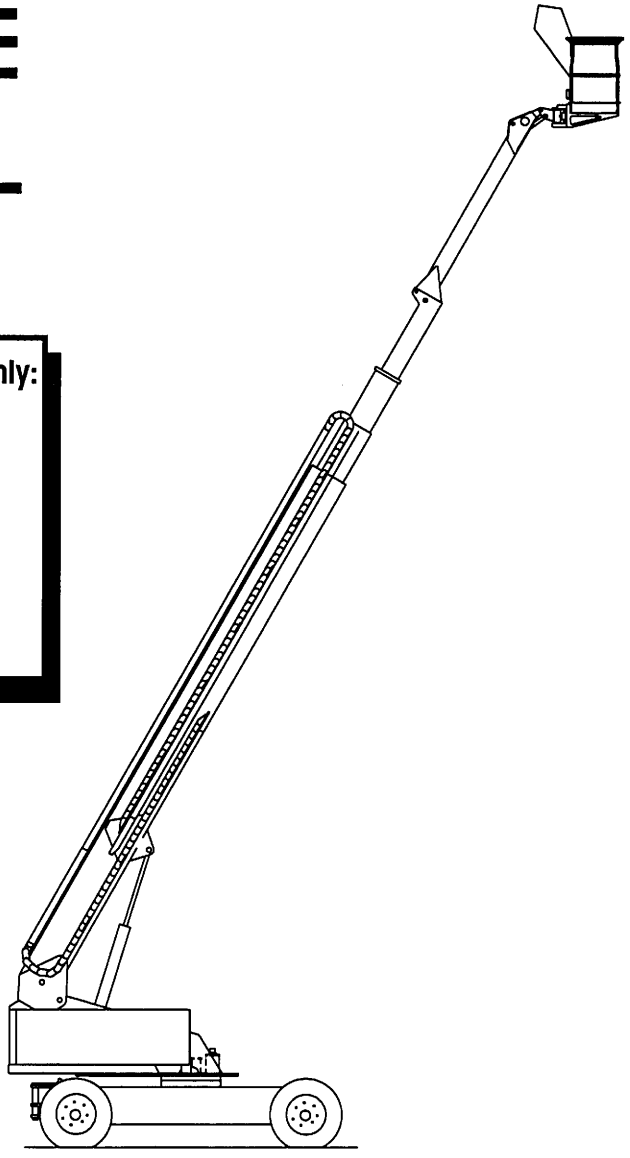
RP 120 "Reach Plus"

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



Part No. 89-126307 • Initial Issue dated October, 1994 •

Table of Contents

Introduction vii
Machine Specifications ix
Machine Component Locator xi
Undercarriage Component Locator xii
Superstructure Component Locator xiii
Boom Component Locator xiv
Platform Component Locator xvii
Lubrication Chart xviii
Lubrication Diagram xix

Section 1: Transportation and Emergency Procedures

Transporting the Unit 1-3
Towing procedures 1-3
Truck or Trailer Transport, Boom in STOW-*N*-GO™ Mode 1-4
Truck or Trailer Transport, Boom in Conventional Mode 1-9
Unloading Procedure 1-11
Emergency System and Procedures 1-15
Emergency Pumps 1-15
Emergency Drive Function 1-16
Emergency Lowering 1-17

Section 2: Hydraulic System

Hydraulic Fluid 2-5
Handling Precautions 2-5
Fluid Recommendations 2-5
Fluid Contamination Checks 2-5
System Flushing Procedure 2-6
Hydraulic System Components 2-7
Electro-Proportional Circuit 2-7
Hydraulic Pump 2-7
Hydraulic pump adjustment 2-7
Emergency Pumps 2-7
Emergency Pump Adjustment 2-7
Ground Valve Bank Assembly 2-8
Inlet Section 2-8
End Cover (Adapter Manifold) 2-8
Main Valve Segment 2-8
Operation 2-9
Maintenance 2-9
Hydraulic Circuit Line Check 2-9
Main Valve Segment 2-9
Valves 2-10
Drive Relief Valve 2-10
Drive Valve Assembly 2-10
Hi/ Low Speed Drive Valve 2-10
Selector Valve 2-10
Flow Divider Valve Assembly 2-11
Motion Control Valve Assembly 2-11
Selector Valve Assembly 2-11
Selector Valve 2-11
Check Valve 2-11

Table of Contents (Continued)

Section 2: Hydraulic System (Continued)

Hydraulic Fluid Reservoir 2-12
Hydraulic reservoir maintenance 2-12
High Pressure Filter 2-12
Boom Lift System 2-12
Boom Lift Valve Segment 2-12
Flow Control Valve 2-13
Flow Control Valve Adjustment 2-13
Lift Cylinder 2-13
Boom Telescope (Extend) System 2-13
Boom Extend valve segment 2-13
Pressure Relief Valve 2-14
Telescope (Extend) Cylinder 2-14
Superstructure Swing System 2-14
Swing Valve Segment 2-15
Swing Drive/ Reducer Assembly 2-15
Swing Drive/ Reducer Assembly Adjustment 2-15
Integral Brake Assembly 2-15
Swing System Maintenance 2-16
Jib Boom System 2-16
Jib Boom Valve Segment 2-16
Jib Cylinder 2-16
Platform Rotate System 2-17
Rotate Control Valve 2-17
Double Pilot Operated Check Valve 2-17
Rotary Actuator 2-17
Rotary Actuator Maintenance 2-18
Platform Rotator Manifold 2-18
Platform Level System 2-18
Level Control Valve 2-19
Double Pilot Operated Check Valve 2-19
Master Level Cylinder 2-19
Slave Level Cylinder 2-19
Relief Valves 2-20
Steer System 2-20
Selector Valve Assembly 2-20
Selector Valve 2-20
Check Valve 2-21
Steer Valve Segment 2-21
Hydraulic Swivel 2-21
Steer Cylinder 2-21
Steer Disconnect Knob 2-21
Steer System Maintenance 2-22
Axle Extend System 2-22
Axle Extend Cylinders 2-23
Selector Valve Assembly 2-23
Selector Valve 2-23
Check Valve 2-23
Steer Valve Segment 2-23
Hydraulic Swivel 2-23

Table of Contents (Continued)

Section 3: Drive System

Drive System Components 3-3
- Drive Motor and Brake Assembly 3-3
- Drive Valve Segment 3-4
- Drive Valve Assembly 3-4
  - Selector Valve 3-4
  - Motion Control Valve Assembly 3-4
    - Motion Control Valve 3-4
    - Flow Control Valve 3-4
  - Flow Divider Valve Assembly 3-5
    - Flow Divider/ Combiner Valve 3-5
    - Gate (Globe) Valve 3-5
- Drive Relief Valve 3-5
- Brake Metering Valve 3-5
  - Brake Metering Valve Adjustment 3-5
- Toggle Switch on the Pendant Control 3-5
- Platform Control Handle (Joystick) 3-5

Section 4: Electrical System

Electrical System 4-3
- Battery 4-3
  - Battery Maintenance (In Storage) 4-3
  - Battery Maintenance (In Use) 4-3
  - Battery Preventive Maintenance 4-4
  - Battery Replacement 4-4
- Movement Alarm 4-4
- Tilt Alarm 4-4
  - Tilt Alarm Test 4-4
  - Tilt Alarm Adjustment 4-5
- Relays 4-5
- Circuit Breakers 4-5
- Limit Switches 4-5
- Emergency Pumps 4-5
- Platform Envelope Control System 4-6
- Emergency Stop Buttons 4-6
- Emergency Stop Cable Adjustment 4-6
- Pendant Switch Removal 4-6
- Ground Control Cabinet Switch Removal 4-6
- Platform Console Switch Removal 4-6
- Drive Controller 4-6
- Creep Speed Adjustments 4-8
- Boom Telescope Adjustment 4-8
- Superstructure Swing Adjustment 4-8

Table of Contents (Continued)

Section 5: Mechanical Components

Mechanical Components 5-3
Tires 5-3
  Changing Tires 5-3
Wheels and Lug Nuts 5-3
Drive Hub Assembly 5-4
Steer Cylinder Pins 5-5
Steer Cylinder 5-5
Steer Arm Pin 5-6
Tie Rod Assembly 5-6
Superstructure 5-7
Hoses and Cables 5-8
Miscellaneous Equipment 5-8
Boom 5-8
  Boom Pivot Pin and Bushing Replacement 5-8
Boom Lift Cylinder 5-9
  Lift Cylinder Pivot Pin Replacement 5-9
  Lift Cylinder Seal Replacement (On Machine) 5-9
  Check Holding Valves 5-9
Boom Disassembly 5-10
Boom Assembly 5-14
Boom Telescope (Extend) Cylinder 5-17
  Telescope (Extend) Boom Cylinder Pin Replacement 5-18
  Telescope (Extend) Cylinder Removal 5-18
  Telescope Cylinder Seal Replacement 5-18
  Telescope Cylinder Installation 5-18
  Checking Holding Valves 5-18
Boom Wire Rope Adjustment 5-18
Boom Wire Rope Replacement 5-21
Wear Pads 5-21
Platform Level Cylinders 5-21
  Platform Level Cylinder Pin Replacement 5-22
  Level Cylinder Seal Replacement 5-22
  Platform Leveling Procedure 5-22
Axle Extend Assembly 5-24
  Axle Extend Cylinder 5-24
    Axle Extend Cylinder Replacement 5-24
    Axle Extend Cylinder Seal Repacement 5-26
  Mechnical Axle Stop 5-26
Axle Tube Assembly Replacement 5-26

Table of Contents (Continued)

Section 6: Maintenance Schedule

Maintenance Schedule 6-3
General Maintenance Tips 6-3
Routine Servicing 6-3
- Shift Service 6-3
- Monthly Service 6-4
- Semi-Annual 6-4
- Annual Service 6-5
- Four Year Interval Service 6-5

Shift Operational Checklist 6-6
Weekly Operational Checklist 6-9
Monthly Operational Checklist 6-11
Semi-Annual Operational Checklist 6-13

Section 7: Troubleshooting

General Troubleshooting Tips 7-3
Troubleshooting Chart 7-4

Index

Appendix

Envelope Control System Operations and Installation Manual
Hydraulic Schematic E-2327510
Electrical Schematic SES-2327790

INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the SIMON AERIALS INC. RP Aerial 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 Aerial Mobile Platforms are designed and built to provide many years of safe, dependable service. To obtain full benefits from your RP, always follow the proper operating and maintenance procedures. Only trained, authorized personnel should be allowed to operate or service this machine. Service personnel should read and study the Operators, Service, Parts and Component Repair Manuals in order to gain a thorough understanding of the unit prior to making any repairs. 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 body of the machine, and at the ground controls and platform control console. 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 AERIALS INC. reserves the right to change, improve, modify or expand features of its equipment. Therefore,specifications, models or equipment are subject to change without notice, and without incurring obligations.

All SIMON AERIALS INC. manuals are periodically updated to reflect changes that occur in the equipment. Please contact the factory for information regarding changes which may affect your machine.

MACHINE SPECIFICATIONS

Working Height	**126 Ft/** 38.58 M
Platform Height	**120 Ft/** 36.58 M
Horizontal Reach (Boom Angle 0°)	**60 Ft 0 In./** 18.29 M
Platform Capacity (Unrestricted)	**500 Lbs. /** 225 Kg
Platform Size	
Standard	**30 In. x 60 In. x 47 In./** .76 M x 1.52 M x 1.19 M
Optional	**36 In. x 96 In. x 47 In./** .91 M x 2.44 M x 1.19 M
Stowed Length (STOW-*N*-GO™ Position)	**36 Ft 0 In./** 10.97 M
Stowed Height	**9 Ft 11.75 In./** 3.04 M
Machine Width: without axles extended	**8 Ft 0 In./** 2.44 M
Machine Width: with axles extended	**11 Ft 8 In./** 3.56 M
Wheelbase	**12 Ft 0 In./** 3.66 M
Ground Clearance	**11 In./** 27.9 cm
Gross Weight (Approx.) (Note 1)	**47,700 Lbs./** 21,636 Kg
Maximum Travel Speed:	
Boom Stowed (Note 1)	**2.8 MPH/** 4.5 KPH
Boom Extended or Elevated	**0.5 MPH /** 0.8 KPH
Outside Turning Radius	**24 Ft 0 In./** 7.32 M
Gradeability (On Hard Surface) (Note 1)	**7.0°/** 12%
Platform Rotation	**180°**
Superstructure Rotation	**360° continuous, either direction**
Tire Size	**15 x 22.5 (16 Ply)**
Tire Pressure (not applicable to foam filled tires)	**110 PSI/** 7.58 Bar/ 7.73 Kg/cm^2
Maximum Hydraulic Pressure	**3000 PSI /** 206 Bar / 210 Kg/cm^2
Hydraulic Tank Capacity	**55 Gal./** 208 Liters
Fuel Capacity:	
Gas or Diesel	**57 Gal./** 216 Liters
Propane	**30 Lbs. /** 14 Kg
Swing Bearing Bolt Torque	**280 Ft Lbs./** 380 Nm/ 38.7 Kg-m
Wheel Lug Nut Torque (Drive and Steer Axles)	**220 Ft Lbs. /** 298 Nm / 30.4 Kg-m
Drive Hub Bolt Torque	**170 Ft Lbs. /** 231 Nm / 23.5 Kg-m
Electrical System	**Two 12 Volt DC Batteries**

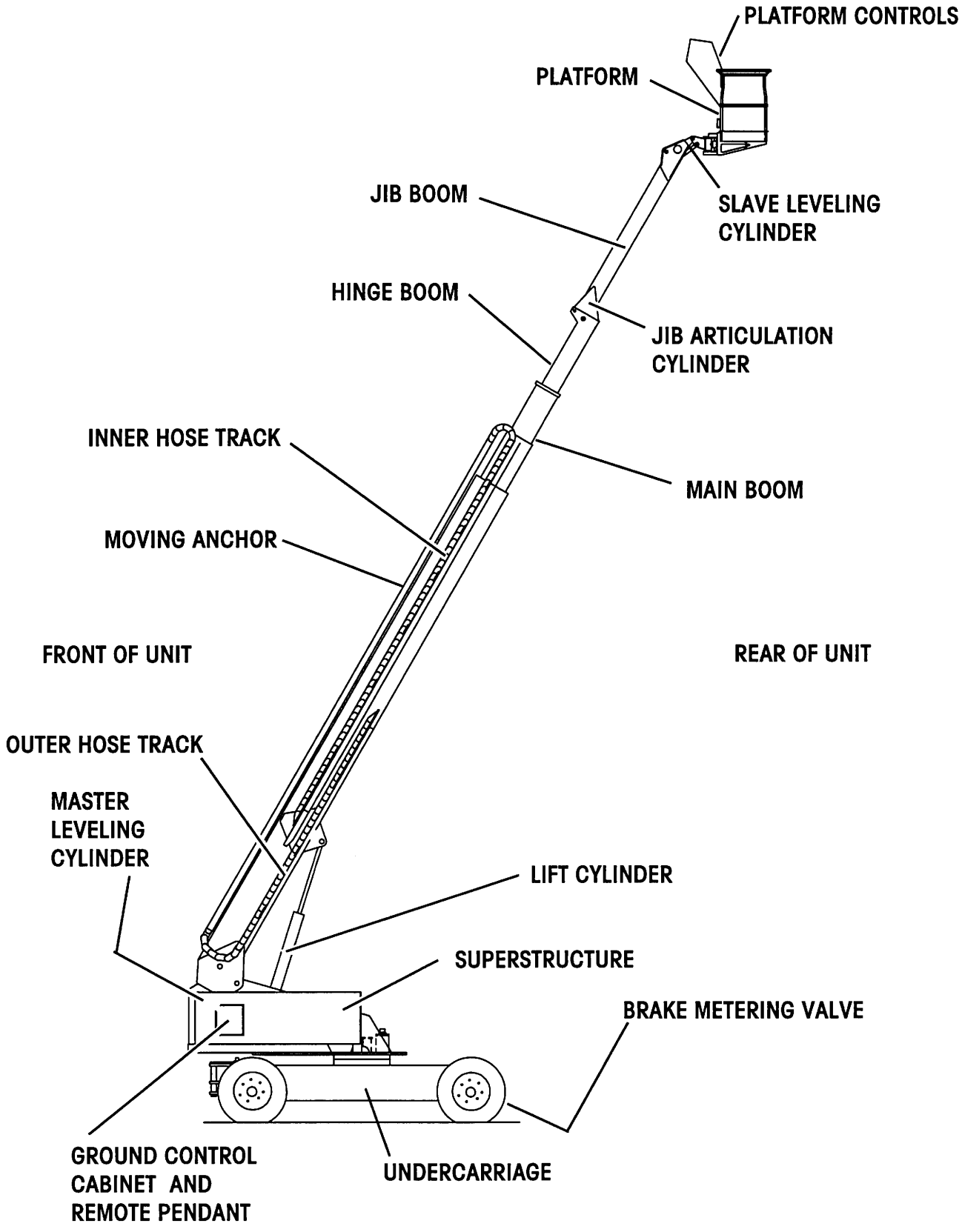
Engine Availability:

Standard . . . Ford CSG-649, 110 HP (82 Kw), Liquid Cooled, Gasoline
Idle Speed: **1000-1100 RPM. Hi Speed: 2750-2775 RPM**

Optional . . . Ford CSG-649, 110 HP (82 Kw), Liquid Cooled, Dual Fuel
Deutz F4L912, 71 HP (53 Kw), Air Cooled, Diesel
Idle Speed: **1500-1600 RPM. Hi Speed: 2650-2675 RPM**
Perkins 4.236, 81 HP (60 Kw), Liquid Cooled, Diesel
Idle Speed: **1800-1900 RPM. Hi Speed: 2800-2825 RPM**

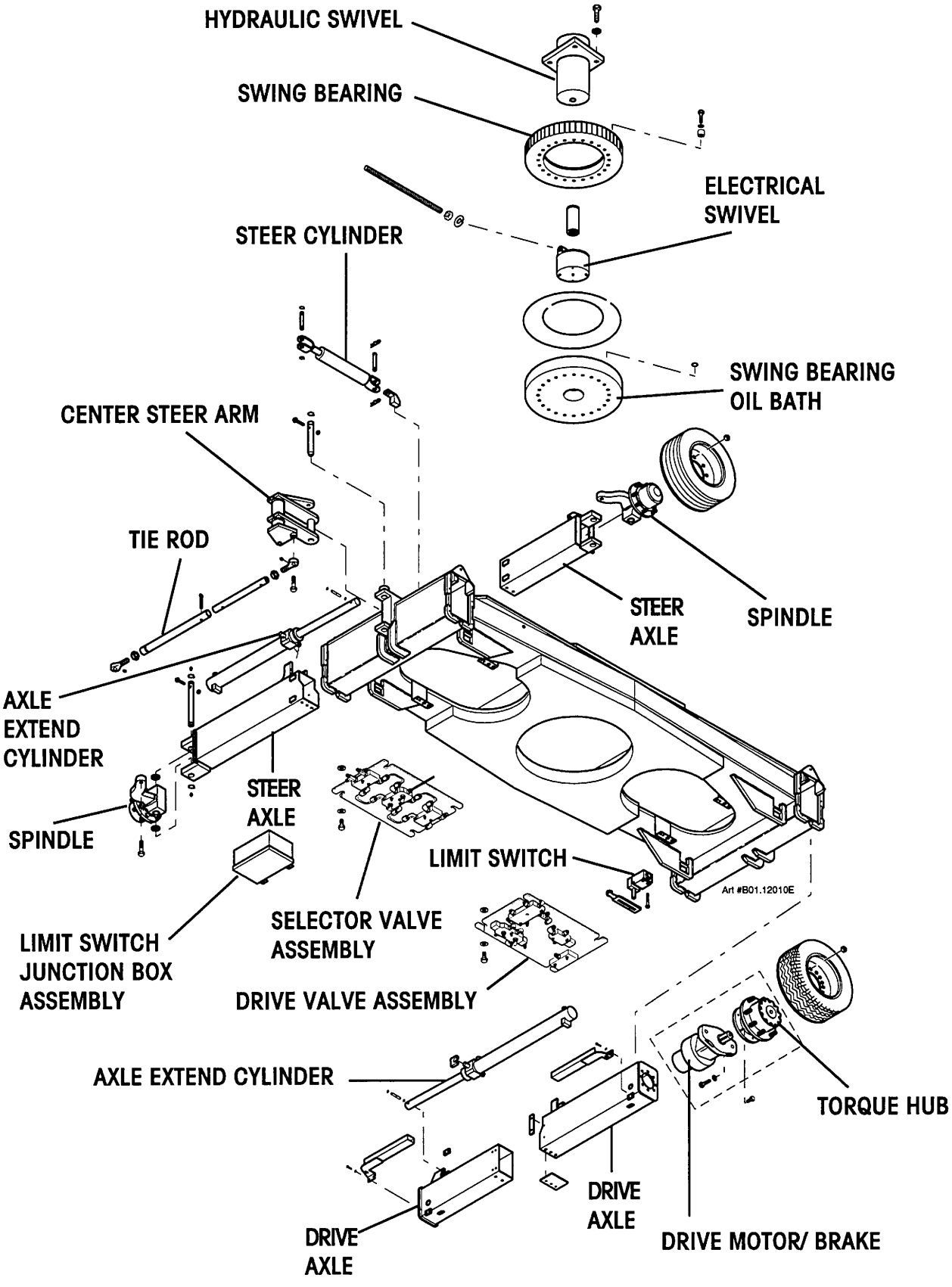
Note 1: Weight and performance shown represent typical units, and should be used as a general guideline only. Many variables between machines can lead to significant differences in these factors. Accurate figures, when necessary for a particular application, can best be determined by testing of the specific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

MACHINE COMPONENT LOCATOR

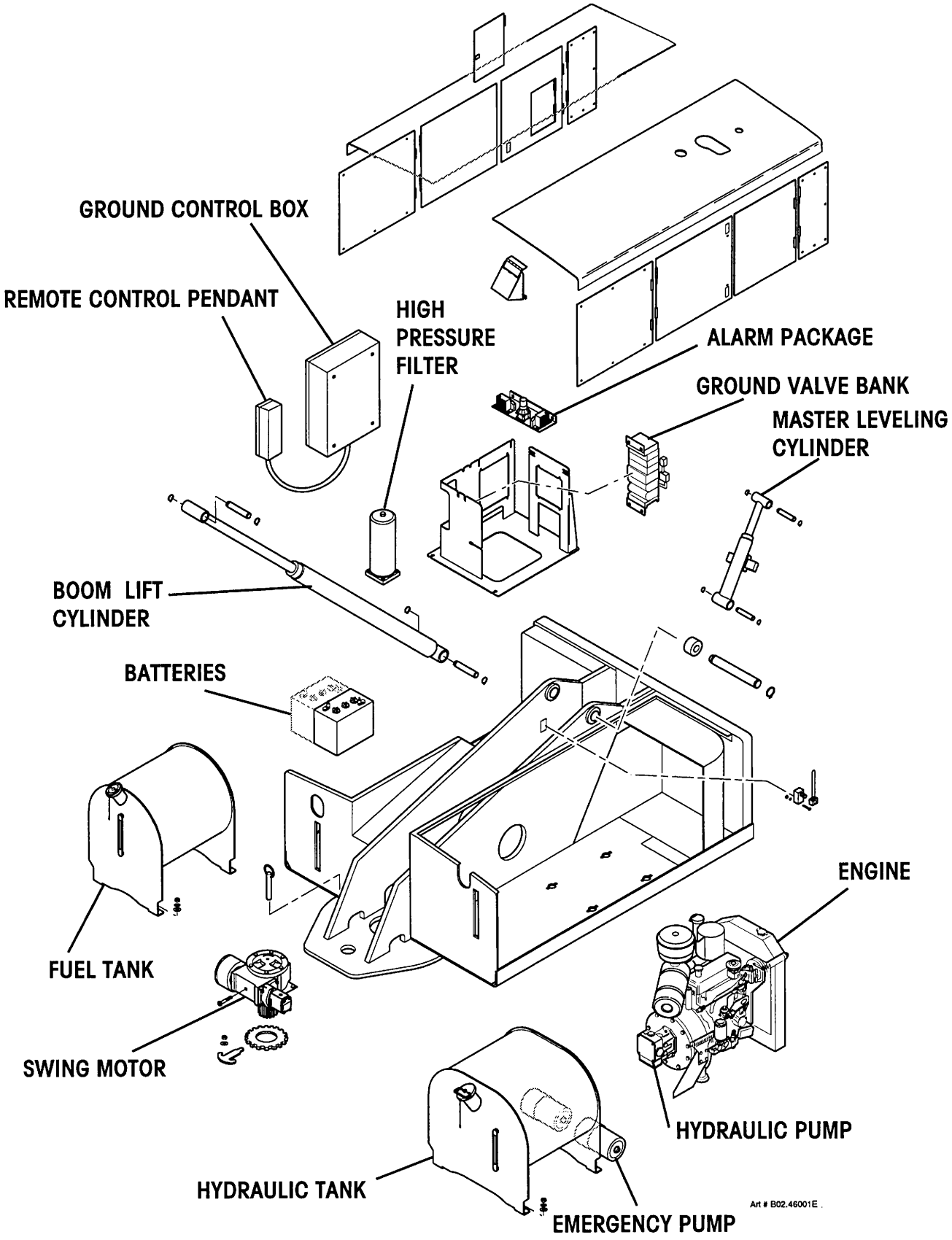


Left Hand Side.

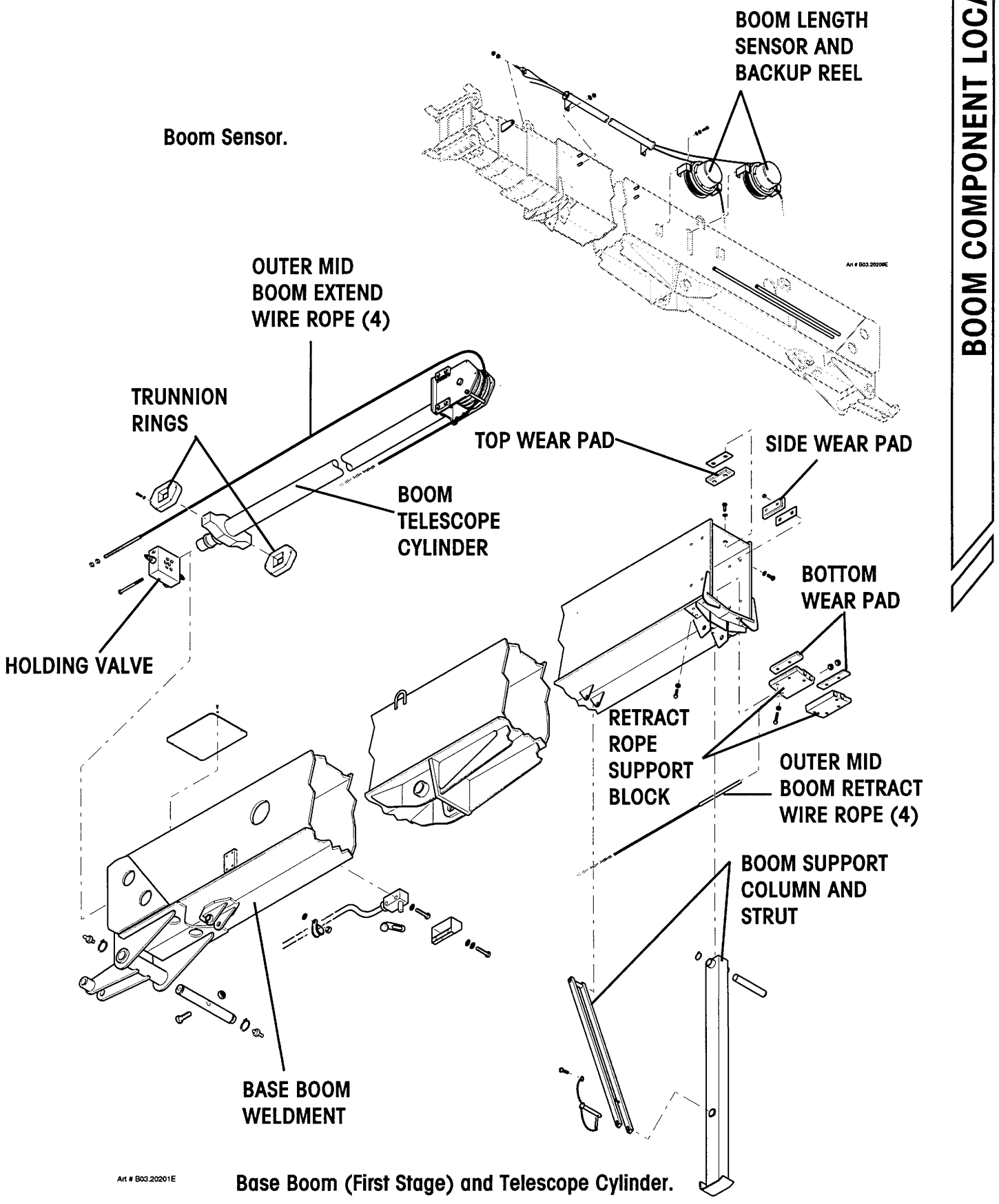
UNDERCARRIAGE COMPONENT LOCATOR



SUPERSTRUCTURE COMPONENT LOCATOR

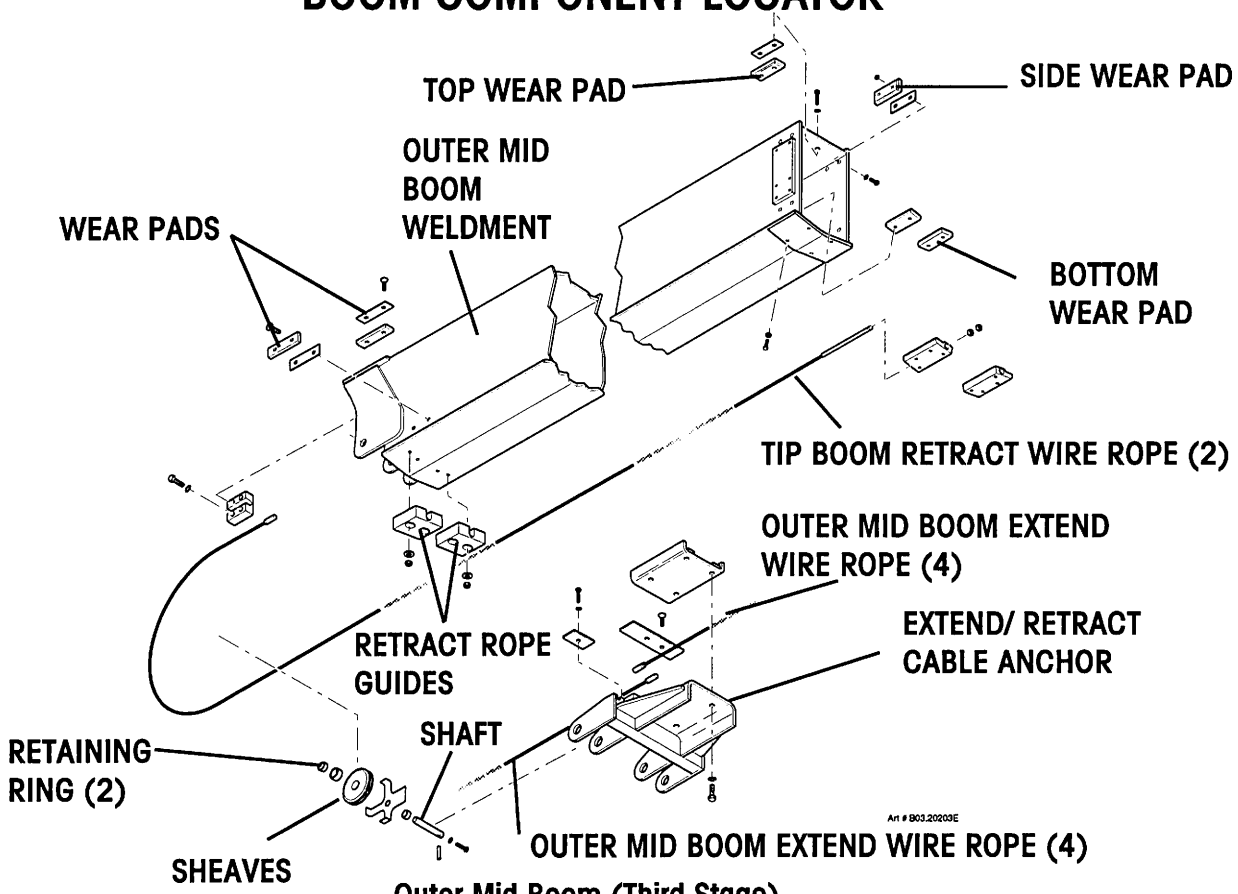


BOOM COMPONENT LOCATOR

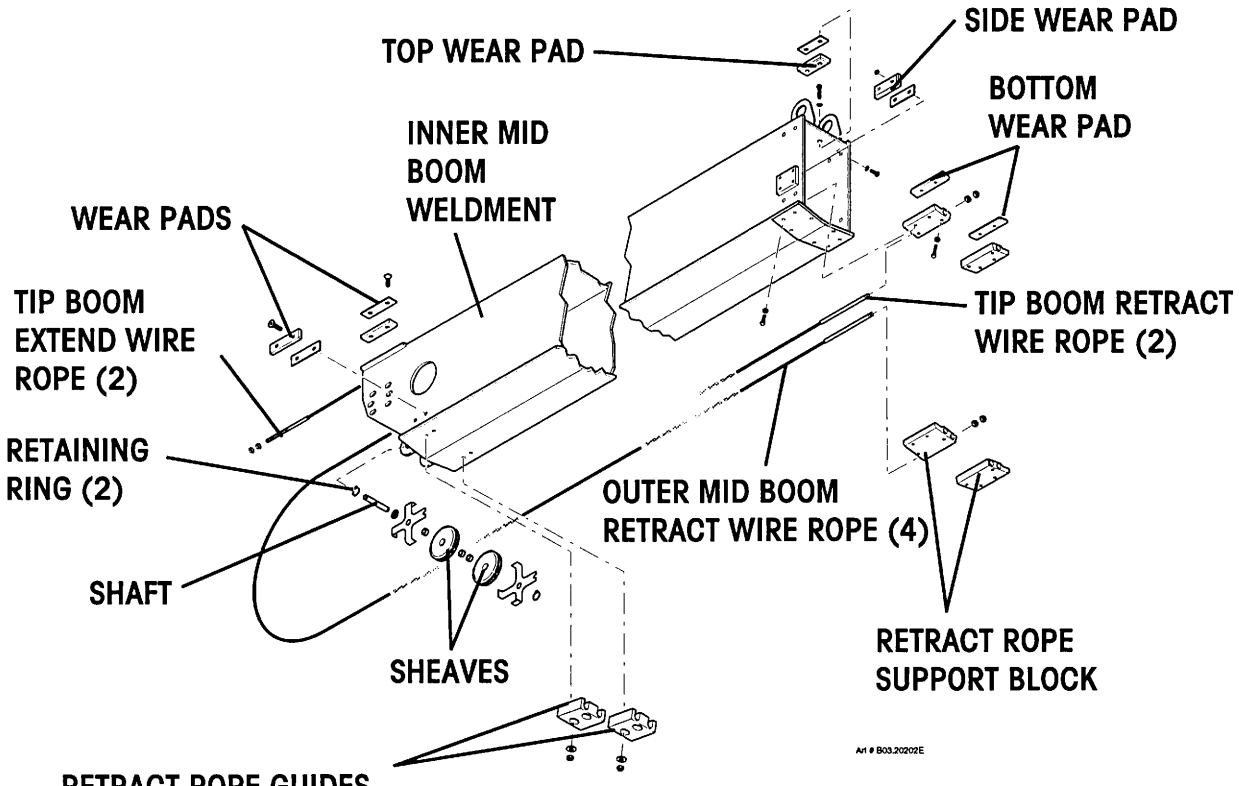


Base Boom (First Stage) and Telescope Cylinder.

BOOM COMPONENT LOCATOR

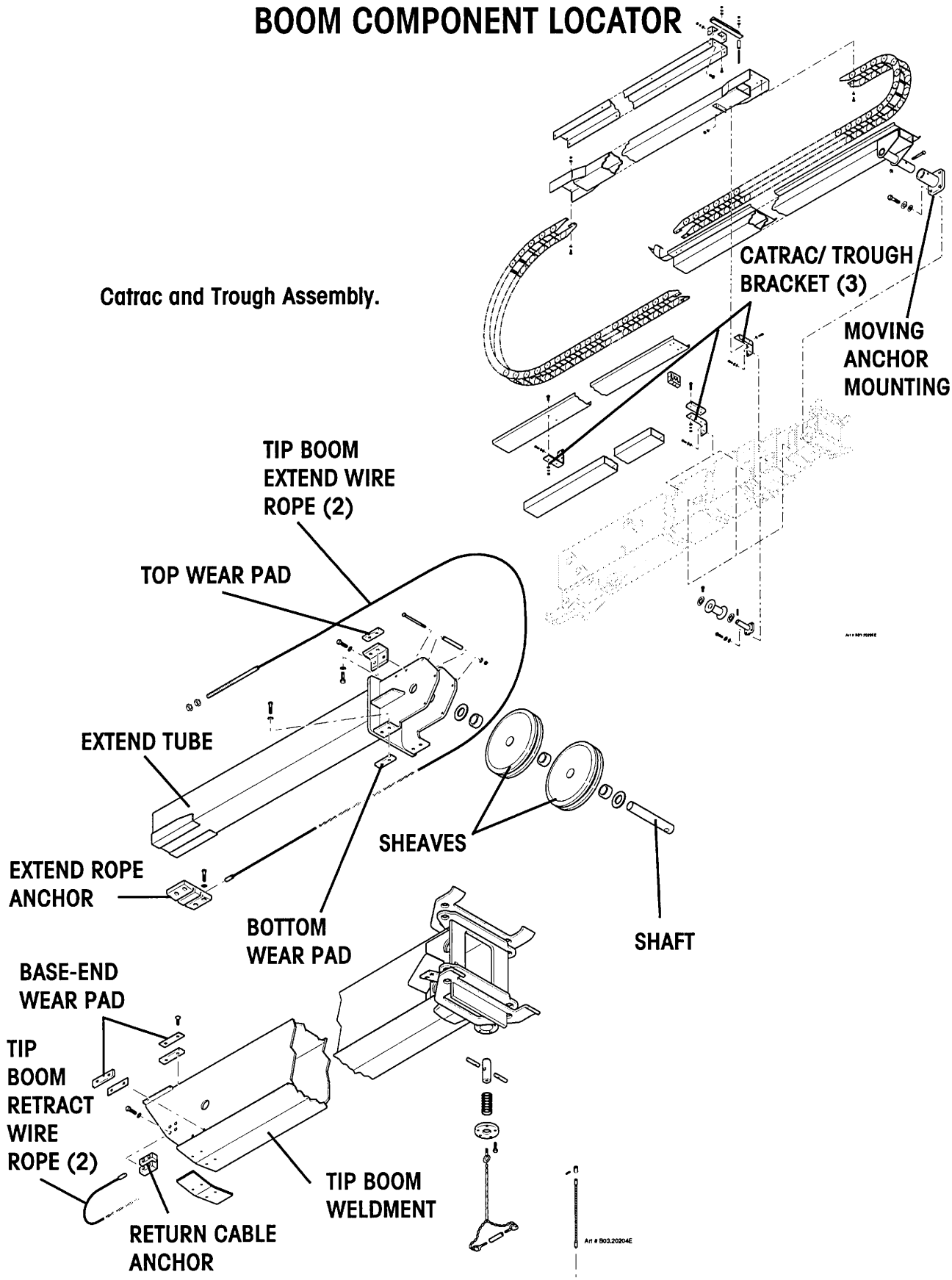


Outer Mid Boom (Third Stage).



Inner Mid Boom (Second Stage).

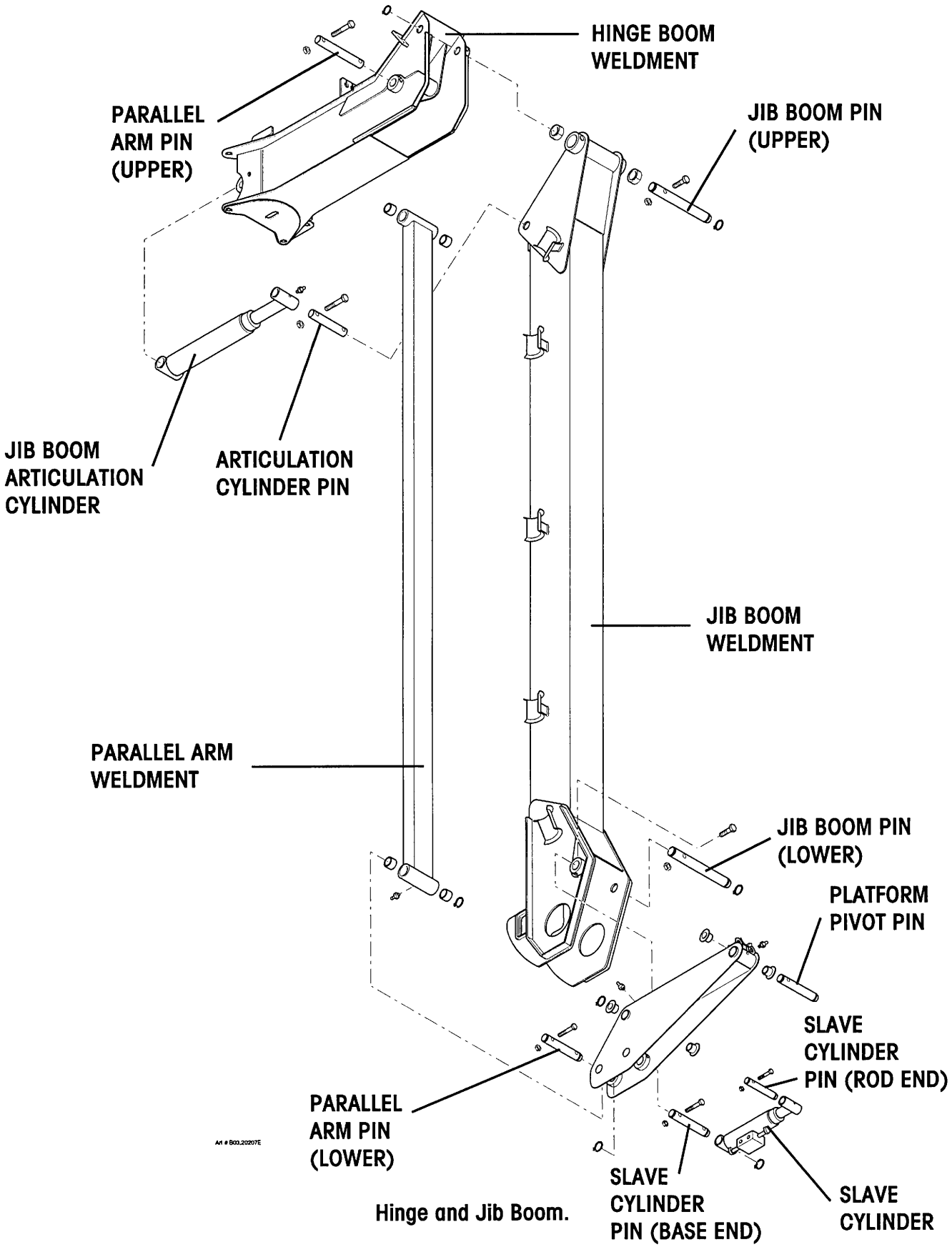
BOOM COMPONENT LOCATOR



Catrac and Trough Assembly.

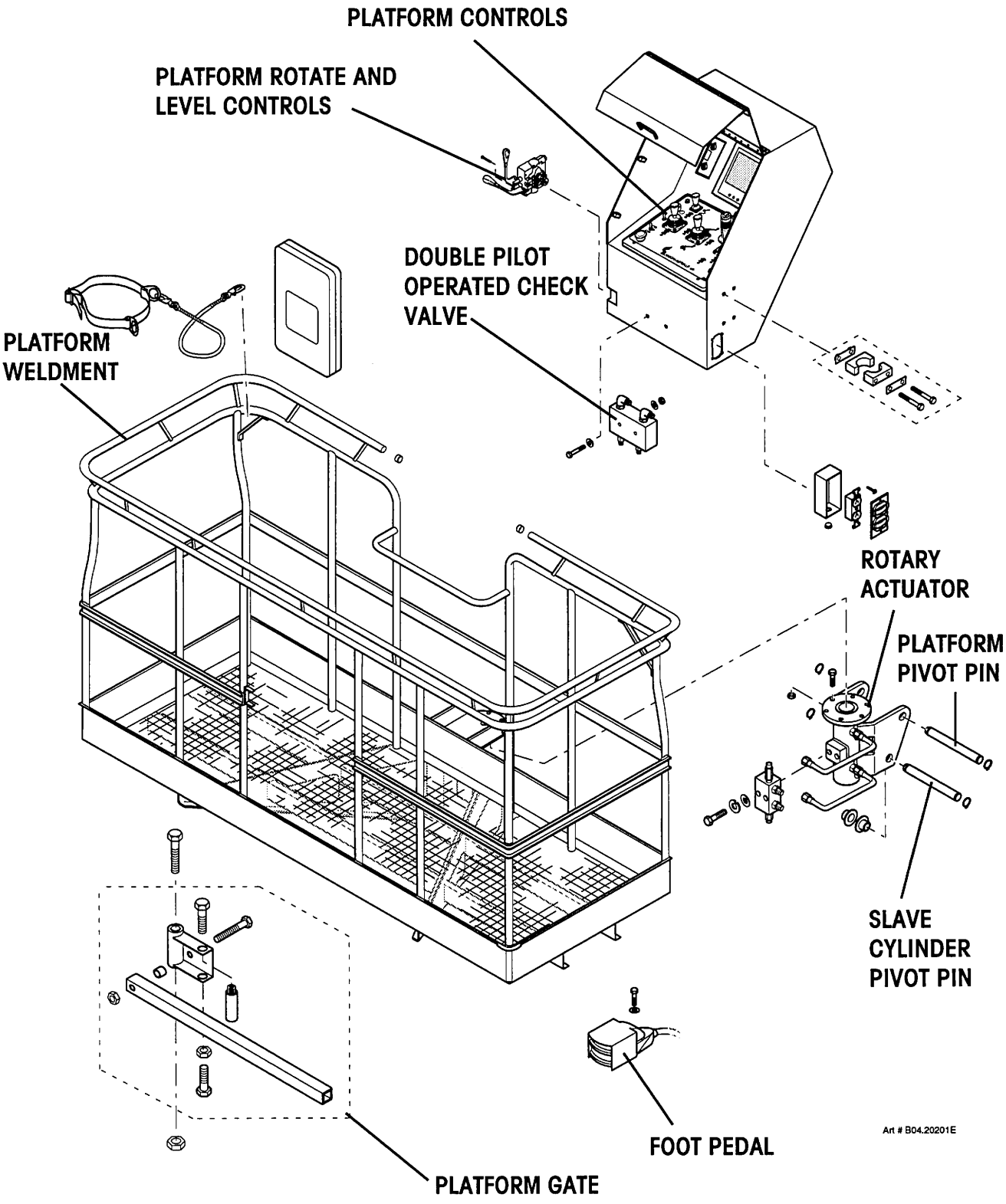
Tip Boom (Fourth Stage).

