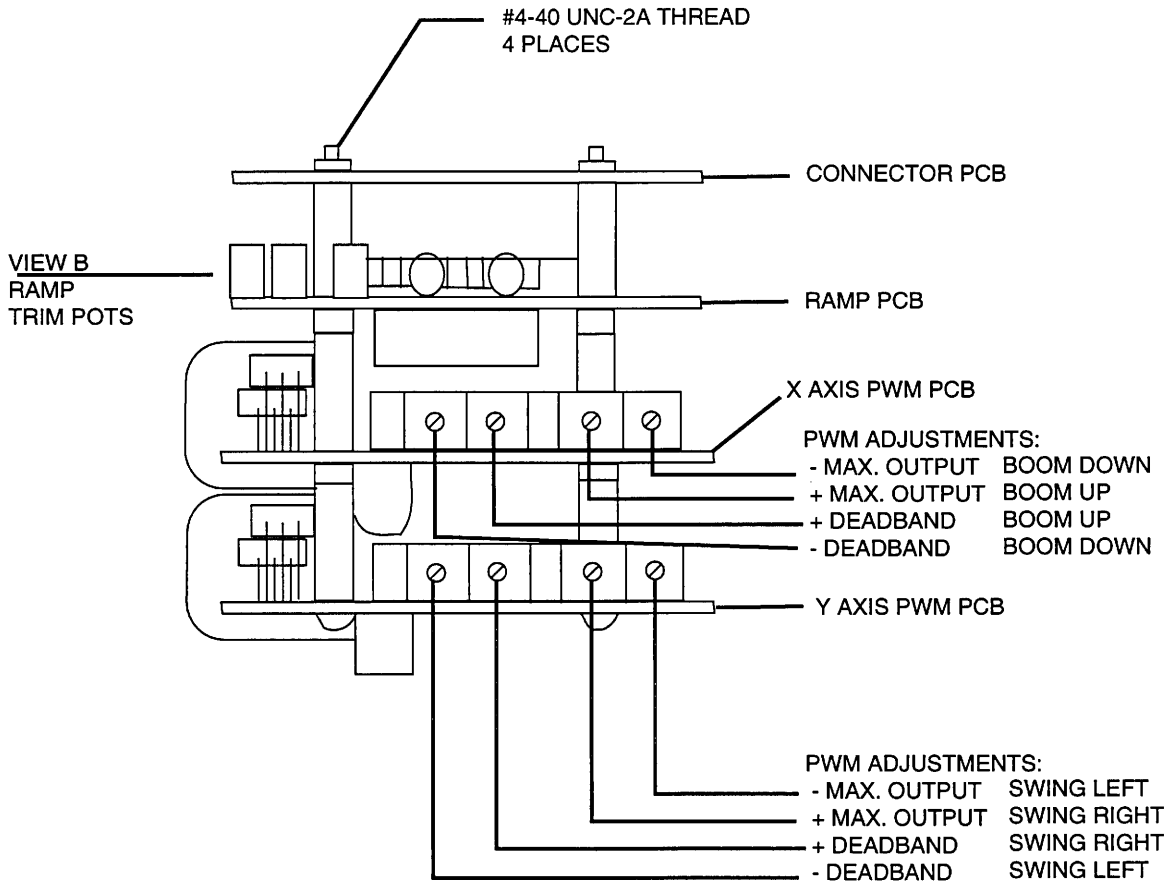
1. Turn appropriate Threshold (Deadband) potentiometer fully counterclockwise.
2. Move control lever in appropriate direction from neutral position until a proximity switch inside the control lever clicks.
3. Turn the appropriate Threshold (Deadband) potentiometer clockwise to permit first flow (first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



Swing and Boom Lift Cards.

Each function also has two additional adjustments on a separate Ramp Card (refer to following table).

swing right	controller right	A1: Acceleration
		D1: Deceleration
swing left	controller left	A2: Acceleration
		D2: Deceleration
boom up	push forward	A3: Acceleration
		D3: Deceleration
boom down	pull back	A4: Acceleration
		D4: Deceleration

To adjust the acceleration or deceleration rate (ramp speed) of a function on the Ramp Card:

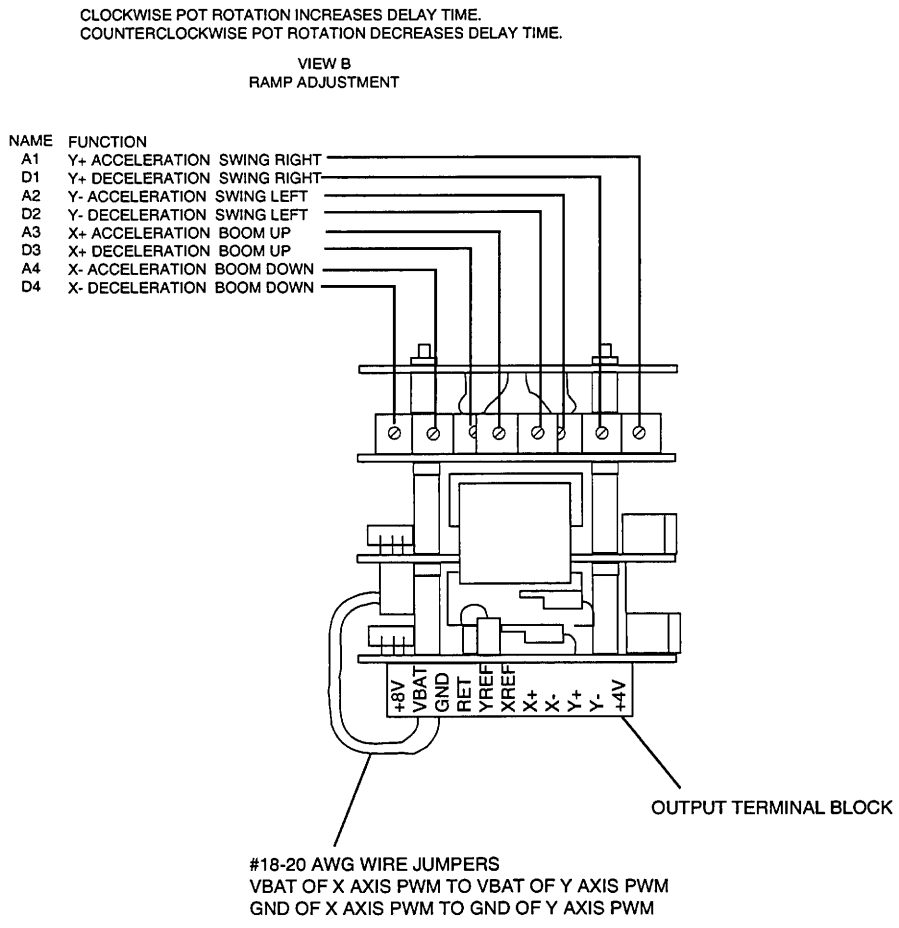
1. Turn the appropriate potentiometer(s) fully counterclockwise.

2. Turn the adjustment one-half the available rotation of the potentiometer(s).

   NOTE: All potentiometers rotate 270°, from fully closed to fully open.

3. While moving the controller, adjust appropriate potentiometer for desired acceleration, or deceleration rate.

   NOTE: Counterclockwise potentiometer rotation decreases delay (ramp) time. Clockwise potentiometer rotation increases delay (ramp) time.



Swing and Boom Lift Cards (View B).

CREEP SPEED ADJUSTMENTS

There are two separate adjustments for creep speed: an adjustment in the ground control box 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 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 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 figure for potentiometer location.)

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 Lift Control Switch to the lift position.

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

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

SUPERSTRUCTURE SWING ADJUSTMENT (PLATFORM CONTROL)

The potentiometer governing the boom swing speed is located inside the platform control console. (Refer to following figure for potentiometer location.)

- Check speed of superstructure rotation.

NOTE: The superstructure should rotate at approximately one complete revolution in 140 seconds.

- Adjust boom swing potentiometer, as necessary.

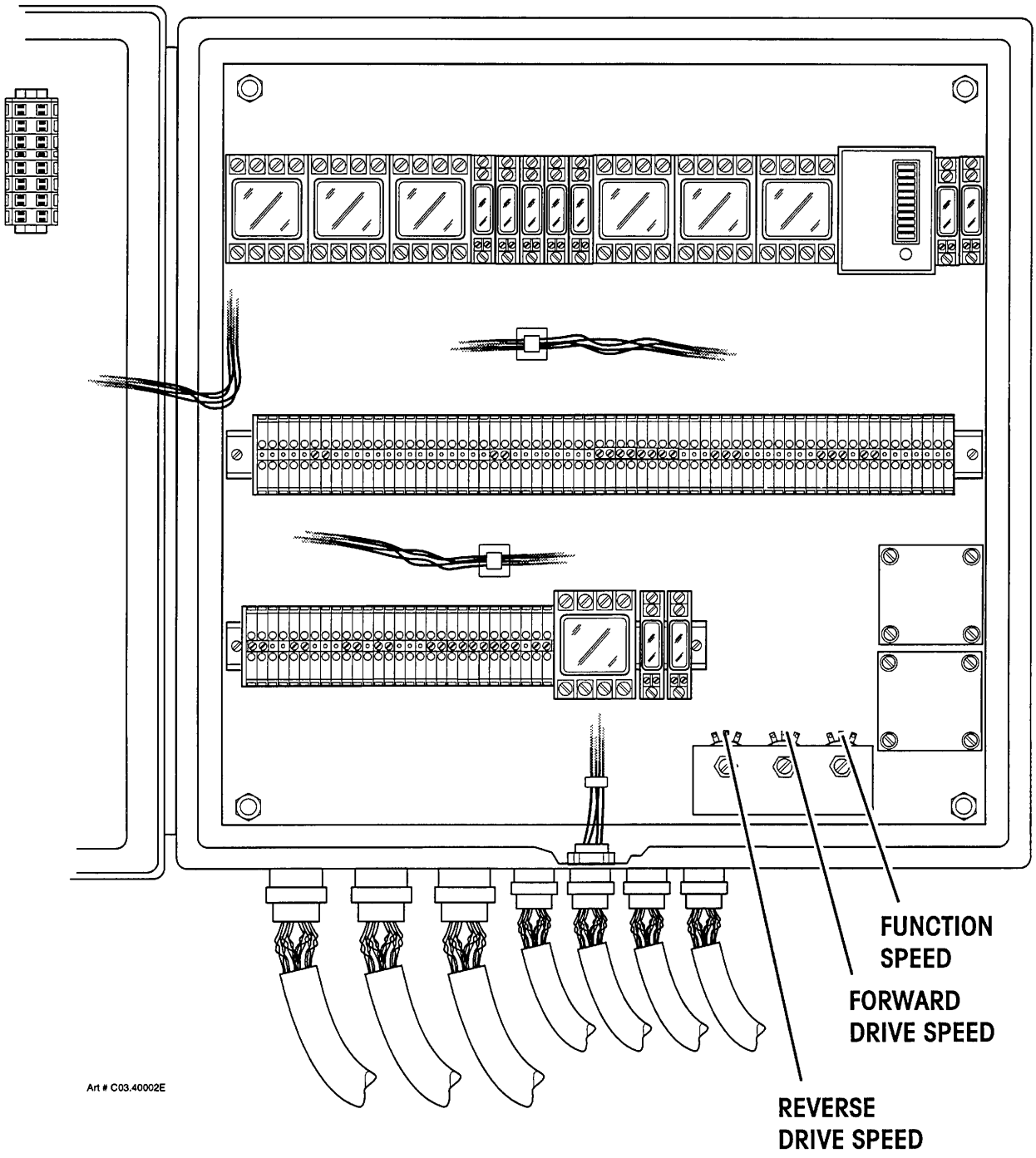
BOOM LIFT ADJUSTMENT (PLATFORM CONTROL)

The potentiometer for boom lift adjustment is located inside the platform control console. (Refer to following figure for potentiometer location.)

- Check speed to fully raise the boom from the lowest position.
- Check speed of boom for complete lowering from highest position.

NOTE: The boom should be fully pivoted to the greatest angle in approximately 80 seconds. It should take about the same amount of time to fully lower the boom from the highest raised position.

- Adjust boom lift speed potentiometer, as necessary.



CLOCKWISE = SPEED DECREASE
COUNTERCLOCKWISE = SPEED INCREASE

Ground Control Adjustments for Boom Functions and Drive Speed.

SECTION 4:
MECHANICAL COMPONENTS

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MECHANICAL COMPONENTS

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

TIRES

Tires used are solid rubber. Inspect tires for cuts, chunking, sidewall damage or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation.

CHANGING TIRES

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

When a tire change is necessary, follow these steps:

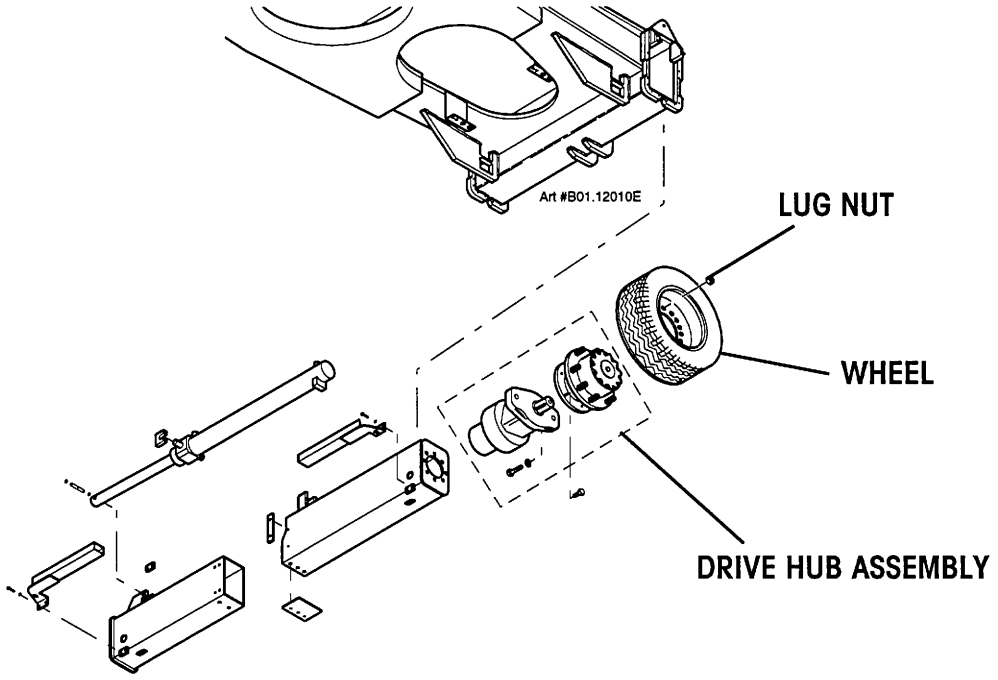
⚠ CAUTION

ALWAYS CHOCK THE WHEELS before you raise the machine.

- Loosen and remove lug nuts, and pull off the tire and wheel assembly.
- Replace the tire and reinstall.
- Fasten lug nuts and tighten to proper torque (see Machine Specifications).
- Lower the machine and remove the chocks.

WHEELS AND LUG NUTS

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



Wheel Assembly and Drive Hub Assembly Location.

DRIVE HUB ASSEMBLY

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

- To remove drive hub assembly:

1. Chock the wheels at one end and raise the machine at the opposite end.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

2. Remove tire and wheel assembly:
    1. Loosen and remove the lug nuts.
    2. 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. At this point remove the hose carrier from the axle tube assembly and lay aside the hoses and hose carrier.
4. Loosen and remove eight capscrews and flat washers on the drive hub assembly.
5. Slide off hydraulic motor with toque hub as one unit.

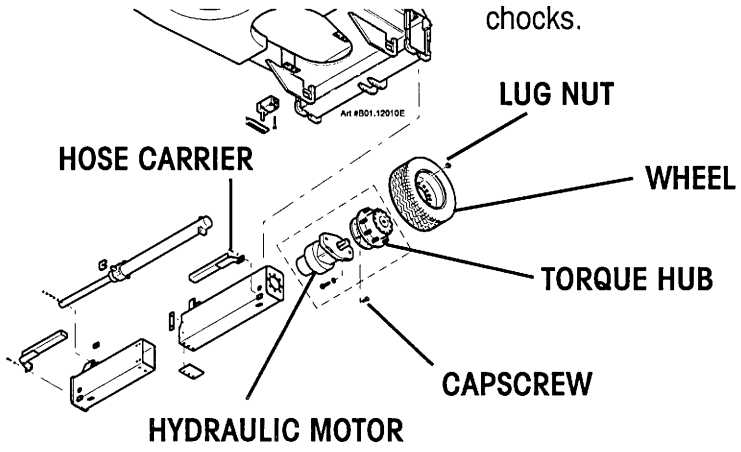
- Install drive hub assembly:

1. Align the drive hub assembly (hydraulic motor and torque hub) with the axle tube assembly.
2. Install the capscrews with flat washers and torque (see Machine Specifications).
3. Connect hydraulic hoses to the drive hub assembly and install hose carrier to the axle tube assembly.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

4. Install tire and wheel assembly:
    1. Position tire and wheel assembly.
    2. Install lug nuts and torque (see Machine Specifications).
5. Lower the machine and remove the wheel chocks.



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

STEER CYLINDER

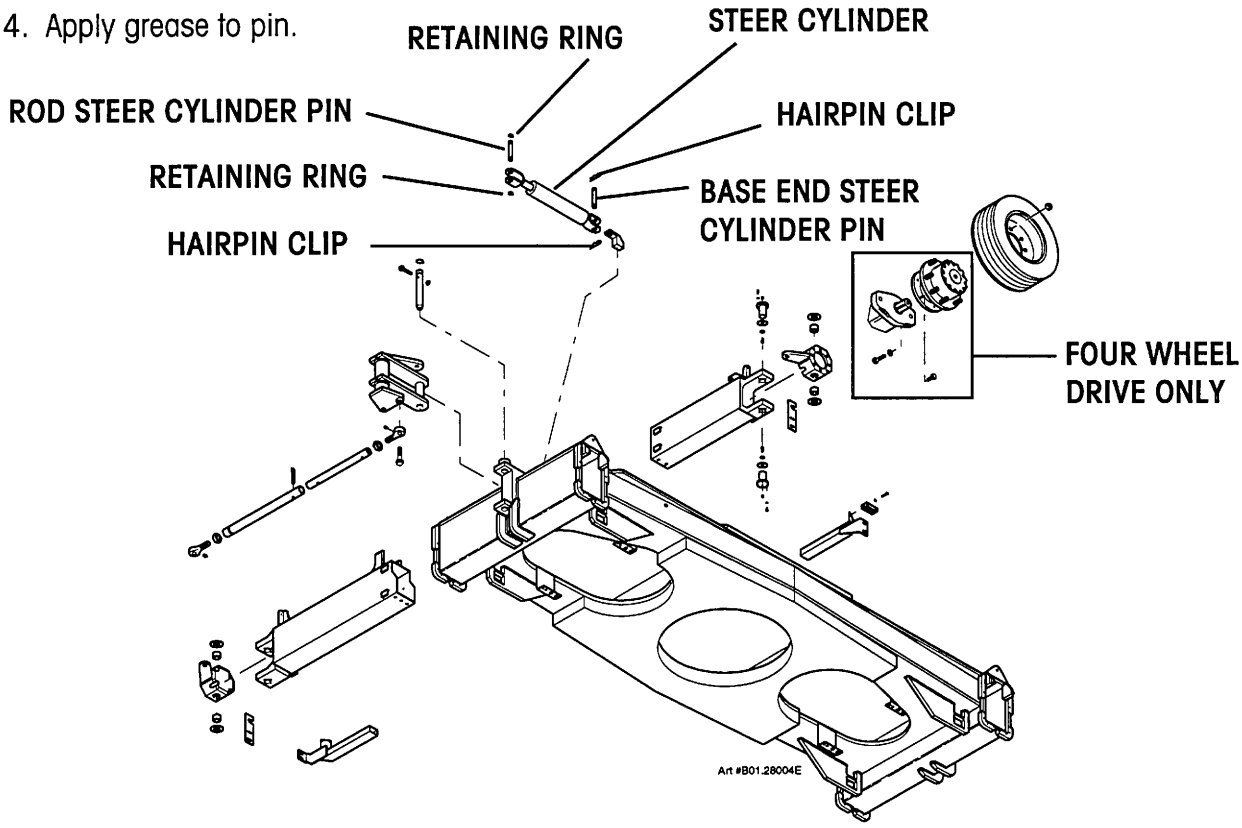
The steer cylinder is of the double acting type. Check the cylinder for hydraulic fluid leaks.

STEER CYLINDER SEAL REPLACEMENT

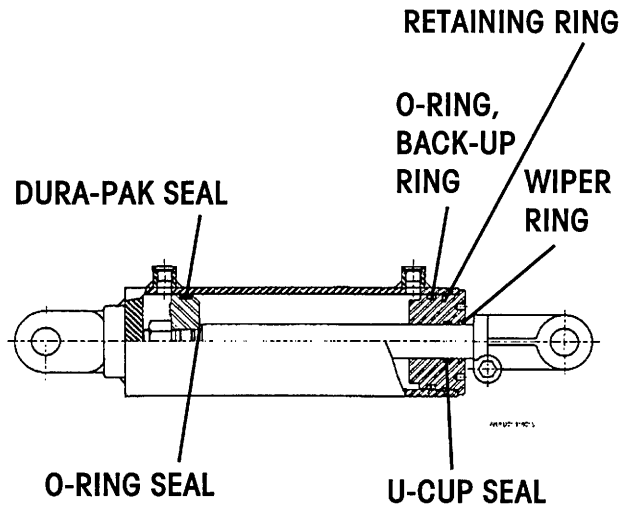
1. Disconnect the hydraulic hoses.
2. Remove the steer cylinder pins
3. Remove the cylinder.
4. Clean the rod end of the cylinder.
5. Loosen the end cap and withdraw it over the piston rod.

⚠ CAUTION

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



Steer Cylinder and Tie Rod Assembly.



Steer Cylinder.

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.

STEER ARM PIN

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

STEER ARM PIN REPLACEMENT

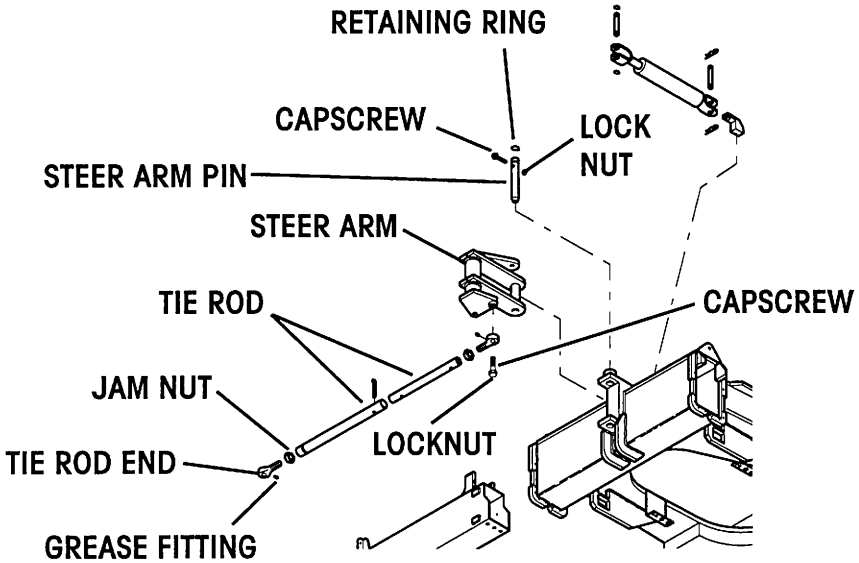
1. Remove capscrew and locknut.
2. Remove retaining ring.
3. Remove the pin and thrust washers.
4. Install new pin with thrust washers and retaining ring.
5. Install capscrew and locknut.
6. Apply grease to pin.

TIE ROD ASSEMBLY

Check for a bent or broken tie rod. Replace if bent 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.
4. Apply grease at tie rod end fitting.



Steer Arm Pin and Tie Rod Assembly.

AXLE EXTEND ASSEMBLY

AXLE EXTEND CYLINDER

There are two axle entend cylinders. The cylinder is double acting and is directly connected to telescoping axle. These cylinders power all axle extend/ retract movement. Check axle pin for wear. Check for lost retaining ring. Replace worn pin and lost retaining ring.

Axle Extend Cylinder Replacement

To replace the axle extend cylinder, the cylinder must be in the retracted position and the axle cylinder stop/ cover in the stowed position.

To remove axle extend cylinder:

1. Remove the tire and wheel assembly.

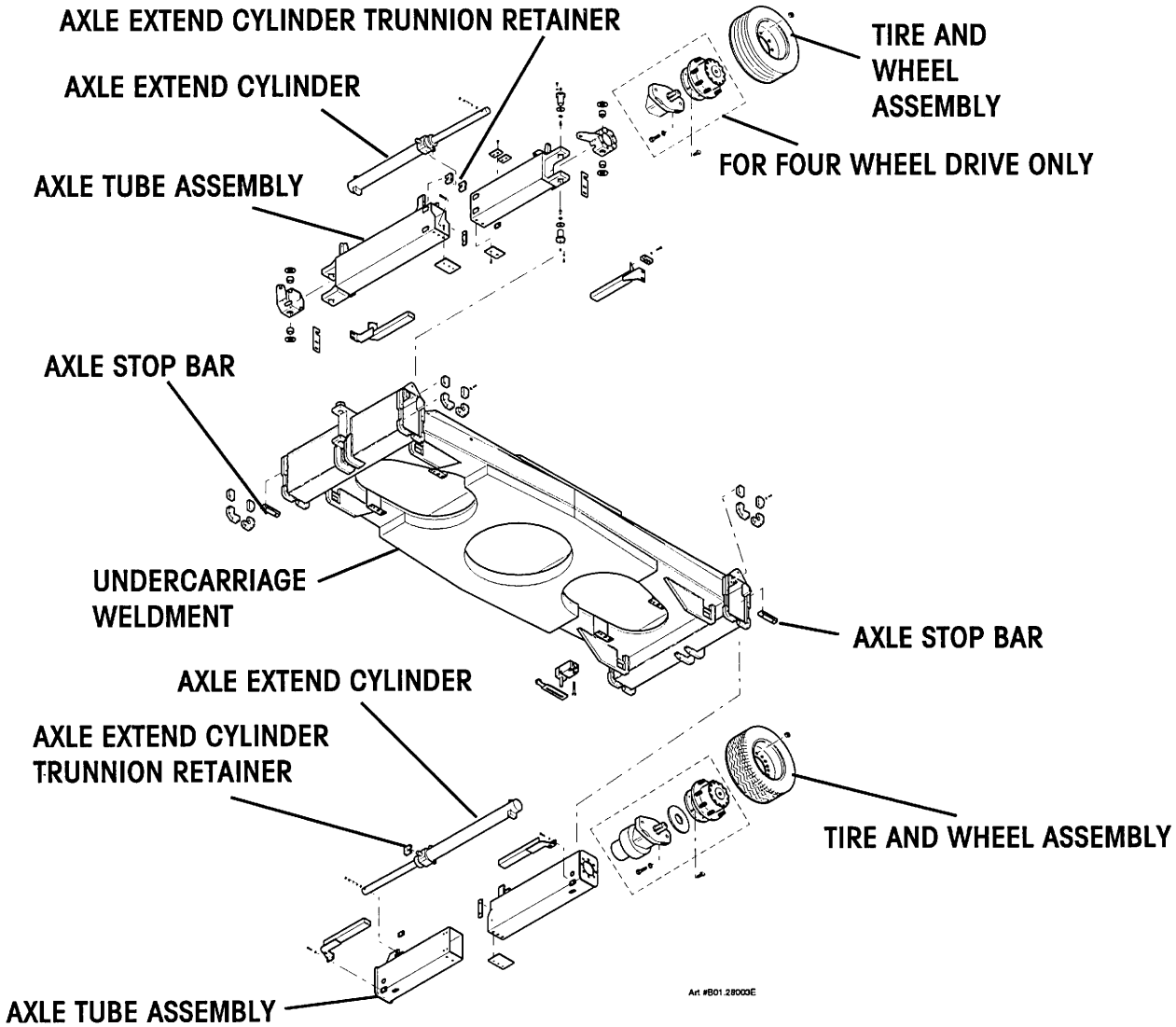
⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

a. Chock the wheels. Raise and support the machine.

b. Loosen and remove the lug nuts.

c. Pull off the tire and wheel assembly.



Axle Extend Cylinder Removal.

Axle Extend Cylinder Replacement (Continued)

2. Remove axle extend cylinder trunnion mounted retainer.

   a. Loosen and remove four capscrews holding the trunnion mounted retainer.

   NOTE: You will have to crawl under the undercarriage to access the four capscrews and retainer.

   b. Remove the axle extend cylinder trunnion mounted retainer.

3. Remove axie stop bar.

   a. Remove two capscrews and lockwashers.

   b. Remove axle stop bar.

