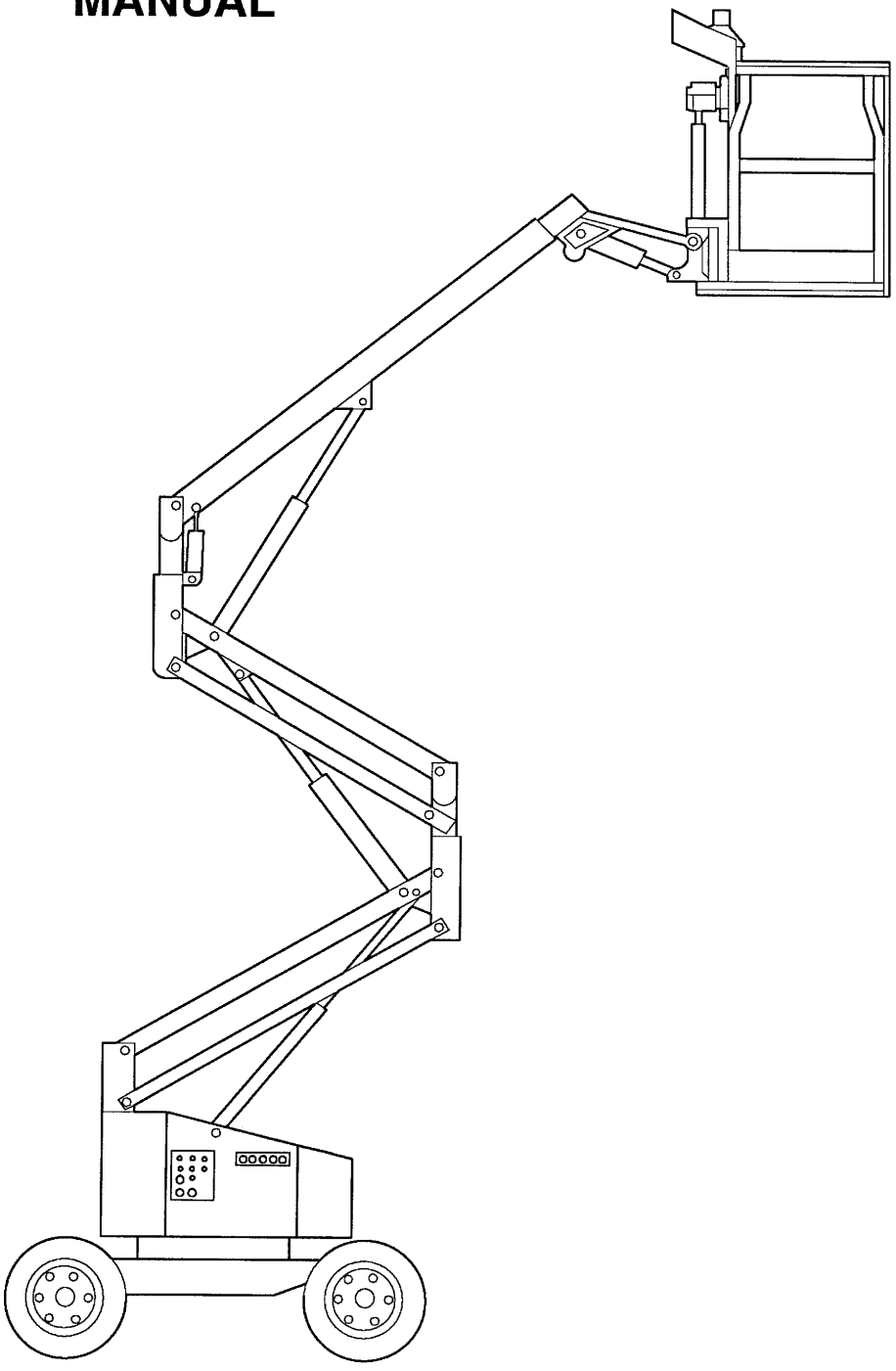
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# SILVER-EAGLE FUEL

89-410517

SIMON

# SERVICE MANUAL



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# INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the SIMON AERIALS INC. SILVER EAGLE Self Propelled Aerial Work Platform. When used in conjunction with the Operators, Parts and Component Repair manuals (provided separately), this Service Manual will assist you in making all 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 SILVER-EAGLE, 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.

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 and platform control stations.

**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.

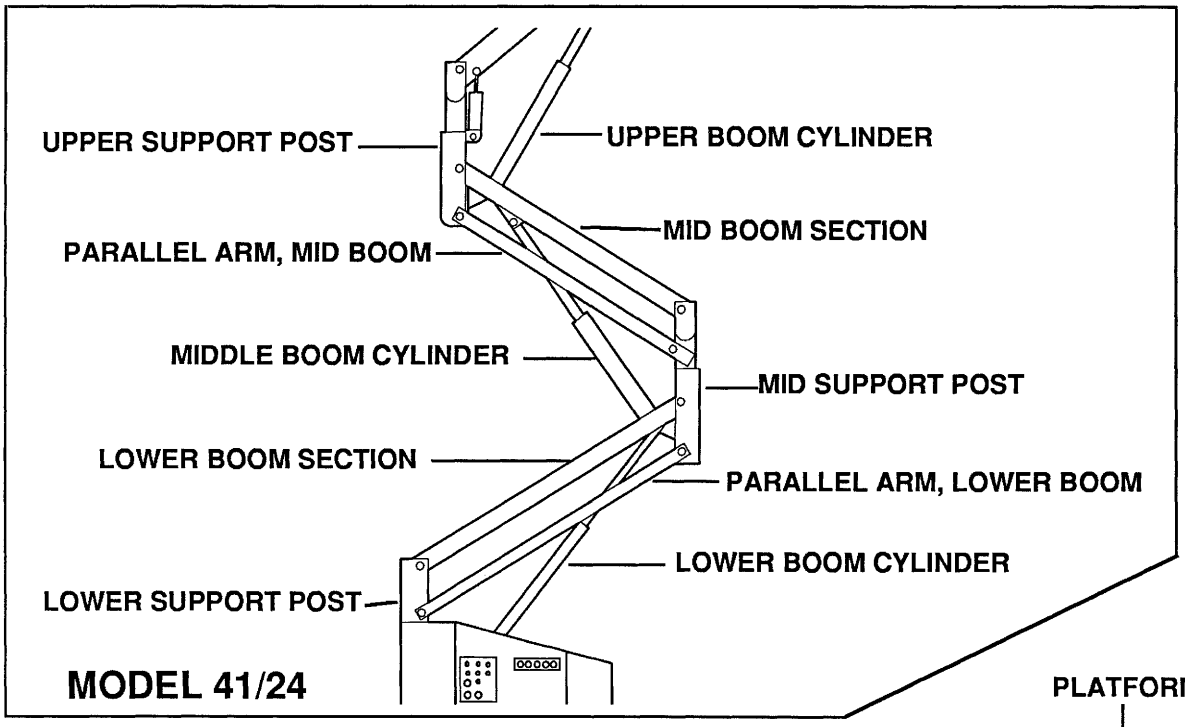
# MACHINE SPECIFICATIONS
# FUEL POWERED
# SILVER EAGLE

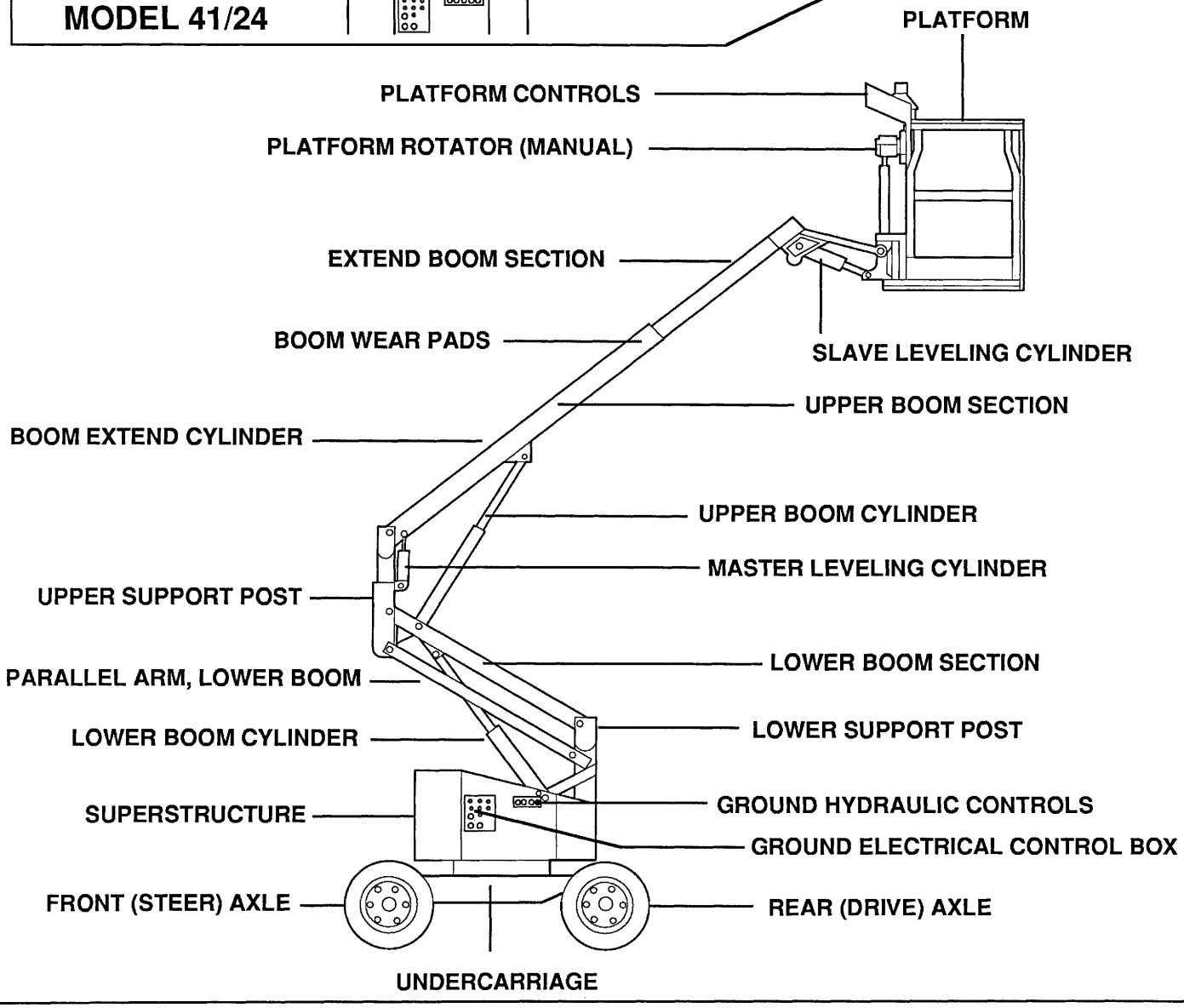
| | MODEL 32/21 | MODEL 41/24 |
|---|---|---|
| WORKING HEIGHT | 38 FT (11.58 M) | 47 FT (14.33 M) |
| PLATFORM HEIGHT | 32 FT (9.75 M) | 41 FT (12.50 M) |
| HORIZONTAL OUTREACH | 21 FT (6.40 M) | 24 FT (7.32 M) |
| SUPERSTRUCTURE ROTATION, STOP TO STOP | 360° | 360° |
| PLATFORM CAPACITY (UNRESTRICTED) | 500 LBS (227 KG) | 500 LBS (227 KG) |
| PLATFORM DIMENSIONS | 30 IN. (0.76 M) x 60 IN. (1.52 M) | 30 IN. (0.76 M) x 60 IN. (1.52 M) |
| PLATFORM ROTATION | 180 DEGREES | 180 DEGREES |
| STOWED LENGTH | 15 FT 7 IN. (4.75 M) | 16 FT 2 IN. (4.93 M) |
| STOWED HEIGHT (GAS OR DIESEL) | 6 FT 7 IN. (2.01 M) | 6 FT 7 IN. (2.01 M) |
| (DUAL FUEL) | 6 FT 11 IN. (2.11 M) | 6 FT 11 IN. (2.11 M) |
| WIDTH | 5 FT 11 IN. (1.80 M) | 5 FT 11 IN. (1.80 M) |
| WHEELBASE | 6 FT 3 IN. (1.91 M) | 6 FT 3 IN. (1.91 M) |
| GROUND CLEARANCE | 8 IN. (0.20 M) | 8 IN. (0.20 M) |
| GROSS WEIGHT | 9,500 LBS (4309 KG) | 13,000 LBS (5897 KG) |
| OUTSIDE TURNING RADIUS | 13 FT 6 IN. (4.12 M) | 13 FT 6 IN. (4.12 M) |
| INSIDE TURNING RADIUS | 6 FT 1 IN. (1.85 M) | 6 FT 1 IN. (1.85 M) |
| GRADEABILITY (ON HARD SURFACE) | 14 DEGREES (25%) | 12 DEGREES (21%) |
| TRAVEL SPEED-BOOMS STOWED | 3.5 MPH (5.6 KPH) | 3.5 MPH (5.6 KPH) |
| BOOMS ELEVATED | 0.5 MPH (0.8 KPH) | 0.5 MPH (0.8 KPH) |
| ENGINE HORSEPOWER-GAS OR DUAL FUEL | 18 | 24 |
| DIESEL | 24 | 24 |

# MACHINE SPECIFICATIONS (CONTINUED)

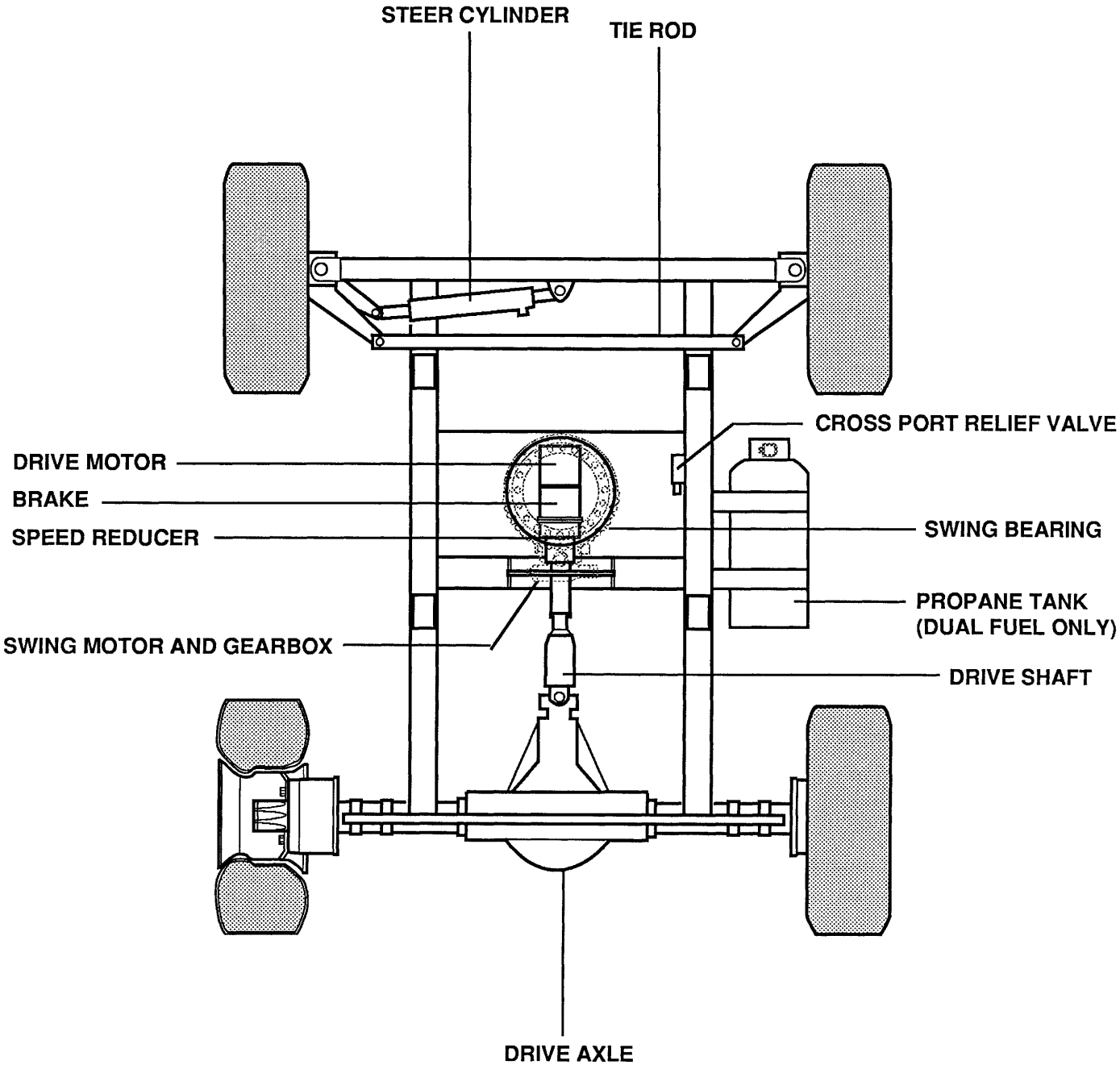
| | |
|---|---|
| PUMP PRESSURE | 2176 PSI (150 BARS) |
| HYDROSTATIC PUMP CHARGE PRESSURE | 70 T0 150 PSI (5 TO 10 BARS) |
| DRIVE SYSTEM PRESSURE (AT REST) | 200 PSI (14 BARS) |
| (MOVING) | 200 TO 3750 PSI |
| DRIVE CROSS PORT RELIEF VALVE SETTING | 3750 PSI (267 BARS) |
| MAXIMUM LIFT SYSTEM PRESSURE | 2500 PSI (178 BARS) |
| LIFT FUNCTION AND STEERING RELIEF VALVE SETTING | 2500 PSI |
| DRIVE CONTROL PRESSURE (AT VALVE AND BRAKE) | 525 PSI (36 BARS) |
| (AT STROKE CYLINDER) | 80 TO 525 PSI |
| DRIVE CONTROL RELIEF VALVE SETTING | 525 PSI |
| MAX. DRIVE PUMP INLET VACUUM UNDER NORMAL CONDITIONS | 5 IN. HG |
| HYDRAULIC FLUID CAPACITY (TANK) | 18.5 GAL. (70 L) |
| (SYSTEM, MODEL 32/21) (APPROX.) | 36 GAL. (136 L) |
| (SYSTEM, MODEL 41/24) (APPROX.) | 42 GAL. (159 L) |
| FUEL CAPACITY (GAS OR DIESEL) | 13.8 GAL. (52 L) |
| (PROPANE) | 34 LBS. (15.4 KG) |
| TIRES | 8.75-16.5 LT, 8 PLY |
| TIRE PRESSURE (STANDARD LIQUID BALLASTED TIRES) | 65 PSI (4.5 BARS) |
| (OPTIONAL PNEUMATIC TIRES) | 65 PSI |
| WHEEL LUG NUT TORQUE | 120 FT LBS (163 NM) |
| AXLE MOUNTING BLOCK BOLT TORQUE | 285 FT LBS (386 NM) |
| SWING BEARING BOLT TORQUE | 85 FT LBS (115 NM) |
| SWING DRIVE MOUNTING BOLT TORQUE | 80 FT LBS (108 NM) |
| COIL RESISTANCE (LIFT POWER SWITCH CONTROL SOLENOID) | AT LEAST 6 OHMS |
| (DRIVE POWER SWITCH CONTROL SOLENOID) | AT LEAST 6 OHMS |
| (STEERING CONTROL VALVE SOLENOID) | AT LEAST 6 OHMS |
| (BRAKE SOLENOID VALVE) | AT LEAST 6 OHMS |
| (LOW SPEED DRIVE SOLENOID) | AT LEAST 6 OHMS |