BOOM COMPONENT LOCATOR



Hinge and Jib Boom.

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 level & condition each shift. Analyze 6 months or 500 hours.*†. Change yearly or 1000 hours.*†
2.	High pressure filter	Filter element.	Change 6 months or 500 hours.*†
3.	Swing bearing (standard open style)	Lithium N.L.G.I. #2 EP. Purge old grease.	Weekly or every 25 hours.*†
4.	Swing bearing gear teeth (standard 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 hours.*† Change if contaminated.
6.	Swing drive gear box	Fill to plug. SAE 140 EP or N.L.G.I. #00 EP oil.	Check monthly or every 100 hrs.*†, Change every two (2) years or 2,000 hours.*
7.	Boom pivot pins and Cylinder pins	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
8.	Wheel bearings	Lithium N.L.G.I. #2 EP. Clean and repack.	Change every six (6) months or 500 hours.*†
9.	Steering spindles	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
10.	Steering linkage	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
11.	Steering tie rod ends	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
12.	Drive wheel power hubs	SAE 80 W 90, SAE 90 or SAE 85-140, half full.	Change after first 50 hours., then Check monthly or every 100 hrs.*†, Change yearly or 1,000 hours.*†
13.	Boom wear pads	Silicone spray.	Monthly or every 100 hours.*†

* Whichever occurs first.

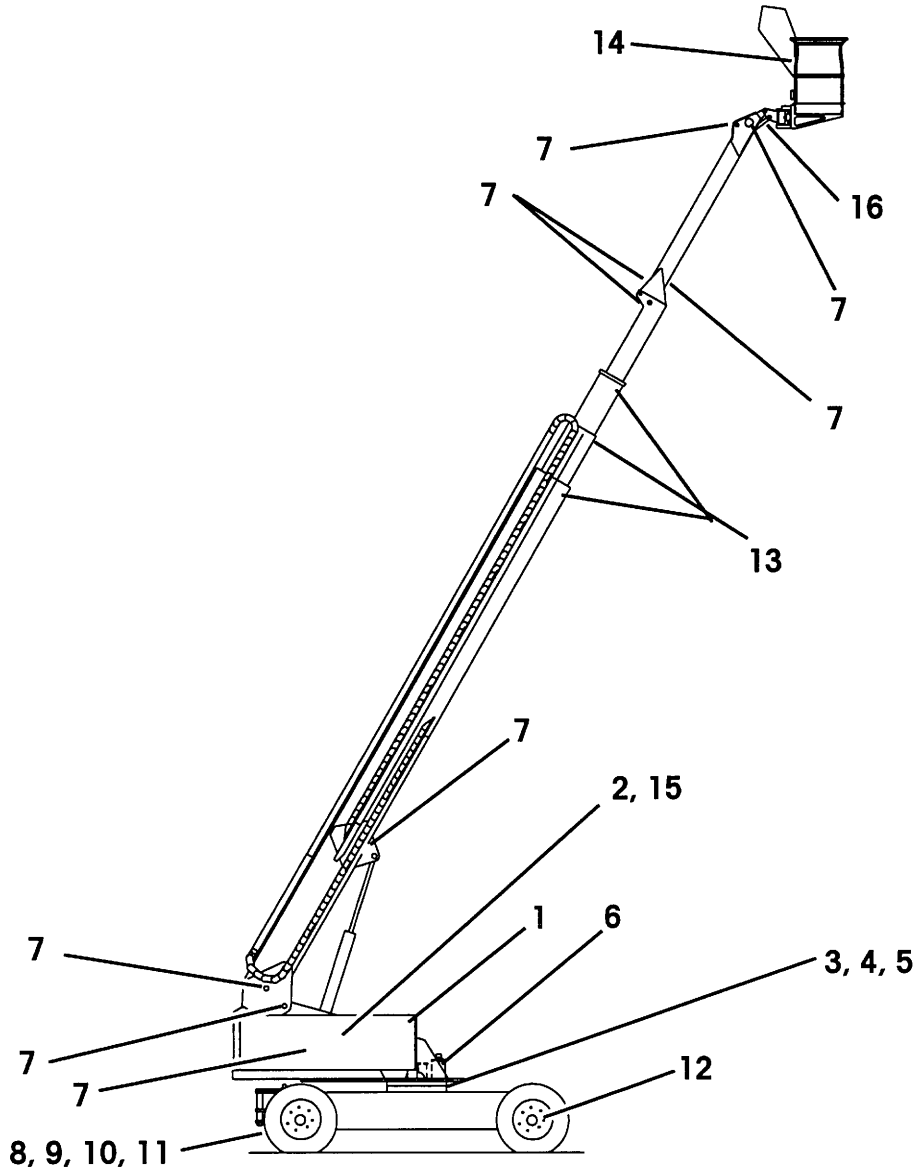
† Different requirements for severe duty applications. See check lists.

LUBRICATION CHART

NO.	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
14.	Platform level and rotate handle pivot pins	WD 40 Spray or equivalent penetrating oil.	Monthly or every 100 hours.*
15.	Valve spool linkage	WD 40 Spray or equivalent penetrating oil.	Monthly or every 100 hours.*
16.	Platform rotate mechanism	Hydraulic fluid.	Yearly.

* Whichever occurs first.

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



SECTION 1:
TRANSPORTATION
AND
EMERGENCY PROCEDURES

Table of Contents, Section 1

Transport the Unit 1-3
Towing procedures 1-3
Truck or trailer Transport, Boom in STOW-N-GO™ Mode 1-4
Truck or trailer Transport, Boom in Conventional Mode 1-9
Unloading Procedure 1-11
Emergency System and Procedures 1-15
Emergency Pumps 1-15
Emergency Drive Function 1-16
Emergency Lowering 1-17

TRANSPORTING THE UNIT

TOWING PROCEDURES

WITHOUT OPTIONAL TOWING PACKAGE:

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

WITH OPTIONAL TOWING PACKAGE:

- Securely attach the RP 120 to a tow vehicle with the tow bar provided.

⚠WARNING

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

- Disengage torque hubs:

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

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

- Pull steer wander control valve, located near the ground controls, 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 RP 120. Tow speed shall not exceed 3 MPH (4.8 KPH).

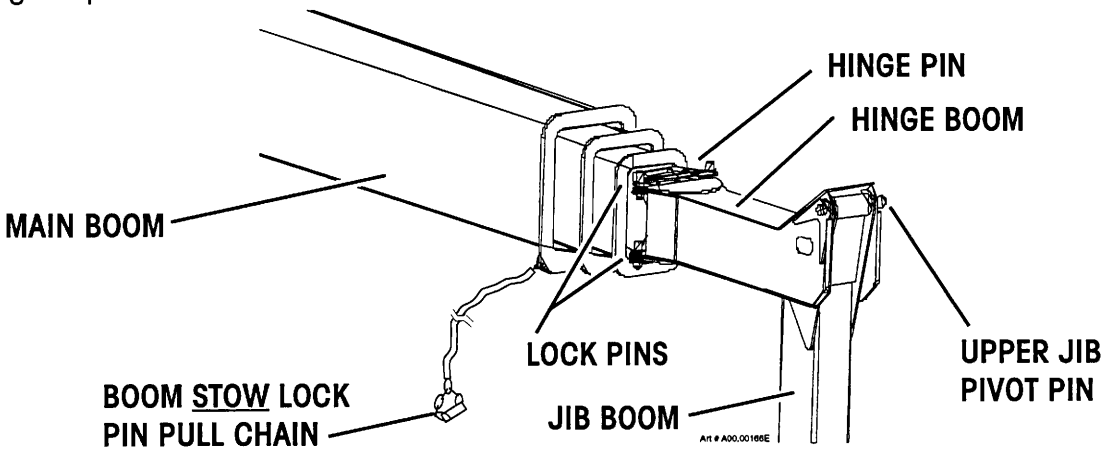
TRUCK OR TRAILER TRANSPORT, BOOM IN STOW-*N*-GO™ MODE

With boom in operational mode and axles retracted:

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

c. Exit the platform. Clean the hinge pin of foreign material to allow ease of jib swing. Lubricate with dry moly if necessary.

d. The boom stowage lock pin has a 5 Ft (1.5 M) long pull chain attached for ease of use. Remove the grip end of the pull chain from its stored position on the left side of the main boom, and let it hang free.



Stow-*N*-Go™ Operational Mode.

2. To place the boom in the Stow-*N*-Go™ position:

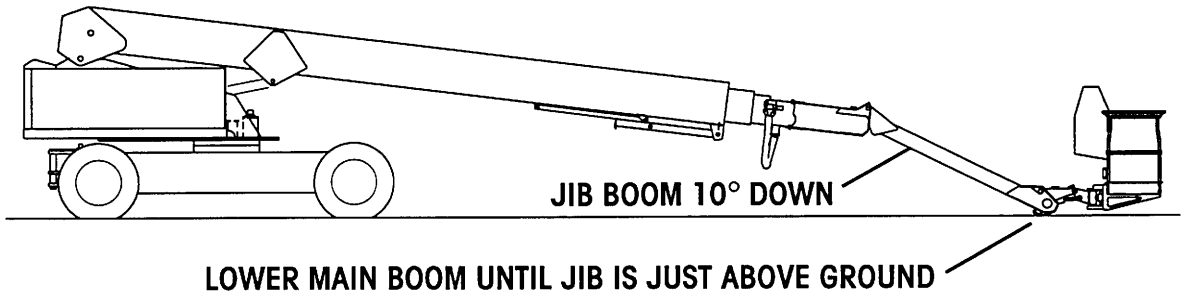
   a. With platform controls, fully retract main boom. Position jib boom about 10° below parallel to main boom. Lower the main boom until the jib boom is just above the ground (not touching the surface).

   b. Rotate the platform 90°, so it is on the right side of the boom.

⚠ CAUTION

Removal of hinge boom lock pins will disable platform electrical controls.

With boom lock pins out of "Operational Mode" position, do not place any load in the unsupported platform.



Preparation for Stow-*N*-Go™ Mode Tie Down of Unit.

TRUCK OR TRAILER TRANSPORT, BOOM IN STOW-*N*-GO™ MODE (CONTINUED)

2. To place the boom in the Stow-*N*-Go™ position (continued):

   e. Remove the hitch pins, and the two lock pins from the hinge boom Stow-*N*-Go™ connection.

      If lock pins do not readily come out, lower main boom (from ground controls) so that slight pressure is applied to the jib boom tip by contact with the truck or trailer bed. Tap the lock pins out with a hammer.

   f. Pull the pin holding the boom support stand strut to the underside of the base boom, and swing the boom support column down. The main boom may have to be raised slightly to allow the support column to swing down completely. Pin the strut to the column.

   g. From ground control, raise main boom to horizontal and lower jib boom until it is 60° below the main boom.

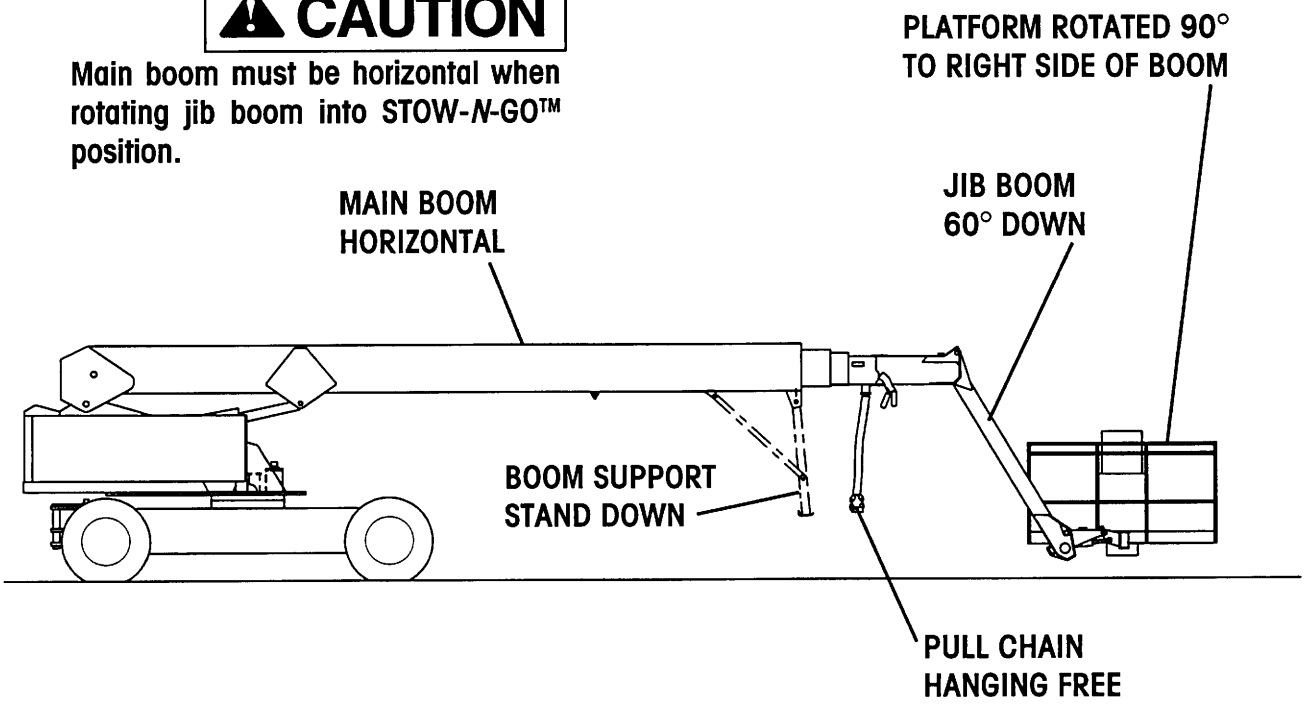
   h. Swing platform and jib boom assembly to side position. Pull the boom stowage lock pin chain, then position the jib boom assembly until the pin holes line up, then release the chain to allow the spring-loaded pin to lock the jib boom in place. Store lock pins removed in step "e" in hinge boom holes.

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

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

⚠ CAUTION

Main boom must be horizontal when rotating jib boom into STOW-*N*-GO™ position.



Preparation for Stow-*N*-Go™ Mode Tie Down of Unit.

TRUCK OR TRAILER TRANSPORT, BOOM IN STOW-*N*-GO™ MODE (CONTINUED)

2. To place the boom in the Stow-*N*-Go™ position (continued):

⚠WARNING

ALWAYS ATTACH THE UNIT TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER. CONNECT WINCH CABLE TO THE TIE DOWN LUGS ON THE UNDERCARRIAGE.

UNASSISTED LOADING OR UNLOADING OF ANY MOBILE PLATFORM IS NOT RECOMMENDED.

k. Take the remote control pendant, and stand behind the left rear wheel, near the stowed platform. Using a winch, carefully drive the unit onto the truck or trailer.

l. Lower the main boom until boom support stand rests firmly on the truck or trailer bed.

⚠ CAUTION

The jib boom should not be raised once the unit is in the STOW-*N*-GO™ position.

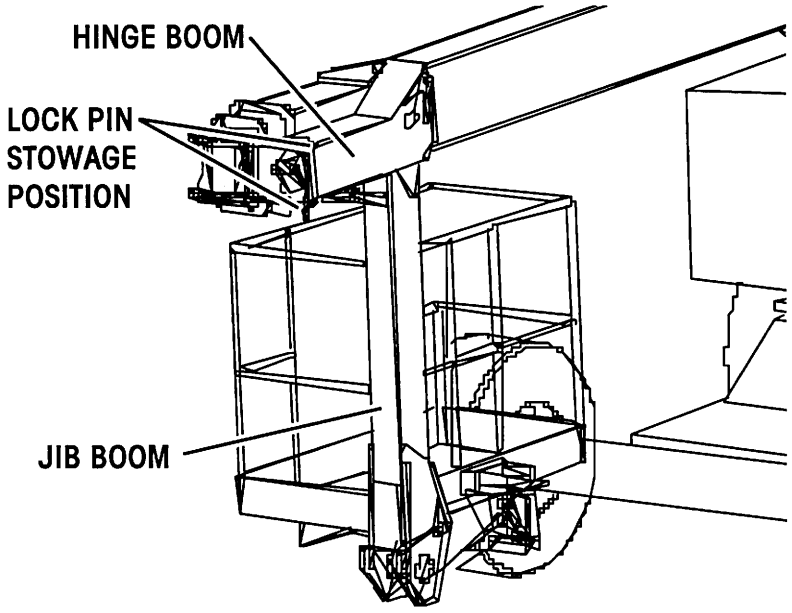
m. Lower the jib boom to rest on the truck or trailer bed.

n. With jib resting, enter the platform and press the foot pedal. Use the platform level control to tilt the platform parallel to the surface of the truck or trailer bed.

⚠ CAUTION

To avoid damaging the unit, the platform MUST NOT be tied to the trailer bed in any way unless firmly supported on blocks.

Strap (do not chain) the platform to the truck or trailer bed. Avoid over-tightening straps.



Stow-*N*-Go™ Storage Mode.

TRUCK OR TRAILER TRANSPORT, BOOM IN STOW-*N*-GO™ MODE (CONTINUED)

2. To place the boom in the Stow-*N*-Go™ position (continued):

   o. Place two 14-1/2" (36.8 cm) high support blocks under platform..

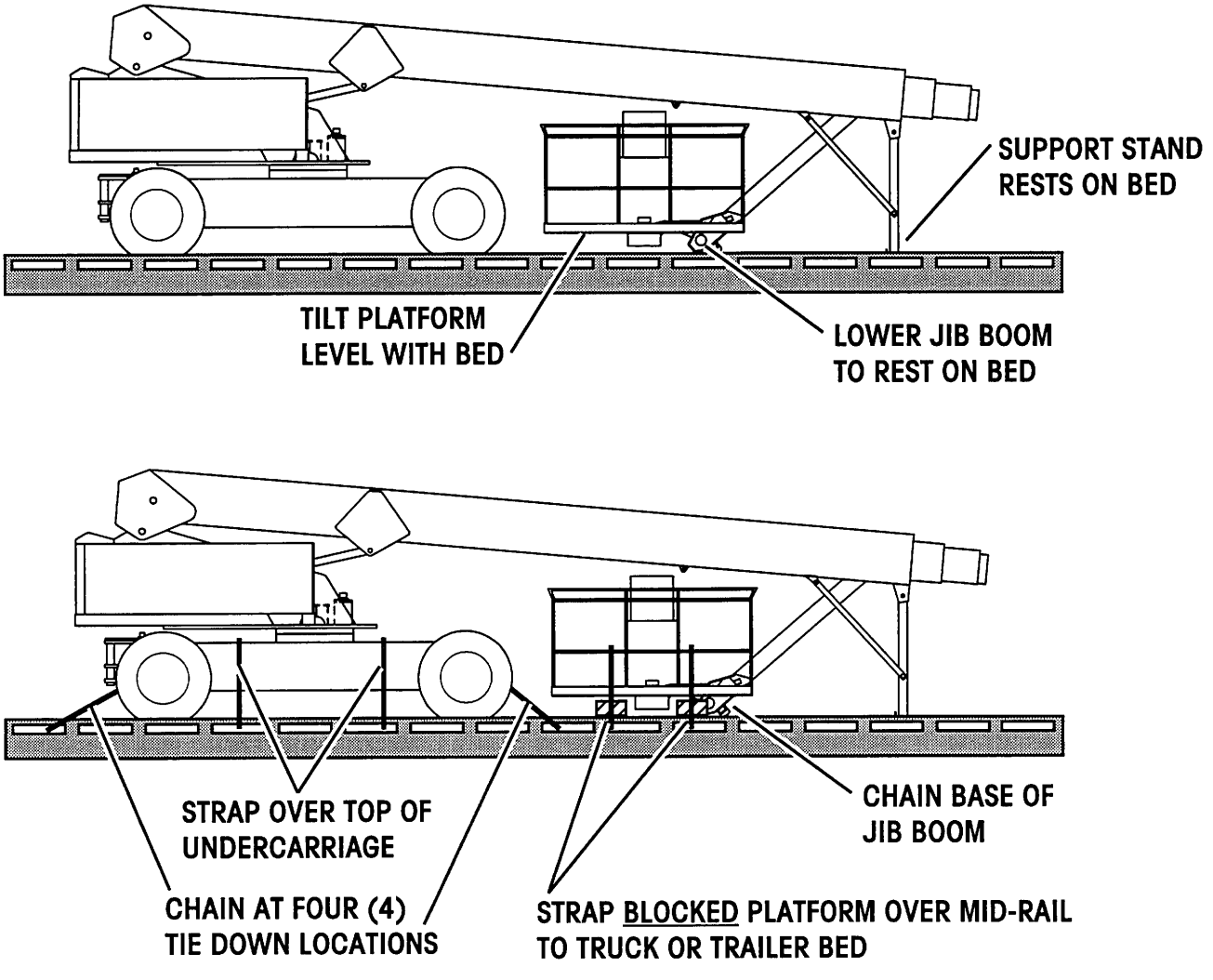
   p. Strap the platform to the truck or trailer bed over the platform mid-rail where indicated by decals.

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

4. Tie down locations are located on all four corners of the undercarriage, and at the base of the jib boom. Use one (1) 1/2 inch, "Grade 7" chain from each of the tie down lugs, and run the chains as shown in the diagram below.

   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.

5. With machine anchored securely and with lock pin in place, further secure the unit with two (2) 4 inch straps: one wrapped over the front of the undercarriage , and the other over the rear. See illustration below.



Stow-*N*-Go™ Mode Tie Down of Unit (Recommended Method).

TRUCK OR TRAILER TRANSPORT, BOOM IN CONVENTIONAL MODE

NOTE: Due to the length of the RP 120, transporting without first placing the jib boom in Stow-*N*-Go™ Mode is normally not practical.

With boom in operational mode and axles retracted:

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.

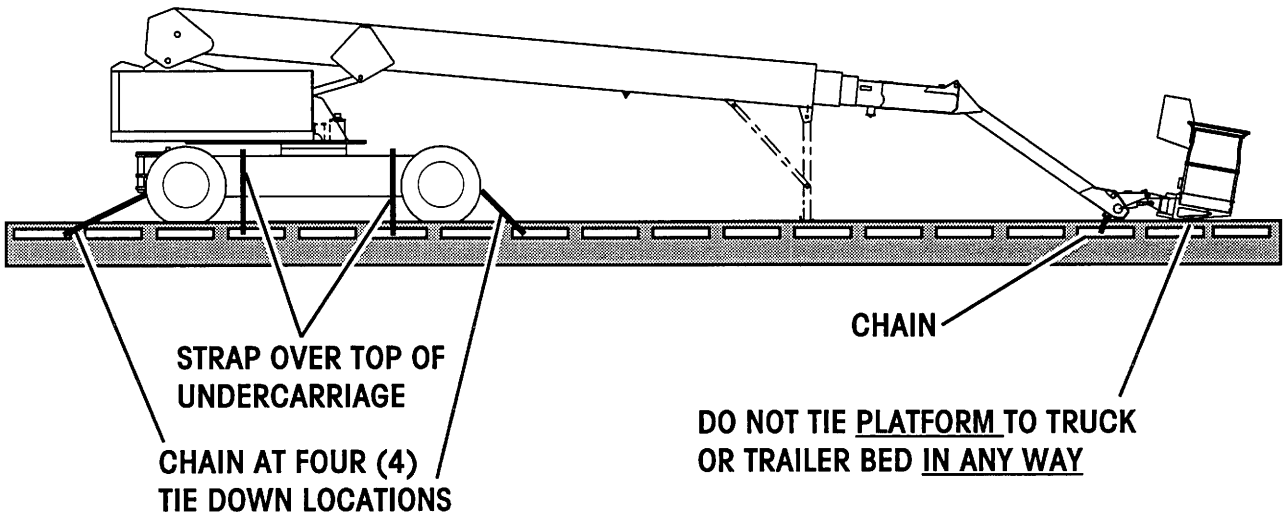
⚠WARNING

ALWAYS ATTACH THE UNIT TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER. CONNECT WINCH CABLE TO THE TIE DOWN LUGS ON THE UNDERCARRIAGE.

UNASSISTED LOADING OR UNLOADING OF ANY MOBILE PLATFORM IS NOT RECOMMENDED.

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

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



Conventional Mode Tie Down of Unit (Recommended Method).

5. If placing the boom in the Stow-*N*-Go™ position is not desired, ensure that the main boom is fully retracted.

   Pull the pin holding the boom support stand strut to the underside of the base boom, and swing the boom support column down. The main boom may have to be raised slightly to allow the support column to swing down completely. Pin the strut to the column.

   Lower the main boom until boom support stand rests firmly on the truck or trailer bed. Lower the jib boom so the tip rests on the truck or trailer bed. Then, use the platform level lever to **rest** the platform base on the bed of the truck or trailer.

⚠ CAUTION

To avoid damaging the unit, the platform MUST NOT be tied to the trailer bed in any way and should only REST on the bed.

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

7. Tie down locations are located on all four corners of the undercarriage and at the base of the jib boom. 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 on the facing page.

   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.

8. With machine anchored securely and with lock pin in place, further secure the unit with two (2) 4 inch straps: one wrapped over the front of the undercarriage , and the other over the rear. See illustration below.

UNLOADING PROCEDURES

⚠WARNING

TO AVOID 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 unit for damage (including the underside). Inspect all hoses, boom sections and cables for chafing or shipping damage. Confirm that all wheel lug nuts and swing bearing bolts are tight (refer to specifications).

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

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

4. Connect battery cables to batteries if required. Check electrolyte level.

5. Open the fuel tank valve and check fuel level.

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

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

8. Close side compartment covers.

9. Attach the unit to a winch and carefully drive off of trailer.

⚠WARNING

ALWAYS USE A WINCH TO ASSIST LOADING OR UNLOADING THE UNIT 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.

READ AND UNDERSTAND ALL SAFETY, CONTROL AND OPERATING INFORMATION FOUND ON THE MACHINE AND IN THIS MANUAL BEFORE OPERATING THE UNIT.

10. Start engine, using the ground controls.

NOTE: Refer to Start-up Procedures and Operator Controls Descriptions in this section.

After a brief warm-up period, select the "HI" engine speed. On the remote control pendant, press and hold the "PUMP" toggle switch to the "MAIN" position, but do not operate any drive or boom function. This is called "deadheading", and will lead to maximum system pressure registering on the gauge at the ground control valve assembly. Refer to the "Machine Specifications" section of this manual for the "Maximum Hydraulic Pressure" for this unit.

Select the "LOW" engine speed and allow the engine to slow to idle speed.

11. Remove tie downs from the platform and base of the jib boom.

12. Remove the two straps that wrap over the top of the undercarriage. Remove four tie down chains. Remove wheel chocks, if used.

UNLOADING PROCEDURES (CONTINUED)

⚠WARNING

WITH BOOM OUT OF "OPERATIONAL MODE" POSITION, DO NOT PLACE ANY LOAD IN THE PLATFORM.

NOTE: Platform electrical controls are disabled (rotate and level controls are operable) until the hinge boom is secured to main boom with upper and lower lock pins.

13. Using the remote control pendant, raise the boom so that the platform will clear any obstacles as the machine is driven down the loading ramp.

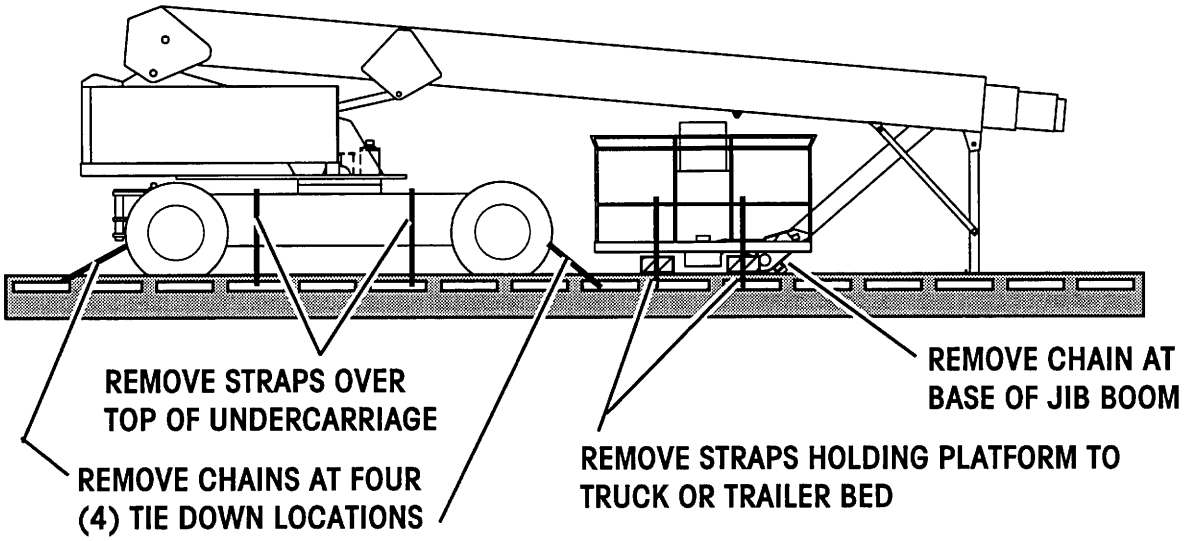
14. Stand in front of the left front wheel (away from the direction of travel) and, using the "DRIVE" toggle in "REVERSE", carefully drive the unit off the truck or trailer with the assistance of a winch. The brakes are automatically released for driving, and will automatically apply when the unit stops.

15. Remove the grip end of the pull chain from its stored position on the left side of the main boom, and let it hang free. The boom stowage lock pin has a 5 Ft (1.5 M) long pull chain attached for ease of use. Remove boom lock pins from stowed position, and let hang.

16. Raise main boom to horizontal and lower jib boom until it is 60° below the main boom.

17. Pull the boom stowage lock pin chain to unlock the jib boom. Swing jib and platform around so that the hinge boom aligns with the main boom (see "Operational Mode" illustration, next page).

18. Lower the main boom so the boom support stand is slightly off the ground. Pull the pin holding the boom support stand strut to the boom support column, and swing boom support column up. Pin the strut to the underside of base boom.



Preparation for Unloading.

UNLOADING PROCEDURES (CONTINUED)

19. Align hinge and main boom holes by moving the jib boom, and insert boom lock pins to secure hinge boom to main boom.

    If hinge and main boom holes do not line up, slightly lower main boom onto ground to apply pressure on jib boom.

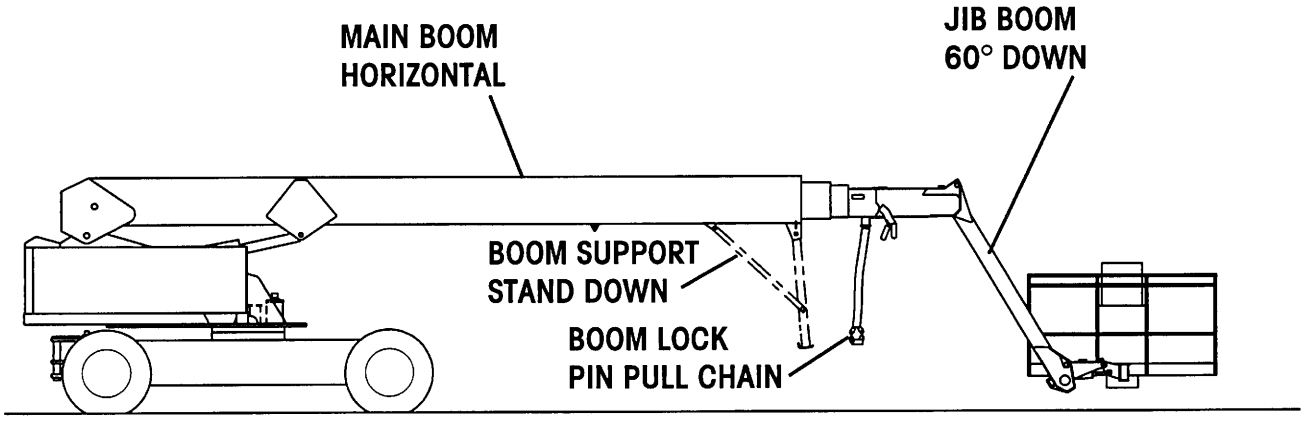
20. Secure hinge boom to main boom with both boom lock pins and hairpin clips.

21. Turn engine off.

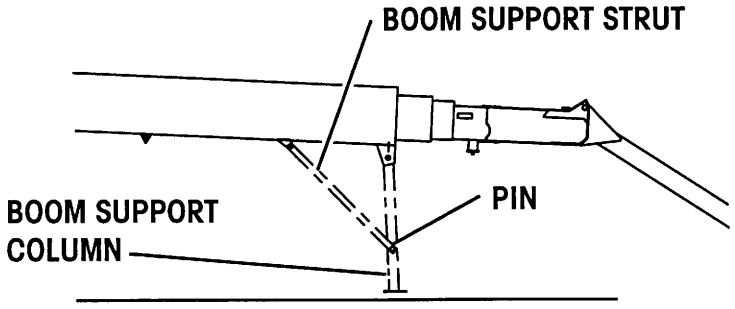
22. Turn the key switch to "PLATFORM CONTROLS".

23. Enter the platform, and restart the engine using the platform controls. Select the "OPERATING" engine speed, and rotate platform 90° to operating position. Test all platform functions.

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



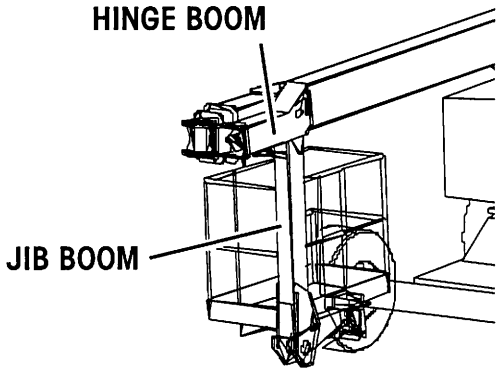
Swing Jib Around to Operational Mode.



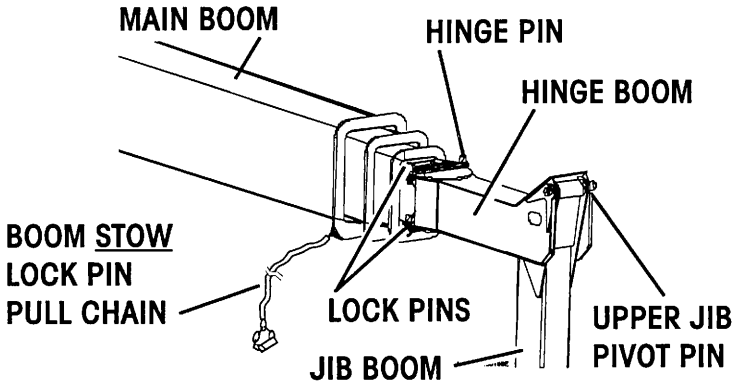
Raise Boom Support Stand.

Upon initial unloading of the machine the Receipt Inspection Adjustment Report must be completed and returned 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.



STOW-*N*-GO™ Storage Mode.



STOW-*N*-GO™ Operational Mode.

EMERGENCY SYSTEM AND PROCEDURES

⚠ DANGER

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

EMERGENCY ELECTRICAL PUMPS

The RP 120 Mobile Platform has two emergency pumps connected in tandem which can be operated from the platform or ground control station to briefly operate the machine when the unit has lost engine power.

- Press and hold the emergency pump button on the remote control pendant, **or**

  Press and hold the auxiliary pump button on the platform control console.

- Select the proper function as desired to fit the situation.

If attempting to both lower and retract the boom from near maximum reach, battery power can be conserved by using the "RETRACT" function to bring the boom in to less than 60 Ft (18.3 M) extension BEFORE selecting the boom "LOWER" function.

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

UNPOWERED EMERGENCY MOVEMENT

Every attempt should be made to restore primary power to the unit before using this procedure.

⚠ DANGER

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

BE ON GUARD AGAINST UNIT RUNAWAY ON SLOPING SURFACES. MOVEMENT SPEED SHALL NOT EXCEED 1 M.P.H. (1.6 K.P.H.).

1. Secure the unit with chains or ropes to the tie down lugs located at the front and rear of the undercarriage. The chains or ropes must be of sufficient capacity to pull the unit.

2. Block wheels.

3. Close brake circuit needle valve located at the center rear of the undercarriage.

4. Disengage torque hubs:

⚠WARNING

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

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

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.

5. Disconnect steer cylinder.

After unblocking the wheels, the unit will be ready to be moved.

After primary power has been restored to the vehicle, engage the torque hubs, reset the brake circuit needle valve, and connect 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 pedal.
2. Press the red emergency stop button.
3. Evaluate the nature of the failure. Return to the ground, using the emergency pumps (see "Emergency Electrical Pumps", 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 and lowering procedure (see "Emergency Electrical Pumps", 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.

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

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

⚠ DANGER

DO NOT TOUCH UNIT !!!

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

CORRECTIVE ACTION

1. Have someone summon first aid or rescue squad.
2. Attempt to talk to operator before taking any rescue measures.
3. **Before attempting emergency lowering procedure, check to see if the operator is:**
   - in a pinned position, or
   - **would be endangered if platform is moved.**
4. After establishing that the machine is not in contact with live power lines, lower the platform or move the unit as necessary, using emergency procedures (see "Emergency Electrical Pumps" or "Unpowered Emergency Movement", earlier in this section).
5. Render first aid to the operator.
6. **Report the incident to your supervisor immediately.**

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

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

⚠ DANGER

DO NOT TOUCH UNIT !!!!

ELECTROCUTION HAZARD !!!!

CORRECTIVE ACTION

1. Have someone summon first aid or rescue squad.

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

3. **If operator is unconscious, check to see if he is:**

   - in a pinned position, or
   - would be endangered if platform is moved,

   before attempting emergency lowering.

4. AFTER POWER IS CUT, lower the platform or move the unit as necessary, using emergency procedures (see "Emergency Electrical Pumps" or "Unpowered Emergency Movement", earlier in this section).

5. Report the incident to your supervisor immediately.

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

Table of Contents, Section 2:

Hydraulic Fluid
- Handling Precautions 2-5
- Fluid Recommendations 2-5
- Fluid Contamination Checks 2-5
- System Flushing Procedure 2-6

Hydraulic System Components
- Electro-Proportional Circuit 2-7
- Hydraulic Pump
  - Hydraulic Pump Adjustment 2-7
- Emergency Pumps
  - Emergency Pump Adjustment 2-7
- Ground Valve Bank Assembly
  - Inlet Section 2-8
  - End Cover (Adapter Manifold) 2-8
  - Main Valve Segment 2-8
  - Operation 2-9
  - Maintenance
    - Hydraulic Circuit Line Check 2-9
    - Main Valve Segment 2-9
- Valves
  - Drive Relief Valve 2-10
  - Drive Valve Assembly 2-10
  - Hi/ Low Speed Drive Valve 2-10
  - Selector Valve 2-10
  - Flow Divider Valve Assembly 2-11
  - Motion Control Valve Assembly 2-11
  - Selector Valve Assembly
    - Selector Valve 2-11
    - Check Valve 2-11
- Hydraulic Fluid Reservoir
  - Hydraulic Reservoir Maintenance 2-12
- High Pressure Filter 2-12
- Boom Lift System
  - Boom Lift Valve Segment 2-12
  - Flow Control Valve
    - Flow Control Valve Adjustment 2-13
  - Lift Cylinder 2-13
- Boom Telescope (Extend) System
  - Boom Extend valve segment 2-13
  - Pressure Relief Valve 2-14
  - Telescope (Extend) Cylinder 2-14
- Superstructure Swing System
  - Swing Valve Segment 2-15
  - Swing Drive/ Reducer Assembly
    - Swing Drive/ Reducer Assembly Adjustment 2-15
    - Integral Brake Assembly 2-15
  - Swing System Maintenance 2-16

Table of Contents, Section 1 (Continued)

Hydraulic System Components (Continued)
- Jib Boom System
  - Jib Boom Valve Segment 2-16
  - Jib Cylinder 2-16
- Platform Rotate System
  - Rotate Control Valve 2-17
  - Double Pilot Operated Check Valve 2-17
  - Rotary Actuator
    - Rotary Actuator Maintenance 2-18
  - Platform Rotator Manifold 2-18
- Platform Level System
  - Level Control Valve 2-19
  - Double Pilot Operated Check Valve 2-19
  - Master Level Cylinder 2-19
  - Slave Level Cylinder 2-19
  - Relief Valves 2-20
- Steer System
  - Selector Valve Assembly 2-20
    - Selector Valve 2-20
    - Check Valve 2-21
  - Steer Valve Segment 2-21
  - Hydraulic Swivel 2-21
  - Steer Cylinder 2-21
  - Steer Disconnect Knob 2-21
  - Steer System Maintenance 2-22
- Axle Extend System
  - Axle Extend Cylinders 2-23
  - Selector Valve Assembly
    - Selector Valve 2-23
    - Check Valve 2-23
  - Steer Valve Segment 2-23
  - Hydraulic Swivel 2-23

HYDRAULIC FLUID

HANDLING PRECAUTIONS

⚠WARNING

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

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

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

⚠WARNING

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

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

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

FLUID RECOMMENDATIONS

We strongly recommend the use of MOBIL DTE-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), use of MOBIL DTE-11M FLUID is satisfactory. For operation in tropical climates, the use of MOBIL DTE-15M is allowable.

FLUID CONTAMINATION CHECKS

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

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

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

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

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

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

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

SYSTEM FLUSHING PROCEDURE

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

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

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

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

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

Turn the main power key switch to the "GROUND" position. Press engine start button to start engine. After a brief warmup period, select the "HIGH" engine RPM setting. Press and hold pump toggle to "MAIN" to engage pump. Briefly cycle all boom functions to flush the hydraulic components of the hydraulic fluid. Use care when doing this as hydraulic fluid is now being returned to container provided. This will remove old fluid from the hydraulic system as the boom is cycled to its maximum limits.

⚠ CAUTION

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

Three cycles of <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 tank to full mark on sight gauge. Operate all functions to their full extreme positions to ensure proper operation. Check for leaks and correct as necessary. Unit is now ready to be placed back in operation.

HYDRAULIC SYSTEM COMPONENTS

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

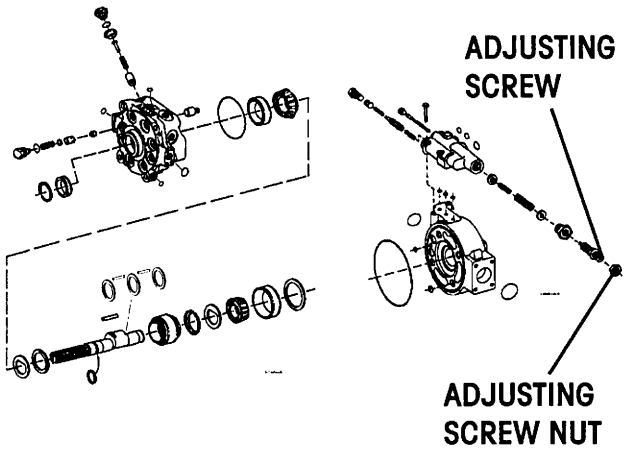
ELECTRO-PROPORTIONAL CIRCUIT

With no function activated, hydraulic fluid flows from the hydraulic reservoir to the pump, to the high pressure filter, then to the valve bank assembly and back to the hydraulic reservoir. When the operator moves a control lever, this initiates the electrical signal to the proper solenoid of the valve bank. The fluid flow is metered by the platform controller or is set at the control module by a potentiometer. The fluid is then directed to the appropriate function and then back to the hydraulic 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 fluid 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.

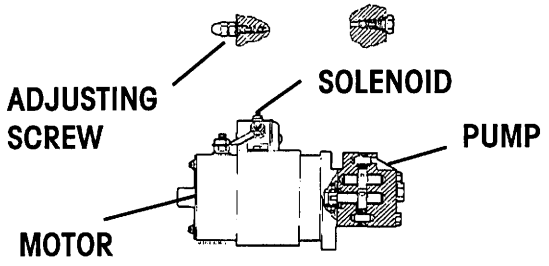
HYDRAULIC PUMP ADJUSTMENT

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 proper setting (see Machine Specification).

EMERGENCY PUMP

Two emergency pumps, connected in tandem, are driven by two electric DC motors. These pumps deliver hydraulic fluid, under pressure, to the valve bank assembly. The electric motors are of a non continuous type and will fail if used excessively.

> **Note:** These pumps should only be used in emergency situations.



Emergency Pump.

EMERGENCY PUMP ADJUSTMENT

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

> **NOTE:** Pump adjustment must be done on one pump at a time. Disconnect the wire to the solenoid on the motor of the pump you are **not** adjusting.