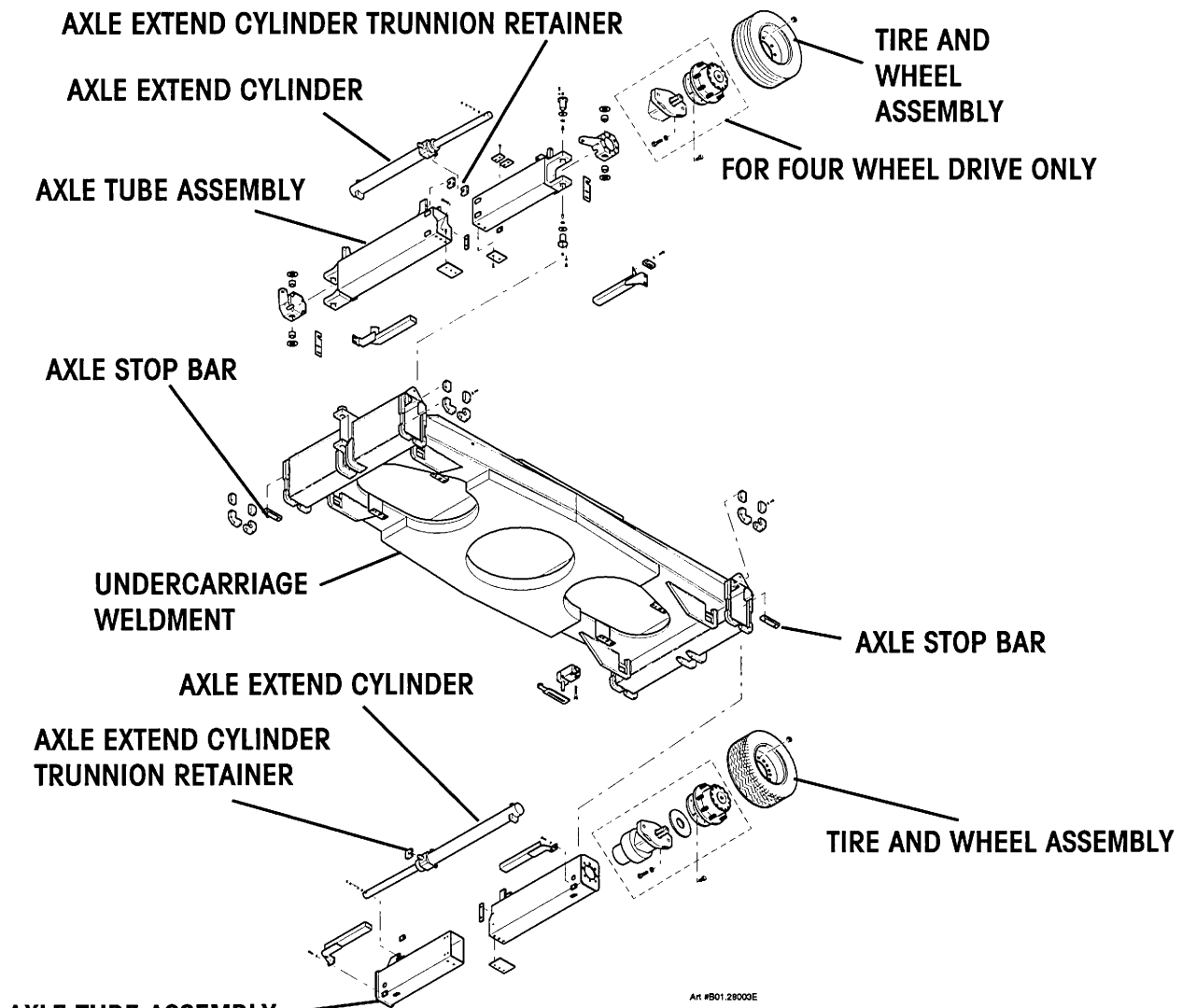
   NOTE: You will have to crawl under the undercarriage to access and remove the axle stop bar.

4. Retract the axle extend cylinder (if not already retracted).

⚠ CAUTION

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

5. Disconnect hoses to the axle extend cylinder.



Axle Extend Cylinder Replacement.

Axle Extend Cylinder Replacement (Continued)

6. Remove retaining ring and axle extend cylinder pin at the rod end of the axle extend cylinder.

7. Pull axle extend cylinder out from the rod end.

To install axle extend cylinder:

1. Push base end of axle extend cylinder through the undercarriage weldment, being careful to align the cylinder to fit in the axle extend cylinder trunnion mounted retainer.

2. Install cylinder pin and retaining ring at the rod end of the axle extend cylinder.

3. Connect the hydraulic hoses to the cylinder.

4. Install axle stop bar:

   NOTE: You will have to crawl under the undercarriage to install the axle stop bar.

   a. Position axle stop bar to line up with the holes on the undercarriage weldment.

   b. Install two capscrews and lockwashers and torque (standard torque for size and gradeof capscrew).

5. Install axle extend cylinder trunnion mounted retainer:

   NOTE: You will have to crawl under the undercarriage to install the axle extend cylinder trunnion mounted retainer.

   a. Position retainer around the axle extend cylinder.

   b. Install four capscrews to hold cylinder.

6. Bleed the system by cycling the axle extend cylinder at least three times.

Axle Extend Cylinder Seal Repacement

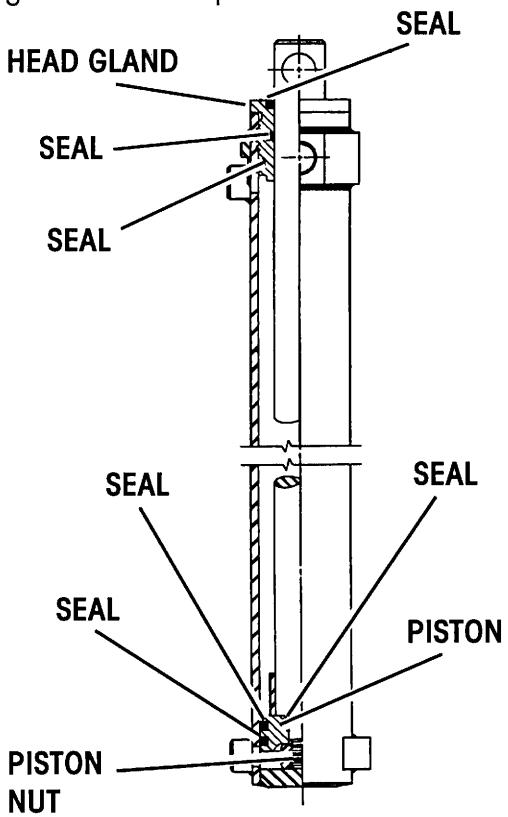
1. Clean the rod end of the cylinder.

2. Unscrew the end cap and pull the cap and rod straight out of the cylinder barrel. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM.

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

4. Replace the seals and reassemble the cylinder. AVOID DIRT IN THE CYLINDER AND ROD DAMAGE.

5. Tighten the end cap.



Axle Extend Cylinder.

MECHANICAL AXLE STOP

To ensure that the extended axle remains in position, each axle has a mechanical axle stop. This axle stop consists of a plate welded to the axle tube assembly and bolted to the undercarriage weldment and a lock pin that slides through the plate and axle tube assembly. Check for lock pin wear.

AXLE TUBE ASSEMBLY REPLACEMENT

The axle tube assembly is extended or retracted by the axle extend cylinder. Replace the tube assembly if bent or damaged.

To remove rear drive axle tube assembly:

1. Chock the steer wheels. Raise and support the machine at the rear drive end.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

2. Remove tire and wheel assembly at each end:
   a. Loosen and remove the lug nuts.
   b. Pull off the tire and wheel assembly.
3. Remove drive hub assembly at each end:

⚠ CAUTION

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

   a. Disconnect hoses to the drive hub assembly. At this point remove the hose carrier from the axle tube assembly and lay aside the hoses and hose carrier.
   b. Loosen and remove eight capscrews and flat washers on the drive hub assembly.
   c. Slide off hydraulic motor with torque hub as one unit.
4. Remove axle extend cylinder:
   a. Remove axle extend cylinder trunnion mounted retainer.
      1. Loosen and remove four capscrews holding the trunnion mounted retainer.

NOTE: You will have to crawl under the undercarriage to access the four capscrews and retainer.

      2. Remove the axle extend cylinder trunnion mounted retainer.
   b. Remove axle stop bar.
      1. Remove two capscrews and lockwashers.
      2. Remove axle stop bar.

NOTE: You will have to crawl under the undercarriage to access and remove the axle stop bar.

   c. Retract the axle extend cylinder (if not already retracted).

⚠ CAUTION

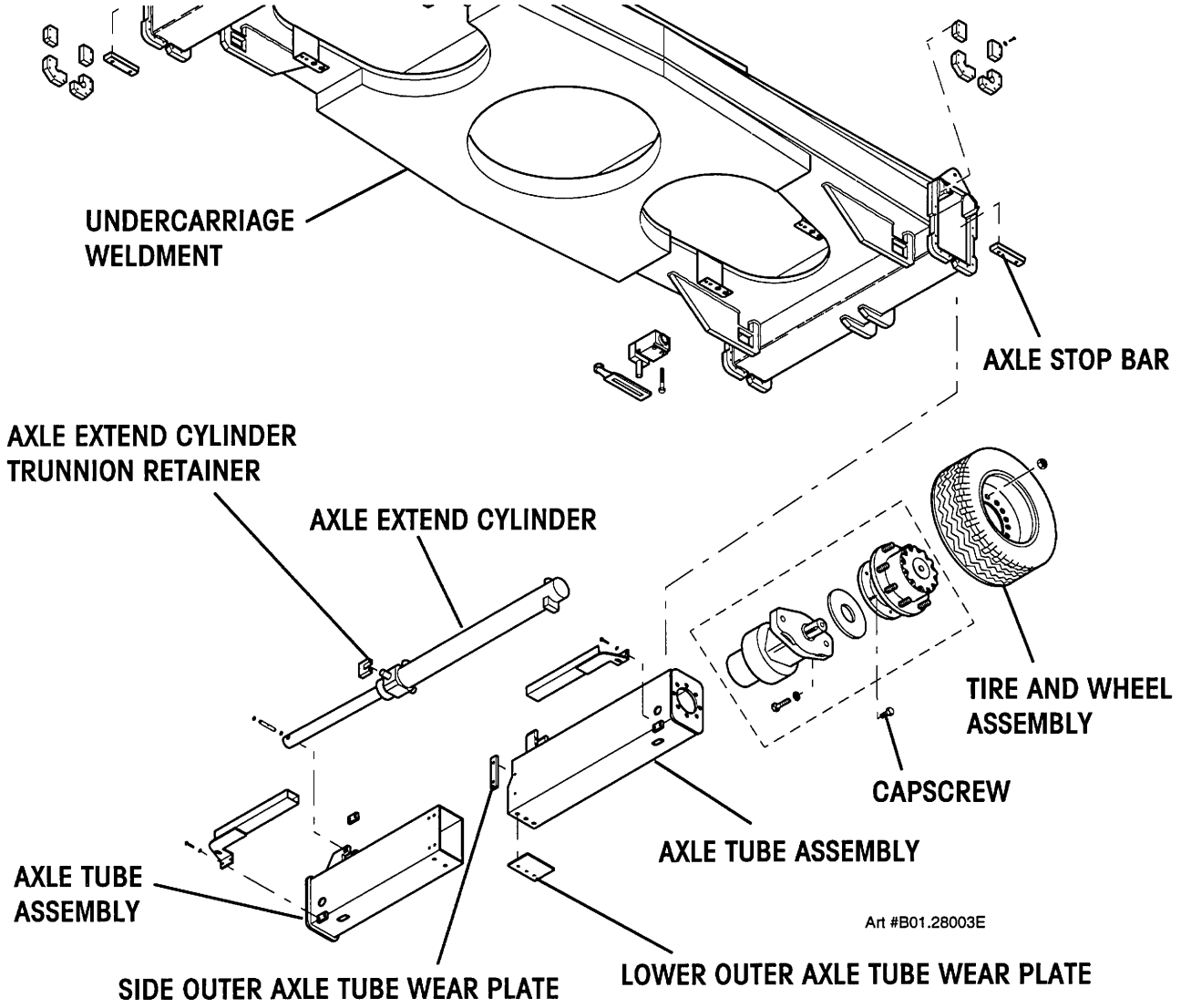
Plug all open hydraulic fittings to prevent contamination by dirt or other foreign objects.

   d. Disconnect hoses to the axle extend cylinder.
   e. Remove retaining ring and axle cylinder pin at the rod end of the axle cylinder.
   f. Pull axle extend cylinder out from the rod end.
5. Remove mechanical axle stop.
6. Remove lower outer axle tube wear plate.
7. Slide the axle tube assembly out. Slide out the inner axle tube assembly first.

AXLE TUBE ASSEMBLY REPLACEMENT (CONTINUED)

To install rear drive axle tube assembly:

1. Install side outer axle tube wear plate to the outer axle tube assembly.
2. Slide outer axle tube assembly into position.
3. Slide inner axle tube assembly into position.
4. Install lower outer axle tube wear plate.
5. Install mechanical axle stop.
6. Install axle extend cylinder:
   a. Push base end of axle extend cylinder through the undercarriage weldment, being careful to align the cylinder to fit in the axle extend cylinder trunnion mounted retainer.
   b. Install cylinder pin and retaining ring at the rod end of the axle cylinder.
   c. Connect the hydraulic hoses to the cylinder.



Rear Drive Axle Tube Assembly Removal.

AXLE TUBE ASSEMBLY REPLACEMENT (CONTINUED)

d. Install axle stop bar:

NOTE: You will have to crawl under the undercarriage to install the axle stop bar.

1. Position axle stop bar to line up with the holes on the undercarriage weldment.

2. Install two capscrews and lockwashers and torque (standard torque for size and grade of capscrew).

e. Install axle extend cylinder trunnion mounted retainer:

NOTE: You will have to crawl under the undercarriage to install the axle extend cylinder trunnion mounted retainer.

1. Position retainer around the axle extend cylinder.

2. Install four cap screws to hold cylinder.

7. Install drive hub assembly on both sides.

a. Align the drive hub assembly (hydraulic motor with torque hub) with the axle tube assembly.

b. Install the eight capscrews with flat washers and torque.

c. Connect hydraulic hoses to the drive hub assembly and install hose carrier to the axle tube assembly.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

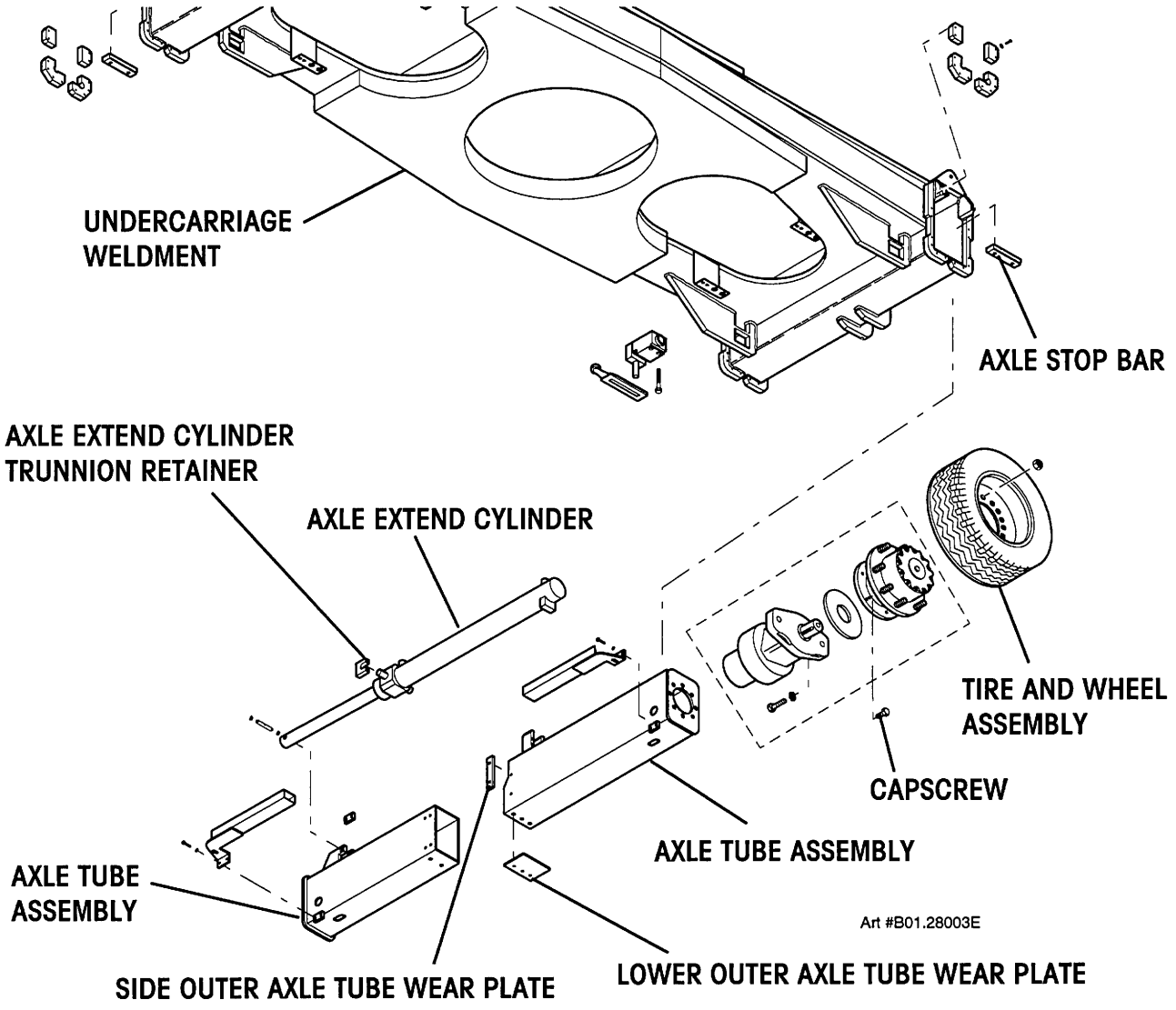
8. Install tire and wheel assembly:

a. Position tire and wheel assembly.

b. Install and torque lug nuts.

9. Lower the machine and remove the steer wheel chocks.

10. Bleed the system by cycling the axle extend cylinder at least three times.



Rear Drive Axle Tube Assembly Installation.

AXLE TUBE ASSEMBLY REPLACEMENT (CONTINUED)

To remove steer axle tube assembly:

1. Chock the rear drive wheels and raise the machine at the steer end.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

2. Remove tire and wheel assembly at each end:

   a. Loosen and remove the lug nuts.

   b. Pull off the tire and wheel assembly.

3. Disconnect the outer tie rod from the spindle and set it to the side.

   - Remove capscrew and locknut holding tie rod to the spindle.

4. Remove spindle assembly:

   NOTE: For four wheel drive remove the drive hub assembly before the spindle assembly is removed.

   Four Wheel Drive Machine only: Remove drive hub assembly at each end:

⚠ CAUTION

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

   1. Disconnect hoses to the drive hub assembly. At this point remove the hose carrier from the axle tube assembly and lay aside the hoses and hose carrier.

   2. Loosen and remove eight capscrews and flat washers on the drive hub assembly.

   3. Slide off hydraulic motor with torque hub as one unit.

   4. Now remove spindle assembly.

   a. Remove retaining ring.

   b. Remove capscrew, thrust washer and locknut.

   c. Remove spindle pin holding the spindle assembly.

5. Remove axle extend cylinder:

   a. Remove axle extend cylinder trunnion mounted retainer.

      1. Loosen and remove four capscrews holding the trunnion mounted retainer.

      NOTE: You will have to crawl under the undercarriage to access the four capscrews and retainer.

      2. Remove the axle extend cylinder trunnion mounted retainer.

   b. Remove axle stop bar.

      1. Remove two capscrews and lockwashers.

      2. Remove axle stop bar.

      NOTE: You will have to crawl under the undercarriage to access and remove the axle stop bar.

   c. Retract the axle extend cylinder (if not already retracted).

AXLE TUBE ASSEMBLY REPLACEMENT (CONTINUED)

⚠ CAUTION

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

d. Disconnect hoses to the axle extend cylinder.

e. Remove retaining ring and axle cylinder pin at the rod end of the axle extend cylinder.

f. Pull axle extend cylinder out from the rod end.

6. Remove mechanical axle stop.

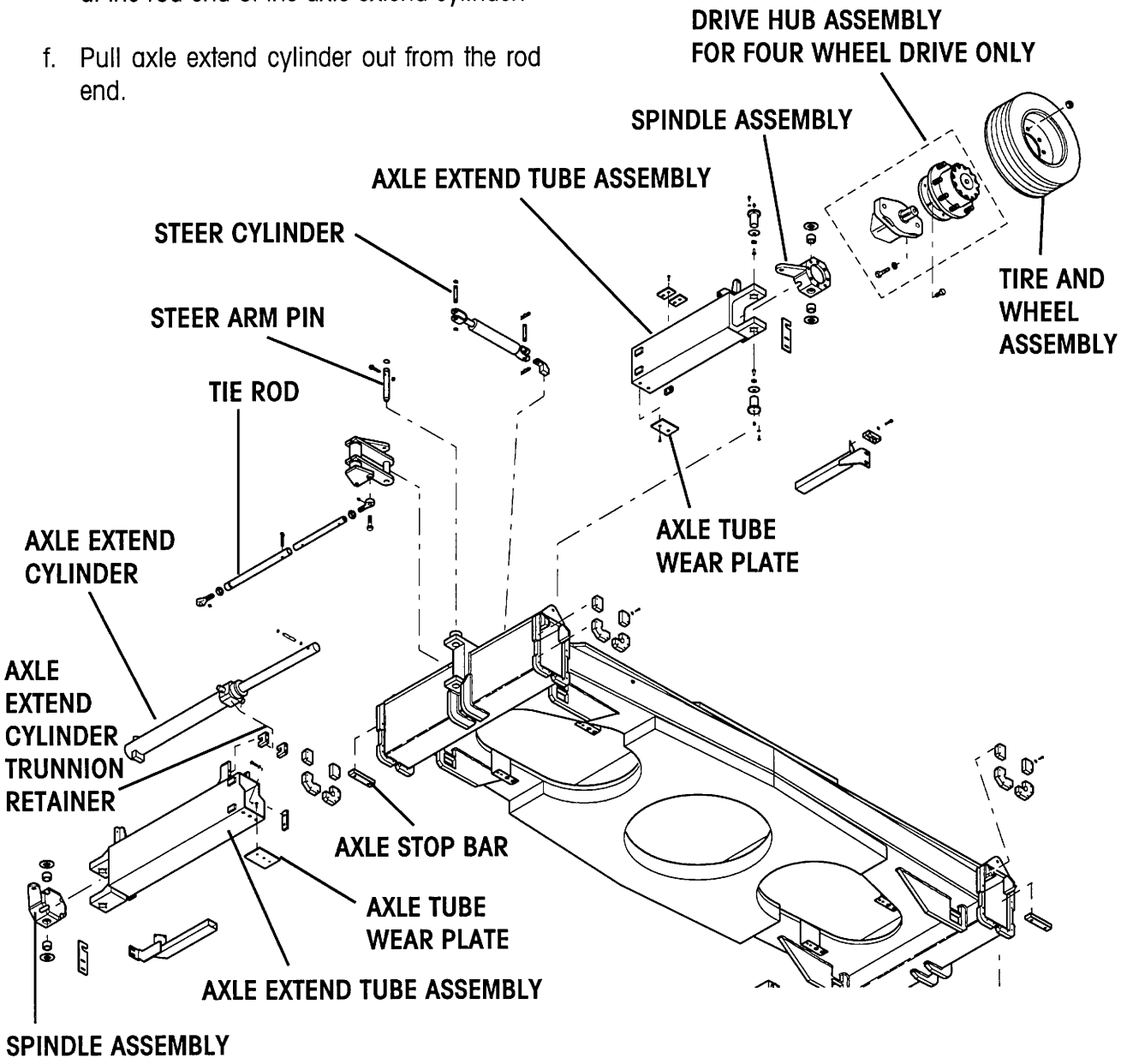
7. Remove lower outer axle tube wear plate.

8. Slide the axle tube assembly out. Slide out the inner axle tube assembly first.

To install steer axle tube assembly:

1. Install side outer axle tube wear plate to the outer axle tube assembly.

2. Slide outer axle tube assembly into position.



Steer Axle Tube Assembly Replacement.

AXLE TUBE ASSEMBLY REPLACEMENT (CONTINUED)

3. Slide inner axle tube assembly into position.

4. Install lower outer axle tube wear plate.

5. Install mechanical axle stop.

6. Install axle extend cylinder:

   a. Push base end of axle extend cylinder through the undercarriage weldment, being careful to align the cylinder to fit in the axle extend cylinder trunnion mounted retainer.

   b. Install cylinder pin and retaining ring at the rod end of the axle extend cylinder.

   c. Connect the hydraulic hoses to the cylinder.

   d. Install axle stop bar:

   NOTE: You will have to crawl under the undercarriage to install the axle stop bar.

      1. Position axle stap bar to line up with the holes on the undercarriage weldment.

      2. Install two capscrews and lockwashers and torque (standard torque for size and grade of capscrew).

   e. Install axle extend cylinder trunnion mounted retainer:

   NOTE: You will have to crawl under the undercarriage to install the axle extend cylinder trunnion mounted retainer.

      1. Position retainer around the axle extend cylinder.

      2. Install four cap screws to hold cylinder.

7. Install spindle assembly:

   a. Position spindle assembly and install spindle pin.

   b. Install capscrew, thrust washer and locknut and torque (standard torque for size and grade of capscrew).

   c. Install retaining ring on spindle pin.

   d. Position tie rod on spindle assembly and install capscrew and locknut.

   NOTE: For four wheel drive, install the drive hub assembly after the spindle assembly is install.

   Four Wheel Drive Machine only: Install drive hub assembly at each end:

   a. Align the drive hub assembly (hydraulic motor with torque hub) with the axle tube assembly.

   b. Install the eight capscrews with flat washers and torque.

   c. Connect hydraulic hoses to the drive hub assembly and install hose carrier to the axle tube assembly.

⚠WARNING

LIQUID BALLASTED OR FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

8. Install tire and wheel assembly at each end:

   a. Position tire and wheel assembly on spindle assembly.

   b. Torque wheel lug nuts (see Machine Specifications).

9. Lower the machine and remove wheel chocks.

SUPERSTRUCTURE

The superstucture 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.

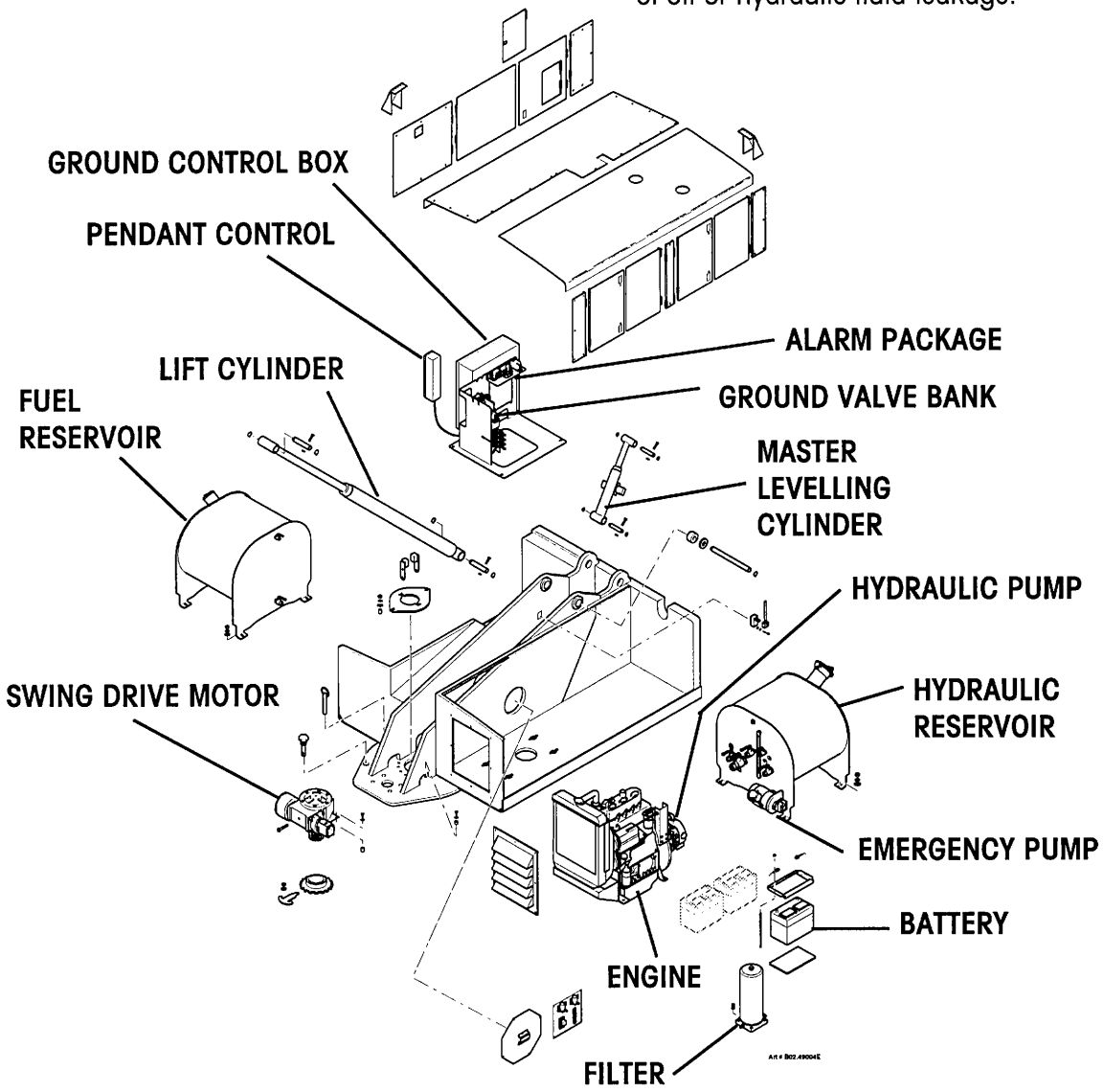
HOSES AND CABLES

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

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.