# MACHINE COMPONENT LOCATOR

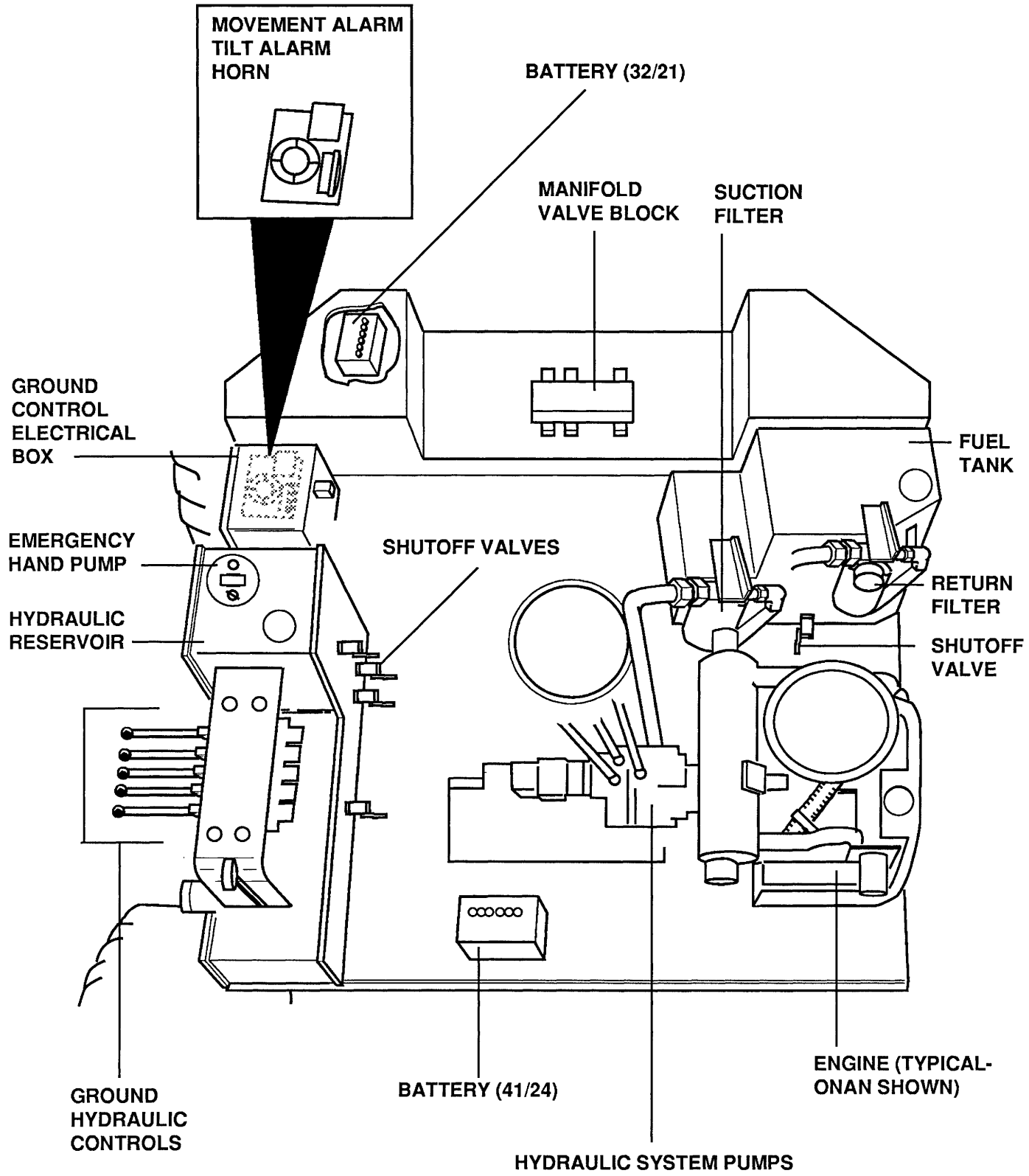


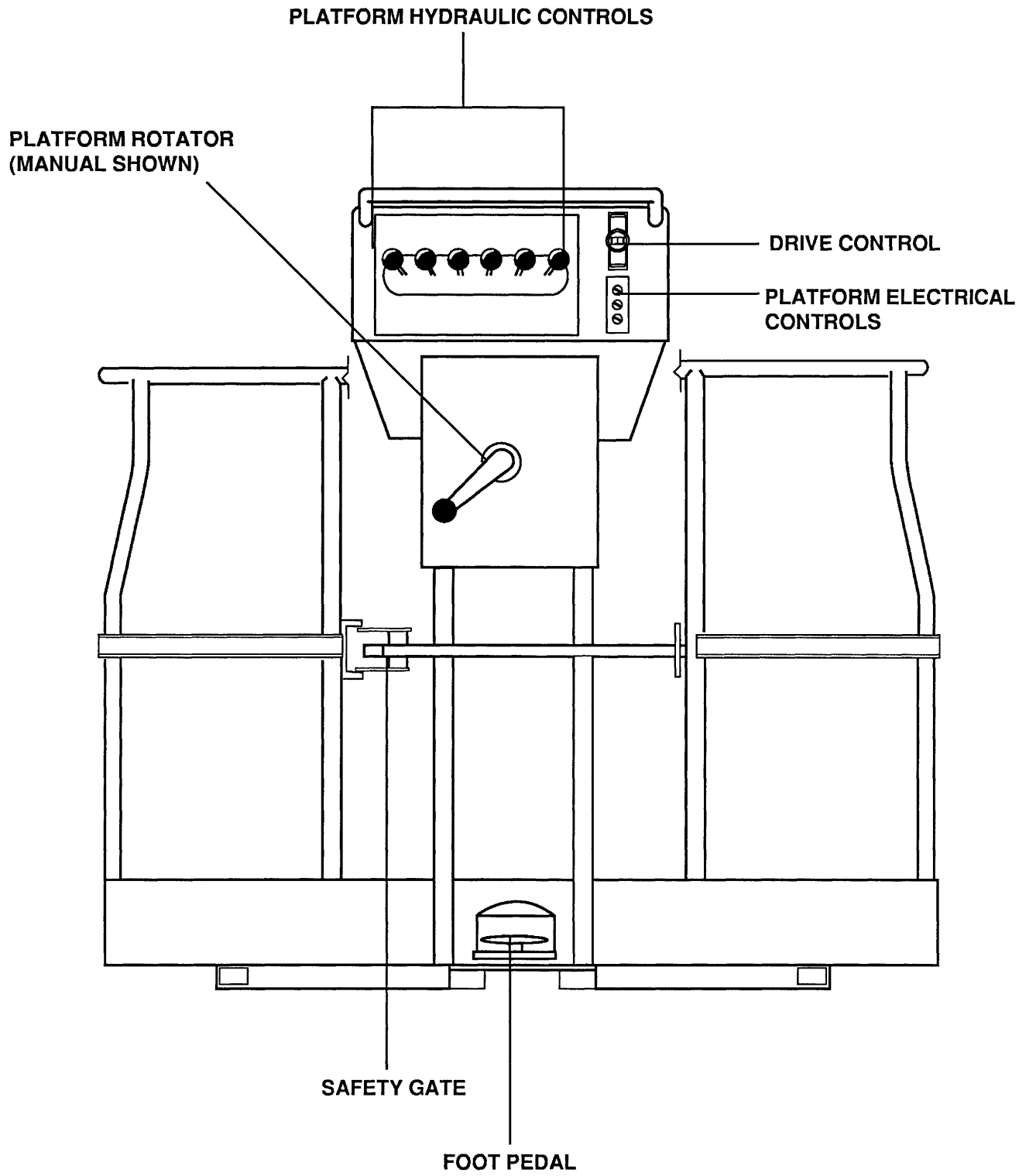
# UNDERCARRIAGE COMPONENT LOCATOR



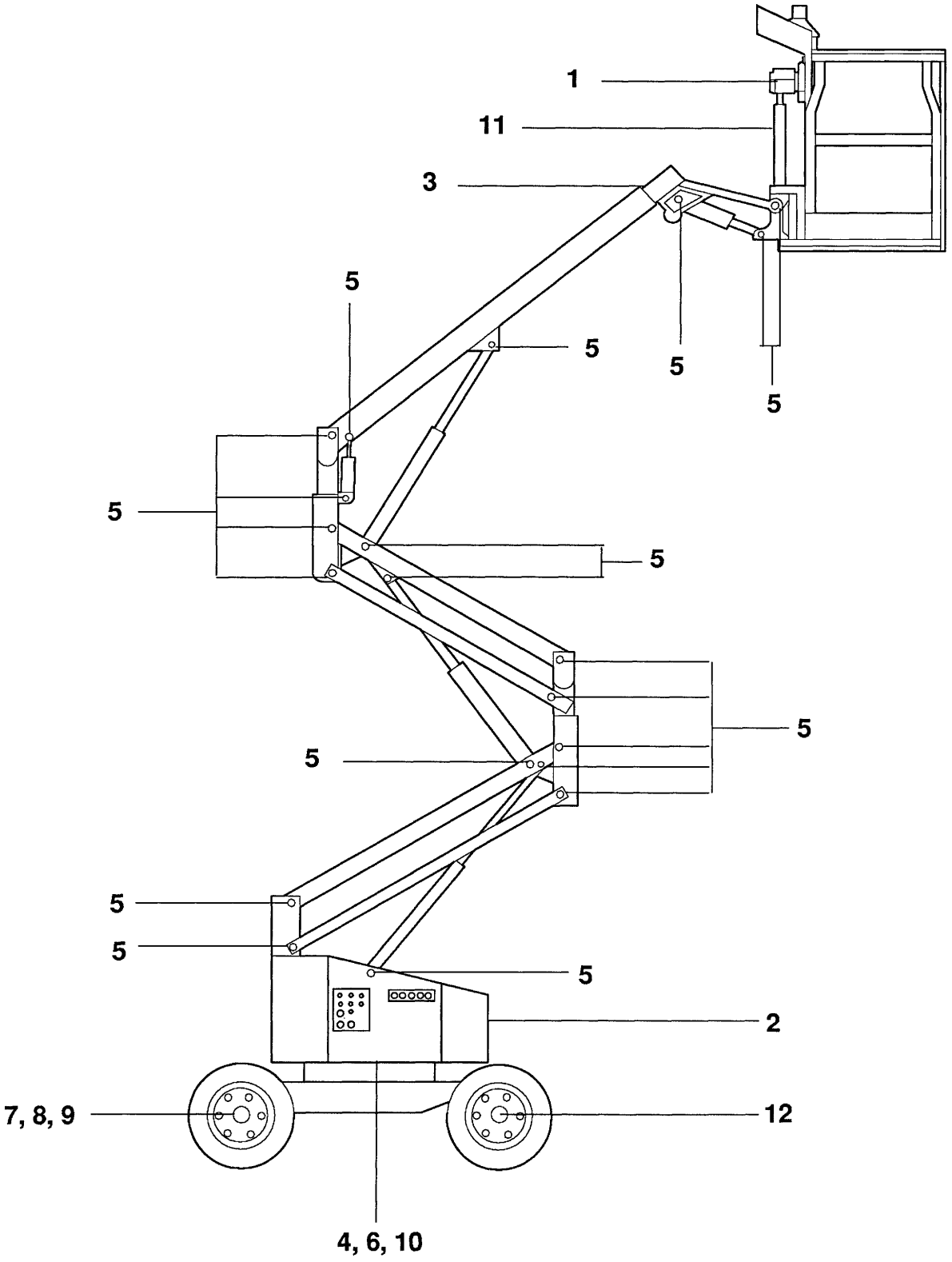
# SUPERSTRUCTURE COMPONENT LOCATOR



# PLATFORM COMPONENT LOCATOR
## (MODEL 41/24 SHOWN)



# LUBRICATION DIAGRAM



# LUBRICATION CHART

| ITEM NO. | DESCRIPTION | SPECIFICATION (QUANTITY) | FREQUENCY OF LUBRICATION |
|---|---|---|---|
| 1 | PLATFORM ROTATOR GEAR BOX | EP - 90W (HALF FULL) | CHECK MONTHLY OR EVERY 100 HRS. *, CHANGE YEARLY OR EVERY 1,000 HRS.* |
| 2 | HYDRAULIC RESERVOIR | MOBIL DTE-15 TO FULL MARK W/ CYLINDERS RETRACTED | CHECK DAILY, ANALYZE EVERY 6 MONTHS, CHANGE YEARLY. |
| 3 | BOOM SLIDE | WD-40 OR SILICONE SPRAY | MONTHLY OR EVERY 100 HRS.* |
| 4 | SWING BEARING | LUBRIPLATE #630-2 (PURGE OLD GREASE) | MONTHLY OR EVERY 100 HRS.* |
| 5 | PIVOT PINS | EP N.L.G.I. #2 (PURGE OLD GREASE) | MONTHLY OR EVERY 100 HRS.* |
| 6 | SWING BEARING GEAR TEETH | EP N.L.G.I. #2 GREASE OR DRI-LUBE (MOLYKOTE 321R OR EQUIVALENT) | EVERY 6 MONTHS OR 500 HRS.* |
| 7 | STEERING SPINDLES | EP N.L.G.I. #2 (PURGE OLD GREASE) | MONTHLY OR EVERY 100 HRS.* |
| 8 | STEERING HUB BEARINGS | LUBRIPLATE #630-2 (CLEAN AND REPACK) | YEARLY OR EVERY 1,000 HRS.* |
| 9 | STEERING LINKAGE | EP N.L.G.I. #2 (PURGE OLD GREASE) | MONTHLY OR EVERY 100 HRS.* |
| 10 | SWING DRIVE GEAR BOX<br>TOP BEARING (41/24) | EP-90W (TO FILL PLUG)<br>EP N.L.G.I. #2 | CHECK MONTHLY OR EVERY 100 HRS.*, CHANGE EVERY 12 MONTHS. |
| 11 | PLATFORM ROTATOR SHAFT | EP N.L.G.I. #2 (PURGE OLD GREASE) | MONTHLY OR EVERY 100 HRS.* |
| 12 | AXLE DIFFERENTIAL | EP-90W (TO FILL PLUG) | CHECK MONTHLY, CHANGE EVERY 6 MONTHS. |
| 13 | SPEED REDUCER | EP-90W (TO FILL PLUG) | CHECK MONTHLY, CHANGE EVERY 6 MONTHS |
| 14 | CONTROL VALVE HANDLE PIVOT PINS | WD40 OR SILCONE SPRAY | MONTHLY OR EVERY 100 HRS.* |

* WHICHEVER OCCURS FIRST.

# EMERGENCY PROCEDURES

**⚠ WARNING**

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

## EMERGENCY HAND PUMP

Each SILVER-EAGLE has an emergency hand pump which can be operated from the ground control station. The pump is located in the side compartment containing the hydraulic controls, mounted on top of the hydraulic tank.

To safely return the platform to the ground position, attach the handle (stored on top of the control panel) to the emergency pump. Close the release valve on top of the pump, pump the handle and operate the boom control levers to lower and retract the boom sections.

Always use caution in selecting the correct valve lever to bring the operator to safety.

## EMERGENCY MOVEMENT

The emergency pump will not provide control or operation of the drive or steering functions. Should it be necessary to move or steer the unit, you must do the following:

NOTE

Unit must be blocked or attached to the tow vehicle prior to the following steps.

## WITHOUT OPTIONAL TOWING PACKAGE:

Remove drive shaft from rear (drive) axle. Remove steering cylinder rod end pin from steering linkage, allowing steering wheels to track tow vehicle.

## WITH OPTIONAL TOWING PACKAGE:

Pull lever provided to disengage rear (drive) axle and pull control valve to allow steering wheels to track tow vehicle.

## EMERGENCY LOWERING

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

**⚠ WARNING**

**DO NOT TRY TO CLIMB DOWN THE BOOM.**

**HAVE AN EXPERIENCED OPERATOR USE THE EMERGENCY PUMP TO SAFELY LOWER THE PLATFORM.**

**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:**

- Remove foot from foot pedal.
- Turn off platform power switch immediately.
- Evaluate the nature of the failure. Return to the ground if possible. If the condition will not allow you to return to the ground, contact an experienced operator to lower the machine using the emergency hand pump and lowering procedure.
- **Report the incident to your supervisor immediately.**

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

**⚠ WARNING**

**DANGER!!! DO NOT TOUCH UNIT!!! DETERMINE THE CAUSE OF THE PROBLEM BEFORE YOU TOUCH THE MACHINE.**

**CORRECTIVE ACTION:**

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

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

**⚠ WARNING**

**DANGER!!! DO NOT TOUCH UNIT!!!!**

**CORRECTIVE ACTION:**

1. Contact authorized personnel to disconnect power supply touching unit.
2. Have someone summon first aid or rescue squad.
3. If operator is unconscious, check to see if he is in a pinned position.
4. AFTER POWER IS CUT, use the emergency lowering procedure to bring platform with operator to a safe location to render first aid.

**NOTE**

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

# HYDRAULIC FLUID

## HANDLING PRECAUTIONS

**⚠ WARNING**

**PERSONS IN REGULAR CONTACT WITH MINERAL OILS NEED TO BE AWARE OF THE IMPORTANCE OF THOROUGH HYGIENE, AND THE CORRECT METHODS FOR HANDLING MINERAL OILS 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 intelligently. Protective clothing and proper washing facilities should be provided or be accessible.

**⚠ WARNING**

**HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE THE SKIN, DAMAGE EYES, AND 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 SURGICALLY REMOVED WITHIN A FEW HOURS BY A DOCTOR FAMILIAR WITH THIS TYPE OF INJURY.**

## FLUID RECOMMENDATIONS

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

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

For operation in tropical climates, the use of MOBIL DTE-16 is allowable.

## FLUID CONTAMINATION CHECKS

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

- Any time the engine driven 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.
- If valve spools at either operator's station have continuous sticking problems which are not corrected by lubrication.
- Once a year, under normal operating conditions.
- Every 6 months, in extremely dusty or dirty operating conditions.

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

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

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

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

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

## SYSTEM FLUSHING PROCEDURE

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

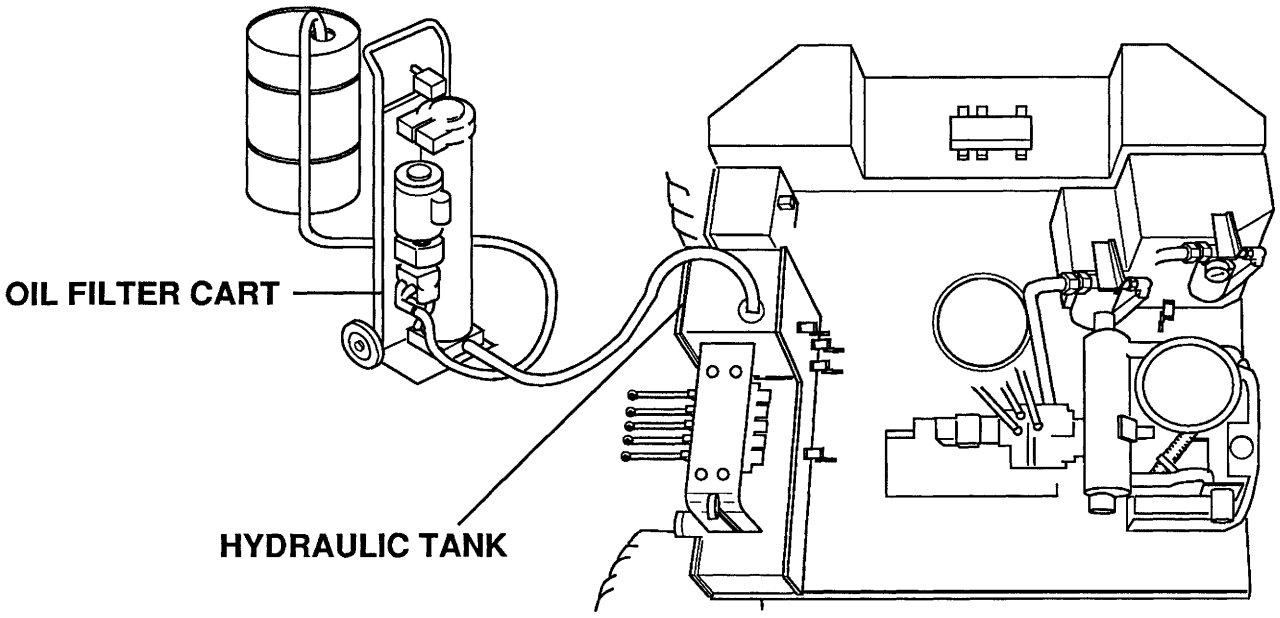
When the hydraulic tank is empty, remove suction hoses between tank and pump. Remove hoses between pump and main valve bank. Flush the hoses. Remove hydraulic fluid filter, and flush the filter body and attaching hoses. Discard old filter element and replace.

With hoses removed from the hydraulic tank, open tank bottom drain and 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 container used for the reservoir fluid.

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 line valves are opened 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.

Disconnect coil wire from engine. Crank engine (at six-second intervals) for 30 seconds. Connect coil wire and turn engine "ON". Turn "Power Control" knob clockwise to engage pump. Use care when doing this as hydraulic fluid is now being returned to container provided above. This will remove old fluid from the rest of the hydraulic system as each function is cycled to its maximum limits.




**Filling Hydraulic Tank.**

**⚠ CAUTION**

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

Three cycles of ALL hydraulic cylinder functions should remove enough old hydraulic fluid from the system.

Flush the drive motors with the WHEELS BLOCKED OFF OF THE GROUND AND THE ENGINE OFF. Remove one of the two hoses from the drive motor. Direct both that hose and another "jumper" hose into a pan to catch the fluid. Start the engine and operate only long enough to purge the fluid from both hoses. Reconnect the hose to the drive motor.

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

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

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

# HYDRAULIC SYSTEM

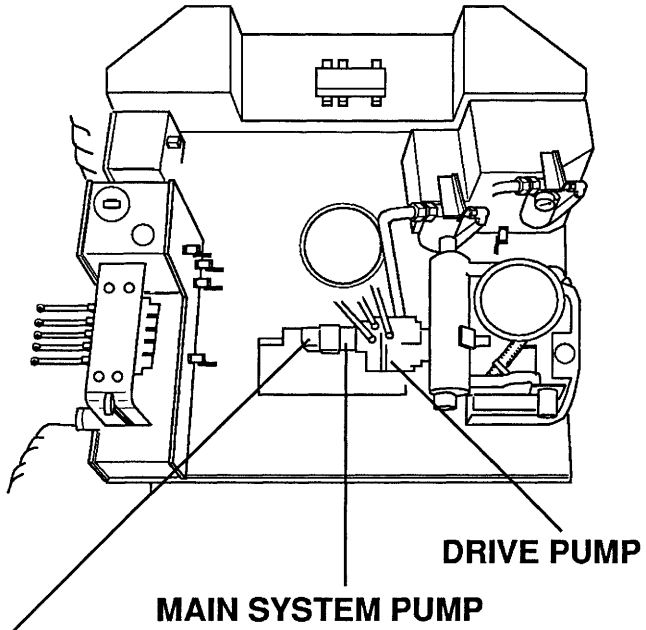
Following is a description of the major components of the SILVER-EAGLE hydraulic system.

## PUMPS

The following engine driven hydraulic pumps are used to operate the various machine functions:

### A. DRIVE PUMP

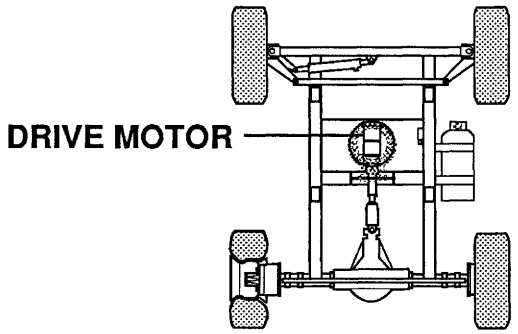
This hydrostatic pump is a variable displacement axial piston pump connected in a closed loop circuit to a fixed displacement axial piston motor. This pump is driven by the engine and provides hydraulic fluid flow to the drive motor when the pump control shaft is moved in one direction or the other. The pump control shaft determines the direction of fluid flow to the motor, allowing forward or reverse travel. The pump also contains a built in charge pump. The charge pump provides hydraulic fluid to the pump/ motor closed loop circuit, in order to replenish any fluid loss due to internal leakage and to prevent pump cavitation. Maximum drive pump pressure is limited by a cross port relief valve (refer to "Machine Specifications"). Since the pump/ motor circuit is a closed loop, either side can be pressurized, depending on travel direction. The cross port relief valve protects either drive hose as required.




**Hydraulic Pump Locations.**

### B. DRIVE MOTOR

A fixed displacement axial piston motor is mounted to the undercarriage of the machine. This motor is driven by hydraulic fluid flow provided by the drive pump. The direction of rotation and speed of this motor depend on the flow from the drive pump. System pressure is dependent on the load on the machine.