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

GROUND VALVE BANK ASSEMBLY

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

INLET SECTION

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

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

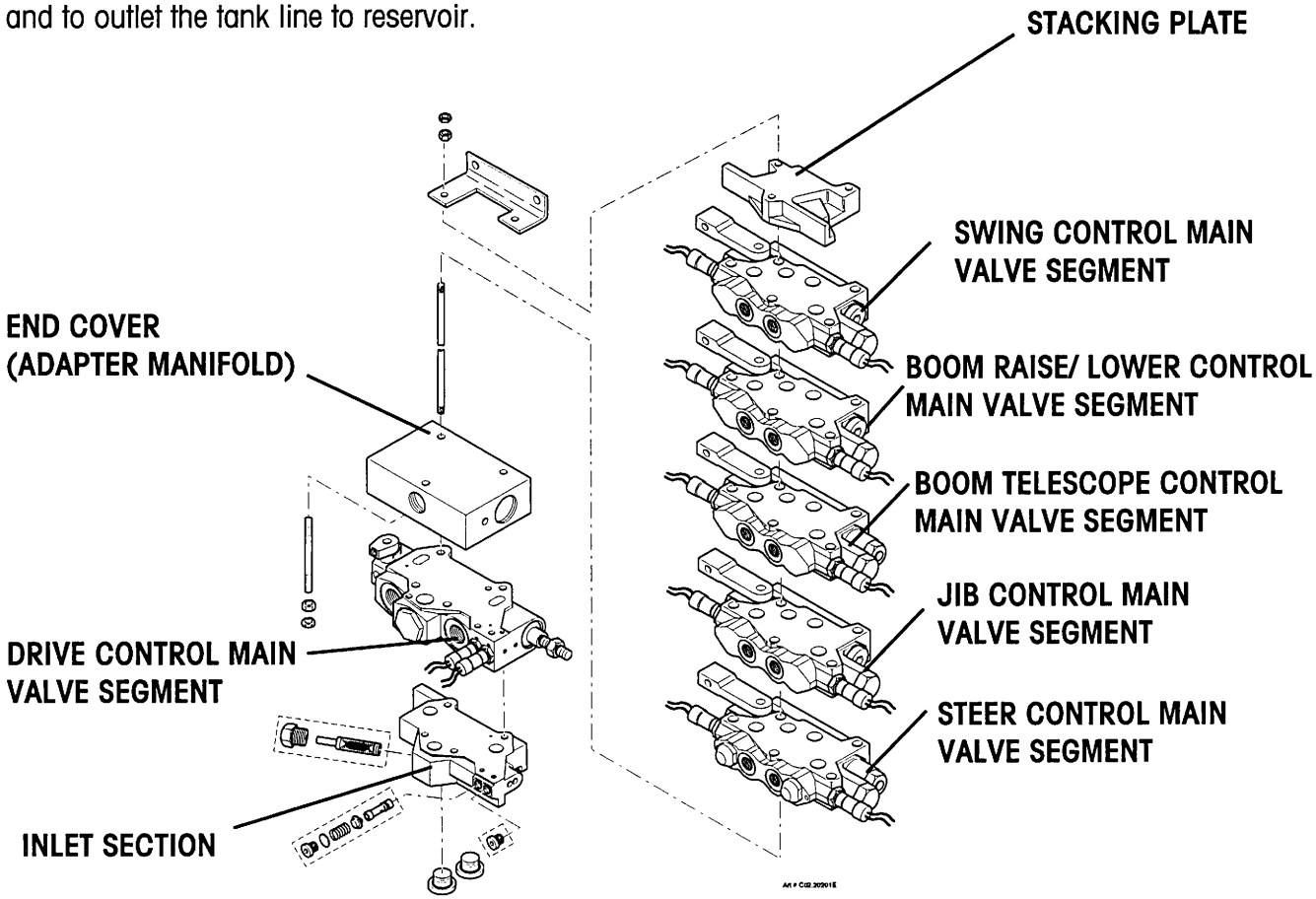
END COVER (ADAPTER MANIFOLD)

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

MAIN VALVE SEGMENT

There are two types of main valve segments. The bottom valve segment is for the drive function. The five top valve segments are for the swing, main boom hoist, telescope, jib boom and steer functions.

The spool in the main valve segment is a 4-way, 3-position closed center. Motion stops in the neutral position, where the pressure is blocked.



Ground Valve Bank Assembly.

OPERATION

To generate a proportional control pressure, the coil inside 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 main spool to furnish the control pressure to shift the main spool to the flow required.

MAINTENANCE

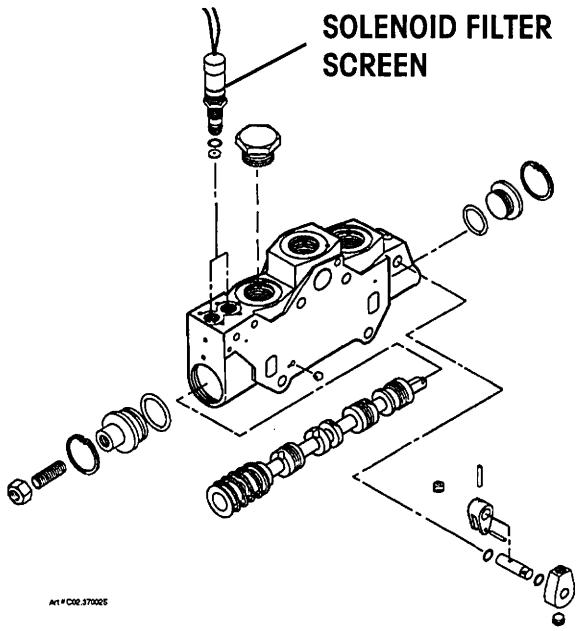
Hydraulic Circuit Line Check

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

Tighten loose fittings and correct any crimped hoses:

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

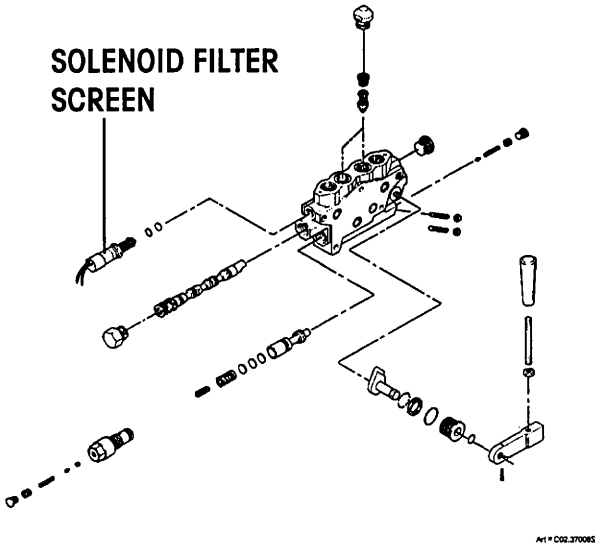
NOTE: Entrapped air in the hydraulic lines is common upon start-up and may result in temporary irregular motion. However, if after a reasonable operating period this condition persists, hydraulic lines should be bled to remove entrapped air and carefully inspected for leaks, starting with the pump suction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



Drive Main Valve Segment.

Main Valve Segment

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



Telescope, Jib, Steer, Boom and Swing Main Valve Segment.

VALVES

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

DRIVE RELIEF VALVE

The drive relief valve is located between the outlet of one drive motor and the inlet to the other drive motor. When the drive motors are in series (high speed drive) the valve will relieve any pressure spikes when driving and steering. In other words, this valve prevents the motors from cavitating or seeing pressure greater than 3000 PSI (207 Bar/ 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.

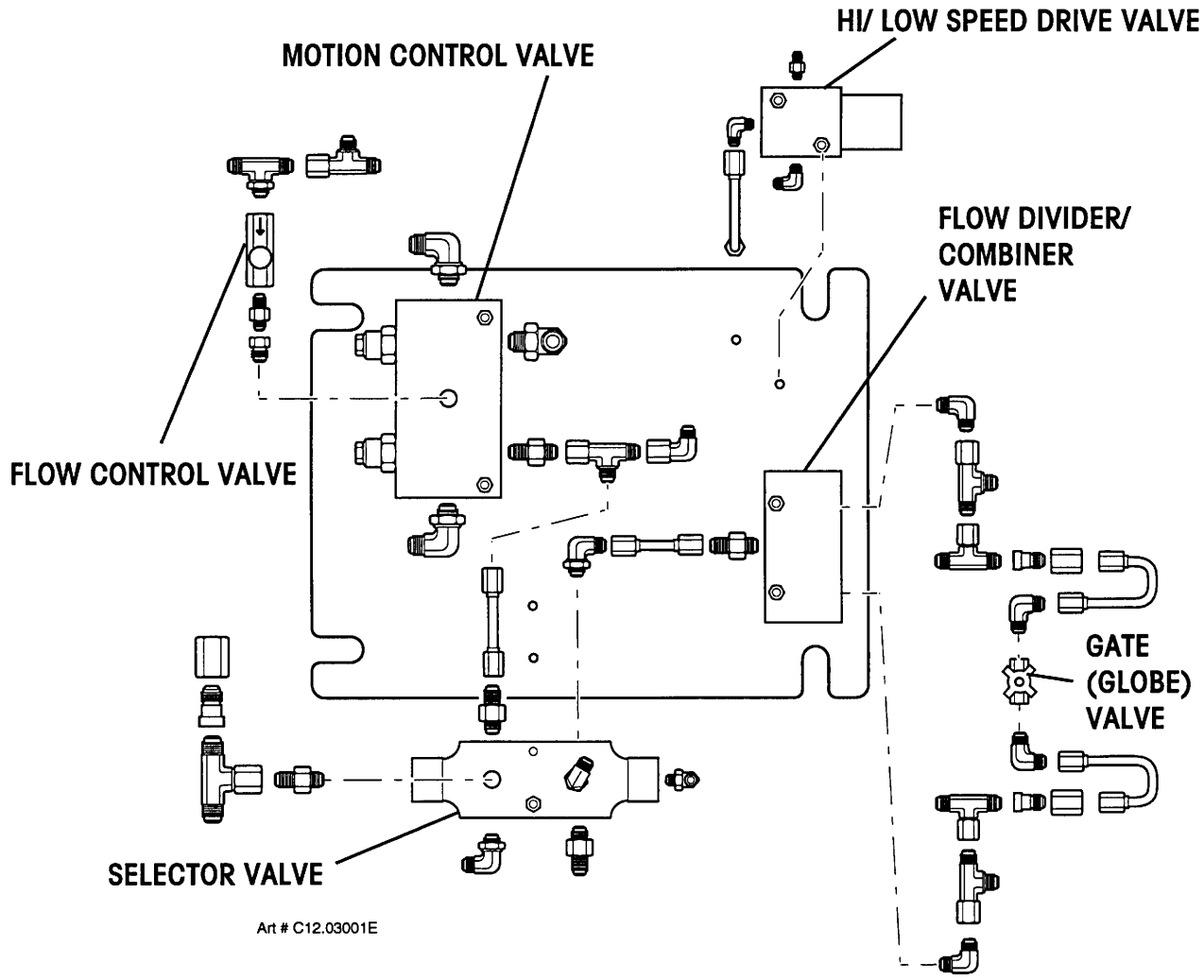
DRIVE VALVE ASSEMBLY

Hi/ Low Speed Drive Valve

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

Selector Valve

This is a manually operated 2 position, 6 port valve. Located in the fluid line between the hydraulic swivel and the steer cylinder. This valve selects pressure and return from the steering selector valve to go to either steer cylinder or the axle extend cylinders.



Drive Valve Assembly.

Flow Divider Valve Assembly

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

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

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

Motion Control Valve Assembly

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

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

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

SELECTOR VALVE ASSEMBLY

This 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.

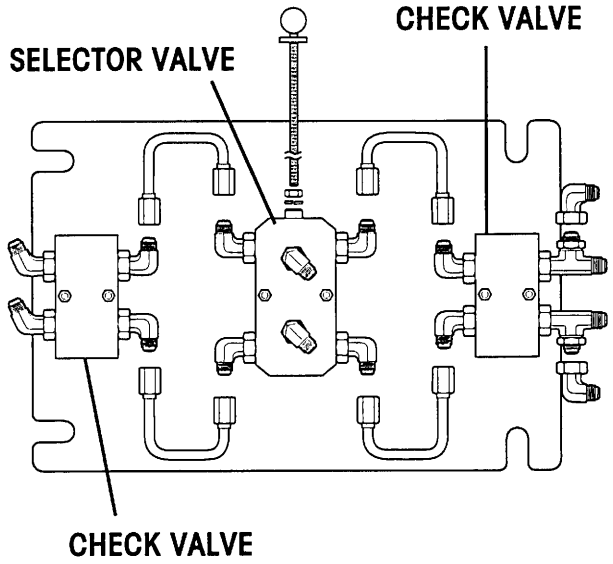
Selector Valve

A manually operated 2 position, 6 way vavle. Located in the fluid line between the hydraulic swivel and the steer cylinder. This valve selects pressure and return from the steering selector valve 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 return fluid flow. This allows the axle cylinders 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 you to return the steer cylinder to the neutral position by applying fluid flow to the steer cylinder in the opposite direction.



Art # C12.01001E

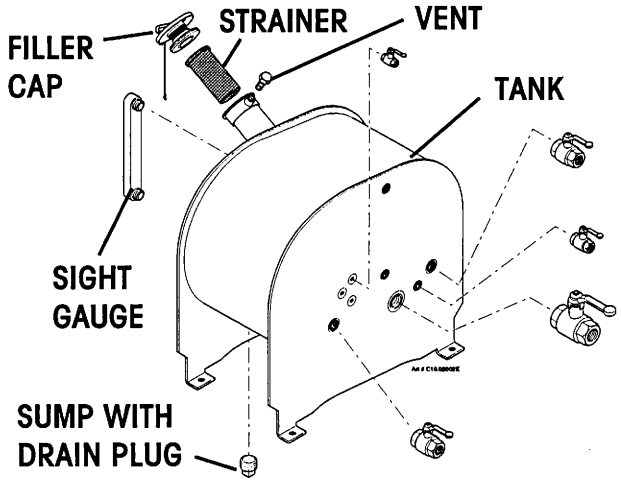
Selector Valve Assembly.

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 and a valve for the emergency pumps suction line.

HYDRAULIC RESERVOIR MAINTENANCE

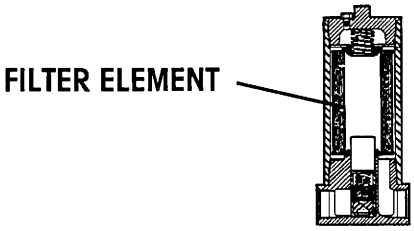
Check tank for signs of leakage. Inspect tank securing bolts for tightness. Clean cap filter by flushing with clean water and dry thoroughly.



Hydraulic Fluid Reservoir.

HIGH PRESSURE FILTER

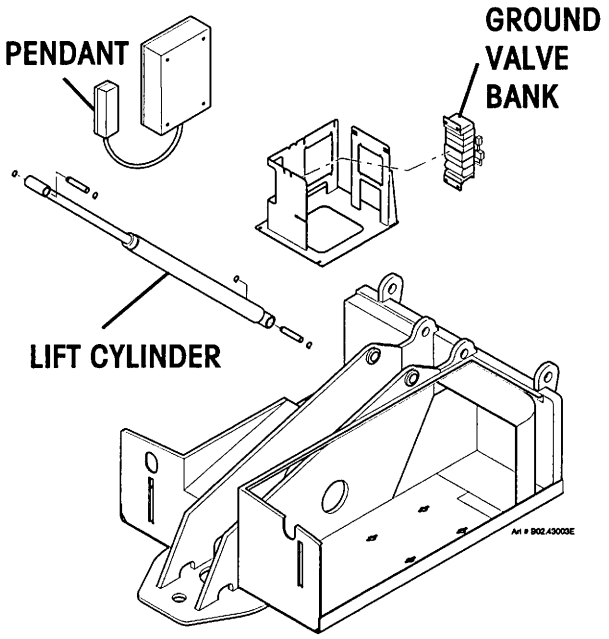
The hydraulic high pressure filter is a non-bypassing filter. This filter allows maximum fluid flow as long as the filter element is free of contaminants. When the filter is clogged, it shuts down the hydraulic flow but will not crush the filter element due to a differential pressure limiting valve.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



High Pressure Filter.

BOOM LIFT SYSTEM

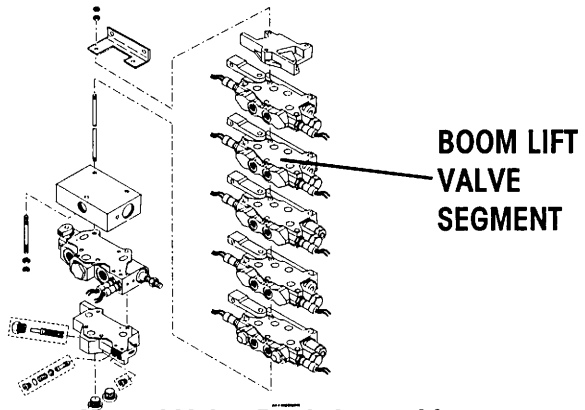
The boom lift system consists of a hydraulic valve segment on the ground valve bank, a flow control valve, a lift cylinder with a counterbalance (holding) valve, a lift toggle switch on the pendant and a control lever on the platform console.



Boom Lift System Components.

BOOM LIFT VALVE SEGMENT

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



Ground Valve Bank Assembly.

FLOW CONTROL VALVE

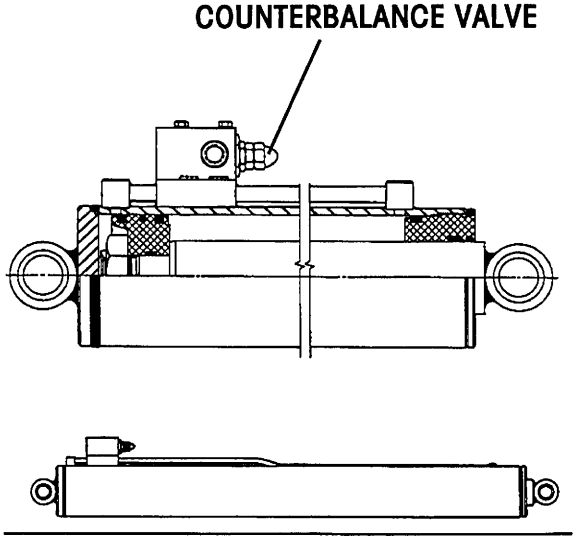
The flow control valve, located at the "boom up" outlet on the boom lift (hoist) valve segment, controls boom down speed. The flow control valve allows full hydraulic fluid flow for the boom up function. For the boom down function, the flow control valve meters the hydraulic fluid flow, thus allowing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

Flow Control Valve Adjustment

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

LIFT CYLINDER

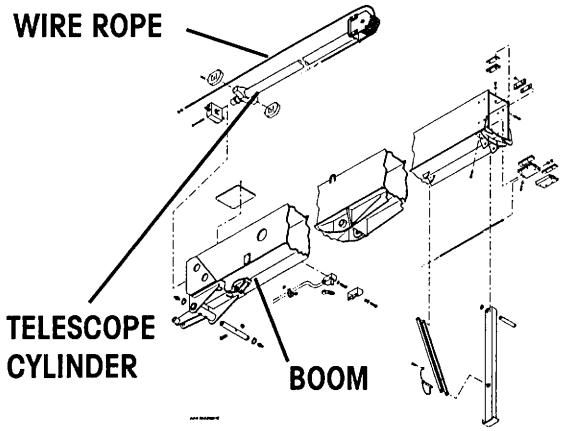
The boom lift function is controlled by a double acting cylinder. The cylinder contains a counterbalance (holding) valve, which will prevent unintended movement of the cylinder should a hose or fitting develop a leak. When the boom is lowered, fluid flows to the rod end cylinder port and to the counterbalance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



Lift Cylinder.

BOOM TELESCOPE (EXTEND) SYSTEM

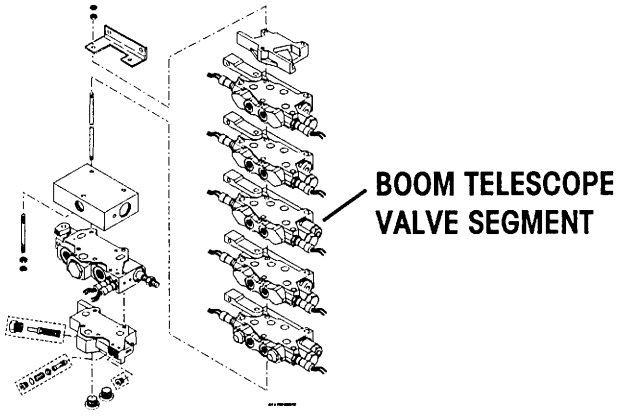
The boom telescope system consists of a hydraulic valve segment on the ground valve bank, a pressure relief valve, a telescope cylinder with two counterbalance (holding) valves, wire ropes and sheave for extend/ retract, a extend toggle switch on the pendant and a control lever on the platform console.



Boom Telescope (Extend) System Components.

BOOM EXTEND VALVE SEGMENT

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



Ground Valve Bank Assembly.

PRESSURE RELIEF VALVE

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

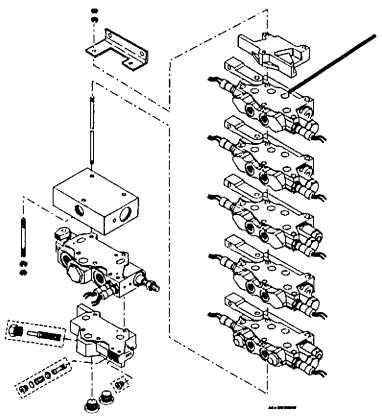
TELESCOPE (EXTEND) CYLINDER

The telescope (extend) cylinder controls the extending and retracting of the boom. The extend function is controlled by a double acting cylinder. 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.

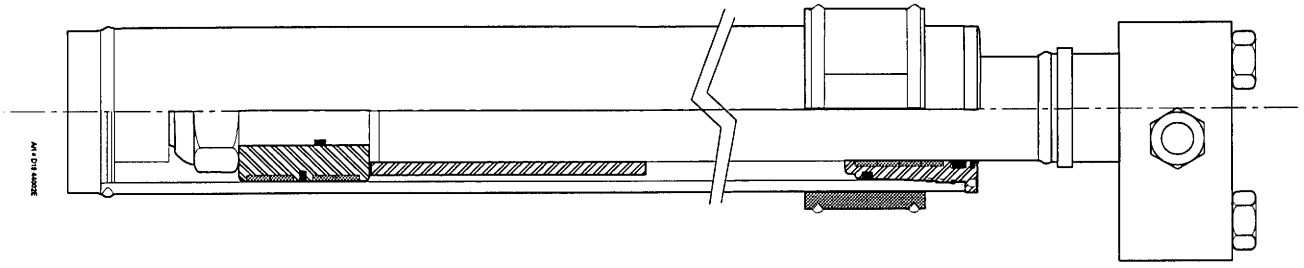
The telescope cylinder is connected to the base and mid boom sections only. The tip boom sections are extended and retracted by wire rope (cable) (see Mechanical Components Section).

SUPERSTRUCTURE SWING SYSTEM

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



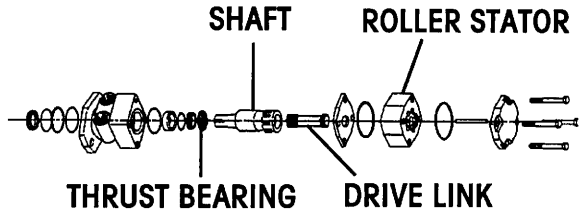
Ground Valve Bank.



Telescope (Extend) Cylinder.

SWING VALVE SEGMENT

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



Swing Drive Motor.

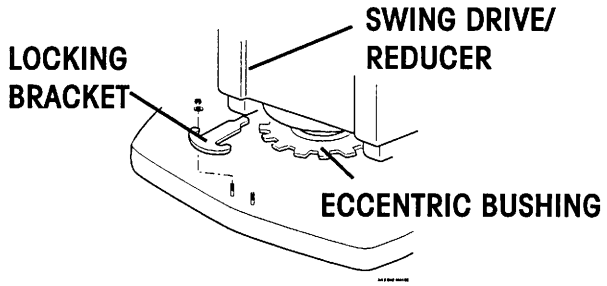
SWING DRIVE/ REDUCER ASSEMBLY

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/ 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.

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.

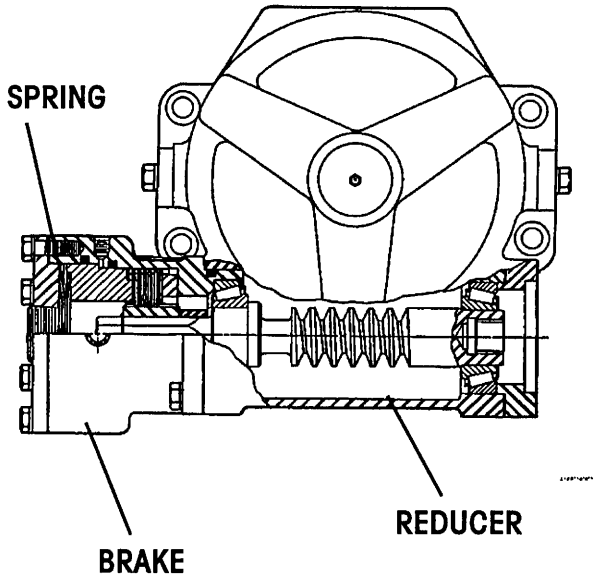


Swing Drive/ Reducer Assembly Adjustment.

Next loosen the foot mount plate bolts on the swing drive/ reducer and turn the eccentric bushing with a punch.

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

Replace the locking bracket and torque the foot mount plate bolts.



Swing Drive Reducer with Integral Brake.

Integral Brake Assembly

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

SWING SYSTEM MAINTENANCE

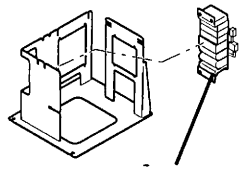
Check the oil in the "oil bath" style swing bearing enclosure monthly for metal shavings or other contaminants. Change the oil if contaminated (see Lubrication Chart).

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).

JIB BOOM SYSTEM

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

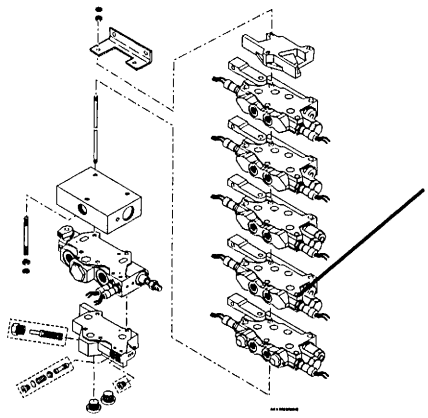


GROUND VALVE BANK

Jib Boom System Components.

JIB BOOM VALVE SEGMENT

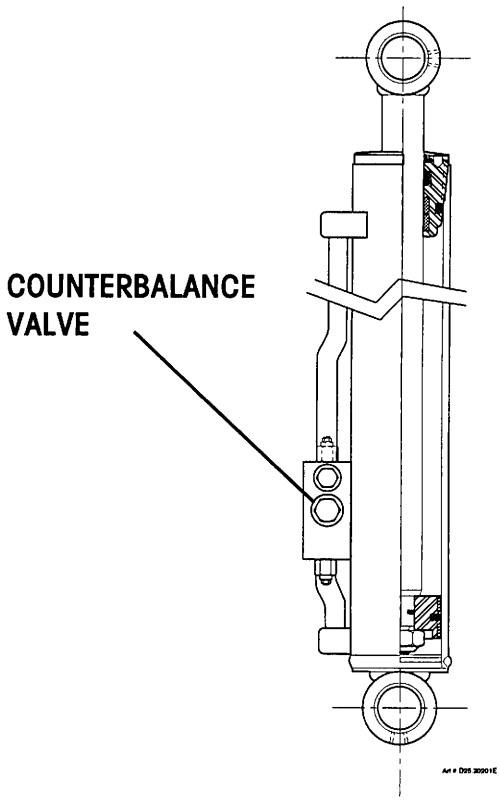
When the jib boom control lever on the platform control or ground control is activated, an electrical signal is transmitted to the valve cartridge in the jib boom valve segment. This allows hydraulic fluid at the selected flow to be sent to the proper end of the cylinder to raise or lower the jib boom.



Ground Valve Bank Assembly.

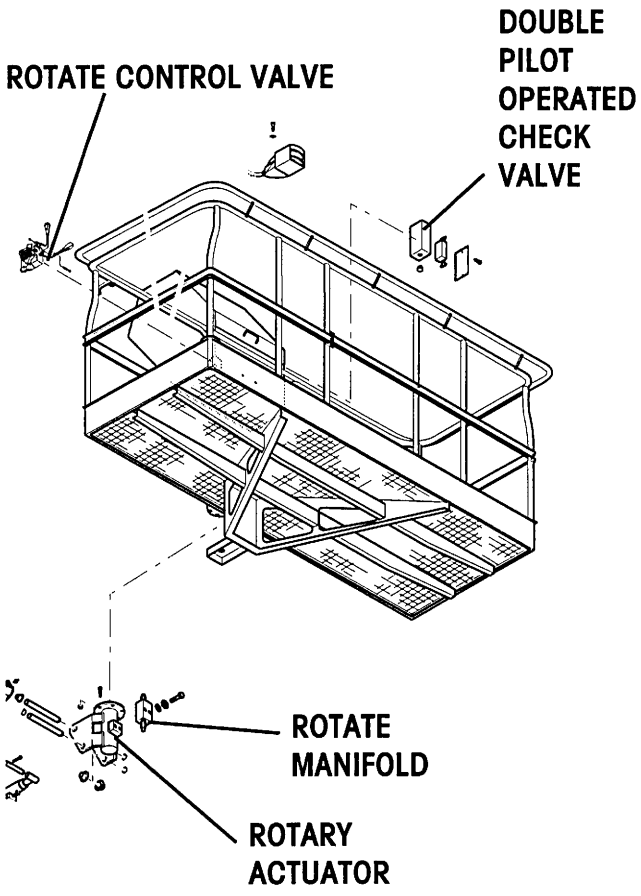
JIB CYLINDER

The jib boom 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 counter-

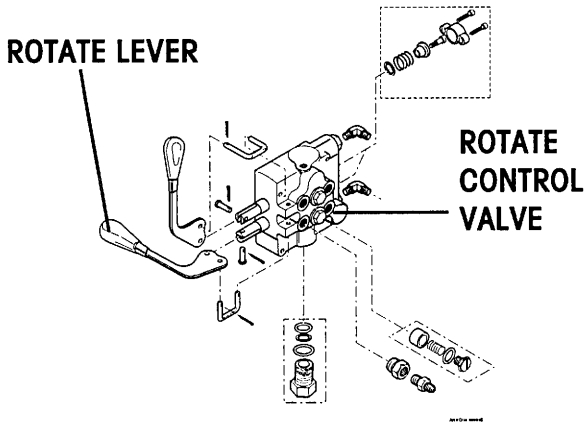


Jib Lift Cylinder.

balance valve, opening this valve and allowing fluid in the base end of the cylinder to flow back to the hydraulic reservoir. When the jib boom section is raised, fluid flows to the base end cylinder port and to the counterbalance valve, opening this valve and allowing fluid in the rod end of the cylinder to flow back to the hydraulic reservoir.



Platform Rotate System Components.



Rotate Control Valve.

PLATFORM ROTATE SYSTEM

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

ROTATE CONTROL VALVE

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

DOUBLE PILOT OPERATED CHECK VALVE

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

ROTARY ACTUATOR

The rotary actuator is a rack and pinion type. Hydraulic fluid enters the actuator from either side depending on the control valve direction and moves a piston which rotates the shaft.

Rotary Actuator Maintenance

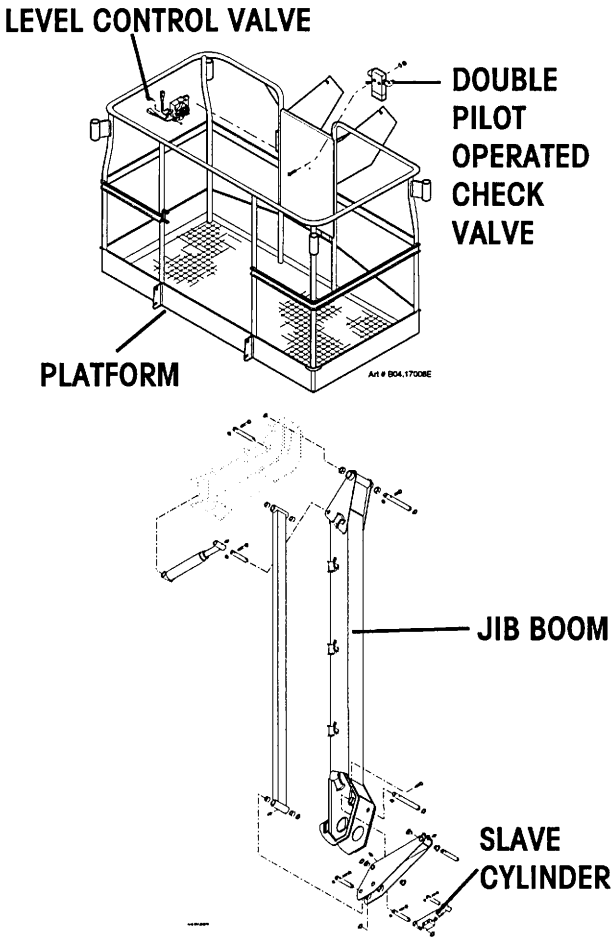
Change the hydraulic fluid once every year (see Lubrication Chart).

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 LEVEL SYSTEM

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

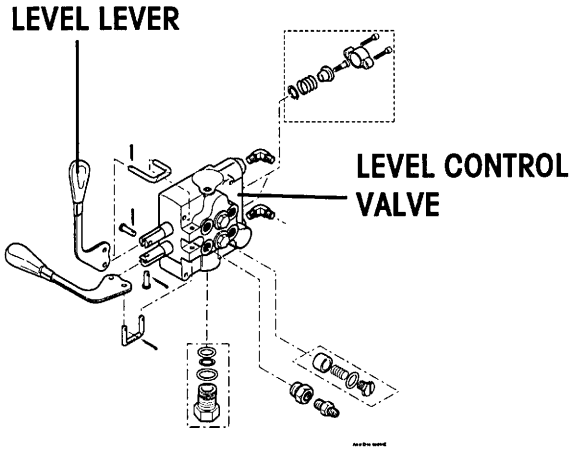


Platform Level System Components.

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

The platform level system is only controlled from the platform.

LEVEL CONTROL VALVE



Level Control Valve.

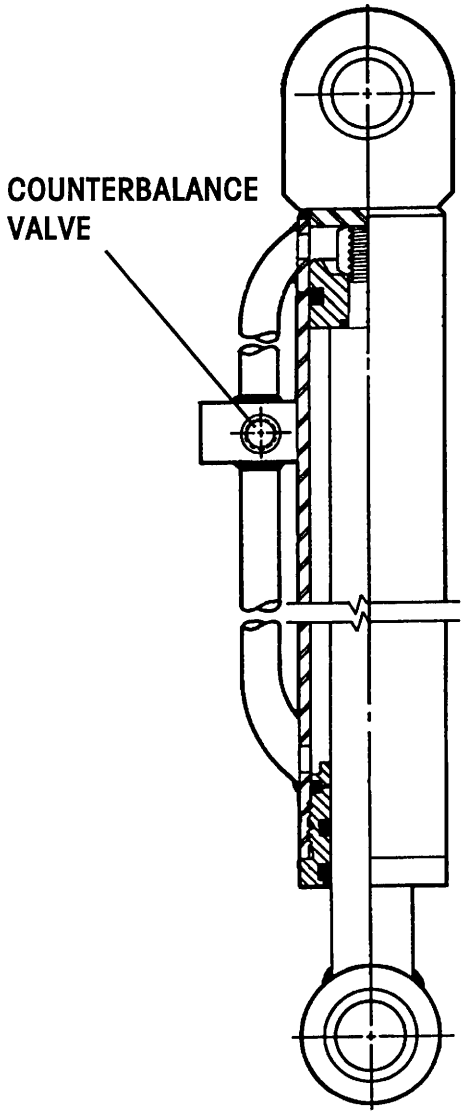
This valve is a three position, four way valve which is manually operated. This control valve directs fluid flow to the level functions.

DOUBLE PILOT OPERATED CHECK VALVE

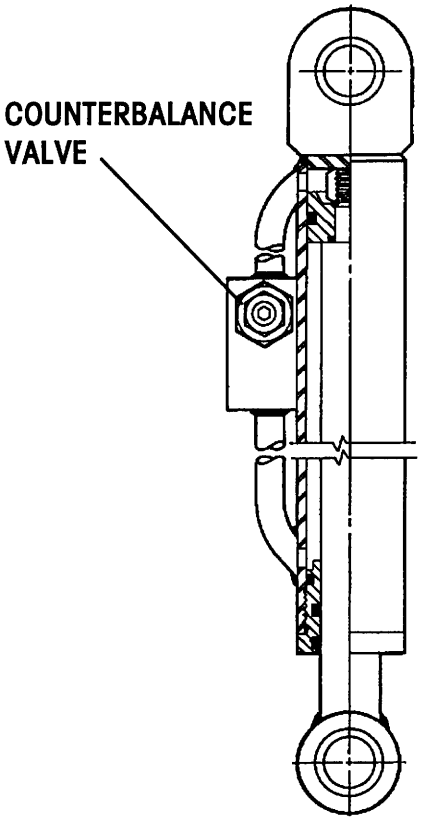
The double pilot operated check valve acts as a locking component for the leveling function and prevents the cylinders from drifting.

MASTER LEVEL CYLINDER

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



Master Level Cylinder.



Slave Level Cylinder.

SLAVE LEVEL CYLINDER

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

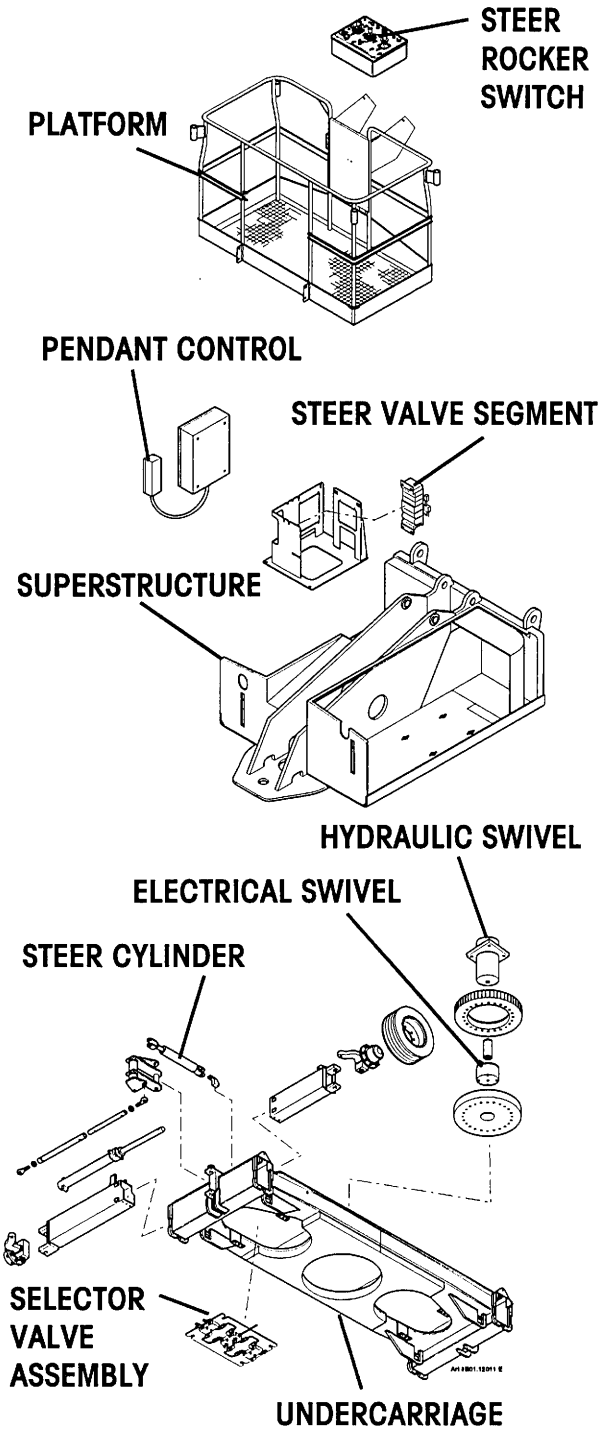
The slave leveling cylinder contains two counterbalance valves (holding valves). The counterbalance valves prevent platform movement in the event of hose failure.

RELIEF VALVES

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

STEER SYSTEM

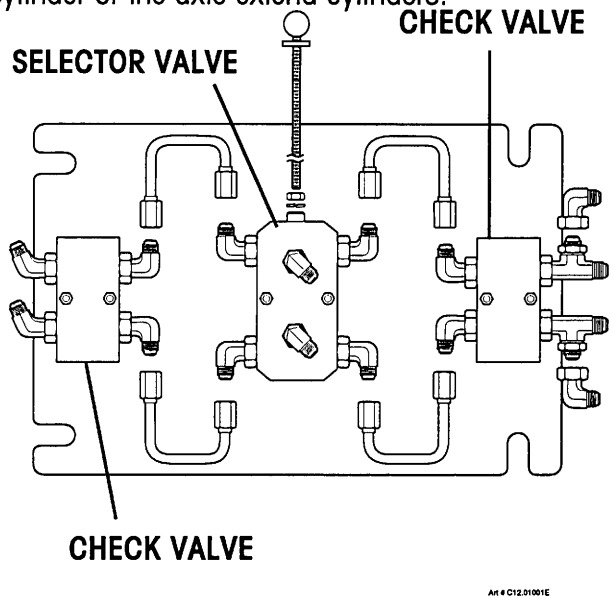
The steering system consists of a selector valve assembly, a steer valve segment, hydraulic swivel, a steer cylinder, a steer toggle switch on the pendant control and a steer rocker switch on the drive lever at the platform control console.



Steer System Components.

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 assembly determines whether fluid flows to the steer cylinder or the axle extend cylinders.



Selector Valve Assembly.

Selector Valve

A manually operated 2 position, 6 way vavle. Located in the fluid line between the hydraulic swivel and the steer cylinder. This valve selects pressure and return from the steering circuit to go to either steer cylinder or the axle extend cylinders.

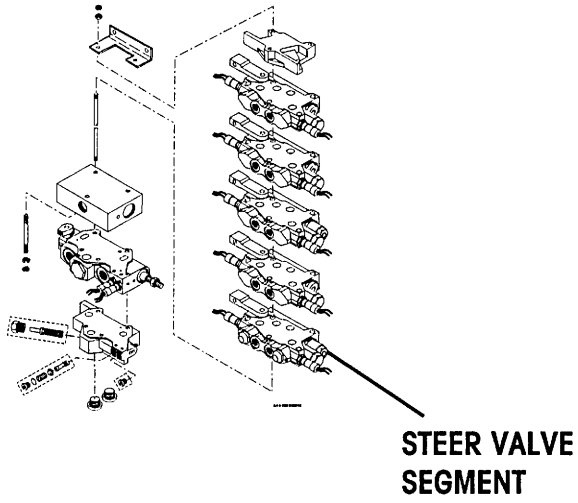
Check Valve

One pilot operated crossover check valve prevents axle cylinder drift by preventing return fluid flow. 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 you to return the steer cylinder to the neutral position by applying fluid flow to the steer cylinder in the opposite direction.

STEER VALVE SEGMENT

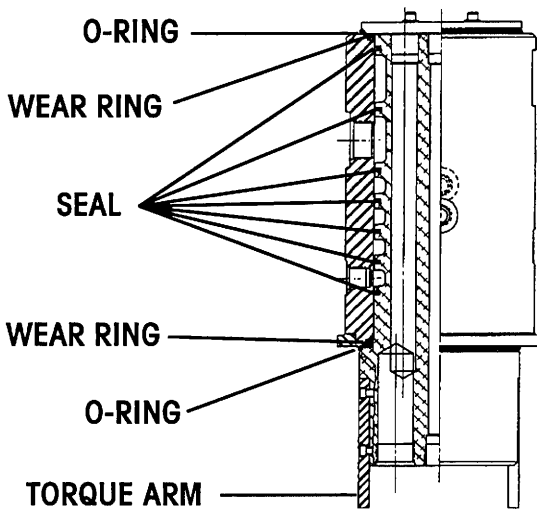
When the steer control lever on the platform control or the steer control toggle switch on the control pendant is activated, an electrical signal is transmitted to the valve cartridge in the steer segment. This allows hydraulic fluid to be sent to the steer cylinder.



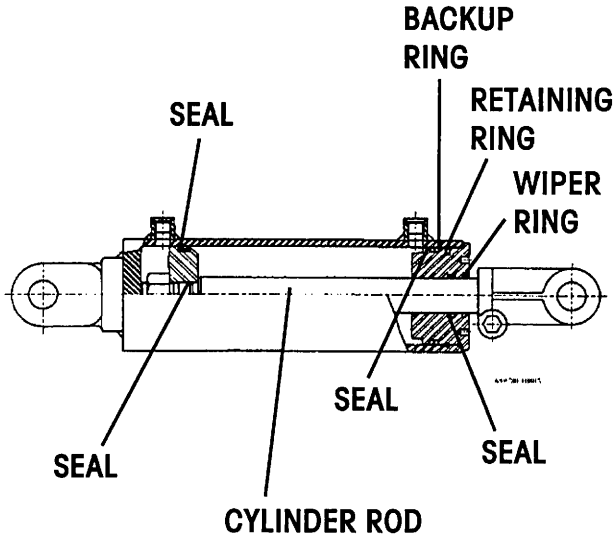
Ground Valve Bank.

HYDRAULIC SWIVEL

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



Hydraulic Swivel.



Steer Cylinder.