Components Found on the Superstructure.

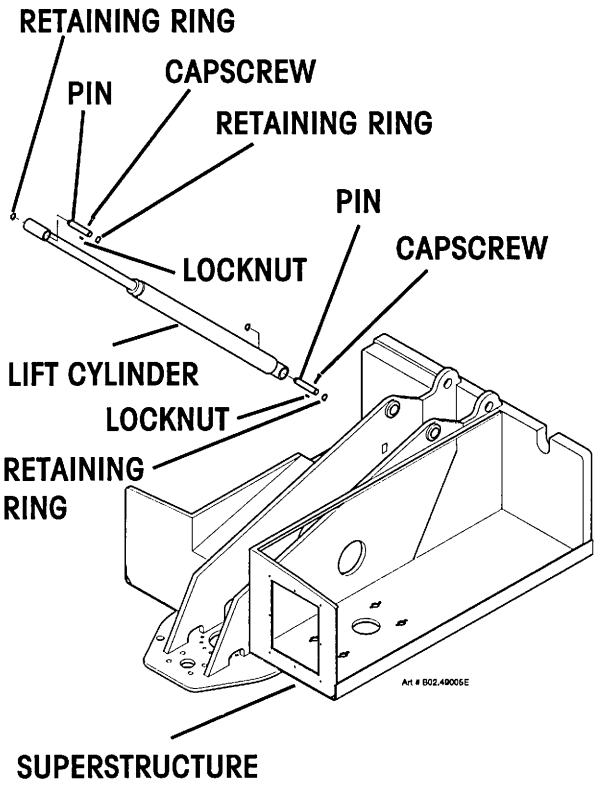
BOOM

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

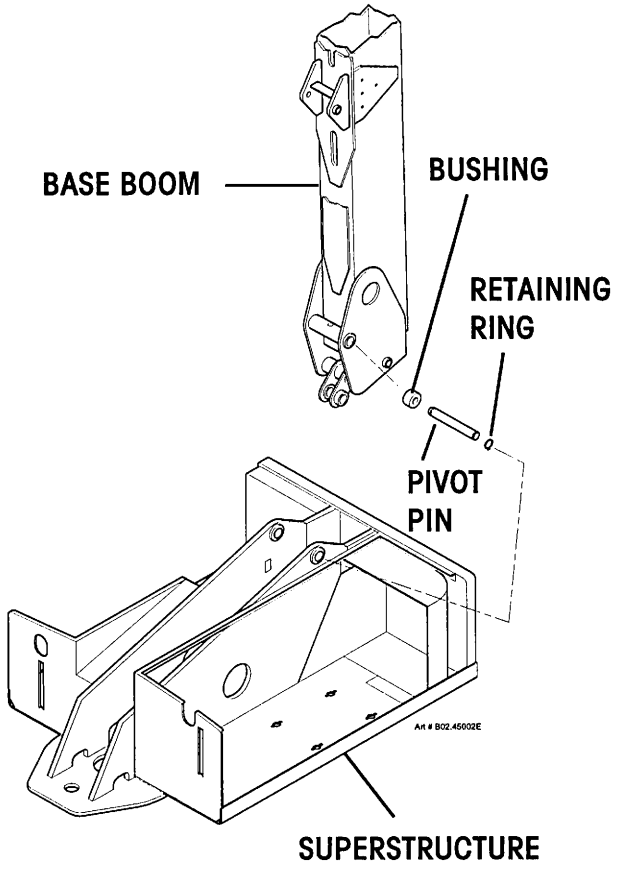
BOOM PIVOT PIN AND BUSHING REPLACEMENT

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.

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



Lift Cylinder Pivot Pin.



Boom Pin and Bushing.

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 locknut and capscrew for tightness. The cylinder and counterbalance valve should be inspected for fluid leakage, damage and security.

Lift Cylinder Pivot Pin Replacement

SUPPORT THE BOOM. Operate the boom lift control to release hydraulic pressure and remove any load on the lift cylinder. Remove the retaining rings. Remove the pin locknut and capscrew. SUPPORT THE LIFT CYLINDER and remove the pin.

Install new pin, locknut, capscrew and retaining rings. Apply grease through the grease fittings.

Lift Cylinder Seal Replacement

SUPPORT THE BOOM. Operate the boom lift control to release hydraulic pressure and remove any load in the lift cylinder circuit. Clean the end of the cylinder, and loosen the cylinder end cap by several turns.

Remove the rod end pivot pin, and support the cylinder barrel. Loosen the end cap completely, and withdraw it carefully with the piston rod. TAKE CARE NOT TO DAMAGE THE ROD SURFACE AND GUARD AGAINST DIRT ENTERING THE SYSTEM. Remove the rod and piston assembly.

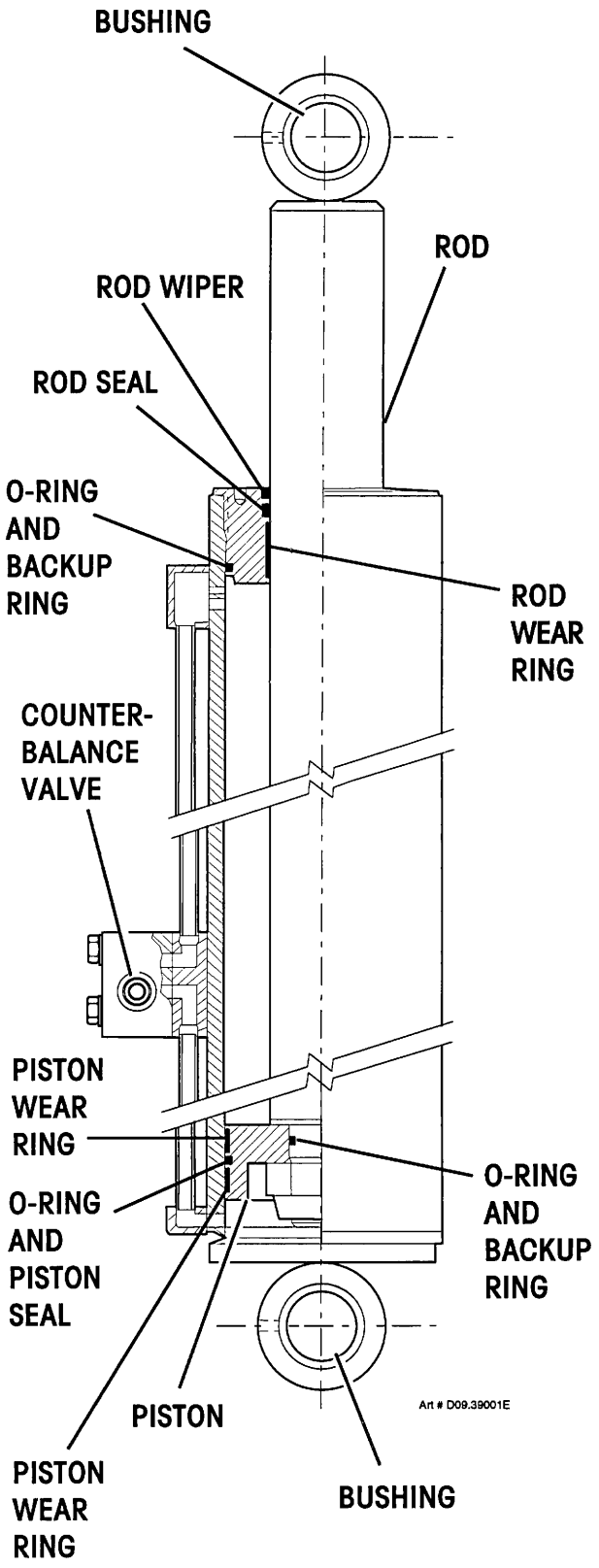
> **NOTE:** It is recommended that the backup rings be replaced when seals are changed.

Replace the seals and reassemble the lift cylinder, again AVOIDING DIRT AND ROD DAMAGE. Tighten the end cap. Install rod end pin.

Check Counterbalance Valves

Stop the engine, and activate the boom lift control lever several times to dissipate residual pressure. If the cylinder subsequently begins to move, the counterbalance valve is faulty and the cartridge should be replaced.

> **NOTE:** The counterbalance valve is preset at the factory and is not adjustable.



Lift Cylinder.

THREE PIECE BOOM

Boom Disassembly

NOTE: This procedure requires two people. Do not attempt the procedure alone.

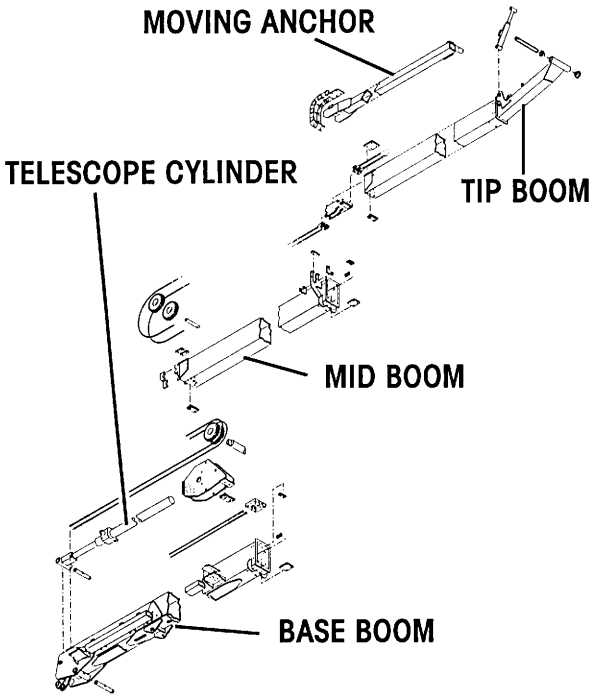
1. Retract the boom and move it to the horizontal position centered between the drive wheels.

NOTE: Boom sections must be fully retracted to remove the telescope cylinder.

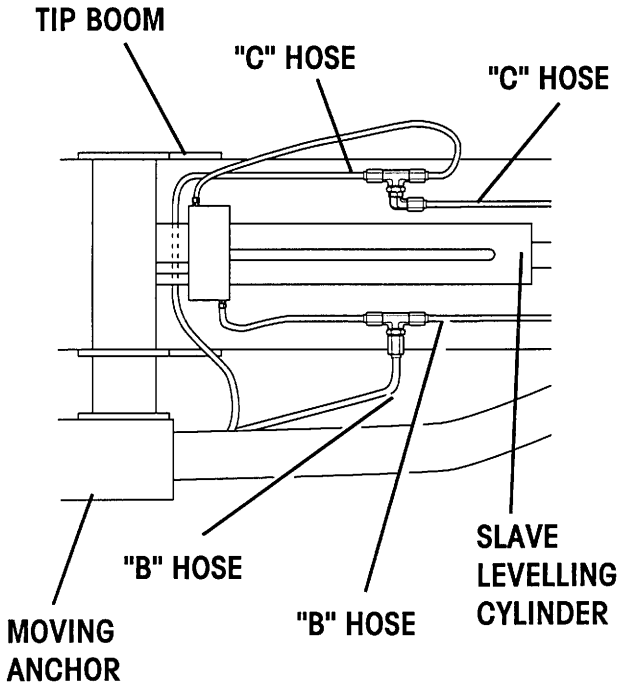
2. To remove the platform:

⚠ CAUTION

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



Three Piece Boom.



Hose Disconnect Locations.

A. Disconnect the two hoses marked "B" from the tee. Plug the 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.

C. Remove the hoses from the hose clamp.

Boom Disassembly (Continued)

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

NOTE: Slave levelling 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.

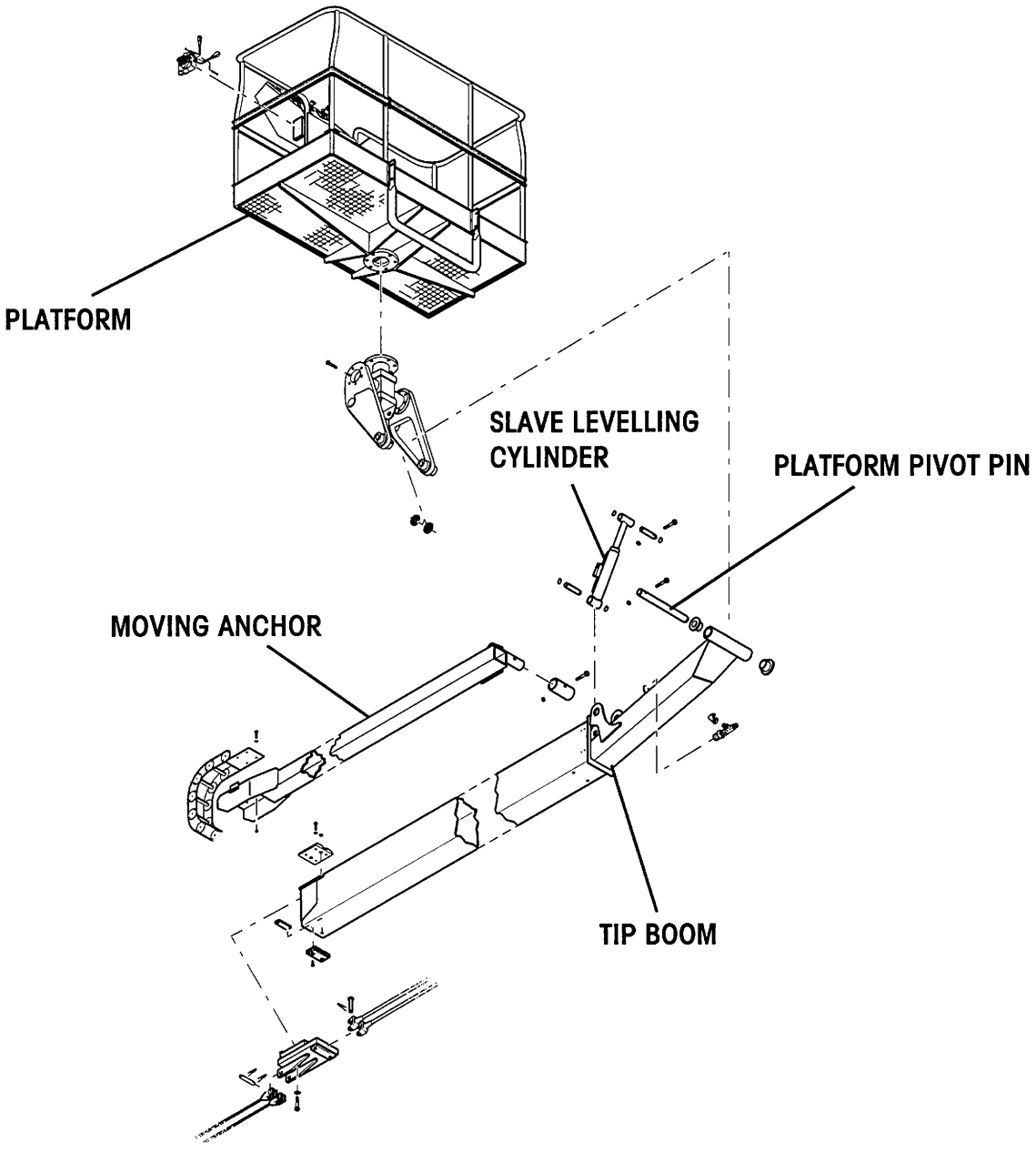
E. Remove the hex head capscrew and locknut on each side of the platform pivot pin.

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.



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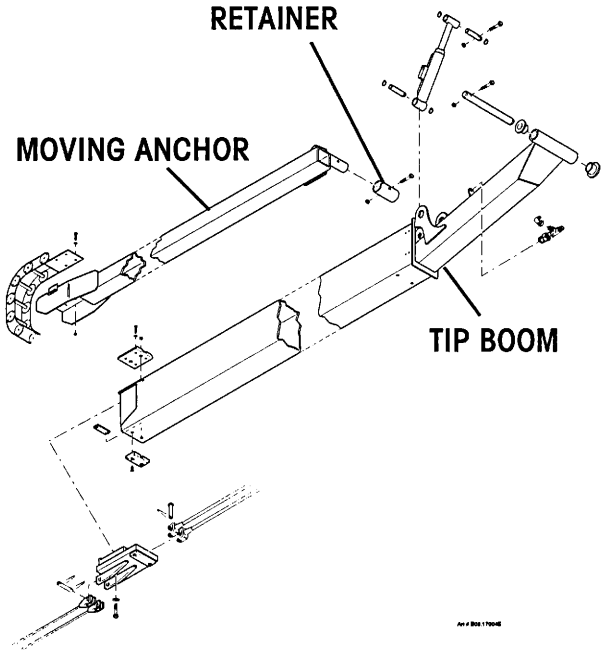
Platform Removal.

Boom Disassembly (Continued)

3. Release the moving anchor from the tip boom. Remove the capscrew and nut holding the retainer to the moving anchor and the tip boom. Slide the moving anchor off of the guide. Support the moving anchor.

⚠ CAUTION

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



Moving Anchor Removal.

4. Remove mid and tip boom sections and telescope cylinder, as one unit, from the base boom assembly. This will require disconnecting:

⚠ CAUTION

Support the base boom with a boom stand or similar rigid platform.

A. The hoses to the rod end of the telescope cylinder.

B. The telescope cylinder rod end pin.

C. The extend ropes to the front (lower) end of the base boom section.

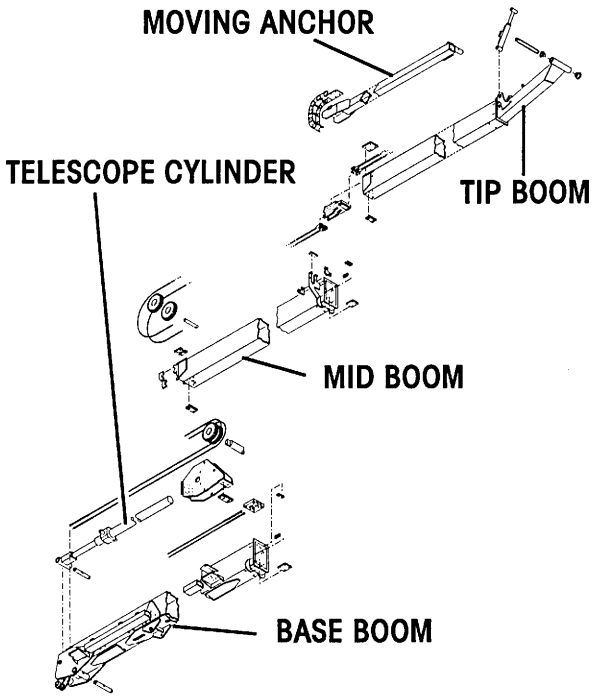
D. The bottom boom wear pad and tapped block from the front (lower) end of the mid boom section.

E. All wear pads from the upper (rear) end of the base boom section.

F. The retract wire rope anchor at the top of the base boom section upper (rear) end.

5. Use a crane to slide out the mid and tip booms, as one unit. Place mid and tip boom assembly on low boom stands or similar rigid platforms.

6. Remove the split half trunnion brackets with wire ropes which attach the telescope cylinder housing (case) to the mid boom section. Hold cylinder and booms with a crane and also remove wear pad and stop plate on bottom of mid boom and tip boom. Lower cylinder and booms with a crane.



Mid and Tip Boom Removal.

Boom Disassembly (Continued)

7. Remove the bolted bracket and wear pad anchoring the ends of the retract and extend ropes on the lower (front) end of the tip boom section.

8. Lift and slide the telescope cylinder out the lower end of the mid boom section.

9. Remove all of the rope guides on the housing of the telescope cylinder to allow the removal of the extend and retract wire ropes from the cylinder.

10. Remove the wire ropes.

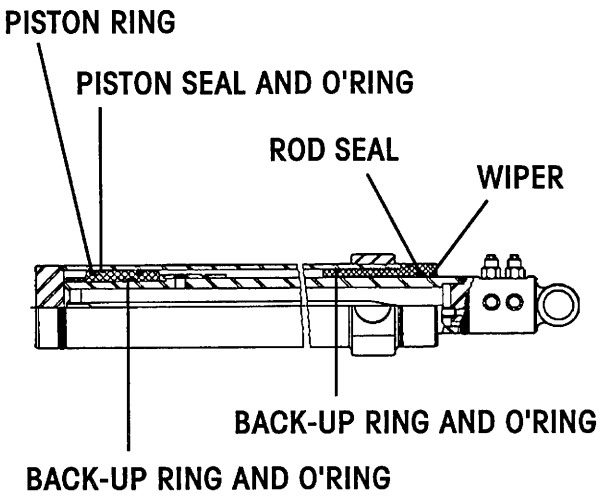
Cylinder is now ready for inspection and maintenance.

Telescope Cylinder Seal Replacement

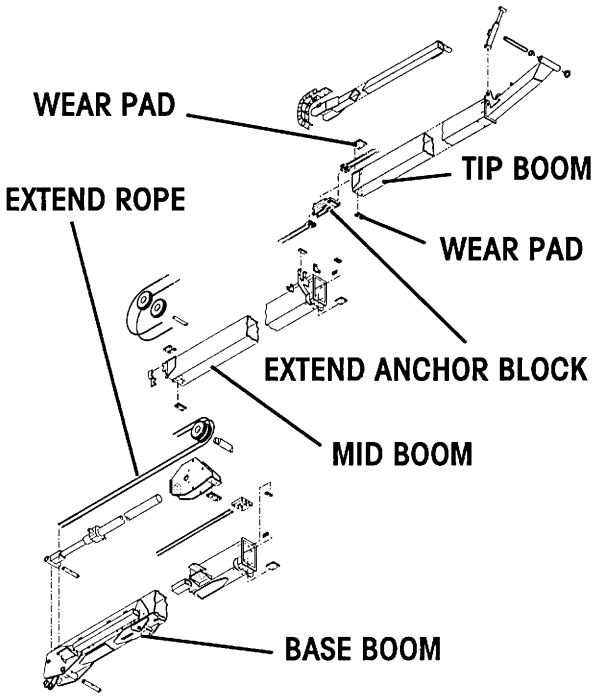
Remove the end cap from the cylinder. Pull the cap and rod straight out of the cylinder barrel. Remove the nut from the end of the rod. Slip off the collar. Examine the rod and seals for signs of damage or wear.

Remove and replace the old seals.

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



Telescope Cylinder Seals and Rings.



Extend Wire Rope Attachment.

Boom Assembly

To install the wire rope on the telescope cylinder:

1. Place cylinder in a horizontal position.

2. Stretch out the wire ropes.

3. Route threaded end of the extend wire ropes around the 12" sheaves (from top down) on cylinder housing.

   NOTE: Pull until both ends are even at the cylinder caps.

   - Cylinder must remain in horizontal position.

4. Attach clevis end of extend ropes to extend wire rope anchor block. This will leave threaded ends on the floor.

5. Use wire ties to hold the extend wire ropes that are not attached to the extend wire rope anchor in position for sliding boom into the base boom.

Boom Assembly (Continued)

6. Replace the anchor wear pad on top of the tip boom.

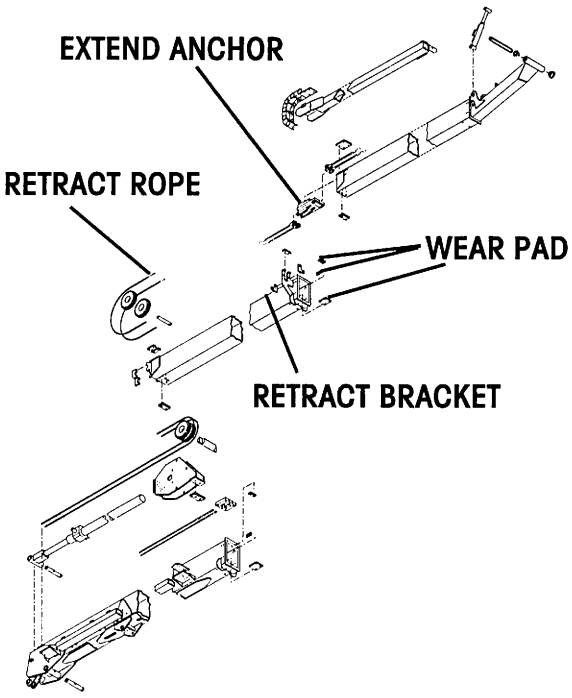
   NOTE: The following procedure requires two people. Do not attempt the procedure alone.

7. Insert telescope cylinder into the tip and mid boom, removing each wire tie as inserting.

   NOTE: Before inserting the cylinder completely, attach retract wire ropes to extend anchor block.

8. Bolt the extend wire rope anchor and wear pad to the tip boom.

9. Lift telescope cylinder with a crane high enough to replace wear pad mounting plate and wear pad.



Retract Wire Rope Attachment.

10. Mount telescope cylinder to the mid boom.

11. Route the retract wire rope from the extend wire rope anchor around the retract sheaves and pull down to retract wire rope bracket which lies on top of the mid boom, then connect threaded ends to retract bracket.

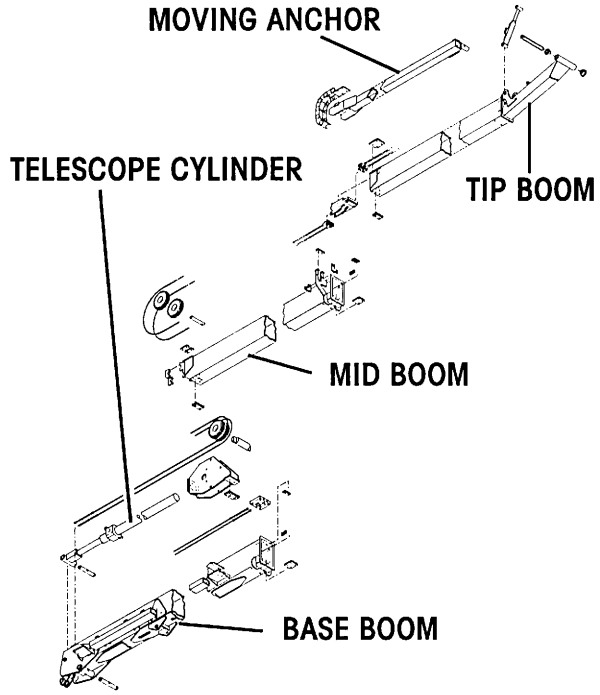
12. Use a crane to slide the mid and tip boom and telescope cylinder into the base boom.

13. Install boom and cylinder assembly into the base boom. This will require connecting:

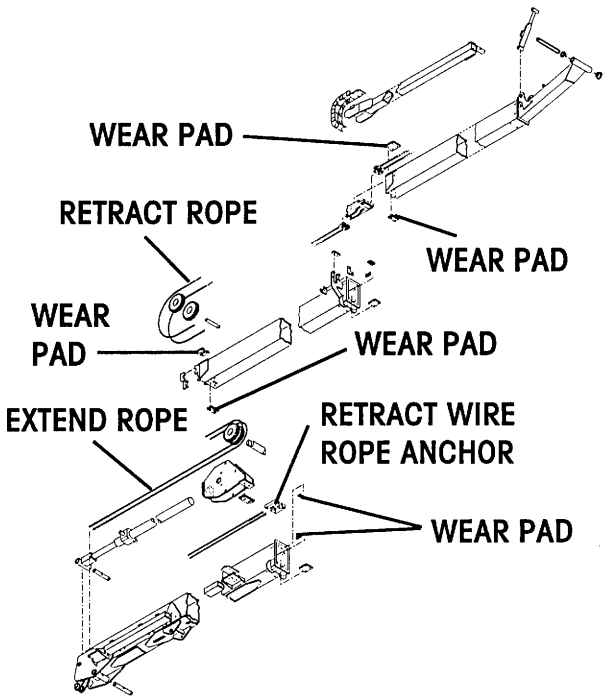
    A. The retract wire rope anchor at the top of the base boom section upper (rear) end.

    B. All wear pads from the upper (rear) end of the base boom section.

    C. The bottom boom wear pad and tapped block from the front (lower) end of the mid boom section.



Telescope Cylinder Installation.



Boom and Cylinder Installation.

Boom Assembly (Continued)

D. The extend ropes to the front (lower) end of the base boom section.

E. The telescope cylinder rod end pin.

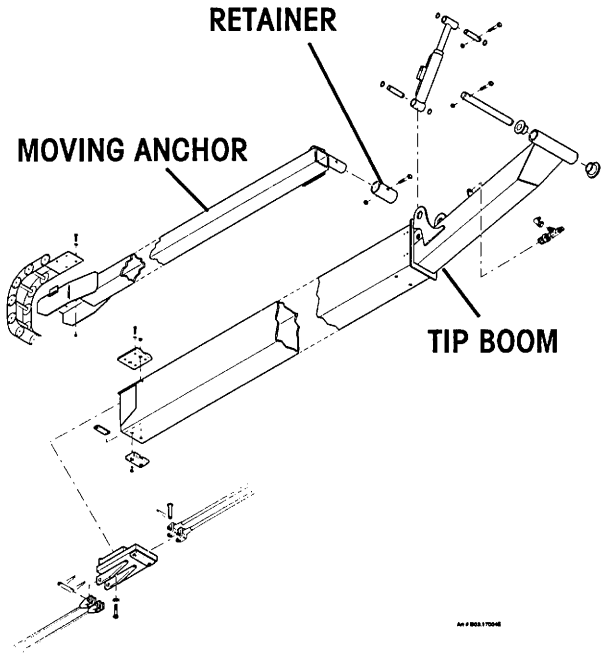
F. The hoses to the rod end of the telescope cylinder.