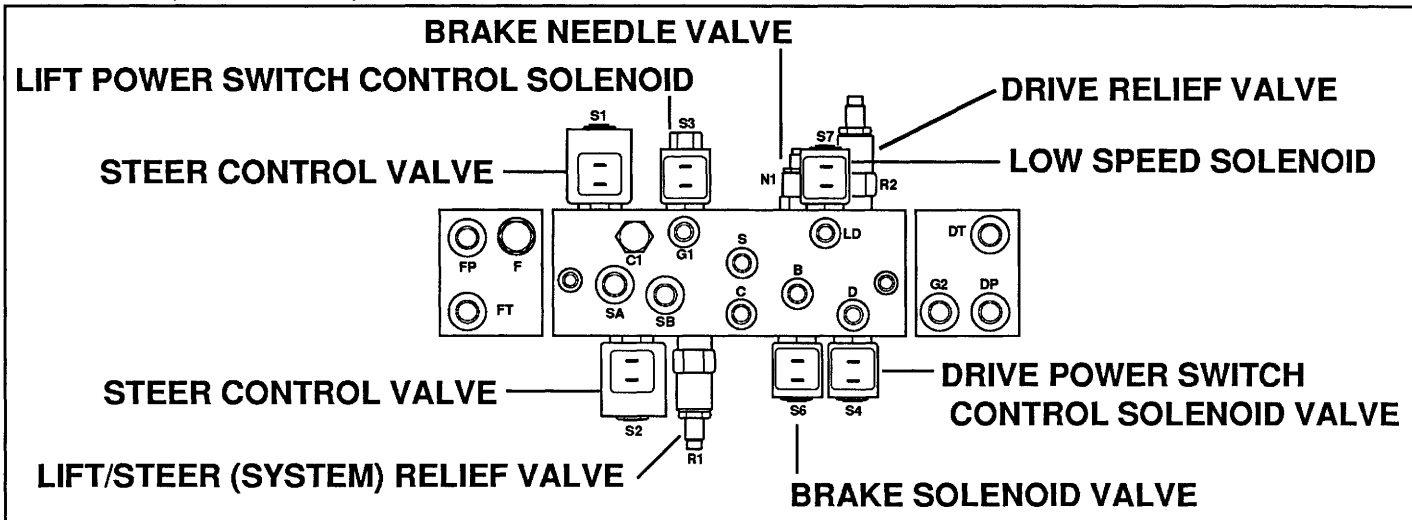

**Drive Motor Location.**

### C. MAIN SYSTEM AND DRIVE CONTROL TANDEM PUMP

This tandem pump, mounted on the end of the drive pump consists of two gear pumps coupled end to end.

One of these pumps provides fluid to operate all the machine functions except "DRIVE" and the drive controller. This pump supplies the system manifold block to operate the functions as selected by the operator, when either the ground control power switch or platform foot switch are activated.

The other pump provides fluid to operate the drive controller and brake. This pump also supplies fluid to the system manifold block. When the platform foot switch is activated, fluid is directed to the drive controller and to the spring applied, hydraulically released brake.




**Valve Manifold Block**

## MANIFOLDS

The hydraulic system manifold block, located on the superstructure base, controls hydraulic fluid flow to operate the lift, drive and brake functions of the machine.

Hydraulic fluid flow from the engine mounted tandem pump is directed to the manifold and dispersed to the valves controlling machine functions through ports identified by letters or numbers stamped into the manifold block. Refer to "Machine Specifications" for system pressures.

**Port marked "FP".** Hydraulic fluid from the larger gear pump enters at this port. Fluid flows through the manifold, **steering control valves** and **lift power switch control solenoid** (normally open), back to the reservoir. When a lift function is selected, the lift power switch control solenoid valve closes, causing fluid to leave the manifold by the **port marked "F"**, where it enters the ground control valve bank to operate the selected boom function.

**Port marked "DP".** Hydraulic fluid from the smaller gear pump enters at this port. Fluid flows through the **drive power switch control solenoid valve** (normally open) back to the reservoir. When the "DRIVE" function is selected (from the operators platform only), the drive solenoid valve closes, causing fluid to flow to **port "D"**, then up the boom to the operator's drive controller valve.

**Ports marked "SA" and "SB".** These ports direct fluid flow from the electrically controlled **steering control valves** mounted on the manifold block to the double-acting steer cylinder end ports to steer the wheels left or right.

**Ports marked "FT" and "DT".** There is one "T" port located at each end of the manifold to allow fluid flow back to the hydraulic fluid reservoir.

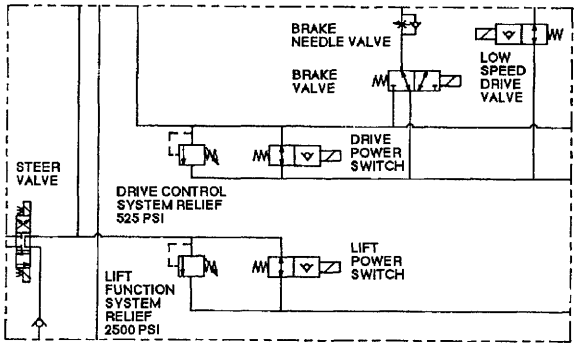
The **Lift function and steering relief valve** acts to regulate pressure in the lift circuit.

The **Brake solenoid valve** controls fluid flow to the brake. Whenever the drive function is selected, this valve opens to release the brake.

The **Brake needle valve** is an adjustable needle valve in the brake line. It allows a free flow of fluid to release the brake and controls flow when the brake is engaged to prevent sudden stops. Fluid leaves the manifold through **Port "B"** for the brake function.

The **Drive control relief valve** acts to prevent component damage due to excessive pressure in the drive/ brake control system.

Ports other than those listed above are not in use.




**Hydraulic Schematic**

## MANIFOLD MAINTENANCE

Operate the engine, and check the manifold block and solenoid securing bolts for tightness. Check the security and condition of hoses, cables and wire connections.

## MANIFOLD ROUTINE SERVICE CHECKS

Refer to "Machine Specifications" to determine coil resistance values.

### 1. Lift power switch control solenoid.

Turn on main power key switch. Use a Volt-Ohmmeter to check for power at lift power switch control solenoid coil when ground power switch is turned on. With power supplied to coil, valve will operate unless coil is open. Check for open coil with an Ohmmeter across the coil leads. The problem, if electrical, may be caused by a bad switch, or by a loose wire in the ground control cabinet or the platform foot pedal switch.

### 2. Drive power switch control solenoid valve.

Turn on main power key switch. Turn ground/ platform switch to "PLATFORM" position. Connect a Volt-Ohmmeter between wire #25 and wire #49 of drive solenoid. Turn the platform ignition switch to the "ON" position, and press foot pedal on platform. Power should be available at wire #49 of drive solenoid. Check valve coil with an ohmmeter.

If drive solenoid valve sticks, it may have to be removed from the manifold to check for contamination.

### 3. Steering control valves and solenoids.

Turn on main power key switch. Turn ground/ platform switch to "PLATFORM" position. Use a Volt-Ohmmeter to check for power at both steering valve solenoids. When the steering switch (at the drive control handle) is pushed, there should be power at one coil for "STEER RIGHT" and at the other coil for "STEER LEFT". Check the coils using an ohmmeter.

If the valve spool sticks, the valve should be removed for inspection. Clean or replace as necessary.

### 4. Brake solenoid valve.

Turn on main power key switch. Turn ground/ platform switch to "PLATFORM" position. Connect a Volt-Ohmmeter between wire #25 and wire #19 on brake solenoid. Enter platform and start engine. Press foot pedal, turn lift/ drive switch to "DRIVE" position and slowly move drive controller forward.

The meter should indicate power to the brake solenoid valve. If necessary, install a tee with pressure gauge in the brake line to see if the brake is being pressurized when the brake solenoid valve is on. The pressure gauge should read the same as the drive controller system pressure. If the meter shows voltage, but no pressure is indicated, the solenoid valve coil may be bad. This coil should be checked using an ohmmeter.

If the brake solenoid valve sticks, it may have to be removed from the manifold to check for contamination.

Malfunction of the brake solenoid can also be caused by the neutral sense control relay keeping the circuit open to the brake solenoid. If, however, the movement alarm sounds when trying to drive the machine, the relay is functioning and the problem is in the brake solenoid valve.

### 5. Low speed drive valve.

The low speed drive solenoid valve is controlled by the boom limit switches. When the booms are in the stowed position, this valve will be closed (not energized). With engine running, foot pedal pressed, and drive controller moved "FORWARD", a meter will indicate voltage when connected between wire #75 and wire #25 at the solenoid. When a boom is raised, opening a limit switch, power to the solenoid should be cut off.

The solenoid coil should be checked using an ohmmeter. Power is supplied to the low speed drive valve through the same relays that supply the brake valve.

Possible failure points for the low speed drive valve:

- A bad boom limit switch.
- An open low speed drive solenoid coil.
- A sticking low speed drive valve.

NOTE

The low speed drive solenoid valve is designed to fail in the "open" position, in order to prevent high speed travel after a component failure.

## RELIEF VALVES

NOTE

Refer to "Machine Specifications" to determine maximum system pressures for your SILVER-EAGLE.

### LIFT/ STEER SYSTEM RELIEF VALVE

To check lift/ steer system relief valve setting, connect pressure gauge to pressure test fitting, located at the pump input port of the ground control valve bank. Select "GROUND" at the platform/ ground selector switch. Turn the main power switch "ON". With BOOM FULLY RETRACTED, operate the telescope lever "IN". In this situation, fluid will be directed through the system relief valve. Note pressure reading.

To adjust lift/ steer system relief valve, turn adjusting bolt on the end of the valve CLOCKWISE TO INCREASE PRESSURE, and COUNTERCLOCKWISE TO DECREASE PRESSURE.

With BOOM FULLY RETRACTED, continue to operate the telescope lever "IN" while turning adjusting bolt until proper reading is achieved. Lock the adjusting bolt.

### DRIVE SYSTEM RELIEF VALVE

To check drive system relief valve, connect pressure gauge to port "D" of the hydraulic system manifold block. Select "PLATFORM" at the platform/ ground selector switch, and depress the foot pedal. Note pressure reading.

To adjust drive system relief valve, turn adjusting bolt on the end of the valve CLOCKWISE TO INCREASE PRESSURE, and COUNTERCLOCKWISE TO DECREASE PRESSURE. Turn adjusting bolt until proper reading is achieved. Lock the adjusting bolt.

## HYDRAULIC FLUID RESERVOIR

The hydraulic fluid reservoir consists of the tank, a filler cap with strainer, a return line defuser, and a suction filter. An emergency hand pump is also included as a permanent part of the hydraulic circuit, for emergency use.

### HYDRAULIC RESERVOIR MAINTENANCE

Check tank for signs of leakage. Inspect tank securing bolts for tightness. Check hand pump operation by closing the release valve, engaging one of the machine function levers and operating the pump handle.

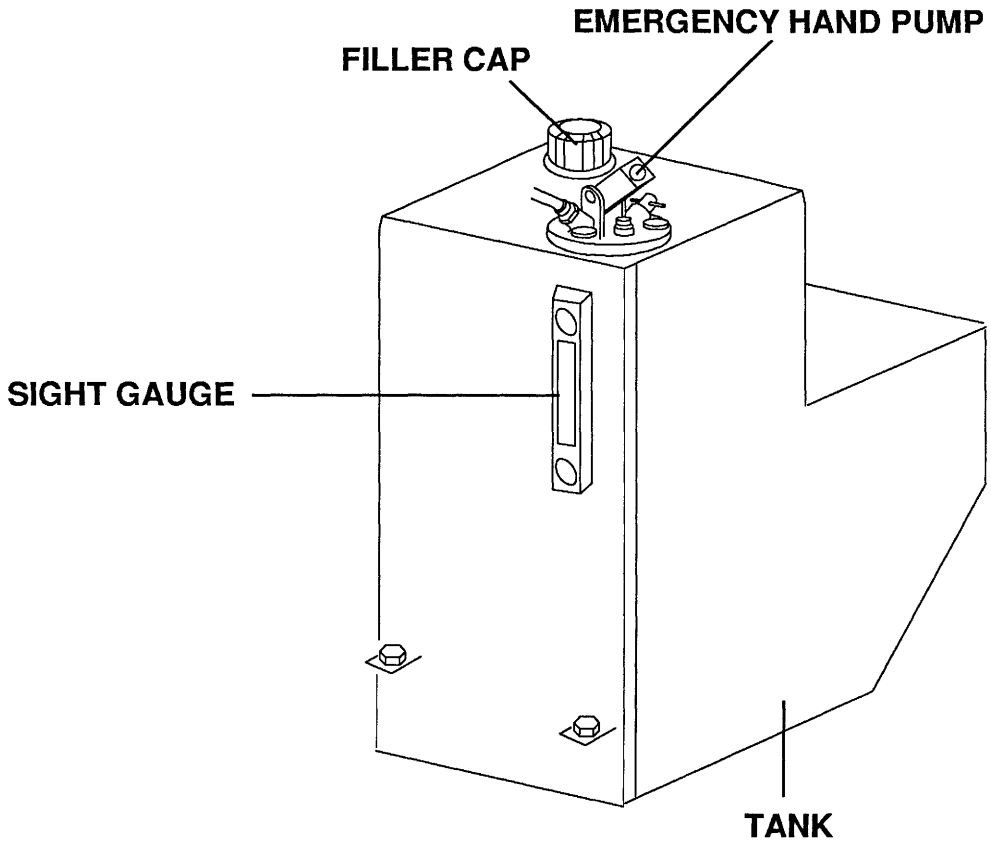
## EMERGENCY HAND PUMP

The emergency hand pump is located on top of the hydraulic tank. It is meant to be used only when the ground and platform controls are inoperative due to engine or pump system failure.

The pump handle is stored near the tank, and a release valve mounted on the pump must be closed before operating the hand pump. There is also a check valve in the hand pump to ground valve bank hose.

Check the operation of the emergency hand pump (see "Hydraulic reservoir maintenance").

Check for leaks around the pump gasket. If the hand pump will not operate, the internal filter may be clogged. Remove the filter and clean it by backwashing.



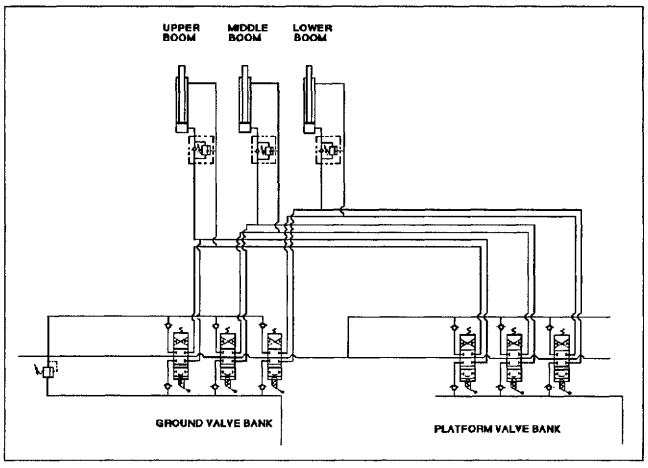

**Hydraulic Tank.**

# BOOM LIFT SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to the ground and platform hydraulic control valve banks.

All boom functions are then controlled by moving the proper control lever in the desired direction. THE SPEED OF BOOM MOVEMENT IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.

Each boom function is controlled by a double acting cylinder. Each cylinder contains a counterbalance valve, which prevents the cylinder from retracting should a base end hose or fitting develop a leak. When a boom section 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 tank.




**Lift System Hydraulic Schematic**

# BOOM LIFT SYSTEM TROUBLESHOOTING

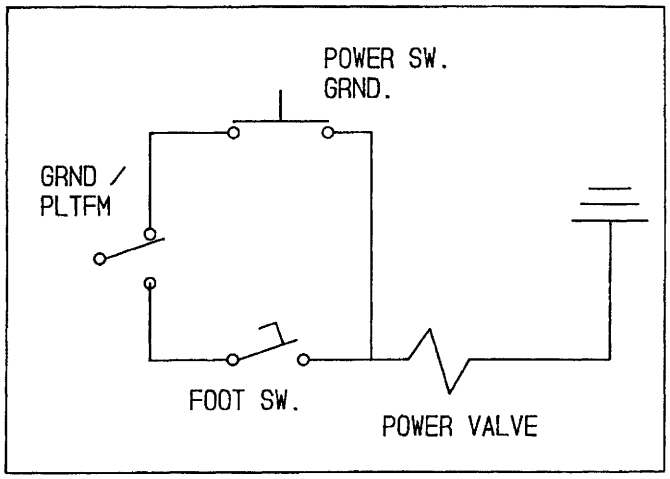
**Problem: No boom functions operate from either ground or platform control stations.**

Check boom functions from ground control station with engine shut off, using emergency hand pump.

If ALL BOOM SECTIONS CAN BE RAISED AND LOWERED slightly with the hand pump, the ground control valve bank is good, and it will be necessary to investigate the hydraulic system, or electrical control system ahead of the control valve banks.

If any boom function FAILS TO OPERATE FROM THE GROUND CONTROL PANEL, using the hand pump, the problem may be in the ground control valve bank. Check the inoperative boom function with the platform control and the hand pump.

If any boom function FAILS TO OPERATE FROM THE PLATFORM CONTROL PANEL using the hand pump, the problem may be a defective holding valve. Remove the holding valve to check for foreign material or internal damage. If faulty, the holding valve must be replaced.




**Electrical Schematic**

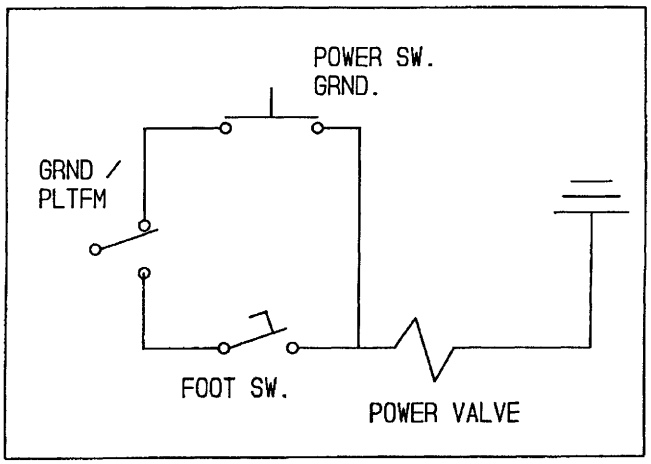
## BOOM EXTEND SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to both the ground and platform hydraulic control valve banks.

The boom extend (telescope) cylinder is then controlled by moving the telescope control lever in the desired direction. THE SPEED OF EXTEND OR RETRACT IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.

The boom extend cylinder is a double acting cylinder, and contains a double acting check valve block located at its base. This check valve prevents the cylinder from moving in or out in the event of a hose or fitting failure. Cylinder movement should only occur when the control valve lever is moved to the "IN" or "OUT" position.

When extending the boom, fluid flows to the base end of the extend cylinder, with a pilot pressure in the base check valve opening another check valve in the rod end. This allows the fluid displaced by the piston inside the cylinder to flow out of the rod end and back to the tank. When the boom is retracted, fluid flow to the rod end of the cylinder opens the base end check valve, allowing displaced fluid to return to the tank. This prevents the boom from extending or retracting unless called for by a control valve.




**Electrical Schematic**

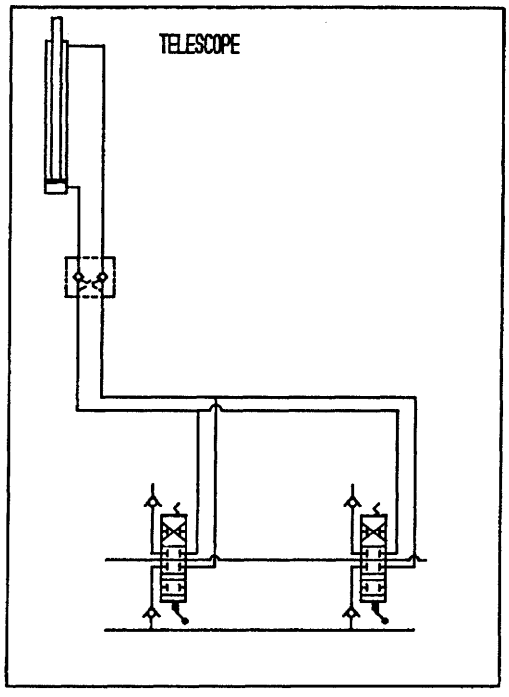
## EXTEND SYSTEM TROUBLESHOOTING

**Problem: Boom will not extend from either ground or platform control stations.**

Check boom extend function from ground control station with engine shut off, using emergency hand pump. If boom CAN BE EXTENDED AND RETRACTED SLIGHTLY with the hand pump, the ground control valve bank is good, and it will be necessary to investigate the hydraulic system manifold, or electrical control system.

If boom FAILS TO EXTEND OR RETRACT FROM THE GROUND CONTROL PANEL using the hand pump, the problem may be in the ground control valve bank. Check with the platform "Boom Telescope" control and the hand pump.

If boom extend function FAILS TO OPERATE FROM THE PLATFORM CONTROL PANEL using the hand pump, the problem may be a defective double acting check valve, or bad cylinder rod packing. Disassemble check valve to check for foreign material or internal damage. Replace if faulty. If necessary, disassemble cylinder for inspection.




**Extend System Hydraulic Schematic**

## SWING SYSTEM

When the power switch at the ground control station is turned and held, or the foot pedal on the platform floor is pressed and held, fluid is sent from the manifold block to the ground and platform hydraulic control valve banks.

Superstructure swing (rotation) is then controlled by moving the swing control lever in the desired direction, left (clockwise) or right (counterclockwise). SPEED OF SWING IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW. Pressure relief is provided by the system relief valve.

The hydraulic swing motor is a gear motor that drives through the swing gearbox to rotate the superstructure. Change in the direction of the flow of hydraulic fluid through the motor leads to left or right swing.

The swing gearbox output pinion gear mates with teeth on the swing bearing mounted to the undercarriage.

The superstructure can swing 360 degrees (non-continuous). There is a mechanical stop to prevent overtravel.

### SWING SYSTEM TROUBLESHOOTING

**Problem: Swing motor will not run in either direction.**

Check swing function from ground control station with engine shut off, using hand pump.

If swing FUNCTIONS with the hand pump, check lift power switch control solenoid valve at hydraulic system manifold block.

If swing DOES NOT FUNCTION with the hand pump, check for mechanical malfunctions.

The mechanical swing stop may be preventing rotation in one direction. Try to operate swing function in opposite direction.

The swing gearbox pinion shaft may be broken. Remove and disassemble worm drive swing gearbox and replace pinion shaft. Re-install gearbox. Be sure bolt heads are recessed in the motor mounting bracket. Check for proper gear adjustment.

The hydraulic swing motor shaft may be broken. Remove and replace swing motor.

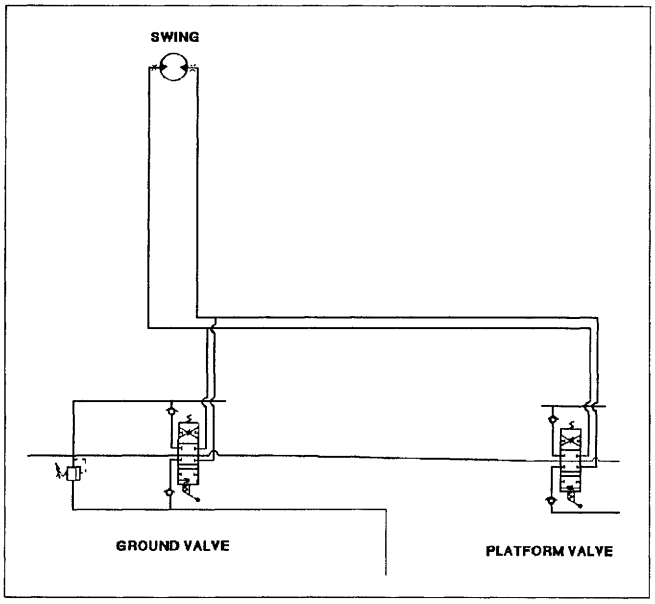
The swing motor pinion key to the gearbox may have sheared off. Remove and replace key.