STEER CYLINDER

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

STEER DISCONNECT KNOB

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

STEER SYSTEM MAINTENANCE

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

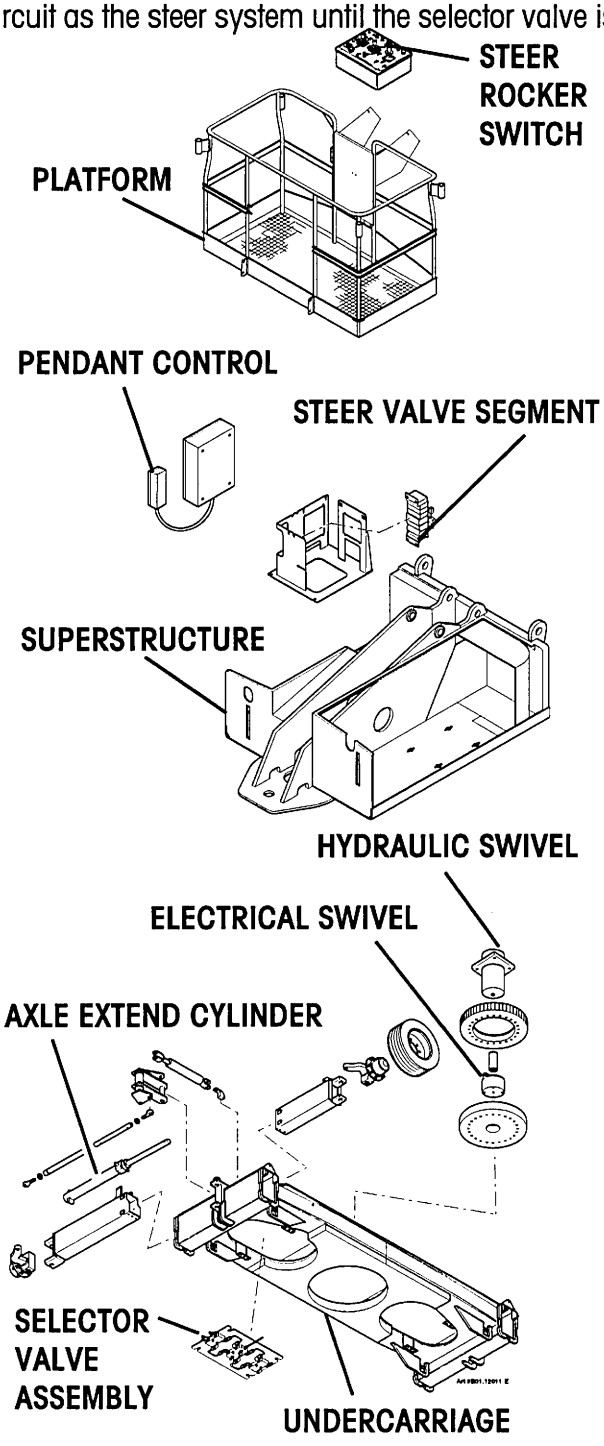
Lubricate linkage as required (see Lubrication Chart).

Check cylinder and hoses for hydraulic fluid leakage and security.

AXLE EXTEND SYSTEM

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

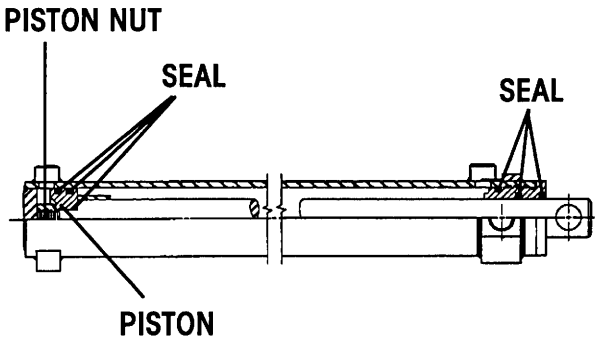
The axle extend system utilizes the same hydraulic circuit as the steer system until the selector valve is positioned to extend the axles; then the hydraulic fluid is diverted to the axle extend cylinders.



Steer System Components.

AXLE EXTEND CYLINDERS

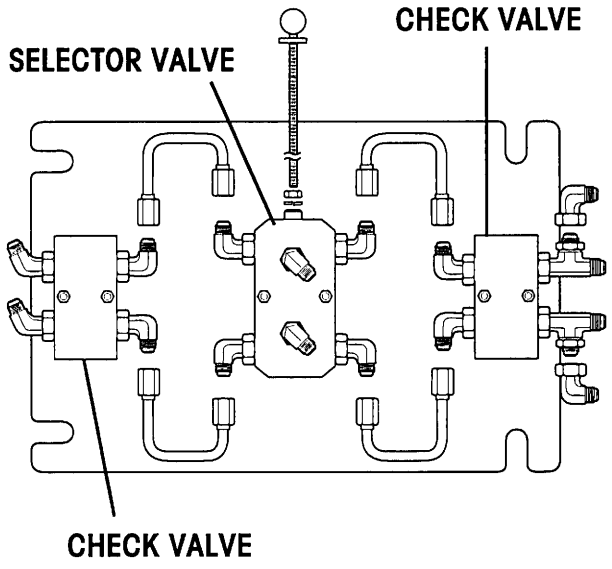
The two cylinders are double acting and are directly connected to telescoping axles. These cylinders power all axle extend/ retract movement.



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.



Selector Valve Assembly.

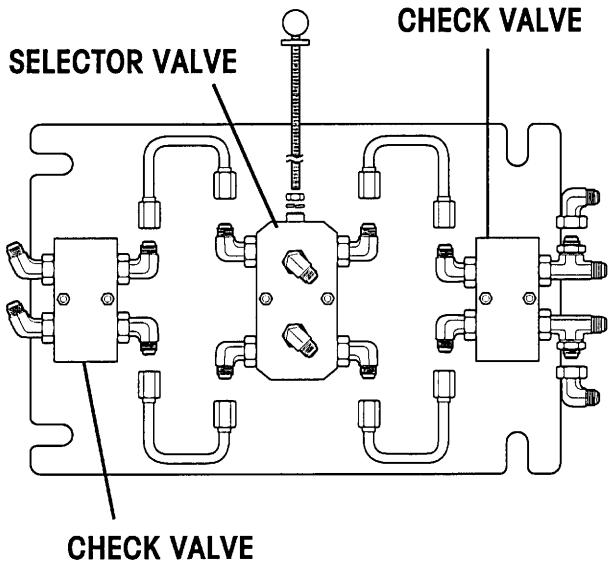
Selector Valve

A manually operated 2 position, 6 way valve. Located in the fluid line between the hydraulic swivel and the steer cylinder. This valve selects pressure and return from the steering circuit 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 return fluid flow. 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 you to return the steer cylinder to the neutral position by applying fluid flow to the steer cylinder in the opposite direction.



Art # C12.01001E

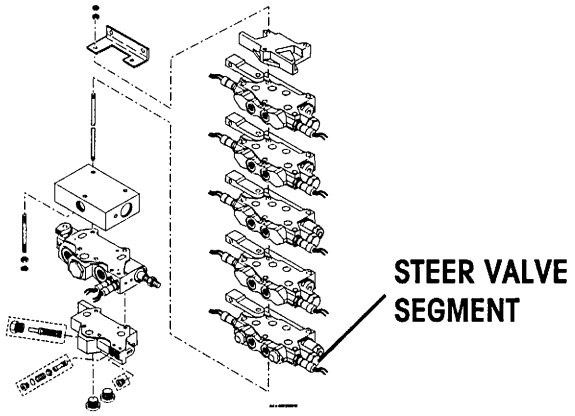
Selector Valve Assembly.

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.

HYDRAULIC SWIVEL

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



Ground Valve Bank.

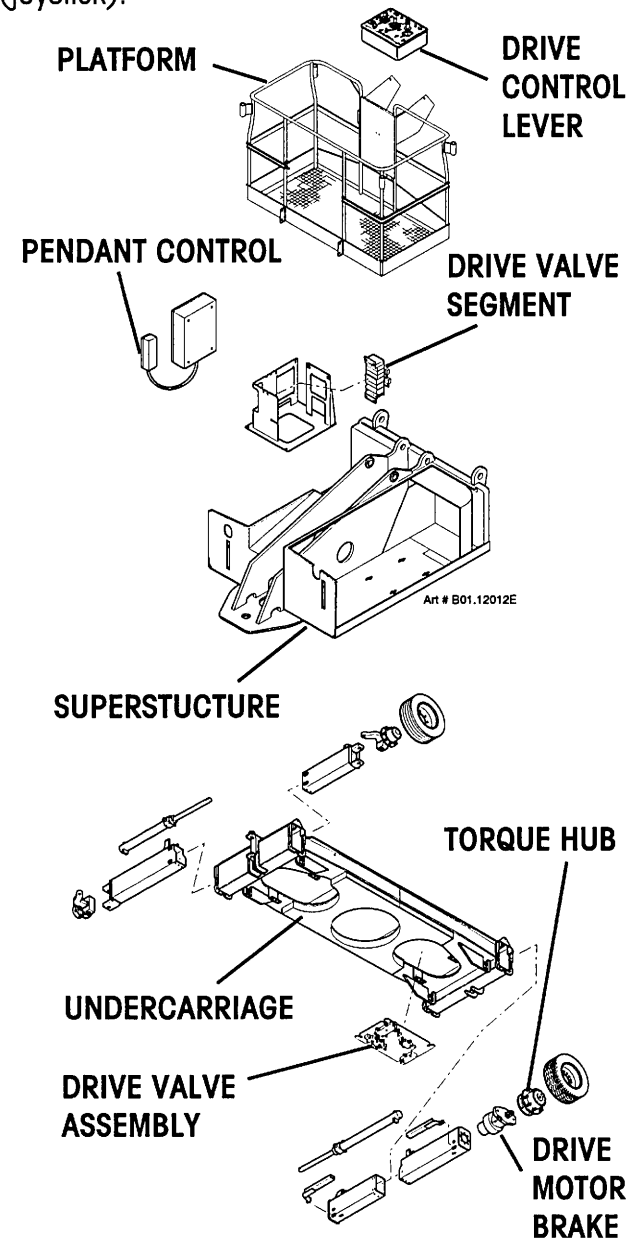
SECTION 3:
DRIVE SYSTEM

Table of Contents, Section 3

Drive System Components 3-3
Drive Motor and Brake Assembly 3-3
Drive Valve Segment 3-4
Drive Valve Assembly 3-4
Selector Valve 3-4
Motion Control Valve Assembly 3-4
Motion Control Valve 3-4
Flow Control Valve 3-4
Flow Divider Valve Assembly 3-5
Flow Divider/ Combiner Valve 3-5
Gate (Globe) Valve 3-5
Drive Relief Valve 3-5
Brake Metering Valve 3-5
Brake Metering Valve Adjustment 3-5
Toggle Switch on the Pendant Control 3-5
Platform Control Handle (Joystick) 3-5

DRIVE SYSTEM COMPONENTS

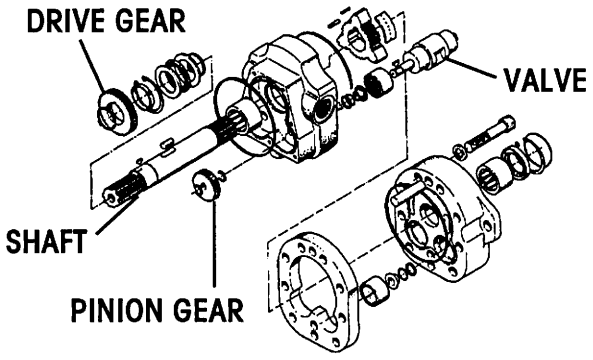
The RP is propelled by two hydraulic drive motors with integral brake assemblies. There is also a 4-wheel drive option which uses two hydraulic drive motors without brakes and two hydraulic drive motors with integral brake assemblies.The drive circuit consists of the two hydraulic drive motor/brake assemblies,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



Drive System Components.

DRIVE MOTOR AND BRAKE ASSEMBLY

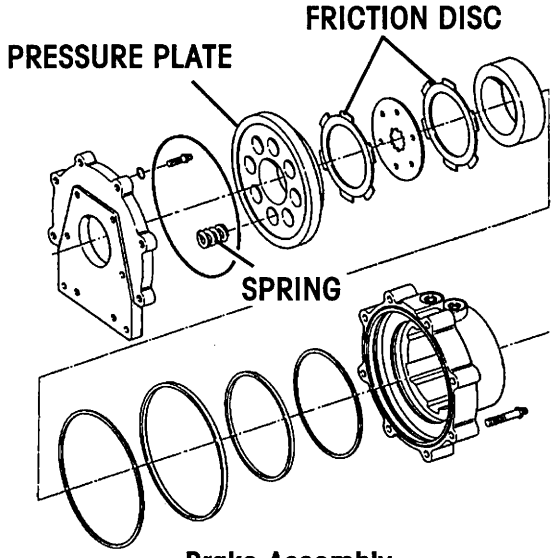
The drive motor is keyed to a shaft which in turn is splined on both ends. One end of the splined shaft is used for the brake while the other end is inserted into the torque hub assembly.



Motor Assembly.

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

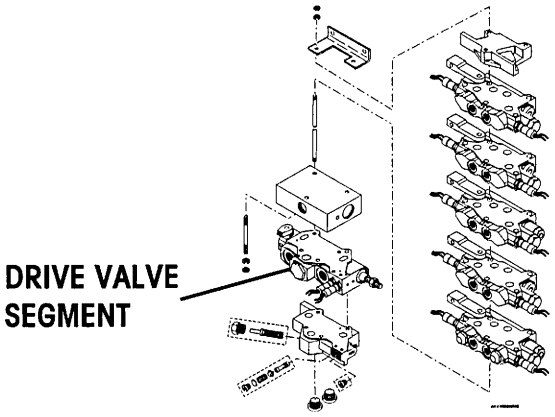
NOTE: Internal leakage in the motor is passed through the brake disc and back to the main hydraulic reservior through the two case drain lines thereby cooling the brake and preventing brake disc wear.



Brake Assembly.

DRIVE VALVE SEGMENT

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



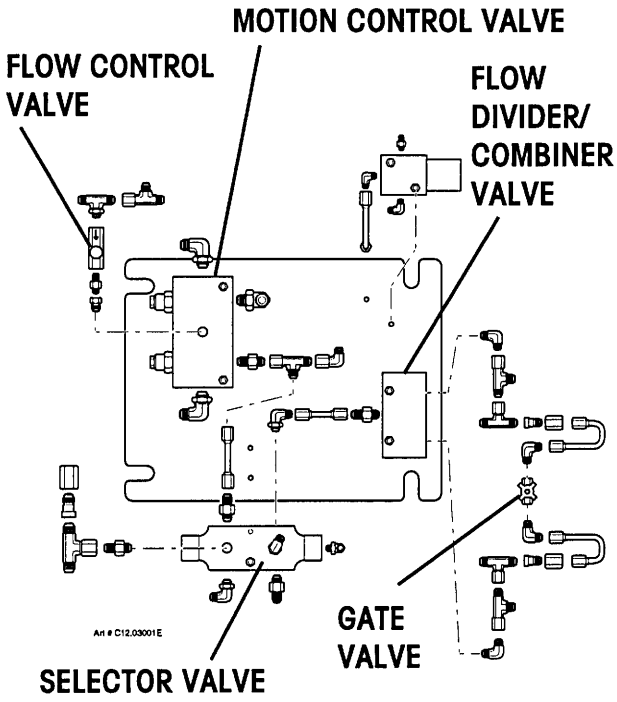
Ground Valve Bank.

DRIVE VALVE ASSEMBLY

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

SELECTOR VALVE

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



Drive Valve Assembly.

MOTION CONTROL VALVE ASSEMBLY

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

Motion Control Valve

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

Flow Control Valve

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

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

FLOW DIVIDER VALVE ASSEMBLY

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

Flow Divider/ Combiner Valve

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

Gate (Globe) Valve

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

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

DRIVE RELIEF VALVE

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

BRAKE METERING VALVE

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

BRAKE METERING VALVE ADJUSTMENT

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

TOGGLE SWITCH ON THE PENDANT CONTROL

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

PLATFORM CONTROL HANDLE (JOYSTICK)

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

SECTION 4:
ELECTRICAL SYSTEM

Table of Contents, Section 4

Electrical System 4-3
Battery 4-3
Battery Maintenance (In Storage) 4-3
Battery Maintenance (In Use) 4-3
Battery Preventive Maintenance 4-4
Battery Replacement 4-4
Movement Alarm 4-4
Tilt Alarm 4-4
Tilt Alarm Test 4-4
Tilt Alarm Adjustment 4-5
Relays 4-5
Circuit Breakers 4-5
Limit Switches 4-5
Emergency Pumps 4-5
Platform Envelope Control System 4-6
Emergency Stop Buttons 4-6
Emergency Stop Cable Adjustment 4-6
Pendant Switch Removal 4-6
Ground Control Cabinet Switch Removal 4-6
Platform Console Switch Removal 4-6
Drive Controller 4-6
Creep Speed Adjustments 4-8
Boom Telescope Adjustment 4-8
Superstructure Swing Adjustment 4-8

ELECTRICAL SYSTEM

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

BATTERY

Two 12 volt batteries supply the electrical current required to operate the electrical circuits for the RP.

BATTERY MAINTENANCE (IN STORAGE)

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

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

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

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

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

BATTERY MAINTENANCE (IN USE)

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

Check battery terminals for:

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

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

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

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

BATTERY PREVENTIVE MAINTENANCE

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

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

Recheck specific gravity of all cells after recharging.

BATTERY REPLACEMENT

To remove the 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 wing nuts and hold downs 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 pendant control is moved off the center "Neutral" position.

⚠WARNING

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

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

TILT ALARM

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

TILT ALARM TEST

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

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

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.

RELAYS

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

CIRCUIT BREAKERS

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

If the 20 amp circuit breaker is tripped, re-set it by pushing in the button. If the breaker trips again, the cause of the high current draw must be corrected prior to further operation.

LIMIT SWITCHES

There are limit switches mounted on the undercarriage as safety devices for the axle extension function. The axle extension limit switches are at each of the four axles.

Unless the axle extend limit switches are closed as shown on the unit 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.

EMERGENCY PUMPS

There are two (2) emergency pumps mounted at the base of the hydraulic tank. They are activated when the Emergency Pump push button on either the platform control console or the remote control pendant is pressed. When either push button is pressed and held, the emergency pump circuit is energized, allowing hydraulic functions (drive, steer or boom functions) should the engine powered hydraulic pump be disabled.

PLATFORM ENVELOPE CONTROL SYSTEM

The platform envelope control system is a microprocessor-based controller optimized for use with the RP 120. Refer to Appendix, Envelope Control, for calibration and adjustment of platform controlled functions.

EMERGENCY STOP BUTTONS

There are two emergency stop buttons: one on the ground control cabinet, and the other on the platform.

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

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

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

PENDANT SWITCH REMOVAL

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

GROUND CONTROL CABINET SWITCH REMOVAL

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

PLATFORM CONSOLE SWITCH REMOVAL

To replace a platform switch or button, remove the two platform console screws and swing the console up on its 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 unit is operated by a "single axis" lever on the platform control console. Flipping the switch on top of the lever steers the unit to the left or right.

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

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

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

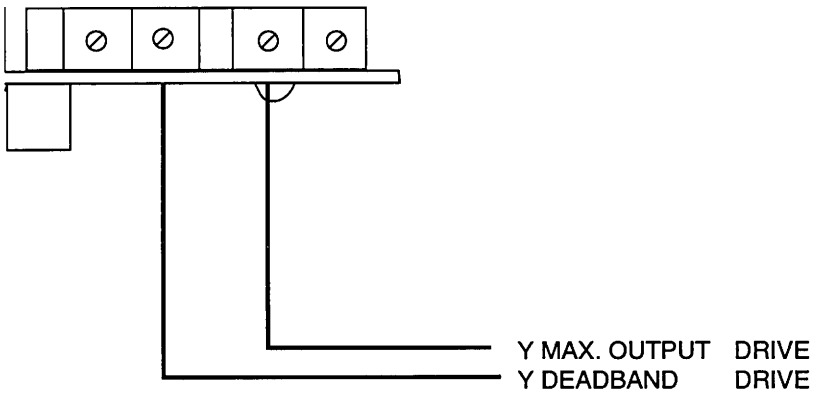
1. Turn appropriate Lo Threshold (Deadband) potentiometer fully counter-clockwise.

2. Push control lever forward until a proximity switch inside the control clicks.

3. Turn the Lo Threshold (Deadband) potentiometer clockwise to permit first flow (first movement).

4. Push control lever fully forward.

5. Turn the Hi Threshold (Max. Output) potentiometer to just permit maximum flow. If turned too high, full flow will occur at a lesser control angle and some controllability will be lost.



Drive and Telescope Cards.

CREEP SPEED ADJUSTMENTS

There are two separate adjustments for creep speed in the ground control box: forward creep and reverse creep.

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

To determine current creep speed setting of the unit:

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

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 locations.)

BOOM TELESCOPE ADJUSTMENT

Boom telescope 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 extended or retracted.

To adjust the boom telescope speed:

- While holding the Deadman button, extend the boom by pressing the Boom Telescope Control Switch to the extend position.

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

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

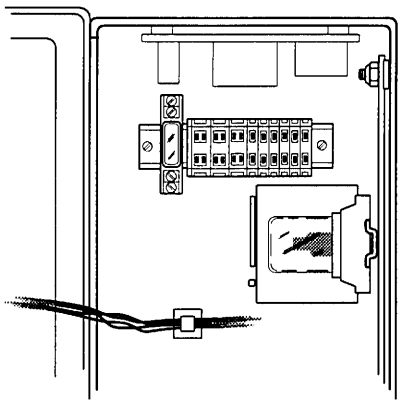
SUPERSTRUCTURE SWING ADJUSTMENT

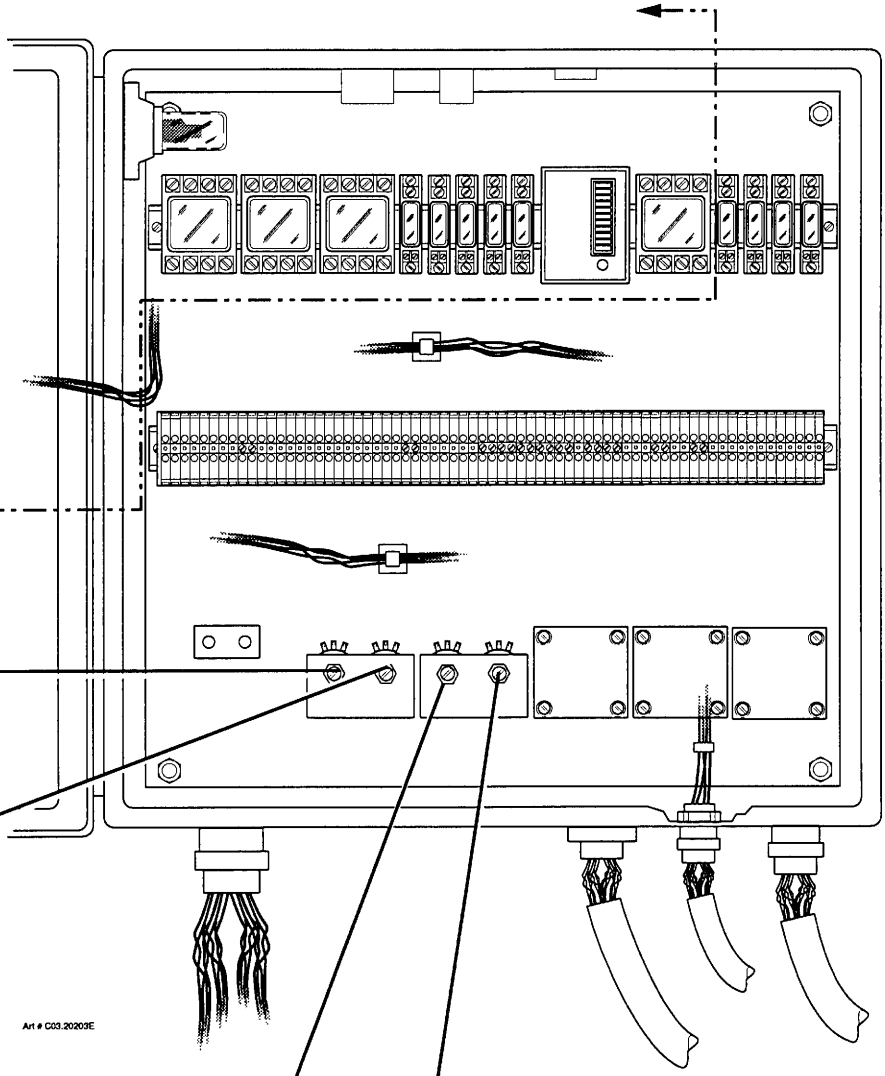
The potentiometer governing the boom swing speed is located inside the ground control box. (Refer to following figure for potentiometer location.)

- Check speed of superstructure rotation.

NOTE: The superstructure should rotate at approximately one complete revolution in 2 minute 20 seconds.

- Adjust boom swing potentiometer, as necessary.




FORWARD
CREEP SPEED
REVERSE
CREEP SPEED
Art # C03.20203E
SWING SPEED
TELESCOPE SPEED
Ground Control Adjustments.
CW = SPEED DECREASE
CCW = SPEED INCREASE

SECTION 5:
MECHANICAL COMPONENTS

Table of Contents, Section 5

Mechanical Components 5-3
Tires 5-3
Changing Tires 5-3
Wheels and Lug Nuts 5-3
Drive Hub Assembly 5-4
Steer Cylinder Pins 5-5
Steer Cylinder 5-5
Steer Arm Pin 5-6
Tie Rod Assembly 5-6
Superstructure 5-7
Hoses and Cables 5-8
Miscellaneous Equipment 5-8
Boom 5-8
Boom Pivot Pin and Bushing Replacement 5-8
Boom Lift Cylinder 5-9
Lift Cylinder Pivot Pin Replacement 5-9
Lift Cylinder Seal Replacement (On Machine) 5-9
Check Holding Valves 5-9
Boom Disassembly 5-10
Boom Assembly 5-14
Boom Telescope (Extend) Cylinder 5-17
Telescope (Extend) Boom Cylinder Pin Replacement 5-18
Telescope (extend) Cylinder Removal 5-18
Telescope Cylinder Seal Replacement 5-18
Telescope Cylinder Installation 5-18
Checking Holding Valves 5-18
Boom Wire Rope Adjustment 5-18
Boom Wire Rope Replacement 5-21
Wear Pads 5-21
Platform Level Cylinders 5-21
Platform Level Cylinder Pin Replacement 5-22
Level Cylinder Seal Replacement 5-22
Platform Leveling Procedure 5-22
Axle Extend Assembly 5-24
Axle Extend Cylinder 5-24
Axle Extend Cylinder Replacement 5-24
Axle Extend Cylinder Seal Repacement 5-26
Mechnical Axle Stop 5-26
Axle Tube Assembly Replacement 5-26

MECHANICAL COMPONENTS

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

TIRES

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

CHANGING TIRES

⚠WARNING

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

When a tire change is necessary, follow these steps:

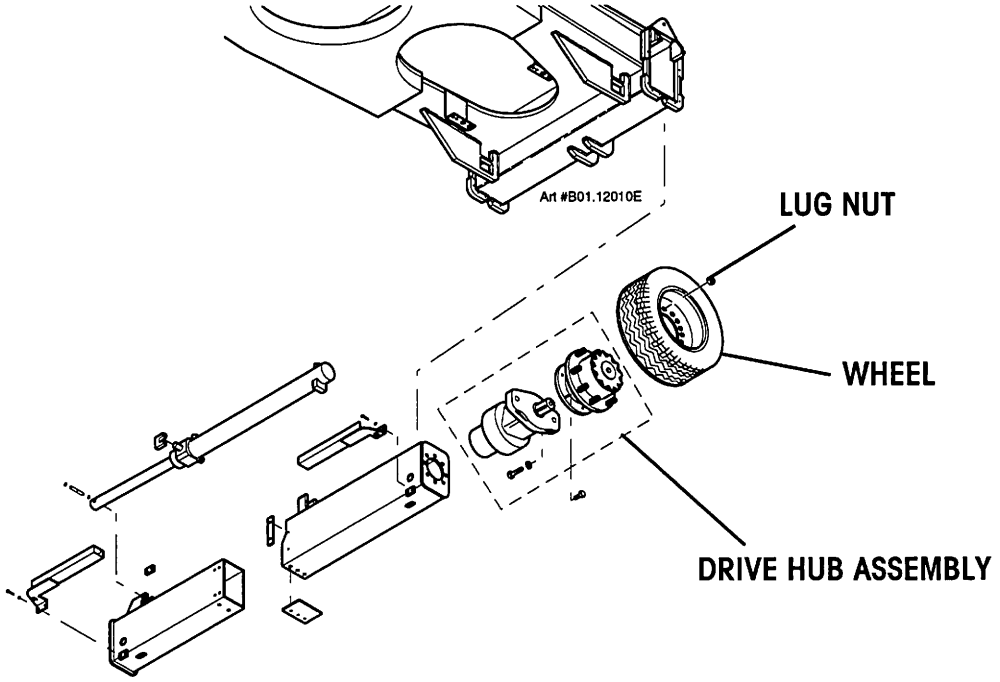
⚠ CAUTION

ALWAYS BLOCK THE WHEELS before you raise the machine.

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

WHEELS AND LUG NUTS

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



Wheel Assembly and Drive Hub Assembly Location.

DRIVE HUB ASSEMBLY

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

- To remove drive hub assembly:

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

⚠WARNING

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

2. Remove tire and wheel assembly:
    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 cap screws and flat washers on the drive hub assembly.
5. Slide off hydraulic motor and torque hub as one unit.

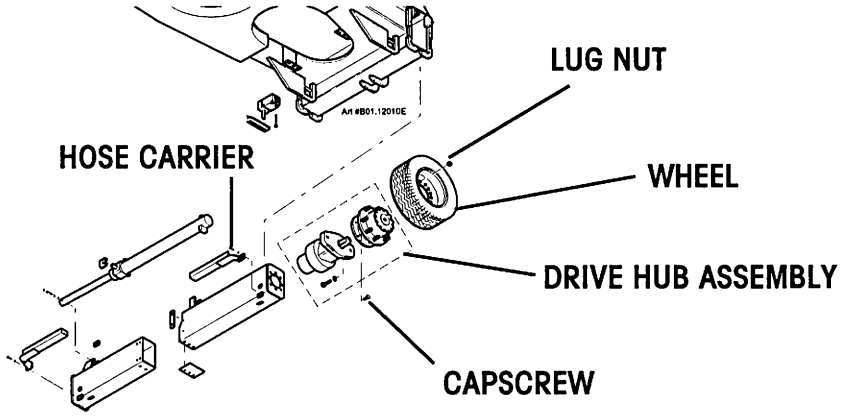
- Install drive hub assembly:

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

⚠WARNING

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

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



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

STEER CYLINDER PINS

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

ROD END CYLINDER PIN REPLACEMENT

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

BASE END CYLINDER PIN REPLACEMENT

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

STEER CYLINDER

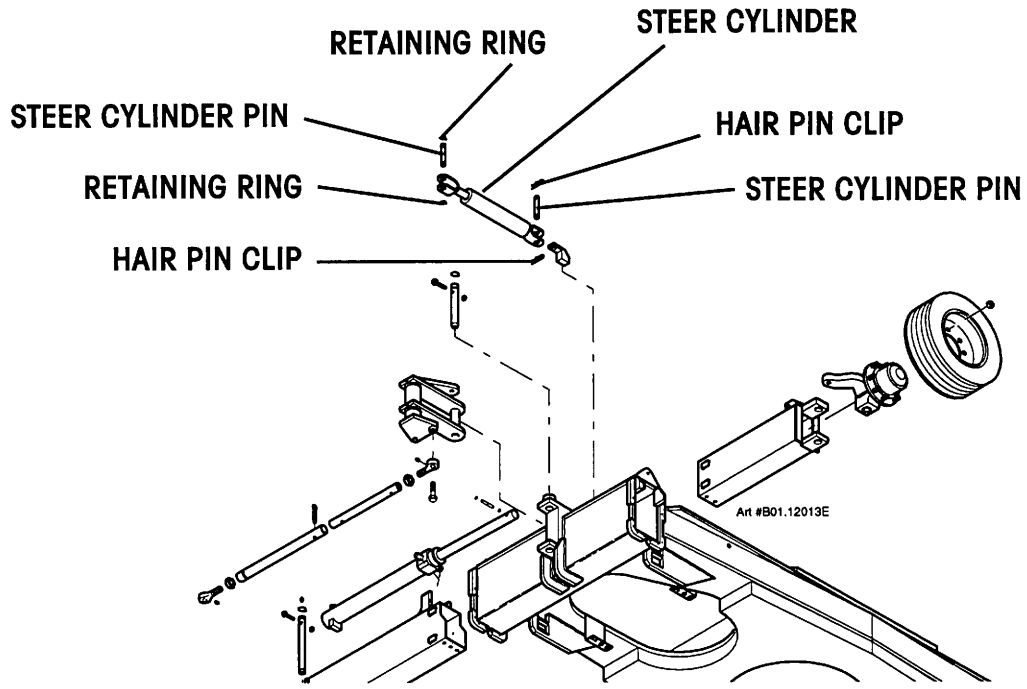
The steer cylinder is of the double acting type. Check the cylinder for hydraulic fluid leaks.

STEER CYLINDER SEAL REPLACEMENT

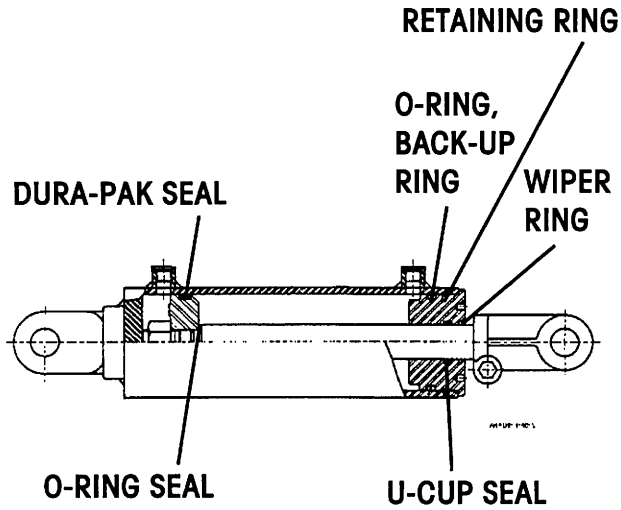
1. Disconnect the hydraulic hoses.
2. Remove the steer cylinder pins
3. Remove the cylinder.
4. Clean the end of the cylinder.
5. Loosen the end cap and withdraw it over the piston rod.

⚠ 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

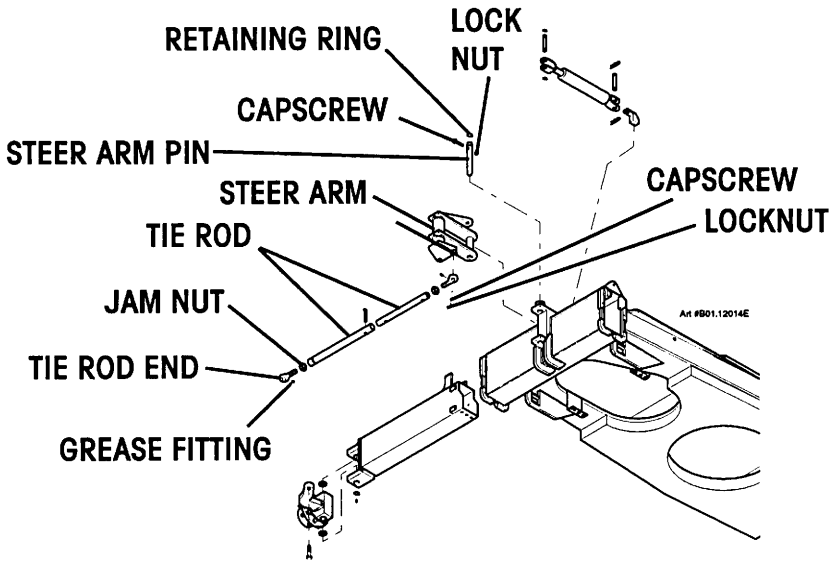
1. Remove capscrew and locknut.
2. Remove retaining ring.
3. Remove the pin and thrust washers.
4. Install new pin with thrust washers and retaining ring.
5. Install capscrew and locknut.
6. Apply grease to pin.

TIE ROD ASSEMBLY

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

TIE ROD ASSEMBLY REPLACEMENT

1. Remove capscrews and lock nuts at both ends.
2. Remove tie rod assembly.
3. Install new tie rod assembly and attach it with the capscrews and lock nuts.
4. Apply grease at fitting.

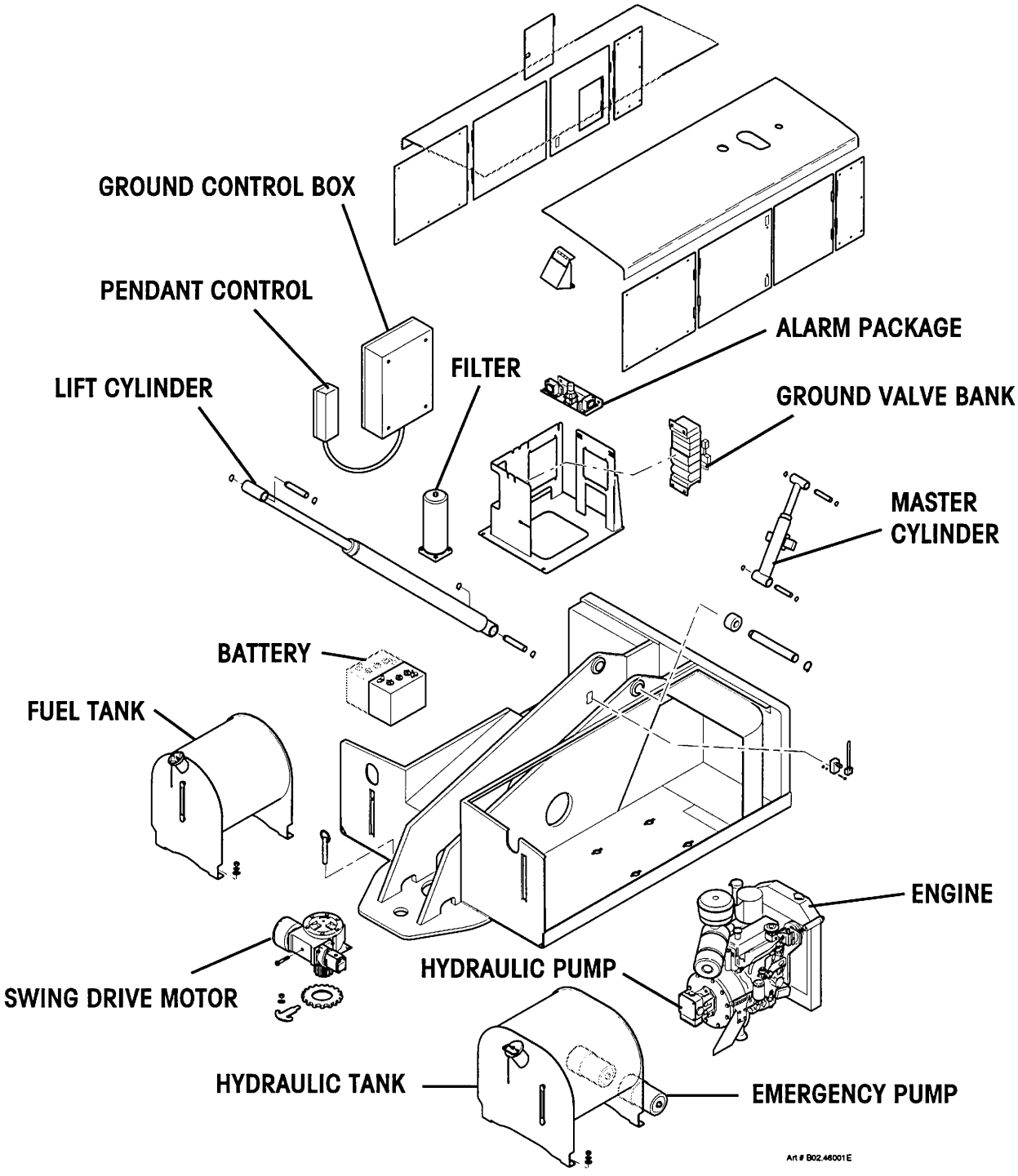


Steer Arm Pin and Tie Rod Assembly.

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.



Components Found on the Superstructure.

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.

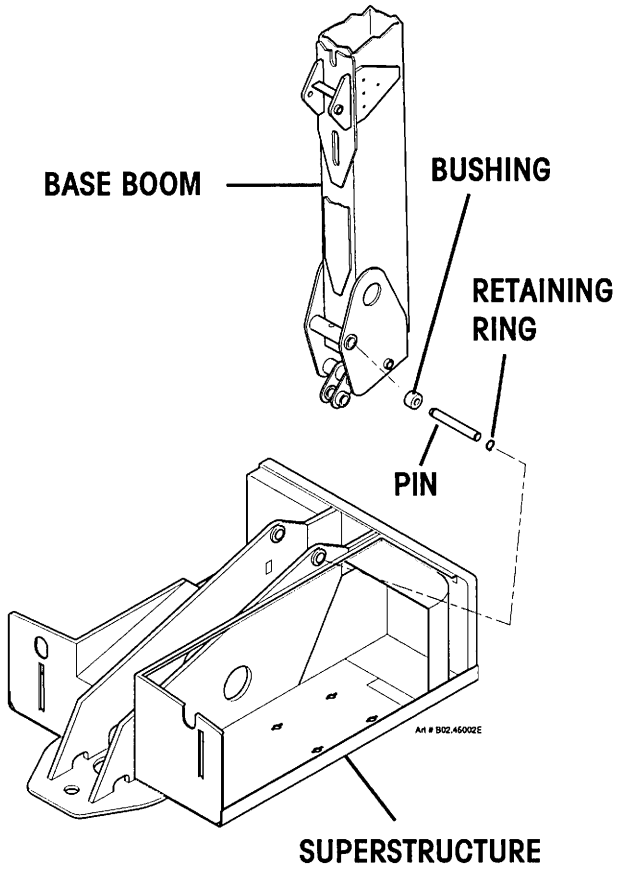
Cables and hoses should be examined for rubbing and chafing, especially in the swing bearing area and the hose track area.

MISCELLANEOUS EQUIPMENT

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

BOOM

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

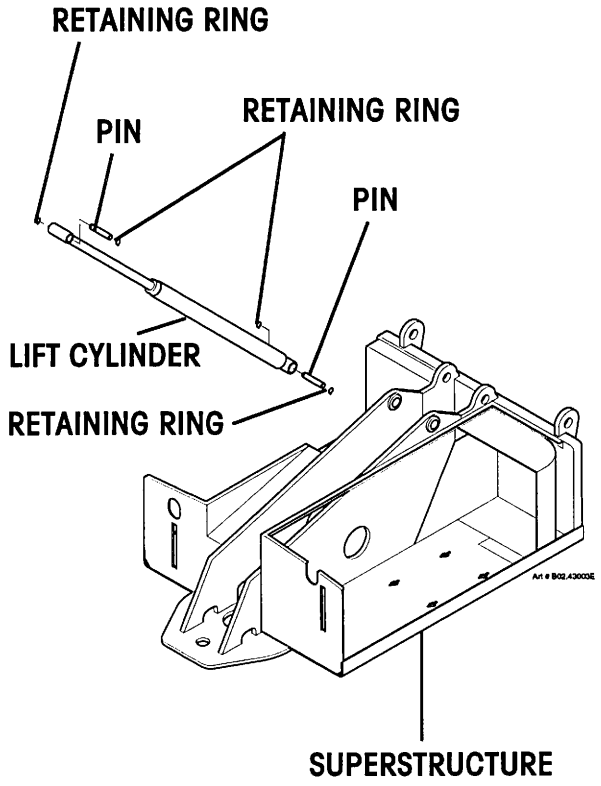


Boom Pin and Bushing.

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 LIFT CYLINDER

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

LIFT CYLINDER PIVOT PIN REPLACEMENT

SUPPORT THE BOOM. Operate the boom lift control to release hydraulic pressure and remove any load on the lift cylinder. Remove the retaining ring. Remove the pin locking bolts and nuts, SUPPORT THE LIFT CYLINDER and remove the pin.

Install new pin and locking bolts and nuts (lubricate bolts before installation) and retaining ring. Apply grease to pin.

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.

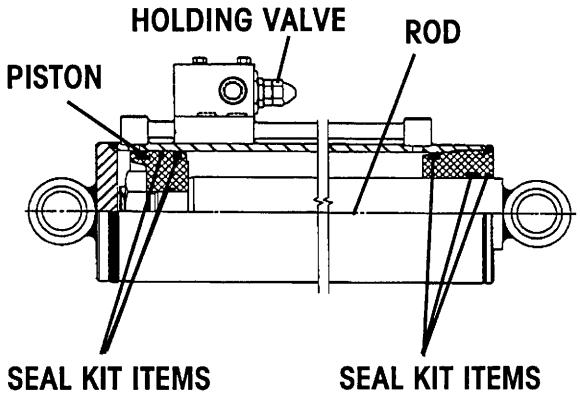
> **NOTE:** It is recommended that the backup rings be replaced when seals are changed.

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

CHECK HOLDING 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 holding valve is faulty and the cartridge should be replaced.