14. 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.



Moving Anchor Installation.

Boom Assembly (Continued)

15. 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.

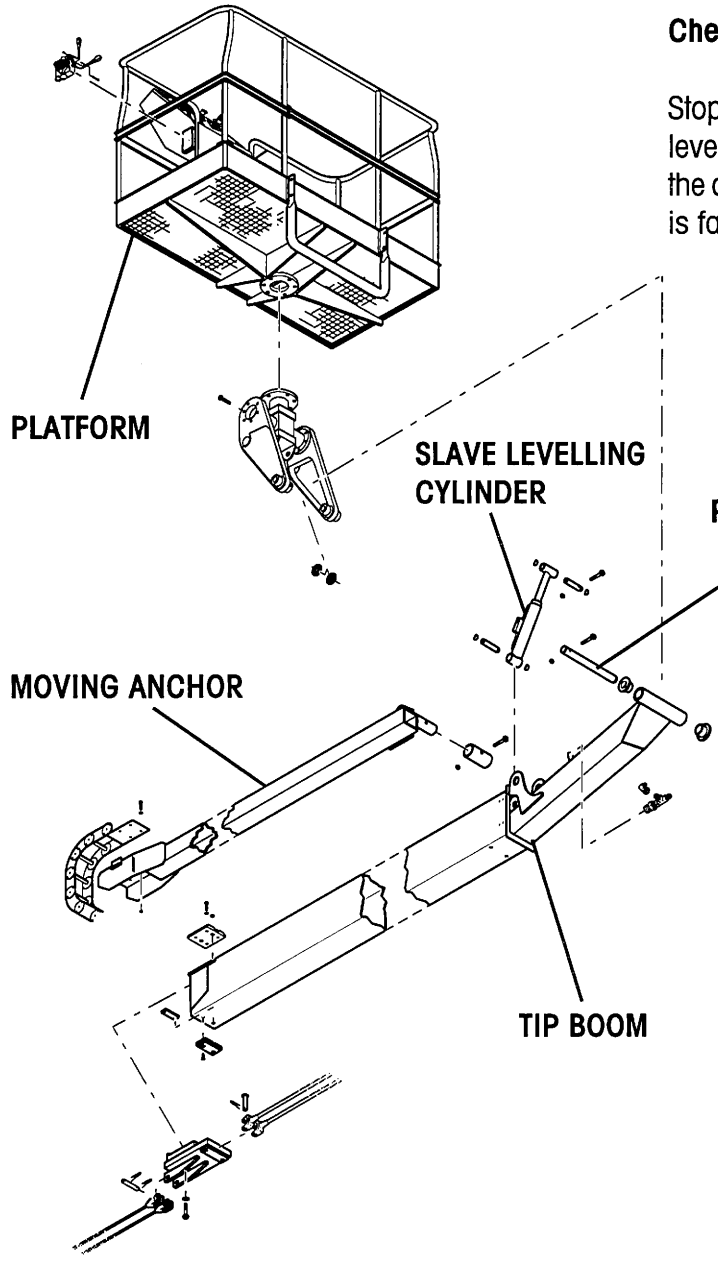
16. Bleed the system by cycling the telescope cylinder at least three times.

17. Test boom operation and adjust the wire rope if necessary (see Boom Wire Rope).

Check Counterbalance Valves

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

NOTE: The counterbalance valve is preset at the factory and is not adjustable.



Platform Installation Part # B03.17006E

Boom Wire Rope

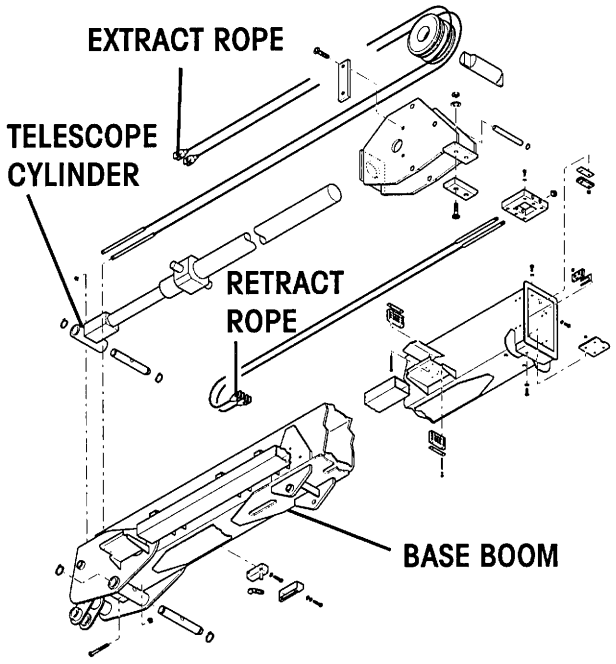
On three piece booms there are two extend wire ropes and two retract wire ropes.

Boom Wire Rope Adjustment

Attach the extend and retract ropes to the base boom and tighten the adjusting nuts to remove all visible slack from the ropes. With the telescope cylinder fully retracted, the boom sections should be positioned relative to each other.

The position of the tip boom section relative to the mid boom is dependent on the adjustment of the extend and retract ropes. To extend the tip boom, tighten the extend ropes. To retract the tip boom, tighten the retract ropes.

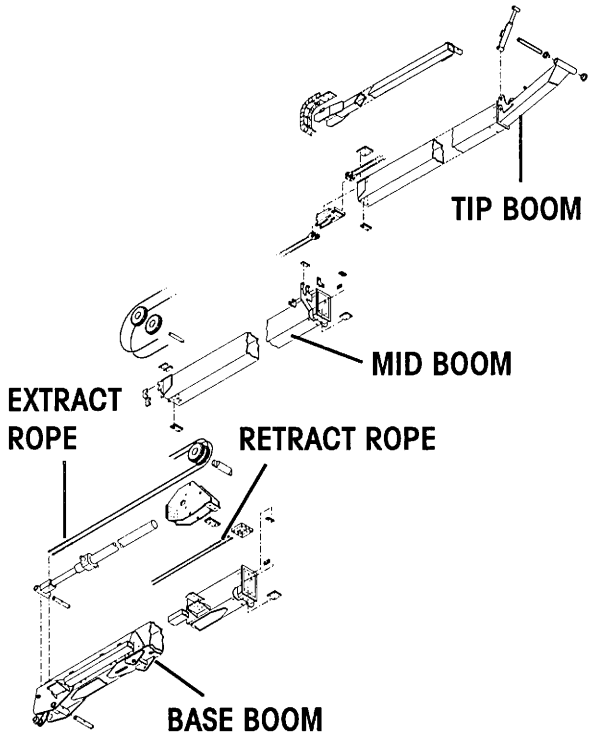
NOTE: Do not allow the ends of the wire ropes to twist while making these initial adjustments.



Wire Rope Adjustment, Base Boom.

Extend the tip boom approximately 2" (50 mm), which will cause increased slack in the retract ropes. Using a wedge or block of wood, lock the tip boom in this slightly extended position. Tighten the retract ropes equally to remove any slack in the ropes.

With the tip boom section still blocked, try to retract the boom. This will cause increased slack in the extend ropes. Tighten the extend ropes equally to remove any slack in the ropes.



Wire Rope Adjustment, Tip Boom.

Remove the wedge or wood block and retract the boom. The tip boom section should be positioned relative to the mid boom section. If not, repeat the above wire rope adjustment procedure.

Fully extend the boom, then retract about 2" (50 mm) and stop. Look inside the boom to determine the amount of slack in the extend ropes. With the boom in this position, the extend ropes should be tight enough so they do not lay loosely on the bottom inside surface of the boom. If the extend ropes have too much slack, tighten the adjusting nuts as necessary to insure both extend ropes are tensioned equally.

Boom Wire Rope Replacement

Wire rope replacement is recommended after every 5,000 hours of operation.

To remove the wire rope from the boom:

NOTE: This procedure requires two people. Do not attempt the procedure alone.

1. Retract the boom and move it to the horizontal position centered between the drive wheels.

NOTE: Boom sections must be fully retracted to replace the wire ropes.

2. To remove the platform:

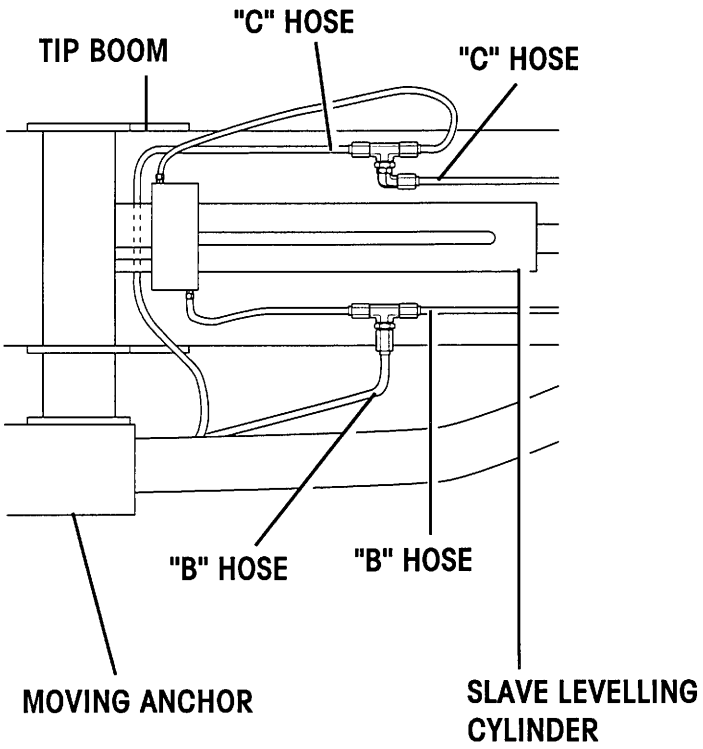
⚠ CAUTION

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 the 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.

C. Remove the hoses from the hose clamp.



Hose Disconnect Locations.

Boom Wire Rope Replacement (Continued)

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

NOTE: Slave levelling 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.

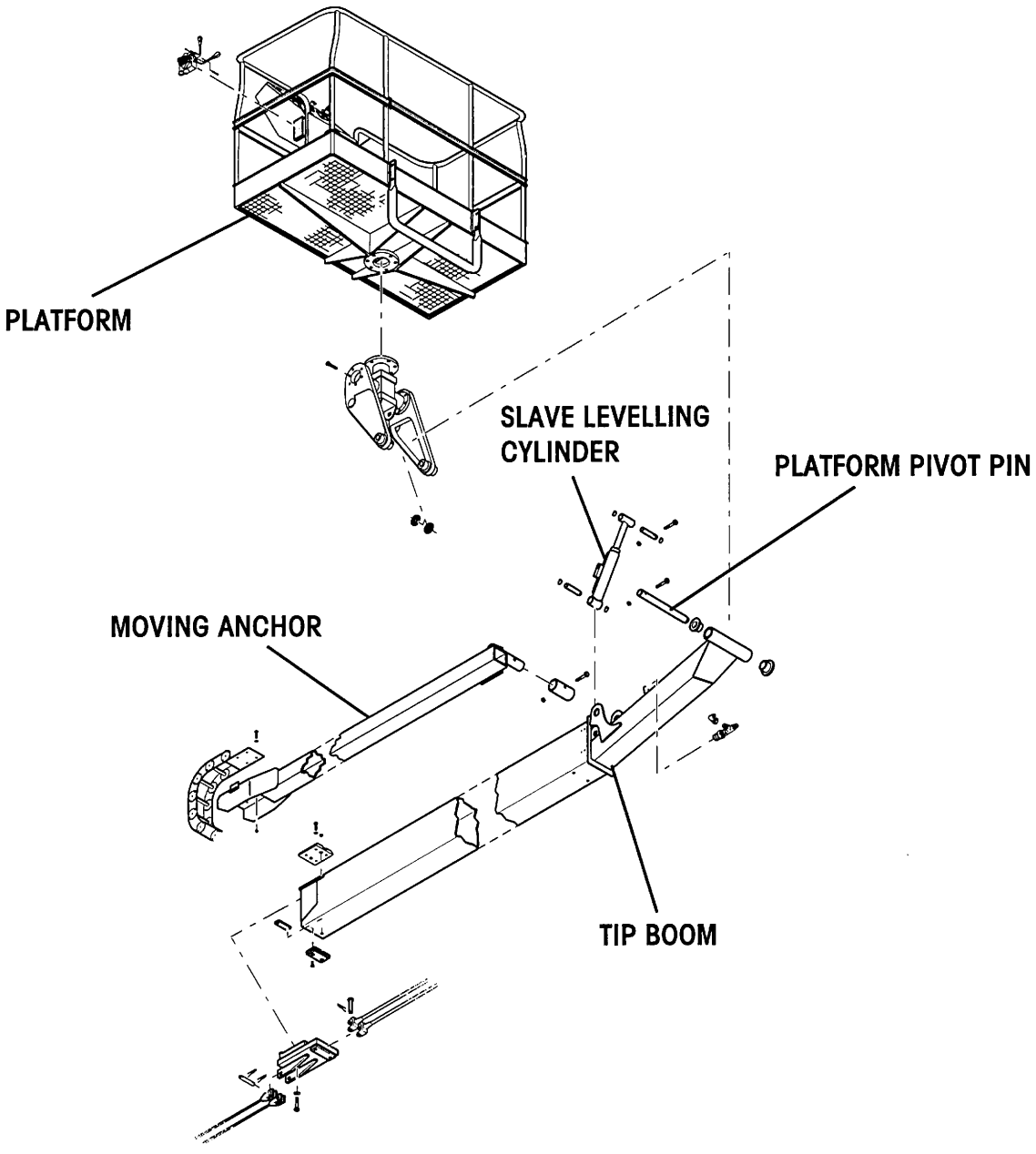
E. Remove the hex head capscrew and locknut on each side of the platform pivot pin.

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.



Art # B03.17006E

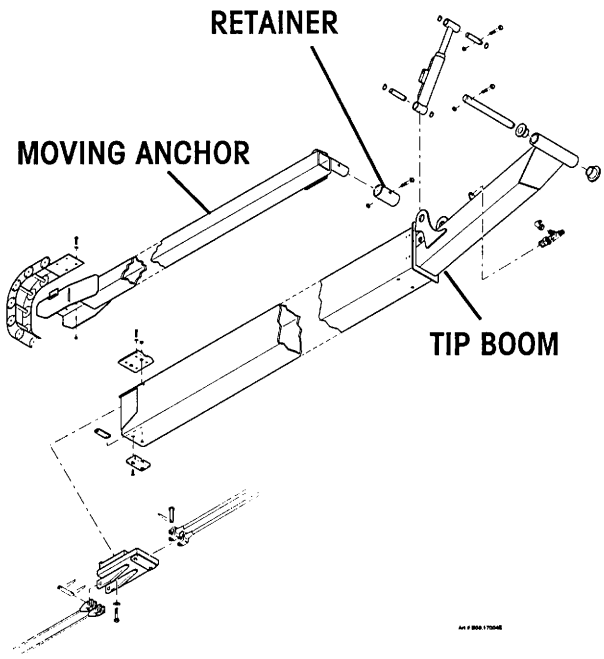
Platform Removal.

Boom Wire Rope Replacement (Continued)

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.



Moving Anchor Removal.

3. Remove mid and tip boom sections and telescope cylinder, as one unit from the base boom assembly. This will require disconnecting:

⚠ CAUTION

Support the base boom with a boom stand or similar rigid platform.

A. Hoses to the rod end of telescope cylinder.

B. The telescope cylinder rod end pin.

C. The extend ropes to the front (lower) end of the base boom section.

D. The bottom boom wear pad and tapped block from the front (lower) end of the mid boom section.

E. All wear pads from the upper (rear) end of the base boom section.

F. The retract wire rope anchor at the top of the base boom section upper (rear) end.

G. Use a crane to slide out the mid and tip booms, as one unit. Place mid and tip boom assembly on low boom stands or similar rigid platforms.

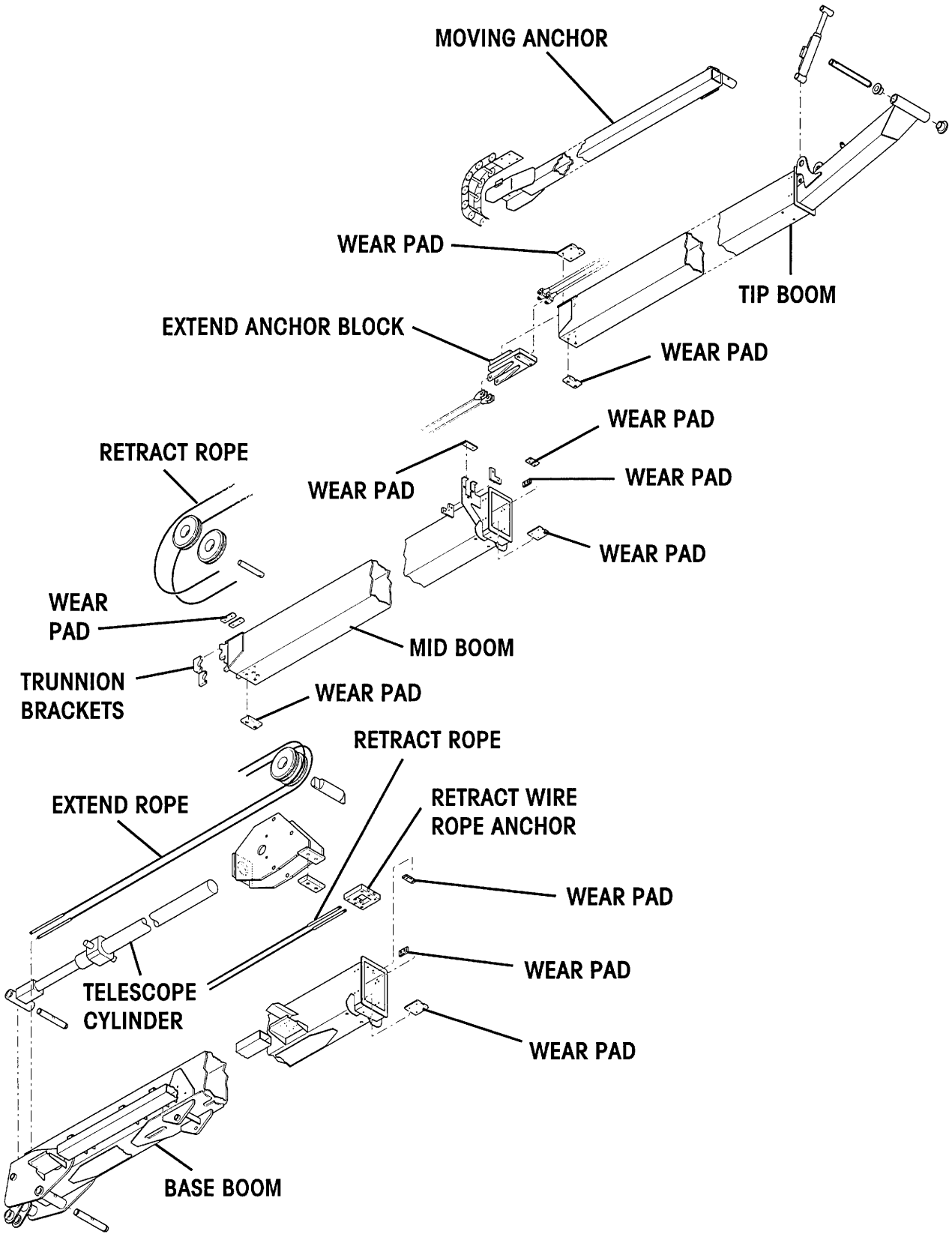
4. Remove the split half trunnion brackets with wire ropes which attach the telescope cylinder housing (case) to the mid boom section. Hold cylinder and booms with a crane and also remove wear pad and stop plate on bottom of mid boom and tip boom. Lower cylinder and booms with a crane.

5. Remove the bolted bracket and wear pad anchoring the ends of the retract and extend ropes on the lower (front) end of the tip boom section.

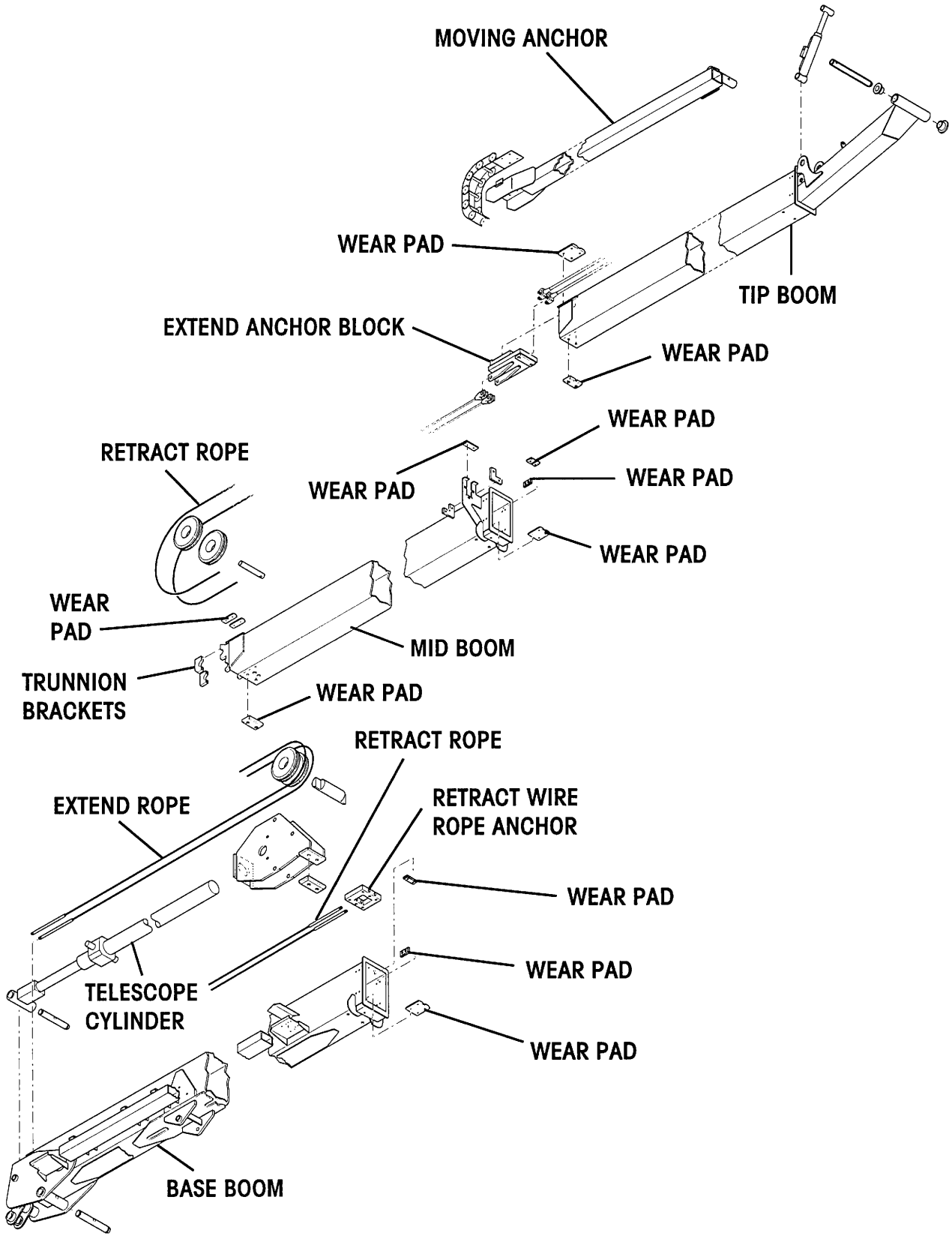
6. Lift and slide the telescope cylinder out the lower end of the mid boom section.

7. Remove all of the rope guides on the housing of the telescope cylinder to allow the removal of the extend and retract wire ropes from the cylinder.

8. Remove the wire ropes.



Wire Rope Removal.



Wire Rope Installation on Telescope Cylinder.

Boom Wire Rope Replacement (Continued)

To install the wire rope on the telescope cylinder:

1. Place cylinder in a horizontal position.

2. Stretch out the replacement ropes and measure the free length of each rope.

   A. Extend ropes should be 5/8" (16 mm) in diameter and 705" (17.907 M) long.

   B. Retract ropes should be 3/8" (10 mm) in diameter and 411" (10.439 M) long.

3. Lubricate all of the wire ropes (Chain and Cable Fluid Lubricant #135 35 or equivalent).

4. Route threaded end of the extend wire ropes around the 12" sheaves (from top down) on cylinder housing.

   NOTE: Pull until both ends are even at the cylinder caps.

   - Cylinder must remain in a horizontal position.

5. Attach clevis end of extend ropes to extend wire rope anchor block. This will leave threaded ends on the floor.

6. Use wire ties to hold the extend wire ropes that are not attached to the extend wire rope anchor in position for sliding boom into the base boom.

7. Replace the anchor wear pad on top of the tip boom.

   NOTE: The following procedure requires two people. Do not attempt the procedure alone.

8. Insert telescope cylinder into the tip and mid boom, removing each wire tie as inserting.

   NOTE: Before inserting the cylinder completely, attach retract wire ropes to extend anchor block.

9. Bolt the extend wire rope anchor and wear pad to the tip boom.

10. Lift cylinder with a crane high enough to replace wear pad mounting plate and wear pad.

11. Mount telescope cylinder to the mid boom.

12. Route the retract wire rope from the extend wire rope anchor around the retract sheaves and pull down to retract wire rope bracket which lies on top of the mid boom, then connect threaded ends to retract bracket.

13. Use a crane to slide the mid and tip boom and telescope cylinder into the base boom.

14. Install boom and cylinder assembly into the base boom. This will require connecting:

   A. The retract wire rope anchor at the top of the base boom section upper (rear) end.

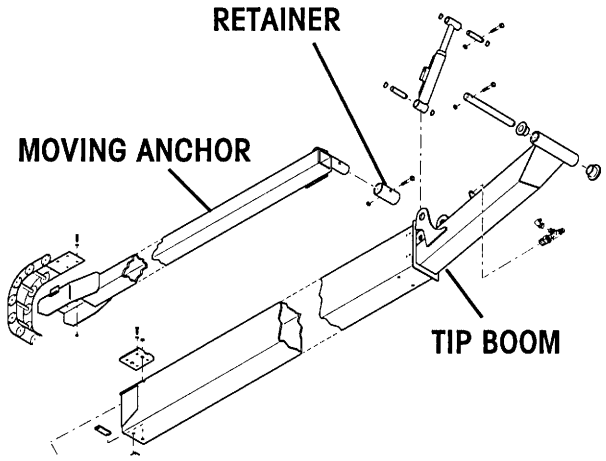
   B. All wear pads from the upper (rear) end of the base boom section.

   C. The bottom boom wear pad and tapped block from the front (lower) end of the mid boom section.

   D. The extend ropes to the front (lower) end of the base boom section.

   E. The telescope cylinder rod end pin.

   G. The hoses to the rod end of the telescope cylinder.



Moving Anchor Installation.

Boom Wire Rope Replacement (Continued)

15. To install moving anchor:

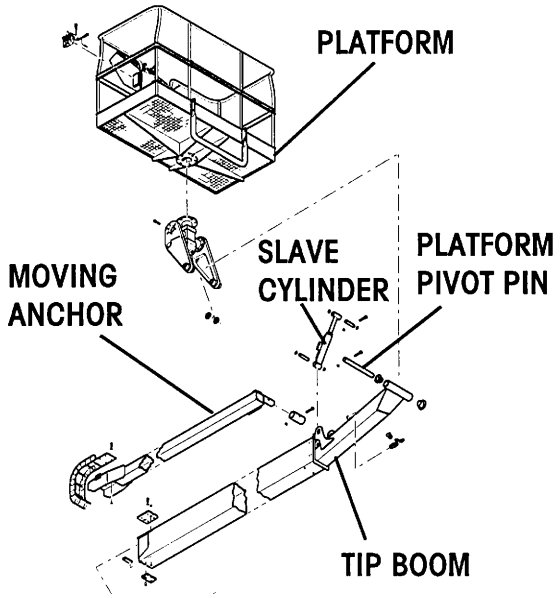
    A. Slide the moving anchor with platform attached back on the moving anchor guide.

    B. Install moving anchor retainer.

    C. Install capscrew and nut holding the retainer.

16. To install platform:

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



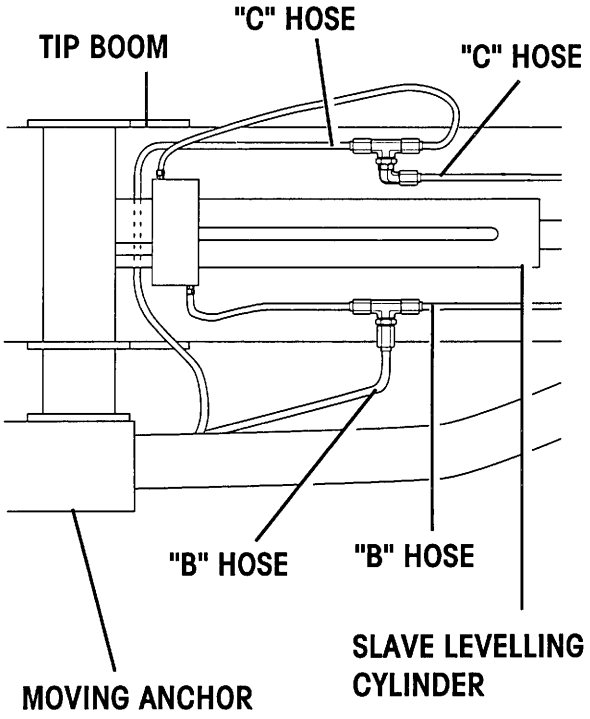
Platform Installation.