### SWING GEAR ADJUSTMENT

If the pinion gear teeth are not engaged properly to the teeth on the swing bearing, loosen the four mounting bolts holding the swing motor mounting bracket.

Turn the worm gear shaft (on the side of the motor housing) with a socket wrench until the pinion gear teeth mesh properly.

Tighten the adjusting screw to obtain .004 to .006" (.10 to .15 mm) gap at gear teeth. Check for minimal backlash and NO INTERFERENCE throughout entire range of swing gear travel. Tighten lock nut on adjusting screw. Tighten the mounting bolts to the recommended torque.

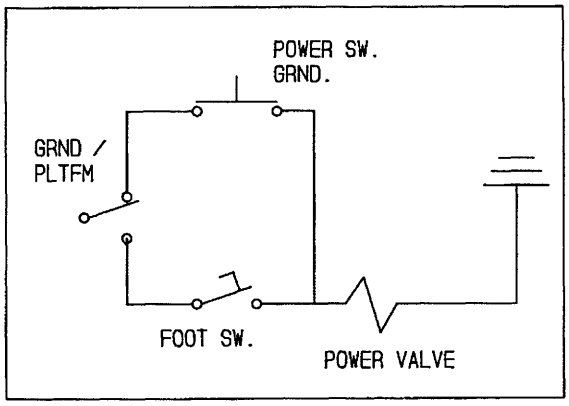



**Swing System Hydraulic Schematic**

# PLATFORM LEVELING SYSTEM

The platform leveling system automatically keeps the platform level, using a master/ slave cylinder arrangement. As the upper 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 occasionally need to be added to the leveling circuit through the platform leveling control valve.

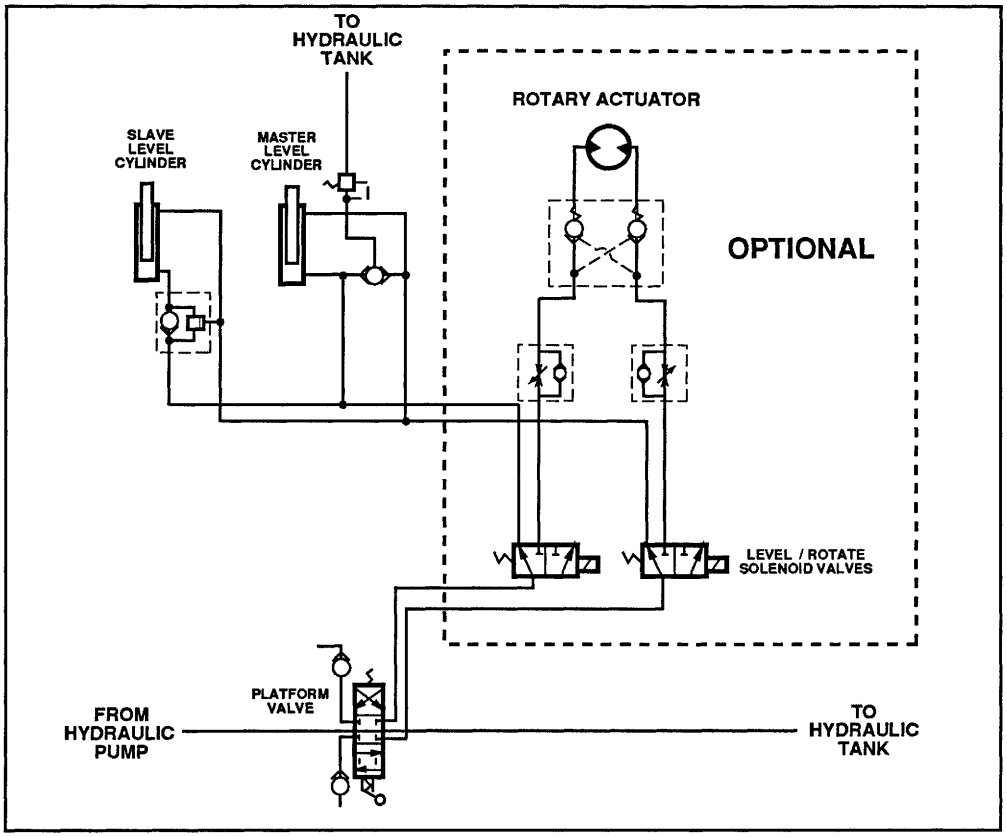
The platform leveling system is only controlled from the platform controls. The ground/ platform selector switch on the ground control panel must be in the "PLATFORM" position. With the foot switch depressed, you can now level the platform by moving the platform level control lever in the direction desired. AMOUNT OF CONTROL LEVER THROW CONTROLS SPEED OF LEVEL.




**Electrical Schematic**

A holding valve on the slave cylinder acts as a safety valve in case of a hose or fitting failure. The holding valve prevents unintended travel of the platform through the use of a counterbalance valve, which is opened only by pilot pressure from the control valve or master cylinder.

On models equipped with the optional hydraulic platform rotator, hydraulic fluid flows to the platform leveling circuit from the platform control valve through a pair of 3-way, 2-position control valves mounted behind the platform control console.




**Platform Level/Rotate Hydraulic Schematic**

### PLATFORM LEVELING SYSTEM TROUBLESHOOTING

**Problem: Platform will not react to platform level control lever movement.**

With foot pedal depressed, move control lever in both directions. If platform DOES NOT RESPOND at all, one or both solenoid activated control valves may not be shifting (models with hydraulic rotator). If platform ATTEMPTS TO MOVE or LEAKS DOWN (slowly drifts out of position), the problem is at slave cylinder.

**Problem: Platform leaks down.**

Remove line from slave cylinder holding valve to control valve.

If platform leaks down and hydraulic FLUID FLOWS from holding valve, remove holding valve and inspect it for damage or dirt. Clean or replace as necessary.

If cylinder leaks down, but NO FLUID FLOWS from holding valve, problem is in slave cylinder. Remove, inspect and repack the slave cylinder as needed.

## PLATFORM ROTATE SYSTEM

A hydraulic platform rotator is an available option on the SILVER-EAGLE.

The optional hydraulic platform rotate circuit consists of a rotary actuator locked in position by a double acting pilot operated check valve. Rotation of the platform is controlled through the shared use of the platform leveling control valve, which is found only on the platform control panel.

The ground/ platform selector switch on the ground control panel must be in the "PLATFORM" position, and the level/ rotate selector switch must be in the "ROTATE" position. With the foot pedal depressed, you can now rotate the platform by moving the platform level/ rotate control lever in the direction desired. SPEED OF ROTATION IS PROPORTIONAL TO THE AMOUNT OF CONTROL LEVER THROW.

### ROTATE SYSTEM TROUBLESHOOTING

**Problem: Platform will not react to platform rotate control lever movement.**

Adjust the flow controls (located between the control valves and the pilot operated check block) to see if that will allow the platform to rotate.

If that does not solve the problem, turn level/ rotate selector switch to the "LEVEL" position, and operate the platform level control. If the leveling circuit works, the problem is not in the manual control valve.

Turn level/ rotate selector switch to the "ROTATE" position, and operate the control in both directions.

If rotator does not operate IN EITHER DIRECTION, one or both of the solenoid activated control valves is not shifting.

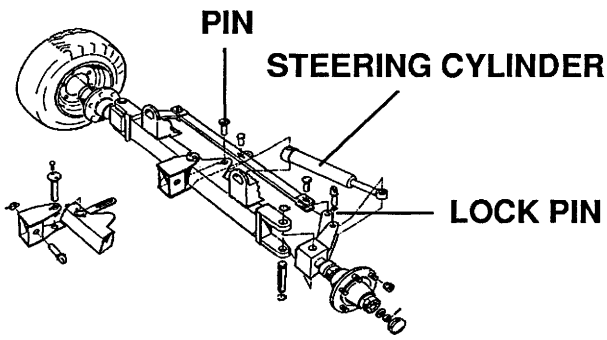
If rotator works IN ONE DIRECTION, look for physical constraints or foreign material restricting platform rotation.

**Problem: Platform rotates faster in one direction than the other.**

Re-adjust the flow controls (located between the control valves and the pilot operated check block) to allow smooth, even travel.

## STEER SYSTEM

The steering circuit is controlled by two steering control valves mounted on the hydraulic system manifold block. These valves are activated by a thumb button on top of the drive control lever. When the thumb button is pressed to steer "LEFT" or "RIGHT", the valve spools shift to allow fluid flow to either the rod end or blank end of the steer cylinder. The blank end of the steer cylinder is attached to the undercarriage, while the rod end is connected to the steering axle linkage. There is a lift and steering relief valve in the hydraulic system manifold block




**Steering Assembly Component Location**

### STEER SYSTEM MAINTENANCE

Check all pins on steering linkage for excessive play, and ensure that all clips are in place and secure. Lubricate linkage as necessary. Check steering cylinder pins for excessive play. Check cylinder and hoses for hydraulic fluid leakage and security.

### STEER SYSTEM TROUBLESHOOTING

**Problem: Unit will not steer; all other functions operate.**

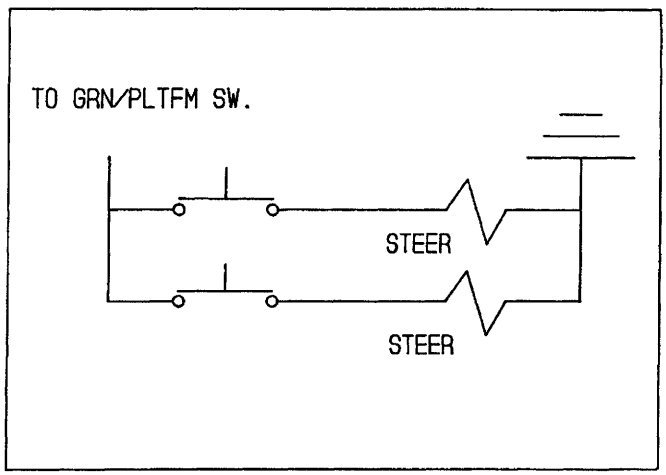
Steer cylinder may not be mechanically connected to steering linkage. Check for disconnected or damaged steering linkage.

The steering solenoid valves may not be shifting. The valve spool may be stuck, the solenoids may not be energizing, or there may be open wires in the steering circuit.

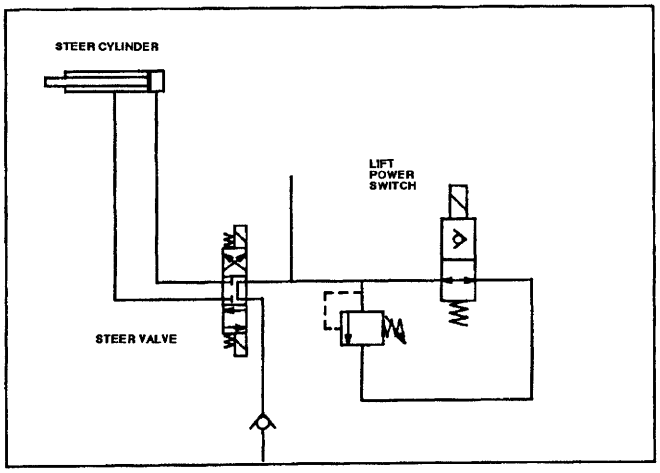
Locate steering valves on manifold. Check to see if the solenoids are being energized. If power is reaching the solenoids, either one or both solenoids are defective or a valve spool is obstructed. Remove valve and inspect, clean, repair or replace as needed. If solenoids are not being energized, check for continuity in the wire harness to the steering control switch on the drive lever.

NOTE

On units with the Tow Package option, check the steering tow release valve for proper position.




**Steer System Electrical Schematic**




**Steer System Hydraulic Schematic**

# DRIVE SYSTEM

Following is a description of the major components of the SILVER-EAGLE drive system.

## HYDROSTATIC TRANSMISSION

Hydrostatic drive systems are used to propel many types of equipment in numerous industries. The hydrostatic transmission on the SILVER-EAGLE consists of a variable displacement pump connected by hydraulic lines to a fixed displacement motor.

### A. DRIVE PUMP

This hydrostatic pump, driven by the engine, is a variable displacement axial piston pump with a control lever connected directly to a tiltable "swashplate". With the engine running and the control lever in the center (neutral) position, there is no stroking of the pistons and no fluid flow out of the pump.

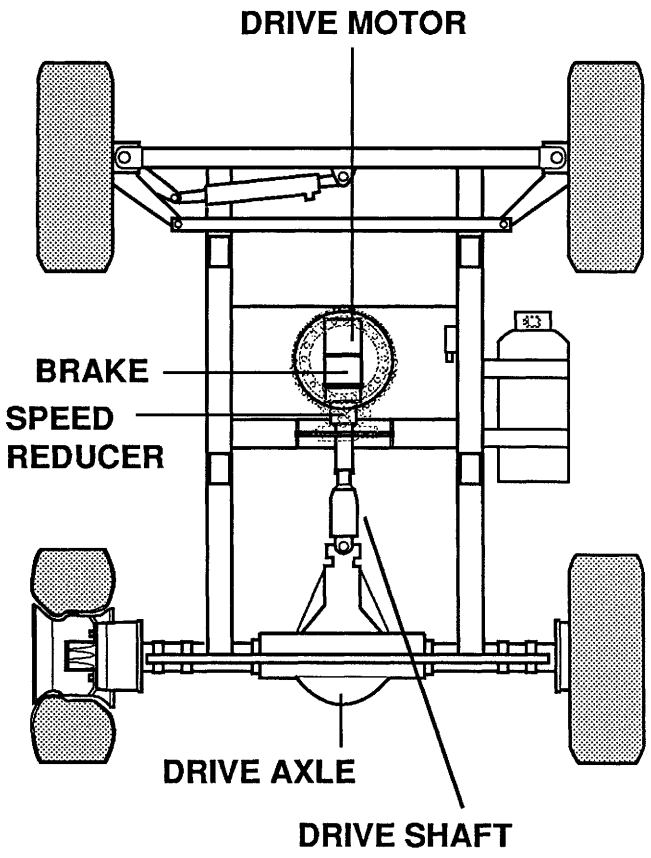
When the pump control lever is moved in the "FORWARD" direction, fluid will flow out of the pump in one direction. When "REVERSE" is selected, fluid will flow from the pump in the other direction.

### B. DRIVE MOTOR

This is a fixed displacement axial piston motor coupled to the drive train. As hydraulic fluid from the pump enters one port or the other, the motor shaft will rotate in one direction or the other. The system has a cross port relief valve to prevent component damage in either direction. The drive system will only develop sufficient pressure to move the machine.

**Drive motor maintenance**

Check all securing bolts for tightness. Check all hoses for security and signs of chafing.

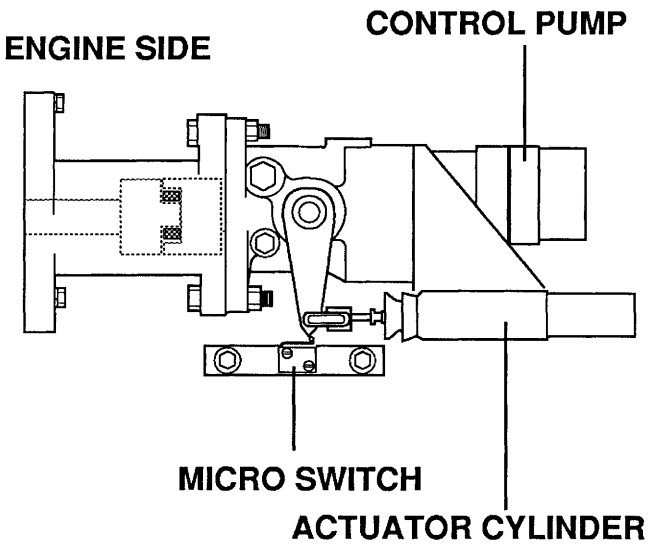



**Drive System Components**

## CONTROL CIRCUIT COMPONENTS

### A. DRIVE PUMP ACTUATOR (STROKE) CYLINDER

The drive swashplate (which varies pump direction and flow) is controlled by an actuating cylinder. This spring centered cylinder is controlled by the directional control valve (platform drive valve) at pressures up to the drive control relief valve setting. When the boom is raised, the center port of the actuating cylinder is opened to tank through a low speed drive solenoid valve, which limits the cylinder stroke (and machine speed).




**Control Circuit Components**

### B. DRIVE CONTROL VALVE

The drive control valve is a spring centered, variable flow, two-way valve. Hydraulic pressure does not reach the stroke cylinder until the power switch is turned or foot pedal is depressed, and the drive control handle is pushed in the desired direction. When the stroke cylinder is forced to one side, the hydraulic fluid from the other side of the cylinder travels back through the drive control valve and to the lines leading to the tank. When the handle is brought to the center position, both lines from the cylinder drain to the tank, allowing the drive pump to return to the center position.

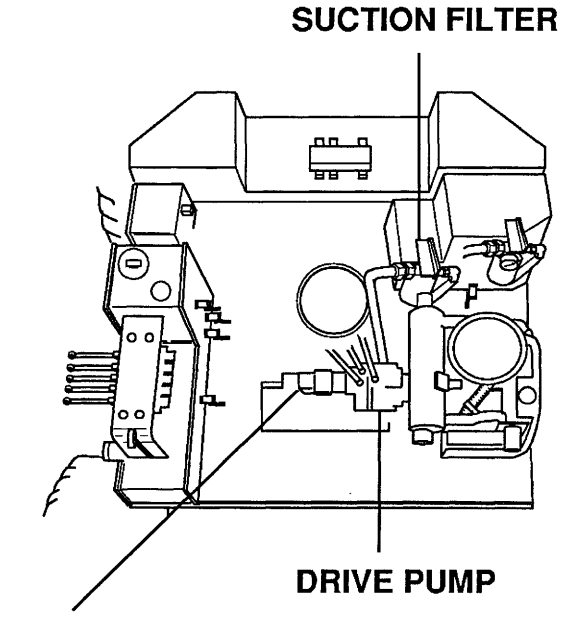
### C. DRIVE SYSTEM CONTROL PUMP

The drive control pump is the segment of the tandem pump mounted farthest from the engine. This gear pump delivers a constant pressure to the drive control valve and the brake system.

To set the pressure, install a pressure gauge in the circuit and adjust the pressure relief valve, which is mounted on the hydraulic system manifold block. Loosen the nut on the valve and adjust the valve to the correct pressure. Tighten the nut, watching that the pressure does not change. Remove the gauge.

### D. MICRO SWITCH

The microswitch (neutral switch) is depressed when the stroke arm is in the neutral position. With the foot pedal depressed and the stroke arm off of the microswitch, the brakes are released and the movement alarm sounds.




**Drive System Components**

## SUCTION FILTER

It is important that only clean hydraulic fluid enters the hydrostatic drive system. Therefore, a 25 micron (nominal rating) filter is used in the charge pump inlet line.

This filter is non-bypassing, and must be changed regularly (at least every 100 hours) to insure system reliability.

## BRAKE

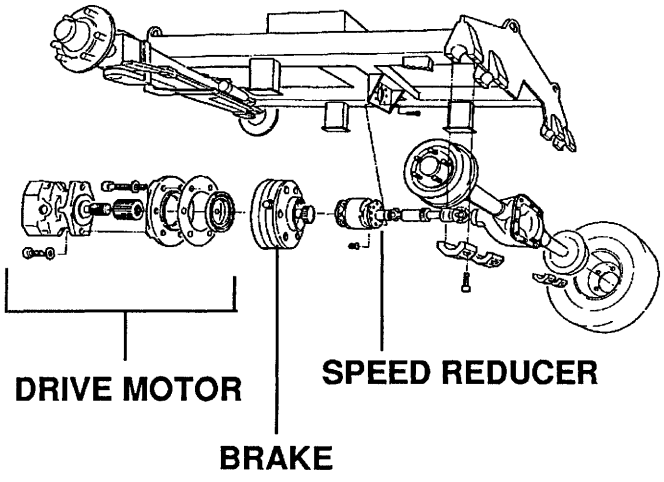
The spring applied, hydraulically released brake is mounted between the drive motor and the speed reducer. The brake is pressurized, causing it to release, whenever:

- the power switch at the ground control panel is turned and held, OR the foot pedal on the platform floor is pressed and held, AND
- a "drive" function is called for, AND
- the drive controller is moved from its center (neutral) position.

If, at any time during normal operation, the operator moves the drive controller to "NEUTRAL" or releases the power switch or foot pedal, the brake will engage, causing the machine to stop traveling. Brake engagement time is determined by the setting of the needle valve in the hydraulic system manifold block.

### BRAKE MAINTENANCE

Check brake oil level. Inspect gaskets for damage. Check for worn out discs or clogged breather plug.




**Brake Removal and Installation**

### BRAKE REPLACEMENT

Remove brake line, and drain the hydraulic fluid from the line. Open the drain plug on the brake, and drain the fluid. Remove the two bolts that hold the drive motor to the speed reducer through the brake. Separate the brake from the motor and reducer.

Position the new brake between the drive motor and speed reducer. Align all three items, and install the two bolts that hold the motor and brake to the reducer. Tighten the bolts.

Attach the brake line. BE SURE THE BRAKE DRAIN PLUG IS CORRECTLY INSTALLED. Add hydraulic fluid.

**⚠ WARNING**

**AFTER BRAKE SERVICING OR REPLACEMENT, TEST THE BRAKES TO ENSURE NO AIR IS TRAPPED IN THE BRAKE LINE, AND BLEED THE LINE IF NECESSARY.**

## SPEED REDUCER

Located between the brake and drive shaft is a single stage speed reducer, consisting of a sun gear and a set of planet (or satellite) gears mounted to a carrier. The speed reducer is in the drive train to reduce the drive motor RPM's, and develop the torque required to move the machine.

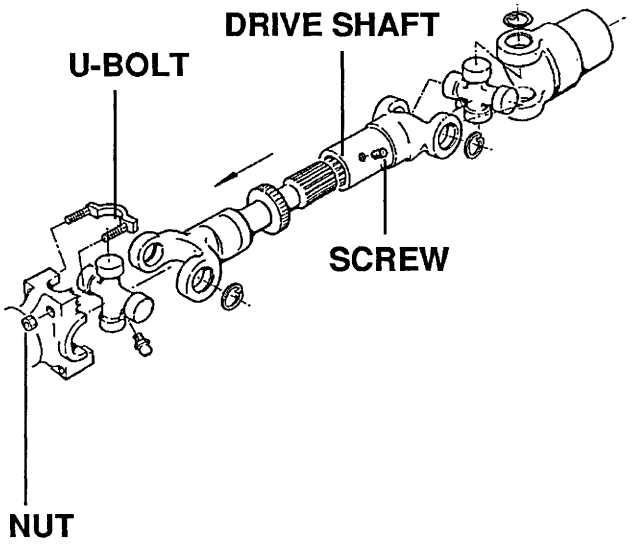
### SPEED REDUCER MAINTENANCE

Check all securing bolts for tightness. Check for oil leaks. Check the speed reducer oil level, and top off if necessary.