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



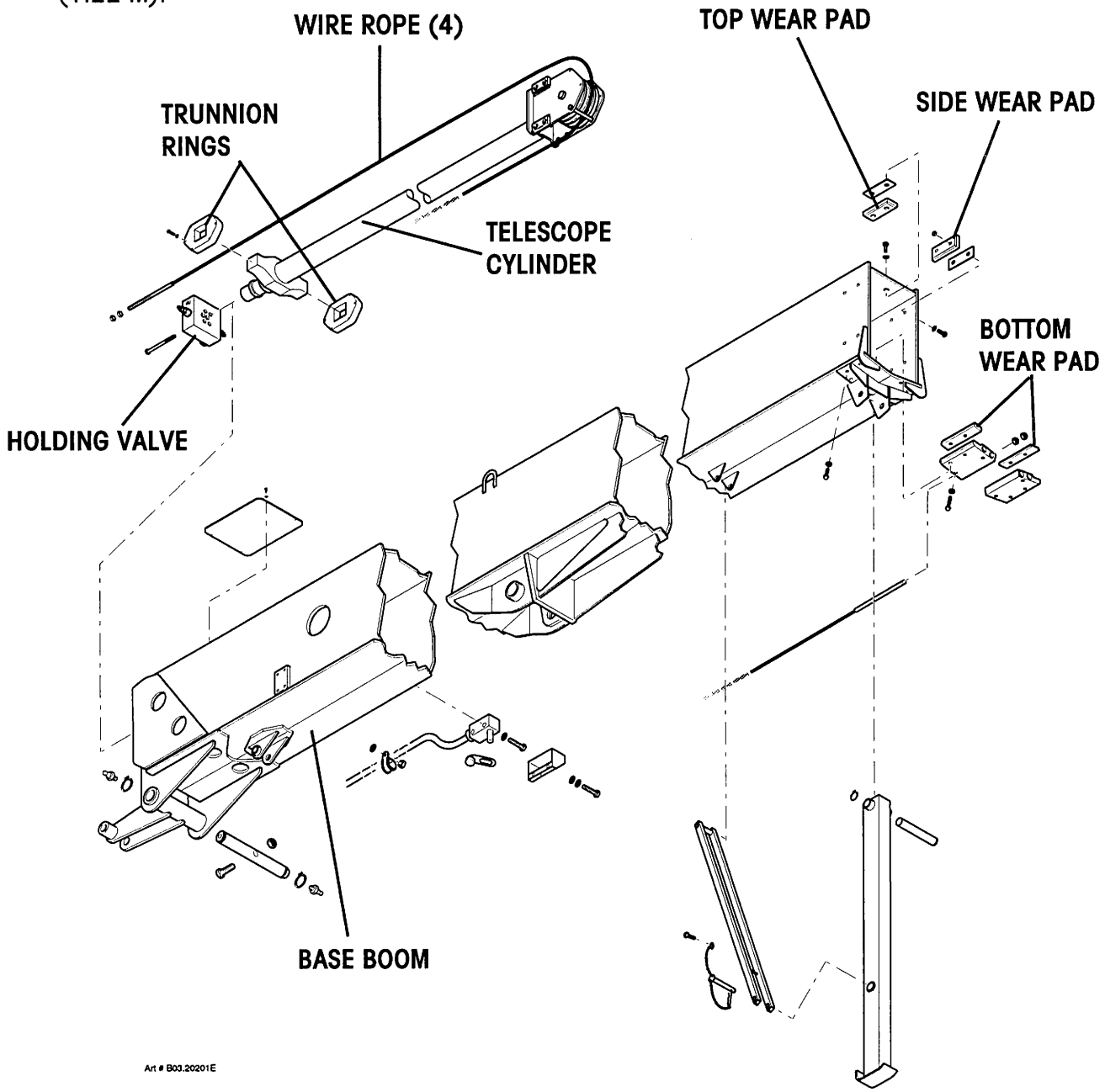
Lift Cylinder.

BOOM DISASSEMBLY

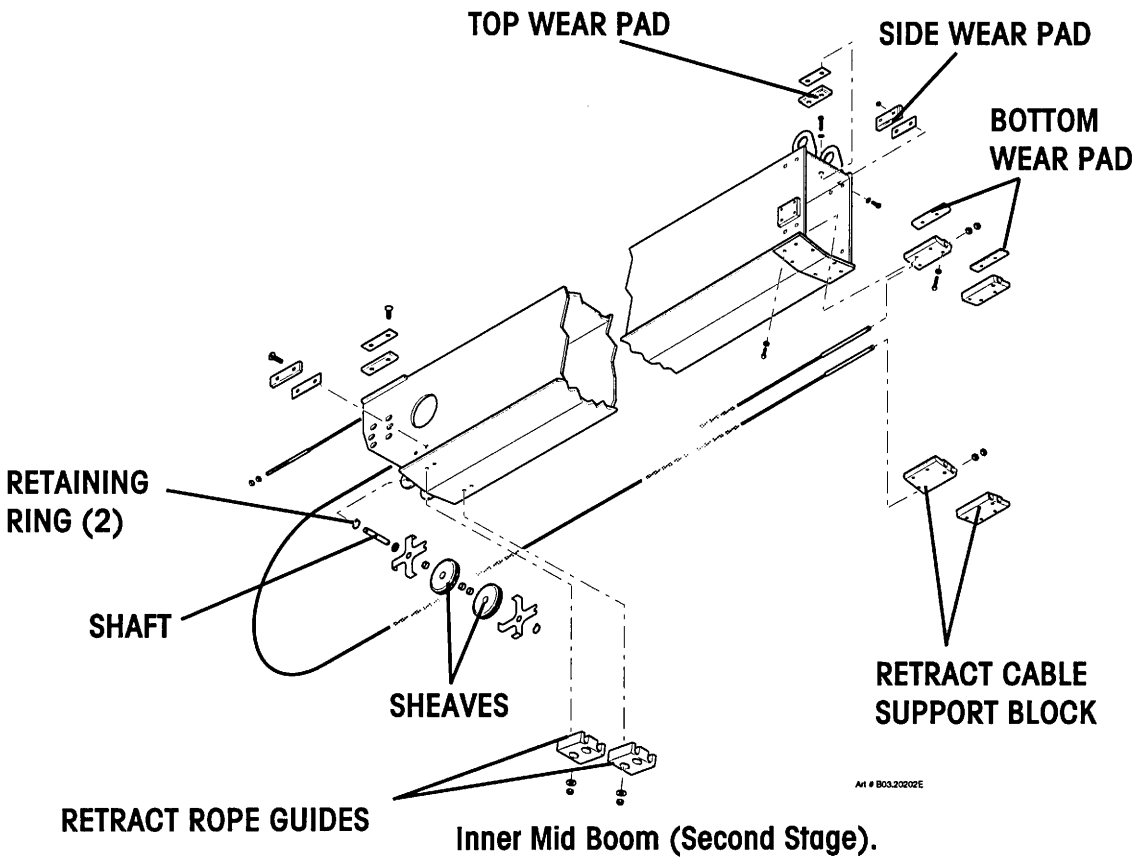
NOTE: This procedure requires two people. Do not attempt the procedure alone.

NOTE: Approximately one gallon (3.79 L) of hydraulic fluid will drain out of the extend cylinder when performing step 3, so have container to catch the flow.

1. Extend boom out enough to remove top wear pads from second stage (inner mid boom).
2. Then, extend boom out at least four (4) feet (1.22 M).
3. Loosen extend cylinder holding valve to remove trapped pressure.
4. Remove extend cylinder holding valve.



Base Boom (First Stage) and Telescope Cylinder.



Inner Mid Boom (Second Stage).

⚠ CAUTION

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

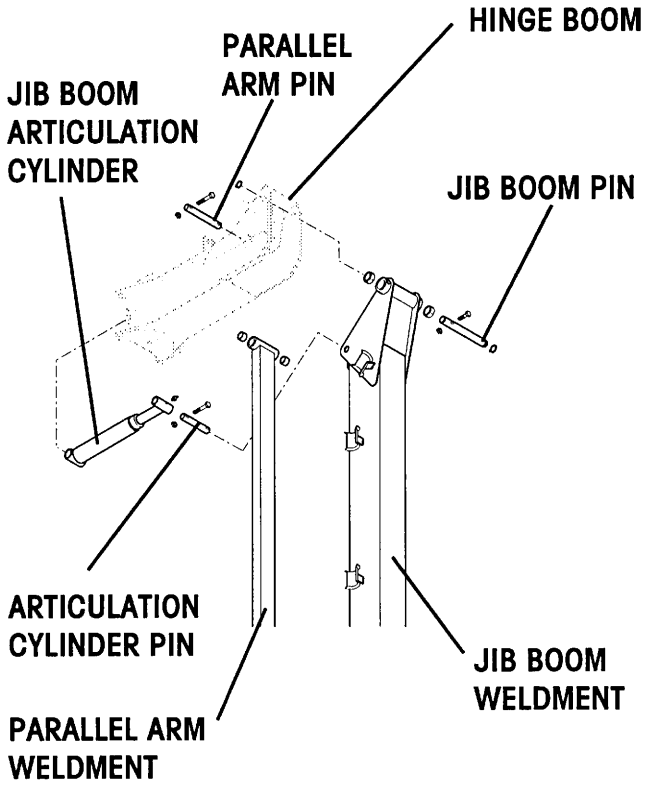
5. Raise jib boom and support the platform.

6. Disconnect all electrical cables and hydraulic hoses at the platform and from the jib boom. **Note the connection of cables and hoses for ease of proper assembly.** Also, unbolt the jib angle sensor.

7. Remove articulation cylinder pin.

8. Remove parallel arm pin to free upper parallel arm weldment.

9. Remove upper jib boom pin to free jib boom weldment.



Jib Boom Assembly.

10. Remove the Catrac and trough assembly. The assembly is secured to the booms with three brackets and the moving anchor mounting. Lay the assembly with hoses to the side.

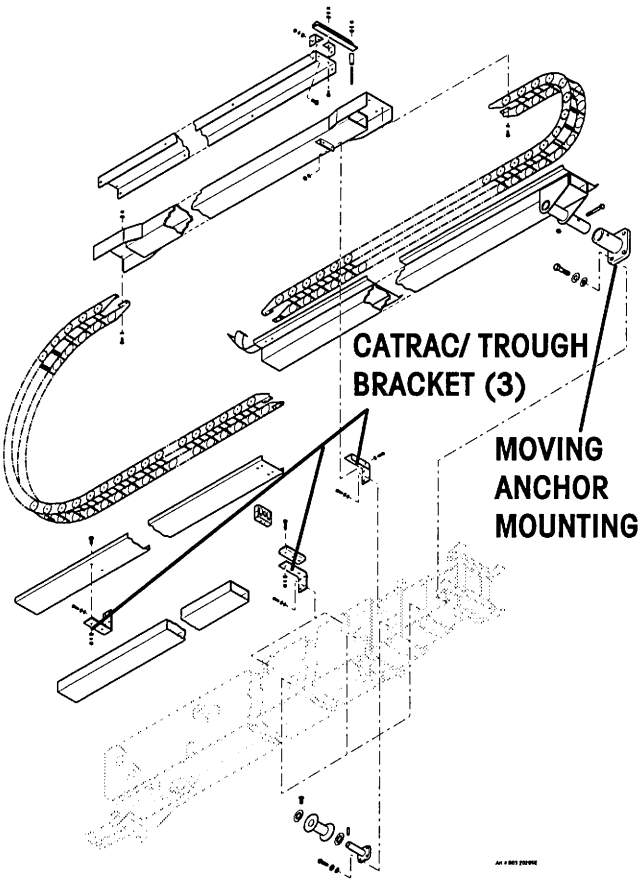
11. Disconnect boom length sensor reels at the cable end attached to eye bolts on the boom.

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

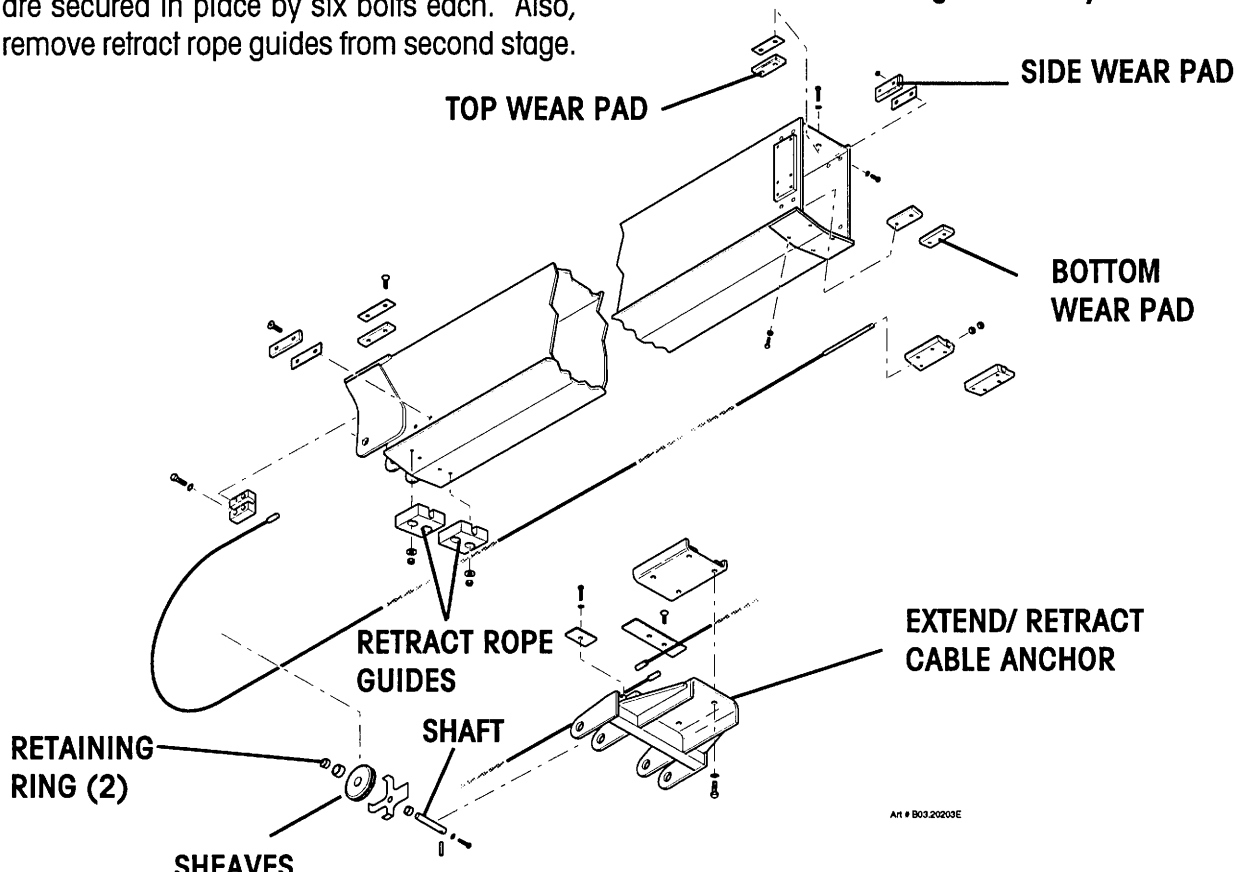
13. Remove wear pads from rear of base boom. For bottom wear pads and retract cable support block, the mid boom must be slid further and lifted up.

14. Slide second stage all the way out of base boom and carefully tie up cables, ensuring that cables are not crossed.

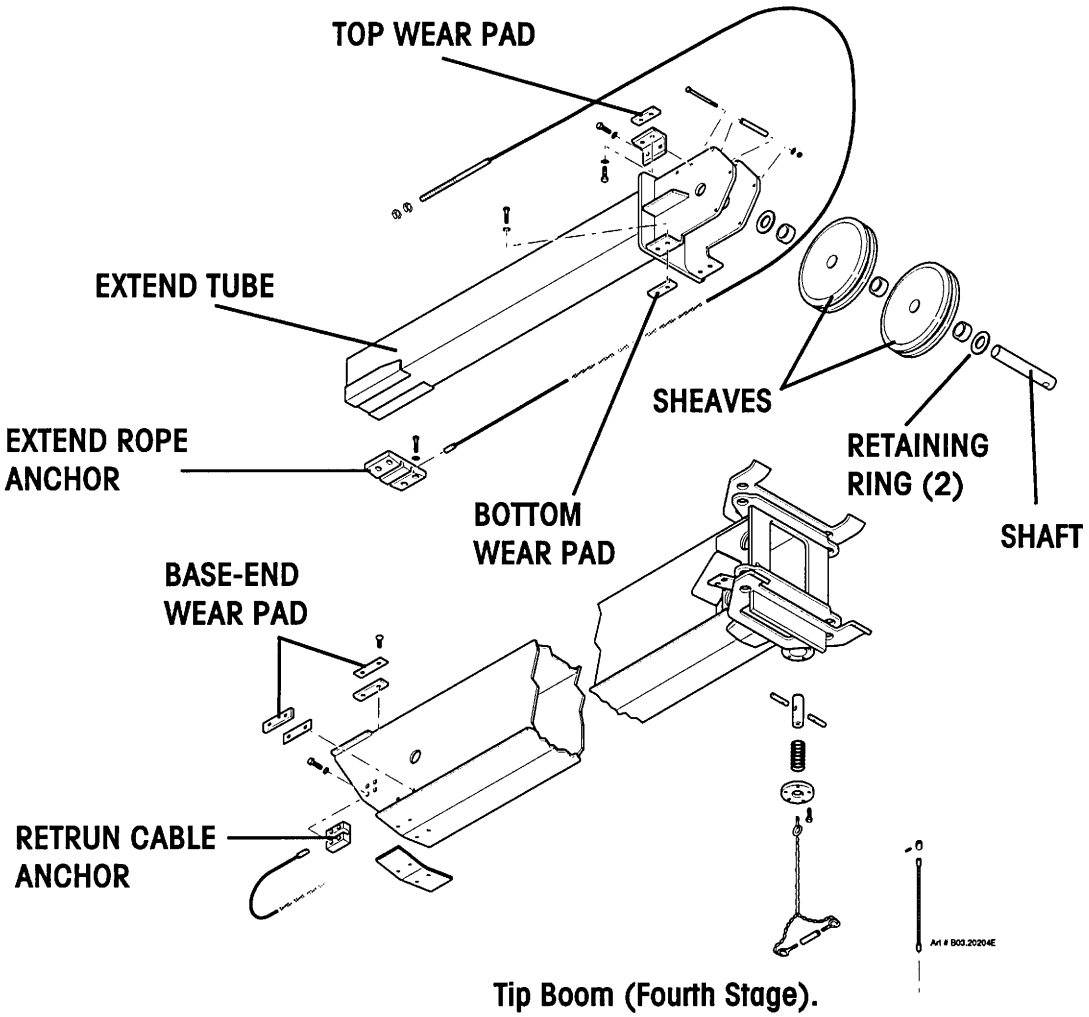
15. While supporting the extend cylinder, remove the two telescope cylinder trunnion rings. They are secured in place by six bolts each. Also, remove retract rope guides from second stage.



Catrac and Trough Assembly.



Outer Mid Boom (Third Stage).



Tip Boom (Fourth Stage).

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

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

18. Pull third stage and cables out of second stage.

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

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

21. Slide extend cylinder out of third stage.

    NOTE: At this point, extend cylinder is accessible.

22. Remove 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.

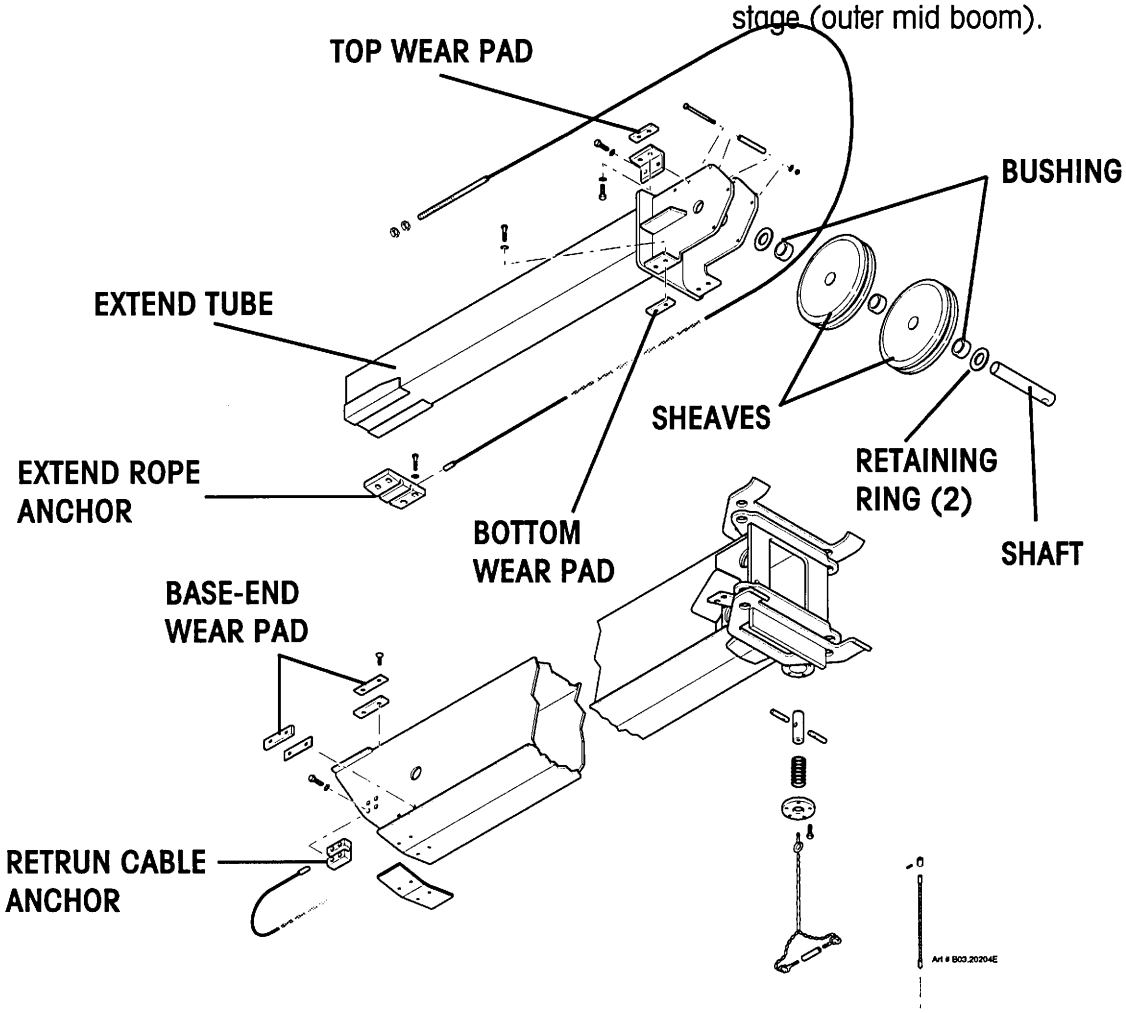
23. Slide out tip boom from third stage and pull out extend tube.

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

BOOM ASSEMBLY

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

1. Pack tip boom sheave bushings 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 fourth stage.
4. Secure one end of wire ropes in place to tip boom with extend rope anchor. Also, secure the stage retract cable in place with return cable anchor.
5. With tip boom base-end wear pads in place, slide tip boom and cables into outer mid boom (third stage).
6. Slide tip boom into third stage; then, install rear wear pads onto third stage. To install bottom wear pads, lift tip boom.
7. With cables attached, slide extend cylinder into third stage. Install retract rope guides and extend/ retract cable anchor along with cables.
8. While supporting extend cylinder, install third stage (outer mid boom).



Tip Boom (Fourth Stage).

9. Slide third stage and cables into second stage far enough to hook up the two extend cables; then pull third and fourth stage back out enough to access sheaves.

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

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

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

13. Install retract rope guides onto second stage.

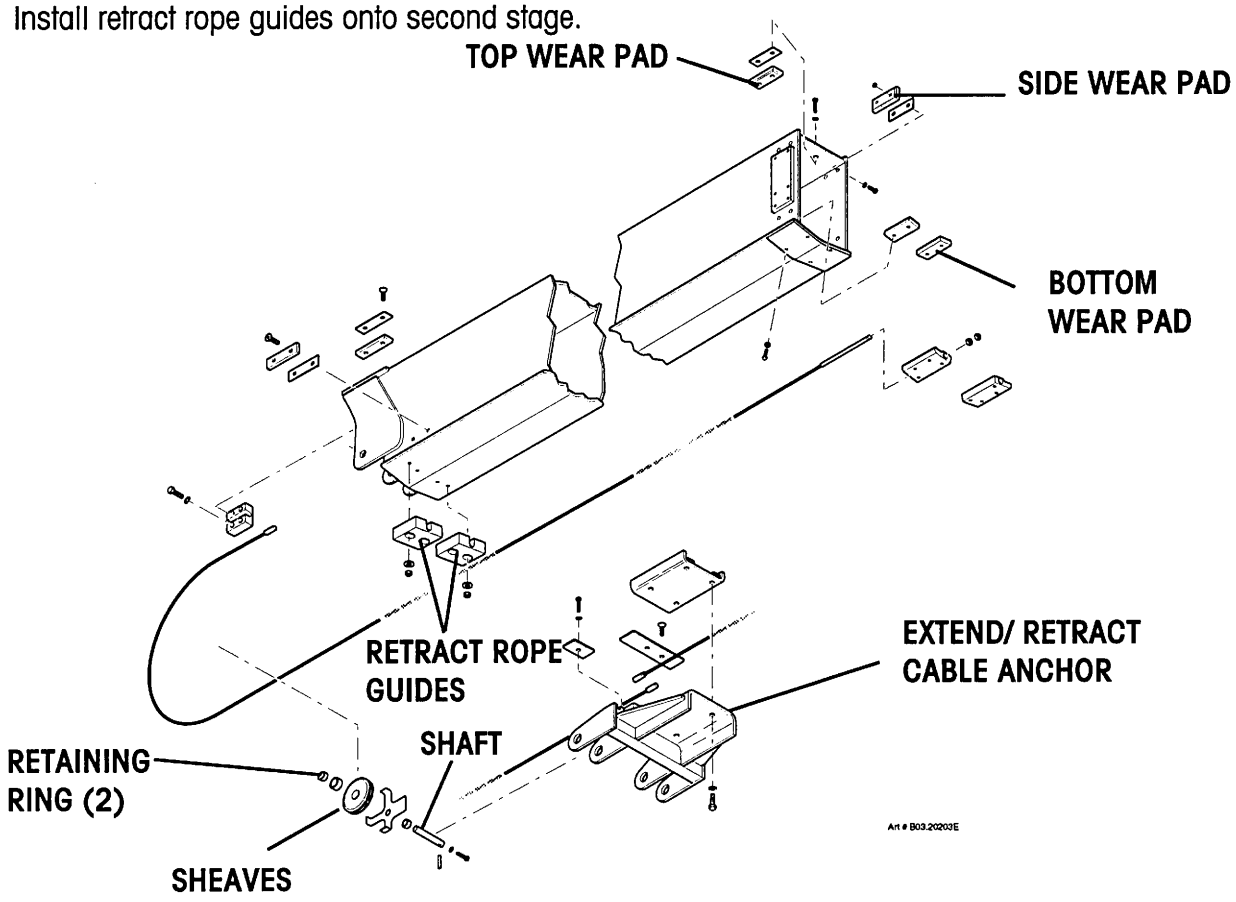
14. While supporting the extend cylinder, install the two telescope cylinder trunnion rings. Also, install retract rope guides and cables onto second stage.

15. Remove access plate from top side of boom.

16. With cables temporarily fixed to the top side of second boom, slide second stage into base boom 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.

18. Install the four cables into back of base boom, ensuring that they are not crossed.



Outer Mid Boom (Third Stage).

19. Install the Catrac and trough assembly. The assembly is secured to the booms with three brackets and the moving anchor mounting.

20. Connect boom length sensor reels at the cable end attached to eye bolts on the boom.

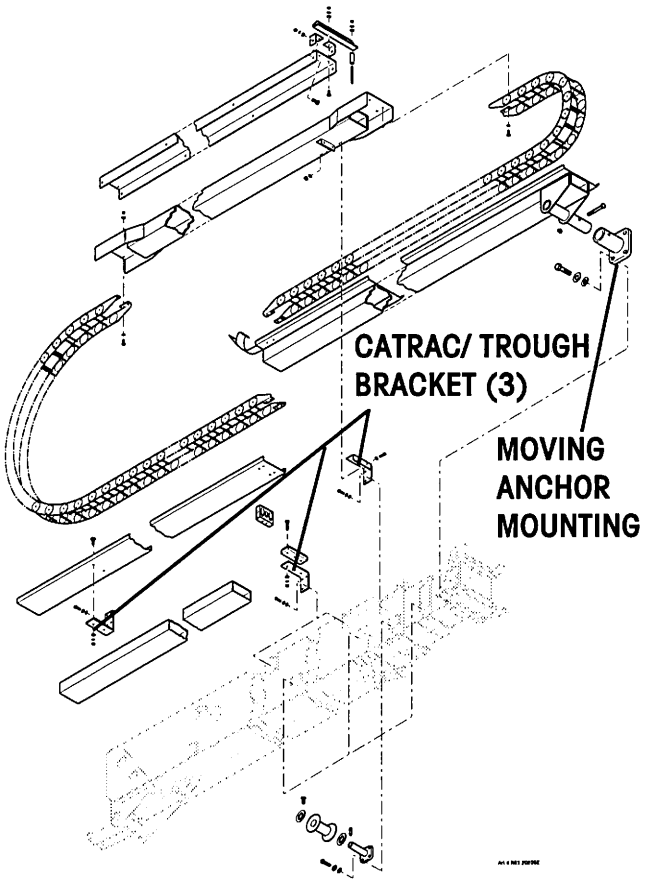
21. Install jib boom and platform.

    a. Attach jib boom weldment to hinge boom with jib boom pin.

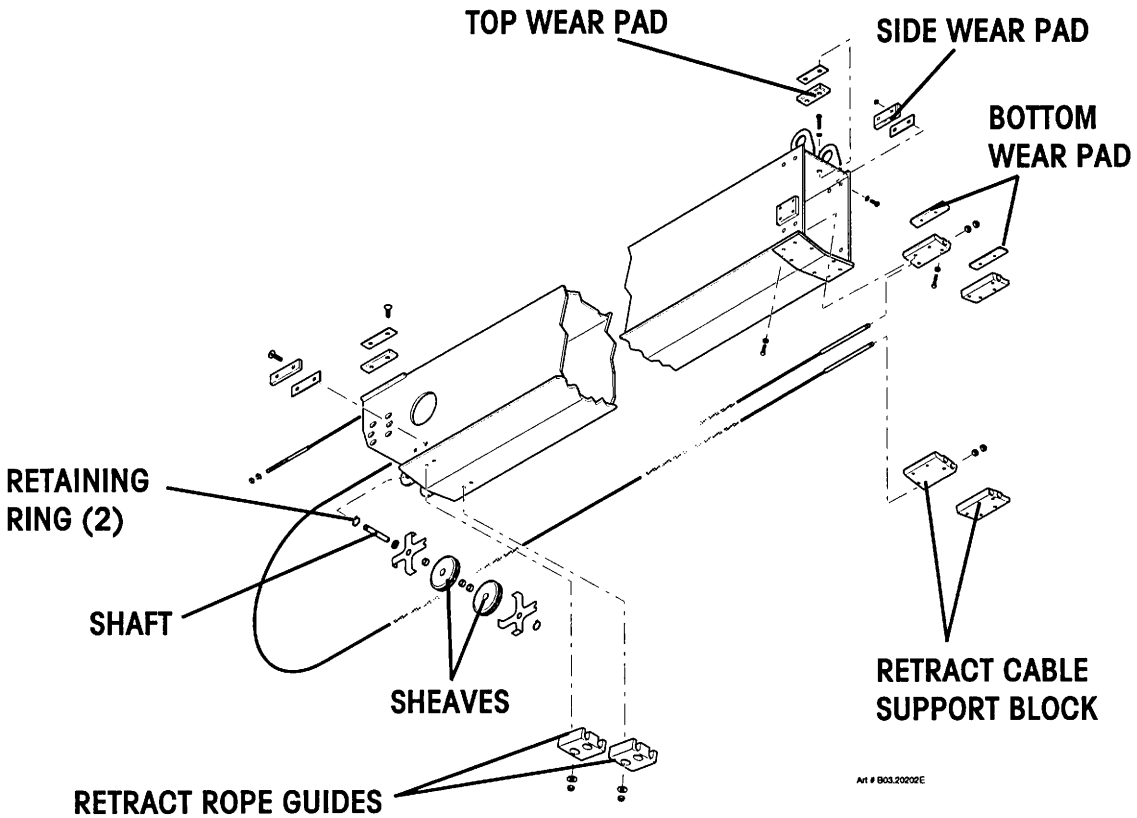
    b. Attach parallel arm weldment to hinge boom with parallel arm pin.

    c. Attach jib boom articulation cylinder to jib boom weldment with articulation cylinder pin.

    d. Ensure that all pin securing devices are in place.



Catrac and Trough Assembly.



Inner Mid Boom (Second Stage).

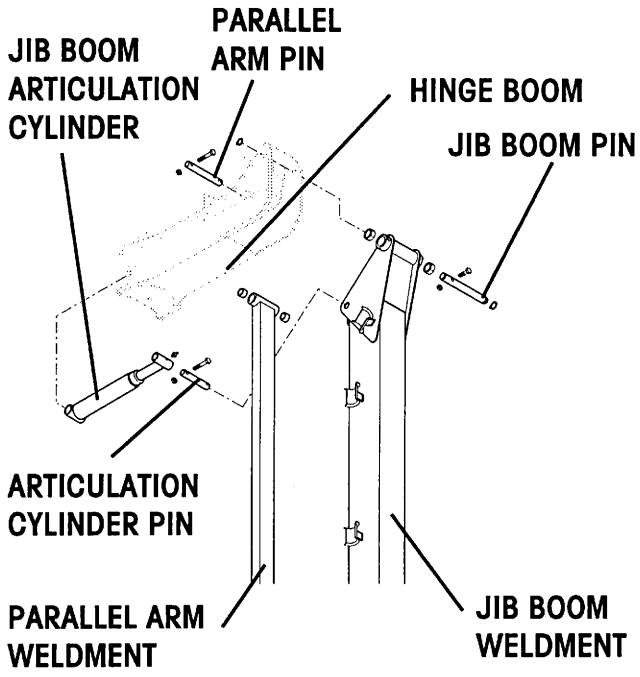
e. Attach and connect jib angle sensor arm.

22. Connect all electrical cables and hydraulic hoses at the platform and to the jib boom.

23. Install extend cylinder holding valve.

24. Turn unit on and flush hydraulic system. (Refer to hydraulic section.)

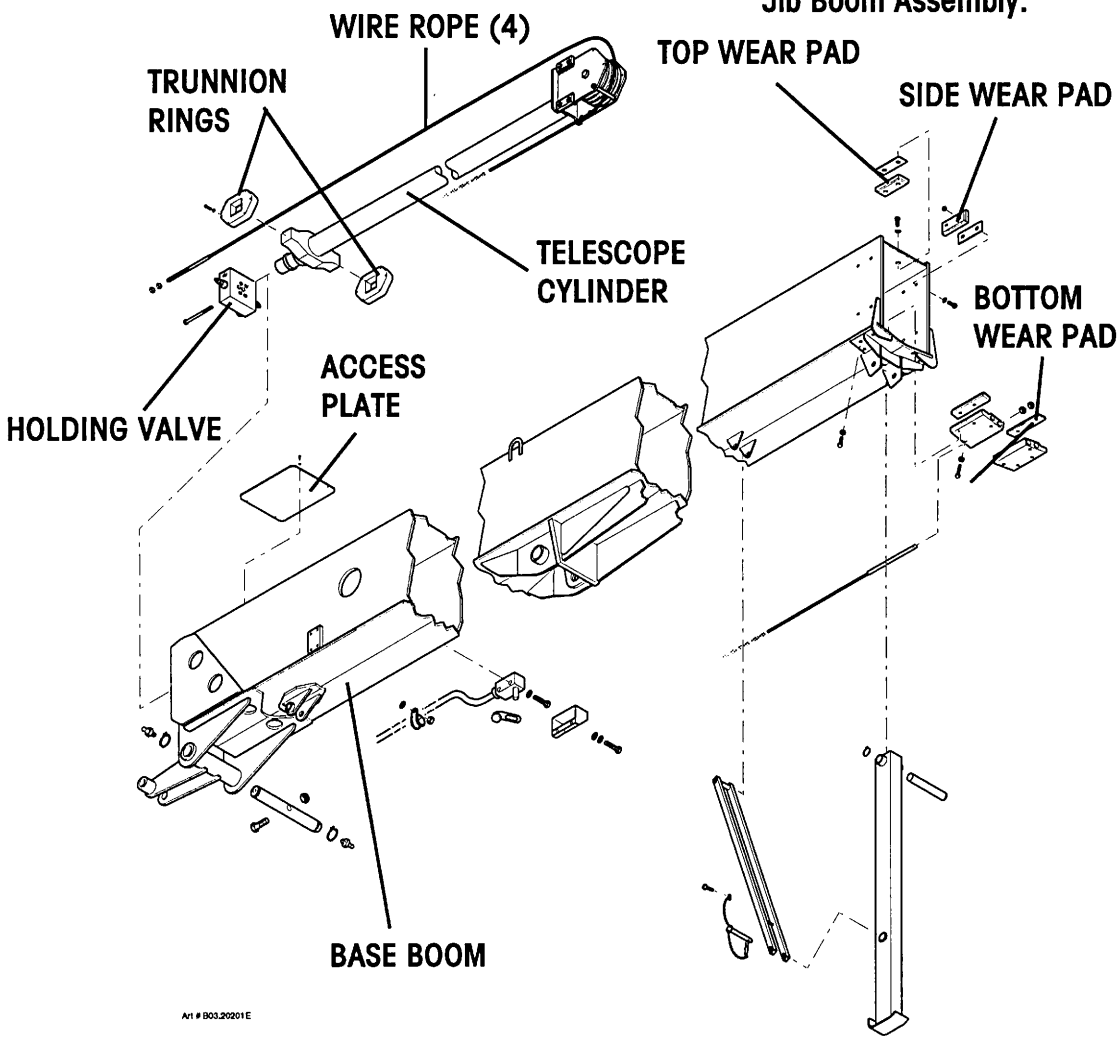
25. Recalibrate the envelope control system. Refer to Appendix in this manual.



Jib Boom Assembly.

BOOM TELESCOPE (EXTEND) CYLINDER

The boom telescope (extend) cylinder is a double acting cylinder. It must be removed from the machine before a thorough inspection can be carried out.



Base Boom (First Stage) and Telescope Cylinder.

TELESCOPE (EXTEND) BOOM CYLINDER PIN REPLACEMENT

Remove the retaining ring, SUPPORT THE CYLINDER and remove the base end pin.

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

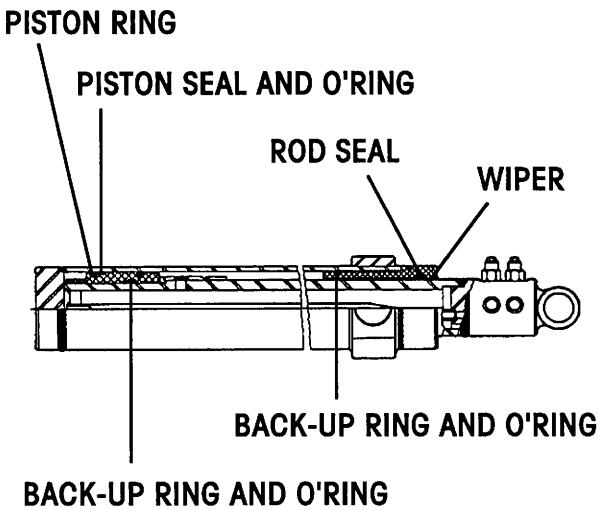
TELESCOPE CYLINDER REMOVAL

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.



Telescope Cylinder Seals and Rings.

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 cables for wear. Replace as necessary.

Refer to Boom Assembly for telescope cylinder installation.

CHECKING HOLDING 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.

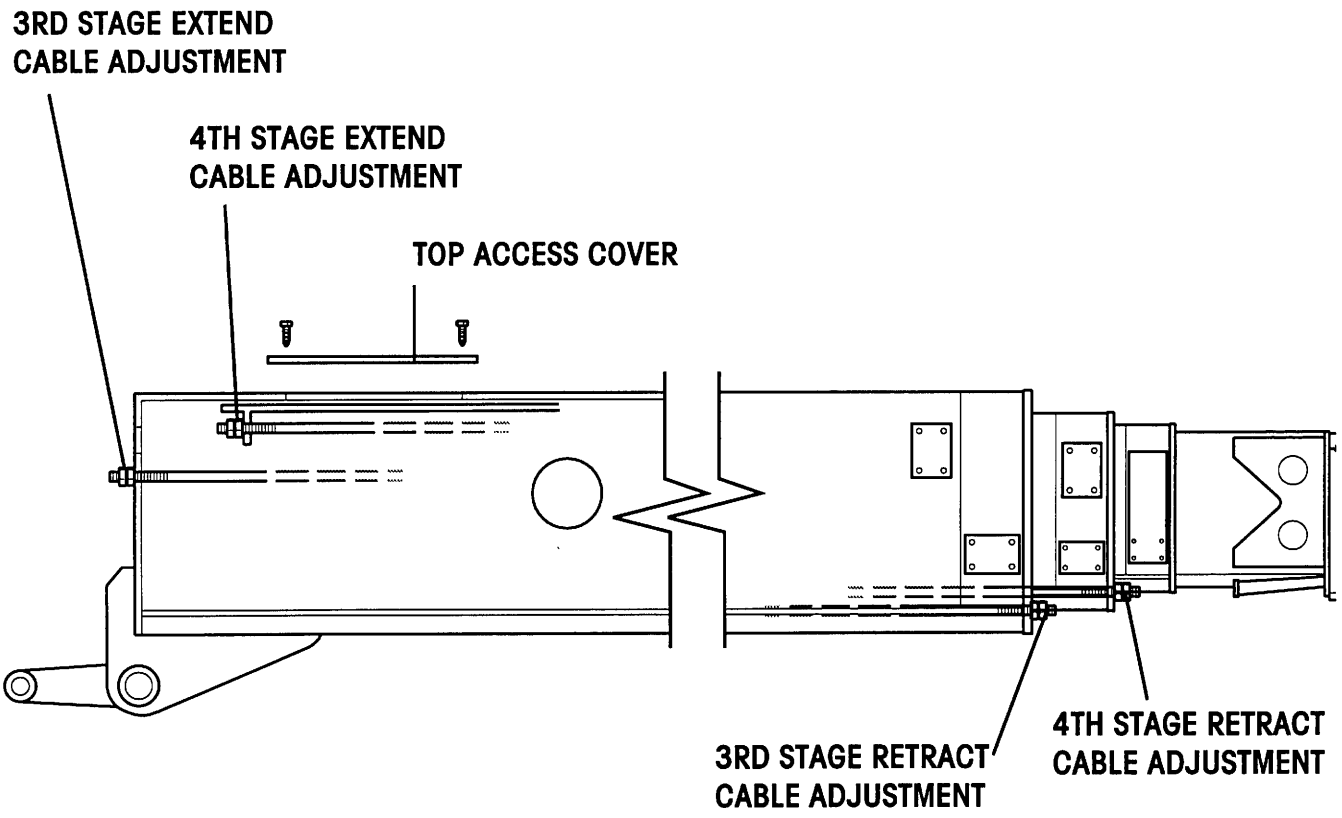
NOTE: The holding valve is pre-set at the factory and is not adjustable.

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 2nd stage and the 1st stage is fixed, due to the stopping of the extend cylinder. The relationship between the 3rd stage and the 2nd stage, is relative due to the tension of the 3rd stage extend and retract cables. Also, the relationship between the 4th stage and the 3rd stage, is relative due to the tension of the 4th stage extend and retract cables.



Boom Cable Adjustments.

1. Fully retract the boom and put a match mark "A" on the side of the 2nd stage boom, flush with the end of the base boom section. Put a match mark 'B' on the side of the 3rd stage boom flush with the end of the 2nd stage boom. Put a match mark 'C' on the side of the 4th stage boom flush with the end of the 3rd 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 3rd stage extend cables by hand. Tighten the adjusting nut on the loosest cables until all four cables are tensioned equally.

3. Torque the adjusting nut on the 3rd stage retract cables to 30 ft/lbs (40.68 Nm) - all four cables.

4. Fully retract the boom while watching the 2nd and 3rd stages. Note whether match mark 'A' aligns with base boom, or match mark 'B' aligns with 2nd 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 3rd stage aligned first, measure the remaining stroke between match mark 'A' on the 2nd stage boom section and the base boom.

   B. If the 2nd stage aligned first, measure the remaining stroke between match mark 'B' on the 3rd stage and the end of the 2nd 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 3rd stage aligned first:

      1. Loosen the adjusting nut on each 3rd stage retract cable 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

      2. Tighten the adjusting nut on each 3rd stage extend cable 2 turns for each 1/8' (3.2 mm) of remaining stroke.

   C. If the 2nd stage stopped first:

      1. Loosen the adjusting nut on each 3rd stage extend cable 2 turns for each 1/8' (3.2 mm) of remaining stroke.

      2. Tighten the adjusting nut on each 3rd stage retract cable 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 3rd stage retract cables and assure that the torque setting is at 30 ft/lbs (40.68 Nm).

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

    NOTE: The 3rd stage is now synchronized to the 2nd stage.

11. Extend the boom approximately 7' (2 M) and remove power. Working through the top access hole in the base section, check the tension of the 4th stage extend cables by hand. Tighten the adjusting nut on the loosest cable until the two cables are equally tensioned.

12. Torque the adjusting nuts on the 4th stage retract cables to 30 ft/lbs (40.68 Nm)

13. Extend the boom until it stops, and check tension of 4th stage extend cables. Tighten the adjusting nut on the loosest cable until the cables are equally tensioned.

14. Fully retract the boom while watching the 4th and 3rd stages. Note whether match mark 'C' aligns with the end of the 3rd stabe before the match mark 'B' aligns itself with the end of the 2nd stage boom.

15. 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.

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

    A. If the 3rd stage aligned first, measure the remaining stroke between match mark 'C' on the 4th stage boom section and the 3rd stage boom.

    B. If the 4th stage aligned first, measure the remaining stroke between match mark 'B' on the 3rd stage and the end of the 2nd stage.

17. 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 3rd stage aligned first:

       1. Loosen the adjusting nut on each 4th stage extend cable 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

2. Tighten the adjusting nut on each 4th stage extend cable 2 turns for each 1/8' (3.2 mm) of remaining stroke.

C. If the 4th stage stopped first:

1. Loosen the adjusting nut on each 4th stage retract cable 2 turns for each 1/8' (3.2 mm) of remaining stroke.

2. Tighten the adjusting nut on each 4th stage extend cable 1-1/2 turns for each 1/8' (3.2 mm) of remaining stroke.

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

19. Recheck the torque of the adjusting nut on the 4th stage retract cables and assure that the torque setting is at 30 ft/lbs (40.68 Nm).