    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.



Hose Disconnect Locations.

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

18. Test boom operation and adjust the wire rope if necessary (see Boom Wire Rope).

FOUR PIECE BOOM

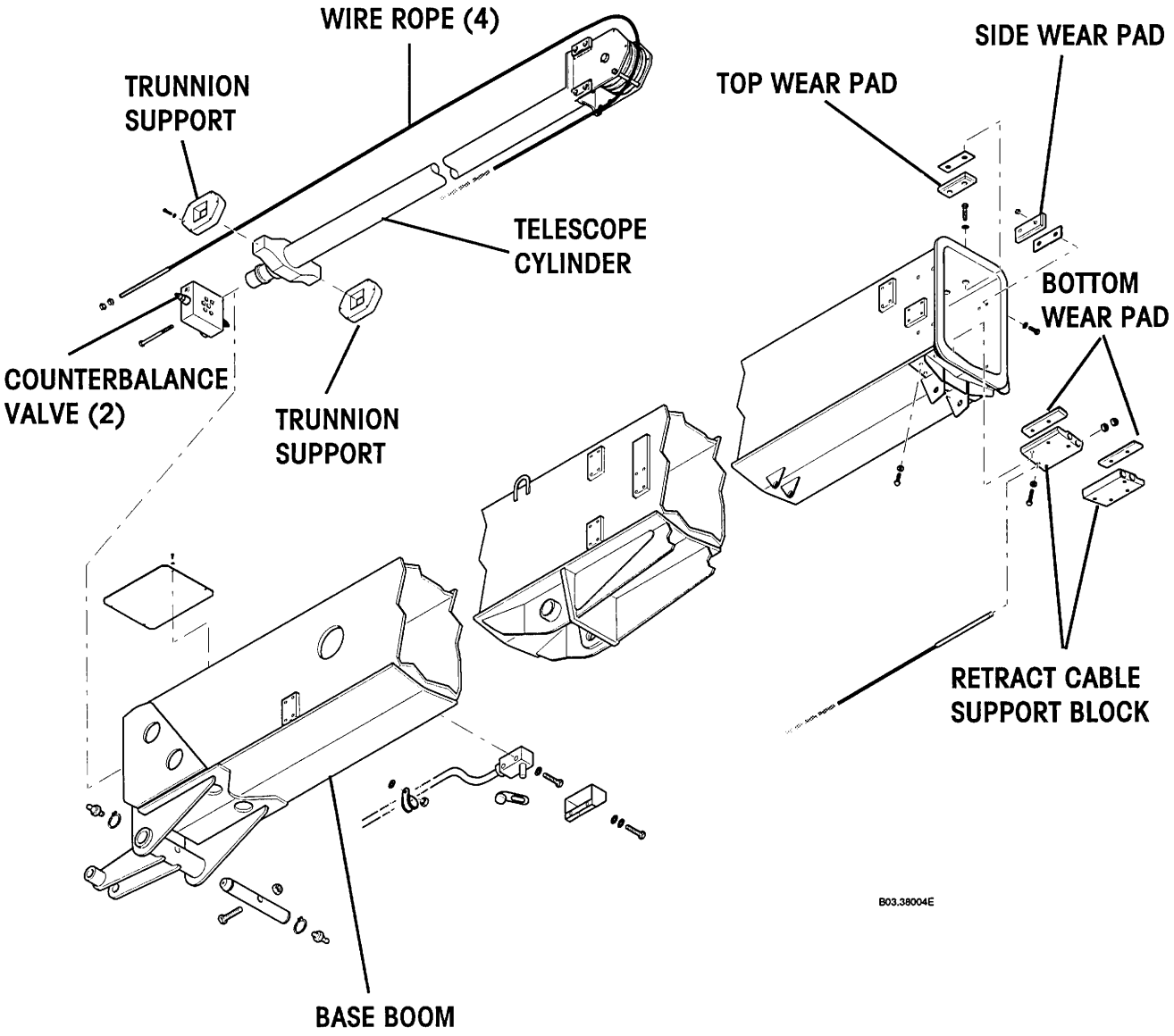
Boom Disassembly

NOTE: This procedure requires two people. Do not attempt the procedure alone.

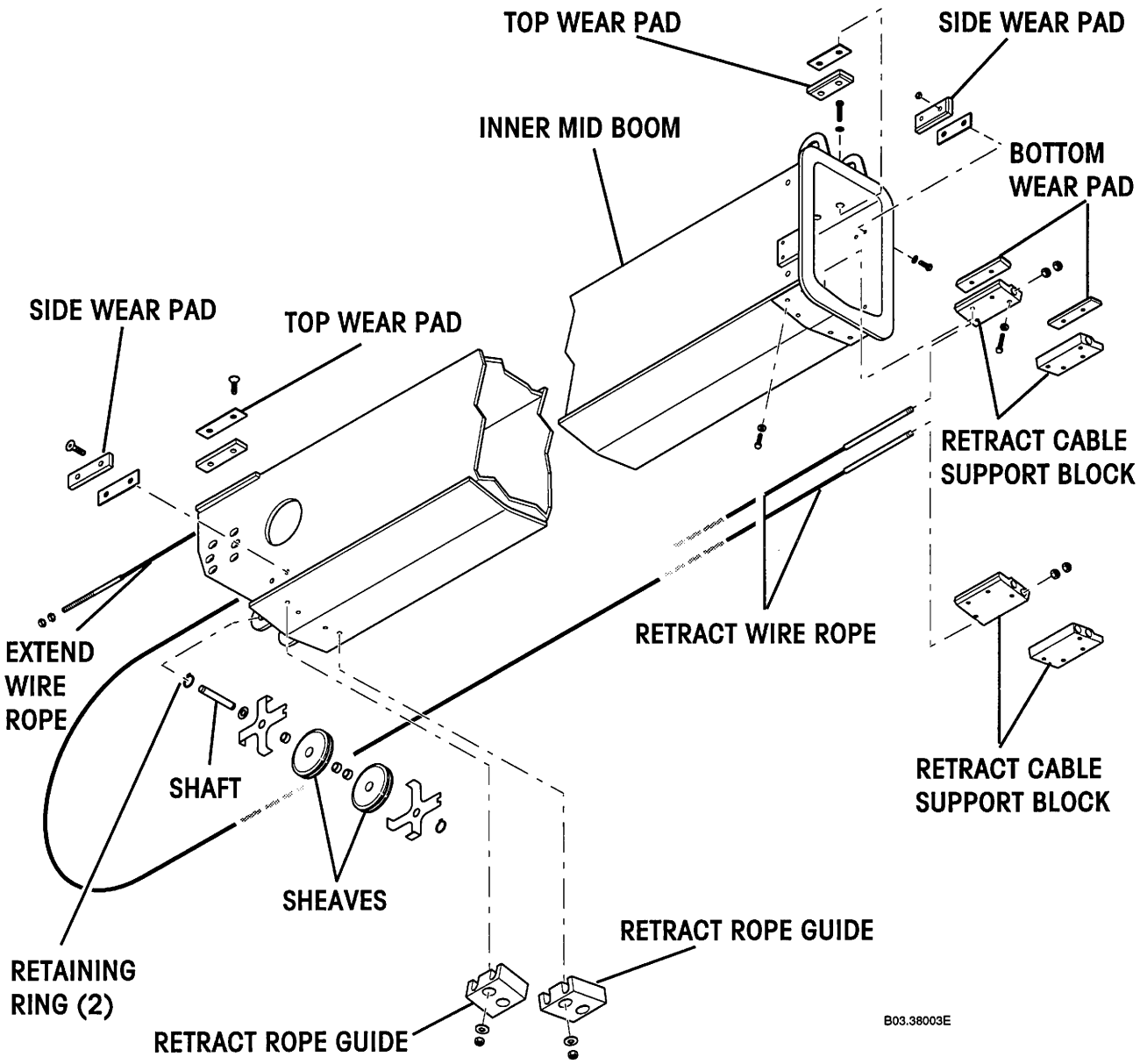
1. Extend boom out enough to remove top wear pads from inner mid boom (second stage).
2. Then, extend boom out at least four (4) feet (1.22 M).

NOTE: Approximately a gallon (3.8 L) of hydraulic fluid will drain out of the telescope cylinder when performing step 3, so have a container to catch the fluid.

3. Loosen telescope cylinder counterbalance valve to remove trapped hydraulic fluid.
4. Remove telescope cylinder counterbalance valve.



Base Boom (First Stage) and Telescope Cylinder.



Inner Mid Boom (Second Stage).

Boom Disassembly (Continued)

⚠ CAUTION

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

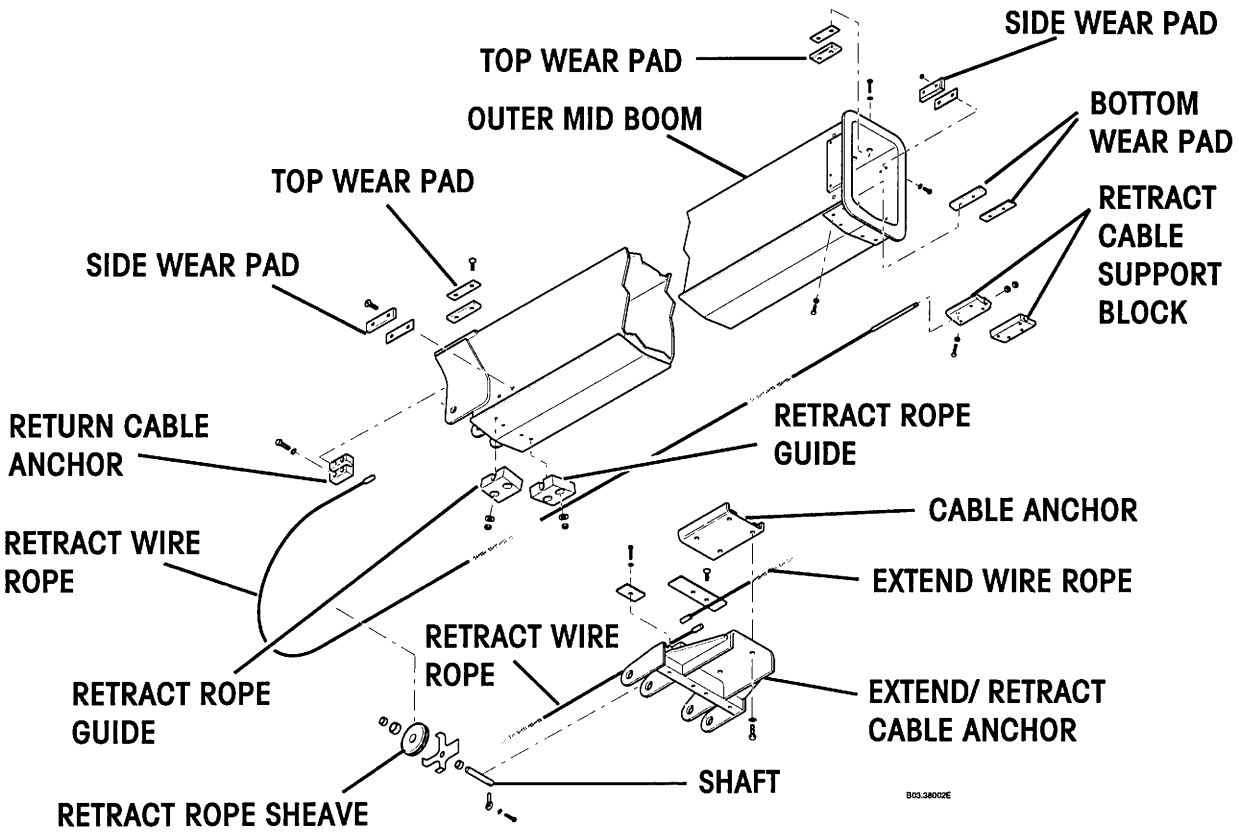
5. Disconnect all electrical cables and hydraulic hoses at the platform.

   IMPORTANT: Make a notation of the connection of wire ropes and hoses for ease of proper assembly.

6. Remove the hose track assembly. The assembly is secured to the booms with three brackets and the moving anchor retainer tube. Lay the assembly with hoses to the side.

7. Remove the four cables from the back of base boom. Slide them inside base boom.

8. Remove wear pads from rear of base boom. To remove the bottom wear pads and retract cable support blocks, the mid boom must be slid out further and lifted up.

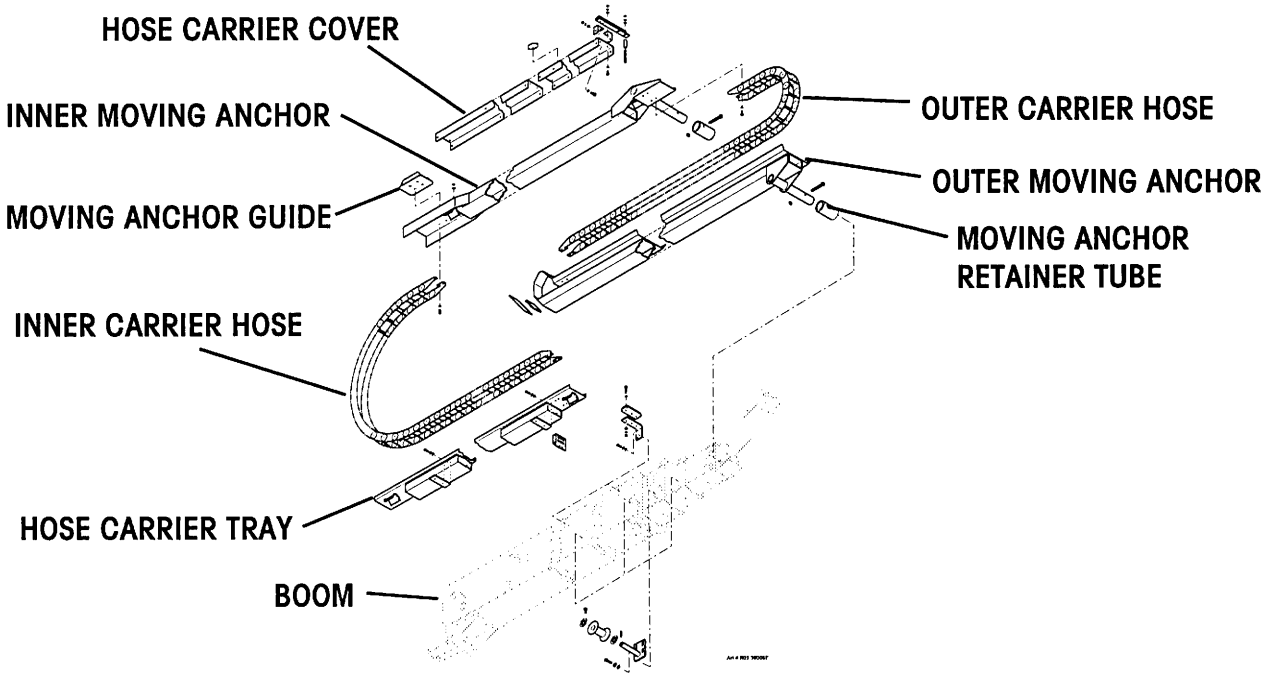


Outer Mid Boom (Third Stage).

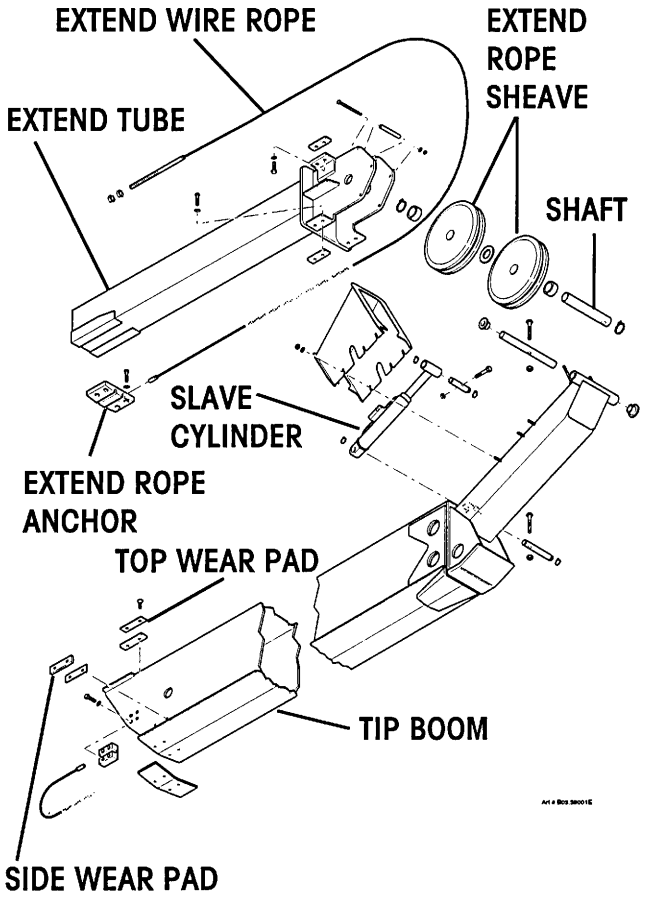
Boom Disassembly (Continued)

9. Slide inner mid boom (second stage) all the way out of base boom and carefully tie up cables, ensuring that cables are not crossed.

10. While supporting the telescope cylinder, remove the two telescope cylinder trunnion rings. They are secured in place by six bolts each. Also, remove retract rope guides from inner mid boom.



Hose Carrier Assembly.



Tip Boom (Fourth Stage) for Top Mount Platform.

Boom Disassembly (Continued)

11. Remove inner mid boom (second stage) sheaves, by removing retract rope sheave shaft and retaining rings.

12. Remove wear pads from rear of inner mid boom (second stage). To remove bottom rear wear pads, lift outer mid boom (third stage). Also remove cable support block from inner mid boom.

13. Pull outer mid boom (third stage) and cables out of inner mid boom (second stage).

14. Support telescope cylinder and remove outer mid boom (third stage) sheaves by removing retract rope sheave shaft and retaining rings.

15. Remove extend/ retract cable anchor. It is held in place with four (4) bolts. Remove retract rope guides. Also, remove return cable anchor.

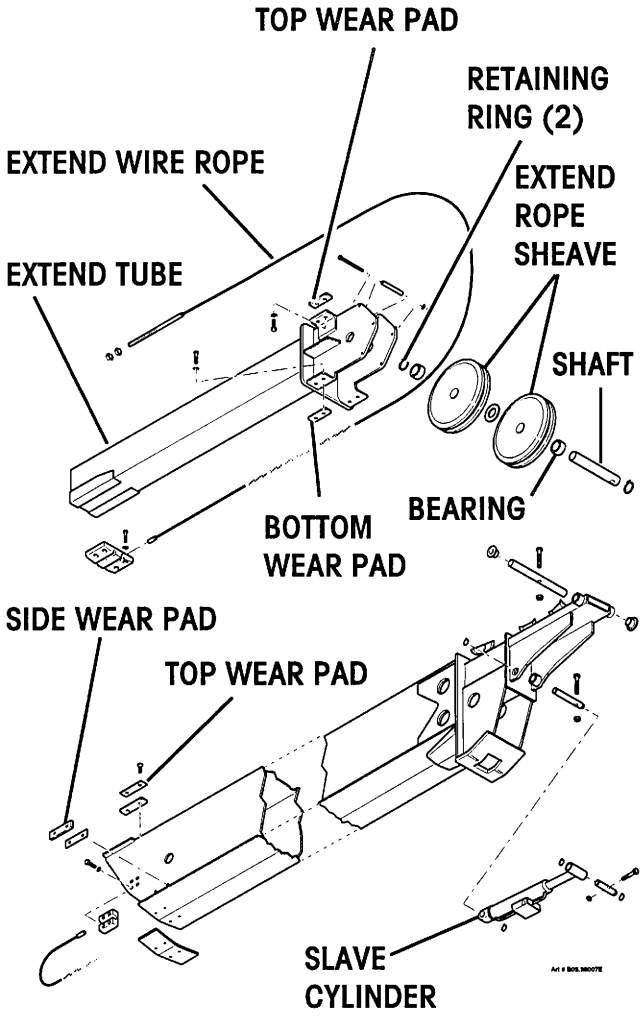
16. Slide telescope cylinder out of outer mid boom (third stage).

    NOTE: At this point, telescope cylinder is accessible.

17. Remove outer mid boom (third stage) rear wear pads. To remove bottom wear pads, lift tip boom (fourth stage). Also, remove extend rope anchor from front of tip boom.

18. Slide out tip boom from outer mid boom (third stage) and pull out extend tube.

    NOTE: At this point, all wear pads and cables are accessible.



Tip Boom (Fourth Stage) for End Mount Platform.

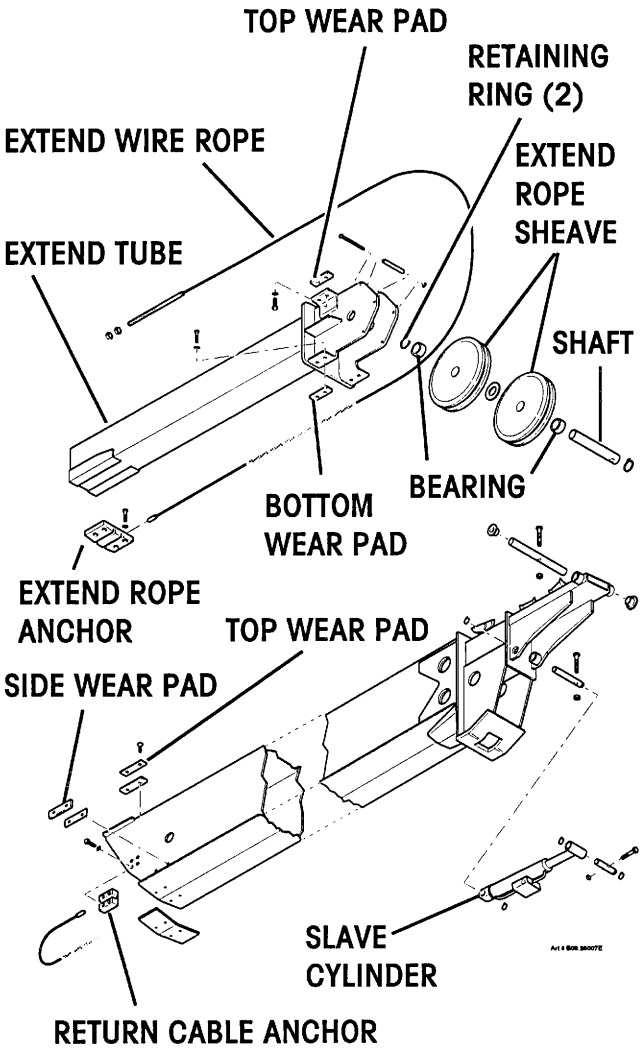
Boom Assembly

NOTE: In most instances, while boom is disassembled, check telescope cylinder for excessive dampness, and check all wear pads and cables for wear. Replace as necessary.

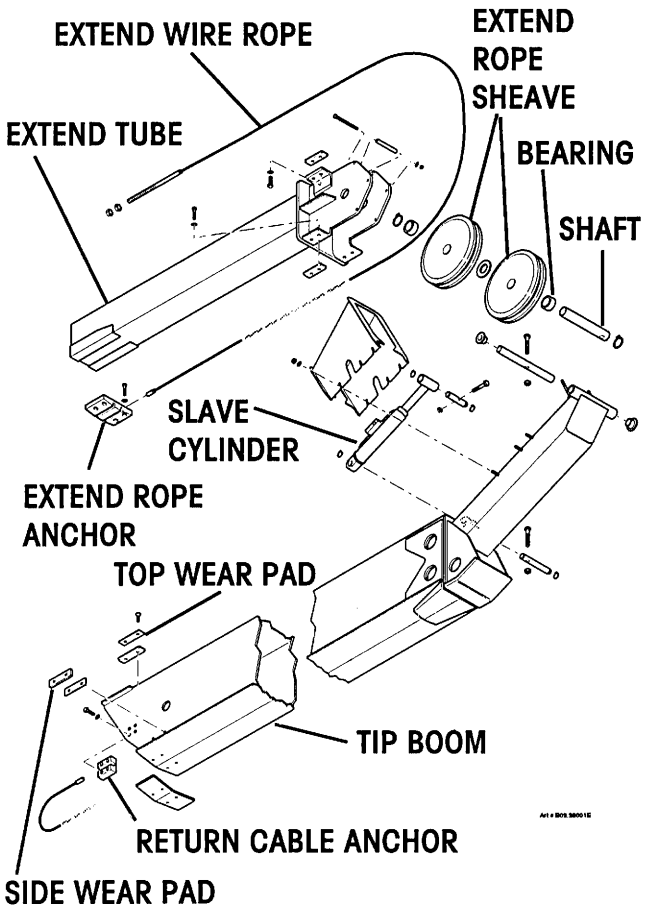
1. Pack tip boom sheave bearing and shaft with grease, and return in place.

2. Tie both ends of cable to extend tube base. Do not cross cables.

3. With wire ropes and extend tube wear pads in place, slide extend cylinder into tip boom.



Tip Boom (Fourth Stage) for End Mount Platform.



Tip Boom (Fourth Stage) for Top Mount Platform.

4. Secure one end of wire ropes in place on tip boom (fourth stage) with extend rope anchor. Also, secure the retract wire rope in place with return cable anchor.

5. With tip boom base-end wear pads in place, slide tip boom and wire ropes into outer mid boom (third stage).

6. Slide tip boom into outer mid boom (third stage); then, install rear wear pads onto outer mid boom (third stage). To install bottom wear pads, lift tip boom.

7. With wire ropes attached, slide telescope cylinder into outer mid boom (third stage). Install retract rope guides and extend/ retract cable anchor along with wire ropes.

8. While supporting telescope cylinder, install outer mid boom (third stage).

Boom assembly (Continued)

9. Slide outer mid boom (third stage) and wire ropes into inner mid boom (second stage) far enough to hook up the two extend wire ropes; then pull outer mid boom (third stage) and tip boom (fourth stage) back out enough to access sheaves.

10. Install wear pads onto rear of inner mid boom (second stage). To install bottom rear wear pads, lift outer mid boom (third stage).

11. With wire ropes threaded inside inner mid boom, install cable support block. Ensure wire ropes are not crossed.

12. Install inner mid boom (second stage) sheaves with wire ropes, by inserting retract rope sheave shaft and retaining rings. The sheaves, bearing and shaft should be packed with grease before installation.

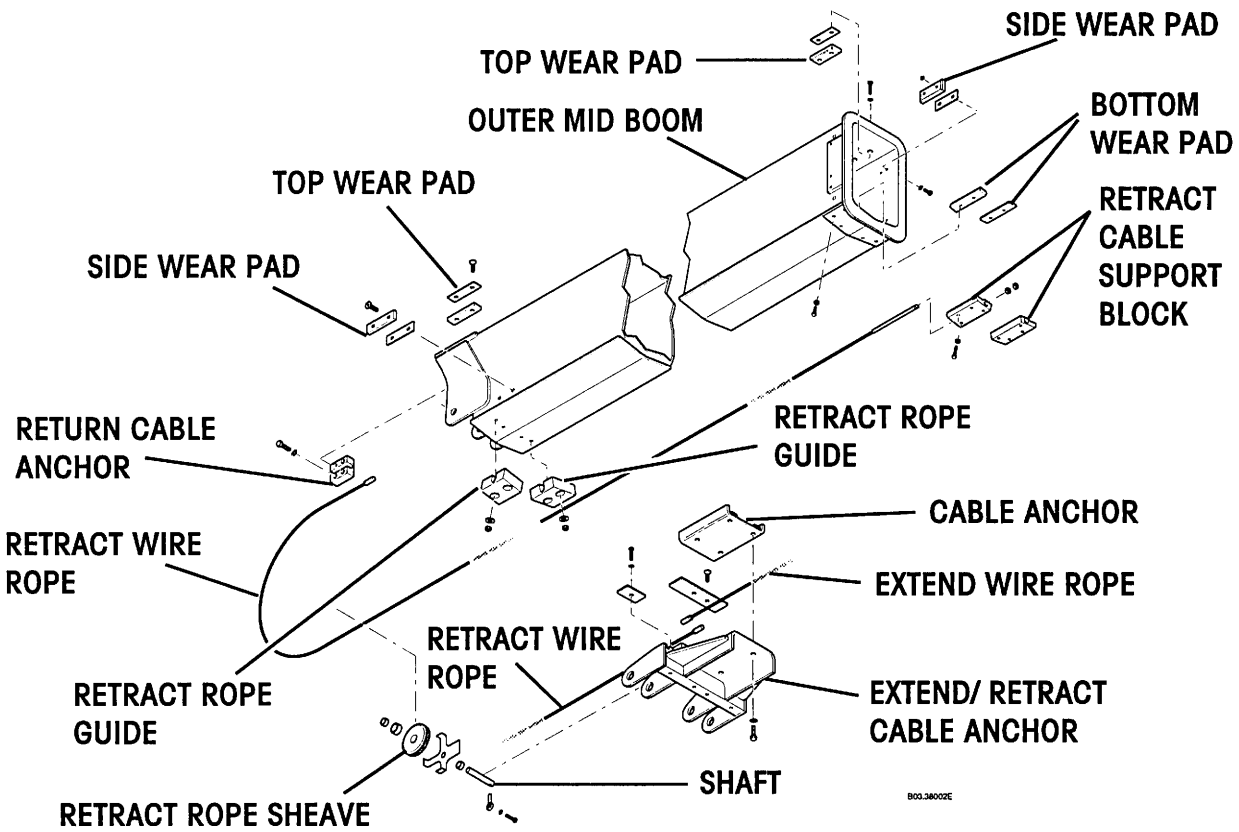
13. Install retract rope guides onto inner mid boom (second stage).