## DRIVE SHAFT AND COUPLING

### Drive Shaft Maintenance

Check the drive shaft securing bolts (at axle end) for tightness. Check the weld at gearbox end for cracks. Check the coupling for cracks and damage.




**Drive Shaft Removal and Installation**

### Drive Shaft Removal

Remove four nuts and two U-bolts from axle end of shaft. Disconnect bolts connecting drive shaft to gear reducer, and remove drive shaft. Remove retaining screw on drive shaft slip yoke, if necessary, to slide drive shaft apart.

### Drive Shaft Installation

Position the drive shaft, and bolt shaft to gear reducer. Line up U-joint to the axle yoke, and install U-bolts and nuts.

## REAR (DRIVE) AXLE

The rear (drive) axle assembly is a standard Ford light truck axle, with a hypoid gear set consisting of a ring gear and an overhung drive pinion supported by two opposed tapered roller bearings.

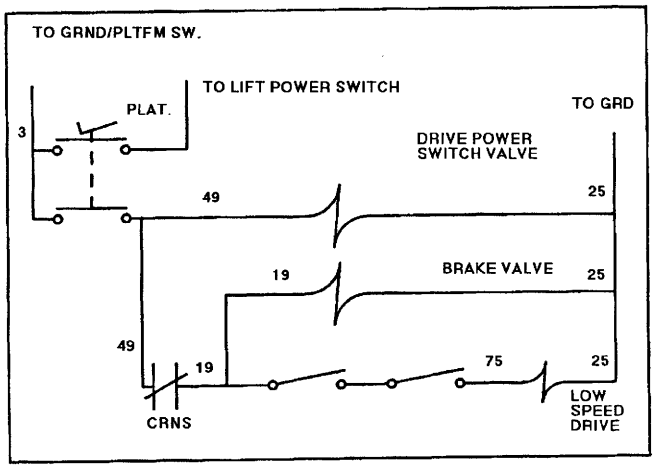
Pinion bearing preload is maintained by a pinion nut and selective shims, assuring seating of the inner and outer bearings. The axle housing assembly consists of a cast center section with two steel tube assemblies and a stamped center cover.

If center cover is removed, replace gasket or use RTV sealant (see Parts Catalog).

If removal or adjustment of the internal gears is required, it is recommended that Ford Truck Shop Manual FPS-12107-88A be obtained.

### REAR AXLE MAINTENANCE

Check all securing bolts for tightness. Check for oil leaks. Check the differential housing oil level and top off if necessary.




**Drive System Electrical Schematic**

# DRIVE SYSTEM TROUBLESHOOTING

**Problem: Unit will not drive either direction.**

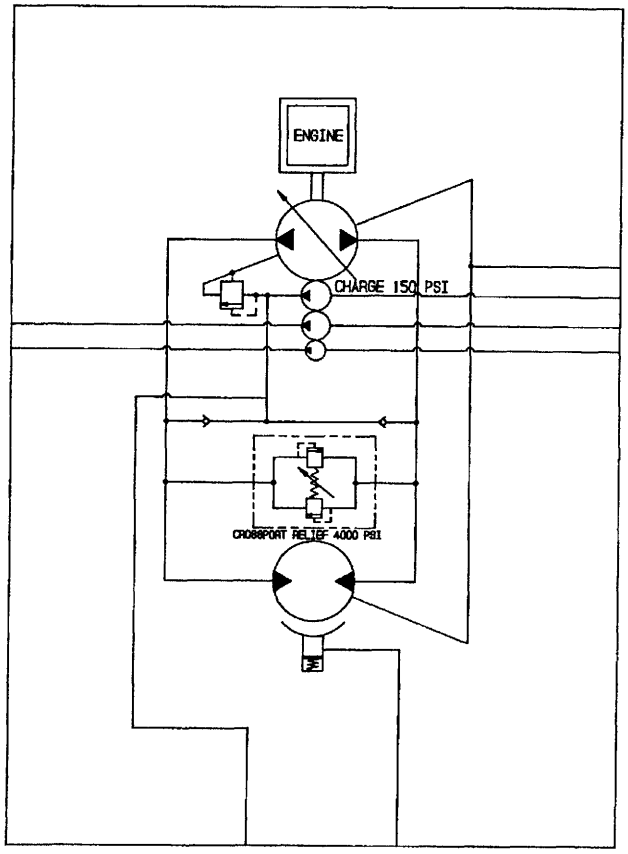
Connecting link from drive pump to actuator cylinder may be loose or missing (See "Drive System Service").

Brakes may not be releasing due to faulty microswitch or brake valve not shifting.

**Problem: Unit drives in only one direction.**

Drive valve may not be working correctly. Check pressure reading in each direction.

Actuating cylinder piston or spring centering bolt may have come loose (See "Drive System Service").




**Drive System Hydraulic Schematic**

**Problem: Hydrostatic pump drags while in neutral.**

Stroke arm cylinder clevis may not be properly adjusted.

Drive controller may be contaminated.

**Problem: Movement alarm beeps while machine is in neutral.**

Pump actuating cylinder may not be properly adjusted.

**Problem: Machine jerky when movement is started.**

Inspect control linkage for proper adjustment.

Check pump actuating cylinder for proper adjustment.

Inspect acceleration valves in drive motor.

**Problem: Loss of power.**

Check drive control system for proper actuator stroking (should operate at any drive system pressure).

Check hydrostatic pump charge pressure .

- If pump charge pressure is low, inspect suction filter and lines for restrictions.
- Inspect charge pump.

Check drive system pressure.

- If system pressure is low, inspect acceleration valves in drive motor.
- Adjust or replace cross port relief valve.

# DRIVE SYSTEM SERVICE

## PUMP ACTUATING (STROKE) CYLINDER ADJUSTMENT

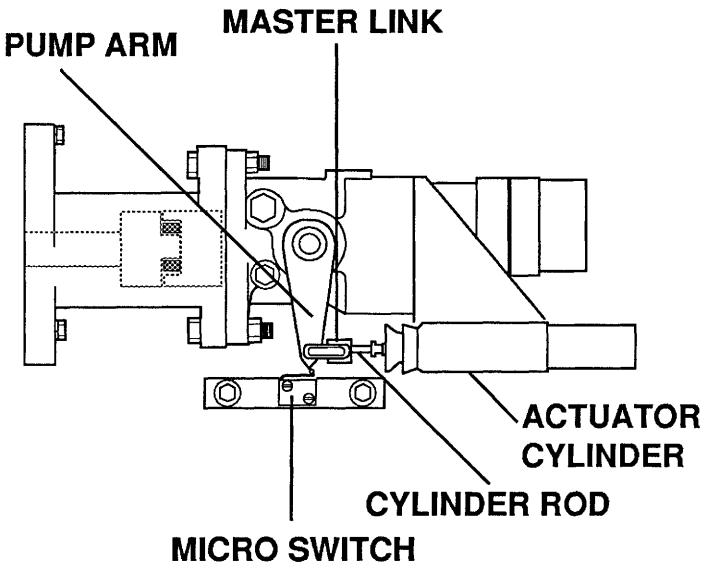
**⚠ WARNING**

**ADJUSTMENTS MUST BE MADE WITH WHEELS OFF THE GROUND, AND LOWER BOOM SLIGHTLY RAISED AND FIRMLY SUPPORTED.**

**WHEELS MAY ROTATE DURING THIS PROCEDURE. STAY CLEAR OF WHEELS WHILE MAKING ADJUSTMENTS. PERSONAL INJURY MAY RESULT.**

If the cylinder IS being replaced, reinstall hoses, but do not install master link. Start the engine and, with the lower boom raised, cycle the drive handle "FORWARD" and "REVERSE" several times to bleed air from the cylinder or supply lines.

If the cylinder IS NOT being replaced, remove the master link connecting the cylinder rod to the pump arm. Start the engine. With the drive handle in neutral, the pump arm will center itself.




**Pump Actuating Cylinder Adjustment**

With the engine running and the drive handle in neutral, loosen the stop nut and adjust the rod end so you can easily slide the master link in position. Install the master link and retainer. Lock the rod end in position with the stop nut.

After adjusting the actuator cylinder, the microswitch must also be adjusted. Turn off the engine. The wheels should still be off the ground.

Turn the ground/ platform selector switch to "PLATFORM", and turn on the ignition, but DO NOT START THE ENGINE. Depress the foot pedal and block it in position. The movement alarm will begin to sound.

**⚠ WARNING**

**THIS PROCEDURE IS USED ONLY IN MAKING THE ADJUSTMENT TO THE MICROSWITCH.**

**NEVER BLOCK THE FOOT PEDAL IN THE DEPRESSED POSITION WITH THE ENGINE RUNNING OR THE WHEELS TOUCHING THE GROUND. SERIOUS INJURY CAN RESULT.**

Loosen the two mounting block bolts. Move the mounting block so that the stroke arm depresses the microswitch (movement alarm will stop). Adjust another 1/32" and re-tighten the bolts.

Move the arm slightly in both directions. If adjustment is correct, the alarm will begin to sound with approximately equal movement in either direction.

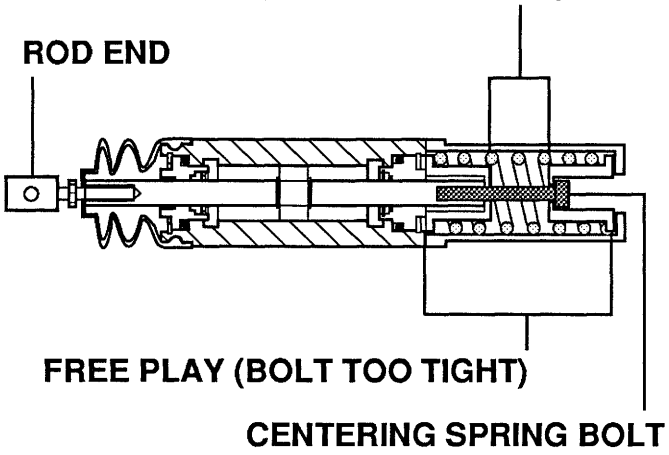
Remove the block from the foot pedal.

## ACTUATOR CYLINDER CENTERING SPRING ADJUSTMENT

NOTE

The socket head bolt used to adjust the centering spring on the actuator control cylinder is installed with "Loctite" and should not be readjusted as a maintenance item. It should only be adjusted if the centering spring adjustment is found to be incorrect.

Remove and clean centering spring bolt. Check screw threads on bolt and cylinder rod for damage. Put a couple of drops of "271 Loctite" or equivalent on the bolt threads. Re-install and tighten the bolt until the CYLINDER ROD END HAS NO FREE PLAY. If bolt is made too tight, the spring will be loose in the end cap.

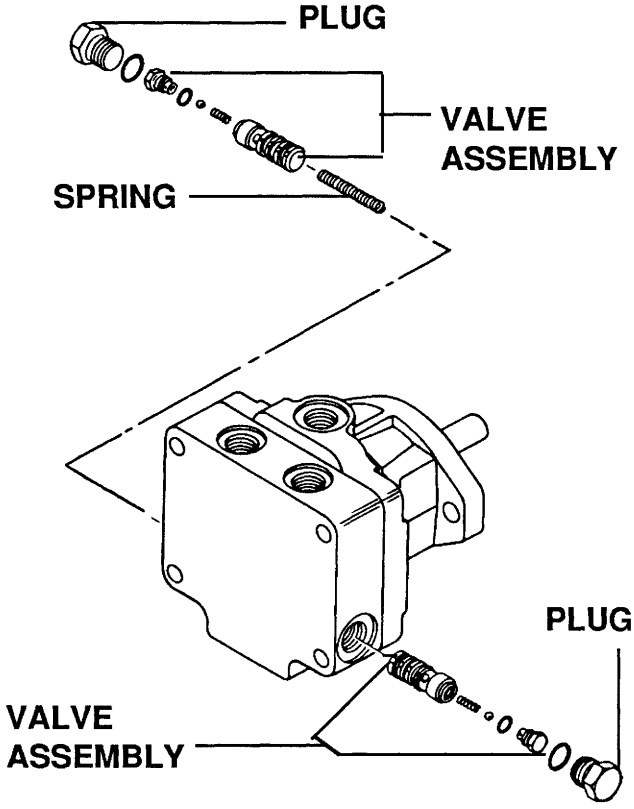



**Centering Spring Adjustment**

## ACCELERATION AND CHARGE RELIEF VALVE INSPECTION

### A. Acceleration Valve

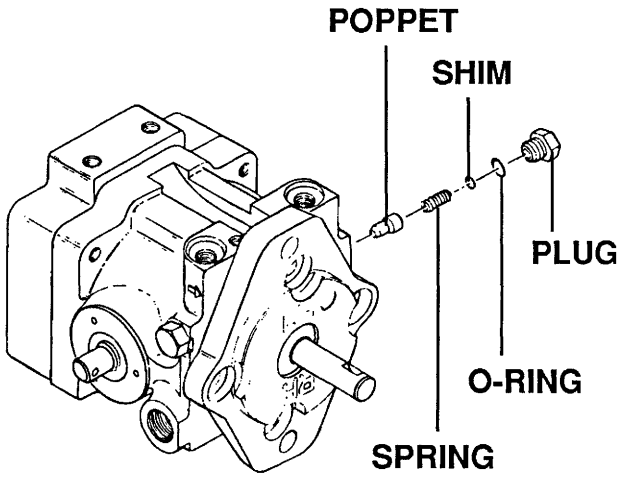
Remove the plugs from each side of the drive motor housing. Remove a valve assembly and the center spring from one side, and the second valve assembly from the other side. Inspect valve bore for damage and foreign material. Replace parts as required and reinstall into housing.



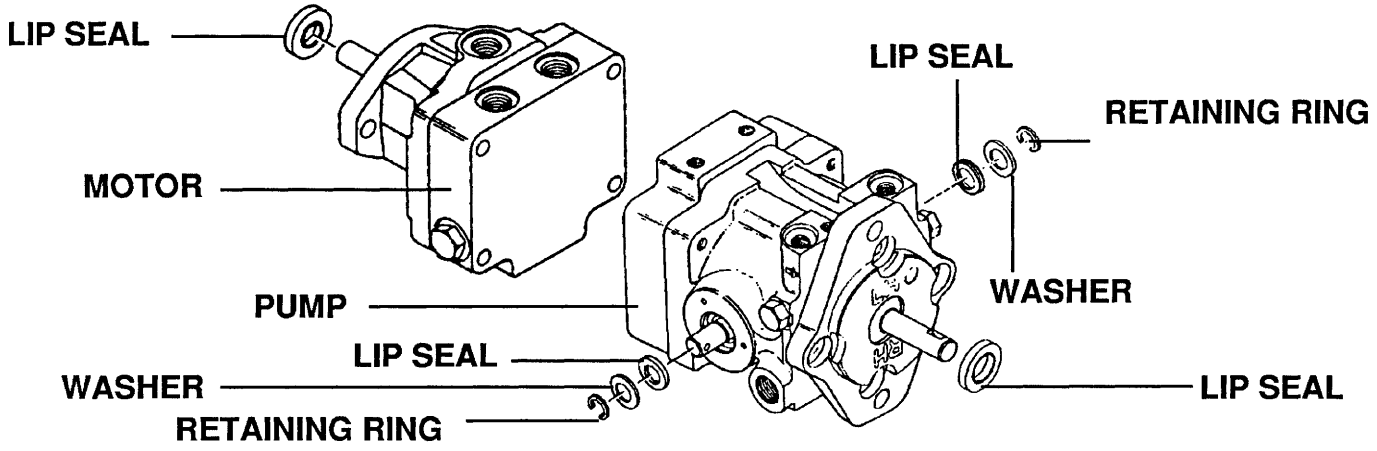

**Removing Acceleration Valve from Drive Motor**

### B. Charge Relief Valve

Remove plug on the side of the drive pump housing. Slide the spring and poppet out of the housing. DO NOT ALTER THE SHIMS, OR INTERCHANGE PARTS WITH ANOTHER VALVE. Inspect the poppet and seat in housing for damage and foreign material. Replace parts as required and reinstall into housing.




**Removing Charge Relief Valve**




**Lip Seal Replacement**

## LIP SEAL REPLACEMENT

Lip type seals are used throughout the drive pump and motor unit. These seals can be replaced without disassembly of the unit. Replacement of either the input or output seal, however, requires removal of the drive unit from the machine.

Pry the seal out of the housing bore, USING CARE NOT TO DISTORT THE HOUSING OR DAMAGE THE BORE OR THE SHAFT. The seal is not reusable.

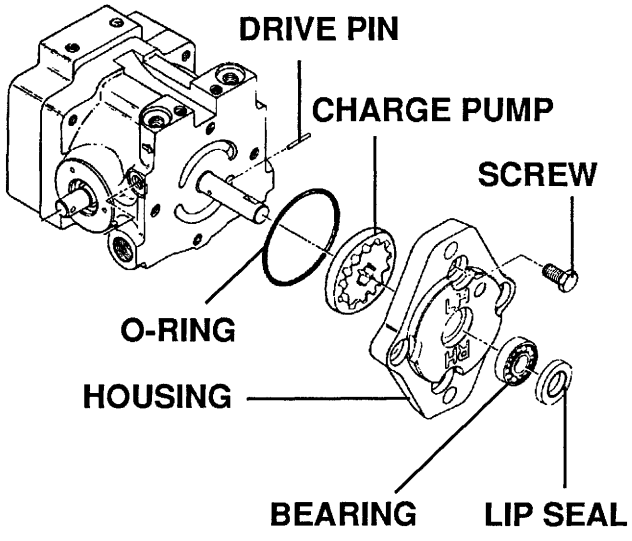
Wrap the shaft extension in thin plastic and lubricate with hydraulic fluid to prevent damage to the seal during assembly. Slide the seal over the shaft and carefully press it into the housing bore.

When replacing trunnion shaft seals, the retaining rings and washers must be removed before removing the seals. Washers should be replaced if noticeably bent or distorted.

## CHARGE PUMP REMOVAL AND INSTALLATION

Note orientation of the charge pump housing to adjacent assembly, and scribe lines or make punch marks to insure proper relocation. Clean shaft extension to remove all sharp edges, burrs and abrasive residue to prevent shaft seal damage.

Remove hex head screws and slide charge pump housing and cartridge (gerotor assembly) off of the shaft. Remove and discard the drive pin. REMOVE SHAFT SEAL AND BEARING FROM HOUSING ONLY IF REPLACEMENT IS NECESSARY.




**Charge Pump Replacement**

Examine wear surfaces of pump cartridge for excessive scratching or heavy wear patterns. If replacement is necessary, both parts of the cartridge must be replaced as a unit. DO NOT REPLACE OR EXCHANGE INDIVIDUAL PARTS WITHIN THE CARTRIDGE. The drive pin is not reusable, and should always be replaced. Visually inspect bearing, o-ring and shaft seal, and replace as required.

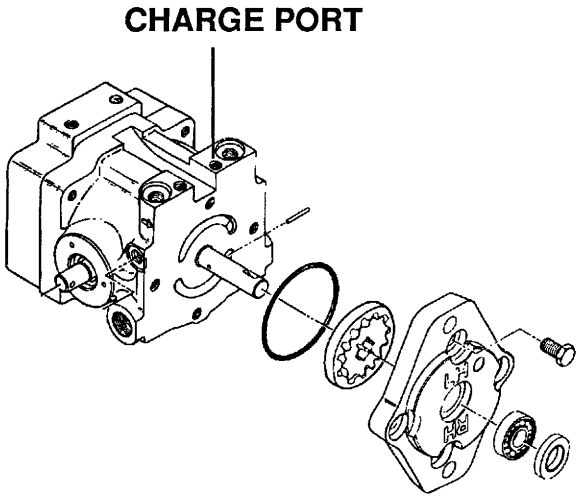
Coat both sides of the pump cartridge and housing face with hydraulic fluid. Install new drive pin into shaft, and slide pump cartridge into place. Wrap the shaft extension with plastic, then coat with hydraulic fluid to prevent damage to shaft seal. Place o-ring into cartridge housing assembly, then slide assembly into position over shaft. Line up location marks, then insert and tighten screws.

## DRIVE PUMP INITIAL START UP PROCEDURE

Prior to installing the drive pump, inspect for shipping damage. Ensure all circuit components are clean prior to installing and filling the pump.

Fill the hydraulic tank on the machine with clean, filtered hydraulic fluid (refer to Lubrication Chart). If gravity feed does not fill the inlet line leading from the tank to the drive pump, that line must also be filled manually prior to start up. Ensure inlet line is free of restrictions, and check fittings for tightness .

Place control lever in neutral. Control linkage must be disconnected from the drive unit during initial start up.




**Charge Pressure Check**

Remove plug from the charge port on the drive pump assembly, and slowly turn the input shaft (hand cranking is recommended) until fluid flows from this port. Install a pressure gauge (1000 PSI capacity) in the charge port with a short section of hose and a snubber needle valve to dampen pulsations.

Start the engine and run at the lowest possible RPM until normal charge pressure has been established, then increase to full engine speed. Charge pressure should remain steady or increase. If pressure decreases, shut down the system and determine the cause.

Run system at full input and output speeds in both directions and observe charge pressure. Operate system for at least fifteen minutes, then shut down and replace inlet filter. Remove gauge and plug port. Check fluid level in tank, and fill as necessary. Unit is ready for operation.

# ELECTRICAL SYSTEM

Following is a description of the major components of the SILVER-EAGLE electrical system.

## 12 VOLT BATTERY

One 12 volt battery supplies the electrical current required to operate the electrical circuit of all engine powered Silver-Eagles. On Model 41/24, the battery is mounted on the superstructure, over the drive axle. On Model 32/21, the battery is located on the post to the left of the ground control panel, and can be reached by removing the sheet metal covering the controls and superstructure post.

To remove the battery, follow these procedures:

**⚠ WARNING**

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

Be sure all power is shut off to the machine. disconnect the battery cables.

**⚠ CAUTION**

ALWAYS DISCONNECT THE NEGATIVE BATTERY CABLE FIRST.

Loosen the bolt holding the battery hold down bracket, and remove the battery.

To install, place the battery in its proper location. Position the battery hold down bracket and tighten the bolt. Connect the battery cables.

**⚠ CAUTION**

ALWAYS CONNECT THE POSITIVE BATTERY CABLE FIRST.