20. Tighten the locking nuts on the extend cables and lock down against the adjusting nuts.

NOTE: The 4th stage is now synchronized to the 3rd stage.

21. Recheck the torque on all the extend and retract cables and ensure that all lock nuts are installed and jammed.

22. 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 extend 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 Dissassembly, and Boom Assembly in this section.

WEAR PADS

Boom sections are protected from wear caused by in and out movement by nylon wear pads mounted at several places along their length. The nylon wear pads should be checked for wear approximately every six months. Fully retract the boom, and check the gap between each wear pad and the boom section. Replace all wear pads after every five thousand (5000) hours of operation.

If any of the preceeding 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.

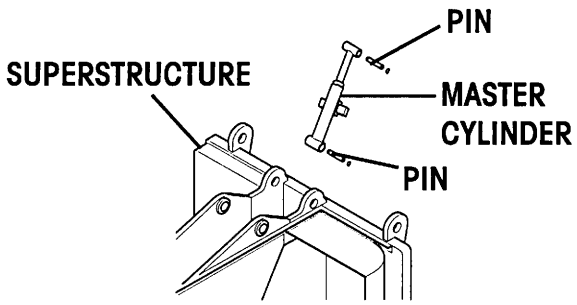
⚠ CAUTION

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 LEVEL CYLINDERS

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

The platform level cylinders (master and slave) are of the double acting type. The pivot pins should be checked for wear. Check the pivot pin locking bolts for tightness. The cylinders should be inspected for



Master Cylinder Pin Replacement.

fluid leakage, damage and security. The seals should be replaced whenever the cylinder is serviced.

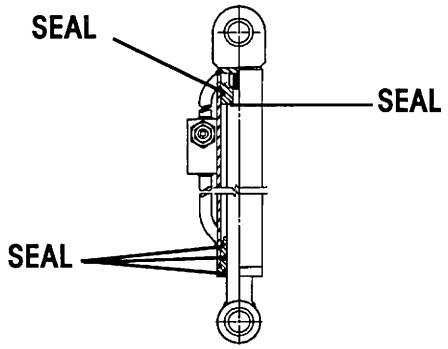
PLATFORM LEVEL CYLINDER PIN REPLACEMENT

SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders. Remove the retaining ring, the pin locking bolts and nuts, and remove the pin.

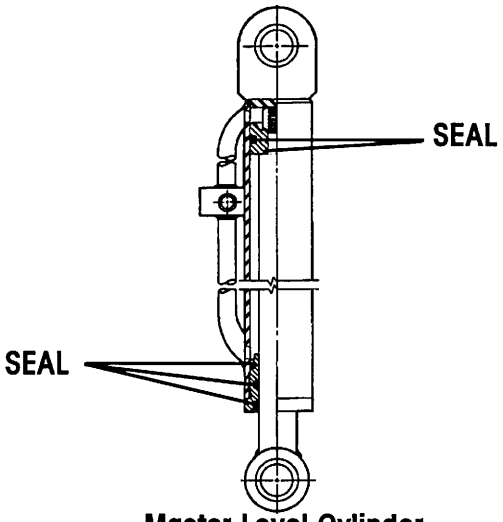
Install new pin, locking bolts and nuts (lubricate bolts before installation) and retaining ring. Apply grease to pin.

LEVEL CYLINDER SEAL REPLACEMENT

Lower the main boom. SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders. Remove the lock collar and pin. Slave



Slave Level Cylinder.



Master Level Cylinder.

cylinder seals can be replaced on the machine. Master cylinder must be removed for seal replacement.

Clean the end of the cylinder. 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. Remove the split pin and nut from the end of the rod. Slip off the collar. Examine the rod and seals for signs of damage or wear.

Remove the old seals and install a new seal kit.

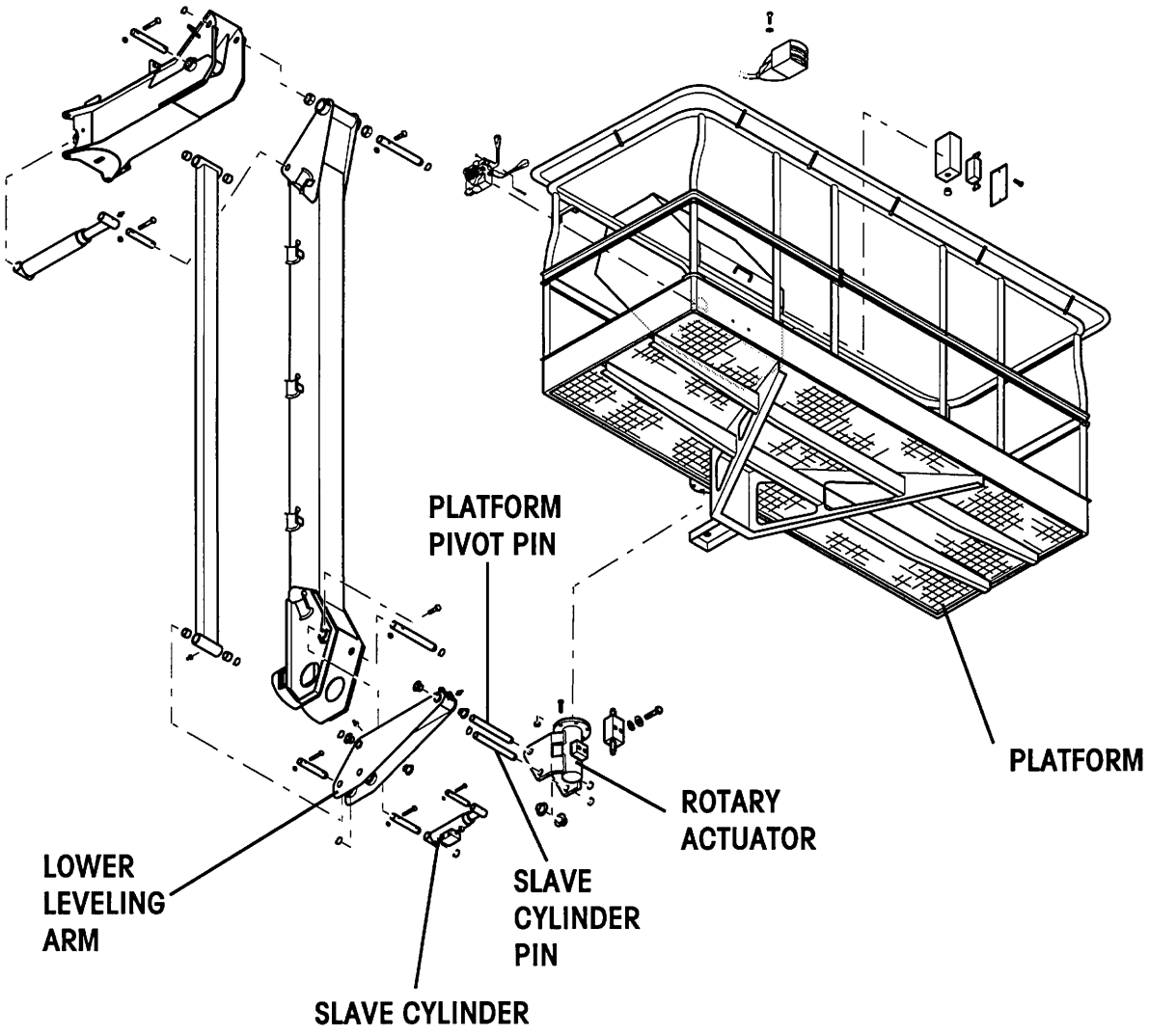
PLATFORM LEVELING PROCEDURE

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

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

⚠ CAUTION

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



Platform Removal.

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

AXLE EXTEND ASSEMBLY

AXLE EXTEND CYLINDER

The cylinders are double acting and are directly connected to telescoping axles. These cylinders power all axle extend/ retract movement. Check axle pin for wear. Check for lost retaining ring.

Axle Extend Cylinder Replacement

To replace the axle extend cylinder, the cylinder must be in the retract position.

To remove axle extend cylinder:

1. Remove the tire and wheel assembly.

⚠WARNING

SOLID RUBBER TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

   a. Block the wheels and raise the machine.

   b. Loosen and remove the lug nuts.

   c. Pull off the tire and wheel assembly.

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 axle 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.

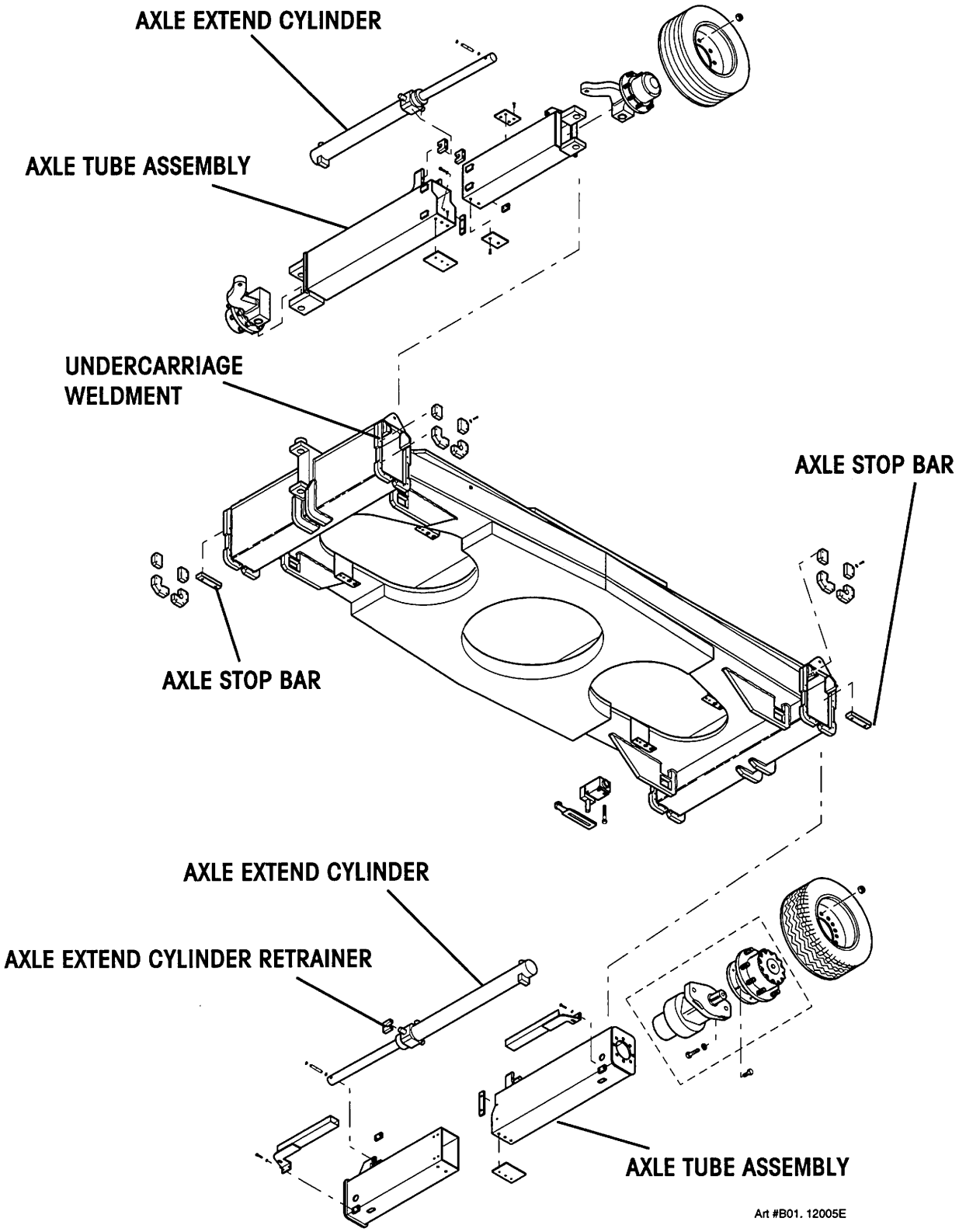
6. Remove retaining ring and axle cylinder pin at the rod end of the axle cylinder.

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 cylinder.



Axle Extend Cylinders Removal.

3. Connect the hydraulic hoses to the cylinder.

4. Install axle stop bar:

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

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

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

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.

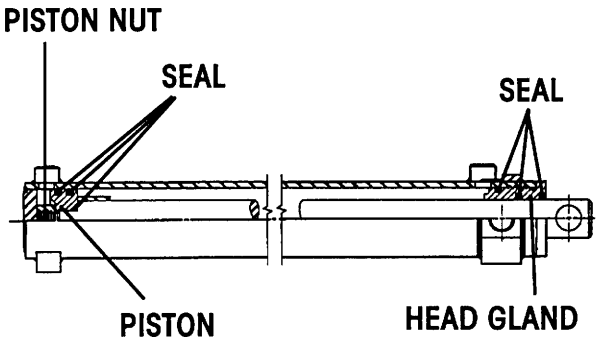
   b. Install four cap screws to hold cylinder.

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

Axle Extend Cylinder Seal Repacement

Clean the end of the cylinder. 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. Examine the rod and seals for signs of damage or wear.

Replace the seals and reassemble the cylinder. AVOID DIRT AND ROD DAMAGE. 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 drive axle tube assembly:

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

   ⚠WARNING

   SOLID RUBBER 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 and toque 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.

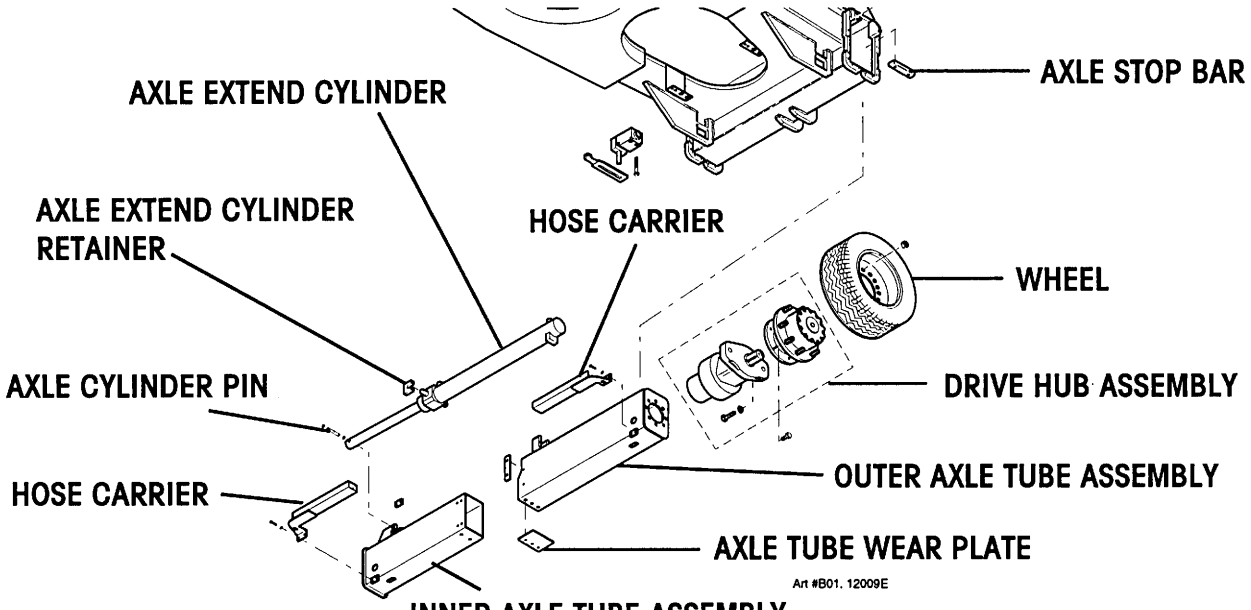
2. Remove axle stop bar.

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.



Drive Axle Tube Assembly Removal.

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.

To install 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.

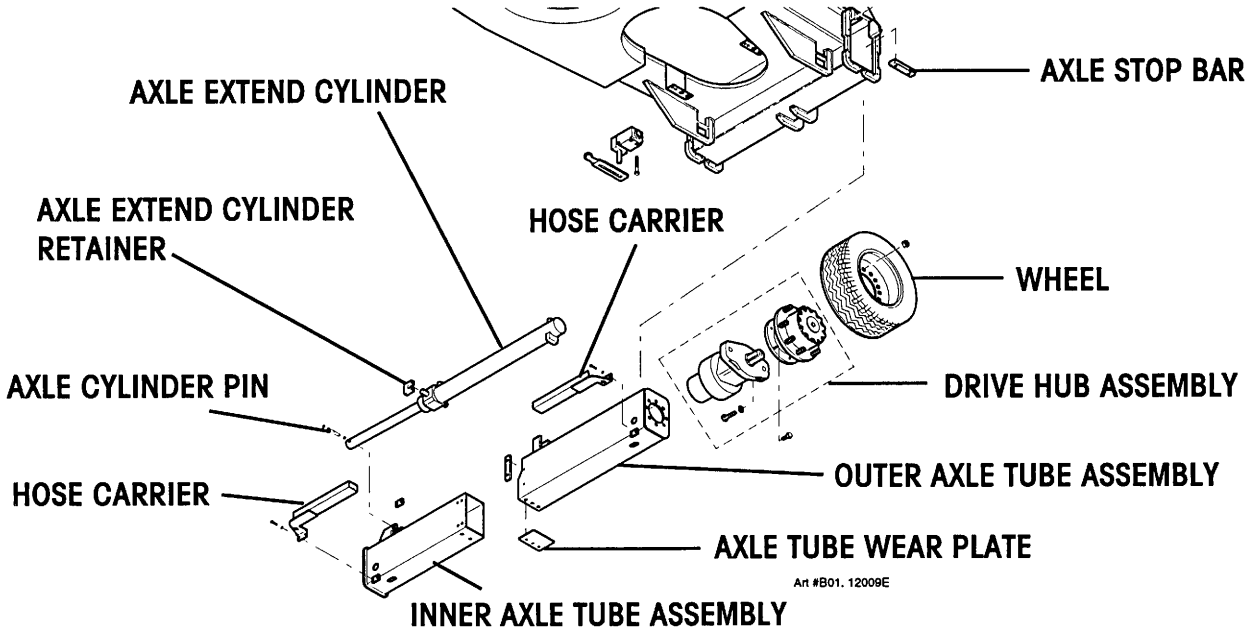
b. Install cylinder pin and retaining ring at the rod end of the axle cylinder.

c. Connect the hydraulic hoses to the cylinder.

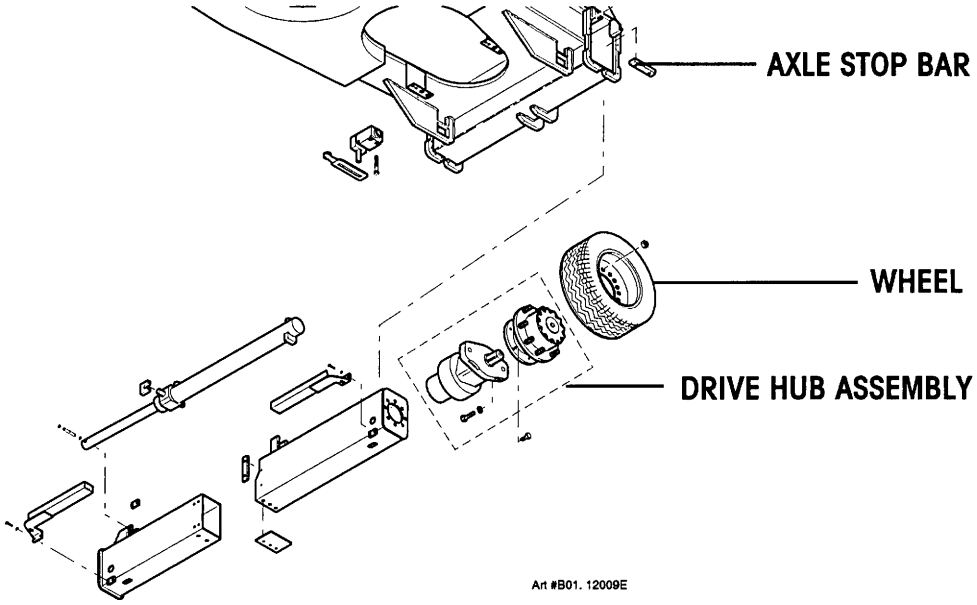
d. Install axle stop bar:

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.



Drive Axle Tube Assembly Installation.



Axle Stop Bar Installation.

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

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 and torque hub) with the axle tube assembly.

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

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

⚠WARNING

SOLID RUBBER 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 blocks.

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

To remove steer axle tube assembly:

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

⚠WARNING

SOLID RUBBER 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.

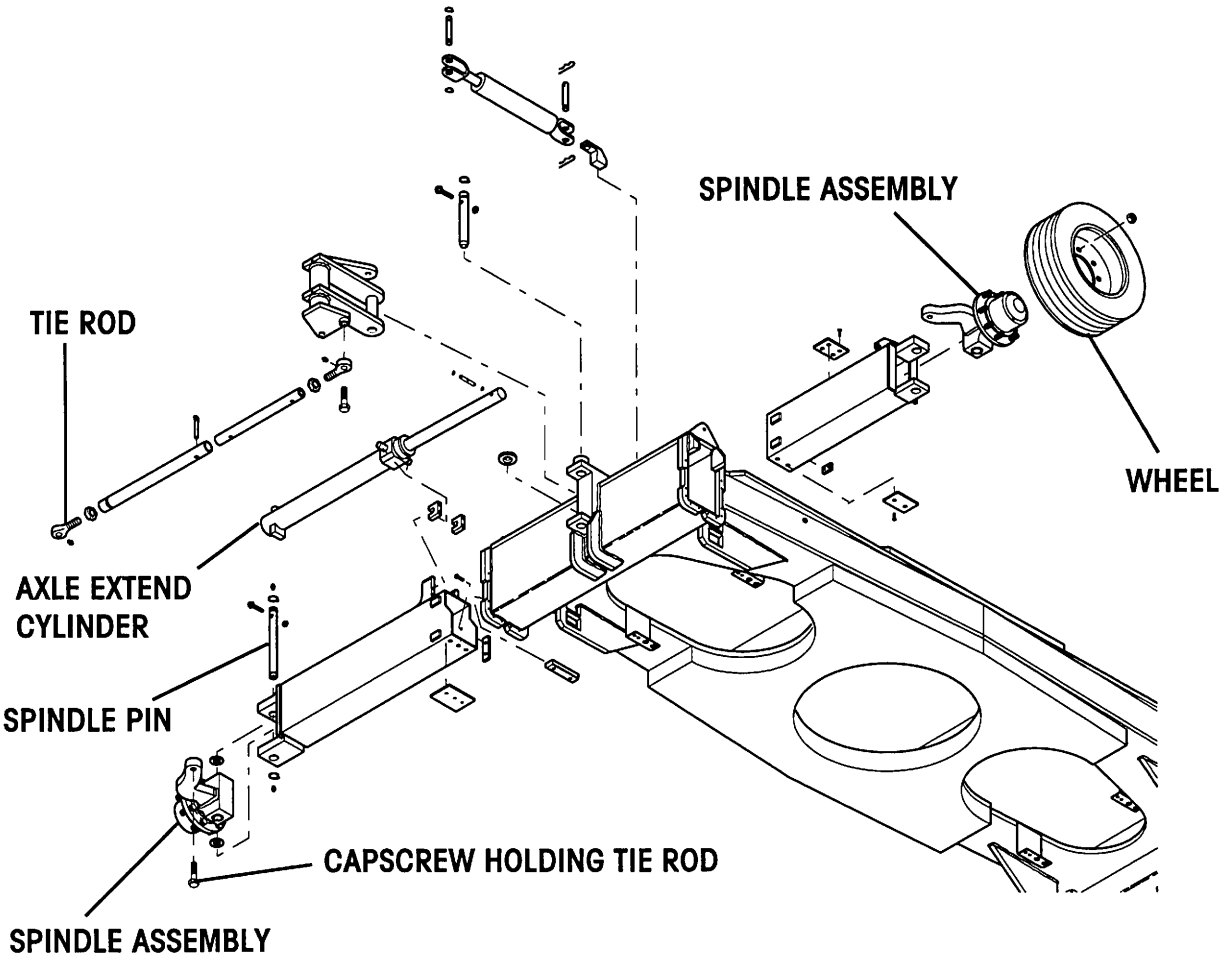
   - Remove capscrew and locknut holding tie rod to the spindle.

4. Remove spindle assembly:

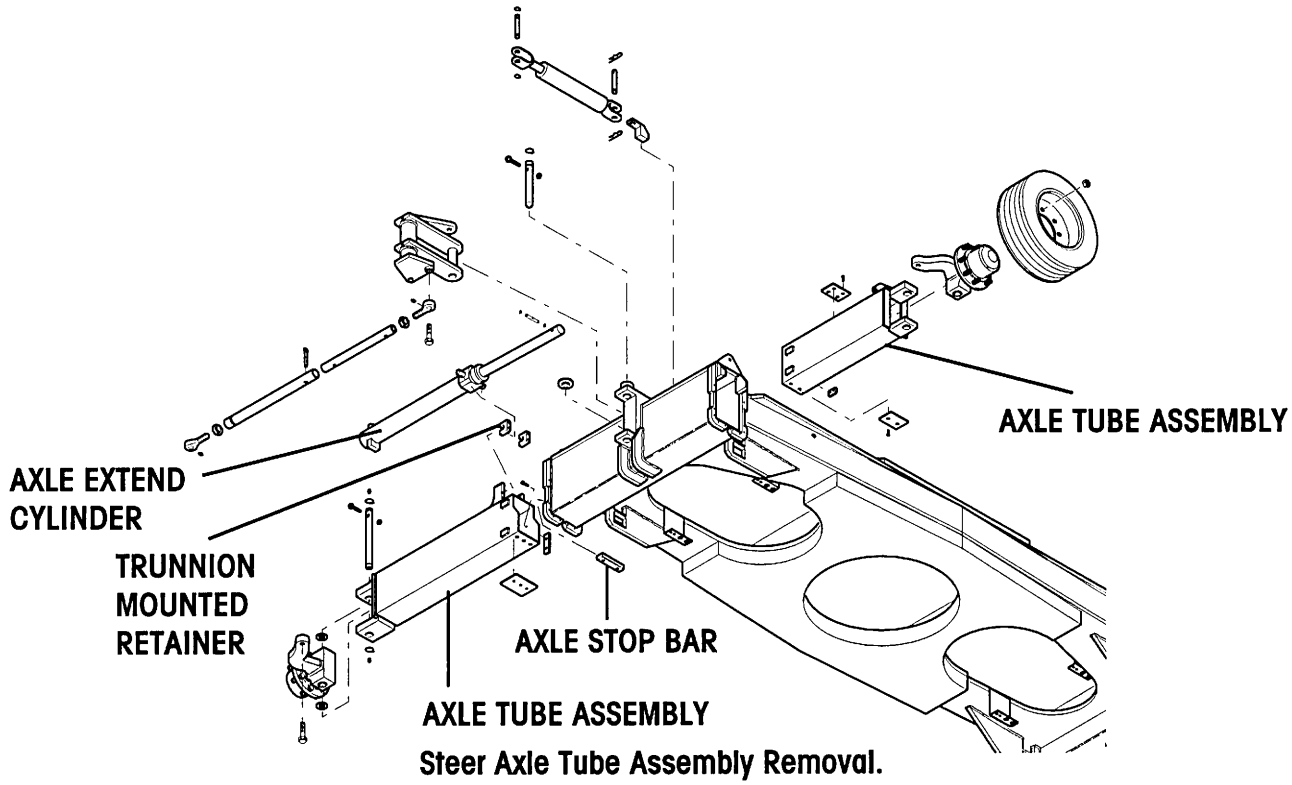
   a. Remove retaining ring.

   b. Remove capscrew, thrust washer and locknut.

   c. Remove spindle pin holding the spindle assembly.



Steer Axle Tube Assembly Removal.



Steer Axle Tube Assembly Removal.

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).

⚠ CAUTION

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

   d. Disconnect hoses to the axle extend cylinder.

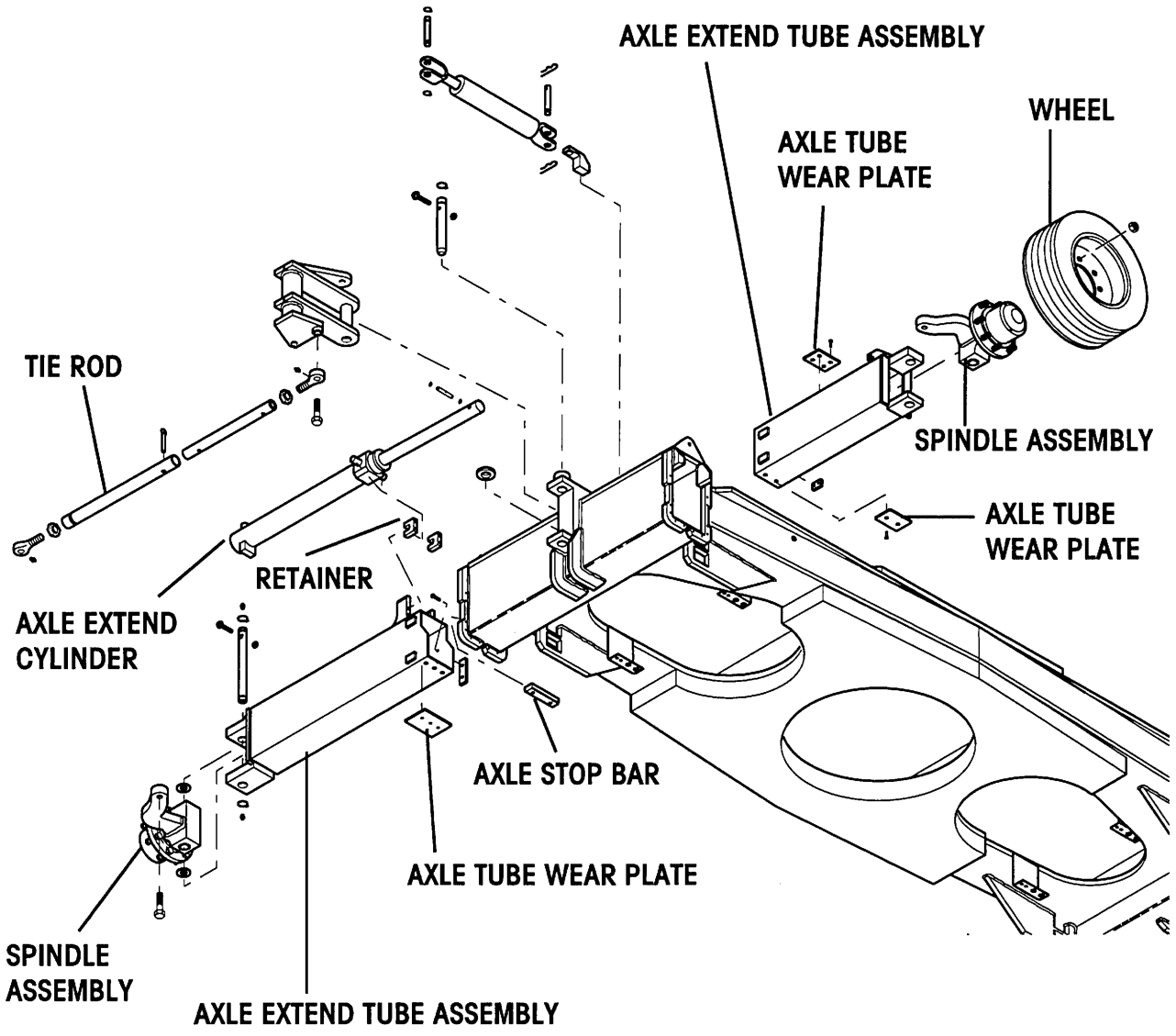
   e. Remove retaining ring and axle cylinder pin at the rod end of the axle cylinder.

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

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.



Axle Extend Tubes Assembly Installation.

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.
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.
   d. Install axle stop bar:

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

      1. Position axle stap bar to line up with the holes on the undercarriage weldment.
      2. Install and torque two capscrews and lockwashers (standard torque for size and grade).

   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:

SECTION 6:
MAINTENANCE SCHEDULE

Table of Contents, Section 6

Maintenance Schedule 6-3
General Maintenance Tips 6-3
Routine Servicing 6-3
Shift Service 6-3
Monthly Service 6-4
Semi-Annual 6-4
Annual Service 6-5
Four Year Interval Service 6-5
Shift Operational Checklist 6-6
Weekly Operational Checklist 6-9
Monthly Operational Checklist 6-11
Semi-Annual Operational Checklist 6-13

MAINTENANCE SCHEDULE

The Simon RP 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.

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

> **NOTE:** 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.

GENERAL MAINTENANCE TIPS

Never leave components or hoses open. They must be protected from contamination (including rain) at all times.

Never open a hydraulic system when there are contaminants in the air.

Use only recommended lubricants. Improper lubricants or incompatible lubricants may be as harmful as no lubrication.

ALWAYS clean the surrounding area before attempting to open hydraulic components.

Watch for makeshift "fixes", which can jeapordize safety as well as lead to more costly repairs.

Any work platform found not to be in safe operating condition should be removed from service until repaired. All repairs should be made by authorized personnel in conformance with the manufacturer's operating, maintenance, and repair manuals.

ROUTINE SERVICING

> **NOTE:** The following recommendations are based on advice of suppliers, and the requirements of various safety regulations. They should be followed with discretion based on factors such as amount and type of machine usage, environmental conditions, and local safety regulations.
>
> **IMPORTANT:** Make certain that the unit is inspected per the operational checklists at the end of this section.

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 in good condition.

PLATFORM RAILS AND SAFETY GATE

Check security of platform top rail safety gate.

MONTHLY SERVICE

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.

HYDRAULIC SYSTEM

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

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

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

CHASSIS BOLTS

Check all bolts for signs of looseness. Refer to numbers 7, 8, and 13 in monthly checklist.

PIVOT PINS AND GREASE FITTINGS

Lubricate all pivot pins and grease fittings.

SEMI-ANNUAL

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.

TEST ALL MACHINE SYSTEMS

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

Test the operation of all machine boom functions.

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.

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

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

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

STRUCTURAL EXAMINATION

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

PLATFORM MOUNTING

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

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 unit.

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

DATE: _____ **INSPECTED BY:** _____

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

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your Simon RP 120 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. Check unit for any prior-shift or transportation damage, i.e. missing parts, torn or loose hoses, hydraulic fluid leaks, torn or disconnected wires, flat or damaged tires etc. The compartment doors on both sides can be opened to inspect components inside.
_____	2. Check for unit damage, broken welds, improper or makeshift repairs.
_____	3. Check hydraulic system for leaks, examine hoses for signs of excessive wear, chafing or twisting. Adjust the hoses and/ or replace them if necessary (refer to RP 120 Service Manual).
_____	4. Check engine oil and fuel levels.
_____	5. Check engine coolant level (liquid cooled engine only).

Continued on following page . . .

CHECKLIST

SHIFT OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	6. Check battery electrolyte level. Check battery terminals for tight connections and cleanliness.
_____	7. Check hydraulic fluid level. The level should be at the line marked on the sight gauge with the unit in stowed position. Inspect condition of hydraulic fluid in the reservoir. Fluid should be a clear amber color.
_____	8. Check that all shutoff valves on hydraulic tank are open (parallel to flow).
_____	9. Check tires for cracks or other damage, and proper inflation pressure (see specifications).
_____	10. Check if wheel lug nuts are tight.
_____	11. Ensure that axle extend interlocks at all four axles are functioning properly.
_____	12. Check hose carrier to verify that it is not bent or sagging.
_____	13. Inspect safety belt connections, and check for worn areas on the belts.
_____	14. Inspect the work platform and boom structure for signs of damage and broken welds. Check platform gate latch for damage.
_____	15. Check pivot pins and STOW-*N*-GO™ hinge and lock pins for security.
_____	16. Check that no attempt had been made to override the drive interlock system by a previous operator.
_____	17. Check that all warning and instructional labels are legible and secure.
_____	18. Start engine. Check that hydraulic pressure is as stated in the machine specifications.
_____	19. Check that the tilt alarm is working properly.
_____	20. When all pre-inspection checks have been completed, test the ground controls for proper operation.

Continued on following page . . .

SHIFT OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	21. Check emergency pumps for operation and that pressure is as stated in the specifications.
_____	22. Check platform controls and graphic display for proper operation.
_____	23. With the platform raised, check for the smooth operation of creep speed drive.
_____	24. Follow engine daily service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.
_____	25. If the black line on the side of the tip boom is out from the outer mid boom more than 6 inches, the system needs calibration.

NOTE: To perform this check, the axles must be extended, the jib boom must be fully lowered (90° below main boom), the main boom must be horizontal and the platform must be extended out until it stops.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR HARSH ENVIRONMENTS

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

INITIAL	DESCRIPTION
_____	• Inspect cylinder boots, valve spool boots, etc., for cuts or other damage after every eight (8) hours of service. Repair or replace if necessary.
_____	• Check hydraulic system for leakage after every eight (8) hours of operation.
_____	• Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

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 RP 120 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.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Shift Operational Checklist.
_____	2. Check wheel lug nut torque (see specifications).
_____	3. Check electrical connections at the hinge boom for tightness and corrosion. Check hydraulic connections for leaks, corrosion and wear.
_____	4. Lubricate swing bearing and drive pinion gear.
_____	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. Lubricate the hinge boom hinge and lock pins.

Continued on following page . . .

WEEKLY OPERATIONAL CHECKLIST (CONTINUED)

ADDITIONAL MAINTENANCE REQUIREMENTS FOR HARSH ENVIRONMENTS

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

INITIAL	DESCRIPTION
_____	• Lubricate all grease fittings (see Lubrication Chart).
_____	• Check oil level in swing drive (see Lubrication Chart).
_____	• Check oil level in power hubs (see Lubrication Chart).
_____	• Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

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 RP 120 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 and Weekly Operational Checklists.
_____	2. Lubricate all grease fittings (see Lubrication Chart).
_____	3. Lubricate all hydraulic valve spool linkages.
_____	4. Check hose and electrical wire condition at the hinge boom to jib boom joint area, the jib boom to lower leveling arm joint area, and the lower leveling arm to platform joint area.
_____	5. Check protective rubber cover around hoses at moving anchor, tip boom, boom hose passages, and at swing bearing.
_____	6. Check boom hose carriers for sag and other damage. If damaged, repair the cause of damage, i.e. hoses too tight, breaking cross braces and worn, cracked or abraded hoses.
_____	7. Check torque of swing bearing bolts (see "Machine Specifications").

Continued on following page . . .

MONTHLY OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	8. Check adjustment and security of swing drive. There should be a slight amount of backlash between the turntable and undercarriage when properly adjusted. Check torque of mounting bolts (see "Machine Specifications").
_____	9. Check oil level in swing drive gear box (see Lubrication Chart).
_____	10. Check oil level in power hubs (see Lubrication Chart).
_____	11. Check that tires are not leaning in or out.
_____	12. Check that wheel spindles turn freely, with no end play.
_____	13. Check drive wheel power hub mounting bolt torque (see "Machine Specifications").
_____	15. Check that neither the main boom nor jib boom drift with a full load, no hydraulic pressure (engine off) and the controls in the "BOOM DOWN" position.
_____	16. Inspect boom cables.
_____	17. Check to make sure boom sections are not dented or bent.
_____	18. Check that all adjustable flow valves are locked. Check settings if any are not locked.
_____	19. Check fuel shutoff rack for proper operation. Loosen lever arm and lubricate with WD-40 or equivalent.
_____	20. Follow engine monthly service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR HARSH ENVIRONMENTS

EVERY 90 DAYS

INITIAL	DESCRIPTION
_____	• Replace high pressure filter element.
_____	• Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

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 RP 120 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 Shift, Weekly 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. Inspect the entire machine for signs of structural damage and broken welds, and worn or damaged components. Replace as necessary.
_____	4. Clean and lubricate all electrical switches with an electrical contact cleaner and ensure that the switches operate freely in all positions.
_____	5. Check the electrical mounting and hardware connections for security.

Continued on following page . . .

SEMI-ANNUAL OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	6. Replace high pressure filter elements.
_____	7. Clean and lubricate the standard open swing bearing gear teeth with dry moly lube spray (not required for oil bath swing bearing).
_____	8. Repack front wheel bearings.
_____	9. Check that engine RPM is as stated in the specifications.
_____	10. Follow engine semi-annual service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

EVERY YEAR

_____	11. Drain and replace fluid from hydraulic reservoir. Drain and replace fluid from drive wheel power hubs. If badly contaminated, it may be necessary to disassemble and inspect components.

EVERY TWO YEARS

_____	12. Drain and replace fluid from swing drive. If badly contaminated, it may be necessary to disassemble and inspect components.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR HARSH ENVIRONMENTS

EVERY SIX MONTHS

_____	• Drain and replace fluid from swing drive and drive wheel power hubs.
_____	• Follow engine severe duty service requirements. Refer to the Engine Maintenance Manual supplied with your RP 120.

SECTION 7:
TROUBLESHOOTING

Table of Contents, Section 7

General Troubleshooting Tips 7-3
Troubleshooting Chart 7-4

GENERAL TROUBLESHOOTING TIPS

Before investigating a malfunction, check the following items:

- The Main Power Key Switch should be in the correct position.
- The Foot Pedal Switch is pressed and held for platform console operation.
- Pump toggle switch is pressed and held for ground control operation.
- Check that battery connections are secure and battery is fully charged.
- Check that the Emergency Stop Buttons at ground and platform control panels are released.
- 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 in cold climates, viscosity too low for warm climates.

  NOTE: Mobil DTE-13M is a multiple viscosity oil that is light enough for cold climates and resists thinning in warm climates.

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

TROUBLESHOOTING CHART

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

TROUBLESHOOTING CHART (CONTINUED)

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

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Boom track sagging.	• Track pin holes stretched usually caused by a damaged "I" beam support.	• Check "I" beam support and replace if necessary.
	• Overhead guard is damaged. If the guard is damaged, the track could get caught and could also tear off the moving anchor.	• Replace overhead guard and any other items damaged due to a damaged guard.
	• Improper lubrication and cleaning.	• Follow proper lubrication and cleaning procedures.
• Engine won't crank	• Starter motor relay (SR1), starter motor interlock relay (CR1), low oil pressure/ high water temperature/ time delay relay (CR10), Power relay (CR3), ground/ platform switch (TGS2), oil pressure relay (CR0), ground toggle, platform ignition and start (TGS4) 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 (SR1). Replace the component(s) that are bad.
• Throttle actuator doesn't work.	• Throttle high speed relay (CRHS), throttle low speed relay (CRLS), circuit breaker 4 (CB4), or circuit breaker 2 (CB2) is bad or a motor failure.	• A breakdown in any one of these components will cause the actuator not to function. Trace the available voltage to the throttle motor. Replace the component(s) that are bad.
• Movement alarm will not sound.	• Movement alarm relay (CRM), power relay (CR3), horn or switch card on drive handle is bad.	• A breakdown in any one of these components will cause the alarm not to function. Trace the available voltage to the horn. Replace the com-ponent(s) that are bad.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Undercarriage drifts down when trying to extend axles.	• Pilot operated check valve.	• Remove, clean, repair or replace the pilot operated check valve.
• Lift (hoist) cylinder drifts down.	1. Holding valve cartridge dirty or faulty. 2. Cylinder packing is damaged.	1. Clean, repair or replace the holding valve. 2. Replace cylinder packing.
• Telescope, swing, hoist functions don't operate.	1. Pendant toggle switces have no voltage. 2. Valve driver in HED control envelope out of adjustment or failed. 3. Valve is stuck.	1. Check voltage available to the toggle switches. 2. Refer to Valve Driver Adjustment Procedure in HED Appendix. 3. Manually engage valve spool.
• Drive function does not operate.	1. Toggle switch has no voltage. 2. Drive card at base of control handle out of adjustment or failed. 3. Ground drive speed control relay is bad.	1. Check voltage available to the toggle switches. 2. Adjust or replace appropriate potentiometer. 3. Ensure proper operation of ground drive speed control relay or replace.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No steer function.	1. Steer toggle switch is bad.	1. Check voltage available to the toggle switch.
	2. Steer/ axle valve.	2. Steer/ axle valve is not fully engaged.
	3. Pilot operated check valve.	3. Pilot operated check valve is dirty. Remove, clean and/ or replace.
	4. Faulty steer cylinder.	4. Possibly plugged steer ports or damaged cylinder packing. Inspect, repair or replace steer cylinder.
• No axle extend/ retract function.	1. Steer toggle switch is bad.	1. Check voltage available to the toggle switch.
	2. Steer/ axle valve.	2. Steer/ axle valve is not fully engaged.
	3. Pilot operated check valve.	3. Pilot operated check valve is dirty. Remove, clean and/ or replace.
	4. Faulty cylinders.	4. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder.
Platform Control		
• No drive function.	1. Platform drive speed control relay (CRC), drive potentiometer is bad.	1. Ensure platform drive speed control relay (CRC) is working properly. If boom is extended, confirm potentiometer is functioning. Repair or replace both components.