14. While supporting the telescope cylinder, install the two telescope cylinder trunnion rings. Also, install retract rope guides and wire ropes onto inner mid boom (second stage).

15. Remove access plate from top side of base boom.

16. With wire ropes temporarily fixed to the top side of inner mid boom, slide inner mid boom (second stage) into base boom (first stage) until it reaches the middle of the access plate.

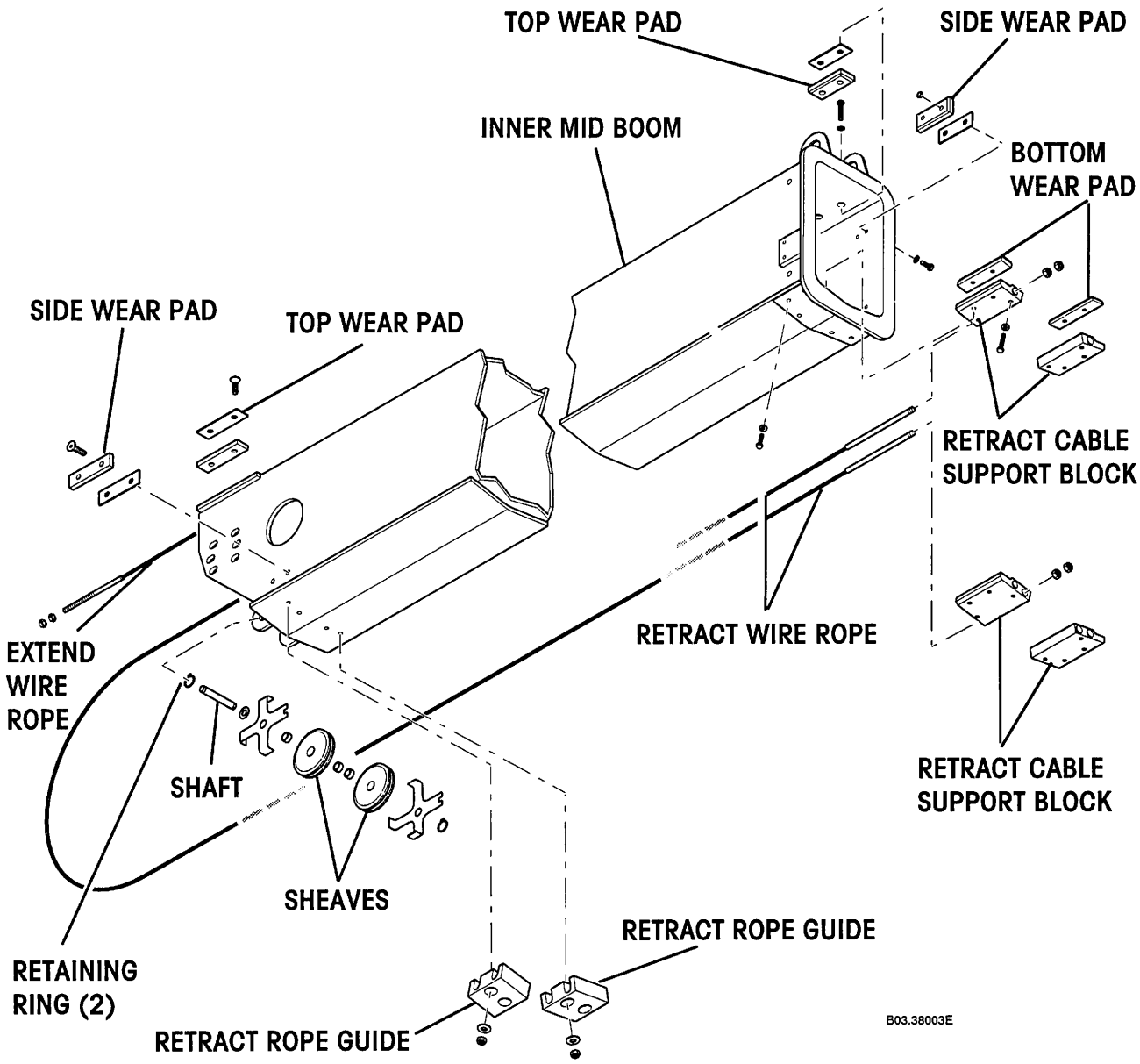
17. Install wear pads to rear of base boom. For bottom wear pads and retract cable support block, the mid boom must be lifted up. Use Loctite on all bolts in top pads.



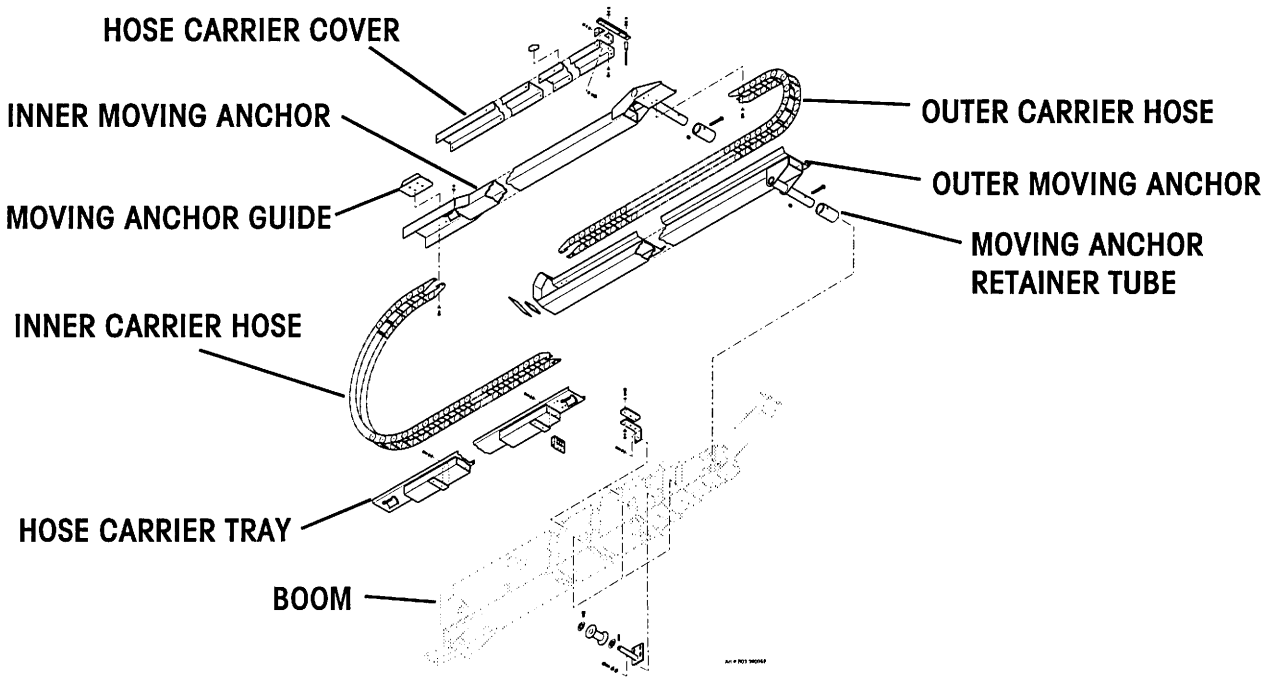
Outer Mid Boom (Third Stage).

Boom assembly (Continued)

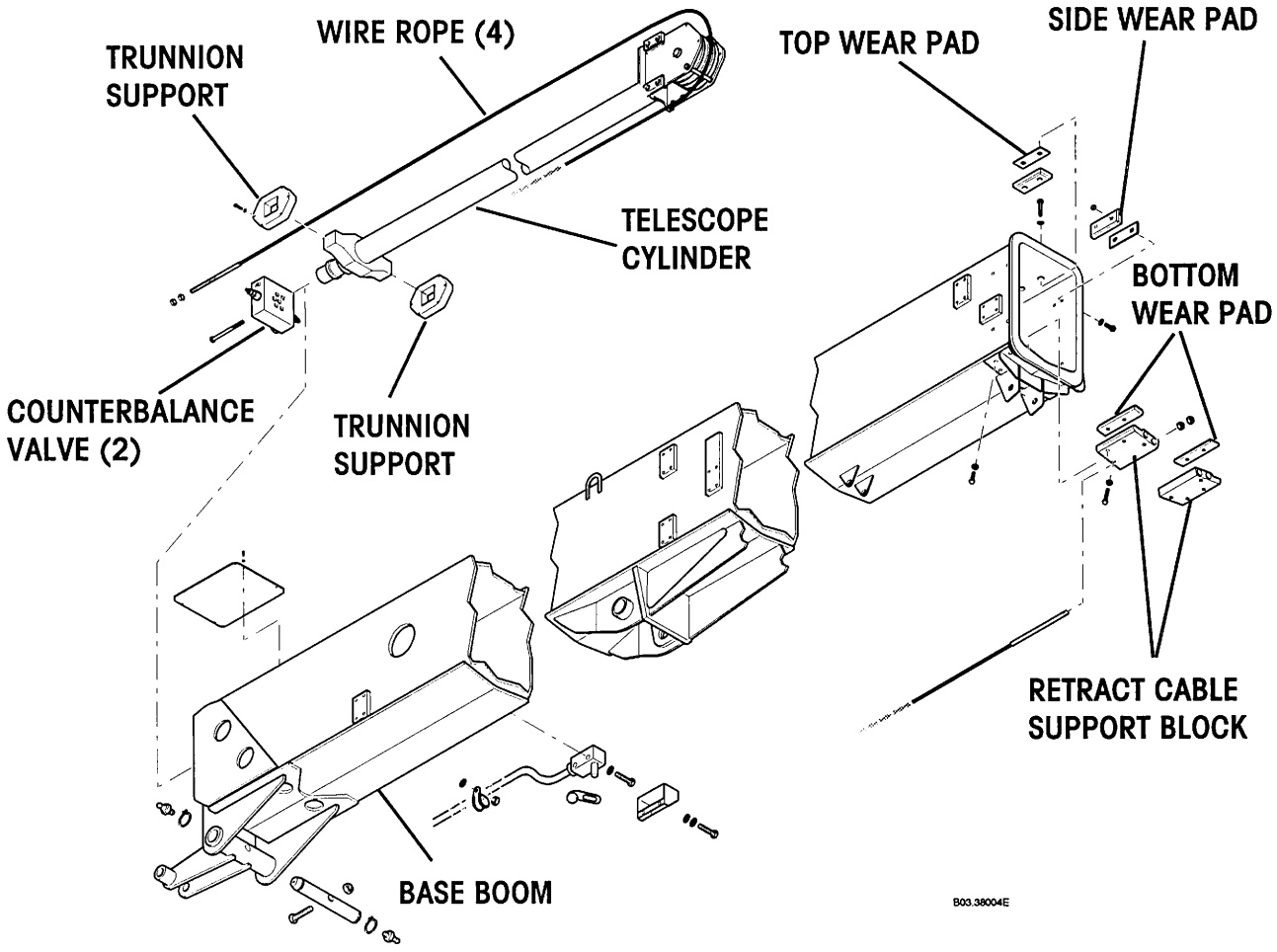
18. Install the four wire ropes into the back of the base boom, ensuring that they are not crossed.
19. Install the hose carrier assembly. The assembly is secured to the booms with three brackets and the moving anchor retainer tube.
20. Connect all electrical cables and hydraulic hoses at the platform.
21. Install telescope cylinder counterbalance valve.
22. Turn unit on and flush hydraulic system. (Refer to hydraulic section.)



Inner Mid Boom (Second Stage).



Hose Carrier Assembly.



Base Boom (First Stage) and Telescope Cylinder.

Boom Telescope Cylinder

The boom telescope cylinder is a double acting cylinder. It must be removed from the machine before a thorough inspection can be completed.

Telescope Cylinder Removal

To remove the telescope cylinder, the boom must be disassembled. Refer to Boom Disassembly in this section.

Telescope Cylinder Seal Replacement

Remove the end cap from the cylinder. Pull the cap and rod straight out of the cylinder barrel. Remove the nut from the end of the rod. Slip off the collar. Examine the rod and seals for signs of damage or wear.

Remove and replace the old seals.

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

Telescope Cylinder Installation

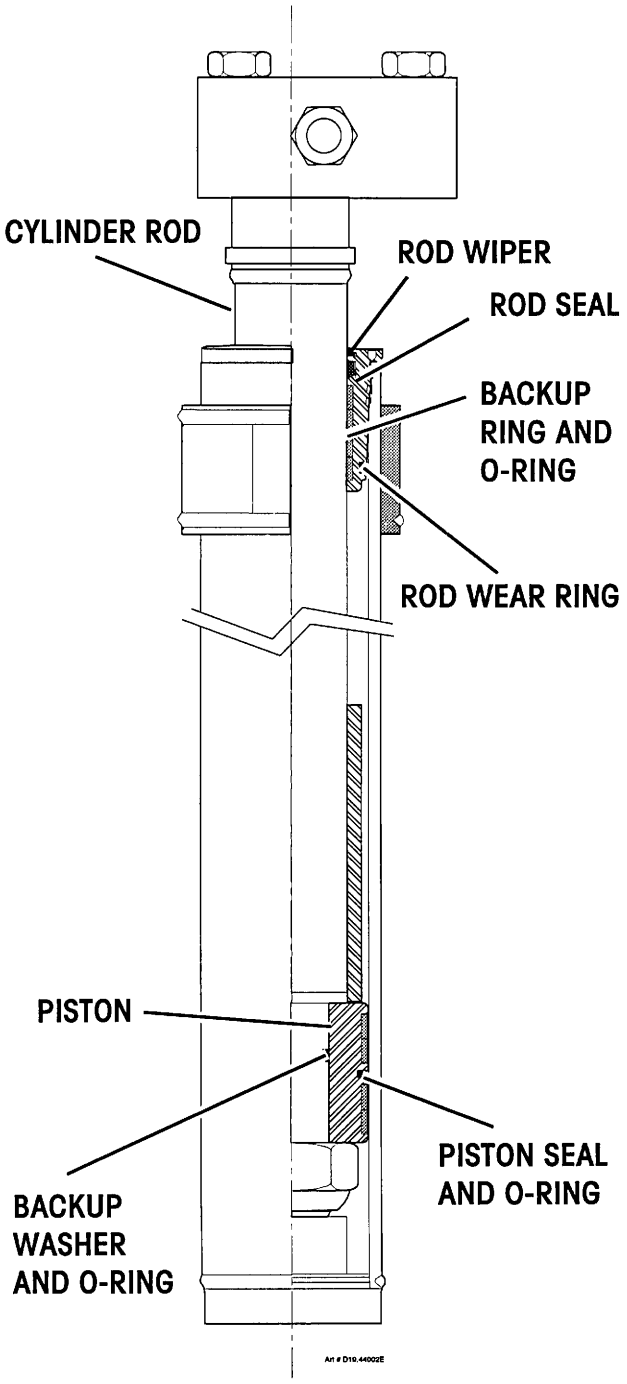
> **NOTE:** In most instances, while boom is disassembled, check all wear pads and wire ropes for wear. Replace as necessary.

Refer to Boom Assembly for telescope cylinder installation.

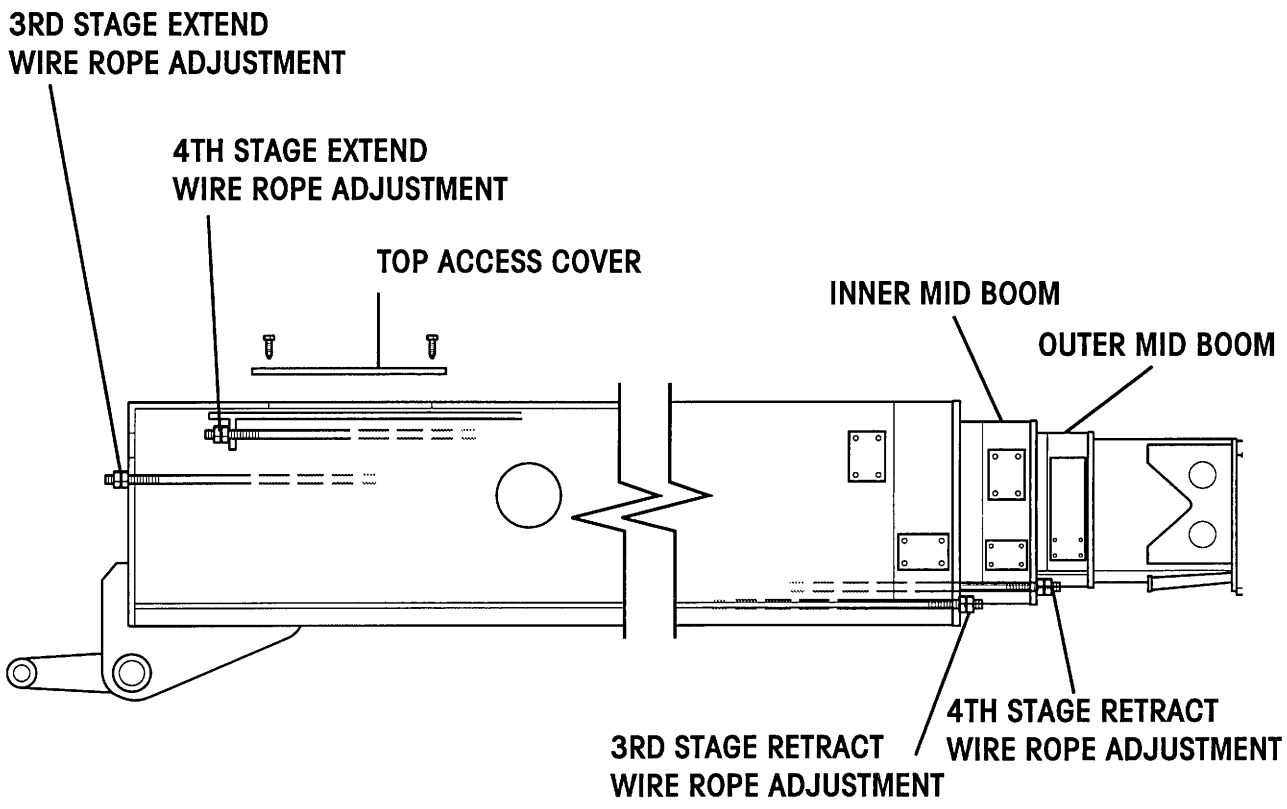
Check Counterbalance Valve

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

> **NOTE:** The counterbalance valve is preset at the factory and is not adjustable.



Telescope Cylinder Seals and Rings.



Boom Cable Adjustments.

Boom Wire Rope Adjustment

⚠WARNING

SHUT OFF ENGINE BEFORE STICKING HANDS INTO THE ACCESS HOLES IN THE BOOM. FAILURE TO DO THIS MAY RESULT IN SEVERE PERSONAL INJURY, INCLUDING LOSS OF HANDS OR FINGERS.

The relationship between inner mid boom (second stage) and the base boom (first stage) is fixed, due to the stopping of the telescope cylinder. The relationship between the outer mid boom (third stage) and the inner mid boom (second stage), is relative due to the tension of the outer mid boom (third stage) extend and retract wire ropes. Also, the relationship between the tip boom (fourth stage) and the outer mid boom (third stage), is relative due to the tension of the tip boom (fourth stage) extend and retract wire ropes.

1. Fully retract the boom and put a match mark "A" on the side of the inner mid boom (second stage boom), flush with the end of the base boom section. Put a match mark 'B' on the side of the outer mid boom (third stage boom) flush with the end of the inner mid boom (second stage boom). Put a match mark 'C' on the side of the tip boom (fourth stage boom) flush with the end of the outer mid boom (third stage boom).

2. Extend the boom approximately 7' (2 M) and remove power. Remove base boom top access cover, and check the tension of the outer mid boom (third stage) extend wire rope by hand. Tighten the adjusting nut on the loosest wire ropes until all four wire ropes are tensioned equally.

3. Torque the adjusting nut on the outer mid boom (third stage) retract wire rope to 30 ft. lbs. (40.68 Nm) - all four wire ropes.

Boom Wire Rope Adjustment (Continued)

4. Fully retract the boom while watching the inner mid boom (second stage) and outer mid boom (third stages). Note whether match mark 'A' aligns with base boom (first stage), or match mark 'B' aligns with inner mid boom (second stage).

5. Extend the boom approximately 6' (0.15 M) and repeat step 4 as slowly as possible. Remove power as soon as one of the match marks (either 'A' or 'B') is aligned.

6. Determine the remaining stroke to fully retract the boom.

   A. If the outer mid boom (third stage) aligned first, measure the remaining stroke between match mark 'A' on the inner mid boom (second stage) section and the base boom (first stage).

   B. If the inner mid boom (second stage) aligned first, measure the remaining stroke between match mark 'B' on the outer mid boom (third stage) and the end of the inner mid boom (second stage).

7. If the remaining stroke is greater than 1/8' (3.2 mm):

   A. Extend the boom approximately 7' (2 M) and remove power.

   B. If the outer mid boom (third stage) aligned first:

      1. Loosen the adjusting nut on each outer mid boom (third stage) retract wire rope 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

      2. Tighten the adjusting nut on each outer mid boom (third stage) extend wire rope 2 turns for each 1/8' (3.2 mm) of remaining stroke.

   C. If the inner mid boom (second stage) stopped first:

      1. Loosen the adjusting nut on each outer mid boom (third stage) extend wire rope 2 turns for each 1/8' (3.2 mm) of remaining stroke.

      2. Tighten the adjusting nut on each outer mid boom (third stage) retract wire rope 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

8 Repeat steps 4 through 7 until the remaining stroke is 1/8' (3.2 mm) or less.

9. Recheck the torque of the adjusting nut on the outer mid boom (third stage) retract wire ropes and assure that the torque setting is at 30 ft. lbs. (40.68 Nm).

10. Tighten the locking nuts on the extend wire ropes and lock down against the adjusting nuts.

    NOTE: The outer mid boom (third stage) is now synchronized to the inner mid boom (second stage).

11. Extend the boom approximately one foot (0.3 M) and remove power. Working through the top access hole in the base section, check the tension of the tip boom (fourth stage) extend wire ropes by hand. Tighten the adjusting nut on the loosest wire rope until the two wire ropes are equally tensioned.

12. Torque the adjusting nuts on the tip boom (fourth stage) retract wire ropes to 30 ft. lbs. (40.68 Nm).

13. Fully retract the boom while watching the tip boom (fourth stage) and outer mid boom (third stage). Note whether match mark 'C' aligns with the end of the outer mid boom (third stage) before the match mark 'B' aligns itself with the end of the inner mid boom (second stage).

Boom Wire Rope Adjustment (Continued)

14. Extend the boom approximately 6' (0.15 M) and repeat step 14 as slowly as possible. Remove power as soon as one of the match marks (either B or C) is aligned.

15. Determine the remaining stroke to fully retract the boom.

    A. If the outer mid boom (third stage) aligned first, measure the remaining stroke between match mark 'C' on the tip boom section (fourth stage) and the outer mid boom (third stage).

    B. If the tip boom (fourth stage) aligned first, measure the remaining stroke between match mark 'B' on the outer mid boom (third stage) and the end of the inner mid boom (second stage).

16. If the remaining stroke is greater than 1/8' (3.2 mm):

    A. Extend the boom approximately 7' (2 M) and remove power.

    B. If the outer mid boom (third stage aligned first:

        1. Loosen the adjusting nut on each tip boom (fourth stage) extend wire rope 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

        2. Tighten the adjusting nut on each tip boom (fourth stage) extend wire rope 2 turns for each 1/8' (3.2 mm) of remaining stroke.

    C. If the tip boom (fourth stage) stopped first:

        1. Loosen the adjusting nut on each tip boom (fourth stage) retract wire rope 2 turns for each 1/8' (3.2 mm) of remaining stroke.

        2. Tighten the adjusting nut on each tip boom (fourth stage) extend wire rope 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

17. Repeat steps 15 through 17 until the remaining stroke is 1/8' (3.2 mm) or less.

18. Recheck the torque of the adjusting nut on the tip boom (fourth stage) retract wire ropes and assure that the torque setting is at 30 ft. lbs. (40.68 Nm).

19. Tighten the locking nuts on the extend wire ropes and lock down against the adjusting nuts.

    NOTE: The tip boom (fourth stage) is now synchronized to the outer mid boom (third stage).

20. Recheck the torque on all the extend and retract wire ropes and ensure that all lock nuts are installed and jammed.

21. Install the inspection cover on the top of the base boom section.

Boom Wire Rope Replacement

Wire rope replacement is recommended after every 5,000 hours of operation.

> **NOTE:** In most instances, while boom is disassembled, check telescope cylinder for excessive dampness, and check all wear pads for wear. Replace as necessary.

To replace the wire ropes, the boom must be disassembled. Refer to Boom Disassembly, and Boom Assembly in this section.

WEAR PAD

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 each wear pad and the boom section. Replace all wear pads after every five thousand (5000) hours of operation.

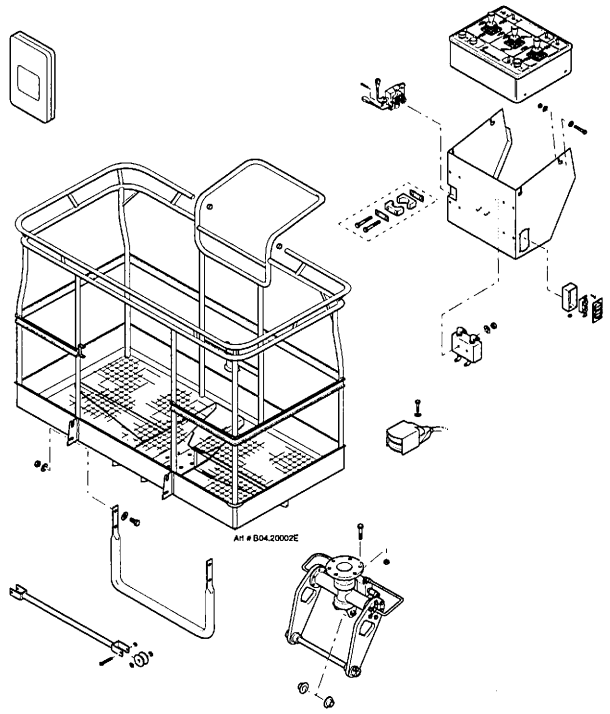
If any of the preceding wear pads are excessively worn, disassemble the boom and replace all wear pads. There are wear pads that are only accessible when the boom is disassembled. Refer to Boom Disassembly in this section.

⚠ 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.

PLATFORM

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



Platform Components.

PLATFORM LEVELLING CYLINDERS

The platform levelling system automatically keeps the platform level, using a master/ slave levelling cylinder arrangement. Whenever the boom is raised or lowered, the master levelling cylinder is forced to move. The fluid displacement from the master levelling cylinder is in turn sent up the boom to the slave levelling cylinder. This forces the slave levelling cylinder to move the same distance as the master levelling cylinder, which keeps the platform parallel to the ground in any boom position.

The platform levelling cylinders (master and slave) are of the double acting type. The pivot pins should be checked for wear. Check the pivot pin locking bolts for tightness. The cylinders should be inspected for fluid leakage, damage and security. The seals should be replaced whenever the cylinder is serviced.

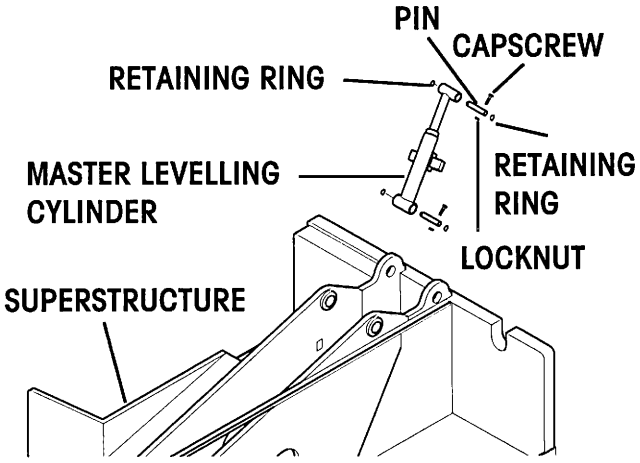
PLATFORM LEVELLING MASTER CYLINDER REPLACEMENT

To remove platform master levelling cylinder:

1. SUPPORT THE PLATFORM to release the load on both master and slave levelling cylinders.
2. Remove the retaining rings, the capscrew and locknut on each end of the cylinder.
3. Remove the pins at each end of the cylinder and remove cylinder.

To install platform master levelling cylinder:

1. Position cylinder and install new pins at both ends.
2. Install capscrew and locknut and retaining rings at each end of the cylinder.
3. Apply grease to pin through grease fitting.