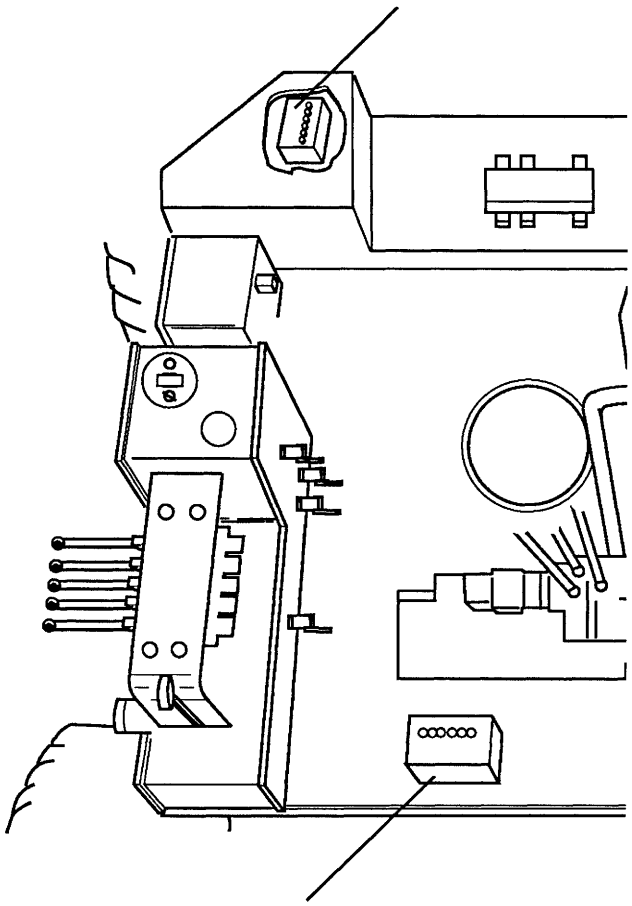
### BATTERY MAINTENANCE

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

Check battery terminals for:

- **Corrosion.** Regularly clean connection 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.

**BATTERY LOCATION (MODEL 32/21)**



**BATTERY LOCATION (MODEL 41/24)**

**Battery Location**

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). Do not use a hose to add water to the battery. Do not allow the electrolyte level to drop below the top of the separators, since this will lead to shortened battery life.

Excessive water usage can indicate that the 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 the 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 TROUBLESHOOTING

Check battery 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.

Recharge the battery as recommended by the manufacturer.

Recheck specific gravity of all cells after recharging. A fully charged battery should indicate between 1.25 and 1.28. A variation of more than 0.03 between cells is an indication that the battery should be replaced.

## EMERGENCY STOP BUTTONS

Two emergency stop buttons (one on the ground control panel, and one on the platform control panel) act as power "on/ off" switches. Both switches must be "ON" to operate the machine. When either of the emergency stop buttons is depressed, all functions stop immediately and the wheel brakes are automatically applied.

When troubleshooting the electrical circuit; if there is a problem with the emergency stop button, check the wiring to the button. If the wiring is correct, replace the emergency stop button.

## FOOT PEDAL SWITCH

The foot pedal is a double pole, double throw switch which must be fully depressed before any machine function can be operated from the platform. When the foot pedal switch is released, power to the lift and drive function solenoid valves is terminated, and all machine functions stop. The foot pedal switch is located on the floor of the platform.

When troubleshooting the electrical and hydraulic circuits to the platform, ensure that the foot pedal switch is depressed. Check the wiring to the foot pedal switch. If the wiring is correct, but there is a problem with the foot pedal circuit, replace the entire switch.

## TILT ALARM

The tilt alarm gives an audible warning when the machine is five degrees or more out of level. The alarm can be tested by manually tipping the alarm sensor (see test procedure, on next page). If the tilt alarm does not function, check the horn, then check the output relay.

Check the wiring. If wiring is correct, replace the alarm.

### TILT ALARM ADJUSTMENT

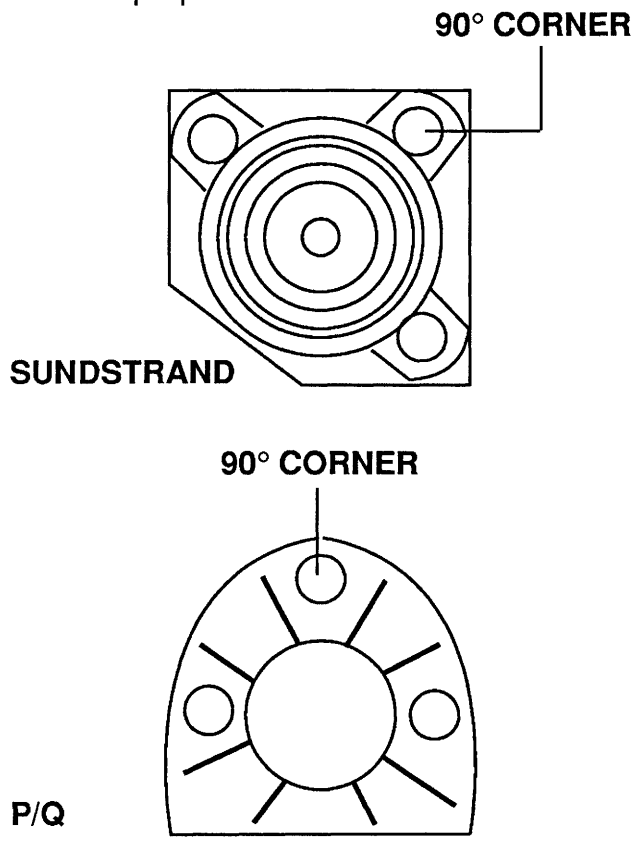
The tilt alarm can be adjusted. Before attempting to adjust the alarm, park the machine on a flat, level surface. Fill the tires to the proper pressure.

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

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

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

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




**Tilt Alarm 90 Degree Corner**

### TILT ALARM TEST

Individually push down on each of the three fastened corners of the tilt alarm. There should be enough travel to cause the alarm to sound as each corner is pressed. If not, the flange nuts have been tightened too far. Loosen the nut on the 90 degree corner and repeat the adjustment procedure. This "Push-to-Test" feature enables the tilt alarm to be tested without losing its adjustment.

## MOVEMENT ALARM

The movement alarm is activated as soon as the machine's drive controller is moved off the center "Neutral" position.

If the movement alarm does not function, check the wiring. If wiring is correct, replace the alarm.

## RELAYS

There are six relays associated with machine functions (refer to Electrical Schematic at the back of this manual). They are:

1. Neutral Start (CRNS)
2. Starter Interlock (CR1)
3. Ignition Relay (CR3)
4. High Throttle (CR5)
5. Tilt Horn (CRTH)
6. Time Delay (CRTD)

## AUTOMATIC WARNING BEACON

There are two types of optional automatic warning beacons available. One is a "strobe" type, with no moving parts, that gives an intense light. The other has a rotating reflector with a less intense light. The beacon activates whenever the ignition is on .

# MECHANICAL COMPONENTS

Following is a description of the major mechanical components of the SILVER-EAGLE.

## TIRES

Pneumatic, liquid ballasted 8.75 - 16.5 LT, 8 ply tires are standard. Check tires for correct pressure, and inspect for cuts, sidewall damage or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation. Consult your tire dealer if liquid ballast is needed.

Foam filled tires are an available option. Check for any significant sidewall or other damage.

### CHANGING TIRES

**⚠ CAUTION**

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

When a tire change is necessary, ALWAYS BLOCK THE WHEELS before you raise the machine. Loosen and remove lug nuts, and pull off the wheel. Replace the tire, and reinstall. Fasten lug nuts and tighten to proper torque. 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 and examine the wheel rims for damage.

## SUPERSTRUCTURE

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

## HOSES AND CABLES

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

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

## TOWING PACKAGE

A towing package is an available option on all SILVER-EAGLE models. IF SO EQUIPPED, the machine can be towed behind another vehicle.

Connect the machine to the tow vehicle. Pull lever provided to disengage the rear (drive) axle, and pull control valve to allow front (steering) wheels to track the towing vehicle.

## MISCELLANEOUS EQUIPMENT

Check all miscellaneous equipment mounted on the machine for secure attachment. Check for evidence of oil or hydraulic fluid leakage. Check all cables and hoses for security and damage

## CYLINDER PIVOT PINS AND PIN BUSHINGS

Check all cylinder pivot pins and pin bushings for wear. Elevate the booms and check each pin individually for rotation or movement. If pins rotate, check if pin locking bolts have sheared. If wear is detected, the pin and bushing must be replaced.

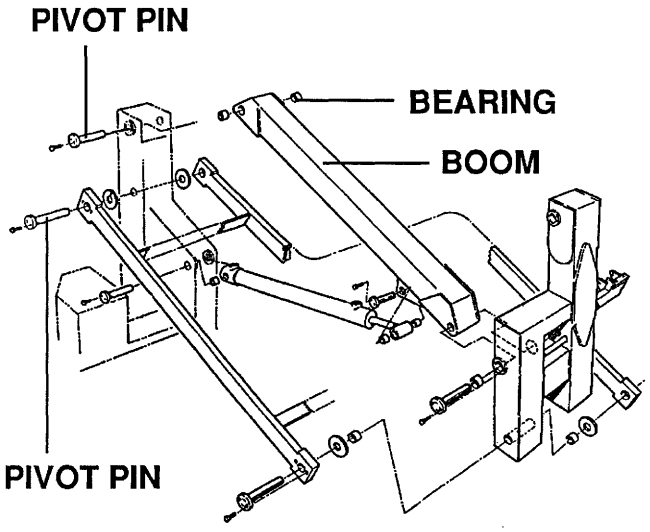
# PIN REPLACEMENT

## BOOM PIVOT PIN REPLACEMENT

**⚠ CAUTION**

It is IMPORTANT TO MAINTAIN CORRECT ALIGNMENT between the boom and side plates during this operation. Any relative movement will make replacement of the pins more difficult.

Support the boom and upper structure securely. Remove the pin locking bolts, and drive out the pivot pin, taking care not to damage the inner bore.




**Boom Pivot Pin Replacement**

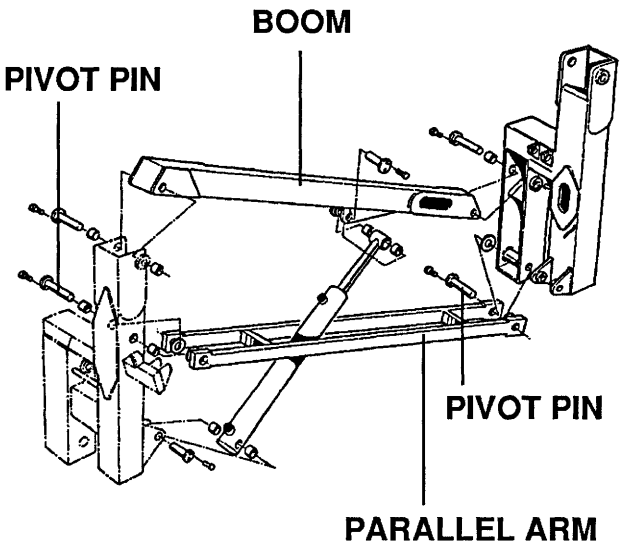
Install new pin and locking bolts (lubricate bolts before installation). Apply grease to pin.

## PARALLEL ARM PIVOT PIN REPLACEMENT

SUPPORT THE BOOM SECURELY. Remove the pin locking bolts, and drive out the pivot pin.

**⚠ CAUTION**

Upon removal of the pin, the parallel arm WILL DROP if not held. The arm is relatively light, and can be held manually in position while the new pin is installed.



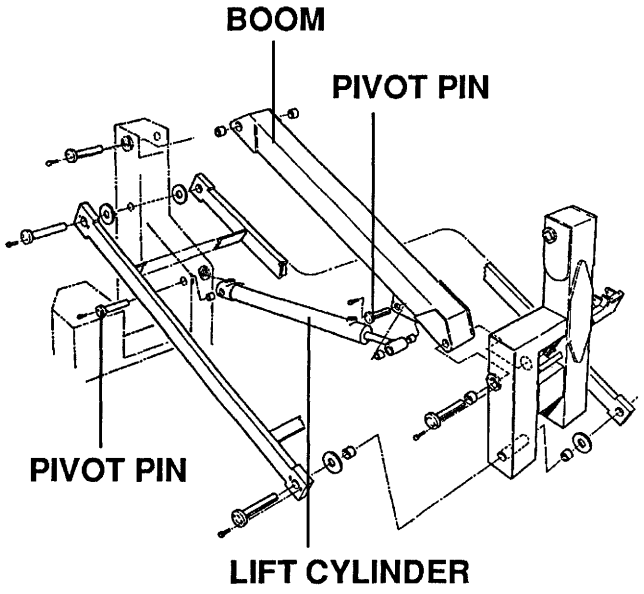

**Parallel Arm Pivot Pin Replacement**

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

## LIFT CYLINDER PIVOT PIN REPLACEMENT

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

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

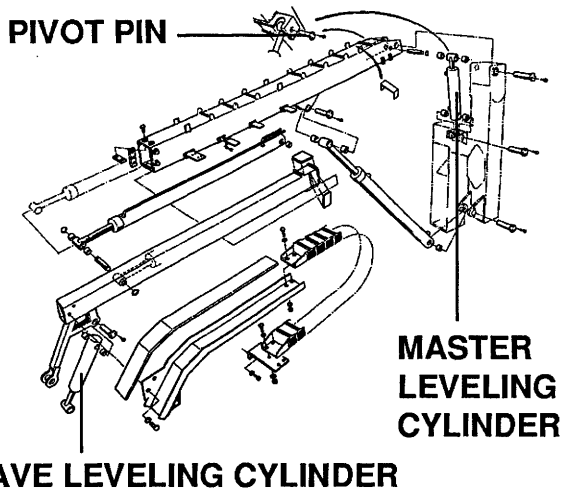



**Lift Cylinder Pivot Pin Replacement**

## PLATFORM LEVEL CYLINDER PIVOT PIN REPLACEMENT

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

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



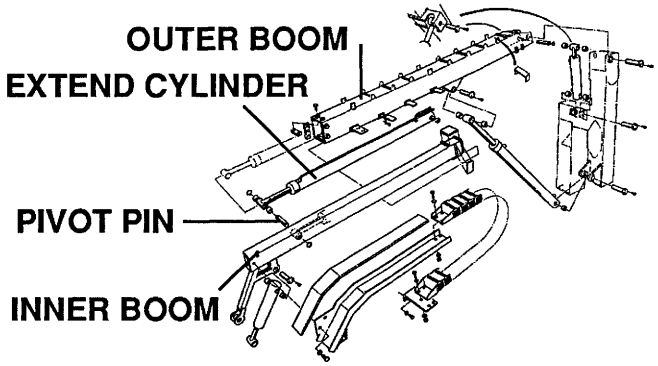

**Level Cylinder Pivot Pin Replacement**

## EXTEND (TELESCOPE) BOOM CYLINDER PIVOT PIN REPLACEMENT

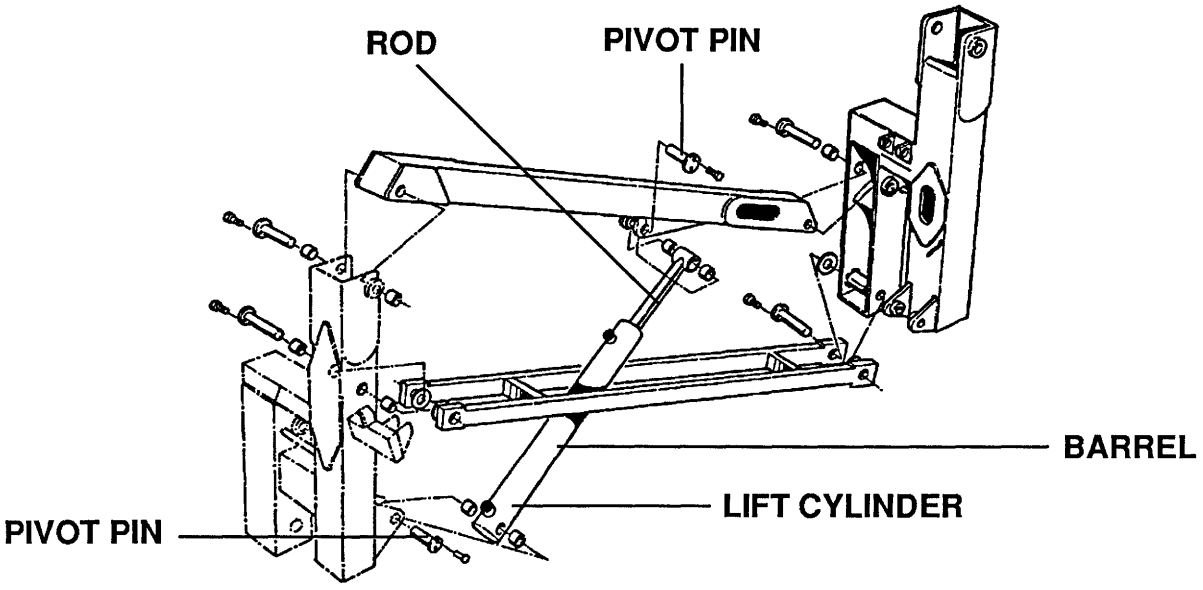
Remove the pin locking bolts, SUPPORT THE CYLINDER and remove the pin. When changing the rod end pivot pin, it may be necessary to extend the boom out to expose the pin.

NOTE

If the extend boom has been greased, the pin recess may be filled and not readily visible.




**Extend Cylinder Pivot Pin Replacement**




**Lift Cylinder Seal Replacement**

## BOOM LIFT CYLINDERS

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

### LIFT CYLINDER SEAL REPLACEMENT (ON MACHINE)

SUPPORT THE BOOM. Operate the proper 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 over the piston rod. TAKE CARE NOT TO DAMAGE THE ROD SURFACE, AND GUARD AGAINST DIRT ENTERING THE SYSTEM.

Replace the seals in the end cap, and reassemble the lift cylinder, again AVOIDING DIRT AND ROD DAMAGE.

### BENCH REPLACEMENT OF LIFT CYLINDER SEALS

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

Extend the cylinder, and examine the protruding rod for score marks and damage. Clean the holding valve, and examine for signs of leakage. BLEED THE SYSTEM after reinstalling the cylinder.

# BOOM EXTEND (TELESCOPE) CYLINDER

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

## EXTEND CYLINDER REMOVAL

Elevate the upper boom to the horizontal position. Extend the boom just enough to expose the upper cylinder pivot pin on the inner boom. Disconnect the hydraulic hoses from the cylinder. Remove the pivot pins from the inner and outer boom, and withdraw the cylinder from the boom.

**⚠ CAUTION**

With the extend cylinder disconnected, CARE MUST BE TAKEN TO PREVENT THE INNER BOOM FROM SLIDING OUT OF THE OUTER BOOM. Secure the inner boom in the fully retracted position.

## EXTEND CYLINDER SEAL REPLACEMENT

Remove the end cap from the cylinder. Pull the cap and rod straight out of the cylinder barrel. 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 set.

## EXTEND CYLINDER INSTALLATION

WITH THE UPPER BOOM IN THE HORIZONTAL POSITION, slide the extend cylinder into the boom. Install the pivot pins and hoses.

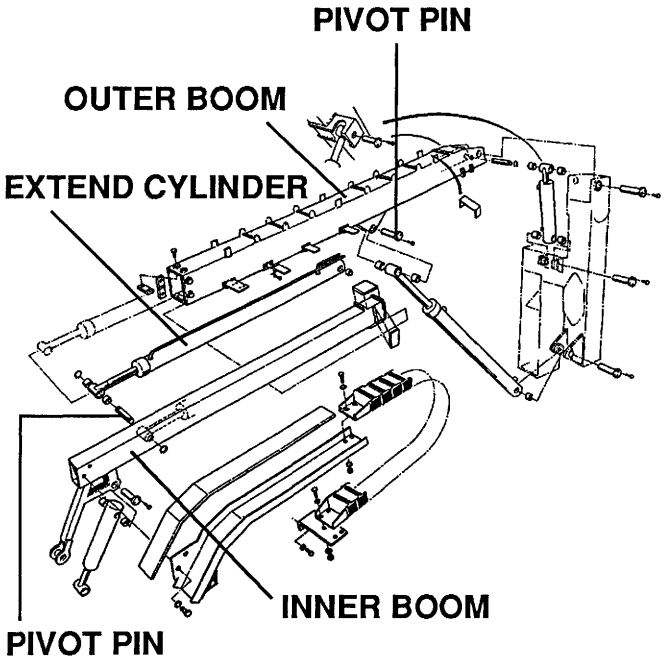
## CHECKING HOLDING VALVES

Clean the end of the cylinder, and loosen the cylinder end cap.

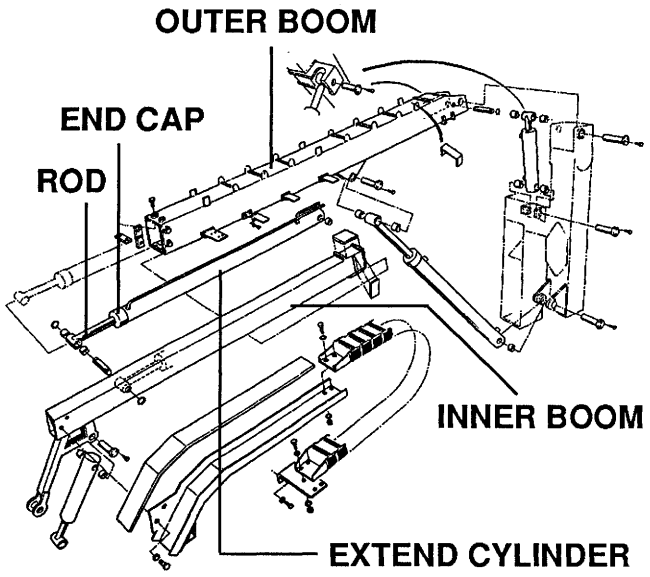
Stop the engine, and activate the appropriate control lever several times to dissipate residual pressure. If the cylinder subsequently begins to move, the valve is faulty and the cartridge should be replaced.

NOTE

The holding valve is pre-set at the factory.




Extend Cylinder Removal




Extend Cylinder Seal Replacement

## WEAR PADS

The nylon wear pads should be checked for wear approximately every six months. Fully retract the upper extend boom, and check the gap between the upper wear pad and the outer boom section, at the lower end of the boom. Inspect the side and lower pads as well.

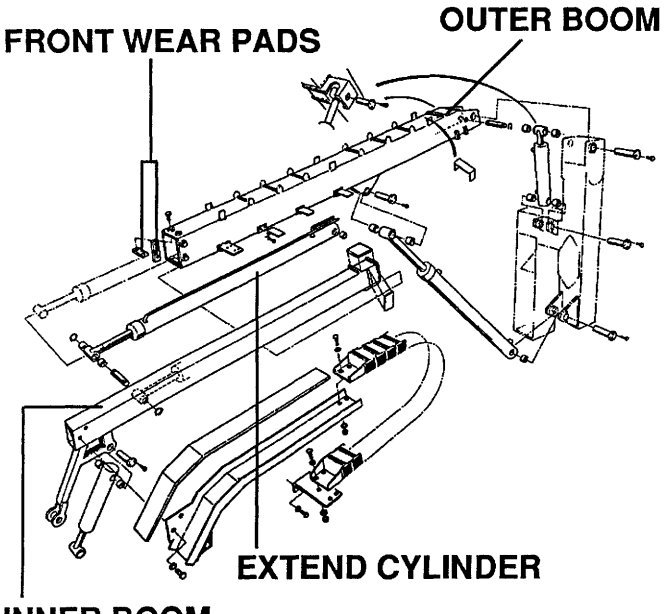
Then, extend the boom out, and check the gap between the lower wear pad and the inner boom section, at the upper end of the outer boom section. Inspect the side and upper pads as well.