TROUBLESHOOTING CHART (CONTINUED)

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

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No lift (hoist) function (continued).	4. Outside the range of computer controlled operation.	4. Retract boom to position the platform within operating zone.
	5. Lift (hoist) spool valve stack.	5. Manually engage lift (hoist) spool and check for operation.
	6. Holding valves not operating properly.	6. Remove, clean, inspect, replace and test unit operation.
	7. Faulty cylinder.	7. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder.
• No extend or retract function/ boom only extends approximately 10' (3 M).	1. Loose wires on control card.	1. Tighten wires and ensure proper location.
	2. Driver board out of adjustment or a faulty card.	2. Adjust or replace cards.
	3. Faulty micro switch in control handle.	3. Test and replace if faulty.
	4. Axle switches not fully engaged.	4. Identify which one or more of the switches is not engaged. Repair or replace switch.
	5. Spool valve stuck.	5. Manually engage spool and check for proper operation. Replace if faulty.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No extend or retract function/ boom only extends 3 meters (continued).	6. Pressure reducing valve.	6. Possibly leaking to tank. Inspect, clean and retest. Replace if faulty.
• No swing function.	1. Loose wires on control card.	1. Tighten wires and ensure proper location.
	2. Platform boom and swing speed control relay (CRS) and swing potentiometer not functioning properly.	2. Ensure proper operation of platform boom and swing speed control relay (CRS) and adjust swing potentiometer or replace it.
	3. X-axis driver board out of adjustment or faulty.	3. Adjust or replace X-axis driver board.
	4. Spool valve stuck.	4. Manually engage swing spool and check for proper operation. Replace if faulty.
	5. Brake on swing box not releasing.	5. Check for proper pressure to release brake. Adjust pressure.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
Platform Control (Cont.)		
• No jib function.	1. Loose wires on Y-axis driver board.	1. Tighten Y-axis wires on driver board.
	2. Driver board out of adjustment or faulty board.	2. Adjust driver board to specifications or replace faulty board.
	3. Axle limit switches are not fully engaged.	3. Identify which one or more of the switches is not engaged. Repair or replace switch.
	4. Outside the range of computer controlled operation.	4. Retract boom to position the platform within operating zone.
	5. Jib spool valve stack.	5. Manually engage lift (hoist) spool and check for operation.
	6. Holding valves not operating properly.	6. Remove, clean, inspect, replace and test unit operation.
	7. Faulty cylinder.	7. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder.
• Jib cylinder drifts down.	1. Holding valve cartridge dirty or faulty.	1. Clean, repair or replace the holding valve.
	2. Cylinder packing is damaged.	2. Replace cylinder packing.

INDEX

INDEX

Index

A

Additional Maintenance Requirements
For Harsh Environment 6-8, 6-10,
..... 6-12, 6-14
Annual Service 6-4
Auxiliary Pump Button 2-15
Axle Extend Assembly 5-22
  Axle Extend Cylinder 5-22
  Axle Tube Assembly 5-24
  Mechanical Axle Stop 5-24
Axle Extend Cylinder 5-22
  Replacement 5-22
  Seal Replacement 5-24
Axle Extend Cylinder Replacement 5-22
Axle Extend Cylinder Seal Repacement ... 5-24
Axle Extend Cylinders 2-23
Axle Extend Limit Switches 6-7
Axle Extend System 2-22
  Axle Extend Cylinders 2-23
  Check Valve 2-23
  Hydraulic Swivel 2-23
  Selector Valve 2-23
  Selector Valve Assembly 2-23
  Steer Valve Segment 2-23
Axle Tube Assembly
  Replacement 5-24

B

Battery 4-3, 6-4
  Maintenance 4-3
  Preventive Maintenance 4-4
  Replacement 4-4
Battery Maintenance 4-3
Battery Preventive Maintenance 4-4
Battery Replacement 4-4
Boom 5-8
  Adjustment 4-8
  Bushing 5-8
  Lift Cylinder 5-9
  Pivot Pin 5-8
  Telescope Cylinder 5-17
  Wear Pads 5-19
Boom Adjustment 4-8
Boom Assembly 5-14
Boom Bushing Replacement 5-8
Boom Component Locator xiii, xiv, xv, xvi
Boom Cylinders 6-4
Boom Disassembly 5-10
Boom Extend Cylinder 5-17
Boom Extend Valve Segment 2-13
Boom Lift Cylinder 5-9
  Holding Valves 5-9
  Pivot Pin Replacement 5-9
  Seal Replacement 5-9
Boom Lift System 2-12
  Flow Control Valve 2-13
    Adjustment 2-13
  Lift Cylinder 2-13, 2-16
  Valve Segment 2-12, 2-16
Boom Pivot Pin Replacement 5-8
Boom Stowage Lock Pin Pull 2-13
Boom Support Stand 2-13
Boom Telescope (Extend) System 2-13
  Boom Extend Valve Segment 2-13
  Extend Cylinder 2-14
  Pressure Relief Valve 2-14
  Telescope Cylinder 2-14
Boom Telescope Cylinder 5-17
Boom Wire Rope
  Adjustment 5-18
  Replacement 5-19
Boom Wire Rope Adjustment 5-18
Boom Wire Rope Replacement 5-19
Brake 2-11
Brake Metering Valve 3-5
  Adjustment 3-5
Brake Metering Valve Adjustment 3-5

C

Cables 5-8
Caution vii
Changing Tires 5-3
Chassis Bolts 6-4
Check Valve 2-21, 2-23
Checking Holding Valves 5-18
Circuit Breakers 4-5
Component Locator x
Control Handle 3-5
Creep Speed
  Adjustment 4-8
Creep Speed Adjustments 4-8
Cylinder
  Axle Extend 2-11, 5-22
  Boom Lift 5-9
  Boom Telescope 5-17
  Extend 2-14
  Lift 2-13, 2-16
  Master Level 2-19
  Platform Level 5-19
  Slave Level 2-19
  Steer 2-10, 2-11,
  2-21

Index (Continued)

Telescope 2-14
Telescope Installation 5-18
Cylinders
Axle Extend 2-23

D

Danger vii
Double Pilot Operated Check Valve 2-19
Drive
Controller 4-6
Drive Brake 3-3
Drive Circuit 2-11
Drive Controller 4-6
Drive Hub Assembly 5-4
Drive Motor ..... 2-10, 2-11, ... 3-3
Drive Relief Valve 3-5
Drive System 3-3
Brake Metering Valve 3-5
Drive Brake 3-3
Drive Motor 3-3
Drive Relief Valve 3-5
Drive Valve Assembly 3-4
Drive Valve Segment 3-4
Flow Control Valve 3-4
Flow Divider Valve Assembly 3-5
Flow Divider/ Combiner Valve 3-5
Gate Valve 3-5
Joystick 3-5
Motion Control Valve 3-4
Motion Control Valve Assembly 3-4
Pendant Control
Toggle Switch 3-5
Platform
Control Handle 3-5
Selector Valve 3-4
Drive Valve Assembly 3-4
Flow Control Valve 3-4
Flow Divider Valve Assembly 3-5
Flow Divider/ Combiner Valve 3-5
Gate Valve 3-5
Motion Control Valve 3-4
Motion Control Valve Assembly 3-4
Selector Valve 3-4
Drive Valve Segment 3-4
Drive/ Steer Controller 4-6
Drive System
Drive Hub Assembly 5-4

E

Electrical System 4-3
Electro-Proportional Circuit 2-7
Electrocution Hazard!!! 2-20
Emergency Electrical Pump 2-15
Emergency Lowering 2-17
Emergency Pump 2-7, 4-5
Adjustment 2-7
Emergency Pump Button 2-15
Emergency Stop Buttons 4-6
Emergency System and Procedures 2-15

F

Flexible Hoses 6-5
Flow Control Valve 3-4
Flow Divider Valve Assembly 3-5
Flow Divider/ Combiner Valve 3-5
Gate Valve 3-5
Flow Divider/ Combiner Valve 3-5
Four Year Interval Service 6-5

G

Gate Valve 3-5
General Maintenance Tips 6-3
General Troubleshooting Tips 7-3
Globe Valve 3-5
Graphic Display for Proper Operation 6-8
Ground Control Cabinet Switch 4-6
Removal 4-6
Ground Control Cabinet Switch Removal 4-6
Ground Valve Bank 2-8
End Cover 2-8
Inlet Section 2-8
Main Valve Segment 2-8, 2-9
Maintenance 2-9
Operation 2-9

H

High Pressure Filter 2-12, 6-4
Holding Valves 5-9
Hoses 5-8
Hoses and Cables 5-8
Hydraulic Fluid 2-5, 6-5
Analysis 2-5
Fluid Contamination Checks 2-5
Fluid Recommendations 2-5
Handling Precautions 2-5
MOBIL DTE-13M 2-5
System Flushing Procedure 2-6

Index (Continued)

Hydraulic Lines 2-9
Check 2-9
Hydraulic Pump 2-7
Adjustment 2-7
Hydraulic Swivel ..... 2-10, 2-21, ... 2-23
Hydraulic System 6-3, 6-4

I

Integral Brake Assembly 2-15
Introduction vii

J

Joystick ..... 3-5.
See also Control Handle

L

Level Control Valve 2-19
Level Cylinder Seal Replacement 5-20
Lift Cylinder Pivot Pin Replacement 5-9
Lift Cylinder Seal Replacement 5-9
Limit Switches 4-5
Lubrication Chart ..... xviii, xix

M

Machine Specifications ix
Maintenance Schedule 6-3
Master Level Cylinder 2-19
Mechanical Components 5-3
Mechnical Axle Stop 5-24
Miscellaneous Equipment 5-8
Monthly Operational Checklist 6-11
Monthly Service 6-4
Motion Control Valve 3-4
Motion Control Valve Assembly 3-4
Flow Control Valve 3-4
Motion Control Valve 3-4
Movement Alarm 4-4

O

Operator Incapacitated 2-19, 2-20

P

Pendant Control
Toggle Switch 3-5
Pendant Switch
Removal 4-6
Pendant Switch Removal 4-6
Pivot Pins and Bearings 6-5
Pivot Pins and Grease Fittings 6-4
Platform
Control Handle 3-5
Platform Component Locator xvii
Platform Console Switch 4-6
Removal 4-6
Platform Console Switch Removal 4-6
Platform Level Cylinder Pin
Replacement 5-20
Platform Level Cylinders 5-19
Master 5-19
Pin Replacement 5-20
Seal Replacement 5-20
Slave 5-19
Platform Level System 2-18
Double Pilot Operated Check Valve 2-19
Level Control Valve 2-19
Master Level Cylinder 2-19
Relief Valves 2-20
Slave Level Cylinder 2-19
Platform Leveling Procedure 5-20
Platform Mounting 6-5
Platform Rails and Safety Gate 6-3
Platform Rotate System
Double Pilot Operated Check Valve 2-17
Platform Rotator Manifold 2-18
Rotary Actuator 2-17
Maintenance 2-18
Rotate Control Valve 2-17
Platform Rotator Manifold 2-18
Pressure Relief Valve 2-14

R

Receipt Inspection Adjustment Report 2-14
Relays 4-5
Relief Valves 2-20
Report the incident to your supervisor 2-18
Reservoir 2-12
Maintenance 2-12
Rotary Actuator 2-17
Maintenance 2-18
Rotary Actuator Maintenance 2-18
Routine Servicing 6-3

S

Selector Valve ..... 2-20, 2-23, ... 3-4
Selector Valve Assembly 2-20, 2-23
Check Valve 2-21, 2-23
Selector Valve 2-20, 2-23
Semi-Annual Operational Checklist 6-13
Shift Operational Checklist 6-6
Slave Level Cylinder 2-19

Index (Continued)

Steer Cylinder 2-21
Steer Disconnect Knob 2-21
Steer System 2-20
  Check Valve 2-21
  Hydraulic Swivel 2-21
  Maintenance 2-22
  Selector Valve 2-20
  Selector Valve Assembly 2-20
  Steer Cylinder 2-21
  Steer Disconnect Knob 2-21
  Steer Valve Segment 2-21
Steer System Maintenance 2-22
Steer Valve Segment 2-21, 2-23
Steer Wander Control Valve 2-3
Steering 6-4
Structural Examination 6-5
Superstructure 5-7
Superstructure Component Locator xii
Superstructure Swing Adjustment 4-6, 4-8
Swing
  Adjustment 4-6, 4-8
Swing Drive/ Reducer Assembly 2-15
Swing Drive/ Reducer Assembly
  Adjustment 2-15
Swing System 2-14
  Integral Brake Assembly 2-15
  Maintenance 2-16
  Swing Drive/ Reducer Assembly 2-15
  Swing Valve Segment 2-15
Swing System
  Swing Drive/ Reducer Assembly
    Adjustment 2-15
Swing Valve Segment 2-15

T

Telescope
  Holding Valves 5-18
Telescope Boom Cylinder Pin
Replacement 5-18
Telescope Cylinder
  Installation 5-18
  Pin Replacement 5-18
  Removal 5-10, 5-14
  Seal Replacement 5-18
Telescope Cylinder Installation 5-18
Telescope Cylinder Removal 5-10, 5-14
Telescope Cylinder Seal Replacement 5-18
Test All Machine Systems 6-4
Tie Down Locations (Recommended) 2-4, 2-6,
..... 2-7, 2-8,
..... 2-10, 2-14
Tilt Alarm
  Adjustment 4-5
Tilt Alarm Adjustment 4-5
Tilt Alarm 4-4
  Test 4-4
Tilt Alarm Test 4-4
Tire Condition 6-3
Tires 5-3
  Changing 5-3
Toggle Switch 3-5
Towing Procedures 2-3
Transporting the Unit 2-3
Troubleshooting Chart 7-4
Truck or Trailer Transport 2-4, 2-9

U

Undercarriage Component Locator xi
Unloading Procedures 2-11
Unpowered Emergency Movement 2-16

V

Valves 2-10
  Boom Extend Segment 2-13
  Boom Lift Valve Segment 2-12, 2-16
  Brake Metering 3-5
  Check 2-11, 2-21,
  2-23
  Double Pilot Operated Check 2-17, 2-19
  Drive Assembly 3-4
  Drive Relief 2-10, 3-5
  Drive Segment 3-4
  Flow Control 2-11, 2-13,
  3-4
    Adjustment 2-13
  Flow Divider 2-11
  Flow Divider Valve Assembly 3-5
  Flow Divider/ Combiner 2-11
  Flow Divider/ Combiner Valve 3-5
  Gate 2-11, 3-5
  Globe 2-11, 3-5
  Hi/ Low Speed Drive 2-10
  Level Control 2-19
  Motion Control 2-11, 3-4
  Motion Control Assembly 3-4
  Pressure Relief 2-14
  Relief 2-20
  Rotate Control 2-17
  Selector 2-10, 2-11,
  2-20,
  ..... 2-23, 3-4
  Selector Assembly 2-11, 2-20,
  2-23

Index (Continued)

Steer Segment 2-21, 2-23
Swing Segment 2-15

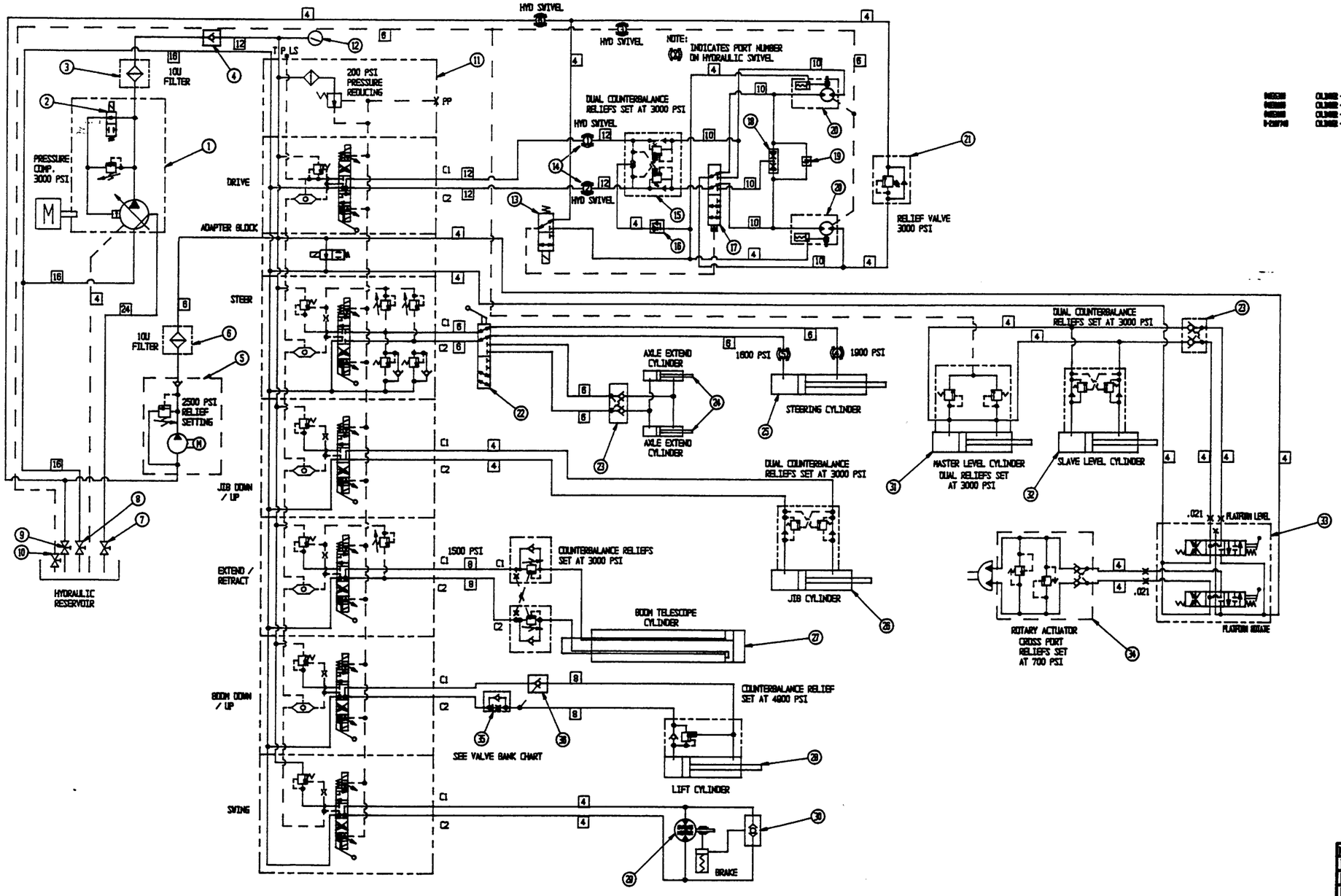
W

Warning vii
Wear Pads 5-19
Weekly Operational Checklist 6-9
Wheels and Lug Nuts 5-3

APPENDIX

Table of Contents, Appendix

Envelope Control System
Hydraulic Schematic E-2327510
Electrical Schematic SES-2327790
Electrical Schematics for Ford F300 B-2368000
Electrical Schematics for Perkins 4.236 B-2370440
Wiring Diagram, Joystick B-2369400
Electrical Schematics D-2319970
Electrical Schematics for Ford 2.3L and Amp Meter SDS-2338060



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: RP-120

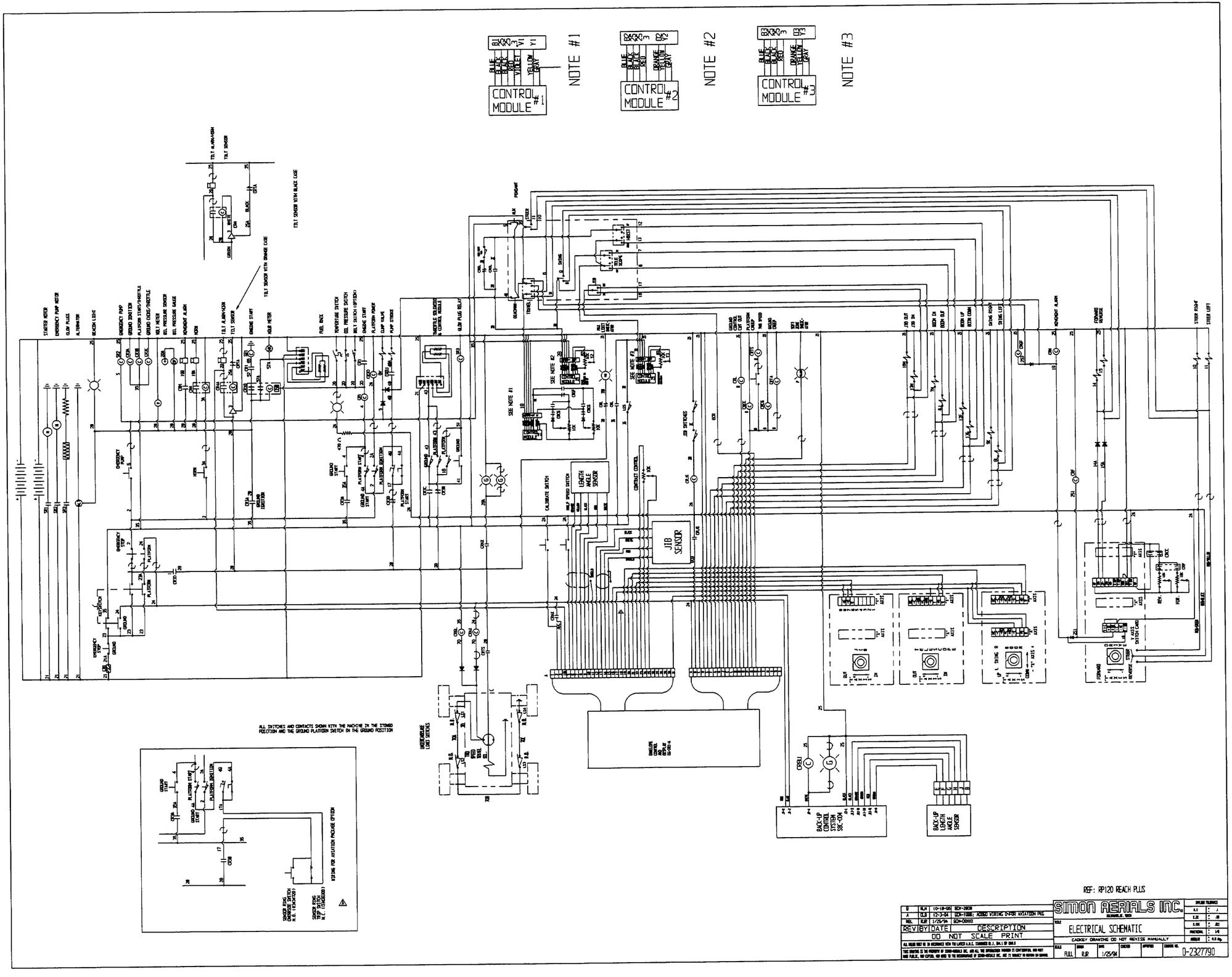
HYDRAULIC SCHEMATIC
ELECTRIC PROPORTIONAL

SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: HYDRAULIC SCHEMATIC

REVISION: A / 1/20/94

DRWG. NO. E-2327510



REF: RP120 REACH PLUS

REV	BY	DATE	DESCRIPTION
D	RLH	10-18-99	ECN-21808
A	DLB	12-3-04	ECN-11686: ADDED WIRING FOR AVIATION PKG
REVS.	RJP	1/25/94	ECN-03002

DO NOT SCALE PRINT

ALL VALUES MUST BE IN ACCORDANCE WITH THE LATEST A.N.S.I. STANDARDS (U.S., METRIC OR DUAL)

THIS DRAWING IS THE PROPERTY OF SIMON-AERIALS INC. AND ALL THE INFORMATION THEREIN IS CONFIDENTIAL AND MUST NOT BE PUBLISH, NOR COPIED, NOR USED TO THE DISADVANTAGE OF SIMON-AERIALS INC. AND IS SUBJECT TO RECALL ON DEMAND.

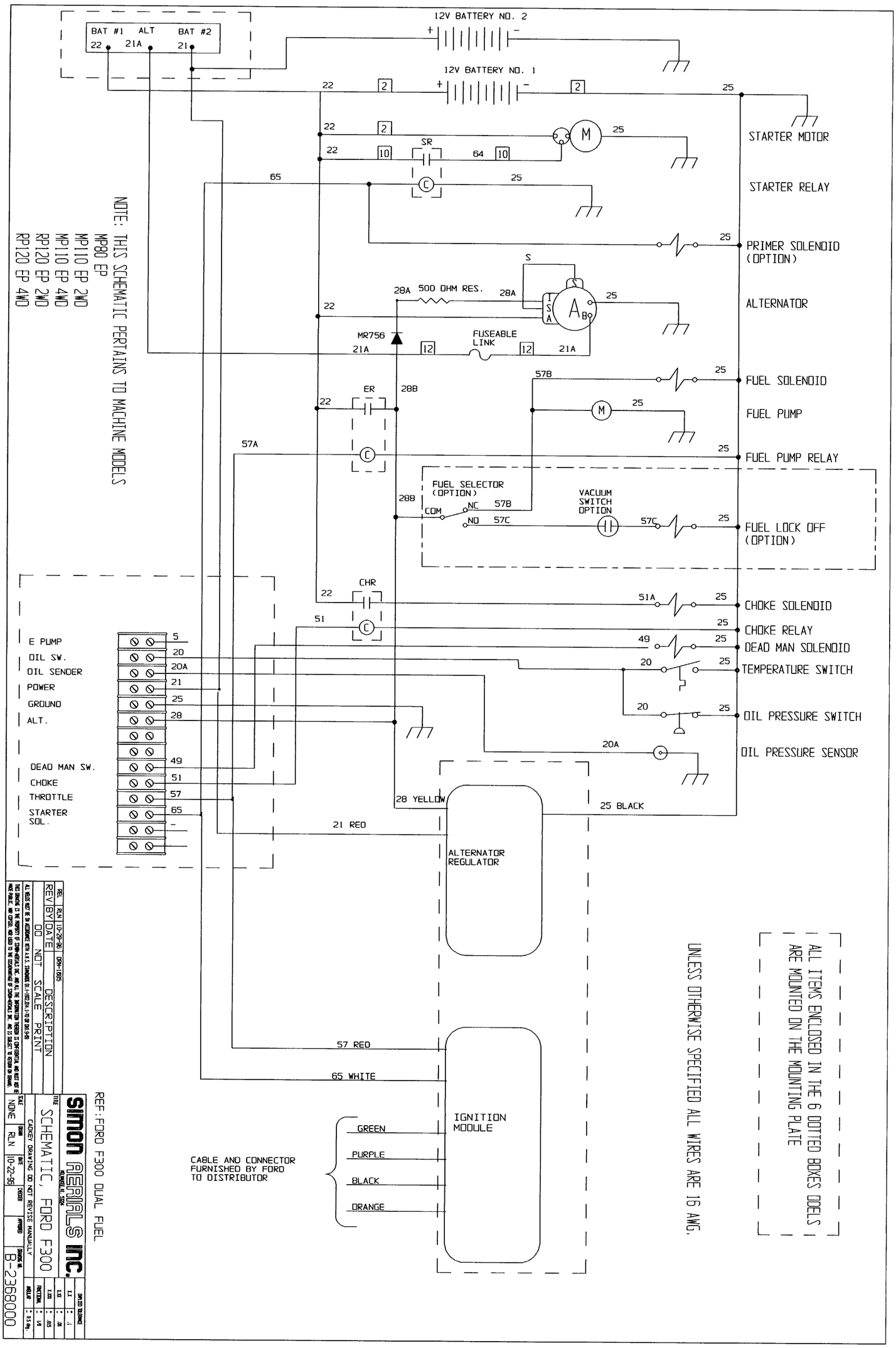
SIMON AERIALS INC.

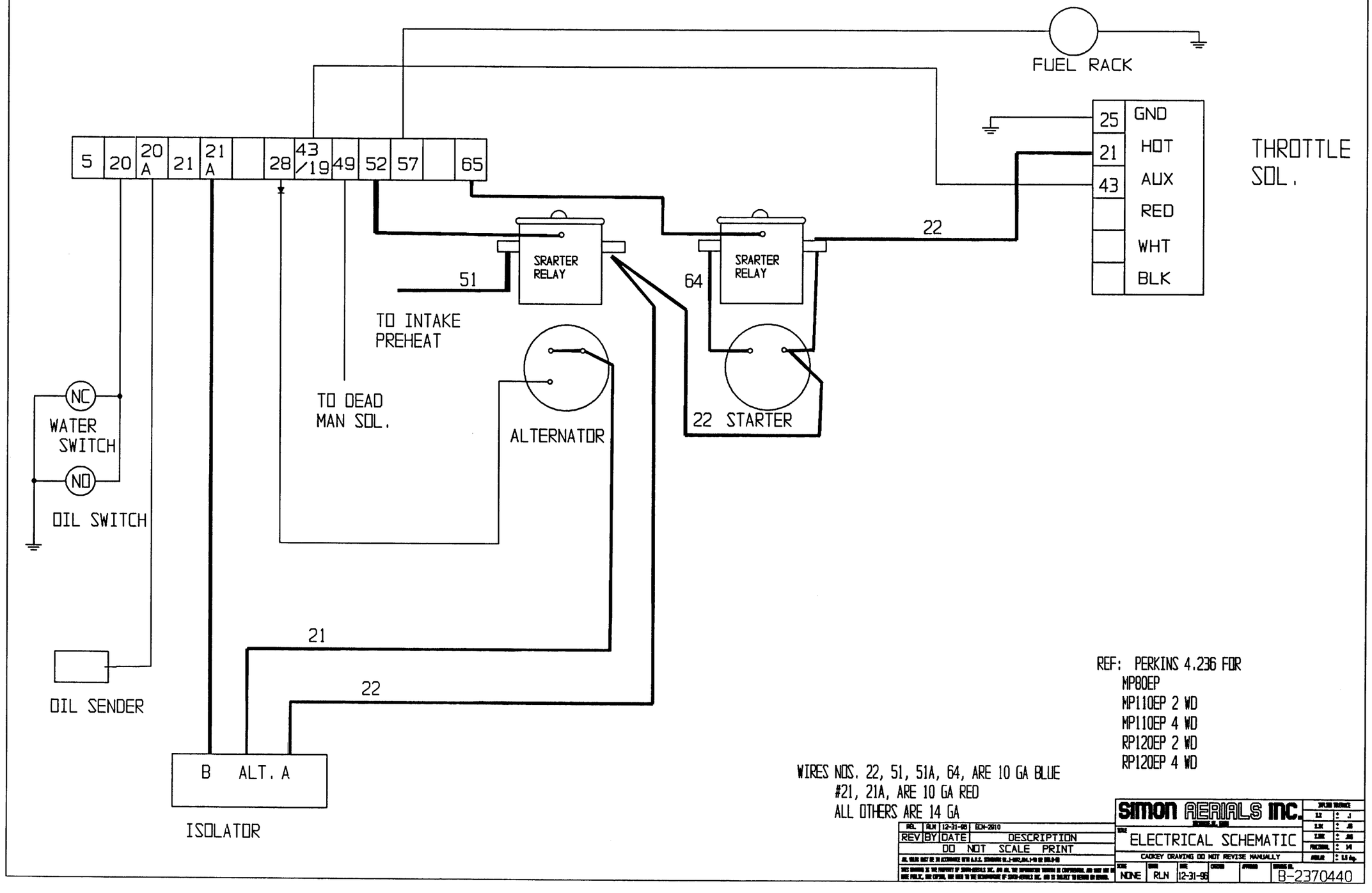
ELECTRICAL SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

UNLESS TOLERANCE	
X.X	± .1
X.XX	± .03
X.XXX	± .001
FRACTIONAL	± 1/16
ANGULAR	± 0.5 deg.

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
FULL	RJP	1/25/94			D-2327790


12V BATTERY NO. 2
BAT #1 ALT BAT #2
22 21A 21
12V BATTERY NO. 1
STARTER MOTOR
STARTER RELAY
PRIMER SOLENOID (OPTION)
ALTERNATOR
28A 500 OHM RES. 28A
MR756
FUSEABLE LINK
21A
FUEL SOLENOID
FUEL PUMP
FUEL PUMP RELAY
FUEL SELECTOR (OPTION)
VACUUM SWITCH OPTION
FUEL LOCK OFF (OPTION)
CHOKE SOLENOID
CHOKE RELAY
DEAD MAN SOLENOID
TEMPERATURE SWITCH
OIL PRESSURE SWITCH
OIL PRESSURE SENSOR
E PUMP
OIL SW.
OIL SENDER
POWER
GROUND
ALT.
DEAD MAN SW.
CHOKE
THROTTLE
STARTER SOL.
28 YELLOW
25 BLACK
21 RED
ALTERNATOR REGULATOR
57 RED
65 WHITE
IGNITION MODULE
GREEN
PURPLE
BLACK
ORANGE
CABLE AND CONNECTOR FURNISHED BY FORD TO DISTRIBUTOR
NOTE: THIS SCHEMATIC PERTAINS TO MACHINE MODELS
MP80 EP
MP110 EP 2WD
MP110 EP 4WD
RP120 EP 2WD
RP120 EP 4WD
UNLESS OTHERWISE SPECIFIED ALL WIRES ARE 16 AWG.
ALL ITEMS ENCLOSED IN THE 6 DOTTED BOXES ODELS ARE MOUNTED ON THE MOUNTING PLATE
REF.:FORD F300 DUAL FUEL
SIMON AERIALS INC.
SCHEMATIC, FORD F300
CADKEY DRAWING DO NOT REVISE MANUALLY
B-2368000
DO NOT SCALE PRINT
DESCRIPTION
REV BY DATE
RLN 10-22-96 DRW-1885



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-2010

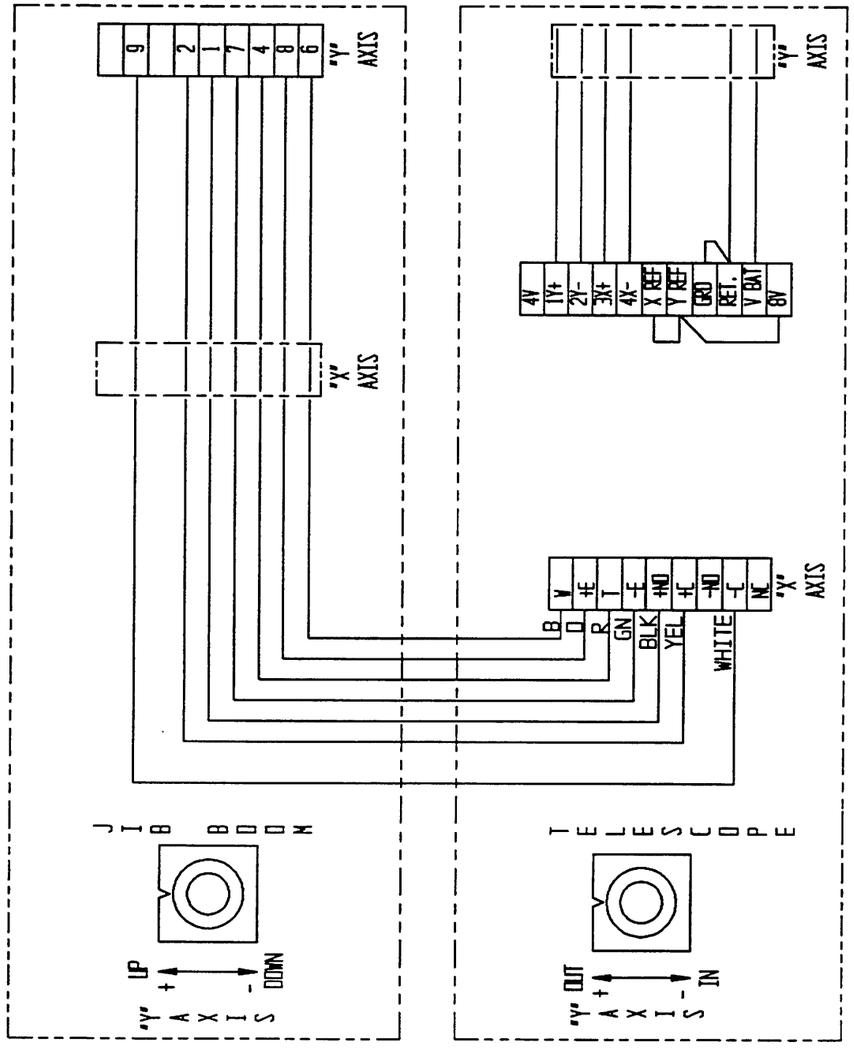
DO NOT SCALE PRINT

SIMON AERIALS INC.

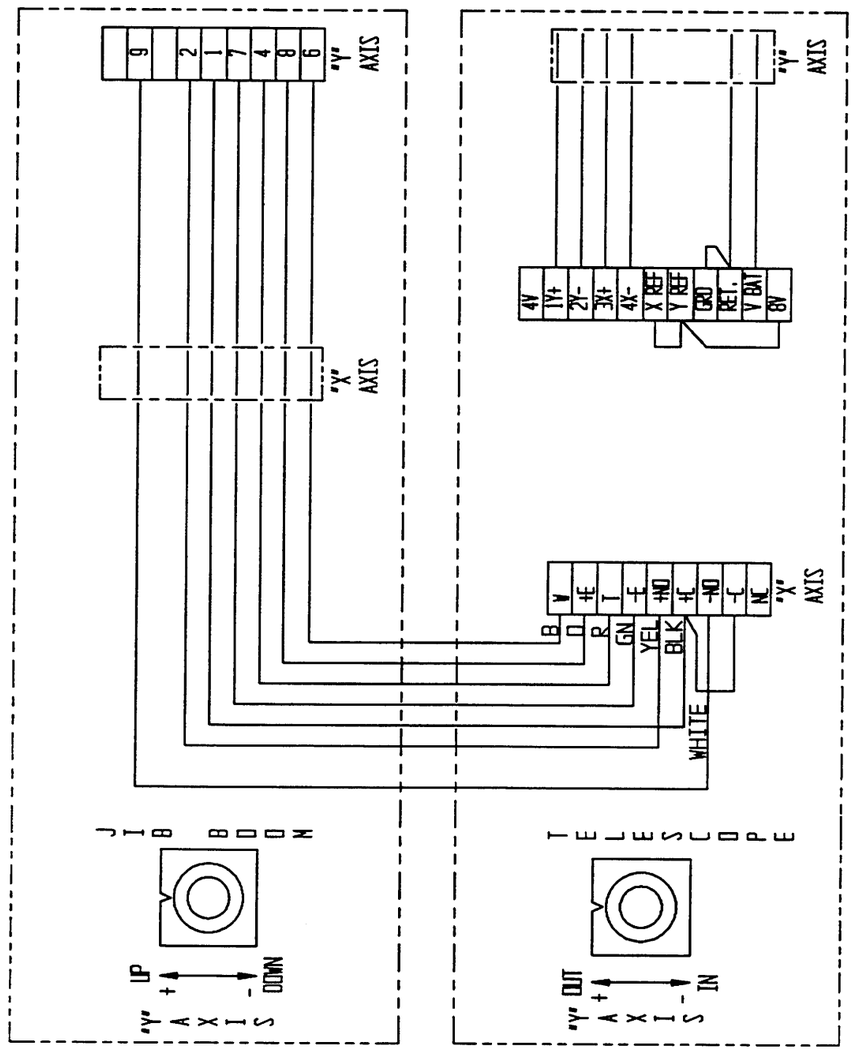
TITLE: ELECTRICAL SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

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



CURRENT WIRING



NEW WIRING

THIS WIRING CHANGE MUST BE DONE WITH EXTEND/RETRACT JOYSTICK REPLACEMENT

REF: RP46, RP66, RP120

WIRING CHANGES ARE AS FOLLOWS:

1. MOVE YEL WIRE TO NO+
2. MOVE BLK WIRE TO C+
3. MOVE WHITE WIRE TO NO-
4. ADD JUMPER FROM C+ TO C-

REL	JTS	12/16/96	ECN-02878
REV	BY	DATE	DESCRIPTION

DO NOT SCALE PRINT

ALL WELDS MUST BE IN ACCORDANCE WITH A.W.S. STANDARDS D1.1-1972,D14.1-70 OR D10.9-69

THIS DRAWING IS THE PROPERTY OF SIMON-AERIALS INC. AND ALL THE INFORMATION THEREON IS CONFIDENTIAL AND MUST NOT BE MADE PUBLIC, NOR COPIED, NOR USED TO THE DISADVANTAGE OF SIMON-AERIALS INC. AND IS SUBJECT TO RETURN ON DEMAND.

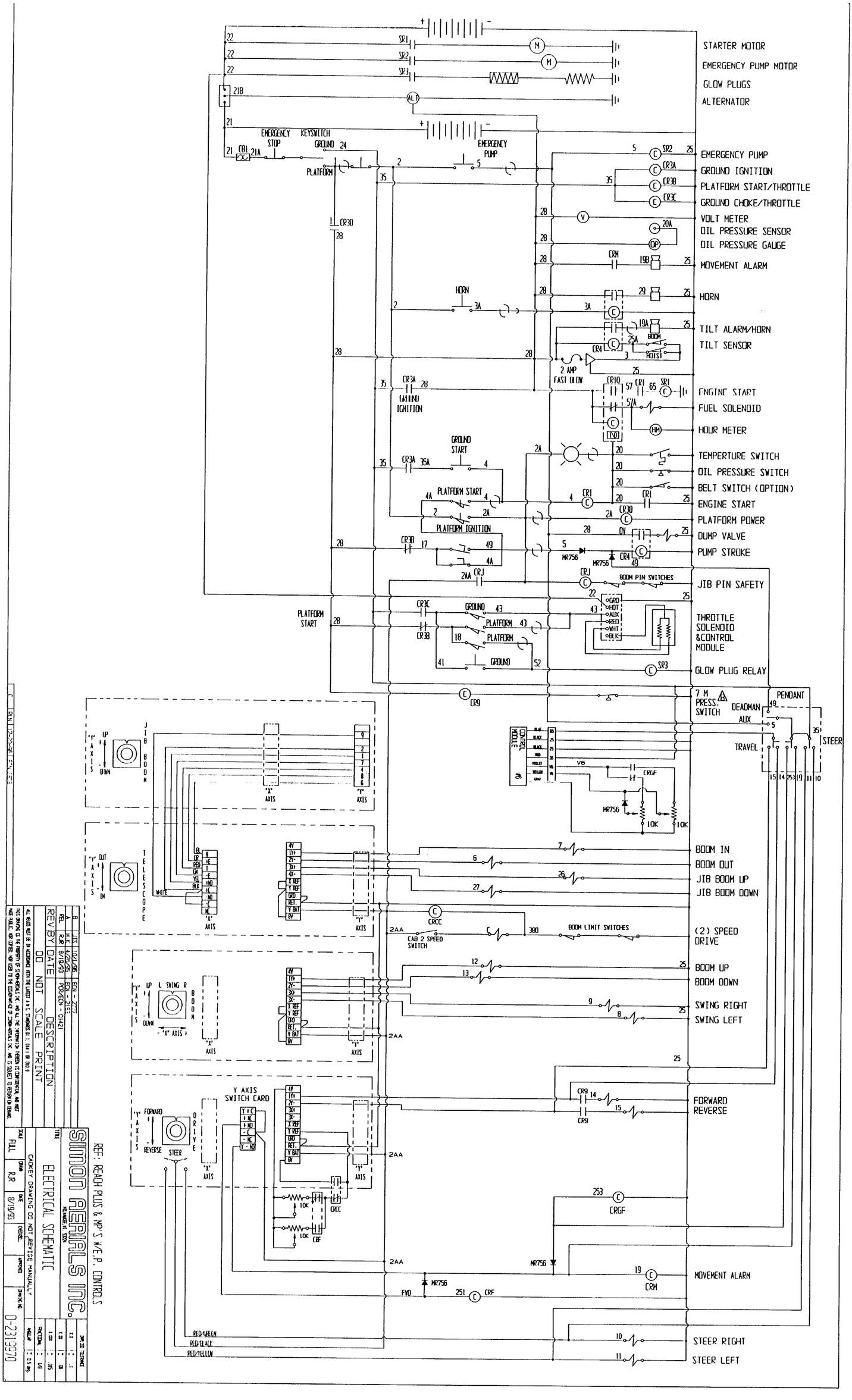
SIMON AERIALS INC.
MILWAUKEE, WI. 53224

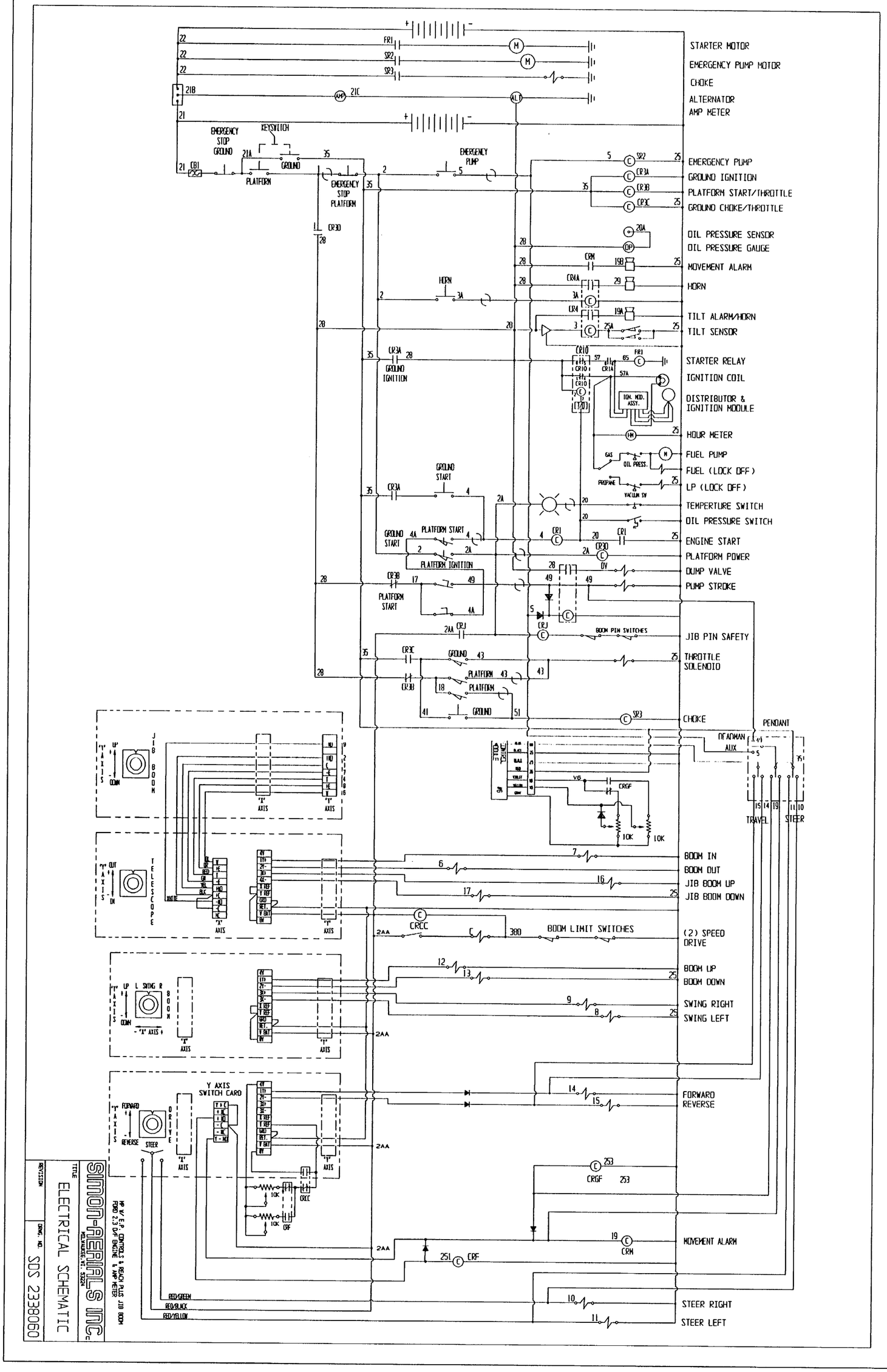
TITLE: WIRING, JOYSTICK

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
FULL	JTS	12/16/96			B-2369400

IMPLIED TOLERANCE	
X.X	± .1
X.XX	± .06
X.XXX	± .015
FRACTIONAL	± 1/8
ANGULAR	± 0.5 deg.