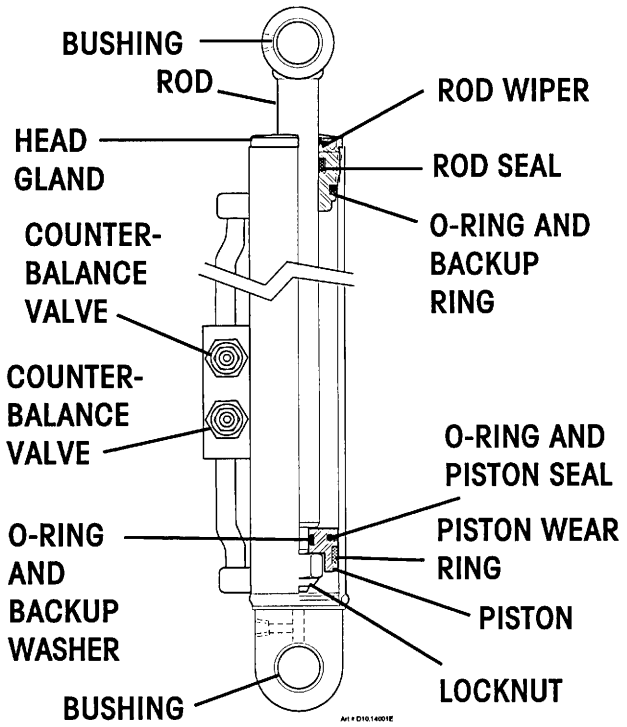


Master Levelling Cylinder and Pin Location.

MASTER LEVELLING CYLINDER SEAL REPLACEMENT

Lower the upper boom. SUPPORT THE PLATFORM to release the load on both master and slave levelling cylinders. Master cylinder must be removed from the machine for seal replacement.

1. Clean the rod end of the cylinder.
2. Unscrew the end cap and pull the cap and rod straight out of the cylinder barrel. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM.
3. Remove the split pin and 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 install a new seal kit.

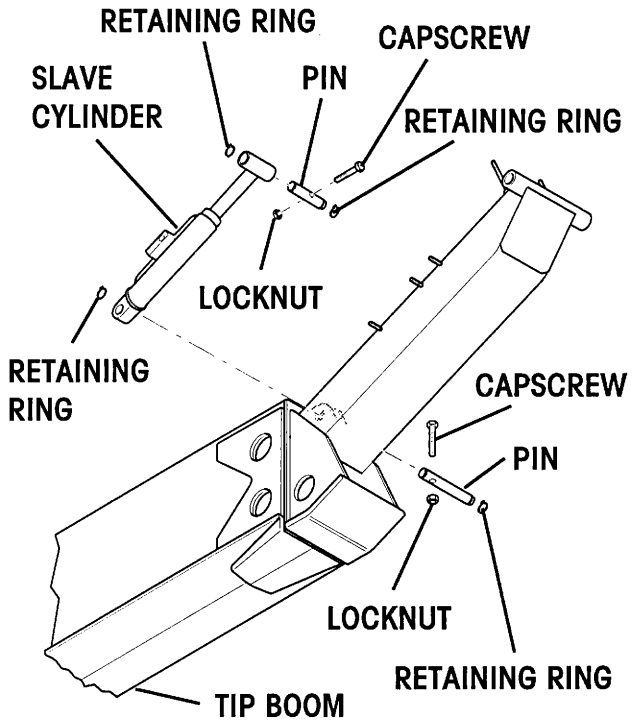


Master Levelling Cylinder.

PLATFORM LEVELLING SLAVE CYLINDER REPLACEMENT

To remove platform slave levelling cylinder pin:

1. SUPPORT THE PLATFORM to release the load on both master and slave levelling cylinders.
2. Remove the retaining rings, the capscrew and locknut on each end of the cylinder.



Slave Levelling Cylinder and Pin Location on Top Mount Boom.

3. Remove the pins at each end of the cylinder and remove cylinder.

To install platform master levelling cylinder pin:

1. Position cylinder and install new pins at both ends.
2. Install capscrew and locknut and retaining rings at each end of the cylinder.
3. Apply grease to pin through grease fitting.

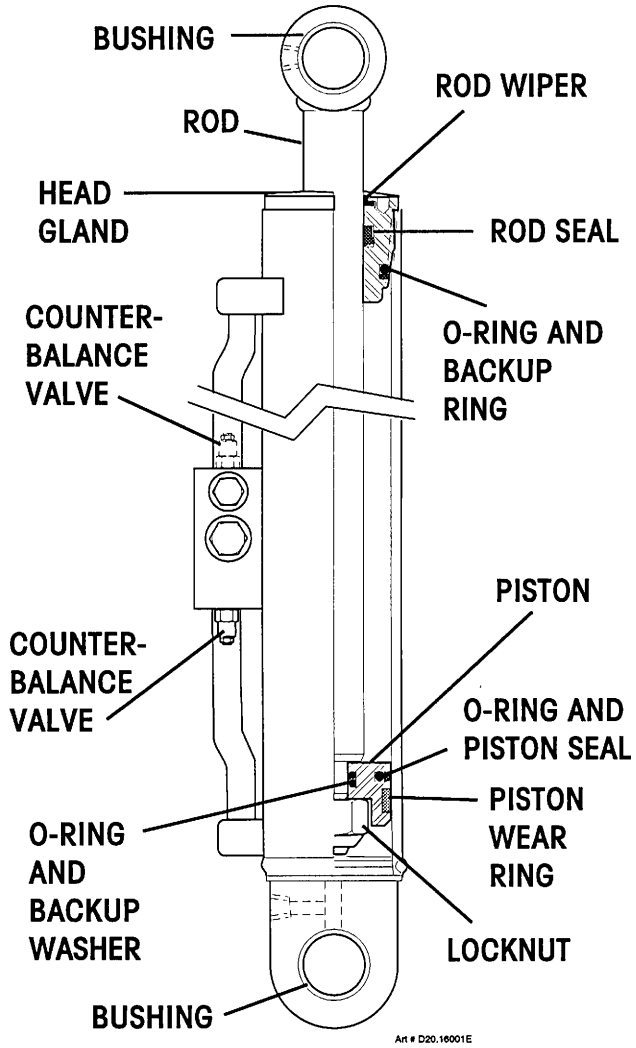
SLAVE LEVELLING CYLINDER SEAL REPLACEMENT

Lower the upper boom. SUPPORT THE PLATFORM to release the load on both master and slave levelling cylinders. Slave levelling cylinder seals can be replaced while the cylinder is on the machine or with the cylinder removed from the machine.

1. Clean the rod end of the cylinder.

2. Unscrew the end cap and pull the cap and rod straight out of the cylinder barrel. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM.

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



Slave Levelling Cylinder.

4. Slip off the collar.

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

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

PLATFORM LEVELLING PROCEDURE

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

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

⚠ CAUTION

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

After bleeding the levelling circuit, raise upper boom to full elevation and then fully lower boom. Check platform levelling operation.

SECTION 5:
MAINTENANCE

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MAINTENANCE SCHEDULE

The Simon MP 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.

DEATH OR SERVER INJURY MAY RESULT IF MACHINE OPERATED IN AN UNSAFE CONDITION. DO NOT OPERATE ANY MACHINE IF IN AN 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 manual). 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 machine 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 machine is inspected per the operational checklists at the end of this section.

SHIFT 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 (not foam filled).

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.

Battery

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 Shift 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.

Cylinder

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 Reservoir

Carefully check the condition of the fluid inside the reservoir 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 reservoir 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.

Annual Inspection

Annual Inspection forms are available from Simon Aerials Parts Department.

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.

SHIFT OPERATIONAL CHECKLIST

All checks must be completed before operation of the machine.

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 machine clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT DAILY INTERVALS OR AFTER EVERY 6 TO 8 HOURS OF USE, WHICHEVER IS SOONER. 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, etc. Open both compartment doors to inspect components inside.
_____	2. Check battery electrolyte level and connections.
_____	3. Check fuel, engine oil and coolant levels.
_____	4. Check hydraulic fluid level. The level should be at the line marked on the sight gauge with the unit in stowed position.
_____	5. Check that all shutoff valves on hydraulic reservoir are open (parallel to flow).
_____	6. Check tires for damage.
_____	7. Check tires for proper pressure (see Machine Specifications). Not applicable for foam filled tires.
_____	8. Check wheel lug nuts for tightness.

Continued on following page . . .

SHIFT OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	9. Ensure that axle extend limit switches at all four axles are functioning properly.
_____	10. Check hoses for worn areas.
_____	11. Check hose carrier to verify that it is not bent or sagging.
_____	12. Inspect safety belt connections, and check for worn areas on the belts.
_____	13. Check platform rails and gate latch for damage.
_____	14. Check pivot pins for security.
_____	15. Check that all warning and instructional labels are legible and secure.
_____	16. Start engine. Check that hydraulic pressure is as stated in "Machine Specifications".
_____	17. Check that the tilt alarm is working properly.
_____	18. Check that no attempt had been made to override the drive interlock system by a previous operator.
_____	19. Perform all pre-inspection checks before any ground and platform tests.
_____	20. Test ground controls for proper operation.
_____	21. Check platform controls for proper operation.
_____	22. With the platform raised, check for the smooth operation of low speed drive.
_____	23. Check emergency pump for proper operation.
_____	24. Follow engine daily service requirements. Refer to the Engine Maintenance Manual supplied with your machine.

Continued on following page . . .

SHIFT OPERATIONAL CHECKLIST (CONTINUED)

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

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

DAILY

INITIAL	DESCRIPTION
_____	25. Inspect cylinder boots, valve spool boots, etc., for cuts or other damage after every eight (8) hours of service. Repair or replace if necessary.
_____	26. Check hydraulic system for leakage after every eight (8) hours of operation.
_____	27. Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your machine.

WEEKLY 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 machine clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT WEEKLY INTERVALS OR EVERY 25 HOURS, WHICHEVER OCCURS FIRST. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
_____	1. Inspect condition of hydraulic fluid in the reservoir. Fluid should have a clear amber color.
_____	2. Lubricate all grease fittings (see Lubrication Chart).
_____	3. Check oil level in swing drive (see Lubrication Chart).
_____	4. Check oil level in power hubs (see Lubrication Chart).
_____	5. Apply lubricant to standard open swing bearing and drive pinion gear (see Lubrication Chart). Check lubricant in optional oil bath swing bearing case, if so equipped, for proper level, and check for dirt or metal contamination (see Lubrication Chart).
_____	6. Check the steering cylinder for fluid leakage. Inspect steering linkage for signs of wear.
_____	7. Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your machine.

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 machine clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT MONTHLY INTERVALS OR EVERY 100 HOURS, WHICHEVER OCCURS FIRST. 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 Shift Operational Checklist.
_____	2. Lubricate all grease fittings (see Lubrication Chart).
_____	3. Apply lubricant to standard open swing bearing and drive pinion gear (see Lubrication Chart). Check lubricant in optional oil bath swing bearing case, if so equipped, for proper level, and check for dirt or metal contamination (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. Check for machine damage, broken welds, loose bolts, improper or makeshift repairs.

Continued on following page . . .

MONTHLY OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	8. Check protective rubber cover around hoses at moving anchor, tip boom, boom hose passages and at swing bearing.
_____	9. Check torque of swing bearing bolts (see "Machine Specifications").
_____	10. 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.
_____	11. Check oil level in swing drive gear box (see Lubrication Chart).
_____	12. Check oil level in power hubs (see Lubrication Chart).
_____	13. Check that tires are not leaning in or out.
_____	14. Check that wheel spindles turn freely, with no end play.
_____	15. Check drive wheel power hub mounting bolt torque (see "Machine Specifications").
_____	16. Check wheel lug nut torque (see "Machine Specifications").
_____	17. 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.
_____	18. Inspect boom wire rope.
_____	19. Check to make sure boom sections are not dented or bent.
_____	20. Check that all adjustable flow valves are locked. Check settings if any are not locked.
_____	21. Check fuel shutoff rack for proper operation. Loosen lever arm and lubricate with WD-40 or equivalent.
_____	22. Follow engine monthly service requirements. Refer to the Engine Maintenance Manual supplied with your machine.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

EVERY 90 DAYS

INITIAL	DESCRIPTION
_____	23. 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 machine clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT SIX MONTH INTERVALS OR EVERY 500 HOURS, WHICHEVER IS SOONER. 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. Check boom lift and telescope cylinders for signs of wear.
_____	10. Clean and lubricate the standard open swing bearing gear teeth with dry moly lube spray (not required for oil bath swing bearing).
_____	11. Follow engine semi-annual service requirements. Refer to the Engine Maintenance Manual supplied with your machine.

SECTION 6:
TROUBLESHOOTING

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GENERAL TROUBLESHOOTING TIPS

Before investigating a malfunction, check the following items:

- The Main Power 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.
- Main Pump Button (Deadman) 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 reset.
- 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-13M is a multiple viscosity hydraulic fluid 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.	1. Excessive water in the hydraulic fluid.	1. Drain and flush hydraulic system. See Section 2, System Flushing Procedure.
	2. Improper oil viscosity.	2. Replace hydraulic fluid with the correct fluid. See Section 2, Fluid Recommendations.
	3. Improper lubrication and hydraulic fluid.	3. Drain and flush hydraulic system. See Section 2, System Flushing Procedure.
	4. Pump cam bearing failure.	4. Rebuild pump as required. See Illustrated Parts Catalog or Component Repair Manual.
	5. Open stroke flow valve.	5. Close pump stroke valve.
	6. Foot pedal blocked closed.	6. Unblock foot pedal.
• Water in hydraulic fluid. Symptoms to watch for are: pitting and etching of pump pistons with pump piston cam wear causing heat build up and premature pump failure.	1. Damp climate.	1. Drain and flush hydraulic system. See Section 2, System Flushing Procedure.
	2. Hydraulic fitting or port open to contaminants.	2. Drain and flush hydraulic system. See Section 2, System Flushing Procedure. Replace worn pump components. See Illustrated Parts Catalog.
	3. Reservoir pressurization inoperative.	3. Check pressure. See Specifications.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• 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.	1. Incompatible fluids or poor quality fluids.	1. Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant. See Section 2, Fluid Recommendation and System Flushing Procedure.
	2. Excessive heating of the fluids.	2. Drain and flush hydraulic system, then fill with recommended hydraulic fluid. See Section 2, Fluid Recommendation and System Flushing Procedure.
• 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.	1. Hydraulic fluid viscosity low.	1. Drain and flush hydraulic system, then fill with recommended hydraulic fluid. See Section 2, Fluid Recommendation and System Flushing Procedure.
	2. Improper or poor grade hydraulic fluid or lubricant without proper anti wear additives.	2. Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant. See Section 2, Fluid Recommendation and System Flushing Procedure.

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.	1. Low reservoir fluid level.	1. Add hydraulic fluid. See Section 2, Fluid Recommendation.
	2. Air leaks in suction line.	2. Repair any suction hose leaks.
	3. Improper hydraulic fluid.	3. Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid.
	4. Vaporization of water.	4. Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid. See Section 2, Fluid Recommendation and System Flushing Procedure.
	5. Hydraulic fluid system has not been warmed before using full system pressure.	5. Warm up system before using full system pressure. See Operator's Manual.
	6. Pump speed too high.	6. Ensure reservoir pressurization is operating properly and adjust pump speed. See Section 2, Hydraulic Pump.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Boom trac cross braces breaking.	1. Hose skiving in the boom trac.	1. Check hydraulic pressure and adjust if necessary. See Section 2, Hydraulic Pump.
	2. System pressure too high, causing boom hoses to shrink more than normal.	2. Check hydraulic pressure and adjust if necessary. See Section 2, Hydraulic Pump.
	3. Hoses too tight in the trac.	3. Adjust hose tension. See Section 4, Boom.
• Boom trac sagging.	1. Trac pin holes stretched usually caused by a damaged "I" beam support.	1. Check "I" beam support and replace if necessary. See Section 4, Boom.
	2. Overhead guard is damaged. If the guard is damaged, the trac could get caught and could also tear off the moving anchor.	2. Replace overhead guard and any other items damaged due to a damaged guard. See Section 4, Boom.
	3. Improper lubrication and cleaning.	3. Follow proper lubrication and cleaning procedures. See Lubrication Chart.
• Engine won't crank.	• Starter motor relay, starter motor interlock relay , low oil pressure/ high water temperature/ time delay relay, Power relay, ground/ platform switch, ground toggle, platform ignition and start is bad 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. Replace the component(s) that are bad. See Section 3, Electrical and Electrical Schematic.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Throttle actuator doesn't work.	• Throttle high speed relay or solenoid is bad.	• A breakdown in any one of these components will cause the actuator not to function. Trace the available voltage to the throttle relay. Replace the component(s) that are bad. See Section 3, Electrical and Electrical Schematic.
• Movement alarm will not sound.	• Movement alarm relay, power relay, 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. See Section 3, Electrical and Electrical Schematic.
• Axle cylinder drifts when trying to extend axles.	• Pilot operated check valve.	• Remove, clean, repair or replace the pilot operated check valve. See Section 2, Selector Valve Assembly.
• Lift cylinder drifts down.	1. Holding valve cartridge dirty or faulty. 2. Cylinder seals are damaged.	1. Clean, repair or replace the holding valve. See Section 4, Boom Lift Cylinder. 2. Replace cylinder seals. See Section 4, Boom Lift Cylinder.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Ground Control (Pendant)		
• Telescope, swing, hoist functions don't operate.	1. Pendant toggle switces have no voltage.	1. Check voltage available to the toggle switches. See Section 3, Electrical System.
	2. #5 potentiometer out of adjustment or failed.	2. Adjust or replace #5 potentiometer. See Section 3, Electrical System.
	3. PWM Driver Module out of adjustment.	3. Adjust maximum output on PWM Driver board or replace. See Section 3, Electrical System.
	4. Valve is stuck.	4. Manually engage valve spool. See Section 2, Ground Valve Bank Assembly.
• Drive function does not operate.	1. Toggle switch has no voltage.	1. Check voltage available to the toggle switches. See Section 3, Electrical System.
	2. #6 potentiometer out of adjustment or failed.	2. Adjust or replace #6 potentiometer. See Section 3, Electrical System.
	3. PWM Driver Module out of adjustment or failed.	3. Adjust maximum output on PWM Drive board or replace. See Section 3, Electrical System.
	4. Ground drive speed control relay is bad.	4. Ensure proper operation of ground drive speed control relay or replace. See Section 3, Electrical System.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Ground Control (Pendant) (Continued)		
• No steer function.	1. Steer toggle switch is bad.	1. Check voltage available to the toggle switch. See Section 3, Electrical System.
	2. Steer/ axle valve.	2. Steer/ axle valve is not fully engaged. See Section 2, Steer System.
	3. Pilot operated check valve.	3. Pilot operated check valve is dirty. Remove, clean and/ or replace. See Section 2, Steer System.
	4. Faulty steer cylinder.	4. Possibly plugged steer ports or damaged cylinder seals. Inspect, repair or replace steer cylinder. See Section 2,Steer System.
• No axle extend/ retract function.	1. Steer toggle switch is bad.	1. Check voltage available to the toggle switch. See Section 3, Electrical System.
	2. Steer/ axle valve.	2. Steer/ axle valve is not fully engaged. See Section 2, Axle Extend System.
	3. Pilot operated check valve.	3. Pilot operated check valve is dirty. Remove, clean and/ or replace. See Section 2, Axle Extend System.
	4. Faulty cylinders.	4. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder. See Section 2, Axle Extend System.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control		
• No drive function.	1. Platform drive speed control relay, drive potentiometer is bad.	1. Ensure platform drive speed control relay is working properly. If boom is extended, confirm potentiometer is functioning. Repair or replace both components. See Section 3, Electrical System.
	2. Loose wires on control card.	2. Tighten wires on control card and ensure proper location. See Section 3, Electrical System.
	3. Driver board card out of adjustment or faulty card.	3. Adjust card according to specifications. Replace faulty card. See Section 3, Electrical System.
	4. Brakes do not release.	4. Check pressure supply to brakes. If no pressure, consult factory. See Section 2, Hydraulic System.
	5. No hydraulic fluid flow available to the drive motors.	5. Test for available fluid flow at the wheel motors. See Section 2, Hydraulic System.
	6. Diverter valve not fully shifted.	6. Inspect, repair or replace. See Section 2, Hydraulic System.
	7. Motor shafts are sheared.	7. Inspect, repair or replace. See Section 2, Hydraulic System.
	8. Torque hubs are damaged.	8. Inspect, repair or replace. See Section 2, Hydraulic System.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Continued)		
• No drive function (continue).	9. Drive valve spool is stuck.	9. Manually engage and check for proper operation. Replace if faulty. See Section 2, Hydraulic System.
• No lift function.	1. Loose wires on Y-axis driver board.	1. Tighten Y-axis wires on driver board. See Section 3, Electrical System.
	2. Driver board out of adjustment or faulty board.	2. Adjust driver board to specifications or replace faulty board. See Section 3, Electrical System.
	3. Axle limit switches are not fully engaged.	3. Identify which one or more of the switches is not engaged. Repair or replace switch. See Section 3, Electrical System.
	4. Platform boom and swing speed control relay (CRS) and boom potentiometer not functioning properly.	4. Ensure platform boom and swing speed control relay is operating properly. Adjust boom potentiometer or replace faulty parts. See Section 3, Electrical System.
	5. Lift spool valve stack.	5. Manually engage lift spool and check for operation. See Section 2, Boom Lift System.
	6. Holding valves not operating properly.	6. Remove, clean, inspect, replace and test unit operation. See Section 2, Boom Lift System.

TROUBLESHOOTING CHART (CONTINUED)

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

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Continued)		
• No swing function.	1. Loose wires on control card.	1. Tighten wires and ensure proper location. See Section 3, Electrical System.
	2. Platform boom and swing speed control relay and swing potentiometer not functioning properly.	2. Ensure proper operation of platform boom and swing speed control relay and adjust swing potentiometer or replace it. See Section 3, Electrical System.
	3. X-axis driver board out of adjustment or faulty.	3. Adjust or replace X-axis driver board. See Section 3, Electrical System.
	4. Spool valve stuck.	4. Manually engage swing spool and check for proper operation. Replace if faulty. See Section 2, Swing System.
	5. Brake on swing box not releasing.	5. Check for proper pressure to release brake. Adjust pressure. See Section 2, Swing System.

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APPENDIX

HYD SWIVEL

HYD SWIVEL

NOTE:
(X) INDICATES PORT NUMBER ON HYDRAULIC SWIVEL

10U FILTER

T P LS

PP

3000 PSI

PROPEL

C1

C2

HYD SWIVEL

HYD SWIVEL

HYD SWIVEL

3000 PSI

ADAPTER BLOCK

DUMP VALVE

STEER

10U FILTER

C1

C2

AXLE EXTEND CYLINDER

1600 PSI

1900 PSI

STEERING CYLINDER

1500 PSI

C1

C1

C2

C2

AXLE EXTEND CYLINDER

EXTEND / RETRACT

BOOM TELESCOPE CYLINDER

C1

C2

HYDRAULIC RESERVOIR

BOOM DOWN / UP

AUXILARY PUMP

HOIST CYLINDER

SWING

C1

C2

SWING MOTOR

BRAKE

SEE VALVE BANK CHART

MASTER LEVEL CYLINDER

SLAVE LEVEL CYLINDER

.021

CAB LEVEL

.021

ROTARY ACTUATOR

CAB ROTATE

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
HYDRAULIC SCHEMATIC MPH-80, MP-95, MP-110 ELECTRIC PROPORTIONAL

REVISION

DRWG. NO.
SDS 2324920

KEY - LINE SIZES	
4	1/4" ID HOSE
6	3/8" ID HOSE
8	1/2" ID HOSE
12	3/4" ID HOSE
16	1" ID HOSE
24	1 1/2" ID HOSE

HYD SWIVEL

NOTE:
(3) INDICATES PORT NUMBER ON HYDRAULIC SWIVEL

DUAL COUNTERBALANCE RELIEFS SET AT 3000 PSI

HYD SWIVEL (1)
HYD SWIVEL (2)
HYD SWIVEL (6)
HYD SWIVEL (4)

10U FILTER

PRESSURE COMP. 3000 PSI

T P LS

200 PSI PRESSURE REDUCING

PP

PROPEL

C1
C2

ADAPTER BLOCK

DUMP VALVE

10U FILTER

2500 PSI RELIEF SETTING

EXTEND / RETRACT

STEER

1500 PSI

AXLE EXTEND CYLINDER

AXLE EXTEND CYLINDER

COUNTERBALANCE RELIEFS SET AT 3000 PSI

BOOM TELESCOPE CYLINDER

1600 PSI (5)

1900 PSI (4)

STEERING CYLINDER

MASTER LEVEL CYLINDER DUAL RELIEFS SET AT 3000 PSI

SLAVE LEVEL CYLINDER DUAL COUNTERBALANCE RELIEFS SET AT 3000 PSI

.021

CAB LEVEL

.021

CAB ROTATE

ROTARY ACTUATOR CROSS PORT RELIEFS SET AT 700 PSI

2500 PSI RELIEF SETTING

HYDRAULIC RESERVOIR

EMERGENCY PUMPS

BOOM DOWN / UP

COUNTERBALANCE RELIEF SET AT 4900 PSI

HOIST CYLINDER

SWING

SWING MOTOR

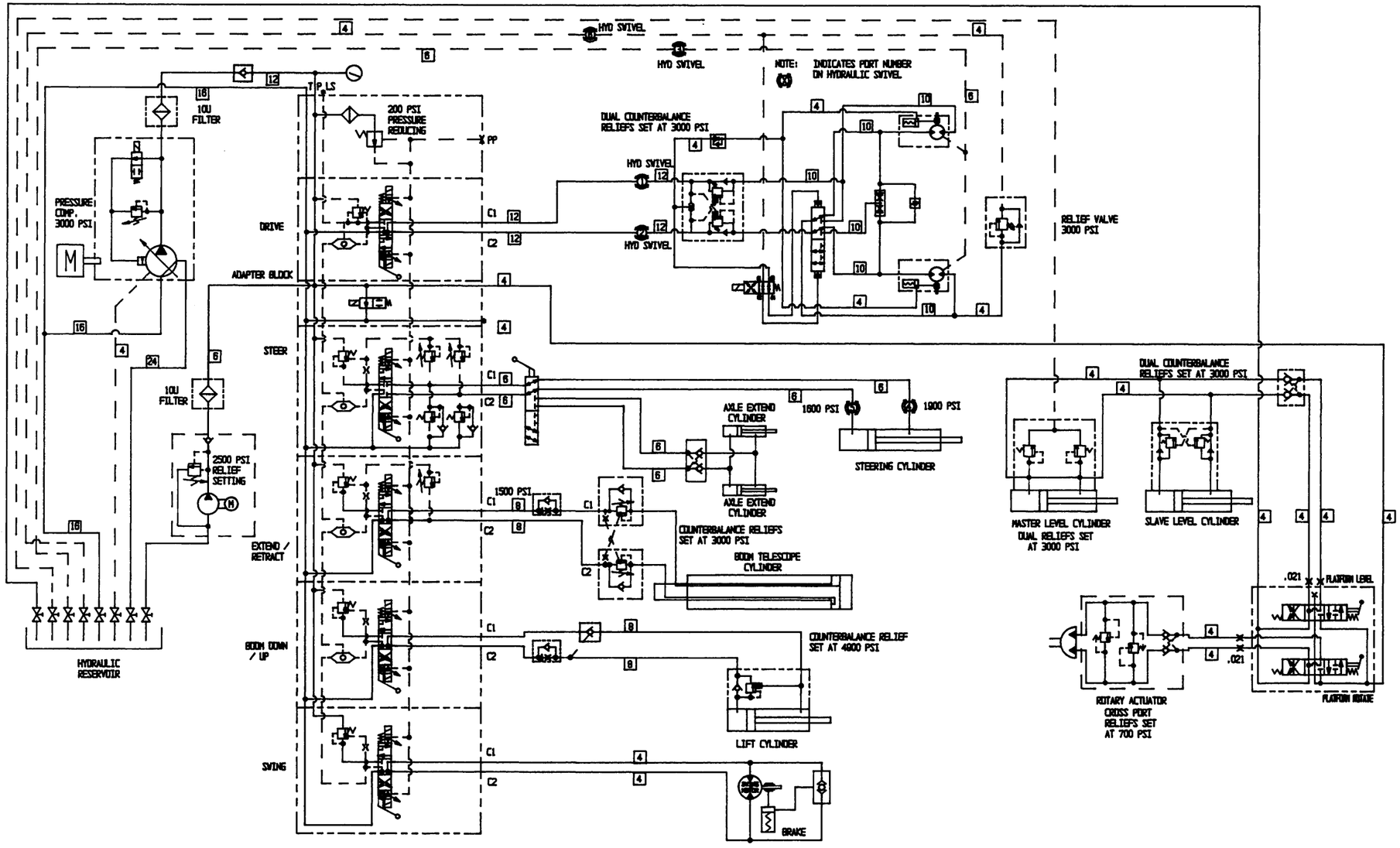
BRAKE

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
HYDRAULIC SCHEMATIC MPH-80, MP-95, MP-110 ELECTRIC PROPORTIONAL

REVISION

DRWG. NO. SDS 2331210



KEY - LINE SIZES
4 — 1/4" ID HOSE
6 — 3/8" ID HOSE
8 — 1/2" ID HOSE
12 — 3/4" ID HOSE
16 — 1" ID HOSE
24 — 1 1/2" ID HOSE