**⚠ CAUTION**

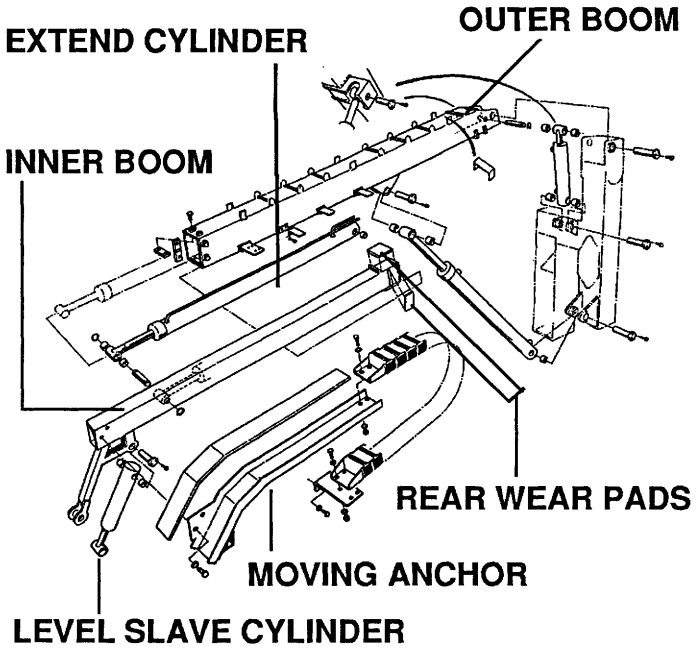
If a pad wears to approximately 3/8" (9.5 mm) thick, it should be replaced or shimmed. Generally, only the bottom pad at the upper end, and the top pad at the lower end of the boom will show wear.

### FRONT (UPPER END) WEAR PAD REPLACEMENT

Remove the bolts holding the lower pad, and remove the pad (the boom may need to be extended out a short distance). Install replacement pad by hammering gently into place, then securing pad with mounting bolts. Repeat this procedure for the side and top pads if required.




**Front (Upper End) Wear Pad Replacement**




**Rear (Lower End) Wear Pad Replacement**

### REAR (LOWER END) WEAR PAD REPLACEMENT

With the booms in stored position, extend the upper boom until the platform rests on the ground. Remove the platform pivot pin and the platform leveling slave cylinder upper pin. Remove the three bolts holding the upper end of the moving anchor to the extend boom section, and set it down. Be careful not to damage the catrac or hoses.

Retract the extend boom until the upper (front) extend cylinder pivot pin approaches the outer boom section. Remove the pin and the front wear pads, then raise the upper boom to clear the platform. Carefully slide the inner boom out of the outer boom section, supporting the boom as it is removed. The rear pads are merely trapped in the space between the inner and outer boom sections. Replace the rear pads, trimming as necessary for proper fit.

Reassemble the boom, making sure the pads are aligned properly as the inner boom section is inserted into the outer boom.

# PLATFORM LEVEL CYLINDERS

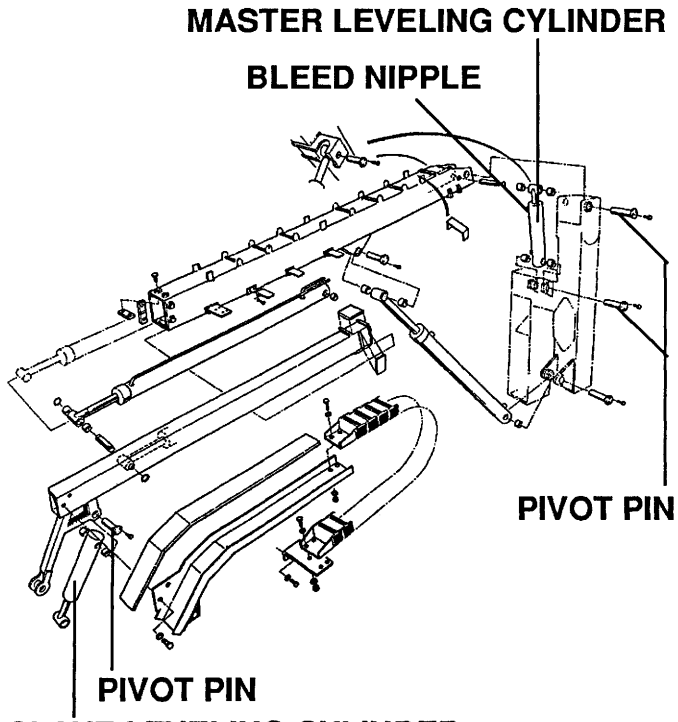
The platform level cylinders are of the double acting type. The pivot pins should be checked for wear. Check the pivot pin locking bolts for tightness. The cylinders should be inspected for fluid leakage, damage and security. The seals should be replaced whenever the cylinder is serviced.

## LEVEL CYLINDER SEAL REPLACEMENT

Lower the upper boom. SUPPORT THE PLATFORM to remove the load on both master and slave leveling cylinders. Remove the pin locking bolts, and remove the pin.

Clean the end of the cylinder, 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.




**Level Cylinders**

## 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.

NOTE

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

With all booms retracted, check the hydraulic fluid level in the tank. Slightly loosen the bleed nipple at the base of the leveling cylinder.

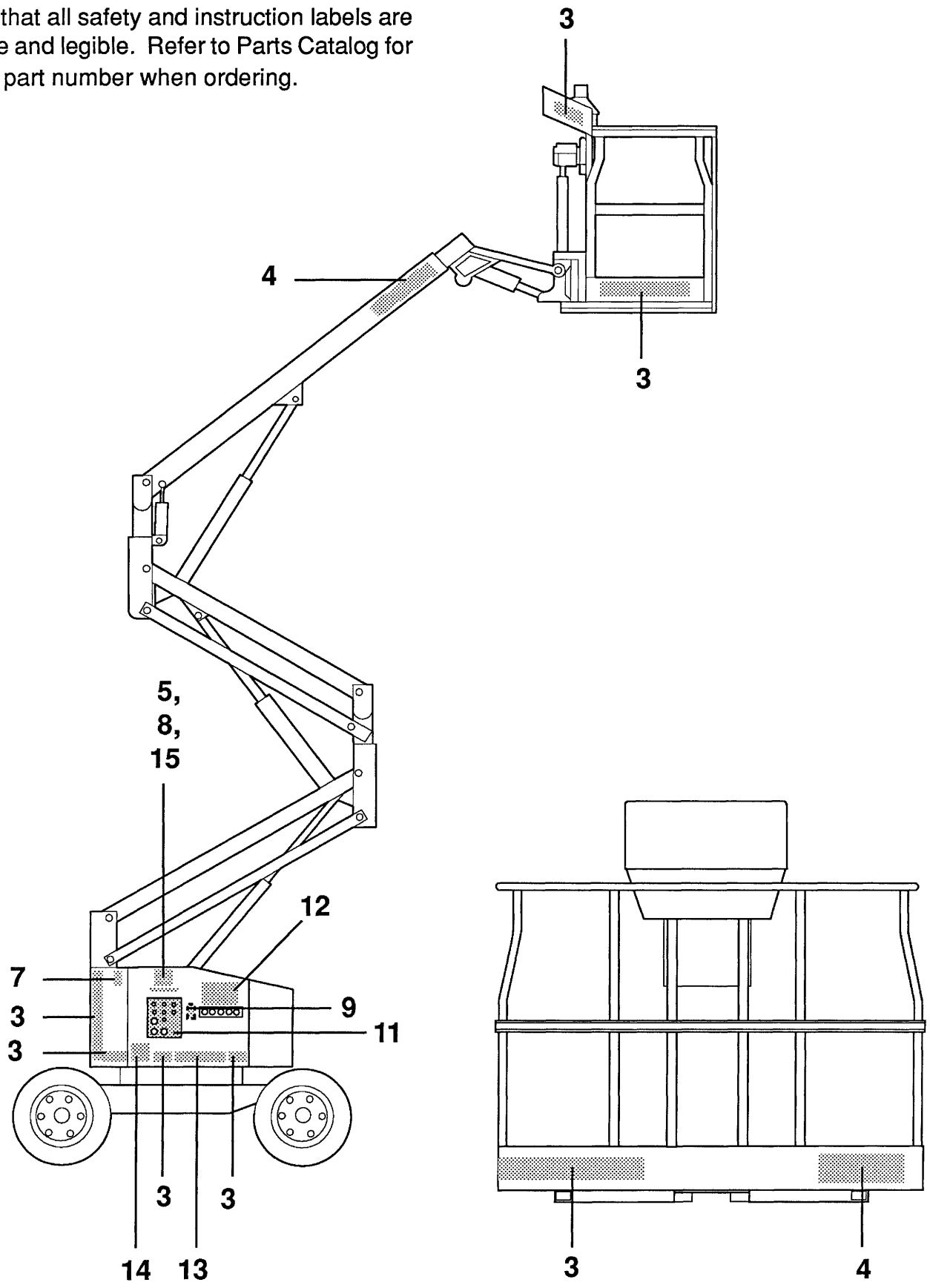
**⚠ WARNING**

**HYDRAULIC FLUID WILL BE FORCIBLY EJECTED FROM THE BLEED NIPPLE. LOOSEN NIPPLE SLOWLY.**

Operate the platform level control to move the platform fully backward and forward, repeating as necessary in order to expel any air from the system. Tighten the bleed nipple, and top off the hydraulic tank. Repeat the procedure as required until all air is expelled.

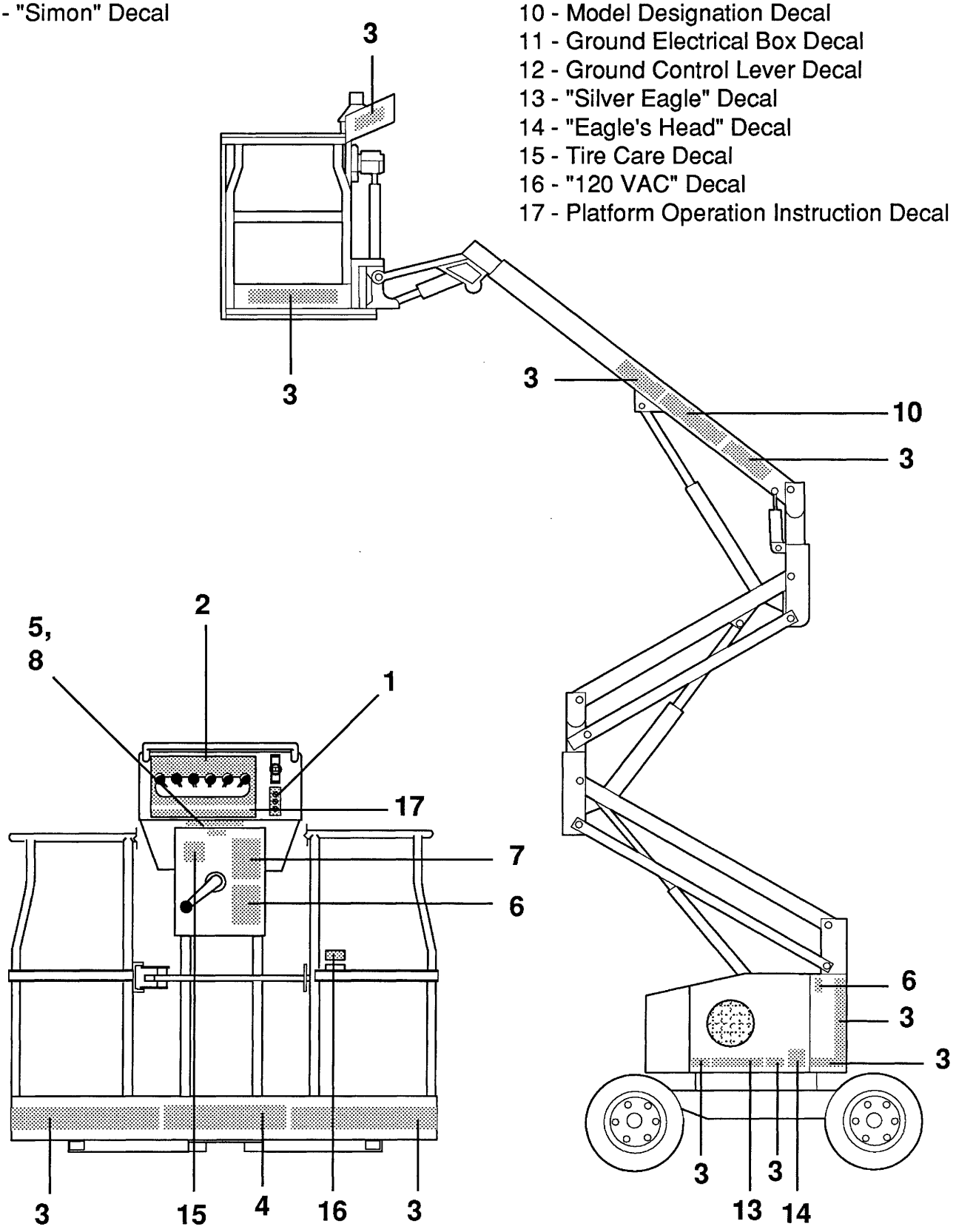
# SAFETY AND INSTRUCTIONAL LABELS

Insure that all safety and instruction labels are in place and legible. Refer to Parts Catalog for proper part number when ordering.



Index for decal location:

1 - Platform Control Panel Decal
2 - Platform Control Lever Decal
3 - Stripe
4 - "Simon" Decal
5 - "Disengage Lockpin" Decal
6 - "Beware, Potential Hazard" Decal
7 - "Danger, Electrocution Hazard" Decal
8 - '500 Lb Payload Capacity" Decal
9 - "Caution For Hydraulic Fluid Use" Decal
10 - Model Designation Decal
11 - Ground Electrical Box Decal
12 - Ground Control Lever Decal
13 - "Silver Eagle" Decal
14 - "Eagle's Head" Decal
15 - Tire Care Decal
16 - "120 VAC" Decal
17 - Platform Operation Instruction Decal



# TROUBLESHOOTING

Before investigating a malfunction, check the following items:

- The ignition switch should be in the "ON" position.
- Be sure that fuel tank (or tanks) are not empty, and that engine is operating properly.
- The "Emergency Stop" buttons on both the ground and platform control panels should be released.
- The "Ground/ Platform" selector switch on the ground control panel should be at the correct setting.
- When attempting to operate any function (other than starting the engine) from the ground control panel, the "Power Control" switch must be held in clockwise position.
- When attempting to operate any function from the platform, the foot pedal on the platform floor must be depressed .
- Check that battery connections are secure, and battery has sufficient charge.
- Hydraulic fluid should be at the correct level.

**Problem: Pump assembly will not operate properly.**

Examine pump for mechanical defect.

Inspect the charge pump.

Check relief valve pressure.

Check manifold.

**Problem: Pump motor will not stop when "drive" function is selected.**

Check relief valve pressure.

Check drive control valve.

**Problem: Pump motor operates, but does not generate hydraulic pressure.**

Check for hydraulic fluid leaks.

Examine pump assembly for mechanical defect.

Check pressure relief valve for correct pressure setting.

**Problem: Pump motor is slow in operation.**

Check that the safe working load has not been exceeded.

Check pressure relief valve for correct pressure setting.

Verify that the correct grade of hydraulic fluid is being used.

Ensure engine is operating at correct speed.

Check electrical circuit for bad or loose connections.

**Problem: Booms will not raise or lower.**

Ensure engine is operating at correct speed.

Check for hydraulic fluid leaks.

Check holding valves for sticking or damage.

**Problem: Extend boom does not operate.**

Check pressure relief valve for correct pressure setting

Inspect boom assembly for damage, or for obstruction between the inner and outer boom sections.

Check boom sliding surfaces for proper lubrication. Lubricate as necessary with silicone spray.

**Problem: Swing function does not operate.**

Check for obstruction at the swing gearbox or swing bearing gear surfaces.

Inspect hydraulic swing motor and gearbox for proper operation.

The mechanical swing stop may be preventing rotation in one direction.

**Problem: Machine steers sluggishly, or not at all.**

Inspect steer cylinder seals for leaks.

Check for loose or damaged steering linkage.

Examine electrical connections on steering control switch (thumb button located on drive control joystick).

**Problem: Drive motor will not operate.**

Ensure engine is operating at correct speed.

Check drive pump actuator (stroke) cylinder pressure.

Check hydrostatic pump charge pressure. If low, inspect suction filter and lines for restrictions. Inspect charge pump.

Check drive system pressure. Inspect accelerator valves and charge check valves in pump.

**Problem: No "High Speed" operation.**

Check control linkage.

Check drive pump.

Inspect boom limit switches for proper adjustment.

Check drive system pressure.

Check foot pedal switch for proper operation.

Verify that the brake is releasing.

**Problem: "High Speed" mode is available with booms elevated.**

Check joystick for correct operation.

Inspect boom limit switches for proper adjustment.

**Problem: "Emergency Stop" function does not work.**

Check that the "Emergency Stop" button is operating correctly.

Check foot pedal switch for correct operation.

# MAINTENANCE SCHEDULE

The Simon SILVER-EAGLE 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, cylinders and pressure valves are self-lubricating.

Consult the accompanying engine manual for service and maintenance instructions specific to the engine supplied with each machine.

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.

## Pivot Pins and Bearings

All pivot pins are "Parco Lubrite 2" treated. This treatment converts the metallic surface of the pin to a manganese/ iron phosphate coating having high oil absorption and corrosion resistant qualities.

All pivot pin bearings are steel backed, acetal copolymer lined.

In tropical climates or other adverse conditions, pins and bearings may require more frequent lubrication.

## 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 or engine 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 or engine systems.

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 the 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.

## DAILY SERVICE

### Hydraulic System

Before checking the hydraulic fluid level, ensure that the machine booms are stowed in the traveling position, and the machine is standing on level ground. Fluid level must be one inch below the top of the level gauge, located on the side of the tank. If the reservoir requires additional fluid, refer to the Lubrication Chart for the correct grade.

After checking the 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 machine tires are in good condition. Check tire pressure.

### Platform Safety Gate

Check the security of the platform safety gate and latching mechanism.

### Engine

Check the engine manual provided with the machine for daily service requirements.

## WEEKLY SERVICE

### Control Valves

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

### Hydraulic System

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

### Steering

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

### Battery

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

### Pivot Pins

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

### Engine

Check the engine manual provided with the machine for weekly service requirements.

## MONTHLY SERVICE

### Hydraulic System

Allow the machine to stand overnight, or for at least eight hours, without operating the pump. This will allow water and any other impurities to separate out of the hydraulic fluid and settle to the bottom of the tank.

Disconnect the 3/4 inch pipe from the pump side of the ball valve at the bottom of the tank, and block off to prevent fluid leakage from the system.

Open the ball valve just enough to allow a gradual trickle of fluid. Drain fluid from the tank into a transparent container, until clean hydraulic fluid flows. Under normal operating conditions, a maximum of one-half pint is usually sufficient to remove all impurities.

Check 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 change will be necessary.

Check for hydraulic system leaks.

### Chassis Bolts

Check all bolts for signs of looseness.

### Swing Bearing

Remove any dirt from between the swing bearing gear teeth, and lubricate.

NOTE

If solvents or a high-pressure washer are used for cleaning the machine, grease the swing bearings.

Check swing gearbox oil level. Top off as required.

The filler plug is located at the top, and the drain plug at the bottom of the gearbox housing. With the machine on level ground, the oil level should reach the filler plug hole. Low oil level is usually due to seal failure on the wormshaft.

**On Model 41/24,** the swing gearbox top bearing should be lubricated with a quality bearing grease. Add grease through the fitting on the top center of the gearbox until grease comes out the purge port on top of the box.

### Lubrication

Lubricate all small pivots (but not the main pin pivots) throughout the machine with any good quality medium grade oil. Special attention should be given to the platform control lever pivots.

### Pivot Pins

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

### Drive Gearbox

Check drive gearbox oil level. Top off as necessary.

### Brake

Check fluid level in brake.

### Engine

Check the engine manual provided with the machine for monthly service requirements.

## SEMI-ANNUAL SERVICE

### Platform Leveling

Examine both platform leveling cylinders, particularly at the pivot points, for any sign of wear or damage. Ensure that the end fittings are secure.

Check cylinders and hose fittings for leaks.

### Platform Pivots

The main pivots on the booms, cylinders and leveling system are fitted with corrosion resistant pins, and pre-lubricated bearings. Check the bearings with the pivot pins removed.

The bearings are steel backed, acetal copolymer lined. If the bearings should show any defect, they must be replaced with the correct type.

### Boom Cylinders

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

Check all cylinders for hydraulic fluid leakage.

### Rear (Drive) Axle

Check axle differential housing oil level. Top off as required.

### Return Line Filter

Change the return line filter element.

Change the suction line filter element.

### Test all Machine Systems

Test the operation of the drive assembly, including drive shaft, axle, couplings and gearbox.

Test the operation of the swing bearing, motor and gearbox.

Test the operation of the platform rotator.

Test the operation of all machine boom functions.

### Engine

Check the engine manual provided with the machine for semi-annual service requirements.

## ANNUAL SERVICE

### Swing Gearbox

Rotate the superstructure for a short period to warm the oil in the swing gearbox. This will allow the oil to flow more freely, and hold any impurities in suspension. Remove the drain and filler plugs from the gearbox housing, and drain the oil. Replace drain plug.

Fill swing gearbox. Replace filler plug.

### Swing Gear Bearings

Grease the swing gear bearings while rotating the superstructure as necessary to insure proper lubrication

### Flexible Hoses

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

### Hydraulic Fluid

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

Hydraulic fluid, when in good condition, is clear amber in color. If the fluid has a cloudy appearance, this indicates the presence of water. If it is dark brown, with a strong "burnt" smell, overheating of the fluid has occurred. The presence of either condition requires a complete fluid change.

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

### Hydraulic Fluid Tank

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

When refilling the tank only, ensure that the fluid temperature is high enough to allow free flow. 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. Remove the tank top plate for internal inspection and cleaning.

Clean or replace the suction hose, and close the drain tap. Reinstall the tank top plate, replacing the gasket if necessary, and refill the tank to the correct level.

### Brake

Check condition of fluid and top off.

### 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 mounting bolts are secure. Check that platform frame members are in good condition.

### Engine

Check the engine manual provided with the machine for annual service requirements.

## 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 bearings as necessary. Pivot pins are treated with an oil absorbing, corrosion resistant coating. The bearings are steel backed, and copolymer lined. Replace with the correct type of pins and bearings.