STARTER MOTOR
EMERGENCY PUMP MOTOR
GLOW PLUGS
ALTERNATOR
EMERGENCY PUMP
GROUND IGNITION
PLATFORM START/THROTTLE
GROUND CHOKE/THROTTLE
VOLT METER
OIL PRESSURE SENSOR
OIL PRESSURE GAUGE
MOVEMENT ALARM
HORN
TILT ALARM/HORN
TILT SENSOR
ENGINE START
FUEL SOLENOID
HOUR METER
TEMPERTURE SWITCH
OIL PRESSURE SWITCH
BELT SWITCH (OPTION)
ENGINE START
PLATFORM POWER
DUMP VALVE
PUMP STROKE
JIB PIN SAFETY
THROTTLE SOLENOID &CONTROL MODULE
GLOW PLUG RELAY
7 M PRESS. SWITCH
PENDANT
DEADMAN
AUX
TRAVEL
STEER
BOOM IN
BOOM OUT
JIB BOOM UP
JIB BOOM DOWN
(2) SPEED DRIVE
BOOM UP
BOOM DOWN
SWING RIGHT
SWING LEFT
FORWARD
REVERSE
MOVEMENT ALARM
STEER RIGHT
STEER LEFT
EMERGENCY STOP
KEYSWITCH
GROUND
EMERGENCY PUMP
PLATFORM
2 AMP FAST BLOW
GROUND IGNITION
PLATFORM START
PLATFORM IGNITION
BOOM PIN SWITCHES
CAB 2 SPEED SWITCH
BOOM LIMIT SWITCHES
Y AXIS SWITCH CARD
JIB BOOM
TELESCOPE
DRIVE
SWING
REF: REACH PLUS & MP'S W.E.P. CONTROLS
SIMON AERIALS INC.
ELECTRICAL SCHEMATIC
D-231990


STARTER MOTOR
EMERGENCY PUMP MOTOR
CHOKE
ALTERNATOR
AMP METER
EMERGENCY STOP GROUND
KEYSWITCH
GROUND
PLATFORM
EMERGENCY STOP PLATFORM
EMERGENCY PUMP
EMERGENCY PUMP
GROUND IGNITION
PLATFORM START/THROTTLE
GROUND CHOKE/THROTTLE
OIL PRESSURE SENSOR
OIL PRESSURE GAUGE
MOVEMENT ALARM
HORN
TILT ALARM/HORN
TILT SENSOR
STARTER RELAY
IGNITION COIL
DISTRIBUTOR & IGNITION MODULE
HOUR METER
FUEL PUMP
FUEL (LOCK OFF)
LP (LOCK OFF)
TEMPERTURE SWITCH
OIL PRESSURE SWITCH
ENGINE START
PLATFORM POWER
DUMP VALVE
PUMP STROKE
JIB PIN SAFETY
THROTTLE SOLENOID
CHOKE
PENDANT
DEADMAN
AUX
TRAVEL
STEER
BOOM IN
BOOM OUT
JIB BOOM UP
JIB BOOM DOWN
(2) SPEED DRIVE
BOOM LIMIT SWITCHES
BOOM UP
BOOM DOWN
SWING RIGHT
SWING LEFT
FORWARD
REVERSE
STEER RIGHT
STEER LEFT
MOVEMENT ALARM
GROUND START
PLATFORM START
PLATFORM IGNITION
BOOM PIN SWITCHES
Y AXIS SWITCH CARD
RED/GREEN
RED/BLACK
RED/YELLOW
SIMON-AERIALS INC
ELECTRICAL SCHEMATIC
SDS 2338060

HED®

ENVELOPE CONTROL SYSTEM

HE001A/HD009A

OPERATIONS AND INSTALLATION MANUAL

HE001A1J.WP
August 16, 1994

HED®
ENVELOPE CONTROL

WARNINGS AND CAUTIONS

WARNING: BEFORE OPERATING EQUIPMENT, READ THIS MANUAL COMPLETELY.

The instructions in this manual are intended for use by a qualified equipment operator. DO NOT OPERATE THIS EQUIPMENT IF:

a) You are not familiar with the operation of this machine,
b) You do not know the safety procedures for this type of equipment,
c) You do not know the hand signals used with this type of equipment (if applicable).

If any of the above apply, receive the training required before operating the equipment or get the assistance of a qualified operator.

WARNING: Calibration must only be performed by qualified personnel. Failure to follow proper sequences and use of invalid calibration points may result in unsafe operating positions.

WARNING: While in calibration mode, the envelope control and the backup system are overridden. It is imperative that while moving from the first calibration position to the second, the operator fully boom up before extending. This will allow operation within safe limits. Failure to follow this sequence may cause the machine to tip over.

WARNING: The **HED®** envelope control must be operated in compliance with all applicable safety regulations, rules, and practices. Failure to follow required safety practices may result in death or serious injury.

CAUTION: It is important for proper calibration, that the chassis be level, Failure to comply will result in errors in side reach calculations and may result in unsafe operating positions.

The information, specifications, and illustrations in this manual are those in effect at the time of printing. **HED®** reserves the right to change specifications or design at any time without notice.

HED®
ENVELOPE CONTROL

TABLE OF CONTENTS

DESCRIPTION 1

SWITCHES 1

INDICATORS 2

DISPLAY CONTRAST 2

CALIBRATION 2
Figure 1 Envelope control system 3

PROGRAM LOGIC 4

WINDOW OF OPERATION 5

BACKUP SYSTEM OPERATION 6

BOOM LENGTH/ANGLE SENSOR 6
Figure 2 Boom length/angle sensor 7

INSTALLATION 8
Figure 3 Connecting diodes to on/off coils 8

BEFORE APPLYING POWER 9

PRIMARY SYSTEM WIRING CHART (HE001A) 10

BACKUP SYSTEM WIRING CHART (HD009A) 11

ROUTINE MAINTENANCE 12

MAINTENANCE PRECAUTIONS 12

VALVE DRIVER ADJUSTMENT 12
Figure 4 Valve driver adjustment location 13
Figure 5 Valve driver location inside enclosure 14

TROUBLESHOOTING 14

TROUBLESHOOTING CHART 15
Figure 6 HE001A controller board part location 16
Figure 7 HD009A controller board part location 17

PARTS LIST 18

SPECIFICATIONS 19

HED®
ENVELOPE CONTROL

DESCRIPTION

The HED® HE001A Envelope control system (primary system) is a microprocessor-based controller optimized for use on Simon Aerials's RP-120, 120 foot telescopic boom truck. The HE001A provides complete system control for the RP-120. Joysticks mounted in the cage provide complete control of the boom and jib motion. A back up system HD009A is provided to monitor the system to assure safe operation.

Information from sensors and switches allows the system to compute the angle and extension of the boom, angle of the jib, platform height, and platform side reach. The HE001A show numerical values for each of these, graphically displays the boom and jib position, and provides status messages for the operator.

Because the envelope system has integrated control of the boom and jib, it is able to reduce the speed of or disable hydraulic functions to provide safe positioning of the platform. These functions are described in the Program Logic section.

Two length/angle sensors are used for redundancy. One for the primary controller (HE001A) and one for the backup controller (HD009A). Various switch inputs indicate to the HE001A controller if the axles are extended and if the chassis is within 5 degrees of level. Operator controls include joysticks for BOOM UP/DOWN, TELESCOPE IN/OUT, SWING LEFT/RIGHT, and JIB UP/DOWN; a calibration key switch; a slow speed switch; and a contrast pot.

The unit is designed with a built-in calibration sequence to calibrate the angle and length sensors. The display prompts the operator through the sequence for easy operation.

Note: See the Calibration section or the Warnings and Cautions section for all applicable Warnings. During calibration, the machine is fully operational with no envelope control. The operator is responsible for following the calibration instructions to remain within safe operating parameters.

SWITCHES

Several switch inputs exist on the HE001A unit. An English/ Metric switch input has been provided to allow the operator to view values in English units (feet) or in metric units (meters). The Calibration key switch allows the operator to enter and then step through the calibration routine. The operator is able to select a slow speed operation mode with the slow speed switch this input causes all functions to go to half speed. Other inputs indicate if the axles are extended and if the chassis is tilted more than 5 degrees.

INDICATORS

Five front-panel LEDs are provided to alert the operator to different system conditions. The POWER LED indicates that the system has power and is running. The OK LED indicates that the computer is functioning properly and all internal tests have passed. The FAIL LED indicates that a problem has been detected and the unit may not function properly. The WARNING LED indicates that the boom tip or platform side reach is within four feet of the side reach limit. The STOP LED indicates that maximum platform side reach has been achieved.

DISPLAY CONTRAST

The readability of the liquid crystal display depends on the viewing angle. Adjust the contrast control for best results.

CALIBRATION

WARNING: Calibration must only be performed by qualified personnel. Failure to follow proper sequences or use of invalid calibration points can result in unsafe platform positions.

WARNING: While in calibration mode, the envelope control and the backup system are overridden. It is imperative that while moving from the first calibration position to the second, the operator fully boom up before extending. This will allow operation within safe limits. Failure to follow this sequence may cause the machine to tip over.

CAUTION: It is important for proper calibration, that the chassis be level, Failure to comply will result in errors in side reach calculations and may result in unsafe operating positions.

The calibration procedure should be run when the system is first installed or when the length/angle or jib sensors are replaced or adjusted. The factory-programmed calibration values are for test purposes only. One sequence calibrates both the HE001A (primary) and the HD009A (backup) controllers.

The machine should be at rest on a level surface with the axles extended to perform this procedure. Turning the CALIBRATION key starts the process and signals the controller that each step of the calibration procedure has been completed. Holding the key in the on position for 3-5 seconds assures proper reading of the switch.

The LCD display prompts the operator to position the machine in two ways. The first is with the boom fully retracted, with the jib at -90 degrees and with the

boom at 0 degrees. This should be with the bottom of the jib touching the ground. The second position is reached by first booming up to maximum angle and then moving the jib fully up. Only then should the boom be fully extended to the second position. This is the second position. If the calibration procedure is performed improperly or if any of the sensors fails, the controller software may reject the resulting calibration values and restart the calibration sequence. If this occurs, fully retract the boom first then jib down and then boom down to the first calibration position.

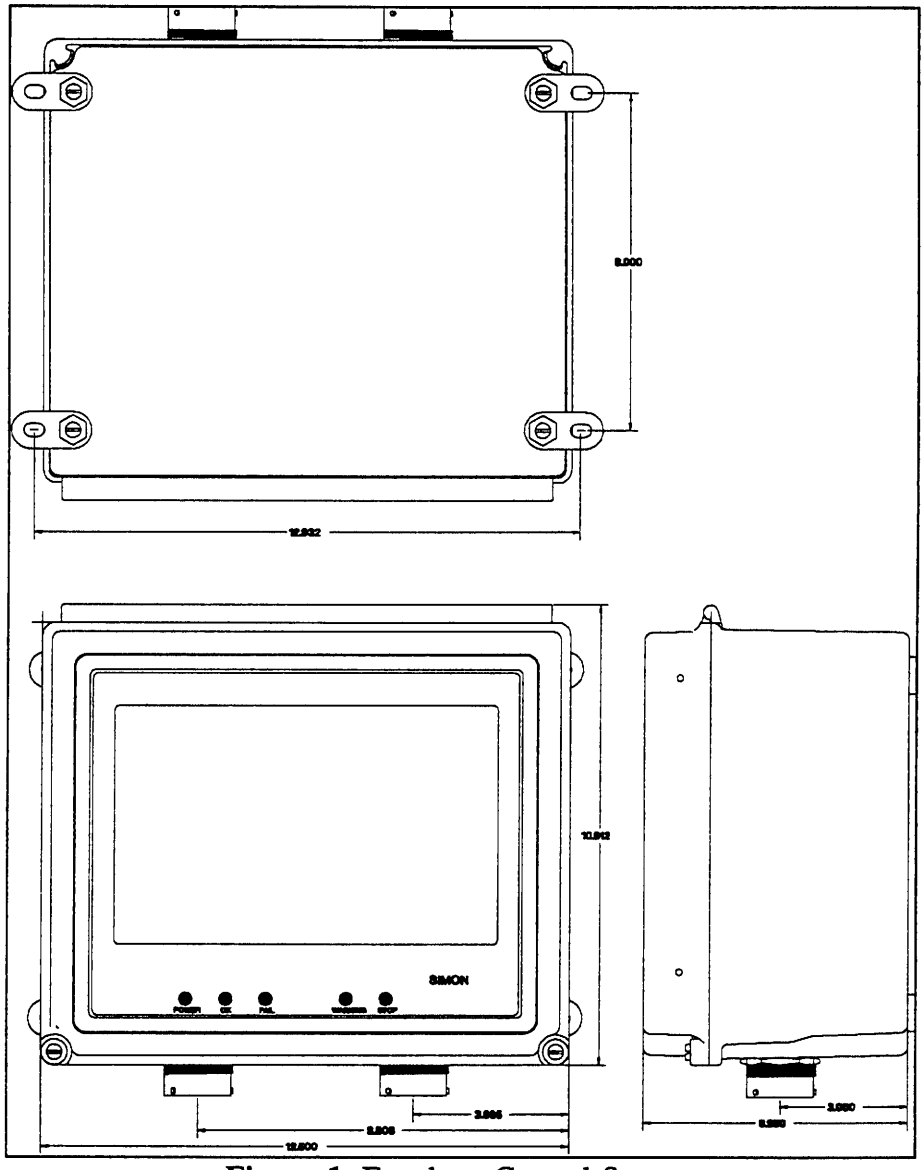


Figure 1: Envelope Control System

PROGRAM LOGIC

The HE001A and HD009A systems function in the following manner:

1. If the Platform Side Reach is greater than or equal to the maximum platform side reach envelope; disable the Pendant Boom Output, the Pendant Jib Output and those joystick functions which will cause a greater side reach (radius). For example: if the boom angle is 20 degrees, the jib is below horizontal, and the side reach limit is reached; the jib up, boom down, and extend functions would be disabled while the jib down, boom up, and retract functions would still function. The display will indicate maximum side reach and the STOP LED will turn on.

2. When the maximum platform side reach limit is achieved, the radius must be reduced by .5 feet before reengaging the boom and jib functions.

3. If the Boom Tip Side Reach is equal to the maximum boom tip side reach envelope; disable the Pendant Boom Output, and those joystick functions which will cause a greater side reach (radius). These would be the boom extend and either the Boom up or Boom Down functions(depending on angle)

4. If the boom angle is greater than 5 degrees from horizontal and extension is greater than 46 feet, deenergize high speed drive output. Reenergize output if the boom angle is less than 0 degrees and extension is less than 45.5 feet.

5. If the boom angle is greater than 0 degrees from horizontal and actual extension is greater than 1 meter (3 feet) and the axles extended input = 0; disable Boom Up, and Boom Extend and jib up functions.

6. If the boom tip or platform side reach is within 4 feet of its respective Limit, Display caution message and turn on the WARNING LED

7. If the platform height is greater then 45 feet and the boom tip or platform side reach is within 2 feet of its respective limit, reduce the boom extend and boom down functions by 50%.

8. If boom angle is greater than 69 degrees, reduce boom up speed by 50%.

9. If the chassis Tilt Signal = 12V turn on the STOP Light display the tilt caution message and disable all functions.

10. If the Half Speed input = 12V all controlled function outputs are reduced by 50% and the slow operation message is displayed.

WINDOW OF OPERATION

Maximum allowed Side Reach

The maximum side reach extends out from the center of rotation for the vehicle. Below boom horizontal, the maximum side reach is set to 60 feet. Above boom horizontal, it cuts back from 60 feet at a 5 degree slope. At boom angles above 55 degrees, the maximum side reach cuts back at a 13 degree slope. All other envelopes are parallel to this curve.

Maximum Boom Tip Side Reach

To facilitate a safe redundant system (HD009A), the maximum side reach of the boom tip was limited to the main envelope curve minus the length of the bucket linkage, the bucket and 5 feet. This generates a boom tip envelope which is a constant 10.87 feet from the maximum side reach curve. When the boom tip reaches this envelope, the boom down or boom up function (depending on angle) and the boom out function is disabled. This creates a jib operation only window between the two envelopes.

Redundant System Envelope

The redundant system envelope is located a constant 2 feet beyond the maximum boom tip envelope curve. The system also calculates the boom tip side reach and will disable the main pump if this envelope is reached.

Reduced Speed Windows

If the measured Boom Angle is greater than or equal to 69 degree, then the boom up function is reduced by 50%.

If the platform height is greater than 95 feet, then all functions except boom retract are reduced by 50%.

If the platform height is greater than 45 feet, and the boom tip is within 2 feet from the maximum boom tip envelope, then reduce the boom extend and boom down functions by 50%.
If the platform height is greater than 45 feet, and the platform is within 2 feet from the maximum side reach envelope, then reduce the boom extend and boom down functions by 50%.

Warning Light Windows

The warning light will turn on at 4 feet before either maximum platform side reach or maximum boom tip side reach. It does not matter which comes first. If the boom tip is within its warning area or the platform is within its warning area the light will turn on. Also a message will be displayed alerting the operator.

Jib Only Window

As stated above, a window of operation exists in which only the jib can be moved. This occurs when the maximum boom tip side reach has been achieved. Operating the jib will be limited by the maximum platform side reach curve.

BACKUP SYSTEM OPERATION

Primarily, the backup system uses a second length/angle sensor to compute the boom tip side reach. It compares this side reach to the maximum boom tip maximum side reach curve plus 2 feet. If this curve is achieved, an output is turned off disabling the pump.

Other checks done by the backup system are receiving serial communication from the primary computer. If data is not received regularly, the pump will be deenergized. The data received from the primary computer is also used. The primary computer sends a length and angle value several times through each program cycle. If this angle data does not match that of the redundant systems within 3 degrees, or if the length does not match within 2 feet, the pump will be shut off.

BOOM LENGTH/ANGLE SENSOR

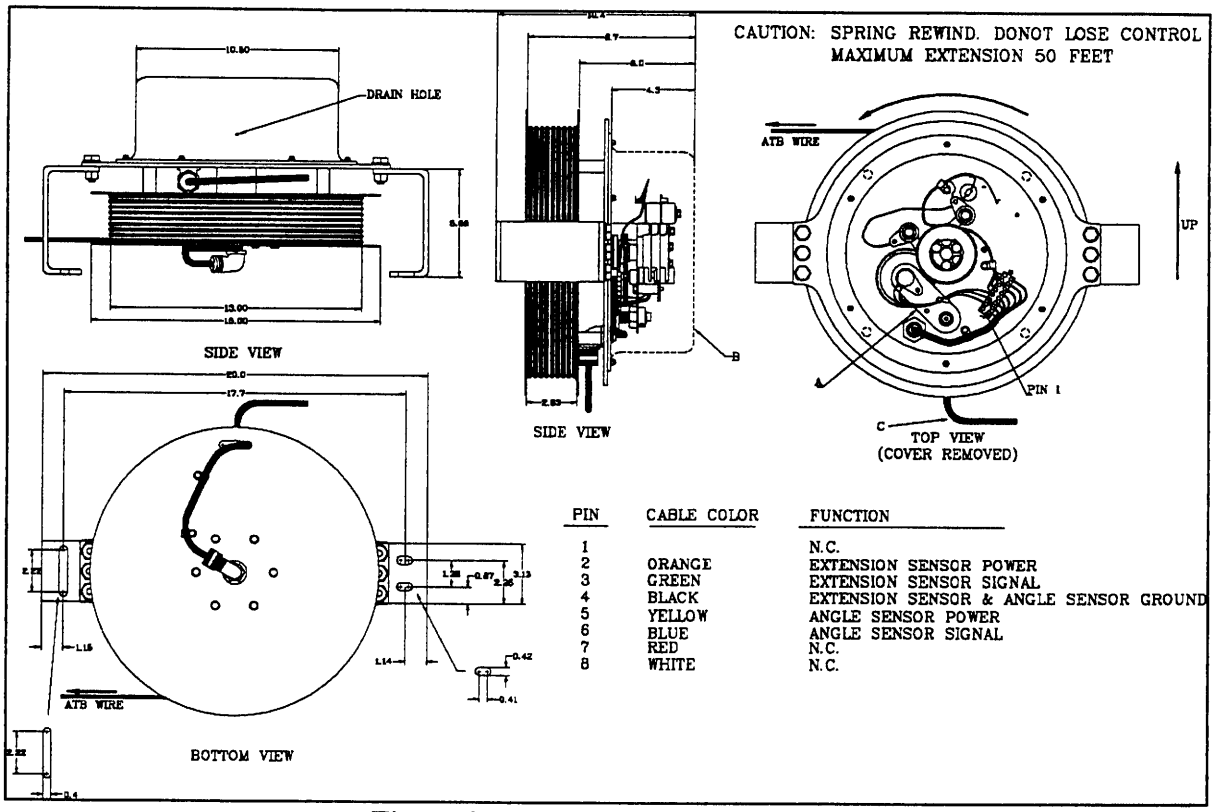
The length/angle sensor is designed to measure the extension of the boom and the angle of the boom with respect to gravity. Two units are used on this system, one is connected to the primary system and one to the backup system. When the length angle sensor is newly installed, or has been worked with, it is important that the potentiometer gear be properly adjusted. This is done in the following manner:

1. Rotate gear arm down and hold.

2. With the boom fully retracted, turn the gear fully counter clockwise.

3. Turn the gear 1/2 turn clock wise and reengage the gears.

Following adjustment of the gears, it is necessary to recalibrate the system, Refer to the Calibration section of this document. Follow all applicable safety standards and read all Warnings and Cautions before calibrating.



PIN	CABLE COLOR	FUNCTION
1		N.C.
2	ORANGE	EXTENSION SENSOR POWER
3	GREEN	EXTENSION SENSOR SIGNAL
4	BLACK	EXTENSION SENSOR & ANGLE SENSOR GROUND
5	YELLOW	ANGLE SENSOR POWER
6	BLUE	ANGLE SENSOR SIGNAL
7	RED	N.C.
8	WHITE	N.C.

Figure 2: Boom length/angle sensor

HED®
ENVELOPE CONTROL

INSTALLATION

1. Refer to the wiring charts on pages 10-11 and Figure 2.

2. The controller should be mounted on shock-absorbing mounts. It is best mounted in a protected area.

3. When installing the unit, the main power should run from the battery through a 10 Amp fast-blow fuse to a power switch or relay, then into the controllers. For best results, connect main power to the auxiliary terminal of the ignition switch, PTO switch, or ignition relay. Use 16 gauge or heavier wire. Power for the Proportional valve drivers should also be run through a 10 Amp fuse.

4. Install fast recovery diodes such as TSF12 (HED P/N 200-003-0012) on the terminals of ON/OFF inductive coils to protect against the effects of inductive switching. When installing diodes, check polarity to prevent damage to diodes (see Figure 3).

5. All connections must be properly insulated to protect against short circuits.

6. Seal all connections with non conductive silicone sealant (HED P/N 105-001-0013 or equivalent).

7. Cover all butt connections with electrical coating such as Scotchkote® brand coating (HED P/N 105-001-0005).

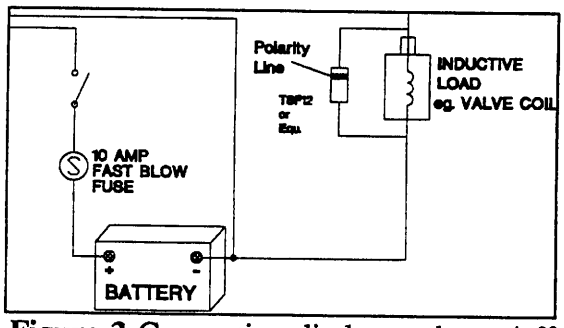


Figure 3 Connecting diodes to the on/off coils

8. The following steps are to be used for installing the Length/Angle Sensors

Caution: Misadjusting the gear on the length sensor potentiometer may result in damage to the potentiometer. Make certain that the potentiometer is centered (5 turns from either end) and the reel is under tension when removing or installing the sensor.

a. Mount the sensor to the side of the boom

b. Remove the cover

c. Untie the length sensing cable and carefully release tension in the reel.

d. Unwrap 5 turns of cable from the sensor reel

e. Attach the cable to the end of the boom.

f. Mark the reel, rotate two turns counter clockwise and wrap the loose cable around reel. If necessary, turn the reel counter clockwise further to wrap the remaining cable.

g. With gear arm held down, rotate gear all the way counter clockwise.

h. Rotate the gear 1/2 turn clockwise and reengage the gears.

i. Install cover with the drain hole on the lowest position (see figure 2).

_____*BEFORE APPLYING POWER*

1. Check power and ground polarity.

2. Check wiring harness for possible shorts before connecting controllers to output devices (e.g. valves, relays) by checking each mating pin terminal.

3. Read the rest of this manual.

HED®
ENVELOPE CONTROL

PRIMARY SYSTEM WIRING CHART (HE001A)

CONNECTOR: DEUTSCH HD34-24-31-ST

PIN #	FUNCTION
1	ENGLISH/METRIC SWITCH (+12 VDC INPUT)
2	CALIBRATE SWITCH (+12 VDC INPUT)
3	AXIAL EXTENDED SWITCH (+12 VDC INPUT)
4	CHASSIS TILT SIGNAL (+12 VDC INPUT)
5	HALF SPEED SIGNAL (+12 VDC INPUT)
6	EXTENSION SENSOR POWER (+11.5 VDC ADJUSTABLE)
7	EXTENSION SENSOR SIGNAL
8	BOOM ANGLE SENSOR POWER (+11.5 VDC)
9	BOOM ANGLE SENSOR SIGNAL
10	EXTENSION/BOOM ANGLE SENSOR GROUND
11	EXTENSION/BOOM ANGLE SENSOR SHIELD
12	JIB ANGLE SENSOR POWER (+4.5 VDC)
13	JIB ANGLE SENSOR SIGNAL
14	JIB ANGLE SENSOR GROUND
15	JIB ANGLE SENSOR SHIELD
16	JOYSTICKS SUPPLY (+4.5 VDC)
17	JOYSTICKS GROUND
18	JOYSTICKS SHIELD
19	BOOM UP/DOWN JOYSTICK SIGNAL
20	BOOM IN/OUT JOYSTICK SIGNAL
21	SWING JOYSTICK SIGNAL
22	JIB JOYSTICK SIGNAL
23	10 K OHM CONTRAST POTENTIOMETER RIGHT SIDE
24	10 K OHM CONTRAST POTENTIOMETER CENTER (WIPER)
25	10 K OHM CONTRAST POTENTIOMETER LEFT SIDE
26-30	N.C.
31	RS-232 COMMUNICATION SIGNAL TO HD009A (SHIELDED CABLE).

HED®
ENVELOPE CONTROL

PRIMARY SYSTEM WIRING CHART(HE001A)

CONNECTOR: DEUTSCH HD34-24-23-PN

PIN #	FUNCTION
A	+12 VDC
B	+ 12 VDC
C	N.C.
D	GROUND
E	N.C.
F	BOOM UP (PROPORTIONAL OUTPUT)
G	BOOM DOWN (PROPORTIONAL OUTPUT)
H	BOOM IN (PROPORTIONAL OUTPUT)
J	BOOM OUT (PROPORTIONAL OUTPUT)
K	SWING CW (PROPORTIONAL OUTPUT)
L	SWING CCW (PROPORTIONAL OUTPUT)
M	JIB UP (PROPORTIONAL OUTPUT)
N	JIB DOWN (PROPORTIONAL OUTPUT)
O	LOWER BOOM CONTROL (ON/OFF OUTPUT)
P	ALARM (ON/OFF OUTPUT)
Q	DRIVE SPEED (ON/OFF OUTPUT)
R	LOWER JIB CONTROL (ON/OFF OUTPUT)
S-X	N.C.

BACKUP SYSTEM WIRING CHART (HD009A)

COLOR	CONNECTOR	FUNCTION
RED	J2-3	+12 VDC
BLACK	J2-1	GROUND
RED	J7-2	+12 VDC
WHITE	J7-4	PUMP ON/OFF OUTPUT
BLUE	J1-2	RS-232 SIGNAL FROM DISPLAY
BROWN	J9-6	LENGTH SENSOR POWER (+12.5 VDC ADJUSTABLE)
RED	J11-5 (+12.5 VDC)	BOOM ANGLE SENSOR POWER
GREEN	J11-10	BOOM ANGLE SENSOR SIGNAL
ORANGE	J11-9	LENGTH SENSOR SIGNAL
BLACK	J11-3	LENGTH/ANGLE SENSOR GROUND AND

SHIELD

HED®
ENVELOPE CONTROL

ROUTINE MAINTENANCE

1. Clean the HE001A controller screen regularly with a soft damp cloth and mild cleaner.

2. Inspect electrical wiring for wear points or other damage. Repair as required.

3. Inspect all connections for looseness or corrosion. Tighten and/or seal as necessary.

MAINTENANCE PRECAUTIONS

When performing any inspection or maintenance work on the HE001A/HD009A system, always exercise care to prevent injury to yourself and others or damage to the equipment. The following are general precautions which should be closely followed in carrying out any maintenance work:

1. Do not have hydraulic power available to the valves when performing electrical tests.

2. Never operate or test any function if any person is in an area where they could be hurt by being hit or squeezed by the equipment.

3. Take care to prevent metal tools from coming in contact with sensitive electronic components.

4. Turn power off before connecting or disconnecting valve coils or other electrical loads.

VALVE DRIVER ADJUSTMENT

The Single Axis Controller board is adjustable for most proportional valves. Each function has already been adjusted at the factory. Only fine tuning adjustments may be needed. To calibrate the unit, perform the following procedure:

1 Start with the power turned off to the HE001A and valve coils connected to the outputs to be adjusted.

2 Connect a multimeter to the valve coil to be adjusted in parallel to measure voltage or in series with the coil to measure current.

3 Turn power on (+12VDC).

4 With the control handle in threshold position set the threshold (start of flow) by adjusting "THR" clockwise

(CW) to increase and counter clockwise (CCW) to decrease until the desired voltage or current is displayed on the meter. Note: Threshold is the position of the handle at which the output first turns on.

5 With the control handle in the maximum flow position, (full on) set the maximum flow by adjusting "MAX." (CW to increase, CCW to decrease) until the desired voltage or current is displayed on the meter.

6 Repeat steps 4 and 5 to verify threshold and maximum levels.

7 Connect the multimeter to the next output to be adjusted and repeat steps 4, 5, and 6.

NOTE: If the desired maximum and threshold values cannot be achieved, one setting may be too high. In this case repeat steps 4, 5, and 6 after:

A)Rotating "MAX" and "THR" CCW 21 turns.
B)Rotating "MAX" CW 5 turns.

9 To adjust the ramp for an output, rotate "RMP" CW to increase or CCW to decrease for each output.

10 To adjust the frequency, place the frequency meter between any output and ground. Rotate "FRQ" CW to increase or CCW to decrease frequency until the desired frequency is achieved.

11 Seal potentiometer's adjustment screws.

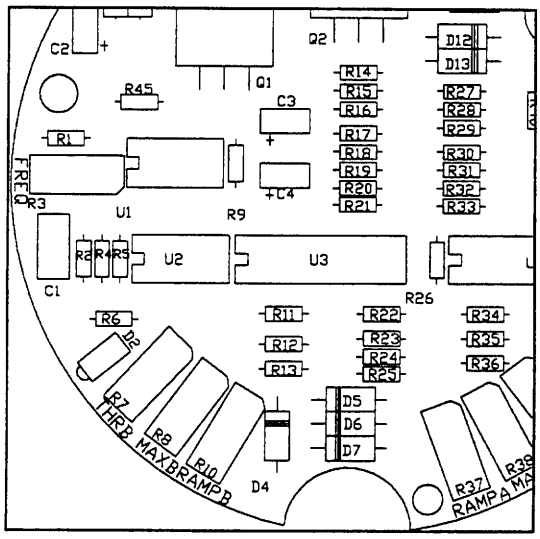


Figure 4 Valve Driver adjustment location

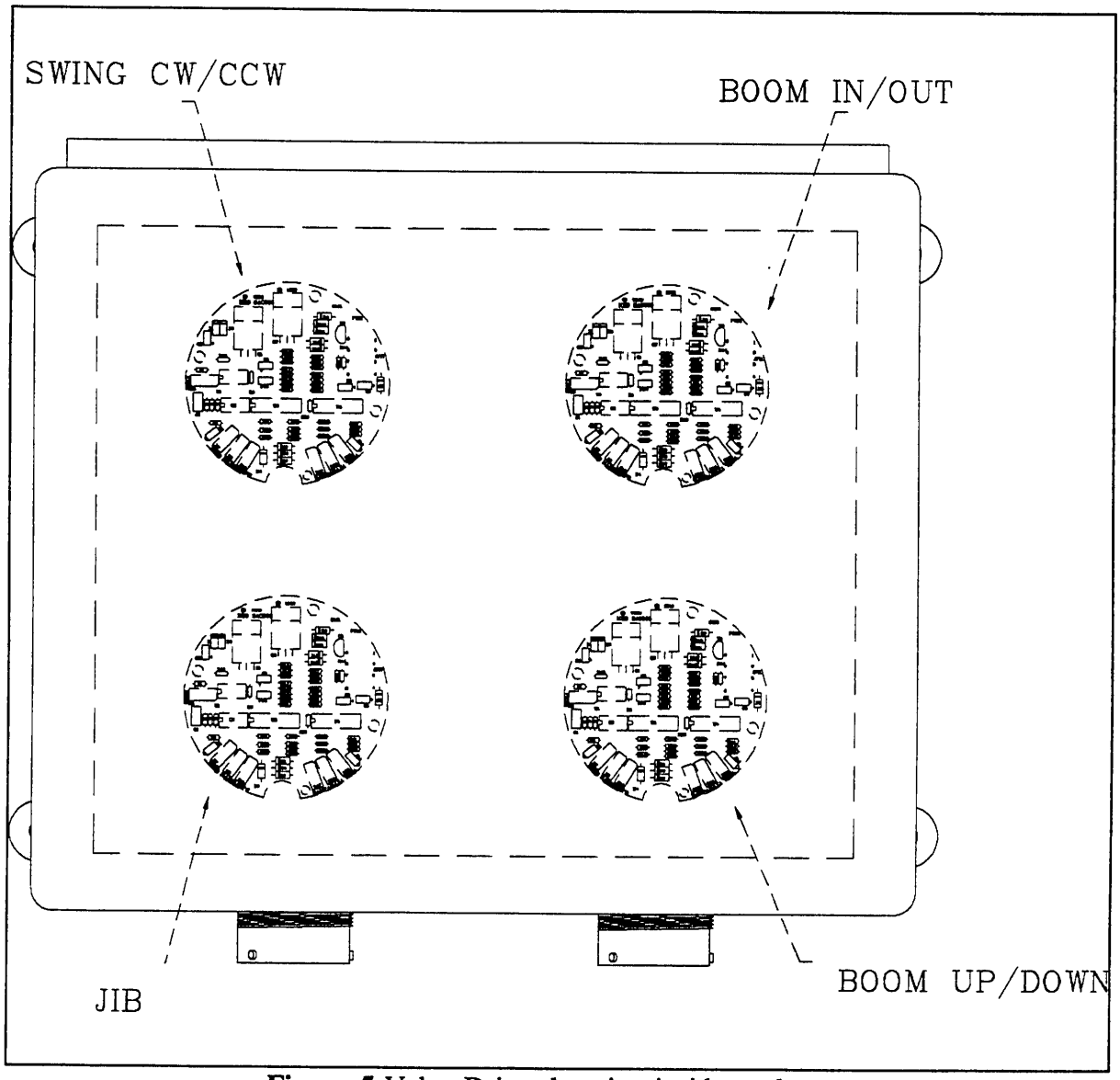


Figure 5 Valve Driver location inside enclosure

TROUBLESHOOTING

This section provides basic operator level troubleshooting for the HE001A/HD009A system. If, after following these instructions, the system still does not function, check the hydraulic system then contact your distributor for further instructions or servicing.

TROUBLESHOOTING CHART

PROBLEM	SOLUTION
The display lights up but does not show anything.	Adjust contrast control pot. Check wiring to contrast pot.
The POWER LED does not light.	Check system power. Check controller circuit board to ensure that power LEDs are on (see FIGURES 6&7).
Certain functions do not operate.	Check output device (eg. valve solenoid) for short circuit or open circuit.
The message "Input fault"	Check Connections from joysticks and sensors.
Calibration procedure will not complete successfully.	Check wiring to extension and angle sensors. Check calibration switch and its wiring. Make sure calibration switch is normally open.
Pump output on backup system keeps turning off.	Verify that side reach is not beyond limits. Check sensors for proper operation. Check communication link from HE001A system. Run calibration procedure. (Pump is always on when in calibration mode).
Controller operation becomes erratic.	Check supply voltage.

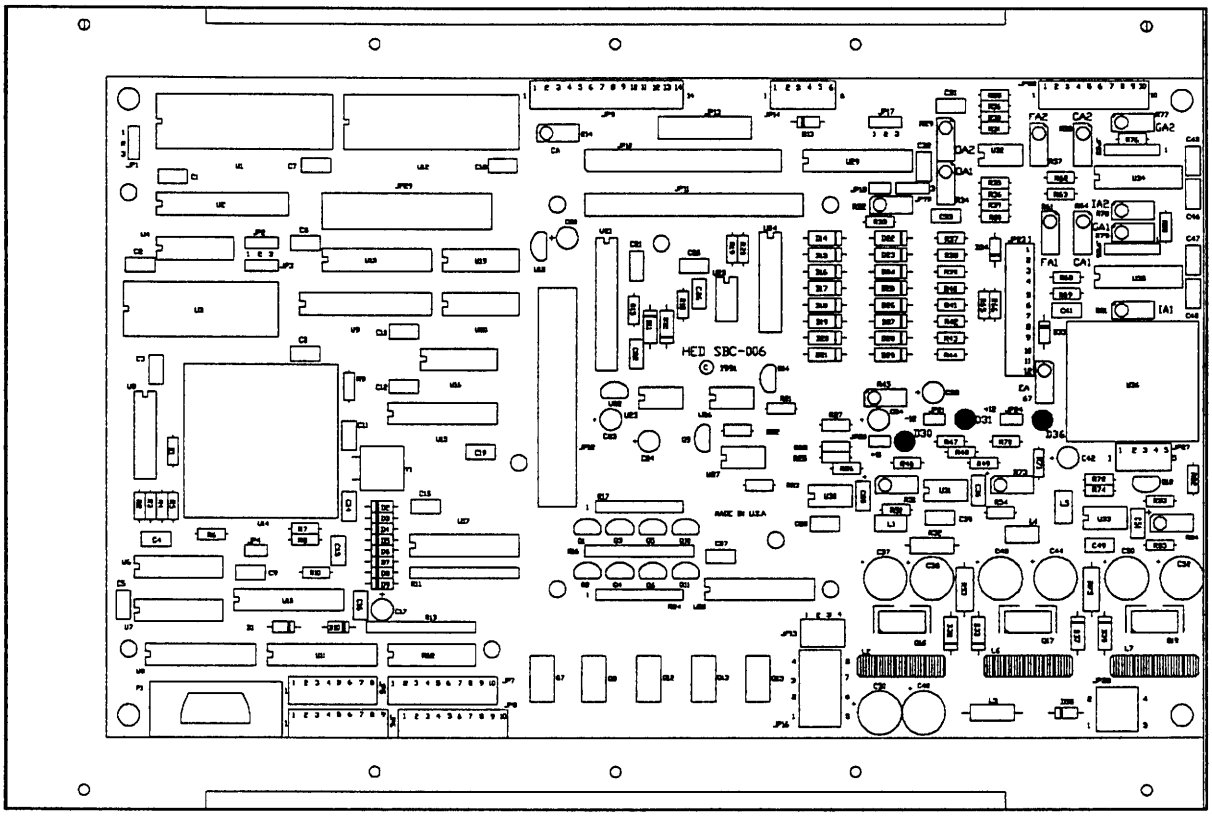


Figure 6 HE001A controller board part position

INDICATOR	FUNCTION	COLOR
D30	+5 volt supply	Red
D31	-12 volt supply	Yellow
D36	+12 volt supply	Green

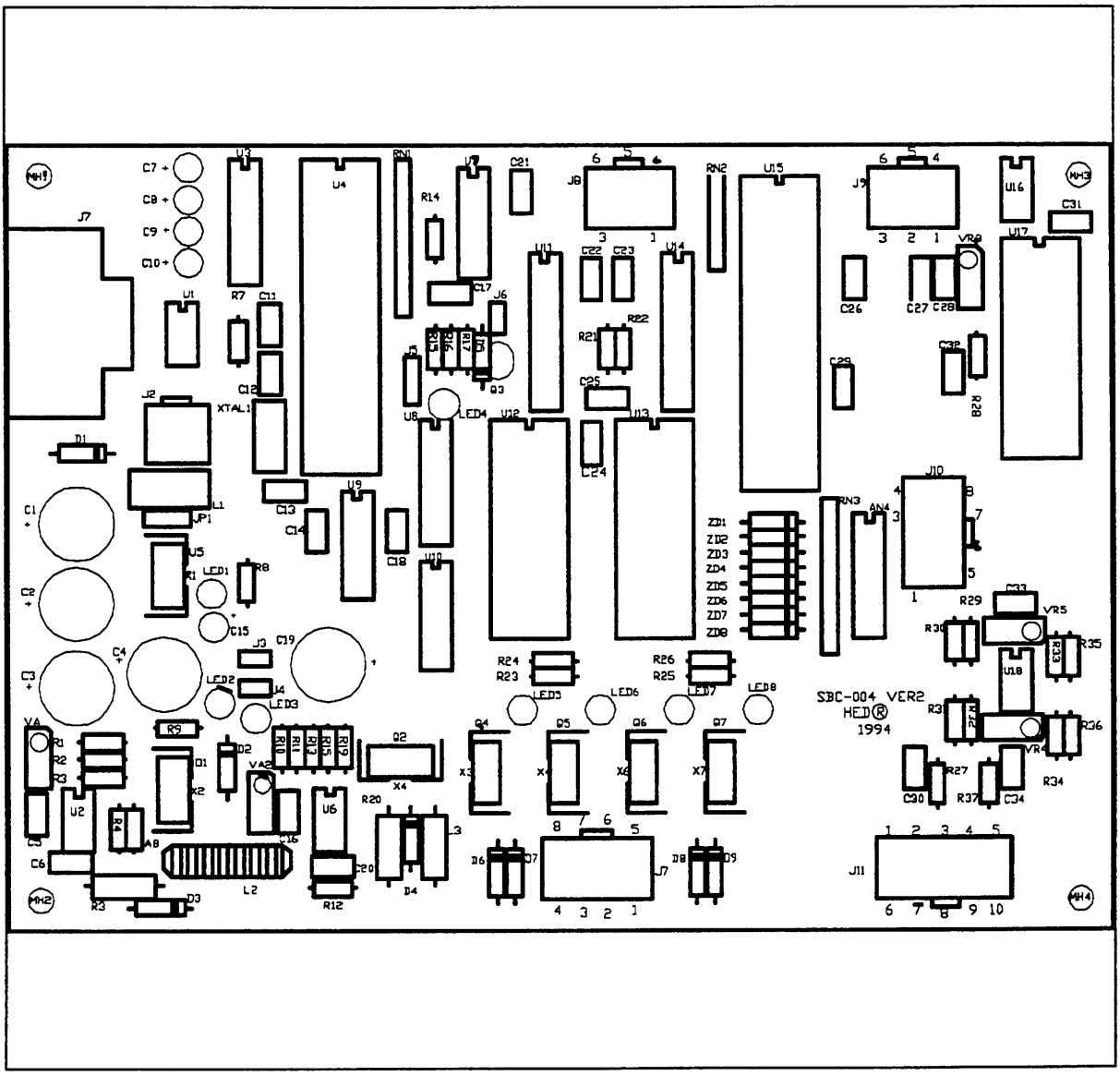


Figure 7: HD009A controller board part position

INDICATOR	FUNCTION	COLOR
LED1	+5 volt supply	Red
LED2	+12.5 volt supply	Orange
LED3	-12.5 volt supply	Yellow
LED4	processor status	Red
LED5	Pump output	Red

HED®
ENVELOPE CONTROL

PARTS LIST

PART NUMBER	DESCRIPTION
HE-001-A	ENVELOPE CONTROL SYSTEM CONSOLE
HD-009-A-2	BACK UP SYSTEM SBC-004 CONTROLLER
200-003-0012	TSF12 FAST-RECOVERY DIODES (Optional)
105-001-0013	NON-CONDUCTIVE SILICONE SEALANT (Optional)
105-001-0005	ELECTRICAL COATING (Optional)

There are no user-serviceable parts inside the controllers. Return the units to the factory for service through your equipment dealer or manufacturer.

Note: For operation with negative ground vehicles only.

HED®
ENVELOPE CONTROL

SPECIFICATIONS

Power supply voltage . . . . . 12V nominal, 9V to 30V transient

Operating temperature
- Display computer . . . . . -40°C to +60°C
(with heaters operating below 0°C)
- Back up system SBC-004 . . . . . -40°C to +85°C

Storage temperature
- Display computer . . . . . -20°C to +70°C
- Back up system SBC-004 . . . . . -40°C to +85°C

Output Current
- On/Off outputs . . . . . 2.5 Amp
- Proportional valve outputs . . . . . 2.0 Amp