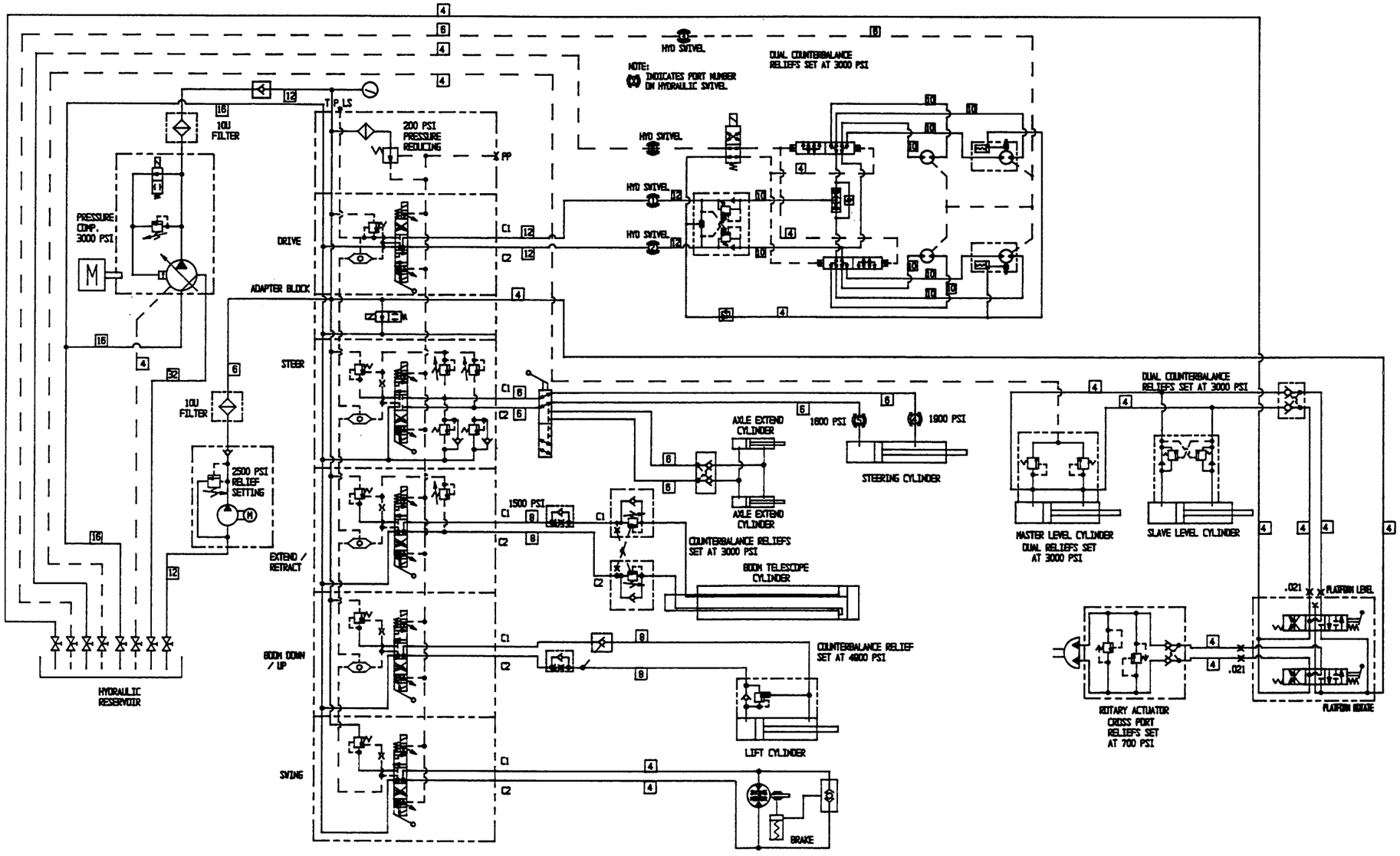
REF: MP-110 W\KEEL BOOM 2 WHEEL DRIVE

SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: HYDRAULIC SCHEMATIC

REVISION

DRWG. NO. E-2337530



KEY - LINE SIZES
4	1/4" ID HOSE
6	3/8" ID HOSE
8	1/2" ID HOSE
12	3/4" ID HOSE
16	1" ID HOSE
24	1 1/2" ID HOSE
32	2" ID HOSE

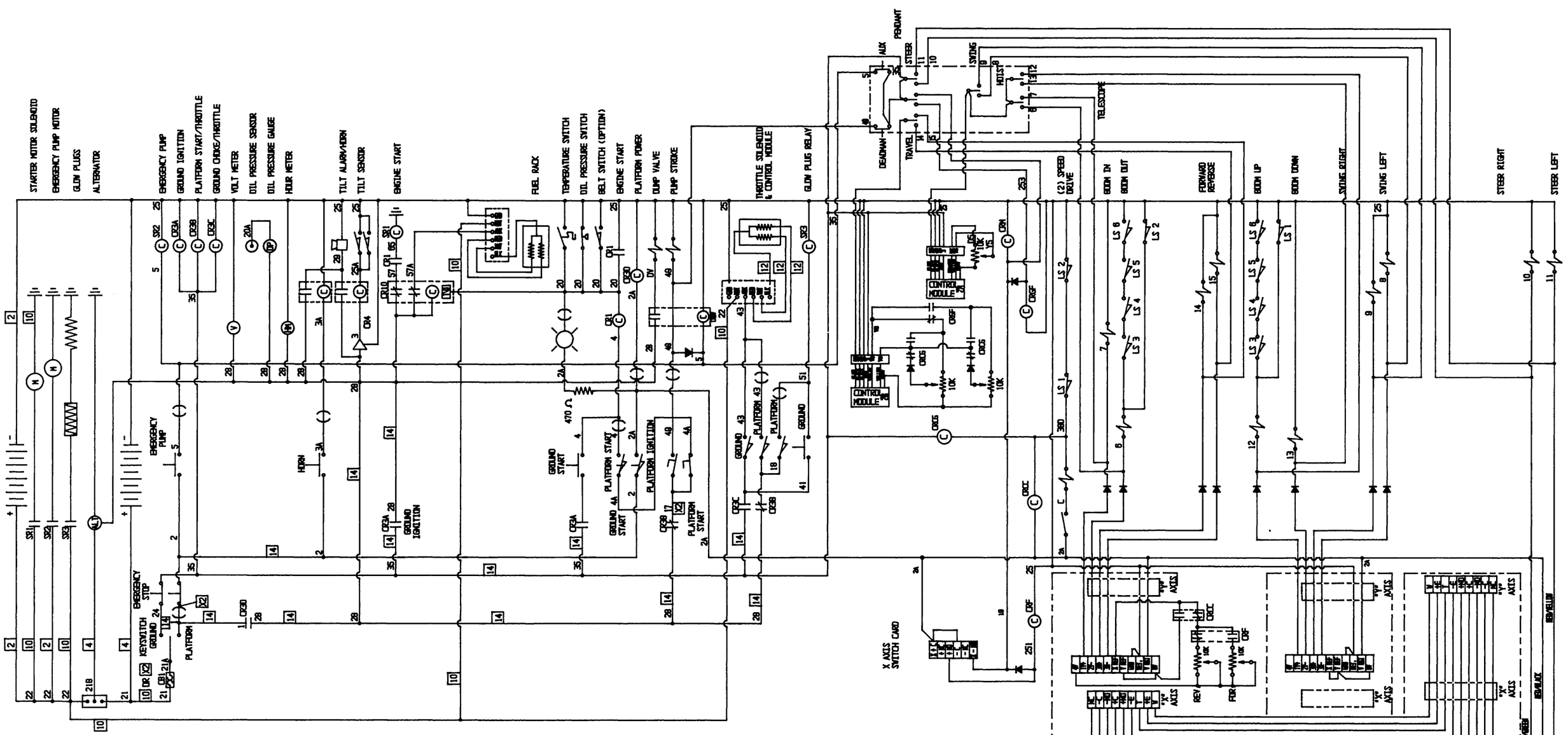
REF:MP-110 4 WD KEEL BOOM

SIMON AERIALS INC.
HOLMBURG, WI. 53224

TITLE: HYDRAULIC SCHEMATIC

REVISION

DWG. NO. SES 2337540



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

20	#2/0 AWG
2	#2 AWG
4	#4 AWG
10	#10 AWG
12	#12 AWG
14	#14 AWG
X2	DOUBLE WIRES

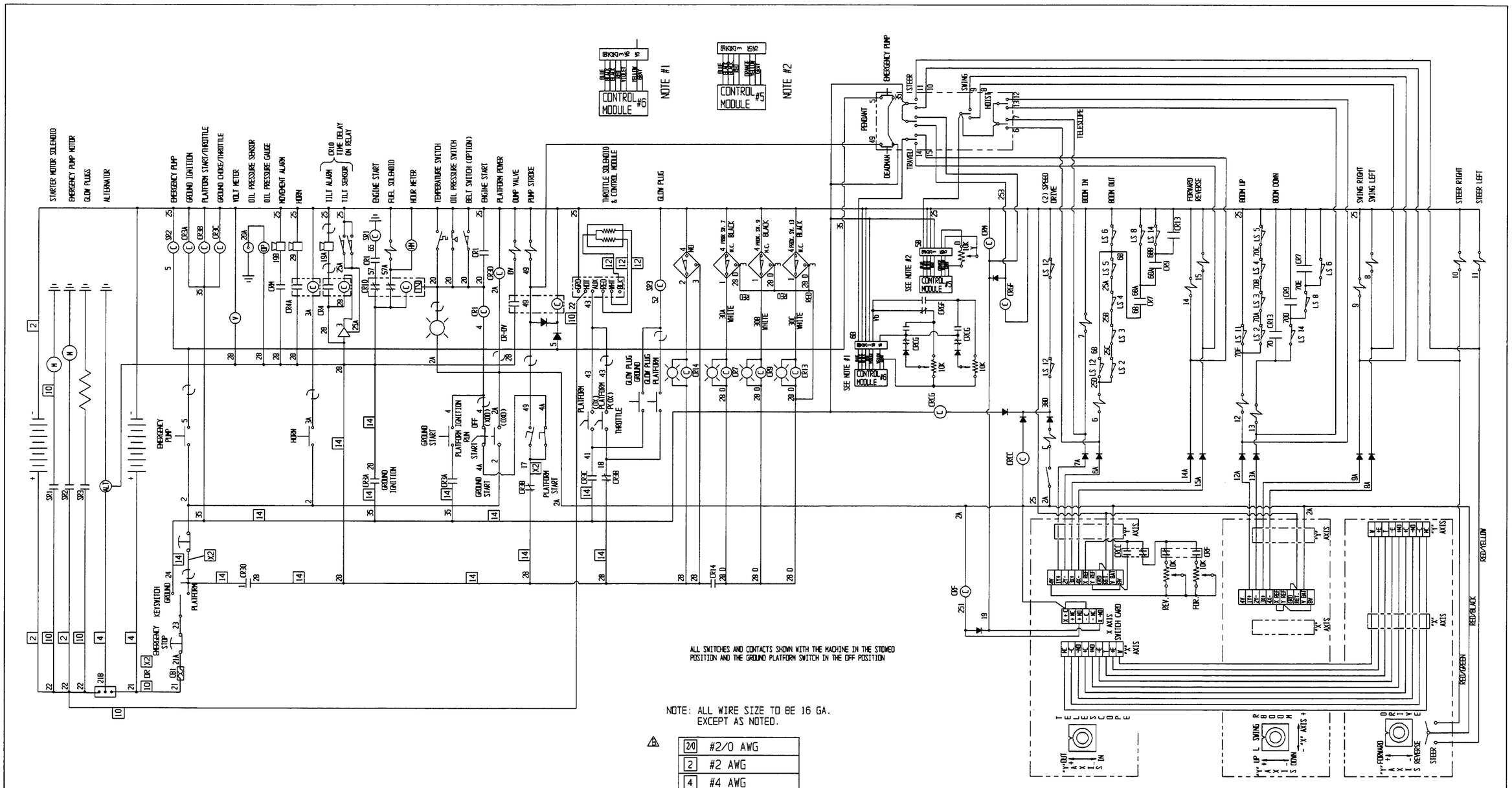
ALL SWITCHES AND CONTACTS SHOWN WITH THE MACHINE IN THE STOWED POSITION AND THE GROUND PLATFORM SWITCH IN THE OFF POSITION

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
ELEC. PROPORTIONAL MPH-80 & MP-95

REVISION: A

DWG. NO.: SDS 2316050



REV	BY	DATE	DESCRIPTION
B	RLN	18-18-96	ECN-2807
A	JWH	7-19-94	ECN-1792 ADDED WIRE SIZES & LEGEND
REL	RJR	3/15/94	DRN-01154

DO NOT SCALE PRINT

ALL WELDS MUST BE IN ACCORDANCE WITH THE LATEST A.W.S. STANDARDS D1.1, D14.1 OR D10.9

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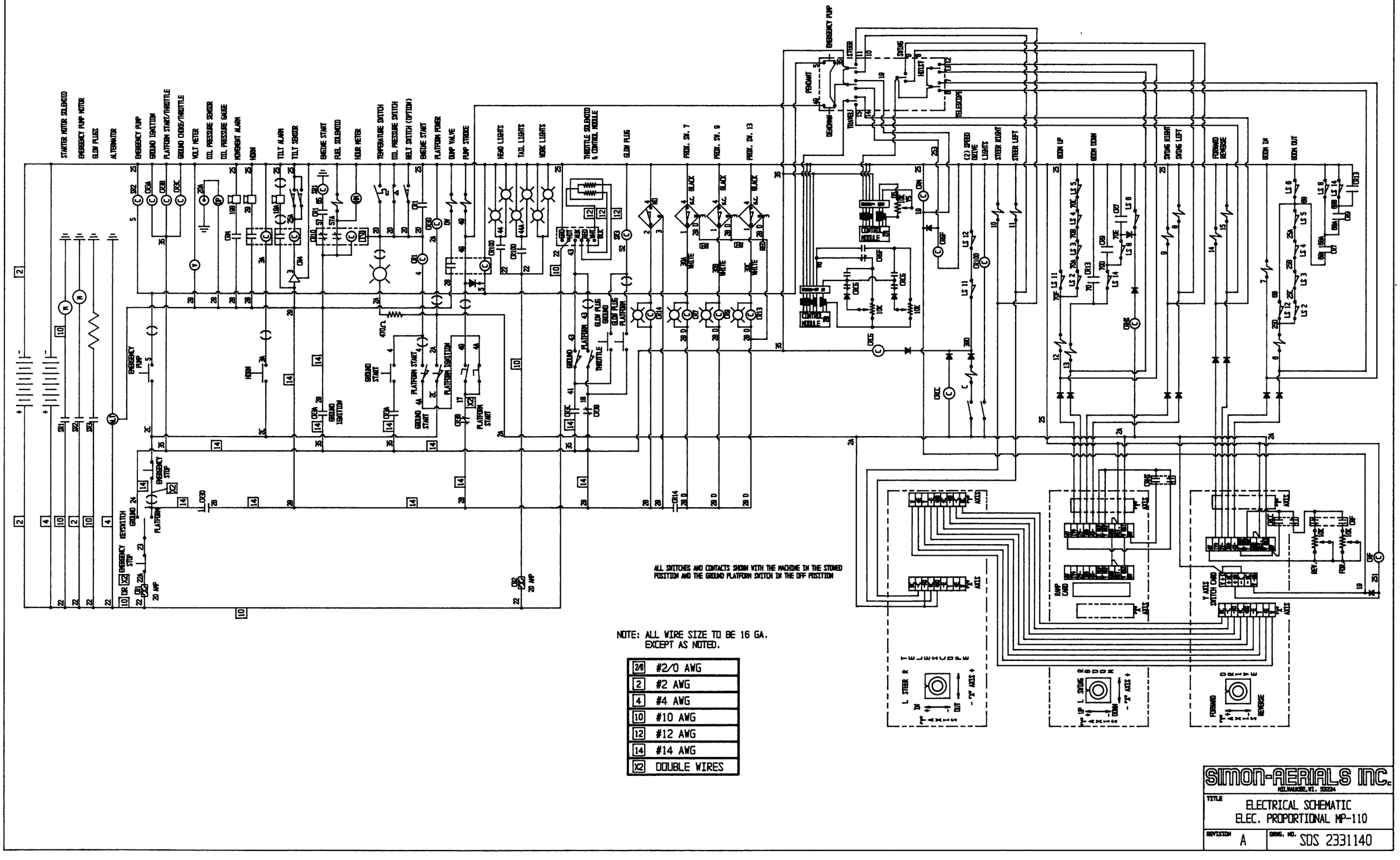
SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
1/1	RJR	3/15/94			D-2331130

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



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

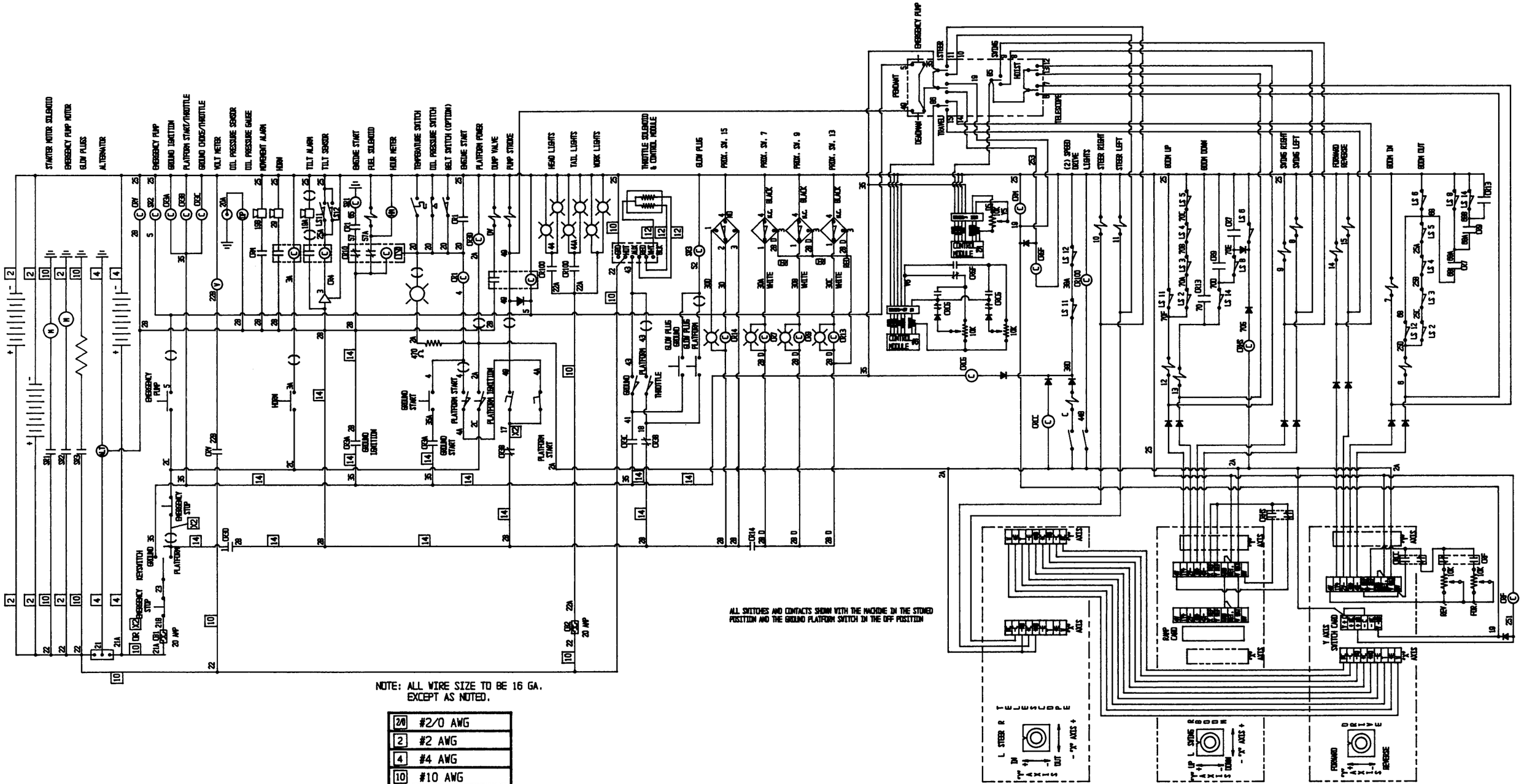
2/0	#2/0 AWG
2	#2 AWG
4	#4 AWG
10	#10 AWG
12	#12 AWG
14	#14 AWG
X2	DOUBLE WIRES

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
ELECTRICAL SCHEMATIC
ELEC. PROPORTIONAL MP-110

REVISION A

DRWG. NO. SDS 2331140



ALL SWITCHES AND CONTACTS SHOWN WITH THE MACHINE IN THE STOWED POSITION AND THE GROUND PLATFORM SWITCH IN THE OFF POSITION

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

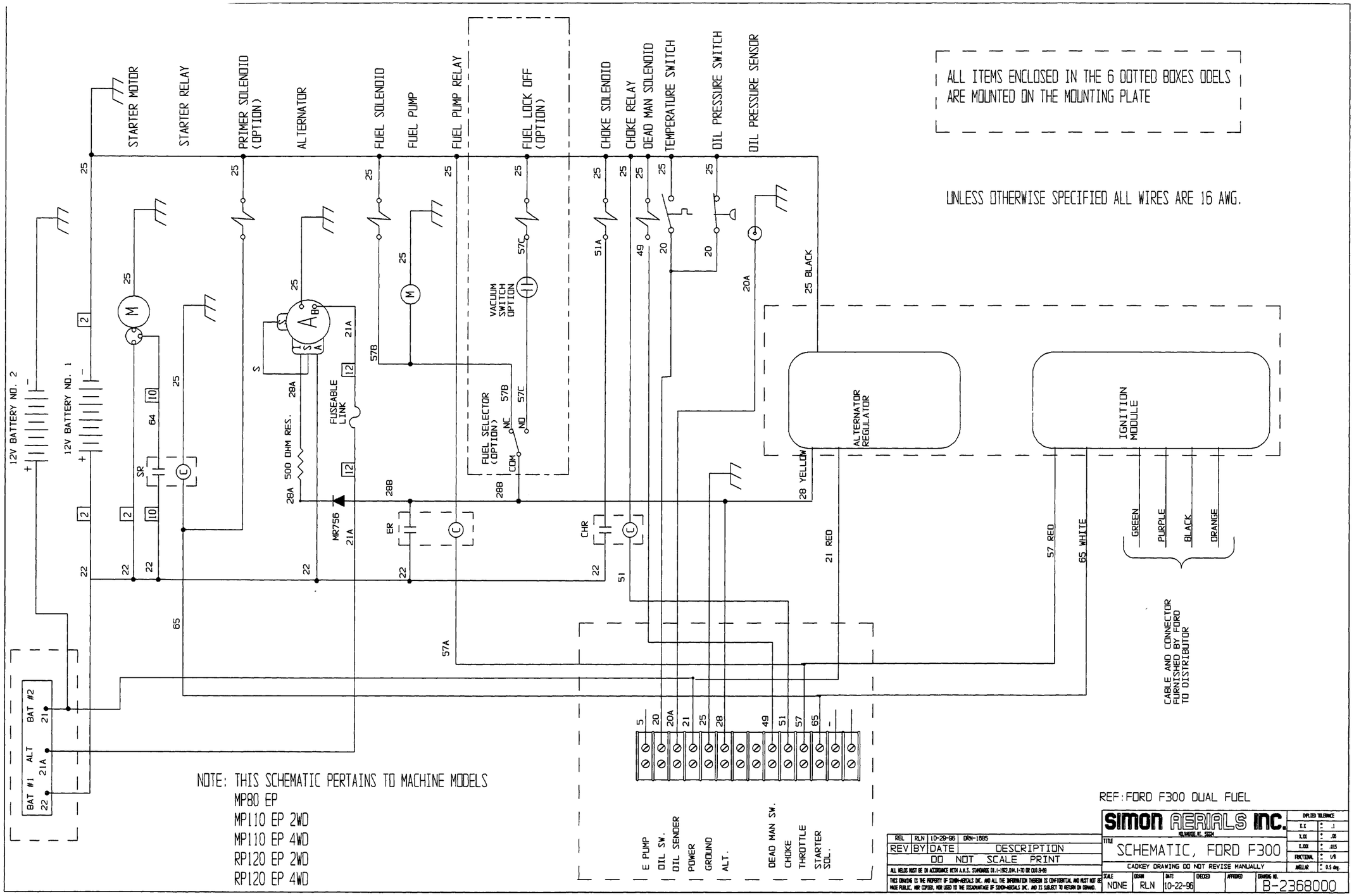
20	#2/0 AWG
2	#2 AWG
4	#4 AWG
10	#10 AWG
12	#12 AWG
14	#14 AWG
X2	DOUBLE WIRES

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
ELEC. PROPORTIONAL MP-110

REVISION: B

DRWG. NO.: SDS 2335390



REL	RLN	10-29-96	DRN-1685
REV	BY	DATE	DESCRIPTION

DO NOT SCALE PRINT

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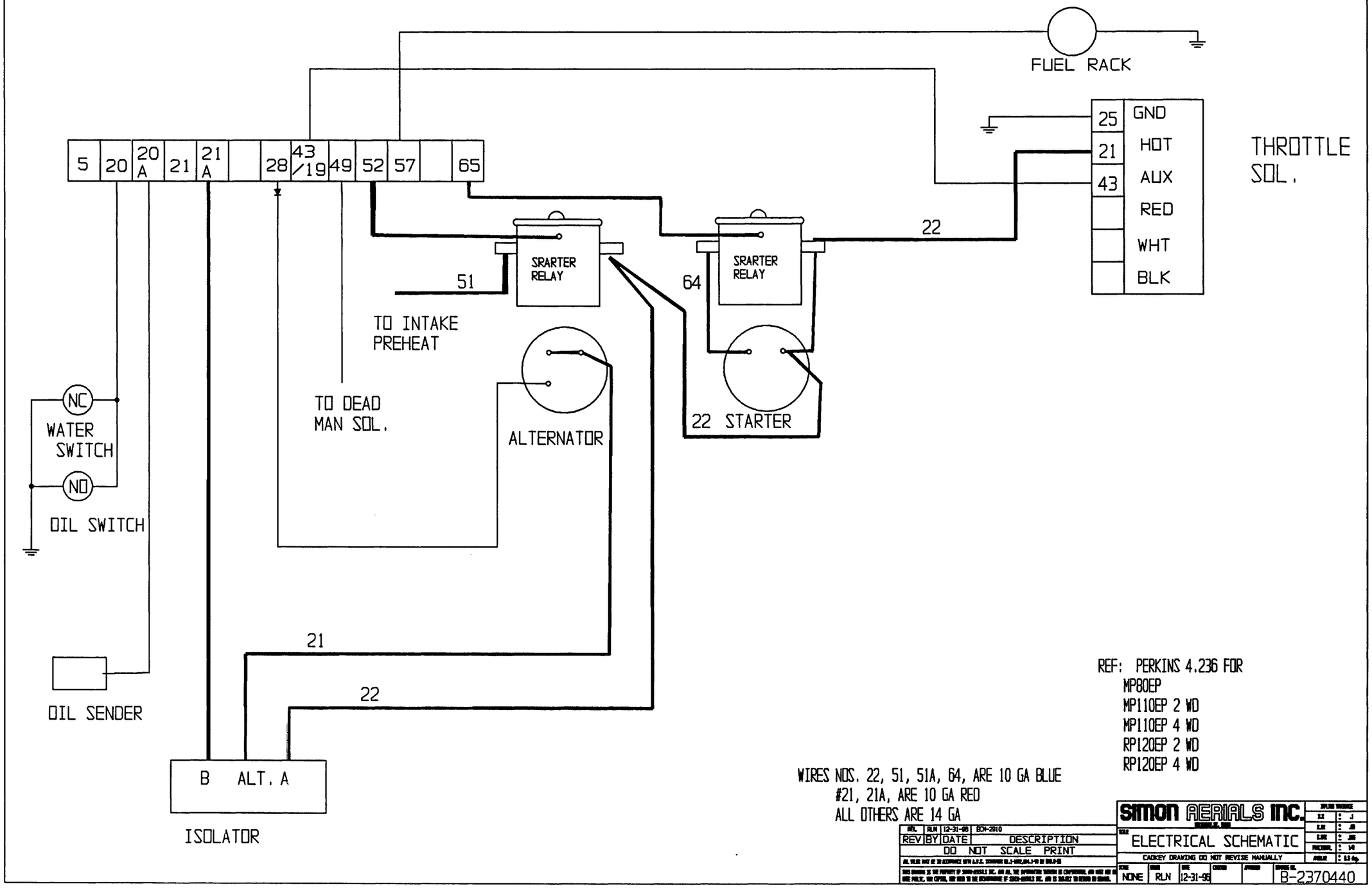
SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: SCHEMATIC, FORD F300

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
NONE	RLN	10-22-96			B-2368000

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



REF: PERKINS 4.236 FOR
MP80EP
MP110EP 2 WD
MP110EP 4 WD
RP120EP 2 WD
RP120EP 4 WD

WIRES NOS. 22, 51, 51A, 64, ARE 10 GA BLUE
#21, 21A, ARE 10 GA RED
ALL OTHERS ARE 14 GA

REV	BY	DATE	DESCRIPTION
	RLN	12-31-96	ECN-2910

DO NOT SCALE PRINT

SIMON AERIALS INC.

TITLE: ELECTRICAL SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
NONE	RLN	12-31-96			B-2370440