# DAILY OPERATIONAL CHECKLIST

**All checks must be completed before operation of the SILVER-EAGLE.**

**MODEL NUMBER** _____ **INSPECTED BY** _____

**SERIAL NUMBER** _____ **DATE** _____

- Keep inspection records up-to-date.
- Record and report all discrepancies to your supervisor.
- A dirty machine cannot be properly inspected.

**Keep your SIMON SILVER-EAGLE clean!!**

**THIS CHECKLIST MUST BE USED DAILY. 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 doors on both sides can be opened to inspect components inside. |
| _____ | 2. Check engine oil and fuel tank levels. |
| _____ | 3. Check engine coolant level (water-cooled engines only). |
| _____ | 4. Check hydraulic fluid level with all cylinders retracted. Fluid level should be approximately 4 inches below top of tank. |
| _____ | 5. Check that hydraulic pressure is as stated on the Data Plate. |
| _____ | 6. Check that wheel lug nuts are tightened to proper torque. |
| _____ | 7. Check tires for damage and proper inflation pressure. |
| _____ | 8. Check for bent or sagging hose track. |
| _____ | 9. Check platform and gate for damage. |
| _____ | 10. Check safety belt connection. |
| _____ | 11. Check battery terminals for cleanliness and tight connections. |
| _____ | 12. Check emergency hand pump for proper operation and hydraulic pressure as stated on Data Plate. |
| _____ | 13. Check that drive interlock system has not been tampered with. |

## DAILY OPERATIONAL CHECKLIST (CONTINUED)

| INITIAL | DESCRIPTION |
|---|---|
| _____ | 14. Check pressure gauge on filter assembly. Replace filter element if gauge reads 20 PSI or higher. We recommend replacing both suction and return filter elements at the same time. |
| _____ | 15. Check warning and operating instruction decals for legibility. |
| _____ | 16. After pre-inspection checks have been completed, check ground control station for proper operation (refer to "Ground Operation and Checks" in Operators Manual). |
| _____ | 17. Check platform controls for proper operation (refer to "Platform Operation and Checks" in Operators Manual). |
| _____ | 18. With platform raised, check for smooth operation of low speed drive. |
| _____ | 19. Check "Emergency Stop" function at both ground and platform. |
| _____ | 20. Follow engine daily service requirements. Refer to the Engine Maintenance Manual supplied with your SILVER-EAGLE. |

## ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

| INITIAL | DESCRIPTION |
|---|---|
| | **DAILY** |
| _____ | 1. Inspect pylon boots, cylinder boots, controller boots, etc., for cuts or other damage after every eight hours of service. Repair or replace if necessary. |
| _____ | 2. Check hydraulic system for leakage after every eight hours of operation. |
| | **WEEKLY** |
| _____ | 1. Inspect condition of hydraulic fluid weekly. Fluid should have a clear, amber color. |
| _____ | 2. Lubricate all grease fittings. |
| _____ | 3. Check all decals for legibility. |
| _____ | 4. Apply dry lubricant to swing drive pinion gear. |

# MONTHLY OPERATIONAL CHECKLIST

**MODEL NUMBER** _____ **INSPECTED BY** _____

**SERIAL NUMBER** _____ **DATE** _____

- Keep inspection records up-to-date.
- Record and report all discrepancies to your supervisor.
- A dirty machine cannot be properly inspected.
  **Keep your SIMON SILVER-EAGLE clean!!**

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

| INITIAL | DESCRIPTION OF CHECKS |
|---|---|
| _____ | 1. Perform all checks listed on Daily Operational Checklist. |
| _____ | 2. Lubricate all grease fittings (including those on drive shaft). |
| _____ | 3. Inspect condition of hydraulic fluid in the tank. Fluid should be a clear, amber color. |
| _____ | 4. Check hydraulic system for leaks. Examine hoses for signs of excessive wear, chafing or twisting. Replace worn hoses if necessary. |
| _____ | 5. Inspect the work platform and boom structure for damage and condition of welds. |
| _____ | 6. Check the low speed drive to ensure it is within specified limits. |
| _____ | 7. Check emergency descent system. |
| _____ | 8. Check all decals for legibility. |
| _____ | 9. Clean and lubricate all valve controls so they do not stick. |
| _____ | 10. Check joints and linkage pins for security. |
| _____ | 11. Check tires for cracks and other damage. |
| _____ | 12. Check for unit damage, broken welds, improper or quick fixes, (i.e. wired parts, improper parts). |

## MONTHLY OPERATIONAL CHECKLIST (CONTINUED)

| INITIAL | DESCRIPTION |
|---|---|
| _____ | 13. Torque eight bolts on axle mounting blocks. |
| _____ | 14. Check rubber wrap around hoses at moving anchor and extend boom. |
| _____ | 15. Check boom hose track for sag and other damage. If damaged, repair, and correct the cause of damage, i.e. hoses too tight, breaking cross braces and worn, cracked or abraded hoses. |
| _____ | 16. Check torque of swing bearing bolts. |
| _____ | 17. Check adjustment and security of swing drive. There should be a slight amount of backlash between the superstructure and undercarriage when properly adjusted. |
| _____ | 18. Check oil level in swing drive. It should be half filled. On Model 41/24, grease top bearing. |
| _____ | 19. Check oil level in rear axle (refer to Lubrication Chart). |
| _____ | 20. Check snap rings on cylinder and other pins. |
| _____ | 21. Follow engine monthly service requirements. Refer to the Engine Maintenance Manual supplied with your SILVER-EAGLE. |

## ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

| INITIAL | DESCRIPTION |
|---|---|
| | **EVERY 90 DAYS** |
| _____ | 1. Change suction and return filter elements. |
| _____ | 2. Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your SILVER-EAGLE. |

# SEMI-ANNUAL OPERATIONAL CHECKLIST

**MODEL NUMBER** _____ **INSPECTED BY** _____

**SERIAL NUMBER** _____ **DATE** _____

- Keep inspection records up-to-date.
- Record and report all discrepancies to your supervisor.
- A dirty machine cannot be properly inspected.
  **Keep your SIMON SILVER-EAGLE clean!!**

**THIS CHECKLIST MUST BE USED AT 6 MONTH INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.**

| INITIAL | DESCRIPTION |
|---|---|
| _____ | 1. Perform all checks listed on Daily and Monthly Operational Checklists. |
| _____ | 2. Have hydraulic fluid sample analyzed at a test laboratory. Follow the recommendations of test results.<br><br>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 damage and broken welds. |
| _____ | 4. Check operating speeds to ensure they are within specified limits. |
| _____ | 5. Check operation of emergency power system. |
| _____ | 6. Check all decals for legibility. |
| _____ | 7. Clean and lubricate all push button switches with an electrical contact cleaner and ensure that the switches operate freely in all positions. |
| _____ | 8. Check all electrical mounting and hardware connections for security. |
| _____ | 9. Check that engine RPM is as stated on Data Plate. |
| _____ | 10. Replace both suction and return filter elements. |
| _____ | 11. Check tightness of upper frame, swing bearing and swing drive mounting bolts. |

## SEMI-ANNUAL OPERATIONAL CHECKLIST (CONTINUED)

| INITIAL | DESCRIPTION |
|---|---|
| _____ | 12. Drain and replace lubricant from swing drive and rear axle. If badly contaminated, it may be necessary to disassemble and inspect components. |
| _____ | 13. Inspect entire machine for worn or damaged components. Replace as necessary. |
| _____ | 14. Lubricate all hydraulic valve spool linkages. |
| _____ | 15. Lubricate swing bearing and drive pinion gear. |
| _____ | 16. Follow engine semi-annual service requirements. Refer to the Engine Maintenance Manual supplied with your SILVER-EAGLE. |

## ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

| INITIAL | DESCRIPTION |
|---|---|
| _____ | 1. Follow engine severe usage service requirements. Refer to the Engine Maintenance Manual supplied with your SILVER-EAGLE. |

# MAINTENANCE CHART

NOTE

This Maintenance Chart is only to be used as a reminder of the detailed instructions given in this manual. All detailed servicing instructions must be implemented.

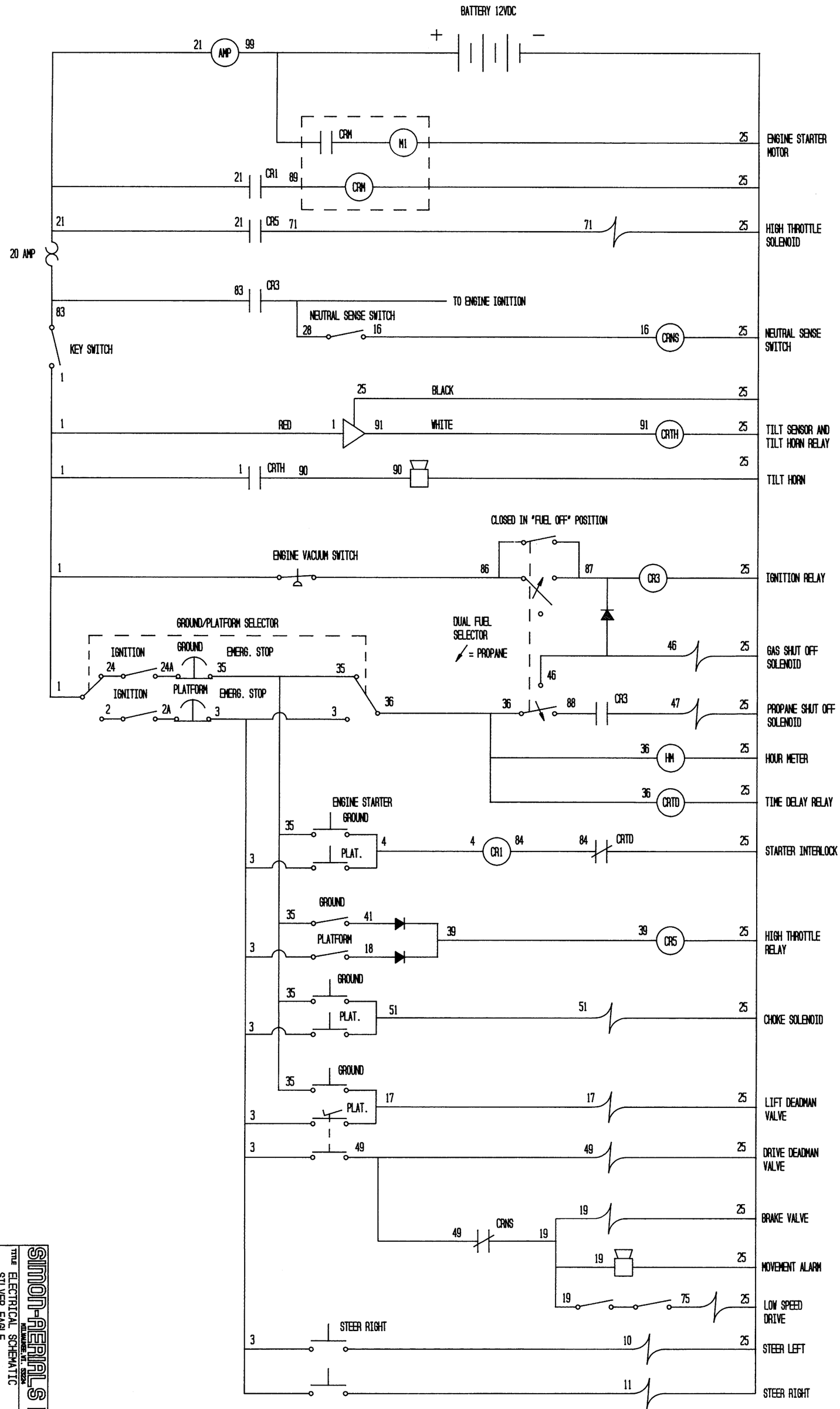
| Maintenance Item | Daily | Weekly | Monthly | Semi-Annual | Annual | 4 Year |
|---|---|---|---|---|---|---|
| Check machine structure | X | | | | | |
| Check platform structure | X | | | | | |
| Check boom structure | X | | | | | |
| Check unit for broken welds | X | | | | | |
| Check tire condition | X | | | | | |
| Check tire pressure | X | | | | | |
| Check wheel lug nuts | X | | | | | |
| Check hose track | X | | | | | |
| Check platform door latch | X | | | | | |
| Check pivot pin security | X | | | | | |
| Check battery terminals | X | | | | | |
| Check engine oil level | X | | | | | |
| Check fuel level | X | | | | | |
| Check engine coolant level | X | | | | | |
| Check pressure gauge on filter assembly | X | | | | | |
| Check hydraulic fluid level | X | | | | | |
| Check hydraulic pressure | X | | | | | |
| Inspect hydraulic system | X | | | | | |
| Check low speed drive | X | | | | | |
| Check platform leveling | X | | | | | |
| Check emergency pump operation | X | | | | | |
| Test all machine systems | X | | | | | |
| Check battery electrolyte | | X | | | | |

# MAINTENANCE CHART

| Maintenance Item | Daily | Weekly | Monthly | Semi-Annual | Annual | 4 Year |
|---|---|---|---|---|---|---|
| Check control valves | | X | | | | |
| Check steering system | | X | | | | |
| Check for tangled hoses | | | X | | | |
| Check chassis bolts | | | X | | | |
| Check moving anchor | | | X | | | |
| Check boom/cylinder pins | | | X | | | |
| Check torque on swing bearing bolts | | | X | | | |
| Torque bolts on axle mounting blocks | | | X | | | |
| Check drive gearbox oil | | | X | | | |
| Check swing gearbox oil level | | | X | | | |
| Check rear axle oil level | | | X | | | |
| Check hydraulic fluid contamination | | | X | | | |
| Lubricate all grease fittings | | | X | | | |
| Clean & lubricate valve controls | | | X | | | |
| Grease swing gear teeth | | | X | | | |
| Lubricate pivot pins | | | X | | | |
| Check engine RPM | | | | X | | |
| Replace fuel filter | | | | X | | |
| Engine tune-up | | | | X | | |
| Check platform mountings | | | | X | | |
| Check boom gland nuts | | | | X | | |
| Check swing drive mounting bolts | | | | X | | |
| Check electrical system | | | | X | | |

# MAINTENANCE CHART

| Maintenance Item | Daily | Weekly | Monthly | Semi-Annual | Annual | 4 Year |
|---|---|---|---|---|---|---|
| Check operating speeds | | | | X | | |
| Replace swing drive and axle fluid | | | | X | | |
| Replace suction and return filter elements | | | | X | | |
| Clean and lubricate push button switches | | | | X | | |
| Lubricate hydraulic valve control linkages | | | | X | | |
| Analyze hydraulic fluid | | | | X | | |
| Check pivots for wear | | | | | X | |
| Check hoses for wear | | | | | X | |
| Change hydraulic fluid | | | | | X | |
| Grease swing bearings | | | | | X | |
| Examine pivot pins | | | | | | X |
| Examine bearings | | | | | | X |

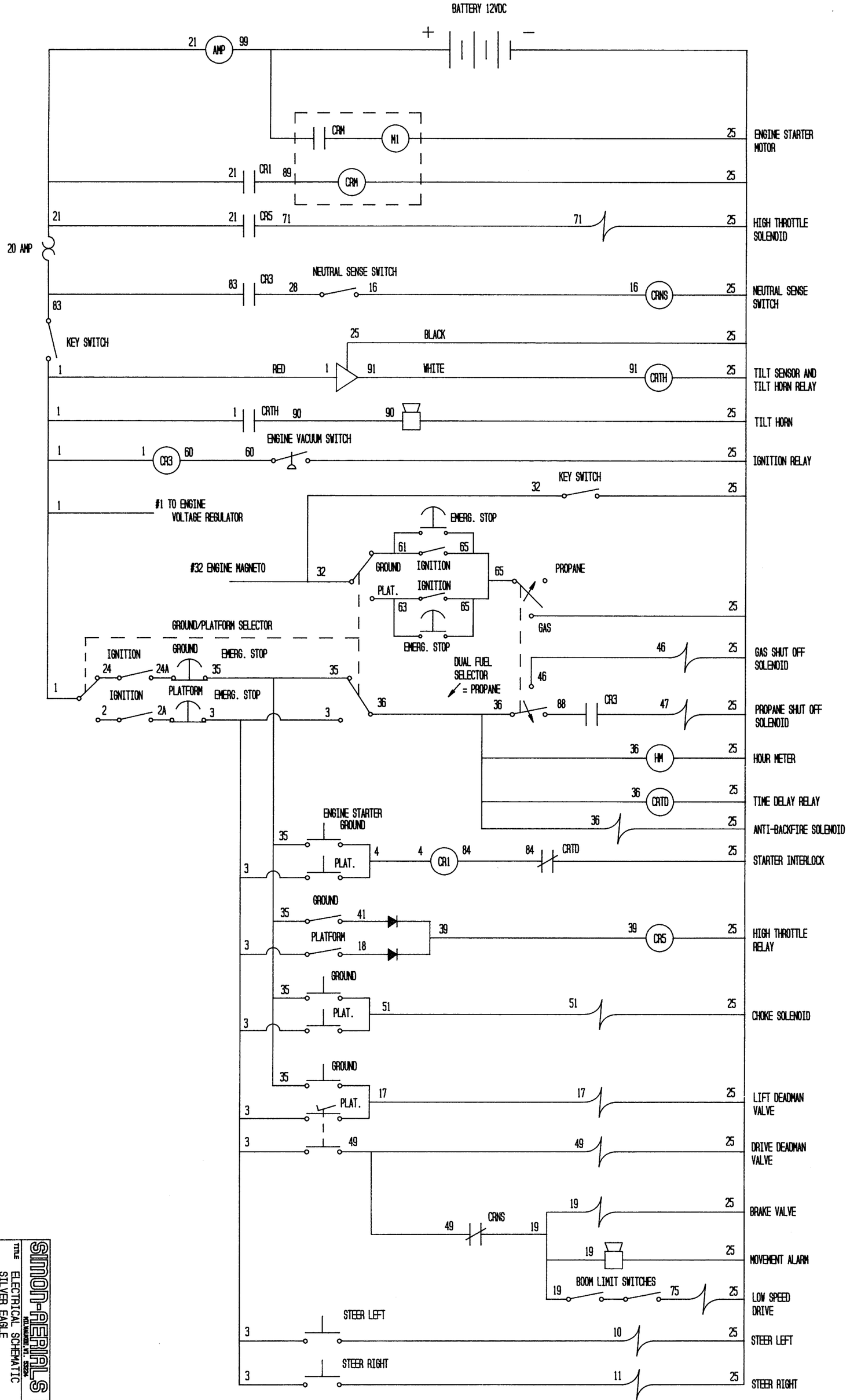



SIMON-AERIALS INC.
MELKSHAM, WILTS. ENGLAND

TITLE: ELECTRICAL SCHEMATIC
SILVER EAGLE
DUAL FUEL / 41/24 ONAN

REVISION

DRWG. NO. SDS-214200-0

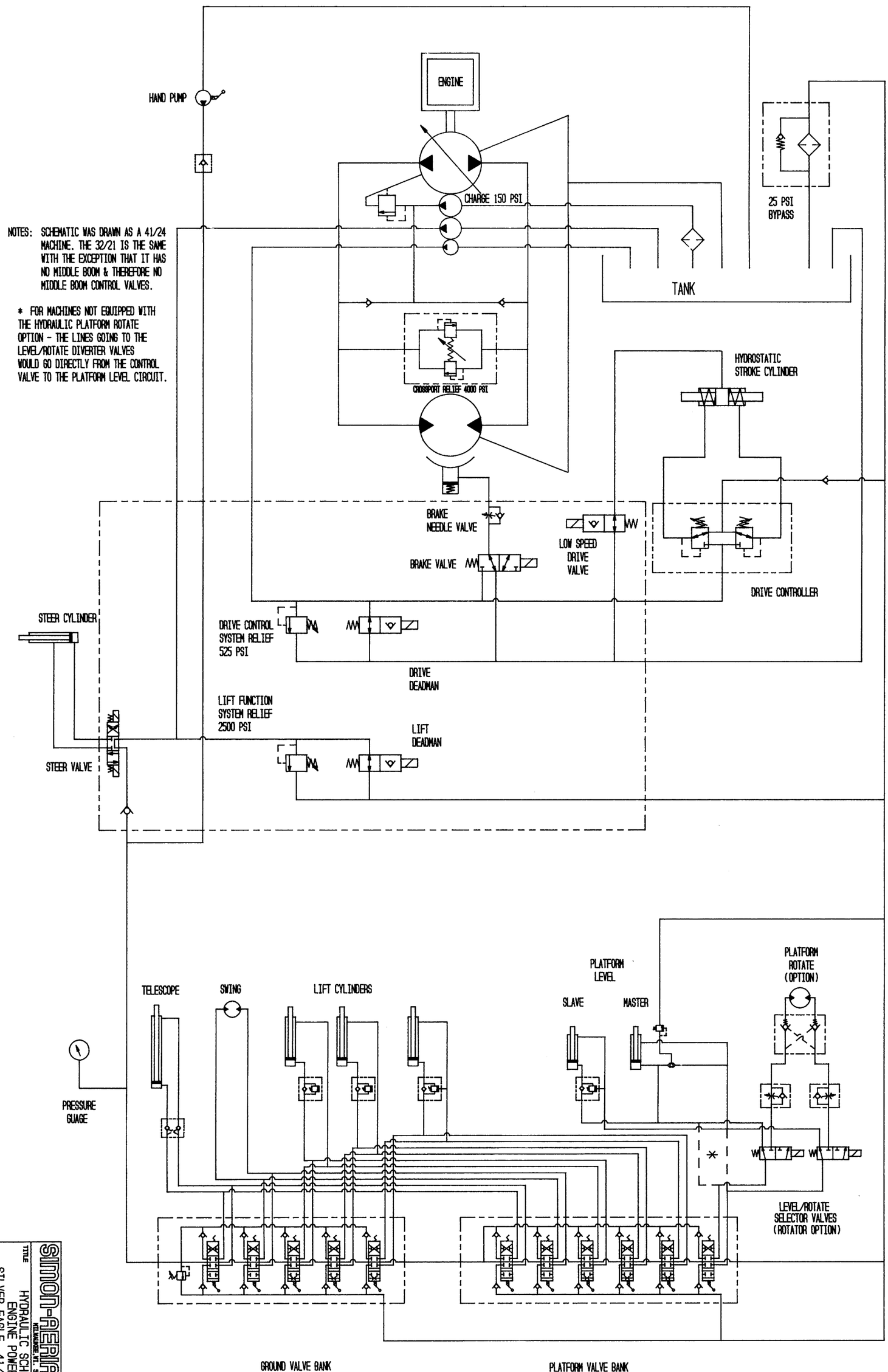



SIMON-AERIALS INC.

TITLE: ELECTRICAL SCHEMATIC
SILVER EAGLE
DUAL FUEL / 32/21 BRIGGS

REVISION

DWNG. NO. SDS-214123-0




SIMON-AERIALS INC.
MELVILLE, NY. 11747

TITLE: HYDRAULIC SCHEMATIC ENGINE POWERED SILVER EAGLE, 41/24, 32/21

REVISION

DRWG. NO. SDS-214303-0